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SYNTHETIC APERTURE RADAR DATA VARIANCE ANALYSIS.(U)
FEB 80 R PIETSCH, W A RASCO F33615-77-C-1169
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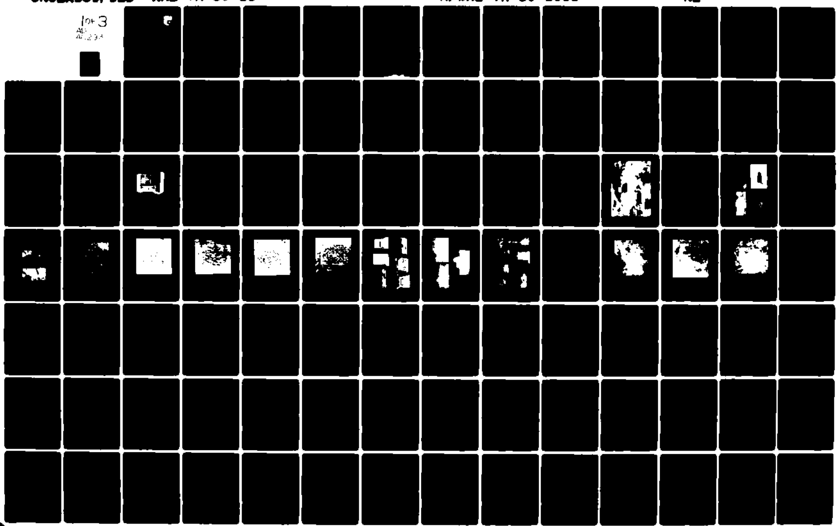

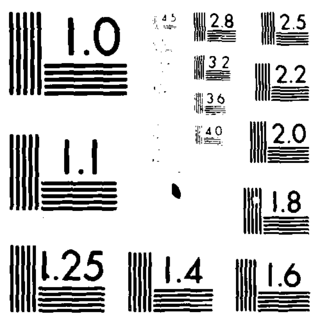

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SYNTHETIC APERTURE RADAR DATA VARIANCE ANALYSIS

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February 1980

Final Report for Period August 1977 to September 1978

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AFWAL-TR-80-1058	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Synthetic Aperture Radar Data Variance Analysis		5. TYPE OF REPORT & PERIOD COVERED Final Report for period Aug 77 - Sep 78
		6. PERFORMING ORG. REPORT NUMBER ARL-TR-80-16
7. AUTHOR(s) Roy Pietsch William A. Rasco, Sr.		8. CONTRACT OR GRANT NUMBER(s) F33615-77-C-1169
9. PERFORMING ORGANIZATION NAME AND ADDRESS Applied Research Laboratories The University of Texas at Austin Austin, TX 78712		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Project 7622
11. CONTROLLING OFFICE NAME AND ADDRESS Avionics Laboratory Air Force Wright Aeronautical Laboratories Air Force Systems Command, W-PAFB, Ohio 45433		12. REPORT DATE February 1980
		13. NUMBER OF PAGES 273
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release, distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

synthetic aperture radar
ground target radar return
target discrimination

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Analysis and investigations in the area of target classification based upon four-look synthetic aperture radar return were conducted using FLAMR data, to determine the extent to which four-look image plane radar returns may be used to discriminate between tactical targets and natural features.

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FOREWORD

This final report is submitted in accordance with the requirements of Contract F33615-77-C-1169. The work documented herein was accomplished under Project 7622, during the period July 1977 to October 1978 under the cognizance of Mr. E. Zelnio, Project Engineer, AFWAL/AARM-1, Avionics Laboratory, Wright-Patterson Air Force Base, Ohio.

The study reported herein was performed by the Aerospace Technology Division, Applied Research Laboratories, The University of Texas at Austin, Austin, Texas.

This report is assigned originator's report number UT/ARL-TR-80-16.

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I. INTRODUCTION

The image-plane data derived from a ground scene by an airborne, imaging Synthetic Aperture Radar (SAR) often exhibit significant look-to-look variations in the returns from a single resolution element. Examination of various resolution elements, or pixels (picture elements) from a number of doppler beam sharpening (DBS) scans, recorded in flight with the Forward Looking Advanced Multimode Radar (FLAMR) experimental flight test radar system, appeared to show that the returns from some types of man-made objects vary over a greater dynamic range than do the returns from other types of objects.

The wavelength of FLAMR was such (.018 meters) that a FLAMR "high resolution" (20 ft) pixel could contain many prominent scatterers. This, with the overlay ratio (4:1) frequently employed, together with the look-to-look change in aspect angle at the target, lead to the expectation that a noticeable variation in the composite return from a given pixel might occur. This variation could be greater for some types of targets than for other types of a more diffuse nature.

To explore this phenomenon, the Avionics Laboratory, Air Force Wright Aeronautical Laboratories (AFWAL) W-PAFB, contracted with Applied Research Laboratories, The University of Texas at Austin (ARL:UT), to undertake an investigation of FLAMR Image Plane data to determine whether the observed variations contain unique information that would permit discrimination between specific vehicle types and specific natural features, and between specific vehicle types of man-made clutter.

To meet the criteria established for the investigation two geographical areas mapped with the FLAMR system were selected: the NEBO radar target array near Barstow, California; and the urban area of Reedley, California. All scenes chosen were mapped in the DBS mode employing 4:1 overlay with 20-ft resolution. Target area selection is discussed in Section III of this report. Ground truth imagery and samples of the radar imagery are also presented. The FLAMR system and the nature of the data gathered with the system are discussed in Section II. The four-look filter magnitude tabulations derived from the wideband tape recordings for the selected scans are presented in Appendix A.

The initial phases of the inquiry were devoted to an analysis of the dispersion characteristics of radar target returns from the various target classes. This effort was stimulated by the need to identify characteristics of the scene statistics of potential value for target discrimination. For the purpose of the investigation the filter magnitude data tabulated in Appendix A was converted to power in arbitrary units. These data in turn were processed to determine the nature and characteristics of target variance. Appendices B through D present the results of the statistical investigations in the form of figures and tables.

The next stage of the research was devoted to the development of parametric discriminant functions and non-parametric discrimination methods based on variants (features) calculated from the four looks (samples) per each pixel on the potential target. The derivation and development of the variants and discriminant functions are delineated in Sections IV and V, respectively.

Due to the result that class separability was due primarily to relative target power rather than look-to-look variation as was initially hoped, the Kolmogorov-Smirnov statistical test was employed to compare the distribution of the total class population for several two class cases to infer whether or not discrimination information exists in the look-to-look variation. The theory and results of the Kolmogorov-Smirnov test are covered in Section VI of the report.

Summary observations are outlined in Section VII.

II. DATA ORIGINS AND CHARACTERISTICS

Origin of Data

The SAR data utilized by ARL:UT in the Data Variance Study for AFWAL was acquired during the FLAMR flight test program. This program consisted of a series of 72 flights during the period August 1972 to March 1976. The following provides brief descriptions of the radar system and the radar mapping modes so that the reader may better understand the nature of the basic radar returns data presented elsewhere in this report.

The FLAMR System

The FLAMR project was sponsored and directed by the Avionics Laboratory (AARM/698DF). The radar was designed, built and operated by Hughes Aircraft Company (HAD). The electronically scanned phased array antenna was designed and built by Emerson Electric Company (EEC). The radar was flown in a modified RB-47H aircraft which was maintained and operated by Rockwell International Corporation (RIC). RIC also was responsible for system instrumentation. The job of ARL:UT was data analysis and evaluation, experiment design, and flight test support during the flight test program. ARL:UT is now maintaining and operating the FLAMR/SAR Data Bank for the Avionics Laboratory.

The FLAMR system was a very flexible and well instrumented state-of-the-art brassboard system for investigating digital control and digital processing techniques for generating realtime, high-resolution synthetic aperture ground maps.

The system was designed for a high degree of flexibility and was thoroughly instrumented. A six-man flight crew consisted of a pilot, co-pilot, drift-sight and vertical camera operator, two radar system operators, and an instrumentation operator.

The instrumentation operator was responsible for operation of the phased array antenna, various oscilloscope recording cameras, the FM tape recorder, the oscillograph, the forward pointing cameras and serviced the wide-band Genisco tape recorder in-flight. The drift-sight operator obtained navigation-update fixes on ground points whose coordinates were precisely known, and also operated the vertical camera as called for by mission plans. The radar system operators monitored system performance, selected operating modes such as stabilized or unstabilized, DBS, SASM, PPI, RBGM, special scan, etc., and system control parameters such as IF Gain, pulse compression gain, map overlay ratio, display threshold, real beam shape, and dB per gray shade assignment to improve the inflight imagery. In addition, system operators used manual override of the autocursor to center the map on a desired terrain point whenever inertial navigator drift resulted in the need for a correction.

The list below contains some of the more important FLAMR parameters.

Transmitter Peak Power	- 100 kW
Pulse Repetition Rate	- 1.7 - 2.3 kHz
Antenna Beamwidth (AZ)	- 1.9°
Wavelength	- 0.018 m
* SAR Resolutions	- 7.5, 20, 40, 80 ft

* The 7.5 ft resolution capability was added late in the program. The amount of imagery obtained, although significant, was substantially less than that obtained at 20, 40, and 80 ft.

Radar Modes - (a) Synthetic Array Strip Map (SASM)

(b) Doppler Beam Sharpened (DBS)

(c) Plan-Position Indicator (PPI)

(d) Real Beam Ground Map (RBGM)

** Frequency Diversity - 4 frequencies available

Map overlay options - 1, 2, or 4

A simplified functional block diagram of the FLAMR is shown in Fig. 1. The antenna pointing angle and beam shape were specified by a general-purpose computer (the ALERT GPC) through the Beam Steering Computer (BSC) which controlled the antenna. The coverage was approximately a 65° (half-angle) cone about the aircraft velocity vector. The system incorporated an Inertial Navigation Unit (INU), the LTN-51, modified to provide position, velocity, acceleration, and attitude data for accurate motion compensation.

The RF section of the system had a high-average-power, Ku-band transmitter, used a binary phase coded waveform at a low Pulse Repetition Frequency (PRF), and had a coherent, frequency-agile, radar master oscillator (RMO). The receiver was a double-conversion superheterodyne system with a wideband first-IF section followed by a matched bandpass filter and in-phase and quadrature second detectors. The local oscillator for the latter was offset by the system synthesizer (HP-5100B). From the output of the receiver to the final map presentation, FLAMR was a completely digital system. The wideband in-phase and Quadrature (I/Q or IPQ) video from the second detector went to two fast

** Substantial data is available without frequency diversity, although much of the imagery was made with frequency "Hop."

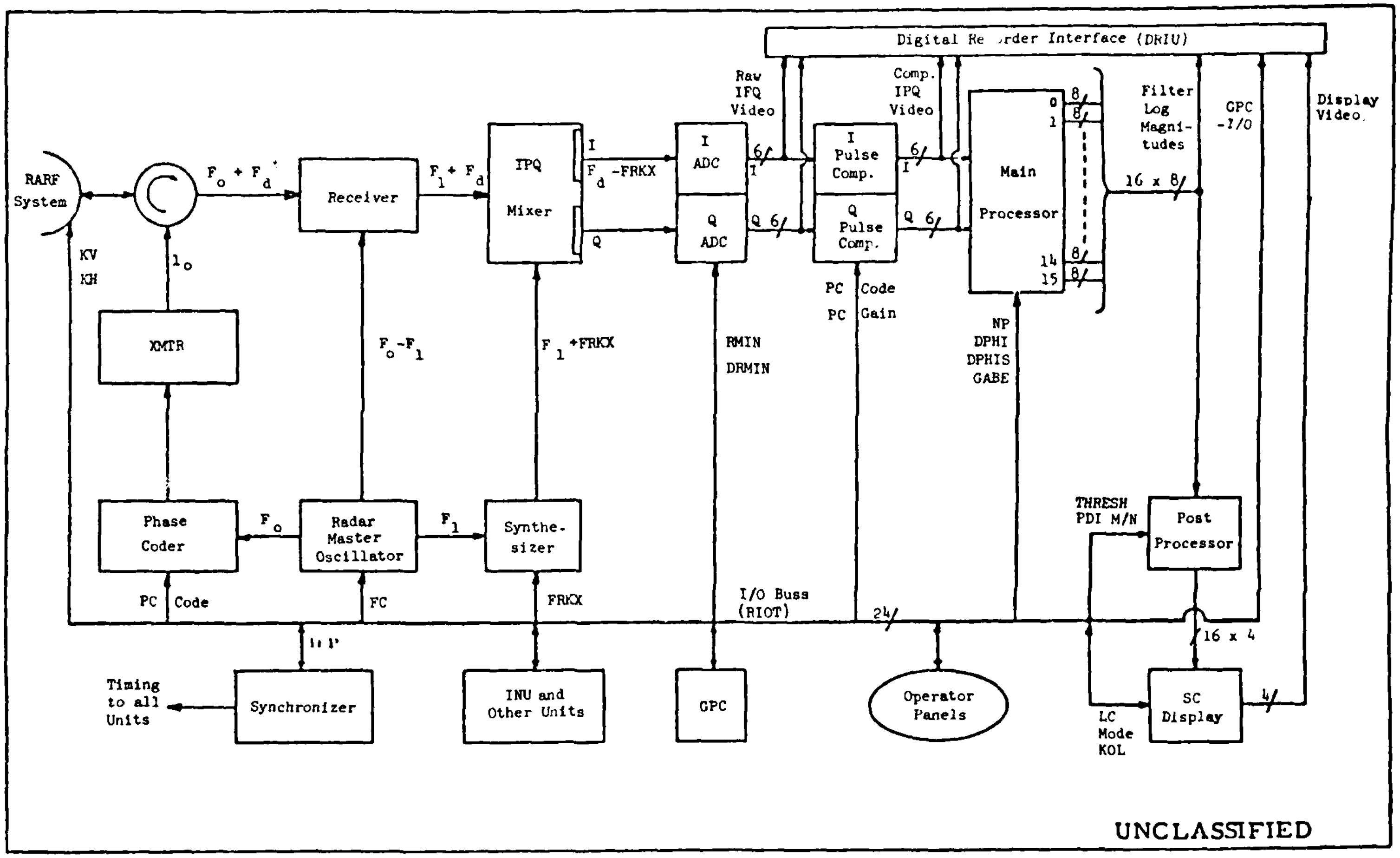

Figure 1. FLAMR System Simplified Block Diagram

Analog-to-Digital Converters (ADC's) where it was range gated and digitized. The buffered outputs were in a 6-bit, 2's-complement format. The range gate delay was controlled by the start range and the rate of range closure on the mapping point. Immediately following the buffered ADC's was the first major instrumentation pickoff. Up to 512 range bins, depending on the pulse compression ratio, were recorded on W.B.T. (wideband magnetic tape) for each pulse and for each component of digital video.

This feature makes FLAMR nearly unique. All range bins and all pulses of the raw I/Q video were recorded on the W.B.T.'s. Also, these band-limited I/Q video data were processed only by introducing a constant frequency off-set to remove the gross doppler shift.

Thus, the I/Q data available on wideband magnetic tapes are uncontaminated by extensive processing and are particularly useful for many current SAR study requirements.

The next step was pulse compression in range, during which the digitized video was correlated with the binary phase code sequence. This process involved adding or subtracting the contents of successive range bins over a span equal to the compression ratio to obtain each range bin of compressed data. The gain could be adjusted by a left-shift operation at this point. The six most-significant bits (MSB's) of each shifted sum were used as a 2's complement representation of the compressed in-phase or quadrature radar return in a particular range bin. There were always 384 range bins for each component of pulse compressed data.

The pulse compressed video was tapped off for recording on the W.B.T. at the second major instrumentation point. However, the capacity of the recording system was insufficient for both compressed and uncompressed I/Q digital video; and only one type could be recorded during a particular flight.

The digital video from the pulse compressor, still in separate components, was rounded to 6 bits and sent to the Digital Doppler Signal Processor (DDSP), which operated on the range-compressed I/Q video data from a specified number of pulses to form 16 overlapping, weighted, complex pre-sums followed by a 16-point discrete Fourier transform for each range bin. Fine phase motion compensation, i.e., synthetic array pointing and focusing, were accomplished during the pre-summing operation. The pre-sum number NP specified the number of pulses used to form each of the 16 complex pre-sums. This controlled the length of a synthetic array for a given PRF and therefore the doppler resolution. The data were uniformly rescaled during pre-summing to adjust the gain.

The 16-point discrete Fourier transform was similar to a bank of 16 filters, each tuned to a specific doppler phase rate and correlating all complex pre-sum data with that phase rate. This served to establish 16 discrete focus points or 16 synthetic beams similar in shape and centered about the array center (focus) point. Calculation of the Fourier components completed the coherent processing and gave an image in complex form -- a pair of 12-bit words for each range-bin/doppler-filter combination.

The magnitude of each of the 16 complex Fourier components (filters) was generated next as $0.5 \log_2 (I^2 + Q^2)$, and the resulting values were referred to as "filter magnitude" data.

The 16 log magnitude values, each an 8-bit word, were recorded on the W.B.T. for all 384 range bins. All 16 filters were always formed; but, depending on the mapping mode, less than 16 were actually used. In the "snapshot" or Doppler Beam Sharpened (DBS) mode, eight filters were used, centered about the designated array center line. From 2 to 12 filters were used in the Synthetic Array Strip Map (SASM) mode.

The log magnitude filter data were next thresholded by subtraction of a 6-bit level. Individual thresholds were used for each filter. Each word of the array was then multiplied by a constant to adjust post processor gamma, and the four MSB's of the result were sent to the digital scan converter where data from successive arrays were overlaid (averaged) as required by the overlay ratio (KOL). The resulting 4-bit display video, with line code and mode information, was tapped off to the instrumentation system and recorded on the W.B.T. and also sent to the Post Processor Display (PPD) and the PPD Repeater in the aircraft, where the resulting maps were displayed for viewing and photography.

Almost all system functions were under control of the ALERT GPC. This computer also used operator inputs, INU inputs, etc., and controlled other system functions having to do with timing (e.g., the IPP value to the system synchronizer), velocity measurement, target tracking, and general housekeeping. All traffic on the computer Input/Output (I/O) bus, also called the Radar Input/Output Terminal (RIOT), was recorded on the W.B.T.

The Digital Recorded Interface Unit (DRIU) buffered the FLAMR digital data and put it in Miller-coded Pulse Code Modulation (PCM) format for recording by the Wideband (tape) Recorder (WBR) in the RB-47H aircraft. The wideband tapes recorded in flight were played back on the Digital Recorder Interface Equipment (DRIE) maintained in the ground station.

Eight tracks of the 16-track wideband tape were used for recording compressed or uncompressed I/Q video data; while filter magnitude, RIOT, and PPD data were each recorded on separate tracks, voice and IRIG-B time code were frequency multiplexed and redundantly recorded on the two outer tracks as a safeguard against loss of information due to edge damage. These two tracks also contained a 200-kHz reference signal. The remaining track was later used for recording FLAP Daisychain data.

The FLAMR system has high-, medium-, and low-resolution mapping modes with respective nominal resolutions of 20, 40 and 80 ft. The addition of the FLAP system, described below, added a fourth super-high-resolution mapping mode with a nominal resolution of about 7.5 ft.

The FLAMR/FLAP System

The FLAMR Angle Processor (FLAP) (see diagram in Fig. 2) was operated parallel with the FLAMR system and derived timing and control signals from it. FLAP was a very high-speed, high-capacity data processing system and was incapable of operating alone; so it is proper to refer to the combination with FLAMR as the FLAMR/FLAP system. This equipment was used on FLAMR flights beginning with Flight 49 on 28 May 1975 to provide three-channel monopulse processing capability as well as to improve the mapping resolution by a factor of three and to increase processing capacity and flexibility.

All FLAP units were under the control of a separate (Datacraft) mini-computer via a Daisychain hookup. Programmable Signal Processor (PSP) output data went to the Datacraft via the same bus. This computer exchanged information with the FLAMR ALERT GPC via direct memory access and with the FLAP control panel via the Daisychain.

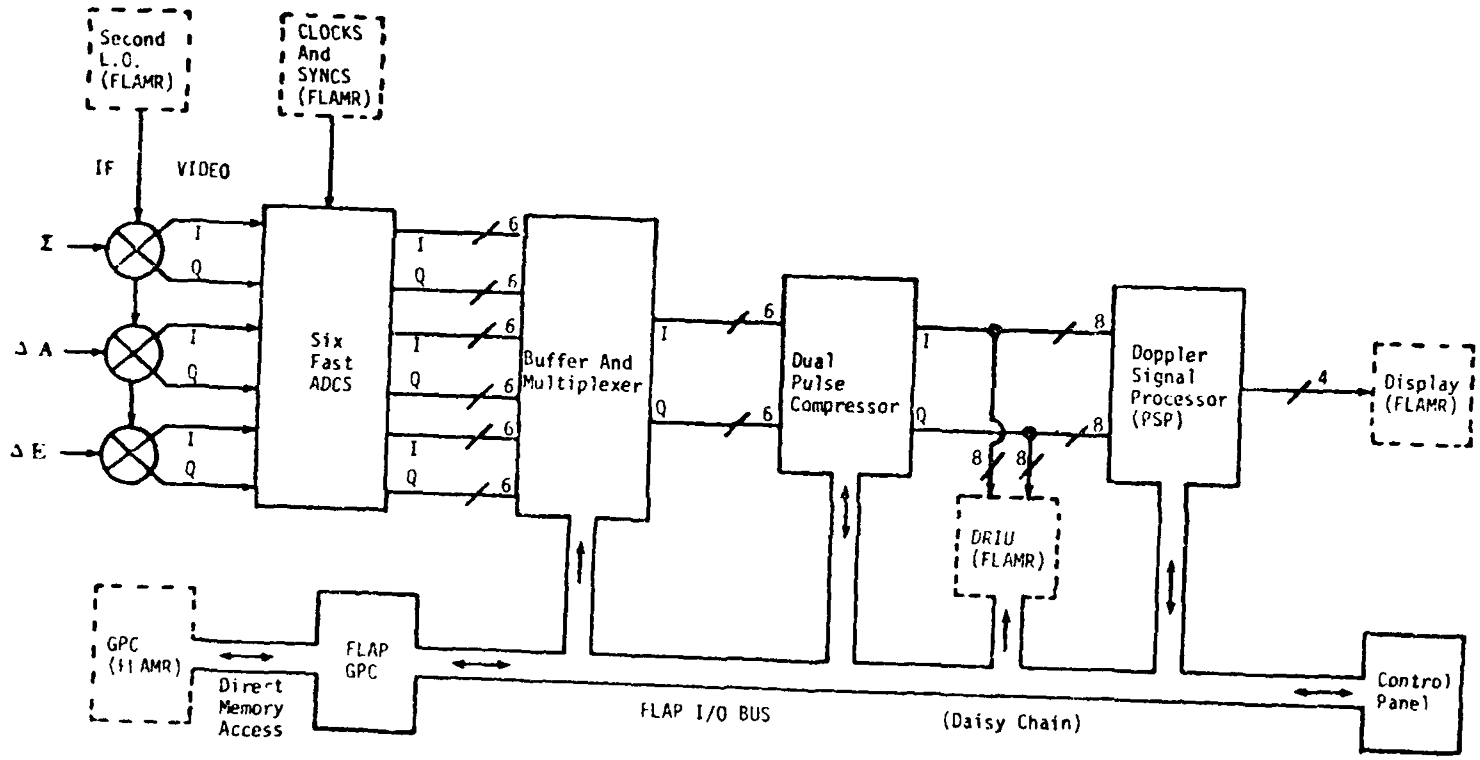

Figure 2

FLAMR Angle Processor (FLAP) Subsystem
Simplified Block Diagram

The wideband tape recording system was modified so that FLAP I/Q video data could be recorded after pulse compression. The choice of recording FLAMR or FLAP I/Q data was made by the operator in flight, but the selection of compressed or uncompressed FLAMR I/Q data was still made by a cable change on the ground. The one remaining unused channel on the 14-channel wideband recorder was used to record FLAP controller I/O traffic (FLAP Daisychain data) in the same way as RIOT data, but there was no way of recording the FLAP/FLAMR data exchanges via direct memory access. Retrieval of RIOT or Daisychain data on 9-track computer tape during play-back of a wideband tape on the DRIE was made switch selectable on the DRIE control panel.

The two major FLAMR mapping modes (DBS and SASM) differed mainly in their scan patterns and in their sequencing with the auxiliary time-shared Clutter Error Detection (CED) mode for doppler supervision of the INU velocity outputs. Within the main mapping modes there were submodes which differed in the details of map scan geographic stabilization. Special-purpose submodes, e.g., reduced scan width for rapid mapping of a series of targets, and PPI scan for low-resolution, short-range mapping, were also programmed.

The basic process of synthetic array formation was the same in all SAR mapping modes. Each synthetic array flown mapped a narrow patch on the ground that was 2 to 12 azimuth elements wide and 384 range bins long. A complete map (frame, scan, or strip) was made up of many of these patches laid side-by-side on the display with varying amounts of overlap (noncoherent integration to reduce "speckle" or radar echo scintillation).

As the mapping aircraft flew from the start (S) to the end (E) of a trajectory segment as shown in Fig. 3, the radar mapped the area corresponding to a scan frame (snapshot) in the DBS mode. The interval ES was divided into a succession of (44*KOL + 1) synthetic array lengths corresponding to the same number of long narrow patches on the map. Thus the array centered at A mapped the patch centered at PC. For the DBS scan pattern shown in the figure, the patches were 8 azimuth elements wide by 384 range bins long on a square sampling grid and were overlapped in azimuth by a factor of KOL:1, KOL=1 (no overlap). Regardless of the overlay ratio, a complete DBS map contains 360 azimuth lines, each consisting of 384 range cells.

Between each complete map frame the system interleaved a velocity measurement (CED) mode with a duty factor of about 0.1 for full-width maps. If desired, the scan width could be reduced to obtain faster map and velocity update rates. The minimum useful map width was three patches, and this gave an update rate somewhat greater than 0.5 maps/sec (somewhat less than 2 sec/ map) in the high-resolution mode.

Succeeding scans could be centered about the same point C, or about any point on the map designated by the operator by use of a cursor. Other options included centering successive scans at the same range and azimuth values, or at a specified latitude and longitude in the so-called Autocursor mode. The Special Scan mode repeatedly mapped four targets in sequence, given their locations with respect to an initial target acquired and designated in the Autocursor mode, and was capable of dropping targets as they passed out of range and adding new targets from a list stored in memory.

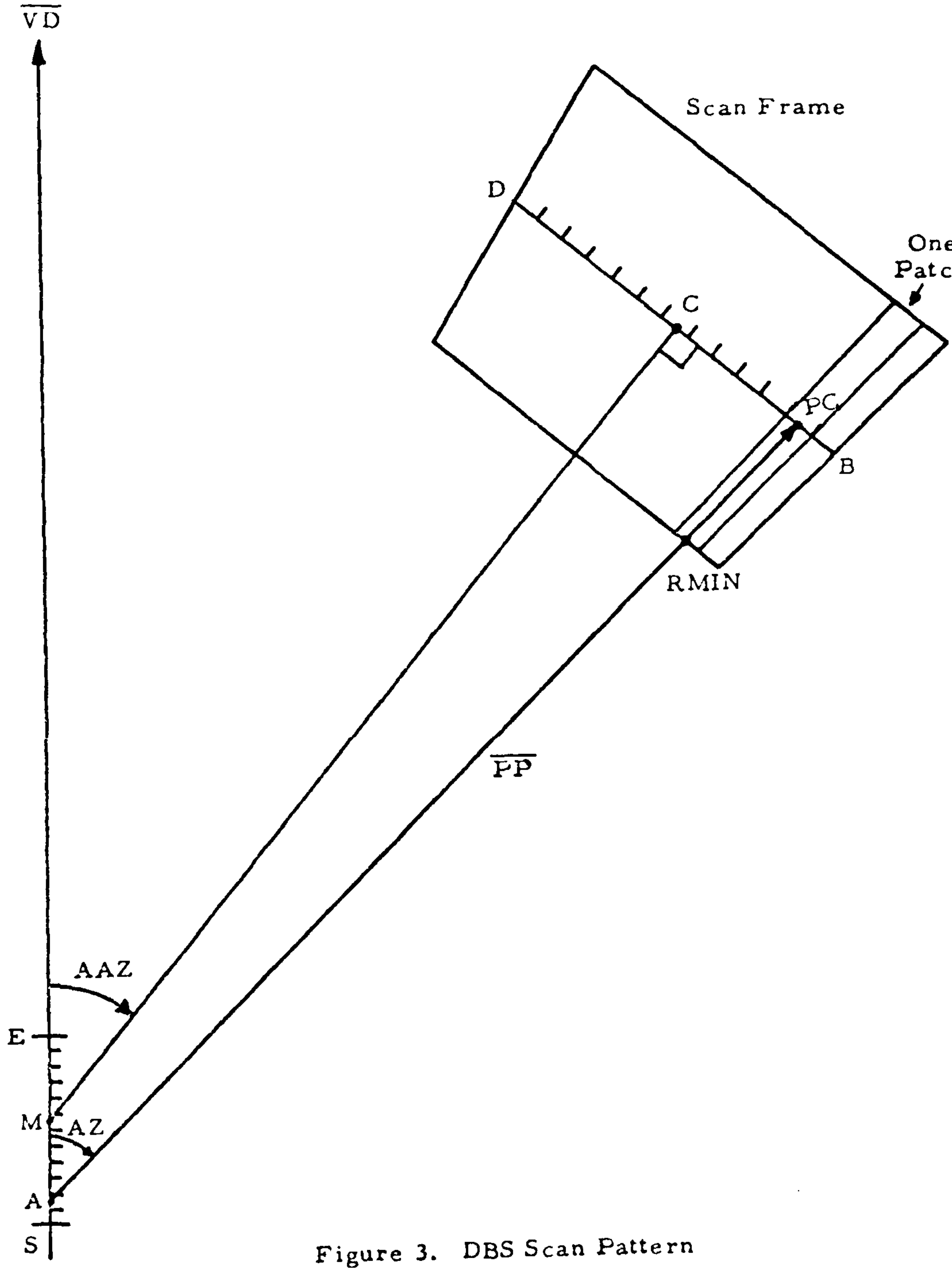

Figure 3. DBS Scan Pattern

The Synthetic Array Strip Map (SASM) mode provided continuous strip maps at forward left or right squint angles of 45° (the value usually selected) or 63.4° (arctan 2) with the same overlay and resolution options as the DBS mode. The line of successive patch centers was nominally parallel to the ground track of the aircraft. Short periods of the velocity measurement (CED) mode alternated with the map arrays with a duty factor of about 0.1, since there were no definite frame or scan divisions in this mode.

There were two stabilization options. In the unstabilized SASM mode, the squint angle and slant range with respect to the aircraft were constant; while in the edge-stabilized submode, the line of patch centers on the ground was a straight line despite small aircraft heading changes.

The FLAP could operate on sum data and exactly duplicate the operation of the FLAMR signal processor. In addition, an extra-high-resolution mode was available. The formats, scan generation, etc., were exactly as in the FLAMR DBS mode except that the FLAP PSP could generate more than 8 filters for each synthetic array (patch) to provide faster scans. A small amount of data at 40 lines/patch was obtained during the flight test program.

Most of the recorded FLAP data were obtained in the CED mode as arrays of 160 pulses of three-channel monopulse data. These arrays were taken at the special CED scan beam pointing positions of 0° and ±60° in azimuth and 6° and 12° depression (positions). Three-channel monopulse data were also recorded while FLAMR was operating in the DBS mode and covered a swath 128 range bins wide through the center of the FLAMR maps. The data available are the FLAP I/Q video data and Daisychain words giving the doppler error (difference between predicted and measured frequency) for the ground return at the intersection of the antenna monopulse surfaces, together with monopulse difference slopes in azimuth and elevation.

SAR Filter Magnitude Relations

The SAR data presented in this report, and used in the Data Variance Study, are digital filter magnitudes recorded in flight. The data are obtained in computer-compatible form using the FLAMR ground playback equipment shown in Fig. 4.

An idealization of the recorded FLAMR filter magnitude data is

$$FM = 16 \log_2 \sqrt{F_I^2 + F_Q^2}$$

$$= 16 \log_2 F$$

where F_I and F_Q are amplitudes from the I and Q filter banks. The above expression is considered to be an idealization because the logarithm to the base 2 and the root-sum-square functions were not computed exactly but evaluated using relations that give approximate results. The error due to the approximation is small and can be neglected.

The maximum filter magnitude has a value of 199. The filter magnitude in decibels is given by

$$FM_{dB} = 20 \log_{10} \sqrt{F_I^2 + F_Q^2}$$

$$= \frac{20}{16} (\log_{10} 2) \text{ FM}$$

$$= 0.376 \text{ FM.}$$

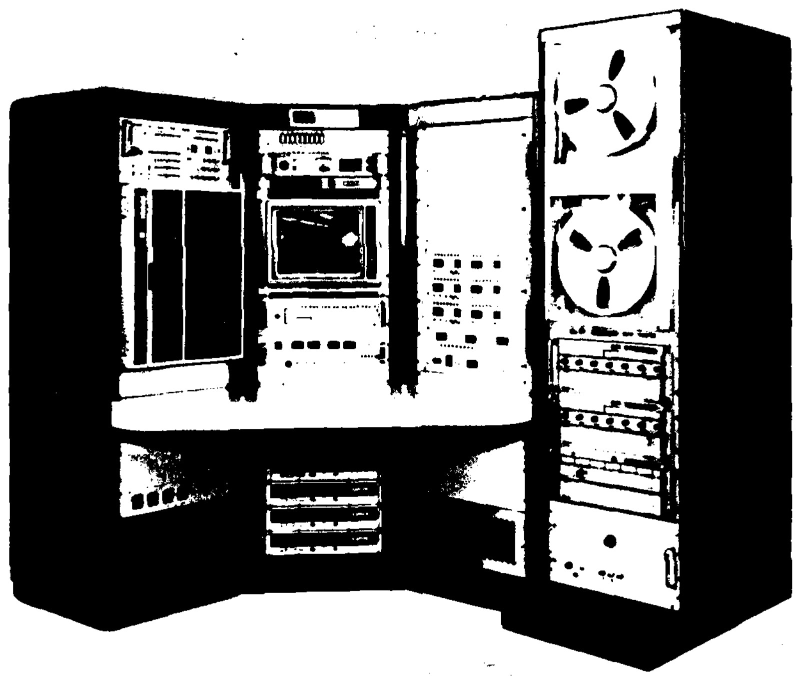

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FIGURE 4
SAR DATA BANK FLIGHT DATA
RETRIEVAL EQUIPMENT

The maximum dynamic range obtained by placing FM = 199 is 75 dB.

Assuming that the radar is linear, the square of the filter magnitude will be proportional to the received echo power, P_r,

$$F^2 = F_I^{\,2} + F_Q^{\,2}$$

$$= K\,P_r$$

where K is a constant. From the radar equation

$$P_r = \frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 R^4 L}$$

where P_t is the transmitted power, G is the antenna gain, λ is the transmitted wavelength, σ is the target radar cross section (RCS), R is the range to the target, and L is the system loss. We find then

$$F^2 = K_1 \sigma \;,$$

which relates the square of the filter magnitude to target RCS.

From the relation involving F and P_r and those involving FM and F, we find

$$FM = 8 \log_2 F^2$$

$$= 8 \log_2 K\,P_r$$

so that

$$P_r = 2^{FM/8}\,K^{-1} \;.$$

This equation gives the return power in terms of the log filter magnitude times a calibration constant. Power is in arbitrary units widely used during the data variance study and is given by

$$P = 2^{FM/8} .$$

Target return echo amplitude, A, can also be expressed in arbitrary units as

$$A = 2^{FM/16} .$$

III. DATA SELECTION

Scene Selection

Scenes used for the data variance study were selected on the basis of the variety of terrain, vegetation, cultural features or tactical vehicles within the scene, the number of pixels available from similar objects, and the availability of ground truth. All scenes selected were mapped in DBS employing 4:1 overlay with 20-ft resolution. The 4:1 overlay implies that four 1:1 DBS maps have been formed and, except for resolution elements contained in the azimuth lines on either side of the map, each resolution element has been mapped four times. Thus, the four maps are the source of the four-look data.

The two scenes selected were: (1) the NEBO radar target array near Barstow, California, and (2) the urban area of Reedley, California. Data were selected from seven DBS scans. Scans 1 through 3 are from the Reedley area and scans 4 through 7 from the NEBO array. Scans 1, 2, 4, 6, and 7 were formed with frequency diversity (i.e., frequency hop on); scans 3 and 5 were formed without frequency diversity (i.e., frequency hop off). The terms hop on and hop off will appear on the tables of filter magnitude data in Appendix A. One scan of Reedley and one scan of the NEBO array without frequency hop were located during the study, and were added to the original set of scans for purposes of obtaining a preliminary indication of the effects of frequency hop on the data variants under investigation.

Target Selection

Filter magnitude data were extracted from DBS FLAMR imagery for which valid ground truth existed. The scenes selected were the urban area of Reedley, California and the NEBO array at Barstow, California. The original target groupings from these scenes are tactical vehicles, natural features, tanks, 2½ ton trucks, other tactical vehicles, man-made clutter, trees, sand, grass, and shadows. This list was later expanded and in some instances made more specific. The tactical vehicles included tanks, 2½ ton trucks, jeeps, 2½ ton shop vans, and 12½ ton truck cranes. Tanks, trucks, vans, jeeps, and cranes selected were as follows: M-48 tank, M-35 2½ ton cargo truck, M-109A3 2½ ton shop van truck, M-151 ¼ ton jeep and M-62 12½ ton truck mounted crane. Trees were grouped as large river bank trees and as young fruit trees. Grass data were selected from a rough grass and weedy area from the Reedley scene. The natural feature group included the river bank trees, young fruit trees, and rough grass, but did not include any of the sand data. The reason for not including the sand along with the trees and grass was that pixels containing the sand data did not appear on the same radar map as the trees and grass and some uncertainty exists as to how gains are to be adjusted when combining unnormalized data from different scenes. Man-made clutter included pixels from a railroad bridge, from a four lane highway bridge, and from a mobile home park.

Data Retrieval

The filter magnitude data used in the data variance study were obtained from the SAR data digitally recorded in flight on wideband magnetic tapes during the FLAMR program. In order to locate suitable scans, it was first necessary to review flight documentation to select such scans and to determine flight number and reel number containing the scans.

The next step in retrieving the data was to replay the appropriate wideband flight tape. This replay is accomplished by means of the wideband tape drive shown on the right in the photograph in Fig. 4, Section II of this report. The recorded imagery is reviewed on the Monitor Display (center) in 16 grey level format. The DBS imagery used in the study is shown on the display in 360 vertical lines comprised of 384 range bins each. When the desired map is painted on the display, the image is then "frozen" and the tape drive halted. The desired objects or features to be sampled are then located on the display.

To locate the brightest pixel in the case of small discrete objects, the set of grey scale emphasis or deletion switches below the monitor are used. To obtain the azimuth line and range bin numbers of the selected pixels, the manual controls below the display are used to position a local cursor over the pixel. The desired coordinates are then read directly from the cursor controls.

After all desired sample pixels on the scan have been identified and coordinates noted, a CCT (Computer-Compatible Tape) is placed on the small tape drive visible at the left in Fig. 4, Section II. The data select/dump controls on the panel to the right of the display are then set to dump the desired data.

The practice in the study was to dump the full scan of FM data (Filter Magnitudes recorded in flight at the output of the Doppler Processor) and a file of the associated RIOT data (Radar Input-Output data recorded from the radar-computer I/O bus). The flight data thus obtained are in computer-compatible format and are processed on a general purpose computer. The FM data are next reformatted and five arrays of FM data, similar to those appearing in Table I, are printed for each selected pixel for use in checking and finalizing the selection and coordinates for the sample pixels. The FM values appearing in Map 1234, the composite 4:1 overlaid map, are examined to verify that the selected coordinates of the center point of the printout array represent, for the case of a small target, the brightest return from the target. If an immediately adjacent pixel has a higher FM value, then the coordinates are changed to the coordinates of the brighter pixel.

No further effort to correct for range/doppler straddling has been made. After the coordinates are finalized, they are used with computer programs and the two data tapes, FM and RIOT, to combine the radar return data and other required information for each sample pixel.

Early in the program, the CDC 3200 digital computer was used to extract these data, and the FM data for each pixel were punched on cards. When the CDC Cyber 171 was installed at ARL:UT (Jan. 78), it was decided that it would be more cost effective and more expedient to use the Cyber to retrieve and store data; consequently manipulations with punched cards was, in general, no longer employed.

Ground Truth

An aerial view of Reedley, CA, taken with a forward looking camera, is shown in Fig. 5. Two types of trees, two types of bridges, mobile

TABLE I

FM PRINTOUT FOR 35 PIXEL SECTIONS
OF THE FOUR SINGLE-FREQUENCY
AND COMPOSITE 4:1 MAPS

R.B. NO.	MAP LINE NUMBER 281	282	283	284	285	286	287	
								- MAP 1 FRQ.=4
58	97	107	79	128	118	90	73	
57	94	77	144	174	161	111	82	
56	106	106	144	176	165	113	99	
55	89	105	108	90	85	82	66	
54	96	105	59	93	80	93	78	
								- MAP 2 FRQ.=3
58	99	96	120	127	124	73	81	
57	117	81	122	152	161	89	80	
56	115	89	124	174	174	73	95	
55	125	117	115	114	107	65	80	
54	163	145	121	86	78	59	91	
								- MAP 3 FRQ.=2
58	93	101	124	81	79	67	72	
57	70	99	112	140	89	99	93	
56	123	81	116	130	80	88	111	
55	95	90	99	75	77	74	92	
54	155	146	108	56	74	81	81	
								- MAP 4 FRQ.=1
58	75	125	120	118	111	82	84	
57	80	99	123	131	102	97	73	
56	85	107	152	150	119	105	82	
55	119	110	106	76	63	88	63	
54	143	84	86	45	97	98	90	
								- MAP 1234
58	93	113	118	121	115	81	78	
57	103	92	131	160	153	101	84	
56	113	100	141	167	162	102	101	
55	115	108	108	100	93	80	80	
54	148	137	108	82	86	89	86	

FIGURE 5 Aerial view of Reedley, CA, showing area in SAR DBS maps: Scenes 1, 2, and 3

homes, and rough grass and weeds were selected as features from this area. The group of targets represented by TREES was divided into tall river bank trees and young fruit trees. The pixels selected for tall river bank trees were selected along the Kings River while the young fruit trees came from an orchard near the center of the photograph. The two groups of trees are also shown in Fig. 6. The two bridge types, highway and railroad, appear together near the top of Fig. 5. Figure 7, a US Geological Survey map of Reedley (Reedley Quadrangle) shows two railroad bridges in this region. At the time the FLAMR flight was made only one railroad bridge existed - the Atchison, Topeka, and Santa Fe. Two views of this bridge are shown in Fig. 8. The mobile home group was selected from the mobile home park shown near the center of Fig. 5 and also in Fig. 6. The group designated as rough grass and weeds was selected from an area just below the Reedley College.

An airborne vertical camera photograph of a static target array consisting of tactical vehicles, howitzers, Honest John rockets, etc. is shown in Fig. 9. This array will be referred to as the NEBO static array. It is located on the Mojave River, at a Marine Corps Supply Center designated as the NEBO Area near Barstow, CA. The positions of the vehicles in Fig. 9 represent their locations at the time the DBS radar maps, Figs. 10, 11, 12, and 13, were made. Figures 14, 15, and 16 show different views of tactical vehicles selected for study targets from this array. Two samples of desert sand are also shown in Fig. 16. These sand regions do not necessarily correspond to the precise regions from which the return radar echos were extracted for desert sand.

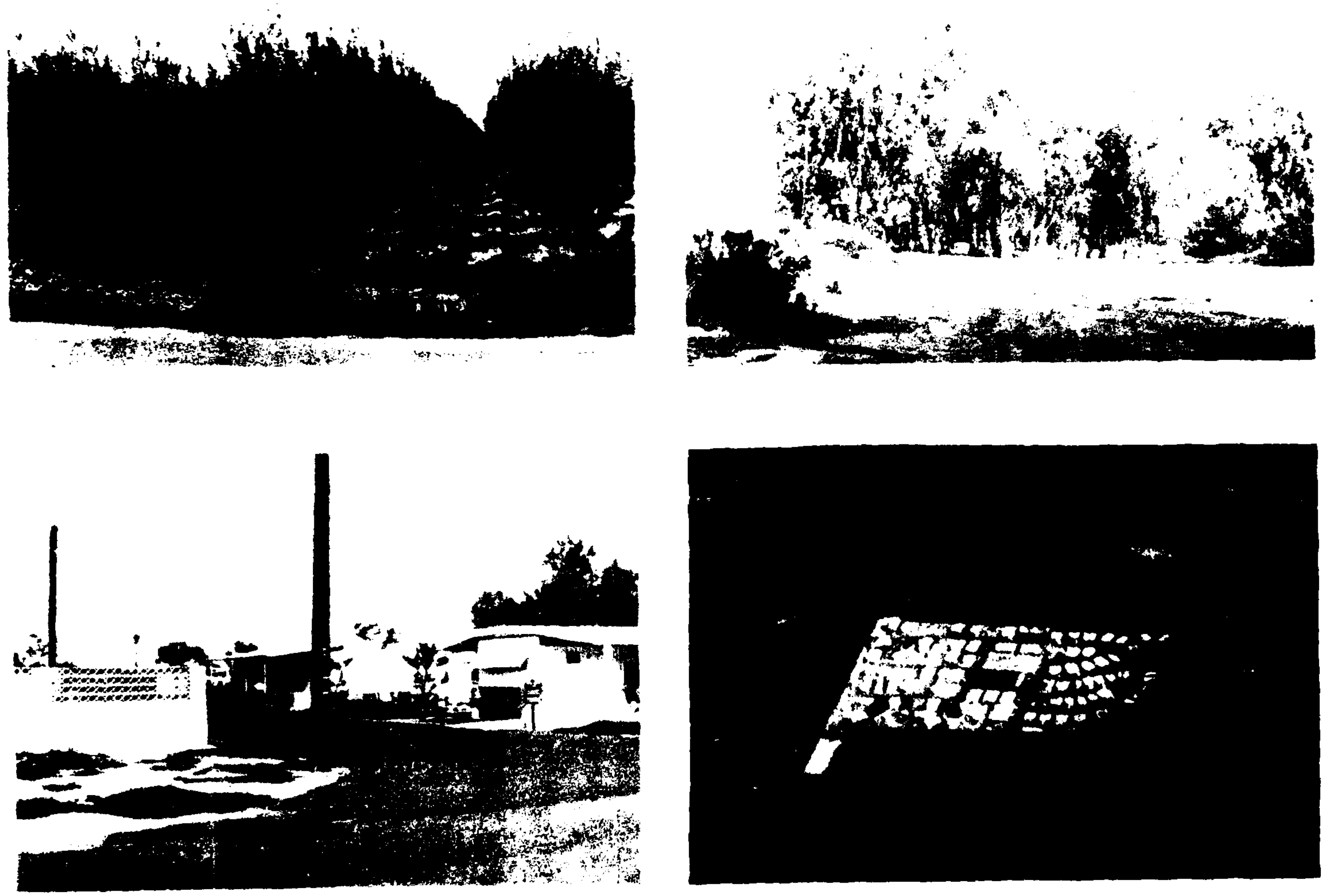

FIGURE 6 Ground truth for Reedley, CA, showing young fruit trees, river bank trees, and mobile homes

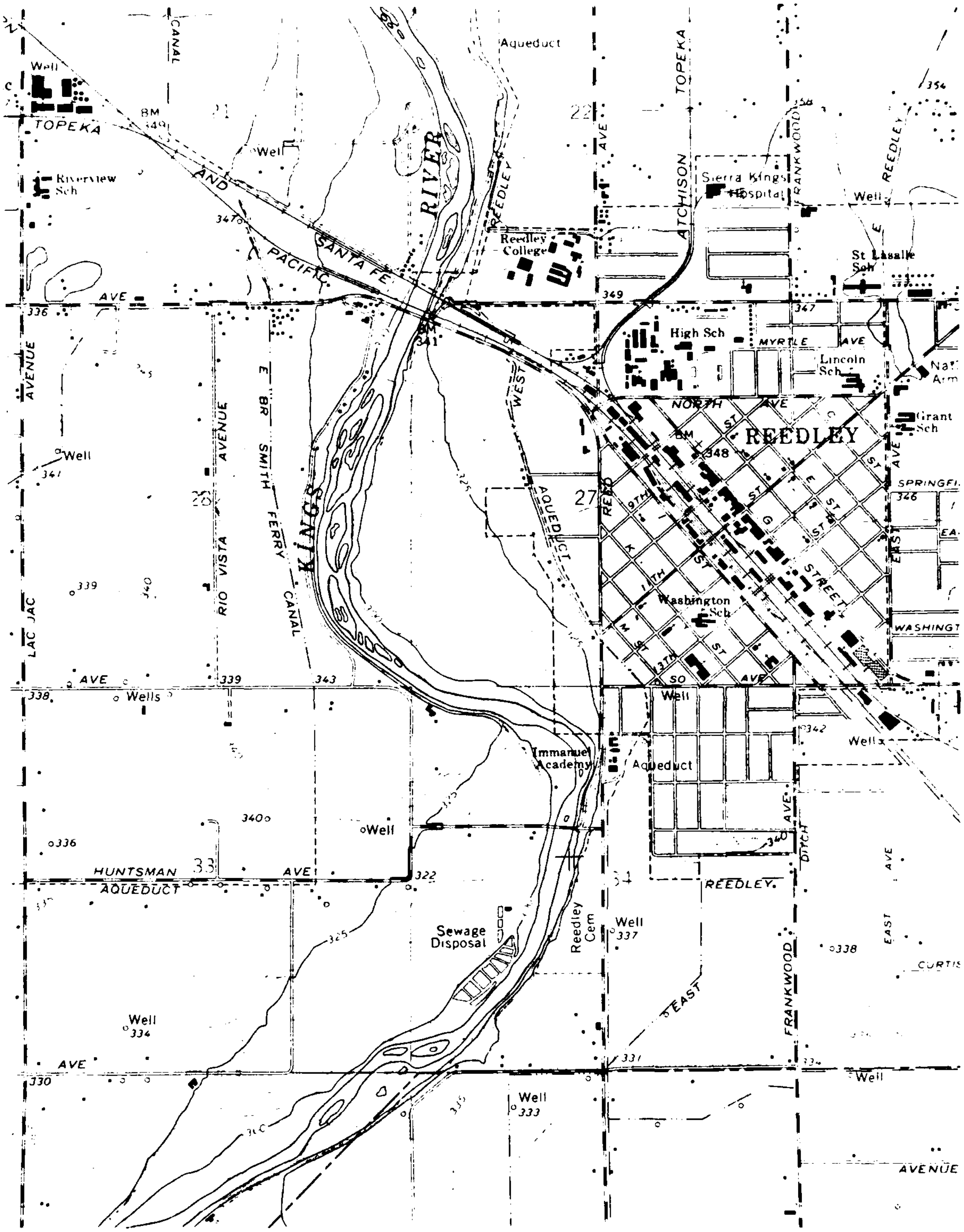

FIGURE 7 USGS Topographic Map: Reedley Quadrangle

FIGURE 8. Ground Truth, Reedley, CA, Showing Two Views of the Atchison, Topeka, and Santa Fe Railroad Bridge Over the Kings River

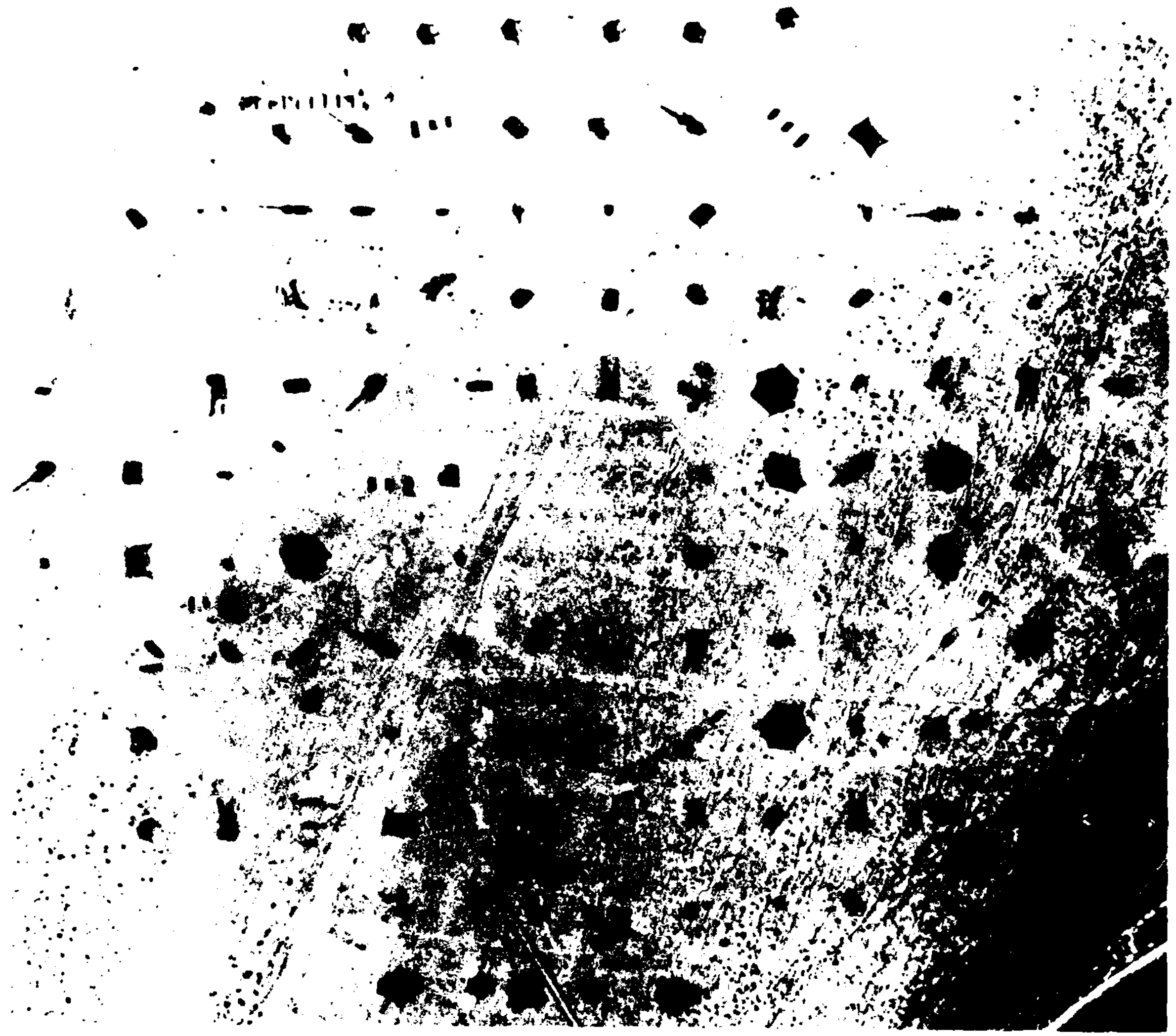

FIGURE 9. Vertical photography of the Nebo static array of vehicles and equipment near Barstow, CA, showing area in SAR DBS maps: Scenes 4, 5, 6, and 7

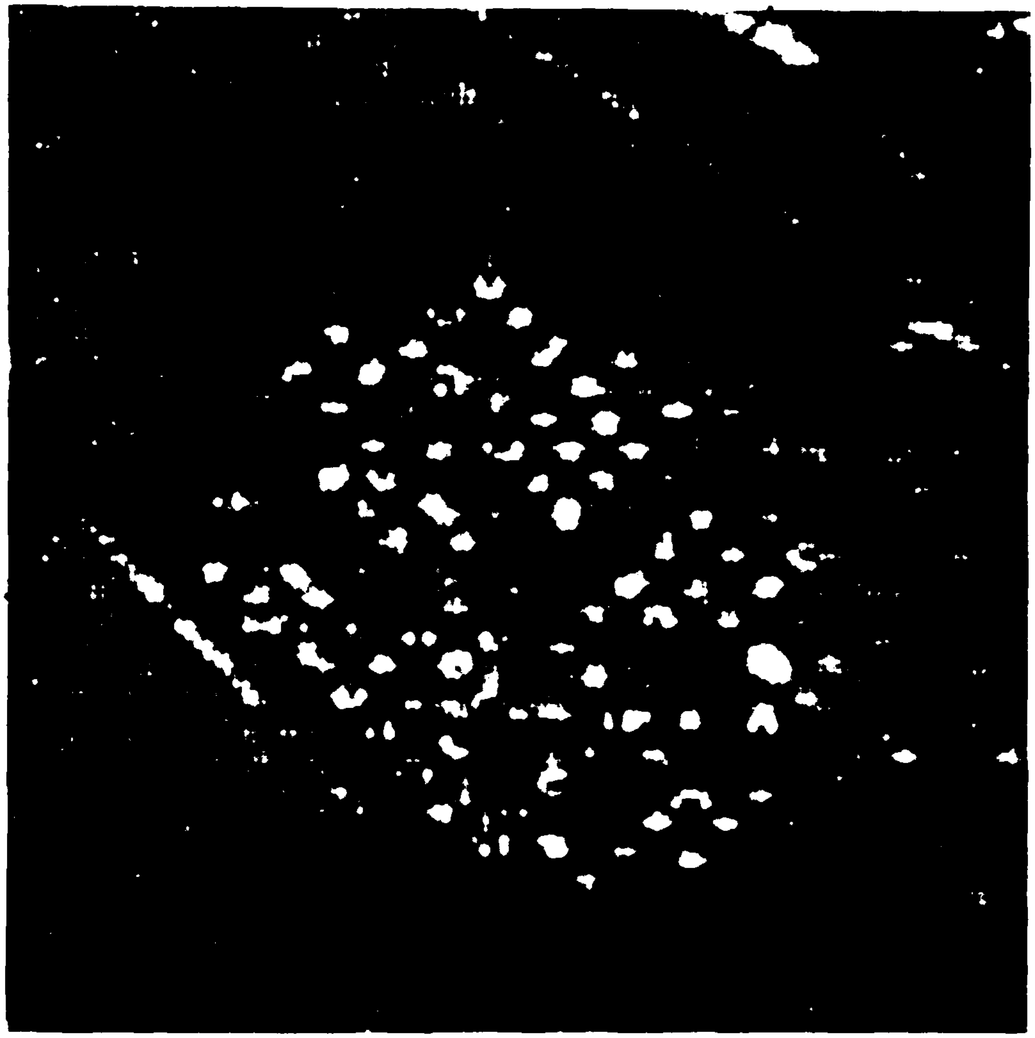

FIGURE 10. SAR DBS 4:1 overlay map of the Nebo static array of vehicles and equipment, Barstow, CA, hop on, Scene 4

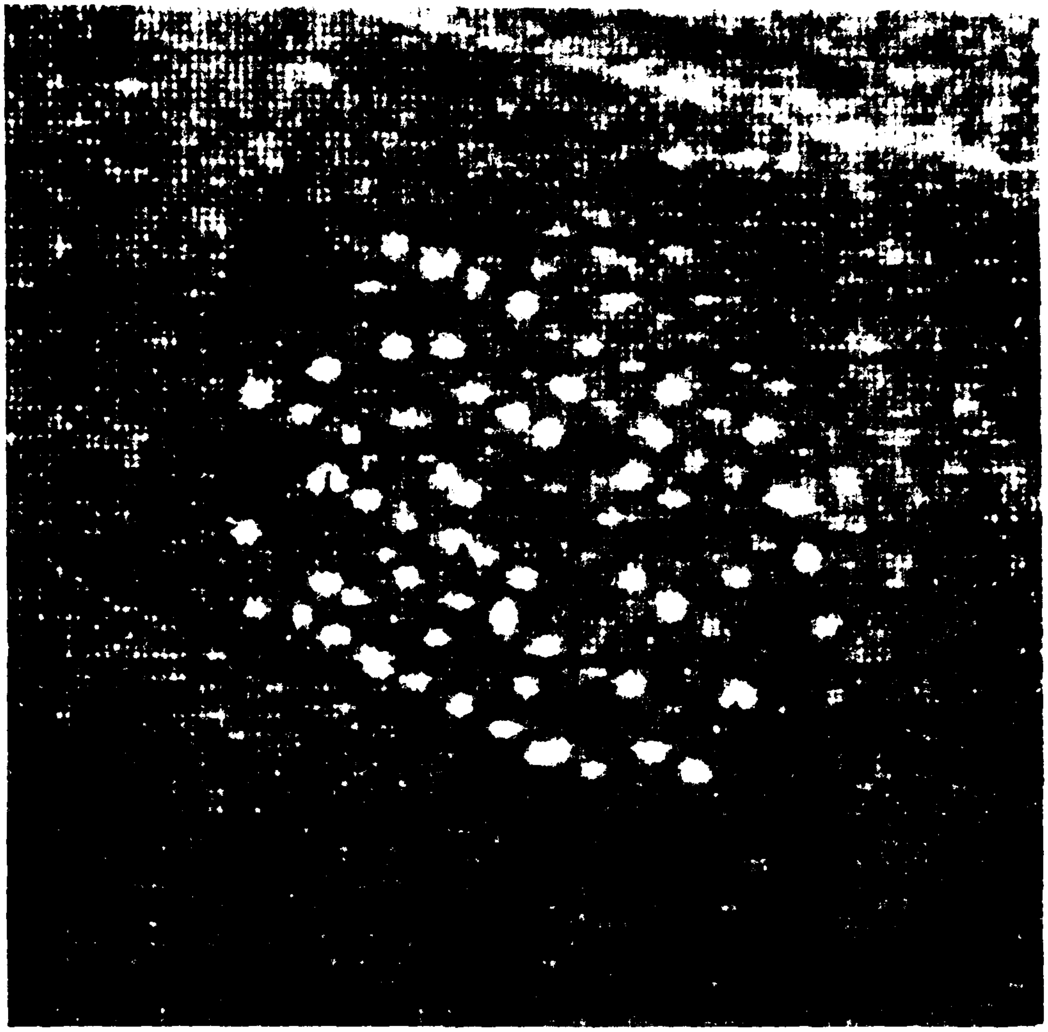

FIGURE 11. SAR DBS 4:1 overlay map of the Nebo static array of vehicles and equipment, Barstow, CA, hop off, Scene 5

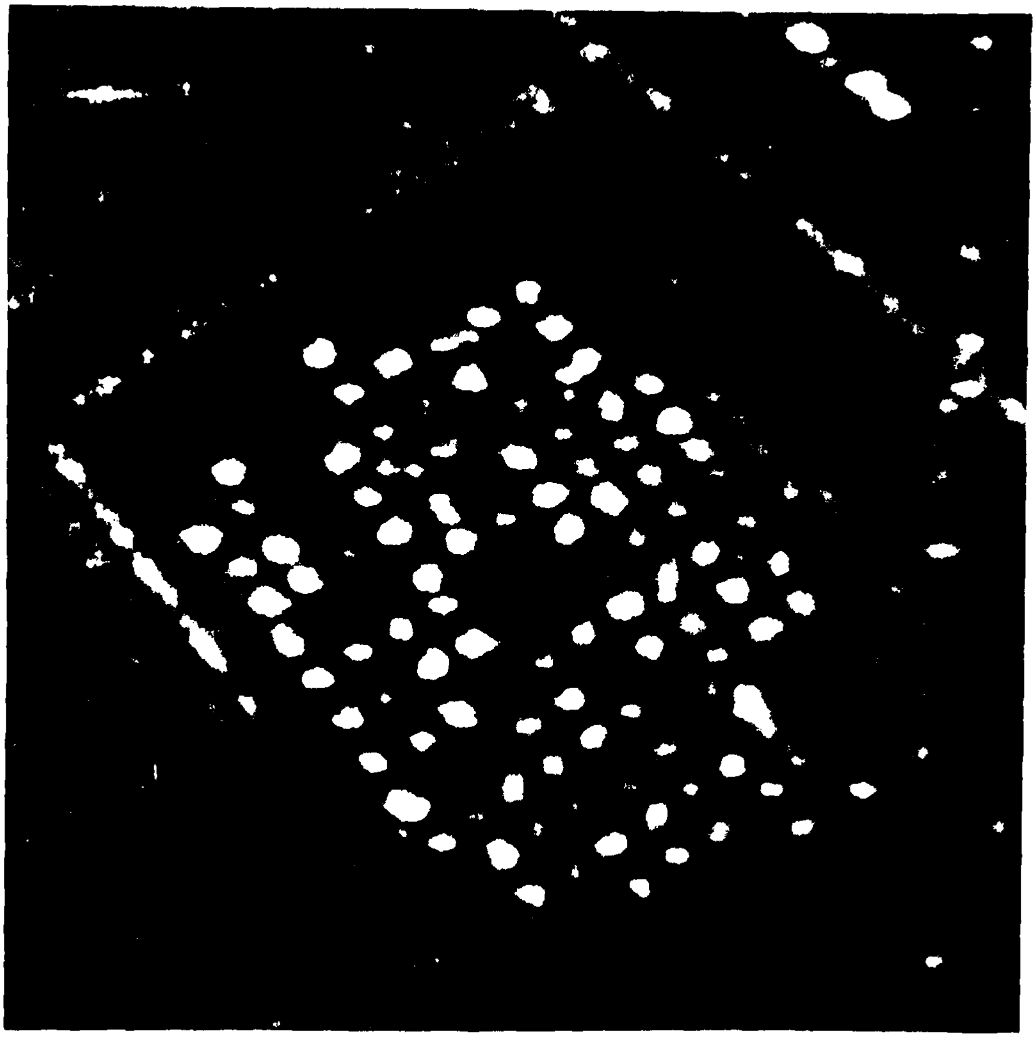

FIGURE 12. SAR DBS 4:1 overlay map of the Nebo static array of vehicles and equipment, Barstow, CA, hop off, Scene 6

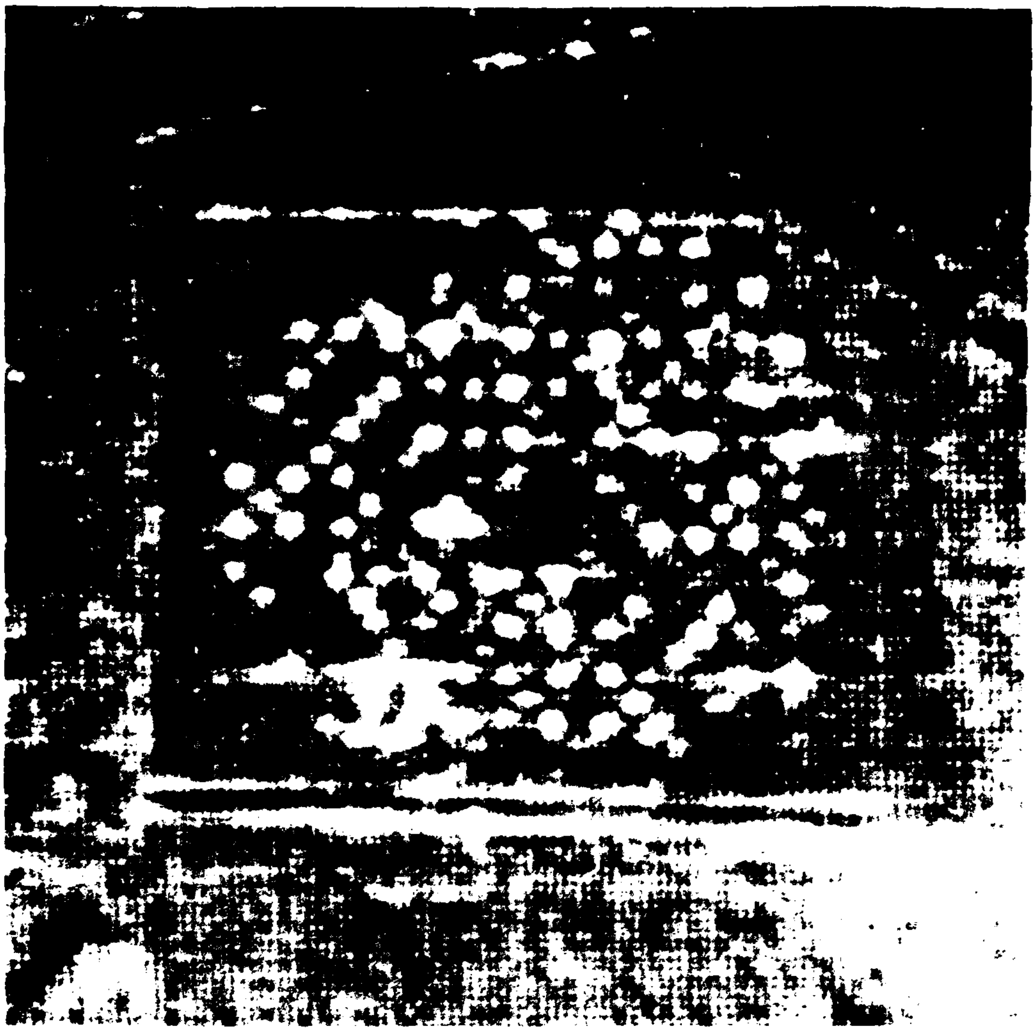

FIGURE 13. SAR DBS 4:1 overlay map of the Nebo static array of vehicles and equipment, Barstow, CA, hop off, Scene 7

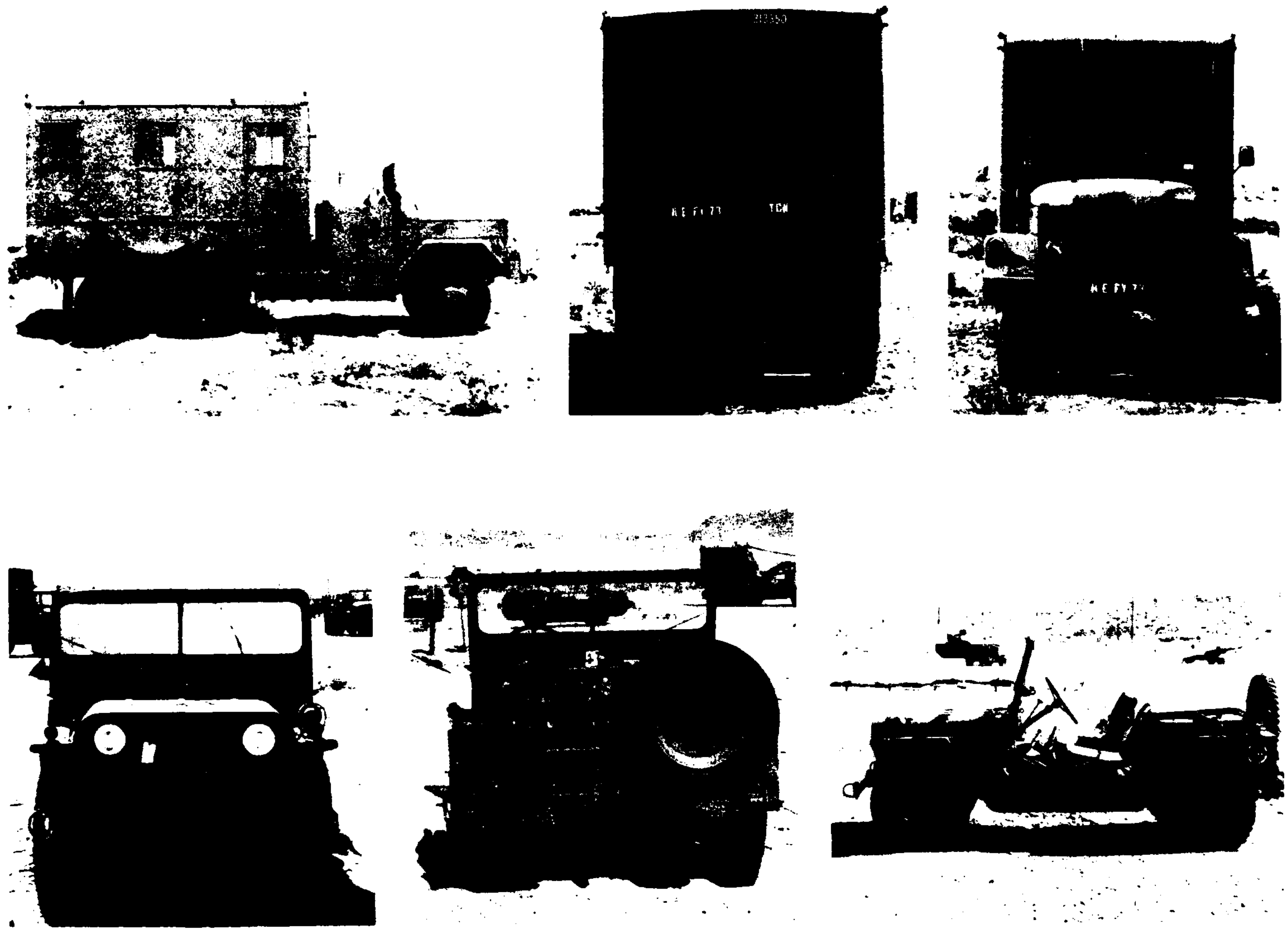

FIGURE 14. Ground truth for the Nebo static array of vehicles and equipment, showing three views of the M109A shop van and the M151 $\frac{1}{4}$ ton jeep

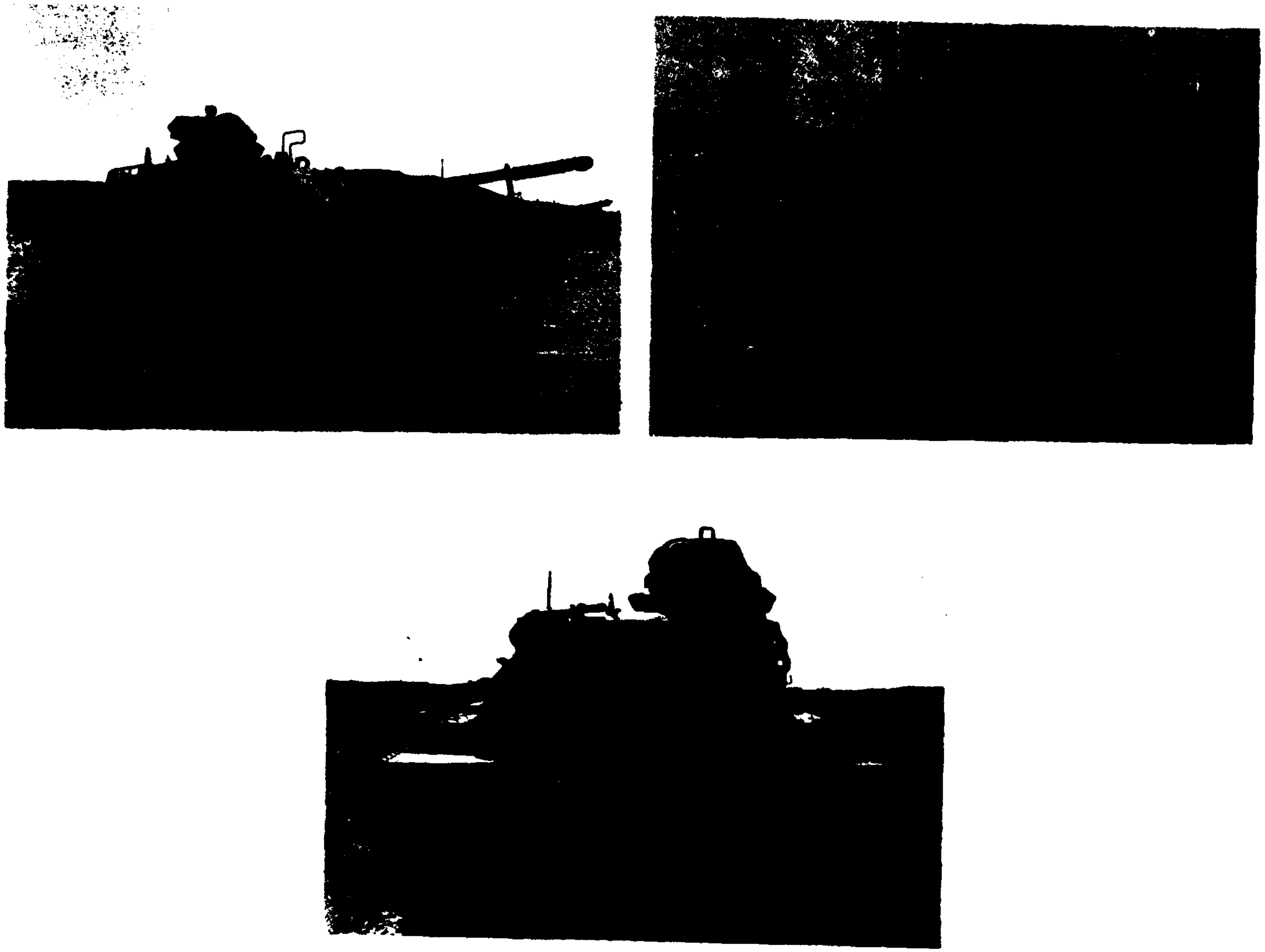

FIGURE 15. Ground truth for the Nebo static array of vehicles and equipment, showing three views of the M48 tank

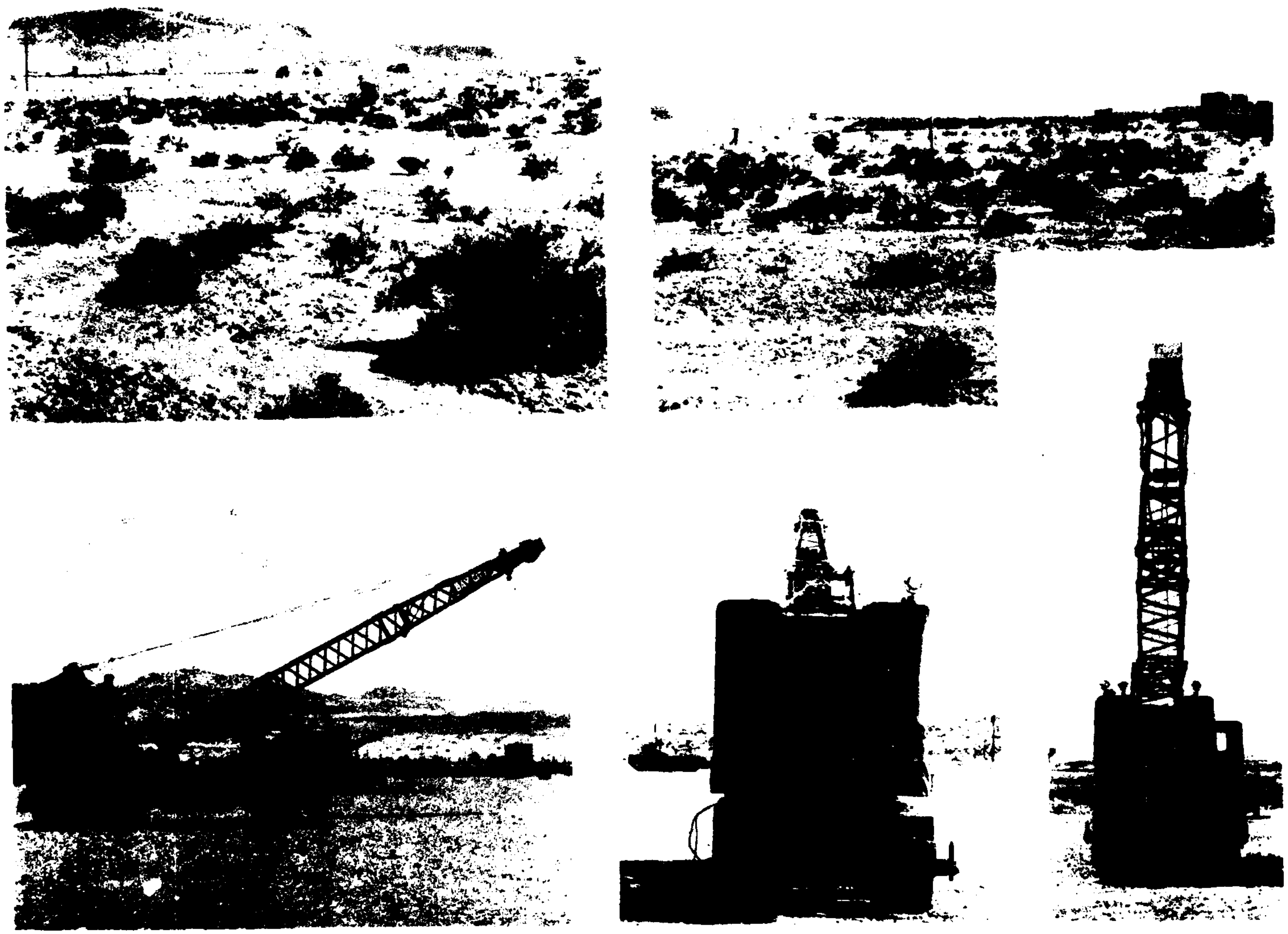

FIGURE 16. Ground truth for the Nebo static array of vehicles and equipment, showing desert sand and the M62 $12\frac{1}{2}$ ton truck mounted crane

DBS Radar Maps

Three DBS radar maps of the Reedley area are shown in Figs. 17, 18, and 19. These should be compared with the area photography (Fig. 5) and the Reedley Quadrangle (Fig. 7). The DBS radar maps shown in Figs. 17 and 18 were made with frequency hop on. The map in Fig. 19 was made without frequency hop.

Four DBS radar maps of the NEBO array are shown in Figs. 10 through 13. All maps with the exception of scene 4 (Fig. 10) were formed with frequency hop off. The maps shown are inverted, left to right, from that shown in the vertical photography.

FIGURE 17. SAR DBS 4:1 overlay map of Reedley, CA, hop on, Scene 1

FIGURE 18. SAR DBS 4:1 overlay map of Reedley, CA, hop on, Scene 2

FIGURE 19. SAR DBS 4:1 overlay map of Reedley, CA, hop off, Scene 3

IV. DISCUSSION OF DISCRIMINANTS

Filter Magnitude Relations

The four single-look data extracted from the FLAMR data for various targets tabulated in Appendix A are in the form of integer log filter magnitudes where the logarithm is to the base 2. The log filter magnitudes used in this study were computed and rounded to integer form in-flight, and then recorded, together with the IPQ data, on the wideband magnetic flight tapes. The radar was uncalibrated for the DBS scans of Reedley, CA, and the NEBO static array of vehicles and equipment. In this form the log filter magnitudes, FM, may be written as

$$FM = \log_2 C|E| \quad ,$$

where E is the electric field strength of the return target echo at the FLAMR antenna and C is an unknown calibration factor. This factor is nearly constant for the four looks but may vary from scene to scene. The magnitude of the IPQ video may also be expressed in terms of E as

$$F = \left[F_I^2 + F_Q^2\right]^{1/2}$$

$$= KE \quad ,$$

where K is constant for each map. Linear amplitudes, A, and power, P, may be expressed in terms of E and F as $A=C|E|=(C/K)F$ and $P=C^2E^2=(C/K)^2F^2$. The log filter magnitude is related to the IPQ filter amplitude by

$$FM = 16 \log_2 F$$

and to power by

$$FM = 8 \log_2 P \quad .$$

Power can then be expressed in arbitrary units as

$$P = 2^{FM/8} \quad .$$

A characteristic of digital maps such as those obtained by the FLAMR system, is the use of discrete pixels (picture elements) to form the map. All power returned by a given "resolution cell" on the surface being mapped is summed and use to represent that resolution cell, or pixel. The return from a discrete scatterer located on or near the boundary of a resolution element will be divided between the adjacent pixels according to the proportion of the return detected in each cell. Such "bin straddling" was not corrected-for in the target data used in this study.

Discriminant Functions

In target discrimination we wish to extract features or discriminants which display the maximum difference between one target class and another, especially between tactical targets and natural features. Furthermore, the discriminants should be as simple as possible from the standpoint of signal processing hardware. The features used in target discrimination may not necessarily coincide with the principal features used to represent the pattern classes.

The discriminant functions employed here, calculated in arbitrary power units are: (1) mean power $\bar{P}$, (2) standard deviation S, (3) average deviation from the mean $\bar{\delta}$, (4) average deviation from the best straight line fit $\bar{\delta}_B$, (5) fast variation V_f, (6) slow variation V_s, (7) major spread r_1, and (8) minor spread r_2. These were computed for each pixel from the four-look data.

These measures of dispersion will now be discussed briefly, with the summation running over the four looks.

(1) Mean power, $\bar{P}$

$$\bar{P} = \frac{1}{4} \sum_{i=1}^{4} P_i$$

This power is in arbitrary units and is not normalized between DBS scenes.

(2) Standard deviation, S

$$S = \left[\frac{1}{3} \sum_{i=1}^{4} (P_i - \bar{P})^2 \right]^{1/2}$$

The standard deviation as given here is an unbiased estimate for most distributions.

(3) Average deviation from the mean, $\bar{\delta}$

$$\bar{\delta} = \frac{1}{4} \sum_{i=1}^{4} |P_i - \bar{P}|$$

This is less efficient that S but is easier to calculate.

(4) Average deviation from the best straight line fit, δ_B

A best straight line curve fit is first obtained from the four-look data in the proper time sequence by the method of least squares. The resulting equation is of the form Ai+B. The average deviation of P_i from this line is given by

$$\delta_B = \frac{1}{4} \sum_{i=1}^{4} |P_i - (Ai+B)| \quad .$$

Ai meaning A times the index i

Employing the best straight line fit to the four-look data has a greater tendency to remove the trend from the data than computations involving the mean, such as those for S and $\bar{\delta}$. Coefficients of the least squares fit to

$$Ai + B$$

are given by

$$A = \frac{\frac{1}{4}\left\{\sum i\ P_i - \sum i \sum P_i\right\}}{\frac{1}{4}\left\{\sum i^2 - \left(\sum i\right)^2\right\}}$$

$$B = \frac{1}{4}\left\{\sum P_i - A\sum i\right\}$$

where i = 1, 2, 3, 4.

(5) Fast variation, V_f

$$V_F^2 = \frac{1}{3}\left(P_1-P_2\right)^2 + \left(P_2-P_3\right)^2 + \left(P_3-P_4\right)^2$$

The subscripts appearing in this relation, that for slow variation, and the relation for average deviation from best straight line fit refer to time sequence and not map number.

(6) Slow variation, V_s

$$V_s^2 = \frac{1}{3}\left\{\left(P_1-P_3\right)^2 + \left(P_2-P_4\right)^2 + \left(P_1-P_4\right)^2\right\}$$

It should be noted that fast variation involves power differences between successive looks and responds to the more rapid part of the variation. Slow variation involves differences in more widely separated looks and is more sensitive to slower fluctuations.

(7) Major spread, r_1

Major spread is the maximum deviation in power and is given by

$$r_1 = P_{MAX} - P_{MIN} \quad .$$

(8) Minor spread, r_2

If the four-look power data are ordered as $P_{MIN} \leq P_2 \leq P_3 \leq P_{MAX}$, minor spread is obtained by

$$r_2 = P_3 - P_2 \quad .$$

After deleting two of the four-look data appearing in the major spread, minor spread is the absolute value of the difference between the remaining two data points.

Normalized discriminant functions based upon pixel mean are obtained by dividing the discriminant function by $\bar{P}$, for example, the normalized discriminant function for standard deviation $S_N = S/\bar{P}$. It follows from

$$S_N = \frac{1}{\bar{P}} \frac{1}{3} \sum \left(P_i - \bar{P} \ ^2 \right)^{1/2}$$

$$= \left[\frac{1}{3} \left(P_i / \bar{P} - 1 \right)^2 \right]^{1/2}$$

that the normalized discriminant function is equal to the discriminant of the normalized power. This process removes the calibration factor and permits comparison of target classes between scences.

The above set of discriminant functions are used in Section V primarily with the parametric models, but these same functions are not used exclusively throughout this report. In the section involving the Kolmogorov-Smirnov test and the test employing the Eigen vectors, a different set of discriminant functions than those above are used in the analyses. This set is more generalized than the former and, consequently, is referred to as generalized relations. The generalized relations for the discrimination functions are given below; a distinct set of discriminant functions is generated for each value of N. The two sets commonly used are those given by N=1 and by N=2. Note that N need not be an integer.

(9) Unnormalized generalized discriminant functions

$$X_1 = \overline{P} = \frac{1}{4}\sum P_i$$

$$X_2^N = \frac{1}{4}\left\{ |P-\overline{P}|^N + |P_2-\overline{P}|^N + |P_3-\overline{P}|^N + |P_4-\overline{P}|^N \right\}$$

$$X_3^N = \frac{1}{3}\left\{ |P_1-P_2|^N + |P_2-P_3|^N + |P_3-P_4|^N \right\}$$

$$X_4^N = \frac{1}{3}\left\{ |P_1-P_4|^N + |P_1-P_3|^N + |P_2-P_4|^N \right\}$$

For $N = 1$, X_2 becomes the average deviation from the mean, $\overline{P}$. For $N = 2$, X_2 becomes a biased standard deviation and X_3 and X_4 become the fast and slow variation previously defined.

(10) Normalized Generalized Discriminant Functions

$$Z_1 = P_{max}/\overline{P} - P_{min}/\overline{P}$$

$$Z_2^N = \frac{1}{4}\left\{ |Y_i-1|^N \right\}$$

$$Z_3^N = \frac{1}{3}\left\{ |Y_1-Y_2|^N + |Y_2-Y_3|^N + |Y_3-Y_4|^N \right\}$$

$$Z_4^N = \frac{1}{3}\left\{ |Y_1-Y_4|^N + |Y_1-Y_3|^N + |Y_2-Y_4|^N \right\}$$

where $Y_i = P_i/\overline{P}$. These relations are obtained by dividing X_2, X_3, X_4 by $\overline{P}$ and by dividing the major spread, r_1 by $\overline{P}$. Note that in the special case for $N = 1$ and $Y_1 > Y_2 > Y_3 > Y_4$, that $Z_3 = (Y_1-Y_4)/3$ and a similar result is obtained for X_3. The effect of this ordering of returns is to make the discriminant function fast variation insensitive to all but the extreme values of the measured power.

V. DISCRIMINATION MODELS

Several models were developed at ARL:UT for target discrimination and classification based upon selected discriminant functions as originally proposed by ARL:UT and AFWAL/AA and later modified.

Using the FLAMR filter magnitude data taken with 4.1 overlay (four-look model), data for the individual looks or maps were separated and presented, for selected tactical and non-tactical targets, in Appendix A of this report. If frequency hop were on during the map formation, then each map was recorded at a different radar frequency. Each point of the scene occurs a maximum of four times in the FLAMR filter magnitude data because of the scan pattern and processor capacity.

The look-to-look fluctuation of the radar return from known targets serves as the basis upon which various models are to be constructed. Since variation in target aspect angle with respect to the illuminating radar is a major contribution to the variation in target radar cross section (RCS), several models required that the observed target return be placed in the proper time sequence. Map sequence and time sequence for a given resolution element are not necessarily equal. For further discussions on this matter see Section II.

The measures of dispersion originally proposed were sample variance, average deviation, range of deviation, color, and deviation of color. Color and deviation of color were dropped from the list of discriminants early in the study. Discriminants added to the list included fast variation, slow variation, deviation from the mean, deviation from the best straight line fit to the four-look return in proper time sequence, and the major and minor spread.

Various combinations of these measures of dispersion were employed in the various models. Neither a consistent set of dispersion measures nor a common data set were used to compare the relative discrimination capability of each of the models. The different models were utilized to attempt different ways of characterizing the discriminant distributions for the purpose of separating target classes based on the dispersion measures, but no attempt was made to quantify the relative merit of the different models for this specific problem.

Two early models from which some success was realized when dealing with non-normalized data were based upon parametric statistics involving four target classes. Valid conclusions about the non-normalized data can only be drawn when the target classes being compared are taken from the same scene. As stated previously, calibrated corner reflectors were not in the various scenes; therefore, no way existed to relate the mean intensity values of the scenes. Thus, care must be taken when reading this and subsequent sections so that one does not draw erroneous conclusions about class separability based on non-normalized data when the classes are taken from different scenes. When non-normalized data is compared between scenes, only conclusions as to the relative merit of discriminant functions or, perhaps, the reliance of the class separability on mean power (e.g., normalized vs. non-normalized comparison) can be made. A brief discussion of these models is presented below. Later in the study, all efforts on the four-class parametric models were dropped in favor of two-class non-parametric models. The non-parametric models included a maximum likelihood model based upon histograms constructed from selected variants, the K-nearest neighbor, the minimum distance model and the Eigen vector model (EVM). These models are discussed briefly, following the discussion of parametric models.

Parametric Model

Sample Variants. Four variants were generated from the four-look FM data discussed previously. The four sequential values representing each pixel, converted to power units, were used to generate four variants employed in the classification model. The FM values are related to power by ($M=8 \log_2 P$) plus a constant so the conversion to power from the log filter magnitudes is given by

$$P = K(2^{M/8}) \quad ,$$

where K is a calibration factor which may change from scan to scan or within a single scan. To illustrate the classification model, data were selected from regions within a scan over which K remained constant.

Four target variants used in the model based upon measurement were selected from the mean, Z_1, sample variance Z_2, fast variation, Z_3, slow variation Z_4, RMS, deviation from the mean δ, and the difference between fast and slow variation, D_{fs}. These functions are defined:

$$Z_1 = \frac{1}{4} \sum^{4} P_i$$

$$Z_2^2 = \frac{1}{3} \sum^{4} (P_i - Z_1)^2$$

$$Z_3 = \frac{1}{3} \left\{ |P_1 - P_2| + |P_2 - P_3| + |P_3 - P_4| \right\}$$

$$Z_4 = \frac{1}{3} \left\{ |P_1 - P_3| + |P_2 - P_4| + |P_1 - P_4| \right\}$$

$$RMS = \sqrt{\Sigma P_i^2/4}$$

$$= \frac{1}{4}\sum |P_i - Z_1|$$

$$D_{fs} = |Z_3 - Z_4|$$

It should be noted in the above relation variants Z_1, Z_2, RMS and δ do not involve time sequence of the data whereas fast variation, slow variation and D_{fs} do involve the time sequence of the return.

Distributions Investigated for the Variants. Since the probability distribution function (PDF) of the measured data or variants derived from the measured data was required in the formulation of the classification model, histograms of the distributions of the various variants were constructed from the sample data sets. Four standard probability distribution functions, which included the Lognormal, the Weibull, the Chi-Square, and the Rayleigh PDF's, were fitted to the data. It was found that the Lognormal and Weibull PDF's generally fitted the test data well with the Weibull PDF giving a better fit than the Lognormal PDF. The Lognormal and the Weibull distributions are written as:

$$p(X) = \frac{1}{\sqrt{2\pi}X\sigma_{LN}} \exp\left\{-(\ell n(X/M)^2/2\sigma_{LN}^2\right\}$$

and

$$p(X) = \frac{n}{\sigma_w}(X/\sigma_w)^{n-1}\exp\left\{-(X/\sigma_w)^n\right\}$$

respectively, where M is the median of X, σ_{LN} is the standard deviation of n(X/M), σ_w is a scale factor, and n is a shape parameter.

Description of Model. To demonstrate the utility of several of the variants studied for discrimination, a classification model based on the statistics of selected variants derived from the SAR return data was formulated and applied to the test sample. Four variants and four classes of objects were used to demonstrate the effectiveness of the discriminant model; however, it should be noted here that the model is by no means limited to these dimensions. Although the Weibull PDF (Probability Distribution Function) fitted the variants for all four classes comprising the test sample, the vector form at the Weibull PDF was not developed. Consequently, the Lognormal distribution was chosen for constructing the classification model. The variants, (Z_1, Z_2, Z_3, Z_4), derived from one set of measurements are assumed to belong to one of four sample classes comprising the test sample. Since these qualities have a Lognormal distribution, the PDF of Z, when Z belongs to class T_i, is represented by $p(Z|T_i)$ and is given as follows:

$$p(Z|T_i) = \frac{1}{(2\pi)^2 |C_i|^{1/2} Z_{pi}} \exp\left\{ -\frac{1}{2}(Z' |C_i^{-1} Z) \right\}$$

where

$$Z = [\ell n(Z_1/M_{i1}) \ , \ \ell n(Z_2/M_{i2}) \ , \ \ldots \ell n(Z_4/M_{i4})]$$

Z' is the transpose of Z, and

$$Z_{pi} = \Pi(Z_r/M_{ir}) \ .$$

M_{ir}, for r=1,2,3,4, are the medians of Z_r when Z_r belongs to T_i. C_i is the covariance matrix of Z. A decision function is formed that assigns each vector Z to one of the sample classes. This function will assign Z to class T_i if the following condition

$$p(Z|T_i) > p(Z|T_j)$$

is met for all j not including i. Inserting the expression

$$r_{ij} = \ln \frac{p(Z|T_i)}{p(Z|T_j)}$$

into the ratio of two probability density functions, one obtains a decision function as follows

$$r_{ij} = -\frac{1}{2}\left[\left(\ln \frac{Z_i}{M_i}\right)' C_i^{-1}\left(\ln \frac{Z_i}{M_i}\right) - \left(\ln \frac{Z_j}{M_j}\right)' C_j^{-1}\left(\ln \frac{Z_j}{M_j}\right)\right]$$

$$+ \frac{1}{2} \ln \frac{C_j}{C_i} + \sum_r \left(\ln \frac{M_{jr}}{M_{ir}}\right)$$

A decision is now made, based on the above equation, as to which class Z belongs. By the assignment criterion noted above, Z is assigned to Class T_i if $r_{ij} > 0$, and is not assigned to T_i if $r_{ij} < 0$. For the selected example given here, only the diagonal terms in the covariance matrices were retained. The off-diagonal terms were set to zero. All combinations for r_{ij} were computed and Z was placed in class k when the condition $r_{kj} > 0$ was met for all j.

Test Results. Employing data representing four sample classes, the model was tested against each data point for several combinations of the measurement vector Z. In these cases, the data set used as a test set was also used as a test set. The results of one test are shown below when the four variants, mean power, σ, fast variation and slow variation were employed in the model.

NUMBER OF CORRECT AND INCORRECT CLASSIFICATIONS
FOR EACH PIXEL VERSUS EACH CLASS

Class Description	Number of Samples	Number of Classifications per Class			
		102	201	202	9000
Fruit Trees	50	34	5	11	0
Mowed Grass Field	49	0	44	5	0
Unmowed Grass & Weed Field	54	1	40	14	0
Metal Mobile Homes	37	0	0	0	37

An example when the covariances are included in the model is shown below for a different set of targets and variants. The variants for this model are mean power, σ, RMS and δ. Target classes 1, 2, 3, and 4 correspond to fruit trees, smooth grass, rough grass and citrus trees.

TARGET CLASSIFICATION TEST

Target	No. 1	No. 2	No. 3	No. 4
1	45	0	1	4
2	4	7	37	1
3	12	0	37	6
4	36	0	0	37

Use of other variants gave varied results. The model failed when applied to data normalized with respect to the four-look mean.

The model was modified to include the Eigen transformation to form a new set of decorrelated variants. The results are shown below for a model employing power mean, average deviation from the mean, slow variation and fast variation. Target class 1, 2, 3, and 4 correspond to grass, young fruit trees, citrus trees and a vineyard.

TARGET CLASSIFICATION TEST

Target	No. 1	No. 2	No. 3	No. 4
1	38	11	0	0
2	0	45	1	4
3	0	0	52	21
4	0	1	0	83

Nonparametric Models

A model similar to the parametric model was developed using four variants. However instead of employing parametric curve fits to the histograms of target PDF, the probability densities were obtained from a table look up from histograms generated from measurement data. Variants employed in the model were mean power, deviation from the mean, slow variation and fast variation. The model was reduced from a four target class model to two target class model. Besides making a decision as to which class the target may be assigned, two other groups were included in the model group 3 and 4. In group 3 the target may be assigned to either target class and in group 4 the target is not assigned to any target class. When applied to target classes of fruit trees and mobile homes the model produced results shown below.

TARGET CLASSIFICATION TEST

Target	No. 1	No. 2	No. 3	No. 4
1	40	0	0	10
2	0	94	0	7

This particular model was not pursued further.

Nearest Neighbor Classifier. A two class nearest neighbor (K-NN) classifier assigns a pattern X of unknown classification to the class of its nearest neighbor. For K = 1, we have the 1-NN classifier which employs only classification based upon the nearest neighbor. In this program, K was variable. The classification determines the K nearest neighbor, from data contained in the two classes, to X and used the majority rule to determine which class to assign to X.

The two classes chosen as a test case were tanks and mobile homes (taken from scenes 3 and 5 without hop). The number of pixels for the two classes were 44 and 50, respectively. Variants employed were mean power, deviation from the mean, fast and slow variation for the unnormalized data, and the difference between slow and fast variation was added to this graph of variants for the normalized data. Test results are shown below employing both unnormalized and normalized return power from four look data placed in proper time sequence. Targets 1 and 2 refer to target classes of tanks and mobile homes, respectively.

SUMMARY OF THE K-NEAREST NEIGHBOR CLASSIFIER

Unnormalized Power

K = 1 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	31	13
2	17	33

K = 3 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	28	16
2	17	33

K = 5 Nearest Neighbor CLassifier Summary

Target	No. 1	No. 2
1	24	20
2	18	32

K = 11 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	18	26
2	15	35

K = 21 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	15	29
2	14	36

Normalized Power

K = 1 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	23	21
2	21	29

K = 3 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	21	23
2	22	28

K = 5 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	16	28
2	20	30

K = 11 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	24	20
2	24	26

K = 21 Nearest Neighbor Classifier Summary

Target	No. 1	No. 2
1	31	13
2	24	26

The number of errors made in classification employing normalized data appeared to increase for both target classes, again pointing to the fact that class separability was due to mean power return rather than a measure of look-to-look dispersion.

Minimum Distance Model

The use of distance functions is one of the earliest concepts in pattern classification. The motivation for using distance functions as a classification tool is that the most obvious way of establishing a measure of similarity between pattern vectors is by their proximity to one another. We say that X, a pattern vector, belongs to class C_j on the basis that it is closer to patterns belonging to this class.

In this classifier the Euclidean distance, D_{ji}, between the pattern vector X_i and a known set of pattern vectors $\overline{X}_j$ defined by

$$D_{ji} = X_i - \overline{X}_j$$

is computed for each class. For the two class problem j = 2. Components of the pattern vector are the various discriminant functions discussed elsewhere. Dimensions of the pattern vector have been selected on four with no attempt to reduce the dimensionality of the vector.

The pattern vectors $\overline{X}_j$ are taken to be the means and/or medians of the set of discriminants derived from measurements from class j. The classifier computes the distance from the pattern X_i of unknown classification and assigns it to the class to which it is closest, i.e., X_i is assigned to class C_j, if $D_{ji} < D_{si}$ for all $j \neq s$.

Since the discriminants computed from measurements for each class were highly correlated, Eigen transformations were applied to the pattern vectors. During this process a new set of pattern vectors $\tilde{X}_i$ was created for each pixel within each class. Means and medians of the transformed vectors $\approx{X}_i$ were taken as being characteristic of the target classes containing these vectors. The minimum-distance classifier was then applied to the transformed data.

An example of the results of applying this classifier to a class of tanks and river trees for unnormalized and normalized data is shown below. The variants were selected from the generalized set of variants for N = 1. Targets 1 and 2 refer to the class of tanks and river trees respectively.

CLASSIFIER BASED ON RECEIVED POWER

Minimum Distance Classifier 1

Minimum Distance Classifier Based on Class Median

Target	No. 1	No. 2	No. 3	No. 4
1	45	0	0	0
2	3	50	0	0

Minimum Distance Classifier Based Upon Class Means

Target	No. 1	No. 2	No. 3	No. 4
1	45	0	0	0
2	5	44	4	0

CLASSIFIER BASED ON NORMALIZED TARGET RETURN

Minimum Distance Classifier 1

Minimum Distance Classifier Based on Class Median

Target	No. 1	No. 2	No. 3	No. 4
1	9	8	28	0
2	4	11	38	0

Minimum Distance Classifier Based Upon Class Means

Target	No. 1	No. 2	No. 3	No. 4
1	13	10	22	0
2	10	14	29	0

It should be noticed that the classifier performed well when operating on received power but performed rather poorly on the normalized data.

Eigen Vector Four Variant Model

Theory. The probability density functions (PDF) were computed for eight unnormalized and seven normalized discriminants derived from FLAMR four look data. Because of the manner by which the discriminant functions were established, it seemed reasonable to assume that the PDF's of any combination of four descriminants selected from the unnormalized set or any combination of four discriminants selected from the normalized set would be representative of the pattern class. We find, however, that the assumption may not be entirely justified since selected sets of discriminants taken from the target classes appear to be highly correlated requiring as few as six and perhaps as many as twelve addition functions to completely describe the pattern. For example, if the discriminant PDF's for a target class are Gaussian random variables with zero mean, four variances and six correlation coefficients would describe the four dimensional PDF.

The discriminants PDS's, however, are not Gaussian and are correlated; by de-correlating the data through appropriate linear transformations, it is possible to arrive at a new set of discriminants whose PDF's statistically describe the class pattern. Furthermore, this new set will contain only four discriminants. We shall now show that this is the case.

Let X be a vector (X_1, X_2, X_3, X_4) where X_1 is discriminant i with zero mean, then the expected value of the matrix XX^T is called the covariance matrix of the random variables X_1, X_2, X_3, and X_4, and we have

$$XX^T = \begin{bmatrix} X_1 \\ \cdot \\ \cdot \\ X_4 \end{bmatrix} \begin{bmatrix} X_1 & \ldots & X_4 \end{bmatrix}$$

$$= \begin{bmatrix} X_1^2 & X_1 X_2 & \ldots \\ X_2 X_1 & & \\ \cdot & & \\ \cdot & & \\ \cdot & & \end{bmatrix}$$

The covariance matrix, B, is given by

$$B = E\left[XX^T\right] = \left[E\left[X_1^2\right] \ \ldots \ E\left[X_1 X_4\right]\right] \qquad (1)$$

we would like to find an orthogonal transformation X = RY such that the non-diagonal terms of $E\left[YY^T\right]$ vanish. Note that any matrix R with real elements, such that

$$RR^T = I,$$

$$R^T = R^{-1} \qquad (2)$$

is an orthogonal matrix.

It follows from the covariance matrix, B (equation 1 above) and the orthogonal matrix equation that

$$B = E\left[RYY^T R^{-1}\right]$$

$$= RE\left[YY^T\right] R^{-1}$$

$$= R \Lambda R^{-1} \qquad (3)$$

since we require the off diagonal terms to vanish.

$$\Lambda = \begin{bmatrix} \lambda_1 & 0 & 0 & 0 \\ 0 & \lambda_2 & 0 & 0 \\ 0 & 0 & \lambda_3 & 0 \\ 0 & 0 & 0 & \lambda_4 \end{bmatrix}$$

From the matrix relation (3) we find that

$$BR = R\Lambda$$

where R is a 4 x 4 matrix. This matrix may be partioned into a matrix of the form

$$R = \left[R_1, R_2, R_3, R_4 \right]$$

with each element R_i being a column matrix.

It follows then, that

$$B R_i = R_i \lambda_i$$

for i = 1, 2, 3, 4. Since λ_i is a scalar, the right side of the above may be permuted giving

$$B R_i = \lambda_i R_i$$

which can be written as

$$(B - \lambda I)R_i = 0$$

for $\lambda = \lambda_i$. This matrix equation represents four linear equations with four unknown variables contained as elements of the column matrix R_i and for this equation to have a non-trivial solution, the determinant of the matrix of the coefficients of R_i must vanish, i.e.,

$$|B - \lambda I| = 0$$

or

$$|B_{rs} - \lambda \delta_{rs}| = 0$$

This equation is called the characteristic equation of the matrix B. It is a polynomial of degree four in λ and has four roots λ_1, λ_2, λ_3, and λ_4 which are called Eigen values or characteristic roots of B.

Placing the solution of the last equation for λI in the equation $(B-\lambda I)R_i = 0$, the equation can be solved for the components for R_i. In addition, since

$$KBR_i = B(KR_i)$$
$$= \lambda(KR_i)$$

a number K can be found such that

$$R_i^* = KR_i$$

is a unit vector. Vectors R_i^* are called Eigen vectors; these vectors satisfy the relation

$$(B - \lambda_i I) R_i^* = 0$$

since B is symmetric, it follows for $\lambda_i \neq \lambda_j$, that

$$R_i^{*T} R_j^* = \delta_{ij}$$

which states that the Eigen vectors are orthogonal vectors. The matrix R^* in partition form is given by

$$R^* = \left[R_1^*, R_2^*, R_3^*, R_4^*\right] \quad .$$

The new set of uncorrelated variants, Y, in terms of the correlated discriminants, X, is given by

$$Y = R^{*-1} X$$
$$= R^{*T} X$$

Briefly, to calculate a set of uncorrelated variants in terms of a set of correlated discriminants, one first calculates the covariance matrix for the correlated discriminants, solves the characteristic equation for the Eigen values, find the Eigen vectors and then computes the uncorrelated variants from a product of the matrix formed from the Eigen vectors, and the correlated discriminants.

Results. Eigen values and Eigen vectors were computed for the target classes (listed later in Table XI of Section VI) that were processed for the Kolmogorov-Smirnov (K-S) two-sample test for four groups of discriminant functions. These functions can be divided as follows:

1. Unnormalized, discriminant set 1 (N=1)
2. Normalized, discriminant set 1 (N=1)
3. Unnormalized, discriminant set 2 (N=2)
4. Normalized, discriminant set 2 (N=2)

The discriminant functions, which will be restated here only, are

1. Unnormalized

$$X_1 = \bar{P} = \frac{1}{4}\left\{\Sigma P_i\right\}$$

$$X_2^N = \frac{1}{4}\left\{|P_1-\bar{P}|^N + |P_2-\bar{P}|^N + |P_3+\bar{P}|^N + |P_4-\bar{P}|^N\right\}$$

$$X_3^N = 1/3\left\{|P_1-P_2|^N + |P_2-P_3|^N + |P_3-P_4|^N\right\}$$

$$X_4^N = 1/3\left\{|P_1-P_4|^N + |P_1-P_3|^N + |P_2-P_4|^N\right\}$$

2. Normalized

X_5 = Major Spread

$Z_1 = X_5/\bar{P}$

$Z_2 = X_2/\bar{P}$

$Z_3 = X_3/\bar{P}$

$Z_4 = X^4/\bar{P}$

These relations are equivalent to those on page 48. The unnormalized discriminants have units of power while the normalized discriminants are dimensionless.

Sample sets of the Eigen vectors obtained in the process of decorrelating the covariance are given in Tables II-VIII. There are four Eigen vectors for each target class; the components of these vectors appear as elements of column matrices in the tables. Target classes by corresponding Eigen vectors for the two target classes are aligned vertically for ease of comparison. Note that the sum of the squares of the elements is unity. Set 1 and Set 2 appearing in the table refers to the set of Eigen vectors for the first and second target classes, respectively. The four Eigen values given for each set of Eigen vectors are presented as elements of a row matrix. These elements also appear as the diagonal elements of the covariance matrix of the set of discriminants formed after the Eigen transformation has been performed. The first Eigen value is equal to $\sigma_{11}{}^2$, the second Eigen value is equal to $\sigma_{22}{}^2$ and so forth.

The Eigen vectors between the two target classes are compared by applying the following relation

"F"

TABLE II-A

TARGET LIST AND FILE DESIGNATION

	Scene				
TARGET CLASS	1	2	3	4	5
Man-made clutter	H1CLUT (111)	H2CLUT (108)	H3CLUT (105)		
Natural features	H1NAT (110)	H2NAT (109)	H3NAT (111)		
Rough grass and weeds			H3GRAS 1 (57) H3GRAS 2 (55)		
River bank trees		H2TREE1 (55)	H3TREE1 (52)		
Young fruit trees		H2TREE2 (53)	H3TREE2 (50)		
Railroad bridge		H2RRB1 (50)			
Highway bridge		H2HWB1 (43)	H3HWB1 (35)		
Bridges		H2BRIDG (53)	H3BRIDG (55)		
Mobile homes		H2MH1 (57)	H3MH1 (50)		
Shadows				H4DARK (56)	
Sand				H4SAND1 (56)	H5SAND1 (56) H5SAND2 (111)
Other Tactical vehicles				H4TACT1 (71)	H5TACT1 (71)
Tactical vehicles				H4TACT2 (88)	H5TACT2 (169)
Tanks				H4TANK1 (48)	H5TANK1 (44)
Trucks, 2 1/2 ton				H4TR251 (56)	H5TR251 (55)

TABLE II

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK) AND MOBILE HOMES (SET 2, H3MH1) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 1

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 30 GROUP 1

.5317E+08	.2133E+07	.4058E+06	.4173E+05

EIGEN VECTORS FROM SET 1 FILE 30 GROUP 1 — Tanks

.4758	.5236	-.6998	.0987
.3313	-.1661	.2279	.9004
.4630	.5237	.6722	-.2439
.6705	-.6512	-.0802	-.3465

EIGEN VALUES FOR SET 2 FILE 30 GROUP 1

.1501E+08	.2937E+07	.6388E+06	.1927E+05

EIGEN VECTORS FROM SET 2 FILE 30 GROUP 1 — Mobile Homes

.3551	.0248	.9175	.1774
.4063	-.0192	-.3221	.8549
.5682	-.7384	-.1347	-.3374
.6212	.6737	-.1905	-.3520

SD BETWEEN VARIANT EIGEN VECTORS

1	.09178	1
2	.95114	1
3	.94623	1
4	.06526	1

RELATIVE MATCH FOR FILE 30 IS 1.34637

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 30 GROUP 2

.4175E+00	.1617E+00	.7401E-02	.1079E-02

EIGEN VECTORS FROM SET 1 FILE 30 GROUP 2 — Tanks

.7777	-.0983	-.5983	-.1660
.2656	.0437	.5563	-.7862
.3388	-.7264	.4507	.3930
.4580	.6788	.3599	.4471

EIGEN VALUES FOR SET 2 FILE 30 GROUP 2

.6271E+00	.2549E+00	.6735E-02	.1320E-02

EIGEN VECTORS FROM SET 2 FILE 30 GROUP 2 — Mobile Homes

.7893	.0574	-.5898	-.1605
.2958	.0380	.6013	-.7413
.4355	-.6676	.3931	.4584
.3159	.7414	.3688	.4632

D BETWEEN VARIANT EIGEN VECTORS

1	.08745	2
2	.08891	2
3	.03706	2
4	.04057	2

RELATIVE MATCH FOR FILE 30 IS .13628

TABLE II (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK) AND MOBILE HOMES (SET 2, H3MH1) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 2

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 30 GROUP 3
   .6775E+08   .1534E+07   .5186E+06   .1127E+04
EIGEN VECTORS FROM SET 1 FILE 30 GROUP 3                Tanks
      .4188      .7072     -.5695      .0122
      .3613     -.1157      .1416      .9143
      .4630      .3516      .7716     -.2580
      .6926     -.6024     -.2453     -.3119
EIGEN VALUES FOR SET 2 FILE 30 GROUP 3
   .2346E+08   .1995E+07   .7813E+06   .1119E+04
EIGEN VECTORS FROM SET 2 FILE 30 GROUP 3
      .2690      .0913      .9588      .0028             Mobile
      .3864     -.0003     -.1111      .9156             Homes
      .6102     -.7381     -.1001     -.2699
      .6372      .6685     -.2415     -.2980
D BETWEEN VARIANT EIGEN VECTORS

  1       .10932   3
  2       .89377   3
  3       .88874   3
  4       .01029   3
RELATIVE MATCH FOR FILE 30 IS                           1.26520
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 30 GROUP 4
   .5251E+00   .1364E+00   .6067E-02   .2075E-03
EIGEN VECTORS FROM SET 1 FILE 30 GROUP 4                Tanks
      .6941     -.0707     -.7158     -.0308
      .2862      .0043      .2373      .9283
      .4350     -.7009      .5022     -.2593
      .4971      .7097      .4232     -.2647
EIGEN VALUES FOR SET 2 FILE 30 GROUP 4
   .8765E+00   .1774E+00   .5569E-02   .1320E-03
EIGEN VECTORS FROM SET 2 FILE 30 GROUP 4                Mobile
      .6674      .0471     -.7428     -.0232            Homes
      .2953      .0304      .2384      .9247
      .5194     -.6930      .4307     -.2541
      .4445      .7188      .4538     -.2826
D BETWEEN VARIANT EIGEN VECTORS

  1       .05169   4
  2       .06066   4
  3       .04117   4
  4       .01022   4
RELATIVE MATCH FOR FILE 30 IS                           .09028
```

TABLE III

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK1) AND TREES (SET 2, H3TREE3) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 1

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 21 GROUP 1

.8196E+08 .3194E+07 .8993E+06 .7164E+05

EIGEN VECTORS FROM SET 1 FILE 21 GROUP 1 — Tanks

.4765	-.4476	.7477	.1162
.3327	.1685	-.2501	.8935
.4824	-.5754	-.6141	-.2430
.6554	.6634	.0353	-.3593

EIGEN VALUES FOR SET 2 FILE 21 GROUP 1

.1621E+08 .2209E+07 .1647E+07 .4890E+05

EIGEN VECTORS FROM SET 2 FILE 21 GROUP 1 — Trees

.3965	.0534	.9148	.0557
.3626	.0794	-.2168	.9029
.7194	-.5691	-.2603	-.3014
.4401	.8167	-.2201	-.3015

SD BETWEEN VARIANT EIGEN VECTORS

1	.16569	1
2	.26576	1
3	.23422	1
4	.05125	1

RELATIVE MATCH FOR FILE 21 IS .39442

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 21 GROUP 2

.4646E+00 .1364E+00 .7331E-02 .1027E-02

EIGEN VECTORS FROM SET 1 FILE 21 GROUP 2 — Tanks

.7744	-.1387	-.5904	-.1800
.2630	.0600	.5679	-.7776
.3211	-.7206	.4698	.3961
.4774	.6767	.3288	.4539

EIGEN VALUES FOR SET 2 FILE 21 GROUP 2

.7646E+00 .1788E+00 .6736E-02 .1720E-02

EIGEN VECTORS FROM SET 2 FILE 21 GROUP 2 — Trees

.7833	.0529	-.5929	-.1789
.2634	.0328	.5827	-.7681
.4523	-.6634	.4069	.4355
.3353	.7456	.3785	.4340

D BETWEEN VARIANT EIGEN VECTORS

1	.09681	2
2	.10663	2
3	.04078	2
4	.02258	2

RELATIVE MATCH FOR FILE 21 IS .15137

TABLE III (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK1) AND TREES (SET 2, H3TREE3) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 2

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 21 GROUP 3

.1034E+09 .2152E+07 .1364E+07 .1249E+04

EIGEN VECTORS FROM SET 1 FILE 21 GROUP 3 — Tanks

.4219	.5526	-.7187	.0110
.3614	-.0953	.1528	.9148
.4856	.5040	.6687	-.2511
.6750	-.6569	-.1137	-.3161

EIGEN VALUES FOR SET 2 FILE 21 GROUP 3

.2209E+08 .1983E+07 .1514E+07 .2652E+04

EIGEN VECTORS FROM SET 2 FILE 21 GROUP 3 — Trees

.3168	.8697	.3784	-.0056
.3760	-.1287	-.0054	.9176
.6976	.0297	-.6565	-.2855
.5212	-.4755	.6526	-.2764

D BETWEEN VARIANT EIGEN VECTORS

1	.14130	3
2	.29981	3
3	.94499	3
4	.02758	3

RELATIVE MATCH FOR FILE 21 IS 1.00181

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 21 GROUP 4

.5808E+00 .1121E+00 .6068E-02 .1636E-03

EIGEN VECTORS FROM SET 1 FILE 21 GROUP 4 — Tanks

.6939	-.1009	-.7120	-.0382
.2855	.0109	.2268	.9311
.4133	-.7092	.5164	-.2442
.5159	.6977	.4184	-.2683

EIGEN VALUES FOR SET 2 FILE 21 GROUP 4

.9587E+00 .1242E+00 .4803E-02 .1870E-03

EIGEN VECTORS FROM SET 2 FILE 21 GROUP 4 — Trees

.6997	.0461	-.7129	-.0049
.2853	.0126	.2745	.9182
.5004	-.6854	.4487	-.2802
.4226	.7266	.4638	-.2799

D BETWEEN VARIANT EIGEN VECTORS

1	.06388	4
2	.07587	4
3	.04722	4
4	.02599	4

RELATIVE MATCH FOR FILE 21 IS .11289

TABLE IV

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK) AND GRASS (SET 2, H3GRAS2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 1

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 34 GROUP 1

.5317E+08 .2133E+07 .4058E+06 .4173E+05

EIGEN VECTORS FROM SET 1 FILE 34 GROUP 1 — Tanks

.4758	.5236	-.6998	.0987
.3313	-.1661	.2279	.9004
.4630	.5237	.6722	-.2439
.6705	-.6512	-.0802	-.3465

EIGEN VALUES FOR SET 2 FILE 34 GROUP 1

.3663E+07 .8203E+06 .7530E+05 .1954E+05

EIGEN VECTORS FROM SET 2 FILE 34 GROUP 1 — Grass

.0916	.1107	.9893	.0260
.4078	.1327	-.0762	.9001
.8589	-.3870	-.0274	-.3344
.2960	.9058	-.1215	-.2779

D BETWEEN VARIANT EIGEN VECTORS

1	.33559	1
2	.93720	1
3	.92692	1
4	.06743	1

RELATIVE MATCH FOR FILE 34 IS 1.36187

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 34 GROUP 2

.4175E+00 .1617E+00 .7401E-02 .1079E-02

EIGEN VECTORS FROM SET 1 FILE 34 GROUP 2 — Tanks

.7777	-.0983	-.5983	-.1660
.2656	.0437	.5563	-.7862
.3388	-.7264	.4507	.3930
.4580	.6788	.3599	.4471

EIGEN VALUES FOR SET 2 FILE 34 GROUP 2

.7246E+00 .1024E+00 .6204E-02 .1614E-02

EIGEN VECTORS FROM SET 2 FILE 34 GROUP 2 — Grass

.7489	.2318	-.5762	-.2311
.2701	.0154	.6441	-.7155
.5709	-.5846	.3126	.4844
.2007	.7774	.3941	.4473

D BETWEEN VARIANT EIGEN VECTORS

1	.17387	2
2	.18679	2
3	.08432	2
4	.06631	2

RELATIVE MATCH FOR FILE 34 IS .27682

TABLE IV (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN TANKS (SET 1, H5TANK) AND GRASS (SET 2, H3GRAS2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 2

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 34 GROUP 3
   .6775E+08   .1534E+07   .5196E+06   .1127E+04
EIGEN VECTORS FROM SET 1 FILE 34 GROUP 3                    Tanks
       .4188       .7072     -.5695      .0122
       .3613     -.1157       .1416      .9143
       .4630       .3516      .7716     -.2580
       .6926     -.6024     -.2453     -.3119
EIGEN VALUES FOR SET 2 FILE 34 GROUP 3
   .5464E+07   .6759E+06   .7862E+05   .9281E+03
EIGEN VECTORS FROM SET 2 FILE 34 GROUP 3                    Grass
       .0742       .1027      .9916      .0276
       .3910       .0804     -.0630      .9147
       .7974     -.5268       .0031     -.2943
       .4536       .8400     -.1132     -.2755
D BETWEEN VARIANT EIGEN VECTORS

 1        .26861   3
 2        .90222   3
 3        .87849   3
 4        .02684   3
RELATIVE MATCH FOR FILE 34 IS                          1.28787
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 34 GROUP 4
   .5251E+00   .1364E+00   .6067E-02   .2075E-03
EIGEN VECTORS FROM SET 1 FILE 34 GROUP 4                    Tanks
       .6941     -.0707     -.7158     -.0308
       .2862       .0043      .2373      .9283
       .4350     -.7009       .5022     -.2593
       .4971       .7097      .4232     -.2647
EIGEN VALUES FOR SET 2 FILE 34 GROUP 4
   .8922E+00   .8099E+01   .5953E-02   .1109E-03
EIGEN VECTORS FROM SET 2 FILE 34 GROUP 4                    Grass
       .6765       .1812     -.7132     -.0301
       .2886       .0267      .2415      .9261
       .5952     -.6295       .4163     -.2759
       .3237       .7551      .5097     -.2555
D BETWEEN VARIANT EIGEN VECTORS

 1        .11837   4
 2        .13335   4
 3        .06100   4
 4        .00956   4
RELATIVE MATCH FOR FILE 34 IS                           .18870
```

TABLE V

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF NATURAL FEATURES (SET 1, H2NAT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H4TACT2) HOP ON, SCENES 2 AND 4, DISCRIMINANT SET 1

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 55 GROUP 1

.6387E+09	.7014E+08	.1967E+08	.6298E+06

EIGEN VECTORS FROM SET 1 FILE 55 GROUP 1 — Natural Features

.4560	-.0224	.8853	.0887
.3646	.0123	-.2766	.8890
.5679	-.7095	-.2794	-.3100
.5802	.7043	-.2485	-.3250

EIGEN VALUES FOR SET 2 FILE 55 GROUP 1

.7173E+10	.6508E+08	.3963E+08	.1349E+07

EIGEN VECTORS FROM SET 2 FILE 55 GROUP 1 — Tactical Vehicles

.4220	.9015	-.0877	.0387
.3856	-.2203	-.0143	.8959
.3616	-.0734	.9157	-.1591
.7366	-.3651	-.3919	-.4130

;D BETWEEN VARIANT EIGEN VECTORS

1	.13097	1
2	.78358	1
3	.78492	1
4	.09091	1

RELATIVE MATCH FOR FILE 55 IS 1.12050

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 55 GROUP 2

.7723E+00	.1705E+00	.5955E-02	.2117E-02

EIGEN VECTORS FROM SET 1 FILE 55 GROUP 2 — Natural Features

.7853	-.0203	-.5988	-.1559
.2816	.0093	.5699	-.7719
.3779	-.7112	.4077	.4303
.4015	.7026	.3878	.4413

EIGEN VALUES FOR SET 2 FILE 55 GROUP 2

.8221E+00	.1587E+00	.7427E-02	.2107E-02

EIGEN VECTORS FROM SET 2 FILE 55 GROUP 2 — Tactical Vehicles

.7803	-.0754	-.6031	-.1474
.2719	-.0093	.5465	-.7920
.3498	-.7091	.4363	.4294
.4413	.7010	.3838	.4081

D BETWEEN VARIANT EIGEN VECTORS

1	.02496	2
2	.02907	2
3	.01871	2
4	.01987	2

RELATIVE MATCH FOR FILE 55 IS .04704

TABLE V (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF NATURAL FEATURES (SET 1, H2NAT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H4TACT2) HOP ON, SCENES 2 AND 4, DISCRIMINANT SET 2

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 55 GROUP 3
   .8328E+09   .5501E+08   .2575E+08   .8440E+05
EIGEN VECTORS FROM SET 1 FILE 55 GROUP 3                 Natural
       .3895     -.0388      .9202     -.0075              Features
       .3730      .0090     -.1501      .9156
       .5874     -.7061     -.2807     -.2784
       .6034      .7070     -.2279     -.2901
EIGEN VALUES FOR SET 2 FILE 55 GROUP 3
   .9084E+10   .9945E+08   .2152E+08   .2007E+05
EIGEN VECTORS FROM SET 2 FILE 55 GROUP 3
       .3701      .9287     -.0240     -.0040              Tactical
       .3693     -.1421      .0420      .9174              Vehicles
       .4834     -.1727      .8182     -.2588
       .7021     -.2959     -.5729     -.3022
SD BETWEEN VARIANT EIGEN VECTORS

  1        .07237    3
  2        .74988    3
  3        .75083    3
  4        .01168    3
RELATIVE MATCH FOR FILE 55 IS                        1.06369
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 55 GROUP 4
   .1017E+01   .1228E+00   .5291E-02   .1839E-03
EIGEN VECTORS FROM SET 1 FILE 55 GROUP 4                 Natural
       .6840     -.0210     -.7283     -.0371              Features
       .2922      .0028      .2271      .9290
       .4617     -.7088      .4672     -.2573
       .4833      .7051      .4470     -.2635
EIGEN VALUES FOR SET 2 FILE 55 GROUP 4
   .1035E+01   .1108E+00   .5786E-02   .1059E-03
EIGEN VECTORS FROM SET 2 FILE 55 GROUP 4
       .6958     -.0268     -.7177     -.0061              Tactical
       .2894     -.0071      .2730      .9174              Vehicles
       .4404     -.7206      .4562     -.2803
       .4880      .6928      .4497     -.2824
SD BETWEEN VARIANT EIGEN VECTORS

  1        .01248    4
  2        .01028    4
  3        .02423    4
  4        .02226    4
RELATIVE MATCH FOR FILE 55 IS                         .03666
```

TABLE VI

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF NATURAL FEATURES (SET 1, H3NAT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H5TACT2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 1

Unnormalized Discriminants

Natural Features

EIGEN VALUES FOR SET 1 FILE 56 GROUP 1

.1259E+11 .7826E+09 .5396E+09 .1538E+08

EIGEN VECTORS FROM SET 1 FILE 56 GROUP 1

.4760	.2509	.8416	.0471
.3553	-.0240	-.2443	.9019
.6262	-.7086	-.1262	-.2997
.5050	.6591	-.4649	-.3074

Tactical Vehicles

EIGEN VALUES FOR SET 2 FILE 56 GROUP 1

.2161E+11 .1929E+10 .2182E+09 .1077E+08

EIGEN VECTORS FROM SET 2 FILE 56 GROUP 1

.5399	-.5522	-.6352	-.0100
.3356	.1469	.1431	.9194
.5060	-.3585	.7457	-.2435
.5829	.7382	-.1414	-.3087

D BETWEEN VARIANT EIGEN VECTORS

1	.07904	1
2	.44805	1
3	.89385	1
4	.04102	1

RELATIVE MATCH FOR FILE 56 IS 1.00382

Normalized Discriminants

Natural Features

EIGEN VALUES FOR SET 1 FILE 56 GROUP 2

.7483E+00 .1520E+00 .6800E-02 .1706E-02

EIGEN VECTORS FROM SET 1 FILE 56 GROUP 2

.7705	.1282	-.5868	-.2135
.2685	.0325	.6259	-.7315
.5073	-.6300	.3591	.4655
.2772	.7652	.3674	.4501

Tactical Vehicles

EIGEN VALUES FOR SET 2 FILE 56 GROUP 2

.7164E+00 .1404E+00 .7592E-02 .1757E-02

EIGEN VECTORS FROM SET 2 FILE 56 GROUP 2

.7541	-.2430	-.5866	-.1679
.2634	-.0126	.5672	-.7802
.2066	-.7566	.4599	.4163
.5650	.6069	.3503	.4356

D BETWEEN VARIANT EIGEN VECTORS

1	.20829	2
2	.21266	2
3	.05895	2
4	.04208	2

RELATIVE MATCH FOR FILE 56 IS .30636

TABLE VI (CONTINUTED)

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF NATURAL FEATURES (SET 1, H3NAT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H5TACT2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 2

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 56 GROUP 3
   .1653E+11    .6830E+09    .5308E+09    .8421E+06
EIGEN VECTORS FROM SET 1 FILE 56 GROUP 3                  Natural
      .4054       .9104      -.0826      -.0082           Features
      .3664      -.1516       .0351       .9174
      .6322      -.3416      -.6345      -.2846
      .5494      -.1775       .7677      -.2781
EIGEN VALUES FOR SET 2 FILE 56 GROUP 3
   .2663E+11    .1948E+10    .2581E+09    .2091E+07
EIGEN VECTORS FROM SET 2 FILE 56 GROUP 3                  Tactical
      .4760      -.6637       .5762      -.0306           Vehicles
      .3555       .1256      -.1001       .9208
      .5331      -.2676      -.7620      -.2522
      .6023       .6871       .2781      -.2961
D BETWEEN VARIANT EIGEN VECTORS

  1         .06656    3
  2         .90935    3
  3         .42080    3
  4         .02170    3
RELATIVE MATCH FOR FILE 56 IS                        1.00443
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 56 GROUP 4
   .9348E+00    .1107E+00    .5627E-02    .1579E-03
EIGEN VECTORS FROM SET 1 FILE 56 GROUP 4                  Natural
      .6901       .0990      -.7168      -.0151           Features
      .2881       .0198       .2607       .9212
      .5427      -.6605       .4372      -.2792
      .3824       .7440       .4766      -.2704
EIGEN VALUES FOR SET 2 FILE 56 GROUP 4
   .8795E+00    .1144E+00    .6174E-02    .1603E-03
EIGEN VECTORS FROM SET 2 FILE 56 GROUP 4                  Tactical
      .6853      -.1375      -.7145      -.0295           Vehicles
      .2857      -.0242       .2404       .9273
      .3437      -.7624       .4868      -.2520
      .5749       .6318       .4412      -.2750
D BETWEEN VARIANT EIGEN VECTORS

  1         .13846    4
  2         .14214    4
  3         .03214    4
  4         .01586    4
RELATIVE MATCH FOR FILE 56 IS                        .20165
```

TABLE VII

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF CLUTTER (SET 1, H3CLUT) AND A CLASS OF TACTICAL VEHICLES (H5TACT2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET I

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 58 GROUP 1
   .2129E+13   .1799E+12   .5417E+11   .1629E+09
EIGEN VECTORS FROM SET 1 FILE 58 GROUP 1                   Clutter
       .7623    -.5903     -.2626      .0372
       .2539     .3296      .1237      .9009
       .4226     .1514      .8451     -.2905
       .4193     .7211     -.4490     -.3203
EIGEN VALUES FOR SET 2 FILE 58 GROUP 1
   .9780E+12   .8729E+11   .9873E+10   .4874E+09
EIGEN VECTORS FROM SET 2 FILE 58 GROUP 1                   Tactical
       .5399    -.5522     -.6352     -.0160               Vehicles
       .3356     .1469      .1431      .9194
       .5060    -.3585      .7457     -.2435
       .5829     .7382     -.1414     -.3087
SD BETWEEN VARIANT EIGEN VECTORS

  1        .14988    1
  2        .27163    1
  3        .24683    1
  4        .03504    1
RELATIVE MATCH FOR FILE 58 IS                        .39799
```

Normalized Discriminant

```
EIGEN VALUES FOR SET 1 FILE 58 GROUP 2
   .8690E+00   .2434E+00   .8316E-02   .2343E-02
EIGEN VECTORS FROM SET 1 FILE 58 GROUP 2                   Clutter
       .7810    -.1035     -.6081      .0979
       .2835    -.0130      .4982      .8193
       .3101    -.7316      .4587     -.3978
       .4621     .6737      .4143     -.4011
EIGEN VALUES FOR SET 2 FILE 58 GROUP 2
   .7164E+00   .1404E+00   .7592E-02   .1757E-02
EIGEN VECTORS FROM SET 2 FILE 58 GROUP 2                   Tactical
       .7541    -.2430     -.5866     -.1679               Vehicles
       .2634    -.0126      .5672     -.7802
       .2066    -.7566      .4599      .4163
       .5650     .6069      .3503      .4356
SD BETWEEN VARIANT EIGEN VECTORS

  1        .07488    2
  2        .07834    2
  3        .04827    2
  4        .99898    2
RELATIVE MATCH FOR FILE 58 IS                        1.00600
```

TABLE VII (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF CLUTTER (SET 1, H3CLUT) AND A CLASS OF TACTICAL VEHICLES (H5TACT2) HOP OFF, SCENES 3 AND 5, DISCRIMINANT SET 2

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 58 GROUP 3
   .2437E+13   .1973E+12   .7184E+11   .4070E+08
EIGEN VECTORS FROM SET 1 FILE 58 GROUP 3                 Clutter
       .7034    -.7016      .1142      .0074
       .2881     .2936     -.0299      .9110
       .4649     .3380     -.7685     -.2812
       .4541     .5544      .6289     -.3016
EIGEN VALUES FOR SET 2 FILE 58 GROUP 3
   .1205E+13   .8816E+11   .1168E+11   .9464E+08
EIGEN VECTORS FROM SET 2 FILE 58 GROUP 3                 Tactical
       .4760    -.6637      .5762     -.0306             Vehicles
       .3555     .1256     -.1001      .9208
       .5331    -.2676     -.7620     -.2522
       .6023     .6871      .2781     -.2961
SD BETWEEN VARIANT EIGEN VECTORS

  1        .14393   3
  2        .32172   3
  3        .29218   3
  4        .02454   3
RELATIVE MATCH FOR FILE 58 IS                          .45847
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 58 GROUP 4
   .1139E+01   .1704E+00   .6591E-02   .1562E-03
EIGEN VECTORS FROM SET 1 FILE 58 GROUP 4                 Clutter
       .6834    -.0272     -.7292     -.0238
       .2928    -.0008      .2443      .9245
       .4321    -.7445      .4410     -.2540
       .5105     .6670      .4628     -.2834
EIGEN VALUES FOR SET 2 FILE 58 GROUP 4
   .8795E+00   .1144E+00   .6174E-02   .1803E-03
EIGEN VECTORS FROM SET 2 FILE 58 GROUP 4                 Tactical
       .6853    -.1375     -.7145     -.0295             Vehicles
       .2857    -.0242      .2404      .9273
       .3437    -.7624      .4868     -.2520
       .5749     .6318      .4412     -.2750
SD BETWEEN VARIANT EIGEN VECTORS

  1        .05481   4
  2        .05975   4
  3        .02644   4
  4        .00536   4
RELATIVE MATCH FOR FILE 58 IS                          .08545
```

TABLE VIII

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF CLUTTER (SET 1, H2CLUT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H4TACT2) HOP ON, SCENES 2 AND 4, DISCRIMINANT SET 1

Unnormalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 57 GROUP 1
    .2072E+13    .9384E+11    .2143E+11    .8813E+09
EIGEN VECTORS FROM SET 1 FILE 57 GROUP 1                 Clutter
        .5329     -.5941      .6021      .0222
        .3457      .1969     -.1452      .9059
        .6386     -.1334     -.6849     -.3245
        .4343      .7684      .3838     -.2713
EIGEN VALUES FOR SET 2 FILE 57 GROUP 1
    .4368E+13    .3962E+11    .2413E+11    .8217E+09
EIGEN VECTORS FROM SET 2 FILE 57 GROUP 1                 Tactical
        .4220      .9015     -.0877      .0387           Vehicles
        .3856     -.2203     -.0143      .8959
        .3616     -.0734      .9157     -.1591
        .7366     -.3651     -.3919     -.4130
D BETWEEN VARIANT EIGEN VECTORS

  1       .21331   1
  2       .96168   1
  3       .95611   1
  4       .10932   1
RELATIVE MATCH FOR FILE 57 IS                          1.37711
```

Normalized Discriminants

```
EIGEN VALUES FOR SET 1 FILE 57 GROUP 2
    .9483E+00    .1724E+00    .8188E-02    .1810E-02
EIGEN VECTORS FROM SET 1 FILE 57 GROUP 2                 Clutter
        .7871     -.0044     -.6071      .1086
        .2844     -.0097      .5135      .8096
        .3802     -.7113      .4246     -.4113
        .3937      .7028      .4330     -.4045
EIGEN VALUES FOR SET 2 FILE 57 GROUP 2
    .8221E+00    .1587E+00    .7427E-02    .2107E-02
EIGEN VECTORS FROM SET 2 FILE 57 GROUP 2                 Tactical
        .7803     -.0754     -.6031     -.1474           Vehicles
        .2719     -.0093      .5465     -.7920
        .3498     -.7091      .4363      .4294
        .4413      .7010      .3838      .4081
SD BETWEEN VARIANT EIGEN VECTORS

  1       .02912   2
  2       .03551   2
  3       .03026   2
  4       .99972   2
RELATIVE MATCH FOR FILE 57 IS                          1.00123
```

TABLE VIII (CONTINUED)

COMPARISON OF EIGEN VECTORS BETWEEN A CLASS OF CLUTTER (SET 1, (H2CLUT) AND A CLASS OF TACTICAL VEHICLES (SET 2, H4TACT2) HOP ON, SCENES 2 AND 4, DISCRIMINANT SET 2

Unnormalized Discriminants

EIGEN VALUES FOR SET 1 FILE 57 GROUP 3

.2412E+13	.1137E+12	.1311E+11	.2337E+08

EIGEN VECTORS FROM SET 1 FILE 57 GROUP 3 — Clutter

.4854	-.7125	.5063	-.0197
.3509	.1479	-.0926	.9200
.6363	-.0601	-.7064	-.3042
.4862	.6832	.4859	-.2463

EIGEN VALUES FOR SET 2 FILE 57 GROUP 3

.5531E+13	.6055E+11	.1310E+11	.1222E+08

EIGEN VECTORS FROM SET 2 FILE 57 GROUP 3 — Tactical Vehicles

.3701	.9287	-.0240	-.0040
.3693	-.1421	.0420	.9174
.4834	-.1727	.8182	-.2588
.7021	-.2959	-.5729	-.3022

SD BETWEEN VARIANT EIGEN VECTORS

1	.14459	3
2	.96811	3
3	.96757	3
4	.03687	3

RELATIVE MATCH FOR FILE 57 IS 1.37684

Normalized Discriminants

EIGEN VALUES FOR SET 1 FILE 57 GROUP 4

.1256E+01	.1142E+00	.5439E-02	.1346E-03

EIGEN VECTORS FROM SET 1 FILE 57 GROUP 4 — Clutter

.6840	-.0040	-.7284	-.0379
.2915	-.0050	.2254	.9296
.4641	-.7156	.4532	-.2592
.4814	.6985	.4617	-.2591

EIGEN VALUES FOR SET 2 FILE 57 GROUP 4

.1035E+01	.1108E+00	.5786E-02	.1059E-03

EIGEN VECTORS FROM SET 2 FILE 57 GROUP 4 — Tactical Vehicles

.6958	-.0268	-.7177	-.0061
.2894	-.0071	.2730	.9174
.4404	-.7206	.4562	-.2803
.4880	.6928	.4497	-.2824

D BETWEEN VARIANT EIGEN VECTORS

1	.01368	4
2	.01203	4
3	.02517	4
4	.02318	4

RELATIVE MATCH FOR FILE 57 IS .03876

$$SD_i = \left[\frac{1}{4}\left\{\sum_{r=1}^{4}\left({}_1E_{ir} - {}_2E_{ir}\right)^2\right\}\right]^{1/2}$$

where ${}_sE_{ir}$ is the r-th element of the i-th Eigen vector (i = 1, 2, 3, 4) for Set S. These values are tabulated and listed in a column labeled "SD Between Variant Eigen Vectors." The numbers 1, 2, 3, 4 refer to the i-th Eigen vector and the 3rd column is the discriminant group number.

The maximum value of SD_i can be found by expanding $\sum\left({}_1E_{ir} - {}_2E_{ir}\right)^2$. When this is done,

$$4\ SD_i^2 = \sum {}_1E_{ir}^2 + \sum {}_2E_{2r}^2 - 2 \sum {}_1E_{ir} \cdot {}_2E_{ir}$$

$$= 2\left[1 - \sum {}_1E_{ir} \cdot {}_2E_{ir}\right]$$

Now ${}_1E$ and ${}_2E$ are unit vectors, so that

$$\sum {}_1E_{ir} \cdot {}_2E_{ir}$$

is the dot product of two unit vectors which can vary between +1 and -1. When the dot product of the two Eigen vectors is +1, $SD_i = 0$; but when the dot product of the two vectors is -1, $SD_i = 1$, from which we conclude that

$$|SD_i| \leq 1$$

If the Eigen vectors from two sets are alike, they will have the same direction and SD_i will be zero. If the Eigen vectors are nearly alike, SD_i will be close to zero. As the dissimilarity between the two sets of Eigen vectors increases, the more SD_i will depart from zero until it reaches its maximum value of 1 -- the value of SD_i denoting the greatest dissimilarity. SD_i is, therefore, a measure of similarity between two Eigen vectors and provides a method for assigning the similarity or dissimilarity for two target classes.

Since the number of Eigen vectors is equal to the number of discriminants contained in the set, there are four Eigen vectors per set. Two sets of Eigen vectors may be compared by examining each SD_i a total of four numbers in this case. If one or more SD_i out of the set of four deviated from zero by a number greater than a yet to be determined threshold, the two target classes would be considered as being dissimilar.

Now instead of examining each SD_i, it would be more convenient to combine the four numbers SD_i such that a single number could be used for testing target similarity. One such number used here, RM, is defined to be the root sum square of SD_i, a number which varies from 0 to 2. RM close to zero would indicate great similarity between two target classes and RM approaching the number two would indicate great dissimilarity between the two classes.

RM appears as the number labeled "RELATIVE MATCH" for the file numbers shown. Eigen vectors for selected target classes such as tanks, tactical vehicles, and natural features are given in Tables II-VIII.

Target classes and file designation which appear in these tables are listed in Table II-A. Numbers in the parentheses indicate the number of pixels (data points) contained in each file.

Four sets of Eigen vectors were generated for selected target classes and discriminants. A set of Eigen vectors were computed for each set of discriminants -- one for the generalized set of discriminants

N = 1, unnormalized; one for the generalized set of discriminants N = 1, normalized; one for the generalized set of discriminants N = 2, unnormalized; and one for the generalized set of discriminants N = 2, normalized. As an example the four sets of Eigen vectors appear in each of the Tables II-VIII. The terms Set 1 and Set 2 appearing in these tables refer to target classes 1 and 2. The corresponding four Eigen vectors appear as a column matrix under the set designation. The SD_i between the two sets of Eigen vectors appear below the listing of Eigen vectors adjacent to the vector number 1, 2, 3, and 4. RM is the last number in the table.

The group number corresponds to the discriminant set

Group	Discriminant Set	
1	N = 1	Unnormalized
2	N = 1	Normalized
3	N = 2	Unnormalized
4	N = 2	Normalized

Specifically these tables contain Eigen vectors for the following target classes.

Table II	Tanks and Mobile Homes, hop off
Table III	Tanks and Trees, hop off
Table IV	Tanks and Grass, hop off
Table V	Natural Features and Tactical Vehicles, hop on
Table VI	Natural Features and Tactical Vehicles, hop off
Table VII	Clutter and Tactical Vehicles, hop off
Table VIII	Clutter and Tactical Vehicles, hop on

RM data taken from these tables and from other such tables not appearing in this report are listed in Table IX. This table provides some indication as to the classification potential of the Eigen vectors for the four groups of discriminant functions.

Employing a fixed threshold, RMT, two target classes will be assumed to be taken from the same population if RM $\leq$ RMT and from different populations if RM > RMT. The type error can be assigned to a control set of data, such as the data in Table IX, according to whether a correct or incorrect classification has been made. For example, the trucks had a high RM (RM>2) indicating that the two sets of trucks were dissimilar when in reality they were not.

Taking RMT = 0.2, a hit or miss is assigned to each RM in Table IX. A hit is assigned for a correct classification and a miss is assigned for an incorrect classification. It is found that groups 1, 2, 3, and 4 made 3, 7, 3, and 12 errors out of 14 possible errors, respectively. From this limited data, fewer errors are made with the unnormalized data than with the normalized data confirming earlier results indicating that class separability, when it exists, is primarily due to a difference in mean power.

AD-A112 931 TEXAS UNIV AT AUSTIN APPLIED RESEARCH LABS F/G 17/9
SYNTHETIC APERTURE RADAR DATA VARIANCE ANALYSIS.(U)
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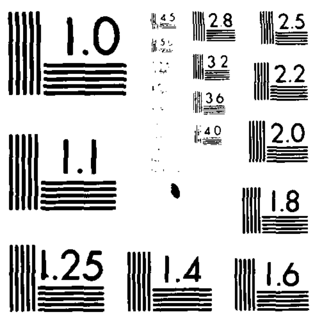
UNCLASSIFIED ARL-TR-80-16 AFWAL-TR-80-1058 NL

2 OF 3



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

TABLE IX

COMPARISON OF THE FOUR EIGEN VECTORS BETWEEN TARGET CLASSES BASED UPON RM

Target Classes	No. of Data Pts.	File No.	DISCRM SET 1 Unnormalized Group 1 (RM)	DISCRM SET 1 Normalized Group 2 (RM)	DISCRM SET 2 Unnormalized Group 3 (RM)	DISCRM SET 2 Normalized Group 4 (RM)
H4TR251 H6TR251	56 55	6	0.800†	1.000†	0.547†	0.057
H4TANK1 H2TREE2	48 53	15	0.179†	0.062†	0.152†	0.047†
H5TANK1 H3TREE3	44 56	21	0.394	0.151†	1.002	0.113†
H4TANK1 H2BRIDG	48 53	24	1.006	0.124†	1.005	0.082†
H5TANK H3BRIDG	* 55	26	1.005	1.003	1.343	0.076†
H5TANK H3MH1	* 50	30	1.346	0.136†	1.265	0.090†
H4TANK1 H1MH1	48 56	31	1.001	1.000	1.001	0.030†
H5TANK H3GRAS3	* *	33	1.302	0.300	1.195	0.193†
H5TANK H3GRAS2	* 55	34	1.362	0.277	1.288	0.189†
H2NAT H4TACT2	109 88	55	1.120	0.047†	1.064	0.037†
H3NAT H5TACT2	111 169	56	1.004	0.306	1.004	0.201
H2CLUT H4TACT2	108 105	57	1.377	1.001	1.377	0.038†
H3CLUT H5TACT2	105 169	58	0.398	1.006	0.458	0.085†
S5SAND1 50/50	50 50	36	0.128	0.071	1.000†	0.033

* Not Available
† Represents an Error

VI. KOLMOGOROV-SMIRNOV TWO-SMAPLE TESTS

Theory

The Kolmogorov-Smirnov test is a nonparametric statistical test used to compare two distributions. These distributions may be either a sample distribution and a theoretical distribution or two sample distributions. Since the theoretical distributions for the selected data and the variants constructed from these data are now known, we shall be concerned with applying this test to two sample distributions for purposes of testing the hypothesis whether or not the two sample distributions are the same, i.e., whether or not the distributions are representative of the same class. This test will not give the classification of a 4 look ensemble on a per sample (pixel) basis, but will rather determine whether or not two distributions of variants (features) based on the 4 look ensembles are similar hence determining the existence of discrimination information.

The chi-squared test is often used in the goodness-of-fit problems when the data can be grouped into categories to form frequer y distributions such as those often used in the form of a histogram to show probability density functions. The Kolmogorov-Smirnov test, unlike the chi-squared test, is based upon the cumulative distribution function (CDF) rather than on frequencies in the two samples.

The test involves the null hypothesis (H_o) that two samples come from populations with the same distribution function versus the alternate hypothesis (H_a) that the two samples do not come from populations with identical distribution functions.

Consider the statistic X_i from sample $\underline{\overline{X}}$ to be ordered such that

$$X_1 \leq X_2 \leq \ \ldots \leq X_n$$

where n is the sample size. The sample CDF will be defined by the proportion of the measurement that does not exceed X so that if $S_n(X)$ is the CDF for one sample; then,

$$\begin{aligned} S_n(X) &= 0 & X &< X_1 \\ &= r/n & X_r &\leq X < X_{r+1} \\ &= 1 & X_n &< X \end{aligned}$$

If the sample $\underline{\overline{X}}$ comes from a completely specified distribution F(X), then

$$\lim_{n \to \infty} \left(S_n(X) - F(X) \right) = 0$$

for all X.

A test for goodness-of-fit to F(X) can be constructed out of any suitable measure of deviation between the two functions. A test function employed by Kolmogorov, D_n, known as the Kolmogorov test statistic is the maximum absolute difference between $S_n(X)$ and F(X) when F(X) represents the CDF of the second sample, then F(X) is replaced with $F_m(X)$ where m is the sample size for the second sample and the Kolmogorov test statistic becomes

$$D_{nm} = \text{MAX}\left| S_n(X) - F_m(X) \right|$$

It was proved by Kolmogorov and Feller that for any given number $\lambda > 0$

$$\lim_{n \to \infty} P(D_n \geq \lambda / \sqrt{n}) = L(\lambda)$$

where

$$L(\lambda) = 2\sum_{n=1}^{\infty} (-1)^{n+1} \exp(-2n^2\lambda^2)$$

and it was shown by Smirnov for the two sample case that

$$\text{Limit } P(D_{nm} \geq \lambda/\sqrt{N}) = L(\lambda)$$

where

$$N = nm/(n + m).$$

Given D_{nm}, confidence limits can be constructed within which either sample distribution can be expected to lie with a confidence level of $1 - \alpha$. From the distribution of D_{nm}, we have that

$$P(D_{nm} > d_{n\alpha}) = \alpha$$

for all X where $d_{n\alpha}$ for five values of α are listed in Table X and the asymptotic relation for $d_{n\alpha}$ is $\lambda/\sqrt{n}$. It follows from this relation that

$$P(D_{nm} \leq d_{n\alpha}) = 1 - \alpha$$

and from the definition of D_{nm}, it also follows that

$$P[S_n(x) - d_{n\alpha} \leq F_m(x) \leq S_n(x) + d_{n\alpha}] = 1 - \alpha$$

and

$$P[F_m(x) - d_{n\alpha} \leq S_n(x) \leq F_m(x) + d_{n\alpha}] = 1 - \alpha$$

When comparing two sample distributions, $d_{n\alpha}$, the last three equations become the confidence statements, and the confidence band of $\pm d_{n\alpha}$ is expected to bracket the entire distribution of S_n or F_m at a confidence level of $1 - \alpha$.

TABLE X

VALUES OF $d_{n\alpha}$ SUCH THAT $P(D_{nm} > d_{n\alpha}) = \alpha$

	α				
n	0.20	0.15	0.10	0.05	0.01
1	0.900	0.925	0.950	0.975	0.995
2	0.684	0.726	0.776	0.842	0.829
3	0.565	0.597	0.642	0.708	0.829
4	0.494	0.525	0.564	0.624	0.734
5	0.446	0.474	0.510	0.563	0.669
6	0.410	0.436	0.470	0.521	0.618
7	0.381	0.405	0.438	0.486	0.577
8	0.358	0.381	0.411	0.457	0.543
9	0.339	0.360	0.388	0.432	0.514
10	0.322	0.342	0.368	0.409	0.486
11	0.307	0.326	0.352	0.391	0.468
12	0.295	0.313	0.338	0.375	0.450
13	0.284	0.302	0.325	0.361	0.433
14	0.274	0.292	0.314	0.349	0.418
15	0.266	0.283	0.304	0.338	0.404
16	0.258	0.274	0.295	0.328	0.392
17	0.250	0.266	0.286	0.318	0.381
18	0.244	0.259	0.278	0.309	0.371
19	0.237	0.252	0.272	0.301	0.363
20	0.231	0.246	0.264	0.294	0.352
25	0.21	0.22	0.24	0.26	0.32
30	0.19	0.20	0.22	0.24	0.29
35	0.18	0.19	0.21	0.23	0.27
over 35	$1.07/\sqrt{n}$	$1.14/\sqrt{n}$	$1.22/\sqrt{n}$	$1.36/\sqrt{n}$	$1.63/\sqrt{n}$

The distribution of a test statistic, when the null hypothesis is true, is usually continuous for classical tests and discrete for distribution free tests. This means one may choose any significance level one wishes for parametric distributions; where as when employing distribution free tests, this is not the case. Either one of the discrete cumulative probabilities of the test statistic must be accepted as the significance level or a significance level must be chosen which is not one of the discretes. If the significance level is not one of the discrete levels of the CP, then a number, the significance level, has been chosen which the test statistic cannot assume and the test will be applied inexactly.

Numerical Procedures

One method for comparing the statistics between two target classes such as those listed in Table XI is to perform the two-sample Kolmogorov-Smirnov test on computed discriminants. A Fortran Program was written to perform this test on eight sets of discriminants computed in power (4 discriminants per set) for selected targets. The input to the program consists of special files (HD XX) containing two header cards plus the filter magnitude data from target files H---, P---, S---, and V---. The H and P target files are listed in Appendix A of this report. The S and V files were preliminary files used in preparing the H files. A list of target classes tested with this program is given in Table XI; the corresponding HD file number which appears will serve as a key for identifying specific data sets being compared. The discriminants employed in the program are listed in Section IV as generalized discriminants for N = 1 and N = 2.

TABLE XI

FILE NUMBERS INDICATING TARGET GROUPS CONSIDERED FOR THE KOLMOGOROV-SMIRNOV TWO-SAMPLE TEST

FILE No.	TARGETS	HOP	TARGET GROUPS by File No.
HD 1	Tanks	—	H5TANK + H4TANK1
** 2	Trucks	—	H5TR251 + H4TR251
3	Tactical Vehicles	—	H5TACT1 + H4TACT1
4	Sand from Two Different Scenes	—	H5SAND1 + H4SAND1
5	Tanks	ON	H4TANK1 + H6TANK1
++6	Trucks	ON	H4TR251 + H6TR251
7	Tanks	ON	H4TANK1 + V7TANK1
8	Trucks	ON	H4TR251 + V7TRUCK
9	Mobile Homes from two Scenes	ON	H2MH1 + H1MH1
10	Mobile Homes from two Scenes	—	H2MH1 + H3MH1
**11	Bridges from two scenes	ON	H2BRIDG + H1BRIDG
**12	Bridges from two scenes	ON	H2BRIDG + H3BRIDG
13	Tanks and River Trees Sample size 13	ON	H4TANK1 + H2TREE1
14	Tanks and River Trees Sample size 25	ON	H4TANK1 + H2TREE1
++15	Tanks and River Trees Sample size 50	ON	H4TANK1 + H2TREE1
**16	Trucks and River Trees Sample size 12	ON	H4TR251 + H2TREE1
**17	Trucks and Trees Sample size 24	ON	H4TR251 + H2TREE1

** Not Processed

++ Eigen Value Comparison Appears in this Report

TABLE XI (CONTINUED)

FILE No.	TARGETS	HOP	TARGET GROUPS by File No.
** 18	Trucks and River Trees Sample size 50	ON	H4TR251 + H2TREE1
HD 19	Tanks and River Trees Sample size 12	OFF	H5TANK1 + H3TREE3
20	Tanks and River Trees Sample size 24	OFF	H5TANK1 + H3TREE3
++21	Tanks and River Trees Sample size 50	OFF	H5TANK1 + H3TREE3
22	River Trees from two Scenes	—	P2TREE1 + P3TREE1
23	Tanks and Mobile Homes	ON	H4TANK1 + H2MH1
++24	Tanks and Bridges	ON	H4TANK1 + H2BRIDG
25	Tanks and Unsorted River Trees	ON	H4TANK1 + H2TREE4
++26	Tanks and Bridges	OFF	H5TANK + H3BRIDG
** 27	Trucks and Mobile Homes	ON	H4TR251 + H2MH1
** 28	Trucks and Bridges	ON	H4TR251 + H2BRIDG
** 29	Trucks and Unsorted River Trees	ON	H4TR251 + H2TREE4
++30	Tanks and Mobile Homes	OFF	H5TANK + H3MH1
++31	Tanks and Mobile Homes	ON	H4TANK1 + H2MH1
32	Tanks and Grass	ON	H4TANK1 + H2GRAS3
++33	Tanks and Grass	OFF	H5TANK + H3GRAS3
++34	Tanks and Grass	OFF	H5TANK + H3GRAS2
** 35	Two groups of Sand Sample Size 100	OFF	S5SAND1 + S5SAND1 Two groups of 100
++36	Two groups of Sand Sample Size 50	OFF	First group of 100 from HD 35
37	Two groups of Sand Sample Size 25	OFF	From first group of 50 from HD 36
38	River Trees and River Trees Sample Size 100	OFF	Two groups first 200 Samples from P300101

** Not Processed

++ Eigen Vector Comparison Appears in this Report

TABLE XI (CONTINUED)

File No.	TARGETS	HOP	TARGET GROUPS by File No.
HD 39	River Trees and River Trees Sample Size 50	OFF	Two groups from HD 38 first group
40	River Trees and River Trees Sample Size 25	OFF	Two groups from HD 39 first group
41	Two groups of Tanks Sample Size 25	OFF	H5 Tank divided into two groups
42	Two groups of Tanks Sample Size 12	OFF	First group from HD41 divided into two groups
43	Two groups of Trucks Sample Size 25	OFF	H5 TR251 divided into two groups
44	Two groups of Trucks Sample Size 12	OFF	First group of HD43 divided into two groups
45	Two halves of a Fruit Orchard	ON	V21A102 + V21B102
46	Weeds and Mowed Grass	OFF	V300202 + V300201
47	Railroad Bridge and Highway Bridge	OFF	H3RRB1 + H3HWB1
48	Mobile Homes and Bridges	OFF	H3MH1 + H3BRIDG
49	Mobile Homes and River Trees	OFF	H37H1 + H3TREE3
50	Weed Field and River Trees	OFF	V300202 + P300101
51	Orchard and River Trees	—	V21A102 + P300101
52	Sand and Weeds	OFF	S5SAND + V300202
53	Tactical Vehicles (two groups) Sample size 36	OFF	From H5TACT1
54	Tactical Vehicles (two groups) Sample size 18	OFF	From HD 53
++55	Tactical Vehicles and Natural features	ON	H2NAT + H4TACT2
++56	Tactical Vehicles and Natural features	OFF	H3NAT + H5TACT2

++ Eigen Vector Comparison Appears in this Report

TABLE XI (CONTINUED)

File No.	TARGETS	HOP	TARGET GROUPS by File No.
HD 57++	Tactical Vehicles and Clutter	ON	H2CLUT + H4TACT2
++58	Tactical Vehicles and Clutter	OFF	H3CLUT + H5TACT2
59	Tanks and Clutter	ON	H2CLUT + H4TANK1
60	Tanks and Clutter	OFF	H3CLUT + H5TANK1
61	Tanks and Natural Features	OFF	H3NAT + H5TANK1
62	Tanks and Natural Features	ON	H2NAT + H4TANK1
63	Tactical Vehicles and Trees	ON	H4TACT2 + H2TREE3
64	Tactical Vehicles and Trees	OFF	H5TACT2 + H3TREE3
65	Tactical Vehicles and Desert Sand	ON	H4TACT2 + H4SAND1
66	Tactical Vehicles and Desert Sand	OFF	H5TACT2 + H5SAND1
67			
68			
69			
70	Tactical Vehicles* and Natural Features	OFF	P5TACT1 + H3NAT2
71	Tactical Vehicles* and Clutter	OFF	P5TACT1 + H3CLUT
72	Tactical Vehicles* and Desert Sand	OFF	P5TACT1 + H5SAND1
** 73	Tactical Vehicles* and Desert Sand*	OFF	P5TACT1 + PT5SAND
74	Tanks* and Tanks*	—	P5TANK1 + P4TANK
75	Tanks* and Desert Sand	OFF	P5TANK1 + H5SAND1
76	Tactical Vehicles* and Natural Features	ON	P4TACT1 + H2NAT
77	Tactical Vehicles* and Clutter	ON	P4TACT1 + H2CLUT

* Single pixel per target

** Not Processed

++ Eigen Vector Comparison Appears in this report

TABLE XI (CONTINUED)

File No.	TARGETS	HOP	TARGET GROUPS by File No.
** 78	Tactical Vehicles* and Sand	ON	P4TACT1 + H4SAND1
79	Tanks* and River Trees	OFF	P5TANK + P3T101
80	Tanks* and River Trees	ON	P4TANK + P2TREE1
81	Tanks* and Desert Sand	ON	P4TANK + H4SAND1
82	Tanks* and River Trees	OFF	P5TANK1 + P3TREE2
83	Tactical Vehicles+ and Natural Features	OFF	H5TACT2 + H3NAT2
84	Tactical Vehicles+ and Clutter	OFF	H5TACT2 + H3CLUT2
85	Tanks+ and Clutter	OFF	H5TANK + H3CLUT2
86	Mobile Homes and Bridges+	OFF	H3MH1 + H3BRIDG
87	Tanks+ and Bridges+	OFF	H5TANK + H3BRIDG
88	Railroad Bridge and Highway Bridge+	OFF	H3RRB1 + H3HWB1
89	Tanks+ and Natural Features	OFF	H5TANK + H3NAT2
90	Tanks* and Cranes*	OFF	P5TANK1 + P5CRAN1

* ..gle Pixel per Target
\+ Duplicate Pixels Removed from File
** Not Processed

The program uses a sort subroutine and a nonparametric statistic subroutine from the IMSL (International Mathematical and Statistics Libraries, Inc.) Library 3 for Cyber 70/170 class and an Eigen value subroutine from the IBM Library.

A two tailed test is then performed to compute the probability of making an error in rejecting the null hypothesis, H_o, that the two target classes come from the same population versus an alternate hypothesis that the two target classes do not come from the same population. This probability is the probability that the two target sets came from the same population.

Results of the test for four sets of discriminants are listed in Tables XIV to XIX. The sets derived from the generalized set of discriminants are labeled variant set 1 and variant set 2 which corresponds to N = 1 and 2 for the generalized discriminants. Results of the test appear in the columns labeled X1, X2, X3, X4 and Z1, Z2, Z3, Z4 which are the discriminant functions appearing on p. 48.

Tests were performed on both the unnormalized and normalized sets thus resulting in the four sets of discriminants. Probabilities listed in the tables have units of percent and are rounded to the nearest integer.

The Eigen values and Eigen vectors were computed for each of the four sets of discriminants and the resulting Eigen vectors were used to transform each set of discriminants to a new set which has the property that the covariances for each set vanishes. Since the covariances are zero, we are assured that discriminants within each set transferred are uncorrelated.

TABLE XII

COMPARISON OF COVARIANCE MATRICES BEFORE AND AFTER APPLICATION OF THE EIGEN TRANSFORMATION FOR VARIANT SET 1

UNNORMALIZED DISCRIMINANTS

COVARIANCE MATRIX 1

1	1	.131E+13	.354E+12	.662E+12	.548F+12	Clutter
1	2	.354E+12	.143E+12	.237E+12	.229F+12	
1	3	.662E+12	.237E+12	.432E+12	.351F+12	
1	4	.548E+12	.229E+12	.351E+12	.387F+12	

COVARIANCE MATRIX 2

2	1	.210E+12	.133E+12	.198E+12	.266F+12	Tanks
2	2	.133E+12	.975E+11	.131E+12	.197F+12	
2	3	.198E+12	.131E+12	.199E+12	.258F+12	
2	4	.266E+12	.197E+12	.258E+12	.407F+12	

DISCRIMINANTS FORMED WITH EIGEN TRANSFORMATIONS

COVARIANCE MATRIX 1

1	1	.206E+13	-.156E+03	-.420E+01	.929F-02	Clutter
1	2	-.156E+03	.169E+12	-.142E+06	-.250F-02	
1	3	-.420E+01	-.142E+06	.456E+11	.134F+03	
1	4	.929E-02	-.250E-02	.134E+03	.146F+09	

COVARIANCE MATRIX 2

2	1	.871E+12	-.166E-02	-.404E+00	-.386F+04	Tanks
2	2	-.166E-02	.349E+11	-.168E+04	.169F+00	
2	3	-.404E+00	-.168E+04	.665E+10	-.411F-04	
2	4	-.386E+04	.169E+00	-.411E-04	.684F+09	

NORMALIZED DISCRIMINANTS

COVARIANCE MATRIX 1

1	1	.443E+00	.158E+00	.156E+00	.275F+00	Clutter
1	2	.158E+00	.613E-01	.579E-01	.102F+00	
1	3	.156E+00	.579E-01	.165E+00	-.483F-02	
1	4	.275E+00	.102E+00	-.483E-02	.282F+00	

COVARIANCE MATRIX 2

2	1	.257E+00	.832E-01	.119E+00	.136F+00	Tanks
2	2	.832E-01	.327E-01	.340E-01	.567F-01	
2	3	.119E+00	.340E-01	.135E+00	-.135F-01	
2	4	.136E+00	.567E-01	-.135E-01	.163F+00	

DISCRIMINANTS FORMED WITH EIGEN TRANSFORMATIONS

COVARIANCE MATRIX 1

1	1	.736E+00	-.582E-14	-.211E-08	-.710F-08	Clutter
1	2	-.582E-14	.205E+00	.276E-11	-.478F-08	
1	3	-.211E-08	.276E-11	.727E-02	.298F-16	
1	4	-.710E-08	-.478E-08	.298E-16	.192F-02	

COVARIANCE MATRIX 2

2	1	.417E+00	.339E-14	-.315E-08	-.665F-10	Tanks
2	2	.339E-14	.162E+00	-.123E-14	-.663F-07	
2	3	-.315E-08	-.123E-14	.740E-02	-.651F-13	
2	4	-.665E-10	-.663E-07	-.651E-13	.108F-02	

TABLE XIII

COMPARISON OF COVARIANCE MATRICES BEFORE AND AFTER APPLICATION OF THE EIGEN TRANSFORMATION TO THE UNNORMALIZED AND NORMALIZED SET OF DISCRIMINANTS, DISCRIMINANT SET 2

UNNORMALIZED DISCRIMINANTS

COVARIANCE	MATRIX 1					
1	1	.131E+13	.431E+12	.743E+12	.644F+12	Clutter
1	2	.431E+12	.201E+12	.337E+12	.304F+12	
1	3	.743E+12	.337E+12	.596E+12	.482F+12	
1	4	.644E+12	.304E+12	.482E+12	.487F+12	
COVARIANCE	MATRIX 2					
2	1	.210E+12	.165E+12	.218E+12	.312F+12	Tanks
2	2	.165E+12	.145E+12	.186E+12	.279F+12	
2	3	.218E+12	.186E+12	.246E+12	.349F+12	
2	4	.312E+12	.279E+12	.349E+12	.542F+12	

DISCRIMINANTS FORMED WITH EIGEN TRANSFORMATIONS

COVARIANCE	MATRIX 1					
1	1	.234E+13	.161E-01	-.771E-01	.251F+05	Clutter
1	2	.161E-01	.196E+12	-.396E+04	-.500F+00	
1	3	-.771E-01	-.396E+04	.559E+11	.343F+06	
1	4	.251E+05	-.500E+00	.343E+06	.176F+08	
COVARIANCE	MATRIX 2					
2	1	.111E+13	.957E+05	.619E+03	-.442F+03	Tanks
2	2	.957E+05	.251E+11	.126E+04	-.131F+00	
2	3	.619E+03	.126E+04	.850E+10	-.390F-03	
2	4	-.442E+03	-.131E+00	-.390E-03	.185F+08	

NORMALIZED DISCRIMINANTS

COVARIANCE	MATRIX 1					
1	1	.443E+00	.187E+00	.252E+00	.348F+00	Clutter
1	2	.187E+00	.811E-01	.110E+00	.150F+00	
1	3	.252E+00	.110E+00	.232E+00	.129F+00	
1	4	.348E+00	.150E+00	.129E+00	.344F+00	
COVARIANCE	MATRIX 2					
2	1	.257E+00	.103E+00	.163E+00	.172F+00	Tanks
2	2	.103E+00	.435E-01	.657E-01	.757F-01	
2	3	.163E+00	.657E-01	.168E+00	.470F-01	
2	4	.172E+00	.757E-01	.470E-01	.200F+00	

DISCRIMINANTS FORMED WITH EIGEN TRANSFORMATIONS

COVARIANCE	MATRIX 1					
1	1	.946E+00	.188E-14	-.315E-14	-.236F-11	Clutter
1	2	.188E-14	.149E+00	.344E-11	.133F-08	
1	3	-.315E-14	.344E-11	.548E-02	.447F-15	
1	4	-.236E-11	.133E-08	.447E-15	.115F-03	
COVARIANCE	MATRIX 2					
2	1	.525E+00	-.133E-11	.305E-13	.198F-14	Tanks
2	2	-.133E-11	.136E+00	.748E-08	-.187F-15	
2	3	.305E-13	.748E-08	.607E-02	-.101F-10	
2	4	.198E-14	-.187E-15	-.101E-10	.208F-03	

TABLE XIV
PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric test between two target classes employing the Kolmogorov-Smirnov two-sample test for man-made structures vs other man-made structures, processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Mobile Homes Scenes 1 & 2	9	On	34	67	64	99	30	46	24	59	34	76	70	79	30	40	36	64
Mobile Homes Scenes 2 & 3	10	— *	02	0	02	0	02	09	82	0	02	0	02	0	02	11	28	0
Railroad Bridge & Highway Bridge	47	Off	0	0	0	0	0	0	05	0	0	0	0	0	0	0	04	0
Mobile Homes & Bridges	48	Off	0	0	0	0	33	51	11	50	0	0	0	0	33	36	46	64
Mobile Homes & River Trees	49	Off	42	06	77	11	0	01	24	0	42	13	49	07				
Mobile Homes & Bridges	86	Off	0	0	0	0	86	71	16	27	0	0	0	0	35	80	64	65
Railroad Bridge & Highway Bridge	88	Off	0	0	01	0	01	0	26	01	0	0	0	0	01	0	16	01

* HOP was on for one scene and off for the other.

TABLE XV

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for various targets with frequency hop off, processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles & Natural Features	83	Off	0	01	06	02	14	01	17	00	0	01	06	03	14	04	07	01
Tactical Vehicles & Clutter	84	Off	0	0	0	0	0	0	07	0	0	0	0	0	0	0	0	0
Tanks & Clutter	85	Off	0	0	0	0	0	0	89	03	0	0	0	0	0	0	07	01
Mobile Homes & Bridges	87	Off	0	02	01	03	0	0	87	0	0	01	02	04	0	0	27	0
Mobile Homes & Bridges	86	Off	0	0	0	0	86	71	16	27	0	0	0	0	85	80	64	65
Railroad Bridge & Highway Bridge	88	Off	0	0	01	0	01	0	26	01	0	0	0	0	01	0	16	01
Tanks & Natural Features	89	Off	0	02	14	02	0	0	04	0	0	02	10	02	0	0	06	06

TABLE XVI

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric test between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop on, processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks From Scene 4 & 6	5	On	71	81	75	83	82	17	56	95	71	82	56	75	82	63	79	56
Trucks From Scene 4 & 6	6	On	0	01	02	06	40	61	56	73	0	01	0	06	40	54	55	86
Tanks From Scene 4 & 7	7	On	06	12	27	19	30	11	88	42	07	12	27	18	30	24	76	07
Trucks From Scene 4 & 7	8	On	0	23	21	06	16	06	22	55	0	24	30	10	16	16	11	15
Tanks & Trees Scenes 4 & 2	13	On	0	13	30	30	05	13	30	30	0	13	30	13	05	13	05	13
Tanks & Trees Scenes 4 & 2	14	On	0	03	01	03	65	64	67	90	0	01	01	03	66	66	97	68
Tanks & Trees	15	On	0	0	0	0	31	27	29	31	0	0	0	0	31	47	55	29
Tanks & Mobile Homes	23	On	0	0	0	0	45	45	06	74	0	0	0	0	45	45	23	65
Tanks & Bridges	24	On	0	0	0	0	75	91	20	16	0	0	0	0	75	91	48	56
Tactical Vehicles Natural Features	55	On	0	0	0	0	74	40	36	54	0	0	0	0	74	68	79	69

TABLE XVI (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric test between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop on, processed without Eigen transforms.

			Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles Clutter	57	On	39	57	87	84	56	53	04	29	39	37	82	76	56	48	07	48
Tanks Clutter	59	On	19	59	75	48	87	71	06	27	19	71	84	78	87	71	25	47
Tanks Natural Features	62	On	0	02	06	07	43	14	32	37	0	04	04	04	43	25	38	17
Tanks Sand	81	On	0	0	0	0	26	24	55	72	0	0	0	0	26	19	87	40

TABLE XVII

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop off, processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks & Trees Scenes 3 & 5	19	Off	58	89	58	30	13	13	58	0	58	89	58	58	13	30	29	05
Tanks & Trees	20	Off	02	08	04	48	16	29	73	04	02	08	16	48	16	48	73	16
Tanks & Trees	21	Off	0	0	0	07	29	27	66	13	0	0	0	03	29	44	40	62
Tanks & Bridges	26	Off	0	0	0	0	02	0	49	01	0	0	01	0	02	0	46	0
Tanks & Mobile Homes	30	Off	02	0	0	0	01	0	27	24	02	0	02	0	01	01	06	01
Tanks & Grass	33	Off	0	02	0	02	0	0	10	0	0	01	01	22	0	0	06	0
Tanks & Tanks	41	Off	01	01	0	01	42	72	97	55	01	01	0	01	42	50	50	50
Tactical Vehicles Natural Features	56	Off	0	0	07	0	33	07	05	0	0	0	05	0	33	12	15	0
Tactical Vehicles Clutter	58	Off	0	0	0	0	0	0	09	0	0	0	0	0	0	0	05	0
Tanks and Clutter	60	Off	0	0	0	0	0	0	42	03	0	0	0	0	0	0	03	0

TABLE XVII (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop off, processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks and Natural Features	61	Off	0	0	03	0	02	04	21	0	0	0	05	0	02	02	21	01
Tactical Vehicles Trees	64	Off	0	0	0	0	90	65	20	19	0	0	0	0	90	91	45	52
Tactical Vehicles Sand	66	Off	0	0	0	0	16	53	20	0	0	0	0	0	16	23	34	06
Tanks and Grass	32	Off	0	0	0	0	52	37	41	56	0	0	0	0	52	33	75	33

TABLE XVIII

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features processed without Eigen Transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles* Natural Features	70	Off	0	0	0	0	53	27	13	14	0	0	01	0	53	29	19	45
Tactical Vehicles* and Clutter	71	Off	0	0	0	0	0	0	24	0	0	0	0	0	0	0	03	0
Tactical Vehicles* and Desert Sand	72	Off	0	42	14	57	34	37	16	02	0	32	16	30	34	34	33	26
Tanks* and Tanks*	74	--	03	09	03	08	87	96	49	75	03	09	03	09	87	80	54	83
Tactical Vehicles* & Natural Features	76	On	0	02	06	02	22	40	[illegible]	46	0	02	07	03	22	43	88	63
Tactical Vehicles* Clutter	77	On	49	55	23	58	25	27	[illegible]	56	49	4	43	55	25	27	26	90
Tanks* and River Trees	79	Off	87	49	58	47	92	62	97	27	[illegible]	[illegible]	[illegible]	55	94	99	87	58
Tanks* and River Trees	80	On	0	0	0	0	05	12	37	31	0	[illegible]	[illegible]	01	05	14	32	07
Tanks* & Desert Sand	81	On	0	0	0	0	26	24	55	73	0	0	0	0	26	19	87	40

TABLE XVIII (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features processed without Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks* & River Trees	82	Off	91	78	39	62	62	62	78	27	91	91	53	62	62	62	78	54
Tanks* and Cranes*	90	Off	34	43	22	28	17	03	58	15	35	68	22	48	17	22	63	07
Tactical Vehicles and Trees	63	On	0	0	0	0	60	98	15	54	0	0	0	0	60	51	54	56
Tactical Vehicles & Desert Sand	65	On	0	0	0	0	19	13	70	97	0	0	0	0	19	15	56	16

TABLE XIX

PROBABILITY THAT TWO TARGET SETS CAME FROM THE SAME POPULATION
(processed without Eigen transforms).

The figures are the result of a nonparametric test between two target classes employing the Kolmogorov-Smirnov two-sample test for natural features vs other natural features.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
River Trees Scenes 2 & 3	22	--	10	01	23	10	23	15	34	23	10	0	04	06	23	06	63	10
Sand	36	--	93	49	52	54	56	28	55	07	93	72	99	73	56	30	57	12
Sand	37	--	17	14	44	41	02	17	04	02	97	14	25	25	02	04	04	04
River Trees & River Trees	39	Off	58	89	49	61	90	12	63	13	58	77	81	77	40	28	70	13
River Trees & River Trees	40	Off	66	23	87	78	92	89	47	89	66	40	40	53	92	99	62	49
Two halves of a Fruit Orchard	45	On	37	59	81	37	21	21	11	55	37	91	59	21	21	29	16	11
Weeds and Mowed Grass	46	Off	0	02	01	0	38	03	59	38	0	01	04	03	38	12	82	22
Weed Field and River Trees	50	Off	0	08	48	11	0	0	03	0	0	16	22	04	0	0	0	0
Orchard & River Trees	51	--	0	0	01	11	11	21	37	21	0	02	04	02	11	08	47	11
Sand & Weeds	52	Off	17	02	59	11	37	0	91	04	16	06	16	11	37	02	37	06

The Kolmogorov-Smirnov test was then repeated performing the two sample test on the transformed discriminants. Results of the test on these discriminants are given in Tables XX to XXIV.

The covariance matrix was generated for each set of four discriminants before and after the transformation with the Eigen vectors. By examining the Eigen values, it was possible to determine that the rank of the covariance matrix was at least four. If the rank was less than four, the Eigen vectors were discarded. A sample listing of the covariance matrix for clutter and tanks is shown in Tables XII and XIII for four sets of discriminants as indicated. The listings are for the matrices computed before and after the application of the Eigen transformation. Notice that after the Eigen transformation, the off diagonal elements in the matrices are small compared with the diagonal elements. By making this comparison for each set of Eigen vectors computed, we are assured that the Eigen vectors have been properly computed and are correct for the given set of discriminants.

TABLE XX

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for various targets with frequency hop off, processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles & Natural Features	83	Off	0	09	00	37	09	0	0	21	01	02	0	21	12	0	77	17
Tactical Vehicles & Clutter	84	Off	0	0	0	0	0	0	29	0	0	0	03	0	0	0	0	0
Tanks & Clutter	85	Off	0	0	0	0	0	0	40	0	0	0	25	0	0	17	06	0
Mobile Homes & Bridges	87	Off	01	0	20	0	0	01	01	0	01	01	0	0	0	27	81	0
Mobile Homes & Bridges	86	Off	0	0	0	0	88	0	0	0	0	0	0	0	94	0	0	05
Railroad Bridge & Highway Bridge	88	Off	0	59	56	16	0	0	0	59	0	34	16	31	0	0	0	42
Tanks and Natural Features	89	Off	03	35	10	0	0	0	07	38	03	21	32	09	0	03	08	52

TABLE XXI

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop on, processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks from Scene 4 & 6	5	On	90	0	16	45	45	0	05	02	79	0	71	0	65	0	54	15
Trucks from Scene 4 & 6	6	On	0	42	05	08	40	67	0	0	01	78	32	0	55	93	0	0
Tanks from Scene 4 & 7	7	On	12	0	19	02	08	0	0	0	18	0	25	06	24	0	0	01
Trucks from Scene 4 & 7	8	On	15	20	14	59	24	0	01	0	23	19	05	03	16	05	03	25
Tanks and Trees Scenes 4 & 2	13	On	13	0	0	0	13	30	0	0	13	0	0	0	13	30	0	0
Tanks and Trees Scenes 4 & 2	14	On	01	0	09	21	66	10	0	0	01	0	0	0	65	22	45	0
Tanks and Trees	15	On	0	0	0	0	30	24	59	02	0	0	0	51	31	17	24	06
Tanks and Mobile Homes	23	On	0	02	0	0	45	93	02	0	0	04	24	0	45	74	73	44
Tanks and Bridges	24	On	0	0	40	0	75	02	20	22	0	0	03	09	76	03	21	0

TABLE XXI (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop on, processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles Natural Features	55	On	0	0	03	94	74	41	51	0	0	0	50	0	86	57	0	15
Tactical Vehicles Clutter	57	On	71	26	01	80	36	40	01	0	90	48	34	67	36	88	0	03
Tanks Clutter	59	On	73	0	01	30	87	58	0	24	71	0	01	50	71	81	22	0
Tanks Natural Features	62	On	0	0	0	12	24	02	15	0	01	0	0	0	38	22	08	05
Tanks Sand	81	On	0	19	0	16	26	26	53	25	0	31	0	56	19	31	08	00

TABLE XXII

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop off, processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks and Trees Scene 3 & 5	19	Off	89	0	02	58	13	05	02	0	89	0	05	30	13	30	05	0
Tanks and Trees	20	Off	16	0	0	48	08	02	02	0	16	0	0	16	16	08	48	29
Tanks and Trees	21	Off	0	0	0	02	12	0	86	07	0	14	0	04	27	03	01	04
Tanks and Bridges	26	Off	0	0	0	0	0	04	57	0	0	01	28	0	0	15	56	0
Tanks and Mobile Homes	30	Off	01	06	0	0	01	0	48	0	0	08	0	45	01	0	0	06
Tanks and Grass	33	Off	04	0	0	0	0	0	07	47	04	0	0	0	0	0	73	0
Tanks and Tanks	41	Off	01	0	05	09	14	38	12	0	01	02	0	08	25	59	64	35
Tactical Vehicles Natural Features	56	Off	0	19	97	92	19	0	0	08	0	0	17	02	23	0	16	0
Tactical Vehicles Clutter	58	Off	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	01
Tanks and Clutter	60	Off	0	0	23	0	0	23	52	0	0	0	31	0	0	07	0	0

TABLE XXII (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features with frequency hop off, processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tanks and Natural Features	61	Off	0	02	03	0	0	0	03	0	0	23	17	0	01	0	68	0
Tactical Vehicles Trees	64	Off	0	0	0	0	89	0	52	66	0	0	0	0	95	0	01	86
Tactical Vehicles Sand	66	Off	0	0	0	0	18	0	0	0	0	0	0	21	24	02	46	05
Tanks and Grass	32	Off	0	17	0	20	36	0	04	0	0	18	0	0	47	07	02	0

TABLE XXIII

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles* & Natural Features	70	Off	0	04	0	65	53	0	0	0	0	0	0	25	53	0	19	09
Tactical Vehicles* & Clutter	71	Off	0	0	11	0	0	01	0	0	0	0	0	02	0	0	0	02
Tactical Vehicles* & Desert Sand	72	Off	20	0	0	0	52	07	0	0	20	01	0	0	47	01	24	06
Tanks* & Tanks*	74	—	03	0	31	03	64	26	54	0	03	31	51	26	87	75	33	09
Tactical Vehicles* & Natural Features	76	On	01	0	58	48	22	10	55	0	01	0	0	01	32	82	06	0
Tactical Vehicles* & Clutter	77	On	42	0	09	0	35	0	0	0	42	0	35	0	25	02	03	03
Tanks* & River Trees	79	Off	68	18	92	00	68	12	27	0	68	97	27	02	87	37	97	09
Tanks* & River Trees	80	On	0	01	03	33	07	08	01	00	0	01	03	79	08	08	09	04
Tanks* & Desert Sand	81	On	0	19	0	16	26	26	53	25	0	31	0	56	19	31	08	00
Tanks* & River Trees	82	Off	69	03	07	00	62	11	27	0	85	85	39	32	62	32	78	03
Tanks* & Cranes*	90	Off	48	3	53	0	09	0	28	06	48	82	08	04	14	0	13	0

*Single pixel per target

TABLE XXIII (continued)

PROBABILITY THAT THE TWO TARGET SETS CAME FROM THE SAME POPULATION

Table entries are the result of a nonparametric comparison between two target classes employing the Kolmogorov-Smirnov two-sample test for tactical vehicles and tanks vs other features processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
Tactical Vehicles & Trees	63	On	0	0	0	0	60	45	12	0	0	0	0	0	78	15	0	0
Tactical Vehicles & Desert Sand	65	On	0	04	16	10	20	29	92	29	0	02	0	13	20	52	75	0

TABLE XXIV

PROBABILITY THAT TWO TARGET SETS CAME FROM THE SAME POPULATION

The figures are the result of a nonparametric test between two target classes employing the Kolmogorov-Smirnov two-sample test for natural features vs other natural features processed with Eigen transforms.

Target Groups	HD File	HOP	Variant Set 1								Variant Set 2							
			Power				Normalized				Power				Normalized			
			X1	X2	X3	X4	Z1	Z2	Z3	Z4	X1	X2	X3	X4	Z1	Z2	Z3	Z4
River Trees Scenes 2 & 3	22	--	11	23	10	0	15	0	0	0	0	0	47	15	23	0	06	0
Sand	36	--	97	02	28	55	28	02	64	96	87	90	28	0	40	04	49	44
Sand	37	--	41	72	75	03	04	0	0	0	25	83	0	0	0	0	0	0
River Trees & River Trees	39	Off	66	66	0	0	40	0	11	0	77	07	04	11	28	0	20	0
River Trees & River Trees	40	Off	40	53	46	0	99	04	48	0	24	0	08	0	98	02	31	0
Two Halves of a Fruit Orchard	45	On	47	13	0	58	29	29	02	0	47	15	0	0	21	29	0	91
Weeds and Mowed Grass	46	Off	06	0	0	01	16	0	12	0	06	0	0	07	11	0	48	0
Weed field and River Trees	50	Off	03	0	0	0	0	0	16	0	08	72	0	02	0	0	0	48
Orchard and River Trees	51	--	01	0	0	0	16	16	01	0	02	0	0	02	16	06	0	01
Sand and Weeds	52	Off	06	0	01	59	08	0	71	0	05	0	02	0	11	0	29	16

VII. SUMMARY AND CONCLUSIONS

SUMMARY OF RESULTS

Parametric Modeling

Employing the Lognormal Probability Distribution Function as the basis for a classification model, the model was tested with data representing four sample target classes. The model was tested against each data point for several combinations of the measurement vector.

An example of applying the model to unnormalized power data from four sample target classes when four variants, mean power, standard deviation, fast variation and slow variation were employed yielded typical results shown in the following table.

TABLE XXV

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS FOR EACH PIXEL VERSUS EACH TARGET CLASS

Class Description	Number of Samples	Classifications per Class			
		Fruit Trees	Mowed Grass	Unmowed Grass/Weeds	Metal Mobile Homes
Fruit Trees	50	68%	10%	22%	0
Mowed Grass Field	49	0	90%	10%	0
Unmowed Grass & Weed Field	54	2%	74%	24%	0
Metal Mobile Homes	37	0	0	0	100%

An example when the covariances are included in the model is shown below for a different set of variants and with citrus trees substituted for the mobile homes used in the preceding example. The variants employed in this model were mean power, σ, RMS, and δ.

TABLE XXVI

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS
FOR EACH PIXEL VERSUS EACH TARGET CLASS

Class Description	Number of Samples	Classifications per Class Fruit Trees	Mowed Grass	Unmowed Grass/Weeds	Citrus Trees
Fruit Trees	50	90%	0	2%	8%
Mowed Grass Field	49	8%	14%	76%	2%
Unmowed Grass & Weed Field	55	22%	0	67%	11%
Citrus Trees	73	49%	0	0	51%

Use of other variants gave varied results. The model failed when applied to data normalized with respect to the four-look mean power.

However, modification of the model to include the Eigen transformation to form a new set of decorrelated variants yielded results such as those shown in the table below. These results are for the model employing the variants, power mean, average deviation from the mean, slow variation and fast variation.

TABLE XXVII

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS
FOR EACH PIXEL VERSUS EACH TARGET CLASS

Class Description	Number of Samples	Classifications per Class Fruit Trees	Mowed Grass	Citrus Trees	Vineyard
Fruit Trees	50	90%	0	2%	8%
Mowed Grass Field	49	22%	78%	0	0
Citrus Trees	73	0	0	71%	29%
Vineyard	84	1%	0	0	99%

Nonparametric Modeling

Two-Target Model Using PDF Histograms From Sample Data. This nonparametric model substituted probability densities obtained from a table look up, based upon histograms generated from sample data for parametric curve fits to the histograms of sample data used with the four variant parametric model discussed previously. Variants employed in the model were mean power, deviation from the mean, slow variation and fast variation. Only two target classes at a time were compared by this model. Note that this model includes ties and unclassifiables as well as incorrect classifications as illustrated by the sample set of results in the following table.

TABLE XXVIII

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS, TIES, AND UNCLASSIFIABLES FOR EACH PIXEL VERSUS EACH TARGET CLASS

Class Description	Number of Samples	Classifications per Class		Not Classified	
		Fruit Trees	Mobile Homes	Ties	Unclassifiables
Fruit Trees	50	80%	0	0	20%
Mobile Homes	101	0	93%	0	7%

Nearest Neighbor Classifier - Unnormalized Power. The table below presents two examples of the results obtained with the two-target, four-variant nearest-neighbor model when used with unnormalized power and the variants mean power, deviation from the mean, fast and slow variation. The target classes for these examples were tanks and mobile homes.

TABLE XXIX

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS
FOR EACH PIXEL VERSUS EACH TARGET CLASS

For K = 1 and UNNORMALIZED POWER

Class Description	Number of Samples	Classifications per Class Tanks	Mobile Homes
Tanks	44	70%	30%
Mobile Homes	50	34%	66%
For K = 21 and UNNORMALIZED POWER			
Tanks	44	34%	66%
Mobile Homes	50	28%	72%

Nearest Neighbor Classifier - Normalized Power. The following table presents two examples of the results obtained with the preceding model but with sample data return powers normalized with respect to the sample mean power for each pixel.

TABLE XXX

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS
FOR EACH PIXEL VERSUS EACH TARGET CLASS

For K = 1 and NORMALIZED POWER

Class Description	Number of Samples	Classifications per Class Tanks	Mobile Homes
Tanks	44	70%	30%
Mobile Homes	50	48%	52%
For K = 21 and NORMALIZED POWER			
Tanks	44	70%	30%
Mobile Homes	50	48%	52%

Minimum Distance Model - Unnormalized Data. Pattern vectors were taken to be the means and/or medians of a set of discriminants derived from sample data. Eigen transformations of these vectors created a new set of pattern vectors for each pixel. Means and medians of these transformed vectors were then taken as being characteristic of the target classes. Examples of applying this classifier to tanks and river trees are shown below where the original sample data was in the form of unnormalized power.

TABLE XXXI

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS, TIES, AND UNCLASSIFIABLES FOR EACH PIXEL VERSUS EACH TARGET CLASS

		Classifier Based on Class Median			
Class Description	Number of Samples	Classifications per Class Tanks	River Trees	Not Classified Ties	Unclassifiables
Tanks	45	100%	0	0	0
River Trees	53	6%	94%	0	0
		Classifier Based on Class Means			
Tanks	45	100%	0	0	0
River Trees	53	9%	83%	8%	0

<u>Minimum Distance Model - Normalized Data</u>. The following table presents examples of results when the preceding model was used with sample data normalized with respect to the pixel mean power.

TABLE XXXII

PERCENTAGES OF CORRECT AND INCORRECT CLASSIFICATIONS, TIES, AND UNCLASSIFIABLES FOR EACH PIXEL VERSUS EACH TARGET CLASS

		Classifier Based on Class Median			
Class Description	Number of Samples	Classifications per Class Tanks	River Trees	Not Classified Ties	Unclassifiables
Tanks	45	20%	18%	62%	0
River Trees	53	8%	21%	71%	0
		Classifier Based on Class Means			
Tanks	45	29%	22%	49%	0
River Trees	53	19%	26%	55%	0

Comparison of Target Classes via "Relative Match" of Four-Eigen-Vector Groups. The results of comparing target classes by means of the "Relative Match" (RM) of their Eigen vectors is presented in Table XXXIII (same as Table IX, page 86).

Kolmogorov-Smirnov Two-Sample Tests. A summary table was made from Tables XIV - XXIV to determine the number of errors made by the Kolmogorov-Smirnov two-sample test. The criteria for determination that an error has been made is as follows: Let P be the probability that the two target classes came from the same population or computed by the Kolmogorov-Smirnov two sample test, then

1. If $P \geq 80$ and the two target samples are known to be from the same population, no error has been made
2. If $P \geq 80$ and the two target samples are known to be from different populations, an error has been made
3. If $P \leq 20$ and the two target samples are known to be from the same population, an error has been made
4. If $P \leq 20$ and the two target samples are known to be from different population, no error has been made.

Due to sponsor interest, the data pertaining to tactical target vs. clutter or natural terrain discrimination was extracted from the tables and analyzed based on criteria 4 above. The decision rule utilized to determine whether or not the two distributions were dissimilar and hence potentially having discrimination information was as follows:

The two distributions are considered dissimilar if five out of eight variants or features pass test 4 above.

TABLE XXXIII

COMPARISON OF THE FOUR EIGEN VECTORS BETWEEN TARGET CLASSES BASED UPON RM

Target Classes	No. of Data Pts.	File No.	DISCRM SET 1 Unnormalized Group 1 (RM)	DISCRM SET 1 Normalized Group 2 (RM)	DISCRM SET 2 Unnormalized Group 3 (RM)	DISCRM SET 2 Normalized Group 4 (RM)
H4TR251 H6TR251	56 55	6	0.800†	1.000†	0.547†	0.057
H4TANK1 H2TREE2	48 53	15	0.179†	0.062†	0.152†	0.047†
H5TANK1 H3TREE3	44 56	21	0.394	0.151†	1.002	0.113†
H4TANK1 H2BRIDG	48 53	24	1.006	0.124†	1.005	0.082†
H5TANK H3BRIDG	* 55	26	1.005	1.003	1.343	0.076†
H5TANK H3MH1	* 50	30	1.346	0.136†	1.265	0.090†
H4TANK1 H1MH1	48 56	31	1.001	1.000	1.001	0.030†
H5TANK H3GRAS3	* *	33	1.302	0.300	1.195	0.193†
H5TANK H3GRAS2	* 55	34	1.362	0.277	1.288	0.189†
H2NAT H4TACT2	109 88	55	1.120	0.047†	1.064	0.037†
H3NAT H5TACT2	111 169	56	1.004	0.306	1.004	0.201
H2CLUT H4TACT2	108 105	57	1.377	1.001	1.377	0.038†
H3CLUT H5TACT2	105 169	58	0.398	1.006	0.458	0.085†
S5SAND1 50/50	50 50	36	0.128	0.071	1.000	0.033

* Not Available
† Represents an Error

Based on the stated decision rule, results of the discrimination test as a function of normalized vs. non-normalized, frequency hop on vs. frequency hop off, and features vs. Eigen-transformed features are shown in Table XXXIV.

TABLE XXXIV

CORRECT TARGET DISCRIMINATION BY THE KOLMOGOROV-SMIRNOV TWO-SAMPLE TEST

	EIGEN TRANSFORMATION			NO EIGEN TRANSFORMATION	
	Power	Normalized		Power	Normalized
OFF	17/20 = .85	17/20 = .85	OFF	16/20 = .8	12/20 = .6
ON	12/14 = .86	6/14 = .3	ON	11/14 = .5	3/14 = .21

In the interpretation of TABLE XXXIV, one must remember that valid conclusions about discriminants (features) based on power cannot be made in these data since the targets and clutter came from different scenes and therefore the power differences are not calibrated. It is valid, however, to draw conclusions on the relative performance of distribution discrimination between Eigen vs. no Eigen transformation and between frequency hop on and frequency hop off assuming, of course, that the differences are statistically significant over the small sample size.

CONCLUSIONS

Based on the analysis performed in this study, the look-to-look variation of 4 look data does not provide sufficient information to perform target vs. clutter discrimination. It is believed that the data for performing this analysis was not optimal in that the radar system was undersampled at the display causing "bin straddling" effects. These effects introduced a degree of uncertainty into the analysis; however, it is also believed that sufficient data was analyzed to justify the above conclusion.

On the positive side however, the Kolmogorov-Smirnov test did show that discrimination information based on the look-to-look variation does exist in the data without frequency hop, but does not exist in the data with frequency hop. This test indicates that future research in this area should investigate data without frequency hop; however, it is clear that data with more than 4 samples should be investigated.

APPENDIX A

TABLES OF FOUR-LOOK FILTER MAGNITUDE DATA

This section contains tables of filter magnitude data by file name for selected features appearing in seven DBS scenes. The tables are divided into eight groups. The first seven groups mainly contain target data selected from adjacent pixels; for example, if the radar return from a vehicle appeared to cover more than one resolution element, all values of filter magnitudes above some mean threshold were listed for that vehicle. Samples of grass, sand, and shadows were selected from a region with no attempt to screen the data as to individual pixel location. Target data appearing in the last group have no adjacent data. Only one pixel per vehicle appears in the tables.

Target designations with possible adjacent pixel data contain the prefix H, while those with a single pixel per target contain the prefix P.

The H tables contain nine unlabeled columns. The first four columns of three digits each are filter magnitude data corresponding to DBS maps 1, 2, 3, and 4. The next column contains the sequence number 1, 2, 3, or 4 that is used to place the FM data in the proper time sequence. Columns six and seven are pixel coordinates--azimuth line number and range bin number. The eight column contains the four-look mean, computed in power and converted to FM units. The last column gives the number of pixels in the table adjacent to the set of coordinates appearing on that row. The number of adjacent pixels may vary from zero to eight. The number zero, however, does not appear in the column; instead, where there are no adjacent pixels, a flag // is used in place of the zero.

Targets H1GRAS1, H2GRAS3, H3GRAS1, and H3GRAS2 are rough grass with weeds from an area close to and just south of Reedley College. File H1GRAS1 had been sorted on the mean FM value, and all mean FM values are less than 100. File H1GRAS3 was sorted on aximuth line number and range bin number. This file has only two mean FM values greater than 99. File H3GRAS1 and H3GRAS2 have been sorted on mean FM values and the largest mean FM value for each file is 99 and 106, respectively.

Files H1NAT, H2NAT, and H3NAT are natural features from scenes 1, 2, and 3. These files are defined as

H1NAT = H1GRAS1 + H1TREE1

H2NAT = H2GRAS3 + H2TREE 3

H3NAT = H3GRAS2 + H3TREE 3

Tall river bank trees appear in files H1TREE1, H2TREE1, H2TREE3, H3TREE1, and H3TREE3. The trees in target group H2TREE1 have a higher average FM value than those in group H1TREE3. The average FM value for group H1TREE1 $\leq$ 122. Group H2TREE2 contains no adjacent pixels and appears to be from a different region along the river bank than H3TREE1.

The tree groups H1TREE2, H2TREE2, and H3TREE2 contain young fruit trees from an area between the Kings River and the town of Reedley.

Targets H1RR1, H2RR1, and H3RR1 are from the Atchison, Topeka, and Santa Fe railroad bridge and targets H1HWB1, H2, HWB1, and H3HWB1 are from a six-lane highway bridge over the Kings River. The BRIDG files are defined as

H1BRIDG = H1RRB1 + 1HWB1

H2BRIDG = H2RRB1 + H2HWB1

H3BRIDG = H3RRB1 + H3HWB1

Targets H1MH1, H2MH2, and H3MH3 are from a mobile home park along the Kings River.

The man-made clutter targets are defined as

H1CLUT = H1BRIDG + H1MH1

H2CLUT = H1BRIDG + H2MH1

H3CLUT = H3BRIDG + H3MH1

and file H3CLUT2 contains very even row from file H3CLUT. Files of the type H--TANK1, P--TANK, H--TR251 and P--TR251 contain the M48 tank and M35 2½ ton cargo gruck. Target files H4TACT1 and H5TACT1 (other tactical vehicle files) contain jeeps, van, and truck mounted cranes. File H4TACT2, H5TACT2, and P5TACT are considered as "tactical vehicle files" since they contain pixels from all tactical vehicles in the NEBO array. H5TACT3 contains every odd row from H5TACT2, and H6TACT1 is given by

H6TACT1 = H6TANK1 + H6TR251

P5TACT1 contains all tactical vehicles except jeeps. Shadows are contained in H4DARK1 and H5DARK. H5SAND1 and H5SAND2 are two samples of sand. H5SAND1 is contained in file H5SAND2 and is approximately half the size of H5SAND2. File P3T101 contains river bank trees with no adjacent pixels listed. Furthermore, only one pixel per tree appears in the file.

1 Reedley, CA:
Scene 1, hop on
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H1GRAS1	TABLE 1
H1NAT	TABLE 2
H1TREE1	TABLE 3
H1TREE2	TABLE 4
H1RRB1	TABLE 5
H1HWB1	TABLE 6
H1BRIDG	TABLE 7
H1MH1	TABLE 8
H1CLUT	TABLE 9

103	104	94	83	1	170	317	99	3
92	107	103	74	1	178	322	99	1
105	107	77	84	2	156	318	99	//
105	104	72	97	2	180	316	99	1
81	89	83	112	3	166	325	99	1
83	94	104	103	3	174	313	99	//
96	98	102	98	4	152	312	99	//
94	77	110	93	4	176	324	99	2
85	103	104	93	4	168	328	99	//
86	105	100	98	2	173	322	99	2
98	101	104	80	1	163	319	99	3
81	98	102	103	4	177	316	99	//
94	89	106	101	4	169	317	99	2
105	104	94	84	3	174	321	99	2
94	78	103	106	3	167	317	99	//
106	100	79	99	2	172	321	99	1
56	101	96	107	3	174	316	99	1
84	93	108	93	1	162	318	98	2
92	99	103	96	3	182	312	98	//
83	103	89	105	3	166	312	98	1
85	91	109	92	4	177	323	98	2
101	101	99	89	4	160	307	98	//
96	106	96	76	2	180	318	98	//
93	104	95	98	1	171	316	98	2
98	103	98	89	1	178	319	98	//
102	99	98	92	2	165	310	98	//
91	109	92	81	2	180	315	98	1
101	98	91	100	4	168	321	98	//
96	85	104	99	4	177	312	98	1
101	95	94	96	3	159	314	97	//
97	98	78	103	3	182	316	97	//
99	59	102	100	3	166	320	97	2
102	98	73	100	2	172	313	97	1
102	96	81	100	1	163	318	97	2
102	84	88	102	3	174	320	97	1

85	103	102	91	3	166	322	97	2
103	80	100	94	2	165	323	97	1
75	104	96	99	3	166	321	97	2
100	99	87	97	2	165	319	97	2
82	104	103	82	2	165	313	97	2
95	103	91	91	4	176	325	96	1
104	85	94	93	3	158	318	96	//
99	88	96	97	2	173	324	96	1
89	101	90	100	4	169	316	96	2
76	91	96	105	3	174	328	96	1
104	85	98	85	2	172	312	96	1
99	88	86	99	2	157	315	95	//
92	99	83	100	3	174	324	95	1
104	88	85	95	2	164	320	95	2
91	87	93	102	2	173	317	95	2
86	95	96	99	2	165	325	95	1
89	96	100	88	2	173	329	94	1
99	101	86	71	2	164	313	94	1
92	86	93	97	3	158	312	93	//
78	78	95	87	4	177	313	87	1
65	85	99	72	2	172	316	87	2

TABLE 1 HIGRAS1: Four look SAR filter magnitude data, weedy grass field, Reedley, CA, hop on, Scene 1.

103	104	94	83	1	170	317	99	3	132	110	125	128	1	315	39	126	1
140	74	113	116	3	334	69	126	//	140	107	119	131	1	315	55	130	2
120	119	120	137	2	332	67	127	//	136	117	115	132	1	315	93	128	3
132	121	104	112	4	329	59	122	//	136	125	127	123	1	315	94	129	3
134	95	106	115	3	327	65	121	//	141	131	133	128	1	314	55	134	2
137	96	102	119	3	327	68	124	//	100	115	140	108	1	314	66	126	1
117	106	119	132	2	325	25	122	1	135	112	108	132	1	314	101	127	//
131	128	87	123	2	325	66	125	1	147	123	117	117	4	313	55	134	1
131	112	109	121	2	325	68	122	//	129	118	117	125	4	313	67	123	2
121	99	104	132	2	325	70	121	//	110	131	113	128	4	313	73	124	1
110	86	132	127	2	324	25	123	1	121	124	120	116	4	313	74	121	2
133	99	104	105	2	324	63	119	2	127	126	124	129	4	313	93	127	2
131	122	99	132	2	324	66	126	1	130	127	126	93	4	312	66	125	1
112	124	139	112	1	323	61	127	1	135	103	124	97	4	312	75	124	1
128	145	90	137	1	323	62	135	2	123	121	119	141	4	312	92	130	2
102	109	138	103	1	323	64	124	2	132	127	108	128	4	312	93	126	2
112	116	135	102	1	322	40	123	1	125	117	126	106	3	311	72	121	1
115	134	125	117	1	322	65	125	1	137	117	136	102	3	311	73	130	1
146	124	124	82	4	321	39	133	1	92	107	103	74	1	178	322	99	1
128	128	123	85	4	321	52	123	1	105	107	77	84	2	156	318	99	//
124	133	119	104	4	321	63	124	//	105	104	72	97	2	180	316	99	1
134	121	113	96	4	320	52	123	1	81	89	83	112	3	166	325	99	1
134	127	107	92	4	320	65	124	//	83	94	104	103	3	174	313	99	//
86	98	134	101	4	320	70	119	1	96	98	102	98	4	152	312	99	//
121	112	134	108	3	319	1	123	1	94	77	110	93	4	176	324	99	2
115	125	126	108	3	319	71	121	1	85	103	104	93	4	168	328	99	//
109	132	138	123	3	318	1	130	1	86	105	100	98	2	173	322	99	2
140	114	68	105	3	318	43	126	1	98	101	104	80	1	163	319	99	3
140	109	104	117	3	318	44	127	1	81	98	102	103	4	177	316	99	//
116	89	126	128	2	317	16	121	//	94	89	106	101	4	169	317	99	2
128	129	76	94	2	317	46	121	2	105	104	94	84	3	174	321	99	2
134	116	97	107	2	317	47	121	2	94	78	103	106	3	167	317	99	//
116	118	131	95	2	317	93	121	2	106	100	79	99	2	172	321	99	1
129	125	106	118	2	316	39	122	1	56	101	96	107	3	174	316	99	1
130	110	116	117	2	316	47	121	2	84	93	108	93	1	162	318	98	2
134	90	92	104	2	316	55	119	1	92	99	103	96	3	182	312	98	//
122	125	137	135	2	316	93	131	4	83	103	89	105	3	166	312	98	1
131	123	127	120	2	316	94	126	4	85	91	109	92	4	177	323	98	2
									101	101	99	89	4	160	307	98	//

TABLE 2 HINAT: Four look SAR filter magnitude data, natural features, Reedley, CA, hop on, Scene 1.

96	106	96	76	2	180	318	98	//
93	104	95	98	1	171	316	98	2
98	103	98	89	1	178	319	98	//
102	99	98	92	2	165	310	98	//
91	109	92	81	2	180	315	98	1
101	98	91	100	4	168	321	98	//
96	85	104	99	4	177	312	98	1
101	95	94	96	3	159	314	97	//
97	98	78	103	3	182	316	97	//
98	59	102	100	3	166	320	97	2
102	98	73	100	2	172	313	97	1
102	96	81	100	1	163	318	97	2
102	84	88	102	3	174	320	97	1
85	103	102	91	3	166	322	97	2
103	80	100	94	2	165	323	97	1
75	104	96	99	3	166	321	97	2
100	99	87	97	2	165	319	97	2
82	104	103	82	2	165	313	97	2
95	103	91	91	4	176	325	96	1
104	85	94	93	3	158	318	96	//
99	88	96	97	2	173	324	96	1
89	101	90	100	4	169	316	96	2
76	91	96	105	3	174	328	96	1
104	85	98	85	2	172	312	96	1
99	88	86	99	2	157	315	95	//
92	99	83	100	3	174	324	95	1
104	88	85	95	2	164	320	95	2
91	87	93	102	2	173	317	95	2
86	95	96	99	2	165	325	95	1
89	96	100	88	2	173	329	94	1
99	101	86	71	2	164	313	94	1
92	86	93	97	3	158	312	93	//
78	78	95	87	4	177	313	87	1
65	85	99	72	2	172	316	87	2

TABLE 2 (Continued) HINAT: natural features.

140	74	113	116	3	334	69	126	//
120	119	120	137	2	332	67	127	//
132	121	104	112	4	329	59	122	//
134	95	106	115	3	327	65	121	//
137	96	102	119	3	327	68	124	//
117	106	119	132	2	325	25	122	1
131	128	87	123	2	325	66	125	1
131	112	109	121	2	325	68	122	//
121	99	104	132	2	325	70	121	//
110	86	132	127	2	324	25	123	1
133	99	104	105	2	324	63	119	2
131	122	99	132	2	324	66	126	1
112	124	139	112	1	323	61	127	1
128	145	90	137	1	323	62	135	2
102	109	138	103	1	323	64	124	2
112	116	135	102	1	322	40	123	1
115	134	125	117	1	322	65	125	1
146	124	124	82	4	321	39	133	1
128	128	123	85	4	321	52	123	1
124	133	119	104	4	321	63	124	//
134	121	113	96	4	320	52	123	1
134	127	107	92	4	320	65	124	//
86	98	134	101	4	320	70	119	1
121	112	134	108	3	319	1	123	1
115	125	126	108	3	319	71	121	1
109	132	138	123	3	318	1	130	1
140	114	68	105	3	318	43	126	1
140	109	104	117	3	318	44	127	1
116	89	126	128	2	317	16	121	//
128	129	76	94	2	317	46	121	2
134	116	97	107	2	317	47	121	2
116	118	131	95	2	317	93	121	2
129	125	106	118	2	316	39	122	1
130	110	116	117	2	316	47	121	2
134	90	92	104	2	316	55	119	1
122	125	137	135	2	316	93	131	4
131	123	127	120	2	316	94	126	4
132	110	125	128	1	315	39	126	1

140	107	119	131	1	315	55	130	2
136	117	115	132	1	315	93	128	3
136	125	127	123	1	315	94	129	3
141	131	133	128	1	314	55	134	2
100	115	140	108	1	314	66	126	1
135	112	108	132	1	314	101	127	//
147	123	117	117	4	313	55	134	1
129	118	117	125	4	313	67	123	2
110	131	113	128	4	313	73	124	1
121	124	120	116	4	313	74	121	2
127	126	124	129	4	313	93	127	2
130	127	126	93	4	312	66	125	1
135	103	124	97	4	312	75	124	1
123	121	119	141	4	312	92	130	2
132	127	108	128	4	312	93	126	2
125	117	126	106	3	311	72	121	1
137	117	136	102	3	311	73	130	1

TABLE 3 HITREE1: Four look SAR filter magnitude data, large river trees, Reedley, CA, hop on, Scene 1.

122	125	123	100	1	275	166	121	//
127	101	126	120	2	292	148	122	//
113	128	114	121	3	263	194	121	//
134	122	114	108	1	250	193	124	//
127	121	130	108	1	266	185	124	3
124	130	113	83	4	281	138	121	//
111	100	138	116	2	252	290	125	1
128	126	115	108	4	296	134	122	1
119	126	110	124	1	266	186	121	3
94	117	122	130	1	291	156	121	//
118	116	122	130	1	259	196	123	1
132	102	103	120	4	281	173	121	//
127	123	126	74	3	262	183	122	//
106	128	129	90	1	258	185	121	1
95	101	110	136	1	258	196	122	1
121	107	122	99	3	207	169	116	//
118	124	111	109	4	249	202	117	//
122	123	104	85	4	201	173	116	//
109	129	97	76	4	280	149	116	//
101	126	117	105	1	290	139	116	//
7	127	121	115	4	257	185	119	1
117	120	123	111	2	300	131	119	//
107	122	125	112	2	269	170	119	//
117	121	104	115	3	287	150	116	//
126	118	85	113	3	263	191	117	1
97	110	118	130	1	251	198	119	//
73	117	121	118	2	276	172	116	1
107	102	63	131	3	294	135	117	1
112	109	125	114	3	254	191	117	//
103	97	127	116	1	298	147	116	//
126	118	107	61	4	265	185	116	2
132	116	88	98	1	283	154	119	//
126	82	89	123	1	258	188	117	//
115	106	108	126	1	242	202	117	//
114	98	127	122	2	277	153	119	//
95	125	107	122	4	288	142	117	1
130	100	92	112	3	255	186	117	//
117	116	121	112	4	296	152	117	//

115	118	124	75	2	268	176	116	//
97	122	118	117	2	284	165	116	//
116	117	126	101	3	262	192	118	1
132	93	96	110	1	251	205	118	//
122	116	118	104	3	278	148	117	//
97	96	121	126	2	293	150	117	//
100	115	127	109	2	253	201	117	1
114	117	104	124	3	295	146	117	//
114	109	125	117	1	267	185	118	2
120	126	73	106	4	281	163	117	//
128	114	76	121	1	258	192	119	//
85	124	124	94	3	295	134	117	2
83	126	112	112	2	277	172	116	1
83	124	122	103	4	289	142	116	1
127	118	92	109	4	256	192	117	//
104	115	122	122	2	285	140	118	//
117	110	121	124	1	266	188	119	//
87	112	127	108	3	294	153	116	//

TABLE 4 HITREE2: Four look SAR filter magnitude data, young fruit trees, Reedley, CA, hop on, Scene 1.

76	56	86	84	3	126	367	80	//
119	127	119	114	4	81	363	121	3
110	115	131	128	4	81	364	124	3
116	131	113	128	4	80	363	124	5
105	101	134	143	4	80	364	132	6
100	112	103	131	3	79	363	118	5
129	115	132	154	3	79	364	141	7
108	99	91	119	3	79	365	109	5
106	95	117	116	3	78	363	111	5
151	136	129	149	3	78	364	144	8
130	118	142	147	3	78	365	139	6
98	96	91	112	3	78	366	102	3
113	63	120	140	2	77	363	127	5
155	145	154	162	2	77	364	155	8
140	143	155	159	2	77	365	152	6
109	90	114	126	2	76	363	116	4
144	155	148	163	2	76	364	155	7
140	162	156	158	2	76	365	156	6
111	154	115	145	1	75	364	143	6
142	162	141	144	1	75	365	151	7
60	105	127	96	1	75	366	113	4
133	144	136	109	1	74	364	136	5
127	150	117	143	1	74	365	140	8
110	111	121	127	1	74	366	119	5
138	134	104	95	4	73	364	129	5
151	162	126	129	4	73	365	151	8
107	118	118	127	4	73	366	120	6
125	141	127	91	4	72	364	130	5
139	171	128	145	4	72	365	157	8
86	124	86	146	4	72	366	132	7
86	118	104	115	4	72	367	111	4
83	131	126	95	3	71	364	121	5
126	143	147	132	3	71	365	140	8
138	119	94	118	3	71	366	126	7
108	99	99	118	3	71	367	109	4
67	128	142	105	3	70	364	129	5
141	140	141	130	3	70	365	139	8

134	133	137	132	3	70	366	134	7
113	75	143	137	2	69	364	133	5
155	153	166	169	2	69	365	163	8
163	143	161	157	2	69	366	158	7
114	118	109	115	2	69	367	114	4
114	56	128	126	2	68	364	121	4
129	151	157	167	2	68	365	157	7
153	154	152	144	2	68	366	151	7
91	122	56	112	2	68	367	111	4
138	127	107	164	1	67	365	150	6
146	139	99	150	1	67	366	143	7
145	99	125	159	1	66	365	147	3
149	139	136	145	1	66	366	143	4
106	92	122	114	1	66	367	113	2

TABLE 5 HIRRB1: Four look SAR filter magnitude data, railroad bridge, Reedley, CA, hop on, Scene 1.

85	100	62	109	3	126	353	98	//
130	128	124	110	4	80	352	125	2
123	109	127	78	3	79	351	119	4
144	136	135	130	3	79	352	137	4
116	111	120	111	3	78	351	115	5
143	106	120	144	3	78	352	136	6
103	98	133	113	2	77	351	120	5
140	154	136	157	2	77	352	150	7
92	127	118	129	2	77	353	122	4
108	79	144	114	2	76	351	129	4
150	136	162	164	2	76	352	157	7
122	142	134	141	2	76	353	137	5
167	174	169	91	1	75	352	167	6
100	121	136	124	1	75	353	126	5
148	151	163	160	1	74	352	157	5
140	138	132	133	1	74	353	136	5
141	134	133	145	4	73	352	139	6
136	146	151	152	4	73	353	148	5
115	127	91	110	4	72	351	117	3
115	127	133	147	4	72	352	136	6
110	124	122	140	4	72	353	129	5
132	128	126	116	3	71	352	127	6
135	120	112	93	3	71	353	123	5
148	152	161	145	3	70	352	153	6
112	107	144	125	3	70	353	131	5
110	79	113	118	2	69	351	111	4
116	158	164	163	2	69	352	159	7
139	156	126	115	2	69	353	143	5
78	65	128	117	2	68	351	116	4
99	154	151	159	2	68	352	152	7
146	132	128	153	2	68	353	144	5
155	156	158	130	1	67	352	153	7
135	138	135	134	1	67	353	136	5
116	91	84	141	1	66	351	126	4
166	159	168	168	1	66	352	166	7
135	122	154	122	1	66	353	141	5
139	109	99	78	4	65	351	124	5
184	184	188	176	4	65	352	184	8
139	133	144	157	4	65	353	147	6
120	109	115	62	4	64	351	112	5
162	168	181	177	4	64	352	174	8
80	111	152	160	4	64	353	149	7
80	112	120	132	4	64	354	121	4
84	123	95	108	3	63	351	111	4
119	129	148	125	3	63	352	136	6
119	110	141	127	3	63	353	130	6
119	85	92	113	3	63	354	109	3
141	105	123	140	3	62	352	134	4
123	132	75	117	2	61	353	122	1
117	119	113	121	1	59	352	118	//

TABLE 6 HIHWB1: Four look SAR filter magnitude data, highway bridge, Reedley, CA, hop on, Scene 1.

116	111	120	111	3	78	351	115	3
84	123	95	108	3	63	351	111	1
86	118	104	115	4	72	367	111	2
120	109	115	62	4	64	351	112	2
106	95	117	116	3	78	363	111	2
106	92	122	114	1	66	367	113	1
60	105	127	96	1	75	366	113	1
91	122	56	112	2	68	367	111	1
110	79	113	118	2	69	351	111	1
114	118	109	115	2	69	367	114	1
124	117	110	104	2	60	367	116	2
123	109	127	78	3	79	351	119	3
127	119	120	105	4	65	365	120	1
103	98	133	113	2	77	351	120	3
117	119	113	121	1	59	352	118	//
100	112	103	131	3	79	363	118	2
78	65	128	117	2	68	351	116	1
110	111	121	127	1	74	366	119	2
109	90	114	126	2	76	363	116	1
107	118	118	127	4	73	366	120	2
115	127	91	110	4	72	351	117	1
128	124	116	125	3	63	367	124	1
119	127	119	114	4	81	363	121	2
105	137	125	95	4	57	367	125	1
83	131	126	95	3	71	364	121	2
139	109	99	78	4	65	351	124	2
130	128	124	110	4	80	352	125	1
116	130	125	97	2	61	367	122	1
92	127	118	129	2	77	353	122	1
80	112	120	132	4	64	354	121	1
110	115	131	128	4	81	364	124	2
123	132	75	117	2	61	353	122	//
114	56	128	126	2	68	364	121	//
116	131	113	128	4	80	363	124	3
135	120	112	93	3	71	353	123	3
113	63	120	140	2	77	363	127	2
116	91	84	141	1	66	351	126	1
122	125	135	121	1	59	367	127	2
110	124	122	140	4	72	353	129	2

131	142	104	117	4	64	365	131	2
138	134	104	95	4	73	364	129	1
120	131	126	124	4	65	367	126	2
138	119	94	118	3	71	366	126	1
119	110	141	127	3	63	353	130	1
108	79	144	114	2	76	351	129	1
115	137	126	130	4	64	367	129	2
132	128	126	116	3	71	352	127	4
83	61	141	120	3	62	365	127	1
100	121	136	124	1	75	353	126	//
95	136	130	115	3	63	365	127	2
112	107	144	125	3	70	353	131	2
125	141	127	91	4	72	364	130	2
67	128	142	105	3	70	364	129	1
143	122	132	60	1	58	366	132	2
143	106	120	144	3	78	352	136	4
135	138	135	134	1	67	353	136	//

TABLE 7 HIBRIDG: Four look SAR filter magnitude data, bridges, Reedley, CA, hop on, Scene 1.

136	112	104	139	3	75	287	130	1
134	128	126	112	3	77	287	127	3
112	111	106	101	3	78	287	108	3
110	110	109	125	3	81	287	115	4
118	97	77	104	3	82	287	106	3
114	105	121	104	3	71	286	113	3
124	114	140	140	3	75	286	133	4
128	125	134	128	3	77	286	129	6
113	66	117	121	3	78	286	114	6
121	99	82	91	3	80	286	107	4
108	108	105	102	3	81	286	106	5
116	82	109	112	3	82	286	109	3
123	138	148	136	2	70	285	139	3
120	104	147	127	2	71	285	134	5
128	84	126	131	2	72	285	125	5
100	101	115	117	2	73	285	110	4
75	82	118	115	2	74	285	109	4
118	103	142	110	2	75	285	128	5
135	124	100	117	2	76	285	124	6
126	119	107	121	2	77	285	120	7
119	105	127	137	2	78	285	127	7
131	131	123	133	2	79	285	130	7
138	120	89	117	2	80	285	125	6
123	123	150	140	2	71	284	139	6
132	143	137	139	2	72	284	138	5
108	120	83	128	2	74	284	118	4
107	143	115	121	2	76	284	129	6
94	128	91	107	2	77	284	114	7
112	89	105	135	2	78	284	121	7
117	101	118	131	2	79	284	121	7
137	103	122	90	2	80	284	124	6
137	121	120	127	2	81	284	128	5
117	130	132	112	2	82	284	125	4
107	129	109	118	2	83	284	119	2
119	113	108	144	1	70	283	130	2
107	126	119	126	1	71	283	121	4
119	118	109	102	1	75	283	113	4
86	130	90	77	1	77	283	114	6
122	108	90	109	1	78	283	112	5
120	112	119	108	1	80	283	115	5
133	127	120	130	1	81	283	128	5
144	127	136	135	1	83	283	137	3
136	130	120	142	1	72	282	134	1
118	134	103	109	1	75	282	122	5
117	132	113	92	1	76	282	120	6
96	122	105	112	1	77	282	112	4
118	117	122	134	1	81	282	125	4
137	114	102	133	1	83	282	128	3
139	135	135	132	4	74	281	135	2
118	102	78	93	4	75	281	105	4
116	79	109	93	4	76	281	106	4
122	111	115	120	4	81	281	117	2
123	140	107	115	4	82	281	127	4
98	91	124	136	4	83	281	124	2
168	153	140	146	4	52	280	156	1
140	133	132	95	4	53	280	132	1

TABLE 8 H1MIII: Four look SAR filter magnitude data, mobile homes, Reedley, CA, hop on, Scene 1.

116	111	120	111	3	78	351	115	3
136	112	104	139	3	75	287	130	1
134	128	126	112	3	77	287	127	3
112	111	106	101	3	78	287	108	3
110	110	109	125	3	81	287	115	4
118	97	77	104	3	82	287	106	3
114	105	121	104	3	71	286	113	3
124	114	140	140	3	75	286	133	4
128	125	134	128	3	77	286	129	6
113	66	117	121	3	78	286	114	6
121	99	82	91	3	80	286	107	4
108	108	105	102	3	81	286	106	5
116	82	109	112	3	82	286	109	3
123	138	148	136	2	70	285	139	3
120	104	147	127	2	71	285	134	5
128	84	126	131	2	72	285	125	5
100	101	115	117	2	73	285	110	4
75	82	118	115	2	74	285	109	4
118	103	142	110	2	75	285	128	5
135	124	100	117	2	76	285	124	6
126	119	107	121	2	77	285	120	7
119	105	127	137	2	78	285	127	7
131	131	123	133	2	79	285	130	7
138	120	89	117	2	80	285	125	6
123	123	150	140	2	71	284	139	6
132	143	137	139	2	72	284	138	5
108	120	83	128	2	74	284	118	4
107	143	115	121	2	76	284	129	6
94	128	91	107	2	77	284	114	7
112	89	105	135	2	78	284	121	7
117	101	118	131	2	79	284	121	7
137	103	122	90	2	80	284	124	6
137	121	120	127	2	81	284	128	5
117	130	132	112	2	82	284	125	4
107	129	109	118	2	83	284	119	2
119	113	108	144	1	70	283	130	2
107	126	119	126	1	71	283	121	4
119	118	109	102	1	75	283	113	4

86	130	90	77	1	77	283	114	6
122	108	90	109	1	78	283	112	5
120	112	119	108	1	80	283	115	5
133	127	120	130	1	81	283	128	5
144	127	136	135	1	83	283	137	3
136	130	120	142	1	72	282	134	1
118	134	103	109	1	75	282	122	5
117	132	113	92	1	76	282	120	6
96	122	105	112	1	77	282	112	4
118	117	122	134	1	81	282	125	4
137	114	102	133	1	83	282	128	3
139	135	135	132	4	74	281	135	2
118	102	78	93	4	75	281	105	4
116	79	109	93	4	76	281	106	4
122	111	115	120	4	81	281	117	2
123	140	107	115	4	82	281	127	4
98	91	124	136	4	83	281	124	2
168	153	140	146	4	52	280	156	1
140	133	132	95	4	53	280	132	1
84	123	95	108	3	63	351	[illegible]	1
86	118	104	115	4	72	[illegible]	[illegible]	2
120	109	115	62	4	64	[illegible]	112	2
106	95	117	116	3	78	363	111	2
106	92	122	114	1	66	367	113	1
60	105	127	96	1	75	366	113	1
91	122	56	112	2	68	367	111	1
110	79	113	118	2	69	351	111	1
114	118	109	115	2	69	367	114	1
124	117	110	104	2	60	367	116	2
123	109	127	78	3	79	351	119	3
127	119	120	105	4	65	365	120	1
103	98	133	113	2	77	351	120	3
117	119	113	121	1	59	352	118	//
100	112	103	131	3	79	363	118	2
78	65	128	117	2	68	351	116	1
110	111	121	127	1	74	366	119	2
109	90	114	126	2	76	363	116	1
107	118	118	127	4	73	366	120	2
115	127	91	110	4	72	351	117	1

TABLE 9 HICLUT: Four look SAR filter magnitude data, man-made clutter, Reedley, CA, hop on, Scene 1.

128	124	116	125	3	63	367	124	1
119	127	119	114	4	81	363	121	2
105	137	125	95	4	57	367	125	1
83	131	126	95	3	71	364	121	2
139	109	99	78	4	65	351	124	2
130	128	124	110	4	80	352	125	1
116	130	125	97	2	61	367	122	1
92	127	118	129	2	77	353	122	1
80	112	120	132	4	64	354	121	1
110	115	131	128	4	81	364	124	2
123	132	75	117	2	61	353	122	//
114	56	128	126	2	68	364	121	//
116	131	113	128	4	80	363	124	3
135	120	112	93	3	71	353	123	3
113	63	120	140	2	77	363	127	2
116	91	84	141	1	66	351	126	1
122	125	135	121	1	59	367	127	2
110	124	122	140	4	72	353	129	2
131	142	104	117	4	64	365	131	2
138	134	104	95	4	73	364	129	1
120	131	126	124	4	65	367	126	2
138	119	94	118	3	71	366	126	1
119	110	141	127	3	63	353	130	1
108	79	144	114	2	76	351	129	1
115	137	126	130	4	64	367	129	2
132	128	126	116	3	71	352	127	4
83	61	141	120	3	62	365	127	1
100	121	136	124	1	75	353	126	//
95	136	130	115	3	63	365	127	2
112	107	144	125	3	70	353	131	2
125	141	127	91	4	72	364	130	2
67	128	142	105	3	70	364	129	1
143	122	132	60	1	58	366	132	2
143	106	120	144	3	78	352	136	4
135	138	135	134	1	67	353	136	//

TABLE 9 (Continued) HICLUT: man-made clutter.

2 Reedley, CA:
Scene 2, hop on.
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H2GRAS3	TABLE 10
H2NAT	TABLE 11
H2TREE1	TABLE 12
H2TREE2	TABLE 13
H2TREE3	TABLE 14
H2RRB1	TABLE 15
H2HWB1	TABLE 16
H2BRIDG	TABLE 17
H2MH1	TABLE 18
H2CLUT	TABLE 19
H2CLUT 2	TABLE 20

47	43	100	95	3	153	358	90	3
70	79	90	102	3	153	359	91	5
97	75	104	102	3	153	360	98	5
89	75	34	36	3	153	361	76	5
92	83	97	78	3	153	362	90	5
86	90	92	69	3	153	363	87	5
98	78	75	77	3	153	364	86	5
62	96	96	94	3	153	365	92	5
64	71	94	79	3	153	366	83	5
62	101	83	87	3	153	367	90	5
55	103	83	85	3	153	368	91	5
62	100	65	85	3	153	369	88	5
45	75	87	69	3	153	370	76	5
79	77	94	93	3	153	371	88	5
82	68	92	101	3	153	372	91	5
79	100	95	78	3	153	373	92	5
50	86	76	95	3	153	374	85	3
82	85	83	68	3	152	358	81	5
85	75	79	94	3	152	359	86	8
73	93	73	101	3	152	360	91	8
56	74	73	83	3	152	361	75	8
61	99	73	101	3	152	362	93	8
80	83	85	76	3	152	363	81	8
82	101	77	60	3	152	364	88	8
64	100	112	77	3	152	365	100	8
81	68	89	91	3	152	366	85	8
105	68	99	101	3	152	367	99	8
93	100	48	70	3	152	368	90	8
89	91	80	52	3	152	369	84	8
98	97	82	85	3	152	370	93	8
86	51	99	93	3	152	371	91	8
95	45	81	99	3	152	372	91	8
86	106	95	84	3	152	373	96	8
72	64	70	109	3	152	374	94	5
104	100	86	76	2	151	358	96	5
81	78	95	60	2	151	35[illegible]	84	8
93	80	85	93	2	151	360	89	8
83	82	90	106	2	151	361	95	8

105	98	51	101	2	151	362	98	7
101	103	92	93	2	151	363	98	6
74	105	90	67	2	151	364	93	5
72	71	85	90	2	151	365	82	5
81	86	89	84	2	151	366	85	5
83	88	92	107	2	151	367	96	5
81	82	91	93	2	151	368	88	5
101	105	88	108	2	151	369	103	5
71	92	83	84	2	151	370	85	5
74	38	82	109	2	151	371	95	5
92	73	90	99	2	151	372	92	5
103	94	98	85	2	151	373	97	5
66	90	91	98	2	151	374	91	3
57	101	88	86	2	150	358	91	3
69	84	94	97	2	150	359	90	5
69	78	80	58	2	150	360	74	5
82	57	90	98	2	150	361	89	5
78	80	83	97	2	150	362	87	4

TABLE 10 H2GRAS3: Four look SAR filter magnitude data, weedy grass field, Reedley, CA, hop on, Scene 2 .

47	43	100	95	3	153	358	90	3
115	99	133	100	4	331	167	120	//
109	99	120	130	3	65	299	120	1
108	101	122	125	2	350	170	118	//
94	117	122	124	2	95	234	118	//
76	110	132	120	4	203	133	121	//
116	108	124	96	3	40	328	115	1
100	123	117	92	4	106	165	114	//
108	124	107	106	4	250	111	114	//
104	129	109	112	3	56	281	118	//
121	123	117	65	3	344	151	117	//
95	126	110	130	3	80	227	122	//
122	114	105	119	1	148	155	117	//
123	119	113	110	3	25	344	117	//
113	107	125	86	3	112	185	114	//
106	116	112	124	1	316	138	116	//
116	110	126	88	2	62	273	116	//
131	105	106	114	1	348	168	119	2
100	103	120	127	1	84	221	118	//
105	125	117	112	3	177	136	117	//
120	127	106	111	2	30	330	119	//
130	95	107	113	1	101	219	118	//
115	119	113	99	1	221	138	113	//
113	130	118	97	2	47	284	120	//
115	121	114	113	4	338	171	116	//
85	101	104	133	4	75	244	119	//
107	126	102	87	4	138	162	113	//
118	117	110	122	4	19	362	118	//
101	104	120	127	4	347	169	118	2
109	127	114	94	4	122	197	116	//
78	126	108	121	3	321	165	117	//
118	121	83	130	3	64	298	121	1
119	122	111	105	1	340	170	116	//
115	86	79	133	1	92	263	119	//
104	130	99	117	3	192	136	119	//
125	104	111	115	4	35	331	116	//
113	117	120	125	1	348	169	120	2
124	128	85	107	2	103	167	119	//

119	117	121	107	2	238	135	117	//
120	104	106	127	1	52	281	118	//
99	118	114	127	2	335	171	118	//
123	106	98	120	1	76	236	116	//
93	126	118	108	3	144	143	117	//
56	121	122	107	3	24	338	115	//
122	112	122	81	3	344	176	116	//
118	125	99	86	1	109	188	115	//
109	126	95	104	1	277	154	114	//
111	96	120	129	4	58	272	119	//
106	121	126	109	2	334	168	118	//
121	118	112	115	1	84	267	117	//
90	119	122	112	3	153	147	115	//
123	95	118	118	2	39	328	117	1
131	100	86	110	1	340	177	118	//
96	124	112	126	1	100	247	119	//
70	79	90	102	3	153	359	91	5
97	75	104	102	3	153	360	98	5
89	75	34	36	3	153	361	76	5
92	83	97	78	3	153	362	90	5
86	90	92	69	3	153	363	87	5
98	78	75	77	3	153	364	86	5
62	96	96	94	3	153	365	92	5
64	71	94	79	3	153	366	83	5
62	101	83	87	3	153	367	90	5
55	103	83	85	3	153	368	91	5
62	100	65	85	3	153	369	88	5
45	75	87	69	3	153	370	76	5
79	77	94	93	3	153	371	88	5
82	68	92	101	3	153	372	91	5
79	100	95	78	3	153	373	92	5
50	86	76	95	3	153	374	85	3
82	85	83	68	3	152	358	81	5
85	75	79	94	3	152	359	86	8
73	93	73	101	3	152	360	91	8
56	74	73	83	3	152	361	75	8
61	99	73	101	3	152	362	93	8

TABLE 11 H2NAT: Four look SAR filter magnitude data, natural features, Reedley, CA, hop on, Scene 2.

80	83	85	76	3	152	363	81	8
82	101	77	60	3	152	364	88	8
64	100	112	77	3	152	365	100	8
81	68	89	91	3	152	366	85	8
105	68	99	101	3	152	367	99	8
93	100	48	70	3	152	368	90	8
89	91	80	52	3	152	369	84	8
98	97	82	85	3	152	370	93	8
86	51	99	93	3	152	371	91	8
95	45	81	99	3	152	372	91	8
86	106	95	84	3	152	373	96	8
72	64	70	109	3	152	374	94	5
104	100	86	76	2	151	358	96	5
81	78	95	60	2	151	359	84	8
93	80	85	93	2	151	360	89	8
83	82	90	106	2	151	361	95	8
105	98	51	101	2	151	362	98	7
101	103	92	93	2	151	363	98	6
74	105	90	67	2	151	364	93	5
72	71	85	90	2	151	365	82	5
81	86	89	84	2	151	366	85	5
83	88	92	107	2	151	367	96	5
81	82	91	93	2	151	368	88	5
101	105	88	108	2	151	369	103	5
71	92	83	84	2	151	370	85	5
74	38	82	109	2	151	371	95	5
92	73	90	99	2	151	372	92	5
103	94	98	85	2	151	373	97	5
66	90	91	98	2	151	374	91	3
57	101	88	86	2	150	358	91	3
69	84	94	97	2	150	359	90	5
69	78	80	58	2	150	360	74	5
82	57	90	98	2	150	361	89	5
78	80	83	97	2	150	362	87	4

TABLE 11 (Continued) H2NAT: natural features.

100	133	130	134	2	126	195	129	//
130	133	113	133	4	66	297	129	//
128	134	99	133	3	104	197	129	2
132	131	122	129	3	249	111	129	//
117	140	102	128	3	81	226	129	1
126	123	118	136	2	310	137	128	1
125	128	137	109	4	259	113	128	1
131	131	108	131	3	105	197	128	1
112	140	123	86	2	79	237	127	1
132	133	126	0	4	355	170	127	//
110	128	132	130	4	42	295	127	4
119	120	130	134	2	343	169	127	//
108	108	136	130	3	57	272	127	1
119	136	129	101	4	74	245	127	//
108	130	130	129	4	353	168	127	2
122	134	116	125	2	31	330	126	//
120	128	134	113	1	188	136	126	1
103	96	95	141	2	46	288	126	//
96	126	131	130	4	42	296	126	3
107	120	117	137	4	352	168	126	1
130	124	112	129	4	83	221	126	//
96	136	113	127	3	64	271	126	//
108	118	138	114	3	41	296	126	3
118	127	135	105	3	64	260	126	//
106	132	113	131	1	188	135	125	1
118	136	117	111	2	78	237	125	2
128	116	99	134	1	309	137	125	1
131	122	116	125	1	133	168	125	//
126	112	132	120	4	67	269	125	//
127	128	93	128	1	77	236	125	1
116	116	134	124	3	41	294	125	2
134	120	124	99	1	196	135	125	//
131	124	120	123	4	258	113	125	1
92	130	131	114	4	170	138	124	//
44	126	136	90	4	19	363	124	//
124	109	136	82	4	75	286	124	//
124	131	118	119	4	58	270	124	//
123	130	100	127	1	125	167	124	1
134	77	126	113	3	56	273	124	1
129	113	101	131	2	126	167	124	1
117	134	118	99	1	148	141	123	//
118	117	128	125	3	41	295	123	4
105	136	101	115	1	69	256	123	//
122	122	127	118	4	331	169	123	//
125	116	114	129	3	96	225	123	//
121	118	113	131	2	190	135	123	//
121	125	68	131	3	73	249	123	1
119	121	118	129	1	204	133	123	//
117	130	115	123	2	207	133	123	//
131	126	105	115	2	103	198	123	1
131	110	108	126	2	351	170	123	//
119	123	127	120	3	73	248	123	1
95	126	110	130	3	80	227	122	1
114	122	133	0	4	354	168	122	1
129	112	86	127	2	54	282	122	//

TABLE 12 H2TREE1: Four look SAR filter magnitude data, large river bank trees, Reedley, CA, hop on, Scene 2 .

98	101	94	101	4	235	185	99	//
91	103	76	106	2	263	190	99	//
66	104	92	107	2	231	179	99	//
70	112	56	97	2	279	184	99	1
111	69	99	51	1	228	178	99	//
105	94	76	103	2	254	194	99	//
82	103	86	108	1	284	172	99	1
96	98	108	73	4	258	211	99	//
97	107	90	97	3	272	192	99	//
94	96	107	93	3	248	192	99	//
99	77	98	106	2	287	176	99	1
102	99	101	93	4	259	180	99	//
61	98	86	110	1	269	204	99	//
65	110	89	100	1	252	213	99	//
72	105	104	95	3	256	211	99	1
101	100	98	96	2	287	177	99	1
84	97	107	99	4	242	184	99	//
82	109	92	96	3	257	180	99	//
108	76	98	97	2	254	203	99	1
100	82	97	105	2	255	176	99	//
100	90	102	100	4	250	211	99	1
105	101	93	89	2	255	196	99	//
112	77	91	89	2	255	208	99	//
104	86	79	104	3	241	181	98	//
100	108	48	86	3	280	184	98	1
84	107	92	96	3	232	185	98	//
96	92	86	108	2	246	196	98	//
99	73	93	106	2	239	193	98	1
96	104	80	101	1	285	172	98	1
101	97	88	101	1	237	176	98	//
94	106	98	86	4	266	200	98	//
102	101	90	97	2	238	183	98	//
90	73	89	110	4	275	190	98	//
103	97	97	93	4	235	170	98	//
91	108	99	76	2	254	211	98	//
66	82	91	111	2	238	192	98	1
87	105	91	101	2	279	192	98	//
105	104	66	90	3	256	190	98	//
104	65	95	103	1	244	191	98	//
73	105	104	84	2	262	213	98	//
93	94	93	106	4	251	150	98	//
98	107	90	80	2	255	178	98	2
95	106	87	97	2	254	179	98	2
109	20	100	87	2	263	187	98	//
107	97	87	91	4	251	180	98	//
89	107	97	86	3	256	204	98	//
96	69	111	70	2	254	202	98	1
79	83	98	109	1	260	203	98	1
63	65	111	96	4	251	211	98	1
106	104	77	67	2	255	179	98	2
104	103	78	93	1	260	204	98	1
92	108	96	65	3	256	210	98	1

TABLE 13 H2TREE2: Four look SAR filter magnitude data, young fruit trees, Reedley, CA, hop on, Scene 2.

115	99	133	100	4	331	167	120	//
109	99	120	130	3	65	299	120	1
108	101	122	125	2	350	170	118	//
94	117	122	124	2	95	234	118	//
76	110	132	120	4	203	133	121	//
116	108	124	96	3	40	328	115	1
118	0	0	0	4	359	169	102	//
100	123	117	92	4	106	165	114	//
108	124	107	106	4	250	111	114	//
104	129	109	112	3	56	281	118	//
121	123	117	65	3	344	151	117	//
95	126	110	130	3	80	227	122	//
122	114	105	119	1	148	155	117	//
123	119	113	110	3	25	344	117	//
119	0	0	0	4	359	164	103	//
113	107	125	86	3	112	185	114	//
106	116	112	124	1	316	138	116	//
116	110	126	88	2	62	273	116	//
131	105	106	114	1	348	168	119	2
100	103	120	127	1	84	221	118	//
105	125	117	112	3	177	136	117	//
120	127	106	111	2	30	330	119	//
92	120	0	0	4	357	165	105	//
130	95	107	113	1	101	219	118	//
115	119	113	99	1	221	138	113	//
113	130	118	97	2	47	284	120	//
115	121	114	113	4	338	171	116	//
85	101	104	133	4	75	244	119	//
107	126	102	87	4	138	162	113	//
118	117	110	122	4	19	362	118	//
101	104	120	127	4	347	169	118	2
109	127	114	94	4	122	197	116	//
78	126	108	121	3	321	165	117	//
118	121	83	130	3	64	298	121	1
119	122	111	105	1	340	170	116	//
115	86	79	133	1	92	263	119	//
104	130	99	117	3	192	136	119	//

125	104	111	115	4	35	331	116	//
113	117	120	125	1	348	169	120	2
124	128	85	107	2	103	167	119	//
119	117	121	107	2	238	135	117	//
120	104	106	127	1	52	281	118	//
99	118	114	127	2	335	171	118	//
123	106	98	120	1	76	236	116	//
93	126	118	108	3	144	143	117	//
56	121	122	107	3	24	338	115	//
122	112	122	81	3	344	176	116	//
118	125	99	86	1	109	188	115	//
109	126	95	104	1	277	154	114	//
111	96	120	129	4	58	272	119	//
106	121	126	109	2	334	168	118	//
121	118	112	115	1	84	267	117	//
90	119	122	112	3	153	147	115	//
123	95	118	118	2	39	328	117	1
131	100	86	110	1	340	177	118	//
96	124	112	126	1	100	247	119	//

TABLE 14 H2TREE3: Four look SAR filter magnitude data, large river bank trees (mainly non-adjacent pixels), Reedley, CA, hop on, Scene 2.

115	92	120	104	4	66	330	112	//
120	137	116	97	3	64	329	125	1
95	101	106	125	3	64	331	112	//
114	140	137	115	2	63	329	132	2
124	118	124	106	2	62	329	120	2
106	100	95	114	1	61	329	106	2
105	131	103	94	1	60	329	117	2
114	129	115	104	4	59	328	119	3
113	124	114	133	4	58	328	124	3
132	131	139	121	4	58	329	132	3
133	139	149	134	3	57	329	141	4
115	108	110	113	3	56	328	112	4
87	96	134	94	3	56	329	119	4
125	113	126	102	2	55	328	120	4
118	76	103	119	2	55	329	112	4
119	133	127	115	2	54	328	126	2
123	115	114	120	1	52	328	119	//
112	116	114	86	3	49	326	111	2
122	106	110	118	3	49	327	116	2
137	135	120	126	3	48	327	131	3
117	109	126	124	2	47	327	121	3
105	124	113	132	2	46	326	123	4
110	103	105	136	2	46	327	122	4
124	100	110	129	1	45	326	121	4
114	120	101	122	1	45	327	117	4
126	120	127	97	1	44	326	122	3
107	129	112	101	4	43	326	117	2
100	125	113	50	4	42	325	113	3
122	131	112	91	3	41	325	121	4
102	118	121	96	3	41	326	113	3
115	116	118	102	3	40	324	114	3
122	125	114	122	3	40	325	121	4
125	99	117	127	2	39	325	121	4
76	116	116	99	2	38	324	109	3
125	99	96	110	2	38	325	113	3
119	112	115	125	1	37	324	119	3
119	110	103	131	1	36	324	120	2
116	80	116	122	4	35	324	115	2
113	96	133	114	4	34	324	121	3
117	114	129	113	3	33	323	120	3
104	127	122	112	3	33	324	119	3
114	134	64	105	3	32	323	121	4
117	126	98	117	2	31	323	118	3
117	111	106	111	2	31	324	112	3
120	106	108	120	2	30	323	115	4
109	94	130	117	1	29	322	119	4
121	127	115	126	1	29	323	123	4
113	97	134	124	1	28	322	124	4
112	128	119	126	1	28	323	123	4
117	109	99	122	4	27	322	115	2

TABLE 15 H2RRB1: Four look SAR filter magnitude data, railroad bridge, Reedley, CA, hop on, Scene 2.

92	126	97	117	2	70	316	115	2
111	121	79	122	1	69	316	116	3
89	119	88	113	1	69	317	109	4
106	130	84	71	1	68	317	116	5
107	128	109	103	1	68	318	116	4
101	128	122	122	4	67	317	122	5
75	126	49	121	4	67	318	116	5
129	131	131	108	4	66	317	128	6
116	131	127	112	4	66	318	124	5
139	121	117	109	3	65	316	127	3
147	151	149	135	3	65	317	147	6
137	118	148	126	3	65	318	137	5
185	193	182	166	3	64	317	185	6
144	142	151	129	3	64	318	144	5
128	177	161	145	2	63	316	164	4
191	196	196	193	2	63	317	194	5
117	94	115	132	2	63	319	121	1
134	114	117	132	2	62	316	127	4
191	116	161	184	2	62	317	181	5
143	140	136	141	1	61	317	140	5
117	128	94	115	1	61	318	119	3
122	67	106	109	1	60	316	111	4
142	140	112	124	1	60	317	135	5
131	109	119	111	4	59	316	121	5
112	107	120	121	4	59	317	116	4
131	116	107	150	4	58	314	137	3
148	150	136	164	4	58	315	154	6
121	106	112	130	4	58	316	121	5
146	125	115	73	3	57	314	132	5
172	167	152	169	3	57	315	167	8
118	78	73	123	3	57	316	113	5
180	175	155	143	3	56	314	171	5
163	161	133	171	3	56	315	163	8
132	107	88	116	3	56	316	120	5
172	184	176	186	2	55	314	181	5
161	168	155	174	2	55	315	167	8
134	85	100	130	2	55	316	125	5
183	136	142	176	2	54	314	172	4
178	141	151	167	2	54	315	167	6
141	84	99	123	2	54	316	128	4
136	141	82	101	1	53	315	131	4
91	108	110	135	1	52	314	121	1

TABLE 16 H2HWB1: Four look SAR filter magnitude data, highway bridge, Reedley, CA, hop on, Scene 2.

143	140	136	141	1	61	317	140	3
117	128	94	115	1	61	318	119	2
122	67	106	109	1	60	316	111	4
142	140	112	124	1	60	317	135	5
131	109	119	111	4	59	316	121	5
112	107	120	121	4	59	317	116	4
131	116	107	150	4	58	314	137	3
148	150	136	164	4	58	315	154	6
121	106	112	130	4	58	316	121	5
146	125	115	73	3	57	314	132	5
172	167	152	169	3	57	315	167	8
118	78	73	123	3	57	316	113	5
180	175	155	143	3	56	314	171	5
163	161	133	171	3	56	315	163	8
132	107	88	116	3	56	316	120	5
172	184	176	186	2	55	314	181	5
161	168	155	174	2	55	315	167	8
134	85	100	130	2	55	316	125	5
183	136	142	176	2	54	314	172	4
178	141	151	167	2	54	315	167	6
141	84	99	123	2	54	316	128	4
136	141	82	101	1	53	315	131	4
91	108	110	135	1	52	314	121	1
120	137	116	97	3	64	329	125	1
85	101	106	125	3	64	331	112	//
114	140	137	115	2	63	329	132	2
124	118	124	106	2	62	329	120	2
106	100	95	114	1	61	329	106	2
105	131	103	94	1	60	329	117	2
114	129	115	104	4	59	328	119	3
113	124	114	133	4	58	328	124	3
132	131	139	121	4	58	329	132	3
133	139	149	134	3	57	329	141	4
115	108	110	113	3	56	328	112	4
87	96	134	94	3	56	329	119	4
125	113	126	102	2	55	328	120	4
118	76	103	119	2	55	329	112	4
119	133	127	115	2	54	328	126	2
123	115	114	120	1	52	328	119	//
112	116	114	86	3	49	326	111	2
122	106	110	118	3	49	327	116	2
137	135	120	126	3	48	327	131	3
117	109	126	124	2	47	327	121	3
105	124	113	132	2	46	326	123	4
110	103	105	136	2	46	327	122	4
124	100	110	129	1	45	326	121	4
114	120	101	122	1	45	327	117	4
126	120	127	97	1	44	326	122	3
107	129	112	101	4	43	326	117	2
100	125	113	50	4	42	325	113	3
122	131	112	91	3	41	325	121	3
102	118	121	96	3	41	326	113	2
115	116	118	102	3	40	324	114	1

TABLE 17 H2BRIDG: Four look SAR filter magnitude data, bridges, Reedley, CA, hop on, Scene 2.

169	149	175	128	1	341	118	165	4
168	154	172	134	1	340	118	164	2
132	174	166	141	2	342	119	163	4
155	162	171	135	2	342	118	161	4
161	145	146	167	4	330	110	158	1
146	130	164	162	1	341	119	157	4
136	127	169	139	3	344	110	155	4
114	137	170	128	3	344	111	155	5
147	136	159	158	1	324	99	153	1
159	142	156	147	4	346	122	153	1
154	157	138	149	1	325	99	151	1
144	133	164	132	2	343	110	151	3
99	147	151	157	1	348	123	149	2
164	127	111	129	4	346	105	149	2
147	139	148	154	2	342	106	148	1
157	145	108	147	4	346	104	148	2
135	121	163	102	2	343	111	148	4
139	124	158	137	3	321	104	146	2
135	150	148	146	1	349	123	146	3
126	154	152	110	4	352	102	146	1
154	129	152	119	3	345	122	146	1
131	129	142	156	4	346	128	145	2
137	146	149	131	4	339	116	143	//
118	129	151	149	1	341	106	143	1
150	133	142	119	2	343	118	141	2
134	146	141	129	2	351	102	139	1
143	141	136	136	4	331	110	139	1
139	146	132	131	3	345	128	139	1
147	140	126	132	4	346	126	139	1
143	114	144	135	4	347	128	138	1
135	147	132	130	2	342	96	138	//
152	98	132	118	3	345	126	138	1
129	148	135	123	2	343	94	138	//
127	108	145	141	2	350	124	137	3
151	124	93	120	3	345	104	137	2
134	129	144	137	1	349	118	137	1

134	141	137	132	4	346	120	137	//
126	147	128	130	2	351	122	136	1
134	131	146	79	1	340	124	136	//
145	136	123	125	2	350	118	136	2
104	105	150	127	3	345	110	136	2
149	113	129	104	4	353	114	135	//
129	75	104	149	1	348	126	135	//
128	147	114	124	4	352	122	135	1
118	147	131	114	2	343	112	135	2
141	131	130	134	2	351	118	135	1
130	144	108	130	1	324	88	134	//
132	108	129	143	2	351	124	133	1
103	95	148	115	4	322	104	133	1
138	117	140	107	3	320	104	132	1
133	121	116	139	4	338	126	131	1
139	129	132	113	2	326	94	131	//
89	119	146	99	1	349	124	131	3
130	109	118	142	2	326	106	131	//
137	126	130	125	4	339	126	131	1

TABLE 18 H2MH1: Four look SAR filter magnitude data, mobile homes, Reedley, CA, hop on, Scene 2.

143	140	136	141	1	61	317	140	3
169	149	175	128	1	341	118	165	4
168	154	172	134	1	340	118	164	2
132	174	166	141	2	342	119	163	4
155	162	171	135	2	342	118	161	4
161	145	146	167	4	330	110	158	1
146	130	164	162	1	341	119	157	4
136	127	169	139	3	344	110	155	4
114	137	170	128	3	344	111	155	5
147	136	159	158	1	324	99	153	1
159	142	156	147	4	346	122	153	1
154	157	138	149	1	325	99	151	1
144	133	164	132	2	343	110	151	3
99	147	151	157	1	348	123	149	2
164	127	111	129	4	346	105	149	2
147	139	148	154	2	342	106	148	1
157	145	108	147	4	346	104	148	2
135	121	163	102	2	343	111	148	4
139	124	158	137	3	321	104	146	2
135	150	148	146	1	349	123	146	3
126	154	152	110	4	352	102	146	1
154	129	152	119	3	345	122	146	1
131	129	142	156	4	346	128	145	2
137	146	149	131	4	339	116	143	//
118	129	151	149	1	341	106	143	1
150	133	142	119	2	343	118	141	2
134	146	141	129	2	351	102	139	1
143	141	136	136	4	331	[illegible]	139	1
139	146	132	131	3	345	128	139	1
147	140	126	132	4	346	126	139	1
143	114	144	135	4	347	128	138	1
135	147	132	130	2	342	96	138	//
152	98	132	118	3	345	126	138	1
129	148	135	123	2	343	94	138	//
127	108	145	141	2	350	124	137	3
151	124	93	120	3	345	104	137	2
134	129	144	137	1	349	118	137	1
134	141	137	132	4	346	120	137	//

126	147	128	130	2	351	122	136	1
134	131	146	79	1	340	124	136	//
145	136	123	125	2	350	118	136	2
104	105	150	127	3	345	110	136	2
149	113	129	104	4	353	114	135	//
129	75	104	149	1	348	126	135	//
128	147	114	124	4	352	122	135	1
118	147	131	114	2	343	112	135	2
141	131	130	134	2	351	118	135	1
130	144	108	130	1	324	88	134	//
132	108	129	143	2	351	124	133	1
103	95	148	115	4	322	104	133	1
138	117	140	107	3	320	104	132	1
133	121	116	139	4	338	126	131	1
139	129	132	113	2	326	94	131	//
89	119	146	99	1	349	124	131	3
130	109	118	142	2	326	106	131	//
137	126	130	125	4	339	126	131	1
117	128	94	115	1	61	318	119	2
122	67	106	109	1	60	316	111	4
142	140	112	124	1	60	317	135	5
131	109	119	111	4	59	316	121	5
112	107	120	121	4	59	317	116	4
131	116	107	150	4	58	314	137	3
148	150	136	164	4	58	315	154	6
121	106	112	130	4	58	316	121	5
146	125	115	73	3	57	314	132	5
172	167	152	169	3	57	315	167	8
118	78	73	123	3	57	316	113	5
180	175	155	143	3	56	314	171	5
163	161	133	171	3	56	315	163	8
132	107	88	116	3	56	316	120	5
172	184	176	186	2	55	314	181	5
161	168	155	174	2	55	315	167	8
134	85	100	130	2	55	316	125	5
183	136	142	176	2	54	314	172	4
178	141	151	167	2	54	315	167	6
141	84	99	123	2	54	316	128	4
136	141	82	101	1	53	315	131	4

TABLE 19 H2CLUT: Four look SAR filter magnitude data, man-made clutter, Reedley, CA, hop on, Scene 2.

91	108	110	135	1	52	314	121	1
120	137	116	97	3	64	329	125	1
85	101	106	125	3	64	331	112	//
114	140	137	115	2	63	329	132	2
124	118	124	106	2	62	329	120	2
106	100	95	114	1	61	329	106	2
105	131	103	94	1	60	329	117	2
114	129	115	104	4	59	328	119	3
113	124	114	133	4	58	328	124	3
132	131	139	121	4	58	329	132	3
133	139	149	134	3	57	329	141	4
115	108	110	113	3	56	328	112	4
87	96	134	94	3	56	329	119	4
125	113	126	102	2	55	328	120	4
118	76	103	119	2	55	329	112	4
119	133	127	115	2	54	328	126	2
123	115	114	120	1	52	328	119	//
112	116	114	86	3	49	326	111	2
122	106	110	118	3	49	327	116	2
137	135	120	126	3	48	327	131	3
117	109	126	124	2	47	327	121	3
105	124	113	132	2	46	326	123	4
110	103	105	136	2	46	327	122	4
124	100	110	129	1	45	326	121	4
114	120	101	122	1	45	327	117	4
126	120	127	97	1	44	326	122	3
107	129	112	101	4	43	326	117	2
100	125	113	50	4	42	325	113	3
122	131	112	91	3	41	325	121	3
102	118	121	96	3	41	326	113	2
115	116	118	102	3	40	324	114	1

TABLE 19 (Continued) H2CLUT: man-made clutter.

169	149	175	128	1	341	118	165	4
132	174	166	141	2	342	119	163	4
161	145	146	167	4	330	110	158	1
136	127	169	139	3	344	110	155	4
147	136	159	158	1	324	99	153	1
154	157	138	149	1	325	99	151	1
99	147	151	157	1	348	123	149	2
147	139	148	154	2	342	106	148	1
135	121	163	102	2	343	111	148	4
135	150	148	146	1	349	123	146	3
154	129	152	119	3	345	122	146	1
137	146	149	131	4	339	116	143	//
150	133	142	119	2	343	118	141	2
143	141	136	136	4	331	110	139	1
147	140	126	132	4	346	126	139	1
135	147	132	130	2	342	96	138	//
129	148	135	123	2	343	94	138	//
151	124	93	120	3	345	104	137	2
134	141	137	132	4	346	120	137	//
134	131	146	79	1	340	124	136	//
104	105	150	127	3	345	110	136	2
129	75	104	149	1	348	126	135	//
118	147	131	114	2	343	112	135	2
130	144	108	130	1	324	88	134	//
103	95	148	115	4	322	104	133	1
133	121	116	139	4	338	126	131	1
89	119	146	99	1	349	124	131	3
137	126	130	125	4	339	126	131	1
122	67	106	109	1	60	316	111	4
131	109	119	111	4	59	316	121	5
131	116	107	150	4	58	314	137	3
121	106	112	130	4	58	316	121	5
172	167	152	169	3	57	315	167	8
180	175	155	143	3	56	314	171	5
132	107	88	116	3	56	316	120	5
161	168	155	174	2	55	315	167	8
183	136	142	176	2	54	314	172	4
141	84	99	123	2	54	316	128	4

91	108	110	135	1	52	314	121	1
85	101	106	125	3	64	331	112	//
124	118	124	106	2	62	329	120	2
105	131	103	94	1	60	329	117	2
113	124	114	133	4	58	328	124	3
133	139	149	134	3	57	329	141	4
87	96	134	94	3	56	329	119	4
118	76	103	119	2	55	329	112	4
123	115	114	120	1	52	328	119	//
122	106	110	118	3	49	327	116	2
117	109	126	124	2	47	327	121	3
110	103	105	136	2	46	327	122	4
114	120	101	122	1	45	327	117	4
107	129	112	101	4	43	326	117	2
122	131	112	91	3	41	325	121	3
115	116	118	102	3	40	324	114	1

TABLE 20 H2CLUT2: Four look SAR filter magnitude data, man-made clutter (every other (even) line from H2CLUT), Reedley, CA, hop on, Scene 2.

3 Reedley, CA:

Scene 3, hop off

TARGET CLASS AND CORRESPONDING TABLE NUMBER

H3GRAS1	TABLE 21
H3GRAS2	TABLE 22
H3NAT	TABLE 23
H3TREE1	TABLE 24
H3TREE2	TABLE 24A
H3TREE3	TABLE 25
H3RRB1	TABLE 26
H3HWB1	TABLE 27
H3BRIDG	TABLE 28
H3MH1	TABLE 29
H3CLUT	TABLE 30

103	104	94	83	1	170	317	99	3
92	107	103	74	1	178	322	99	1
105	107	77	84	2	156	318	99	//
105	104	72	97	2	186	316	99	1
81	89	83	112	3	166	325	99	1
83	94	104	103	3	174	313	99	//
96	98	102	98	4	152	312	99	//
94	77	110	93	4	176	324	99	2
85	103	104	93	4	168	328	99	//
86	105	100	98	2	173	322	99	2
98	101	104	80	1	163	319	99	3
81	98	102	103	4	177	316	99	//
94	89	106	101	4	169	317	99	2
105	104	94	84	3	174	321	99	2
94	78	103	106	3	167	317	99	//
106	100	79	99	2	172	321	99	1
56	101	96	107	3	174	316	99	1
84	93	108	93	1	162	318	98	2
92	99	103	96	3	182	312	98	//
83	103	89	105	3	166	312	98	1
85	91	109	92	4	177	323	98	2
101	101	99	89	4	160	307	98	//
96	106	96	76	2	180	318	98	//
93	104	95	98	1	171	316	98	2
98	103	98	89	1	178	319	98	//
102	99	98	92	2	165	310	98	//
91	109	92	81	2	180	315	98	1
101	98	91	100	4	168	321	98	//
96	85	104	99	4	177	312	98	1
101	95	94	96	3	159	314	97	//
97	98	78	103	3	182	316	97	//
98	59	102	100	3	166	320	97	2
102	98	73	100	2	172	313	97	1
102	96	81	100	1	163	318	97	2
102	84	88	102	3	174	320	97	1
85	103	102	91	3	166	322	97	2
103	80	100	94	2	165	323	97	1

75	104	96	99	3	166	321	97	2
100	99	87	97	2	165	319	97	2
82	104	103	82	2	165	313	97	2
95	103	91	91	4	176	325	96	1
104	85	94	93	3	158	318	96	//
99	88	96	97	2	173	324	96	1
89	101	90	100	4	169	316	96	2
76	91	96	105	3	174	328	96	1
104	85	98	85	2	172	312	96	1
99	88	86	99	2	157	315	95	//
92	99	83	100	3	174	324	95	1
104	88	85	95	2	164	320	95	2
91	87	93	102	2	173	317	95	2
86	95	96	99	2	165	325	95	1
89	96	100	88	2	173	329	94	1
99	101	86	71	2	164	313	94	1
92	86	93	97	3	158	312	93	//
78	78	95	87	4	177	313	87	1
65	85	99	72	2	172	316	87	2

TABLE 21 H3GRAS1: Four look SAR filter magnitude data, rough grass and weeds, filter magnitudes less than 100, Reedley, CA, hop off, Scene 3.

83	105	71	118	3	166	317	106	//
109	113	90	101	1	179	308	106	//
120	83	85	90	2	157	317	106	//
119	102	91	73	2	172	318	106	2
107	80	102	114	1	171	326	106	1
91	106	114	101	4	176	326	106	//
94	113	110	89	1	154	306	106	//
100	65	119	83	4	176	312	106	//
92	113	111	91	4	168	325	106	3
105	103	112	100	3	159	316	106	//
111	63	100	114	4	153	304	106	1
80	108	115	96	4	161	301	106	//
106	111	103	101	4	160	313	106	//
106	94	99	114	4	161	316	106	1
90	112	104	104	3	174	302	105	//
106	79	112	103	3	167	319	105	1
117	74	82	103	2	172	326	105	1
111	102	82	108	1	155	301	105	1
118	92	90	96	2	173	318	105	2
115	87	99	100	4	169	326	105	1
63	101	104	114	3	174	315	105	//
81	100	106	113	3	174	310	105	//
91	106	107	105	1	162	317	104	1
94	99	103	112	1	179	316	104	1
113	96	94	103	2	164	317	104	1
84	117	100	68	2	173	323	104	//
89	112	69	109	3	158	314	104	1
86	103	101	112	3	174	325	104	1
106	93	100	110	4	169	324	104	1
104	100	92	111	3	174	312	104	//
106	112	101	84	2	156	306	104	//
89	109	102	108	3	174	326	104	1
84	111	78	112	3	166	313	104	//
70	101	111	106	3	166	301	104	//
97	100	67	116	3	167	325	104	1
101	103	61	111	1	179	321	103	1
83	107	105	104	4	152	301	103	//
99	87	115	87	4	176	321	103	//

102	94	113	86	4	169	314	103	//
99	102	112	73	1	179	318	103	2
94	105	104	106	2	156	311	103	1
103	65	102	111	2	172	317	103	2
110	90	101	104	2	164	318	103	1
104	95	102	107	1	154	308	103	//
83	88	116	91	4	168	320	103	1
107	105	97	101	2	156	310	103	1
85	104	97	112	3	166	308	103	//
99	88	113	95	4	152	304	103	1
104	108	102	91	1	170	308	103	//
107	104	96	100	2	180	319	102	1
77	103	69	114	3	158	313	102	1
92	109	104	92	1	178	317	102	2
108	102	100	92	2	164	311	102	//
96	105	109	90	1	179	322	102	1
106	93	105	99	2	156	301	102	1

TABLE 22 H3GRAS2: Four look SAR filter magnitude data, rough grass and weeds, filter magnitudes greater than 100, Reedley, CA, hop off, Scene 3.

83	105	71	118	3	166	317	106	//	114	121	137	122	3	175	35	127	//
142	116	150	143	4	320	7	143	//	145	138	142	136	2	172	65	141	//
126	128	137	149	3	318	3	139	//	132	130	149	146	1	170	64	142	//
105	139	107	142	2	316	13	133	//	139	132	138	117	4	168	64	134	//
136	143	123	128	1	315	17	135	//	133	149	126	139	3	166	66	140	//
138	129	132	123	4	313	17	132	//	142	129	147	141	4	160	66	141	//
137	124	96	141	3	311	33	133	//	117	133	139	120	3	159	64	131	//
137	133	133	133	3	310	7	134	//	117	123	142	117	3	158	39	130	//
125	116	134	111	3	310	14	125	//	118	127	145	137	2	157	64	136	//
115	78	128	152	2	308	8	138	//	117	147	98	137	2	156	66	136	//
138	128	136	112	1	307	30	132	//	99	135	127	146	4	153	67	135	//
133	118	112	132	1	307	33	127	//	81	95	150	135	3	151	68	137	//
109	119	132	121	4	304	54	123	//	150	119	129	111	1	147	70	137	//
122	126	135	129	3	302	57	129	//	120	124	121	138	1	146	42	128	//
115	124	140	134	2	300	54	132	//	135	137	143	143	3	143	70	140	//
122	135	130	146	1	299	57	137	//	105	126	137	133	2	140	72	130	//
87	122	130	130	4	297	57	125	//	138	111	103	93	3	134	78	124	//
116	139	7	121	3	278	63	126	//	119	98	132	133	2	132	55	126	//
90	105	115	138	2	276	37	124	//	115	85	142	141	2	132	74	134	//
118	72	123	137	4	272	63	126	//	109	113	90	101	1	179	308	106	//
128	120	143	130	2	268	32	133	//	120	83	85	90	2	157	317	106	//
130	132	118	117	4	265	63	126	//	119	102	91	73	2	172	318	106	2
125	137	100	113	3	263	60	126	//	107	80	102	114	1	171	326	106	1
120	134	111	117	1	258	37	124	//	91	106	114	101	4	176	326	106	//
101	125	102	137	2	252	38	125	//	94	113	110	89	1	154	306	106	//
134	146	116	122	1	226	65	135	//	100	65	119	83	4	176	312	106	//
134	50	148	127	1	218	60	136	//	92	113	111	91	4	168	325	106	3
110	133	132	141	4	201	30	133	//	105	103	112	100	3	159	316	106	//
126	136	115	132	3	199	32	130	//	111	63	100	114	4	153	304	106	1
123	135	139	123	4	193	54	132	//	80	108	115	96	4	161	301	106	//
56	137	121	103	3	191	51	124	//	106	111	103	101	4	160	313	106	//
124	136	113	119	3	190	31	126	//	106	94	99	114	4	161	316	106	1
96	145	126	123	1	187	32	133	//	90	112	104	104	3	174	302	105	//
137	107	123	122	4	185	33	127	//	106	79	112	103	3	167	319	105	1
114	138	112	129	4	185	57	128	//	117	74	82	103	2	172	326	105	1
116	128	125	127	3	183	57	125	//	111	102	82	108	1	155	301	105	1
147	116	97	137	2	181	34	136	//	118	92	90	96	2	173	318	105	2
102	125	117	136	1	179	34	126	//	115	87	99	100	4	169	326	105	1

TABLE 23 H3NAT: Four look SAR filter magnitude data, natural features, Reedley, CA, hop off, Scene 3.

63	101	104	114	3	174	315	105	//
81	100	106	113	3	174	310	105	//
91	106	107	105	1	162	317	104	1
94	99	103	112	1	179	316	104	1
113	96	94	103	2	164	317	104	1
84	117	100	68	2	173	323	104	//
89	112	69	109	3	158	314	104	1
86	103	101	112	3	174	325	104	1
106	93	100	110	4	169	324	104	1
104	100	92	111	3	174	312	104	//
106	112	101	84	2	156	306	104	//
89	109	102	108	3	174	326	104	1
84	111	78	112	3	166	313	104	//
70	101	111	106	3	166	301	104	//
97	100	67	116	3	167	325	104	1
101	103	61	111	1	179	321	103	1
83	107	105	104	4	152	301	103	//
99	87	115	87	4	176	321	103	//
102	94	113	86	4	169	314	103	//
99	102	112	73	1	179	318	103	2
94	105	104	106	2	156	311	103	1
103	65	102	111	2	172	317	103	2
110	90	101	104	2	164	318	103	1
104	95	102	107	1	154	308	103	//
83	88	116	91	4	168	320	103	1
107	105	97	101	2	156	310	103	1
85	104	97	112	3	166	308	103	//
99	88	113	95	4	152	304	103	1
104	108	102	91	1	170	308	103	//
107	104	96	100	2	180	319	102	1
77	103	69	114	3	158	313	102	1
92	109	104	92	1	178	317	102	2
108	102	100	92	2	164	311	102	//
96	105	109	90	1	179	322	102	1
106	93	105	99	2	156	301	102	1

TABLE 23 (Continued) H3NAT: natural features

131	133	104	121	2	116	99	126	1
137	129	129	77	1	99	99	129	1
132	117	119	119	1	98	99	124	1
126	137	115	128	1	115	98	129	3
121	136	122	131	2	116	97	129	2
121	138	87	131	1	115	97	129	2
140	116	130	142	4	96	96	136	2
146	126	122	116	3	103	96	134	//
125	88	117	146	4	97	96	133	3
80	151	151	118	1	99	95	143	1
146	155	152	130	1	98	95	149	3
144	144	150	144	4	97	95	146	3
144	119	128	135	3	111	93	135	3
138	131	131	138	3	110	93	135	3
139	114	117	104	1	106	92	126	1
133	88	129	150	3	111	92	138	3
136	114	114	121	3	103	92	125	2
109	104	127	148	3	110	92	134	3
142	126	92	130	4	105	92	132	1
116	151	125	134	2	101	91	139	1
131	136	134	146	3	102	91	138	3
98	125	135	121	3	103	91	126	2
81	142	101	112	3	119	89	127	2
129	139	136	124	1	107	89	133	1
96	140	96	121	2	108	89	126	1
118	128	119	127	4	104	89	124	3
98	144	110	107	3	118	89	129	1
125	98	135	121	4	105	89	126	3
132	135	133	116	4	121	88	131	1
146	133	131	123	4	104	88	136	3
130	144	124	117	4	120	88	133	2
143	131	133	118	4	105	88	134	3
121	143	125	119	3	110	87	132	//
139	127	96	93	1	91	85	127	2
133	124	101	122	1	90	85	124	2
136	137	117	115	4	129	84	130	3
137	111	123	114	1	91	84	126	4
123	126	142	124	3	127	84	132	3

139	124	132	113	4	128	84	131	5
124	124	111	138	2	92	83	128	2
95	137	141	126	4	129	83	133	3
128	[illegible]	108	137	1	91	83	127	2
132	129	129	136	3	127	83	132	3
111	132	147	128	4	128	83	136	5
128	104	129	146	3	95	80	134	1
113	139	112	121	2	108	80	127	//
108	138	101	133	4	96	80	129	1
132	113	103	135	3	126	80	127	3
149	125	153	131	2	125	79	145	3
116	107	126	134	3	127	79	125	2
139	138	138	143	2	124	79	140	1
137	133	136	79	3	126	79	132	3

TABLE 24 H3TREE1: Four look SAR filter magnitude data, large river bank trees, Reedley, CA, hop off, Scene 3.

90	105	76	96	3	289	176	96	//
99	77	98	106	2	287	176	99	1
101	100	98	96	2	287	177	99	2
106	82	91	73	2	287	178	94	1
96	104	80	101	1	285	172	98	2
67	54	90	110	1	285	173	96	2
97	92	65	71	1	285	177	88	//
103	89	68	86	1	285	182	92	//
82	103	86	108	1	284	172	99	3
99	99	86	86	1	284	184	94	1
106	83	85	64	4	283	173	93	2
99	82	96	61	4	283	176	91	2
95	83	106	68	4	283	177	95	2
102	97	61	31	4	283	184	92	1
75	100	96	91	4	283	189	94	1
104	90	72	58	4	282	173	92	2
103	75	91	84	4	282	176	93	2
78	103	94	91	4	282	189	95	2
107	64	74	96	3	281	173	95	1
93	69	103	91	3	281	180	94	1
77	99	100	69	3	281	189	93	1
99	91	97	98	3	280	180	97	1
100	108	48	86	3	280	184	98	1
72	102	97	98	3	280	192	96	1
93	92	93	102	2	279	174	96	//
70	112	56	97	2	279	184	99	1
87	105	91	101	2	279	192	98	1
99	97	81	81	1	277	176	92	2
84	104	75	88	1	277	182	93	2
82	96	98	77	1	277	194	91	//
101	101	47	80	1	276	176	94	3
91	98	7	104	1	276	177	96	3
102	99	59	98	1	276	182	97	3
97	56	105	91	1	276	183	96	3
97	104	75	49	4	275	176	94	3
105	59	85	92	4	275	182	94	3
90	73	89	110	4	275	190	98	1
83	101	66	81	4	274	177	89	2
77	100	92	91	4	274	178	93	1
93	85	101	99	4	274	180	96	1
102	76	95	86	4	274	181	93	2
74	105	43	101	4	274	184	96	//
78	105	86	95	4	274	187	95	1
87	75	97	106	4	274	188	96	1
102	89	92	91	4	274	190	95	1
91	85	91	102	4	274	192	94	//
106	90	84	49	3	272	173	94	//
97	107	90	97	3	272	192	99	//
91	77	83	109	3	272	196	97	//
96	86	102	86	3	272	198	95	//

TABLE 24A H3TREE2: Four look SAR filter magnitude data, young fruit trees, Reedley, CA, hop off, Scene 3.

142	116	150	143	4	320	7	143	//
126	128	137	149	3	318	3	139	//
105	139	107	142	2	316	13	133	//
136	143	123	128	1	315	17	135	//
138	129	132	123	4	313	17	132	//
137	124	96	141	3	311	33	133	//
137	133	133	133	3	310	7	134	//
125	116	134	111	3	310	14	[illegible]	//
115	78	128	152	2	308	8	138	//
138	128	136	112	1	307	30	132	//
133	118	112	132	1	307	33	127	//
109	119	132	121	4	304	54	123	//
122	126	135	129	3	302	57	129	//
115	124	140	134	2	300	54	132	//
122	135	130	146	1	299	57	137	//
87	122	130	130	4	297	57	125	//
116	139	7	121	3	278	63	126	//
90	105	115	138	2	276	37	124	//
118	72	123	137	4	272	63	126	//
128	120	143	130	2	268	32	133	//
130	132	118	117	4	265	63	126	//
125	137	100	113	3	263	60	126	//
120	134	111	117	1	258	37	124	//
101	125	102	137	2	252	38	125	//
134	146	116	122	1	226	65	135	//
134	50	148	127	1	218	60	136	//
110	133	132	141	4	201	30	133	//
126	136	115	132	3	199	32	130	//
123	135	139	123	4	193	54	132	//
56	137	121	103	3	191	51	124	//
124	136	113	119	3	190	31	126	//
96	145	126	123	1	187	32	133	//
137	107	123	122	4	185	33	127	//
114	138	112	129	4	185	57	128	//
116	128	125	127	3	183	57	125	//
147	116	97	137	2	181	34	136	//
102	125	117	136	1	179	34	126	//
114	121	137	122	3	175	35	127	//
145	138	142	136	2	172	65	141	//
132	130	149	146	1	170	64	142	//
139	132	138	117	4	168	64	134	//
133	149	126	139	3	166	66	140	//
142	129	147	141	4	160	66	141	//
117	133	139	120	3	159	64	131	//
117	123	142	117	3	158	39	130	//
118	127	145	137	2	157	64	136	//
117	147	98	137	2	156	66	136	//
99	135	127	146	4	153	67	135	//
81	95	150	135	3	151	68	137	//
150	119	129	111	1	147	70	137	//
120	124	121	138	1	146	42	128	//
135	137	143	143	3	143	70	140	//
105	126	137	133	2	140	72	130	//
138	111	103	93	3	134	78	124	//
119	98	132	133	2	132	55	126	//
115	85	142	141	2	132	74	134	//

TABLE 25 H3TREE3: Four look SAR filter magnitude data, large river bank trees (all non-adjacent pixels), Reedley, CA, hop off, Scene 3.

139	138	153	74	2	76	290	142	//
120	154	117	128	4	73	290	140	//
116	127	98	93	3	71	293	116	//
128	129	170	154	2	69	290	157	//
130	143	100	164	1	67	290	150	//
128	142	166	134	1	67	292	152	//
149	154	93	108	4	65	290	144	//
62	132	113	109	3	63	290	119	//
96	58	142	99	2	61	290	126	//
125	124	71	125	2	60	293	121	//
144	124	154	100	4	57	291	143	//
165	107	133	152	3	54	292	153	//
150	127	148	113	1	51	292	142	//
149	125	73	112	4	49	294	135	//
123	129	158	147	3	47	292	147	//
111	128	105	91	3	46	289	116	1
126	110	49	91	2	45	290	113	1
100	130	76	91	2	45	295	115	//
87	108	102	133	1	43	291	119	//
150	153	149	103	4	41	292	148	//
114	117	145	155	4	41	294	144	//
114	93	162	144	2	37	292	148	1
133	133	117	73	2	37	294	126	//
116	101	168	164	2	36	292	158	2
147	118	97	159	1	35	292	147	1
131	132	112	72	1	35	294	125	1
126	126	119	59	1	34	294	121	1
122	165	168	138	3	31	293	159	//

TABLE 26 H3RRB1: Four look SAR filter magnitude data, railroad bridge, Reedley, CA, hop off, Scene 3.

98	96	134	102	3	71	278	120	2
75	124	128	113	3	70	274	120	1
116	120	107	125	3	70	277	119	4
114	121	129	139	3	70	278	129	4

111	116	131	112	2	69	274	121	3
126	106	85	128	2	69	277	120	4
125	120	83	137	2	69	278	126	4
102	133	111	125	2	68	274	123	3
91	138	102	85	2	68	275	123	3
138	130	130	166	2	68	278	152	3
115	98	131	136	1	67	274	127	2
161	136	105	164	1	67	278	155	2
164	151	130	146	1	66	278	153	2
128	112	86	109	4	65	274	116	1
105	152	137	123	4	65	278	140	3
95	129	115	102	4	64	274	117	2
130	103	103	76	4	64	277	116	3
148	138	125	133	4	64	278	139	3
117	122	133	111	4	64	292	124	//
119	113	88	123	3	63	274	116	2
95	143	145	144	3	63	278	141	3
125	59	83	125	3	62	274	117	1
124	147	120	139	3	62	278	137	3
20	50	137	105	2	61	277	122	4
135	122	152	145	2	61	278	143	5
111	92	169	156	2	60	277	156	4
185	181	178	182	2	60	278	182	6
162	178	153	161	2	60	279	167	5
185	175	176	169	1	59	278	178	5
164	174	179	161	1	59	279	172	5
112	120	131	86	1	59	280	120	2
135	106	155	129	1	58	278	142	3
113	115	95	133	4	57	274	121	1
144	141	143	130	4	57	278	141	2
107	98	112	129	4	56	274	117	2
146	136	141	134	4	56	278	140	2
126	91	122	71	3	55	274	117	1
143	140	146	145	3	55	278	144	2
126	130	137	123	3	54	278	130	1

TABLE 27 H3HWB1: Four look SAR filter magnitude data, highway bridge, Reedley, CA, hop off, Scene 3.

139	138	153	74	2	76	290	142	//
120	154	117	128	4	73	290	140	//
116	127	98	93	3	71	293	116	//
128	129	170	154	2	69	290	157	//
130	143	100	164	1	67	290	150	//
128	142	166	134	1	67	292	152	//
149	154	93	108	4	65	290	144	//
62	132	113	109	3	63	290	119	//
96	58	142	99	2	51	290	126	//
125	124	71	125	2	60	293	121	//
144	124	154	100	4	57	291	143	//
165	107	133	152	3	54	292	153	//
150	127	148	113	1	51	292	142	//
149	125	73	112	4	49	294	135	//
123	129	158	147	3	47	292	147	//
111	128	105	91	3	46	289	116	1
126	110	49	91	2	45	290	113	1
100	130	76	91	2	45	295	115	//
87	108	102	133	1	43	291	119	//
150	153	149	103	4	41	292	148	//
114	117	145	155	4	41	294	144	//
114	93	162	144	2	37	292	148	1
133	133	117	73	2	37	294	126	//
116	101	168	164	2	36	292	158	2
147	118	97	159	1	35	292	147	1
131	132	112	72	1	35	294	125	1
126	126	119	59	1	34	294	121	1
122	165	168	138	3	31	293	159	//
98	96	134	102	3	71	278	120	//
75	124	128	113	3	70	274	120	//
161	136	105	164	1	67	278	155	1
164	151	130	146	1	66	278	153	2
128	112	86	109	4	65	274	116	1
105	152	137	123	4	65	278	140	3
95	129	115	102	4	64	274	117	2
130	103	103	76	4	64	277	116	3
148	138	125	133	4	64	278	139	3
117	122	133	111	4	64	292	124	//

119	113	88	123	3	63	274	116	2
95	143	145	144	3	63	278	141	3
125	59	83	125	3	62	274	117	1
124	147	120	139	3	62	278	137	3
20	50	137	105	2	61	277	122	4
135	122	152	145	2	61	278	143	5
111	92	169	156	2	60	277	156	4
185	181	178	182	2	60	278	182	6
162	178	153	161	2	60	279	167	5
185	175	176	169	1	59	278	178	5
164	174	179	161	1	59	279	172	5
112	120	131	86	1	59	280	120	2
135	106	155	129	1	58	278	142	3
113	115	95	133	4	57	274	121	1
144	141	143	130	4	57	278	141	2
107	98	112	129	4	56	274	117	1
146	136	141	134	4	56	278	140	1

TABLE 28 H3BRIDG: Four look SAR filter magnitude data, bridges, Reedley, CA, hop off, Scene 3.

142	124	99	4	281	4	132	1
140	110	134	2	284	5	132	//
100	136	136	3	270	4	132	//
116	95	97	2	285	0	131	//
144	102	80	2	276	17	130	//
98	99	146	1	282	0	131	1
115	120	74	3	254	4	129	//
133	128	58	2	285	3	131	2
129	129	101	4	280	14	131	1
137	132	99	2	284	14	132	1
127	99	138	1	267	14	129	//
136	134	90	1	282	4	130	1
128	114	87	2	252	4	131	//
117	142	100	4	265	11	128	//
143	96	100	2	253	1	129	//
123	103	137	3	286	11	127	//
121	138	83	1	274	16	125	//
139	50	102	1	283	16	125	1
117	90	77	2	253	6	124	//
125	131	101	1	282	6	125	//
127	131	82	1	282	11	125	//
119	127	73	1	283	17	123	1
105	123	139	3	255	2	127	1
55	102	119	2	277	6	124	1
136	119	95	4	272	6	124	//
133	80	112	2	276	10	124	//
129	99	115	4	272	16	126	//
133	114	55	2	285	14	120	1
65	96	130	2	260	9	120	//
117	128	54	3	278	0	118	//
66	113	123	2	268	2	117	//
87	98	126	1	274	0	118	//
79	126	108	2	269	14	121	//
126	107	74	4	281	13	122	1
112	88	132	1	274	10	119	//
121	107	49	3	278	7	121	2
119	92	111	2	277	3	117	//
31	103	113	3	271	14	119	//
104	129	66	1	275	5	117	//

124	110	91	3	286	4	112	1
43	111	125	1	258	2	116	//
113	87	82	2	285	2	114	1
113	85	121	4	281	1	112	1
80	106	130	2	260	6	116	//
105	64	124	3	270	2	112	//
96	124	117	4	256	3	114	1
102	105	45	3	279	7	116	1
113	112	86	4	265	9	113	//
103	57	127	1	275	14	114	//
86	120	119	2	268	8	114	//

TABLE 29 H3MH1: Four look SAR filter magnitude data, mobile homes, Reedley, CA, hop off, Scene 3.

139	138	153	74	2	76	290	142	//
132	142	124	99	4	281	4	132	1
124	140	110	134	2	284	5	132	//
133	100	136	136	3	270	4	132	//
146	116	95	97	2	285	0	131	//
124	144	102	80	2	276	17	130	//
114	98	99	146	1	282	9	131	1
143	115	120	74	3	254	4	129	//
139	133	128	58	2	285	3	131	2
140	129	129	101	4	280	14	131	1
136	137	132	99	2	284	14	132	1
126	127	99	138	1	267	14	129	//
127	136	134	90	1	282	4	130	1
144	128	114	87	2	252	4	131	//
42	117	142	100	4	265	11	128	//
117	143	96	100	2	253	1	129	//
124	123	103	137	3	286	11	127	//
113	121	138	83	1	274	16	125	//
120	139	50	102	1	283	16	125	1
134	117	90	77	2	253	6	124	//
128	125	131	101	1	282	6	125	//
125	127	131	82	1	282	11	125	//
131	119	127	73	1	283	17	123	1
111	105	123	139	3	255	2	127	1
138	55	102	119	2	277	6	124	1
114	136	119	95	4	272	6	124	//
127	133	80	112	2	276	10	124	//
136	129	99	115	4	272	16	126	//
102	133	114	55	2	285	14	120	1
125	65	96	130	2	260	9	120	//
114	117	128	54	3	278	0	118	//
123	66	113	123	2	268	2	117	//
125	87	98	126	1	274	0	118	//
130	79	126	108	2	269	14	121	//
132	126	107	74	4	281	13	122	1
107	112	88	132	1	274	10	119	//

132	121	107	49	3	278	7	121	2
126	119	92	111	2	277	3	117	//
132	31	103	113	3	271	14	119	//
115	104	129	66	1	275	5	117	//
94	124	110	91	3	286	4	112	1
118	43	111	125	1	258	2	116	//
127	113	87	82	2	285	2	114	1
109	113	85	121	4	281	1	112	1
100	80	106	130	2	260	6	116	//
107	105	64	124	3	270	2	112	//
60	96	124	117	4	256	3	114	1
130	102	105	45	3	279	7	116	1
121	113	112	86	4	265	9	113	//
109	103	57	127	1	275	14	114	//
107	86	120	119	2	268	8	114	//
120	154	117	128	4	73	290	140	//
116	127	98	93	3	71	293	116	//
128	129	170	154	2	69	290	157	//
130	143	100	164	1	67	290	150	//
128	142	166	134	1	67	292	152	//
149	154	93	108	4	65	290	144	//
62	132	113	109	3	63	290	119	//
96	58	142	99	2	61	290	126	//
125	124	71	125	2	60	293	121	//
144	124	154	100	4	57	291	143	//
165	107	133	152	3	54	292	153	//
150	127	148	113	1	51	292	142	//
149	125	73	112	4	49	294	135	//
123	129	158	147	3	47	292	147	//
111	128	105	91	3	46	289	116	1
126	110	49	91	2	45	290	113	1
100	130	76	91	2	45	295	115	//
87	108	102	133	1	43	291	119	//
150	153	149	103	4	41	292	148	//
114	117	145	155	4	41	294	144	//
114	93	162	144	2	37	292	148	1

TABLE 30 H3CLUT: Four look SAR filter magnitude data, man-made clutter, Reedley, CA, hop off, Scene 3.

[illegible]	[illegible]	[illegible]	[illegible]	2	37	294	126	//
[illegible]	[illegible]	[illegible]	164	2	36	292	158	2
[illegible]	[illegible]	[illegible]	159	1	35	292	147	1
[illegible]	[illegible]	112	72	1	35	294	125	1
[illegible]	[illegible]	119	59	1	34	294	121	1
[illegible]	[illegible]	168	138	3	31	293	159	//
[illegible]	96	134	102	3	71	278	120	//
[illegible]	124	128	113	3	70	274	120	//
161	136	105	164	1	67	278	155	1
164	151	130	146	1	66	278	153	2
128	112	86	109	4	65	274	116	1
105	152	137	123	4	65	278	140	3
95	129	115	102	4	64	274	117	2
130	103	103	76	4	64	277	116	3
148	138	125	133	4	64	278	139	3
117	122	133	111	4	64	292	124	//
119	113	88	123	3	63	274	116	2
95	143	145	144	3	63	278	141	3
125	59	83	125	3	62	274	117	1
124	147	120	139	3	62	278	137	3
20	50	137	105	2	61	277	122	4
135	122	152	145	2	61	278	143	5
111	92	169	156	2	60	277	156	4
185	181	178	182	2	60	278	182	6
162	178	153	161	2	60	279	167	5
185	175	176	169	1	59	278	178	5
164	174	179	161	1	59	279	172	5
112	120	131	86	1	59	280	120	2
135	106	155	129	1	58	278	142	3
113	115	95	133	4	57	274	121	1
144	141	143	130	4	57	278	141	2
107	98	112	129	4	56	274	117	1
146	136	141	134	4	56	278	140	1

TABLE 30 (Continued) H3CLUT: man-made clutter.

4 Nebo Static Array of Vehicles and Equipment:
Scene 4, hop on
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H4DARK	TABLE 31
H4TANK1	TABLE 32
H4TR251	TABLE 33
H4TACT1	TABLE 34
H4TACT2	TABLE 35
H4SAND1	TABLE 36

42	3	8	12	4	6	48	28	3
24	18	8	12	4	6	49	17	5
42	3	41	12	4	6	50	34	5
50	3	8	12	4	6	51	35	5
42	36	8	12	4	6	52	32	5
9	3	8	12	4	6	53	8	5
9	3	8	12	4	6	54	8	4
9	3	8	12	4	6	55	8	3
9	3	8	12	4	6	56	8	2
9	3	8	12	4	6	57	8	2
40	42	8	12	4	6	58	34	2
9	3	23	12	4	6	59	14	2
9	3	8	12	4	6	60	8	2
9	3	8	12	4	6	61	8	2
9	3	39	12	4	6	62	25	2
9	3	8	12	4	6	63	8	2
9	3	8	12	4	6	64	8	2
9	3	8	12	4	6	65	8	2
9	3	8	12	4	6	66	8	2
9	36	39	12	4	6	67	31	2
42	3	8	12	4	6	68	28	2
40	36	8	12	4	6	69	31	2
65	43	48	59	4	6	70	57	2
69	47	48	59	4	6	71	59	2
9	3	8	12	4	6	72	8	2
40	26	8	12	4	6	73	28	2
40	34	8	12	4	6	74	30	2
9	3	8	12	4	6	75	8	2
42	3	8	12	4	6	76	28	2
9	36	8	12	4	6	77	23	2
9	3	41	12	4	6	78	27	2
9	3	8	12	4	6	79	8	2
9	3	8	12	4	6	80	8	2
9	18	23	12	4	6	81	17	2
9	3	41	12	4	6	82	27	2
56	3	8	51	4	6	83	46	2
9	3	8	12	4	6	84	8	2
9	47	8	45	4	6	85	38	2

40	3	8	12	4	6	86	26	2
9	3	8	12	4	6	87	8	2
24	3	8	12	4	6	88	15	2
32	3	8	12	4	6	89	20	2
9	34	8	12	4	6	90	22	2
9	3	8	12	4	6	91	8	2
9	3	8	12	4	6	92	8	2
48	3	8	12	4	6	93	33	2
65	43	60	68	4	6	94	62	2
53	57	52	60	4	6	95	56	2
95	77	99	85	4	6	96	92	1
56	1	11	13	4	7	48	41	3
17	24	11	13	4	7	49	17	5
48	1	42	13	4	7	50	38	5
61	1	11	13	4	7	51	45	5
48	32	11	13	4	7	52	35	5
17	1	11	13	4	7	53	12	5
17	1	11	13	4	7	54	12	4

TABLE 31 H4DARK: Four look SAR filter magnitude data, shadows, Nebo vehicle array, Barstow, CA, hop on, Scene 4.

100	116	56	86	2	162	163	103	1
71	103	73	84	2	163	163	90	1
84	75	82	92	1	173	173	85	2
71	99	76	60	1	173	174	86	4
71	90	66	80	1	173	175	80	3
88	104	88	80	4	174	174	94	5
85	88	81	93	4	174	175	88	4
48	86	87	79	4	175	174	81	2
83	70	100	78	1	173	146	88	1
97	102	122	88	4	174	146	109	2
115	99	119	69	4	175	146	110	1
76	62	78	85	1	180	188	78	3
101	82	103	105	1	180	189	100	3
73	61	70	92	1	181	188	80	3
110	114	110	110	1	181	189	111	3
90	89	79	98	3	184	171	91	3
108	64	72	74	3	184	172	93	3
72	85	78	86	3	185	171	82	4
112	77	93	96	3	185	172	101	4
87	49	80	84	2	186	172	81	2
100	88	92	95	4	199	172	95	2
81	87	88	96	3	200	172	89	2
93	80	45	95	3	200	173	88	2
56	63	87	102	4	198	157	89	3
77	96	123	131	4	198	158	120	3
109	82	109	119	4	199	157	110	5
104	112	142	149	4	199	158	138	5
59	56	90	97	3	200	157	87	3
120	102	123	124	3	200	158	120	3
90	85	102	87	3	208	182	93	2
85	107	106	73	3	209	182	100	3
89	89	87	114	3	209	183	101	3
79	51	85	87	2	210	183	81	2
89	64	70	93	3	209	162	85	3
122	48	69	119	3	209	163	113	4
86	66	96	106	2	210	162	96	5
137	130	100	118	2	210	163	128	6
98	18	72	65	2	210	164	84	3
93	53	71	110	2	211	162	97	4
114	108	93	117	2	211	163	111	5
71	54	83	91	1	212	163	81	2
77	75	102	83	2	211	193	90	1
84	86	108	99	1	212	193	98	2
96	98	103	87	1	213	193	97	1
73	90	104	92	3	224	175	94	3
114	78	122	124	3	224	176	118	3
69	97	96	78	3	225	175	96	3
92	99	115	112	3	225	176	108	3

TABLE 32 H4TANK1: Four look SAR filter magnitude data, M48 tanks, Nebo vehicle array, Barstow, CA, hop on, Scene 4.

86	66	88	89	4	159	166	85	2
67	83	82	83	3	160	166	80	4
96	100	85	92	3	160	167	94	4
56	77	73	91	3	161	166	80	4
87	95	54	84	3	161	167	86	4
75	84	81	76	2	162	166	80	2
135	140	107	122	4	166	166	132	2
83	115	93	107	4	166	167	105	4
81	92	56	100	4	166	168	90	3
74	114	98	102	4	167	167	104	4
66	114	83	111	4	167	168	105	3
80	56	52	79	3	169	167	73	//
107	98	95	121	4	166	160	110	2
95	63	80	85	4	166	161	85	4
85	57	79	87	4	166	162	81	2
132	108	103	138	4	167	160	128	4
100	71	97	93	4	167	162	94	3
98	97	107	120	3	168	160	109	3
77	64	95	78	3	168	161	84	4
69	56	69	72	3	169	161	68	2
93	76	85	51	1	173	181	83	3
91	75	116	99	1	173	182	104	3
94	83	89	66	4	174	181	87	3
96	84	112	88	4	174	182	100	3
96	91	74	83	4	174	160	89	3
87	89	100	84	4	174	161	92	3
98	90	97	82	4	175	160	93	3
105	81	88	69	4	175	161	93	3
89	85	78	88	3	184	164	86	3
101	102	111	108	3	184	165	106	5
98	41	82	93	3	184	166	89	3
81	89	78	79	3	185	164	83	4
105	115	112	105	3	185	165	110	6
85	85	87	96	3	185	166	89	4
99	51	47	83	2	186	165	86	3
101	107	95	84	3	185	195	99	2
95	75	84	77	3	185	196	86	2

90	132	111	78	2	186	195	118	3
88	84	87	68	2	187	195	84	1
75	70	85	45	1	196	196	75	//
90	86	100	100	2	187	181	96	3
113	103	93	79	2	187	182	103	5
103	111	82	90	2	187	183	101	3
93	86	74	110	1	188	181	98	4
125	105	72	91	1	188	182	111	6
116	113	107	103	1	188	183	111	4
86	84	77	76	1	189	182	82	3
102	125	126	107	1	188	154	119	4
70	96	89	107	1	188	155	97	4
87	82	83	102	1	189	153	92	2
109	141	142	134	1	189	154	136	4
55	115	113	134	1	189	155	122	4
59	101	87	89	1	189	156	91	3
78	68	90	89	1	189	157	84	1
64	45	80	91	4	199	175	80	1
101	92	92	99	3	200	175	97	1

TABLE 33 H4TR251: Four look SAR filter magnitude data, M35 cargo 2½ ton trucks, Nebo vehicle array, Barstow, CA, hop on, Scene 4.

82	91	85	53	4	166	182	84	//
87	114	127	102	4	166	175	115	2
123	123	115	125	2	178	150	122	1
127	125	107	88	1	181	175	119	1
142	91	102	129	4	182	160	130	1
114	103	99	105	3	184	186	107	1
90	123	84	124	1	189	147	116	1
126	114	100	95	3	193	203	115	1
120	116	95	116	2	195	169	115	1
133	100	110	99	2	203	155	120	1
91	107	105	108	1	205	180	104	1
94	113	124	113	1	212	186	115	2
153	98	126	123	3	216	170	139	1
95	65	79	88	3	160	161	86	1
101	133	153	153	2	162	178	146	//
90	123	70	111	2	170	178	111	1
131	118	79	102	3	176	193	119	1
134	124	135	113	2	178	171	129	1
96	76	84	110	3	185	144	98	1
64	94	93	119	4	191	185	105	1
75	88	115	91	2	195	194	102	1
166	167	155	164	1	196	161	164	//
138	126	114	132	1	196	206	130	1
114	110	122	108	4	199	179	115	1
130	132	137	122	2	203	169	131	1
122	120	133	116	4	207	159	125	1
50	56	128	115	1	213	173	115	1
103	85	91	107	1	220	173	100	2
112	97	111	108	2	171	150	108	//
63	84	77	64	2	171	157	75	//
83	79	82	96	3	177	186	87	//
76	82	72	86	2	179	164	80	//
73	82	85	64	2	179	195	79	//
99	111	113	102	4	190	192	108	//
81	91	102	90	2	195	182	93	//
93	73	94	72	2	203	162	87	//
86	86	76	79	3	209	169	83	//
100	107	110	98	1	212	201	105	//

66	82	82	95	3	160	178	85	//
39	85	88	85	3	161	162	83	1
88	90	107	101	4	167	174	99	2
110	100	121	103	4	167	175	112	2
69	66	53	100	3	169	178	85	1
106	85	96	98	3	177	150	98	1
126	113	36	115	3	177	193	116	1
113	113	105	103	2	178	172	109	1
116	105	104	103	1	181	161	108	1
109	99	88	65	4	182	175	98	1
89	105	84	71	3	185	186	93	1
77	93	87	104	2	186	144	94	1
61	113	89	101	1	188	147	102	1
69	82	64	107	4	190	185	93	1
49	62	70	72	3	192	188	66	//
89	100	88	56	3	192	202	91	1
98	104	109	93	3	193	161	103	//
101	99	81	92	2	194	169	95	1
62	60	104	98	2	195	193	94	1
118	94	98	106	2	195	206	108	1
115	111	118	108	4	198	179	114	1
119	101	91	101	2	202	155	108	1
113	132	113	108	2	202	169	121	1
99	66	98	88	4	206	179	93	1
49	105	110	87	3	208	159	101	1
78	97	110	105	2	211	186	102	2
95	92	102	111	1	212	185	102	2
80	101	119	83	4	214	173	106	1
98	69	99	105	4	215	170	98	1
87	106	89	85	4	215	175	95	//
98	81	95	114	4	215	197	103	//
95	76	78	95	2	219	173	89	1
85	100	74	76	1	221	173	89	1

TABLE 34 H4TACT1: Four look SAR filter magnitude data, other tactical vehicles, M151 $\frac{1}{4}$ ton jeeps, M109A3 $2\frac{1}{2}$ ton shop van trucks, and M62 $12\frac{1}{2}$ ton truck mounted (Bay City) cranes, Nebo vehicle array, Barstow, CA, hop on, Scene 4.

82	91	85	53	4	166	182	84	//	90	89	79	98	3	184	171	91	1
67	83	82	83	3	160	166	60	1	72	85	78	86	3	185	171	82	2
56	77	73	91	3	161	166	80	2	87	49	80	84	2	186	172	81	1
75	84	81	76	2	162	166	80	1	81	87	88	96	3	200	172	89	//
83	115	93	107	4	166	167	105	1	56	63	87	102	4	198	157	89	1
74	114	98	102	4	167	167	104	1	109	82	109	119	4	199	157	110	2
80	56	52	79	3	169	167	73	//	59	56	90	97	3	200	157	87	1
95	63	80	85	4	166	161	85	1	90	85	102	87	3	208	182	93	1
132	108	103	138	4	167	160	128	2	89	89	87	114	3	209	183	101	1
98	97	107	120	3	168	160	109	2	89	64	70	93	3	209	162	85	1
69	56	69	72	3	169	161	68	1	86	66	96	106	2	210	162	96	2
91	75	116	99	1	173	182	104	1	98	18	72	65	2	210	164	84	1
96	84	112	88	4	174	182	100	1	114	108	93	117	2	211	163	111	2
87	89	100	84	4	174	161	92	1	77	75	102	83	2	211	193	90	//
105	81	88	69	4	175	161	93	1	96	98	103	87	1	213	193	97	//
101	102	111	108	3	184	165	106	2	114	78	122	124	3	224	176	118	1
81	89	78	79	3	185	164	83	1	92	99	115	112	3	225	176	108	1
85	85	87	96	3	185	166	89	1	123	123	115	125	2	178	150	122	//
101	107	95	84	3	185	195	99	1	142	91	102	129	4	[illegible]	160	130	1
90	132	111	78	2	186	195	118	1	90	123	84	124	1	189	147	116	1
75	70	85	45	1	196	196	75	//	120	116	95	116	2	195	169	115	//
113	103	93	79	2	187	182	103	2	91	107	105	108	1	205	180	104	//
93	86	74	110	1	188	181	98	1	153	98	126	123	3	216	170	139	1
116	113	107	103	1	188	183	111	1	101	133	153	153	2	162	178	146	//
102	125	126	107	1	188	154	119	2	131	118	79	102	3	176	193	119	1
87	82	83	102	1	189	153	92	1	96	76	84	110	3	185	144	98	//
55	115	113	134	1	189	155	122	1	75	88	115	91	2	195	194	102	1
78	68	90	89	1	189	157	84	//	138	126	114	132	1	196	206	130	//
101	92	92	99	3	200	175	97	//	130	132	137	122	2	203	169	131	1
71	103	73	84	2	163	163	90	//	50	56	128	115	1	213	173	115	//
71	99	76	60	1	173	174	86	1	112	97	111	108	2	171	150	108	//
88	104	88	80	4	174	174	94	2	83	79	82	96	3	177	186	87	//
48	86	87	79	4	175	174	81	1	73	82	85	64	2	179	195	79	//
97	102	122	88	4	174	146	109	//	81	91	102	90	2	195	182	93	//
76	62	78	85	1	180	188	78	1	86	86	76	79	3	209	169	83	//
73	61	70	92	1	181	188	80	1	66	82	82	95	3	160	178	85	//

TABLE 35 H4TACT2: Four look SAR filter magnitude data, tactical vehicles (H4TACT1 plus M48 tanks and 2½ ton trucks), Nebo array, Barstow, CA, hop on, Scene 4.

88	90	107	101	4	167	174	99	//
69	66	53	100	3	169	178	85	//
126	113	36	115	3	177	193	116	1
116	105	104	103	1	181	161	108	1
89	105	84	71	3	185	186	93	//
61	113	89	101	1	188	147	102	1
49	62	70	72	3	192	188	66	//
98	104	109	93	3	193	161	103	//
62	60	104	98	2	195	193	94	1
115	111	118	108	4	198	179	114	//
113	132	113	108	2	202	169	121	1
49	105	110	87	3	208	159	101	//
95	92	102	111	1	212	185	102	//
98	69	99	105	4	215	170	98	1
98	81	95	114	4	215	197	103	//
85	100	74	76	1	221	173	89	//

TABLE 35 (Continued) H4TACT2: tactical vehicles.

76	70	45	67	1	197	212	69	3
73	69	58	20	1	197	213	65	5
52	51	70	69	1	197	214	64	5
64	56	82	89	1	197	215	79	5
64	43	54	80	1	197	216	68	5
67	12	55	59	1	197	217	58	5
50	72	58	51	1	197	218	61	5
34	43	67	59	1	197	219	57	5
55	69	63	20	1	197	220	60	5
83	59	74	59	1	197	221	73	3
61	47	47	53	4	198	212	54	5
61	55	68	53	4	198	213	61	8
40	59	80	70	4	198	214	70	8
77	51	52	77	4	198	215	70	8
62	36	55	72	4	198	216	62	8
66	47	47	52	4	198	217	56	8
63	59	52	43	4	198	218	56	8
74	3	67	12	4	198	219	63	8
71	55	74	68	4	198	220	69	8
78	26	47	43	4	198	221	63	5
56	32	42	61	4	199	212	53	5
74	50	68	13	4	199	213	64	8
66	58	88	44	4	199	214	75	8
86	65	69	66	4	199	215	75	8
73	40	51	77	4	199	216	68	8
81	57	58	57	4	199	217	69	8
48	57	68	62	4	199	218	61	8
74	32	70	57	4	199	219	66	8
77	50	71	66	4	199	220	69	8
61	32	58	44	4	199	221	53	5
33	65	53	74	3	200	212	64	5
65	70	77	76	3	200	213	73	8
67	48	69	72	3	200	214	67	8
75	56	58	47	3	200	215	64	8
66	41	54	57	3	200	216	58	8
51	52	77	74	3	200	217	69	8
62	64	68	71	3	200	218	67	8
86	39	81	73	3	200	219	78	8
66	62	67	39	3	200	220	62	8
71	31	58	55	3	200	221	60	5
72	48	44	71	3	201	212	65	5
55	72	73	72	3	201	213	70	8
55	72	71	54	3	201	214	66	8
65	73	79	75	3	201	215	74	8
57	48	85	72	3	201	216	73	8
56	56	73	75	3	201	217	68	7
55	48	69	46	3	201	218	58	6
73	48	77	73	3	201	219	72	5
57	64	69	15	3	201	220	61	5
72	17	54	70	3	201	221	64	3
73	86	55	71	2	202	212	76	3
83	51	64	66	2	202	213	72	5
75	72	47	57	2	202	214	67	5
71	71	49	70	2	202	215	68	5
69	41	78	54	2	202	216	68	5
48	67	65	62	2	202	217	62	4

TABLE 36 H4SAND1: Four look SAR filter magnitude data, desert sand, Nebo array, Barstow, CA, hop on, Scene 4.

5 Nebo Static Array of Vehicles and Equipment:
Scene 5, hop off
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H5TANK1	TABLE 37
H5TR251	TABLE 38
H5TACT1	TABLE 39
H5TACT2	TABLE 40
H5TACT3	TABLE 41
H5SAND1	TABLE 42
H5SAND2	TABLE 43
H5DARK	TABLE 44

103	105	93	91	2	179	189	100	1
110	79	90	96	2	154	160	99	//
93	49	87	83	4	159	151	85	4
101	50	90	48	4	167	159	89	3
83	91	109	111	1	197	154	104	2
108	96	72	91	2	202	195	98	2
113	123	115	89	2	203	173	115	4
116	85	77	100	3	209	182	103	3
91	102	93	96	3	177	171	96	1
111	115	87	60	2	186	153	106	1
71	86	119	108	4	190	167	107	3
94	81	113	109	4	214	161	105	//
59	96	79	40	2	179	190	83	1
98	90	69	77	3	168	177	88	3
85	74	66	94	3	168	178	84	2
60	91	73	78	3	169	176	80	2
90	101	40	64	3	169	177	89	3
75	79	57	93	3	201	195	82	1
86	108	98	75	2	203	195	98	1
86	77	100	85	2	178	171	90	1
67	84	94	79	1	165	159	85	2
94	76	85	72	4	166	159	85	4
81	57	91	97	4	166	160	88	4
85	57	94	79	4	167	160	85	3
96	77	56	78	3	208	182	84	1
93	99	79	88	2	210	181	92	2
103	89	83	83	2	210	182	93	2
55	69	72	86	4	158	152	75	1
79	58	45	74	4	159	150	70	3
75	74	37	82	3	160	150	74	3
81	58	52	81	3	160	151	74	3
45	79	57	69	1	189	166	69	2
84	64	58	73	4	190	166	74	3
81	81	72	48	4	191	166	76	2
99	93	77	60	2	202	172	90	3
105	120	90	19	2	202	173	107	3
98	90	103	81	2	203	172	96	4
79	91	97	85	1	204	173	90	2
79	54	32	46	3	185	155	65	2
103	105	56	78	2	186	154	97	4
62	54	38	19	2	186	155	52	3
54	71	66	24	2	187	155	62	2
57	62	67	53	1	197	155	61	2
96	67	101	98	4	198	154	95	2

TABLE 37 H5TANK1: Four look SAR filter magnitude data, M48 tanks, Nebo array, Barstow, CA, hop off, Scene 5.

77	54	45	95	4	151	175	82	3
69	83	60	99	3	152	174	87	4
94	37	58	106	3	152	175	94	6
93	74	82	83	3	152	176	85	4
81	92	49	91	3	153	174	86	4
97	23	42	92	3	153	175	87	7
92	82	77	94	3	153	176	88	5
92	77	55	75	2	154	175	81	4
65	92	75	52	2	154	176	80	3
91	83	61	54	3	169	186	81	1
102	110	79	84	2	170	185	100	4
113	111	91	98	2	171	185	106	4
89	52	113	102	2	170	184	102	3
86	75	133	110	2	171	184	119	4
69	88	68	89	1	172	184	82	2
82	83	63	84	3	185	193	80	2
124	119	109	111	2	186	193	117	4
103	118	88	84	2	186	194	106	4
120	123	114	105	2	187	193	117	4
95	113	87	72	2	187	194	100	4
49	91	91	47	1	188	193	83	2
49	96	95	101	1	157	172	94	2
72	102	119	110	1	157	173	109	2
83	91	118	131	4	158	173	119	2
70	110	108	83	1	156	166	102	3
105	96	99	110	1	156	167	104	4
70	111	94	109	1	157	166	104	3
104	93	91	128	1	157	167	114	4
61	72	75	98	1	157	168	85	2
80	90	95	73	4	183	179	87	3
86	61	89	120	4	183	180	105	5
61	74	58	98	4	183	181	84	3
91	109	89	89	3	184	179	98	5
122	29	91	130	3	184	180	119	7
73	81	64	101	3	184	181	88	4
77	99	49	87	3	185	179	88	3
94	67	76	97	3	185	180	89	4

114	24	85	85	4	199	188	100	3
91	93	112	120	4	199	189	110	3
121	104	92	59	3	200	188	108	4
126	108	112	122	3	200	189	119	4
83	101	83	71	3	201	188	90	2
86	88	79	59	2	163	164	82	3
101	96	97	88	2	163	165	96	3
82	94	95	66	1	164	164	89	4
108	113	115	105	1	164	165	111	4
85	92	77	91	1	165	165	88	2
86	84	78	69	4	206	186	81	3
88	74	90	74	4	206	187	84	3
118	111	99	118	4	207	186	114	5
102	89	93	107	4	207	187	100	5
86	115	84	105	3	208	186	104	4
80	89	79	100	3	208	187	90	4
83	87	57	83	3	209	186	82	2
83	68	88	107	4	174	164	94	//

TABLE 38 H5TR251: Four look SAR filter magnitude data, M35 cargo 2½ ton trucks, Nebo array, Barstow, CA, hop off, Scene 5.

98	86	77	89	3	152	166	90	//
83	91	118	131	4	158	173	119	1
106	76	87	90	4	159	185	95	1
87	98	76	78	4	166	182	88	//
125	82	75	113	3	168	145	113	1
89	101	91	113	3	176	194	103	1
107	107	117	118	1	188	182	113	1
122	97	115	105	3	192	173	113	2
50	110	104	117	3	193	151	108	1
115	98	107	103	3	193	162	107	1
98	97	94	46	3	193	174	93	2
59	96	102	100	1	204	162	96	1
70	107	101	92	2	210	160	98	1
111	123	84	60	2	173	170	111	//
108	102	105	71	3	184	157	102	1
85	99	89	106	3	200	199	98	1
112	111	91	117	3	161	180	111	1
125	138	131	135	1	164	152	133	1
116	109	127	106	2	171	161	118	1
109	110	119	106	1	173	147	112	2
123	106	108	130	4	175	175	121	1
117	109	114	98	4	182	185	111	2
98	64	114	128	1	189	149	116	//
101	119	98	117	3	192	184	112	1
100	121	115	102	1	196	198	113	1
90	88	109	98	4	199	170	99	1
113	85	105	99	4	206	158	104	1
125	115	115	124	4	207	164	121	1
141	120	133	124	4	207	174	132	1
79	105	124	112	4	214	184	113	1
69	64	90	51	4	158	161	77	//
81	99	64	85	1	164	187	88	//
100	80	71	75	2	170	151	88	//
86	78	77	69	2	170	166	78	//
90	42	92	104	4	175	187	94	//
106	99	58	77	3	185	197	96	//
78	83	84	53	4	190	178	79	//
61	75	89	70	1	212	189	78	//
86	63	35	59	3	216	180	73	//
98	66	88	98	4	159	174	92	1
90	81	69	100	3	160	185	90	1
83	95	95	35	2	162	181	89	1
86	118	120	120	1	164	153	116	1
90	83	93	99	4	167	144	93	1
111	109	70	75	2	170	162	102	1
111	123	84	60	2	170	173	111	//
84	110	107	76	1	172	147	102	1
115	60	98	87	4	174	147	102	1
101	57	70	82	4	175	194	88	1
110	94	75	110	3	176	175	104	1
106	72	76	104	1	181	184	98	1
95	71	45	104	4	183	158	93	1
101	85	100	100	4	183	185	98	1
96	91	91	81	2	187	149	91	//
103	112	81	71	2	187	165	101	//
120	112	98	109	2	187	182	112	1
105	45	37	89	3	192	152	92	1
93	79	89	82	3	192	162	87	1
119	99	109	95	3	192	174	109	2
97	47	44	74	3	192	185	83	1
101	101	98	64	2	195	188	97	1
106	99	90	77	2	195	189	97	1
102	114	117	86	1	196	197	110	1
88	74	102	95	4	198	170	94	1
102	65	61	75	4	199	200	88	1
65	101	95	47	1	204	163	91	1
59	97	104	95	1	205	158	96	1
100	96	107	99	4	206	164	101	1
121	119	91	115	3	208	175	116	1
92	91	66	97	3	209	161	91	1
103	97	95	92	4	215	183	97	1

TABLE 39 H5 TACT1: Four look SAR filter magnitude data, other tactical vehicles, M151 ¼ ton jeeps, M109A3 2½ ton shop van trucks, and M62 12½ ton truck mounted cranes, Nebo array, Barstow, CA, hop off, Scene 5.

98	86	77	89	3	152	166	90	//
77	54	45	95	4	151	175	82	3
69	83	60	99	3	152	174	87	4
94	37	58	106	3	152	175	94	6
93	74	82	83	3	152	176	85	4
81	92	49	91	3	153	174	86	4
97	23	42	92	3	153	175	87	7
92	82	77	94	3	153	176	88	5
92	77	55	75	2	154	175	81	4
65	92	75	52	2	154	176	86	3
91	83	61	54	3	169	186	81	1
102	110	79	84	2	170	185	100	4
113	111	91	98	2	171	185	106	4
89	52	113	102	2	170	184	102	3
86	75	133	110	2	171	184	119	4
69	88	68	89	1	172	184	82	2
82	83	63	84	3	185	193	80	2
124	119	109	111	2	186	193	117	4
103	118	88	84	2	186	194	106	4
120	123	114	105	2	187	193	117	4
95	113	87	72	2	187	194	100	4
49	91	91	47	1	188	193	83	2
49	96	95	101	1	157	172	94	2
72	102	119	110	1	157	173	109	2
83	91	118	131	4	158	173	119	3
70	110	108	83	1	156	166	102	3
105	96	99	110	1	156	167	104	4
70	111	94	109	1	157	166	104	3
104	93	91	128	1	157	167	114	4
61	72	75	98	1	157	168	85	2
80	90	95	73	4	183	179	87	3
86	61	89	120	4	183	180	105	5
61	74	58	98	4	183	181	84	3
91	109	89	89	3	184	179	98	5
122	29	91	130	3	184	180	119	7
73	81	64	101	3	184	181	88	4
77	99	49	87	3	185	179	88	3
94	67	76	97	3	185	180	89	4

114	24	85	85	4	199	188	100	3
91	93	112	120	4	199	189	110	3
121	104	92	59	3	200	188	108	4
126	108	112	122	3	200	189	119	4
83	101	83	71	3	201	188	90	2
86	88	79	59	2	163	164	82	3
101	96	97	88	2	163	165	96	3
82	94	95	66	1	164	164	89	4
108	113	115	105	1	164	165	111	4
85	92	77	91	1	165	165	88	2
86	84	78	69	4	206	186	81	3
88	74	90	74	4	206	187	84	3
119	111	99	118	4	207	186	114	5
102	89	93	107	4	207	187	100	5
86	115	84	105	3	208	186	104	4
80	89	79	100	3	208	187	90	4
83	87	57	83	3	209	186	82	2
83	68	88	107	4	174	164	94	//
103	105	93	91	2	179	189	100	1
110	79	90	96	2	154	160	99	//
93	49	87	83	4	159	151	85	4
101	50	90	48	4	167	159	89	3
83	91	109	111	1	197	154	104	2
108	96	72	91	2	202	195	98	2
113	123	115	89	2	203	173	115	4
116	85	77	100	3	209	182	103	3
91	102	93	96	3	177	171	96	1
111	115	87	60	2	186	153	106	1
71	86	119	108	4	190	167	107	3
94	81	113	109	4	214	161	105	//
59	96	79	40	2	179	190	83	1
98	90	69	77	3	168	177	88	3
85	74	66	94	3	168	178	84	2
60	91	73	78	3	169	176	89	2
90	101	40	64	3	169	177	89	3
75	79	57	93	3	201	195	82	1
86	108	98	75	2	203	195	98	1
86	77	100	85	2	178	171	90	1
67	84	94	79	1	165	159	85	2

TABLE 40 H5TACT2: Four look SAR filter magnitude data, tactical vehicles (H5TACT1 plus M48 tanks and 2½ ton cargo trucks), Nebo array, Barstow, CA, hop off, Scene 5.

AD-A112 931 TEXAS UNIV AT AUSTIN APPLIED RESEARCH LABS F/G 17/9
SYNTHETIC APERTURE RADAR DATA VARIANCE ANALYSIS.(U)
FEB 80 R PIETSCH, W A RASCO F33615-77-C-1169
UNCLASSIFIED ARL-TR-80-16 AFWAL-TR-80-1058 NL

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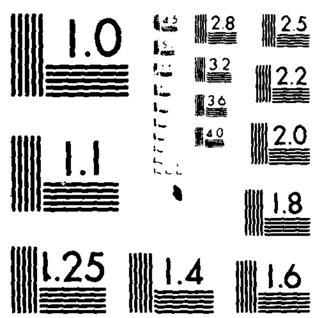

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

94	76	85	72	4	166	159	85	4
81	57	91	97	4	166	160	88	4
85	57	94	79	4	167	160	85	3
96	77	56	78	3	208	182	84	1
93	99	79	88	2	210	181	92	2
103	89	83	83	2	210	182	93	2
55	69	72	86	4	158	152	75	1
79	58	45	74	4	159	150	70	3
75	74	37	82	3	160	150	74	3
81	58	52	81	3	160	151	74	3
45	79	57	69	1	189	166	69	2
84	64	58	73	4	190	166	74	3
81	81	72	48	4	191	166	76	2
99	93	77	60	2	202	172	90	3
105	120	90	19	2	202	173	107	3
98	90	103	81	2	203	172	96	4
79	91	97	85	1	204	173	90	2
79	54	32	46	3	185	155	65	2
103	105	56	78	2	186	154	97	4
62	54	38	19	2	186	155	52	3
54	71	66	24	2	187	155	62	2
57	62	67	53	1	197	155	61	2
96	67	101	98	4	198	154	95	2
106	76	87	90	4	159	185	95	1
87	98	76	78	4	166	182	88	//
125	82	75	113	3	168	145	113	1
89	101	91	113	3	176	194	103	1
107	107	117	118	1	188	182	113	1
122	97	115	105	3	192	173	113	2
50	110	104	117	3	193	151	108	1
115	98	107	103	3	193	162	107	1
98	97	94	46	3	193	174	93	2
59	96	102	100	1	204	162	96	1
70	107	101	92	2	210	160	98	1
111	123	84	60	2	173	170	111	//
108	102	105	71	3	184	157	102	1
85	99	89	106	3	200	199	98	1
112	111	91	117	3	161	180	111	1

125	138	131	135	1	164	152	133	1
116	109	127	106	2	171	161	118	1
108	110	119	106	1	173	147	112	2
123	106	108	130	4	175	175	121	1
117	109	114	98	4	182	185	111	2
98	64	114	128	1	189	149	116	//
101	119	98	117	3	192	184	112	1
100	121	115	102	1	196	198	113	1
90	88	109	98	4	199	170	99	1
113	85	105	99	4	206	158	104	1
125	115	115	124	4	207	164	121	1
141	120	133	124	4	207	174	132	1
79	105	124	112	4	214	184	113	1
69	64	90	51	4	158	161	77	//
81	99	64	85	1	164	187	88	//
100	80	71	75	2	170	151	88	//
86	78	77	60	2	170	166	78	//
90	42	92	104	4	175	187	94	//
106	99	58	77	3	185	197	96	//
78	83	84	53	4	190	178	79	//
61	75	89	70	1	212	189	78	//
86	63	35	59	3	216	180	73	//
98	66	88	98	4	159	174	92	1
90	81	69	100	3	160	185	90	1
83	95	95	35	2	162	181	89	1
86	118	120	120	1	164	153	116	1
90	83	93	99	4	167	144	93	1
111	109	70	75	2	170	162	102	1
111	123	84	60	2	170	173	111	//
84	110	107	76	1	172	147	102	1
115	60	98	87	4	174	147	102	1
101	57	70	82	4	175	194	88	1
110	94	75	110	3	176	175	104	1
106	72	76	104	1	181	184	98	1
95	71	45	104	4	183	158	93	1
101	85	100	100	4	183	185	98	1
96	91	91	81	2	187	149	91	//
103	112	81	71	2	187	165	101	//
120	112	98	109	2	187	182	112	1
105	45	37	89	3	192	152	92	1

TABLE 40 (Continued) H5TACT2: tactical vehicles.

93	79	89	82	3	192	162	87	1
119	99	109	95	3	192	174	109	2
97	47	44	74	3	192	185	83	1
101	101	98	64	2	195	188	97	1
106	99	90	77	2	195	189	97	1
102	114	117	86	1	196	197	111	1
88	74	102	95	4	198	170	94	1
102	65	61	75	4	199	200	88	1
65	101	95	47	1	204	163	91	1
59	97	104	95	1	205	158	96	1
100	96	107	99	4	206	164	101	1
121	119	91	115	3	208	175	116	1
92	91	66	97	3	209	161	91	1
103	97	95	92	4	215	183	97	1

TABLE 40 (Continued) H5TACT2: tactical vehicles.

98	86	77	89	3	152	166	90	//	60	91	73	78	3	169	176	80	1
69	83	60	99	3	152	174	87	1	75	79	57	93	3	201	195	82	//
93	74	82	83	3	152	176	85	1	86	108	98	75	2	203	195	98	//
97	23	42	92	3	153	175	87	3	86	77	100	85	2	178	171	90	1
92	77	55	75	2	154	175	81	1	94	76	85	72	4	166	159	85	1
91	83	61	54	3	169	186	81	//	101	50	90	48	4	167	159	89	1
113	111	91	98	2	171	185	106	1	96	77	56	78	3	208	182	84	//
86	75	133	110	2	171	184	119	1	93	99	79	88	2	210	181	92	//
82	83	63	84	3	185	193	80	1	55	69	72	86	4	158	152	75	1
103	118	88	84	2	186	194	106	2	81	58	52	81	3	160	151	74	1
95	113	87	72	2	187	194	100	1	84	64	58	73	4	190	166	74	//
49	96	95	101	1	157	172	94	1	99	93	77	60	2	202	172	90	2
83	91	118	131	4	158	173	119	2	98	90	103	81	2	203	172	96	3
105	96	99	110	1	156	167	104	1	79	91	97	85	1	204	173	90	2
104	93	91	128	1	157	167	114	1	103	105	56	78	2	186	154	97	2
80	90	95	73	4	183	179	87	1	54	71	66	24	2	187	155	62	1
61	74	58	98	4	183	181	84	1	57	62	67	53	1	197	155	61	1
122	29	91	130	3	184	180	119	3	87	98	76	78	4	166	182	88	//
77	99	49	87	3	185	179	88	1	89	101	91	113	3	176	194	103	//
114	24	85	85	4	199	188	100	1	122	97	115	105	3	192	173	113	//
121	104	92	59	3	200	188	108	2	115	98	107	103	3	193	162	107	1
83	101	83	71	3	201	188	90	1	59	96	102	100	1	204	162	96	//
101	96	97	88	2	163	165	96	1	111	123	84	60	2	173	170	111	//
108	113	115	105	1	164	165	111	1	85	99	89	106	3	200	199	98	//
86	84	78	69	4	206	186	81	1	125	138	131	135	1	164	152	133	//
118	111	99	118	4	207	186	114	2	108	110	119	106	1	173	147	112	1
86	115	84	105	3	208	186	104	2	117	109	114	98	4	182	185	111	//
83	87	57	83	3	209	186	82	1	101	119	98	117	3	192	184	112	1
103	105	93	91	2	179	189	100	//	90	88	109	98	4	199	170	99	1
93	49	87	83	4	159	151	85	2	125	115	115	124	4	207	164	121	//
83	91	109	111	1	197	154	104	1	79	105	124	112	4	214	184	113	//
113	123	115	89	2	203	173	115	3	81	99	64	85	1	164	187	88	//
91	102	93	96	3	177	171	96	1	86	78	77	60	2	170	166	78	//
111	115	87	60	2	186	153	106	1	106	99	58	77	3	185	197	96	//
94	81	113	109	4	214	161	105	//	61	75	89	70	1	212	189	78	//
98	[illegible]	69	77	3	168	177	88	1	98	66	88	98	4	159	174	92	1

T' 41 H5TACT3: Four look SAR filter magnitude data, tactical vehicles (e ery other line from H5TACT1), Nebo array, Barstow, CA, hop off, Scene 5.

83	95	95	35	2	162	181	89	//
90	83	93	99	4	167	144	93	//
111	123	84	60	2	170	173	111	//
115	60	98	87	4	174	147	102	1
110	94	75	110	3	176	175	104	//
95	71	45	104	4	183	158	93	//
96	91	91	81	2	187	149	91	//
120	112	98	109	2	187	182	112	//
93	79	89	82	3	192	162	87	1
97	47	44	74	3	192	185	83	1
106	99	90	77	2	195	189	97	//
88	74	102	95	4	198	170	94	1

TABLE 41 (Continued) H5TACT3: tactical vehicles.

78	65	63	53	2	218	125	68	1
66	70	63	51	2	218	128	64	2
57	68	38	60	2	218	129	60	4
74	54	67	58	2	218	130	66	4
76	52	54	60	2	218	134	65	3
62	54	56	60	2	218	135	58	5
67	54	56	60	2	218	136	60	5
62	52	63	58	2	218	137	59	3
33	52	59	63	2	218	143	56	1
70	54	59	60	2	218	144	62	3
70	36	30	71	2	218	145	63	3
66	65	59	56	2	218	146	62	4
67	21	48	58	2	218	147	57	4
59	36	59	45	2	218	148	53	4
59	62	56	76	2	218	151	66	//
73	77	59	45	2	218	154	69	3
41	77	48	44	2	218	155	63	3
75	49	78	41	2	219	125	69	1
59	57	53	66	2	219	129	60	6
59	59	53	58	2	219	130	57	5
46	76	70	50	2	219	131	67	5
78	70	53	40	2	219	132	68	3
75	57	53	57	2	219	134	64	6
63	57	53	42	2	219	135	56	7
59	49	53	66	2	219	136	59	6
72	70	53	65	2	219	137	67	4
59	41	61	32	2	219	139	54	3
59	62	79	65	2	219	145	69	3
46	74	62	48	2	219	147	63	4
71	62	66	57	2	219	148	65	5
59	66	62	57	2	219	149	62	3
62	65	53	49	2	219	154	59	5
15	49	53	48	2	219	155	47	5
62	57	76	53	1	220	127	66	4
53	48	76	45	1	220	128	63	5
46	65	73	58	1	220	130	64	4
49	58	80	47	1	220	132	67	3
62	61	59	62	1	220	133	61	4
61	48	59	67	1	220	134	61	4
38	50	64	53	1	220	135	55	4
44	50	64	55	1	220	138	56	3
53	57	83	45	1	220	139	69	3
58	71	53	70	1	220	140	65	3
46	56	68	29	1	220	141	57	1
53	73	53	53	1	220	149	62	2
49	32	74	55	1	220	154	61	3
28	74	43	66	1	220	155	63	3
62	74	72	53	1	220	167	68	//
70	40	53	45	1	220	171	58	//
54	66	53	70	1	220	173	63	//
65	64	64	61	1	220	176	64	1
61	73	43	72	1	220	177	67	1
32	72	71	61	1	221	126	66	2
45	55	78	61	1	221	127	66	4
42	71	75	53	1	221	128	66	4
61	54	59	53	1	221	129	57	3

TABLE 42 H5SAND1: Four look SAR filter magnitude data, desert sand (short list), Nebo array, Barstow, CA, hop off, Scene 5.

78	65	63	53	2	218	125	68	1
66	70	63	51	2	218	128	64	2
57	68	38	60	2	218	129	60	4
74	54	67	58	2	218	130	66	4
76	52	54	60	2	218	134	65	3
62	54	56	60	2	218	135	58	5
67	54	56	60	2	218	136	60	5
62	52	63	58	2	218	137	59	3
33	52	59	63	2	218	143	56	1
70	54	59	60	2	218	144	62	3
70	36	30	71	2	218	145	63	3
66	65	59	56	2	218	146	62	4
67	21	48	58	2	218	147	57	4
59	36	59	45	2	218	148	53	4
59	62	56	76	2	218	151	66	//
73	77	59	45	2	218	154	69	3
41	77	48	44	2	218	155	63	3
75	49	78	41	2	219	125	69	1
59	57	53	66	2	219	129	60	6
59	59	53	58	2	219	130	57	5
46	76	70	50	2	219	131	67	5
78	70	53	40	2	219	132	68	3
75	57	53	57	2	219	134	64	6
63	57	53	42	2	219	135	56	7
59	49	53	66	2	219	136	59	6
72	70	53	65	2	219	137	67	4
59	41	61	32	2	219	139	54	3
59	62	79	65	2	219	145	69	3
46	74	62	48	2	219	147	63	4
71	62	66	57	2	219	148	65	5
59	66	62	57	2	219	149	62	3
62	65	53	49	2	219	154	59	5
15	49	53	48	2	219	155	47	5
62	57	76	53	1	220	127	66	4
53	48	76	45	1	220	128	63	5
46	65	73	58	1	220	130	64	5
49	58	80	47	1	220	132	67	4
62	61	59	62	1	220	133	61	5

61	48	59	67	1	220	134	61	4
38	50	64	53	1	220	135	55	4
44	50	64	55	1	220	138	56	3
53	57	83	45	1	220	139	69	3
58	71	53	70	1	220	140	65	4
46	56	68	29	1	220	141	57	2
53	73	53	53	1	220	149	62	3
49	32	74	55	1	220	154	61	5
28	74	43	66	1	220	155	63	4
62	74	72	53	1	220	167	68	1
70	40	53	45	1	220	171	58	1
54	66	53	70	1	220	173	63	2
65	64	64	61	1	220	176	64	2
61	73	43	72	1	220	177	67	2
32	72	71	61	1	221	126	66	2
45	55	78	61	1	221	127	66	5
42	71	75	53	1	221	128	66	6
61	54	59	53	1	221	129	57	7
32	46	59	53	1	221	130	51	4
24	72	57	53	1	221	132	61	3
40	46	49	71	1	221	141	58	4
61	55	41	61	1	221	144	57	3
79	63	67	53	1	221	149	69	1
63	62	57	71	1	221	153	64	2
77	59	58	71	1	221	154	69	4
45	55	49	71	1	221	167	60	2
65	46	67	53	1	221	171	61	3
32	54	58	61	1	221	173	55	4
42	46	41	22	1	221	174	40	4
45	77	41	53	1	221	176	63	5
48	44	51	64	4	222	128	54	5
55	51	67	64	4	222	129	61	7
38	52	80	60	4	222	130	67	4
59	68	71	61	4	222	132	66	3
63	35	49	74	4	222	134	63	3
68	62	66	72	4	222	141	68	3
75	27	66	53	4	222	142	65	4
55	43	74	77	4	222	143	69	4
71	60	57	53	4	222	144	62	4

TABLE 43 H5SAND2: (includes most of H5SAND1), Nebo array, Barstow, CA, hop off, Scene 5.

75	48	59	53	4	222	145	64	5
63	48	62	35	4	222	146	57	4
59	48	80	64	4	222	147	68	4
56	59	71	68	4	222	155	65	1
64	35	67	77	4	222	167	68	1
56	56	74	61	4	222	169	64	2
69	27	33	43	4	222	171	55	5
71	70	74	35	4	222	172	69	6
46	35	80	53	4	222	173	66	5
59	61	62	68	4	222	175	63	5
46	59	78	73	4	222	176	69	4
56	27	41	59	4	222	177	51	3
53	57	58	79	4	223	126	67	//
61	50	54	48	4	223	128	54	2
53	42	74	77	4	223	130	69	2
70	49	71	56	4	223	132	65	2
66	63	63	64	4	223	133	64	4
66	40	61	79	4	223	134	68	3
79	40	72	56	4	223	135	69	3
78	61	58	40	4	223	136	66	1
66	24	72	73	4	223	139	67	//
61	57	54	40	4	223	141	55	2
69	57	58	58	4	223	144	62	3
71	40	74	64	4	223	146	67	4
71	24	71	65	4	223	147	66	4
71	50	58	61	4	223	148	62	2
69	65	58	73	4	223	152	67	1
53	49	74	73	4	223	153	67	1
61	24	70	40	4	223	169	59	2
66	65	54	70	4	223	170	65	4
53	32	62	73	4	223	171	62	4
66	40	58	58	4	223	172	59	4
61	42	45	40	4	223	174	50	2
53	53	72	56	4	223	176	62	3

TABLE 43 (Continued) H5SAND2: desert sand.

15	37	18	53	4	6	58	40	4
38	27	33	20	4	6	59	31	3
15	43	78	64	4	6	61	65	3
48	43	18	20	4	6	62	39	3
46	27	66	20	4	6	64	52	1
15	35	76	53	4	6	66	62	3
46	43	33	76	4	6	67	62	5
30	35	58	69	4	6	68	57	5
48	45	71	64	4	6	69	62	5
59	45	74	76	4	6	70	69	5
59	43	62	80	4	6	71	68	5
54	57	51	20	4	6	72	51	3
38	56	90	73	4	6	74	77	3
48	27	59	59	4	6	75	53	4
38	56	51	20	4	6	77	47	4
68	51	33	35	4	6	78	55	5
38	37	49	61	4	6	79	51	3
71	35	62	20	4	6	83	60	//
15	35	51	59	4	6	85	49	3
54	35	51	20	4	6	86	46	3
15	43	41	43	4	6	90	39	1
48	45	18	51	4	6	93	45	2
71	44	58	60	4	6	94	62	3
72	58	49	74	4	6	95	67	2
15	27	18	59	4	6	96	44	1
53	61	45	48	4	7	48	53	1
22	40	45	48	4	7	49	42	2
61	32	14	48	4	7	50	49	2
69	24	53	83	4	7	51	71	1
62	54	53	65	4	7	54	60	1
61	32	14	48	4	7	55	49	2
62	40	14	48	4	7	56	50	2
22	32	53	17	4	7	57	40	3
22	40	14	56	4	7	58	43	4
53	32	45	17	4	7	59	43	3
22	32	71	61	4	7	61	59	3
53	32	14	17	4	7	62	39	3
53	32	45	17	4	7	64	43	1
22	32	70	56	4	7	66	57	3
53	32	45	75	4	7	67	62	5
53	32	53	58	4	7	68	52	5
53	42	58	61	4	7	69	55	5
69	57	72	69	4	7	70	68	5
61	32	58	56	4	7	71	56	5
53	57	45	17	4	7	72	50	3
61	45	76	77	4	7	74	70	3
53	32	53	48	4	7	75	49	4
66	40	53	64	4	7	76	59	4
61	50	14	17	4	7	77	49	4
69	32	14	48	4	7	78	55	5
53	40	45	56	4	7	79	50	3
22	32	45	48	4	7	85	41	3
53	32	45	17	4	7	86	43	3
22	32	53	48	4	7	90	44	1
53	32	14	48	4	7	93	44	2

TABLE 44 H5DARK: Four look SAR filter magnitude data, shadows, Nebo array, Barstow, CA, hop off, Scene 5.

6 Nebo Static Array of Vehicles and Equipment:
Scene 6, hop on
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H6TANK1	TABLE 45
H6TR251	TABLE 46
H6TACT1	TABLE 47

125	118	91	112	1	145	243	117	3
126	116	141	120	1	145	244	130	3
121	105	111	80	4	146	243	111	4
128	113	145	138	4	146	244	136	4
98	111	105	113	4	147	244	108	2
116	121	93	124	3	140	228	118	3
105	124	110	106	3	141	227	114	3
98	118	130	124	3	141	228	122	5
101	123	131	113	3	141	229	122	4
103	106	125	119	2	142	228	117	4
47	106	124	103	2	142	229	112	3
118	109	135	151	4	162	260	138	3
106	87	97	108	4	162	261	102	3
128	159	161	163	4	163	260	158	5
112	102	107	113	4	163	261	109	5
109	155	147	142	3	164	260	146	3
82	104	112	88	3	164	261	102	3
109	60	118	90	1	137	206	107	3
131	88	112	115	1	137	207	119	3
134	123	122	120	4	138	206	126	5
142	117	96	110	4	138	207	128	5
110	120	87	125	4	139	206	117	3
119	94	97	75	4	139	207	106	3
111	110	121	118	4	147	211	116	3
109	115	119	87	4	147	212	112	3
114	120	125	110	3	148	211	119	5
123	115	104	112	3	148	212	115	5
98	118	104	112	3	149	211	110	3
115	102	92	118	3	149	212	111	3
88	84	68	83	4	131	178	83	//
136	135	138	113	1	176	252	134	1
147	133	157	151	1	177	252	150	1
138	133	118	143	2	166	230	136	2
133	132	147	131	2	167	224	138	//
152	138	151	160	2	167	230	153	3
112	82	107	90	2	167	231	103	3
119	105	135	143	1	168	230	133	2
127	125	113	142	2	174	241	131	1

120	151	133	163	2	175	241	151	2
118	135	110	130	1	176	241	127	1
121	97	136	124	1	168	216	126	2
68	68	134	118	1	169	215	121	3
138	114	153	152	1	169	216	146	3
107	114	110	132	4	170	216	120	2
139	133	128	145	4	179	222	138	2
172	154	133	164	3	180	222	162	3
142	105	110	108	3	180	223	128	3
155	143	116	152	3	181	222	148	2
98	114	105	118	1	145	200	111	3
93	107	98	99	1	145	201	100	3
105	125	116	136	4	146	200	126	5
143	118	126	104	4	146	201	131	5
97	92	86	119	4	147	200	106	3
137	117	122	127	4	147	201	128	3
111	86	128	89	1	152	226	115	//

TABLE 45 H6TANK1: Four look SAR filter magnitude data, M48 tanks, Nebo array, Barstow, CA, hop on, Scene 6.

138	132	150	145	4	123	211	143	//
120	143	131	123	4	130	231	133	//
134	141	126	136	3	132	211	135	//
83	62	83	87	3	132	233	82	1
135	141	131	91	3	132	234	133	2
143	137	141	98	3	132	235	137	1
160	169	126	157	2	134	219	160	2
167	176	149	173	2	135	219	170	2
128	131	149	131	2	135	220	138	3
134	134	160	123	2	135	221	147	1
103	148	122	132	1	136	231	136	3
146	144	153	160	1	136	232	153	3
115	145	125	141	1	137	231	137	3
163	141	151	164	1	137	232	158	3
138	128	125	135	4	138	225	133	//
126	148	132	103	3	140	246	136	1
147	134	106	113	3	141	247	135	1
153	145	137	147	2	142	204	147	1
135	152	150	129	2	142	249	145	2
154	148	131	134	2	143	204	145	1
175	178	172	161	2	143	249	173	4
160	156	144	150	2	143	250	154	4
114	153	127	119	1	144	231	139	//
145	142	139	120	1	144	233	139	//
151	159	145	148	1	144	249	152	3
136	138	119	136	1	144	250	134	3
144	131	140	136	1	145	208	139	//
153	142	149	136	1	145	226	147	1
135	125	143	138	1	145	253	137	//
157	125	143	146	4	146	226	147	1
131	109	136	139	4	147	219	133	//
152	111	144	150	4	147	230	146	1
173	136	169	175	3	148	230	169	2
134	149	123	134	3	148	247	139	//
147	168	150	158	3	149	205	159	1
149	135	148	152	3	149	230	147	1
135	169	162	129	3	149	241	159	2
127	161	141	143	2	150	205	149	1
149	176	181	164	2	150	241	173	3

109	123	155	156	2	150	242	148	3
129	141	132	133	2	151	216	135	2
141	125	133	149	2	151	217	140	2
121	123	147	109	2	151	241	134	2
138	139	128	127	1	152	216	134	2
125	126	120	142	1	152	255	132	2
153	100	87	163	1	152	256	151	2
146	96	92	143	1	153	256	137	2
78	77	100	79	4	154	175	88	//
128	153	133	151	4	154	254	146	//
129	102	121	141	4	155	213	130	//
124	127	132	156	4	155	242	143	2
144	143	171	115	4	155	259	157	1
89	138	85	155	3	156	241	141	2
141	162	157	177	3	156	242	166	2
160	162	143	147	3	156	259	156	1

TABLE 46 H6TR251: Four look SAR filter magnitude data, M35 cargo 2½ ton trucks, Nebo array, Barstow, CA, hop on, Scene 6.

115	145	125	141	1	137	231	137	3
138	132	150	145	4	123	211	143	//
120	143	131	123	4	130	231	133	//
134	141	126	136	3	132	211	135	//
83	62	83	87	3	132	233	82	1
135	141	131	91	3	132	234	133	2
143	137	141	98	3	132	235	137	1
160	169	126	157	2	134	219	160	2
167	176	149	173	2	135	219	170	2
128	131	149	131	2	135	220	138	3
134	134	160	123	2	135	221	147	1
103	148	122	132	1	136	231	136	3
146	144	153	160	1	136	232	153	3
163	141	151	164	1	137	232	158	3
138	128	125	135	4	138	225	133	//
126	148	132	103	3	140	246	136	1
147	134	106	113	3	141	247	135	1
153	145	137	147	2	142	204	147	1
135	152	150	129	2	142	249	145	2
154	148	131	134	2	143	204	145	1
175	178	172	161	2	143	249	173	4
160	156	144	150	2	143	250	154	4
114	153	127	119	1	144	231	139	//
145	142	139	120	1	144	233	139	//
151	159	145	148	1	144	249	152	3
136	138	119	136	1	144	250	134	3
144	131	140	136	1	145	208	139	//
153	142	149	136	1	145	226	147	1
135	125	143	138	1	145	253	137	//
157	125	143	146	4	146	226	147	1
131	109	136	139	4	147	219	133	//
152	111	144	150	4	147	230	146	1
173	136	169	175	3	148	230	169	2
134	149	123	134	3	148	247	139	//
147	168	150	158	3	149	205	159	2
149	135	148	152	3	149	230	147	1

135	169	162	129	3	149	241	159	2
127	161	141	143	2	150	205	149	1
149	176	181	164	2	150	241	173	3
109	123	155	156	2	150	242	148	3
129	141	132	133	2	151	216	135	2
141	125	133	149	2	151	217	140	2
121	123	147	109	2	151	241	134	2
138	139	128	127	1	152	216	134	2
125	126	120	142	1	152	255	132	2
153	100	87	163	1	152	256	151	2
146	96	92	143	1	153	256	137	2
78	77	100	79	4	154	175	88	//
128	153	133	151	4	154	254	146	//
129	102	121	141	4	155	213	130	//
124	127	132	156	4	155	242	143	2
144	143	171	115	4	155	259	157	1
89	138	85	155	3	156	241	141	3
141	162	157	177	3	156	242	166	3
160	162	143	147	3	156	259	156	1
125	118	91	112	1	145	243	117	3
126	116	141	120	1	145	244	130	3
121	105	111	80	4	146	243	111	4
128	113	145	138	4	146	244	136	4
98	111	105	113	4	147	244	108	2
116	121	93	124	3	140	228	118	3
105	124	110	106	3	141	227	114	3
98	118	130	124	3	141	228	122	5
101	123	131	113	3	141	229	122	4
103	106	125	119	2	142	228	117	4
47	106	124	103	2	142	229	112	3
118	109	135	151	4	162	260	138	3
106	87	97	108	4	162	261	102	3
128	159	161	163	4	163	260	158	5
112	102	107	113	4	163	261	109	5
109	155	147	142	3	164	260	146	3
82	104	112	88	3	164	261	102	3

TABLE 47 H6TACT1: Four look SAR filter magnitude data, tactical vehicles, Nebo array, Barstow, CA, hop on, Scene 6.

109	60	118	90	1	137	206	107	3
131	88	112	115	1	137	207	119	3
134	123	122	120	4	138	206	126	5
142	117	96	110	4	138	207	128	5
110	120	87	125	4	139	206	117	3
119	94	97	75	4	139	207	106	3
111	110	121	118	4	147	211	116	3
109	115	119	87	4	147	212	112	3
114	120	125	110	3	148	211	119	5
123	115	104	112	3	148	212	115	5
98	118	104	112	3	149	211	110	3
115	102	92	118	3	149	212	111	3
88	84	68	83	4	131	178	83	//
136	135	138	113	1	176	252	134	1
147	133	157	151	1	177	252	150	1
138	133	118	143	2	166	230	136	2
133	132	147	131	2	167	224	138	//
152	138	151	160	2	167	230	153	3
112	82	107	90	2	167	231	103	3
119	105	135	143	1	168	230	133	2
127	125	113	142	2	174	241	131	1
120	151	133	163	2	175	241	151	2
118	135	110	130	1	176	241	127	1
121	97	136	124	1	168	216	126	2
68	68	134	118	1	169	215	121	3
138	114	153	152	1	169	216	146	3
107	114	110	132	4	170	216	120	2
139	133	128	145	4	179	222	138	2
172	154	133	164	3	180	222	162	3
142	105	110	108	3	180	223	128	3
155	143	116	152	3	181	222	148	2
98	114	105	118	1	145	200	111	3
93	107	98	99	1	145	201	100	3
105	125	116	136	4	146	200	126	5
143	118	126	104	4	146	201	131	5
97	92	86	119	4	147	200	106	3
137	117	122	127	4	147	201	128	3

111	86	128	89	1	152	226	115	//
129	131	114	103	3	148	205	124	1
116	142	147	152	3	157	200	145	//
125	140	106	150	3	157	242	139	2
140	103	148	136	2	159	263	139	//
148	129	127	133	1	160	246	138	//
114	122	124	114	1	160	250	119	//
131	120	143	138	1	161	205	136	//
142	135	134	145	3	165	226	140	//
135	133	124	139	2	166	218	134	//
138	140	143	157	2	166	237	147	//
149	147	113	136	3	172	227	142	//
125	152	130	153	3	172	238	146	//
100	120	132	142	2	175	214	131	//
146	148	160	158	1	176	218	155	//
115	145	139	123	4	179	245	136	//
148	150	127	137	3	181	233	144	//
143	148	154	133	3	181	256	147	//
160	142	130	129	2	183	235	147	//
123	142	136	146	1	184	230	139	//
128	119	139	116	4	187	234	129	//

TABLE 47 (Continued) H6TACT1: tactical vehicles

7 Nebo Static Array of Vehicles and Equipment:
Scene 7, hop on
TARGET CLASS AND CORRESPONDING TABLE NUMBER

H7TANK1	TABLE 48

139	123	130	124	1	138	177	131	2
159	166	169	140	1	139	177	162	4
104	149	124	100	1	139	178	135	4
140	162	164	141	4	140	177	157	3
101	143	137	114	4	140	178	133	3
136	141	133	147	4	116	181	140	2
134	94	116	122	4	116	182	123	2
122	139	111	144	4	117	181	135	2
139	141	110	128	2	153	183	134	//
117	126	133	103	4	148	192	124	2
132	126	147	122	4	148	193	136	2
110	130	132	134	4	149	193	129	2
146	141	136	122	1	162	198	139	3
120	128	111	113	1	162	199	120	3
150	144	160	146	1	163	198	152	4
118	126	130	141	1	163	199	132	4
111	101	116	132	4	164	198	121	2
120	68	104	109	1	114	192	110	2
120	136	131	75	1	115	191	127	4
157	135	140	139	1	115	192	146	4
116	144	147	105	4	116	191	138	3
153	151	141	144	4	116	192	148	3
133	103	130	135	1	138	202	130	2
146	140	133	123	1	138	203	138	2
122	115	121	142	1	139	202	130	2
145	155	164	135	4	124	202	154	1
146	151	167	133	4	125	202	155	1
119	127	141	135	4	148	212	133	3
145	140	151	150	4	148	213	147	3
132	130	143	143	4	149	212	139	3
156	135	136	162	4	149	213	153	3
79	106	94	92	3	158	218	96	2
67	101	104	90	3	159	217	97	2
71	112	95	89	3	159	218	100	2

TABLE 48 H7TANK1: Four look SAR filter magnitude data, M48 tanks, Nebo array, Barstow, CA, hop on, Scene 7.

8 Single Pixel Target Files:
Scenes 3, 4, and 5
TARGET CLASS AND CORRESPONDING TABLE NUMBER

P5TANK1	TABLE 49
P5TR251	TABLE 50
P5JEEP1	TABLE 51
P5VAN1	TABLE 52
P5CRAN1	TABLE 53
P5TACT1	TABLE 54
P4TANK	TABLE 55
P4TR25	TABLE 56
P4JEEP	TABLE 57
P4VAN	TABLE 58
P4CRAN	TABLE 59
P4TACT	TABLE 60
P3T101	TABLE 61

110	79	90	96	2	154	160	99
93	49	87	83	4	159	151	85
101	50	90	48	4	167	159	89
83	91	109	111	1	197	154	104
108	96	72	91	2	202	195	98
113	123	115	89	2	203	173	115
116	85	77	100	3	209	182	103
91	102	93	96	3	177	171	96
103	105	93	91	2	179	189	100
111	115	87	60	2	186	153	106
71	86	119	108	4	190	167	107
94	81	113	109	4	214	161	105

TABLE 49 P5TANK1: Four look SAR filter magnitude data, M48 tanks, one pixel per tank, Nebo array, Barstow, CA, hop off, Scene 5.

94	37	58	106	3	152	175	94
104	93	91	128	1	157	167	114
106	95	126	115	4	159	173	116
108	113	115	105	1	164	165	111
86	75	133	110	2	171	184	119
90	98	91	126	4	175	154	112
103	89	54	108	4	175	164	99
103	85	93	105	4	175	165	99
122	29	91	130	3	184	180	119
124	119	109	111	2	186	193	117
120	123	114	105	2	187	193	117
88	129	132	114	1	188	161	124
137	130	106	128	3	193	168	129
126	108	112	122	3	200	189	119
118	111	99	118	4	207	186	114
121	112	98	100	4	215	169	112

TABLE 50 P5TR251: Four look SAR filter magnitude data, M35 cargo $2\frac{1}{2}$ ton trucks, one pixel per truck, Nebo array, Barstow, CA, hop off, Scene 5.

98	86	77	89	3	152	166	90
69	64	90	51	4	158	161	77
81	99	64	85	1	164	187	88
100	80	71	75	2	170	151	88
86	78	77	60	2	170	166	78
90	42	92	104	4	175	187	94
106	99	58	77	3	185	197	96
78	83	84	53	4	190	178	79
61	75	89	70	1	212	189	78
86	63	35	59	3	216	180	73

TABLE 51 P5JEEP1: Four look SAR filter magnitude data, M151 ¼ ton jeeps, one pixel per jeep, Nebo array, Barstow, CA, hop off, Scene 5.

83	91	118	131	4	158	173	119
106	76	87	90	4	159	185	95
87	98	76	78	4	166	182	88
125	82	75	113	3	168	145	113
89	101	91	113	3	176	194	103
107	107	117	118	1	188	182	113
122	97	115	105	3	192	173	113
50	110	104	117	3	193	151	108
115	98	107	103	3	193	162	107
98	97	94	46	3	193	174	93
59	96	102	100	1	204	162	96
70	107	101	92	2	210	160	98
111	123	84	60	2	173	170	111
108	102	105	71	3	184	157	102
85	99	89	106	3	200	199	98

TABLE 52 P5VAN1: Four look SAR filter magnitude data, M109A3 2½ ton shop van truck, one pixel per van, Nebo array, Barstow, CA, hop off, Scene 5.

112	111	91	117	3	161	180	111
125	138	131	135	1	164	152	133
116	109	127	106	2	171	161	118
108	110	119	106	1	173	147	112
123	106	108	130	4	175	175	121
117	109	114	98	4	182	185	111
98	64	114	128	1	189	149	116
101	119	98	117	3	192	184	112
100	121	115	102	1	196	198	113
90	88	109	98	4	199	170	99
113	85	105	99	4	206	158	104
125	115	115	124	4	207	164	121
141	120	133	124	4	207	174	132
79	105	124	112	4	214	184	113

TABLE 53 P5CRAN1: *Four look* SAR *filter* magnitude data, M62 12½ ton truck mounted crane, one pixel per crane, Nebo array, Barstow, CA, hop off, Scene 5.

110	79	90	96	2	154	160	99
112	111	91	117	3	161	180	111
125	138	131	135	1	164	152	133
116	109	127	106	2	171	161	118
108	110	119	106	1	173	147	112
123	106	108	130	4	175	175	121
117	109	114	98	4	182	185	111
98	64	114	128	1	189	149	116
101	119	98	117	3	192	184	112
100	121	115	102	1	196	198	113
90	88	109	98	4	199	170	99
113	85	105	99	4	206	158	104
125	115	115	124	4	207	164	121
141	120	133	124	4	207	174	132
79	105	124	112	4	214	184	113
83	91	118	131	4	158	173	119
106	76	87	90	4	159	185	95
87	98	76	78	4	166	182	88
125	82	75	113	3	168	145	113
89	101	91	113	3	176	194	103
107	107	117	118	1	188	182	113
122	97	115	105	3	192	173	113
50	110	104	117	3	193	151	108
115	98	107	103	3	193	162	107
98	97	94	46	3	193	174	93
59	96	102	100	1	204	162	96
70	107	101	92	2	210	160	98
111	123	84	60	2	173	170	111
108	102	105	71	3	184	157	102
85	99	89	106	3	200	199	98
94	37	58	106	3	152	175	94
104	93	91	128	1	157	167	114
106	95	126	115	4	159	173	116
108	113	115	105	1	164	165	111
86	75	133	110	2	171	184	119
90	98	91	126	4	175	154	112
103	89	54	108	4	175	164	99
103	85	93	105	4	175	165	99
122	29	91	130	3	184	180	119
124	119	109	111	2	186	193	117
120	123	114	105	2	187	193	117
88	129	132	114	1	188	161	124
137	130	106	128	3	193	168	129
126	108	112	122	3	200	189	119
118	111	99	118	4	207	186	114
121	112	98	100	4	215	169	112
93	49	87	83	4	159	151	85
101	50	90	48	4	167	159	89
83	91	109	111	1	197	154	104
108	96	72	91	2	202	195	98
113	123	115	89	2	203	173	115
116	85	77	100	3	209	182	103
91	102	93	96	3	177	171	96
103	105	93	91	2	179	189	100
111	115	87	60	2	186	153	106
71	86	119	108	4	190	167	107
94	81	113	109	4	214	161	105

TABLE 54 P5TACT1: Four look SAR filter magnitude data, tactical vehicles (from P5TANK1, P5TR251, P5VAN1, and P5CRAN1) (no jeeps), one pixel per vehicle, Nebo array, Barstow, CA, hop off, Scene 5.

97	102	122	88	4	174	146	109
87	89	100	84	4	174	161	92
88	104	88	80	4	174	174	94
86	109	90	89	2	178	157	98
110	114	110	110	1	181	189	111
112	77	93	96	3	185	172	101
104	112	142	149	4	199	158	138
100	88	92	95	4	199	172	95
140	96	118	125	3	200	203	128
89	89	87	114	3	209	183	101
137	130	100	118	2	210	163	128
84	86	108	99	1	212	193	98
114	78	122	124	3	224	176	118

TABLE 55 P4TANK: Four look SAR filter magnitude data, M48 tanks, one pixel per tank, Nebo array, Barstow, CA, hop on, Scene 4.

96	100	85	92	3	160	167	94
135	140	107	122	4	166	166	132
132	108	103	138	4	167	160	128
91	75	116	99	1	173	182	104
105	81	88	69	4	175	161	93
105	115	112	105	3	185	165	110
90	132	111	78	2	186	195	118
116	113	107	103	1	188	183	111
109	141	142	134	1	189	154	136
134	121	124	117	4	199	166	126
137	127	150	111	3	200	196	139
117	110	105	114	3	208	197	112
127	91	107	126	4	223	183	120

TABLE 56 P4TR25: Four look SAR filter magnitude data, M35 cargo 2½ ton trucks, one pixel per truck, Nebo array, Barstow, CA, hop on, Scene 4.

82	91	85	53	4	166	182	84
112	97	111	108	2	171	150	108
63	84	77	64	2	171	157	75
83	79	82	96	3	177	186	87
76	82	72	86	2	179	164	80
73	82	85	64	2	179	195	79
99	111	113	102	4	190	192	108
81	91	102	90	2	195	182	93
93	73	94	72	2	203	162	87
86	86	76	79	3	209	169	83
100	107	110	98	1	212	201	105

TABLE 57 P4JEEP: Four look SAR filter magnitude data, M151 ¼ ton jeep, one pixel per jeep, Nebo array, Barstow, CA, hop on, Scene 4.

95	65	79	88	3	160	161	86
101	133	153	153	2	162	178	146
90	123	70	111	2	170	178	111
131	118	79	102	3	176	193	119
134	124	135	113	2	178	171	129
96	76	84	110	3	185	144	98
64	94	93	119	4	191	185	105
75	88	115	91	2	195	194	102
166	167	155	164	1	196	161	164
138	126	114	132	1	196	206	130
114	110	122	108	4	199	179	115
130	132	137	122	2	203	169	131
122	120	133	116	4	207	159	125
50	56	128	115	1	213	173	115
103	85	91	107	1	220	173	100

TABLE 58 P4VAN: Four look SAR filter magnitude data, M109A3 2½ ton shop van truck, one pixel per van, Nebo array, Barstow, CA, hop on, Scene 4.

87	114	127	102	4	166	175	115
123	123	115	125	2	178	159	122
127	125	107	88	1	181	175	119
142	91	102	129	4	182	160	130
114	103	99	105	3	184	186	107
90	123	84	124	1	189	147	116
126	114	100	95	3	193	203	115
120	116	95	116	2	195	169	115
133	100	110	99	2	203	155	120
91	107	105	108	1	205	180	104
94	113	124	113	1	212	186	115
153	98	126	123	3	216	170	139

TABLE 59 P4CRAN: Four look SAR filter magnitude data, M62 12½ ton truck mounted crane, one pixel per crane, Nebo array, Barstow, CA, hop on, Scene 4.

82	91	85	53	4	166	182	84
95	65	79	88	3	160	161	86
101	133	153	153	2	162	178	146
90	123	70	111	2	170	178	111
131	118	79	102	3	176	193	119
134	124	135	113	2	178	171	129
96	76	84	110	3	185	144	98
64	94	93	119	4	191	185	105
75	88	115	91	2	195	194	102
166	167	155	164	1	196	161	164
138	126	114	132	1	196	206	130
114	110	122	108	4	199	179	115
130	132	137	122	2	203	169	131
122	120	133	116	4	207	159	125
50	56	128	115	1	213	173	115
103	85	91	107	1	220	173	100
87	114	127	102	4	166	175	115
123	123	115	125	2	178	150	122
127	125	107	88	1	181	175	119
142	91	102	129	4	182	160	130
114	103	99	105	3	184	186	107
90	123	84	124	1	189	147	116
126	114	100	95	3	193	203	115
120	116	95	116	2	195	169	115
133	100	110	99	2	203	155	120
91	107	105	108	1	205	180	104
94	113	124	113	1	212	186	115
153	98	126	123	3	216	170	139
96	100	85	92	3	160	167	94
135	140	107	122	4	166	166	132
132	108	103	138	4	167	160	128
91	75	116	99	1	173	182	104
105	81	88	69	4	175	161	93
105	115	112	105	3	185	165	110
90	132	111	78	2	186	195	118

116	113	107	103	1	188	183	111
109	141	142	134	1	189	154	136
134	121	124	117	4	199	166	126
137	127	150	111	3	200	196	139
117	110	105	114	3	208	197	112
127	91	107	126	4	223	183	120
97	102	122	88	4	174	146	109
87	89	100	84	4	174	161	92
88	104	88	80	4	174	174	94
86	109	90	89	2	178	157	98
110	114	110	110	1	181	189	111
112	77	93	96	3	185	172	101
104	112	142	149	4	199	158	138
100	88	92	95	4	199	172	95
140	96	118	125	3	200	203	126
89	89	87	114	3	209	183	101
137	130	100	118	2	210	163	128
84	86	108	99	1	212	193	98
114	78	122	124	3	224	176	118
112	97	111	108	2	171	150	108
63	84	77	64	2	171	157	75
83	79	82	96	3	177	186	87
76	82	72	86	2	179	164	80
73	82	85	64	2	179	195	79
99	111	113	102	4	190	192	108
81	91	102	90	2	195	182	93
93	73	94	72	2	203	162	87
86	86	76	79	3	209	169	83
100	107	110	98	1	212	201	105

TABLE 60 P4TACT: Four look SAR filter magnitude data, tactical vehicles (all tactical vehicles including jeeps), one pixel per vehicle, Nebo array, Barstow, CA, hop on, Scene 4.

131	133	134	121	2	116	99	126
137	124	129	77	1	99	99	129
132	117	119	119	1	93	91	124
126	137	115	128	1	115	91	129
121	136	122	131	2	115	97	129
121	138	87	131	1	115	97	129
143	116	131	142	4	95	96	136
146	126	122	116	3	1[illegible]3	96	134
125	88	117	146	4	97	96	133
86	151	151	118	1	99	95	143
146	155	152	130	1	93	95	144
144	144	151	144	4	97	95	145
144	119	128	135	3	111	93	135
139	131	131	138	3	11[illegible]	93	135
134	114	117	104	1	106	92	126
133	88	129	158	3	111	92	138
136	114	114	121	3	113	92	122
109	104	127	148	3	11[illegible]	92	134
142	126	92	130	4	1[illegible]5	92	132
116	151	125	134	2	1[illegible]1	91	139
131	136	134	146	3	1[illegible]2	91	138
98	125	135	121	3	1[illegible]3	91	126
81	142	101	112	3	119	89	127
128	139	136	124	1	1[illegible]7	89	133
95	140	96	121	2	1[illegible]3	89	126
118	128	119	127	4	1[illegible]4	89	124
94	144	11[illegible]	107	3	118	89	129
125	98	135	121	4	1[illegible]5	89	126
132	135	133	116	4	121	89	131
146	133	131	123	4	1[illegible]4	89	136
13[illegible]	144	124	117	4	12[illegible]	89	133
14[illegible]	131	133	118	4	1[illegible]5	88	134
121	143	125	119	3	11[illegible]	87	132
139	127	96	93	1	91	85	127
133	124	101	122	1	9[illegible]	85	124
136	137	117	115	4	129	84	139

137	111	123	114	1	91	84	126
12[illegible]	126	142	124	3	127	84	132
134	124	132	113	4	123	84	131
124	124	111	138	2	92	83	12[illegible]
95	137	141	126	4	129	83	133
123	116	108	137	1	91	83	127
132	129	129	136	3	127	83	132
111	132	147	126	4	123	83	135
128	104	129	146	3	95	83	134
11[illegible]	139	112	121	2	1[illegible]8	8[illegible]	127
108	138	131	133	4	96	81	124
132	113	103	135	3	126	80	127
149	125	153	131	2	125	73	145
116	107	126	134	3	127	70	125
139	138	138	143	2	124	70	140
137	133	136	79	3	126	70	132

TABLE 61 P3T101: Four look SAR filter magnitude data, large river bank trees (high return targets only), one pixel per tree, Reedley, CA, hop off, Scene 3.

APPENDIX B

PROBABILITY DISTRIBUTION HISTOGRAMS

PDF Equations

Probability distribution functions and frequency functions presented as count ratios have been constructed in the form of histograms for eight unnormalized and seven normalized discriminants for selected target classes from data given in Appendix A of this report. The discriminant was computed for each pixel listed in the target class from the four-look filter magnitude data after the four-look data were placed in the proper time sequence.

Data are tabulated in Appendix A for the target classes in the form of log filter magnitudes according to map number. The fifth column in those tables is a frequency sequence or map sequence number as explained in Section II of this report. All pixels along a given azimuth line have the same frequency number.

Target classes for which the distribution histograms have been plotted are listed in Table B-1. Only a sample set of histograms is included in this report. A set of histograms consists of five pages of histograms per target class. Median data extracted from these graphs are summarized later in Appendix C.

Since all unnormalized power functions contain arbitrary units, the abscissas for the distribution curves are labeled relative power in decibels. All histograms were formed with unequal bin size in power. Early in the study it was found that using equal bin size in power produced histograms where most of the data were contained in a few bins, with a few

TABLE B-1

PDF TARGET LIST AND FILE DESIGNATION

Target Class	Scene 1	2	3	4	5
Man-made clutter	H1CLUT	H2CLUT	H3CLUT		
Natural features	H1NAT	H2NAT	H3NAT		
Rough grass and weeds			H3GRAS1 H3GRAS2		
River bank trees		H2TREE1	H3TREE1		
Young fruit trees		H2TREE2	H3TREE2		
Railroad bridge		H2RR1			
Highway bridge		H2HWB1	H3HWB1		
Bridges		H2BRIDG	H3BRIDG		
Mobile homes		H2MH1	H3MH1		
Shadows				H4DARK	
Sand				H4SAND	H5SAND1 H5SAND2
O-Tactical vehicles				H4TACT1	H5TACT1
Tactical vehicles				H4TACT2	H5TACT2
Tanks				H4TANK1	H5TANK1
Trucks, 2 1/2 ton				H4TR251	H5TR251

a count as low as one or two. Such histograms give no indication as to the nature of the distribution. To avoid this problem, the bin size was allowed to vary in power by maintaining a constant bin size in decibels. The discriminant was then plotted on a logarithmic scale. Bin size in power is given by

$$\Delta P(I) = 10^{M(I+1)/10} - 10^{M(I)/10} \quad ,$$

where I is bin number and M(I) is the logarithm of the bin lower boundary in decibels. For a 0.2 dB bin width

$$\Delta P(I) = 0.585 \times 10^{M(I)} \quad ,$$

from which it should be noted that the bin width is greater than half the sum of all preceding bins. Ordinates of the count ratio histograms are formed for the discriminant by counting all pixels whose discriminant value is contained with the region $(10^{M(I)/10}, 10^{M(I+1)/10})$ and dividing by the total number of pixels forming the distribution.

The probability density function is formed from the count ratio histograms by dividing each bin by ΔP.

Suppose that the number of counts per bin is B(I), then the count ratio for bin F(I) is B(I)/N where N is the total number of counts. The probability density function, PDF(I), is related to F(I) by

$$F(I) = PDF(I)\,\Delta P(I)$$

so that

$$PDF(I) = \frac{B(I)}{N\Delta(I)} \quad .$$

The cumulative probability function, CPD(I), is given by

$$CPD(I) = \quad PDF(J)\ \Delta P(J)$$

$$= \quad \frac{B(J)}{N\Delta P(J)}\ \Delta P(J)$$

which equals unity when summed over all bins. When all bin sizes are equal, the frequency functions (count ratios) and the probability density functions appear similar, which is not the case for the functions presented here.

Sample Histograms

Four sets of probability distribution distograms are given here for target classes involving no hop when the SAR maps were formed. "No hop" histograms are shown since it was pre-supposed before reducing the data that a greater statistical difference would be apparent between dissimilar target classes when frequency diversity was not employed. Frequency diversity was included in the design of the FLAMR system to reduce the effects of target scintillation and thereby produce maps with less granularity than one might expect without hop.

It appears that the spread in the standard deviation, average deviation from the mean, and average deviation from the best straight line fit is greater for natural features without hop than with hop while the inverse is the case for man-made objects. This effect is readily apparent by comparing the histograms from target classes from scene 2 to those from scene 3 (Reedley) and those from scene 4 (NEBO) to those from scene 5.

Histograms presented here are for target classes H3CLUT (Man-made Clutter), H3NAT (natural features), H5TACT2 (tactical vehicles) and H5TANK (tanks).

The first set of histograms, set a, shows the PDF's and count ratios for target power for each of the four maps. Since the sum of PDF(I)ΔP(I) over all bins is equal to 1, and ΔP(I) is a large number for large I, the ordinate on the PDF cufves has been multiplied by the median in power for each distribution to avoid small numbers on the ordinate axis. The median in decibels is printed above each distribution. The bins for this set were 1 dB wide. This set is labeled "Four-Map Non-Parametric Power Distributions for Target Class xxxxx." The power distributions for the four maps are presented to determine the general characteristic of the power distribution for each map, and to determine whether the power distribution remains relatively unchanged between maps.

Sets b and c show PDF and count ratio histograms for mean power, standard deviation, average deviation from the mean, average deviation from the best straight line fit to the four-look data, fast variation, slow variation, major spread, and minor spread. The bins for these histograms are 2 dB wide. The histograms in set b and c are labeled "Non-Parametric Probability Density Functions for Eight Variants Calculated in Power From Target Class xxxxx" and "Non-Parametric Count Ratio Distributions per 2 dB Bin for Eight Variants Calculated in Power from Target Class xxxxx," respectively. Variants here are the discriminant functions.

Histogram sets d and e are similar to those in sets b and c except that the discriminant has been normalized by dividing by the mean pixel power. The histogram for the distribution in mean power has not been normalized and it is presented with the normalized distributions merely for reference. Notice that the medians in decibels are much smaller for

for the normalized distributions than for the unnormalized distributions. The bin width for the normalized distributions has been reduced to 1 dB.

A list of targets for which the PDF and count ratio histograms have been included in this report is given in Table B-1. The graphs are identified by target file number traceable back to tables of filter magnitude data by the same file number. More tables of filter magnitude data exist than have been processed and presented here. What has been presented is thought to be representative.

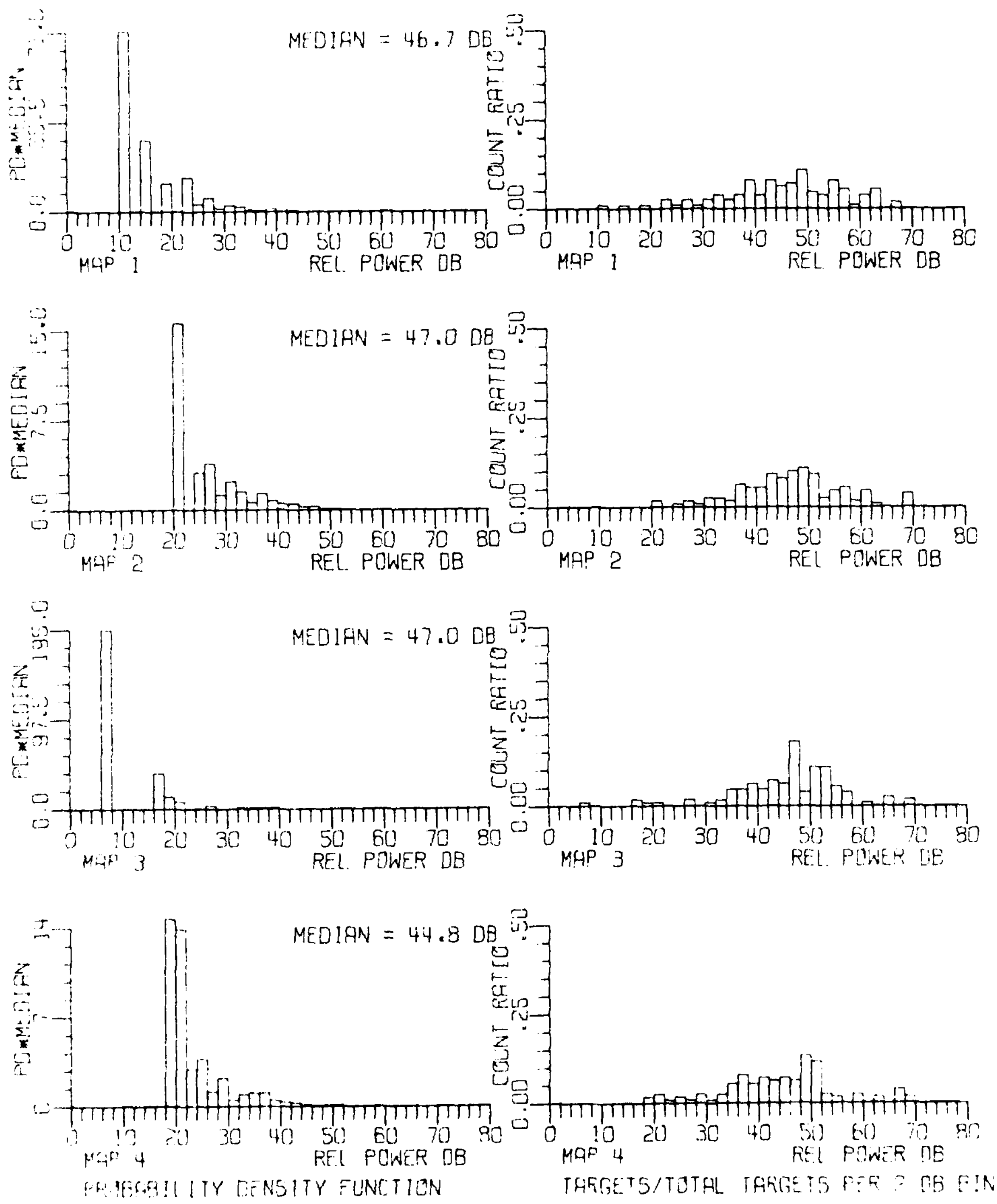

FIGURE B1 (a)
FOUR MAP NON-PARAMETRIC POWER DISTRIBUTIONS
FOR TARGET CLASS **H3CLUT**

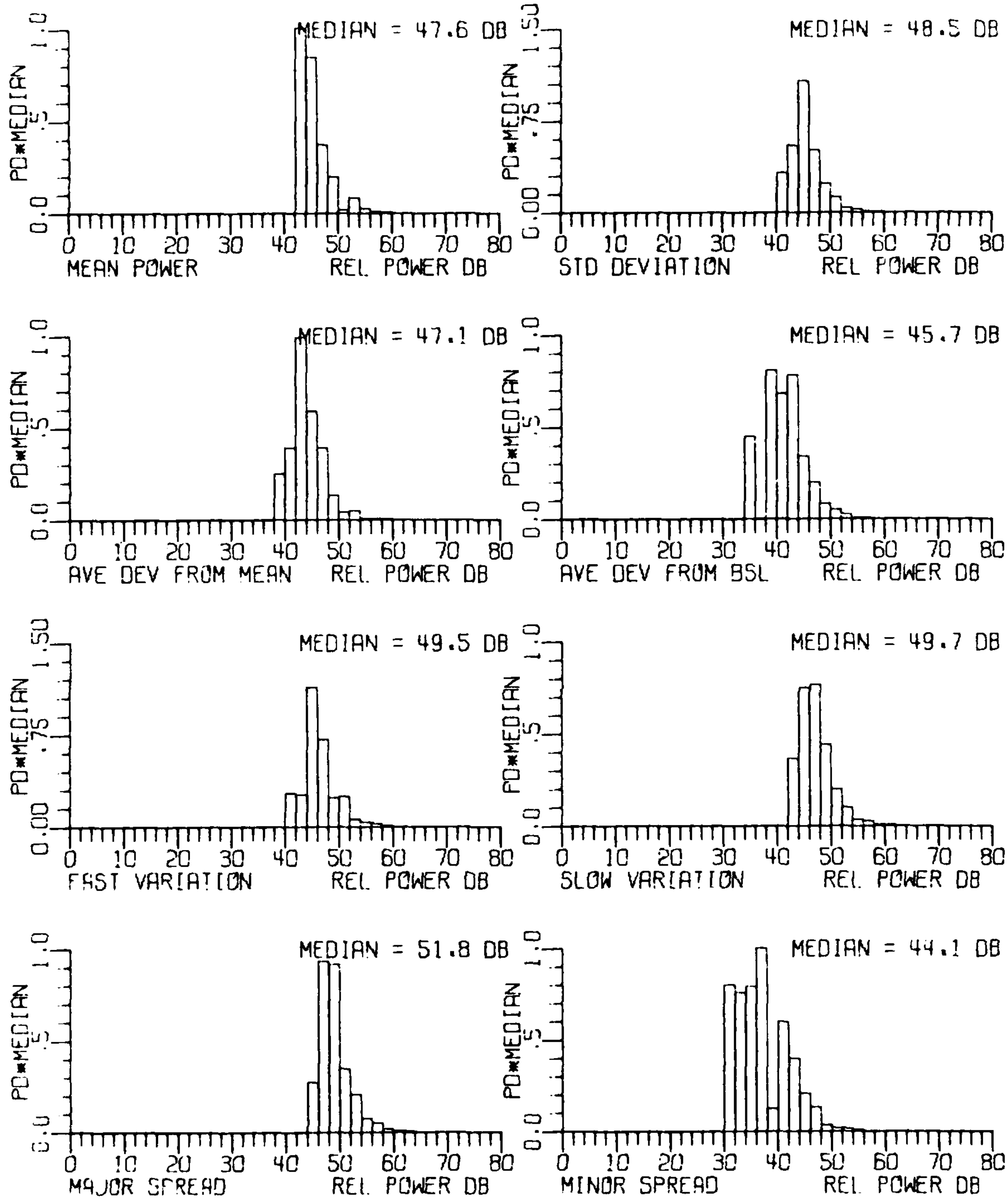

FIGURE B1 (b)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3CLUT**

TAPE 5344 3/

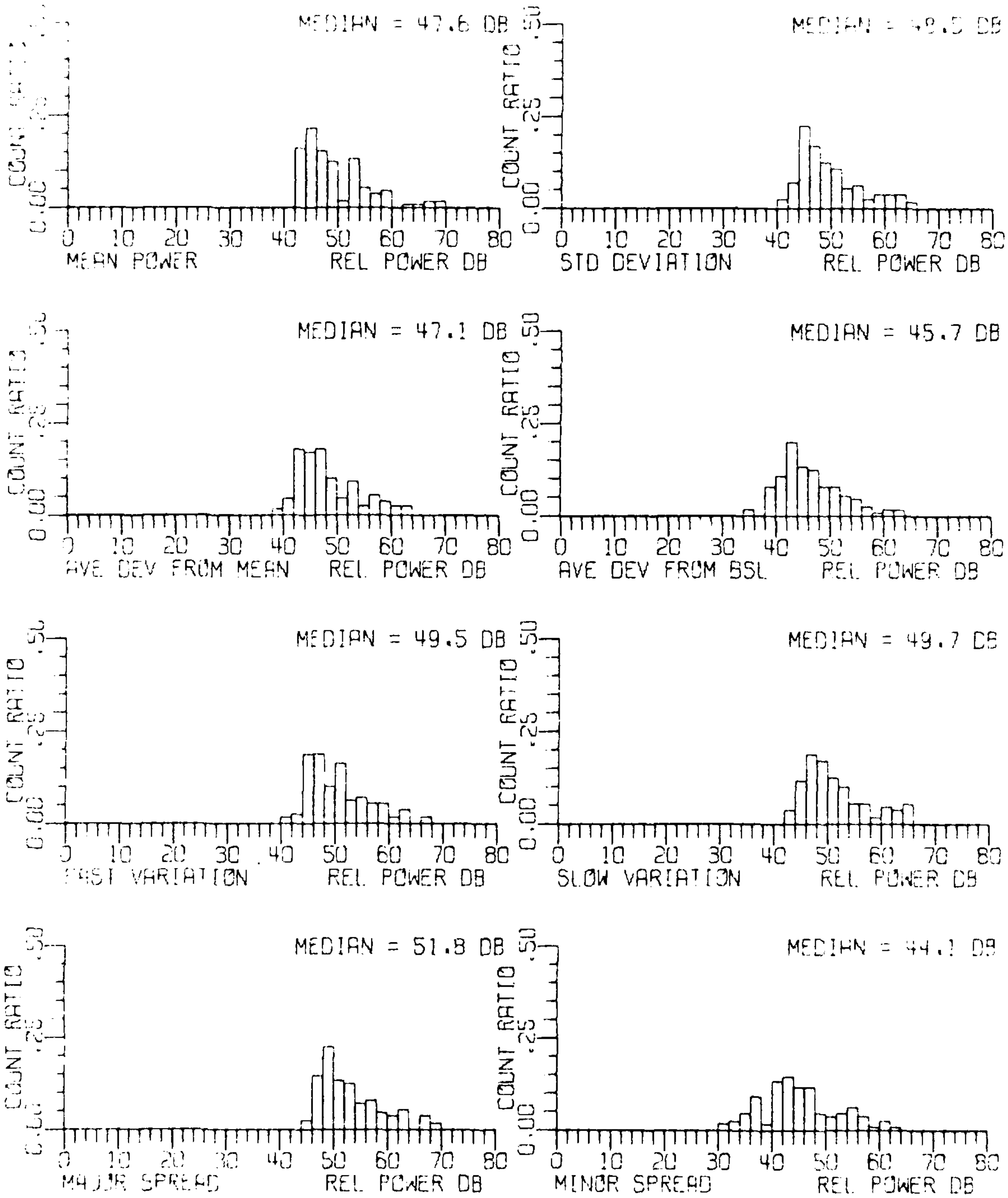

FIGURE B1 (c)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 2 DB BIN
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3CLUT**

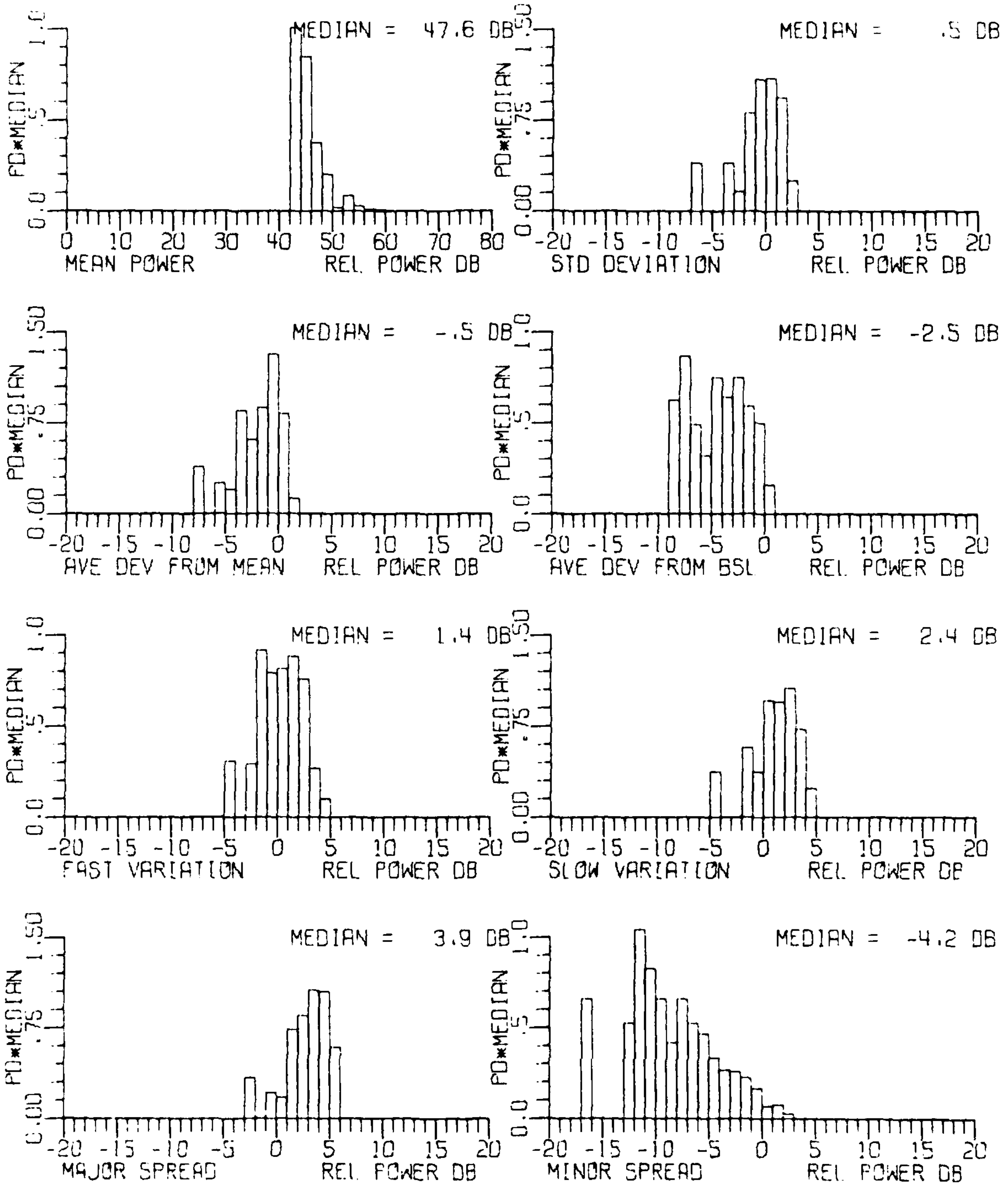

FIGURE B1 (d)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3CLUT**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

TAPE 5344 3 /

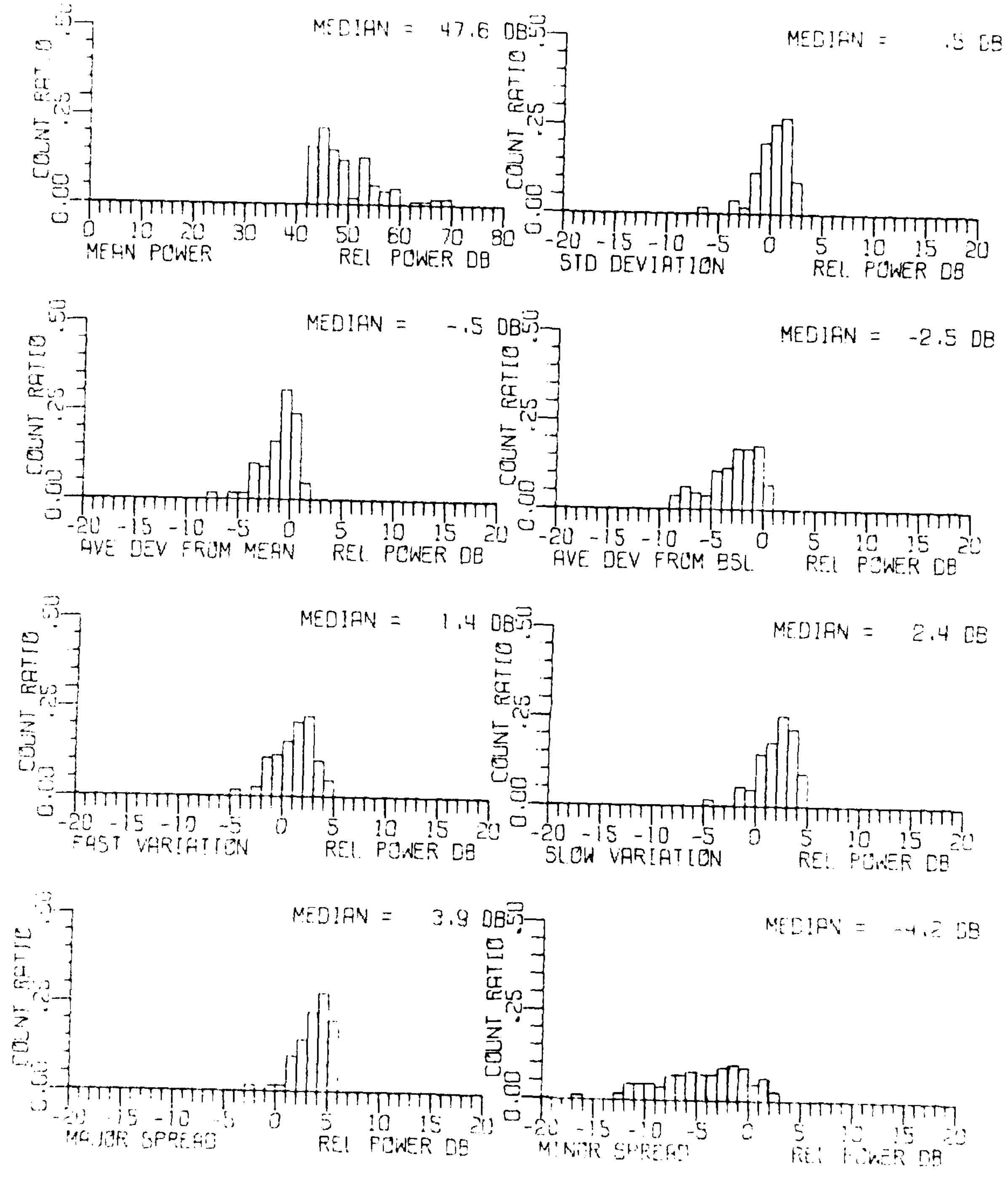

FIGURE B1 (e)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 1 DB BIN
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS H3CLUT
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

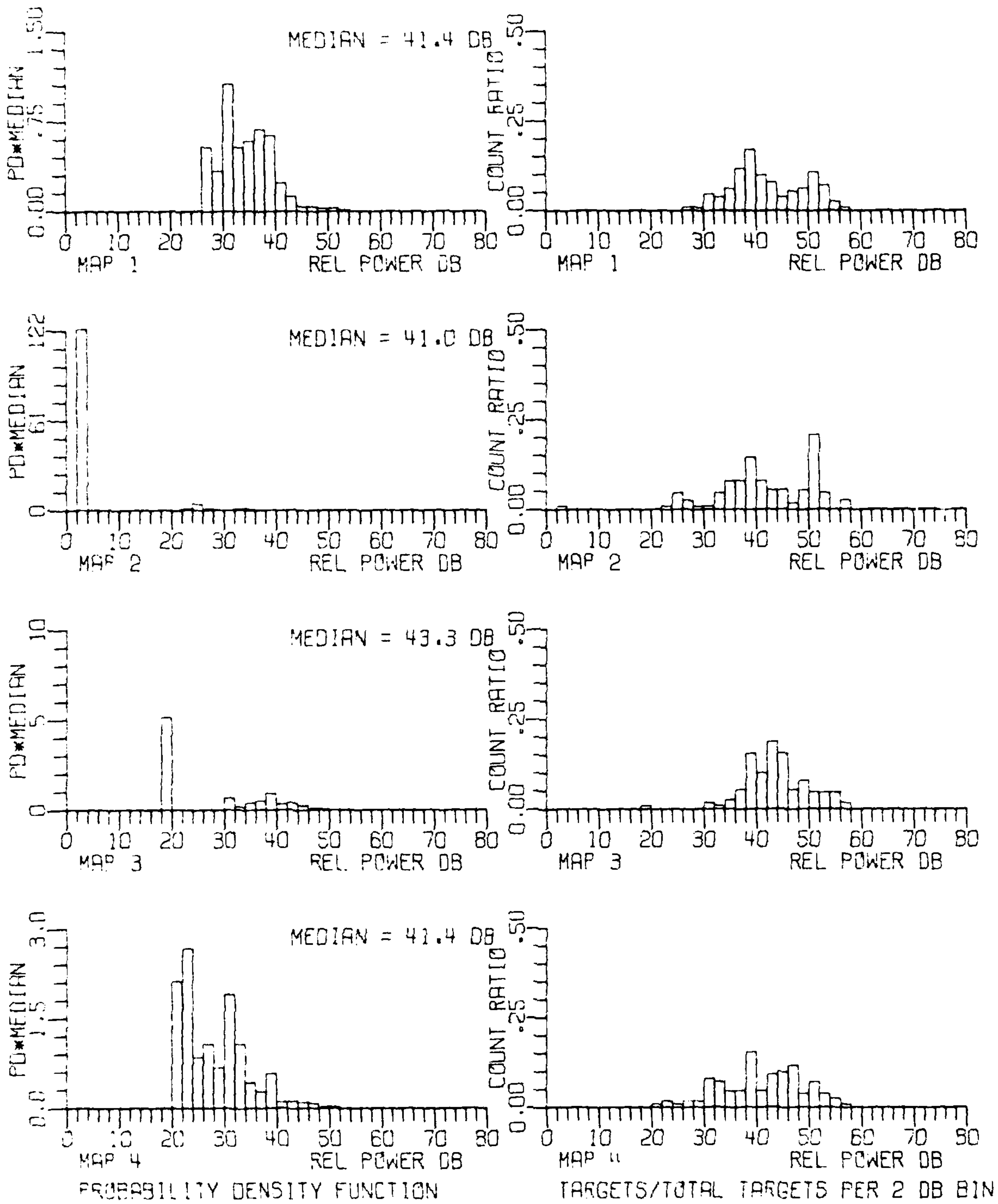

FIGURE B2 (a)
FOUR MAP NON-PARAMETRIC POWER DISTRIBUTIONS
FOR TARGET CLASS **H3NAT**

TAPE 5344 3

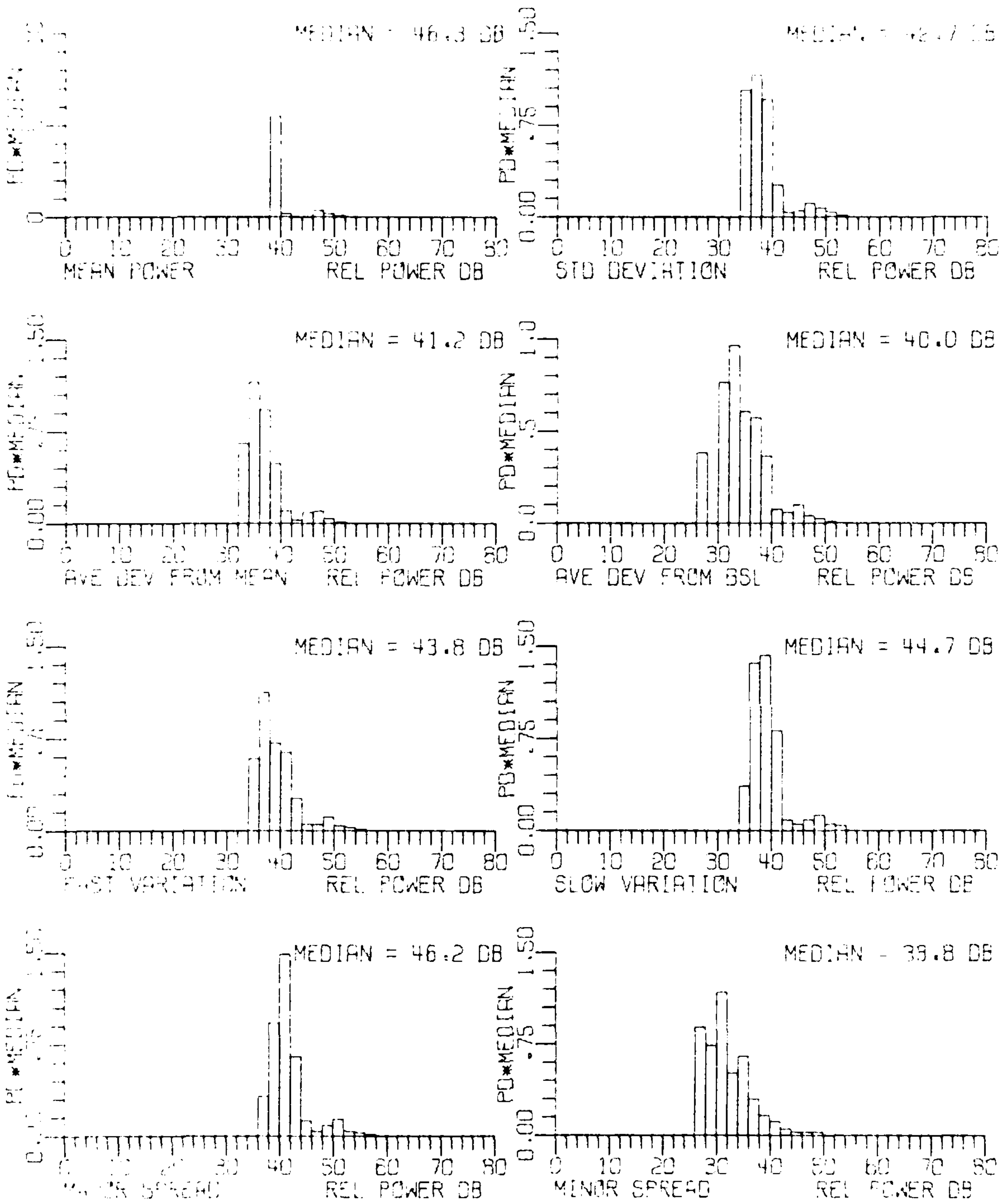

FIGURE B2 (b)
NON PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3NAT**

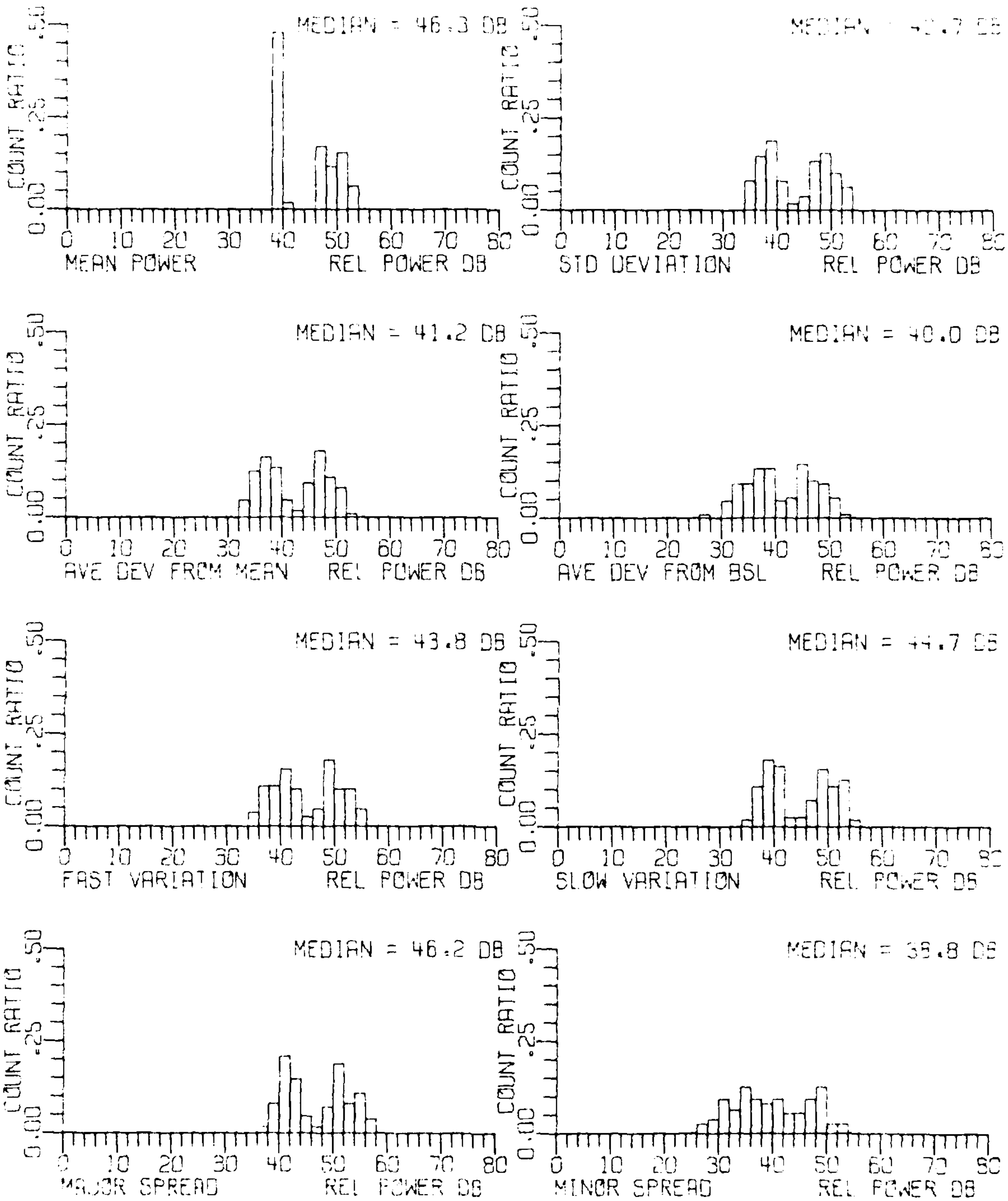

FIGURE B2 (c)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 2 DB BIN
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3NAT**

TAPE 5344 3

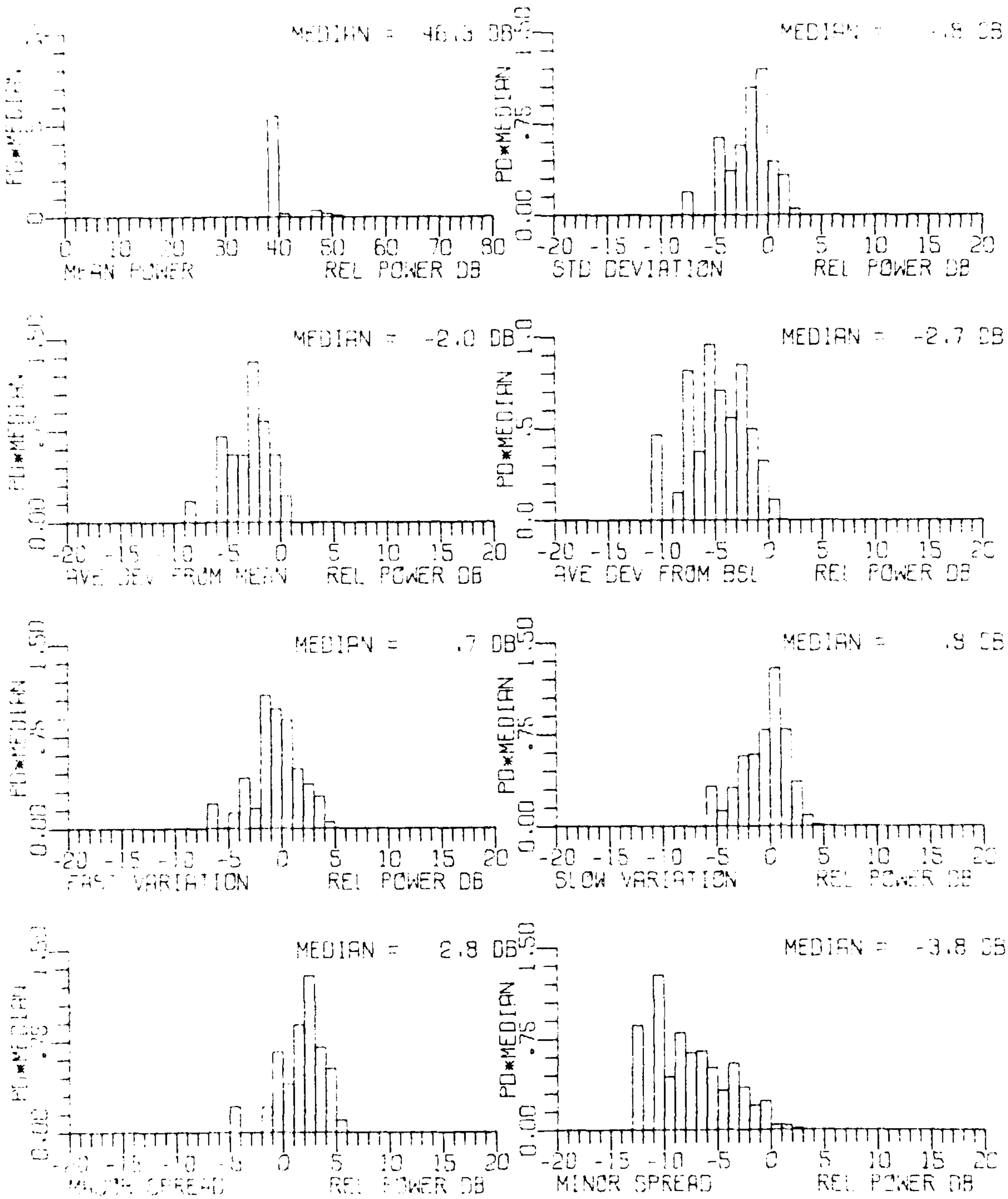

FIGURE B2 (d)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3NAT**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

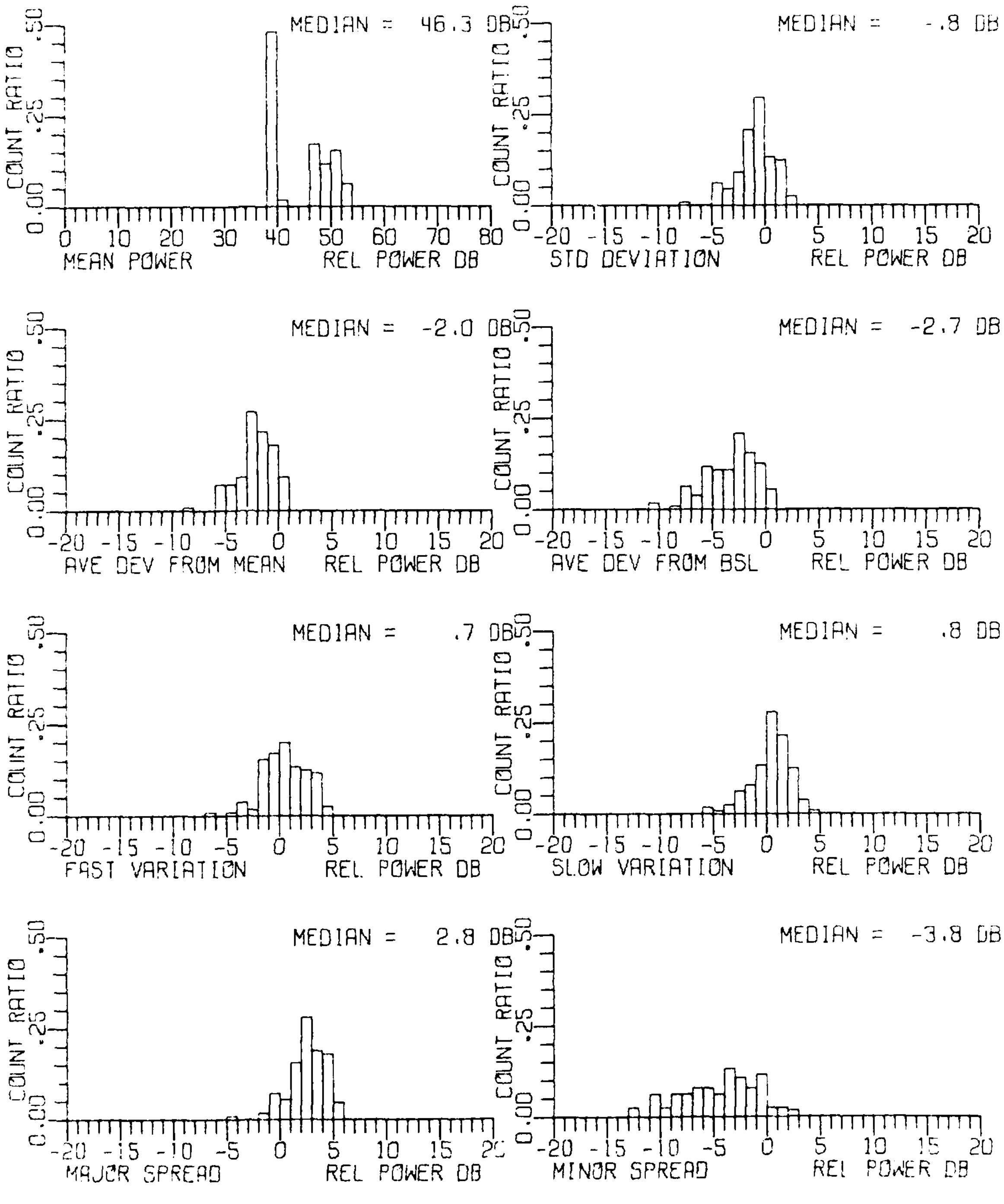

FIGURE 32 (e)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 1 DB BIN
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H3NAT**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

TAPE 5344 3 ?.

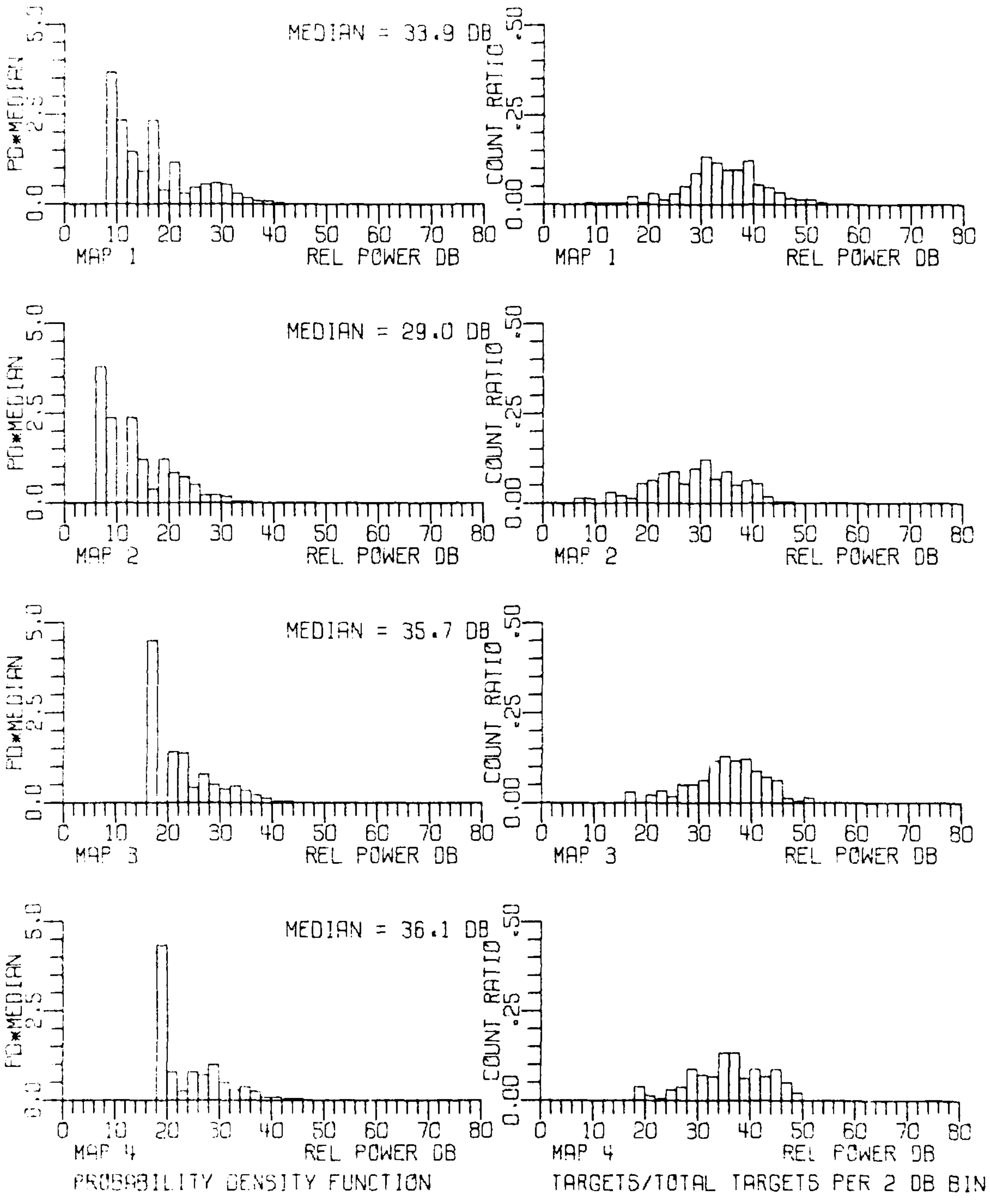

FIGURE B3 (a)
FOUR MAP NON-PARAMETRIC POWER DISTRIBUTIONS
FOR TARGET CLASS **H5TACT2**

TAPE 5344 S

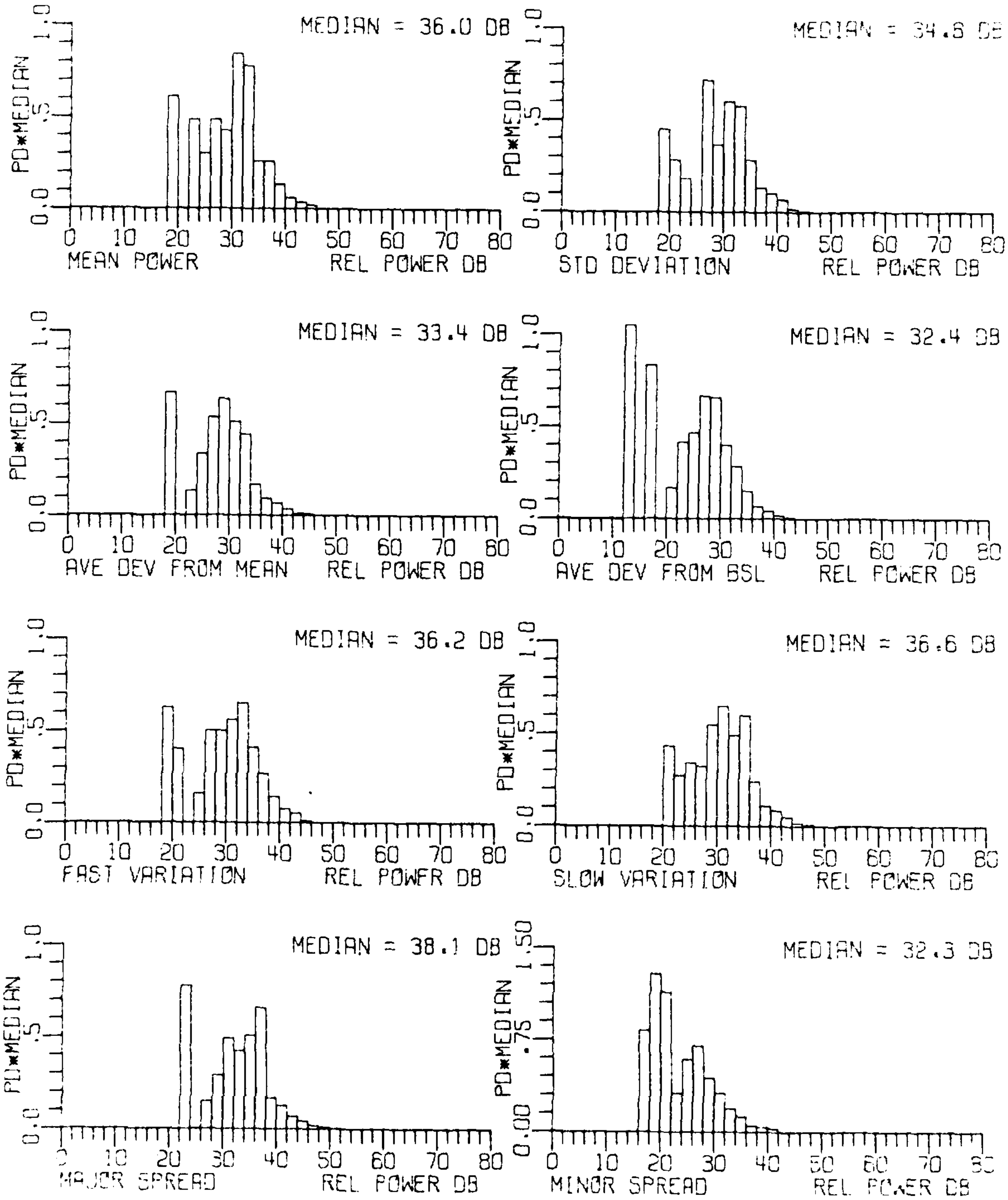

FIGURE B3 (b)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TACT2**

TAPE 5344 5

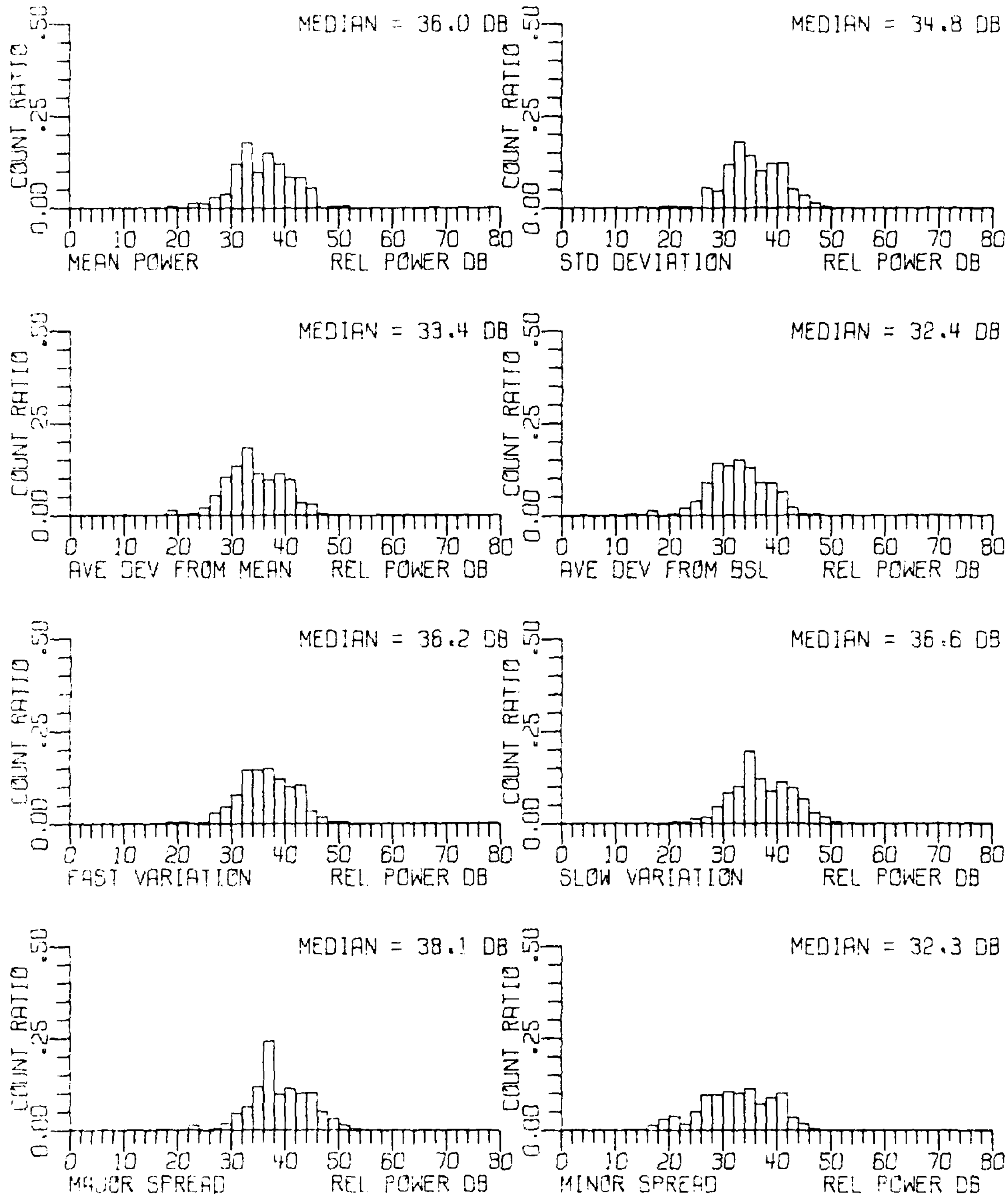

FIGURE B3 (c)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 2 DB BIN
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TACT2**

TAPE 5344 5

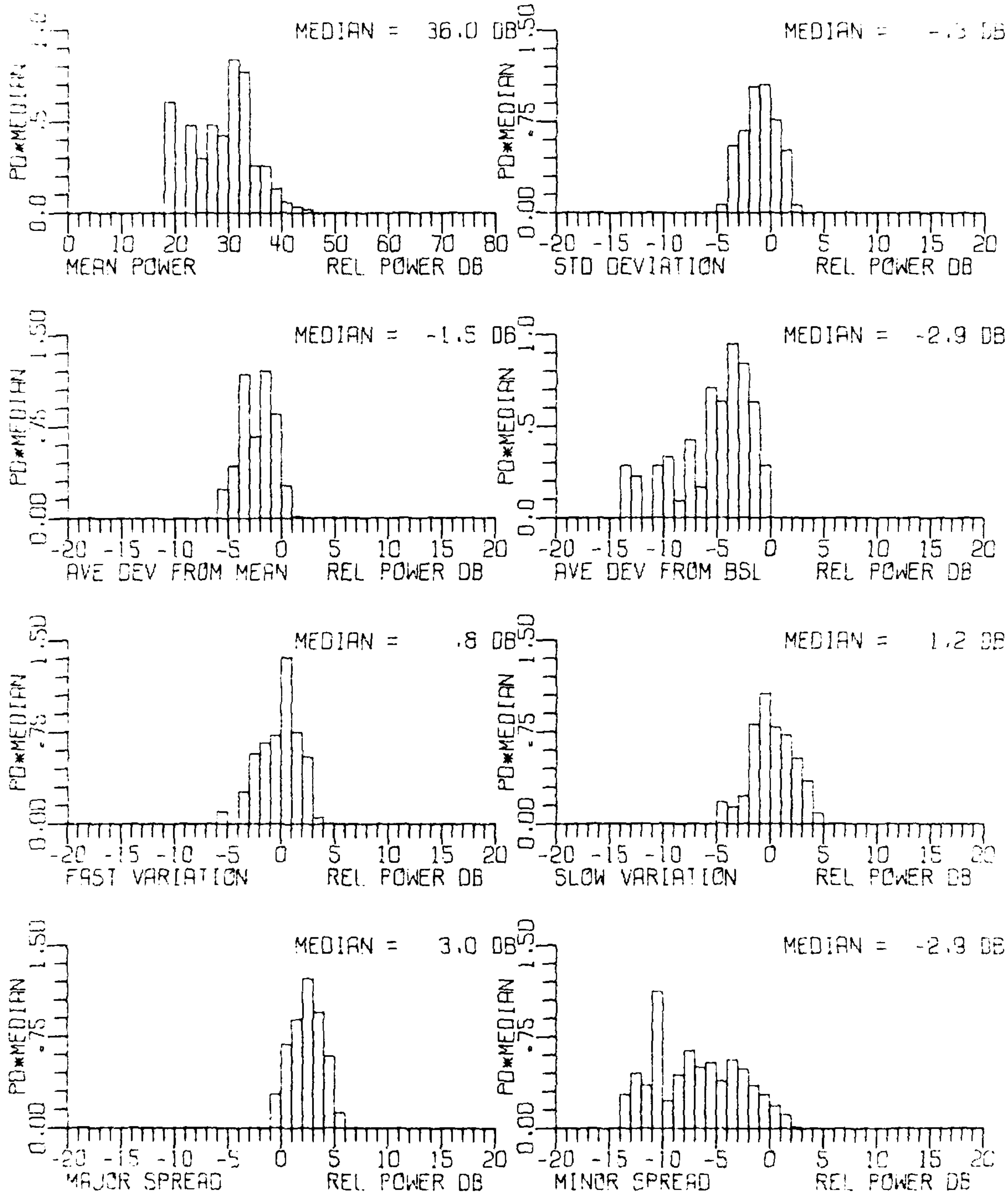

FIGURE B3 (d)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TACT2**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

TAPE 5344 5

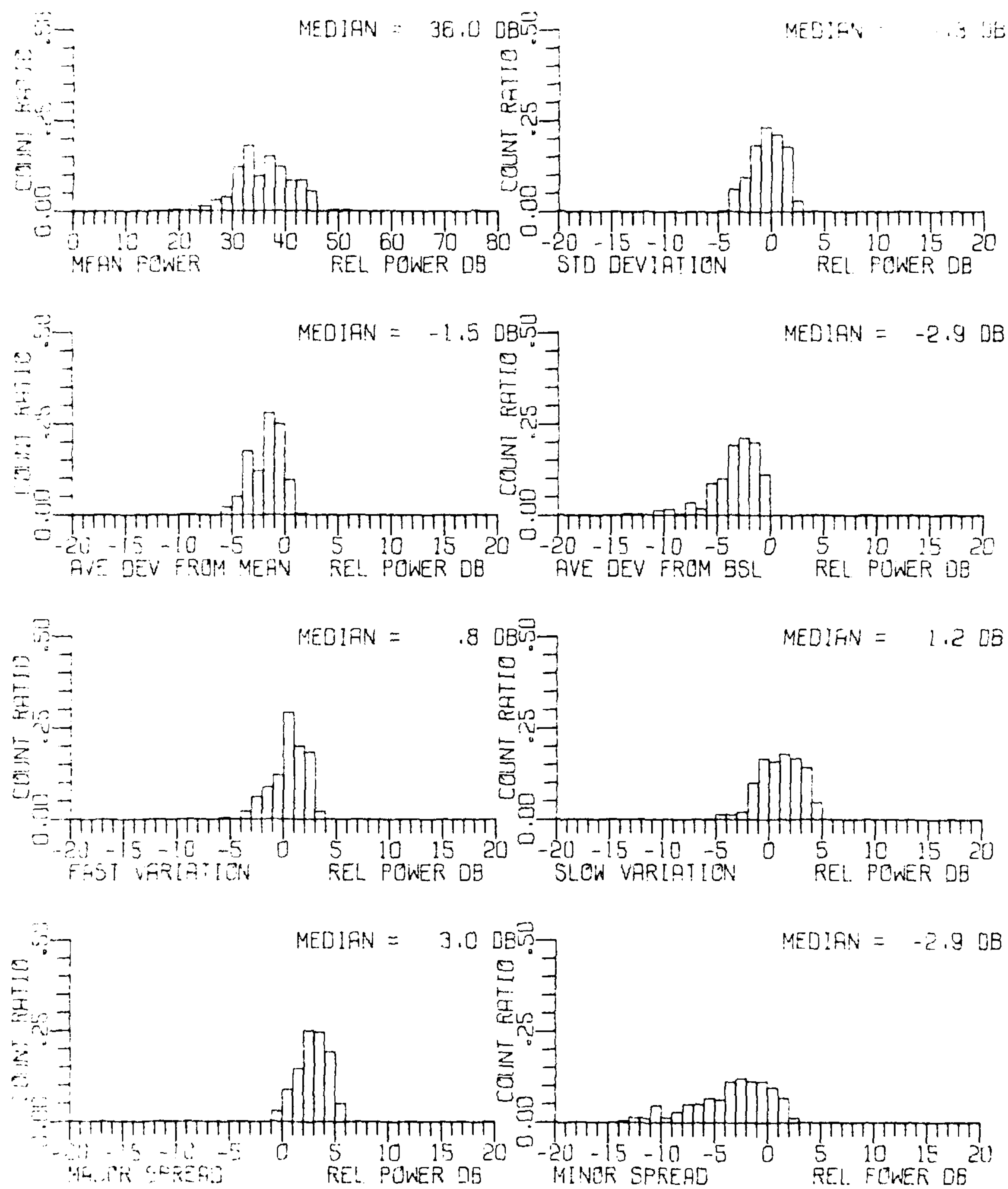

FIGURE B3 (e)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 1 DB BIN
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TACT2**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

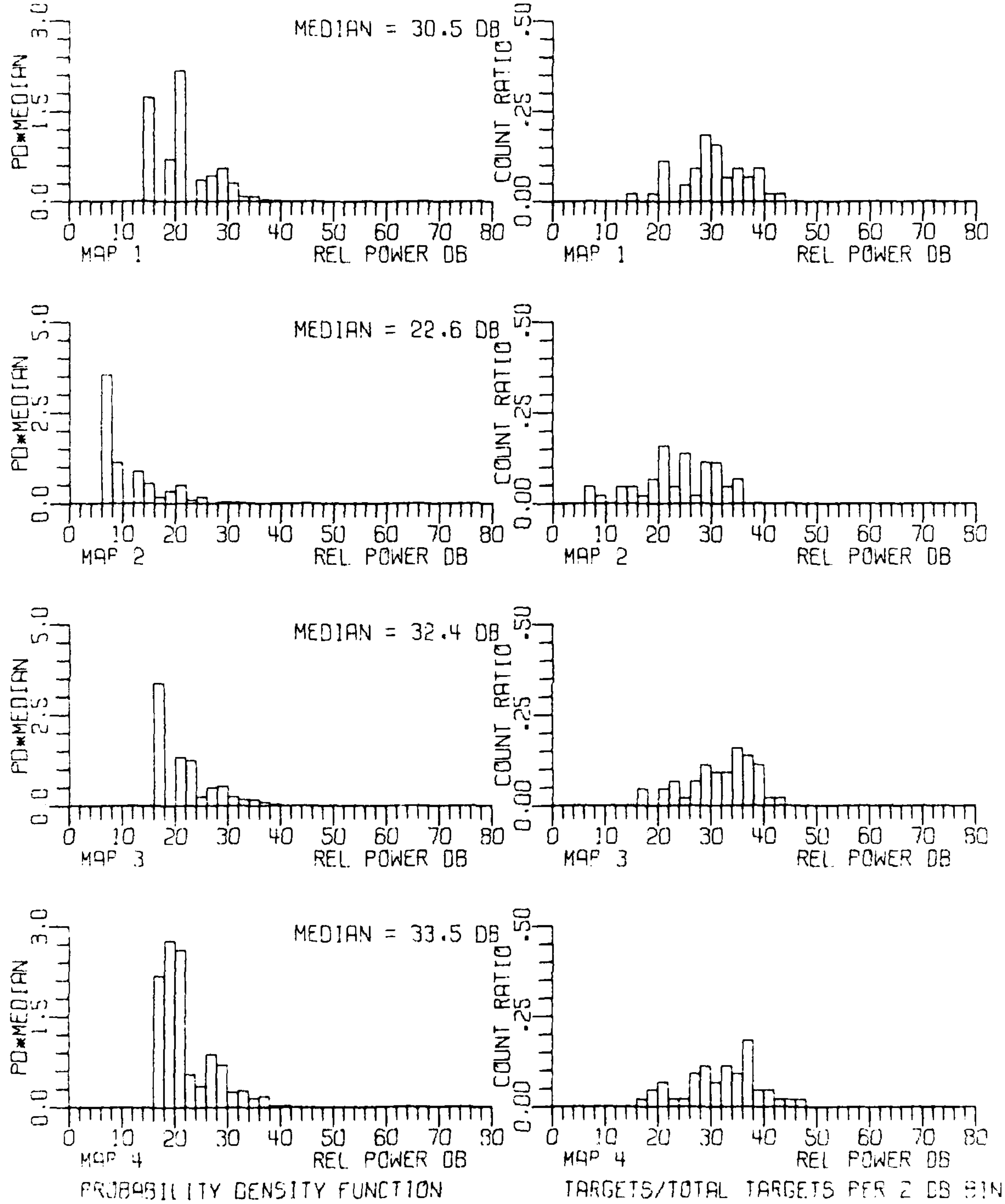

FIGURE B4 (a)
FOUR MAP NON-PARAMETRIC POWER DISTRIBUTIONS
FOR TARGET CLASS **H5TANK**

TAPE 5344 5

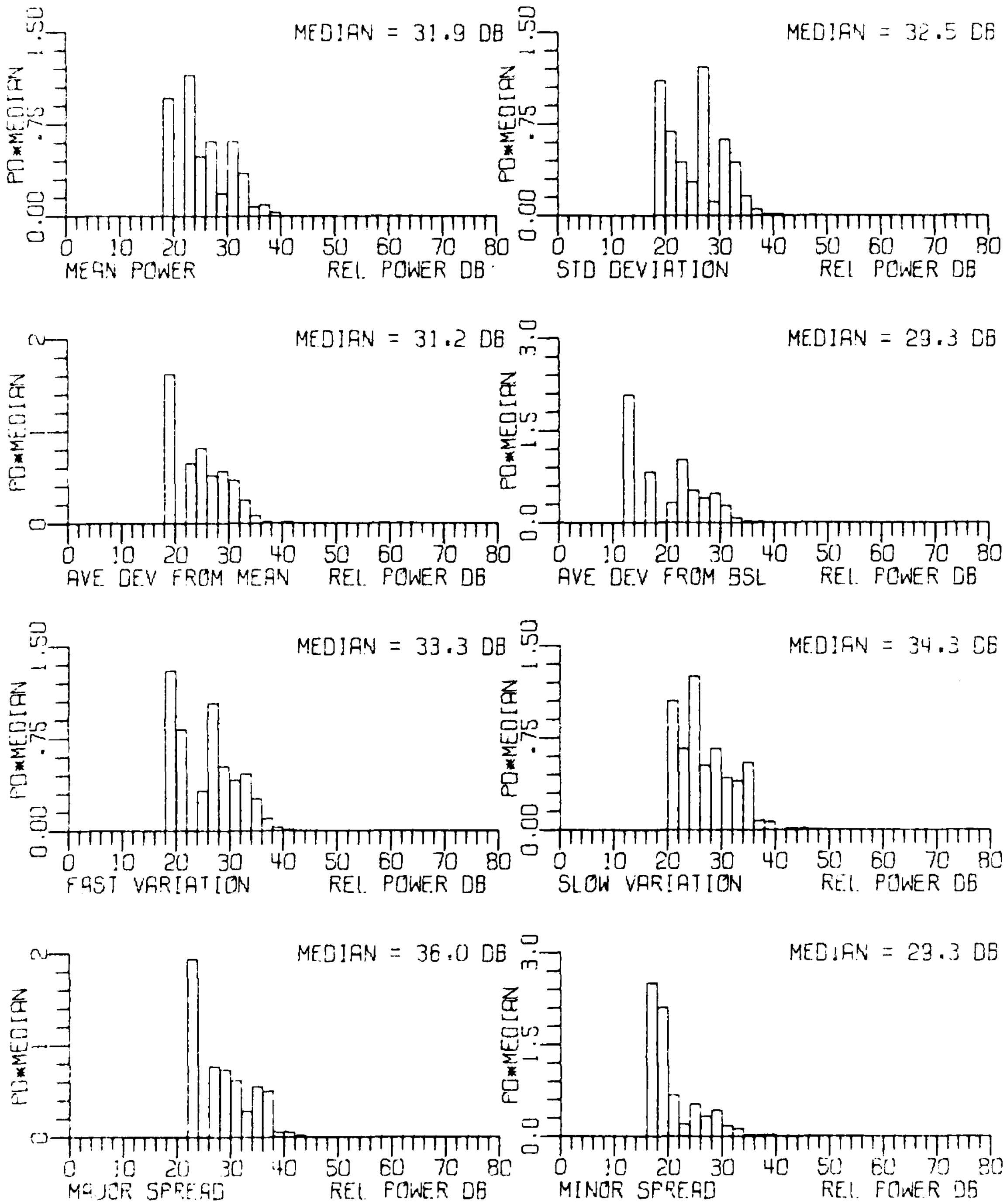

FIGURE B4 (b)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TANK**

TAPE 5344 5

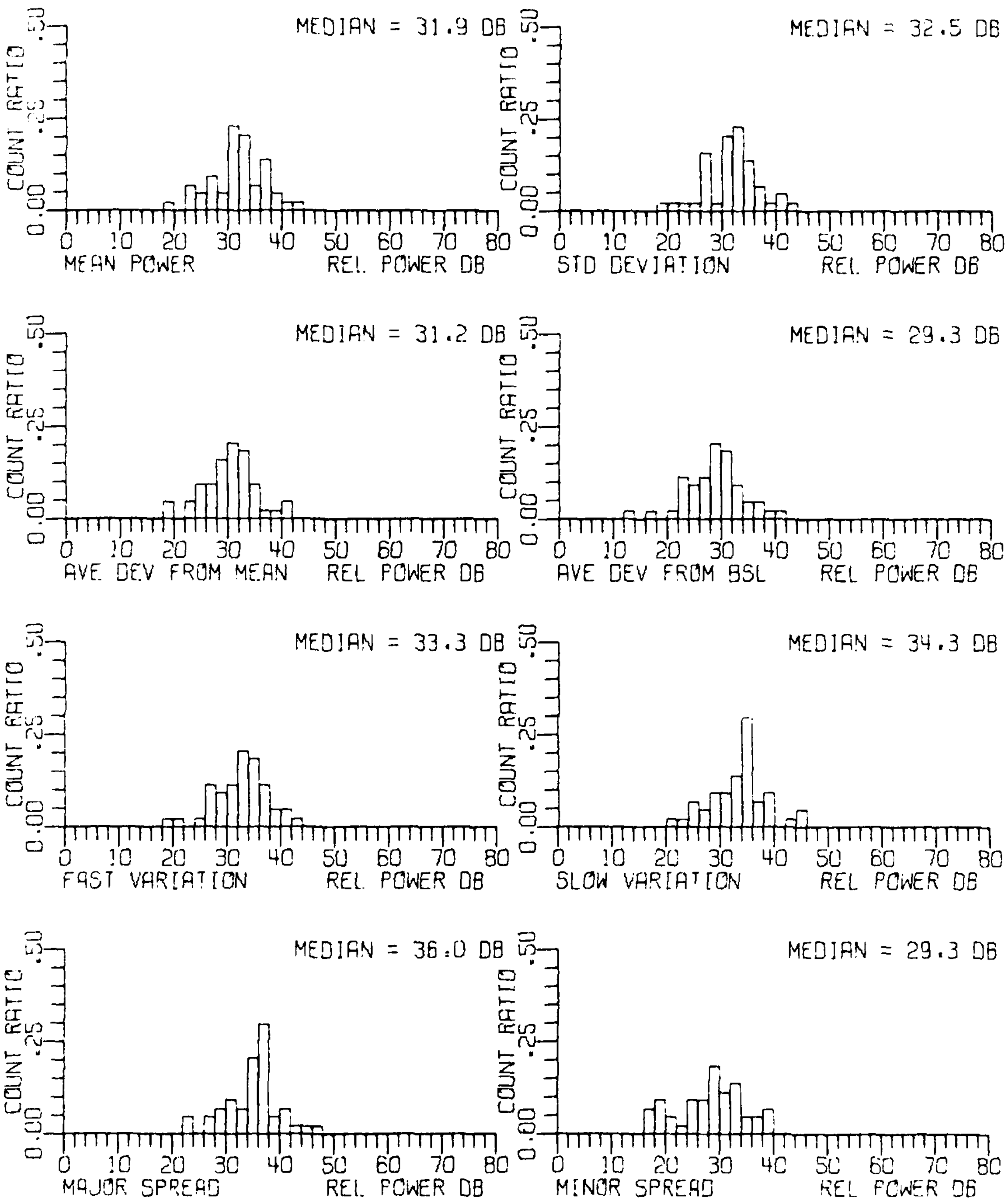

FIGURE B4 (c)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 2 DB BIN
FOR EIGHT VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TANK**

TAPE 5344 5

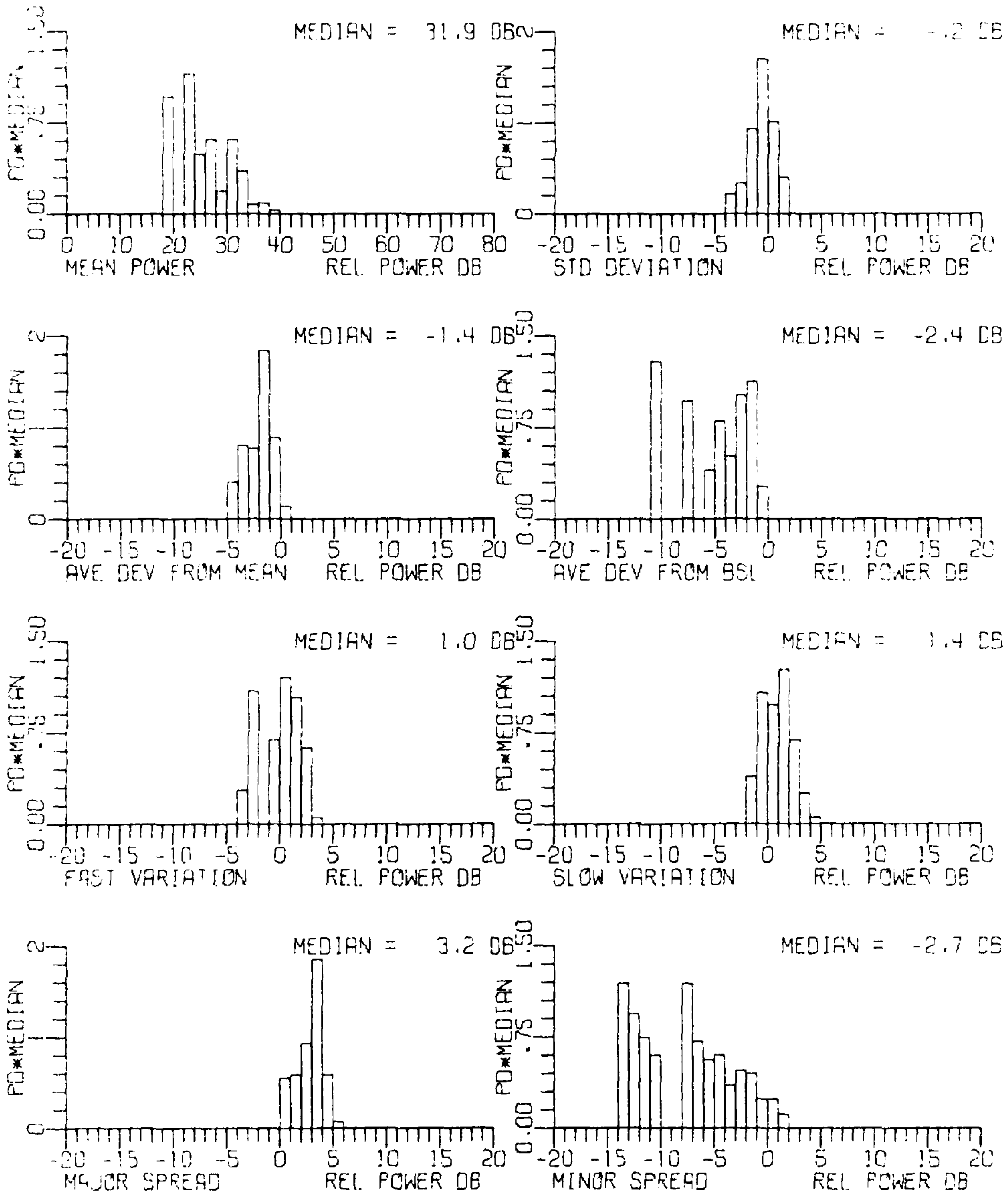

FIGURE B4 (a)
NON-PARAMETRIC PROBABILITY DENSITY FUNCTIONS
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TANK**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

TAPE 5344 5

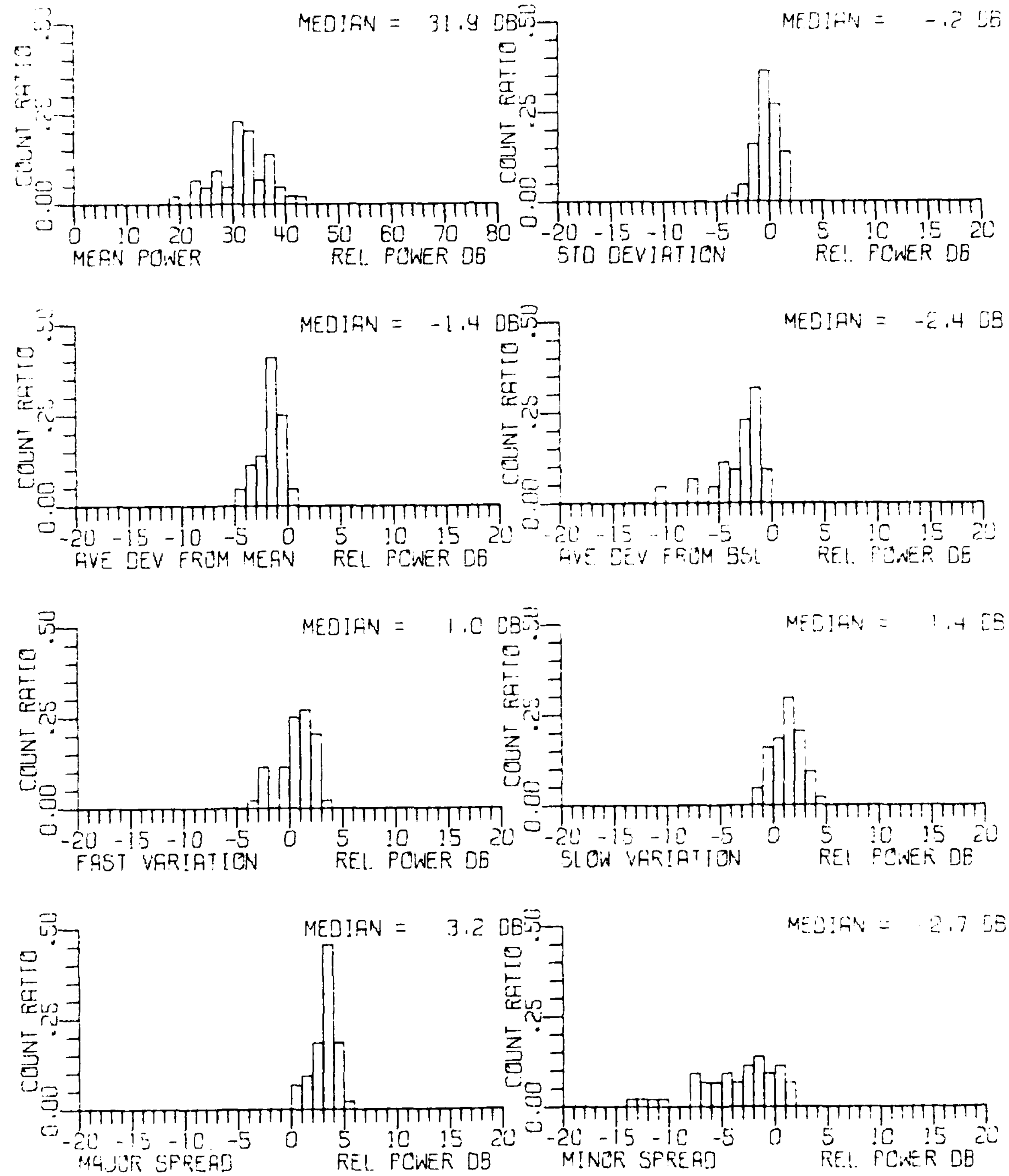

FIGURE B4 (e)
NON-PARAMETRIC COUNT RATIO DISTRIBUTIONS PER 1 DB BIN
FOR SEVEN VARIANTS CALCULATED IN POWER FROM TARGET CLASS **H5TANK**
NORMALIZED WITH RESPECT TO INDIVIDUAL PIXEL MEAN POWER

APPENDIX C

SUMMARY MEDIAN TABLES

This section contains three tables of summary median data extracted from the five sets of histograms for each target class. Table C-1 contains the power median for each of the four maps for the indicated target class. The median as listed has units of log power (arbitrary units) in decibels. The four map medians should be nearly constant for each target class, since the gain of the four maps were set equal. The gain equalization, however, involved the sum of the return power from all pixels within the map and not just those for a selected target class; consequently, a variation in the median from map-to-map can occur over a selection of pixels comprising a class of targets. A large change in any of the medians implies a change in target statistics between maps. Since there is not a priority reason why the statistics should change from map-to-map, an observed change in the power median would be reason to question the validity of the observed filter magnitude data for that target class.

It should be noticed that the man of the medians for a single target class varies between scenes. This occurs because the map gain varied between the scenes.

Table C-2 contains the median for eight unnormalized discriminants. These quantities computed in log power (in arbitrary units), are listed in decibels. A comparison of the medians can be made between target classes from the same scene but not between those from different scenes because of possible map gain changes between scenes. In order to form some basis for comparing target discriminants from different scenes, the discriminants were normalized pixel-by-pixel before computing the medians, and these data are presented in Table C-3. Discriminant medians computed from different scenes can then be compared. However, it is not apparent from these data that target classes can be separated based upon the medians for this set of normalized discriminants.

TABLE C-1

MAP-TO-MAP MEDIAN POWER VARIATION

Target Class	File	Scene	Power Median in dB Map 1	Map 2	Map 3	Map 4
Man Made Clutter	H1CLUT	1	44.4	44.8	44.0	44.0
	H2CLUT	2	48.9	48.5	48.5	49.7
	H3CLUT	3	46.7	47.0	47.0	44.8
Natural Features	H1NAT	1	37.4	37.5	40.6	41.8
	H2NAT	2	37.6	37.3	37.6	35.4
	H3NAT	3	41.4	41.0	43.3	41.4
Rough Grass & Weeds	H3GRAS1	3	35.4	35.7	37.6	35.7
	H3GRAS2	3	38.0	37.3	40.6	36.1
River Bank Trees	H2TREE1	2	44.1	47.4	48.2	44.4
	H3TREE1	3	47.0	48.5	48.5	47.8
Young Fruit Trees	H2TREE2	2	36.9	36.5	36.5	35.4
	H3TREE2	3	34.2	36.1	35.7	33.9
Railroad Bridge	H2RR1	2	43.6	43.6	43.3	42.9
Highway Bridge	H2HWB1	2	45.5	49.3	48.2	45.5
	H3HWB1	3	48.9	51.2	47.0	47.4
Bridges	H2BRIDG	2	45.2	45.9	44.8	43.3
	H3BRIDG	3	51.6	50.4	47.8	46.3
Mobile Homes	H2MH1	2	51.6	50 4	50.4	52.3
	H3MH1	3	41.0	42.9	46.7	43.3
Shadows	H4DARK	4	3.4	1.1	3.0	4.5
Sand	H5SAND1	5	21.1	21.1	23.3	23.3
	H5SAND2	5	22.2	19.6	23.3	22.6
O-Tactical Vehicles	H4TACT1	4	37.6	36.1	37.6	38.0
	H5TACT1	5	36.5	31.6	37.6	37.6
Tactical Vehicles	H4TACT2	4	—	—	—	—
	H5TACT2	5	33.9	29.0	35.7	36.1
Tanks	H4TANK1	4	32.7	32.7	34.6	33.5
	H5TANK	5	30.5	32.6	32.4	33.5
Trucks	H4TR251	4	34.2	32.0	33.9	33.5
	H5TR251	5	33.1	29.0	35.0	35.4

TABLE C-II

CLASS VARIATION IN UNNORMALIZED DISCRIMINANT MEDIANS

Target Class	File	Scene	Median in dB Mean Power	Std Dev	Avg Dev from Mean	Avg Dev from BSL
Man Made Clutter	H1CLUT	1	46.3	45.3	44.0	42.2
	H2CLUT	2	50.7	50.3	49.1	48.3
	H3CLUT	3	47.6	48.5	47.1	45.7
Natural Features	H1NAT	1	37.4	38.7	37.5	37.0
	H2NAT	2	38.4	38.7	37.2	36.5
	H3NAT	3	46.3	42.7	41.2	40.0
Rough Grass & Weeds	H3GRAS1	3	36.7	34.6	33.3	32.0
	H3GRAS2	3	39.1	38.2	36.7	36.4
River Bank Trees	H2TREE1	2	47.0	45.9	44.9	44.1
	H3TREE1	3	49.3	48.7	47.5	46.3
Young Fruit Trees	H2TREE2	2	37.1	36.0	34.8	33.7
	H3TREE2	3	35.6	35.2	33.7	32.7
Railroad Bridge	H2RR1	2	44.8	43.5	42.7	41.1
Highway Bridge	H2HWB1	2	48.0	47.5	46.6	46.2
	H3HWB1	3	51.7	48.5	47.2	46.3
Bridges	H2BRIDG	2	44.8	43.5	42.7	41.1
	H3BRIDG	3	52.9	51.5	50.3	48.8
Mobile Homes	H2MH1	2	52.3	52.6	51.2	50.2
	H3MH1	3	46.5	46.3	45.3	42.9
Shadows	H4DARK	4	8.1	9.2	8.0	5.7
Sand	H5SAND1	5	23.7	22.6	21.4	19.7
	H5SAND2	5	23.7	22.9	21.7	20.3
O-Tactical Vehicles	H4TACT1	4	38.7	39.4	41.1	34.6
	H5TACT1	5	36.9	36.5	35.2	33.8
Tactical Vehicles	H4TACT2	4	36.8	35.9	34.7	33.6
	H5TACT2	5	36.0	34.8	33.4	32.4
Tanks	H4TANK1	4	35.1	34.8	33.5	32.2
	H5TANK	5	31.9	32.5	31.5	29.3
Trucks	H4TR251	4	34.5	33.4	32.3	31.3
	H5TR251	5	35.5	34.6	33.3	32.1

TABLE C-II (continued)

CLASS VARIATION IN UNNORMALIZED DISCRIMINANT MEDIANS

Target Class	File	Scene	Fast Var (Median in dB)	Slow Var (Median in dB)	Major Spread (Median in dB)	Minor Spread (Median in dB)
Man Made Clutter	H1CLUT	1	46.3	47.1	48.8	40.9
	H2CLUT	2	51.5	51.6	53.8	45.7
	H3CLUT	3	49.5	49.7	51.8	44.1
Natural Features	H1NAT	1	40.6	39.6	41.8	36.4
	H2NAT	2	40.4	40.1	42.1	34.4
	H3NAT	3	43.8	44.7	46.2	38.8
Rough Grass & Weeds	H3GRAS1	3	35.8	36.3	38.2	30.8
	H3GRAS2	3	39.6	39.5	41.8	35.3
River Bank Trees	H2TREE1	2	47.8	47.3	49.2	43.6
	H3TREE1	3	50.3	50.1	51.9	44.0
Young Fruit Trees	H2TREE2	2	37.1	37.5	39.5	32.7
	H3TREE2	3	36.6	36.2	38.5	32.2
Railroad Bridge	H2RR1	2	45.2	44.8	47.0	41.0
Highway Bridge	H2HWB1	2	48.9	49.4	50.7	45.7
	H3HWB1	3	49.9	50.7	51.8	45.8
Bridges	H2BRIDG	2	45.2	44.8	47.0	41.0
	H3BRIDG	3	52.4	53.3	55.1	46.9
Mobile Homes	H2MH1	2	53.8	54.0	56.0	48.2
	H3MH1	3	47.5	48.7	49.7	42.7
Shadows	H4DARK	4	10.9	10.5	12.3	- 1.9
Sand	H5SAND1	5	23.9	23.6	25.7	18.4
	H5SAND2	5	24.0	23.9	26.2	18.4
O-Tactical Vehicles	H4TACT1	4	38.6	37.8	36.6	35.0
	H5TACT1	5	37.8	38.0	39.7	34.6
Tactical Vehicles	H4TACT2	4	37.0	37.8	39.3	29.7
	H5TACT2	5	36.2	36.6	38.1	32.3
Tanks	H4TANK1	4	36.2	36.2	37.9	29.3
	H5TANK	5	33.3	34.3	36.0	29.3
Trucks	H4TR251	4	34.7	34.9	36.8	31.2
	H5TR251	5	36.3	36.5	38.0	32.2

TABLE C-III

CLASS VARIATION IN NORMALIZED DISCRIMINANT MEDIANS

Target Class	File	Scene	Std Deviation	Median in dB Avg Dev from Mean	Avg Dev from BSL
Man Made Clutter	H1CLUT	1	-0.3	-1.6	-2.8
	H2CLUT	2	-0.4	-1.4	-2.2
	H3CLUT	3	0.5	-0.5	-2.5
Natural Features	H1NAT	1	-1.3	-2.5	-3.8
	H2NAT	2	-0.5	-1.7	-2.7
	H3NAT	3	-0.8	-2.0	-2.7
Rough Grass & Weeds	H3GRAS1	3	-2.0	-3.2	-4.2
	H3GRAS2	3	-0.9	-2.5	-2.8
River Bank Trees	H2TREE1	2	-0.9	-2.5	-3.2
	H3TREE1	3	-0.3	-1.5	-2.7
Young Fruit Trees	H2TREE2	2	-0.8	-2.2	-3.4
	H3TREE2	3	-0.5	-1.8	-2.9
Railroad Bridge	H2RR1	2	-1.3	-2.5	-3.0
Highway Bridge	H2HWB1	2	0.2	-1.2	-1.9
	H3HWB1	3	-0.2	-1.4	-3.3
Bridges	H2BRIDG	2	-1.3	-2.5	-3.0
	H3BRIDG	3	0.6	-0.5	-2.5
Mobile Homes	H2MH1	2	-0.3	-1.4	-2.1
	H3MH1	3	0.5	-0.6	-2.5
Shadows	H4DARK	4	-1.0	-2.3	-3.8
Sand	H5SAND1	5	-1.1	-2.1	-3.5
	H5SAND2	5	-1.0	-1.9	-3.3
O-Tactical Vehicles	H4TACT1	4	-0.8	-2.0	-2.7
	H5TACT1	5	-0.7	-1.9	-3.1
Tactical Vehicles	H4TACT2	4	-0.4	-1.8	-2.7
	H5TACT2	5	-0.3	-1.5	-2.9
Tanks	H4TANK1	4	-0.3	-1.4	-2.9
	H5TANK	5	-0.2	-1.4	-2.4
Trucks	H4TR251	4	-0.5	-1.8	-3.4
	H5TR251	5	0.1	-1.0	-2.7

TABLE C-III (continued)

CLASS VARIATION IN NORMALIZED DISCRIMINANT MEDIANS

Target Class	File	Scene	Median in dB Fast Var	Slow Var	Major Spread	Minor Spread
Man Made Clutter	H1CLUT	1	0.7	1.2	3.1	-4.4
	H2CLUT	2	1.1	1.2	2.9	-3.5
	H3CLUT	3	1.4	2.4	3.9	-4.2
Natural Features	H1NAT	1	-0.2	0.3	2.1	-4.5
	H2NAT	2	0.9	1.0	2.9	-3.6
	H3NAT	3	0.7	0.8	2.8	-3.8
Rough Grass & Weeds	H3GRAS1	3	-0.7	-0.3	1.4	-5.7
	H3GRAS2	3	0.1	0.3	2.5	-4.1
River Bank Trees	H2TREE1	2	0.8	0.0	2.1	-3.8
	H3TREE1	3	0.9	1.1	3.0	-5.3
Young Fruit Trees	H2TREE2	2	0.1	0.4	2.4	-4.1
	H3TREE2	3	0.9	0.6	2.7	-3.6
Railroad Bridge	H2RR1	2	0.0	0.4	2.3	-3.4
Highway Bridge	H2HWB1	2	1.6	0.9	3.3	-2.9
	H3HWB1	3	0.5	1.3	3.0	-5.4
Bridges	H2BRIDG	2	0.0	0.4	2.3	-3.4
	H3BRIDG	3	1.1	2.4	3.9	-4.9
Mobile Homes	H2MH1	2	1.1	1.2	3.0	-3.9
	H3MH1	3	1.6	2.3	3.7	-3.7
Shadows	H4DARK	4	-0.5	0.0	2.4	-10.6
Sand	H5SAND1	5	0.1	0.1	2.3	-4.9
	H5SAND2	5	0.2	0.5	2.4	-5.4
O-Tactical Vehicles	H4TACT1	4	0.3	0.8	2.7	-3.7
	H5TACT1	5	0.7	0.7	2.8	-3.5
Tactical Vehicles	H4TACT2	4	0.3	0.7	2.8	-4.8
	H5TACT2	5	0.8	1.2	3.0	-2.9
Tanks	H4TANK1	4	0.4	1.4	3.1	-4.5
	H5TANK	5	1.0	1.4	3.2	-2.7
Trucks	H4TR251	4	0.1	0.5	2.9	-3.7
	H5TR251	5	0.9	1.8	3.2	-2.6

APPENDIX D

STATISTICAL PARAMETERS

The class mean, standard deviation (sigma), mean to sigma ratio, and median of the eight discriminants (variants) appearing in Table C-2 of Appendix C computed in power are given in this section for all target classes listed in Table B-1 of Appendix B. These parameters are listed in Tables D-1 through D-8. Entries in the tables are in logarithms times 10. Since table entries are in logarithms, negative numbers indicate that the value of the parameter to the base ten is less than one.

Upon examination of the mean of the four-pixel mean for all pixels, members of a single class indicate that the gain of scene 1 may be lower than that of scenes 2 and 3; likewise, the gain of scene 5 may be lower than that of scenes 4 or 6.

It should be noted that in general the median of the pixel means is nearly equal to the mean of the pixel means for natural targets, while for man-made targets the equality does not appear to hold, the median is lower than the mean. These tables also show that the mean-to-sigma rate for the unnormalized data is generally positive for natural features and negative for man-made features, an effect which might be attributed to a greater variation in radar return from man-made objects than from natural features within the four map looks.

TABLE D-I

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 1

HIBRIDG

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 46.7 SIGMA = 44.2 MEAN/SIGMA = 2.5 MEDIAN = 46.1
VARIANT 2 MEAN = 46.7 SIGMA = 45.3 MEAN/SIGMA = 1.4 MEDIAN = 45.1
VARIANT 3 MEAN = 45.4 SIGMA = 44.1 MEAN/SIGMA = 1.3 MEDIAN = 44.0
VARIANT 4 MEAN = 43.9 SIGMA = 43.2 MEAN/SIGMA = .7 MEDIAN = 42.2
VARIANT 5 MEAN = 47.8 SIGMA = 46.8 MEAN/SIGMA = 1.0 MEDIAN = 46.1
VARIANT 6 MEAN = 48.3 SIGMA = 47.1 MEAN/SIGMA = 1.2 MEDIAN = 47.1
VARIANT 7 MEAN = 50.0 SIGMA = 48.5 MEAN/SIGMA = 1.5 MEDIAN = 48.4
VARIANT 8 MEAN = 43.7 SIGMA = 45.0 MEAN/SIGMA = -1.2 MEDIAN = 41.2

NORMALIZED VARIANTS

VARIANT 1 MEAN = 46.7 SIGMA = 44.2 MEAN/SIGMA = 2.5 MEDIAN = 46.1
VARIANT 2 MEAN = -.2 SIGMA = -4.2 MEAN/SIGMA = 4.0 MEDIAN = -.1
VARIANT 3 MEAN = -1.4 SIGMA = -5.4 MEAN/SIGMA = 4.0 MEDIAN = -1.4
VARIANT 4 MEAN = -2.9 SIGMA = -5.7 MEAN/SIGMA = 2.8 MEDIAN = -2.8
VARIANT 5 MEAN = 1.0 SIGMA = -2.6 MEAN/SIGMA = 3.5 MEDIAN = .7
VARIANT 6 MEAN = 1.5 SIGMA = -1.8 MEAN/SIGMA = 3.3 MEDIAN = 1.3
VARIANT 7 MEAN = 3.2 SIGMA = -1.1 MEAN/SIGMA = 4.3 MEDIAN = 3.4
VARIANT 8 MEAN = -3.0 SIGMA = -4.2 MEAN/SIGMA = 1.2 MEDIAN = -4.2

HICLUT

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 47.6 SIGMA = 48.9 MEAN/SIGMA = -1.4 MEDIAN = 46.3
VARIANT 2 MEAN = 47.3 SIGMA = 49.4 MEAN/SIGMA = -2.1 MEDIAN = 45.3
VARIANT 3 MEAN = 46.1 SIGMA = 48.1 MEAN/SIGMA = -2.0 MEDIAN = 44.0
VARIANT 4 MEAN = 44.6 SIGMA = 46.2 MEAN/SIGMA = -1.6 MEDIAN = 42.2
VARIANT 5 MEAN = 48.3 SIGMA = 49.7 MEAN/SIGMA = -1.3 MEDIAN = 46.3
VARIANT 6 MEAN = 49.1 SIGMA = 51.7 MEAN/SIGMA = -2.6 MEDIAN = 47.1
VARIANT 7 MEAN = 50.7 SIGMA = 52.7 MEAN/SIGMA = -2.0 MEDIAN = 48.8
VARIANT 8 MEAN = 43.9 SIGMA = 45.8 MEAN/SIGMA = -1.9 MEDIAN = 40.9

NORMALIZED VARIANTS

VARIANT 1 MEAN = 47.6 SIGMA = 48.9 MEAN/SIGMA = -1.4 MEDIAN = 46.3
VARIANT 2 MEAN = -.3 SIGMA = -4.2 MEAN/SIGMA = 3.9 MEDIAN = -.3
VARIANT 3 MEAN = -1.6 SIGMA = -5.5 MEAN/SIGMA = 3.9 MEDIAN = -1.6
VARIANT 4 MEAN = -2.9 SIGMA = -5.9 MEAN/SIGMA = 3.1 MEDIAN = -2.8
VARIANT 5 MEAN = .9 SIGMA = -2.6 MEAN/SIGMA = 3.5 MEDIAN = .7
VARIANT 6 MEAN = 1.4 SIGMA = -1.9 MEAN/SIGMA = 3.3 MEDIAN = 1.2
VARIANT 7 MEAN = 3.1 SIGMA = -1.1 MEAN/SIGMA = 4.2 MEDIAN = 3.1
VARIANT 8 MEAN = -3.3 SIGMA = -4.2 MEAN/SIGMA = .9 MEDIAN = -4.4

TABLE D-I (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 1

H1GRAS1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.6	SIGMA = 29.0	MEAN/SIGMA = 7.6	MEDIAN = 36.7
VARIANT 2	MEAN = 34.8	SIGMA = 30.9	MEAN/SIGMA = 3.9	MEDIAN = 34.6
VARIANT 3	MEAN = 33.6	SIGMA = 29.9	MEAN/SIGMA = 3.6	MEDIAN = 33.3
VARIANT 4	MEAN = 32.6	SIGMA = 29.8	MEAN/SIGMA = 2.7	MEDIAN = 32.0
VARIANT 5	MEAN = 36.1	SIGMA = 33.0	MEAN/SIGMA = 3.0	MEDIAN = 35.8
VARIANT 6	MEAN = 36.3	SIGMA = 32.7	MEAN/SIGMA = 3.6	MEDIAN = 36.3
VARIANT 7	MEAN = 38.2	SIGMA = 34.2	MEAN/SIGMA = 4.0	MEDIAN = 38.2
VARIANT 8	MEAN = 32.9	SIGMA = 32.5	MEAN/SIGMA = .4	MEDIAN = 30.8

NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.6	SIGMA = 29.0	MEAN/SIGMA = 7.6	MEDIAN = 36.7
VARIANT 2	MEAN = -1.8	SIGMA = -6.4	MEAN/SIGMA = 4.5	MEDIAN = -2.0
VARIANT 3	MEAN = -3.0	SIGMA = -7.4	MEAN/SIGMA = 4.3	MEDIAN = -3.2
VARIANT 4	MEAN = -4.0	SIGMA = -7.2	MEAN/SIGMA = 3.2	MEDIAN = -4.2
VARIANT 5	MEAN = -.5	SIGMA = -4.2	MEAN/SIGMA = 3.6	MEDIAN = -.7
VARIANT 6	MEAN = -.3	SIGMA = -4.4	MEAN/SIGMA = 4.1	MEDIAN = -.3
VARIANT 7	MEAN = 1.6	SIGMA = -3.1	MEAN/SIGMA = 4.7	MEDIAN = 1.4
VARIANT 8	MEAN = -3.7	SIGMA = -4.3	MEAN/SIGMA = .7	MEDIAN = -5.7

H1HWB1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 56.8	SIGMA = 61.0	MEAN/SIGMA = -4.2	MEDIAN = 50.4
VARIANT 2	MEAN = 54.6	SIGMA = 57.5	MEAN/SIGMA = -2.9	MEDIAN = 49.3
VARIANT 3	MEAN = 53.3	SIGMA = 56.0	MEAN/SIGMA = -2.7	MEDIAN = 48.3
VARIANT 4	MEAN = 52.0	SIGMA = 55.2	MEAN/SIGMA = -3.2	MEDIAN = 46.5
VARIANT 5	MEAN = 55.8	SIGMA = 59.0	MEAN/SIGMA = -3.2	MEDIAN = 50.4
VARIANT 6	MEAN = 56.3	SIGMA = 59.1	MEAN/SIGMA = -2.8	MEDIAN = 51.1
VARIANT 7	MEAN = 58.2	SIGMA = 61.3	MEAN/SIGMA = -3.1	MEDIAN = 52.7
VARIANT 8	MEAN = 52.1	SIGMA = 55.7	MEAN/SIGMA = -3.7	MEDIAN = 44.8

NORMALIZED VARIANTS

VARIANT 1	MEAN = 56.8	SIGMA = 61.0	MEAN/SIGMA = -4.2	MEDIAN = 50.4
VARIANT 2	MEAN = -.5	SIGMA = -4.2	MEAN/SIGMA = 3.7	MEDIAN = -.5
VARIANT 3	MEAN = -1.7	SIGMA = -5.4	MEAN/SIGMA = 3.7	MEDIAN = -1.7
VARIANT 4	MEAN = -3.4	SIGMA = -6.5	MEAN/SIGMA = 3.0	MEDIAN = -3.9
VARIANT 5	MEAN = .5	SIGMA = -3.1	MEAN/SIGMA = 3.6	MEDIAN = .2
VARIANT 6	MEAN = 1.3	SIGMA = -1.5	MEAN/SIGMA = 2.8	MEDIAN = .9
VARIANT 7	MEAN = 2.9	SIGMA = -1.0	MEAN/SIGMA = 3.9	MEDIAN = 2.7
VARIANT 8	MEAN = -3.1	SIGMA = -4.4	MEAN/SIGMA = 1.3	MEDIAN = -4.1

TABLE D-I (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 1

[illegible]

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 48.3 SIGMA = 50.3 MEAN/SIGMA = -2.0 MEDIAN = 46.6
VARIANT 2 MEAN = 47.9 SIGMA = 50.7 MEAN/SIGMA = -2.8 MEDIAN = 45.5
VARIANT 3 MEAN = 46.6 SIGMA = 49.4 MEAN/SIGMA = -2.8 MEDIAN = 44.0
VARIANT 4 MEAN = 45.1 SIGMA = 47.4 MEAN/SIGMA = -2.3 MEDIAN = 43.0
VARIANT 5 MEAN = 48.8 SIGMA = 50.8 MEAN/SIGMA = -2.0 MEDIAN = 46.9
VARIANT 6 MEAN = 49.8 SIGMA = 53.1 MEAN/SIGMA = -3.3 MEDIAN = 47.0
VARIANT 7 MEAN = 51.3 SIGMA = 54.1 MEAN/SIGMA = -2.7 MEDIAN = 48.9
VARIANT 8 MEAN = 44.1 SIGMA = 46.4 MEAN/SIGMA = -2.3 MEDIAN = 40.6

NORMALIZED VARIANTS

VARIANT 1 MEAN = 48.3 SIGMA = 50.3 MEAN/SIGMA = -2.0 MEDIAN = 46.6
VARIANT 2 MEAN = -.4 SIGMA = -4.3 MEAN/SIGMA = 3.9 MEDIAN = -.4
VARIANT 3 MEAN = -1.7 SIGMA = -5.5 MEAN/SIGMA = [illegible].9 MEDIAN = -1.7
VARIANT 4 MEAN = -2.9 SIGMA = -6.2 MEAN/SIGMA = 3.3 MEDIAN = -2.9
VARIANT 5 MEAN = .8 SIGMA = -2.6 MEAN/SIGMA = 3.4 MEDIAN = .6
VARIANT 6 MEAN = 1.2 SIGMA = -2.1 MEAN/SIGMA = 3.3 MEDIAN = 1.1
VARIANT 7 MEAN = 3.0 SIGMA = -1.1 MEAN/SIGMA = 4.1 MEDIAN = 3.0
VARIANT 8 MEAN = -3.7 SIGMA = -4.3 MEAN/SIGMA = .7 MEDIAN = -4.8

HIMAT

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 44.6 SIGMA = 44.6 MEAN/SIGMA = .0 MEDIAN = 37.4
VARIANT 2 MEAN = 44.4 SIGMA = 45.0 MEAN/SIGMA = -.6 MEDIAN = 38.7
VARIANT 3 MEAN = 43.2 SIGMA = 43.8 MEAN/SIGMA = -.6 MEDIAN = 37.5
VARIANT 4 MEAN = 41.7 SIGMA = 42.3 MEAN/SIGMA = -.7 MEDIAN = 37.0
VARIANT 5 MEAN = 45.5 SIGMA = 46.1 MEAN/SIGMA = -.7 MEDIAN = 40.6
VARIANT 6 MEAN = 46.1 SIGMA = 46.9 MEAN/SIGMA = -.9 MEDIAN = 39.6
VARIANT 7 MEAN = 47.7 SIGMA = 48.3 MEAN/SIGMA = -.6 MEDIAN = 41.8
VARIANT 8 MEAN = 41.2 SIGMA = 43.0 MEAN/SIGMA = -1.8 MEDIAN = 36.4

NORMALIZED VARIANTS

VARIANT 1 MEAN = 44.6 SIGMA = 44.6 MEAN/SIGMA = .0 MEDIAN = 37.4
VARIANT 2 MEAN = -.9 SIGMA = -4.6 MEAN/SIGMA = 3.7 MEDIAN = -1.3
VARIANT 3 MEAN = -2.1 SIGMA = -5.8 MEAN/SIGMA = 3.7 MEDIAN = -2.5
VARIANT 4 MEAN = -3.4 SIGMA = -6.4 MEAN/SIGMA = 3.1 MEDIAN = -3.8
VARIANT 5 MEAN = .3 SIGMA = -3.0 MEAN/SIGMA = 3.3 MEDIAN = -.2
VARIANT 6 MEAN = .8 SIGMA = -2.3 MEAN/SIGMA = 3.1 MEDIAN = .3
VARIANT 7 MEAN = 2.5 SIGMA = -1.5 MEAN/SIGMA = 3.9 MEDIAN = 2.1
VARIANT 8 MEAN = -3.5 SIGMA = -4.2 MEAN/SIGMA = .7 MEDIAN = -4.5

TABLE D-1 (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 1

HIRRBI

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 53.7	SIGMA = 54.7	MEAN/SIGMA = -1.0	MEDIAN = 49.6
VARIANT 2	MEAN = 53.1	SIGMA = 54.2	MEAN/SIGMA = -1.1	MEDIAN = 50.1
VARIANT 3	MEAN = 51.8	SIGMA = 53.0	MEAN/SIGMA = -1.1	MEDIAN = 48.4
VARIANT 4	MEAN = 50.7	SIGMA = 52.3	MEAN/SIGMA = -1.6	MEDIAN = 46.3
VARIANT 5	MEAN = 54.6	SIGMA = 56.1	MEAN/SIGMA = -1.5	MEDIAN = 50.9
VARIANT 6	MEAN = 54.4	SIGMA = 55.4	MEAN/SIGMA = -1.0	MEDIAN = 51.4
VARIANT 7	MEAN = 56.5	SIGMA = 57.5	MEAN/SIGMA = -1.1	MEDIAN = 53.4
VARIANT 8	MEAN = 50.5	SIGMA = 52.5	MEAN/SIGMA = -2.0	MEDIAN = 46.5

NORMALIZED VARIANTS

VARIANT 1	MEAN = 53.7	SIGMA = 54.7	MEAN/SIGMA = -1.0	MEDIAN = 49.6
VARIANT 2	MEAN = -.3	SIGMA = -4.5	MEAN/SIGMA = 4.1	MEDIAN = -.6
VARIANT 3	MEAN = -1.5	SIGMA = -5.8	MEAN/SIGMA = 4.2	MEDIAN = -1.7
VARIANT 4	MEAN = -2.9	SIGMA = -5.9	MEAN/SIGMA = 3.0	MEDIAN = -2.7
VARIANT 5	MEAN = .9	SIGMA = -2.6	MEAN/SIGMA = 3.6	MEDIAN = .8
VARIANT 6	MEAN = 1.2	SIGMA = -2.2	MEAN/SIGMA = 3.4	MEDIAN = .8
VARIANT 7	MEAN = 3.0	SIGMA = -1.3	MEAN/SIGMA = 4.3	MEDIAN = 2.9
VARIANT 8	MEAN = -2.6	SIGMA = -4.0	MEAN/SIGMA = 1.4	MEDIAN = -3.0

HTIRFFI

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 47.3	SIGMA = 43.3	MEAN/SIGMA = 4.0	MEDIAN = 46.6
VARIANT 2	MEAN = 47.2	SIGMA = 44.5	MEAN/SIGMA = 2.6	MEDIAN = 46.7
VARIANT 3	MEAN = 46.0	SIGMA = 43.3	MEAN/SIGMA = 2.7	MEDIAN = 45.4
VARIANT 4	MEAN = 44.4	SIGMA = 42.0	MEAN/SIGMA = 2.4	MEDIAN = 43.9
VARIANT 5	MEAN = 48.3	SIGMA = 45.7	MEAN/SIGMA = 2.5	MEDIAN = 47.9
VARIANT 6	MEAN = 48.9	SIGMA = 46.8	MEAN/SIGMA = 2.1	MEDIAN = 48.0
VARIANT 7	MEAN = 50.5	SIGMA = 47.8	MEAN/SIGMA = 2.7	MEDIAN = 49.9
VARIANT 8	MEAN = 43.9	SIGMA = 43.7	MEAN/SIGMA = .3	MEDIAN = 42.5

NORMALIZED VARIANTS

VARIANT 1	MEAN = 47.3	SIGMA = 43.3	MEAN/SIGMA = 4.0	MEDIAN = 46.6
VARIANT 2	MEAN = -.1	SIGMA = -4.3	MEAN/SIGMA = 4.2	MEDIAN = -.3
VARIANT 3	MEAN = -1.3	SIGMA = -5.6	MEAN/SIGMA = 4.3	MEDIAN = -1.4
VARIANT 4	MEAN = -2.8	SIGMA = -6.1	MEAN/SIGMA = 3.3	MEDIAN = -2.8
VARIANT 5	MEAN = 1.0	SIGMA = -2.8	MEAN/SIGMA = 3.8	MEDIAN = .8
VARIANT 6	MEAN = 1.6	SIGMA = -1.9	MEAN/SIGMA = 3.5	MEDIAN = 1.2
VARIANT 7	MEAN = 3.2	SIGMA = -1.2	MEAN/SIGMA = 4.5	MEDIAN = 3.0
VARIANT 8	MEAN = -3.3	SIGMA = -4.0	MEAN/SIGMA = .7	MEDIAN = -3.7

TABLE D-I (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 1

H1TREE2

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 44.7	SIGMA = 38.3	MEAN/SIGMA = 6.3	MEDIAN = 44.1
VARIANT 2	MEAN = 44.1	SIGMA = 40.6	MEAN/SIGMA = 3.5	MEDIAN = 43.8
VARIANT 3	MEAN = 42.9	SIGMA = 39.3	MEAN/SIGMA = 3.5	MEDIAN = 42.6
VARIANT 4	MEAN = 41.7	SIGMA = 38.6	MEAN/SIGMA = 3.1	MEDIAN = 41.2
VARIANT 5	MEAN = 45.3	SIGMA = 41.8	MEAN/SIGMA = 3.5	MEDIAN = 44.9
VARIANT 6	MEAN = 45.7	SIGMA = 42.8	MEAN/SIGMA = 2.9	MEDIAN = 45.4
VARIANT 7	MEAN = 47.5	SIGMA = 43.7	MEAN/SIGMA = 3.8	MEDIAN = 47.3
VARIANT 8	MEAN = 41.9	SIGMA = 40.6	MEAN/SIGMA = 1.3	MEDIAN = 41.4

NORMALIZED VARIANTS

VARIANT 1	MEAN = 44.7	SIGMA = 38.3	MEAN/SIGMA = 6.3	MEDIAN = 44.1
VARIANT 2	MEAN = -.6	SIGMA = -5.2	MEAN/SIGMA = 4.7	MEDIAN = -.6
VARIANT 3	MEAN = -1.8	SIGMA = -6.4	MEAN/SIGMA = 4.6	MEDIAN = -2.0
VARIANT 4	MEAN = -2.9	SIGMA = -6.6	MEAN/SIGMA = 3.6	MEDIAN = -3.2
VARIANT 5	MEAN = .7	SIGMA = -3.4	MEAN/SIGMA = 4.2	MEDIAN = .5
VARIANT 6	MEAN = 1.0	SIGMA = -3.0	MEAN/SIGMA = 4.0	MEDIAN = .9
VARIANT 7	MEAN = 2.8	SIGMA = -2.1	MEAN/SIGMA = 4.9	MEDIAN = 2.7
VARIANT 8	MEAN = -2.7	SIGMA = -3.9	MEAN/SIGMA = 1.2	MEDIAN = -3.6

TABLE D-II

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 2

H2BRIDG

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	56.2	60.3	-4.1	45.5
2	55.3	59.1	-3.8	45.8
3	54.1	58.1	-4.0	44.4
4	53.9	58.0	-4.1	43.6
5	57.2	61.1	-3.9	46.8
6	56.2	59.9	-3.8	47.4
7	58.6	62.4	-3.7	49.2
8	54.7	59.5	-4.8	43.2

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	56.2	60.3	-4.1	45.5
2	-.4	-4.5	4.1	-.5
3	-1.6	-5.8	4.2	-1.6
4	-2.3	-5.4	3.1	-2.4
5	1.1	-2.4	3.6	1.0
6	1.0	-2.9	3.9	1.0
7	3.0	-1.4	4.3	2.9
8	-2.6	-3.8	1.2	-2.6

H2CLUT

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	55.8	59.0	-3.2	50.7
2	55.4	58.0	-2.7	50.3
3	54.2	57.0	-2.8	49.1
4	53.7	56.8	-3.1	48.2
5	57.0	60.0	-2.9	51.5
6	56.5	59.0	-2.5	51.6
7	58.7	61.3	-2.6	53.8
8	54.1	58.4	-4.2	45.1

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	55.8	59.0	-3.2	50.7
2	-.2	-4.2	4.0	-.4
3	-1.4	-5.5	4.1	-1.5
4	-2.2	-5.6	3.4	-2.2
5	1.3	-2.4	3.7	1.1
6	1.3	-2.3	3.6	1.2
7	3.2	-1.1	4.3	2.9
8	-2.8	-3.9	1.1	-3.6

TABLE D-II (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 2

H2GRAS3

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	34.2	31.3	2.9	33.9
2	33.7	31.6	2.1	33.1
3	32.5	30.3	2.2	32.1
4	31.6	29.9	1.7	30.6
5	35.2	33.5	1.7	34.4
6	35.2	33.1	2.1	34.7
7	37.1	34.9	2.2	36.7
8	31.4	30.8	.7	30.4

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	34.2	31.3	2.9	33.9
2	-.5	-5.1	4.6	-.7
3	-1.7	-6.4	4.7	-1.8
4	-2.5	-6.3	3.7	-2.7
5	1.0	-3.0	4.0	.8
6	.9	-3.3	4.2	.5
7	2.9	-1.9	4.8	2.6
8	-2.8	-4.3	1.5	-3.2

H2HWB1

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	61.5	55.5	-4.0	48.0
2	59.6	52.4	-2.8	47.5
3	58.4	51.2	-2.8	46.6
4	58.2	51.2	-2.9	46.2
5	61.2	63.9	-2.7	48.9
6	60.9	63.9	-3.1	49.4
7	63.0	55.8	-2.9	50.7
8	58.7	52.1	-3.4	45.7

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	61.5	55.5	-4.0	48.0
2	-.2	-4.7	4.5	.0
3	-1.4	-5.8	4.4	-1.3
4	-1.9	-6.1	4.2	-1.9
5	1.4	-2.9	4.3	1.5
6	1.1	-2.7	3.8	.9
7	3.2	-1.5	4.7	3.3
8	-2.3	-3.3	1.1	-3.5

TABLE D-II (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 2

H2MH1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 55.3	SIGMA = 55.6	MEAN/SIGMA = -.2	MEDIAN = 52.3
VARIANT 2	MEAN = 55.4	SIGMA = 56.0	MEAN/SIGMA = -.6	MEDIAN = 52.6
VARIANT 3	MEAN = 54.3	SIGMA = 55.0	MEAN/SIGMA = -.7	MEDIAN = 51.2
VARIANT 4	MEAN = 53.5	SIGMA = 54.3	MEAN/SIGMA = -.8	MEDIAN = 50.2
VARIANT 5	MEAN = 56.9	SIGMA = 57.7	MEAN/SIGMA = -.8	MEDIAN = 53.8
VARIANT 6	MEAN = 56.9	SIGMA = 57.4	MEAN/SIGMA = -.5	MEDIAN = 54.0
VARIANT 7	MEAN = 58.7	SIGMA = 59.3	MEAN/SIGMA = -.6	MEDIAN = 56.0
VARIANT 8	MEAN = 53.5	SIGMA = 56.0	MEAN/SIGMA = -2.5	MEDIAN = 48.2

NORMALIZED VARIANTS

VARIANT 1	MEAN = 55.3	SIGMA = 55.6	MEAN/SIGMA = -.2	MEDIAN = 52.3
VARIANT 2	MEAN = .0	SIGMA = -4.0	MEAN/SIGMA = 4.0	MEDIAN = -.3
VARIANT 3	MEAN = -1.2	SIGMA = -5.3	MEAN/SIGMA = 4.1	MEDIAN = -1.4
VARIANT 4	MEAN = -2.1	SIGMA = -5.9	MEAN/SIGMA = 3.8	MEDIAN = -2.1
VARIANT 5	MEAN = 1.4	SIGMA = -2.4	MEAN/SIGMA = 3 8	MEDIAN = 1.1
VARIANT 6	MEAN = 1.5	SIGMA = -1.9	MEAN/SIGMA = 4	MEDIAN = 1.2
VARIANT 7	MEAN = 3.3	SIGMA = -1.0	MEAN/SIGMA = 4.3	MEDIAN = 3.0
VARIANT 8	MEAN = -2.9	SIGMA = -4.0	MEAN/SIGMA = 1.0	MEDIAN = -3.9

H2NAT

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 41.5	SIGMA = 40.9	MEAN/SIGMA = .6	MEDIAN = 37.6
VARIANT 2	MEAN = 41.0	SIGMA = 41.0	MEAN/SIGMA = .0	MEDIAN = 37.9
VARIANT 3	MEAN = 39.8	SIGMA = 39.8	MEAN/SIGMA = .0	MEDIAN = 36.6
VARIANT 4	MEAN = 38.7	SIGMA = 38.9	MEAN/SIGMA = -.2	MEDIAN = 36.3
VARIANT 5	MEAN = 42.4	SIGMA = 42.6	MEAN/SIGMA = -.2	MEDIAN = 40.0
VARIANT 6	MEAN = 42.5	SIGMA = 42.7	MEAN/SIGMA = -.2	MEDIAN = 38.6
VARIANT 7	MEAN = 44.5	SIGMA = 44.4	MEAN/SIGMA = .1	MEDIAN = 41.0
VARIANT 8	MEAN = 38.7	SIGMA = 39.5	MEAN/SIGMA = -.8	MEDIAN = 34.5

NORMALIZED VARIANTS

VARIANT 1	MEAN = 41.5	SIGMA = 40.9	MEAN/SIGMA = .6	MEDIAN = 37.6
VARIANT 2	MEAN = -.5	SIGMA = -5.2	MEAN/SIGMA = 4.7	MEDIAN = -.5
VARIANT 3	MEAN = -1.7	SIGMA = -6.5	MEAN/SIGMA = 4.8	MEDIAN = -1.7
VARIANT 4	MEAN = -2.7	SIGMA = -6.3	MEAN/SIGMA = 3.6	MEDIAN = -2.7
VARIANT 5	MEAN = .9	SIGMA = -3.1	MEAN/SIGMA = 4.0	MEDIAN = .8
VARIANT 6	MEAN = .9	SIGMA = -3.2	MEAN/SIGMA = 4.2	MEDIAN = .9
VARIANT 7	MEAN = 2.9	SIGMA = -2.0	MEAN/SIGMA = 4.9	MEDIAN = 2.9
VARIANT 8	MEAN = -2.8	SIGMA = -4.5	MEAN/SIGMA = 1.7	MEDIAN = -3.3

TABLE D-II (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 2

H2RRB1

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 45.6 SIGMA = 44.6 MEAN/SIGMA = 1.0 MEDIAN = 44.8
VARIANT 2 MEAN = 44.7 SIGMA = 43.7 MEAN/SIGMA = 1.1 MEDIAN = 43.5
VARIANT 3 MEAN = 43.5 SIGMA = 42.4 MEAN/SIGMA = 1.1 MEDIAN = 42.7
VARIANT 4 MEAN = 42.8 SIGMA = 42.3 MEAN/SIGMA = .5 MEDIAN = 41.1
VARIANT 5 MEAN = 46.3 SIGMA = 45.5 MEAN/SIGMA = .7 MEDIAN = 45.2
VARIANT 6 MEAN = 46.1 SIGMA = 45.0 MEAN/SIGMA = 1.1 MEDIAN = 44.8
VARIANT 7 MEAN = 48.1 SIGMA = 46.9 MEAN/SIGMA = 1.2 MEDIAN = 47.0
VARIANT 8 MEAN = 42.4 SIGMA = 43.0 MEAN/SIGMA = -.6 MEDIAN = 41.0

NORMALIZED VARIANTS

VARIANT 1 MEAN = 45.6 SIGMA = 44.6 MEAN/SIGMA = 1.0 MEDIAN = 44.8
VARIANT 2 MEAN = -.8 SIGMA = -4.8 MEAN/SIGMA = 4.0 MEDIAN = -1.3
VARIANT 3 MEAN = -2.0 SIGMA = -6.1 MEAN/SIGMA = 4.1 MEDIAN = -2.5
VARIANT 4 MEAN = -2.8 SIGMA = -5.5 MEAN/SIGMA = 2.7 MEDIAN = -3.0
VARIANT 5 MEAN = .7 SIGMA = -2.4 MEAN/SIGMA = 3.1 MEDIAN = -.0
VARIANT 6 MEAN = .6 SIGMA = -3.3 MEAN/SIGMA = 3.9 MEDIAN = .4
VARIANT 7 MEAN = 2.6 SIGMA = -1.6 MEAN/SIGMA = 4.2 MEDIAN = 2.3
VARIANT 8 MEAN = -3.2 SIGMA = -4.5 MEAN/SIGMA = 1.3 MEDIAN = -3.4

H2TREE1

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 47.2 SIGMA = 40.0 MEAN/SIGMA = 7.2 MEDIAN = 47.1
VARIANT 2 MEAN = 46.3 SIGMA = 42.2 MEAN/SIGMA = 4.0 MEDIAN = 45.9
VARIANT 3 MEAN = 45.0 SIGMA = 40.9 MEAN/SIGMA = 4.1 MEDIAN = 44.9
VARIANT 4 MEAN = 44.2 SIGMA = 41.1 MEAN/SIGMA = 3.1 MEDIAN = 44.1
VARIANT 5 MEAN = 47.8 SIGMA = 44.4 MEAN/SIGMA = 3.4 MEDIAN = 47.8
VARIANT 6 MEAN = 47.5 SIGMA = 43.9 MEAN/SIGMA = 3.6 MEDIAN = 47.3
VARIANT 7 MEAN = 49.6 SIGMA = 45.5 MEAN/SIGMA = 4.1 MEDIAN = 49.2
VARIANT 8 MEAN = 43.9 SIGMA = 42.3 MEAN/SIGMA = 1.5 MEDIAN = 43.6

NORMALIZED VARIANTS

VARIANT 1 MEAN = 47.2 SIGMA = 40.0 MEAN/SIGMA = 7.2 MEDIAN = 47.1
VARIANT 2 MEAN = -.9 SIGMA = -5.2 MEAN/SIGMA = 4.4 MEDIAN = -.9
VARIANT 3 MEAN = -2.1 SIGMA = -6.4 MEAN/SIGMA = 4.3 MEDIAN = -2.5
VARIANT 4 MEAN = -2.9 SIGMA = -6.1 MEAN/SIGMA = 3.2 MEDIAN = -3.2
VARIANT 5 MEAN = .7 SIGMA = -2.9 MEAN/SIGMA = 3.6 MEDIAN = .8
VARIANT 6 MEAN = .4 SIGMA = -3.7 MEAN/SIGMA = 4.1 MEDIAN = .0
VARIANT 7 MEAN = 2.5 SIGMA = -2.0 MEAN/SIGMA = 4.5 MEDIAN = 2.1
VARIANT 8 MEAN = -3.1 SIGMA = -4.5 MEAN/SIGMA = 1.3 MEDIAN = -3.8

TABLE D-III

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 3

H3GRAS1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.6	SIGMA = 29.0	MEAN/SIGMA = 7.6	MEDIAN = 36.7
VARIANT 2	MEAN = 34.8	SIGMA = 30.9	MEAN/SIGMA = 3.9	MEDIAN = 34.6
VARIANT 3	MEAN = 33.6	SIGMA = 29.9	MEAN/SIGMA = 3.6	MEDIAN = 33.3
VARIANT 4	MEAN = 32.6	SIGMA = 29.8	MEAN/SIGMA = 2.7	MEDIAN = 32.0
VARIANT 5	MEAN = 36.1	SIGMA = 33.0	MEAN/SIGMA = 3.0	MEDIAN = 35.8
VARIANT 6	MEAN = 36.3	SIGMA = 32.7	MEAN/SIGMA = 3.6	MEDIAN = 36.3
VARIANT 7	MEAN = 38.2	SIGMA = 34.2	MEAN/SIGMA = 4.0	MEDIAN = 38.2
VARIANT 8	MEAN = 32.9	SIGMA = 32.5	MEAN/SIGMA = .4	MEDIAN = 30.8

NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.6	SIGMA = 29.0	MEAN/SIGMA = 7.6	MEDIAN = 36.7
VARIANT 2	MEAN = -1.8	SIGMA = -6.4	MEAN/SIGMA = 4.5	MEDIAN = -2.0
VARIANT 3	MEAN = -3.0	SIGMA = -7.4	MEAN/SIGMA = 4.3	MEDIAN = -3.2
VARIANT 4	MEAN = -4.0	SIGMA = -7.2	MEAN/SIGMA = 3.2	MEDIAN = -4.2
VARIANT 5	MEAN = -.5	SIGMA = -4.2	MEAN/SIGMA = 3.6	MEDIAN = -.7
VARIANT 6	MEAN = -.3	SIGMA = -4.4	MEAN/SIGMA = 4.1	MEDIAN = -.3
VARIANT 7	MEAN = 1.6	SIGMA = -3.1	MEAN/SIGMA = 4.7	MEDIAN = 1.4
VARIANT 8	MEAN = -3.7	SIGMA = -4.3	MEAN/SIGMA = .7	MEDIAN = -5.7

H3GRAS2

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.2	SIGMA = 29.8	MEAN/SIGMA = 9.4	MEDIAN = 39.1
VARIANT 2	MEAN = 38.5	SIGMA = 34.8	MEAN/SIGMA = 3.7	MEDIAN = 38.2
VARIANT 3	MEAN = 37.2	SIGMA = 33.5	MEAN/SIGMA = 3.6	MEDIAN = 36.7
VARIANT 4	MEAN = 36.6	SIGMA = 33.9	MEAN/SIGMA = 2.7	MEDIAN = 36.4
VARIANT 5	MEAN = 40.2	SIGMA = 37.3	MEAN/SIGMA = 2.8	MEDIAN = 39.6
VARIANT 6	MEAN = 39.6	SIGMA = 35.5	MEAN/SIGMA = 4.1	MEDIAN = 39.5
VARIANT 7	MEAN = 41.9	SIGMA = 37.9	MEAN/SIGMA = 4.1	MEDIAN = 41.8
VARIANT 8	MEAN = 35.7	SIGMA = 34.8	MEAN/SIGMA = .9	MEDIAN = 35.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.2	SIGMA = 29.8	MEAN/SIGMA = 9.4	MEDIAN = 39.1
VARIANT 2	MEAN = -.8	SIGMA = -5.0	MEAN/SIGMA = 4.2	MEDIAN = -.9
VARIANT 3	MEAN = -2.1	SIGMA = -6.2	MEAN/SIGMA = 4.2	MEDIAN = -2.5
VARIANT 4	MEAN = -2.7	SIGMA = -5.8	MEAN/SIGMA = 3.1	MEDIAN = -2.8
VARIANT 5	MEAN = .9	SIGMA = -2.3	MEAN/SIGMA = 3.2	MEDIAN = .1
VARIANT 6	MEAN = .4	SIGMA = -4.3	MEAN/SIGMA = 4.6	MEDIAN = .3
VARIANT 7	MEAN = 2.7	SIGMA = -1.9	MEAN/SIGMA = 4.6	MEDIAN = 2.5
VARIANT 8	MEAN = -3.6	SIGMA = -4.7	MEAN/SIGMA = 1.1	MEDIAN = -4.1

TABLE D-III (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 3

H3BRIDG

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 57.1 SIGMA = 60.7 MEAN/SIGMA = -3.6 MEDIAN = 52.7
VARIANT 2 MEAN = 56.1 SIGMA = 57.8 MEAN/SIGMA = -1.7 MEDIAN = 51.5
VARIANT 3 MEAN = 54.9 SIGMA = 56.5 MEAN/SIGMA = -1.6 MEDIAN = 50.3
VARIANT 4 MEAN = 52.8 SIGMA = 55.3 MEAN/SIGMA = -2.5 MEDIAN = 48.8
VARIANT 5 MEAN = 56.8 SIGMA = 59.0 MEAN/SIGMA = -2.2 MEDIAN = 52.4
VARIANT 6 MEAN = 58.0 SIGMA = 59.6 MEAN/SIGMA = -1.5 MEDIAN = 53.3
VARIANT 7 MEAN = 59.5 SIGMA = 61.3 MEAN/SIGMA = -1.8 MEDIAN = 55.1
VARIANT 8 MEAN = 53.5 SIGMA = 56.1 MEAN/SIGMA = -2.6 MEDIAN = 46.9

NORMALIZED VARIANTS

VARIANT 1 MEAN = 57.1 SIGMA = 60.7 MEAN/SIGMA = -3.6 MEDIAN = 52.7
VARIANT 2 MEAN = .6 SIGMA = -4.4 MEAN/SIGMA = 5.0 MEDIAN = .7
VARIANT 3 MEAN = -.7 SIGMA = -5.7 MEAN/SIGMA = 5.1 MEDIAN = -.5
VARIANT 4 MEAN = -2.4 SIGMA = -6.2 MEAN/SIGMA = 3.8 MEDIAN = -2.4
VARIANT 5 MEAN = 1.4 SIGMA = -2.9 MEAN/SIGMA = 4.3 MEDIAN = 1.4
VARIANT 6 MEAN = 2.5 SIGMA = -2.0 MEAN/SIGMA = 4.4 MEDIAN = 2.5
VARIANT 7 MEAN = 3.9 SIGMA = -1.4 MEAN/SIGMA = 5.2 MEDIAN = 4.0
VARIANT 8 MEAN = -2.5 SIGMA = -3.1 MEAN/SIGMA = .6 MEDIAN = -4.2

H3CLUT

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 54.6 SIGMA = 59.4 MEAN/SIGMA = -4.8 MEDIAN = 47.2
VARIANT 2 MEAN = 53.8 SIGMA = 56.7 MEAN/SIGMA = -2.9 MEDIAN = 47.7
VARIANT 3 MEAN = 52.5 SIGMA = 55.4 MEAN/SIGMA = -2.9 MEDIAN = 46.4
VARIANT 4 MEAN = 50.6 SIGMA = 54.1 MEAN/SIGMA = -3.5 MEDIAN = 45.5
VARIANT 5 MEAN = 54.6 SIGMA = 57.9 MEAN/SIGMA = -3.3 MEDIAN = 48.8
VARIANT 6 MEAN = 55.7 SIGMA = 58.5 MEAN/SIGMA = -2.8 MEDIAN = 49.4
VARIANT 7 MEAN = 57.2 SIGMA = 60.2 MEAN/SIGMA = -3.0 MEDIAN = 51.3
VARIANT 8 MEAN = 51.1 SIGMA = 54.9 MEAN/SIGMA = -3.8 MEDIAN = 44.0

NORMALIZED VARIANTS

VARIANT 1 MEAN = 54.6 SIGMA = 59.4 MEAN/SIGMA = -4.8 MEDIAN = 47.2
VARIANT 2 MEAN = .6 SIGMA = -4.7 MEAN/SIGMA = 5.3 MEDIAN = .7
VARIANT 3 MEAN = -.6 SIGMA = -5.9 MEAN/SIGMA = 5.3 MEDIAN = -.5
VARIANT 4 MEAN = -2.3 SIGMA = -5.8 MEAN/SIGMA = 3.5 MEDIAN = -2.4
VARIANT 5 MEAN = 1.6 SIGMA = -2.7 MEAN/SIGMA = 4.2 MEDIAN = 1.4
VARIANT 6 MEAN = 2.4 SIGMA = -2.3 MEAN/SIGMA = 4.8 MEDIAN = 2.4
VARIANT 7 MEAN = 3.9 SIGMA = -1.6 MEAN/SIGMA = 5.6 MEDIAN = 4.0
VARIANT 8 MEAN = -2.7 SIGMA = -3.6 MEAN/SIGMA = .9 MEDIAN = -3.7

TABLE D-III (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 3

H3NAT

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 47.3	SIGMA = 47.6	MEAN/SIGMA = -.2	MEDIAN = 46.3
VARIANT 2	MEAN = 46.9	SIGMA = 47.4	MEAN/SIGMA = -.5	MEDIAN = 42.7
VARIANT 3	MEAN = 45.6	SIGMA = 46.1	MEAN/SIGMA = -.5	MEDIAN = 41.2
VARIANT 4	MEAN = 44.6	SIGMA = 45.6	MEAN/SIGMA = -.9	MEDIAN = 40.0
VARIANT 5	MEAN = 48.4	SIGMA = 49.2	MEAN/SIGMA = -.8	MEDIAN = 43.8
VARIANT 6	MEAN = 48.2	SIGMA = 48.6	MEAN/SIGMA = -.5	MEDIAN = 44.7
VARIANT 7	MEAN = 50.2	SIGMA = 50.7	MEAN/SIGMA = -.5	MEDIAN = 46.2
VARIANT 8	MEAN = 44.4	SIGMA = 46.0	MEAN/SIGMA = -1.6	MEDIAN = 38.8

NORMALIZED VARIANTS

VARIANT 1	MEAN = 47.3	SIGMA = 47.6	MEAN/SIGMA = -.2	MEDIAN = 46.3
VARIANT 2	MEAN = -.5	SIGMA = -4.9	MEAN/SIGMA = 4.4	MEDIAN = -.8
VARIANT 3	MEAN = -1.8	SIGMA = -6.2	MEAN/SIGMA = 4.4	MEDIAN = -2.0
VARIANT 4	MEAN = -2.7	SIGMA = -5.9	MEAN/SIGMA = 3.2	MEDIAN = -2.7
VARIANT 5	MEAN = 1.0	SIGMA = -2.4	MEAN/SIGMA = 3.5	MEDIAN = .7
VARIANT 6	MEAN = .8	SIGMA = -3.5	MEAN/SIGMA = 4.3	MEDIAN = .8
VARIANT 7	MEAN = 2.9	SIGMA = -1.7	MEAN/SIGMA = 4.6	MEDIAN = 2.8
VARIANT 8	MEAN = -3.2	SIGMA = -4.5	MEAN/SIGMA = 1.3	MEDIAN = -3.8

H3RRB1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 54.3	SIGMA = 54.3	MEAN/SIGMA = -.0	MEDIAN = 53.5
VARIANT 2	MEAN = 55.3	SIGMA = 55.3	MEAN/SIGMA = -.1	MEDIAN = 53.9
VARIANT 3	MEAN = 54.1	SIGMA = 54.3	MEAN/SIGMA = -.2	MEDIAN = 52.4
VARIANT 4	MEAN = 51.7	SIGMA = 51.2	MEAN/SIGMA = .5	MEDIAN = 51.2
VARIANT 5	MEAN = 55.8	SIGMA = 55.4	MEAN/SIGMA = .4	MEDIAN = 54.4
VARIANT 6	MEAN = 57.4	SIGMA = 57.8	MEAN/SIGMA = -.4	MEDIAN = 55.1
VARIANT 7	MEAN = 58.5	SIGMA = 58.5	MEAN/SIGMA = .0	MEDIAN = 57.5
VARIANT 8	MEAN = 53.7	SIGMA = 55.7	MEAN/SIGMA = -2.0	MEDIAN = 48.4

NORMALIZED VARIANTS

VARIANT 1	MEAN = 54.3	SIGMA = 54.3	MEAN/SIGMA = -.0	MEDIAN = 53.5
VARIANT 2	MEAN = 1.0	SIGMA = -5.2	MEAN/SIGMA = 6.2	MEDIAN = .9
VARIANT 3	MEAN = -.2	SIGMA = -6.6	MEAN/SIGMA = 6.4	MEDIAN = -.3
VARIANT 4	MEAN = -1.9	SIGMA = -6.9	MEAN/SIGMA = 5.0	MEDIAN = -2.0
VARIANT 5	MEAN = 1.8	SIGMA = -3.6	MEAN/SIGMA = 5.4	MEDIAN = 1.6
VARIANT 6	MEAN = 2.9	SIGMA = -2.3	MEAN/SIGMA = 5.2	MEDIAN = 2.7
VARIANT 7	MEAN = 4.2	SIGMA = -1.9	MEAN/SIGMA = 6.2	MEDIAN = 4.2
VARIANT 8	MEAN = -1.8	SIGMA = -3.0	MEAN/SIGMA = 1.2	MEDIAN = -2.0

TABLE D-III (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 3

H3HWB1

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 57.5 SIGMA = 61.4 MEAN/SIGMA = -3.9 MEDIAN = 47.8
VARIANT 2 MEAN = 55.6 SIGMA = 58.3 MEAN/SIGMA = -2.7 MEDIAN = 47.8
VARIANT 3 MEAN = 54.3 SIGMA = 57.0 MEAN/SIGMA = -2.6 MEDIAN = 46.8
VARIANT 4 MEAN = 52.7 SIGMA = 56.0 MEAN/SIGMA = -3.3 MEDIAN = 45.9
VARIANT 5 MEAN = 56.6 SIGMA = 59.7 MEAN/SIGMA = -3.1 MEDIAN = 49.3
VARIANT 6 MEAN = 57.4 SIGMA = 59.9 MEAN/SIGMA = -2.6 MEDIAN = 49.2
VARIANT 7 MEAN = 59.1 SIGMA = 61.8 MEAN/SIGMA = -2.7 MEDIAN = 51.5
VARIANT 8 MEAN = 52.0 SIGMA = 55.7 MEAN/SIGMA = -3.7 MEDIAN = 45.6

NORMALIZED VARIANTS

VARIANT 1 MEAN = 57.5 SIGMA = 61.4 MEAN/SIGMA = -3.9 MEDIAN = 47.8
VARIANT 2 MEAN = .0 SIGMA = -4.1 MEAN/SIGMA = 4.2 MEDIAN = -.1
VARIANT 3 MEAN = -1.2 SIGMA = -5.3 MEAN/SIGMA = 4.2 MEDIAN = -1.2
VARIANT 4 MEAN = -2.6 SIGMA = -5.8 MEAN/SIGMA = 3.2 MEDIAN = -2.6
VARIANT 5 MEAN = 1.1 SIGMA = -2.5 MEAN/SIGMA = 3.7 MEDIAN = 1.0
VARIANT 6 MEAN = 1.8 SIGMA = -1.9 MEAN/SIGMA = 3.6 MEDIAN = 1.6
VARIANT 7 MEAN = 3.4 SIGMA = -1.1 MEAN/SIGMA = 4.5 MEDIAN = 3.2
VARIANT 8 MEAN = -3.1 SIGMA = -3.4 MEAN/SIGMA = .3 MEDIAN = -5.1

H3MH1

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 46.8 SIGMA = 44.0 MEAN/SIGMA = 2.9 MEDIAN = 46.5
VARIANT 2 MEAN = 47.5 SIGMA = 45.4 MEAN/SIGMA = 2.1 MEDIAN = 46.3
VARIANT 3 MEAN = 46.2 SIGMA = 44.1 MEAN/SIGMA = 2.1 MEDIAN = 45.3
VARIANT 4 MEAN = 44.8 SIGMA = 43.5 MEAN/SIGMA = 1.3 MEDIAN = 42.9
VARIANT 5 MEAN = 48.7 SIGMA = 47.0 MEAN/SIGMA = 1.7 MEDIAN = 47.5
VARIANT 6 MEAN = 49.2 SIGMA = 47.1 MEAN/SIGMA = 2.0 MEDIAN = 48.7
VARIANT 7 MEAN = 50.9 SIGMA = 48.6 MEAN/SIGMA = 2.3 MEDIAN = 49.7
VARIANT 8 MEAN = 43.5 SIGMA = 42.1 MEAN/SIGMA = 1.4 MEDIAN = 42.7

NORMALIZED VARIANTS

VARIANT 1 MEAN = 46.8 SIGMA = 44.0 MEAN/SIGMA = 2.9 MEDIAN = 46.5
VARIANT 2 MEAN = .6 SIGMA = -4.9 MEAN/SIGMA = 5.6 MEDIAN = .5
VARIANT 3 MEAN = -.6 SIGMA = -6.2 MEAN/SIGMA = 5.5 MEDIAN = -.6
VARIANT 4 MEAN = -2.1 SIGMA = -5.4 MEAN/SIGMA = 3.3 MEDIAN = -2.5
VARIANT 5 MEAN = 1.8 SIGMA = -2.5 MEAN/SIGMA = 4.2 MEDIAN = 1.6
VARIANT 6 MEAN = 2.3 SIGMA = -2.9 MEAN/SIGMA = 5.2 MEDIAN = 2.3
VARIANT 7 MEAN = 4.0 SIGMA = -2.0 MEAN/SIGMA = 6.1 MEDIAN = 3.7
VARIANT 8 MEAN = -3.0 SIGMA = -4.4 MEAN/SIGMA = 1.4 MEDIAN = -3.7

TABLE D-III (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM REEDLEY SCENE 3

H3TREE1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.2	SIGMA = 48.4	MEAN/SIGMA = 1.8	MEDIAN = 49.3
VARIANT 2	MEAN = 49.7	SIGMA = 47.7	MEAN/SIGMA = 2.0	MEDIAN = 48.7
VARIANT 3	MEAN = 48.5	SIGMA = 46.7	MEAN/SIGMA = 1.7	MEDIAN = 47.5
VARIANT 4	MEAN = 47.1	SIGMA = 45.0	MEAN/SIGMA = 2.1	MEDIAN = 46.3
VARIANT 5	MEAN = 50.9	SIGMA = 48.8	MEAN/SIGMA = 2.1	MEDIAN = 50.3
VARIANT 6	MEAN = 51.3	SIGMA = 49.8	MEAN/SIGMA = 1.5	MEDIAN = 50.1
VARIANT 7	MEAN = 53.0	SIGMA = 50.9	MEAN/SIGMA = 2.1	MEDIAN = 51.9
VARIANT 8	MEAN = 46.9	SIGMA = 48.9	MEAN/SIGMA = -2.0	MEDIAN = 44.0

NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.2	SIGMA = 48.4	MEAN/SIGMA = 1.8	MEDIAN = 49.3
VARIANT 2	MEAN = -.3	SIGMA = -4.6	MEAN/SIGMA = 4.4	MEDIAN = -.3
VARIANT 3	MEAN = -1.5	SIGMA = -5.9	MEAN/SIGMA = 4.4	MEDIAN = -1.5
VARIANT 4	MEAN = -2.7	SIGMA = -6.2	MEAN/SIGMA = 3.5	MEDIAN = -2.7
VARIANT 5	MEAN = 1.1	SIGMA = -3.0	MEAN/SIGMA = 4.0	MEDIAN = .9
VARIANT 6	MEAN = 1.2	SIGMA = -2.4	MEAN/SIGMA = 3.6	MEDIAN = 1.1
VARIANT 7	MEAN = 3.1	SIGMA = -1.4	MEAN/SIGMA = 4.5	MEDIAN = 3.0
VARIANT 8	MEAN = -3.6	SIGMA = -4.0	MEAN/SIGMA = .4	MEDIAN = -5.3

H3TREE3

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.0	SIGMA = 46.9	MEAN/SIGMA = 3.1	MEDIAN = 49.6
VARIANT 2	MEAN = 49.5	SIGMA = 47.0	MEAN/SIGMA = 2.5	MEDIAN = 48.3
VARIANT 3	MEAN = 48.2	SIGMA = 45.7	MEAN/SIGMA = 2.5	MEDIAN = 47.3
VARIANT 4	MEAN = 47.3	SIGMA = 45.8	MEAN/SIGMA = 1.5	MEDIAN = 45.9
VARIANT 5	MEAN = 51.0	SIGMA = 49.2	MEAN/SIGMA = 1.8	MEDIAN = 49.8
VARIANT 6	MEAN = 50.8	SIGMA = 48.2	MEAN/SIGMA = 2.7	MEDIAN = 49.8
VARIANT 7	MEAN = 52.9	SIGMA = 50.4	MEAN/SIGMA = 2.5	MEDIAN = 51.6
VARIANT 8	MEAN = 47.1	SIGMA = 46.5	MEAN/SIGMA = .5	MEDIAN = 46.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.0	SIGMA = 46.9	MEAN/SIGMA = 3.1	MEDIAN = 49.6
VARIANT 2	MEAN = -.3	SIGMA = -4.9	MEAN/SIGMA = 4.6	MEDIAN = -.5
VARIANT 3	MEAN = -1.6	SIGMA = -6.2	MEAN/SIGMA = 4.6	MEDIAN = -1.8
VARIANT 4	MEAN = -2.7	SIGMA = -6.0	MEAN/SIGMA = 3.3	MEDIAN = -2.7
VARIANT 5	MEAN = 1.1	SIGMA = -2.6	MEAN/SIGMA = 3.7	MEDIAN = .7
VARIANT 6	MEAN = 1.1	SIGMA = -3.1	MEAN/SIGMA = 4.2	MEDIAN = 1.1
VARIANT 7	MEAN = 3.0	SIGMA = -1.6	MEAN/SIGMA = 4.7	MEDIAN = 3.0
VARIANT 8	MEAN = -2.9	SIGMA = -4.4	MEAN/SIGMA = 1.5	MEDIAN = -3.3

TABLE D-IV

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 4

H4DARK1

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 18.5 SIGMA = 25.4 MEAN/SIGMA = -6.9 MEDIAN = 10.2
VARIANT 2 MEAN = 18.3 SIGMA = 24.2 MEAN/SIGMA = -5.9 MEDIAN = 11.4
VARIANT 3 MEAN = 16.9 SIGMA = 22.8 MEAN/SIGMA = -5.9 MEDIAN = 9.9
VARIANT 4 MEAN = 16.1 SIGMA = 22.5 MEAN/SIGMA = -6.3 MEDIAN = 9.1
VARIANT 5 MEAN = 19.9 SIGMA = 26.3 MEAN/SIGMA = -6.4 MEDIAN = 12.8
VARIANT 6 MEAN = 19.5 SIGMA = 24.9 MEAN/SIGMA = -5.4 MEDIAN = 12.2
VARIANT 7 MEAN = 21.8 SIGMA = 28.0 MEAN/SIGMA = -6.2 MEDIAN = 14.7
VARIANT 8 MEAN = 13.4 SIGMA = 20.9 MEAN/SIGMA = -7.5 MEDIAN = -2.0

NORMALIZED VARIANTS

VARIANT 1 MEAN = 18.5 SIGMA = 25.4 MEAN/SIGMA = -6.9 MEDIAN = 10.2
VARIANT 2 MEAN = -.3 SIGMA = -2.6 MEAN/SIGMA = 2.3 MEDIAN = -3.1
VARIANT 3 MEAN = -1.6 SIGMA = -3.7 MEAN/SIGMA = 2.1 MEDIAN = -4.7
VARIANT 4 MEAN = -2.7 SIGMA = -5.0 MEAN/SIGMA = 2.3 MEDIAN = -4.7
VARIANT 5 MEAN = 1.0 SIGMA = -1.4 MEAN/SIGMA = 2.4 MEDIAN = -1.2
VARIANT 6 MEAN = 1.3 SIGMA = -.5 MEAN/SIGMA = 1.8 MEDIAN = -2.1
VARIANT 7 MEAN = 3.0 SIGMA = .3 MEAN/SIGMA = 2.7 MEDIAN = .7
VARIANT 8 MEAN = -5.9 SIGMA = -5.3 MEAN/SIGMA = -.6 MEDIAN = -7.5

H4DARK

UN-NORMALIZED VARIANTS

VARIANT 1 MEAN = 18.6 SIGMA = 25.8 MEAN/SIGMA = -7.2 MEDIAN = 8.1
VARIANT 2 MEAN = 17.5 SIGMA = 24.4 MEAN/SIGMA = -6.8 MEDIAN = 9.2
VARIANT 3 MEAN = 16.5 SIGMA = 23.4 MEAN/SIGMA = -6.9 MEDIAN = 8.0
VARIANT 4 MEAN = 16.1 SIGMA = 23.2 MEAN/SIGMA = -7.1 MEDIAN = 5.7
VARIANT 5 MEAN = 19.7 SIGMA = 27.0 MEAN/SIGMA = -7.3 MEDIAN = 10.9
VARIANT 6 MEAN = 17.6 SIGMA = 23.3 MEAN/SIGMA = -5.7 MEDIAN = 10.5
VARIANT 7 MEAN = 20.9 SIGMA = 27.8 MEAN/SIGMA = -6.9 MEDIAN = 12.3
VARIANT 8 MEAN = 17.1 SIGMA = 24.6 MEAN/SIGMA = -7.5 MEDIAN = -1.9

NORMALIZED VARIANTS

VARIANT 1 MEAN = 18.6 SIGMA = 25.8 MEAN/SIGMA = -7.2 MEDIAN = 8.1
VARIANT 2 MEAN = -.7 SIGMA = -2.7 MEAN/SIGMA = 2.1 MEDIAN = -1.0
VARIANT 3 MEAN = -1.9 SIGMA = -3.8 MEAN/SIGMA = 2.0 MEDIAN = -2.3
VARIANT 4 MEAN = -3.0 SIGMA = -5.1 MEAN/SIGMA = 2.1 MEDIAN = -3.8
VARIANT 5 MEAN = .5 SIGMA = -1.4 MEAN/SIGMA = 2.0 MEDIAN = -.5
VARIANT 6 MEAN = 1.0 SIGMA = -.8 MEAN/SIGMA = 1.8 MEDIAN = -.0
VARIANT 7 MEAN = 2.6 SIGMA = .1 MEAN/SIGMA = 2.4 MEDIAN = 2.4
VARIANT 8 MEAN = -4.2 SIGMA = -3.1 MEAN/SIGMA = -1.1 MEDIAN =-10.6

TABLE D-IV (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 4

H4SAND1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 25.3	SIGMA = 22.7	MEAN/SIGMA = 2.6	MEDIAN = 24.8
VARIANT 2	MEAN = 24.8	SIGMA = 23.2	MEAN/SIGMA = 1.7	MEDIAN = 23.9
VARIANT 3	MEAN = 23.6	SIGMA = 22.0	MEAN/SIGMA = 1.7	MEDIAN = 22.9
VARIANT 4	MEAN = 22.7	SIGMA = 21.6	MEAN/SIGMA = 1.1	MEDIAN = 21.7
VARIANT 5	MEAN = 26.2	SIGMA = 24.9	MEAN/SIGMA = 1.3	MEDIAN = 25.2
VARIANT 6	MEAN = 26.3	SIGMA = 24.7	MEAN/SIGMA = 1.6	MEDIAN = 25.5
VARIANT 7	MEAN = 28.2	SIGMA = 26.5	MEAN/SIGMA = 1.7	MEDIAN = 27.1
VARIANT 8	MEAN = 22.9	SIGMA = 22.8	MEAN/SIGMA = .1	MEDIAN = 20.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 25.3	SIGMA = 22.7	MEAN/SIGMA = 2.6	MEDIAN = 24.8
VARIANT 2	MEAN = -.5	SIGMA = -5.9	MEAN/SIGMA = 5.3	MEDIAN = -.5
VARIANT 3	MEAN = -1.7	SIGMA = -7.0	MEAN/SIGMA = 5.3	MEDIAN = -1.5
VARIANT 4	MEAN = -2.8	SIGMA = -6.8	MEAN/SIGMA = 4.0	MEDIAN = -2.7
VARIANT 5	MEAN = .8	SIGMA = -3.7	MEAN/SIGMA = 4.5	MEDIAN = .7
VARIANT 6	MEAN = 1.0	SIGMA = -3.6	MEAN/SIGMA = 4.6	MEDIAN = 1.0
VARIANT 7	MEAN = 2.8	SIGMA = -2.6	MEAN/SIGMA = 5.4	MEDIAN = 2.8
VARIANT 8	MEAN = -2.3	SIGMA = -3.6	MEAN/SIGMA = 1.4	MEDIAN = -3.8

H4TACT1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.2	SIGMA = 52.4	MEAN/SIGMA = -6.3	MEDIAN = 38.6
VARIANT 2	MEAN = 44.5	SIGMA = 49.0	MEAN/SIGMA = -4.5	MEDIAN = 37.8
VARIANT 3	MEAN = 43.3	SIGMA = 47.7	MEAN/SIGMA = -4.4	MEDIAN = 36.6
VARIANT 4	MEAN = 42.2	SIGMA = 46.9	MEAN/SIGMA = -4.7	MEDIAN = 35.0
VARIANT 5	MEAN = 45.6	SIGMA = 50.0	MEAN/SIGMA = -4.4	MEDIAN = 38.7
VARIANT 6	MEAN = 46.2	SIGMA = 50.9	MEAN/SIGMA = -4.6	MEDIAN = 39.4
VARIANT 7	MEAN = 47.8	SIGMA = 52.3	MEAN/SIGMA = -4.5	MEDIAN = 41.1
VARIANT 8	MEAN = 42.4	SIGMA = 48.1	MEAN/SIGMA = -5.6	MEDIAN = 34.6

NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.2	SIGMA = 52.4	MEAN/SIGMA = -6.3	MEDIAN = 38.6
VARIANT 2	MEAN = -.5	SIGMA = -4.8	MEAN/SIGMA = 4.3	MEDIAN = -.8
VARIANT 3	MEAN = -1.7	SIGMA = -6.1	MEAN/SIGMA = 4.4	MEDIAN = -2.0
VARIANT 4	MEAN = -2.7	SIGMA = -6.3	MEAN/SIGMA = 3.6	MEDIAN = -2.7
VARIANT 5	MEAN = .8	SIGMA = -3.0	MEAN/SIGMA = 3.8	MEDIAN = .3
VARIANT 6	MEAN = 1.1	SIGMA = -2.6	MEAN/SIGMA = 3.7	MEDIAN = .8
VARIANT 7	MEAN = 2.9	SIGMA = -1.6	MEAN/SIGMA = 4.4	MEDIAN = 2.7
VARIANT 8	MEAN = -3.2	SIGMA = -3.9	MEAN/SIGMA = .7	MEDIAN = -3.7

TABLE D-IV (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 4

H4TACT2

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	42.2	46.0	-3.8	36.8
2	42.2	46.5	-4.3	35.9
3	41.0	45.5	-4.5	34.7
4	39.6	43.1	-3.5	33.6
5	43.1	47.0	-3.9	37.0
6	44.1	48.6	-4.6	37.8
7	45.4	49.5	-4.1	39.3
8	40.4	47.1	-6.6	29.7

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	42.2	46.0	-3.8	36.8
2	-.4	-4.7	4.3	-.4
3	-1.7	-6.0	4.3	-1.8
4	-2.5	-6.4	3.8	-2.7
5	.9	-2.9	3.9	.3
6	1.2	-2.6	3.8	.7
7	3.0	-1.5	4.4	2.8
8	-3.6	-4.0	.4	-4.8

H4TANK1

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	40.4	43.9	-3.6	35.1
2	40.3	44.5	-4.2	34.8
3	39.2	43.5	-4.3	33.5
4	36.6	39.0	-2.3	32.2
5	40.7	44.0	-3.2	36.2
6	42.4	47.0	-4.6	36.2
7	43.6	47.7	-4.1	37.9
8	39.6	44.8	-5.2	29.3

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	40.4	43.9	-3.6	35.1
2	-.2	-4.7	4.5	-.3
3	-1.5	-5.9	4.4	-1.4
4	-2.7	-6.3	3.5	-2.9
5	.9	-2.9	3.8	.4
6	1.5	-2.5	3.9	1.4
7	3.1	-1.7	4.8	3.1
8	-2.9	-3.5	.6	-4.5

TABLE D-IV (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 4

H4TR251

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 40.3	SIGMA = 43.6	MEAN/SIGMA = -3.3	MEDIAN = 34.5
VARIANT 2	MEAN = 40.0	SIGMA = 42.9	MEAN/SIGMA = -3.0	MEDIAN = 33.4
VARIANT 3	MEAN = 38.9	SIGMA = 41.9	MEAN/SIGMA = -3.1	MEDIAN = 32.3
VARIANT 4	MEAN = 37.7	SIGMA = 40.8	MEAN/SIGMA = -3.1	MEDIAN = 31.3
VARIANT 5	MEAN = 41.2	SIGMA = 44.2	MEAN/SIGMA = -2.9	MEDIAN = 34.7
VARIANT 6	MEAN = 41.6	SIGMA = 44.7	MEAN/SIGMA = -3.1	MEDIAN = 34.9
VARIANT 7	MEAN = 43.3	SIGMA = 46.3	MEAN/SIGMA = -3.0	MEDIAN = 36.8
VARIANT 8	MEAN = 38.7	SIGMA = 42.9	MEAN/SIGMA = -4.1	MEDIAN = 31.2

NORMALIZED VARIANTS

VARIANT 1	MEAN = 40.3	SIGMA = 43.6	MEAN/SIGMA = -3.3	MEDIAN = 34.5
VARIANT 2	MEAN = -.7	SIGMA = -5.1	MEAN/SIGMA = 4.4	MEDIAN = -.5
VARIANT 3	MEAN = -1.9	SIGMA = -6.5	MEAN/SIGMA = 4.5	MEDIAN = -1.8
VARIANT 4	MEAN = -3.1	SIGMA = -6.3	MEAN/SIGMA = 3.2	MEDIAN = -3.4
VARIANT 5	MEAN = .7	SIGMA = -3.0	MEAN/SIGMA = 3.6	MEDIAN = .1
VARIANT 6	MEAN = .8	SIGMA = -3.1	MEAN/SIGMA = 3.9	MEDIAN = .5
VARIANT 7	MEAN = 2.7	SIGMA = -1.7	MEAN/SIGMA = 4.3	MEDIAN = 2.9
VARIANT 8	MEAN = -3.0	SIGMA = -4.7	MEAN/SIGMA = 1.8	MEDIAN = -3.7

TABLE D-V

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 5

H5DARK

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 21.5	SIGMA = 21.5	MEAN/SIGMA = .0	MEDIAN = 19.2
VARIANT 2	MEAN = 21.8	SIGMA = 22.6	MEAN/SIGMA = -.8	MEDIAN = 19.0
VARIANT 3	MEAN = 20.6	SIGMA = 21.3	MEAN/SIGMA = -.7	MEDIAN = 17.8
VARIANT 4	MEAN = 19.4	SIGMA = 20.7	MEAN/SIGMA = -1.2	MEDIAN = 16.2
VARIANT 5	MEAN = 23.0	SIGMA = 24.2	MEAN/SIGMA = -1.2	MEDIAN = 19.8
VARIANT 6	MEAN = 23.5	SIGMA = 24.1	MEAN/SIGMA = -.6	MEDIAN = 21.1
VARIANT 7	MEAN = 25.1	SIGMA = 25.9	MEAN/SIGMA = -.8	MEDIAN = 22.4
VARIANT 8	MEAN = 19.5	SIGMA = 20.6	MEAN/SIGMA = -1.1	MEDIAN = 16.8

NORMALIZED VARIANTS

VARIANT 1	MEAN = 21.5	SIGMA = 21.5	MEAN/SIGMA = .0	MEDIAN = 19.2
VARIANT 2	MEAN = .1	SIGMA = -4.6	MEAN/SIGMA = 4.8	MEDIAN = .0
VARIANT 3	MEAN = -1.1	SIGMA = -6.1	MEAN/SIGMA = 5.0	MEDIAN = -1.2
VARIANT 4	MEAN = -2.5	SIGMA = -6.0	MEAN/SIGMA = 3.6	MEDIAN = -2.9
VARIANT 5	MEAN = 1.2	SIGMA = -3.0	MEAN/SIGMA = 4.2	MEDIAN = 1.1
VARIANT 6	MEAN = 1.9	SIGMA = -2.4	MEAN/SIGMA = 4.4	MEDIAN = 1.7
VARIANT 7	MEAN = 3.5	SIGMA = -1.5	MEAN/SIGMA = 5.0	MEDIAN = 3.4
VARIANT 8	MEAN = -2.0	SIGMA = -4.7	MEAN/SIGMA = 2.7	MEDIAN = -2.1

H5SAND1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 23.7	SIGMA = 19.4	MEAN/SIGMA = 4.3	MEDIAN = 23.7
VARIANT 2	MEAN = 23.0	SIGMA = 21.0	MEAN/SIGMA = 2.0	MEDIAN = 22.6
VARIANT 3	MEAN = 21.9	SIGMA = 19.9	MEAN/SIGMA = 2.0	MEDIAN = 21.4
VARIANT 4	MEAN = 20.6	SIGMA = 18.6	MEAN/SIGMA = 2.0	MEDIAN = 19.7
VARIANT 5	MEAN = 24.3	SIGMA = 22.2	MEAN/SIGMA = 2.1	MEDIAN = 23.9
VARIANT 6	MEAN = 24.6	SIGMA = 23.1	MEAN/SIGMA = 1.5	MEDIAN = 23.6
VARIANT 7	MEAN = 26.3	SIGMA = 24.2	MEAN/SIGMA = 2.2	MEDIAN = 25.7
VARIANT 8	MEAN = 20.9	SIGMA = 21.1	MEAN/SIGMA = -.2	MEDIAN = 18.4

NORMALIZED VARIANTS

VARIANT 1	MEAN = 23.7	SIGMA = 19.4	MEAN/SIGMA = 4.3	MEDIAN = 23.7
VARIANT 2	MEAN = -.9	SIGMA = -4.7	MEAN/SIGMA = 3.8	MEDIAN = -1.1
VARIANT 3	MEAN = -2.1	SIGMA = -5.9	MEAN/SIGMA = 3.9	MEDIAN = -2.1
VARIANT 4	MEAN = -3.2	SIGMA = -6.5	MEAN/SIGMA = 3.3	MEDIAN = -3.5
VARIANT 5	MEAN = .5	SIGMA = -3.2	MEAN/SIGMA = 3.6	MEDIAN = .1
VARIANT 6	MEAN = .6	SIGMA = -2.5	MEAN/SIGMA = 3.1	MEDIAN = .1
VARIANT 7	MEAN = 2.4	SIGMA = -1.6	MEAN/SIGMA = 4.0	MEDIAN = 2.3
VARIANT 8	MEAN = -3.1	SIGMA = -3.9	MEAN/SIGMA = .8	MEDIAN = -4.9

TABLE D-V (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 5

H5TACT2

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.0	SIGMA = 41.0	MEAN/SIGMA = -2.0	MEDIAN = 35.9
VARIANT 2	MEAN = 38.5	SIGMA = 40.0	MEAN/SIGMA = -1.5	MEDIAN = 34.7
VARIANT 3	MEAN = 37.3	SIGMA = 38.7	MEAN/SIGMA = -1.4	MEDIAN = 33.4
VARIANT 4	MEAN = 35.8	SIGMA = 37.5	MEAN/SIGMA = -1.7	MEDIAN = 32.4
VARIANT 5	MEAN = 39.5	SIGMA = 41.2	MEAN/SIGMA = -1.7	MEDIAN = 36.2
VARIANT 6	MEAN = 40.3	SIGMA = 41.8	MEAN/SIGMA = -1.5	MEDIAN = 36.5
VARIANT 7	MEAN = 41.8	SIGMA = 43.3	MEAN/SIGMA = -1.5	MEDIAN = 38.1
VARIANT 8	MEAN = 36.8	SIGMA = 38.8	MEAN/SIGMA = -1.9	MEDIAN = 32.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.0	SIGMA = 41.0	MEAN/SIGMA = -2.0	MEDIAN = 35.9
VARIANT 2	MEAN = -.2	SIGMA = -5.1	MEAN/SIGMA = 4.8	MEDIAN = -.3
VARIANT 3	MEAN = -1.5	SIGMA = -6.4	MEAN/SIGMA = 4.9	MEDIAN = -1.5
VARIANT 4	MEAN = -2.8	SIGMA = -6.6	MEAN/SIGMA = 3.8	MEDIAN = -2.9
VARIANT 5	MEAN = .9	SIGMA = -3.8	MEAN/SIGMA = 4.7	MEDIAN = .8
VARIANT 6	MEAN = 1.5	SIGMA = -2.3	MEAN/SIGMA = 3.8	MEDIAN = 1.2
VARIANT 7	MEAN = 3.1	SIGMA = -1.9	MEAN/SIGMA = 5.0	MEDIAN = 3.0
VARIANT 8	MEAN = -2.3	SIGMA = -3.9	MEAN/SIGMA = 1.6	MEDIAN = -2.9

H5TACT3

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.1	SIGMA = 41.1	MEAN/SIGMA = -2.1	MEDIAN = 35.5
VARIANT 2	MEAN = 38.5	SIGMA = 39.9	MEAN/SIGMA = -1.4	MEDIAN = 34.3
VARIANT 3	MEAN = 37.3	SIGMA = 38.6	MEAN/SIGMA = -1.4	MEDIAN = 33.0
VARIANT 4	MEAN = 35.8	SIGMA = 37.4	MEAN/SIGMA = -1.6	MEDIAN = 31.9
VARIANT 5	MEAN = 39.5	SIGMA = 41.1	MEAN/SIGMA = -1.6	MEDIAN = 36.0
VARIANT 6	MEAN = 40.3	SIGMA = 41.7	MEAN/SIGMA = -1.5	MEDIAN = 35.7
VARIANT 7	MEAN = 41.9	SIGMA = 43.2	MEAN/SIGMA = -1.4	MEDIAN = 38.0
VARIANT 8	MEAN = 36.7	SIGMA = 38.5	MEAN/SIGMA = -1.8	MEDIAN = 33.4

NORMALIZED VARIANTS

VARIANT 1	MEAN = 39.1	SIGMA = 41.1	MEAN/SIGMA = -2.1	MEDIAN = 35.5
VARIANT 2	MEAN = -.4	SIGMA = -5.0	MEAN/SIGMA = 4.7	MEDIAN = -.5
VARIANT 3	MEAN = -1.6	SIGMA = -6.3	MEAN/SIGMA = 4.7	MEDIAN = -1.6
VARIANT 4	MEAN = -3.0	SIGMA = -6.7	MEAN/SIGMA = 3.7	MEDIAN = -2.9
VARIANT 5	MEAN = .7	SIGMA = -3.8	MEAN/SIGMA = 4.5	MEDIAN = .8
VARIANT 6	MEAN = 1.4	SIGMA = -2.4	MEAN/SIGMA = 3.8	MEDIAN = .9
VARIANT 7	MEAN = 3.0	SIGMA = -1.9	MEAN/SIGMA = 4.9	MEDIAN = 2.8
VARIANT 8	MEAN = -2.5	SIGMA = -4.0	MEAN/SIGMA = 1.5	MEDIAN = -3.5

TABLE D-V (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 5

H5TANK1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 35.4	SIGMA = 36.0	MEAN/SIGMA = -.5	MEDIAN = 33.3
VARIANT 2	MEAN = 35.3	SIGMA = 36.0	MEAN/SIGMA = -.7	MEDIAN = 32.8
VARIANT 3	MEAN = 34.0	SIGMA = 34.6	MEAN/SIGMA = -.6	MEDIAN = 31.4
VARIANT 4	MEAN = 32.6	SIGMA = 33.6	MEAN/SIGMA = -1.0	MEDIAN = 29.5
VARIANT 5	MEAN = 36.2	SIGMA = 36.8	MEAN/SIGMA = -.6	MEDIAN = 33.7
VARIANT 6	MEAN = 37.2	SIGMA = 38.1	MEAN/SIGMA = -.9	MEDIAN = 34.7
VARIANT 7	MEAN = 38.7	SIGMA = 39.5	MEAN/SIGMA = -.8	MEDIAN = 36.3
VARIANT 8	MEAN = 33.5	SIGMA = 34.9	MEAN/SIGMA = -1.4	MEDIAN = 29.7

NORMALIZED VARIANTS

VARIANT 1	MEAN = 35.4	SIGMA = 36.0	MEAN/SIGMA = -.5	MEDIAN = 33.3
VARIANT 2	MEAN = -.2	SIGMA = -6.2	MEAN/SIGMA = 6.0	MEDIAN = -.2
VARIANT 3	MEAN = -1.4	SIGMA = -7.4	MEAN/SIGMA = 6.0	MEDIAN = -1.3
VARIANT 4	MEAN = -2.7	SIGMA = -6.5	MEAN/SIGMA = 3.8	MEDIAN = -2.5
VARIANT 5	MEAN = .9	SIGMA = -4.1	MEAN/SIGMA = 5.0	MEDIAN = .9
VARIANT 6	MEAN = 1.6	SIGMA = -3.5	MEAN/SIGMA = 5.1	MEDIAN = 1.4
VARIANT 7	MEAN = 3.3	SIGMA = -3.0	MEAN/SIGMA = 6.2	MEDIAN = 3.2
VARIANT 8	MEAN = -2.1	SIGMA = -4.1	MEAN/SIGMA = 2.0	MEDIAN = -2.6

H5TANK

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 34.5	SIGMA = 35.5	MEAN/SIGMA = -1.1	MEDIAN = 31.9
VARIANT 2	MEAN = 34.3	SIGMA = 35.4	MEAN/SIGMA = -1.1	MEDIAN = 32.5
VARIANT 3	MEAN = 32.9	SIGMA = 33.9	MEAN/SIGMA = -.9	MEDIAN = 31.2
VARIANT 4	MEAN = 31.7	SIGMA = 33.1	MEAN/SIGMA = -1.4	MEDIAN = 29.3
VARIANT 5	MEAN = 35.1	SIGMA = 35.9	MEAN/SIGMA = -.7	MEDIAN = 33.3
VARIANT 6	MEAN = 36.2	SIGMA = 37.6	MEAN/SIGMA = -1.4	MEDIAN = 34.3
VARIANT 7	MEAN = 37.7	SIGMA = 38.9	MEAN/SIGMA = -1.2	MEDIAN = 36.0
VARIANT 8	MEAN = 32.0	SIGMA = 33.1	MEAN/SIGMA = -1.1	MEDIAN = 29.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 34.5	SIGMA = 35.5	MEAN/SIGMA = -1.1	MEDIAN = 31.9
VARIANT 2	MEAN = -.1	SIGMA = -6.2	MEAN/SIGMA = 6.0	MEDIAN = -.2
VARIANT 3	MEAN = -1.4	SIGMA = -7.4	MEAN/SIGMA = 6.0	MEDIAN = -1.4
VARIANT 4	MEAN = -2.6	SIGMA = -6.5	MEAN/SIGMA = 3.9	MEDIAN = -2.4
VARIANT 5	MEAN = 1.0	SIGMA = -3.9	MEAN/SIGMA = 4.9	MEDIAN = 1.0
VARIANT 6	MEAN = 1.6	SIGMA = -3.5	MEAN/SIGMA = 5.0	MEDIAN = 1.4
VARIANT 7	MEAN = 3.3	SIGMA = -3.0	MEAN/SIGMA = 6.2	MEDIAN = 3.2
VARIANT 8	MEAN = -2.3	SIGMA = -4.2	MEAN/SIGMA = 1.8	MEDIAN = -2.7

TABLE D-V (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 5

H5SAND2

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	23.9	19.7	4.1	23.7
VARIANT 2	23.2	20.9	2.3	22.9
VARIANT 3	22.0	19.8	2.2	21.7
VARIANT 4	20.8	18.8	2.0	20.3
VARIANT 5	24.5	22.4	2.1	24.0
VARIANT 6	24.7	22.9	1.9	23.9
VARIANT 7	26.5	24.2	2.4	26.2
VARIANT 8	20.8	21.1	-.2	18.4

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	23.9	19.7	4.1	23.7
VARIANT 2	-.8	-4.9	4.1	-1.0
VARIANT 3	-2.0	-6.1	4.1	-1.9
VARIANT 4	-3.1	-6.4	3.3	-3.3
VARIANT 5	.6	-3.0	3.6	.2
VARIANT 6	.8	-2.8	3.5	.5
VARIANT 7	2.6	-1.7	4.3	2.4
VARIANT 8	-3.3	-4.0	.8	-5.4

H5TACT1

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	40.6	42.3	-1.7	37.0
VARIANT 2	39.7	40.8	-1.1	36.5
VARIANT 3	38.4	39.5	-1.1	35.3
VARIANT 4	37.2	38.6	-1.4	34.2
VARIANT 5	40.9	42.4	-1.4	38.0
VARIANT 6	41.3	42.4	-1.1	38.0
VARIANT 7	43.1	44.3	-1.2	39.8
VARIANT 8	38.2	39.7	-1.5	34.8

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	40.6	42.3	-1.7	37.0
VARIANT 2	-.4	-5.1	4.7	-.7
VARIANT 3	-1.7	-6.3	4.6	-1.9
VARIANT 4	-2.8	-7.3	4.4	-3.1
VARIANT 5	.8	-4.3	5.1	.7
VARIANT 6	1.2	-2.3	3.5	.7
VARIANT 7	3.0	-1.9	4.9	2.8
VARIANT 8	-2.6	-4.1	1.5	-3.5

TABLE D-V (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 5

H5TR251

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 38.8	SIGMA = 39.3	MEAN/SIGMA = -.6	MEDIAN = 35.5
VARIANT 2	MEAN = 38.9	SIGMA = 40.0	MEAN/SIGMA = -1.2	MEDIAN = 34.6
VARIANT 3	MEAN = 37.7	SIGMA = 38.8	MEAN/SIGMA = -1.1	MEDIAN = 33.3
VARIANT 4	MEAN = 35.6	SIGMA = 36.6	MEAN/SIGMA = -1.1	MEDIAN = 32.1
VARIANT 5	MEAN = 39.4	SIGMA = 40.4	MEAN/SIGMA = -1.0	MEDIAN = 36.3
VARIANT 6	MEAN = 40.9	SIGMA = 42.3	MEAN/SIGMA = -1.4	MEDIAN = 36.5
VARIANT 7	MEAN = 42.1	SIGMA = 43.3	MEAN/SIGMA = -1.2	MEDIAN = 38.0
VARIANT 8	MEAN = 36.9	SIGMA = 38.4	MEAN/SIGMA = -1.6	MEDIAN = 32.2

NORMALIZED VARIANTS

VARIANT 1	MEAN = 38.8	SIGMA = 39.3	MEAN/SIGMA = -.6	MEDIAN = 35.5
VARIANT 2	MEAN = .0	SIGMA = -4.5	MEAN/SIGMA = 4.5	MEDIAN = .1
VARIANT 3	MEAN = -1.2	SIGMA = -5.9	MEAN/SIGMA = 4.7	MEDIAN = -1.0
VARIANT 4	MEAN = -2.8	SIGMA = -6.2	MEAN/SIGMA = 3.3	MEDIAN = -2.7
VARIANT 5	MEAN = .9	SIGMA = -3.2	MEAN/SIGMA = 4.1	MEDIAN = .9
VARIANT 6	MEAN = 1.8	SIGMA = -1.9	MEAN/SIGMA = 3.7	MEDIAN = 1.8
VARIANT 7	MEAN = 3.3	SIGMA = -1.3	MEAN/SIGMA = 4.6	MEDIAN = 3.2
VARIANT 8	MEAN = -2.1	SIGMA = -3.6	MEAN/SIGMA = 1.5	MEDIAN = -2.6

TABLE D-VI

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 6

H6TANK1

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	50.9	53.6	-2.6	45.4
2	50.4	53.1	-2.7	45.6
3	49.1	51.7	-2.7	44.3
4	47.5	49.9	-2.4	42.8
5	51.3	53.7	-2.4	46.6
6	52.2	55.2	-3.0	46.7
7	53.9	56.6	-2.7	49.0
8	47.7	51.3	-3.6	41.0

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	50.9	53.6	-2.6	45.4
2	-.4	-5.2	4.8	-.7
3	-1.7	-6.6	4.9	-1.8
4	-2.9	-7.3	[illegible]	-2.9
5	.8	-4.0	4.8	.6
6	1.3	-2.7	3.9	.8
7	3.0	-2.1	5.2	2.8
8	-3.3	-5.3	1.9	-3.4

H6TR251

UN-NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	57.1	58.6	-1.5	53.7
2	56.3	57.4	-1.2	52.5
3	55.0	56.3	-1.2	51.3
4	53.8	55.7	-1.8	50.8
5	57.4	58.8	-1.4	54.6
6	57.9	59.2	-1.2	54.3
7	59.7	61.0	-1.3	56.3
8	54.3	56.6	-2.3	48.5

NORMALIZED VARIANTS

VARIANT	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
1	57.1	58.6	-1.5	53.7
2	-.5	-4.9	4.4	-.7
3	-1.7	-6.1	4.4	-2.1
4	-2.8	-6.5	3.7	-3.2
5	.8	-2.9	3.7	.4
6	1.0	-2.8	3.9	.8
7	2.8	-1.8	4.7	2.7
8	-3.2	-3.8	.5	-4.0

TABLE D-VII

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM BARSTOW SCENE 7

H7TANK1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 53.6	SIGMA = 54.5	MEAN/SIGMA = -.9	MEDIAN = 50.5
VARIANT 2	MEAN = 52.8	SIGMA = 53.8	MEAN/SIGMA = -1.0	MEDIAN = 49.8
VARIANT 3	MEAN = 51.7	SIGMA = 52.7	MEAN/SIGMA = -1.0	MEDIAN = 48.9
VARIANT 4	MEAN = 50.5	SIGMA = 51.9	MEAN/SIGMA = -1.4	MEDIAN = 46.9
VARIANT 5	MEAN = 54.1	SIGMA = 55.0	MEAN/SIGMA = -1.0	MEDIAN = 50.2
VARIANT 6	MEAN = 54.3	SIGMA = 55.6	MEAN/SIGMA = -1.2	MEDIAN = 51.7
VARIANT 7	MEAN = 56.1	SIGMA = 57.1	MEAN/SIGMA = -1.0	MEDIAN = 53.0
VARIANT 8	MEAN = 51.6	SIGMA = 53.7	MEAN/SIGMA = -2.1	MEDIAN = 47.2

NORMALIZED VARIANTS

VARIANT 1	MEAN = 53.6	SIGMA = 54.5	MEAN/SIGMA = -.9	MEDIAN = 50.5
VARIANT 2	MEAN = -.6	SIGMA = -5.9	MEAN/SIGMA = 5.4	MEDIAN = -.6
VARIANT 3	MEAN = -1.8	SIGMA = -7.2	MEAN/SIGMA = 5.4	MEDIAN = -1.9
VARIANT 4	MEAN = -2.9	SIGMA = -6.0	MEAN/SIGMA = 3.1	MEDIAN = -3.0
VARIANT 5	MEAN = .7	SIGMA = -3.3	MEAN/SIGMA = 4.1	MEDIAN = .5
VARIANT 6	MEAN = 1.0	SIGMA = -4.2	MEAN/SIGMA = 5.2	MEDIAN = .8
VARIANT 7	MEAN = 2.8	SIGMA = -2.7	MEAN/SIGMA = 5.5	MEDIAN = 2.8
VARIANT 8	MEAN = -2.6	SIGMA = -4.3	MEAN/SIGMA = 1.7	MEDIAN = -3.8

TABLE D-VIII

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P4TR25

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.9	SIGMA = 47.0	MEAN/SIGMA = -.2	MEDIAN = 44.4
VARIANT 2	MEAN = 46.5	SIGMA = 47.2	MEAN/SIGMA = -.6	MEDIAN = 44.7
VARIANT 3	MEAN = 45.4	SIGMA = 45.9	MEAN/SIGMA = -.5	MEDIAN = 44.1
VARIANT 4	MEAN = 44.6	SIGMA = 45.6	MEAN/SIGMA = -1.0	MEDIAN = 41.9
VARIANT 5	MEAN = 48.2	SIGMA = 49.5	MEAN/SIGMA = -1.3	MEDIAN = 46.3
VARIANT 6	MEAN = 47.8	SIGMA = 47.6	MEAN/SIGMA = .2	MEDIAN = 46.2
VARIANT 7	MEAN = 49.9	SIGMA = 50.6	MEAN/SIGMA = -.7	MEDIAN = 47.6
VARIANT 8	MEAN = 45.2	SIGMA = 45.5	MEAN/SIGMA = -.3	MEDIAN = 40.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.9	SIGMA = 47.0	MEAN/SIGMA = -.2	MEDIAN = 44.4
VARIANT 2	MEAN = -.6	SIGMA = -4.4	MEAN/SIGMA = 3.9	MEDIAN = -.5
VARIANT 3	MEAN = -1.7	SIGMA = -5.8	MEAN/SIGMA = 4.1	MEDIAN = -1.4
VARIANT 4	MEAN = -2.8	SIGMA = -5.7	MEAN/SIGMA = 2.9	MEDIAN = -3.0
VARIANT 5	MEAN = .6	SIGMA = -2.8	MEAN/SIGMA = 3.5	MEDIAN = .9
VARIANT 6	MEAN = 1.1	SIGMA = -2.5	MEAN/SIGMA = 3.6	MEDIAN = .5
VARIANT 7	MEAN = 2.8	SIGMA = -1.2	MEAN/SIGMA = 4.0	MEDIAN = 2.5
VARIANT 8	MEAN = -2.3	SIGMA = -4.5	MEAN/SIGMA = 2.2	MEDIAN = -3.1

P4VAN

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 51.6	SIGMA = 55.6	MEAN/SIGMA = -3.9	MEDIAN = 43.4
VARIANT 2	MEAN = 48.9	SIGMA = 51.6	MEAN/SIGMA = -2.7	MEDIAN = 44.9
VARIANT 3	MEAN = 47.7	SIGMA = 50.3	MEAN/SIGMA = -2.6	MEDIAN = 43.4
VARIANT 4	MEAN = 46.7	SIGMA = 49.7	MEAN/SIGMA = -3.0	MEDIAN = 43.4
VARIANT 5	MEAN = 50.1	SIGMA = 52.7	MEAN/SIGMA = -2.6	MEDIAN = 46.0
VARIANT 6	MEAN = 50.7	SIGMA = 53.5	MEAN/SIGMA = -2.8	MEDIAN = 45.7
VARIANT 7	MEAN = 52.3	SIGMA = 55.0	MEAN/SIGMA = -2.7	MEDIAN = 48.2
VARIANT 8	MEAN = 48.0	SIGMA = 51.1	MEAN/SIGMA = -3.1	MEDIAN = 41.0

NORMALIZED VARIANTS

VARIANT 1	MEAN = 51.6	SIGMA = 55.6	MEAN/SIGMA = -3.9	MEDIAN = 43.4
VARIANT 2	MEAN = -.2	SIGMA = -4.4	MEAN/SIGMA = 4.2	MEDIAN = -.6
VARIANT 3	MEAN = -1.5	SIGMA = -5.8	MEAN/SIGMA = 4.3	MEDIAN = -1.9
VARIANT 4	MEAN = -2.8	SIGMA = -6.2	MEAN/SIGMA = 3.4	MEDIAN = -3.2
VARIANT 5	MEAN = .9	SIGMA = -3.6	MEAN/SIGMA = 4.4	MEDIAN = .8
VARIANT 6	MEAN = 1.6	SIGMA = -1.8	MEAN/SIGMA = 3.3	MEDIAN = 2.0
VARIANT 7	MEAN = 3.1	SIGMA = -1.2	MEAN/SIGMA = 4.4	MEDIAN = 2.6
VARIANT 8	MEAN = -2.6	SIGMA = -4.0	MEAN/SIGMA = 1.4	MEDIAN = -2.8

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P4TACT

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	47.6	52.7	-5.0	41.8
VARIANT 2	46.4	49.4	-3.0	40.9
VARIANT 3	45.2	48.1	-3.0	39.3
VARIANT 4	43.9	47.3	-3.3	38.0
VARIANT 5	47.5	50.5	-3.0	41.5
VARIANT 6	48.1	51.3	-3.2	42.1
VARIANT 7	49.7	52.8	-3.1	44.4
VARIANT 8	44.7	48.6	-3.9	36.9

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	47.6	52.7	-5.0	41.8
VARIANT 2	-.5	-4.5	4.0	-.8
VARIANT 3	-1.7	-5.8	4.1	-1.9
VARIANT 4	-2.8	-6.1	3.4	-3.0
VARIANT 5	.7	-3.0	3.7	.6
VARIANT 6	1.1	-2.3	3.4	1.0
VARIANT 7	2.8	-1.3	4.1	2.5
VARIANT 8	-3.0	-3.8	.8	-3.4

P4TANK

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	44.7	46.4	-1.8	38.1
VARIANT 2	44.9	47.1	-2.2	38.4
VARIANT 3	43.8	46.1	-2.3	37.1
VARIANT 4	40.7	41.3	.6	35.4
VARIANT 5	45.1	46.5	-1.4	38.6
VARIANT 6	47.2	49.7	-2.5	40.0
VARIANT 7	48.3	50.4	-2.1	41.9
VARIANT 8	43.7	47.3	-3.6	29.7

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	44.7	46.4	-1.8	38.1
VARIANT 2	-.2	-4.8	4.6	-.1
VARIANT 3	-1.5	-6.1	4.6	-1.3
VARIANT 4	-2.7	-6.4	3.7	-3.0
VARIANT 5	.9	-3.0	4.0	.8
VARIANT 6	1.4	-2.6	4.0	1.7
VARIANT 7	3.1	-1.6	4.7	3.3
VARIANT 8	-4.5	-4.2	-.3	-7.3

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P4CRAN

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.0	SIGMA = 46.3	MEAN/SIGMA = -.3	MEDIAN = 43.4
VARIANT 2	MEAN = 46.8	SIGMA = 48.5	MEAN/SIGMA = -1.7	MEDIAN = 43.8
VARIANT 3	MEAN = 45.5	SIGMA = 47.3	MEAN/SIGMA = -1.7	MEDIAN = 42.3
VARIANT 4	MEAN = 44.4	SIGMA = 45.2	MEAN/SIGMA = -.8	MEDIAN = 42.1
VARIANT 5	MEAN = 47.9	SIGMA = 49.1	MEAN/SIGMA = -1.2	MEDIAN = 44.9
VARIANT 6	MEAN = 48.6	SIGMA = 50.7	MEAN/SIGMA = -2.1	MEDIAN = 44.7
VARIANT 7	MEAN = 50.1	SIGMA = 51.8	MEAN/SIGMA = -1.7	MEDIAN = 46.5
VARIANT 8	MEAN = 42.1	SIGMA = 43.0	MEAN/SIGMA = -.9	MEDIAN = 39.0

NORMALIZED VARIANTS

VARIANT 1	MEAN = 46.0	SIGMA = 46.3	MEAN/SIGMA = -.3	MEDIAN = 43.4
VARIANT 2	MEAN = -.2	SIGMA = -4.1	MEAN/SIGMA = 3.9	MEDIAN = -.3
VARIANT 3	MEAN = -1.4	SIGMA = -5.2	MEAN/SIGMA = 3.8	MEDIAN = -1.0
VARIANT 4	MEAN = -2.1	SIGMA = -5.8	MEAN/SIGMA = 3.7	MEDIAN = -1.5
VARIANT 5	MEAN = 1.2	SIGMA = -2.2	MEAN/SIGMA = 3.5	MEDIAN = 1.2
VARIANT 6	MEAN = 1.3	SIGMA = -2.2	MEAN/SIGMA = 3.6	MEDIAN = 1.2
VARIANT 7	MEAN = 3.1	SIGMA = -1.0	MEAN/SIGMA = 4.2	MEDIAN = 2.9
VARIANT 8	MEAN = -3.2	SIGMA = -2.7	MEAN/SIGMA = -.5	MEDIAN = -7.0

P4JEEP

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.0	SIGMA = 36.2	MEAN/SIGMA = -.1	MEDIAN = 32.8
VARIANT 2	MEAN = 33.5	SIGMA = 32.9	MEAN/SIGMA = .6	MEDIAN = 31.7
VARIANT 3	MEAN = 32.4	SIGMA = 32.0	MEAN/SIGMA = .5	MEDIAN = 30.4
VARIANT 4	MEAN = 31.3	SIGMA = 31.5	MEAN/SIGMA = -.1	MEDIAN = 28.6
VARIANT 5	MEAN = 34.7	SIGMA = 34.2	MEAN/SIGMA = .5	MEDIAN = 33.6
VARIANT 6	MEAN = 35.1	SIGMA = 34.8	MEAN/SIGMA = .4	MEDIAN = 32.2
VARIANT 7	MEAN = 36.8	SIGMA = 36.2	MEAN/SIGMA = .6	MEDIAN = 34.7
VARIANT 8	MEAN = 33.0	SIGMA = 33.9	MEAN/SIGMA = -.8	MEDIAN = 28.2

NORMALIZED VARIANTS

VARIANT 1	MEAN = 36.0	SIGMA = 36.2	MEAN/SIGMA = -.1	MEDIAN = 32.8
VARIANT 2	MEAN = -1.9	SIGMA = -8.1	MEAN/SIGMA = 6.1	MEDIAN = -1.7
VARIANT 3	MEAN = -3.0	SIGMA = -9.2	MEAN/SIGMA = 6.2	MEDIAN = -2.8
VARIANT 4	MEAN = -3.6	SIGMA = -8.1	MEAN/SIGMA = 4.4	MEDIAN = -3.4
VARIANT 5	MEAN = -.5	SIGMA = -5.5	MEAN/SIGMA = 5.0	MEDIAN = -.4
VARIANT 6	MEAN = -.5	SIGMA = -6.0	MEAN/SIGMA = 5.5	MEDIAN = -.6
VARIANT 7	MEAN = 1.4	SIGMA = -4.5	MEAN/SIGMA = 5.9	MEDIAN = 1.7
VARIANT 8	MEAN = -2.7	SIGMA = -4.5	MEAN/SIGMA = 1.8	MEDIAN = -2.6

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P5CRAN1

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	44.9	44.6	.2	42.4
VARIANT 2	43.4	42.7	.7	41.5
VARIANT 3	42.2	41.4	.8	40.4
VARIANT 4	41.5	40.7	.8	39.3
VARIANT 5	45.1	44.6	.5	43.4
VARIANT 6	44.7	44.0	.7	43.1
VARIANT 7	46.9	46.2	.6	44.7
VARIANT 8	42.1	41.7	.4	40.2

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	44.9	44.6	.2	42.4
VARIANT 2	-1.1	-6.3	5.2	-.9
VARIANT 3	-2.3	-7.8	5.5	-2.3
VARIANT 4	-3.1	-7.7	4.6	-3.6
VARIANT 5	.5	-5.1	5.6	.6
VARIANT 6	.3	-3.8	4.2	.4
VARIANT 7	2.3	-2.8	5.1	2.4
VARIANT 8	-2.7	-5.6	2.9	-3.6

P5JEEP1

UN-NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	32.5	30.5	2.0	29.7
VARIANT 2	32.7	31.0	1.7	30.4
VARIANT 3	31.4	29.8	1.5	29.1
VARIANT 4	30.9	29.7	1.1	29.0
VARIANT 5	34.0	32.3	1.7	32.6
VARIANT 6	34.2	32.9	1.3	32.0
VARIANT 7	36.1	34.4	1.7	33.7
VARIANT 8	28.6	31.1	-2.4	25.6

NORMALIZED VARIANTS

	MEAN	SIGMA	MEAN/SIGMA	MEDIAN
VARIANT 1	32.5	30.5	2.0	29.7
VARIANT 2	.2	-5.7	5.9	.2
VARIANT 3	-1.1	-6.6	5.5	-1.2
VARIANT 4	-1.7	-6.9	5.3	-2.5
VARIANT 5	1.6	-3.0	4.6	.8
VARIANT 6	1.7	-3.4	5.1	1.8
VARIANT 7	3.7	-2.8	6.4	3.8
VARIANT 8	-5.2	-5.3	.1	-7.4

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P5TACT1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 42.7	SIGMA = 43.0	MEAN/SIGMA = -.3	MEDIAN = 41.7
VARIANT 2	MEAN = 42.0	SIGMA = 41.8	MEAN/SIGMA = .2	MEDIAN = 40.2
VARIANT 3	MEAN = 40.8	SIGMA = 40.5	MEAN/SIGMA = .3	MEDIAN = 39.0
VARIANT 4	MEAN = 39.4	SIGMA = 39.4	MEAN/SIGMA = -.1	MEDIAN = 37.7
VARIANT 5	MEAN = 43.1	SIGMA = 43.1	MEAN/SIGMA = .0	MEDIAN = 41.1
VARIANT 6	MEAN = 43.8	SIGMA = 43.7	MEAN/SIGMA = .1	MEDIAN = 41.7
VARIANT 7	MEAN = 45.4	SIGMA = 45.3	MEAN/SIGMA = .1	MEDIAN = 43.5
VARIANT 8	MEAN = 40.4	SIGMA = 40.7	MEAN/SIGMA = -.3	MEDIAN = 38.4

NORMALIZED VARIANTS

VARIANT 1	MEAN = 42.7	SIGMA = 43.0	MEAN/SIGMA = -.3	MEDIAN = 41.7
VARIANT 2	MEAN = -.4	SIGMA = -5.1	MEAN/SIGMA = 4.7	MEDIAN = -.6
VARIANT 3	MEAN = -1.7	SIGMA = -6.6	MEAN/SIGMA = 4.8	MEDIAN = -1.9
VARIANT 4	MEAN = -3.0	SIGMA = -7.3	MEAN/SIGMA = 4.3	MEDIAN = -3.0
VARIANT 5	MEAN = .7	SIGMA = -4.1	MEAN/SIGMA = 4.8	MEDIAN = .8
VARIANT 6	MEAN = 1.2	SIGMA = -2.5	MEAN/SIGMA = 3.7	MEDIAN = .8
VARIANT 7	MEAN = 2.9	SIGMA = -1.9	MEAN/SIGMA = 4.8	MEDIAN = 2.8
VARIANT 8	MEAN = -2.2	SIGMA = -5.0	MEAN/SIGMA = 2.8	MEDIAN = -2.7

P5TANK1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 38.7	SIGMA = 36.9	MEAN/SIGMA = 1.8	MEDIAN = 37.5
VARIANT 2	MEAN = 38.5	SIGMA = 36.6	MEAN/SIGMA = 1.9	MEDIAN = 37.6
VARIANT 3	MEAN = 37.3	SIGMA = 35.1	MEAN/SIGMA = 2.2	MEDIAN = 36.3
VARIANT 4	MEAN = 36.0	SIGMA = 34.7	MEAN/SIGMA = 1.2	MEDIAN = 34.7
VARIANT 5	MEAN = 39.5	SIGMA = 37.6	MEAN/SIGMA = 1.9	MEDIAN = 39.7
VARIANT 6	MEAN = 40.4	SIGMA = 38.7	MEAN/SIGMA = 1.6	MEDIAN = 38.4
VARIANT 7	MEAN = 41.9	SIGMA = 40.3	MEAN/SIGMA = 1.6	MEDIAN = 41.1
VARIANT 8	MEAN = 37.1	SIGMA = 36.1	MEAN/SIGMA = .9	MEDIAN = 35.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 38.7	SIGMA = 36.9	MEAN/SIGMA = 1.8	MEDIAN = 37.5
VARIANT 2	MEAN = -.2	SIGMA = -5.7	MEAN/SIGMA = 5.5	MEDIAN = -.5
VARIANT 3	MEAN = -1.4	SIGMA = -7.0	MEAN/SIGMA = 5.6	MEDIAN = -1.3
VARIANT 4	MEAN = -2.8	SIGMA = -7.0	MEAN/SIGMA = 4.2	MEDIAN = -2.7
VARIANT 5	MEAN = .9	SIGMA = -3.8	MEAN/SIGMA = 4.7	MEDIAN = .9
VARIANT 6	MEAN = 1.5	SIGMA = -3.5	MEAN/SIGMA = 5.0	MEDIAN = 1.1
VARIANT 7	MEAN = 3.2	SIGMA = -2.4	MEAN/SIGMA = 5.6	MEDIAN = 2.8
VARIANT 8	MEAN = -1.6	SIGMA = -3.8	MEAN/SIGMA = 2.2	MEDIAN = -2.7

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P5TR251

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 43.8	SIGMA = 42.2	MEAN/SIGMA = 1.6	MEDIAN = 43.0
VARIANT 2	MEAN = 43.5	SIGMA = 42.0	MEAN/SIGMA = 1.5	MEDIAN = 41.9
VARIANT 3	MEAN = 42.3	SIGMA = 40.6	MEAN/SIGMA = 1.7	MEDIAN = 40.9
VARIANT 4	MEAN = 40.4	SIGMA = 39.5	MEAN/SIGMA = .9	MEDIAN = 39.1
VARIANT 5	MEAN = 44.1	SIGMA = 42.7	MEAN/SIGMA = 1.5	MEDIAN = 42.1
VARIANT 6	MEAN = 45.5	SIGMA = 44.2	MEAN/SIGMA = 1.4	MEDIAN = 44.1
VARIANT 7	MEAN = 46.8	SIGMA = 45.5	MEAN/SIGMA = 1.4	MEDIAN = 45.3
VARIANT 8	MEAN = 41.5	SIGMA = 41.1	MEAN/SIGMA = .4	MEDIAN = 40.6

NORMALIZED VARIANTS

VARIANT 1	MEAN = 43.8	SIGMA = 42.2	MEAN/SIGMA = 1.6	MEDIAN = 43.0
VARIANT 2	MEAN = -.2	SIGMA = -4.1	MEAN/SIGMA = 3.9	MEDIAN = -.4
VARIANT 3	MEAN = -1.4	SIGMA = -5.5	MEAN/SIGMA = 4.1	MEDIAN = -1.8
VARIANT 4	MEAN = -3.0	SIGMA = -6.2	MEAN/SIGMA = 3.2	MEDIAN = -3.1
VARIANT 5	MEAN = .6	SIGMA = -2.9	MEAN/SIGMA = 3.5	MEDIAN = -.4
VARIANT 6	MEAN = 1.8	SIGMA = -1.9	MEAN/SIGMA = 3.7	MEDIAN = 1.1
VARIANT 7	MEAN = 3.1	SIGMA = -1.0	MEAN/SIGMA = 4.2	MEDIAN = 2.9
VARIANT 8	MEAN = -2.0	SIGMA = -5.0	MEAN/SIGMA = 3.0	MEDIAN = -2.4

P5VAN1

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 40.2	SIGMA = 38.7	MEAN/SIGMA = 1.5	MEDIAN = 38.6
VARIANT 2	MEAN = 40.2	SIGMA = 40.0	MEAN/SIGMA = .2	MEDIAN = 38.6
VARIANT 3	MEAN = 38.8	SIGMA = 38.5	MEAN/SIGMA = .3	MEDIAN = 37.1
VARIANT 4	MEAN = 37.1	SIGMA = 35.3	MEAN/SIGMA = 1.8	MEDIAN = 35.3
VARIANT 5	MEAN = 40.9	SIGMA = 39.5	MEAN/SIGMA = 1.5	MEDIAN = 39.4
VARIANT 6	MEAN = 42.1	SIGMA = 42.6	MEAN/SIGMA = -.6	MEDIAN = 38.5
VARIANT 7	MEAN = 43.5	SIGMA = 43.3	MEAN/SIGMA = .3	MEDIAN = 41.9
VARIANT 8	MEAN = 38.5	SIGMA = 38.5	MEAN/SIGMA = .0	MEDIAN = 35.3

NORMALIZED VARIANTS

VARIANT 1	MEAN = 40.2	SIGMA = 38.7	MEAN/SIGMA = 1.5	MEDIAN = 38.6
VARIANT 2	MEAN = -.4	SIGMA = -5.9	MEAN/SIGMA = 5.5	MEDIAN = -.6
VARIANT 3	MEAN = -1.8	SIGMA = -7.5	MEAN/SIGMA = 5.7	MEDIAN = -1.9
VARIANT 4	MEAN = -2.9	SIGMA = -9.4	MEAN/SIGMA = 6.6	MEDIAN = -3.1
VARIANT 5	MEAN = .9	SIGMA = -5.8	MEAN/SIGMA = 6.7	MEDIAN = .9
VARIANT 6	MEAN = 1.1	SIGMA = -2.2	MEAN/SIGMA = 3.3	MEDIAN = .1
VARIANT 7	MEAN = 3.0	SIGMA = -2.6	MEAN/SIGMA = 5.6	MEDIAN = 3.0
VARIANT 8	MEAN = -2.5	SIGMA = -6.2	MEAN/SIGMA = 3.7	MEDIAN = -3.0

TABLE D-VIII (CONTINUED)

STATISTICAL PARAMETERS FOR TARGETS SELECTED FROM THE P-FILES

P3T101

UN-NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.2	SIGMA = 48.4	MEAN/SIGMA = 1.8	MEDIAN = 49.3
VARIANT 2	MEAN = 49.7	SIGMA = 47.7	MEAN/SIGMA = 2.0	MEDIAN = 48.7
VARIANT 3	MEAN = 48.5	SIGMA = 46.7	MEAN/SIGMA = 1.7	MEDIAN = 47.5
VARIANT 4	MEAN = 47.1	SIGMA = 45.0	MEAN/SIGMA = 2.1	MEDIAN = 46.3
VARIANT 5	MEAN = 50.9	SIGMA = 48.8	MEAN/SIGMA = 2.1	MEDIAN = 50.3
VARIANT 6	MEAN = 51.3	SIGMA = 49.8	MEAN/SIGMA = 1.5	MEDIAN = 50.1
VARIANT 7	MEAN = 53.0	SIGMA = 50.9	MEAN/SIGMA = 2.1	MEDIAN = 51.9
VARIANT 8	MEAN = 46.9	SIGMA = 48.9	MEAN/SIGMA = -2.0	MEDIAN = 44.0

NORMALIZED VARIANTS

VARIANT 1	MEAN = 50.2	SIGMA = 48.4	MEAN/SIGMA = 1.8	MEDIAN = 49.3
VARIANT 2	MEAN = -.3	SIGMA = -4.6	MEAN/SIGMA = 4.4	MEDIAN = -.3
VARIANT 3	MEAN = -1.5	SIGMA = -5.9	MEAN/SIGMA = 4.4	MEDIAN = -1.5
VARIANT 4	MEAN = -2.7	SIGMA = -6.2	MEAN/SIGMA = 3.5	MEDIAN = -2.7
VARIANT 5	MEAN = 1.1	SIGMA = -3.0	MEAN/SIGMA = 4.0	MEDIAN = .9
VARIANT 6	MEAN = 1.2	SIGMA = -2.4	MEAN/SIGMA = 3.6	MEDIAN = 1.1
VARIANT 7	MEAN = 3.1	SIGMA = -1.4	MEAN/SIGMA = 4.5	MEDIAN = 3.0
VARIANT 8	MEAN = -3.6	SIGMA = -4.0	MEAN/SIGMA = .4	MEDIAN = -5.3

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