

SBM-JRA Meeting

High Pressure Cells for SANS

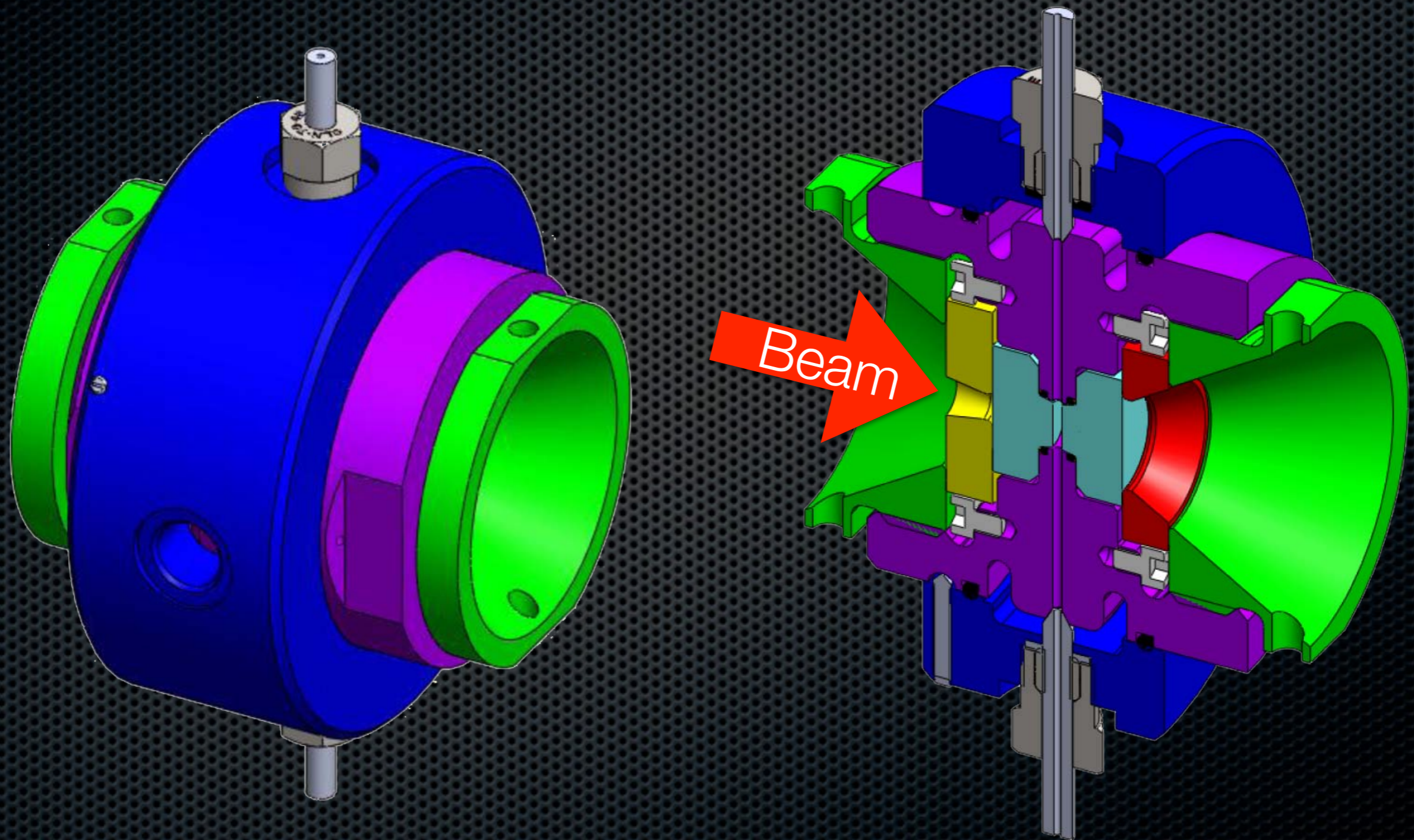
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SANS High-Pressure Cells

- ✦ 2.4 kbar cell available on D11 for old detector since the 80's, 20° total access to the scattered beam.
- ✦ 5 kbar cell developed a few years ago at PSI (apparently with Nova Swiss): 20° access, DLS, $35+2+2+35=74$ mm of sapphire in the beam.
- ✦ D11 team ordered a new cell to Nova Swiss with the aim to cover the new detector. Nova Swiss proposed a 5 kbar cell with 35° access (2x15 mm of sapphire).

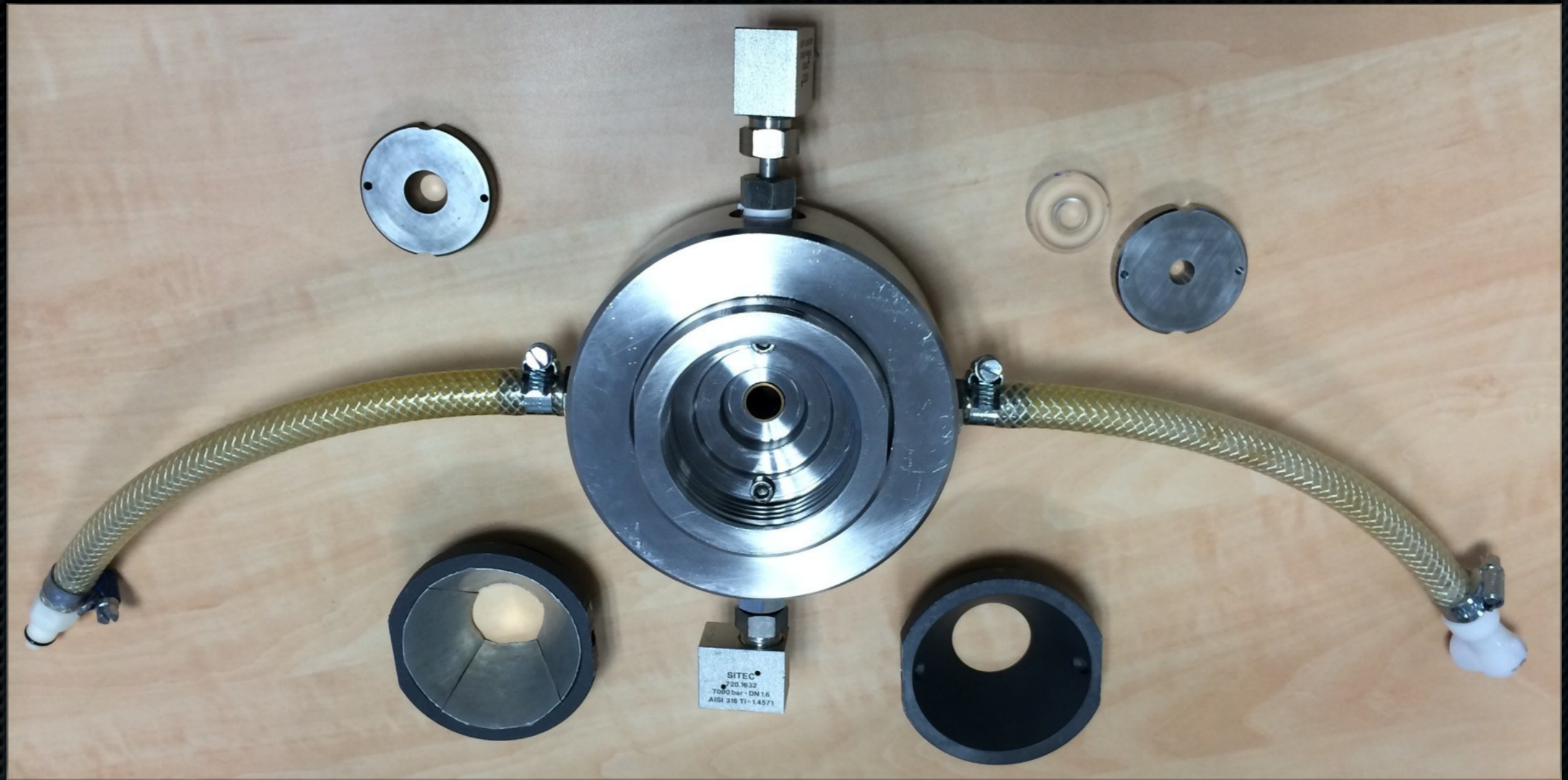
5 kbar Nova Swiss Cell





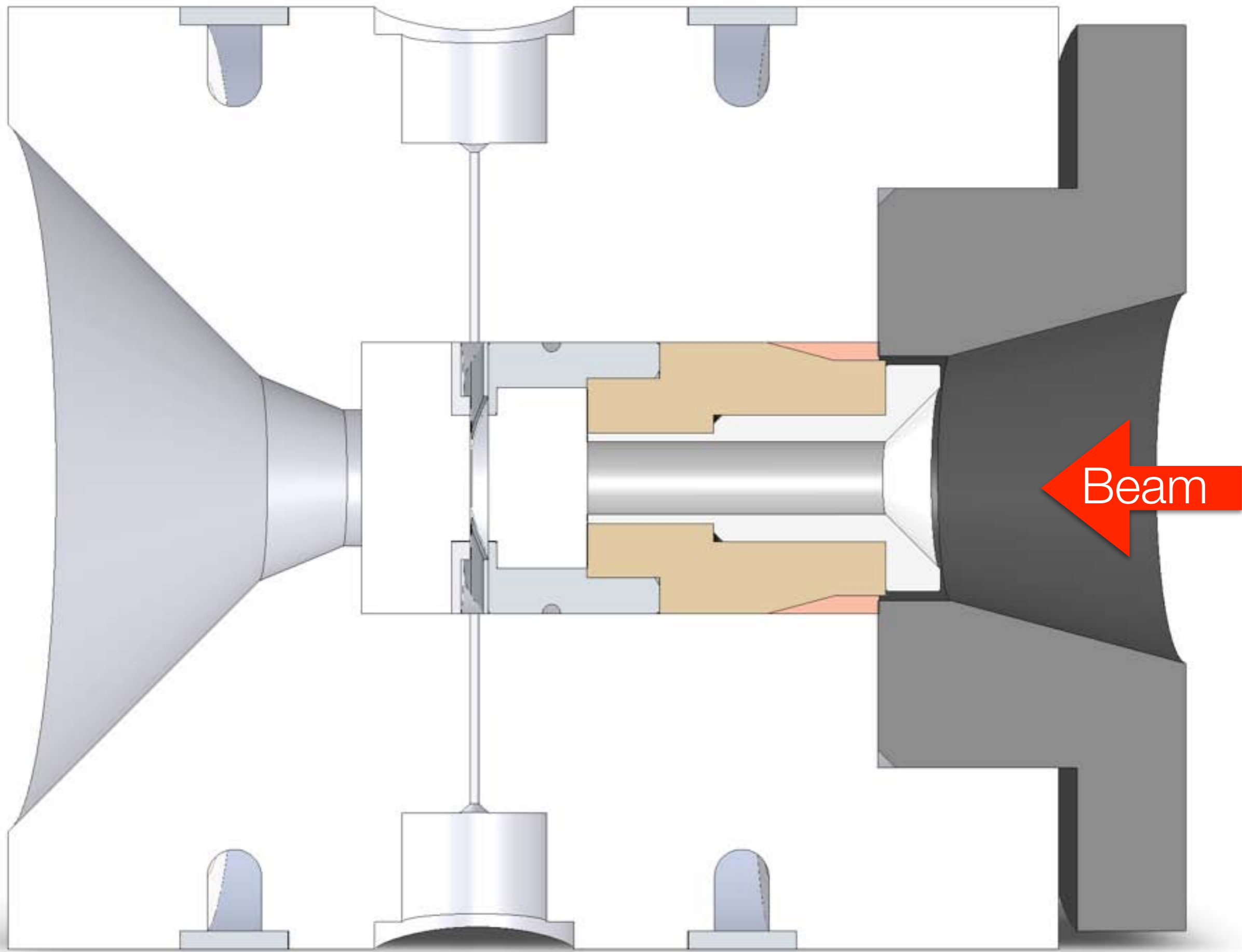
5 kbar Nova Swiss Cell

35° access (3.8 kbar @ 45°, 3.4 kbar @ 63°)



5 → 2 kbar Nova Swiss Cell

35° access (≈ 1.5 kbar @ 45°, ≈ 1.3 kbar @ 63°)

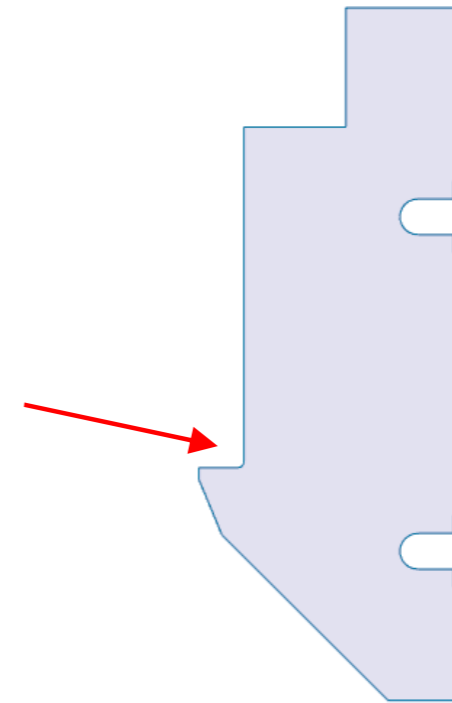


Beam





Modèle 3D



Modèle 2D axisymétrique

Fig. 1 : Modèles de la cellule optique.

Un filet de taille 1 mm est appliqué au niveau du coin intérieur de la cellule (voir flèche), et permet de réduire les effets de concentration de contraintes.

5.1.2. Propriétés des matériaux (a 100°C) :

Materiaux	APX4 QT1100	X13T6	819AW	Unités
Limite d'élasticité (a 100 °C)	1100	628	1800	Mpa
Limite de traction (a 100 °C)	815	977	1394	Mpa
Module de Young	210	201	210	Mpa
Coefficient de Poisson	0.3	0.3	0.3	-
Masse volumique	7900	7940	7900	Kg/m ³
Allongement Longitudinal	16%	25%	8%	

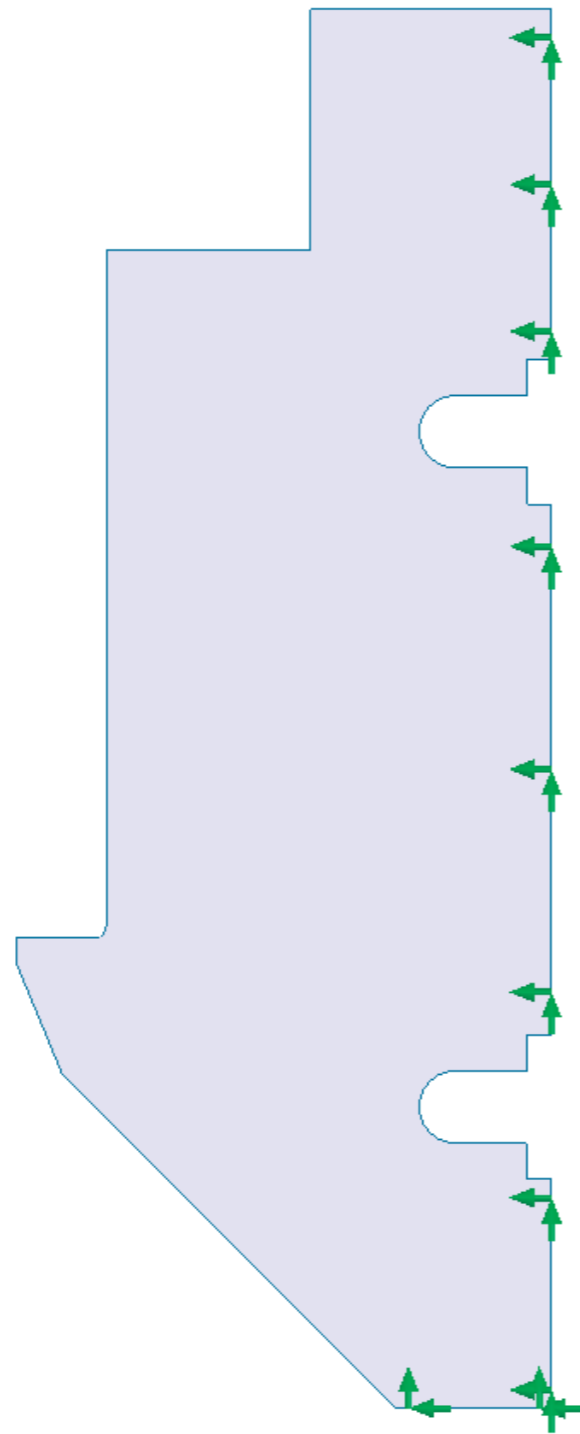


Fig. 2 : Conditions limites
(Appui plan)

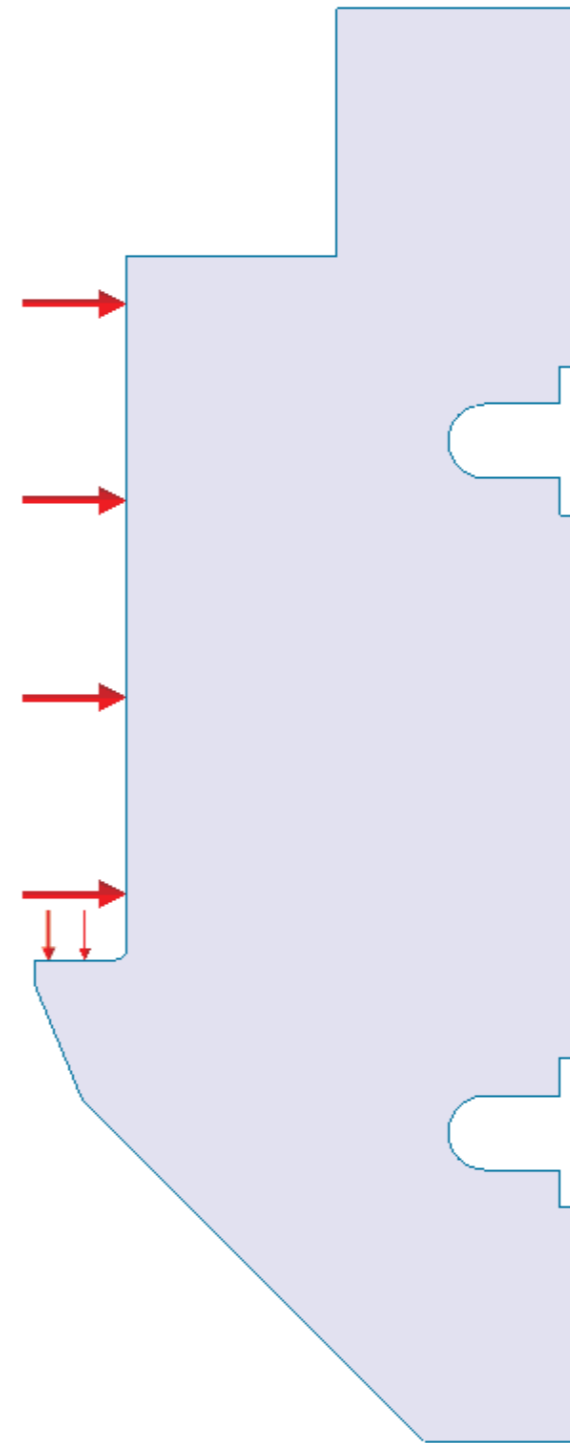


Fig. 3 : Chargement
(Pression)

Type de maillage	Maillage 2D axi symétrique
Mailleur utilisé:	Maillage basé sur la courbure (quadratique) raffiné au niveau de la paroi interne
Taille d'élément maximum	0.5 mm
Taille d'élément minimum	0.03 mm
Qualité de maillage	Haute

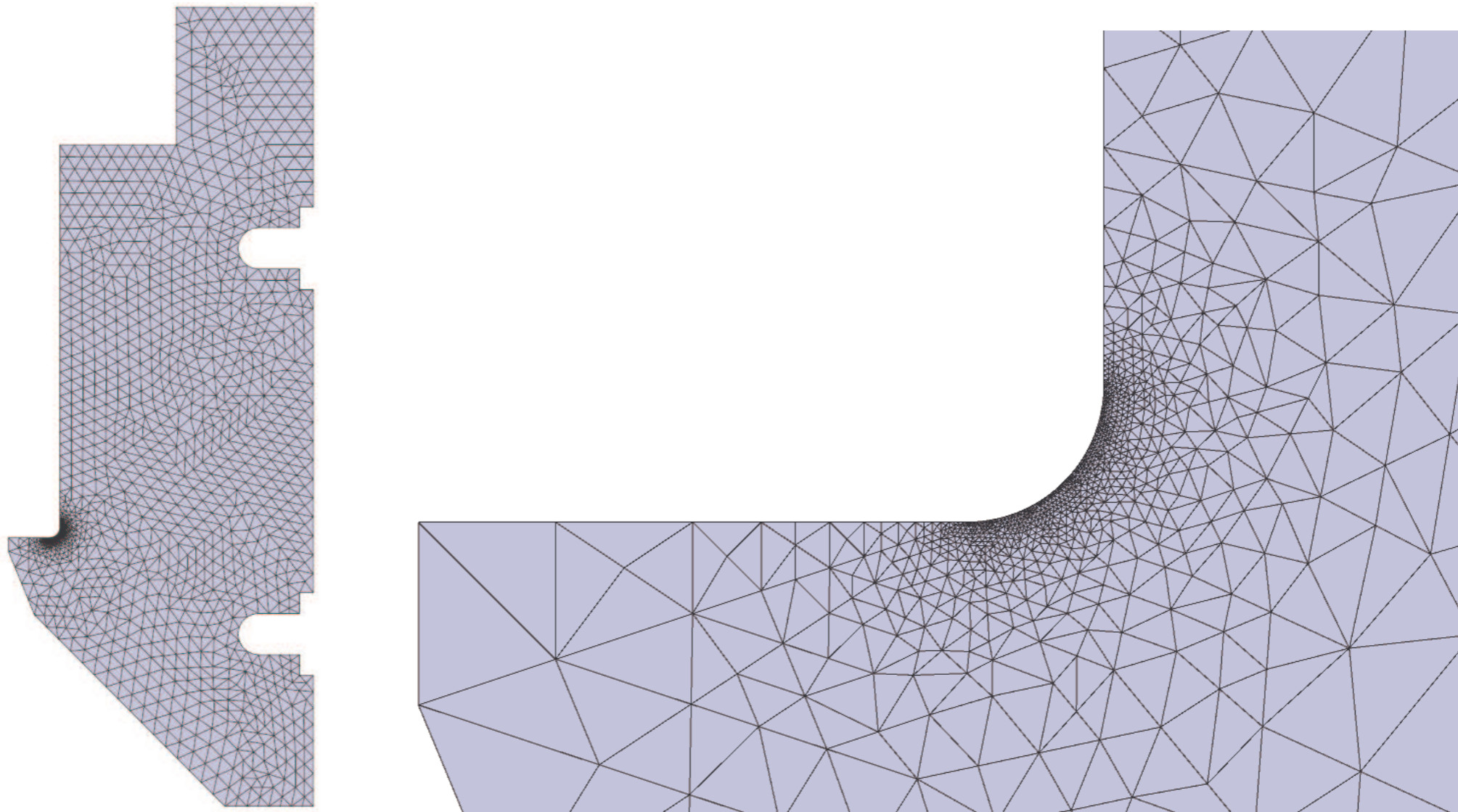


Fig. 4 : Cellule optique - Maillage 2D (Détail à droite)

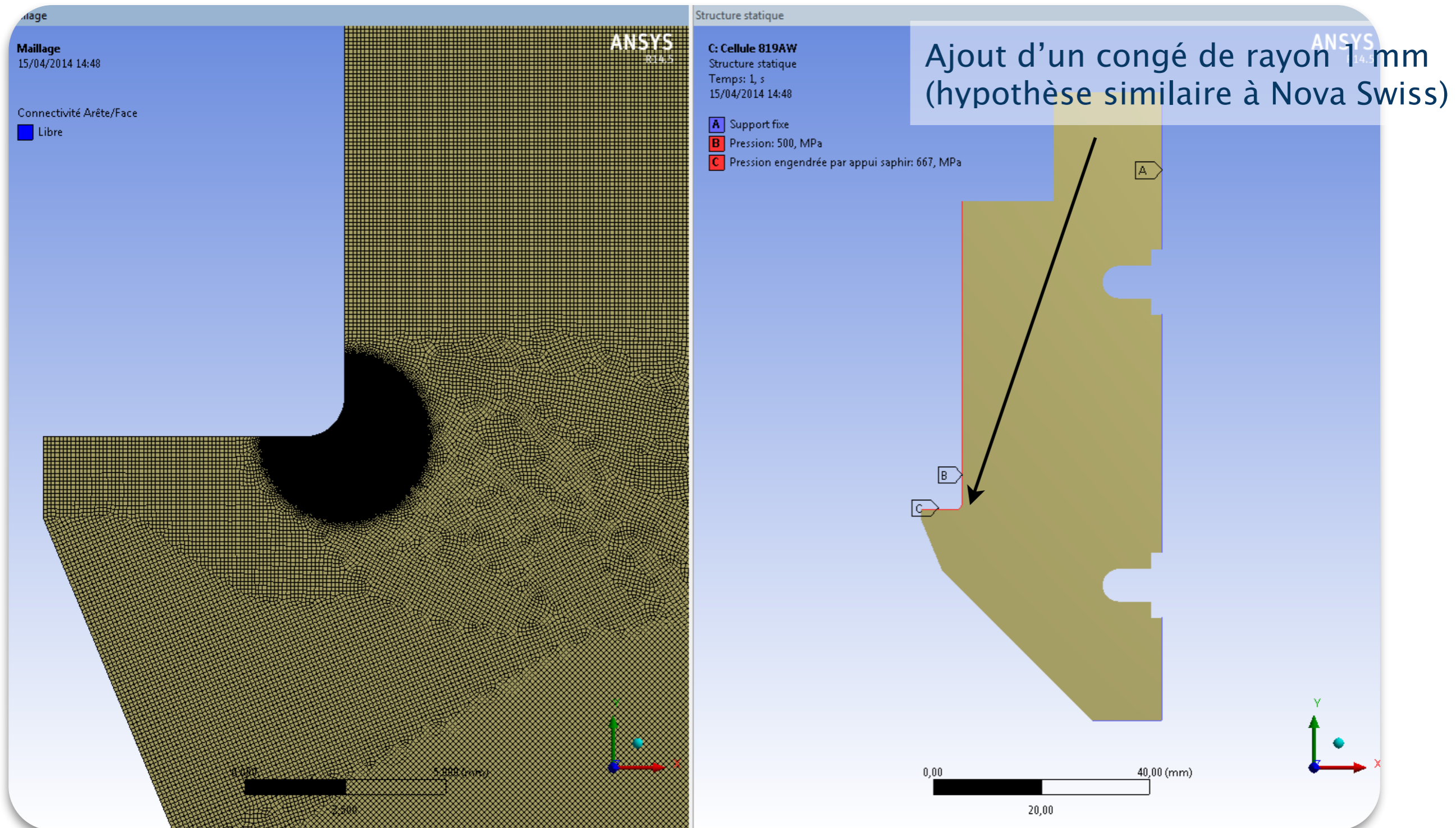


Figure A2 : Maillage (gauche) / Support et charge appliqués sur le corps de la cellule (droite)

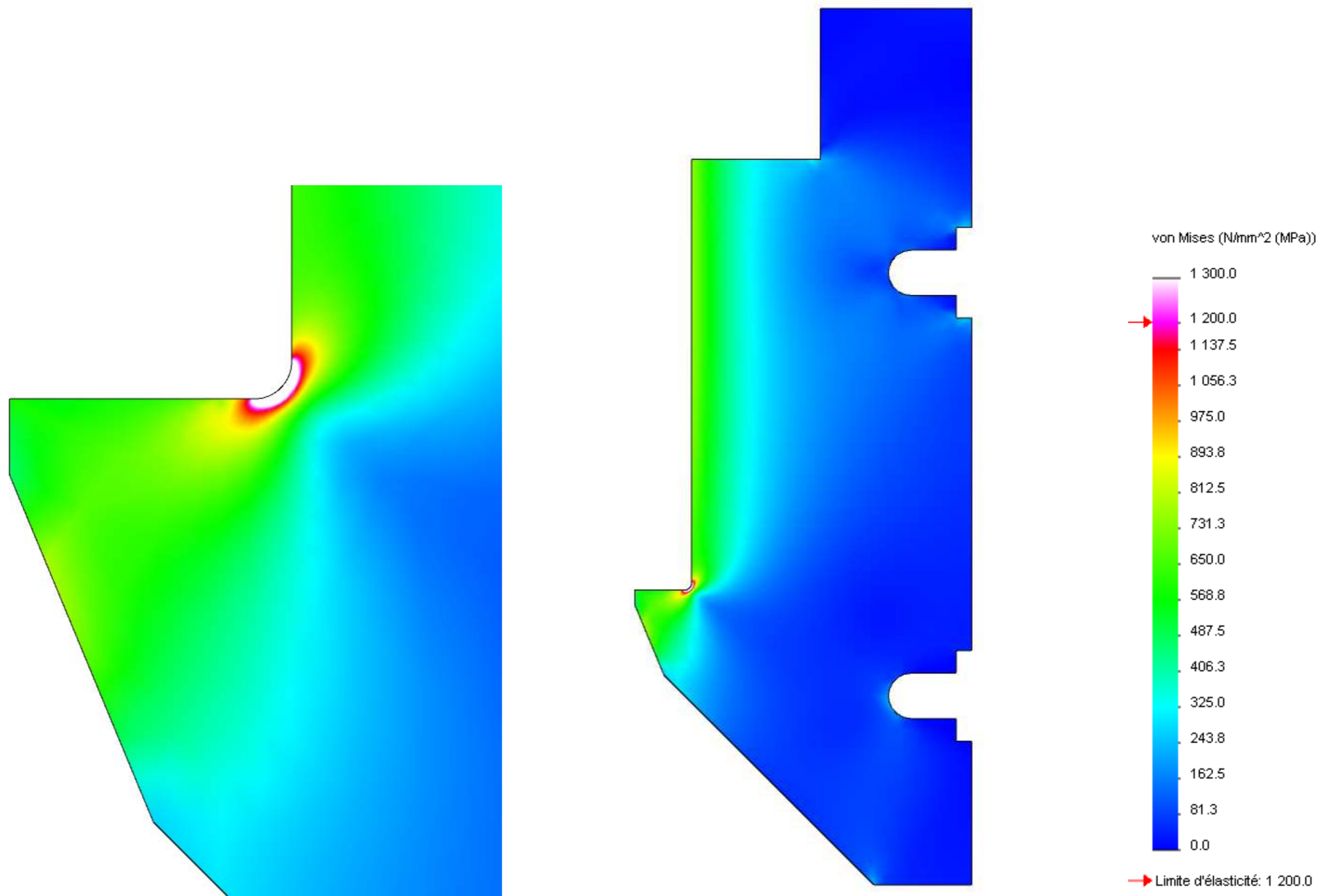


Fig. 7 : Contraintes équivalentes de Von Mises – Matériau : 819 AW (Détail à gauche)

ANSYS – 819AW – Offset Yield Strength

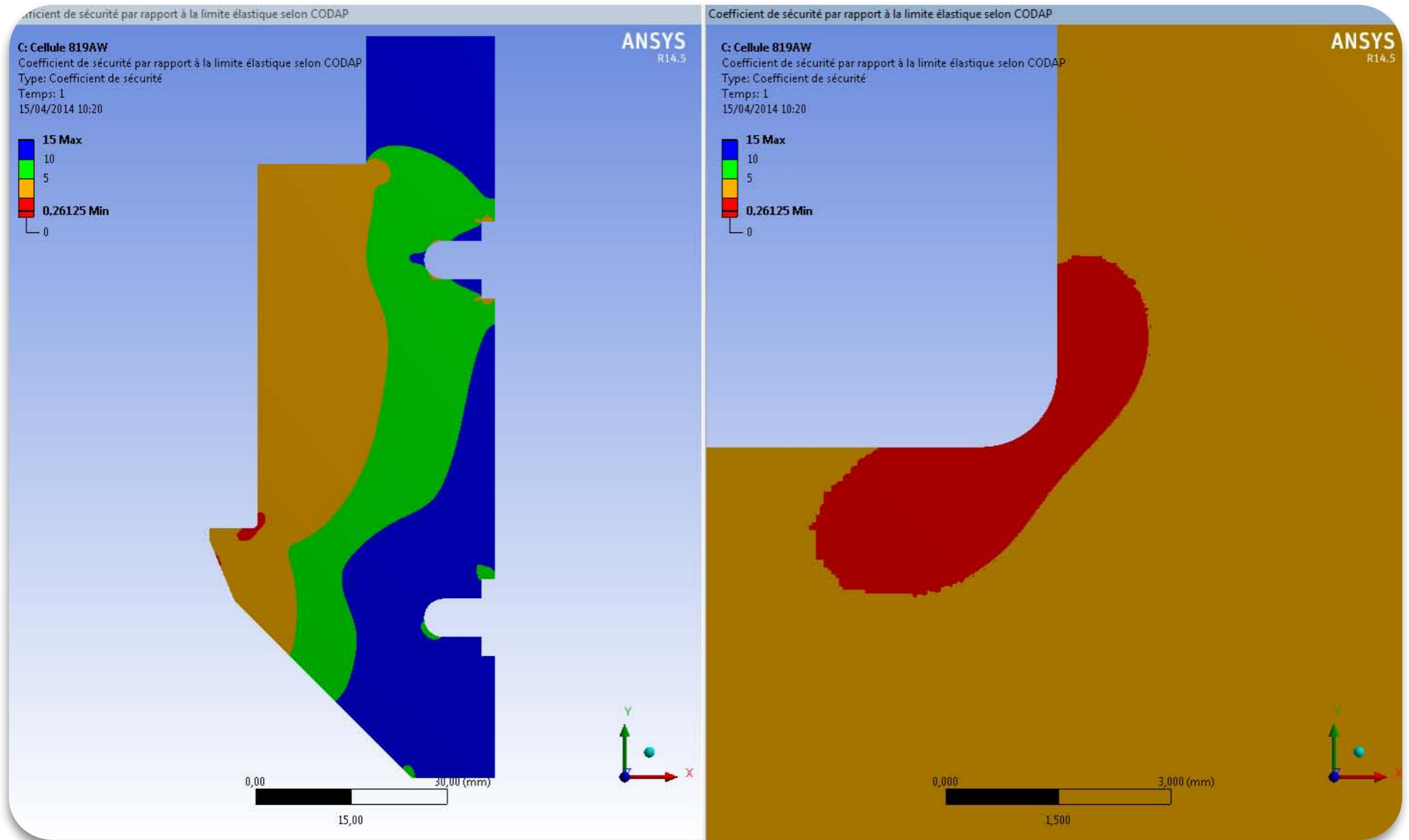


Figure B1 : Coefficient de sécurité par rapport au critère d'élasticité CODAP

ANSYS – 819AW – Ultimate TS

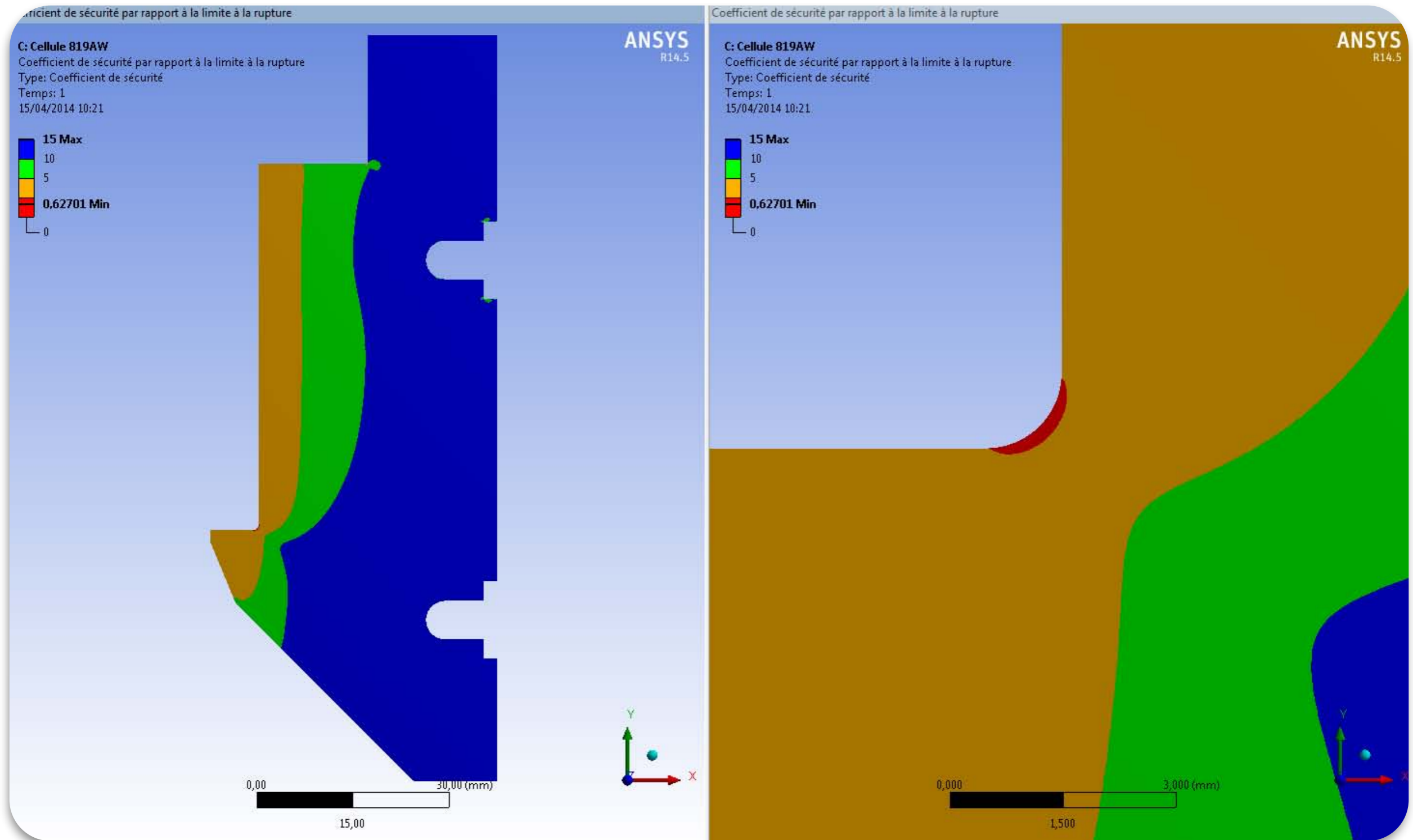


Figure B2 : Coefficient de sécurité par rapport à la limite à la rupture

ANSYS – 819AW – Total deformation

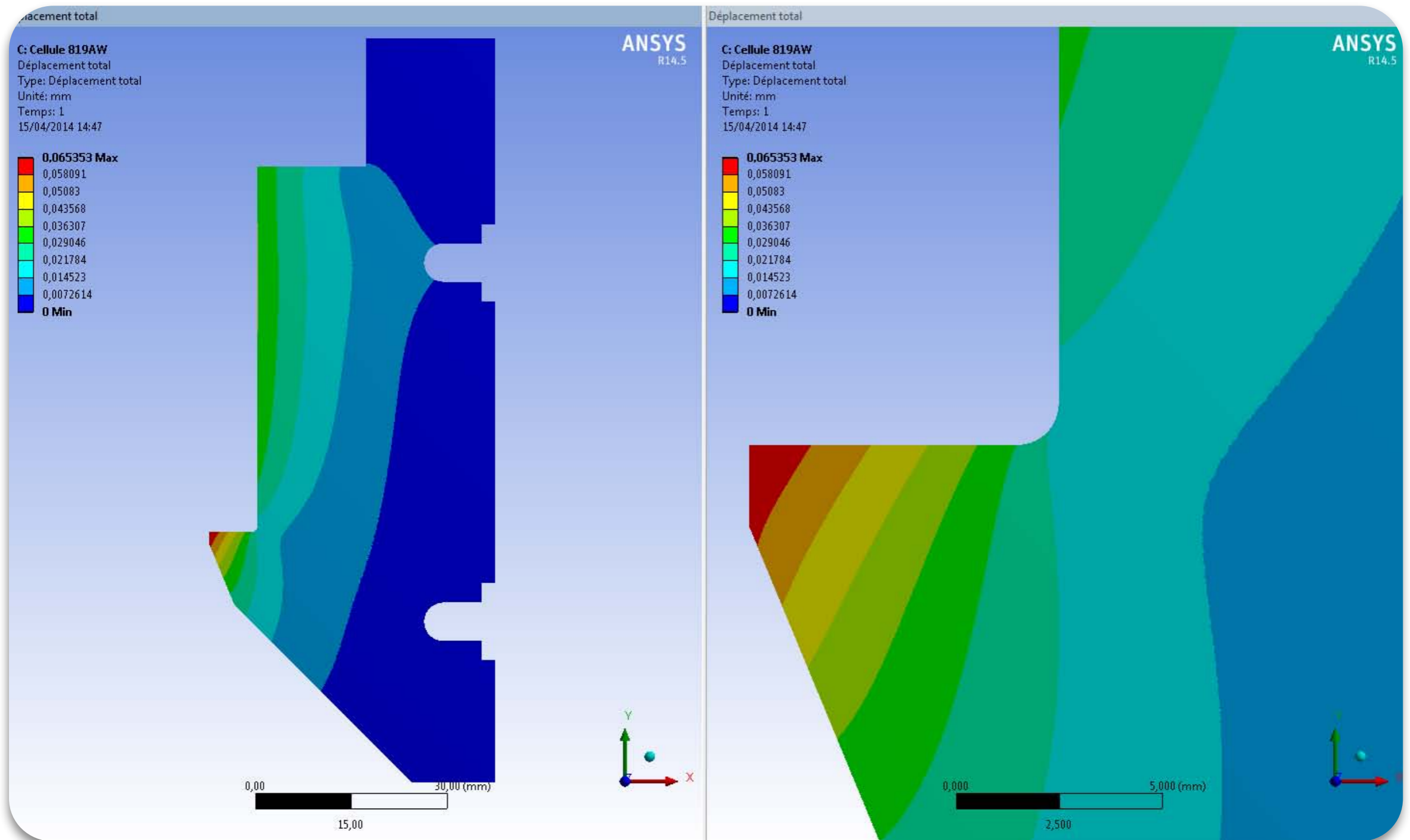


Figure C1 : Déplacement total

ANSYS – Custom 465 H1000 – OYS

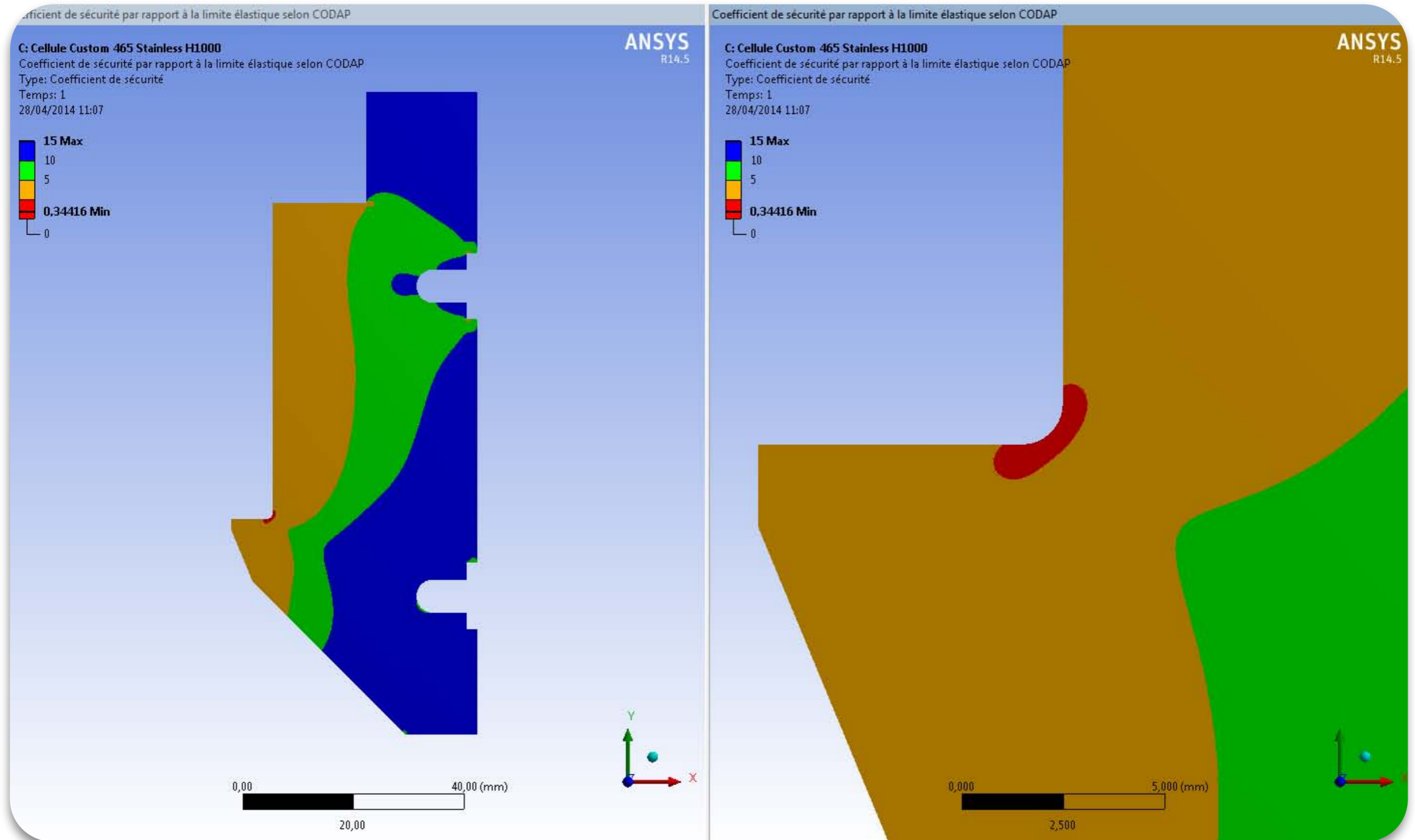


Figure B1 : Coefficient de sécurité par rapport au critère d'élasticité CODAP

ANSYS – Custom 465 H1000 – UTS

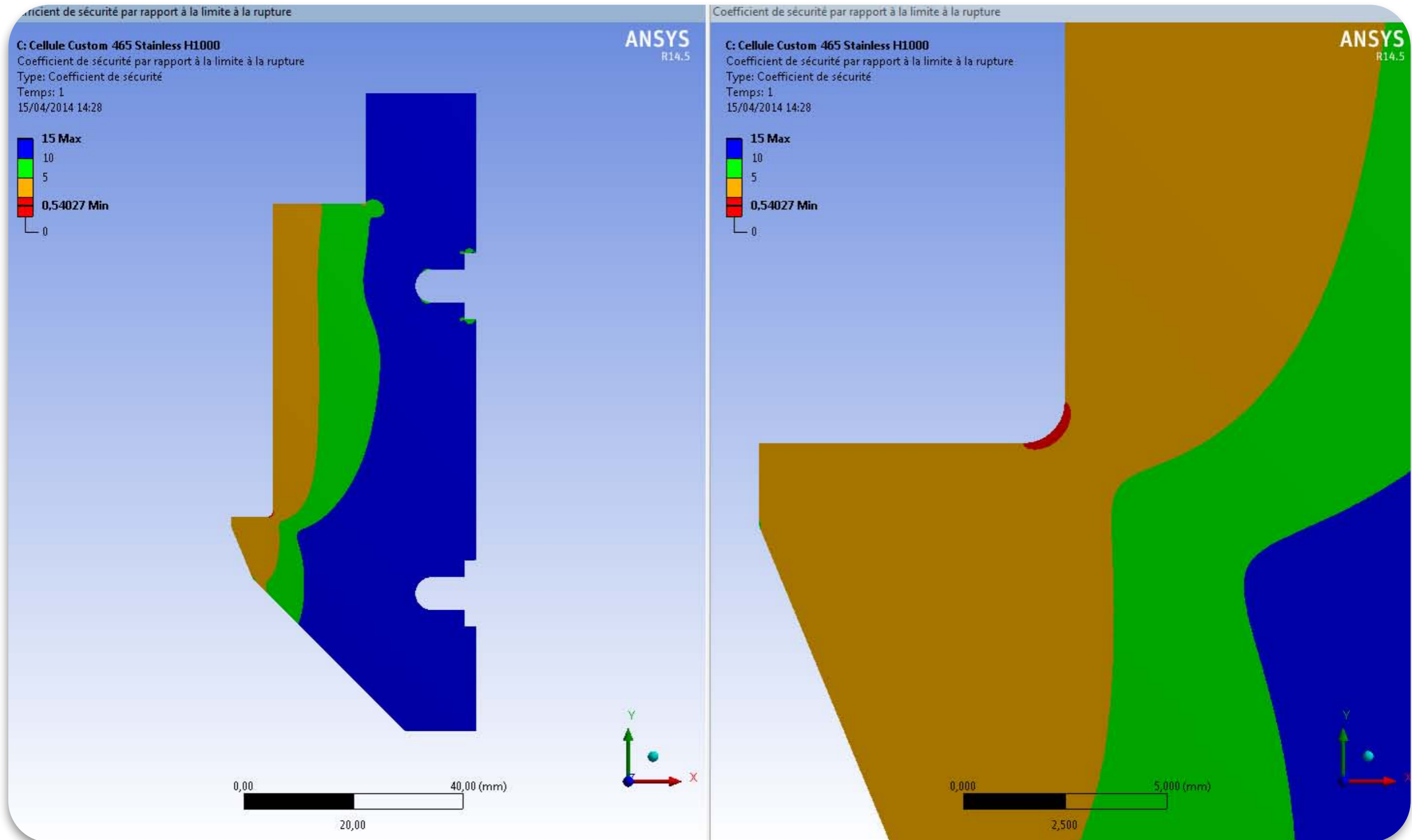
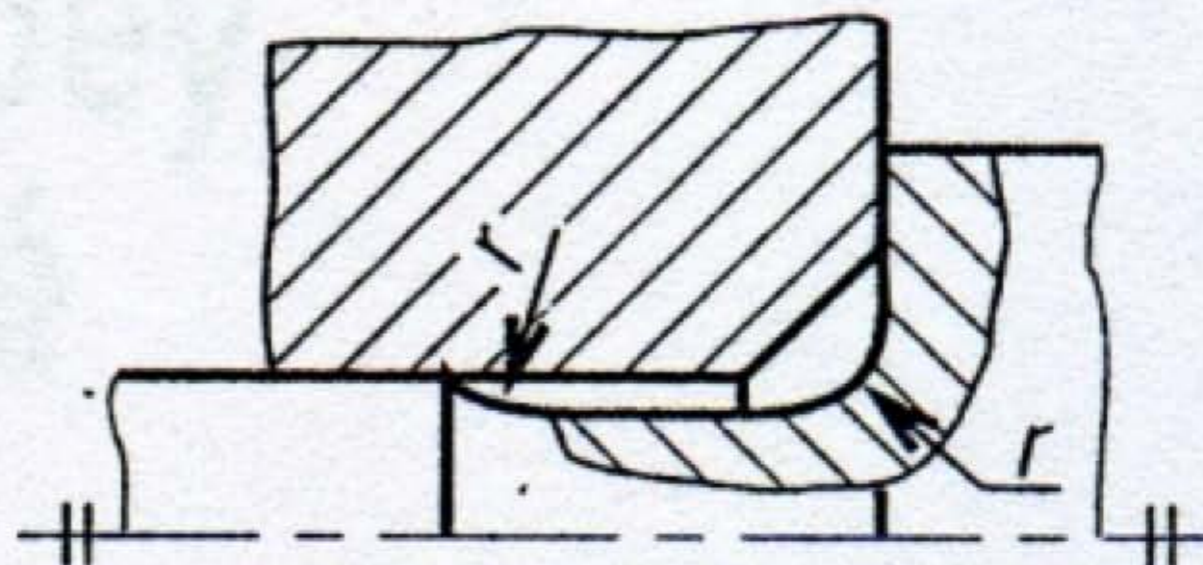
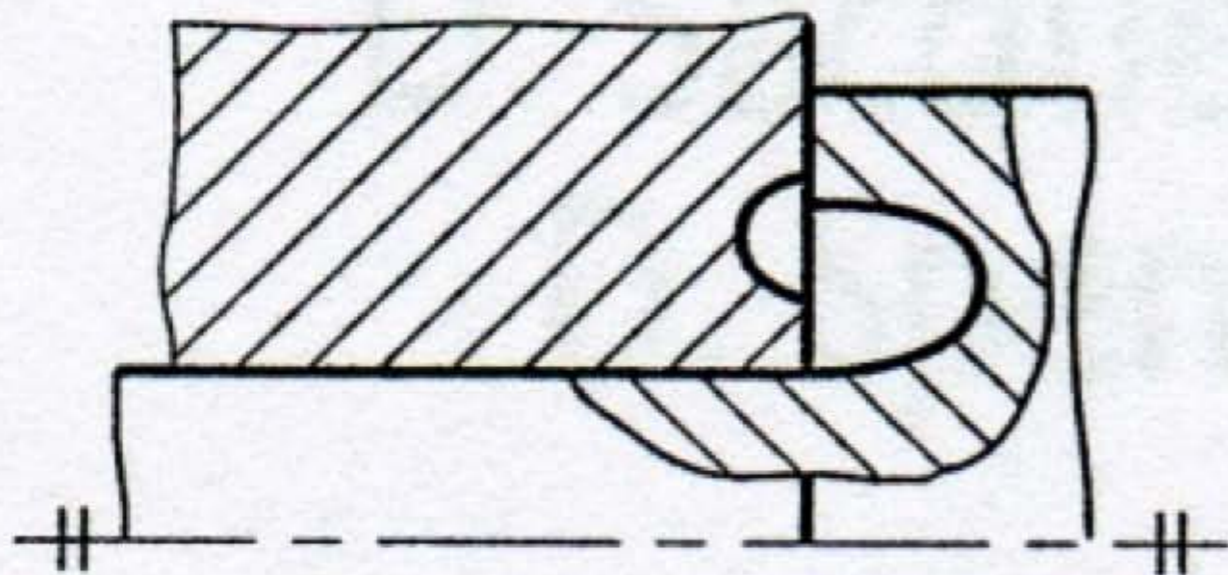
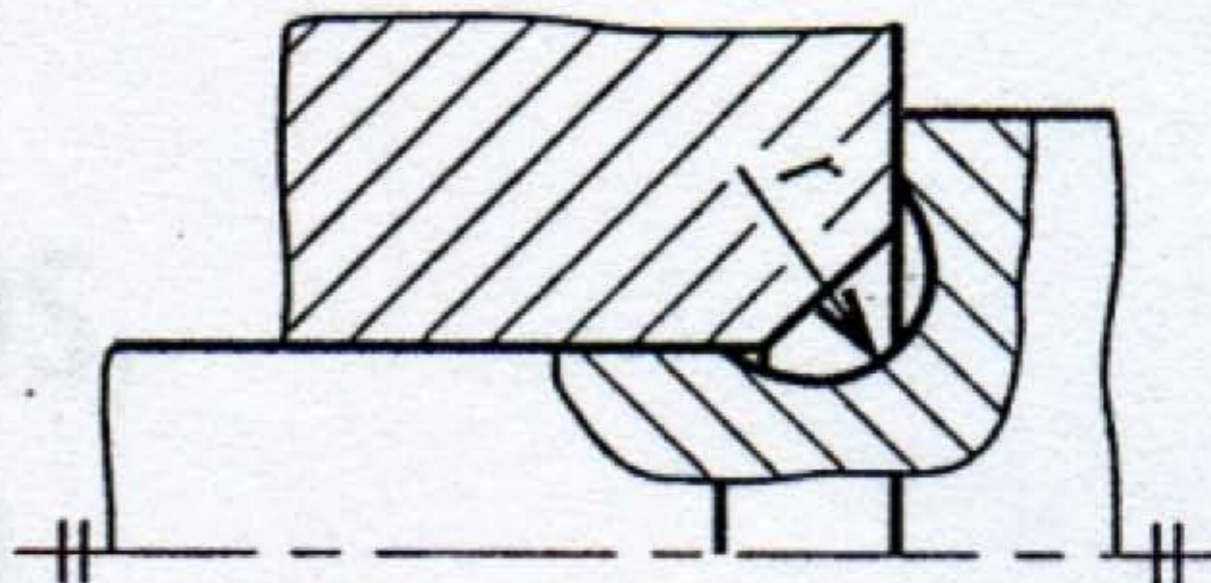
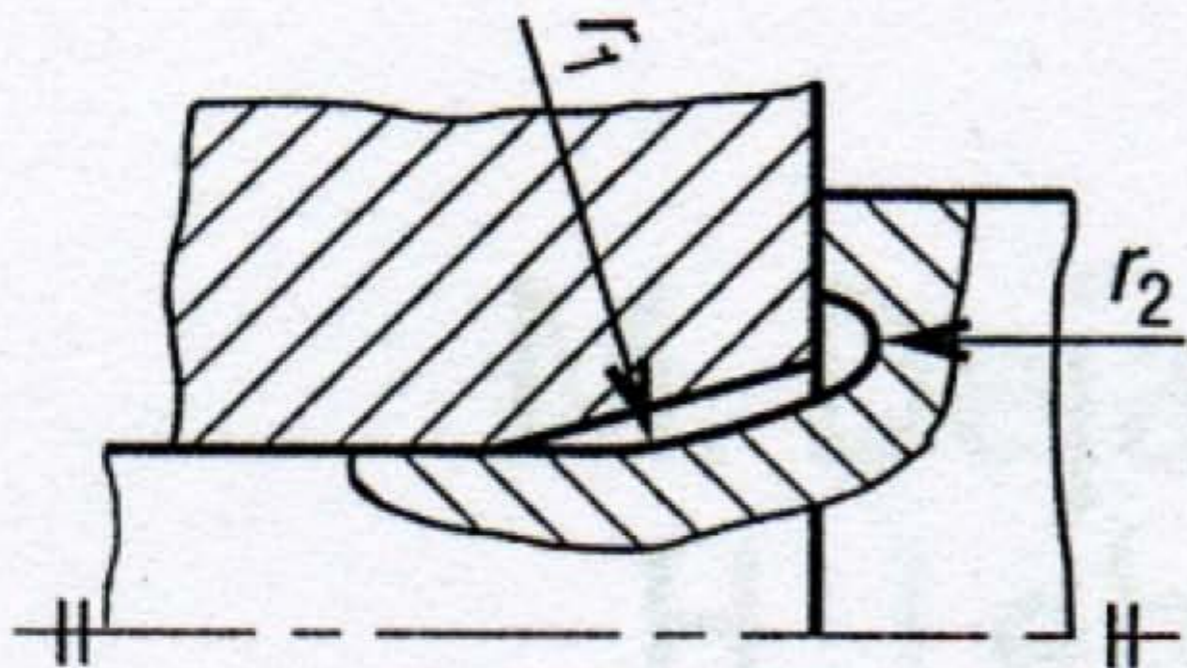


Figure B2 : Coefficient de sécurité par rapport à la limite à la rupture

Special solutions for stepped shafts



ANSYS – Custom 465 H1000 – Deformation

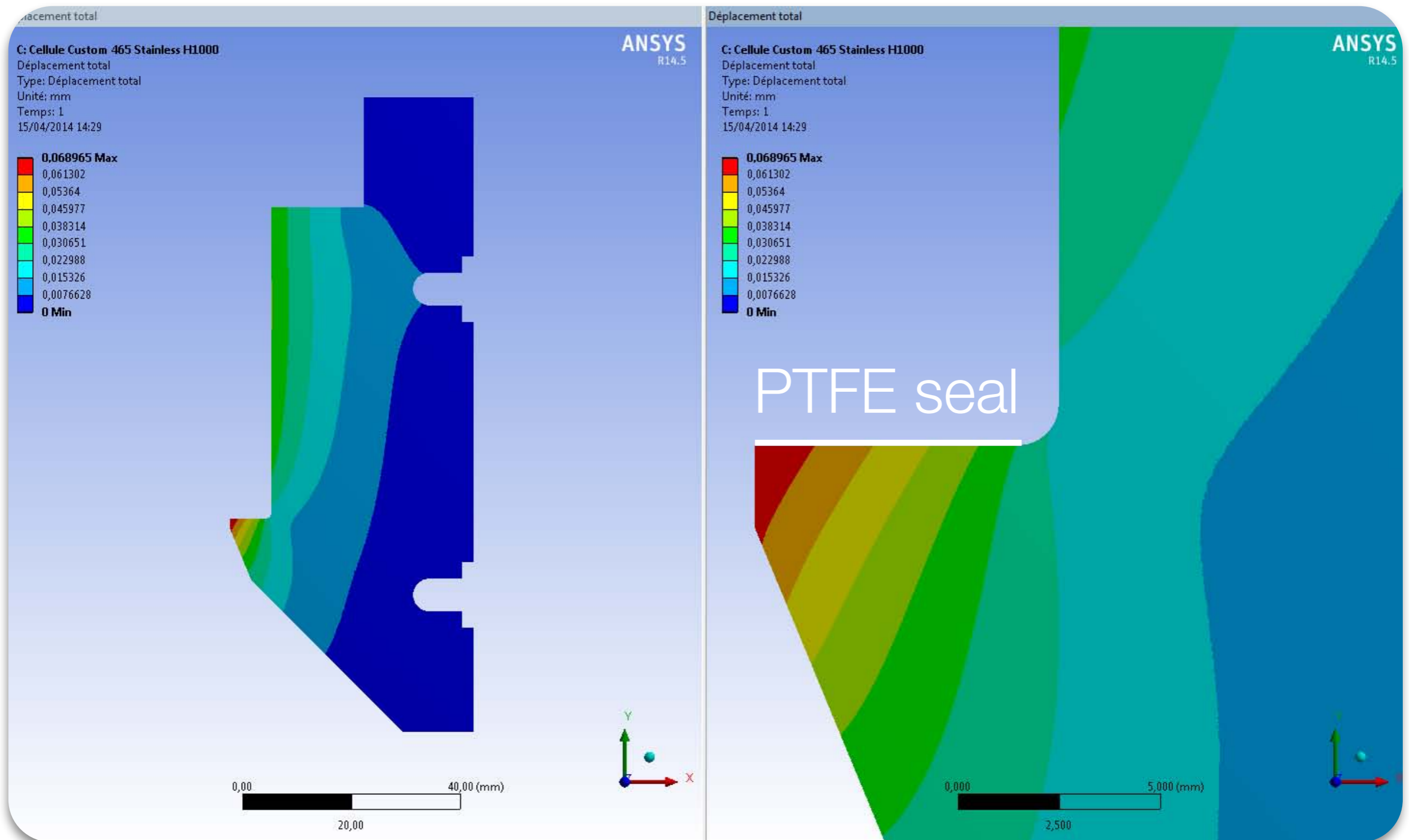
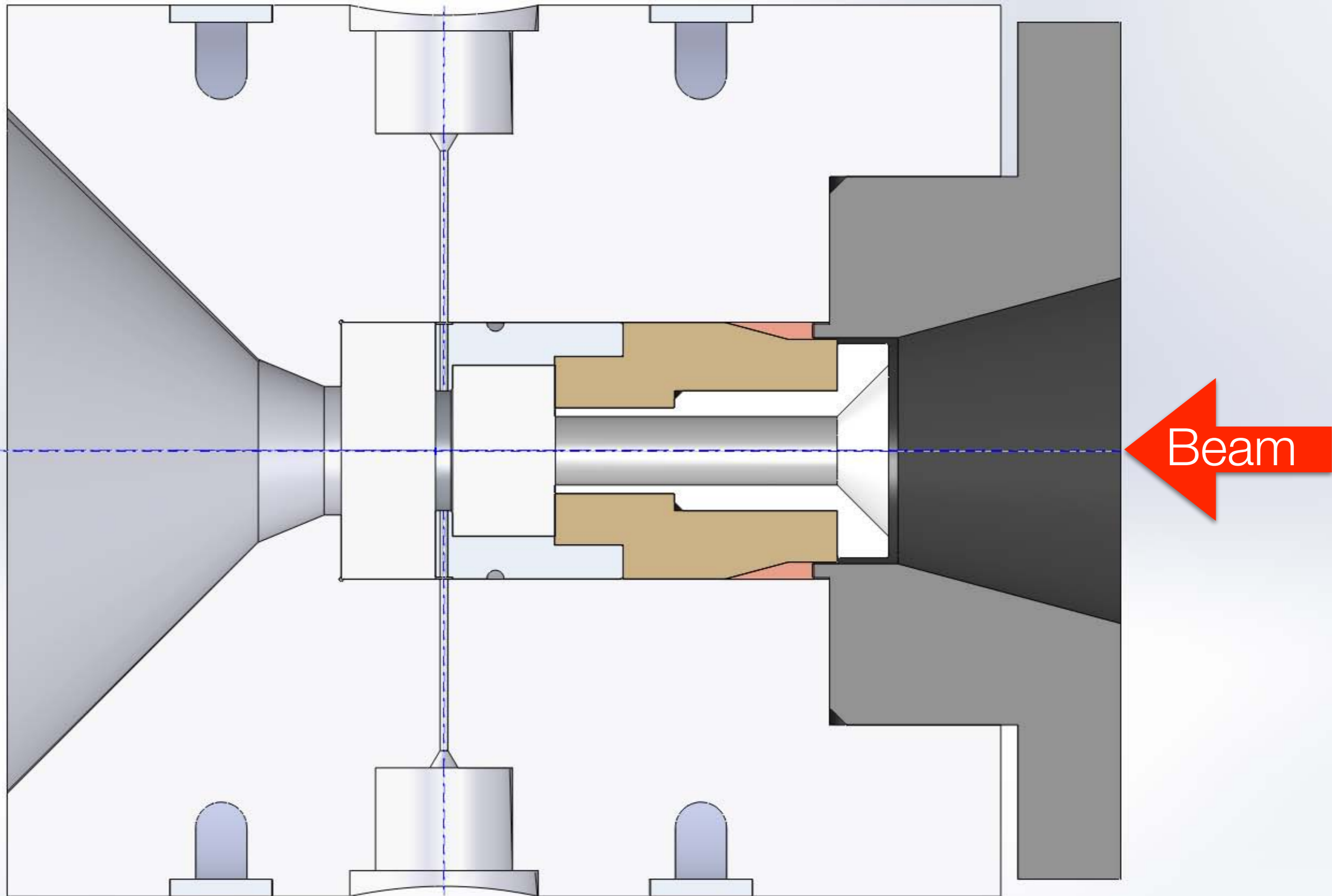


Figure C1 : Déplacement total



Sapphire orientation

