



Revision and Abstract

Description	Revision	Date
Creation	A	2015/07/22-SA
Update	B	2016/04/24-SA

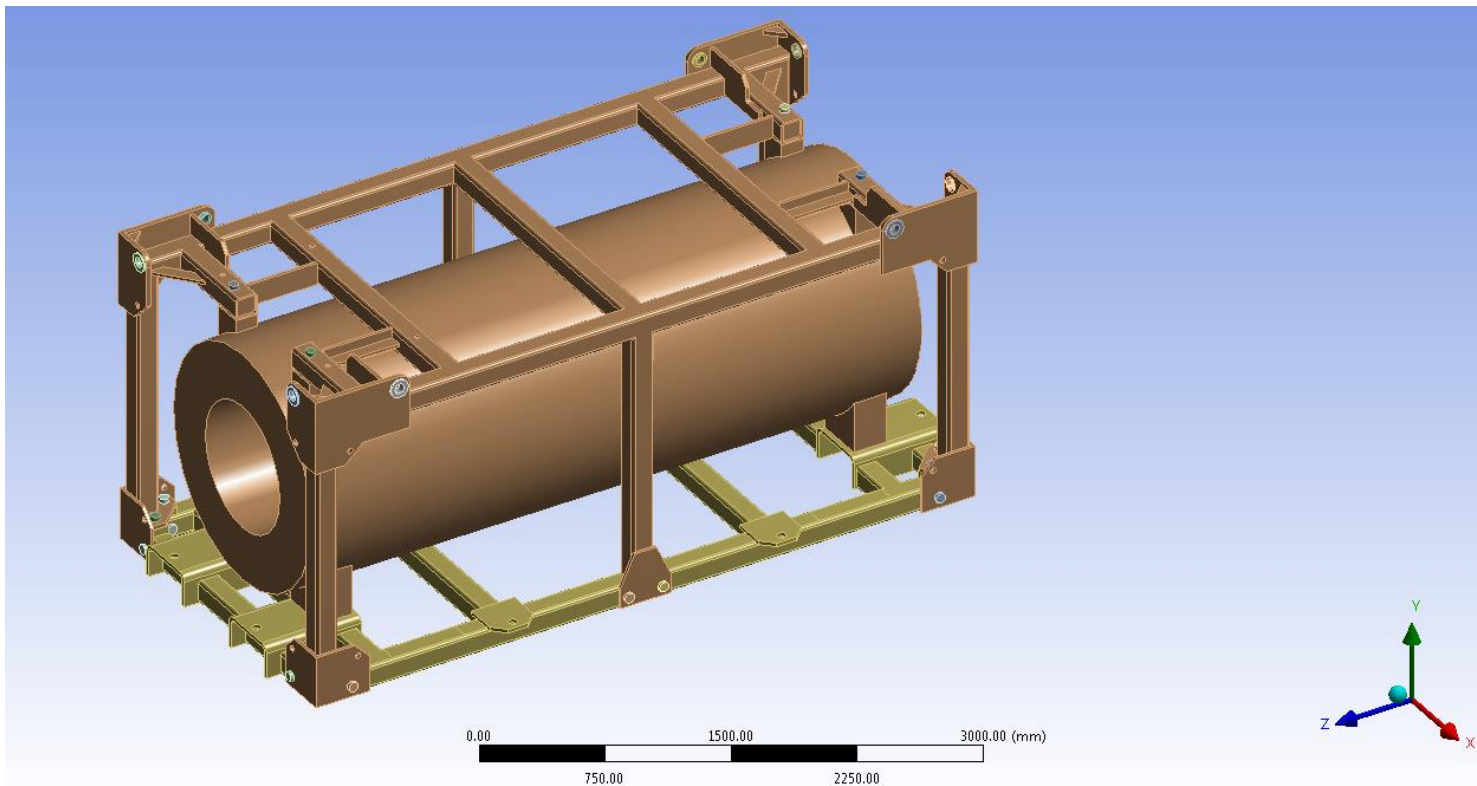
ABSTRACT

This report presents calculation made by Sigmaphi.

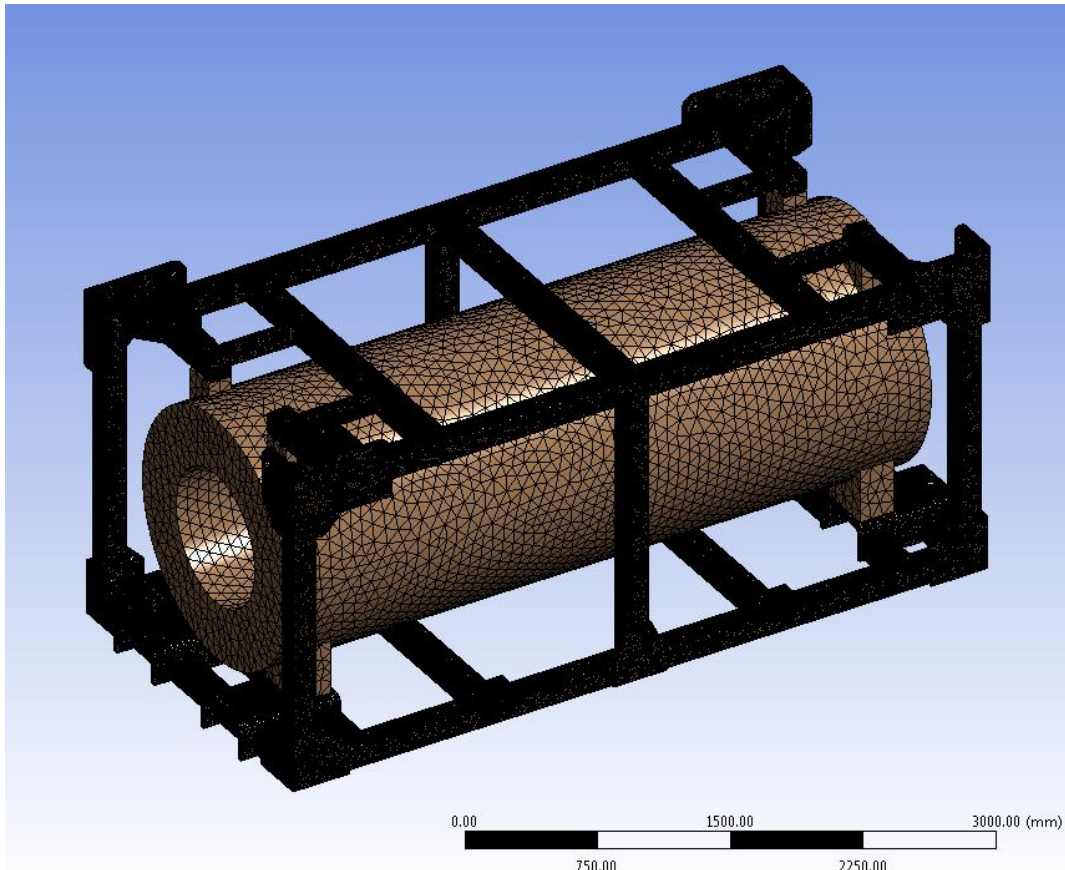
We studied 5 cases:

- Case 1 : Axial acceleration 3G + gravity
- Case 2 : Lateral acceleration 3G +gravity
- Case 3 : Lifting (2 points)
- Case 4 : Vertical acceleration 3G +gravity
- Case 5 : Modal analysis
- Case 6 : Axial acceleration 3G (40° down direction)+gravity
- Case 7 : Axial acceleration 3G (40° up direction)+gravity
- Case 8 : Lateral acceleration 3G (40° down direction)+gravity
- Case 9 : Lateral acceleration 3G (40° down direction)+gravity

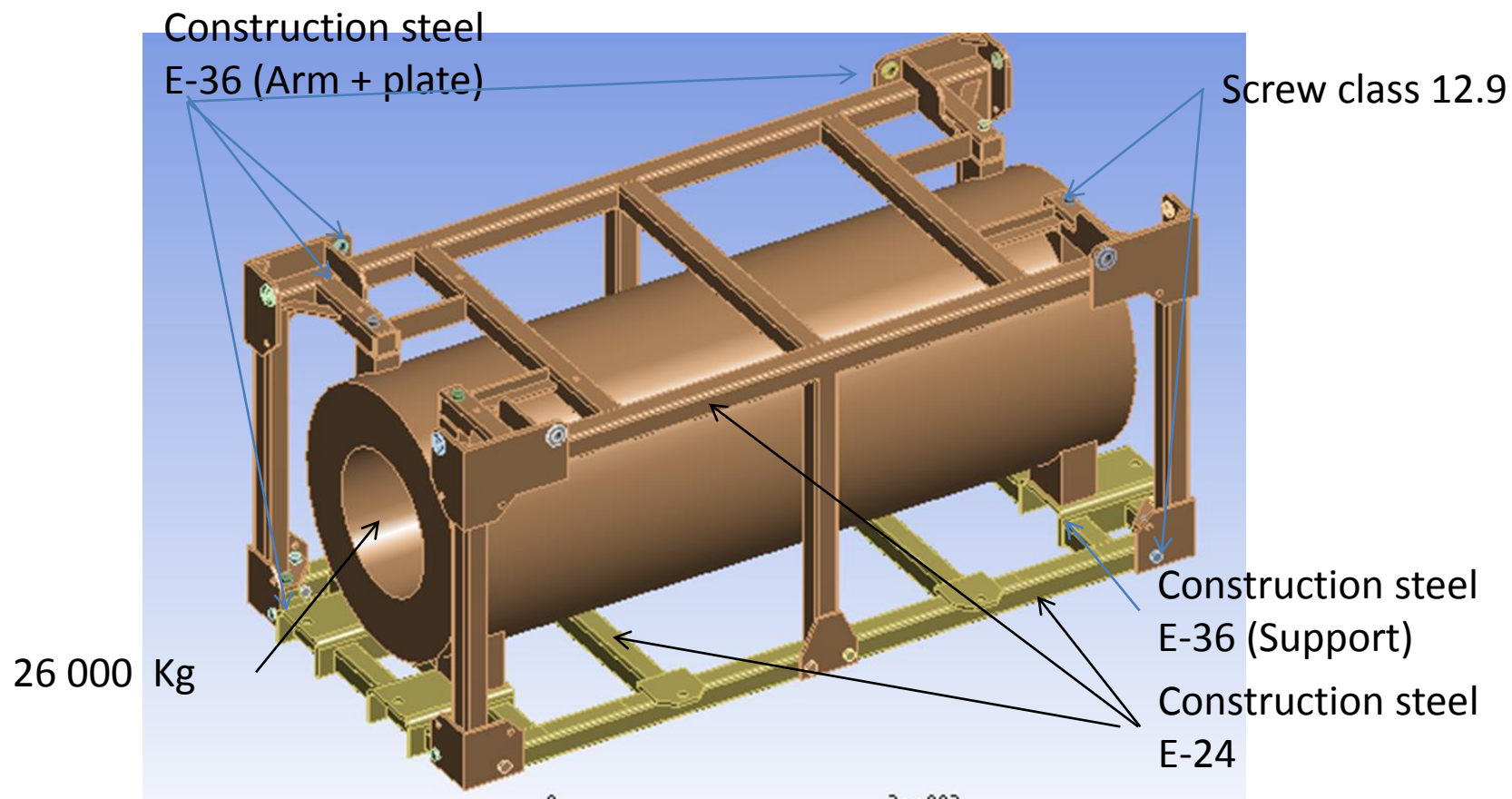
Ansys axis (Orientation of the model)



Mesh



Material and weight



Summary

	<u>Screws</u> (Class 12.9 –Re 1080 Mpa) Acceptance Re 1026 Mpa	<u>Stand 1</u> (Superior part) (E36 –Re 355 Mpa) Acceptance E36 Re-320 Mpa (E24 –Re 235 Mpa) Acceptance E24 Re-225 Mpa	<u>Stand 2</u> (Inferior part) (E36 –Re 355 Mpa) Acceptance E36 Re-320 Mpa (E24 –Re 235 Mpa) Acceptance E24 Re-225 Mpa	<u>Acceptance</u>
Case 1	964 Mpa	76 Mpa	208 Mpa	Ok
Case 2	981 Mpa	112 Mpa (Linearized)	245 Mpa (Linearized)	Ok
Case 3	502 Mpa	202 Mpa (Linearized)	228 Mpa	Ok
Case 4	303 Mpa	32 Mpa	189 Mpa	Ok
Case 5	/	/	/	/
Case 6	474 Mpa	67 Mpa	199 Mpa	Ok
Case 7	574 Mpa	82 Mpa	318 Mpa	Ok
Case 8	747 Mpa	77 Mpa (Linearized)	173 Mpa (Linearized)	Ok
Case 9	963 Mpa	97 Mpa (linearized)	241 Mpa (Linearized)	Ok

Loading case 1 (axial acceleration 3G)

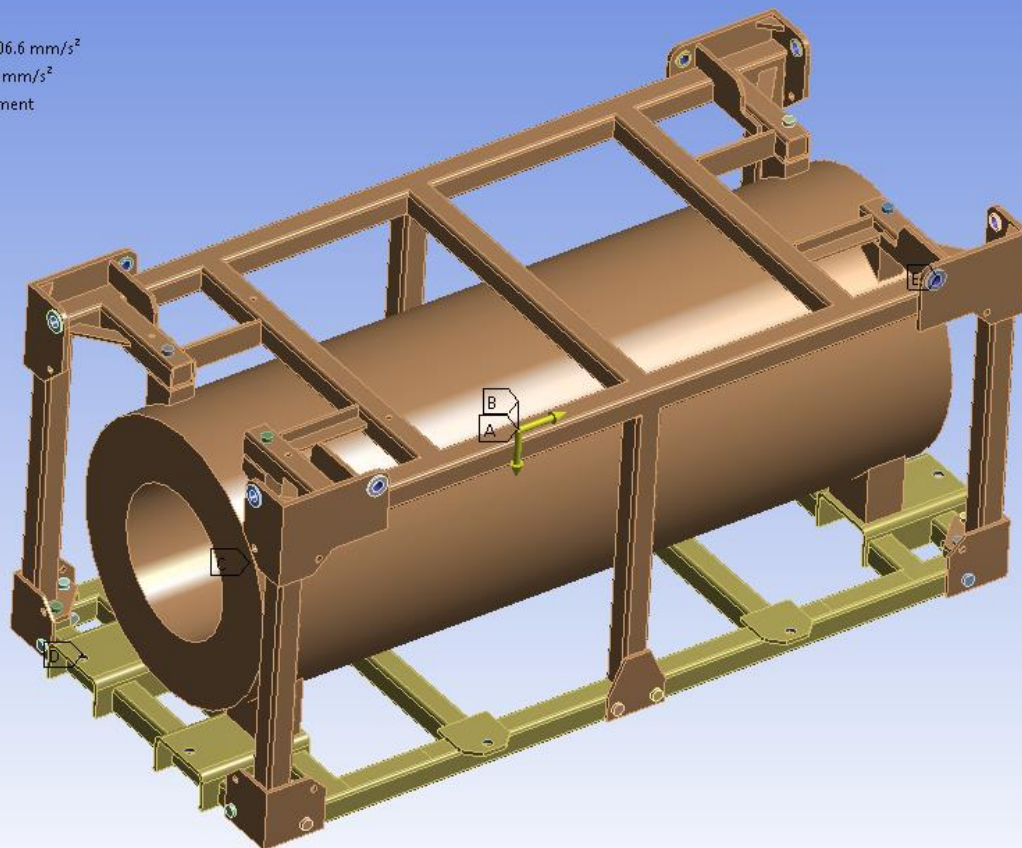
B: Axial

Support fixe 2

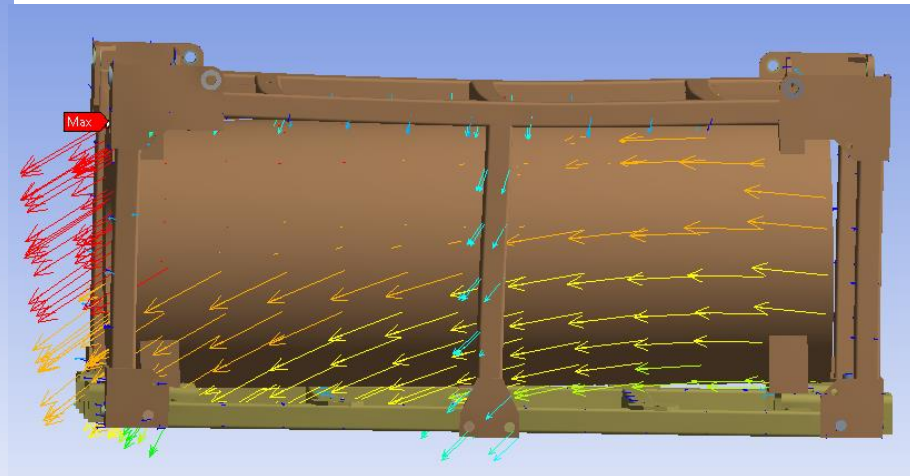
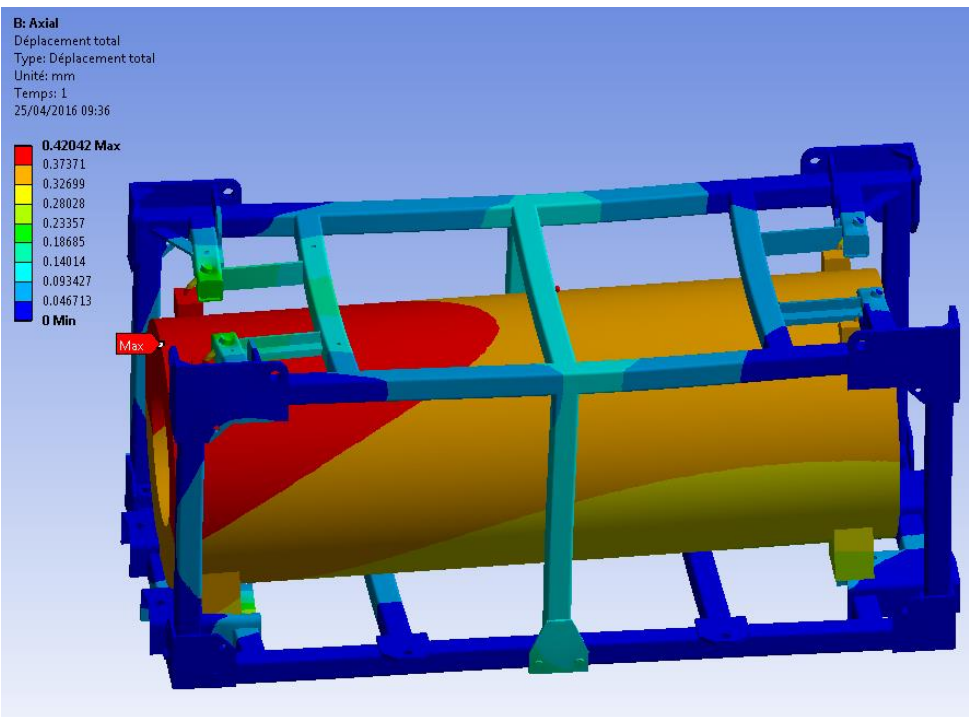
Temps: 1. s

25/04/2016 09:35

- A** Gravité terrestre: 9806.6 mm/s²
- B** Accélération: 29500 mm/s²
- C** Support sans frottement
- D** Support fixe
- E** Support fixe 2



Displacement Total (Case 1)



Stress Von Mises Stand 1 (Case 1)

B: Axial

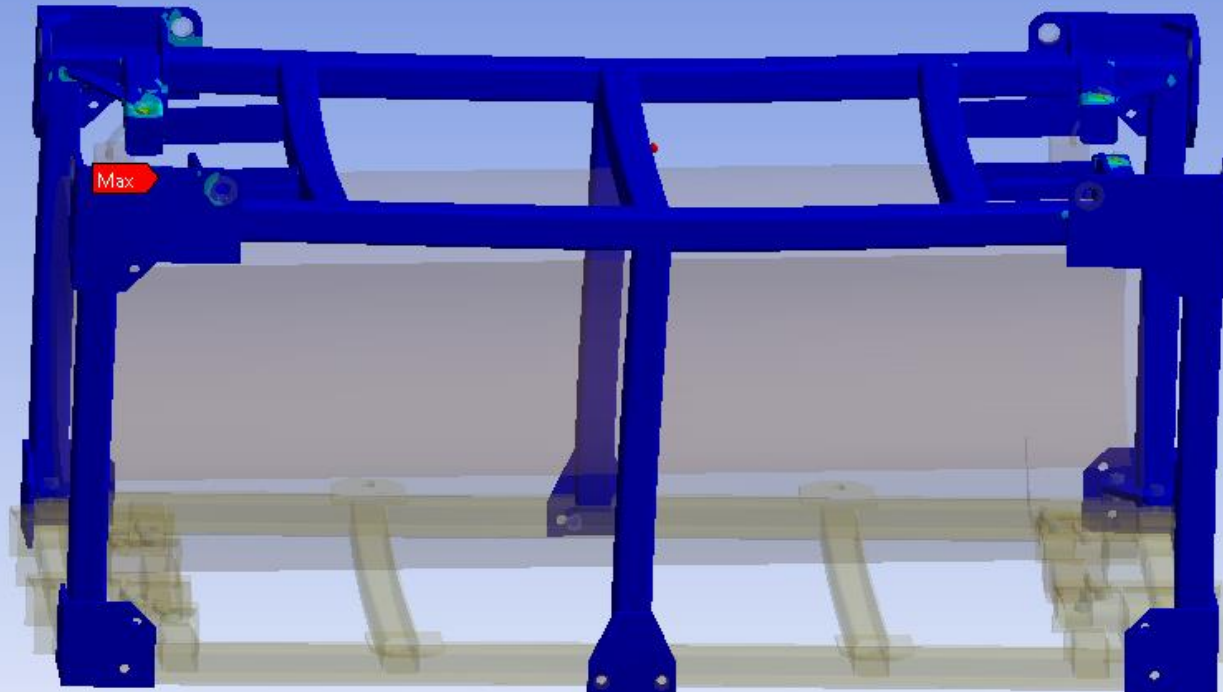
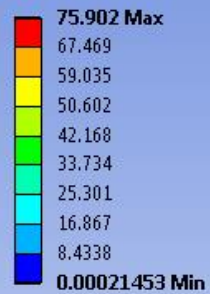
Contrainte équivalente (Von-Mises) - chassis1

Type: Contrainte équivalente (Von-Mises)

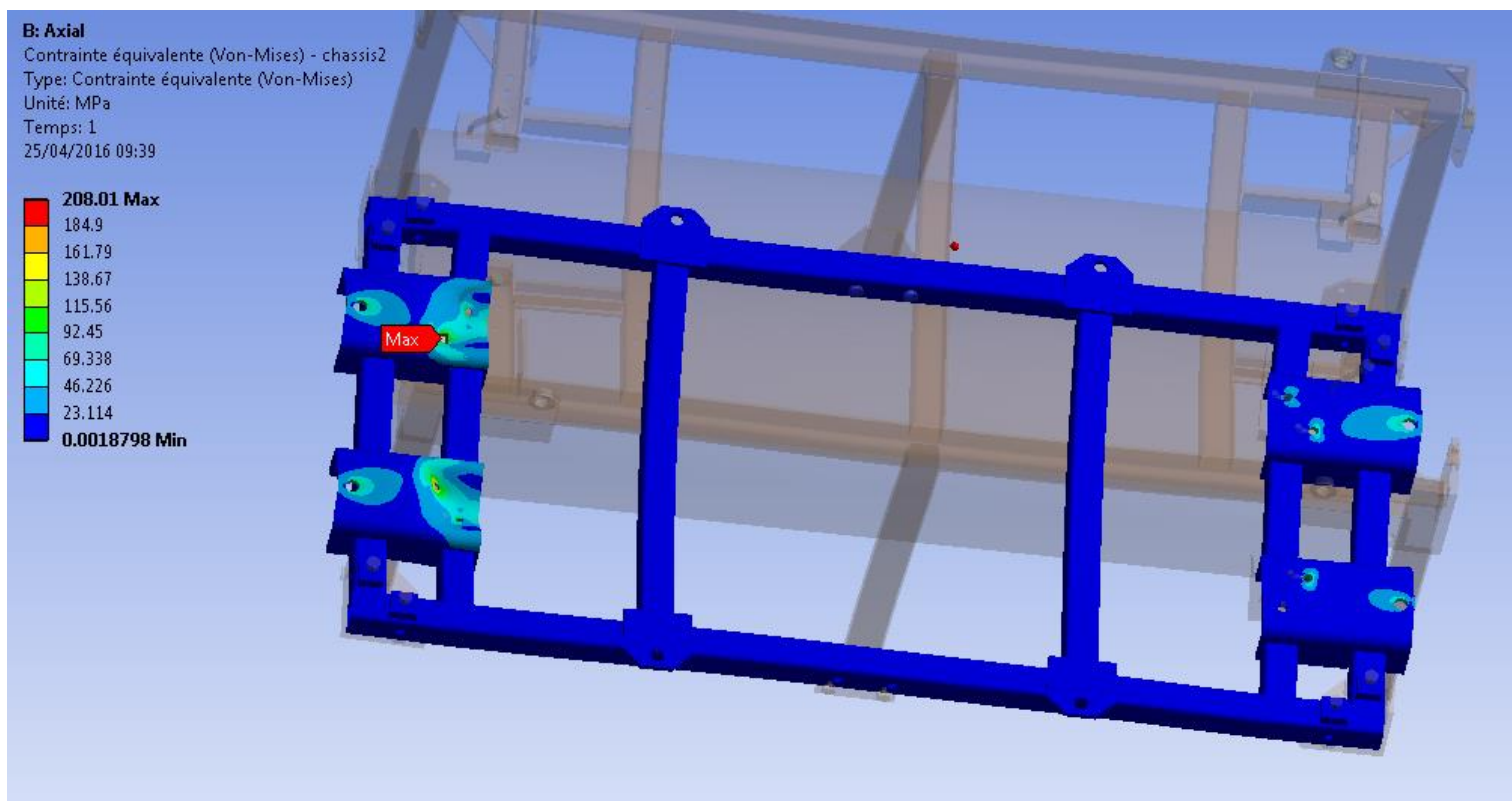
Unité: MPa

Temps: 1

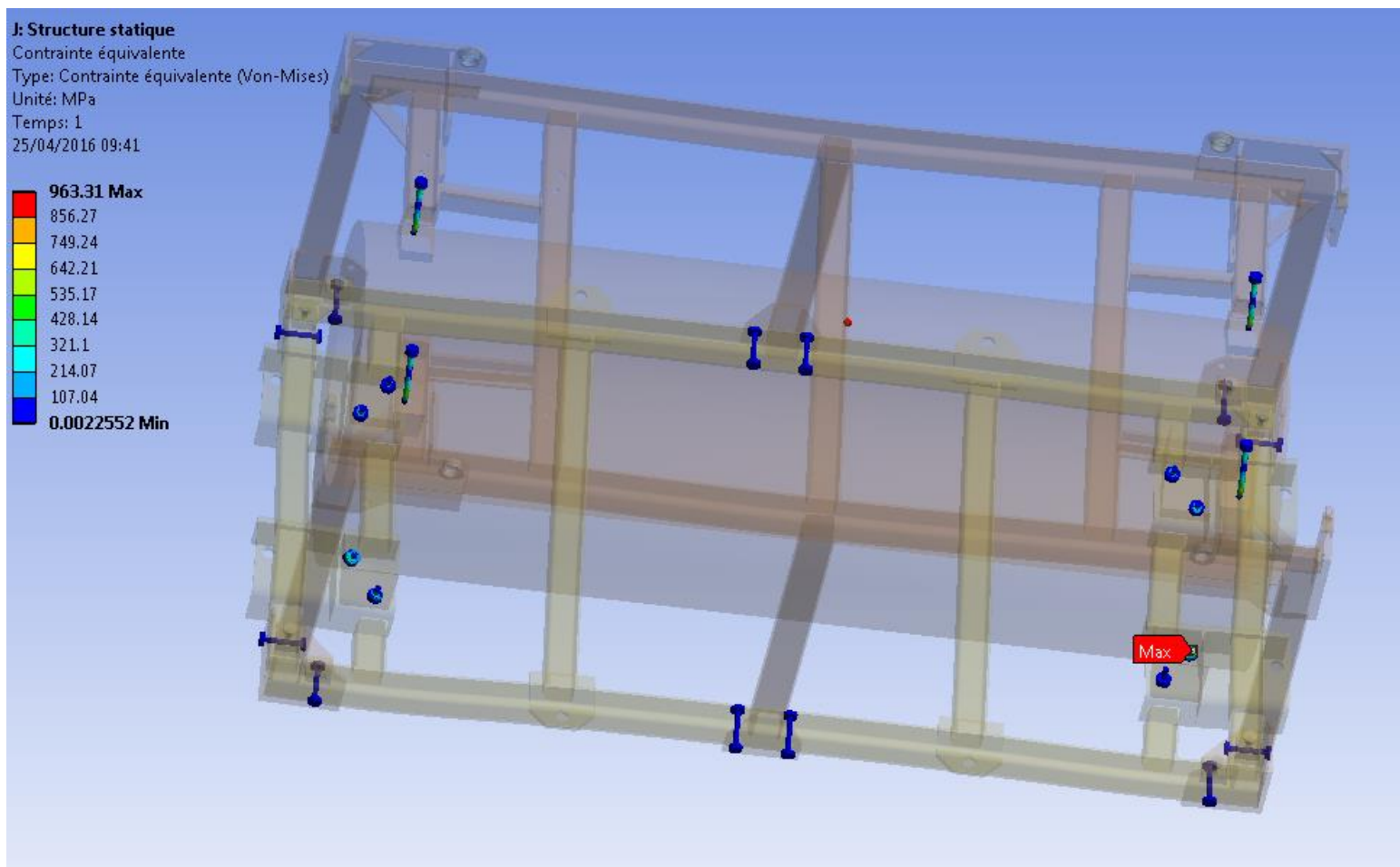
25/04/2016 09:38



Stress Von Mises Stand 2 (Case 1)



Stress Von Mises Screws (Case 1)

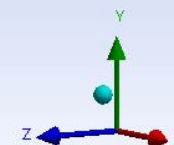
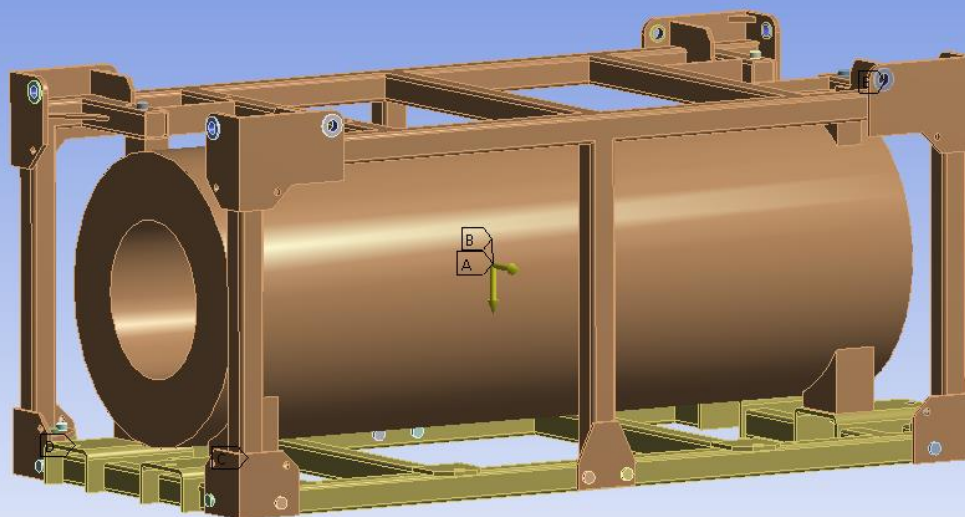


Loading case 2 (lateral acceleration 3G)

C: radial
Support fixe 2
Temps: 1. s
25/04/2016 09:54

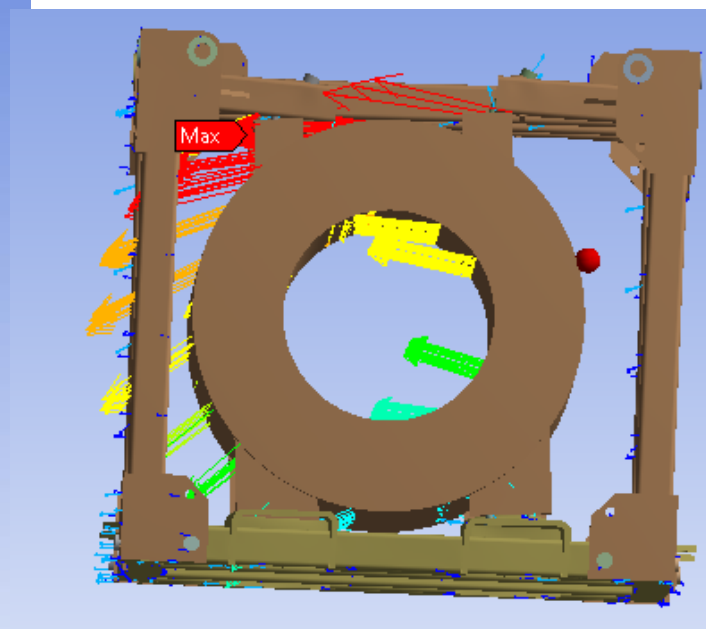
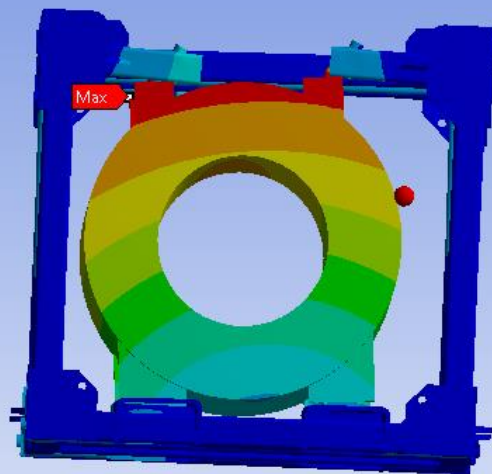
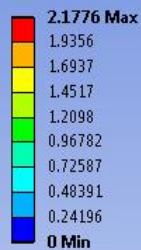
- A** Gravité terrestre: 9806.6 mm/s²
- B** Accélération: 29500 mm/s²
- C** Support sans frottement
- D** Support fixe
- E** Support fixe 2

ANSYS
R15.0

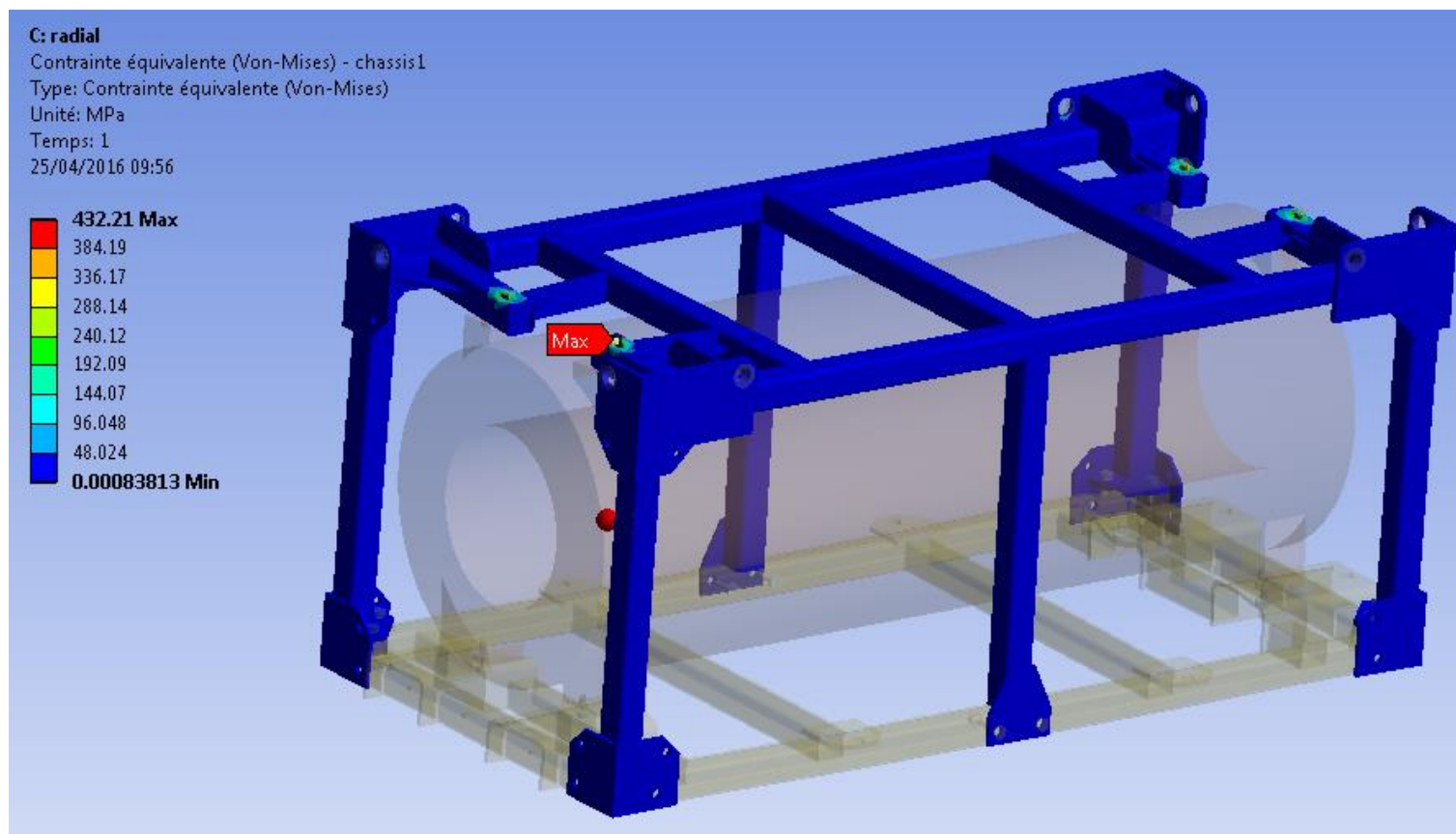


Displacement Total (Case 2)

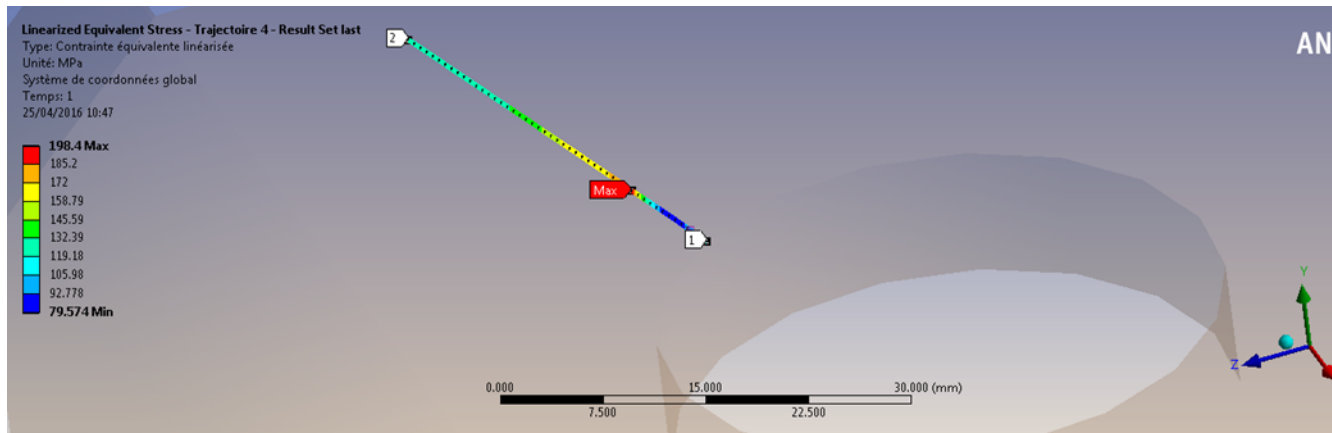
C: radial
Déplacement total
Type: Déplacement total
Unité: mm
Temps: 1
25/04/2016 09:55



Stress Von Mises stand 1 (Case 2)



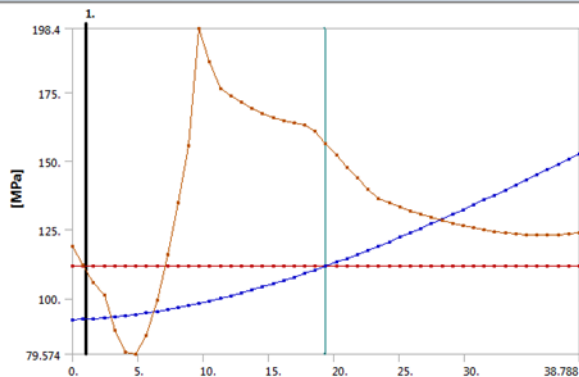
Stress Von Mises stand 1 (Case 2)



\\ Géométrie / Aperçu avant impression / Aperçu du rapport

Graphique

Données tabulaires



	Longueur [mm]	Membrane [MPa]	Flexion [MPa]	Membrane+Flexion [MPa]	Pointe [MPa]	Total [MPa]
1	0.	111.71	58.549	92.182	30.437	119.12
2	0.80807	111.71	56.109	92.34	21.592	112.06
3	1.6161	111.71	53.67	92.561	17.142	105.79
4	2.4242	111.71	51.23	92.846	20.066	101.32
5	3.2323	111.71	48.791	93.194	34.286	88.282
6	4.0404	111.71	46.351	93.605	56.855	80.246
7	4.8484	111.71	43.912	94.076	81.088	79.574
8	5.6565	111.71	41.472	94.609	105.81	86.393
9	6.4646	111.71	39.033	95.201	130.71	99.129
10	7.2727	111.71	36.593	95.851	155.68	115.81
11	8.0807	111.71	34.153	96.559	180.67	134.96
12	8.8888	111.71	31.714	97.323	205.66	155.64
13	9.6969	111.71	29.274	98.141	127.91	198.4
14	10.505	111.71	26.835	99.013	112.39	186.27
15	11.313	111.71	24.395	99.937	101.19	176.63
16	12.121	111.71	21.956	100.91	95.92	173.74
17	12.929	111.71	19.516	101.93	90.91	171.36
18	13.737	111.71	17.077	103.01	86.038	169.27
19	14.545	111.71	14.637	104.12	81.329	167.45
20	15.353	111.71	12.198	105.28	76.813	165.94
21	16.161	111.71	9.7581	106.49	72.525	164.73

Stress Von Mises Stand 2 (Case 2)

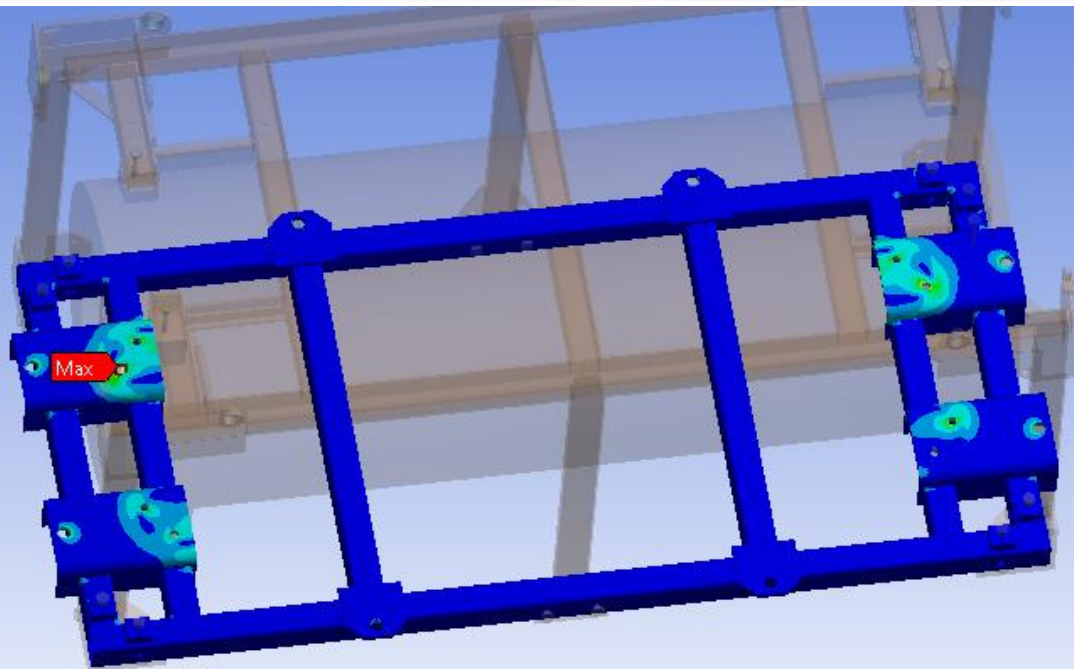
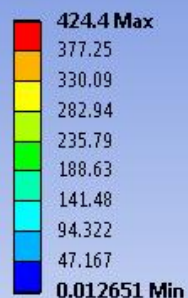
Contrainte équivalente (Von-Mises) - chassis2

Type: Contrainte équivalente (Von-Mises)

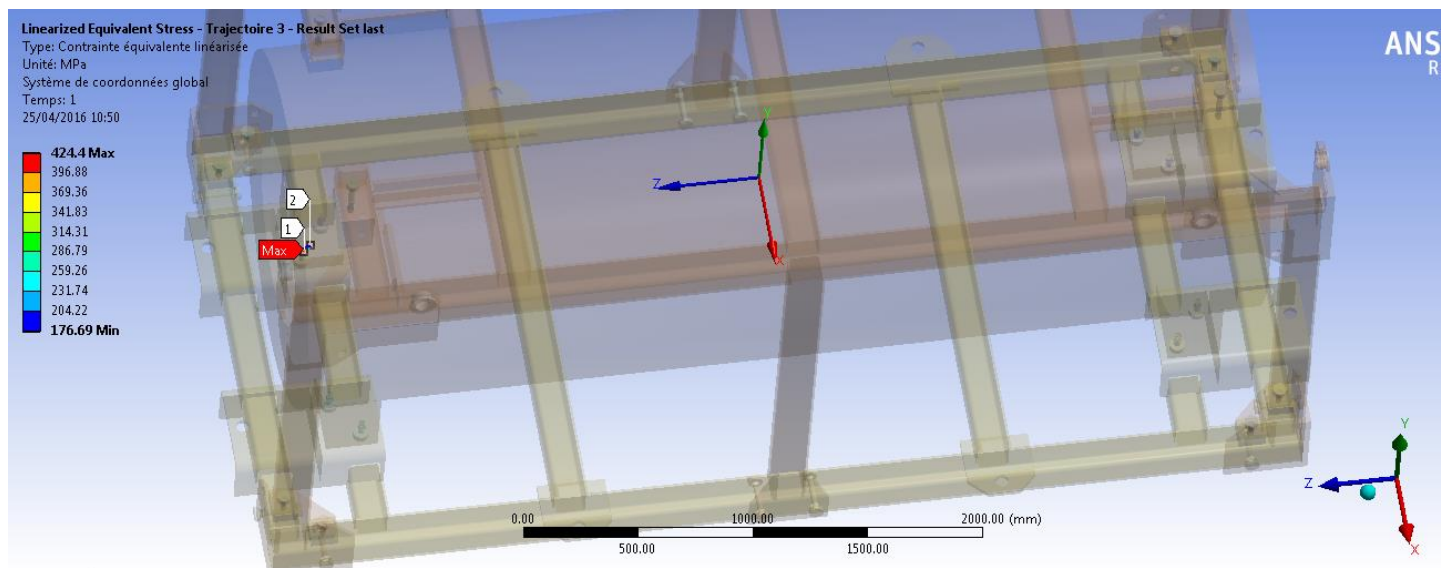
Unité: MPa

Temps: 1

25/04/2016 10:49

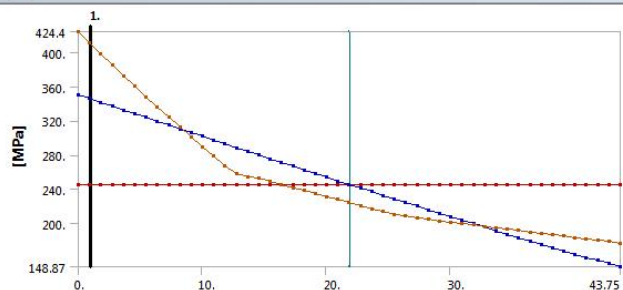


Stress Von Mises Stand 2 (Case 2)



\ Géométrie \ Aperçu avant impression \ Aperçu du rapport /

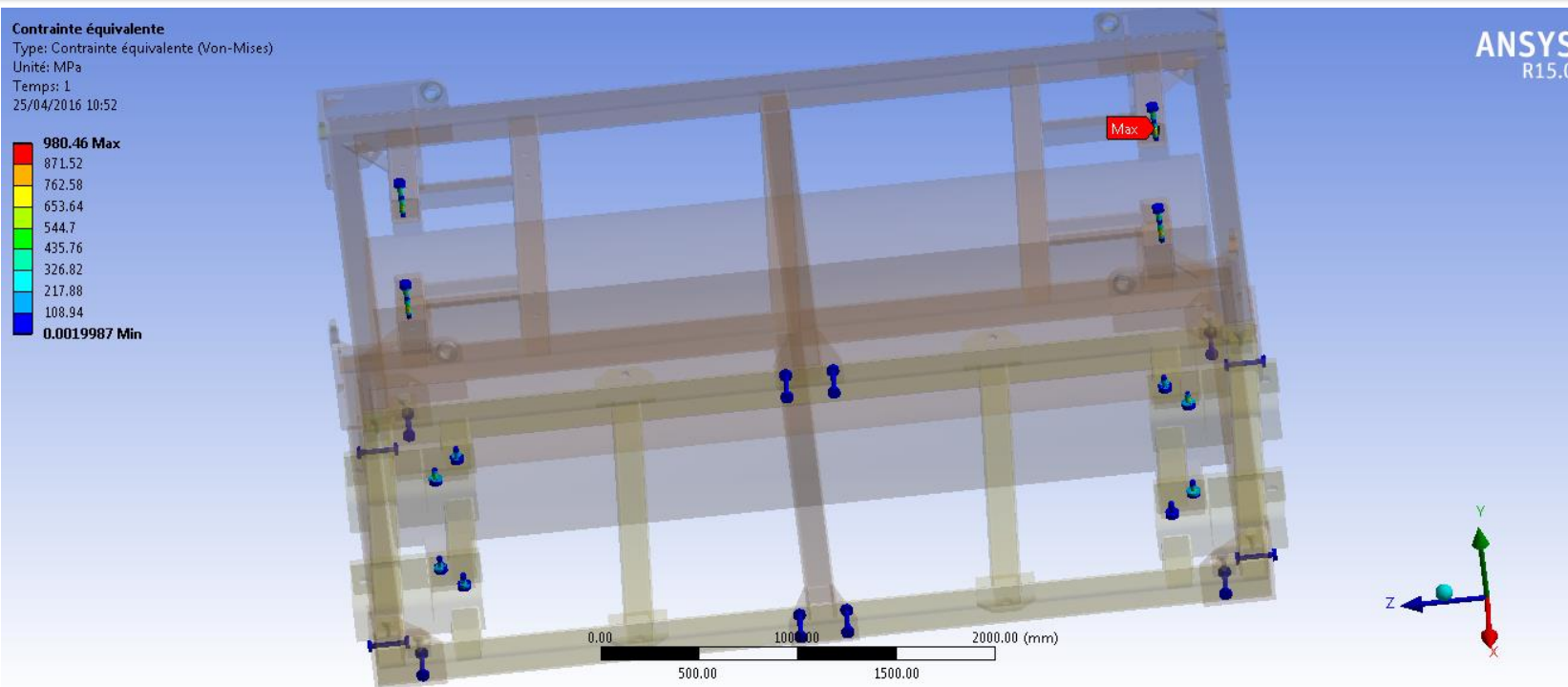
Graphique



Données tabulaires

	Longueur [mm]	Membrane [MPa]	Flexion [MPa]	Membrane+Flexion [MPa]	Pointe [MPa]	Total [MPa]
1	0.	245.18	111.35	350.52	94.085	424.4
2	0.91146	245.18	106.71	346.06	84.498	412.
3	1.8229	245.18	102.07	341.6	73.431	398.43
4	2.7344	245.18	97.427	337.14	63.105	385.62
5	3.6458	245.18	92.788	332.69	52.78	372.93
6	4.5573	245.18	88.148	328.25	42.456	360.39
7	5.4688	245.18	83.509	323.81	32.136	348.01
8	6.3802	245.18	78.87	319.38	21.823	335.81
9	7.2917	245.18	74.23	314.95	11.538	323.8
10	8.2031	245.18	69.591	310.53	1.839	312.02
11	9.1146	245.18	64.952	306.11	9.3267	300.48
12	10.026	245.18	60.312	301.71	19.595	289.22
13	10.938	245.18	55.673	297.31	29.904	278.27
14	11.849	245.18	51.033	292.91	40.224	267.66
15	12.76	245.18	46.394	288.53	50.547	257.45

Stress Von Mises Screws (Case 2)

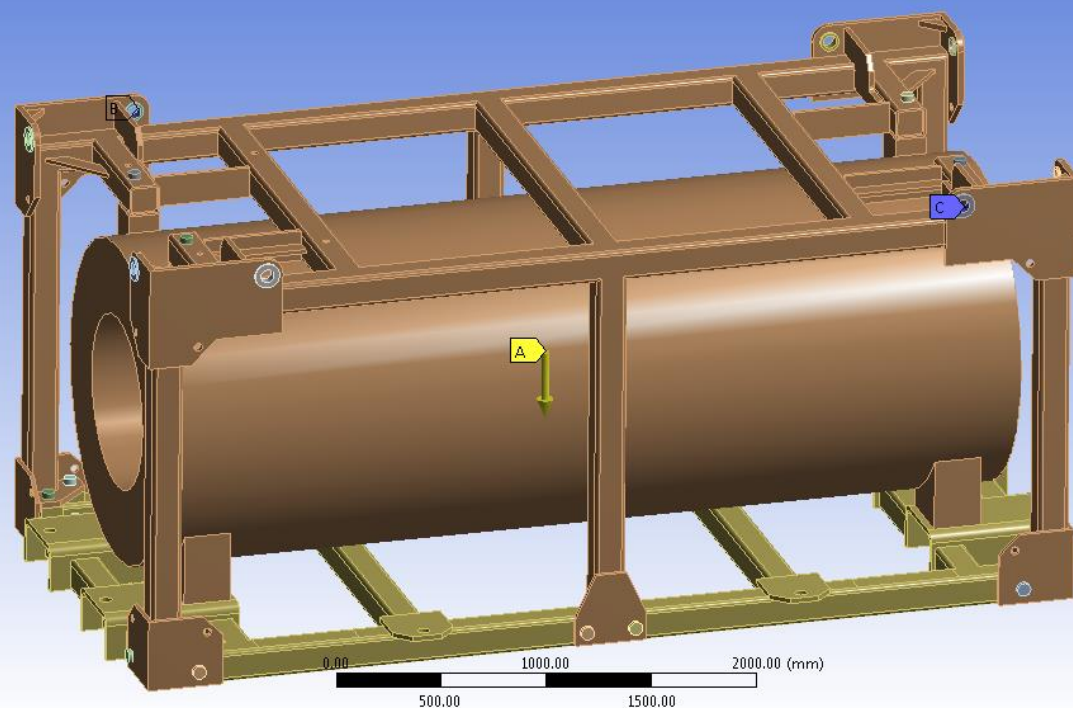


Loading case 3 (2 points) (lifting)

Support cylindrique 2

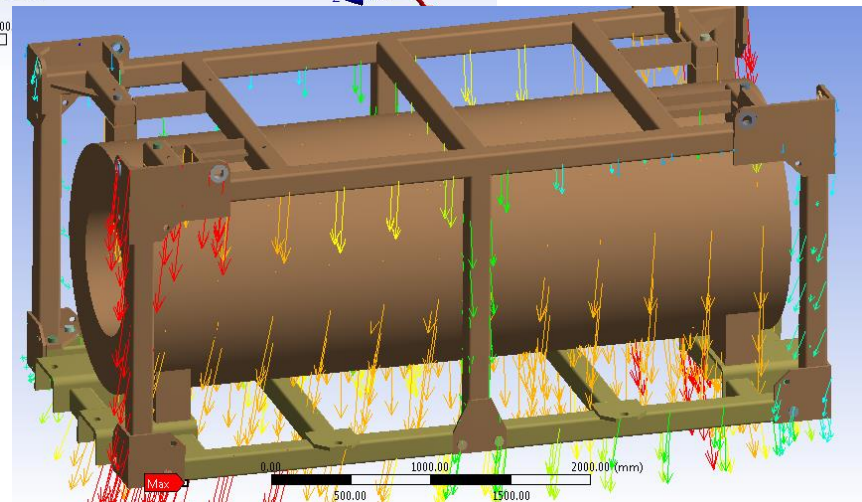
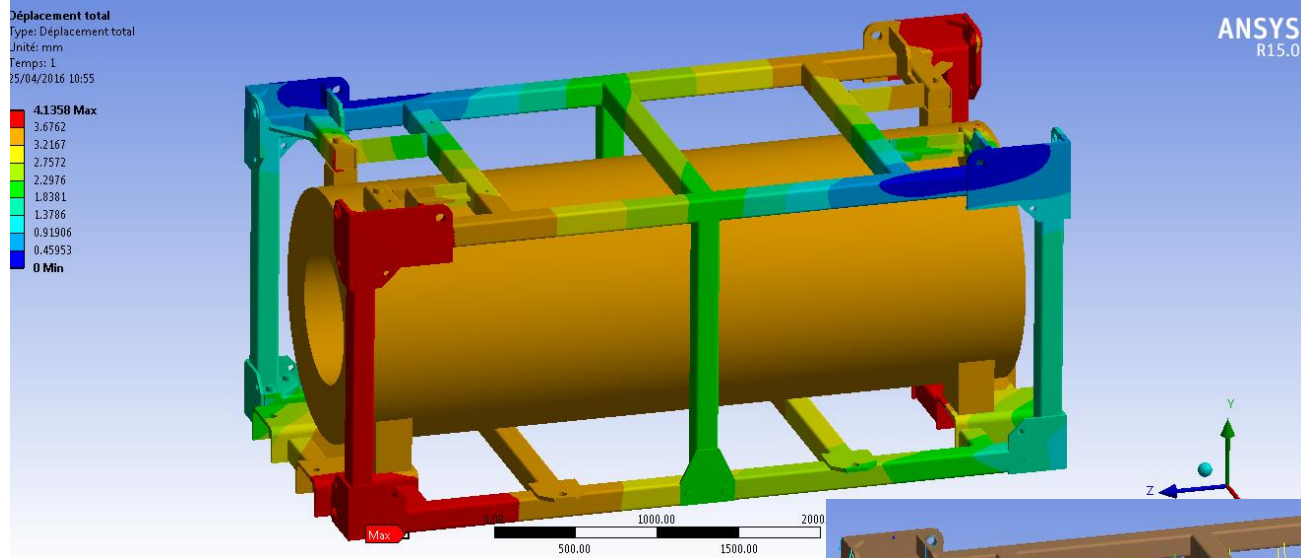
Temps: 1. s
25/04/2016 10:54

- A** Gravité terrestre: 9806.6 mm/s²
- B** Support cylindrique: 0. mm
- C** Support cylindrique 2: 0. mm

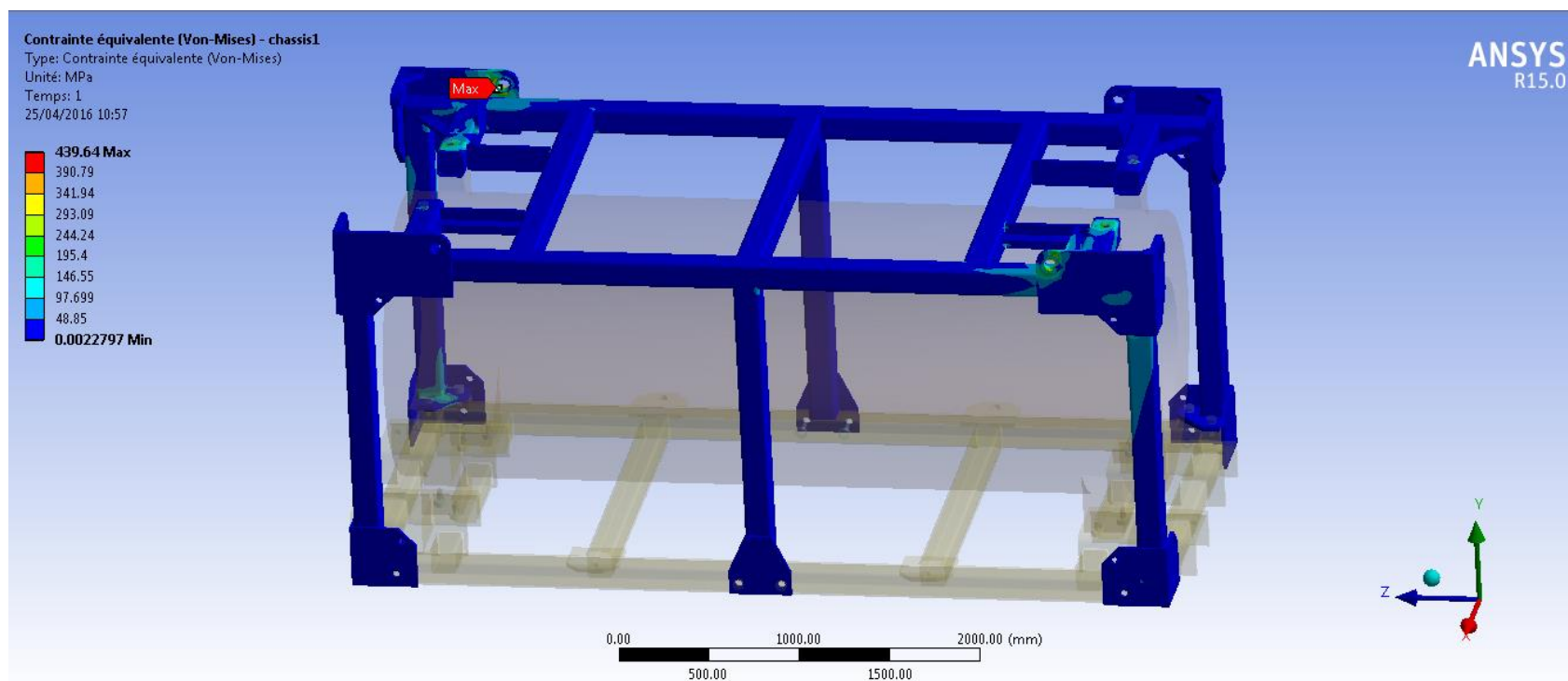


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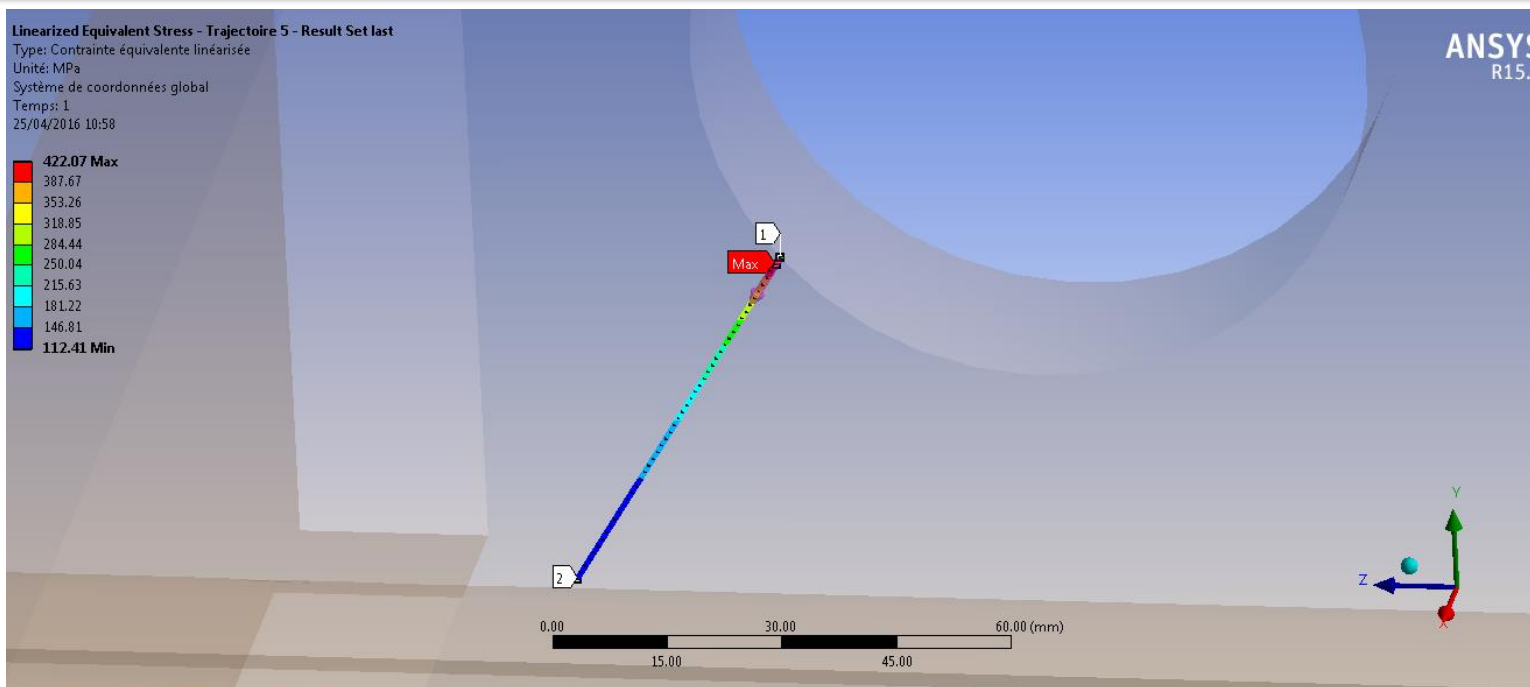
Displacement Total (Case 3)



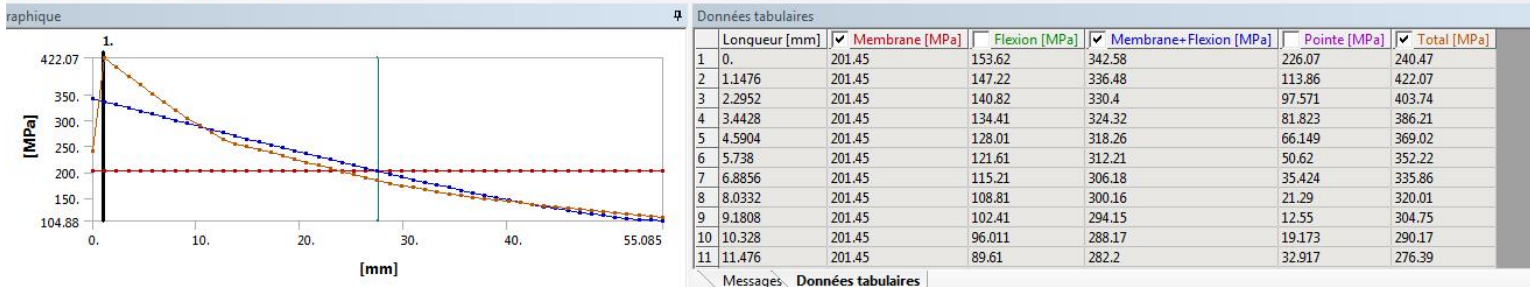
Stress Von Mises Stand 1(Case 3)



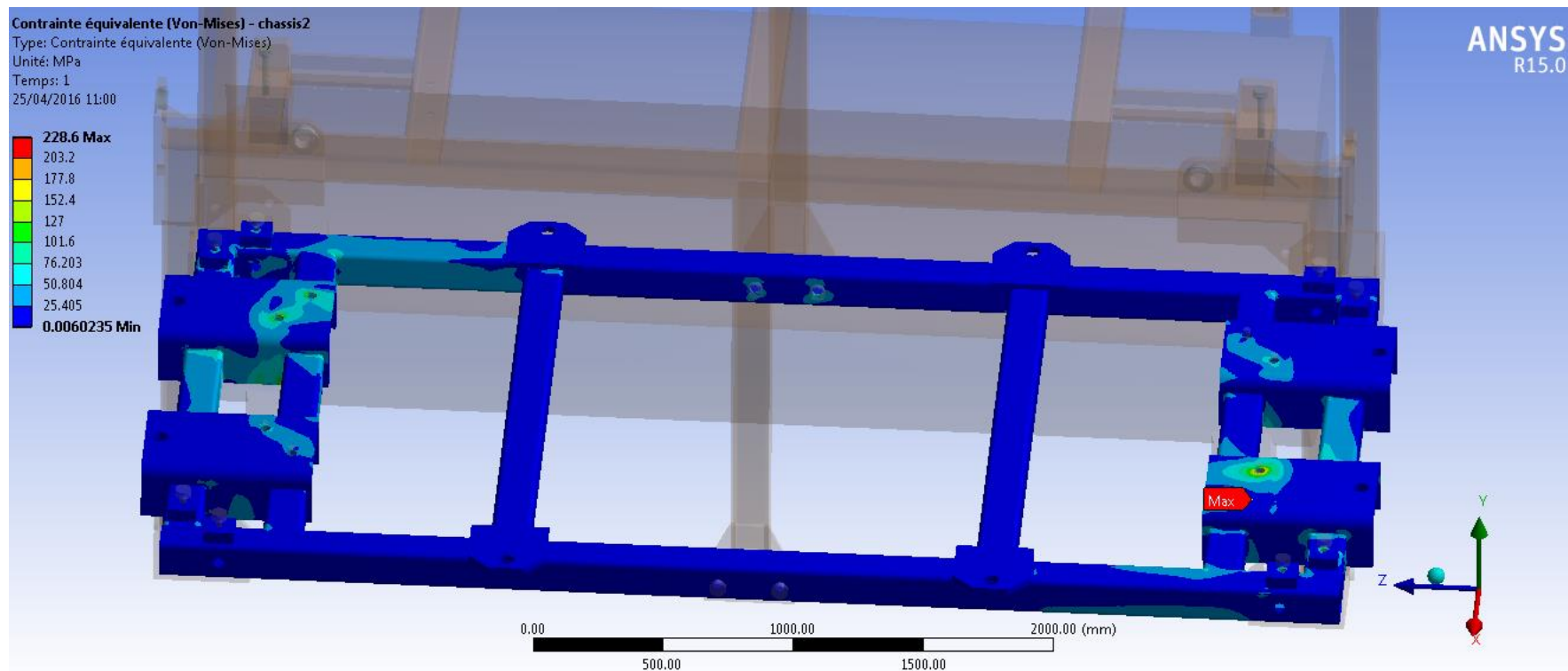
Stress Von Mises Stand 1(Case 3)



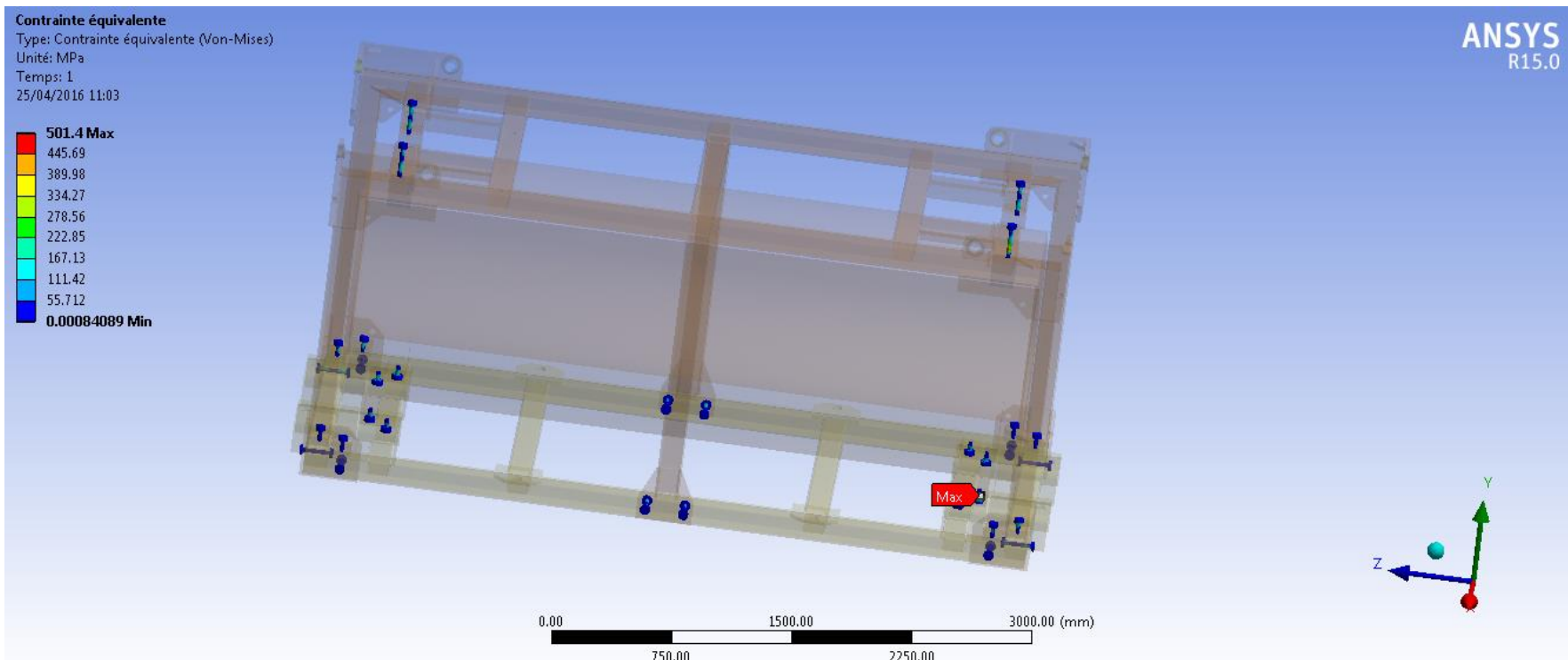
Géométrie / Aperçu avant impression / Aperçu du rapport



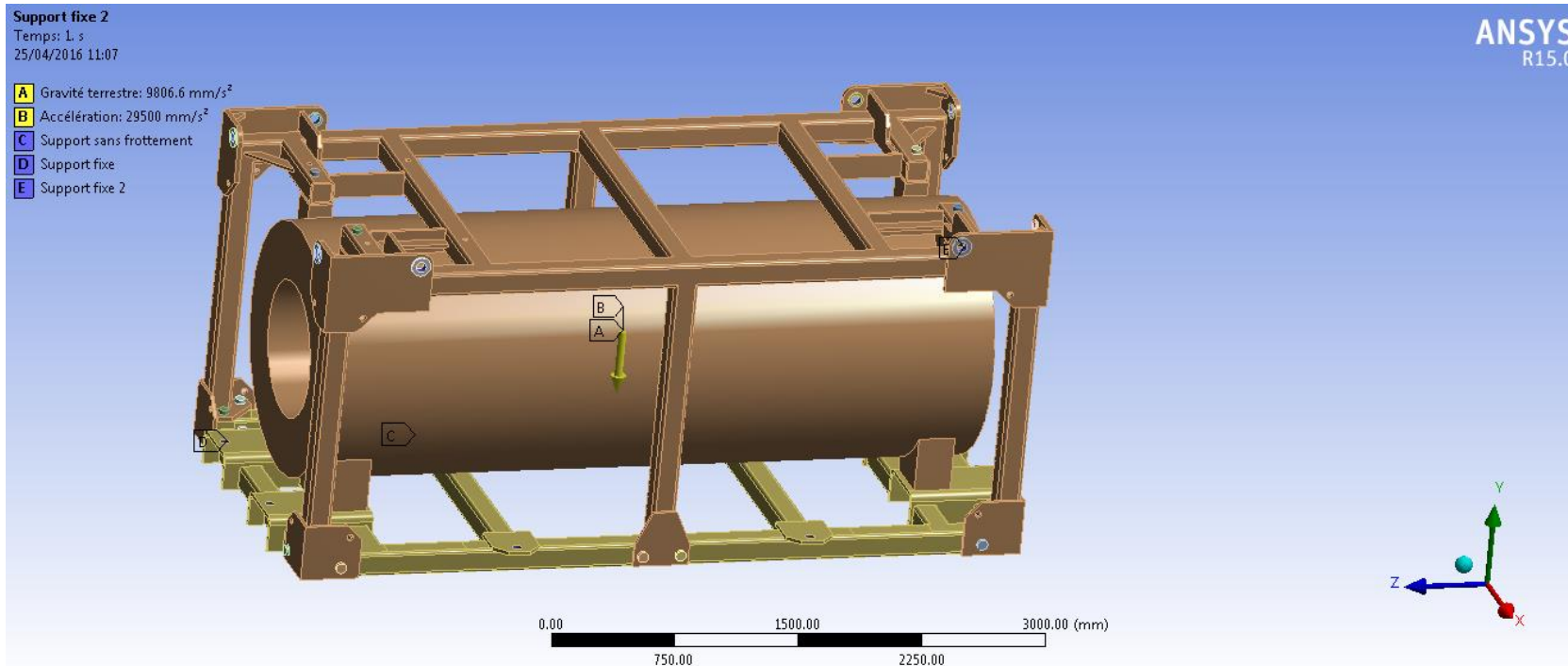
Stress Von Mises Stand 2 (Case 3)



Stress Von Mises Screws (Case 3)

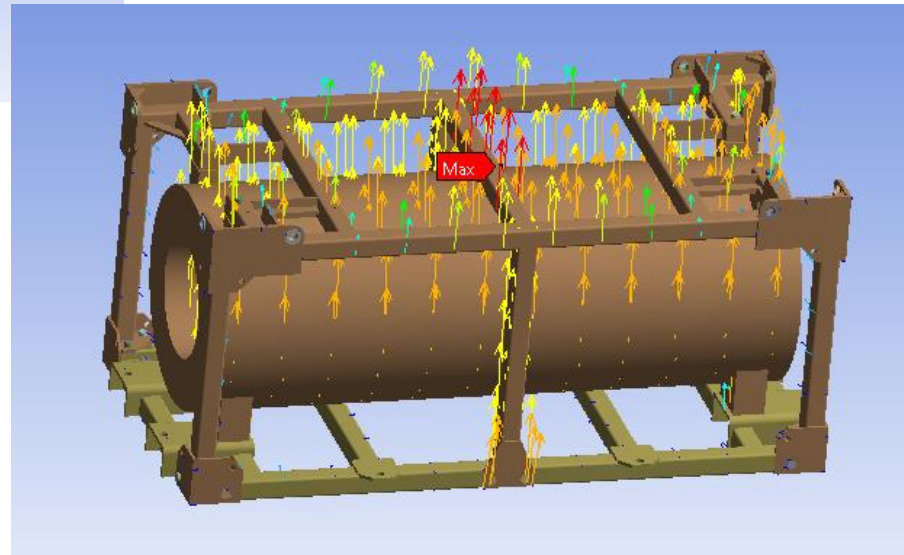
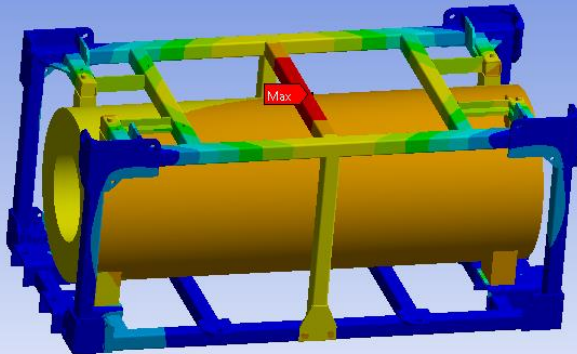
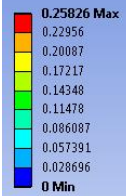


Loading case 4 (vertical acceleration 3G + Gravity)



Displacement (Case4)

Déplacement total
Type: Déplacement total
Unité: mm
Temps: 1
25/04/2016 11:21



Stress Von Mises Stand 1 (Case 4)

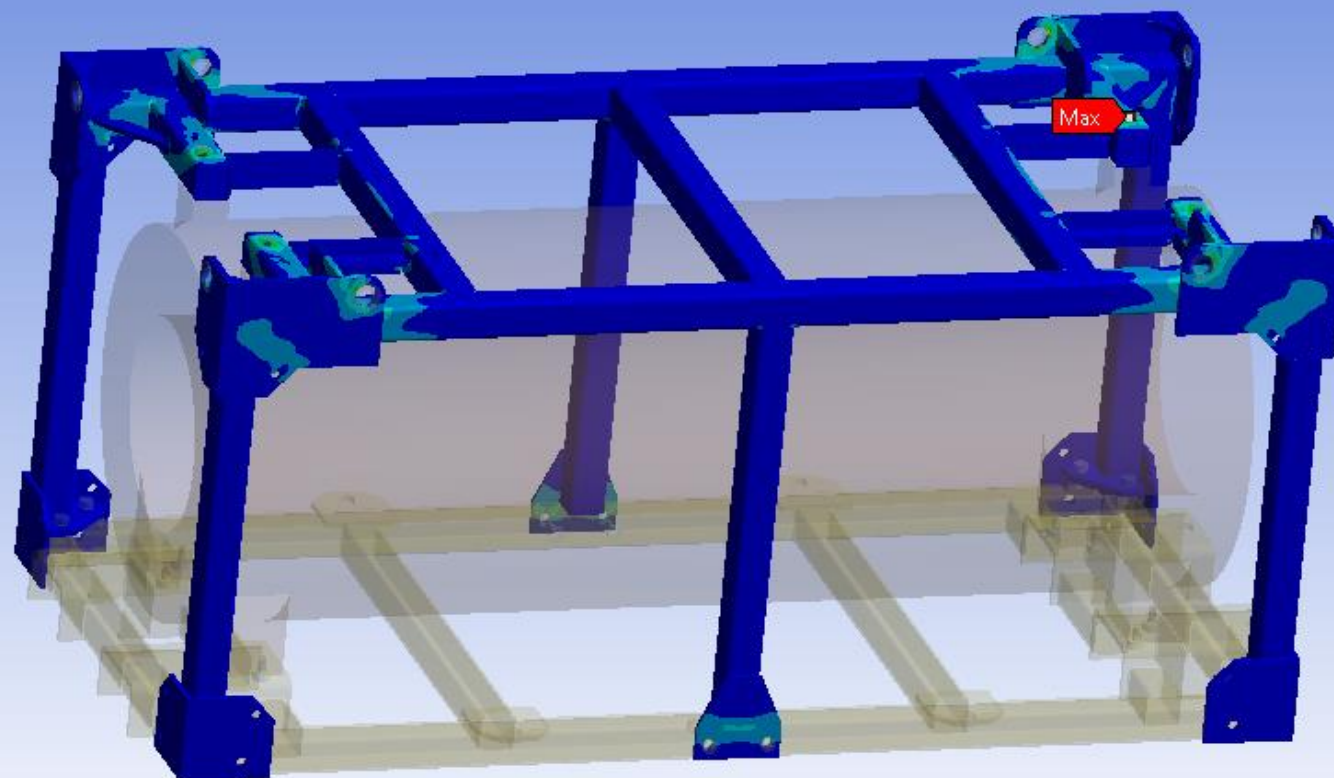
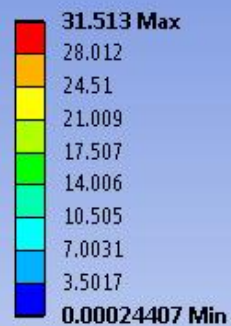
Contrainte équivalente (Von-Mises) - chassis1

Type: Contrainte équivalente (Von-Mises)

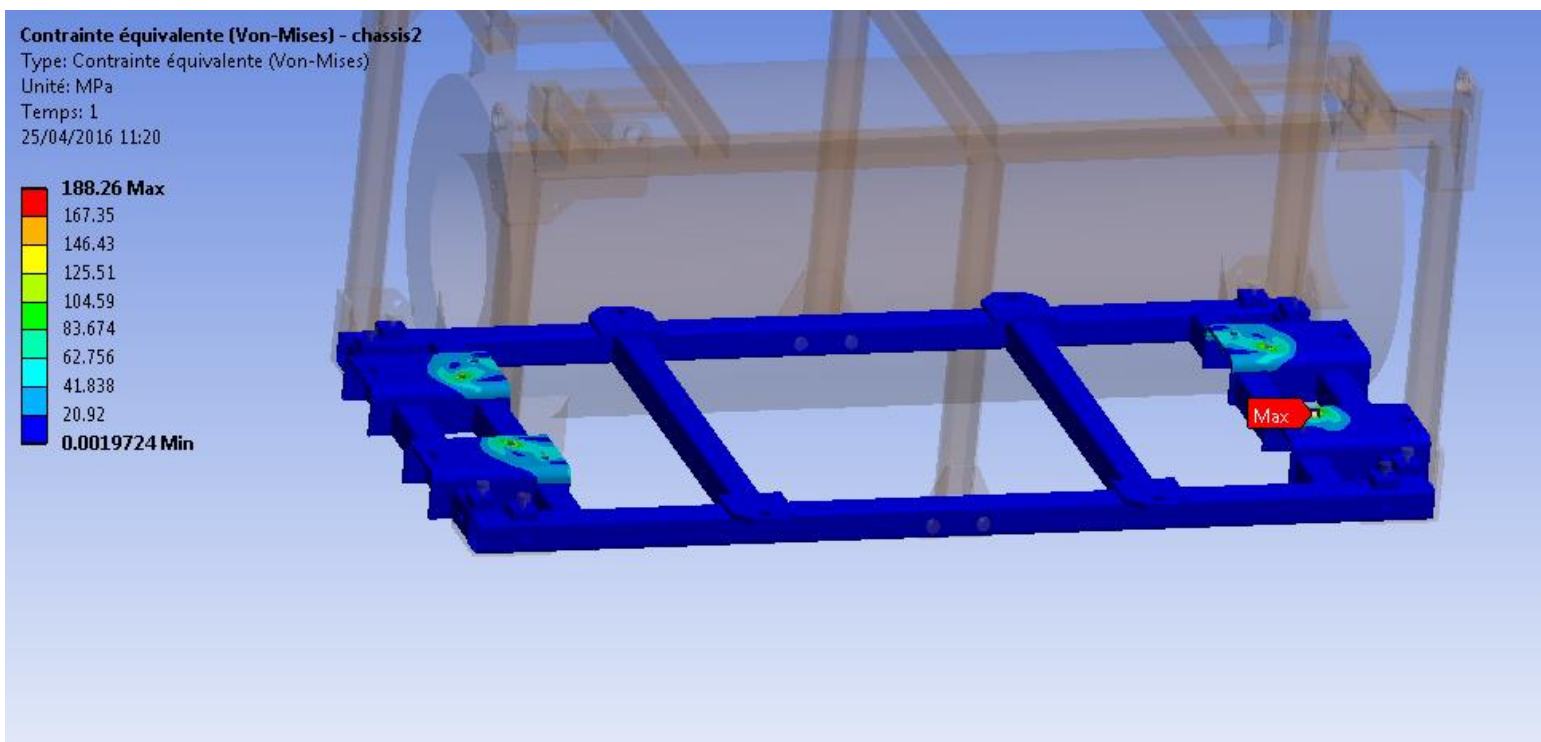
Unité: MPa

Temps: 1

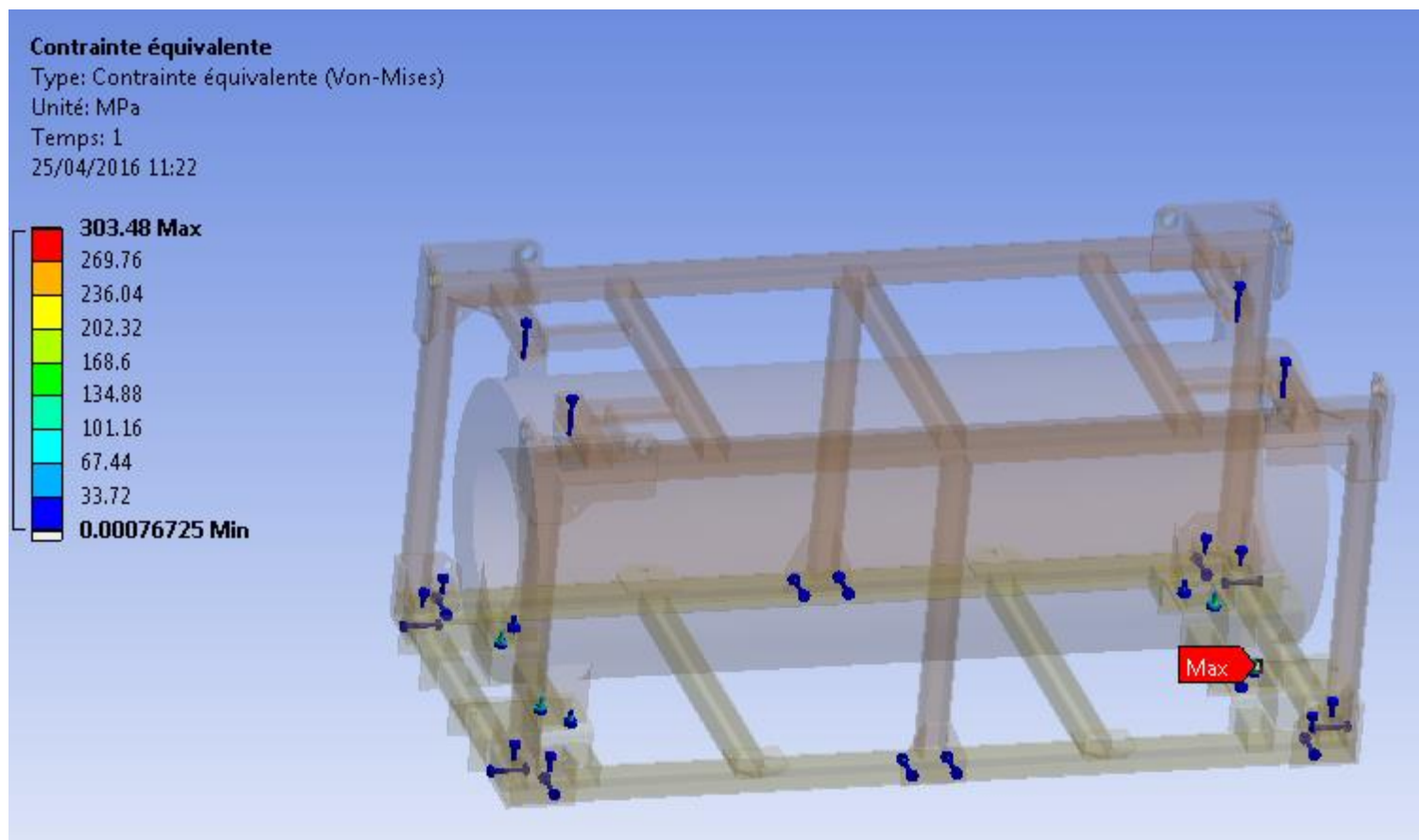
25/04/2016 11:19



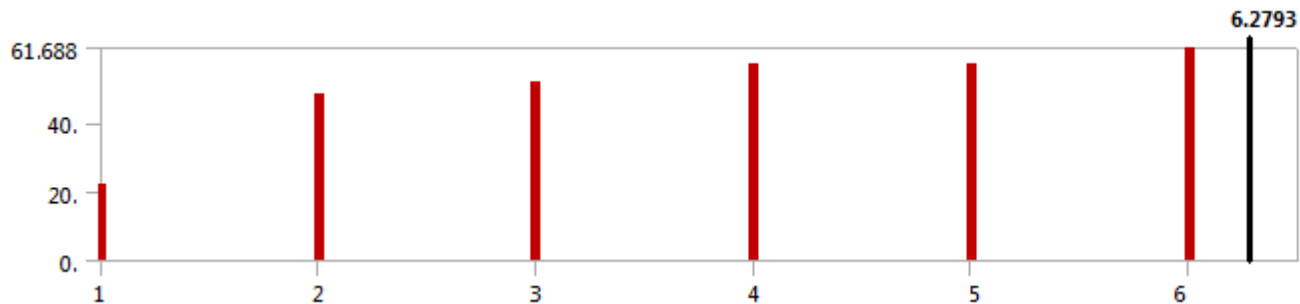
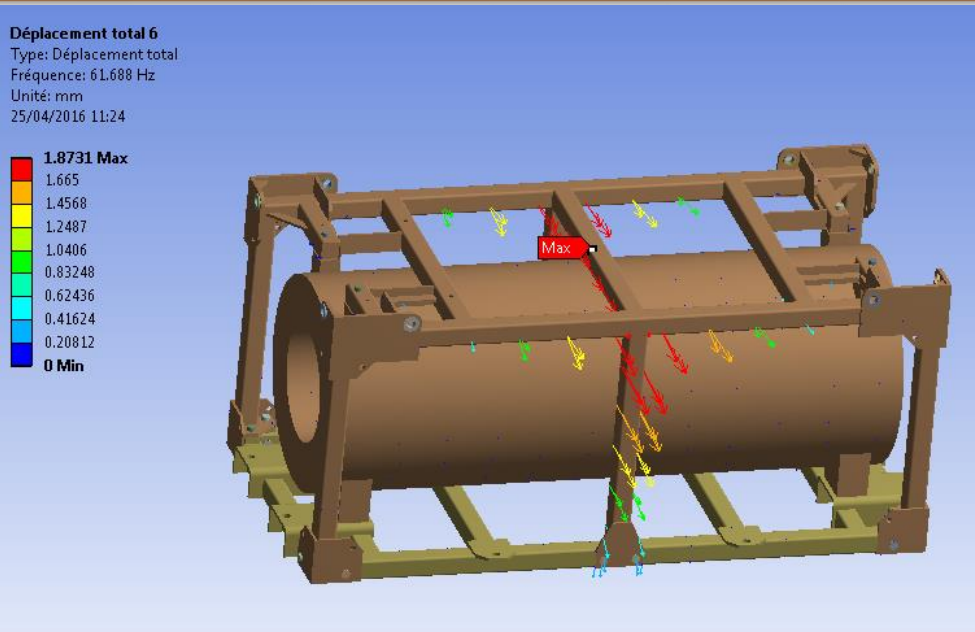
Stress Von Mises Stand 2 (Case 4)



Stress Von Mises Screws (Case 4)

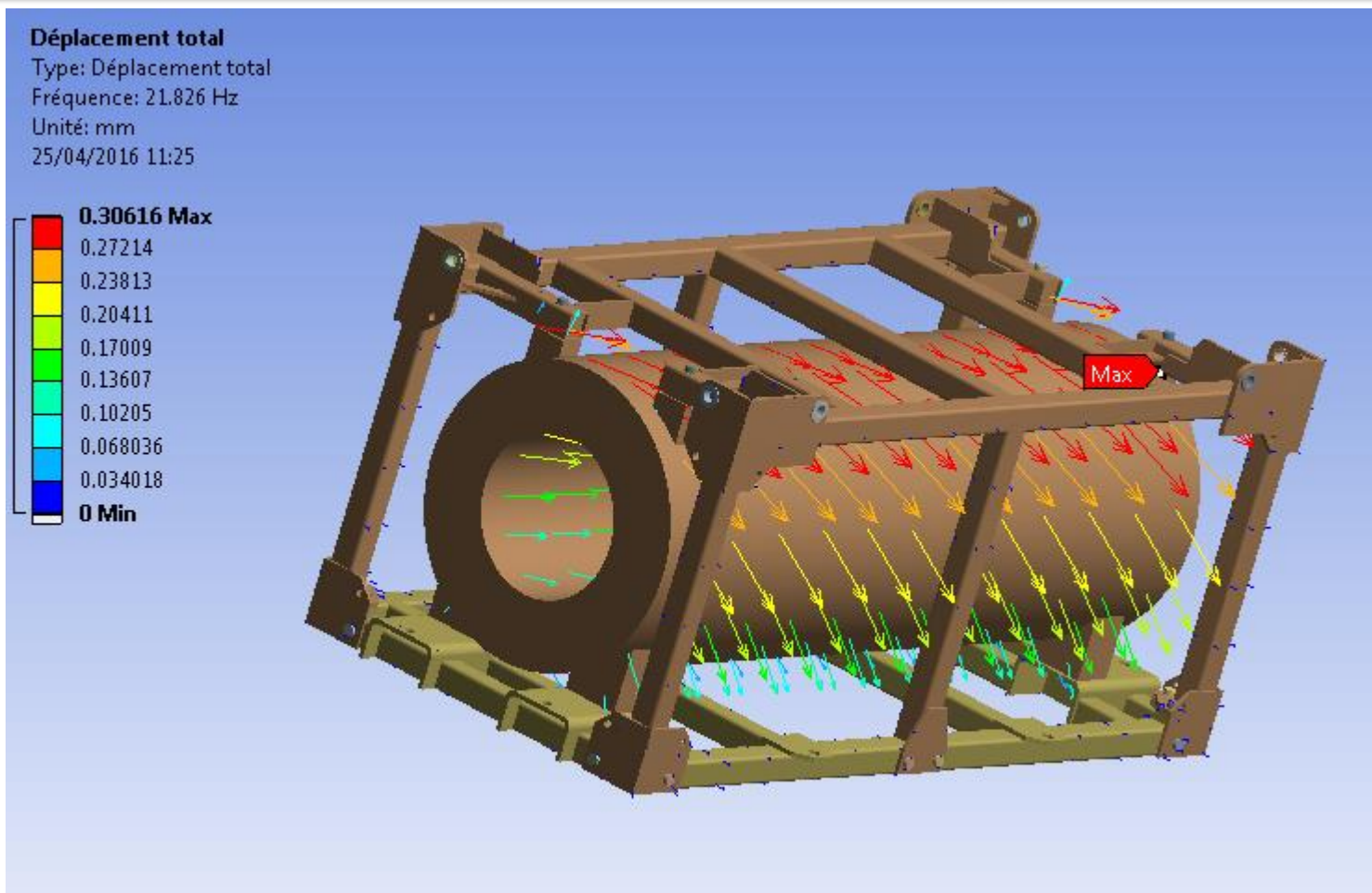


Ansys Model-Modal analysis (Case 5)

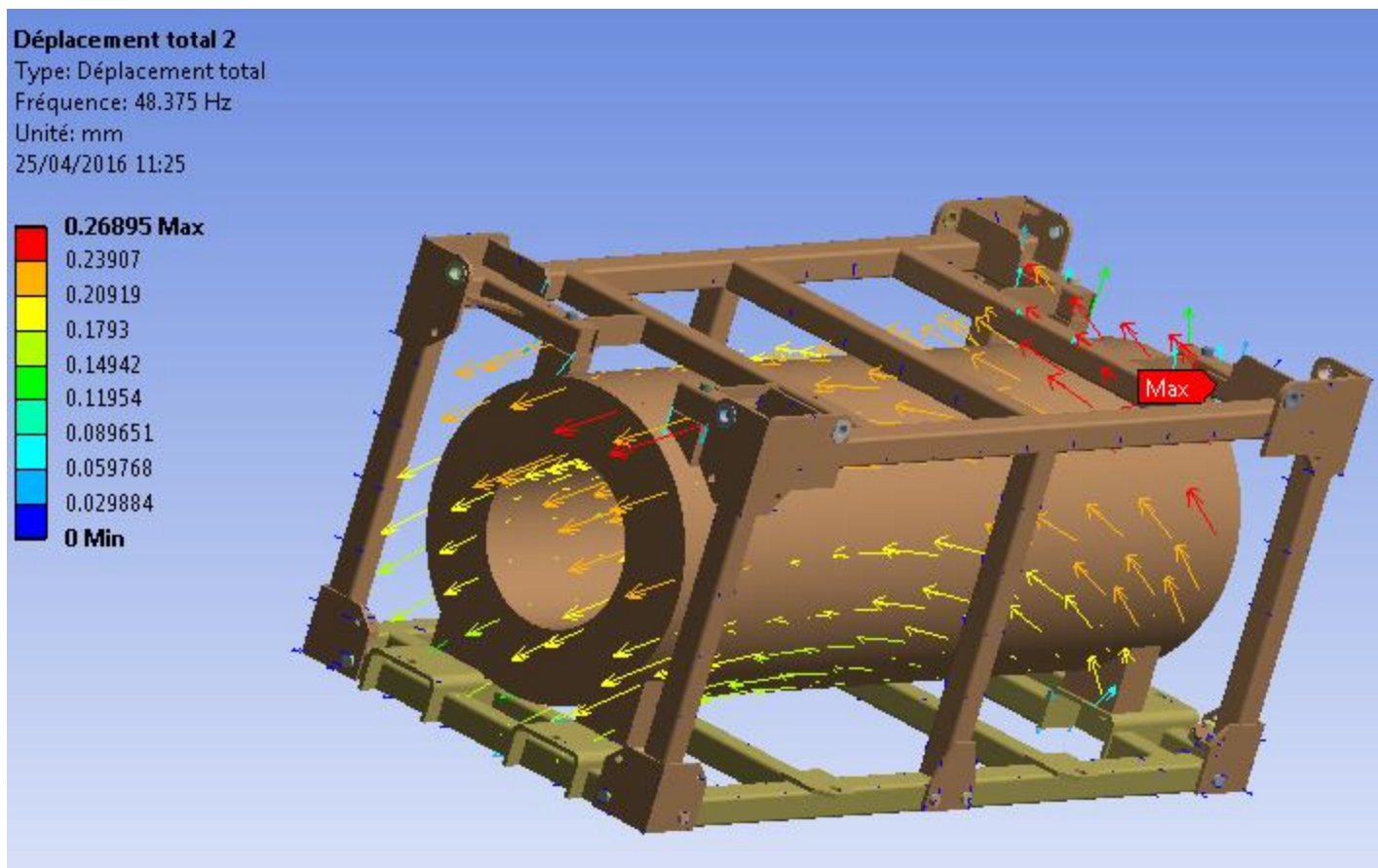


Mode	Fréquence [Hz]
1	21.826
2	48.375
3	51.537
4	56.754
5	57.057
6	61.688

Ansys Model-Modal analysis-Mode 1



Ansys Model-Modal analysis-Mode 2



Ansys Model-Modal analysis-Mode 3

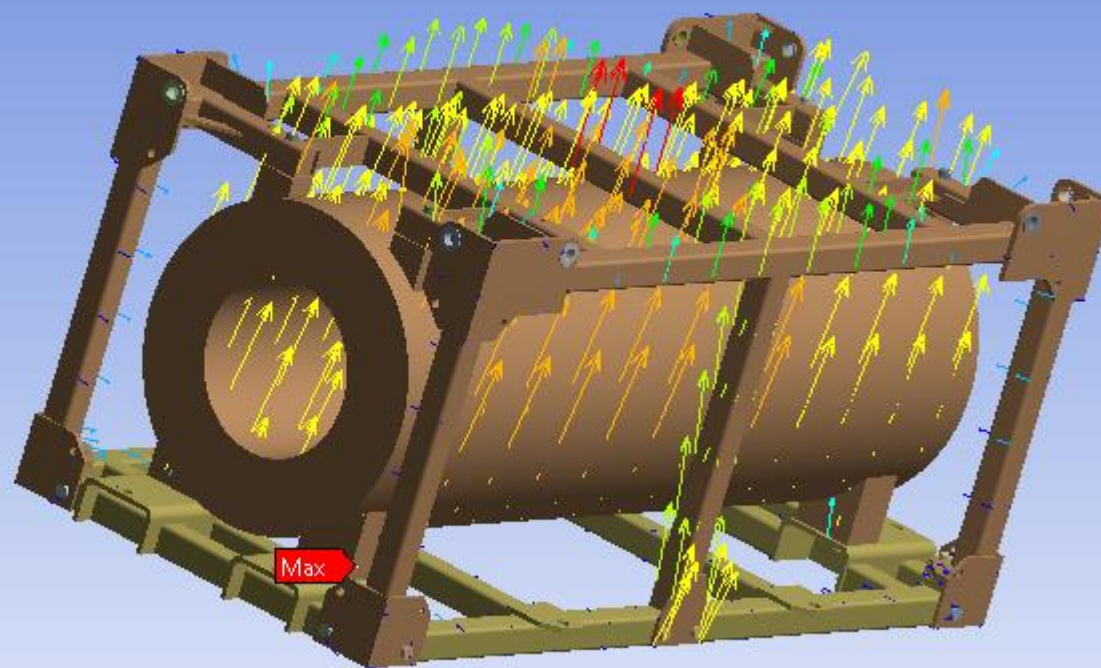
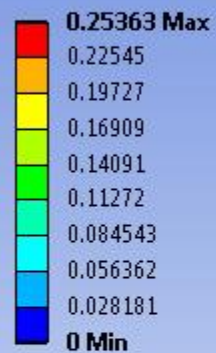
Déplacement total 3

Type: Déplacement total

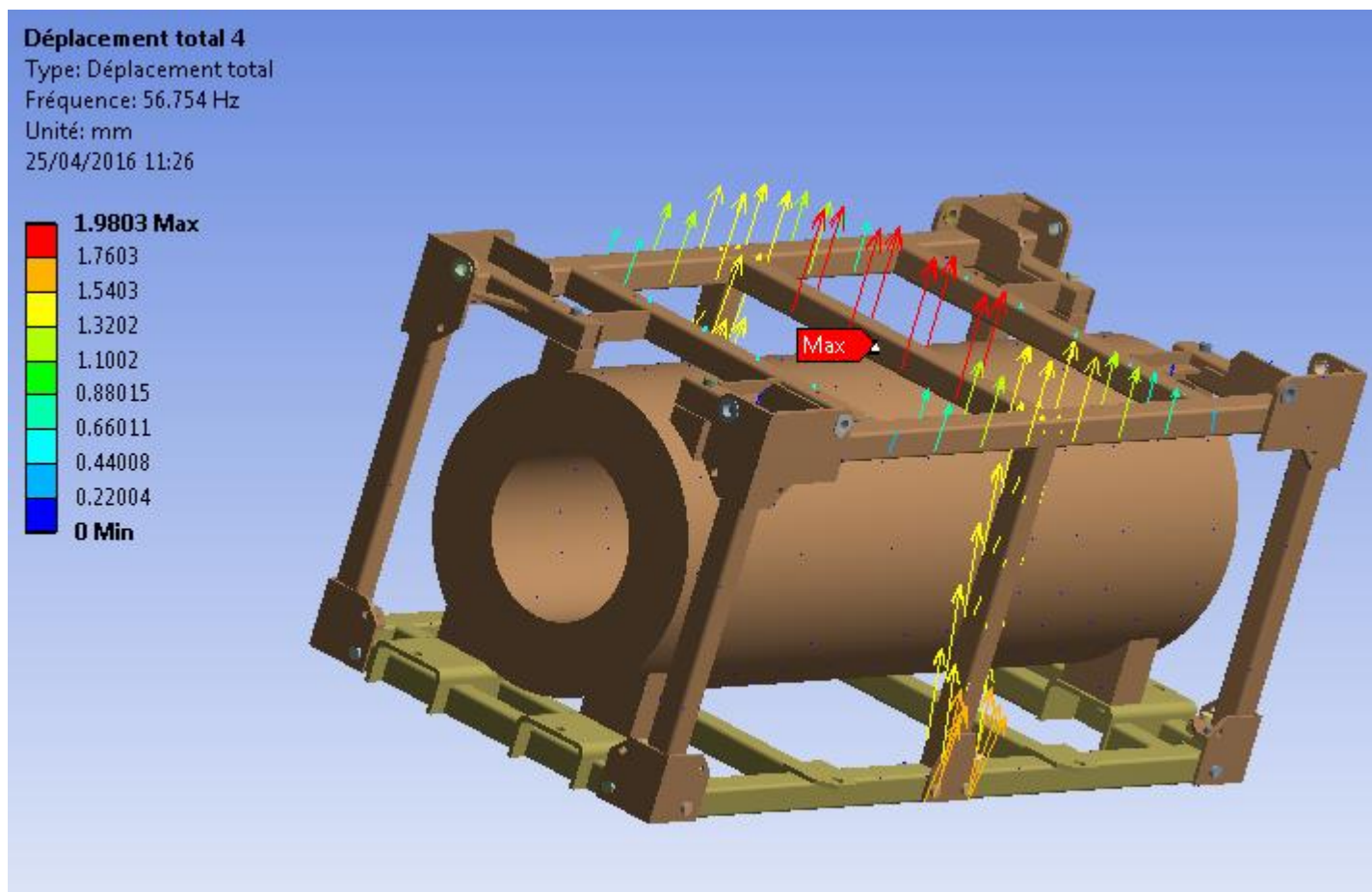
Fréquence: 51,537 Hz

Unité: mm

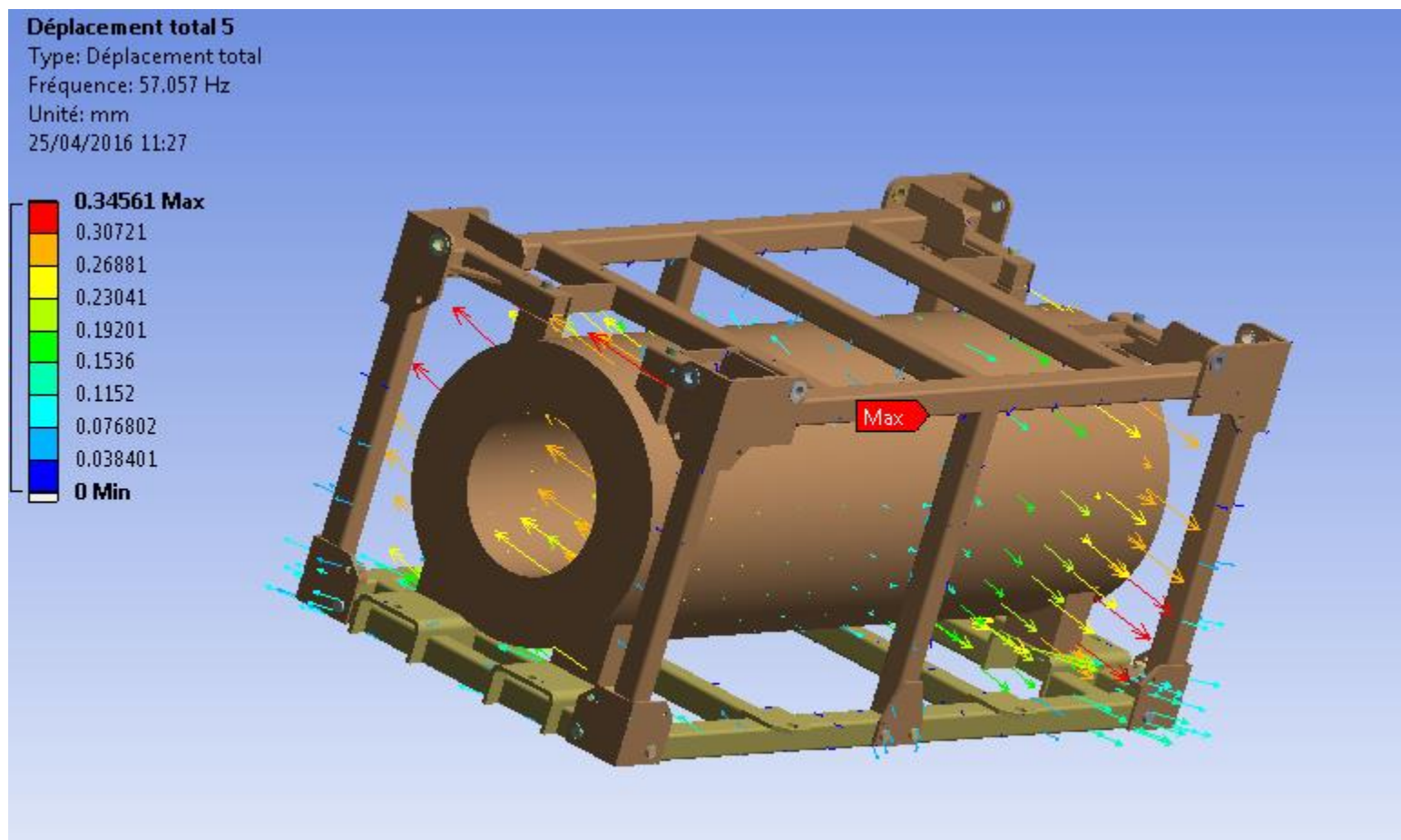
25/04/2016 11:26



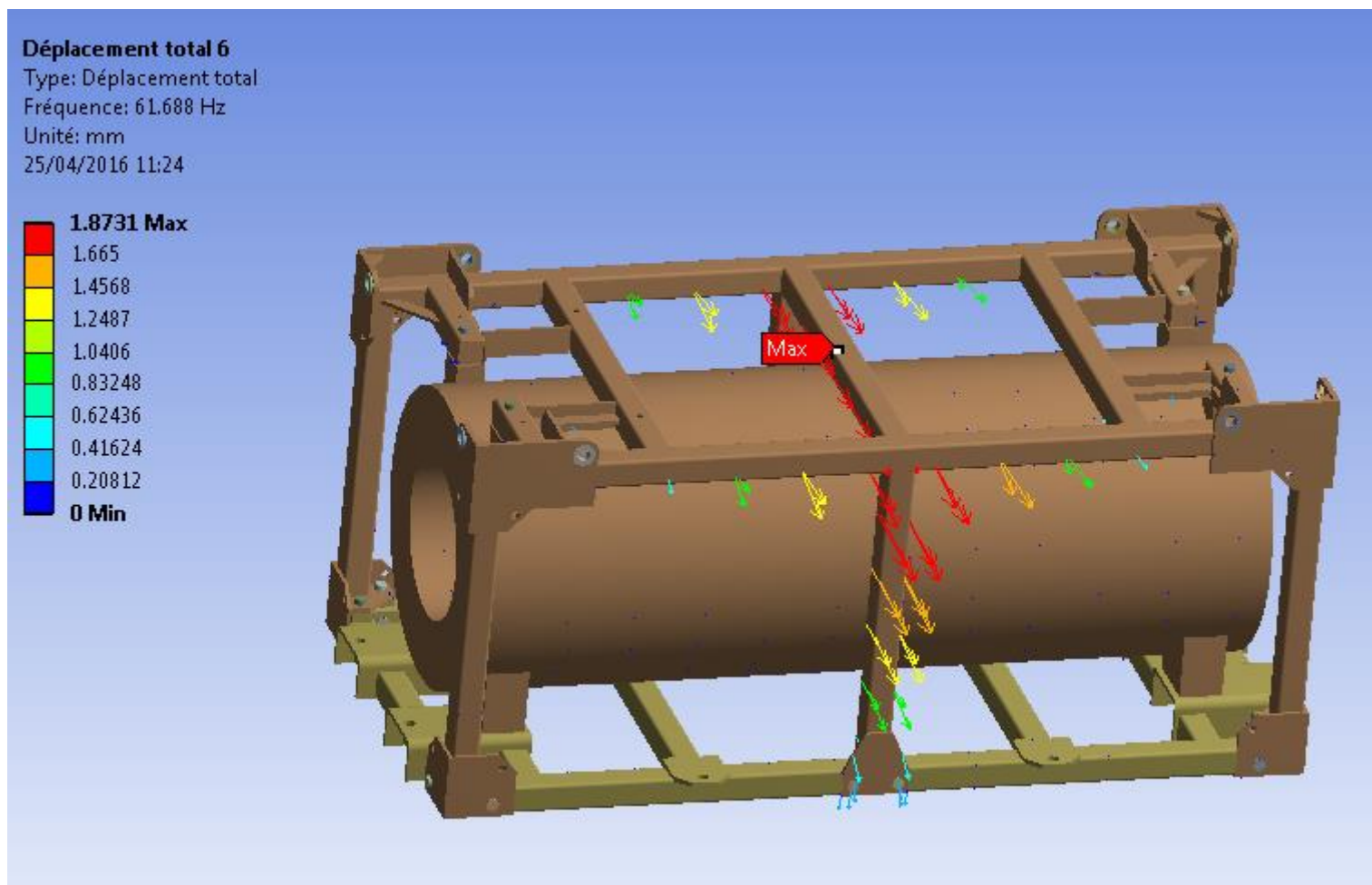
Ansys Model-Modal analysis-Mode 4



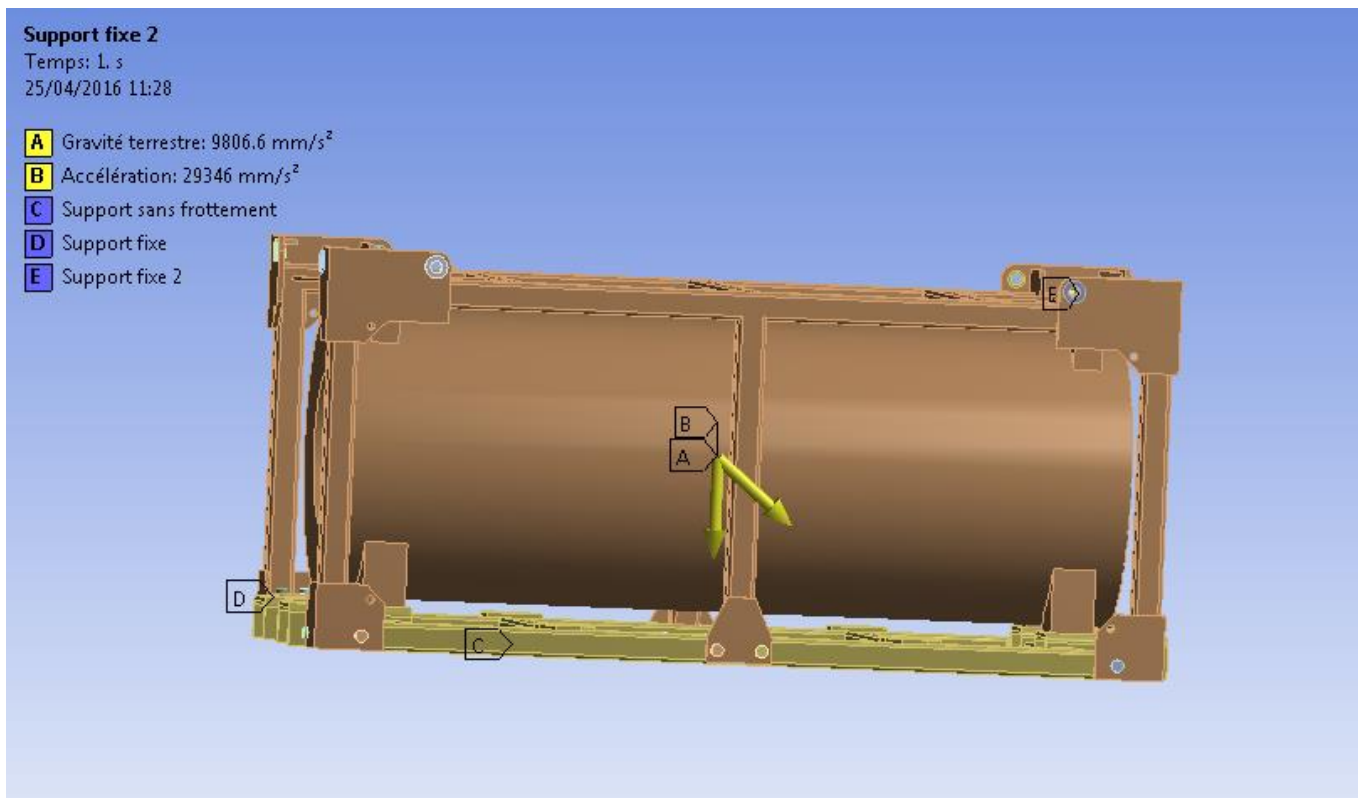
Ansys Model-Modal analysis-Mode 5



Ansys Model-Modal analysis-Mode 6



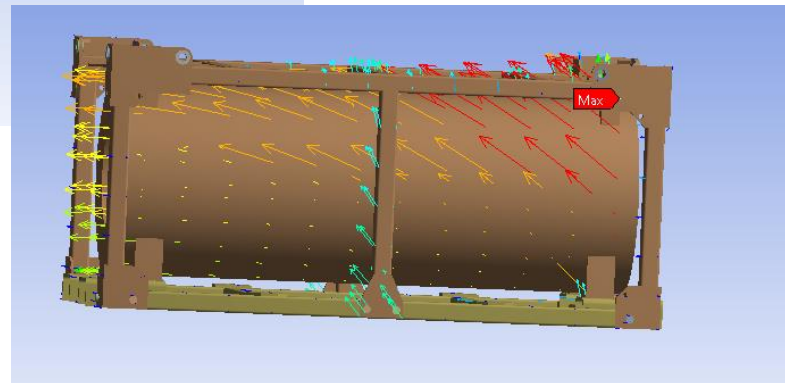
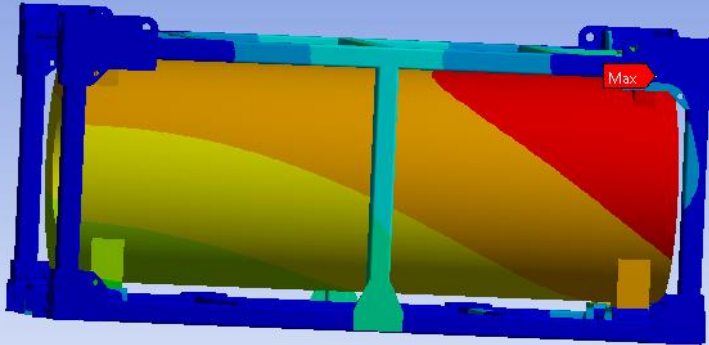
Loading case 6 (Axial acceleration 3G @ 40° down direction + Gravity)



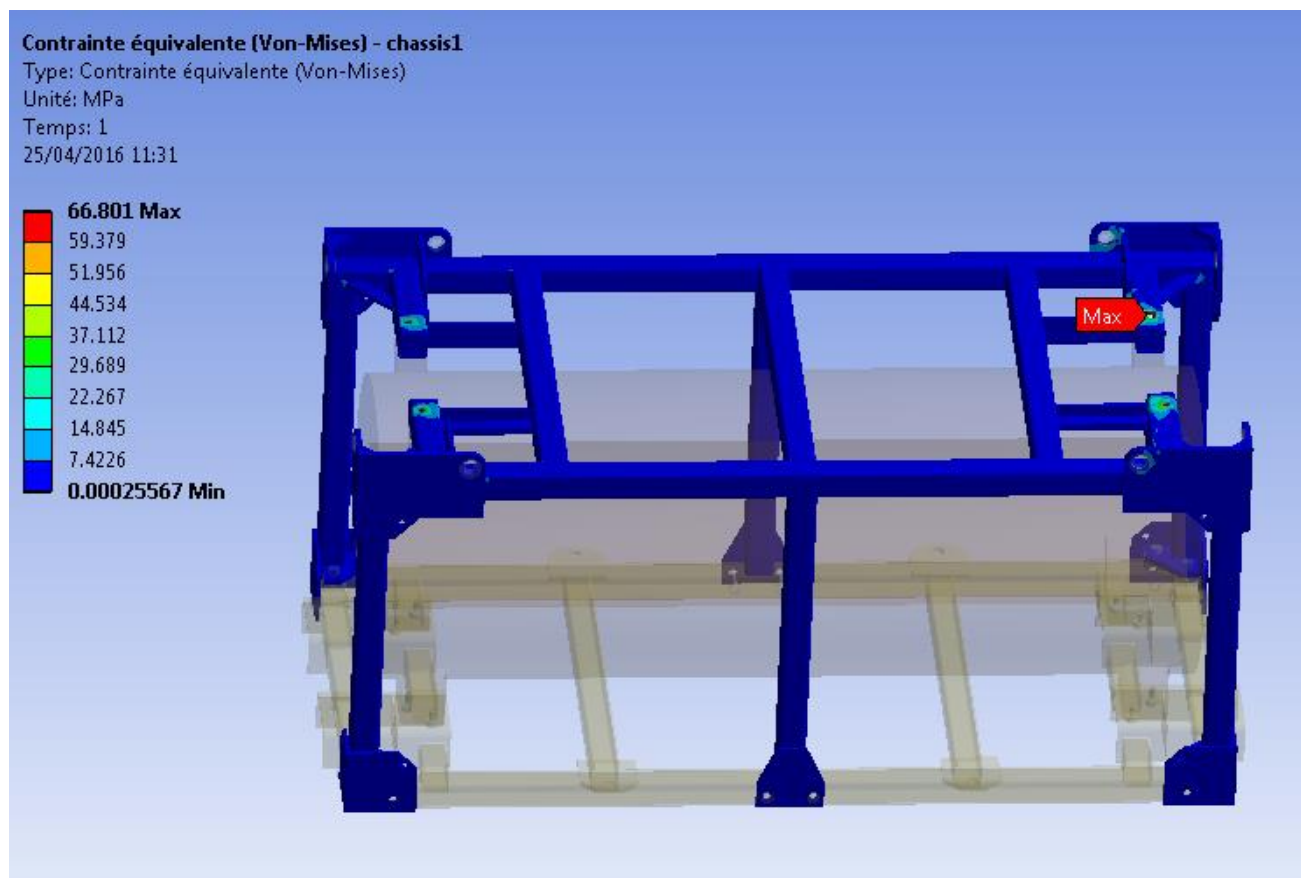
Displacement (Case6)

Déplacement total
Type: Déplacement total
Unité: mm
Temps: 1
25/04/2016 11:30

0.34018 Max
0.30238
0.26458
0.22678
0.18899
0.15119
0.11339
0.075595
0.037797
0 Min



Stress Von Mises Stand 1 (Case 6)



Stress Von Mises Stand 2 (Case 6)

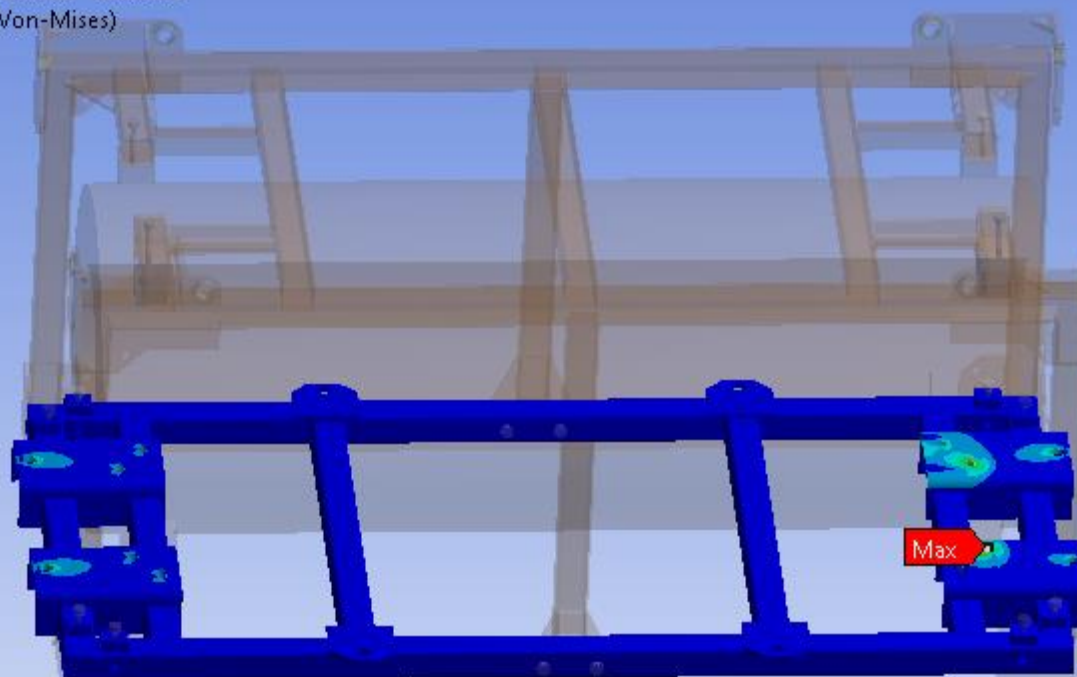
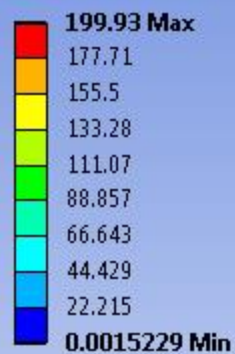
Contrainte équivalente (Von-Mises) - chassis2

Type: Contrainte équivalente (Von-Mises)

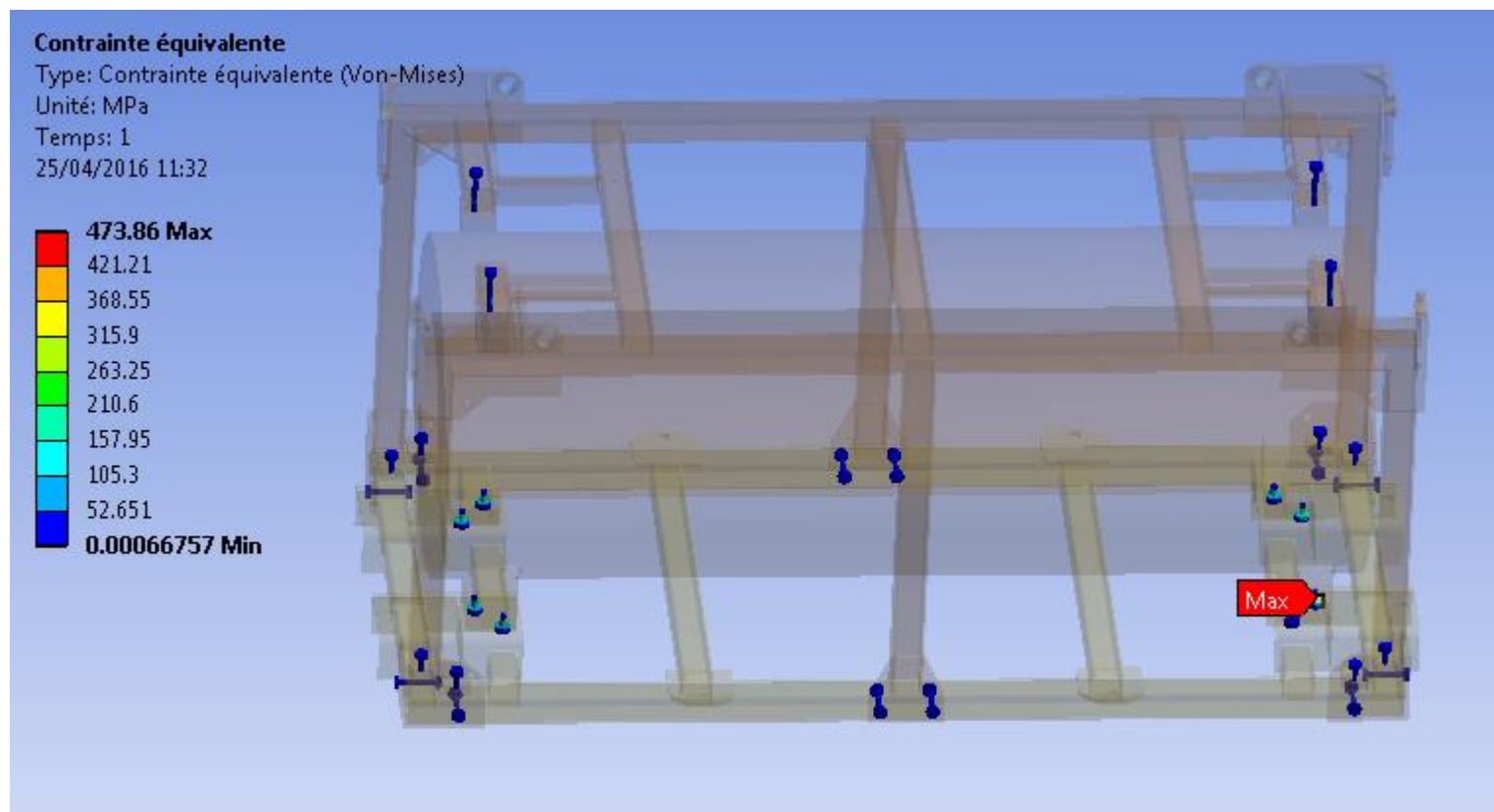
Unité: MPa

Temps: 1

25/04/2016 11:31



Stress Von Mises Screws (Case 6)



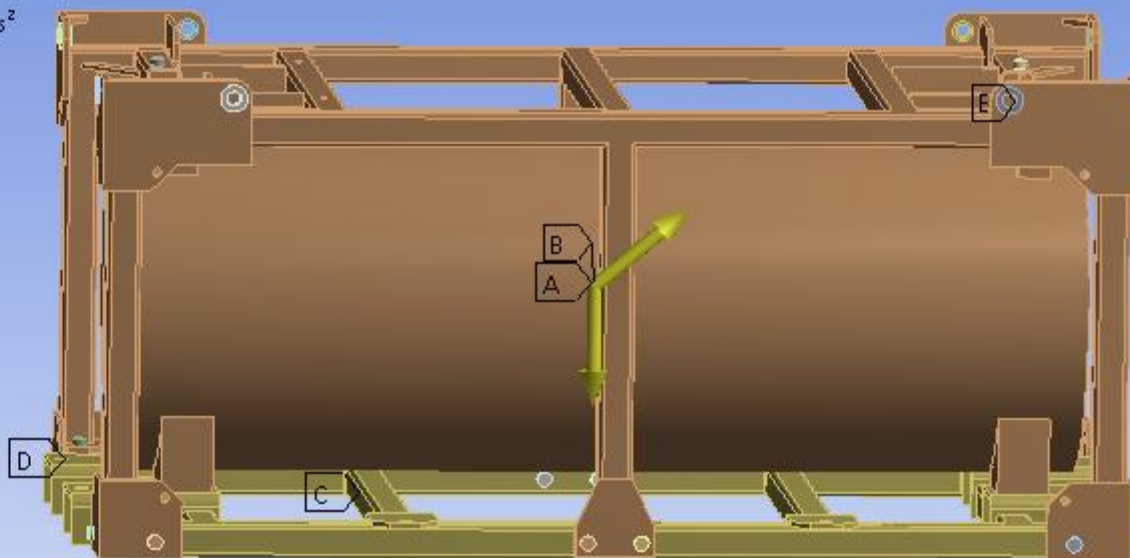
Loading case 7 (Axial acceleration 3G @ 40° Up direction + Gravity)

Support fixe 2

Temps: 1. s

25/04/2016 11:33

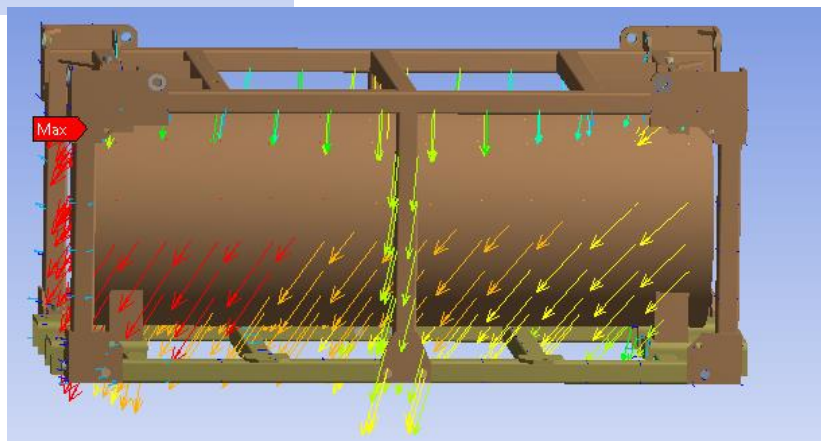
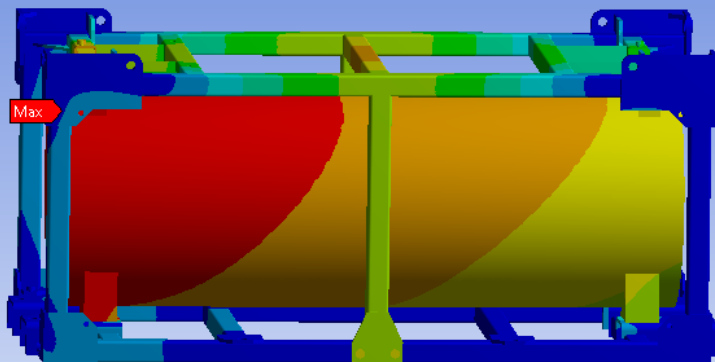
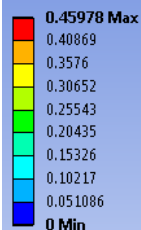
- A** Gravité terrestre: 9806.6 mm/s²
- B** Accélération: 29346 mm/s²
- C** Support sans frottement
- D** Support fixe
- E** Support fixe 2



Displacement (Case7)

Déplacement total

Type: Déplacement total
Unité: mm
Temps: 1
25/04/2016 11:34



Stress Von Mises Stand 1 (Case 7)

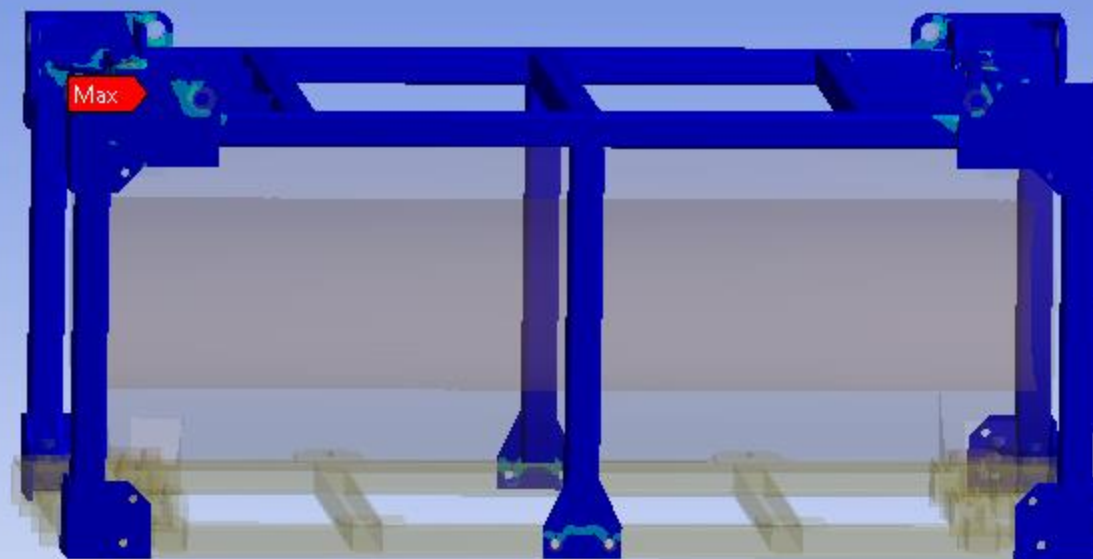
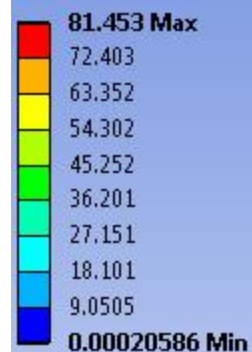
Contrainte équivalente (Von-Mises) - chassis1

Type: Contrainte équivalente (Von-Mises)

Unité: MPa

Temps: 1

25/04/2016 11:35



Stress Von Mises Stand 2 (Case 7)

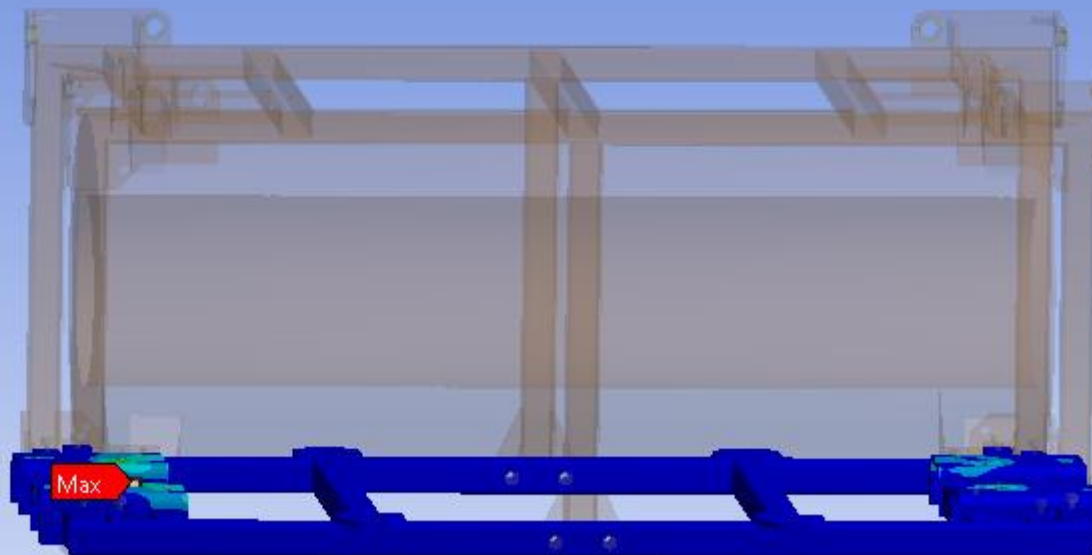
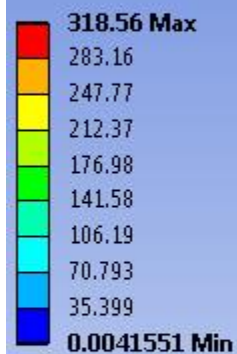
Contrainte équivalente (Von-Mises) - chassis2

Type: Contrainte équivalente (Von-Mises)

Unité: MPa

Temps: 1

25/04/2016 11:35



Stress Von Mises Screws (Case 7)

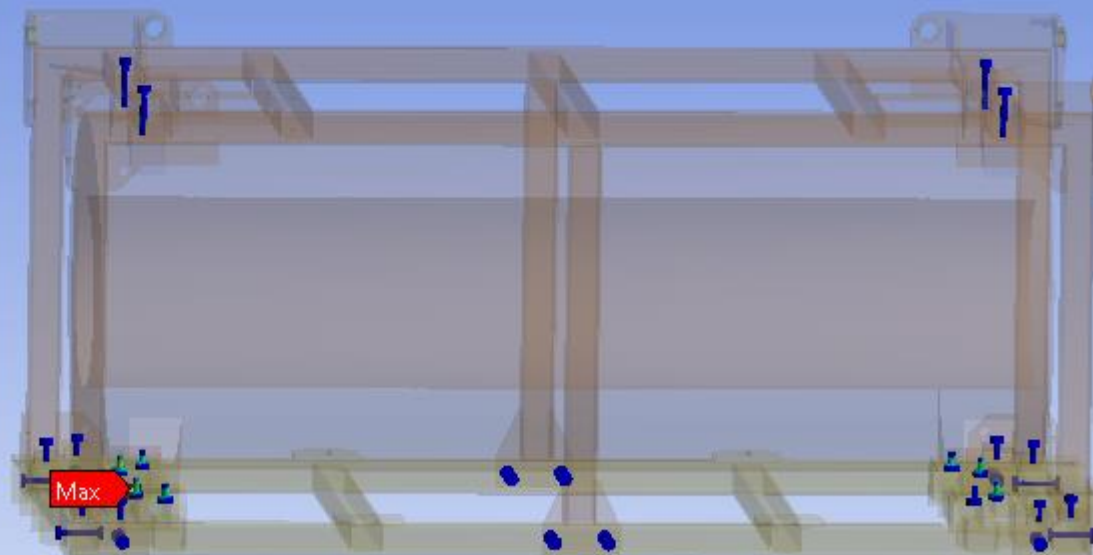
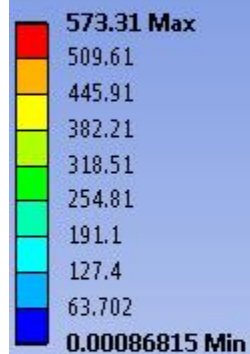
Contrainte équivalente

Type: Contrainte équivalente (Von-Mises)

Unité: MPa

Temps: 1

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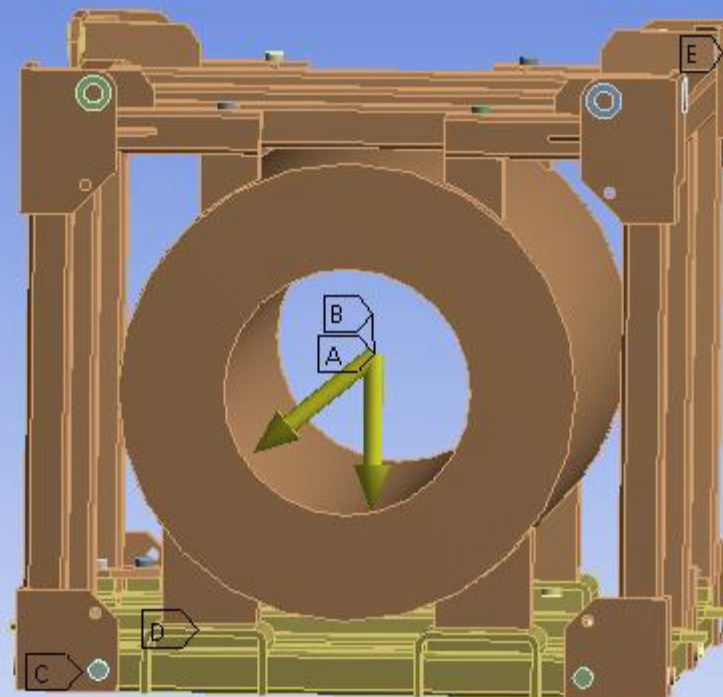
Loading case 8 (Lateral acceleration 3G @ 40° down direction + Gravity)

Support fixe 2

Temps: 1. s

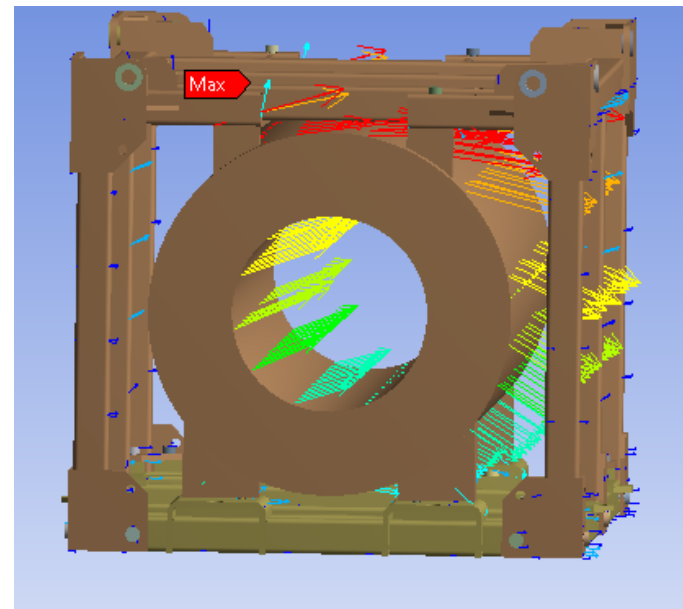
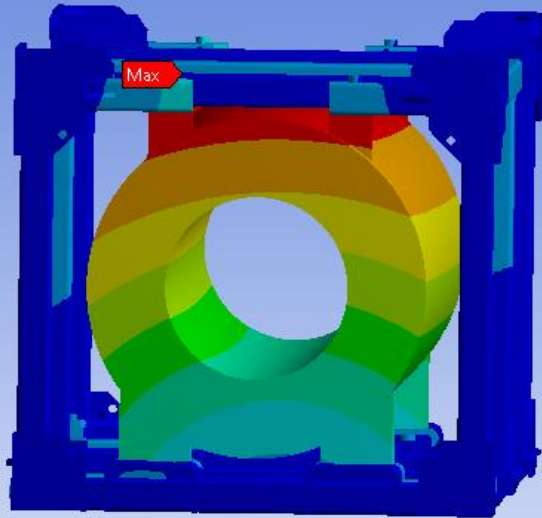
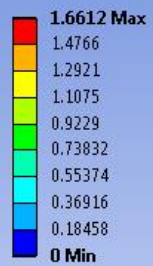
25/04/2016 11:38

- A** Gravité terrestre: 9806.6 mm/s²
- B** Accélération: 29346 mm/s²
- C** Support sans frottement
- D** Support fixe
- E** Support fixe 2

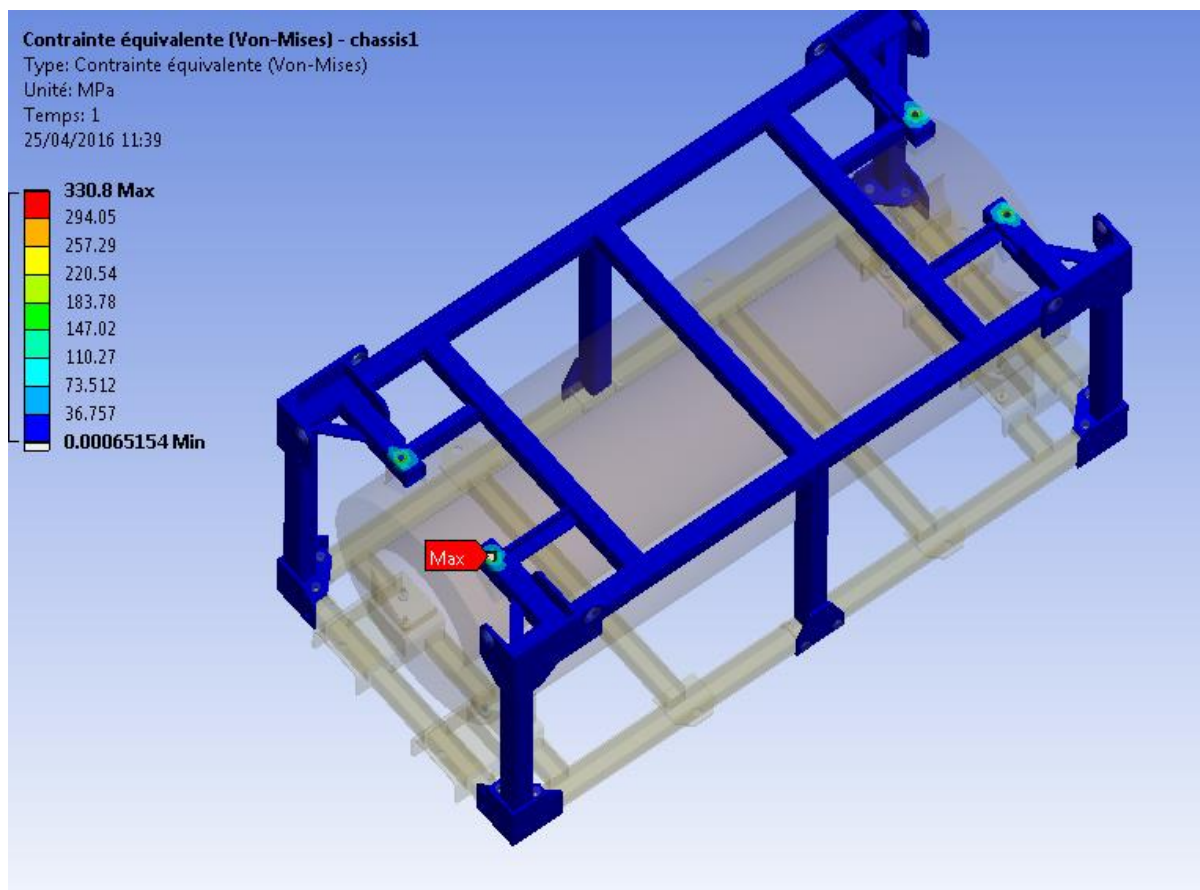


Displacement (Case 8)

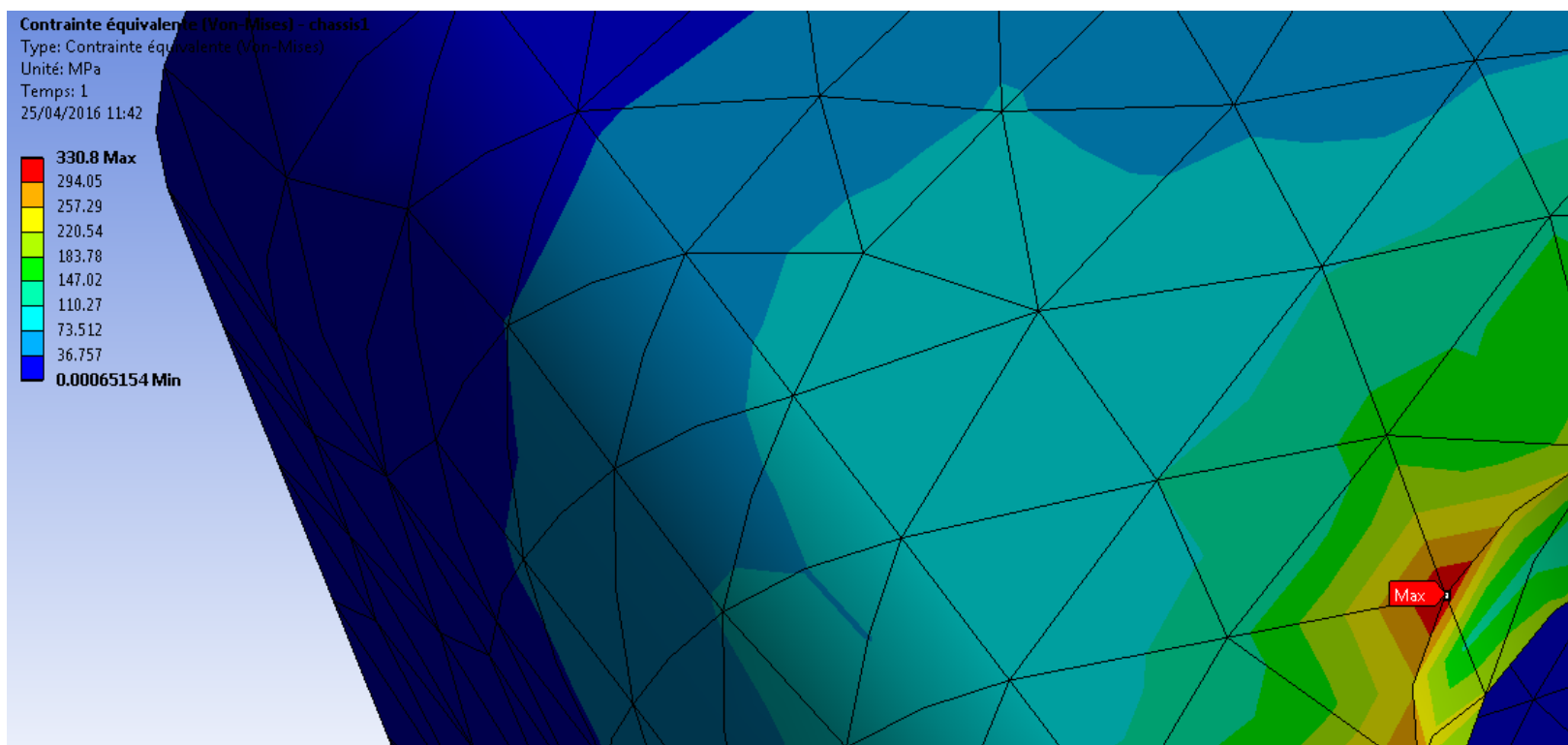
Déplacement total
Type: Déplacement total
Unité: mm
Temps: 1
25/04/2016 11:38



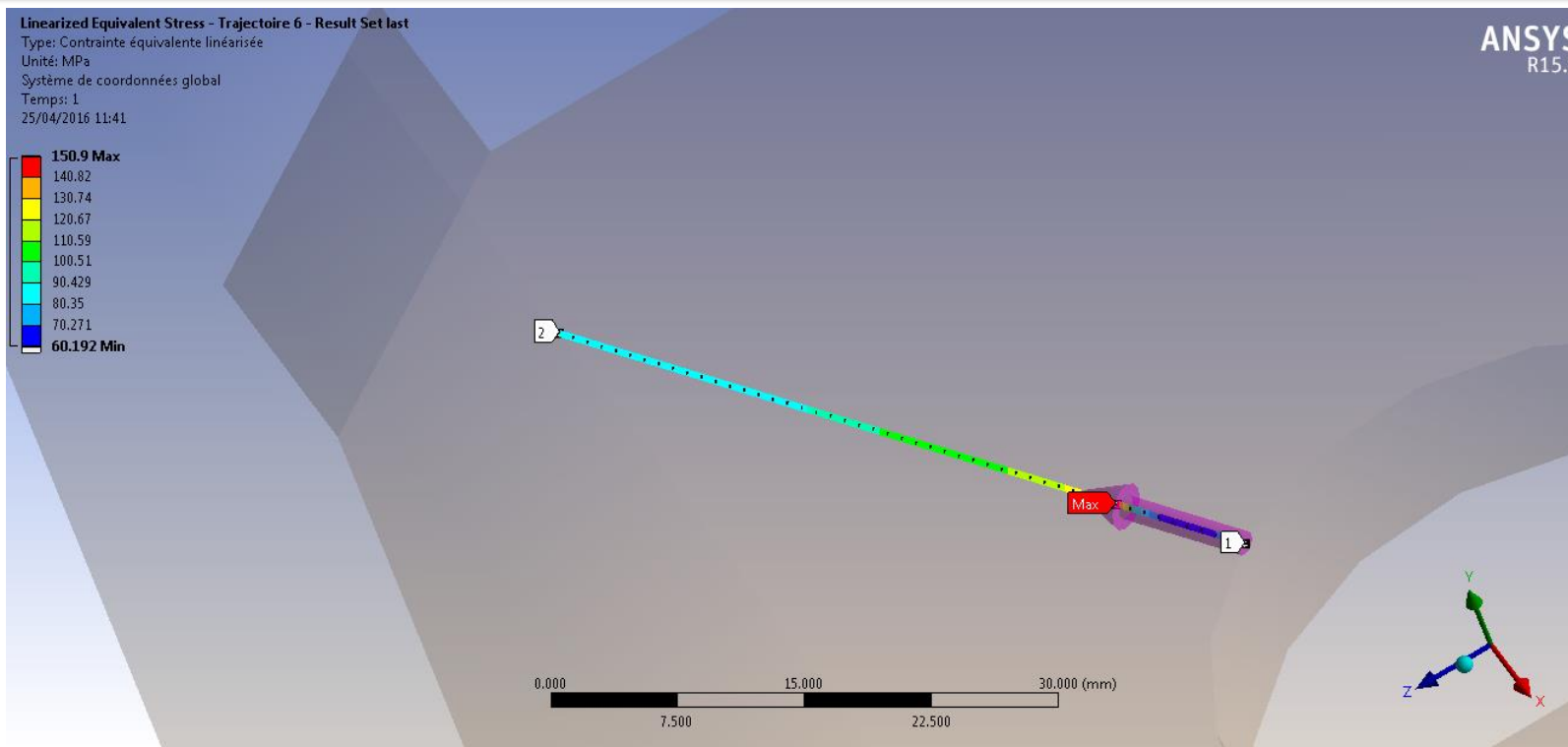
Stress Von Mises Stand 1 (Case 8)



Stress Von Mises Stand 1 (Case 8)



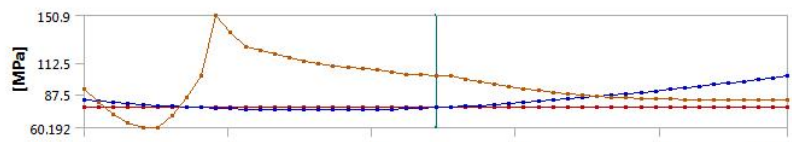
Stress Von Mises Stand 1 (Case 8)



\ Géométrie \ Aperçu avant impression \ Aperçu du rapport /

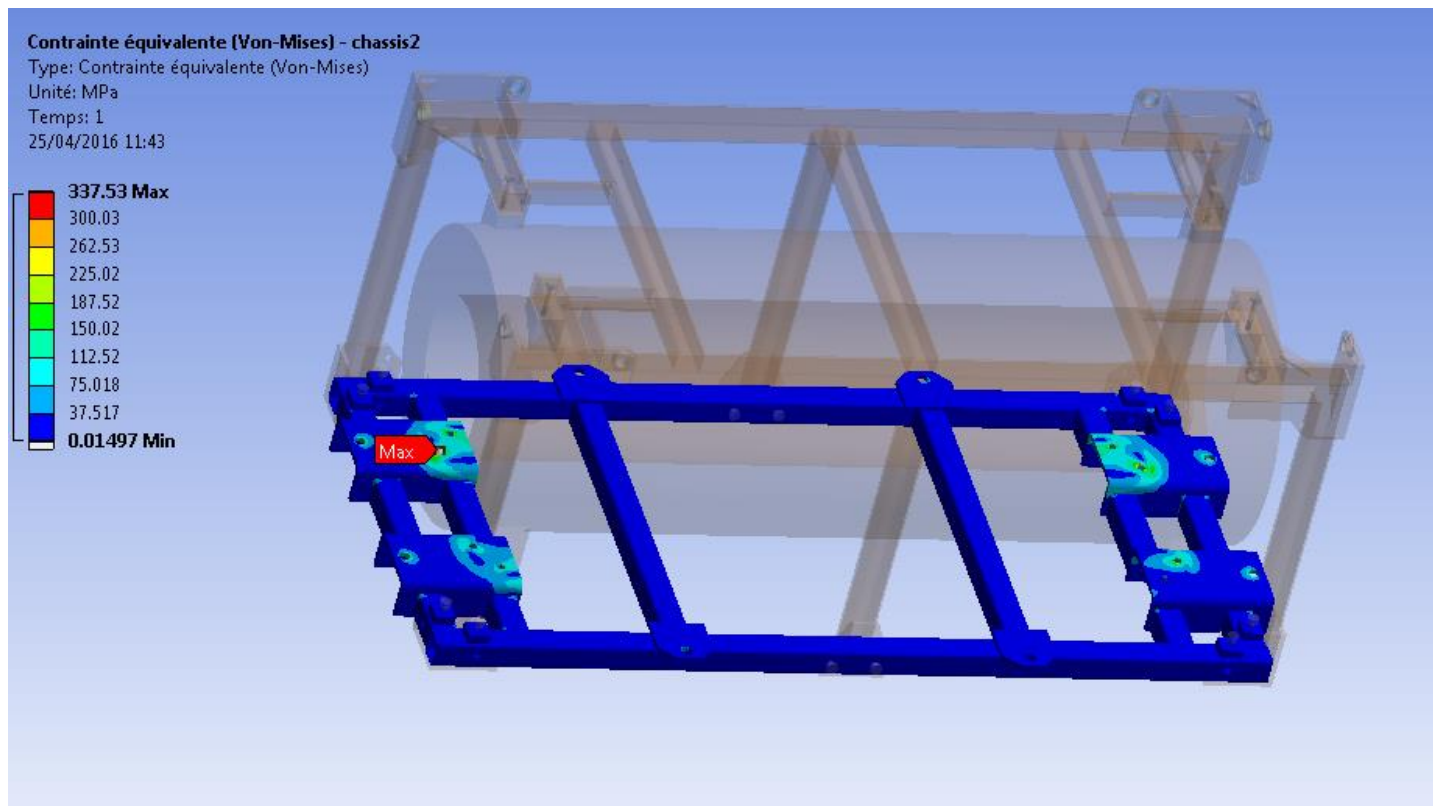
Graphique

Données tabulaires

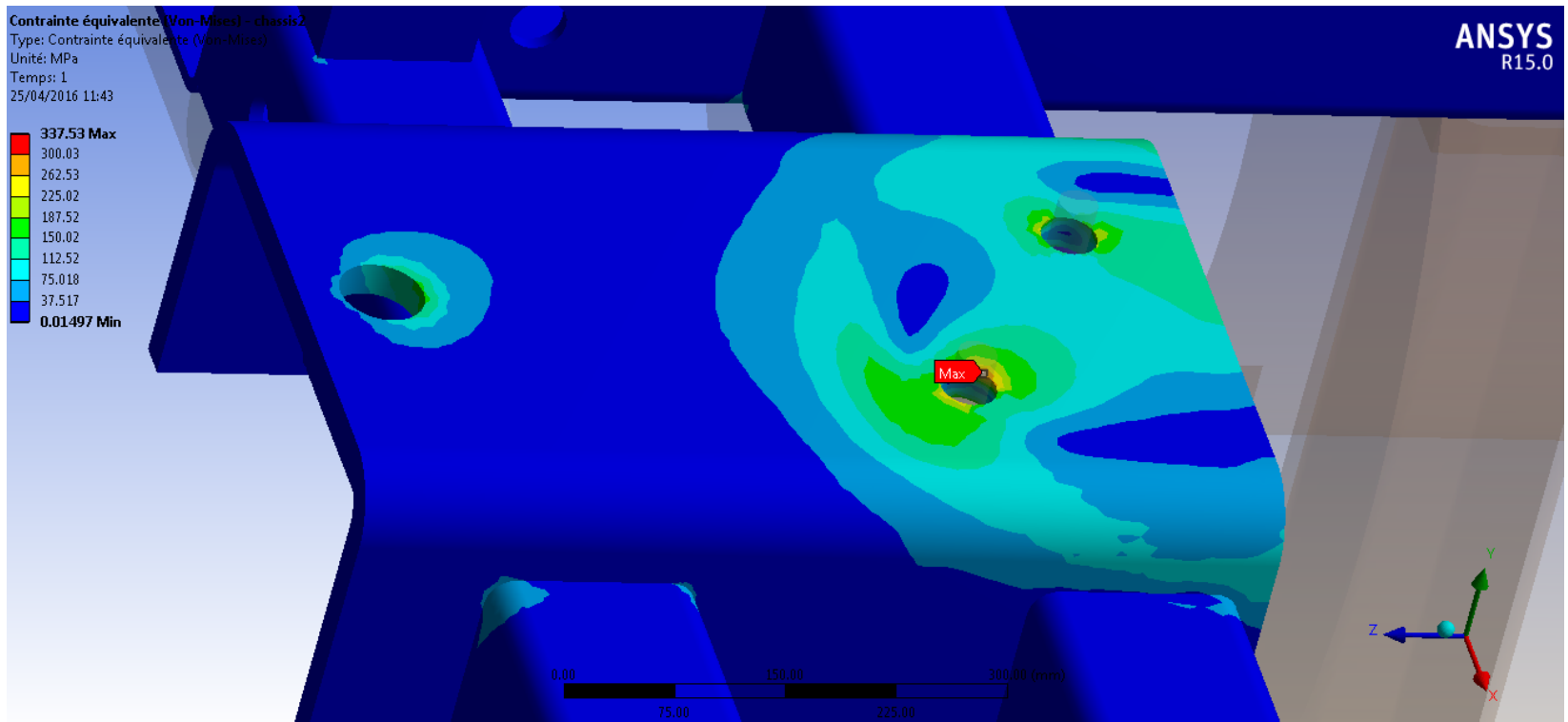


Longueur [mm]	Membrane [MPa]	Flexion [MPa]	Membrane+Flexion [MPa]	Pointe [MPa]	T
1 0.	76.399	52.488	82.21	26.16	91.44
2 1.0185	76.399	50.301	81.302	30.161	80.20
3 2.0369	76.399	48.114	80.444	39.275	70.85
4 3.0554	76.399	45.927	79.636	50.604	64.00
5 4.0738	76.399	43.74	78.881	63.142	60.19
6 5.0923	76.399	41.553	78.18	83.013	60.52
7 6.1107	76.399	39.366	77.534	103.85	69.49

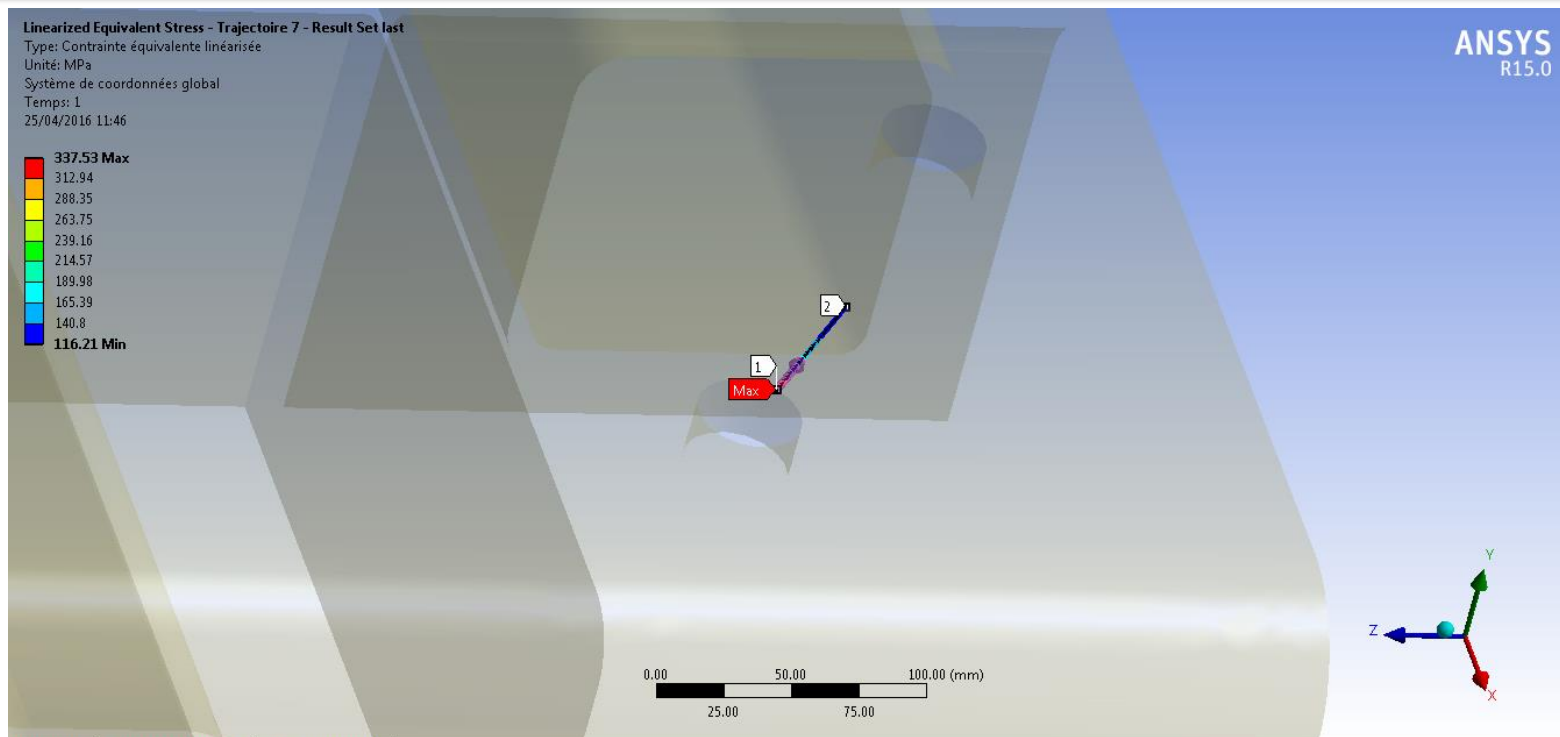
Stress Von Mises Stand 2 (Case 8)



Stress Von Mises Stand 2 (Case 8)

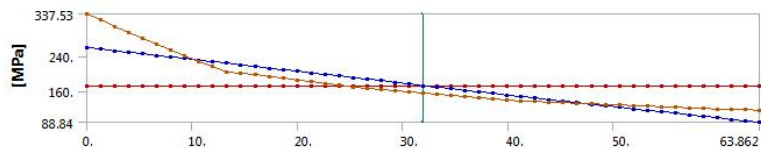


Stress Von Mises Stand 2 (Case 8)



\Géométrie \Aperçu avant impression \Aperçu du rapport /

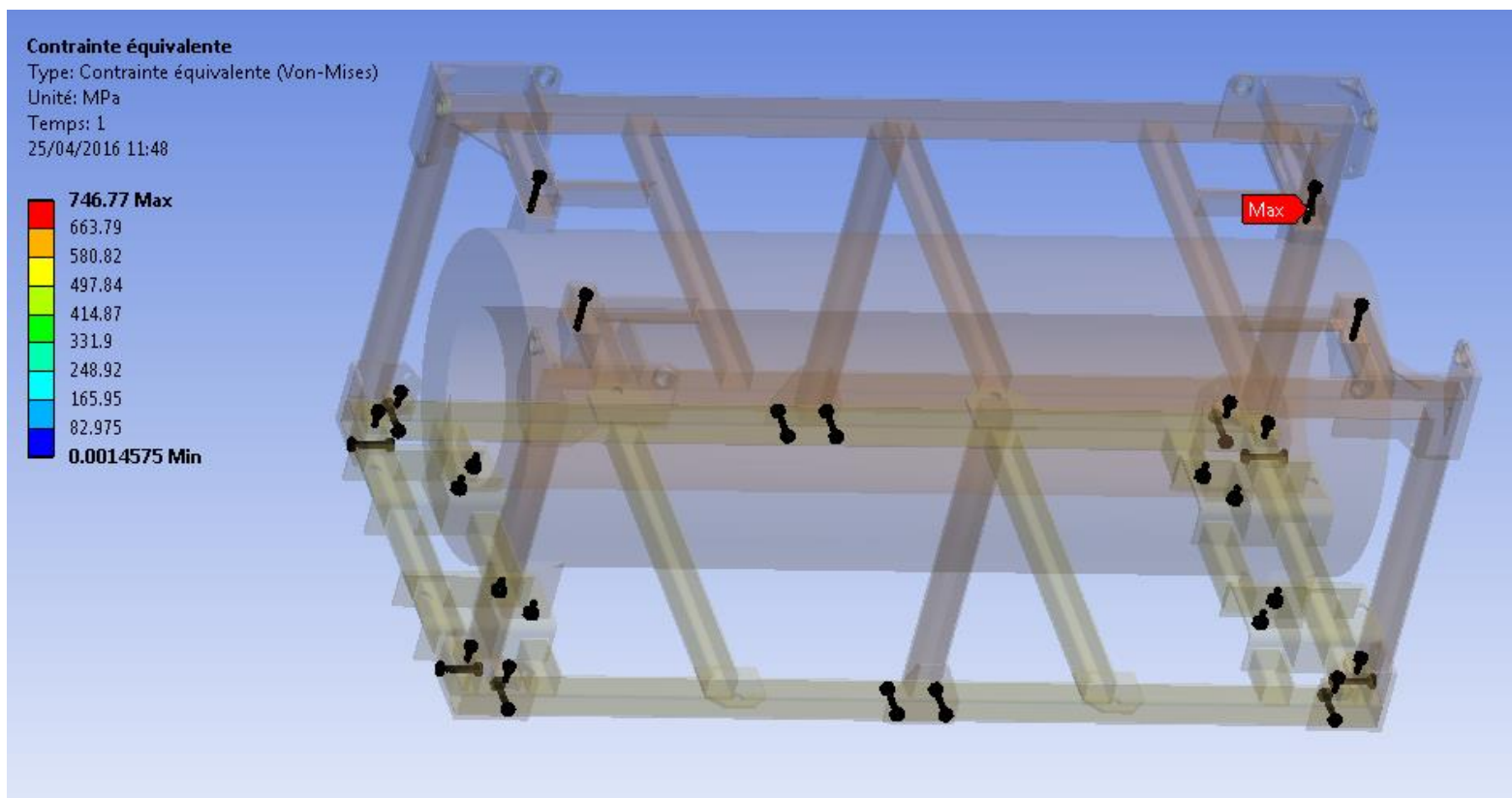
Graphique



Données tabulaires

	Longueur [mm]	Membrane [MPa]	Flexion [MPa]	Membrane+Flexion [MPa]	Pointe [MPa]	Tot.
1	0.	173.06	89.155	260.58	95.071	337.53
2	1.3305	173.06	85.44	256.91	82.463	323.36
3	2.6609	173.06	81.725	253.24	69.866	309.35
4	3.9914	173.06	78.011	249.57	57.285	295.52
5	5.3218	173.06	74.296	245.91	44.727	281.91
6	6.6523	173.06	70.581	242.25	31.118	267.39
7	7.9827	173.06	66.866	238.58	18.459	254.06

Stress Von Mises Screws (Case 8)



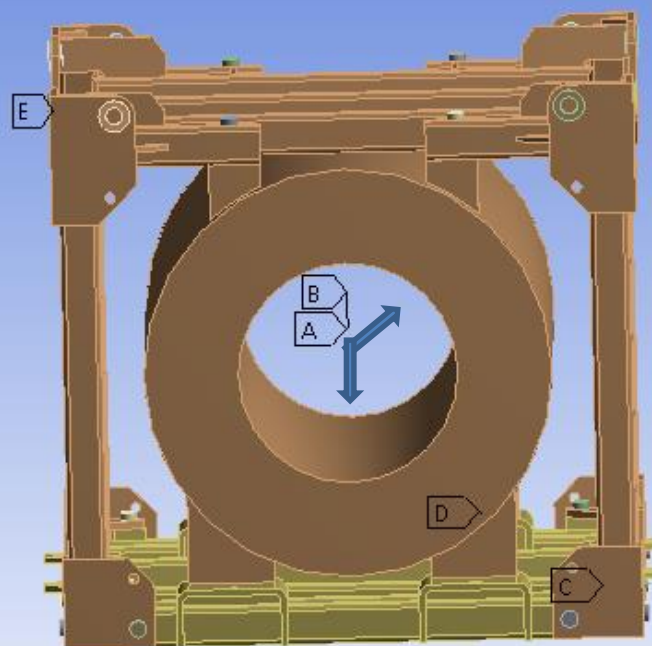
Loading case 9 (Lateral acceleration 3G @ 40° Up direction + Gravity)

Support fixe 2

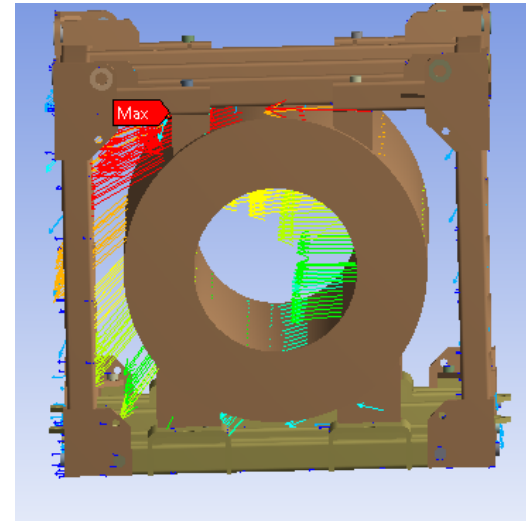
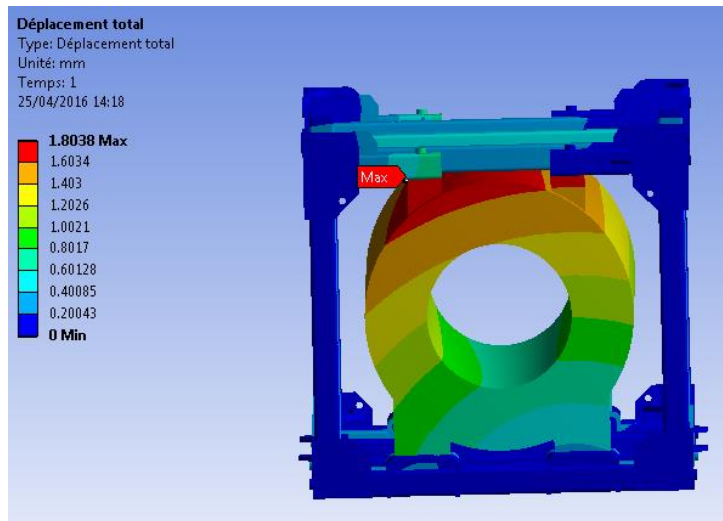
Temps: 1. s

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- A** Gravité terrestre: 9806.6 mm/s²
- B** Accélération: 29346 mm/s²
- C** Support sans frottement
- D** Support fixe
- E** Support fixe 2



Displacement (Case 9)



Stress Von Mises Stand 1 (Case 9)

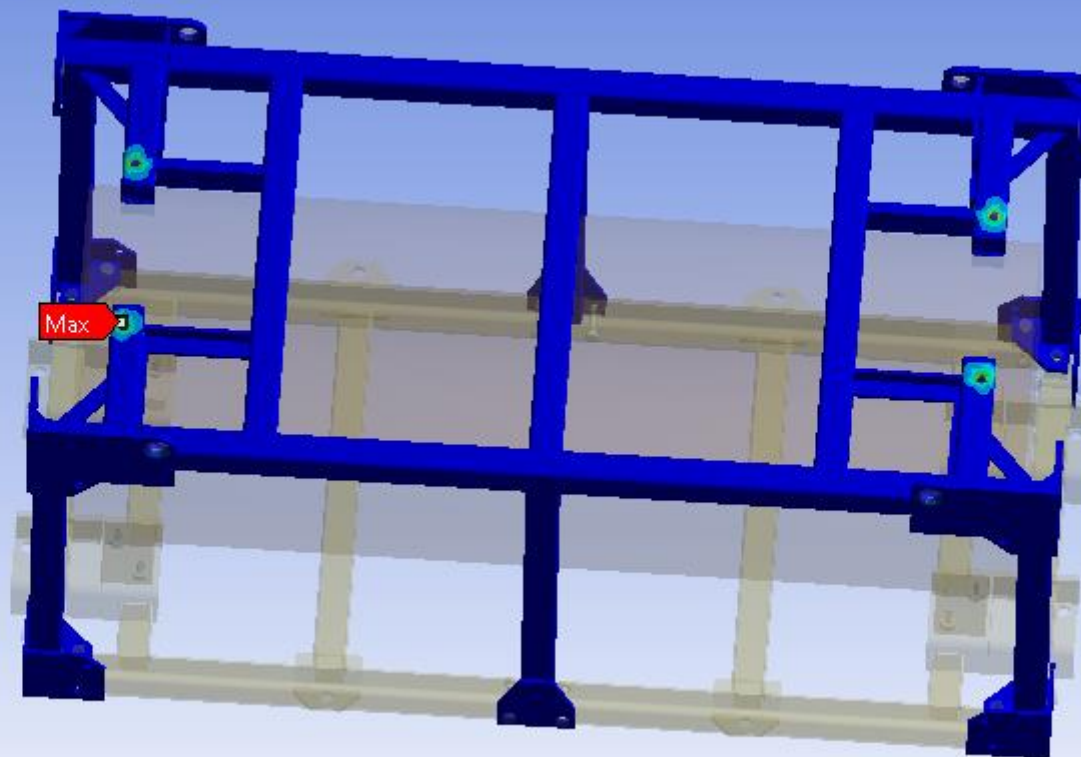
Contrainte équivalente (Von-Mises) - chassis1

Type: Contrainte équivalente (Von-Mises)

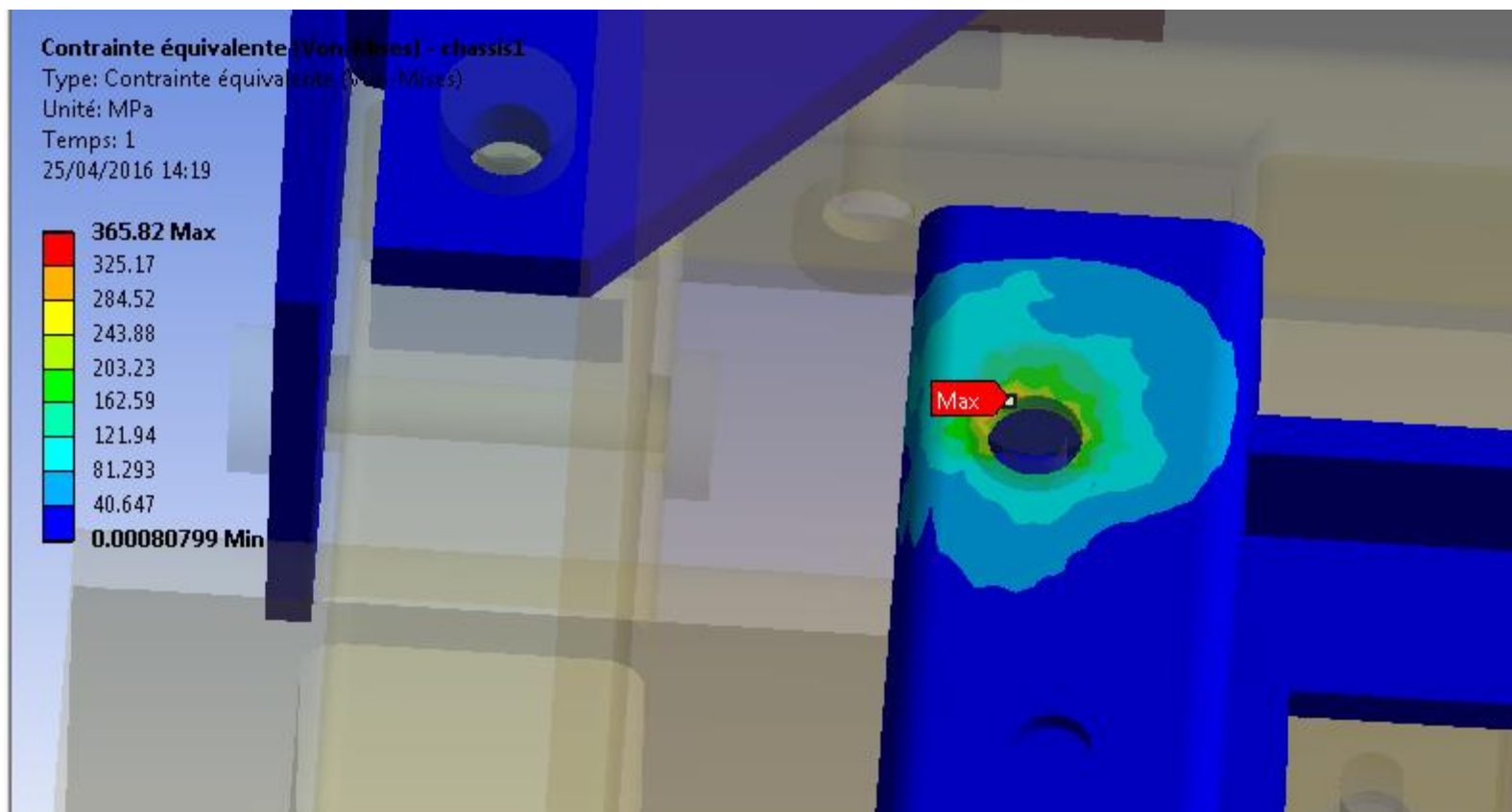
Unité: MPa

Temps: 1

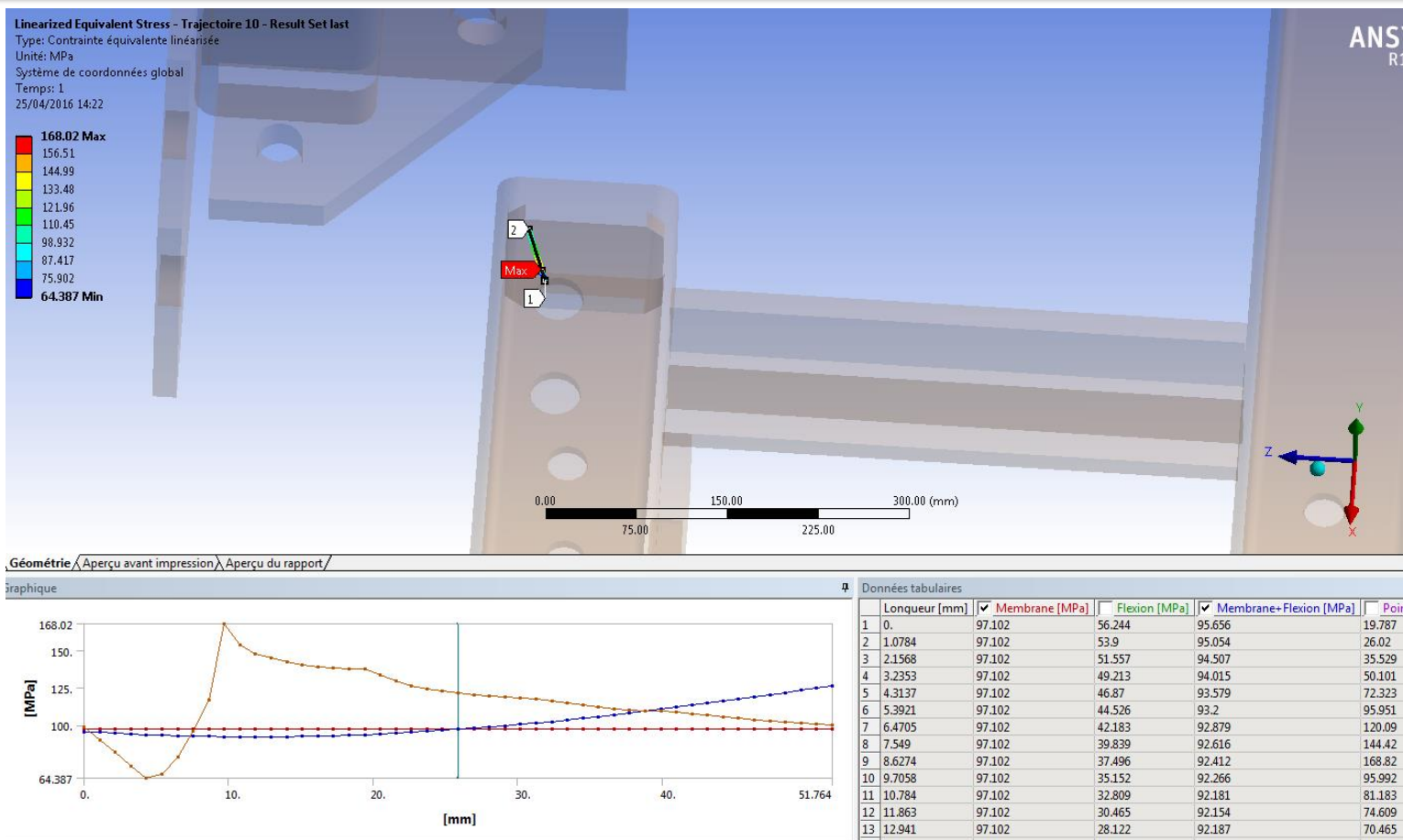
25/04/2016 14:19



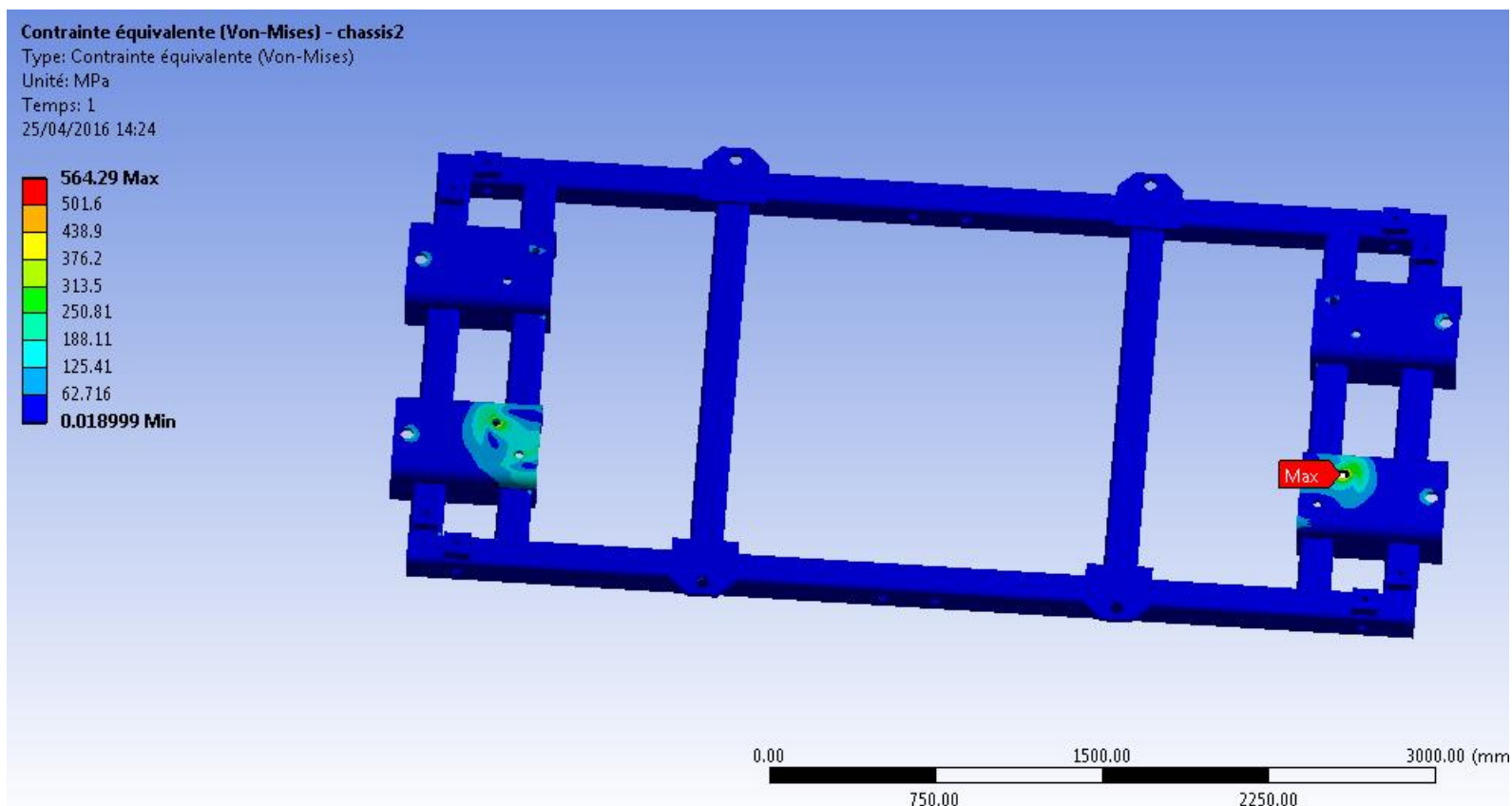
Stress Von Mises Stand 1 (Case 9)



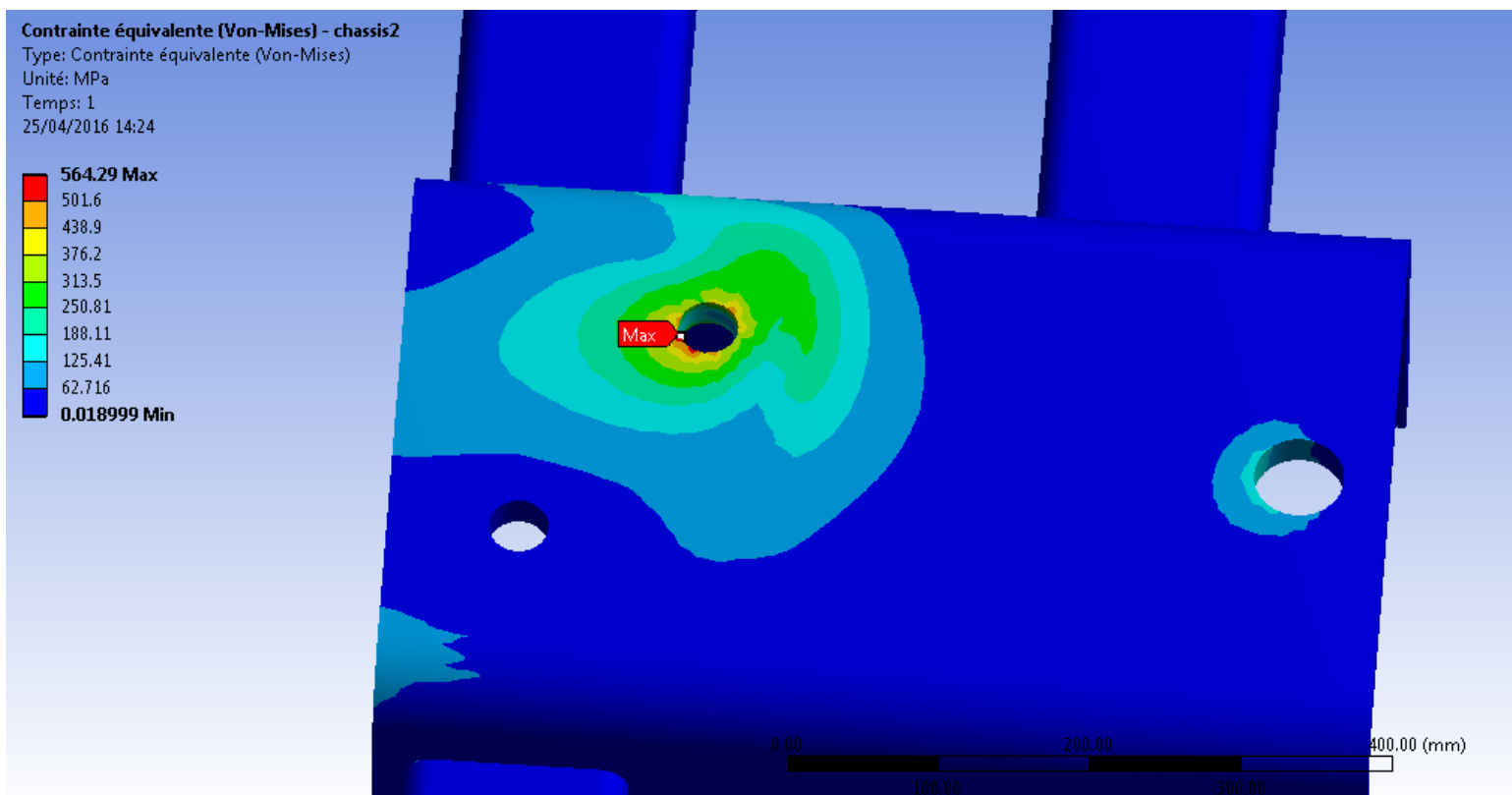
Stress Von Mises Stand 1 (Case 9)



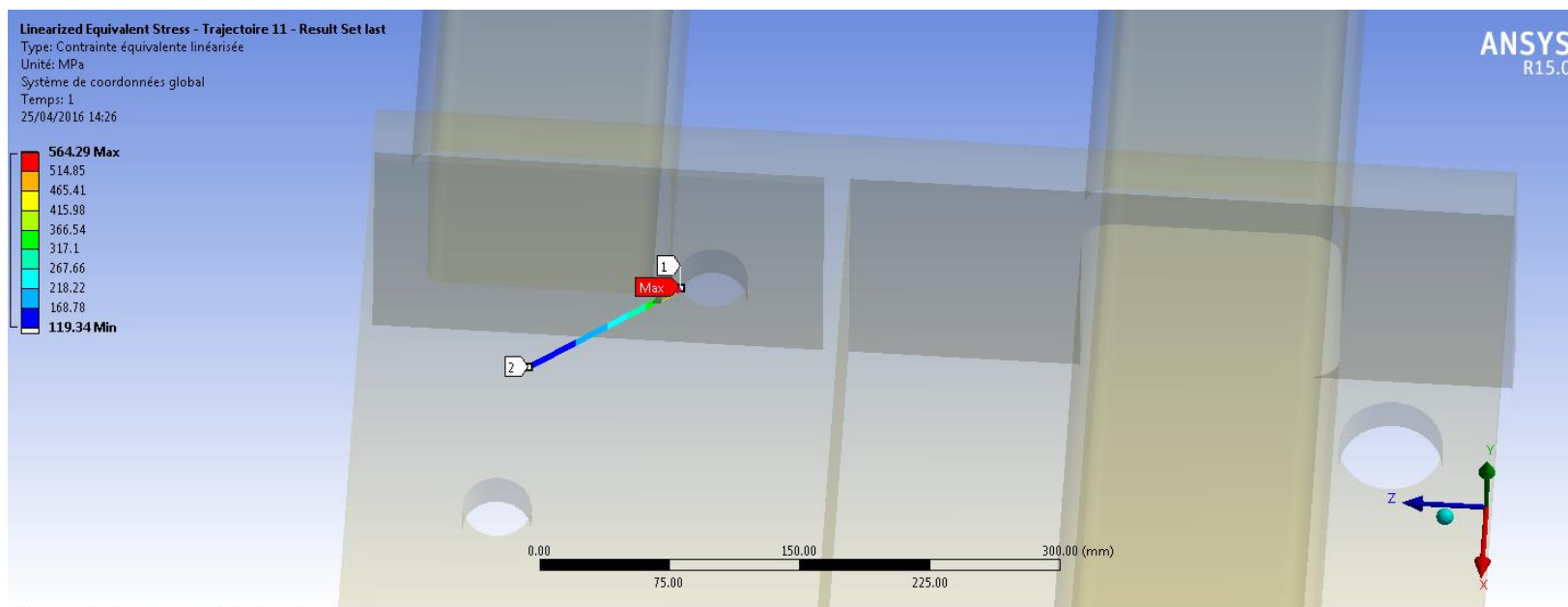
Stress Von Mises Stand 2 (Case 9)



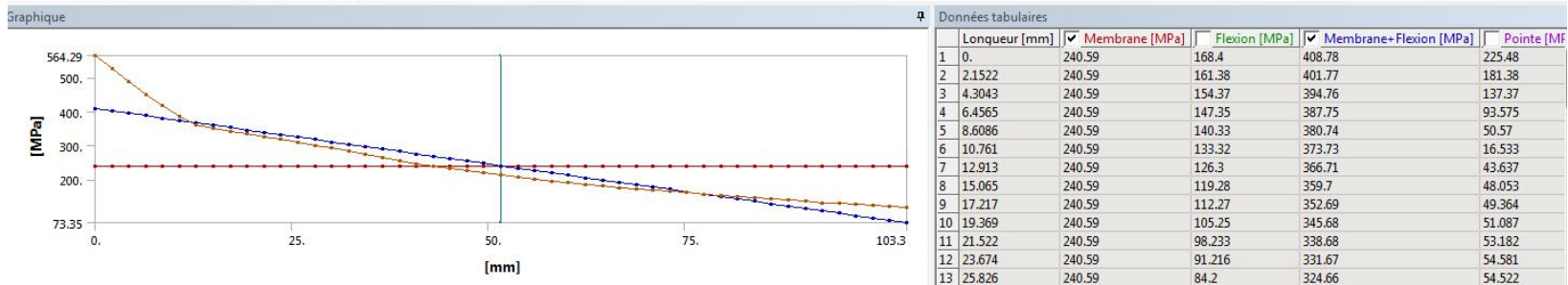
Stress Von Mises Stand 2 (Case 9)



Stress Von Mises Stand 2 (Case 9)



√ Géométrie / Aperçu avant impression / Aperçu du rapport /



Stress Von Mises Screws (Case 9)

