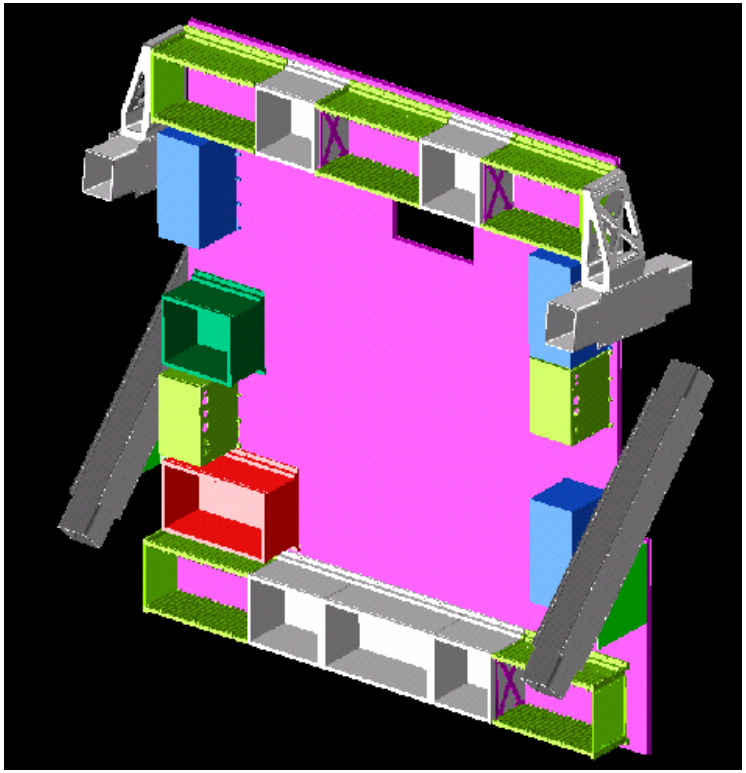
RAM RADIATOR STATUS

Massimiliano Olivier

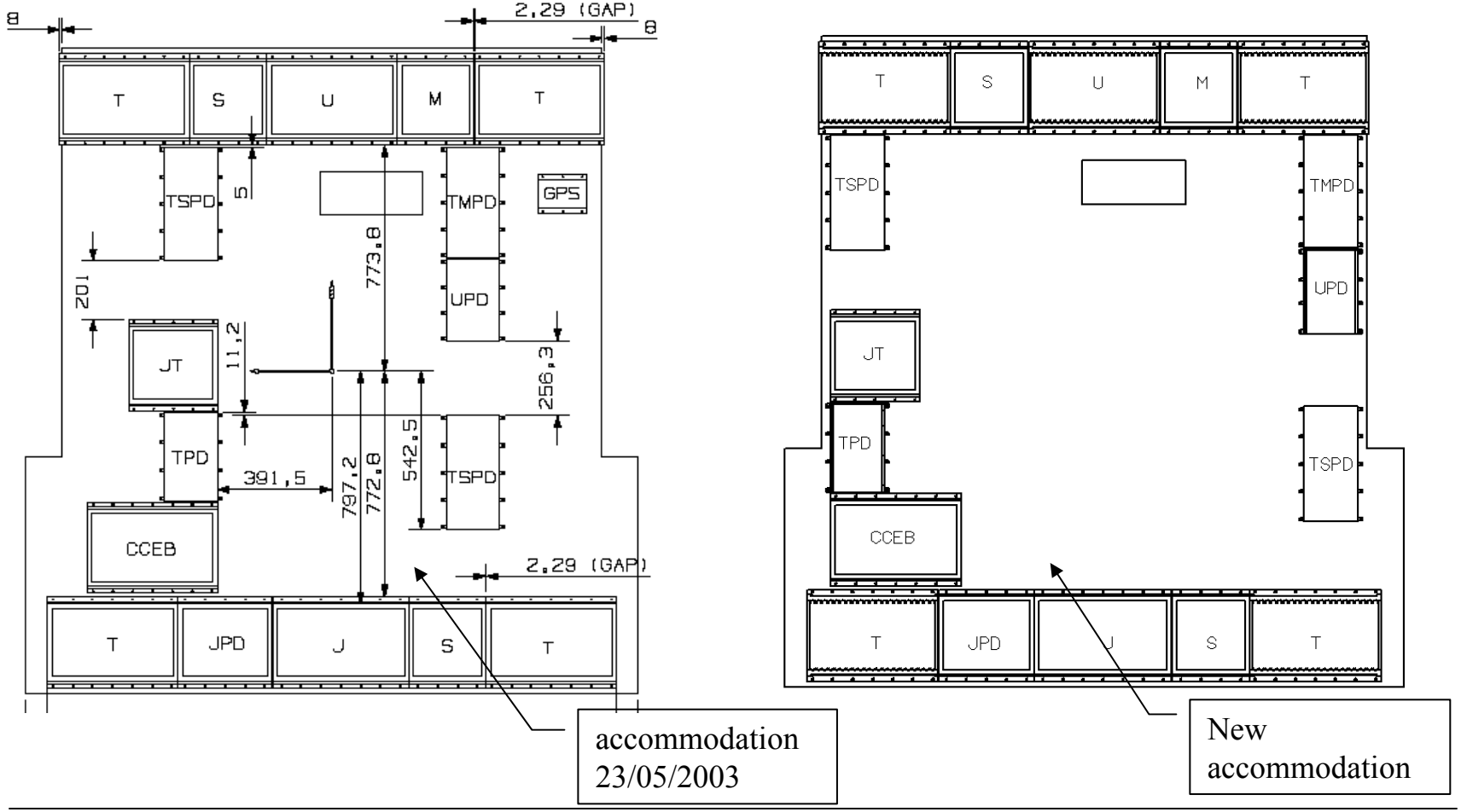
RAM radiator: “squared” crates layout (no more gemini)



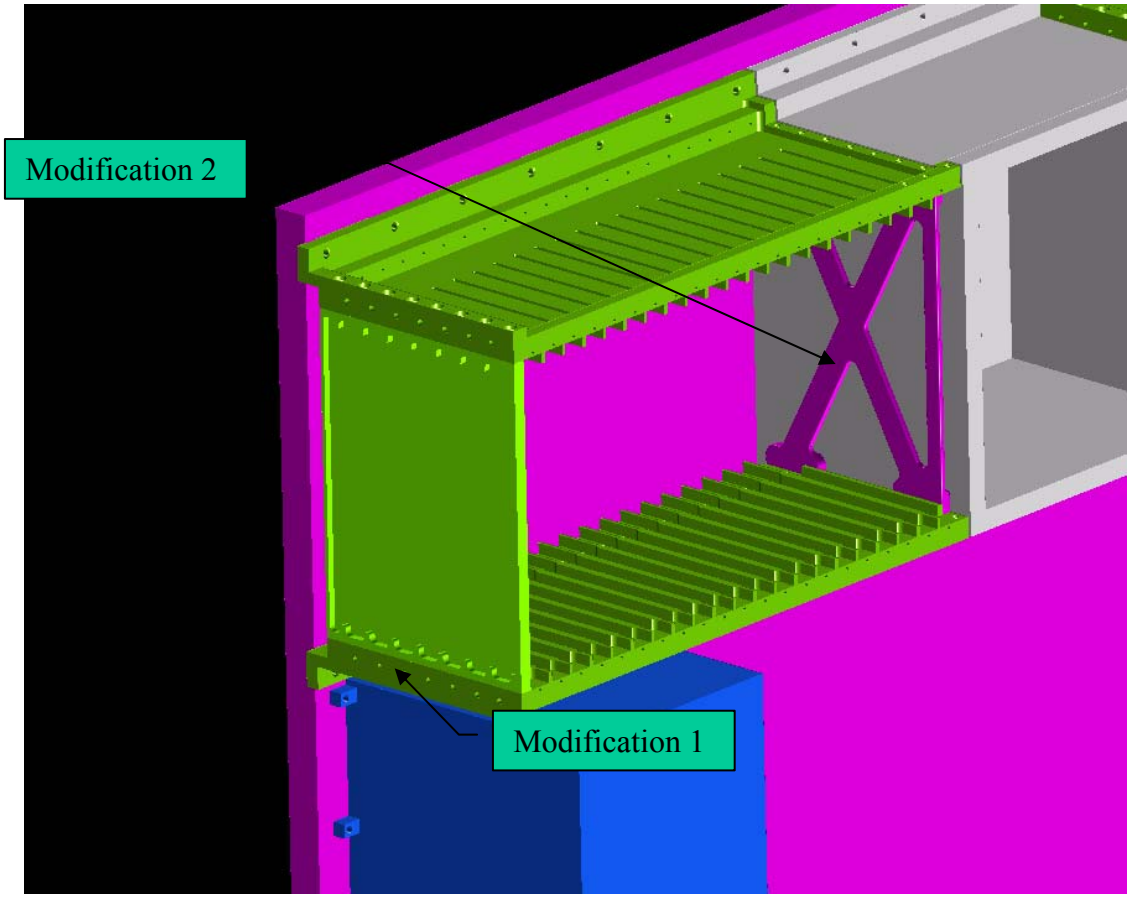
Introduction

- A different layout than the standard “GEMINI” for the RAM radiator has been considered, moving columns of XPD outwards
  - On WAKE the Gemini configuration is the only possible, due to CAB and TRDGB
- Foreseen advantages:
  - Reduced lenght of the mid brackets =less weight
  - Structure (column) closer to the constraints (USS)
  - “Framed” RAM radiator, with the frame constrained to the USS, is stiffer

Comparison between
the new accommodation of RAM radiator and the accommodation 23/05/2003

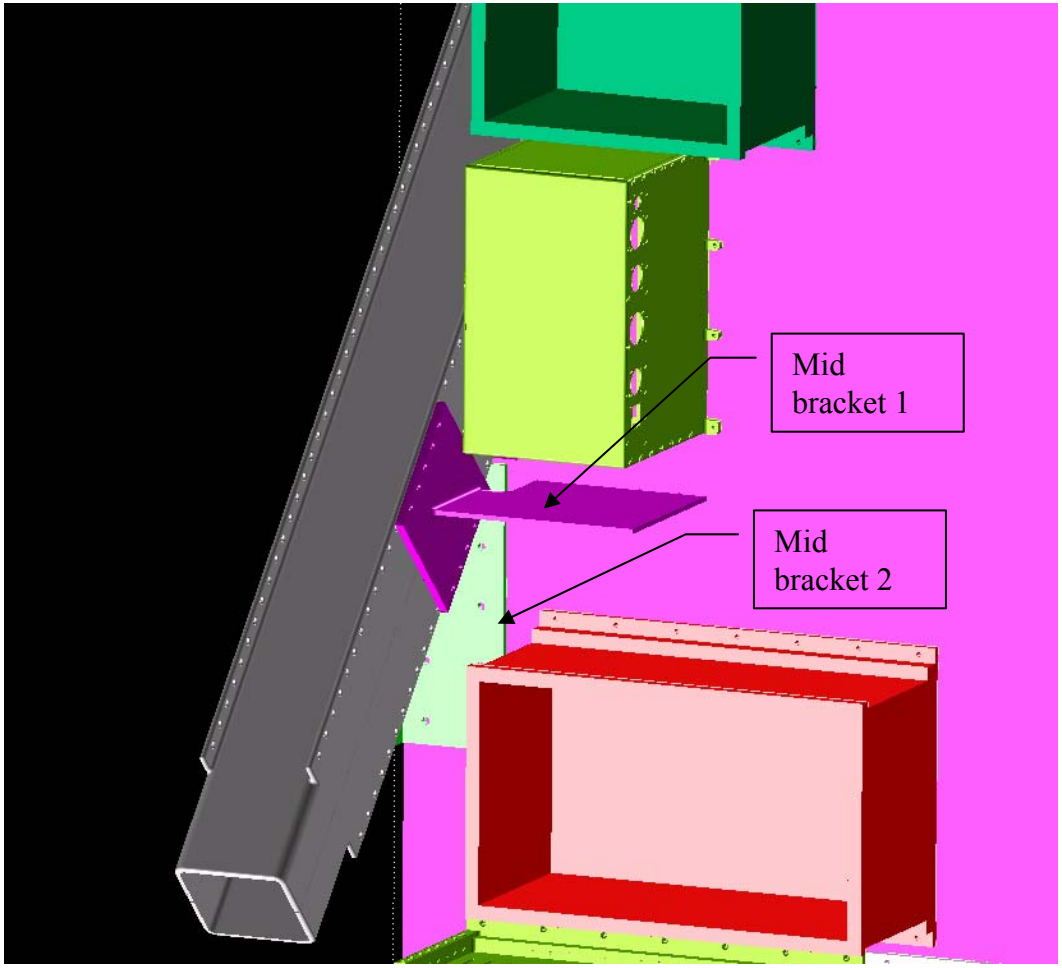


New accommodation, Design changes 1



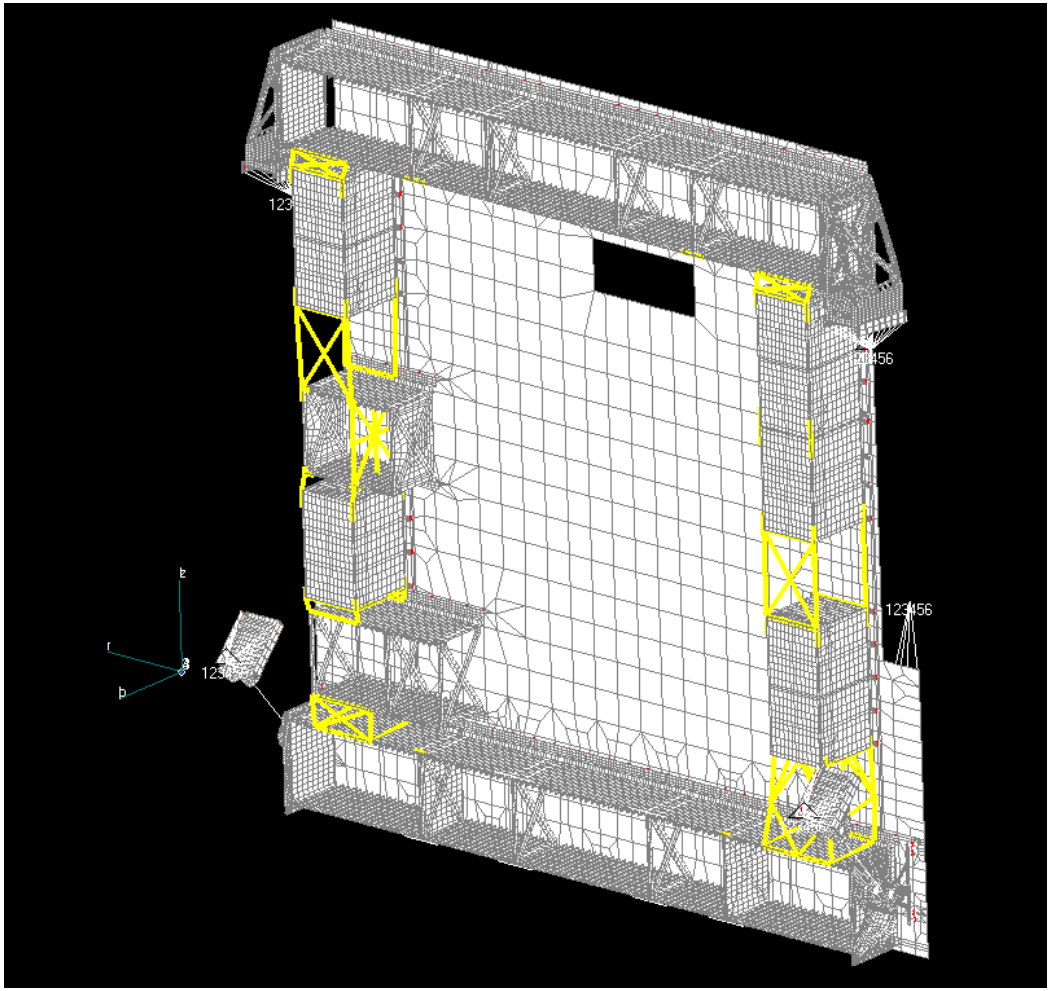
- T-CRATES have been modified

New accommodation, Design changes 2



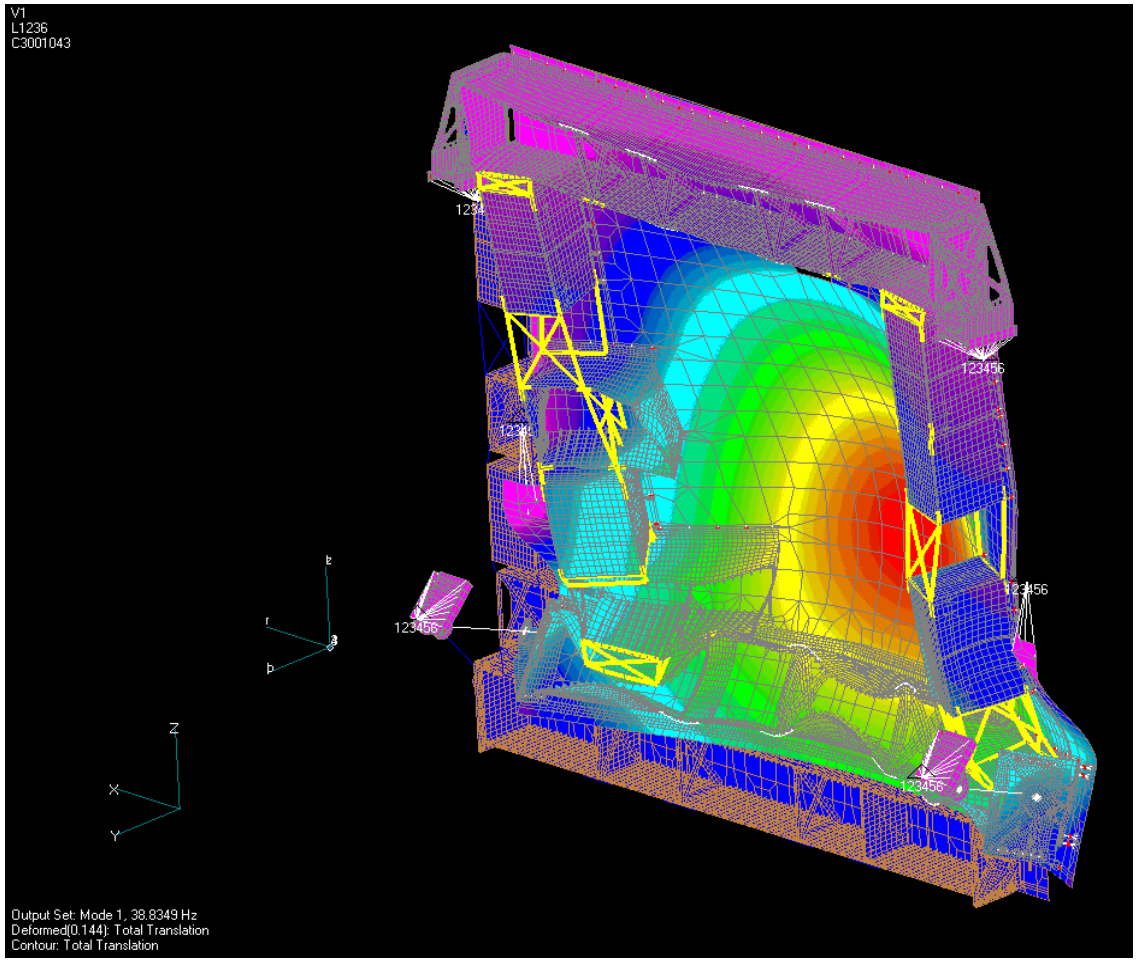
- Mid brackets have been designed (draft solution)

New accommodation - FE model modifications



- Brackets (UPPER,MID AND LOWER) haven't been updated
- XPD position has been changed
- Boxes masses haven't been updated

New accommodation - Modal analysis results



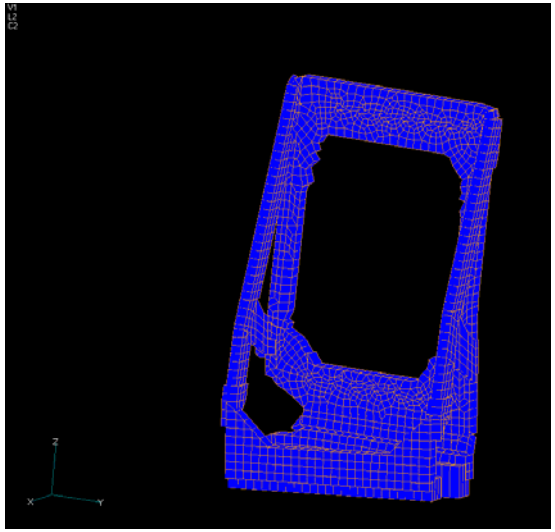
- A new run has been performed with draft version of the mid brackets: the first frequency is 38.83 Hz
- COMPARED TO about 31 Hz before

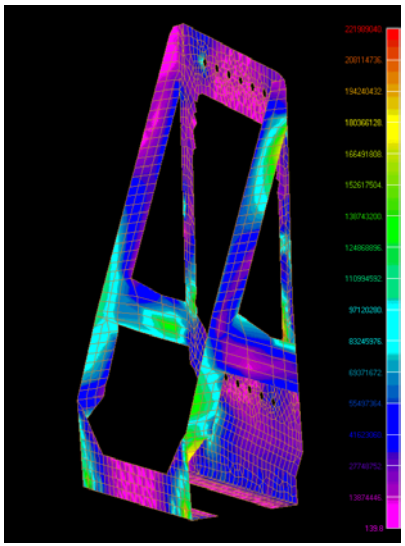
RAM RADIATOR

BRACKETS DESIGN

UPPER BRACKET

- ALREADY REPORTED in WAKE RADIATOR
- Option UB 20 chosen as baseline
- Load Case 2050 used for dimensioning



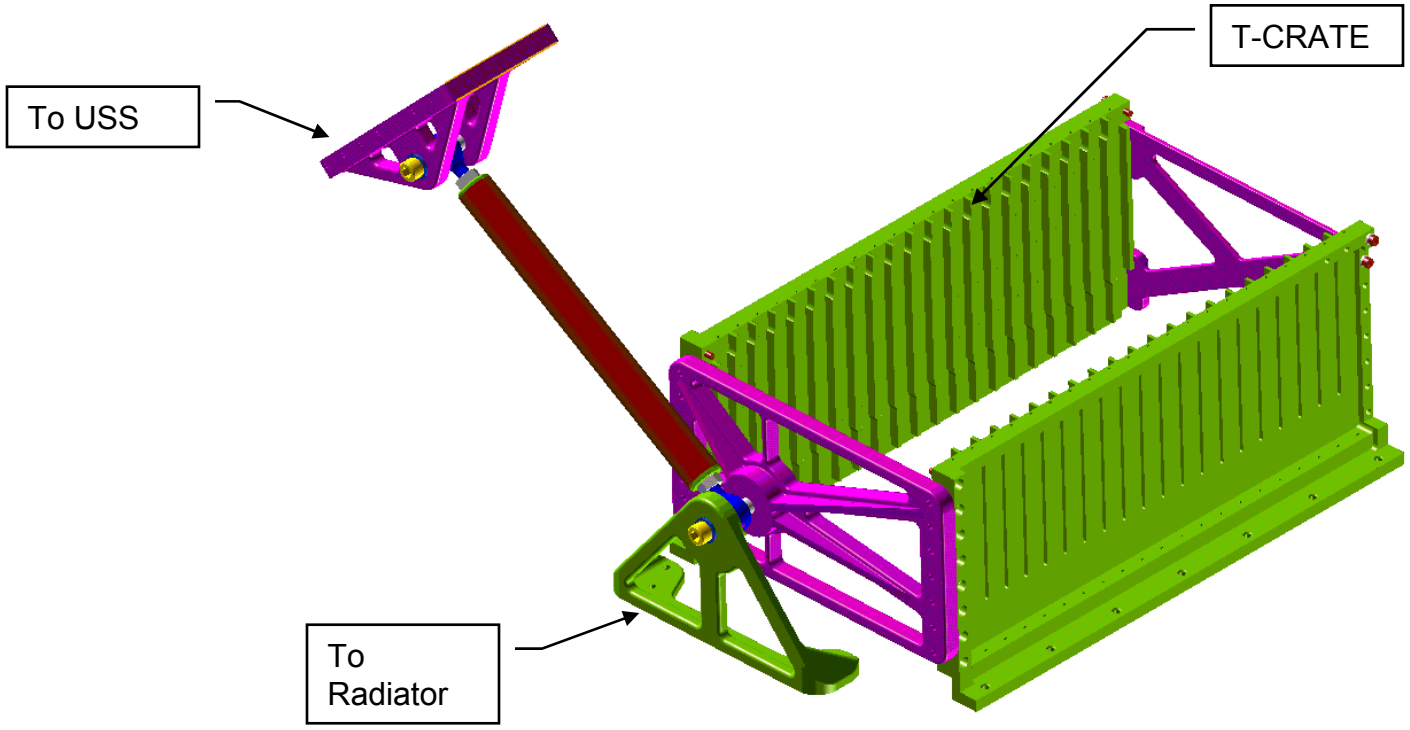


Lower Bracket (also called rod) detailed design

- Optimization proceeded in parallel to WAKE radiator
  - this solution wasn't implemented on WAKE

CAD DESIGN

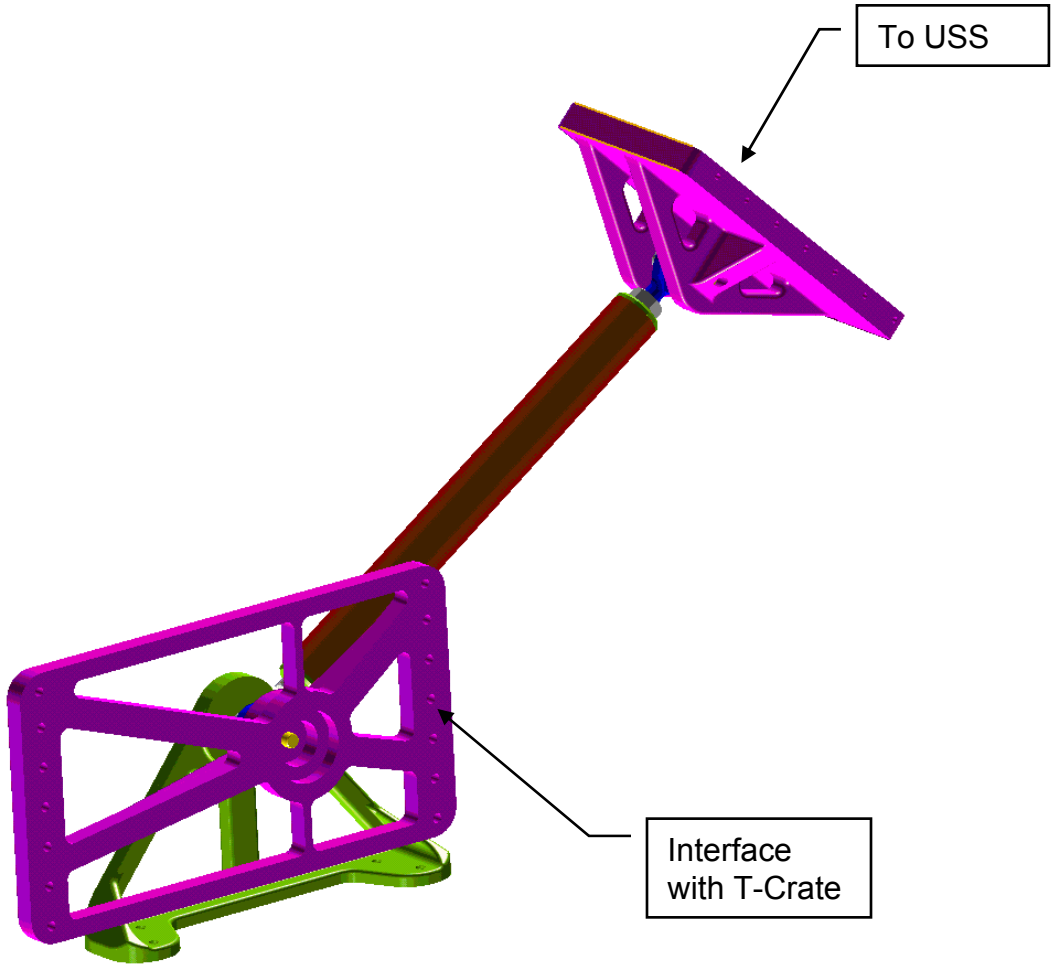
LOWER BRACKET



CAD DESIGN

LOWER BRACKET

From T-crate point of view

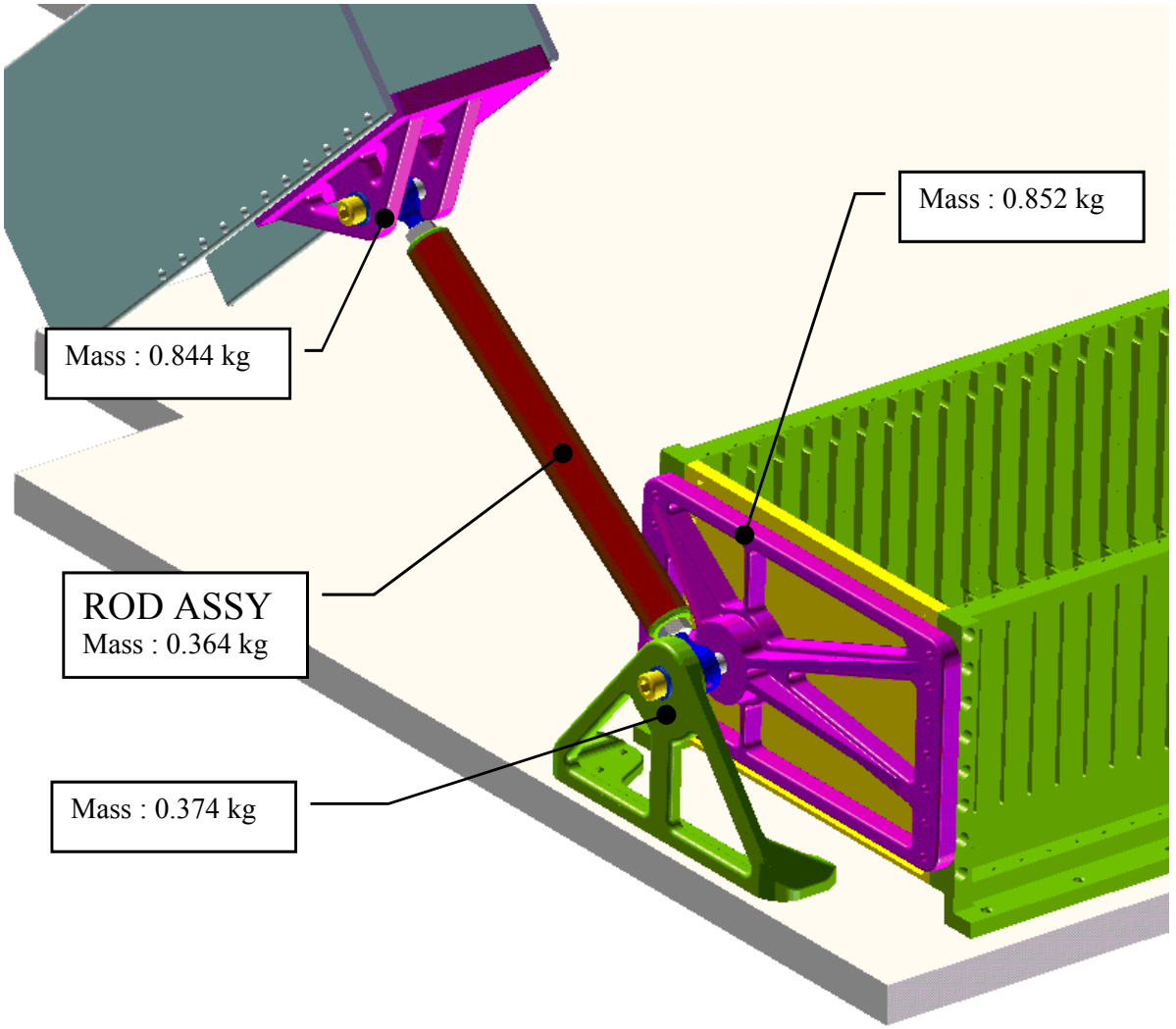


CAD DESIGN

LOWER BRACKET

Mass of the parts

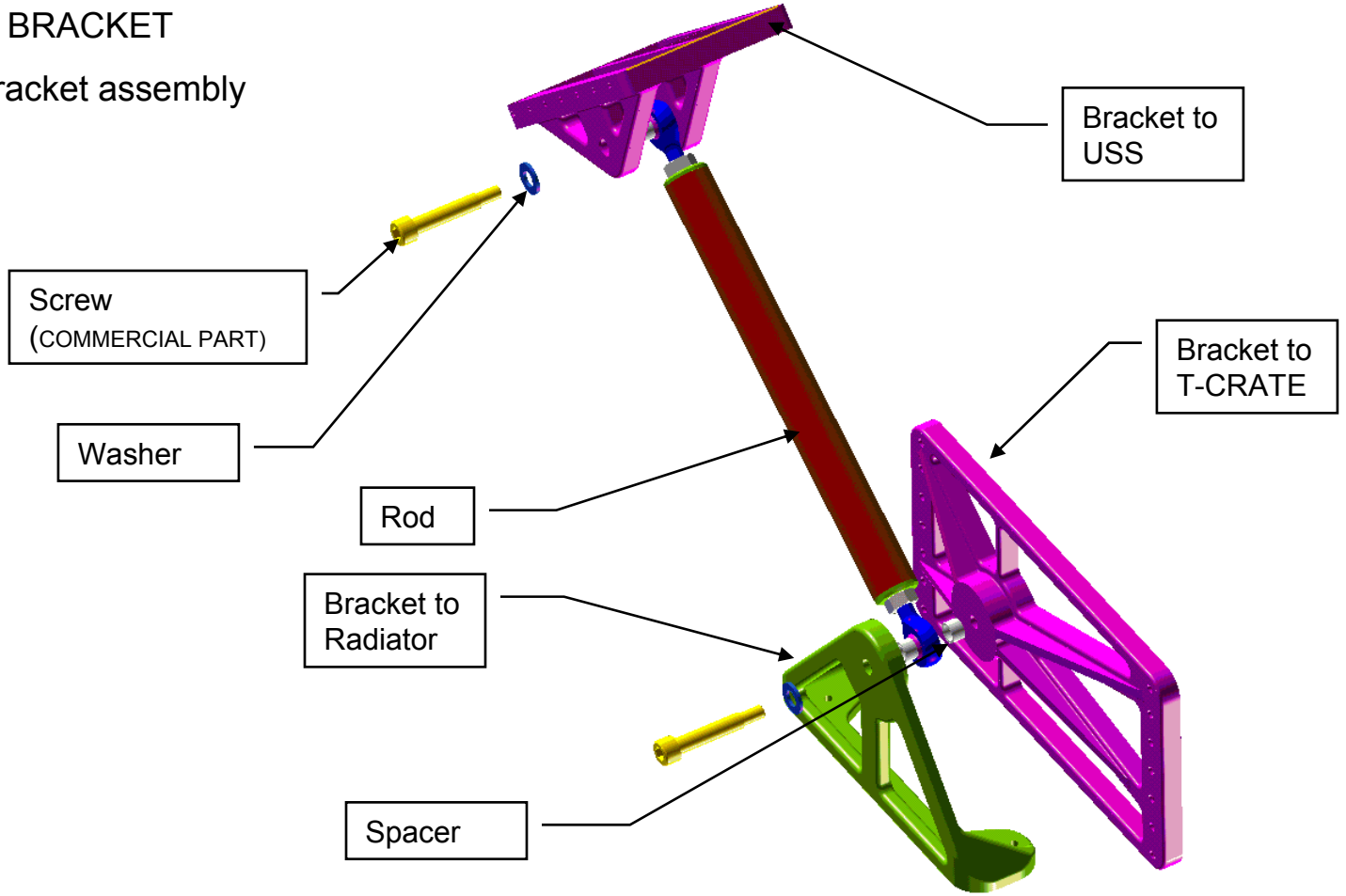
TOTAL MASS : 2,84 kg



CAD DESIGN

LOWER BRACKET

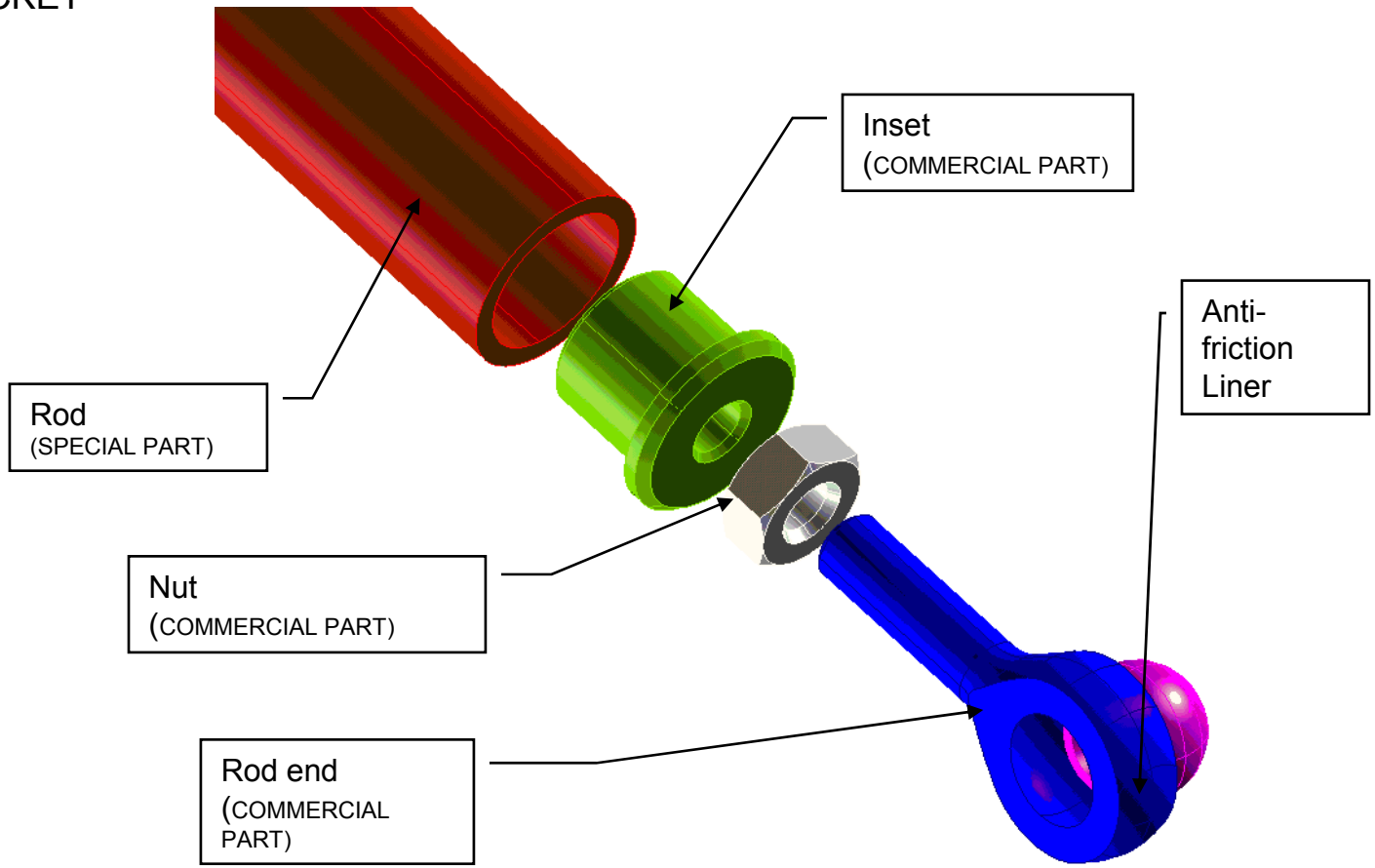
Lower bracket assembly



CAD DESIGN

LOWER BRACKET

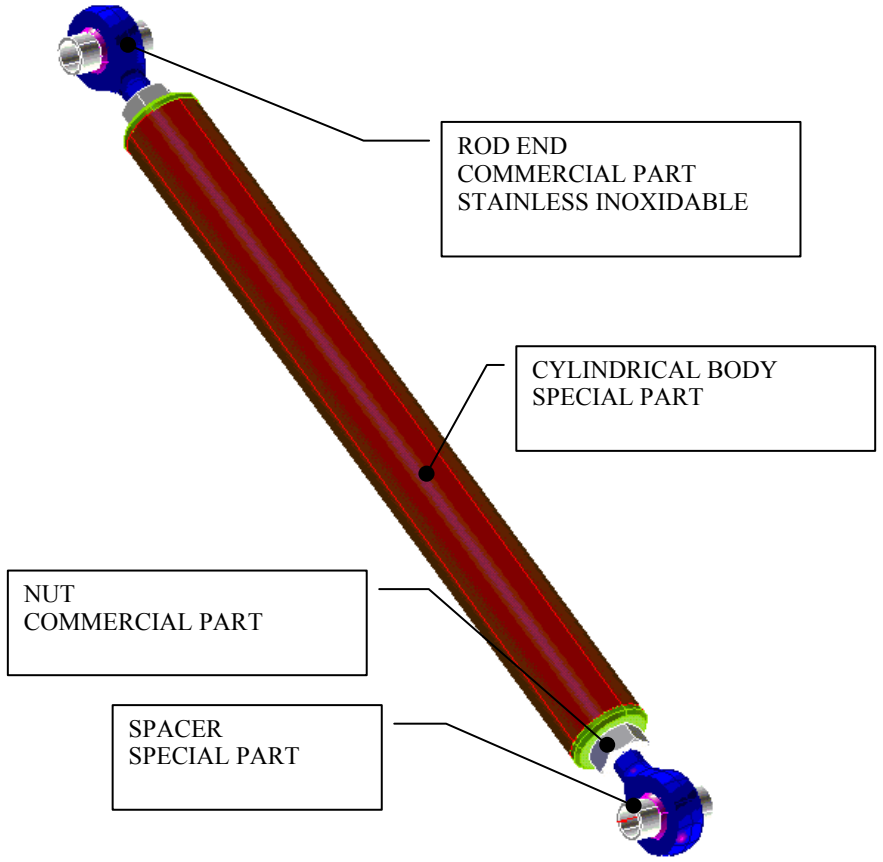
Rod assembly



CAD DESIGN

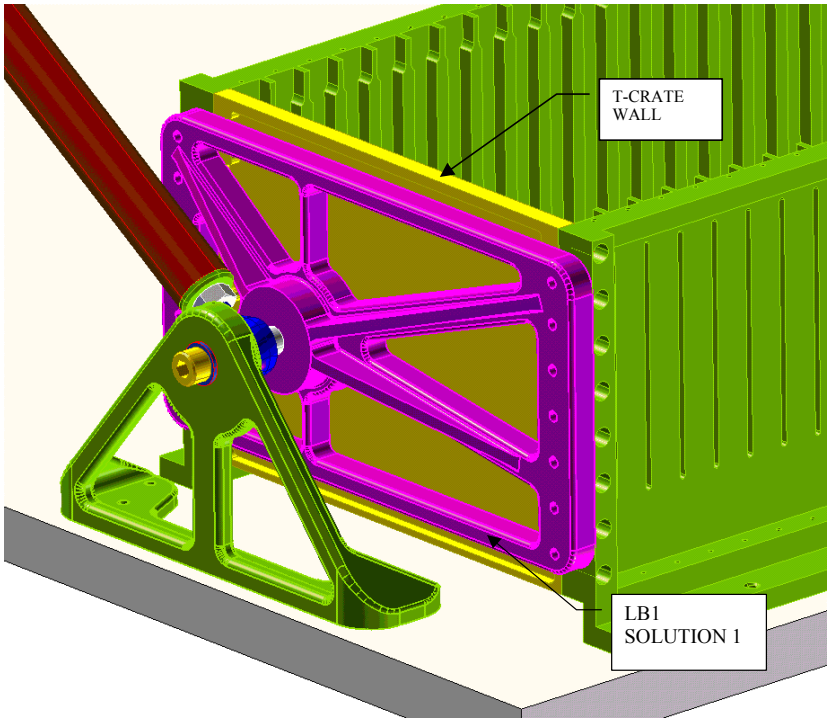
LOWER BRACKET

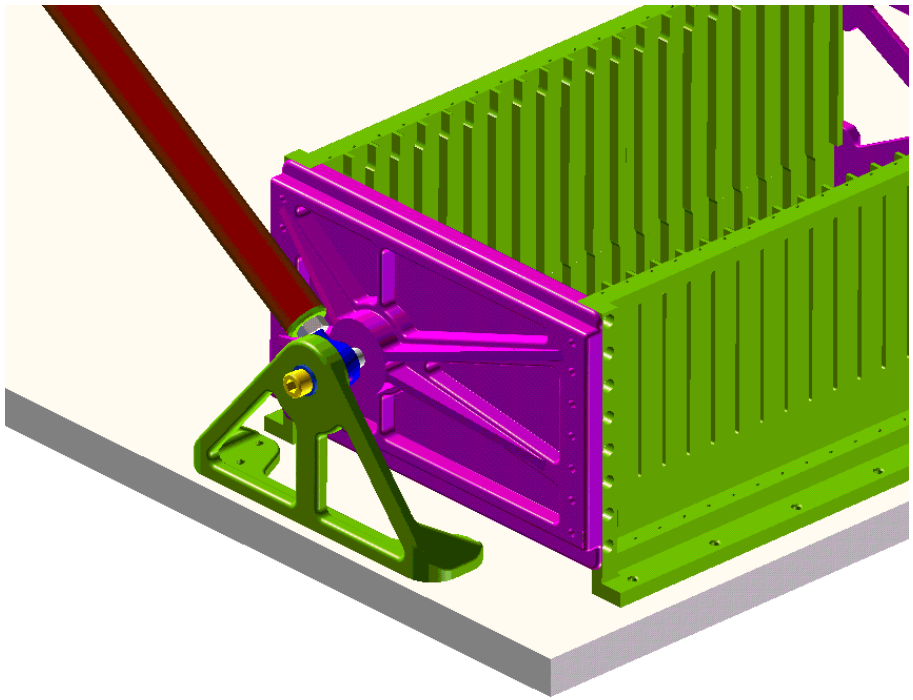
Rod assembly



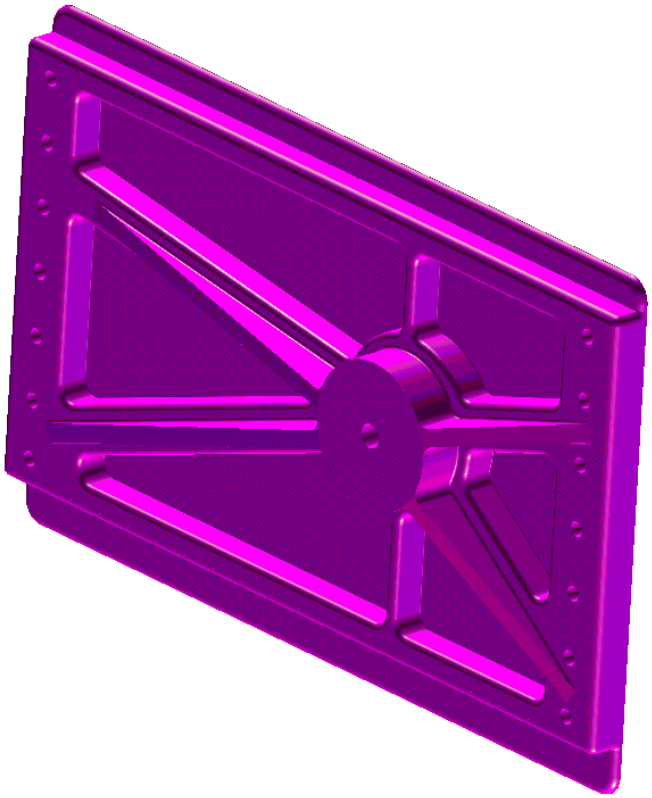
LOWER BRACKET OPTION 2

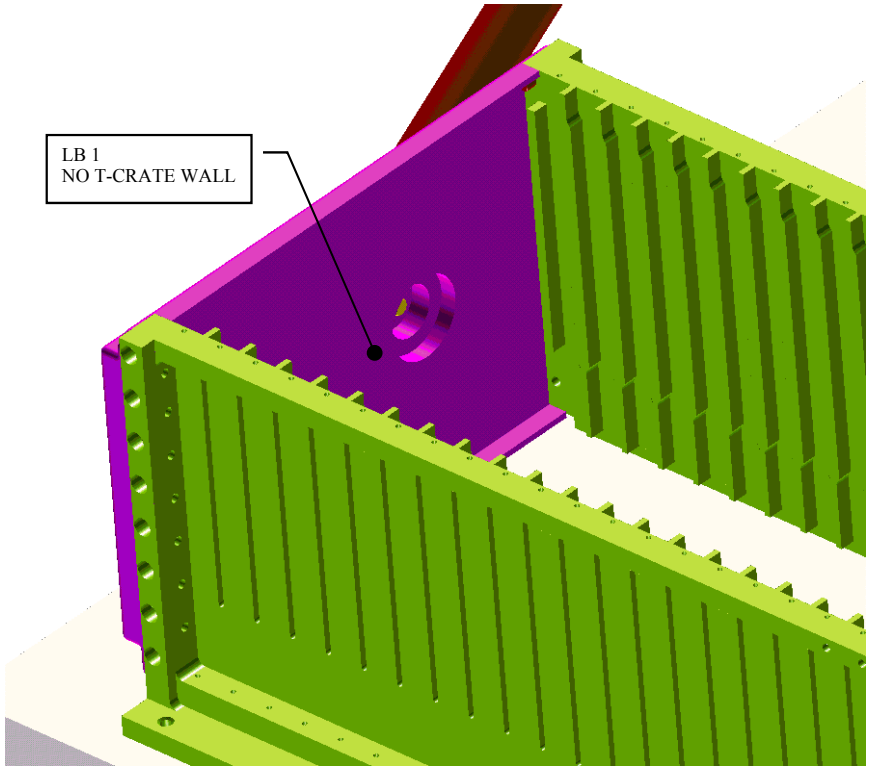
Removal of crate end wall





Saving ~230 g



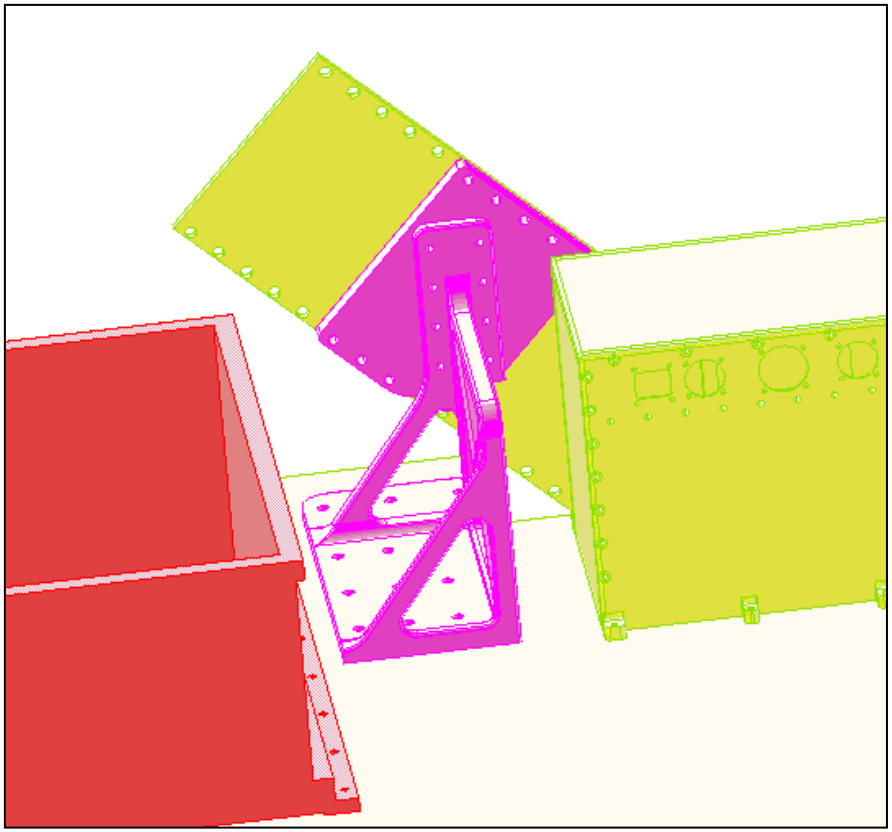


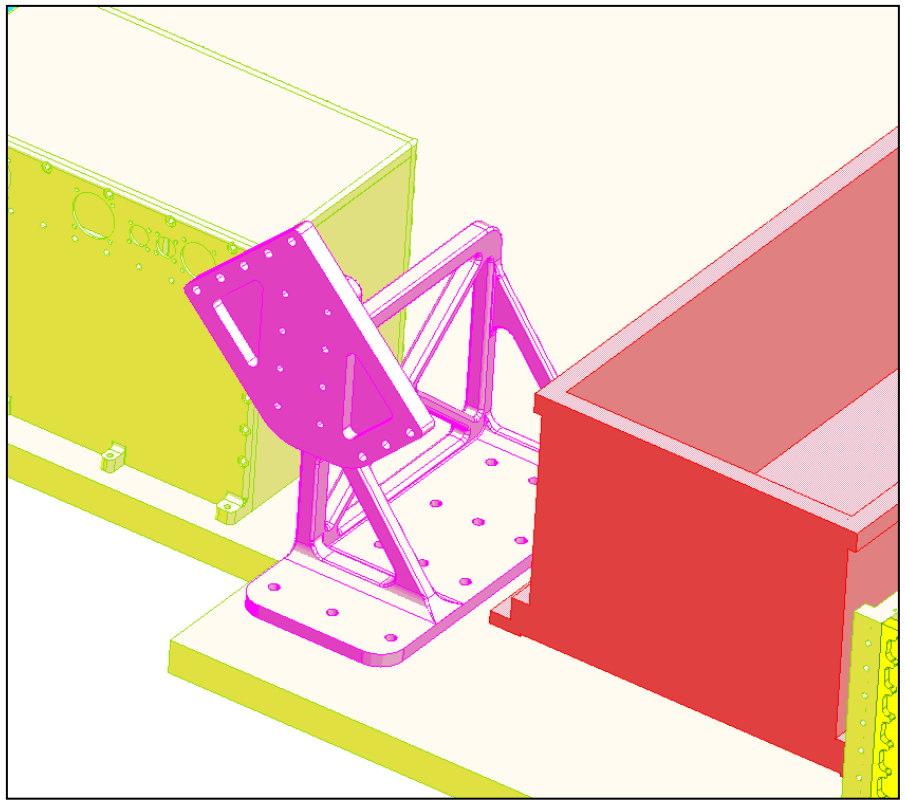
Lower rod

- Final mass < 3 Kg
- The final choice of the lower fixation (rod vs. plate) will depend on system level considerations about
  - frequency
  - loads exchanged with the USS
  - Overall load path stresses in other parts

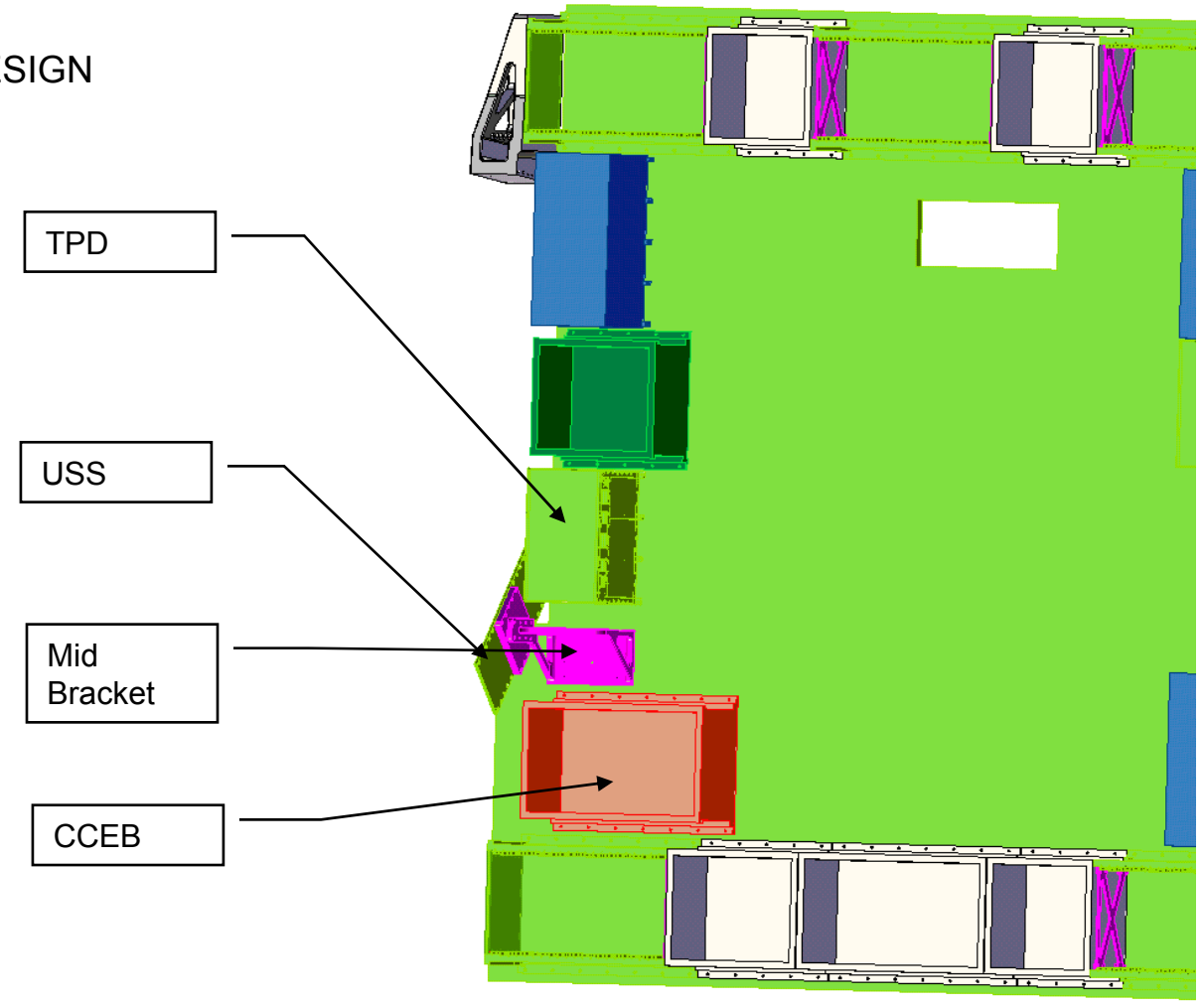
MID BRACKET for RAM radiator

RAM radiator MID BRACKET

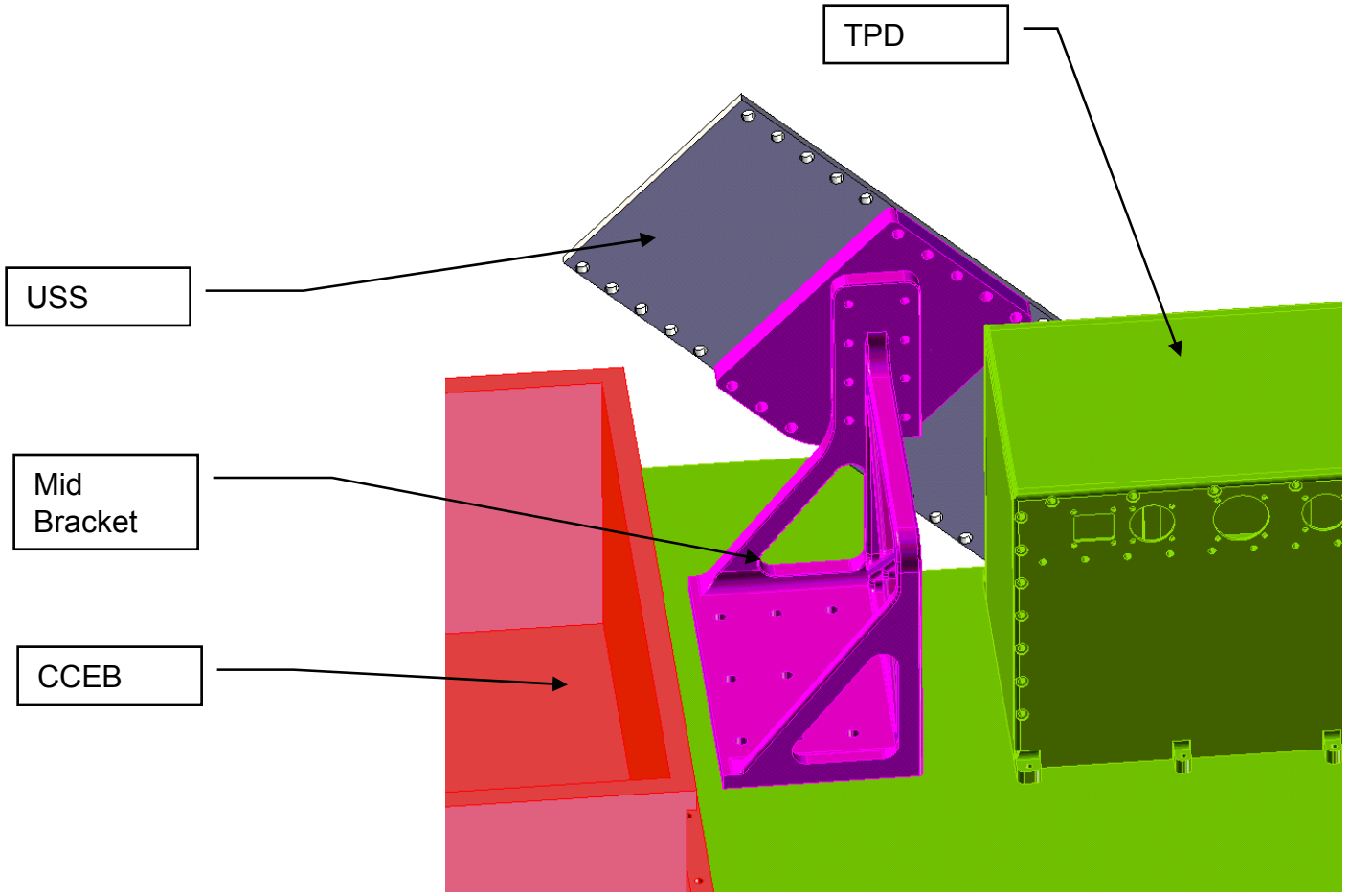


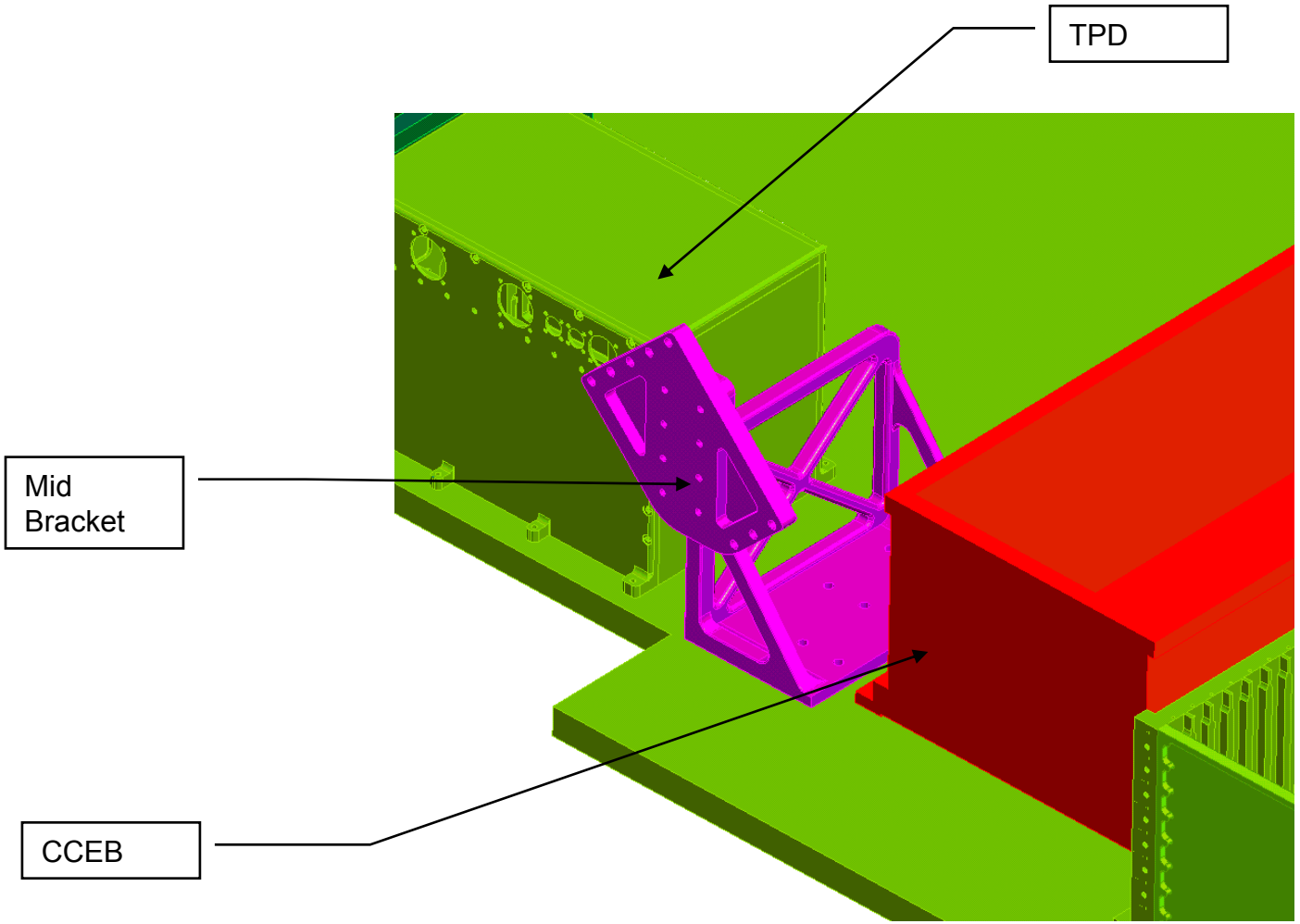


MID BRACKET
MECHANICAL DESIGN



"Short" mid bracket design

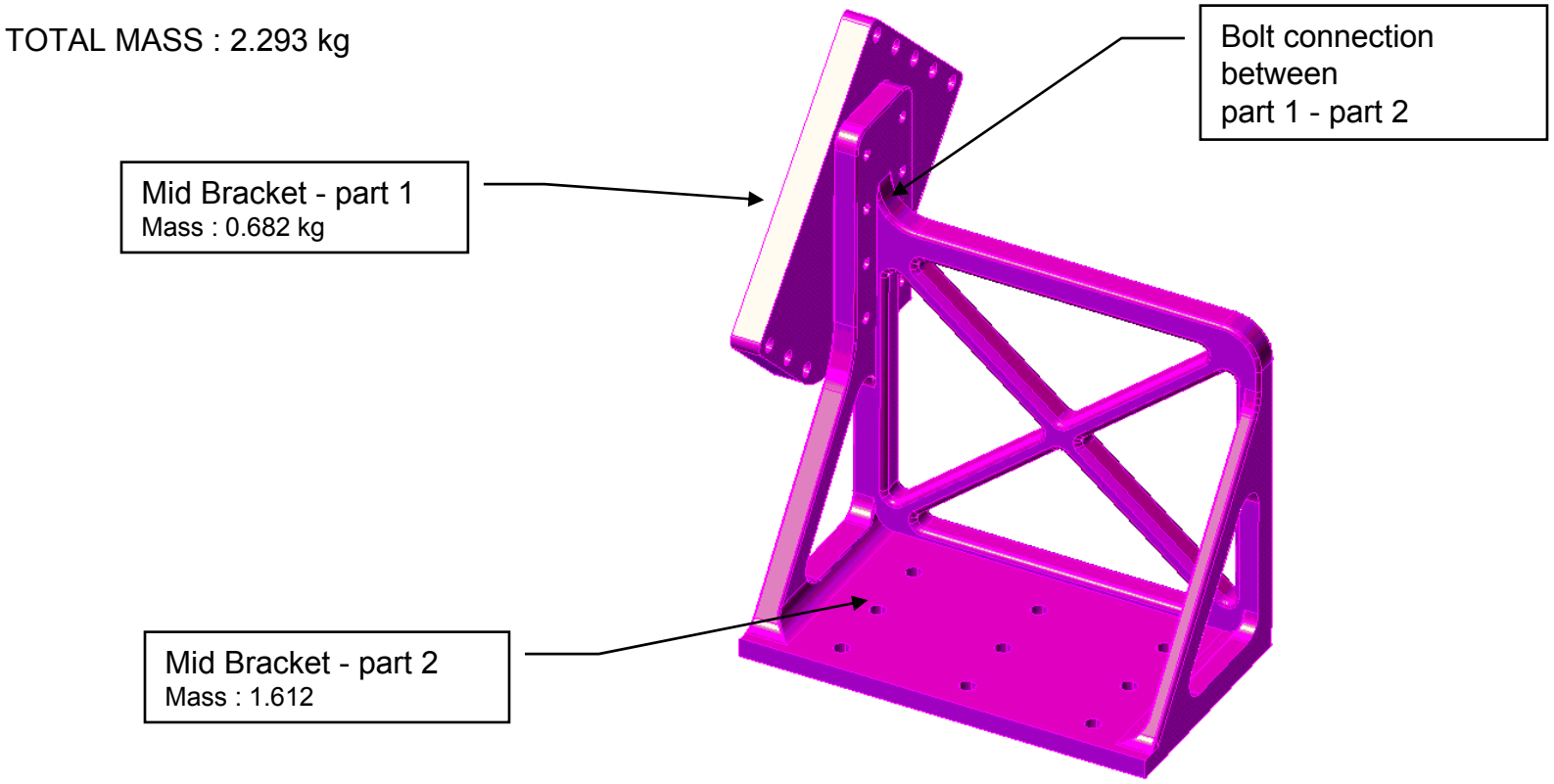



TPD
Mid
Bracket
CCEB

CAD DESIGN

MID BRACKET

TOTAL MASS : 2.293 kg



Model Configuration

- Upper Bracket UB20
- “Short” Mid bracket
- Light rod
- No gemini structure

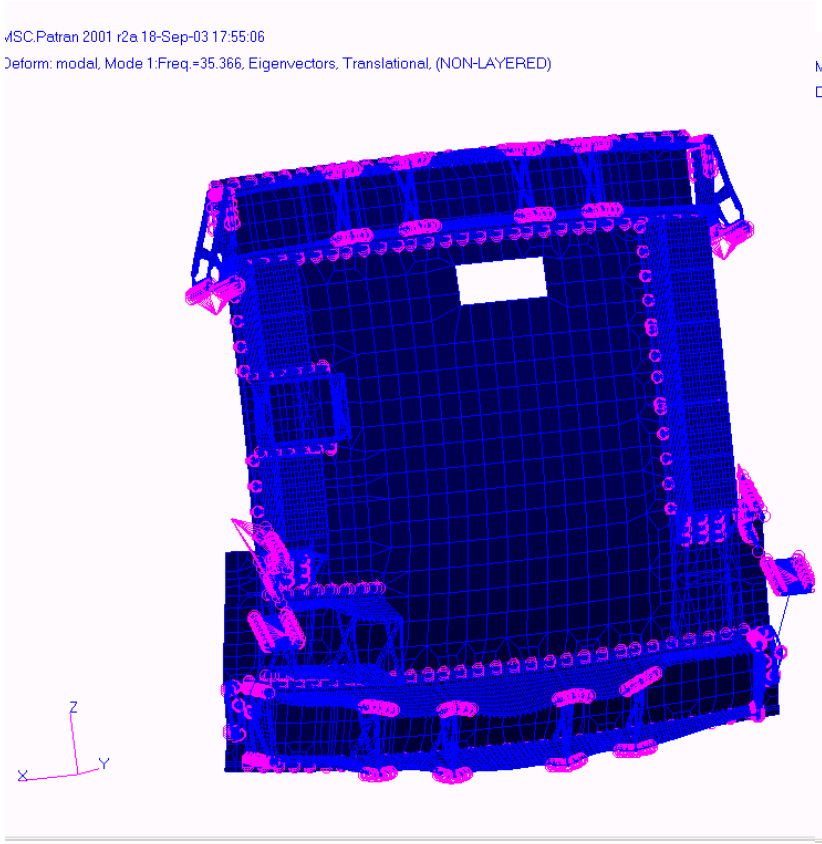
RESULTS
calculated for 128 load cases

Results summary

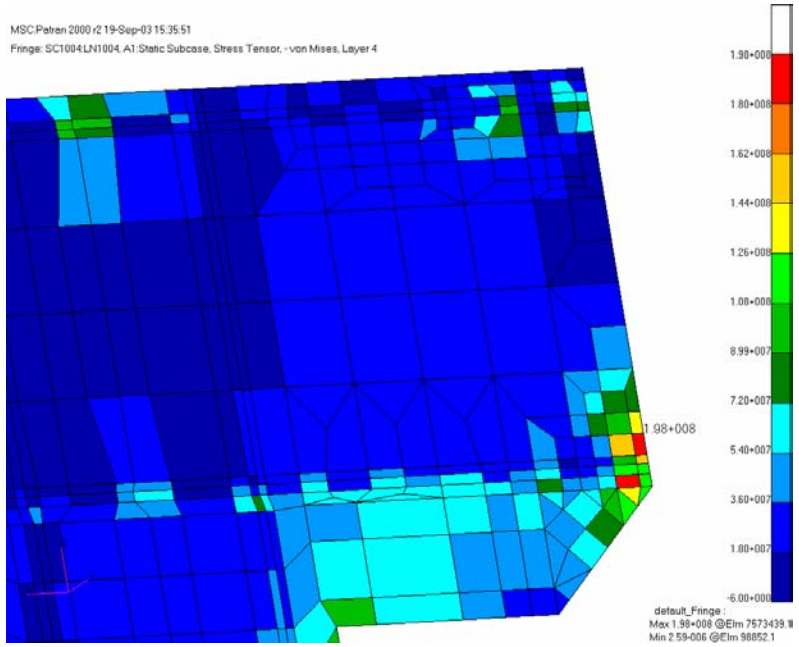
- Stresses (calculated with 128 load cases) are too high in
  - crates
  - XPD
  - top bracket
  - mid brackets
  - intercrate links
- Forces are too high in
  - panel inserts

Frequency

35.4 Hz



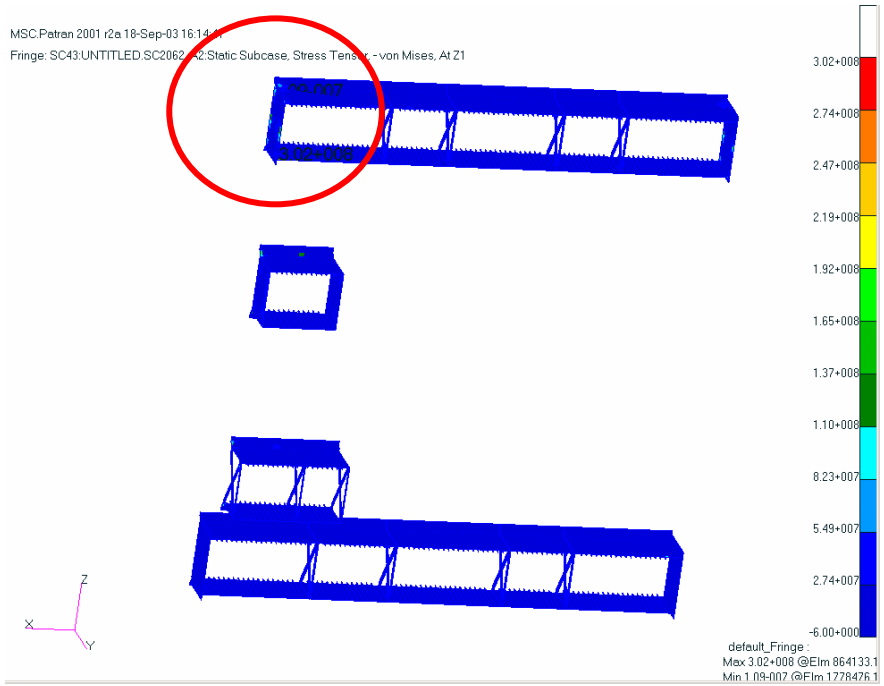
SKINS

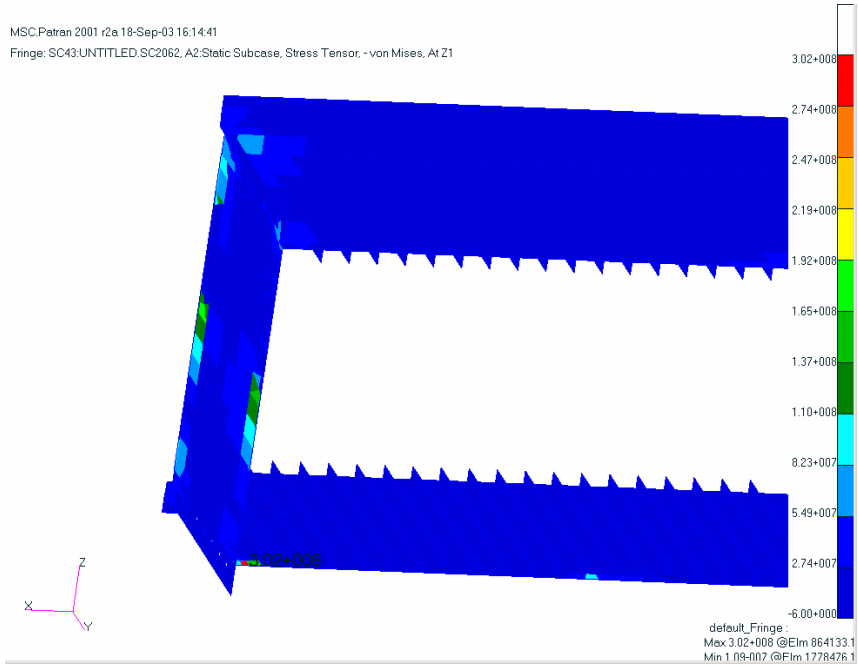


SKINS	
MPa	MoS
294	-0.24

Worst LC over 128

CRATES

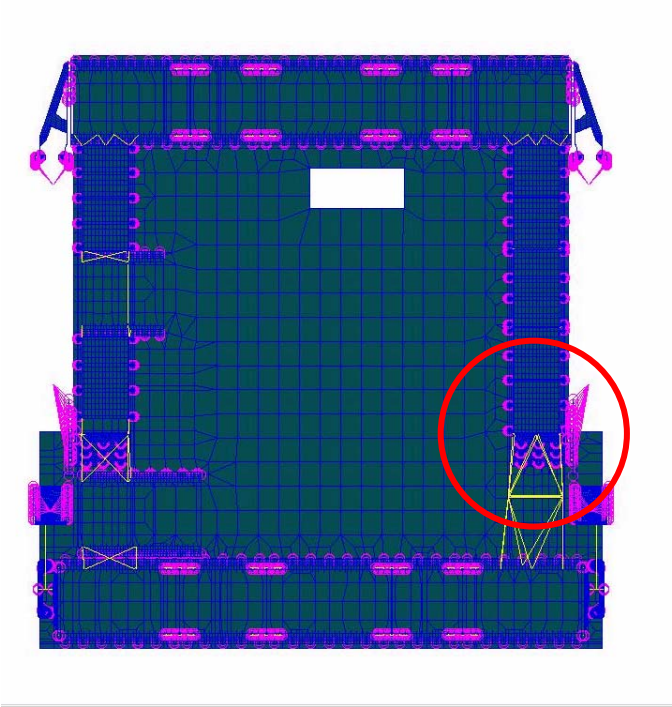


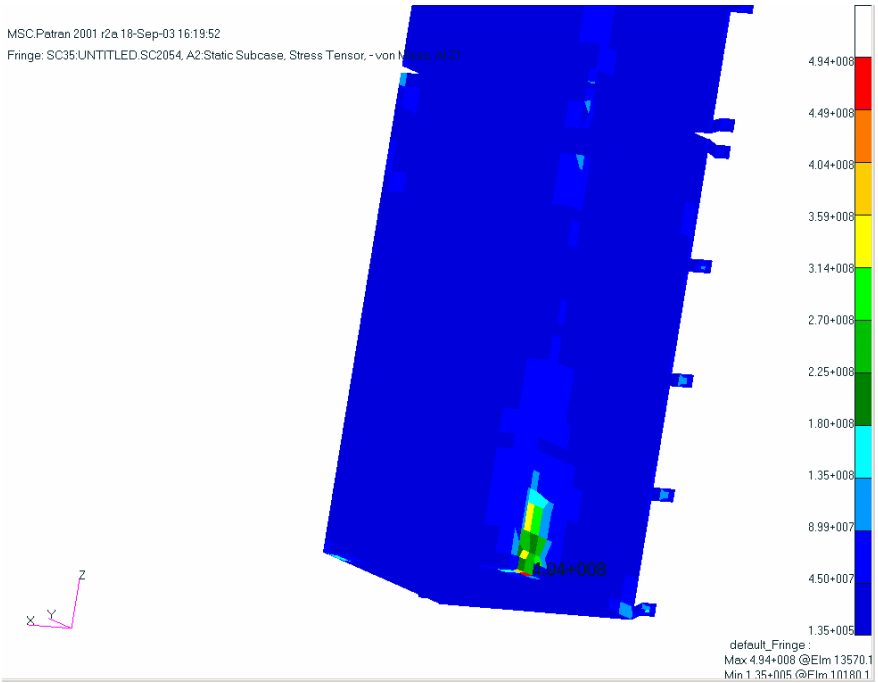


Worst LC over 128

CRATE	
MPa	MoS
302	-0.26

XPD

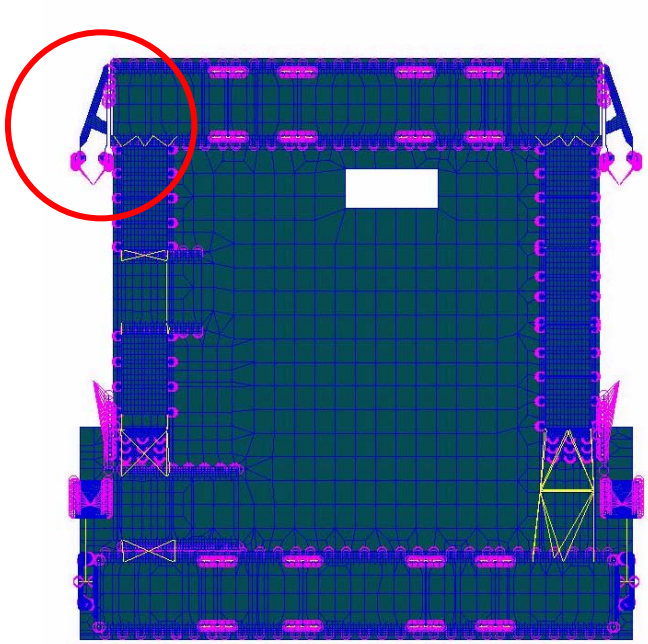


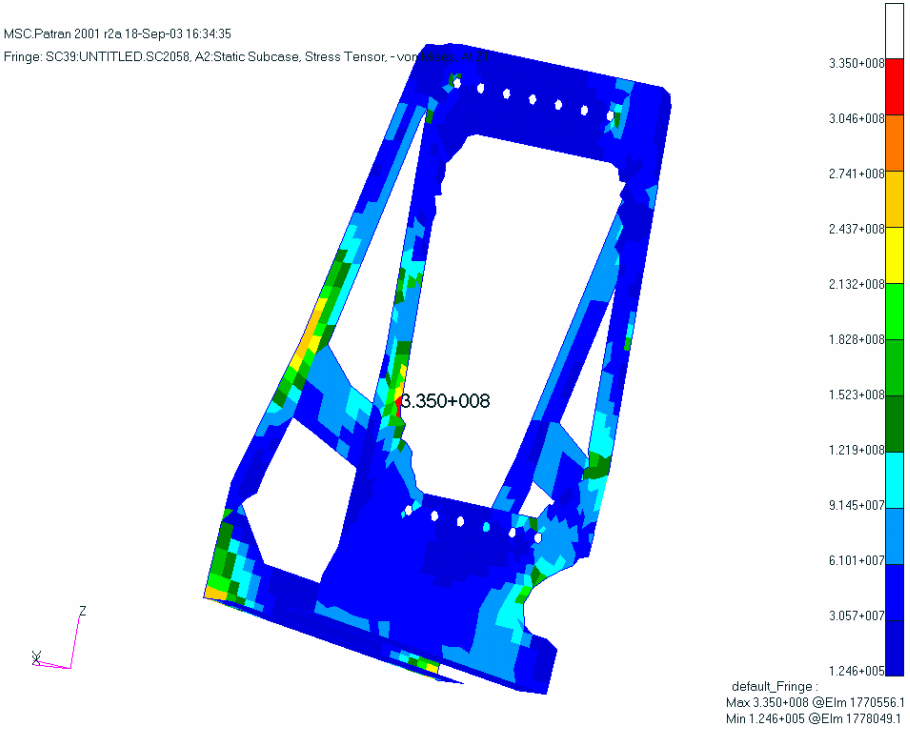


XPD	
MPa	MoS
494	-0.55

Worst LC over 128

TOP BRACKET

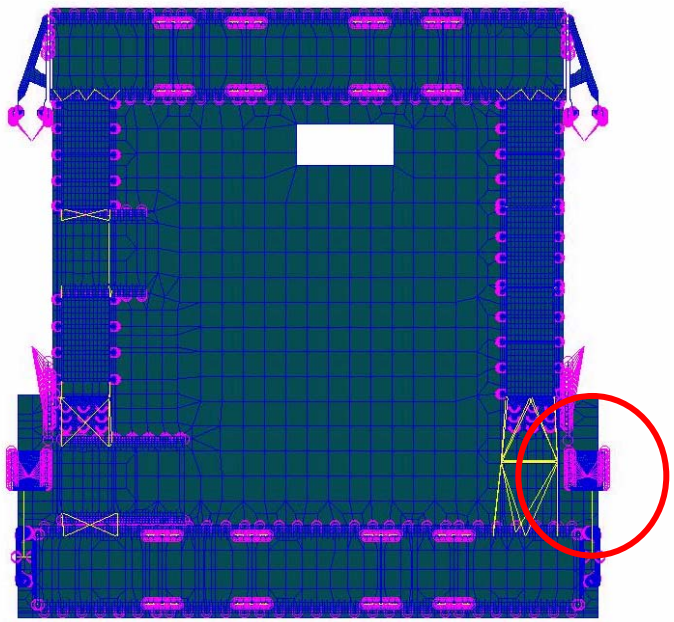


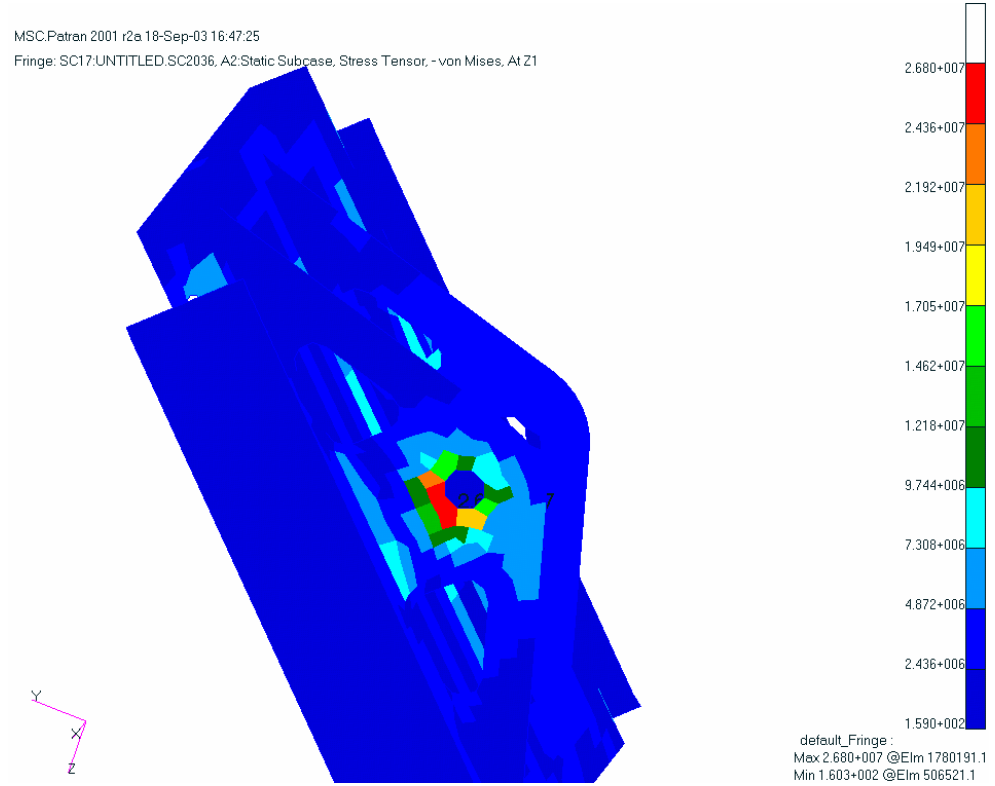


TOP BRACKET	
MPa	MoS
335	-0.33

Worst LC over 128

LOWER BRACKET

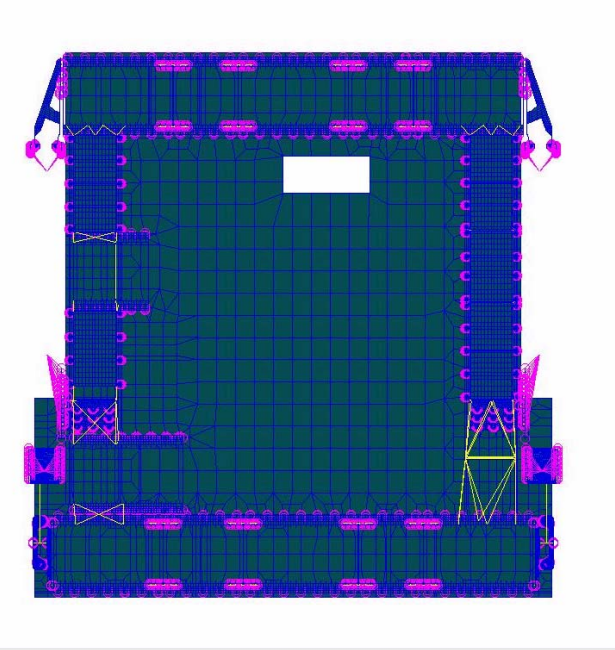


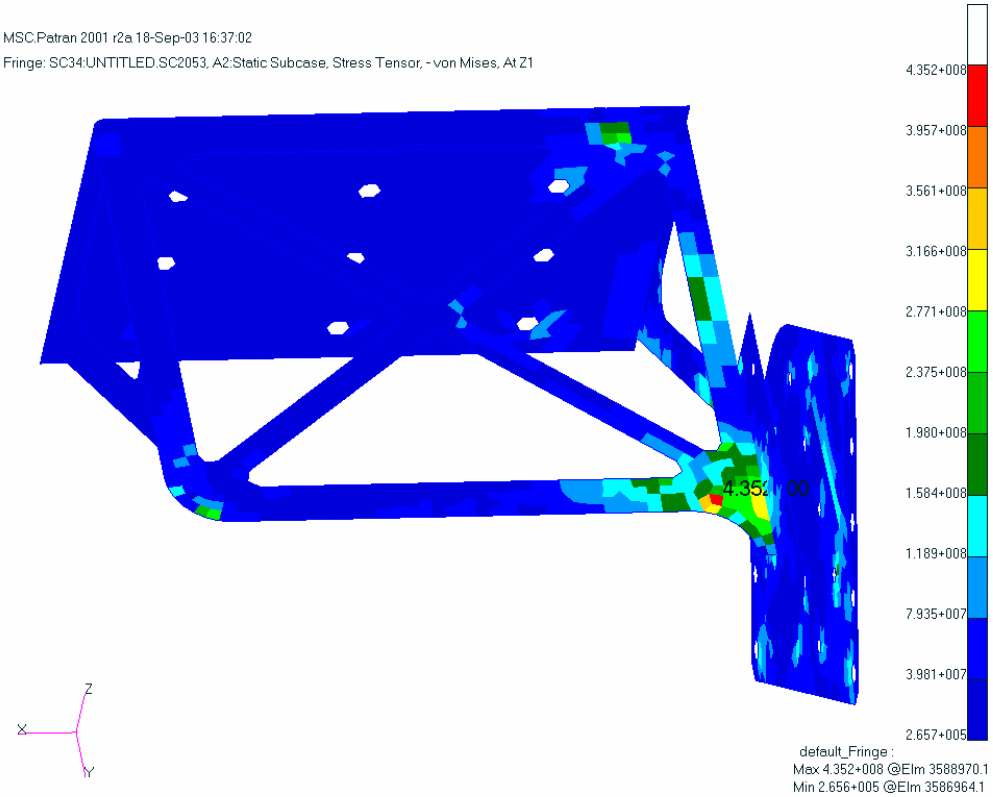


LOWER BRACKET		
Mpa	N	MoS
26.8	-3270	7.36

Worst LC over 128

MID BRACKET

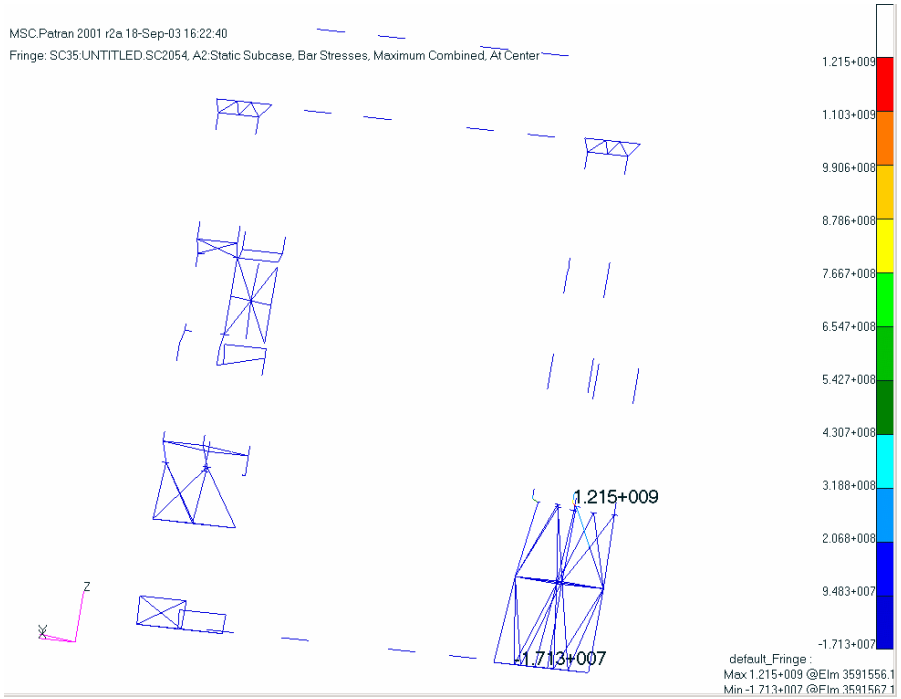


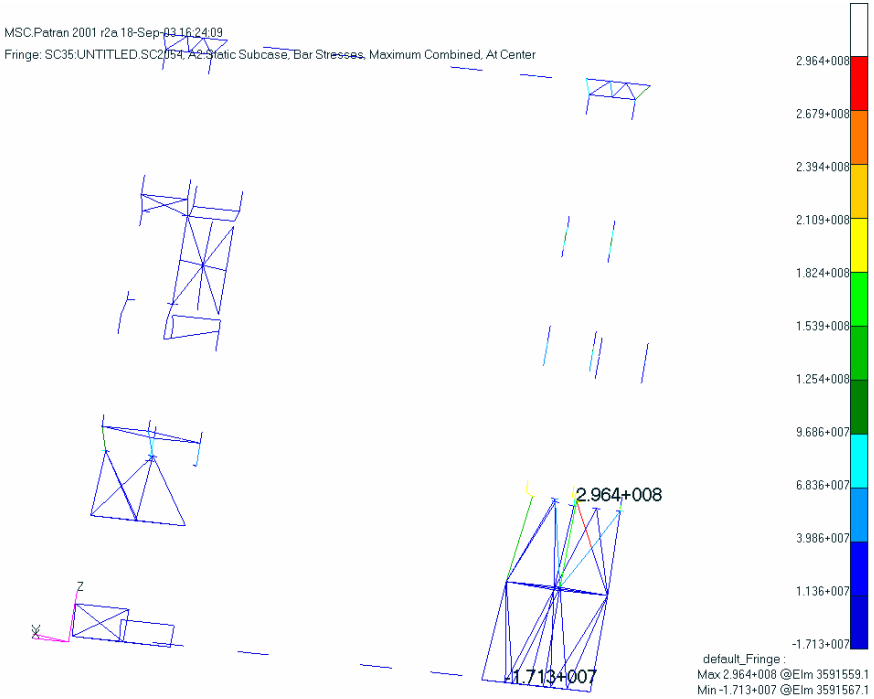


MID BRACKET	
MPa	MoS
435	-0.49

Worst LC over 128

INTERCRATE LINKS





intercrate LINKS	
MPa	**MoS**
1214	**-0.81**

Worst LC over 128

Lession learned: framed RAM radiator

- Mass reduction is low due to the small relative mass of the mid brackets compared to the whole system
- Connecting the XPD near the USS
  - bracket compliance is reduced
    - The bracket design could be made more compliant BUT this is critical due to lower envelope available
  - high loads are transferred to radiator
- Interface stiffness changes, new criticalities during next CLA cycle could arise.
- It is mandatory to update boundary conditions with CLA, because fixation point of USS used by LMSO until now is no longer representative

CONCLUSIONS

- The framed structure is abandoned for RAM radiator.

- It is better to go back to the Gemini layout, to transfer in a more effective way the imposed displacements/rotations