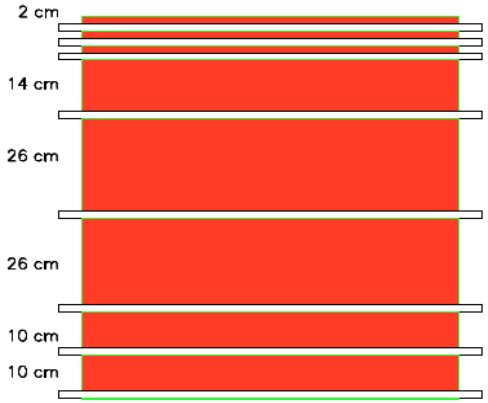
SuperB IFR
mechanics of **IFR prototype – by C. Fanin**

- Design by Claudio Fanin, INFN PD
- Prototype have been delivered to INFN LNL

- Useful cross section of 65x65 cm^2
- Composed by 46 plates, 2 cm thick, welded to a base of beams
- Horizontal position for test beam
- Vertical position for cosmics
- Thickness layout as defined:

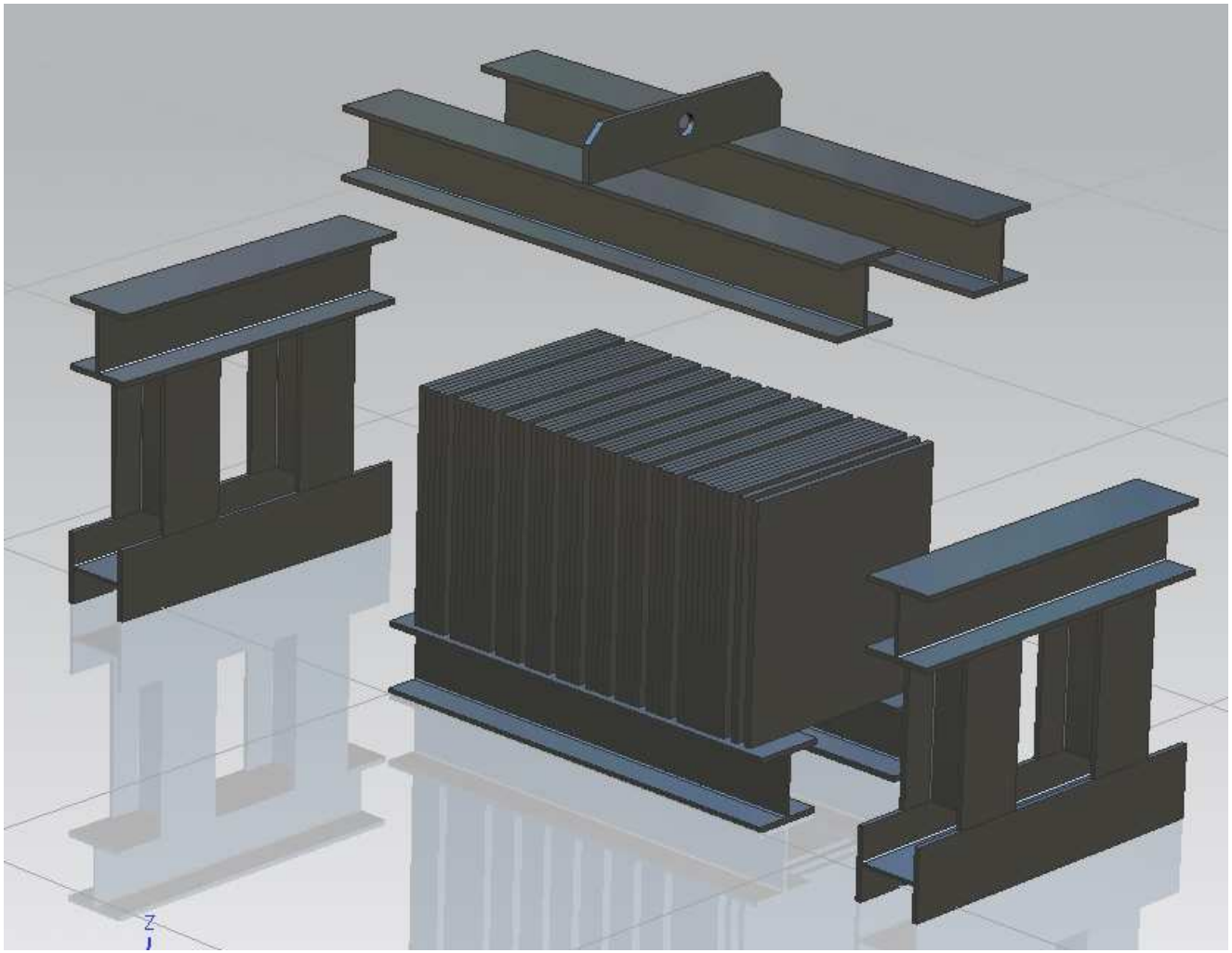
|2|2| 16 | 8 | 8 | 8 | 8 | 8 | 8 | 14 | 10 |

- Overall thickness as CDR = 920 mm
- Slots 30 mm wide, accessible from sides
- Mass ~ 4t



SuperB IFR
mechanics of **IFR prototype – by C. Fanin**

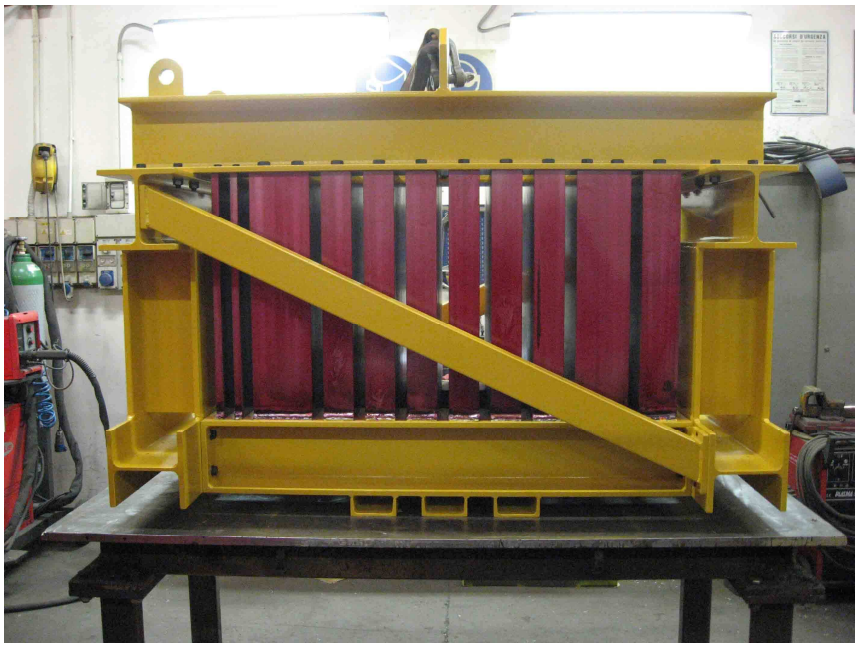
Removable surrounding beams would allow vertical position for test with cosmics and insertion of scintillators boxes

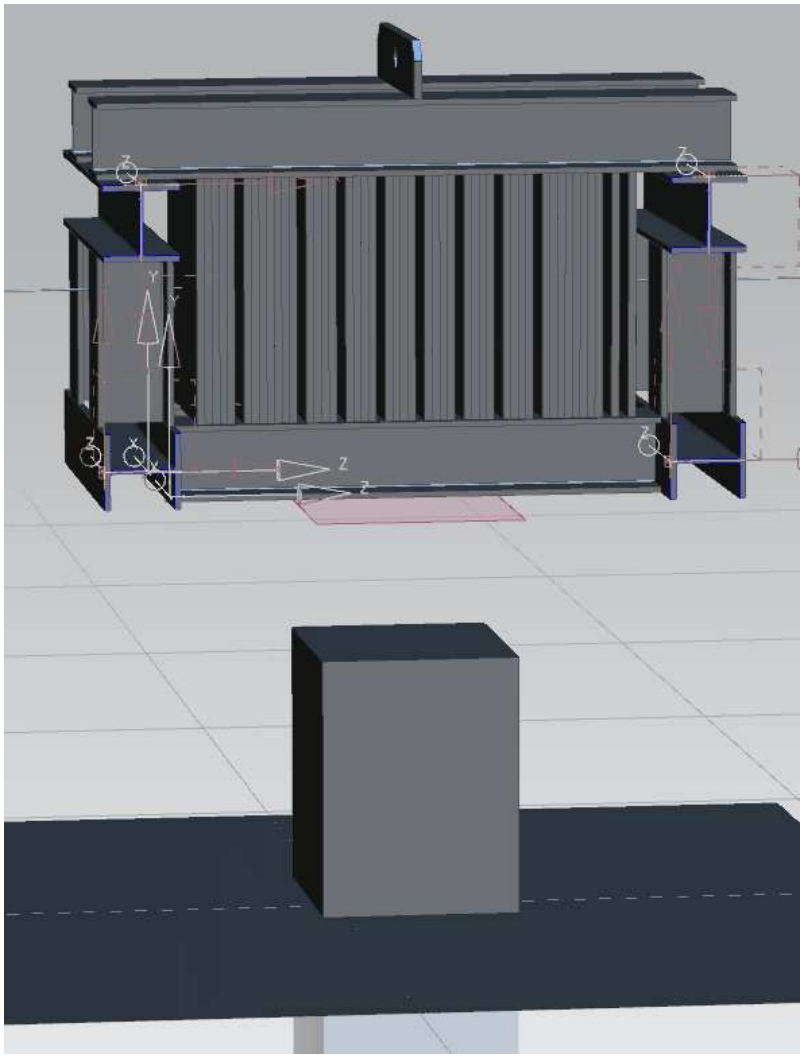


SuperB IFR
mechanics of **IFR prototype – by C. Fanin**

Prototype vs test beam trolley seems easily unstable

Foreseen holes pattern to add legs on the 4 corners to ensure stability, if front beams not removed

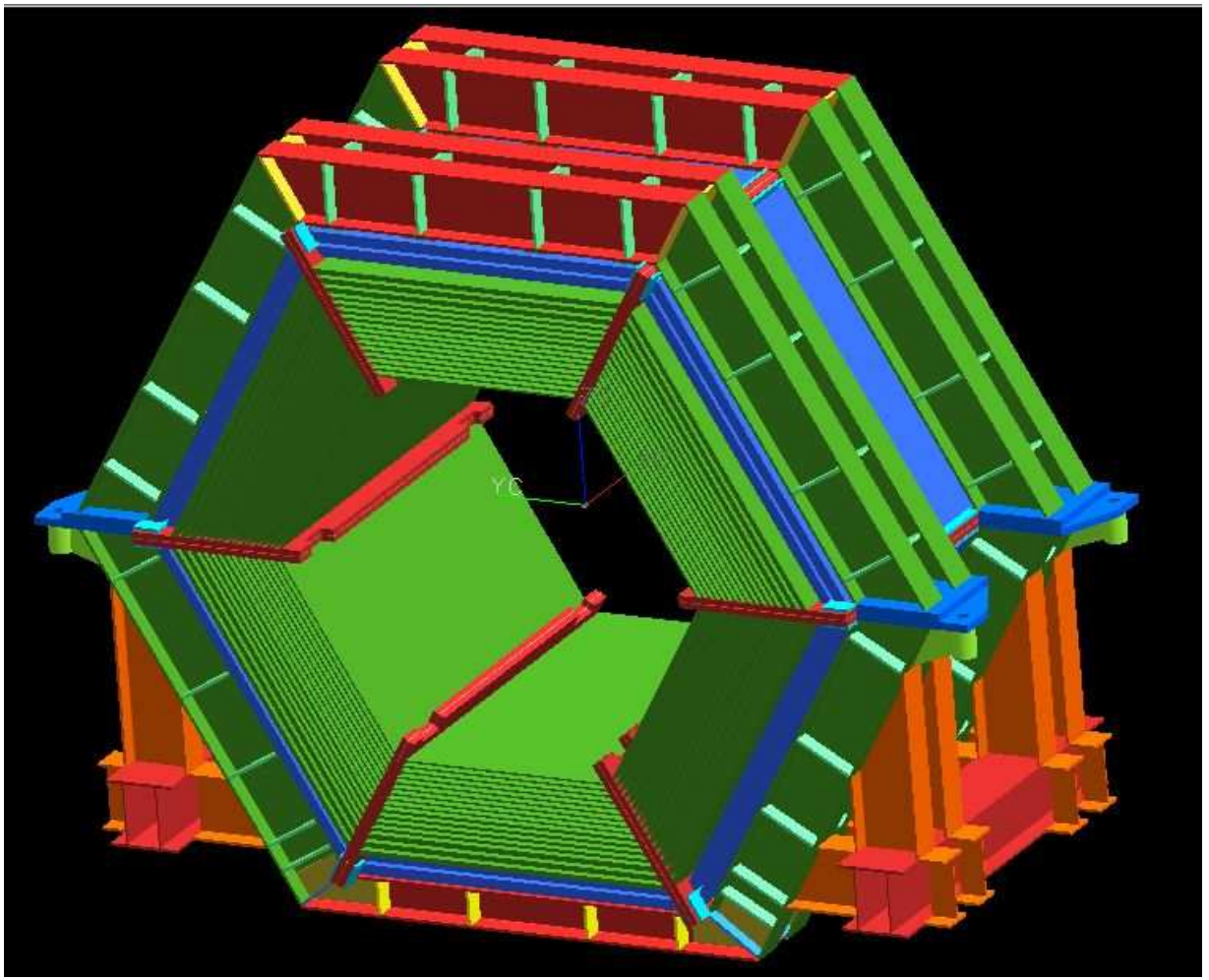




SuperB IFR
Work in progress on IFR

Remodeling of Babar IFR Barrel have been started to understand how IFR is assembled, how increase its thickness and in order to perform structural simulations of the different scenarios.

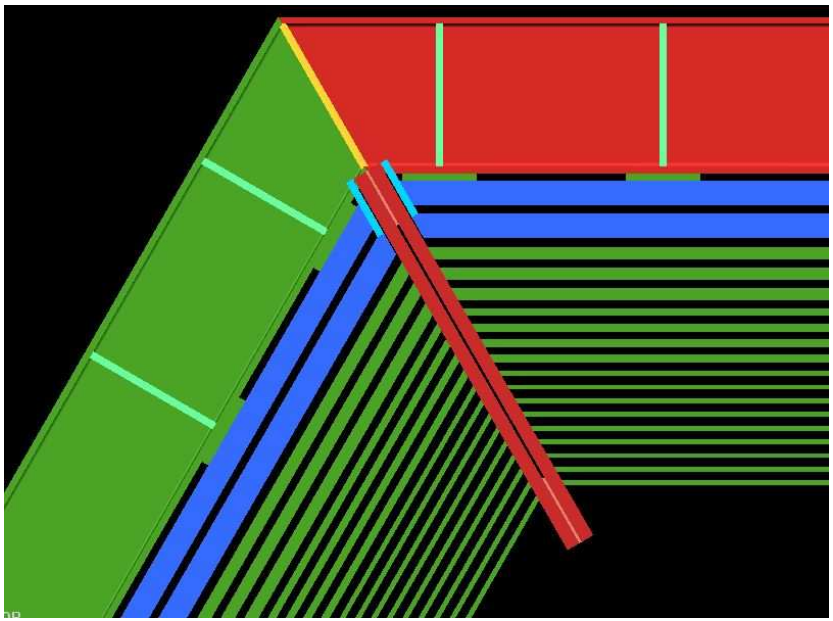
Still many parts and details missing.

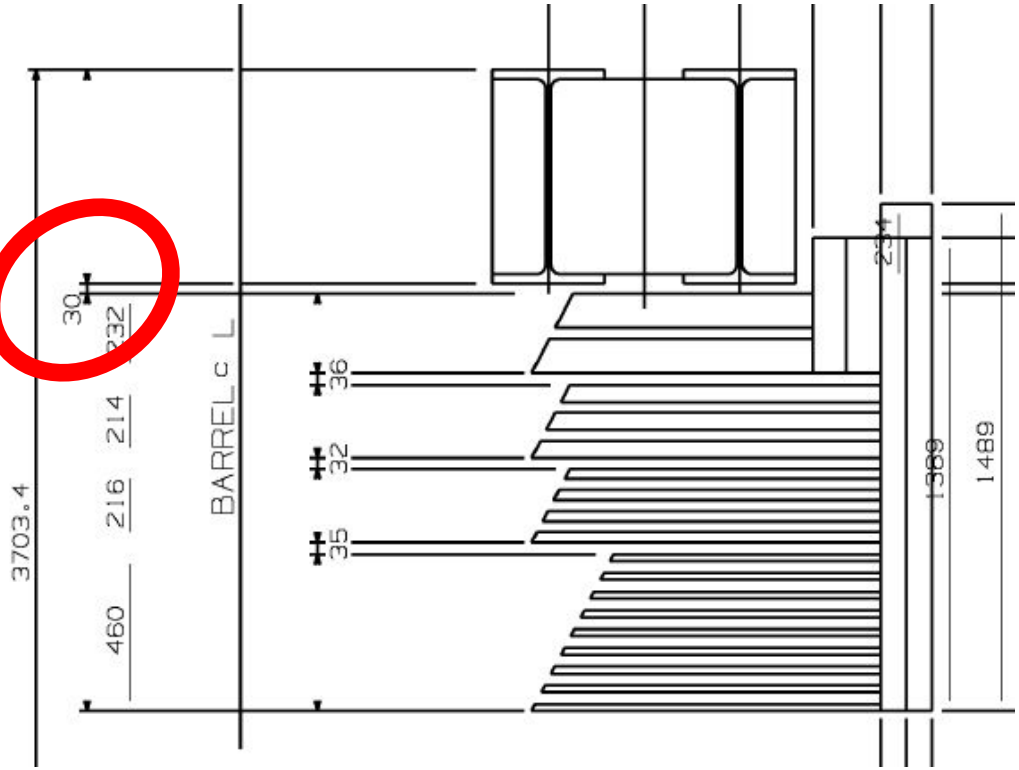


SuperB IFR
Outer side instrumented layer

There is already a 30 mm nominal gap between arch/cradle beams and wedge

To be checked if the gap is really there (30 mm wide) or it was foreseen to compensate wedges tolerances, thus 3(mm not uniform everywhere

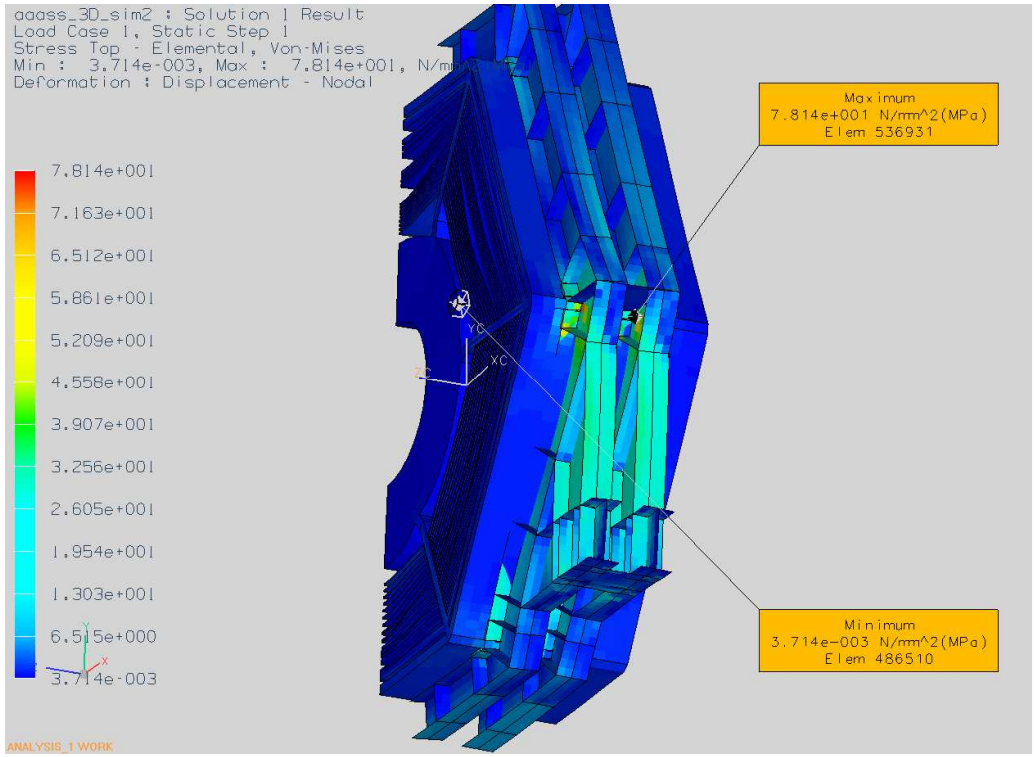




If the gap is there, and assuming is not needed to add steel plates outside the barrel, must be studied how to modify wedges to beams connections to allow a layer of scintillators

SuperB IFR
How free the outer gap for instrumented layer

Preliminary FEA analysis have been performed to check the IFR deformation induced by modifying the connections from wedges to beams, reduced to “small” shims at the hexagon vertex, wrt current Babar design.



Two similar FEA models:

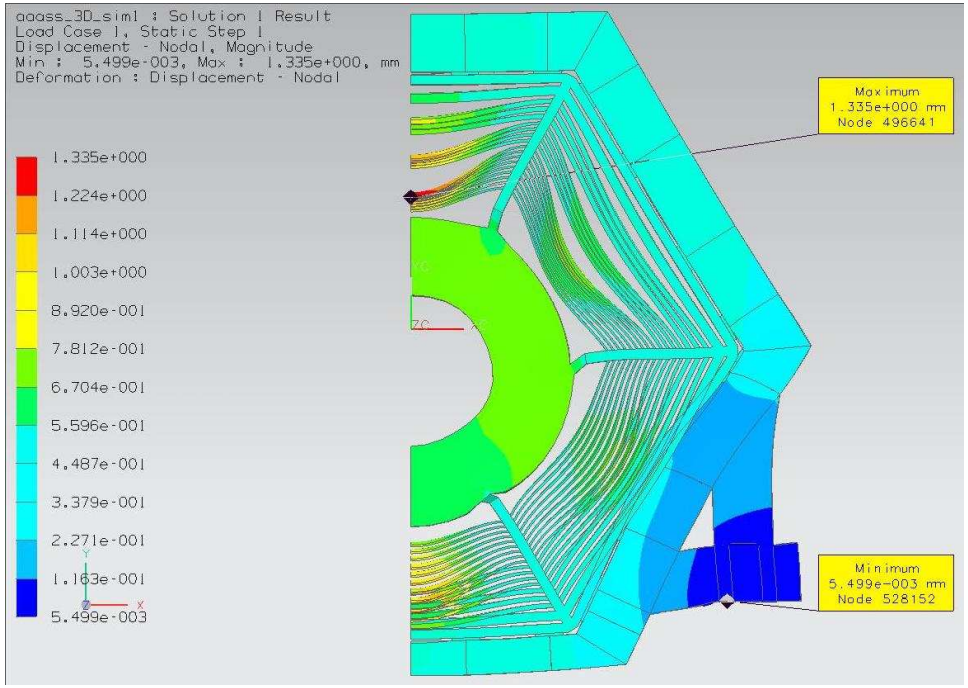
- as Babar barrel IFR
- Babar barrel with modified connections

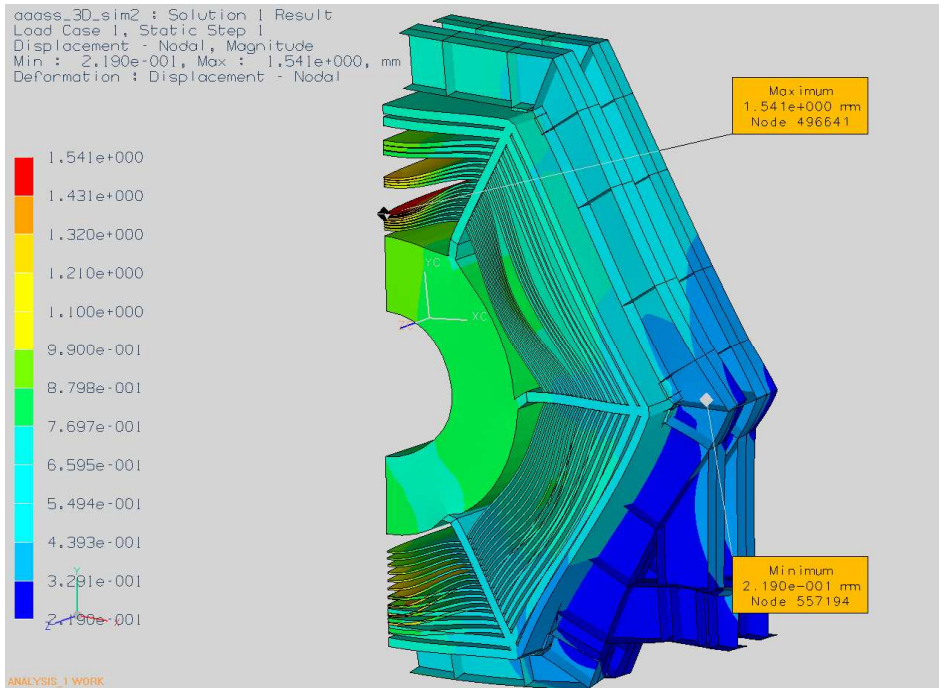
Still very preliminary models:

- Weight of the inner detectors, magnet coil etc.. unkown
- The way they act on the IFR unknown.
- The increasing of weight due to brass plates still is not taken in account
- plates in front of barrel not in the model

SuperB IFR
FEA preliminary analysis

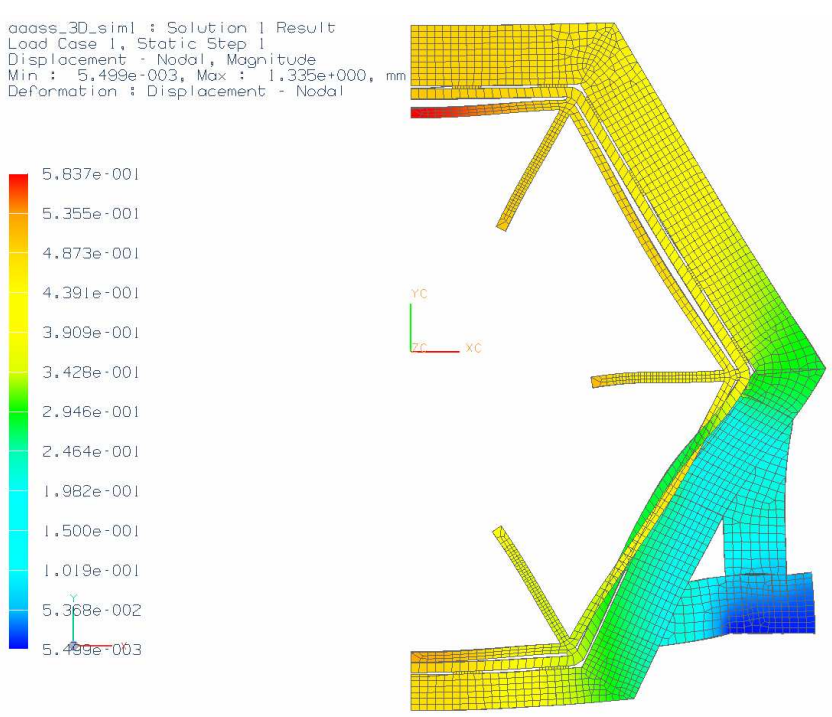
- Reducing the connections, deformation of barrel increase, as obvious
- Large contribution to the global maximum deformation is given by deformation of horizontal steel plates of top and bottom wedges (order of 60-70% of the global maximum deformation)

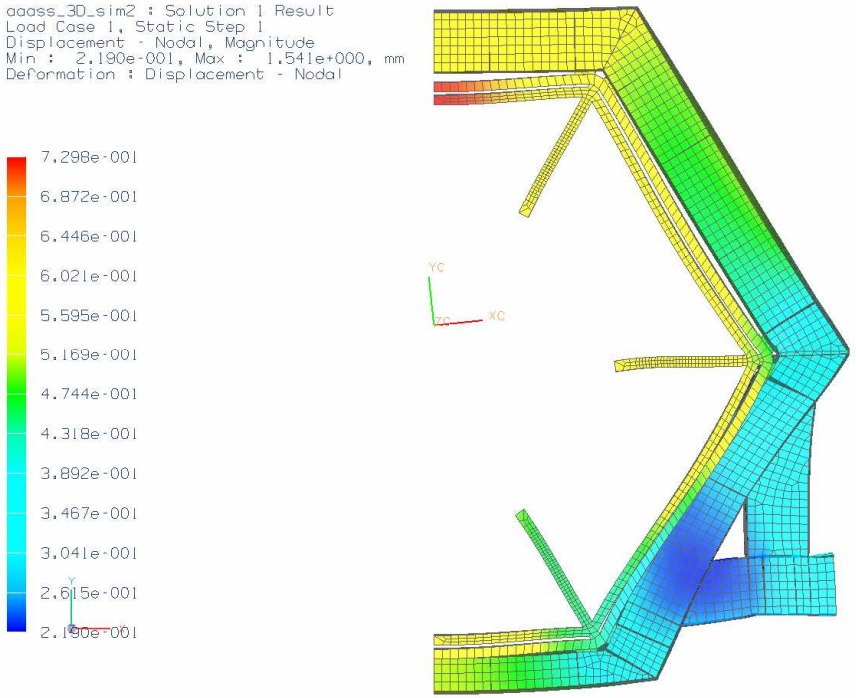




SuperB IFR
FEA preliminary analysis

- Reduction of connections induce overall deformation increased of about 15%
- The deformation of the outer wedge plates is increased by 26 %
- Thus lost of stiffness is clearly visible locally on the top outer wedge, less visible in the inner layers





SuperB IFR
FEA preliminary analysis

If order of magnitude of loads and weights is not completely wrong:

- the increase of deformation is of the order of tenth of mm, large relative value, but negligible compared to overall dimensions and reasonable wrt construction/assembly tolerances.
- Overall deformation seems mainly dependent from deformation of top outer wedge, to be studied
- Modification to “cradle/arcs to wedges” interfaces seems feasible without redoing the cradle and the arcs.
- Modification imply removing and modifying shimms, adding new holes and screws on all outer wedges, cradle, arcs.
- This would leave free most of the gap betweeen cradle/arc and wedges
- Connections on the vertex need adequate extension to allow correctly spaced holes for a number of screws, where calculation of strenght must be performed
- Expected distance between scintillators of adjacent wedges (outer layer): 30-50 cm

To get reliable FEA analysis:

- refining FEA model (connection area, missing parts and plates, missing DIRC support etcc)
- Consider also values of stresses vs strenght
- Correctly input all loads (inner detectors and magnet) and the way they to act
- Compare FEA results with results of Babar models/measures (and other FEA software)