



# Status of EMR project @ Geneva

*MICE meeting  
October 5, 2010*

1. EMR Production & Assembly status
2. EMR Outer box (1<sup>st</sup> frame already manufactured)
3. EMR Integration @ RAL (Issues / KL)

**University of Geneva:** *A.Blondel, J-S Graulich, V.Verguilov,  
Coralie Husi, F.Masciocchi, L.Nicola, R.Bloch, N.Geisig, P.Béné, F.Cadoux*



## EMR production & Assembly status



Today, **8 EMR planes** (or 4 modules) out of 48 have been completed.  
Mechanics is ready for **10 more planes** by end of November 2010  
(including unavailability of 1 technician for 6 weeks)



Above, the assembly stands of EMR planes(1 for plane assembly, 1 for module assembly)



# EMR production & Assembly status



What we learned from the first 2 plane assemblies ...

no loctite glue to be used close to the fiber!!



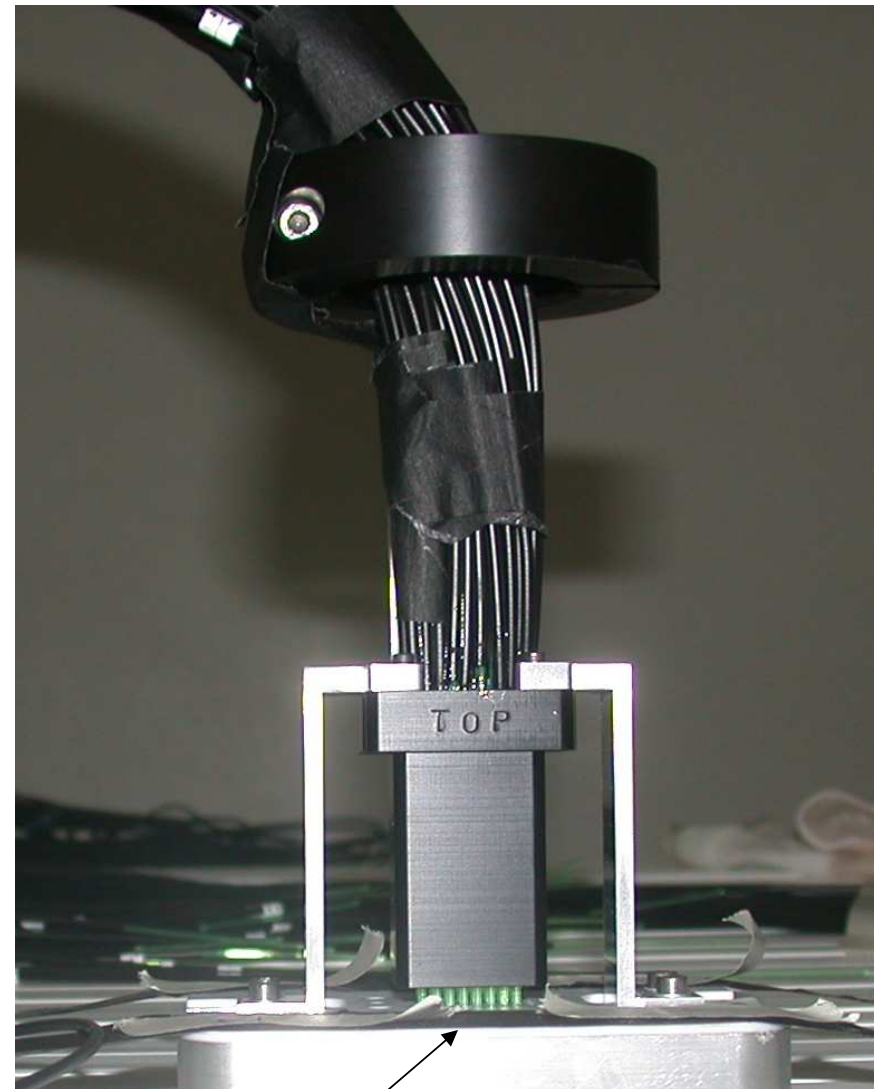
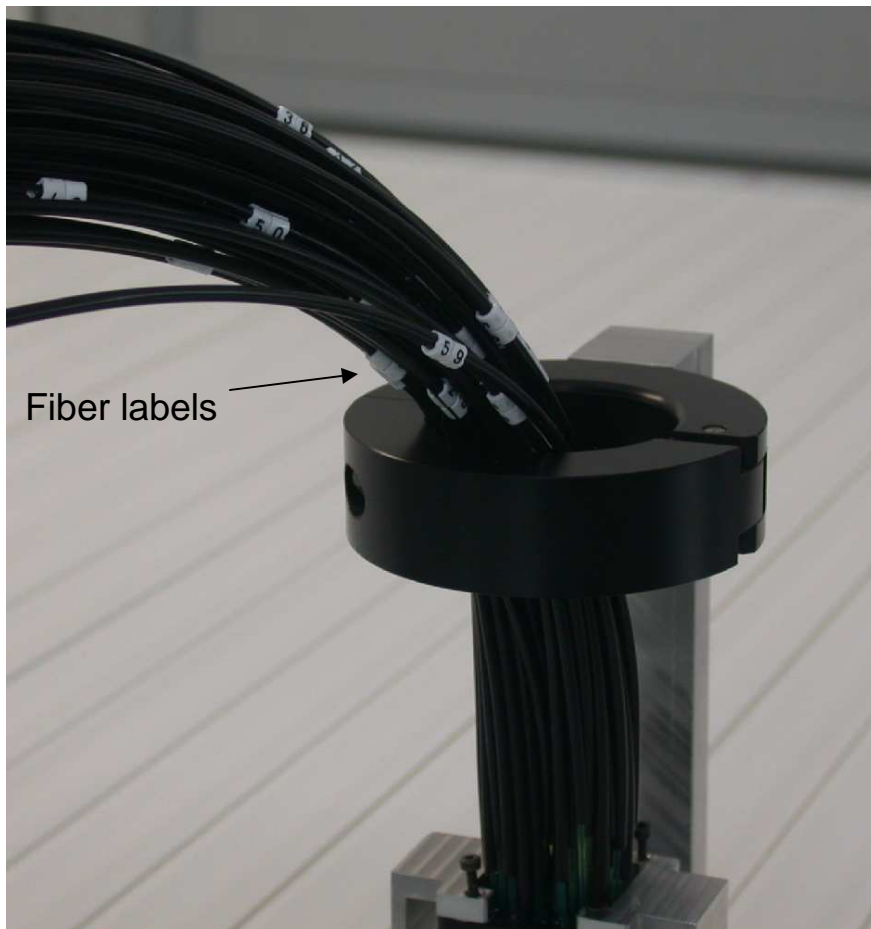
Above, the torque wrench is used to apply a torque on each nut (back off prevention)



# EMR production & Assembly status



Fiber connection to the PMT connector (2 types)...  
need to label each of the fibers individually



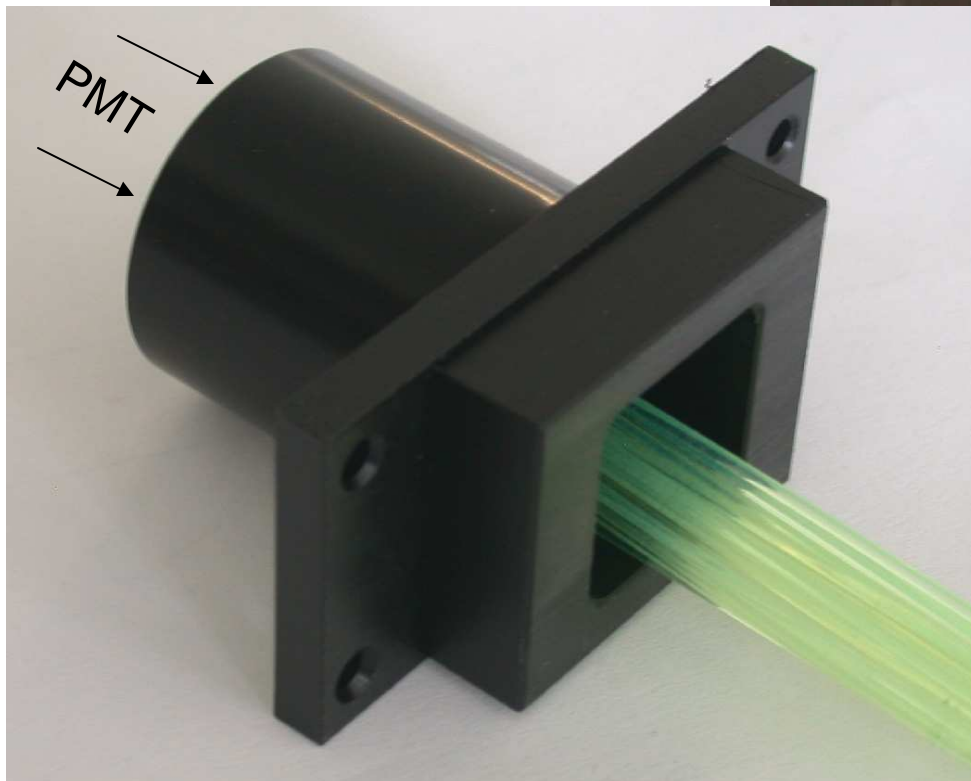
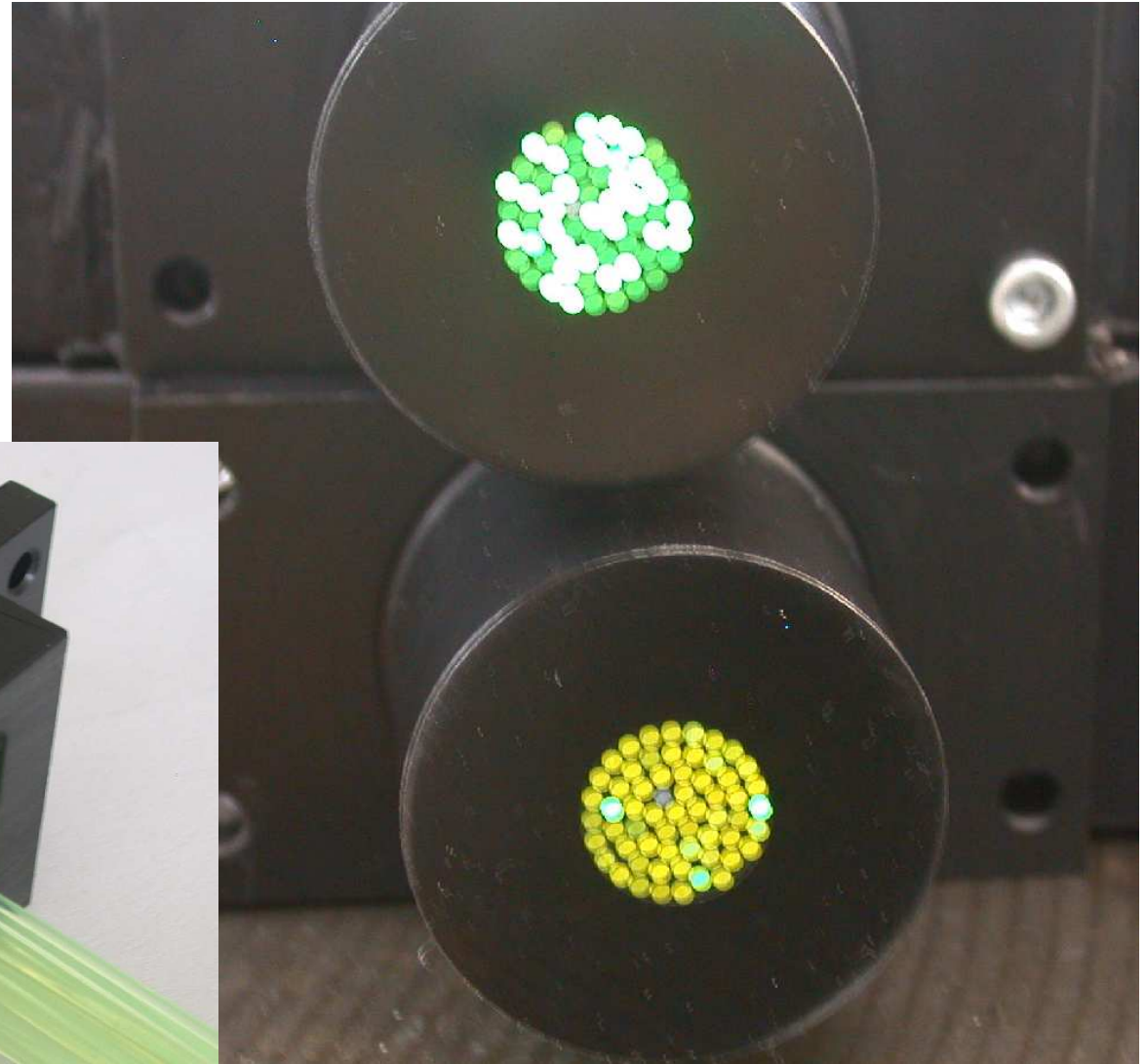
Teflon plate insertion (ungluing)



# EMR production & Assembly status



Fiber ends after polishing



As seen by the PMT's...



# EMR production & Assembly status



Each plane is completely sealed / outside light which includes the 2 PMT connectors per plane



Above, the assembly the dry assembly of 1 module after sealing



# EMR production & Assembly status



A team fully committed to the EMR project...final bolting on 2 complete modules

They are almost 100% dedicated to EMR  
(since January 2010)  
+ Florian Masciocchi (design office)

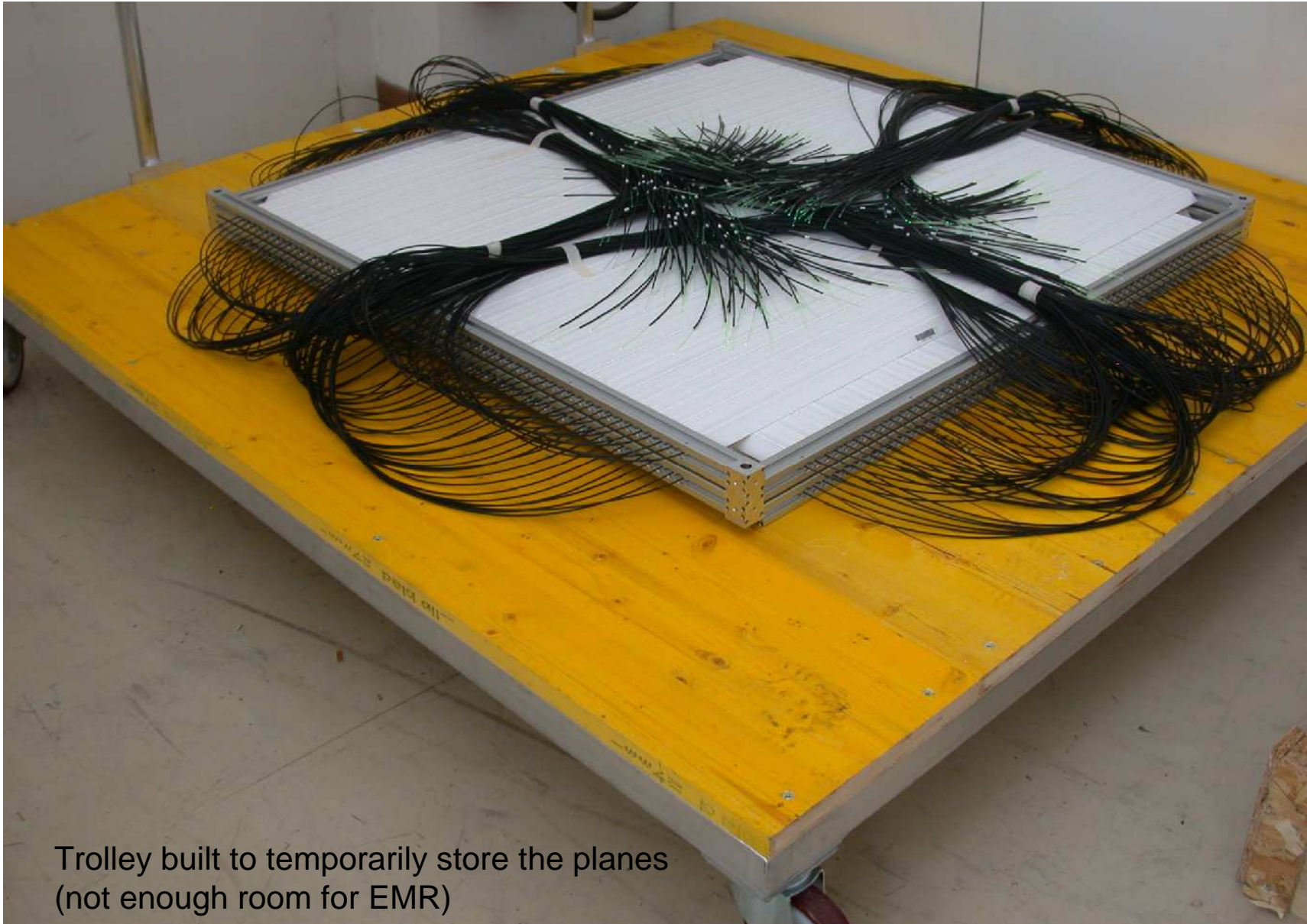




# EMR production & Assembly status



Storage issue (awaiting for assembly onto the Outer box frame)



Trolley built to temporarily store the planes  
(not enough room for EMR)





# EMR production & Assembly status



Manufacturing of the first EMR Frame (see next for more explanations)



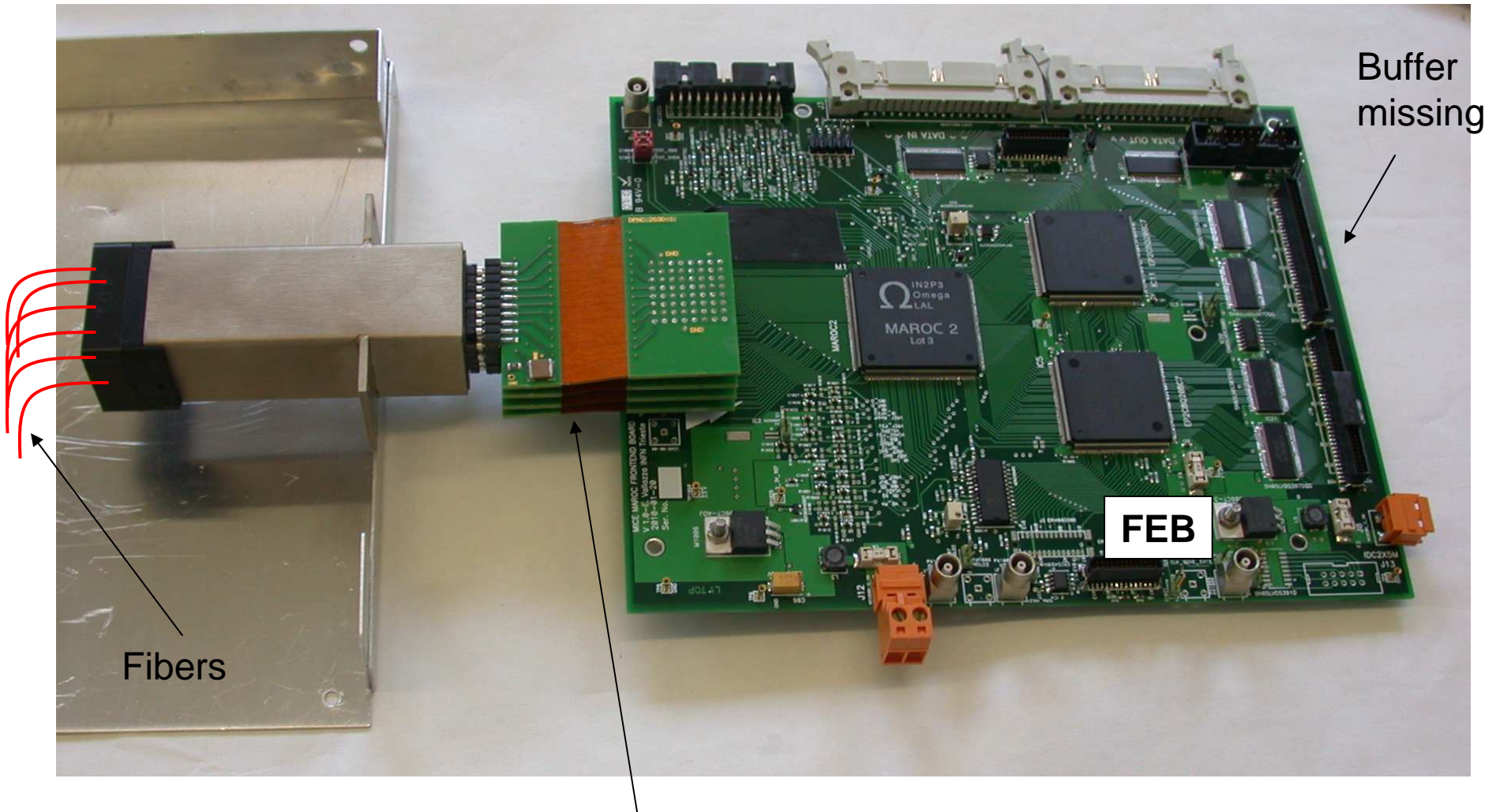
Everything done “in house”... @ the workshop of the University of Geneva (welding facility)



# EMR production & Assembly status



“64 pixels Phototube” (all assembled)



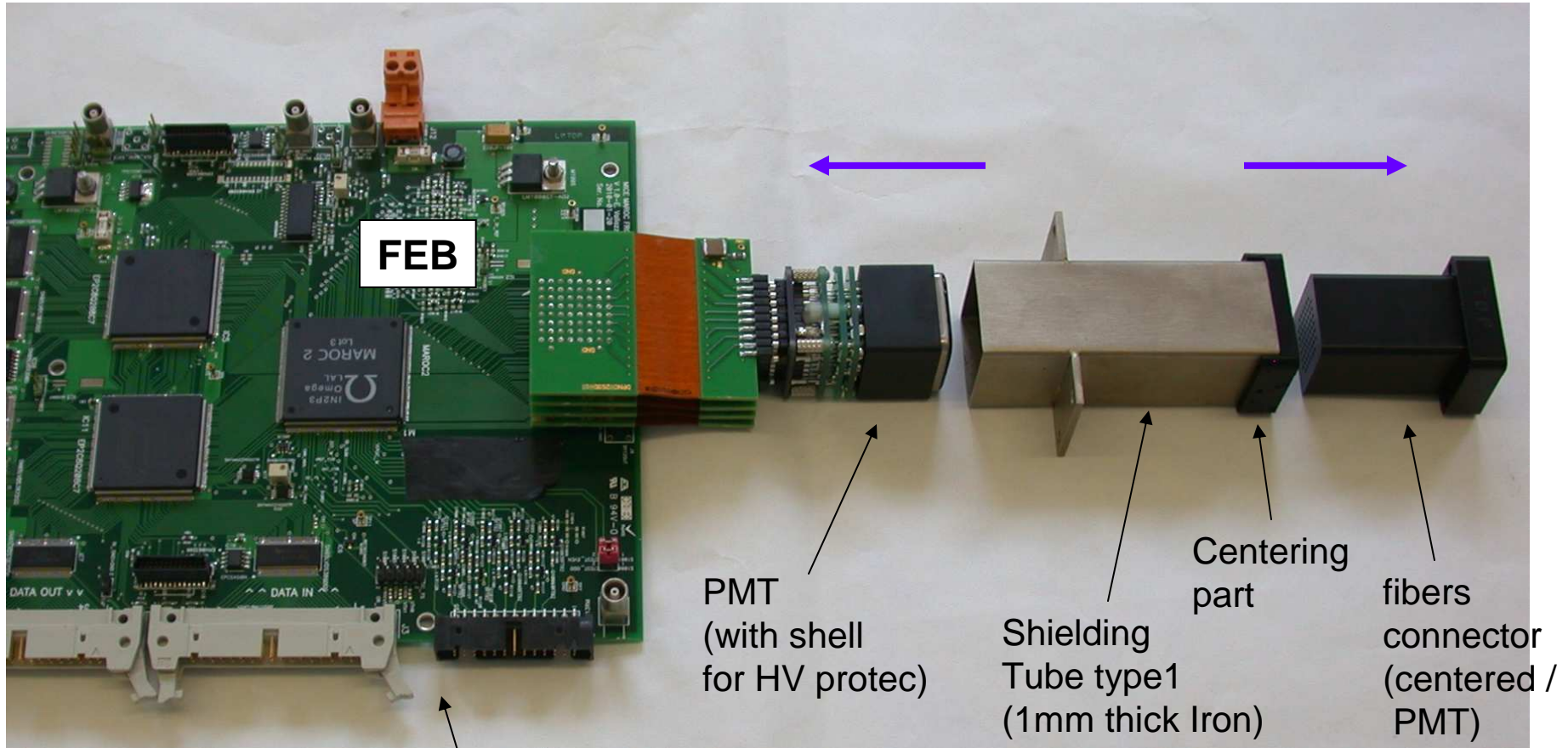
Flex connection being tested @UNIGE...mechanical proto for tuning



# EMR production & Assembly status



“64 pixels Phototube” (exploded...)



NOT shown here: the base plate for FEB support (design in progress)



# EMR production & Assembly status



“Mono pixel Phototube” (all assembled...)



“Mono pixel Phototube” (exploded...)



PMT + electronics

Spring system

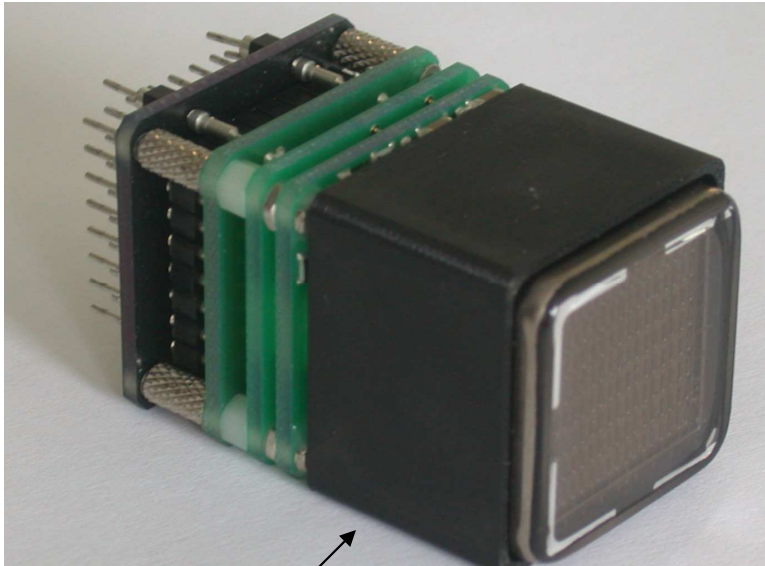
Shielding tube type2



# EMR production & Assembly status



Status on the part deliveries @ Geneva



Shielding all delivered...but to be nickel plated



Full prod delivered mid October (sub contracted)

Part done with 3D printer (used as a precise guide and HV Protection)





# EMR production & Assembly status

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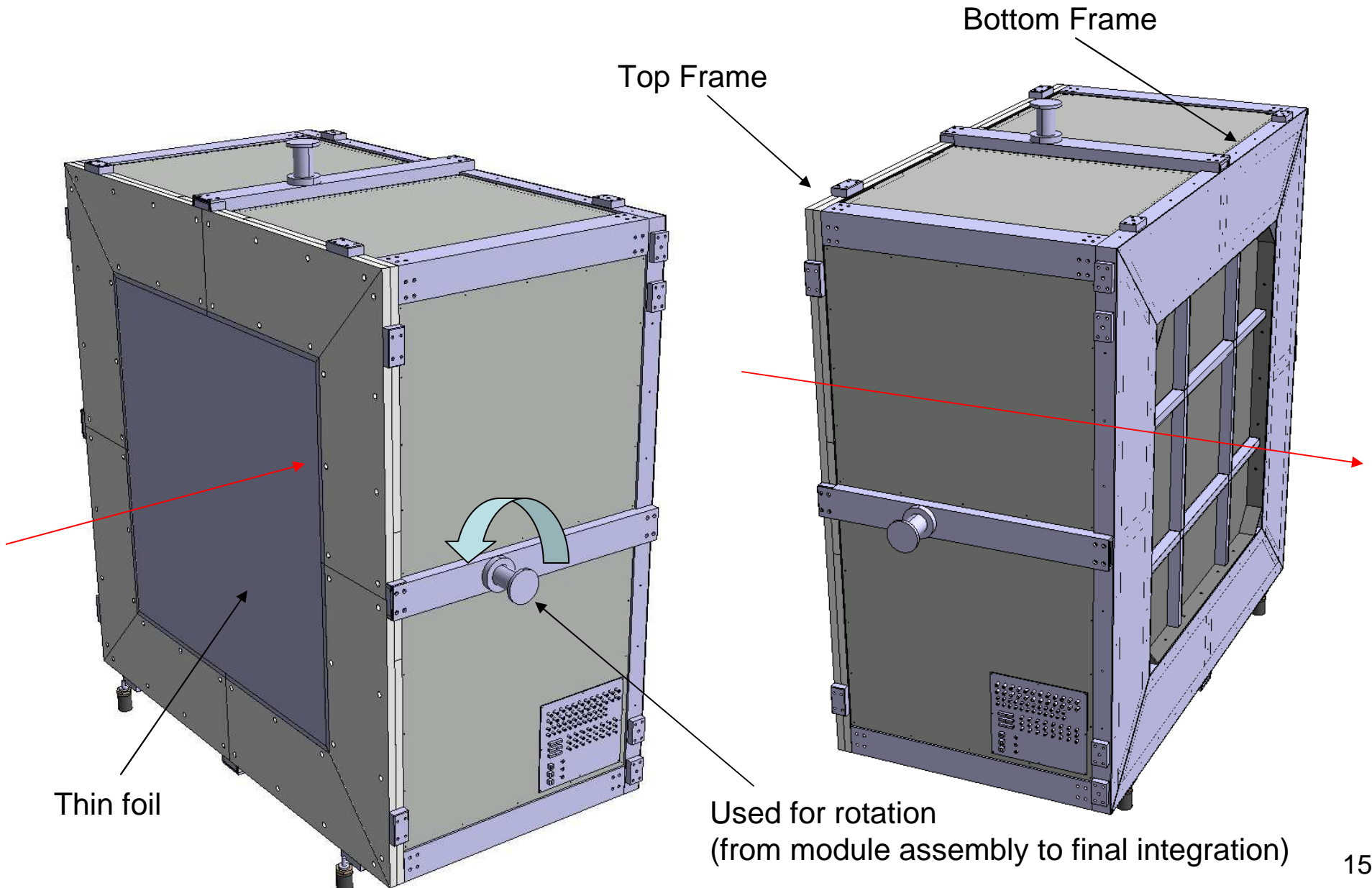
## Tentative schedule for EMR:

Based on the realistic assumption of **1 complete module / week** (if parts are available)

- **4** modules OK today...
- **20** are still missing (7-8 months including unavailability of technicians, such as military service...all the QA tests)
- Bottom frame is ready (still need to black treat it)
- Final assembly **May – June 2011 (1 month saving if turn over is optimized between technicians)**
- All the electronics, cabling, patch panels should be done accordingly

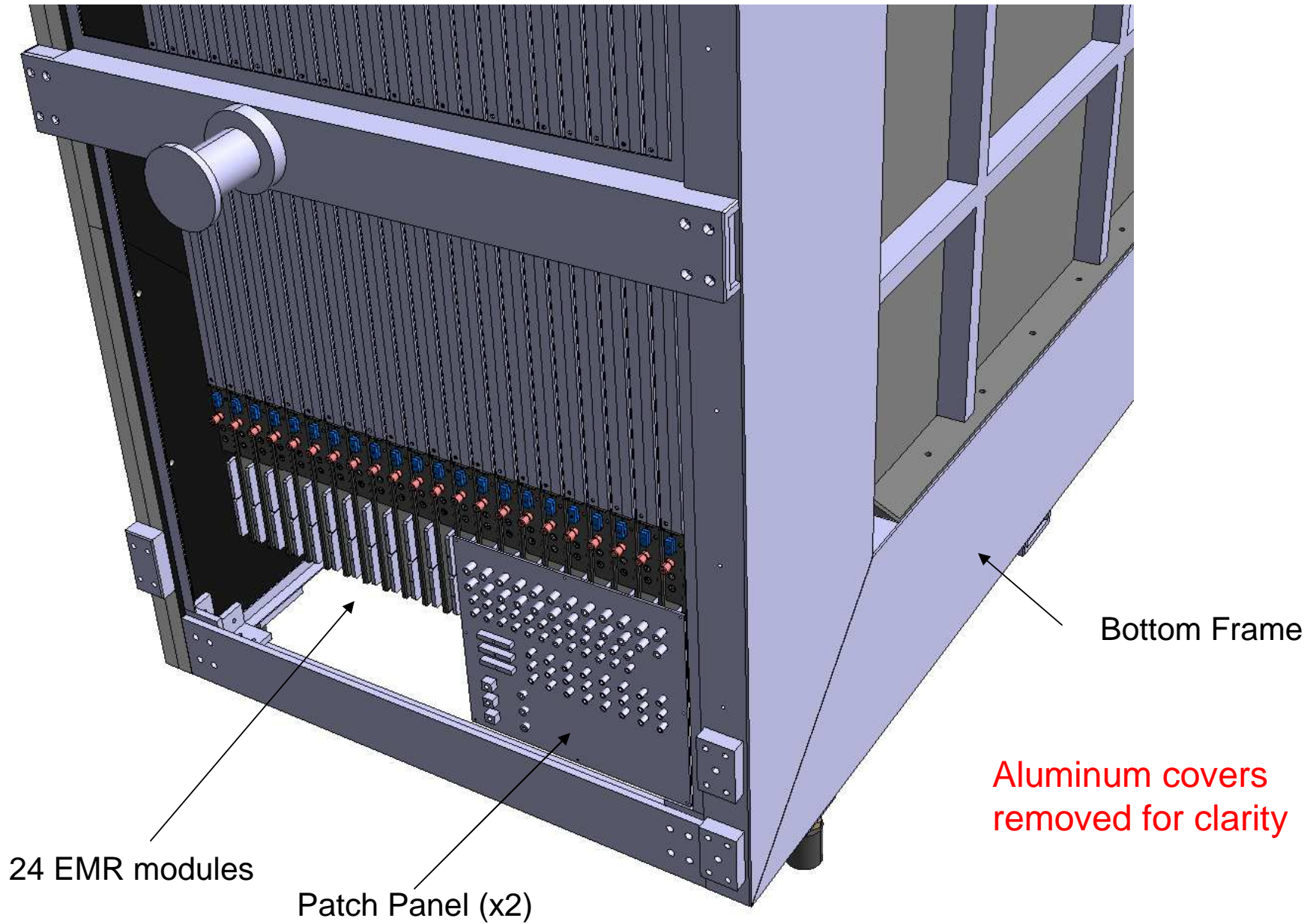


# EMR Outer Box (latest design)





# EMR Outer Box (latest design)





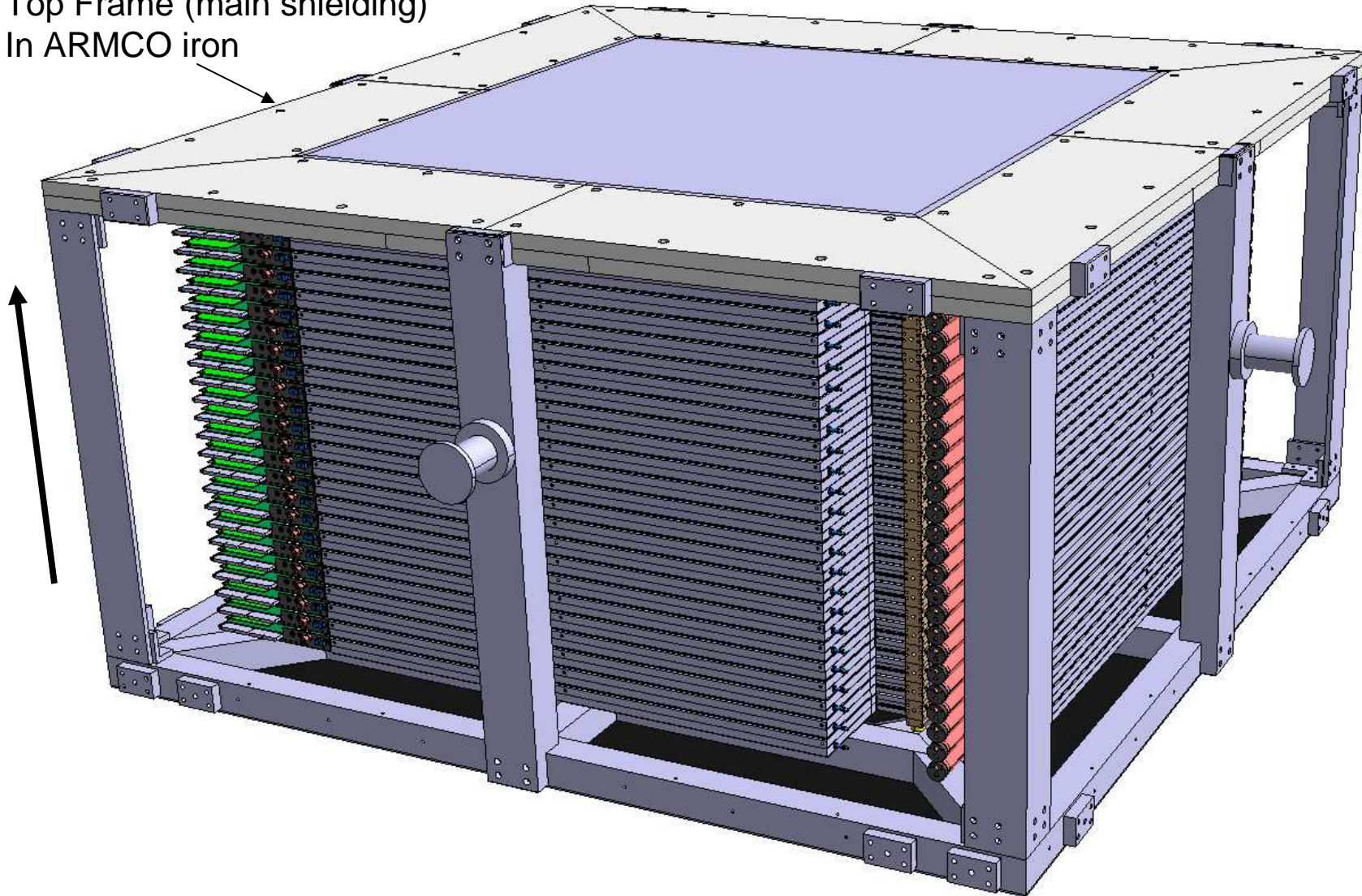


# EMR Outer Box (latest design)



Assembly on horizontal plane (Bottom frame as the starting point)

Top Frame (main shielding)  
In ARMCO iron

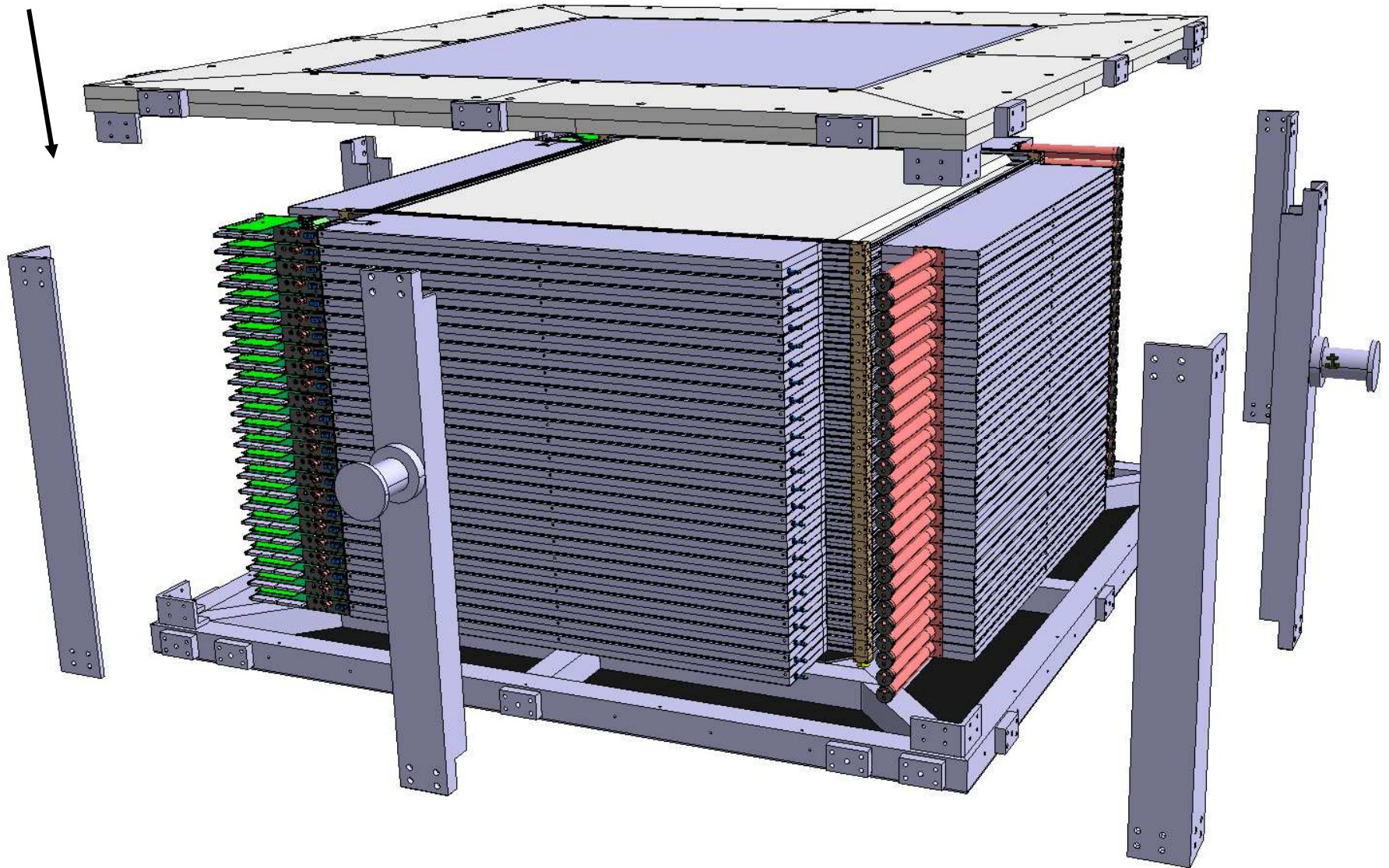




# EMR Outer Box (latest design)



Assembly on horizontal plane (exploded view)

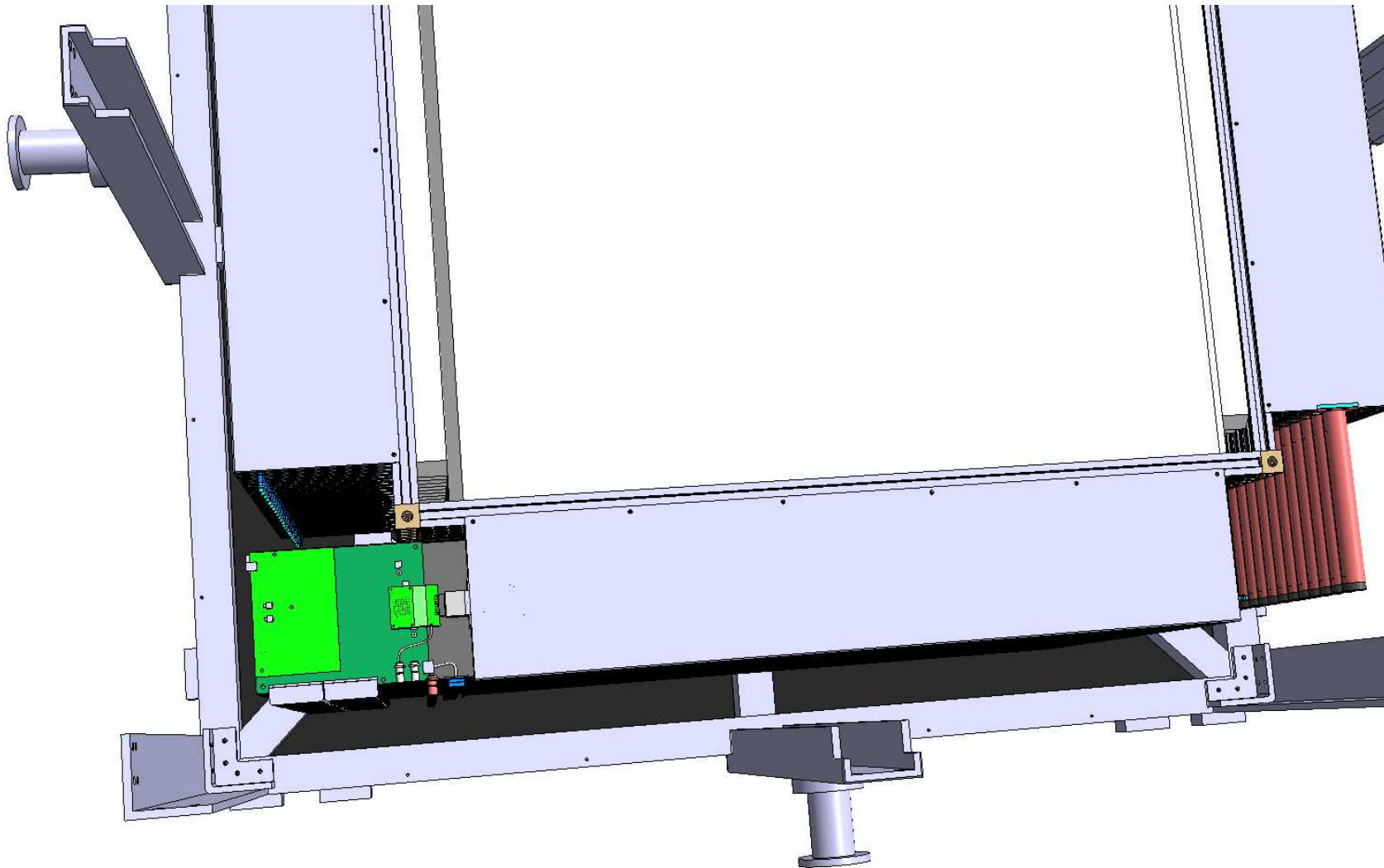




# EMR Outer Box (latest design)



Assembly on horizontal plane (exploded view)

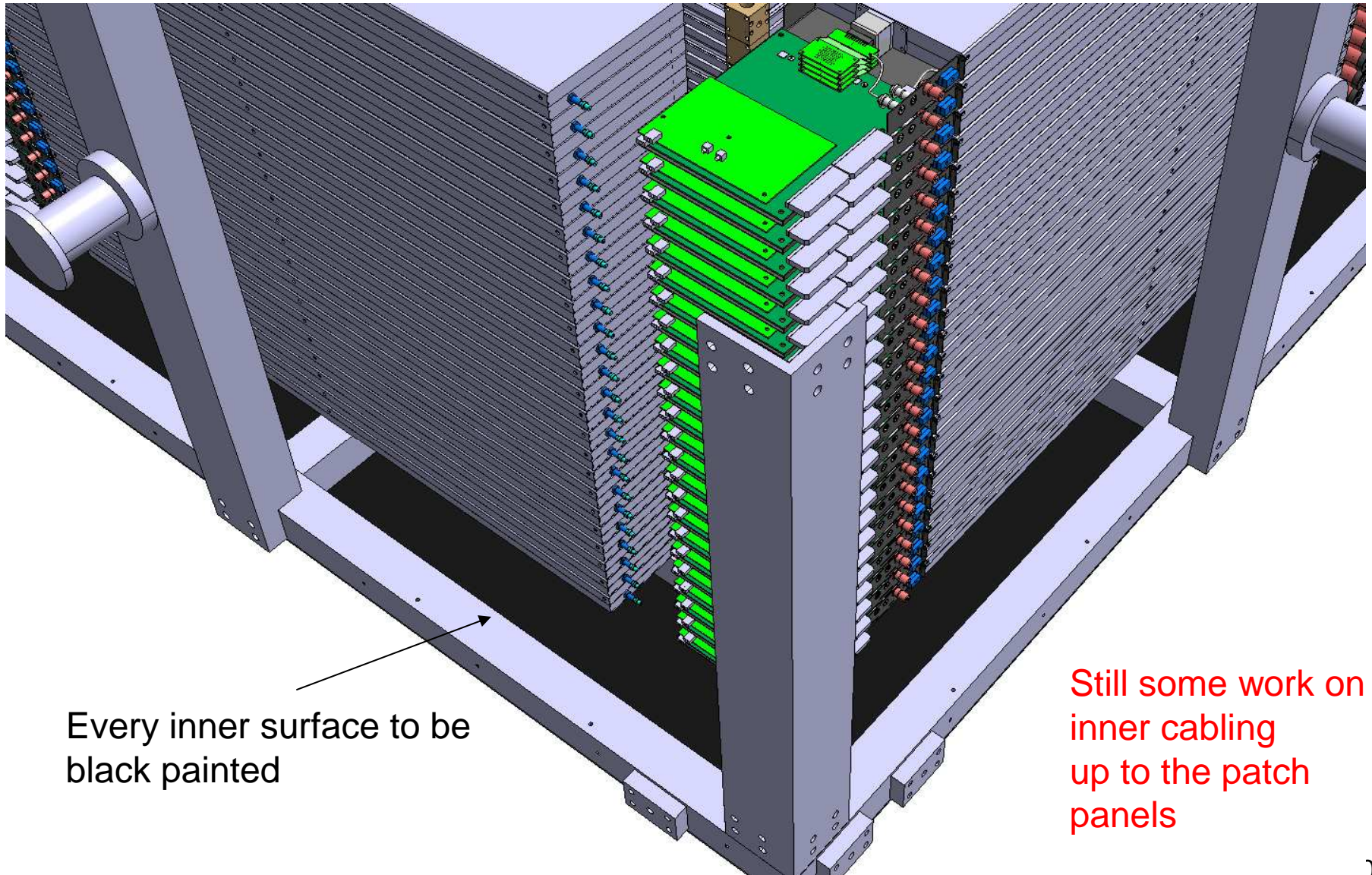




# EMR Outer Box (latest design)



Inner view on Modules stacking up



Every inner surface to be black painted

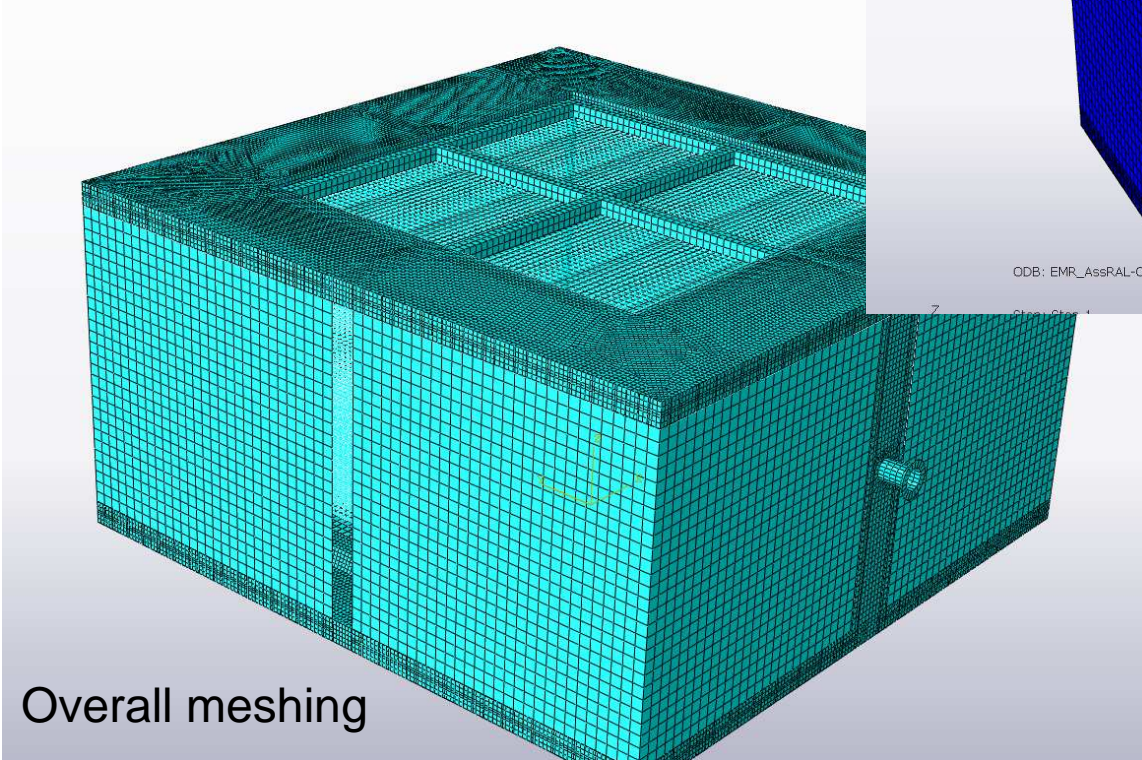
Still some work on inner cabling up to the patch panels



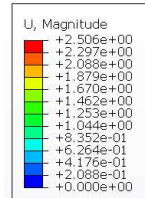
# EMR Outer Box (latest design)



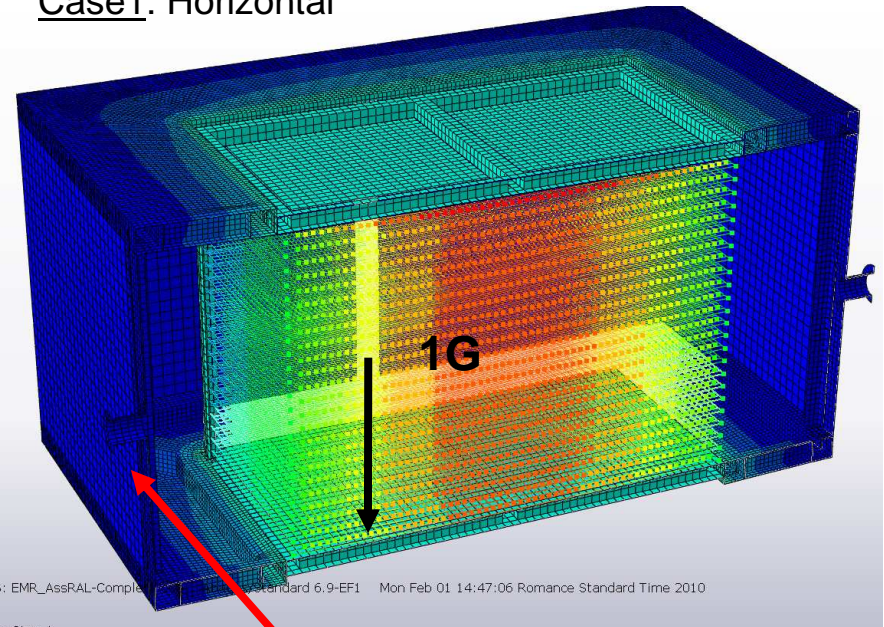
FEA's to be updated soon  
(including the magnetic force...see after)



Overall meshing



Case1: Horizontal



ODB: EMR\_AssRAL-Complete... Standard 6.9-EF1 Mon Feb 01 14:47:06 Romance Standard Time 2010

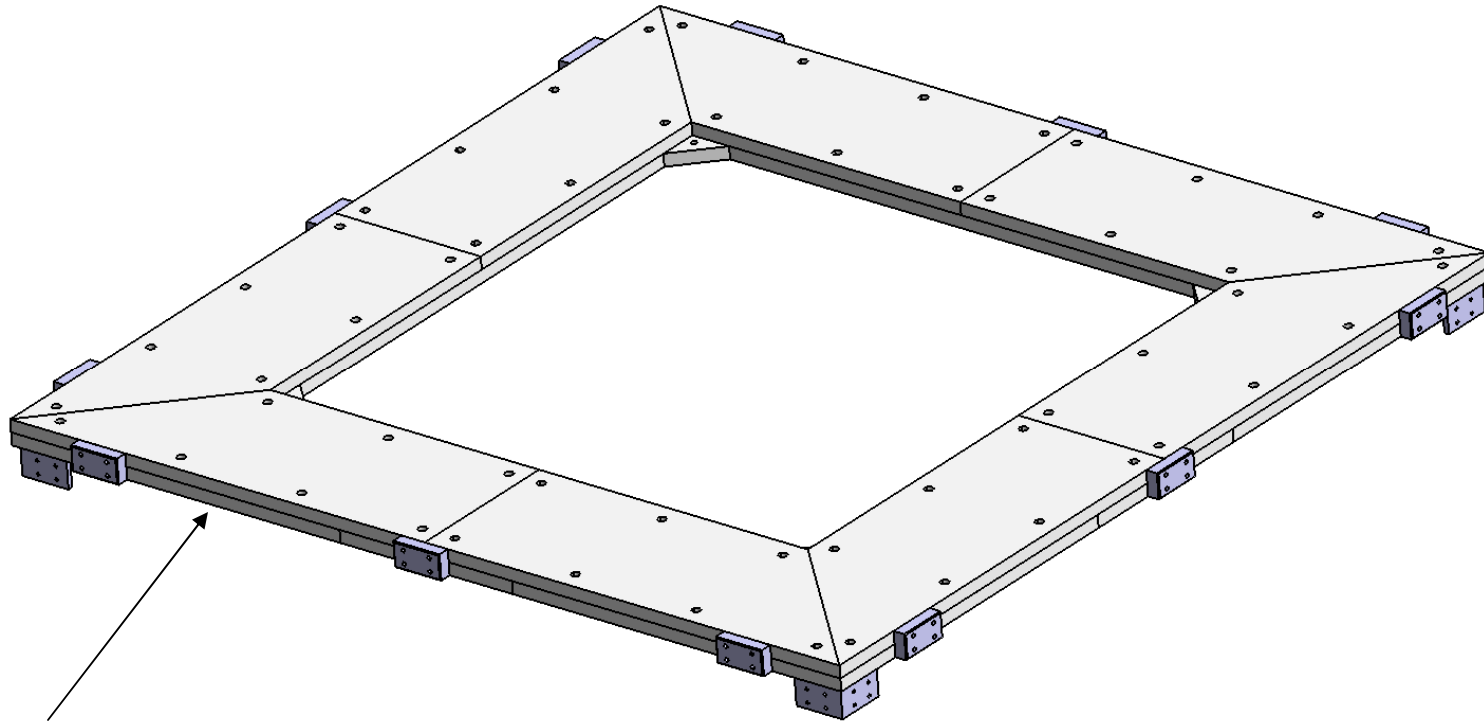
Simply supported on  
2 sides (boundary conditions)



# EMR Outer Box (latest design)



Global shielding (known as “Blondel Plate”)



50mm thick in ARMCO Iron (from CERN store)

- Made of 2 x 25mm thick plates
- Water jet cutting out at 0,1-0,2 mm accuracy
- Each part (sector) less than 50 Kg (handling issue)
- Same outer shape as the bottom frame
- Assembly by bolts and welding (to be confirmed by CERN)
- Approx. weight : 755 Kg

See next for resulting



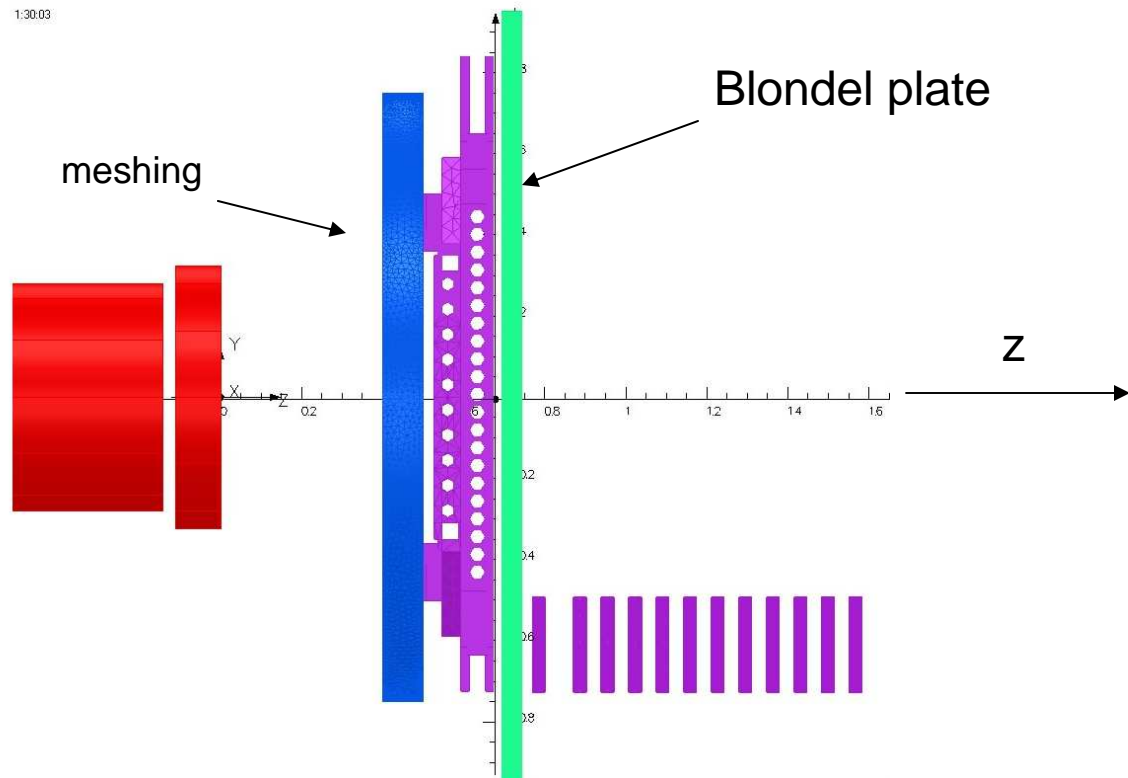
magnetic force



# EMR Outer Box (latest design)



Magnetic force as calculated by G. Gregoire



Calcul des forces sur la plaque Blondel.

a. Les composantes x et y sont très faibles en raison de la quasi-symétrie des détecteurs downstream par rapport aux plans YZ et ZX

$$F_x = 0.22 \text{ N} ; F_y = 5.3 \text{ N}$$

b. La composante z vaut  $F_z = -11.7 \text{ kN}$

c. Le moment de force sur la plaque Blondel évalué par rapport au point  $x=y=z=0 \text{ m}$  (centre du dernier end coil) est

$$C_x = 156 \text{ Nm} ; C_y = -23 \text{ Nm} ; C_z = -4 \text{ Nm}$$

**11700 N**



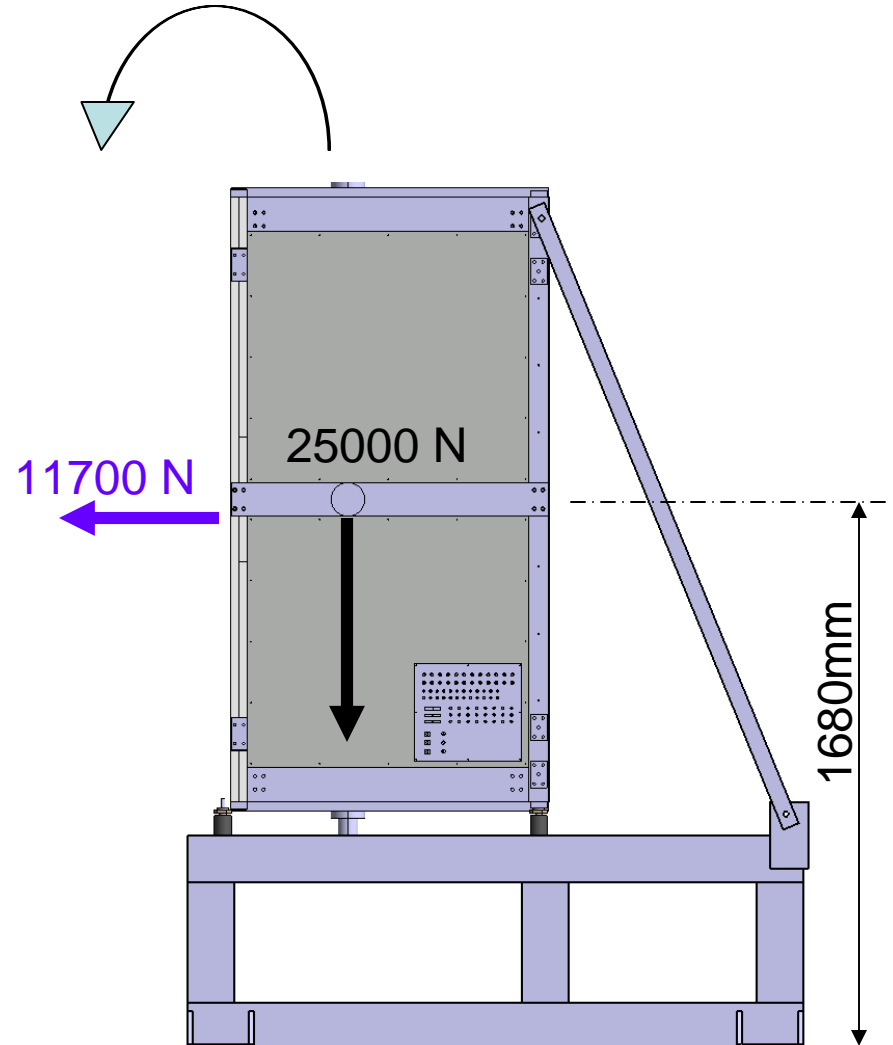
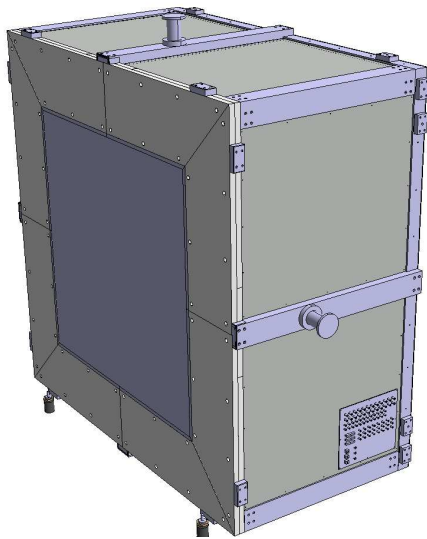
# EMR Integration @ RAL (latest design)



## EMR Weight sharing & applied forces :

- Bottom frame: 145 Kg
- Bottom plate: 25 Kg
- 24 modules: 1440 Kg
- Vertical beams (x8): 130 Kg
- Al plates and Patch panels: 40 Kg
- Blondel plate: 755 Kg

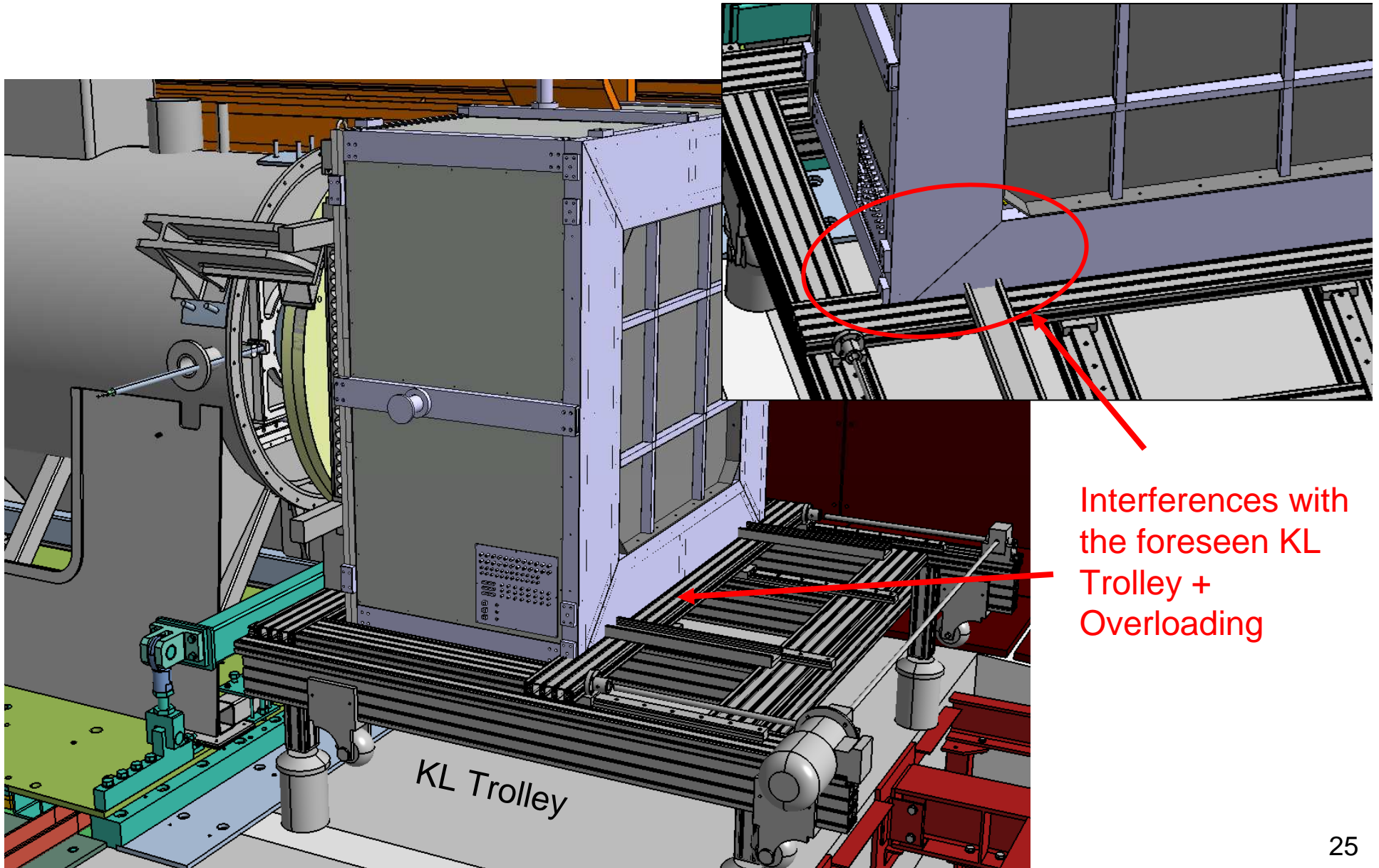
**TOTAL is : 2535 Kg**





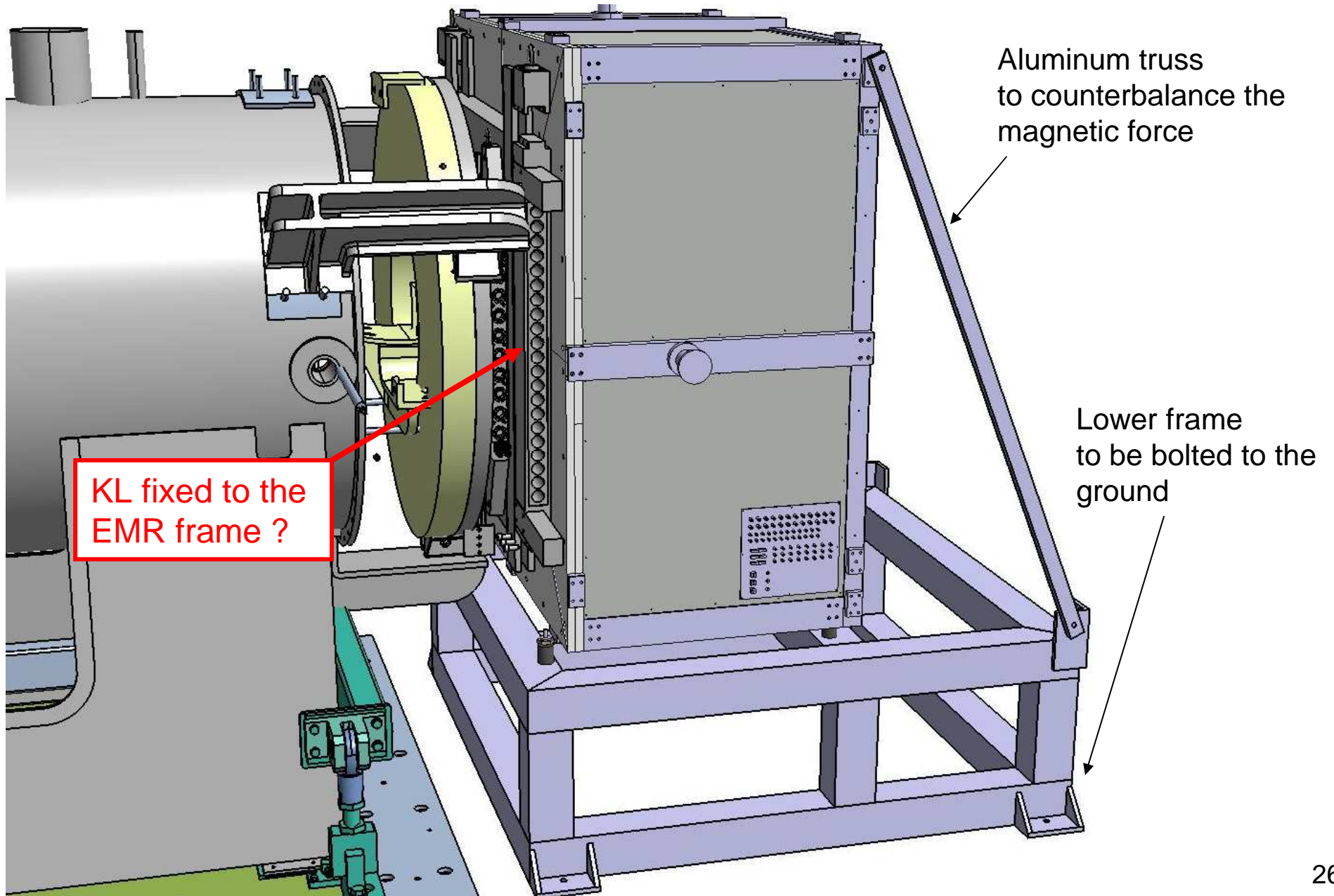


# EMR Integration @ RAL (latest design)



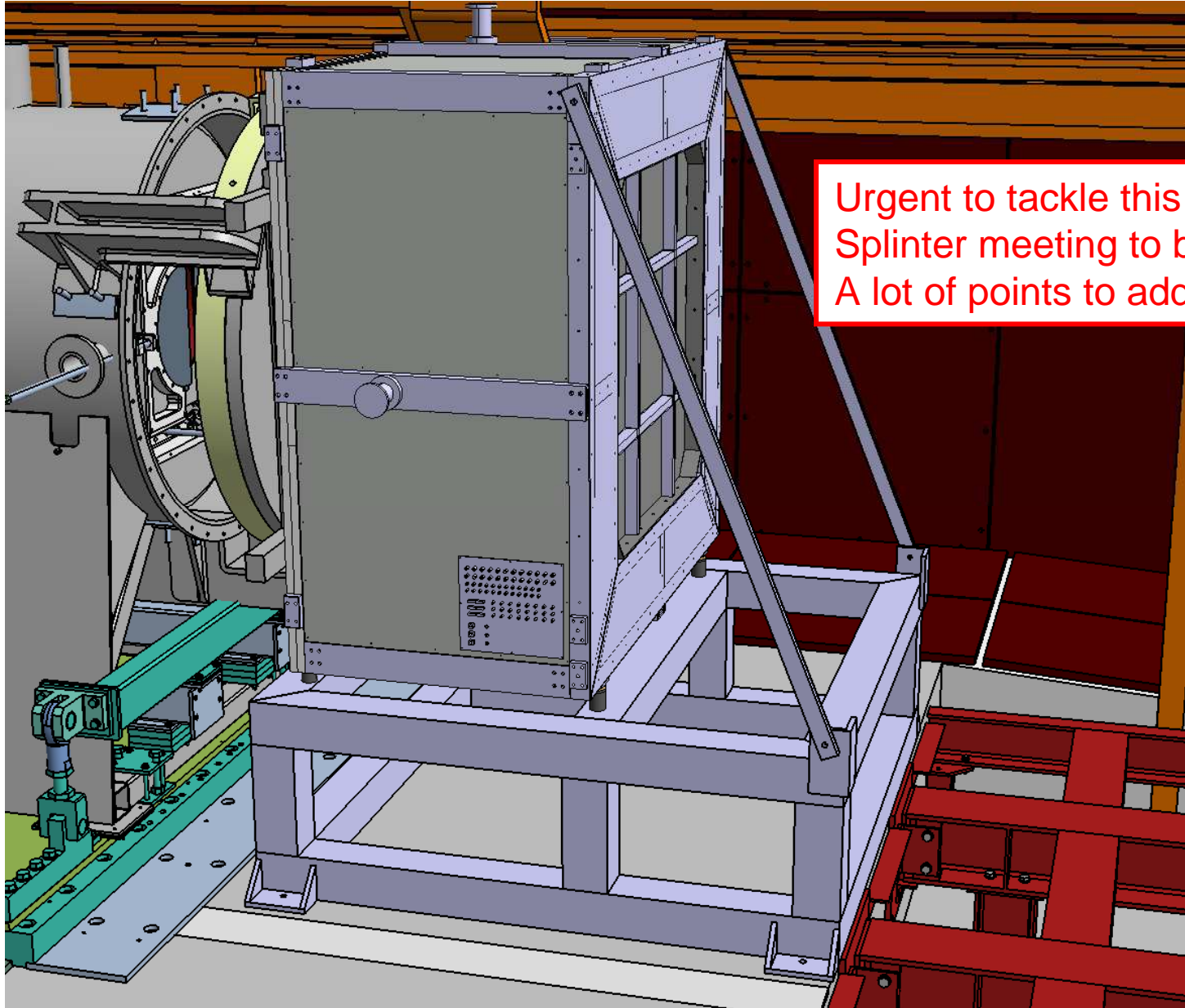


# EMR Integration @ RAL (latest design)





## EMR Integration @ RAL (latest design)



Urgent to tackle this issue  
Splinter meeting to be held this week...  
A lot of points to address ...