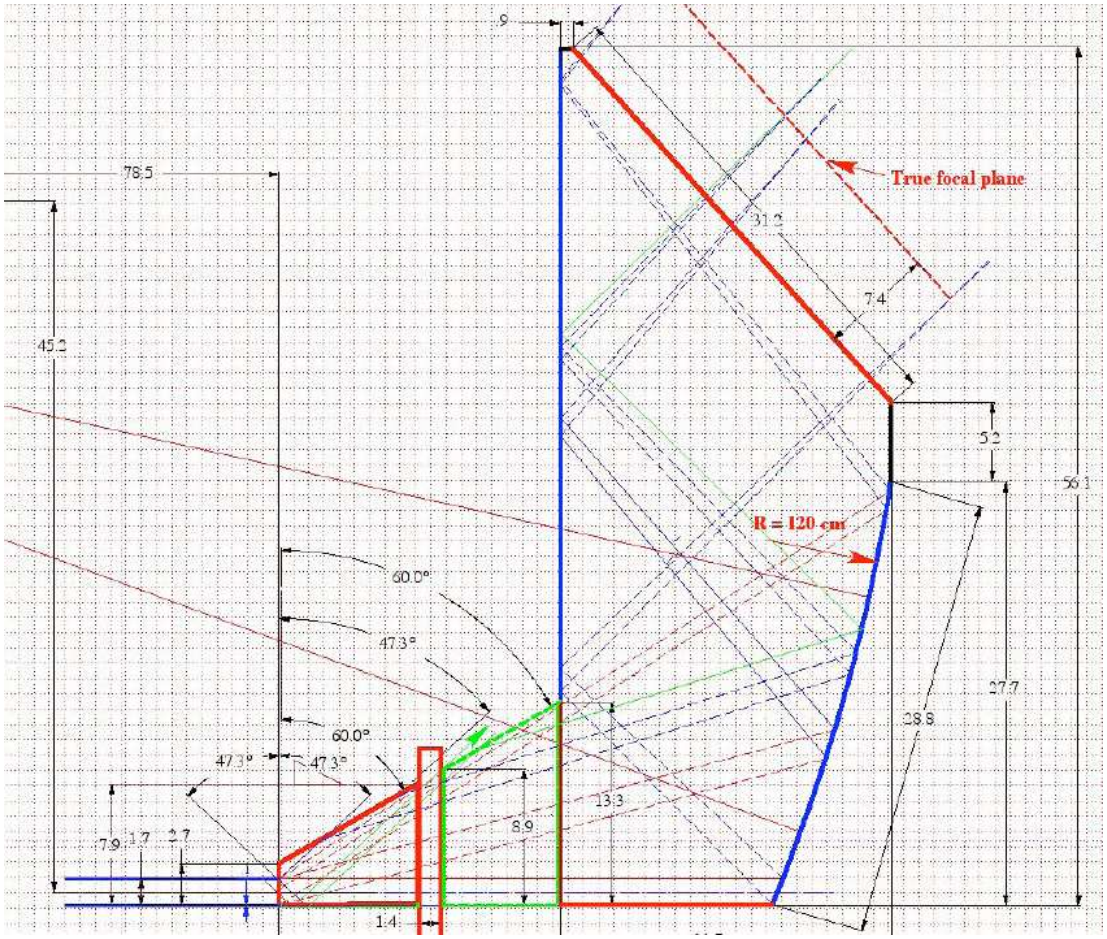
Dirc SOB

FDIRC mechanics and design

- Fblocks must be optically coupled to barboxes
- Fblocks must be supported and positioned precisely, facing barboxes
- Fblocks must have their supports, independent from barboxes

Thus barbox + Fblock assembly is an over-constrained system

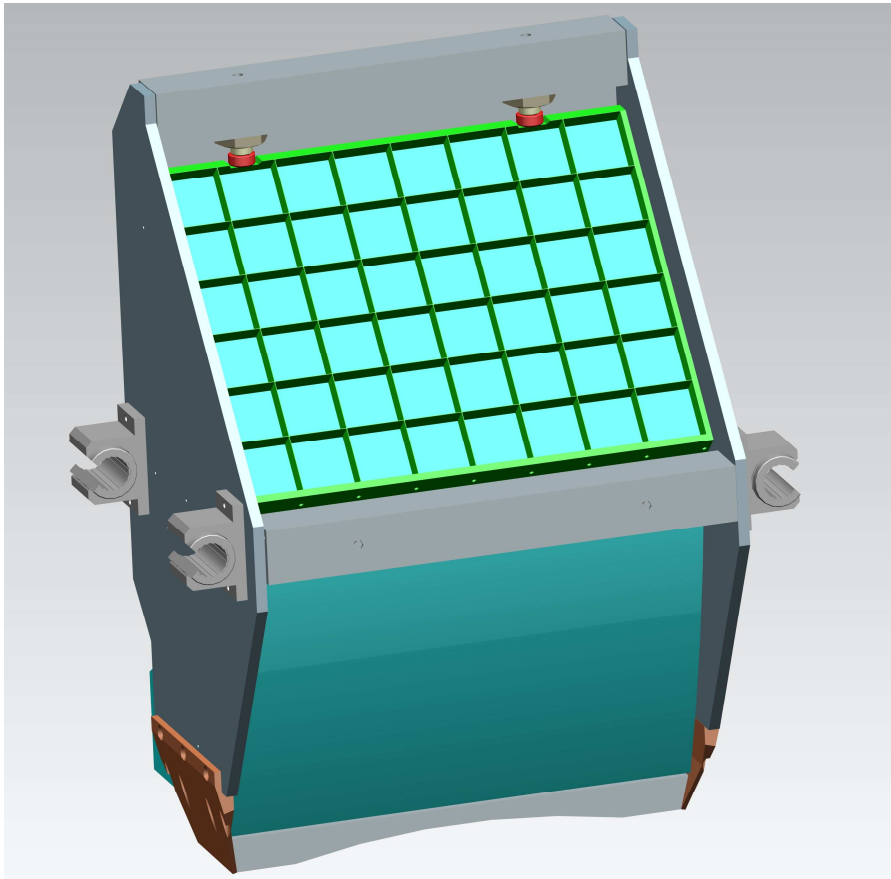
System must be precise to avoid mechanical stresses due to misaligment etc…



FDIRC
Fblocks mechanical supports

FBlock wrapped by an “Fbox”:

- “easy” and safe installation
- precise, repeatible and reliable positioning
- gentle and precise approach to barboxes
- optical coupling to barboxes
- avoid mechanical stresses on barboxes
- stand FBlock mass of 100kg



Fbox

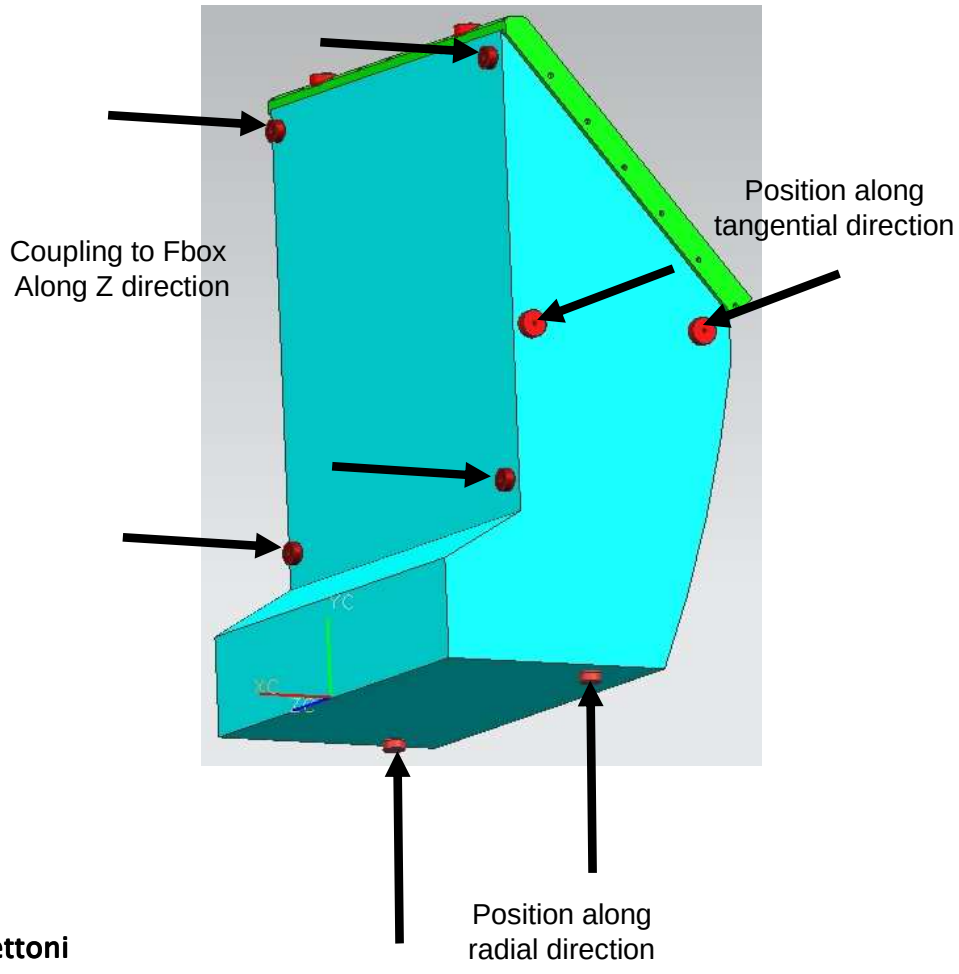
- composed by aluminum plates, assembled around the block
- supporting FBlock by low friction polymer buttons
- It is interface between Fblock and outer supports/references
- Fblock position along Z: fixing it to reference buttons fixed on the shield flange.
- position and tilt on XY plane: by meaning of rails

FDIRC
Fblocks mechanical supports

Buttons layout inside the Fbox

- Four buttons between back plate and Fblock back face
- Two reference buttons on the Fblock downward side (defining position along tangential direction)
- Two buttons on the Fblock bottom face (defining radial position and tilt around Z axis)
- On the opposite faces “spring loaded buttons” to push Fblock against reference buttons, avoiding clearance, compensating thermal dilatation Fbox-Fblock.
- Over constrained layout, should be possible due to low box stiffness.

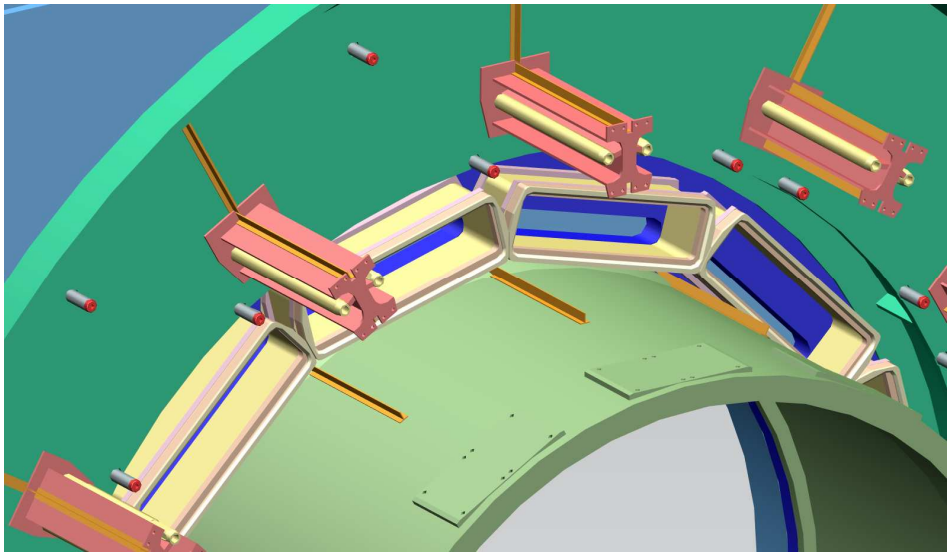
Fblock surface below buttons could require protective coating (e.g. to protect mirror coating)

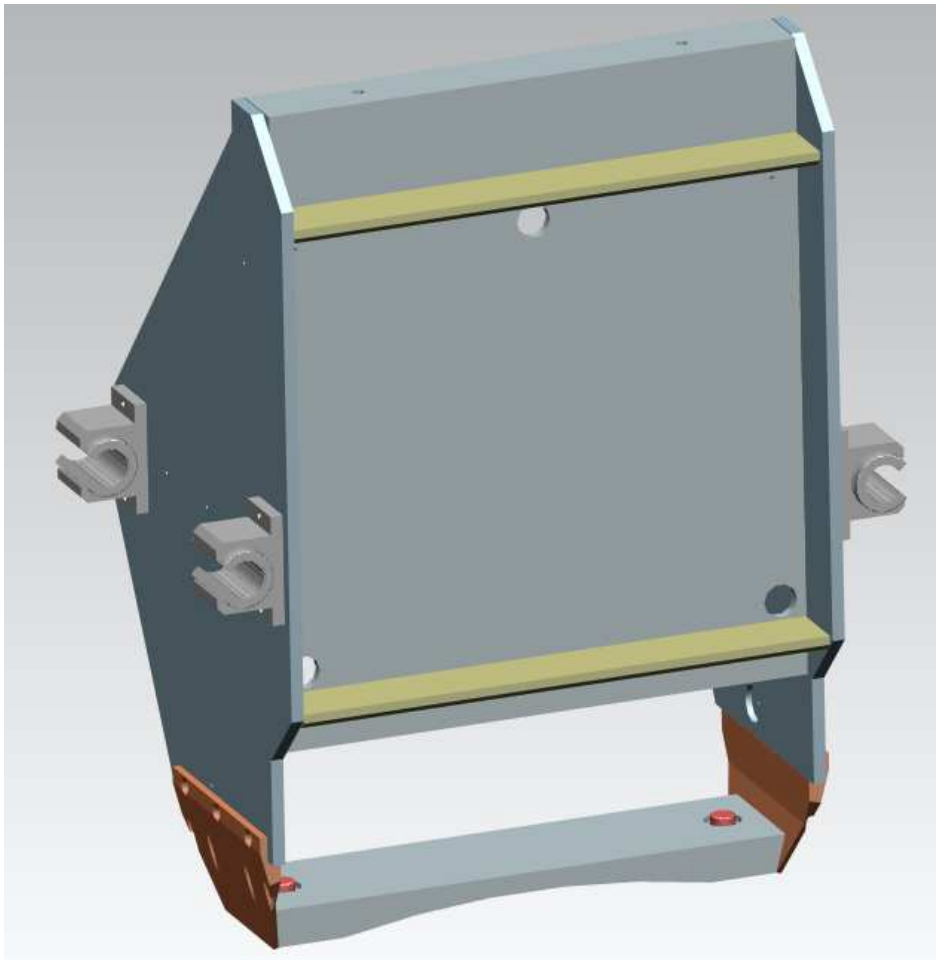


FDIRC
Fblocks mechanical supports

Position references for Fbox are:

- three reference buttons to define Z position and tilt on X,Y axis
- two rails to define Fbox position in XY and tilt around Z axis
- Those reference feature must be precise (machining/assembly/measuring)

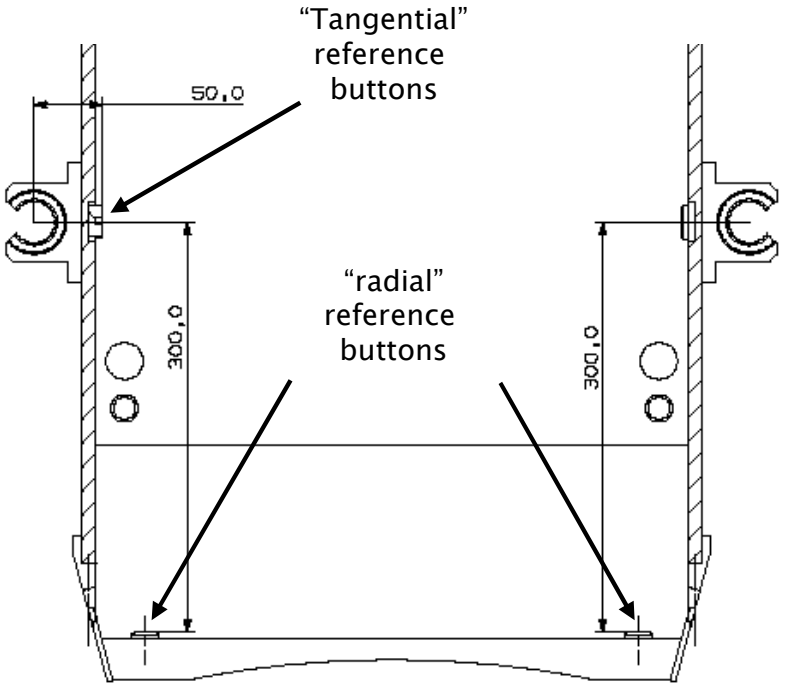




FDIRC
Fblocks mechanical supports

If rails and Z-buttons are precise,
a few relevant dimensions of Fbox ensure precision:

- "radial" distance between bottom reference buttons and bearings axis
- "tangential" distance between reference bearing and reference buttons on Fblock side.



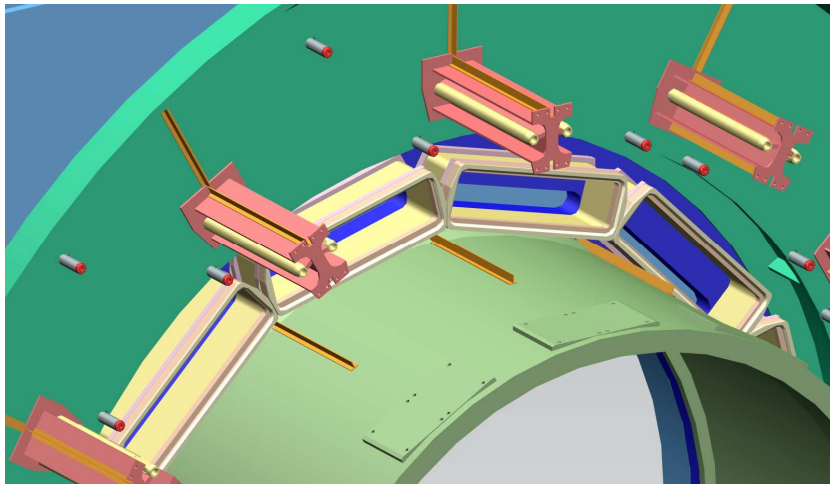
- Machining and assembly of Fbox parts and buttons must ensure precision of the relevant dimensions
- assembled Fbox must be measured:
  empty/with dummy Fblock/with final block
- reference buttons faces / Fblock faces must be positioned inside given tolerance w.r.t. references (dummy rails).

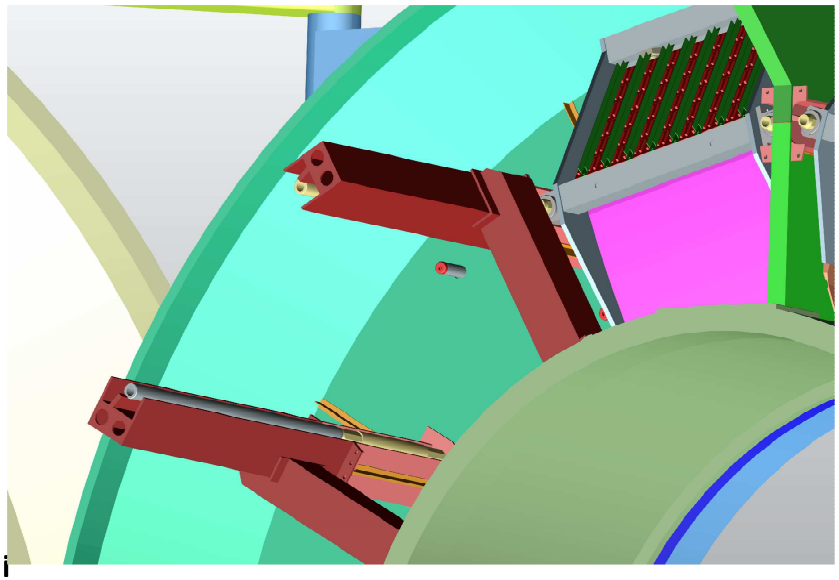
FDIRC
Insertion and optical coupling procedure

Fblocks to barboxes “gluing” should be made outside the inner cylinder, thus ~Z=-700mm w.r.t. nominal position, to allow access to gluing area.

Then gentle approach of the assembly to Z final position by a screw mechanism

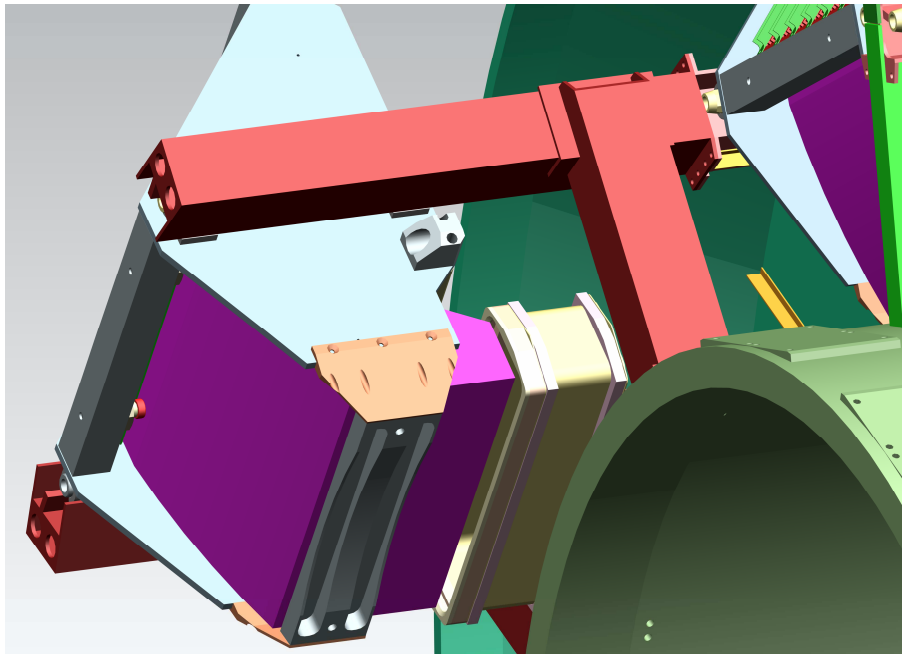
- Insert barbox (installation fixture already existing)
- Mount a fixture (t.b.d.) to connect barboxes to Fbox rails
- Mount extension rails on the Fbox reference rails
- Handle Fbox (by crane… with an handling fixture…t.b.d.) to rotate and align Fbox to rails
- Insert Fbox on the extension rails

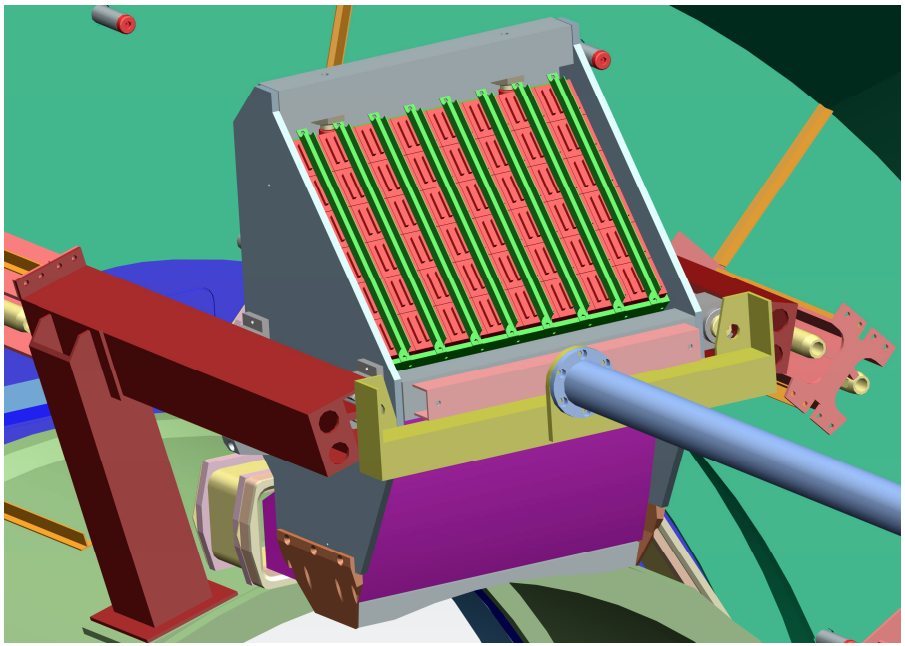


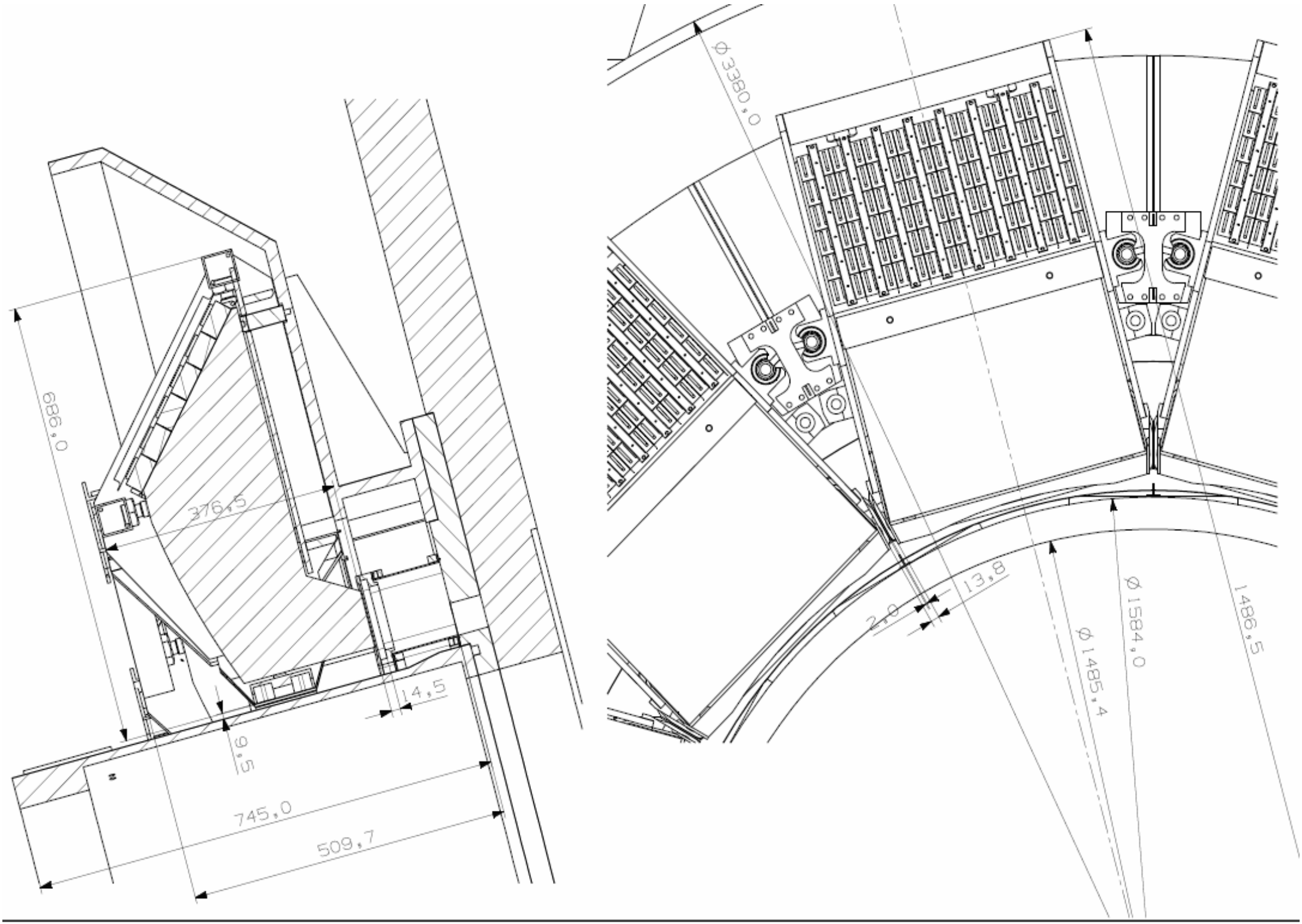


FDIRC
Insertion and optical coupling procedure

- Move back barbox to 700mm outside from its nominal position (fixture to guide barboxes needed)
- Approach Fblock to barbox, till RTV seal is on adherence on both
- Check relative alignment, check seal, prepare for gluing, poor RTV….wait curing?
- Insert the assembly till Fblock touch buttons on back shield,
- Fix Fbox along Z, toward Z-buttons (elastic coupling t.b.d.)
- Relax redundant bearings (way to be defined)
- Insertion after/before curing ..?
- Barbox screwing to the interface flange?






686,0
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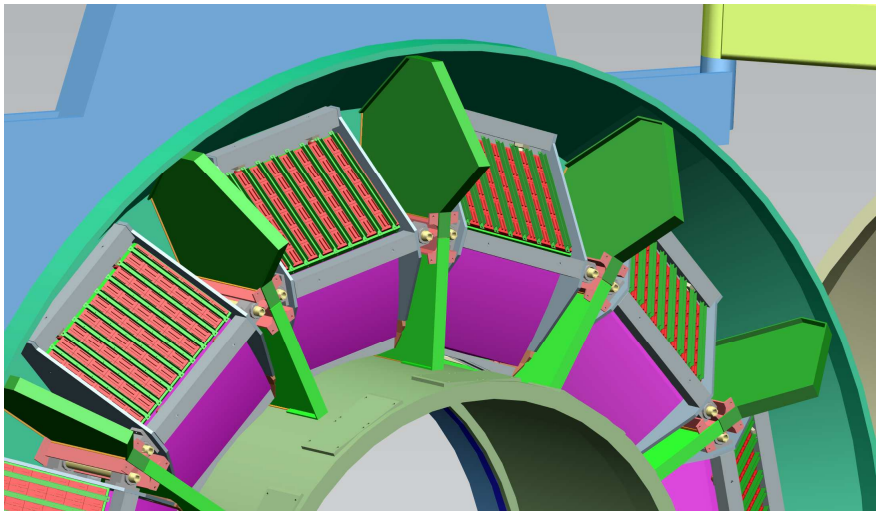
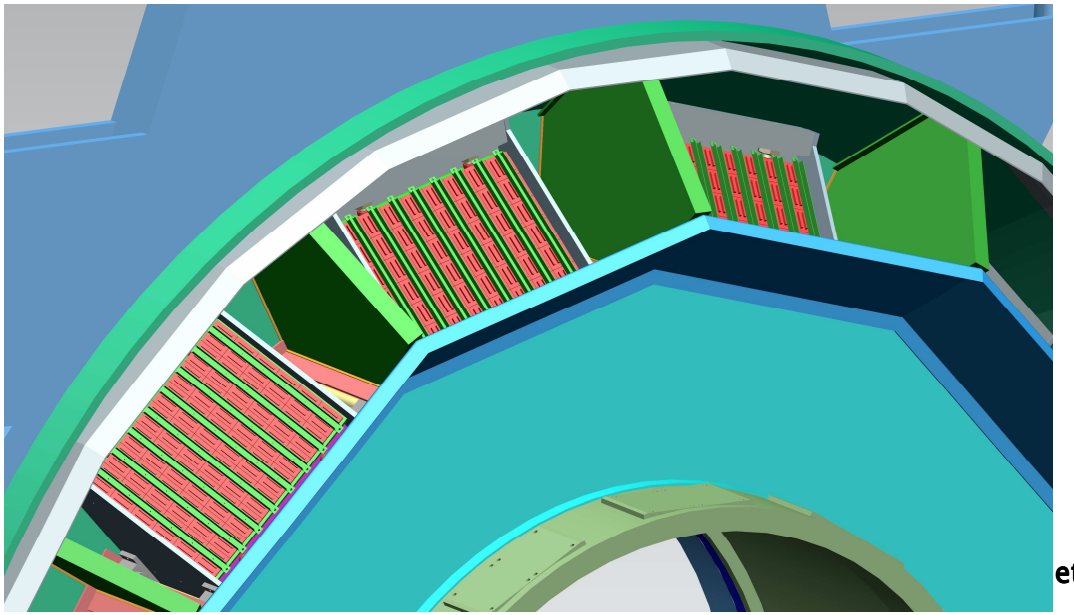
6,5
745,0
509,7
Ø3380,0
13,8
2,0
Ø1584,0
Ø1485,4
1486,5

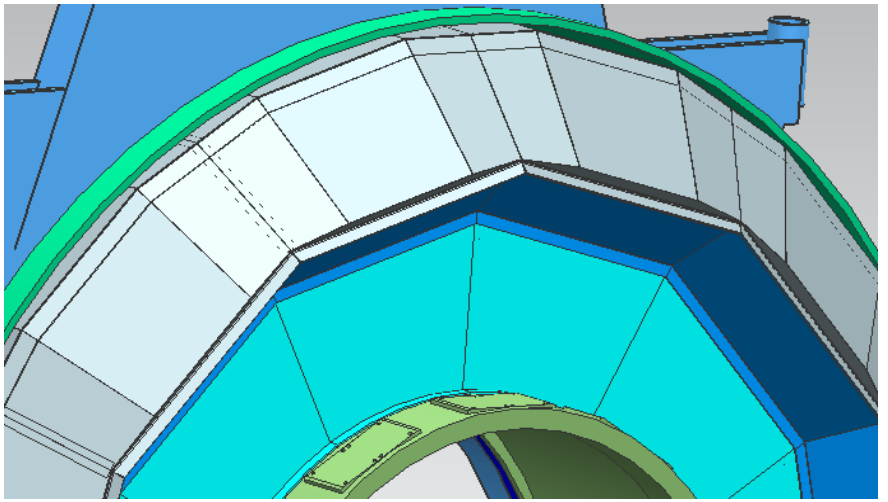
FDIRC
optical shield / light shield

Sealing vs light

- Each Fbox enclosed inside a light-shield composed by:
- Two parts radial screens interposed between Fblocks
- Three parts covers on top of each Fblock, sealed to radial septums, back shield, cylinder
- Must allows easy access the electronics
- Must avoid to end up with black tape and falling screws.

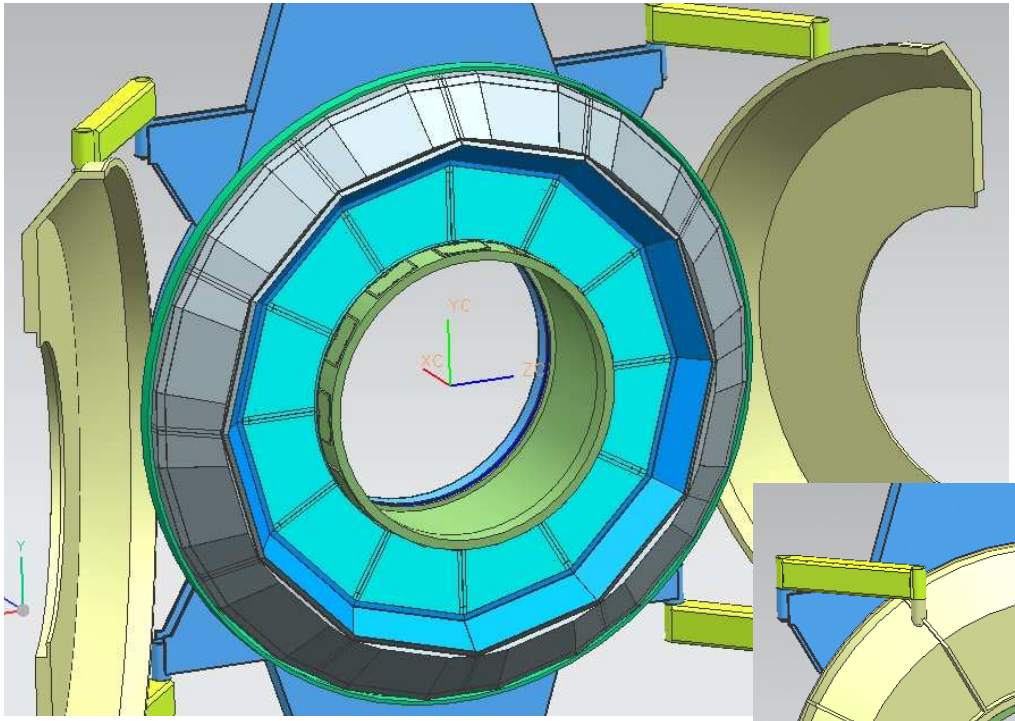


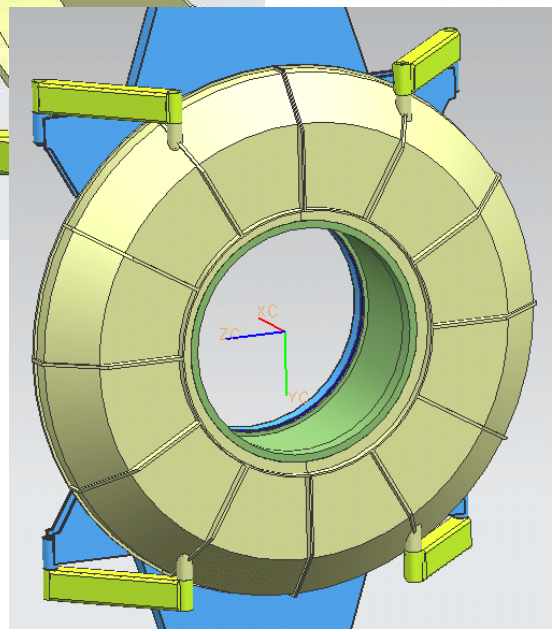




FDIRC
Magnetic shield and optical shield

- Overall magnetic enclosure could be composed by a back shield and two doors, of adequate thickness
- New inner cylinder much shorter than Babar one (about an half).
- New magnetic shield much smaller than Babar one.
- Saving of a lot of space in the backward area
- Opening/partition options: turning doors, sliding doors, covers to put/remove
- Baseline could be turning doors, being their weight small (1ton @ 20mm thickn.)
- To be calculated wrt weight, magnetic force, quenches, earthquake,
- T.b.d. ways and procedures to move and to fix them.



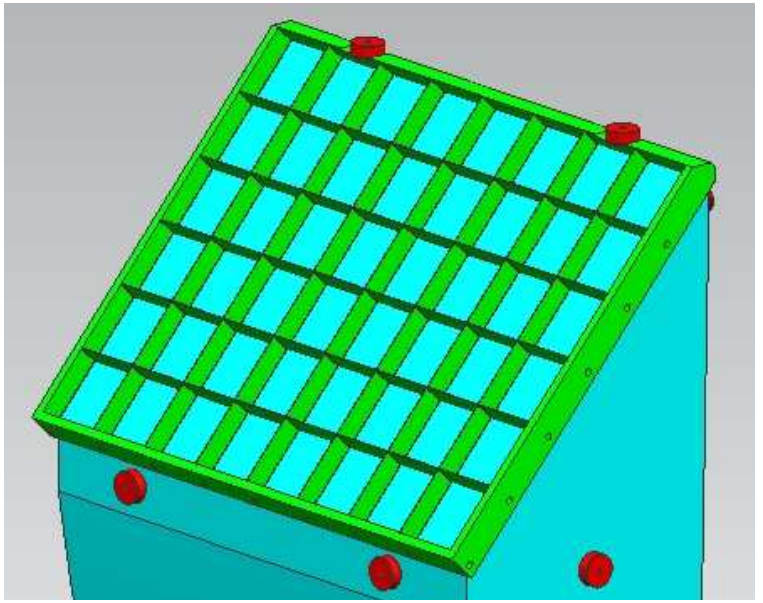


FDIRC
PMTs lodging grid (honeycomb)

- PMTs lodging grid (honeycomb)
- 48 PMTs (array 8x6) to be posiitoned and optically coupled to the “focusing face” of the Fblock
- PMTs dimensions 52x52 with +/- 0.3 mm linear tolerance
- PMTs coupled to Fblock through TRV

Grid frame:

- Dimension about 420 x 320 mm, 20 mm thick
- Mounted and fitted to the Fblock face (sealing or gueing along borders)
- keeps PMTs in right position,
- allows single PMT placement/replacement
- Optical coupling between PMTs and Fblock face t.b.d.
- Current baseline is optical RTV layer between PMTs and quartz, to be studied and tested.
- distributes vacuum to avoid air bubbles in between PMTs, RTV, Fblock surfaces
- Grid walls as thin as possible (e.g. 0.5 mm with vacuum grooves width of 0.3 – 0.4 mm)
- Requirements: flatness for uniform vacuum distribution, precise PMT positioning



Possible technology: Composite C-fiber structure, production procedure and tools t.b.d.

FDIRC
Conclusion: a lot of open issues

- Barbox and installation fixture drawings part on paper, part on files, may be fully retrievable at LBL?
- Barbox clearance vs. lodging slot/rails still to be fully understood
- Magnetic shield: still needed? Which thickness, specs, requirements?
- Fbox constraints/supports to be fully understood
- Fbox to be finalized, build prototype, test
- Buttons material, tests
- RTV test, choice, thickness, injection, confinement, tools
- Fbox handling and insertion fixture and procedure
- Tools and procedure for Fbox+barbox movements
- Risk analysis vs earthquake, magnet quench, etc…
- PMTs positioning, C-fiber honeycomb,
- PMTs replacement procedure
- PMTs optical contact