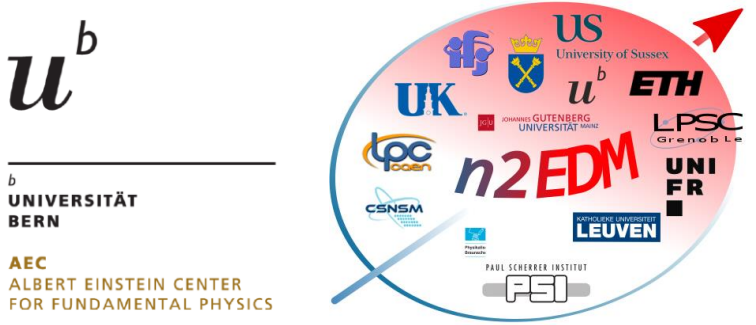
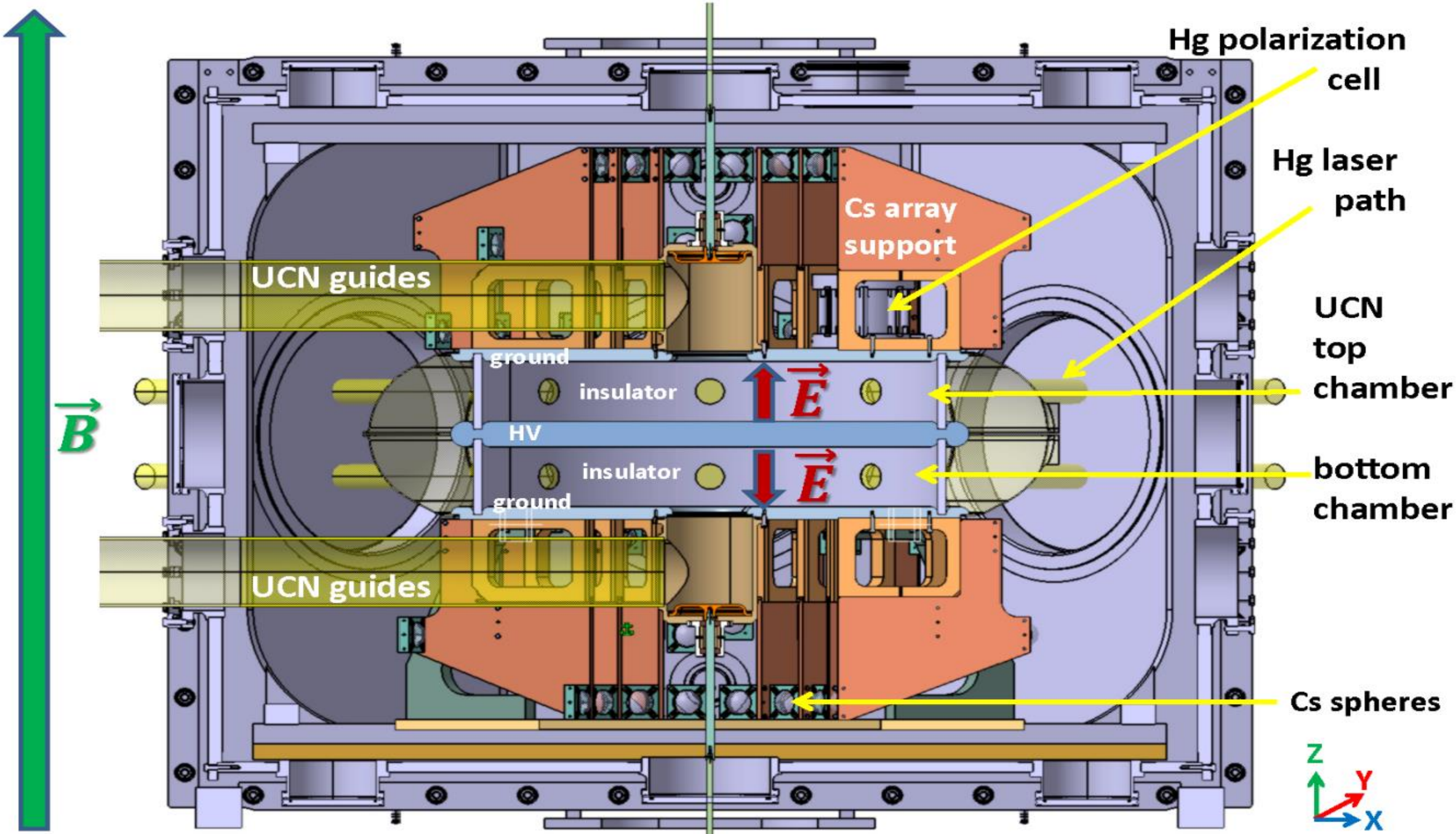


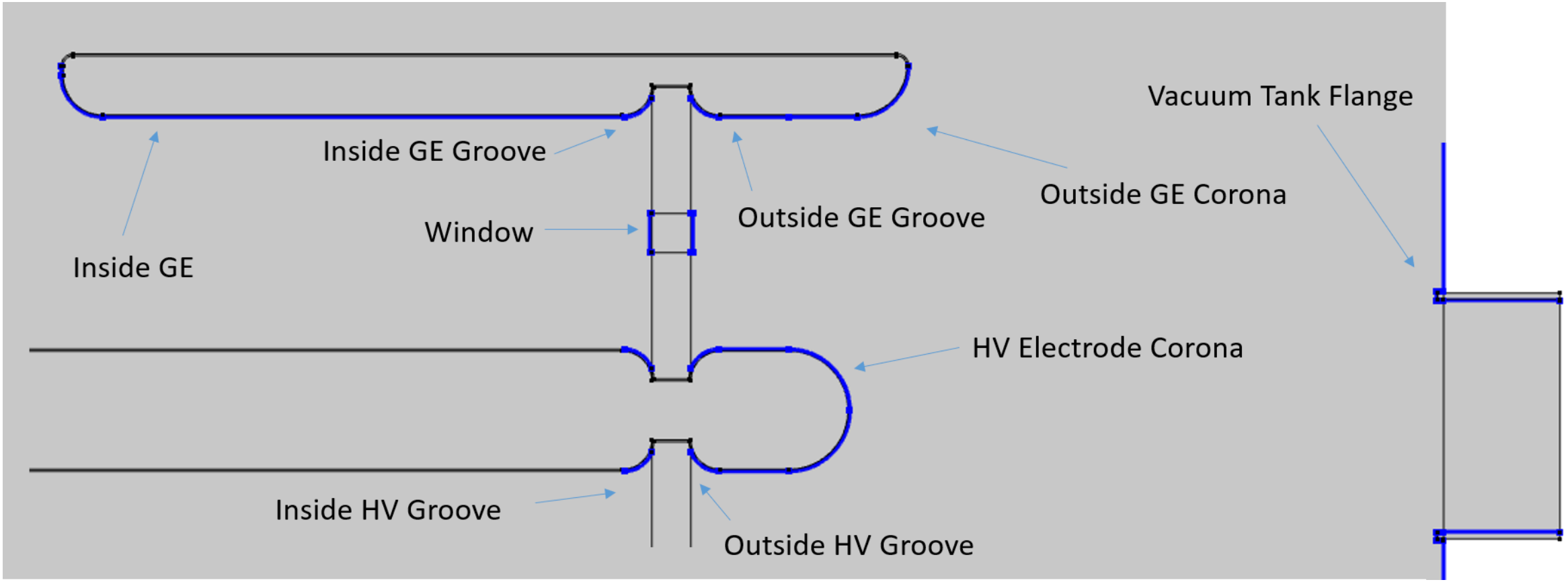
Update: n2EDM Precession Chamber and Feedthrough

JACOB THORNE



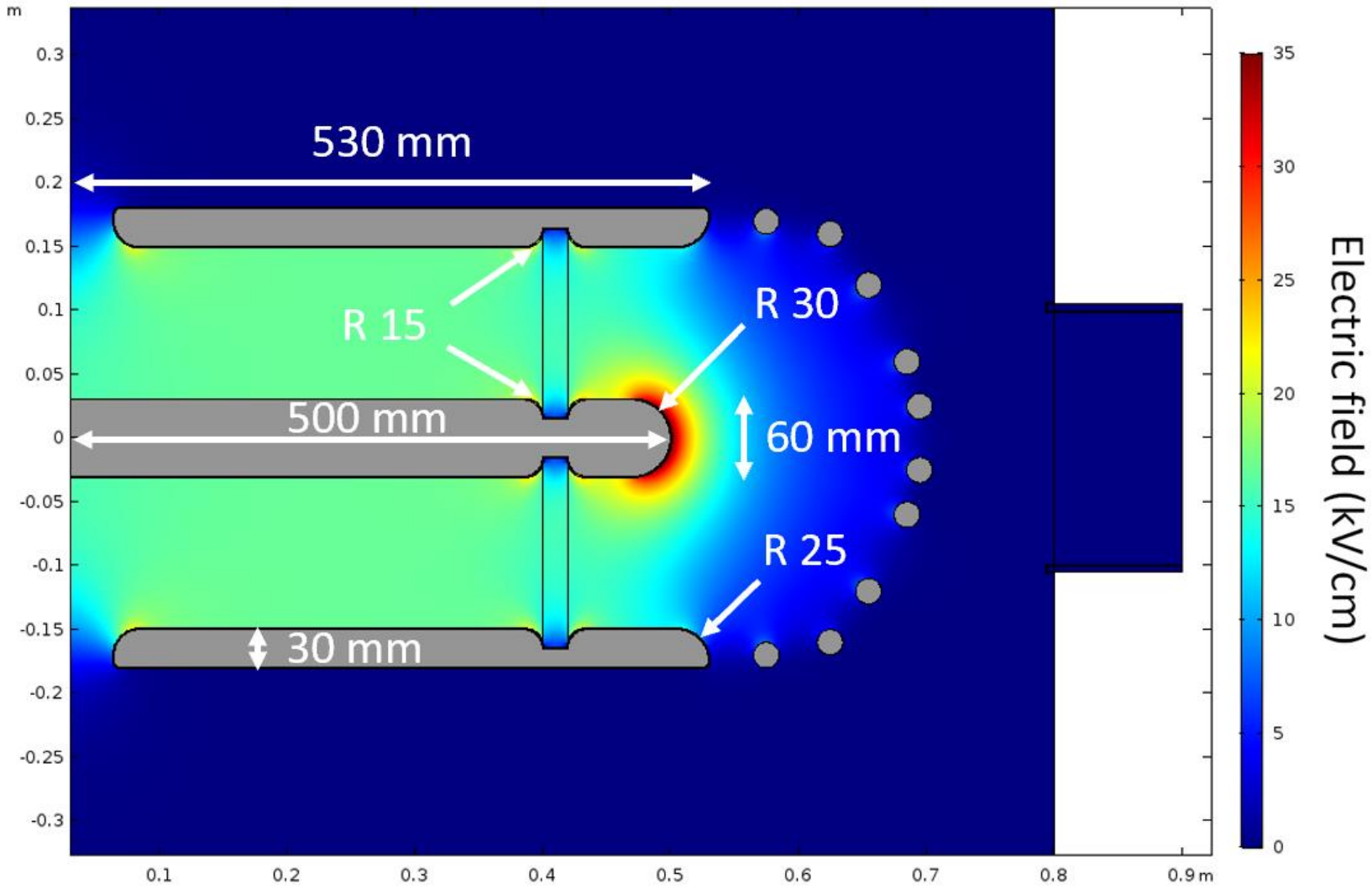
BVR 2019 design

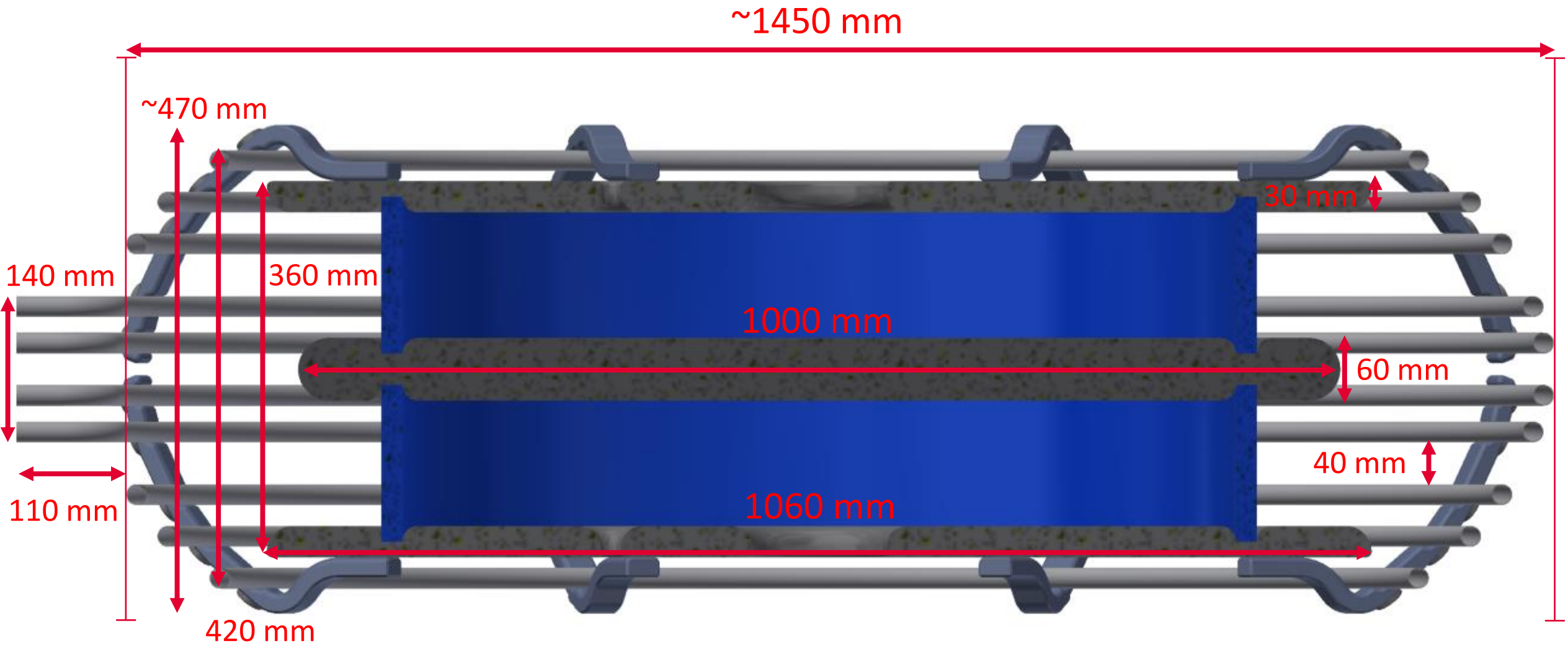
Optimisation process



Summary of simulations

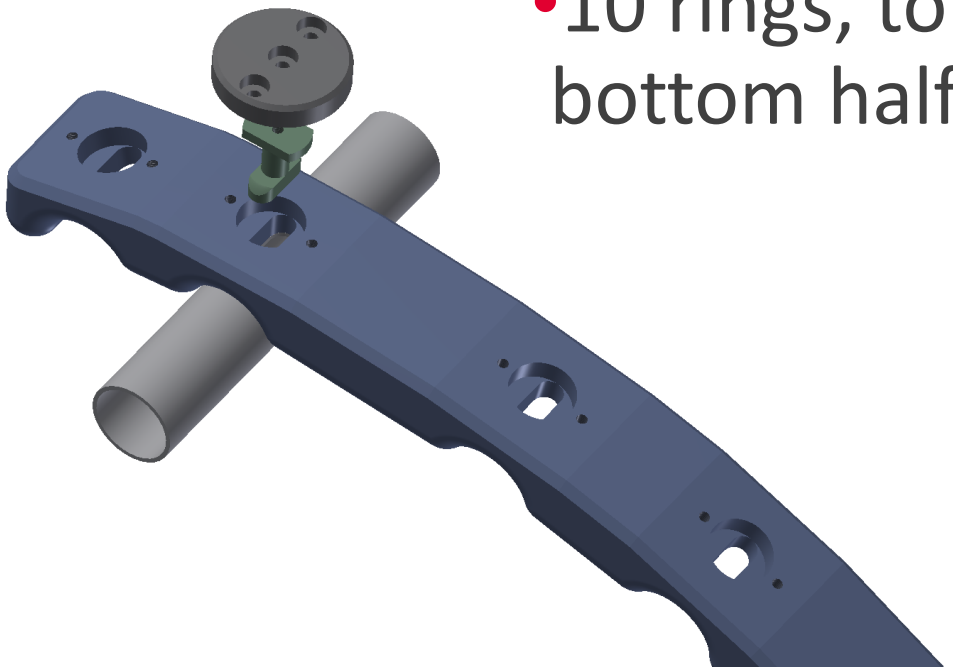
- Achieved same electric field as that on previous nEDM at 200 kV potential
- Ground shell ring position optimised to shield external components from HV

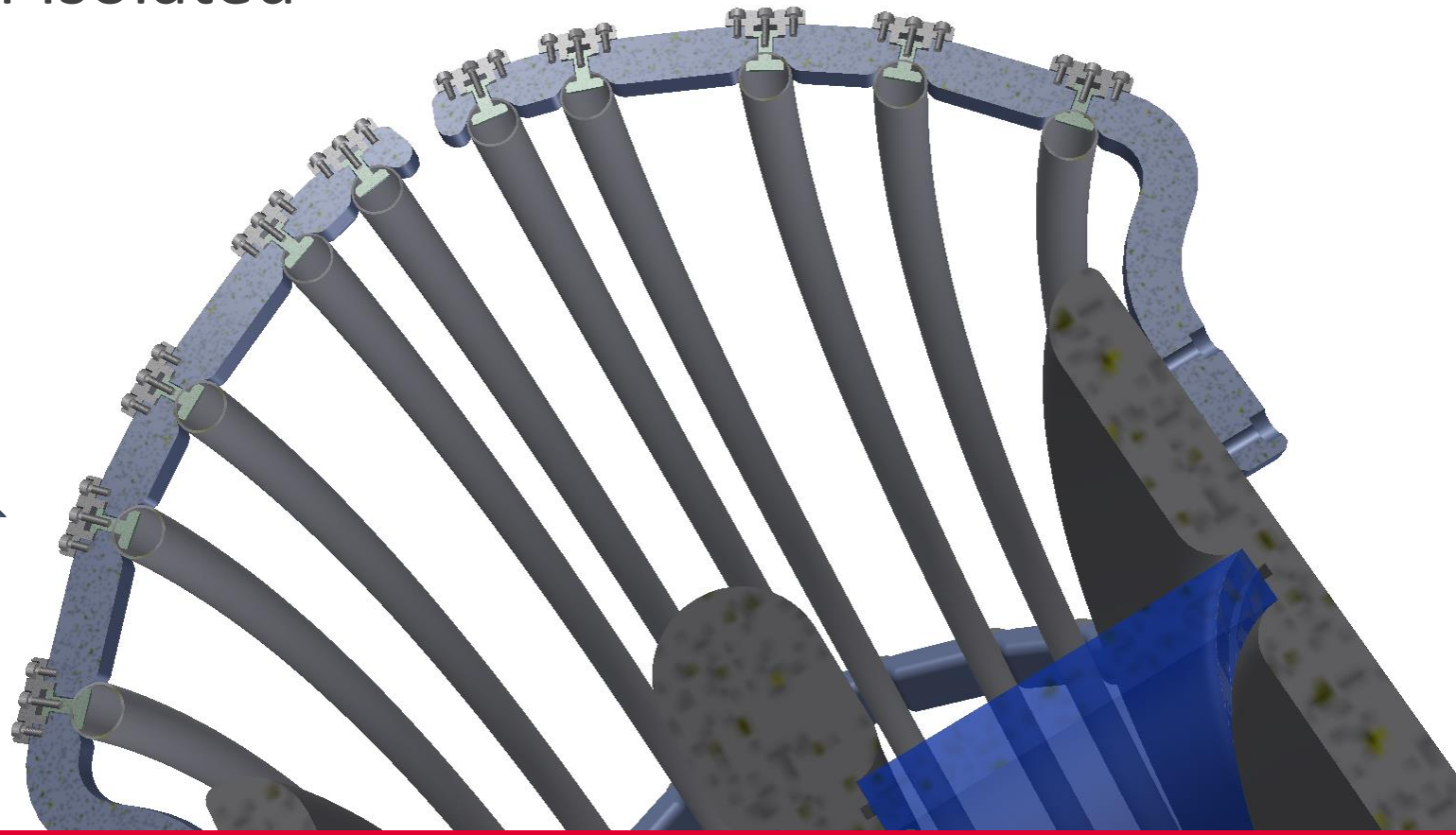



~1450 mm
~470 mm
140 mm
360 mm
30 mm
1000 mm
60 mm
40 mm
110 mm
1060 mm
420 mm

Ground ring fixing

- 10 rings, top and bottom half isolated

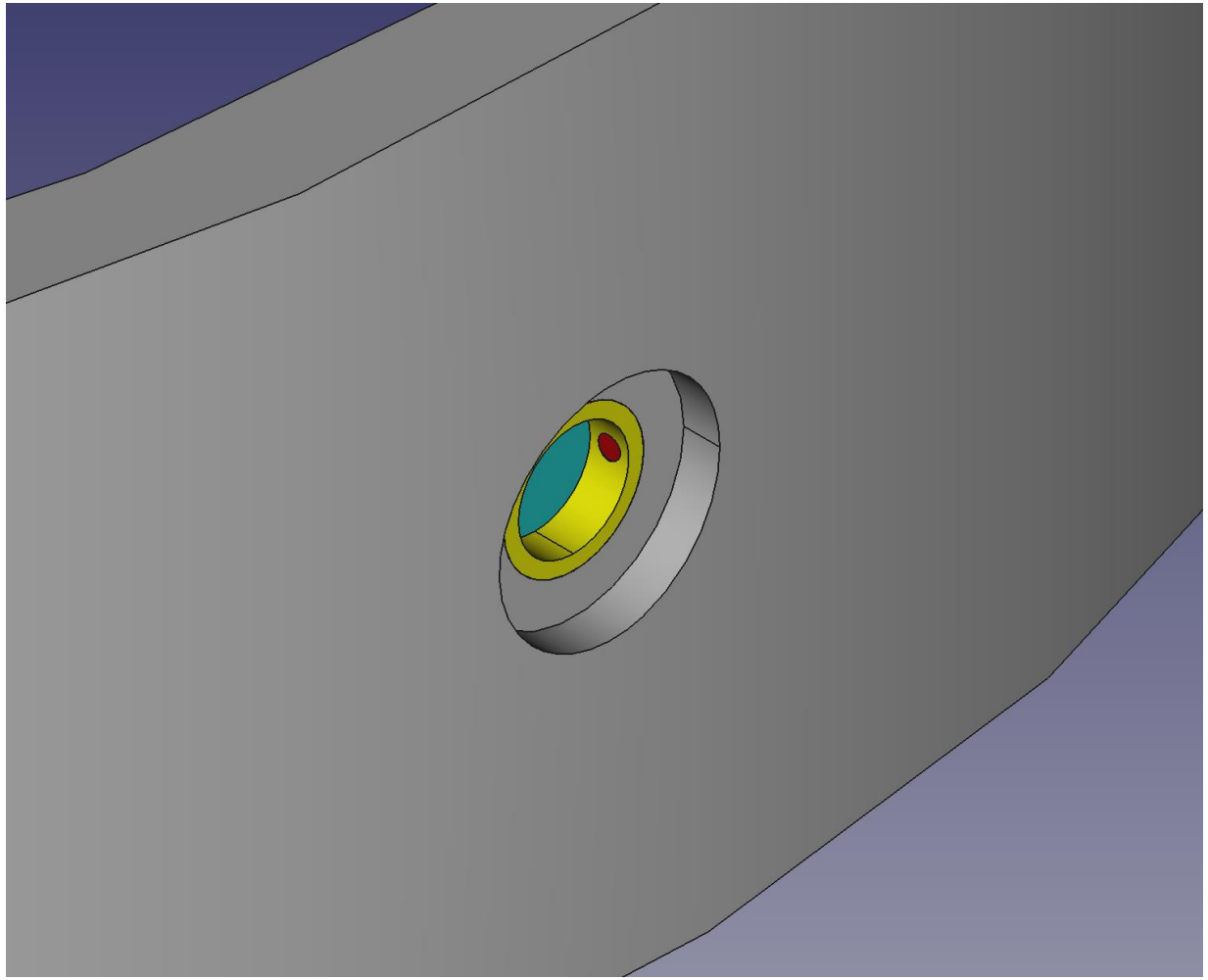




- Rings fixed by plug, bolted onto bracket

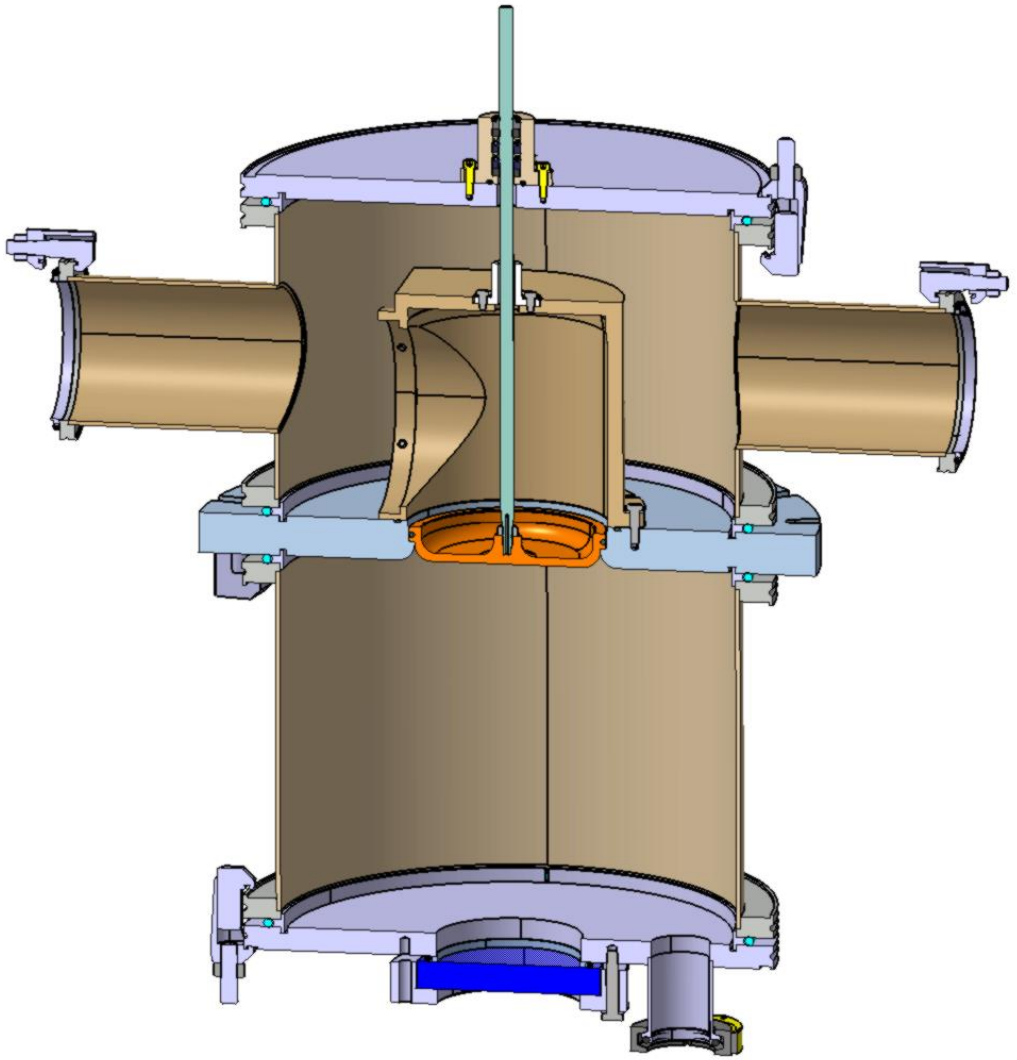
Insulator ring

- Raw Rexolite block available
- Investigating machining options
- Once made can be coated with DLC then tested in Mainz at TRIGA reactor
- Currently quartz window for Hg laser light under development.
- Window is made of quartz disk sitting in a machined hole. PTFE tape then covers the edges of the disk, this is pressed in by a split ring.



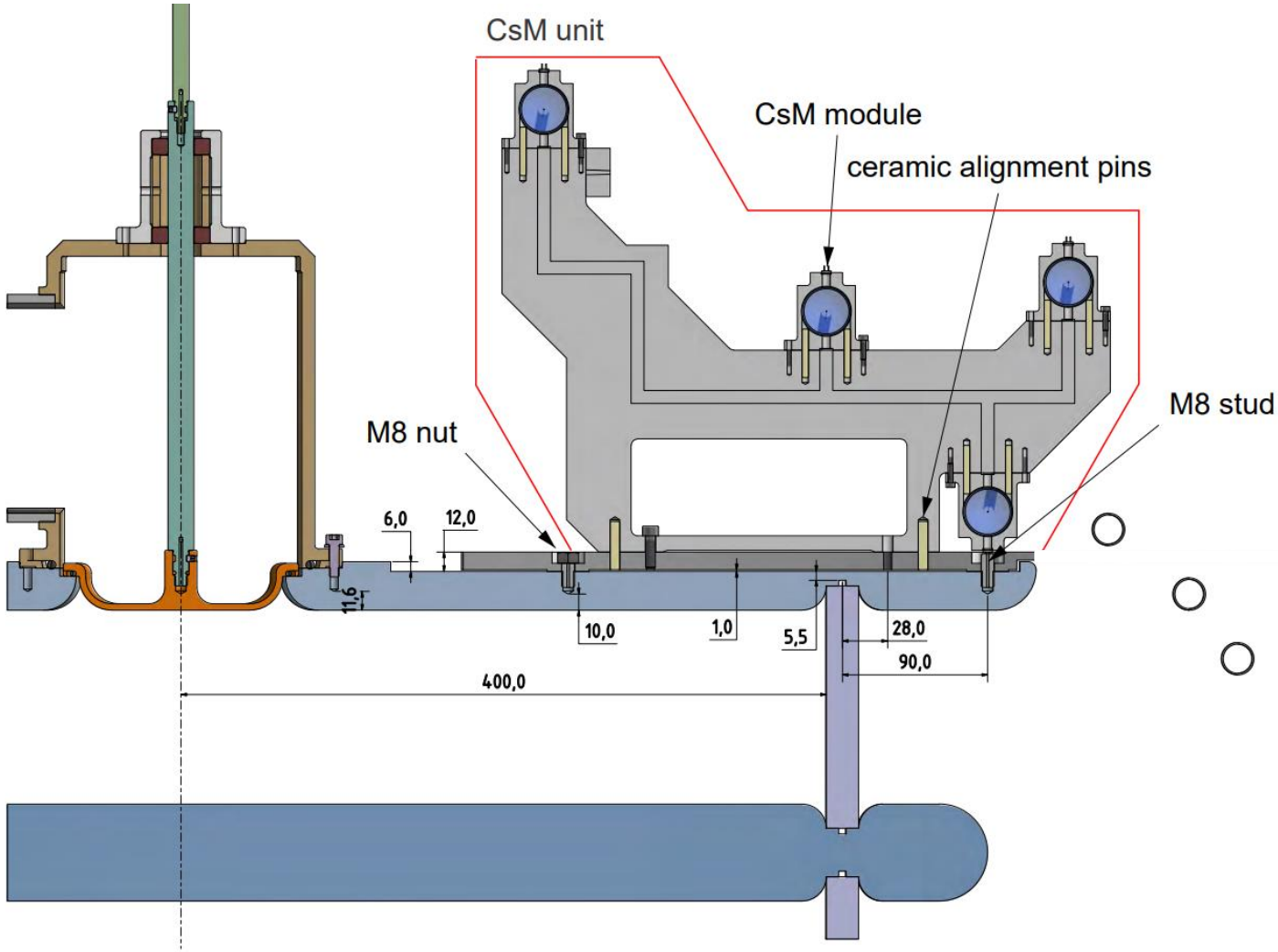
UCN plug

Pneumatic actuator tested
- magnetically approved from Allard
- mechanically tested with Ti rod in vacuum
    - ~100'000 cycles straight
    - ~100'000 cycles upside-down
    - since July ~1'4 Mio cycles (in air)
    - shows no big wear and tear

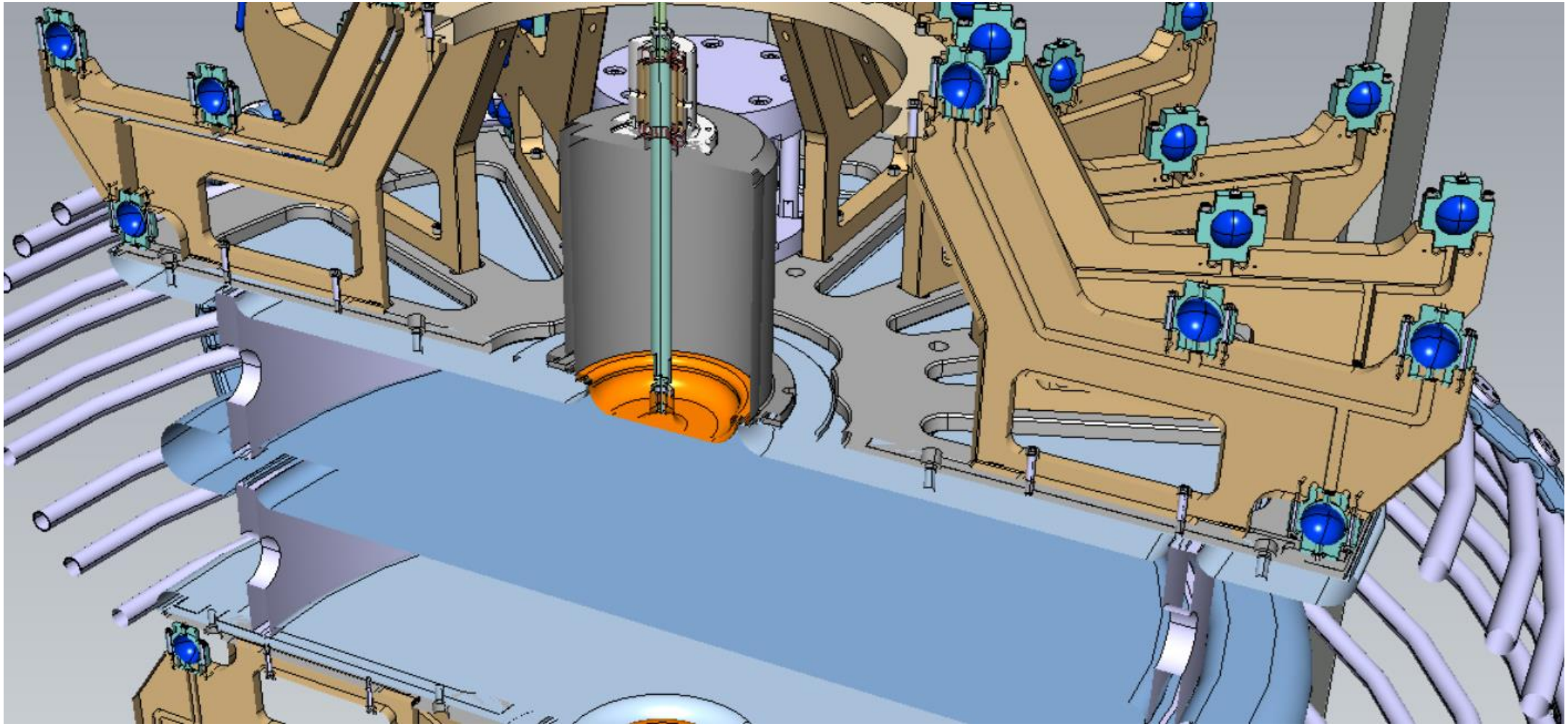


Cs magnetometry layout

- Decided to use adapter plate in order to avoid additional machined holes on electrodes (also avoid magnetic contamination and enable modularity of Cs fins)
- The relative positions of the Hg and Cs volumes must be known with a total error margin of 0.5 mm.

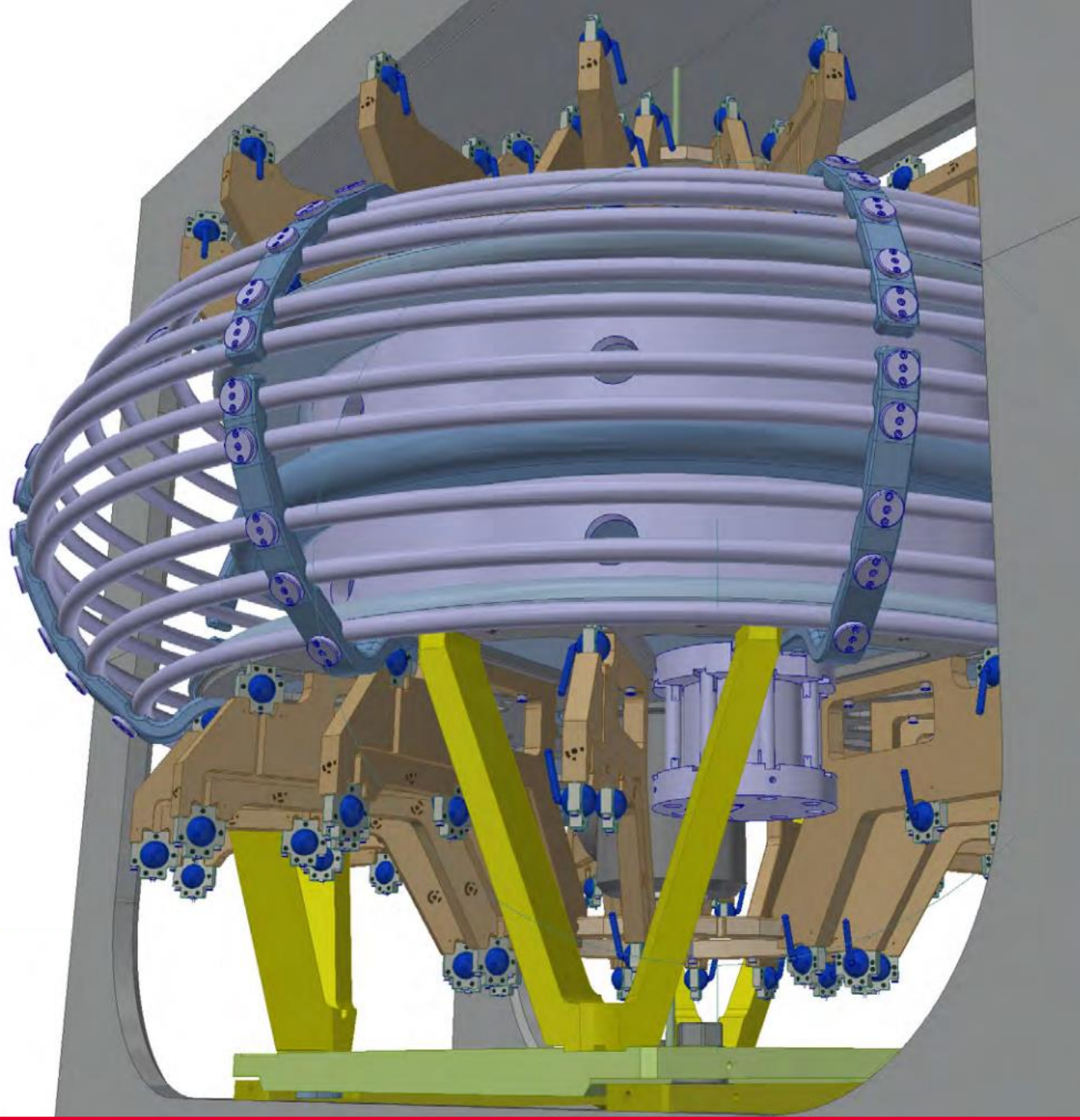


UCN and Cs fins installed



Design summary

- In final stages of design, require review from every party involved
- Pending HV experimental testing still to be performed



Small scale test chamber

- Constructed smaller scale version of the n2EDM chamber. Electrodes made of aluminium, insulators made of glass or POM-C.
- Use this to test: surface finishing method, cleaning process, maximum achievable electric field, o-ring sealing method, effect of insulator material, etc.

Feedthrough

- Initial testing performed
- Stable up to 140 kV but breakdowns beyond this, still working to solve this
- Possible vacuum issues using POM-C insulator (outgassing)
- Working on improvement, possibly switch aluminium rod to titanium

Feedthrough interface

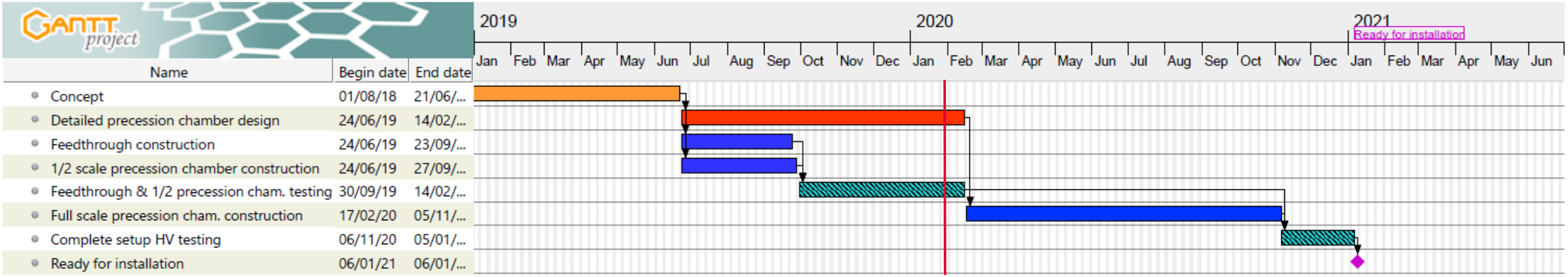
- Aluminium rod connects to the HV electrode using banana plug
- Ball is to shield end of the feedthrough
- Currently under testing

Timeline

Simplified n2EDM timeline

22-Nov-2019

Gantt Chart



Name	Begin date	End date
Concept	01/08/18	21/06/...
Detailed precession chamber design	24/06/19	14/02/...
Feedthrough construction	24/06/19	23/09/...
1/2 scale precession chamber construction	24/06/19	27/09/...
Feedthrough & 1/2 precession cham. testing	30/09/19	14/02/...
Full scale precession cham. construction	17/02/20	05/11/...
Complete setup HV testing	06/11/20	05/01/...
Ready for installation	06/01/21	06/01/...

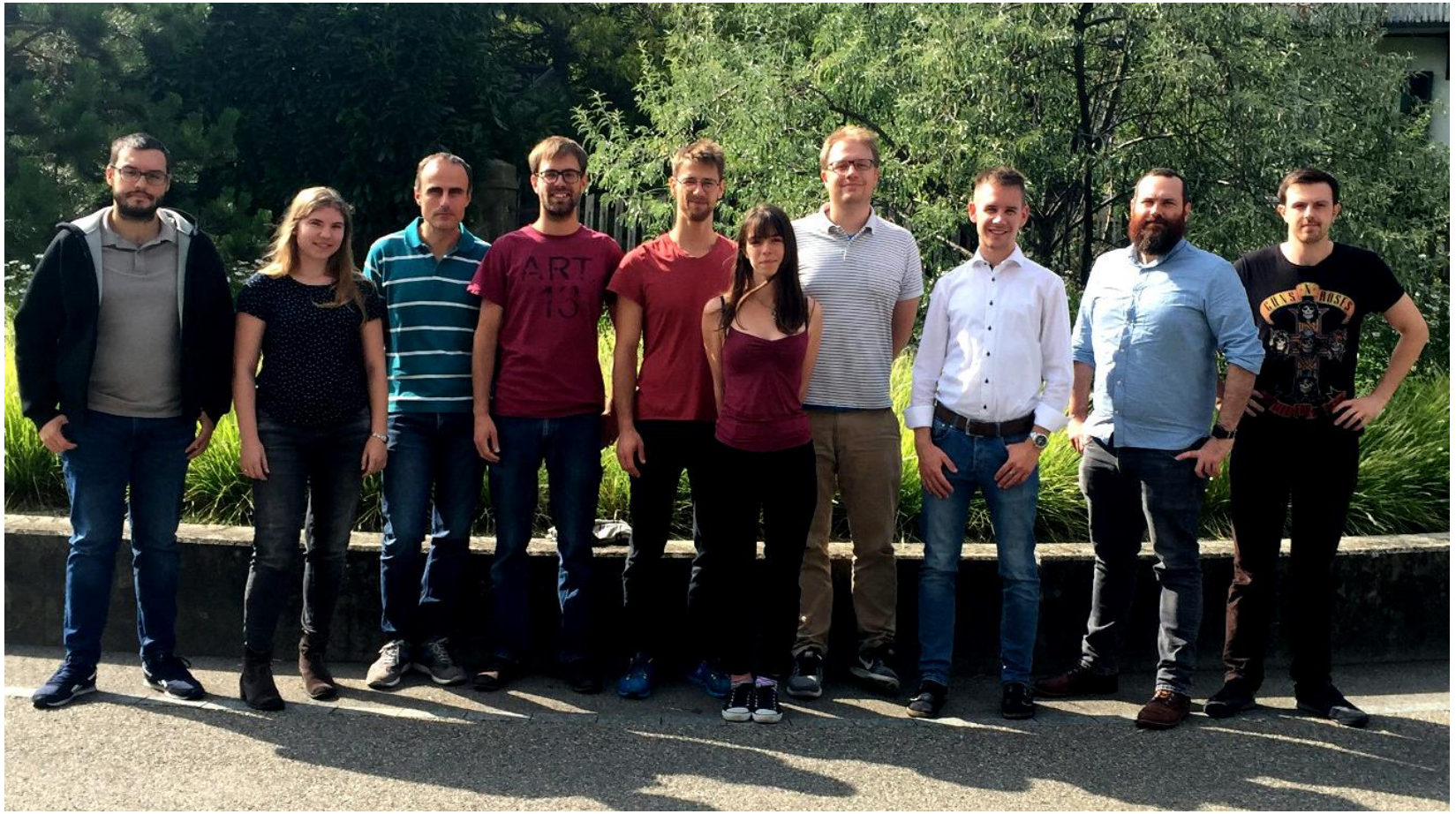
= Design concept = Detailed design* = Machining = Characterisation

*input required from collaboration

Summary

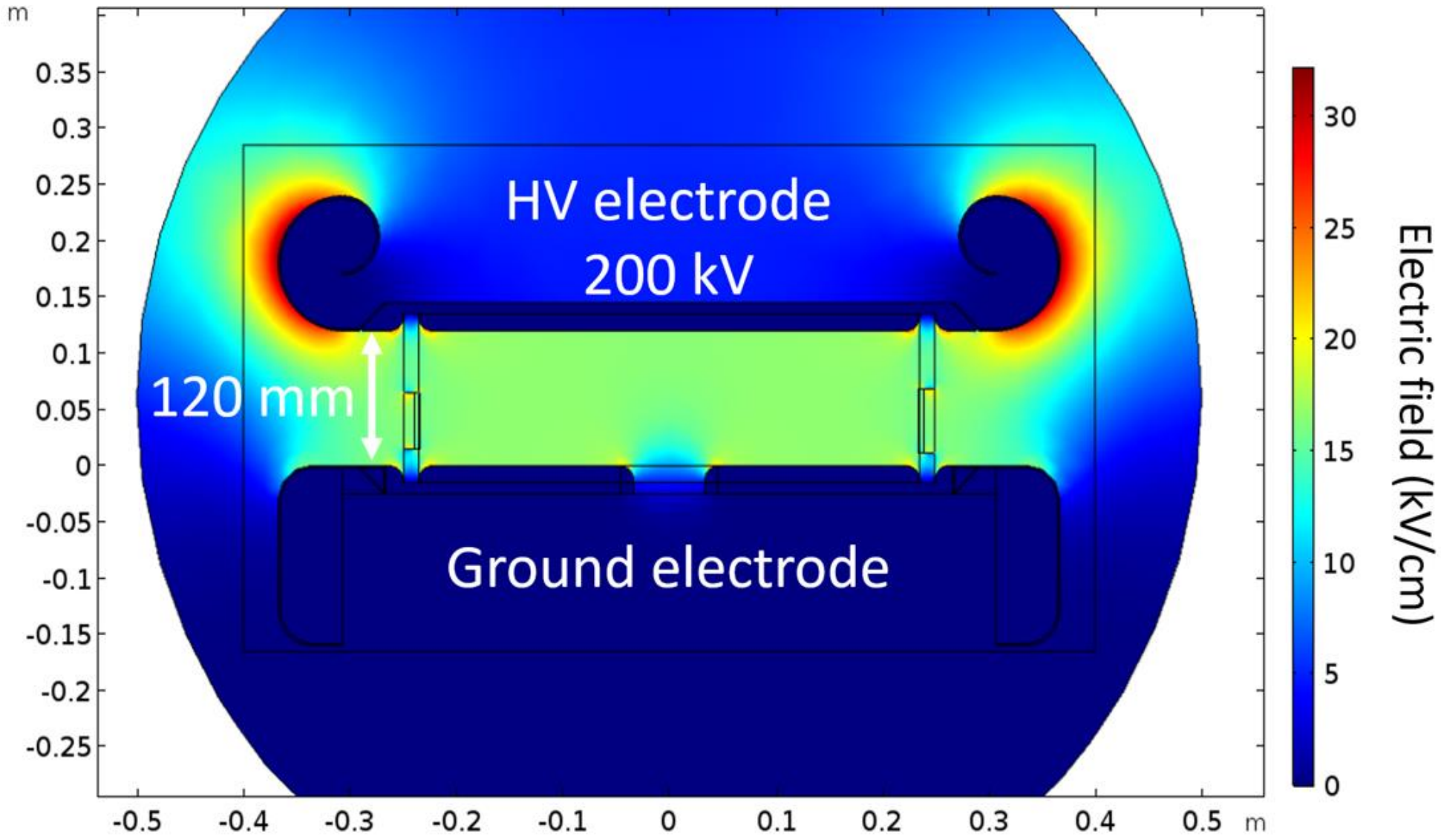
- Soon approaching final design review of the n2EDM precession chamber
- Production of the chamber, aiming to be complete by end of 2020
- Further development to be performed on the feedthrough

Thanks for your attention!



Backup slides

nEDM COSMOL simulation



O-ring sealing

- Position moved to bottom of groove
- Compression done by weight of electrodes
- Groove designed so o-ring completely compressed and insulator is flush