Status of seismic attenuation and suspension design and construction

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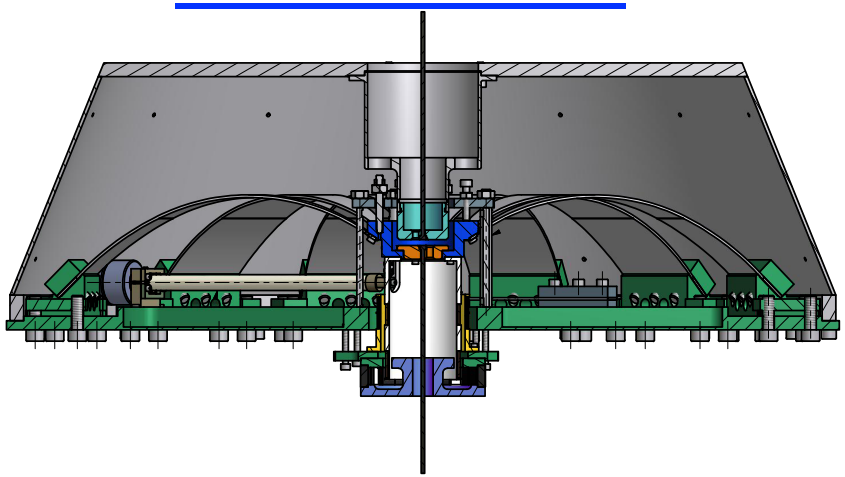
JGW-G1100524-v0

Prototyping strategy

- Seismic attenuation design is modular
- Every relevant part of the system is prototyped
- Prototypes are tested before production

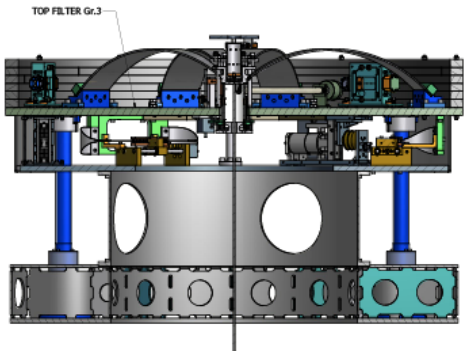
Standard filter

- Prototyped
- Tested in NIKHEF
- More tests ongoing
- Ordered (19 units)
- T1100450-v7 Gr.2
- T1100386-v1



Top filter – Inverted Pendulum

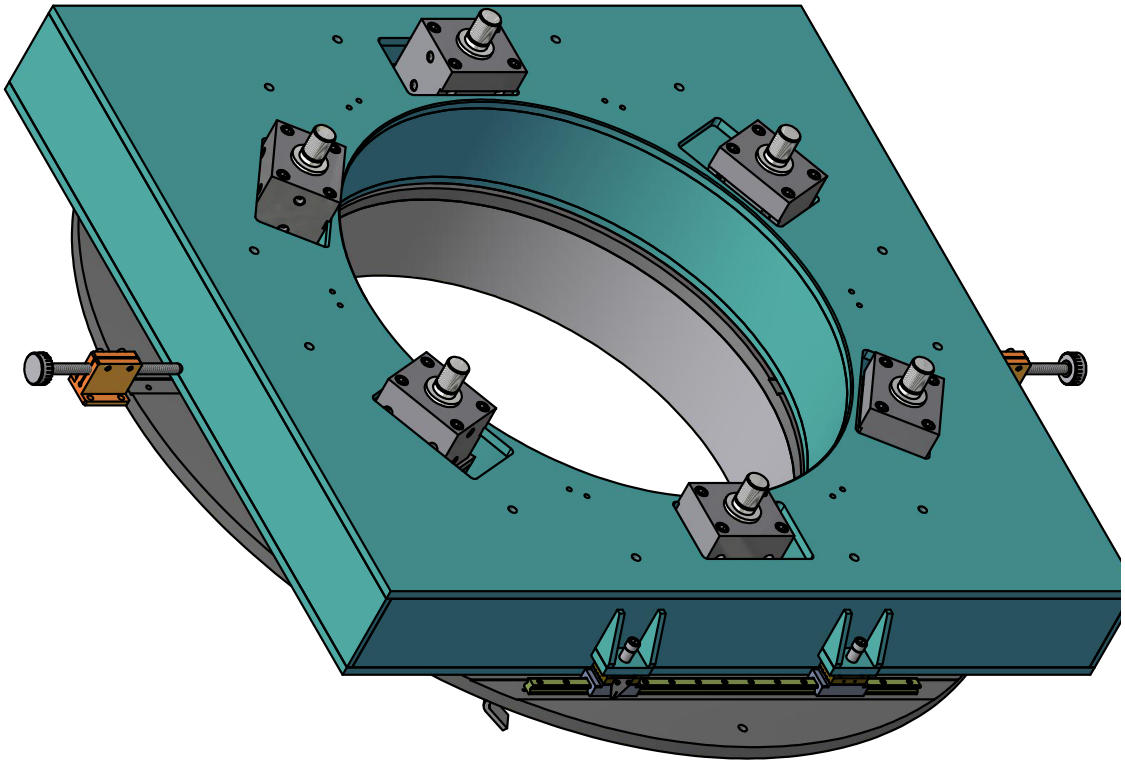
- Prototyped
- Starting tests
- T1100452-v1
- T1100450-v7 Gr.1-3-5-6-8



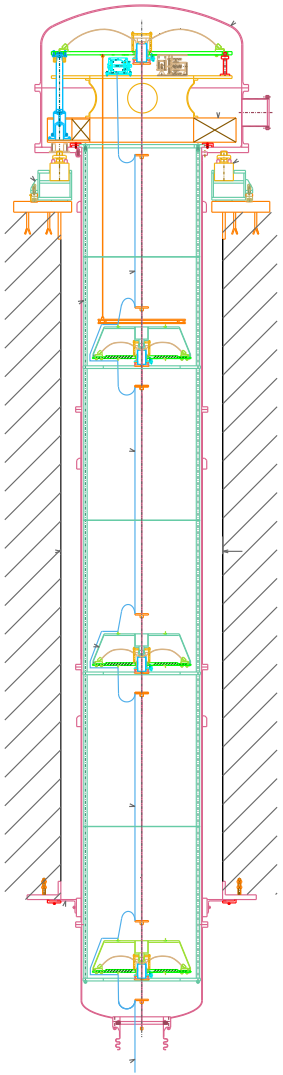
- Please visit us downstairs

IP basement

- Designed
- Prototype in construction
- T1100450-v7 Gr.0

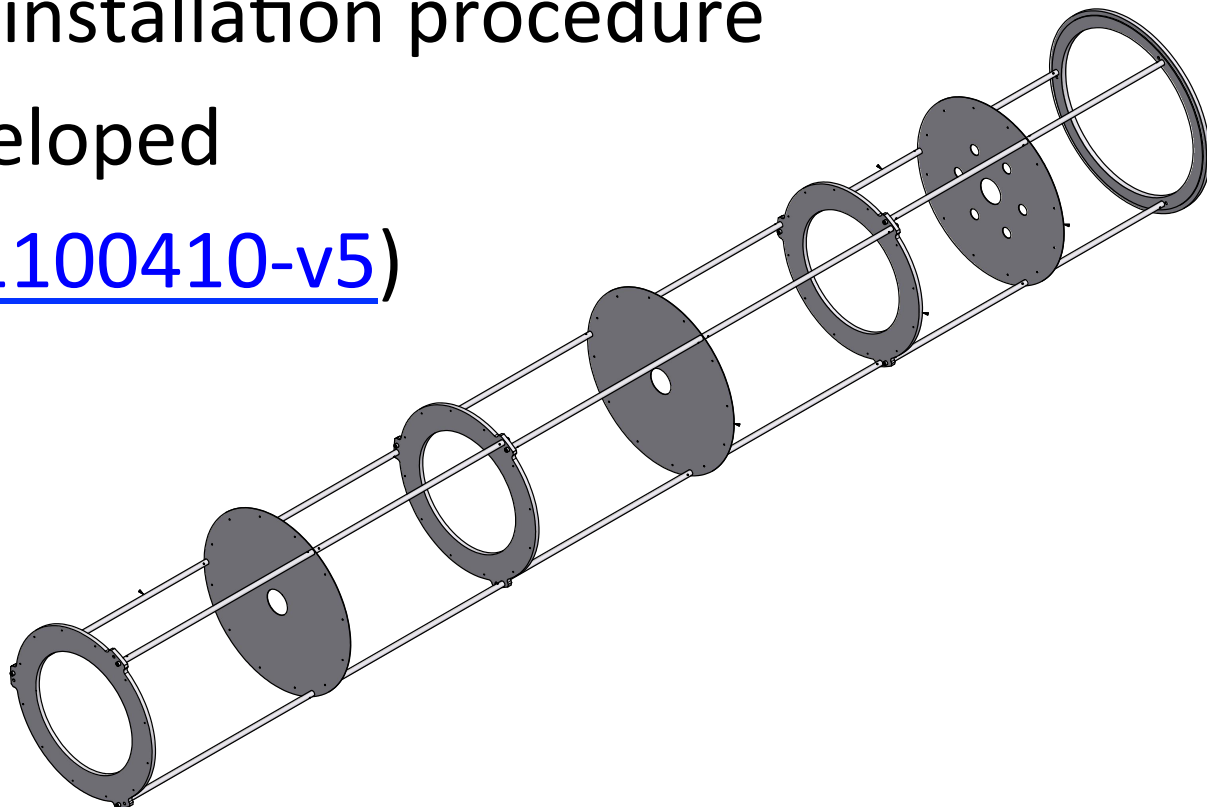


Safety-Installation structure/procedure



- Designed
- Prototype in construction
- Safe installation procedure developed

(see T1100410-v5)

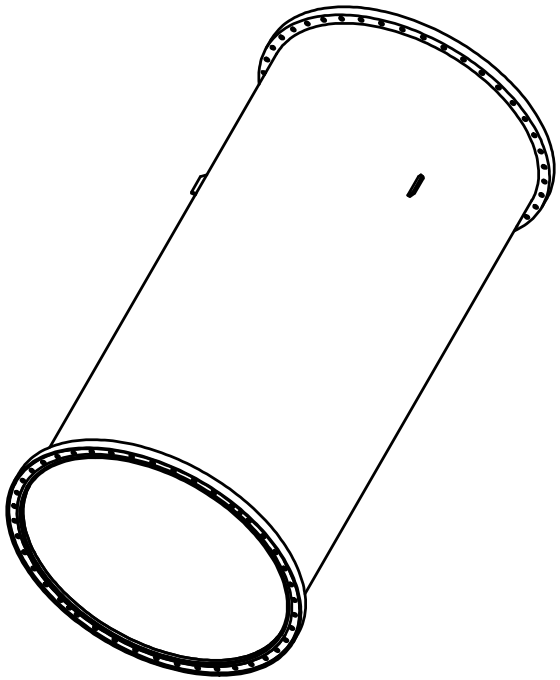


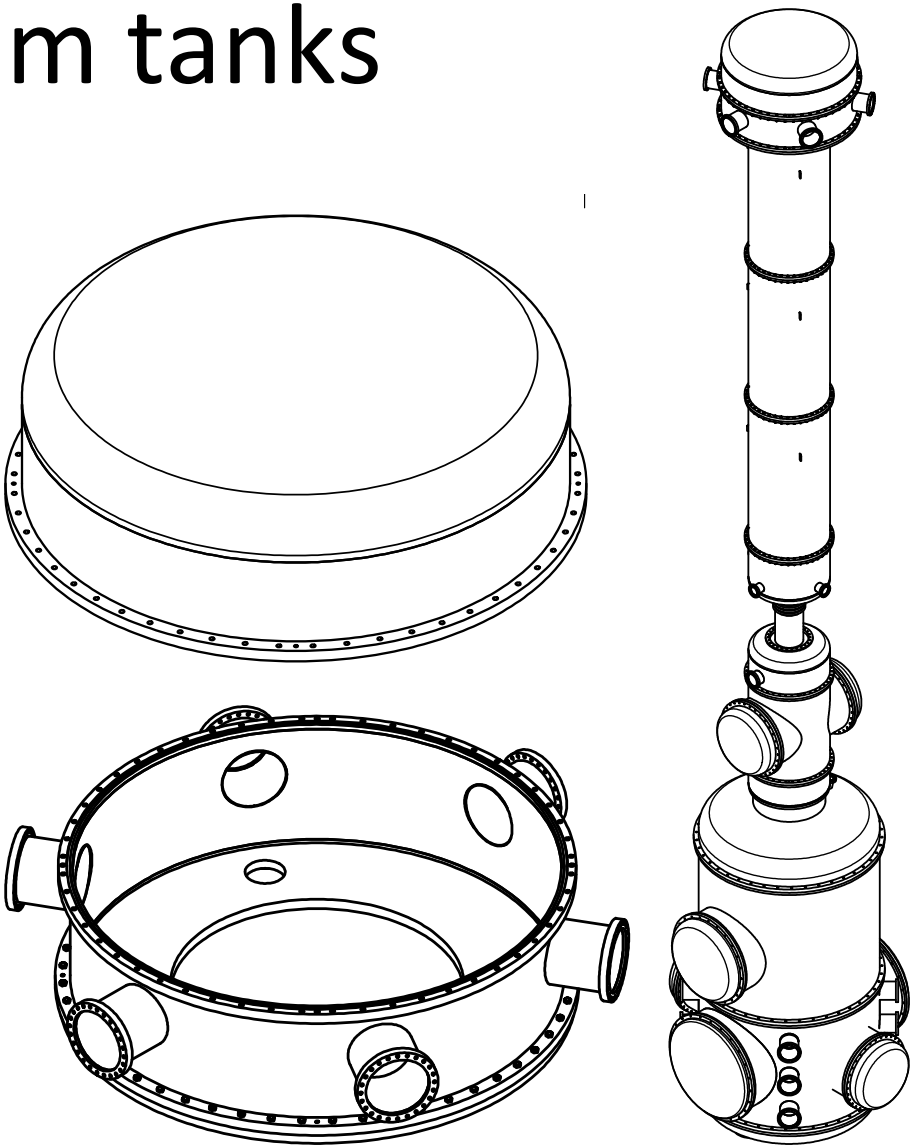
Design

- Ongoing design work involves
- Cabling
- Vacuum
- Type-B seismic chains
  - Recycler mirrors
  - Beam Splitter

Vacuum tanks

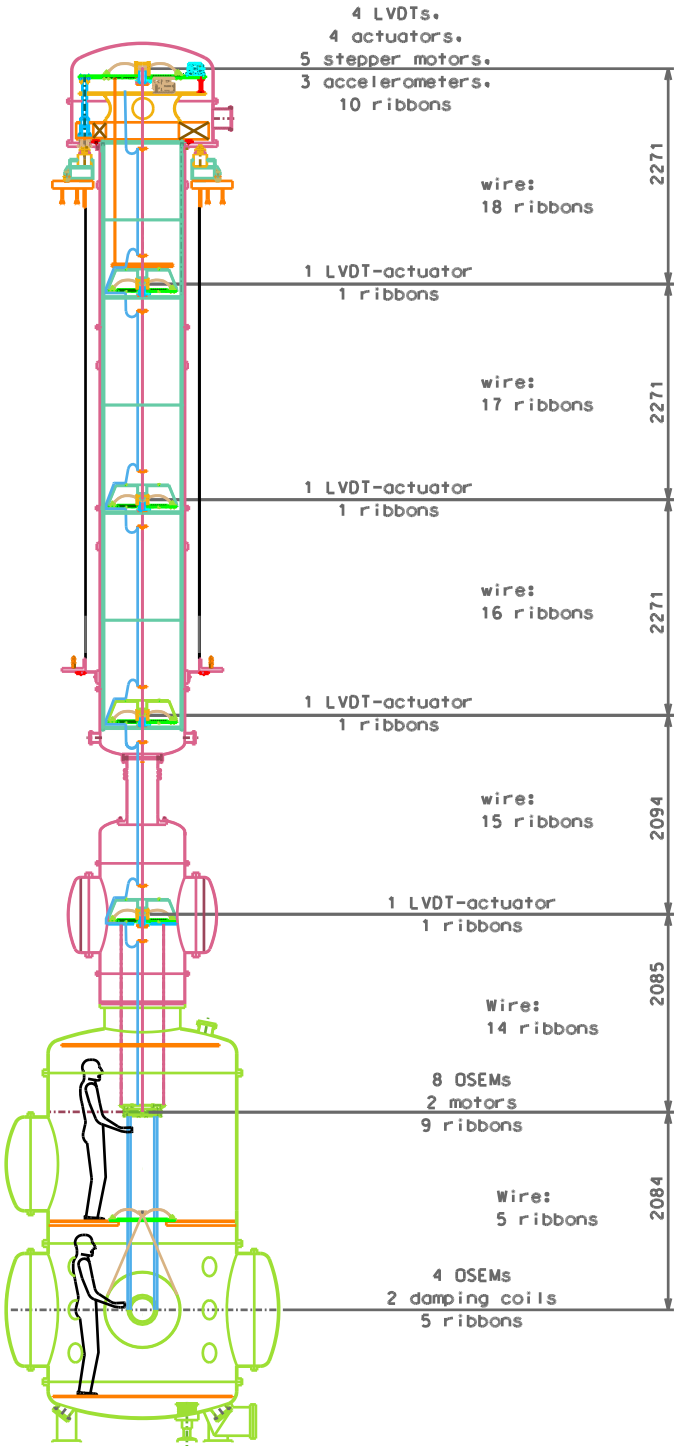
- Being designed
- T1100418-v3





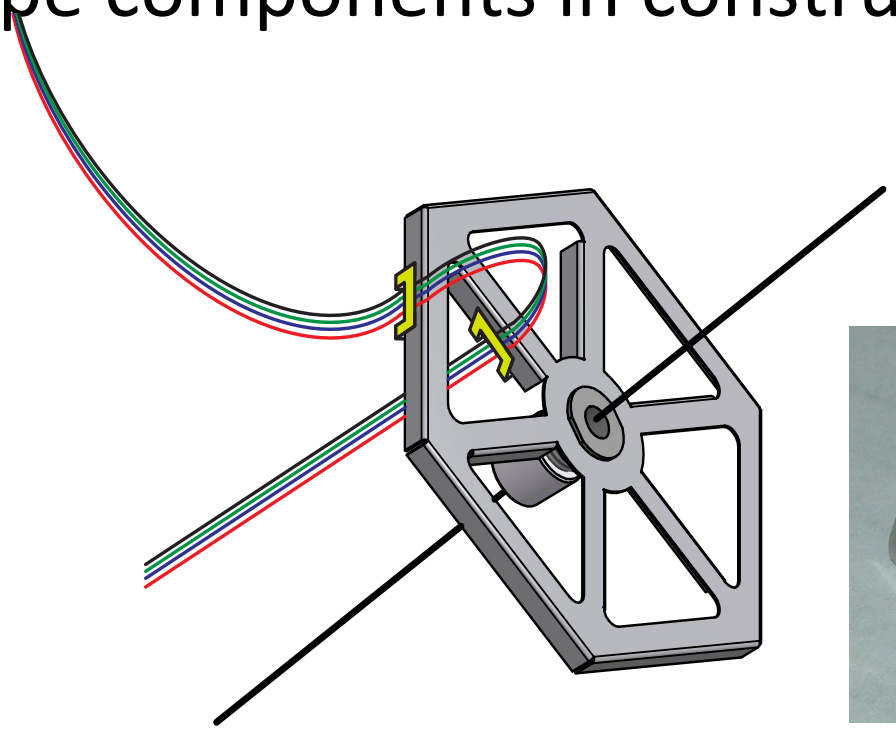
UHV cabling and connectoring

- Suspended chain
  - 18 ribbons
  - 144 conductors
  - 15 m extension
- Pre-isolator
  - 10 ribbons
  - 80 conductors
- Low electrical and mechanical noise required



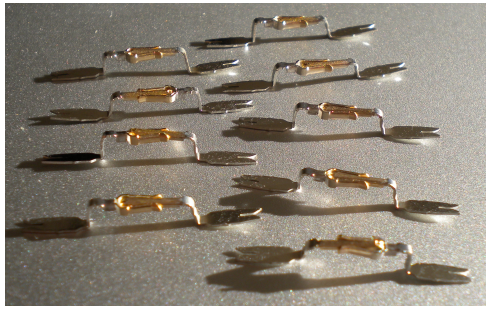
UHV cabling and connectoring

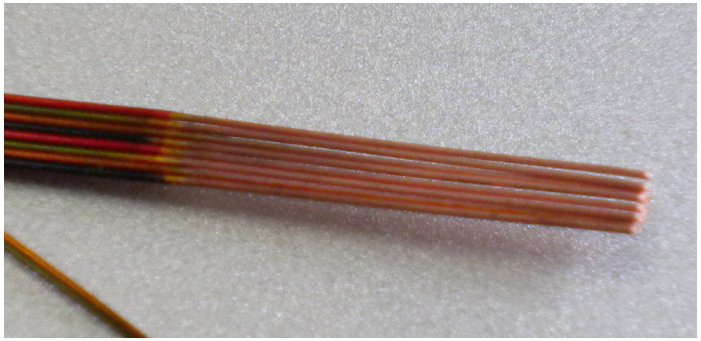
- Routing scheme being designed
  (see T1100499-v3)
- Sample prototype components in construction

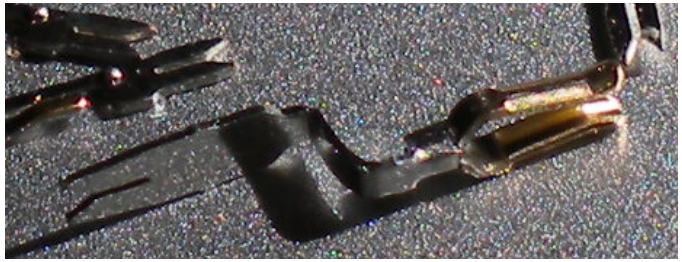


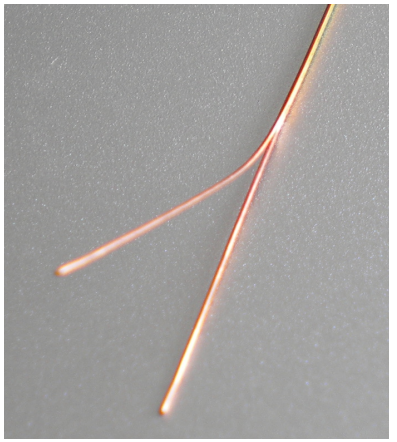
UHV cabling and connectoring

- Cable type identified
- Connector strategy provisionally chosen (see T1100499-v3), designing connector housings
- Samples being procured







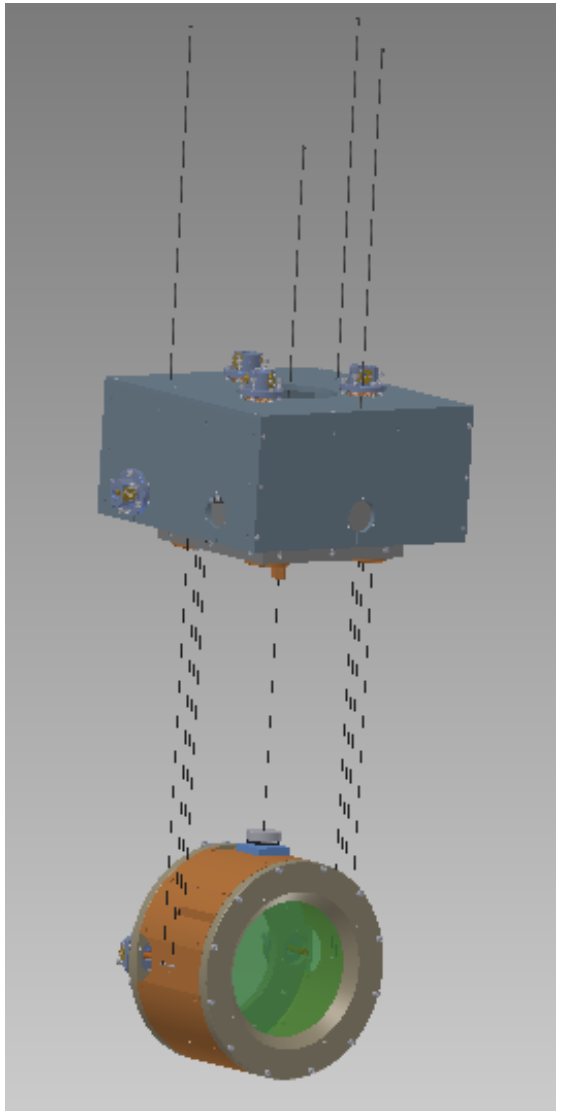


Type-B payload

- Being Designed according to simulations (see Takanori's presentation)

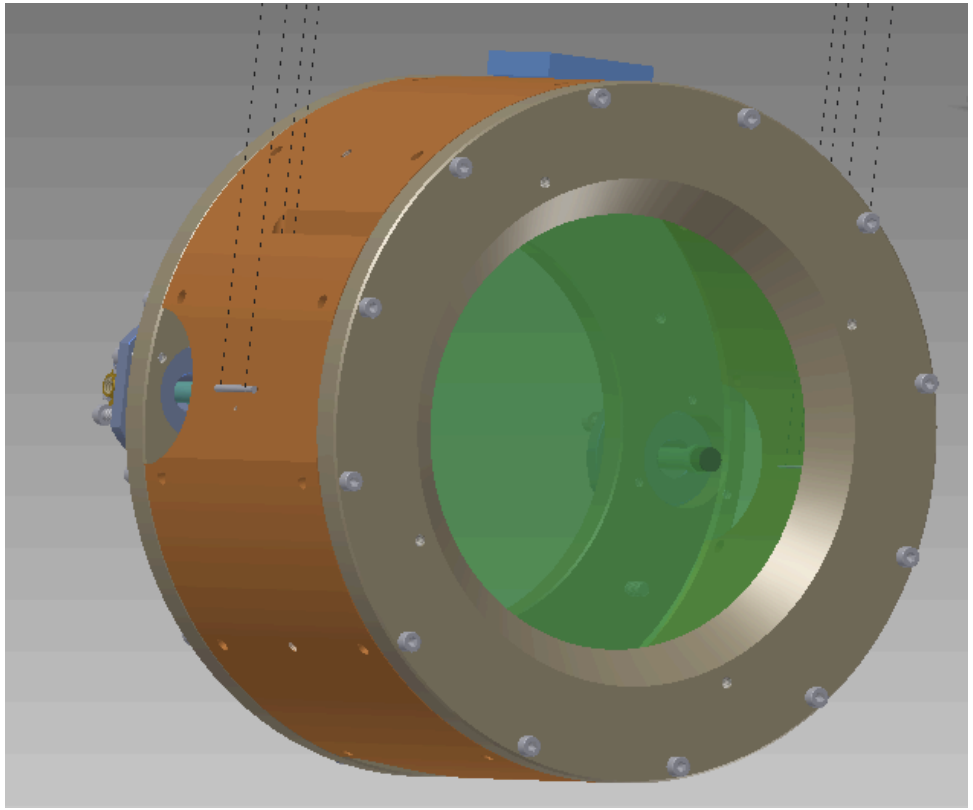
D1100470-v6

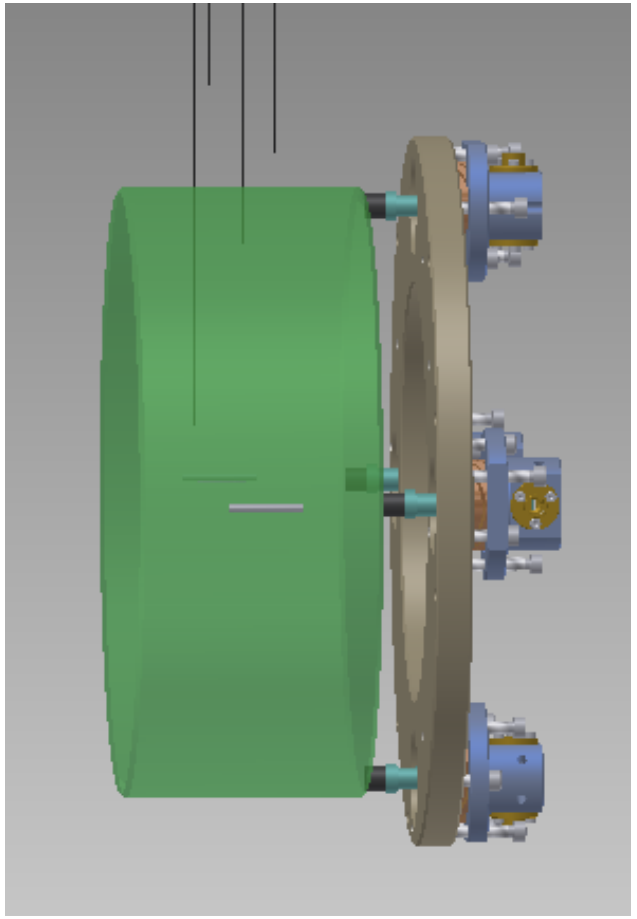
- Decided for a concentric design, despite geometric difficulties
  D1100542-v1



Recycler mirror controls

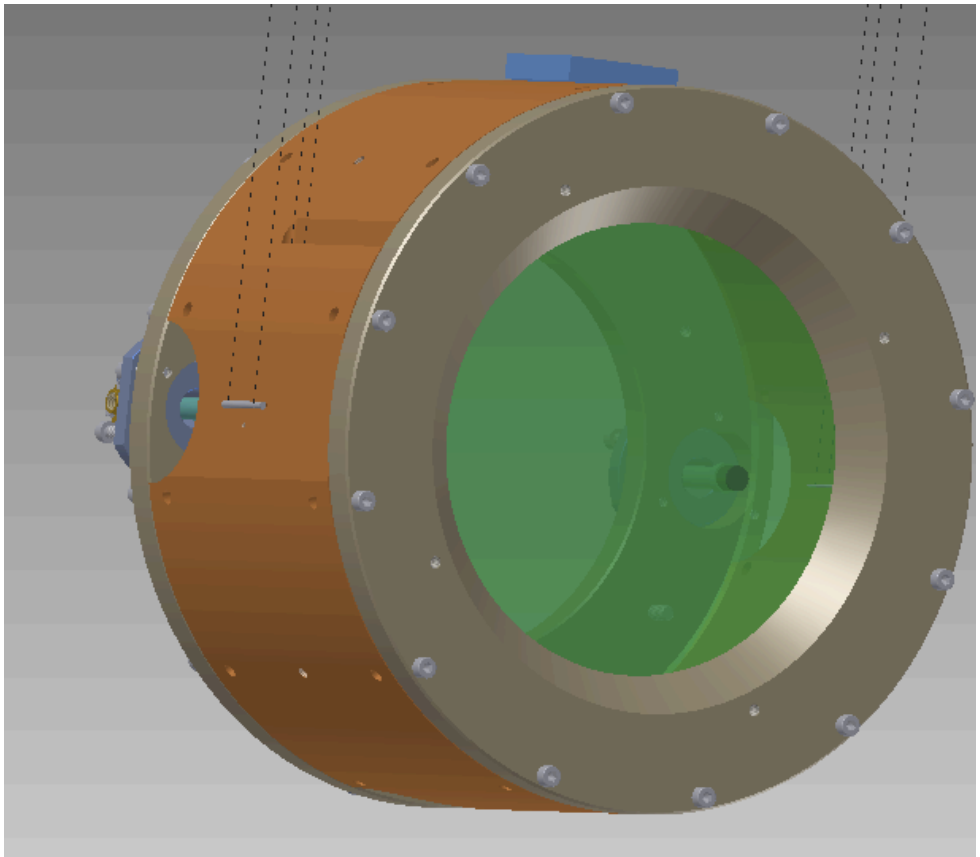
- Four wire suspension
- Thin wall concentric recoil mass (Titanium gr.5)
- OSEM sensor actuators





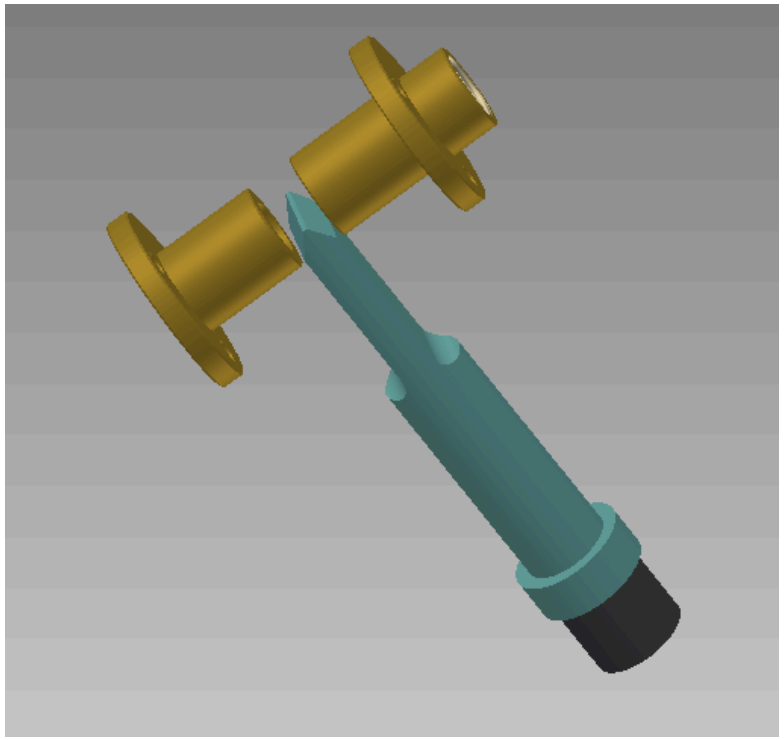
Recoil mass controls

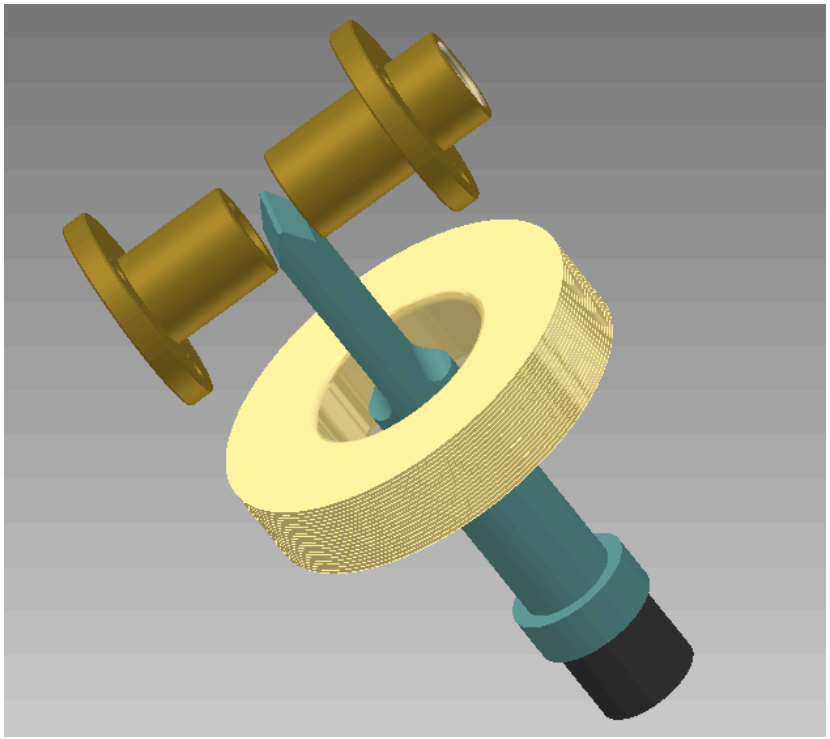
- Eddy current mitigation:
  - Titanium recoil mass with Scalloping
  - OSEM support plate and OSEM coil support out of C-loaded PEEK



OSEM working principle

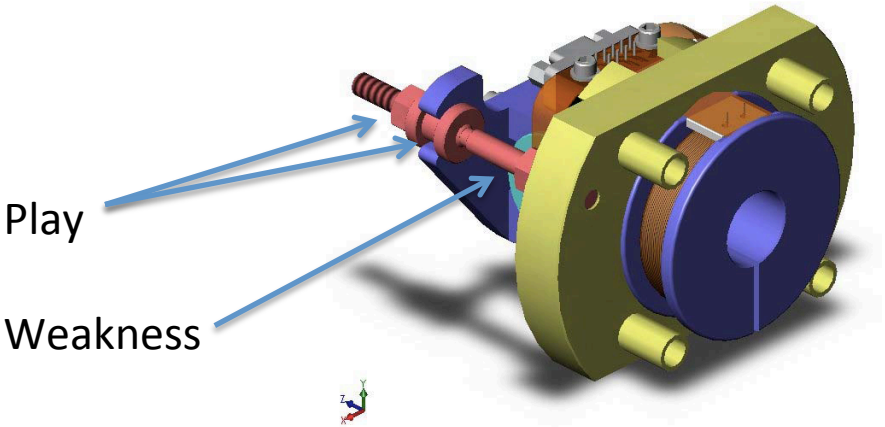
- Position sensor: LED-photodiode pair reads shadow of mirror's flag
- Actuator: Coil apply force on magnet at base of flag

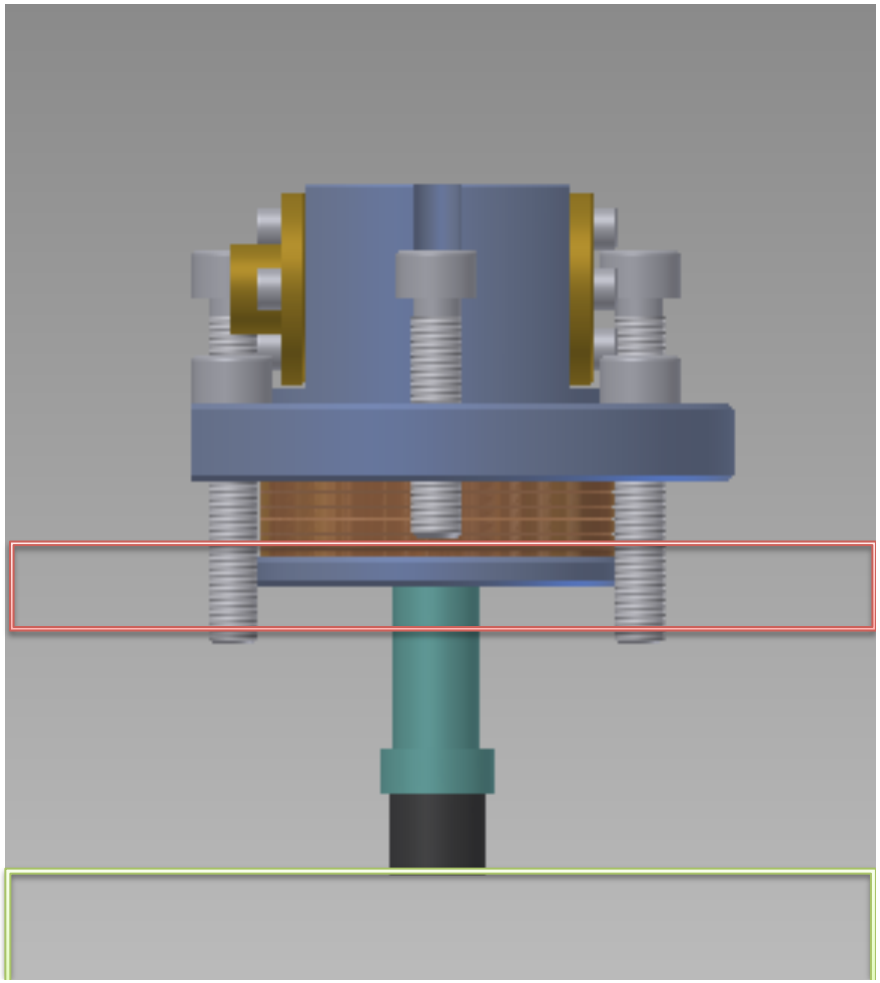




OSEM mechanical structure

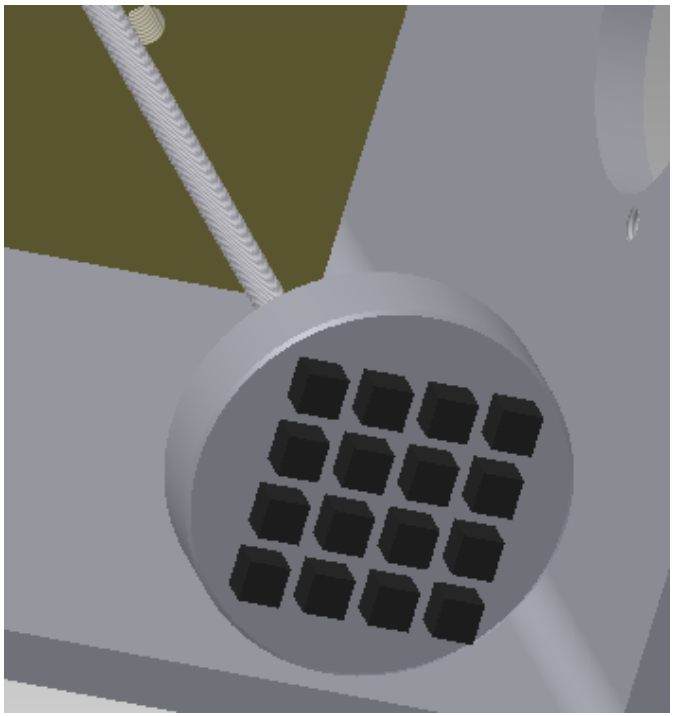
- Three pulling screws
- Three pushing screw
- Allows zero-settings
- While guaranteeing mechanical stability
  (screw play elimination)

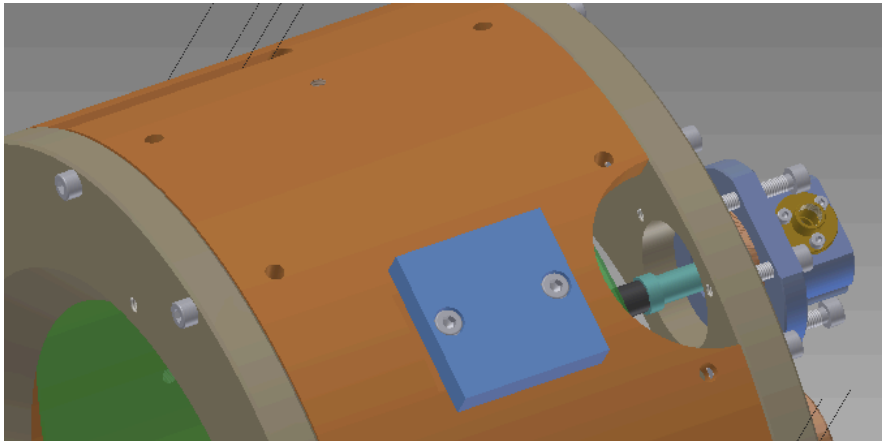




Modal damping

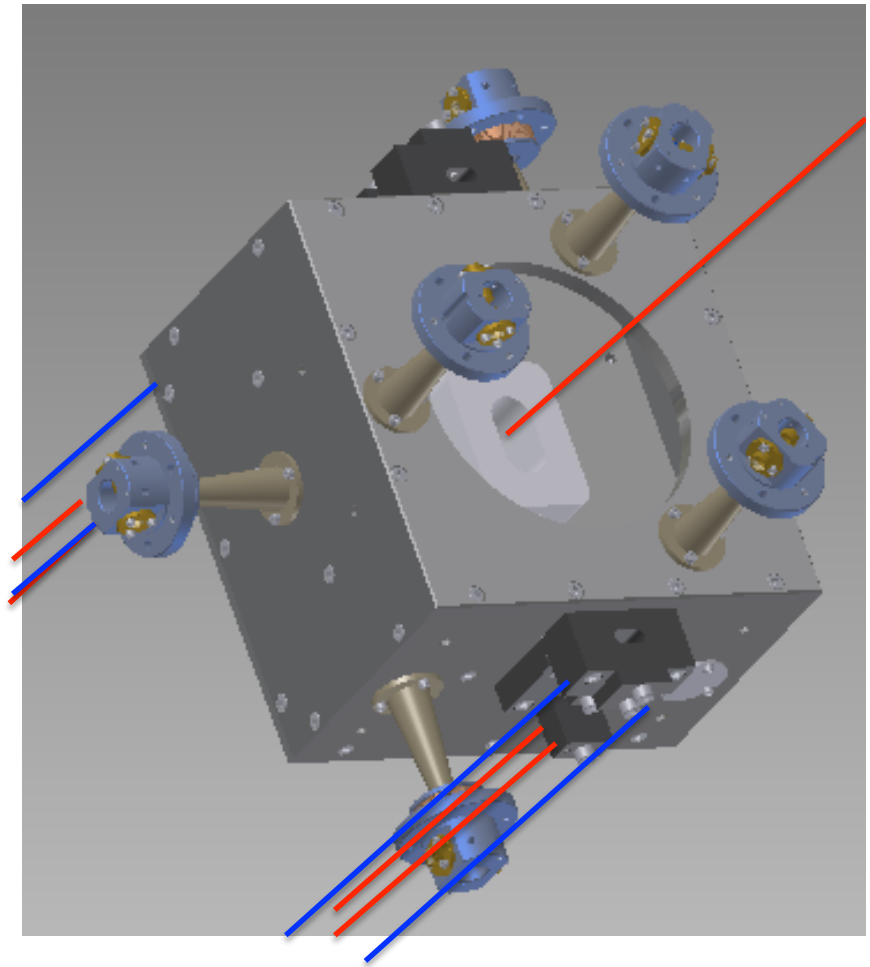
- Whip from intermediate mass, with magnets, causes Eddy current damping on pad on mirror recoil mass





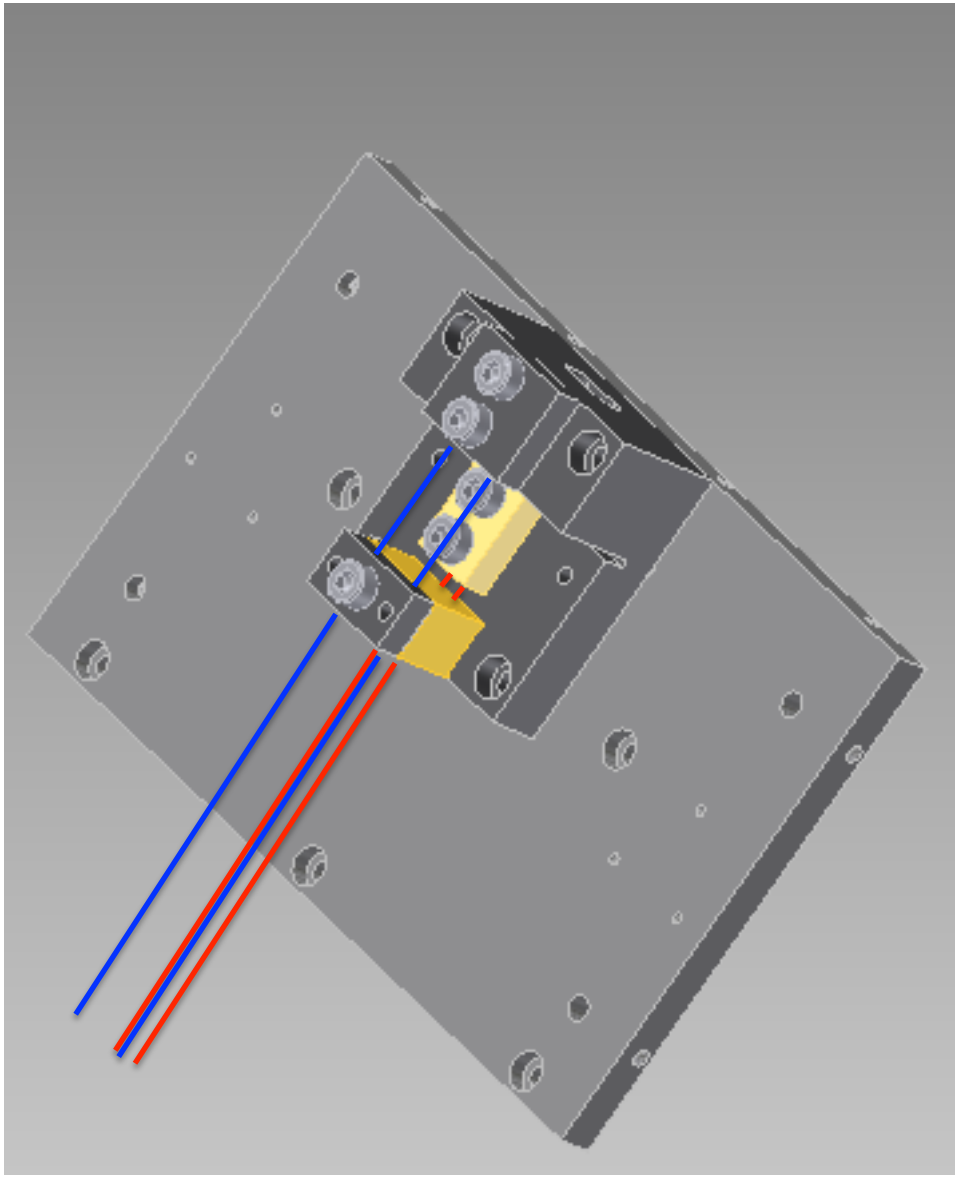
Intermediate mass structure and controls

- Suspends mirror and its recoil mass
- Suspended from a central wire from a small GAS filter
- Controlled from a recoil mass suspended from the body of the GAS filter above



Wire clamping structure

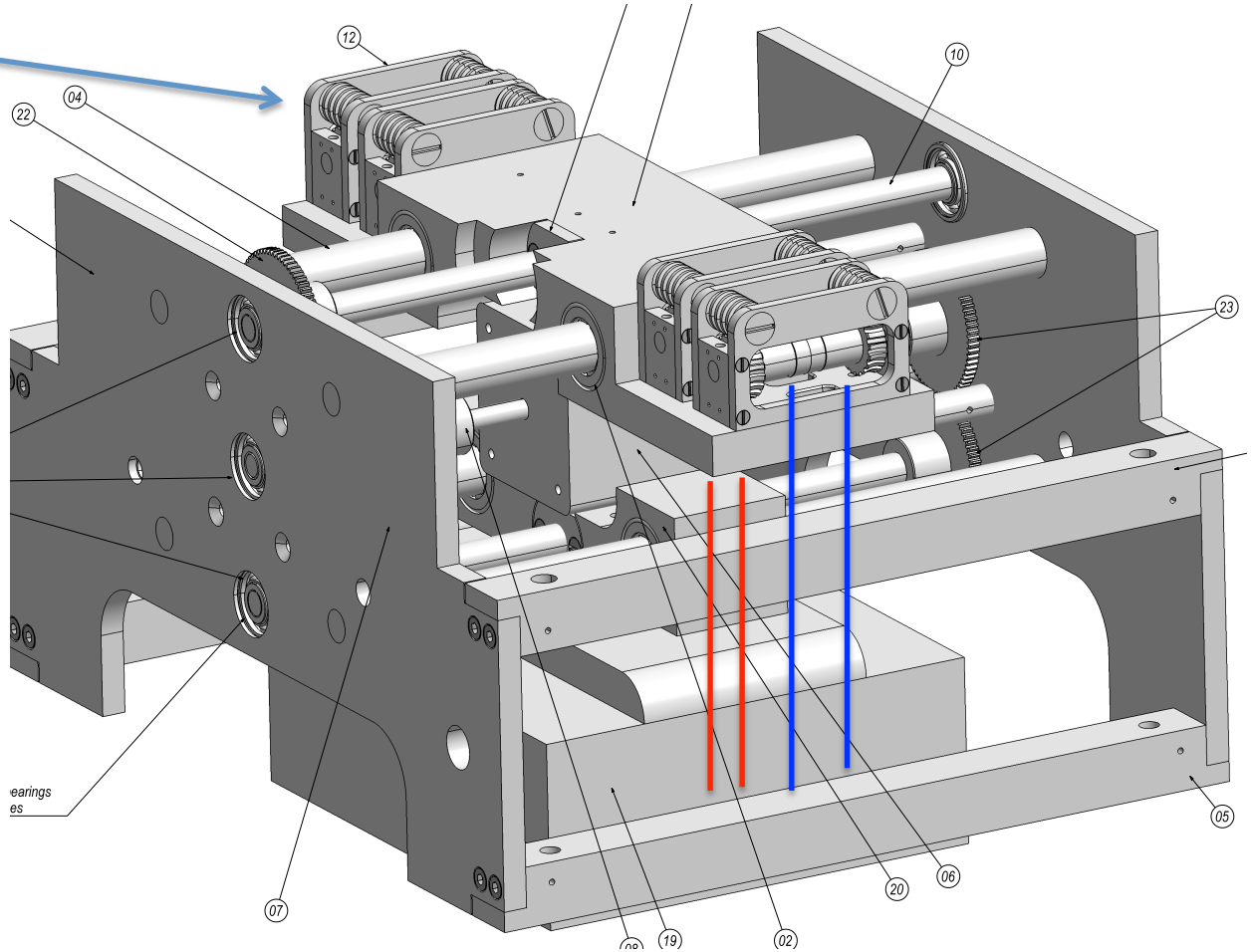
- Double clamping
  - UPPER For weight support
  - LOWER For flexure point definition



NIKHEF suspension wiring tooling

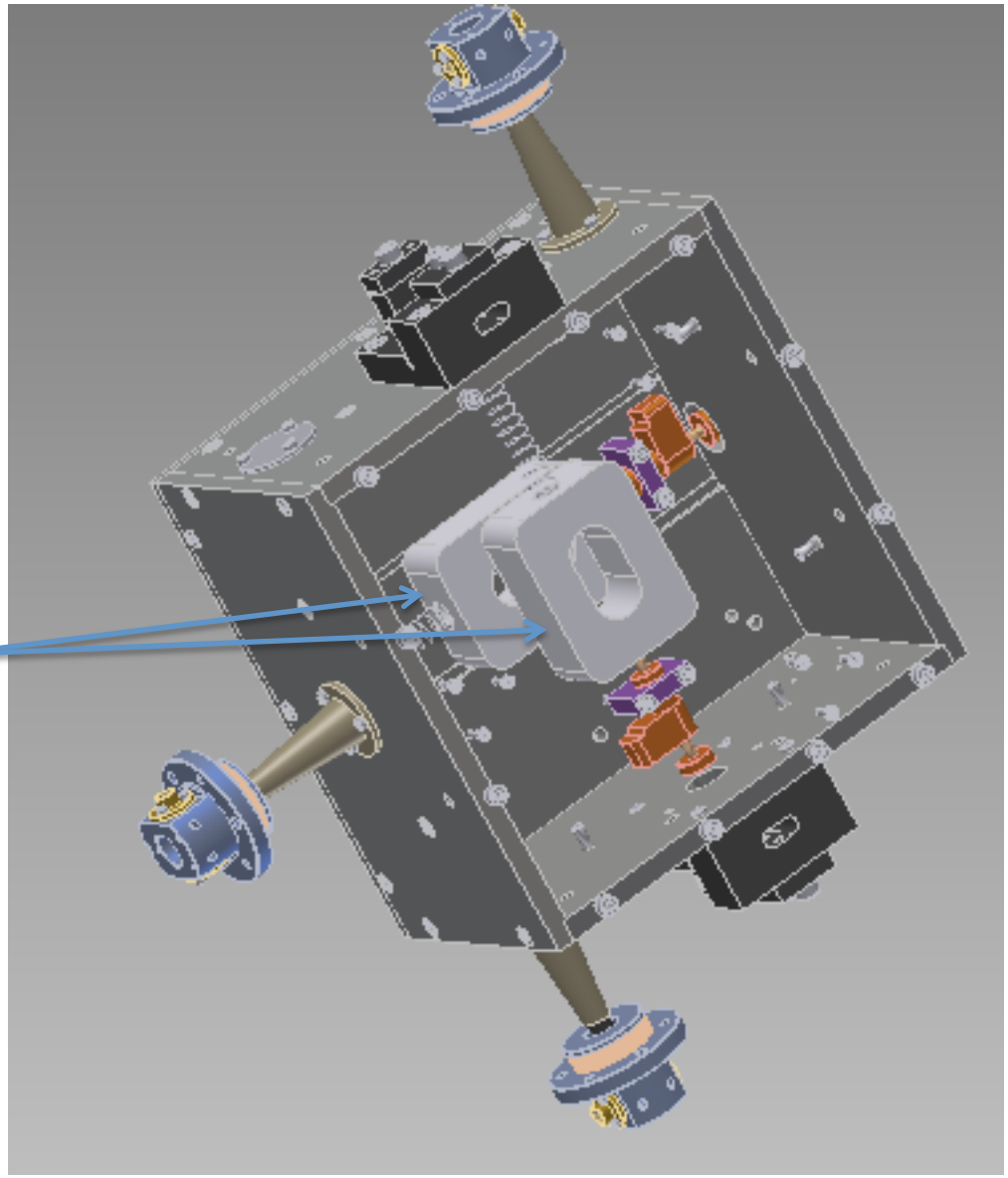
Jo Van Den Brand
Eric Hennes
Alessandro Bertolini
From NIKHEF are joining the seismic group

- The eight capstans will be used to pre-tension the four mirror and recoil mass wires before clamping



Static attitude controls

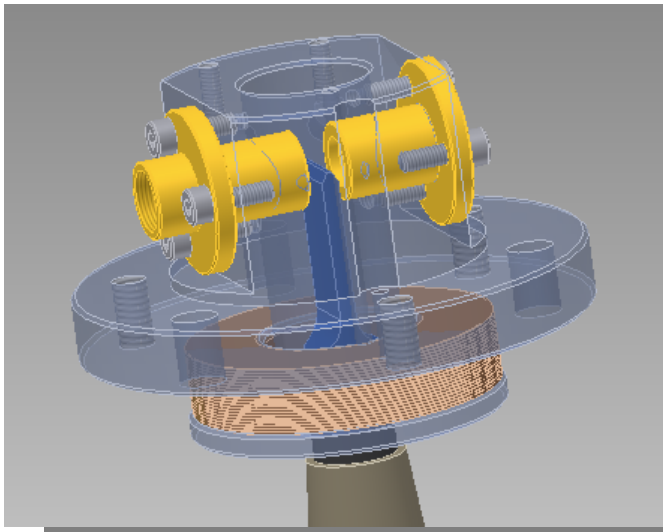
- Tuneable suspension point height for pitch-roll frequency reduction
- Longitudinal moving mass for pitch and roll

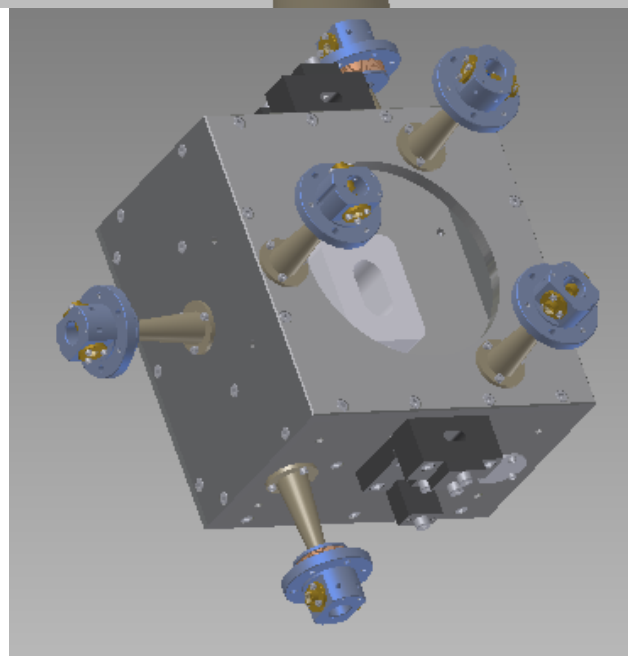


Dynamic controls

- Shadow-meter/Voice-coil control units in all degrees of freedom

- Positioning of control units for diagonal or block control matrix

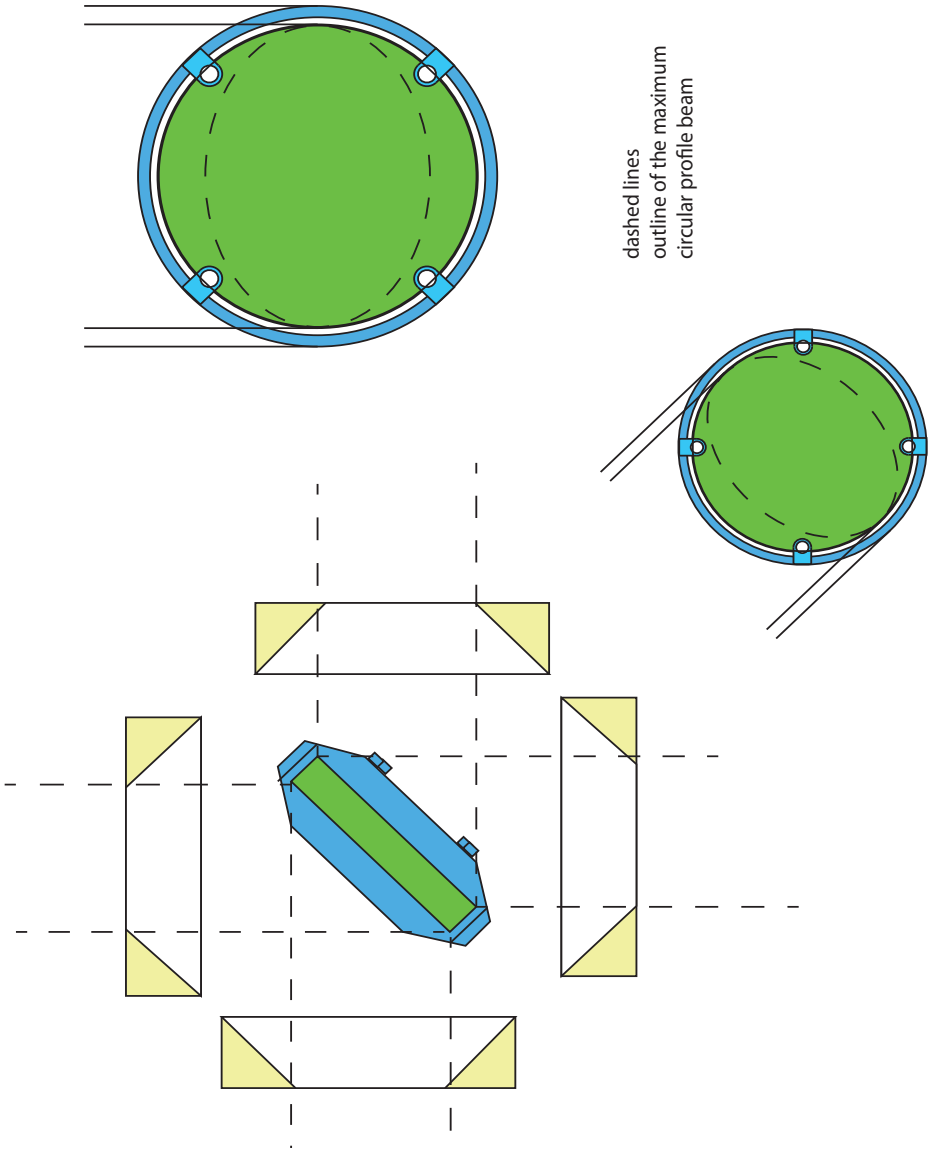




Support from
Ludovico Carbone andreas Freise Birmingham
Nick Lockerbie Strathclyde

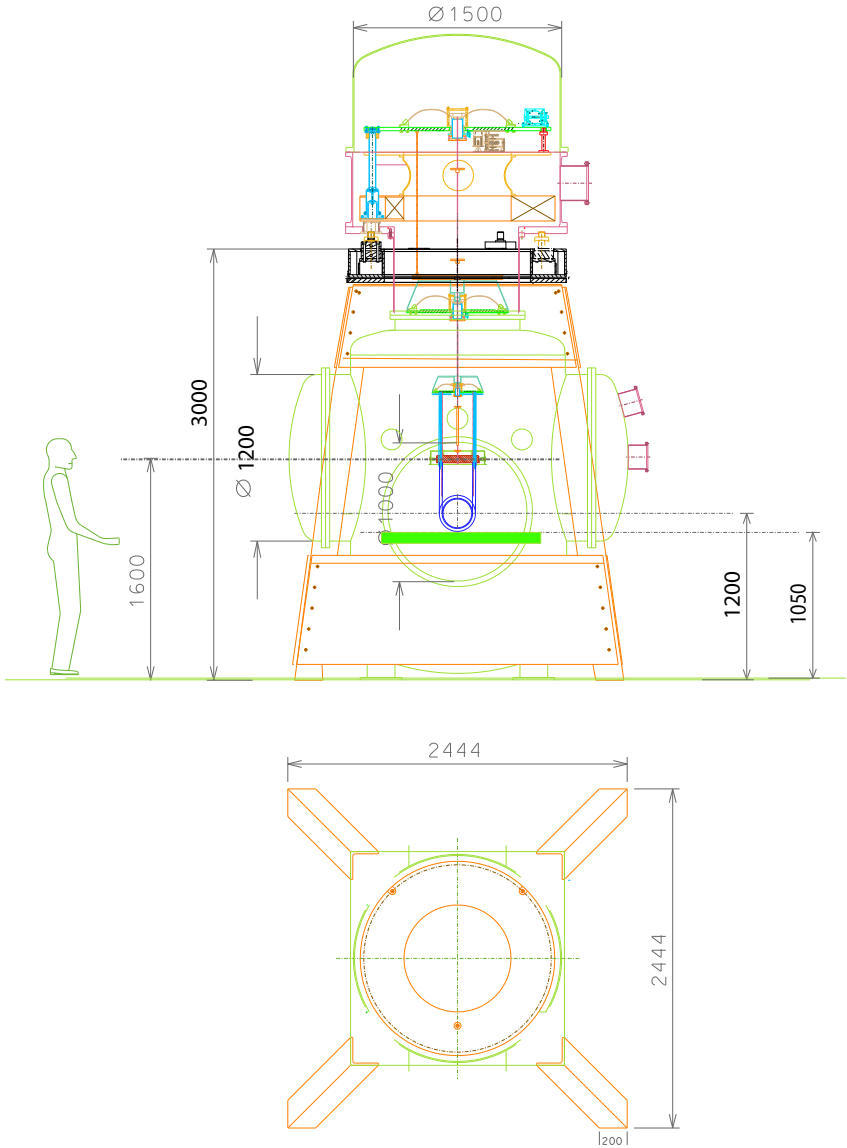
Design ahead

- Beam splitter suspensions
- Need to start its design before finalizing recycler suspensions



Design ahead

- Type-B support structure
- Starting Design
- D1100470-v6



Seismic and suspensions
Conclusions

- Production On track
- Prototyping On track
- Design On track
- As everybody else, swamped with work !