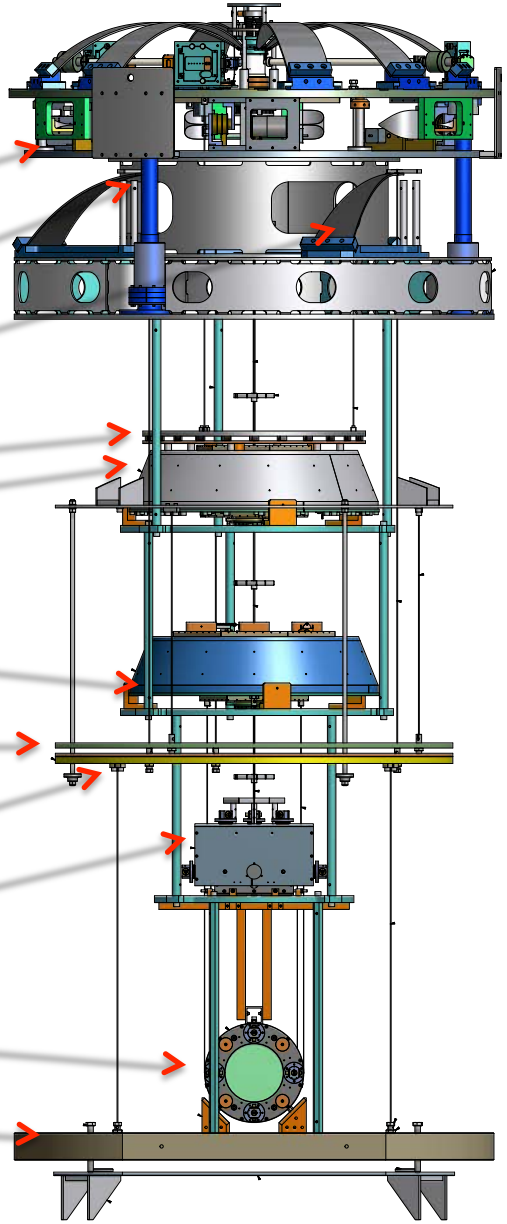
Type B seismic towers

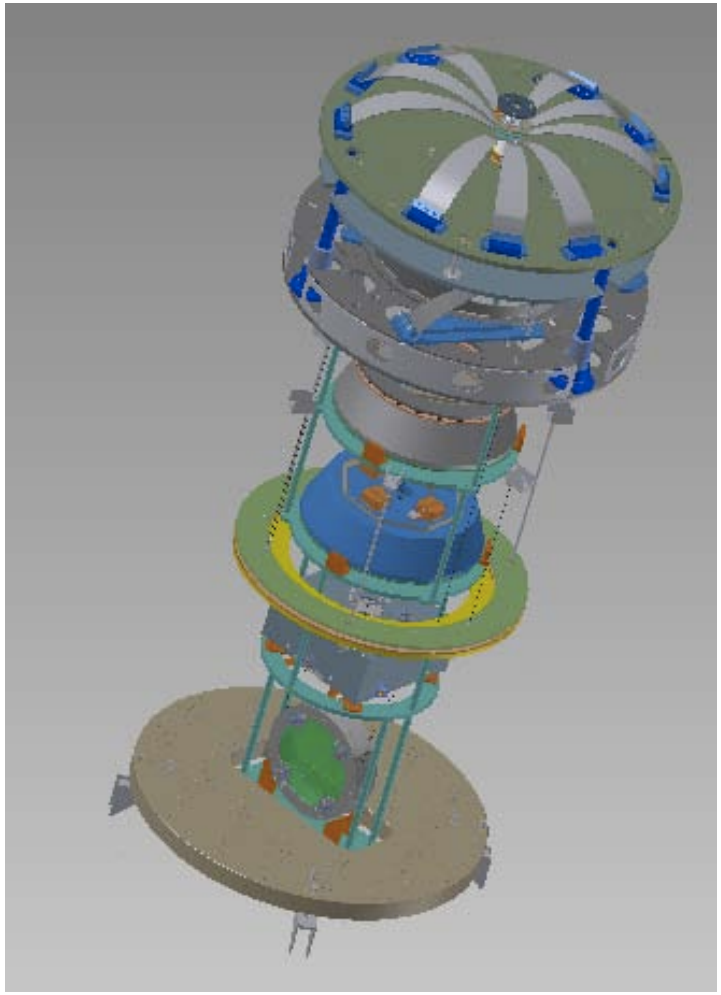
Riccardo DeSalvo
JGW-G1200806

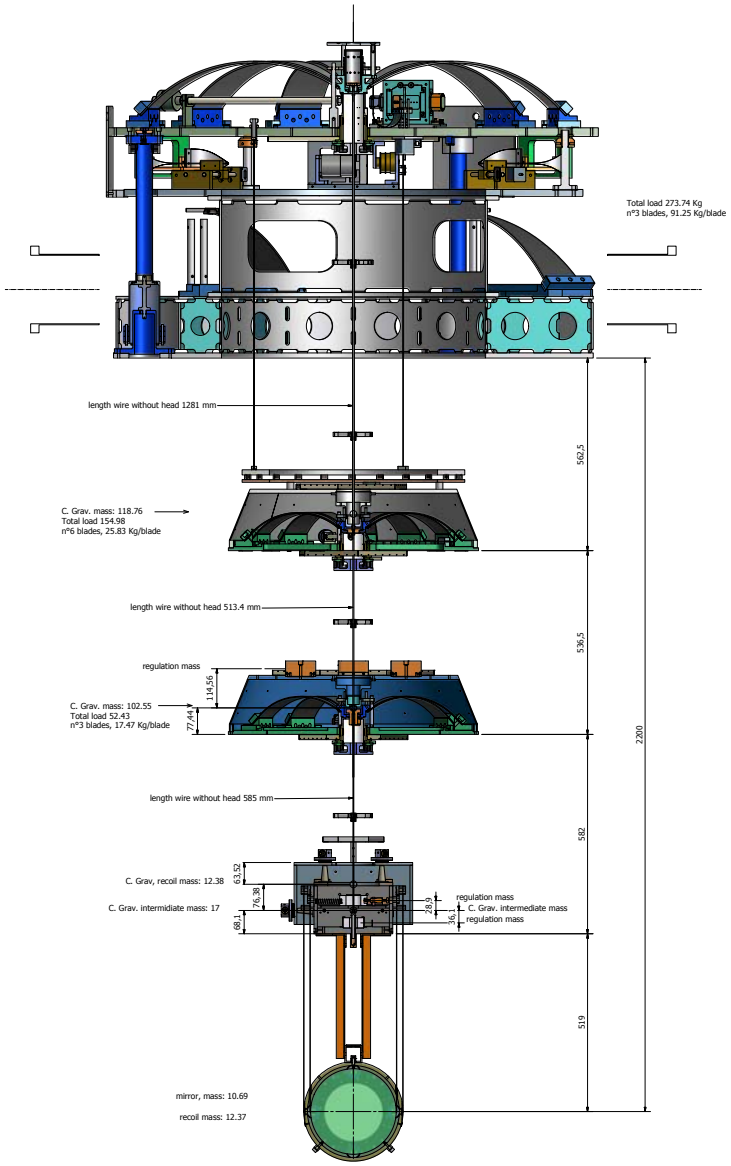
Chain type B

- Top filter (vertical actuation)
- Inverted pen. (x-y-phi actuation)
- Optical bench vertical springs
- Eddy current damper
- Top filter
- Bottom filter (pitch-yaw controls)
- Optical bench damper
- Optical bench intermediate mass
- Intermediate mass-recoil mass
- Test mass-recoil mass
- Optical bench



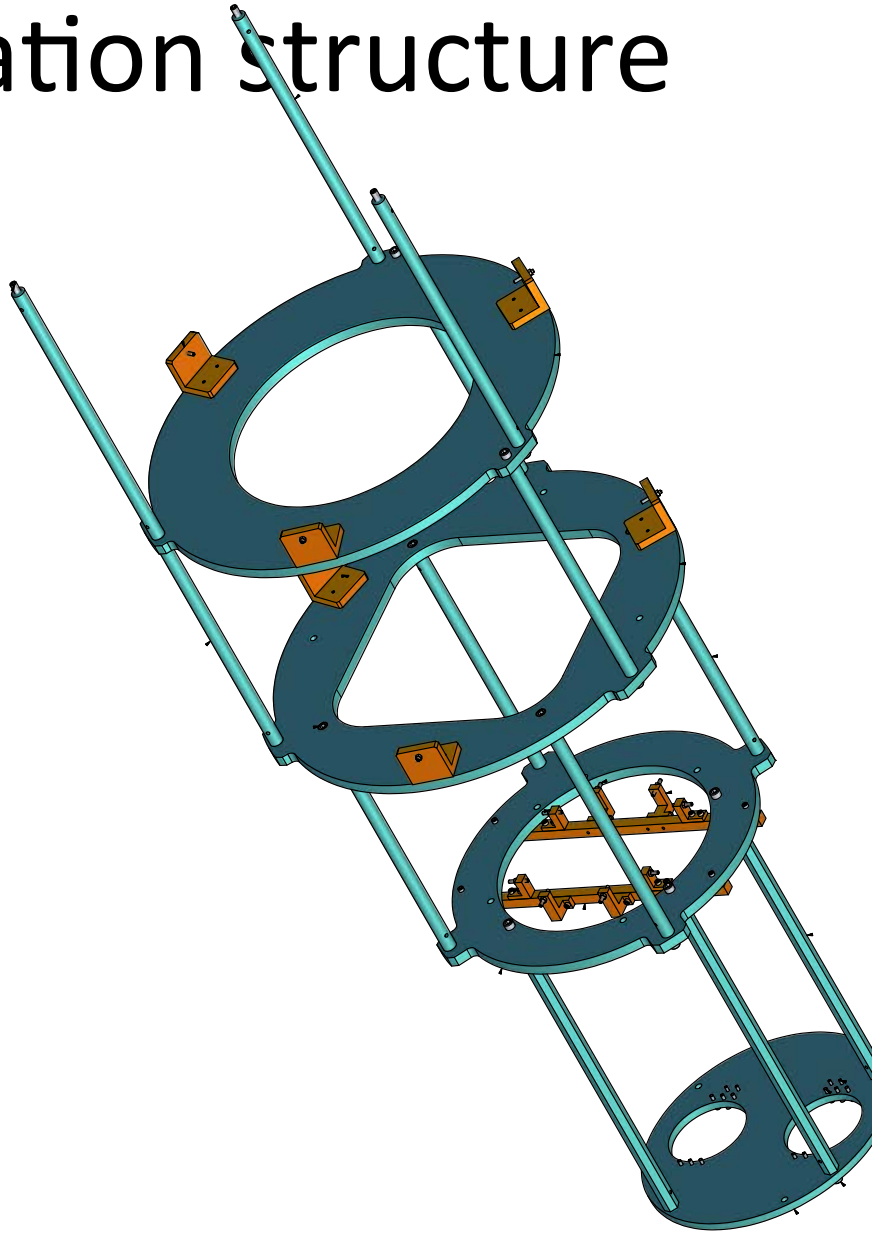
Chain type B data





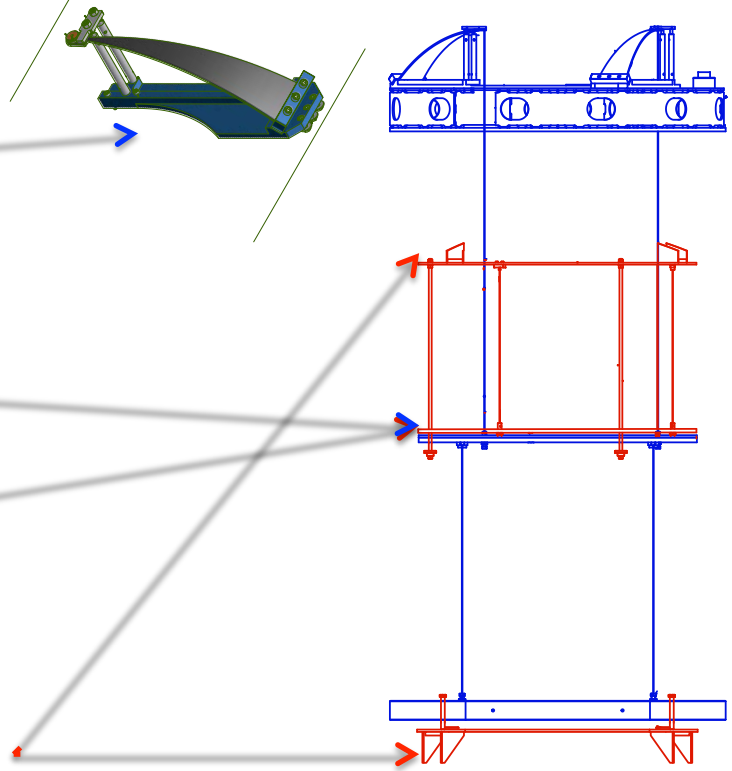
Safety and installation structure

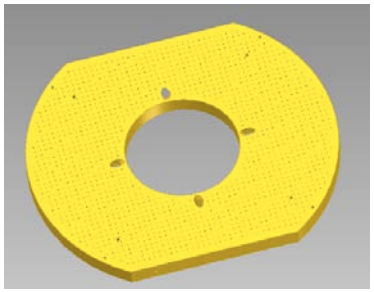
- Mounts on bottom of Inverted Pendulum structure
- Locks chain during transport from clean room to vacuum chamber
- Limits range in case of earthquake or failure

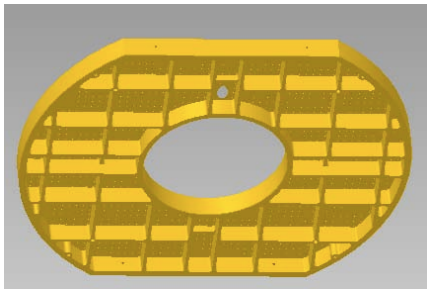


Optical bench

- Single stage vertical attenuation (1 Hz)
- Double pendulum horizontal attenuation
- Eddy current damping
- Safety structure attachment to vacuum chamber

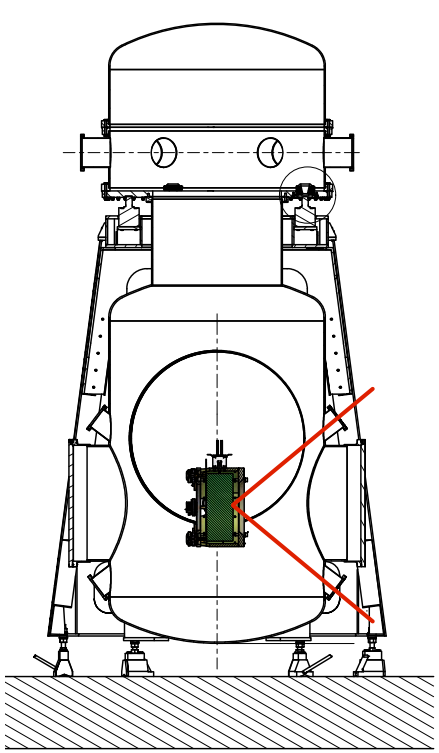


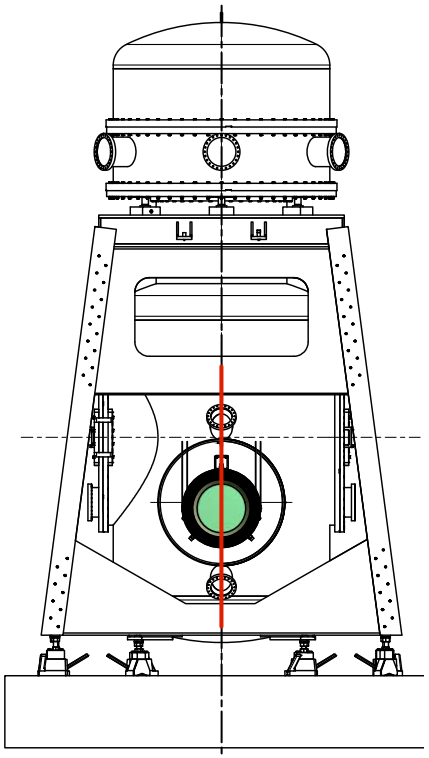




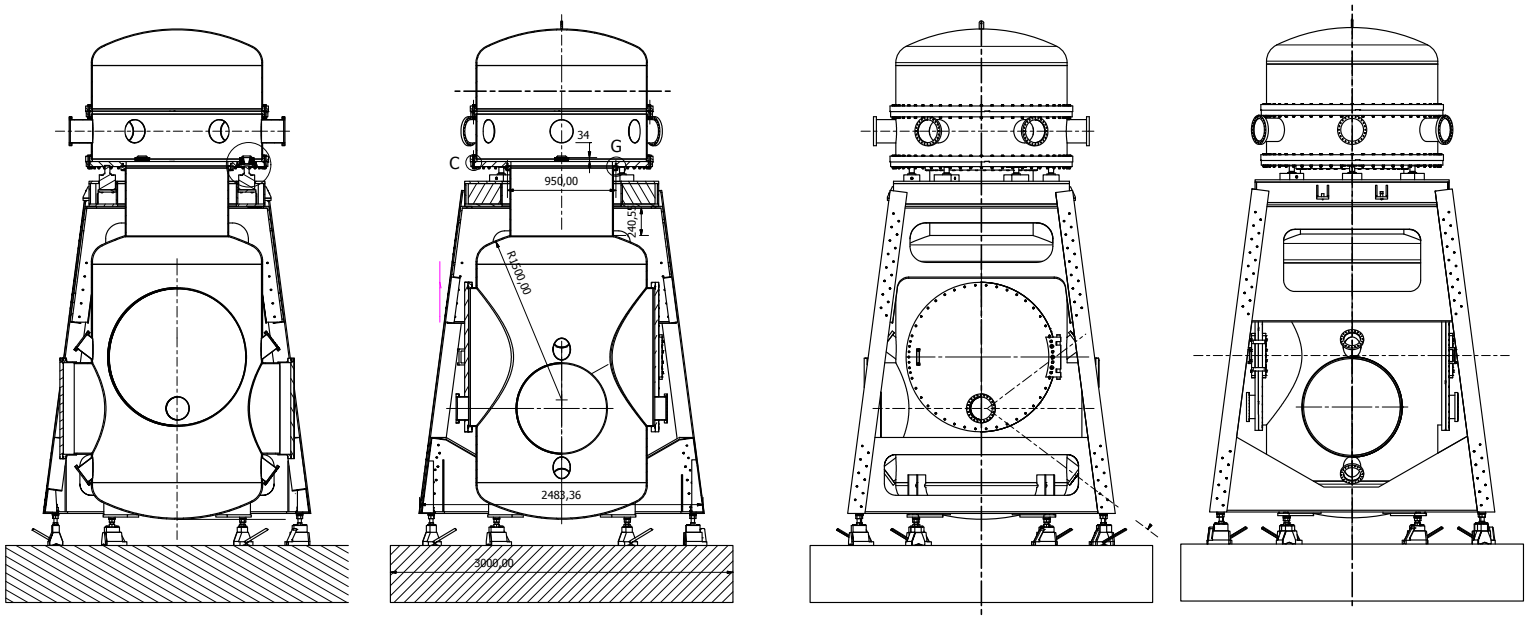
Optical levers

- Optical ports above and below beam-line

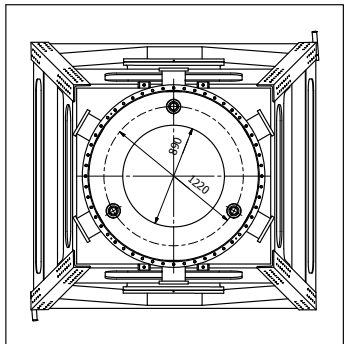


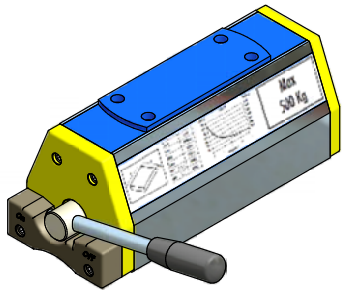


Vacuum tank/external structure



- Mount on magnetic shoes to allow x-y translation

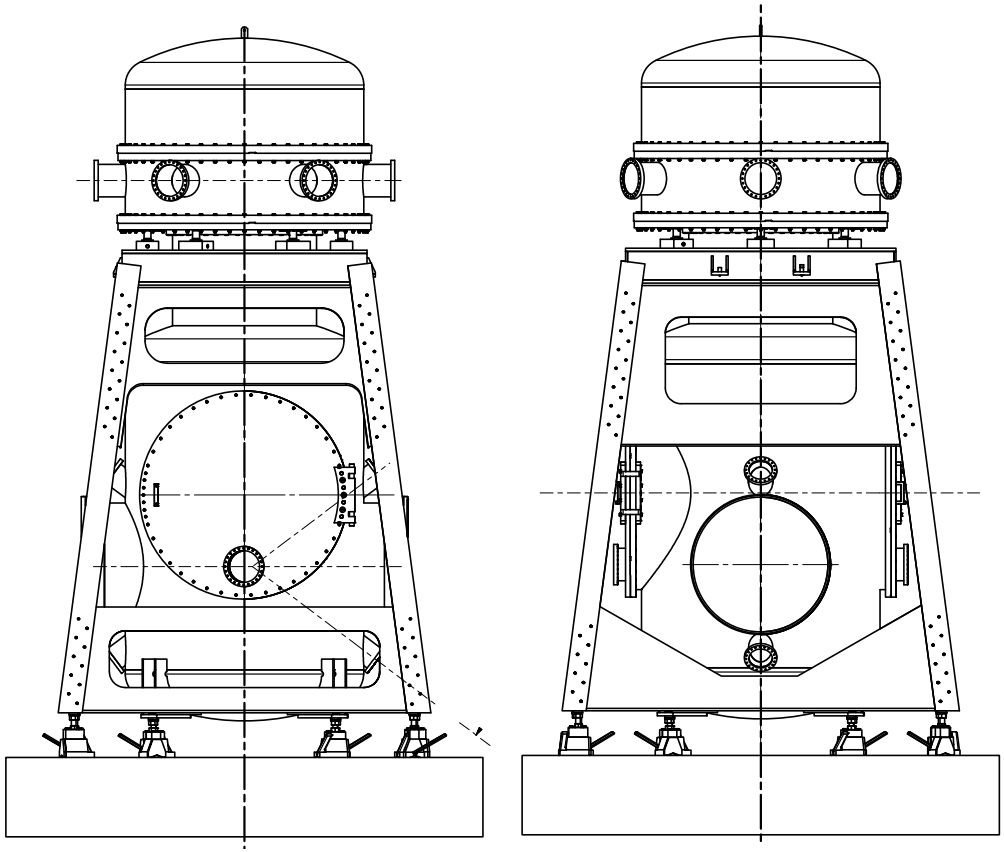




- Binding force 2 ton per foot

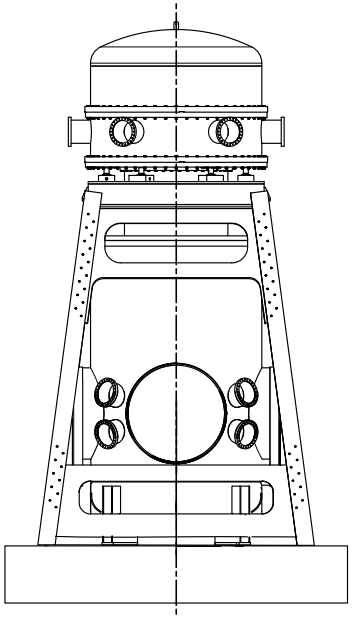
External structure

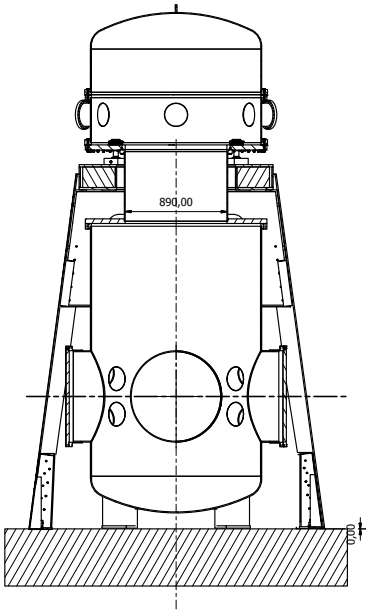
- Independent from vacuum tank (vibration mitigation)
- High rigidity
- Supports Inverted Pendulum structure through bellows
- Top and bottom mini-skirt connected by 4 bolted L-beams

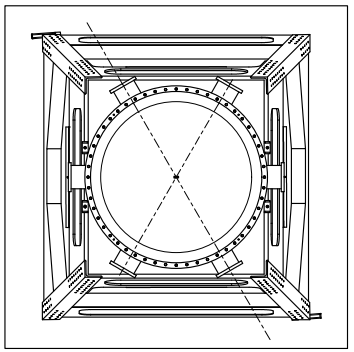


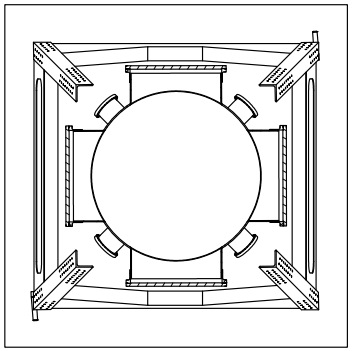
Beam splitter

- No magnetic feet
- Top loading of components
- Corner mount of optical levers



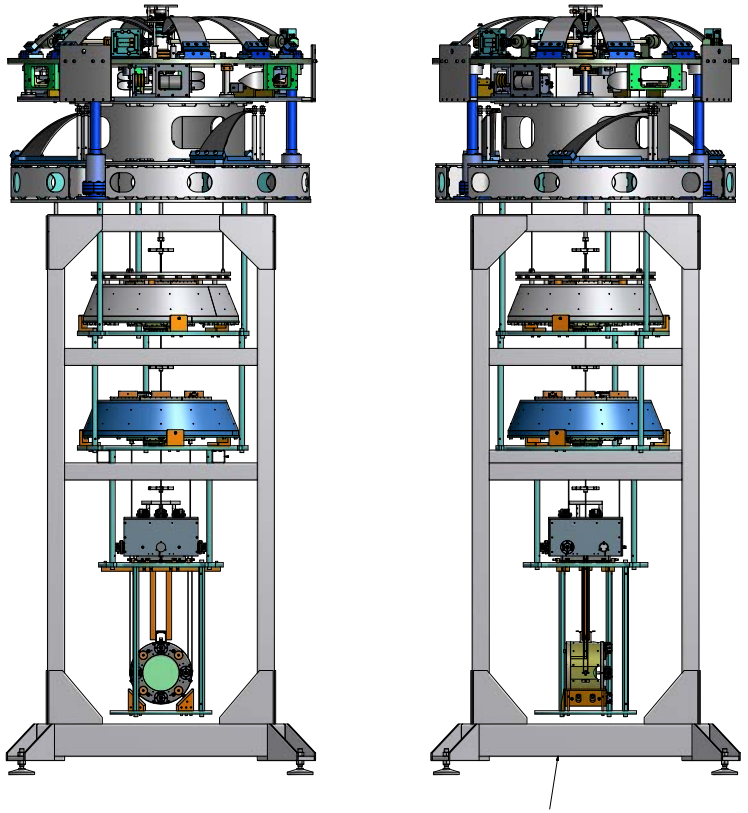






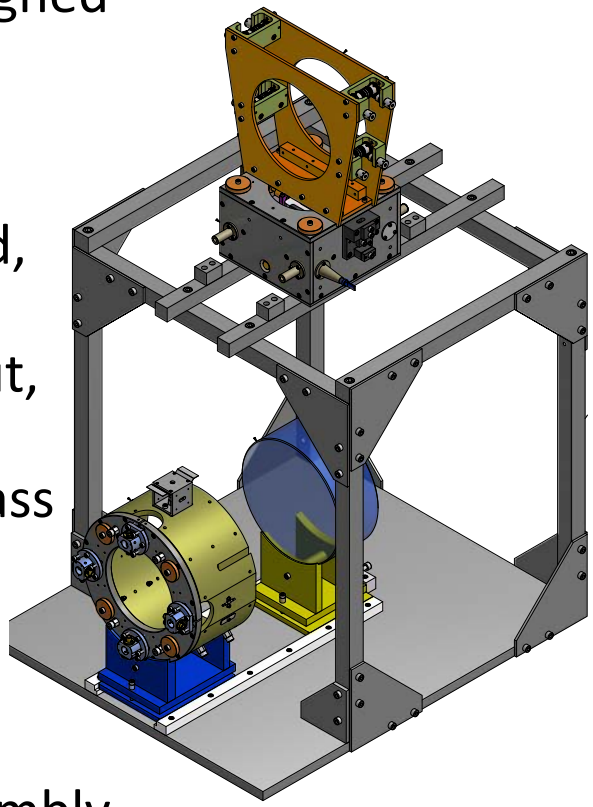
Assembly sequence

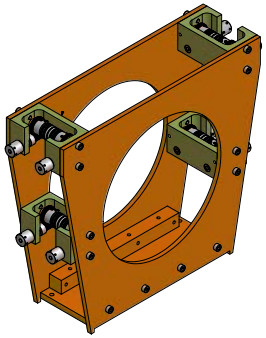
- Entire chain assembled on an assembly structure in a clean room
- Structure locked to safety structure at all levels
- Structure lifted and lowered in vacuum tank
- Chain freed for operation

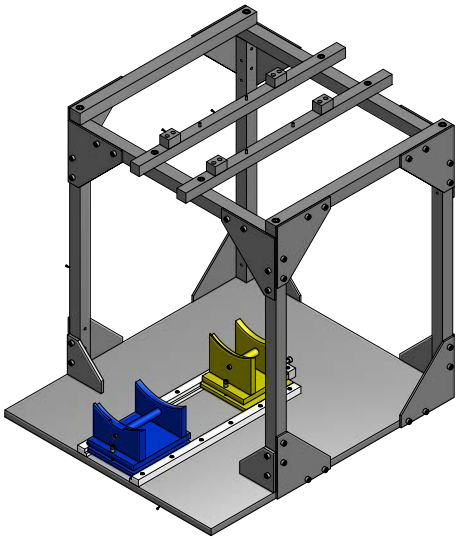


Mirror suspension sequence

- Mirror suspended to intermediate mass, aligned with winches
- Recoil mass slides in position
- Recoil mass suspended, aligned with winches
- Wires clamped, and cut, winch box removed
- Intermediate recoil mass mounted around intermediate mass
- Mirror locked with transport strut
- Moved to further assembly

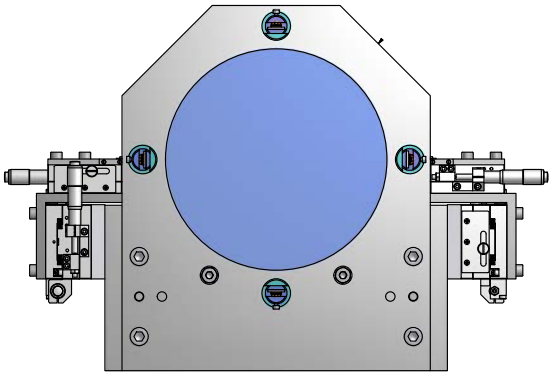


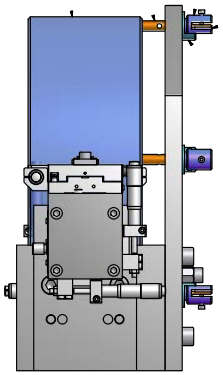


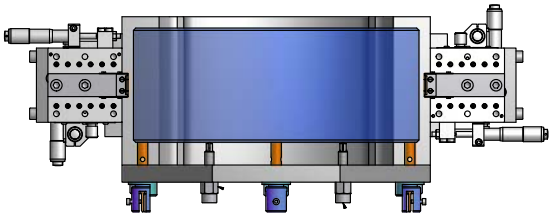


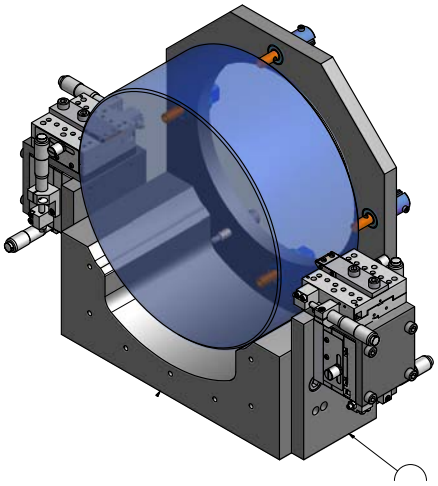
Mirror glueing jig

- Breakoffs micrometrically positioned
- OSEM flags pre-positioned
- Glue
- Remove jig



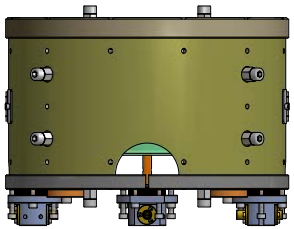
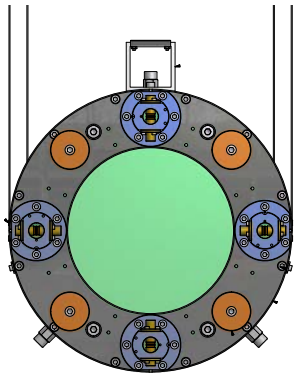
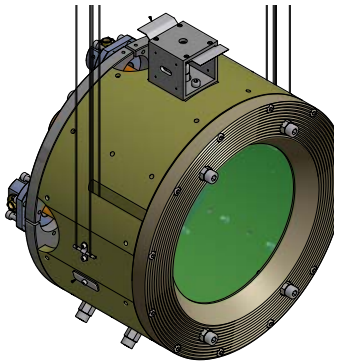
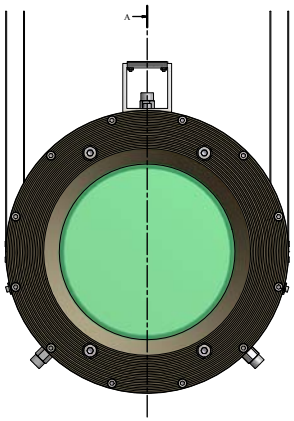
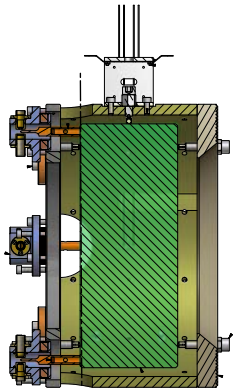
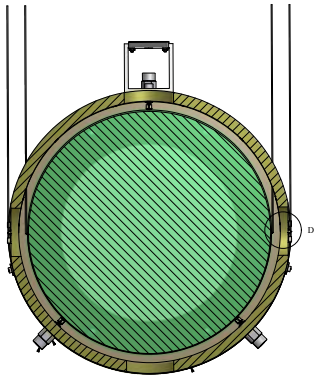
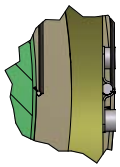






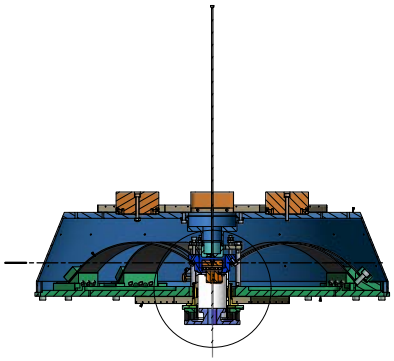
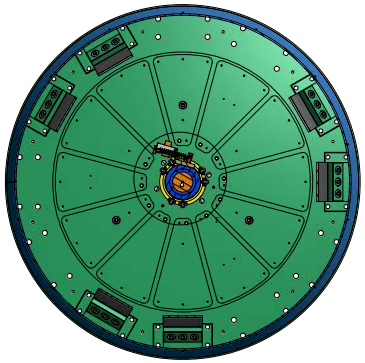
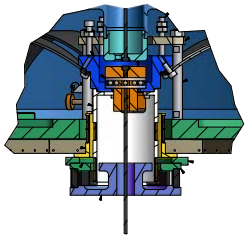
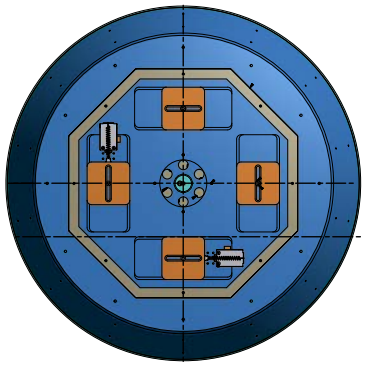
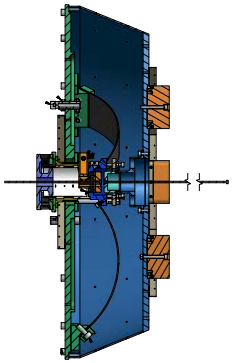
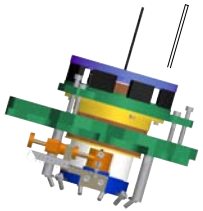
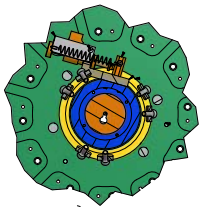
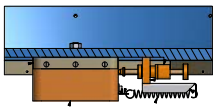
Mirror-recoil mass assembly

- Titanium used to reduce OSEM Eddy current back action
- DLC coating to absorb scattered light

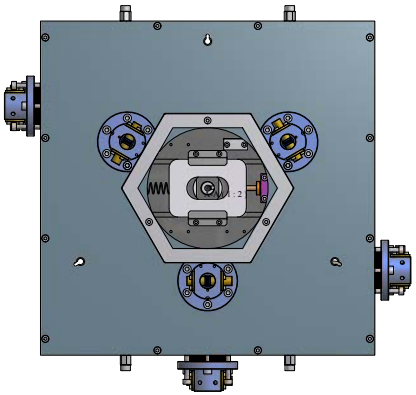
Bottom filter

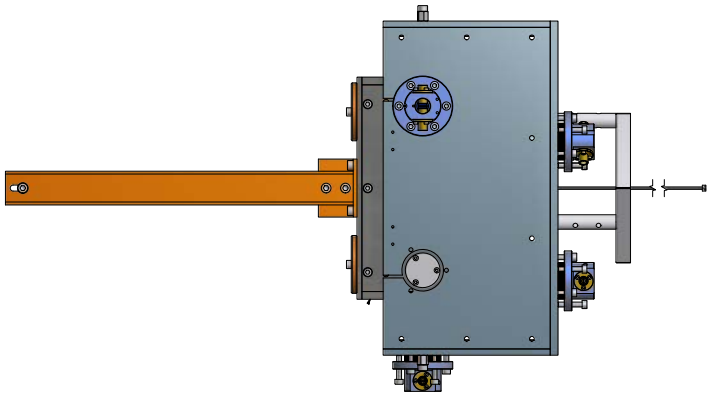
- Pitch-Roll alignment of suspensions
- Yaw alignment of intermediate mass and its recoil mass
- Similar to standard filter

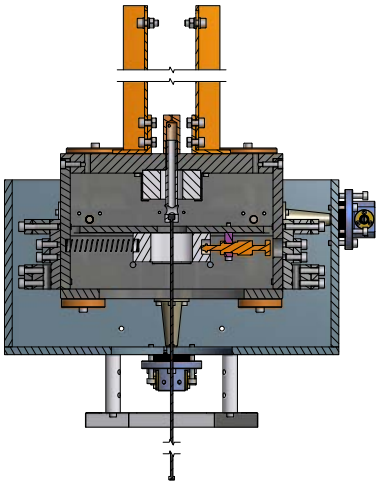









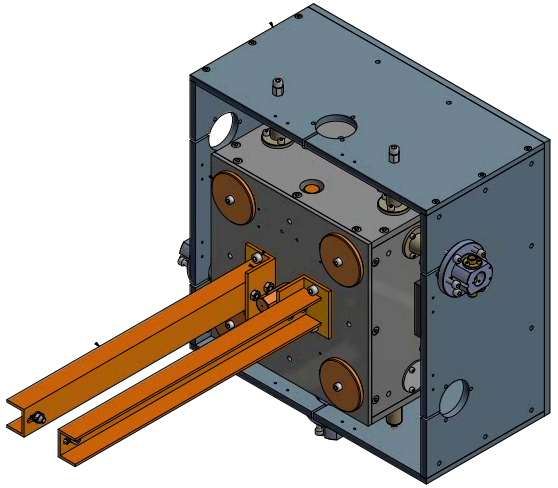
Intermediate mass assembly

- Pitch-roll static controls of test mass
- Six OSEM for coarse dynamic control of suspensions in all six degrees of freedom
- Diagonalized control matrix

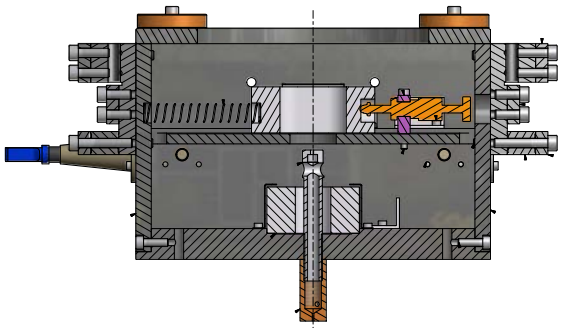


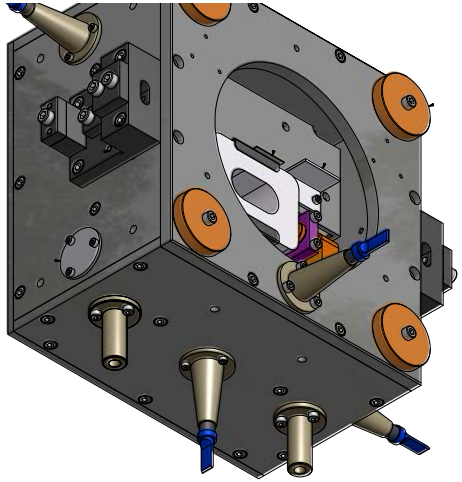


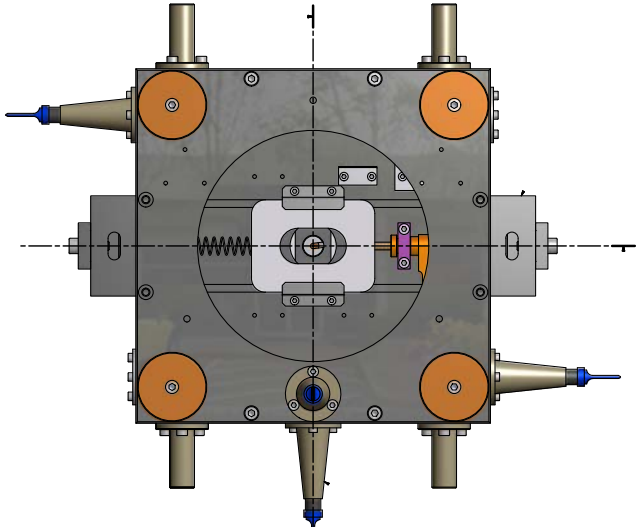


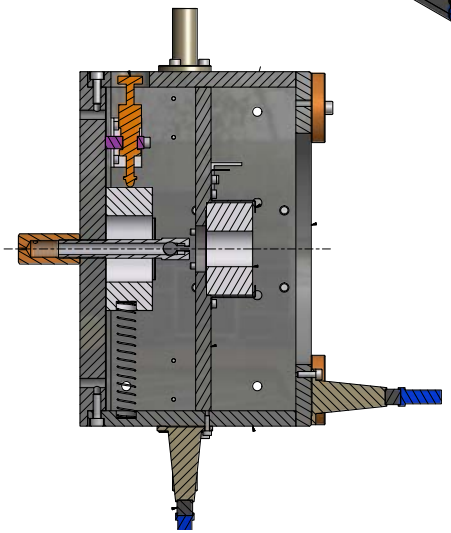


Intermediate mass









Intermediate recoil mass