Detector Mechanics

Noam Tal Hod, Benny Pasmantirer, Oz Diner

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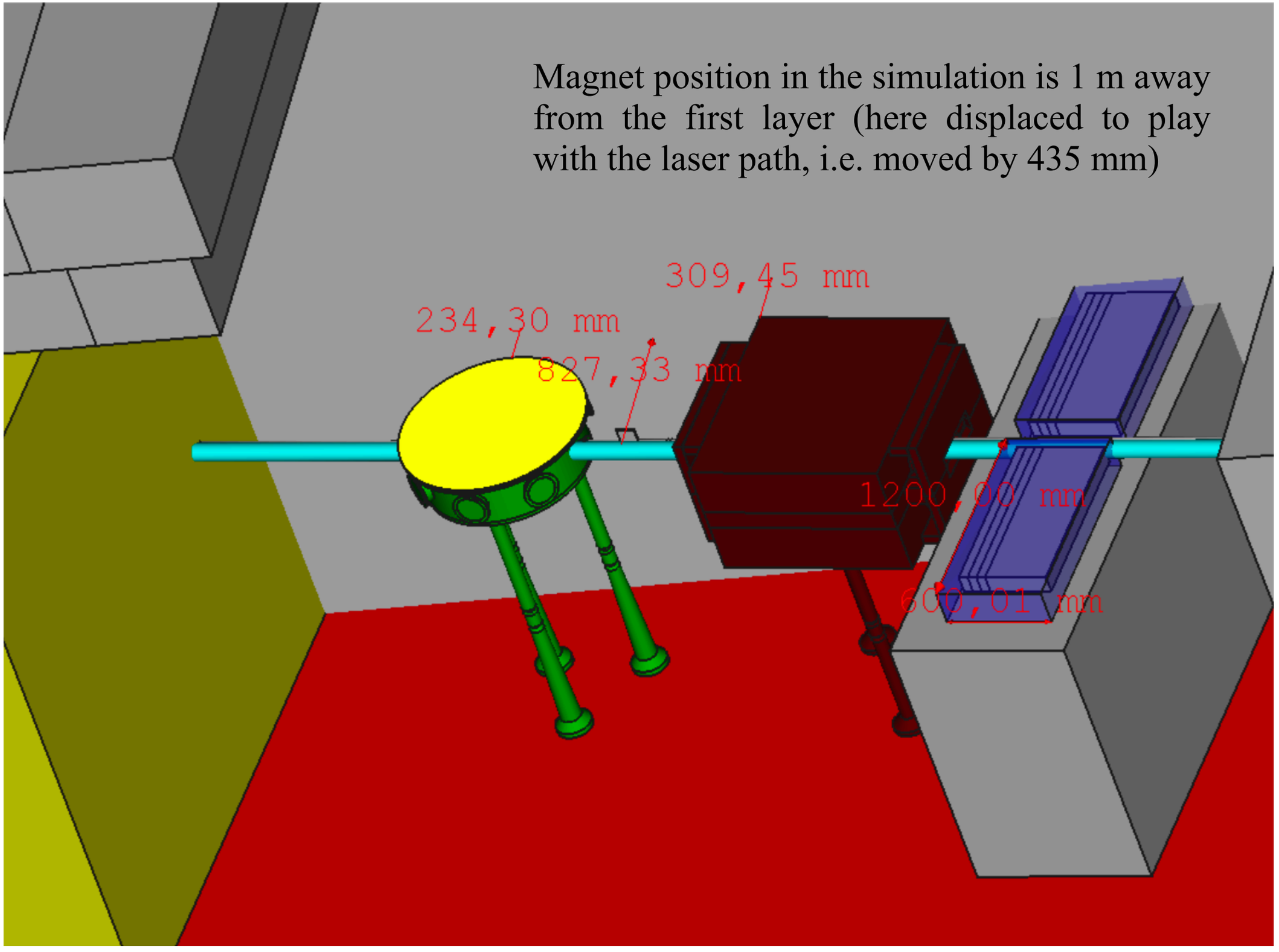
Driving principles

- **Precision**
  - Tracker alone: ~1% energy resolution and ~25 μm position resolution (details tomorrow)
  - Calo alone (Mykyta's slides): ~20% energy resolution and ~800 μm position resolution
  - Cherenkov: ???
  - Need to be able to know the relative position
    - between the tracker modules within ~25-50 μm (can compensate with sw)
    - between the calo modules within ~100 μm (?)
    - between the Cherenkov modules ???
    - tracker vs calo modules within ~100 μm (?)
  - Immune to vibrations

- **Compactness & coverage**
  - space available for the arm close to the wall (next slide)
  - minimum material budget
  - maximum acceptance per subsystem
  - space for power supply, FE elx, cooling, etc

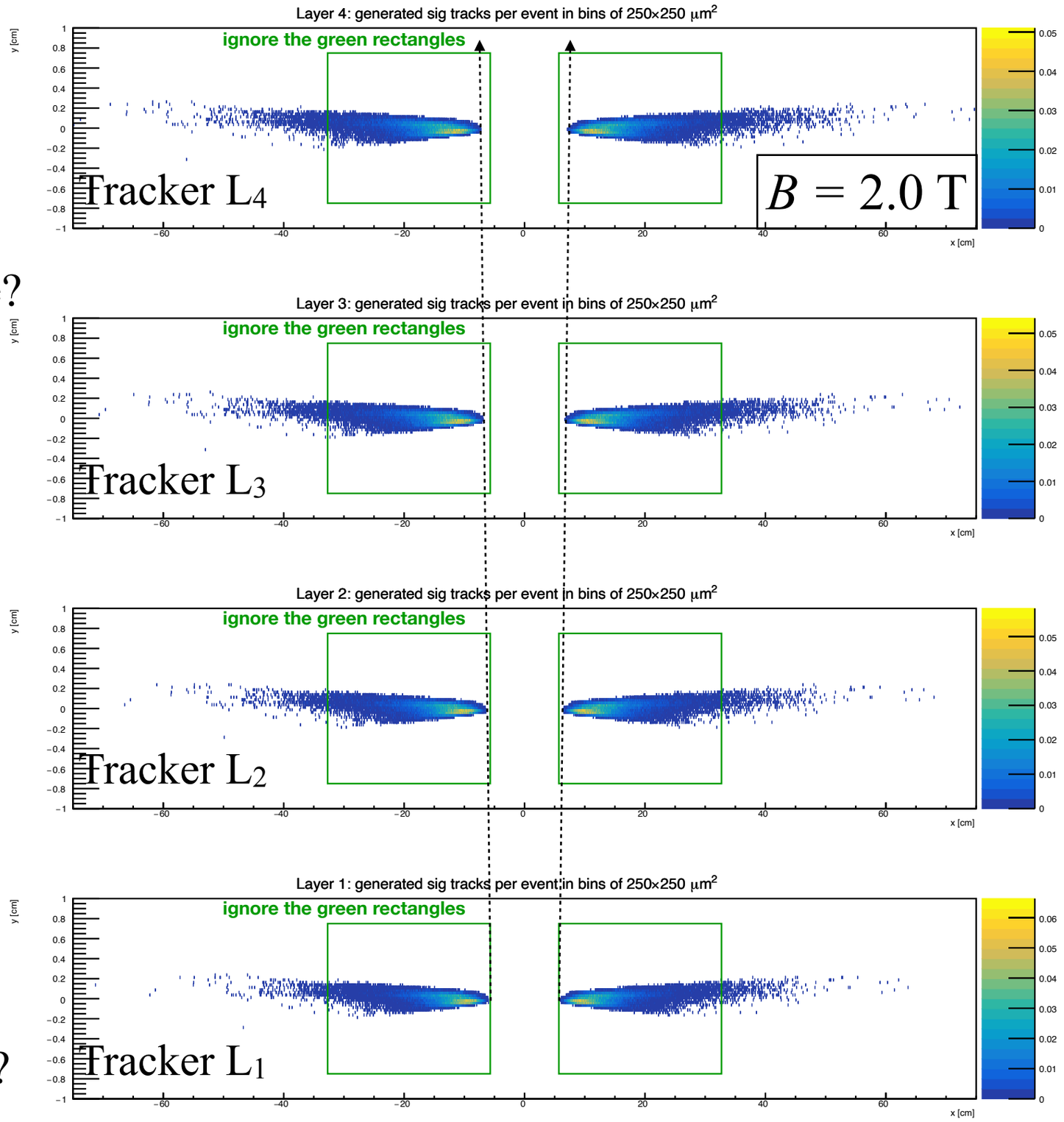
- **Modularity**
  - swap between setups from $e + \gamma_L$ to $\gamma_B + \gamma_L$
  - subsystems mounted on a single platform using the same mechanical interfaces
  - platform is remotely movable with respect to the beampipe and dipole

Existing CAD from Louis



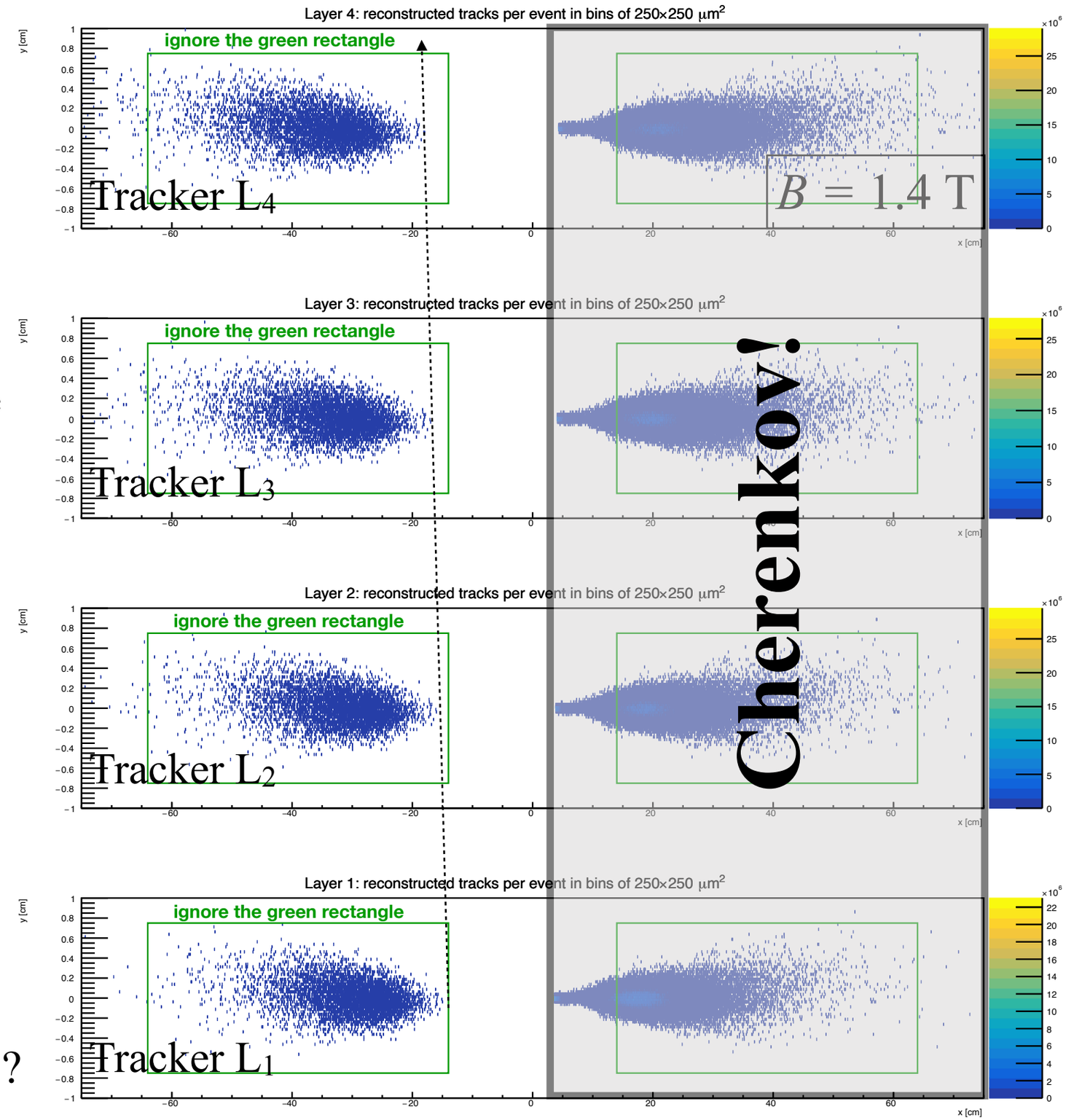
$\gamma_B + \gamma_L$ dimensions etc

- Magnetic field
  - assumed here: 2.0 T (max is 2.2 T)
- Distance in z from dipole to tracker L_1: assumed <u>1 m now</u> - already not possible?
- Distance in x from the beampipe centre to the active material edge
  - tracker: assumed <u>5.7 cm</u>
  - calo: same? maybe shifted a bit?
- Length in x of a single arm
  - tracker 27.12 cm (or up to ~50 cm)
  - calo: 55 cm (from Mykyta's slides)
- Distance in z from L_i to L_{i+1}
  - tracker: assumed 10 cm now
  - calo: as in <u>Mykyta's slides</u>
- Distance in z from tracker L_4 to calo L_1?

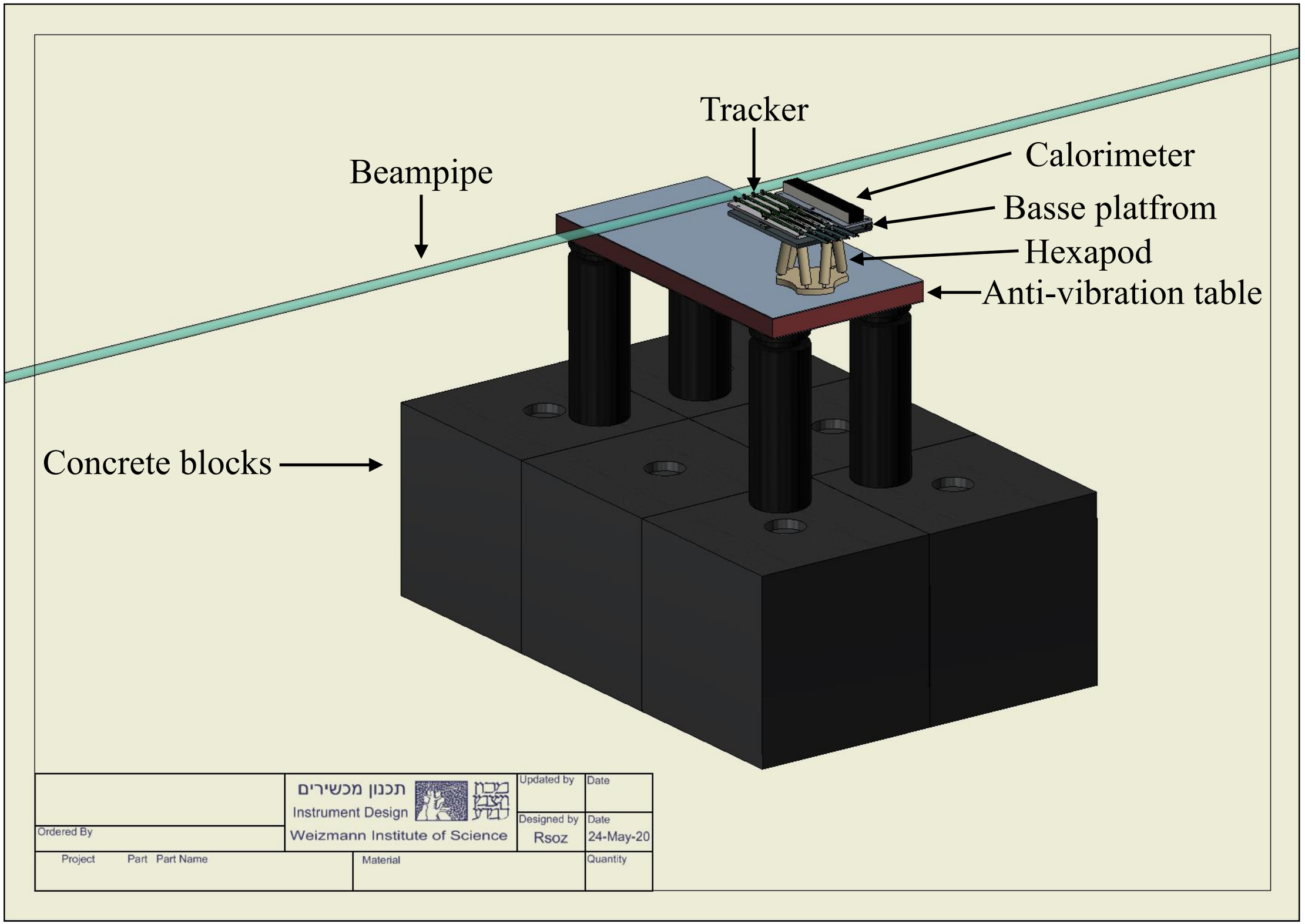


$e + \gamma_L$ dimensions etc

- Magnetic field
  - assumed here: 1.4 T (max is 2.2 T)
- Distance in z from dipole to tracker L_1: assumed 1 m now (same as for $\gamma_B + \gamma_L$)
- Distance in x from the beampipe centre to the active material edge
  - tracker: assumed 14 cm
  - calo: same? maybe shifted a bit?
- Length in x of a single arm
  - tracker 27.12 cm (or up to ~50 cm)
  - calo: 55 cm (from Mykyta's slides)
- Distance in z from L_i to L_{i+1}
  - tracker: assumed 10 cm now
  - calo: as in Mykyta's slides
- Distance in z from tracker L_4 to calo L_1?



$\gamma_B + \gamma_L$, one sided: overview



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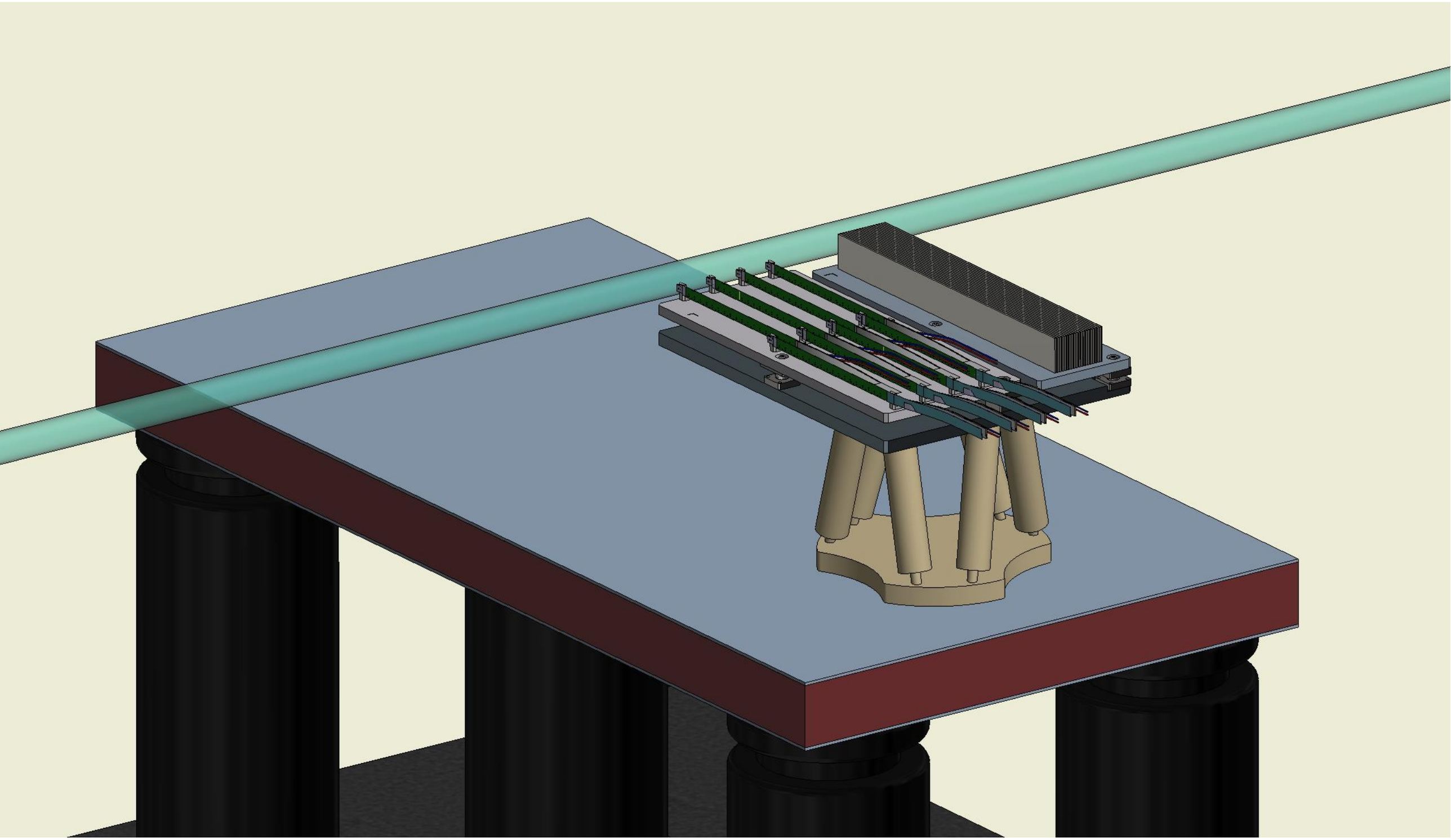

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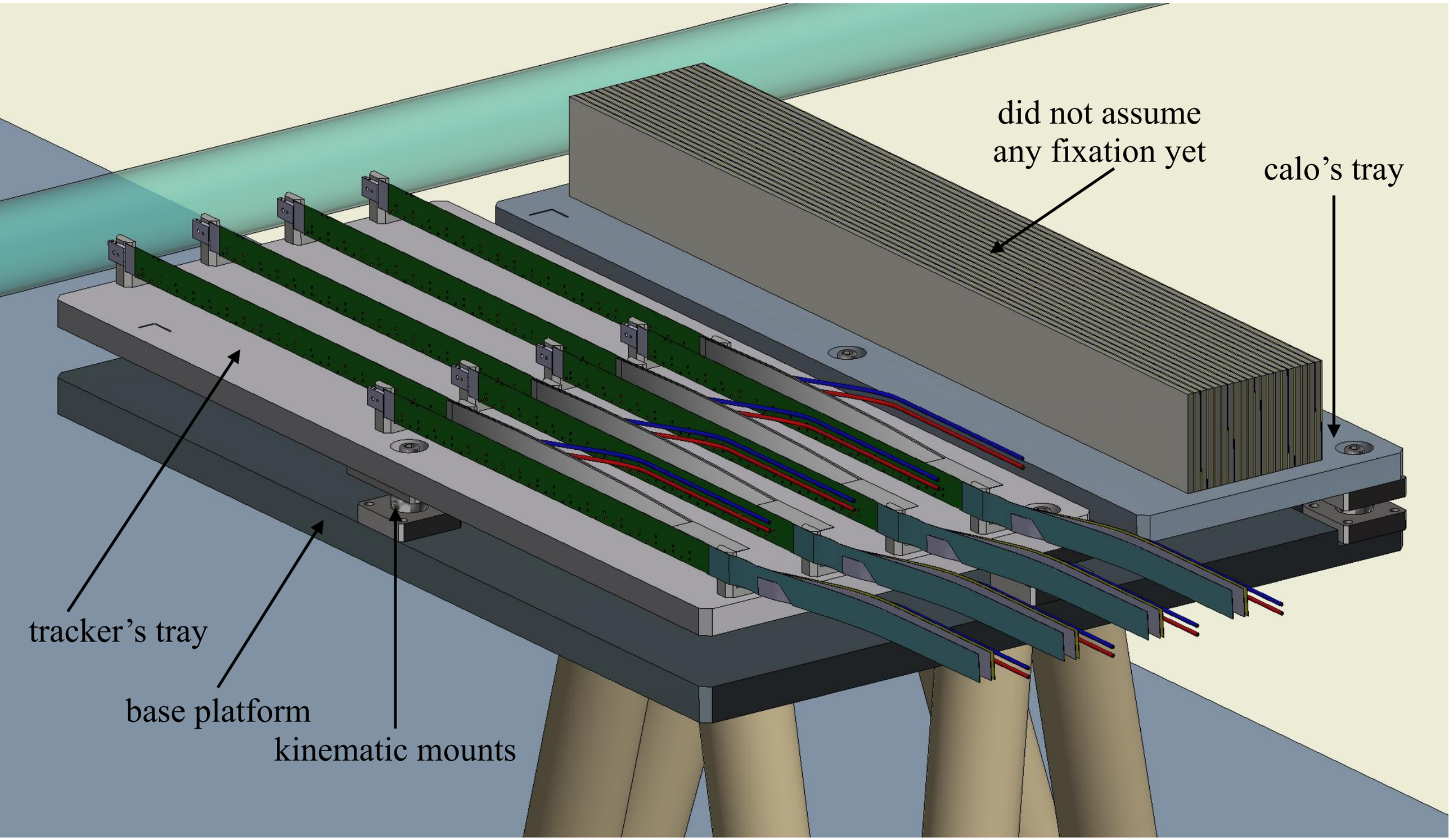
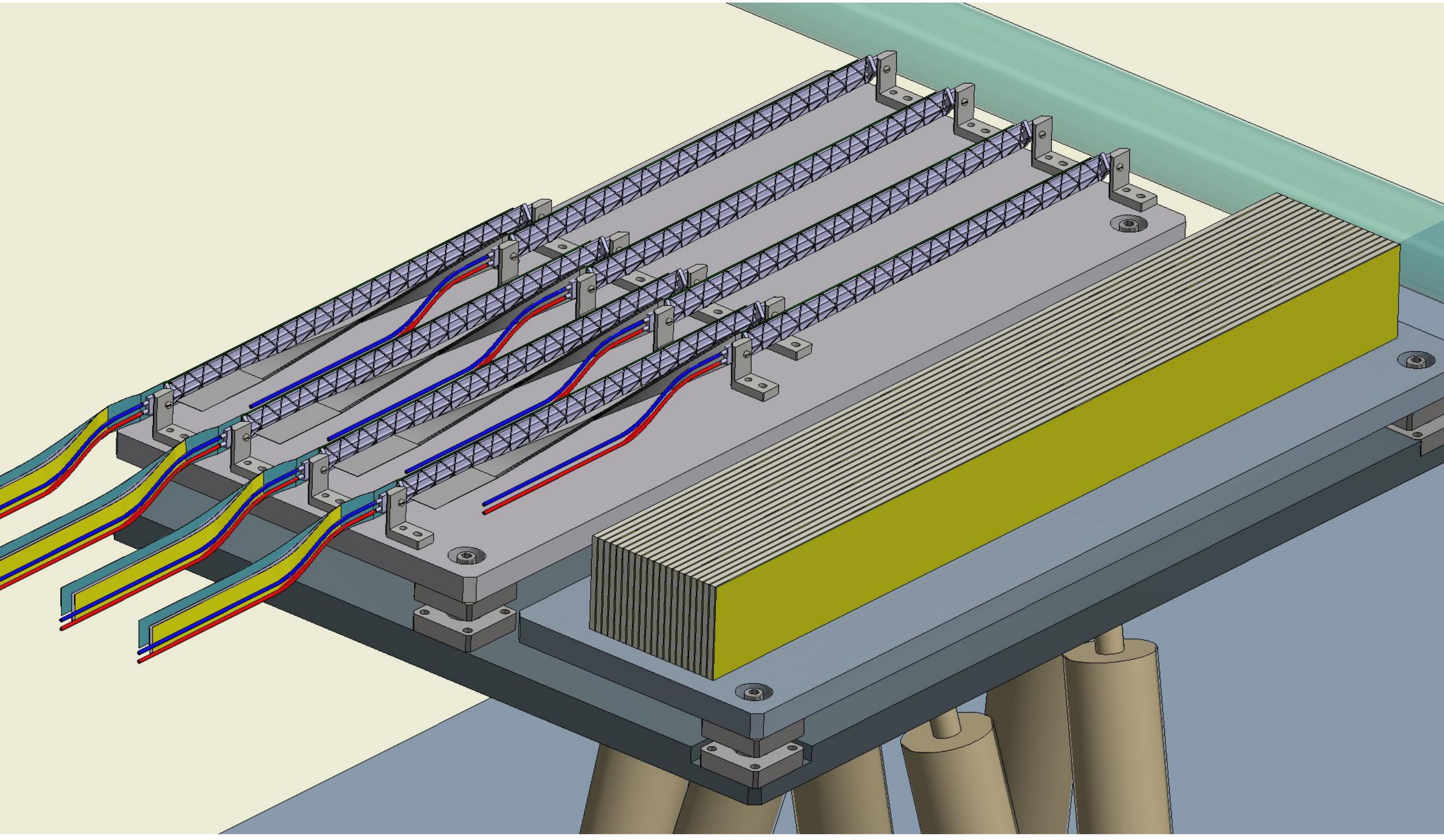
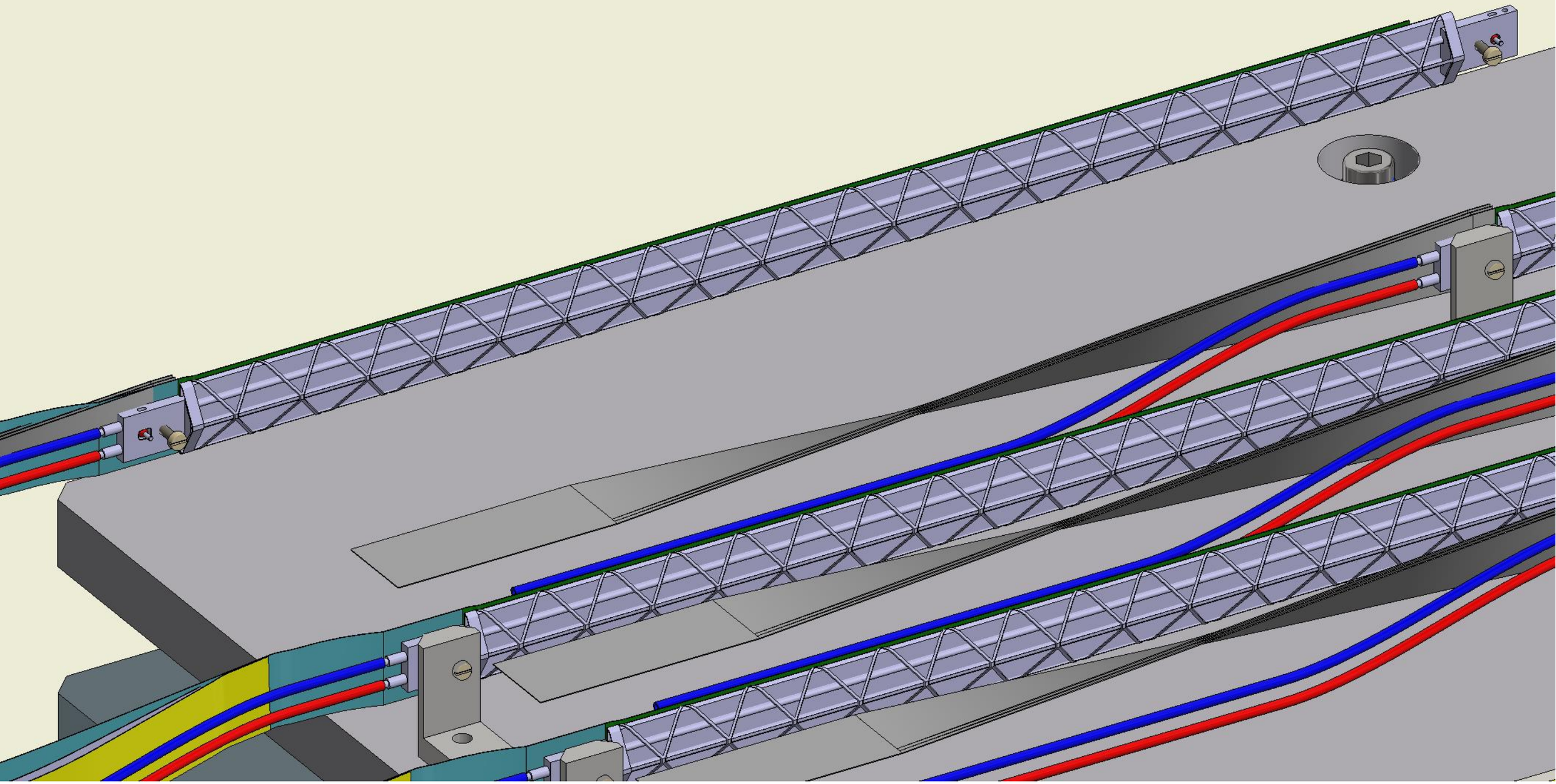


$\gamma_B + \gamma_L$, one sided: backview



$\gamma_B + \gamma_L$, one sided: stave fixation

L-shapes mounted with precision ruby-spheres



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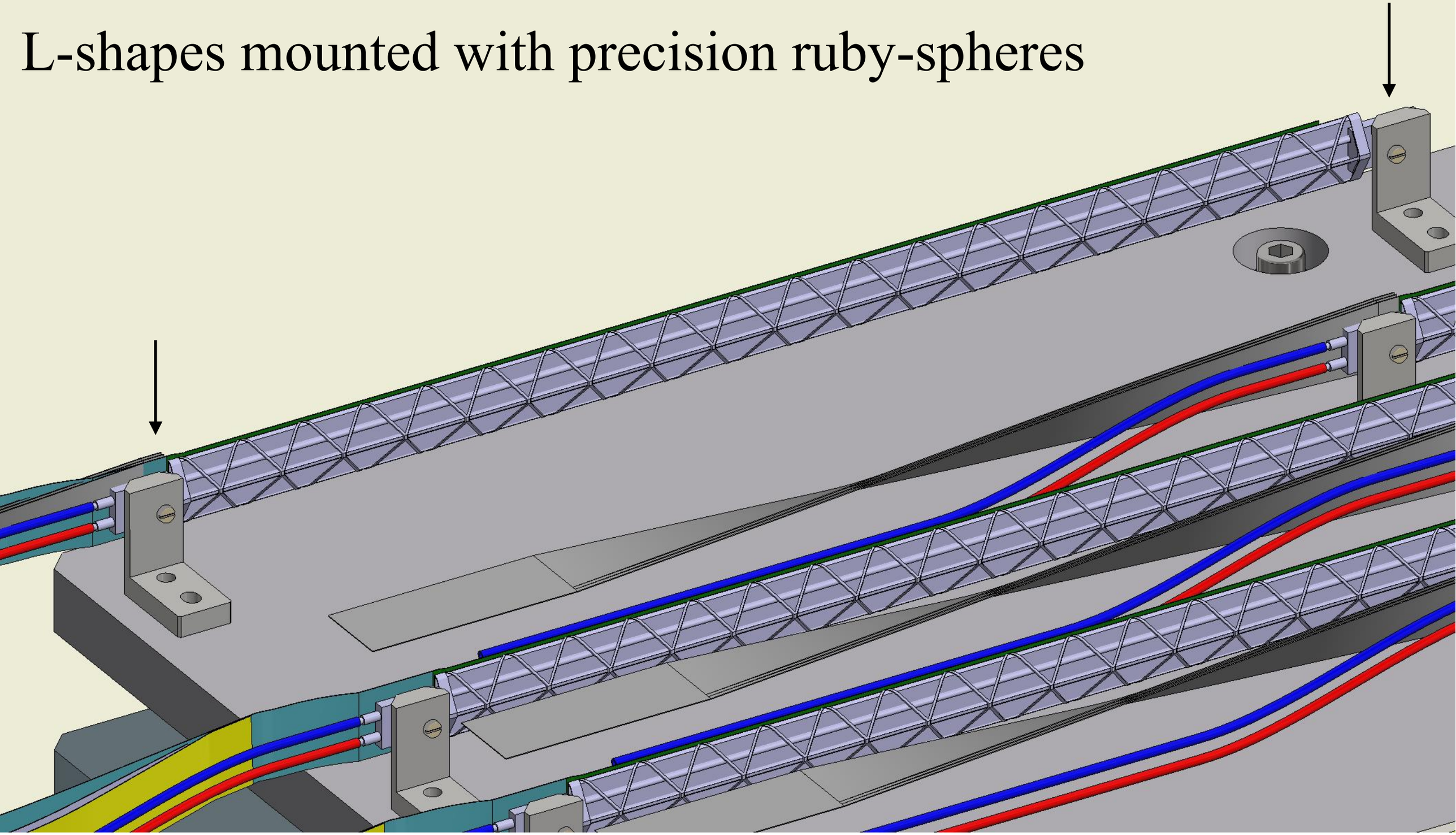

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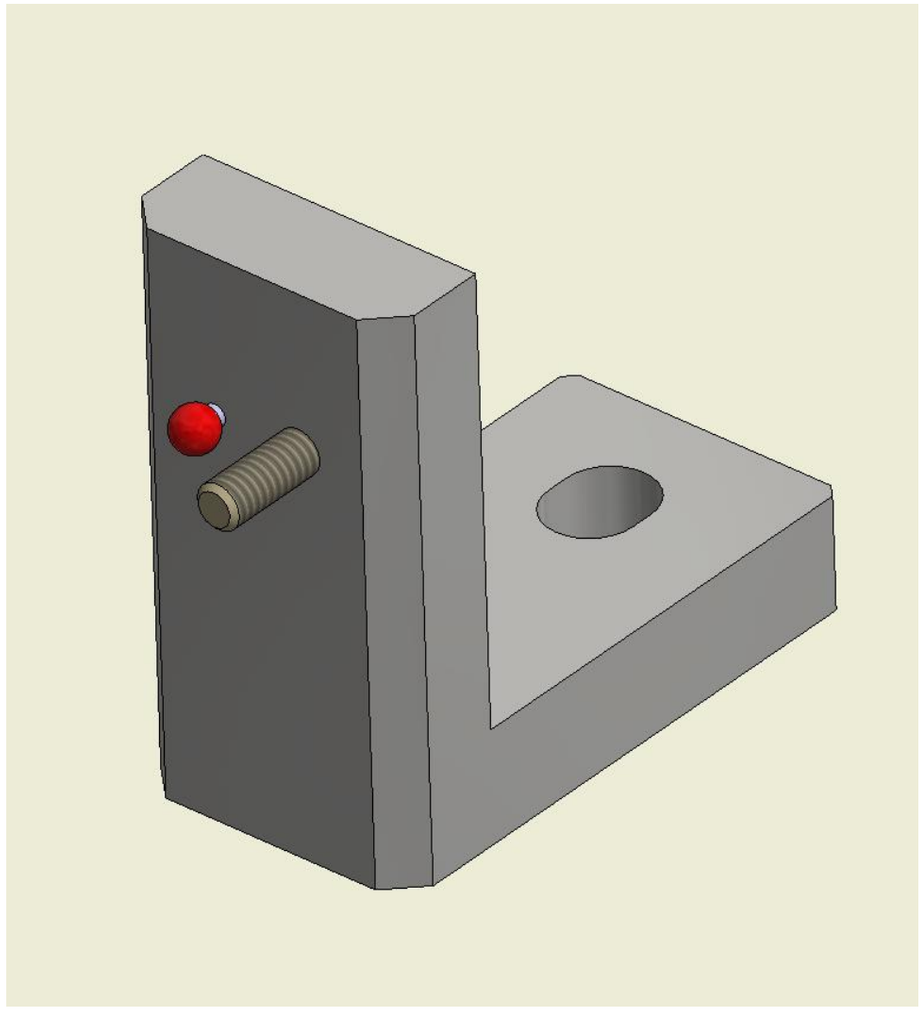
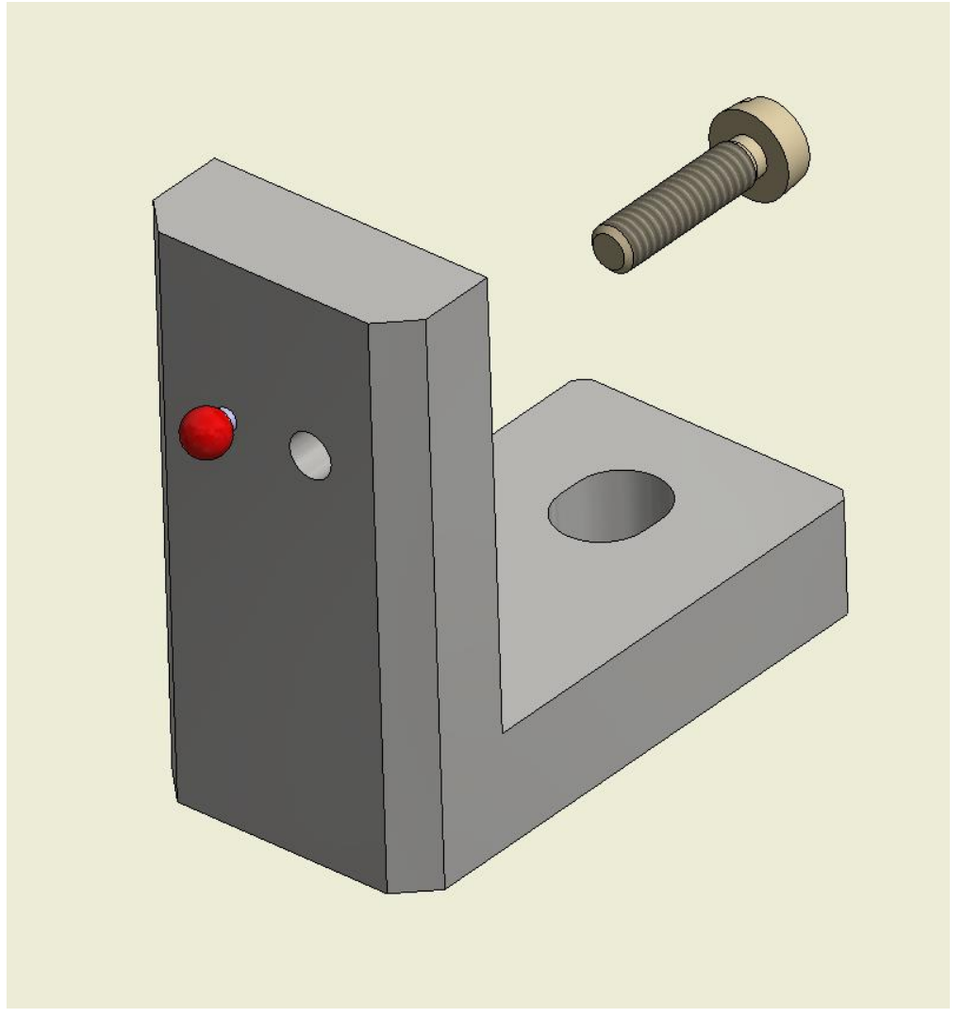
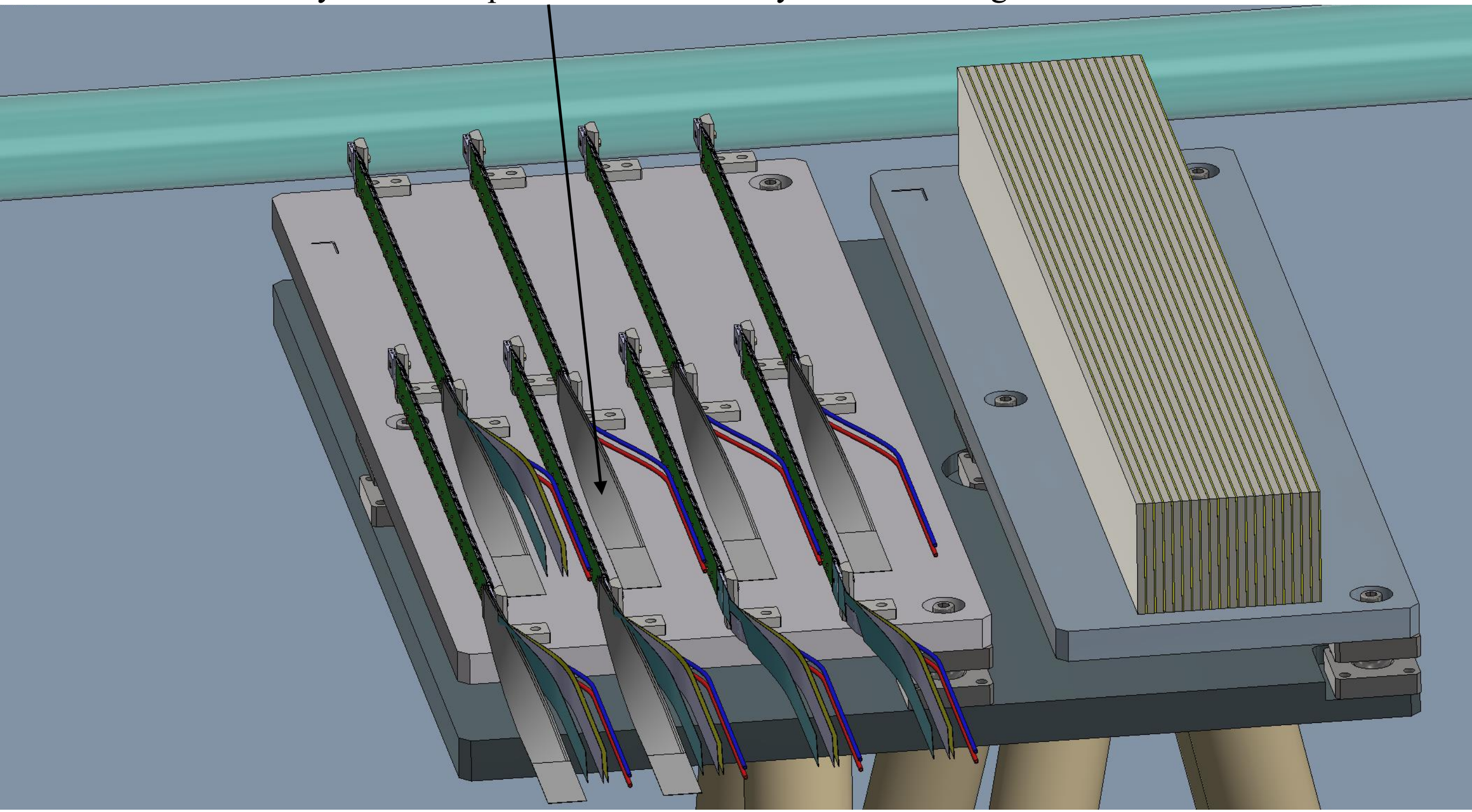


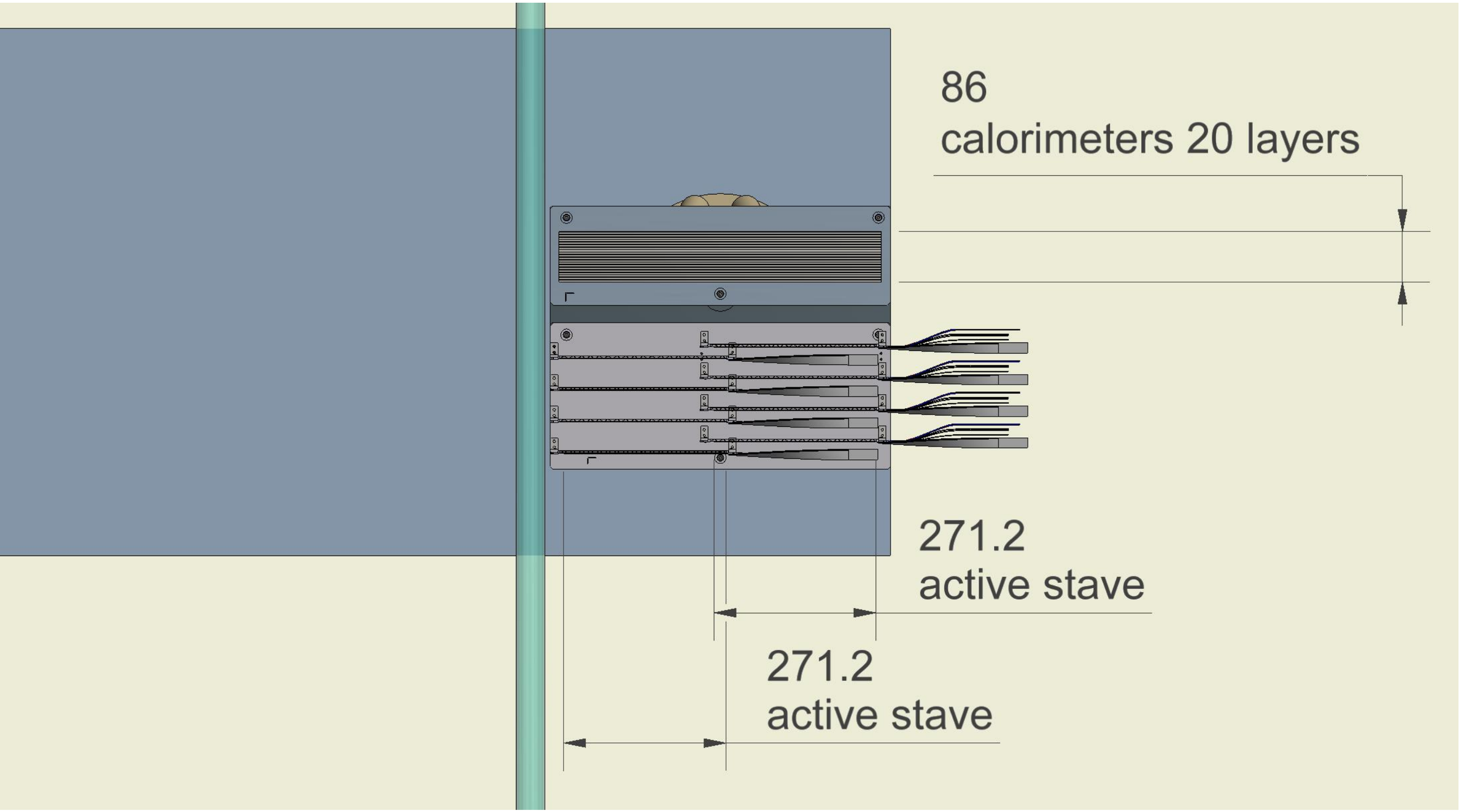


$\gamma_B + \gamma_L$, one sided: top view

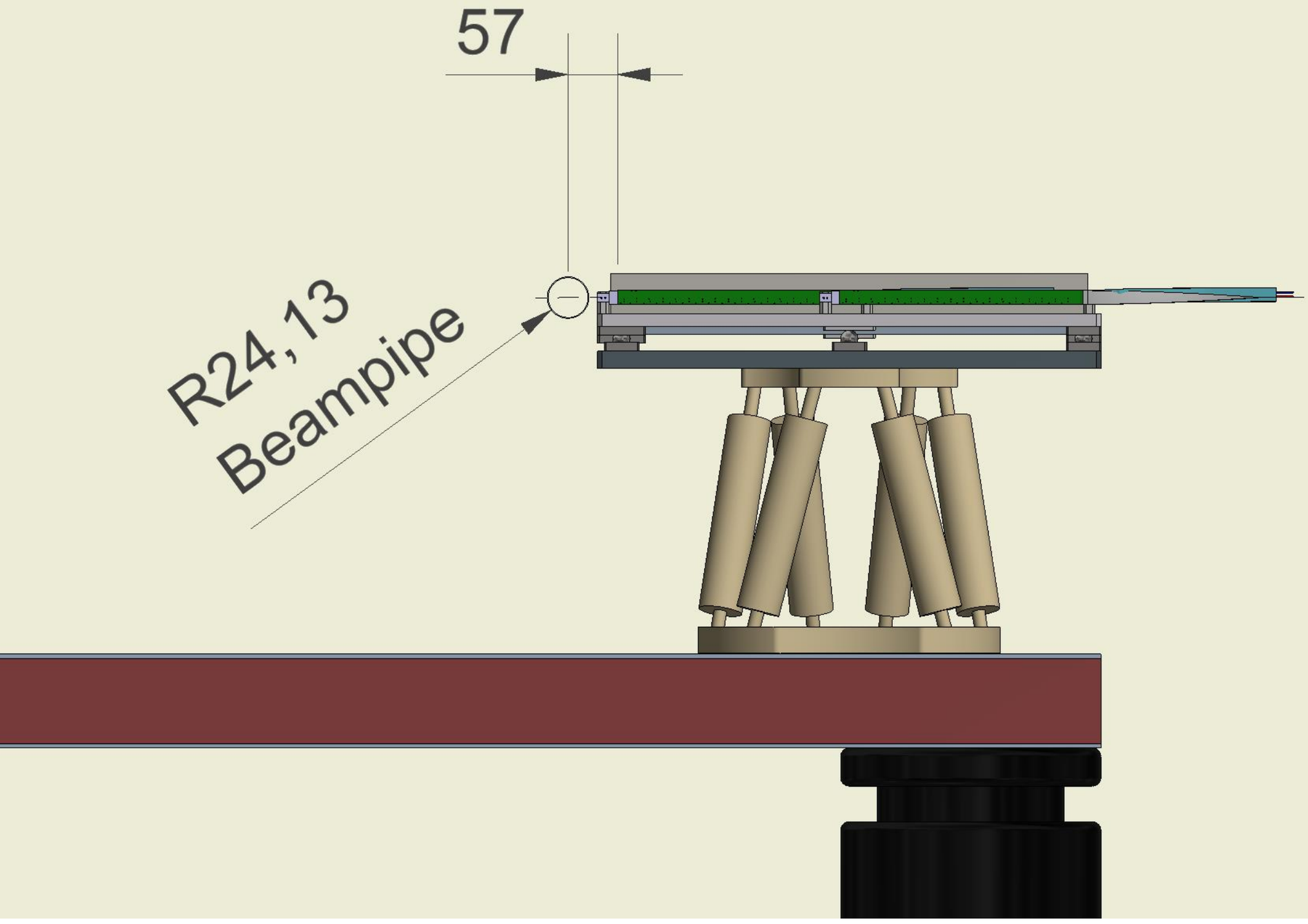
twist the flex interfaces (power and readout) to reduce material budget
but we're not sure yet if this is possible mechanically without damages



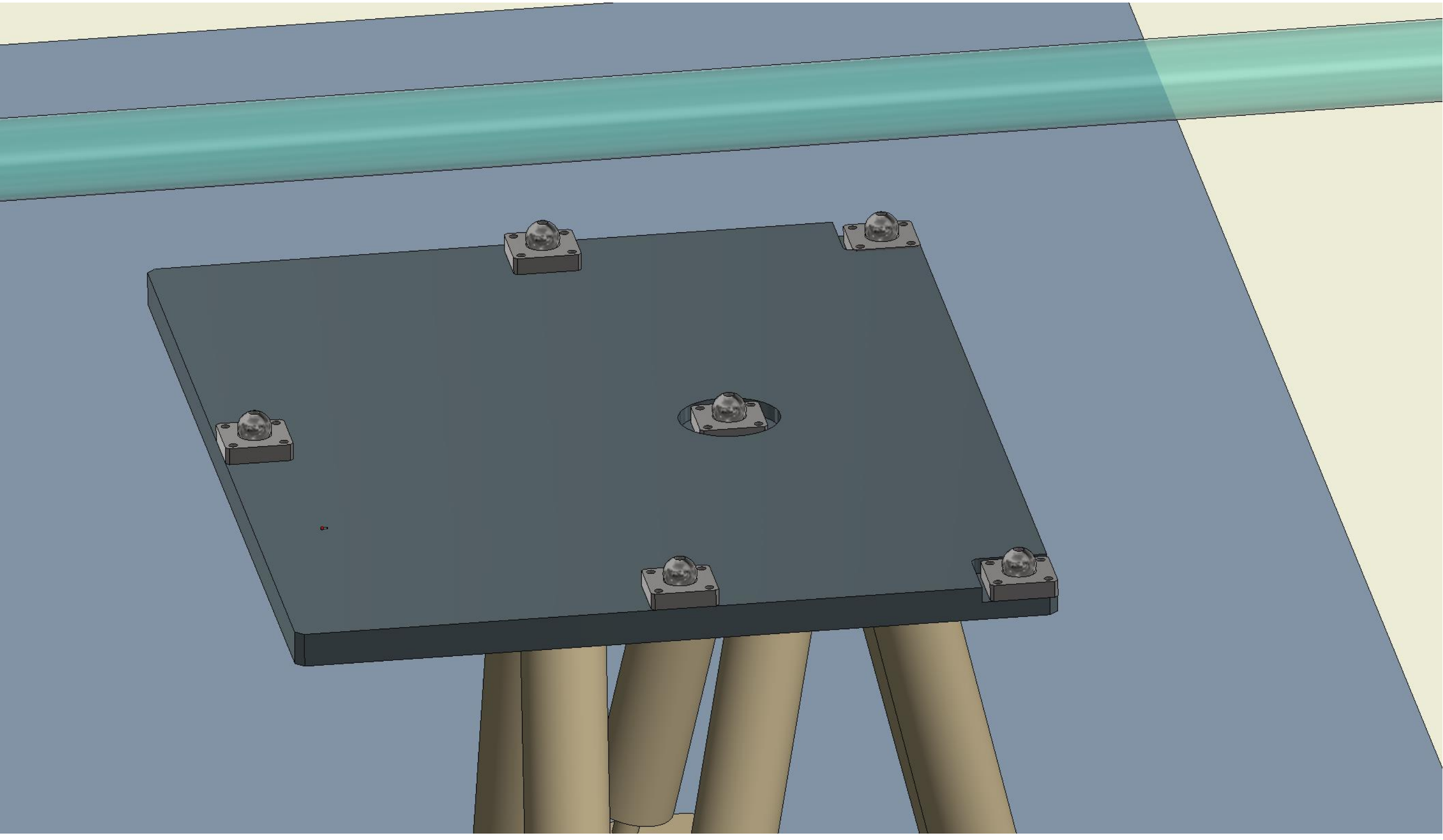
$\gamma_B + \gamma_L$, one sided: top view



$\gamma_B + \gamma_L$, one sided: head-on view



$\gamma_B + \gamma_L$, one sided: kinematic mounts



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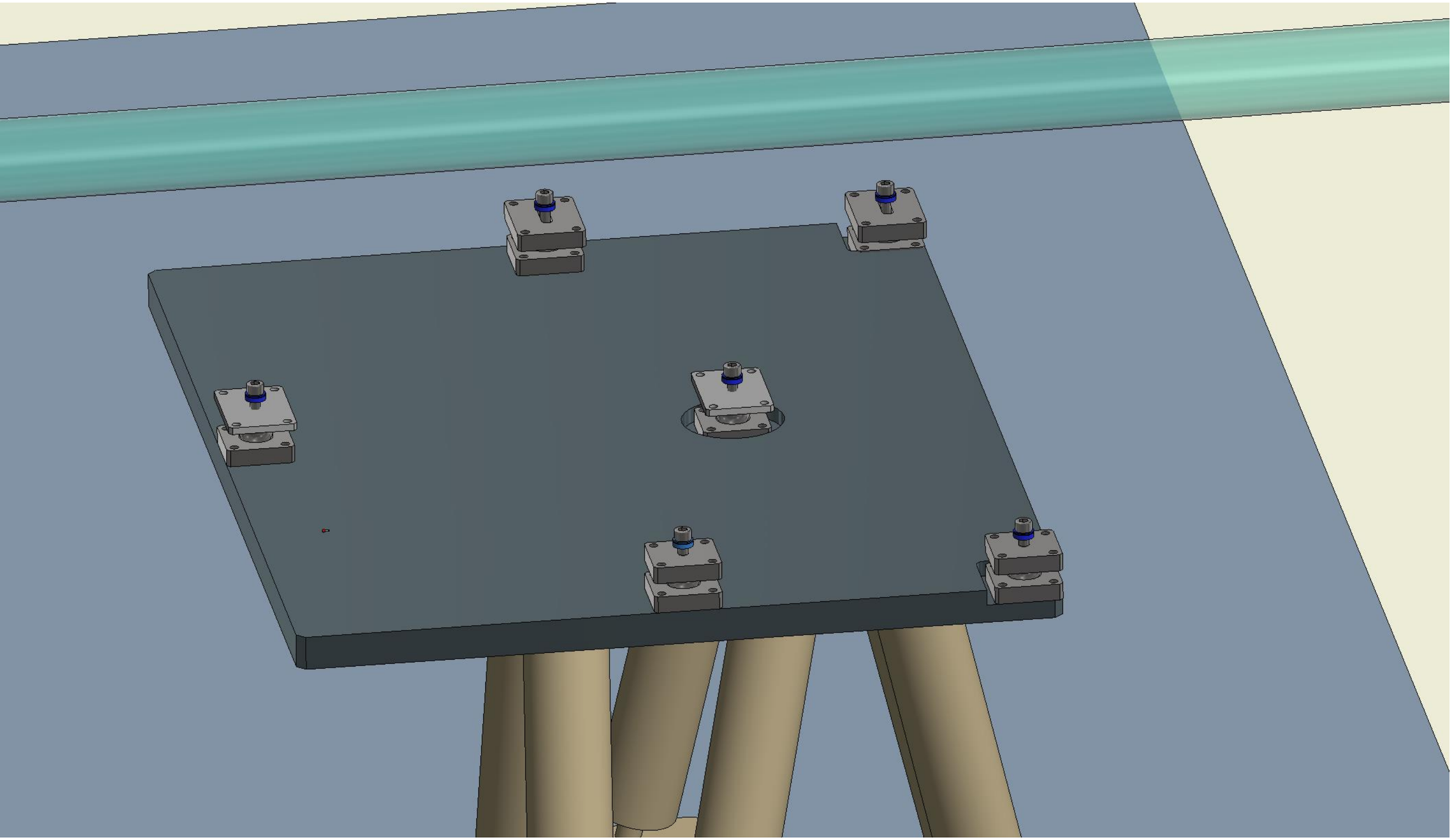

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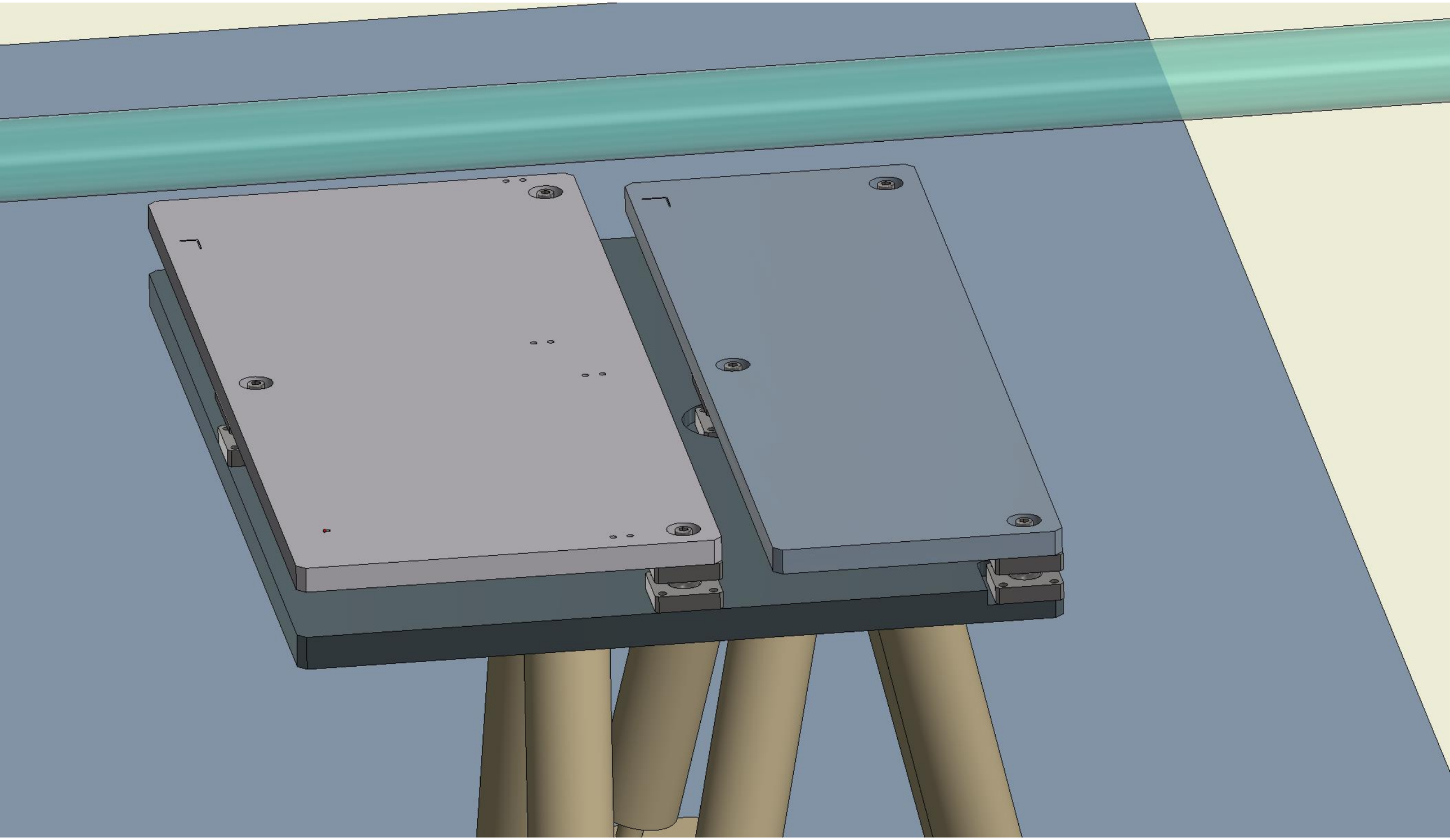

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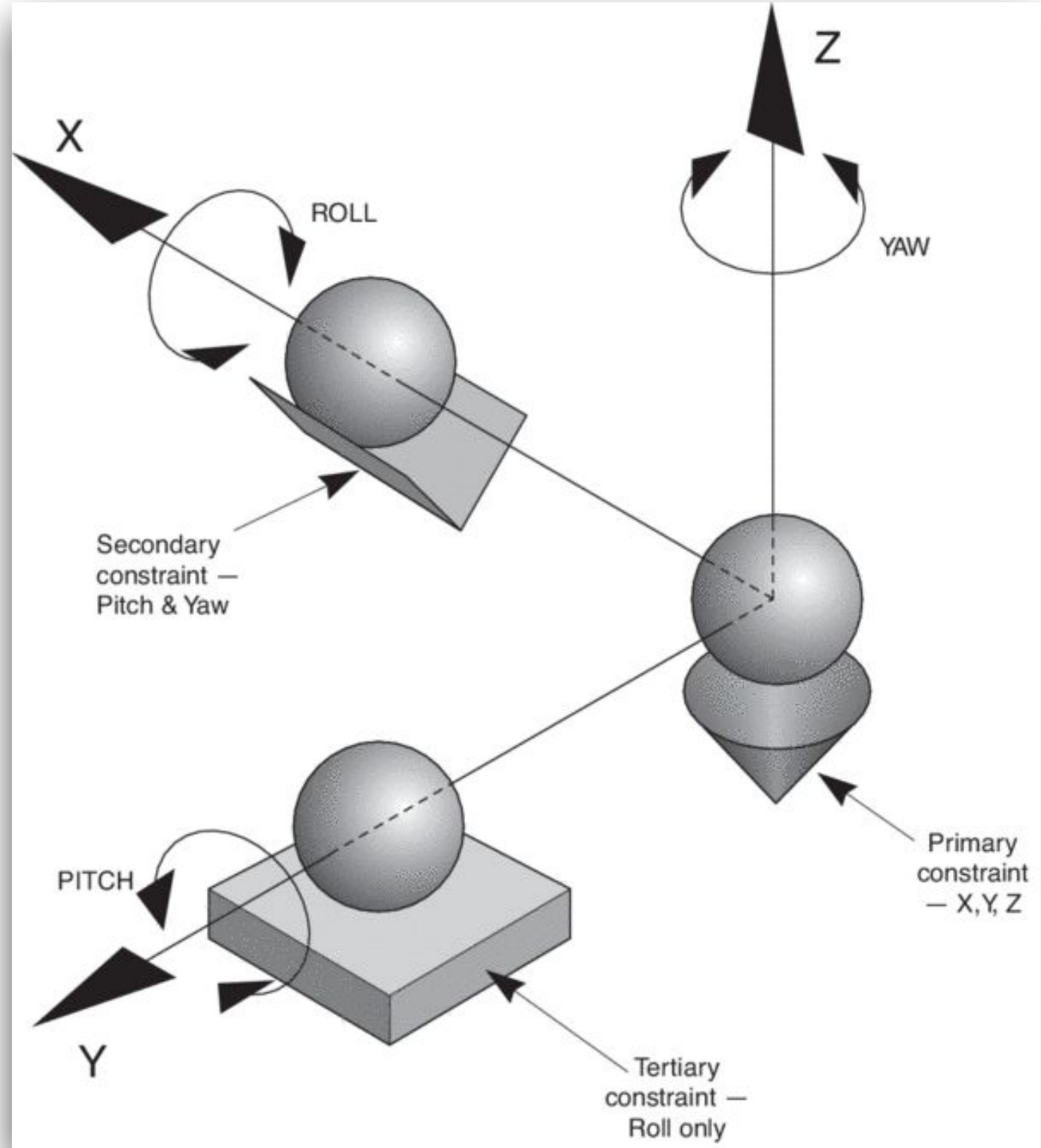
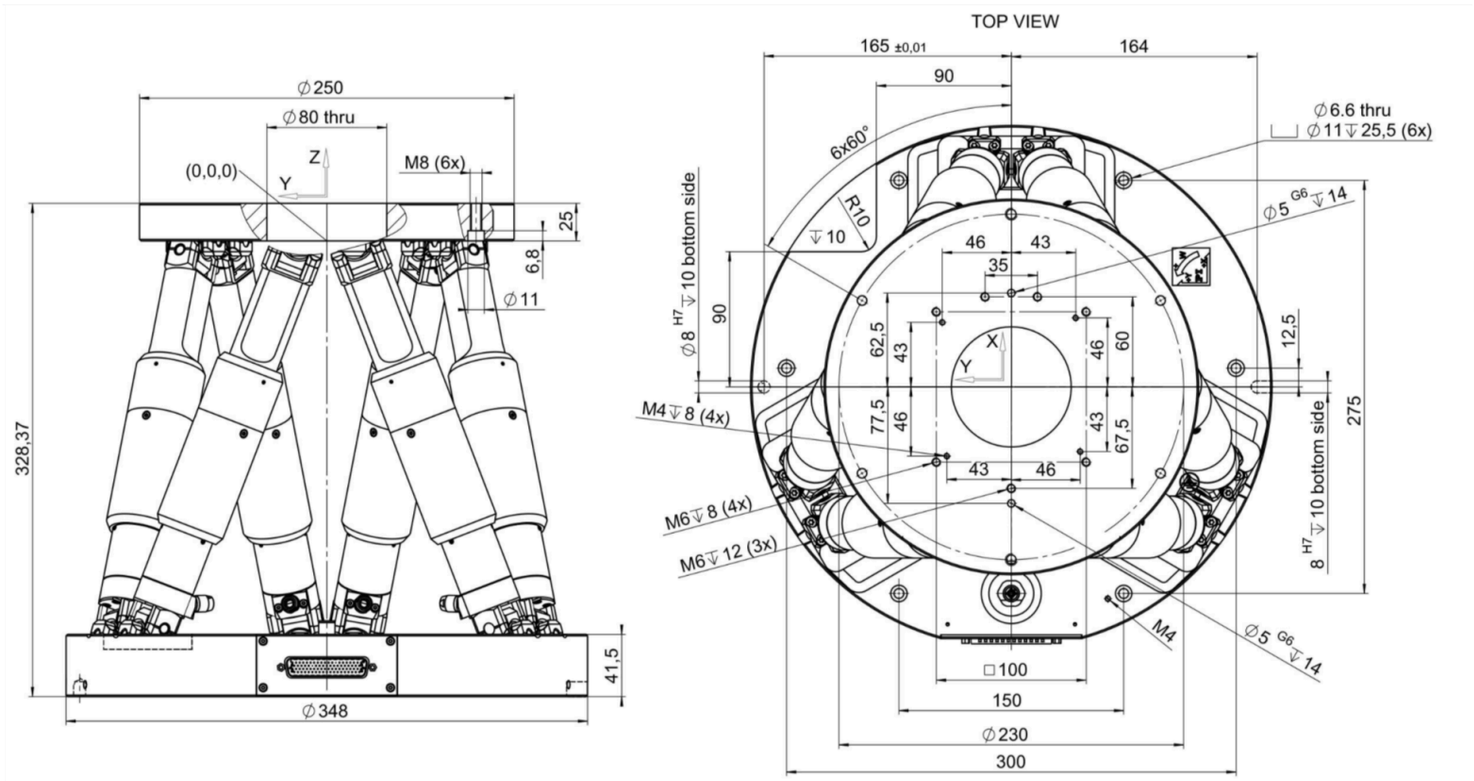


Hexapod

- H-850 6-Axis Hexapod
  - Load capacity to 250 kg
  - Repeatability to ±0.2 µm
  - Travel ranges to ±50 mm / ±30°
  - Actuator resolution to 2.5 nm
  - Variants with BLDC motors and absolute encoders
  - Works in any orientation



BACKUP