Module Length & Actuator Choice

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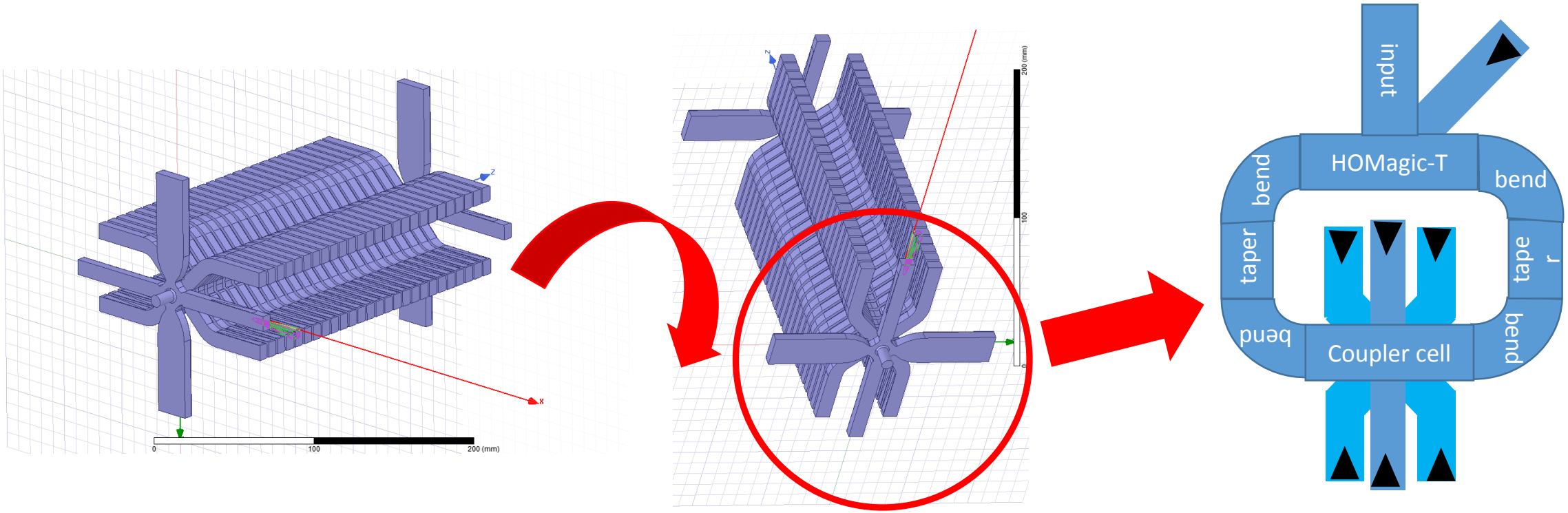
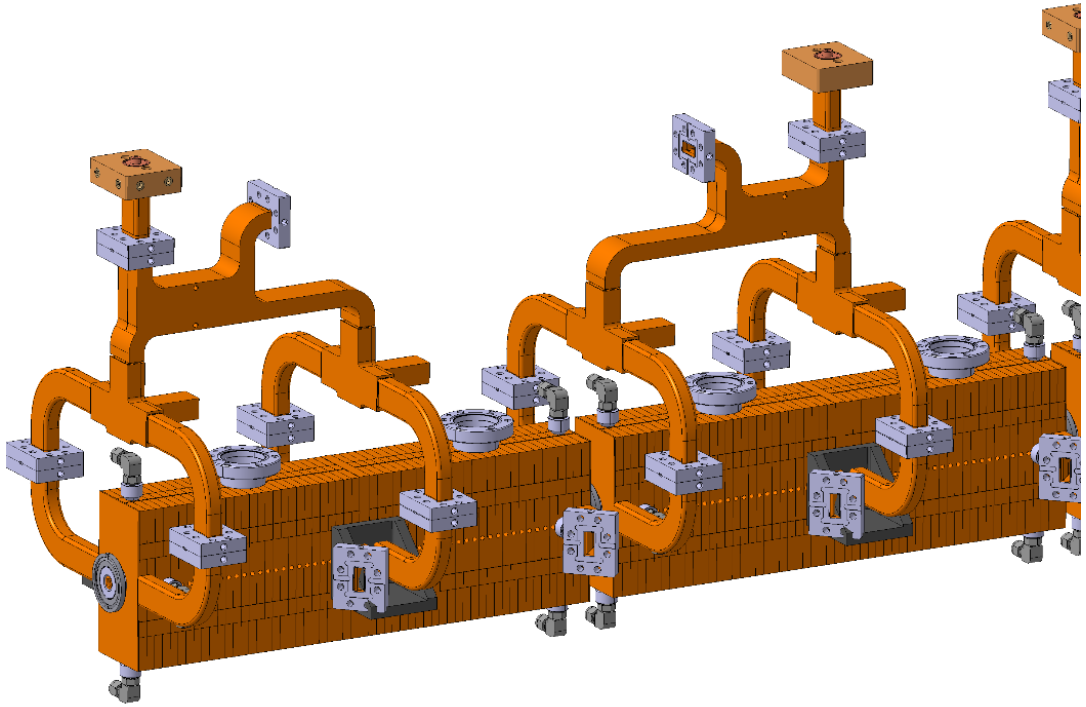
Rectangular Disc Structure

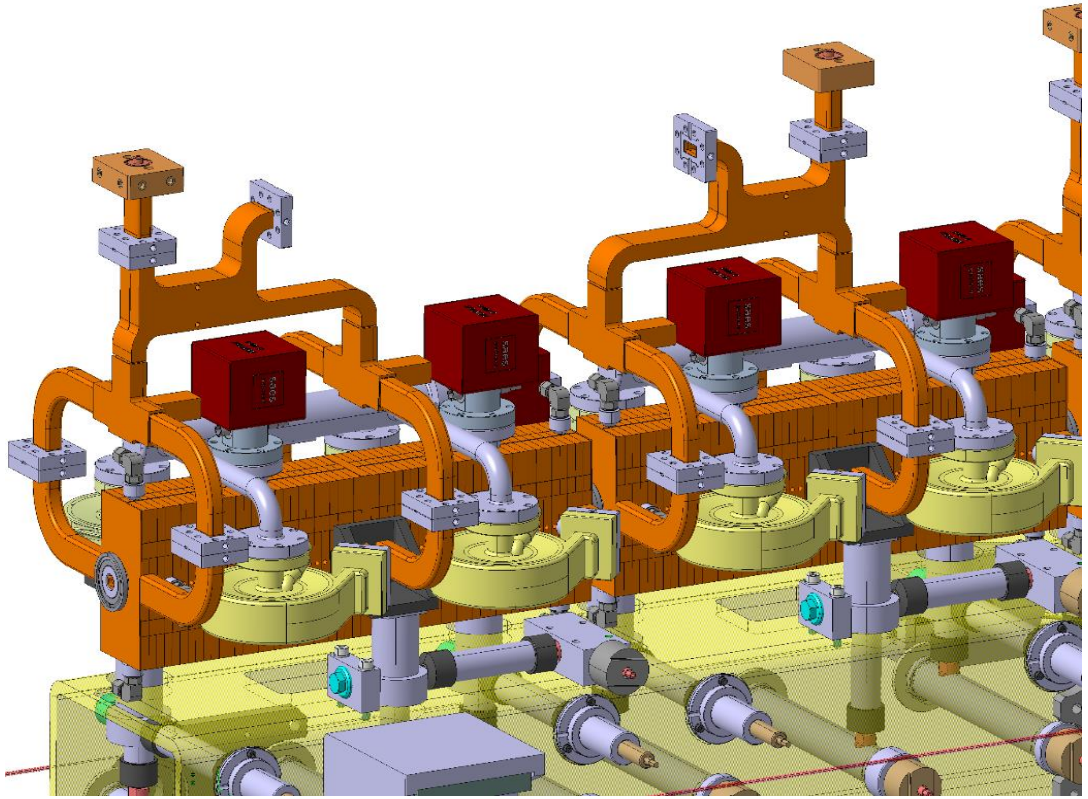
Slide curtesy of Alexej Grudiev
https://edms.cern.ch/nav/D:1989604:V1/D:1989604:V1



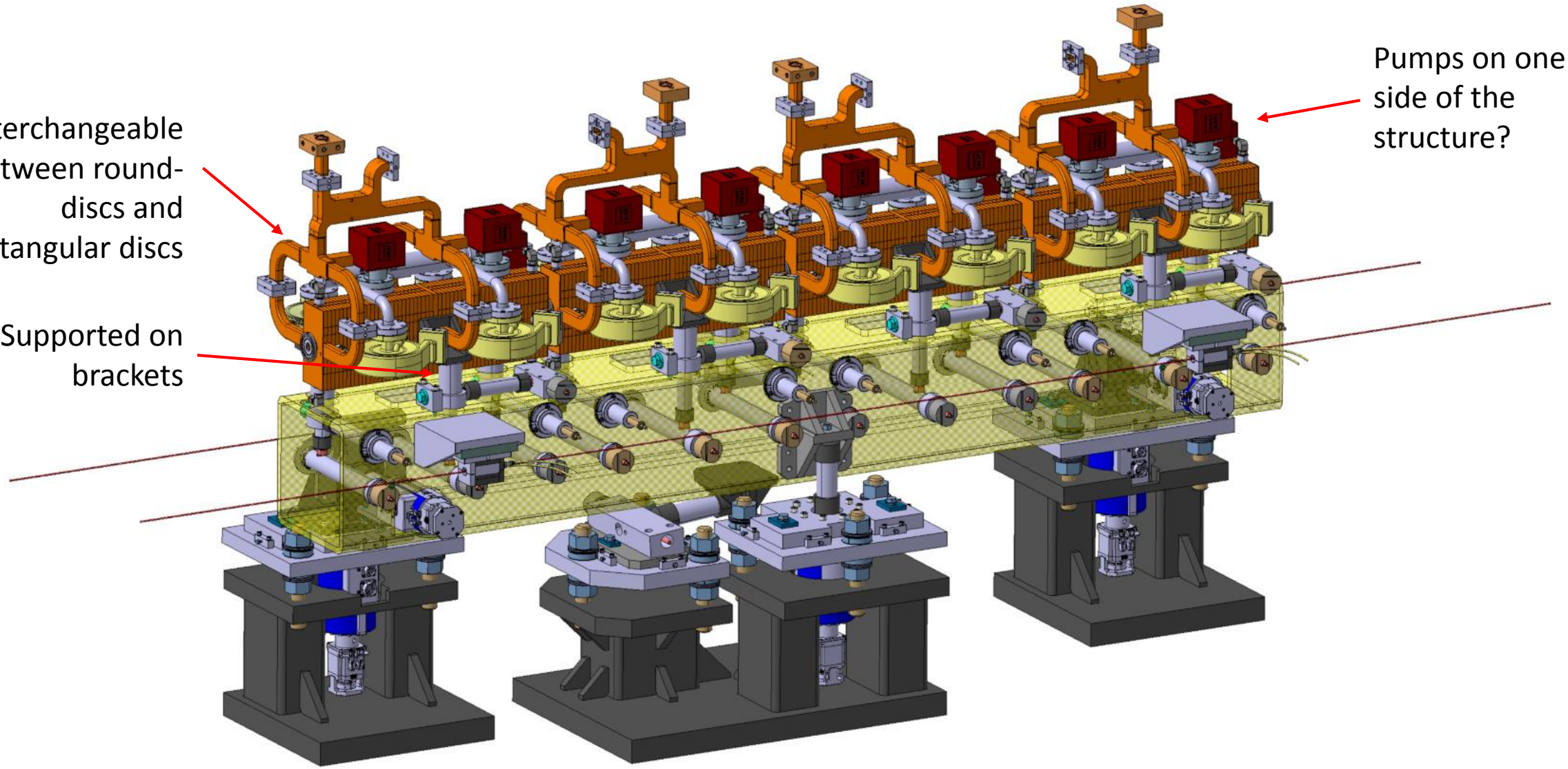
- Cells (regular and coupler) are the same as for kCLIC structure https://edms.cern.ch/document/1989604/1
- Damping waveguides are the same as for CLIC-Gstar: https://edms.cern.ch/document/1524527/1 This is still to be confirmed by GdfidL calculations, ongoing
- SiC damping loads are the same as for kCLIC structure. To be confirmed by GdfidL simulations, ongoing

Rectangular Disc Structure





Module


Interchangeable between round-discs and rectangular discs
Supported on brackets
Pumps on one side of the structure?

Length

- Klystron CLIC TD26 Structures (e.g. CLEAR)
  - 26 discs (8.319mm) + 4 coupler discs + structure connection (12.136mm) = 478mm structure length without interconnects
  - 4 interconnects (37.3mm[1.])
  - 2061.2mm flange to flange module length (~2030mm girder length?)
- DB CLIC 33 Disc Structures (PIP)
  - 33 discs (8.319mm) + 4 coupler discs + structure connection (12.136mm) = 561.2mm structure length without interconnects
  - 4 interconnects (37.3mm[1.])
  - 2394mm flange to flange module length

1. Increased from the nominal 25mm to allow 3mm offset between structures and a fixed flange on one side

Length

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  - 2061.2mm flange to flange module length (~2030mm girder length?)
- DB CLIC 33 Disc Structures (PIP)
  - 33 discs (8.319mm) + 4 coupler discs + structure connection (12.136mm) = 561.2mm structure length without interconnects
  - 4 interconnects (37.3mm)
  - **2394mm flange to flange module length**
  - **Longer than the 2310mm available space in the lab**

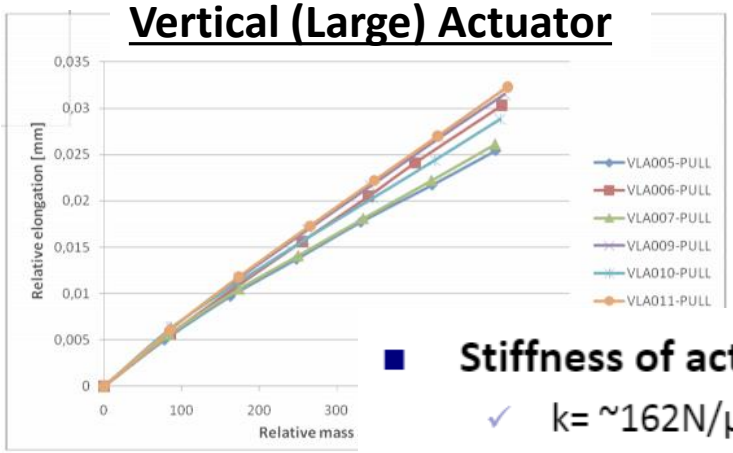
Actuators (Stiffness)

Specification

The functional requirements concerning the high resolution linear actuators are given in Table 6.

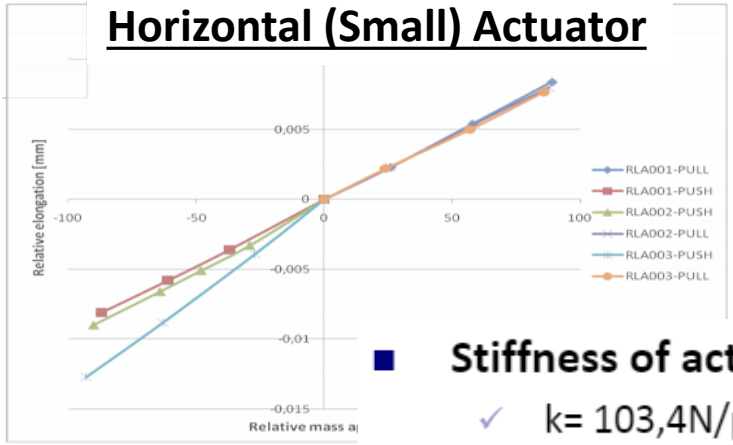
Requirements	Type of high resolution linear actuator	
	RLA	VLA
Range on each axis	± 3 mm	± 3 mm
Minimum effective displacement over the whole range (resolution)	0.5 µm	0.5 µm
Load capacity	< 100 kg	< 500 kg
Maximum transversal force at actuator piston	<0.8kN	<1kN
Stiffness of actuator (longitudinal and transversal)	>200 N/µm	>200 N/µm
Repeatability of displacement (no loss of steps or hysteresis)	< 1 µm	< 1 µm
Maximum cable length between motor and driver	50 m	50 m
Normal speed	>0.01 mm/s	>0.01 mm/s
Main supply	230 V 50 Hz	230 V 50 Hz

Vertical (Large) Actuator



- **Stiffness of actuator:**
  - ✓ k= ~162N/µm, σ=15,4N/µm

Horizontal (Small) Actuator



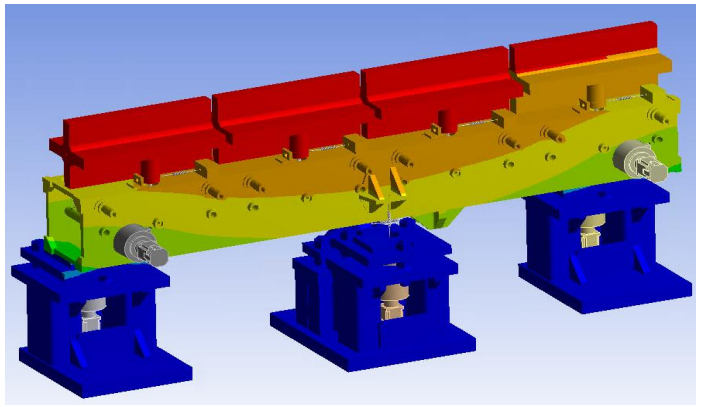
- **Stiffness of actuator:**
  - ✓ k= 103,4N/µm, σ=7,16N/µm

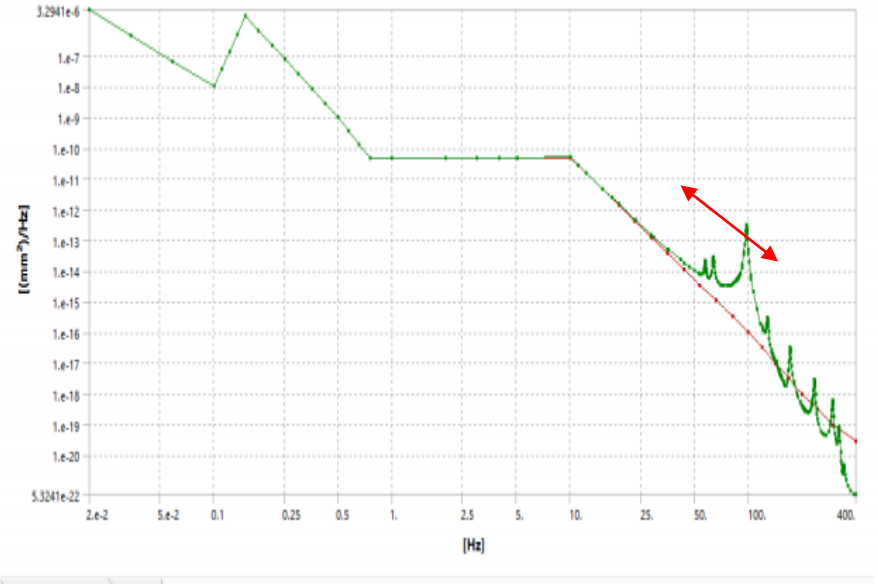
Test data: *Mateusz Sosin: Qualification of linear actuators from ZTS VVÚ KOŠICE - 14.2.2011 – 11.3.2011*

Actuator Stiffness Impact

- Currently the stiffness of the lateral actuator is the limiting factor

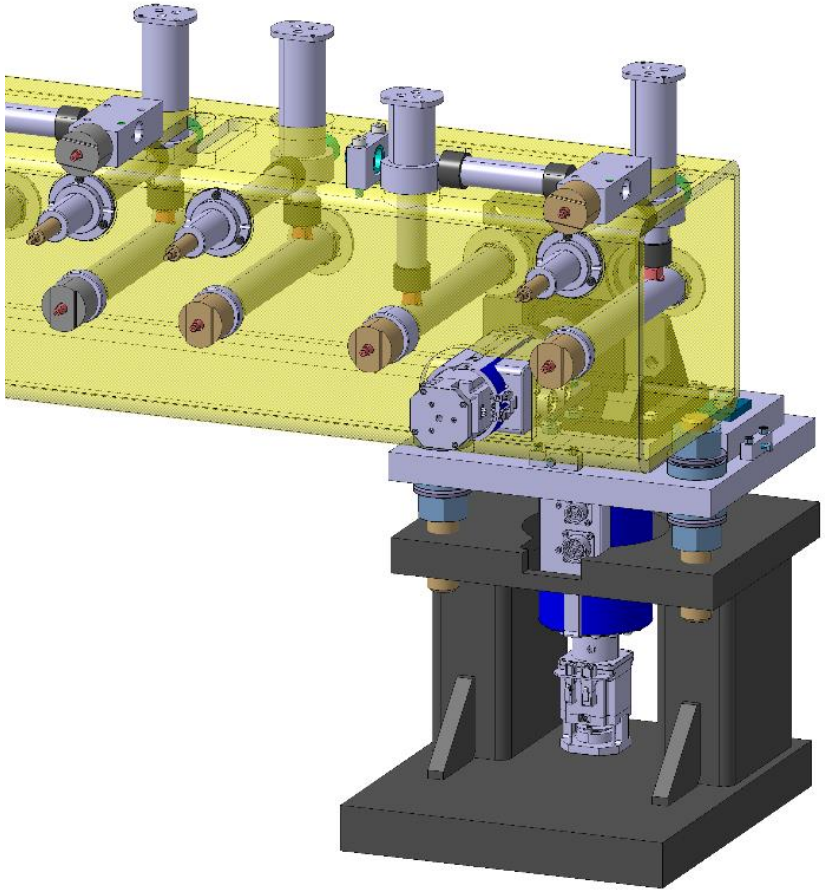
	Harmonic Frequencies for each lateral actuator design			
Mode #	Small (RLA)	Large (VLA)	Specification (200N/µm)	Ideal
1	51.5	54.6	55.9	62.8
2	63.1	63.2	63.4	64.5
3	80.0	84.0	85.6	93.3
4	89.7	89.7	93.6	118.3
5	121.3	121.2	124.5	128.6

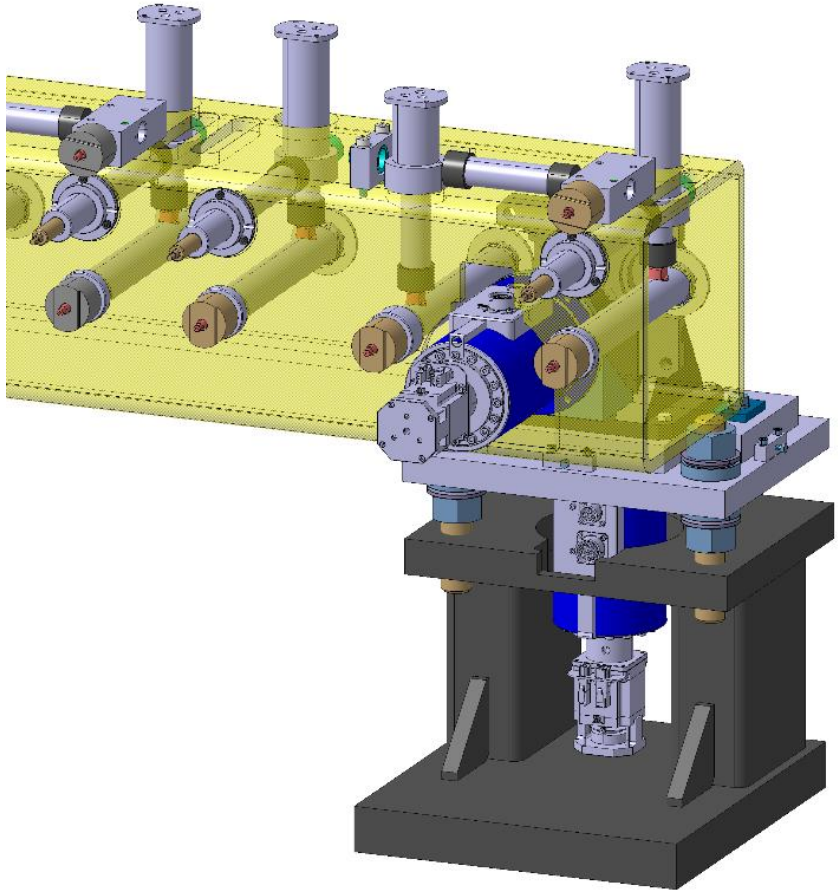




Impact on ground noise excitation is small, but it does increase the risk of a local excitation at operational frequency

Lateral Actuator Choice

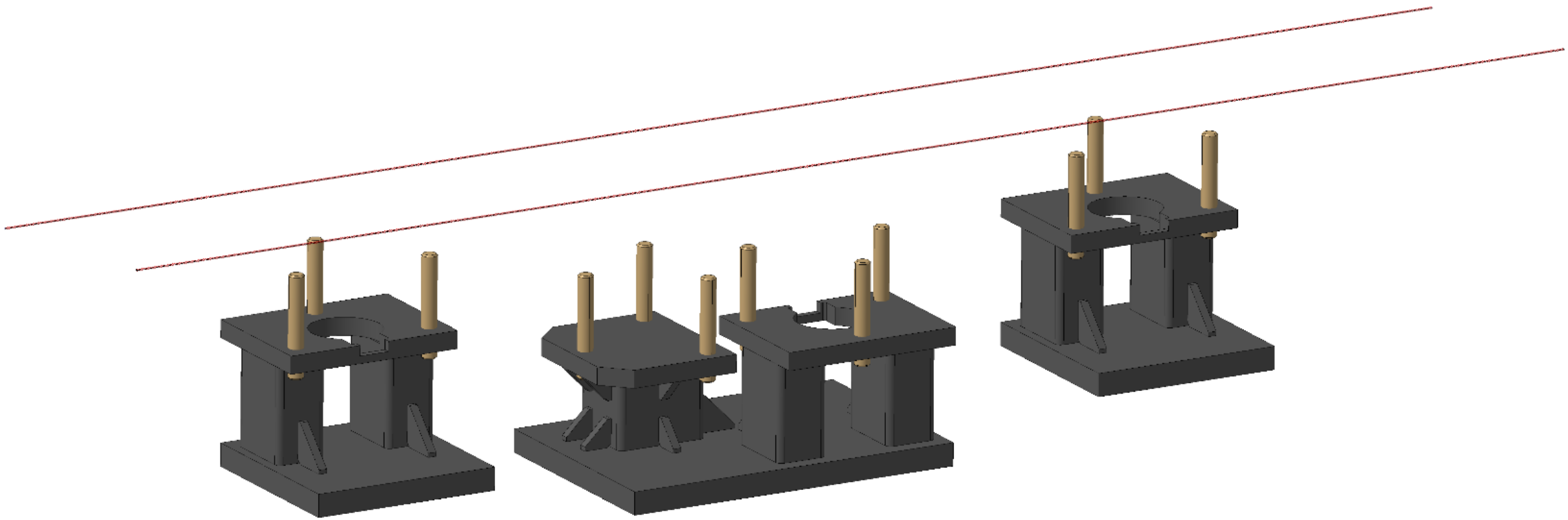




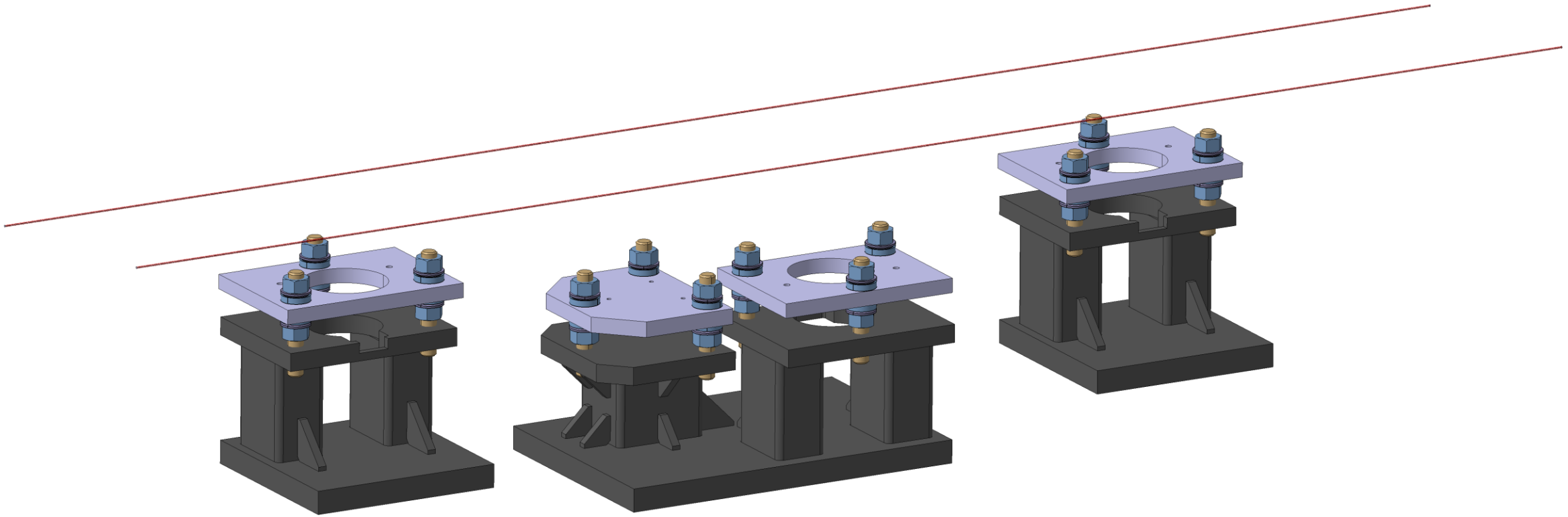
It is possible to integrate the larger style of actuator into the girder, but is more complicated.

1. Do we think this is worth it for the stiffness increase?
2. Do we have sufficient large actuators for the module (5)?
    I. CLEAR had 4
3. Number of cables/ controls within the lab not a problem

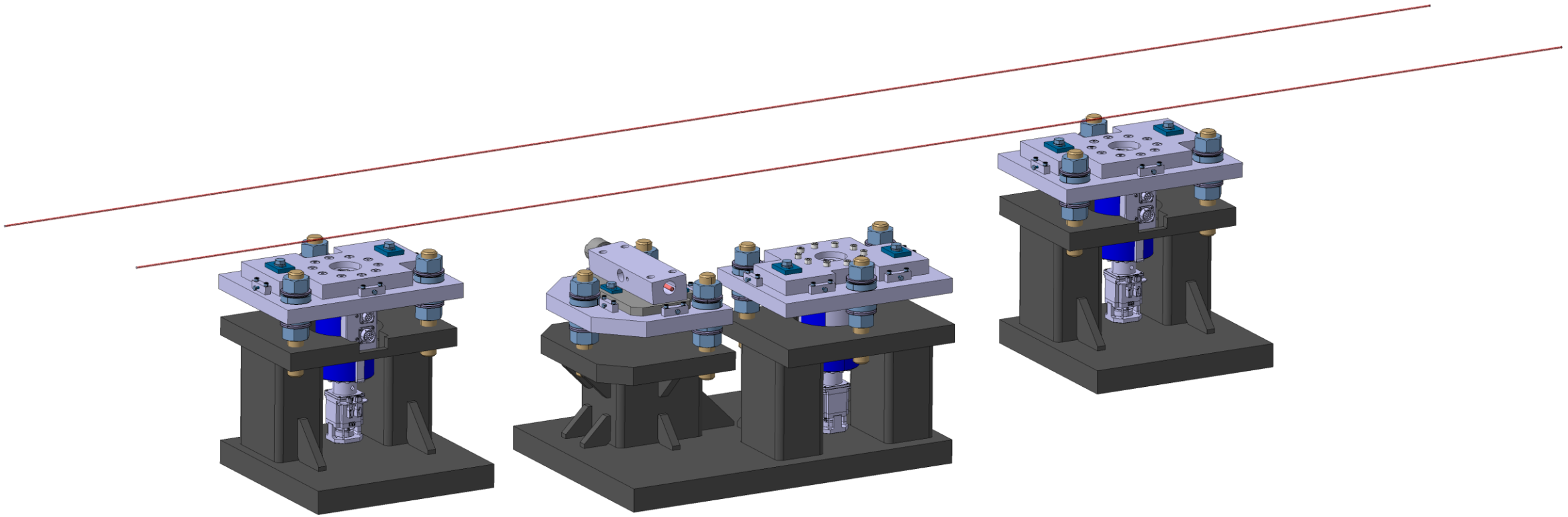
Assembly Order



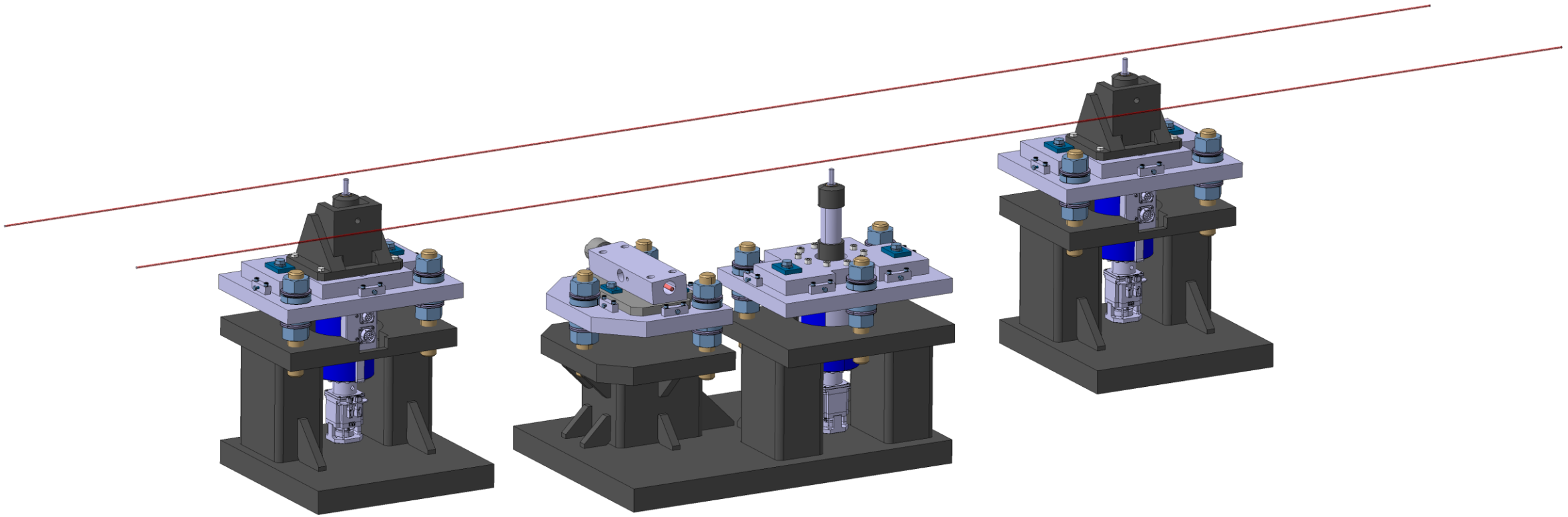
Assembly Order



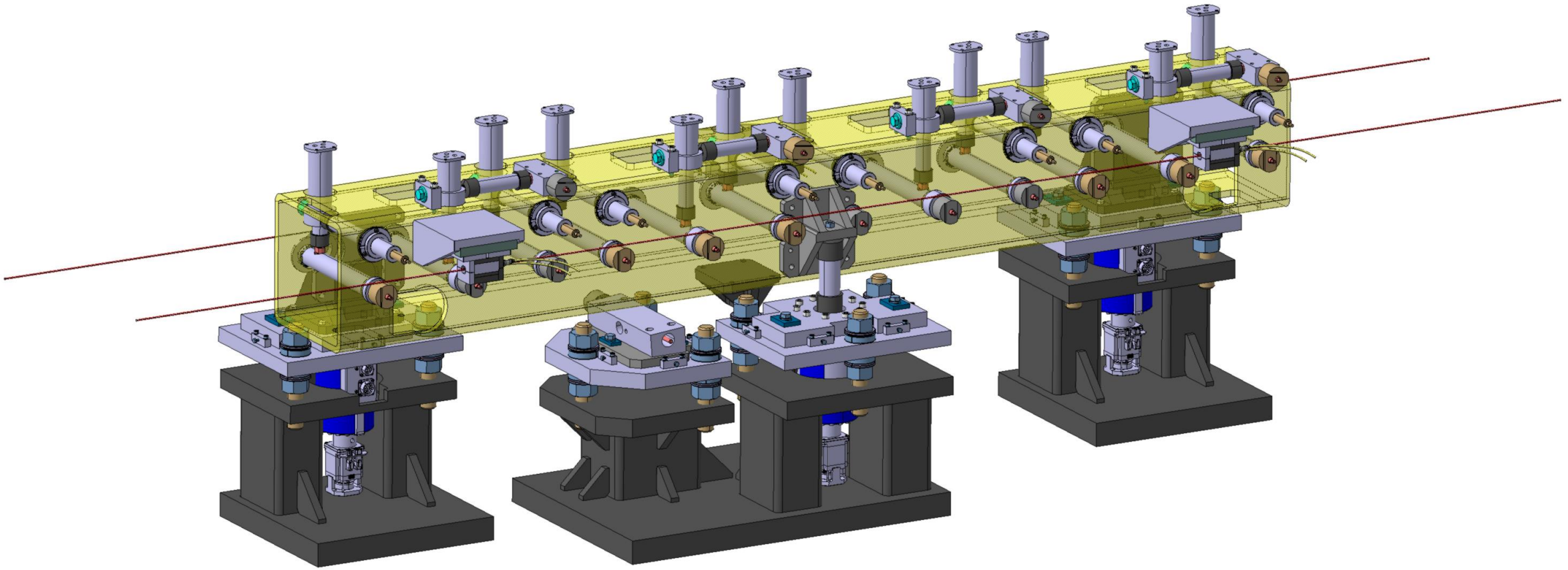
Assembly Order



Assembly Order

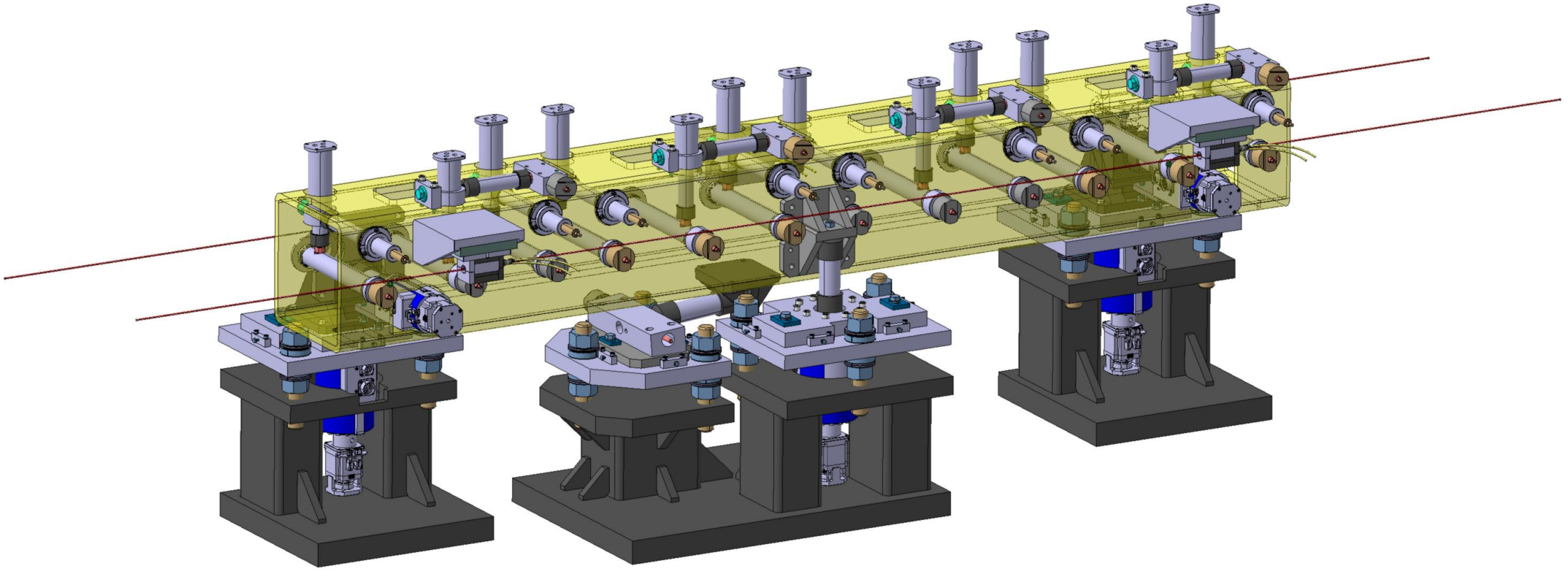


Assembly Order



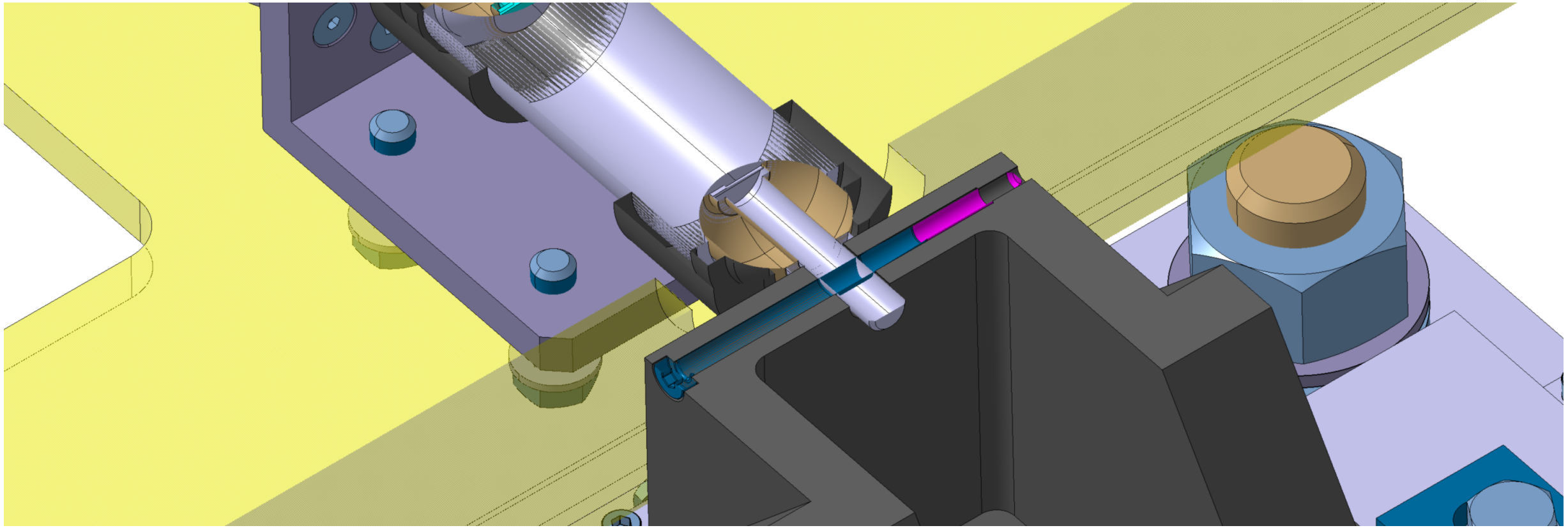
Assembly Order

Lateral Actuators inserted from the side and attached to the underside of the girder so they can be installed in-situ



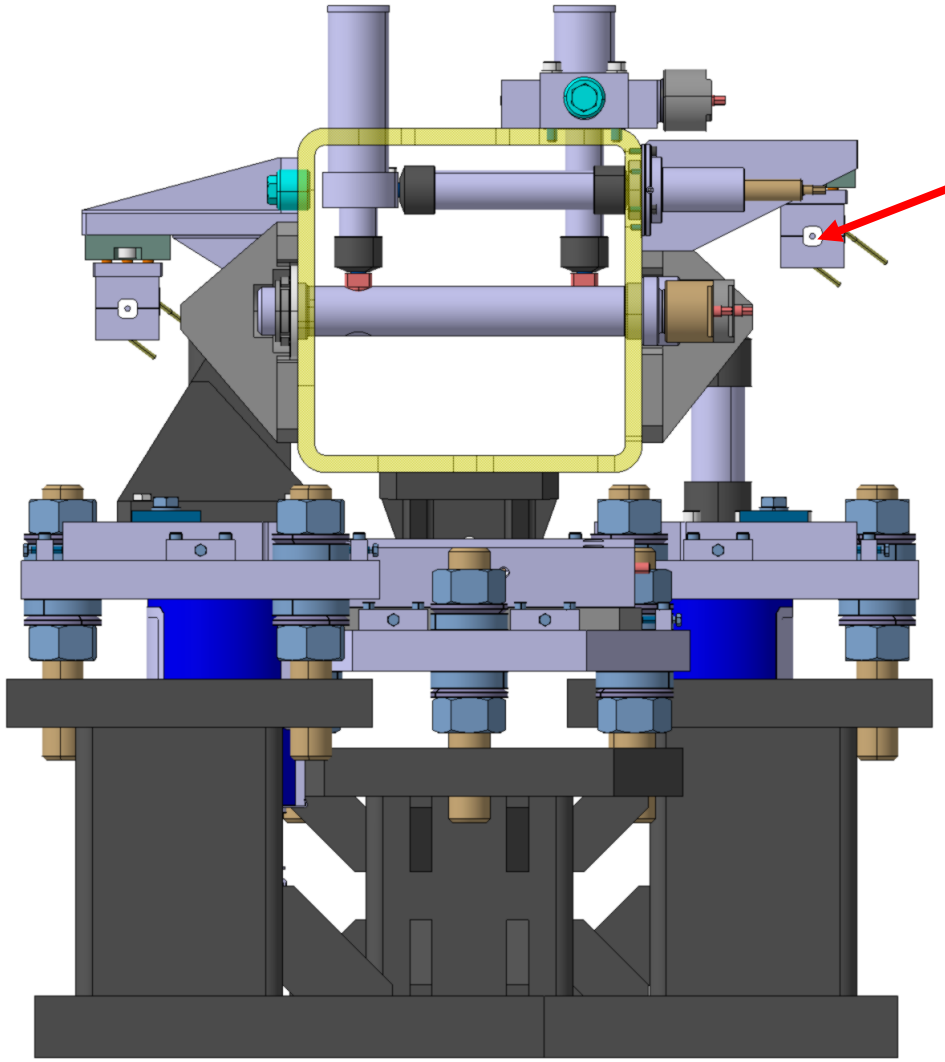
Assembly Order

Lateral joint fixed from the side so it can be attached and installed after the vertical joint and actuator



Vertical joint and bracket hidden

Assembly Order



Wire sensors

Beam height 30mm higher than the other lab modules

Assembly Order