

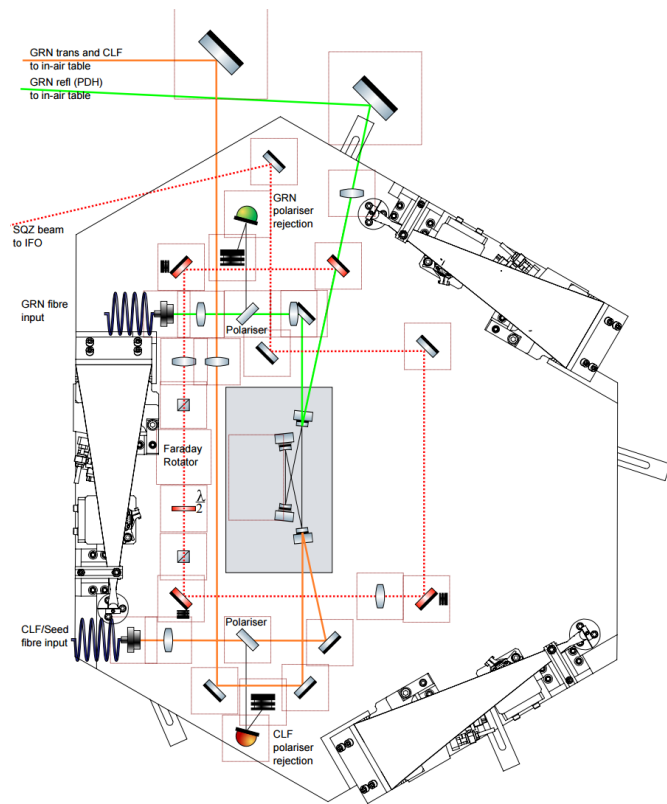
# VOPO HAM 5 & HAM 6 Layout

LIGO MIT Lab

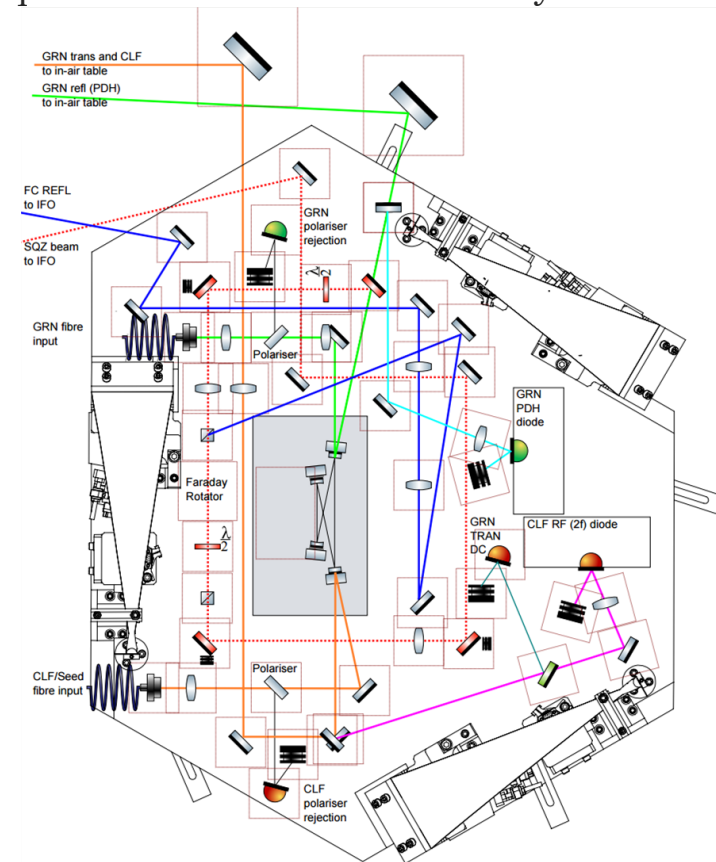
Barsotti, Lisa  
Matichard, Fabrice  
Miller, John  
Fernandez Galiana, Alvaro

# Optical Layout

- 2 different layouts:
- O2 Squeezer model (*early* squeezing)



- O3 Squeezer model with filter cavity + RFPD in Vacuum

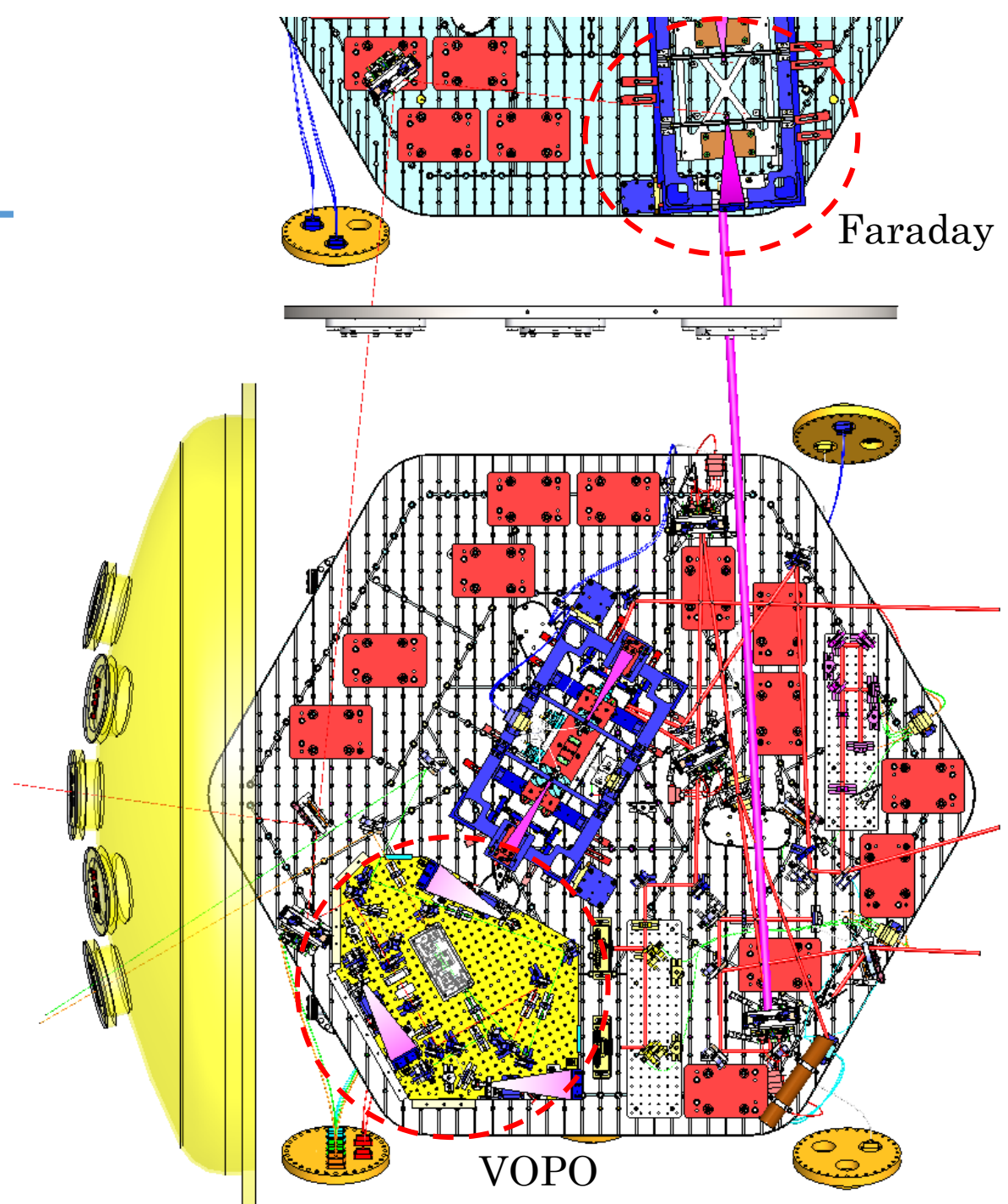


# O2 LAYOUT

- HAM 5 & HAM 6 LAYOUT FOR O2

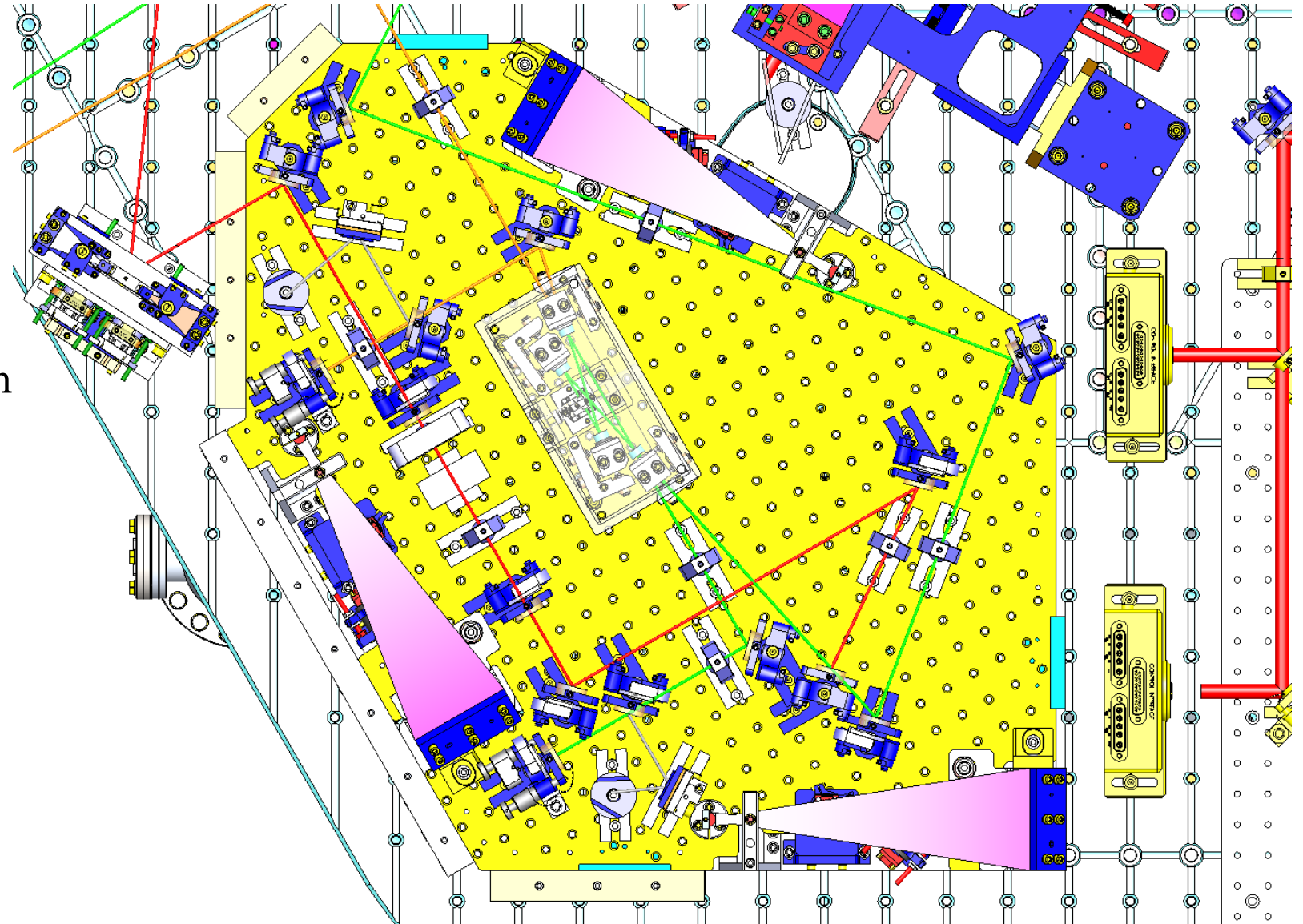
- NO Filter Cavity
- RFPD in Air

- To be added:
  - VOPO Suspension (x1)
  - Tip-Tilt (x1)
  - 2" Mirror (x2)
  - Beam Splitter (x1)



# O2 LAYOUT

- Injection Bench O2
- Green Beam: 532 nm
- Orange Beam: 1064 nm
- Red Beam: SQZ



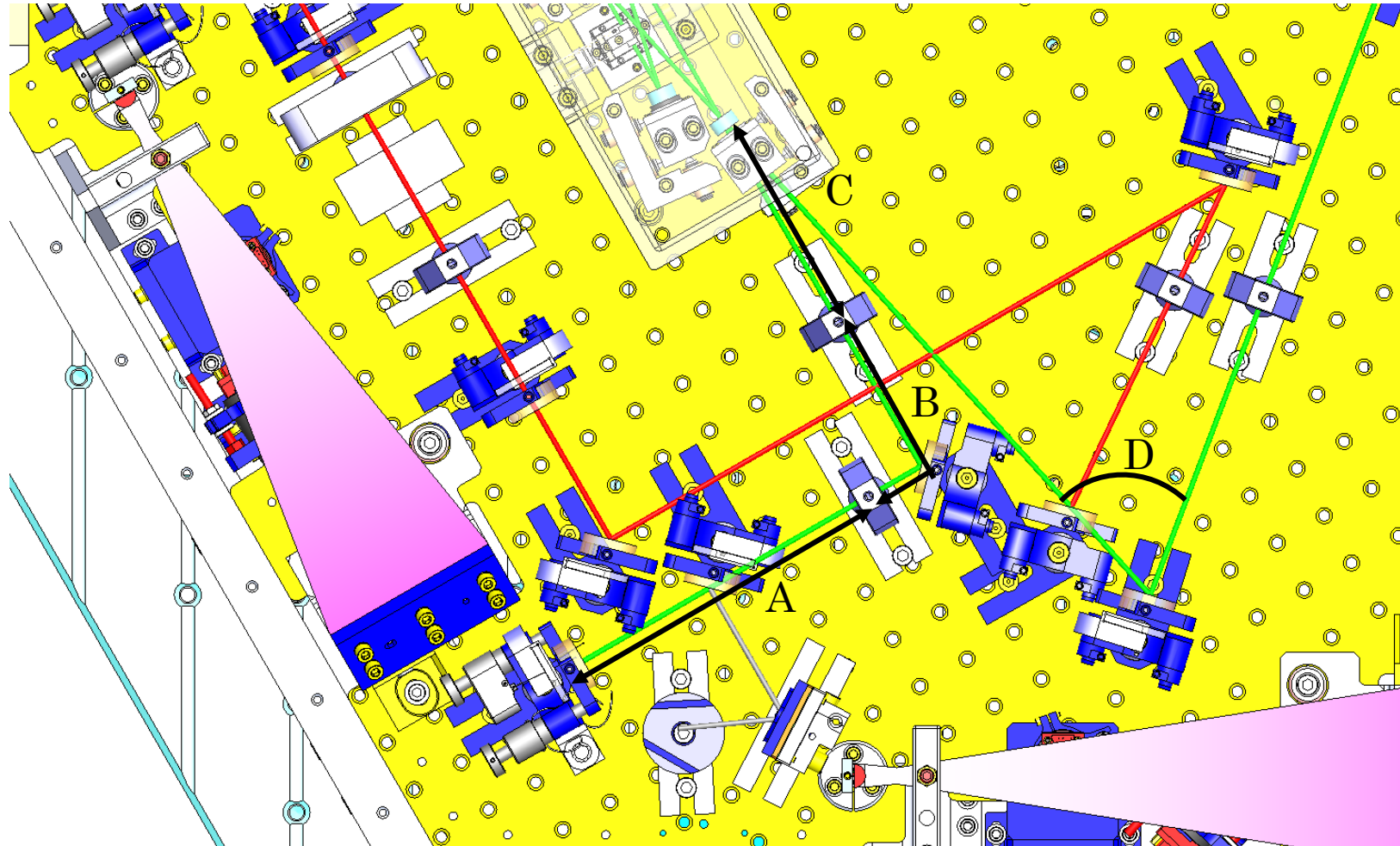
# O2 LAYOUT

- Injection Bench O2

- Green Beam:

- A = 0.149 m
- B = 0.106 m
- C = 0.10862 m
- D =

- Fiber-Lens1: 0.149
- Fiber-Lens 2: 0.255
- Fiber-Cavity: 0.36362



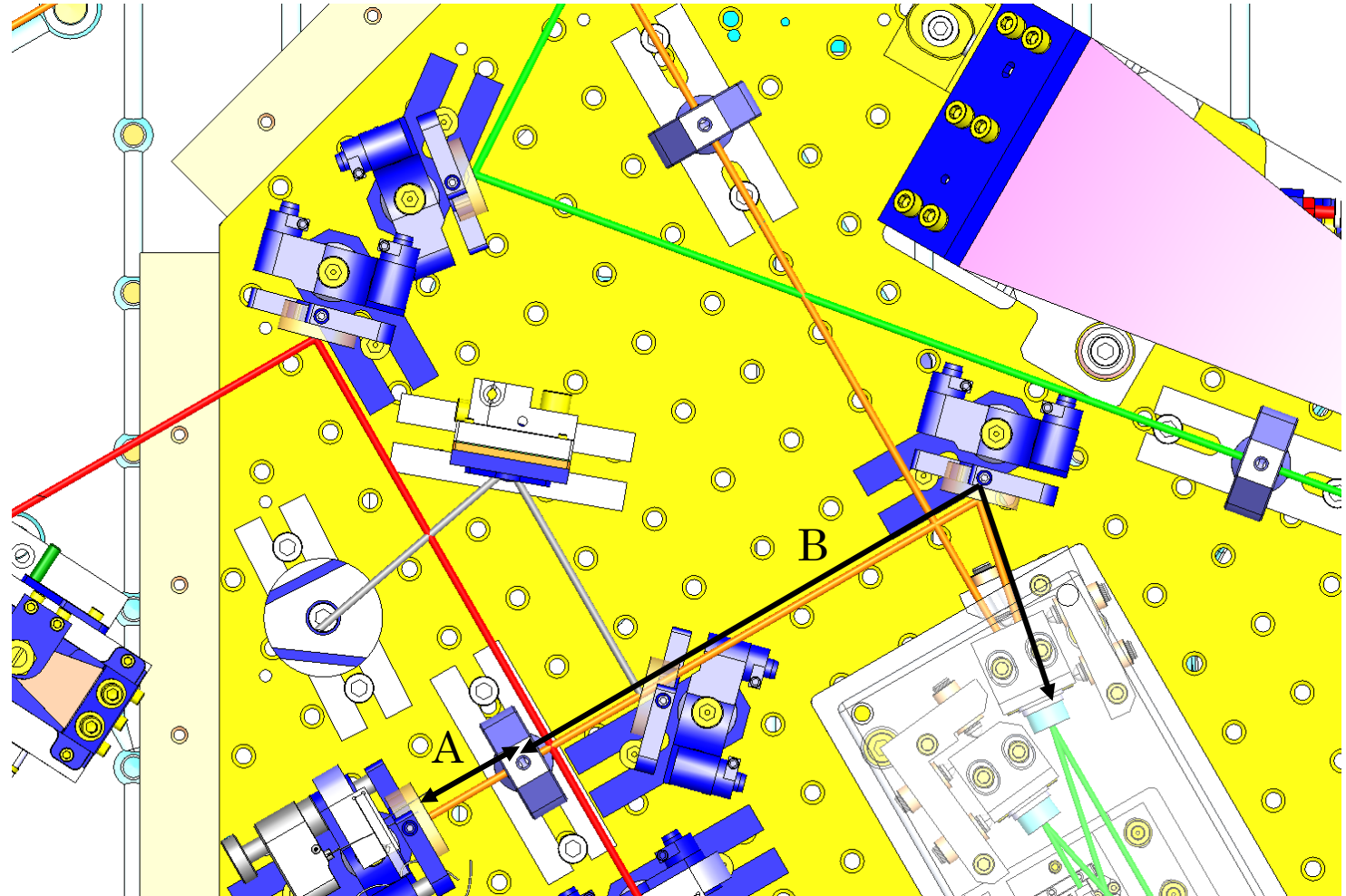
# O2 LAYOUT

- Injection Bench O2

- Orange Beam:

- A = 0.030 m
- B = 0.250 m

- Fiber-Lens1: 0.030 m
- Fiber-Cavity: 0.280 m



# O2 LAYOUT

- Injection Bench O2

- SQZ Beam:

- A = 0.346m
- B = 0.534m
- C = 67.50° (33.75° incidence)

- Cavity-Lens1: 0.346m
- Cavity-Lens 2: 0.880 m

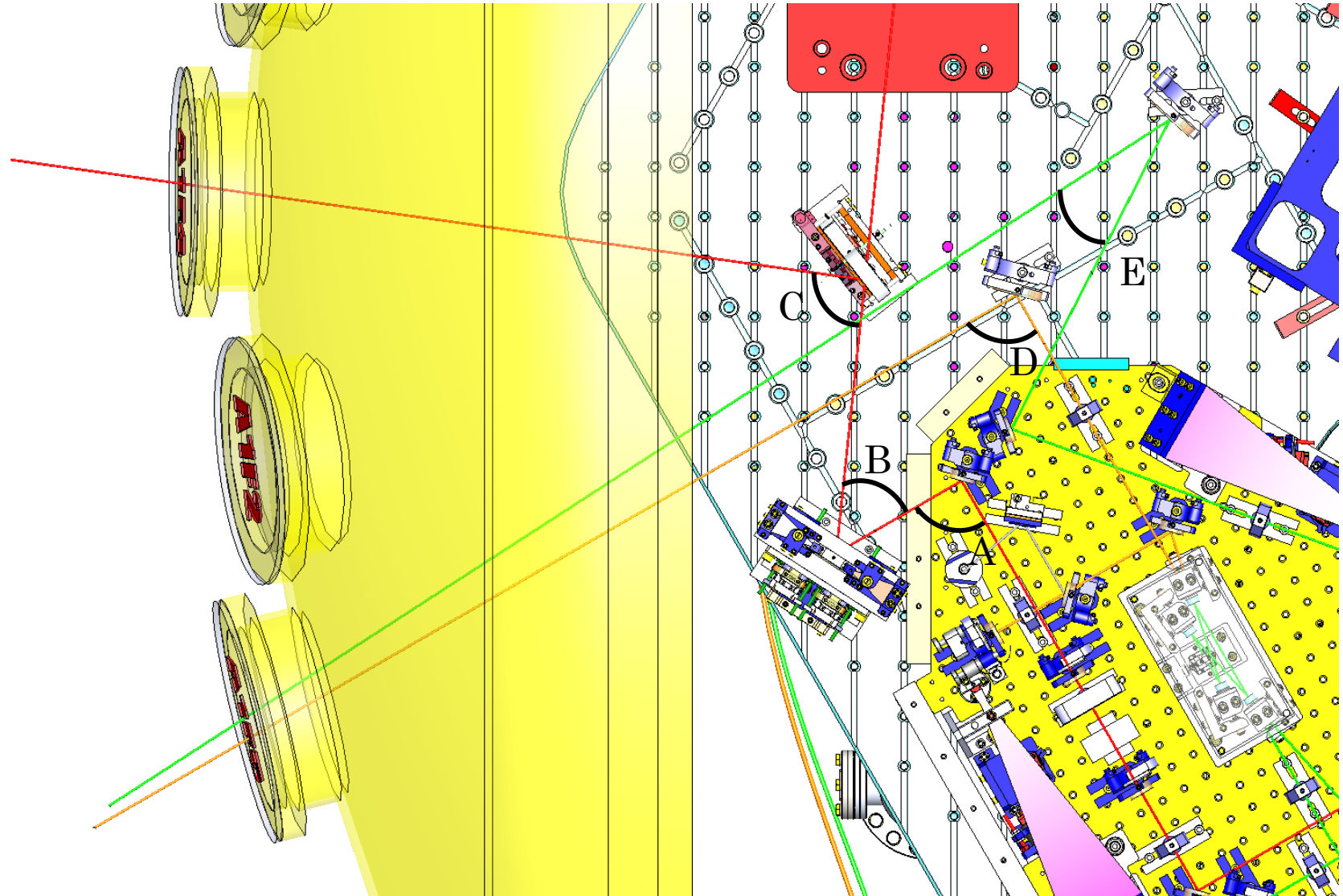


# O2 LAYOUT

- HAM 6 O2

- HAM 6 Beam:

- A =  $90^\circ$  ( $45^\circ$  incidence)
- B =  $54^\circ$  ( $27^\circ$  incidence)
- C =  $92^\circ$  ( $46^\circ$  incidence)
- D =  $90^\circ$  ( $45^\circ$  incidence)
- E =  $32^\circ$  ( $16^\circ$  incidence)

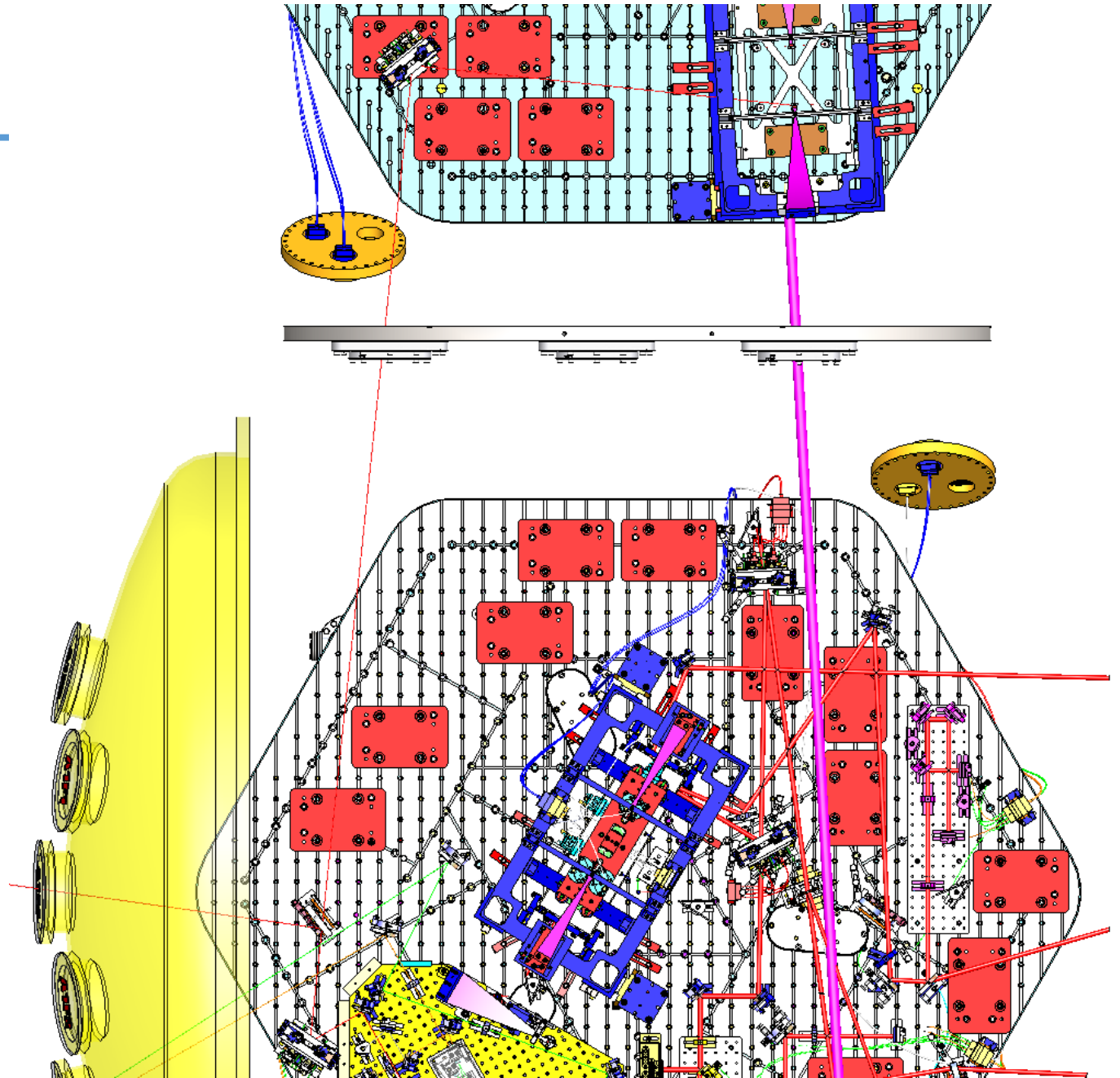




# O2 LAYOUT

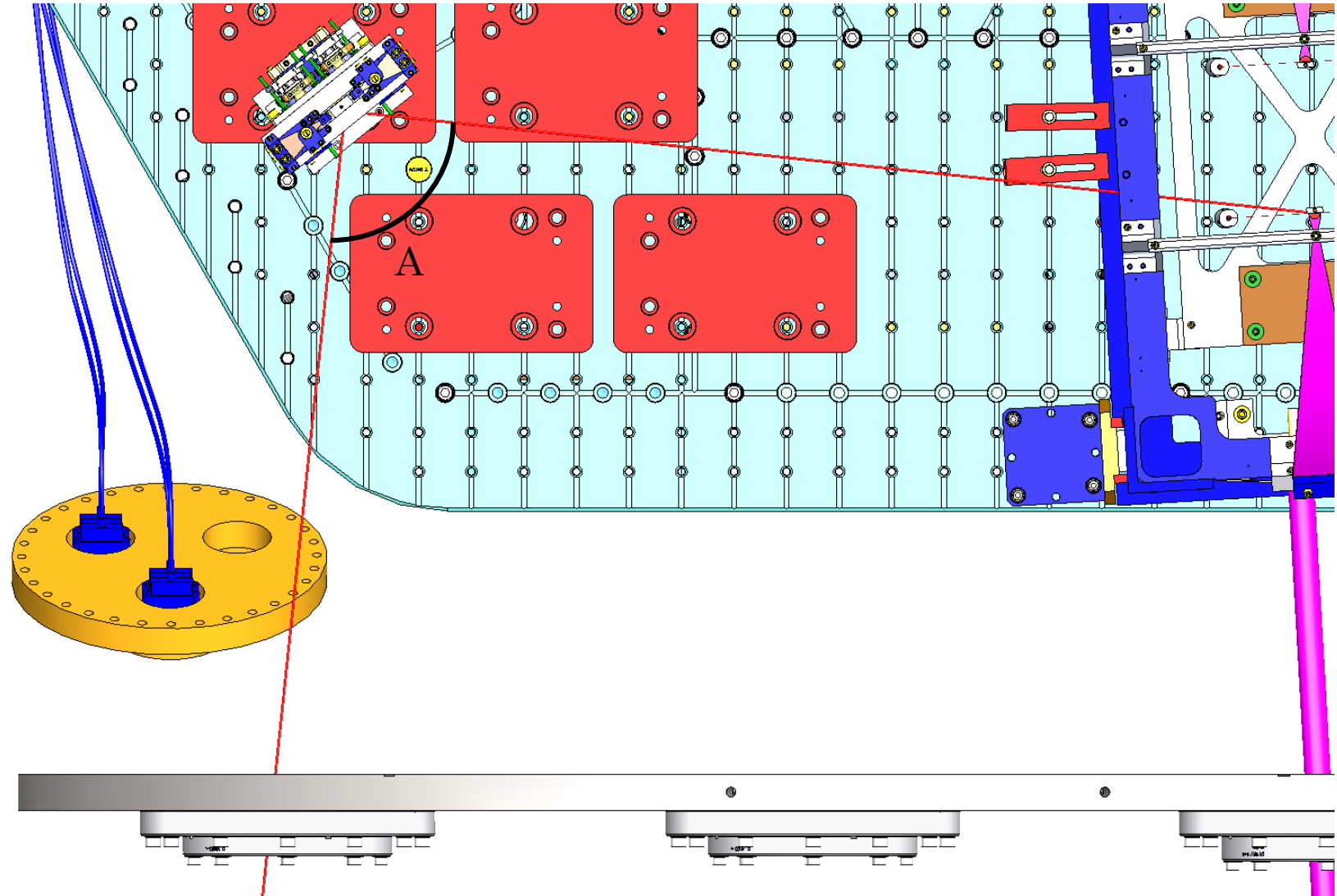
- HAM 5 & 6 O2 Layout

- SQZ Beam (Red):
  - Cavity Out – Faraday : 4.7146m



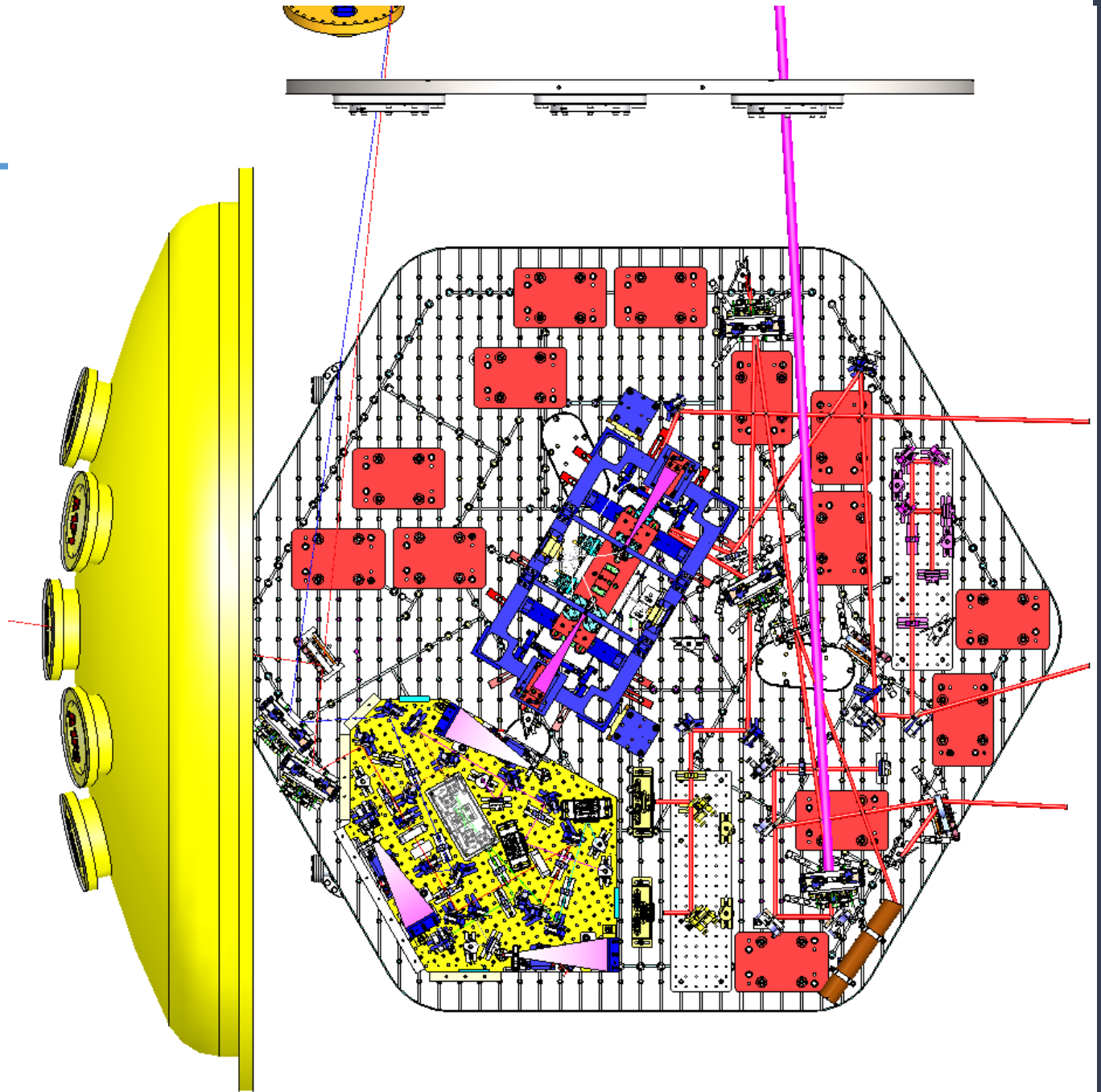
# O2 LAYOUT

- HAM 5 O2 Layout
- HAM 5 SQZ Beam:
  - $A = 90^\circ$



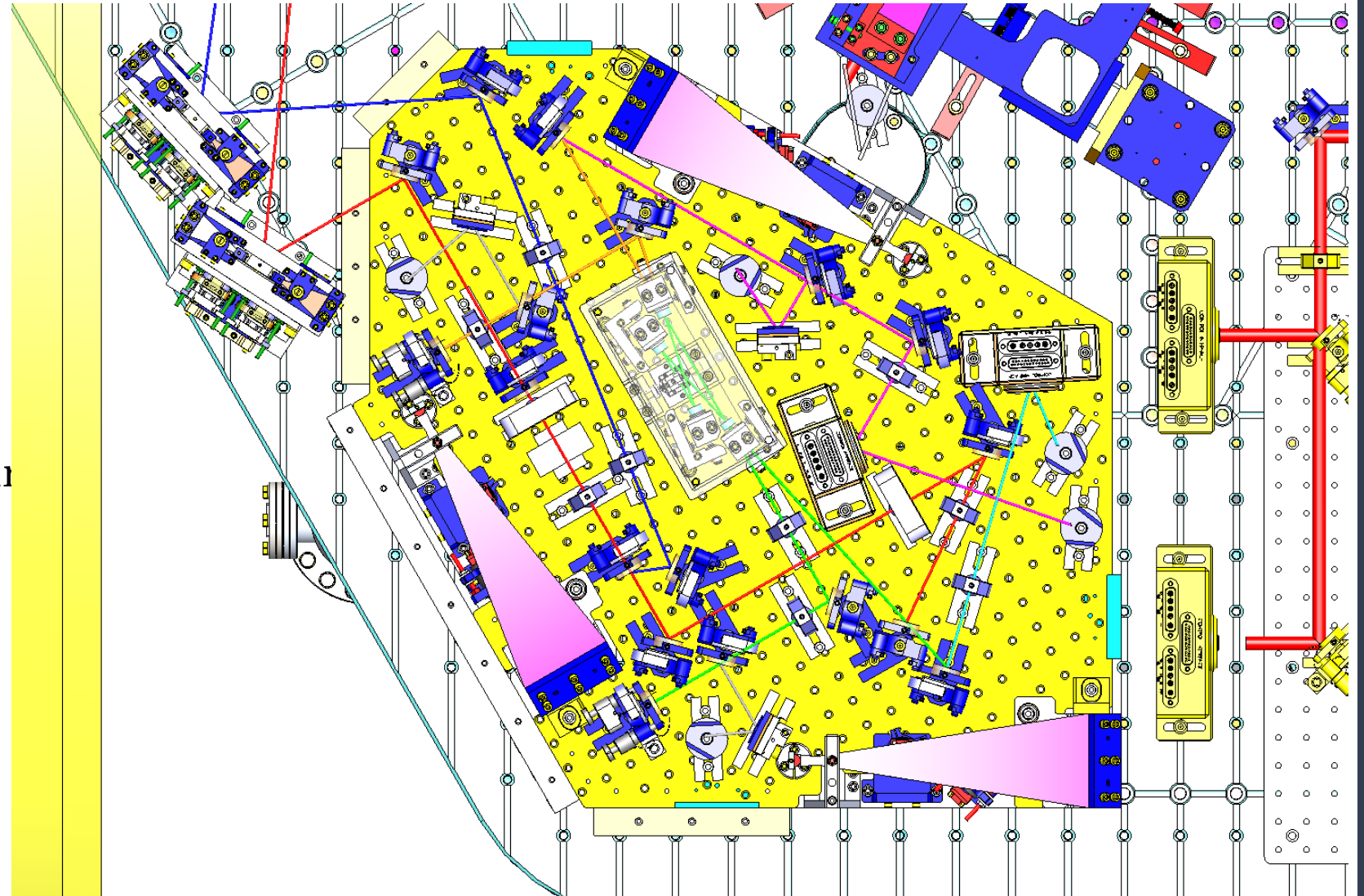
# O3 LAYOUT

- HAM 6 O3
- Filter Cavity
- RFPD in Vacuum
- To be added (from O2):
  - Tip-Tilt (x1)
- To be removed (from O2):
  - 2" Mirror (x2)



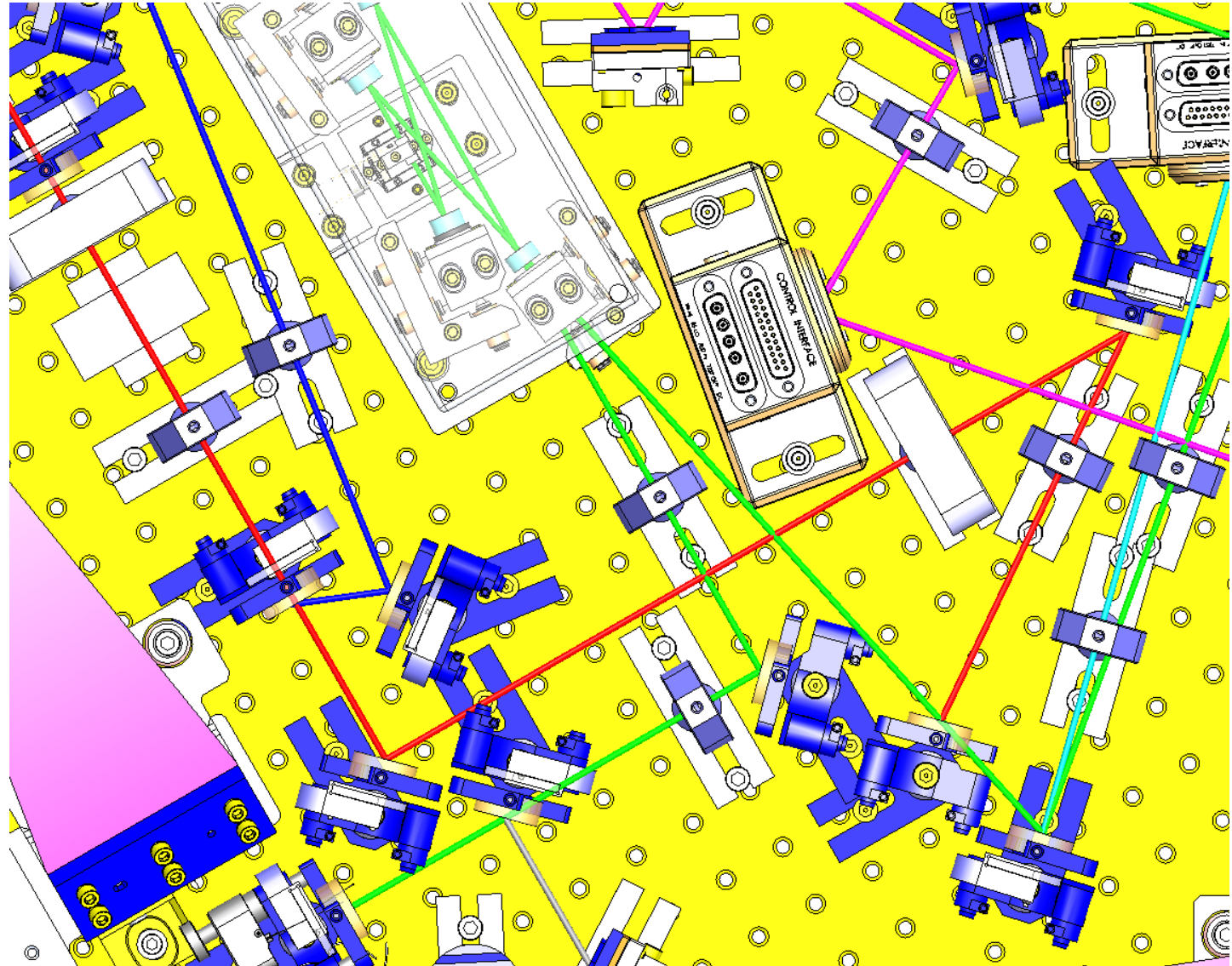
# O3 LAYOUT

- Injection Bench 03
- Green Beam: 532 nm
- Orange Beam: 1064 nm
- Red Beam: SQZ
- Blue Beam: FC to IF



# O3 LAYOUT

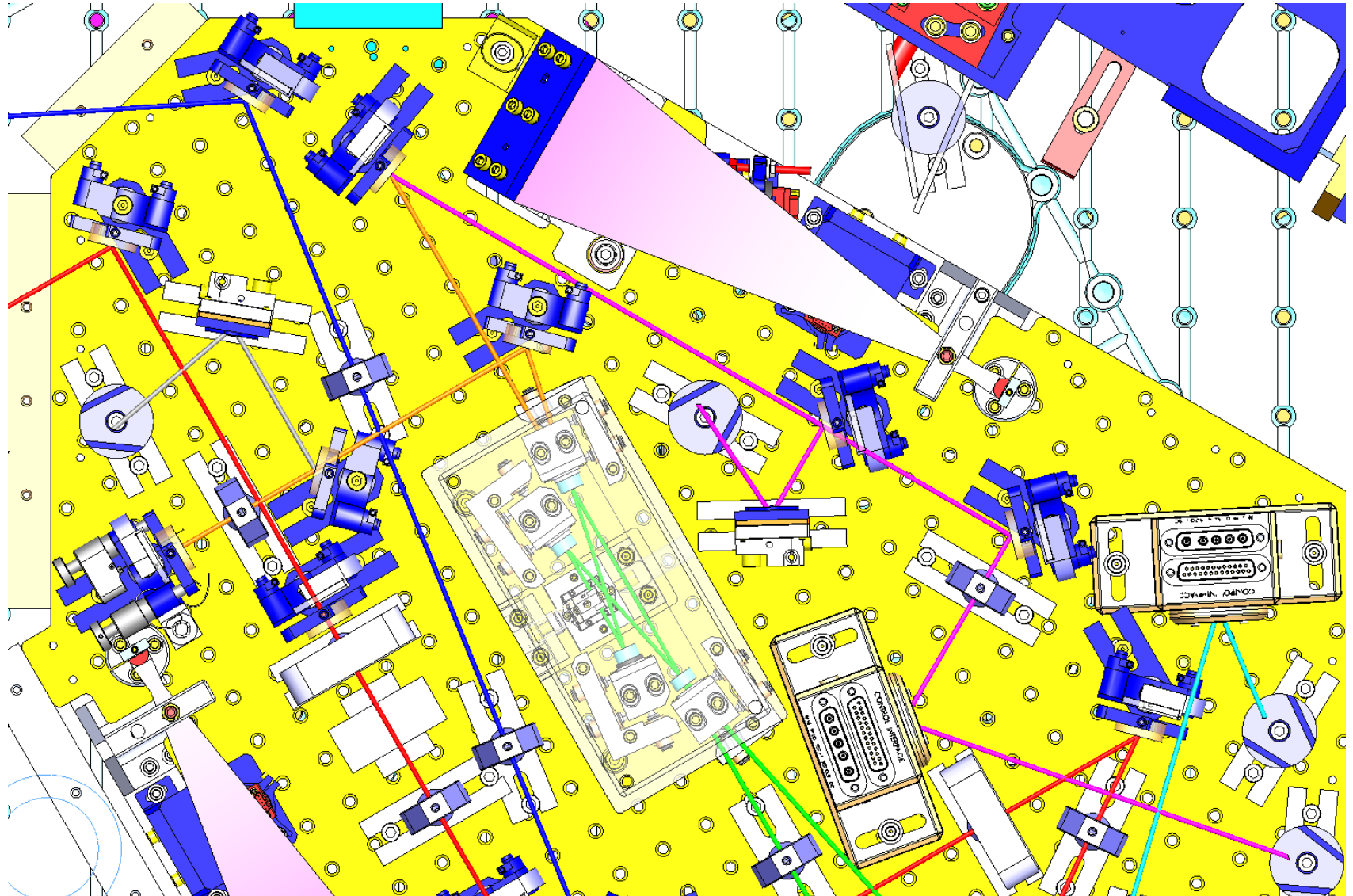
- Injection Bench 03
- Orange Beam:
  - Same as O2
- Pink Beam:
  - RFPD in Vacuum



# O3 LAYOUT

- Injection Bench 03

- Blue Beam:
  - RFPD in Vacuum



# O3 LAYOUT

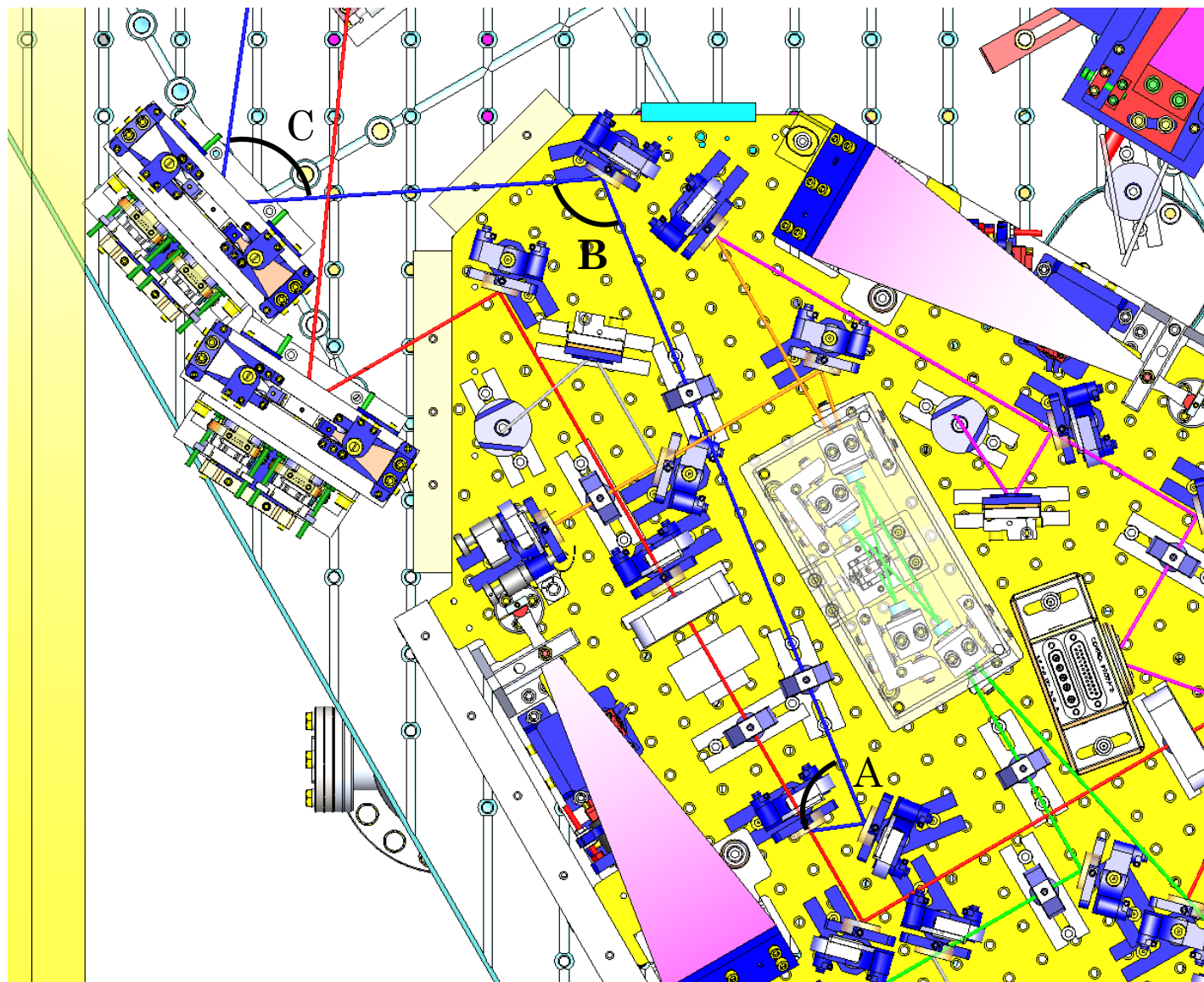
- Injection Bench + HAM 6  
O3

- SQZ (red) Beam:

- Same as O2

- FC (Blue) Beam:

- A =  $75.82^\circ$  ( $37.91^\circ$  incidence)
- B =  $108.36^\circ$  ( $54.18^\circ$  incidence)
- C =  $78^\circ$  ( $39^\circ$  incidence)



# O3 LAYOUT

---

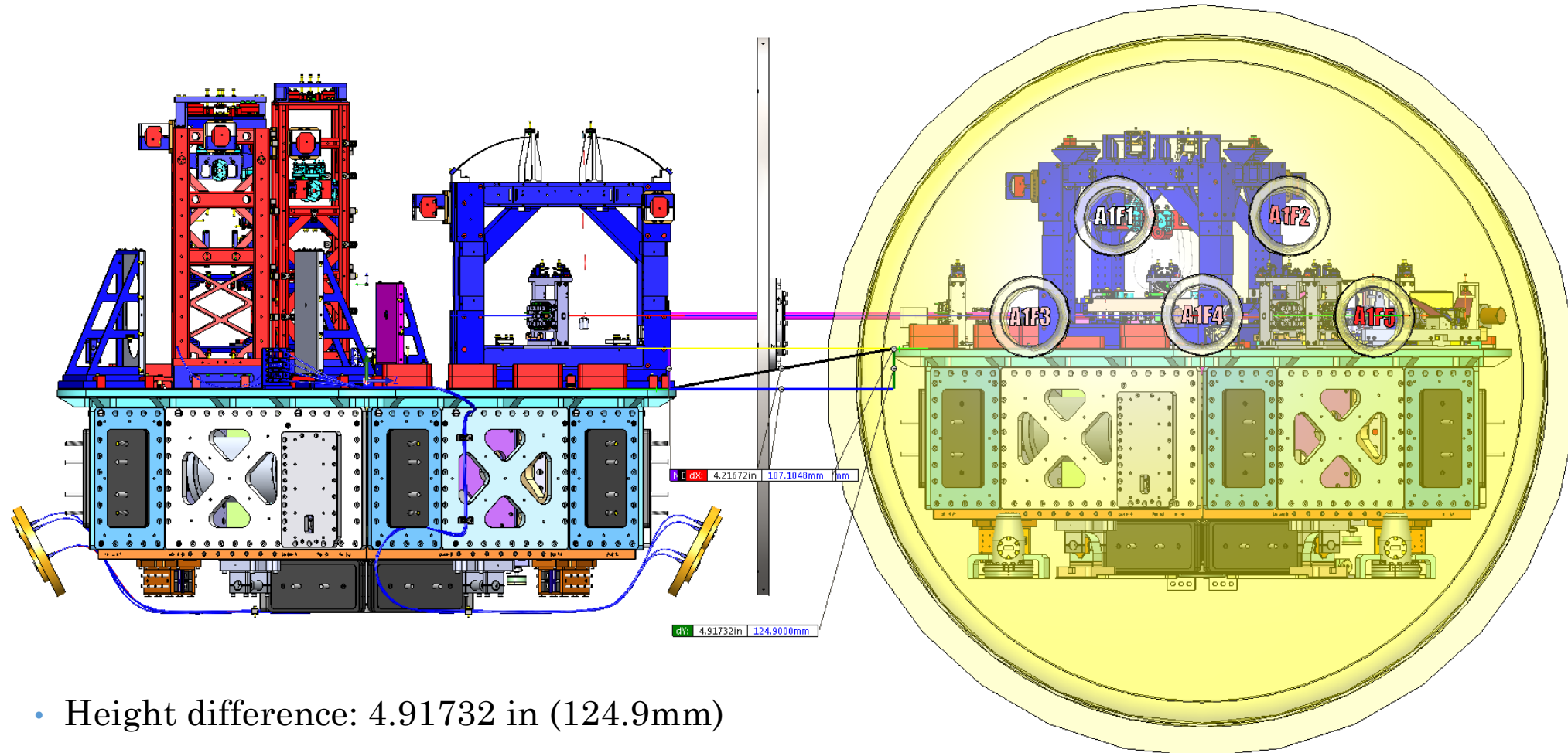
- HAM 6 O3





# HEIGHT “PROBLEM”

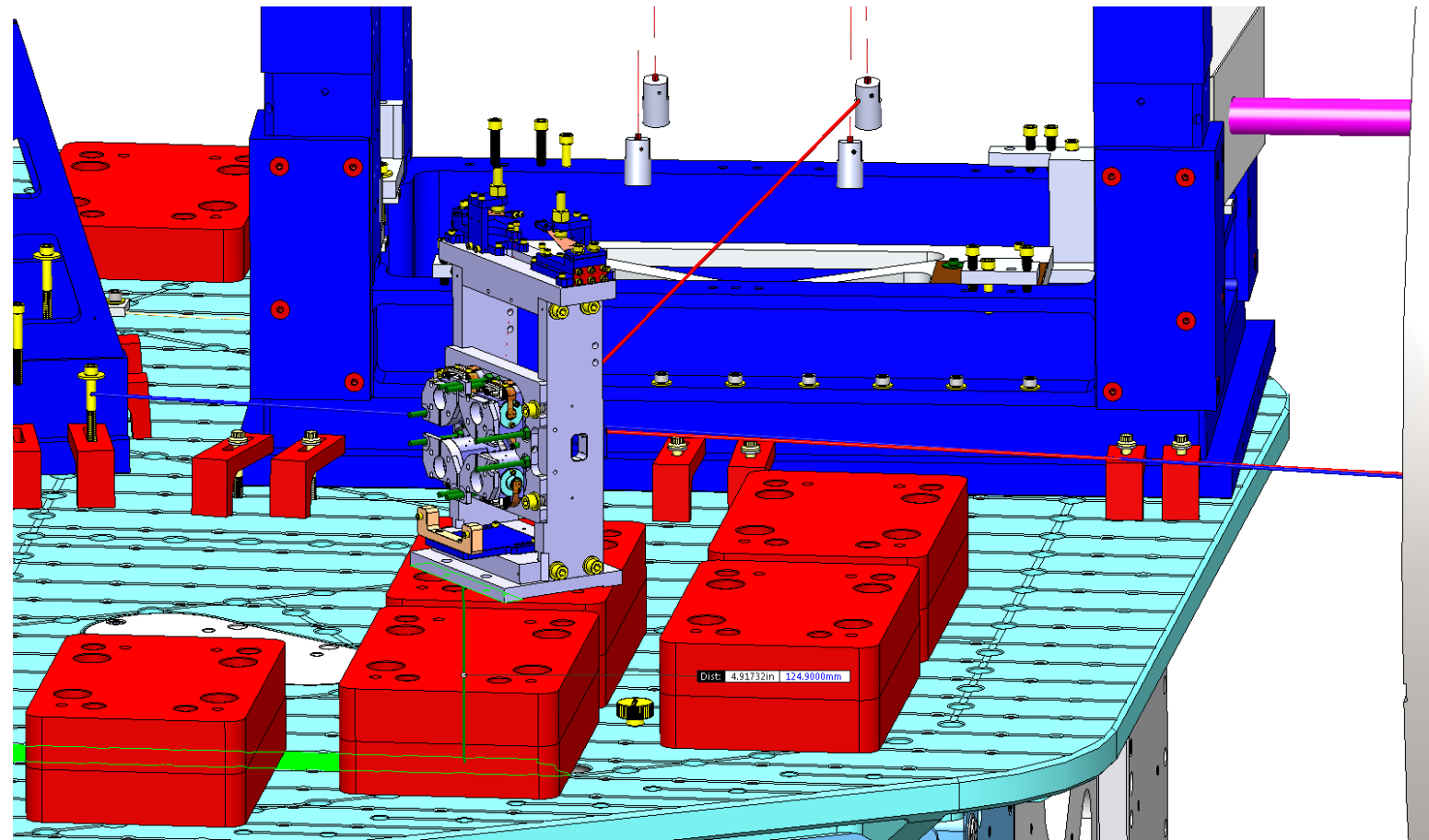
- Height difference Ham 5 - 6



- Height difference: 4.91732 in (124.9mm)

# HEIGHT “PROBLEM”

- Height difference Ham 5 - 6



- **NOTA:** A 124.9mm high Aluminum base will have to be designed in order to raise the Tip-Tilt in Ham 5