# NGAO OSM

Design Study Update

1) LGS Design

2) LOWFS Dewar Design:

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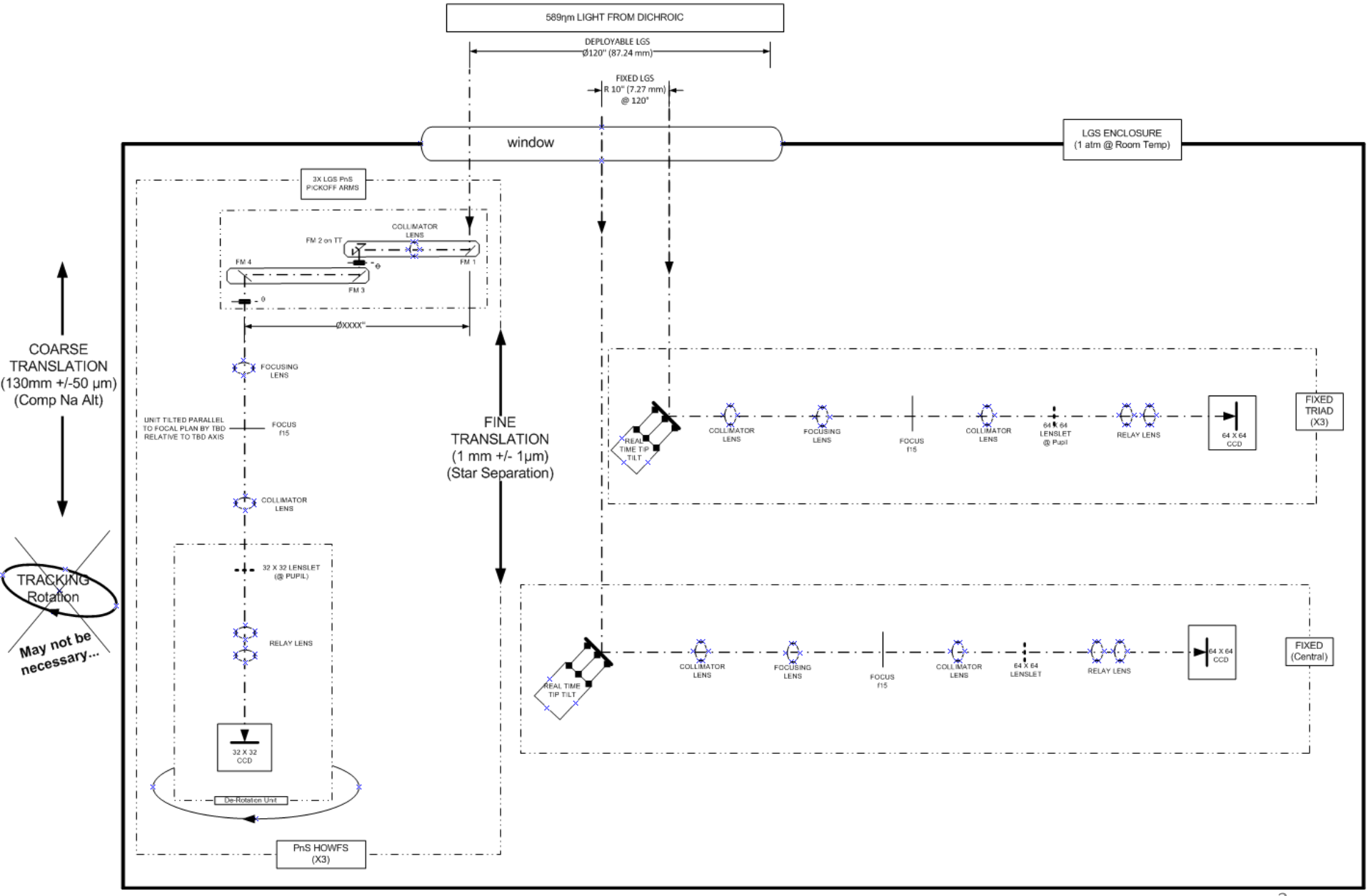
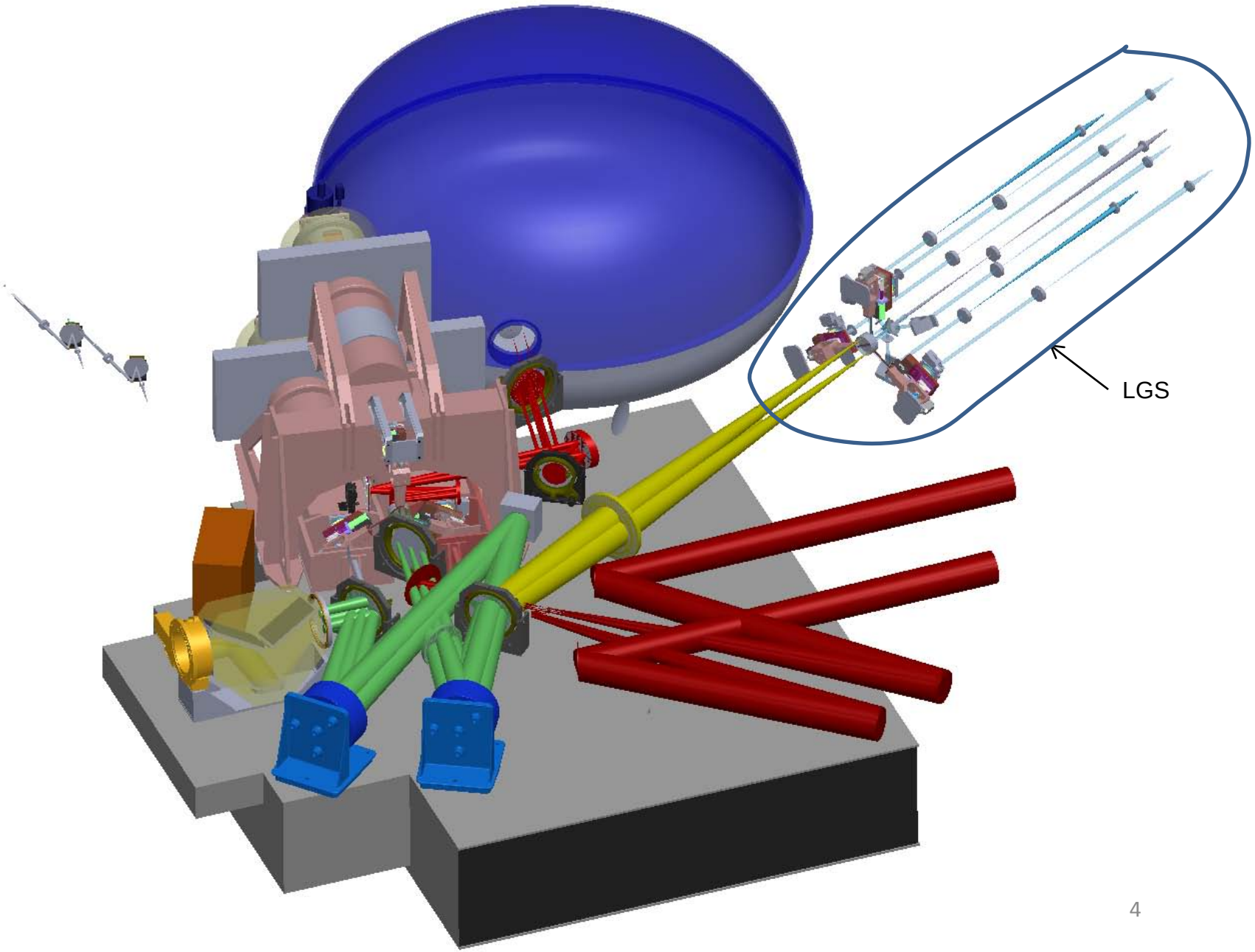
Version 20

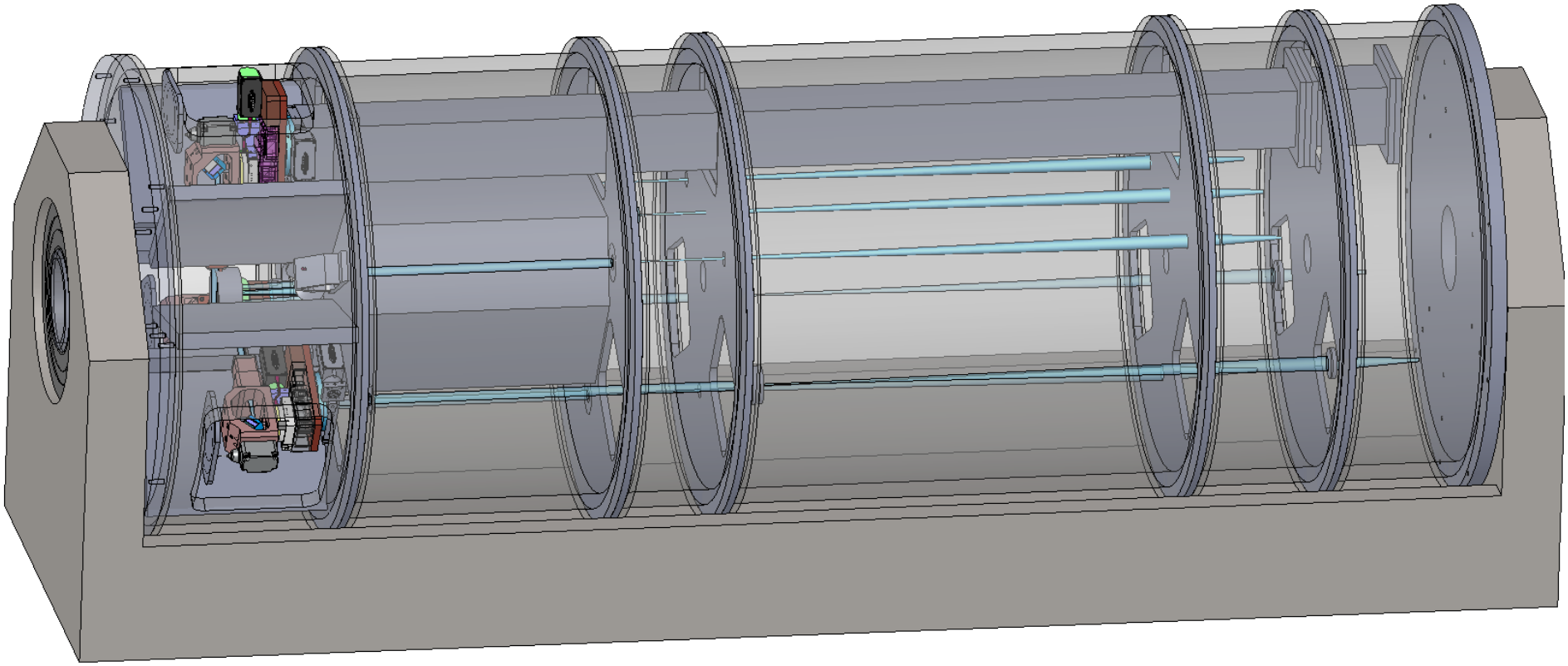
# 1
# LGS Design

# 1.1) LGS Schematic diagram and motion control

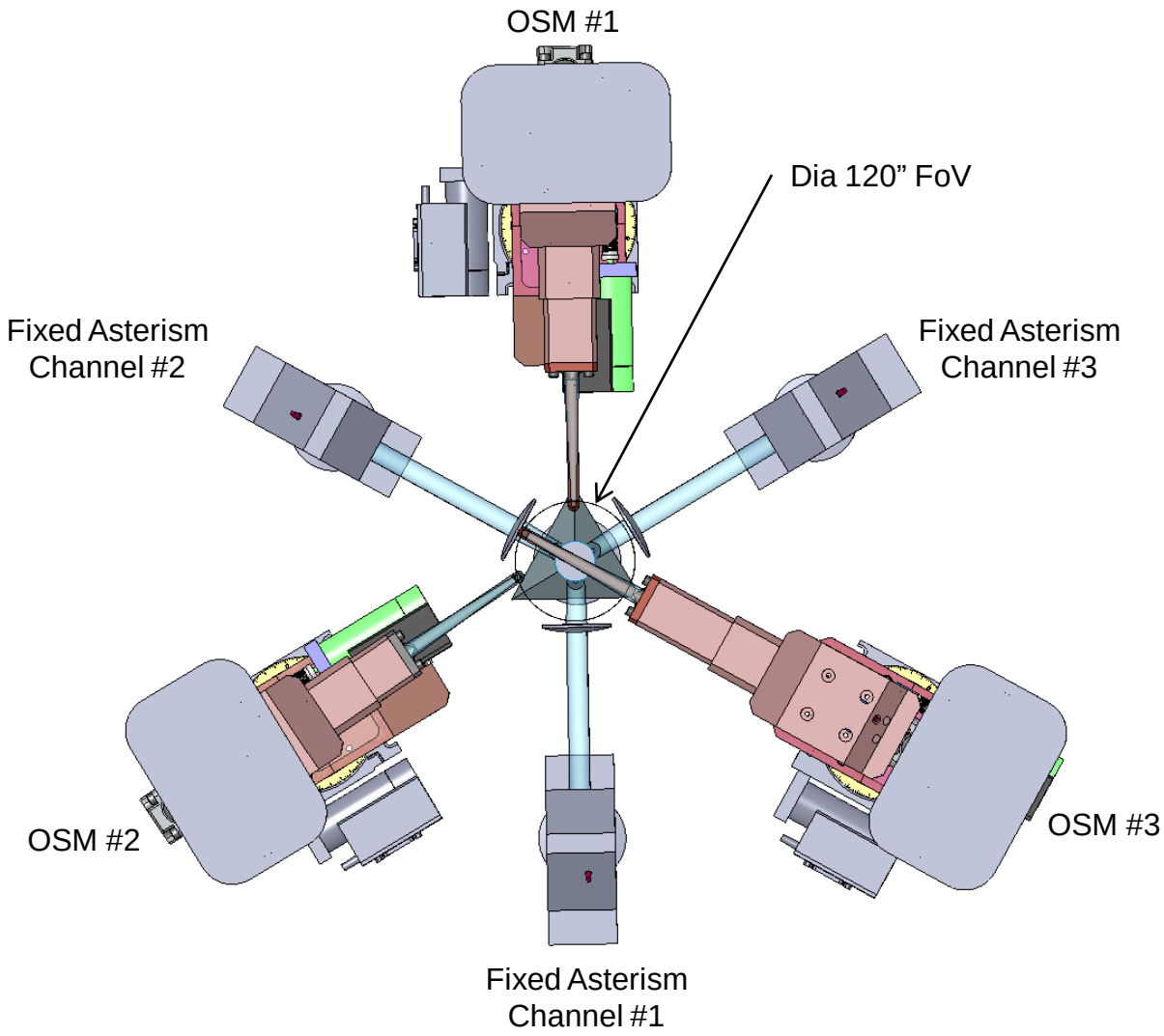


# 1.2) LGS within NGAO

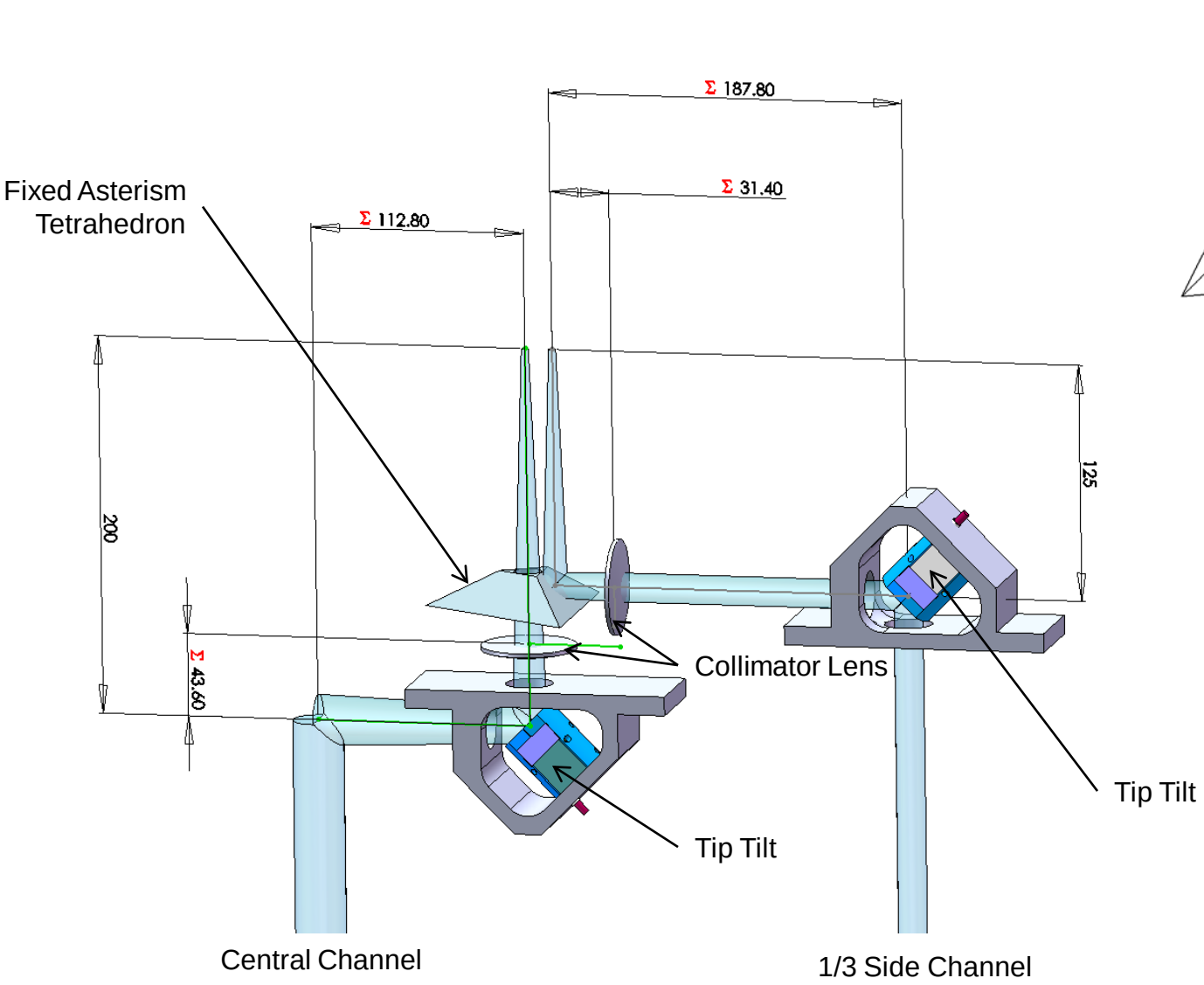


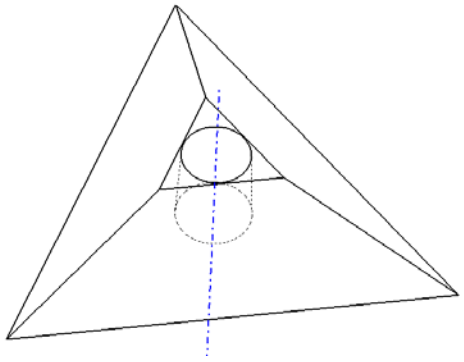


# 1.3) LGS Overview, Front View



# 1.4) Fixed Asterism Layout

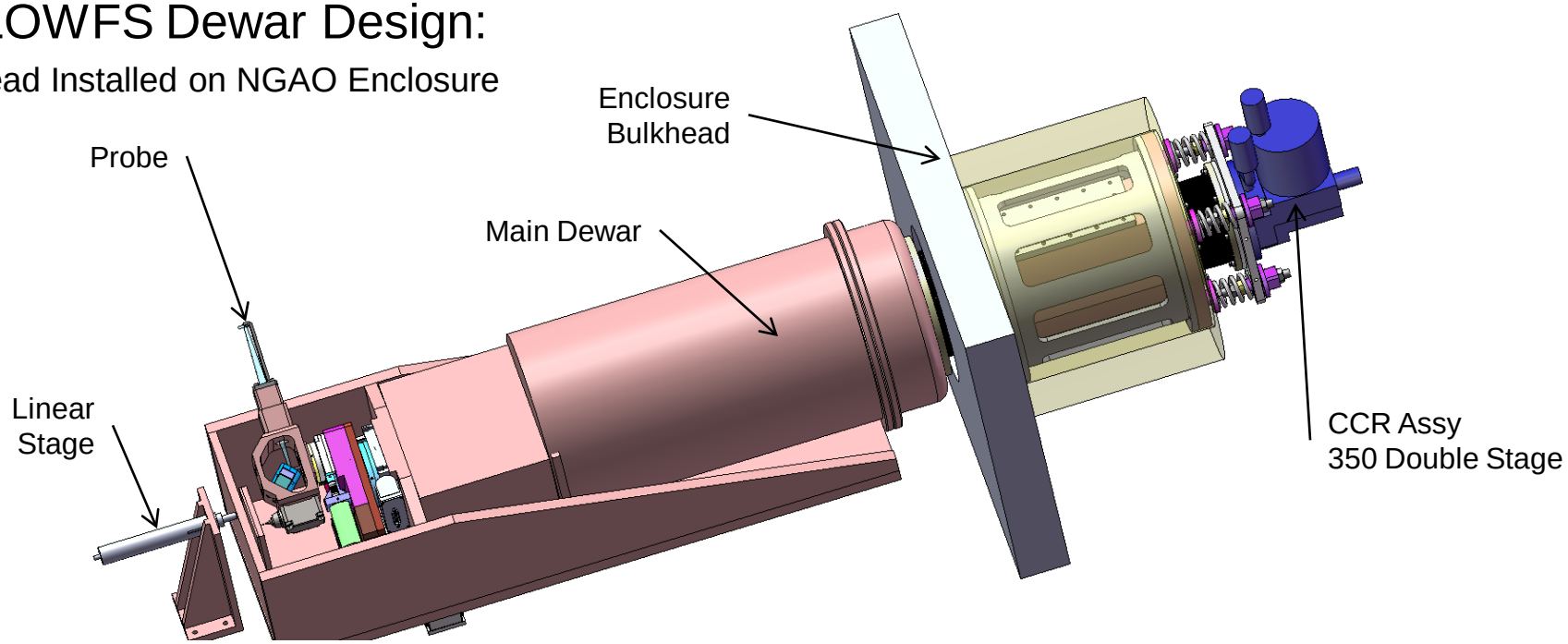


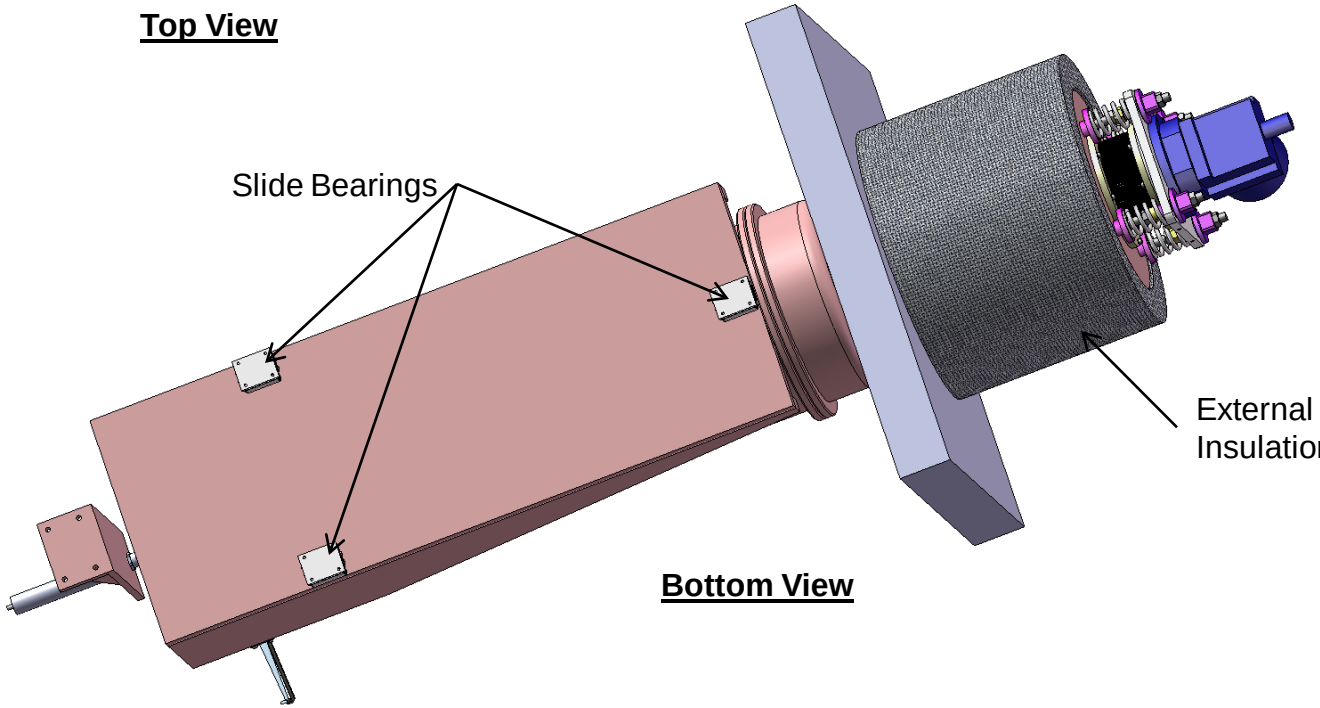
# 2
# LOWFS
# Dewar Design

# 2.1) LOWFS Dewar Design:

Cold Head Installed on NGAO Enclosure

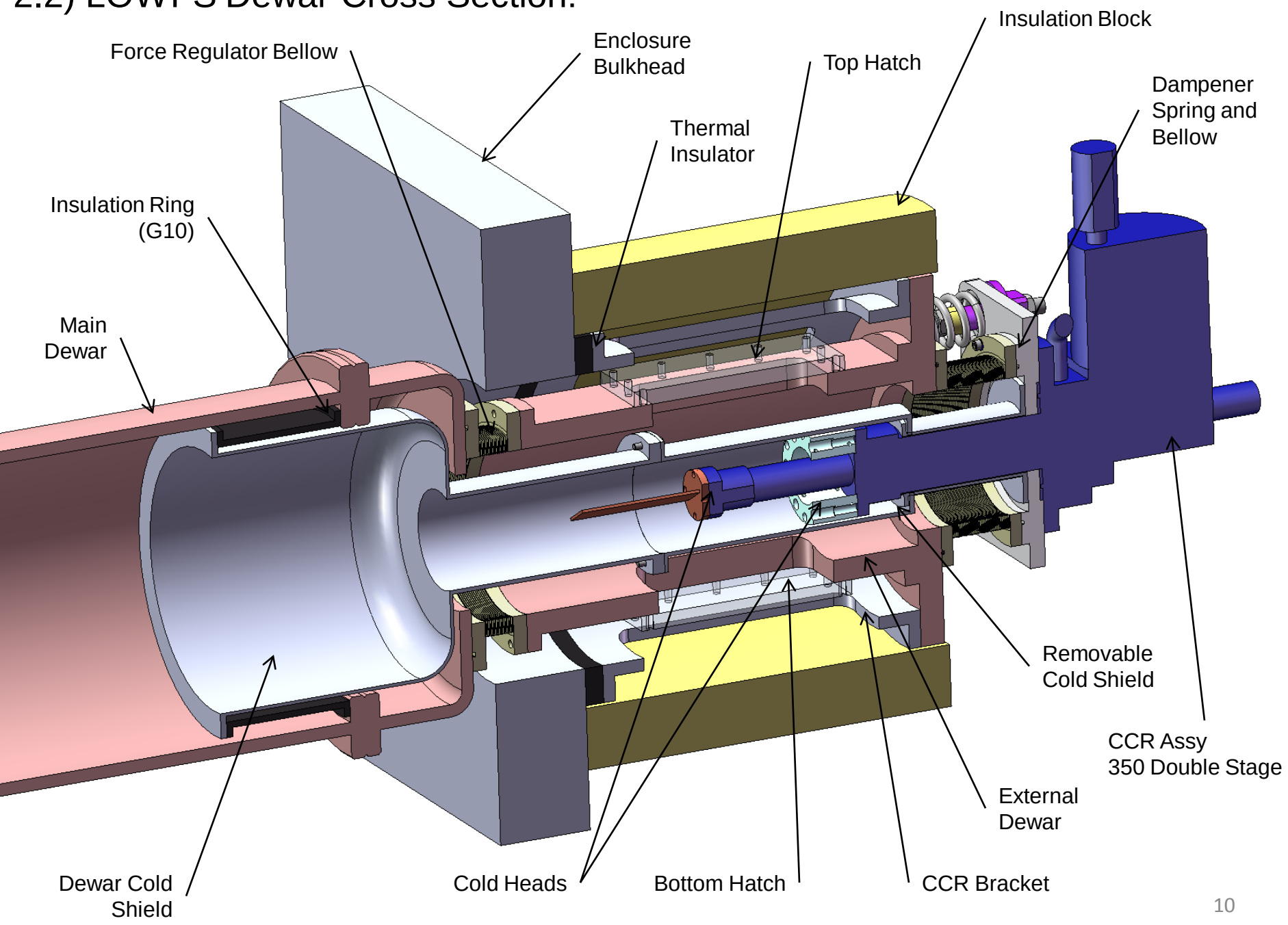



**Top View**




**Bottom View**

# 2.2) LOWFS Dewar Cross Section:



# 2.3) External Forces estimate

- Assumption:

A 5.4” ID Vacuum Bellow subjected to an estimated atmospheric pressure P of 15 psi at sea level would have to resist a force

$F = P\pi R^2 = 15 \times \pi \times 2.7^2 = 343$ lbs

- Spring Analysis

1) Wire Diameter:

One 5 in ID Spring D, Stressed S at 5E4 psi would need a wire diameter $d^3 = FD / 0.393S = (343 \times 5) / (0.393 \times 5E4)$ ➔ d = .50 in

2) Deflection for 343 Lbs Load, using N = 10 coils and SS302 with G = 10E6:

Deflection $L = 8FND^3 / Gd^4 = 8 \times 343 \times 10 \times 5^3 / 10E6 \times .5^4 = 3430000 / 437500 = 5.5$ in

3) Estimated Force $F_2$ to Deflect the spring 6mm (.24in):

$F_2 = LGd^4 / 8ND^3 = .24 \times 10E6 \times .5^4 / 8 \times 10 \times 5^3 = 105000 / 10000 = 15$ Lbs

4) Max Stress at 5.74 in deflection:

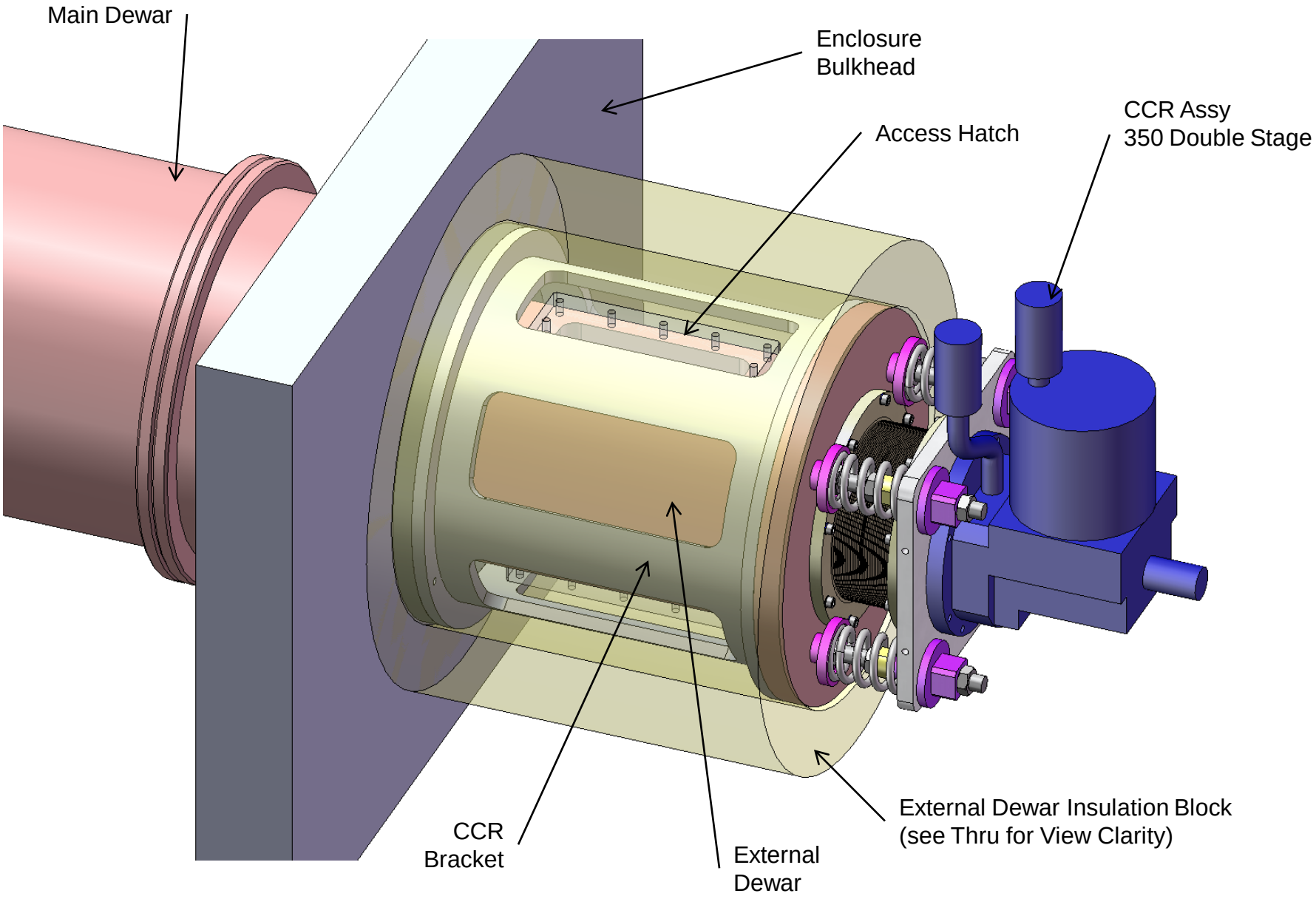
$S = GdL / \pi ND^2 = 10E6 \times .5 \times 5.74 / \pi \times 10 \times 5^2 = 36540$ psi

4) Estimated Spring rate:

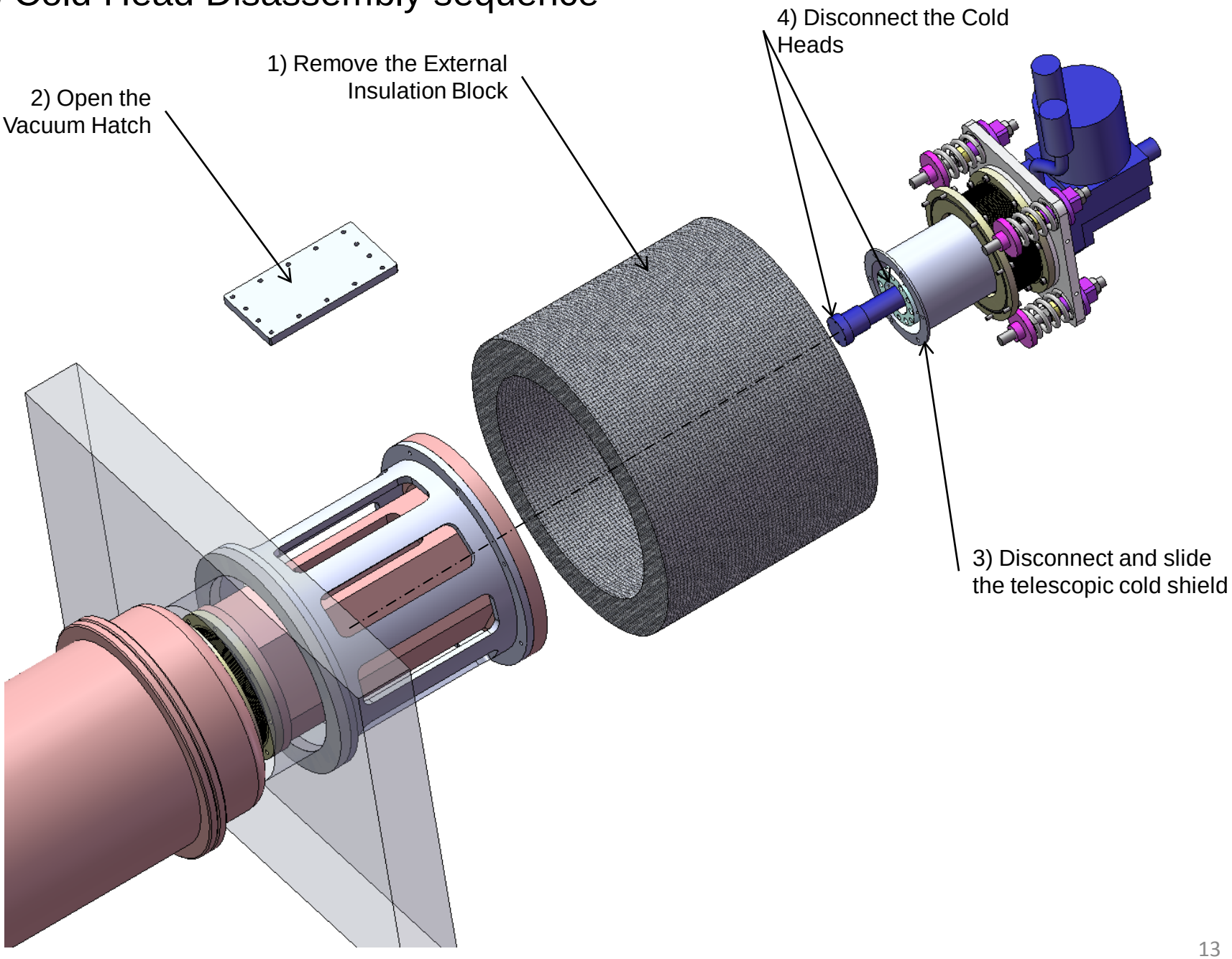
14 Lbs / .24” ➔ 58 Lbs / in

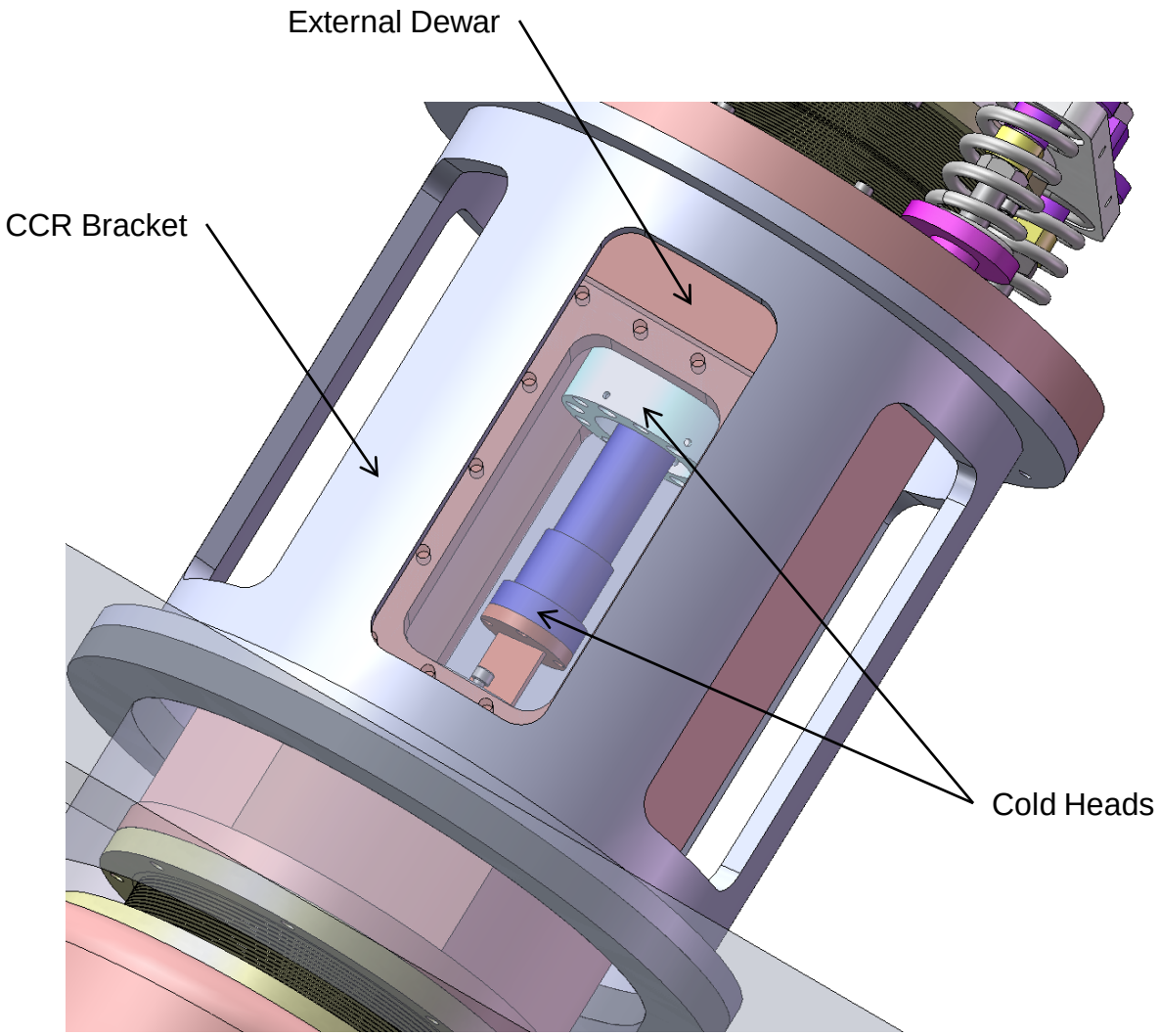
5) PI M-235.2DG Linear Stage Capability: 120N (26 Lbs)

# 2.4) Cold Head Installation



# 2.5) Cold Head Disassembly sequence






View looking down the Hatch
(Cold Shield disconnected)