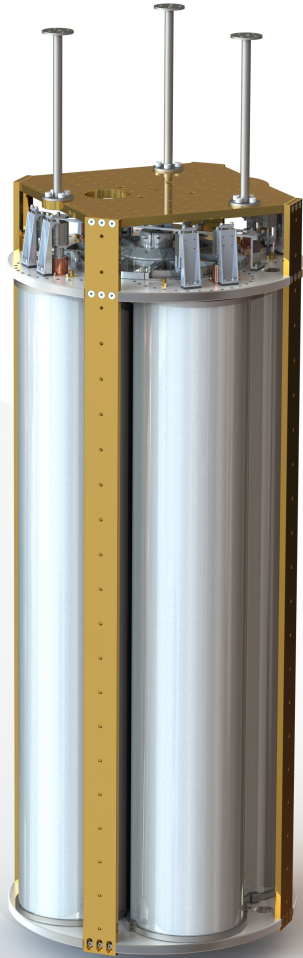# ADMX 2A Cavity Array Mechanical Design

J. Gleason, D. Tanner, N. Sullivan, J. Yang

2A Cavity Array Fabrication Deliverables

2A core and interface components

- Cavity array core assembly

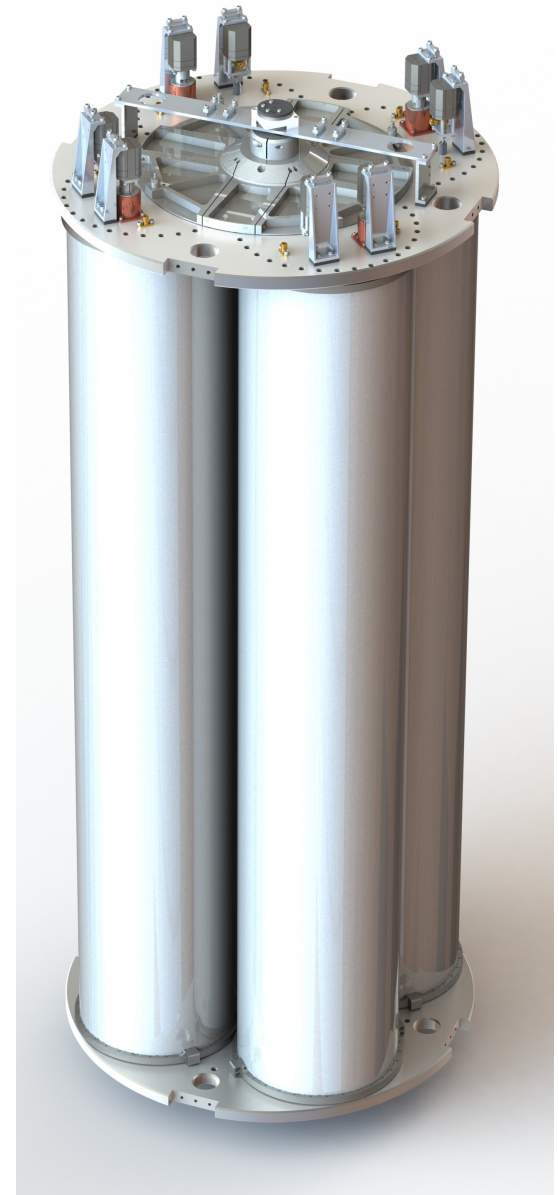- Interface to insert components

- Assembly / test fixtures

- Crating / shipping components

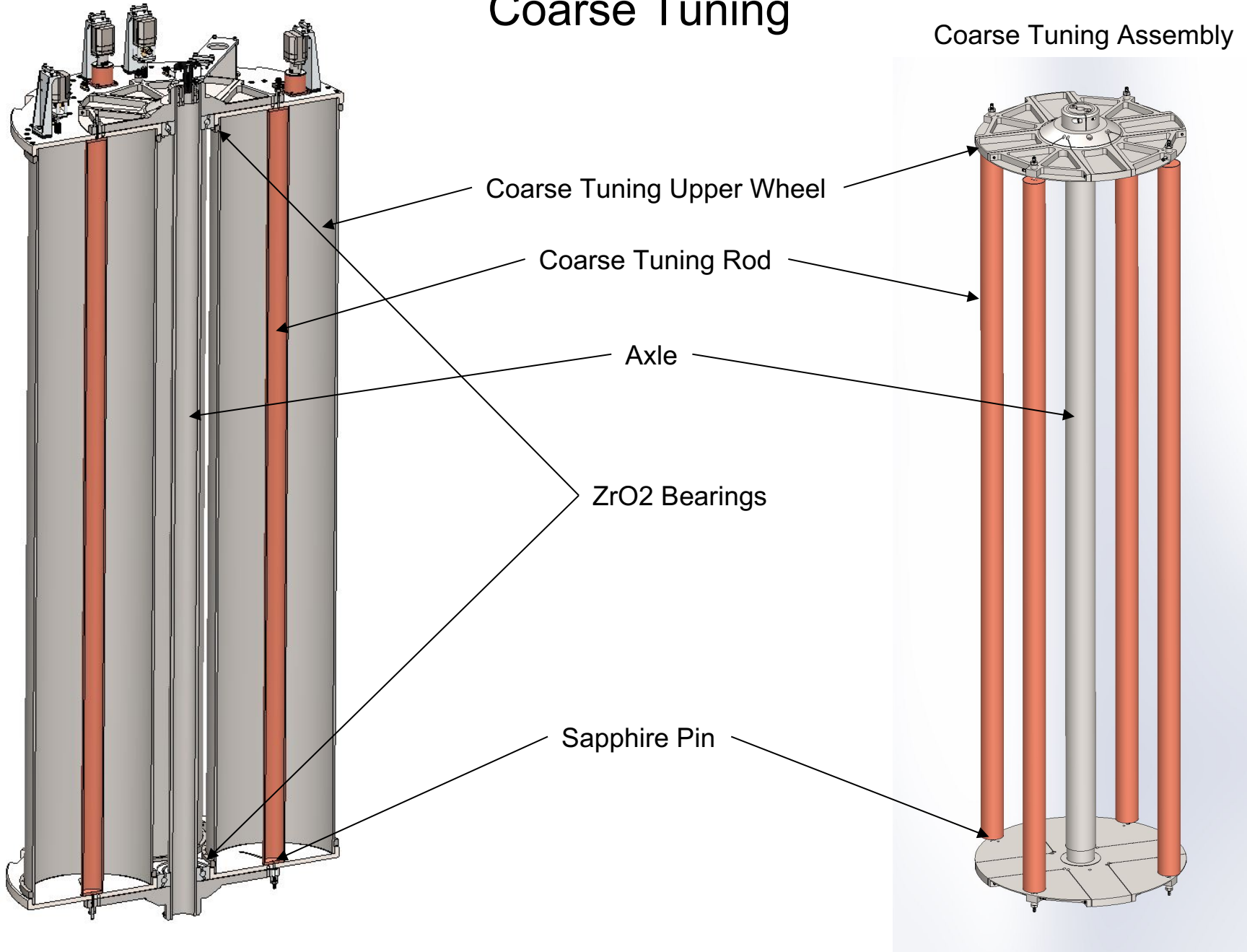# 2A Cavity Array Core Assembly Overview

Prototype v2

2A

- Based on Prototype v2 design
- Cavity ID and coarse tuning rod OD scaled by 2.85 → tuning range 1.5 - 2.2 GHz
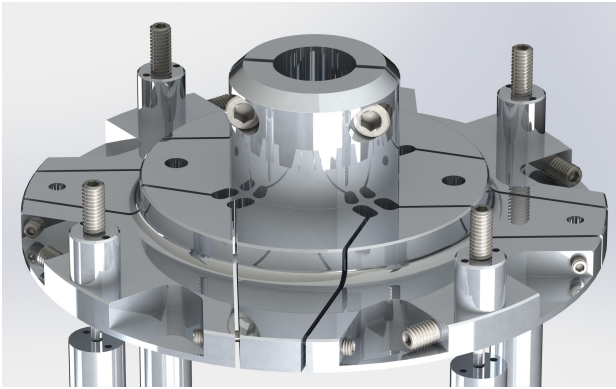- Cavity length scaled by 5.5 to 37.85"
- 76 liters volume
- 76 kg

Coarse Tuning

Coarse Tuning Assembly

Coarse Tuning Upper Wheel

Coarse Tuning Rod

Axle

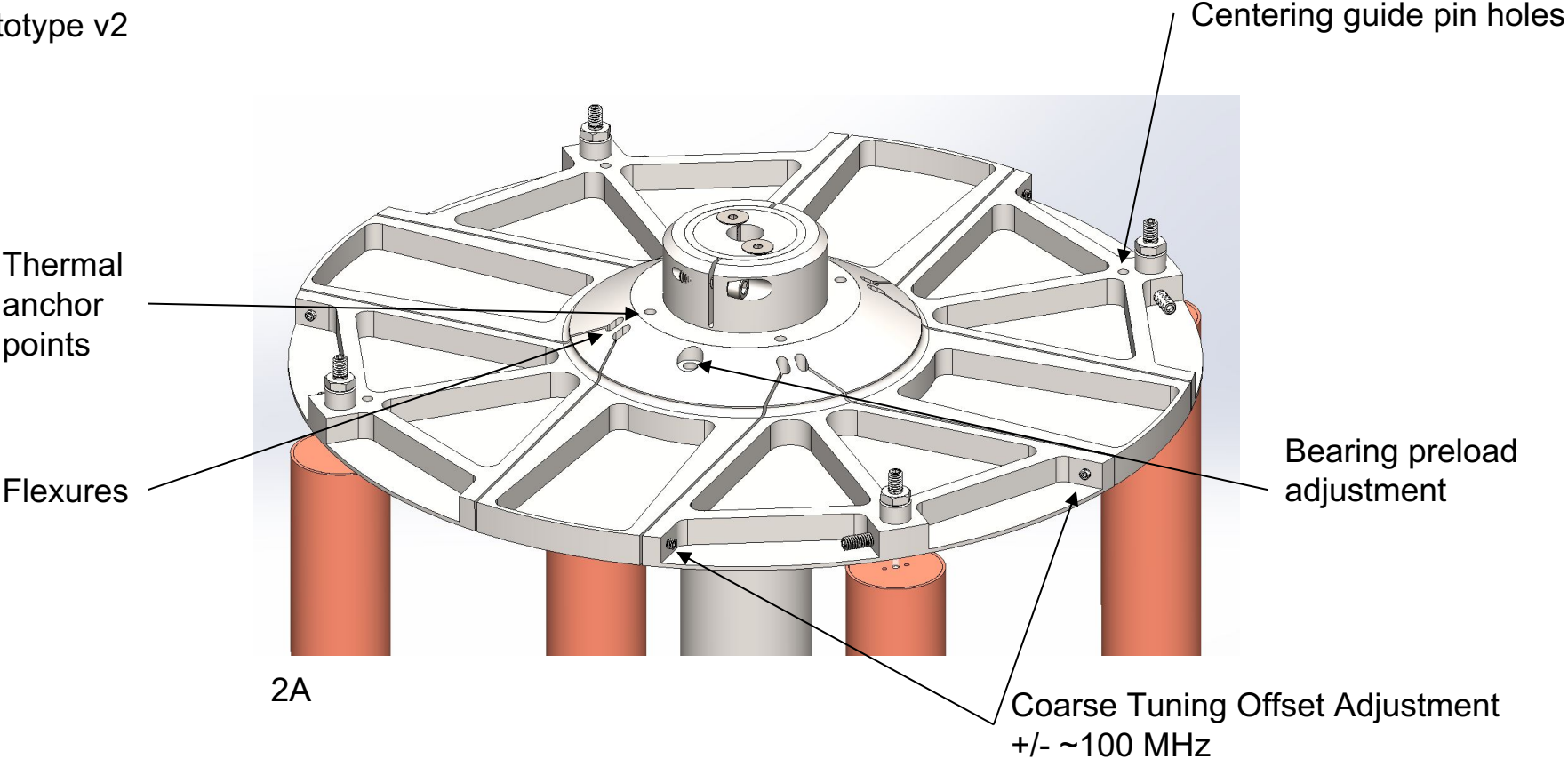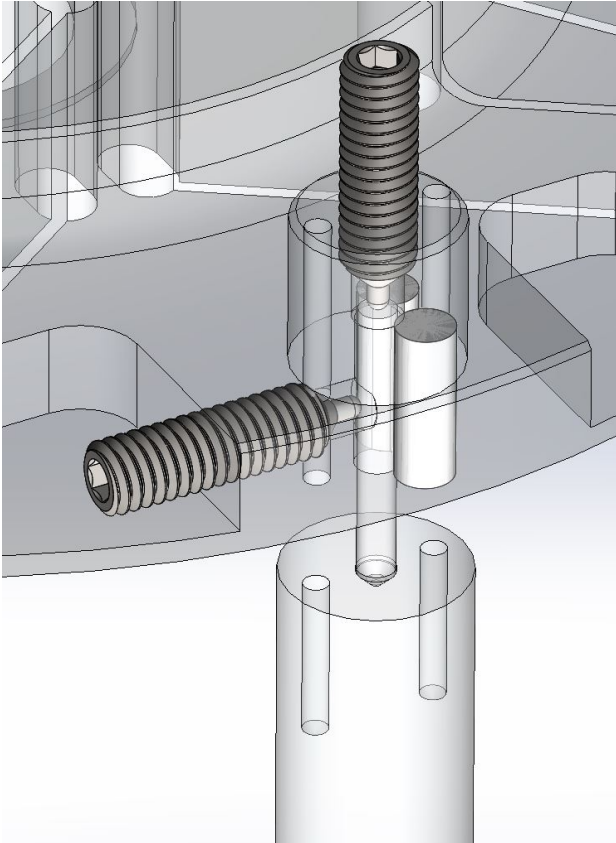ZrO2 Bearings

Sapphire Pin

Coarse Tuning Wheel Design

Prototype v2

- Similar flexure design to prototype.
- Added light-weighting, individual centering holes, and thermal anchor points

Centering guide pin holes

Thermal anchor points

Flexures

Bearing preload adjustment

2A

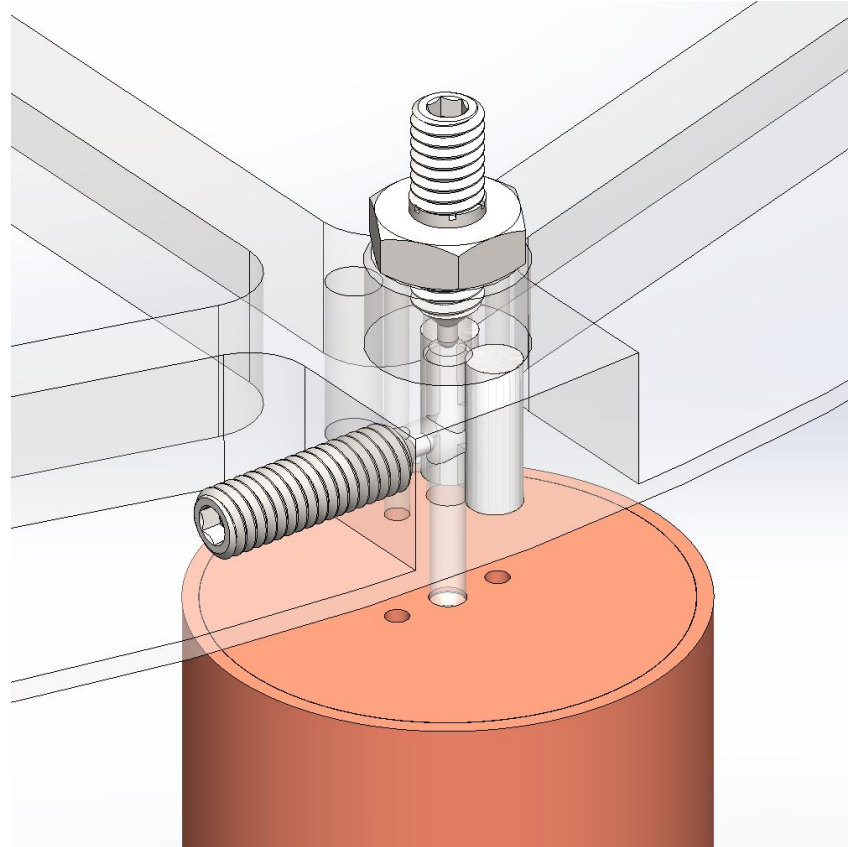Coarse Tuning Offset Adjustment +/- ~100 MHz
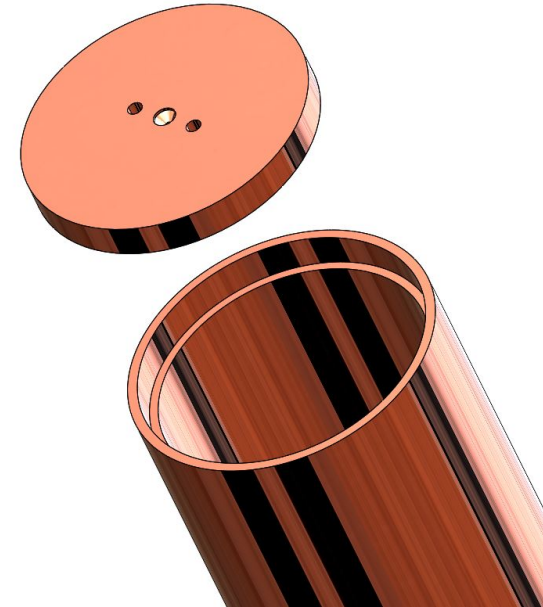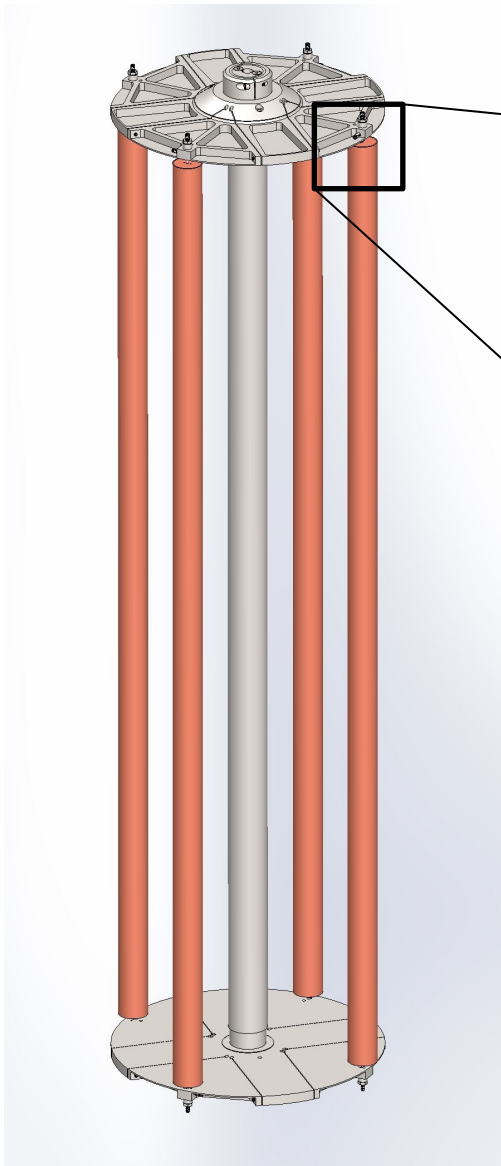
Rod Mounting

Prototype

2A

- Identical mounting scheme to prototype with addition of metal lock nuts and increased spring tensions
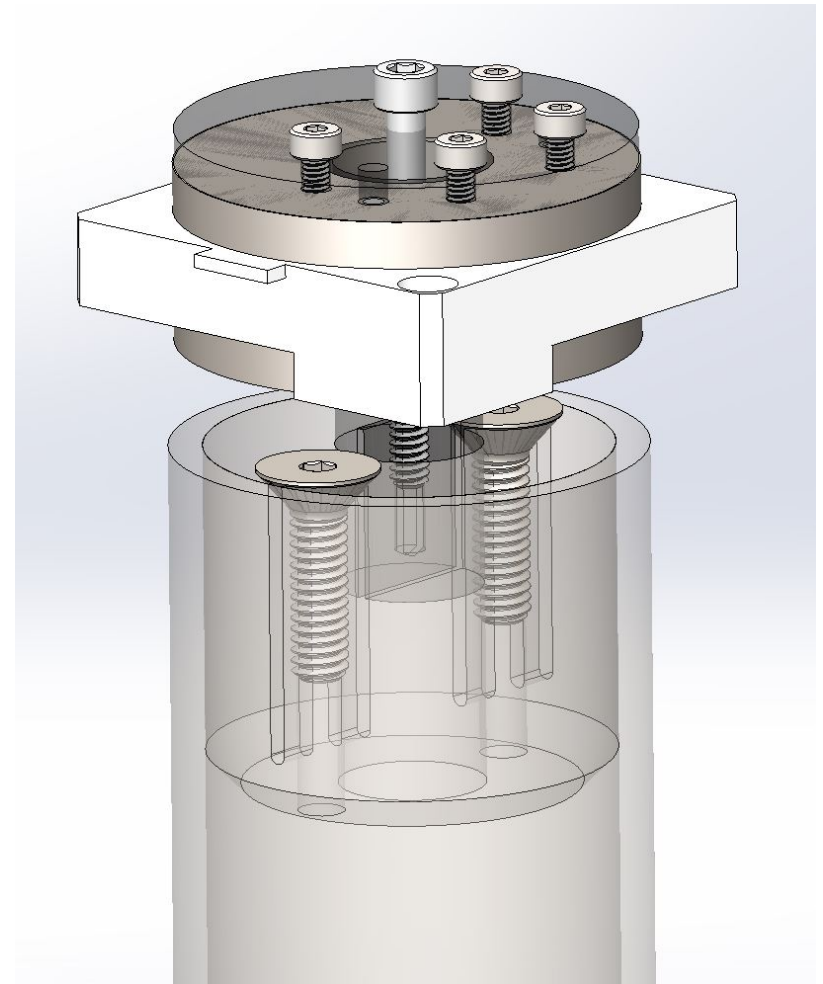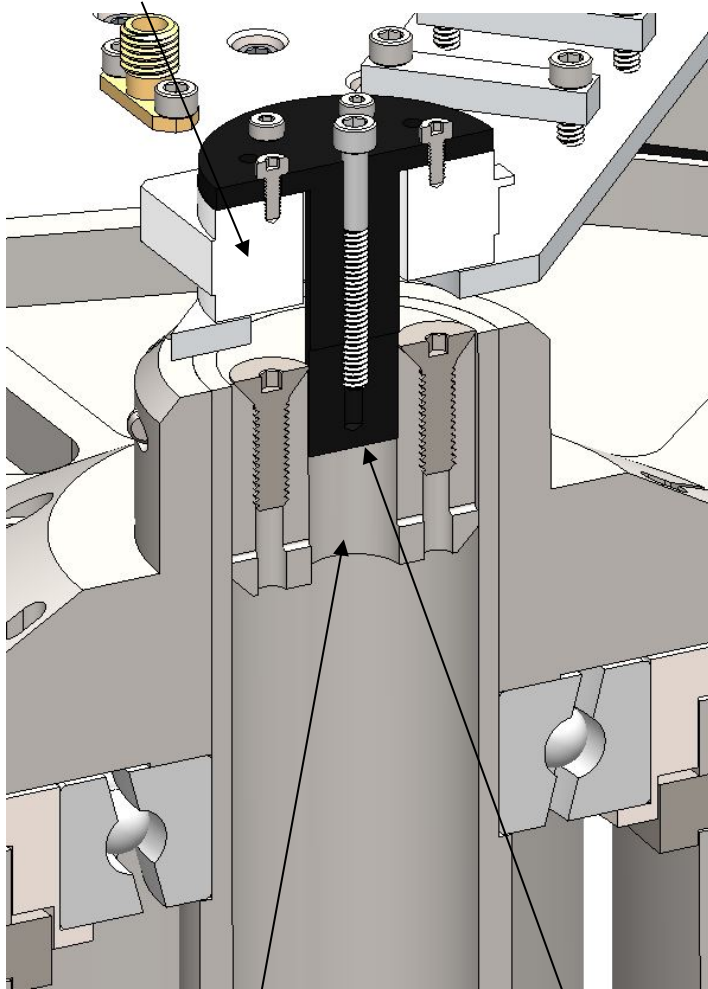
Coarse Tuning Rod Design

- Tube material 1.0" ID x 1.13 OD
- 99.99% C101 Cu

Coarse Tuning Rotary Stage Coupling
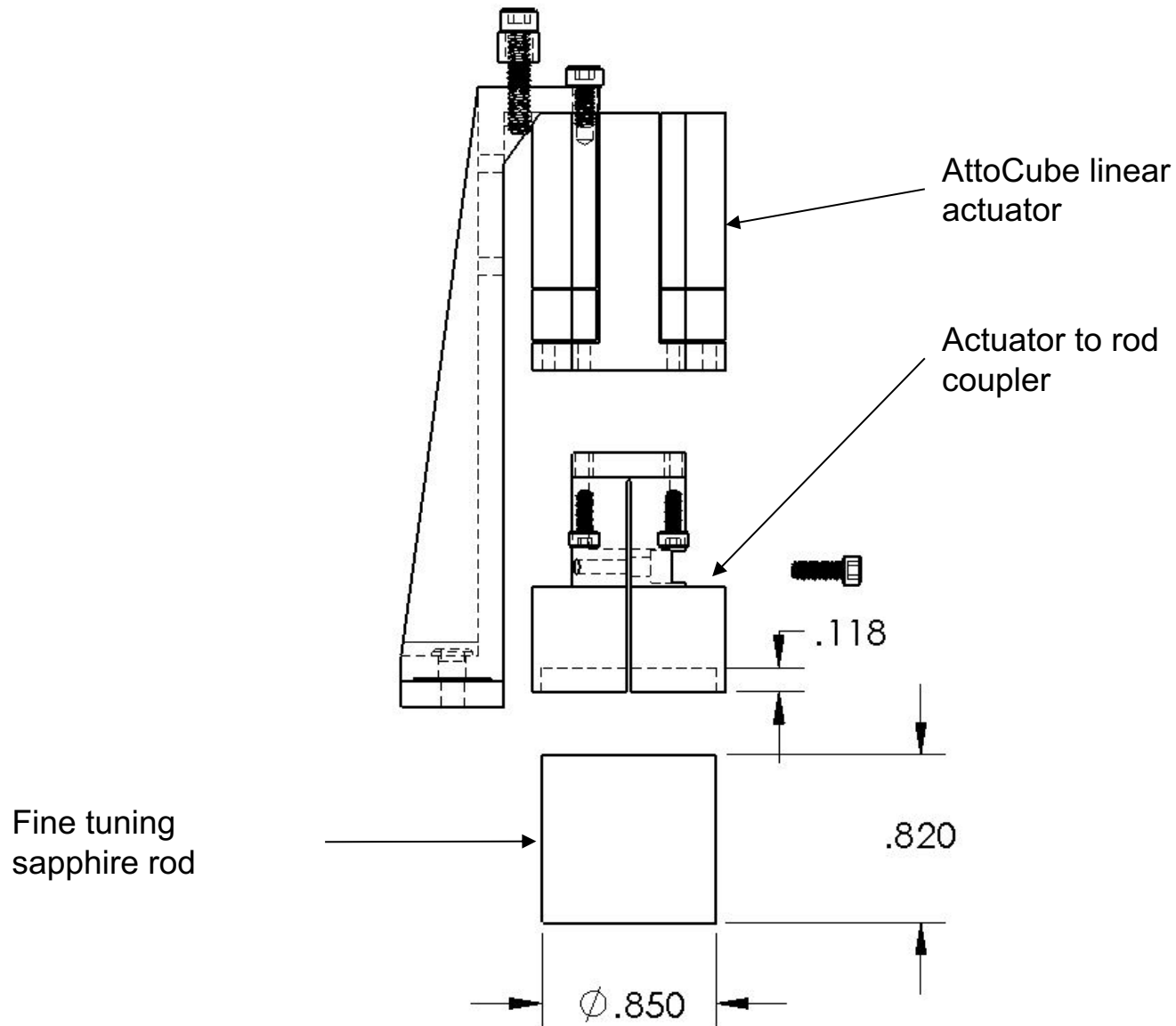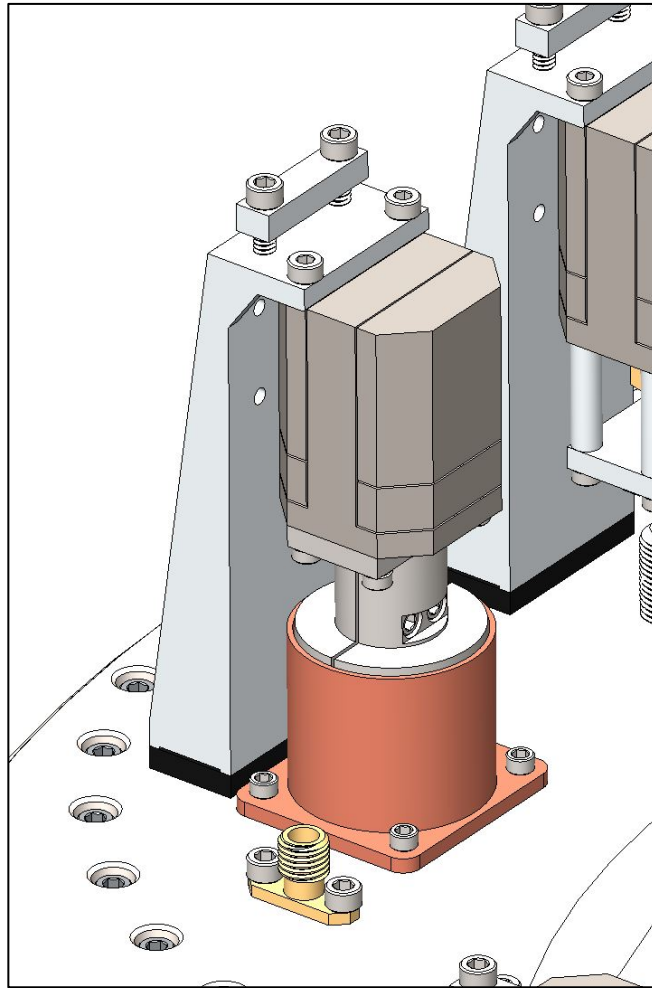
AttoCube rotary stage

Expansion Plug   Delrin Coupler
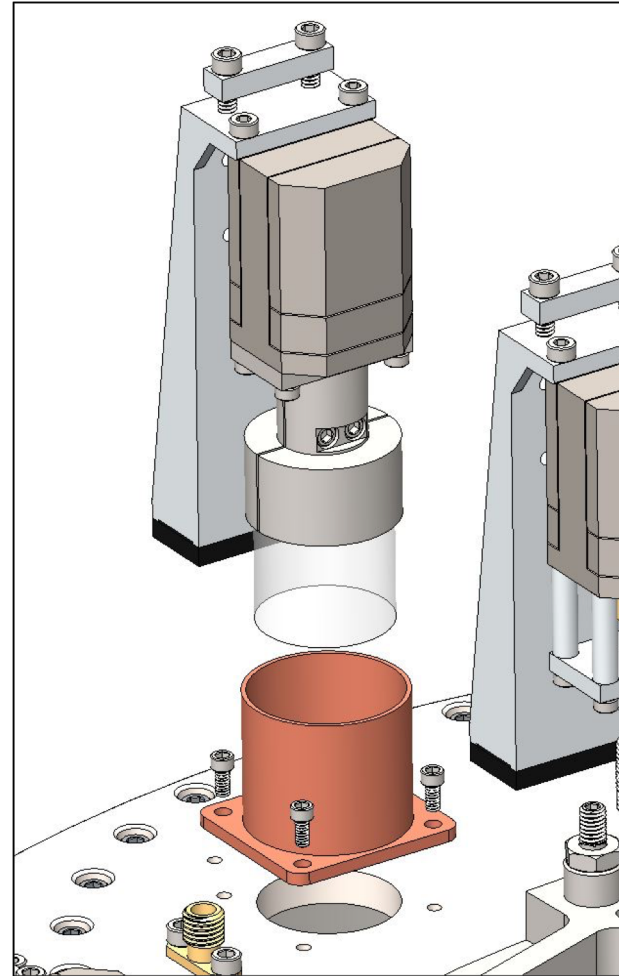
Fine Tuning Actuator Assembly (2A)

AttoCube linear actuator

Actuator to rod coupler
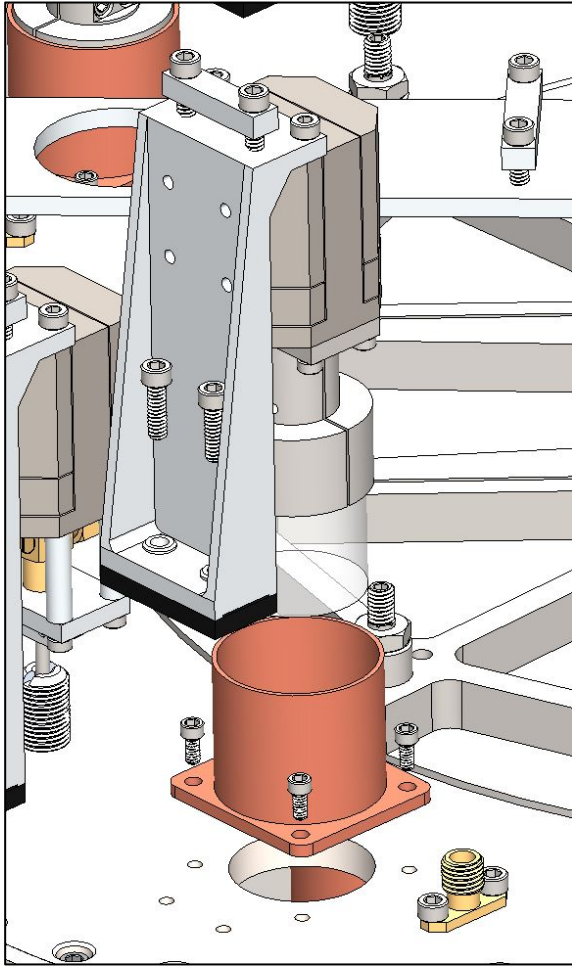
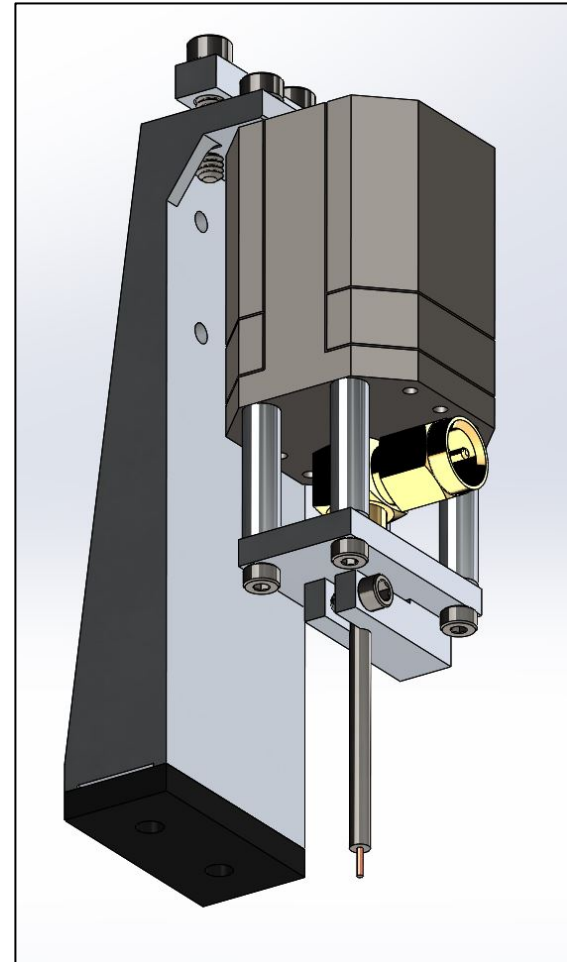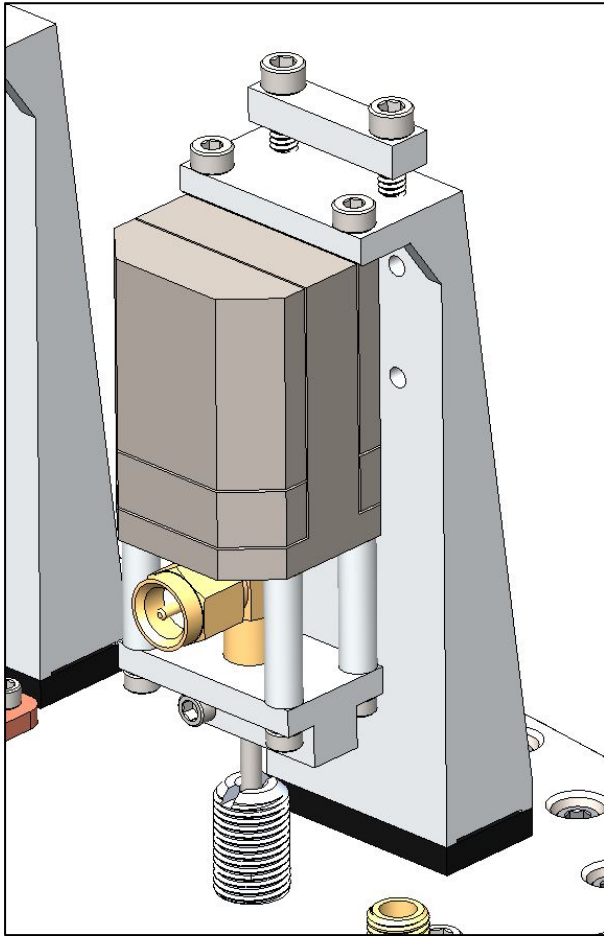Fine tuning sapphire rod

.118

.820

⌀.850

Fine Tuning (2A)

- Rod holder to RF shroud gap = 0.010"
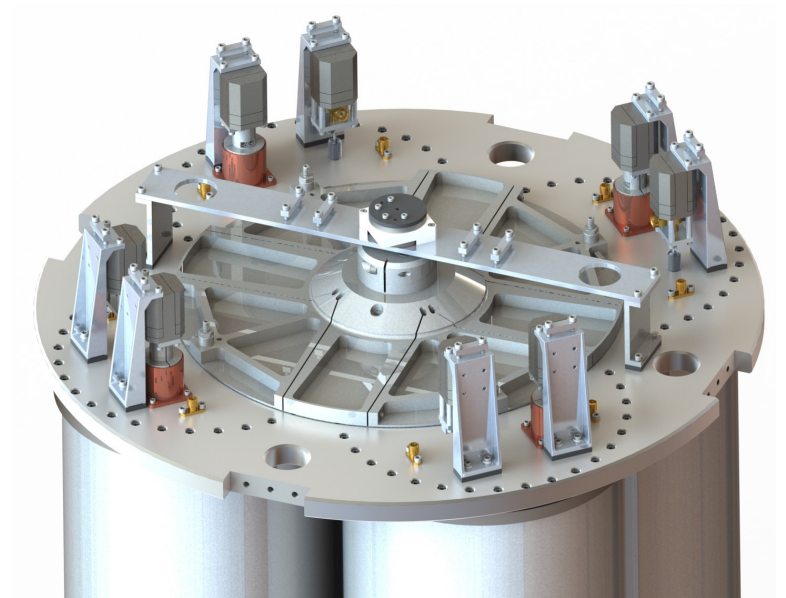- Minimum length of gap is 12mm

Fine Tuning (2A)

- PEEK / Nylon thermal isolation
- Screw pattern for copper braid to intermediate cold plate
- Tuning rod to cavity end plate gap = 0.010"
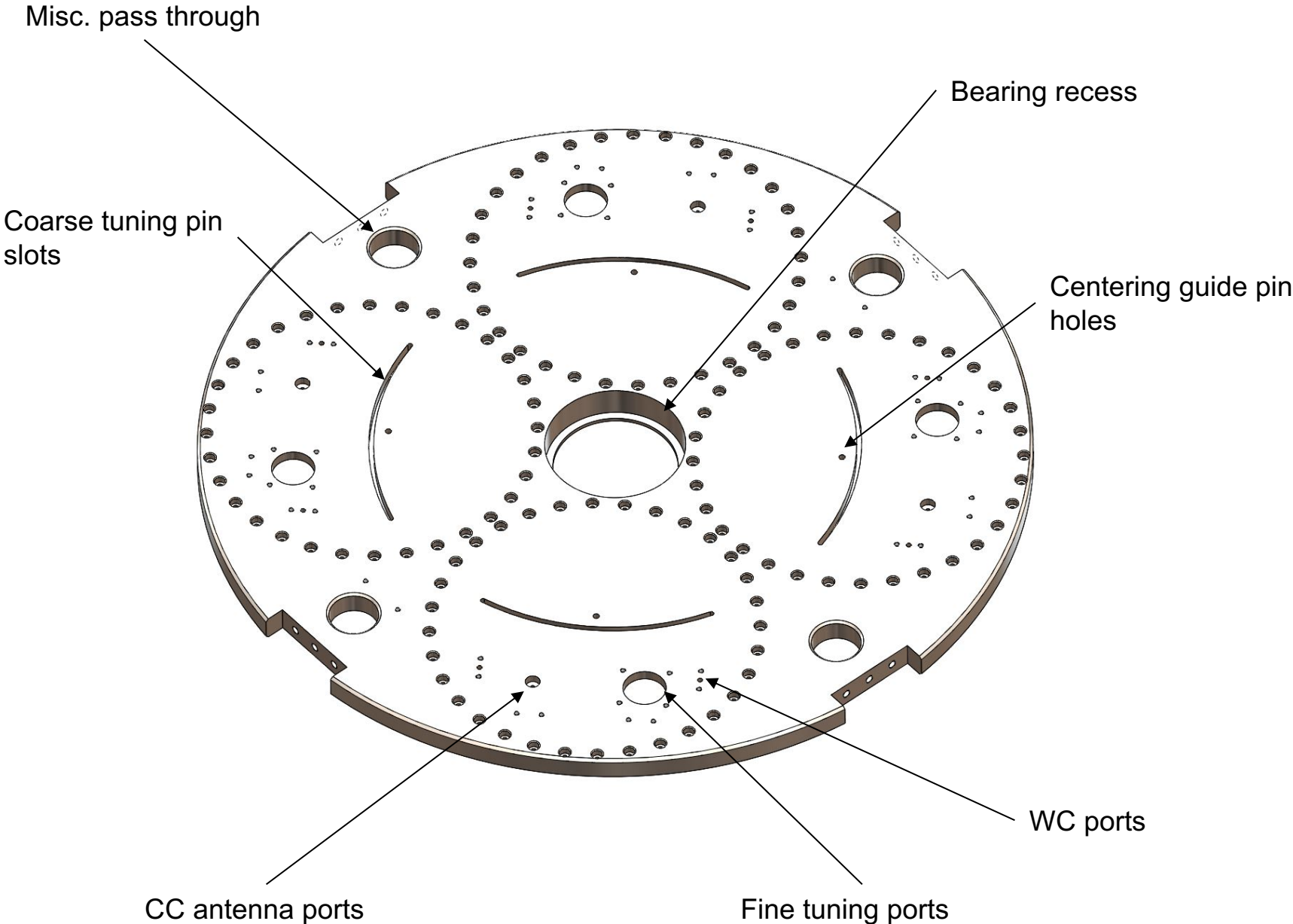
Critically Coupled Antenna Actuation

- Same as prototype with smaller RG405 cable
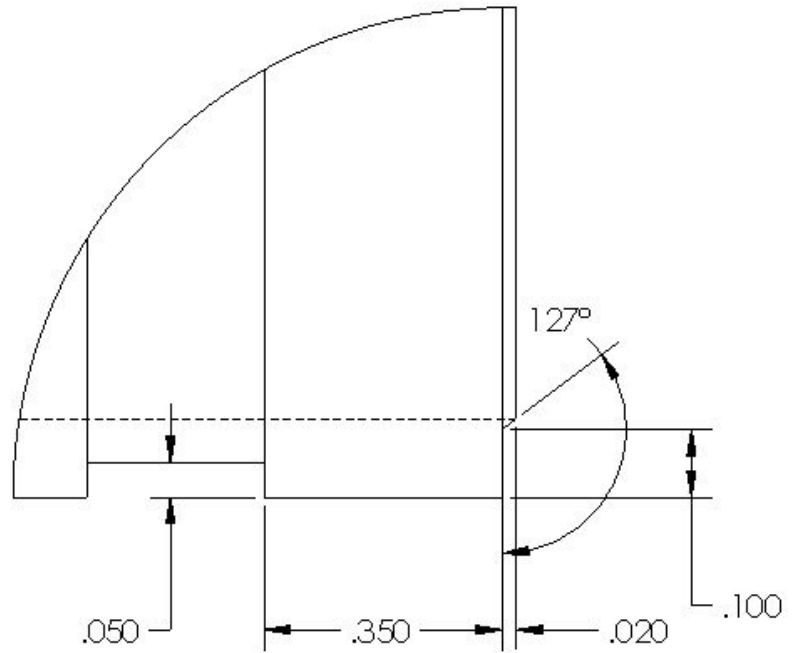
Linear Actuator Placement

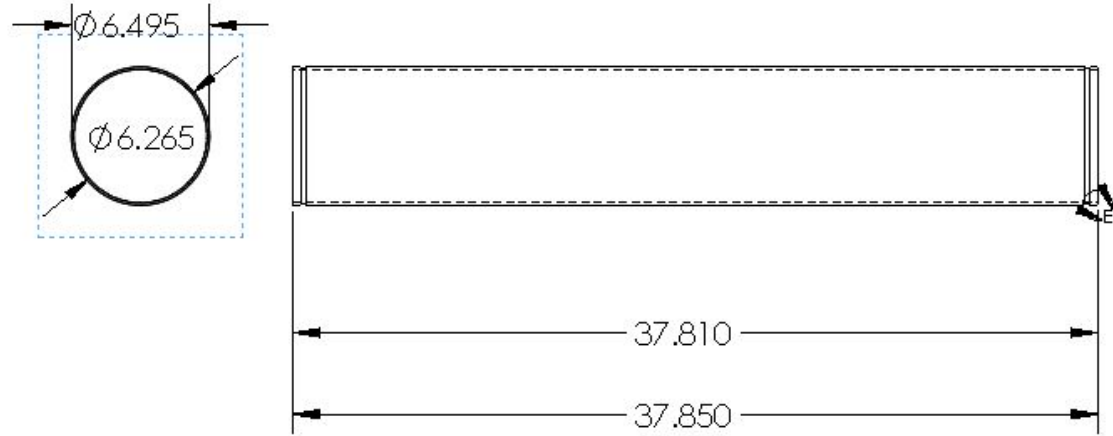
- Extra space allows all actuators on top
- shorter cable runs
- 9% greater cavity volume

End Plate Design

Misc. pass through

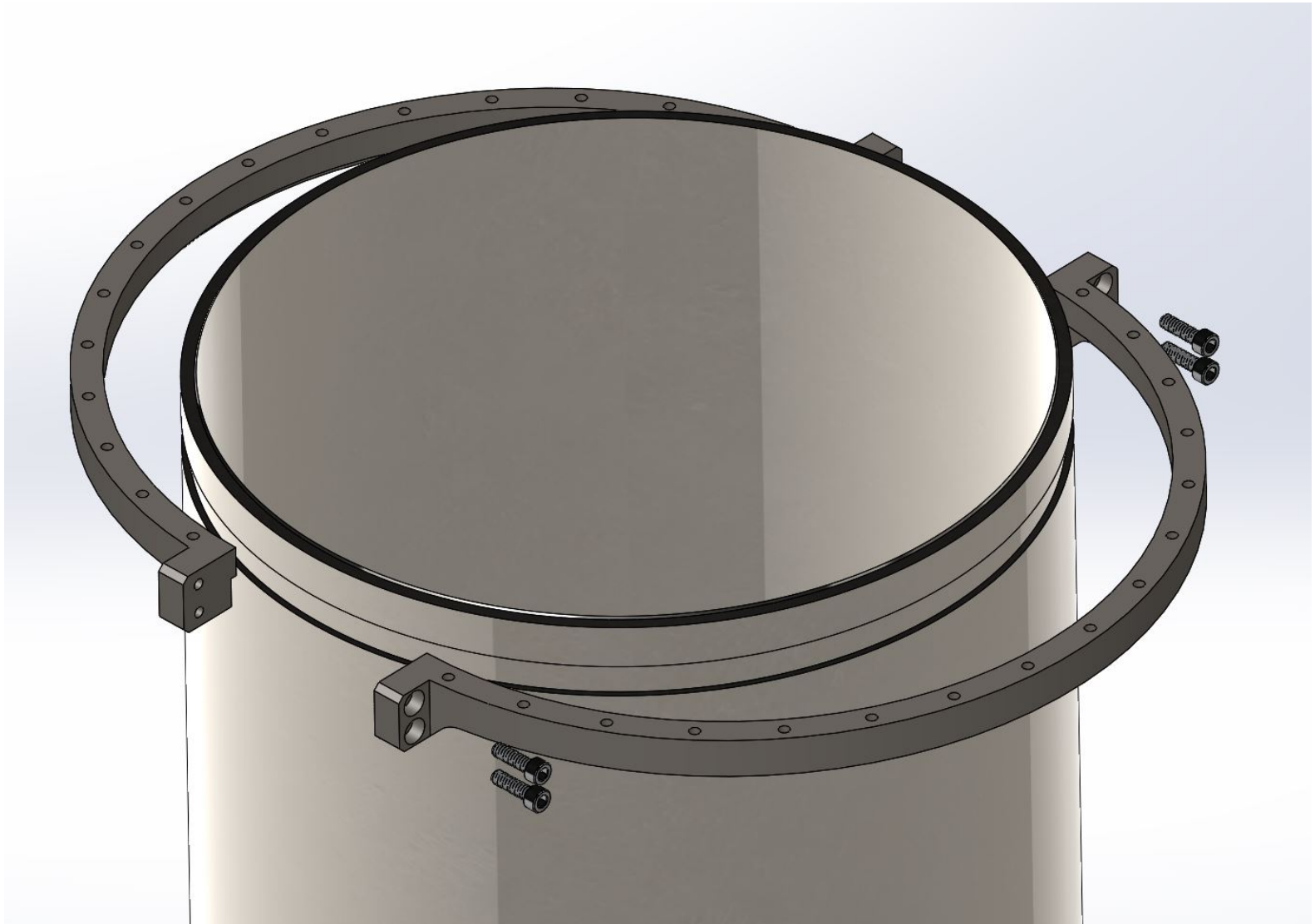Bearing recess

Coarse tuning pin slots

Centering guide pin holes

CC antenna ports

Fine tuning ports

WC ports

Tube Design Details

- Cu plated SS
- 0.120" nominal wall thickness

Ø6.495

Ø6.265

37.810

37.850

127°

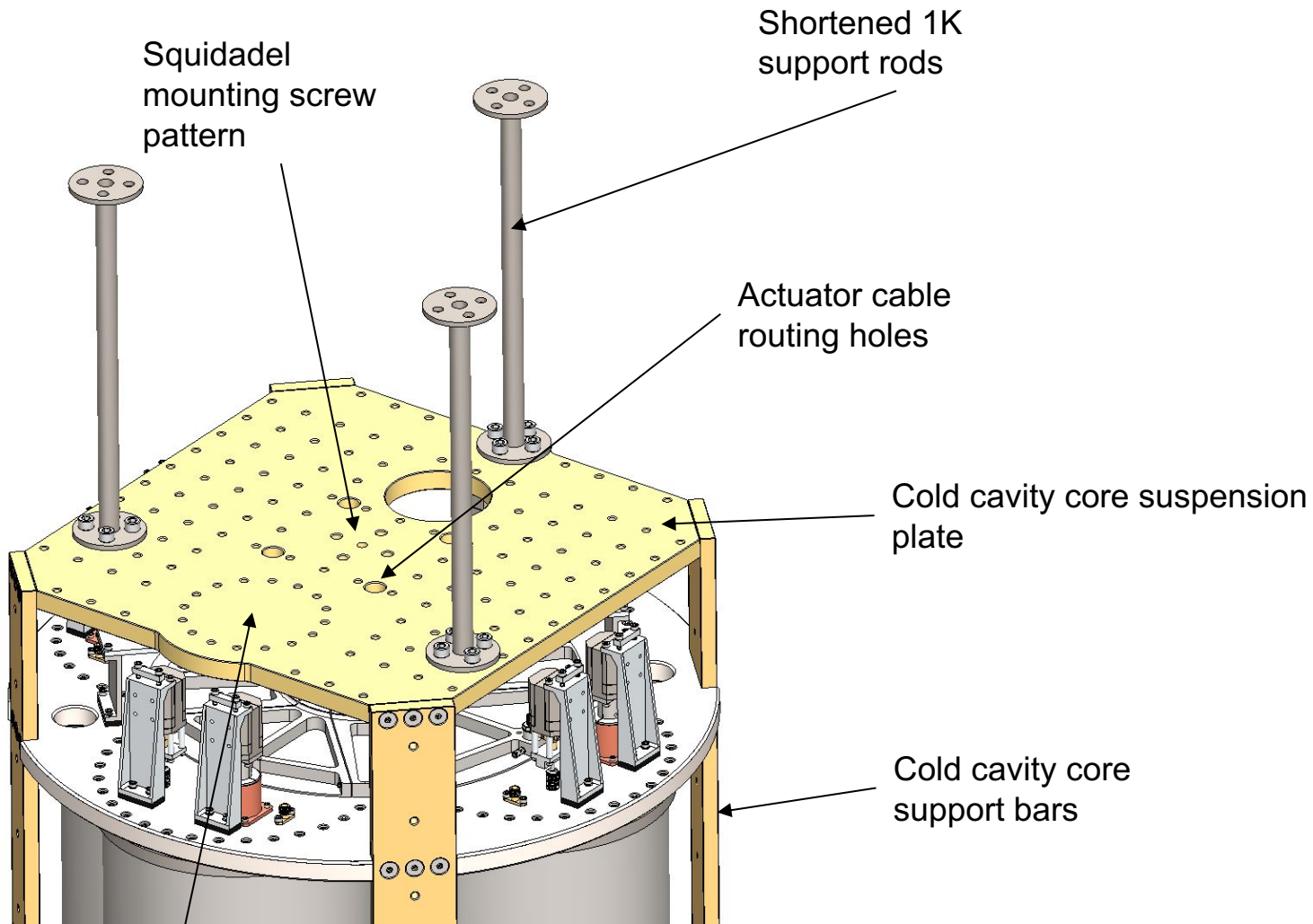.050

.350

.020

.100

Tube to End Plate Interface
(2A)

Tube to End Plate Interface (2A)

Interfacing to ADMX Insert

Squidadel mounting screw pattern

Shortened 1K support rods

Actuator cable routing holes

Cold cavity core suspension plate

Cold cavity core support bars

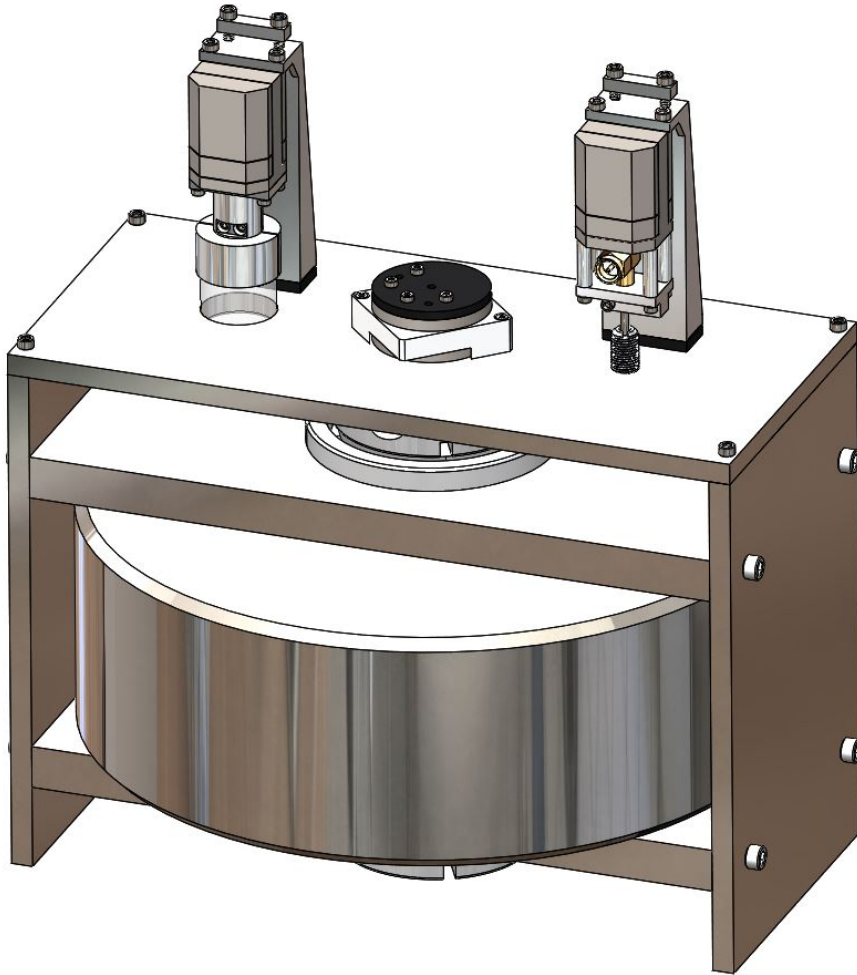DF mounting screw pattern
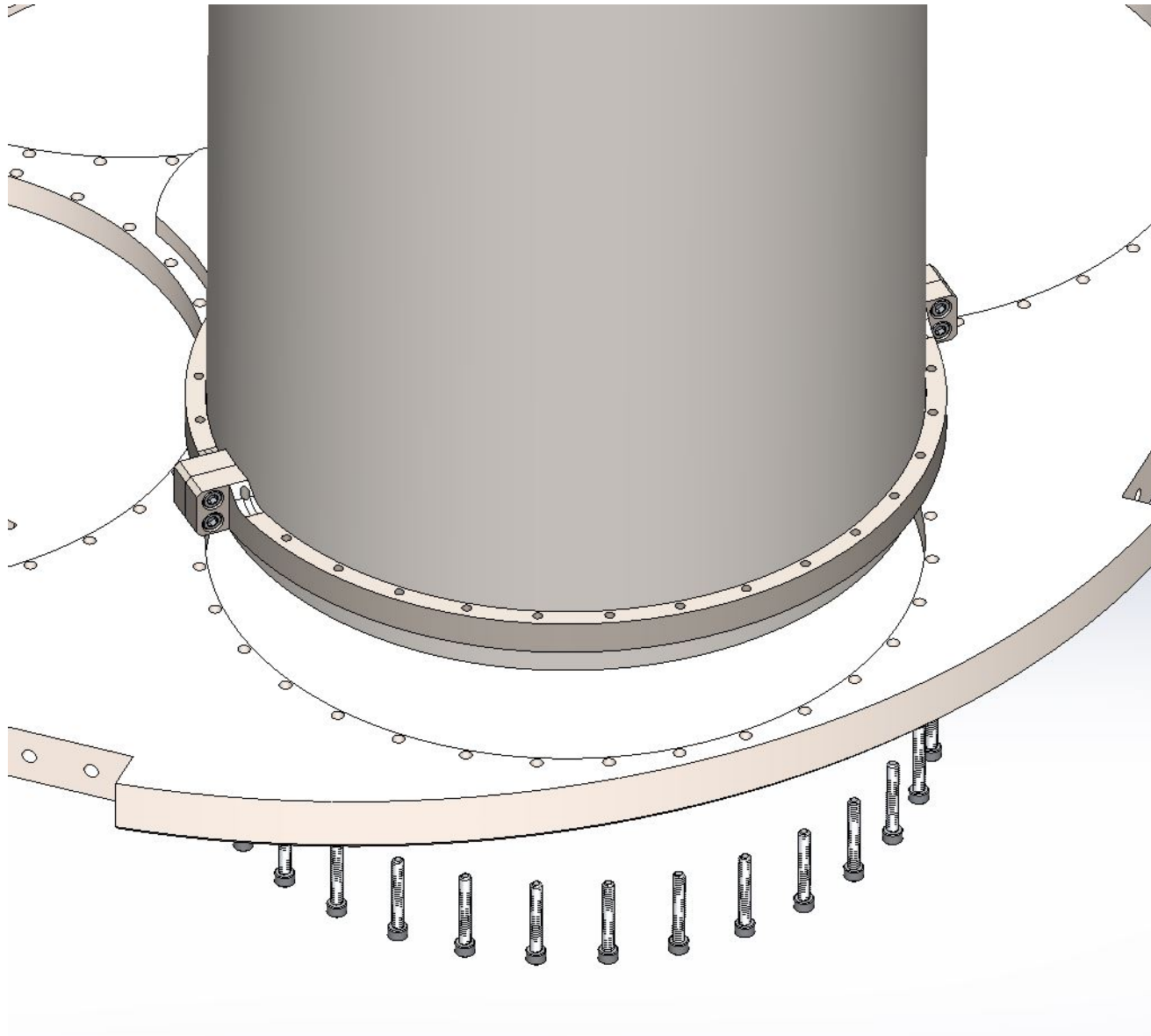
Interfacing to ADMX Insert
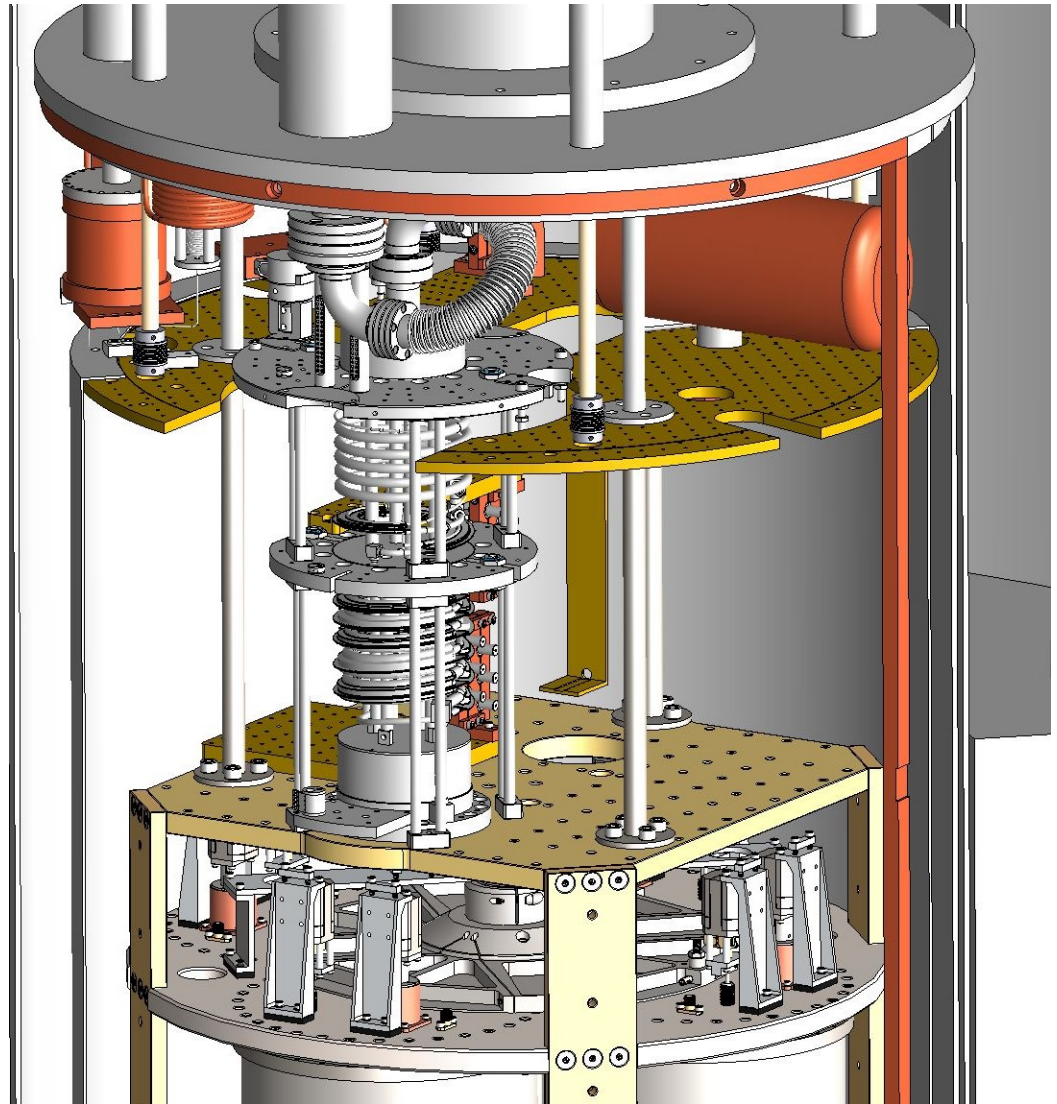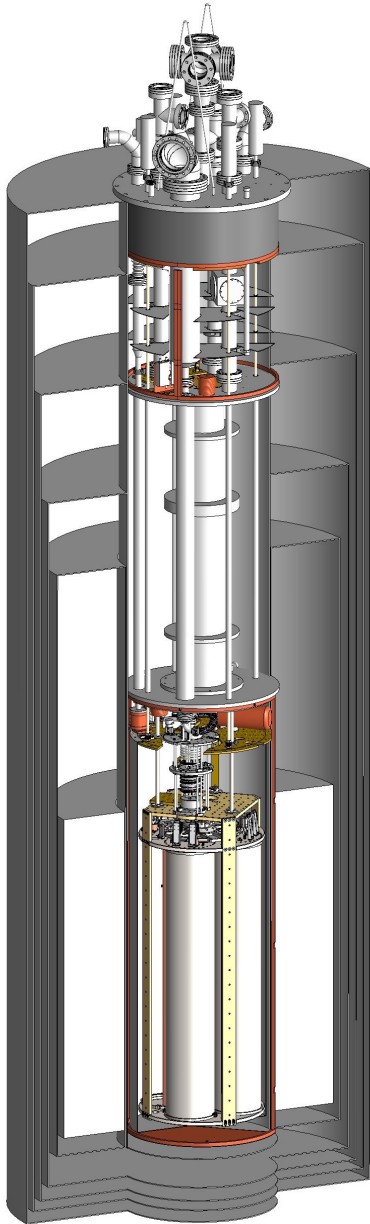
Actuator Test Rig

- Duplicates operating conditions for linear and rotary actuators

Fine Tuning Linear Stage

Coarse Tuning Rotary Stage

Fine Tuning Rod

Upper Coarse Tuning Wheel

Upper Bearing

Cavity

Coarse Tuning Rod

Axle

Critically Coupled Antenna

Antenna Actuator