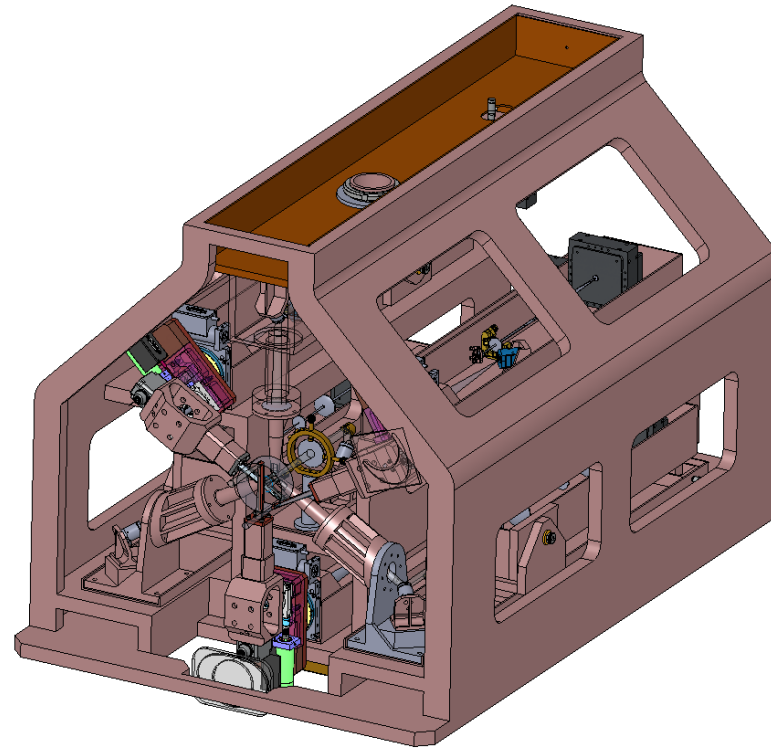


NGAO

Laser Guide Star



12/07/2009
MINI-REVIEW
(MINI-ANSWERS)

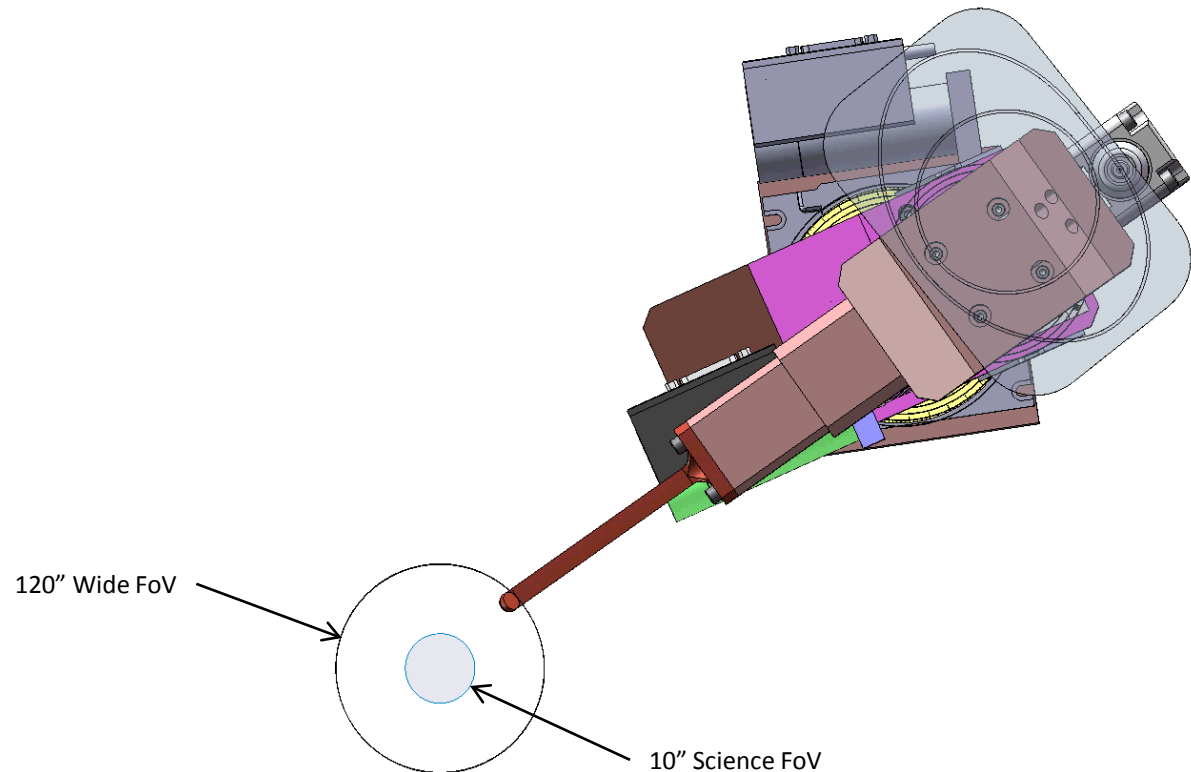
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Laser Guide Star Mini-Review mini-answers

- 1) Movie with the pick-off arms moving.....P 3
- 2) Folded motor has additional gear train - check specs for backlash.....P4
- 3) Illustrations shouldn't show obscuration of the science field.OK, No Action!
- 4) Use shallower angles at the tip-tilt and fold mirror (for making the overall length shorter.....P5
- 5) Can we use a yaw-pitch mechanism..... Stalcup
- 6) Do we need a pick-off for this ast all or use a tetrahedron.....P6 & 7
- 7) Distortion of the on-sky of the fixed asterism on skyStalcup
- 8) Eye-bolts to lift the LGS WFS assembly to facilitate lifting.....On-Going
- 9) Access to the linear stage is limited (the structure is 200 Kgs). Jack screws.....On-Going
- 10) Tracking of the sodium error needs more thought (PW)
- 11) Addition of a custom "Fail-Safe" Device.....P8 & 9

1) Motion Video



2) Backlash elimination



The backlash specified by the vendor is 200 μrad (0.011°) for each stages.

This would translate by a field inaccuracy of $(300 \tan 0.011) + (260 \tan 0.011) = 0.112\text{mm}$

Adding a constant 0.5 Lbs-in (.06Nm) torque (preloaded Spiral Spring) eliminates the backlash for any position of the Crank – Arm over a 360° rotation.

Adding 2 springs diametrically opposed prevents the addition of an undesired torque across the axis of rotation.

$$M = \frac{\pi E b t^3 \Theta}{6L}$$

L = active length of material

$$\Theta = \frac{\sqrt{D_s^2 + 1.27Lt} - D_s}{2t} - \frac{2L}{\pi(OD + D_s)}$$

D_s = Arbor diameter, inches

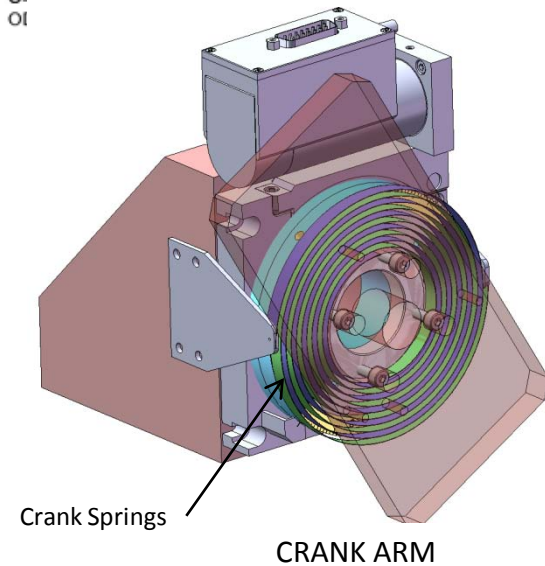
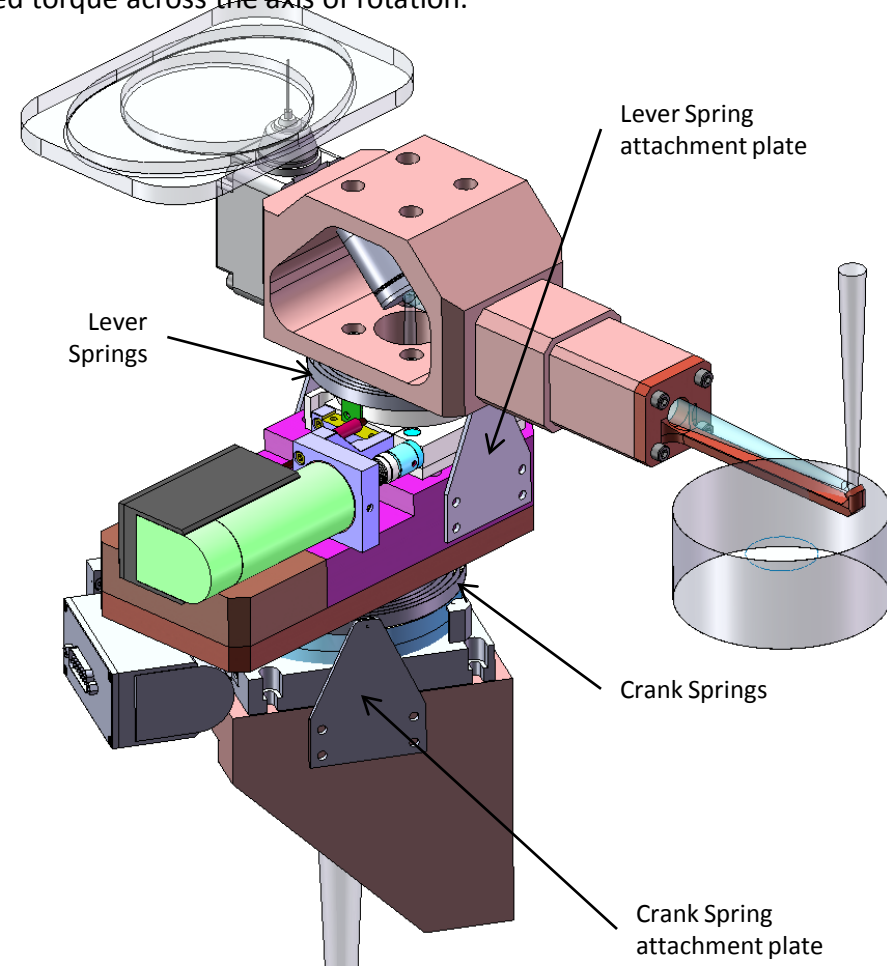
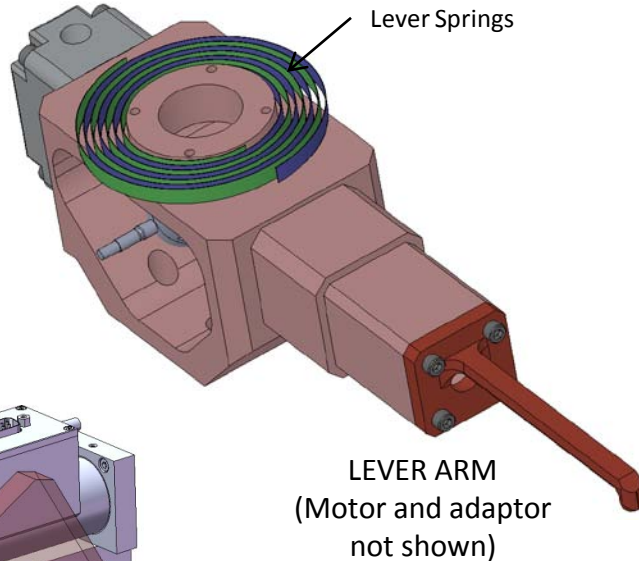
E = modulus of elasticity, psi

b = Width, inches

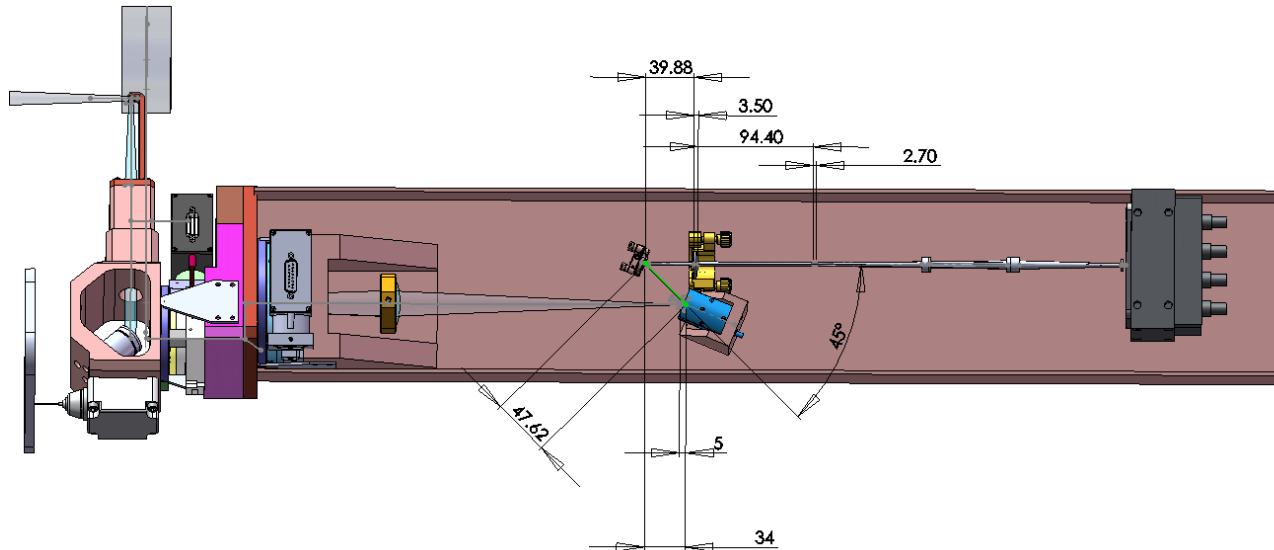
t = Thickness, inches

Θ = Angular deflection, radians

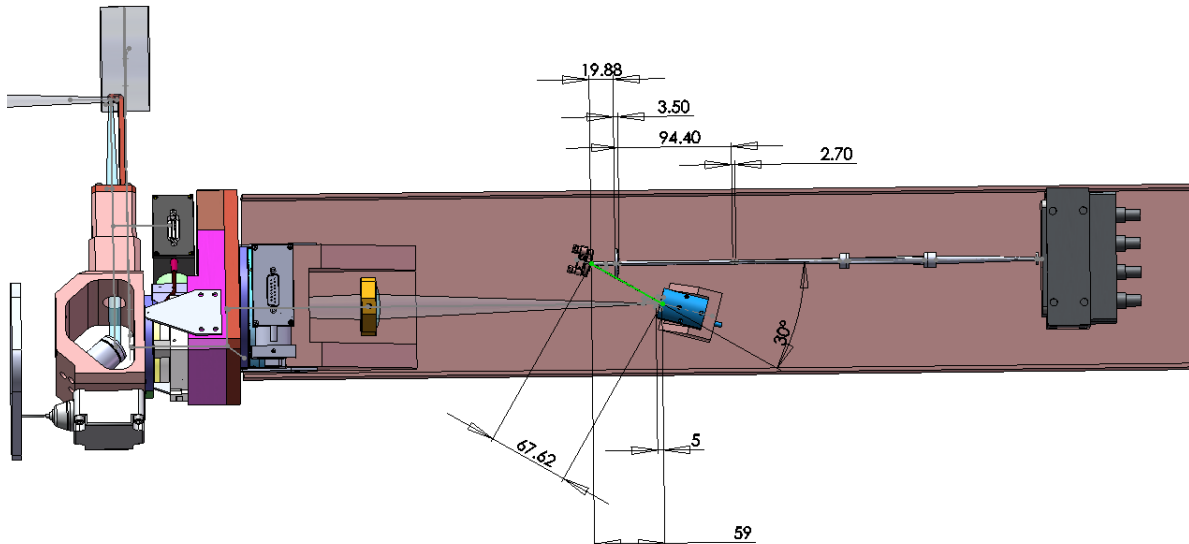
01



3) Closing the Fold Mirror angle



Using a 45° angle instead of a 90° angle allows to shorten the beam 34mm.



Using a 30° angle instead of a 90° angle allows to shorten the beam 59mm.

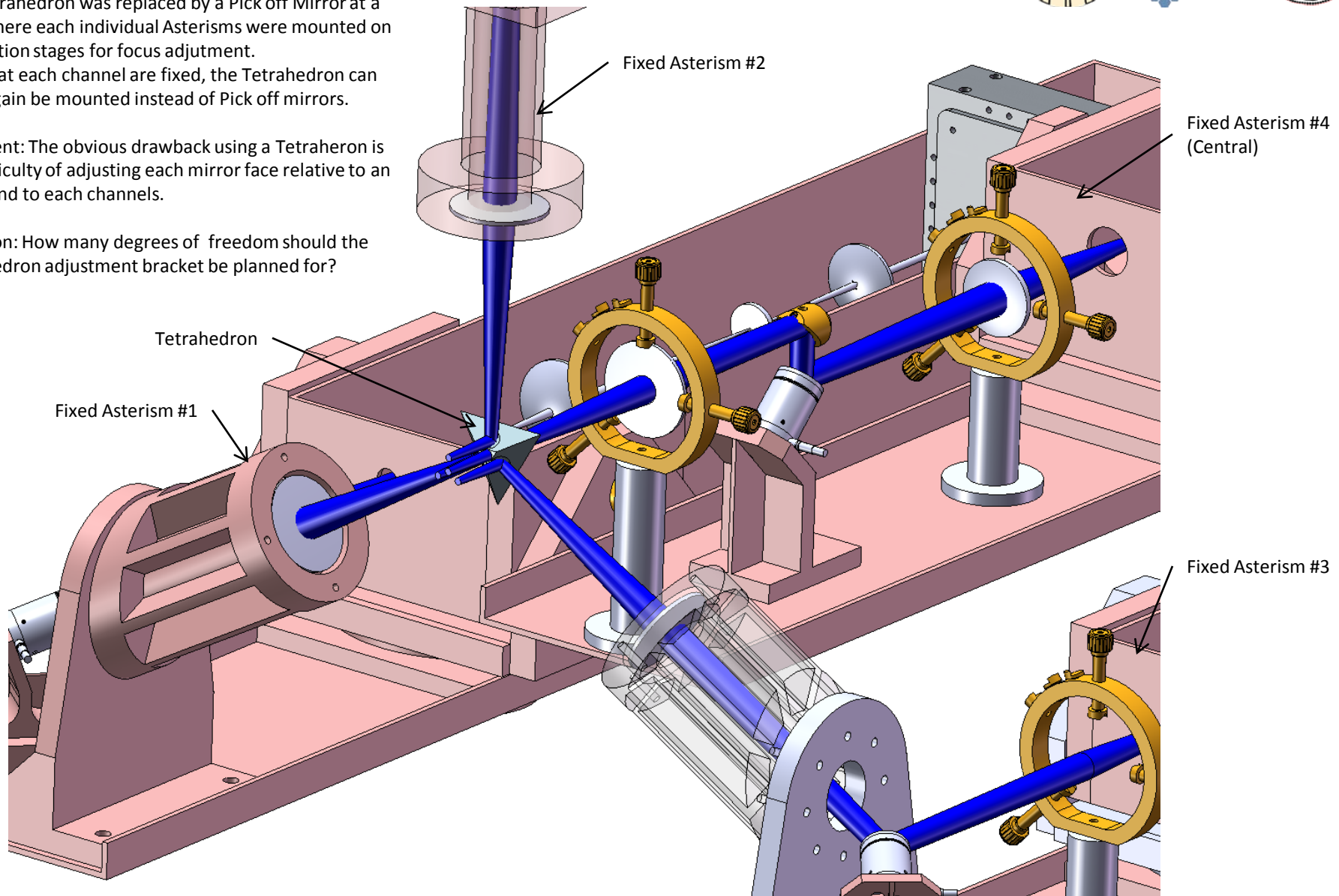
4) Replacing the Fixed Asterism Pick off with a Tetrahedron



The Tetrahedron was replaced by a Pick off Mirror at a time where each individual Asterisms were mounted on Translation stages for focus adjustment.
Now that each channel are fixed, the Tetrahedron can once again be mounted instead of Pick off mirrors.

Comment: The obvious drawback using a Tetrahedron is the difficulty of adjusting each mirror face relative to an other and to each channels.

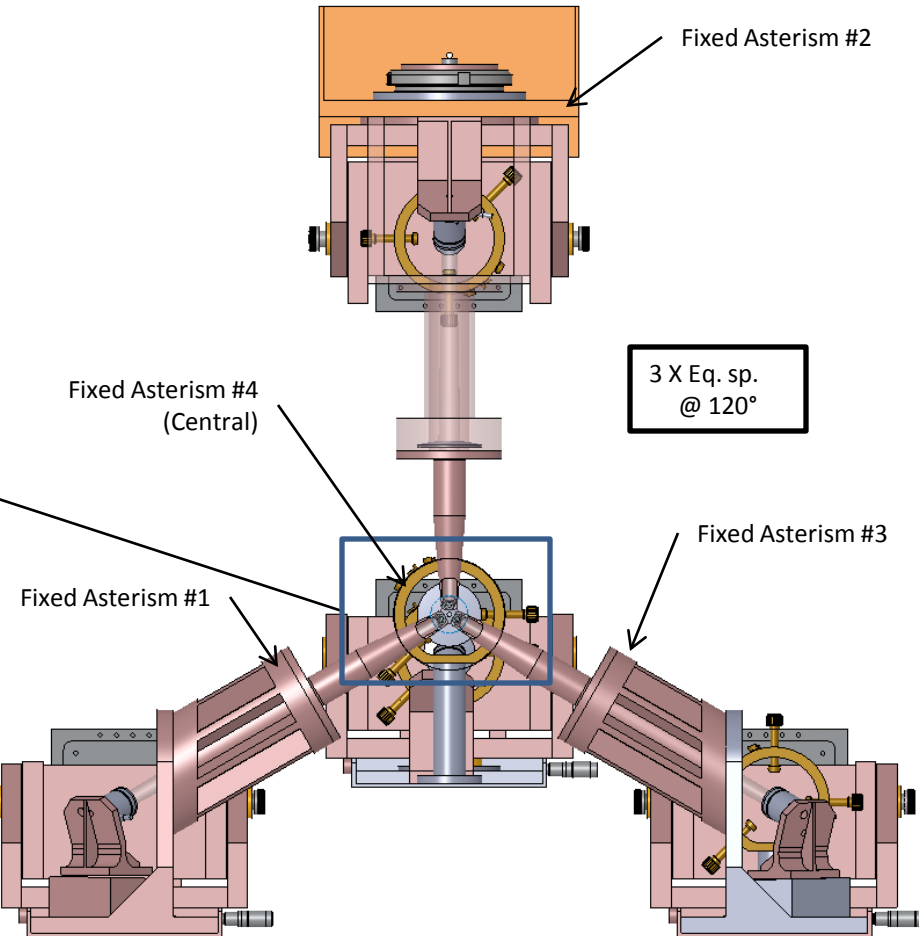
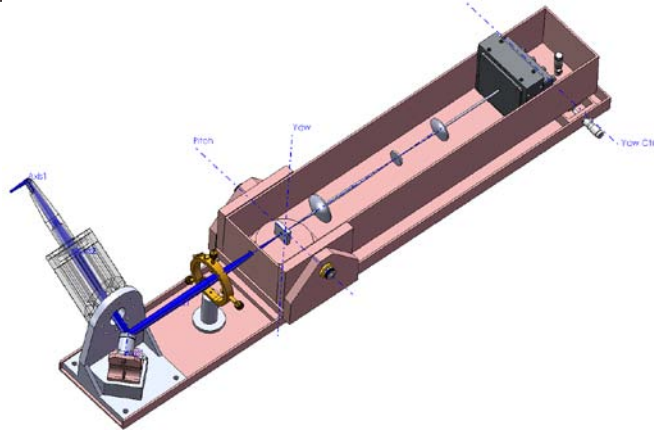
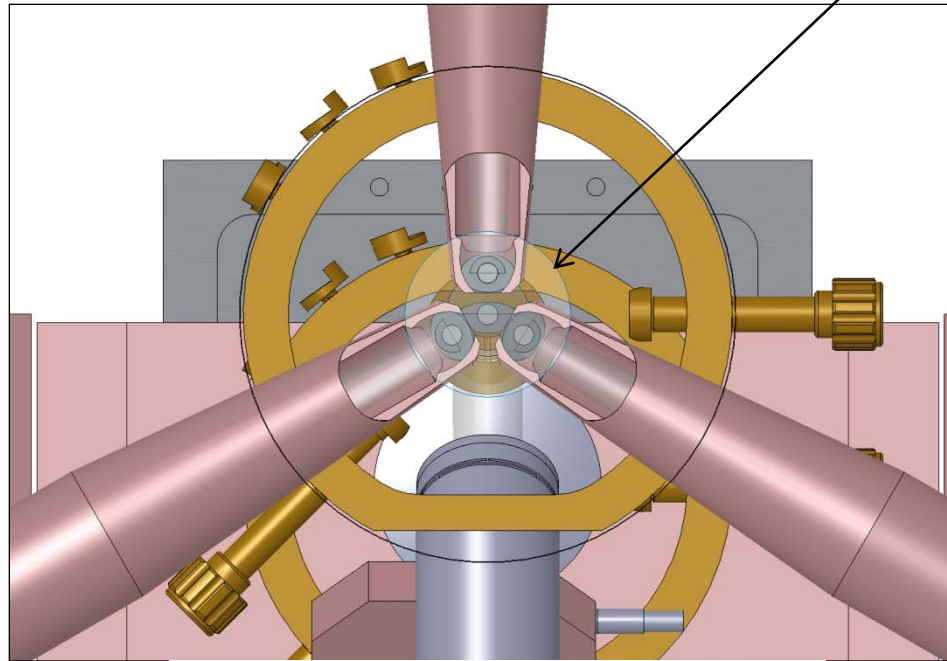
Question: How many degrees of freedom should the Tetrahedron adjustment bracket be planned for?



4.1) Replacing the Fixed Asterism Pick off with a Tetrahedron WAS:

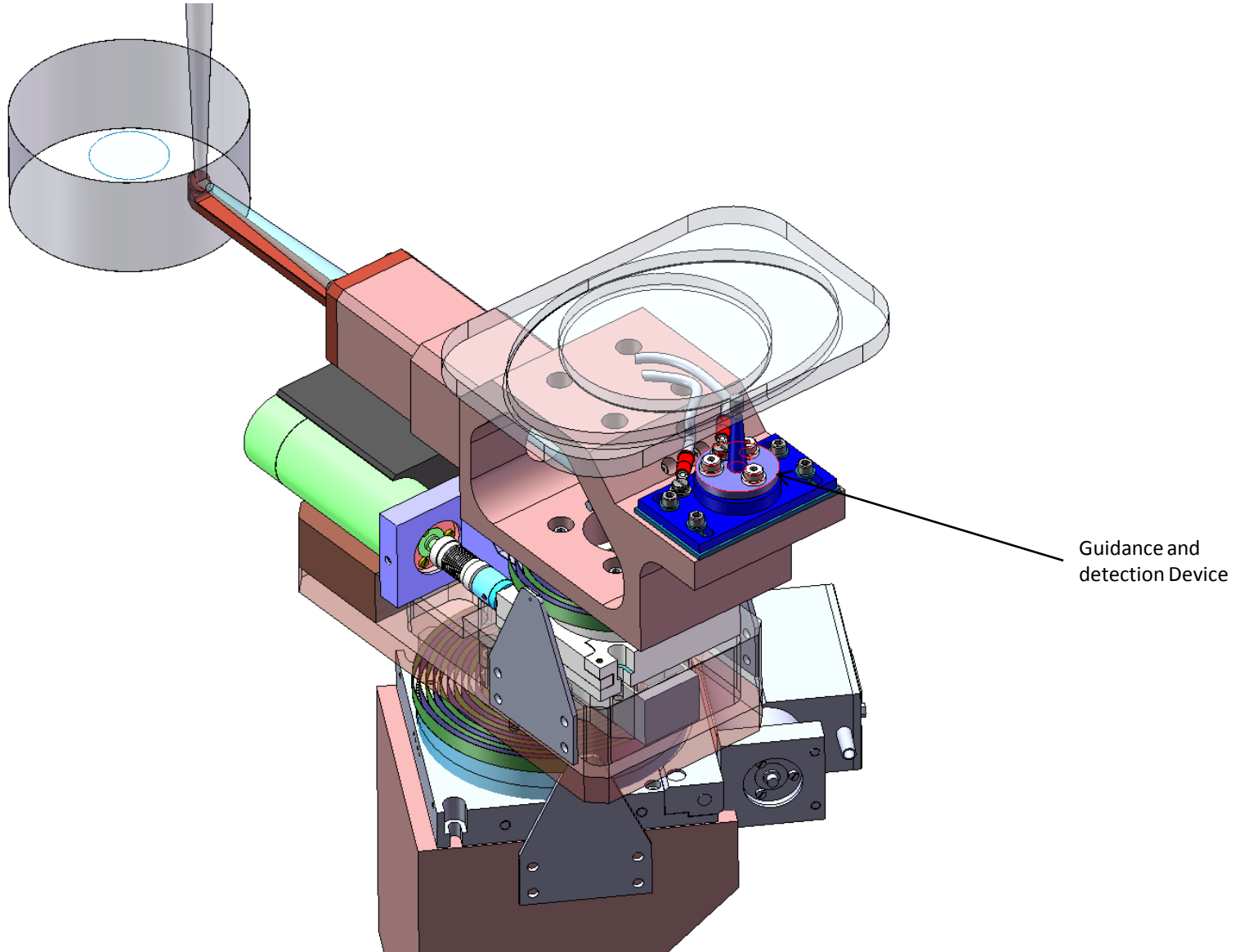


10" For



5) Guidance and detection device

A single custom Device is guiding the arm through its allowed path after detecting software error.



5.1) Guidance and detection device detail



The device is composed of an electrically insulated Wobbler and a base bracket.

The wobbler is composed of a Ball Bearing Track Roller (Mc Master 3668K2), a steel shaft threaded through the Normally Open Switch, held on the base between 3 compression springs and 3 shoulder bolts.

The wobbler is wired to the control board.

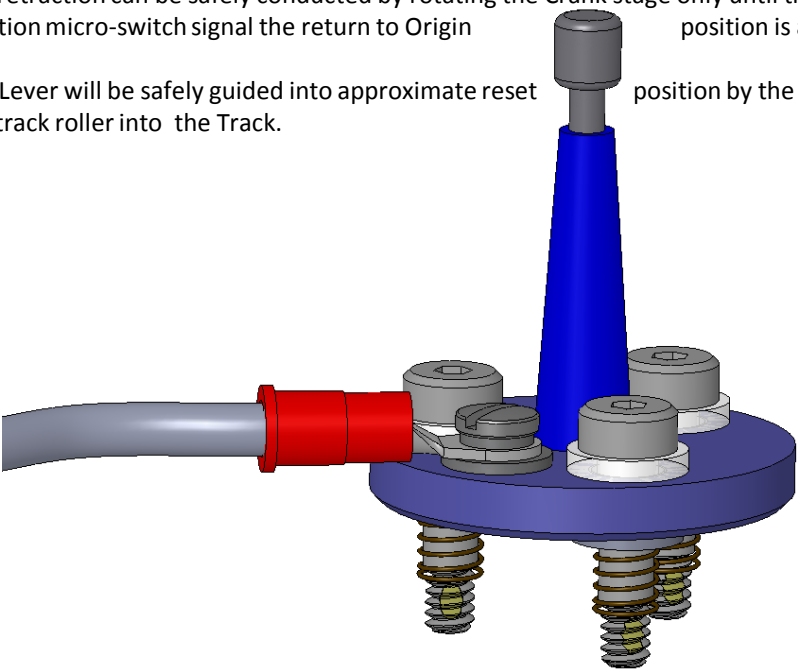
Operation:

Shortly after the arm deviates from its allowed path, the track roller will contact the custom track and the spring mounted wobbler will deflect 1 mm before closing the circular Normally Open Switch to signal the anomaly and shut down the crank and lever stages.

Full retraction can be safely conducted by rotating the Crank stage only until the Initial Position micro-switch signal the return to Origin position is achieved.

The Lever will be safely guided into approximate reset position by the action of the track roller into the Track.

Custom Track



WOBBLER ASSEMBLY

