

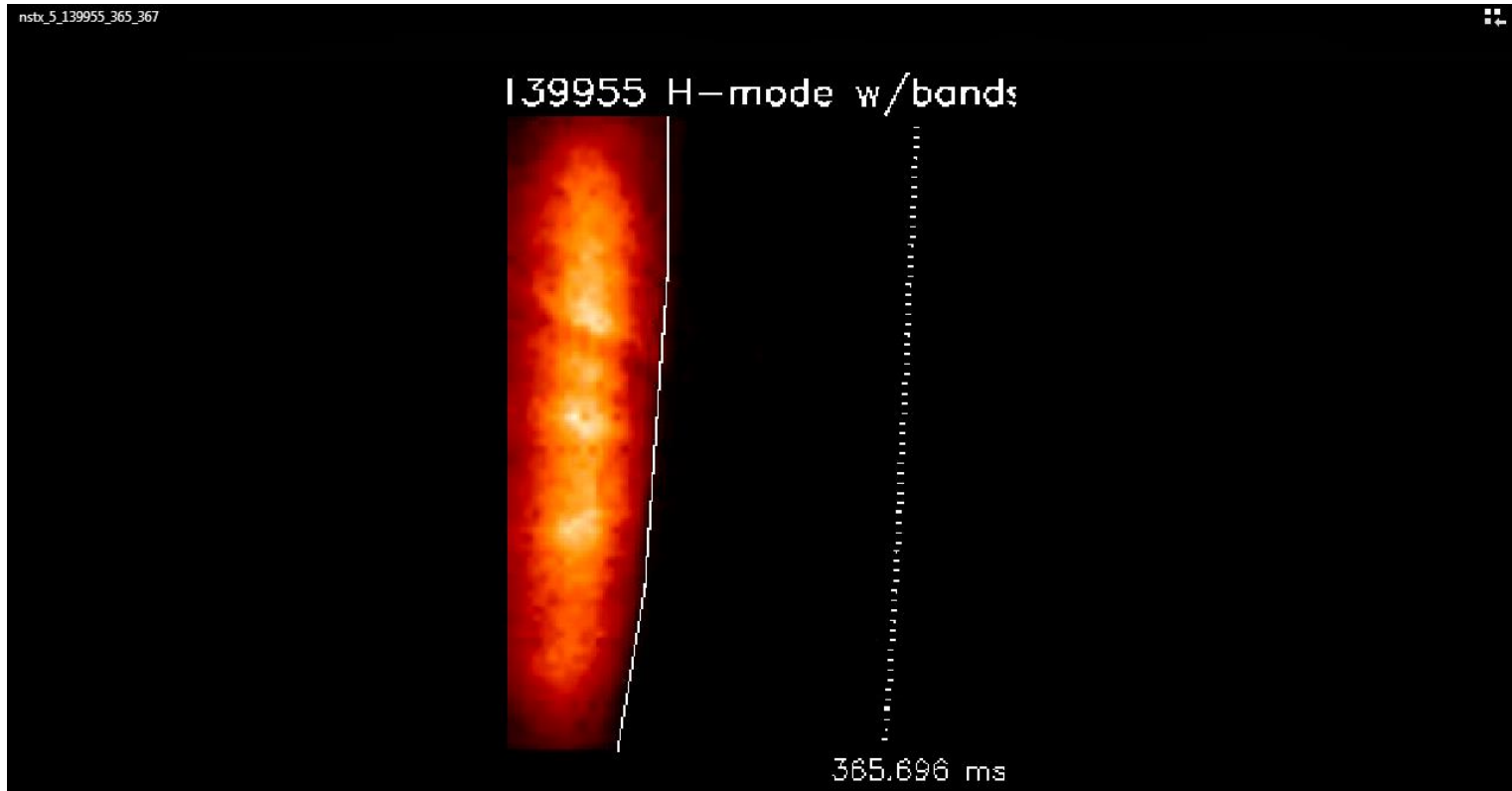
GPI Zoom Optics Design Review

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Motivation

- Current GPI setup has produced a few movies that show small-scale fluctuations, but most movies do not resolve these features
- Want to be able to modify field-of-view of GPI movies
- Zoom in to see finer structure in turbulence (ETG scale)
- Zoom out to see entire gas puff and large-scale phenomena

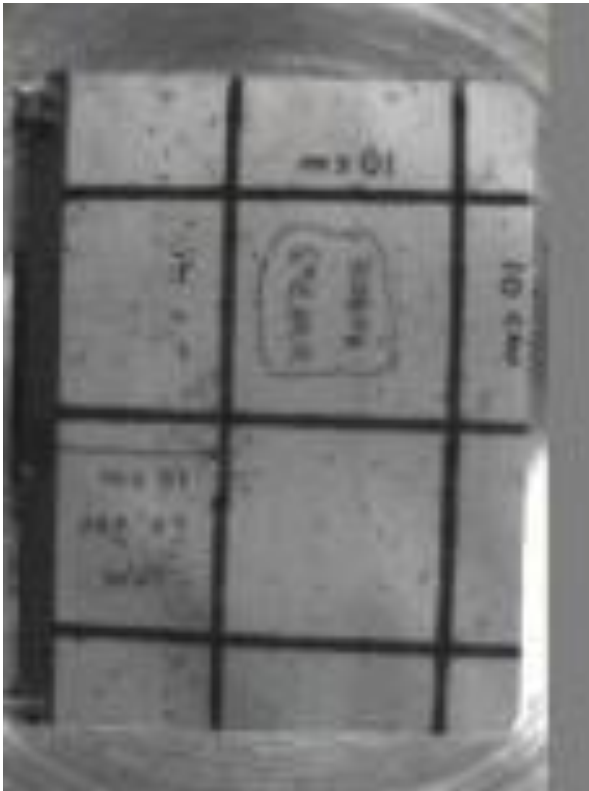
Current GPI setup



For a handful of runs, resolution was optimal presumably because the angle of view was precisely aligned with B field -> We can't control this, so we need another way to increase resolution -> Zoom lens

Lens Comparison

Current lens (f=25mm)



New zoom lens (@ f=25mm)



New zoom lens can replicate field of view of current lens

Zoom Lens Field of View Extrema

$f=8\text{mm}$ -> $\sim 3x$ zoom out



$f=48\text{mm}$ -> $\sim 2x$ zoom in

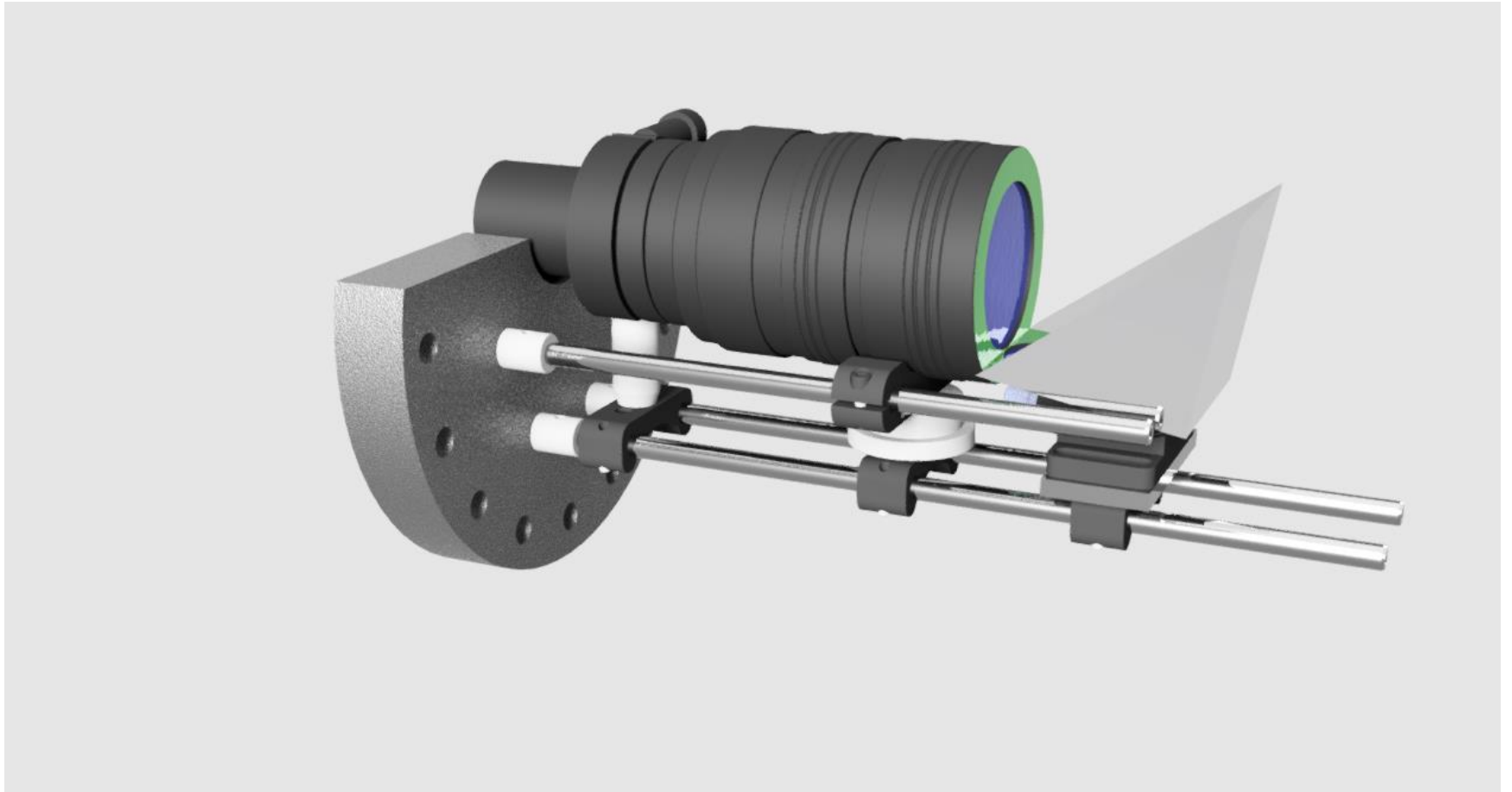


This will be enough resolution to see ETG scale structures ($\sim 1\text{mm}$)

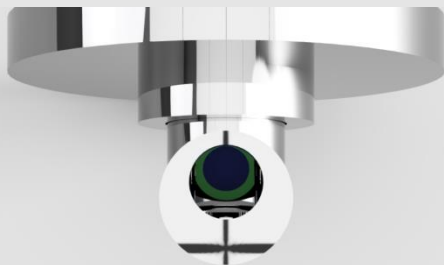
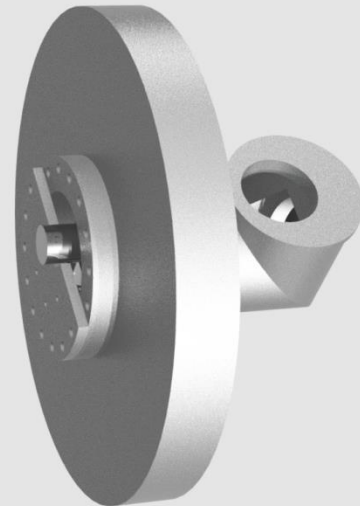
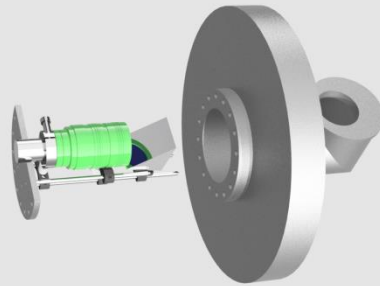
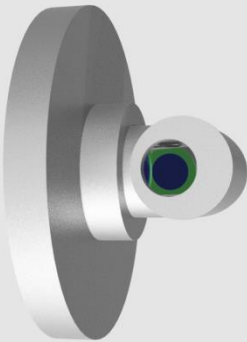
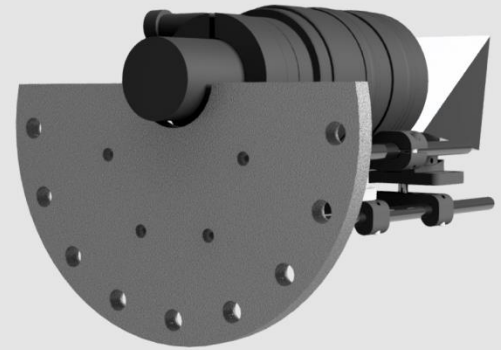
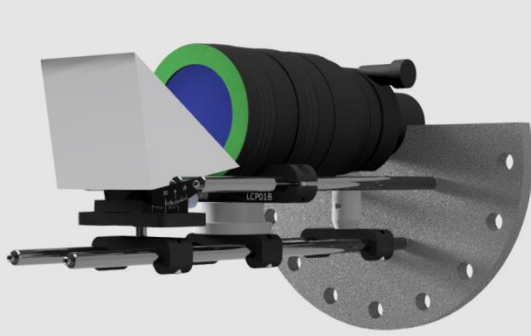
Design Requirements/Goals

- Mount inside existing GPI port on Bay B
- Stable, sturdy configuration to house zoom lens and mirror interface
- Have ability to easily change focal length of lens and angle of mirror
- Use purchasable parts as much as possible, as opposed to machined ones

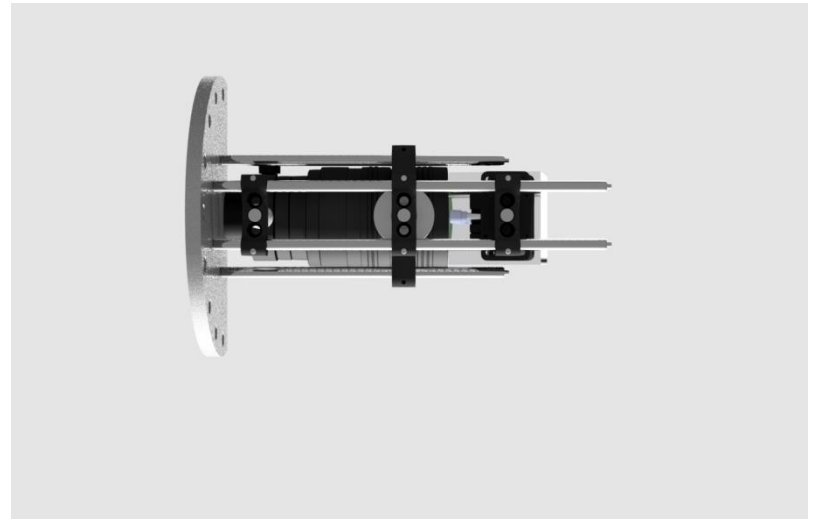
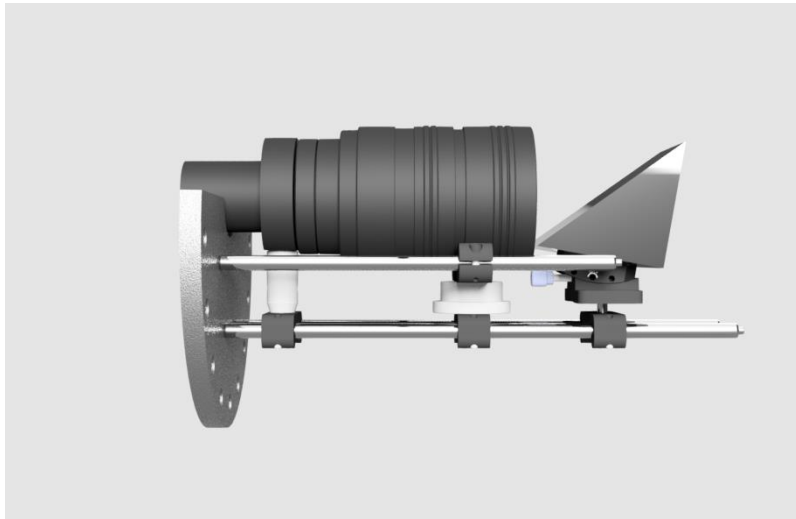
Proposed Design



Proposed Design

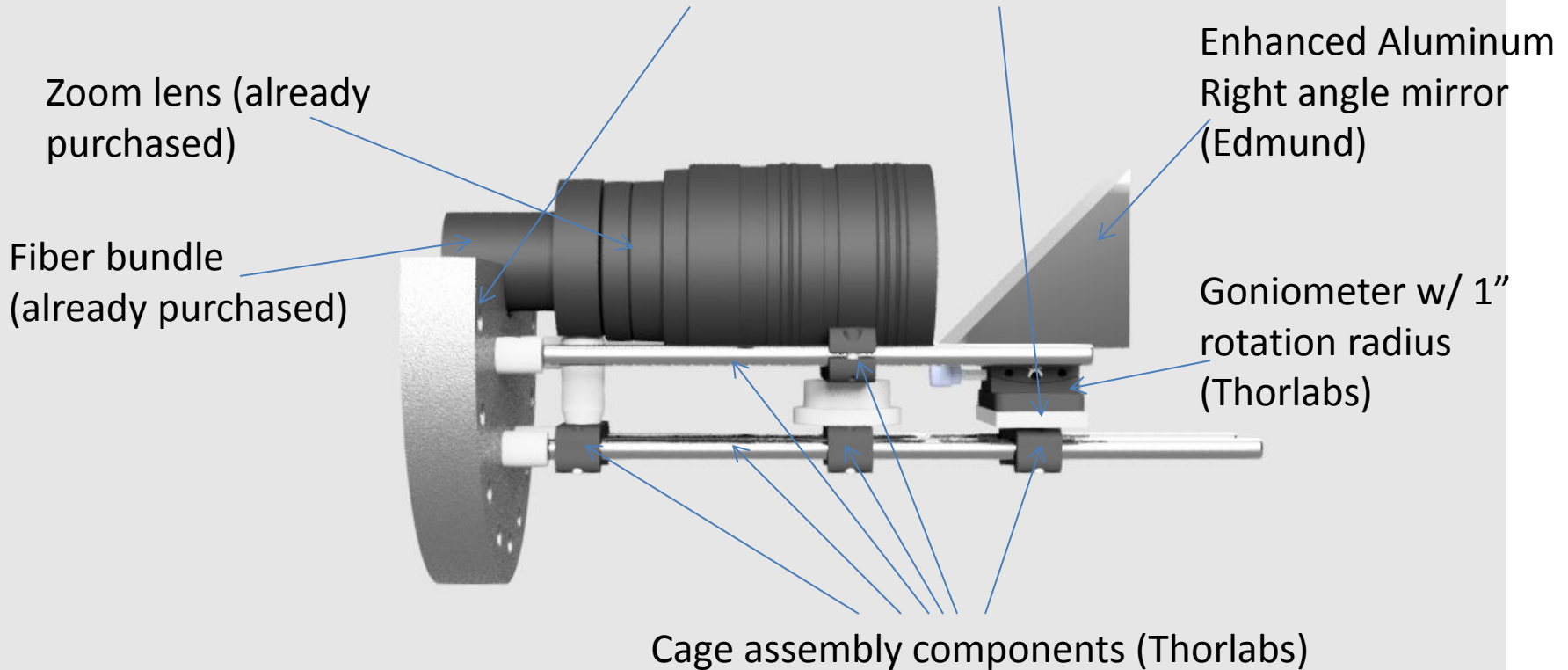


Side & Bottom Views



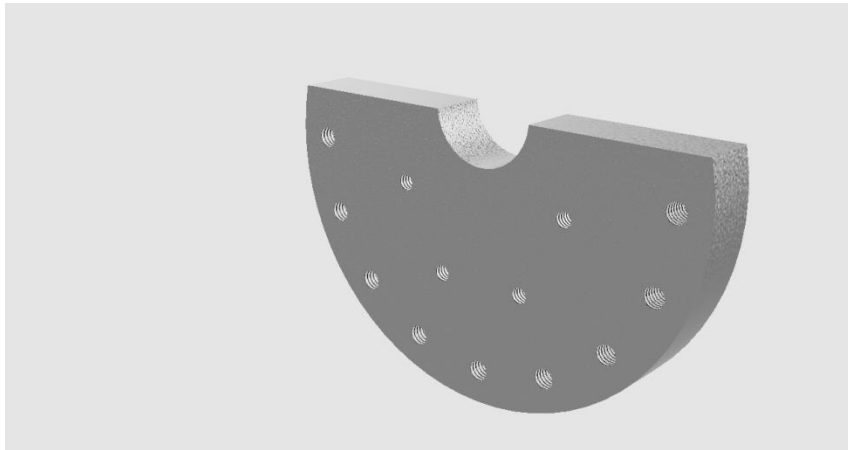
Parts Detail

Only two pieces to be machined: outer flange and small spacer plate



Machined Parts Detail

Metal flange; $\frac{3}{4}$ " thick; 6" diameter with same outer hole pattern as Bay B flange. $\frac{1}{4}$ "-20 counterbore mounting holes for cage rods



Drawing here

1"x2"x0.17" metal spacer plate.
8-32 and 4-40 holes for mounting.



Drawing here

Parts List

Model #	Make	Quantity	Total Price	Description				
GN1	Thor	1	\$ 138.60	Small Goniometer (1")				
LCP01B	Thor	1	\$ 29.00	60mm Cage Plate Adapter				
CP02B	Thor	3	\$ 42.00	30mm Cage Plate Adapter				
TR1	Thor	1	\$ 4.74	1" post, 8-32 setscrew, 1/4"-20 tap				
RS05P8E	Thor	1	\$ 18.90	1/2" post, 8-32 taps				
ER6-P4	Thor	1	\$ 33.44	6" Cage Assembly Rod (4 pack)				
AP8E4E	Thor	4	\$ 7.60	External-External Thread Adapter, 8-32, 4-40				
AI25E8E	Thor	4	\$ 18.80	Internal-Internal Thread Adapter, 8-32, 1/4"-20				
SM1RC	Thor	2	\$ 44.00	C Mount Lens Tube Ring				
45-689	Edmund	1	\$ 215.00	N-BK7 Enhanced Aluminum Right Angle Mirror, 50mm				
03-630	Edmund	1	\$ 25.00	C Mount Double Female Adapter				
55-024	Edmund	1	\$ 189.00	Z-axis Rack & Pinion Stage				
		Total:	\$ 766.08					