

Starlight Suppression System

- “Expanded” Lyot coronagraph, with four pupil locations: coarse DM, fine DM, shaped pupil, Lyot mask
- Anamorphic optics provide circular beam cross section onto coarse DM and beyond
- Polarizing beamsplitter arrangement provides two distinct coronagraphs (paths)
- Two fine DMs per path in a Michelson arrangement for amplitude and phase correction
- System comprises only collimating and focusing mirrors, with aberrations corrected everywhere along the optical train at the level of $\sim 0.001\lambda$
- Options under consideration include removing polarizing elements and also possibly the Michelson, leading towards an all-reflective, single path system

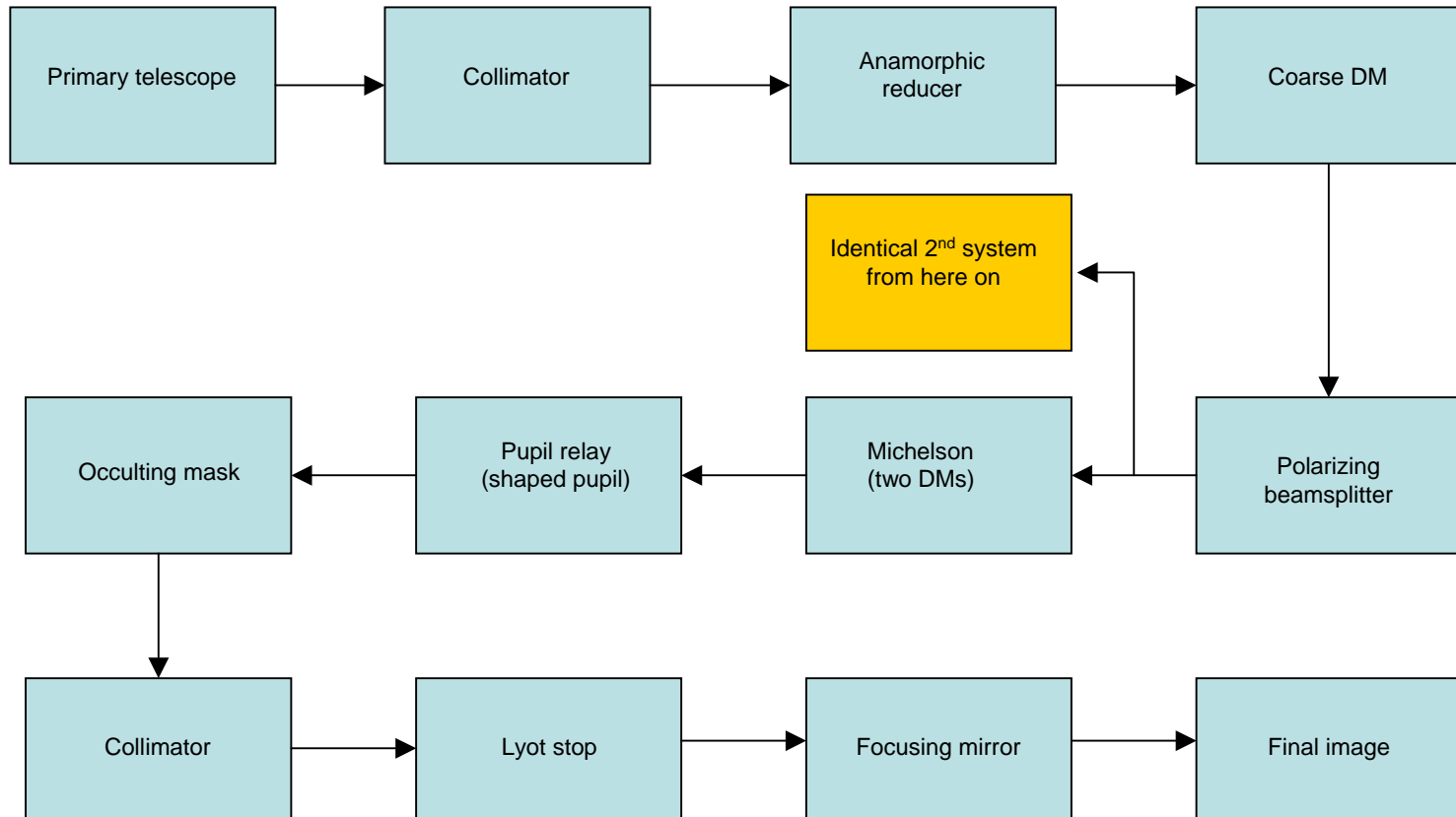
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System Block Diagram

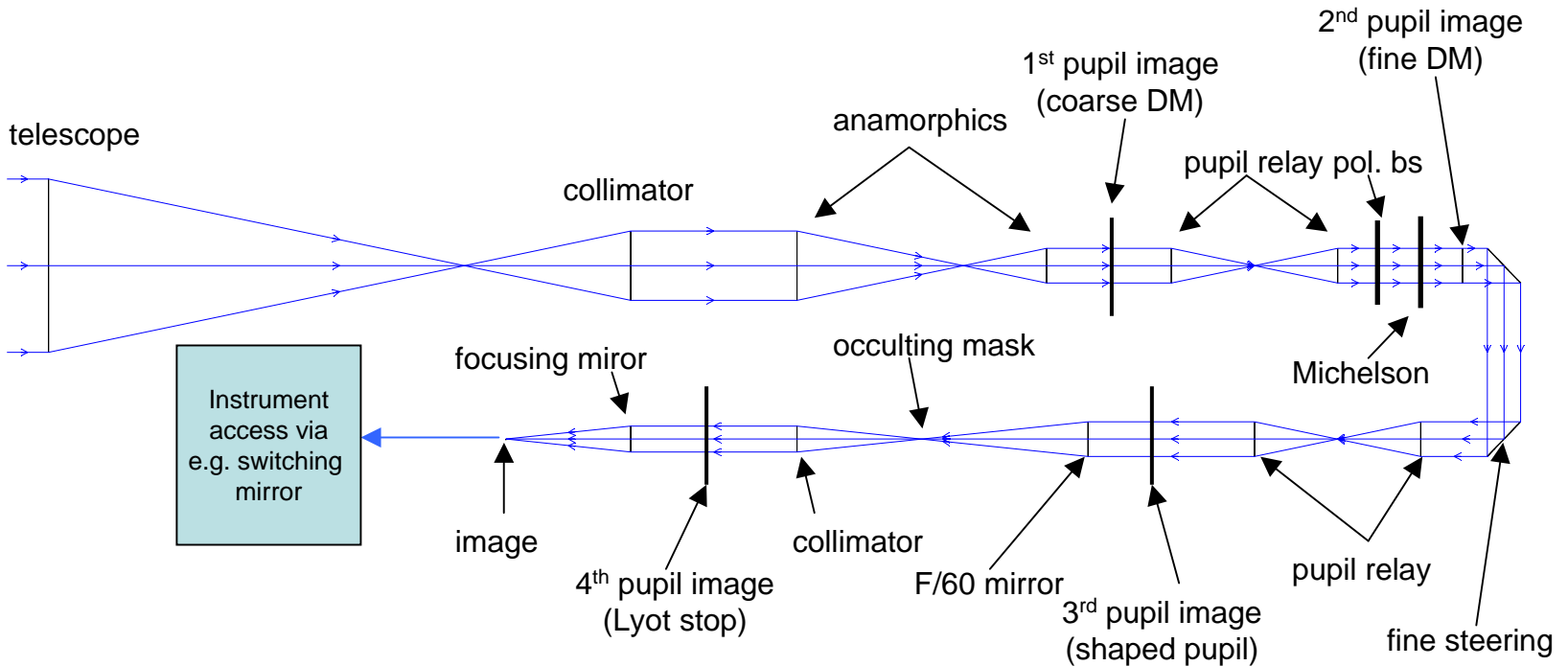


Terrestrial Planet Finder

TPF

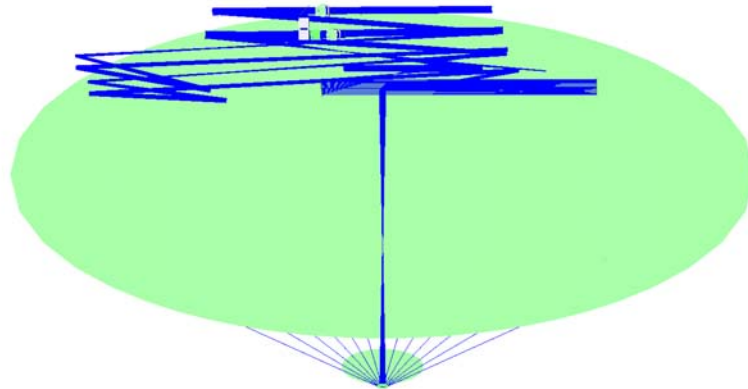
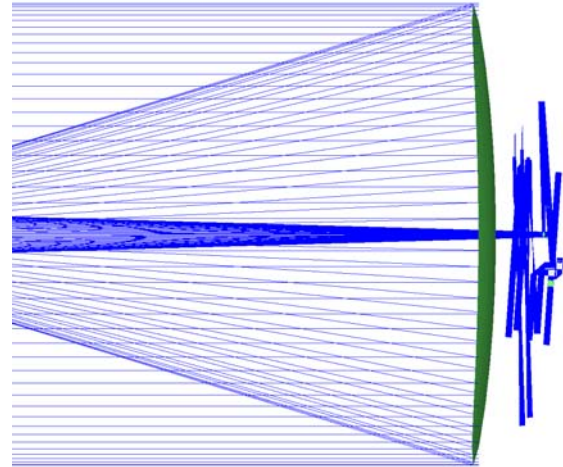
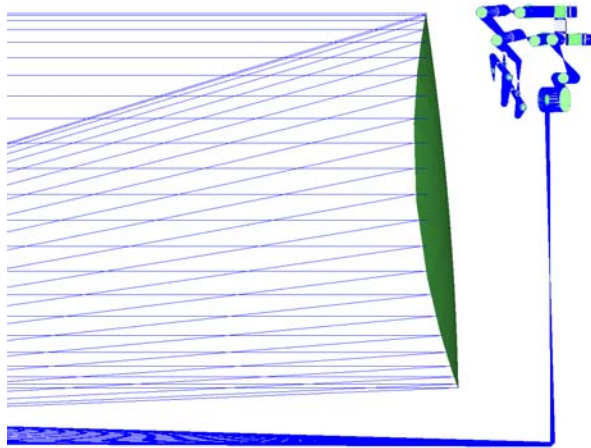


System Schematic



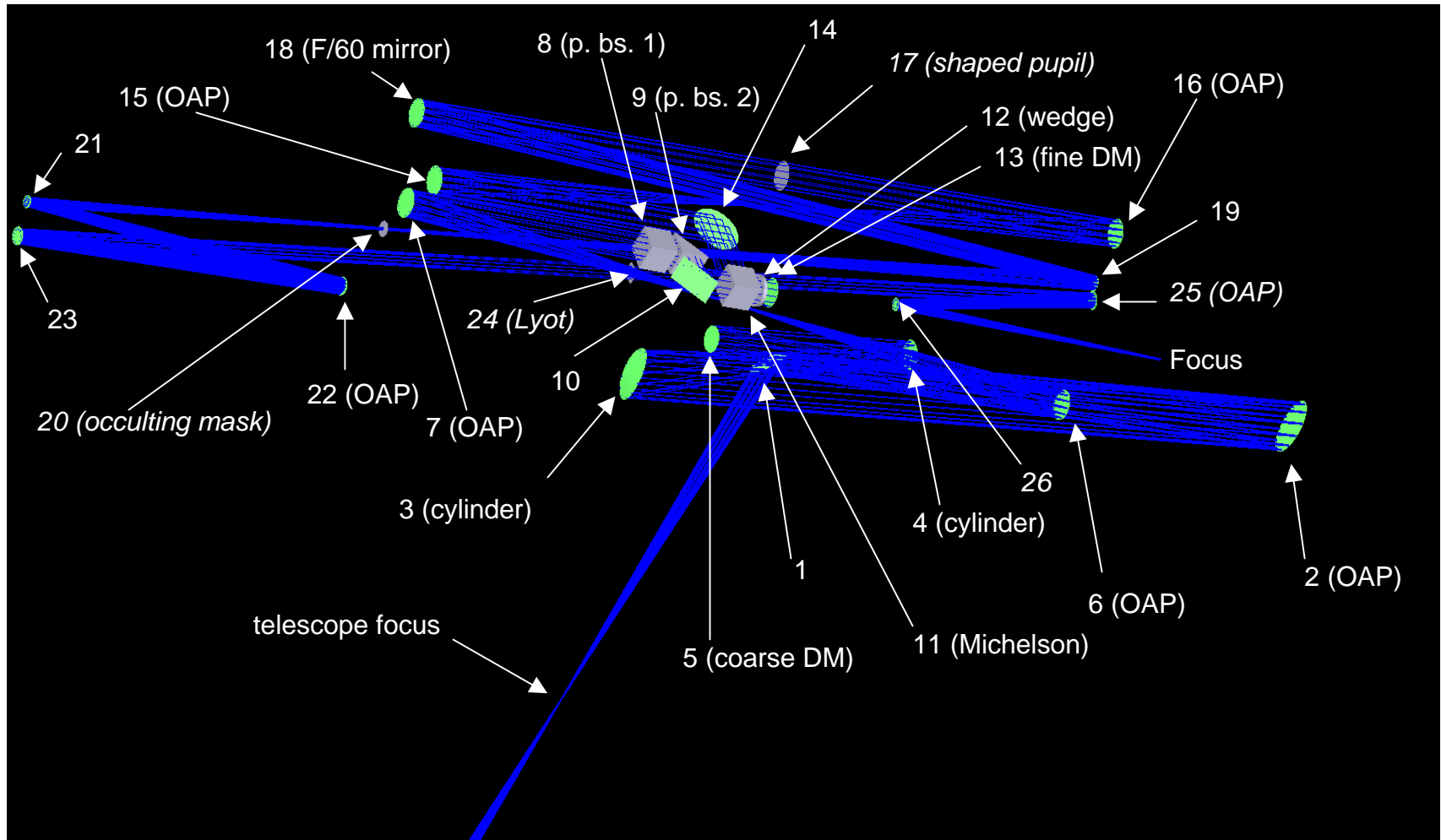
- shows the number of pupil locations, intermediate foci, collimated spaces
- not all optical elements identified
- beam diameters & focal lengths not to scale
- mirrors shown as perfect lenses

Three views of the SSS accommodation behind the telescope primary



TPF Terrestrial Planet Finder

Optical layout (single path)



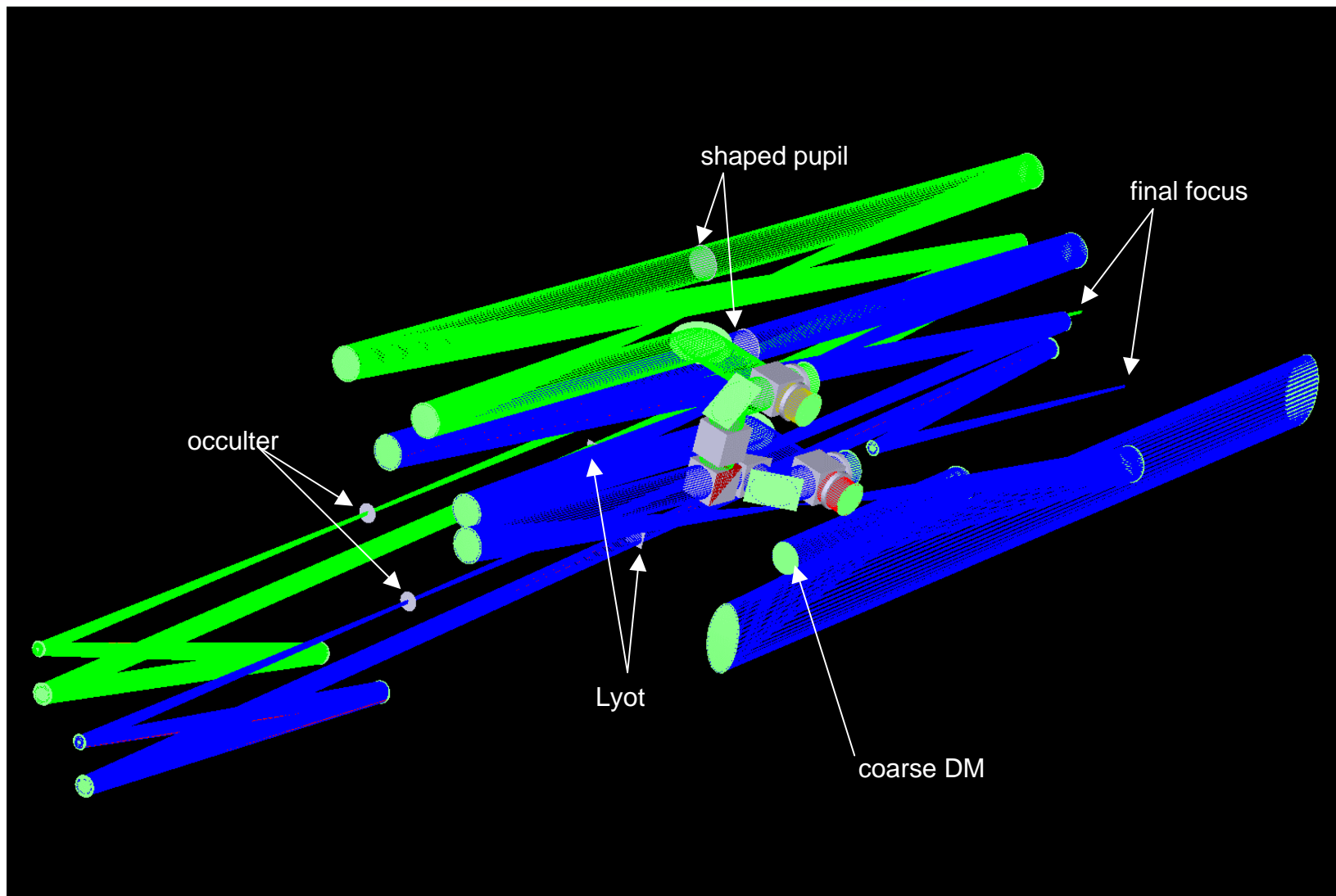
All powered mirrors are off-axis parabolas (OAP). Numbering of elements follows table on p. 7. Shows one polarization path and a single path through the Michelson (one fine DM).

Optical layout (all paths)



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Shows both polarizations and two fine DMs per path (complete Michelson arrangement)
Second polarization path shown in green.

Element listing



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Element #	Type	Approximate beam footprint (mm)	Function	Comment
1	Flat mirror	140x46	Fold	
2	Parabolic mirror	230x100	Collimator	
3	Cylindrical mirror	230x100	Anamorphic reducer (1)	
4	Cylindrical mirror	100 Ø	Anamorphic reducer (2)	(3) and (4) operate as a Keplerian telescope
5	Deformable mirror	100 Ø	Coarse DM	Pupil location
6	Parabolic mirror	100 Ø	Pupil relay (1)	
7	Parabolic mirror	100 Ø	Pupil relay (2)	Unused intermediate focus between 6 and 7
8	Polarizing beamsplitter (1)	100 Ø		
9	Polarizing beamsplitter (2)	100 Ø	Increases unwanted beam extinction	
10	Flat mirror	140x100	Fold	Can be used for steering
11	Beamsplitter	100 Ø	Michelson	
12	Wedge	100 Ø		Chromatic correction

Element listing (2)



12	Wedge	100 Ø		Chromatic correction
13	Deformable mirror	100 Ø	Fine DM	Pupil location
12	Wedge	100 Ø	Same as 12	Interferometer return path
11	Beamsplitter	100 Ø	Michelson	Interferometer return path
14	Flat mirror	100x140	Fold	Can be used for steering
15	Parabolic mirror	100 Ø	Pupil relay (1)	Focusing
16	Parabolic mirror	100 Ø	Pupil relay (2)	Collimating
17	Optional mask	100 Ø	Shaped Pupil	<i>Pupil location</i>
18	Parabolic mirror	100 Ø		F/60
19	Flat mirror	56 Ø	Fold	

Bold face italics indicate user-accessible location

Element listing (3)



Terrestrial Planet Finder

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18	Parabolic mirror	100 Ø		F/60
19	Flat mirror	56 Ø	Fold	
20	Mask		<i>Occluding mask</i>	
21	Flat mirror	35x30	Fold	
22	Parabolic mirror	55x60	Collimator	
23	Flat mirror	52 Ø	Fold	
24	Stop	50 Ø	<i>Lyot stop</i>	<i>Pupil location</i>
25	Parabolic mirror	52 Ø		<i>Focal length can be set to provide proposer's desired F/no</i>
26	Flat mirror	35x32	Fold	<i>Improves beam location for additional instrument volume</i>
27			Final focus	

Bold face italics indicate user-accessible location