

# REQUIREMENTS FOR THE DETECTOR ASSEMBLY

## Spartan IR Camera for the SOAR Telescope

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### 1 Location

The location of the corners of the detector are found by ray tracing the design f21d4x106-13.zmx. See Table 1.

The rotation axis is 16.67 mm behind the detector surface and 4mm (in the detector plane) from the nearest edge. By placing the rotation axis behind the detector, the shift between the f/12 and f/21 channels is small at the pyramid.

### 2 Tolerance

The tolerance on the focus is 0.07 mm for f/12 and 0.20 mm for f/21 to limit the loss in Strehl to 0.007. The tolerance on the rotation is in Table 2.

### 3 Gravity

When the direction of gravity, which is in the y-z plane, changes, the focus must not change by more than 0.03mm, and the shift in the perpendicular direction must be less than 0.009mm. This requirement preserves focus and insures that the four detectors maintain boresight to  $\frac{1}{2}$  pixel.

Table 1 Detector position. The origin is at the apex of the pyramid. The x-axis is perpendicular to plates of COB. The y-axis is toward the exterior of cryo-optical box (COB). z is perpendicular to the base of pyramid. The “B” detectors are closer to the wall of the COB

Detector	Point on Rotation Axis			Dir. Rotation Axis			Normal, f/12		
	x	y	z	x	y	z	x	y	z
B2	-88.080	46.082	35.585	-0.5000	-0.5000	0.7071	-0.6639	0.7456	0.0578
B1	88.080	46.082	35.585	-0.5000	0.5000	-0.7071	-0.6639	-0.7456	-0.0578
A2	-88.080	-46.082	35.585	-0.5000	0.5000	0.7071	0.7456	0.6639	0.0578
A1	88.080	46.082	35.585	-0.5000	-0.5000	-0.7071	0.7456	-0.6639	-0.0578
	<b>Corner 1 f/12</b>			<b>Corner 2 f/12</b>			<b>Corner 3 f/12</b>		
B2	-56.856	57.930	66.042	-37.856	76.930	39.172	-54.917	56.085	12.368
B1	56.856	57.930	66.042	37.856	76.930	39.172	54.917	56.085	12.368
A2	-53.849	-52.571	64.378	-34.849	-71.571	37.508	-55.694	-54.510	10.705
A1	53.849	-52.571	64.378	34.849	-71.571	37.508	55.694	-54.510	10.705
	<b>Corner 1 f/21</b>			<b>Corner 2 f/21</b>			<b>Corner 3 f/21</b>		
B2	-53.637	52.133	64.220	-34.637	71.133	37.349	-56.517	54.00	7.018
B1	53.637	52.133	64.220	34.637	71.133	37.349	56.517	54.00	8.018
A2	-57.125	-58.351	66.149	-38.125	-77.351	39.279	-54.866	-56.219	12.499
A1	57.125	-58.351	66.149	38.125	-77.351	39.279	54.866	-56.219	12.499

Table 2 Tolerance of the positioning of the tilt axis.

Parameter	Tolerance f/21		Tol f/12
Tilt axis out of detector plane	276 mrad	16 deg	96 mrad
Tilt axis in detector plane	21 mrad	1.2 deg	7 mrad
Tilt angle	2.0 mrad	0.12 deg	0.7 mrad
Translate in plane	0.6 mm		0.2 mm
Translate perp to plane	7.0 mm		2.4 mm