

# Request for Quote for Mirrors

## Spartan IR Camera

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1 May 2001  
1 June 2001 Revised  
12 September 2001 Added flats, cell specification, & metrology.  
19 September 2001 Revised mirror parameters. Revised metrology & surface specification.  
4 February 2002 Larger field. Revised surface specification.

This RFQ is for four off-axis aspheric mirrors, two flat mirrors, and mating kinematic cells for use in the Spartan Infrared Camera for the SOAR Telescope ([www.soartelescope.org](http://www.soartelescope.org)). The mirrors are listed in Table 1. The radii of curvature are specified at room temperature. Items 2, 4, and 5 will be ordered immediately. Items 1 and 3 are part of an upgrade and will be ordered in April 2002 if the budget allows.

Item	Pieces	RC	Conic constant	Distance	CA	S
1	2	3	4	5	6	7
		mm		mm	mm	
1 f21 collimator	1	1206	-0.469 ±0.0028	142.2	152	25%
2 f11 collimator	1	1400	-1.177 ±0.0023	146.0	235	19%
3 f21 camera	1	1652	-2.929 ±0.042	120.5	160	25%
4 f11 camera	1	1141	-0.907 ±0.0043	126.7	165	29%
5 Fold	2	flat	NA	NA	92	84%

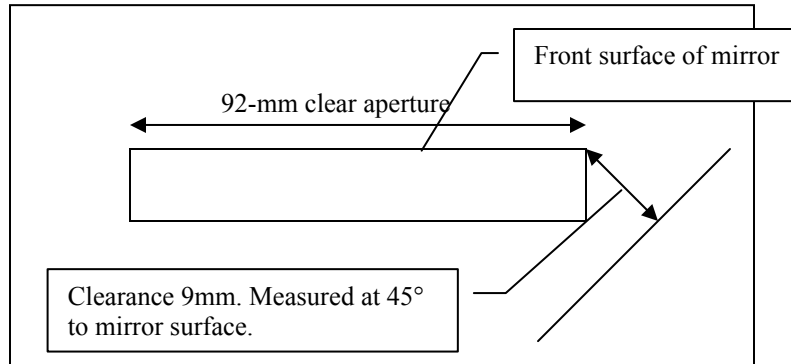
### Notes

- 3 Radius of curvature at vertex of parent. The mirrors are concave. Tolerances are ±0.5%.
- 5 Distance from the vertex of the parent to the center of the clear aperture.
- 6 Diameter of clear aperture
- 7 Specified surface error applies for points separated by distances up to CA\*S.

**Kinematic mirror cells:** The kinematic cell attaches to the mirror and bolts to a mounting block (supplied by MSU) made of 6061 aluminum. The attachment between the cell and mounting block is at three points at the rear of the mirror and cell. At these three points, the cell should be parallel within 2mrad of the mean surface of the mirror.

The mirror must tilt by less than 15μrad as the direction of gravity changes from normal to the mirror to parallel. In addition, the shift must be less than 10μ in the directions parallel to the mirror and 15μ in the perpendicular direction.

**Space constraints:** For the aspheric mirrors, the kinematic cells may extend radially beyond the clear aperture by 5mm. The distance between the mirror surface and rear of the cell must be less than 50mm. See figure for the space constraints of the flat mirror and the kinematic cell.



Material: The mirror must work at 77K. Fused silica is suggested.

Surface accuracy: For the aspheric mirrors, the peak-to-valley surface accuracy is 1/12 the test wavelength 0.6328 microns, or alternatively the root-mean-square surface accuracy is 1/48 of 0.6328 microns. Please quote also an alternative specification of 1/8 wave. For the flats, the peak-to-valley surface accuracy is 1/16 of the test wavelength 0.6328 microns. The specification for surface accuracy applies for points separated by distances up to a fraction *S* of the diameter (See Table).

Element thickness: The surface figure should be true to 1/12 wave as the direction of gravity changes from normal to parallel to the mirror.

Surface quality: 60/40 scratch dig.

Coating: Gold.

Environmental conditions: Operation will be at liquid nitrogen temperature.

Metrology for off-axis mirrors: The focal length must be measured to 0.1mm. Reference marks must be placed to locate the mirrors to the accuracies in the following table.

Item	$x \pm dx$	$y \pm dy$	$\theta z \pm d\theta z$
1	2	3	4
	mm	mm	mrad
1 f21 collimator	142.2 ± 0.1	0.0 ± 0.3	0.0 ± 2.4
2 f11 collimator	146.0 ± 0.1	0.0 ± 0.3	0.0 ± 1.9
3 f21 camera	120.5 ± 0.1	0.0 ± 0.3	0.0 ± 1.9
4 f11 camera	126.7 ± 0.1	0.0 ± 0.2	0.0 ± 1.4

**Notes**

- z-direction is parallel to the symmetry axis of the parent.
- (x,y,z) is the vector from the vertex of parent to the center of clear aperture.
- 4 Rotation about the center of the clear aperture.

Deliverables: (1) A mechanical drawing of the mirrors and cells due 4–6 weeks after start of contract. These will be used to fabricate the mounting blocks. (2) A project schedule due 4–6 weeks after start of contract. (3) Witnessed test of the optics including test data. (4) Mirrors and cells.