Scattered Light Issues
Deployed and Free Flyers

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Scattered light (from Sun) is relatively easy to control in a conventional single spacecraft telescope. The same techniques used for HST, Kepler, SIRTF/Spitzer, etc etc.

In a deployed telescope tube, the telescope should be light tight, and the scattered light issues are identical to a normal space telescope.
How much scattering is permitted?

CCD’s only see “edge” never body of optics spacecraft.

Scattered flux (per pixel) should be \( \leq 1/100 \) of flux in central pixel of ref star.

Ref star \( \sim 12 \) mag, scattered light should be fainter than \( \sim 17 \) mag/pixel.
Local zodi 22 mag/arcsec\(^2\), \( \sim 27 \) mag/pixel.

Scattered Light issues for separate spacecraft

Case I
Unshielded from direct scattered light

Permissible Sun location
Numbers, this is a spreadsheet

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<td>Sun</td>
<td>-26 mag</td>
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fraction of sunlight going to 1 pixel = \( \frac{\text{scat\_area/1m}^2}{40m} \times \frac{\text{pix\_width}}{2\pi} \)

Geometry
area of scatter           \( 0.000235619 \ m^2 \)

razor edge                 \( 100 \ \text{um} \)
length                     \( 2.35619449 \ m \)

Distance                   \( 40 \ m \)
pixel width                \( 10 \ \text{um} \)
pix/dist                   \( 9.95E-15 \)

Total factor               \( 2.34E-18 \)
in mag                      \( 44.08 \)
mag/pix                    \( 18.08 \)
Design strategy for FF with direct 1-scatter to CCD.

Make scattering area as small as possible
   Small diameter sun shade on optic (1.5m dia) slightly larger than optic
   Razor’s edge (100um) on the sun shade. A real razor, I think has a 25um
   edge

Edge of razor, Must block the rest of the spacecraft as seen from the CCD.
Case II, baffles on CCD’s to block view of the edge of the Optic S/C sunshade.

The concept here is to have a tube on the CCD that prevents the CCD from making an image.