

SBIG's new OAG-8300 Off-Axis guider for the ST-8300 and STF-8300 cameras was announced recently at AIC and here on the SBIG list. With the OAG-8300 the user will have the option of one of three interchangeable faceplate threads: STL size (2.156"), SCT size (2") or T-thread. We previously stated that SBIG does not recommend the T-thread adapter for general use but it was being offered for those who had no other alternative. T-threads are used on a variety of accessories, including 35mm camera adapters for SCTs, where they vignette horribly. Unfortunately this recommendation created some anxiety among those who are interested in this new OAG on an 8300 camera, but want to stick with T-thread adapters for various reasons.

The designer of the OAG-8300, Alan Holmes, recently returned from an imaging conference in Chile so we tasked him to quantify the effect of using t-threads with this OAG. Before coming to the conclusion, though, some myths and misconceptions need to be addressed. First, when we say that t-threads may vignette the pick-off mirror, this does not mean it will black out a portion of the field of view of the guide camera. The effect of vignetting that we are talking about here is a slight dimming of the stars due to the fact that the pick-off mirror does not see all the light cone. The field will still be as large as an unvignetted field and there will be as many stars, but they will be dimmer. The questions are how much, and so what? This issue is not unique to the OAG-8300, by the way. All off-axis guider arrangements using pick-off mirrors or prisms have to face this issue. Most just don't mention it. The typical OAG uses a smaller mirror to get closer to the imaging CCD and avoid vignetting. In these cases, the off-axis guiders just accept whatever light they can catch, but still often vignette when using t-thread adapters (Figure 1).



Figure 1.

Typical off-axis guider assembly with unblocked aperture on left and t-thread adapter added on right.

Our OAG-8300, on the other hand, has built-in optics that doubles the field of view of the guide camera in order to make finding guide stars easier (Figure 2.). To accommodate this larger field of view, the OAG-8300 uses a larger pick-off mirror than most off-axis guider assemblies (Figure 3).

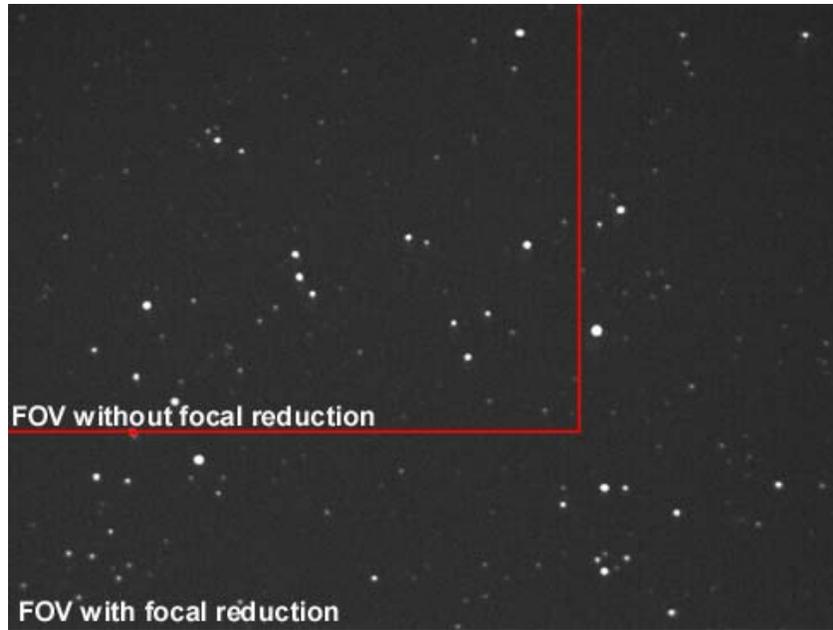


Figure 2

ST-i image taken through the OAG-8300 off-axis guider using a TeleVue NP101 at F/5 (resulting in F/3.5 guiding focal ratio)

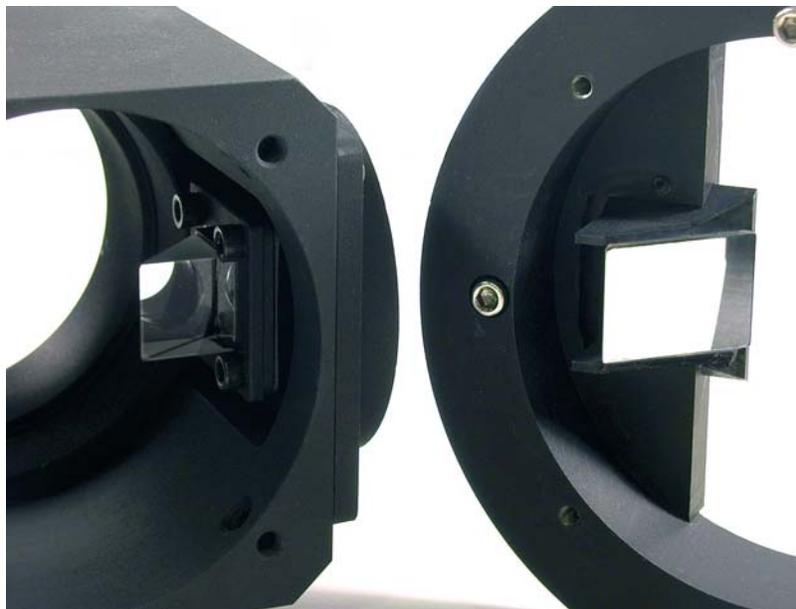


Figure 3.

***Left:** Typical pick-off mirror or prism in an OAG must be made small enough that it does not vignette the imaging CCD. **Right:** The mirror in the OAG-8300 has twice the area of the mirror or prism in a typical OAG.*

The benefit of having twice the pick-off area means that on average stars will appear brighter than they would with a mirror of smaller area. The trick is to get this pick-off mirror as close to the imaging CCD as it can to avoid being vignetted itself by the off-axis guider body aperture, and still avoid vignetting of the imaging CCD in the process

After running ray traces of the OAG at various $f/ratios$, Alan concluded that at $F/10$ using the t-thread adapter has almost no adverse effect. It is still better than using an OAG with a smaller mirror. And at $f/5$, on average the star brightness is roughly equal to what our OAG with its larger mirror would be if it had no focal reduction. Stars are about half as bright on average, but this is also about what they would be with a smaller pick-off mirror as well. So there is no disadvantage when compared to any other OAG, only when compared to the possible benefits of the OAG-8300 used at full aperture.

The recommendation we make against using the T-thread adapter is therefore intended to discourage its use only because it limits the performance of this uniquely designed OAG, not because it will not work, or will work poorly. If this were the case we would not offer the T-thread faceplate. So if you must use the OAG-8300 with t-threads, it will perform at least as well as any other OAG systems (Figure 4 - below right). Faster systems with the larger aperture faceplates will produce brighter guide stars (Figure 4 - below left).



Figure 4.

Left: OAG-8300 with STL adapter plate. **Right:** OAG-8300 with T-thread adapter plate