

# Using the *INFINITY XLKP™* w/HotSpot

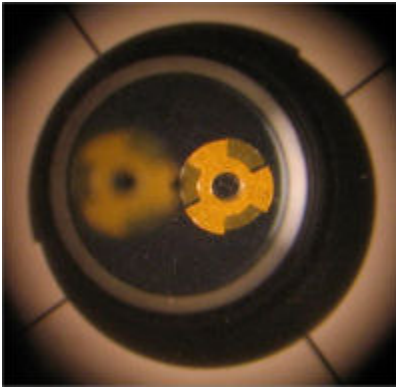
ALL PICS & ILLUSTRATIONS COMPLIMENTS OF JASON KHADDER

See an instructional video tutorial at: <http://www.youtube.com/watch?v=Vj12cx3tnsM>

Note: For the best results in eliminating axial errors, the *INFINITY XLKP™* should be used along with a Cheshire or Barlowed laser (to adjust the Primary). That said, the *XLKP™* can often achieve “very good” results as a stand-alone tool by iteratively achieving image convergence in the CENTRAL pupil when adjusting the Primary mirror and paired discs in the OFFSET pupil when adjusting the Secondary mirror.

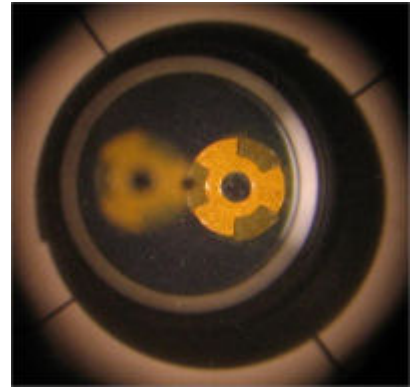
**IMPORTANT:** Best results are achieved with the *INFINITY XLKP™* when the autocollimator mirror is at or very near the focal plane; in this scenario, all the reflections appear the same “size”.

MIRROR ABOVE FOCAL PLANE



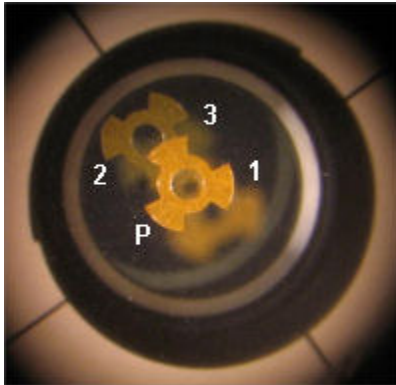
- Once you have gone through the procedure in the following pages, look closely in the OFFSET pupil. If unequal-sized images are present, adjust the focuser in or out as necessary to bring the images as close as possible to the same size before final alignment tweaks are made.

MIRROR BELOW FOCAL PLANE



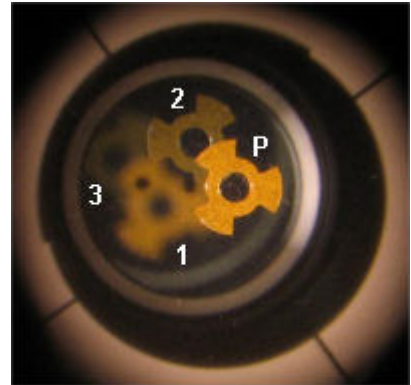
## Identification of the Four Center Spot Reflections

CENTRAL PUPIL



- Reflection "P" is the sharpest and brightest of all the rest.
- Reflection "1" is oriented like "P" but is typically somewhat fuzzy.
- Reflection "2" is the sharpest and brightest inverted reflection.
- Reflection "3" is the dimmest inverted reflection & is somewhat fuzzy.

OFFSET PUPIL



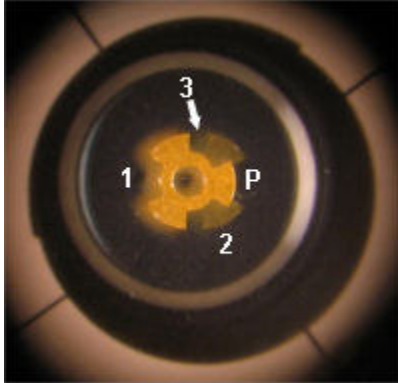
## Successful Axial Convergence and What it Means!

Once the collimation exercise is done, when "all" tools simultaneously yield "textbook" visual queues, optical axes convergence has been accomplished. With sustainment of final adjustment settings, you can be confident that your scope will perform to its maximum image-detail-delivering potential that the atmospheric “seeing” will allow.

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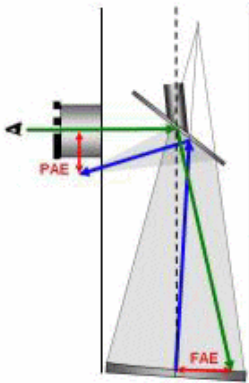
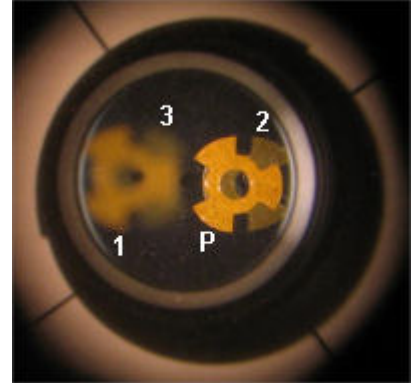
## STEP 1: Assessing Overall Optical Axes Alignment:

CENTRAL PUPIL



- Insert the *INFINITY XLKP™* in the focuser & examine both pupil views.
- Axial alignment errors will likely be present as depicted.
- The objective will be to have only "P" be visible via the CENTRAL pupil & a "Perfect" disc via the OFFSET pupil. Anything else is indicative of axial misalignment.

OFFSET PUPIL



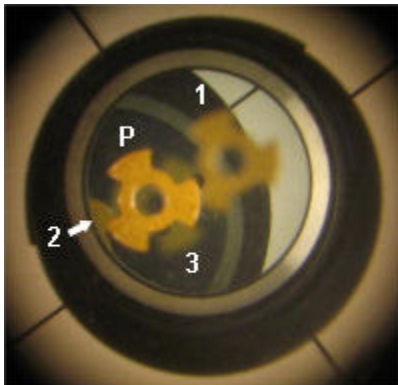
### There are two types of axial alignment errors:

- FAE (Focuser Axial Error) is the distance between the primary mirror center point and the focuser axis.
- PAE (Primary Axial Error) is the distance between the primary mirror focal point and the focuser axis.

Eliminating both errors is the main goal of "axial" collimation. Typically, FAE is eliminated first by adjusting the secondary mirror then PAE is eliminated by adjusting the primary mirror.

## STEP 2: Assessing FAE

CENTRAL PUPIL

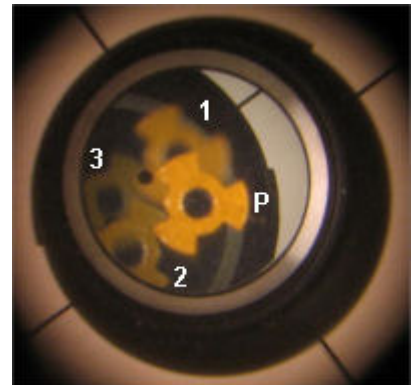


The "Carefully Decollimated Primary (CDP)" protocol was pioneered by Vic Menard

Using the CENTRAL pupil only:

Intentionally de-collimate the primary mirror by slightly adjusting one of the 3 cell collimation knobs until reflections "1" and "2" are sufficiently separated to clearly see "P" and "3"

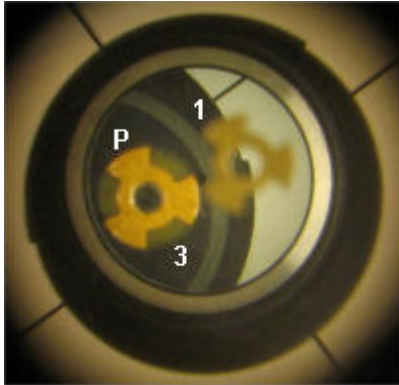
OFFSET PUPIL



## STEP 3: Eliminating FAE by adjusting the secondary mirror:

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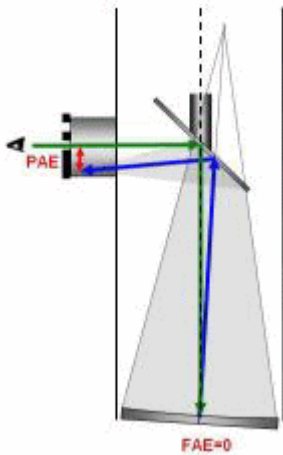
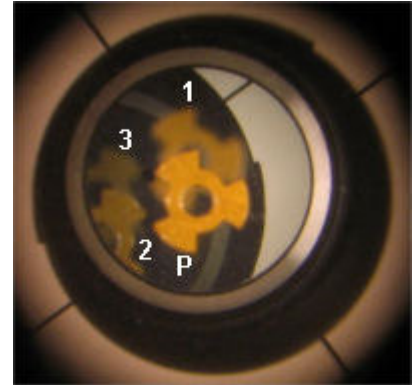
CENTRAL PUPIL



Using the CENTRAL pupil only:

Adjust only the secondary mirror until reflections "P" and "3" stack forming a perfect disc - an indication of FAE elimination.

OFFSET PUPIL

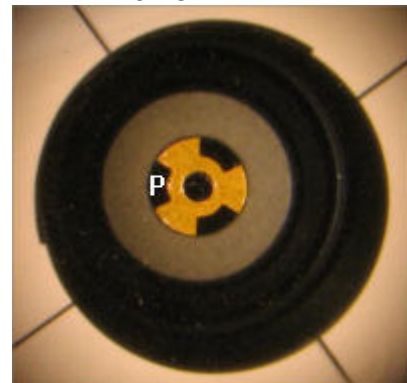


Stacking reflections "P" and "3" via the central pupil using the CDP eliminates FAE.

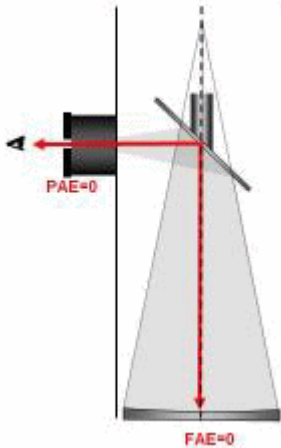
## STEP 4: Eliminating PAE by adjusting the primary mirror:

- Remove the *INFINITY XLKP™* autocollimator and replace it with the *BLACKCAT XL™* Cheshire (or similar PAE alignment tool).
- Adjust only the primary mirror until Reflection "P" is perfectly centered in the Cheshire ring (or the return shadow of the center spot is centered on the Barlowed laser return screen).

CHESHIRE VIEW



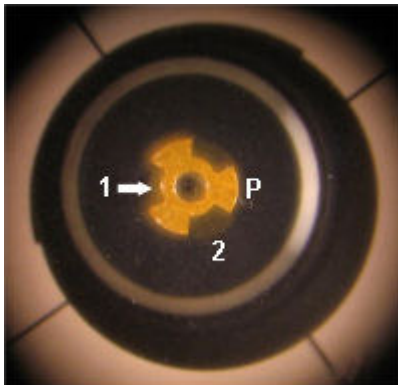
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Centering reflection "**P**" using the Cheshire (or similar PAE alignment tool) eliminates PAE.

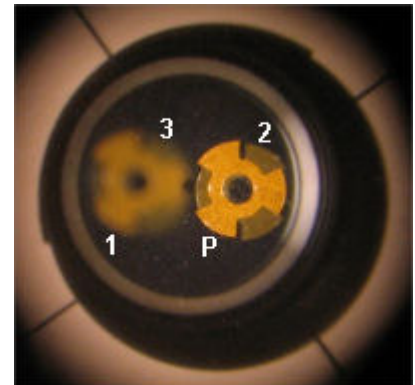
## STEP 5: Checking for residual errors:

CENTRAL PUPIL



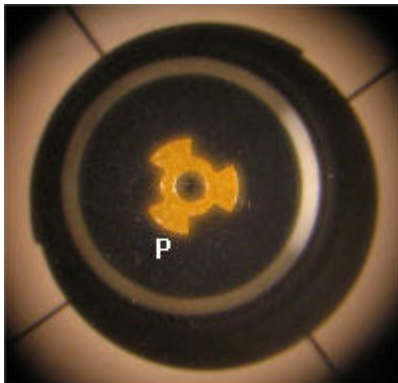
- Re-insert the *INFINITY XLKP™* and check reflections via both pupils.
- If you see faint residual background ghosts via the CENTRAL pupil and/or fragmented discs via the OFFSET pupil then you still have residual axial alignment errors –proceed to step 6

OFFSET PUPIL



## STEP 6: Correcting residual errors:

CENTRAL PUPIL



- Looking through the OFFSET pupil, re-adjust the tilt and/or rotation of the Secondary mirror to merge "**P**" and "**2**" into a perfect disc.
- Repeat Steps 4 – 6 as necessary until all tools exhibit "textbook" collimation queues (as shown here and in step 4).

OFFSET PUPIL

