NIRSPEC

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NIRSPEC Optics Design Note 28.01
Guider Camera Alignment

This document describes the guider camera alignment procedure, as modified from NODN2800. There are a few differences between the procedure in this note and that in the earlier note.

Most notably, we do not count on aligning the laser to the instrument axis so that the flat mirror can be properly aligned. Instead, we directly image the flat mirror target in the SCAM. We then use the flat mirror target as a fiducial for aligning the laser (something which is required later for aligning the tilt of the flat mirror). I think that this approach will produce smaller misalignments.

See NOAN0200 for guider installation procedures.

1. Locate the pixel on the optical axis of the CCD.

The guider optics should be aligned so that the center of the NIRSPEC field is located onto the CCD pixel which corresponds to the on-axis ray of the Nikon lens. The CCD chip is located within the Nikon lens focal plane with some amount of lateral misalignment, so the central pixel does not correspond to the on-axis pixel. To locate the on-axis pixel,

A. Autocollimate the laser to the Nikon lens (with the lens attached to the guider camera).
B. Attach a pinhole (10 :m) to the laser.
C. Image the pinhole onto the CCD.
D. Measure & record the position of the pinhole in pixels _____ X _____ Y

This pixel location marks the optical axis of the guider for all future alignment operations.

2. Attach the calibration unit/guider assembly to NIRSPEC.

Make sure that the guider flat mount, guider collimator mount, and CCD camera are attached to the optical plate.

3. Align the guider flat mount (laterally). (NIRSPEC must be cold)

A. Place the dummy guider flat substrate into the guider flat mount.
B. Affix the guider flat acetate target onto the substrate.

C. Image the cross-hair at the SCAM. If the cross-hair cannot be imaged very well, then tape a pinhole to the acetate at the cross-hair. The pinhole would then serve as the target.
D. Position the substrate in x-y until the out-of-focus cross-hair is positioned on the center of the slit. Note that this assumes that the center of the slit corresponds to the NIRSPEC optical axis. This is not strictly true, but should produce misalignments within our tolerances. Of course, if the SCAM pixel corresponding to the optical axis is known, then use that location.

4. Shift the other mounts correspondingly.

Use the microadjusters to translate the collimating mirror mount and CCD mount the same amount that the flat mount was moved.

5. Align the collimating mirror (in tilt).

A. Remove flat mirror substrate and screw the Nikon lens target onto the lens. The target extends about 35 mm from the front of the lens and has a crosshair marking its center.
B. Install the collimating mirror in its mount.
C. Image the target on the CCD through the collimating mirror. Note that the focus of the Nikon lens will be near infinity.
D. Adjust the tilt of the collimating mirror until the center of the target falls onto the on-axis pixel.

6. Align the flat mirror (in tilt).

A. Remove the Nikon lens and install the flat mirror substrate with acetate target.
B. Position the laser so that it strikes the cross-hair target, and its return beam (off the dewar window) falls back on itself. Make sure there is enough room so that a pinhole can be inserted into the beam with 2.049 m between it and the center of the flat. We assume that this condition places the laser onto the instrument axis. This is probably the weakest part of the alignment procedure, but we cannot think of a better way to position the laser onto the axis.
C. Insert a pinhole with 2.049 m between it and the center of the flat.
D. Image the pinhole and focus the lens to produce a sharp image on the CCD.
E. Adjust the tilt of the flat mirror until the pinhole image falls on the on-axis pixel.

7. Focus the Nikon lens.

A. Remove the flat mirror.
B. Screw the red filter onto the Nikon lens.
C. Install the flat mirror substrate with acetate target.
D. Adjust the Nikon lens until the telescope focal plane line (on the acetate target) is in sharp focus.