

NICI Mechanism Interactions and Interlocks

NICI System Design Note # SDN1005

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1.0 Introduction

Most of the Mechanisms in NICI work independently and can be commanded without any concern as to what other elements of the instrument are doing. There are a few operations that must be coordinated between mechanisms and some operations that are conditional on the instrument state. This memo will describe these interacting and interlocked operations.

2.0 Interactions

2.1 Dithering

The Aladdin arrays have significant image persistence. When the array is blasted with light a ghost image will be seen for the next few frames. When dithering we will move the image by moving the steering mirror and move the focal plane mask by rotating the focal plane mask wheel. Rather than move one and then the other we would prefer to move them together so that the star stays on the mask and does not blast the array. Alternatively the pupil mask wheel could be turned to the blank position while the moves are accomplished but this will probably take longer.

2.2 Spider Mask Rotator

When the Spider Mask Rotator tracking is active the spider mask position will be a function of the instrument rotator position. As the instrument rotates the spider mask will rotate to maintain alignment between the spider mask and the reimaged spiders.

2.4 Atmospheric Refraction Correction

As the telescope tracks toward or away from the meridian the relative position between the visible portion of the star will shift with respect to the infrared image of the same star. Since we are guiding in the visible this means that the science image will drift. To prevent this drift we will effectively drift the wavefront sensor in the opposite direction using the steering mirror. Once the star is properly positioned this mode will be activated and will then adjust the steering mirror as a function of airmass and azimuth.

2.5 Flexure Compensation

If required the steering mirror will be moved as a function of the telescope position to cancel internal instrument flexures that cause image drift at the science detector. It is not clear yet whether this mode will be required.

3.0 Interlocks

3.1 ND Filter Wheel and APDs

The Avalanche Photodiode Detectors (APD) used in the wavefront sensor can be damaged by too much light and care must be taken to protect them. The ND filter wheel can be used to limit the light on the APDs. When ever a request is made to change the ND filter wheel filter a calculation will be done to determine if the new requested filter will result in too much light on the APDs. If so, the move will not be done and an error condition will be returned.

3.2 Mechanisms moving during cooldown

The mechanisms should not be moved during the instrument cooldown. The mechanisms can be moved when the instrument is fully warm or fully cold. There will be a temperature sensor on the cold structure that can be used to tell when it has achieved an adequate temperature.

4.0 Safety during a Slew or setup on a new Science Object

Given the array persistence, operational procedures will have to be established to avoid blasting the array. The following are suggested:

Pupil Wheel should be Blanked-off at the completion of the observing sequence on a science object before slewing to the next star. After the star has been acquired and the AO system has locked in the star the star will be on the focal plane mask and the pupil mask can be opened.

Focal plane masks should be changed on Sky to avoid a un-occulted bright star being imaged onto the array.