Southern African Large Telescope

Prime Focus Imaging Spectrograph

Interface Mounting and Alignment Plan

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1. Scope

This document outlines the procedures that will be used to mechanically mount the Prime Focus Imaging Spectrograph (PFIS) to the Prime Focus Instrument Platform (PFIP). In particular, the detailed plan to confirm multi-axis alignment and focusing will be discussed.

2. Mechanical Mounting

The mating of the PFIS to the PFIP is performed through the use of a semi-kinematic, 12-point mount to the interface ring. These mounting points are located on, and equally spaced around, the bottom invar ring of the PFIS support truss. Each point consists of a mounting pad with a machined shim, through which a bolt holds PFIS to the ring. The interface ring is constructed of steel; therefore, to account for thermal variations in the diameter, two of the PFIS pads are specially constructed. One has a pin, constraining that point to the underlying interface ring while the pad on the opposite side has a slot. Each of the remaining pads has an oversized hole to provide enough clearance for the bolt under the full range of operating temperatures. The thicknesses of the shims will be adjustable and thus allow for the alignment procedure described below.

3. Guider Interface

TBD

4. Alignment Procedure

The $x$-$y$ position of the center of the SALT field at the position of the focal plane, relative to the geometric center of the interface ring, will be determined during the SALT commissioning phase through the use of the SALTICAM in Verification Instrument mode. The value of this position should then be transmitted to the PFIS team. The pad with the pin has a shim that can be fabricated to take up small discrepancies between the optical center of field and the center of the interface ring. The shim can be machined at any time prior to mounting.

Corrections for rotations in $tip$-$tilt$ will need to be performed on the telescope. These will be achieved through the use of an optical verification utilizing a mirror permanently affixed to the PFIS structure. A similar mirror should be attached to the PFIP, and comparisons can be made with a theodolite from the CCAS tower. Relative angles will be measured and new shim thicknesses calculated. This procedure does not require any on-sky time.

Finally, adjustments in the $z$ direction, along the optical axis of the collimator tube, will need to be performed using guider observations of bright stars. The guider will be mounted to PFIS directly. Verifications of the proper spacing between the guider and the PFIS focal plane will be made prior to installation on the PFIP. The guider will be used to monitor the focus of bright stars while an adjustment to the telescope focal position is adjusted. The deviation between the true focus position and the ideal position in the prime focus Focal Plane Frame (FPF: see
document SALT-1000AS0031/SALT Axes and Calibration Definition) will be measured. The thicknesses of the shims can be adjusted until this deviation is within specification.

5. Final Focusing

Once the PFIS is aligned and all adjustments to the shim thicknesses made, the slit mask plane should be defined as the focal plane of the telescope. All focusing of the other assemblies should be made relative to this plane.

SALTICAM employs a kinematic mounting structure that allows for the adjustment of the focus position. This will be adjusted so that it is in focus.

Finally, verification of the slitviewer focus will be made by inserting one of the reflective long slits into the focal plane and imaging a fully illuminated field with SALTICAM.