Joe, Alan and I went up to the 20” Jamieson telescope Thursday 24th to make some measurements and to do some star tests in preparation for installing a new focuser on the bottom of the scope and to prepare for a redesign and installation of new baffle tubes for both the primary and secondary mirrors. Cassegrain telescopes are designed to perform best with minimal optical aberrations at one specific primary/secondary mirror separation distance. Deviation from this distance introduces aberrations, the dominant one being spherical aberration.

A star test revealed that when the secondary mirror is placed at the middle point of its focus travel the image showed spherical aberration appearing as undercorrection. Moving the secondary mirror further away from the primary mirror showed significantly less spherical with a TCS focus setting of 61460. This brings the focal plane to 14 5/8” below the base plate of the original Crayford focuser. We did not determine the point of minimal spherical aberration, which would require more extensive testing with a camera and software to analyze the images.

We also noted that the secondary mirror is not centered on the optical axis of the primary mirror. Whenever decenter is present an error of tilt is also introduced in order to make the star image appear to be in optical alignment. The dominant aberrations introduced by both secondary mirror decenter and tilt are coma and astigmatism and the two errors can add. Tilt can appear to compensate for decenter when in fact the system it is out of alignment. I think this is the situation we currently have with the 20”. Unfortunately the way the telescope was designed there does not appear to be any adjustment available to correct secondary decenter. However, we may be able to modify the upper rings of the scope to allow for adjustment. We did not measure the amount of decenter. We saw some slight astigmatism in the star test as we passed from inside to outside of focus but we were using a star diagonal and did not test without the diagonal. Even with the alignment errors mentioned the in-focus star image looks reasonably good but we were using Vega for our star test which is way too bright for sensitive testing. I suspect the images of fainter stars would sharpen up a bit with proper collimation.

An unexpected problem we noticed while performing the star test was that the mechanical axis of focus travel (piston) is not aligned to the optical axis of the primary mirror. When the secondary was refocused to star test at different mirror separations we saw the optical collimation of the telescope improve or degrade depending on the focus position of the secondary mirror. We would not have noticed this problem if we had not been star testing at different mirror separations. The secondary spider bolt holes are cut with slots which allow for tilting the entire spider so we should be able to correct this problem, possibly with a laser.

A mechanical problem we noted that Alan mentioned in his email was a 1-2 second delay in response when reversing direction on the dec motor when pushing the drift buttons on the hand paddle. This could be caused by too large of a gap between the worm and bull gear or possibly a malfunction of the spring loaded tension tool that Bruce Hille installed on the dec axis to add preload to the gears.

Thanks,

Gary