



*The Smithsonian Astrophysical Observatory &
The University of Arizona Steward Observatory*



MMT Conversion Internal Technical Memo: March 10, 2000

TO: Scott, JT
FROM: Steve West
RE: Initial results from primary mirror cell dynamic impulse test
CC: Shawn, Tom, Craig, John, Brian C., Warren

You recall that we put 3 separate impulses into the mirror cell during the recent off-zenith cell certification. Each impulse was applied with a 4x4 along the +z-axis to the underside of the trunnion ring at a south-west location so all modes would be excited. The FFT analysis for each impulse gives repeatable results, so I show only one impulse here.

Conditions:

- Cell was zenith pointing
- Dummy mirror was supported at the nominal working position (i.e. about 3-4mm above the static supports and centered).
- The outer loops were closed.

Results:

The data were gathered by Tom using his rtran routine sampling all six hardpoints at 37 Hz. I put the resulting raw hardpoint load cell voltages through the matrix to convert to solid-body forces and moments, and then FFTed the results.

The first six graphs show the time series forces and moments just after the impulse. The last six graphs show the corresponding FFTs after removal of global tilt and piston from the data.

Cursory discussion:

The times-series force data clearly show the response difference between having a large (y and z) and small (x) number of inner loops with which to close the outer loop. This difference should be illustrated again between the x and y moments and the z moment. However, I don't understand why the y-moment time-series doesn't seem to conform.

All the FFTs seem to have two major features in common--a feature near 3Hz and another large resonance. I presume that the 3 Hz feature is due to the servo loop(s). The ratio between the lateral (near 9 Hz) and axial (near 14 Hz) platform resonances is about 1.5 which is the expected ratio for our Stewart platform geometry. If the mirror and cell were infinitely rigid and the struts had a 80 N/um stiffness, the axial frequency would be near 40Hz. Clearly the compliance in the dummy mirror and cell significantly degrade it.

There is quite a bit more information here, but it will have to wait until there is more time. Anyone wishing the data is welcome to it.





