



MULTIPLE MIRROR TELESCOPE OBSERVATORY

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MMTO Technical Memorandum 84-1

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Subject: Open Loop Flexure Coefficients for MMT Phasing

- (1) During the December 14-16 DSI observing run we used the optical coherent beamcombiner, which is stepper motor controlled for path-length adjustment (1 step = $0.18 \mu\text{m}$ change in pathlength), and which is now interphased to the TCS computer for open-loop adjustment. Goring and Quast provided the interfacing to the TCS computer and Montgomery and Hege developed the software for open-loop control with elevation change. During this observing run we set out to test this open-loop control of the MMT pathlengths which included the determination of the open-loop phasing coefficients. This memo describes the results, the problems encountered, and future procedures.
- (2) Before giving the measurements, we point out again the close inter-relation between telescope pointing and phasing. Take two telescopes with a separation of D ($D = 5$ meters for telescope pairs A and D, B and E, and C and F). If the MMT mount is offset by 1 arc second in the direction connecting the two telescope centers, and if this offset is compensated by tilting the secondaries of the two telescopes, the pathlength difference between the two telescopes changes by $D/206500$ which for $D = 5$ meters corresponds to $\approx 25 \mu\text{m}$ or ≈ 150 steps. This major change stresses the significance of the complex interaction between telescope phasing and pointing. Before phasing measurements can be made satisfactorily it is necessary to define a clear, precise, repeatable procedure for the pointing of the six MMT telescopes. Using that procedure the open-loop coefficients should be measured and then the same procedure should be followed during the observing run.
- (3) We identify now the following possible procedures:
 - (a) Always point the MMT to the object under study with the guide telescope to a precision of ~ 0.1 arc sec. Adjust the secondaries to put the images at the desired position in the field of view. The problem with this is that the guide telescope can only see stars with $V = 5$ and brighter.
 - (b) Use one of the MMT telescopes as the guide telescope as described above. It's secondary is therefore never adjusted in tilt (and focus) and its image is used to point the telescope. We tried this mode with partial success but gave up after the azimuth/wind direction induced pointing errors were discovered (see Technical Memo 84-2).