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MILLIARC SECOND ASTROMETRY WITH OPTICAL INTERFEROMETERS

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Abstract

Optical interferometry has routinely demonstrated submilliarc second precision in angular measurements for binary star astrometry and a few milliarc second precision for wide angle astrometry. With the Mark III Stellar Interferometer, a *long* baseline optical interferometer on Mt. Wilson, California, many spectroscopic binaries have been resolved for the first time. The smallest separation measured between two components is only 2 mas (milliarc second), the maximum magnitude difference is 4 mag, and the smallest semimajor axis is 5 mas. Such high angular resolution and dynamic range have been used to determine stellar masses with precision better than 5 % and differential stellar luminosities to better than 0.1 mag with separation of milliarc seconds. For some binary stars, not only have the systems been resolved, but also the diameter of the primary component has been determined, yielding direct measurements of stellar effective temperature with high accuracy. Using interferometer observations, the distances to the Hyades and the Pleiades can be determined to better than 1 PC without influence of interstellar extinction. For wide-angle astrometry with the Mark III interferometer, the observation results yielded average formal 1σ errors for FK5 stars of 6 mas in declination and 10 mas in right ascension. Presently a new infrared interferometer is under construction at Palomar Mt., California. This interferometer is being optimized to perform high accuracy narrow-angle astrometry using long baselines, observations at 2.2 μm, and phase referencing to increase sensitivity in order to find nearby reference stars. The goal is to demonstrate astrometric accuracies of better than 0.05 mas for a differential measurement between closely-spaced stars,

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