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Spectral Astrometry for the Dectection of Exoplanets: Measuring Angles/Detecting Objects through Wavelength Dependent Long Baseline Interferometry

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Traditionally, a long baseline interferometer measures the angular position of an object by equalizing the path lengths of the two interfered beams, so that a white light signal will produce a large signal. This prevents the measurement of more than one object simultaneously, and requires very precise (sub wavelength) path length control. I will discuss the advantages of dispersing the output of a long baseline interferometer into many fine spectral channels, and using phase stepping data collection techniques. The post dispersion allows the simultaneous observation of more than one object at non-equal pathlengths and the angular measurement to be differential. This relaxes the pathlength control tolerance by many orders of magnitude, obviating a huge engineering challenge for the current plan for the Space Interferometry Mission A scheme for an inexpensive flexible and fiberoptically linked space borne long baseline interferometer is described for the detection of exoplanets. Spectral astrometry can also enhance the contrast of a direct image of a exoplanet in the glare of its parent star. This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.