STELLAR DIAMETER MEASUREMENTS WITH FIBER OPTIC DOUBLE FOURIER INTERFEROMETRY —EXPERIMENTAL STUDY

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Abstract. Long baseline optical interferometry has been successfully employed to measure the diameters of stars. In this technique, bandwidth smearing can affect the measurement accuracy. These bandwidth smearing effects can be, to some extent, eliminated by dividing the whole observing spectral band into sub-bands and calculating the star's diameter based on the visibilities and spatial frequencies at the corresponding sub-bands. In the visible range, dividing the whole spectral band can be implemented by introducing a spectrograph, while in the IR domain, this operation can be performed efficiently with the technique of double Fourier interferometry (DFI) without losing the advantage of multiplexing. In particular, the use of IR single-mode fiber optics for DFI will make the interferometer extremely compact, light, insensitive to surrounding conditions, etc. We established an IR single-mode fiber optic double Fourier interferometer in the laboratory, in which the optical path difference modulations are generated by stretching fiber arms and the beam combination is carried out with a fiber optic directional coupler. In this paper, we report on experiments and experimental results from measurements of the diameter of an artificial star with the technique of fiber optic DFI.

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