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**Title:** Externally Dispersed Interferometer for Precision Doppler Velocimetry: Theory of Instrument  
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### Abstract

The combination of an interferometer crossed with a medium resolution external disperser forms an exciting new instrument (EDI) for broadband high resolution spectroscopy including Doppler velocimetry. A prototype has been tested on sunlight and bright starlight. Precision of better than 1 m/s has been achieved in laboratory null tests. The EDI has advantages of compact size, low cost, unlimited bandwidth, extreme robustness to beamshape variation, and high etendue. It has much larger bandwidth than previous interferometer-grating hybrids. A theoretical study of the signal to noise properties shows it is competitive with a R=60k grating spectrometer in photon noise while having several orders of magnitude more robustness to various kinds of beam drift errors. Instrument variations useful for general high resolution spectroscopy have been identified. Prototype developed at Lawrence Livermore Nat. Laboratory