High-Spectral Resolution Dark Holes: Concept, Results, and Promise

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Abstract

Next generation high contrast imaging instruments face a challenging trade off: they will be required to deliver data with high spectral resolution at a fast cadence and across a wide field of view. For instruments that employ focal plane wavefront sensing and therefore require super-Nyquist sampling, these requirements cannot simultaneously be met with a traditional lenslet integral field spectrograph (IFU). For the SPIDERS pathfinder instrument, we are demonstrating an imaging Fourier transform spectrograph (IFTS) that offers a different set of tradeoffs than an IFU, delivering up to R20,000 spectral resolution across a dark hole. We will present preliminary results from our instrument including the first high-resolution chromaticity analysis of a self-coherent-camera based dark hole. This concept and our results have the possibility to shape how future high contrast imaging spectrographs and focal plane wavefront sensors are designed and deployed to upcoming extremely large telescopes.

Keywords: focal plane wavefront sensing, spectroscopy

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