TDEM-15 Abstract

Threshold raw retrieved contrast in coronagraphs is limited by internal polarization.

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Our ability to characterize most exoplanetary systems in the UV, optical and IR is determined by how completely the optical system can extinguish the incoherent "white-light" complex EM field from the star while at the same time passing the complex EM field from the nearby exoplanet with minimum attenuation.

The small angular separation between a star and its exoplanet leads to the requirement that the optical system be diffraction limited, and thus has zero geometric wavefront error. However, polarization aberrations introduced by an imbalance in the complex EM reflectance and transmittance from mirrors, stops, occulting masks and windows within the telescope & instrument distorts the EM field to limit system optical contrast[1,2].

This TDEM15 will use the comprehensive resources at the Polarization Laboratory of the College of Optical Sciences, University of Arizona and the NASA/JPL coronagraph testbeds to 1. Develop polarization aberration requirements for high contrast exoplanetary systems, 2. Examine in detail the sources of polarization aberration by applying polarization ray tracing to the WFIRST-CGI, the LUVOIR and the HabEx systems. 3. Recommend and where appropriate develop polarization metrology & mitigation technologies.

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[1] Breckinridge, J. , W.S.T. Lam and R. A. Chipman (2015) "Polarization aberrations in astronomical telescopes" Publ. Astron Soc. Of the Pacific 127:445-468 and R. A. Chipman, Wai Sze T. Lam and J. Breckinridge (2015) "Polarization aberrations in astronomical telescopes" Proc SPIE 9613 doi:10.1117/12.2188921

[2] J. B. Breckinridge and R. Chipman (2016) "Telescope polarization and image quality: Lyot coronagraph performance", Proc. PASP 9904-042.