

A Cryogenic MidIR Nuller for TPF

G. Vasisht, J. K. Wallace, R. Bartos, S. R. Martin

Integral to the TPF interferometric testbed activity is the development of a Cryogenic Nuller that can demonstrate 10^{-6} broadband, white-light nulls. In addition, the Cryogenic Nuller must demonstrate stabilization of the deep null on timescales of 10^3 - 10^4 s, and perform detection of a faint pseudo-planet at realistic TPF flux levels. Cryogenic operation is necessitated by the requirement for a low radiative background. Our instrument consists of an artificial star and planet source feeding a modified Mach-Zehnder nulling interferometer with active pathlength and tilt control, all located within a large cryogenic chamber. A single nulled output is spatially filtered and relayed into a camera (that shares vacuum with the cryogenic chamber). The camera is equipped with a low background As:Si BIB focal plane detector. In this paper, we discuss the system level requirements imposed by the need to obtain unprecedented deep and stable nulls and summarize our design approach for the Cryogenic Nuller.