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ORIGINAL ARTICLE

A space Fresnel Imager for ultra-violet astrophysics: example on accretion disks

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Abstract The Fresnel Diffractive Imager concept is proposed for space borne astronomical imaging at Ultra-Violet wavelengths, using diffractive focalization. The high angular resolution and high dynamic range provided by this new concept makes it an ideal tool to resolve circumstellar structures such as disks or jets around bright sources, among them, pre-main sequence stars and young planetary disks. The study presented in this paper addresses the following configuration of Fresnel diffractive imager: a diffractive array 4 m large, with 696 Fresnel zones operating in the ultra-violet domain. The diffractive arrays are opaque foils punched with a large number of void subapertures with carefully designed shapes and positions. In the proposed space missions, these punched foils would be deployed in space. Depending on the size of the array and on the working spectral band, the focal length of such imagers will range from a few kilometers to a few tens of kilometers. Thus, such space mission requires a formation flying configuration for two satellites around the L2 Sun-Earth Lagragian point. In this article, we investigate numerically the potential of Fresnel arrays for imaging circumstellar dust environments. These

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