

Generation 2 testbed of Fresnel imager: first results on the sky

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Abstract We present and discuss the first sky images obtained with a second generation “Fresnel Diffractive Array Imager” (FDAI) prototype. These images have been made on high contrast multiple stars (STF-1273 and BU-893), and on Saturn. The focusing objective: a 200×200 mm “Fresnel array”, is a $50 \mu\text{m}$ -thick opaque foil featuring approximately 250,000 specially shaped void apertures, corresponding to 696 Fresnel zones. It focusses light by diffraction. This prototype has been installed in parallel to the 76 cm “*grand équatorial*” (17.89 m focal length) at the *Observatoire de la Côte d’Azur*, (Nice, France). The Fresnel array is attached close to the front end and on the side of the 19 m long refractor’s tube. The “receiver module” (field optics, chromatic corrector and cameras) is placed at prime focus of the Fresnel array, and attached to the refractor tube close to the rear end. The chromatic correction in the receiver module is adapted to 800 nm, but operates successfully in the two spectral bands used: 630–745 nm and 750–950 nm. This setup has been used to test the on-sky capabilities of the diffractive imaging system in angular resolution, limiting magnitude and contrast, and to experience some of the situations that will be encountered in a future space-borne formation flying configuration. We have obtained high contrast diffraction-limited images of various celestial

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