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NEOCAM INSTRUMENT DESIGN AND PERFORMANCE MODEL

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ABSTRACT

The Near-Earth Object Camera (NEOCam) is a space telescope that is optimized for detection of potentially hazardous asteroids and comets. The mission consists of a 50-cm telescope operating at 4-5.2 and 6-10 microns imaged simultaneously through a beamsplitter. The choice of architecture is driven by the need to maximize sensitivity to ~300 K objects, while also maximizing sky coverage. The design is uniquely enabled by the development of sensitive detectors operating out beyond 10 microns at temperatures suitable for cooling using purely passive techniques, rather than expendable cryogens or expensive cryocoolers. This enables a mission lifetime long enough to detect objects with synodic periods longer than a few years.

NEOCam's detectors have undergone an extensive development effort over the last decade as a result of NASA's investment in maturing the technology. The arrays are now available in a 2048 x 2048 format, and flight-like prototypes have been

manufactured, delivered, and incorporated into a flight-like focal plane mosaic. Radiation tests, thermal cycling, and vibrations tests have been performed to ensure survivability in the Sun-Earth L1 Lagrange point environment. Characterization of latent image performance, quantum efficiency, noise, well depth, and other parameters has been undertaken (Dorn et al. 2016, McMurtry et al. 2013). Moreover, preliminary work on an engineering unit of the NEOCam camera assembly enclosure that houses the focal plane modules has begun.

Using as-measured performance numbers from these arrays and the NEOCam Survey Simulator tool, NEOCam's top level scientific objectives have been flowed down to lower level requirements on the flight and ground system. Detailed performance budgets have been developed for key input parameters such as instrument sensitivity, field of view, field of regard, observing overheads, and cadence. The model of instrument sensitivity now incorporates image quality, the natural sky background, and detector characteristics. As more measurements of the as-built NEOCam instrument become available, these will be incorporated into the performance model. Here, we report on the current status of this work, and future plans.

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