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An Image Simulator for NEOCam

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ABSTRACT

We describe the science image simulator for the Near-Earth Object Camera (NEOCam) mission. The purpose of the simulator is to produce realistic raw image data, with properties similar enough to real data as to exercise all components of the science data processing system, and sufficient to characterize the likely performance of the processing algorithms relative to the mission requirements. The simulator is intended to support testing of data processing algorithms and system throughput. It is not intended for forward modeling and comparison to real data, or any similar procedure.

Using the output of the NEOCam Survey Simulator, the image simulator first adds the survey dither pattern that produces a table of the telescope boresight centers for every exposure that ultimately corresponds to one image at the end of the simulations. The image simulator then adds the astrophysical sources obtained from the ALLWISE Source Catalog and the diffuse infrared background. The sources will consist of background stars and galaxies as well as solar system objects such as comets and asteroids at the correct positions for the time of the simulated

observation. Artificial populations of faint sources, those fainter than the ALLWISE detection sensitivity, were also injected. Point sources are modeled using a spatially variant PSF derived from NEOCam instrument optics modeling. The detector readout incorporates the gain, read noise, flatfield, dark, cosmic rays, non-linearity and saturation.

The modular design of the image simulator makes updating the detector, instrument and survey strategy easy to update as new test data become available. This feature makes the simulator a key part of NEOCam systems engineering toolkit to validate overall system performance, and to support trade studies when used in concert with the NEOCam Survey Simulator and Science Data System.

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