Measurement of the Count-Rate Non-linearity in WFC3-IR Detectors

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Abstract.
The Detector Characterization Laboratory at NASA/GSFC has investigated the count-rate non-linearity (reciprocity failure) characteristics of 1.7 micron cut-off HgCdTe devices that are very similar to the WFC3 IR detector. The reciprocity failure follows a power law behavior over the range of fluxes tested (0.1-10^4 photons/second). The slope of the power law varies among detectors, ranging from 0.3-1% dex at 1.1micron, which is much smaller than the 6% dex effect observed with the HST NICMOS 2.5 micron cut-off detectors. Reciprocity failure is nevertheless an important effect in the calibration of WFC3 data, as well as in other applications in which there is a large difference in flux between the photometric standards and the scientific sources of interest. Furthermore, the variation among detectors demonstrates that demonstrates that a measurement made with the WFC3 IR detector is necessary in order to provide a proper calibration of the WFC3 IR data.