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The Effects of Photo-Generated Carrier Diffusion on Blooming in an IR Detection System Exposed to High Intensity Sources BRYANT WYSOCKI, MICHAEL MARCINIAK, AFIT, MITCHELL HAERI, Raytheon — Extremely sensitive focal plane arrays (FPA's) with high spatial resolution play an ever-increasing role in infrared imaging. Military and intelligence operations rely heavily on the information gathered by these systems, requiring them to be hardened against enemy countermeasures. A study of the blooming effects in a 640 x 480 indium-antimonide (InSb) FPA with 20 μm pixel-to-pixel spacing and operated at 77 K is presented. Electronic and optical blooming from both a high-intensity blackbody spectral source and a 4.6 μm narrow line-width laser source is examined. A 30-μm pinhole/mask was fastened directly to the FPA to achieve spatial isolation of individual pixels in an attempt to separate optical and electronic effects. A series of experiments were run to determine the relative contributions of each. The spectral source and the laser were each used to bloom the FPA both with and without the mask present. Optical effects caused by ghosting, diffraction, lens and housing scatter were shown to dominate, resulting in global loss of image quality. Effects due to electronic phenomenon, such as carrier diffusion and charge bleeding, were shown to be minimal and locally constrained to $\sim$ 20 μm. A simulation of carrier drift and diffusion was constructed to provide a theoretical model of the crosstalk between pixels.

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