**A Monolithic Ge-on-Si CMOS Imager for Short Wave Infrared**

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Visible-band cameras using silicon imagers provide excellent video under daylight and artificially illuminated night-time conditions. The night sky provides illumination in the short-wave infrared (SWIR) band which cannot be detected with a silicon sensor. Adding SWIR detectors to a CMOS imager enables a camera which can be used day or night without artificial illumination.

Germanium is chemically compatible with silicon and optically responsive from blue to 1.6m but until now, there has been no good technique for integrating single-crystal germanium detectors on silicon. This paper describes a monolithic CMOS imager with Ge detectors fabricated within a conventional 180 nm CMOS foundry process. A 744 x 576 format imager with 10 µm pixel pitch provides a large field of view without incurring a size and weight penalty in the optics. A sensitive analog signal chain with a novel correlated double sampling (CDS) provides a noise floor of 5 electrons. The imagers are hermetically packaged with a thermo-electric cooler in a windowed metal package. A compact camera core has been designed around the imager.

In field tests, the camera operates with positive SNR under cloudless, moonless conditions and outperforms the best EMCCD cameras. It also provides useful fog and haze penetration over long distances in daylight and provides a low cost solution for many industrial SWIR machine vision applications.