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WHITE PAPERS & APPLICATION NOTES



1. What is extended range?

Extended wavelength InGaAs

InGaAs material absorbs light in the short wave infra-red spectrum and can be used as an optical detector in this range. Standard InGaAs-based detectors have a long wavelength cutoff of 1700 nm. They are fabricated by growing a crystalline layer of InGaAs on an indium phosphate (InP) substrate. In this case, the substrate has the same lattice constant as the alloy resulting in lattice-matching.

The sensitivity of InGaAs can be extended to higher wavelengths (up to 2.5 µm). Introducing more indium into the ternary compound increases its bandgap and hence enables the detection of longer wavelengths. In Ga_{0.53}In_{0.47}As with a longer cutoff is called "extended wavelength InGaAs."

Consequences on image quality

However, changing the composition of a ternary compound (InGaAs) will also change the lattice constant of the material. Adding a little more indium increases the lattice constant of the thin film, which causes a mismatch with the substrate, reducing the quality of the thin film. Lattice mismatching means more crystal structure defects, leading to raw images of poor quality. Until now, this has prevented extended SWIR imaging from becoming more widespread.

This image captured in dark conditions. Acquisition parameters: resolution: 640x512px, 400fps, integration time: 2.00 µs.

Extended Range SWIR Imaging with C-RED 2 ER InGaAs Camera

C-RED 2 ER is a highly sensitive extended short wave infrared (1300 nm – 2200 nm) camera. It is based on a VGA (640 x 512 pixels) ER-InGaAs detector array and offers framerates up to 600 Hz. This camera is a real breakthrough, as it is the only one with such technology on the market. It opens new imaging and sensing opportunities for life science, defense, laser measurements, and industrial applications.

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