Comparison of intrapixel measurement techniques using a SWIR format TV detector

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The Intrapixel sensitivity defines the variation of the pixel signal with the position of the incoming flux within the pixel surface. In the past, this feature was considered negligible in the system error budget. This assumption can no longer be made with the development of undersampled instruments and the current science objectives which target to sense extremely weak effects involved in gravitational shearing, precise astrometry and exoplanets detection. Therefore, the intrapixel response has to be evaluated during the detector characterization phase.

At CEA-IRFU, a test bench called “Intrapix” has been specifically designed for this measurement by means of the determination of the MTF at frequencies well beyond the Nyquist frequency of the detector [1]. Two detectors issued from the ASTEROID and ALFA [2] programs were characterized. These detectors are SWIR sensitive photodiodes with a 15 µm pixel pitch and Source Follower per Detector ROIC architecture. The measured results are in accordance with the predictions and consistent with the diode technologies.

The ongoing activity aims to compare different intrapixel measurement techniques using the ASTEROID detector, which has already been tested with the « Intrapix » bench. The idea consists in taking advantage of the spot scan technique developed by the CEA-LETI at 1.55µm in order to estimate the response delivered by each of the two techniques. The first results will be presented, taking into account the spot scan test bench characterization in terms of stability.

[1] Pichon, Thibault, et al. « Quantix and Intrapix : test benches dedicated to quantum efficiency measurement and intra-pixel response of detectors from VIS to LWIR », Proc. SPIE 12191, X-Ray, Optical, and Infrared Detectors for Astronomy X, 121912I (29 August 2022); https://doi.org/10.1117/12.2630232

[2] Gravrand, Olivier, et al. "Fabrication and characterization of a high performance NIR 2kx2k MCT array at CEA and Lynred for astronomy applications." Infrared Technology and Applications XLVIII. Vol. 12107. SPIE, 2022.