**SRI 2024** 

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## UFERI –Hybrid Photon-Counting Pixel Detector Prototype for Diffraction Experiments at Synchrotrons

Friday 30 August 2024 12:00 (15 minutes)

In preparation of the upcoming upgrade of the SOLEIL synchrotron to a fourth-generation facility [1], the local detector group and the ASIC design group from AGH University, Krakow, are developing a new single photon-counting hybrid pixel detector prototype called UFERI (Ultra-Fast Energy Resolved Imager [2]). It is dedicated to pseudo-Laue diffraction applications in intense, pink beams at photon energies between 5 to 30 keV. With its three thresholds, UFERI is able to discriminate several energy levels and its short dead time ensures a high count rate capability up to 7 Mcnts/s/pix. To maintain a low noise in high count rate operation, a capacitor discharge technique [3] is implemented on-chip. Additionally, three independent gates for the three discriminators combined with a short gating time allow for ultra-fast pump-probe-probe measurements. In this contribution, a description of the ASIC's architecture as well as the main results of the characterisation are presented. We show the energy calibrations, threshold dispersions and gain spread, as well as the count rate and timing performance of UFERI.

[1] J. Susini, J. M. Cassagne, B. Gagey, A. Nadji, A. Taleb, A. Thompson and J. Daillant, "A brief introduction to the Synchrotron SOLEIL and its upgrade programme", The European Physical Journal Plus 2024 139:1, vol. 139, no. 1, pp. 1-8, 1 2024.

[2] F. Orsini, A. Dawiec, B. Kanoute, P. Grybos, R. Kleczek, P. Kmon and P. Otfinowski, "Ultra-Fast Energy Resolved Imager for 'Pseudo' Laue diffraction experiments at synchrotron facilities", Journal of Instrumentation, vol. 19, no. 02, p. C02055, 2 2024.

[3] R. Kleczek, P. Kmon, P. Maj, R. Szczygiel, M. Zoladz and P. Grybos, "Single Photon Counting Readout IC with 44 e-rms ENC and 5.5 e-rms Offset Spread with Charge Sensitive Amplifier Active Feedback Discharge", IEEE Transactions on Circuits and Systems I: Regular Papers, vol. 70, no. 5, pp. 1882-1892, 5 2023

## I plan to submit also conference proceedings

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