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P1.74: Ultra-Fast Energy Resolved Imager for 'Pseudo'Laue diffraction experiments at synchrotron facilities

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'Pseudo'Laue diffraction experiments [1], with multi pink beam, is being considered as an option for the upgrade of SOLEIL [2] for fast time resolved crystallographic applications in the energy range from 5 to 30 keV. A factor of over 1000 in acquisition speed, compared to current performances, may be expected and the capability of simultaneous measurements of photon fluxes at different energies is a mandatory requirement for the detector. Such a detector would address thematic as serial synchrotron crystallography, in situ macromolecular crystallography, in vivo crystallography and high-pressure/temperature crystallography (quasi-crystal). Pump-probe time resolved technique is also considered.

For this purpose, a feasibility phase has been launched within a SOLEIL-AGH collaboration for the design of a new photon counting ASIC prototype (named UFERI), with some architecture parts inspired from previous work [3]. A very high counting rate for the ASIC has been an essential requirement to be compatible with the photon flux expected on the future detector surface, and three discriminators and counters have been implemented in each pixel of 75 µm pitch. The UFERI ASIC prototypes have been tested successfully and the very first hybrid pixel modules are now under tests with X-rays in laboratory. Preliminary results will be presented at time of the conference.

[1] Z. Ren et al, J. Synchrotron Radiation (1999)., vol 6, 891-917.
[2] Conceptual Design Report for SOLEIL upgrade (2021) https://www.synchrotron-soleil.fr/
[3] R. Kleczek et al, IEEE Journal of Solid-State Circuits (2018) PP. 1-12. 10.1109/JSSC.2018.2851234.

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