XPAD, an hybrid pixel detector for charge density study on laboratory diffractometers.

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The new generation of X-ray detectors, the hybrid pixel area detectors or 'pixel detectors', are based on direct detection and single-photon counting processes. Large linearity range, high dynamic and extremely low noise leading to unprecedented high signal-to-noise ratio, fast readout time (high frame rates) and electronic shutter are among their intrinsic characteristics which render them very attractive. First used on synchrotron beam lines, we will show that these detectors are also promising at laboratory sources, in particular for pump-probe or quasi-static experiments [1] and accurate electron density measurements [2]. An original laboratory diffractometer made from a Nonius Mach3 goniometer equipped with an Incoatec Mo micro source and an XPAD pixel area detector has been developed at the CRM2 laboratory. First we have collected an Mo Kα accurate charge density quality data up to 1.21 $Å^{-1}$ resolution on a sodium nitroprusside crystal using this prototype diffractometer. The quality of the data which were used for the multipolar charge density analysis will be discussed. In a second time, we will compare the measurements obtained with three different diffractometers (XPAD, Agilent Atlas CCD and PHOTON100 CMOS on the same crystal of a relatively weakly scattering pure organic compound, the 4-benzyloxy-3-methoxybenzaldehyde ($C_{15}H_{14}O_3$) to 0.96 $Å^{-1}$ resolution.

[1] Diffraction studies under in-situ electric field using a 2D hybrid pixel XPAD detector : P. Fertey, P. Allé, E. Wenger, B. Dinkespiler, S. Hustache, K. Medjoubi, F. Picca, C. Lecomte and C. Mazzoli, *Journal of Applied Crystallography*, **46**, 1151-1161, 2013.

[2] XPAD X-ray hybrid pixel detector for charge density quality diffracted intensities on a laboratory equipment : E. Wenger, S. Dahaoui, P. Allé, P. Parois, C. Palin, C. Lecomte and D. Schaniel, Acta Crystallographica B, **70**, 5, 783-791, 2014.

Keywords: Hybrid pixel detector, CCD X-ray detectors, CMOS X-ray detectors, charge density study.