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## Development of Data Correction Techniques for the 1M Large Pixel Detector at FXE

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STFC's developed 1M Large Pixel Detector (LPD) [1] is now in operation on the femtosecond experiment (FXE) instrument [2] at the EuXFEL. LPD consists of more than 1 million pixels split across 2048 ASICs, with each ASIC having dimensions  $32 \times 16$  pixels and a pixel pitch of  $500\mu\text{m}$ . LPD's three parallel gain stages provide a large dynamic range, capable of detecting 105 photon/pixel/12keV x-ray pulse. When adding in the fact that each image is captured using 1 of the 512 available memory cells, more than 1.5 billion sets of individual pixel gain correction coefficients are required. This paper reviews recent progress in finalising these values. One method for calculating these coefficients is through comparison of LPD signals to an independent reference signal. In these measurements a combination of Si photodiodes and Si Avalanche Photodiodes (APD) were used. Through utilising these correlations the entire 1M of individual pixel outputs can be aligned on a common axis and their relative gains extracted, with correction to a common axis the first step towards a unified energy calibration per pixel. This technique is expanded across a range of memory cells as well as the detector gain stages. Finally a validation of the correction will be presented, including examples applied to liquid scatter data acquired at FXE.

[1] M. Hart et al., "Development of the LPD, a high dynamic range pixel detector for the European XFEL," 2012 IEEE Nuclear Science Symposium and Medical Imaging Conference Record (NSS/MIC), pp. 534-537, doi: <https://doi.org/10.1109/NSSMIC.2012.6551165>

[2] D. Khakhulin et al., "Ultrafast X-ray Photochemistry at European XFEL: Capabilities of the Femtosecond X-ray Experiments (FXE) Instrument", 2020, Applied Sciences, 10(3), 995. <https://doi.org/10.3390/app10030995>

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