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Characterization of the ePixM monolithic CMOS sensor for soft X-rays

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ePixM is a charge-integrating pixel detector which is being developed for soft X-rays experiments at LCLS-II. To enable single-photon detection with photon energies down to 250 eV, a monolithic active pixel sensor has been designed on a CMOS 150 nm process with a high-resistivity substrate [1]. The sensor is fully depleted, so charges are collected by drift. The back-side of the wafers has been post-processed at SLAC to form a thin entrance window [2]. Small-scale devices, consisting of 48x48 pixels, have been mounted on a dedicated carrier board, as shown in Figure 1. The response of the pixel circuitry has been measured with a calibration signal injected at the pixel input, as shown in Figure 2, as well as with an Fe55 source. Both the automatic gain-switching capability and the correlated pre-charging technique are functional. A readout noise of 16 electrons has been measured with the devices operated at room temperature. The performance of the sensor and of the readout electronics will be presented.

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