Silicon Drift Detectors for High Speed X-Ray Applications

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X-ray spectrometers for high speed applications are developed by integrating silicon drift detector (SDD) with advanced front-end ASIC Cube preamplifiers. The latest spectrometer has a shorter signal rise time and lower electronic noise compared with previous version. Such improvement enable the capability of data collection at extremely high count rate for either qualitative or quantitative analysis. To further improve the count rate performance as well as data collection efficiency, multi-channel (up to 7) SDD are introduced to achieve larger solid angle. Figure 1 shows the Mn X-ray throughput of a single element SDD equipped with an advanced digital pulse processor (DPP). Under 10 Mcps ICR, the OCR can reach 4 Mcps, the peak shift is less than 0.025KeV and the resolution is under 280KeV. Figure 2 is a fluorescence computed microtomography measurement under APS synchrotron beamline. This measurements was possible with a 4 element SDD along with an advanced DPP having a wide dynamic range.

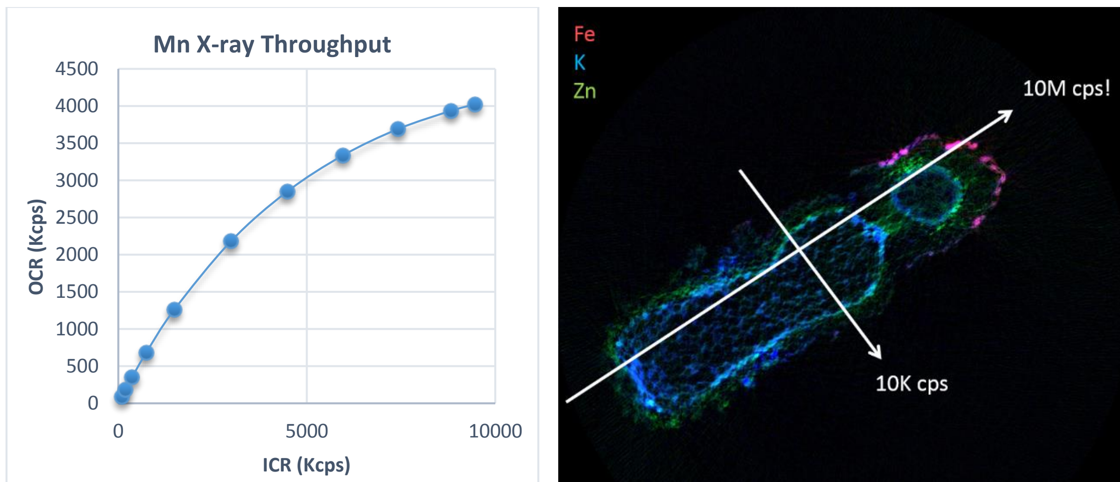

Figure 1. SDD detector throughput on Mn sample with advanced digital pulse processor

Figure 2. fluorescence computed microtomography (fCMT) measurement at up to 10 Mcps taken with 4 element detector and advanced digital pulse processor at APS