

Seven-Element SDD with Optimized Packing Factor to Reduce Scattering Background

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We have developed a new seven-element Silicon Drift Detector (SDD), the “Vortex ME-7”, for synchrotron applications which require very high count rate x-ray data collection. Each of the seven die in this device is 50 mm² so that the total active area is 350 mm². We optimized the packing factor to reduce the scattering background. In addition, a significant improvement in the high count-rate capability has been achieved by using an ASIC preamplifier combined with an advanced digital pulse processor (DPP): the “Xspress3”, developed by Quantum Detectors (Harwell Oxford, UK) and the “FalconX” developed by XIA LLC (Hayward, CA USA).

When seven single elements are used, special care must be taken to pack them all as close as possible to the center point and to minimized the “dead space” between the elements. We achieved both goals and the resulting seven-element SDD design is shown in Fig. 1.

Preliminary work presenting the high count rate capabilities of the SDD with ASIC electronics was published earlier [1]. The new seven-element detector, together with its ASIC preamplifier and new advanced processor, produces a dramatic increase in count rate capability and enhances the efficiency of the measuring methods whenever high count rate and good energy resolution play an important role. The count rate capability of each single channel is presented in Fig. 2.

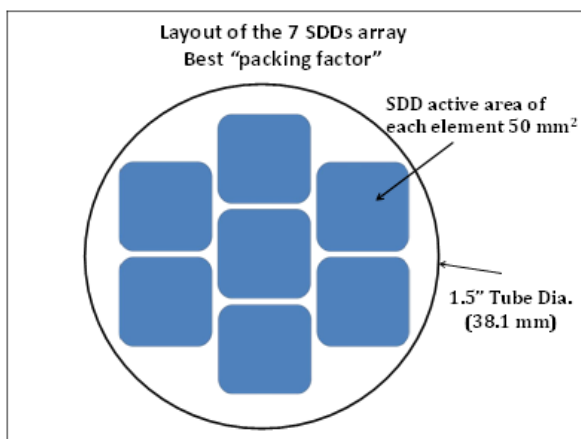


Fig 1. Seven-element SDD configuration

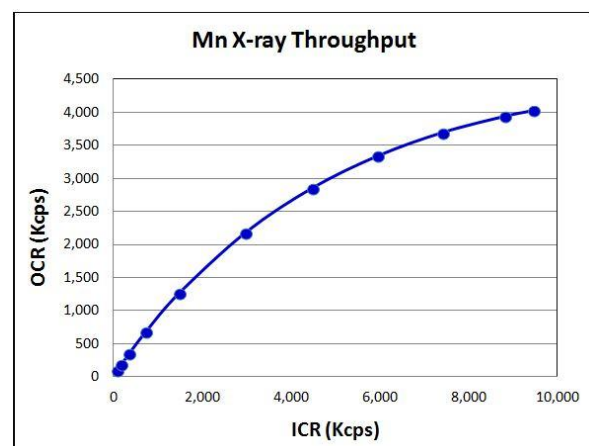


Fig 2. Count rate performance with new DPP

[1] S. Barkan, V.D. Saveliev, Y. Wang, L. Feng, E.V. Damron, Y. Tomimatsu, “Extreme High Count Rate Performance with a Silicon Drift Detector and ASIC Electronics”, Biological and Chemical Research, Volume 2015, 338-344.