Silicon Drift Detectors (SDDs) with sensitive areas of up to 10 mm² are commercially available for several years. They are widely used in XRF, electron microprobe analysis systems and synchrotron applications. The typical energy resolution is better than 140 eV (FWHM) at 5.9 keV and –20°C. The outstanding property of a SDD is the extremely small anode capacitance, which is practically independent of the active area. Thus, the electronics noise is very low, and much shorter shaping times than for PIN diodes or Si(Li) detectors can be used.

The two main noise contributions of a detector are the leakage current and the capacitance. The equivalent noise charge increases linearly with the capacitance but only with the square root of the leakage current, which is correlated to the temperature. The leakage current depends on the detector area, but due to the drift principle the anode size and thus the capacitance is constant. Because of this it can be expected that even SDDs with much more than 10 mm² areas still have a good energy resolution.

Large-area Silicon Drift Detectors (SDDs) with sensitive areas of 100 mm² are presented that are used for x-ray spectroscopy. By thermoelectric cooling, the leakage current is reduced to such a low level that energy resolutions of better than 165 eV (FWHM) at 5.9 keV are achieved.

The hexagonal shape of the SDDs makes it simple to build arrays of various configurations. With an optimized separation technique of the dies a very small gap between the active areas of the individual SDD chips is reached. No bonding connection on the SDD's entrance window side is required, thus the single detector components can be mounted very close together. A 7-element array detector is presented which has an overall sensitive area of 700 mm².