KETEK's New SDD Generation

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KETEK is the world market leader for Silicon drift detectors (SDDs). Among all market competitors KETEK offers by far the largest product variety associated with SDD modules, operating electronics and detector accessories. The focus on market needs and the traditionally close collaboration with its customers allows KETEK to develop products of highest performance and quality. In this talk we present our latest developments in SDD technology.

Mobile XRF systems call for low power consumption and very reliable operation in harsh environment at temperatures up to +50 °C. For such applications we developed a new generation of SDD modules capable of continuously operating the detector chip at temperatures down to -60 °C for heat sink temperatures up to +65 °C. Permanent storage even at ambient temperatures up to +80 °C is possible without any long term degradation of detector performance. For operation at heat sink temperatures of + 20 °C, we succeeded to halve the power consumption of our modules down to <1 W, while still reaching optimum chip operating temperatures of -60 °C.

KETEK serves not only the XRF but also the EDX market, where applications, e.g. in SEM or TEM systems, require the detection of low energy X-rays <1 keV. Our latest module generation tailored for such applications combines the new cooling technology with a standard polymer (AP3.3) window and a Xenon fill. In contrast to the Nitrogen fill used before, Xenon dramatically reduces heat transport via the filling gas within the encapsulated module. The new design allows for excellent low energy X-ray transmission while achieving a cooling performance comparable to that of conventional vacuum encapsulated detectors.
The new cooling technology is available for all our vacuum encapsulated modules having collimated chip sizes from 7 to 150 mm² (active area 12 to 170 mm²) and for our Xenon filled TO8 modules having chip sizes from 7 mm² to 50 mm² (active area 12 to 65 mm²).

For best cooling and spectroscopic performance in EDX and XRF analysis KETEK offers in-house developed and patented carbon windows as an alternative to AP3.3 and Beryllium windows. The carbon windows are compatible to our TO8 vacuum encapsulation process and are fully inert and non-toxic. Both the AP3.3 and the Beryllium replacement have an X-ray transmission surpassing that of their conventional counterparts and excel in light tightness as well as in mechanical stress and water vapor resistance. Every window undergoes a strict quality control and a burn-in-test. KETEK's new carbon windows will raise spectroscopic detector performance to an unprecedented level.

Addressing applications requiring large detector areas we present our new all-in-one 7-channel 560 mm² (collimated) SDD array featuring single channel read out, total OCR up to 3.5 Mcps (<50 % dead time) and a guaranteed energy resolution of <139 eV at peaking times from 0.5 to 4 µs. The technological superiority of KETEK products is also acknowledged by NASA, with whom KETEK is successfully collaborating in the Mars 2020 mission. Here, KETEK is currently working on the integration of two 50 mm² modules into the next Mars rover.