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ARDESIA - a Fast SDD X-ray Spectrometer for Synchrotron Applications

ARDESIA is an SDD-based, X-ray spectrometer, optimized for synchrotron experiments that require high count rates (>1Mcps/channel) and excellent energy resolution (<150 eV FWHM at shaping times faster than 200 ns). The main target applications are XRF and XAFS techniques. The detection module consists of 2 × 2-pixel monolithic SDD (5 mm pitch) coupled with a 4-channel version of the CUBE CMOS preamplifier. The mechanical structure of the instrument has been realized to fit inside a sample chamber with a finger-like structure. The system grants proper cooling (-40oC), static vacuum condition (10-2 mbar). ARDESIA is also equipped with two auxiliary electronics: for power and SDD biasing SDD and for closed-loop double Peltier TEC driving. The output signals of the instrument are then processed by digital pulse processors using short pulse processing times, to show good performances at high count rates (about 1 Mcps per channel). Two different campaigns of measurements in synchrotron beamlines have been performed to assess the performance of the instrument. At the LNF DA�NE-Light DXR1 soft X-ray beamline, XRF measurements on low atomic number elements (down to C-K line, 270 eV) have demonstrated good energy resolution and first XAFS spectrum of Silicon K-edge in a PyrexTM glass sample has been acquired. At the LISA beamline of ESRF, XAFS measurements on different samples, such as Kesterite and Photochabourneite, are performed. demonstrating high count rate capability and stability of the instrument over time.

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