

Application Specific Integrated Circuits in large format hyperspectral imaging radiation detectors for space-borne instrumentation

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The observation of X- and γ -ray emissions coming from the deep space is fundamental for the study of matter under extreme conditions of gravity and for the understanding of the early Universe. Due to the absorption of X-/ γ -rays in the atmosphere, the realization of high spectroscopic-resolution and high-granularity radiation detectors with large format focal planes is made even more challenging by the strict constraints that characterize the design of space-borne instrumentation. In this context, the integration of the scientific payload cannot overlook the delicate interplay between the sensors and the readout electronics, making vital the use of Application Specific Integrated Circuits (ASICs). Moving through the common ground of large format high-resolution silicon drift detectors (SDDs), the design and experimental results of mixed-signal ASICs — with ENC levels of few tens of electrons r.m.s. and with input energy range extending from 500 eV to 5 MeV — realized for different space mission concepts, are reviewed highlighting challenges and goals of a long-standing research activity of Politecnico di Milano within the ReDSOX collaboration.

Summary

Primary author: MELE, Filippo (Politecnico di Milano and Istituto Nazionale di Fisica Nucleare)

Presenter: MELE, Filippo (Politecnico di Milano and Istituto Nazionale di Fisica Nucleare)

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