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Event processing in X-IFU detector onboard Athena.

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Abstract

The X-ray Observatory ATHENA was proposed in April 2014 as the mission to implement the science theme "The Hot and Energetic Universe" selected by ESA for L2 (the second Large-class mission in ESAs Cosmic Vision science programme). One of the two X-ray detectors designed to be onboard ATHENA is X-IFU, a cryogenic microcalorimeter based on Transition Edge Sensor (TES) technology that will provide spatially resolved high-resolution spectroscopy. X-IFU will be developed by a consortium of European research institutions currently from France (leadership), Italy, The Netherlands, Belgium, UK, Germany and Spain. From Spain, IFCA (CSIC-UC) is involved in the Digital Readout Electronics (DRE) unit of the X-IFU detector, in particular in the Event Processor Subsystem. We at IFCA are in charge of the development and implementation in the DRE unit of the Event Processing algorithms, designed to recognize, from a noisy signal, the intensity pulses generated by the absorption of the X-ray photons, and lately extract their main parameters (coordinates, energy, arrival time, grade, etc.)

Here we will present the design and performance of the algorithms developed for the event recognition (adjusted derivative), and pulse grading/qualification as well as the progress in the algorithms designed to extract the energy content of the pulses (pulse optimal filtering). IFCA will finally have the responsibility of the implementation on board in the (TBD) FPGAs or micro-processors of the DRE unit, where this Event Processing part will take place, to fit into the limited telemetry of the instrument.