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## A 32 channels mixed-signal processor for the tracking system of the GAPS experiment

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This work reports the design and the experimental results from the characterization of a readout ASIC developed for the General AntiParticle Spectrometer (GAPS) balloon mission that will search for an indirect signature of dark matter through the detection of low-energy ( $< 0.25$  GeV/n) cosmic-ray antiprotons, antideuterons, and antihelium.

GAPS relies on a tracker system which serves as the target and tracker for the initial cosmic-ray particle and its annihilation products. The lithium-drifted silicon, Si(Li), detectors of the GAPS tracker system will be read out with a mixed-signal processor that was fabricated in a 180 nm CMOS technology. The ASIC, named SLIDER32 (32 channels Si-Li DETector Readout ASIC), is comprised of 32 analog readout channels, an 11-bit SAR ADC and a digital back-end section which is responsible for defining channel settings and for sending digital information to the data acquisition system (DAQ). The core of the ASIC is a low-noise analog channel implementing a dynamic signal compression which makes the conditioning network suitable for resolving both X-rays in the range of 20 to 100 keV and charged particles with energy deposition of up to 100 MeV. It also features an energy resolution of 4 keV FWHM in the 20-100 keV range with a 40 pF detector capacitance, to clearly distinguish X-rays from antiprotonic or antideuteronic exotic atoms. The readout electronics of the ASIC, which is expected to run at a temperature of about  $-40$  °C, has to comply with a detector leakage current of the order of 5-10 nA per strip and with a power dissipation limited to less than 10 mW/channel to be compatible with the balloon nature of the experiment.

The ASIC has been thoroughly tested and a complete set of experimental results, focused on the performance of the low-noise analog channel, will be presented at the conference.

### Collaboration

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