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Cleopatra: a recycling integrator ASIC for the readout of hydrogenated amorphous silicon detectors in radiotherapy dosimetry

The Cleopatra ASIC is a 12-channel prototype designed within the HASPIDE project for the readout of hydrogenated amorphous silicon sensors in real-time dosimetry for radiation diagnostic and therapy. In particular, IORT and FLASH radiotherapy use high particle fluxes and require a high dynamic input range. The analog front-end is a current-to-frequency converter based on the recycling integrator principle, to cover a dynamic range of four orders of magnitude with high linearity. Three different input amplifier configurations have been implemented to check the trade-off between detector capacitance and maximum output frequency. Cleopatra has been designed in CMOS 28 nm technology and successfully tested in the laboratory. The prototype is now being tested under radiation with an array of sensors.

A new version of the ASIC is being designed, featuring 32 input channels.

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