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Development of a wide dynamic range and high-precision ammeter for beamline instrumentation at SIRIUS

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Sirius beamlines require specialized electronic devices to monitor key parameters of the photon beam, such as position and flux, through the detection of extremely low-level electrical currents. Furthermore, experiments conducted in fly-scan mode usually demand fast, high-precision low-level current measurements. To address these requirements, the development of a wide dynamic range ammeter (from 1 pA to 10 mA) has been addressed, based on a logarithmic transimpedance amplifier, eliminating the need for scale switching and featuring high precision and fast response. The proposed device converts the input current into a logarithmic output voltage and offers two operation modes: the logarithmic ammeter and the logarithmic ratiometer, both of which are particularly useful in X-ray spectroscopy experiments. This paper considers an overview of the device as well as its preliminary characterization and results, including logarithmic conformity, bandwidth, and noise.

Footnotes

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