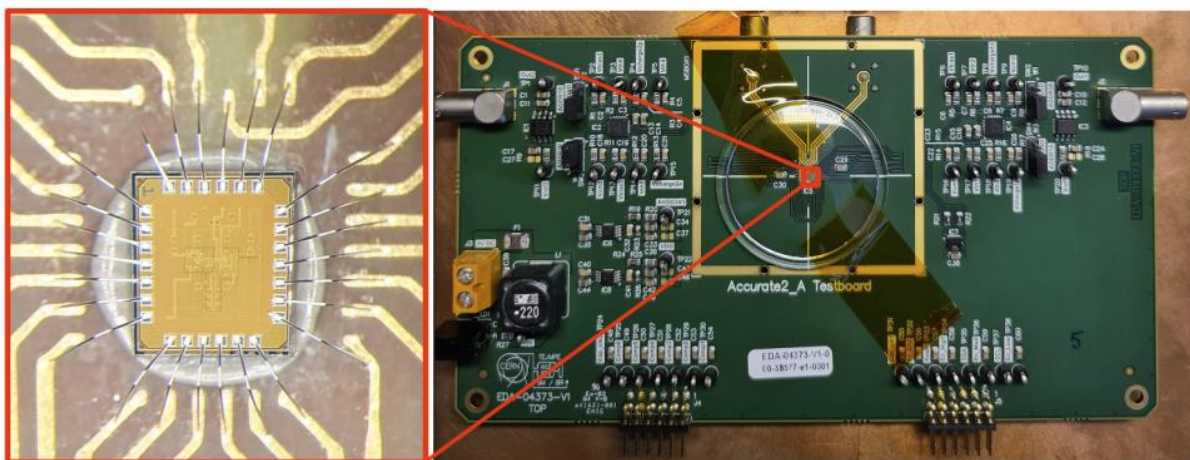


ACCURATE 2

Overview

Ultra-low current measurement ASIC that is designed to measure electrical current from a femtoampere to twenty microamperes, enabling high accuracy & high resolution current sensing.



ACCURATE ASIC and its test board

Technical features

- current measurement resolution of 200 aA with a dynamic range spanning from 6 fA to 20 uA (169 dB dynamic range) without band switching based on charge balancing and direct slope (first-ever reported ASIC with this capability)
- Global error smaller than $\pm 6\%$ at 25°C
- Two versions:
 - mixed-signal chip in which analog signals are directly processed to be sent via a serial communication
 - analog-only version, where digital section is embedded in a separate field-programmable gate array (FPGA)
- Measurement of dose rates from 5 $\mu\text{Sv/h}$ to 7.4 Sv/h, corresponding to femtoampere to microampere span

Technological readiness

- Exceptionally well performance proven by elaborate laboratory & field tests carried out at CERN calibration lab, PSAIF facility, GSI Helmholtz Centre for Heavy Ion Research, Lausanne University Hospital (CHUV)
- Ready to be integrated into commercial product
- ACCURATE 3 chip with integrated solution for improving charge collection is currently developed & interfacing ASIC with different kinds of sensors is under study

Comparison to commercial solutions

- According to state-of-the-art study carried out at CERN, the chip outperforms any other solution currently available on the market (see table for comparison)

Year	Minimum Current Resolution	Maximum measurable Current	Tech. node	Ref.
2013	550 aA	30 nA	350 nm	Carminati 2013
2015	314 fA	250 μ A	180 nm	Pol 2015
2016	100 fA	16 μ A	500 nm	Li 2016
2017	1 fA	5 μ A	350 nm	Voulgari 2017
2017	470 fA	20 μ A	350 nm	Ghoreishizadeh 2017
2018	80 pA	12 μ A	350 nm	Fausti 2018
2021	200 aA	20 μA	130 nm	ACCURATE 2