



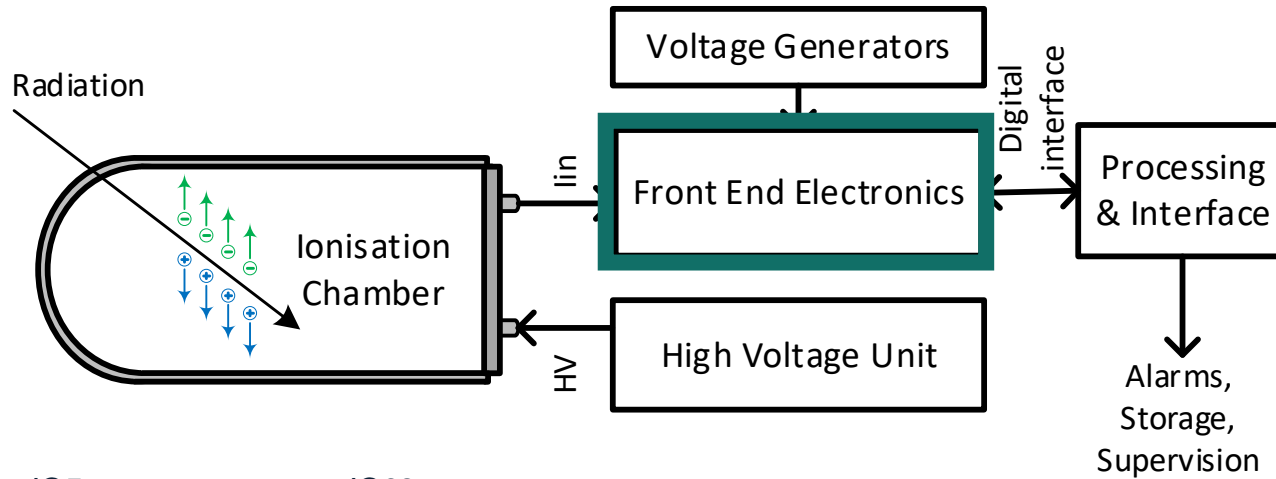
HSE  
Occupational Health & Safety  
and Environmental Protection unit

# Challenges faced in the design and characterization of a sub femtoampere sensitive ASIC based ultra-low current measurement system for radiation monitoring

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# Radiation Monitoring System

## Challenges



### Complex radiation environment

- Different chambers

### Output current dynamic range

- > 9 decade

### Current resolution

- Femtoampere

### Complex input profile

- Pulsed or slow changing

### Measurement Time

- For currents >10 pA a measurement value is available every 100 ms; for lower currents it takes hundreds of seconds

IG5



IG32



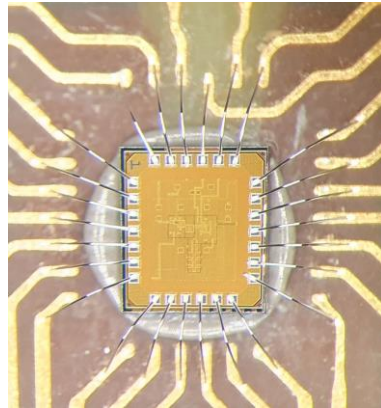
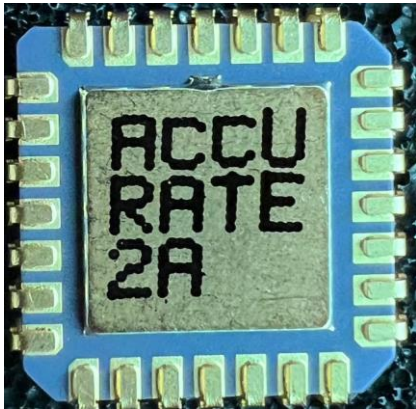
PTW T32006



BLM Chamber



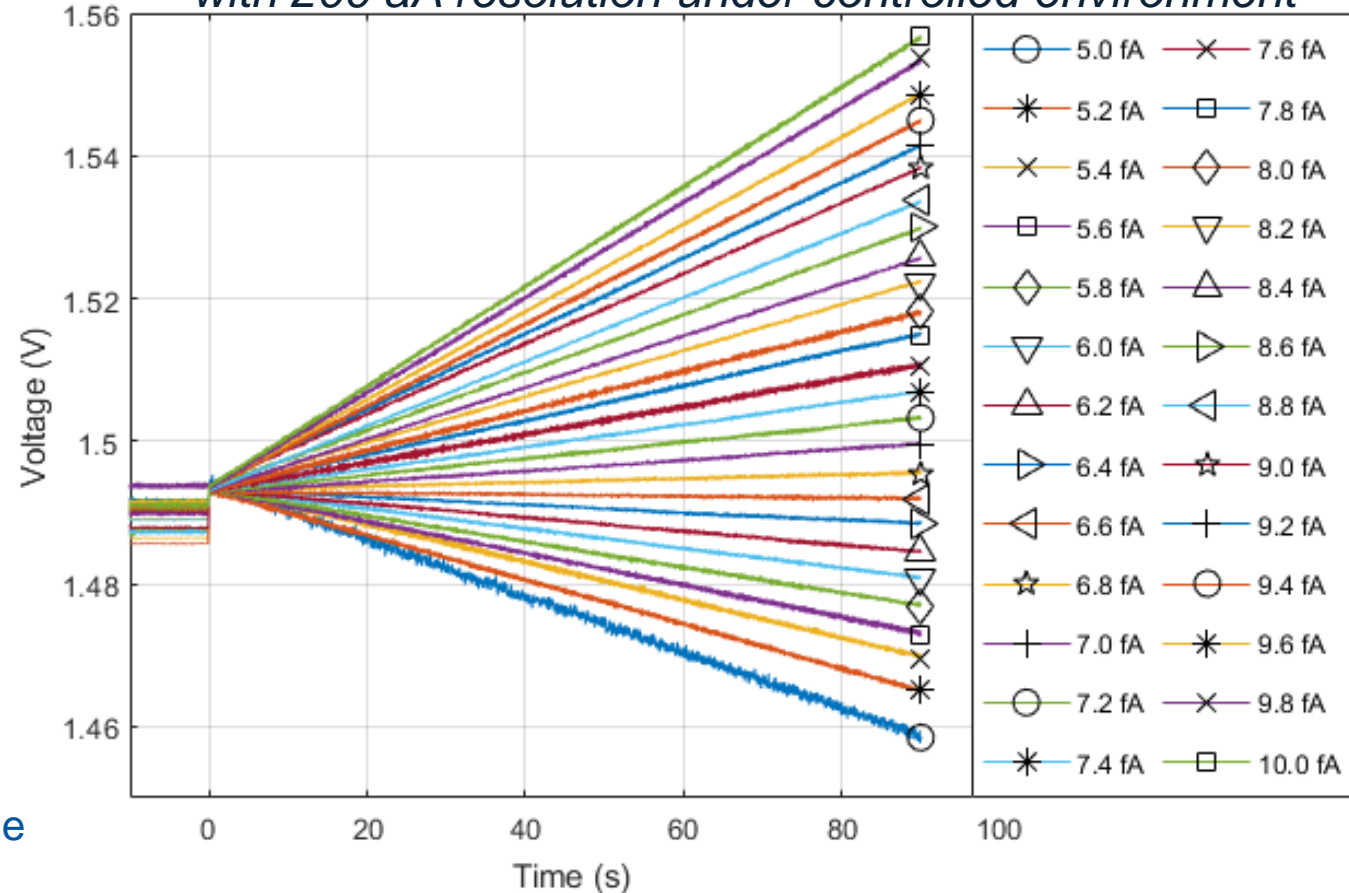
# ACCURATE 2 ASIC



## Design Critical Points

- Simulator gm to be set for simulating femtoampere current
- Using thick gate transistors in critical paths
- Guarding the critical input as much as possible using a stable voltage
- Characterising the current source – even best device in market has an accuracy of 1% + 7 fA in the lowest range

*Integrator output of ACCURATE 2A for input current swept with 200 pA resolution under controlled environment*



Thank you!

