Multi-coincidence set-up for nuclear forensics with Si-strip and Compton-suppressed HPGe detectors

L.G. Sarmiento Pico

(Bianca Ademar & Guillaume Pédehontaa-Hiaa)

Lund University, Sweden

15th Nordic Meeting in Nuclear Physics, Visby, Sweden, 2026

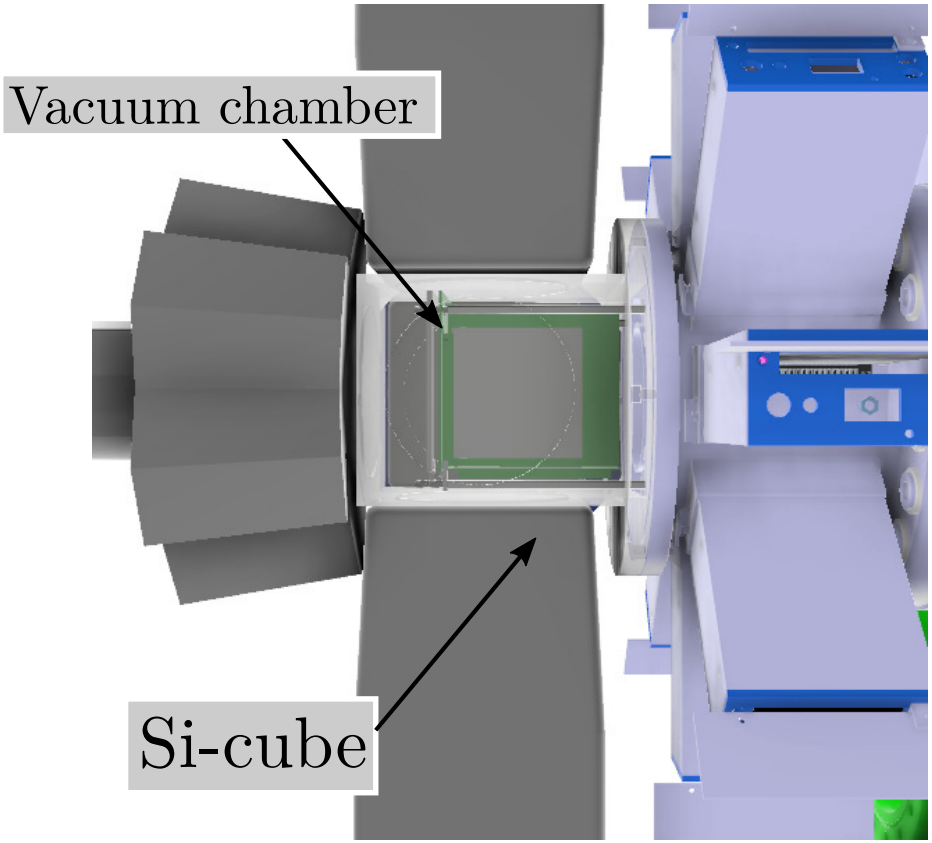
More and better monitoring is always welcome

- Examples from the literature include airborne emissions of ^{131}I in Norway,
- exotic ^{106}Ru cloud over Europe in 2017.
- ...
- potential accidental emission from spallation on Tungsten (^{148}Gd, ...) [ESS].
  - Anticipated target activity after 5y ($T_{1/2} > 10\,\mathrm{h}$) 10^{17} Bq.

At Lund University there is infrastructure, normally used for basic research, which can be employed for applied research, including but not limited to environmental monitoring.

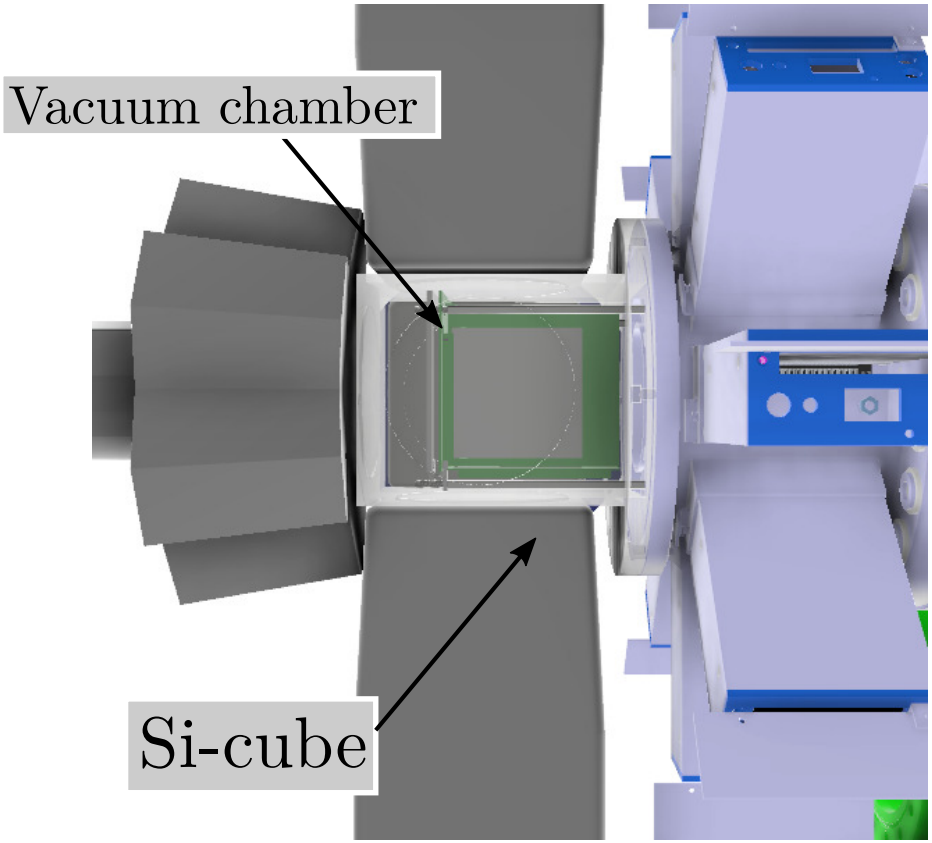
LUNDIUM, the decay station

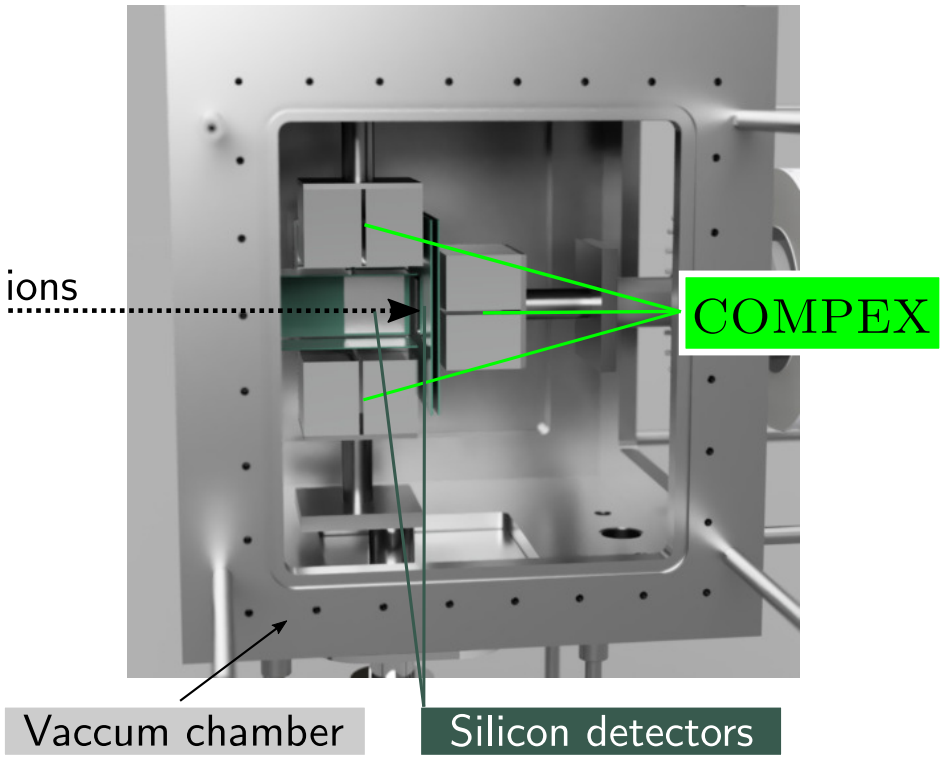
TASISPEC



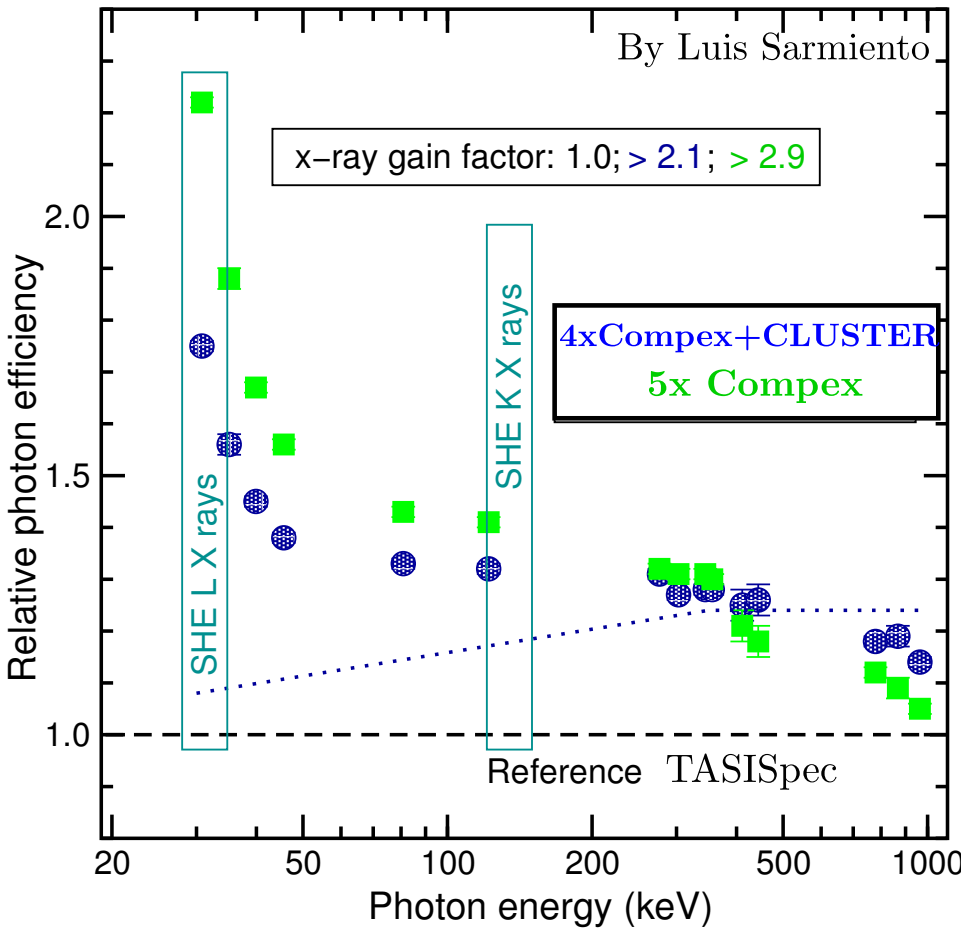
LUNDIUM, the decay station

TASISPEC → LUNDIUM

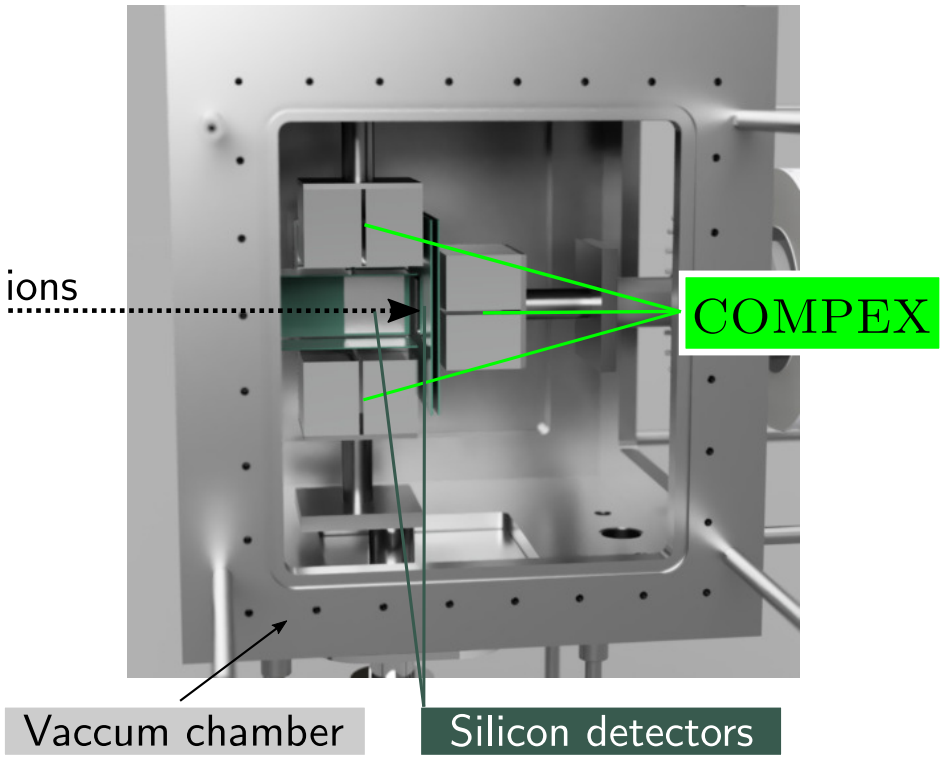




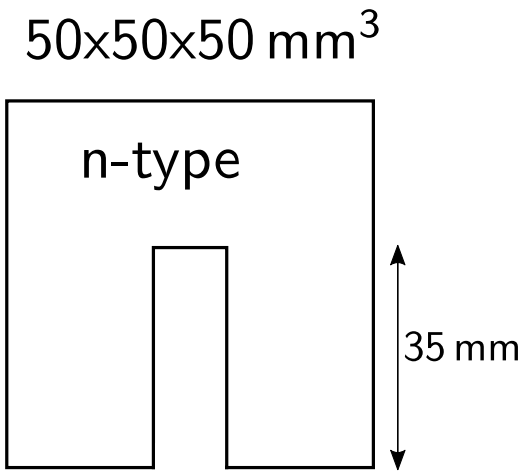
LUNDIUM, the decay station



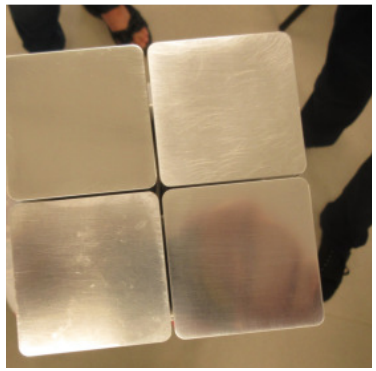
→ LUNDIUM



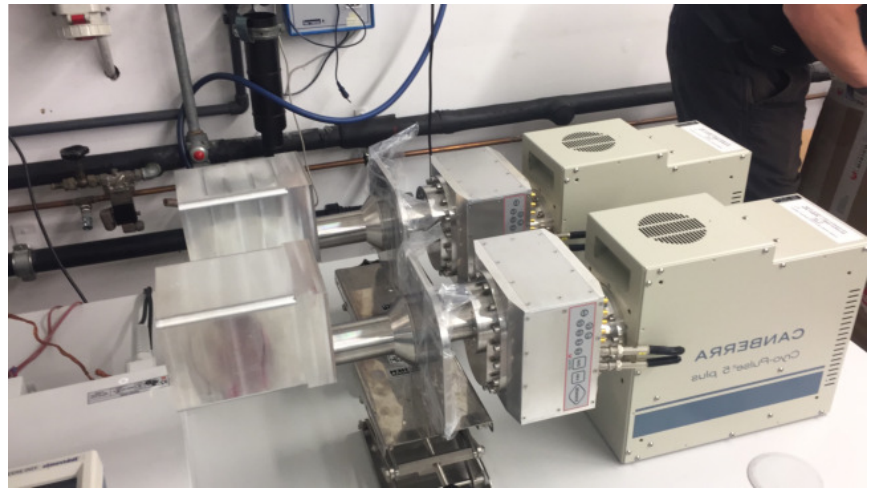
Compex



'Cubic' encapsulated crystals



4 crystals in a common cryostat

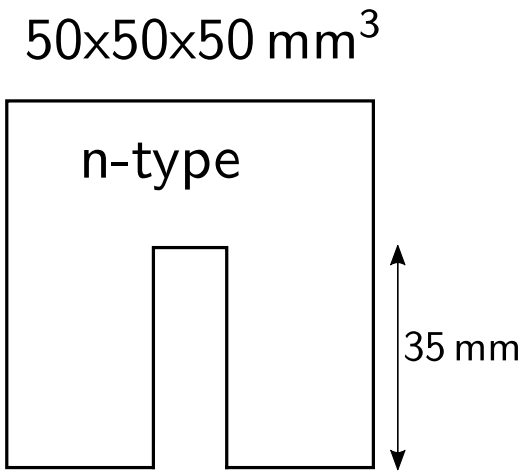


Mechanical cooling, $T \sim$ -160 °C

Knut och Alice Wallenbergs Stiftelse

A. Såmark-Roth, *et al.* EPJA 56 141 (2020)

Compex



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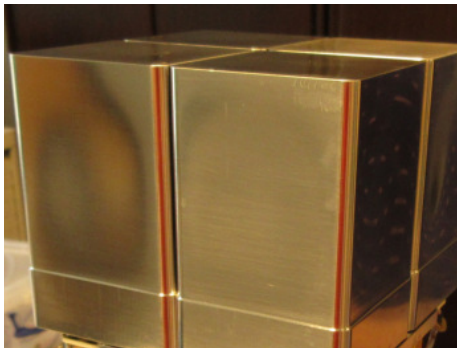
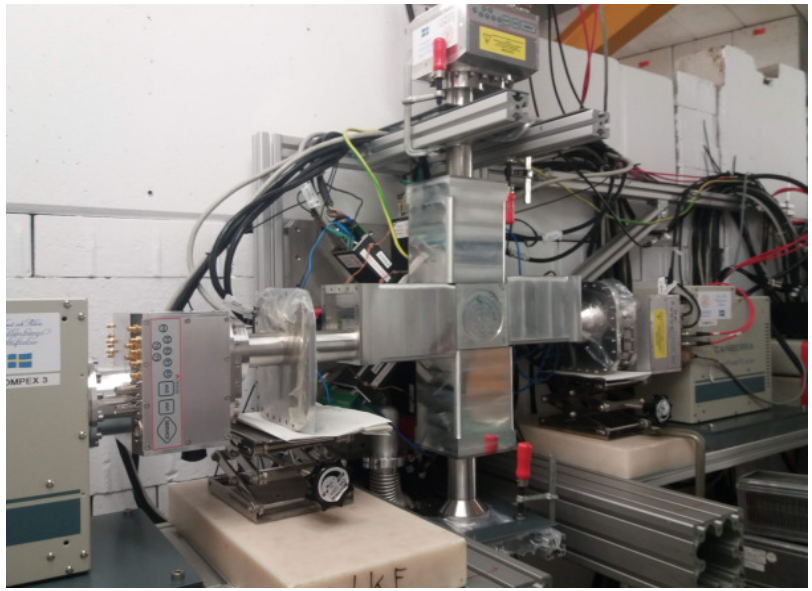


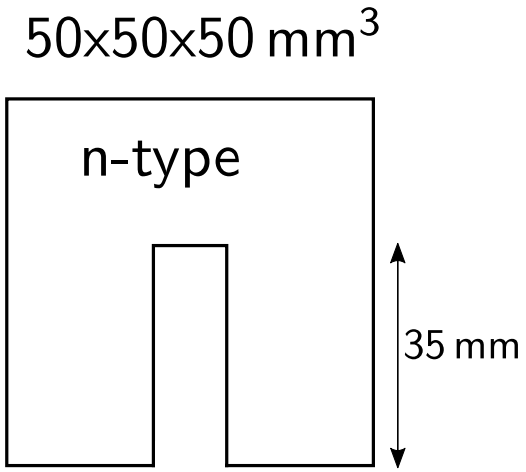
4 crystals in a common cryostat



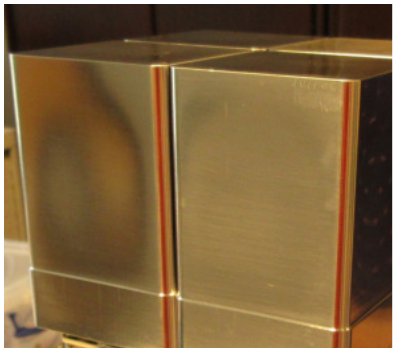
Typical resolutions:
1.9 keV @1.33 MeV
0.8 keV @122 keV

A. Såmark-Roth, *et al.* EPJA 56 141 (2020)

Compex



'Cubic' encapsulated crystals



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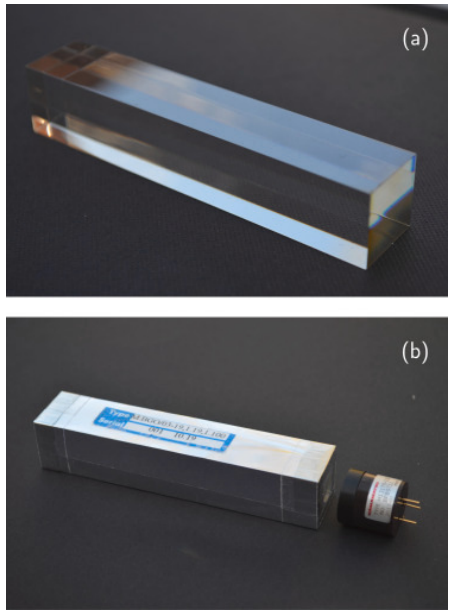

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Knut och Alice Wallenbergs Stiftelse

Crafoordska stiftelsen

A. Såmark-Roth, *et al.* EPJA 56 141 (2020)

Proof-of-concept, new monitoring device

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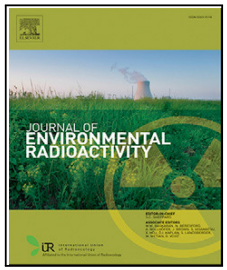


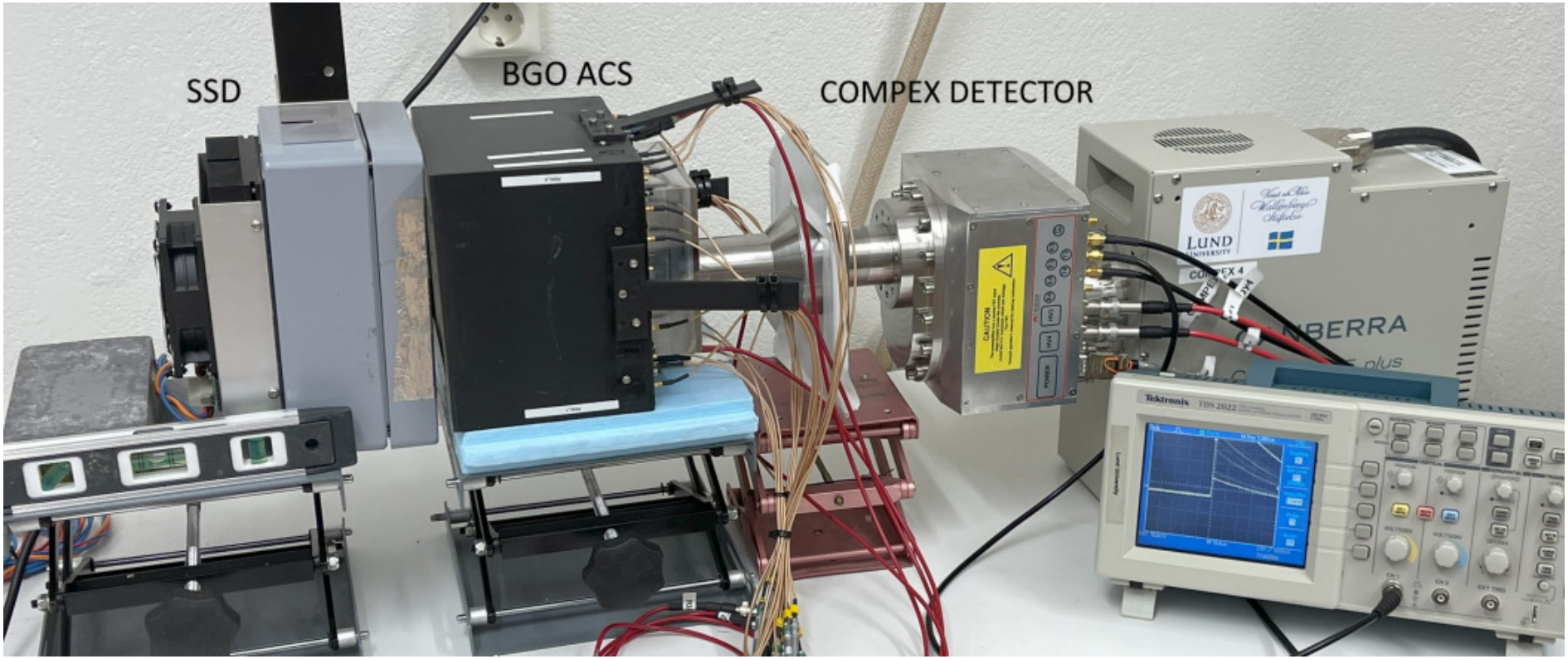
Check for updates

Multi-coincidence set-up for nuclear forensics with Si-strip and Compton-suppressed HPGe detectors

Y. Hrabar *, P. Golubev, S. Englund, D. Rudolph, L.G. Sarmiento, K. Eriksson Stenström

Department of Physics, Lund University, 22100 Lund, Sweden

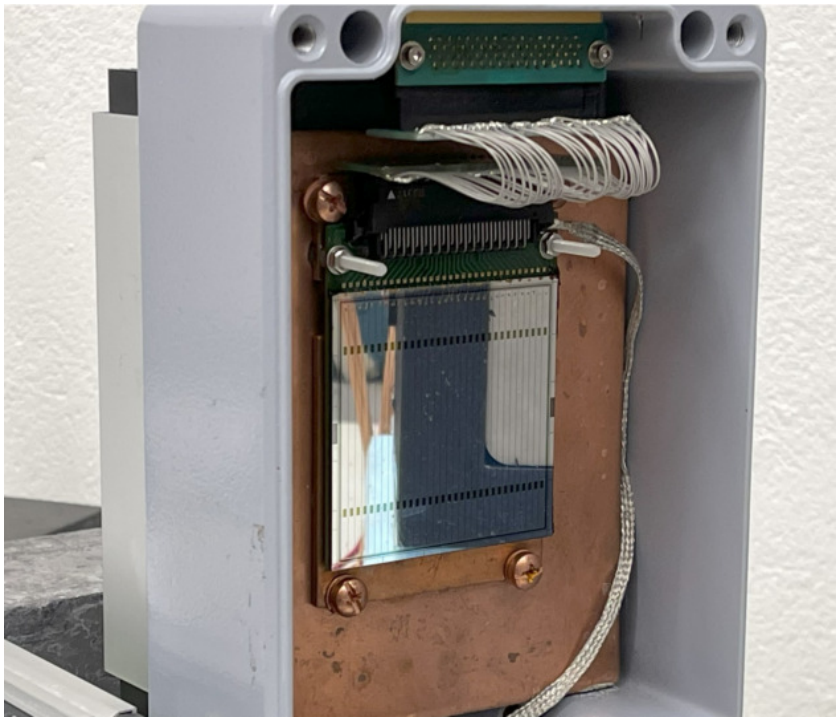
Proof-of-concept, new monitoring device



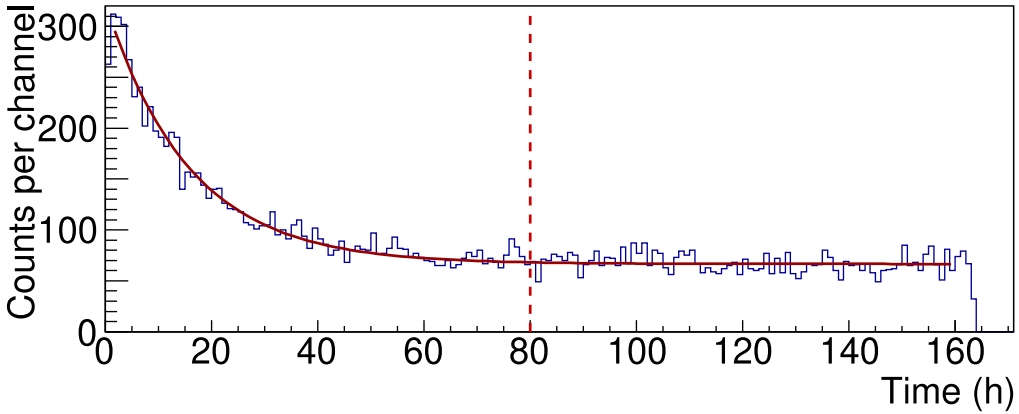
S. Englund. BSc thesis, LU (2025)

Proof-of-concept, new monitoring device

Filter from unventilated crawspace (^{220}Rn)



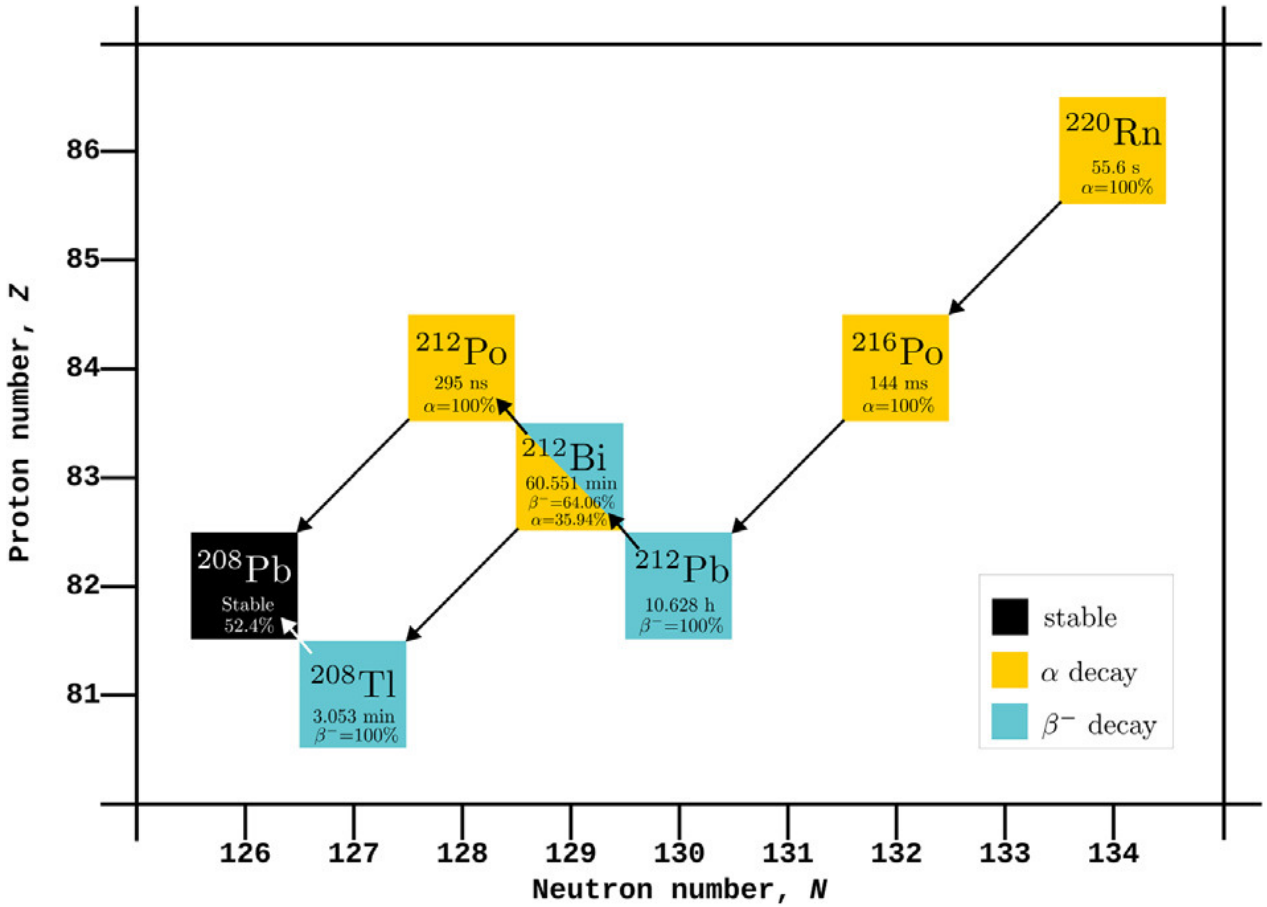
$T_{1/2}(^{212}\mathrm{Pb}) = 10.6\,\mathrm{h}$



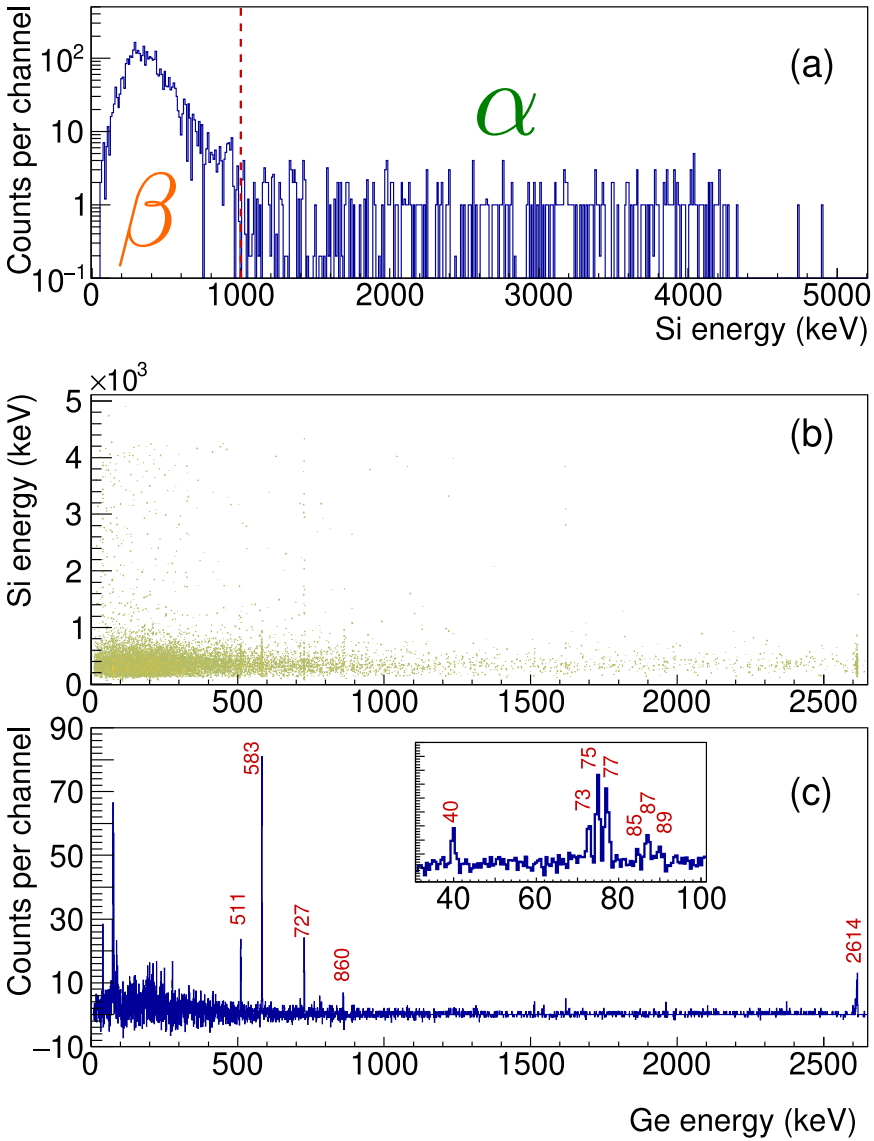
Measurement Background

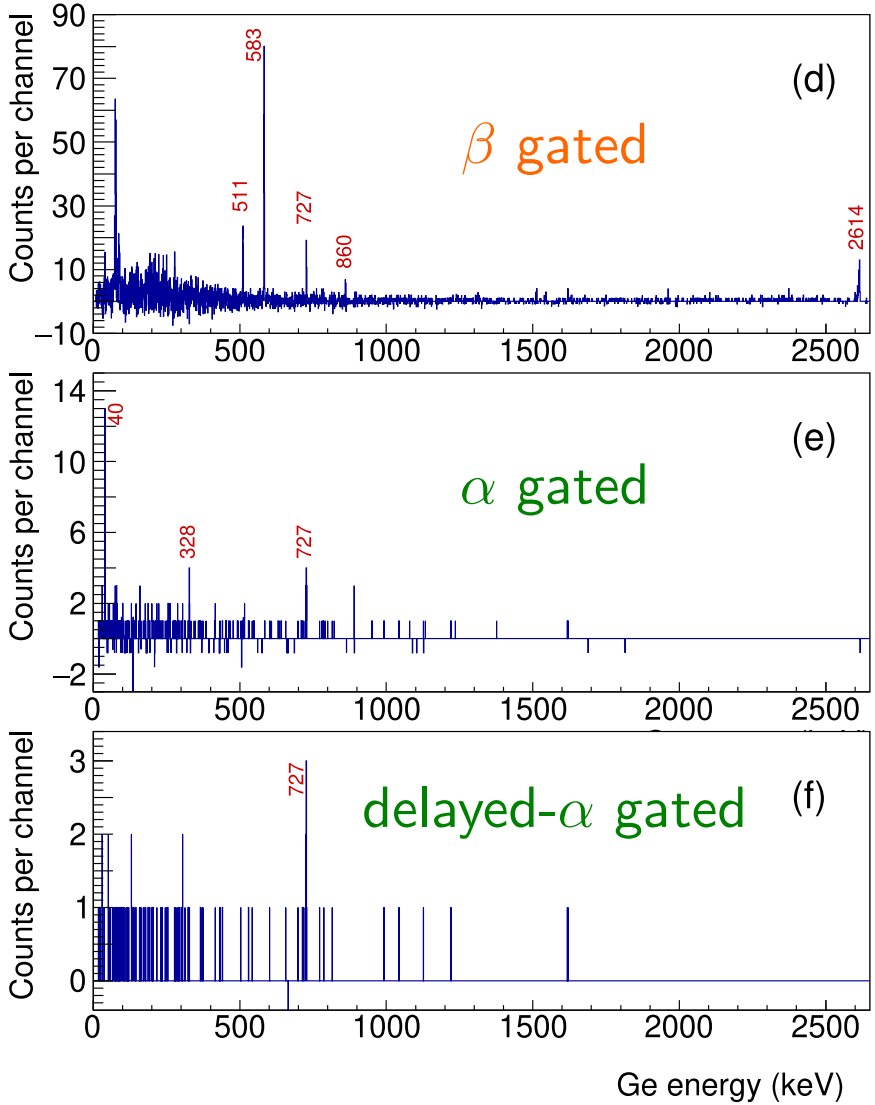
S. Englund. BSc thesis, LU (2025)

Proof-of-concept, new monitoring device

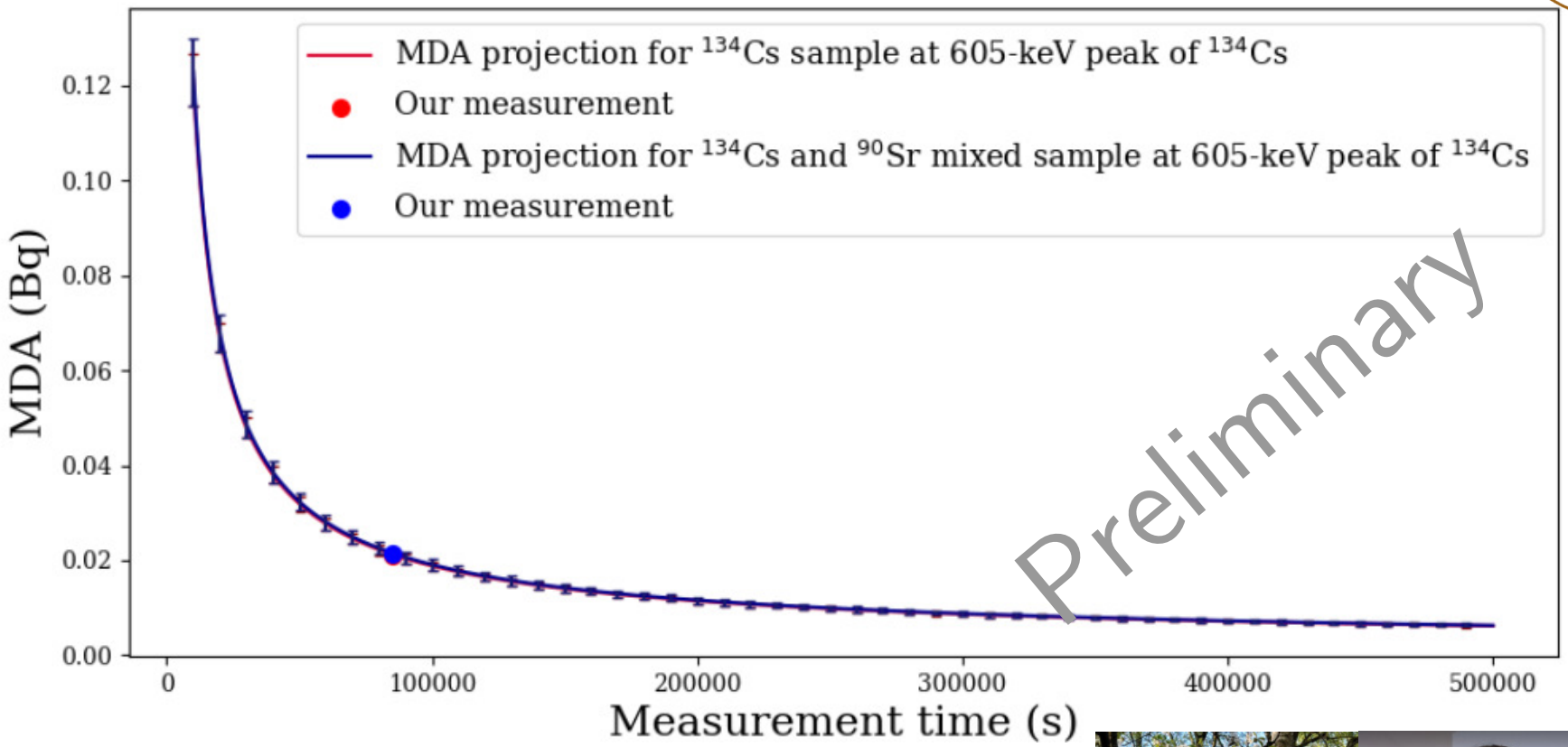


Proof-of-concept, new monitoring device



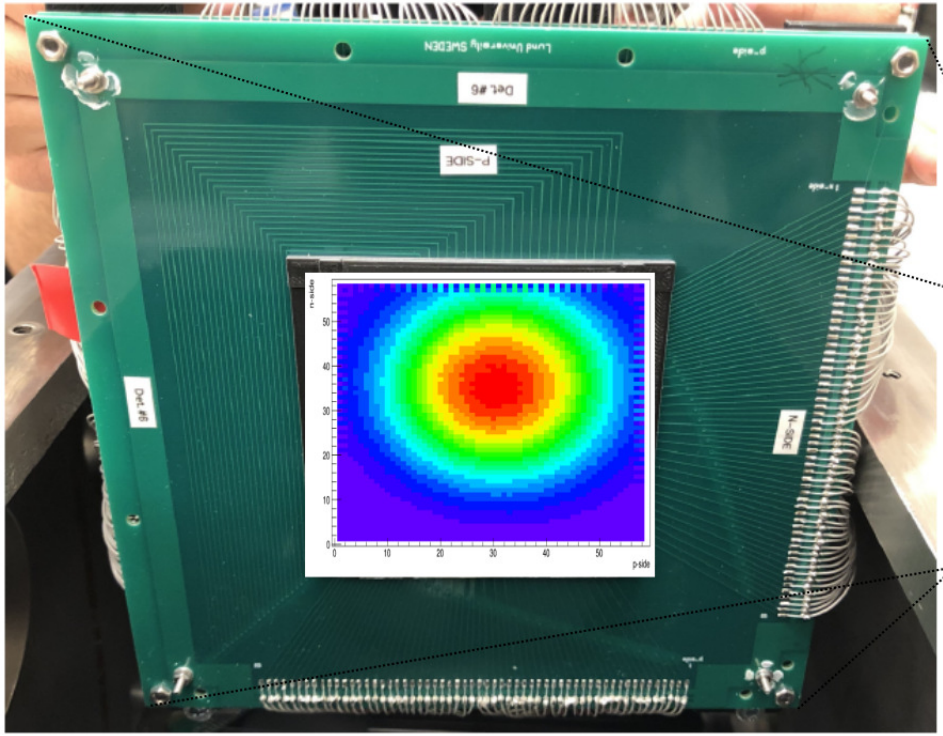


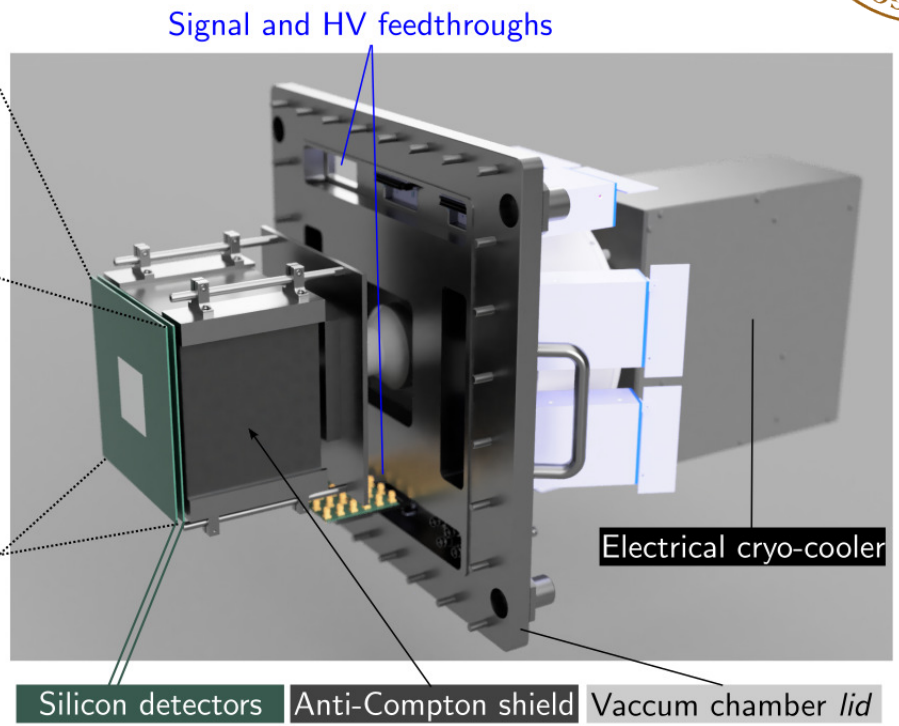
Minimum Detectable Activities



We (w/ B. Ademar & GPH) are currently estimating the Minimum Detectable Activities using IAEA-TERC (Terrestrial Environmental Radiochemistry Laboratory)

Next step: rebranding LUNDIUM





Lund **U**niversity **N**ext-generation **D**evice for **I**dentification of **U**nknown radioactive sources and environmental **M**onitoring, L.U.N.D.I.U.M.

... pending on funding (fingers crossed)

(Needs *only* 1 PhD and minimal investment for machinning parts)

We anticipate to resolve ^{239}Pu/^{240}Pu and ^{238}Pu/^{241}Am. Maybe ^{233}U and ^{236}U.