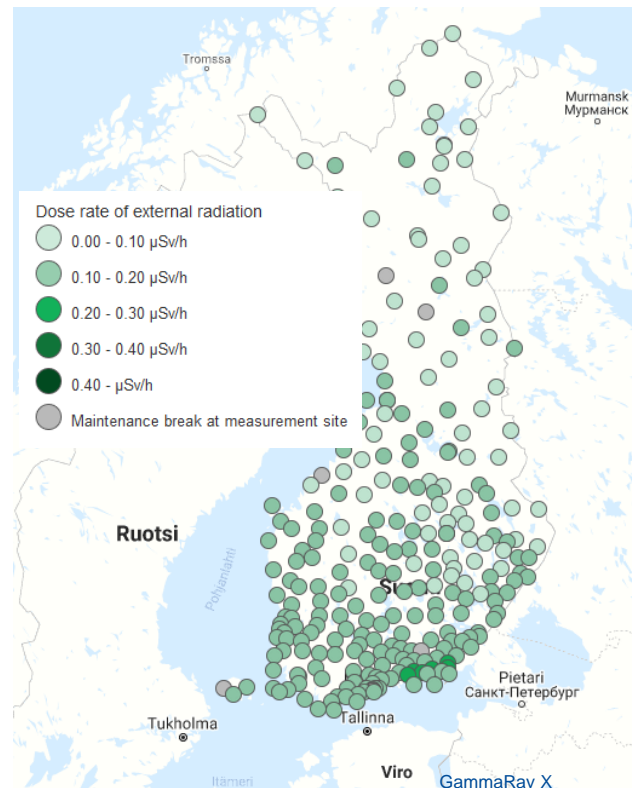
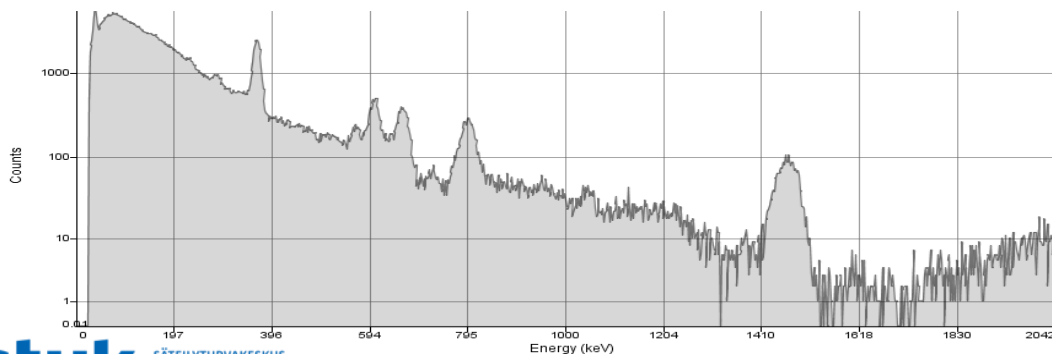


# Novel Detector for Finnish Early Warning Network

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Kari Peräjärvi, Olof Tengblad, Mika Kiiskinen, Maarit Muikku

# Finnish early warning network today

- Network of 257 automatic dose rate monitoring stations
- 29 monitoring stations equipped with a  $\text{LaBr}_3$  spectrometer
  - More sensitive to changes of radiation levels
  - Nuclide identification capability



# Example

Detector reading:

$^{137}\text{Cs}$  , 1  $\mu\text{Sv/h}$

Possible source:

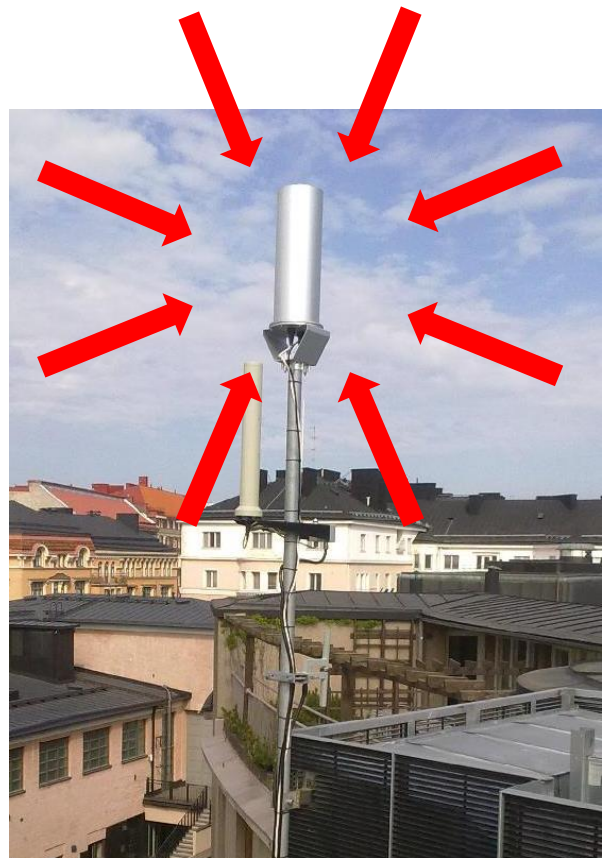
a)  $^{137}\text{Cs}$  fallout on the ground

700  $\text{kBq/m}^2$

b) Airborne  $^{137}\text{Cs}$

10  $\text{kBq/m}^3$

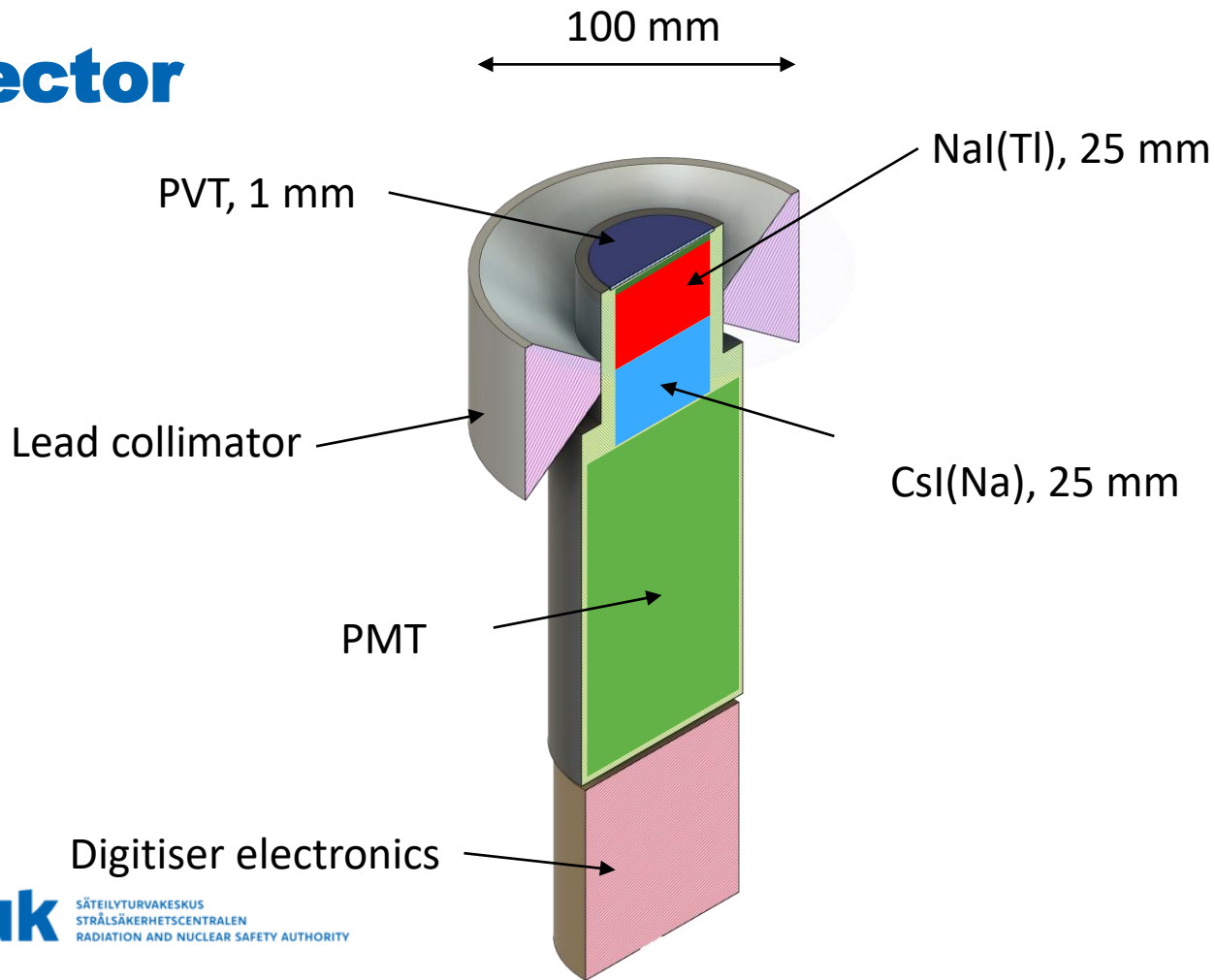
Internal dose: 70  $\mu\text{Sv/h}$



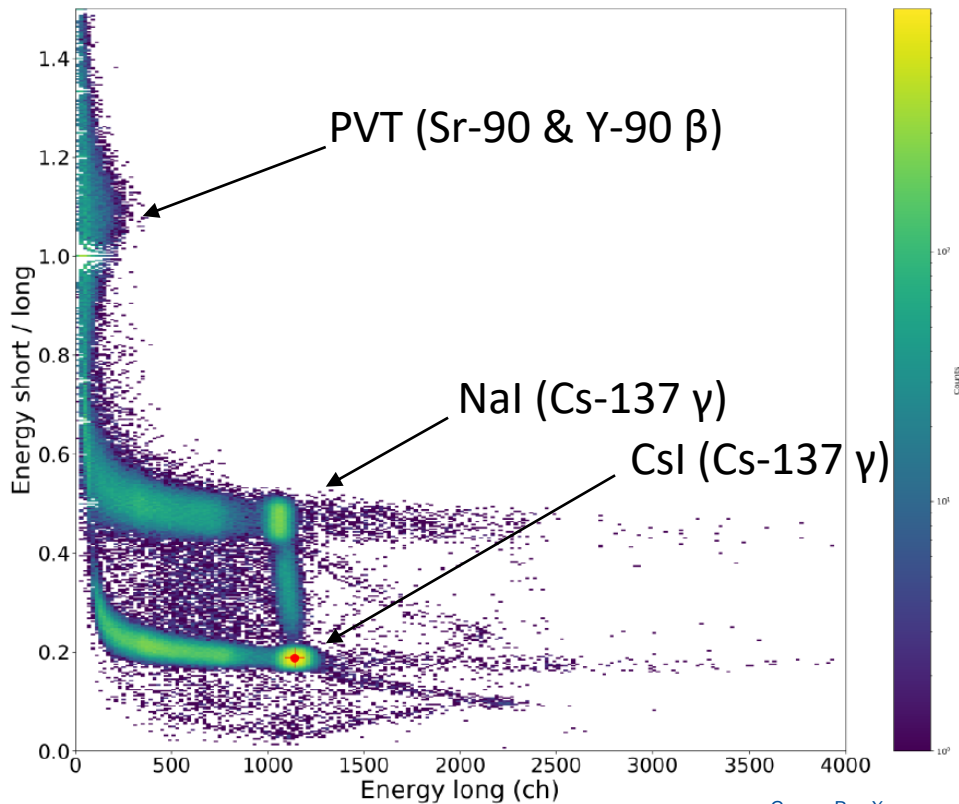
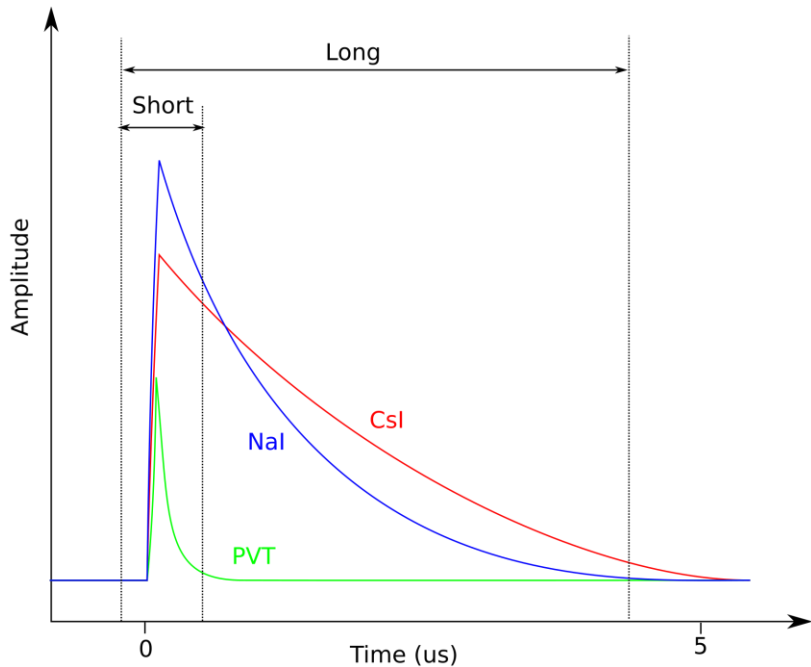
# Objectives

- Novel spectrometer to distinguish between
  - Radioactive fallout
  - Airborne radioactivity
  - Detector contamination

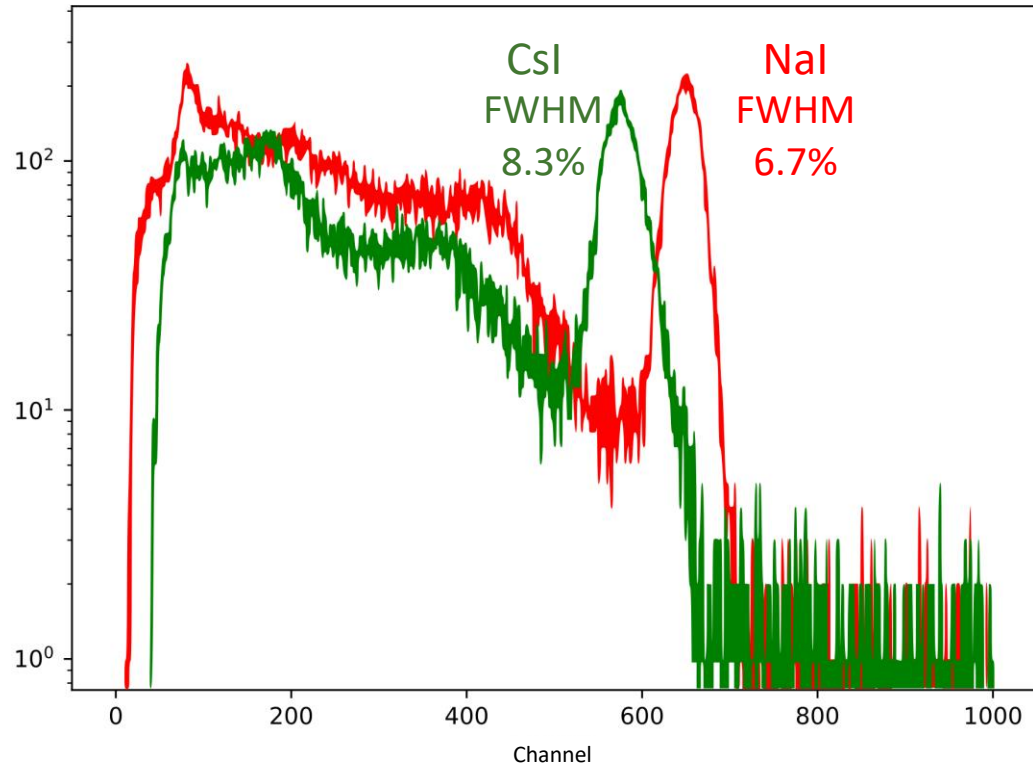
# Detector



# Pulse shape discrimination



# Cs-137 spectrum



# Outdoor testing

Tested on STUK's roof in Helsinki since January 2021

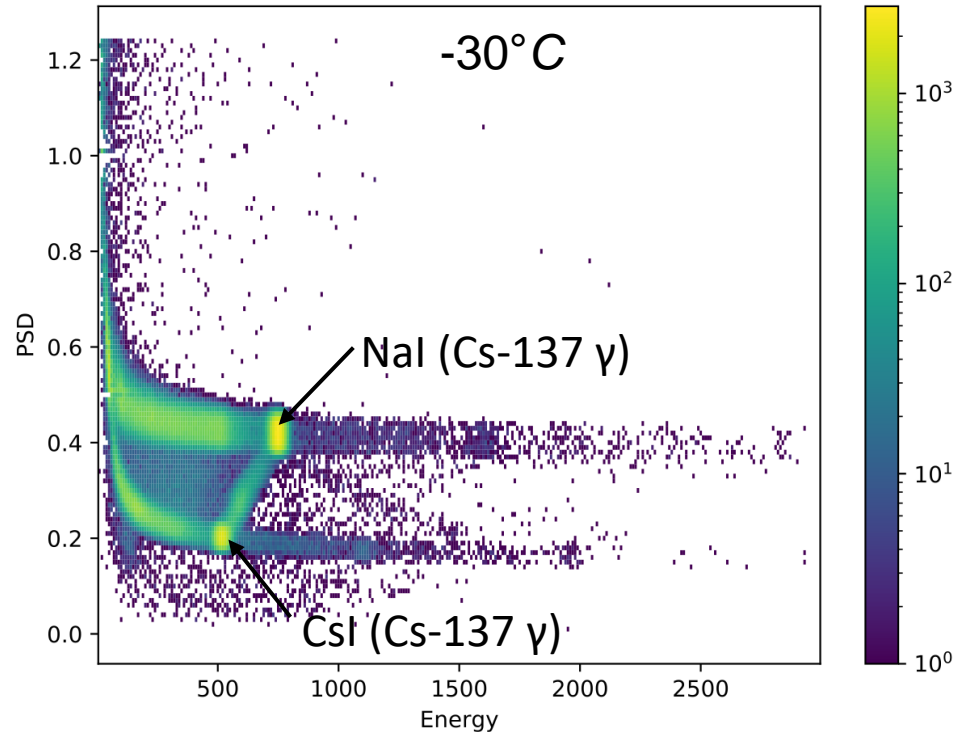
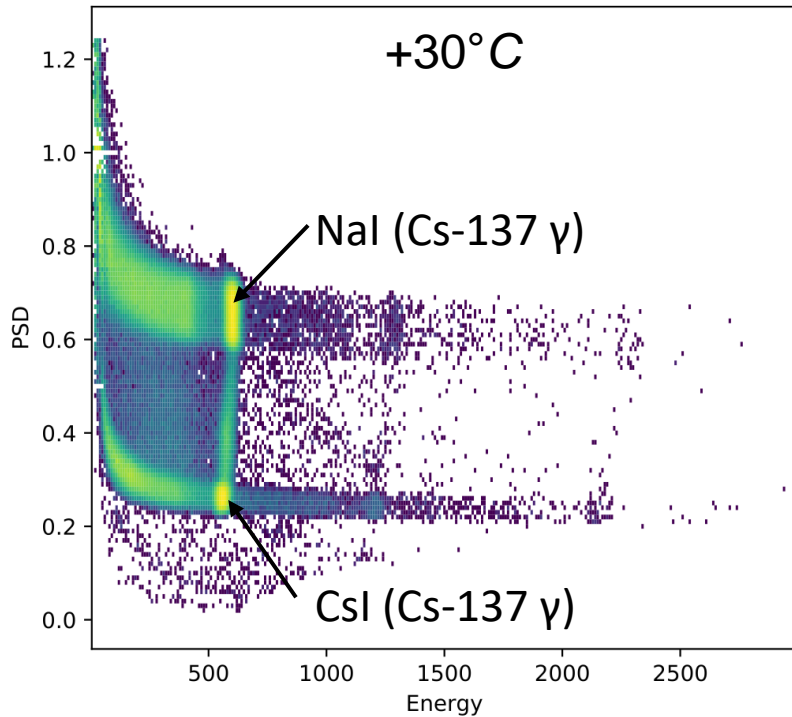
Prototype includes

- LTE modem
- GPS
- Multiple temperature sensors
- 24h battery backup





# Temperature dependence



# Summary

- Novel spectrometer can distinguish between
  - Radioactive fallout
  - Airborne radioactivity
  - Detector contamination
- Scintillator signals are temperature dependent
  - Software stabilisation works well
- Complete monitoring system
  - Station unit with LTE data transfer and battery backup
  - Server software automated data processing