Mobile ground-based atmospheric radioxenon measurements –

new possibilities

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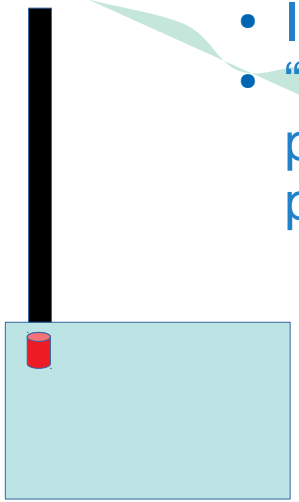
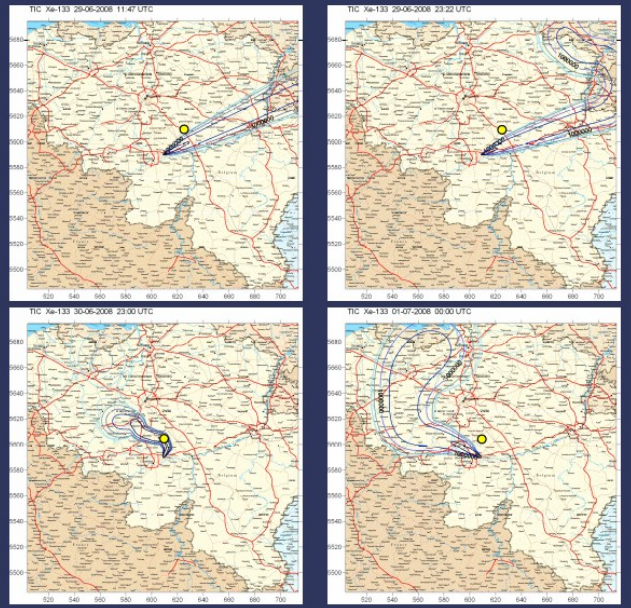
Why do ground-based mobile measurements?

- Map the global background
- Find new release sources
- Independent verification of stack measurements
- Alternative to stack measurements
- Improve ATM
- “Plume hunting” - move the sampling point into the plume using ATM forecast – increase detection probability and signal



Plume – hunting in Belgium 2008



Examples of plume predictions (from SCK-CEN in Mol, Belgium) and position of sampler (yellow marker)

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Method of measurement

Sampling on-site

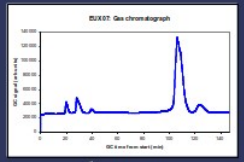
Atmospheric samples

Pre-measurement on NaI

Processing

Transport to Sweden

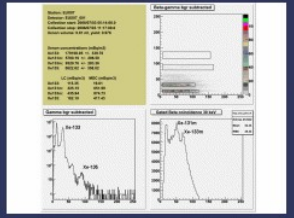
Stack samples, inject directly into detector cell



Quantification

Activity measurement.
Adapt acquisition time according to sample strength

Analysis



Today: two main methodologies

Field sampling

Sample transport

Lab processing and analysis

Transportable xenon system

+ Light-weight and simple equipment in the field
+ Short installation time
+ Well known ambient detector (lab) background
+ Plume-hunting possible

- Long process time => Lower sensitivity
- Sample transport logistics
- Labor-intensive
- Risk for operational mistakes

+ Higher measurement sensitivity
+ Less manual operation
+ Less labor (after installation)
+ Well known ambient detector (site) background

- Requires more power, carrier gas and controlled temp. environment
- Heavier equipment
- Longer installation time
- No plume-hunting

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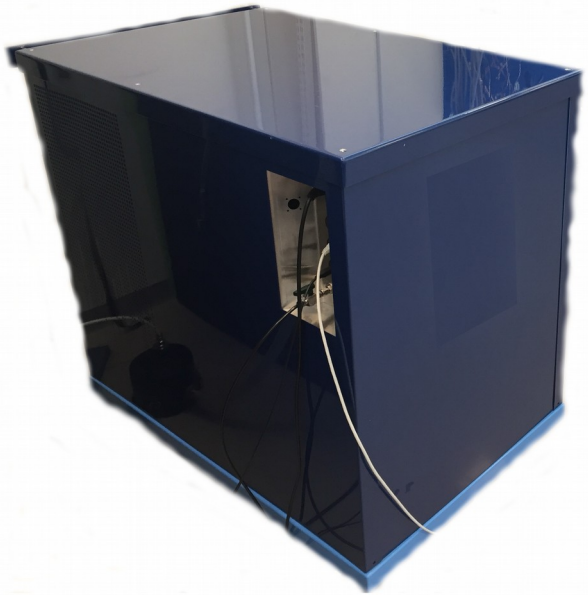
SAUNA Q_B - a new alternative



- Weight 370 kg
- Transported in one piece
- Power consumption
  - < 1.5 kW (max)
  - < 0.9 kW (mean)
- Calibrated at factory
- Simple installation:
  - ➔ Connect power, nitrogen, internet
  - ➔ Press start button

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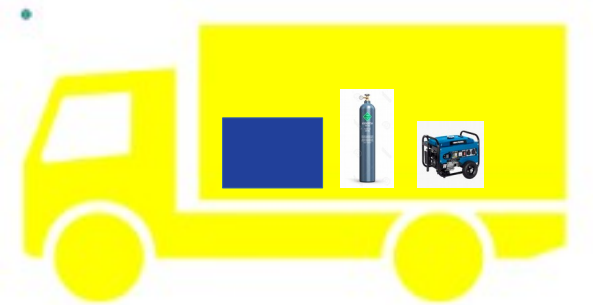
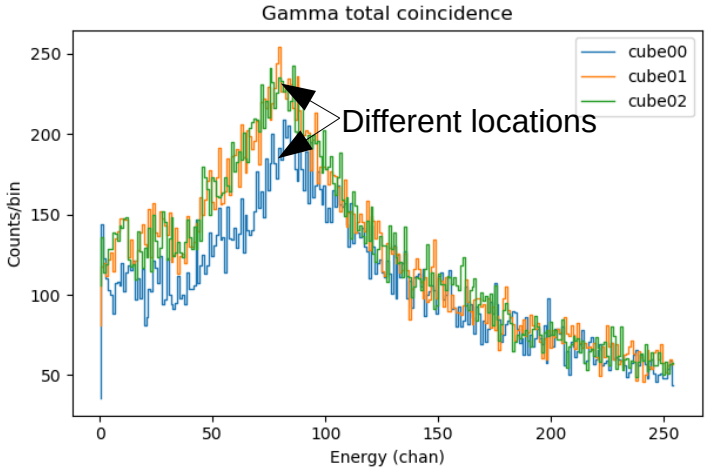
Compared to “field sampling”:

+ Light-weight and simple equipment in the field
+ Short installation time
~~+ Well known ambient detector background~~
+ Plume-hunting possible

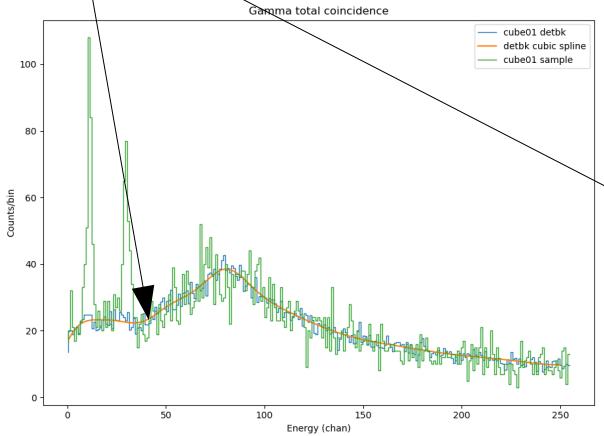
~~- Long process time => Lower sensitivity~~
~~- Sample transport logistics~~
~~- Labor-intensive~~
~~- Risk for operational mistakes~~
- Requires power (but not very much..)

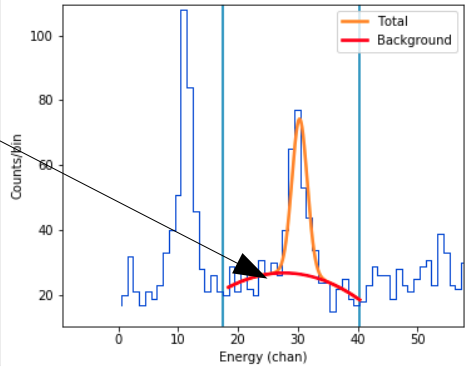


How to handle the ambient detector background?



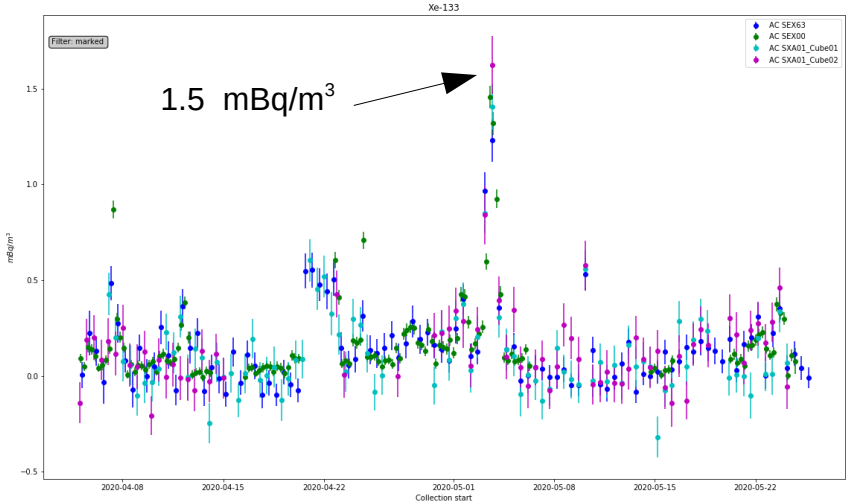
- Measure later (takes time, ideally days)
- Use a standard background, probably OK for stronger samples
- Fit to background shape
- Don’t use it! – Use peak-fitting analysis with appropriate background shape



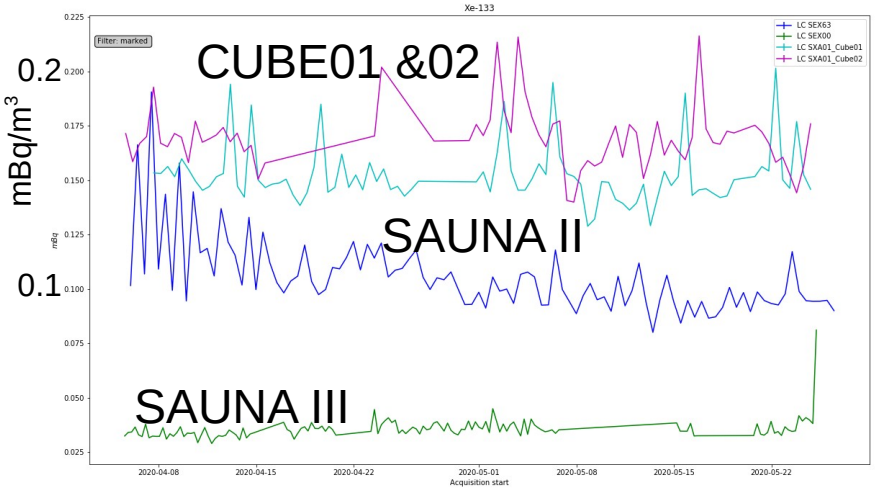


Some results from on-going CUBE-tests.
Four co-located xenon systems running at FOI

Activity concentration Xe-133



Critical limit Xe-133



Summary

- The measurement units developed for the radioxenon array concept are suitable for ground-based mobile measurements.

- A faster and simpler way to map the global radioxenon background

- Can also be used as
  - alternative to
  - independent verification of

  … stack measurements

- There are several options how to handle the varying ambient (site) background in the detector

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