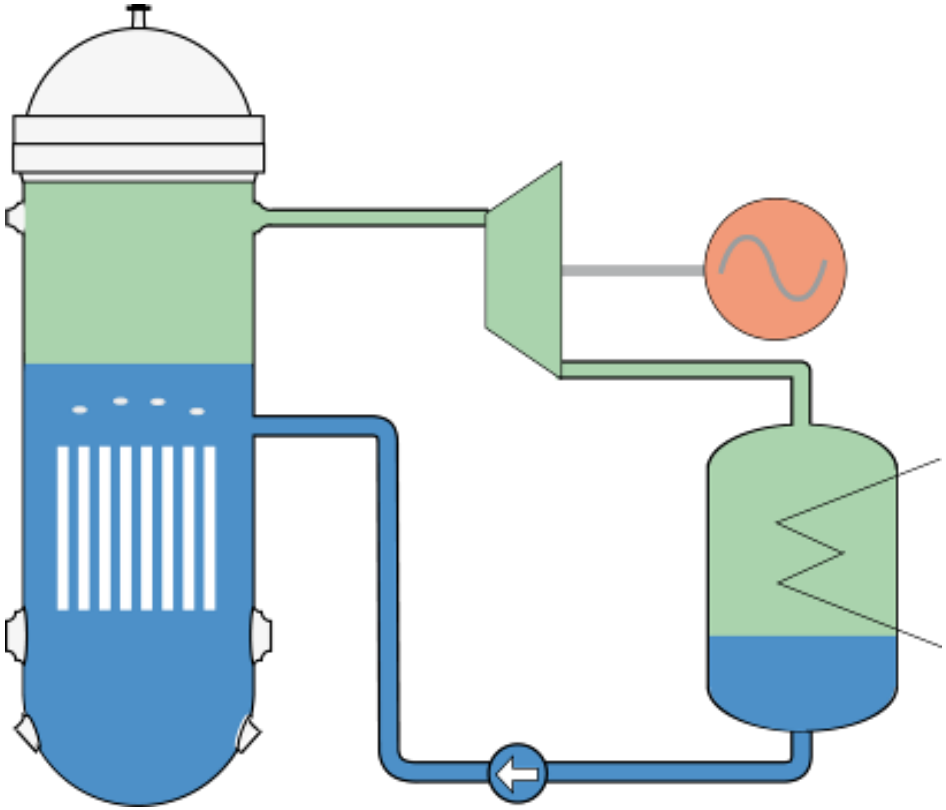
Gamma spectrometry applications at Forsmark

GammaUser 2014

2014.10.07

Sekretessklass: Öppen (S1)

Forsmark NPP – three Boiling Water Reactors



- Process systems (water)
- Contamination of process systems
- Condenser off-gas and ventilation
- Environment
- Waste and free release
- Whole body counting

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Count rooms at F1, F2 and F3

- Main task is to measure samples from the process and the environment – liquid and gas
- Equipment:
  - Canberra detectors, p-type coaxial, 10–40 %
  - Canberra electronics: Lynx, DSA2000, analogue ICB modules
  - Canberra software: VMS-Genie and Pro-Count, now changing to Genie2000 and Apex client/server solution
- Calibration with multi-gamma standard except for gas geometries (Am-241 + Eu-152)
- No summing corrections
- Challenges:
  - Upgrading the system
  - Handling nuclide data in LIMS

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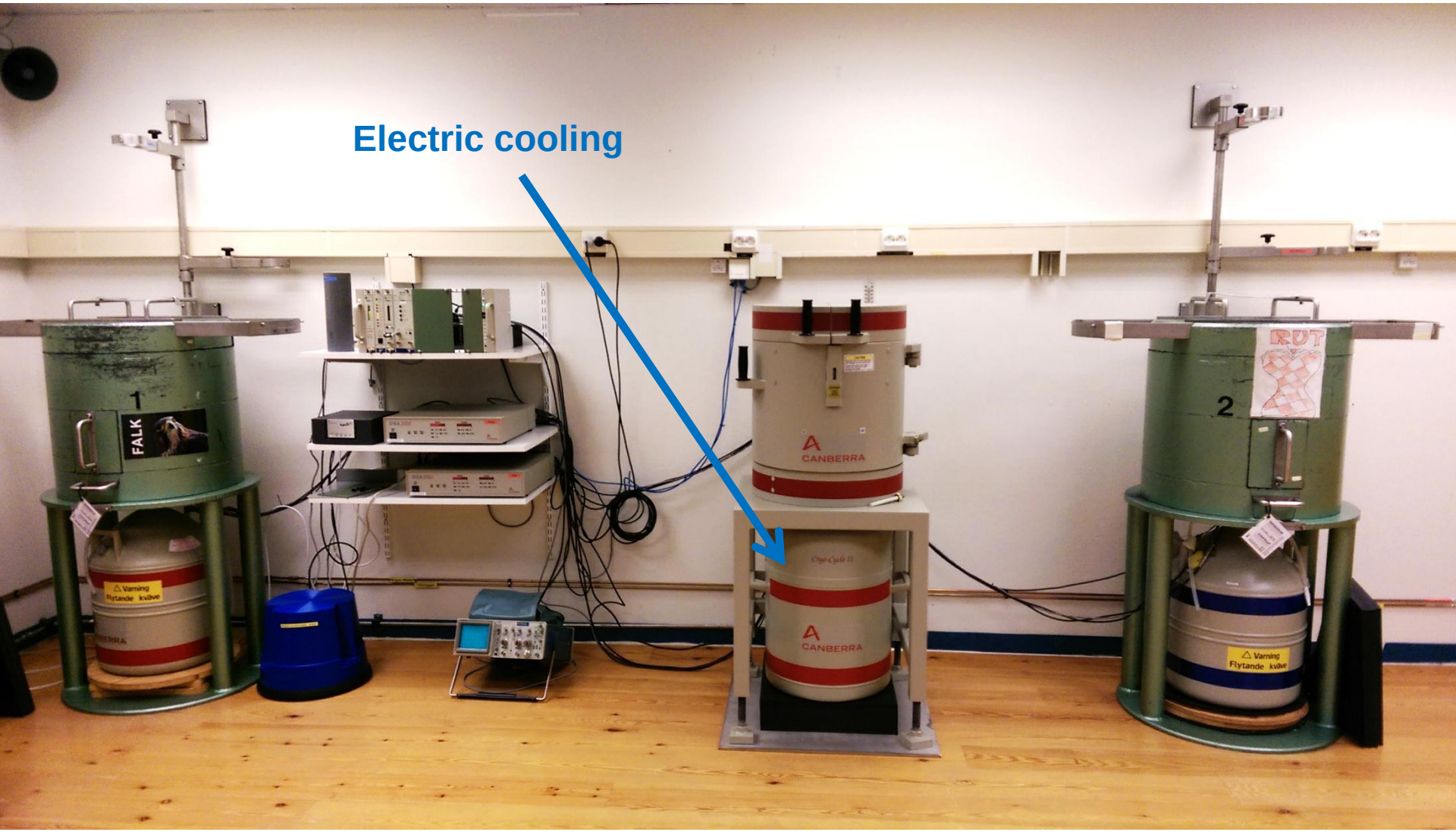
Count room F3



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Inner surface activity of process systems

- External measurements on pipes and heat exchangers to determine contamination on inner surfaces
  - What causes dose rates in the plant?
  - Long-term trending, nuclide specific decontamination factors
  - Annual reports and cross-department seminar
- Original system MADAC by Asea Atom has been developed
  - Collimated lead shield on mobile cart
  - Mobile Ortec detector, 4%, 5 L dewar
  - Dspec LF, Gammavision 6.09
  - Efficiency calibration with flat source and transfer software Simba
- Challenges:
  - To get a correct efficiency evaluation – system knowledge!
  - Rough handling, wear on the equipment

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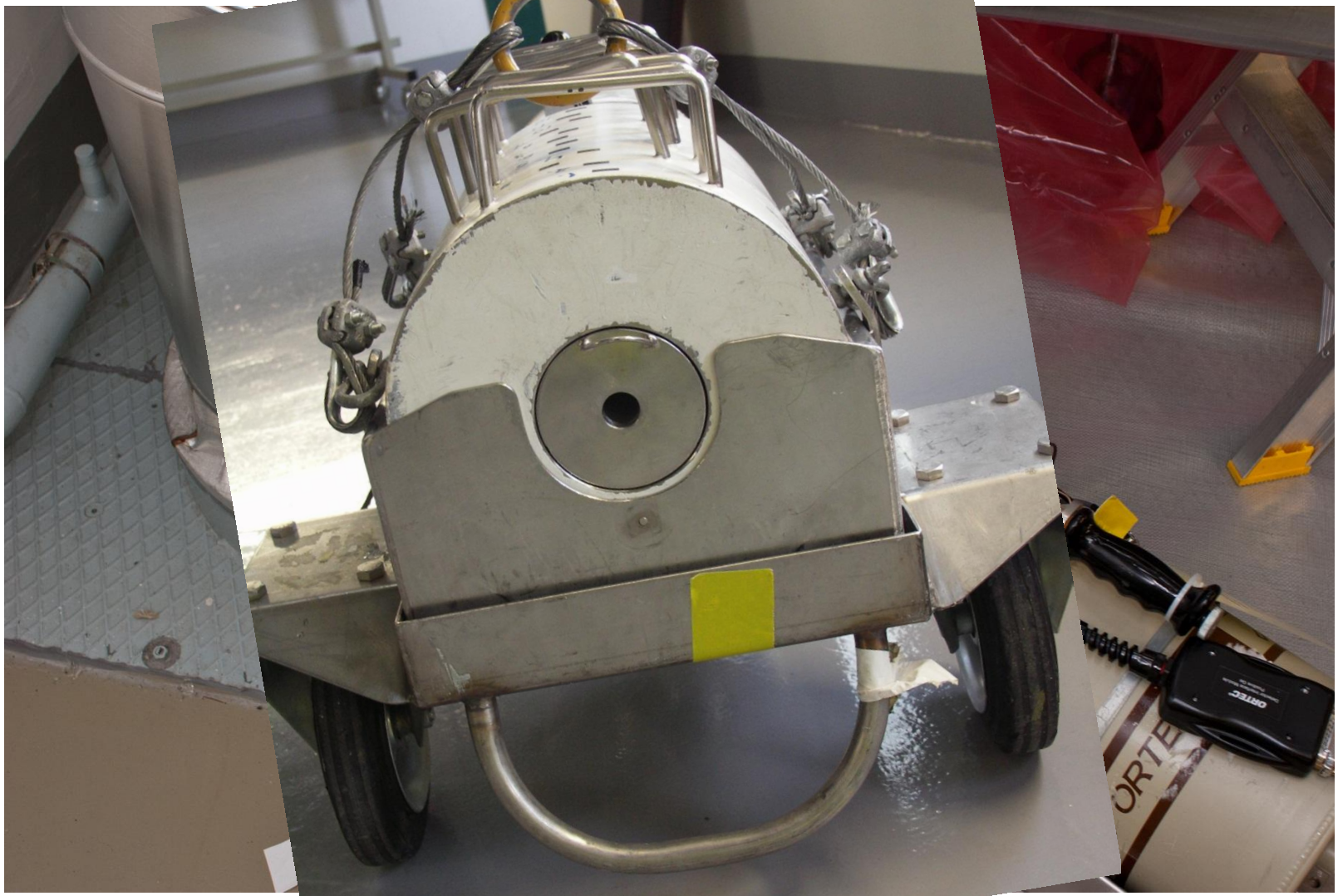
Mobile equipment for inner surface activity



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On-line off-gas measurement (FINESS)

- Tracking of fuel failures in condenser off-gas
  - Repeated measurements on a flow-through cell
  - Xe-133, Xe-135, Xe-138, Kr-85m, Kr-88…
  - Fuel failure detection and development
  - Tool to locate failed fuel (flux-tilting)
- Equipment:
  - Planar or small coaxial Ortec detectors, X-cooler 2
  - Ortec electronics: Dspec Plus
  - Gammavision 6.04, using job files and ROI reports
- No efficiency calibration – only trending of raw data
- Challenges:
  - Inflexible analysis routine
  - No network connection, only local access to data

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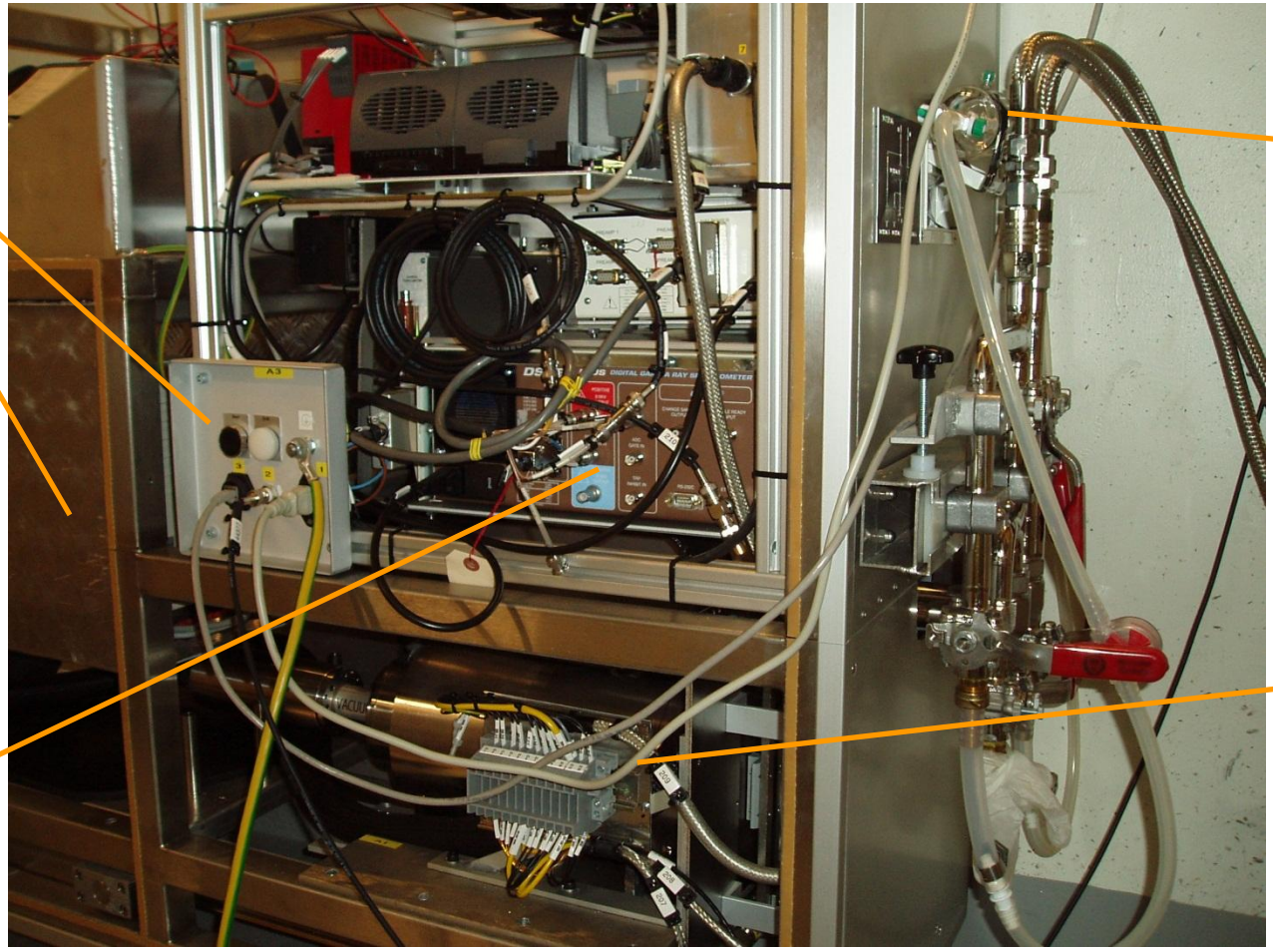
On-line off-gas measurement (FINESS)



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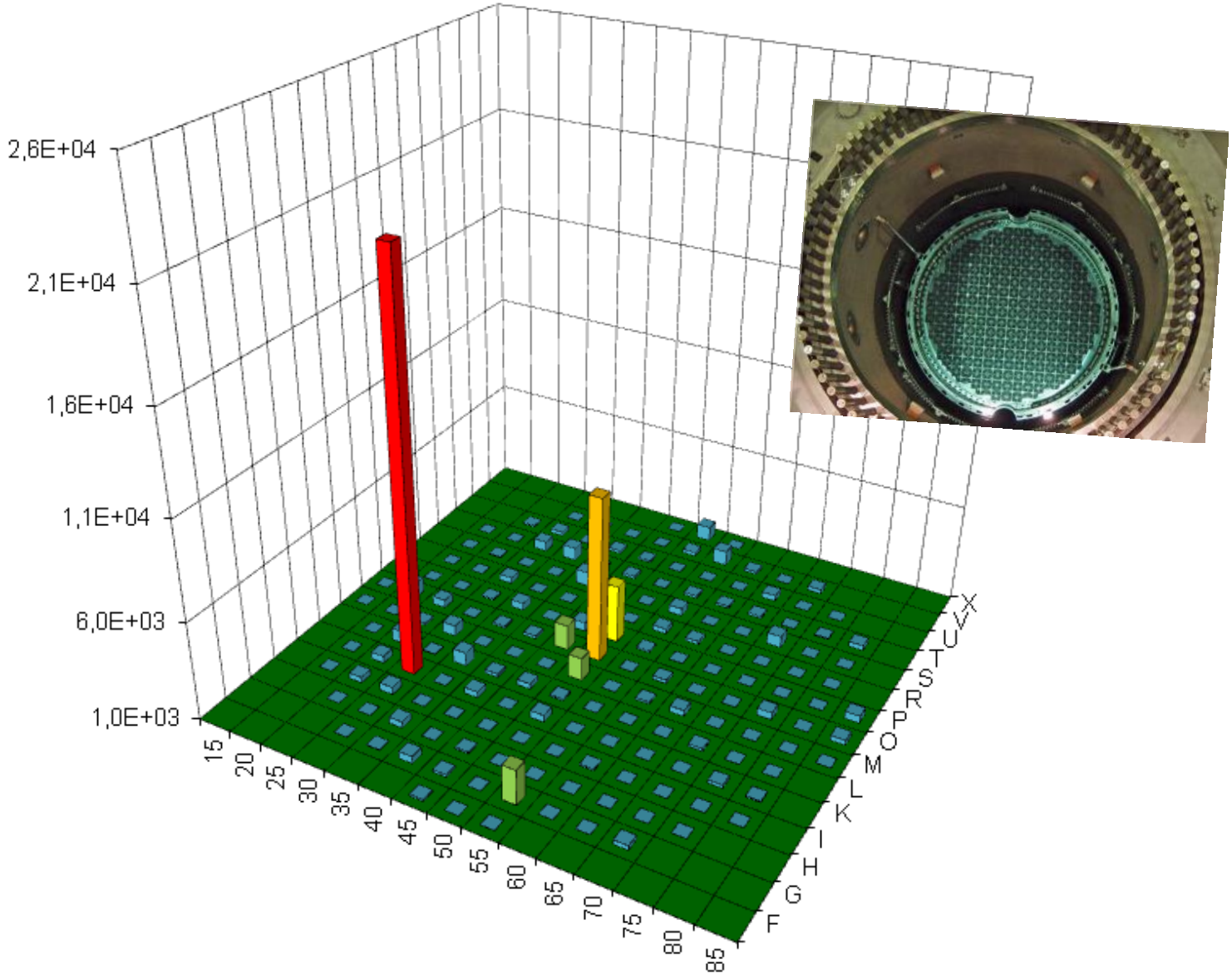
Fuel failures, Xe-133 indications



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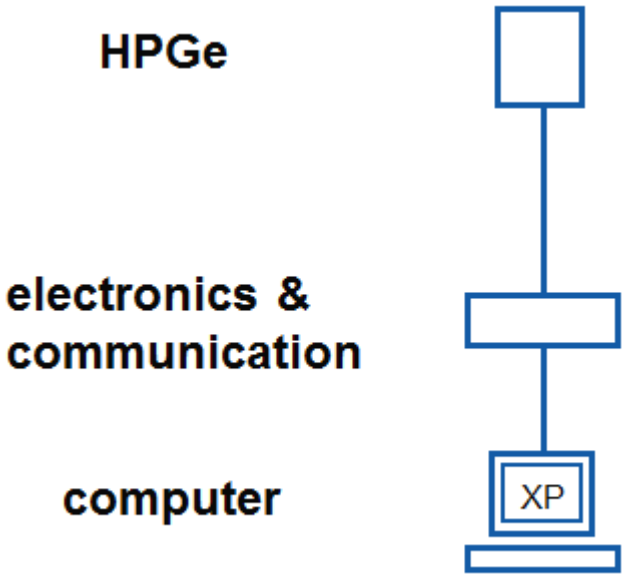
Stack monitoring



- On-line measurements
  - 10 L flow-through steel marinelli beakers
  - Ortec detectors, coaxial, ca 15%
  - Ortec electronics, Dspec Jr 2.0
  - Ortec/Gammadata software Gammavision/Windas
  - Indirect calibration using process gas
  - Extremely flexible data handling
- Challenges:
  - Correct and traceable calibration
  - Electric cooling
  - Background interpretation, 1 month measurement time

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For another time…

- Waste, free release measurements
- Challenges:
  - Uneven distribution of radioactive materials
  - Representative calibrations
  - Combined uncertainties, missing and dangerous?
  - Nuclide vectors

Thank you!

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