TG 11 Overview
Material screening

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Outline

- New Ge spectrometers
- Material selection for the cryostat
- Cables
- Intercomparison activities
- Status of the Rn monitor
- Design of Ar purification plant

New Ge spectrometers

- HADES: 2 detector setup

  $\rightarrow$ Talk of Mikael Hult
- MPIK: Corrado

  $\rightarrow$ Talk of Mark Heisel

  (Diploma thesis Werner Maneschg)
- LNGS: GeMPI 3

  $\rightarrow$ Talk of Mark Heisel
- No γ-screening measurements for some months @ MPIK due to renovation works!

Material selection for cryostat

- Gamma activity measurements of stainless steel successfully finished
  - Missing batch for cylindrical part found
  - Discussion of results $\rightarrow$ Talk of Gerd Heusser
  - ICPMS results $\rightarrow$ Talk by V. Kornoukhov
- Welding rods and wires selected
  - 1 sample had high ^{40}K (200 mBq/kg), No improvement by acetone cleaning $\Rightarrow$ replaced!
  - 1 sample with high ^{60}Co (~130 mBq/kg), Cleaning improved only ^{40}K $\Rightarrow$ Anyhow used (Low mass)

The cable issue

- Clean cables not yet discovered
- Best choice: Kapton cable (^{226}Ra: 9±6 mBq/kg
  ^{228}Th: <4 mBq/kg)
- Alternatives: PEN, Cuflon, …

PEN screening	^{232}Th	^{238}U	^{40}K
	Activity [mBq/kg]		
ICPMS	< 0.07	< 0.2	< 12
GeMPI		< 590	640 ± 50
^{228}Ra	150 ± 10		
^{228}Th	150 ± 10		
^{235}U		< 590	
^{226}Ra		290 ± 10	

small sample

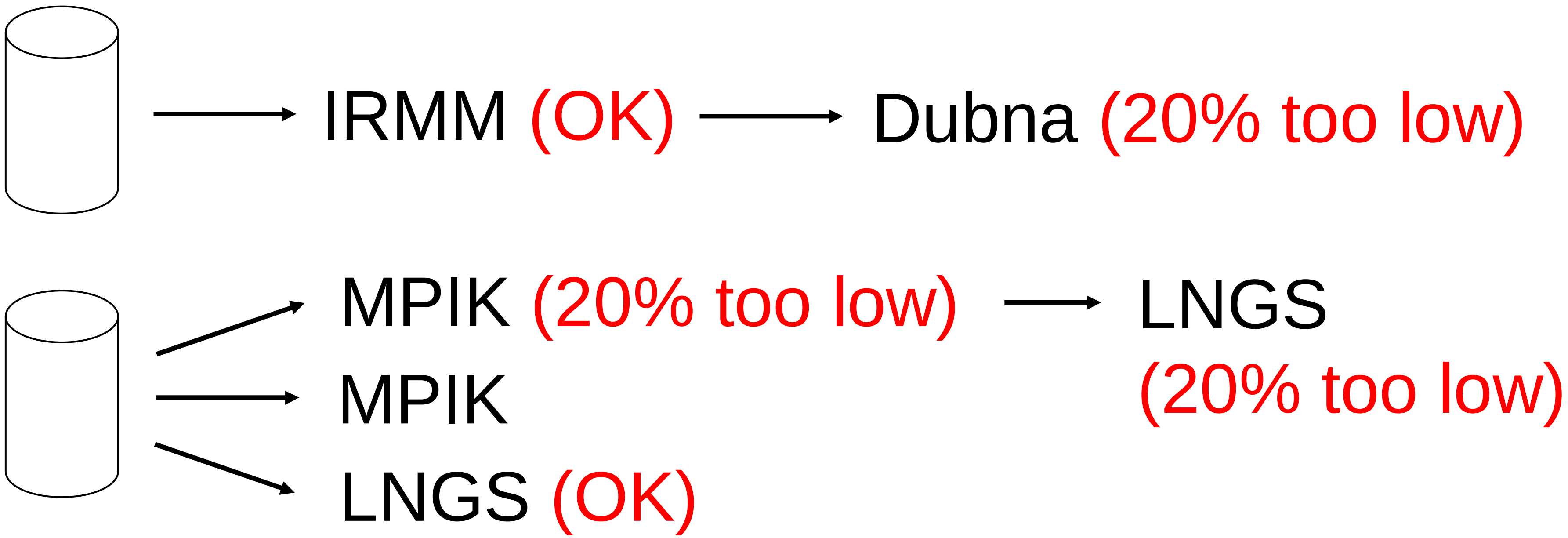
4.4 kg sample

Recent results for Kapton and PEN (ICPMS / Gamma)

spec. Act. [mBq/kg]	^{232}Th (^{228}Th)	^{238}U (^{226}Ra)	^{40}K (^{40}K)
Kapton	0.6 ± 0.2 (< 25)	12 ± 4 (< 40)	9 ± 2 (140 ± 30)
PEN	100 ± 30 (150 ± 10)	160 ± 50 (290 ± 10)	170 ± 50 (640 ± 50)

Results from the NPL intercomparison exercise

- 4 GERDA labs participated
- Good agreement for IRMM / LNGS
- ~20% deviation for MPIK / Dubna (Baksan)

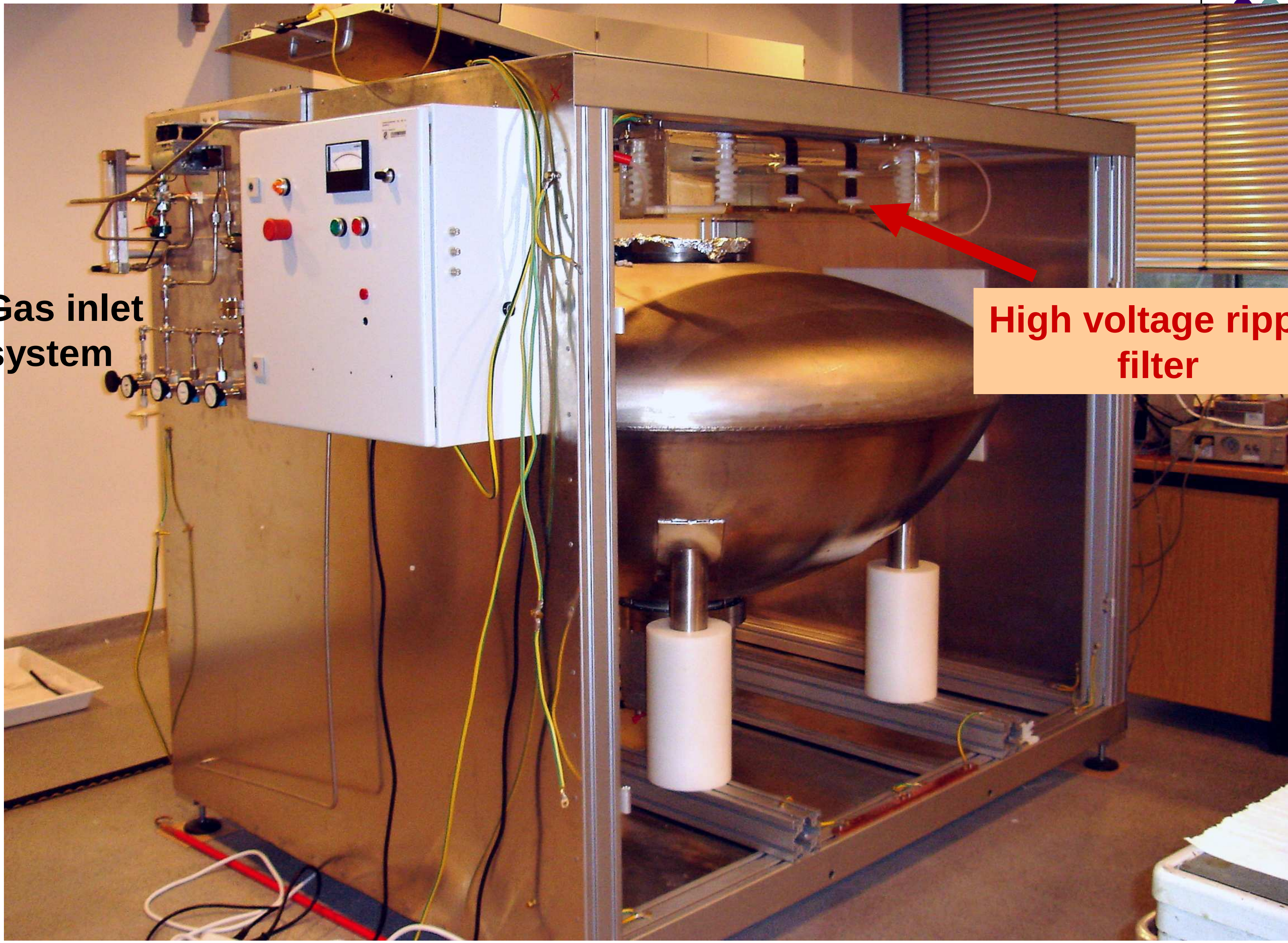


Further intercomparison activites

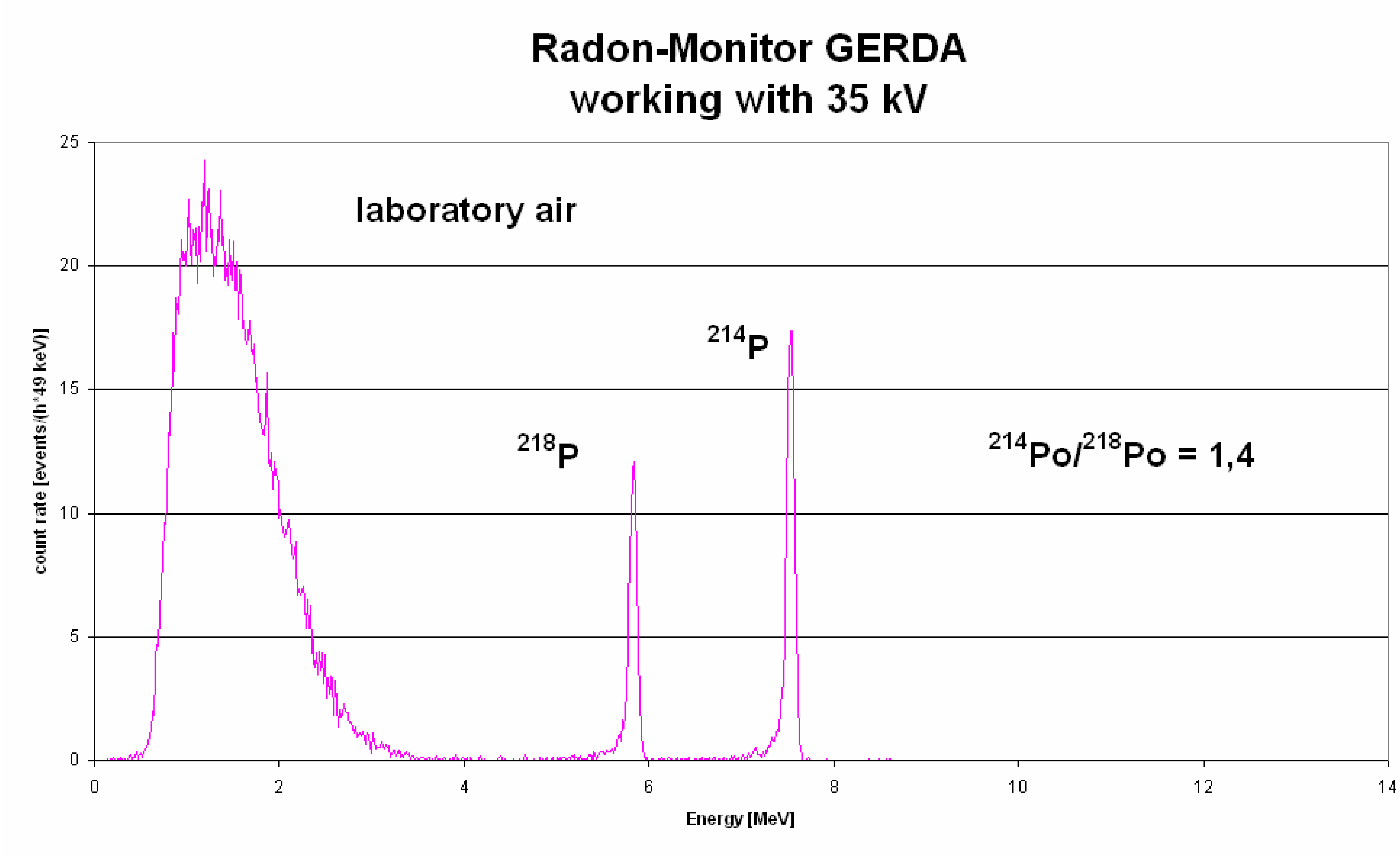
- MC code intercomparison exercise conducted by ICRM (International Committee for Radionuclide Metrology)
  - Differences between different (version of) codes analyzed

  $\rightarrow$ Talk of Dusan Budjáš during MaGe workshop
- Preparation of high density reference standards

The Rn Monitor is partly dismantled for cleaning



Spectrum of collected Rn-daughters



Jürgen Kiko, Jochen Schreiner MPIK HD

Next steps

- Purification of the inner vessel
- Calibration with a Rn – source
- Modifications of the insulator setup for higher collection voltage
- Electronic improvements for background reduction

^{222}Rn in Ar: What do we know?

- Measured initial ^{222}Rn concentrations in Ar:
  - Ar 5.0: (8.4 ± 0.2) mBq/m^3 (STP)
  - Ar 6.0: (0.38 ± 0.02) mBq/m^3 (STP)
- ^{222}Rn decays (3.8 days half-life)

  $\Rightarrow$ Final concentration depends on ^{222}Rn emanation-rate of storage tank
- Example: Ar 5.0 (LNGS): <0.02 mBq/m^3 (STP)
- Initial activties rather high $\Rightarrow$ Long times for ^{222}Rn decay required (not practical)

Strategy for getting pure LAr in GERDA (Proposal)

- 1st filling without purification
  - ^{222}Rn decays inside cryostat
- LAr refilling necessary from time to time to replace evaporation losses
- Regular ^{222}Rn spikes must be avoided $\Rightarrow$ High purity of refilled LAr is crucial
- Purification plant needed:
  - Concept: Cryo-Adsorption on charcoal
  - Reduction of ^{222}Rn by factor 500 for ~200 liters LAr

Achieved ^{222}Rn reductions

Quality	Sample size (STP)	Mass of charcoal	Reduction factor	Phase
Ar 4.6	141 m^3	150 g	> 400	Gas
Ar 5.0	200 m^3	60 g	10	Liquid
Ar 6.0	104 m^3	60 g	18	Liquid

- Liquid phase adsorption less efficient
- Size of column (charcoal mass) to be determined
- Design studies will be performed soon @ MPIK
- Initially pure argon crucial to keep column size moderate