

NPL 200-litre drum comparisons

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Overview

- Background (2007 comparison)
- Preparation of standard drum
- Conduct of exercise
- Results and conclusions
- Details of 2009 exercise



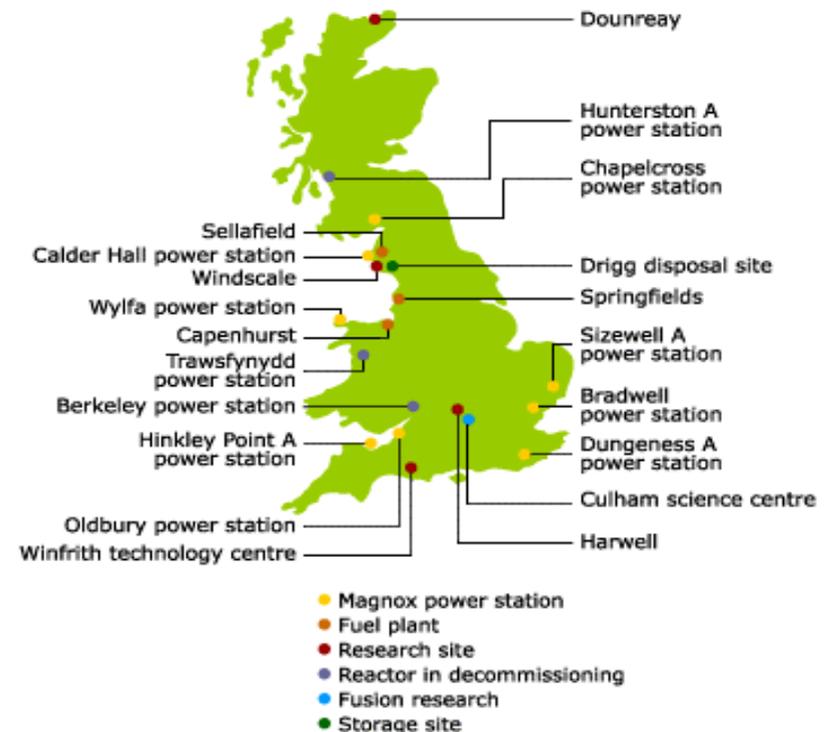
Background

- Site decommissioning a major activity for UK nuclear industry

- radioactivity measurements needed to categorise waste

- need for **standards and reference materials**

- NPL ran workshop (2005) to identify exact requirements



Background

- Highest priority **large-volume γ measurements:**

- ^{241}Am , ^{137}Cs and ^{60}Co
- $< 0.4 \text{ Bq g}^{-1}$
- concrete or soft waste
- 200 L drum format



- Would prepare single prototype **soft waste** 'standard drum' first

- Run **comparison** to:

- Give users opportunity to check systems with traceable standard
- Give NPL feedback on the prototype

Preparation of standard drum

1. Procured bulk resin (90kg), dried and loaded into 240 x 500 ml bottles, 190 g per bottle
2. Prepared mixed radionuclide standard solution (^{241}Am , ^{137}Cs and ^{60}Co)
3. Added ~0.1 g solution to each bottle, dried resin surface, sealed, tumbled and packed into drum



Activity concentrations in drum

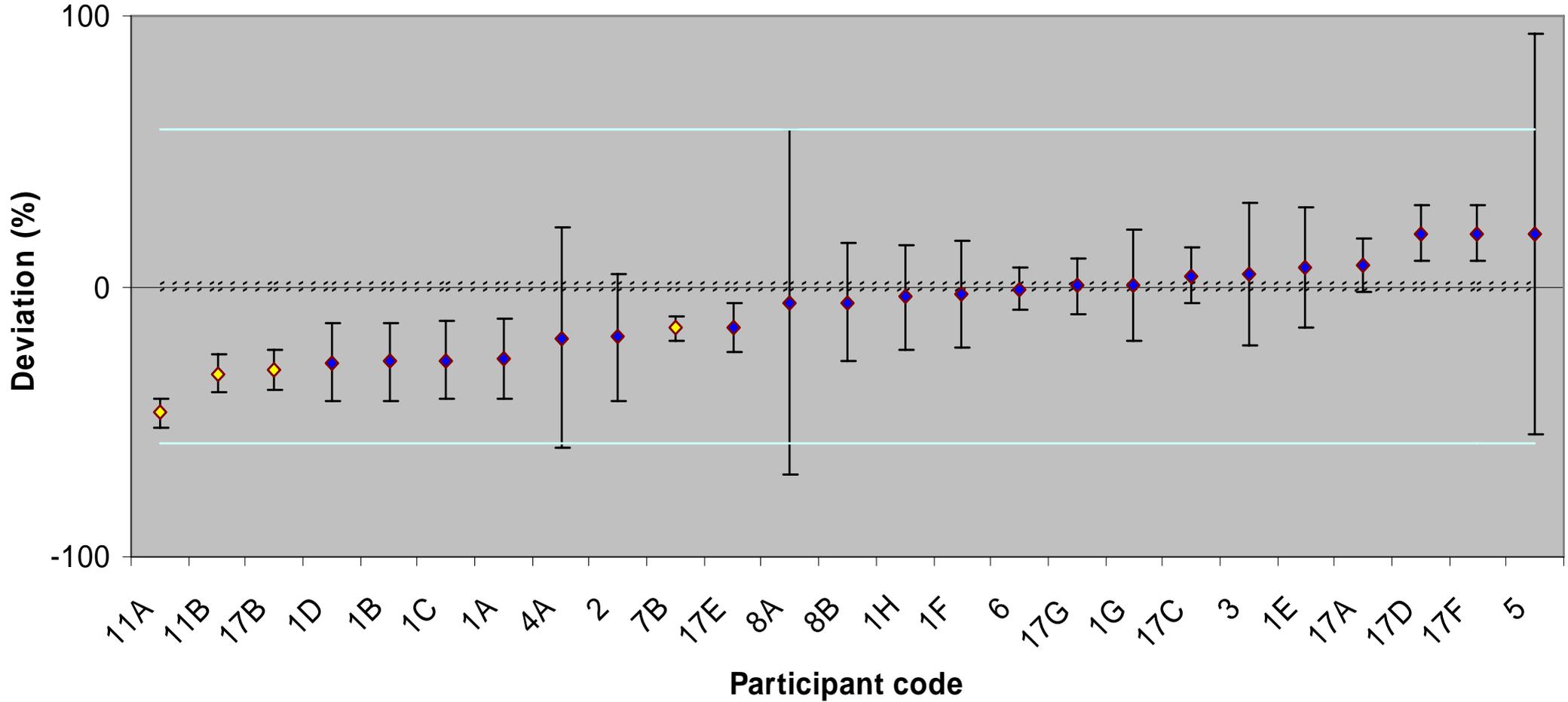
Radionuclide	Activity concentration (1200 UTC, 1 Dec 06) (Bq g ⁻¹)	Relative uncertainty (%, <i>k</i> =1)
²⁴¹ Am	0.2594	0.57
¹³⁷ Cs	0.0295	0.87
⁶⁰ Co	0.03731	0.62

Conduct of exercise

- 18 laboratories took part
- Given details of (empty) drum and resin
- Drum moved 'site-to-site'
- Later - draft report and second workshop
- Users supplied additional data
- NPL issued final report
(NPL Report IR 2, see: www.npl.co.uk, 'Publications')

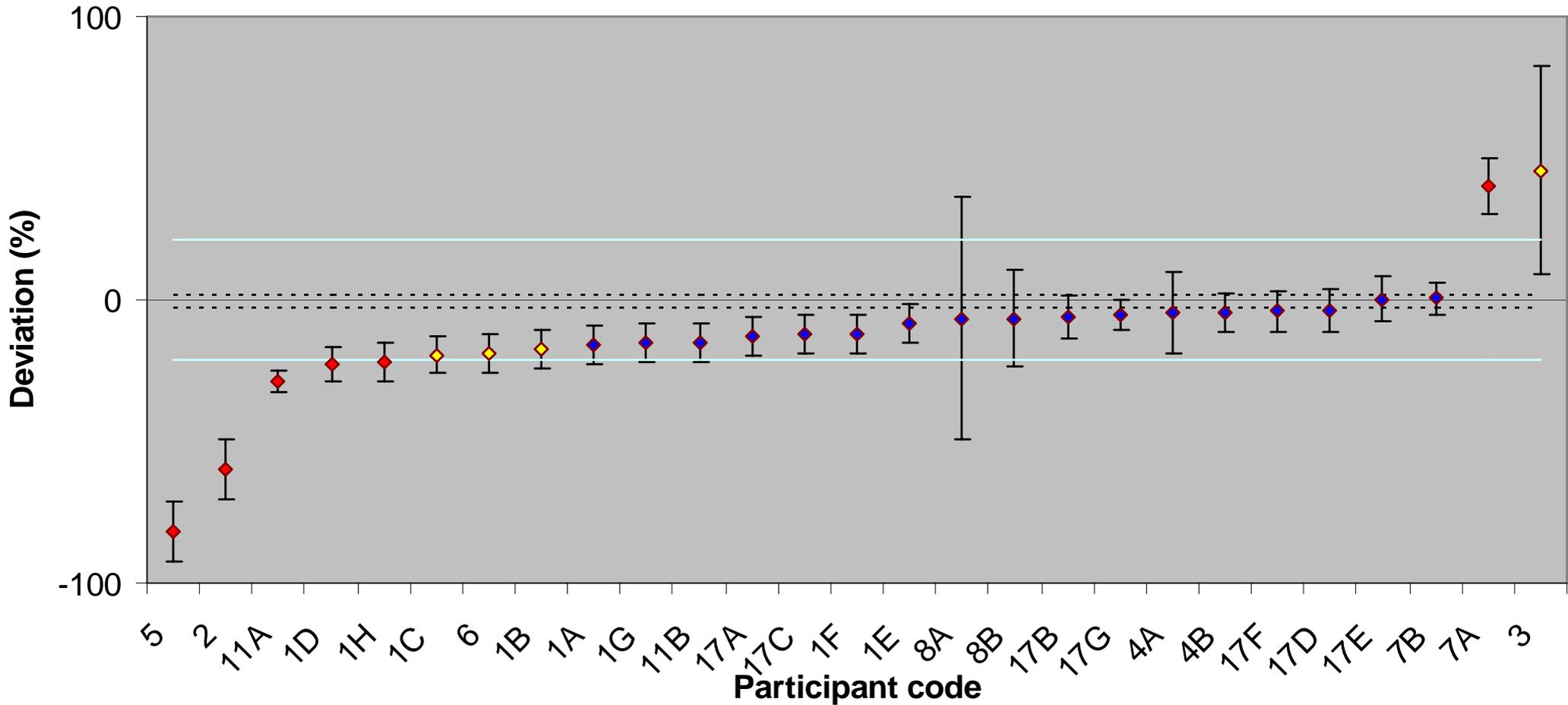
Deviation plot for ^{241}Am results

(Participants 4(B) and 7(A) outside limits of plot)



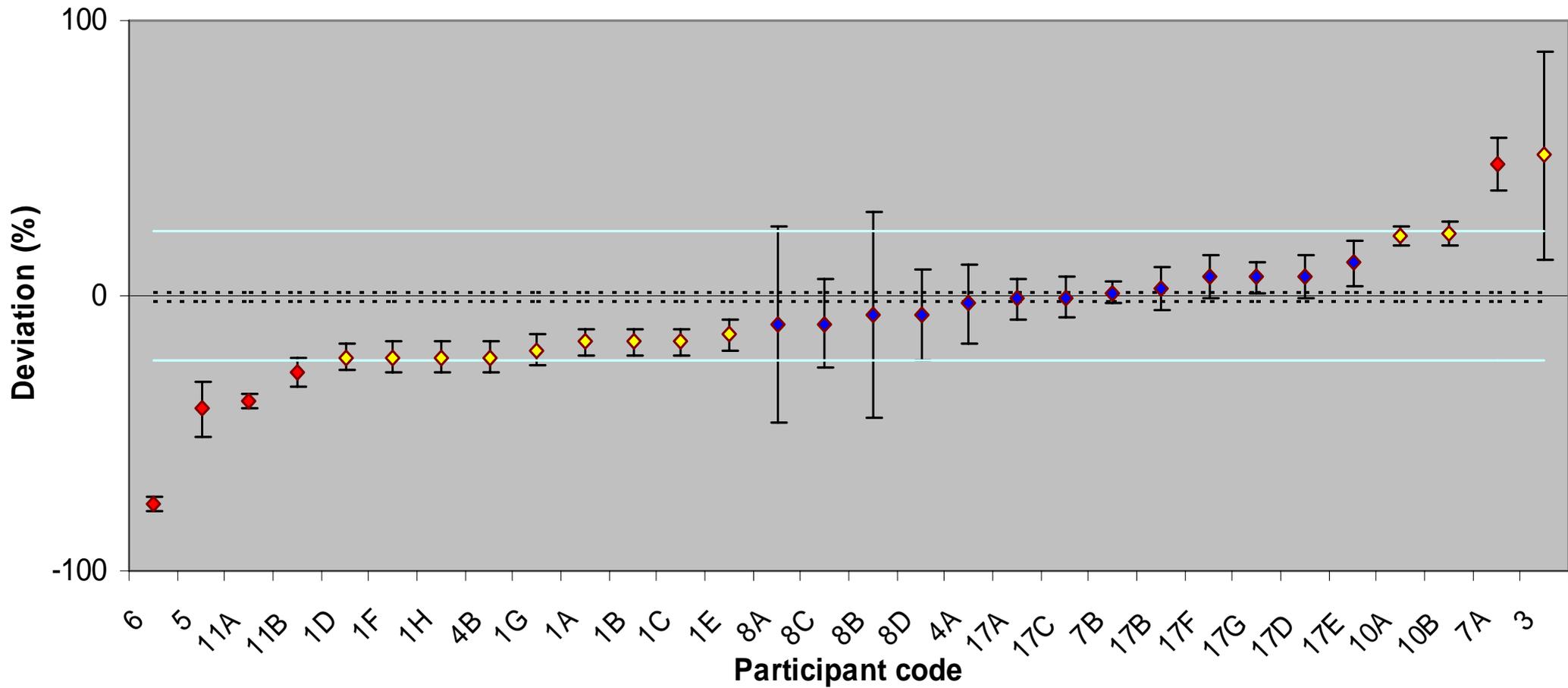
Deviation plot for ^{137}Cs results

(Participants 10(A) and 10(B) outside limits of plot)



Deviation plot for ^{60}Co results

(Participants 13 and 15 outside limits of plot)



Conclusions (2007 comparison)

- **'Standard drum' prepared, and measured by 17 UK groups**
- **58% of total data set 'in agreement' with NPL**
- **15% of data discrepant or questionable for no clear reason**
- **^{137}Cs and ^{60}Co – low activities and 'layering' of drum caused problems**
- **Importance of accurate modelling clearly demonstrated**
- **Some problems with estimating uncertainties**
- **One or two 'procedural' issues (e.g. entering wrong details of drum)**
- **Second comparison requested (drum with 'hotspot')**

2009 exercise

- **Same nuclides as before**
- **Activity to be concentrated into 'hot volume' of resin bottles**
- **Size / location of hot volume will not be disclosed initially**
- **Will offer two drum types: 0.10 – 0.35 Bq/g and 5 – 20 Bq/g**
- **Expressions of interest by 27 February**
- **Drums to be circulated March – November**
- **Results by November / December**
- **Workshop in February 2010**
- **Report in March 2010**