NPL Environmental Comparison 2004

Results: Beta-Gamma Samples

Andy Pearce

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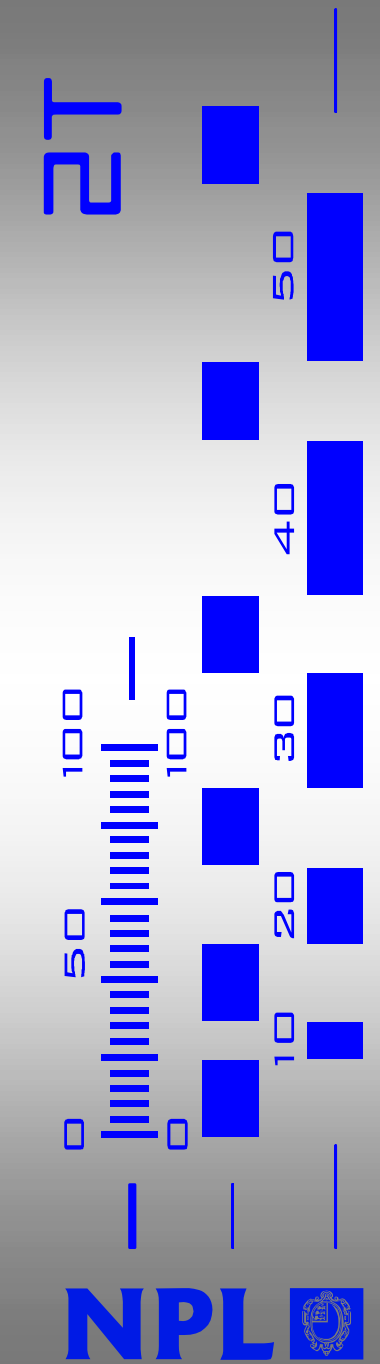

NPL Environmental Comparison 2004

- Introduction
- Uptake of Samples
- Summary of Results
- Participant's Methods
- Results in Detail
- Conclusions

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Introduction

- 32 laboratories participated in the beta-gamma comparison
- 8 principal radionuclides:

  BGH samples: 1-10 $Bq.g^{-1}$ principal

  BGL samples: 5-15 $Bq.kg^{-1}$ principal

- 6 secondary radionuclides (descendants and impurities)

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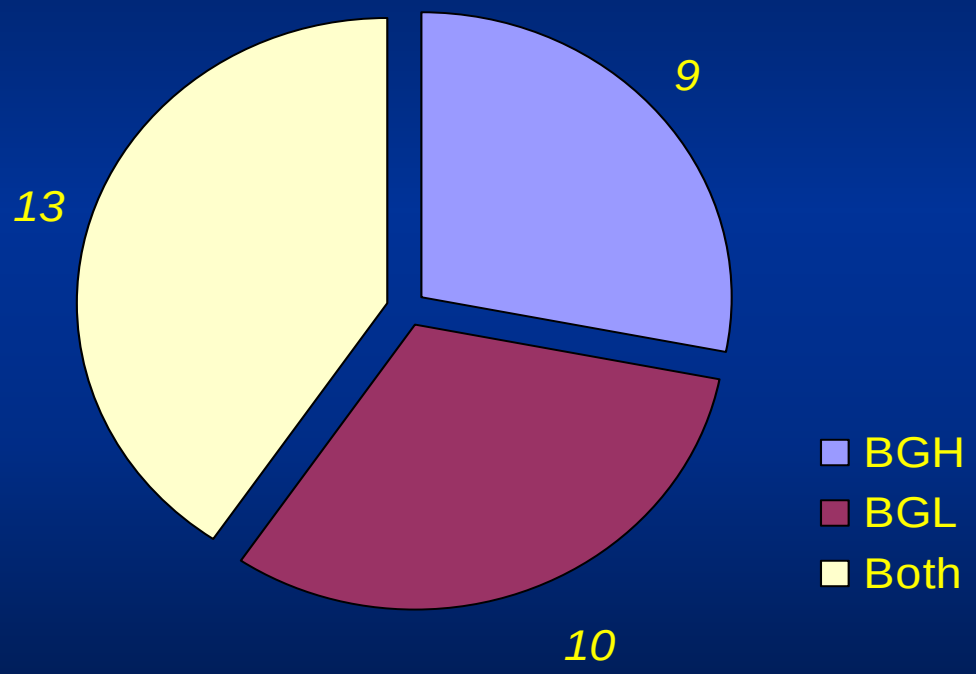
Uptake of Beta-Gamma Samples

32 Laboratories participated in the beta-gamma part of the exercise

- 9 taking high level only (BGH)
- 10 taking low level only (BGL)
- 13 taking both (BGH and BGL)



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Summary of Results – High Level

Nuclide	Proportion of good results
^{144}Ce	90 %
^{60}Co	80 %
^{137}Cs	80 %
^{155}Eu	80 %
^{154}Eu	70 %
^{95}Zr	70 %
$^{106}Ru/^{106}Rh$	50 %
^{134}Cs	50 %

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Summary of Results – Low Level

Nuclide	Proportion of good results
^{137}Cs	90 %
^{60}Co	80 %
^{134}Cs	80 %
^{95}Zr	80 %
^{155}Eu	80 %
^{144}Ce	75 %
$^{106}Ru/^{106}Rh$	60 %
^{154}Eu	60 %

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Participants' Methods

All analysts used Germanium gamma spectrometry.

- Detector sizes ranging from 20-80 %
- Various geometries:
  - 30 ml – 3 l containers
  - marinelli beakers and plastic bottles
- All used commercially available software
- A majority used reasonable nuclear data

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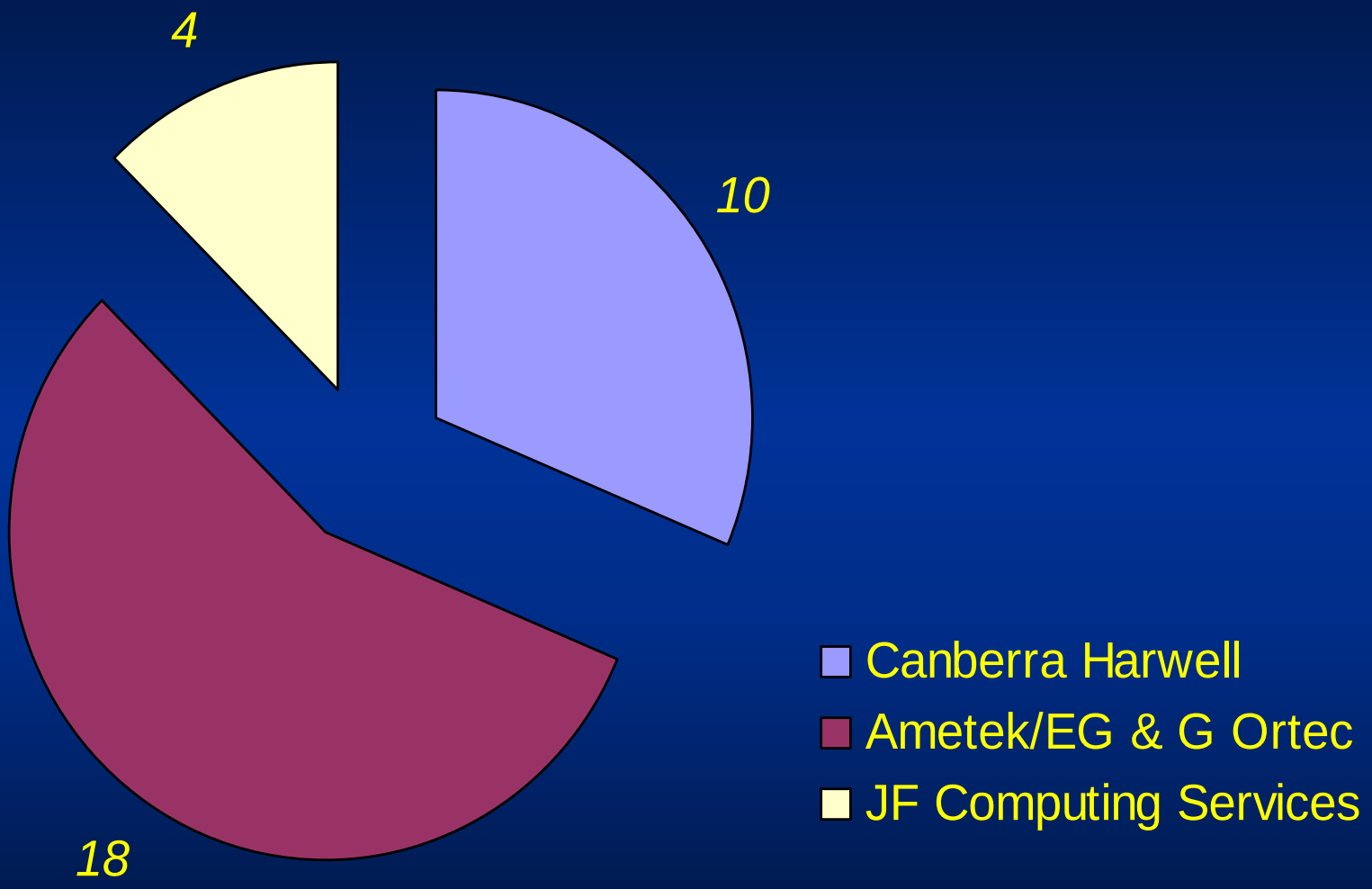
Analysis Software by Manufacturer



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Nuclear Decay Data

Participants taking data from various, mostly good, sources:

- IAEA data – TECDOC 619
- The Radiochemical Manual
- NPL Report RSA (EXT) 53
- Web databases - NUDAT/ENSDF/ToRI
- ICRP38/Older editions of Table of Isotopes

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High Level Beta-Gamma Results

Whisker plots follow, in summary:

- Most radionuclides do not present a problem for most analysts, however there are still a few “hot spots”
- Cascade summing may still be presenting a problem for many analysts

Figure 39 - Reported Ce-144 high level results

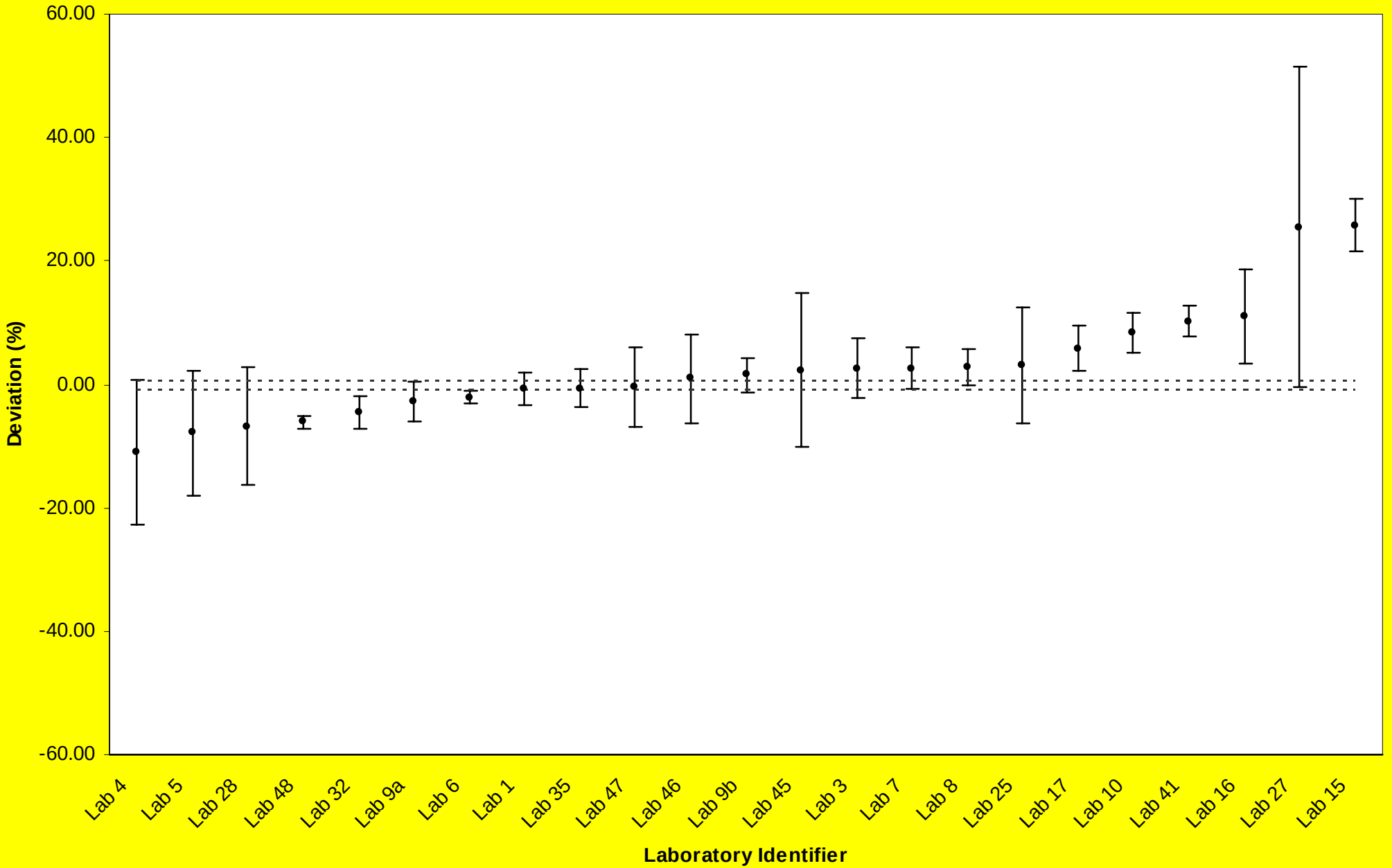


Figure 25: Reported Co-60 high level results

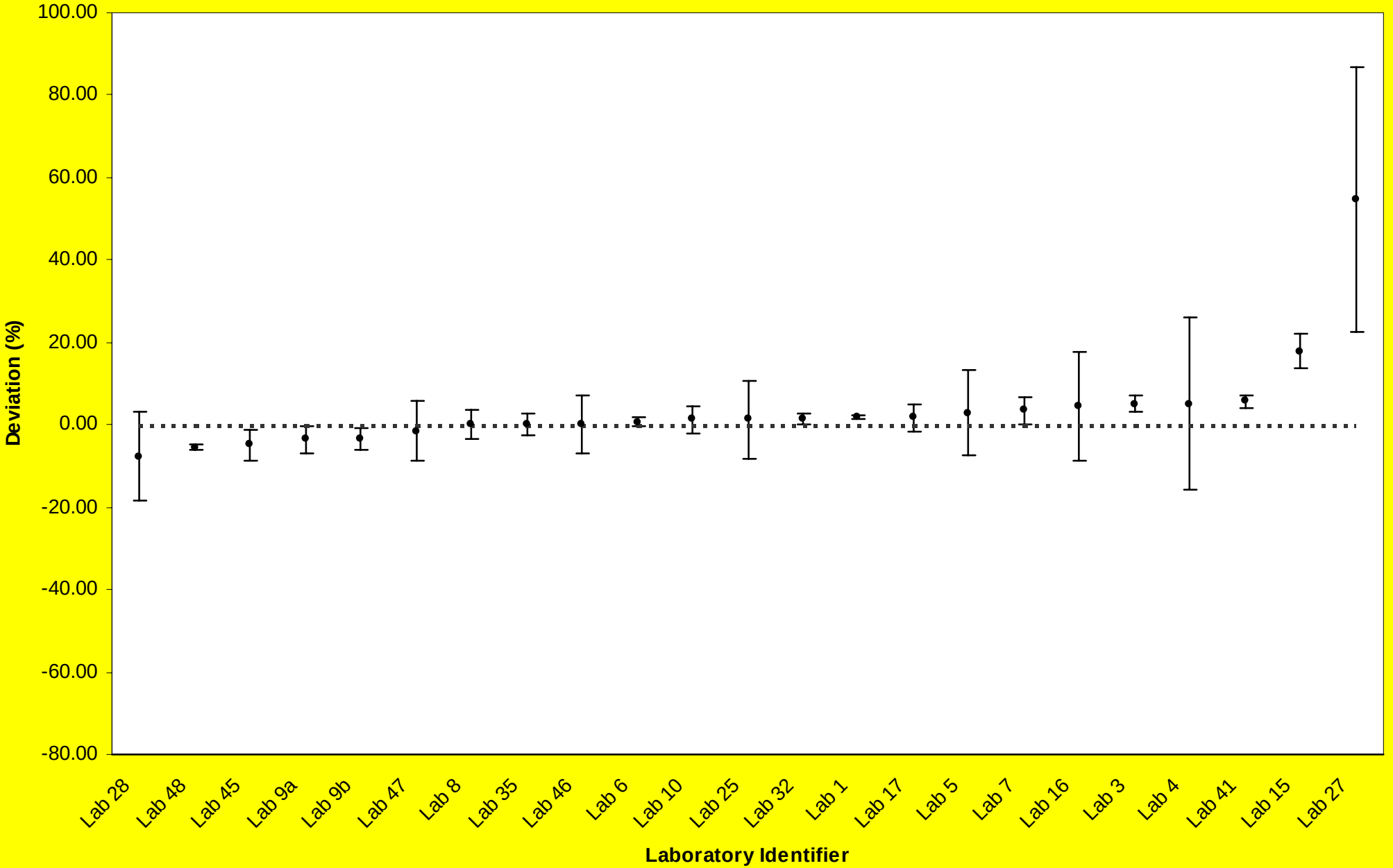


Figure 37: Reported Cs-137 high level results

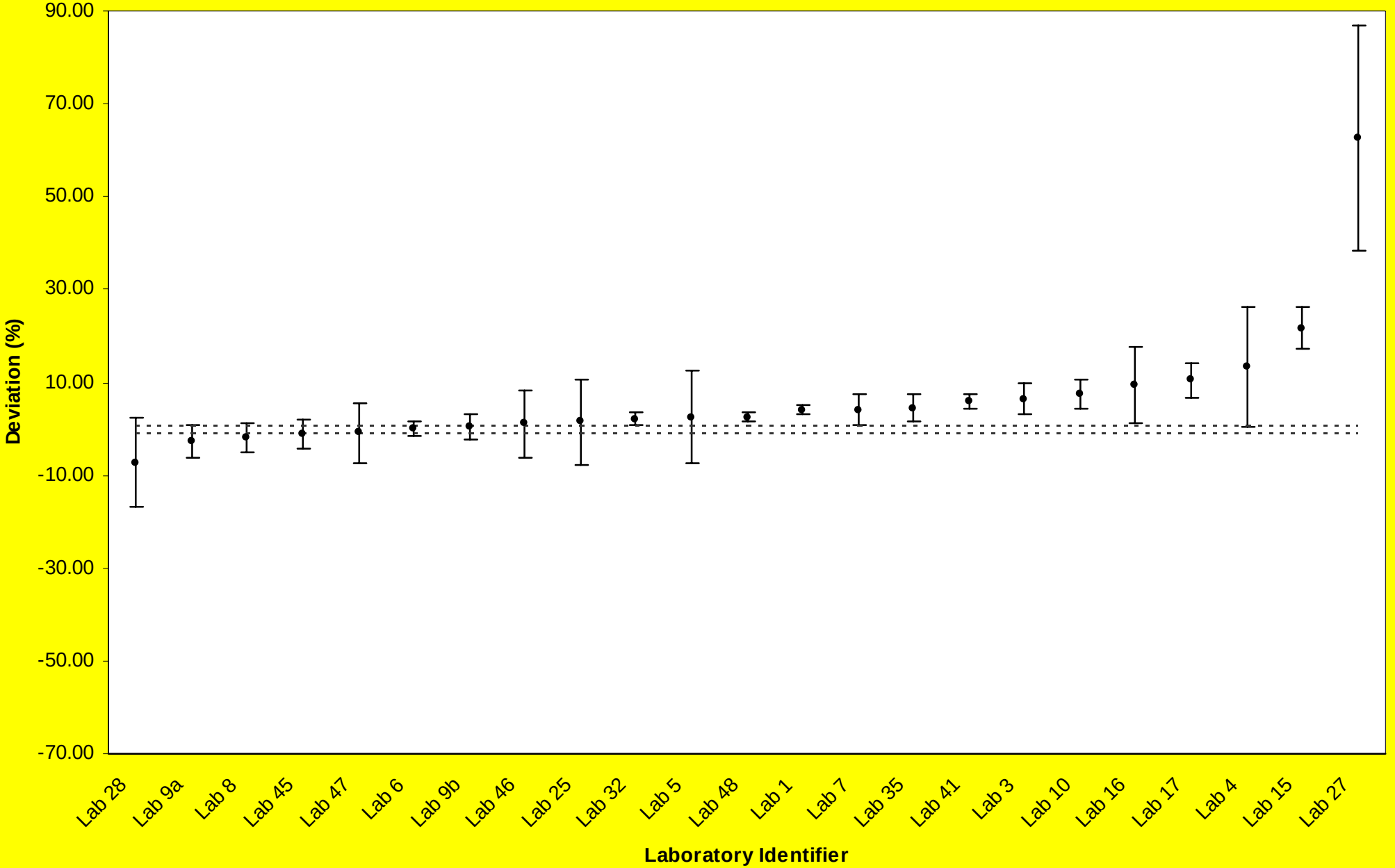


Figure 43: Reported Eu-155 high level results

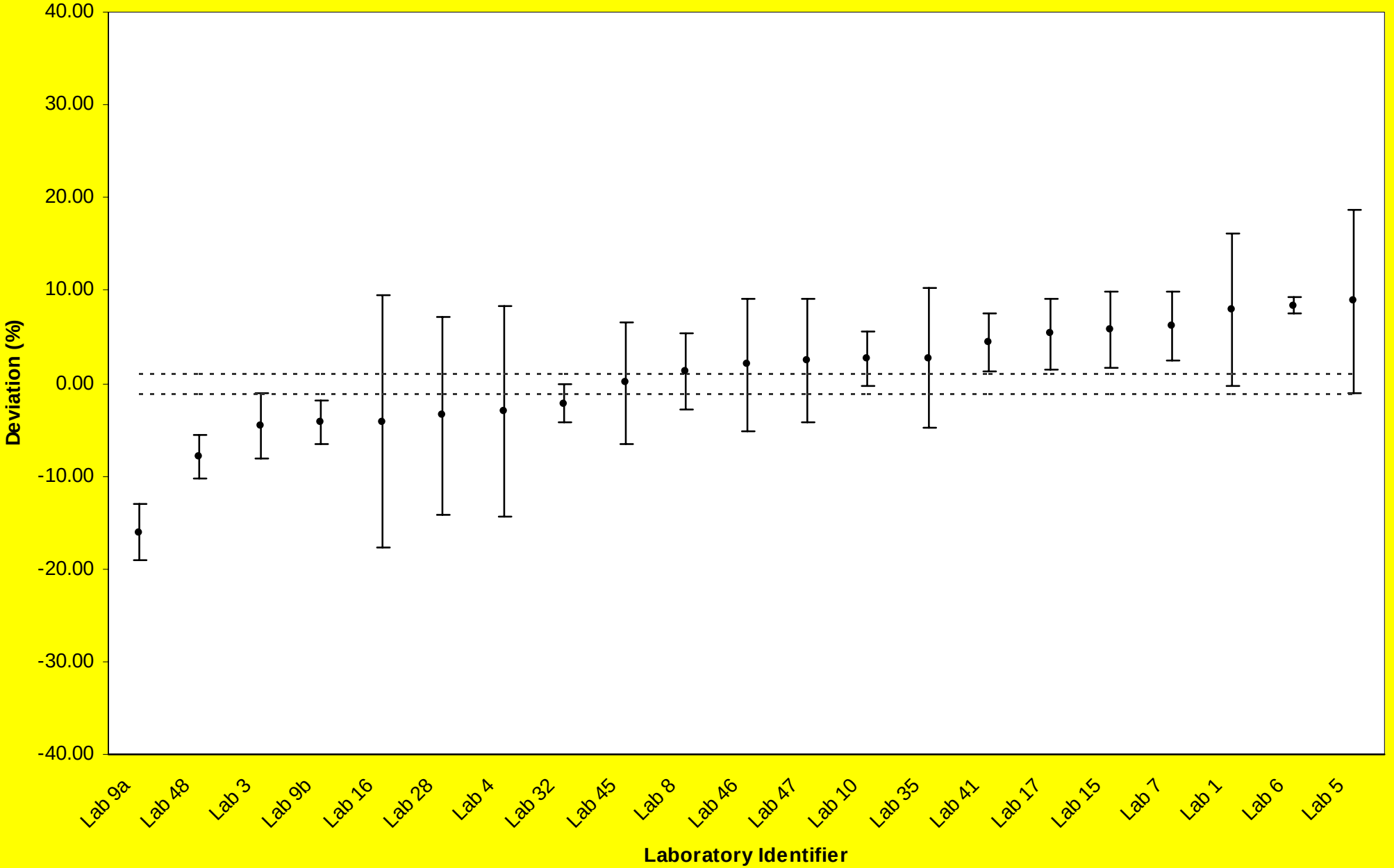


Figure 41: Reported Eu-154 low level results

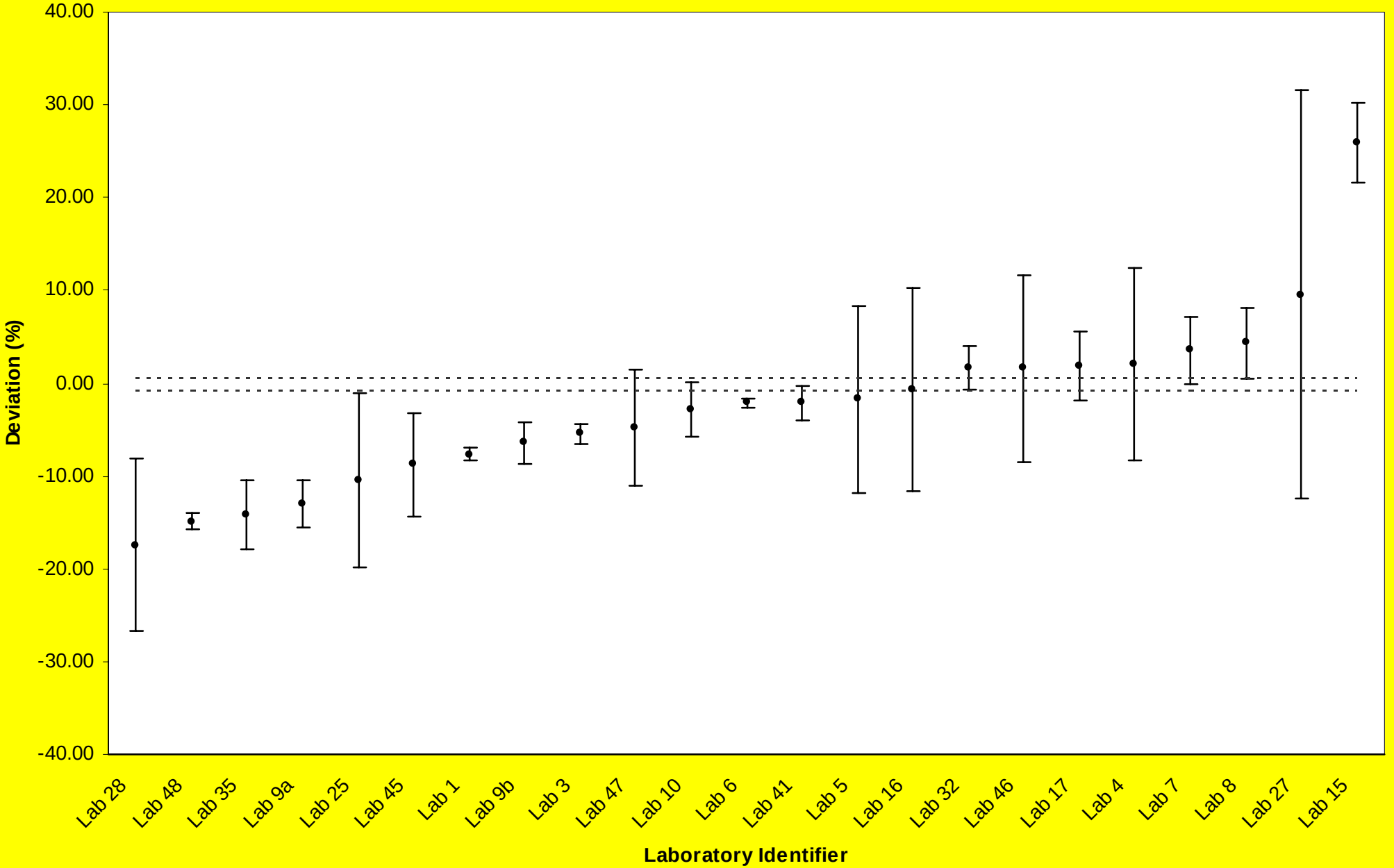


Figure 27: Reported Zr-95 high level results

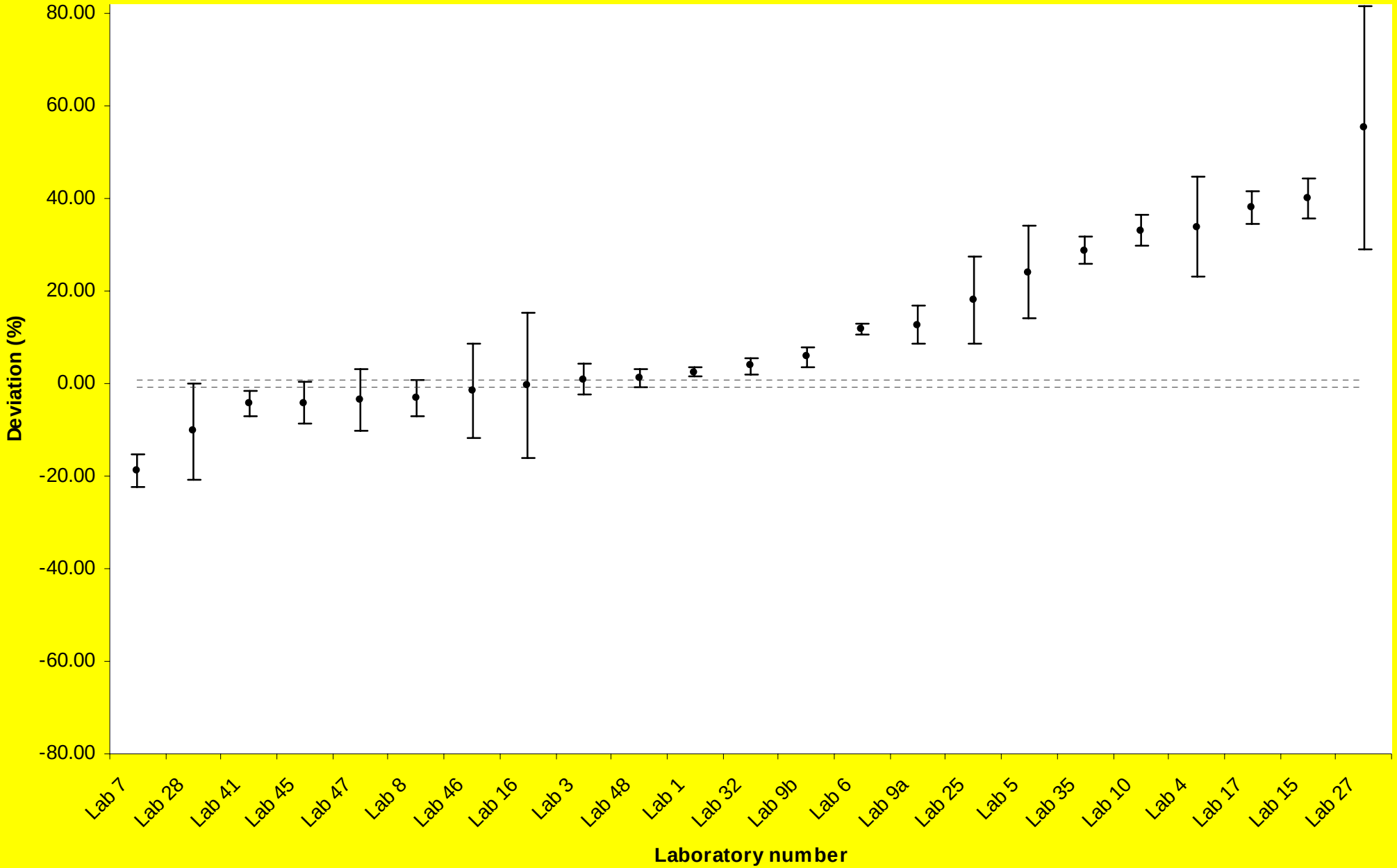


Figure 29 - Reported Ru-106 high level results

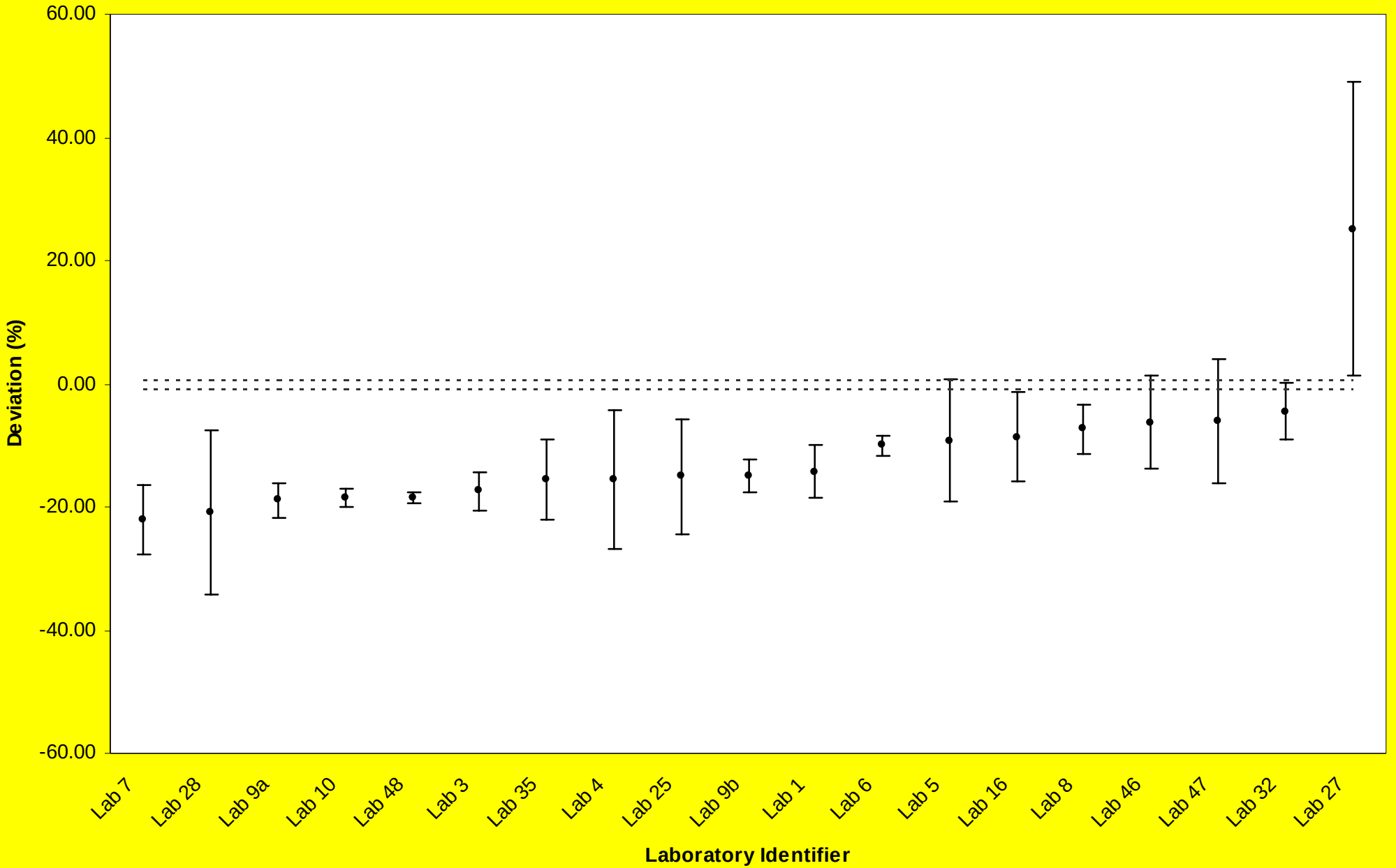
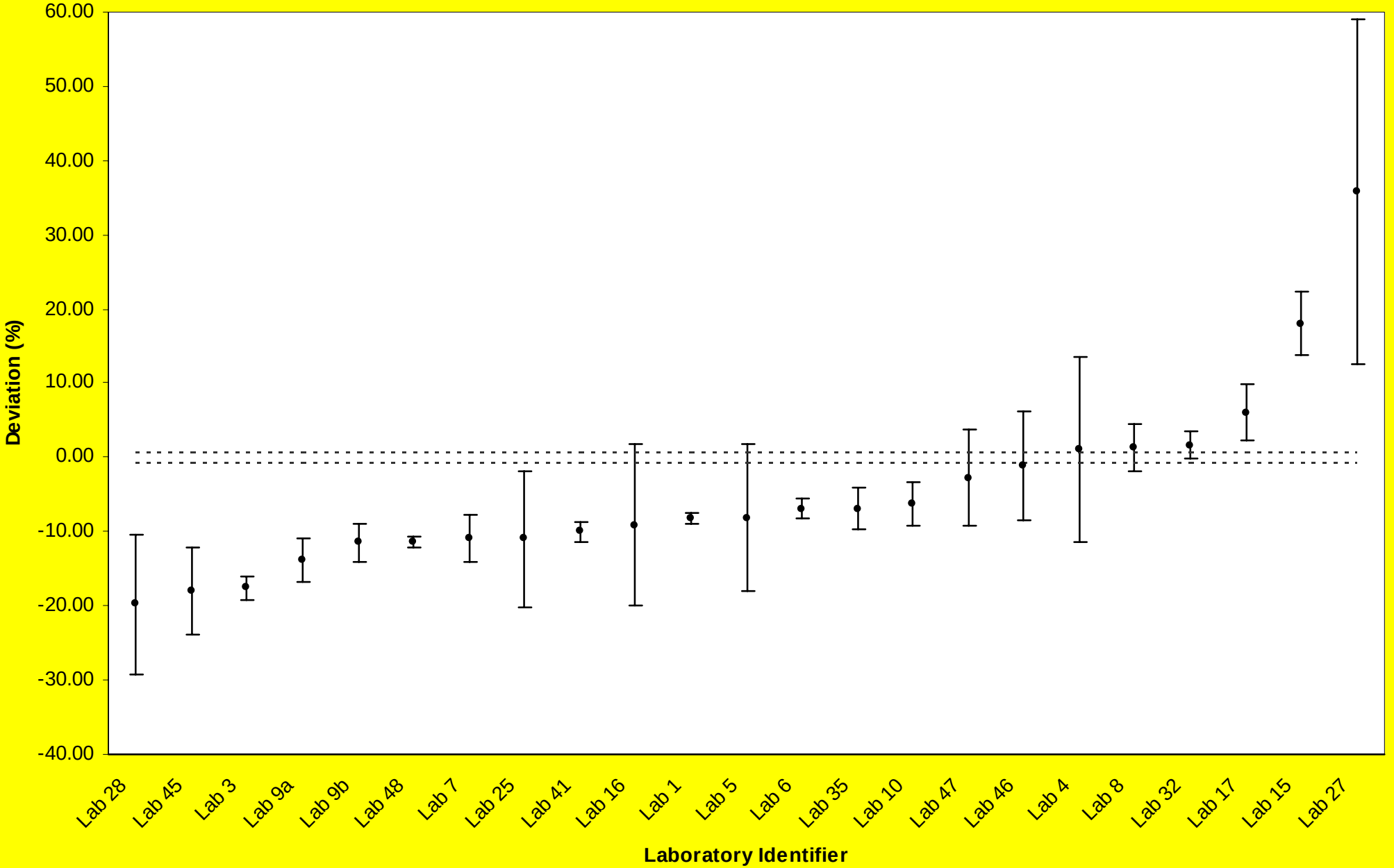


Figure 31: Reported Cs-134 high level results



Low Level Beta-Gamma Results

Whisker plots follow, in summary:

- The same problems seem to be encountered with the low level samples as with the high, but larger counting uncertainties make reaching objective conclusions difficult.

Figure 53 - Reported Cs-137 low level results

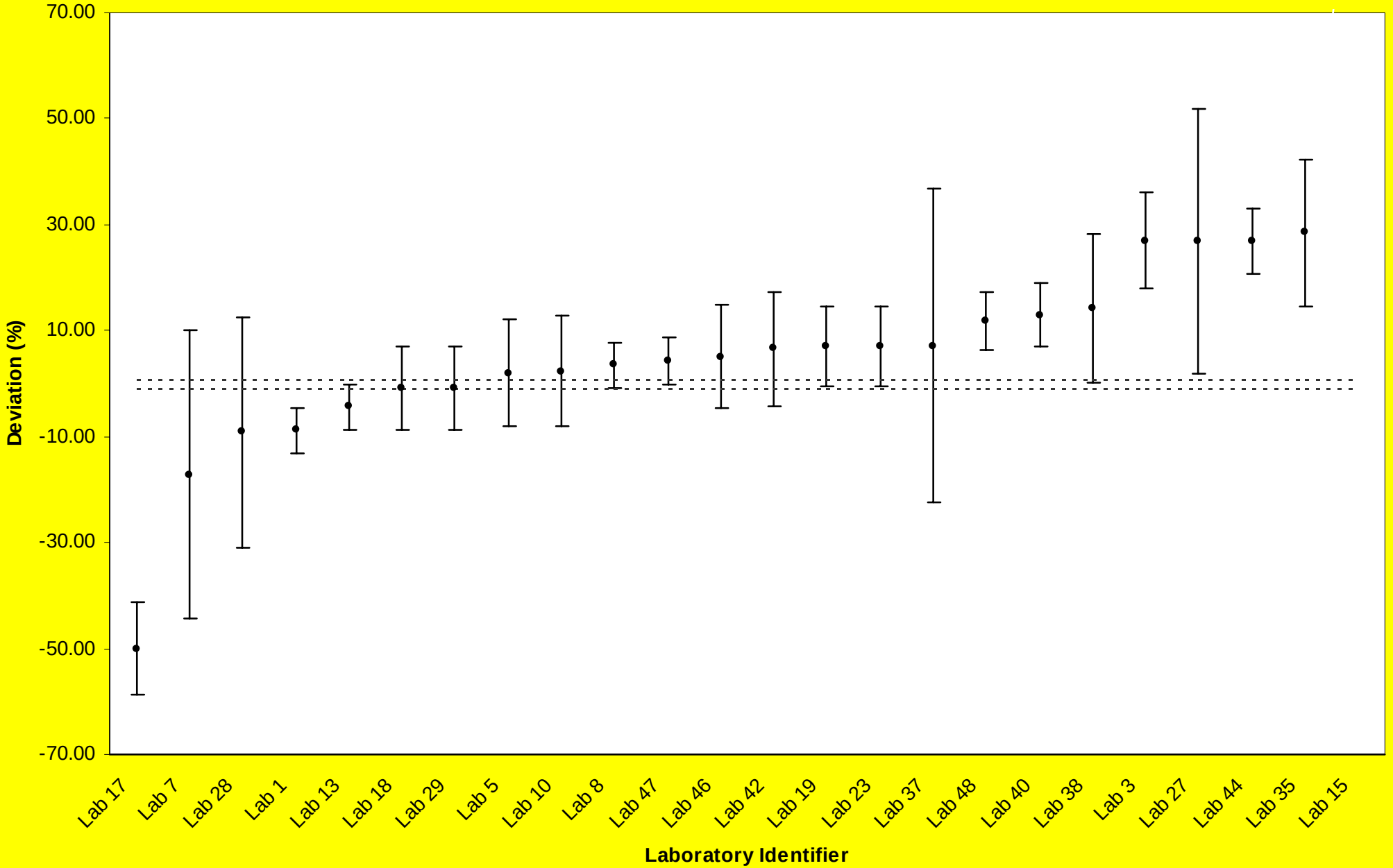


Figure 45: Reported Co-60 low level results

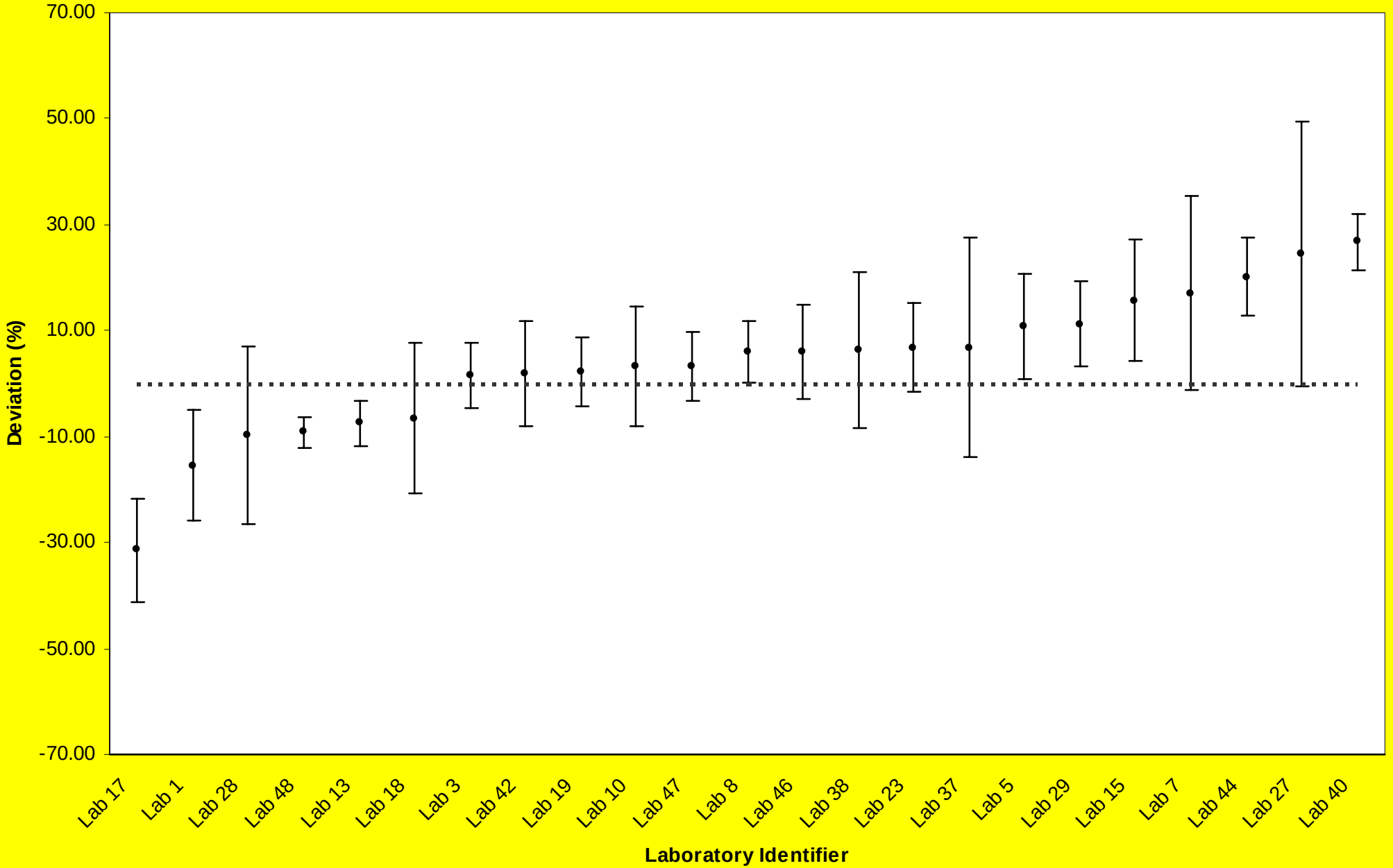


Figure 51: Reported Cs-134 low level results

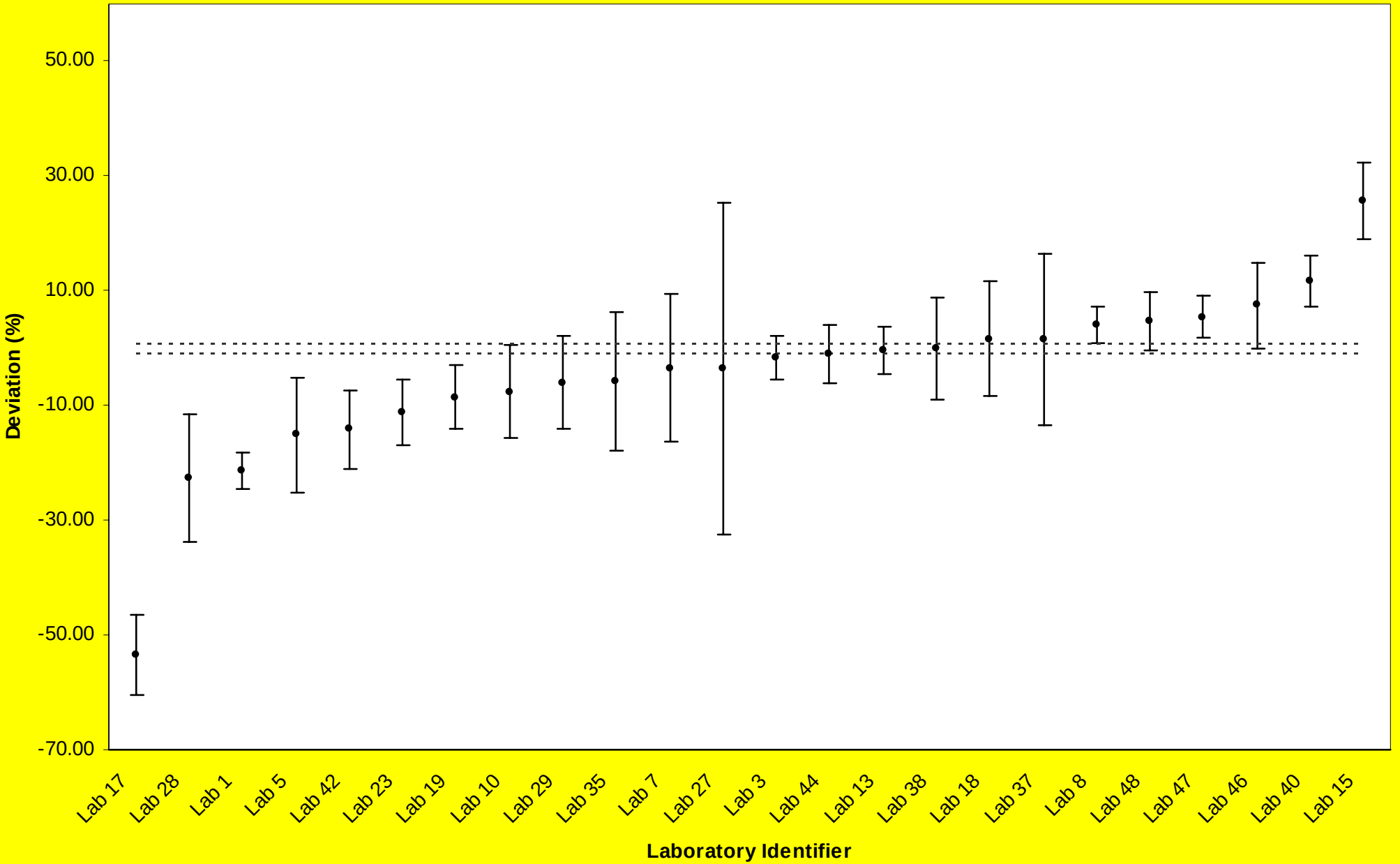


Figure 47 - Reported Zr-95 low level results

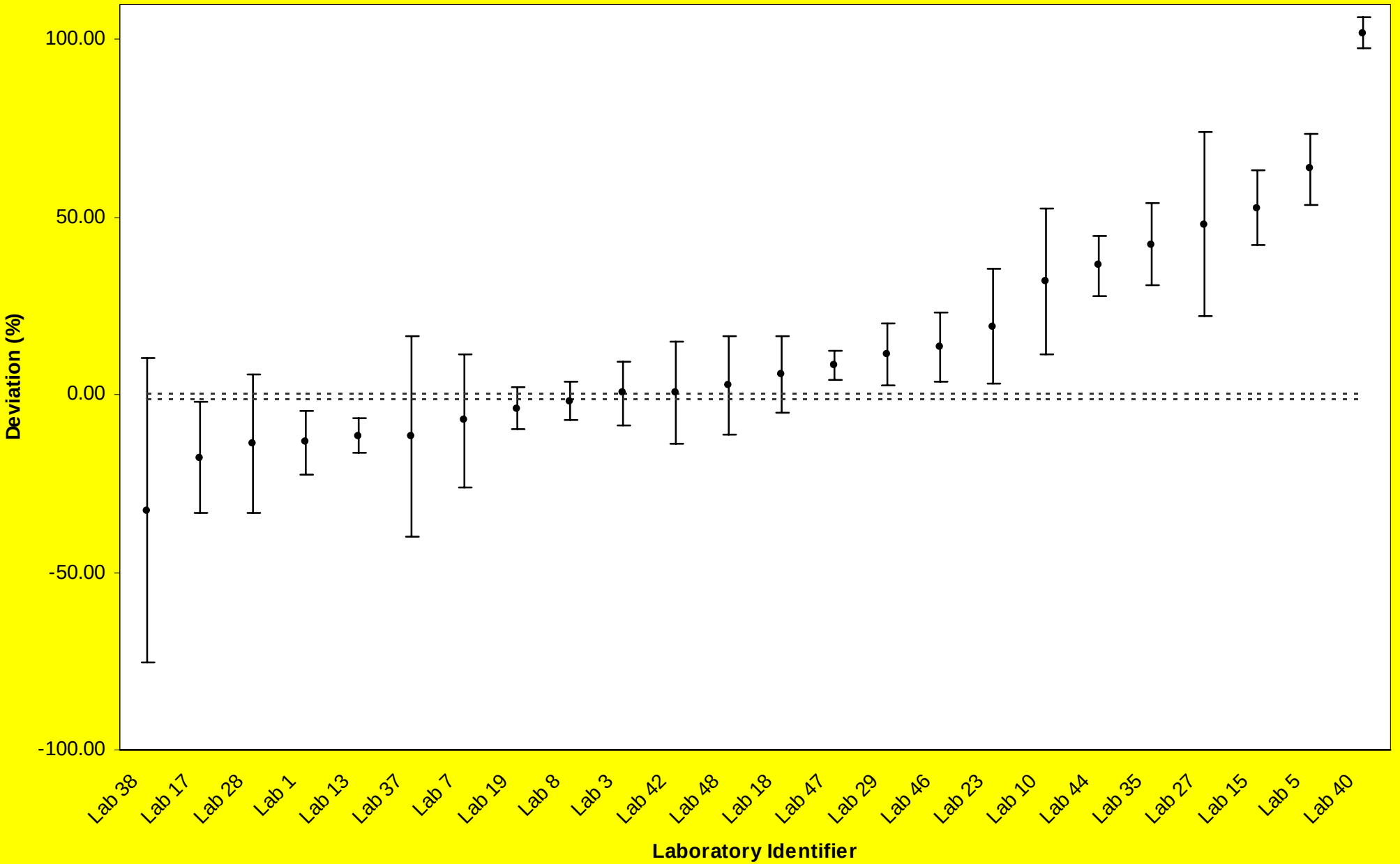


Figure 58: Reported Eu-155 low level results

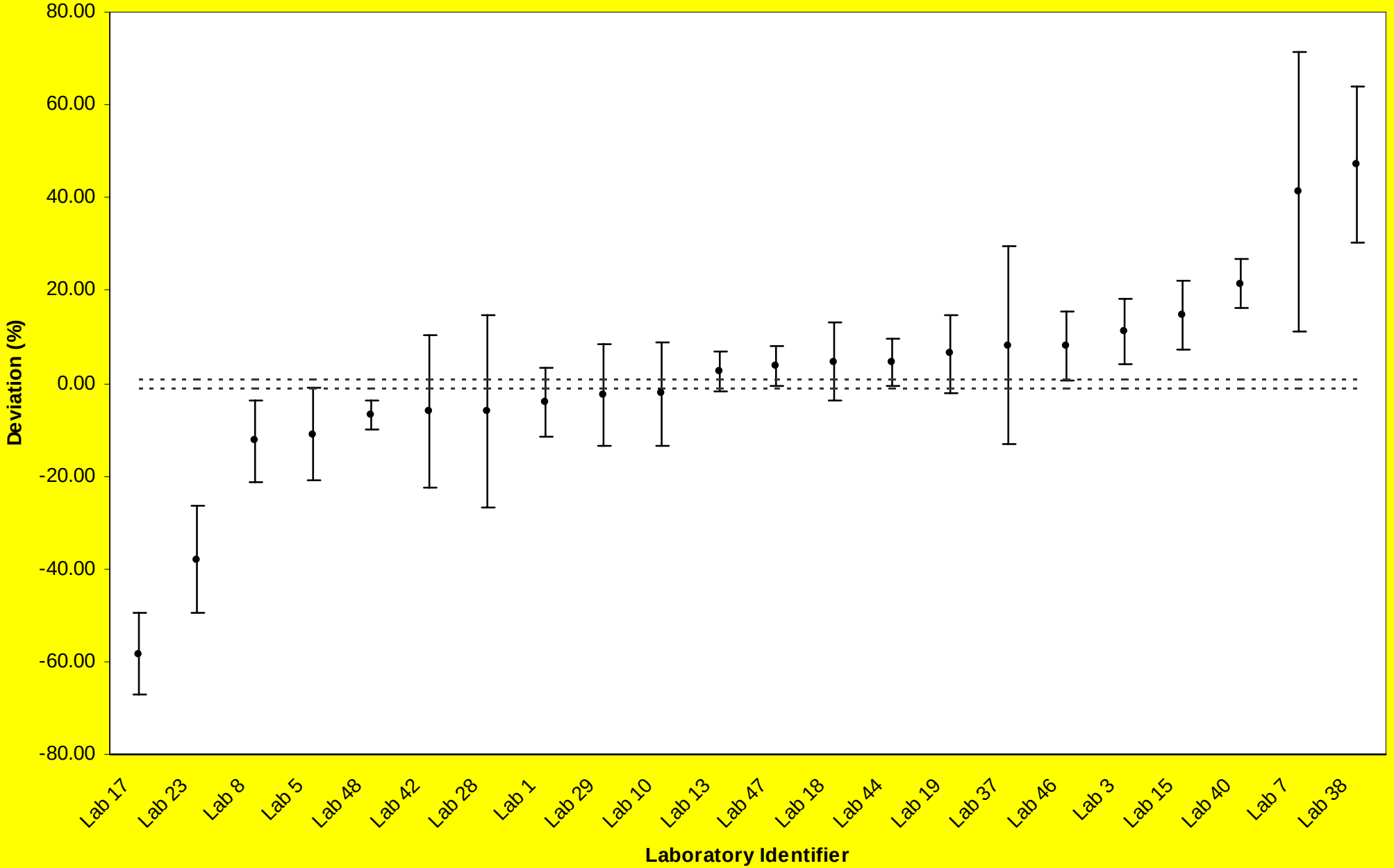


Figure 55: Reported Ce-144 low level results

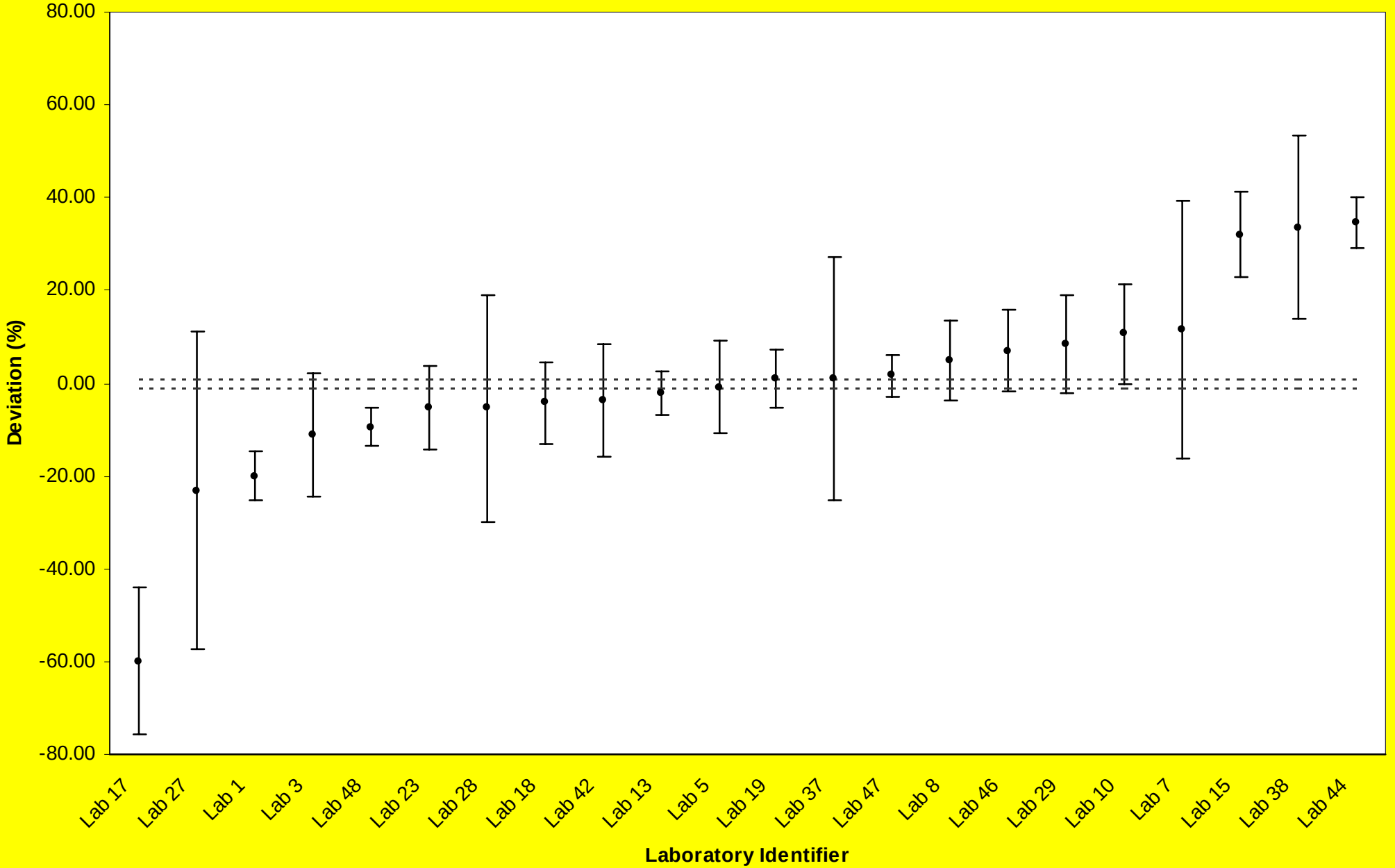


Figure 49: Reported Ru-106 low level results

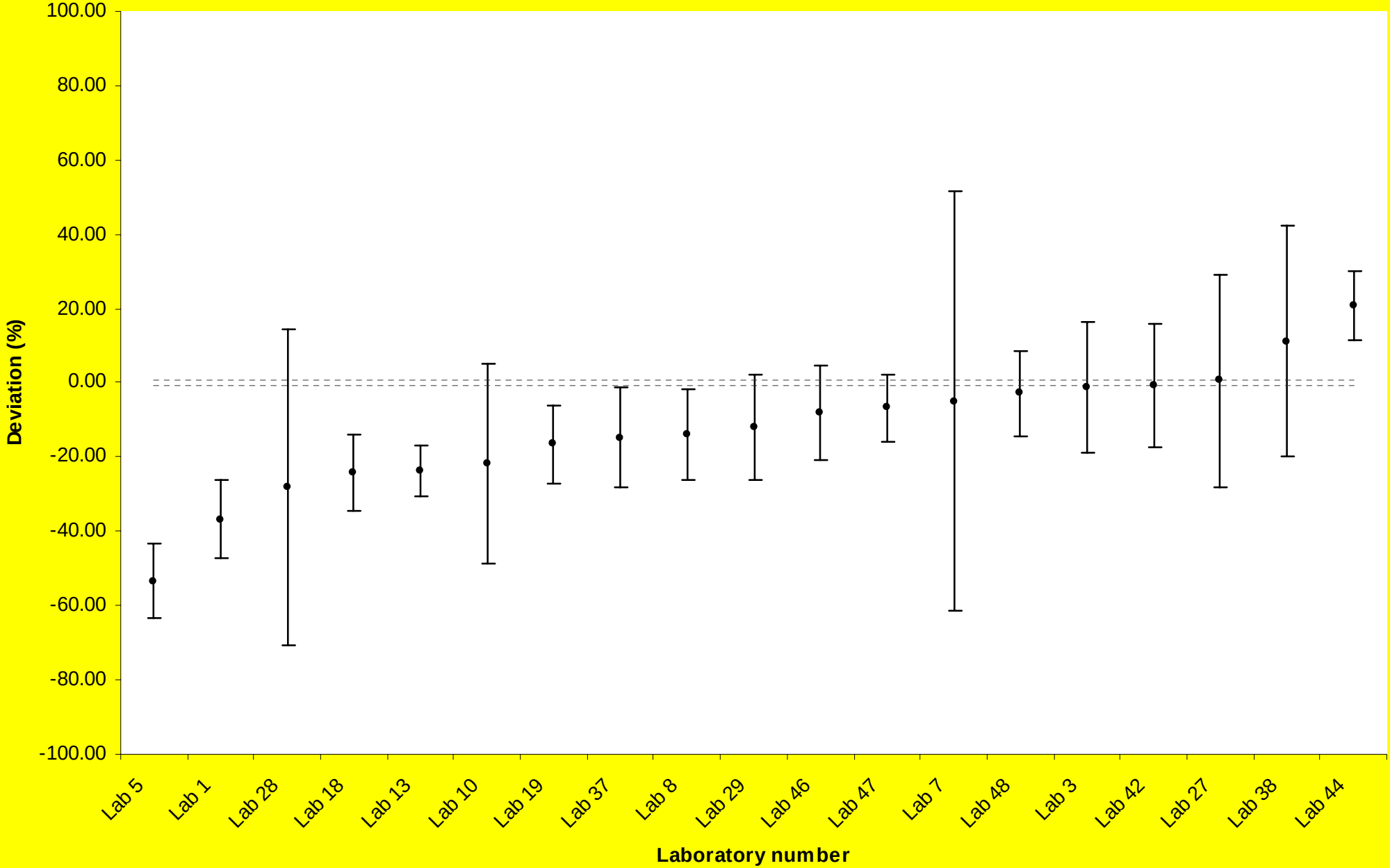
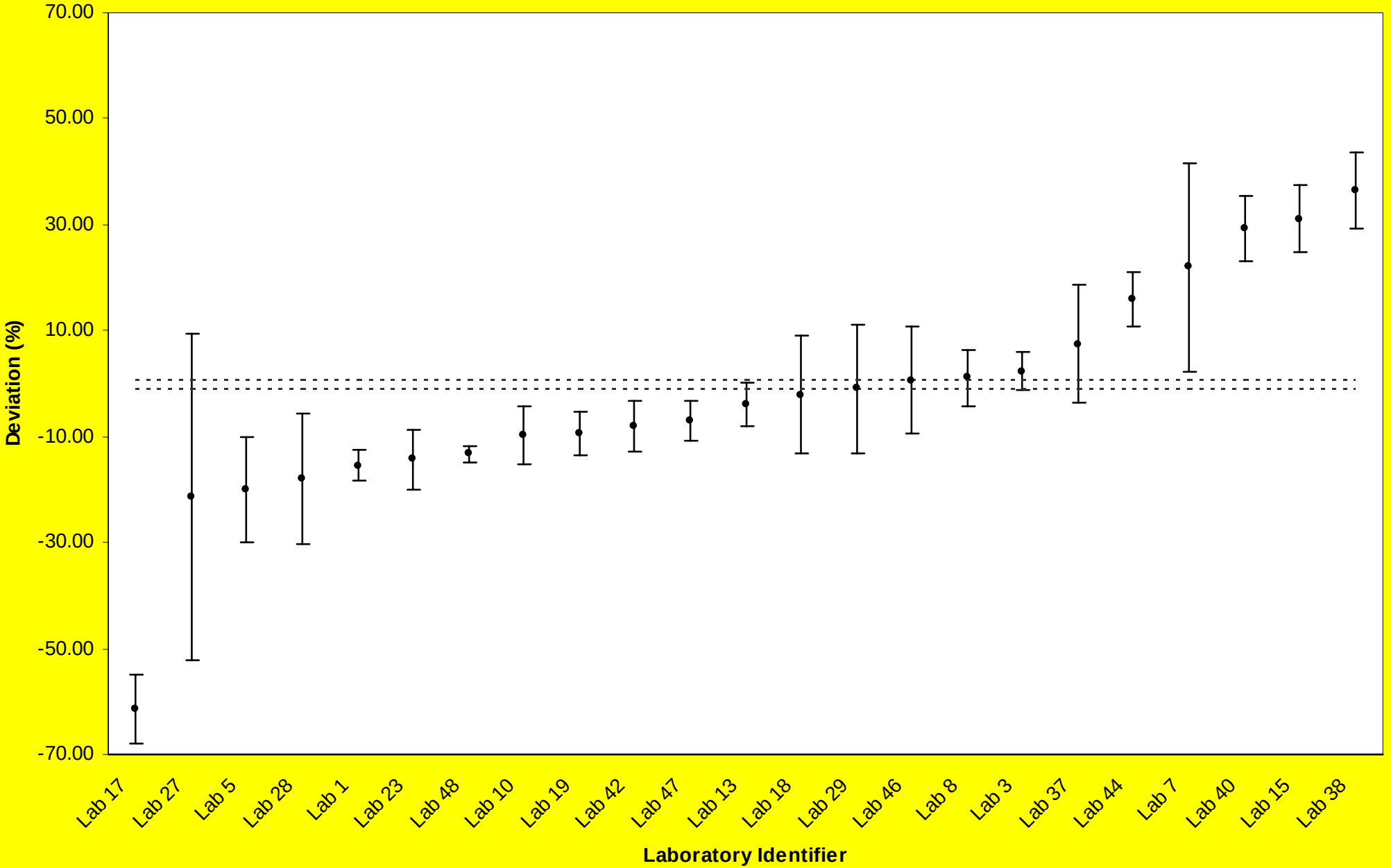


Figure 57: Reported Eu-154 low level results



Conclusions

In summary:

- Overall, very little change in performance compared with last year
- Some technical issues clearly remain with some radionuclides – Coincidence summing? Interference correction?
- Although the situation continues to improve, better uncertainty evaluations are still needed in some cases.

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