

# **Calibration of Surface Contamination Monitors**

## **UKAS Accredited Organisations**

### **2008 Comparison**

### **Preliminary data**

# **Schedule**

- 27 May**
- meeting of UKAS labs
  - agreed comparison exercise
  - Mini 900 E
  - each participant ships to next
- 26 June** - first measurement
- 11 September** - final measurement
- 25 November** - first wash-up meeting

# Instrument responses

Agreed all UKAS labs will report (on certificates) at least one of three standard response factors:

(1) Instrument response (emissions) =  $(R_s - R_b)/(SER/A_s)$

(2) Instrument response (activity) =  $(R_s - R_b)/(SER/A_s)/P$

(3)  $2\pi$  efficiency =  $(R_s - R_b)/(SER/A_s)/A_p$

Assume probe area =  $6.4 \text{ cm}^2$

# Comparison – minimum outputs

**Comparison against type-test benchmarks (where available)**

**(a) participant mean**

**(b) catalogue value from website**

**(c) DSTL historical data**

**Compliance based on uncertainties and  $\pm 30\%$  (GPG14)**

***Source uniformity data***

***Comparison of snapshot and eye-averaging techniques***

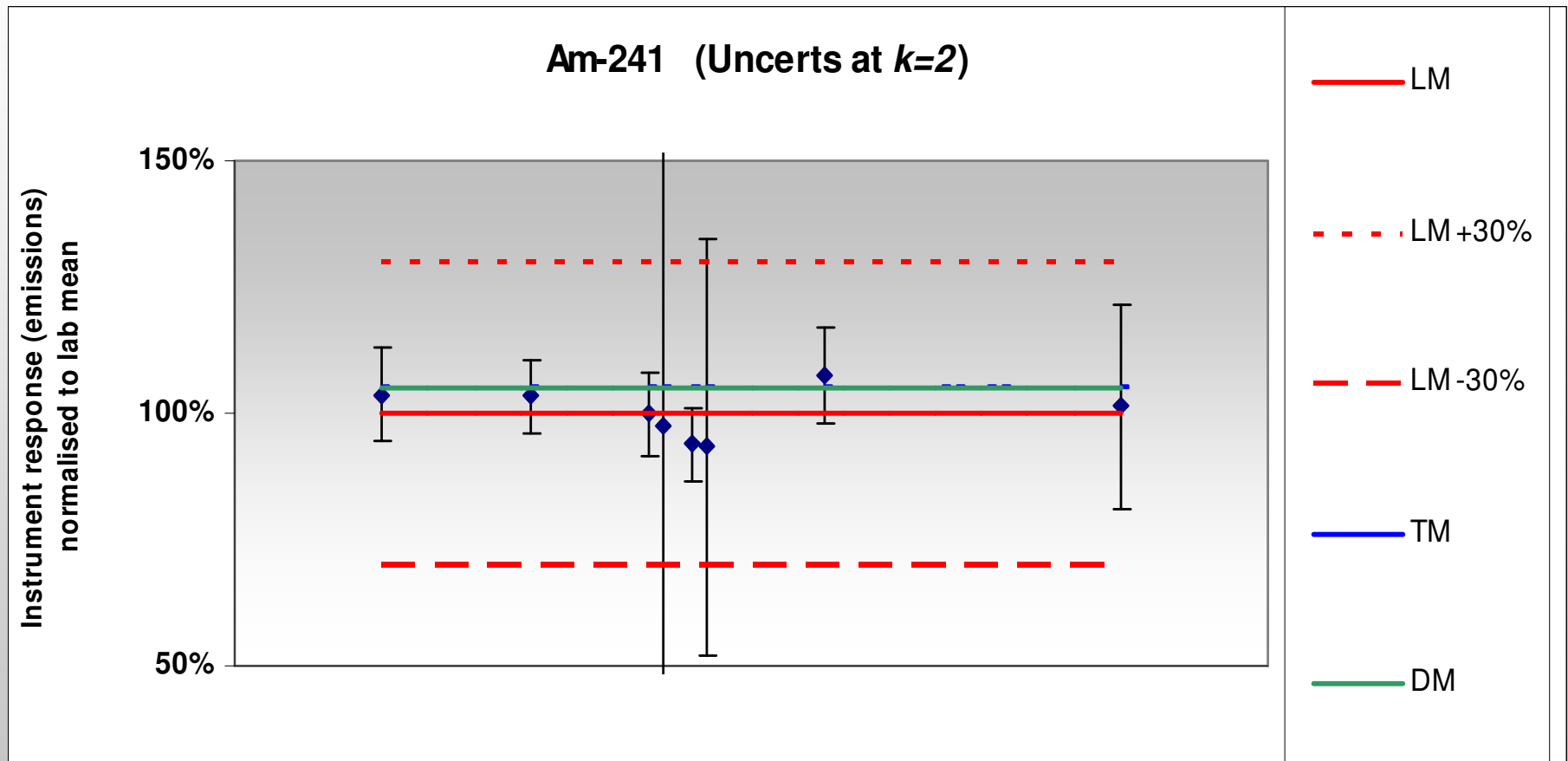
# Instrument



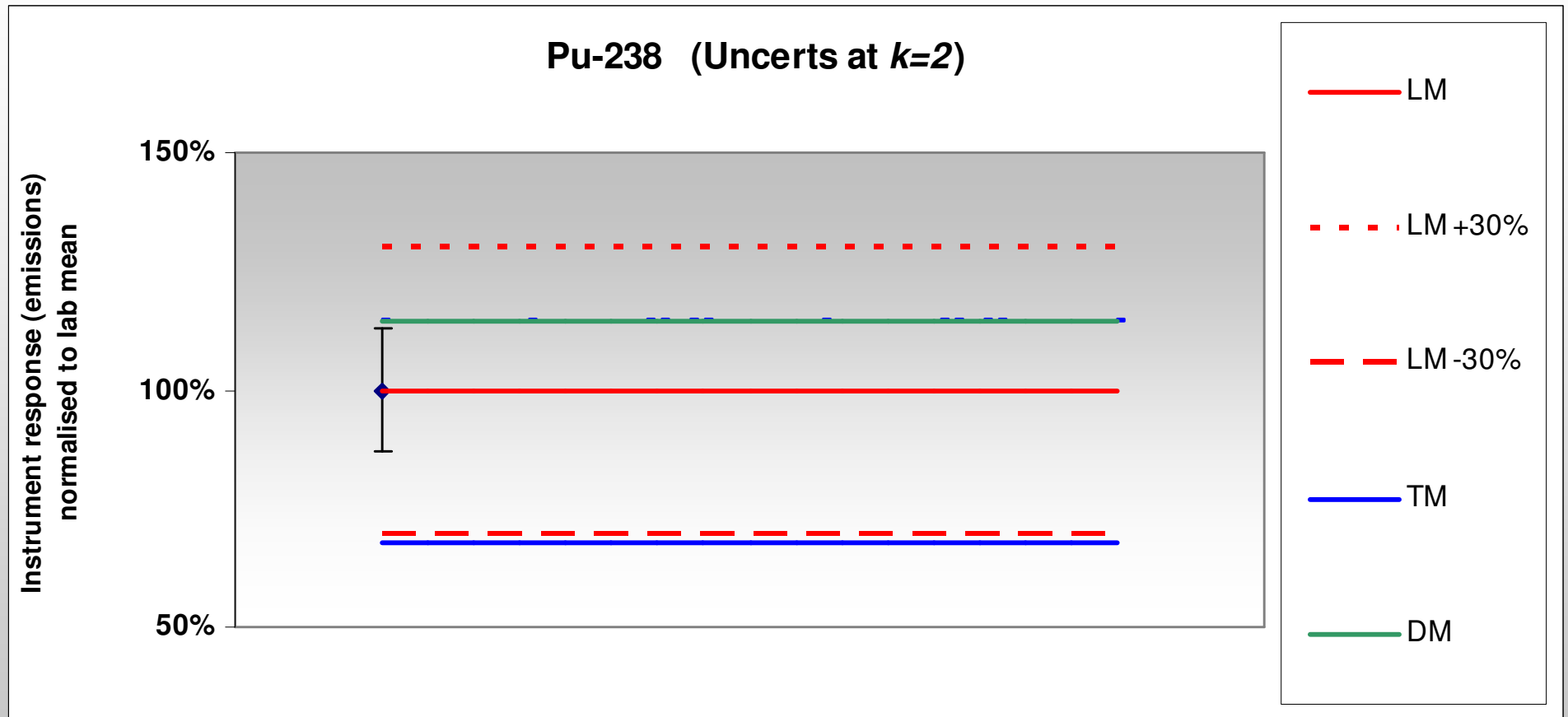
## Comparison Table

	Window	Sensitivities			
		Alpha ( $^{238}\text{Pu}$ )	Beta ( $^{14}\text{C}$ )	Beta ( $^{90}\text{Sr}/^{90}\text{Y}$ )	Gamma ( $^{137}\text{Cs}$ )
<b>900E</b>	6.4 cm <sup>2</sup>	0.6 s <sup>-1</sup> for 1 Bqcm <sup>-2</sup>	0.7 s <sup>-1</sup> for 1 Bqcm <sup>-2</sup>	1.8 s <sup>-1</sup> for 1 Bqcm <sup>-2</sup>	2.2 s <sup>-1</sup> for 1 mSv <sup>-1</sup>

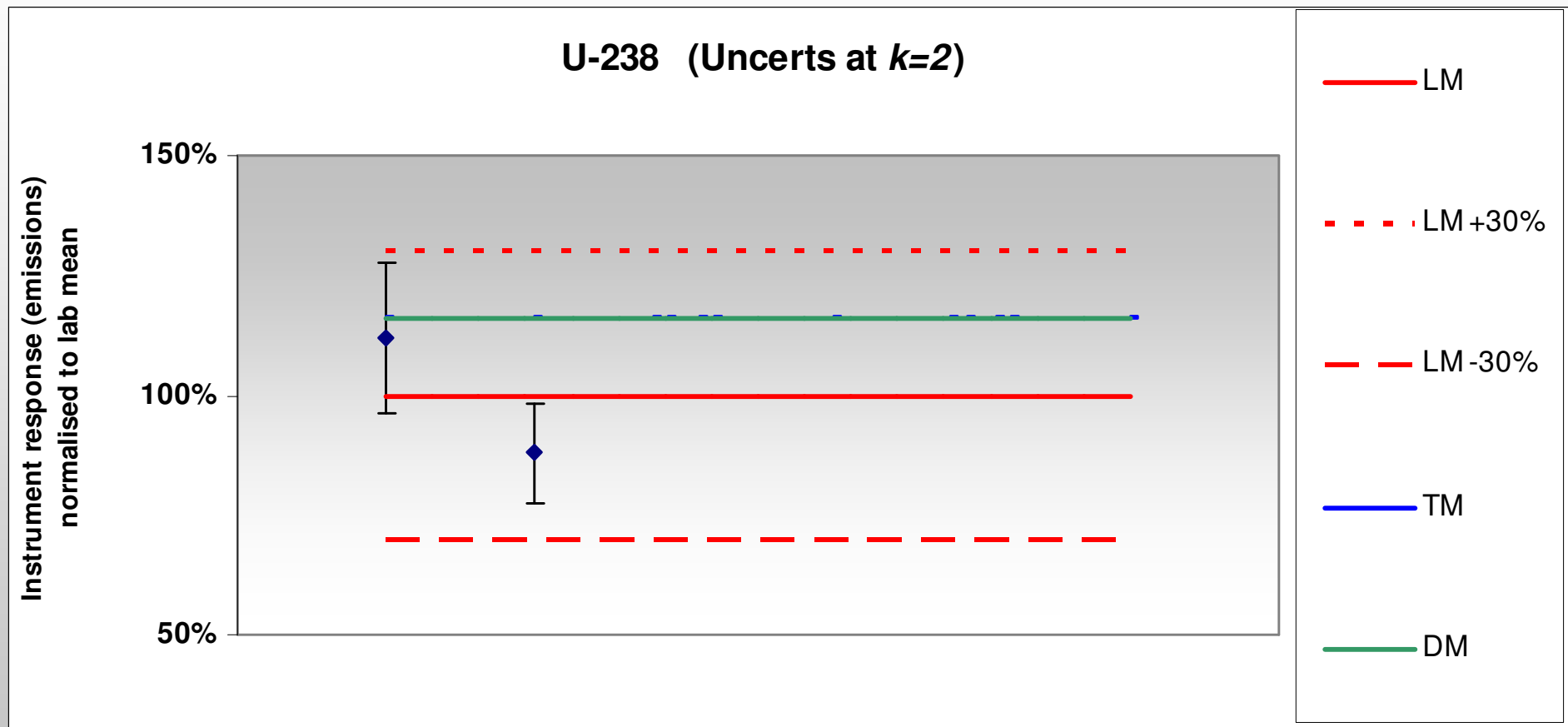
# Comparison results



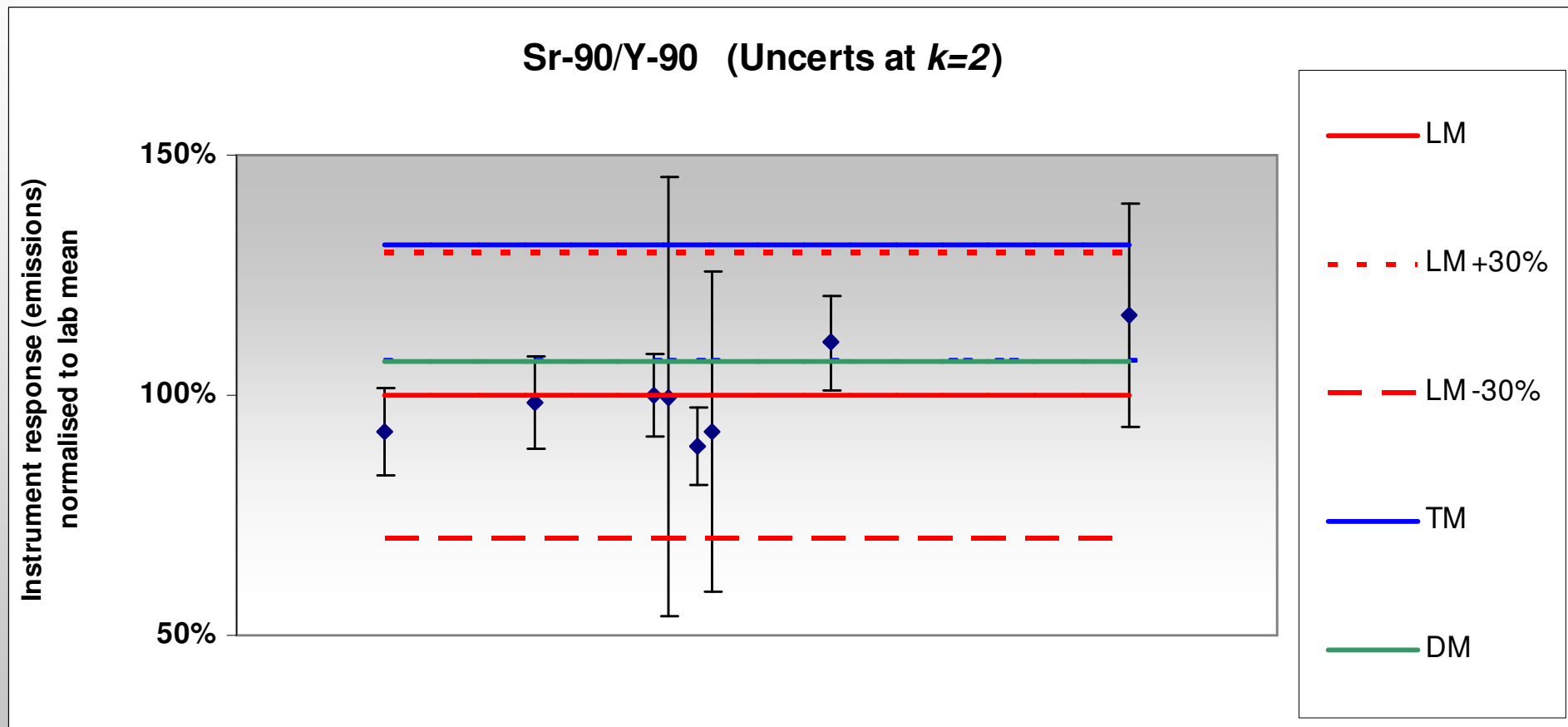
# Comparison results



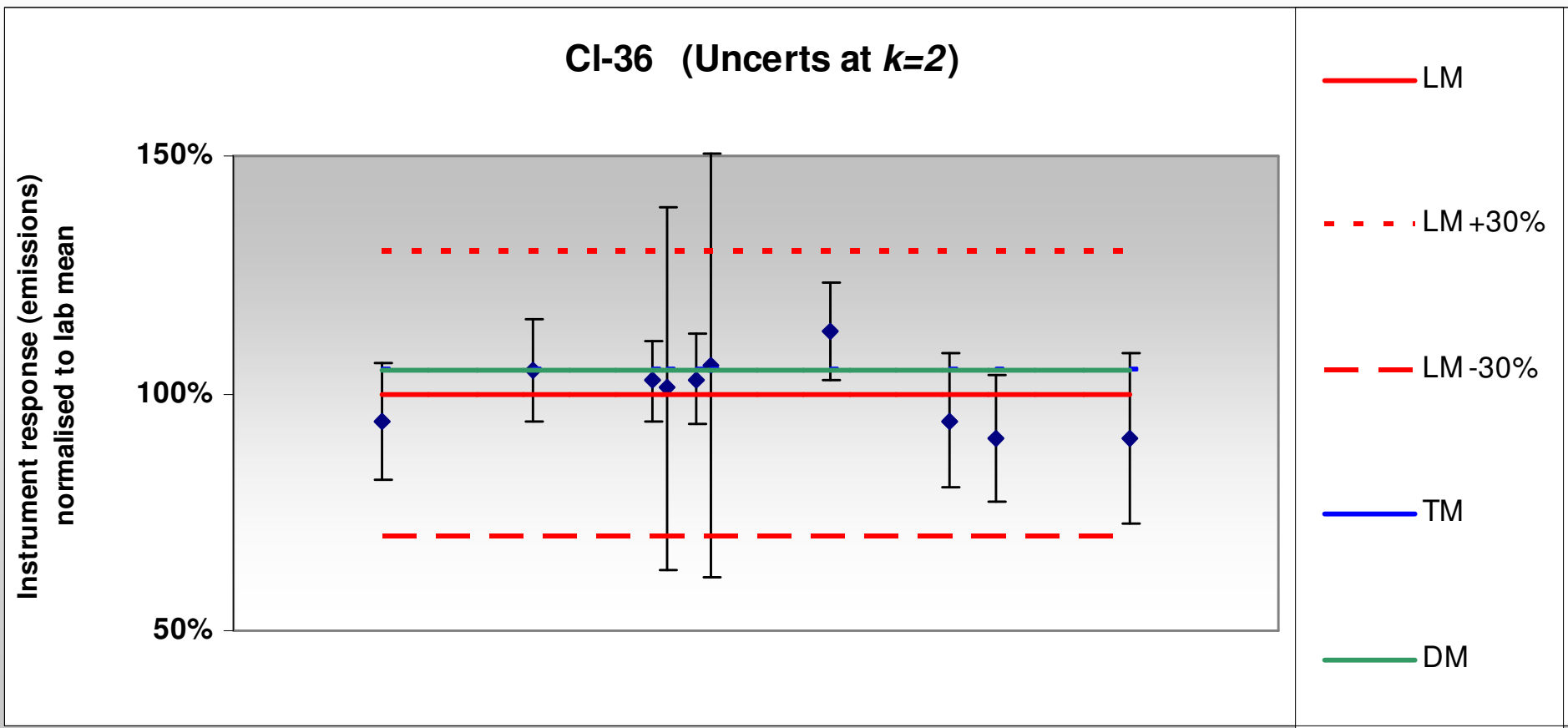
# Comparison results



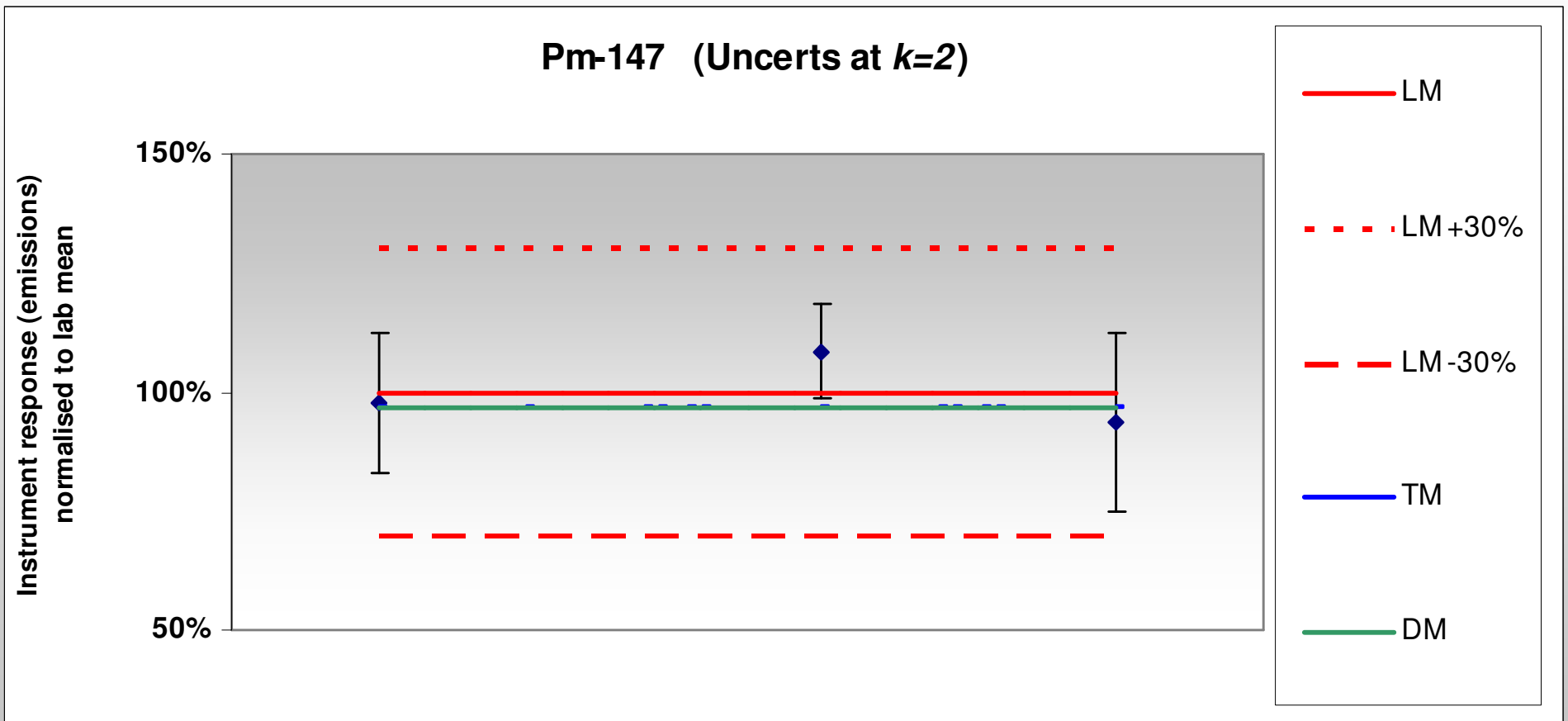
# Comparison results



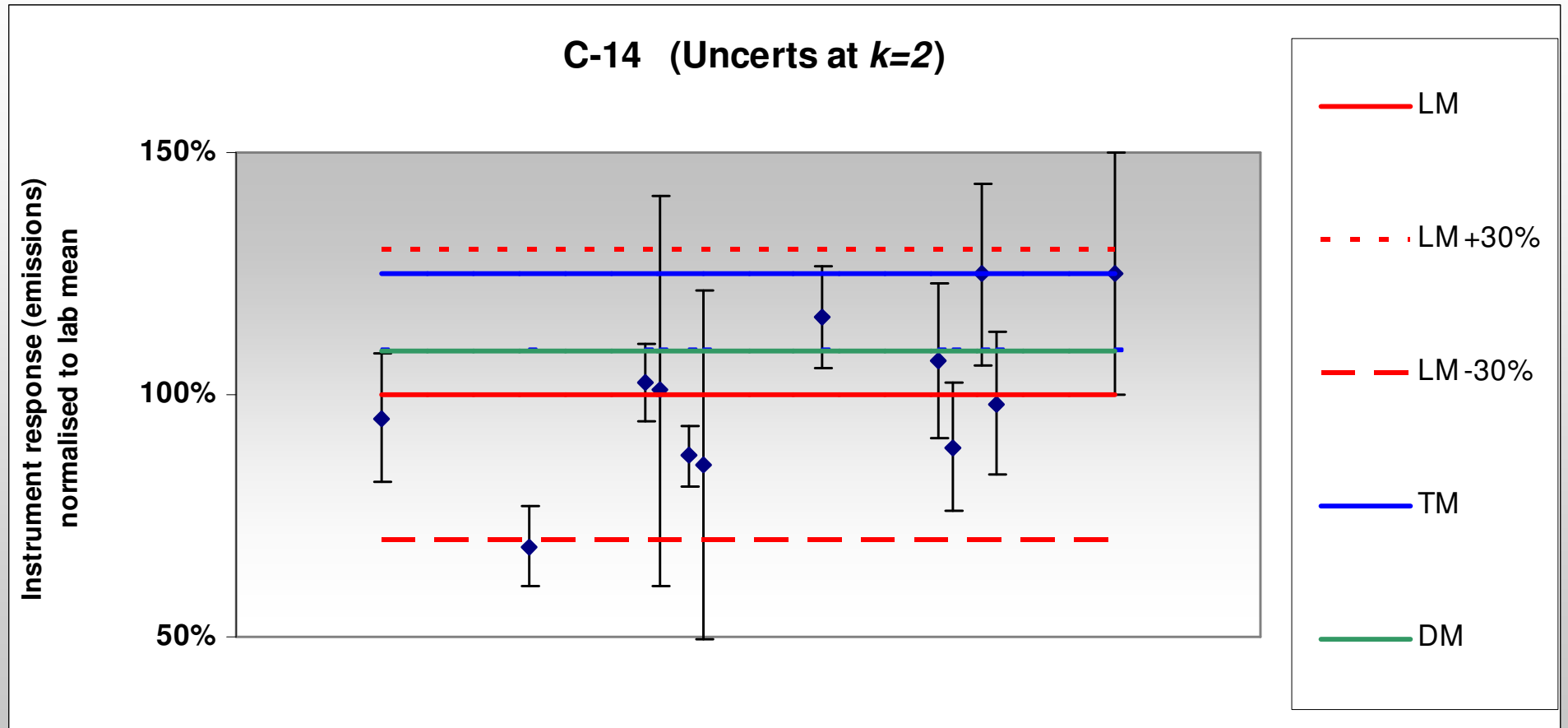
# Comparison results



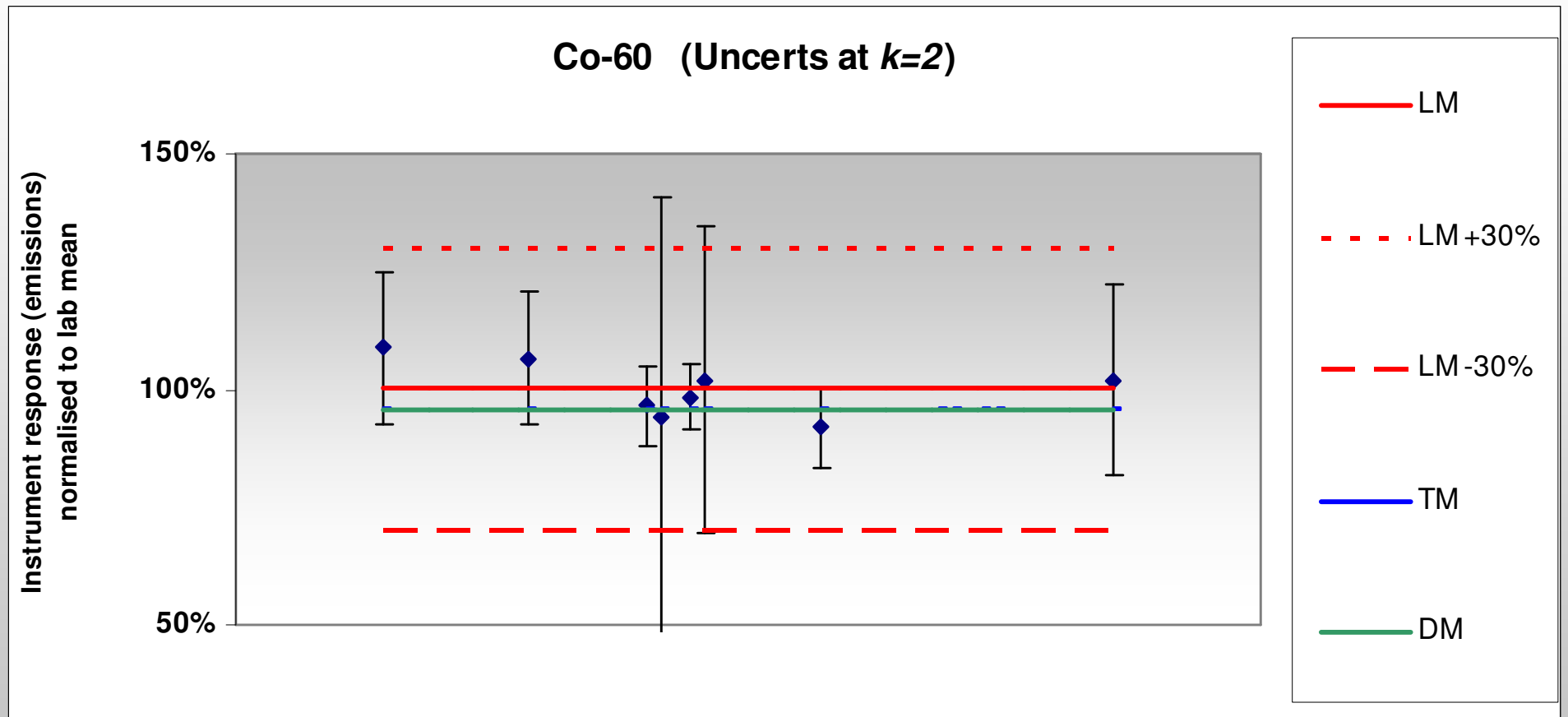
# Comparison results



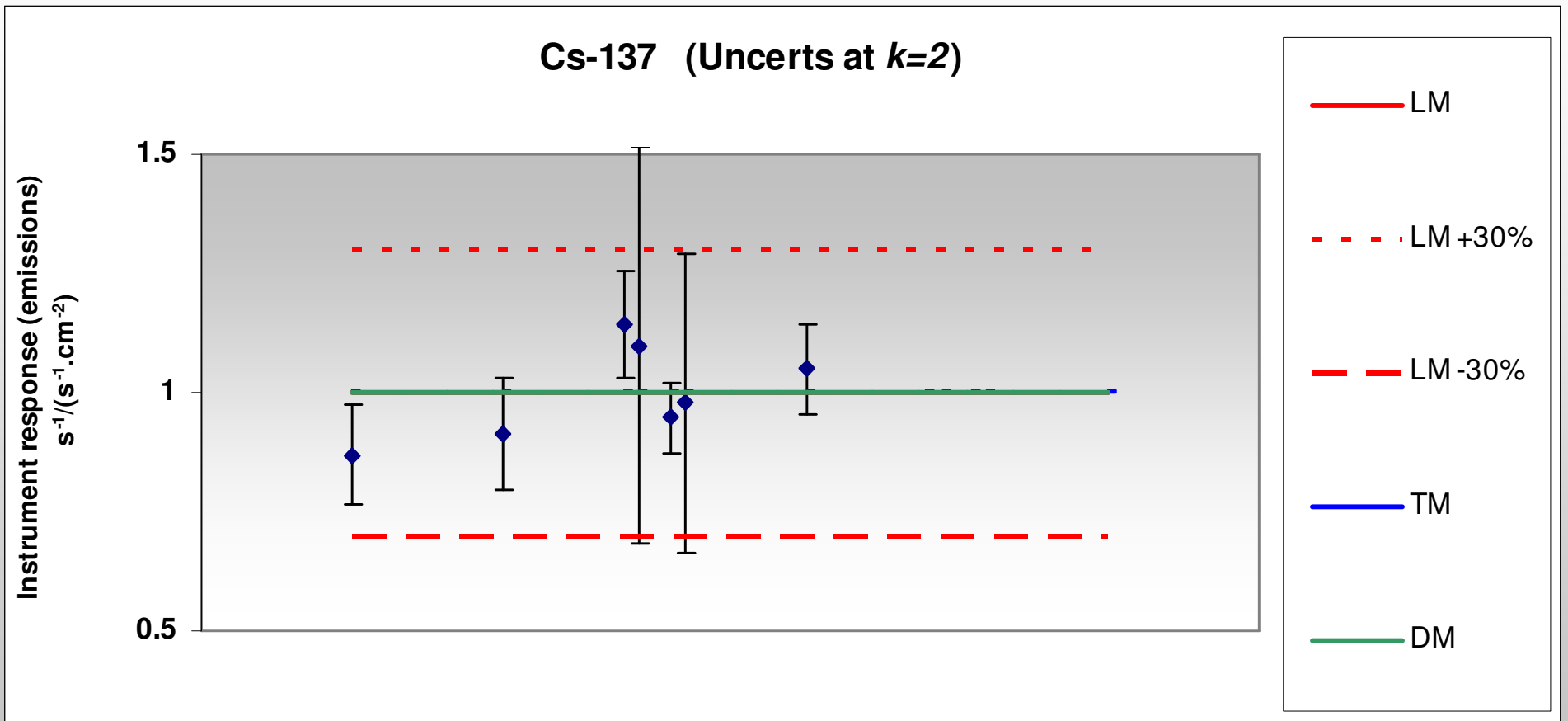
# Comparison results



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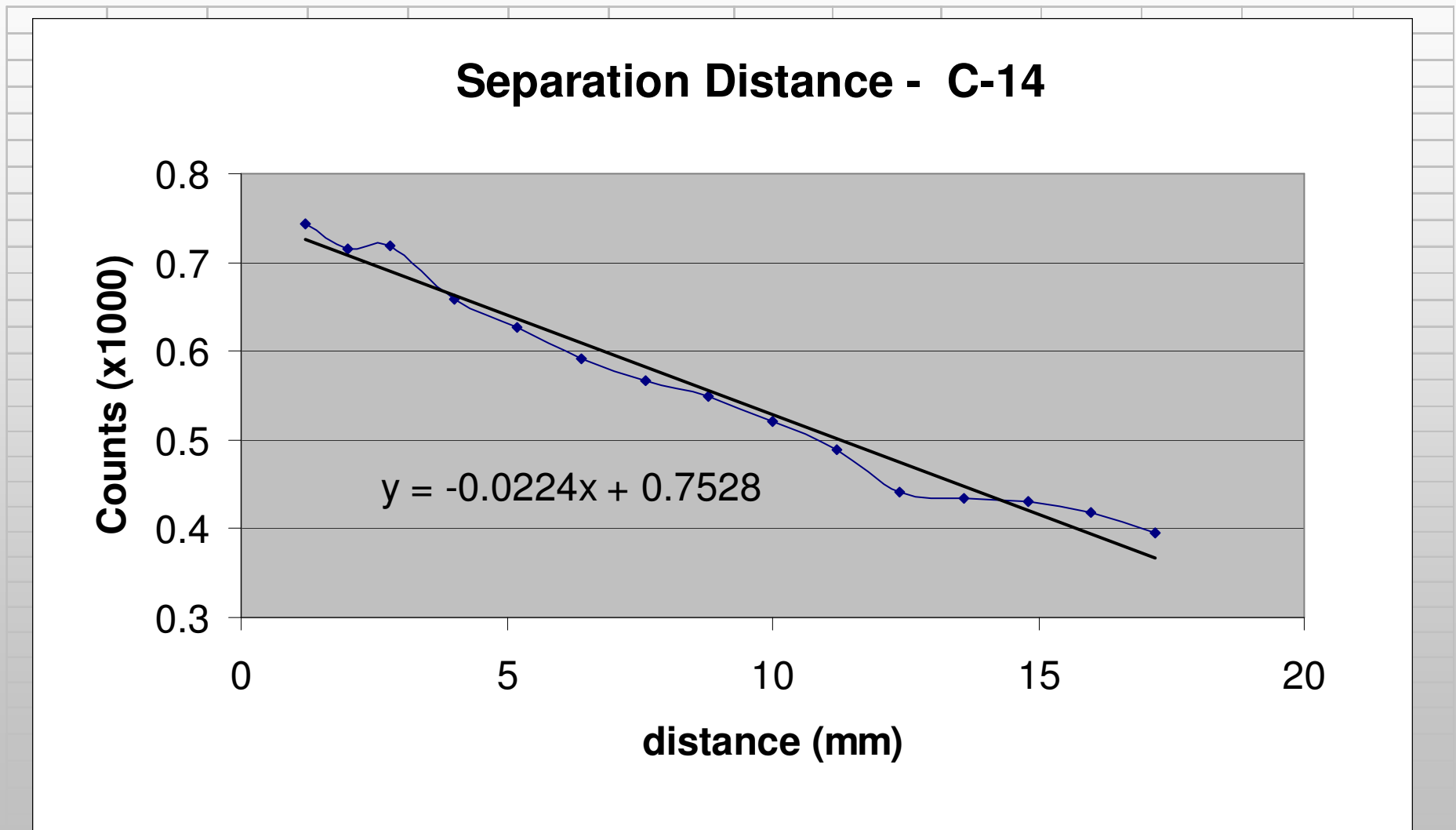


# Comparison results





# Variation of Response with Source-Detector Separation



## Variation of Response with Source-Detector Separation

Nuclide	change in response at 3 mm separation for change of 0.1 mm
Sr-90	0.23 %
Cl-36	0.18 %
Cs-137	0.20 %
Co-60	0.24 %
C-14	0.33 %
Am-241	0.65 %
Pu-239	0.61 %
U-238	1.3 %

# Thoughts/Questions

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- **Under what conditions and with what sources were manufacturers responses determined?**
- **Snapshot readings provide SD and SDOM**
- **SDOM is used for uncertainty on calibration factor**
- **Eye-averaging only estimates standard deviation NOT standard deviation of the mean**
- **How do we convert EA SDs to equivalent of SS SDOMs?**
- **Are SS observations under-estimating because the observer is biased by the first reading?**
- **How do we make EA more objective/less operator dependent?**

# Thoughts/Questions

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- **Difference between EA and SS means is small**
- **Results indicate good reproducibility between UKAS labs**
- **Results suggest C-14 spreads are result of source variations NOT lab techniques**
  
- **For UKAS labs**
  - **performance is good**