

Individual Evaluation Report for Laboratory No. 17

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The TRIC-2008 Proficiency test

Evaluation Criterias

Based on more than 40 years experience with open world-wide laboratory intercomparison studies, it was decided to use a modified u-score evaluation, where the trueness and precision of participants' results are evaluated separately.

For trueness evaluation the participants' results are assigned 'Acceptable' if:

$$A1 \leq A2$$

$$A1 = |Value_{IAEA} - Value_{Lab}|$$

where

$$A2 = 2.58 \times \sqrt{Unc_{IAEA}^2 + Unc_{Lab}^2}$$

For evaluation of precision estimator P is calculated for each participant, according to the following formula:

$$P = \sqrt{\left(\frac{Unc_{IAEA}}{Value_{IAEA}}\right)^2 + \left(\frac{Unc_{Lab}}{Value_{Lab}}\right)^2} \times 100 \quad [\%]$$

P directly depends on the measurement uncertainty claimed by the participant. The acceptance limit for precision (LAP) for each analyte respectively is defined in Tables 1 - 3 including any adjustment due to the concentration or activity level of the analytes concerned and the complexity of the analytical problem. Participants' results are scored as 'Acceptable' for precision when ($P < LAP$) or ($P = LAP$).

In the final evaluation, both scores for trueness and precision are combined. A result must obtain 'Acceptable' score in both criteria to be assigned final score 'Acceptable'. Obviously, if a score 'Not Acceptable' was obtained for both, trueness and precision, the final score will also be 'Not Acceptable'. In cases where either precision or trueness is 'Not Acceptable', further check is applied. The value of the relative bias (RB) is compared with the maximum acceptable bias (MAB), which is defined by the IAEA in advance, similarly as LAP. If ($RB < MAB$) or ($RB = MAB$), the final score will be 'Warning'. If $RB > MAB$, the result will be 'Not Acceptable'. 'Warning' will reflect mainly two situations. The first situation will be a biased result with small measurement uncertainty, however still within MAB. The second situation will appear when result close to the assigned property value will be reported, but the associated uncertainty is large.

References:

- 1.) Guide to the Expression of Uncertainty in Measurement, International Organization for Standardization, Geneva, 1995.
- 2.) Quantifying Uncertainty in Nuclear Analytical Measurements, TECDOC-1401, International Atomic Energy Agency, Vienna, 2004.
- 3.) C. J. Brookes, I. G. Betteley, and S. M. Loxton, Fundamentals of Mathematics and Statistics, Wiley, UK, 1979.
- 4.) ISO 5725 (E), 'Accuracy (trueness and precision) of Measurement Methods and Results', International Organization for Standardization, Geneva, 1994.

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Acceptance Limits

Please find below in the tables the acceptance limits for LAP (%) and MAB (%) in relation to the matrix and the analyte that have been used for the evaluation.

Parameter Table

| Sample | LAP(%) | MAB(%) |
|--------|--------|--------|
| T14 | 130 | 130 |
| T15 | 50 | 50 |
| T16 | 25 | 25 |
| T17 | 18 | 18 |
| T18 | 300 | 300 |
| T19 | 5 | 5 |

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Laboratory No. 17, Results submitted on 2009-02-28

2010-07-07

Individual Evaluation

Reference Date: 01 December 2008

| Sample | IAEA Value [TRU] | IAEA Unc [1sigma] | Lab Value [TRU] | Lab Unc [1sigma] | Lab Unc % | Rel. Bias % | z-Score | u-Test | Ratio Lab/IAEA | A1 | A2 | Trueness | P(%) | Precision | Final Score |
|--------|------------------|-------------------|-----------------|------------------|-----------|-------------|---------|--------|----------------|-------|-------|----------|-------|-----------|-------------|
| T14 | 1.54 | 0.05 | 1.75 | 0.18 | 10.29 | 13.64 | 0.10 | 1.12 | 1.14 | 0.21 | 0.48 | A | 10.79 | A | A |
| T15 | 4.07 | 0.05 | 4.32 | 0.23 | 5.32 | 6.14 | 0.12 | 1.06 | 1.06 | 0.25 | 0.61 | A | 5.46 | A | A |
| T16 | 7.74 | 0.06 | 7.76 | 0.29 | 3.74 | 0.26 | 0.01 | 0.07 | 1.00 | 0.02 | 0.76 | A | 3.82 | A | A |
| T17 | 14.46 | 0.08 | 15.4 | 0.5 | 3.25 | 6.50 | 0.36 | 1.86 | 1.07 | 0.94 | 1.31 | A | 3.29 | A | A |
| T18 | 0.67 | 0.05 | 0.80 | 0.17 | 21.25 | 19.40 | 0.06 | 0.73 | 1.19 | 0.13 | 0.46 | A | 22.52 | A | A |
| T19 | 568.7 | 2.3 | 581 | 9 | 1.55 | 2.16 | 0.43 | 1.32 | 1.02 | 12.30 | 23.97 | A | 1.60 | A | A |