# Protocol for a CCRI(II) Key Comparison of <sup>99</sup>Tc

## 1. Comparison protocol

1.1 Pilot institute: National Physical Laboratory (NPL), UK

**1.2** Participants: BARC BEV **BIPM** CIEMAT CMI **CNEA ENEA-INMRI IFIN-HH** IRA **IRMM KRISS** LNE-LNHB LNMRI/IRD NIM NIST NMIJ **NMISA** NPL POLATOM PTB VNIIM

**1.3** Comparison Nuclide Solution: An aqueous solution of  $^{99}$ Tc as ammonium pertechnetate dissolved in 0.1 M ammonium hydroxide. The solution is contained in a flame-sealed ampoule at a nominal volume of 3 ml. Activity concentration approximately 50-100 kBq/g. Container: NPL-style ampoule supplied by NPL

Mass: 3 grams

The reference date has been fixed as **1st March 2012, 12 h UTC**. Please use the half-life  $T_{1/2} = 7.72 \ 10^7 \text{ d}$ ;  $u = 0.04 \ 10^7 \text{ d}$ , (DDEP)

Recommended nuclear data: Decay Data Evaluation project (http://www.nucleide.org/DDEP\_WG/DDEPdata.htm)

# 1.4 Schedule

Distribution: It has been agreed that the solution will be distributed to the participant in January 2012.

The following schedule for reporting is proposed:

#### **Reporting dead line: 31<sup>st</sup> May 2012**

Draft A sent to participants: 31<sup>st</sup> August 2012 Draft A acceptance dead line: 31<sup>st</sup> October 2012 Draft B sent to participants: 15<sup>th</sup> November 2012 Draft B acceptance dead line: 31<sup>st</sup> December 2012

## **1.5** The measurand for this exercise is activity per mass.

**1.6** The NPL shall be responsible for maintaining up-to-date key comparison status reports and shall transmit them to the Executive secretary of CCRI(II).

**1.7** The costs associated with the organisation of the comparison, preparing, calibrating and shipping the <sup>99</sup>Tc comparison solutions will be borne by the NPL.

**1.8** All results, method of standardisation, associated uncertainties, and any additional requested information shall be transmitted to the NPL using the reporting forms provided. The NPL shall send a copy of its own results to the Executive Secretary of the CCRI(II) prior to receipt of any results from participants. Please do not send your results until you have received this notification.

**1.9** Participants must provide a list and evaluation of the principal components of the uncertainty budget based on the Guide to the Expression of Uncertainty in Measurement, published by ISO. In addition to the principal components of the uncertainty, common to all of the participants, individual institutes must add any other components they consider appropriate. Uncertainties are evaluated at a level of one standard uncertainty and information must be given on the number of effective degrees of freedom, required for a proper estimate of the level of confidence, where this is appropriate.

**1.10** Transport of the <sup>99</sup>Tc ampoules will be arranged by the NPL using their normal radioactive shipment arrangements. Immediately after receipt, the participating institute shall check for any damage to the samples and report this to the NPL.

#### 2. Preparation of the report on the comparison

**2.1** The NPL is responsible for the preparation of the report on the comparison. The report passes through a number of stages before publication and these are referred to here as Draft A and Draft B.

**2.2** During the comparison, as the results are received by the NPL, they are kept confidential by the NPL until all participants have completed their measurements and all the results have been received, or until the dead line for receipt of results has passed.

**2.3** A result from a participant is not considered complete without an associated uncertainty and is not included in the draft report unless it is accompanied by an uncertainty supported by a complete uncertainty budget. Uncertainties are drawn up following the guidance given in the Technical Protocol.

**2.4** If, on examination of the complete set of results, NPL finds results that appear to be anomalous, the corresponding institutes are invited to check their result for numerical errors but without being informed as to the magnitude or sign of the apparent anomaly. If no numerical error is found, the result stands and the complete set of results is sent to al participants.

**2.5** The draft A report is prepared as soon as all the results have been received from the participants. It includes the results, uncertainties and standardisation methods and experimental details transmitted by the participants, identified by name.

**2.6** Draft A of the report is sent to the participants as soon as possible after the completion of the comparison to all the participants for comments, with a reasonable deadline for replies. The date at which this draft is sent to the participants is taken to be the end date for the comparison and is subsequently referred to as such.

**2.7** If any controversial or contradictory comments are received by the NPL, they will be circulated to all participants and discussion continues until a consensus is reached.

**2.8** Draft A is considered as confidential to the participants. Copies are not given to nonparticipants, and graphs or other parts of the draft are not used in oral presentations at an external conference without the specific agreement of all the participants. The results may be the subject of an internal report if they are shown in relative terms and the names of participants hidden. At this stage, a participant may publish experimental techniques of special interest or new developments of a measurement method made in the frame of the comparison, as long as no information or comments are made about the comparison results.

**2.9** Note that once all participants have been informed of the results, individual results and uncertainties may be changed or removed, or the complete comparison abandoned, only with the agreement of all participants and on the basis of a clear failure of the travelling standard or some other phenomenon that renders the comparison or part of it invalid.

**2.10** An institute that considers its result unrepresentative of its standards may request a subsequent bilateral comparison with the NPL or one of the other participants. This should take place as soon as possible after the completion of the comparison in progress. The subsequent bilateral comparison is considered as a new and distinct comparison.

**2.11** On receipt of final comments from participants, the second draft, draft B, is prepared by the BIPM incorporating the agreed comments on the draft A and Appendix regarding the comparison reference value and degrees of equivalence.

**2.12** As the comparison could be linked to the extended SIR, the KCRV (in terms of Equivalent Activity) will be determined by the BIPM and the Appendix will be produced by the KCWG, including the comparison results in the KCRV and degrees of equivalence in the KCDB.

**2.13** The draft B is circulated through the participants. Once agreed, draft B is not considered confidential and may be the subject of a publication, with the exception of the Appendix containing proposals for the reference value and degrees of equivalence.

**2.14** Draft B will be sent to the CCRI(II) for review and approval.

**2.15** In the event that there is disagreement concerning the results or the interpretation of the results of a key comparison, and the disagreement cannot be resolved by the participants, by the key Comparison Working Group or by the Consultative Committee, the matter is referred to the CIPM for decision.

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