

# Technical protocol

## APMP international key comparison of activity measurement of Fe-59 (APMP.RI(II)-K2.Fe-59)

### 1. Introduction

A plan of the regional key comparison of activity measurements of  $^{59}\text{Fe}$  solution was discussed at the 10th meeting of APMP/TCRI in Taiwan. Ampoules of  $^{59}\text{Fe}$  solution will be distributed in mid-June 2014 to all the participants. The participants are required to measure its activity and report to the coordinating laboratory (NMIJ). One ampoule containing the same radioactive solution will be sent to the SIR at the BIPM.

### 2. Source preparation

The original solution of  $^{59}\text{Fe}$  will be provided by Japan Radio Isotope Association. The chemical form of the solution is  $\text{FeCl}_3$ . A carrier concentration of  $\text{FeCl}_3$  is 0.1 mg/g in 0.1 N HCl. The nominal activity concentration will be 500 kBq/g on June 1<sup>st</sup>, 2014. The solution will be distributed to the participants in 5 mL glass ampoules. An ampoule of 3.6 mL will be sent to the SIR at the BIPM. The activities of solution in these ampoules will be measured in a well-type pressurized ionization chamber before shipping.

### 3. Measurement

Participants will be required to report activities concentration [in Bq/g]. Report form will be sent to participants later. Uncertainty estimation shall be performed according to GUM. A reference date of the measurement is set at June 1<sup>st</sup>, 2014 UTC 0:00:00.

### 4. Time schedule

The sample will be distributed in mid-June. Deadline of a report will be September 15<sup>st</sup>, 2014. The NMIJ will prepare a draft A report until the end of March 2015. After circulation of the draft A report among participants, it will become a draft B report. The final report will be published in 2015-2016. Work flow of the comparison will be to Appendix 3 of CIPM MRA-D-05 "Measurement comparisons in the context of the CIPM MRA".

### 5. Estimation of the comparison results

The result of each participant will be estimated by using  $E_n$  evaluations according to the following formula;

$$E_n = \frac{A_{lab} - A_{ref}}{\sqrt{U_{lab}^2 + U_{ref}^2}},$$

where  $A_{lab}$  and  $U_{lab}$  are the activity and expanded uncertainty obtained by each participating laboratory, respectively, and  $A_{ref}$  and  $U_{ref}$  are the activity and an expanded uncertainty obtained by the coordinating laboratory, respectively.

The obtained results of the APMP comparison will be linked by using the SIR result of the NMIJ (coordinating laboratory). They will be reflected to Key Comparison Reference Value (KCRV). Degrees of equivalence between the APMP comparison results and the KCRV will be published in the final report published by the BIPM.

## 6. Participants

The current participants are listed in Table 1.

Table 1. List of the laboratories participating in the comparison of Fe-59

Name of participant	Acronym	Country
Australian Nuclear Science and Technology Organization	ANSTO	Australia
Bhabha Atomic Research Centre	BARC	India
Institute of Nuclear Energy Research	INER	Taiwan
Korea Research Institute of Standards and Science	KRISS	Korea
National Laboratory for Metrology of Ionizing Radiation	LNMRI	Brazil
National Institute of Metrology	NIM	China
National Metrology Institute of South Africa	NMISA	South Africa
Office of Atoms for Peace	OAP	Thailand
Pusat Teknologi Keselamatan Dan Metrologi Radiasi	PTKMR	Indonesia
National Metrology Institute of Japan	NMIJ	Japan

## 7. Coordinating laboratory

The NMIJ will serve as a pilot laboratory.

Contact person will be Dr. Akira Yunoki.

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