

Results for the “REIMEP 18” Inter-laboratory Comparison Campaign for the Measurement of Uranium Isotope Ratios

S. RICHTER¹ AND R. WELLUM²

¹Institute for Reference Materials and Measurements, Geel, Belgium ; stephan.richter@cec.eu.int

²Institute for Reference Materials and Measurements, Geel, Belgium ; roger.wellum@cec.eu.int

Inter-laboratory comparisons are organized for a variety of sample types and elements in order to assess the performance of isotopic measurements on a worldwide level.

The REIMEP 18 (“Regular International Measurement Evaluation Program”) campaign for the measurement of uranium isotope ratios in nitric acid was started in December 2005. Four samples of 2.5mg uranium, ranging from depleted up to slightly enriched uranium, are sent to more than 70 participating laboratories, coming mainly from the nuclear safeguards and the isotope geochemistry area, and using a variety of techniques such as alpha-spectrometry, TIMS, ICP-MS, AMS, RIMS, etc. As observed during several REIMEP campaigns done during the past 10 years, REIMEP 18 is designed to show the present state of uranium isotope measurements and gives the opportunity for participating laboratories to evaluate their own performance, to identify possible problems and to improve their own measurement procedures. Due to instrumental improvements in measurement techniques and instrumentation continuously going on over the years, measurement campaigns such as REIMEP are an important and very much appreciated way to achieve an ongoing careful quality control on an international level.

Certification measurements at IRMM are performed using recently upgraded techniques for high precision and high accuracy uranium isotope ratio measurements. $^{235}\text{U}/^{238}\text{U}$ measurements are performed using a UF_6 gas source mass spectrometer, calibrated using synthetic isotope mixtures. $^{234}\text{U}/^{238}\text{U}$ measurements, even down to values of $5.5\text{E}-5$ (equilibrium value) are performed on a TRITON TIMS, using $1\text{E}12$ Ohm Faraday cup amplifiers for the detection of ^{234}U in order to improve the signal-to-noise-ratio, so without the need to use ion counting. $^{236}\text{U}/^{238}\text{U}$ measurements are performed on a TRITON TIMS using a procedure in which ^{236}U was detected using an ion counter and which has been validated using our special synthetic mixtures with $^{236}\text{U}/^{238}\text{U}=1\text{E}-6, 1\text{E}-7$ and $1\text{E}-8$.

Details of the sample preparation and certifications will be given as well as comparative results of the measurements made by all (>70) participating laboratories worldwide. Results will be discussed regarding the use of various measurement procedures, calibration techniques, instrumentation, etc.