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STANDARDIZATION OF ^{59}Fe BY 4π(PC)β–γ SOFTWARE COINCIDENCE SYSTEM

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The procedure of the standardization of ^{59}Fe using a 4π(PC)β–γ software coincidence system is presented. The radioactive solution was part of an ampoule sent to the National Laboratory for Metrology of Ionizing Radiation (LNMRI), from Rio de Janeiro, by the Technical Committee on Ionizing Radiation of the BIPM for an international comparison.

Fe-59 decays with a half-life of 44.495 days by beta minus emission to the excited levels of ^{59}Co, followed mainly by 1099 keV and 1291 kev gamma transitions. The standardization was performed in a triple 4πβ–γ coincidence system consisting of a thin window gas-flow proportional counter (PC) in 4π geometry coupled to a 50.1 mm × 50.1 mm NaI(Tl) scintillator and to a 20% relative efficiency HPGe detector. The data acquisition was carried out by means of a Software Coincidence System (SCS) developed at the Nuclear Metrology Laboratory (LMN) at the IPEN-CNEN/SP. The SCS is based on a National Instruments PCI-6132 card capable of up to four independent analog inputs, and the signals were processed by means of a LabView Version 8.5 acquisition program. Information on pulse height and time of occurrence were registered for both beta and gamma channels.

The sources were prepared using Collodion films metalized with gold on both sides. The source masses were determined by the pycnometer technique. A seeding agent (Cyastat SM) was used to improve the deposit uniformity and the sources were dried in a warm nitrogen jet.

The activity calculation was performed by means of the software coincidence code SCTAC version 6.0, developed at the LMN, which allows selection of several gamma windows for the coincidence measurements, applying corrections for dead time and accidental coincidences after the experiment has been completed. The activity was obtained by means of the extrapolation curve setting two gamma windows at 1099-keV and 1291 keV total absorption peaks, respectively. The beta efficiency was changed by using Collodion films and aluminium foils as external absorbers on both sides of the sources.

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