An Update on the NIST Program for ^{137}Cs and ^{60}Co Gamma-Ray Beams

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International Comparisons

The NIST participated in the EUROMET key comparison (EUROMET.RI(I)-K1 and EUROMET.RI(I)-K4) of air-kerma and absorbed dose to water from ^{60}Co gamma-ray beams. Approximately 26 countries from around the world participated in this comparison, which started in January 2004 and was completed in 2008. The test was coordinated by Istvan Csete at the Országos Mèrèsügyi Hivatal (OMH). The NIST served as the host laboratory for participants in the Sistema Interamericano de Metrología (SIM) regional metrological organization, comprising national standards laboratories in the Americas, including Canada, Brazil, and Argentina. A set of instruments were shipped from the NIST to each of the facilities in a star-shaped pattern during the fall of 2007 and winter of 2008, and later reported to the EUROMET coordinator. The set included four chambers and two electrometers. Each chamber was calibrated with both electrometers and with the NIST system before and after the set was shipped to each of the SIM participants. The multiple measurements made at the NIST after the complete set was returned from each of the SIM participants reproduced within 0.30 %. In early 2008 the instruments were returned to the EUROMET coordinating laboratory in Budapest.

At the request of the Kenya Bureau of Standards (KEBS), a bilateral comparison for air kerma from ^{137}Cs radiation-protection level beams was started in December 2008. An A5 chamber was used; this test is still in progress.

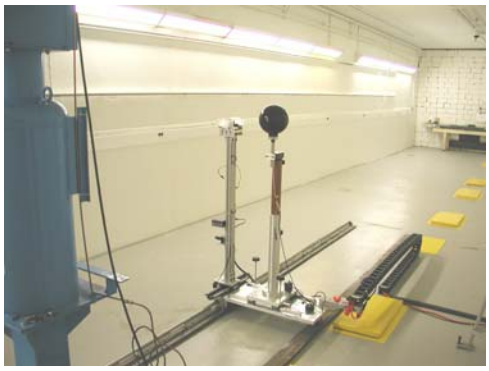
Proficiency tests with US Secondary Standard Calibration Facilities (SSCFs)

As part of the NIST mission to disseminate the national standard for air kerma and absorbed dose to water nationwide, the NIST performs periodic measurement-quality assurance through proficiency tests with SSCFs. These include facilities accredited by the following US organizations: the American Association of Physics in Medicine (AAPM), the National Voluntary Laboratory Accreditation Program (NVLAP), the Department of Energy Laboratory Accreditation Program (DOELAP), and the Health Physics Society (HPS).

In particular, the AAPM accredits three calibration laboratories that serve North American clinics. These laboratories maintained a relative agreement with the NIST to within 0.3 % both for air kerma and for absorbed dose to water from ^{60}Co beams.

Calibration Range for Low-Level Air-Kerma Rates

In early 2006 the development of a new ^{137}Cs calibration range was completed. The lowest air-kerma rate available is 1.8×10^{-6} Gy/h. Some of the details of the development can be found in R. Minniti and S. Seltzer, "Calibration of a ^{137}Cs gamma-ray beam irradiator using large size chambers," Appl. Radiat. Isot. **65**, 401-406 (2007). Following the development of this new calibration range, a first proficiency test was conducted during 2008 with one of the SSCFs accredited both by the Health Physics Society and the AAPM. A 16 L chamber was used.



Plans for Eliminating the Use of ^{137}Cs Irradiators in the United States

In February of 2008 a report published by the National Academies of Sciences entitled "Radiation Source Use and Replacement" became available, recommending the replacement or elimination of CsCl radionuclide sources in the United States. The motivation for this recommendation was the potential use of radioactive CsCl in a malicious act. As the ^{137}Cs irradiators used in medical and industrial applications, as well as those used for calibrating radiation detector instruments, utilize CsCl, the endorsement of such of recommendation by the US Nuclear Regulatory Commission (NRC) could have resulted in the elimination of ^{137}Cs irradiators in the United States. The published report is available at (http://www.nap.edu/catalog.php?record_id=11976).

Eliminating the use of ^{137}Cs irradiators, would directly affect the network of secondary standards calibration facilities (SSCFs) in the US that provide calibration of radiation detector instrumentation for medical, radiation protection and homeland security applications nationwide. The NIST became aware of these plans in March, 2008, and since then participated actively in meetings held by the US NRC and in discussions with the user community. The US NRC held a public meeting September 29-30, 2008, to obtain direct input from the user community. The meeting included manufacturers of sources and of radiation detectors, users of blood irradiators, and representatives from calibration facilities, industry, academia, and various medical and radiological societies.
In parallel, the NIST was active in coordinating a separate workshop on the same topic on October 6, 2008, during the CIRMS annual meeting, which included representatives from the US Congress, the NRC, and the user community.

The final decision on this topic was announced by the US NRC on December 12, 2008, and can be found at http://www.nrc.gov/reading-rm/doc-collections/news/2008/08-223.html. In brief, the US NRC decided not to eliminate the use of CsCl in the US, based in part on the fact that at this time there are no practical replacements. Instead, the NRC recommendation was to enhance the security of facilities that employ these irradiators in their applications.