The following is a summary of completed and in-progress Standard Reference Materials.

Nuclide	Completion Date
^{131}I	yearly January
^{99}Mo	yearly February
^{67}Ga	yearly April
^{99m}Tc	yearly May
^{201}Tl	yearly August
^{111}In	yearly June
^{133}Xe	yearly September
^{90}Y	yearly October
^{125}I	yearly December
^{229}Th	January 2009
^{243}Am	August 2009
^{239}Pu	August 2009
^{242}Pu	July 2010
^{99}Tc	December 2010
^{63}Ni	March 2011
^{244}Cm	April 2012
^{228}Ra	November 2012
^{237}Np	March 2013
^{209}Po	March 2015
^{129}I	June 2015
^{14}C	June 2015 (Re certification)
^{3}H	September 2015
^{238}Pu	May 2016

LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé L. Laureano-Pérez, R. Fitzgerald
ACTIVITY	New Standardization of ^{209}Po
KEYWORDS	liquid scintillation, α spectrometry, Po-209, SRM
RESULTS	Ultra-pure, carrier-free ^{209}Po solution standards have been prepared and standardized for their massic alpha-particle emission rate. The standards, which will be disseminated by the National Institute of Standards and Technology (NIST) as Standard Reference Material SRM 4326a, have a mean mass of (5.169 ± 0.003) g of a solution of polonium in nominal 2.0 mol▪L^{-1} HCl (having a solution density of (1.032 ± 0.002) g▪ mL^{-1} at 20 °C) that are contained in 5 mL, flame-sealed, borosilicate glass ampoules. They are certified to contain a 209Po massic alpha-particle emission rate of (39.01 ± 0.18) s^{-1}▪g^{-1} as of a reference time of 1200 EST, 01 December 2013. This new standard series replaces SRM 4326 that was issued by NIST in 1994. The standardization was based on 4πα liquid scintillation (LS) spectrometry with two different LS counting systems and under wide variations in measurement and counting source conditions. The methodology for the standardization, with corrections for detection of the low-energy conversion electrons from the delayed 2 keV isomeric state in ^{205}Pb and for the radiations accompanying the small 0.45 % electron-capture branch to ^{209}Bi, involves a unique spectral analysis procedure that is specific for the case of ^{209}Po decay. The entire measurement protocol is similar, but revised and improved from that used for SRM 4326. Spectroscopic impurity analyses revealed that no photon-emitting or alpha-emitting radionuclidic impurities were detected. The most common impurity associated with ^{209}Po is ^{208}Po and the activity ratio of ^{208}Po/^{209}Po was < 10−7.
PUBLICATIONS	SRM 4326a Certificate, NIST 2015 **Journal of Research of the National Institute of Standards and Technology**, 120, 138-163 (2015).
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4326a
OTHER RELATED PUBLICATIONS	R.Collé, Long Term Stability of Carrier-Free Polonium Solution Standards, *Radioact. Radiochem*. **4**, no. 2, 20-35 (1993) R. Collé, et al., Delayed Isomeric State in ^{205}Pb and Its Implications for 4πα Liquid Scintillation Spectrometry,of ^{209}Po, *Appl. Radiat. Isot*. **45**, 1165-1175 (1994). R. Collé, et al., Preparation and Calibration of Carrier-Free ^{209}Po Solution

	Standards, *J. Res. NIST* **100**, 1-36 (1995). R. Collé, L. Laureano-Perez, I. Outola, A Note on the Half-Life of ^{209}Po, *Appl. Radiat. Isot*. **65**, 728-730 (2007). L. Laureano-Perez, R. Collé, R. Fitzgerald, et al. A Liquid-Scintillation Based Primary Standardization of ^{210}Pb, *Appl. Radiat. Isot*. **65**, 1328- 1380 (2007). R. Collé, L. Laureano-Perez, On the Standardization of ^{209}Po and ^{210}Pb, in LSC 2008, Advances in Liquid Scintillation Spectrometry, Radiocarbon, Tucson, Arizona, USA, 2009, pp. 77-85. F.J.Schima, R.Collé. Alpha-Particle and Electron Capture Decay of ^{209}Po, Nucl. Instrum. Meth. Phys. Res. A 369, 498-502 (1996).
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé L. Laureano-Pérez, R. Fitzgerald
ACTIVITY	A new Determination of the ^{209}Po half-life
KEYWORDS	liquid scintillation, α spectrometry, Po-209, SRM
RESULTS	A substantial 25% error in the then-known and accepted (102 ± 5) year halflife of ^{209}Po was reported on in 2007. This error was detected from decay data from two separate primary standardizations of a ^{209}Po solution standard, which were performed approximately 12 years apart. Despite author claims that this observation was not a new half-life determination, it was nevertheless included in subsequent nuclear data evaluations and compilations to obtain a currently tabulated value of (115 ± 13) a, computed from the median and range of the two half-life reports. A third primary standardization on the identical ^{209}Po solution has since been performed to derive a new half-life value of (125.2 ± 3.3) a. This half-life determination was obtained from 30 distinct data sets over a period of 20.7 years, encompassing over 700 liquid scintillation measurements with nearly 50 counting sources all prepared from the same solution, and as obtained over a very broad range of measurement conditions (composition of cocktails, characteristics of counters, time sequencing) during five periods in 1993, 1994, 2005, and 2013.
PUBLICATIONS	J. Physics G: Nuclei. Part. Phys. 41 (2014) 105103
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4326a
OTHER RELATED PUBLICATIONS	R.Collé, Long Term Stability of Carrier-Free Polonium Solution Standards, *Radioact. Radiochem*. **4**, no. 2, 20-35 (1993) R. Collé, et al., Delayed Isomeric State in ^{205}Pb and Its Implications for 4$\pi\alpha$ Liquid Scintillation Spectrometry,of ^{209}Po, *Appl. Radiat. Isot*. **45**, 1165-1175 (1994). R. Collé, et al., Preparation and Calibration of Carrier-Free ^{209}Po Solution Standards, *J. Res. NIST* **100**, 1-36 (1995). R. Collé, L. Laureano-Perez, I. Outola, A Note on the Half-Life of ^{209}Po, *Appl. Radiat. Isot*. **65**, 728-730 (2007). L. Laureano-Perez, R. Collé, R. Fitzgerald, et al. A Liquid-Scintillation Based Primary Standardization of ^{210}Pb, *Appl. Radiat. Isot*. **65**, 1328- 1380 (2007). R. Collé, L. Laureano-Perez, On the Standardization of ^{209}Po and ^{210}Pb, in LSC 2008, Advances in Liquid Scintillation Spectrometry, Radiocarbon, Tucson, Arizona, USA, 2009, pp. 77-85.

	F.J.Schima, R.Collé. Alpha-Particle and Electron Capture Decay of ^{209}Po, Nucl. Instrum. Meth. Phys. Res. A 369, 498-502 (1996).
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	L. Laureano-Pérez, R. Fitzgerald, D. Bergeron, R.Collé
ACTIVITY	Standardization of ^{129}I
KEYWORDS	liquid scintillation, LTAC, TDCR, I-129
RESULTS	Iodine-129 is a long-lived radioisotope with a half-life of 16.1 x 10^6 years, with low-energy beta and gamma emissions, to xenon-129. It is of special interest in the monitoring and effects of man-made nuclear fission decay products, where it serves as both tracer and potential radiological contaminant. A new standard solution of ^{129}I was developed. The certified massic activity for ^{129}I was obtained by πβ(LS)-γ(NaI) live-timed anticoincidence (LTAC) measurements with confirmation by the triple-to-double-coincidence ratio (TDCR) method and by 4παβ liquid scintillation (LS) spectrometry with three commercial LS counters. The standard which will be disseminated by National Institute of Standards and Technology (NIST) as SRM® 4949d, in a nominal 0.011 mol•L^{-1} NaOH and 0.007 mol•L^{-1} Na_2SO_3 (having a solution density of (0.999 ± 0.002) g•mL^{-1} at 23 C) that are contained in a flame-sealed borosilicate-glass ampoule has a certified iodine-129 massic activity, of (2.747 ± 0.030) kBq•g^{-1} at a Reference Time of 1200 EST, 01 January 2014.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4929d
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	L. Laureano-Pérez and D. Bergeron
ACTIVITY	^{14}C Comparison with NRC and recalibration
KEYWORDS	liquid scintillation, triple-to-double coincidence ratio (TDCR), comparison, hexadecane, C-14
RESULTS	An informal bilateral comparison of ^{14}C liquid scintillation (LS) counting at the National Research Council of Canada (NRC) and the National Institute of Standards and Technology (NIST) has been completed. A ^{14}C-labeled n-hexadecane (disseminated by the National Institute of Standards and Technology (NIST) as Standard Reference Material SRM®4222c), was measured at both laboratories. Despite observed LS cocktail instabilities, the two laboratories achieved accord in their standardizations using two measurement techniques. NRC massic activities were -0.7 % (CNET) and -0.5 % (TDCR) different from the certified activity and NIST recovered activities -0.5 % (CNET) and 0.3 % (TDCR) different from the certified activity. The certified value for the massic activity is consistent with the original decay-corrected calibration value of 1990 to + 0.26 %.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	4222c
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé, L. Laureano-Pérez, R. Fitzgerald, D. Bergeron
ACTIVITY	Standardization of ^{3}H
KEYWORDS	liquid scintillation, LTAC, TDCR, H-3
RESULTS	A new National Institute of Standards and Technology (NIST) tritiated-water (^{3}H-labeled oxidane) standard was prepared and calibrated. It is the 17th in a series of linked standards since 1954 and will be disseminated as Standard Reference Material® SRM 4927g. Hydrogen-3, in a 5-mL, flame-sealed, borosilicate-glass ampoule, with a reference time of 1200 EST, 1 May 2015 has a massic activity of 544.2 kBq g^{-1} and a relative expanded (k = 2) uncertainty of 0.96 %. It is in agreement with two previous 1999 issues, *viz*., SRM 4927F and 4926E to -0.07 %. In agreement to - 0.27 % with a BIPM organized 2009 Key Comparison Reference Value (KCRV). Independent confirmatory measurements show SRM 4927F and 4927g were in agreement to -0.32 % and -0.16%, respectively. A curious finding was an apparent 2.6 % discrepancy between the reported values for F1994 and F2009 solutions, which represent the LPRI 1994 standard and 2009 measurements by LNHB for a CCRI(II) international comparison.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4927g
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé, L. Laureano-Pérez
ACTIVITY	Standardization of ^{238}Pu
KEYWORDS	liquid scintillation, Pu-238
RESULTS	A new National Institute of Standards and Technology (NIST) ^{238}Pu standard was prepared and it is being calibrated. It will be disseminated as Standard Reference Material® SRM 4323c. The certified massic activity for ^{238}Pu will be obtained by 4πα liquid scintillation (LS) spectrometry with three commercial LS counters. The certified activity will be linked to previous issues *viz*,. 4323A and 4323B. Dilution factors will also be confirmed by 4πα liquid scintillation (LS) spectrometry.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4323c
OTHER RELATED PUBLICATIONS	
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LABORATORY	National Institute of Standards and Technology (NIST)
NAMES	R.Collé, R. Fitzgerald L. Laureano-Pérez,
ACTIVITY	Long-Term Stability of Carrier-Free Solutions of Polonium and Its Impact of the ^{209}Po Half-Life Determination.
KEYWORDS	liquid scintillation, α spectrometry, Po-209, SRM
RESULTS	A rigorous investigation of the stability of polonium solutions has been completed. Polonium solutions at trace concentrations, under various alkaline, neutral, or weakly acidic conditions are known to be unstable: being readily hydrolyzed, chemically deposited, or volatilized; exhibiting "radiocolloidal" behavior; and undergoing "plate-out" or adsorption onto glass surfaces. Stored polonium solutions, such as those needed for SRMs, are generally considered by NIST to be stable in the acid range of 0.1 to 1.0 normality, but scant data existed on any possible long-term effects, particularly for very dilute, carrier- free, aged solutions. The present work was based on careful radionuclidic assays of solutions of ^{209}Po having massic concentrations of less than 10^{12} atoms of Po per gram of solution that have been stored in flame-sealed ampoules for ages ranging from 1.8 years to 22.4 years. Measurements were made for the soluble and readily removable ^{209}Po activity as well as for any insoluble residual activity adhering to the glass surfaces. It was found that the solutions were stable for periods greater 20 years with deposition losses that were negligible within the low-level measurement uncertainties and less than few tenths of a percent in worst cases. The findings validate the recently determined ^{209}Po half-life, having a value of (125.2 ± 3.3) a, that was based on 30 distinct data sets of decay measurements by NIST of stored ^{209}Po solution over a period of 20.7 years during five periods in 1993, 1994, 2005, and 2013. The new assay results extend the ^{209}Po decay curve to 2015.
PUBLICATIONS	
IN PROGRESS	
INFORMATION	
SOURCE IN PREPARATION	SRM 4326a
OTHER RELATED PUBLICATIONS	R. Collé, Long Term Stability of Carrier-Free Polonium Solution Standards, *Radioact. Radiochem*. **4**, no. 2, 20-35 (1993) R. Collé, L. Laureano-Perez, I. Outola, A Note on the Half-Life of ^{209}Po, *Appl. Radiat. Isot*. **65**, 728-730 (2007). R. Collé, R.P. Fitzgerald and L Laureano-Perez, A new determination of the ^{209}Po half-life J. Physics G: Nuclei. Part. Phys. **41** (2014) 105103 R. Collé and A.M. Collé, On the ^{209}Po half-life error and its confirmation : a critique, J.Radioanal Nucl Chem DOI 10.1007/s10967-

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