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^{222}Rn and ^{226}Ra Measurement Standards and Calibration Activities at NIST: A 83-Year Perspective

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The National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS), has a long and proud 83-year (c. 1914-1997) history in preparing, calibrating, and providing activity standards for ^{226}Ra and ^{222}Rn. It is perhaps the only national metrological standards laboratory that disseminates ^{222}Rn emanation standards based on calibrated ^{226}Ra solutions that are still directly relatable to the international 1913 Curie and 1934 Honigschmid standards. Over the years, the NIST/NBS standards have, in many ways, served as almost informal international standards. A substantial portion of the ^{222}Rn measurement calibrations made in the world today, including most ^{222}Rn measurement interlaboratory intercomparisons, are based on NIST standards. The primary objectives of the NIST ^{226}Ra and ^{222}Rn standards program have always been threefold: viz., to maintain national standards, to develop and disseminate suitable transfer standards for use by other laboratories, and to provide mechanisms for insuring the quality of measurements (traceable to national standards) made by our user community. Major recent emphases have been on improving our primary calibration capabilities; developing new (and sometimes novel) transfer standards, other than ^{226}Ra solutions, that could be used in other ^{222}Rn measurement applications; and actively interacting with the commercial radon measurement industry and other principal ^{222}Rn measurement laboratories, such as within the geophysical research community. This paper provides a historical overview and a summary of the highlights of these program activities.