Contribution ID : **83** Type : **Oral Presentation**

STATE OF THE ART ANALYSIS OF RADIOXENONS AND KRYPTON-85 AT THE BFS NOBLE GAS LABORATORY

Monday, 26 September 2016 11:40 (0:20)

Content

Since the early 1970s the noble gas laboratory of the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz, BfS) operates laboratory based measurement systems to determine the activity concentrations of krypton-85 (85Kr) and radioxenon, mainly xenon-133 (133Xe) in air. After cryogenic adsorption/desorption of the noble gases, followed by gas-chromatographic separation of krypton and xenon, these systems measure the beta decays in proportional counters, housed within an anti-coincidence system and a 10 cm lead shield. The minimum detectable activity (MDA) for this method is 0.01 Bq for 133Xe and 0.03 Bq for 85Kr in 1-2 m3 of air, the minimum detectable concentration (MDC) for a typical 10 m3 weekly sample is 1 mBq•m-3 and 6 mBq•m-3, respectively. In 2014, this method was accredited according to DIN EN ISO/IEC 17025, and a strict quality assurance program including internal and external quality controls are in place, in accordance with the requirements for the accreditation.

A SAUNA (Swedish Automatic Unit for Noble Gas Acquisition) laboratory noble gas system was installed at the BfS laboratories in 2009. This system is capable of measuring Xe-isotopes 133Xe, 135Xe, 133mXe and 131mXe in air samples simultaneously and is routinely used within the laboratory's role as a Support Laboratory for the Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organisation (CTBTO). As with the conventional systems above the amount of stable Xe is determined using gas chromatography, but activities of the individual Xe-isotopes are measured using beta-gamma coincidence techniques, with an MDC one order of magnitude below that of the conventional proportional counters. While the lower MDC allows characterization of the background and its variability, which is typically close to the MDC of the conventional system for most environmental sites, the ability to measure four Xe-isotopes simultaneously allows isotopic source discrimination. Consequently, the SAUNA system is increasingly used for routine analyses of samples from the BfS' national and international noble gas network, with contributing partner institutions at more than 10 stations (as of January 2016), and accreditation of this system is envisaged within the next couple of years.

In this paper the systems, their advantages and improvements will be described, with an emphasis on internal and external quality controls, accuracy and repeatability. Results of comparative analyses of routine samples, standards and samples from Proficiency Test Excercises (PTE) organized by the CTBTO will be shown. Examples will be given to highlight the information gained from long time-series of Xe activity concentrations in the atmosphere coupled with isotopic information through routine analyses for 133Xe, 135Xe, 133mXe and 131mXe.

About the Presenter

Dr Clemens Schlosser works with the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz, BfS) and is the head of BfS' Noble Gas Laboratory in Freiburg, Germany. Clemens oversees the global noble gas monitoring network of the BfS and has more than 25 years of experience in the measurement of radioactive noble gases. His experience as radionuclide expert is sought as an adviser to the German Foreign Ministry and Permanent Mission of the Federal Republic of Germany to the Office of the United Nations and to other International Organizations. Clemens was the project leader for the BfS part of the CTBTO's International Monitoring System (IMS) Noble Gas Equipment Test (INGE).

Primary author(s) : Dr. SCHLOSSER, Clemens (Ferderal Office for Radiation Protection, Germany)

Co-author(s) : SCHMID, Sabine (Federal Office for Radiation Protection, Germany); Dr. BOLLHOEFER, Andreas (German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz, BfS)); BIERINGER, Jacqueline (Federal Office for Radiation Protection, Germany)

Presenter(s) : Dr. SCHLOSSER, Clemens (Ferderal Office for Radiation Protection, Germany)

Session Classification : Radioactive Noble Gases

Track Classification : Radioactive Noble Gases