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# Production and characterization of a $^{222}$Rn - emanating stainless steel source

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Future liquid xenon detectors require unprecedented low levels of intrinsic radioactive backgrounds. Particularly $^{222}$Rn and its subsequent decay products represent threatening background sources for the sensitivity of such experiments. Therefore, extensive radon screening campaigns, as well as studies on novel approaches for radon mitigation, need to be carried out. They both crucially depend on infrastructure allowing to measure radon at very low activities. For the correct quantification of detection efficiencies as well as radon mitigation factors, reliable sources of known and stable radon emanation are required.
A new approach to producing clean radon sources by implantation of $^{226}$Ra ions into stainless steel has been investigated. In a proof of principle study, two stainless steel plates have been implanted at the ISOLDE facility located at CERN. Results from a complete characterization of the sources will be presented. Each sample provides a radon emanation rate of about 2 Bq which has been measured using electrostatic radon monitors as well as miniaturized proportional counters. Additional measurements using HPGe and alpha spectrometry as well as measurements of the radon emanation rate at low temperatures were carried out. Limitations, improvements and possible applications of this technique will be discussed.

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