Contribution ID: **45** Type: **Invited talk**

Removing Rn-222 from xenon for large-scale for large scale rare event searches

Wednesday, 25 October 2023 11:10 (25 minutes)

With ever larger detectors and the self-shielding properties of liquid xenon, the intrinsic purity of liquid xenon detectors is becoming increasingly important for rare event searches such as double neutrinoless double beta decay or dark matter. In this context, the isotope Rn-222 and its decay progenies are of particular importance. The selection of low-activity materials and surface passivation, the construction of the detector under clean room conditions in a low radon atmosphere are the most important prerequisites to keep the radon concentration in the detector as low as possible. Continuous active removal of Rn-222 from the LXe in the detector will be the last step to decrease its concentration even further. In this talk, cryogenic *online distillation* for the removal of radioactive noble gases, especially Rn-222, from xenon will be presented. In particular, with this method new records in Rn-222 concentration below 1 µBq/kg have been achieved in the dark matter experiment XENONnT.
These methods are also suitable for removing other impurities such as krypton with its radioactive isotope Kr-85 and argon with its radioactive isotope Ar-39 and Ar-42 from xenon.

The talk will also give an outlook on how these methods can be further developed to achieve the required purity of LXe for the next generation of rare events searches such as the planned dark matter experiment DARWIN/XLZD and even neutrinoless double beta decay searches beyond nEXO. In particular, the developments just started within the ERC Advanced Grant project *LowRad* with a targeted radon purity of 1 radon atom per 100 mol xenon also aim at integrating the necessary very sensitive online diagnostic methods.

Primary author: WEINHEIMER, Christian (University of Münster)

Presenter: WEINHEIMER, Christian (University of Münster)

Session Classification: Challenges of a program towards the kton scale