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BOOK OF ABSTRACTS

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Radon background in rare event searches at DARWIN experiment

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One of the most intriguing questions of new physics is the possible existence of, so called, “dark” or “missing” matter. One of the possible candidate for the cold dark matter, is the weakly interacting massive particle (WIMP) which is investigated using several types of experiments. Among many, the direct detection liquid noble gasses experiments are the leading ones in terms of sensitivity to $> \text{GeV}$ WIMP mass parameter space. The foreseen future European astroparticle observatory, DARWIN, is designed as an ultimate direct detection liquid xenon based experiment in dark matter searches. DARWIN’s rich experimental program of also includes other rare event searches, such as an investigation of the Majorana nature of neutrinos through neutrinoless double beta decay, the search for the axion, a hypothetical particle proposed as a solution of the strong CP problem or many others.

Rare event searches, besides large scale detectors with low detection threshold, require high control and almost background free environment. Two types of background processes can mimic the WIMP recoil signal, nuclear and electronic recoil events. The dominant electronic recoil background is coming from the radon progenies (Rn^{222}). Since it is created by radioactive decay inside all detector materials, the effective detector shielding is hindered. Here we present the requirements of radon level in xenon target necessary to reach the foreseen sensitivity in rare event searches. We also give the state-of-the-art of radon mitigation strategies which include material selection and screening, on-line radon removal techniques, as well as the off-line methods of tagging electronic recoil events from radon progenies.

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