

First Evidence of the Solubility of Adsorbed Radon Daughters in Liquid Xenon

Saturday, 2 December 2017 16:00 (10 minutes)

Dual phase liquid/gas xenon time projection chambers (TPCs) currently set the worlds most sensitive limits on weakly interacting massive particles (WIMPs), a favored dark matter candidate. Radon and radon daughters produce problematic backgrounds for these searches. During detector construction, ^{222}Rn and daughters plate out onto detector surfaces. While ^{222}Rn has a half-life of 3.8 d, the long-lived daughter ^{210}Pb (half life ~ 22.3 y) can be a source of background events in even the longest running searches. Of particular concern for liquid xenon dark matter detectors are the ‘naked beta’ decays of ^{210}Pb and ^{210}Bi . Rejection of these backgrounds relies solely on being able to distinguish electron recoils from nuclear recoils. Typically it is assumed that once ^{222}Rn and daughters plate out, they remain stuck to the surface, where a fiducial volume cut will reject the ‘naked beta’ decays of ^{210}Pb and ^{210}Bi . However, evidence of ^{210}Bi mobility has been observed in the liquid scintillator environment of the KamLAND detector. If radon daughters are soluble in liquid xenon, they pose a serious background distributed in the fiducial volume. We present studies performed on a xenon TPC test bed at LBNL, showing first evidence of the solubility of adsorbed radon daughters in liquid xenon.

Session

Works in Progress (15+5 min)

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