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Enhanced recombination of ^{124}Xe and the flow-tag of ^{214}Pb in LUX-ZEPLIN

In this talk I will describe analyses of two of the most notable backgrounds in the recent LUX-ZEPLIN (LZ) dark matter search: ^{124}Xe double L-shell capture decays and ^{214}Pb daughters of ^{222}Rn. First, we observe that ^{124}Xe double L-shell capture decays have charge yields deviating 30% from standard electronic recoil (ER) backgrounds, resulting in increased overlap with high-mass WIMPs. This effect was expected from the measured charge yields of related decays, indicating that enhanced electron-ion recombination arising from larger ionization densities is responsible. Next, the largest background in the WIMP search comes from ^{214}Pb decays following ^{222}Rn emanation into the liquid. To mitigate these events, we have developed methods to control and map the flow of the liquid xenon in LZ. The flow maps are used to derive temporally-evolving volumes –representing 15% of the recent WIMP search exposure –that contain around 60% of ^{214}Pb beta decays. Finally, I will describe how the flow-tag and enhanced recombination are relevant to calibrations, sidebands, and future dark matter searches.

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