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Atom counting system to measure ultralow Kr-85 contamination in liquid xenon dark matter detectors TAE HYUN YOON, CLAIRE ALLRED, LUKE GOETZKE, ELENA APRILE, TANYA ZELEVINSKY, Columbia University
— The XENON experiment aims at the direct detection of dark matter in the form of Weakly Interacting Massive Particles (WIMPs) via their elastic scattering off Xe nuclei. For Xe targets, Kr contamination contributes background events through beta decay of radioactive ^{85}Kr. To achieve the required sensitivity, it is necessary to suppress Kr contamination of Xe to the part per trillion (ppt) level. We have developed and are currently testing a single Kr atom counting apparatus using the Atom Trap Trace Analysis method. The low-level atom number measurement is made possible by cooling and trapping metastable Kr atoms with magneto-optical techniques and detecting their laser fluorescence with a sensitive photodetector. Since Ar and Kr have similar wavelengths, the cold-atom apparatus has been initially tested with Ar to avoid contamination. Results from tests with both Ar and Kr will be presented.

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