



Contribution ID: 418

Type: Oral Presentation

## Instrument Development for Liquid Xenon Dark Matter Searches: An Atom Trap Trace Analysis System to Measure Ultra-low Krypton Contamination in Xenon

*Saturday 11 June 2011 14:50 (20 minutes)*

The XENON dark matter experiments search for low-energy elastic scatters of Weakly Interacting Massive Particles off of Xe nuclei. For Xe targets and other noble liquids used in rare process searches, Kr contamination contributes background events through the beta decay of long-lived radioactive  $^{85}\text{Kr}$ . To achieve the sensitivity required of the next generation of dark matter detectors, the Kr contamination must be reduced to the part per trillion (ppt) level. We have developed and are currently testing a device to count single Kr atoms using the Atom Trap Trace Analysis (ATTA) method. Measurements of Kr in Xe at the ppt level are made possible by cooling and trapping metastable Kr 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 Ar will be presented.

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**Session Classification:** Dark Matter Detectors

**Track Classification:** Dark Matter Detectors