Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Using Atom Trap Trace Analysis (ATTA) To Measure Trace Krypton Contamination in Xenon[1] ANDRE LOOSE, TAE-HYUN YOON, LUKE GOETZKE, ELENA APRILE, TANYA ZELEVINSKY, Department of Physics, Columbia University, New York, NY 10027, USA — For Xe and other noble liquids used in rare process searches like the XENON dark matter experiments, Kr contamination contributes background events through the beta decay of long-lived radioactive ^{85}Kr. To achieve the sensitivity required of the next generation of detectors, the Kr contamination must be reduced to below the part per trillion (ppt) level. While cryogenic distillation is an established technology for the purification of Xe from Kr at the ppt level, there is no conventional method capable of reliably measuring such extremely low contamination. We developed an ATTA system based on laser cooling, trapping and counting of single Kr atoms in Xe, which will enable a rapid and reliable measurement of Kr concentration at the required ppt level. A RF plasma discharge is used to excite ^{84}Kr atoms to the metastable state. The ^{84}Kr* are cooled and trapped in a MOT using traditional magneto-optical techniques. The low contamination level of Kr in Xe leads to an average population of the MOT of less than one atom. Since Ar and Kr have similar wavelengths, the apparatus has been initially setup up using Ar, to avoid contamination with Kr. We will discuss switching from Ar to Kr in Xe, and initial measurements using Xe with defined levels of Kr contamination.

[1]The ATTA experiment is funded by the NSF MRI program.

Andre Loose
Columbia University

Date submitted: 25 Jan 2013 Electronic form version 1.4