Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Progress towards a primary, ultracold-atom-based pressure standard in the XHV regime DANIEL S. BARKER, JULIA K. SCHERSCHLIGT, NIKOLAI N. KLIMOV, JAMES A. FEDCHAK, STEPHEN ECKEL, Sensor Science Division, National Institute of Standards and Technology, Gaithersburg, MD 20899 — Preparation and evaluation of ultra-high-vacuum (UHV) and extreme-high-vacuum (XHV) environments is critical for high-quality semiconductor fabrication and emerging quantum technologies. Vacuum sensors for these pressure ranges, such as ion-gauges, are not primary (i.e., they require calibration themselves) and have large, poorly-understood uncertainties. We present our progress towards a primary standard for vacuum measurement in the XHV using a gas of ultra-cold atoms confined in a magnetic trap. Our apparatus will allow high-accuracy measurements of atom-molecule collision cross-sections that are necessary to extract the vacuum pressure from the observed background-gas-limited lifetime of the trapped atoms. We are also developing a chip-scale atom trap that integrates all the optics and electromagnets required to create magnetically-trapped, ultra-cold gases. This nano-fabricated atom-trapping chip will form the basis for a deployable, primary vacuum sensor with embedded traceability that can replace an ion gauge.

Daniel Barker
Univ of Maryland-College Park

Date submitted: 28 Jan 2017 Electronic form version 1.4