

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

UHV Ion Source for Highly Enriched and Purified ^{28}Si KE TANG, K.J. DWYER, HYUN-SOO KIM, A.N. RAMANAYAKA, J.M. POMEROY, National Institute of Standards and Technology — In order to improve the chemical purity of highly enriched ^{28}Si deposited for solid state quantum information, we have developed a NIST-made Ultra-High Vacuum (UHV) compatible ion source to replace our traditional High-Vacuum (HV) Penning ion source. Highly enriched ^{28}Si is a critical material for quantum information since the reduced ^{29}Si nuclear spin allows for much longer coherence (T_2) times of qubits. We have successfully deposited epitaxial ^{28}Si films with enrichments up to 99.99998% (0.127ppm ^{29}Si) using mass filtered ion beam deposition using natural abundance silane gas source. However, the chemical contamination levels of nitrogen, carbon and oxygen are unsatisfactorily high in the films we have grown, most likely due to the poor vacuum in our HV ion source. In this talk, we will present the design, performance and optimization of a new UHV ion source for this purpose.

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Date submitted: 09 Nov 2016

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