Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Strategies for alignment and e-beam contact to buried atomic-precision devices in Si JONATHAN WYRICK, PRADEEP NAMBOODIRI, XIQIAO WANG, ROY MURRAY, JOSEPH HAGMANN, KAI LI, MICHAEL STEWART, CURT RICHTER, RICHARD SILVER, National Institute of Standards and Technology — STM based hydrogen lithography has proven to be a viable route to fabrication of atomic-precision electronic devices. The strength of this technique is the ability to control the lateral placement of phosphorus atoms in a single atomic layer of Si with sub-nanometer resolution. However, because of limitations in the rate at which a scanning probe can pattern a device, as well as the ultimate size of contacts that can be fabricated (on the order of a micron in length), making electrical contact to STM fabricated devices encased in Si is nontrivial. One commonly implemented solution to this challenge is to choose the exact location on a Si surface where a device is to be patterned by STM and to design fiducials to aid in navigating the probe to that predetermined location. We present results from an alternate strategy for contacting buried devices based on performing the STM lithography fabrication first, and determination of the buried structure location after the fact using topographically identifiable STM fabricated fiducials. AFM, scanning capacitance, and peak force Kelvin microscopy as well as optical microscopy techniques are evaluated as a means for device relocation and to quantify the comparative accuracy of these techniques.

Jonathan Wyrick
NIST

Date submitted: 10 Nov 2016 Electronic form version 1.4