Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Optical and electrical manipulation of a single bi-stable Si-atom in GaAs PAUL KOENRAAD, ERWIN SMAKMAN, Eindhoven University of Technology — We will show that a Si atom in the outermost layer of GaAs has a bi-stable character much alike the well-known DX-center in $Al_xGa_{1-x}As$. In the ground state the Si atom is negatively charged and in the excited metastable state it is positively charged. These two charge states are related to a modification of the bond configuration of the Si atom in the GaAs surface layer. The voltage dependence of this bi-stable character can be used to bring the Si atom in either of the two states while probing it with an STM tip. The electrical excitation and relaxation processes were studied by analyzing the current and voltage dependence of the observed Random Telegraph Noise. We have successfully used this to create a memory element based on a single impurity atom. Our low T STM setup allows to illuminate the tunneling area and/or to collect tunneling induced photons from the area below the STM tip. We will show our recent results with the optical manipulation of the bond configuration and corresponding charge state of a single bi-stable Si atom as a function of the excitation wavelength (E.P. Smakman et al. PRB **87** 085414 (2013)). This allowed us to unravel different pathways for the excitation and relaxation processes that are involved in this optical manipulation.

Paul Koenraad
Eindhoven University of Technology

Date submitted: 14 Nov 2013 Electronic form version 1.4