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Scheme for locking cooling and slowing lasers for a silicon magneto-optical trap SAM RONALD, JONATHAN GILBERT, WILLIAM FAIRBANK, SIU AU LEE, Colorado State University — An attractive design for scalable quantum computer architectures has been proposed by Bruce Kane using single dopants in a crystal lattice. We are working on a magneto-optical trap (MOT) for single silicon atoms as a source for precise single ion implantation. Our laser systems operate at 221.74 nm utilizing frequency quadrupling of a Ti:Sapphire ring laser. The Zeeman slowing laser for cooling atoms in a silicon atomic beam has been locked to a molecular tellurium reference line for long term frequency stability. A portion of the second harmonic beam from the Zeeman slowing laser is acousto-optically shifted and used to lock the laser to a weak molecular tellurium absorption line. A portion of the unshifted second harmonic beam is overlapped with a portion of the second harmonic output of our main trapping laser system for the MOT to create a heterodyne beat note that is used to set our trapping laser detuning. In this talk I will discuss the setup for laser locking and present saturation spectra of molecular tellurium as referenced to the 221.74 nm transition in silicon, observed in the silicon beam and in a hollow cathode discharge.

Sam Ronald
Colorado State University

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