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Laser cooling and Zeeman slowing of a silicon atomic beam[1] SAM RONALD, WILLIAM FAIRBANK, SIU AU LEE, Colorado State University — We are attempting to cool and trap a single atom of silicon in a magneto-optical trap to be used as a highly controlled source for an ion beam. The ultimate goal is the deterministic implantation of single silicon atoms in an array in a silicon chip to be used as a set of qubits in a quantum computer. Our silicon is generated in an atomic beam at a relatively high temperature. In order to have an appreciable number of trappable atoms, we use a variable pitch Zeeman slower to precool this beam. Zeeman slowers are used to cool atomic beams by creating a varying magnetic field to match the deceleration of atoms with a certain entrance velocity. To address the $^3P_2$ to $^3D_2$ transition at 221.7nm, we utilize a frequency quadrupled CW laser. When the cooling laser is used simultaneously as a probe of the velocity distribution changes, interesting features have been observed which allow us to evaluate the performance of the slower. In this talk, I will describe the construction of the slower, the analysis techniques used, and evaluate the performance of our Zeeman slower, as well as discuss how they will impact future developments for the project.

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