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Laser cooling and trapping of atomic mercury JUSTIN PAUL, CHRISTIAN LYTLE, JASON JONES, University of Arizona — The level structure of the Hg atom is similar to other alkaline earth-like atoms, offering the possibility to realize an extremely high quality resonance factor (Q) on the "clock" transition ($^1S_0 -^3 P_0$) when confined in an optical lattice at the Stark-shift free wavelength. A key feature of the Hg system is the reduced uncertainty due to black-body induced Stark shifts, making it an interesting candidate as an optical frequency standard. For cooling on the $^1S_0 -^3 P_1$ transition at 253.7 nm, we employ an optically pumped semiconductor laser (OPSEL) operating at 1015 nm. The OPSEL frequency is quadrupled, generating over 120 mW at 253.7 nm. With this laser source we have trapped Hg^{199} from a background vapor in a standard MOT. We trap up to $2x10^6$ atoms with a $1/e^2$ radius of our MOT of ∼310 microns, corresponding to a density of 1.28×10^{11} atoms/cm^3. Using the time- of-flight method, we have measured a doppler-limited temperature of 46μK for the MOT. We have also generated 10 mW at the 266 nm clock transition using a frequency-quadrupled fiber laser. This light will be referenced to an iodine standard for assisting in high-precision spectroscopy of the $^1S_0 -^3 P_0$ transition. We present updated results on the MOT and the probe laser system.

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