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Stabilized 2051 nm TmHo:YLF laser and applications in Barium 137[1] MATTHEW HOFFMAN, ADAM KLECZEWSKI, ERIC MAGNUSON, BORIS BLINOV, E.N. FORTSON, University of Washington — We report on the development of a tunable frequency stabilized laser operating at a wavelength of 2051 nm and its applications in $^{137}Ba^{+}$. A commercially available TmHo: YLF laser was frequency doubled using a periodically poled lithium niobate crystal and then frequency shifted using a broadband acousto-optic modulator. The shifted 1025 nm beam was then sent into a reference cavity with a finesse of approximately 350,000 made of ultra-low expansion glass, and the laser frequency is stabilized using the Pound-Drever-Hall method. Using a linear Paul trap, we confine and laser cool single barium ions, and excite the $6S_{3/2}$ to $5D_{3/2}$ clock transition at 2051 nm. We plan to use this electric quadrupole transition as a clock transition in an optical frequency standard. This TmHo: YLF laser will also be employed to perform precision spectroscopy of the $5D_{3/2}$ manifold which will allow us to determine the nuclear magnetic octopole moment of ^{137}Ba. Finally, we have plans to use this laser to test atomic parity non-conservation in a single trapped ^{137}Ba ion.

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