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A Novel Short Extended Cavity Diode Laser for Red Wavelengths[1]

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We present the design and characterization of a short extended cavity diode laser with immediate applications in ultracold atomic physics. To reach wavelengths unavailable in commercial laser diodes, a laser was constructed such that it could be cooled without loss in performance. We demonstrate that this laser design has a mode-hop-free tuning range of 20 GHz or greater when modulating laser current, and that it can also be adjusted using temperature controls and a piezo-electric output coupler mount. We also show that this laser achieves stable single-mode operaction with both 90% and 50% reflective output couplers without degrading its performance. Finally, we present an application of this laser as a repumper in cooling and trapping experiments of ^{88}Sr, including increasing the yield of trapped atoms and studying the lifetimes of metastable atomic states.

[1]In collaboration with Aaron Dunn, Andrew Traverso, Natali Martinez de Escobar, Pascal Mickelson, Sarah Nagel, and Tom Killian, Department of Physics, Rice University.