Abstract Submitted
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Efficient Optically Pumped Cesium Vapor Laser B. ZHDANOV, T. EHRENREICH, R.J. KNIZE, U. S. Air Force Academy — We have demonstrated a cesium laser with 81% slope efficiency relative to the input pump power. The maximum output power at 894 nm was 0.36 W with a pump power of 0.57 W (the overall optical efficiency was 63%). Optically pumped alkali lasers have a number of desirable features as compared to solid state or fiber lasers: the quantum efficiency is high (95.3% for Cs as compared to 76% for a 1.06 μm Nd:YAG laser); the gain medium is a gas with excellent optical quality; thermal problems are reduced since the gas gain medium can be flowed to remove heat. We used the three-level pump scheme to create the population inversion on the D1 transition ($6P_{1/2}$ to $6S_{1/2}$) in the Cs atomic vapor. A narrowband pump laser operating at 852 nm pumps the atoms to the $6P_{3/2}$ state (D2 line) which is then rapidly quenched to the $6P_{1/2}$ state by an ethane buffer gas. This creates a population inversion between the $6P_{1/2}$ and $6S_{1/2}$ states and lasing at 894 nm. The experimental set-up consisted of a Coherent MBR 110 Ti:Sapphire laser used as a pump source and a 2 cm long Cs vapor cell with AR coated windows positioned in the center of a 16 cm long stable laser cavity. The cell was filled with metallic cesium and 500 Torr of ethane at 20^{o}C and was placed inside a temperature controlled oven. The laser cavity was longitudinally pumped through the input cavity mirror.

Thomas Ehrenreich
U. S. Air Force Academy

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