

Stabilization of narrow band semiconductor lasers for application to cesium fountain clock

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Abstrak

ABSTRACT

For the purpose of optically cooling, trapping, detecting and accelerating Cesium atoms in a "fountain clock", semiconductor lasers with external resonator have been designed, built and tested in their spectral characteristic and their long-term frequency drift.

Multiple Quantum Well lasers with AR coating on one end face and a high reflection coating on the other end face have been used which produce 50 mW at 852 nm (single end output). With an external grating resonator the line width was reduced to 150 KHz. Doppler emitted and saturated absorption spectra of the two Cs fine structure transitions were recorded. The saturated absorption lines (Lamb dips) were utilized as optical discriminators in order to stabilize the laser frequencies off line center as is required for optical cooling. Beat frequency measurements between two external resonator laser diodes permitted to measure the 150 KHz line width, and to observe the quality of the long-term frequency stabilization.