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Laser-Atomic Oscillator YUAN-YU JAU, WILLIAM HAPPER, Princeton University — We report a newly developed technique, laser-atomic oscillator, for simultaneously generating stable optical and electrical modulations with a very few components. It requires only a semiconductor laser, a vapor cell, and a few optical components. No photodetector and electronic feedback are needed. In this new system, the ground-state hyperfine coherence of alkali-metal atoms is spontaneously generated. The modulated laser light with a spectrum of a small optical comb is automatically produced, and the spacing between the comb peaks is photonically locked to the hyperfine frequency. The charge carriers in the semiconductor laser are also modulated at the hyperfine frequency. Laser-atomic oscillator is purely optical. Its simple structure allows the system to be very compact. We believe this new technique will bring some advantages in the applications of atomic chronometry, atomic magnetometry, and generation of multi-coherent light.

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