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Portable Dual-Wavelength Optical Atomic Rubidium Clock

We report progress on the development and out-of-lab demonstrations of a next-generation optical timing reference based on the dual-wavelength excitation of the $5S_{1/2} \rightarrow 5D_{5/2}$ two-photon transition of rubidium-87.

We make use of the robustness of mature laser telecommunications technologies, FPGA-based control systems and automation, and a compact optical frequency comb to generate stable clock outputs in the optical (778nm, 385THz) and radio frequency (1GHz) domains for interfacing with both optical systems and conventional electronics. We have measured fractional frequency instability of the rubidium clock of 1.5×10^{-13} at 1s, integrating down at $1/\sqrt{\tau}$ to 3×10^{-15} at 8,000s.

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