Compact atomic clocks based on coherent population trapping: technologies and performances for applications

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The atomic CPT interaction technique allows building all-optical setup microwave clocks with high frequency stability in compact vapor-cell devices. These clocks are suitable for a wide range of applications from industry environment to on-board systems.

First we will report our best performance achieved with a laboratory prototype: the pulsed caesium CPT clock with orthogonal linear polarizations arranged in the so-called double-lambda configuration using two separate phase-locked lasers tuned to the D1 line. The short term frequency stability has been measured at the level of $3\times10^{-13}\tau^{-1/2}$. The mid-term stability is limited at a few 10^{-14} after hundreds of seconds. The main noise sources impacting both short and mid terms will be discussed.

Then we will review novel CPT clock technologies, including the generation of high spectral purity microwave signal with a continuous dual-frequency laser. Alternatively, the approach using modulated lasers will be presented with progress towards an industrial prototype.