Optical frequency measurement of Rb $5S$-$5P$ transition with a frequency comb

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Femtosecond optical frequency comb technology [1] allows to count optical frequencies against radiofrequency clock. We used an erbium-fiber-based fs comb made by *Menlo Systems* to measure frequency of optical transitions in rubidium atomic vapor against a commercial rubidium clock. The Rb clock was continuously calibrated against GPS satellite time allowing to achieve 11 digits of precision in absolute frequency determination.

We have set up an external cavity diode laser at 780 nm that excites D_2 line in Rb vapor and recorded saturation spectroscopy peaks from ^{85}Rb and ^{87}Rb isotopic hyperfine transitions. The Rb optical cell was placed inside a magnetic shield to minimize Zeeman shift. Diode laser was scanned across the Rb spectrum and its absolute optical frequency was measured precisely from a beatnote with the optical frequency comb. For extraction of hyperfine transition frequencies it is important to use multiple peak fit. Peak positions agree within 1 MHz with the literature [2].

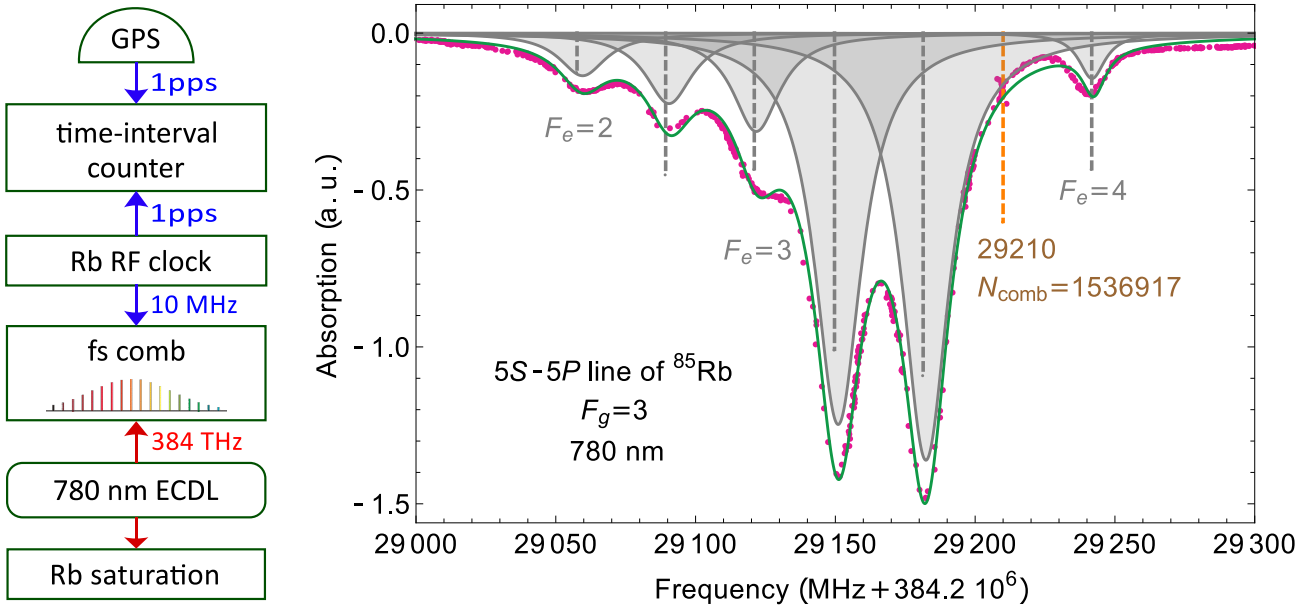

Figure 1: *Left: Experimental scheme. Right: Precision measurement of absolute frequencies of Rb saturation peaks using optical frequency comb. Multiple peaks fitting using Lorentz functions is shown.*

References

[1] T.W. Hänsch et al, Phil. Trans. Roy. Soc. London A **363**, 2155 (2005).
[2] D. Steck, Rubidium Numbers, 2010.