Transfer of optical frequency references
Post-doctoral position – 12 Months

Laboratory: FEMTO-ST – CNRS UMR6174
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Context
The Time and Frequency department of the FEMTO-ST intitute is one of the world leaders for the realization of microwave frequency references ranging from the MEMS based CPT atomic clock to the state of the art microwave cryogenic sapphire oscillators. In the last decade, our scientific activity was extended to the optical domain with the realization of the cavity stabilized laser, single-ion optical clock, a superradiant laser and a compact cesium cell based optical reference. In the optical domain, the target performances also range from compact references to state-of-the-art ultra-stable sources.
Optical frequency combs based on femtosecond lasers are key systems of this ensemble of optical references to allow for inter-comparisons between a wide range of wavelength. In a first step they will help in the development of references by frequent and short runs of characterization. In the longer run these references will require reliable operation of the comparison infrastructure for longer campains in which other metrological laboratories such as SYRTE or PTB will be involved, thanks to the French and European optical fiber networks.

Mission
The candidate will setup a part of this comparison infrastructure based on two (or more) femtosecond lasers. One the main objectives is to implement the optical frequency stability transfer of the ultra-stable laser based on silicon cryogenic cavity signal at 1542 nm to 871 nm (Yb+ clock transition) and to 578 nm (Yb superradiant laser). The noise of this transfer has to be compatible with the noise of the reference expected to be in the low 10-17 decade making this realization challenging. A less challenging transfer to 894 nm (D1 line of Cs) for compact cell based optical clocks has also to be implemented. The relevant results will be presented in international conferences and published in peer-review journals.

Profile
The candidate will have a strong background in frequency metrology and in optics (3 years PhD thesis or 1 year post-doc minimum). Ideally the candidate will have worked on ultra-stable lasers, optical frequency comb stabilization (for microwave generation or for optic-optic transfer), ultra-stable optical links, optical frequency standards comparisons or ultra-low phase noise measurements.
A good understanding of digital electronics will be greatly appreciated.

Skills
- Guided and free-space optic
- Continuous and/or femtosecond lasers (in the frame of frequency metrology).
- Lasers stabilization, noise reduction and feedback.
- Frequency and phase noise measurements, noise measurement and analysis.
- RF and microwave electronics (basic).
- Instrumentation and programming.
- Digital electronic and FPGA.
- Experimental and team work.