

FIXED-TERM CONTRACT of 12 month (Research Engineer)

FEMTO-ST – CNRS UMR6174 – Time and Frequency Dpt.

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Characterization of the REFIMEVE+ fiber link.

The Time and Frequency department of the FEMTO-ST institute (UMR CNRS 6174) and the Besançon Observatory are involved in the development of a one-of-a-kind metrological platform dedicated to the frequency stability and phase noise characterization of frequency sources (oscillators) from 1 s to 1 day of integration time.

This platform is based on radiofrequency, microwave and optical frequency standards (3 quartz oscillators, 3 Hydrogen Masers, 3 Cryogenic Sapphire Oscillators and 3 Ultra Stable Lasers associated with frequency combs, all up and running). Moreover, in the frame of the REFIMEVE+ EquipeX, a fiber link between all the French metrological laboratories is under construction. The REFIMEVE+ project (or MEFINEV+ project - Metrological Fiber Network with European Vocation + -) is based on a scientific innovation, the ability to transfer an ultra-stable optical frequency on the Internet network over long-distances without any traffic disruption (www.refimeve.fr).

The proposed position regards the exploitation and the metrological characterization of this fiber link between Paris and Besançon. An ultra-stable laser in Besançon will be locked to the REFIMEVE+ signal and will be compared, via microwave generation with an optical frequency comb, to the cryogenic sapphire oscillator and to the Hydrogen Maser at FEMTO-ST. In order to realize this frequency comparison the candidate will have to develop the ultra-stable fiber link between the cryogenic sapphire oscillators room and the laser room in order to transfer the cryogenic sapphire oscillator spectral purity ($-106 \text{ dB}\cdot\text{rad}^2\cdot\text{Hz}^{-1}$ at 1 Hz) and relative frequency stability ($5\cdot 10^{-16}$ at 1 second) without degradation. The candidate will also have the opportunity to develop and setup experiments based on the REFIMEVE+ ultra-stable signal. The methods developed could also be used for the characterization of a cryogenic silicon optical cavity.

Results will be presented at international workshops or conferences. The candidate will have the opportunity to work in a high-level environment in an internationally recognized time and frequency metrology laboratory, benefiting from high-end metrological characterization equipment and know-how.

The candidate should preferably have some of the following skills:

- Optics and guided optics
- Frequency metrology
- Optical frequency combs - femtosecond lasers
- Basic knowledge of analog electronics
- RF and microwave electronics