

Post-doc position in Lille, France

Laboratory: PhLAM/IRCICA, Université de Lille

Funding : ANR project FARCO, 2023-2025

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Generation of triple frequency combs in all fiber systems

Summary : Optical frequency comb (OFC) are coherent light sources emitting a broad spectrum of discrete and evenly spaced narrow frequency lines. They are widely used as an optical reference and have led to a major revolution in various fields such as



high-resolution spectroscopy, optical referencing of atomic clocks, astronomy, and high-capacity optical communications. In recent years, multi-frequency comb systems, made of several frequency combs with slightly different repetition rates, have gained significant interest. Such systems promise multi-dimensional spectroscopy in the study of ultrafast dynamics or precise distance measurement,

motivating the search for speed, precision and accuracy. However, OFC science has reached a technological plateau. FARCO sets the ambitious goal to revolutionize the field by developing a new class of all-fibre laser sources based on **multi-frequency comb generation**. By exploiting **spatial multiplexing in optical fibers**, we will design, fabricate and test a **triple-frequency comb light source in the 1 μ m window delivering 100's of pJ pulses at 10 GHz repetition rate over a bandwidth of 10 THz with an excellent mutual coherence**. All fibers will be fabricated by FiberctechLille, the fiber drawing facility of the lab in Lille. The developed tri-comb source will be optimized for advanced coherent Raman spectroscopy and imaging with pharmaceutical and medical demonstrations. We anticipate that this approach will enable to gain more than **one order of magnitude** in speed in label free chemical analysis and imaging. This project is funded by the French ANR in close collaboration with Hervé Rigneault from the Fresnel institute in Marseille (other partner).

Skills: Frequency combs, nonlinear fiber optics

Duration: 2 years

Start: Early 2023

Net salary: 2250 € per month