

Ultrastable frequency transfer through the REFIMEVE optical fiber network

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Optical fiber links enable the accurate and ultra-stable transfer of an optical frequency reference to distant locations connected by optical fibers. They provide unprecedented resolution for clock comparisons and have shown great potential in a wide range of applications such as spectroscopy, fundamental physics, geodesy, search for dark matter or tests of general relativity for example [1]. In France, we have implemented a wide scale fiber network, called REFIMEVE, which is using installed telecom fibers provided mainly by the French academic network of RENATER. It disseminates an ultra-stable and accurate time and frequency signals generated at LNE-SYRTE to partner laboratories at the national scale and to connection points to European National Metrological Institutes. The network is currently composed of five national-scale links and three regional links, for a total of 2×3400 km and it disseminates an accurate frequency signal with a residual transfer uncertainty better than 10^{-19} . It is highly reliable and robust thanks to repeater laser stations installed along the network, which provide both remote control and real-time supervision [2].

REFIMEVE is part of the fiber links enabling the accurate comparison of a wide set of European atomic clocks, which benefits to fundamental metrology and can be applied to chronometric geodesy or search for new physics. With a connection to the Italian Quantum Backbone, it enables recently the first comparison of Italian and French atomic clocks, exploiting four months of quasi-continuous operation of the French and Italian links [3]. REFIMEVE also currently benefits to remote laser control, photonics and high-resolution spectroscopy, among them precision molecular spectroscopy in the mid-infrared using Quantum Cascade Lasers [4].

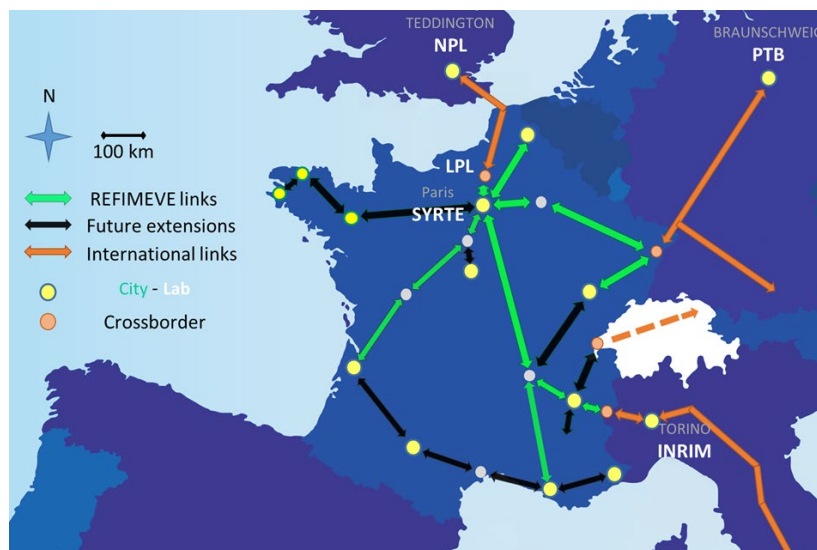


FIG. 1: Map of the REFIMEVE network and its European connection.

References

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