

REFIMEVE+ : towards a wide optical fiber network for optical frequency standard dissemination

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Résumé

Coherent optical fiber links were established over ranges of 1000 km, enabling unprecedented resolution for clock comparisons. By opening a new era of optical metrology, these fiber links create opportunities for a wide range of high precision measurements in any physics laboratories. Such development however requires that the techniques are extended beyond the current point-to-point architecture and some effective fiber network architecture is implemented in order to disseminate an ultrastable frequency standard to a large number of laboratories.

The REFIMEVE+ project aims to build such a wide scale fiber network, highly reliable and robust, capable at the same time of comparing the best optical clocks and of disseminating an optical frequency standard. To that aim, our groups have explored several dissemination techniques and network building blocks, and the way to combine them and to improve their reliability in terms of uptime and cycle-slip free operation [1-3].

In view of multi-user dissemination, we introduce a generalization of the repeater laser station (RLS), based on an ultra-low sensitivity multi-branch Michelson interferometer. This Super-RLS enables us to feed five links at once and acts as a metrological node. As a first

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step, we will show that an optical frequency can be disseminated at two places simultaneously with the same performance that obtained with RLSs [4]. We will also show how to combine Super-RLS, RLS and two-way techniques for a wide and versatile optical metrological network.

We will also present the latest experimental results we obtained over several months for the 1400-km long optical fiber link between Syrte and Université of Strasbourg. We improved the robustness of the link, which instability is in the 10-20 range at long-term. The reliability of this technology has also been demonstrated in the frame of the knowledge transfer achieved with SME, where most of the metrological network equipments are now commercially available.

References

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