

Comparison campaigns of time transfer techniques between calibrated observatories

C. Courde, E. Samain, P. Exertier, M. Laas-Bourez, N. Martin, JM. Torre, P. Fridelance, P. Guillemot, R. Sherwood, M. Abgrall, G. D. Rovera, P. Urich

*Géoazur UMR 7329, Université de Nice Sophia Antipolis, Observatoire de la Côte d'Azur, CNRS
2130 Route de l'Observatoire 06460 Caussols, France*

LNE-SYRTE, Observatoire de Paris – LNE – CNRS – UPMC, Paris, France

NERC, Space Geodesy Facility Herstmonceux, United Kingdom

CNES, French Space Agency, Toulouse, France

Phusipus Intégration, Saint Vallier, France

The Time Transfer by Laser Link (T2L2) project is designed to the comparison of ground clocks thanks to a space instrument able to time tag laser pulses reaching the satellite and a SLR stations network. Compared to the microwave techniques, as the GPS-Common View, T2L2 should improve the time transfer uncertainty of at least one order of magnitude. The stability of this optical technique gives the opportunity to compare today's most accurate frequency standard.

The years 2012-2013 were devoted to the study of T2L2 accuracy and stability. In this presentation, we will report on the results obtained during two campaigns:

- a preliminary campaign in 2012 at OCA between the FTLRS and the MéO stations, conducted with an independent clock for each station. A direct comparison based on the STX301event timer was implemented in addition of T2L2 and GPS-CV techniques. The difference obtained between T2L2 and direct comparison was around 170 ps. This result gives a compatible agreement with the T2L2 ground to ground expanded uncertainty of 140 ps and the expanded uncertainty of the direct comparison.
- a two month campaign in 2013 between three European laboratories (NERC, Observatoire de Paris, Observatoire de la Côte d'Azur) calibrated independently for the two techniques. The difference between T2L2 and GPS-CV is remained in average below 300 ps, with a standard deviation below 500 ps mostly due to GPS-CV. The good agreement between the two techniques confirms that the two independent calibration processes have been carried out in a rigorous way.

We will focus on the instrumental deployment, the calibration processes and the ground metrology implemented.