

Laboratory report for the CCTF September 2012



TAI/12-28
CCTF/12-36

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VSL Time and Frequency activities report 2009 - 2012

Staff

The staff involved in Time and Frequency at VSL consists of 5 persons (approximately 1.5 full-time person equivalent).

Erik Dierikx (Scientist)

Roland van Bemmelen (Engineer)

Faisal Mubarak (Scientist)

Leendert Jol (Engineer)

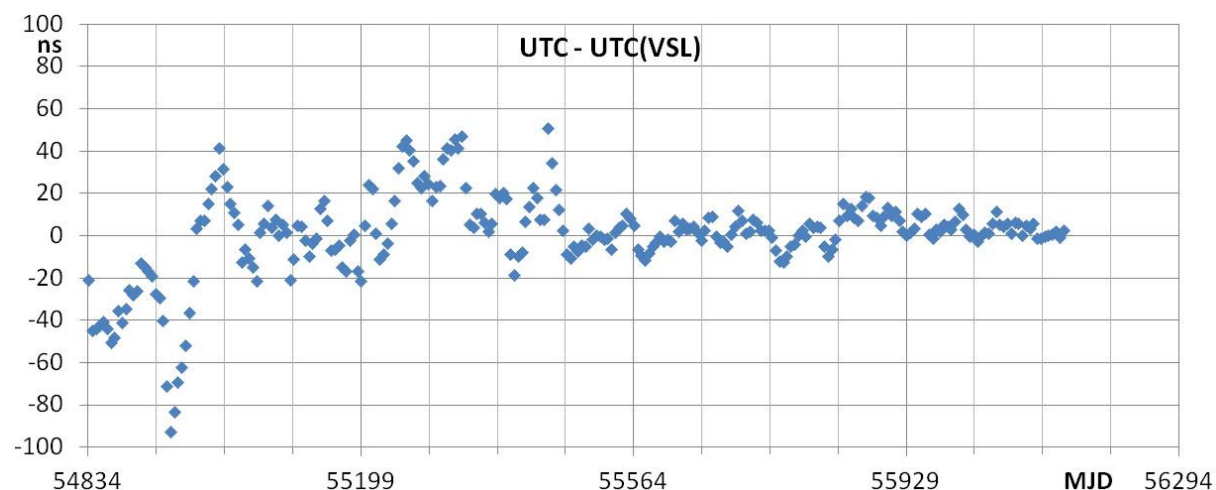
Marc Pieksma (Marketing and consultancy)

Timescale realization

The VSL laboratory is equipped with 4 industrial Cesium clocks, type HP 5071 with high performance Cs tubes. Between May 2009 and September 2012, 3 of the Cs beam tubes have been replaced.

UTC(VSL) is realized from one master Cs-clock in combination with a microphase stepper. In case of failure, a back-up realization is maintained within a few ns from UTC(VSL).

Clock data is reported to the BIPM monthly for the computation of UTC and daily for the computation of UTCr.





Time links

Time links between UTC(VSL) and UTC realizations in other laboratories are maintained with two different techniques:

- Two way satellite time and frequency transfer (TWSTFT)
 - The TW-station is based on a SATRE modem and includes an automated delay monitoring system.
 - Bihourly measurement sessions are performed with laboratories in Europe and USA.
 - Measurement data is reported daily to the BIPM.
 - A calibration of the TW station with a travelling station is foreseen in 2013.
- GNSS measurements
 - Two geodetic GNSS receivers are available:
 - Septentrio PolaRx2 receiver.
 - Topcon GPS receiver (operational until april 2012)
 - Septentrio PolaRx4TR receiver (operational from may 2012)
 - The receivers produce both Rinex data and CGGTTS (P3) data.
 - One receiver is connected to the UTC(VSL) timescale. Data from this receiver is reported daily to the BIPM.
 - The other receiver is connected to the back-up timescale realization.
 - A delay calibration of the receivers is scheduled for October 2012.

Time dissemination

Time information is disseminated from the laboratory by:

- NTP server: ntp.vsl.nl
- Weekly Time Service Bulletin, containing measurement information on GPS, DCF77 and radio time signals.
- The telephone modem service (0900 - 6171819) was stopped on 31 December 2009.

Developments

- TWSTFT station delay calibration

VSL has continued the development on the automated delay calibrations in the TWSTFT station.

In 2010, a completely new design was made for the delay calibration system (also referred to as Satellite Simulator). The objectives of the new design were:

- to make the measurements more reliable and
- to put the most sensitive components in an indoor environment.

The new design was built in 2011 and implements a dual bi-directional up- and down converter.

The equipment was installed in a test set-up and has been running in bihourly sessions from August 2011. The test results are satisfactory and the new delay calibration system is now ready to be implemented for routine measurements in the VSL TW station.

- TF transfer by optical fibers

Within the European Metrology Research Program (EMRP), VSL initiated a proposal for collaboration on the development of time transfer by optical fibers. This proposal was merged with another proposal for extremely accurate frequency comparison of optical clocks through optical fibers. The merged proposal has been accepted for a joint research project called "Network for European Accurate Time and Frequency Transfer" (NEAT-FT). This project started in June 2012. In this project, VSL will contribute to the development of one-way time dissemination and two-way time transfer in existing telecommunication fiber networks.

Erik Dierikx
Delft, 10 September 2012