**REPORT OF THE 21th MEETING**
**OF THE CCTF WORKING GROUP ON TWSTFT**

Held at Howard International House, Taipei, Taiwan
on 5-6 September 2013

The 21th meeting of the Consultative Committee for Time and Frequency (CCTF) Working Group (WG) on Two-Way Satellite Time and Frequency Transfer (TWSTFT) was held on 5-6 September 2013 in Taipei, which was part of the AP-RASC'13/ATF Workshop conference. The WG meeting was organized by the TL and was chaired by the chair of the working group, Dirk Piester of PTB. Other contributions to the meeting, and attendees list, are available on the BIPM open access website:

http://www.bipm.org/wg/AllowedDocuments.jsp?wg=TWSTFT

Documents related to the details of financial issues, and attendees list with e-mails, are available for Participating Stations on TWSTFT restricted access of:

http://www.bipm.org/en/committees/cc/cctf/

## Agenda (*5-6 September)*

**A- Laboratory Status Reports** (see full reports on *BIPM TWSTFT web-site*).

**AOS**

- Calibration of TW (Timetech trip)
- 420 km AOS/GUM Fiber link
- pionier-optical time and frequency dissemination system

**METAS**

- TW Station modification in 2012
- Calibration of TW (Timetech trip)
- Accumulation of PTB/CH calibration uncertainty
- TW GPS Calibration bridge (TM198) for non-UTC link

**NICT**

- Stop using of NICT modem, replaced by Satre modem
- AM2 will stop and replaced by AM4, 24 hr operate
- Study of TW carrier phase, domestic and NICT/PTB link
- T2K Neutrino Experiment

**NIM**

- New station NIM02, domestic use
- Eu/Asia PFS comparison

**NIST**

- no big change
- monitor the USNO/NIST difference, work very well
- monitor Eu/Eu some links, diurnal improved about 200 ps (since last Autumn?)
- moving to new building (not yet)
- study diurnal
- Satellite contract extended smoothly

**NMIJ**

- no plan to join Asia link, waiting for new SATRE modem,
- Asia/Eu link, 2.4m 10W station is ready for AM4 link
- VLBI will keep going and TWCP will begin next year,

**OP**

- Calibration trip by timetech
- TWCP
- finalize document of improve the TW links in Eu
- T2L2 project
- change definition of UTC(OP), involve 3 fountain clocks
- 540 km TWOTT link (SATRE modem, 20Mchips)
- Satellite simulator

**PTB**

- update of UTC(PTB) since June 2012
- PTB04 for TWCP since summer 2013
- Eu/Asia fountain clocks comparison
- new TW station at new time lab 600 m away from UTC(PTB) lab
- PTB05 under construction

**SP**

- SATSIM not in use, new SATSIM antenna needed
- Adding PTF1 and PTF2
- increased variations in SP Tx power (new transceiver/SSPA combination)
- raw data to SP server 193.10.7.50/IGSRT.SP.SE
- study diurnal using Kalman filter

**TL**

- AsiaPacific network(GE23)
- Asia/Eu network AM2
- Asia/Hawaii link GE23, replace HD of Satre modem
- PTB/TL result and PTB/NICT/TL closure loop 0.73 ns, sd=0.4ns
- USNO/Hawaii(KPGO)/TL link
- 2014 IFCS will be held in Taipei

**VNIIFTRI**

- new realization strategy of UTC(SU)-> Cs fountain + HM
- calibration TW PTB/SU, timetech mobile twTW station

- AM2 possibly will operate in Jan. and Feb. 2014
- 7th international symposium "Metrology of time and space" in Suzdal, Ru

**USNO**

- Calibration in parts, characterize, other
- Upgrading distribution amplifier
- logging system
- new calibration techniques, measurement delay via each device
- USNO/AMC fiber optic test
- in-house TWSTFT modem(FPGA/DSP)

**VSL**

- SatSim version 3
- calibration TW (Timetech trip)
- TWOTT network EMRP NEST-FT
- November 2012 workshop on TWOTFT
- first trial base on white rabbit technology

**B- Presentations**

- TWSTFT: present, ongoing and oncoming: (Dr. W Lewandowski)
- ER/US TWSTFT sites real-time monitor (Dr. J. Achkar)
- Status of TWSTFT contract regarding the EU-EU and US-EU link (A. Bauch, presented by Dr. D. Piester)
- TWSTFT diurnal evaluation between hardware and software receivers: (Mr. Y.-J. Huang)
- "Applications" of TWOTT* in accurate time transfer:
  a. Stability of GPS PPP link on the baseline of 270 km compared to glass fiber measurements (TWOTT) (Dr J Nawrocki et al.)
  b. Applications of TWOTT at SP (Dr. K Jaldehag)

(*TWOTT = Two-Way Optical Fiber Time and Frequency Transfer)

- TWOTT practical issues: Name, format, calibration etc: (Drs Jiang and J Nawrocki)
  - AOS daily submits the optical fiber data to BIPM: point/5s
  - Monthly data processing
  - Discussion on data format for TWOTFT

- Time link calibration: (Drs S.Y. Lin and Z Jiang)
  - CGGTTS format, Total delay
  - Joseph: T2L2 develop very precise 1PPS measure by oscilloscope

- Stability of the UTC time links, Problem and Progress: (Dr. D Matsakis)
  - inconsistence between NIST/USNO, PTB/NIST, PTB/USNO and circular T
  - change of the CCD of USNO/PTB KU and X band 2ns ~ -5ns in 4 years
  - NIST/PTB TW-PPP double difference
  - Triangle closure sums is not consistence within 2 ns
  - Can optical fibers transfer time?

- TW Link Calibration by Mobile Ground Station: (Dr. W Schaefer)

**C-Discussions**

1. Implementation of the new calibration results: schedule
2. The proposition of Dr. Luc Erard of merging CCTF working groups on TWSTT and ATFT
   - Discussion on merging some working groups of CCTF (for example some functions of ATFT into TWSTFT)
   - Amemiya-san: We should discuss this with the WG of ATFT.
   - Erik: A Big WG will be too complex to focus practical issues.
   - Włodek: TWSTFT WG works very well, keep its independence.

3. Next meeting: VNIIFTRI will host the 22 CCTF TWSTFT WG in Russia jointly to the 7-th International Symposium Metrology of Time and Space. Need to apply early for Visa.

**D- Highlight**

The meeting was ended by a simple Ceremony for the retirement of Dr. Włodek Lewandowski. Dirk, Jerzy, Jiang and Calvin etc. gave short speeches. A wishing card signed by all the attendees and a souvenir, prepared by Calvin Lin, Bill Tseng, Dirk Piester and Zhiheng Jiang, were given to Wlodek.

**E- Picture of all the attendees and thanks to the organizer TL**

**G-Lab tour (9/6)**
**2:00~4:00 at TL**

Edited by W. Lewandowski and Z Jiang
Reporters: Shinn-Yan (Calvin) LIN and Wen-Hung (Bill) TSENG