

## **REPORT OF THE 12th MEETING OF THE CCTF WORKING GROUP ON TWO-WAY SATELLITE TIME AND FREQUENCY TRANSFER**

held in Tokyo, Japan,  
on 14 and 15 October 2004

The 12th 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 14 and 15 October 2004 in Tokyo, Japan. The WG meeting was organized by the National Institute of Information and Communications Technology (NICT) and was chaired by Bill Klepczynski of US State Department. Other contributions to the meeting are available on the BIPM web site:

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

### **Agenda of the meeting**

- 1) Status of INTELSAT Agreement (B. Klepczynski, US State Department)
- 2) Participating Station Reports (NICT, KRIS, NTSC, TL, NIST, USNO, METAS, NPL, OCA, OP, PTB, TUG, VSL, IEN, SP)
- 3) VSL - Taiwan Link (VSL and TL)
- 4) BIPM TWSTFT Data Processing (Z. Jiang and W. Lewandowski, BIPM)
- 5) TWSTFT between USNO and PTB (D. Piester, PTB)
- 6) Frequency change in the transatlantic link (Discussion)
- 7) Problems with observing schedule for Europe (G. de Jong, VSL)
- 8) Results of recent TUG TWSTFT calibration trip between PTB, OP, VSL, NPL (R. Hlavac, NPL, on behalf of O. Koudelka, TUG)
- 9) BIPM GPS calibration of PTB, OP, VSL, NPL during TWSTFT trip (W. Lewandowski, L. Tisserand)
- 10) Comparison of GPS and TWSTFT calibrations (W. Lewandowski, BIPM, et al.)
- 11) ETS-VIII time comparison system and Quasi-Zenith satellite positioning system (Mr Hama, NICT)
- 12) Pacific Rim Status (Y. Takahashi, NICT)

### **Summary of the meeting**

**Status of INTELSAT agreement.** The time metrology community continue to have free time from INTELSAT, and with new satellite there is more service. However this is not yet formalized, and there is still a lot to do. We need a quick agreement. INTELSAT would wish to use our activities for advertising. USNO could sign Cooperation Research and Development Agreement. However, US government does not allow INTELSAT logo to be displayed on USNO web-page. B. Klepczynski is in charge of the relations with INTELSAT management.

**Frequency change in transatlantic link.** T. Parker suggested creation of a group for experimentation between NIST, NPL, PTB, and USNO on frequency changes before problems of August 2005.

**VSL – Taiwan link.** A TWSTFT link was established between VSL and TL using PAS-4 satellite at 72° East. Elevation angles are 28.74° at the TL and 4.90° at the VSL. G. de Jong reported that the differences between VSL/TL TWSTFT link and *Circular T* are displaying a change of about 20 ns which occurred slowly over several weeks. This can not come from satellite transponder as its hardware can change by no more than 1 ns.

**North America – Asia link.** According to T. Parker there is not NIST specific project of a link to Asia, but this is considered in the future. It depends on funding. According to Y. Takahashi NICT consider to negotiate with USNO about NICT modem.

**NICT – PTB link.** According to Y. Takahashi the PTB could be equipped with NICT modem during spring 2005.

**Reports from Participating Stations** (see full reports on BIPM TWSTFT web-site). NICT is equipped with Atlantis modem and a NICT modem; used satellites are JCSAT and PAS-8. KRIS is evaluating TWSTFT data and will be sending them to BIPM within some months. NTSC is evaluating ionospheric effects on TWSTFT measurements. TL has three operational TWSTFT links (NICT, AUS, VSL), and a project of a C-band link with NIST. NMIJ is equipped with an Atlantis modem and a NICT modem, and is using JCSAT-1B. Since January 2003 NICT/NTSC TWSTFT link was used for TAI. NIST is observing 4 times a day on transatlantic links, and considers buying 2nd Earth station. USNO works on TWSTFT carrier-phase with TimeTech, and conducts X-band transatlantic calibrations. At METAS TWSTFT station is fully operational and data will be sent soon to the BIPM. At NPL three calibrations were performed: TWSTFT by TUG station, GPS by TTS-2 and Ashtech Z-12T. OCA will publish soon 4 sessions/day data on ftp site. AT OP Satre time tag error was removed since 1st January 2004; 2nd Satre modem will be purchased before end of 2004; 2nd TWSTFT station is foreseen for 2005/2006. PTB is looking for a new strategy for steering UTC(PTB). VSL will be moving its time laboratory to a new laboratory 3 km away. SP and IEN provided could not attend this meeting but sent written reports available on this web page.

**Pacific Rim status.** Two times a week observations. 5ns rms between TWSTFT and GPS CV: a problem to be understood. The NICT modem will be fully operational during spring 2005. A calibration trip could be organized in Japan in 2005.

**TWSTFT calibration trips.** Detailed results of July 2004 TUG calibration trip to PTB, OP, NPL and VSL were reported. Next calibration trip could be organised during PTTI PS meeting.

**BIPM Reports.** BIPM TWSTFT data processing and GPS calibrations used for TWSTFT were presented.

***BIPM TWSTFT web-site.*** Besides meeting reports it should soon contain more information as TWSTFT schedules, used satellites and frequencies, laboratories equipment, etc.

***Organization of WG.*** B. Klepczynski recalled that M. Imae coordinates TWSTFT activities in Asia-Pacific region, T. Parker in North America, and G. de Jong in Europe. G. de Jong serves also as Co-Chairman of WG.

### **Chairman conclusions**

- A group composed of NIST, NPL, PTB and USNO should work on frequency shift problem and report on it to PS meeting during PTTI.
- Laboratories should send to B. Klepczynski comments on codes for European stations. To resolve the problem one possibility would be to shorten sessions from 2 min to 1 min. At PTTI PS meeting decision should be taken.

### **Forthcoming meetings**

It was agreed that the next meeting of participating stations would be held during the PTTI conference at the beginning of December 2004, and in March 2005 during the EFTF. The next full meeting of the Working Group will be held at the NMI Van Swinden Laboratorium (VSL), Delft, the Netherlands, on 15 and 16 November 2005.

W. Lewandowski  
Secretary of the CCTF WG on TWSTFT

## APPENDIX

### List of participants

#### 12th TWSTFT WG Meeting attendee list

	Family name	First name	Organization	
1	Smith	Alan	USNO	
2	Matsakis	Demetrios	USNO	
3	Jiang	Zhiheng	BIPM	
4	Lewandowski	Włodzimierz	BIPM	
5	Achkar	Joseph	SYRTE	
6	Hlavac	Roman	NPL	
7	Schaefer	Wolfgang	Time Tech GmbH	
8	Lin	Shinn-yan	TL	
9	Li	Huanxin	NTSC	
10	Li	Zhigang	NTSC	
11	Christian	Schlunegger	METAS	
12	Yu	Dai-Hyuk	KRISS	
13	Yang	Sunghoon	KRISS	
14	Parker	Thomas	NIST	
15	de Jong	Gerrit	VSL	
16	Klepczynski	William	U.S.A	
17	Piester	Dirk	PTB	
18	Baumont	Francoise	OCA	
19	Imae	Michito	AIST	
20	Suzuyama	Tomonari	AIST	
21	Morikawa	Takao	NICT	
22	Hosokawa	Mizuhiko	NICT	
23	Takahashi	Yukio	NICT	
24	Hama	Shinichi	NICT	
25	Aida	Masanori	NICT	
26	Maeno	Hideo	NICT	
27	Nishiguchi	Hiroshi	JGPSC	Observer

*Excused:*

IEN, ROA and SP