

11th BIPM TWSTFT Monthly Report

To: TWSTFT Participating Stations

Dear Colleagues,

Please find enclosed BIPM TWSTFT Monthly Report in a new presentation.

From now only data corresponding to the dates of the last *Circular T* will be provided in the tables. Data from the past BIPM TWSTFT Monthly Reports will be presented on plots. The results of the comparison of eight TWSTFT links to GPS are given in Tables and Figures 1 to 8 of the Appendix.

Following the recommendations of the last CCTF and the meeting of the Participating Stations of the CCTF WG on TWSTFT held in Torino on March 15, two TWSTFT links, NPL/PTB in Europe and NRLM/CRL in Japan are planned to be introduced into TAI from July 2000. These two TWSTFT links will be in parallel with the best possible GPS links that will continue to provide data to be kept as backup.

We will be pleased to receive your comments on this report.

Sincerely Yours,

Jacques Azoubib and Włodzimierz Lewandowski

**Appendix to
11th BIPM TWSTFT Monthly Report**

TWSTFT links computed at the BIPM

Because the TWSTFT data are unevenly spaced by intervals of 2 or 3 days, they are linearly interpolated to give the data for the TAI standard dates at intervals of 5 days.

Note: When TWSTFT sessions are missing and data are interpolated between TWSTFT sessions more than 5 days apart, results are printed in bold characters. Upper limit for interpolation is 12 days.

Table 1. TUG/PTB link

BIPM Report No.	Date 2000 (MJD)	[UTC(TUG) – UTC(PTB)] /ns		
		Circular T (TWSTFT)	GPS	Circular T – GPS
11	5 February (51579)	1055	1058	–3
	10 February (51584)	1077	1082	–5
	15 February (51589)	1098	1103	–5
	20 February (51594)	1117	1117	0
	25 February (51599)	1143	1145	–2

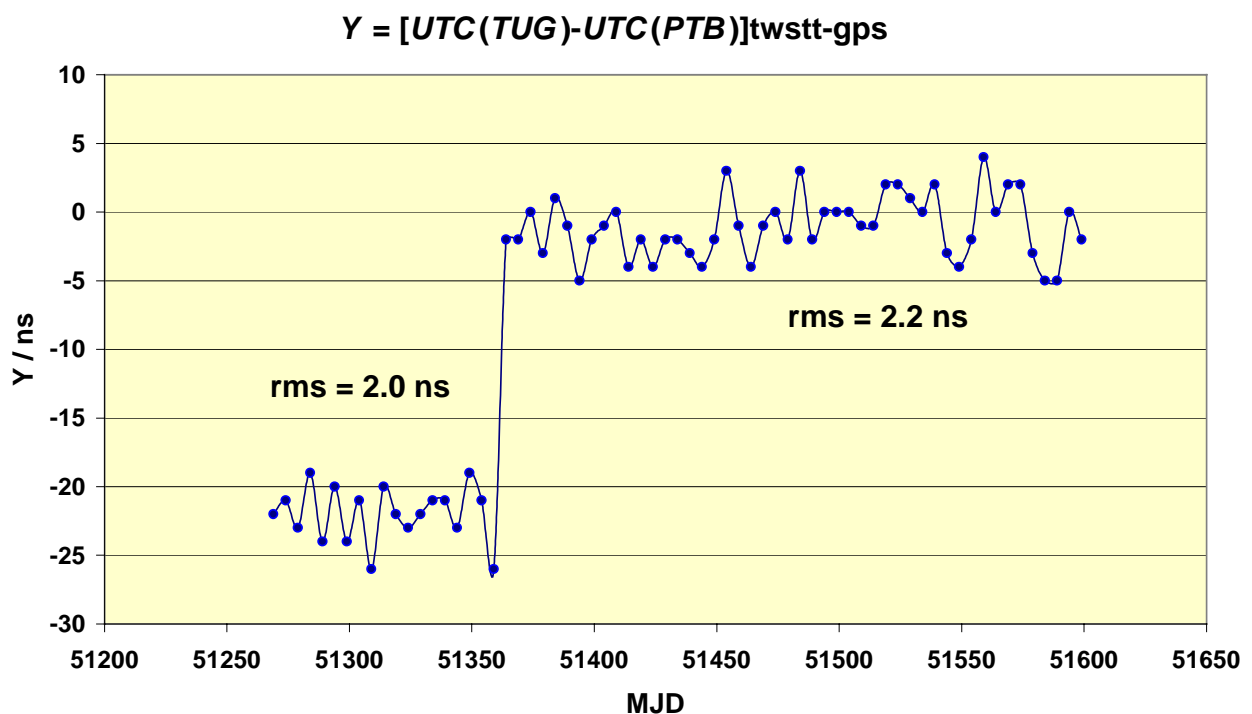


Figure 1. TWSTFT – GPS for TUG/PTB link

Notes: The TUG/PTB TWSTFT link was calibrated by the transport of a TWSTFT station in May-June 1998. Until 30 June 1999 the *Circular T* GPS data for TUG were calibrated using an outdated value; this is the reason for the offset of about – 22 ns between the two techniques.

It is notable that, for the TUG/PTB link, the TWSTFT and GPS techniques were independently calibrated, and the results agree to within the associated uncertainties.

The TUG/PTB TWSTFT link has been included in the computation of TAI since July 1999. The GPS link between the TUG and the PTB is also computed as a check and the data kept in reserve; this link was calibrated by the transport of a GPS receiver in May-June 1998 (4th BIPM GPS calibration trip).

Table 2. PTB/NIST link

BIPM Report No.	Date 2000 (MJD)	[UTC(PTB) – UTC(NIST)] /ns		
		TWSTFT	Circular T (GPS)	TWSTFT–Circular T
11	5 February (51579)	14	15	–1
	10 February (51584)	14	13	1
	15 February (51589)	14	13	1
	20 February (51594)	14	18	–4
	25 February (51599)	14	16	–2

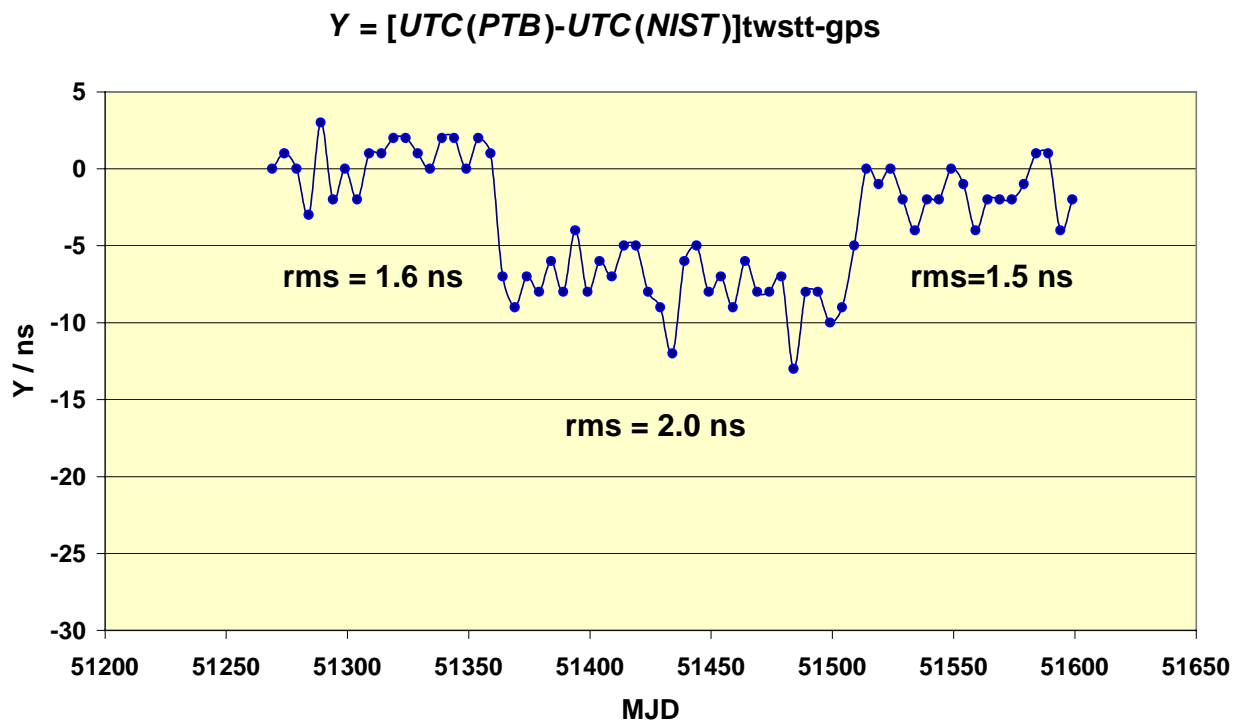


Figure 2. TWSTFT – GPS for PTB/NIST link

Notes: Since July 1999 the GPS link between Europe and North America has been corrected by ionospheric delays derived from an IGS map rather than, as previously, by direct ionospheric measurements. This is the reason for the step of about – 8 ns at the beginning of July 1999 between the TWSTFT and GPS values.

A new calibration of the PTB/NIST TWSTFT link derived from *Circular T* after July 1999 was applied starting from 29 November 1999 (MJD = 51511).

The PTB/NIST GPS link has been included in the computation of TAI since 1 January 2000 (MJD = 51544), and is considered as primary link. The TWSTFT link between the NIST and the PTB computed in parallel is considered as secondary link and data its kept in reserve.

Table 3. USNO/NPL link

BIPM Report No.	Date 2000 (MJD)	[UTC(USNO) – UTC(NPL)] /ns		
		Circular T (TWSTFT)	GPS	Circular T – GPS
11	5 February (51579)	89	89	0
	10 February (51584)	87	88	-1
	15 February (51589)	84	84	0
	20 February (51594)	77	75	2
	25 February (51599)	68	71	-3

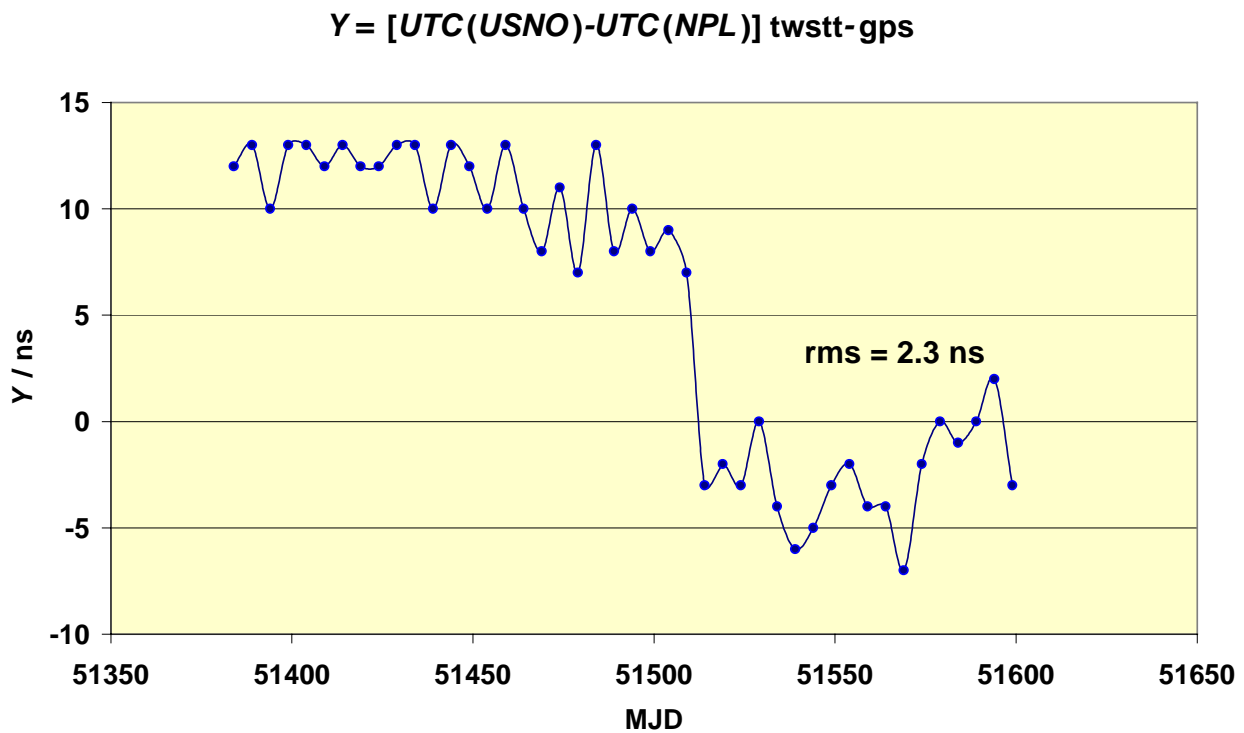


Figure 3. TWSTFT – GPS for USNO/NPL link

Notes: From 25 July 1999 (MJD = 51384) to 29 November 1999 (MJD = 51511) the USNO/NPL TWSTFT link has been calibrated by a value derived from *Circular T* data of June 1999.

A new calibration of the USNO/NPL TWSTFT link derived from *Circular T* after June 1999 was applied starting from 29 November 1999 (MJD = 51511).

The USNO/NPL TWSTFT link has been included in the computation of TAI since 1 January 2000 (MJD = 51544).

Table 4. USNO/PTB link

BIPM Report No.	Date 2000 (MJD)	[UTC(USNO) – UTC(PTB)] /ns		
		TWSTFT	Circular T (GPS)	TWSTFT–Circular T
11	5 February (51579)	6	5	1
	10 February (51584)	10	8	2
	15 February (51589)	10	12	–2
	20 February (51594)	10	7	3
	25 February (51599)	8	4	4

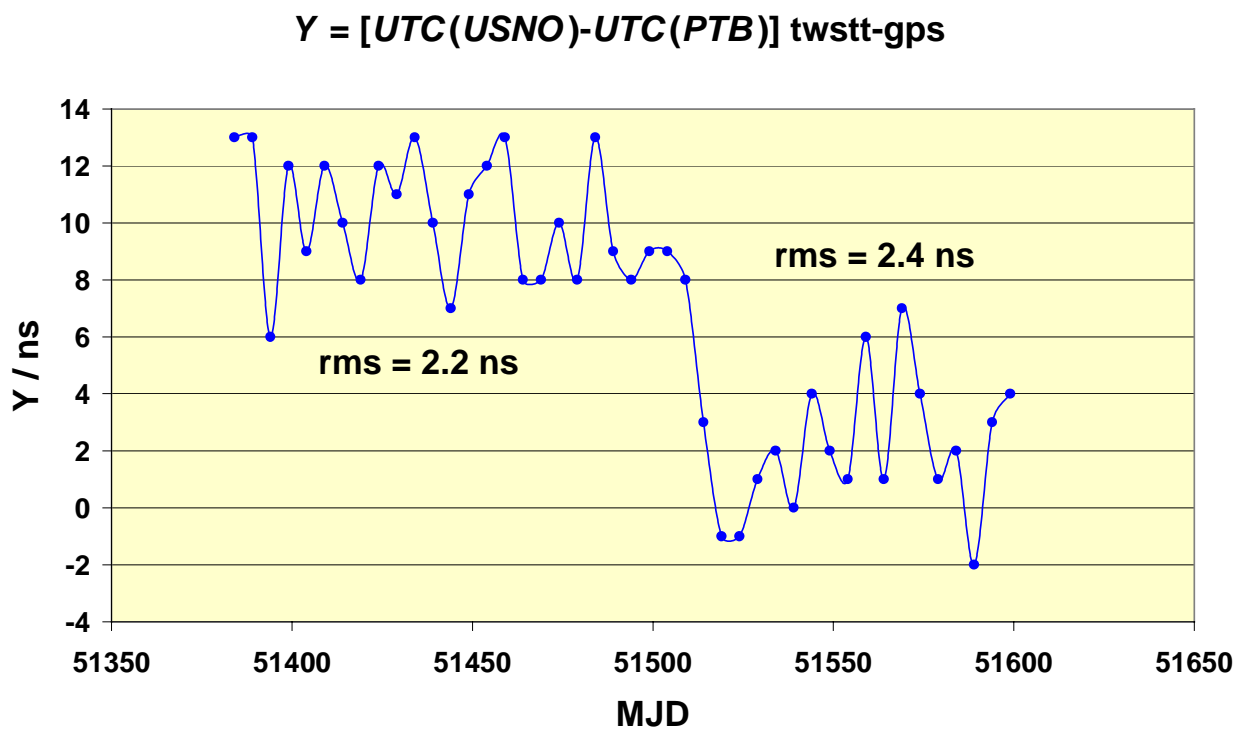


Table 4. TWSTFT – GPS for USNO/PTB link

Notes: A calibration of the USNO/PTB TWSTFT link derived from *Circular T* values from July 1999 was applied starting from 29 November 1999 (MJD = 51511).

Table 5. VSL/PTB link

BIPM Report No.	Date 2000 (MJD)	[UTC(VSL) – UTC(PTB)] /ns		
		Circular T (TWSTFT)	GPS	Circular T – GPS
11	5 February (51579)	-1	-1	0
	10 February (51584)	-4	-4	0
	15 February (51589)	-3	-2	-1
	20 February (51594)	-1	-2	1
	25 February (51599)	-1	-2	1

$$Y = [UTC(VSL) - UTC(PTB)]_{\text{twstt-gps}}$$

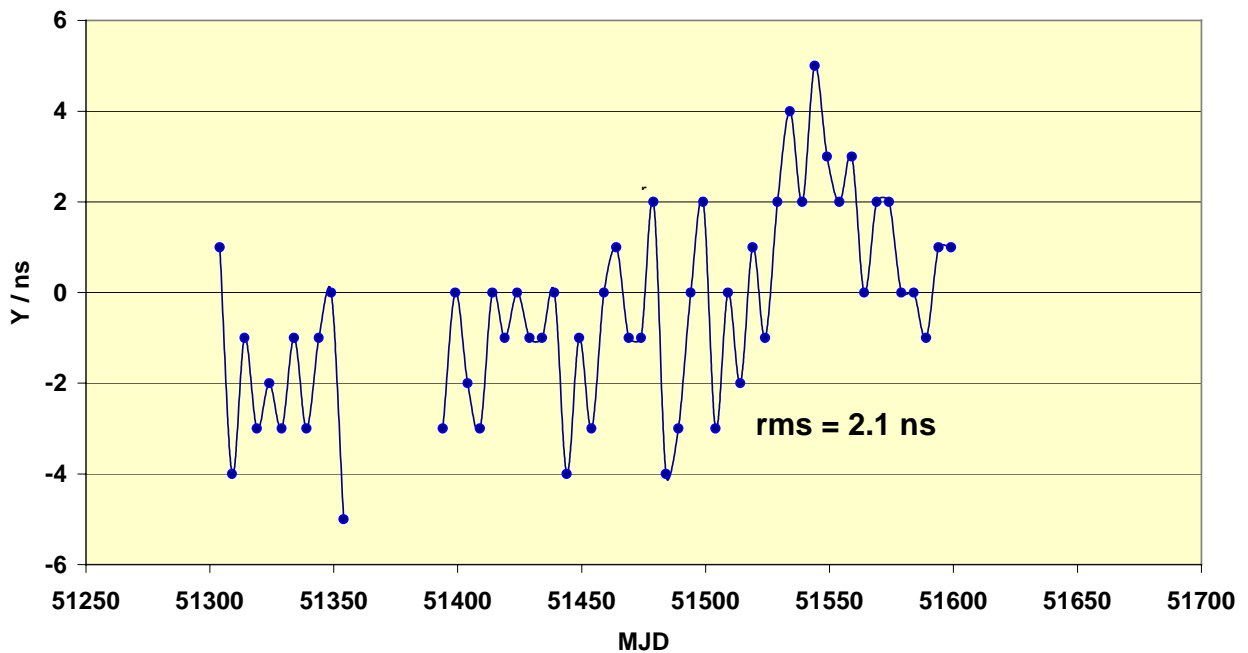


Figure 5. TWSTFT – GPS for VSL/PTB link

Notes: The VSL/PTB TWSTFT link was calibrated by *Circular T*.

The VSL/PTB TWSTFT link has been included in the computation of TAI since 1 January 2000 (MJD = 51544).

Table 6. NPL/NIST link

BIPM Report No.	Date 2000 (MJD)	[UTC(NPL) – UTC(NIST)] /ns		
		TWSTFT	Circular T (GPS)	TWSTFT–Circular T
11	5 February (51579)	–71	–69	–2
	10 February (51584)	–65	–66	1
	15 February (51589)	–60	–59	–1
	20 February (51594)	–53	–52	–1
	25 February (51599)	–47	–48	1

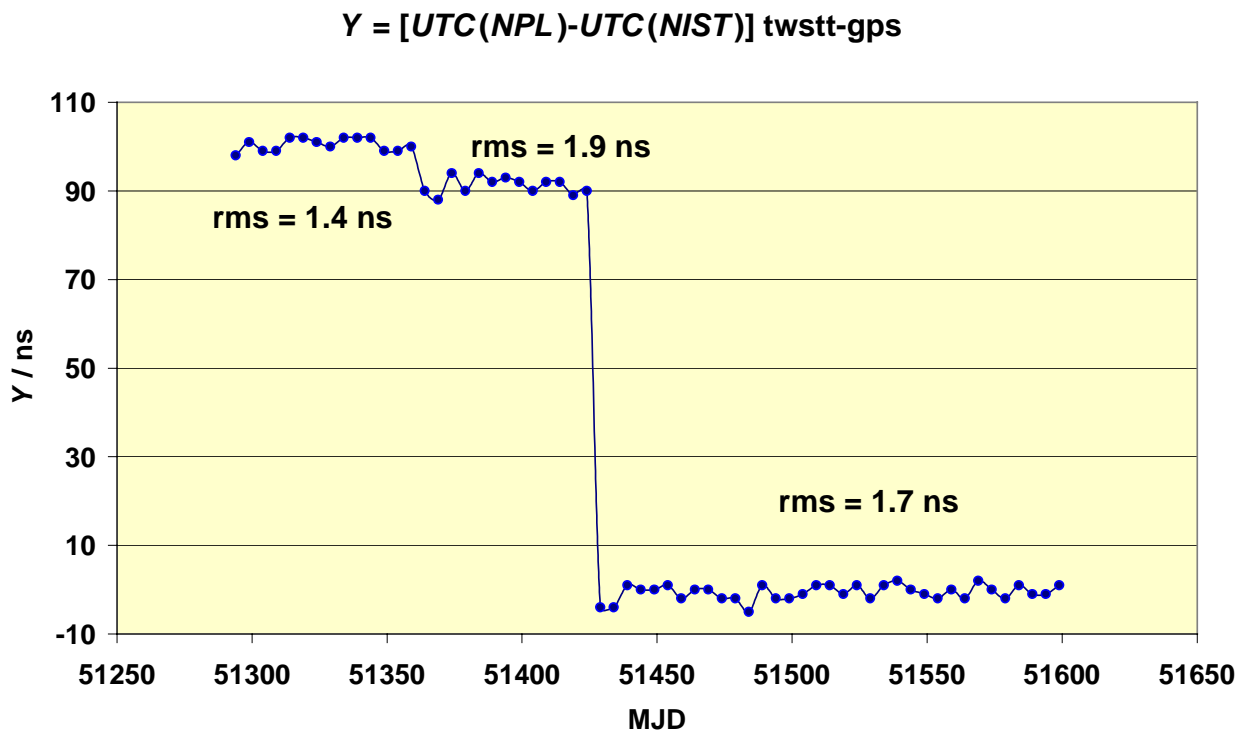


Figure 6. TWSTFT – GPS NPL/NIST link

Notes: The NPL/NIST TWSTFT link was calibrated using *Circular T* values dating from July 1999, and the calibration value was applied at the beginning of September 1999 (MJD = 51429).

Since 5 July 1999 (MJD = 51364) the GPS link between Europe and North America has been corrected by ionospheric delays derived from an IGS map rather than, as previously, by direct ionospheric measurements. This is the reason for the step of about – 8 ns at the beginning of July 1999 between the TWSTFT and GPS values.

Table 7. NPL/PTB link

BIPM Report No.	Date 1999/2000 (MJD)	[UTC(NPL) - UTC(PTB)] /ns		
		TWSTFT	Circular T (GPS)	TWSTFT-Circular T
11	5 February (51579)	-84	-84	0
	10 February (51584)	-78	-79	1
	15 February (51589)	-73	-72	-1
	20 February (51594)	-67	-70	3
	25 February (51599)	-60	-64	4

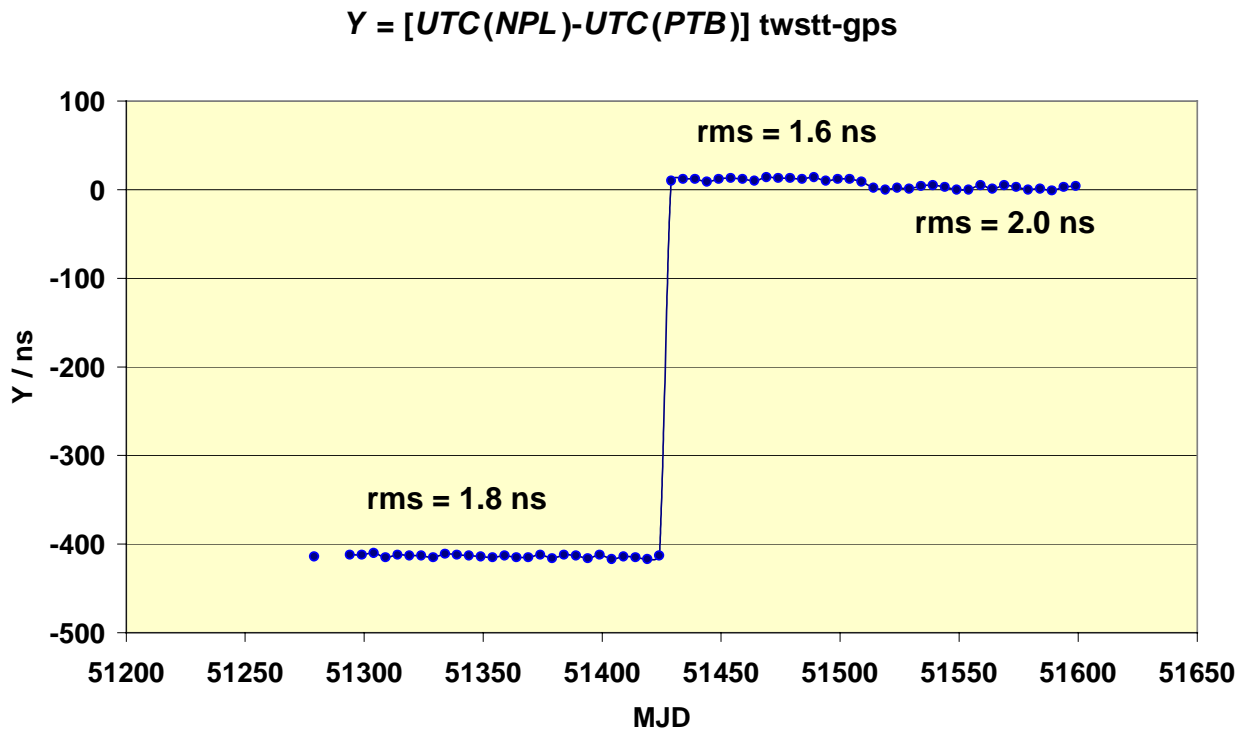


Figure 7. TWSTFT – GPS for NPL/PTB link

Note: A new calibration of the NPL/PTB TWSTFT link using *Circular T* was applied on 29 November 1999 (MJD = 51511).

Table 8. NPL/VSL link

BIPM Report No.	Date 2000 (MJD)	[UTC(NPL) – UTC(VSL)] /ns		
		TWSTFT	Circular T (GPS)	TWSTFT–Circular T
11	5 February (51579)	–83	–83	0
	10 February (51584)	–74	–75	1
	15 February (51589)	–69	–69	0
	20 February (51594)	–66	–69	3
	25 February (51599)	–60	–63	3

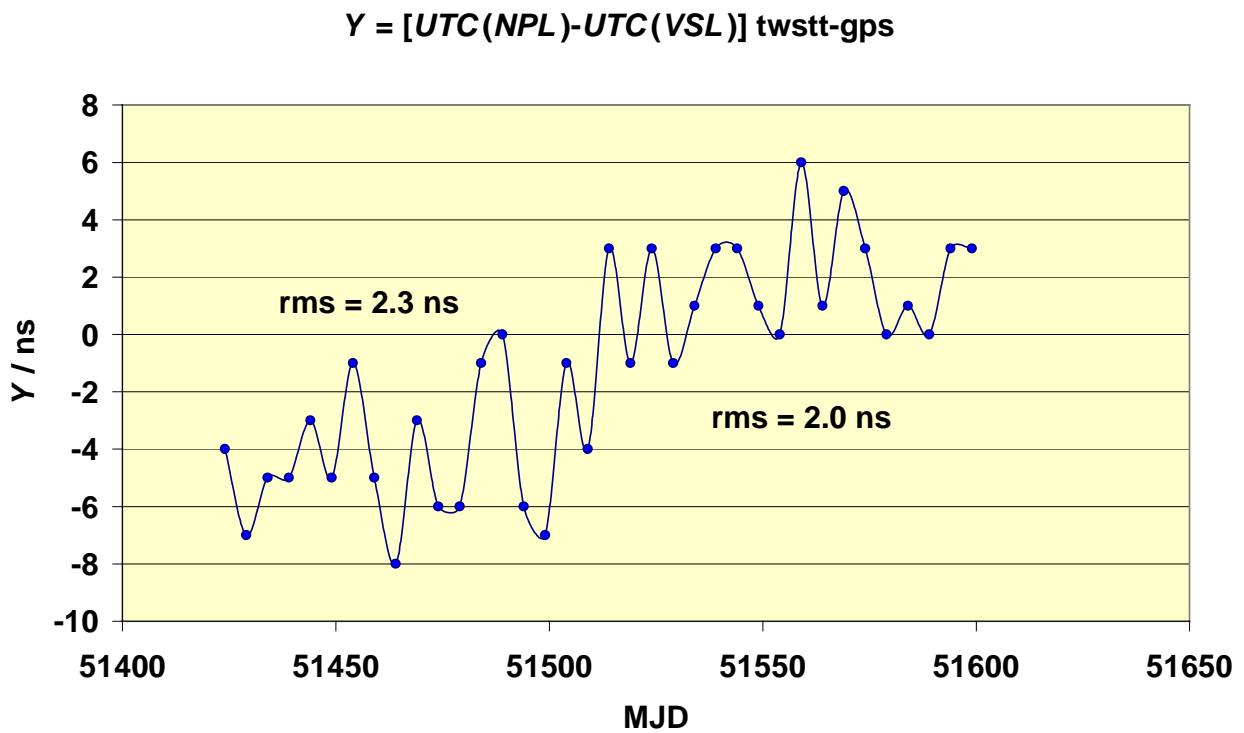


Figure 8. TWSTFT – GPS for NPL/VSL link

Note: A new calibration of the NPL/VSL TWSTFT link using *Circular T* was applied on 29 November 1999 (MJD = 51511).