



Bureau International des Poids et Mesures

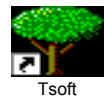
The 2012 UTC Time Links

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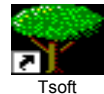


Jiang & Lewandowski, BIPM, CCTF TW WG, 6-7 Sept 2012, BIPM



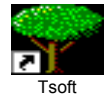
Profile

- What's new in the 2012 UTC time links
- Status of the TW links
 - Europe-Asia
 - Europe-Europe-America
 - Combination of multi-technique links
- The time link products on the BIPM ftp site



What's new in the 2012 UTC time links

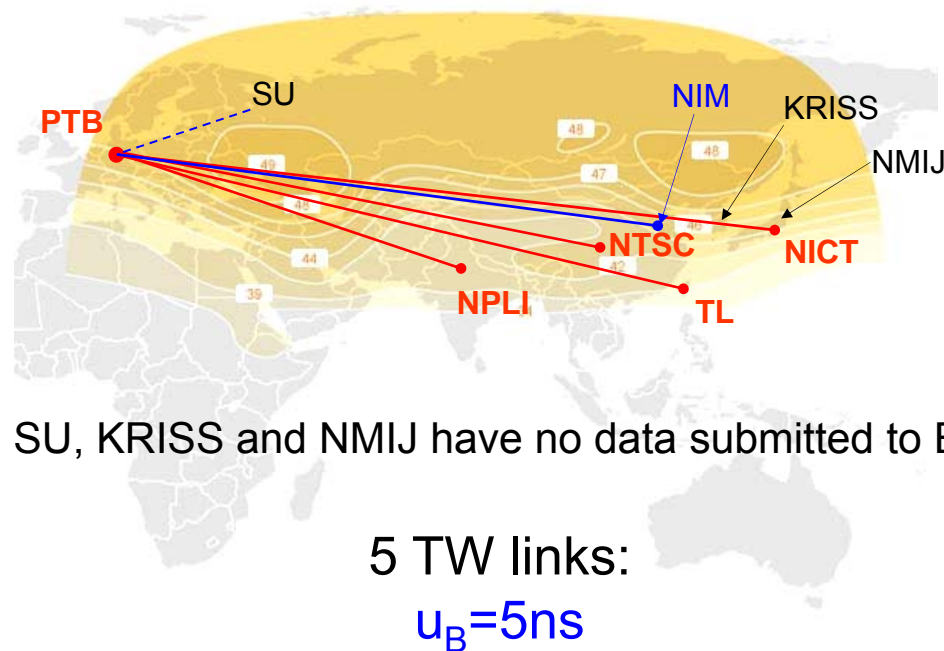
- 5 Europe-Asia TW links via AM2 back to UTC
- More combined time links:
 - 13 TW+GPSPPP combinations
 - 6 GPS+GLN combinations



5 Europe-Asia TW links via AM2

Coverage of the AM2 TW satellite

Visibility and EIRP/dBW



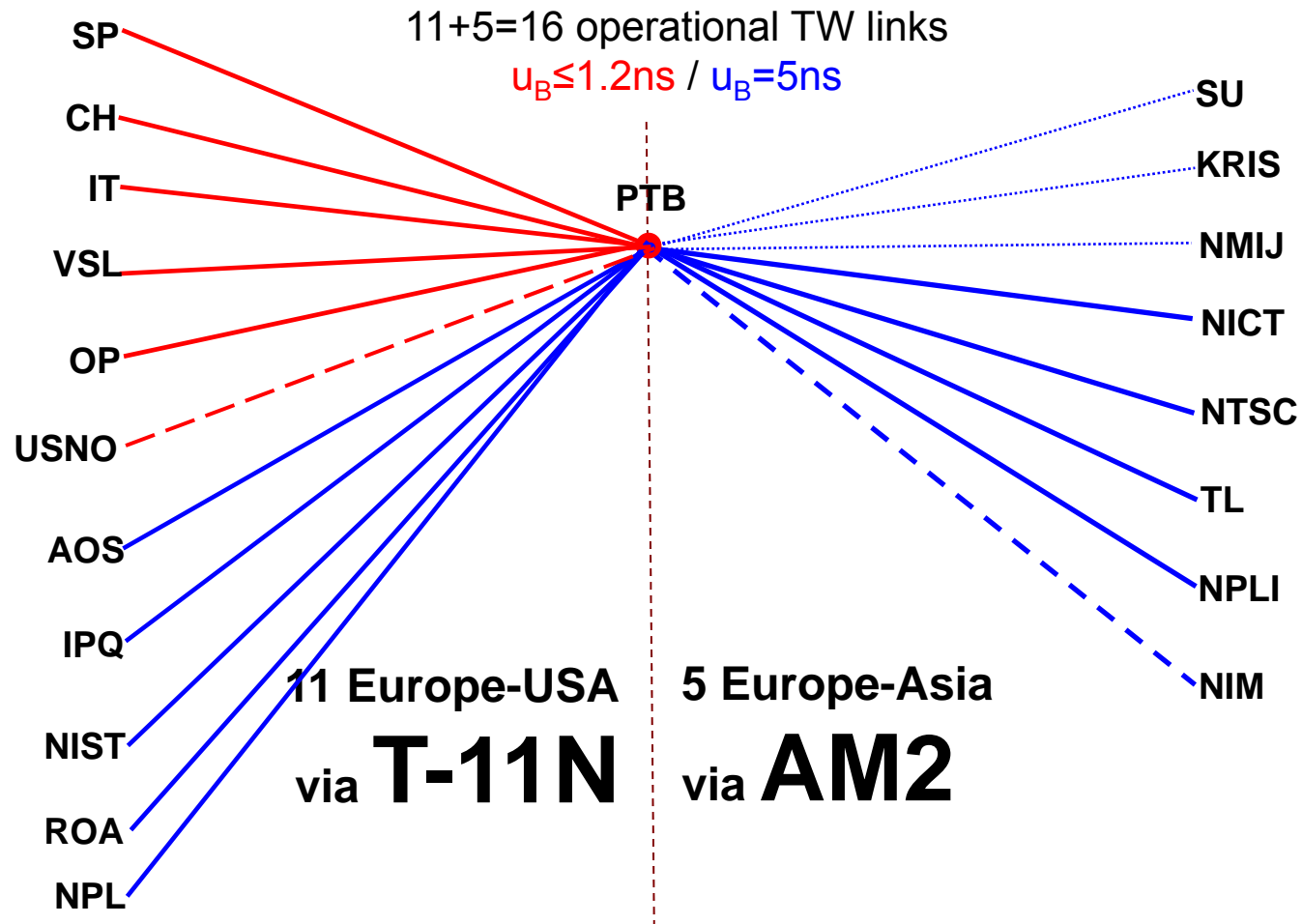
Equivalent isotropically radiated power (EIRP) or, alternatively, Effective isotropically radiated power



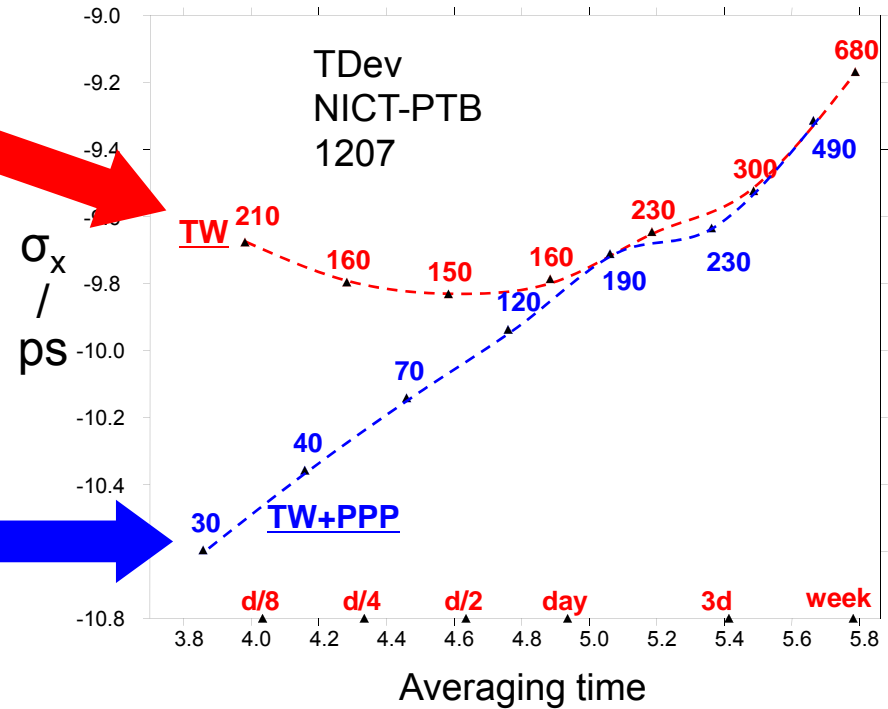
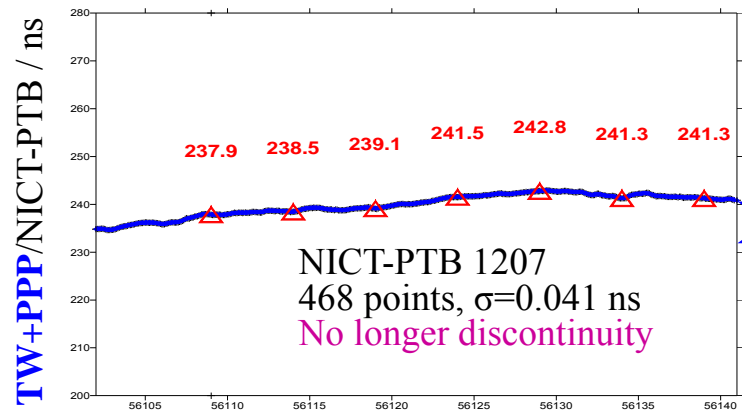
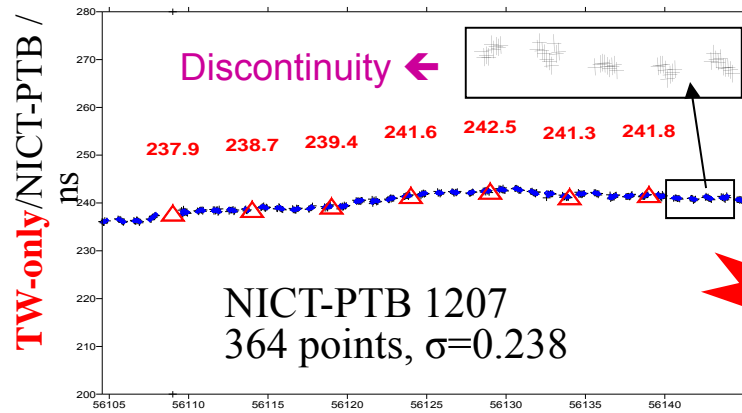
Jiang & Lewandowski, BIPM, CCTF TW WG, 6-7 Sept 2012, BIPM



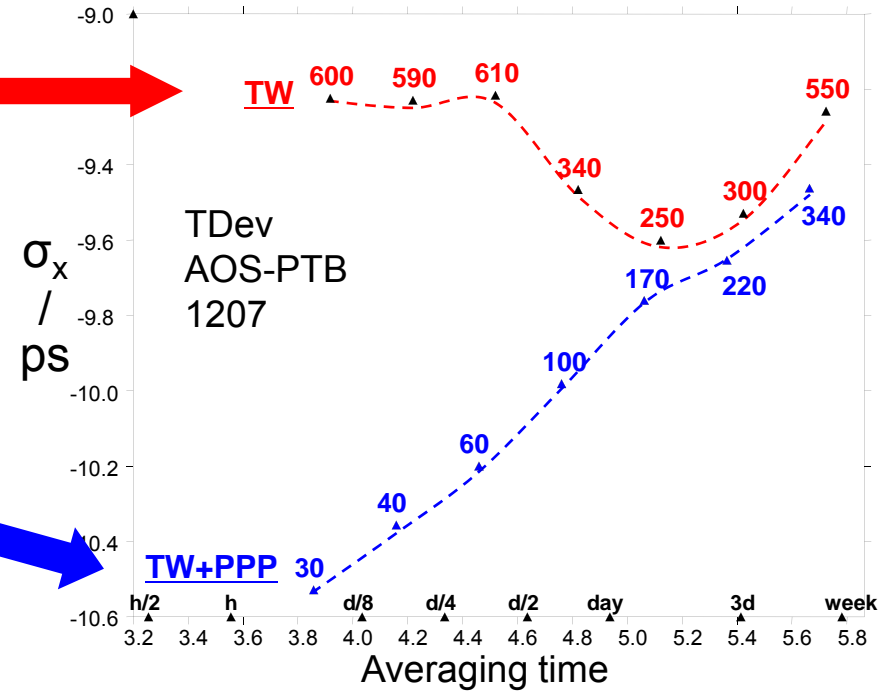
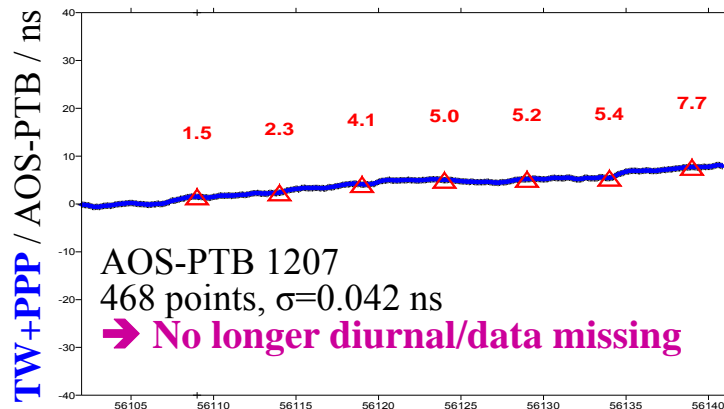
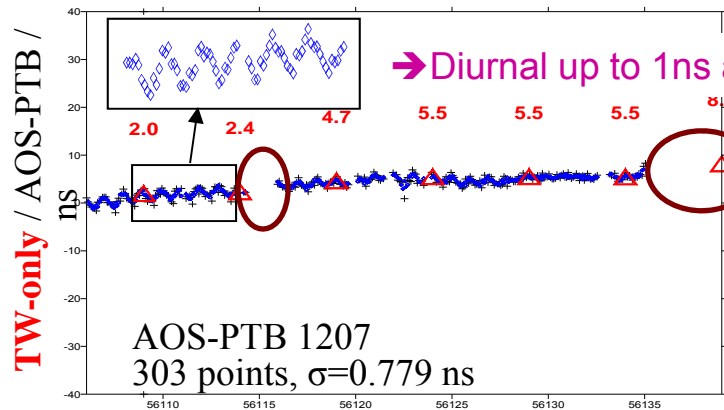
Operational Europe-US-Asia TW links



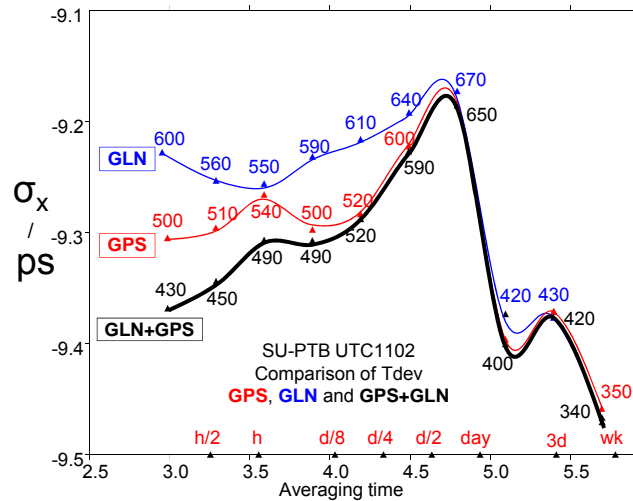
TW Asia-Europe Links via AM2



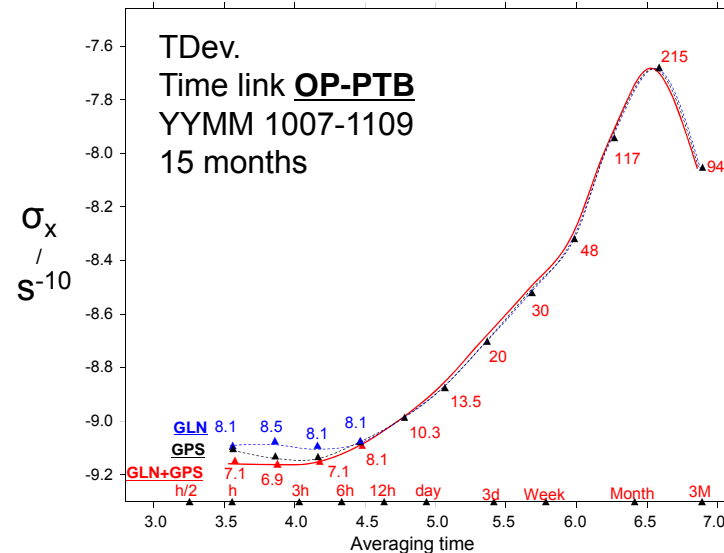
TW Europe-Europe Links via T-11N



Combination GLN+GPS



One month Tdev on the baseline SU-PTB for the time links of 1102



15 months' long-term Tdev on the baseline OP-PTB between 1007-1109

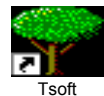
The TDev between GPS-only, GLN-only and GPS+GLN combined links

Gains of the combinations in UTC

Doubling measurement data, the combination reduces

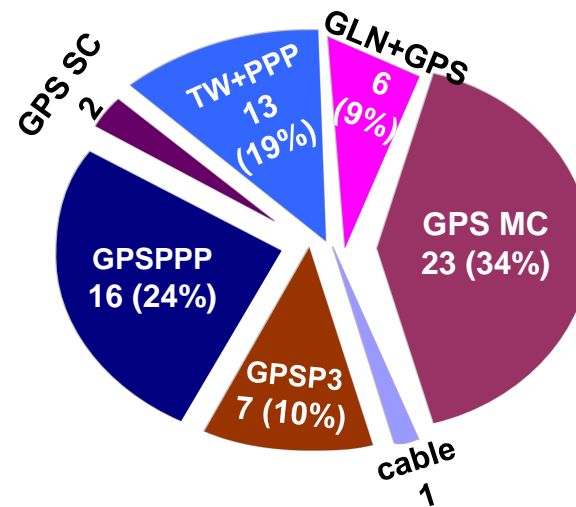
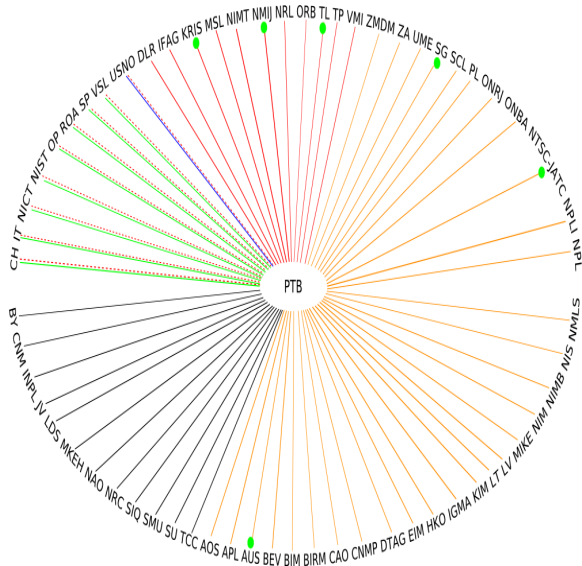
- the interpolation uncertainty
- the discontinuities/data missing
- disturbance of the outliers
- the diurnals in TW
- the measurement instability

→ Fully use the redundant measurement data and increase the robustness



Present UTC network: 68 Links

Time Transfer Techniques used in UTC (July 2012 / Circular T295)



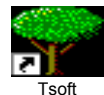
- 13 TW and TWPPP links (19%), except for USNO, NTSC and NIM
- 16 GPS CP links (24%)
- More than half GNSS code links (56%)
- 19 Combined links of TW+PPP and GPS+GLN (28%)

Products of UTC time links on ftp

Products of monthly and long-term (since 2008)

- Time link
- Time link comparison = Link2 – Link1

→ visit <ftp://tai.bipm.org/TimeLink/LkC/>



Result of the time link Comparisons



BIPM
Bureau International des Poids et Mesures

New search facility:
BIPM metrology portal

Tel : +33 1 45 07 70 70 | Télécopie : +33 1 45 94 20 24

BIPM Home | Site map | Metrology portal | KCDB | JCTLM-DB | Contact us

METRE CONVENTION | CIPM MRA | COMMITTEES | BIPM | SCIENTIFIC WORK | SI | PUBLICATIONS | DATABASES

> You are here: [scientific work](#) > [time, frequency and gravimetry](#) > FTP server

Time Department

Summary

- International Atomic Time
- Clock comparisons
- Joint projects
- Future work
- BIPM calibrations of time transfer equipment
- BIPM services in the field of time, frequency and gravimetry
- Technical partnerships of the Time, Frequency and Gravimetry Section
- Recent publications
- What time is it?
- Secondments to the BIPM
- FTP server of the Time, Frequency and Gravimetry

Introduction | **Data** | **Publications** | **Scales** | **Links**

The complete set of publications and time-data files can be accessed via anonymous ftp (<ftp://62.161.69.5> or <ftp2.bipm.org>).

The files are organized in the following four subdirectories:

- data** – all data used for the computation of TAI;
- publication** – the latest issues of the BIPM's publications on time scales (including *Circular T*);
- scale** – time scales data;
- links** – results of link comparisons.










→ Related articles

<http://www.bipm.org/en/publications/>

Get in the directory: LkC

Index of ftp://tai.bipm.org/TimeLink/LkC/

[Up to higher level directory](#)

	<u>Name</u>	<u>Size</u>	<u>Last Modified</u>
YYMM {	 0501		12/07/2005 00:00:00
	 0502		20/07/2005 00:00:00
		
	 0901		12/02/2009 16:31:00
	 0902		13/03/2009 14:57:00
	 0903		10/04/2009 12:41:00
	 0904 		15/05/2009 14:49:00
		
	 LongTerm		10/04/2009 12:44:00
		BIPM_LKC_CFS-PTTI2005.doc	285 KB
	ReadMe_LinkComparison_ftp_v7.doc	181 KB	29/05/2008 00:00:00














Get in the directory: **YYMM**

Index of ftp://tai.bipm.org/TimeLink/LkC/0904/



[Up to higher level directory](#)

Baseline

<u>Name</u>			
 AOSPTB			
 CHPTB			
 DLRPTB			
... ..			
 KRIS NICT			
 KRIS PTB			
 NICTPTB			
... ..			
 NTSCNICT			
 USNO PTB		 Dlk	15/05/2009 14:49:00 → difference of links
		 Lnk	15/05/2009 14:49:00 → Links

Index of ftp://tai.bipm.org/TimeLink/LkC/0904/USNOPTB/

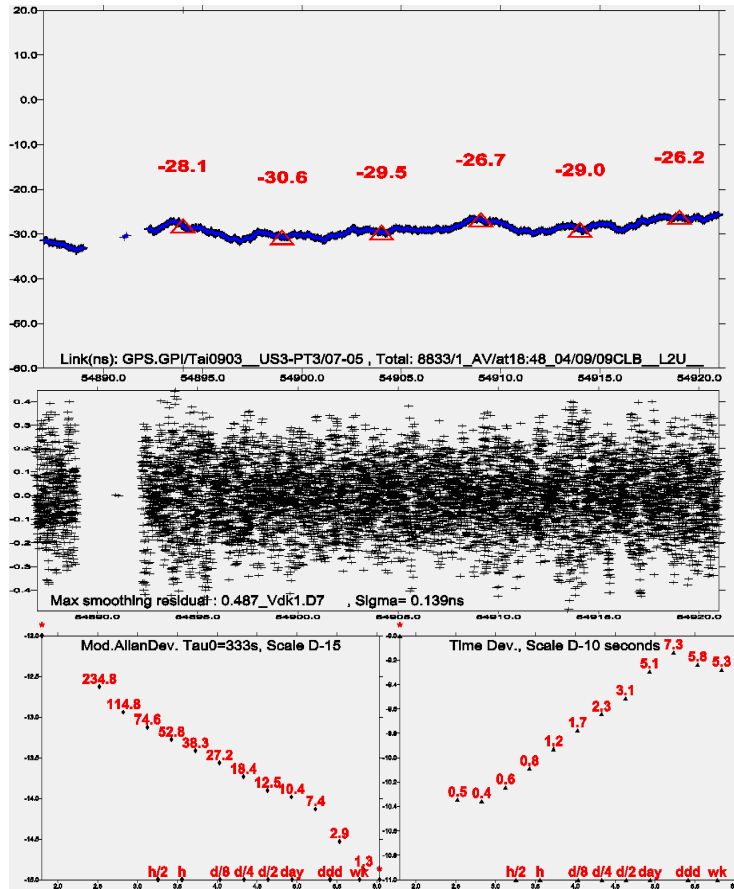
[Up to higher level directory](#)

<u>Name</u>	<u>Size</u>	<u>Last Modified</u>	
 Dlk		15/05/2009 14:49:00	→ difference of links
 Lnk		15/05/2009 14:49:00	→ Links

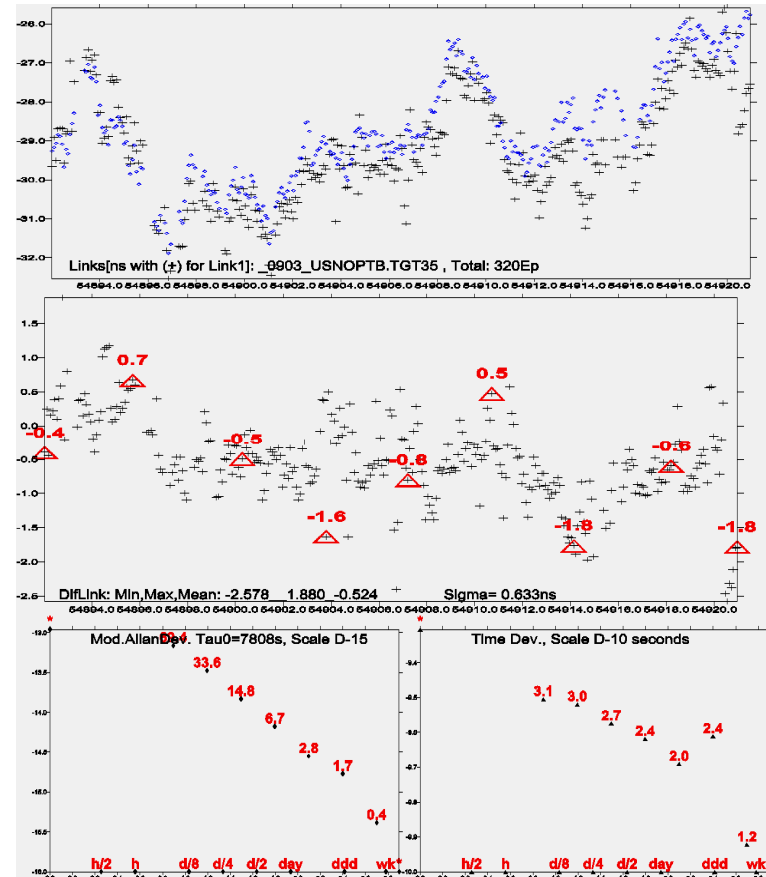


Examples: Plots of Link and link comparison

USNO-PTB 0903 GPS PPP **Link:**



USNO-PTB 0903 **Link comparisons** between GPS PPP and TW Ku:



Summary of the 2012 TW links

- 5 Asia-Europe TW links back to UTC
 - 5 more new UTC TW links are expected
 - Combined TW+PPP links improve:
 - discontinuities, outliers and diurnals
 - measurement uncertainty $u_A \leq 0.3$ ns
 - Major challenge is the calibration (u_B):
 - mobile calibration station (TimeTech): $u_B \leq 1$ ns ?
 - calibrations made by the UTC laboratories (MRA): $u_B \leq 1\sim 2$ ns ?
 - BIPM transportable link-calibration station (BIPM): $u_B \leq 2$ ns ?
 - Absolute receiver calibration: $u_B \leq 1$ ns ?
- Variations of the TW calibrations and the interval of repeat calibration ?

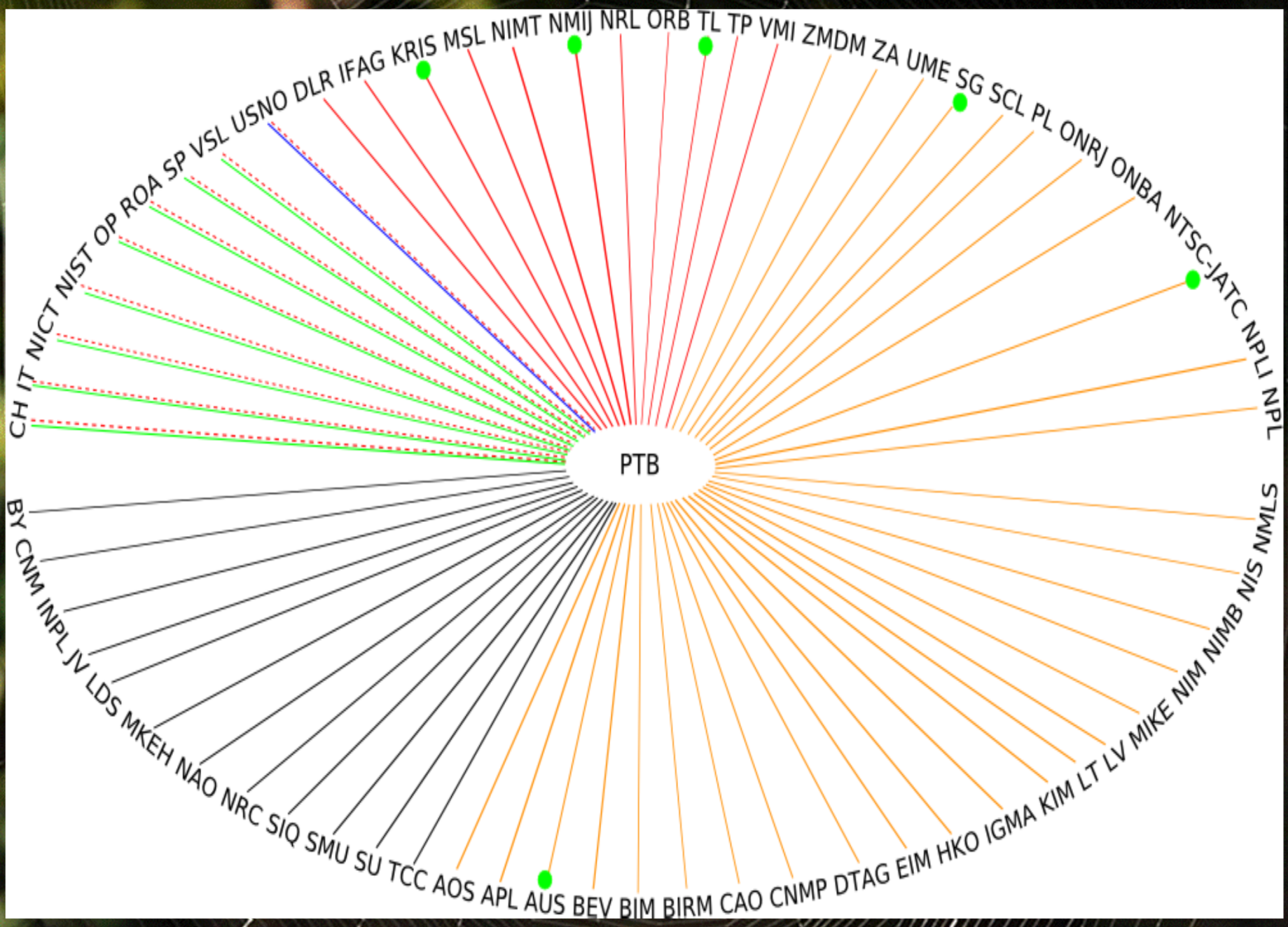
Thank for your attention



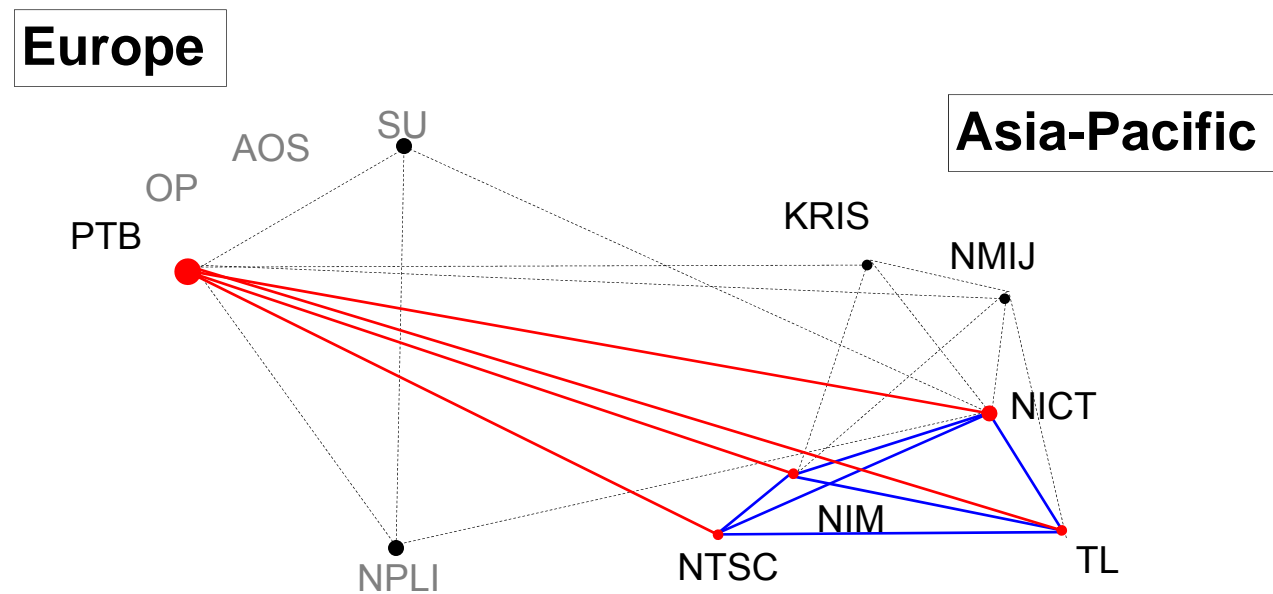
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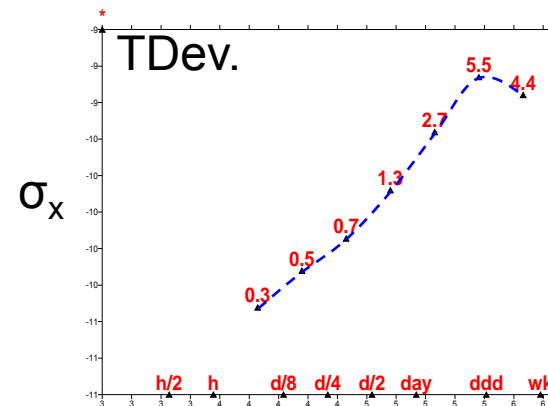
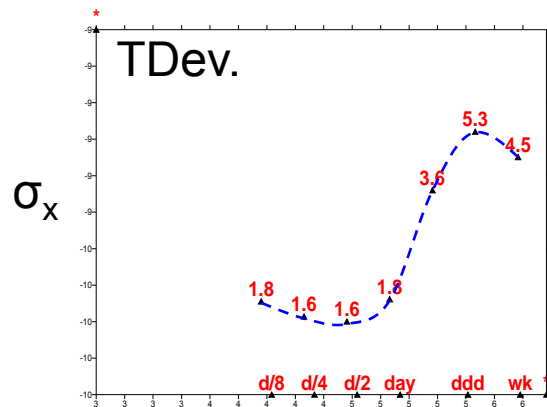
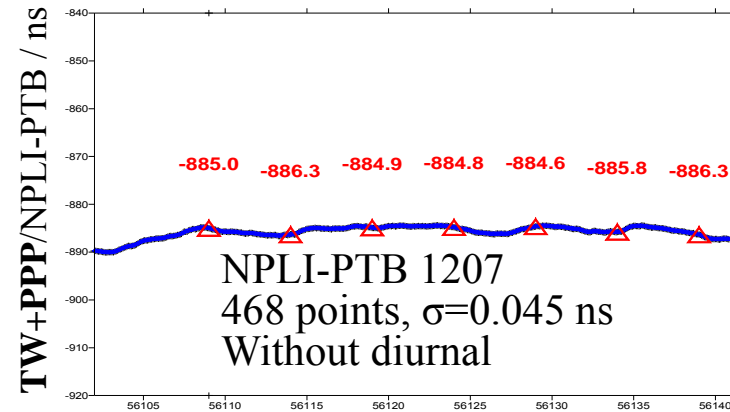
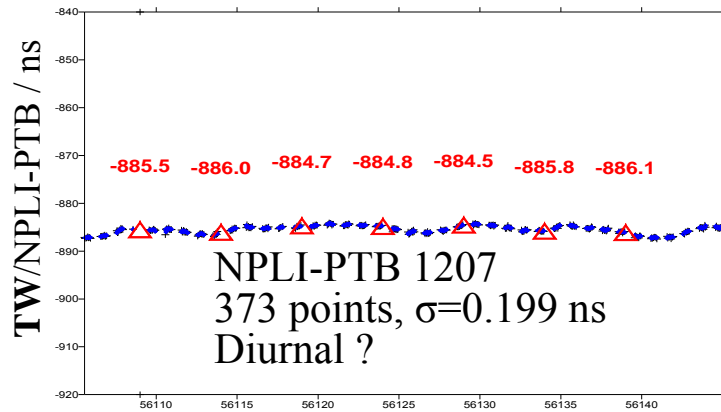
Operational and Coming up Asia-Asia-Europe TW links



Pilot study:

- PPP assisted GNSS-TW link calibrations
- Combination of PPP and TW links

TW Asia-Asia-Europe Links via AM2 2/2



→ TW+PPP combination improves :
 - the interpolation
 - the measurement stability

