

UNCERTAINTIES OF TIME LINKS USED FOR TAI

Expression of uncertainty for TAI time links

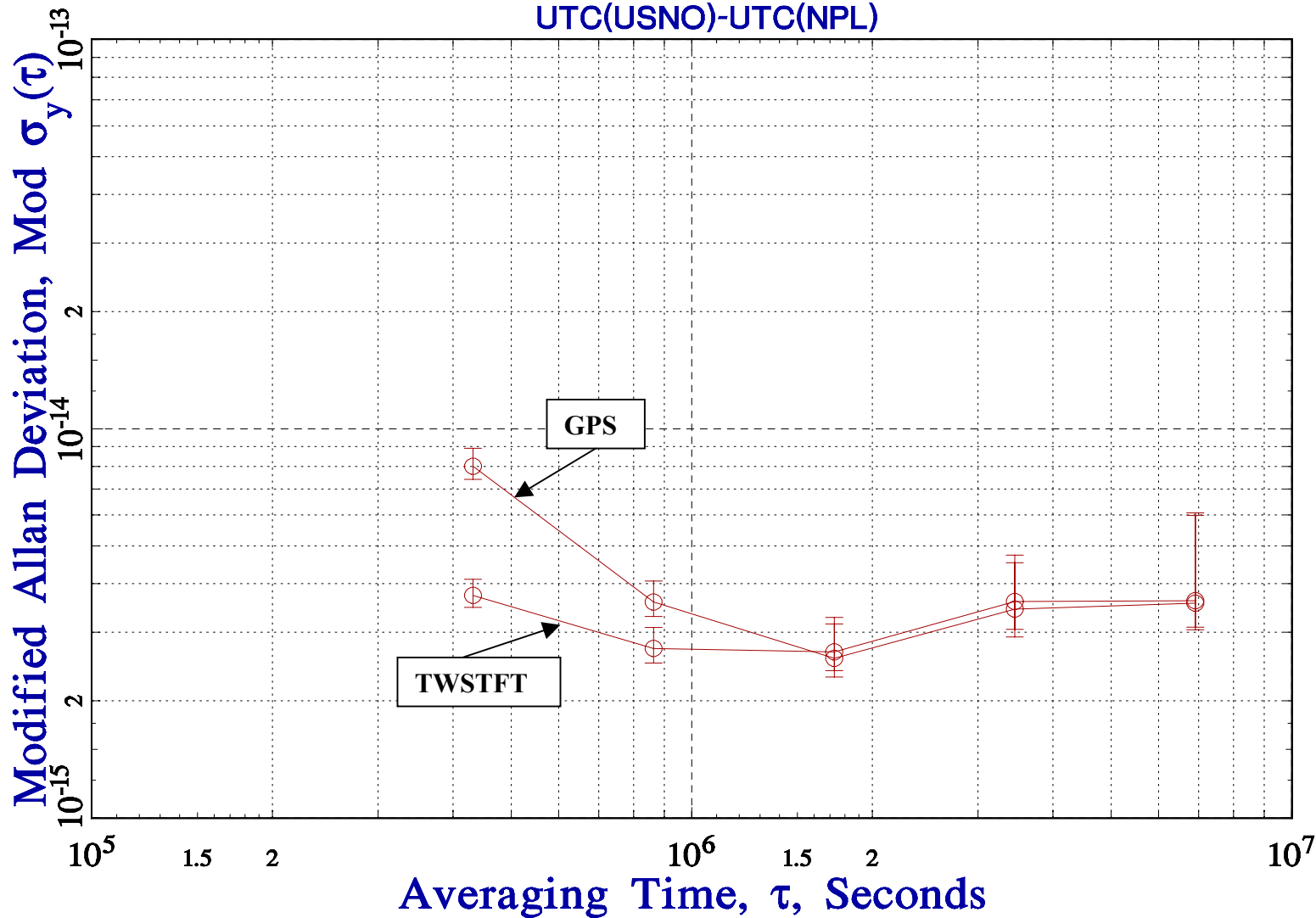
- **Type A (or precision) measured by statistical analysis.**
- **Type B (or accuracy) evaluated by means other than statistical analysis and by external calibration.**

How we determined uncertainties of type A and B

Method	Type A	Type B
<p>GPS</p>	<p>Level of white phase noise modulation for $[UTC(k)-UTC(l)]$</p>	<p>Evaluated from: Calibration Coordinates Ionsopheric delay Multipath Comparison with TWSTFT </p>
<p>TWSTFT</p>	<p>On-site comparison of two TWSTFT equipment (Kirchner et al)</p>	<p>Evalutated from : Type of calibration Reciprocity or not of satellite path Comparison with TWSTFT </p>

FREQUENCY STABILITY

UTC(USNO)-UTC(NPL)



Time links used for the computation of TAI and their uncertainties

Link Lab1/Lab2	Type Lab1/Lab2	uA/ns	uB/ns	Calibration Type Lab1/Lab2	Calibration Dates Lab1/Lab2
AOS/NPL	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Oct/2002 Jul
APL /USNO	GPS MC	1.5	20.0	NA /GPS EC	NA /2002 Apr
AUS/CRL	GPS MC	2.5	10.0	GPS EC/GPS EC	2002 Oct/2002 Aug
BEV/NPL	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Dec/2003 Aug
BIRM/CRL	GPS MC	4.0	20.0	NA /GPS EC	NA /2002 Aug
CAO/PTB	GPS SC	2.5	20.0	NA /GPS EC	NA /2002 Mar
CH/PTB	GPS SC	2.0	20.0	NA /GPS EC	NA /2002 Mar
CNM /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
CNMP/USNO	GPS MC	4.0	7.0	GPS EC/GPS EC	2002 Oct/2002 Apr
CRL /PTB	GPS MC	2.0	5.0	GPS EC/GPS EC	2003 Oct/2003 Aug
CSIR/PTB	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Aug
DLR /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Apr/2003 Aug
DTAG/PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1998 May/2003 Aug



Link Lab1/Lab2	Type Lab1/Lab2	uA/ns	uB/ns	Calibration Type Lab1/Lab2	Calibration Dates Lab1/Lab2
IEN /PTB	TWSTFT	1.0	5.0	LC (GPS SC)	2002 Feb
IFAG/PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jun/2003 Aug
IGMA/NIST	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Jul
INPL/PTB	GPS SC	4.0	10.0	GPS EC/GPS EC	1987 Jun/2003 Jun
JATC/NTSC	INT LK	0.2	20.0	NA	NA
JV /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Jun
KRIS/CRL	GPS MC	2.5	20.0	NA /GPS EC	NA /2002 Aug
LDS /PTB	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Jun
LT /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Nov/2003 Jun
MSL /CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NAO /CRL	GPS SC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIM /CRL	GPS SC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIMB/PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Jun
NIMT/CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIST/PTB	TWSTFT	0.5	5.0	LC(GPS SC)	2003 Sep
NMC /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Aug
NMIJ/CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
NMLS/CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NPL /PTB	TWSTFT	0.5	5.0	LC(GPS SC)	1999 Nov



Link Lab1/Lab2	Type Lab1/Lab2	uA/ns	uB/ns	Calibration Type Lab1/Lab2	Calibration Dates Lab1/Lab2
NRC /USNO	GPS SC	3.0	15.0	GPS EC/GPS EC	1982/2002 Apr
NTSC/CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
OMH /PTB	GPS SC	2.5	20.0	NA /GPS EC	NA /2003 Aug
ONBA/USNO	GPS MC	5.0	7.0	GPS EC/GPS EC	2000 Oct/2002 Apr
ONRJ/NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
OP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2004 Jan/2003 Aug
ORB /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jul/2003 Aug
PL /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Aug
ROA /PTB	TWSTFT	1.0	5.0	LC(GPS SC)	2001 Dec
SCL /CRL	GPS SC	4.0	10.0	GPS EC/GPS EC	1993 May/2002 Aug
SG /CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
SMU /PTB	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Aug
SP /PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1997 Oct/2003 Aug
SU /PTB	GPS SC	3.0	5.0	GPS EC/GPS EC	2003 Apr/2003 Jun
TCC /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
TL /CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
TP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Jun
UME /PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Jun
USNO/PTB	TWSTFT	0.5	3.0	BC(GPS P3)	2003 Sep

CONCLUSIONS

- There are large uncertainties of type B for most of TAI time links.
- Further GPS calibration campaigns are necessary to resolve this problem.
- Uncertainties of $[UTC - UTC(i)]$ values will soon be published in *Circular T*.