

# Key issues on contributing to UTC and UTCr

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10h Meeting of laboratories contributing to UTC  
Sèvres, 16 September 2015



**B**ureau  
International des  
Poids et  
Mesures

# Contribution to UTC

NMIs, DIs, other institutes, organizations

Equipped with:

- ✓ Clocks
- ✓ Time transfer equipment
- ✓ Some maintaining PSFS

CIRCULAR T 332  
2015 SEPTEMBER 08, 10h UTC

ISSN 1143-1393

BUREAU INTERNATIONAL DES POIDS ET MESURES  
ORGANISATION INTERGOUVERNEMENTALE DE LA CONVENTION DU METRE  
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1 - Coordinated Universal Time UTC and its local realizations UTC(k). Computed values of  $[UTC-UTC(k)]$  and uncertainties valid for the period of this Circular. From 2015 July 1, 0h UTC,  $TAI-UTC = 36$  s.

Date 2015 MJD	0h UTC	JUL 31	AUG 5	AUG 10	AUG 15	AUG 20	AUG 25	AUG 30	Uncertainty/ns	Notes		
										57234	57239	57244
Laboratory k		$[UTC-UTC(k)]/ns$										
AOS (Borowiec)			-3.4	-1.5	0.5	2.0	1.5	1.1	-0.3	0.3	5.1	5.1
APL (Laurel)			2.0	-2.6	-3.0	-6.9	-7.8	-8.5	-4.8	0.3	4.9	4.9
AUS (Sydney)			-805.7	-792.0	-776.6	-759.5	-727.1	-699.2	-675.5	0.3	5.1	5.1
BEV (Wien)			27.3	33.6	26.6	14.6	5.4	3.9	0.8	0.3	3.1	3.1
BIM (Sofiya)			2537.7	2545.3	2585.0	2596.2	2631.5	2640.4	2693.2	1.5	7.0	7.2
BIRM (Beijing)			-40.5	-	-	-	-	-	-	1.5	20.0	20.1
BY (Minsk)			7.0	10.1	11.1	5.4	5.7	4.8	4.3	1.5	7.0	7.2
CAO (Cagliari)			-	-7114.4	-7209.4	-7313.7	-7412.4	-7502.9	-7595.2	8.0	7.0	10.7
CH (Bern-Wabern)			7.0	6.6	6.3	7.1	8.3	10.3	12.3	0.3	1.3	1.3
CNM (Queretaro)			-3.6	-4.8	-4.9	-3.2	-4.0	-0.5	-1.9	3.0	5.0	5.8
CNMP (Panama)			-90.5	-56.3	-31.1	-5.0	-11.4	-5.5	-16.1	3.5	5.1	6.2
DFNT (Tunis)			11741.1	11924.0	12093.4	12274.3	12462.4	12674.5	-	0.3	20.0	20.0
DMDM (Belgrade)			-5.0	-6.5	2.9	6.3	3.6	2.0	0.4	0.3	7.0	7.0
DTAG (Frankfurt/M)			49.2	53.5	59.7	63.9	68.3	77.1	79.5	0.3	10.0	10.0
EIM (Thessaloniki)			14.7	15.4	-	-	-	-	-	7.5	5.1	9.0
ESTC (Noordwijk)			-0.5	0.7	0.8	-0.6	-1.0	1.0	0.7	0.4	5.0	5.1
HKO (Hong Kong)			22.8	25.1	24.8	23.9	18.5	23.3	24.8	0.3	5.1	5.1
IFGA (Wetzell)			-899.5	-890.8	-886.3	-879.6	-872.0	-869.4	-862.4	0.3	5.0	5.0
IGNA (Buenos Aires)			-	-	-	-	-	-	-	-	-	-
IMBH (Sarajevo)			-1.3	4.7	7.2	10.6	13.2	21.5	28.2	0.3	7.0	7.1

## Participation to CCTF-K001.UTC NMIs, DIs

**Key and supplementary comparisons - Results**

**CCTF-K001.UTC**

**Results**

Laboratory individual measurements | **Equivalence statements** | Degrees of equivalence | Graph(s) of equivalence

The key comparison reference value of the key comparison CCTF-K001.UTC is UTC, as decided by the CCTF at its 15th meeting held in 2001.

The degree of equivalence of each laboratory  $k$  with respect to the key comparison reference value is given by a pair of terms both expressed in ns:  
 $D_k = [UTC - UTC(k)]$ , where  $UTC(k)$  is the local representation of UTC maintained by laboratory  $k$ , and  
 $U_k$ , the expanded uncertainty (coverage factor equal to 2), of  $D_k$ .

The KCDB gives access to the degrees of equivalence for the last month.

$U_k = 2 u_k$  where  $u_k$  is the combined standard uncertainty of  $[UTC - UTC(k)]$ .  
 $U_k$  does not include the prediction component due to the delay of publication of  $[UTC - UTC(k)]$ .  
 The  $u_k$  values are valid for the whole month of calculation.  
 No pair-wise degrees of equivalence are computed for this key comparison.

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Key comparison CCTF-K001.UTC - Results  
Degrees of equivalence  $D_k = [UTC - UTC(k)]$  for August 2015  
Computed 2015 SEPTEMBER 08, 10h UTC

Coordinated Universal Time UTC and its local realizations UTC(k) in National Metrology Institutes and Designated Institutes.

Computed values of  $[UTC - UTC(k)]$  and uncertainties valid for the period of this publication

Date 2015 0h UTC MJD	AUG 5	AUG 10	AUG 15	AUG 20	AUG 25	AUG 30	Uncertainty/ns	$U_k$
Laboratory k		$[UTC - UTC(k)]/ns$						
ANM	11924.0	12093.4	12274.3	12462.4	12674.5	-	40.0	
BGIM	10.1	11.1	5.4	5.7	4.8	4.3	14.4	
BEV	33.6	26.6	14.6	5.4	3.9	0.8	6.2	
BIM	2545.3	2585.0	2596.2	2631.5	2640.4	2693.2	14.4	
BMM	1002.0	1305.2	1509.2	1836.4	2115.2	2421.1	41.2	
BSMI	13.6	13.9	11.7	9.1	7.0	4.9	10.0	
CENAM	-4.8	-4.9	-3.2	-4.0	-0.5	-1.9	11.6	
CENAM/PAIP	-56.3	-31.1	-5.0	-11.4	-5.5	-16.1	12.4	
DMDM	-6.5	2.9	6.3	3.6	2.0	0.4	14.0	
EIM	15.4	-	-	-	-	-	18.0	
ESA	0.7	0.8	-0.6	-1.0	1.0	0.7	10.2	
FTMC	966.0	967.3	965.8	967.0	964.2	962.2	10.8	
GUM	-22.1	-22.9	-19.7	-9.9	1.6	6.6	10.0	
IMBH	4.7	7.2	10.6	13.2	21.5	28.2	14.2	
INM	1066.7	1057.6	1040.9	1044.1	1055.8	1045.5	41.0	
INMETRO	-31.4	-24.4	-17.2	-19.9	-24.1	-23.6	40.0	
INPL	46.1	46.2	49.0	54.1	68.5	68.2	14.2	
INRIM	-1.4	-2.0	-1.8	-2.3	-3.5	-4.5	2.6	
INTI	63.1	48.8	51.2	43.3	40.3	40.5	40.4	
IPFASCR	-46.2	-45.0	-45.6	-41.7	-35.3	-35.6	10.2	
JV	-29.9	-34.5	-39.1	-43.3	-45.1	-38.6	40.0	
KazhMetr	-744.1	-736.8	-729.5	-716.6	-717.0	-699.4	14.4	
KIBS	2026.8	2113.8	-	-	-	-	40.2	
KIM-LPII	656.5	656.7	674.5	707.7	748.3	762.5	40.2	
KRISS	28.1	25.5	22.7	19.0	15.8	12.5	10.0	
LNESYRTE	-1.6	-1.5	-1.1	-0.8	-0.4	-0.3	2.6	

## NMIs signatories of the CIPM MRA, DIs

- ✓ Also participate to UTC
- ✓ Fullfil the conditions for declaring CMCs

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# Participation to UTCr

- Participants to UTC  
 With capacity of submitting
- ✓ Daily clock data
  - ✓ Daily time transfer files

UTCr\_1536  
 2015 SEPTEMBER 09, 12h UTC

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Computed values of [UTCr-UTC(k)]

Date 2015	Oh UTC	AUG 31	SEP 1	SEP 2	SEP 3	SEP 4	SEP 5	SEP 6
MJD		57265	57266	57267	57268	57269	57270	57271
Laboratory k		[UTCr-UTC(k)]/ns						
AOS (Borowiec)		0.7	-1.1	-1.3	-0.9	-2.0	-1.6	-1.4
AUS (Sydney)		-662.4	-660.2	-655.7	-651.0	-647.2	-643.0	-640.5
BEV (Wien)		2.3	-4.8	-2.0	0.5	-2.3	-4.2	-7.2
CH (Bern-Wabern)		12.9	12.9	13.7	14.0	13.6	13.3	13.2
CNM (Queretaro)		-2.7	-3.8	-4.8	-2.5	-4.7	-4.3	-3.0
CNMP (Panama)		-15.9	-20.6	-27.4	-20.0	-20.9	-17.7	-20.0
DMDM (Belgrade)		1.6	4.1	5.9	12.1	12.8	11.2	7.9
DTAG (Frankfurt/M)		78.6	78.7	81.5	81.1	83.9	84.4	85.8
ESTC (Noordwijk)		0.4	0.2	0.8	1.1	1.2	1.7	2.1
IFAG (Wetzell)		-868.3	-851.4	36.0	-895.9	-591.8	-850.0	-319.5
IMBH (Sarajevo)		33.3	36.2	34.8	37.0	39.6	42.2	43.0
INTI (Buenos Aires)		33.7	35.5	33.1	30.9	33.5	30.7	27.1
INXE (Rio de Janeiro)		-23.0	-26.4	-29.0	-29.2	-31.5	-33.0	-30.0
IT (Torino)		-4.5	-5.5	-5.3	-5.4	-5.6	-5.8	-5.6
KRIS (Daejeon)		12.3	11.1	11.1	10.1	9.6	8.5	8.2
LT (Vilnius)		959.4	950.9	949.5	950.8	941.1	941.2	936.0
MTC (Makkah)		225.3	227.4	227.7	228.1	230.1	231.5	232.3
NAO (Mizusawa)		66.8	62.7	58.4	63.6	61.9	62.1	67.5
NICT (Tokyo)		13.1	12.6	13.1	13.1	13.4	13.8	14.0
NIM (Beijing)		2.3	1.8	1.7	1.8	1.5	1.7	1.8
NIMT (Pathumthani)		21.0	21.9	24.0	23.6	18.1	18.3	16.2
NIST (Boulder)		13.8	13.5	13.5	13.4	13.1	13.3	13.5
NMIJ (Tsukuba)		2.8	2.4	2.5	2.8	2.8	2.9	2.9
NMLS (Sepang)		-190.5	-189.5	-191.5	-190.2	-191.3	-188.2	-190.7

- ✓ Weekly solution
- ✓ Calculated over four weeks of data
- ✓ Fully automated procedure
- ✓ « quasi » real time

✓ Different data submission is necessary for UTC and UTCr.

✓ There are no cross-checks between UTC and UTCr data.

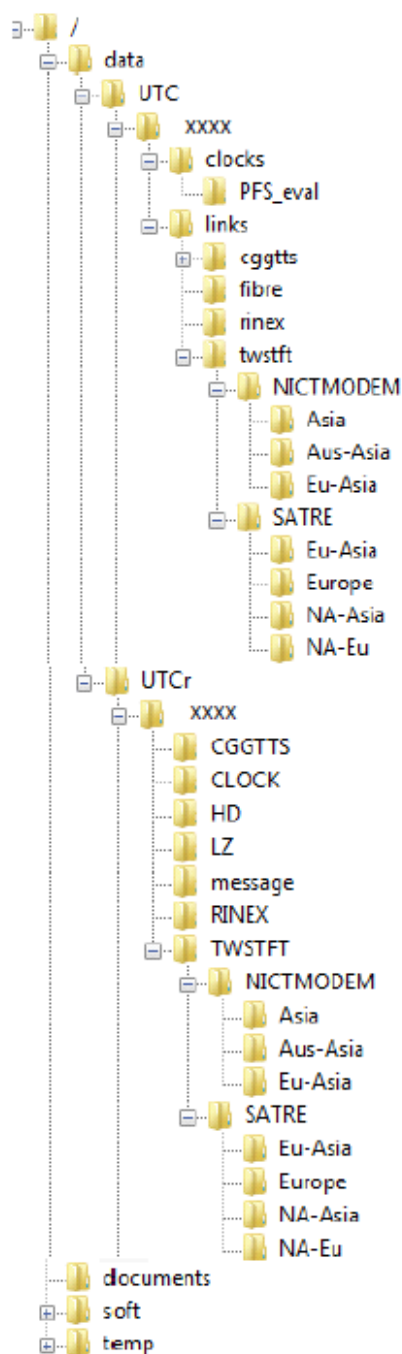
✓ Data downloading from the server is automated

✓ In the process of calculation of Circular T laboratories are contacted if necessary (completing /correcting/clarifying).

✓ The objective is providing optimal, final results.

✓ The process of calculation of UTCr has been fully automated. Reminders are automatically sent.

✓ The objective is providing rapid results.



#### Regarding files submission for UTC:

Put your data in the remote directory `"/data/UTC/XXXX/"` where "XXXX" is the BIPM acronym of your laboratory, as in Section 1 of Circular T (see [laboratory list](#)).

Use the FTP data structure and put the data files in the appropriate subdirectory (refer to "Names convention" for more details on file names):

#### `/data/UTC/XXXX/clocks`

The standard name for the clock data files is: `CDLL_yy.mm_` (see [format](#) and [clock codes](#))

#### `/data/UTC/XXXX/clocks/PFS_eval`

The standard names for the PFS and SFS data files are respectively `XXXXyyymm.PFS` and `XXXXyyymm.SFS` where "yyymm" is the Circular T interval corresponding to the period of evaluation (see [PSFS format](#))

`/data/UTC/XXXX/links` (Daily data uploading is requested)

#### `/data/UTC/XXXX/links/cggtts`

files named as for example : `GMLLmodd.ddd`, `GSSLmodd.ddd`, `GZLLmodd.ddd`, `LZLLmodd.ddd`, `RMLLmodd.ddd`, etc... (see [cggtts format v1](#), [cggtts format v2](#), [CGGTTS headers](#) ). Check and update antenna coordinates in case of new values.

You may also create additional subdirectories in `"/links/cggtts"` if you have several receivers according to the name convention `LLmo`

#### `/data/UTC/XXXX/links/fibre`

files named `FBAABBdd.ddd` where "AA" and "BB" are the two alphabetical character codes of the two laboratories under comparison.

#### `/data/UTC/XXXX/links/rinex`

Files named `ssssdoy0.yyc.2` (for IGS receivers) or `LLomdoy0.yyc.2` (for non IGS receivers) "ssss" is a 4-character acronym for the receiver: IGS acronym in the case of IGS receivers "doy" is the day of year number "yy" are the last two digits of the year number (see [details](#)).

`/data/UTC/XXXX/links/twstft` (Daily data upload is requested) files named `TWLABdd.ddd` (see [TW header](#), and [twstft directory structure](#))

# Data submission, instructions and deadlines

Data submission is via  
ftp **ONLY**

Messages with information, requests, etc.  
should be addressed to [tai@bipm.org](mailto:tai@bipm.org)

**UTC**

**UTCr**

**Clock file**  
**[UTC(k) – clock]**  
**at standard MJDs**  
**0 h UTC**  
**Clock steps (jumps)**

**Clock file**  
**[UTC(k) – clock]**  
**Every day**  
**at 0 h UTC**  
**Clock steps (jumps)**

**Time Transfer files**  
**daily/weekly/monthly**

**Time Transfer files**  
**daily (data), daily submission**

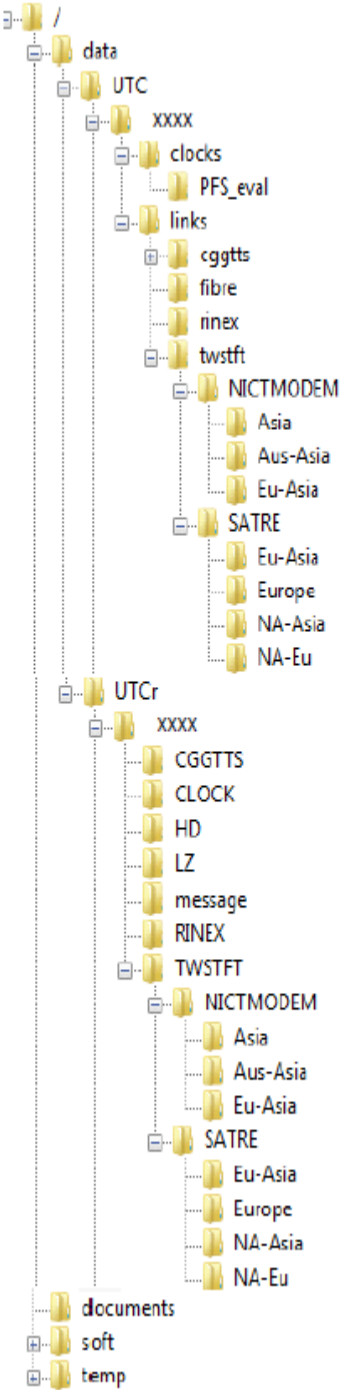
**Deadline**  
**4 of the month**

**FINAL deadline** Sunday  
**midnight UTC**

**Deadline PSFS**  
**4 of the month**

**Reminders (autom)**  
**Pre-calculation Tue. 12 h UTC**  
**Final results / Publication**  
**Wednesday 18 h UTC (latest)**

**Publication**  
**8 to 10 month**



# The Time Department «wish list»

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- ◆ If you have a master (unique) clock , send a data file (filled with zeros); in 2016 we will stop the creation of master files with T-Soft;
- ◆ Daily files can be extracted from TTS-2 receivers (contact a colleague who could!);
- ◆ Backup receiver is welcome;
- ◆ If you plan to operate a new «master receiver», submit at least one month of overlapping data old-new, we need to check their alignment;
- ◆ Submit RINEX files whenever possible (TTS-4 data, for ex.);
- ◆ Guidelines for contribution, data submission, formats, etc. are available on the web, consult them when necessary.

# Web Visit

- the intergovernmental organization through which Member States act together on matters related to measurement science and measurement standards.

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## About the BIPM



GNSS receiver antenna for time transfer and dissemination

### Metrology area:

- ↘ Acoustics, Ultrasound and Vibration
- ↘ Chemistry and Biology
- ↘ Electricity and Magnetism
- ↘ Ionizing Radiation
- ↘ Length
- ↘ Mass and related quantities
- ↘ Photometry and Radiometry
- ↘ Thermometry
- ↘ Time and Frequency
- ↘ Units



UTC Date: **Tuesday 15 September**

UTC **23:07:18**

↘ [International time](#)

Your estimated transmission delay: 0.02 second(s)

### BIPM News:

- ↘ First comparisons of  $^{18}\text{F}$  activity using the SIR Transfer Instrument

### The BIPM's mission and role:

The mission of the BIPM is to ensure and promote the global

**THANKS FOR YOUR CONTRIBUTION!**