

Table of contents

1b.1/ BIPM (20162) 3
1b.2/ NIM (20252)..... 14
1b.3/ BIPM (20343) 49

Notations

As presented in [Petit et al., 2001] for the Z12-T, the calibration of a geodetic system is divided in (up to) 6 different parts (Figure 1)

- X_P = Delay of the 1PPS-in with respect to the laboratory reference
- X_O = Delay of the “internal reference” with respect to the 1PPS-in

$(X_P + X_O) = \text{REFDLY.}$

- X_C = antenna cable delay

- $[X_D = \text{short cable} + \text{splitter delay}]$

$(X_C + X_D) = \text{CABDLY.}$ In practice, X_D is generally not used.

- X_R = receiver internal delay, measured from the “internal reference”

- X_S = antenna delay

$(X_R + X_S) = \text{INTDLY.}$

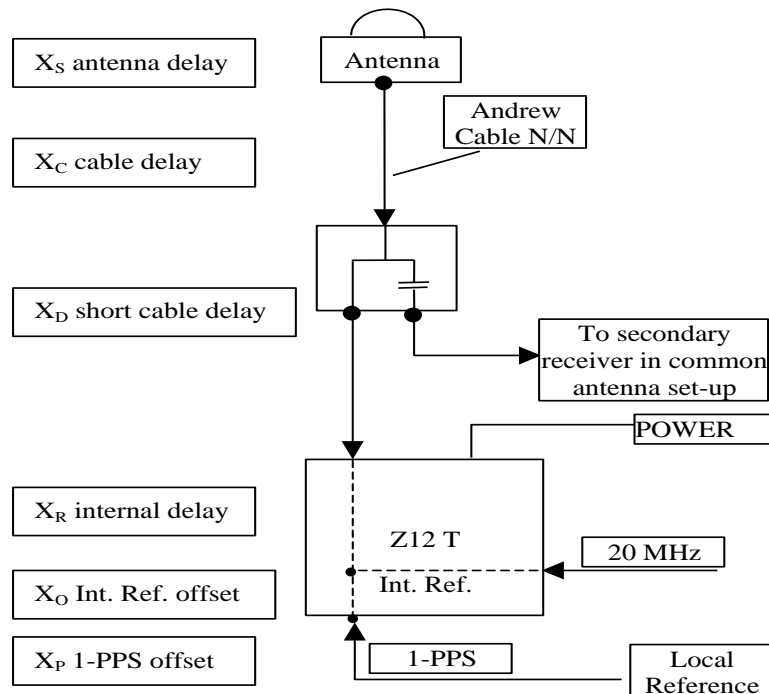


Figure 1: Definition of the different delays used in the most general set-up of a geodetic system (here shown for a Z12-T) from [Petit et al, 2001].

1/ phase 1b

Laboratories: BIPM, NIM

1b.1/ BIPM (20162)**Period**

MJD 59010 to 59015

Delays

BP21: (page 4)
 $X_O = 30.12$ ns (78.86-48.74)
 $X_P = 43.14$ ns (48.69-5.55)
REFDLY = 73.26 ns
CABDLY = 140.80 ns (C201)

TS03: (page 4)
REFDLY = 27.23 ns (32.78-5.55)
CABDLY = 212.10 ns

INTDLY
29.1 ns (P1), 29.1 ns (P2)
43.6 ns (B1I), 43.5 (B2I)

TS04: (page 5)
REFDLY = 28.09 ns (33.64-5.55)
CABDLY = 212.30 ns

INTDLY
27.2 ns (P1), 27.2 ns (P2)
42.3 ns (B1I), 42.3 (B2I)

Setup at the BIPM**Annex A - Information Sheet**

(to be repeated for each calibrated system)

Laboratory:	BIPM	
Date and hour of the beginning of measurements:	MJD 59010	
Date and hour of the end of measurements:	MJD 59015	
Information on the system		
	Local:	Travelling:
4-character BIPM code	BP21	TS03
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	NIM-TF-GNSS-3 120105
1 PPS trigger level /V:		0~2
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	No
Length outside the building /m:	~ 15 m	~ 10 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Harxon HXCCSX601A C18100100558
Temperature (if stabilised) /°C		
Measured delays /ns		
(if needed fill box "Additional Information" below)		
	Local:	Travelling:
• Delay from local UTC to receiver 1 PPS-in:	43.14 ns	27.23 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	30.12 ns	
• Antenna cable delay:	140.80 ns	212.10 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)
Data used for the generation of CGGTTS files		
• INT DLY (GPS) /ns:	29.1 ns (P1), 29.1 ns (P2)	
• INT DLY (Galileo) /ns:		
• INT DLY (GLONASS) /ns:		
• CAB DLY /ns:		
• REF DLY /ns:		
• Coordinates reference frame:		
Latitude or X /m:		
Longitude or Y /m:		
Height or Z /m:		
General information		
• Rise time of the local UTC pulse:		
• Is the laboratory air conditioned:		
Set temperature value and uncertainty:	22 ± 1°C	
Set humidity value and uncertainty:		

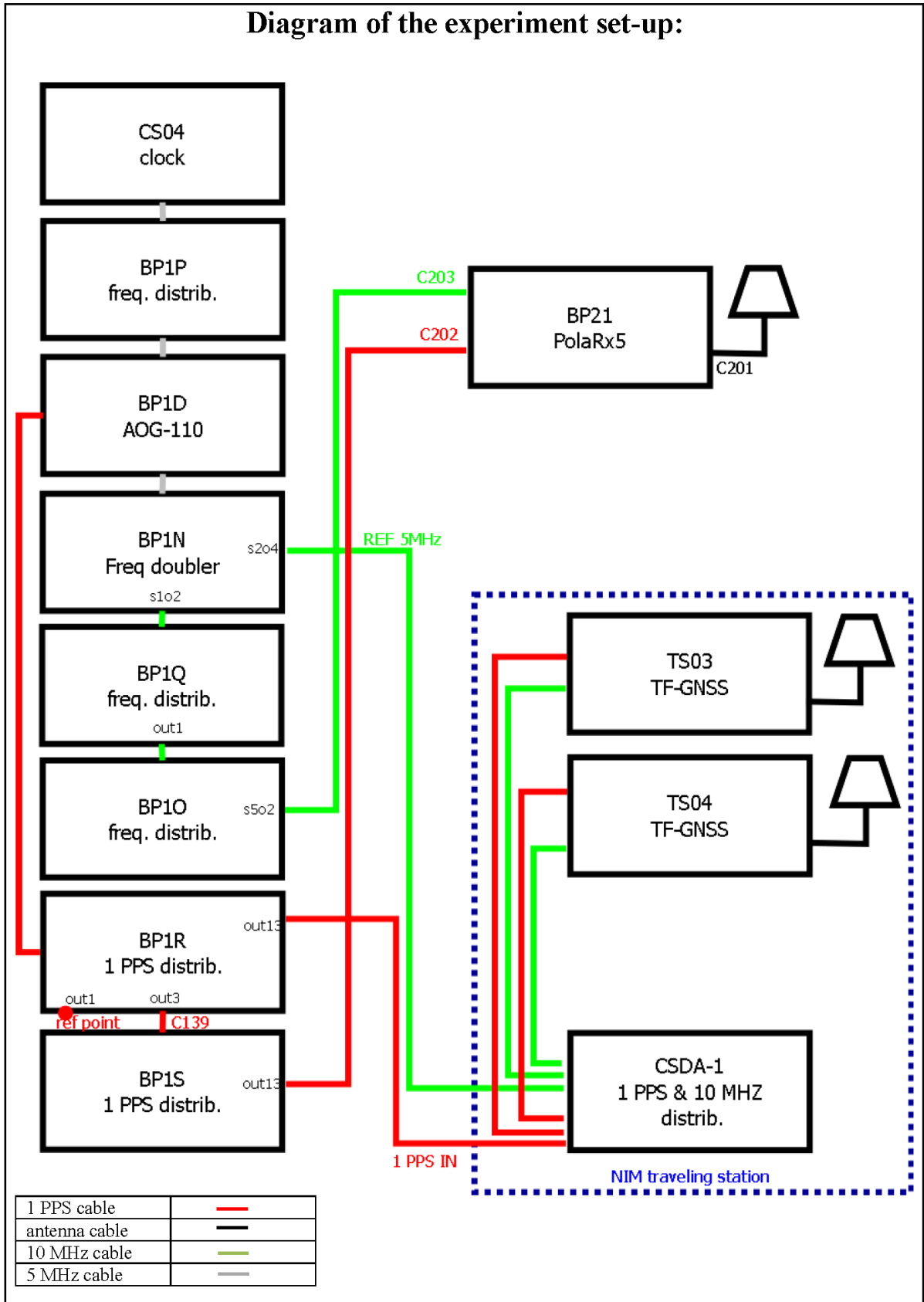
(1) For a trip with closure, not needed if the traveling equipment is used in the same set-up throughout.

Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	BIPM	
Date and hour of the beginning of measurements:	MJD 59010	
Date and hour of the end of measurements:	MJD 59015	
Information on the system		
	Local:	Travelling:
4-character BIPM code	BP21	TS04
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	NIM-TF-GNSS-3 120104
1 PPS trigger level /V:		0~2
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	No
Length outside the building /m:	~ 15 m	~ 10 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Harxon HXCCSX601A C18100100564
Temperature (if stabilised) /°C		
Measured delays /ns		
(if needed fill box "Additional Information" below)		
	Local:	Travelling:
• Delay from local UTC to receiver 1 PPS-in:	43.14 ns	29.08 ns
Delay from 1 PPS-in to internal Reference (if different): <small>(see section 2 for details)</small>	30.12 ns	
• Antenna cable delay:	140.80 ns	212.30 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)
Data used for the generation of CGGTTS files		
• INT DLY (GPS) /ns:	27.2 ns (P1), 27.2 ns (P2)	
• INT DLY (Galileo) /ns:		
• INT DLY (GLONASS) /ns:		
• CAB DLY /ns:		
• REF DLY /ns:		
• Coordinates reference frame:		
Latitude or X /m:		
Longitude or Y /m:		
Height or Z /m:		
General information		
• Rise time of the local UTC pulse:		
• Is the laboratory air conditioned:		
Set temperature value and uncertainty:	22 ± 1°C	
Set humidity value and uncertainty:		

(1) For a trip with closure, not needed if the traveling equipment is used in the same set-up throughout.



Log of Events / Additional Information :

All measurements at BIPM carried out by L. Tisserand.

Equipment used to measure delays is a Time Interval Counter (TIC), model 53230A, maker Keysight, S/N MY58390132, with measurement uncertainty typically less than 0.5 ns (using external reference frequency as timebase).

TS03-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 121791
 Number of huge residuals = 8513. New iteration
 Number of huge residuals = 8. New iteration
 Computed code bias (P1/P2)/m = 32.512 32.010
 Computed baseline (X,Y,Z)/m = -3.240 0.453 2.755
 RMS of residuals /m = 0.665

Number of phase differences to fit baseline
 L1/L2 = 113287
 L5 = 43012
 A priori baseline (X,Y,Z)/m = -3.240 0.453 2.755
 17276 clock jitters computed out of 17276 intervals
 AVE jitter /ps = 0.0 RMS jitter /ps = 4.4

Iter 1 Large residuals L1= 2
 Iter 1 Large residuals L2= 13
 Iter 1 Large residuals L5= 5
 Computed baseline L1 (X,Y,Z)/m = 0.168 0.076 0.140
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = 0.181 0.062 0.143
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.180 0.082 0.160
 RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 2
 Iter 2 Large residuals L2= 13
 Iter 2 Large residuals L5= 5
 Computed baseline L1 (X,Y,Z)/m = 0.168 0.076 0.140
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = 0.181 0.062 0.143
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.180 0.082 0.160
 RMS of residuals L5 /m = 0.004

Final baseline L1 (X,Y,Z)/m = -3.072 0.530 2.895
 Final baseline L2 (X,Y,Z)/m = -3.059 0.515 2.898
 Final baseline L5 (X,Y,Z)/m = -3.060 0.535 2.915

COMPUTATION OF CODE DIFFERENCES

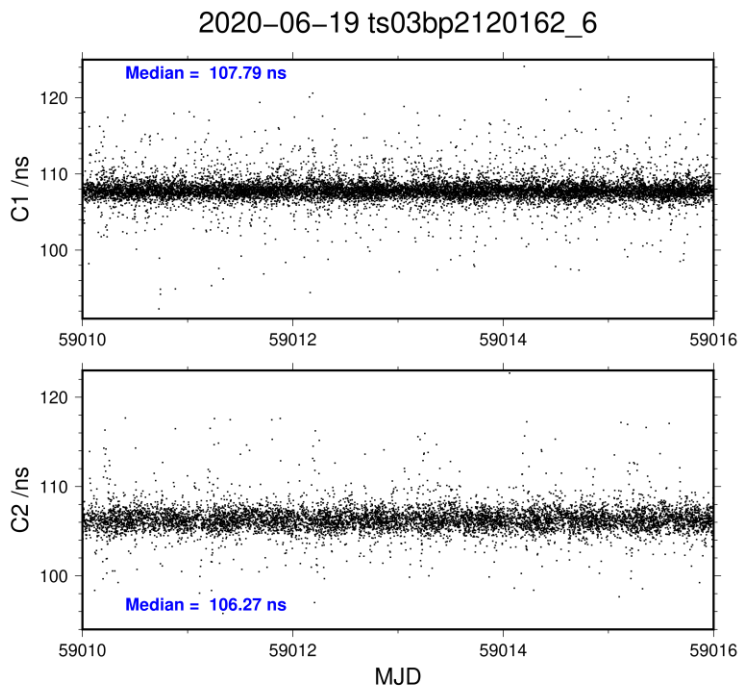
Total number of code differences = 439592

Global average of individual differences

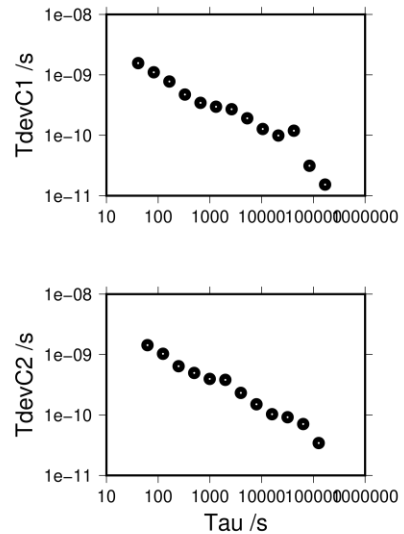
Code	#pts	ave/ns	rms/ns
C1	125176	107.893	2.959
C2	82995	106.324	2.566
P1	117552	107.916	2.185
P2	117190	106.228	3.438
E1	84488	107.877	2.663
E5	85681	109.013	2.428

Number of 300s epochs in out file = 1728

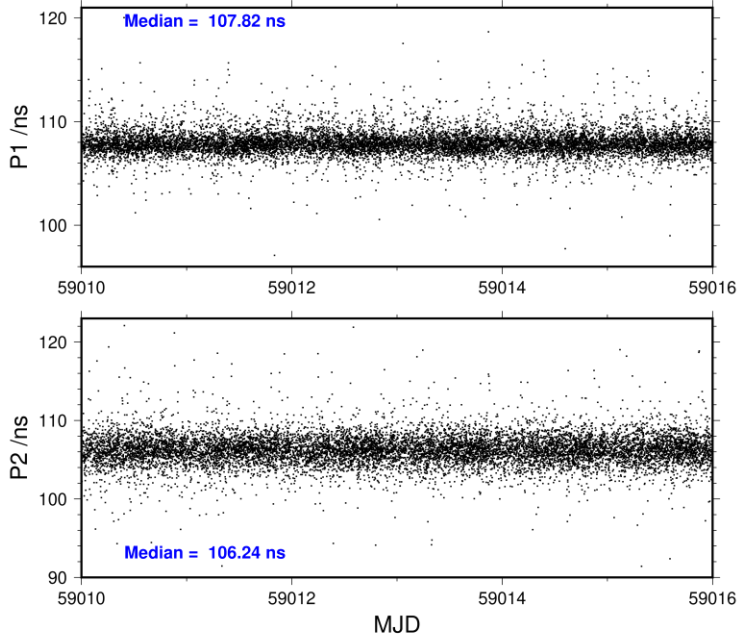
Code	#pts	median/ns	ave/ns	rms/ns
C1	12608	107.794	107.900	1.554
C2	8349	106.270	106.325	1.445
P1	11774	107.823	107.908	1.191
P2	11741	106.243	106.254	1.955
E1	8558	107.798	107.884	1.539
E5	8648	109.001	109.015	1.502



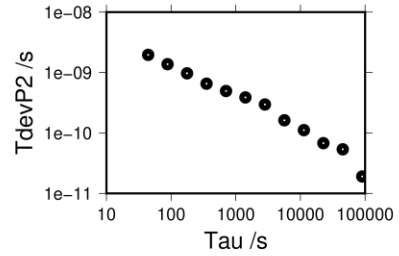
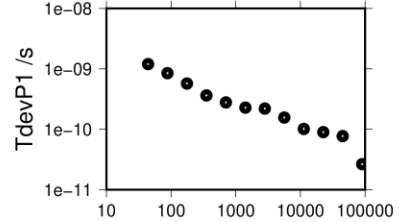
168330 s: C1= 15 ps
 84165 s: C1= 31 ps 127105 s: C2= 34 ps
 42083 s: C1= 119 ps 63552 s: C2= 71 ps
 21041 s: C1= 99 ps 31776 s: C2= 92 ps
 10521 s: C1= 127 ps 15888 s: C2= 103 ps
 5260 s: C1= 191 ps 7944 s: C2= 150 ps
 2630 s: C1= 270 ps 3972 s: C2= 232 ps
 1315 s: C1= 297 ps 1986 s: C2= 381 ps
 658 s: C1= 345 ps 993 s: C2= 395 ps
 329 s: C1= 473 ps 496 s: C2= 497 ps
 164 s: C1= 777 ps 248 s: C2= 642 ps
 82 s: C1= 1102 ps 124 s: C2= 1029 ps
 41 s: C1= 1563 ps 62 s: C2= 1431 ps



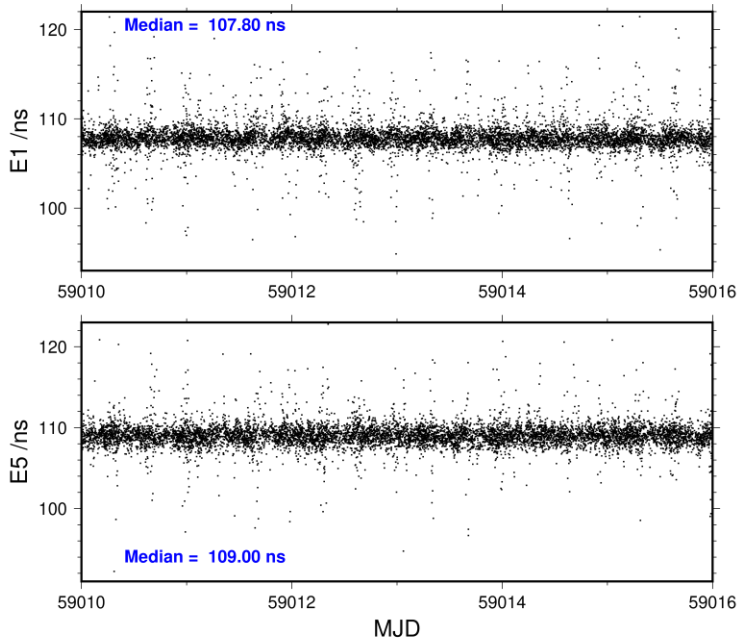
2020-06-19 ts03bp2120162_6



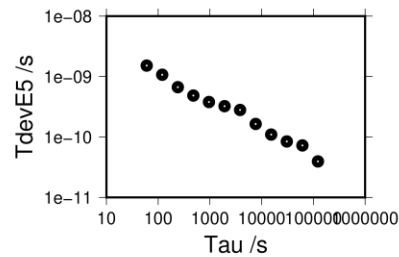
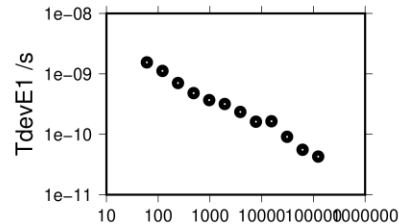
90127 s: P1= 27 ps	90381 s: P2= 19 ps
45064 s: P1= 77 ps	45190 s: P2= 54 ps
22532 s: P1= 90 ps	22595 s: P2= 68 ps
11266 s: P1= 101 ps	11298 s: P2= 111 ps
5633 s: P1= 157 ps	5649 s: P2= 162 ps
2816 s: P1= 220 ps	2824 s: P2= 296 ps
1408 s: P1= 229 ps	1412 s: P2= 388 ps
704 s: P1= 278 ps	706 s: P2= 494 ps
352 s: P1= 364 ps	353 s: P2= 654 ps
176 s: P1= 572 ps	177 s: P2= 971 ps
88 s: P1= 847 ps	88 s: P2= 1376 ps
44 s: P1= 1200 ps	44 s: P2= 1961 ps



2020-06-19 ts03bp2120162_6



124000 s: E1= 43 ps	122709 s: E5= 39 ps
62000 s: E1= 55 ps	61355 s: E5= 72 ps
31000 s: E1= 91 ps	30677 s: E5= 84 ps
15500 s: E1= 164 ps	15339 s: E5= 110 ps
7750 s: E1= 162 ps	7669 s: E5= 164 ps
3875 s: E1= 234 ps	3835 s: E5= 280 ps
1938 s: E1= 317 ps	1917 s: E5= 323 ps
969 s: E1= 368 ps	959 s: E5= 379 ps
484 s: E1= 480 ps	479 s: E5= 486 ps
242 s: E1= 706 ps	240 s: E5= 667 ps
121 s: E1= 1119 ps	120 s: E5= 1073 ps
61 s: E1= 1547 ps	60 s: E5= 1517 ps



TS04-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 121430
 Number of huge residuals = 8346. New iteration
 Number of huge residuals = 7. New iteration
 Computed code bias (P1/P2)/m = 33.222 32.492
 Computed baseline (X,Y,Z)/m = -3.463 0.725 3.078
 RMS of residuals /m = 0.658

Number of phase differences to fit baseline
 L1/L2 = 112885
 L5 = 42874
 A priori baseline (X,Y,Z)/m = -3.463 0.725 3.078
 17276 clock jitters computed out of 17276 intervals
 AVE jitter /ps = 0.1 RMS jitter /ps = 4.3

Iter 1 Large residuals L1= 4
 Iter 1 Large residuals L2= 13
 Iter 1 Large residuals L5= 2
 Computed baseline L1 (X,Y,Z)/m = 0.099 0.037 0.071
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = 0.102 0.043 0.078
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.110 0.058 0.095
 RMS of residuals L5 /m = 0.003

Iter 2 Large residuals L1= 4
 Iter 2 Large residuals L2= 13
 Iter 2 Large residuals L5= 2
 Computed baseline L1 (X,Y,Z)/m = 0.099 0.037 0.071
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = 0.102 0.043 0.078
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.110 0.058 0.095
 RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m = -3.363 0.762 3.148
 Final baseline L2 (X,Y,Z)/m = -3.361 0.768 3.156
 Final baseline L5 (X,Y,Z)/m = -3.352 0.783 3.173

COMPUTATION OF CODE DIFFERENCES

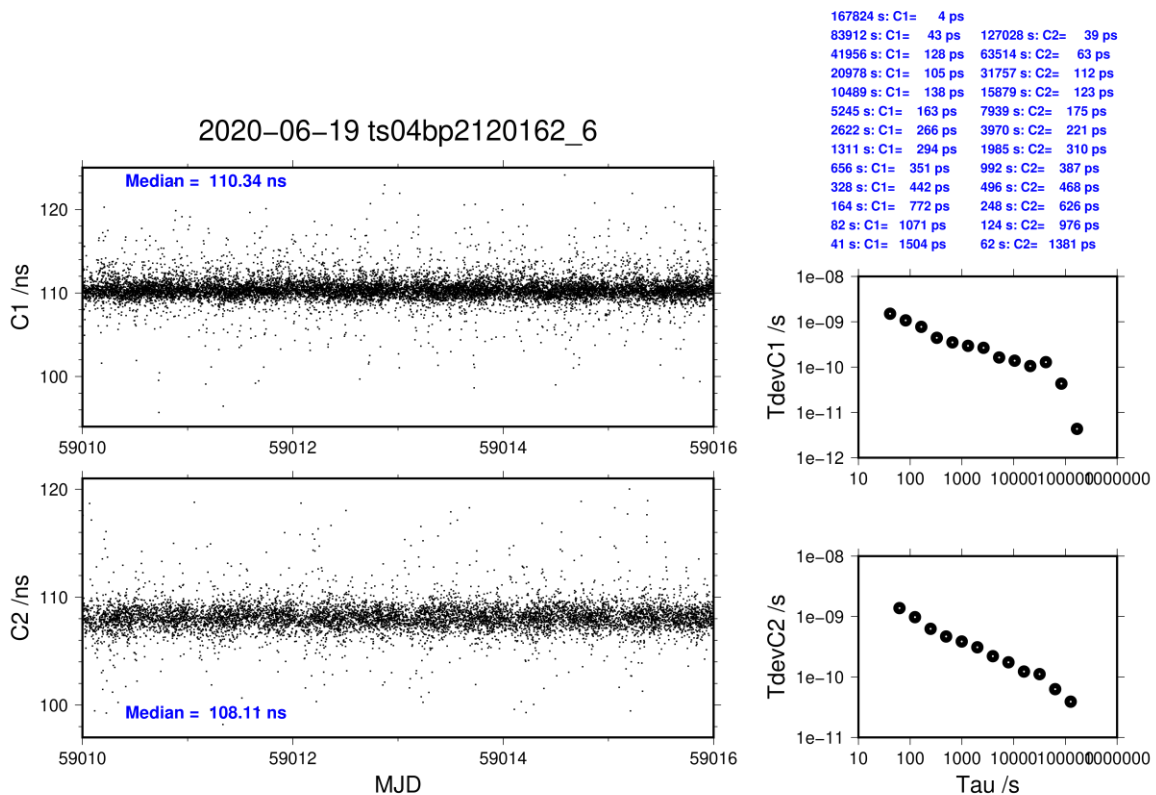
Total number of code differences = 439665

Global average of individual differences

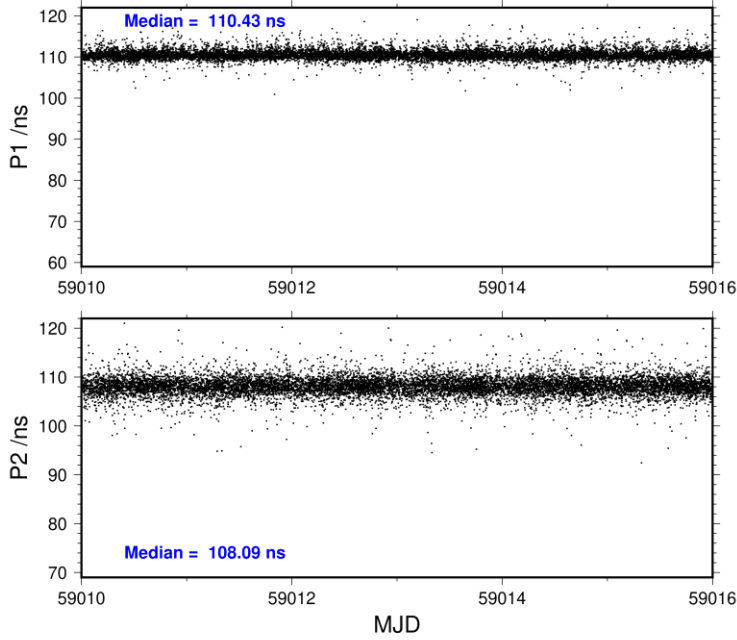
Code	#pts	ave/ns	rms/ns
C1	125249	110.449	2.937
C2	82879	108.151	2.571
P1	117278	110.521	2.160
P2	116915	108.069	3.430
E1	84307	110.386	2.657
E5	85411	111.530	2.462

Number of 300s epochs in out file = 1728

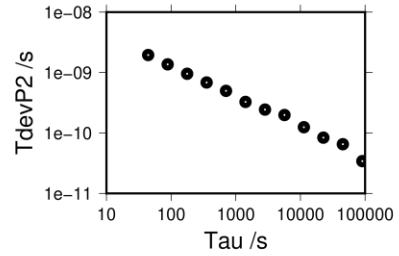
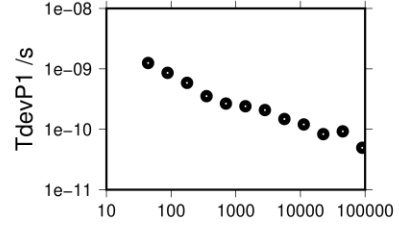
Code	#pts	median/ns	ave/ns	rms/ns
C1	12646	110.341	110.444	1.510
C2	8354	108.106	108.144	1.387
P1	11751	110.433	110.520	1.257
P2	11715	108.087	108.073	1.955
E1	8547	110.268	110.401	1.518
E5	8631	111.505	111.526	1.548



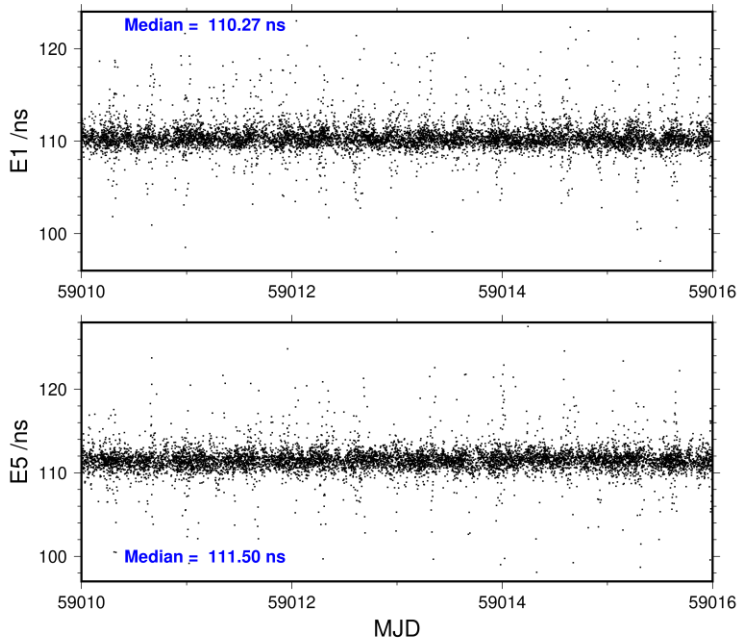
2020-06-19 ts04bp2120162_6



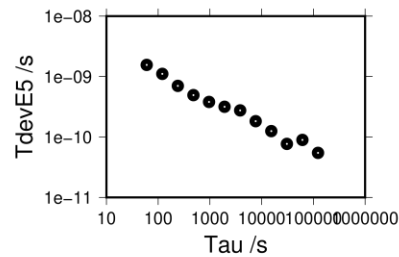
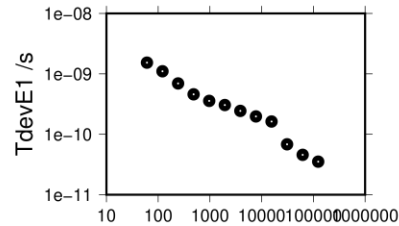
90304 s: P1= 49 ps	90581 s: P2= 34 ps
45152 s: P1= 92 ps	45291 s: P2= 65 ps
22576 s: P1= 83 ps	22645 s: P2= 84 ps
11288 s: P1= 120 ps	11323 s: P2= 125 ps
5644 s: P1= 148 ps	5661 s: P2= 198 ps
2822 s: P1= 208 ps	2831 s: P2= 244 ps
1411 s: P1= 241 ps	1415 s: P2= 327 ps
706 s: P1= 267 ps	708 s: P2= 497 ps
353 s: P1= 354 ps	354 s: P2= 684 ps
176 s: P1= 588 ps	177 s: P2= 954 ps
88 s: P1= 859 ps	88 s: P2= 1368 ps
44 s: P1= 1252 ps	44 s: P2= 1953 ps



2020-06-19 ts04bp2120162_6



124160 s: E1= 35 ps	122951 s: E5= 55 ps
62080 s: E1= 46 ps	61476 s: E5= 90 ps
31040 s: E1= 68 ps	30738 s: E5= 77 ps
15520 s: E1= 163 ps	15369 s: E5= 125 ps
7760 s: E1= 198 ps	7684 s: E5= 183 ps
3880 s: E1= 244 ps	3842 s: E5= 276 ps
1940 s: E1= 305 ps	1921 s: E5= 316 ps
970 s: E1= 357 ps	961 s: E5= 380 ps
485 s: E1= 458 ps	480 s: E5= 494 ps
242 s: E1= 695 ps	240 s: E5= 702 ps
121 s: E1= 1103 ps	120 s: E5= 1107 ps
61 s: E1= 1532 ps	60 s: E5= 1561 ps



1b.2/ NIM (20252)**Period**

MJD 59100 to 59106

Delays

TS03: (cf page 15-16)

REFDLY = 283.2 ns
CABDLY = 212.1 ns

TS04: (cf page 15-16)

REFDLY = 284.0 ns
CABDLY = 212.3 ns

IM15: (cf page 15-16)

REFDLY = 119.4 ns
CABDLY = 212.4 ns

IMEJ (IM06): (cf page 15-16)

REFDLY = 121.7 ns
CABDLY = 248.7 ns

BJNM (IM05): (cf page 18-19)

REFDLY = 324.8 ns
CABDLY = 125.0 ns

IM21: (cf page 18-19)

REFDLY = 119.8 ns
CABDLY = 212.3 ns

IMEU (IM03): (cf page 18-19)

REFDLY = 120.1 ns
CABDLY = 250.3 ns

Setup at the NIM**Information Sheet**

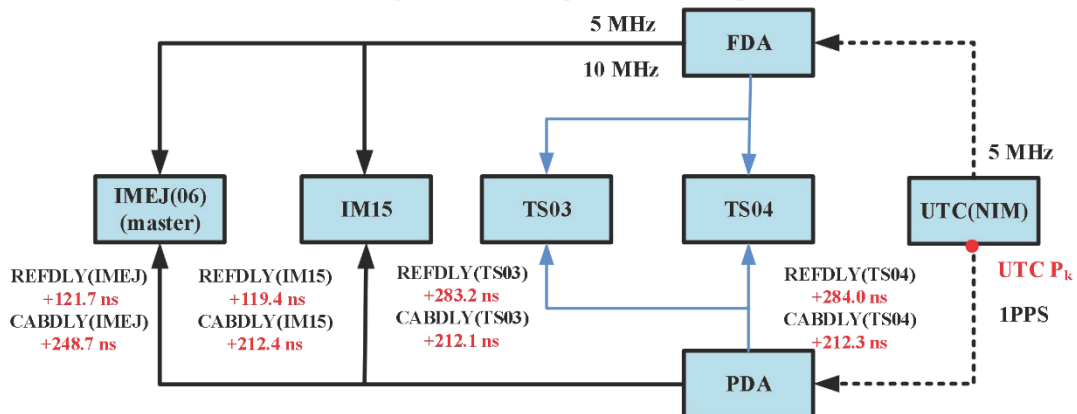
(to be repeated for each calibrated system)

Laboratory:	NIM	
Date and hour of the beginning of measurements:	UTC time 0:00 am Sep. 8,2020	
Date and hour of the end of measurements:	UTC time 0:00 am Sep. 15,2020	
Information on the system		
	Local:	Receiver to be calibrated:
4-character BIPM code	(1)IM15 (2)IM06	(1)TS03 (2)TS04
Receiver maker and type: Receiver serial number:	(1)maker: NIM type: NIM-TF-GNSS-3 serial number: 2016016 (2)maker:Dicom type: GTR50 serial number:1007011	(1)maker: NIM type: NIM-TF-GNSS-3 serial number: 120105 (2)maker: NIM type: NIM-TF-GNSS-3 serial number: 120104
1 PPS trigger level /V:	0~2	0~2
Antenna cable maker and type: Phase stabilised cable (Y/N):	maker: type: Phase stabilised cable:N	maker: type: Phase stabilised cable:N
Length outside the building /m:	(1) 5 m (2) 5 m	(1) 5 m (2) 5 m
Antenna maker and type: Antenna serial number:	(1)maker: Harxon type: HXCCSX601A Serial number: 2016016 (2)maker:Novatel type: GPS-702-GGG Serial number: NAE10220060	(1)maker: Harxon type: HXCCSX601A Serial number: C18100100558 (2)maker: Harxon type: HXCCSX601A Serial number: C18100100564
Temperature (if stabilised) /°C		
Measured delays /ns		
	Local:	Receiver to be calibrated:
Delay from local UTC to receiver 1 PPS-in:	(1) 119.4 (2)121.7	(1) 283.2 (2) 284.0
Delay from 1 PPS-in to internal		

Reference (if different):		
Antenna cable delay:	(1)212.4 (2)248.7	(1) 212.1 (2) 212.3
Splitter delay (if any):		
Additional cable delay (if any):		
Data used for the generation of CGGTTS files (IM15)		
INT DLY (BDS) /ns:	-23.4 (BDS B1), -25.8 (BDS B2)	
INT DLY (GLONASS) /ns:	0.0	
CAB DLY /ns:	212.4	
REF DLY /ns:	119.4	
Coordinates reference frame:	ITRF	
Latitude or X /m:	-2154286.895	
Longitude or Y /m:	+4373440.505	
Height or Z /m:	+4098885.481	
Data used for the generation of CGGTTS files (IM06)		
INT DLY (GPS) /ns:	-31.8 (GPS P1), -18.4 (GPS P2), -31.0 (GPS C1)	
INT DLY (GLONASS) /ns:	0.0	
CAB DLY /ns:	248.7	
REF DLY /ns:	121.7	
Coordinates reference frame:	ITRF	
Latitude or X /m:	-2154288.06	
Longitude or Y /m:	+4373440.56	
Height or Z /m:	+4098884.94	
Data used for the generation of CGGTTS files (TS03)		
INT DLY (GPS) /ns:	0.0 ns (GPS C1), 29.1 ns (GPS P1), 29.1 ns (GPS P2)	
INT DLY (BDS) /ns:	43.6 ns (BDS B1), 43.5 ns (BDS B2)	
CAB DLY /ns:	212.1	
REF DLY /ns:	283.2	
Coordinates reference frame:	ITRF	
Latitude or X /m:	-2154290.970	
Longitude or Y /m:	+4373440.436	
Height or Z /m:	+4098898.019	
Data used for the generation of CGGTTS files (TS04)		
INT DLY (GPS) /ns:	0.0 ns (GPS C1), 27.2 ns (GPS P1), 27.2 ns (GPS P2)	
INT DLY (BDS) /ns:	42.3 ns (BDS B1), 42.3 ns (BDS B2)	

CAB DLY /ns:	212.3
REF DLY /ns:	284.0
Coordinates reference frame:	ITRF
Latitude or X /m:	-2154288.855
Longitude or Y /m:	+4373434.931
Height or Z /m:	+4098890.420
General information	
Rise time of the local UTC pulse	unknown
Is the laboratory air conditioned	Yes
Set temperature value and uncertainty:	26.0°C ±0.2 °C
Set humidity value and uncertainty:	21% ± 1%

Diagram of the experiment set-up



Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	NIM	
Date and hour of the beginning of measurements:	UTC time 0:00 am Sep. 8,2020	
Date and hour of the end of measurements:	UTC time 0:00 am Sep. 15,2020	
Information on the system		
	Local:	Travelling:
4-character BIPM code	(1)BJNM (2)IM21 (3)IMEU	(1)TS03 (2)TS04
<ul style="list-style-type: none"> • Receiver maker and type: Receiver serial number:	(1) maker: NIM type: SEPT POLARX3ETR serial number: 2001087 (2) maker: NIM type: NIM-TF-GNSS-3 serial number: 120101 (3) maker: NIM type: NIM-TF-GNSS-3 serial number: YTJ160	(1) maker: NIM type: NIM-TF-GNSS-3 serial number: 120105 (2) maker: NIM type: NIM-TF-GNSS-3 serial number: 120104
1 PPS trigger level /V:	0~2	
<ul style="list-style-type: none"> • Antenna cable maker and type: Phase stabilised cable (Y/N):	(1) maker: type: Phase stabilised cable:N (2) maker: type: Phase stabilised cable:N (3) maker: JiangXi Linktrend Cable Tech Co. type: SDFB Phase stabilised cable:N	(1) maker: type: Phase stabilised cable:N (2) maker: type: Phase stabilised cable:N
Length outside the building /m:	(1) 5 m (2) 5 m (3) 5 m	(1) 5 m (2) 5 m
<ul style="list-style-type: none"> • Antenna maker and type: Antenna serial number:	(1) maker: Novatel type: NOV702GG Serial number: NAE09190046 (2) maker: Harxon type: HXCCSX601A Serial number: C18050106111 (3) maker: Javad type: JNSMARANT_GGD Serial number: 0155	(1)maker: Harxon type: HXCCSX601A Serial number: C18100100558 (2)maker: Harxon type: HXCCSX601A Serial number: C18100100564
Temperature (if stabilised) /°C		
Measured delays /ns		
(if needed fill box "Additional Information" below)		
	Local:	Travelling:
<ul style="list-style-type: none"> • Delay from local UTC to receiver 1 PPS-in: 	(1) 324.8 (2) 119.8 (3) 120.1	(1) 283.2 (2) 284.0

Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)		
• Antenna cable delay:	(1) 125.0 (2) 212.3 (3) 250.3	(1) 212.1 (2) 212.3
Splitter delay (if any):		
Additional cable delay (if any):		

Data used for the generation of CGGTTS files(BJNM)

• INT DLY (GPS) /ns:	69.3 ns (GPS P1), 76.6 ns (GPS P2)
• INT DLY (Galileo) /ns:	0.0 ns (GAL E1), 0.0 ns (GAL E5a)
• INT DLY (GLONASS) /ns:	0.0 ns (GLONASS C1), 0.0 ns (GLONASS P3)
• CAB DLY /ns:	125.0
• REF DLY /ns:	324.8
• Coordinates reference frame:	ITRF
Latitude or X /m:	-2154287.41
Longitude or Y /m:	+4373440.05
Height or Z /m:	+4098885.63

Data used for the generation of CGGTTS files(IM21)

• INT DLY (GPS) /ns:	-37.9 (GPS C1), -38.8 (GPS P1), -43.6 (GPS P2)
• INT DLY (Galileo) /ns:	0.0 ns (GAL E1), 0.0 ns (GAL E5a)
• INT DLY (GLONASS) /ns:	0.0 ns (GLONASS C1), 0.0 ns (GLONASS P1), 0.0 ns (GLONASS P2)
• CAB DLY /ns:	212.3
• REF DLY /ns:	119.8
• Coordinates reference frame:	ITRF
Latitude or X /m:	-2154284.865
Longitude or Y /m:	+4373434.794
Height or Z /m:	+4098892.720

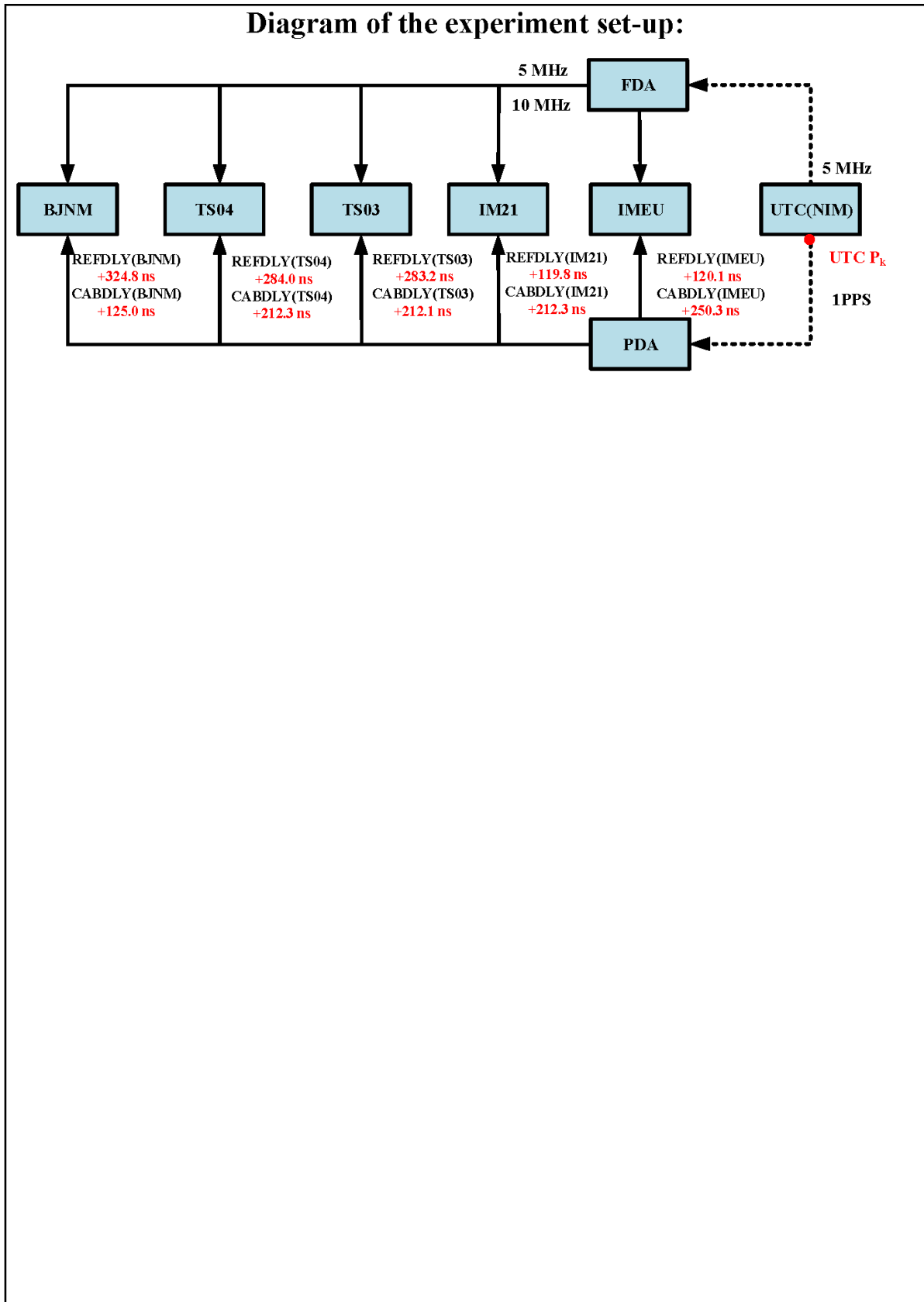
Data used for the generation of CGGTTS files(IMEU)

• INT DLY (GPS) /ns:	-40.3 ns (GPS C1), -44.4 ns (GPS P3)
• INT DLY (Galileo) /ns:	0.0 ns (GAL E1), 0.0 ns (GAL E5a)
• INT DLY (GLONASS) /ns:	0.0 ns (GLONASS C1), 0.0 ns (GLONASS P3)
• CAB DLY /ns:	250.3
• REF DLY /ns:	120.1
• Coordinates reference frame:	ITRF
Latitude or X /m:	-2154288.619
Longitude or Y /m:	+4373441.259
Height or Z /m:	+4098883.749

Data used for the generation of CGGTTS files(TS03)

• INT DLY (GPS) /ns:	0.0 ns (GPS C1), 29.1 ns (GPS P1), 29.1 ns (GPS P2)
• INT DLY (Galileo) /ns:	0.0 ns (GAL E1), 0.0 ns (GAL E5a)

• INT DLY (GLONASS) /ns:	0.0 ns (GLONASS C1), 0.0 ns (GLONASS P3)
• CAB DLY /ns:	212.1
• REF DLY /ns:	283.2
• Coordinates reference frame:	ITRF
Latitude or X /m:	-2154290.970
Longitude or Y /m:	+4373440.436
Height or Z /m:	+4098898.019
Data used for the generation of CGGTTS files(TS04)	
• INT DLY (GPS) /ns:	0.0 ns (GPS C1), 27.2 ns (GPS P1), 27.2 ns (GPS P2)
• INT DLY (Galileo) /ns:	0.0 ns (GAL E1), 0.0 ns (GAL E5a)
• INT DLY (GLONASS) /ns:	0.0 ns (GLONASS C1), 0.0 ns (GLONASS P3)
• CAB DLY /ns:	212.3
• REF DLY /ns:	284.0
• Coordinates reference frame:	ITRF
Latitude or X /m:	-2154291.371
Longitude or Y /m:	+4373439.689
Height or Z /m:	+4098896.939
General information	
• Rise time of the local UTC pulse:	unknown
• Is the laboratory air conditioned:	Yes
Set temperature value and uncertainty:	26.0°C ±0.2 °C
Set humidity value and uncertainty:	21% ± 1%



Log of Events / Additional Information :

REFDLY and ANTDLY for NIM receivers

	IM21	IM15	IM06
REFDLY (ns)	119.8	119.4	121.7
ANTDLY (ns)	212.3	212.4	248.7
	IM05	IM03	TS03
REFDLY (ns)	324.8	120.1	283.2
ANTDLY (ns)	125.0	250.3	212.1
	TS04	TF11	
REFDLY (ns)	284.0	130.8	
ANTDLY (ns)	212.3	215.0	

IM15-TS03

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 148506
 Computed code bias (P1/P2)/m = 35.152 32.827
 Computed baseline (X,Y,Z)/m = -1.478 -5.326 4.873
 RMS of residuals /m = 0.415

Number of phase differences to fit baseline

L1/L2 = 147575

L5 = 0

A priori baseline (X,Y,Z)/m = -1.478 -5.326 4.873

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = 0.0 RMS jitter /ps = 3.6

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.018 0.035 0.015

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = -0.020 0.036 0.013

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -1.497 -5.291 4.888

Final baseline L2 (X,Y,Z)/m = -1.498 -5.290 4.886

Final baseline L5 (X,Y,Z)/m = -1.498 -5.290 4.887

COMPUTATION OF CODE DIFFERENCES

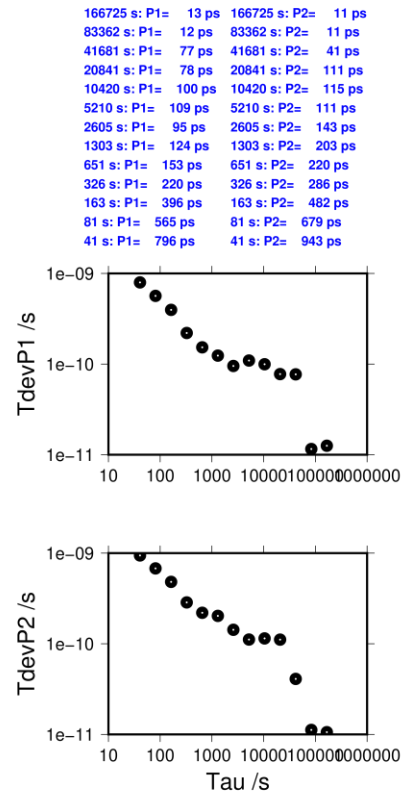
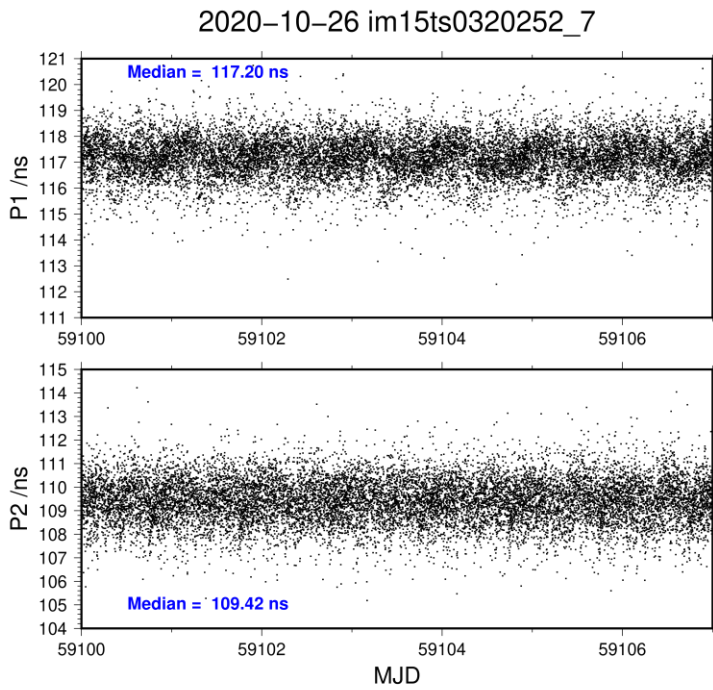
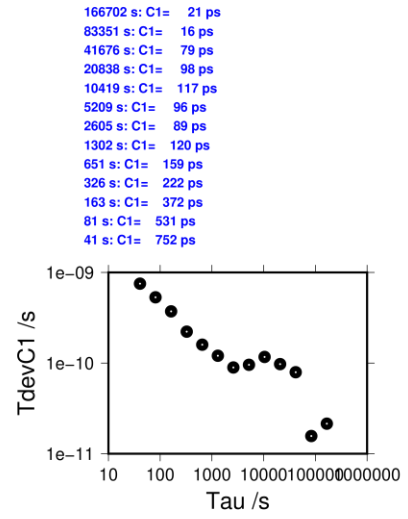
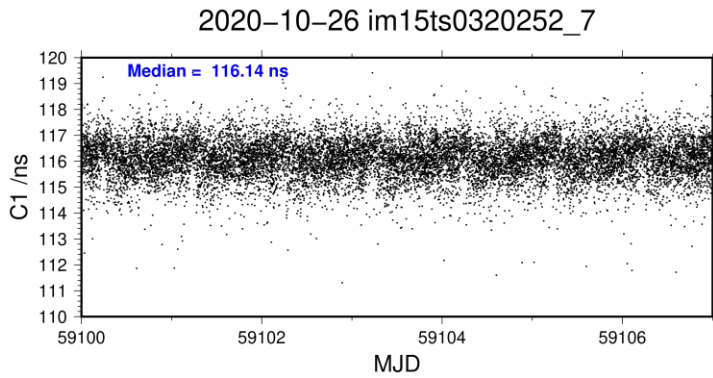
Total number of code differences = 421479

Global average of individual differences

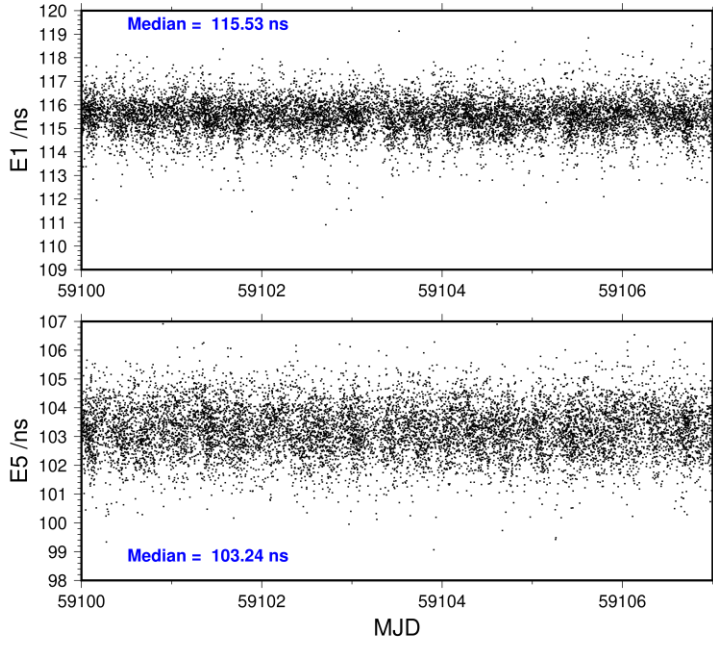
Code	#pts	ave/ns	rms/ns
C1	148461	116.107	1.357
P1	148451	117.170	1.293
P2	148451	109.414	1.487
E1	106370	115.508	1.288
E5	107097	103.227	1.228

Number of 300s epochs in out file = 2016

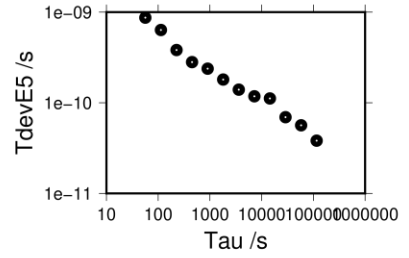
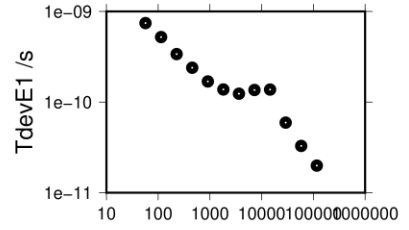
Code	#pts	median/ns	ave/ns	rms/ns
C1	14854	116.140	116.118	0.748
P1	14852	117.202	117.182	0.785
P2	14852	109.425	109.411	0.954
E1	10623	115.534	115.515	0.742
E5	10694	103.237	103.235	0.876



2020-10-26 im15ts0320252_7



116552 s: E1= 20 ps	115778 s: E5= 38 ps
58276 s: E1= 33 ps	57889 s: E5= 56 ps
29138 s: E1= 59 ps	28945 s: E5= 69 ps
14569 s: E1= 137 ps	14472 s: E5= 111 ps
7284 s: E1= 136 ps	7236 s: E5= 118 ps
3642 s: E1= 124 ps	3618 s: E5= 140 ps
1821 s: E1= 138 ps	1809 s: E5= 180 ps
911 s: E1= 169 ps	905 s: E5= 238 ps
455 s: E1= 239 ps	452 s: E5= 281 ps
228 s: E1= 338 ps	226 s: E5= 382 ps
114 s: E1= 521 ps	113 s: E5= 635 ps
57 s: E1= 744 ps	57 s: E5= 869 ps



IM15-TS04

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 148490
 Computed code bias (P1/P2)/m = 34.445 32.200
 Computed baseline (X,Y,Z)/m = -1.928 -5.568 4.954
 RMS of residuals /m = 0.407

Number of phase differences to fit baseline

L1/L2 = 147530

L5 = 0

A priori baseline (X,Y,Z)/m = -1.928 -5.568 4.954

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = -0.1 RMS jitter /ps = 3.5

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = 0.010 0.018 -0.001

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = 0.011 0.015 -0.005

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -1.918 -5.550 4.953

Final baseline L2 (X,Y,Z)/m = -1.917 -5.553 4.949

Final baseline L5 (X,Y,Z)/m = -1.918 -5.552 4.951

COMPUTATION OF CODE DIFFERENCES

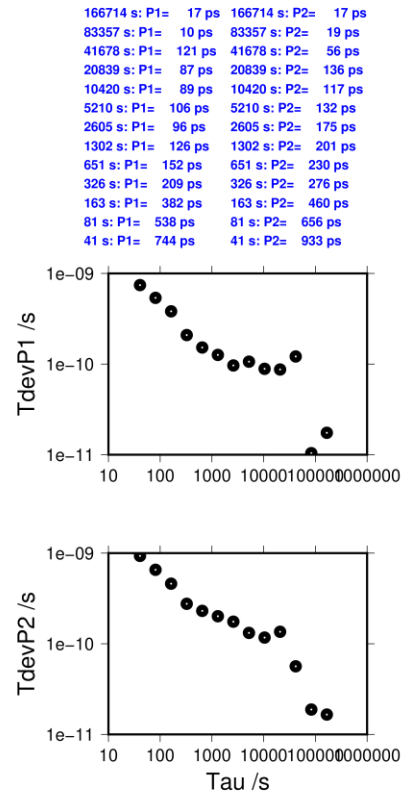
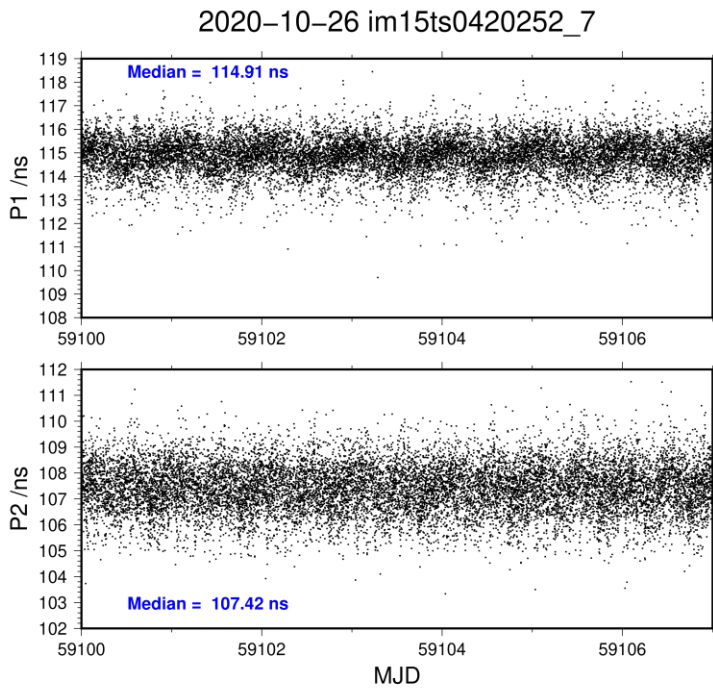
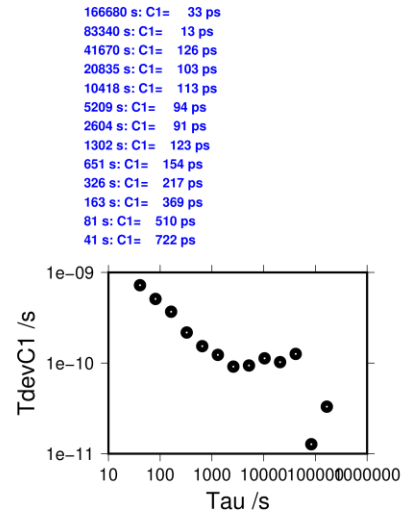
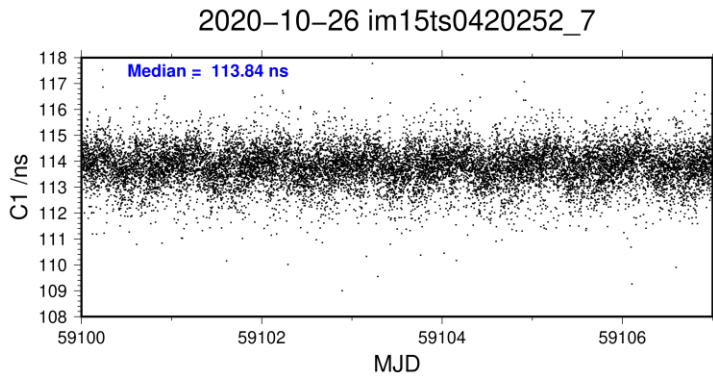
Total number of code differences = 423381

Global average of individual differences

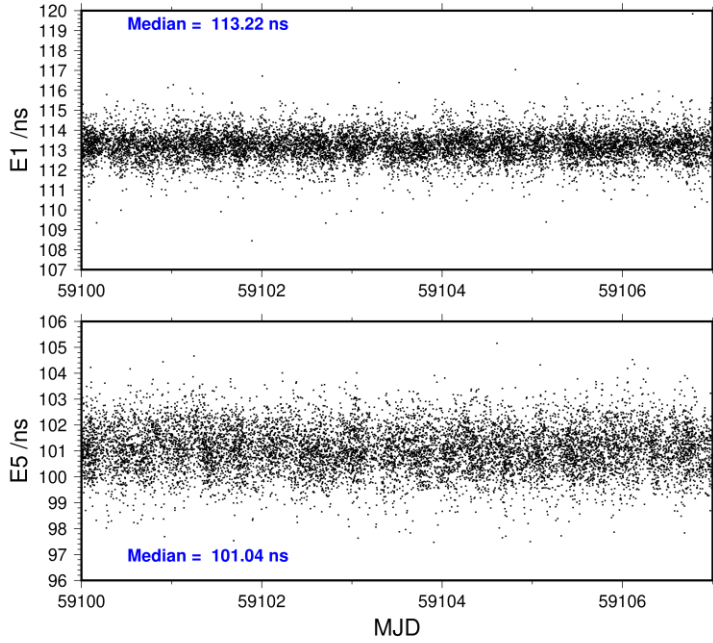
Code	#pts	ave/ns	rms/ns
C1	148446	113.799	1.341
P1	148435	114.878	1.261
P2	148435	107.401	1.465
E1	106353	113.198	1.259
E5	107069	101.045	1.246

Number of 300s epochs in out file = 2016

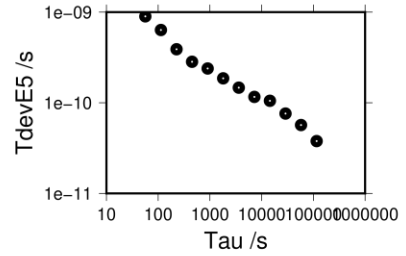
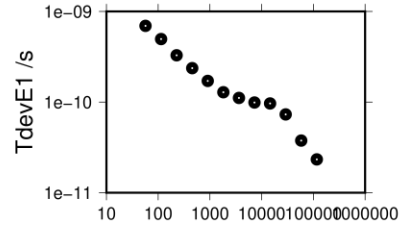
Code	#pts	median/ns	ave/ns	rms/ns
C1	14856	113.837	113.809	0.729
P1	14853	114.911	114.882	0.750
P2	14853	107.424	107.401	0.941
E1	10627	113.221	113.211	0.699
E5	10698	101.042	101.052	0.891



2020-10-26 im15ts0420252_7



116508 s: E1= 23 ps	115735 s: E5= 38 ps
58254 s: E1= 38 ps	57867 s: E5= 57 ps
29127 s: E1= 73 ps	28934 s: E5= 76 ps
14564 s: E1= 97 ps	14467 s: E5= 105 ps
7282 s: E1= 99 ps	7233 s: E5= 116 ps
3641 s: E1= 111 ps	3617 s: E5= 147 ps
1820 s: E1= 128 ps	1808 s: E5= 186 ps
910 s: E1= 171 ps	904 s: E5= 239 ps
455 s: E1= 237 ps	452 s: E5= 284 ps
228 s: E1= 328 ps	226 s: E5= 389 ps
114 s: E1= 495 ps	113 s: E5= 635 ps
57 s: E1= 693 ps	57 s: E5= 897 ps



IMEJ-TS03

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 160778
 Number of huge residuals = 14. New iteration
 Computed code bias (P1/P2)/m = 15.567 16.434
 Computed baseline (X,Y,Z)/m = -0.196 -5.270 5.524
 RMS of residuals /m = 0.515

Number of phase differences to fit baseline

L1/L2 = 144007

L5 = 0

A priori baseline (X,Y,Z)/m = -0.196 -5.270 5.524

18745 clock jitters computed out of 18966 intervals

AVE jitter /ps = 1.6 RMS jitter /ps = 47.1

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.020 0.015 0.003

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = -0.016 0.010 -0.001

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -0.217 -5.256 5.527

Final baseline L2 (X,Y,Z)/m = -0.212 -5.260 5.523

Final baseline L5 (X,Y,Z)/m = -0.214 -5.258 5.525

COMPUTATION OF CODE DIFFERENCES

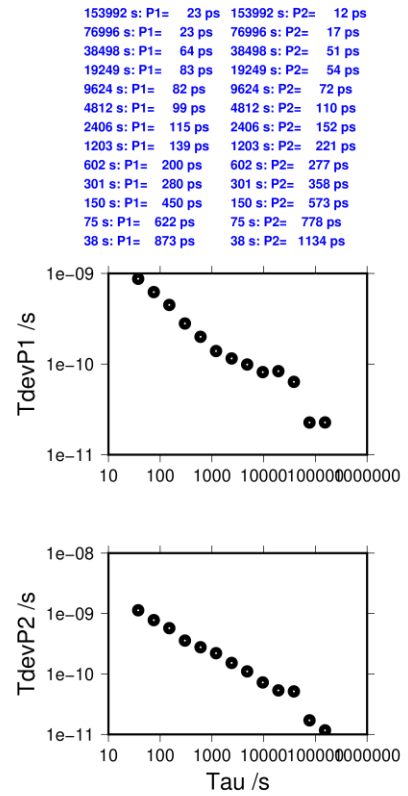
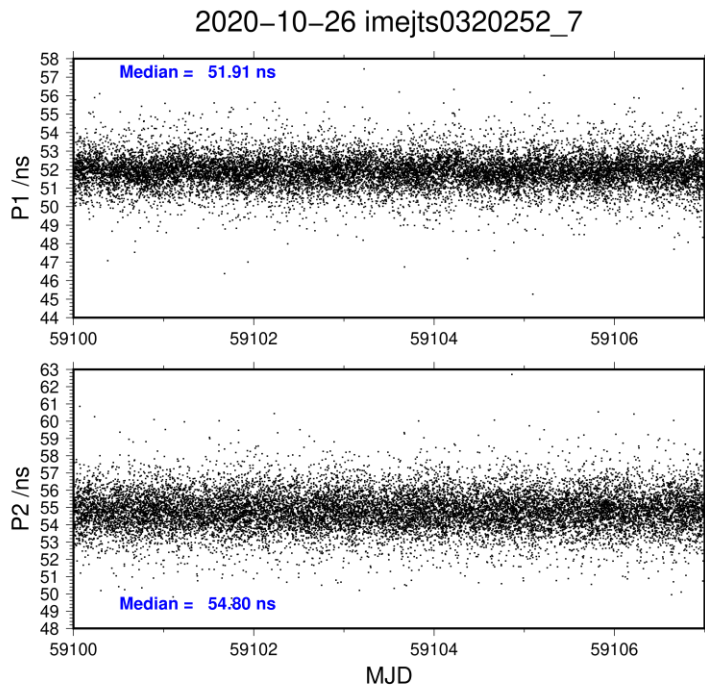
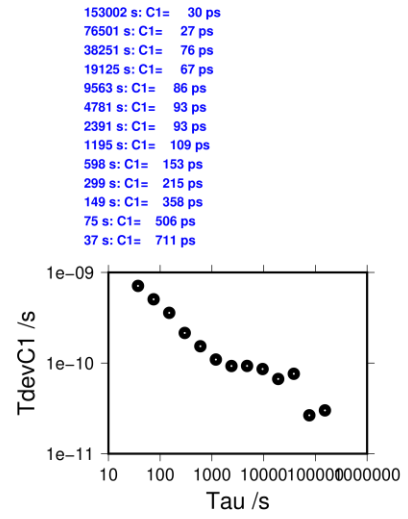
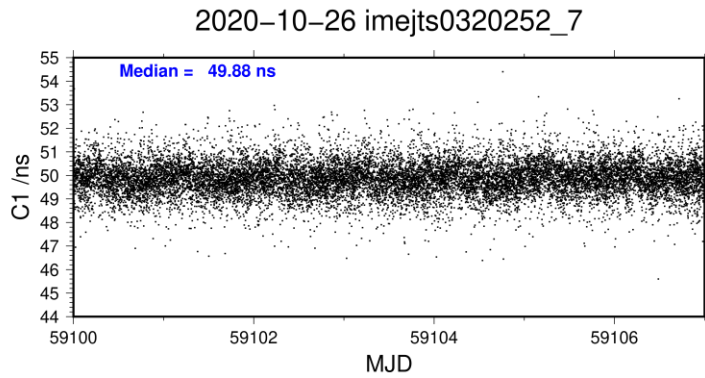
Total number of code differences = 161733

Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	161671	49.871	1.297
P1	160715	51.889	1.614
P2	160715	54.794	1.976

Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	16184	49.878	49.876	0.709
P1	16080	51.912	51.906	0.875
P2	16080	54.795	54.806	1.121



IMEJ-TS04

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 160757
 Number of huge residuals = 14. New iteration
 Computed code bias (P1/P2)/m = 14.867 15.816
 Computed baseline (X,Y,Z)/m = -0.643 -5.525 5.603
 RMS of residuals /m = 0.511

Number of phase differences to fit baseline

L1/L2 = 144023

L5 = 0

A priori baseline (X,Y,Z)/m = -0.643 -5.525 5.603

18741 clock jitters computed out of 18959 intervals

AVE jitter /ps = 1.4 RMS jitter /ps = 47.1

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = 0.008 0.008 -0.014

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = 0.013 0.004 -0.018

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -0.635 -5.516 5.589

Final baseline L2 (X,Y,Z)/m = -0.630 -5.521 5.585

Final baseline L5 (X,Y,Z)/m = -0.632 -5.518 5.587

COMPUTATION OF CODE DIFFERENCES

Total number of code differences = 161711

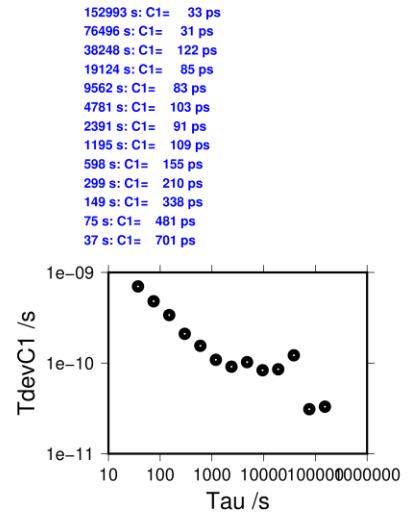
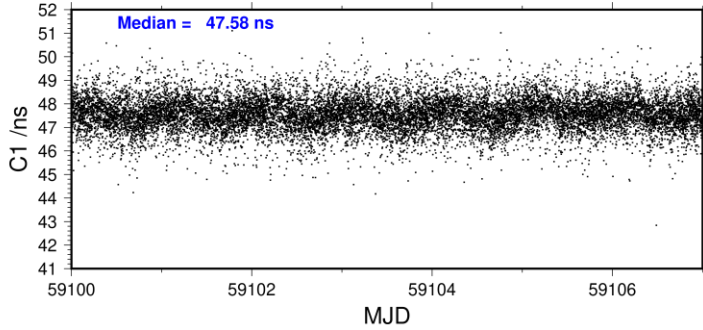
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	161649	47.571	1.280
P1	160693	49.604	1.596
P2	160693	52.782	1.962

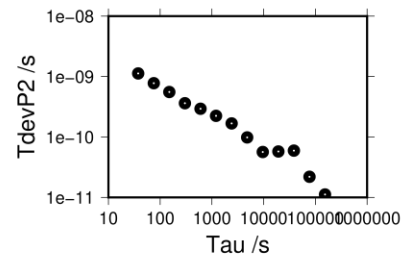
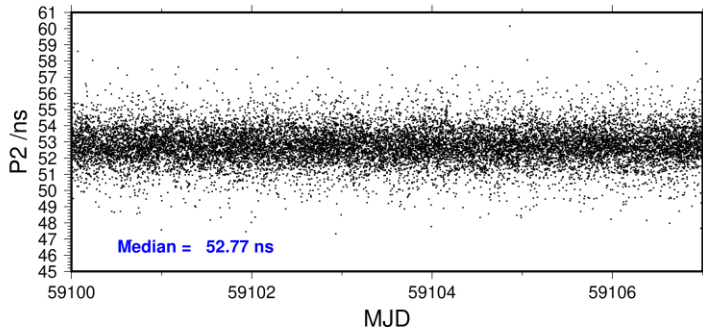
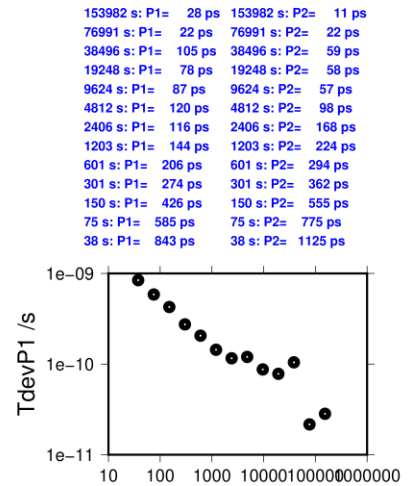
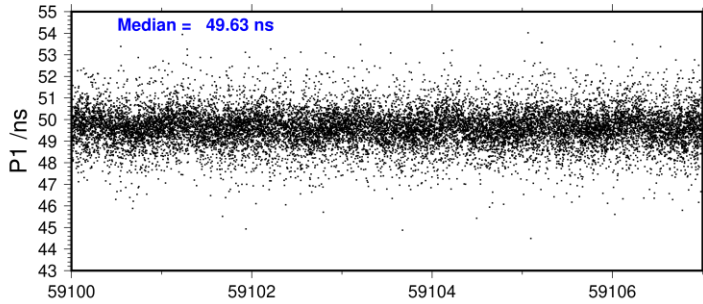
Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	16185	47.579	47.577	0.694
P1	16081	49.628	49.621	0.845
P2	16081	52.770	52.794	1.115

2020-10-26 imejts0420252_7



2020-10-26 imejts0420252_7



BJNM-TS03

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 160356
 Number of huge residuals = 7. New iteration
 Computed code bias (P1/P2)/m = -23.525 -20.503
 Computed baseline (X,Y,Z)/m = -0.619 -4.843 4.739
 RMS of residuals /m = 0.496

Number of phase differences to fit baseline

L1/L2 = 158242

L5 = 0

A priori baseline (X,Y,Z)/m = -0.619 -4.843 4.739

20059 clock jitters computed out of 20059 intervals

AVE jitter /ps = 0.0 RMS jitter /ps = 5.0

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.036 0.082 0.029

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = -0.034 0.081 0.022

RMS of residuals L2 /m = 0.005

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -0.655 -4.762 4.768

Final baseline L2 (X,Y,Z)/m = -0.653 -4.762 4.761

Final baseline L5 (X,Y,Z)/m = -0.654 -4.762 4.765

COMPUTATION OF CODE DIFFERENCES

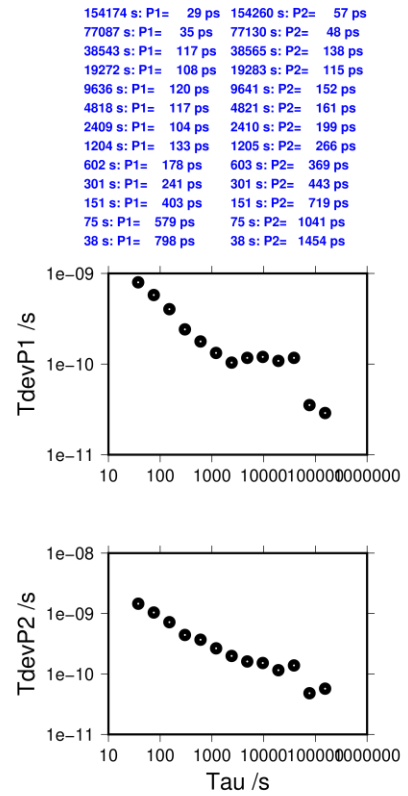
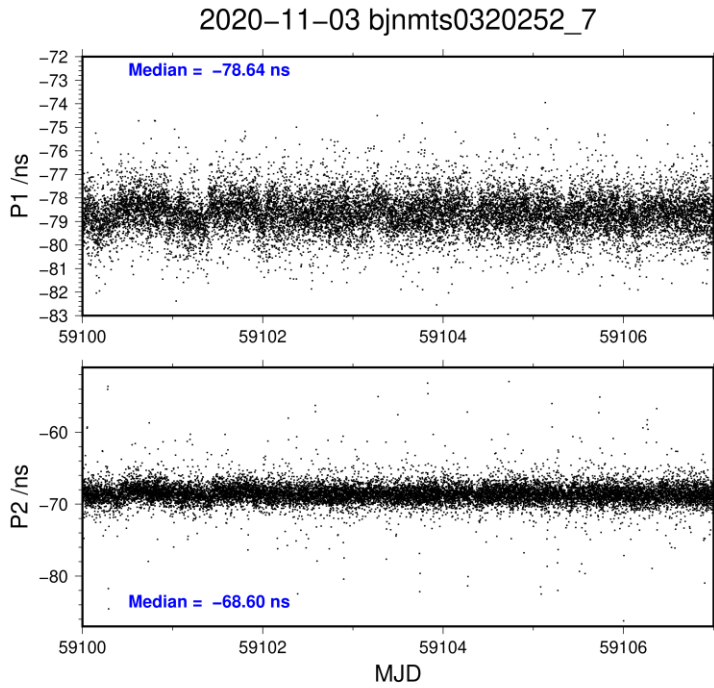
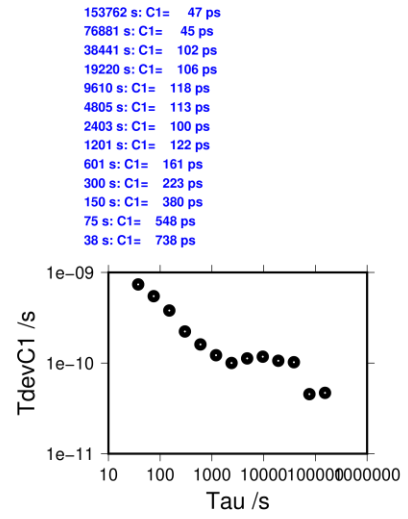
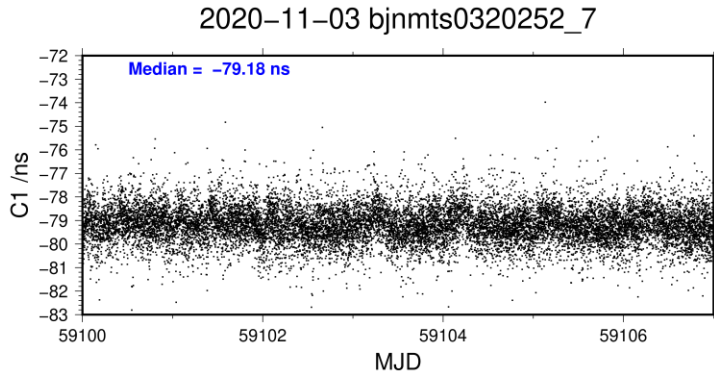
Total number of code differences = 304234

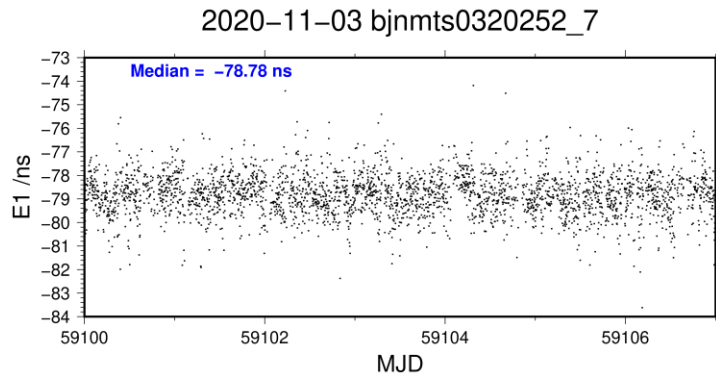
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	160957	-79.183	1.459
P1	160296	-78.646	1.501
P2	160226	-68.557	2.012
E1	31336	-78.822	1.569

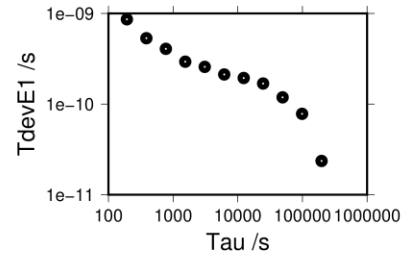
Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	16104	-79.180	-79.175	0.758
P1	16061	-78.645	-78.638	0.811
P2	16052	-68.597	-68.565	1.458
E1	3134	-78.781	-78.804	0.860





- 197577 s: E1= 24 ps
- 98788 s: E1= 78 ps
- 49394 s: E1= 119 ps
- 24697 s: E1= 169 ps
- 12349 s: E1= 194 ps
- 6174 s: E1= 212 ps
- 3087 s: E1= 257 ps
- 1544 s: E1= 293 ps
- 772 s: E1= 407 ps
- 386 s: E1= 533 ps
- 193 s: E1= 862 ps



BJNM-TS04

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 160348
 Number of huge residuals = 9. New iteration
 Computed code bias (P1/P2)/m = -24.228 -21.125
 Computed baseline (X,Y,Z)/m = -1.068 -5.094 4.820
 RMS of residuals /m = 0.493

Number of phase differences to fit baseline
 L1/L2 = 158116
 L5 = 0
 A priori baseline (X,Y,Z)/m = -1.068 -5.094 4.820
 20059 clock jitters computed out of 20059 intervals
 AVE jitter /ps = -0.1 RMS jitter /ps = 4.9

Iter 1 Large residuals L1= 0
 Iter 1 Large residuals L2= 1
 Iter 1 Large residuals L5= 0
 Computed baseline L1 (X,Y,Z)/m = -0.009 0.071 0.013
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = -0.003 0.068 0.006
 RMS of residuals L2 /m = 0.005
 No computed baseline L5, will use L1/L2

Iter 2 Large residuals L1= 0
 Iter 2 Large residuals L2= 1
 Iter 2 Large residuals L5= 0
 Computed baseline L1 (X,Y,Z)/m = -0.009 0.071 0.013
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = -0.003 0.068 0.006
 RMS of residuals L2 /m = 0.005
 No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -1.076 -5.023 4.833
 Final baseline L2 (X,Y,Z)/m = -1.071 -5.025 4.826
 Final baseline L5 (X,Y,Z)/m = -1.074 -5.024 4.829

COMPUTATION OF CODE DIFFERENCES

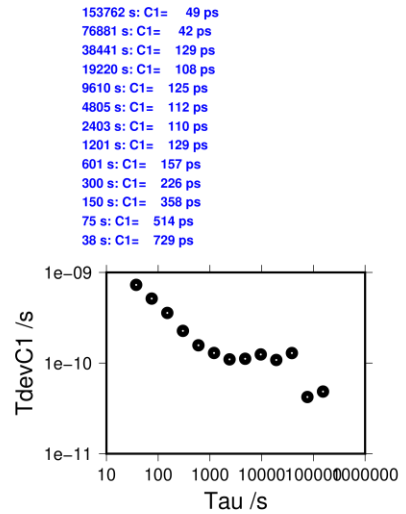
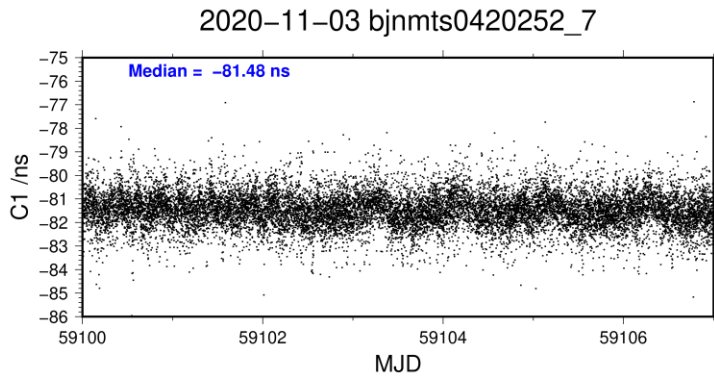
Total number of code differences = 303215

Global average of individual differences

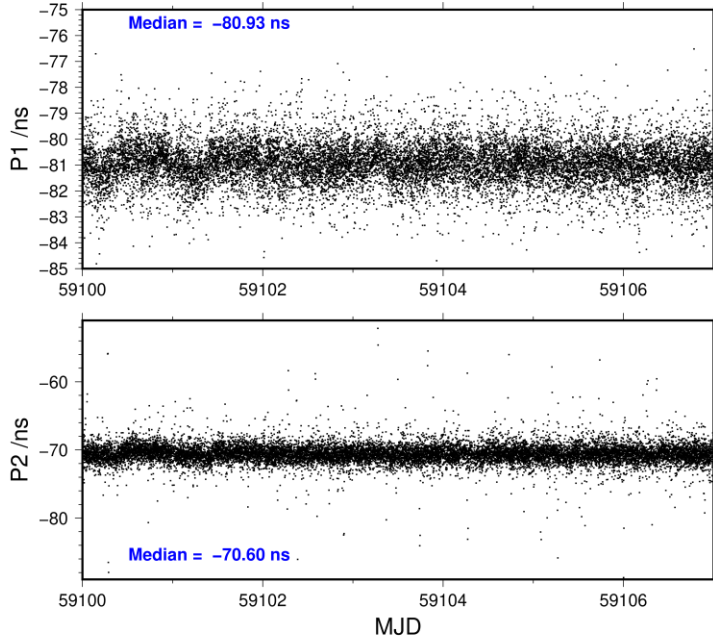
Code	#pts	ave/ns	rms/ns
C1	160955	-81.491	1.447
P1	160287	-80.937	1.487
P2	160216	-70.574	1.991
E1	31333	-81.113	1.560

Number of 300s epochs in out file = 2016

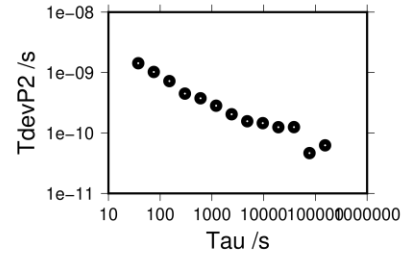
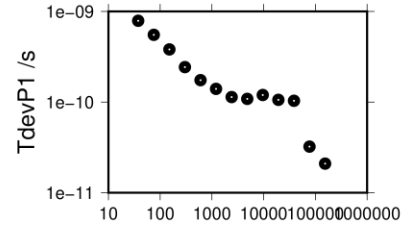
Code	#pts	median/ns	ave/ns	rms/ns
C1	16104	-81.480	-81.479	0.740
P1	16061	-80.927	-80.926	0.790
P2	16054	-70.604	-70.575	1.442
E1	3132	-81.105	-81.101	0.823



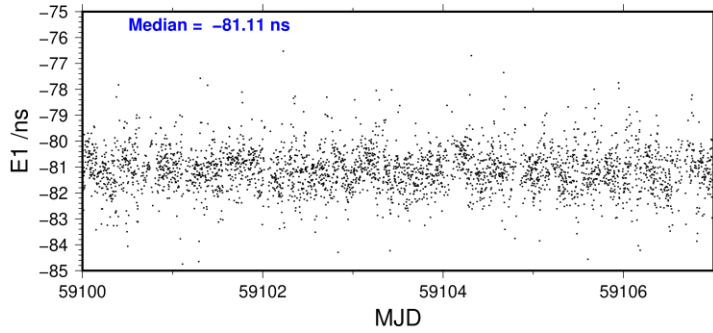
2020-11-03 bjmmts0420252_7



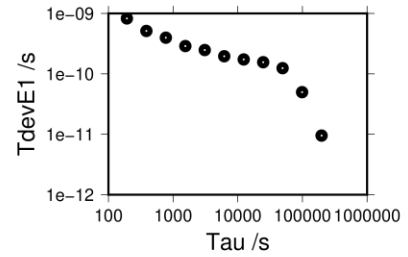
154174 s:	P1= 21 ps	154241 s:	P2= 63 ps
77087 s:	P1= 32 ps	77121 s:	P2= 47 ps
38543 s:	P1= 103 ps	38560 s:	P2= 125 ps
19272 s:	P1= 106 ps	19280 s:	P2= 125 ps
9636 s:	P1= 120 ps	9640 s:	P2= 145 ps
4818 s:	P1= 108 ps	4820 s:	P2= 157 ps
2409 s:	P1= 114 ps	2410 s:	P2= 204 ps
1204 s:	P1= 140 ps	1205 s:	P2= 283 ps
602 s:	P1= 174 ps	602 s:	P2= 375 ps
301 s:	P1= 243 ps	301 s:	P2= 448 ps
151 s:	P1= 381 ps	151 s:	P2= 723 ps
75 s:	P1= 553 ps	75 s:	P2= 1022 ps
38 s:	P1= 788 ps	38 s:	P2= 1426 ps



2020-11-03 bjmmts0420252_7



197703 s:	E1= 10 ps
98851 s:	E1= 50 ps
49426 s:	E1= 124 ps
24713 s:	E1= 156 ps
12356 s:	E1= 173 ps
6178 s:	E1= 195 ps
3089 s:	E1= 248 ps
1545 s:	E1= 288 ps
772 s:	E1= 397 ps
386 s:	E1= 513 ps
193 s:	E1= 827 ps



IM21-TS03

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 147341
 Computed code bias (P1/P2)/m = 31.578 31.267
 Computed baseline (X,Y,Z)/m = -3.551 0.411 -2.341
 RMS of residuals /m = 0.415

Number of phase differences to fit baseline

L1/L2 = 146397

L5 = 0

A priori baseline (X,Y,Z)/m = -3.551 0.411 -2.341

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = 0.0 RMS jitter /ps = 3.3

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.028 0.035 0.006

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = -0.027 0.039 0.005

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -3.579 0.446 -2.335

Final baseline L2 (X,Y,Z)/m = -3.578 0.450 -2.336

Final baseline L5 (X,Y,Z)/m = -3.579 0.448 -2.335

COMPUTATION OF CODE DIFFERENCES

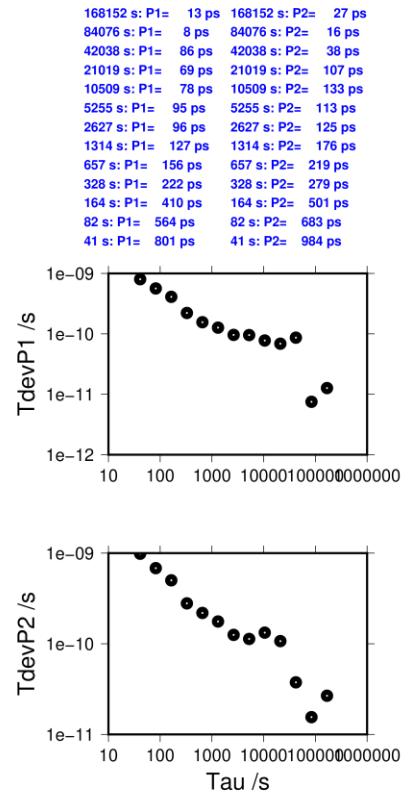
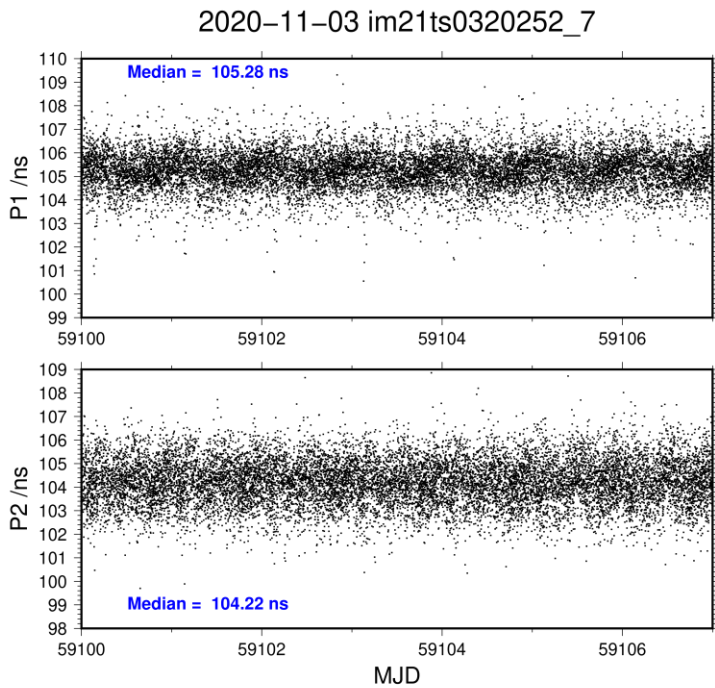
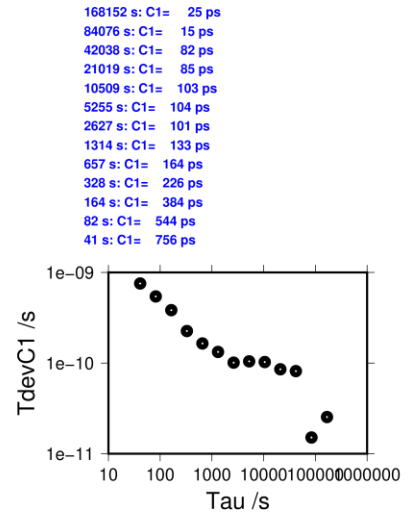
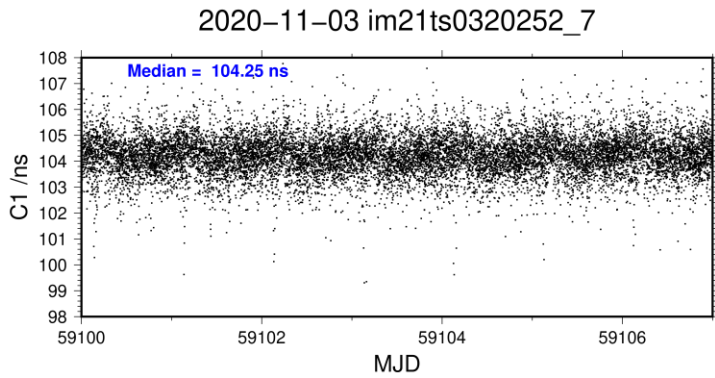
Total number of code differences = 355806

Global average of individual differences

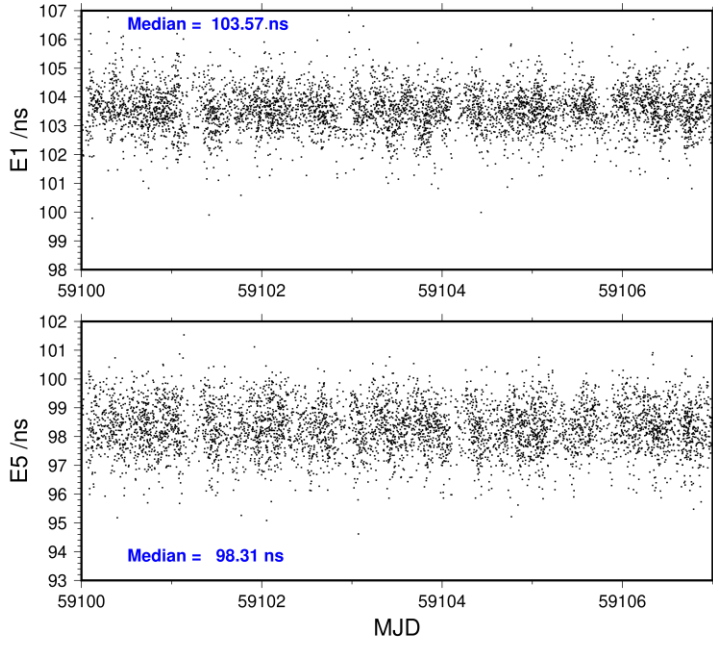
Code	#pts	ave/ns	rms/ns
C1	147289	104.214	1.384
P1	147286	105.253	1.307
P2	147286	104.211	1.479
E1	51674	103.562	1.229
E5	51676	98.315	1.099

Number of 300s epochs in out file = 2016

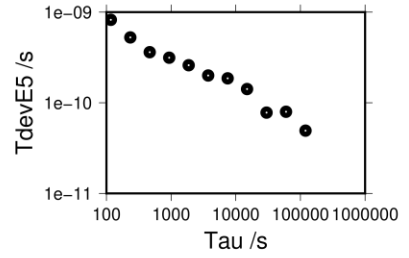
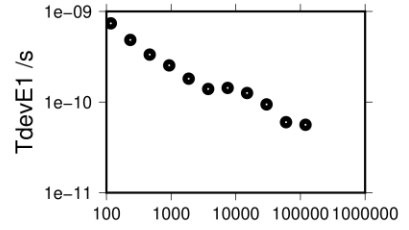
Code	#pts	median/ns	ave/ns	rms/ns
C1	14726	104.246	104.233	0.760
P1	14726	105.276	105.264	0.788
P2	14726	104.219	104.212	0.973
E1	5171	103.571	103.570	0.729
E5	5171	98.314	98.318	0.828



2020-11-03 im21ts0320252_7



119731 s: E1= 56 ps	119731 s: E5= 49 ps
59865 s: E1= 60 ps	59865 s: E5= 80 ps
29933 s: E1= 94 ps	29933 s: E5= 78 ps
14966 s: E1= 126 ps	14966 s: E5= 142 ps
7483 s: E1= 143 ps	7483 s: E5= 186 ps
3742 s: E1= 140 ps	3742 s: E5= 200 ps
1871 s: E1= 181 ps	1871 s: E5= 260 ps
935 s: E1= 254 ps	935 s: E5= 314 ps
468 s: E1= 334 ps	468 s: E5= 361 ps
234 s: E1= 485 ps	234 s: E5= 526 ps
117 s: E1= 739 ps	117 s: E5= 823 ps



IM21-TS04

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 147317
 Computed code bias (P1/P2)/m = 30.869 30.640
 Computed baseline (X,Y,Z)/m = -4.001 0.169 -2.259
 RMS of residuals /m = 0.413

Number of phase differences to fit baseline

L1/L2 = 146342

L5 = 0

A priori baseline (X,Y,Z)/m = -4.001 0.169 -2.259

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = -0.1 RMS jitter /ps = 3.2

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = 0.000 0.016 -0.012

RMS of residuals L1 /m = 0.003

Computed baseline L2 (X,Y,Z)/m = 0.003 0.017 -0.014

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -4.001 0.185 -2.271

Final baseline L2 (X,Y,Z)/m = -3.998 0.186 -2.273

Final baseline L5 (X,Y,Z)/m = -3.999 0.186 -2.272

COMPUTATION OF CODE DIFFERENCES

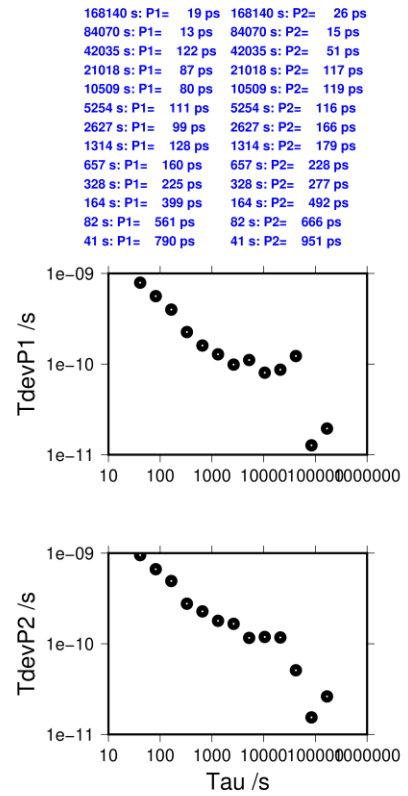
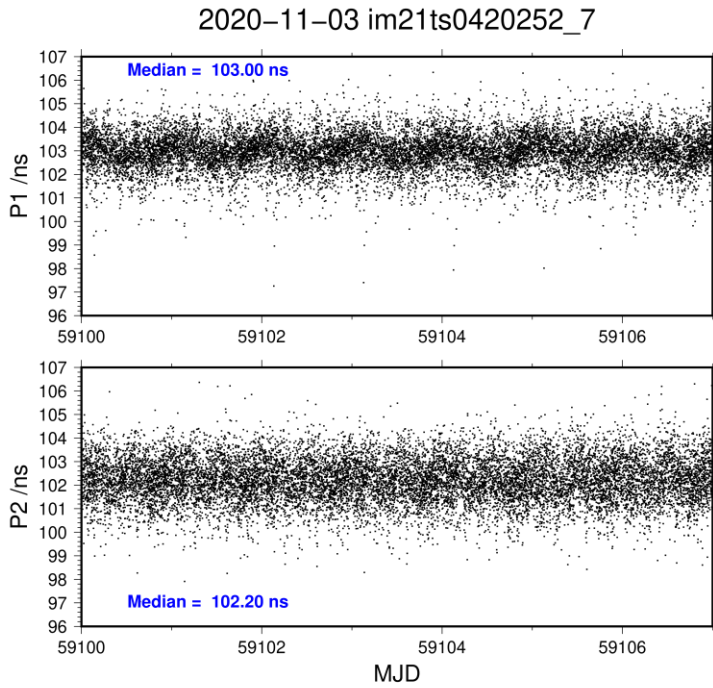
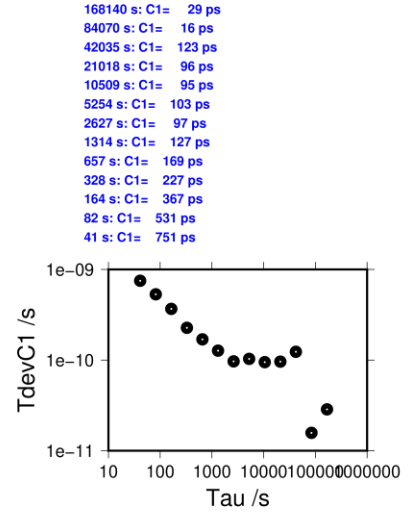
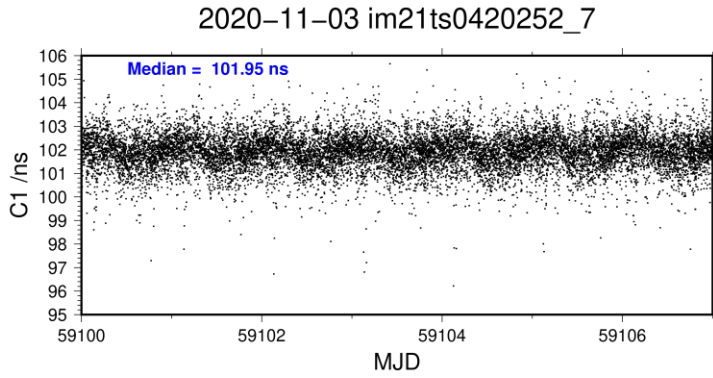
Total number of code differences = 355684

Global average of individual differences

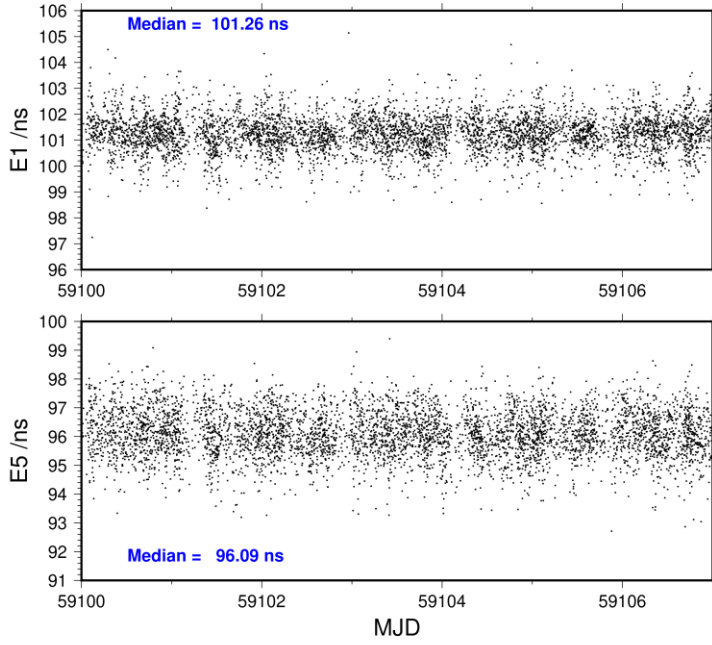
Code	#pts	ave/ns	rms/ns
C1	147268	101.907	1.376
P1	147262	102.962	1.302
P2	147262	102.199	1.466
E1	51638	101.244	1.218
E5	51640	96.096	1.087

Number of 300s epochs in out file = 2016

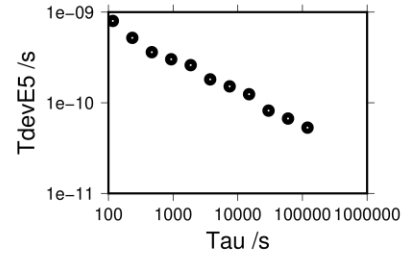
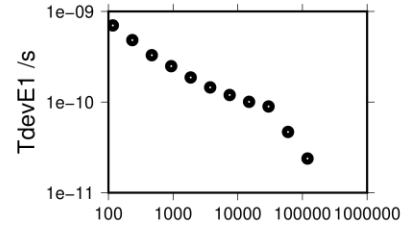
Code	#pts	median/ns	ave/ns	rms/ns
C1	14727	101.948	101.925	0.752
P1	14727	102.998	102.975	0.787
P2	14727	102.204	102.206	0.955
E1	5170	101.260	101.254	0.705
E5	5170	96.088	96.099	0.806



2020-11-03 im21ts0420252_7



119754 s: E1= 24 ps	119754 s: E5= 53 ps
59877 s: E1= 47 ps	59877 s: E5= 67 ps
29938 s: E1= 89 ps	29938 s: E5= 82 ps
14969 s: E1= 101 ps	14969 s: E5= 124 ps
7485 s: E1= 120 ps	7485 s: E5= 152 ps
3742 s: E1= 145 ps	3742 s: E5= 181 ps
1871 s: E1= 187 ps	1871 s: E5= 260 ps
936 s: E1= 249 ps	936 s: E5= 302 ps
468 s: E1= 329 ps	468 s: E5= 362 ps
234 s: E1= 483 ps	234 s: E5= 520 ps
117 s: E1= 701 ps	117 s: E5= 799 ps



IMEU-TS03

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 148761
 Number of huge residuals = 38. New iteration
 Computed code bias (P1/P2)/m = 47.208 51.921
 Computed baseline (X,Y,Z)/m = 0.424 -6.057 6.592
 RMS of residuals /m = 0.544

Number of phase differences to fit baseline

L1/L2 = 147830

L5 = 0

A priori baseline (X,Y,Z)/m = 0.424 -6.057 6.592

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = 0.1 RMS jitter /ps = 5.1

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.033 0.030 0.038

RMS of residuals L1 /m = 0.002

Computed baseline L2 (X,Y,Z)/m = -0.030 0.031 0.035

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = 0.392 -6.027 6.629

Final baseline L2 (X,Y,Z)/m = 0.395 -6.026 6.627

Final baseline L5 (X,Y,Z)/m = 0.393 -6.027 6.628

COMPUTATION OF CODE DIFFERENCES

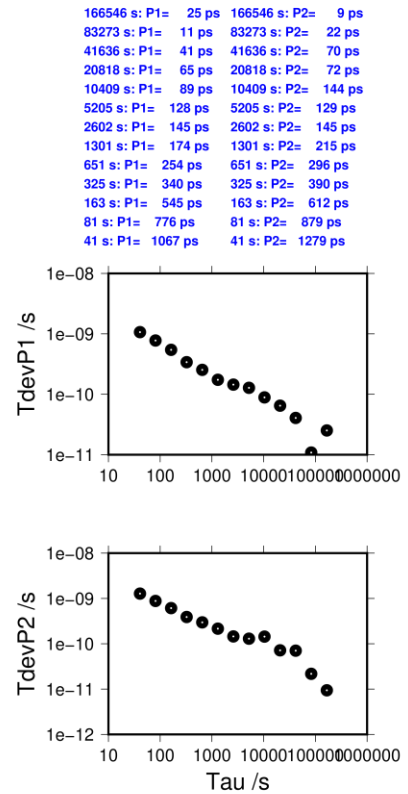
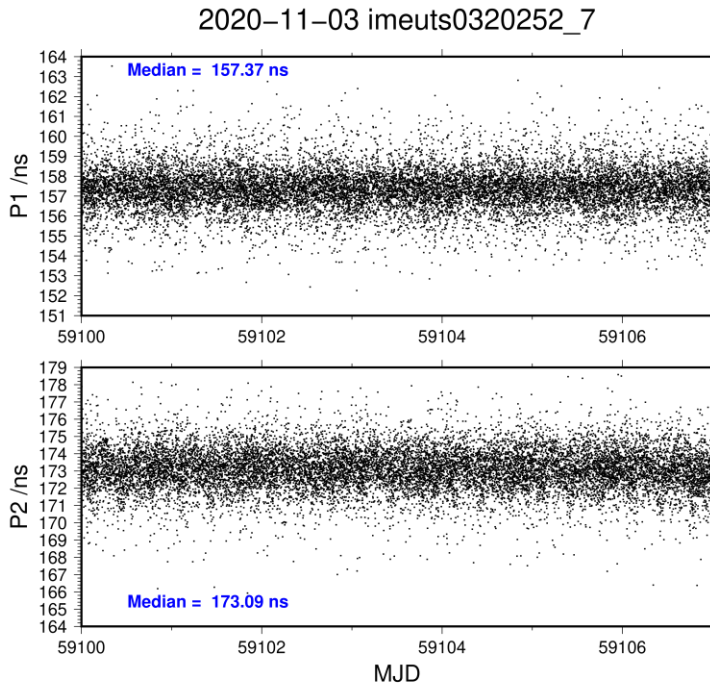
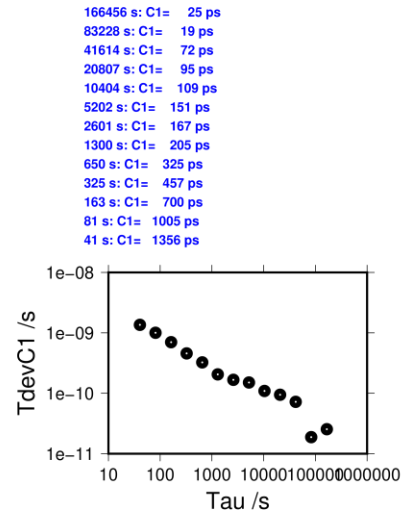
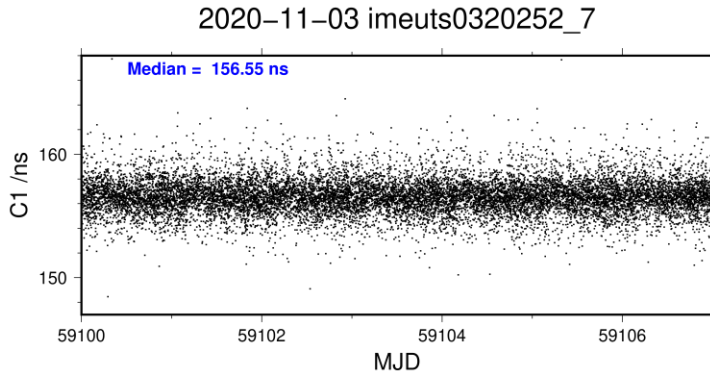
Total number of code differences = 255592

Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	148751	156.533	2.684
P1	148683	157.351	1.815
P2	148683	173.076	1.975

Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	14876	156.548	156.574	1.375
P1	14868	157.367	157.369	1.072
P2	14868	173.095	173.091	1.247



IMEU-TS04

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 148739
 Number of huge residuals = 34. New iteration
 Computed code bias (P1/P2)/m = 46.501 51.295
 Computed baseline (X,Y,Z)/m = -0.025 -6.300 6.673
 RMS of residuals /m = 0.533

Number of phase differences to fit baseline

L1/L2 = 147776

L5 = 0

A priori baseline (X,Y,Z)/m = -0.025 -6.300 6.673

20156 clock jitters computed out of 20156 intervals

AVE jitter /ps = 0.0 RMS jitter /ps = 5.1

Iter 1 Large residuals L1= 0

Iter 1 Large residuals L2= 0

Iter 1 Large residuals L5= 0

Computed baseline L1 (X,Y,Z)/m = -0.004 0.014 0.022

RMS of residuals L1 /m = 0.002

Computed baseline L2 (X,Y,Z)/m = 0.001 0.010 0.017

RMS of residuals L2 /m = 0.003

No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = -0.030 -6.286 6.694

Final baseline L2 (X,Y,Z)/m = -0.024 -6.290 6.689

Final baseline L5 (X,Y,Z)/m = -0.027 -6.288 6.692

COMPUTATION OF CODE DIFFERENCES

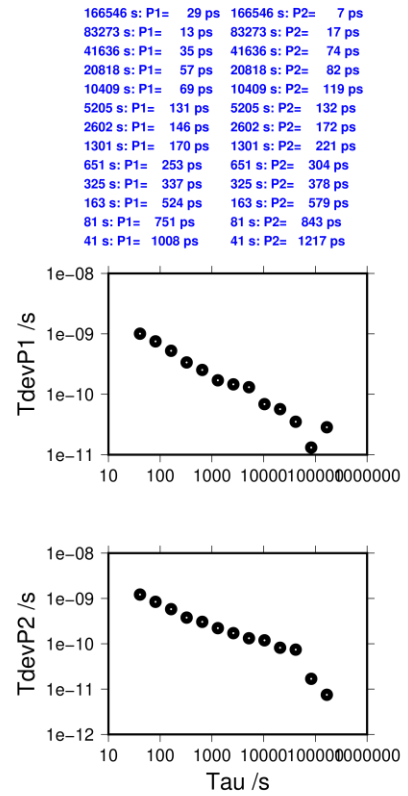
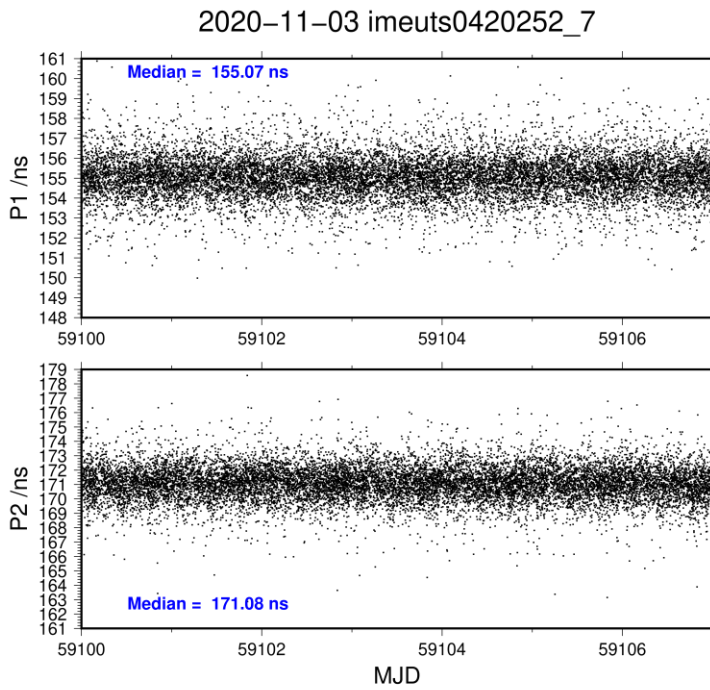
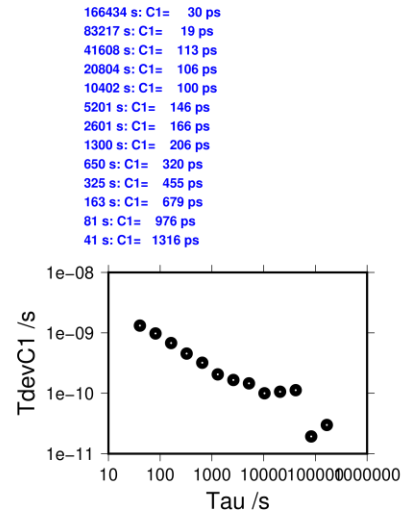
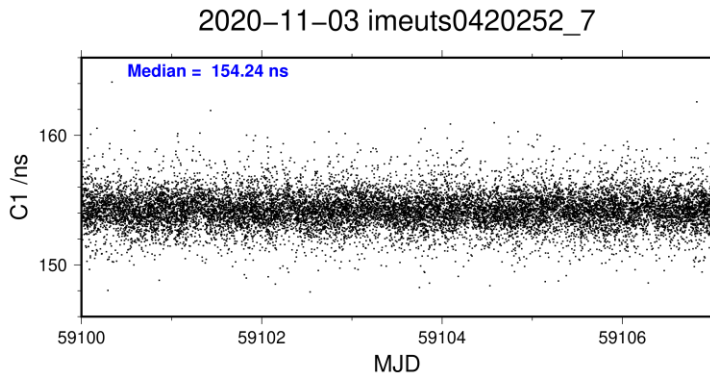
Total number of code differences = 254404

Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	148734	154.224	2.666
P1	148664	155.059	1.790
P2	148663	171.064	1.930

Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	14878	154.236	154.260	1.341
P1	14868	155.073	155.074	1.030
P2	14868	171.081	171.073	1.200



1b.3/ BIPM (20343)

Period

MJD 59191 to 59197

Delays

BP21: (cf page 50)

receiver PPS-in compensation = 29.64 ns

REFDLY = 43.26 ns

CABDLY = 140.80 ns (C201)

TS03: (cf page 50)

REFDLY = 26.95 ns

CABDLY = 212.10 ns

TS04: (cf page 51)

REFDLY = 27.86 ns

CABDLY = 212.30 ns

Setup at the BIPM**Annex A - Information Sheet**

(to be repeated for each calibrated system)

Laboratory:	BIPM	
Date and hour of the beginning of measurements:	MJD 59191	
Date and hour of the end of measurements:	MJD 59197	
Information on the system		
	Local:	Travelling:
4-character BIPM code	BP21	TS03
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	NIM-TF-GNSS-3 120105
1 PPS trigger level /V:		0~2
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	No
Length outside the building /m:	~ 15 m	~ 10 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Harxon HXCCSX601A C18100100558
Temperature (if stabilised) /°C		
Measured delays /ns		
(if needed fill box "Additional Information" below)		
	Local:	Travelling:
• Delay from local UTC to receiver 1 PPS-in:	43.26 ns	26.95 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)		
• Antenna cable delay:	140.80 ns	212.10 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)
Data used for the generation of CGGTTS files		
• INT DLY (GPS) /ns:		
• INT DLY (Galileo) /ns:		
• INT DLY (GLONASS) /ns:		
• CAB DLY /ns:		
• REF DLY /ns:		
• Coordinates reference frame:		
Latitude or X /m:		
Longitude or Y /m:		
Height or Z /m:		
General information		
• Rise time of the local UTC pulse:		
• Is the laboratory air conditioned:		
Set temperature value and uncertainty:		22 ± 1°C
Set humidity value and uncertainty:		

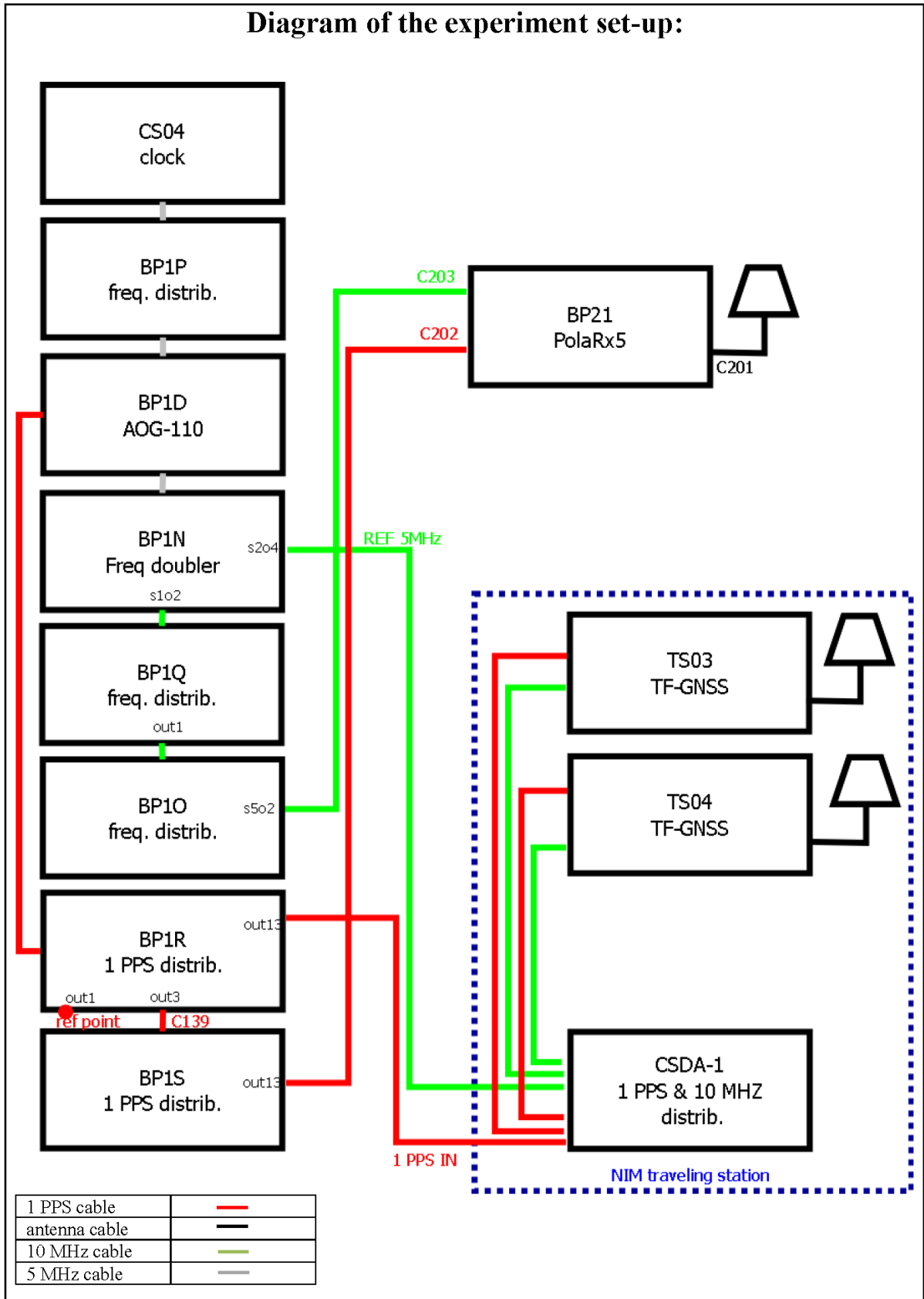
(1) For a trip with closure, not needed if the traveling equipment is used in the same set-up throughout.

Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	BIPM	
Date and hour of the beginning of measurements:	MJD 59191	
Date and hour of the end of measurements:	MJD 59197	
Information on the system		
	Local:	Travelling:
4-character BIPM code	BP21	TS04
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	NIM-TF-GNSS-3 120104
1 PPS trigger level /V:		0~2
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	No
Length outside the building /m:	~ 15 m	~ 10 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Harxon HXCCSX601A C18100100564
Temperature (if stabilised) /°C		
Measured delays /ns		
(if needed fill box "Additional Information" below)		
	Local:	Travelling:
• Delay from local UTC to receiver 1 PPS-in:	43.26 ns	27.86 ns
Delay from 1 PPS-in to internal Reference (if different): <small>(see section 2 for details)</small>		
• Antenna cable delay:	140.80 ns	212.30 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)
Data used for the generation of CGGTTS files		
• INT DLY (GPS) /ns:		
• INT DLY (Galileo) /ns:		
• INT DLY (GLONASS) /ns:		
• CAB DLY /ns:		
• REF DLY /ns:		
• Coordinates reference frame:		
Latitude or X /m:		
Longitude or Y /m:		
Height or Z /m:		
General information		
• Rise time of the local UTC pulse:		
• Is the laboratory air conditioned:		
Set temperature value and uncertainty:		22 ± 1°C
Set humidity value and uncertainty:		

(1) For a trip with closure, not needed if the traveling equipment is used in the same set-up throughout.



Log of Events / Additional Information :

All measurements at BIPM carried out by L. Tisserand.

Equipment used to measure delays is a Time Interval Counter (TIC), model 53230A, maker Keysight, S/N MY58390132, with measurement uncertainty typically less than 0.5 ns (using external reference frequency as timebase).

TS03-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 147170
 Apriori codes biases from 27276 high elev obs : 23.586 23.169
 Iteration 0: Obs used = 197260; Huge residuals = 1394; Large residuals = 44526
 Iteration 1: Obs used = 204796; Huge residuals = 651; Large residuals = 35350
 Iteration 2: Obs used = 207851; Huge residuals = 229; Large residuals = 31259
 Iteration 3: Obs used = 208842; Huge residuals = 54; Large residuals = 29810
 Iteration 4: Obs used = 209078; Huge residuals = 19; Large residuals = 29466
 Iteration 5: Obs used = 209143; Huge residuals = 1; Large residuals = 29363
 Iteration 6: Obs used = 209148; Huge residuals = 0; Large residuals = 29356
 Computed code bias (P1/P2)/m = 22.099 21.494
 Computed baseline (X,Y,Z)/m = -3.871 1.508 5.819
 RMS of residuals /m = 0.910

Number of phase differences to fit baseline
 L1/L2 = 138470
 L5 = 61359
 A priori baseline (X,Y,Z)/m = -3.871 1.508 5.819
 20153 clock jitters computed out of 20153 intervals
 AVE jitter /ps = -3.3 RMS jitter /ps = 5.4

Iter 1 Large residuals L1= 4
 Iter 1 Large residuals L2= 11
 Iter 1 Large residuals L5= 11
 Computed baseline L1 (X,Y,Z)/m = -0.651 -0.788 -1.634
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = -0.641 -0.772 -1.609
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = -0.689 -0.814 -1.603
 RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 4
 Iter 2 Large residuals L2= 11
 Iter 2 Large residuals L5= 11
 Computed baseline L1 (X,Y,Z)/m = -0.652 -0.788 -1.635
 RMS of residuals L1 /m = 0.004
 Computed baseline L2 (X,Y,Z)/m = -0.642 -0.773 -1.611
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = -0.691 -0.814 -1.603
 RMS of residuals L5 /m = 0.004

New iteration of baseline
 New apriori baseline (X,Y,Z)/m = -4.518 0.728 4.196
 20153 clock jitters computed out of 20153 intervals
 AVE jitter /ps = 1.8 RMS jitter /ps = 3.6

Iter 3 Large residuals L1= 4
 Iter 3 Large residuals L2= 12
 Iter 3 Large residuals L5= 11
 Computed baseline L1 (X,Y,Z)/m = 0.025 -0.226 -0.078
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = 0.034 -0.211 -0.054

RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.008 -0.217 -0.060
 RMS of residuals L5 /m = 0.003

Iter 4 Large residuals L1= 4
 Iter 4 Large residuals L2= 12
 Iter 4 Large residuals L5= 11
 Computed baseline L1 (X,Y,Z)/m = 0.025 -0.226 -0.078
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = 0.034 -0.211 -0.054
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.008 -0.217 -0.060
 RMS of residuals L5 /m = 0.003
 WARNING Phase baseline L1 differs from a priori by > 10 cm

Final baseline L1 (X,Y,Z)/m = -4.494 0.502 4.118
 Final baseline L2 (X,Y,Z)/m = -4.484 0.516 4.141
 Final baseline L5 (X,Y,Z)/m = -4.510 0.510 4.136

COMPUTATION OF CODE DIFFERENCES

Total number of code differences = 534096

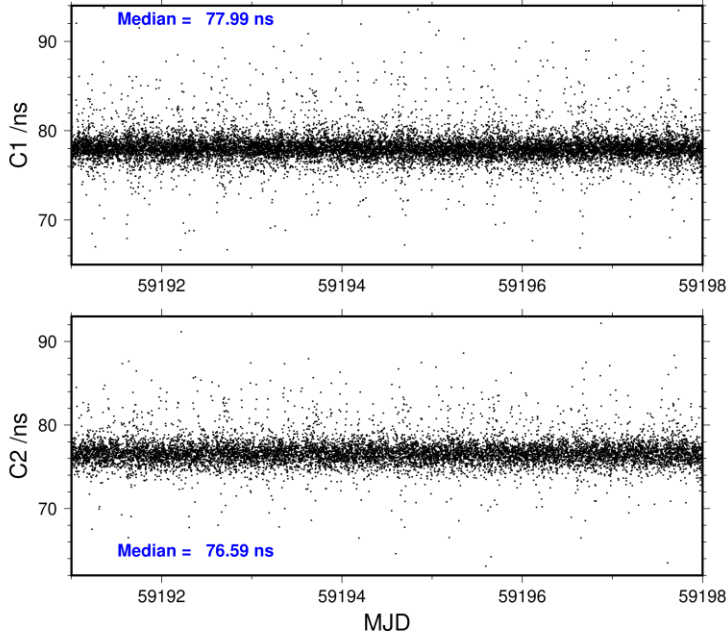
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	150443	78.094	2.983
C2	110147	76.680	2.736
P1	142982	78.093	2.373
P2	142850	76.502	3.757
E1	108595	78.026	2.727
E5	110166	79.502	2.487

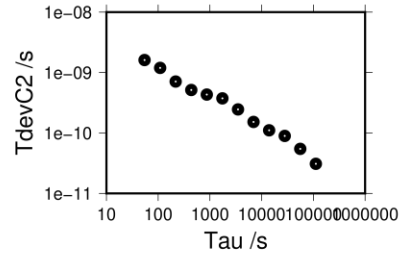
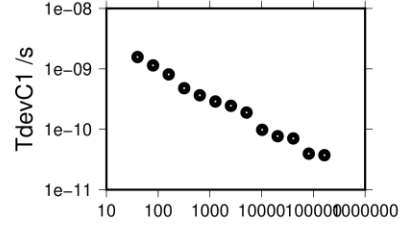
Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	15151	77.991	78.098	1.580
C2	11087	76.595	76.688	1.619
P1	14314	78.031	78.082	1.298
P2	14300	76.528	76.514	2.171
E1	10978	77.953	78.030	1.536
E5	11133	79.463	79.497	1.579

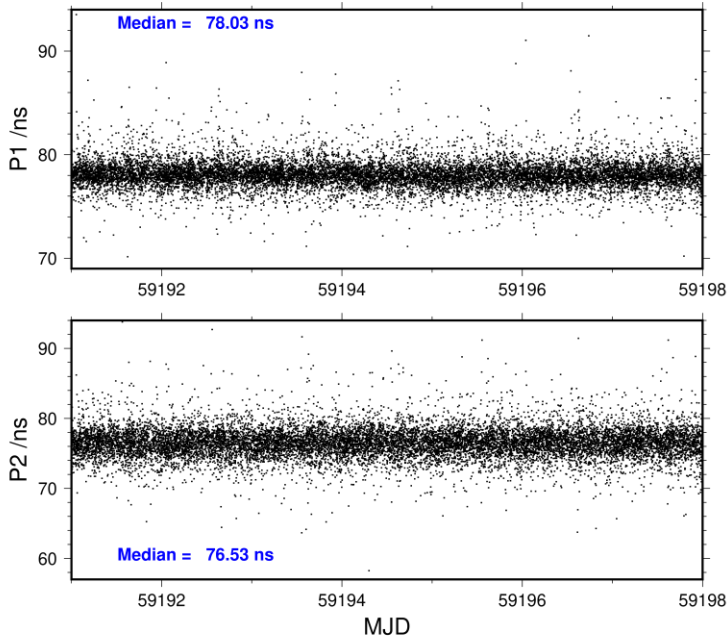
2021-01-20 ts03bp2120343_7



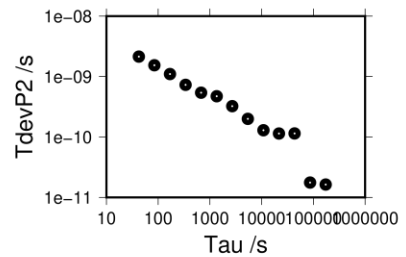
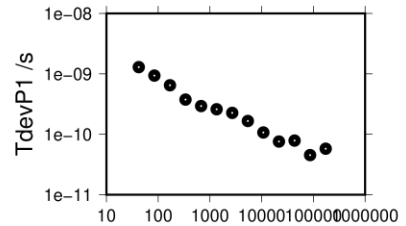
163434 s: C1= 37 ps
81717 s: C1= 39 ps 111674 s: C2= 31 ps
40859 s: C1= 71 ps 55837 s: C2= 55 ps
20429 s: C1= 77 ps 27918 s: C2= 89 ps
10215 s: C1= 98 ps 13959 s: C2= 111 ps
5107 s: C1= 189 ps 6980 s: C2= 152 ps
2554 s: C1= 245 ps 3490 s: C2= 245 ps
1277 s: C1= 288 ps 1745 s: C2= 374 ps
638 s: C1= 366 ps 872 s: C2= 433 ps
319 s: C1= 478 ps 436 s: C2= 515 ps
160 s: C1= 811 ps 218 s: C2= 710 ps
80 s: C1= 1141 ps 109 s: C2= 1193 ps
40 s: C1= 1571 ps 55 s: C2= 1609 ps



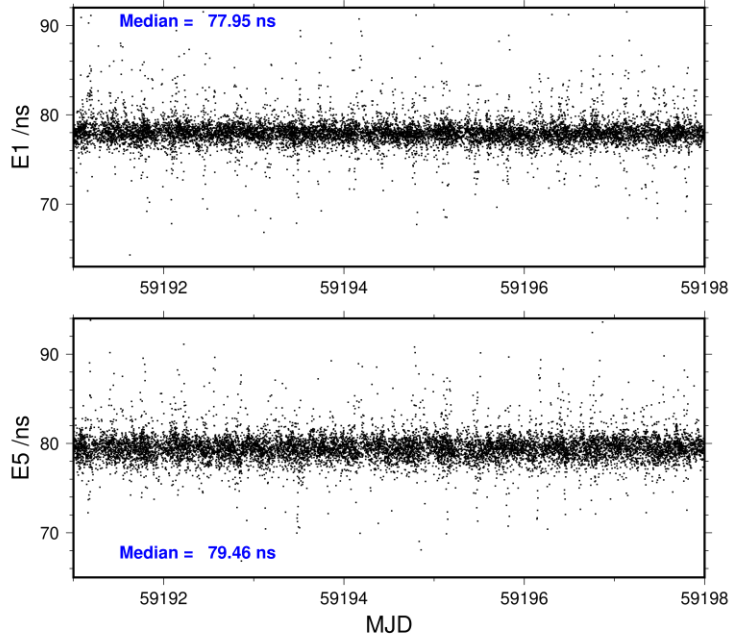
2021-01-20 ts03bp2120343_7



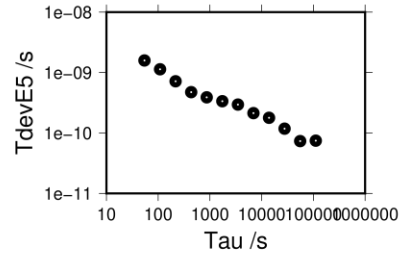
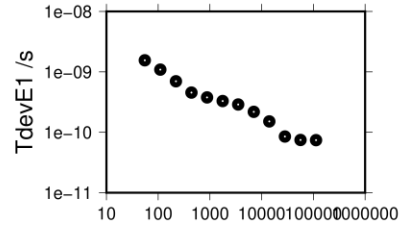
172992 s: P1= 58 ps 173161 s: P2= 16 ps
86496 s: P1= 45 ps 86581 s: P2= 18 ps
43248 s: P1= 79 ps 43290 s: P2= 114 ps
21624 s: P1= 76 ps 21645 s: P2= 114 ps
10812 s: P1= 107 ps 10823 s: P2= 129 ps
5406 s: P1= 166 ps 5411 s: P2= 200 ps
2703 s: P1= 226 ps 2706 s: P2= 324 ps
1352 s: P1= 260 ps 1353 s: P2= 473 ps
676 s: P1= 293 ps 676 s: P2= 541 ps
338 s: P1= 375 ps 338 s: P2= 728 ps
169 s: P1= 647 ps 169 s: P2= 1101 ps
84 s: P1= 935 ps 85 s: P2= 1539 ps
42 s: P1= 1291 ps 42 s: P2= 2137 ps



2021-01-20 ts03bp2120343_7



112783 s: E1= 74 ps	111212 s: E5= 75 ps
56391 s: E1= 75 ps	55606 s: E5= 73 ps
28196 s: E1= 85 ps	27803 s: E5= 118 ps
14098 s: E1= 151 ps	13902 s: E5= 179 ps
7049 s: E1= 218 ps	6951 s: E5= 213 ps
3524 s: E1= 288 ps	3475 s: E5= 295 ps
1762 s: E1= 329 ps	1738 s: E5= 335 ps
881 s: E1= 378 ps	869 s: E5= 389 ps
441 s: E1= 454 ps	434 s: E5= 474 ps
220 s: E1= 698 ps	217 s: E5= 718 ps
110 s: E1= 1088 ps	109 s: E5= 1134 ps
55 s: E1= 1551 ps	54 s: E5= 1584 ps



TS04-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 146867
 Apriori codes biases from 27342 high elev obs : 24.499 23.752
 Iteration 0: Obs used = 200192; Huge residuals = 2245; Large residuals = 40858
 Iteration 1: Obs used = 210788; Huge residuals = 647; Large residuals = 27479
 Iteration 2: Obs used = 213093; Huge residuals = 138; Large residuals = 24148
 Iteration 3: Obs used = 213594; Huge residuals = 15; Large residuals = 23371
 Iteration 4: Obs used = 213636; Huge residuals = 2; Large residuals = 23299
 Iteration 5: Obs used = 213639; Huge residuals = 1; Large residuals = 23292
 Iteration 6: Obs used = 213645; Huge residuals = 0; Large residuals = 23284
 Computed code bias (P1/P2)/m = 23.289 22.390
 Computed baseline (X,Y,Z)/m = -4.349 1.436 5.661
 RMS of residuals /m = 0.847

Number of phase differences to fit baseline
 L1/L2 = 138747
 L5 = 65747
 A priori baseline (X,Y,Z)/m = -4.349 1.436 5.661
 20156 clock jitters computed out of 20156 intervals
 AVE jitter /ps = -2.4 RMS jitter /ps = 4.6

Iter 1 Large residuals L1= 3
 Iter 1 Large residuals L2= 12
 Iter 1 Large residuals L5= 10
 Computed baseline L1 (X,Y,Z)/m = -0.424 -0.557 -1.238
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = -0.423 -0.552 -1.226
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = -0.474 -0.566 -1.210
 RMS of residuals L5 /m = 0.003

Iter 2 Large residuals L1= 3
 Iter 2 Large residuals L2= 12
 Iter 2 Large residuals L5= 10
 Computed baseline L1 (X,Y,Z)/m = -0.424 -0.557 -1.238
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = -0.423 -0.553 -1.227
 RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = -0.474 -0.567 -1.210
 RMS of residuals L5 /m = 0.003

New iteration of baseline
 New apriori baseline (X,Y,Z)/m = -4.773 0.881 4.428
 20156 clock jitters computed out of 20156 intervals
 AVE jitter /ps = 1.4 RMS jitter /ps = 2.5

Iter 3 Large residuals L1= 3
 Iter 3 Large residuals L2= 12
 Iter 3 Large residuals L5= 10
 Computed baseline L1 (X,Y,Z)/m = 0.024 -0.167 -0.051
 RMS of residuals L1 /m = 0.003
 Computed baseline L2 (X,Y,Z)/m = 0.025 -0.163 -0.040

RMS of residuals L2 /m = 0.005
 Computed baseline L5 (X,Y,Z)/m = 0.011 -0.165 -0.031
 RMS of residuals L5 /m = 0.003
 WARNING Phase baseline L1 differs from a priori by > 10 cm

Final baseline L1 (X,Y,Z)/m = -4.749 0.714 4.377
 Final baseline L2 (X,Y,Z)/m = -4.747 0.718 4.389
 Final baseline L5 (X,Y,Z)/m = -4.761 0.717 4.397

COMPUTATION OF CODE DIFFERENCES

Total number of code differences = 533094

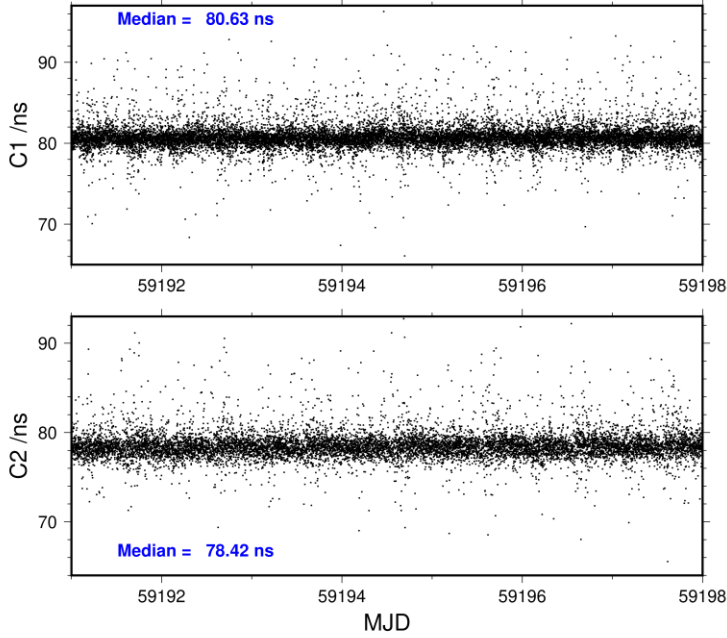
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	150460	80.725	2.944
C2	110098	78.511	2.703
P1	143035	80.787	2.326
P2	142733	78.278	3.735
E1	108544	80.655	2.670
E5	110171	81.953	2.509

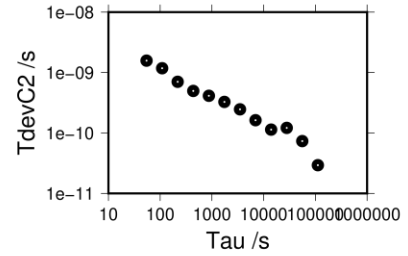
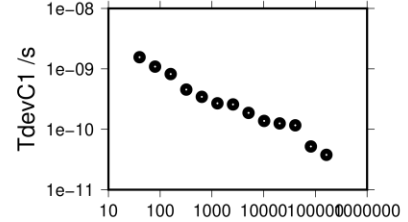
Number of 300s epochs in out file = 2016

Code	#pts	median/ns	ave/ns	rms/ns
C1	15135	80.631	80.739	1.553
C2	11080	78.421	78.522	1.584
P1	14293	80.725	80.779	1.288
P2	14272	78.295	78.296	2.115
E1	10973	80.580	80.653	1.524
E5	11113	81.886	81.963	1.567

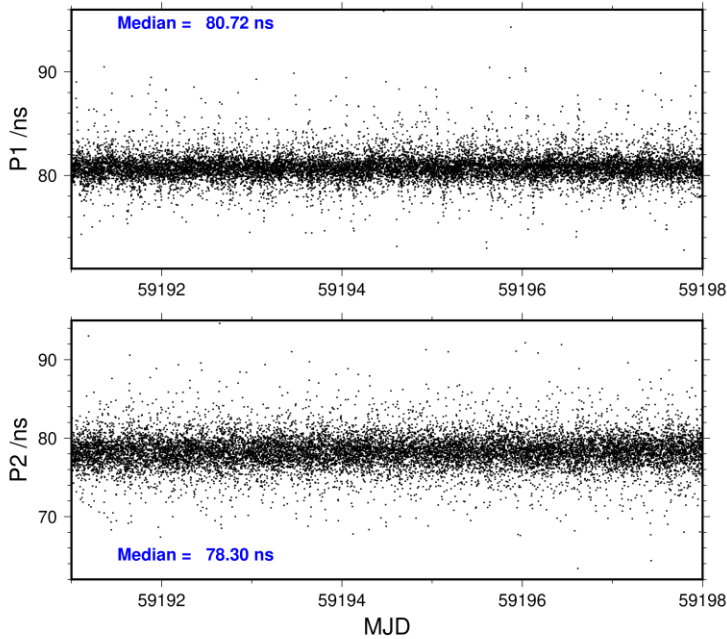
2021-01-20 ts04bp2120343_7



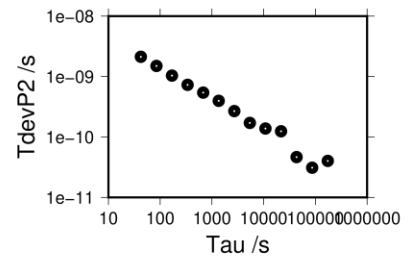
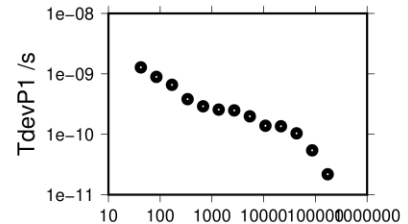
163607 s: C1= 38 ps
81804 s: C1= 52 ps 111744 s: C2= 29 ps
40902 s: C1= 116 ps 55872 s: C2= 73 ps
20451 s: C1= 125 ps 27936 s: C2= 121 ps
10225 s: C1= 137 ps 13968 s: C2= 114 ps
5113 s: C1= 187 ps 6984 s: C2= 163 ps
2556 s: C1= 258 ps 3492 s: C2= 246 ps
1278 s: C1= 269 ps 1746 s: C2= 326 ps
639 s: C1= 345 ps 873 s: C2= 413 ps
320 s: C1= 455 ps 436 s: C2= 496 ps
160 s: C1= 820 ps 218 s: C2= 704 ps
80 s: C1= 1089 ps 109 s: C2= 1179 ps
40 s: C1= 1557 ps 55 s: C2= 1572 ps



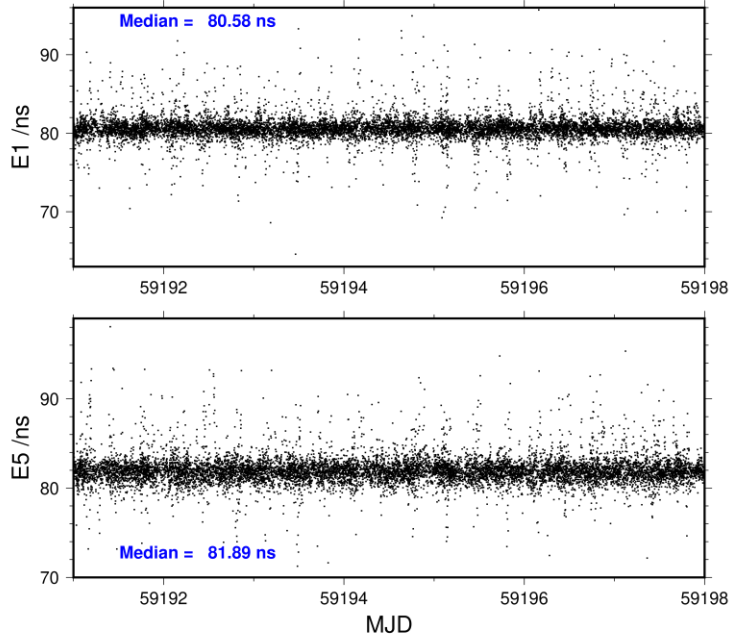
2021-01-20 ts04bp2120343_7



173246 s: P1= 22 ps 173501 s: P2= 40 ps
86623 s: P1= 54 ps 86750 s: P2= 31 ps
43312 s: P1= 104 ps 43375 s: P2= 46 ps
21656 s: P1= 136 ps 21688 s: P2= 124 ps
10828 s: P1= 138 ps 10844 s: P2= 138 ps
5414 s: P1= 198 ps 5422 s: P2= 171 ps
2707 s: P1= 248 ps 2711 s: P2= 268 ps
1353 s: P1= 256 ps 1355 s: P2= 396 ps
677 s: P1= 290 ps 678 s: P2= 542 ps
338 s: P1= 381 ps 339 s: P2= 728 ps
169 s: P1= 658 ps 169 s: P2= 1037 ps
85 s: P1= 892 ps 85 s: P2= 1497 ps
42 s: P1= 1278 ps 42 s: P2= 2127 ps



2021-01-20 ts04bp2120343_7



112834 s: E1= 78 ps	111413 s: E5= 65 ps
56417 s: E1= 84 ps	55706 s: E5= 58 ps
28209 s: E1= 90 ps	27853 s: E5= 125 ps
14104 s: E1= 156 ps	13927 s: E5= 151 ps
7052 s: E1= 198 ps	6963 s: E5= 199 ps
3526 s: E1= 281 ps	3482 s: E5= 278 ps
1763 s: E1= 328 ps	1741 s: E5= 353 ps
882 s: E1= 381 ps	870 s: E5= 371 ps
441 s: E1= 456 ps	435 s: E5= 490 ps
220 s: E1= 691 ps	218 s: E5= 721 ps
110 s: E1= 1078 ps	109 s: E5= 1123 ps
55 s: E1= 1553 ps	54 s: E5= 1568 ps

