Table of contents

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) = REFDLY.

- X_C = antenna cable delay
- [X_D = short cable + splitter delay]

(X_C + X_D) = 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) = INTDLY.

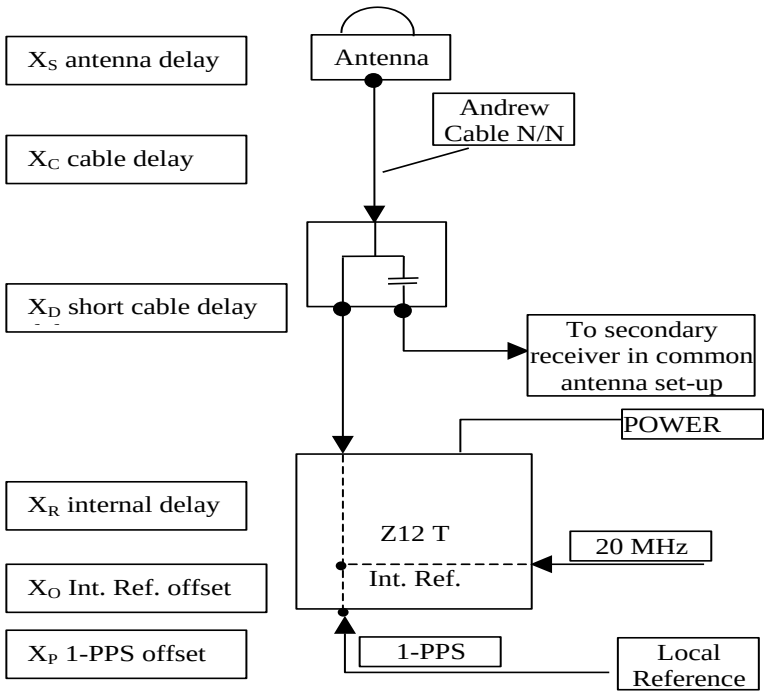


Figure 1: Definition of the different delays used in the most general set-up of a geodetic system (here shown for a Z12-T) from [Petit et al, 2001].

3/ phase 3

Laboratories: BIPM, NIST, USNO

3.1/ BIPM (21226)

Period

MJD 59440 to 59449

Delays

BP1J: (cf page 4)

X_O = 140.86 ns (209.47-68.61)

X_P = 53.60 ns (68.61-15.01)

REFDLY = 194.46 ns

CABDLY = 176.38 ns (C211)

BP25: (cf page 5)

REFDLY = 53.49 ns (68.50-15.01)

CABDLY = 176.24 ns (C208)

BP21: (cf page 4)

REFDLY = 43.30 ns (58.31-15.01)

CABDLY = 140.80 ns (C201)

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 59440
Date and hour of the end of measurements:	MJD 59449

Information on the system

	Local:	Travelling:
4-character BIPM code	BP21	BP1J
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	Septentrio PolaRx4proTR 27
1 PPS trigger level /V:		
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	HYLM195
Length outside the building /m:	~ 15 m	~ 15 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Septentrio SEPCHOKE MC 5131
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:	43.30 ns	53.60 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	PPSin compensation enable	140.86 ns
• Antenna cable delay:	140.80 ns	176.38 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 59440
Date and hour of the end of measurements:	MJD 59449

Information on the system

	Local:	Travelling:
4-character BIPM code	BP21	BP25
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	Mesit GTR55 1808001
1 PPS trigger level /V:		
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	HYLM195
Length outside the building /m:	~ 15 m	~ 15 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Novatel GNSS-850 NMLK18070096N
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:	43.30 ns	53.49 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	PPSin compensation enable	
• Antenna cable delay:	140.80 ns	176.24 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

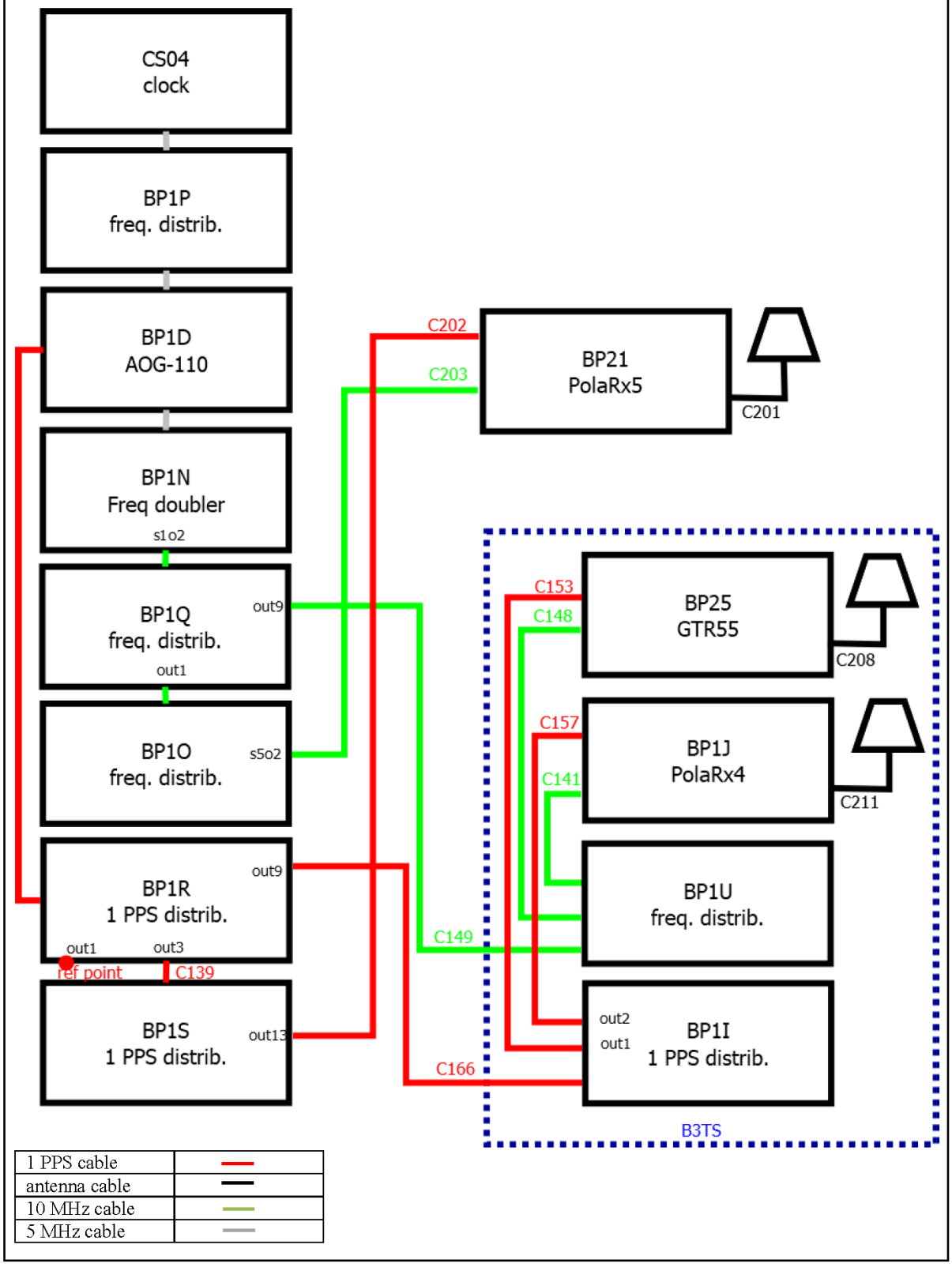
• INT DLY (GPS) /ns:	
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	
Longitude or Y /m:	
Height or Z /m:	

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.

Diagram of the experiment set-up:



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).

BP1J-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 193155
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 39097 high elev obs : -26.918 -26.630
Iteration 0: Obs used = 295387; Huge residuals = 3869; Large residuals = 16027
Iteration 1: Obs used = 300834; Huge residuals = 0; Large residuals = 6710
Computed code bias (P1/P2)/m = -27.024 -26.756
Computed baseline (X,Y,Z)/m = -3.682 -0.614 3.222
RMS of residuals /m = 0.635

Number of phase differences to fit baseline
L1/L2 = 187414
L5 = 96215
A priori baseline (X,Y,Z)/m = -3.682 -0.614 3.222
28796 clock jitters computed out of 28796 intervals
AVE jitter /ps = 0.1 RMS jitter /ps = 3.6

Iter 1 Large residuals L1= 2
Iter 1 Large residuals L2= 8
Iter 1 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.084 0.040 0.141
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.092 0.041 0.155
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.085 0.037 0.147
RMS of residuals L5 /m = 0.003

Iter 2 Large residuals L1= 2
Iter 2 Large residuals L2= 8
Iter 2 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.084 0.040 0.141
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.092 0.041 0.155
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.085 0.037 0.147
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = -3.594 -0.574 3.370
28796 clock jitters computed out of 28796 intervals
AVE jitter /ps = 0.0 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 2
Iter 3 Large residuals L2= 8
Iter 3 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.002 -0.003 -0.002
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.011 -0.001 0.013
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.003 -0.007 0.005
RMS of residuals L5 /m = 0.003

No computed baseline E6, will use L1/L2
No computed baseline B3, will use L1/L2
No computed baseline E7, will use L1/L2
No computed baseline B7, will use L1/L2
No computed baseline E8, will use L1/L2
No computed baseline B8, will use L1/L2

Final baseline L1 (X,Y,Z)/m =	-3.592	-0.576	3.367
Final baseline L2 (X,Y,Z)/m =	-3.584	-0.574	3.382
Final baseline L5 (X,Y,Z)/m =	-3.591	-0.581	3.375
Final baseline E6 (X,Y,Z)/m =	-3.588	-0.575	3.375
Final baseline E7 (X,Y,Z)/m =	-3.588	-0.575	3.375
Final baseline E8 (X,Y,Z)/m =	-3.588	-0.575	3.375
Final baseline B3 (X,Y,Z)/m =	-3.588	-0.575	3.375
Final baseline B7 (X,Y,Z)/m =	-3.588	-0.575	3.375
Final baseline B8 (X,Y,Z)/m =	-3.588	-0.575	3.375

COMPUTATION OF CODE DIFFERENCES

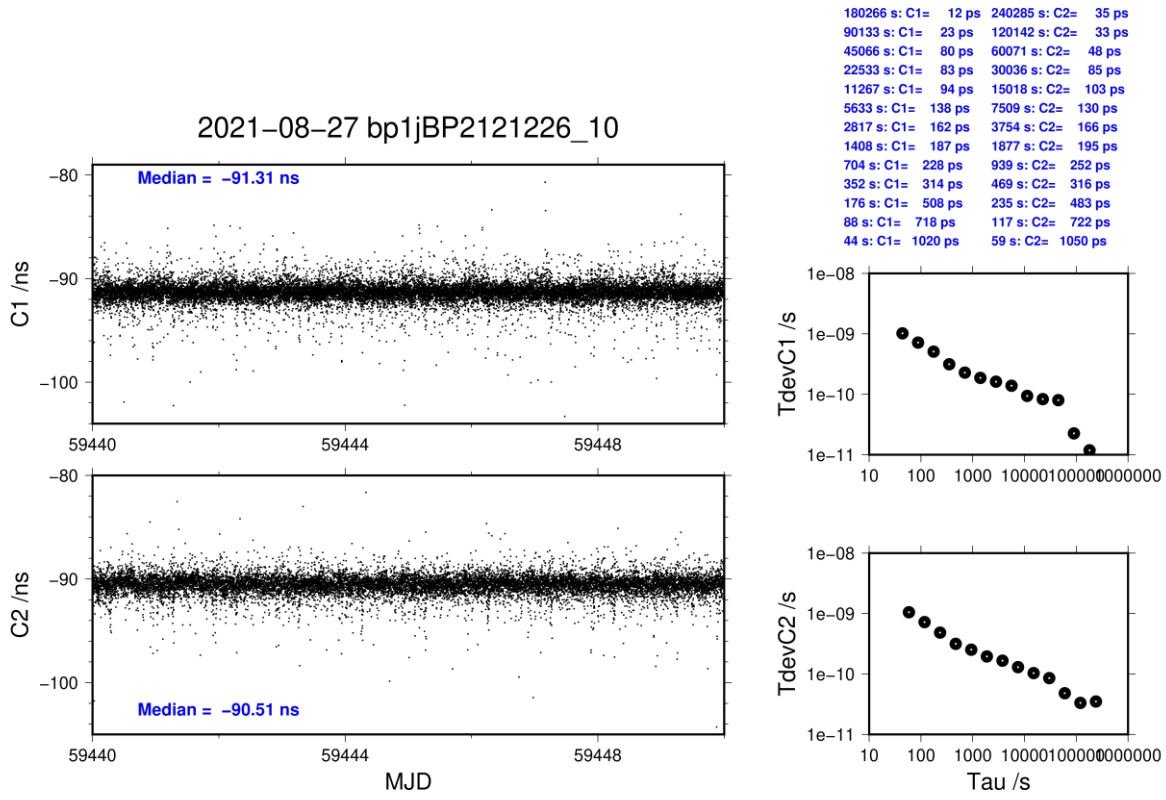
Total number of code differences = 511135

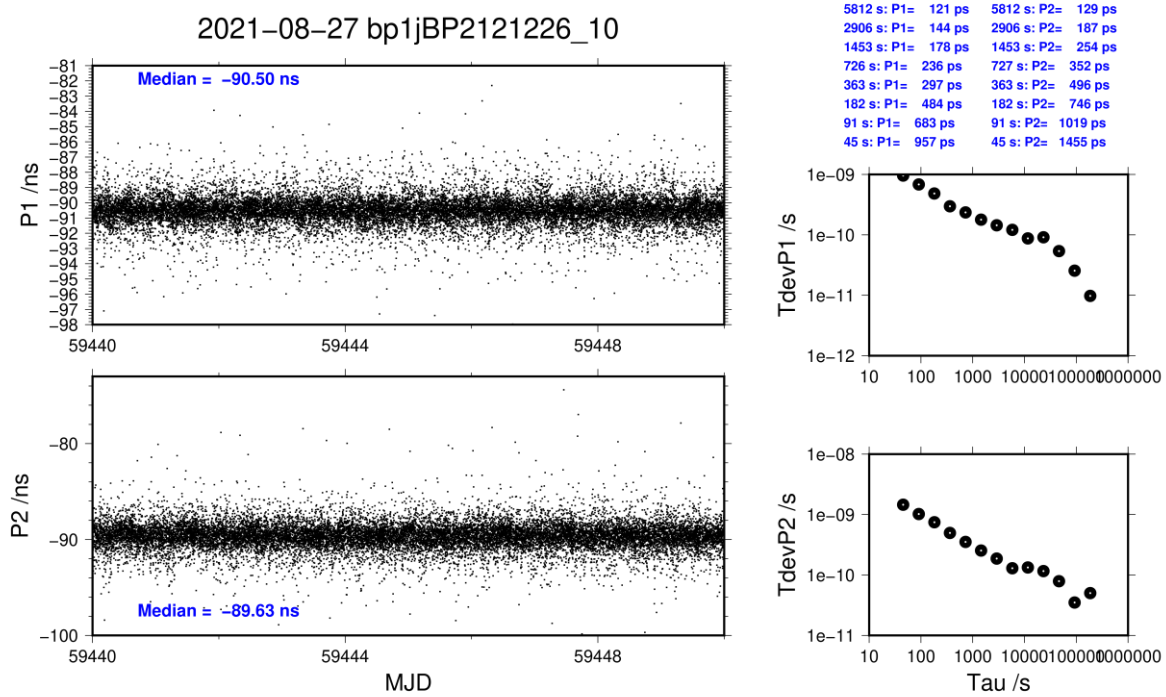
Global average of individual differences

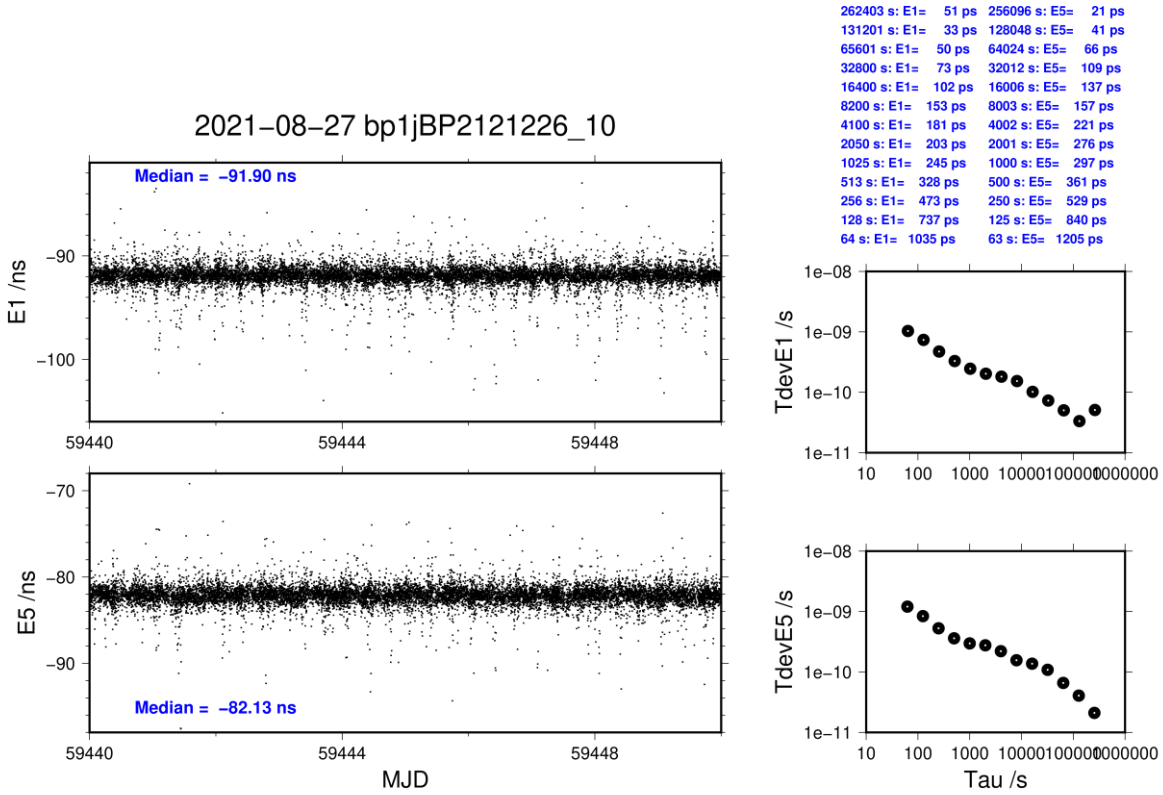
Code	#pts	ave/ns	rms/ns
C1	196467	-91.323	2.107
C2	147274	-90.554	1.914
P1	191151	-90.517	1.842
P2	191111	-89.647	2.626
E1	134913	-91.912	1.877
E5	138157	-82.141	1.843

Number of 300s epochs in out file = 2880

Code	#pts	median/ns	ave/ns	rms/ns
C1	19626	-91.315	-91.322	1.016
C2	14724	-90.507	-90.572	1.029
P1	19023	-90.500	-90.508	0.963
P2	19022	-89.629	-89.647	1.456
E1	13483	-91.900	-91.931	1.031
E5	13815	-82.126	-82.148	1.190


2021−08−27 bp1jBP2121226_10
Median = −91.31 ns
Median = −90.51 ns
C1 /ns
C2 /ns
MJD
180266 s: C1= 12 ps 240285 s: C2= 35 ps
90133 s: C1= 23 ps 120142 s: C2= 33 ps
45066 s: C1= 80 ps 60071 s: C2= 48 ps
22533 s: C1= 83 ps 30036 s: C2= 85 ps
11267 s: C1= 94 ps 15018 s: C2= 103 ps
5633 s: C1= 138 ps 7509 s: C2= 130 ps
2817 s: C1= 162 ps 3754 s: C2= 166 ps
1408 s: C1= 187 ps 1877 s: C2= 195 ps
704 s: C1= 228 ps 939 s: C2= 252 ps
352 s: C1= 314 ps 469 s: C2= 316 ps
176 s: C1= 508 ps 235 s: C2= 483 ps
88 s: C1= 718 ps 117 s: C2= 722 ps
44 s: C1= 1020 ps 59 s: C2= 1050 ps
TdevC1 /s
TdevC2 /s
Tau /s


2021−08−27 bp1jBP2121226_10
Median = −90.50 ns
Median = −89.63 ns
P1 /ns
P2 /ns
MJD
185980 s: P1= 10 ps 185990 s: P2= 50 ps
92990 s: P1= 26 ps 92995 s: P2= 35 ps
46495 s: P1= 54 ps 46497 s: P2= 79 ps
23248 s: P1= 91 ps 23249 s: P2= 116 ps
11624 s: P1= 87 ps 11624 s: P2= 133 ps
5812 s: P1= 121 ps 5812 s: P2= 129 ps
2906 s: P1= 144 ps 2906 s: P2= 187 ps
1453 s: P1= 178 ps 1453 s: P2= 254 ps
726 s: P1= 236 ps 727 s: P2= 352 ps
363 s: P1= 297 ps 363 s: P2= 496 ps
182 s: P1= 484 ps 182 s: P2= 746 ps
91 s: P1= 683 ps 91 s: P2= 1019 ps
45 s: P1= 957 ps 45 s: P2= 1455 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021−08−27 bp1jBP2121226_10
Median = −91.90 ns
Median = −82.13 ns
E1 /ns
E5 /ns
MJD
262403 s: E1= 51 ps
131201 s: E1= 33 ps
65601 s: E1= 50 ps
32800 s: E1= 73 ps
16400 s: E1= 102 ps
8200 s: E1= 153 ps
4100 s: E1= 181 ps
2050 s: E1= 203 ps
1025 s: E1= 245 ps
513 s: E1= 328 ps
256 s: E1= 473 ps
128 s: E1= 737 ps
64 s: E1= 1035 ps
256096 s: E5= 21 ps
128048 s: E5= 41 ps
64024 s: E5= 66 ps
32012 s: E5= 109 ps
16006 s: E5= 137 ps
8003 s: E5= 157 ps
4002 s: E5= 221 ps
2001 s: E5= 276 ps
1000 s: E5= 297 ps
500 s: E5= 361 ps
250 s: E5= 529 ps
125 s: E5= 840 ps
63 s: E5= 1205 ps
TdevE1 /s
TdevE5 /s
Tau /s

BP25-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 189676
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 39097 high elev obs : 3.889 5.626
Iteration 0: Obs used = 297782; Huge residuals = 0; Large residuals = 6674
Iteration 1: Obs used = 297782; Huge residuals = 0; Large residuals = 6674
Computed code bias (P1/P2)/m = 3.627 5.255
Computed baseline (X,Y,Z)/m = -4.966 -0.633 4.555
RMS of residuals /m = 0.607

Number of phase differences to fit baseline
L1/L2 = 183326
L5 = 95862
A priori baseline (X,Y,Z)/m = -4.966 -0.633 4.555
28796 clock jitters computed out of 28796 intervals
AVE jitter /ps = -0.5 RMS jitter /ps = 4.6

Iter 1 Large residuals L1= 1
Iter 1 Large residuals L2= 3
Iter 1 Large residuals L5= 20
Computed baseline L1 (X,Y,Z)/m = -0.075 -0.084 0.117
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.042 -0.093 0.141
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = -0.067 -0.089 0.149
RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 1
Iter 2 Large residuals L2= 3
Iter 2 Large residuals L5= 20
Computed baseline L1 (X,Y,Z)/m = -0.075 -0.084 0.117
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.042 -0.093 0.141
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = -0.067 -0.089 0.149
RMS of residuals L5 /m = 0.004

New iteration of baseline
New apriori baseline (X,Y,Z)/m = -5.025 -0.721 4.685
28796 clock jitters computed out of 28796 intervals
AVE jitter /ps = 0.3 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 1
Iter 3 Large residuals L2= 3
Iter 3 Large residuals L5= 20
Computed baseline L1 (X,Y,Z)/m = -0.005 -0.028 -0.006
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.028 -0.037 0.017
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.012 -0.036 0.024
RMS of residuals L5 /m = 0.004

No computed baseline E6, will use L1/L2
No computed baseline B3, will use L1/L2
No computed baseline E7, will use L1/L2
No computed baseline B7, will use L1/L2
No computed baseline E8, will use L1/L2
No computed baseline B8, will use L1/L2

Final baseline L1 (X,Y,Z)/m =	-5.030	-0.750	4.678
Final baseline L2 (X,Y,Z)/m =	-4.997	-0.758	4.702
Final baseline L5 (X,Y,Z)/m =	-5.013	-0.757	4.708
Final baseline E6 (X,Y,Z)/m =	-5.014	-0.754	4.690
Final baseline E7 (X,Y,Z)/m =	-5.014	-0.754	4.690
Final baseline E8 (X,Y,Z)/m =	-5.014	-0.754	4.690
Final baseline B3 (X,Y,Z)/m =	-5.014	-0.754	4.690
Final baseline B7 (X,Y,Z)/m =	-5.014	-0.754	4.690
Final baseline B8 (X,Y,Z)/m =	-5.014	-0.754	4.690

COMPUTATION OF CODE DIFFERENCES

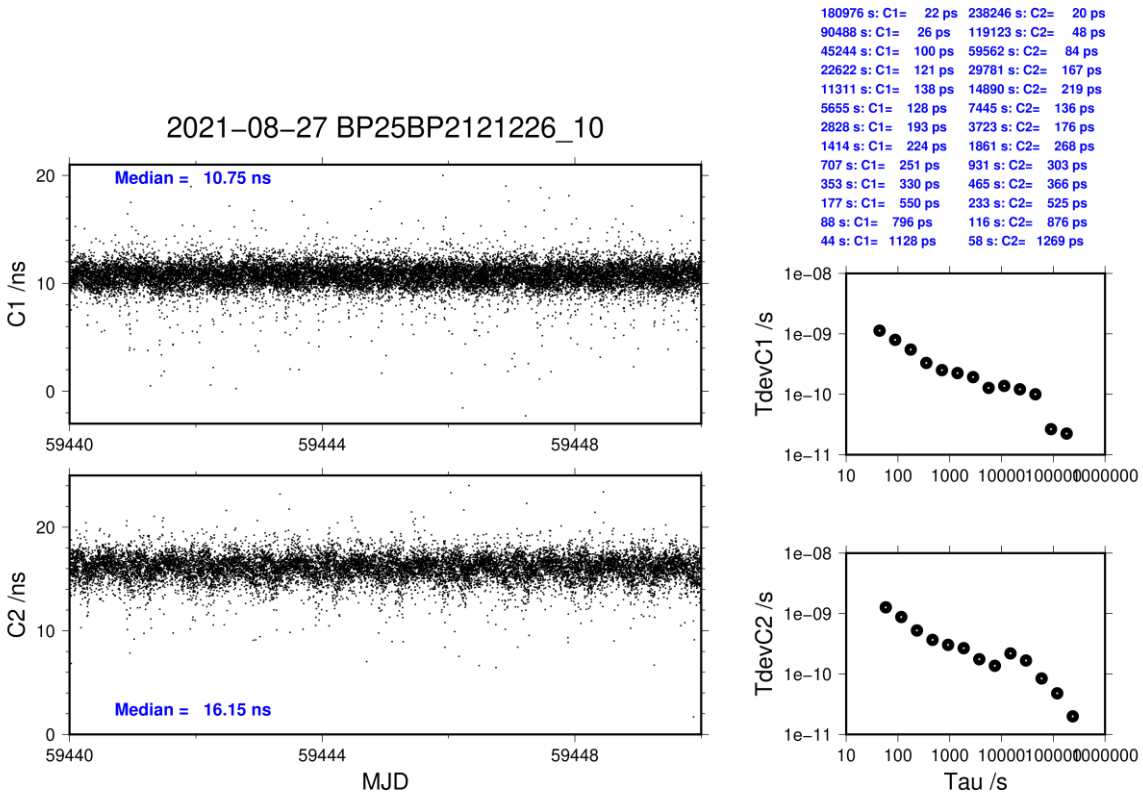
Total number of code differences = 754432

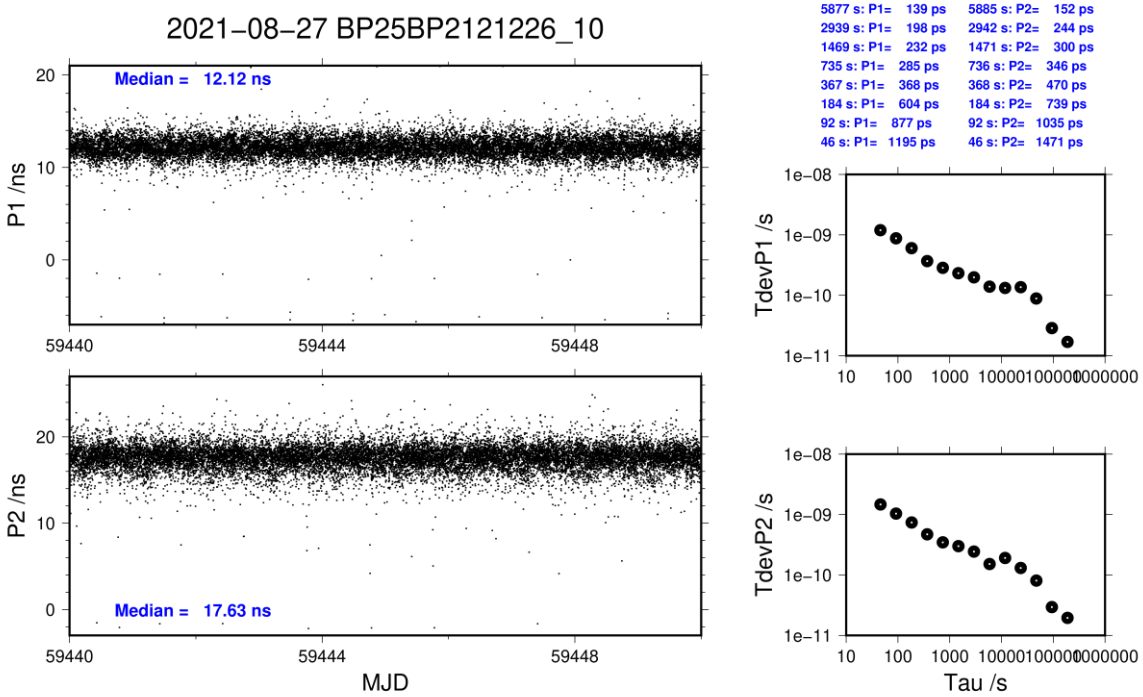
Global average of individual differences

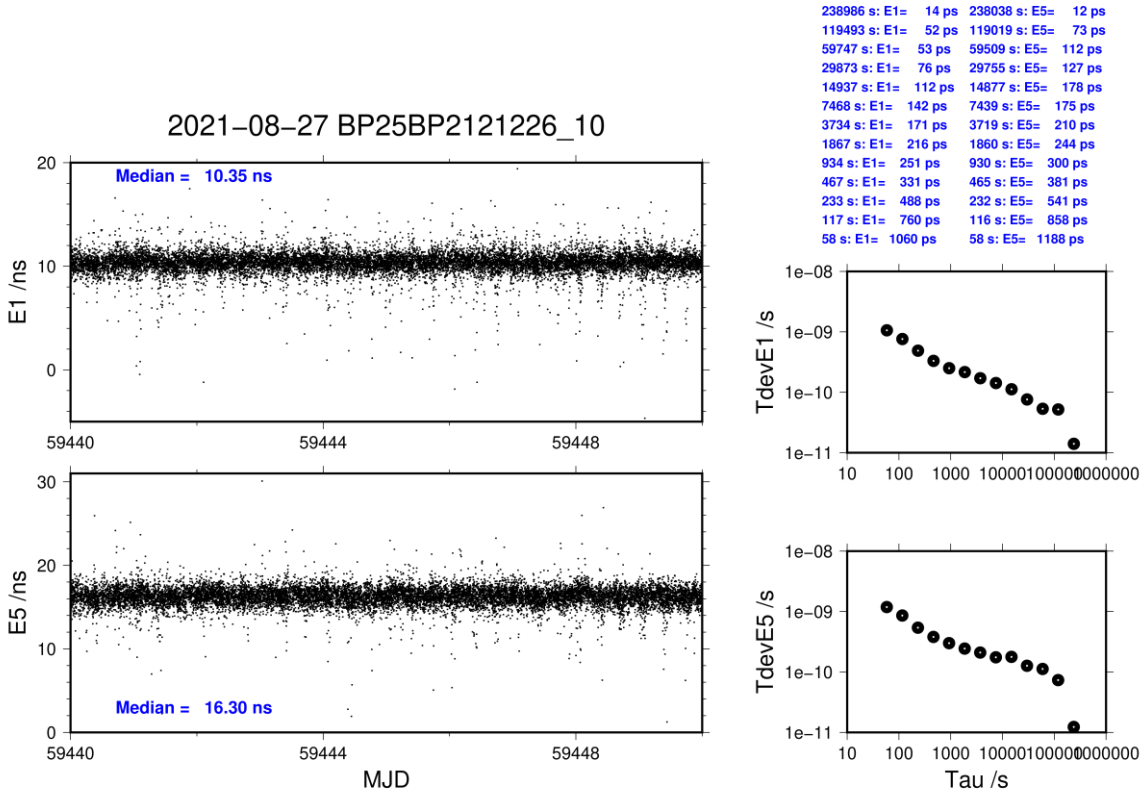
Code	#pts	ave/ns	rms/ns
C1	195330	10.691	2.052
C2	148503	16.069	2.066
P1	189143	12.083	1.960
P2	188752	17.529	2.476
E1	148186	10.333	1.795
E5	148817	16.267	1.788

Number of 300s epochs in out file = 2880

Code	#pts	median/ns	ave/ns	rms/ns
C1	19549	10.748	10.708	1.125
C2	14850	16.149	16.072	1.239
P1	18811	12.125	12.119	1.216
P2	18787	17.634	17.549	1.480
E1	14804	10.354	10.324	1.057
E5	14863	16.298	16.249	1.202


2021–08–27 BP25BP2121226_10
Median = 10.75 ns
Median = 16.15 ns
C1 /ns
C2 /ns
MJD
180976 s: C1= 22 ps 238246 s: C2= 20 ps
90488 s: C1= 26 ps 119123 s: C2= 48 ps
45244 s: C1= 100 ps 59562 s: C2= 84 ps
22622 s: C1= 121 ps 29781 s: C2= 167 ps
11311 s: C1= 138 ps 14890 s: C2= 219 ps
5655 s: C1= 128 ps 7445 s: C2= 136 ps
2828 s: C1= 193 ps 3723 s: C2= 176 ps
1414 s: C1= 224 ps 1861 s: C2= 268 ps
707 s: C1= 251 ps 931 s: C2= 303 ps
353 s: C1= 330 ps 465 s: C2= 366 ps
177 s: C1= 550 ps 233 s: C2= 525 ps
88 s: C1= 796 ps 116 s: C2= 876 ps
44 s: C1= 1128 ps 58 s: C2= 1269 ps
TdevC1 /s
TdevC2 /s
Tau /s


2021–08–27 BP25BP2121226_10
Median = 12.12 ns
Median = 17.63 ns
P1 /ns
P2 /ns
MJD
188076 s: P1= 17 ps 188317 s: P2= 19 ps
94038 s: P1= 29 ps 94158 s: P2= 29 ps
47019 s: P1= 89 ps 47079 s: P2= 81 ps
23510 s: P1= 136 ps 23540 s: P2= 131 ps
11755 s: P1= 132 ps 11770 s: P2= 191 ps
5877 s: P1= 139 ps 5885 s: P2= 152 ps
2939 s: P1= 198 ps 2942 s: P2= 244 ps
1469 s: P1= 232 ps 1471 s: P2= 300 ps
735 s: P1= 285 ps 736 s: P2= 346 ps
367 s: P1= 368 ps 368 s: P2= 470 ps
184 s: P1= 604 ps 184 s: P2= 739 ps
92 s: P1= 877 ps 92 s: P2= 1035 ps
46 s: P1= 1195 ps 46 s: P2= 1471 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021–08–27 BP25BP2121226_10
Median = 10.35 ns
Median = 16.30 ns
E1 /ns
E5 /ns
MJD
59440
59444
59448
238986 s: E1= 14 ps 238038 s: E5= 12 ps
119493 s: E1= 52 ps 119019 s: E5= 73 ps
59747 s: E1= 53 ps 59509 s: E5= 112 ps
29873 s: E1= 76 ps 29755 s: E5= 127 ps
14937 s: E1= 112 ps 14877 s: E5= 178 ps
7468 s: E1= 142 ps 7439 s: E5= 175 ps
3734 s: E1= 171 ps 3719 s: E5= 210 ps
1867 s: E1= 216 ps 1860 s: E5= 244 ps
934 s: E1= 251 ps 930 s: E5= 300 ps
467 s: E1= 331 ps 465 s: E5= 381 ps
233 s: E1= 488 ps 232 s: E5= 541 ps
117 s: E1= 760 ps 116 s: E5= 858 ps
58 s: E1= 1060 ps 58 s: E5= 1188 ps
TdevE1 /s
TdevE5 /s
Tau /s

3.2/ NIST (21296)

Period

MJD 59510 to 59529

Delays

BP1J: (cf page 3& 17)

X_O = 138.80 ns
X_P = 467.30 ns (53.60+413.70)
REFDLY = 606.10 ns
CABDLY = 176.38 ns (C211)

BP25: (cf page 3 & 17)

REFDLY = 467.19 ns (53.49+413.70)
CABDLY = 176.24 ns (208)

NIST: (cf page 17)

REFDLY = 65.90 ns
CABDLY = 275.50 ns

NISG: (cf page 18)

X_O = 39.10 ns
X_P = 1553.10 ns
REFDLY = 1592.20 ns
CABDLY = 298.50 ns

NISS: (cf page 19)

X_O = 194.40 ns
X_P = 105.00 ns
REFDLY = 299.40 ns
CABDLY = 298.90 ns

NISX: (cf page 20)

X_O = 57.00 ns
X_P = 395.30 ns
REFDLY = 452.30 ns
CABDLY = 185.00 ns

Setup at the NIST

Annex A - Information Sheet

Laboratory:	**NIST**
Date and hour of the beginning of measurements:	
Date and hour of the end of measurements:	

Information on the system		
	Local:	**Traveling:**
4-character BIPM code	**NIST**	
Receiver maker and type: Receiver serial number:	Novatel OEM4-G2 S/N	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilised cable (Y/N):	Andrew FSJ-50A N	
Length outside the building /m:	65	
Antenna maker and type: Antenna serial number:	Novatel 702	
Temperature (if stabilized) /°C		

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	65.9	413.7 (BP1J, BP25)
Delay from 1 PPS-in to internal Reference (if different): (X_O)	N/A	138.8 (BP1J)
Antenna cable delay: (X_C)	275.5	
Splitter delay (if any):	N/A	
Additional cable delay (if any):	N/A	

Data used for the generation of CGGTTS files	
• INT DLY (or X_R+X_S) (GPS) /ns:	-72.6 (C1),-72.3(P2)
• INT DLY (or X_R+X_S) (GLONASS) /ns:	
• CAB DLY (or X_C) /ns:	275.5
• REF DLY (or X_P+X_O) /ns:	65.9
• Coordinates reference frame:	WGS84
X /m:	-1288398.51
Y /m:	-4721696.92
Z /m	4078625.35

General information	
• Rise time of the local UTC pulse:	3 ns
• Is the laboratory air conditioned:	yes
Set temperature value and uncertainty:(°C)	23 (.1)
Set humidity value and uncertainty: (%)	35 (.1)

Annex A - Information Sheet

Laboratory:	NIST
Date and hour of the beginning of measurements:	
Date and hour of the end of measurements:	

Information on the system		
	Local:	**Traveling:**
4-character BIPM code	NISG	
Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR Full S/N 3034704	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilized cable (Y/N):	Andrew LDF2-50 (white) N	
Length outside the building /m:	5.0	
Antenna maker and type: Antenna serial number:	Novatel 750 NEG10500001	
Temperature (if stabilized) /°C		

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	1553.1	413.7 (BP1J, BP25)
Delay from 1 PPS-in to internal Reference (if different): (X_O)	39.1	138.8 (BP1J)
Antenna cable delay: (X_C)	298.5	
Splitter delay (if any):	N/A	
Additional cable delay (if any):	N/A	

Data used for the generation of CGGTTS files	
• INT DLY (or X_R+X_S) (GPS) /ns:	30.2 (P1), 28.5 (P2)
• INT DLY (or X_R+X_S) (GAL) /ns:	32.5 (E1), 33.0 (E5a)
• CAB DLY (or X_C) /ns:	298.5
• REF DLY (or X_P+X_O) /ns:	1592.2
• Coordinates reference frame:	WGS84
X /m:	-1288547.201
Y /m:	-4721701.166
Z /m	4078586.530

General information	
• Rise time of the local UTC pulse:	3 ns
• Is the laboratory air conditioned:	yes
Set temperature value and uncertainty: (°C)	22(.1)
Set humidity value and uncertainty: (%)	45 (.1)

Annex A - Information Sheet

Laboratory:	NIST
Date and hour of the beginning of measurements:	
Date and hour of the end of measurements:	

Information on the system		
	Local:	**Traveling:**
4-character BIPM code	NISS	
Receiver maker and type: Receiver serial number:	Septentrio PolaRx3e TRPro S/N 2001106	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilized cable (Y/N):	Andrew LDF2-50 (white) N	
Length outside the building /m:	5.0	
Antenna maker and type: Antenna serial number:	Novatel 703 NEG10450005	
Temperature (if stabilized) /°C		

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	105.0	413.7 (BP1J, BP25)
Delay from 1 PPS-in to internal Reference (if different): (X_O)	194.4	138.8 (BP1J)
Antenna cable delay: (X_C)	298.9	
Splitter delay (if any):	N/A	
Additional cable delay (if any):	N/A	

Data used for the generation of CGGTTS files	
• INT DLY (or X_R+X_S) (GPS) /ns:	46.0 (P1), 46.4 (P2)
• INT DLY (or X_R+X_S) (GLONASS) /ns:	
• CAB DLY (or X_C) /ns:	
• REF DLY (or X_P+X_O) /ns:	299.4
• Coordinates reference frame:	WGS84
X /m:	-1288542.084
Y /m:	-4721698.629
Z /m	4078590.796

General information	
• Rise time of the local UTC pulse:	3 ns
• Is the laboratory air conditioned:	yes
Set temperature value and uncertainty: (°C)	22(.1)
Set humidity value and uncertainty: (%)	45 (.1)

Annex A - Information Sheet

Laboratory:	NIST
Date and hour of the beginning of measurements:	
Date and hour of the end of measurements:	

Information on the system		
	Local:	**Traveling:**
4-character BIPM code	NISX	
Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR Full S/N 4701498	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilized cable (Y/N)	FSJ1-50A N	
Length outside the building /m:	25.0	
Antenna maker and type: Antenna serial number:	Novatel 750 NDE11330004	
Temperature (if stabilized) /°C		

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	395.3	413.7 (BP1J, BP25)
Delay from 1 PPS-in to internal Reference (if different): (X_O)	57.0	138.8 (BP1J)
Antenna cable delay: (X_C)	185.0	
Splitter delay (if any):	N/A	
Additional cable delay (if any):	N/A	

Data used for the generation of CGGTTS files	
• INT DLY (or X_R+X_S) (GPS) /ns:	
• INT DLY (or X_R+X_S) (GAL) /ns:	
• CAB DLY (or X_C) /ns:	
• REF DLY (or X_P+X_O) /ns:	
• Coordinates reference frame:	
X /m:	
Y /m:	
Z /m	

General information	
• Rise time of the local UTC pulse:	3 ns
• Is the laboratory air conditioned:	yes
Set temperature value and uncertainty: (°C)	
Set humidity value and uncertainty: (%)	

NIST-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 499203
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 73693 high elev obs : 160.681 160.868
Iteration 0: Obs used = 787341; Huge residuals = 0; Large residuals = 69689
Iteration 1: Obs used = 787341; Huge residuals = 0; Large residuals = 69689
Computed code bias (P1/P2)/m = 156.225 156.462
Computed baseline (X,Y,Z)/m = 69.428 38.005 56.354
RMS of residuals /m = 0.945

Number of phase differences to fit baseline
L1/L2 = 486237
L5 = 0
A priori baseline (X,Y,Z)/m = 69.428 38.005 56.354
57350 clock jitters computed out of 57350 intervals
AVE jitter /ps = -0.8 RMS jitter /ps = 9.9

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 = -0.763 -3.113 2.595
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.771 -3.113 2.597
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 68.661 34.892 58.950
57350 clock jitters computed out of 57350 intervals
AVE jitter /ps = 0.8 RMS jitter /ps = 5.9

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.080 -0.119 0.085
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.088 -0.119 0.086
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2
WARNING Phase baseline L1 differs from a priori by > 10 cm

Final baseline L1 (X,Y,Z)/m = 68.581 34.773 59.035
Final baseline L2 (X,Y,Z)/m = 68.573 34.773 59.036
Final baseline L5 (X,Y,Z)/m = 68.577 34.773 59.035

COMPUTATION OF CODE DIFFERENCES

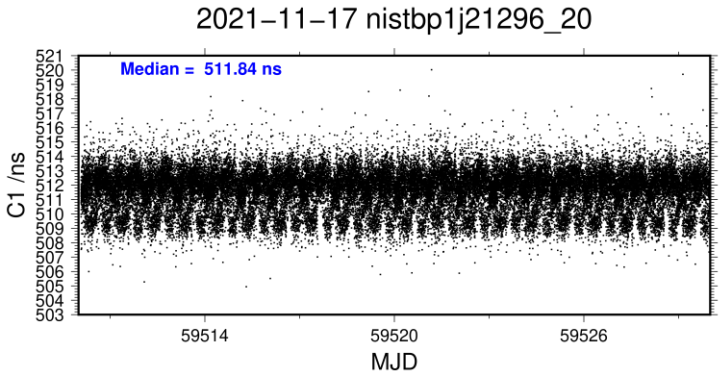
Total number of code differences = 499415

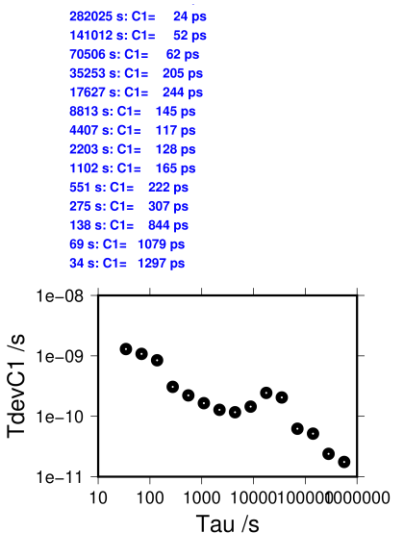
Global average of individual differences

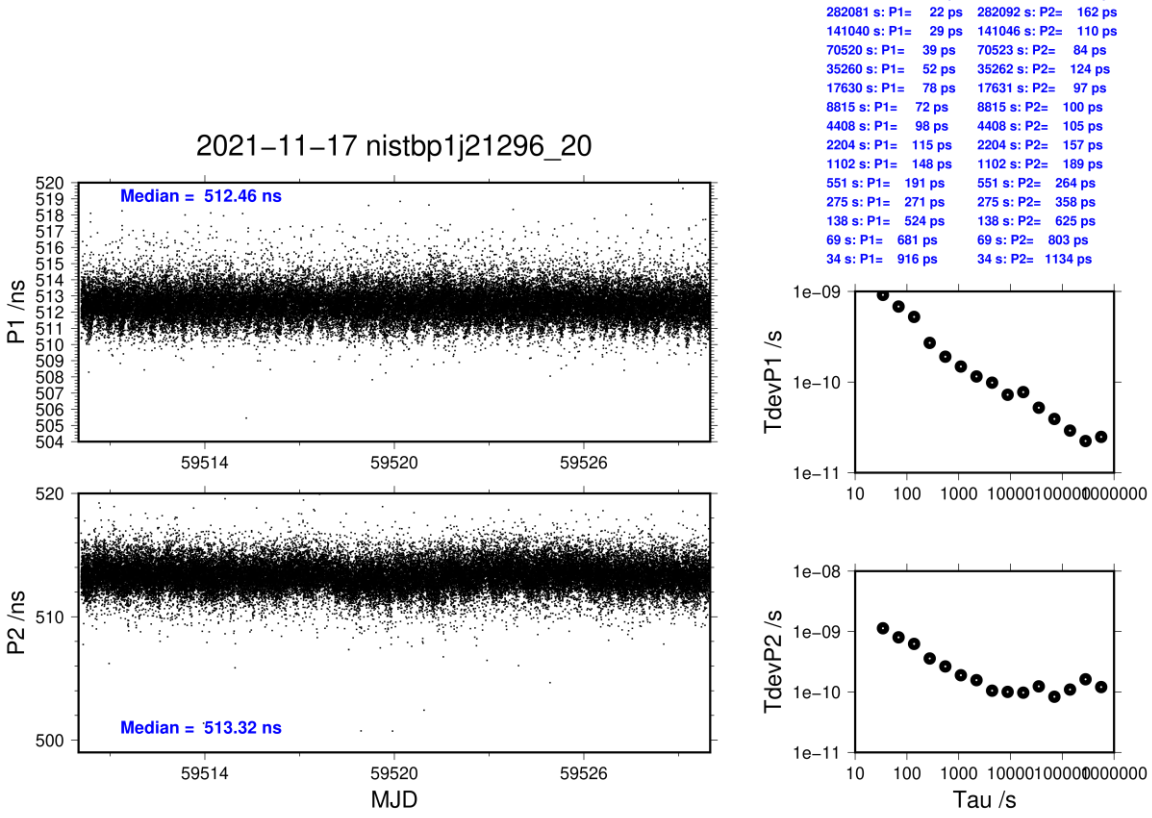
Code	#pts	ave/ns	rms/ns
C1	499189	511.615	1.786
P1	499110	512.499	1.453
P2	499073	513.317	1.694

Number of 300s epochs in out file = 5738

Code	#pts	median/ns	ave/ns	rms/ns
C1	49994	511.837	511.622	1.404
P1	49984	512.464	512.507	0.936
P2	49982	513.316	513.329	1.159






2021−11−17 nistbp1j21296_20
Median = 512.46 ns
Median = 513.32 ns
P1 /ns
P2 /ns
MJD
59514
59520
59526
282081 s: P1= 22 ps
282092 s: P2= 162 ps
141040 s: P1= 29 ps
141046 s: P2= 110 ps
70520 s: P1= 39 ps
70523 s: P2= 84 ps
35260 s: P1= 52 ps
35262 s: P2= 124 ps
17630 s: P1= 78 ps
17631 s: P2= 97 ps
8815 s: P1= 72 ps
8815 s: P2= 100 ps
4408 s: P1= 98 ps
4408 s: P2= 105 ps
2204 s: P1= 115 ps
2204 s: P2= 157 ps
1102 s: P1= 148 ps
1102 s: P2= 189 ps
551 s: P1= 191 ps
551 s: P2= 264 ps
275 s: P1= 271 ps
275 s: P2= 358 ps
138 s: P1= 524 ps
138 s: P2= 625 ps
69 s: P1= 681 ps
69 s: P2= 803 ps
34 s: P1= 916 ps
34 s: P2= 1134 ps
TdevP1 /s
TdevP2 /s
Tau /s

NIST-BP25

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 457034
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 74033 high elev obs : 130.235 129.157
Iteration 0: Obs used = 712912; Huge residuals = 0; Large residuals = 59122
Iteration 1: Obs used = 712912; Huge residuals = 0; Large residuals = 59122
Computed code bias (P1/P2)/m = 126.361 125.306
Computed baseline (X,Y,Z)/m = 69.813 37.832 55.357
RMS of residuals /m = 0.987

Number of phase differences to fit baseline
L1/L2 = 452041
L5 = 0
A priori baseline (X,Y,Z)/m = 69.813 37.832 55.357
57574 clock jitters computed out of 57574 intervals
AVE jitter /ps = -0.5 RMS jitter /ps = 8.6

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 = -1.002 -3.538 2.845
RMS of residuals L1 /m = 0.005
Computed baseline L2 (X,Y,Z)/m = -1.005 -3.538 2.847
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 68.810 34.294 58.204
57574 clock jitters computed out of 57574 intervals
AVE jitter /ps = 0.7 RMS jitter /ps = 7.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.084 -0.171 0.104
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.088 -0.170 0.107
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2
WARNING Phase baseline L1 differs from a priori by > 10 cm

Final baseline L1 (X,Y,Z)/m = 68.726 34.123 58.308
Final baseline L2 (X,Y,Z)/m = 68.722 34.123 58.310
Final baseline L5 (X,Y,Z)/m = 68.724 34.123 58.309

COMPUTATION OF CODE DIFFERENCES

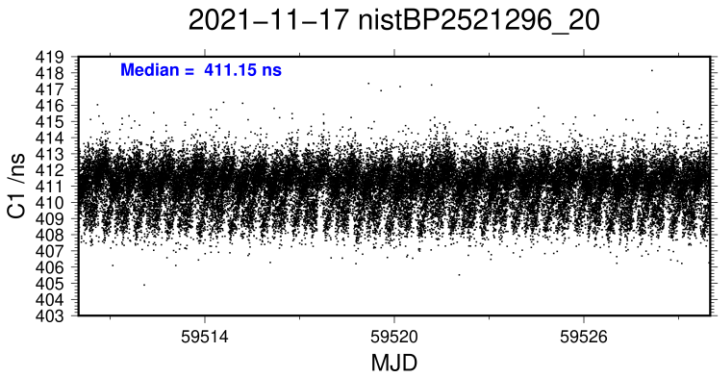
Total number of code differences = 457037

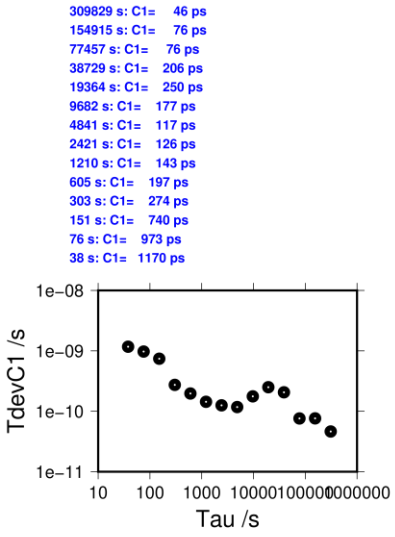
Global average of individual differences

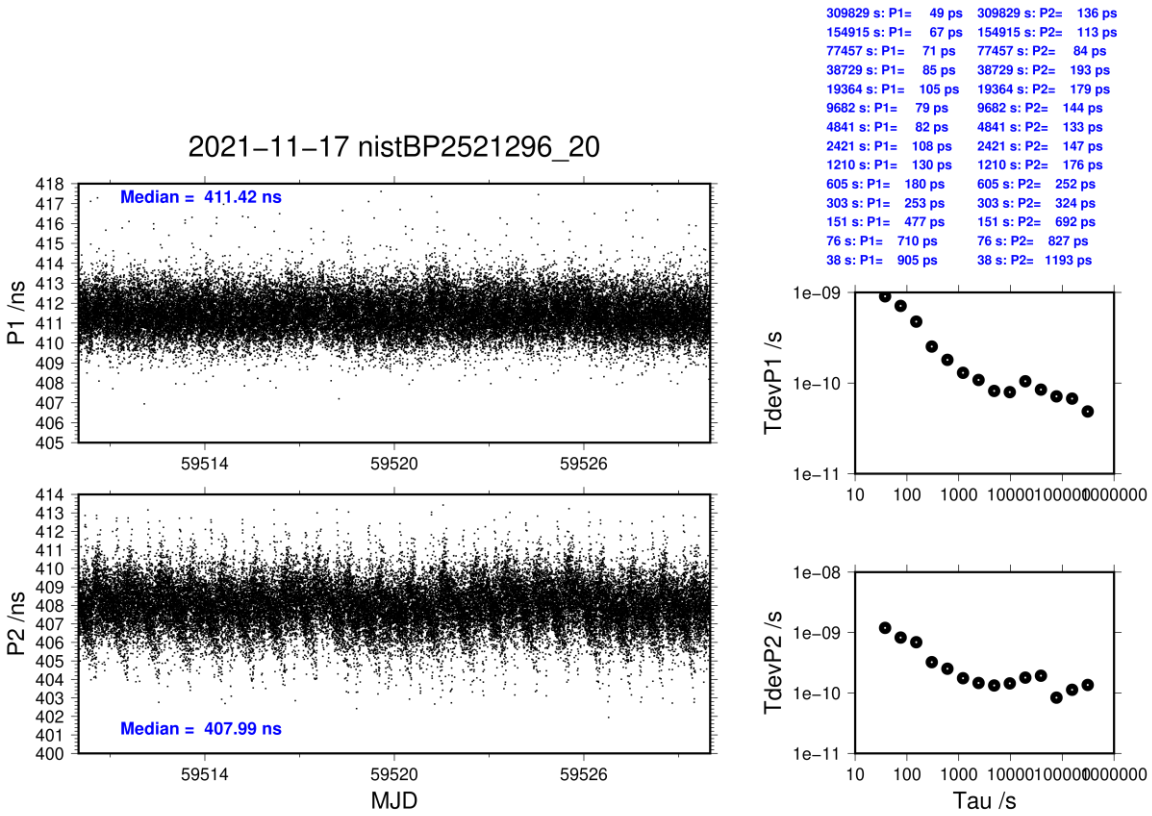
Code	#pts	ave/ns	rms/ns
C1	456982	410.974	1.542
P1	456982	411.462	1.282
P2	456978	407.975	1.595

Number of 300s epochs in out file = 5760

Code	#pts	median/ns	ave/ns	rms/ns
C1	45682	411.151	410.977	1.271
P1	45682	411.424	411.467	0.928
P2	45682	407.990	407.985	1.216






309829 s: P1= 49 ps 309829 s: P2= 136 ps
154915 s: P1= 67 ps 154915 s: P2= 113 ps
77457 s: P1= 71 ps 77457 s: P2= 84 ps
38729 s: P1= 85 ps 38729 s: P2= 193 ps
19364 s: P1= 105 ps 19364 s: P2= 179 ps
9682 s: P1= 79 ps 9682 s: P2= 144 ps
4841 s: P1= 82 ps 4841 s: P2= 133 ps
2421 s: P1= 108 ps 2421 s: P2= 147 ps
1210 s: P1= 130 ps 1210 s: P2= 176 ps
605 s: P1= 180 ps 605 s: P2= 252 ps
303 s: P1= 253 ps 303 s: P2= 324 ps
151 s: P1= 477 ps 151 s: P2= 692 ps
76 s: P1= 710 ps 76 s: P2= 827 ps
38 s: P1= 905 ps 38 s: P2= 1193 ps
2021−11−17 nistBP2521296_20
Median = 411.42 ns
P1 /ns
Median = 407.99 ns
P2 /ns
MJD
TdevP1 /s
TdevP2 /s
Tau /s

NISG-BP1J

COMPUTATION OF BASELINE

Number of phase differences to fit baseline
L1/L2 = 516247
L5 = 271626
A priori baseline (X,Y,Z)/m = 216.800 38.800 97.900
57113 clock jitters computed out of 57113 intervals
AVE jitter /ps = 1.5 RMS jitter /ps = 6.3

Iter 1 Large residuals L1= 7
Iter 1 Large residuals L2= 15
Iter 1 Large residuals L5= 245
Computed baseline L1 (X,Y,Z)/m = 0.242 -0.041 0.042
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.243 -0.044 0.046
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.289 -0.026 0.025
RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 7
Iter 2 Large residuals L2= 15
Iter 2 Large residuals L5= 245
Computed baseline L1 (X,Y,Z)/m = 0.242 -0.041 0.042
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.243 -0.044 0.046
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.289 -0.026 0.025
RMS of residuals L5 /m = 0.004

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 217.042 38.757 97.944
57113 clock jitters computed out of 57113 intervals
AVE jitter /ps = -0.7 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 6
Iter 3 Large residuals L2= 14
Iter 3 Large residuals L5= 245
Computed baseline L1 (X,Y,Z)/m = 0.063 -0.017 -0.001
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.063 -0.019 0.003
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.104 -0.001 -0.021
RMS of residuals L5 /m = 0.004

Iter 4 Large residuals L1= 6
Iter 4 Large residuals L2= 14
Iter 4 Large residuals L5= 245
Computed baseline L1 (X,Y,Z)/m = 0.063 -0.017 -0.001
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.063 -0.019 0.003
RMS of residuals L2 /m = 0.004

Computed baseline L5 (X,Y,Z)/m = 0.104 -0.001 -0.021
RMS of residuals L5 /m = 0.004

Final baseline L1 (X,Y,Z)/m = 217.105 38.741 97.943
Final baseline L2 (X,Y,Z)/m = 217.106 38.738 97.947
Final baseline L5 (X,Y,Z)/m = 217.146 38.756 97.923

COMPUTATION OF CODE DIFFERENCES

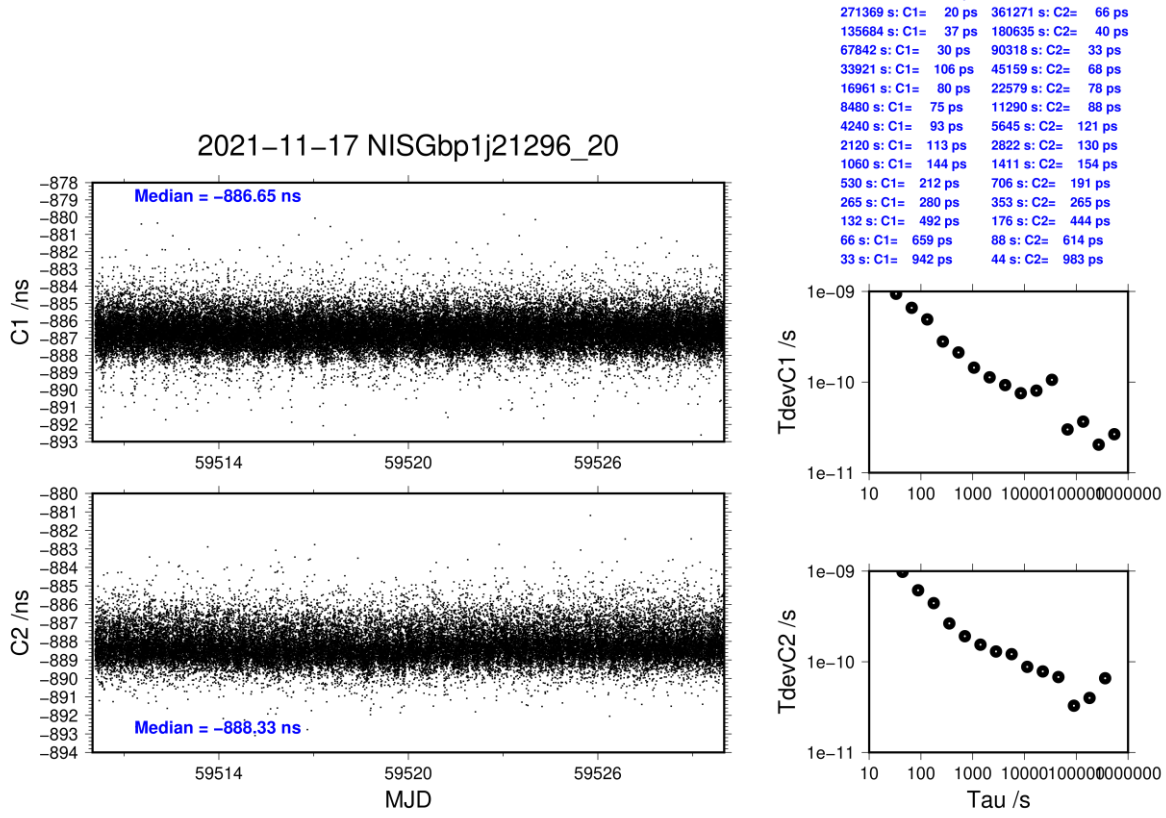
Total number of code differences = ******

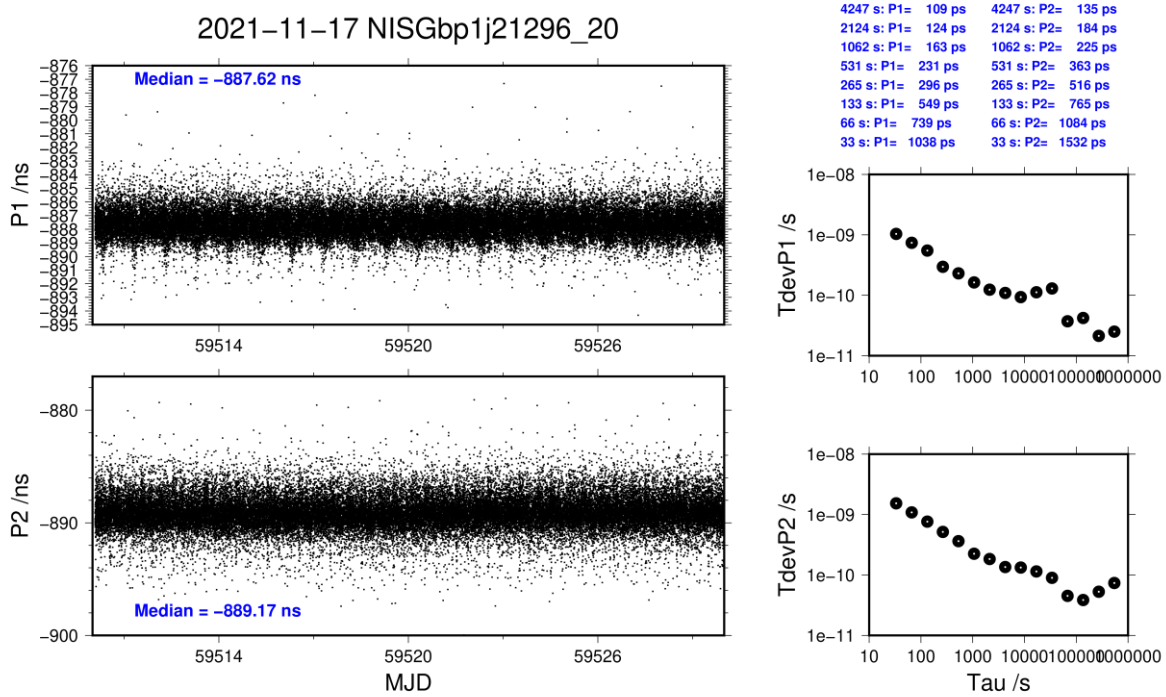
Global average of individual differences

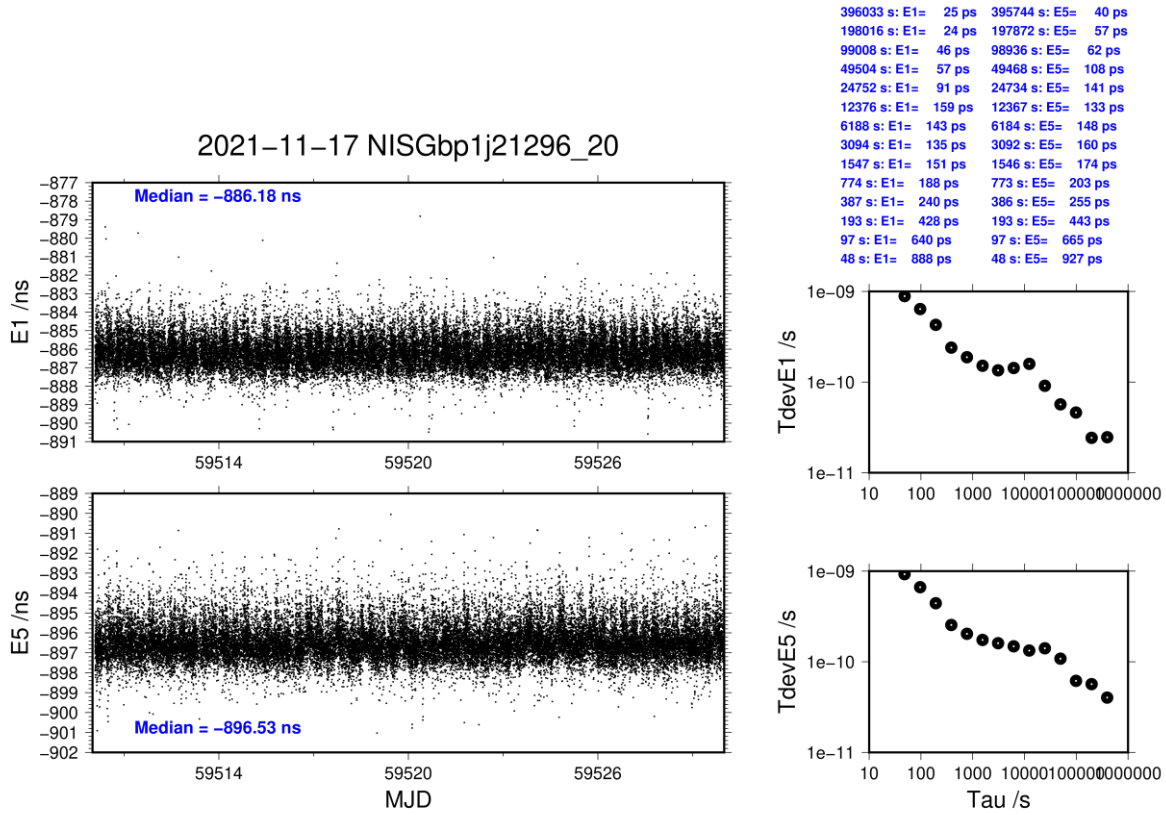
Code	#pts	ave/ns	rms/ns
C1	520167	-886.583	1.645
C2	390533	-888.206	1.655
P1	519317	-887.557	1.707
P2	519317	-889.115	2.354
E1	356214	-886.109	1.350
E5	356498	-896.406	1.338

Number of 300s epochs in out file = 5718

Code	#pts	median/ns	ave/ns	rms/ns
C1	51948	-886.649	-886.598	0.937
C2	39021	-888.326	-888.208	0.921
P1	51860	-887.615	-887.571	1.039
P2	51860	-889.170	-889.095	1.523
E1	35596	-886.179	-886.100	0.888
E5	35622	-896.534	-896.419	0.935


2021−11−17 NISGbp1j21296_20
Median = −886.65 ns
Median = −888.33 ns
C1 /ns
C2 /ns
MJD
59514
59520
59526
271369 s: C1= 20 ps
135684 s: C1= 37 ps
67842 s: C1= 30 ps
33921 s: C1= 106 ps
16961 s: C1= 80 ps
8480 s: C1= 75 ps
4240 s: C1= 93 ps
2120 s: C1= 113 ps
1060 s: C1= 144 ps
530 s: C1= 212 ps
265 s: C1= 280 ps
132 s: C1= 492 ps
66 s: C1= 659 ps
33 s: C1= 942 ps
361271 s: C2= 66 ps
180635 s: C2= 40 ps
90318 s: C2= 33 ps
45159 s: C2= 68 ps
22579 s: C2= 78 ps
11290 s: C2= 88 ps
5645 s: C2= 121 ps
2822 s: C2= 130 ps
1411 s: C2= 154 ps
706 s: C2= 191 ps
353 s: C2= 265 ps
176 s: C2= 444 ps
88 s: C2= 614 ps
44 s: C2= 983 ps
TdevC1 /s
TdevC2 /s
Tau /s


2021−11−17 NISGbp1j21296_20
Median = −887.62 ns
Median = −889.17 ns
P1 /ns
P2 /ns
MJD
59514
59520
59526
271829 s: P1= 21 ps
135915 s: P1= 42 ps
67957 s: P1= 37 ps
33979 s: P1= 130 ps
16989 s: P1= 112 ps
8495 s: P1= 93 ps
4247 s: P1= 109 ps
2124 s: P1= 124 ps
1062 s: P1= 163 ps
531 s: P1= 231 ps
265 s: P1= 296 ps
133 s: P1= 549 ps
66 s: P1= 739 ps
33 s: P1= 1038 ps
271829 s: P2= 53 ps
135915 s: P2= 39 ps
67957 s: P2= 45 ps
33979 s: P2= 90 ps
16989 s: P2= 115 ps
8495 s: P2= 132 ps
4247 s: P2= 135 ps
2124 s: P2= 184 ps
1062 s: P2= 225 ps
531 s: P2= 363 ps
265 s: P2= 516 ps
133 s: P2= 765 ps
66 s: P2= 1084 ps
33 s: P2= 1532 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021−11−17 NISGbp1j21296_20
Median = −886.18 ns
Median = −896.53 ns
E1 /ns
E5 /ns
MJD
396033 s: E1= 25 ps
198016 s: E1= 24 ps
99008 s: E1= 46 ps
49504 s: E1= 57 ps
24752 s: E1= 91 ps
12376 s: E1= 159 ps
6188 s: E1= 143 ps
3094 s: E1= 135 ps
1547 s: E1= 151 ps
774 s: E1= 188 ps
387 s: E1= 240 ps
193 s: E1= 428 ps
97 s: E1= 640 ps
48 s: E1= 888 ps
395744 s: E5= 40 ps
197872 s: E5= 57 ps
98936 s: E5= 62 ps
49468 s: E5= 108 ps
24734 s: E5= 141 ps
12367 s: E5= 133 ps
6184 s: E5= 148 ps
3092 s: E5= 160 ps
1546 s: E5= 174 ps
773 s: E5= 203 ps
386 s: E5= 255 ps
193 s: E5= 443 ps
97 s: E5= 665 ps
48 s: E5= 927 ps
TdevE1 /s
TdevE5 /s
Tau /s

NISG-BP25

COMPUTATION OF BASELINE

Number of phase differences to fit baseline
L1/L2 = 460832
L5 = 248594
A priori baseline (X,Y,Z)/m = 217.200 38.100 97.200
57338 clock jitters computed out of 57338 intervals
AVE jitter /ps = 1.1 RMS jitter /ps = 4.1

Iter 1 Large residuals L1= 5
Iter 1 Large residuals L2= 4
Iter 1 Large residuals L5= 6
Computed baseline L1 (X,Y,Z)/m = 0.032 -0.021 0.029
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.031 -0.017 0.026
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.084 0.000 -0.004
RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 5
Iter 2 Large residuals L2= 4
Iter 2 Large residuals L5= 6
Computed baseline L1 (X,Y,Z)/m = 0.032 -0.021 0.029
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.031 -0.017 0.026
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.084 0.000 -0.004
RMS of residuals L5 /m = 0.004

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 217.231 38.081 97.227
57338 clock jitters computed out of 57338 intervals
AVE jitter /ps = -0.1 RMS jitter /ps = 0.1

Iter 3 Large residuals L1= 5
Iter 3 Large residuals L2= 4
Iter 3 Large residuals L5= 6
Computed baseline L1 (X,Y,Z)/m = 0.013 -0.006 0.003
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.012 -0.002 -0.001
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.063 0.015 -0.030
RMS of residuals L5 /m = 0.004

Final baseline L1 (X,Y,Z)/m = 217.244 38.075 97.230
Final baseline L2 (X,Y,Z)/m = 217.243 38.079 97.227
Final baseline L5 (X,Y,Z)/m = 217.294 38.096 97.197

COMPUTATION OF CODE DIFFERENCES

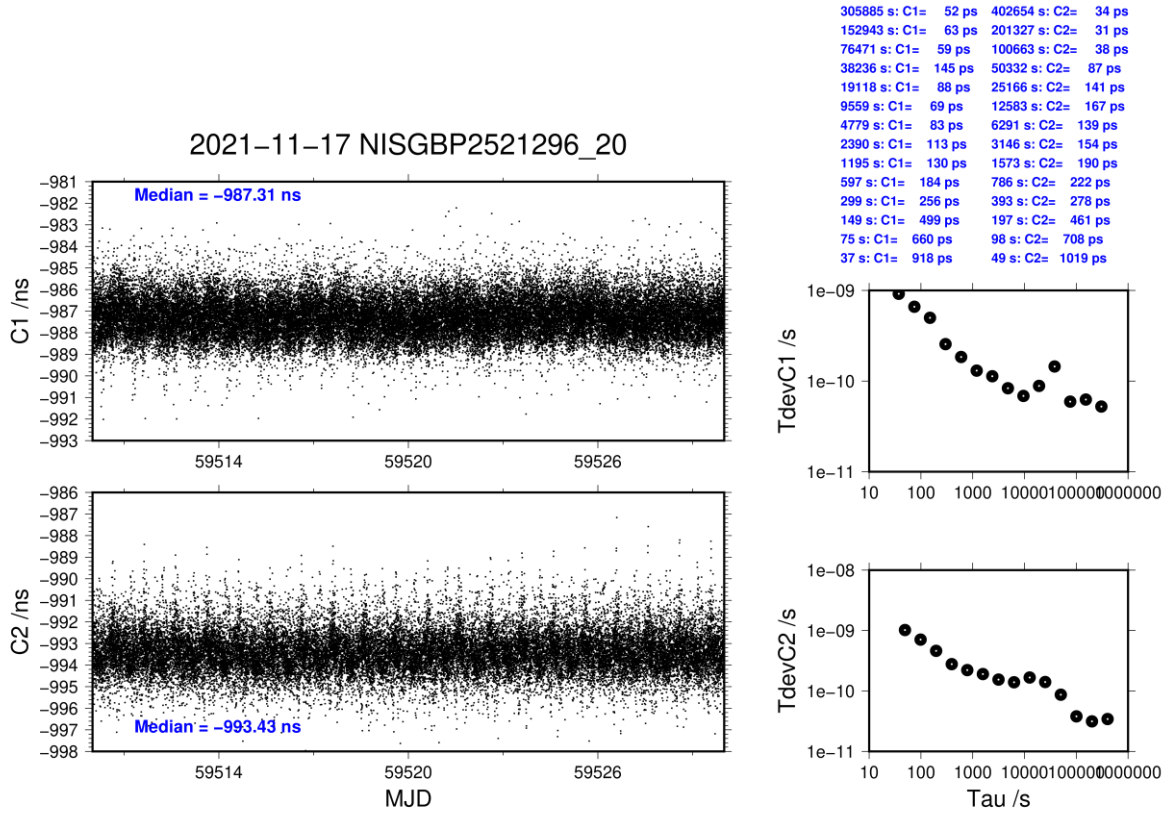
Total number of code differences = ******

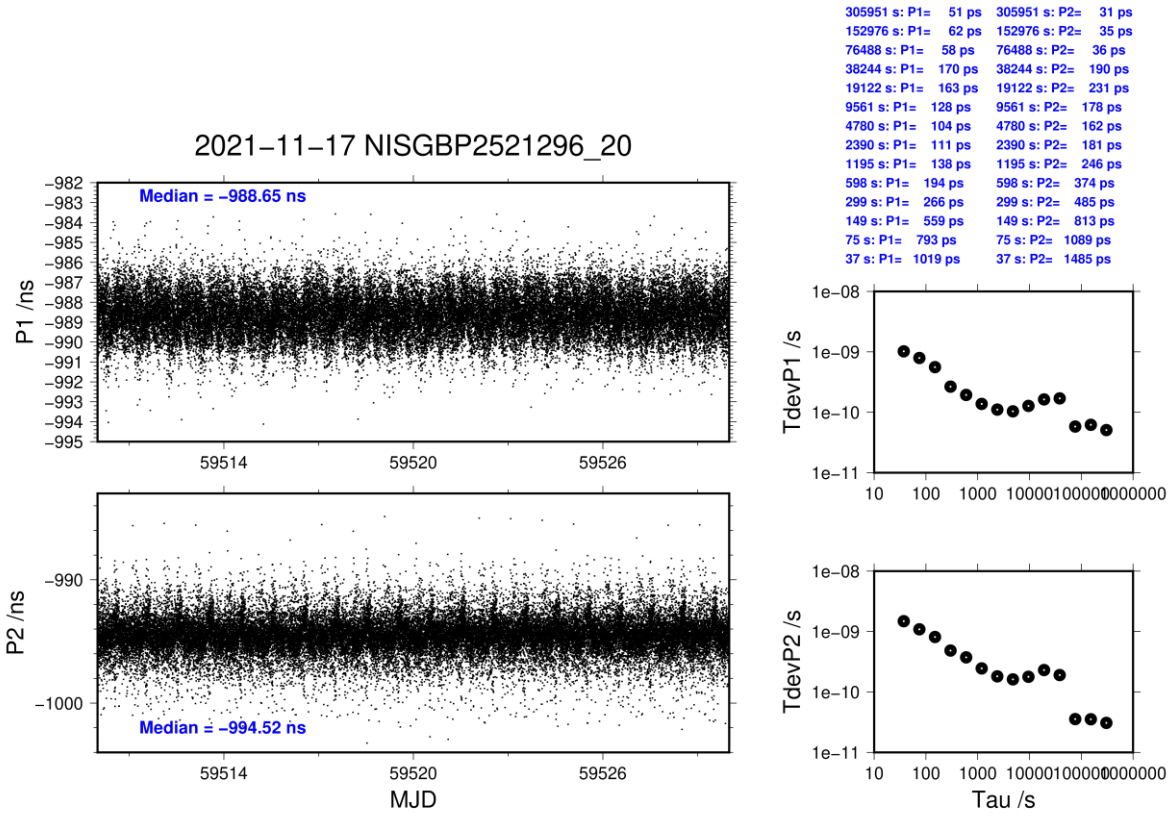
Global average of individual differences

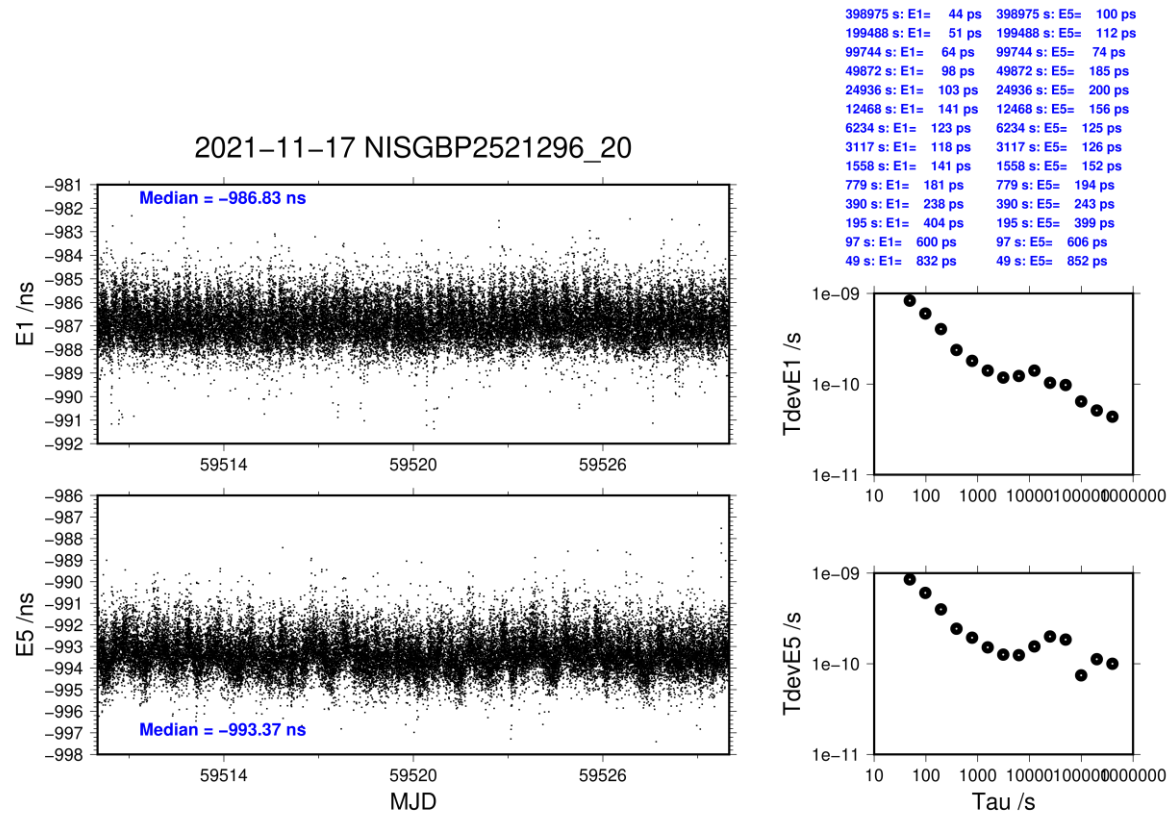
Code	#pts	ave/ns	rms/ns
C1	463204	-987.266	1.448
C2	351832	-993.381	1.460
P1	463079	-988.619	1.541
P2	463079	-994.536	2.218
E1	354851	-986.786	1.233
E5	354861	-993.310	1.128

Number of 300s epochs in out file = 5740

Code	#pts	median/ns	ave/ns	rms/ns
C1	46263	-987.311	-987.277	0.924
C2	35145	-993.429	-993.379	1.003
P1	46253	-988.647	-988.632	1.053
P2	46253	-994.517	-994.510	1.536
E1	35469	-986.833	-986.779	0.840
E5	35469	-993.373	-993.310	0.881




2021−11−17 NISGBP2521296_20
Median = −988.65 ns
P1 /ns
Median = −994.52 ns
P2 /ns
MJD
305951 s: P1= 51 ps
152976 s: P1= 62 ps
76488 s: P1= 58 ps
38244 s: P1= 170 ps
19122 s: P1= 163 ps
9561 s: P1= 128 ps
4780 s: P1= 104 ps
2390 s: P1= 111 ps
1195 s: P1= 138 ps
598 s: P1= 194 ps
299 s: P1= 266 ps
149 s: P1= 559 ps
75 s: P1= 793 ps
37 s: P1= 1019 ps
305951 s: P2= 31 ps
152976 s: P2= 35 ps
76488 s: P2= 36 ps
38244 s: P2= 190 ps
19122 s: P2= 231 ps
9561 s: P2= 178 ps
4780 s: P2= 162 ps
2390 s: P2= 181 ps
1195 s: P2= 246 ps
598 s: P2= 374 ps
299 s: P2= 485 ps
149 s: P2= 813 ps
75 s: P2= 1089 ps
37 s: P2= 1485 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021−11−17 NISGBP2521296_20
Median = −986.83 ns
E1 /ns
Median = −993.37 ns
E5 /ns
MJD
398975 s: E1= 44 ps
199488 s: E1= 51 ps
99744 s: E1= 64 ps
49872 s: E1= 98 ps
24936 s: E1= 103 ps
12468 s: E1= 141 ps
6234 s: E1= 123 ps
3117 s: E1= 118 ps
1558 s: E1= 141 ps
779 s: E1= 181 ps
390 s: E1= 238 ps
195 s: E1= 404 ps
97 s: E1= 600 ps
49 s: E1= 832 ps
398975 s: E5= 100 ps
199488 s: E5= 112 ps
99744 s: E5= 74 ps
49872 s: E5= 185 ps
24936 s: E5= 200 ps
12468 s: E5= 156 ps
6234 s: E5= 125 ps
3117 s: E5= 126 ps
1558 s: E5= 152 ps
779 s: E5= 194 ps
390 s: E5= 243 ps
195 s: E5= 399 ps
97 s: E5= 606 ps
49 s: E5= 852 ps
TdevE1 /s
TdevE5 /s
Tau /s

NISS-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 408780
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 68937 high elev obs : 126.287 126.466
Iteration 0: Obs used = 673682; Huge residuals = 114; Large residuals = 11614
Iteration 1: Obs used = 673760; Huge residuals = 0; Large residuals = 11422
Computed code bias (P1/P2)/m = 126.424 126.637
Computed baseline (X,Y,Z)/m = 212.083 36.497 93.577
RMS of residuals /m = 0.610

Number of phase differences to fit baseline
L1/L2 = 487869
L5 = 0
A priori baseline (X,Y,Z)/m = 212.083 36.497 93.577
55025 clock jitters computed out of 55051 intervals
AVE jitter /ps = 0.5 RMS jitter /ps = 9.0

Iter 1 Large residuals L1= 69
Iter 1 Large residuals L2= 70
Iter 1 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.049 -0.239 0.039
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.054 -0.251 0.047
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

Iter 2 Large residuals L1= 69
Iter 2 Large residuals L2= 70
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.049 -0.239 0.039
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.054 -0.251 0.047
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 212.032 36.252 93.620
55025 clock jitters computed out of 55051 intervals
AVE jitter /ps = -0.0 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 69
Iter 3 Large residuals L2= 70
Iter 3 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = 0.003 -0.001 -0.002
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.002 -0.013 0.006
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = 212.035 36.251 93.618
Final baseline L2 (X,Y,Z)/m = 212.030 36.239 93.626
Final baseline L5 (X,Y,Z)/m = 212.032 36.245 93.622

COMPUTATION OF CODE DIFFERENCES

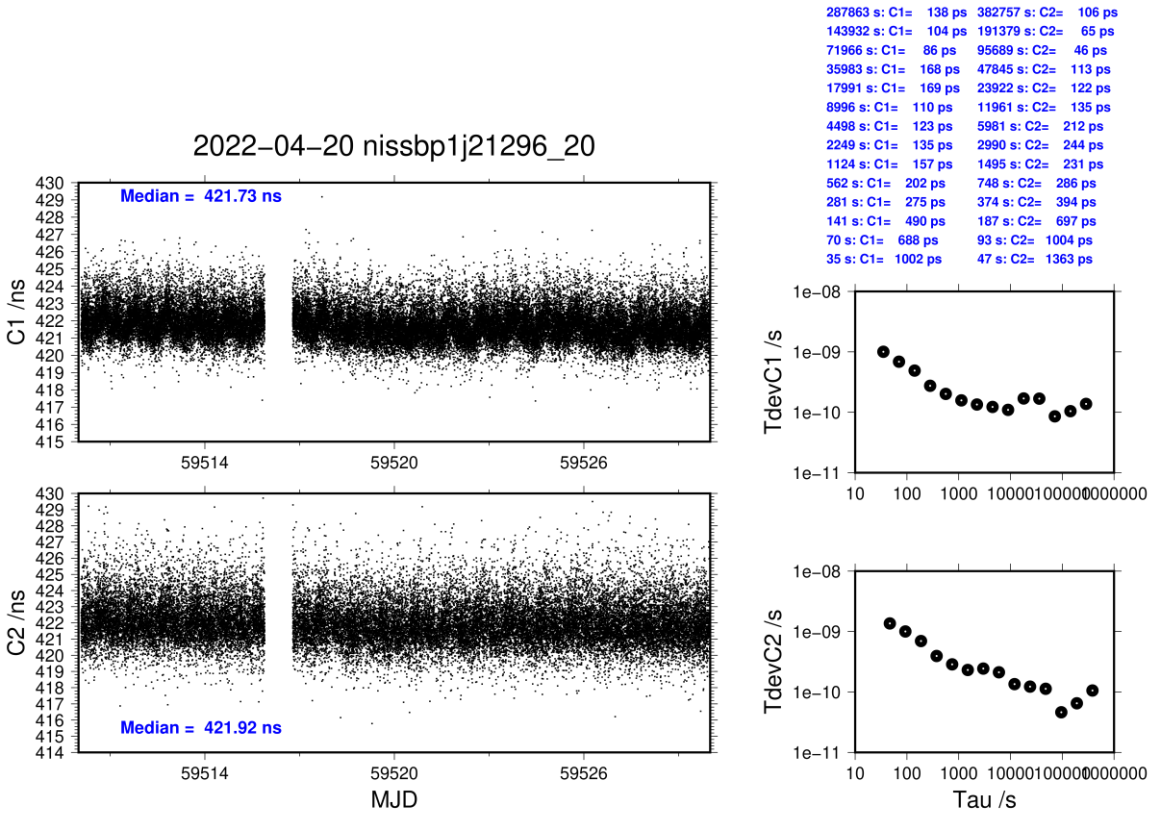
Total number of code differences = 886496

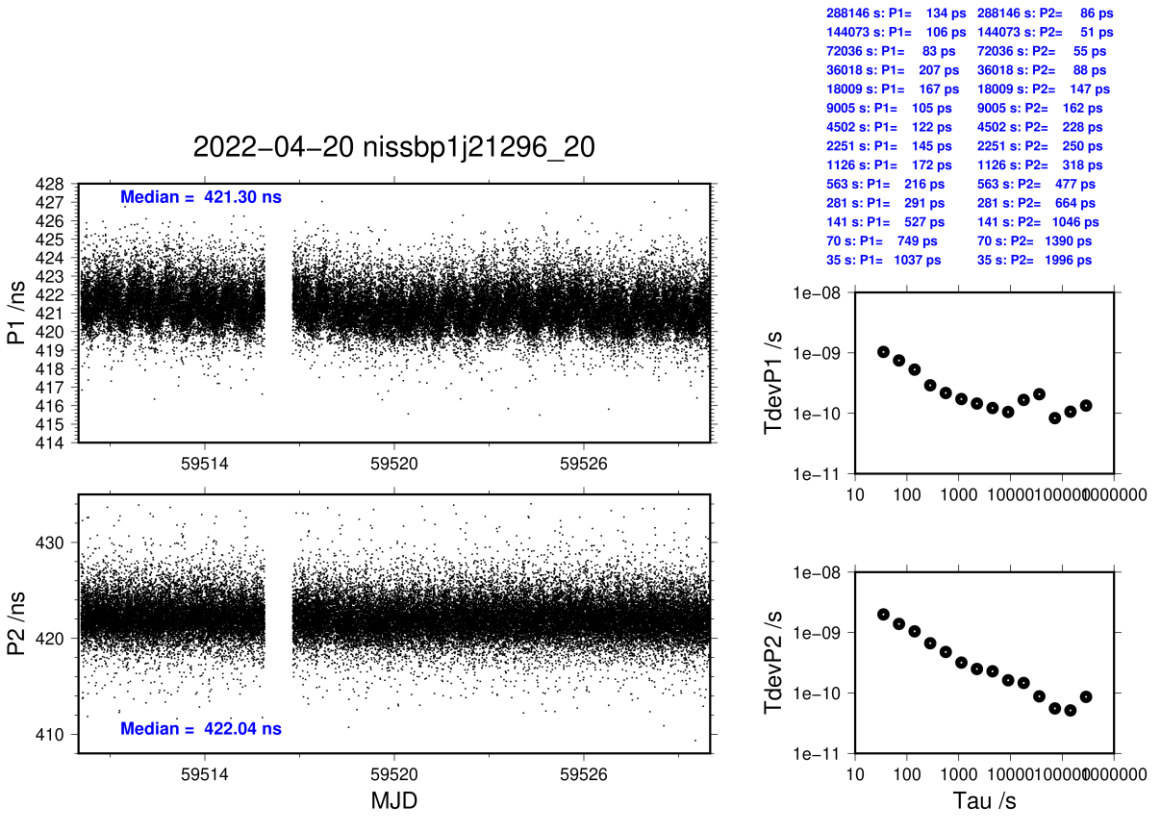
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	490486	421.815	1.680
C2	368487	422.053	2.201
P1	490031	421.363	1.738
P2	489923	422.126	2.945

Number of 300s epochs in out file = 5520

Code	#pts	median/ns	ave/ns	rms/ns
C1	48980	421.726	421.825	1.007
C2	36837	421.920	422.068	1.390
P1	48932	421.295	421.374	1.065
P2	48932	422.042	422.161	1.996




2022−04−20 nissbp1j21296_20
Median = 421.30 ns
Median = 422.04 ns
P1 /ns
P2 /ns
MJD
59514
59520
59526
288146 s: P1= 134 ps 288146 s: P2= 86 ps
144073 s: P1= 106 ps 144073 s: P2= 51 ps
72036 s: P1= 83 ps 72036 s: P2= 55 ps
36018 s: P1= 207 ps 36018 s: P2= 88 ps
18009 s: P1= 167 ps 18009 s: P2= 147 ps
9005 s: P1= 105 ps 9005 s: P2= 162 ps
4502 s: P1= 122 ps 4502 s: P2= 228 ps
2251 s: P1= 145 ps 2251 s: P2= 250 ps
1126 s: P1= 172 ps 1126 s: P2= 318 ps
563 s: P1= 216 ps 563 s: P2= 477 ps
281 s: P1= 291 ps 281 s: P2= 664 ps
141 s: P1= 527 ps 141 s: P2= 1046 ps
70 s: P1= 749 ps 70 s: P2= 1390 ps
35 s: P1= 1037 ps 35 s: P2= 1996 ps
TdevP1 /s
TdevP2 /s
Tau /s

NISS-BP25

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 445194
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 78185 high elev obs : 97.719 96.803
Iteration 0: Obs used = 727046; Huge residuals = 82; Large residuals = 13432
Iteration 1: Obs used = 726809; Huge residuals = 0; Large residuals = 13587
Computed code bias (P1/P2)/m = 96.936 95.863
Computed baseline (X,Y,Z)/m = 212.629 36.813 92.190
RMS of residuals /m = 0.642

Number of phase differences to fit baseline
L1/L2 = 475432
L5 = 0
A priori baseline (X,Y,Z)/m = 212.629 36.813 92.190
55248 clock jitters computed out of 55274 intervals
AVE jitter /ps = 0.3 RMS jitter /ps = 6.4

Iter 1 Large residuals L1= 72
Iter 1 Large residuals L2= 73
Iter 1 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.392 -1.177 0.693
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.399 -1.179 0.691
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

Iter 2 Large residuals L1= 72
Iter 2 Large residuals L2= 73
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.392 -1.177 0.693
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.399 -1.179 0.691
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 212.233 35.635 92.882
55248 clock jitters computed out of 55274 intervals
AVE jitter /ps = 0.3 RMS jitter /ps = 2.1

Iter 3 Large residuals L1= 72
Iter 3 Large residuals L2= 73
Iter 3 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.056 -0.039 0.030
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = -0.063 -0.041 0.028
RMS of residuals L2 /m = 0.005
No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = 212.177 35.596 92.912
Final baseline L2 (X,Y,Z)/m = 212.170 35.594 92.910
Final baseline L5 (X,Y,Z)/m = 212.173 35.595 92.911

COMPUTATION OF CODE DIFFERENCES

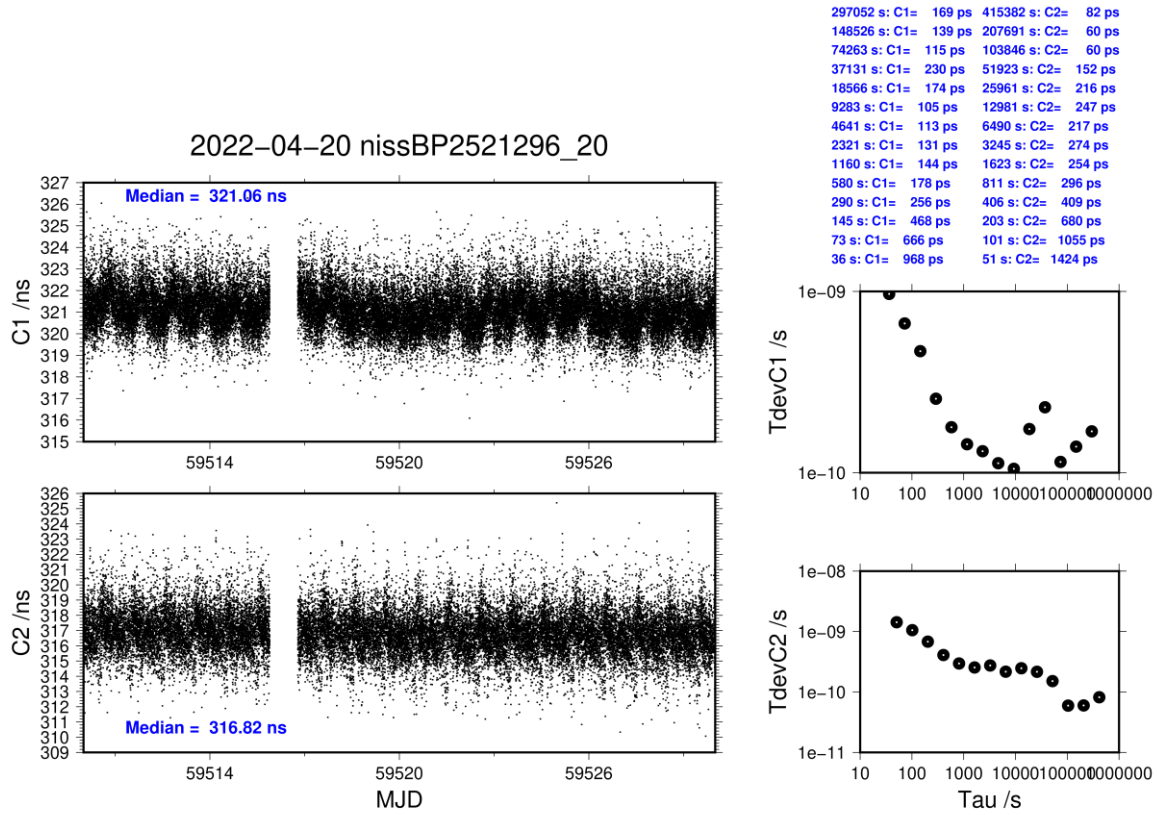
Total number of code differences = 849492

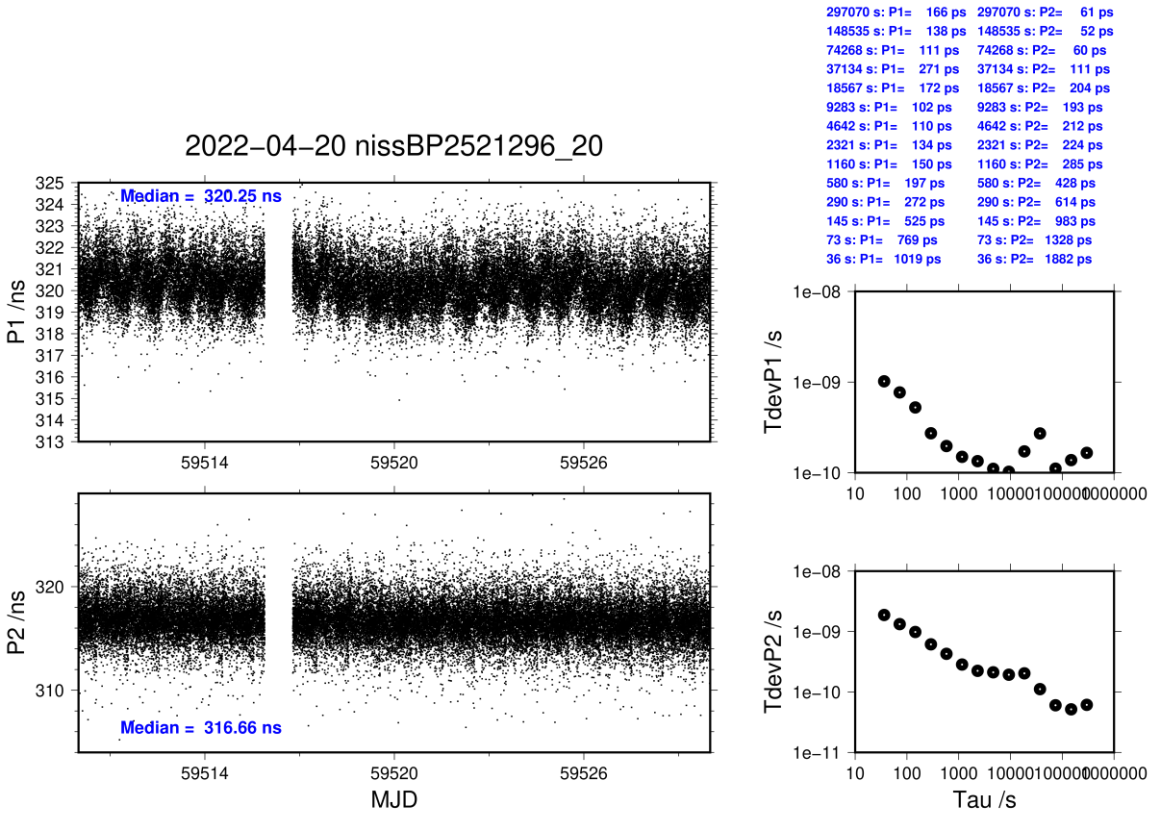
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	477011	321.100	1.476
C2	341062	316.841	2.048
P1	476952	320.302	1.552
P2	476874	316.676	2.758

Number of 300s epochs in out file = 5542

Code	#pts	median/ns	ave/ns	rms/ns
C1	47647	321.058	321.115	0.985
C2	34074	316.820	316.860	1.462
P1	47644	320.255	320.316	1.069
P2	47644	316.659	316.712	1.888




2022−04−20 nissBP2521296_20
Median = 320.25 ns
Median = 316.66 ns
P1 /ns
P2 /ns
MJD
297070 s: P1= 166 ps 297070 s: P2= 61 ps
148535 s: P1= 138 ps 148535 s: P2= 52 ps
74268 s: P1= 111 ps 74268 s: P2= 60 ps
37134 s: P1= 271 ps 37134 s: P2= 111 ps
18567 s: P1= 172 ps 18567 s: P2= 204 ps
9283 s: P1= 102 ps 9283 s: P2= 193 ps
4642 s: P1= 110 ps 4642 s: P2= 212 ps
2321 s: P1= 134 ps 2321 s: P2= 224 ps
1160 s: P1= 150 ps 1160 s: P2= 285 ps
580 s: P1= 197 ps 580 s: P2= 428 ps
290 s: P1= 272 ps 290 s: P2= 614 ps
145 s: P1= 525 ps 145 s: P2= 983 ps
73 s: P1= 769 ps 73 s: P2= 1328 ps
36 s: P1= 1019 ps 36 s: P2= 1882 ps
TdevP1 /s
TdevP2 /s
Tau /s

NISX-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 522569
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 73786 high elev obs : 41.207 40.706
Iteration 0: Obs used = 898747; Huge residuals = 70; Large residuals = 4839
Iteration 1: Obs used = 898747; Huge residuals = 0; Large residuals = 4769
Computed code bias (P1/P2)/m = 41.265 40.685
Computed baseline (X,Y,Z)/m = 2.802 -0.580 0.055
RMS of residuals /m = 0.526

Number of phase differences to fit baseline
L1/L2 = 519703
L5 = 273810
A priori baseline (X,Y,Z)/m = 2.802 -0.580 0.055
57371 clock jitters computed out of 57371 intervals
AVE jitter /ps = -0.0 RMS jitter /ps = 6.1

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 = -0.025 -0.077 0.017
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = -0.027 -0.084 0.027
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = -0.031 -0.083 0.029
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 2.775 -0.661 0.076
57371 clock jitters computed out of 57371 intervals
AVE jitter /ps = 0.0 RMS jitter /ps = 0.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.000 0.002 -0.004
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = -0.002 -0.005 0.006
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = -0.006 -0.005 0.008
RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m = 2.775 -0.659 0.072
Final baseline L2 (X,Y,Z)/m = 2.773 -0.666 0.082
Final baseline L5 (X,Y,Z)/m = 2.770 -0.666 0.084

COMPUTATION OF CODE DIFFERENCES

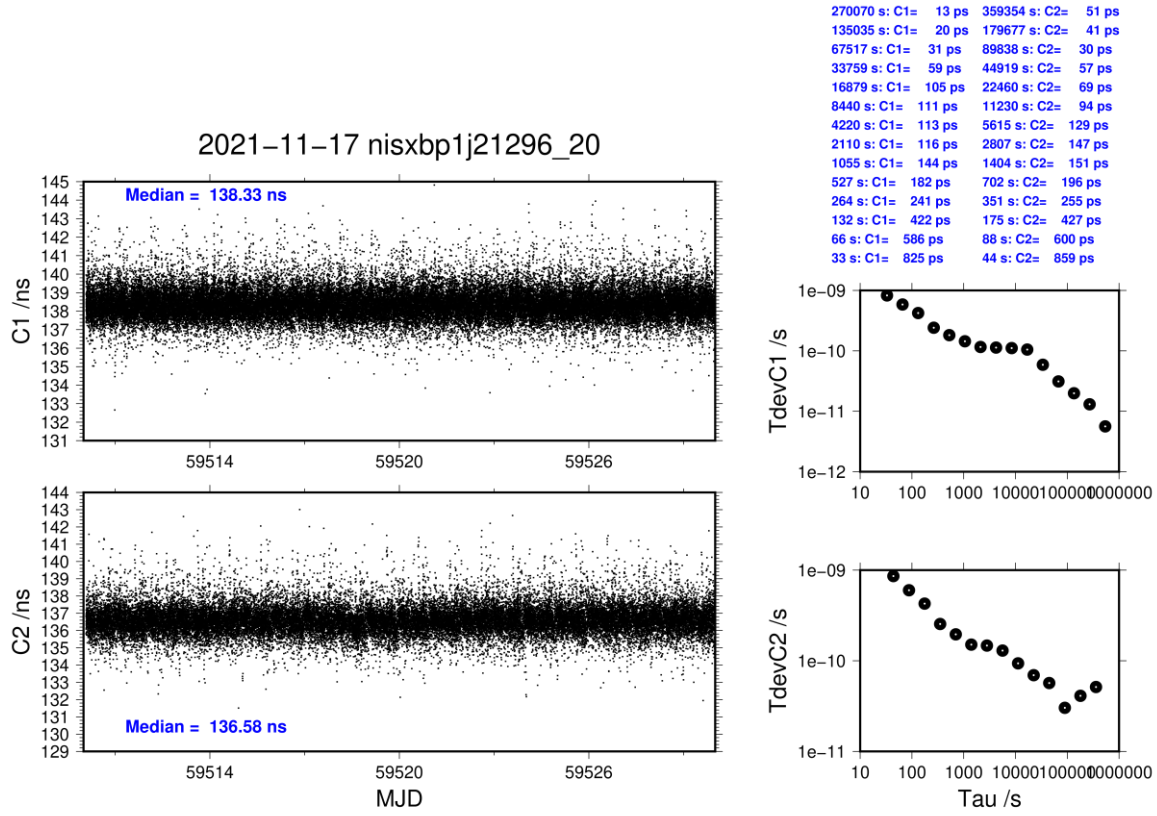
Total number of code differences = ******

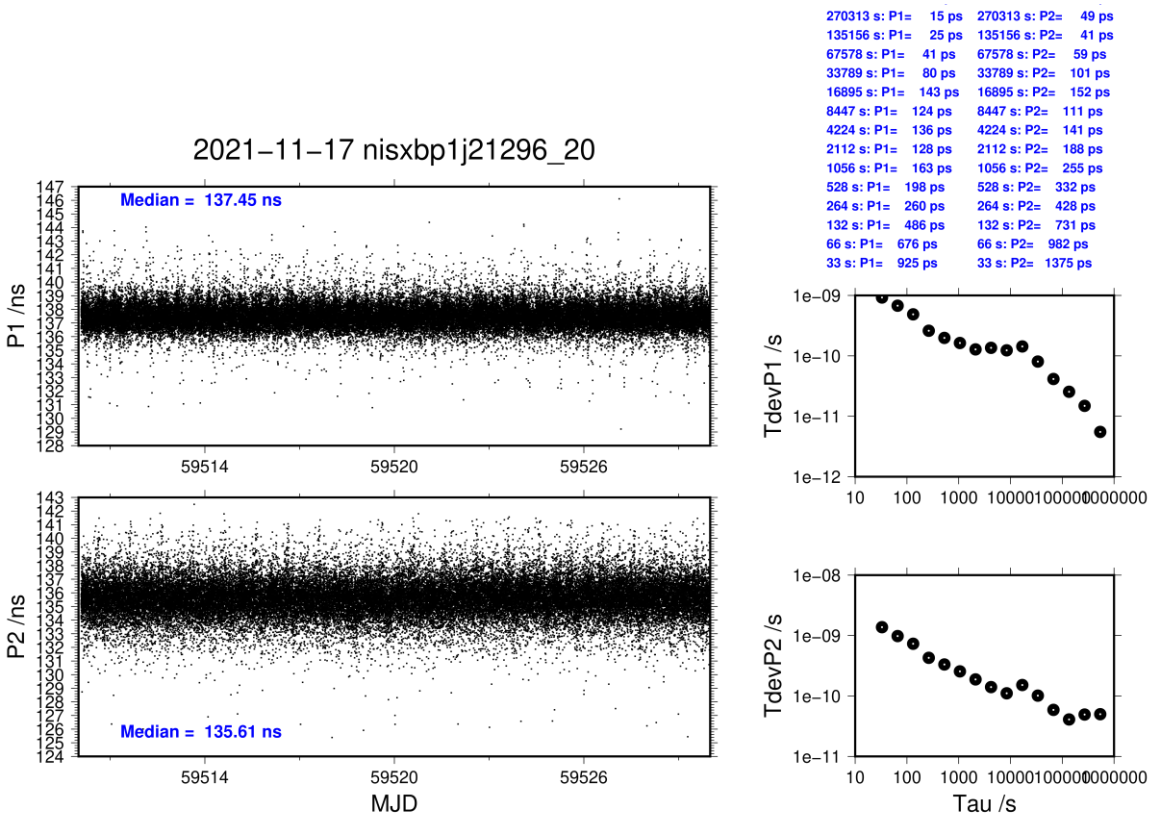
Global average of individual differences

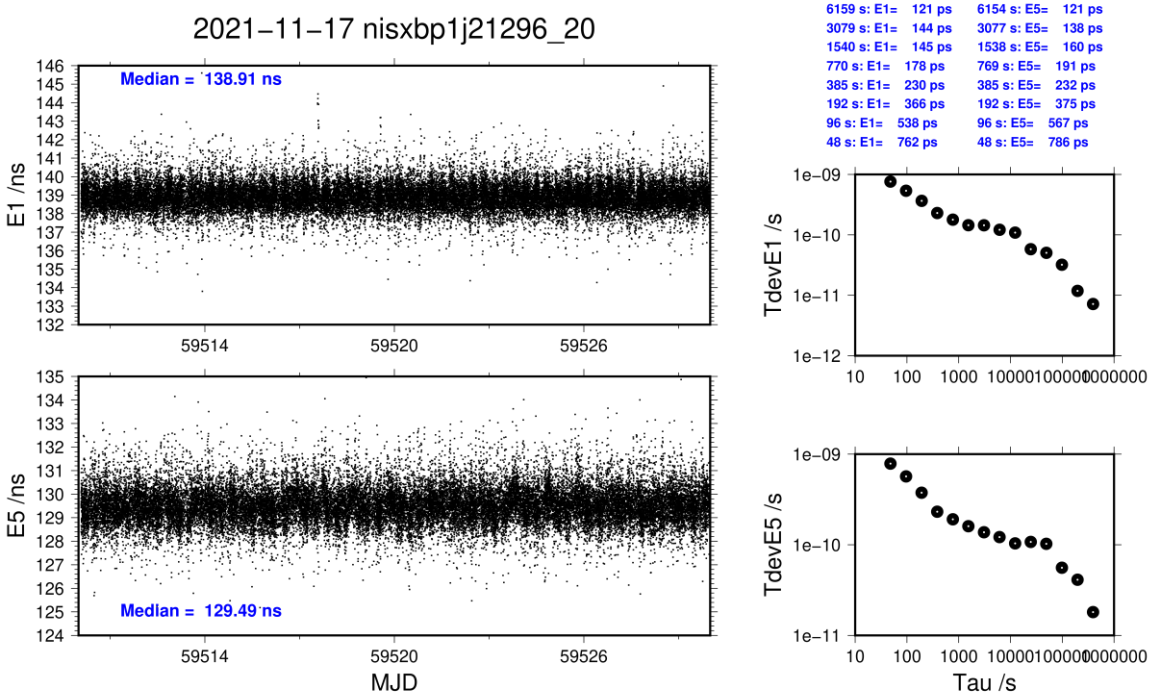
Code	#pts	ave/ns	rms/ns
C1	522899	138.388	1.469
C2	392835	136.613	1.632
P1	522431	137.510	1.554
P2	522431	135.582	1.938
E1	358096	138.928	1.224
E5	358400	129.523	1.180

Number of 300s epochs in out file = 5738

Code	#pts	median/ns	ave/ns	rms/ns
C1	52207	138.332	138.386	0.826
C2	39236	136.576	136.615	0.856
P1	52160	137.451	137.508	0.939
P2	52160	135.607	135.601	1.390
E1	35772	138.911	138.936	0.763
E5	35799	129.487	129.519	0.799




2021−11−17 nisxbp1j21296_20
Median = 137.45 ns
Median = 135.61 ns
P1 /ns
P2 /ns
MJD
59514
59520
59526
270313 s: P1= 15 ps 270313 s: P2= 49 ps
135156 s: P1= 25 ps 135156 s: P2= 41 ps
67578 s: P1= 41 ps 67578 s: P2= 59 ps
33789 s: P1= 80 ps 33789 s: P2= 101 ps
16895 s: P1= 143 ps 16895 s: P2= 152 ps
8447 s: P1= 124 ps 8447 s: P2= 111 ps
4224 s: P1= 136 ps 4224 s: P2= 141 ps
2112 s: P1= 128 ps 2112 s: P2= 188 ps
1056 s: P1= 163 ps 1056 s: P2= 255 ps
528 s: P1= 198 ps 528 s: P2= 332 ps
264 s: P1= 260 ps 264 s: P2= 428 ps
132 s: P1= 486 ps 132 s: P2= 731 ps
66 s: P1= 676 ps 66 s: P2= 982 ps
33 s: P1= 925 ps 33 s: P2= 1375 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021−11−17 nisxbp1j21296_20
Median = 138.91 ns
Median = 129.49 ns
E1 /ns
E5 /ns
MJD
59514
59520
59526
394153 s: E1= 7 ps 393856 s: E5= 18 ps
197077 s: E1= 12 ps 196928 s: E5= 41 ps
98538 s: E1= 32 ps 98464 s: E5= 56 ps
49269 s: E1= 50 ps 49232 s: E5= 102 ps
24635 s: E1= 58 ps 24616 s: E5= 107 ps
12317 s: E1= 109 ps 12308 s: E5= 104 ps
6159 s: E1= 121 ps 6154 s: E5= 121 ps
3079 s: E1= 144 ps 3077 s: E5= 138 ps
1540 s: E1= 145 ps 1538 s: E5= 160 ps
770 s: E1= 178 ps 769 s: E5= 191 ps
385 s: E1= 230 ps 385 s: E5= 232 ps
192 s: E1= 366 ps 192 s: E5= 375 ps
96 s: E1= 538 ps 96 s: E5= 567 ps
48 s: E1= 762 ps 48 s: E5= 786 ps
TdevE1 /s
TdevE5 /s
Tau /s

NISX-BP25

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 465289
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 74124 high elev obs : 10.816 9.044
Iteration 0: Obs used = 786361; Huge residuals = 0; Large residuals = 2011
Iteration 1: Obs used = 786361; Huge residuals = 0; Large residuals = 2011
Computed code bias (P1/P2)/m = 10.906 9.015
Computed baseline (X,Y,Z)/m = 2.939 -1.357 -0.585
RMS of residuals /m = 0.489

Number of phase differences to fit baseline
L1/L2 = 463393
L5 = 250457
A priori baseline (X,Y,Z)/m = 2.939 -1.357 -0.585
57596 clock jitters computed out of 57596 intervals
AVE jitter /ps = 0.0 RMS jitter /ps = 3.9

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 = 0.007 0.023 -0.056
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.008 0.031 -0.059
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.007 0.032 -0.061
RMS of residuals L5 /m = 0.004

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 2.946 -1.330 -0.643
57596 clock jitters computed out of 57596 intervals
AVE jitter /ps = 0.0 RMS jitter /ps = 0.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = -0.001 -0.003 -0.000
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = -0.000 0.005 -0.004
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = -0.001 0.009 -0.006
RMS of residuals L5 /m = 0.004

Final baseline L1 (X,Y,Z)/m = 2.945 -1.333 -0.643
Final baseline L2 (X,Y,Z)/m = 2.946 -1.325 -0.646
Final baseline L5 (X,Y,Z)/m = 2.945 -1.321 -0.649

COMPUTATION OF CODE DIFFERENCES

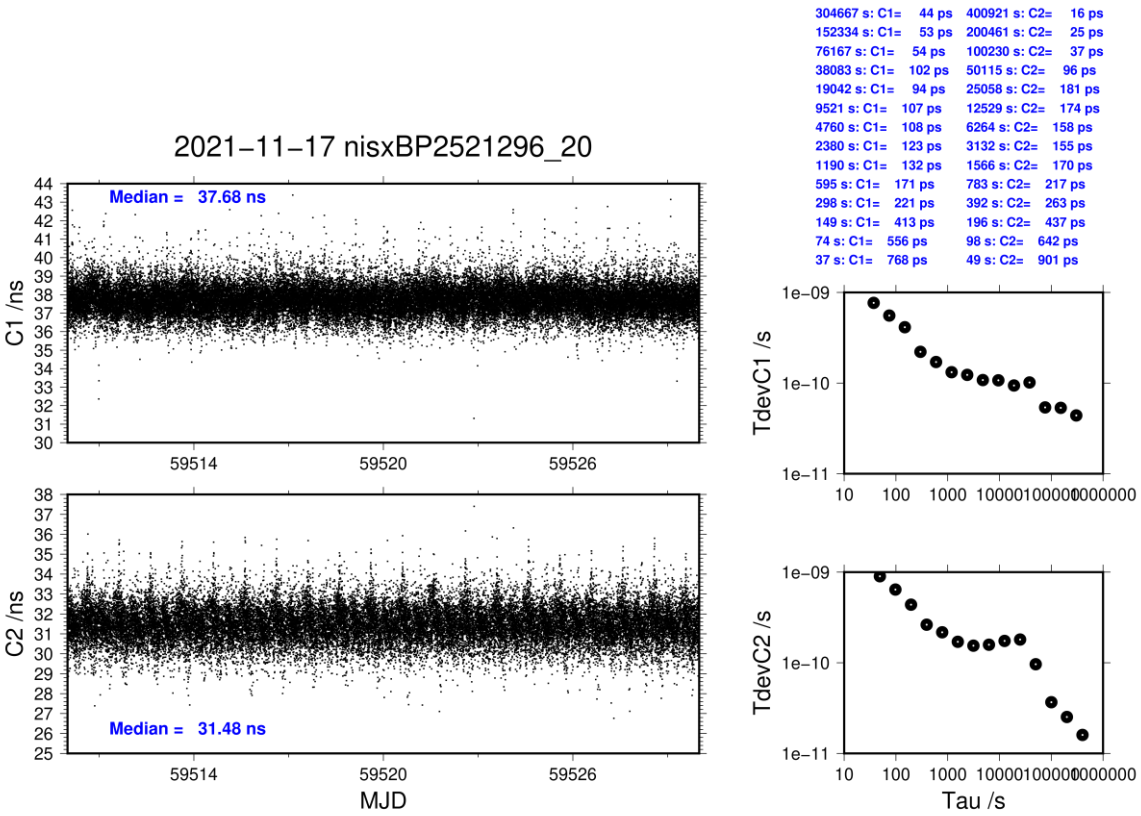
Total number of code differences = ******

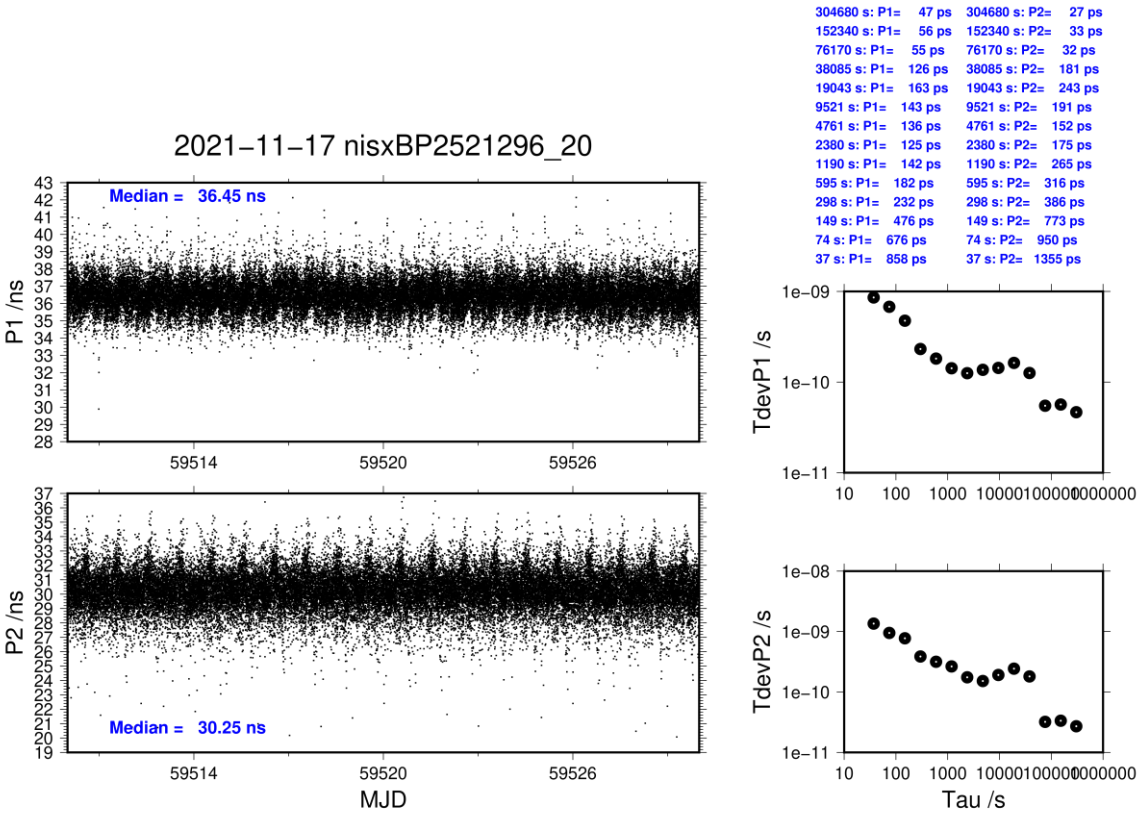
Global average of individual differences

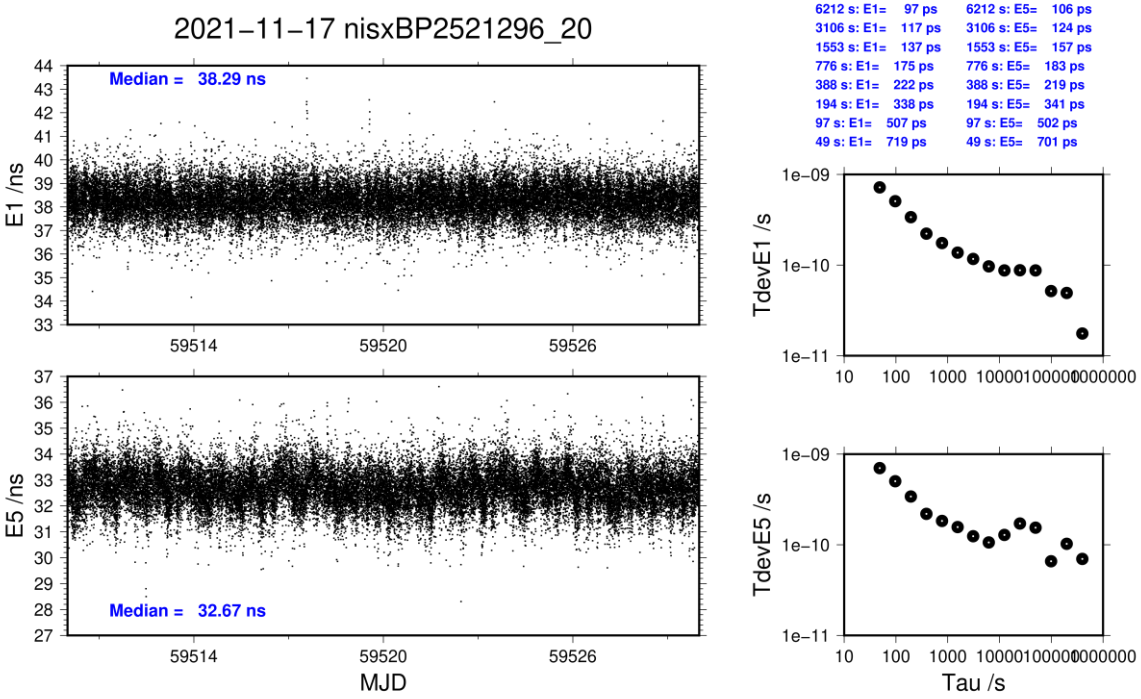
Code	#pts	ave/ns	rms/ns
C1	465239	37.708	1.222
C2	353536	31.488	1.371
P1	465227	36.469	1.317
P2	465227	30.222	1.841
E1	356307	38.290	1.084
E5	356306	32.682	0.985

Number of 300s epochs in out file = 5760

Code	#pts	median/ns	ave/ns	rms/ns
C1	46456	37.678	37.703	0.785
C2	35303	31.479	31.491	0.923
P1	46454	36.448	36.464	0.907
P2	46454	30.255	30.239	1.389
E1	35601	38.289	38.291	0.722
E5	35601	32.675	32.678	0.744




2021−11−17 nisxBP2521296_20
Median = 36.45 ns
Median = 30.25 ns
P1 /ns
P2 /ns
MJD
304680 s: P1= 47 ps
152340 s: P1= 56 ps
76170 s: P1= 55 ps
38085 s: P1= 126 ps
19043 s: P1= 163 ps
9521 s: P1= 143 ps
4761 s: P1= 136 ps
2380 s: P1= 125 ps
1190 s: P1= 142 ps
595 s: P1= 182 ps
298 s: P1= 232 ps
149 s: P1= 476 ps
74 s: P1= 676 ps
37 s: P1= 858 ps
304680 s: P2= 27 ps
152340 s: P2= 33 ps
76170 s: P2= 32 ps
38085 s: P2= 181 ps
19043 s: P2= 243 ps
9521 s: P2= 191 ps
4761 s: P2= 152 ps
2380 s: P2= 175 ps
1190 s: P2= 265 ps
595 s: P2= 316 ps
298 s: P2= 386 ps
149 s: P2= 773 ps
74 s: P2= 950 ps
37 s: P2= 1355 ps
TdevP1 /s
TdevP2 /s
Tau /s


2021−11−17 nisxBP2521296_20
Median = 38.29 ns
Median = 32.67 ns
E1 /ns
E5 /ns
MJD
397565 s: E1= 18 ps
198783 s: E1= 49 ps
99391 s: E1= 52 ps
49696 s: E1= 87 ps
24848 s: E1= 88 ps
12424 s: E1= 87 ps
6212 s: E1= 97 ps
3106 s: E1= 117 ps
1553 s: E1= 137 ps
776 s: E1= 175 ps
388 s: E1= 222 ps
194 s: E1= 338 ps
97 s: E1= 507 ps
49 s: E1= 719 ps
397565 s: E5= 70 ps
198783 s: E5= 102 ps
99391 s: E5= 66 ps
49696 s: E5= 154 ps
24848 s: E5= 172 ps
12424 s: E5= 128 ps
6212 s: E5= 106 ps
3106 s: E5= 124 ps
1553 s: E5= 157 ps
776 s: E5= 183 ps
388 s: E5= 219 ps
194 s: E5= 341 ps
97 s: E5= 502 ps
49 s: E5= 701 ps
TdevE1 /s
TdevE5 /s
Tau /s

3.3/ USNO (21355)

Period

MJD 59569 to 59579

Delays

BP1J: (page 3 & 48)

X_O = 131.38 ns (146.89-15.51)

X_P = 40.00 ns (53.60-13.60)

REFDLY = 171.38 ns

CABDLY = 176.38 ns (C211)

BP25:

receiver did not collect GNSS data

USN6 (US06): (cf page 47)

« delay from local UTC(k) to 1PPS-in » from Annex A is for informational purposes only

CGGTTS TOTDLY = -6.0 ns (GPS C1), -8.8 ns (GPS P2)

USN7 (US09): (cf page 49)

CGGTTS TOTDLY = 204.8 ns (GPS C1), 200.8 ns (GPS P2)

USN8 (US10): (cf page 52)

« delay from local UTC(k) to 1PPS-in » from Annex A is for informational purposes only

CGGTTS TOTDLY = 199.5 ns (GPS C1), 196.4 ns (GPS P2)

USN9 (US11): (cf page 54)

« delay from local UTC(k) to 1PPS-in » from Annex A is for informational purposes only

CGGTTS TOTDLY = 203.0 ns (GPS C1), 217.9 ns (GPS P2)

Setup at the USNO

Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	USNO (Washington DC)
Date and hour of the beginning of measurements:	**Dec-21-2021 00:00:00**
Date and hour of the end of measurements:	**Jan-07-2022 23:59:59**

Information on the system

	Local:	**Travelling:**
4-character BIPM code	USN6	BP1J, BP25
• Receiver maker and type: Receiver serial number:	NovAtel ProPak3 NOV1	Septentrio 27 (3001388), Mesit 1808001
1 PPS trigger level /V:	1V	
• Antenna cable maker and type: Phase stabilised cable (Y/N):	FSJ1-50A Y	
Length outside the building /m:	>39m	
• Antenna maker and type: Antenna serial number:	TOPCON/CRG5 762-7615	
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:	0.231ns	(see diagram)
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	N/A	(see diagram)
• Antenna cable delay:		(1)
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

• INT DLY (GPS) /ns:	P1= -6.0ns, P2= -8.8ns
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	1112162.141
Longitude or Y /m:	-4842854.681
Height or Z /m:	3985497.078

General information

• Rise time of the local UTC pulse:	0.300 ns (0V to 1V)
• Is the laboratory air conditioned:	Y
Set temperature value and uncertainty:	21.02 ± 0.7 °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.

Diagram of the experiment set-up:

USNO to BIPM Clock Signals (12/21/2021) to (01/28/2022)

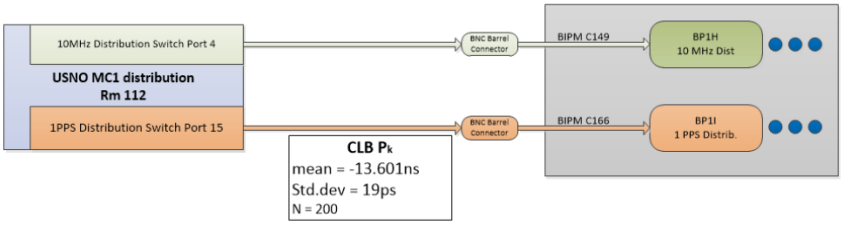


Figure 1: Clock Signal connections

BP1J Start: Dec-09-2021

Before Operation:
mean = +15.493ns
Std. dev = 43ps
N = 200

During Operation:
mean = +146.884ns
Std. dev = 122ps
N = 200

BP1J End: Jan-28-2022

During Operation:
mean = +146.884 ns
Std. dev = 122 ps
N = 200

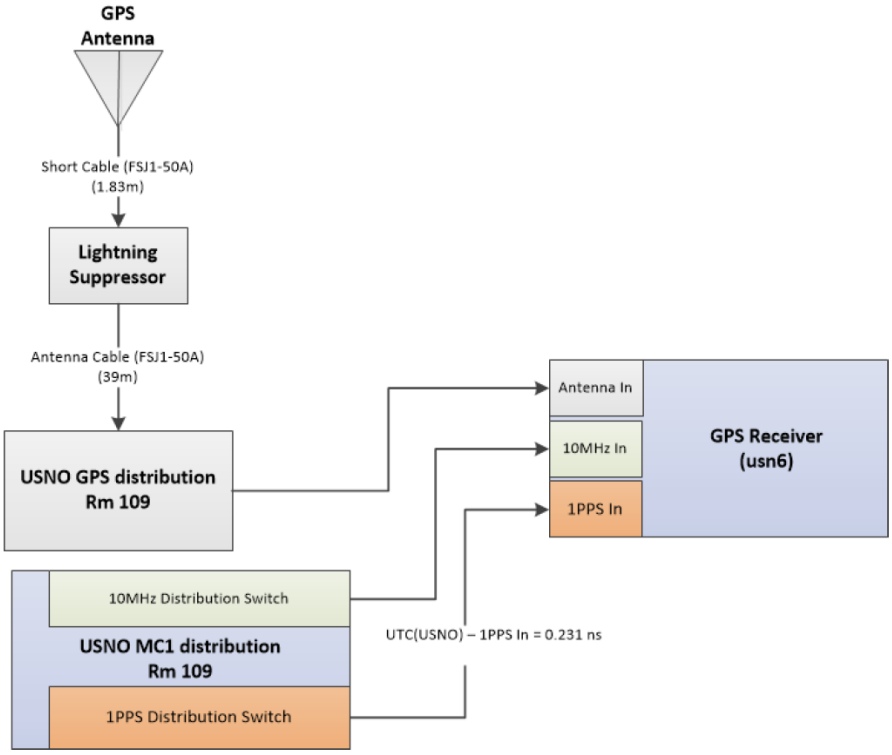
After Operation:
mean = +15.526 ns
Std. dev = 46 ps
N = 200

Figure 2: BP1J Tare Measurements

NOTES:

- BP25 Receiver did not collect GNSS data. Main display on the BP25 web page shows that 1PPS input is "Not Connected", regardless of an actual connection of a 1PPS signal.
- All 1PPS measurements done using BIPM TIC SR620

USNO Clock and GPS Distribution (usn6)



Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	USNO (Washington DC)
Date and hour of the beginning of measurements:	**Dec-21-2021 00:00:00**
Date and hour of the end of measurements:	**Jan-07-2022 23:59:59**

Information on the system

	Local:	**Travelling:**
4-character BIPM code	USN7	BP1J, BP25
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5 TR 3013939	Septentrio 27 (3001388), Mesit 1808001
1 PPS trigger level /V:	1V	
• Antenna cable maker and type: Phase stabilised cable (Y/N):	FSJ1-50A Y	
Length outside the building /m:	>39m	
• Antenna maker and type: Antenna serial number:	TOPCON/CRG5 762-7615	
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:	0.0 ns (included in INT DLY)	(see diagram)
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	N/A	(see diagram)
• Antenna cable delay:		(1)
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

• INT DLY (GPS) /ns:	P1= 204.8 ns, P2= 200.8 ns
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	1112162.141
Longitude or Y /m:	-4842854.681
Height or Z /m:	3985497.078

General information

• Rise time of the local UTC pulse:	0.300 ns (0V to 1V)
• Is the laboratory air conditioned:	Y
Set temperature value and uncertainty:	21.02 ± 0.7 °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.

Diagram of the experiment set-up:

USNO to BIPM Clock Signals (12/21/2021) to (01/28/2022)

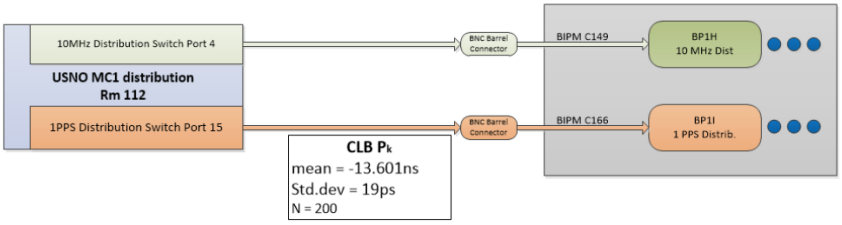


Figure 1: Clock Signal connections

BP1J Start: Dec-09-2021

Before Operation:
mean = +15.493ns
Std. dev = 43ps
N = 200

During Operation:
mean = +146.884ns
Std. dev = 122ps
N = 200

BP1J End: Jan-28-2022

During Operation:
mean = +146.884 ns
Std. dev = 122 ps
N = 200

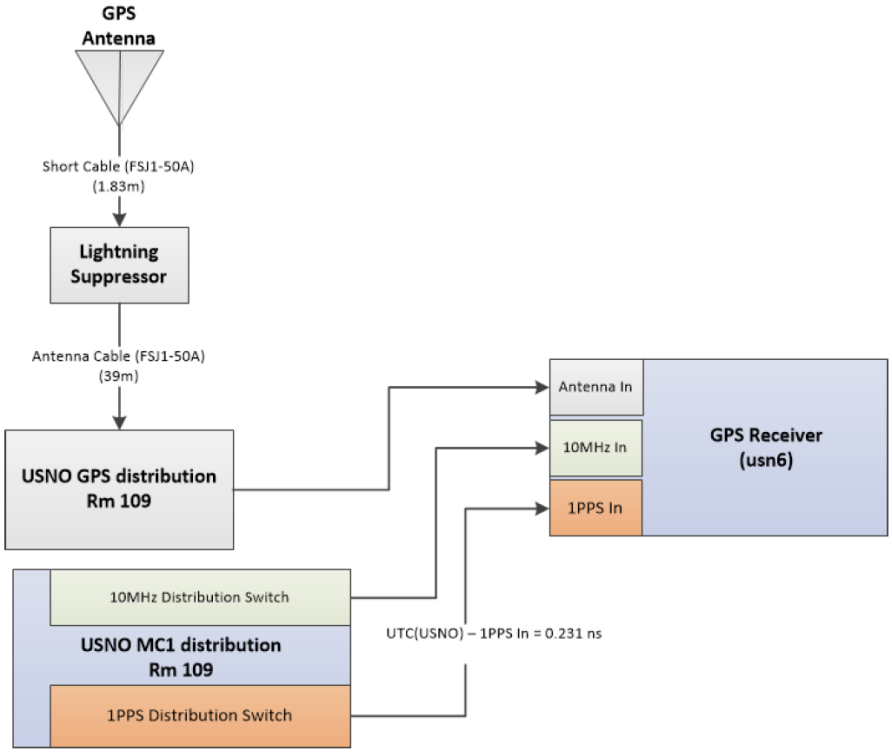
After Operation:
mean = +15.526 ns
Std. dev = 46 ps
N = 200

Figure 2: BP1J Tare Measurements

NOTES:

- BP25 Receiver did not collect GNSS data. Main display on the BP25 web page shows that 1PPS input is "Not Connected", regardless of an actual connection of a 1PPS signal.
- All 1PPS measurements done using BIPM TIC SR620

USNO Clock and GPS Distribution (usn6)



Log of Events / Additional Information :

Note that in the diagram USN6 is specified. Please disregard the UTC(USNO) – 1PPS In. Otherwise, the configuration of the two GNSS receiver systems is identical between USN6 and USN7.

Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	USNO (Washington DC)
Date and hour of the beginning of measurements:	**Dec-21-2021 00:00:00**
Date and hour of the end of measurements:	**Jan-07-2022 23:59:59**

Information on the system

	Local:	**Travelling:**
4-character BIPM code	USN8	BP1J, BP25
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701171 (SP10)	Septentrio 27 (3001388), Mesit 1808001
1 PPS trigger level /V:	1V	
• Antenna cable maker and type: Phase stabilised cable (Y/N):	FSJ1-50A Y	
Length outside the building /m:	>39m	
• Antenna maker and type: Antenna serial number:	TOPCON/CRG5 762-7615	
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:	-0.226ns	(see diagram)
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	N/A	(see diagram)
• Antenna cable delay:	N/A	(1)
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

• INT DLY (GPS) /ns:	P1= 199.5ns, P2= 196.4ns
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	1112162.141
Longitude or Y /m:	-4842854.681
Height or Z /m:	3985497.078

General information

• Rise time of the local UTC pulse:	0.300 ns (0V to 1V)
• Is the laboratory air conditioned:	Y
Set temperature value and uncertainty:	21.02 ± 0.7 °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.

Diagram of the experiment set-up:

USNO to BIPM Clock Signals (12/21/2021) to (01/28/2022)

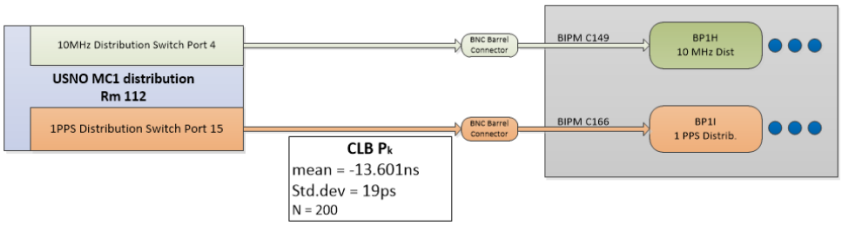


Figure 1: Clock Signal connections

BP1J Start: Dec-09-2021

Before Operation:
mean = +15.493ns
Std. dev = 43ps
N = 200

During Operation:
mean = +146.884ns
Std. dev = 122ps
N = 200

BP1J End: Jan-28-2022

During Operation:
mean = +146.884 ns
Std. dev = 122 ps
N = 200

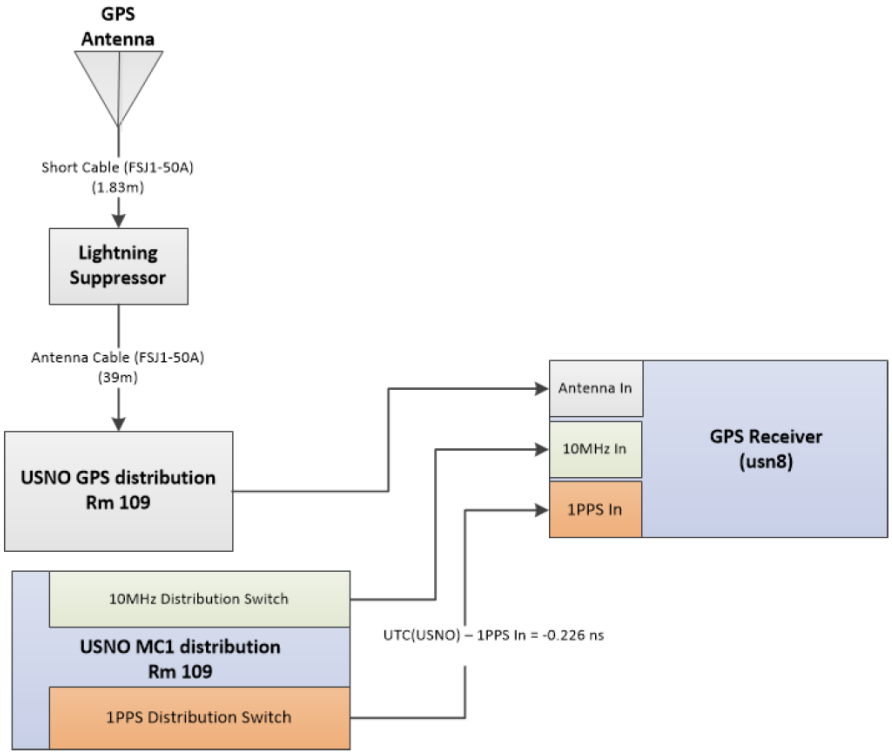
After Operation:
mean = +15.526 ns
Std. dev = 46 ps
N = 200

Figure 2: BP1J Tare Measurements

NOTES:

- BP25 Receiver did not collect GNSS data. Main display on the BP25 web page shows that 1PPS input is "Not Connected", regardless of an actual connection of a 1PPS signal.
- All 1PPS measurements done using BIPM TIC SR620

USNO Clock and GPS Distribution (usn8)



Annex A - Information Sheet

(to be repeated for each calibrated system)

Laboratory:	USNO (Washington DC)
Date and hour of the beginning of measurements:	**Dec-21-2021 00:00:00**
Date and hour of the end of measurements:	**Jan-07-2022 23:59:59**

Information on the system

	Local:	**Travelling:**
4-character BIPM code	USN9	BP1J, BP25
• Receiver maker and type: Receiver serial number:	NovAtel ProPak6 NOV5	Septentrio 27 (3001388), Mesit 1808001
1 PPS trigger level /V:	1V	
• Antenna cable maker and type: Phase stabilised cable (Y/N):	FSJ1-50A Y	
Length outside the building /m:	>39m	
• Antenna maker and type: Antenna serial number:	TOPCON/CRG5 762-7615	
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:	0.3 ns	(see diagram)
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	N/A	(see diagram)
• Antenna cable delay:	N/A	(1)
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

• INT DLY (GPS) /ns:	P1= 203.0089ns, P2=217.8599ns
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	1112162.141
Longitude or Y /m:	-4842854.681
Height or Z /m:	3985497.078

General information

• Rise time of the local UTC pulse:	0.300 ns (0V to 1V)
• Is the laboratory air conditioned:	Y
Set temperature value and uncertainty:	21.02 ± 0.7 °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.

Diagram of the experiment set-up:

USNO to BIPM Clock Signals (12/21/2021) to (01/28/2022)

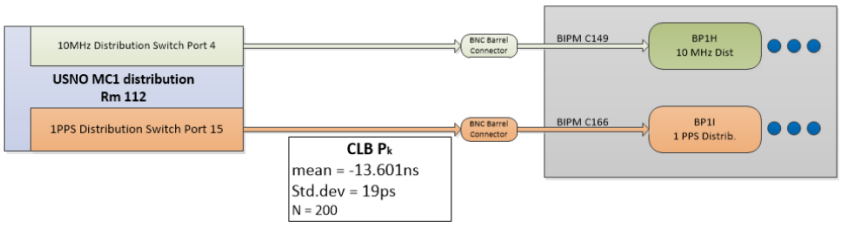


Figure 1: Clock Signal connections

BP1J Start: Dec-09-2021

Before Operation:
mean = +15.493ns
Std. dev = 43ps
N = 200
During Operation:
mean = +146.884ns
Std. dev = 122ps
N = 200

BP1J End: Jan-28-2022

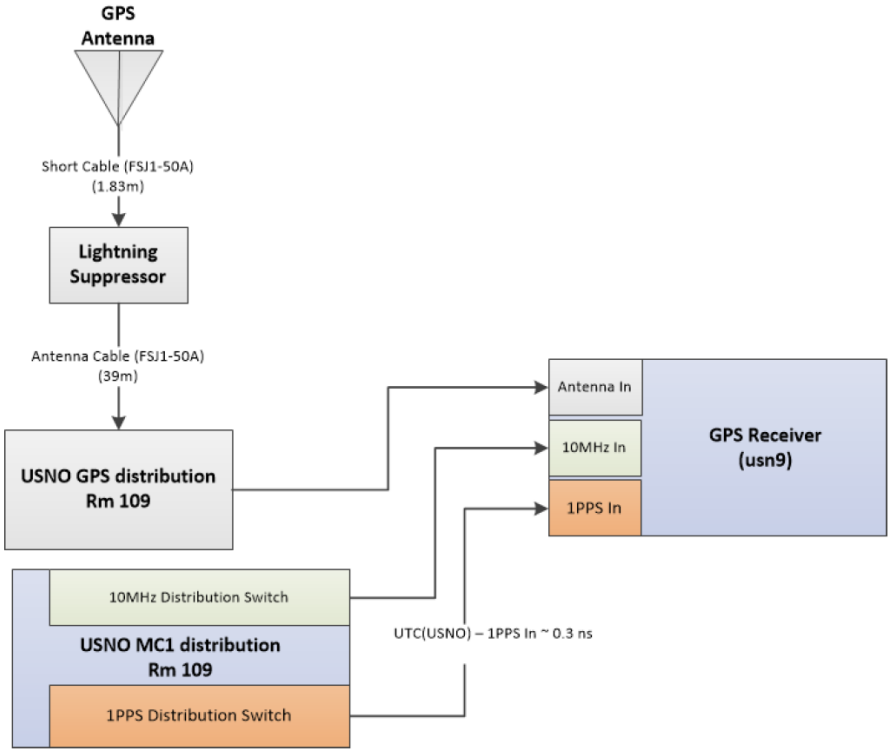
During Operation:
mean = +146.884 ns
Std. dev = 122 ps
N = 200
After Operation:
mean = +15.526 ns
Std. dev = 46 ps
N = 200

Figure 2: BP1J Tare Measurements

NOTES:

- BP25 Receiver did not collect GNSS data. Main display on the BP25 web page shows that 1PPS input is "Not Connected", regardless of an actual connection of a 1PPS signal.
- All 1PPS measurements done using BIPM TIC SR620

USNO Clock and GPS Distribution (usn9)



Log of Events / Additional Information :

USN6-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 277714
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 38903 high elev obs : -19.288 -19.940
Iteration 0: Obs used = 478973; Huge residuals = 0; Large residuals = 2765
Iteration 1: Obs used = 478973; Huge residuals = 0; Large residuals = 2765
Computed code bias (P1/P2)/m = -19.383 -20.077
Computed baseline (X,Y,Z)/m = 4.227 0.969 0.159
RMS of residuals /m = 0.535

Number of phase differences to fit baseline
L1/L2 = 276026
L5 = 0
A priori baseline (X,Y,Z)/m = 4.227 0.969 0.159
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = 0.1 RMS jitter /ps = 4.8

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 = 0.058 -0.116 0.037
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.057 -0.116 0.034
RMS of residuals L2 /m = 0.004
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 = 0.058 -0.116 0.037
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.057 -0.116 0.034
RMS of residuals L2 /m = 0.004
No computed baseline L5, will use L1/L2

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 4.285 0.854 0.194
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = -0.1 RMS jitter /ps = 0.1

Iter 3 Large residuals L1= 0
Iter 3 Large residuals L2= 1
Iter 3 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = 0.009 -0.002 0.002
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.008 -0.002 -0.001
RMS of residuals L2 /m = 0.004
No computed baseline L5, will use L1/L2

Final baseline L1 (X,Y,Z)/m = 4.294 0.852 0.197
Final baseline L2 (X,Y,Z)/m = 4.293 0.852 0.194
Final baseline L5 (X,Y,Z)/m = 4.293 0.852 0.195

COMPUTATION OF CODE DIFFERENCES

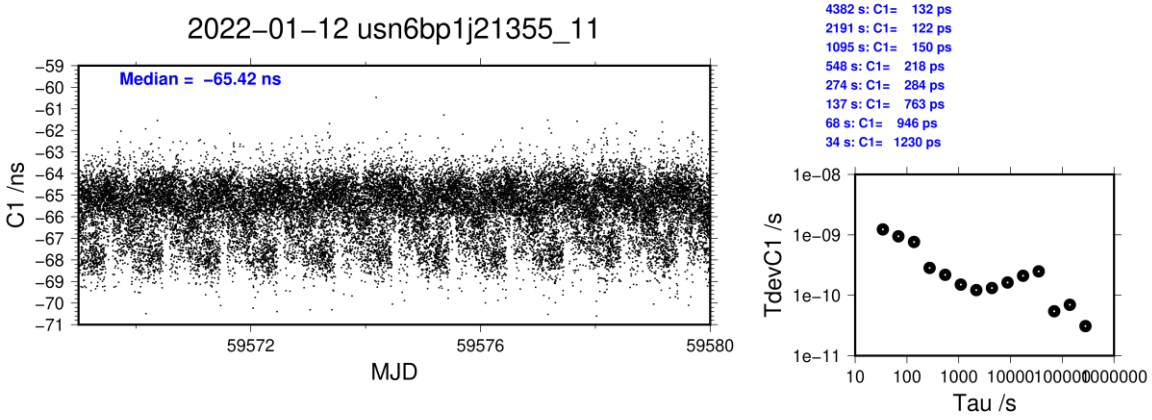
Total number of code differences = 495727

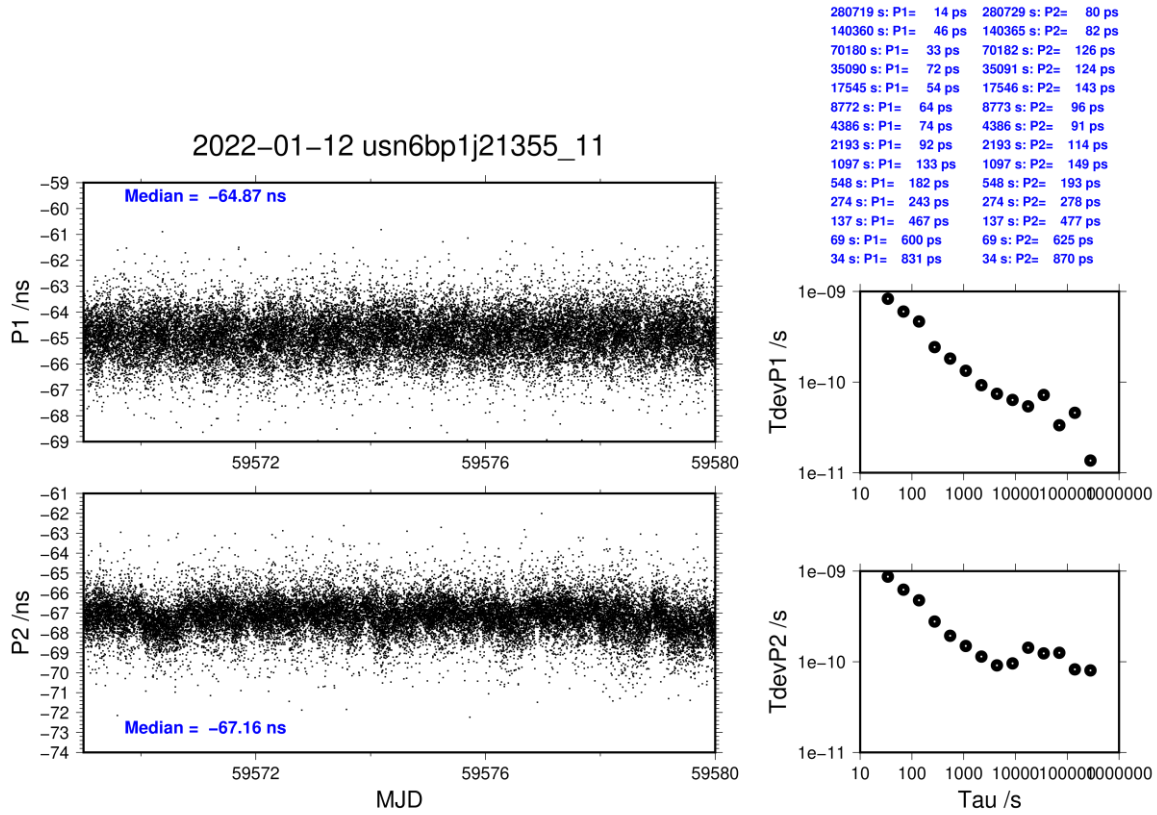
Global average of individual differences

Code	#pts	ave/ns	rms/ns
C1	277928	-65.683	1.926
P1	277646	-64.896	1.658
P2	277632	-67.201	1.907

Number of 300s epochs in out file = 3168

Code	#pts	median/ns	ave/ns	rms/ns
C1	27754	-65.416	-65.666	1.294
P1	27727	-64.874	-64.880	0.840
P2	27726	-67.159	-67.177	0.910




2022−01−12 usn6bp1j21355_11
Median = −64.87 ns
Median = −67.16 ns
P1 /ns
P2 /ns
MJD
59572
59576
59580
280719 s: P1= 14 ps
140360 s: P1= 46 ps
70180 s: P1= 33 ps
35090 s: P1= 72 ps
17545 s: P1= 54 ps
8772 s: P1= 64 ps
4386 s: P1= 74 ps
2193 s: P1= 92 ps
1097 s: P1= 133 ps
548 s: P1= 182 ps
274 s: P1= 243 ps
137 s: P1= 467 ps
69 s: P1= 600 ps
34 s: P1= 831 ps
280729 s: P2= 80 ps
140365 s: P2= 82 ps
70182 s: P2= 126 ps
35091 s: P2= 124 ps
17546 s: P2= 143 ps
8773 s: P2= 96 ps
4386 s: P2= 91 ps
2193 s: P2= 114 ps
1097 s: P2= 149 ps
548 s: P2= 193 ps
274 s: P2= 278 ps
137 s: P2= 477 ps
69 s: P2= 625 ps
34 s: P2= 870 ps
TdevP1 /s
TdevP2 /s
Tau /s

USN7-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 278272
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 38975 high elev obs : 28.667 27.542
Iteration 0: Obs used = 480919; Huge residuals = 102; Large residuals = 1803
Iteration 1: Obs used = 480908; Huge residuals = 0; Large residuals = 1712
Computed code bias (P1/P2)/m = 28.537 27.398
Computed baseline (X,Y,Z)/m = 4.217 0.959 0.150
RMS of residuals /m = 0.504

Number of phase differences to fit baseline
L1/L2 = 277031
L5 = 150061
A priori baseline (X,Y,Z)/m = 4.217 0.959 0.150
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = 0.2 RMS jitter /ps = 3.7

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 = 0.063 -0.107 0.045
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.062 -0.108 0.042
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.065 -0.115 0.044
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 4.279 0.852 0.193
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = -0.1 RMS jitter /ps = 0.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = 0.012 -0.000 0.002
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.011 -0.000 -0.000
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.016 -0.007 0.002
RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m = 4.291 0.852 0.196
Final baseline L2 (X,Y,Z)/m = 4.290 0.851 0.193
Final baseline L5 (X,Y,Z)/m = 4.296 0.844 0.195

COMPUTATION OF CODE DIFFERENCES

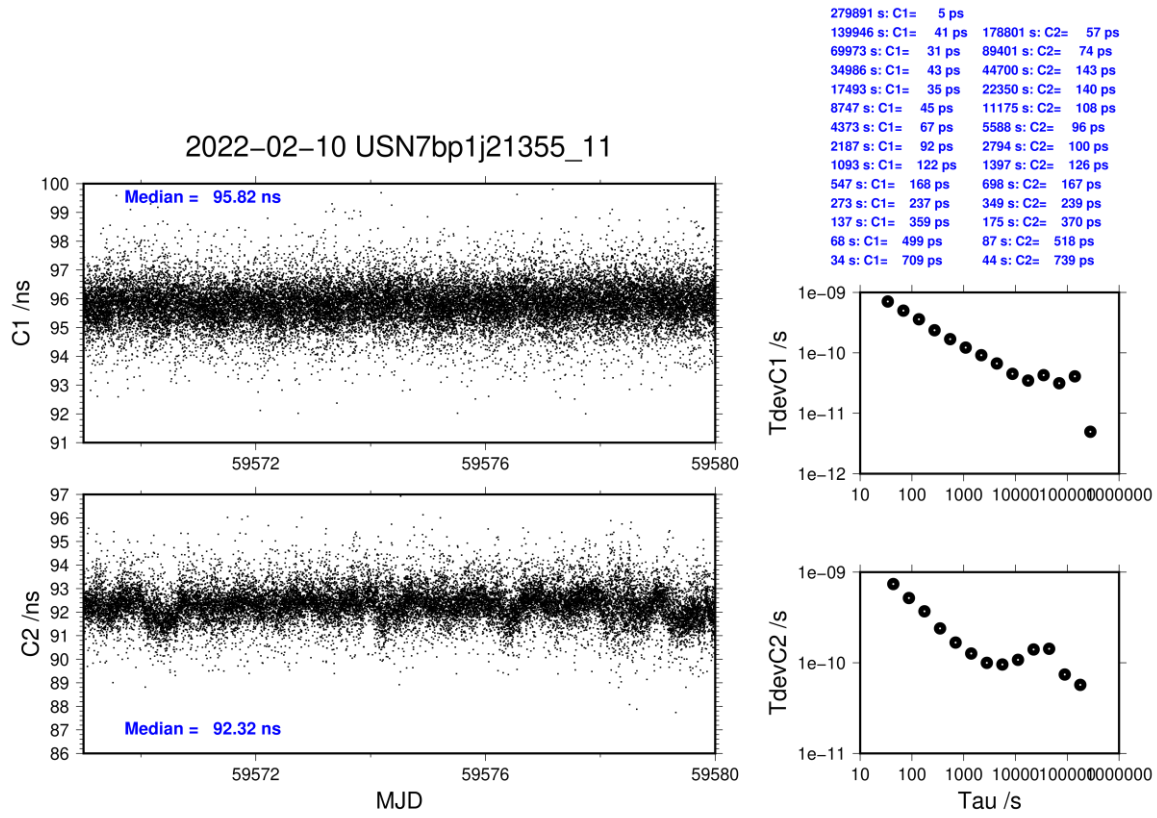
Total number of code differences = 702055

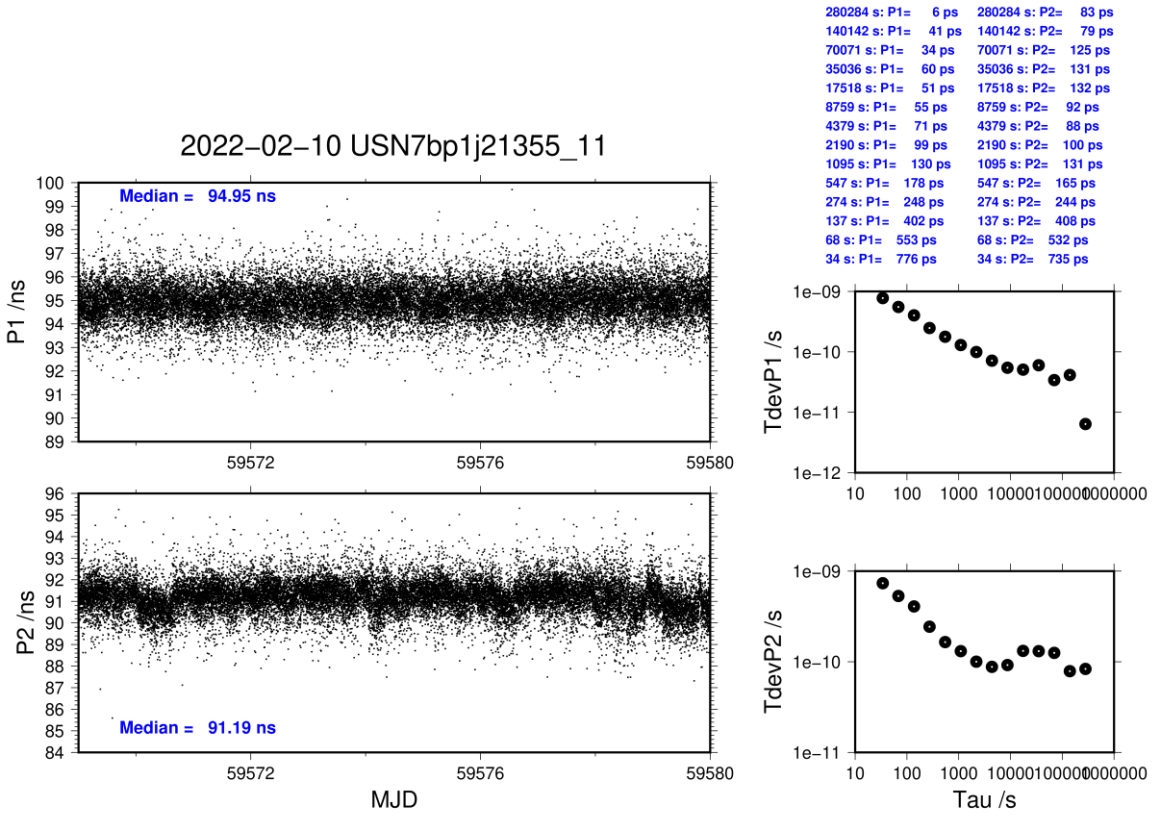
Global average of individual differences

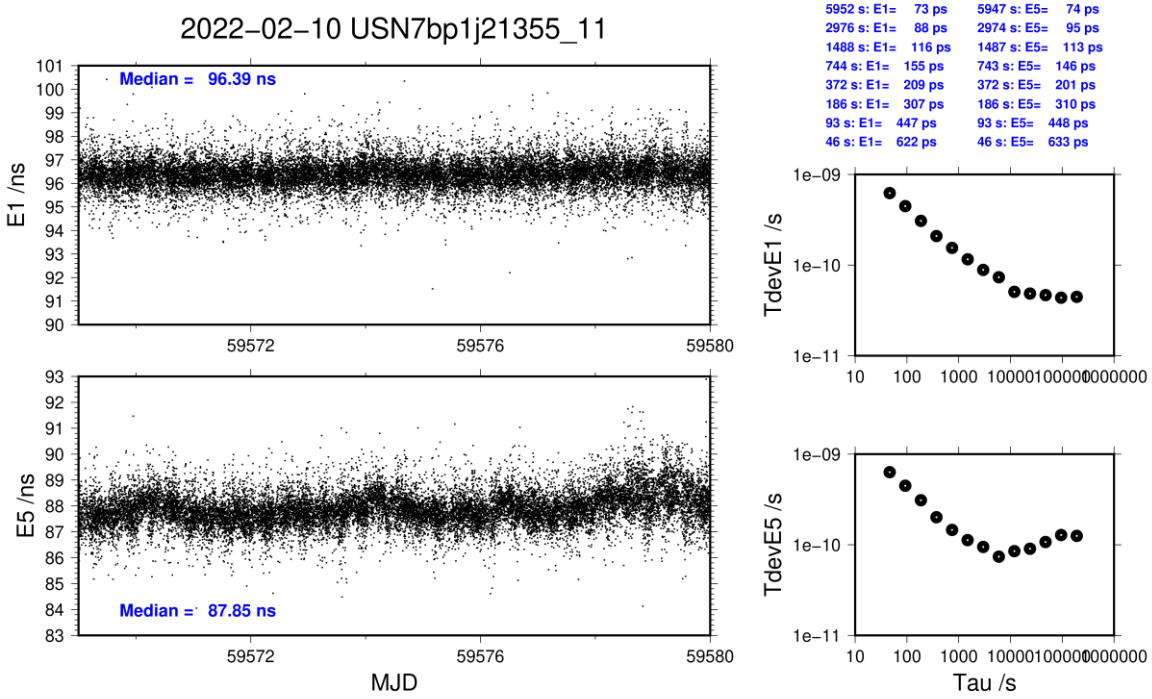
Code	#pts	ave/ns	rms/ns
C1	278502	95.813	1.698
C2	218001	92.308	1.759
P1	278146	94.953	1.733
P2	278145	91.160	1.570
E1	204445	96.388	1.400
E5	204645	87.881	1.319

Number of 300s epochs in out file = 3168

Code	#pts	median/ns	ave/ns	rms/ns
C1	27809	95.822	95.821	0.708
C2	21766	92.317	92.320	0.764
P1	27770	94.951	94.962	0.778
P2	27770	91.195	91.172	0.786
E1	20433	96.392	96.403	0.630
E5	20449	87.852	87.890	0.684




2022–02–10 USN7bp1j21355_11
Median = 94.95 ns
Median = 91.19 ns
P1 /ns
P2 /ns
MJD
59572
59576
59580
280284 s: P1= 6 ps
140142 s: P1= 41 ps
70071 s: P1= 34 ps
35036 s: P1= 60 ps
17518 s: P1= 51 ps
8759 s: P1= 55 ps
4379 s: P1= 71 ps
2190 s: P1= 99 ps
1095 s: P1= 130 ps
547 s: P1= 178 ps
274 s: P1= 248 ps
137 s: P1= 402 ps
68 s: P1= 553 ps
34 s: P1= 776 ps
280284 s: P2= 83 ps
140142 s: P2= 79 ps
70071 s: P2= 125 ps
35036 s: P2= 131 ps
17518 s: P2= 132 ps
8759 s: P2= 92 ps
4379 s: P2= 88 ps
2190 s: P2= 100 ps
1095 s: P2= 131 ps
547 s: P2= 165 ps
274 s: P2= 244 ps
137 s: P2= 408 ps
68 s: P2= 532 ps
34 s: P2= 735 ps
TdevP1 /s
TdevP2 /s
Tau /s


2022–02–10 USN7bp1j21355_11
Median = 96.39 ns
Median = 87.85 ns
E1 /ns
E5 /ns
MJD
59572
59576
59580
190466 s: E1= 45 ps
95233 s: E1= 44 ps
47617 s: E1= 47 ps
23808 s: E1= 48 ps
11904 s: E1= 51 ps
5952 s: E1= 73 ps
2976 s: E1= 88 ps
1488 s: E1= 116 ps
744 s: E1= 155 ps
372 s: E1= 209 ps
186 s: E1= 307 ps
93 s: E1= 447 ps
46 s: E1= 622 ps
190317 s: E5= 125 ps
95159 s: E5= 128 ps
47579 s: E5= 107 ps
23790 s: E5= 90 ps
11895 s: E5= 85 ps
5947 s: E5= 74 ps
2974 s: E5= 95 ps
1487 s: E5= 113 ps
743 s: E5= 146 ps
372 s: E5= 201 ps
186 s: E5= 310 ps
93 s: E5= 448 ps
46 s: E5= 633 ps
TdevE1 /s
TdevE5 /s
Tau /s

USN8-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 278288
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 38975 high elev obs : 42.749 41.947
Iteration 0: Obs used = 481766; Huge residuals = 104; Large residuals = 988
Iteration 1: Obs used = 481766; Huge residuals = 0; Large residuals = 884
Computed code bias (P1/P2)/m = 42.634 41.802
Computed baseline (X,Y,Z)/m = 4.217 0.960 0.152
RMS of residuals /m = 0.442

Number of phase differences to fit baseline
L1/L2 = 277072
L5 = 150090
A priori baseline (X,Y,Z)/m = 4.217 0.960 0.152
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = 0.2 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 = 0.063 -0.107 0.042
RMS of residuals L1 /m = 0.002
Computed baseline L2 (X,Y,Z)/m = 0.063 -0.108 0.040
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.065 -0.116 0.041
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 4.279 0.852 0.193
31676 clock jitters computed out of 31676 intervals
AVE jitter /ps = -0.1 RMS jitter /ps = 0.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = 0.011 0.000 0.002
RMS of residuals L1 /m = 0.002
Computed baseline L2 (X,Y,Z)/m = 0.011 -0.001 0.000
RMS of residuals L2 /m = 0.004
Computed baseline L5 (X,Y,Z)/m = 0.016 -0.008 0.002
RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m = 4.291 0.853 0.195
Final baseline L2 (X,Y,Z)/m = 4.291 0.852 0.194
Final baseline L5 (X,Y,Z)/m = 4.295 0.845 0.195

COMPUTATION OF CODE DIFFERENCES

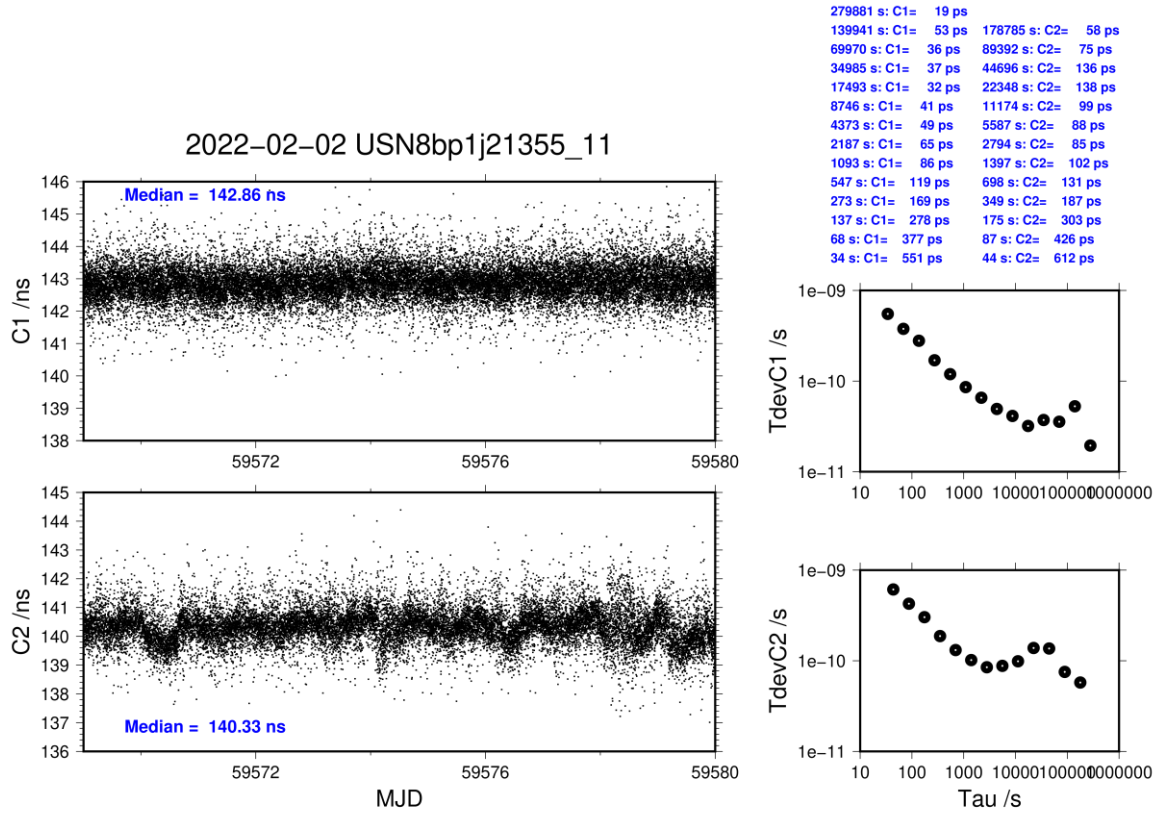
Total number of code differences = 702074

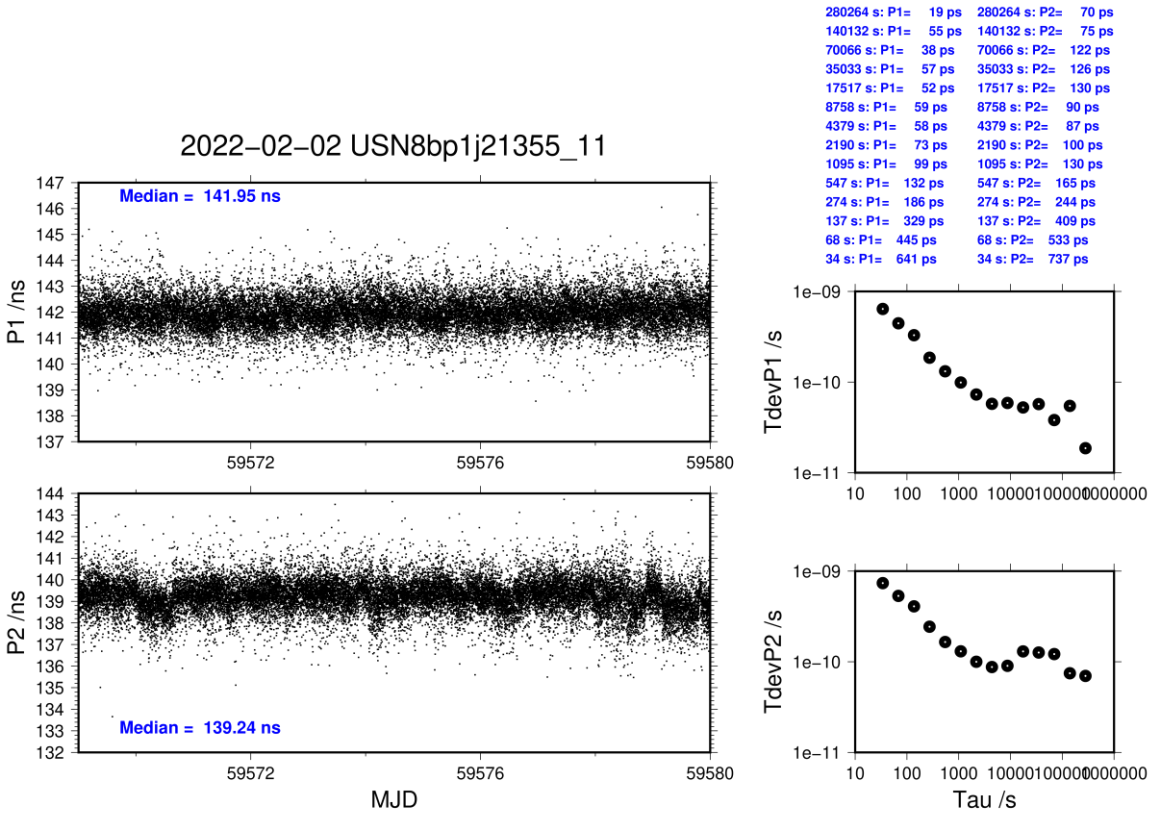
Global average of individual differences

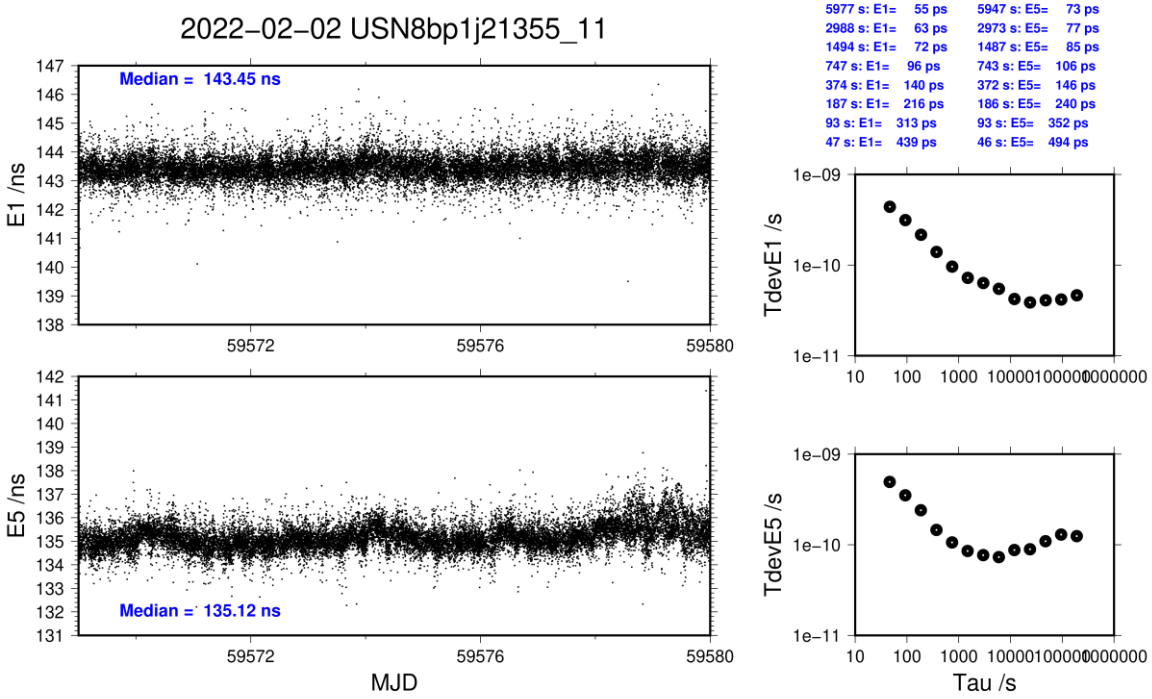
Code	#pts	ave/ns	rms/ns
C1	278535	142.878	1.225
C2	218021	140.331	1.384
P1	278161	141.979	1.281
P2	278161	139.206	1.570
E1	203597	143.461	0.958
E5	204638	135.171	0.976

Number of 300s epochs in out file = 3168

Code	#pts	median/ns	ave/ns	rms/ns
C1	27810	142.861	142.877	0.541
C2	21768	140.334	140.335	0.639
P1	27772	141.948	141.976	0.632
P2	27772	139.240	139.217	0.785
E1	20349	143.454	143.465	0.442
E5	20451	135.120	135.168	0.559




2022−02−02 USN8bp1j21355_11
Median = 141.95 ns
Median = 139.24 ns
P1 /ns
P2 /ns
MJD
59572
59576
59580
280264 s: P1= 19 ps
140132 s: P1= 55 ps
70066 s: P1= 38 ps
35033 s: P1= 57 ps
17517 s: P1= 52 ps
8758 s: P1= 59 ps
4379 s: P1= 58 ps
2190 s: P1= 73 ps
1095 s: P1= 99 ps
547 s: P1= 132 ps
274 s: P1= 186 ps
137 s: P1= 329 ps
68 s: P1= 445 ps
34 s: P1= 641 ps
280264 s: P2= 70 ps
140132 s: P2= 75 ps
70066 s: P2= 122 ps
35033 s: P2= 126 ps
17517 s: P2= 130 ps
8758 s: P2= 90 ps
4379 s: P2= 87 ps
2190 s: P2= 100 ps
1095 s: P2= 130 ps
547 s: P2= 165 ps
274 s: P2= 244 ps
137 s: P2= 409 ps
68 s: P2= 533 ps
34 s: P2= 737 ps
TdevP1 /s
TdevP2 /s
Tau /s


2022−02−02 USN8bp1j21355_11
Median = 143.45 ns
Median = 135.12 ns
E1 /ns
E5 /ns
MJD
59572
59576
59580
191253 s: E1= 46 ps
95626 s: E1= 42 ps
47813 s: E1= 41 ps
23907 s: E1= 39 ps
11953 s: E1= 42 ps
5977 s: E1= 55 ps
2988 s: E1= 63 ps
1494 s: E1= 72 ps
747 s: E1= 96 ps
374 s: E1= 140 ps
187 s: E1= 216 ps
93 s: E1= 313 ps
47 s: E1= 439 ps
190299 s: E5= 125 ps
95149 s: E5= 130 ps
47575 s: E5= 109 ps
23787 s: E5= 89 ps
11894 s: E5= 87 ps
5947 s: E5= 73 ps
2973 s: E5= 77 ps
1487 s: E5= 85 ps
743 s: E5= 106 ps
372 s: E5= 146 ps
186 s: E5= 240 ps
93 s: E5= 352 ps
46 s: E5= 494 ps
TdevE1 /s
TdevE5 /s
Tau /s

USN9-BP1J

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 218747
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 30161 high elev obs : 43.286 48.507
Iteration 0: Obs used = 378735; Huge residuals = 0; Large residuals = 1163
Iteration 1: Obs used = 378735; Huge residuals = 0; Large residuals = 1163
Computed code bias (P1/P2)/m = 43.202 48.457
Computed baseline (X,Y,Z)/m = 4.262 0.954 0.180
RMS of residuals /m = 0.506

Number of phase differences to fit baseline
L1/L2 = 217450
L5 = 149674
A priori baseline (X,Y,Z)/m = 4.262 0.954 0.180
31674 clock jitters computed out of 31674 intervals
AVE jitter /ps = 0.1 RMS jitter /ps = 4.4

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 = 0.029 -0.097 0.015
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.028 -0.099 0.014
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.032 -0.104 0.012
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = 4.290 0.856 0.194
31674 clock jitters computed out of 31674 intervals
AVE jitter /ps = -0.0 RMS jitter /ps = 0.1

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 0
Iter 2 Large residuals L5= 0
Computed baseline L1 (X,Y,Z)/m = 0.005 -0.002 0.002
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.004 -0.004 0.000
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.009 -0.010 -0.000
RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m = 4.295 0.854 0.196
Final baseline L2 (X,Y,Z)/m = 4.295 0.851 0.194
Final baseline L5 (X,Y,Z)/m = 4.299 0.846 0.194

COMPUTATION OF CODE DIFFERENCES

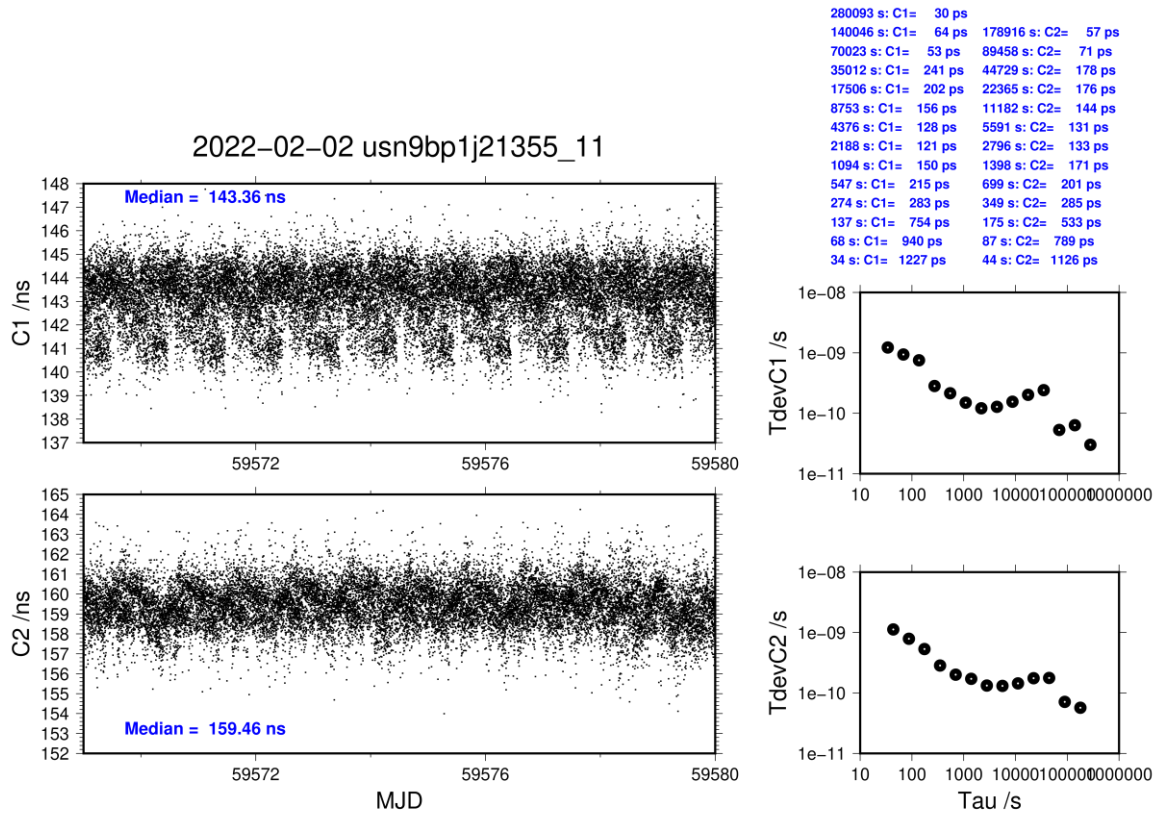
Total number of code differences = 698585

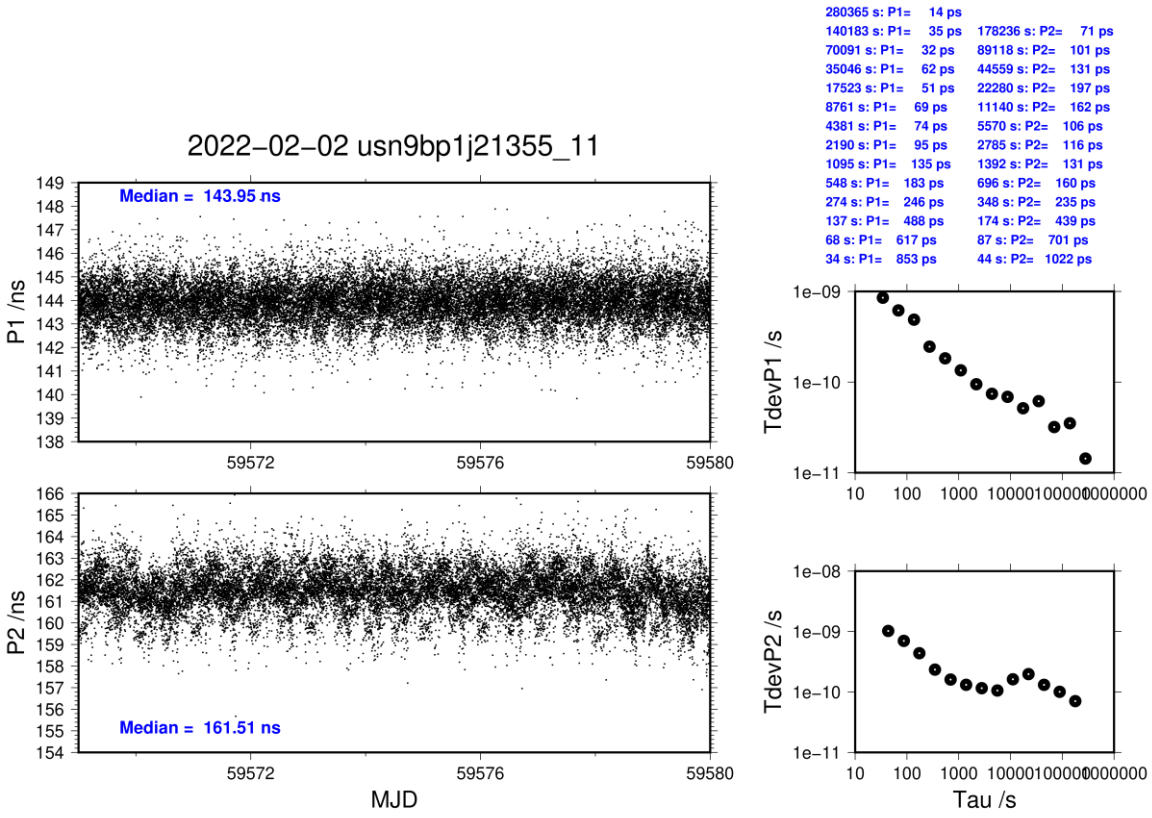
Global average of individual differences

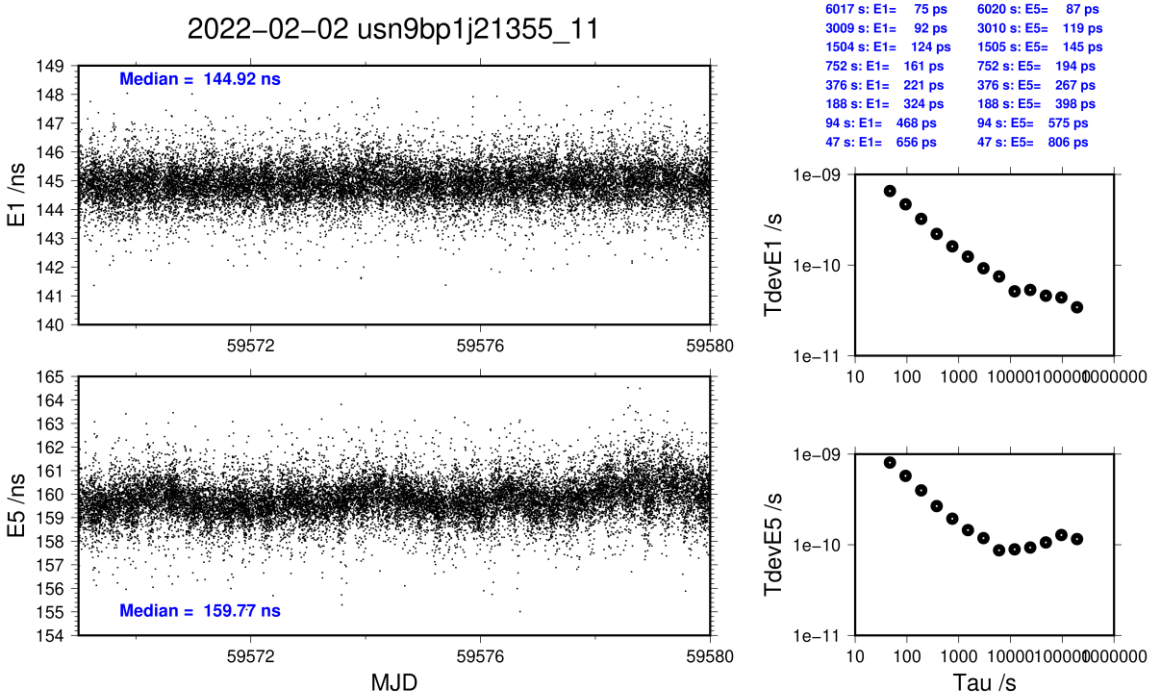
Code	#pts	ave/ns	rms/ns
C1	278306	143.141	1.917
C2	217849	159.420	2.009
P1	278038	143.928	1.669
P2	218692	161.474	1.632
E1	202260	144.914	1.379
E5	202189	159.763	1.694

Number of 300s epochs in out file = 3168

Code	#pts	median/ns	ave/ns	rms/ns
C1	27789	143.364	143.158	1.284
C2	21752	159.463	159.438	1.113
P1	27762	143.952	143.944	0.863
P2	21835	161.507	161.483	0.995
E1	20211	144.921	144.931	0.660
E5	20204	159.768	159.784	0.845




2022–02–02 usn9bp1j21355_11
Median = 143.95 ns
Median = 161.51 ns
P1 /ns
P2 /ns
MJD
59572
59576
59580
280365 s: P1= 14 ps
140183 s: P1= 35 ps
70091 s: P1= 32 ps
35046 s: P1= 62 ps
17523 s: P1= 51 ps
8761 s: P1= 69 ps
4381 s: P1= 74 ps
2190 s: P1= 95 ps
1095 s: P1= 135 ps
548 s: P1= 183 ps
274 s: P1= 246 ps
137 s: P1= 488 ps
68 s: P1= 617 ps
34 s: P1= 853 ps
178236 s: P2= 71 ps
89118 s: P2= 101 ps
44559 s: P2= 131 ps
22280 s: P2= 197 ps
11140 s: P2= 162 ps
5570 s: P2= 106 ps
2785 s: P2= 116 ps
1392 s: P2= 131 ps
696 s: P2= 160 ps
348 s: P2= 235 ps
174 s: P2= 439 ps
87 s: P2= 701 ps
44 s: P2= 1022 ps
TdevP1 /s
TdevP2 /s
Tau /s


2022–02–02 usn9bp1j21355_11
Median = 144.92 ns
Median = 159.77 ns
E1 /ns
E5 /ns
MJD
59572
59576
59580
192559 s: E1= 34 ps
96279 s: E1= 44 ps
48140 s: E1= 46 ps
24070 s: E1= 53 ps
12035 s: E1= 51 ps
6017 s: E1= 75 ps
3009 s: E1= 92 ps
1504 s: E1= 124 ps
752 s: E1= 161 ps
376 s: E1= 221 ps
188 s: E1= 324 ps
94 s: E1= 468 ps
47 s: E1= 656 ps
192625 s: E5= 116 ps
96313 s: E5= 128 ps
48156 s: E5= 106 ps
24078 s: E5= 93 ps
12039 s: E5= 89 ps
6020 s: E5= 87 ps
3010 s: E5= 119 ps
1505 s: E5= 145 ps
752 s: E5= 194 ps
376 s: E5= 267 ps
188 s: E5= 398 ps
94 s: E5= 575 ps
47 s: E5= 806 ps
TdevE1 /s
TdevE5 /s
Tau /s

3.4/ BIPM (22084)

Period

MJD 59663 to 59667

Delays

BP1J: (cf page 70)

X_O = 140.93 ns (209.40-68.47)

X_P = 53.45 ns (68.47-15.02)

REFDLY = 194.38 ns

CABDLY = 176.38 ns (C211)

BP25: (cf page 71)

REFDLY = 53.35 ns (68.37-15.02)

CABDLY = 176.24 ns (C208)

BP21: (cf page 70)

REFDLY = 43.29 ns (58.31-15.02)

CABDLY = 140.80 ns (C201)

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 59663
Date and hour of the end of measurements:	MJD 59667

Information on the system

	Local:	**Travelling:**
4-character BIPM code	BP21	BP1J
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	Septentrio PolaRx4proTR 27
1 PPS trigger level /V:		
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	HYLM195
Length outside the building /m:	~ 15 m	~ 15 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Septentrio SEPCHOKE MC 5131
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:	43.29 ns	53.45 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	PPSin compensation enable	140.93 ns
• Antenna cable delay:	140.80 ns	176.38 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 59663
Date and hour of the end of measurements:	MJD 59667

Information on the system

	Local:	**Travelling:**
4-character BIPM code	BP21	BP25
• Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 4701229	Mesit GTR55 1808001
1 PPS trigger level /V:		
• Antenna cable maker and type: Phase stabilised cable (Y/N):	LMR-195	HYLM195
Length outside the building /m:	~ 15 m	~ 15 m
• Antenna maker and type: Antenna serial number:	Septentrio SEPCHOKE B3E6 5253	Novatel GNSS-850 NMLK18070096N
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:	43.29 ns	53.35 ns
Delay from 1 PPS-in to internal Reference (if different): (see section 2 for details)	PPSin compensation enable	
• Antenna cable delay:	140.80 ns	176.24 ns
Splitter delay (if any):		(1)
Additional cable delay (if any):		(1)

Data used for the generation of CGGTTS files

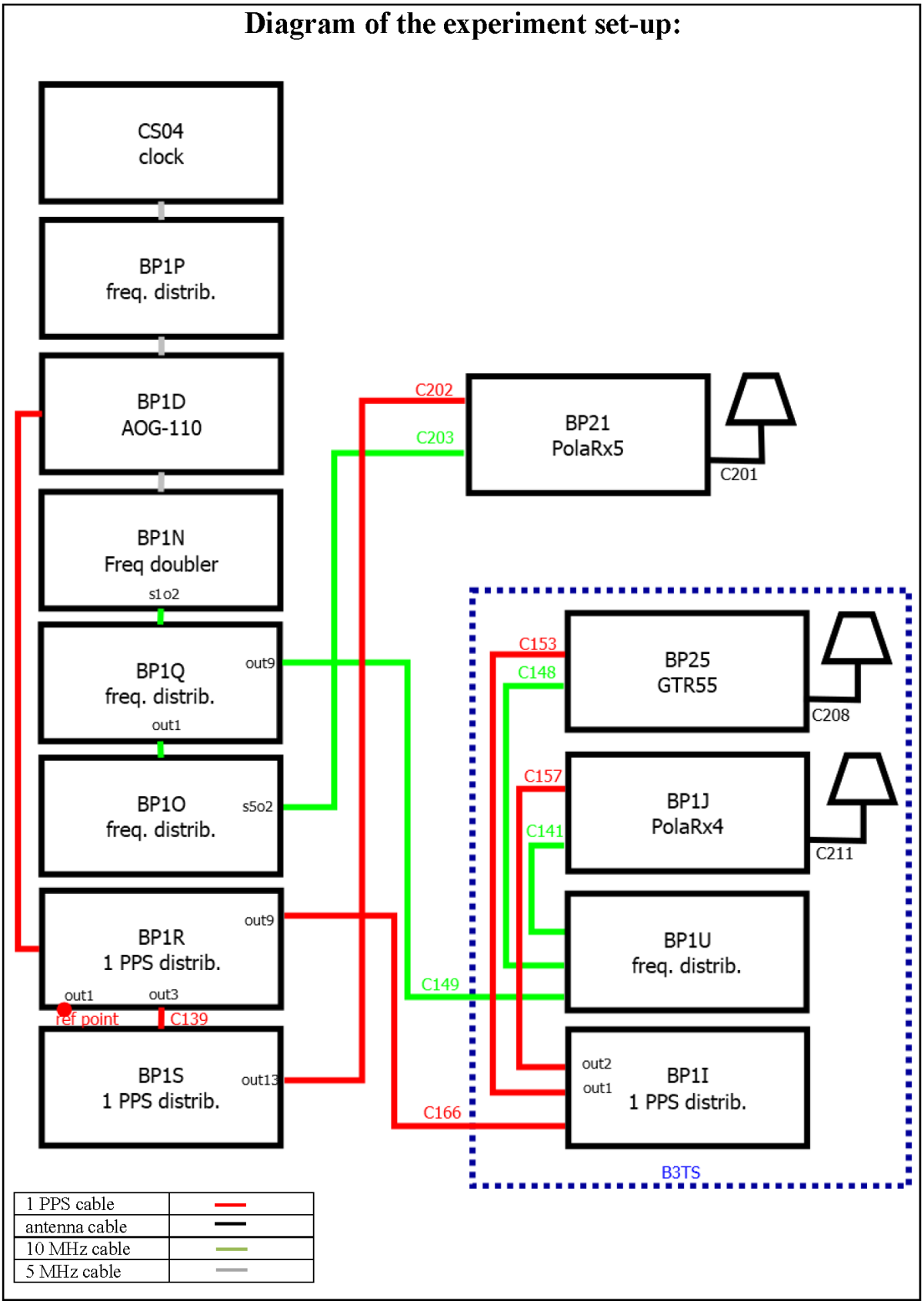
• INT DLY (GPS) /ns:	
• INT DLY (Galileo) /ns:	
• INT DLY (GLONASS) /ns:	
• CAB DLY /ns:	
• REF DLY /ns:	
• Coordinates reference frame:	
Latitude or X /m:	
Longitude or Y /m:	
Height or Z /m:	

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.

Diagram of the experiment set-up:



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).

Software of BP25 receiver has been upgrade.

BP1J-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 100038
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 18801 high elev obs : -26.978 -26.707
Iteration 0: Obs used = 155363; Huge residuals = 1653; Large residuals = 8615
Iteration 1: Obs used = 157345; Huge residuals = 0; Large residuals = 4980
Computed code bias (P1/P2)/m = -27.065 -26.802
Computed baseline (X,Y,Z)/m = -3.710 -0.584 3.196
RMS of residuals /m = 0.679

Number of phase differences to fit baseline
L1/L2 = 97262
L5 = 50154
A priori baseline (X,Y,Z)/m = -3.710 -0.584 3.196
14394 clock jitters computed out of 14394 intervals
AVE jitter /ps = -0.1 RMS jitter /ps = 3.8

Iter 1 Large residuals L1= 0
Iter 1 Large residuals L2= 5
Iter 1 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.116 0.031 0.176
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.121 0.029 0.172
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.110 0.015 0.162
RMS of residuals L5 /m = 0.003

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 5
Iter 2 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.116 0.031 0.176
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.121 0.029 0.172
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.110 0.015 0.162
RMS of residuals L5 /m = 0.003

New iteration of baseline
New apriori baseline (X,Y,Z)/m = -3.592 -0.554 3.370
14394 clock jitters computed out of 14394 intervals
AVE jitter /ps = 0.1 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 0
Iter 3 Large residuals L2= 5
Iter 3 Large residuals L5= 1
Computed baseline L1 (X,Y,Z)/m = 0.006 -0.008 0.008
RMS of residuals L1 /m = 0.003
Computed baseline L2 (X,Y,Z)/m = 0.011 -0.010 0.004
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.003 -0.024 -0.004
RMS of residuals L5 /m = 0.003

Final baseline L1 (X,Y,Z)/m =	-3.585	-0.562	3.378
Final baseline L2 (X,Y,Z)/m =	-3.581	-0.564	3.374
Final baseline L5 (X,Y,Z)/m =	-3.589	-0.578	3.366

COMPUTATION OF CODE DIFFERENCES

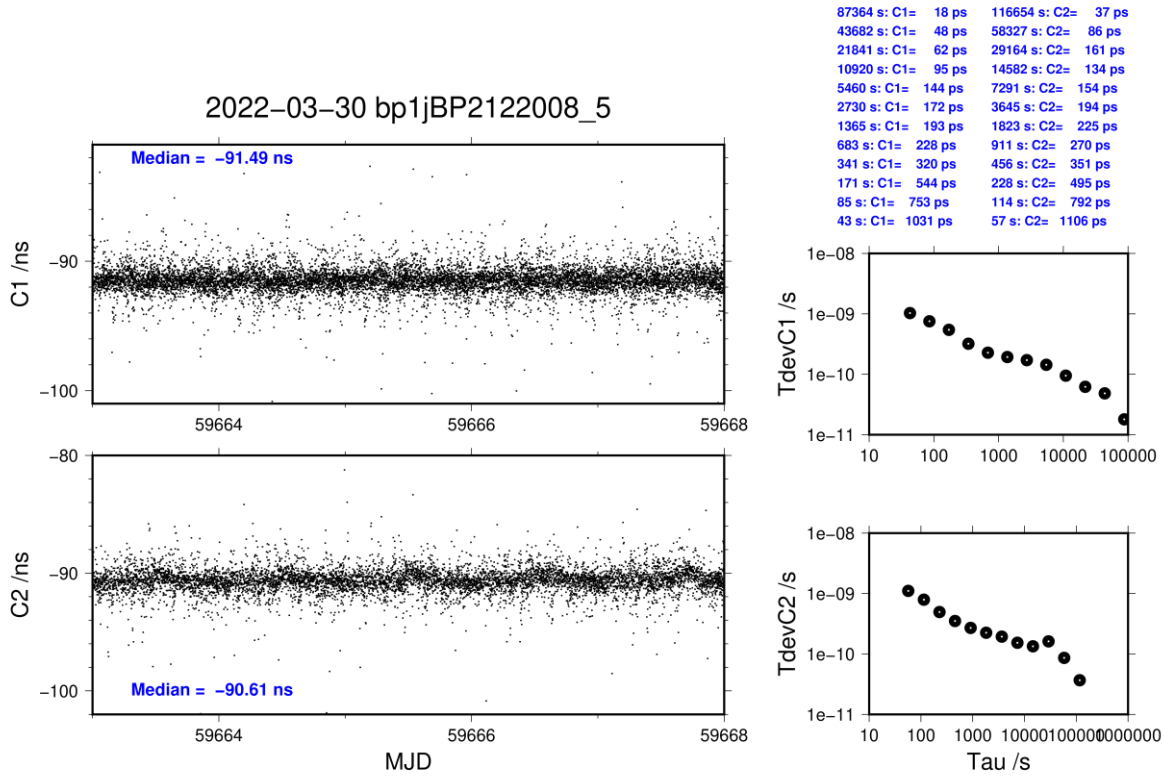
Total number of code differences = 259732

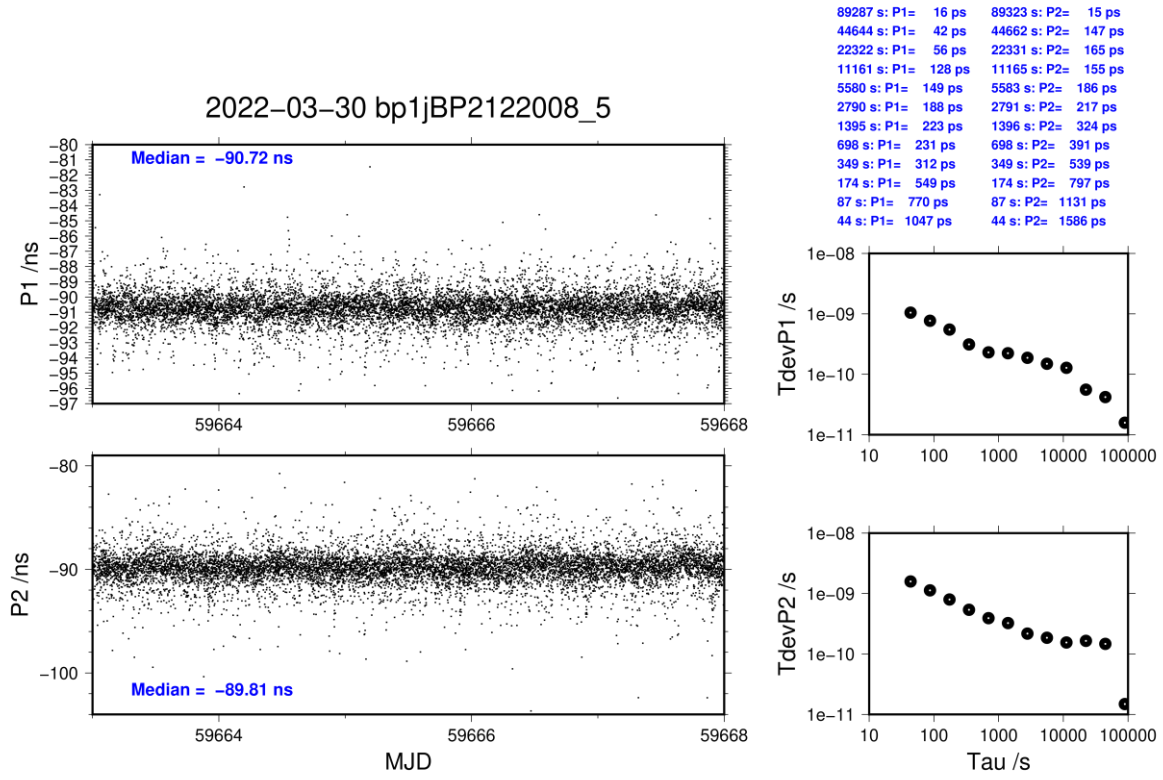
Global average of individual differences

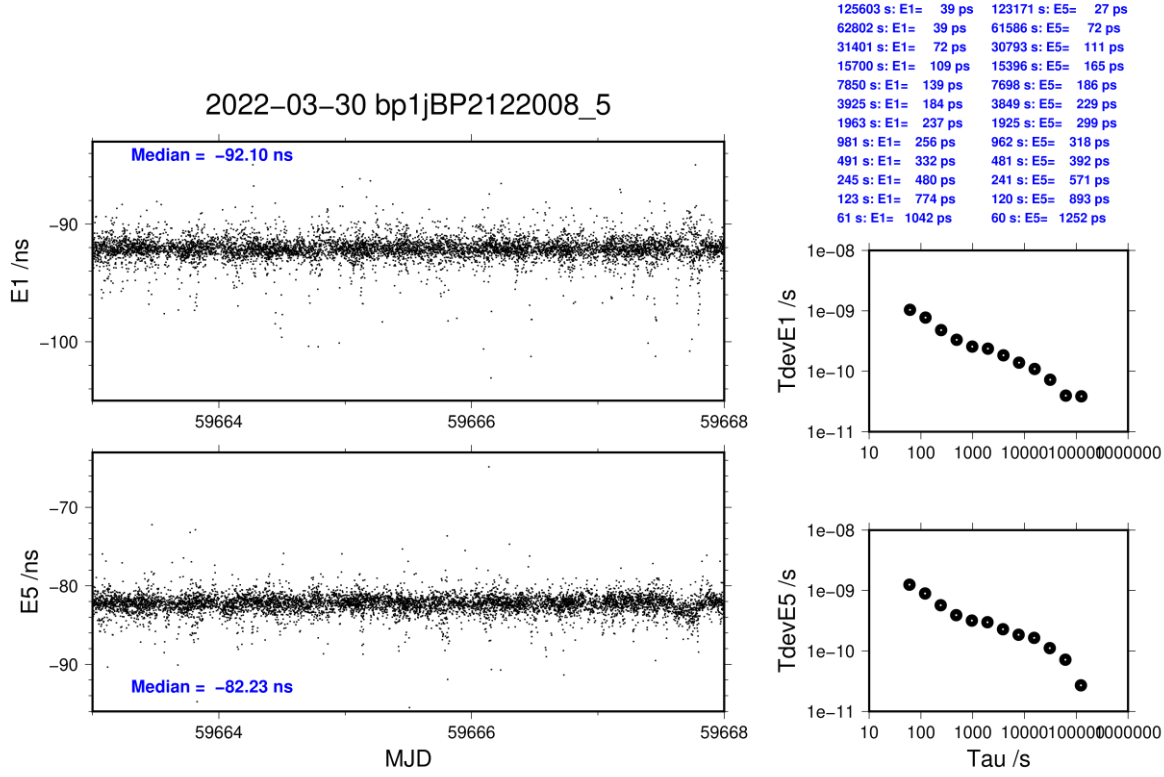
Code	#pts	ave/ns	rms/ns
C1	101296	-91.473	2.178
C2	75958	-90.610	2.084
P1	99140	-90.722	2.025
P2	99116	-89.833	2.935
E1	70462	-92.096	1.985
E5	71838	-82.274	1.970

Number of 300s epochs in out file = 1440

Code	#pts	median/ns	ave/ns	rms/ns
C1	10121	-91.490	-91.468	1.048
C2	7580	-90.609	-90.636	1.113
P1	9903	-90.715	-90.720	1.070
P2	9899	-89.811	-89.840	1.608
E1	7040	-92.102	-92.115	1.055
E5	7179	-82.227	-82.297	1.267




2022−03−30 bp1jBP2122008_5
Median = −90.72 ns
Median = −89.81 ns
P1 /ns
P2 /ns
MJD
89287 s: P1= 16 ps
44644 s: P1= 42 ps
22322 s: P1= 56 ps
11161 s: P1= 128 ps
5580 s: P1= 149 ps
2790 s: P1= 188 ps
1395 s: P1= 223 ps
698 s: P1= 231 ps
349 s: P1= 312 ps
174 s: P1= 549 ps
87 s: P1= 770 ps
44 s: P1= 1047 ps
89323 s: P2= 15 ps
44662 s: P2= 147 ps
22331 s: P2= 165 ps
11165 s: P2= 155 ps
5583 s: P2= 186 ps
2791 s: P2= 217 ps
1396 s: P2= 324 ps
698 s: P2= 391 ps
349 s: P2= 539 ps
174 s: P2= 797 ps
87 s: P2= 1131 ps
44 s: P2= 1586 ps
TdevP1 /s
TdevP2 /s
Tau /s


2022−03−30 bp1jBP2122008_5
Median = −92.10 ns
Median = −82.23 ns
E1 /ns
E5 /ns
MJD
125603 s: E1= 39 ps
62802 s: E1= 39 ps
31401 s: E1= 72 ps
15700 s: E1= 109 ps
7850 s: E1= 139 ps
3925 s: E1= 184 ps
1963 s: E1= 237 ps
981 s: E1= 256 ps
491 s: E1= 332 ps
245 s: E1= 480 ps
123 s: E1= 774 ps
61 s: E1= 1042 ps
123171 s: E5= 27 ps
61586 s: E5= 72 ps
30793 s: E5= 111 ps
15396 s: E5= 165 ps
7698 s: E5= 186 ps
3849 s: E5= 229 ps
1925 s: E5= 299 ps
962 s: E5= 318 ps
481 s: E5= 392 ps
241 s: E5= 571 ps
120 s: E5= 893 ps
60 s: E5= 1252 ps
TdevE1 /s
TdevE5 /s
Tau /s

BP25-BP21

COMPUTATION OF BASELINE

Number of codes to fit baseline and biases = 98358
Compute baseline with sin(elev) between 0.05 and 0.90
Apriori codes biases from 18801 high elev obs : 3.864 5.551
Iteration 0: Obs used = 156779; Huge residuals = 0; Large residuals = 3839
Iteration 1: Obs used = 156779; Huge residuals = 0; Large residuals = 3839
Computed code bias (P1/P2)/m = 3.641 5.319
Computed baseline (X,Y,Z)/m = -5.022 -0.650 4.538
RMS of residuals /m = 0.641

Number of phase differences to fit baseline
L1/L2 = 95152
L5 = 49646
A priori baseline (X,Y,Z)/m = -5.022 -0.650 4.538
14396 clock jitters computed out of 14396 intervals
AVE jitter /ps = -0.5 RMS jitter /ps = 4.8

Iter 1 Large residuals L1= 0
Iter 1 Large residuals L2= 3
Iter 1 Large residuals L5= 10
Computed baseline L1 (X,Y,Z)/m = -0.003 -0.073 0.145
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.008 -0.068 0.160
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = -0.007 -0.072 0.152
RMS of residuals L5 /m = 0.004

Iter 2 Large residuals L1= 0
Iter 2 Large residuals L2= 3
Iter 2 Large residuals L5= 10
Computed baseline L1 (X,Y,Z)/m = -0.003 -0.073 0.145
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.008 -0.068 0.160
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = -0.007 -0.072 0.152
RMS of residuals L5 /m = 0.004

New iteration of baseline
New apriori baseline (X,Y,Z)/m = -5.020 -0.721 4.690
14396 clock jitters computed out of 14396 intervals
AVE jitter /ps = 0.3 RMS jitter /ps = 0.3

Iter 3 Large residuals L1= 0
Iter 3 Large residuals L2= 2
Iter 3 Large residuals L5= 10
Computed baseline L1 (X,Y,Z)/m = 0.008 -0.036 -0.001
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.018 -0.030 0.013
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.012 -0.035 0.006
RMS of residuals L5 /m = 0.004

Iter 4 Large residuals L1= 0
Iter 4 Large residuals L2= 2
Iter 4 Large residuals L5= 10
Computed baseline L1 (X,Y,Z)/m = 0.008 -0.036 -0.001
RMS of residuals L1 /m = 0.004
Computed baseline L2 (X,Y,Z)/m = 0.018 -0.030 0.013
RMS of residuals L2 /m = 0.005
Computed baseline L5 (X,Y,Z)/m = 0.012 -0.035 0.006
RMS of residuals L5 /m = 0.004

Final baseline L1 (X,Y,Z)/m = -5.012 -0.756 4.689
Final baseline L2 (X,Y,Z)/m = -5.001 -0.751 4.703
Final baseline L5 (X,Y,Z)/m = -5.008 -0.756 4.696

COMPUTATION OF CODE DIFFERENCES

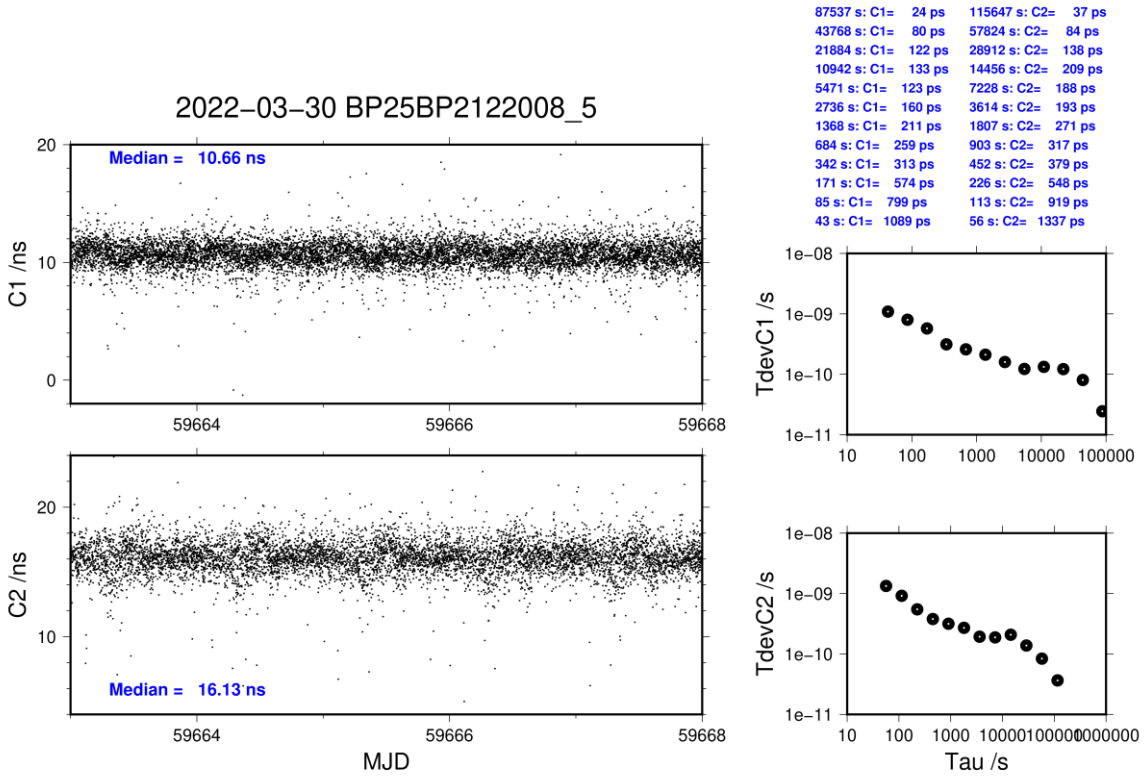
Total number of code differences = 391071

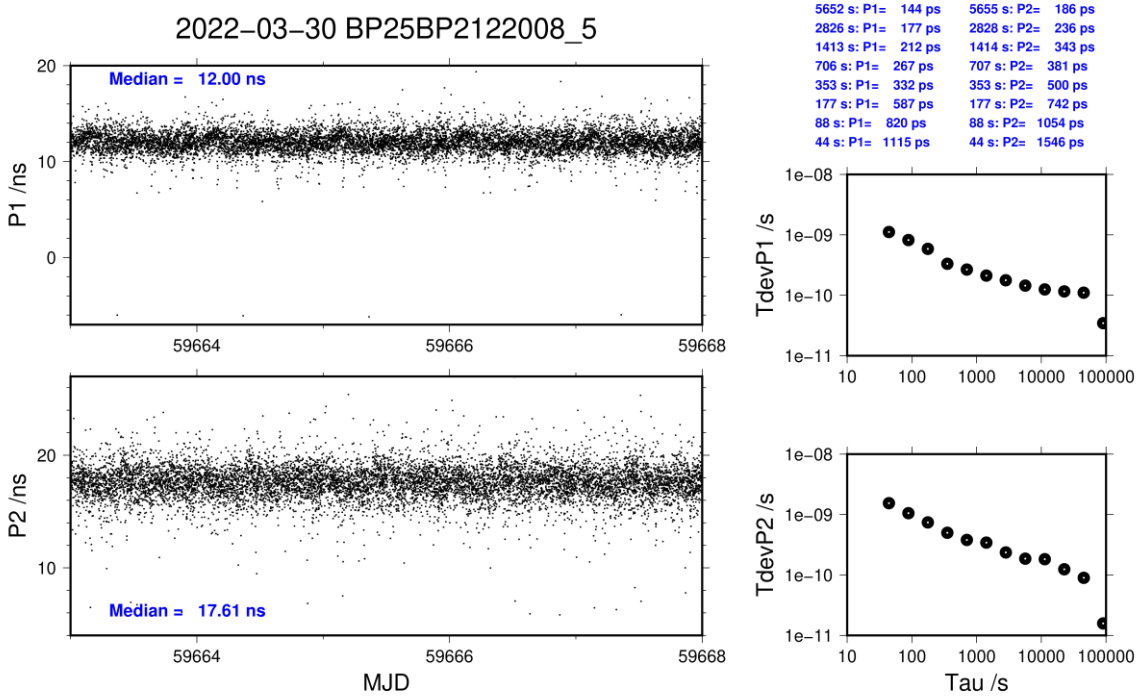
Global average of individual differences

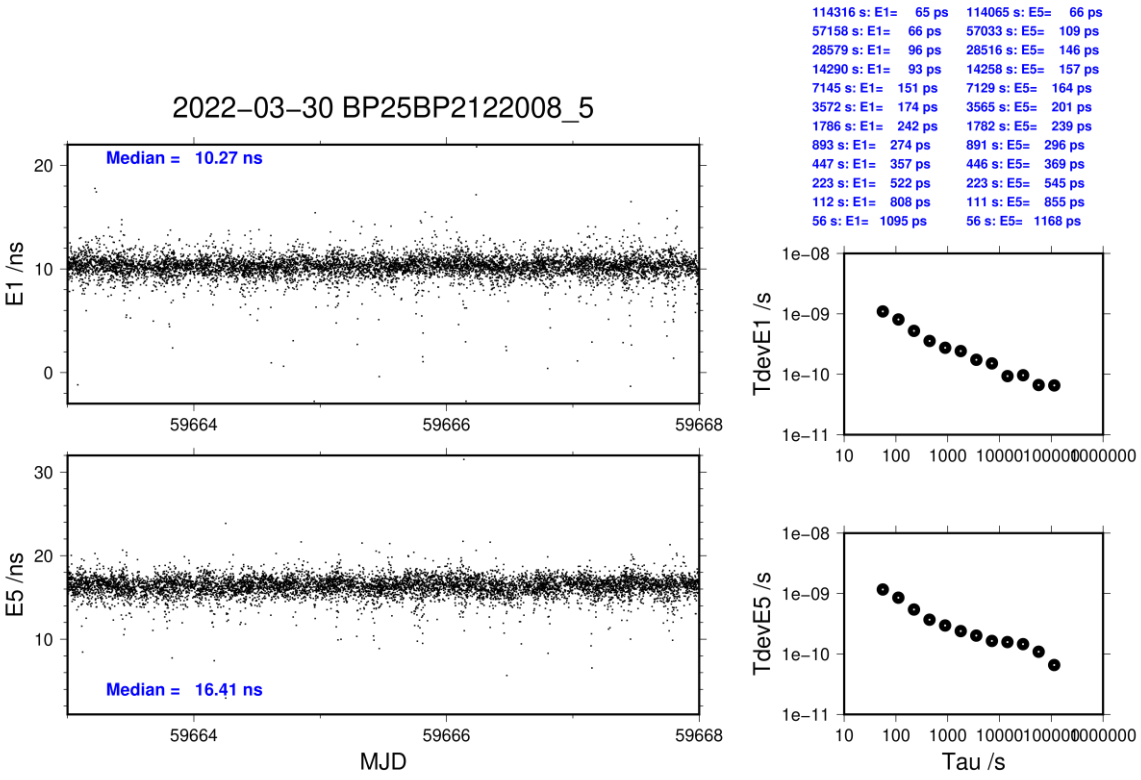
Code	#pts	ave/ns	rms/ns
C1	100804	10.636	2.091
C2	76349	16.112	2.124
P1	98127	11.962	1.992
P2	98004	17.562	2.671
E1	77215	10.245	1.910
E5	77535	16.360	1.809

Number of 300s epochs in out file = 1440

Code	#pts	median/ns	ave/ns	rms/ns
C1	10101	10.660	10.658	1.109
C2	7646	16.126	16.108	1.295
P1	9778	11.998	12.011	1.142
P2	9772	17.613	17.567	1.535
E1	7735	10.270	10.232	1.115
E5	7752	16.411	16.340	1.187


2022–03–30 BP25BP2122008_5
Median = 10.66 ns
Median = 16.13 ns
C1 /ns
C2 /ns
MJD
87537 s: C1= 24 ps
43768 s: C1= 80 ps
21884 s: C1= 122 ps
10942 s: C1= 133 ps
5471 s: C1= 123 ps
2736 s: C1= 160 ps
1368 s: C1= 211 ps
684 s: C1= 259 ps
342 s: C1= 313 ps
171 s: C1= 574 ps
85 s: C1= 799 ps
43 s: C1= 1089 ps
115647 s: C2= 37 ps
57824 s: C2= 84 ps
28912 s: C2= 138 ps
14456 s: C2= 209 ps
7228 s: C2= 188 ps
3614 s: C2= 193 ps
1807 s: C2= 271 ps
903 s: C2= 317 ps
452 s: C2= 379 ps
226 s: C2= 548 ps
113 s: C2= 919 ps
56 s: C2= 1337 ps
TdevC1 /s
TdevC2 /s
Tau /s


2022–03–30 BP25BP2122008_5
Median = 12.00 ns
Median = 17.61 ns
P1 /ns
P2 /ns
MJD
90429 s: P1= 35 ps
45214 s: P1= 110 ps
22607 s: P1= 116 ps
11304 s: P1= 125 ps
5652 s: P1= 144 ps
2826 s: P1= 177 ps
1413 s: P1= 212 ps
706 s: P1= 267 ps
353 s: P1= 332 ps
177 s: P1= 587 ps
88 s: P1= 820 ps
44 s: P1= 1115 ps
90484 s: P2= 16 ps
45242 s: P2= 90 ps
22621 s: P2= 124 ps
11311 s: P2= 183 ps
5655 s: P2= 186 ps
2828 s: P2= 236 ps
1414 s: P2= 343 ps
707 s: P2= 381 ps
353 s: P2= 500 ps
177 s: P2= 742 ps
88 s: P2= 1054 ps
44 s: P2= 1546 ps
TdevP1 /s
TdevP2 /s
Tau /s


2022−03−30 BP25BP2122008_5
Median = 10.27 ns
Median = 16.41 ns
E1 /ns
E5 /ns
MJD
59664
59666
59668
114316 s: E1= 65 ps
57158 s: E1= 66 ps
28579 s: E1= 96 ps
14290 s: E1= 93 ps
7145 s: E1= 151 ps
3572 s: E1= 174 ps
1786 s: E1= 242 ps
893 s: E1= 274 ps
447 s: E1= 357 ps
223 s: E1= 522 ps
112 s: E1= 808 ps
56 s: E1= 1095 ps
114065 s: E5= 66 ps
57033 s: E5= 109 ps
28516 s: E5= 146 ps
14258 s: E5= 157 ps
7129 s: E5= 164 ps
3565 s: E5= 201 ps
1782 s: E5= 239 ps
891 s: E5= 296 ps
446 s: E5= 369 ps
223 s: E5= 545 ps
111 s: E5= 855 ps
56 s: E5= 1168 ps
TdevE1 /s
TdevE5 /s
Tau /s