U.S. Department of Commerce
Time and Frequency Division
National Institute of Standards and Technology
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Report of Calibration: Cal_Id:1014-2021

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Abstract

This report is a record of the calibration results of TC_2 — the site GNSS receiver of AGGO, La Plata, Argentina, ON_I—the site receiver of ONBA, Buenos Aires, Argentina, and INTI—the site receiver of Instituto Nacional de Tecnología Industrial, Argentina, performed via the NIST traveling receiver nb05 during the trip from NIST, Boulder to Argentina and back. Three sets of data were collected between MJD59383-59686 (June 18, 2021 and April 17, 2022) by simultaneous operation of a pair of co-located GNSS receivers. The purpose of this campaign was to measure the internal delay of the local(visited) receivers and thereby calibrating the links comprising NIST and the visited laboratories for time transfer applications using L1,L2 GPS signals. The calibration campaign was initiated by NIST in consultation with the visited laboratories as per the guidelines set by BIPM [1].

Contents

1 List of Acronyms

Table 1: List of acronyms used in this report

BIPM	Bureau International des Poids et Mesures, Sèvres, France
CCTF	Consultative Committee on Time and Frequency
CGGTTS	CCTF Global GNSS Time Transfer Standard format
NIST	National Institute of Standards and Technology
nb05	NIST-owned GPS and GLONASS only traveling system
NIST	Four-letter code of NIST primary receiver
labv	Generic four-letter code assiged to a receiver at the visited lab
TC_2	Four-letter code for AGGO, La Plata, Argentina
ON_I	Four-letter code for ONBA, Buenos Aires
INTI	Instituto Nacional de Tecnología Industrial
PPS	Pulse per second
RINEX	Receiver Independent Exchange format
TIC	Time Interval Counter

2 Description of the traveling GNSS receiver

The NIST Traveling System consists of Septentrio PolaRx3eTR PRO GNSS receiver unit (nb05), a Novatel pin-wheel antenna and antenna cable (LMR 100A), laptop, time interval counter(TIC) and two auxiliary cables (RG223 with BNC connectors) to be used for measuring the REFDLY for the traveling receiver. An HP53132A time interval counter is provided for measuring REFDLY at each station in a consistent manner. For more information, please refer to the NIST traveling receiver operator's manual.

3 Computing delays in the measurement setup

The difference of the total delay for a pair of co-located receivers is the sum of the delays incurred in the antenna cable(CABDLY) and the internal delay(INTDLY), minus the time offset at the latching point of the receiver as referenced to a fixed point, usually UTC(k)(REFDLY). The internal delay is comprised of both code- and frequency-dependent delays in the antenna and the receiver. After accounting for the baseline geometry, the difference in pseudoranges between a pair of receivers, say for P1, is given by

$$\mathrm{RAWDIF(P1)}_{\mathrm{A-B}} = \Delta\mathrm{CABDLY}_{\mathrm{A-B}} + \Delta\mathrm{INTDLY}_{\mathrm{A-B}} - \Delta\mathrm{REFDLY}_{\mathrm{A-B}}, \tag{1}$$

where $\mathrm{RAWDIF(P1)}_{\mathrm{A-B}}$ is the raw difference of pseudorange measurements of two receivers. Similarly for C1 and P2, $\mathrm{RAWDIF(C1/P2)}_{\mathrm{A-B}}$ is given by using the corresponding set of delays on the right hand side of Eq.(1). The notation for the receivers A and B correspond to the traveling- and station-receiver. $\Delta\mathrm{CABDLY}_{\mathrm{A-B}}$ and $\Delta\mathrm{REFDLY}_{\mathrm{A-B}}$ for nb05(A) and labv/NIST(B) are given in Table 2, referenced from Annexes—at the end of this report. We will refer to the visited laboratory receiver as labv. NIST and nb05 are NIST station- and traveling-receivers respectively. In this calibration campaign, we calibrate a total of three receivers in the visited laboratories. The INTDLY values used for

NIST are from the latest G1 campaign as described in the G1 calibration report Cal_Id:1001-2020[2]. The procedure for measuring nb05 REFDLY (both X_P and X_O) is outlined in the operating manual. The visited laboratories are responsible for the REFDLY and CABDLY values for their station receivers.

Table 2: REFDLY and CABDLY and their differences between traveling and station receivers

Pair	MJD	REF_{DLY} (nb05)	REF_{DLY} (labv)	CAB_{DLY} (nb05)	CAB_{DLY} (labv)	ΔREF_{DLY} (ns)	ΔCAB_{DLY} (ns)
nb05-NIST	59384-59394	605.2	65.9	199.6	275.5	539.3	-75.9
nb05-TC_2	59503-59511	226.0	12.3	199.6	207.9	213.7	-8.3
nb05-ON_I	58524-59535	220.0	48.9	199.6	160.4	171.1	39.2
nb05-INTI	59624-59630	233.0	8.0	199.6	129.3	225.0	70.3
nb05-NIST	59676-59686	605.2	65.9	199.6	275.5	539.3	-75.9

4 Computing raw difference of GPS psuedoranges

The RINEX files for a pair of co-located receivers during the data acquisition period, MJD column in Table 2, are processed using *dclrinex* software provided by the BIPM that solves for the baseline between the phase centers of the two antennas from L1 and L2 phase differences[3, 4]. Subsequently, the P1 and P2 pseudorange differences are formed after accounting for the baseline. For the NIST station receiver(NIST), the RINEX files were corrected for C1P1 bias[5]. The results with the average values of RAWDIF are given in Table 3. The values for ΔINTDLY between a given pair of receivers are computed using Eq.(1) and are given in Table 4. Since no RINEX files were available for ON_I, we used CGGTTS files for computing RAWDIF(C1)[6]. ON_I is presumed to have operated in auto compensation ON mode.

Table 3: Computed raw P1, C1, and P2 differences between station and traveling receivers

Pair	MJD	RAWDIF(P1) (ns)	RAWDIF(P2) (ns)	RAWDIF(C1) (ns)
nb05-NIST	59384-59394	-495.18	-490.93	-494.08
nb05-TC_2	59503-59511	-205.27	-198.91	-205.94
nb05-ON_I	59524-59535	—	—	157.66
nb05-INTI	59624-59630	15.12	17.03	21.02
nb05-NIST	59676-59686	-495.21	-490.83	-494.21

5 Uncertainty estimates

Systematic and statistical uncertainties are assigned as given in Table 5. Misclosure is inferred from Table 3 and RAWDIf uncertainties for labv is from time deviation (TDEV), see attached plots at the end of this report. All other uncertainties are fixed values. The combined uncertainty given in Table 6 is obtained by combining uncorrelated (assumed) uncertainties in quadrature.

Table 4: INTDLY differences between traveling and station receivers.

Pair	MJD	ΔINTDLY(P1) (ns)	ΔINTDLY(P2) (ns)	ΔINTDLY(C1) (ns)
nb05-NIST	59384-59394	120.02	124.27	121.11
nb05-TC_2	59503-59511	16.72	23.09	16.05
nb05-ON_I	59524-59535	—	—	-25.76
nb05-INTI	59624-59630	84.82[1]	74.43[2]	85.22
nb05-NIST	59676-59686	119.99	124.32	120.99

[1,2]: INTI receiver produces RINEX after accounting for CAB_{DLY}=129.3 ns, INTDLY(P1)=-36.3 ns, INTDLY(P2)=-24.0 ns, INTDLY(C1)=-30.8 ns, and REF_{DLY}=8 ns. We apply this correction to the computed RAWDIF from RINEX to estimate ΔINTDLY.

Table 5: Uncertainty assigned for each station

quantity	unc type	TC_2 (ns)	ON_I (ns)	INTI (ns)
$RAWDIF\ (P1)_{nb05-labv}$	u_a	0.20	—	0.30
$RAWDIF(P2)_{nb05-labv}$	u_a	0.10	—	0.30
$RAWDIF\ (C1)_{nb05-labv}$	u_a	0.10	1.10	0.30
nb05 antenna position	$u_{b,11}$	0.05	0.05	0.05
labv antenna position	$u_{b,12}$	0.05	0.05	0.05
nb05 multipath	$u_{b,13}$	0.20	0.20	0.20
labv multipath	$u_{b,14}$	0.20	0.20	0.20
$REFDLY_{nb05}$	$u_{b,21}$	0.10	0.10	0.10
$REFDLY_{labv}$	$u_{b,22}$	0.10	0.10	0.10
$CABDLY_{nb05}$	$u_{b,31}$	0.10	0.10	0.10
$CABDLY_{labv}$	$u_{b,32}$	0.10	0.10	0.10
Misclosure	$u_{b,1}$	0.10	0.10	0.10

Table 6: INTDLY of station receivers

Rcvr	Model	INTDLY(P1) (ns)	INTDLY(C1) (ns)	INTDLY(P2) (ns)
TC_2	PolaRx5TR	30.1 ±0.4	31.9±0.4	28.3±0.4
ON_I	TTS-2	—	73.7±1.2	—
INTI	GTR50	-38.0±0.5	-37.3±0.5	-23.0±0.5

6 Secondary information

1. RAWDIF and TDev plots: Attached separately.
2. Annex A: Attached separately.
3. Data files: ftp//ftp.NIST.gov/pub/pml/688gps/GNSS-Calibrations/cal_id_1014-2021.tar.gz

References

[1] ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/

[2] ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/group1/1001-2018/1001-2020-phase3-report.pdf

[3] ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/doc-soft/

[4] http://www.bipm.org/wg/CCTF/WGGNSS/Allowed/BIPM_guidelines_V3/Annex-3_Computation-procedure-Rinex_V2.pdf

[5] ftp://dgn6.esoc.esa.int/CC2NONCC/

[6] P Defraigne and G Petit, CGGTTS-Version 2E : an extended standard for GNSS Time Transfer, Metrologia, vol. 52 G1, no. 6, 2015

Annex A - Information Sheet

Laboratory	**NIST**
Date and hour of the beginning of measurements:	MJD 59384.0
Date and hour of the end of measurements:	MJD 59394.0

Information on the system		
	Local:	**Traveling:**
4-character BIPM code	**NIST**	**NB05**
Receiver maker and type: Receiver serial number:	Novatel OEM4-G2 SWU04029169	Septentrio PolaRx3eTR PRO
1 PPS trigger level /V:	1	1
Antenna cable maker and type: Phase stabilized cable (Y/N):	Andrew FSJ-50A N	Timesmicrowave LMR 100A N
Length outside the building /m:	65	10
Antenna maker and type: Serial number:	Novatel 702 04230007	Novatel 702 S/N 010017577
Temperature (if stabilized) /°C		

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	65.9	413.5 (327.7+85.78)
Delay from 1 PPS-in to internal Reference (if different): (X_O)		191.7
Antenna cable delay: (X_C)	275.5	199.6
Splitter delay (if any):		
Additional cable delay (if any):		

Data used for the generation of CGGTTS files	
INT DLY (or X_R+X_S) (GPS) /ns: (Cal_Id:1001-2020)	-73.76(P1) ,-72.92 (P2), -73.08 (C1)
INT DLY (or X_R+X_S) (Galileo) /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:	
Set humidity value and uncertainty:	

Annex A - Information Sheet

Laboratory:	**AGGO, La Plata, Argentina**
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	**AGGO**	
Receiver maker and type: Receiver serial number:	Septentrio PolaRx5TR 3228290	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilized cable (Y/N):	EcoFlex 10 LowLoss 50Ω, Germany N	
Length outside the building /m:	50	
Antenna maker and type: Antenna serial number:	Leica LEIAR25.R4 LEIT: 726722	
Temperature (if stabilized) /°C	-	

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	12.3 ns	
Delay from 1 PPS-in to internal Reference (if different): (X_O)	-	
Antenna cable delay: (X_C)	205.661 ns	
Splitter delay (if any) (**LDCBS1X4**):	Typ.: 0.1 Max.: 1.0 (from datasheet)	
Additional cable delay (if any):	2.267 ns	

Data used for the generation of CGGTTS files	
INT DLY (or X_R+X_S) (GPS) /ns:	30
INT DLY (or X_R+X_S) (Galileo) /ns:	30
CAB DLY (or X_C) /ns:	201.715
REF DLY (or X_P+X_O) /ns:	12.3
Coordinates reference frame:	WGS84
X /m:	2765120.90
Y /m:	-4449250.25
Z /m	-3626405.60

General information	
Rise time of the local UTC pulse:	2.7 ns
Is the laboratory air conditioned:	yes
Set temperature value and uncertainty:	(21 ± 1) ºC
Set humidity value and uncertainty:	(50 ± 10) %

Annex A - Information Sheet

Laboratory:	**ONBA**, BUENOS AIRES, ARGENTINA
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	ON__	
Receiver maker and type: Receiver serial number:	ONBA-Space Research Centre, Polish Academy of Sciences, TTS-2, RSN#21	
1 PPS trigger level /V:	0.5 V	
Antenna cable maker and type: Phase stabilized cable (Y/N):	LMR -195 PVC CATVR (UL) RG-58 NO	
Length outside the building /m:	15 m	
Antenna maker and type: Antenna serial number:	TRC PROCOM DENMARK GPS 2000	
Temperature (if stabilized) /°C	NO	

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	48.9 ns	
Delay from 1 PPS-in to internal Reference (if different): (X_O)		
Antenna cable delay: (X_C)	160.4 ns	
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:	- 1.0 ns
INT DLY (or X_R+X_S) (Galileo) /ns:	---
CAB DLY (or X_C) /ns:	160.4
REF DLY (or X_P+X_O) /ns:	48.93 ns
Coordinates reference frame:	ITRF97
X /m:	2756757.33 m
Y /m:	-4473139.02 m
Z /m	-3603454.25 m

General information	
Rise time of the local UTC pulse:	06 ns
Is the laboratory air conditioned:	YES
Set temperature value and uncertainty:	20 °C +- 1°C
Set humidity value and uncertainty:	---

Annex A - Information Sheet

Laboratory:	**INTI**
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	**INTI**	
Receiver maker and type: Receiver serial number:	DICOM GTR50 S/N: 1203120	
1 PPS trigger level /V:	1	
Antenna cable maker and type: Phase stabilized cable (Y/N):	BELDEN VENLO, HOLLAND 2010 50 ohm. Not stabilized	
Length outside the building /m:	5 (estimated)	
Antenna maker and type: Antenna serial number:	Novatel GPS-702	
Temperature (if stabilized) /°C	-	

Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	8	
Delay from 1 PPS-in to internal Reference (if different): (X_O)	-	
Antenna cable delay: (X_C)	129.3	
Splitter delay (if any):	-	
Additional cable delay (if any):	-	

Data used for the generation of CGGTTS files	
INT DLY (or X_R+X_S) (GPS) /ns:	-30.8
INT DLY (or X_R+X_S) (Galileo) /ns:	-
CAB DLY (or X_C) /ns:	129.3
REF DLY (or X_P+X_O) /ns:	8
Coordinates reference frame:	WGS84
X /m:	2745680.77
Y /m:	-4483306.05

Z /m	-3599317.03
General information	
Rise time of the local UTC pulse:	1.4 ns
Is the laboratory air conditioned:	yes
Set temperature value and uncertainty:	(21+/-1) °C
Set humidity value and uncertainty:	(50 +/- 10) %

Annex A - Information Sheet

Laboratory	**NIST**
Date and hour of the beginning of measurements:	MJD 59676.0
Date and hour of the end of measurements:	MJD 59686.0

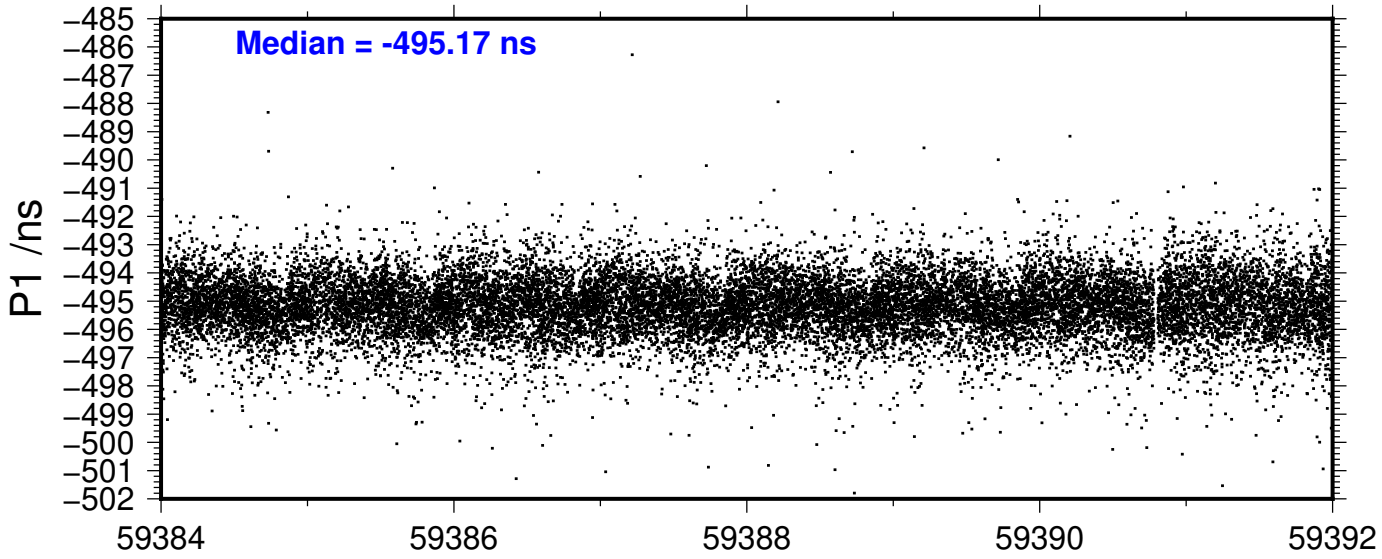
Information on the system		
	Local:	**Traveling:**
4-character BIPM code	**NIST**	**NB05**
Receiver maker and type: Receiver serial number:	Novatel OEM4-G2 SWU04029169	Septentrio PolaRx3eTR PRO
1 PPS trigger level /V:	1	1
Antenna cable maker and type: Phase stabilized cable (Y/N):	Andrew FSJ-50A N	Timesmicrowave LMR 100A N
Length outside the building /m:	65	10
Antenna maker and type: Serial number:	Novatel 702 04230007	Novatel 702 S/N 010017577
Temperature (if stabilized) /°C		

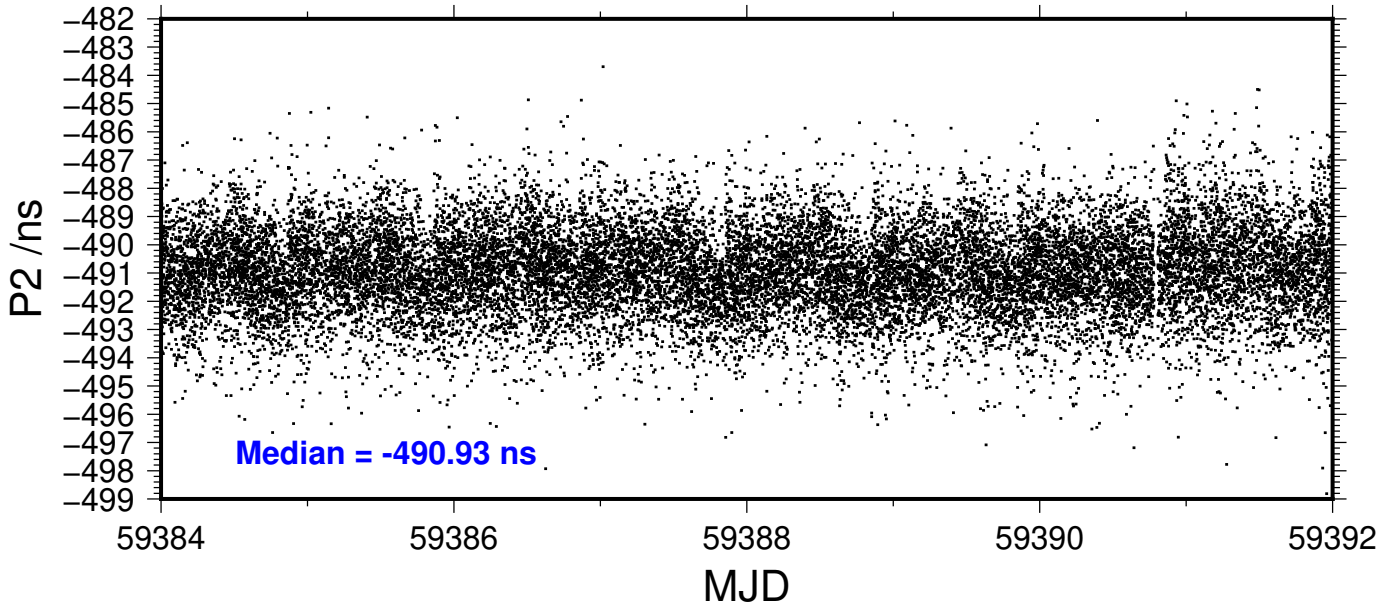
Measured delays /ns		
	Local:	**Traveling:**
Delay from local UTC to receiver 1 PPS-in (X_P)	65.9	413.5 (327.7+85.83)
Delay from 1 PPS-in to internal Reference (if different): (X_O)		191.8
Antenna cable delay: (X_C)	275.5	199.6
Splitter delay (if any):		
Additional cable delay (if any):		

Data used for the generation of CGGTTS files	
INT DLY (or X_R+X_S) (GPS) /ns: (Cal_Id:1001-2020)	-73.76(P1) ,-72.92 (P2), -73.08 (C1)
INT DLY (or X_R+X_S) (Galileo) /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

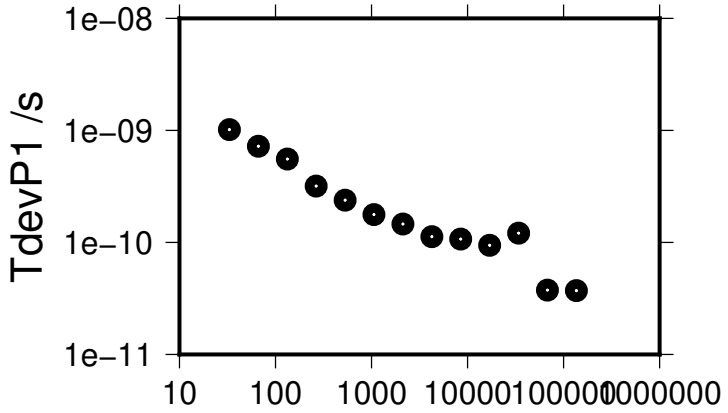
General information	
Rise time of the local UTC pulse:	3 ns
Is the laboratory air conditioned:	Yes
Set temperature value and uncertainty:	
Set humidity value and uncertainty:	

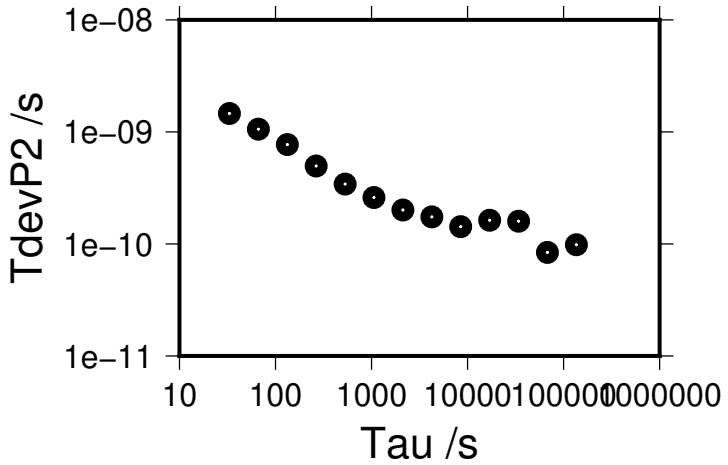
2022-04-25 nb05nist21170_8

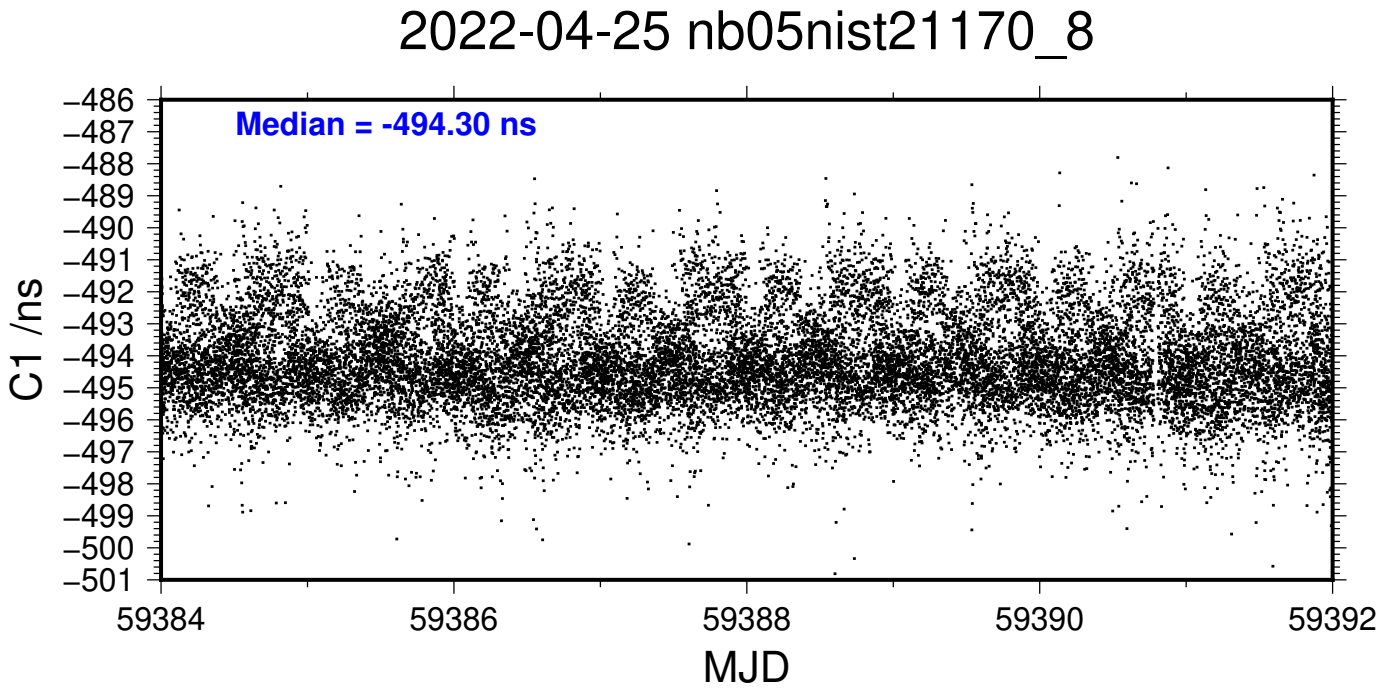




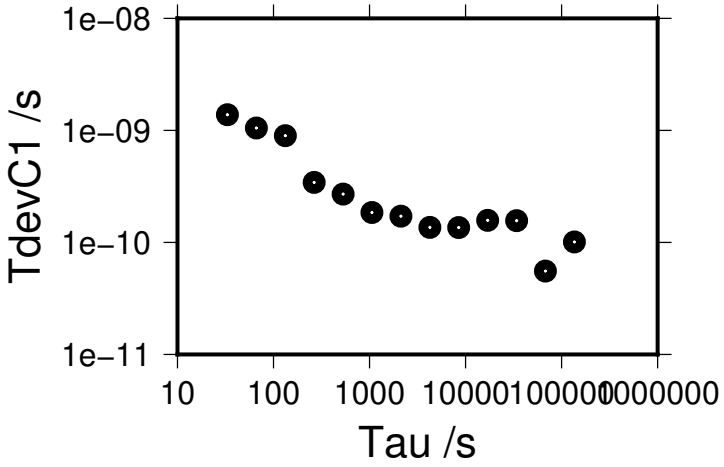
135826 s: P1= 37 ps	135832 s: P2= 98 ps
67913 s: P1= 38 ps	67916 s: P2= 84 ps
33956 s: P1= 121 ps	33958 s: P2= 160 ps
16978 s: P1= 94 ps	16979 s: P2= 163 ps
8489 s: P1= 107 ps	8490 s: P2= 143 ps
4245 s: P1= 113 ps	4245 s: P2= 174 ps
2122 s: P1= 146 ps	2122 s: P2= 201 ps
1061 s: P1= 177 ps	1061 s: P2= 260 ps
531 s: P1= 238 ps	531 s: P2= 342 ps
265 s: P1= 319 ps	265 s: P2= 496 ps
133 s: P1= 554 ps	133 s: P2= 771 ps
66 s: P1= 722 ps	66 s: P2= 1057 ps
33 s: P1= 1017 ps	33 s: P2= 1458 ps

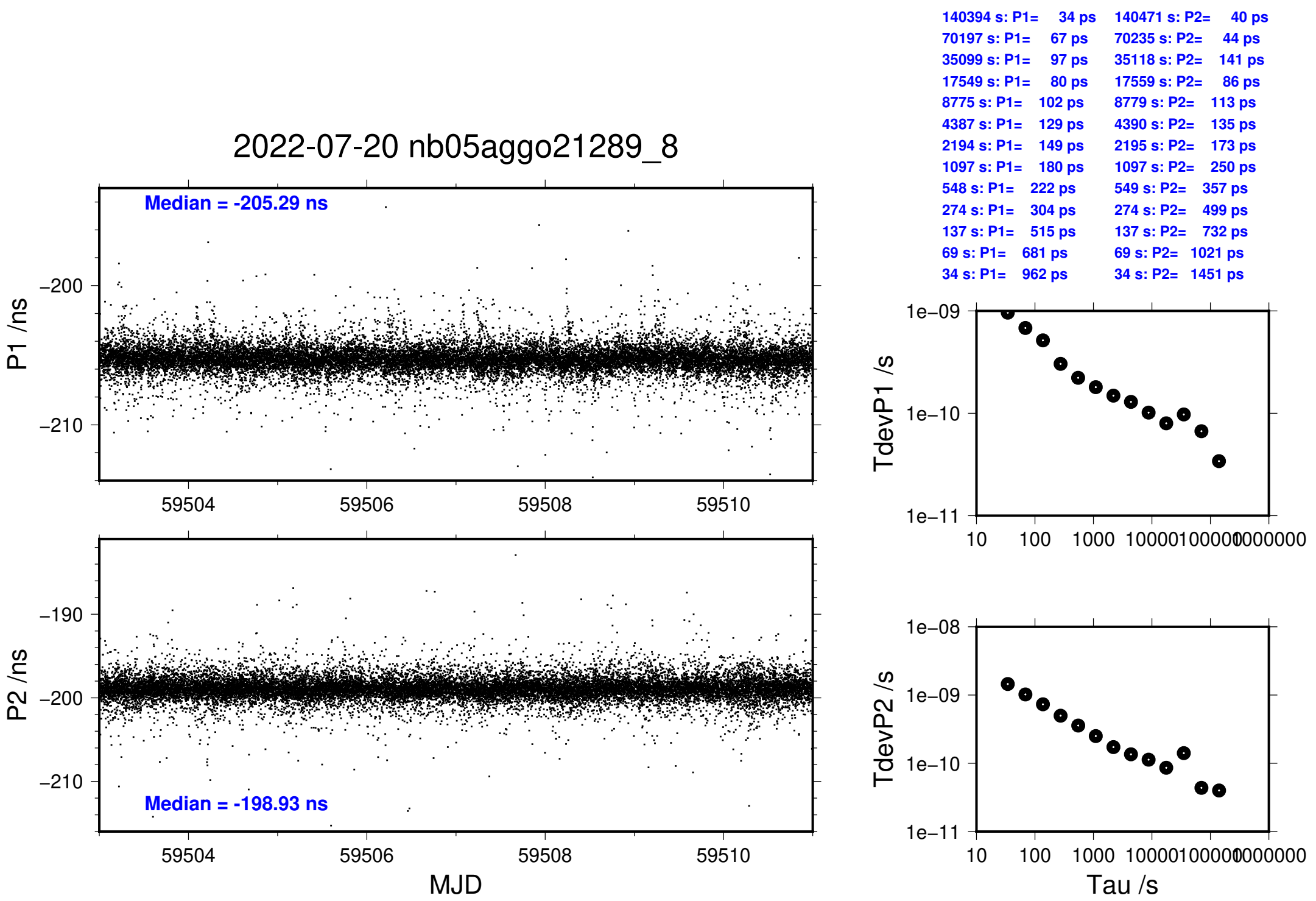






135813 s: C1= 101 ps
67906 s: C1= 55 ps
33953 s: C1= 156 ps
16977 s: C1= 158 ps
8488 s: C1= 136 ps
4244 s: C1= 136 ps
2122 s: C1= 171 ps
1061 s: C1= 185 ps
531 s: C1= 270 ps
265 s: C1= 343 ps
133 s: C1= 896 ps
66 s: C1= 1050 ps
33 s: C1= 1380 ps

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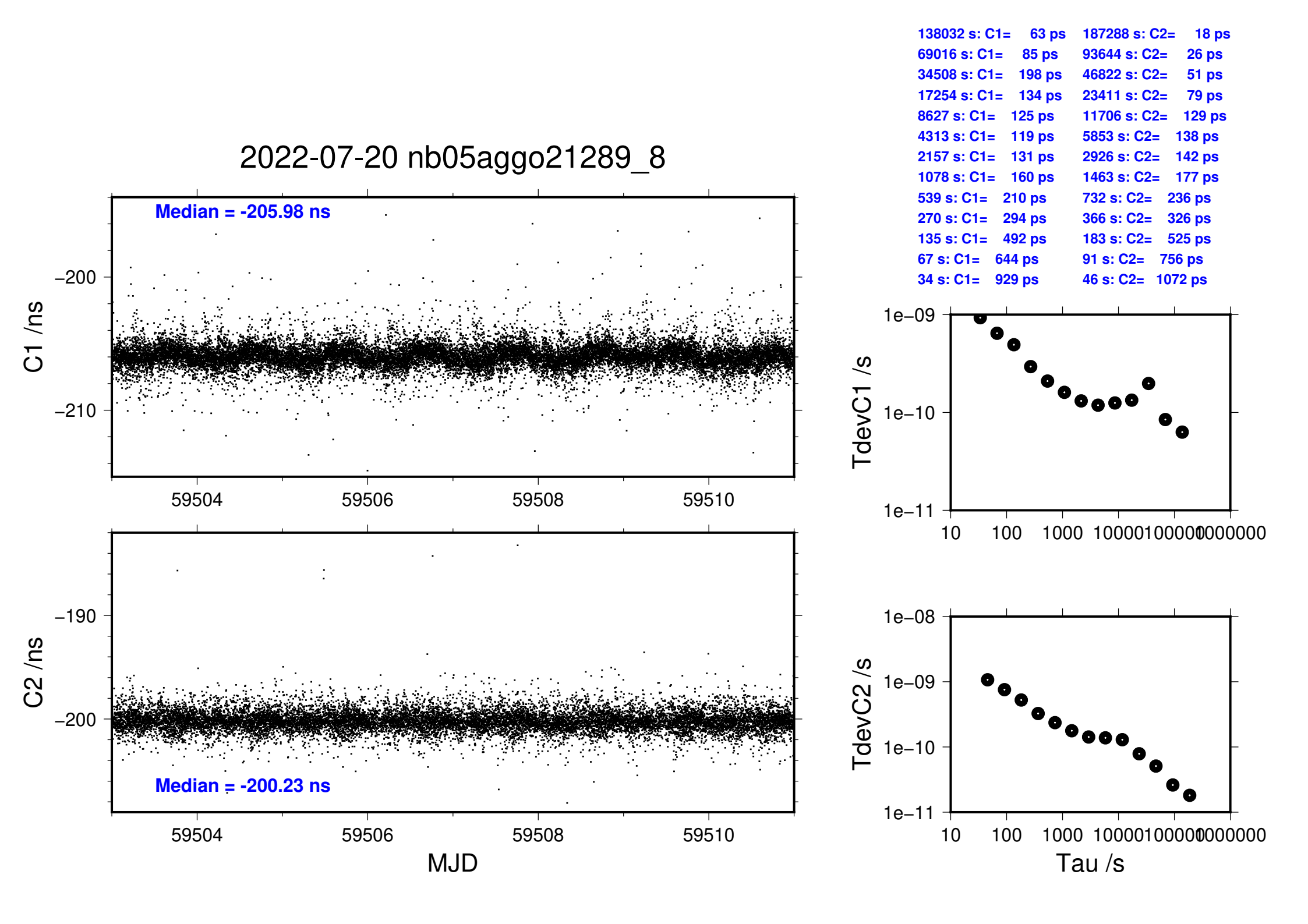
Median = -205.29 ns
Median = -198.93 ns
P1 /ns
P2 /ns
MJD
59504
59506
59508
59510
140394 s: P1= 34 ps
140471 s: P2= 40 ps
70197 s: P1= 67 ps
70235 s: P2= 44 ps
35099 s: P1= 97 ps
35118 s: P2= 141 ps
17549 s: P1= 80 ps
17559 s: P2= 86 ps
8775 s: P1= 102 ps
8779 s: P2= 113 ps
4387 s: P1= 129 ps
4390 s: P2= 135 ps
2194 s: P1= 149 ps
2195 s: P2= 173 ps
1097 s: P1= 180 ps
1097 s: P2= 250 ps
548 s: P1= 222 ps
549 s: P2= 357 ps
274 s: P1= 304 ps
274 s: P2= 499 ps
137 s: P1= 515 ps
137 s: P2= 732 ps
69 s: P1= 681 ps
69 s: P2= 1021 ps
34 s: P1= 962 ps
34 s: P2= 1451 ps
TdevP1 /s
TdevP2 /s
Tau /s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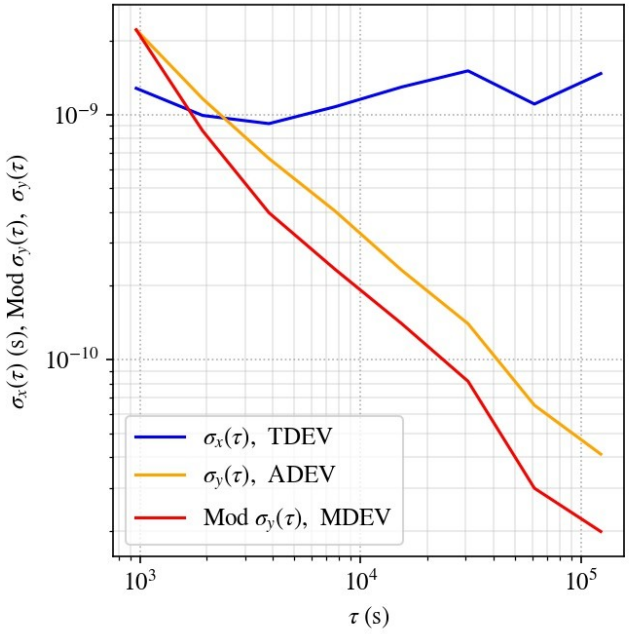
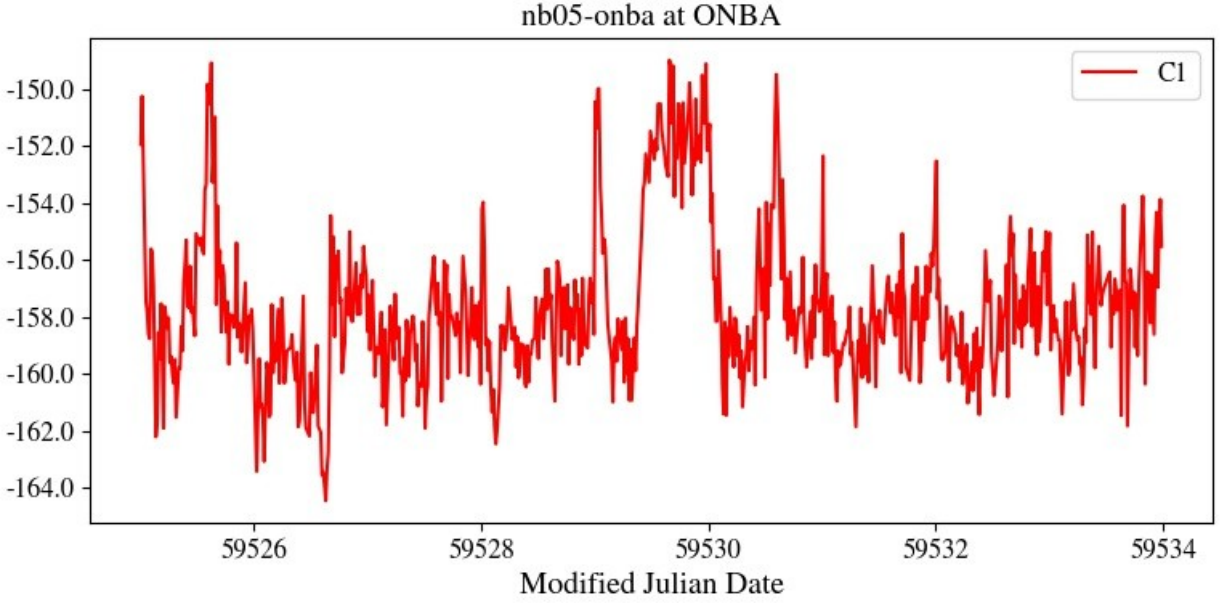
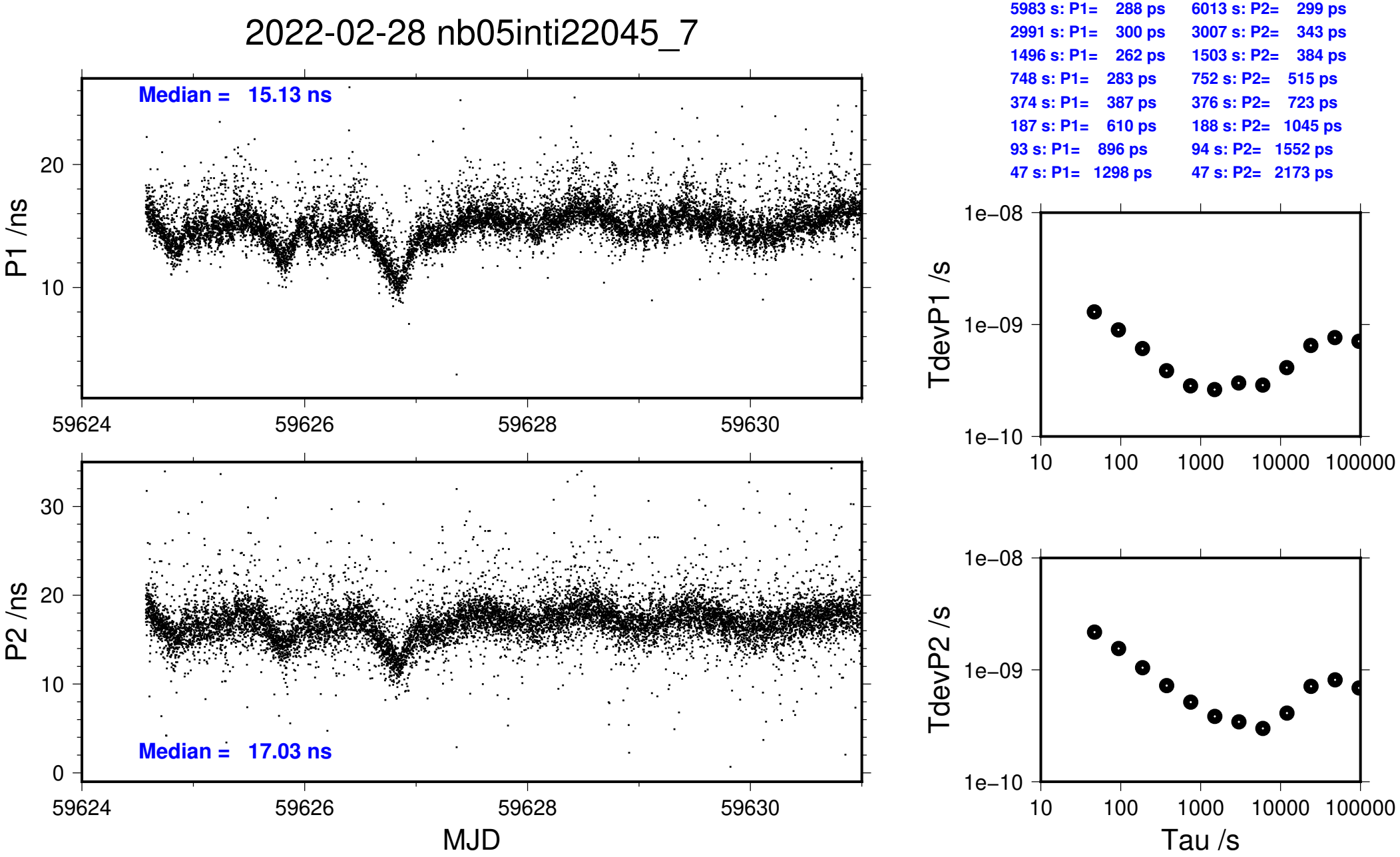
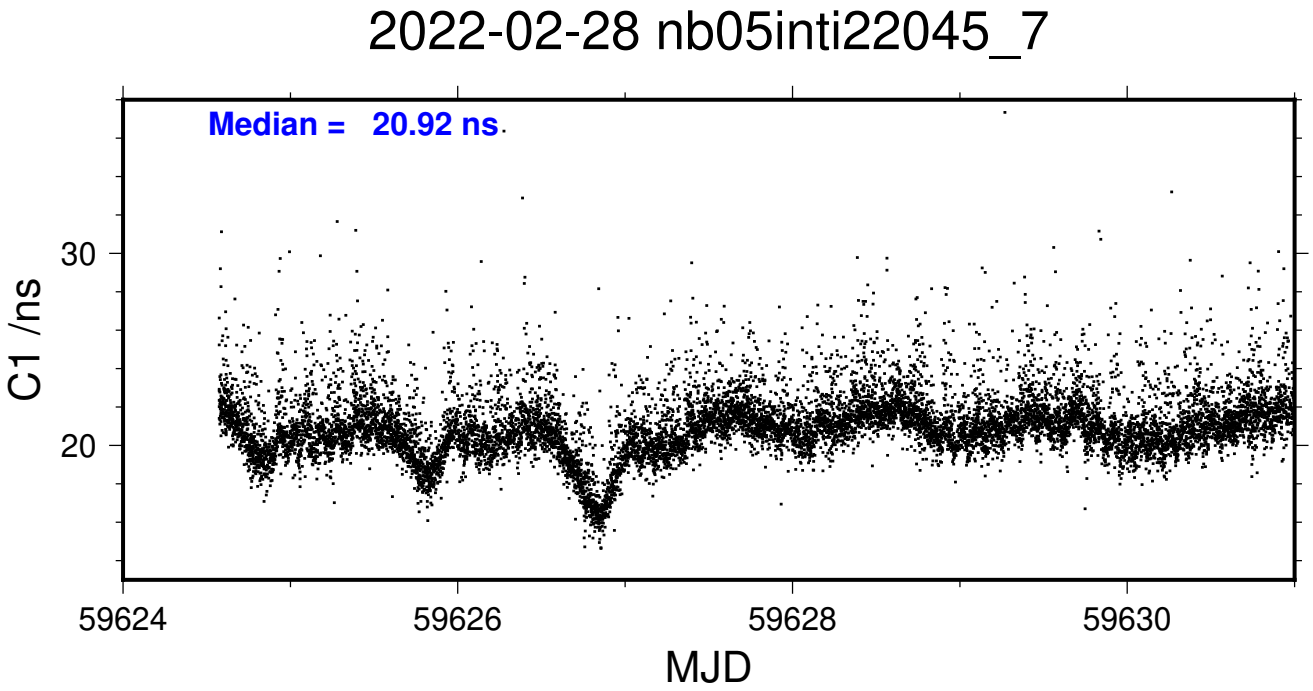
Median = -205.98 ns
Median = -200.23 ns
C1 /ns
C2 /ns
MJD
138032 s: C1= 63 ps
69016 s: C1= 85 ps
34508 s: C1= 198 ps
17254 s: C1= 134 ps
8627 s: C1= 125 ps
4313 s: C1= 119 ps
2157 s: C1= 131 ps
1078 s: C1= 160 ps
539 s: C1= 210 ps
270 s: C1= 294 ps
135 s: C1= 492 ps
67 s: C1= 644 ps
34 s: C1= 929 ps
187288 s: C2= 18 ps
93644 s: C2= 26 ps
46822 s: C2= 51 ps
23411 s: C2= 79 ps
11706 s: C2= 129 ps
5853 s: C2= 138 ps
2926 s: C2= 142 ps
1463 s: C2= 177 ps
732 s: C2= 236 ps
366 s: C2= 326 ps
183 s: C2= 525 ps
91 s: C2= 756 ps
46 s: C2= 1072 ps
TdevC1 /s
TdevC2 /s
Tau /s



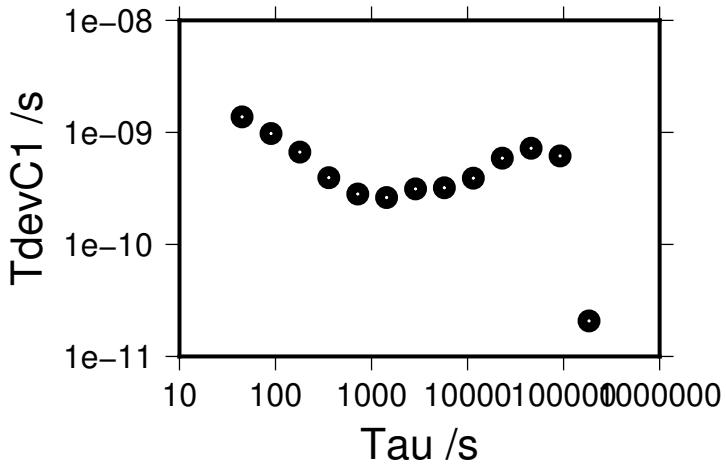


tau(s)	ns
960	1.28
1920	0.99
3840	0.91
7680	1.08
15360	1.29
30720	1.51
61440	1.10
122880	1.47

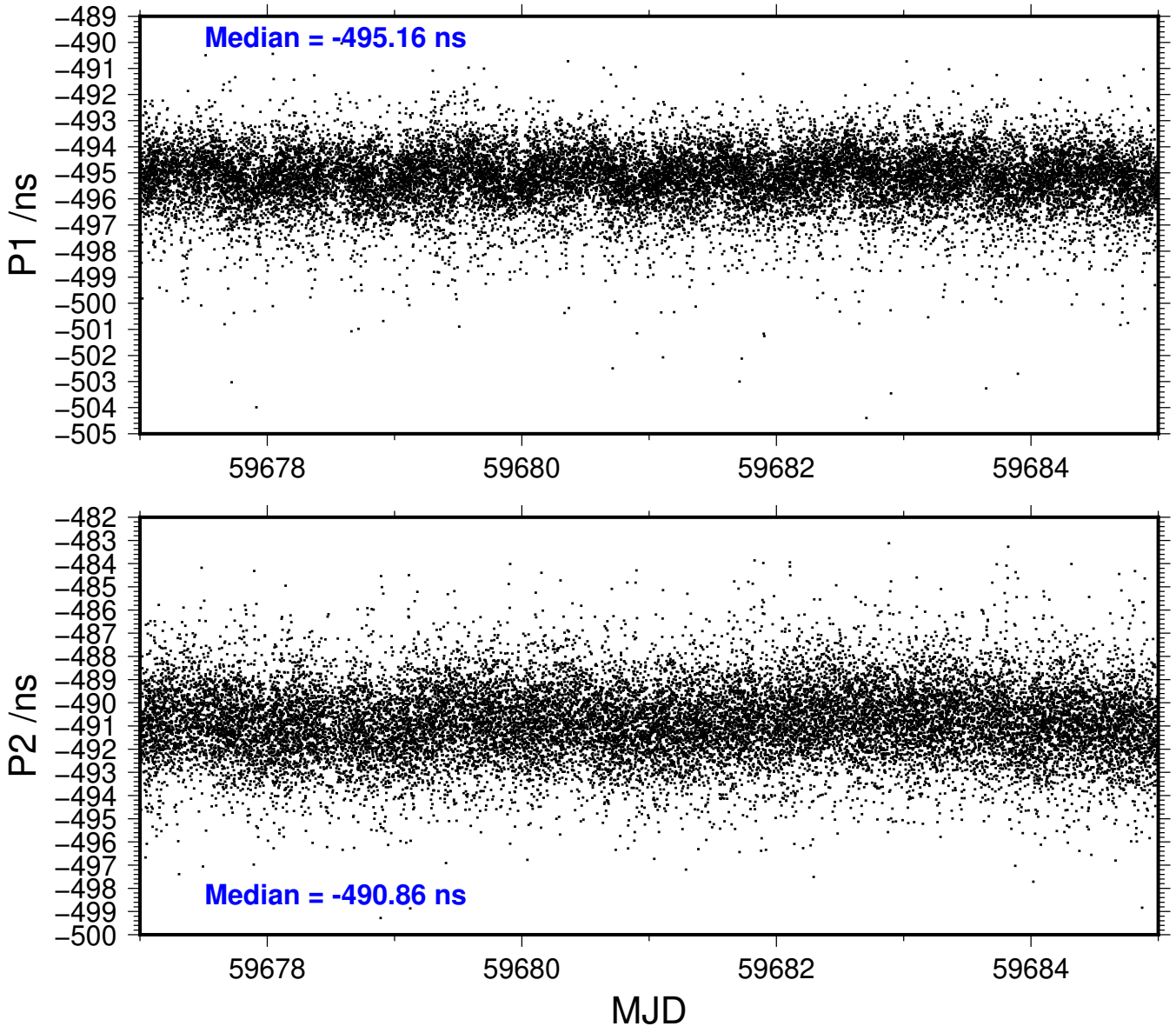

2022-02-28 nb05inti22045_7
Median = 15.13 ns
P1 /ns
20
10
59624
59626
59628
59630
P2 /ns
30
20
10
0
Median = 17.03 ns
MJD
95720 s: P1= 708 ps
96214 s: P2= 689 ps
47860 s: P1= 765 ps
48107 s: P2= 814 ps
23930 s: P1= 650 ps
24054 s: P2= 712 ps
11965 s: P1= 412 ps
12027 s: P2= 411 ps
5983 s: P1= 288 ps
6013 s: P2= 299 ps
2991 s: P1= 300 ps
3007 s: P2= 343 ps
1496 s: P1= 262 ps
1503 s: P2= 384 ps
748 s: P1= 283 ps
752 s: P2= 515 ps
374 s: P1= 387 ps
376 s: P2= 723 ps
187 s: P1= 610 ps
188 s: P2= 1045 ps
93 s: P1= 896 ps
94 s: P2= 1552 ps
47 s: P1= 1298 ps
47 s: P2= 2173 ps
TdevP1 /s
1e−08
1e−09
1e−10
10
100
1000
10000
100000
TdevP2 /s
Tau /s



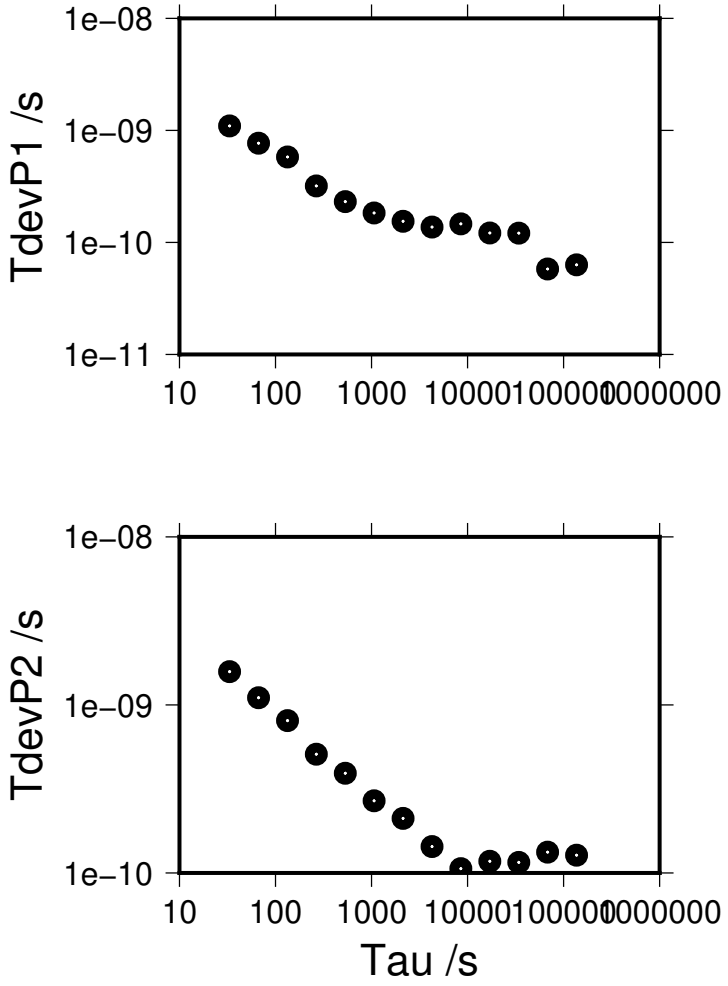
183754 s: C1= 21 ps
91877 s: C1= 617 ps
45939 s: C1= 722 ps
22969 s: C1= 588 ps
11485 s: C1= 391 ps
5742 s: C1= 320 ps
2871 s: C1= 314 ps
1436 s: C1= 262 ps
718 s: C1= 281 ps
359 s: C1= 394 ps
179 s: C1= 667 ps
90 s: C1= 977 ps
45 s: C1= 1378 ps

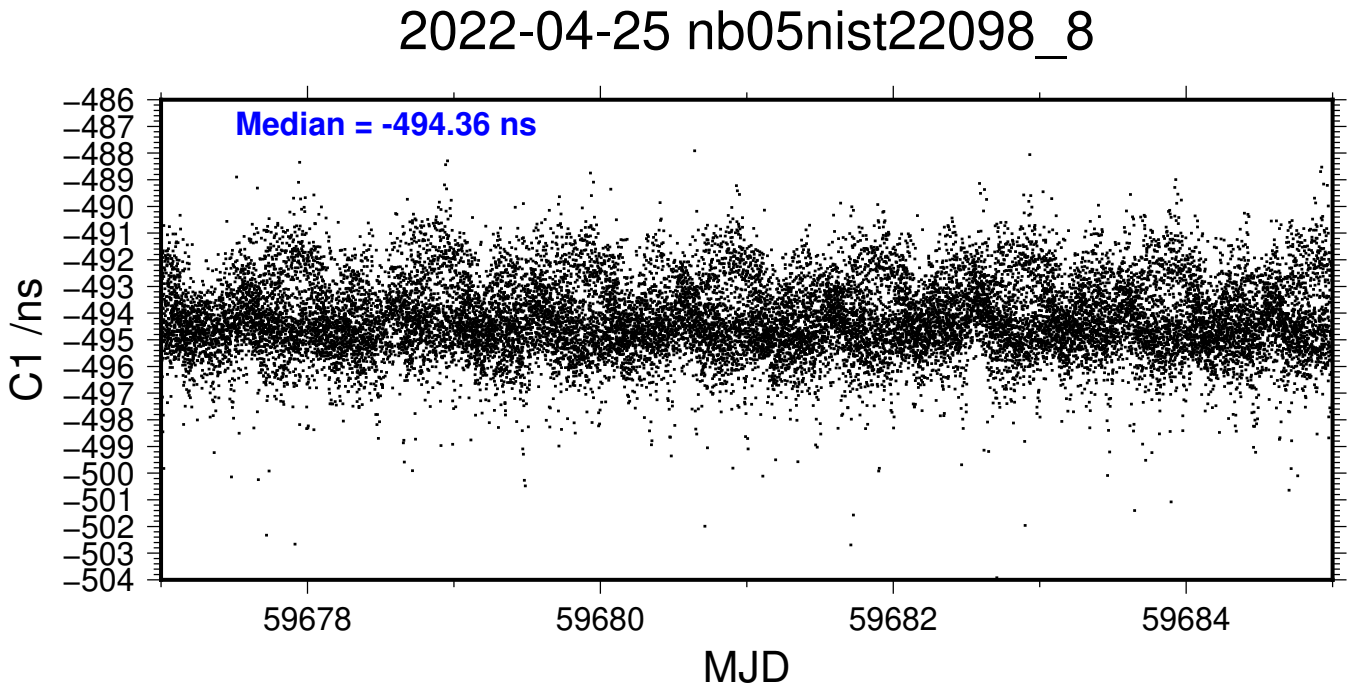


2022-04-25 nb05nist22098_8



136336 s: P1= 63 ps	136336 s: P2= 128 ps
68168 s: P1= 58 ps	68168 s: P2= 133 ps
34084 s: P1= 121 ps	34084 s: P2= 116 ps
17042 s: P1= 121 ps	17042 s: P2= 117 ps
8521 s: P1= 146 ps	8521 s: P2= 106 ps
4260 s: P1= 137 ps	4260 s: P2= 144 ps
2130 s: P1= 154 ps	2130 s: P2= 211 ps
1065 s: P1= 183 ps	1065 s: P2= 269 ps
533 s: P1= 231 ps	533 s: P2= 392 ps
266 s: P1= 319 ps	266 s: P2= 509 ps
133 s: P1= 579 ps	133 s: P2= 806 ps
67 s: P1= 769 ps	67 s: P2= 1104 ps
33 s: P1= 1097 ps	33 s: P2= 1579 ps





136329 s: C1= 90 ps
68165 s: C1= 86 ps
34082 s: C1= 206 ps
17041 s: C1= 208 ps
8521 s: C1= 208 ps
4260 s: C1= 186 ps
2130 s: C1= 160 ps
1065 s: C1= 187 ps
533 s: C1= 243 ps
266 s: C1= 330 ps
133 s: C1= 789 ps
67 s: C1= 1049 ps
33 s: C1= 1363 ps