

# Local Differential Calibration Report

Date:15/03/2018

**Introduction:** CSIR-NPL India (NPLI), got GTR51 receiver which is pre calibrated from UFE, Czech Republic. We calibrated locally our PolaRx3eTR (BIPM code LITI) receiver with respect to GTR51 (BIPM code LIAA) receiver. To calibrate LITI receiver we used two software DCLRINEX and R2CGTTS which is made by BIPM and ORB respectively.

**Procedure used:** The figure1 shows a practical setup for GNSS receiver. We used CGGTTS and Rinex file of LIAA and LITI receiver for a single day (MJD58187). Although PolaRx3eTR receiver generate CGGTTS but in this calibration we used R2CGGTTS software to generate CGGTTS file for PolaRx3eTR receiver. We made comparison using DCLRINEX software between these two receiver.

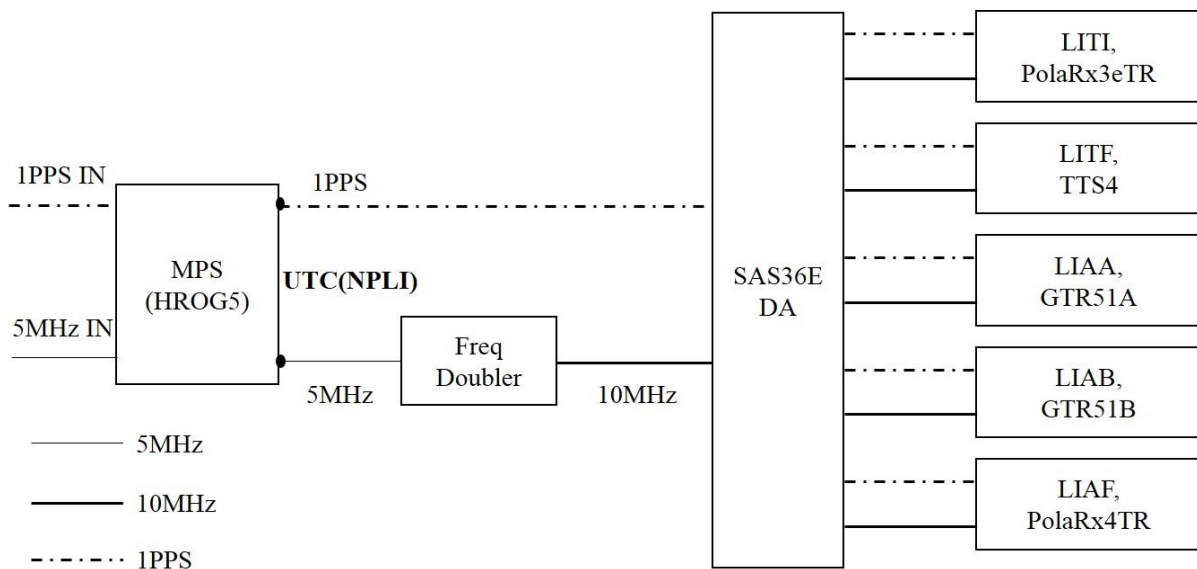


Figure1: Practical Set-up for GNSS Rx

**Calculation and Measurement using DCLRINEX:** The figure2 to figure4 shows the results of DLRRINEX software. We used the medc1, medp1 and medp2 values to calculate the internal delay of PolaRx3eTR receiver. In the GTR51 receiver tale1 all delays are included in Rinex file. We are concern about the delays of LITI receiver.

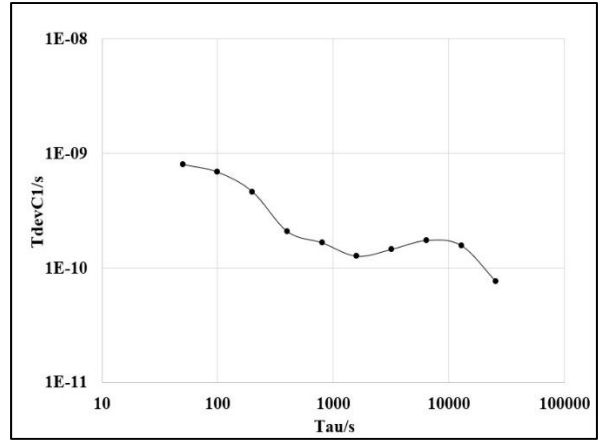
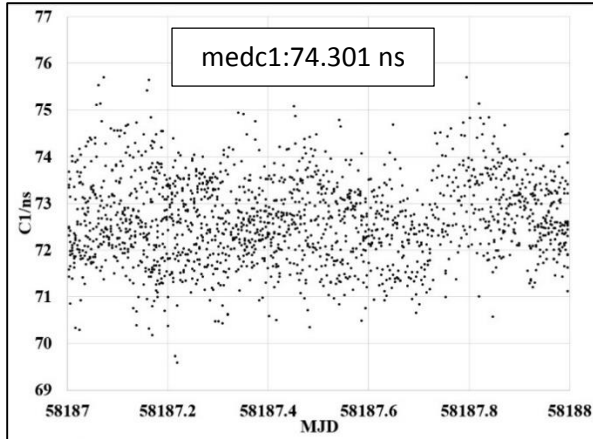


Figure2: C1 measurement and Allan deviation for the period of 10<sup>th</sup> March, 2018

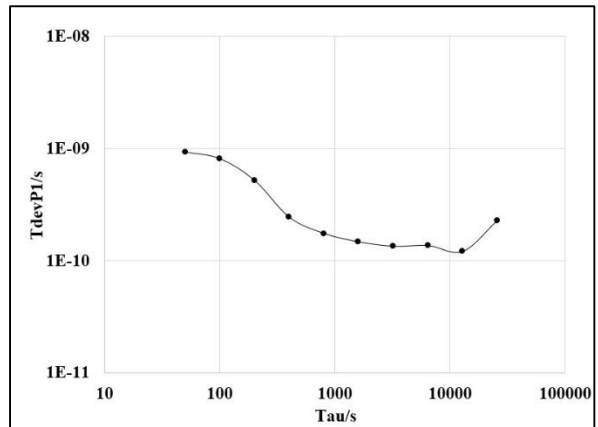
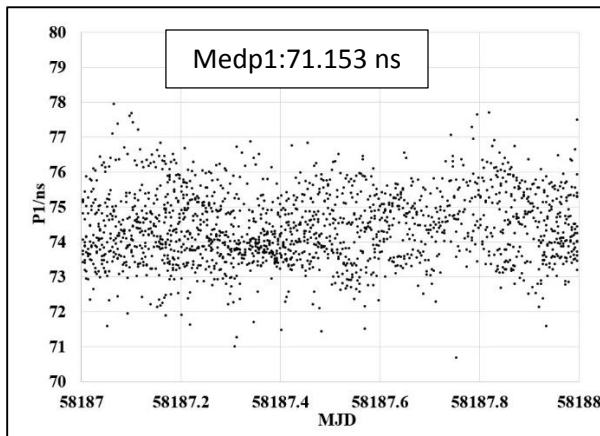


Figure3: P1 measurement and Allan deviation for the period of 10<sup>th</sup> March, 2018

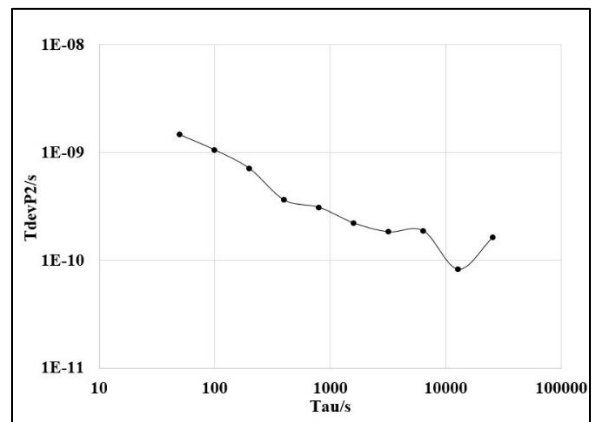
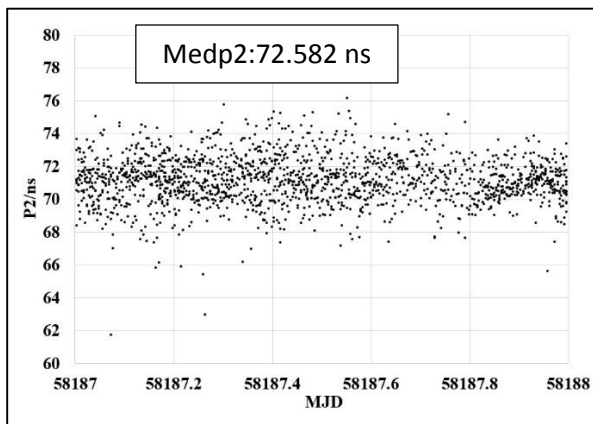


Figure4: P2 measurement and Allan deviation for the period of 10<sup>th</sup> March, 2018

Table1

GTR51 (LIAA) Delays				
Cable Delay, ns	Ref Delay, ns	Internal Delay, ns (pre-calibrated)		
		C1	P1	P2
132.9	96.7	-23.0	-25.9	-26.9

Table2

PolarX3eTR (LITI) Delay					
medc1, ns	Cable Delay, ns	Ref Delay, ns			C1:Int Delay, ns
	$X_C$	$X_P$	$X_O$	$X_P + X_O$	$C1\#X_S + X_R$
72.582	150.0	96.1	188.0	284.1	61.518
medp1	Cable Delay	Ref Delay			P1:Int Delay
	$X_C$	$X_P$	$X_O$	$X_P + X_O$	$P1\#X_S + X_R$
74.301	150.0	96.1	188.0	284.1	59.799
medp2	Cable Delay	Ref Delay			P2:Int Delay
	$X_C$	$X_P$	$X_O$	$X_P + X_O$	$P2\#X_S + X_R$
71.153	150.0	96.1	188.0	284.1	62.947

**P3 Data Measurement:** The P3 common view is performed between these two receiver with two different internal delays. In first case, we put internal delay zero ( $P1=0ns$ ,  $P2=0ns$ ) and in second case we put measured internal delays ( $P1=59.8ns$ ,  $P2=63.0ns$ ) from DCLRINEX processing for LITI receiver. As a result, we got an average of  $-54.512ns$  and  $0.343ns$  in first and second case respectively.

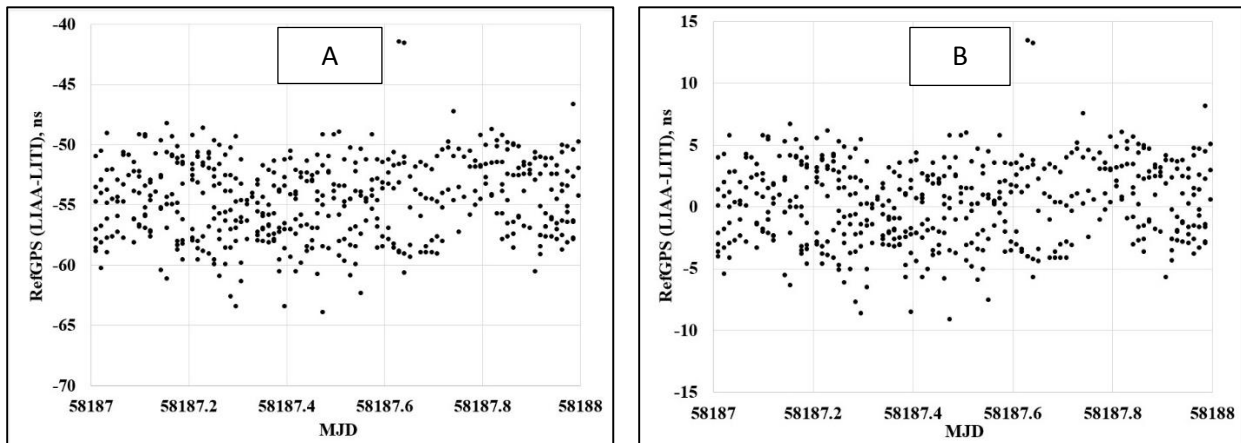


Figure5: P3 measurement results for the period of 10<sup>th</sup> March, 2018, A. When  $P1=0ns$  and  $P2=0ns$  and B. When  $P1=59.8ns$  and  $P2=63.0ns$

**Conclusion:** The locally differential calibrated GNSS PolaRx3eTR(LITI) receiver's internal delay are C1:61.5ns, P1:59.8ns and P2:63.0ns. The uncertainty of Refdelay of LITI(PolaRx3eTR) is calculated is 0.5ns.