

Calibration Information of the GPS Time and Frequency Transfer Receivers at NIM(New Campus)

1. Motivation and the description of the calibration

Since 2010, we have started to build the new clock room at our new campus(Changping campus). Since Oct 14th 2012, we have changed our UTC(NIM) to the new time scale UTC(NIM1) implemented at the new campus. In order to contribute to the realization of TAI with low uncertainty, a calibration of the time transfer link between National Institute of Metrology (NIM), P. R. China, and Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany, is needed. IMPR receiver (Septentrio PolaRx2eTR) located at the old campus has been calibrated since the end of 2009 by BIPM. So we can use it as the reference receiver to calibrate other receivers with the differential calibration. A self-developed traveling GPS (Global Positioning System) receiver of NIM, NIM acronym IMEU firstly was assembled, operated and calibrated with the reference receiver IMPR. Shortly After that, it was moved to the new campus and calibrated the two GNSS time and frequency transfer receivers including IMEJ(Dicom GTR50) and BJNM(Septentrio PolaRx3eTR). The NIM calibrator, NIM acronym IMEC, was calibrated differentially in 2014 by NIM using this method.

The principle concept of the differential calibration of GPS(Global Positioning System) time and frequency transfer receiver is addressed by BIPM. Here we don't repeat the description of the differential calibration.

2. Experimental setup of the differential calibration

In the campaigns, the receivers used were as follows in table 1.

Table 1. Receivers used for the differential calibration

Timing lab	Receiver name	Receiver model	Role
NIM	IMPR	Septentrio Plorax2eTR	Reference receiver
NIM	IMEU	NIMTFGNSS-1	Receiver to be calibrated Traveling receiver
NIM	IMEJ	Dicom GTR50	Receiver to be calibrated
NIM	BJNM	Septentrio Plorax3eTR	Receiver to be calibrated
NIM	IMEC	NIMTFGNSS-2	Receiver to be calibrated

The scheme of the differential calibration between two receivers(R1 and R2) is shown in figure 1. The first differential calibration experiment for the calibration of IMEU as the traveling receiver between IMEU and IMPR as the reference receiver has been done in Hepingli campus. And then we moved IMEU to the changping campus and implemented the differential calibration experiments among IMEU,

BJNM and IMEJ at the same time. And the latest calibration happened in April 2012. IMEC was calibrated in 2014. During the calibration, the 30-s RINEX files and P3 code CCGTTS files (finally used in the calibration computation) are generated and recorded automatically by all the receivers, and moreover there is not any manual interruption of GPS receiver measurement.

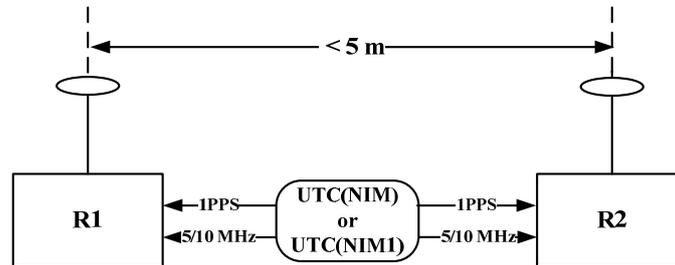


Figure 1. Hardware set-up during the differential calibration

The calibration results of three receivers are as follows.

IMEJ:

INT DLY = -34.4 ns (GPS P1), -23.3 ns (GPS P2)

CAB DLY = 248.7 ns

REF DLY = 122.2 ns

IMEU

INT DLY = -45.8 ns (GPS P3)

CAB DLY = 250.3 ns

REF DLY = 115.5 ns

BJNM:

INT DLY = 64.6 ns (GPS P1), 64.6 ns (GPS P2)

CAB DLY = 125.0 ns

REF DLY = 315.3 ns

IMEC:

INT DLY = -34.6 ns (GPS P3)

CAB DLY = 203.0 ns

REF DLY = 142.5 ns

