



Study on the Correlation between UTC and IGRT during April 2020-April 2022

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The International GNSS Service's (IGS) rapid time scale (IGRT) [1], based on IGS rapid products, is frequently used for time transfer via the Precise Point Positioning (PPP) technique. This paper studies the correlation between Coordinated Universal Time (UTC) and IGRT, which has stayed well within ± 15 ns from April 2020 to the date of this submission. The International Bureau of Weights and Measures (BIPM) regularly publishes UTC-UTC(k) for all participating laboratories [2], as well as IGRT-UTC(k) [3]. Utilizing these two sets of data, anyone can easily and simply derive UTC-IGRT using the corresponding data of any of any lab(k). The inference is complicated by the laboratory-specific bias and noise-differences between the time-transfer data used by the BIPM and those used by the IGS.

The difference between UTC and IGRT has been determined utilizing the data for a few timing labs, including NICT, PTB, USNO, INIRM, NIM and NPLI (figure 1). This study has been carried out for the two years since April 2020, to look into the long-term performance. The correlation between IGRT and UTC via the corresponding data of different lab(k) has been found to have similar nature both in terms of shape and magnitude. For the first 14 months, IGRT-UTC averaged 5 ns with a fluctuation of 2 to 3 ns, and perhaps had a very slow average drift of -0.15 ns/day over much of this period. Since very roughly MJD 59350 (16 May 2021), IGRT-UTC started to drop rapidly and assumed a value -10 ns after about 20-25 days. IGRT-UTC stayed stable at -10 ns through at least 59400.

This work will present an analysis updated through April 2022, discuss the frequency stability of IGRT with respect to UTC and UTCr, and IGRT's short-term stability with respect to the several UTC(k).

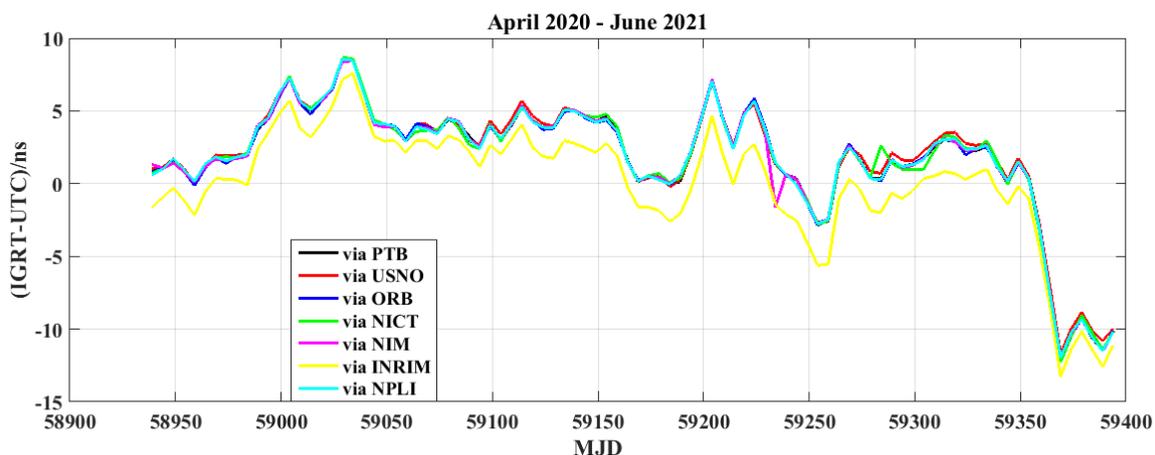


Figure 1. IGRT-UTC as seen through several laboratories, April 2020 - July 2021

1. M. J. Coleman, Clock Products Working Group Technical Report 2019, pp. 201-210, *International GNSS Service Technical Report*, 2019, DOI: 10.7892/boris.14400
2. utc-utc(k), <https://webtai.bipm.org/ftp/pub/tai/other-products/utclab/>
3. https://webtai.bipm.org/ftp/pub/tai/data/yyyy/time_transfer/ and PPP data Files /ppp/yyyyymm.gpi