Contribution ID: **161** Type: **Invited Poster**

The Decoupling of Geostationary Satellite's Orbit and Clock Offset by Dual-Carrier Differential Method

The coupling of the orbit and the clock offset seriously affects the clock offset measurement of geostationary orbit (GEO) navigation satellites, and even makes the L-band measurement data unusable [1-2]. To solve the coupling problem, we propose a dual-carrier differential method, which is a further utilization of orbit determination by transfer tracking [3-5]. The dual-carrier differential method can obtain the decimeter-level line-of-sight distance variation of GEO satellites in real time.

We conducted an experiment using the Zhongxing-10 communication satellite and verified the feasibility of the dual-carrier differential method. Fig.1 is the setup and theoretical diagram of the system, and Fig.2 shows the variation in the line-of-sight distance of the Zhongxing-10 satellite to the ground station during the experiment period.

Furthermore, we performed an error analysis of the experiment. After the real-time correction of the phase drift of the ground station, the remaining total error can reach the level of 0.3 m/day. This means that when measuring the clock offset of GEO navigation satellites, the periodic effect of the orbit can be effectively reduced in real time.

Through the combination of the dual-carrier differential method and the existing L-band clock offset measurement method, the clock offset measurement of GEO navigation satellites in the future will achieve higher accuracy and stability.

Reference

[1] Chen J, Wang J, Yu C, et al. Improving BDS broadcast ephemeris accuracy using ground-satellite-link observations[J]. Satellite Navigation, 2022, 3(1): 11.
[2] Zhou S S, Hu X G, Wu B, et al. Orbit determination and time synchronization for a GEO/IGSO satellite navigation constellation with regional tracking network[J]. Science China Physics, Mechanics and Astronomy, 2011, 54: 1089-1097.
[3] Li Z G, Yang X H, Ai G X, et al. A new method for determination of satellite orbits by transfer[J]. Science in China Series G: Physics, Mechanics and Astronomy, 2009, 52: 384-392.
[4] Fen C, XuHai Y, MuDan S, et al. Orbit Determination of Geostationary Earth Orbit Satellite by Transfer with Differenced Ranges between Slave-Slave Stations[J]. The Journal of Navigation, 2014, 67(1): 163-175.
[5] Fen C, Xuhai Y, Zhigang L, et al. Signal biases calibration for precise orbit determination of the Chinese area positioning system using SLR and C-band transfer ranging observations[J]. The Journal of Navigation, 2016, 69(6): 1234-1246.

Authors: Mr WANG, LiJun (Tsinghua University); Ms WANG, ShiGuang (Tsinghua University); Mr ZHANG, TongBao (Tsinghua University); Ms TANG, XueYi (Tsinghua University)

Presenters: Ms WANG, ShiGuang (Tsinghua University); Mr ZHANG, TongBao (Tsinghua University); Ms TANG, XueYi (Tsinghua University)

Track Classification: Time and Frequency Transfer