

## **Recommendation for Committee Decision#21-B**

**Prepared by:** Working Group D

**Date of Submission:** 06 December 2017

**Issue Title:** On the monitoring of offsets between GNSS times (revision of Recommendation #21-A)

### **Background/Brief Description of the Issue:**

Offsets between GNSS times are important information for GNSS users. Monitoring of the offsets between GNSS times and provision of consistent broadcast information are essential to improve interoperability and combined navigation using multiple GNSS.

### **Discussion/Analyses:**

Information of the differences between the GNSS times is the basis of interoperability and combined application of the various GNSS systems. Every GNSS system has its own time system and they are different. The time offsets between different GNSS could be measured continuously by GNSS timing receivers, could be obtained by direct time comparison link or computed from a common reference. The monitoring and broadcast of GNSS time offsets are technically possible and will benefit GNSS providers and users.

The time offset between GPS and Galileo (GGTO) is being monitored and is currently broadcast in Galileo navigation message. GLONASS also broadcasts its offset to GPS time. The time offset parameters of BDT relative to the other three GNSS times have been designed in BeiDou navigation messages and the relevant experiments of monitoring and prediction have been implemented.

In order to improve the monitoring of offsets between GNSS times, the different GNSS should work for reaching consistency in the procedures for monitoring and broadcasting the GNSS time offsets.

### **Recommendation of Committee Action:**

- 1. GNSS Providers should consider monitoring of offsets between GNSS times and implement the broadcast of this information in the navigation messages.*
- 2. GNSS Providers are encouraged to undertake studies on possible approaches for giving information on the offsets between GNSS times.*

*3. In order to improve consistency of offsets between GNSS times broadcast by the various systems, GNSS Providers should discuss on the adoption of the same or similar models.*

*4. In order to promote GNSS compatibility and interoperability, GNSS providers and time relevant organizations, including the BIPM, actively develop methods to monitor the offsets between GNSS times, share the monitoring data and relevant research results and actively collaborate with the relevant experts in WG D and S.*

## **Recommendation for Committee Decision**

**Prepared by:** Working Group D

**Date of Submission:** 6 December 2017

**Issue Title:** Guidelines on Selection and Prioritizing Laser Ranging to GNSS Satellites by the International Laser ranging Service (ILRS)

### **Background/Brief Description of the Issue:**

The International Laser Ranging Service (ILRS) coordinates a global network of approximately 40 laser tracking stations.

Laser tracking provides a very accurate means of determining satellite orbits, including of the GNSS satellites fitted with laser retroreflectors.

The ILRS supports a variety of satellite missions, with the highest priority being for the ITRF and Earth remote sensing. Currently the ILRS tracks all GNSS satellites in an uncoordinated fashion.

### **Discussion/Analyses:**

The ILRS is close to being overloaded and will be unable to track all future GNSS satellites. Satellite laser ranging is the best independent means of evaluating the precise GNSS satellite orbits derived by GNSS System Providers, and other researchers and third parties.

It is vital that this valuable service continues to be provided, so that GNSS orbits with centimeter-level accuracy can be assured with progressive refinements in orbit models and analyses.

The ILRS seeks advice on how to select and prioritize the GNSS satellites that should be tracked.

### **Recommendation of Committee Action:**

*That ICG work with the ILRS to develop guidelines on how to select and prioritize GNSS satellite laser tracking to ensure the best utilization of the ILRS resources.*