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Clocks and Time scales:

The Time Lab of the Royal Observatory of Belgium (ROB) contains presently 3 Cesium clocks HP5071A with standard tubes, one active H-maser CH1-75 and one passive H-maser CH1-76. A new H-maser CH1-75A has been installed in December 2005, it should replace the CH1-75 for the generation of UTC in the coming months, when it will have reached a sufficient long-term stability. The time laboratory temperature variations are kept smaller than 0.2°C.

During the period 2004-2006, the UTC(ORB) time scale was generated from the frequency of the H-maser CH1-75, of which the auto-tuning is based on the 5Mhz frequency from the passive H-maser CH1-76. The monitoring of UTC(ORB) is performed daily from a comparison with the USNO Master Clock MC3 used to steer the USNO Ashtech Z-XII3T receiver (IGS station). This comparison is done using the self-developed RINEX-CGGTTS conversion software using the P3 ionosphere-free combination and IGS rapid and ultra-rapid orbits. The behavior of UTC(ORB) with respect to UTC is shown in Figure1. The epochs of large variations correspond to maintenance of one of the masers due to failures; at these epochs UTC(ORB) was realized by a cesium clock.

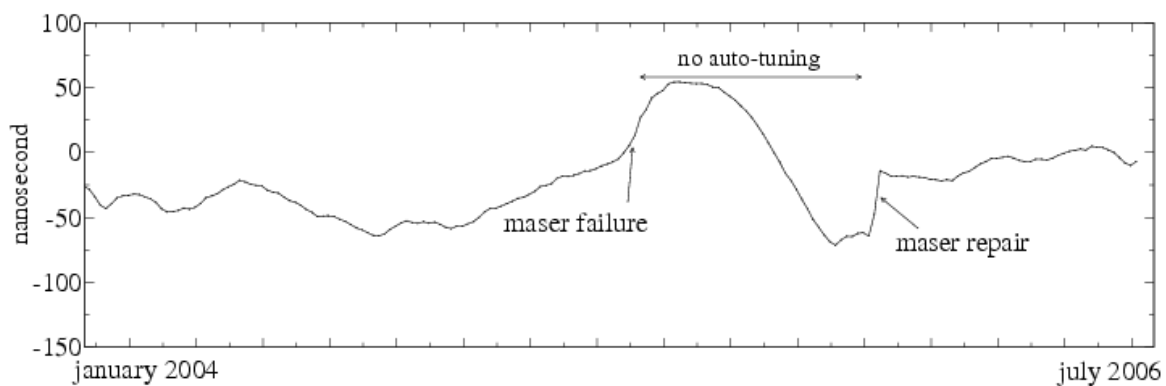The ROB also installed a redundant NTP system for distribution of UTC(ORB) via the internet.

Figure 1. UTC-UTC(ORB) from 2004.0 to 2006.5

GPS Time transfer using geodetic receivers

During the last two year, the software developed at ROB for giving CGGTTS files from rinex files has been regularly updated, up to the final version V4.0; this last version allows a better treatment of the observations at sec 0.001 or xx.999, and accounts for the TGD correction in the MSIO and MDIO values of the CGGTTS files. Also, some changes have been performed in the header generation, in order to include the softawre version, and to change the computation of CK in consequence. A parallel version has also been created for receivers measuring C1 and P2 rather than P1 and P2.

A new software called Atomium has been developed for using code and carrier phase measurements in PPP mode, as well as in single difference mode, using IGS satellite clocks and orbits. The differences between the results obtained with Atomium and the IGS solutions are at the level of 200 ps max peak to peak for one day.

The ROB also took part in the calibration campaigns of geodetic receivers organized by the BIPM for Ashtech Z-XII3T receivers as well as for the PolaRx2 receivers. Furthermore, several tests were performed to show that it is very difficult to get a correct calibration using splitters.

References:

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