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Clocks and Time scales:

The Laboratory of the Time Department of the Real Observatorio de la Armada (ROA) maintains 5 cesium clocks, HP5071A model (three of them with high performance tube) and one active H-maser, MHM-2010 model. This H-maser was installed in May 2005, and contributes to the generation of UTC since April 2006.

During the period 2006-2008, the UTC(ROA) time scale was generated from the frequency output of one of the high performance caesium clock (serial number 583). The used timescale algorithm optimized the long term stability of UTC(ROA) sustained by the stability of the ensemble of clocks. Once checked that H-maser had passed the stabilization run and that it reached the expected long-term stability, last summer ROA carried out the task of development of a new algorithm for UTC(ROA), based on the H-maser as master clock, using the Auxiliary Output Generator output, steered by the new algorithm, as the physical realisation of the local UTC. This new setup constitutes the new realization of UTC(ROA) since 26th February 2009 (MJD 54888). The behaviour of UTC(ROA) with respect to UTC is monitored monthly through the reported data by BIPM's CirT. UTC(ROA) is steered once a week (Tuesday morning).

The most popular system for distribution of UTC(ROA) is based on NTP time protocol. ROA has a free access server (hora.roa.es), who attends continuously around 1.5M requests of synchronization every day. During last three years, customers with special needs on security and accuracy, demanded from ROA to establish other similar services (P2P) providing access to UTC(ROA) to several administrative governmental services and private networks. The national time scale is also disseminated by means of a Telephone Code ("European Telephone Time Code") server.

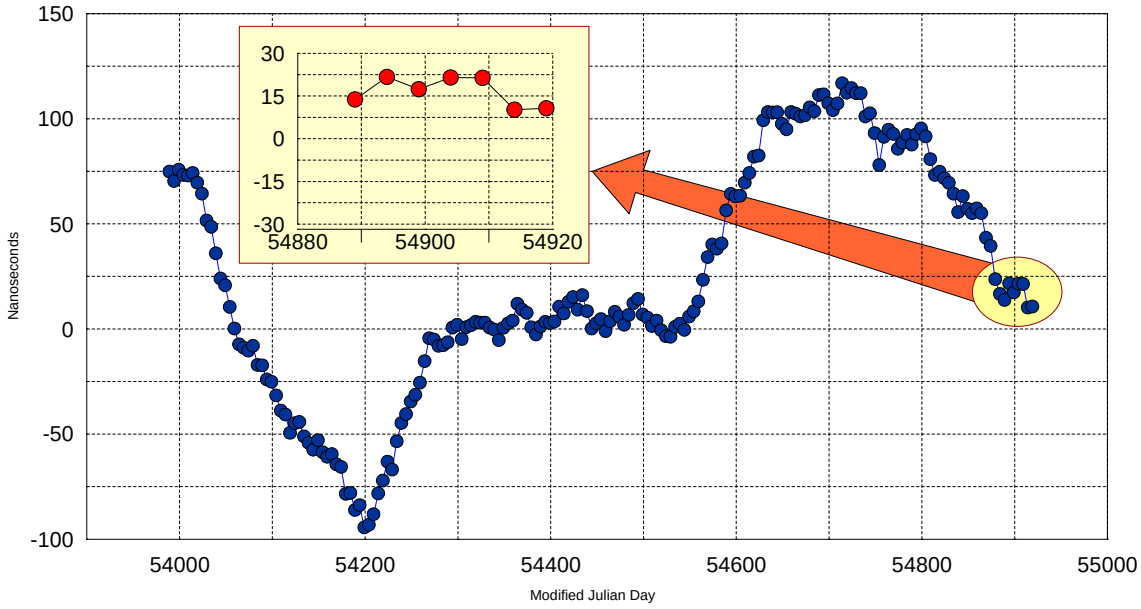

Figure 1. UTC-UTC(ROA) from 2006.5 to 2009.5

Time transfer links

The main link for the contribution of ROA to TAI is based on a TWSTFT Ku-band station; a secondary link is maintained as spare of the TW link , it is based on a PolaRx2 GPS geodetic receiver. Since march 2006 ROA operates a new GPS geodetic receiver model GTR-50 from DICOM. The single channel GPS receivers (two TTR-6 and one TTR-5 AOA model), that have historically been used, are still in use.

Since February 2008, ROA participates with his PolaRx2 in the TAIPPP experience, piloted by the BIPM Time, Frequency and Gravimetry Section.

In June, the GPS station designated ROAP was integrated in the International GNSS Service network. This station consists of the PolaRx2 receiver and a choke ring SEN67157596-CR L1/L2. Since November 2008, it is used as new tracking station by the NRCan IGS Analysis Centre.

In October 2008, in collaboration with PTB, ROA carried out an experience for calibrating the link PTB-ROA. For this experience we used as travelling GPS system composed by a GTR50 receiver and a Novatel GPS-702-GG antenna. The results are still in discussion, but predict the reduction in the current uncertainty of this link.

Events, seminars and conferences:

ROA hosted in San Fernando the Fifth International Time Scale Algorithm Symposium (VITSAS), organized in collaboration with BIPM, INRIM and USNO. This symposium was attended by 76 persons, from every continent except Antarctica, by students as well as senior scientists. A selection of works was published in one special issue of METROLOGIA.

The symposium took place in April 2008, and dealt with several topics encompassing laboratory-specific innovations and practices, GNSS applications, UTC generation, TWSTFT applications, GPS applications, small-ensemble applications, robust algorithms, and statistical measures that are either robust themselves or which reflect nonstationarity and robustness characteristics of the clocks. A tutorial session was held the previous day of the meeting, with eight talks covering the basic statistical methodology in timescale algorithms, relativistic and astronomical aspects of timescales, specific applications to GNSS GALILEO, the effects of timescale noise, and a detailed presentation of Finite Impulse Response (FIR) timescale models.

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