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THE PUBLIC SERVICE OF THE OFFICIAL TIME AT THE OBSERVATORIO NAVAL BUENOS AIRES

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RESUMEN

El Observatorio Naval Buenos Aires (ONBA), a través del Servicio Público de la Hora Oficial Argentina, mantiene, conserva y difunde la representación local de UTC como UTC (ONBA) (BIPM Circular T), la cual es la base legal del tiempo en la República Argentina. Se presentan las actividades y proyectos del ONBA, entre ellos, la participación en la Firma Digital y el nuevo equipamiento que permitió mejorar la trazabilidad de UTC(ONBA) a UTC.

ABSTRACT

The Observatorio Naval Buenos Aires (ONBA), through the Public Service of the Official Time Argentina (hereinafter, Time Service) generates, maintains and disseminates UTC (ONBA), which is the basis of the Argentine legal time. We present activities, projects such as time stamping to digital signature and new equipment acquired to improve traceability UTC (ONBA) to UTC.

Key Words: time

1. HISTORICAL INTRODUCTION

ONBA was created in 1881 to provide time to the ships docked at the port of Buenos Aires. This department of the Argentine Navy has been charged, since 1923, to maintain and disseminate the Argentine legal time. In 1956 the service of standard frequencies and time signals began and the first atomic clock was installed in 1967 (Cifuentes & Nicodemo 2009).

Between 1930 and 1988 ONBA contributed to the analysis of the irregularities of the earth's rotation and with astrometric observations to the international time and latitude services; then it was replaced by space techniques.

At present, the Time Service of the ONBA generates and maintains the local realization of UTC called UTC (ONBA) which is the basis of the Argentine legal time.

UTC (ONBA) is disseminated by time signals; the legal time is distributed to the entire country by telephone line. ONBA is a member of the National Council of Communications.

In 2007 ONBA was transferred from the Argentine Navy to the Ministry of Defence.

2. TIME SERVICE

The Time Service is equipped with two low performance industrial caesium clocks Symmetricom 5071A, which were acquired in 2007 and 2011, a microphase-stepper, a GPS single-frequency multichannel receiver TTS-2, a Universal Frequency Counter Agilent – 53132A and One-input fifteen-output pulse distribution amplifier. UTC (ONBA) is generated by a clock Symmetricom 5071A.

2.1. *Traceability to UTC*

Traceability refers to an unbroken chain of calibrations relating instrument measurements to a known reference.

It is important to note that traceability is the property of a measurement result, not of an instrument. If a measurement such as an NTP timestamp is made using a reference such as UTC (ONBA), and if the uncertainty of the measurement is known and documented, the measurement is said to be traceable to UTC (ONBA). The GPS time transfer technique is used by the BIPM to compare the UTC time scales of time laboratories. The GPS multichannel receiver TTS-2 simultaneously tracks up to eight satellites and compares the master clock at ONBA to a time reference broadcast by the satellites. Clock readings around the world are then combined at the BIPM Time Department through the ALGOS algorithm to produce the international reference UTC every month, as published in monthly Circular T, giving

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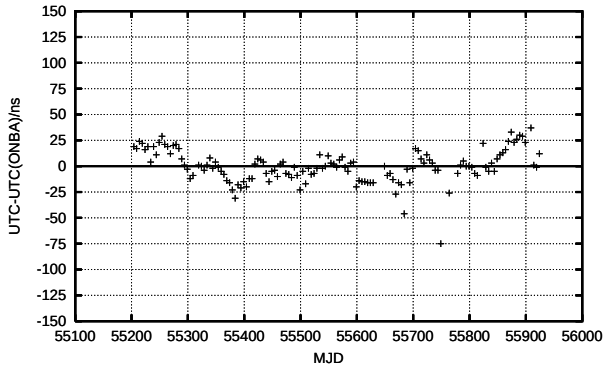

Fig. 1. The traceability UTC (ONBA) to UTC.

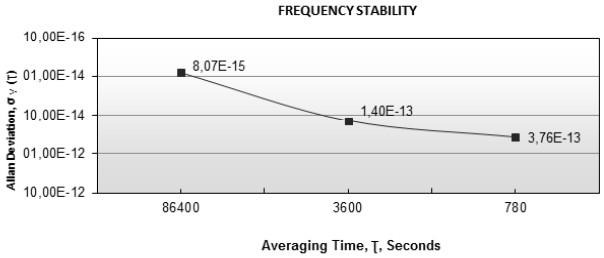

Fig. 2. Frequency stability of Master Clock over daily and sub-daily periods.

traceability of UTC (ONBA) to UTC. Two other institutes in Argentina contribute to the realization of the UTC time scale, the Instituto Geográfico Nacional Argentino (IGNA) and the Instituto Nacional de Tecnología Industrial (INTI) (BIPM 2010).

After removing outliers, Figure 1 shows the difference UTC (ONBA), generated by the 1 pps output of the Master Clock, to UTC from MJD 55197 (January 2010) to MJD 55926 (December 2011) within 50 ns.

2.2. *Frequency Stability*

It is also important to characterize the frequency stability of the master clock. Stability indicates how well an oscillator can produce the same time and frequency offset. Figure 2 plots the Allan Deviation showing that frequency stability improves at longer averaging times.

2.3. *Time Dissemination*

ONBA has the legal responsibility of the Time dissemination in Argentina. UTC (ONBA) is disseminated according to the recommendations of the International Telecommunication Union, Radiocommunication Sector (ITU-R).

Legal Time disseminated by telephone is supplied by speaking clocks within 1 ms precision.

Radio-broadcast signal time is acheduled every hour and half hour.

The LOL station (Buenos Aires, Argentina) broadcasts time signals and standard frequencies at 5, 10, and 15 MHz that operate at 2 Kw in five one-hour intervals per day. One interval of transmission contains second pulses of five cycles of 1000 Hz modulation and announcements of hours and minutes every 5 minutes, followed by 3 minutes of 1000 Hz or 440 Hz modulation (De Biasi et al. 2003).

DUT1 is transmitted according to the code CCIR of the ITU-R.

3. NEW SERVICES AND EQUIPMENT

In today's computerized society, most computers transfer data via networks. The built-in clocks of PCs are not highly precise, and so, without regular periodic time synchronization, inconsistencies are bound to occur in file information Network Time Protocol (NTP); NTP is an Internet standard protocol which enables client computers to maintain system time synchronization to the UTC (ONBA) time scale.

A digital signature is an electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged. Digital signatures are easily transportable, cannot be imitated by someone else, and can be automatically time-stamped.

A secure and reliable time source is needed by these authorities to guarantee a legal value to these documents. A Time Stamping Authority (TSA) thus provides a trusted time certification.

In Argentina, the governmental body charged with the digital information exchange in the Public Administration (ONTI) has regulated that the TSA shall be synchronized within 1 second to UTC (ONBA) (Secretaría de la Gestión Pública–ONTI 2001).

ONBA is developing this new time service and will acquire new equipment: a third atomic clock, standard frequencies transmitters, a frequency and time interval counter, a multi-channel phase comparator, a multi-frequency GPS/GLONASS/Galileo receiver, Primary Time Servers and Time Stamp Servers.

ONBA, INTI and IGNA are working jointly in a project for developing a National Atomic Time scale.

4. CONCLUSION

The equipment of ONBA has been partially updated. The new atomic clock has improved the traceability of UTC (ONBA) to UTC within 100 ns as recommended by the BIPM. The second clock will start to be compared shortly. With the new equipment we expect to improve the measurement capabilities, to support of time and frequency activities, and to disseminate UTC (ONBA) making use of new information technologies as NTP service and digital signatures.

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REFERENCES

BIPM 2010, Annual Report on Time Activities

BIPM Circular T, Monthly publication (Sèvres, France: BIPM)

Cifuentes, A., & Nicodemo, C. 2009, Bol. Asoc. Argentina Astron., 52

De Biasi, M. S., et al. 2003, ADeLA Publications Series, 1, 23

Ley 25.506 Firma Digital 2001, Secretaría de la Gestión Pública, Oficina Nacional de tecnologías de la Información (ONTI)