

TIME ACTIVITIES IN ARGENTINA

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Abstract

Two institutions maintain local UTC scales in Argentina : the Observatorio Naval Buenos Aires (ONBA) and the Instituto Geográfico Militar Argentino (IGMA). ONBA provides the legal Argentine time scale. Both laboratories had been linked by TV for years. Since June 2001, a multi-channel TTS-2 receiver developed and constructed by the Polish Academy of Sciences has been operational at ONBA. GPS multi-channel common views between ONBA and USNO are calculated at BIPM within the organization of international time links. IGMA is equipped with HP5071A clocks and GPS single-channel receivers. A clock update is necessary at ONBA. Both laboratories are planning to work in close cooperation.

INTRODUCTION

Two institutions share the responsibility for timekeeping in Argentina: the Observatorio Naval Buenos Aires (ONBA) and the Instituto Geográfico Militar Argentino (IGMA). For each institution, a historical background is given. We describe their respective responsibilities and activities. Information on the equipment of the time laboratories is given. No time activities have been developed at the Argentine national metrology institute, the Instituto Nacional de Tecnología Industrial (INTI), which has delegated this function to ONBA and IGMA.

Representatives from both institutions are members of the Argentine Commission of Metrology.

HISTORICAL BACKGROUND

OBSERVATORIO NAVAL BUENOS AIRES (ONBA)

ONBA was created in 1881 to provide time to the ships that were at the port of Buenos Aires. This department of the Argentine Navy was charged, some years later, to maintain and disseminate the Argentine legal time. In the 30s, the first speaking clock of French fabrication acquired by the Navy was

installed at the Time Service of ONBA. In 1936, ONBA started calculating and publishing the *Almanaque Náutico* (*Nautical Almanac*), and later on a *Supplement to the Nautical Almanac* containing the apparent places of a selected list of brilliant southern stars to fulfill the needs of navigation and geodesy. They have been continuously published since then; the *Nautical Almanac* includes today the elements necessary to aeronautics. The tables in the almanac give the ephemerides of the Sun, Moon, and planets at intervals of 20 m of UT, and Sun and Moon rises and sets up to -70° latitude. A CD-ROM is available to calculate the ephemerides of the Sun, Moon, and planets.

Between 1930 and 1940, ONBA started contributing to the analysis of the irregularities of the earth's rotation, and contributed with its astrometric observations to the international time and latitude services. This activity was interrupted in 1988 when the space techniques became the unique contribution to the determination of the earth rotation parameters.

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

INSTITUTO GEOGRÁFICO MILITAR ARGENTINO (IGMA)

At the beginning of the 20th century, IGMA established a Time Service to provide support to the determination of geographic and gravimetric coordinates. In 1918, IGMA assumed the responsibility of realizing fundamental geodetic measures; in the following years, its Time Service acquired the equipment adequate for this activity.

Since 1930, IGMA had participated in the international programs and campaigns to monitor earth rotation. This activity was interrupted in 1990, after the classical instruments for astrometry had been replaced by the space observing techniques.

In 1931, it was entrusted with the International Time Service (Servicio Internacional de la Hora, SIH), a responsibility accomplished until present without interruption. The USA Defense Mapping Agency (DMA), today the National Imagery Mapping Agency (NIMA), has operated since 1983 a GPS satellite orbit monitoring station at IGMA.

The Time Service of IGMA maintains UTC (IGMA) and contributes with its clocks to the formation of the international atomic time scales at the Bureau International des Poids et Mesures (BIPM).

TIME SERVICES

The ONBA and the IGMA time services operate independent equipment to generate their respective realizations of UTC. Both laboratories are linked by TV for clock comparison; the uncertainty of the link is about 50 ns.

The Time Service at ONBA is equipped by two industrial cesium clocks, a microphase-stepper, a GPS receiver Truetime XL-DC, and a recently incorporated a GPS single-frequency multi-channel receiver TTS-2 developed by the Polish Academy of Sciences. UTC (ONBA) is generated by a HP5061A clock and a microphase-stepper.

The Time Service at IGMA has four industrial cesium clocks, a microphase-stepper, and two Ashtech

ZY12 GPS receivers. Two HP5071A high-performance-tube clocks and the GPS receivers have been provided by NIMA. The source of UTC (IGMA) is a high-performance clock TST 6459 plus a microphase-stepper.

BIPM monthly *Circular T* provides traceability of UTC (ONBA) and of UTC (IGMA) to UTC.

TIME DISSEMINATION

Time dissemination in Argentina is under the responsibility of ONBA.

LOL station (Buenos Aires, Argentina) broadcasts time signals and standard frequencies at 5, 10, and 15 MHz in five 1-hour interval 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. DUT1 is transmitted according to the ITU-R recommendations.

A telephone time service is provided by voice announces of the legal time all over the territory.

CONCLUSION

The equipment of the two Argentine time laboratories has been partially updated in the last few years. Neither operates a complete ensemble of standard equipment comparable to that of other laboratories contributing to the international time scales.

The Time Service at ONBA complies well with the requirements of national timekeeping, but a clock update should be necessary to contribute with clock data to TAI. Only GPS link data are provided to BIPM.

The Time Service at IGMA has proved to contribute strongly to NIMA in the orbit monitoring of GPS satellites. IGMA clocks participate in TAI, but the GPS files transmitted to BIPM do not follow the CGGTTS standard format [1].

Both institutions are planning to start cooperation to profit from the best instruments operated by each of the respective services; this could lead in the future to a unique local realization of UTC in Argentina.

REFERENCES

- [1] W. Lewandowski, J. Azoubib, A. G. Gevokyan, P. P. Bogdanov, W. J. Klepczynski, M. Miranian, J. Danaher, N. B. Koshelyaevsky, and D. W. Allan, 1997, "A contribution to the standardization of GPS and GLONASS time transfers," in Proceedings of the 28th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting, 3-5 December 1996, Reston, Virginia, USA (U.S. Naval Observatory, Washington, DC), pp. 367-386.