SIM MWG5 Activities 2021-2022

Diego Luna

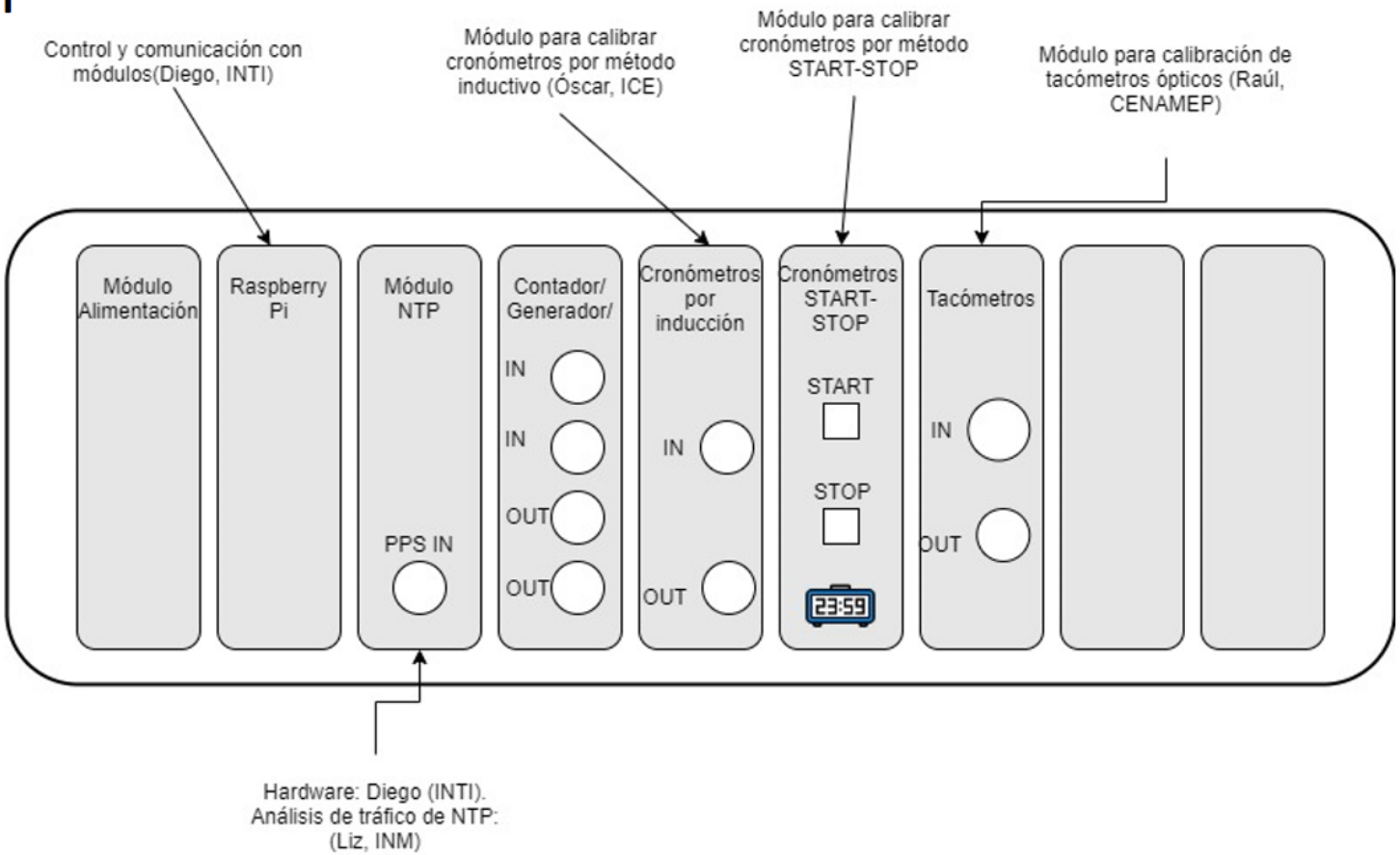
May 24th, 2022

Project presentation: Digital Platform for T&F meas.

1. BID finnancial support
2. **Objective:** This project aims to conceptualize, design and implement an economic and open platform for time and frequency measurements.
3. **Expected impact:** The main goal of this project is to propose and build a modular and economic measurement system capable of performing time and frequency measurements with traceability to a known reference

Project presentation: Digital Platform for T&F meas.

Proposal:

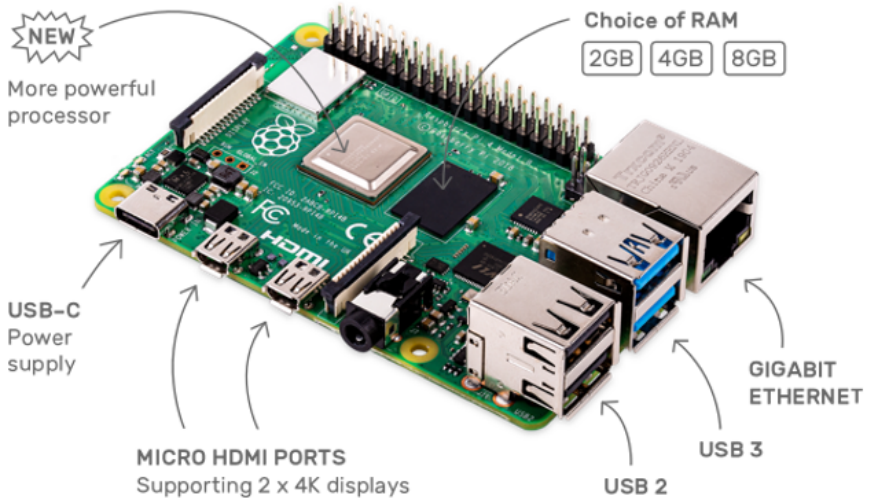


Project presentation: Digital Platform for T&F meas.

Example:

Raspberry Pi®

"single-board computer"



Question: Can the GPIO ports be used to sinchronize the raspberry, and serve as a stratum 1 NTP server?

We think the answer is YES!

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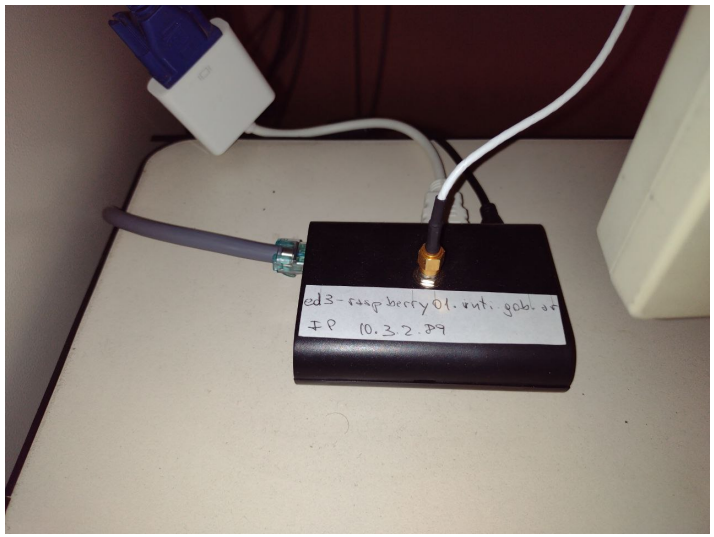

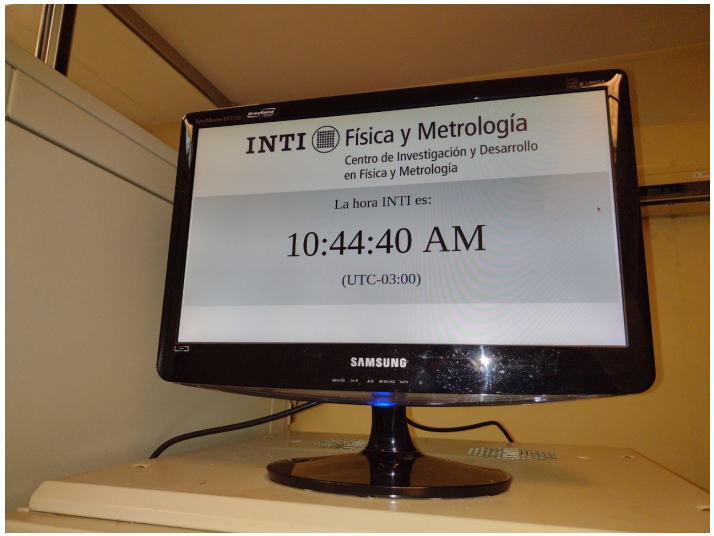

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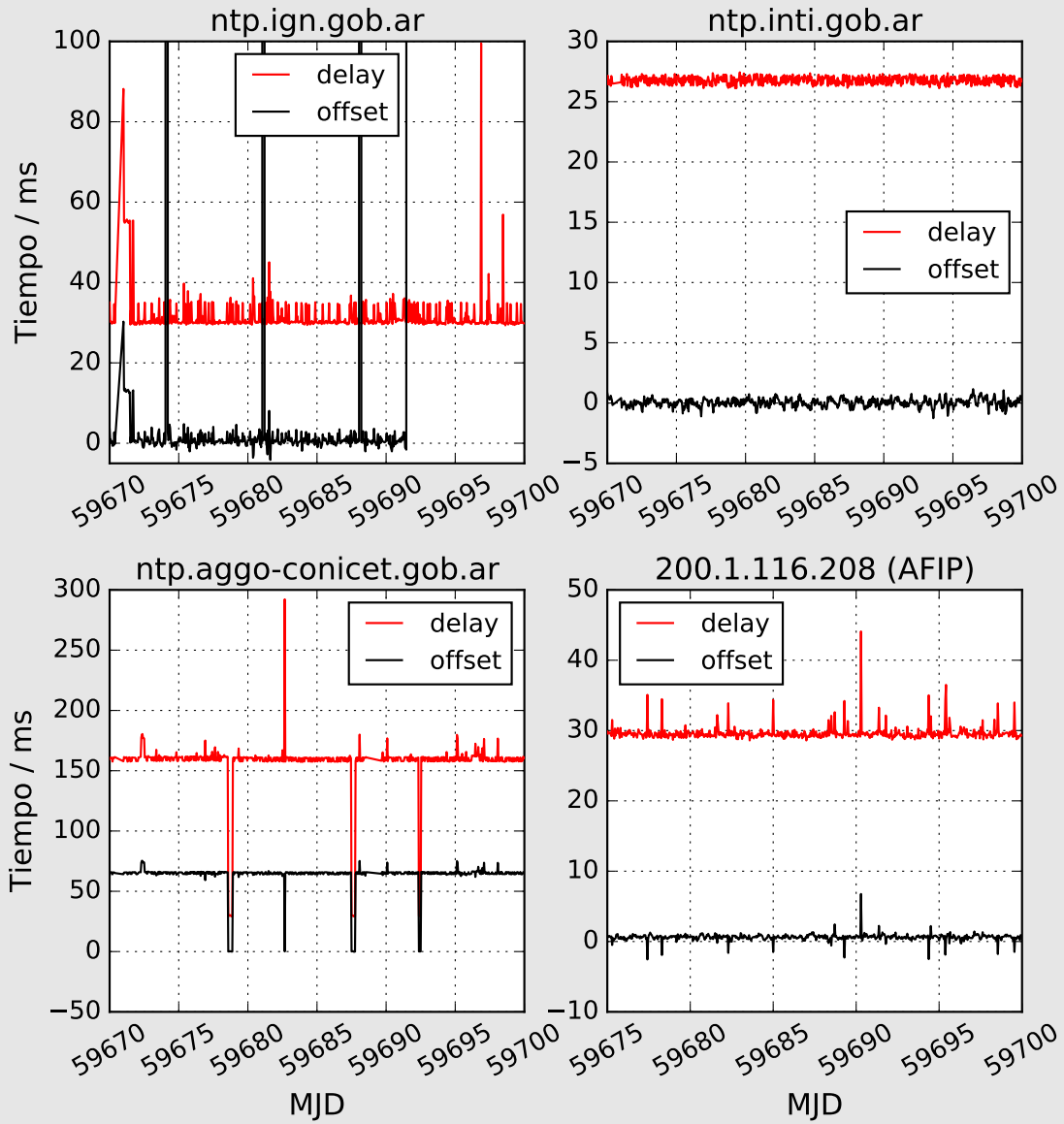
Diferencias de tiempo con NTP stratum 1 de INTI durante el mes 4 de 2022



Red Nacional de Tiempo

Última actualización: 2022-05-02 09:01:57 UTC-3

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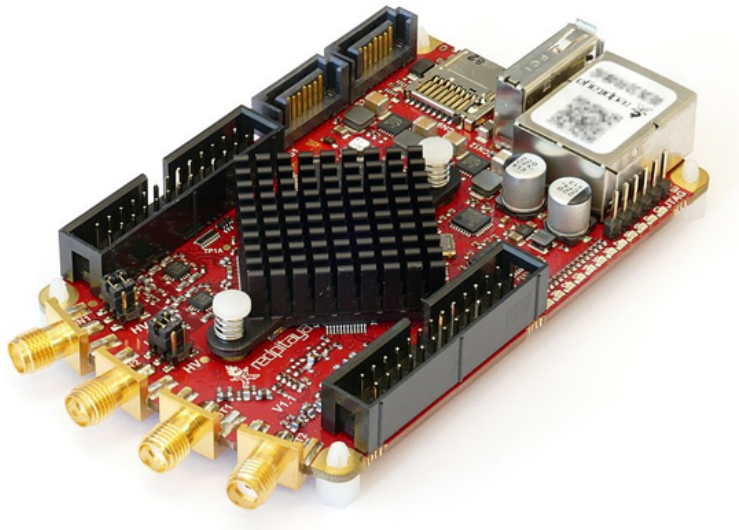
Example:

redpitaya

"**Red Pitaya** is a Zynq7 **FPGA** – based low cost electronic board "



Question: Can this board be used to perform measurements with traceability to a national standard?

We think the answer is YES!

3D printed or standard case?

Project presentation: Digital Platform for T&F meas.

Participating NMIs

Liz Hernández (INM)
Alexander Guevara (INM)
Raúl Ortiz (CENAMEP AIP)
Óscar Fallas (ICE)
Eduardo López (CENAM)
Carlos Ortiz (CENAM)

Project presentation: SIM Receiver (not granted)

SIM Grant Proposal — April 2021

TITLE
Calibration of GNSS timing stations for UTC(k) generation in the SIM region

DESCRIPTION
Timing laboratories make use of Global Navigation Satellite Systems (GNSS) in order to compare their clocks remotely and to UTC at BIPM. These calibrations are essential for realising timescales traceable to UTC and for generating UTC(k). To achieve and maintain low uncertainty of UTC(k) with respect to UTC, the receiving stations must be periodically calibrated. The same calibration is required for a developing lab to become a UTC(k) lab and participate in Circular T. In SIM region we have very large number of labs that need their GNSS receivers calibrated. For the low levels of uncertainty it is necessary to perform these calibrations regularly. The calibration is done using a travelling GNSS receiver system that compares its measurements with those of the timing laboratory. Due to high number of Timing laboratories in SIM region

Peer Reviews

1. INTI, Argentina (May 2022)
2. INM, Colombia (planned for August 2022)
3. INDECOPI, Perú and UTE, Uruguay are organizing their reviews for 2022

Interaction of WG and NMIs

1. Uruguay
2. Paraguay
3. Perú
4. Bolivia

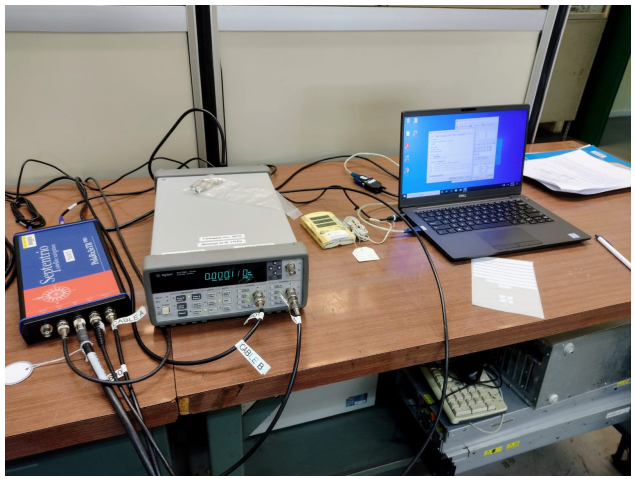
Feel free to contact us if you think we can help.

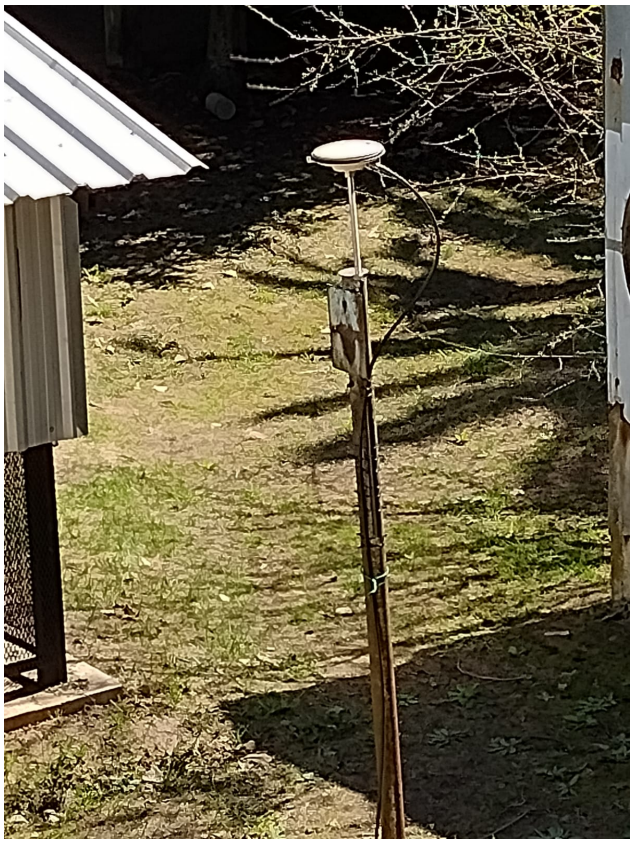
Receivers calibration in Argentina

1. AGGO
2. IGN
3. INTI
4. ONBA

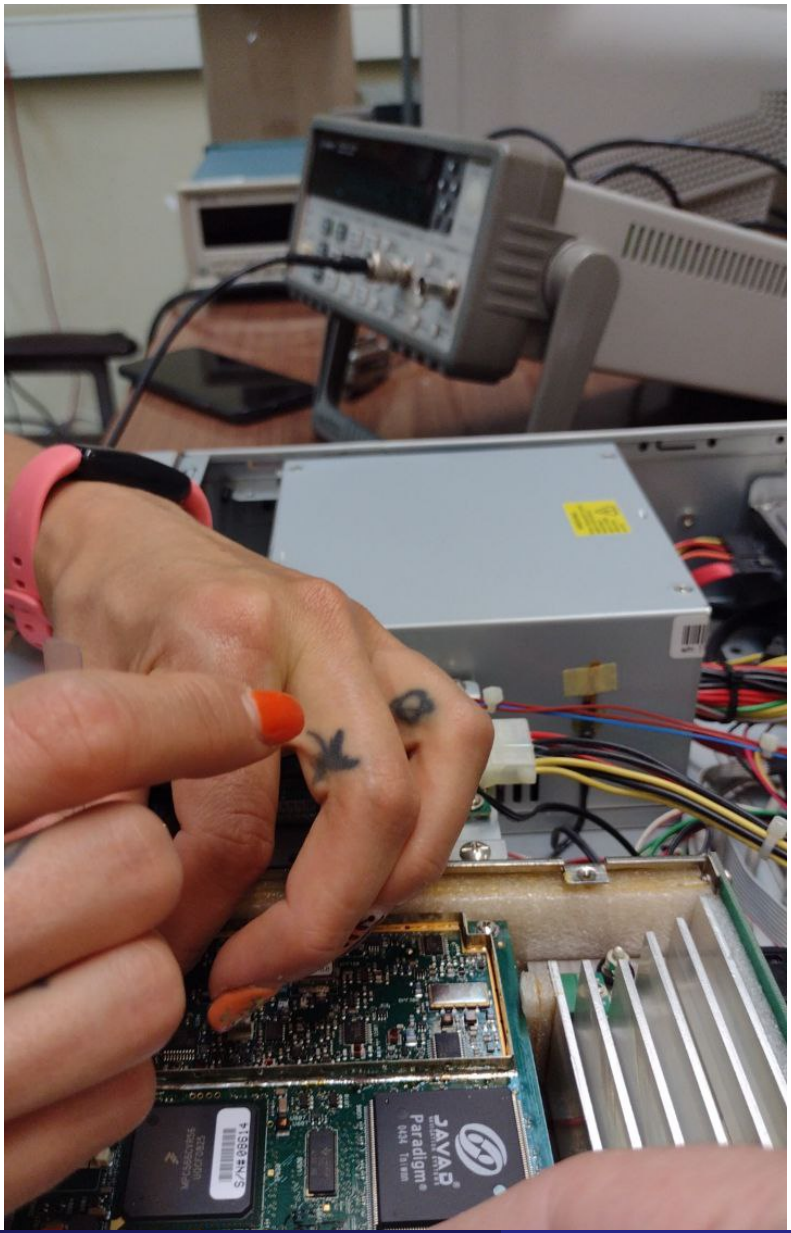
Final report in prepararation.

Receivers calibration in Argentina, INTI





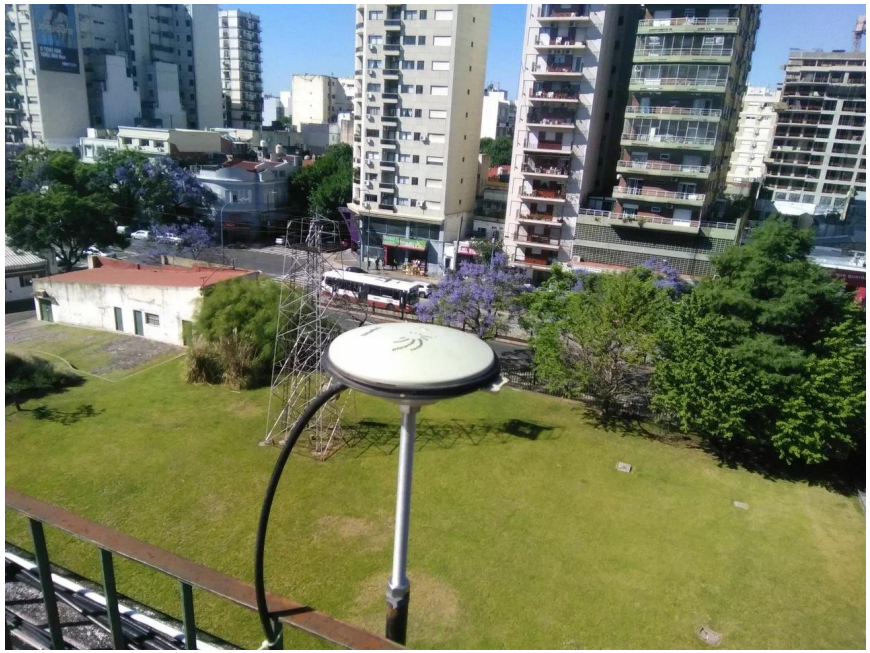
Receivers calibration in Argentina, INTI



Receivers calibration in Argentina, AGGO

Receivers calibration in Argentina, ONBA

Receivers calibration in Argentina, IGN



Receivers calibration in Circular T

(Discussion of Circular T example and explanatory document)
link to document

Receivers calibration in Circular T

New proposal to be discussed at the CCTF WGMRA

- The ageing uncertainty increases to a conventional fixed value of 10 ns when 8 years have elapsed since calibration. When 12 years have elapsed, the calibration is considered invalid, and the link will be considered Not Calibrated
- A laboratory linked by a NC or NC_AL link will appear as Not Calibrated in section 1. No uncertainty can be assigned to the access to UTC through such a UTC(k)
- When 12 years have elapsed since calibration, the calibration is considered invalid, and the link will be considered Not Calibrated.

Receivers calibration in Circular T

Uncalibrated links in SIM Region:

Lab	Country	unc Cirt	MRA	CMC	CMC vs UTC	Uncertainty	To be calibrated
AGGO	Argentina	20					YES
APL	USA	20					
IGNA	Argentina	20					YES
INCP	Peru	20	YES	YES			
INM	Colombia	20	YES	YES			
INTI	Argentina	20	YES	YES			YES
LRTE	Brazil	20					
NRL	USA	20					
ONRJ	Brazil	20	YES	YES	Local clock vs UTC	46.6 ns (2 sigma)	YES

Receivers calibration in Circular T

Calibrated links SIM Region:

- CENAM (2017)
- CENAMEP (2017)
- NRC (2017)
- ICE (2019)
- NIST (2020)
- INXE (2020)
- USNO (2020)

(Information from https://webtai.bipm.org/database/gnss.html)

Gracias

Gracias, Thank you, O brigado.
Diego