

GPS Time and Frequency Transfer Activities at NIST

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Code-Based Common-View

- Backup link for contributing NIST time scale to the computation of TAI and UTC
- Support the development of new GPS clocks
- Time and frequency comparison network in the Inter-American Metrology System (SIM)
- Synchronization of clocks in radio stations WWV/WWVB, and WWVH to UTC(NIST)
- Time Measurement and Analysis Service (TMAS)

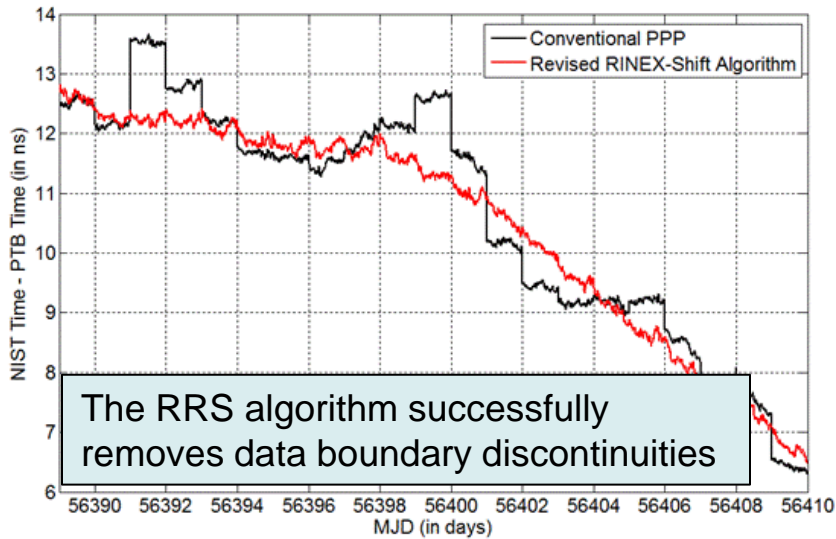
Code-Based One-Way

- Frequency Measurement and Analysis Service (FMAS)
- GPS Disciplined Oscillator and GPS One-Way Receiver Calibration Service
- NIST GPS Data Archive

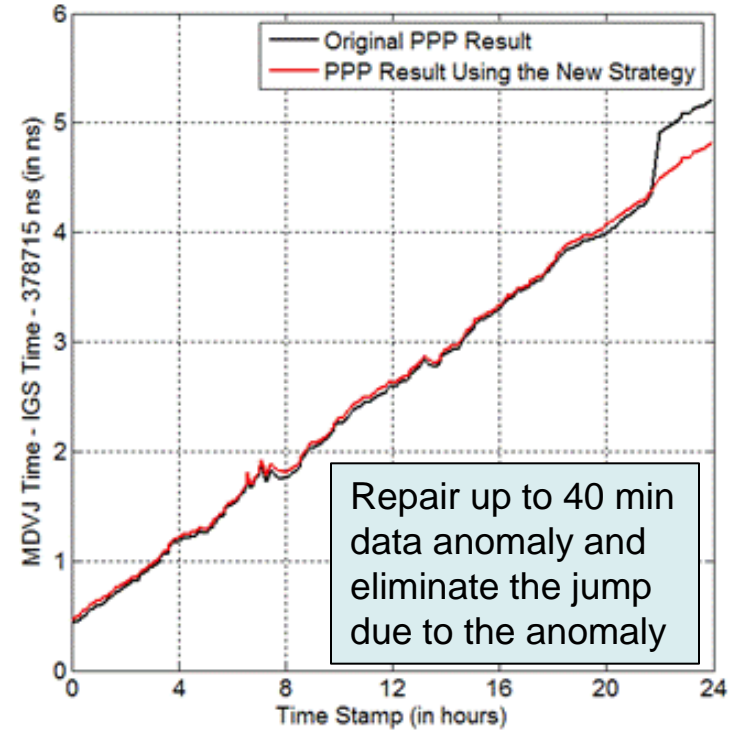
Carrier-Phase (1)

- Contribute NIST time scale to the computation of TAI and UTC, and compare remote clocks with the BIPM TAIPPP results
- Support the development of new GPS clocks
- Participate in the IGS tracking network
- Compare remote clock with the IGS clock products
- Analyze carrier-phase data for studies of receiver performance and remote clock comparison

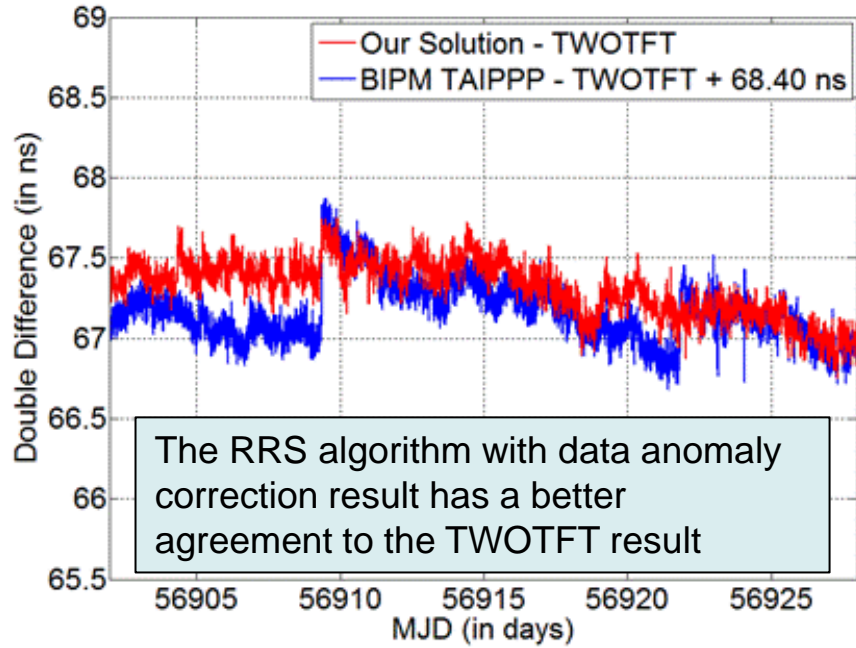
Carrier-Phase (2)



The RRS algorithm successfully removes data boundary discontinuities



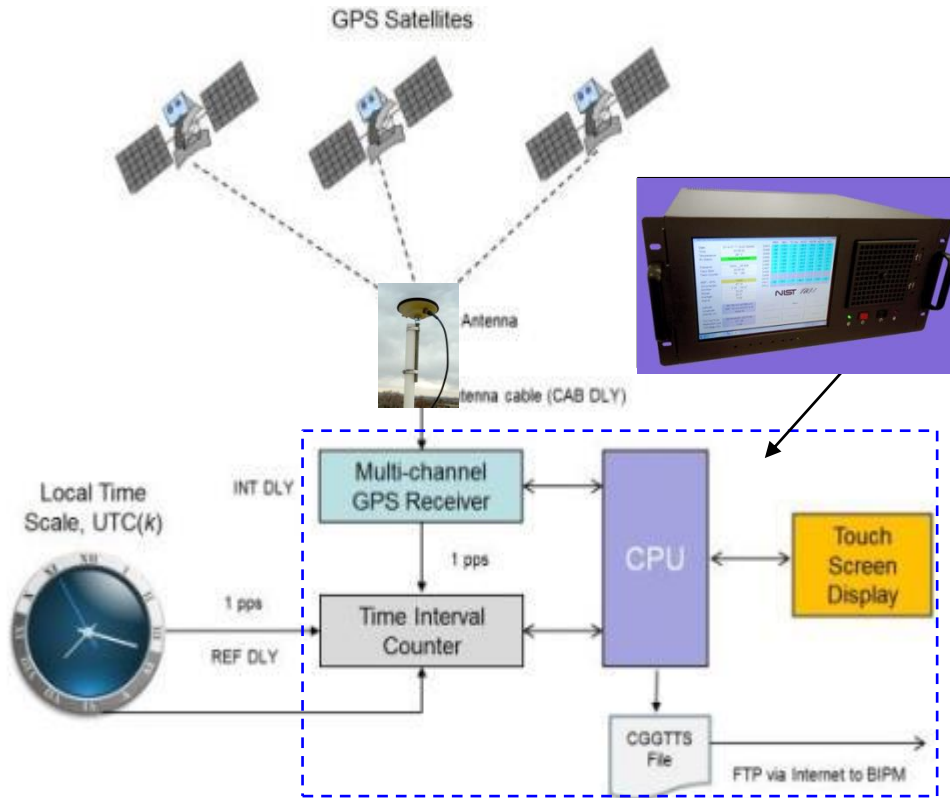
Repair up to 40 min data anomaly and eliminate the jump due to the anomaly



The RRS algorithm with data anomaly correction result has a better agreement to the TWOTFT result

The Revised Rinex Shift (RRS) algorithm is developed by Dr. Jian Yao and Dr. Judah Levine. Please contact: jian.yao@boulder.nist.gov more detailed information.

NIST TAI-1 GPS Time Transfer Receiver

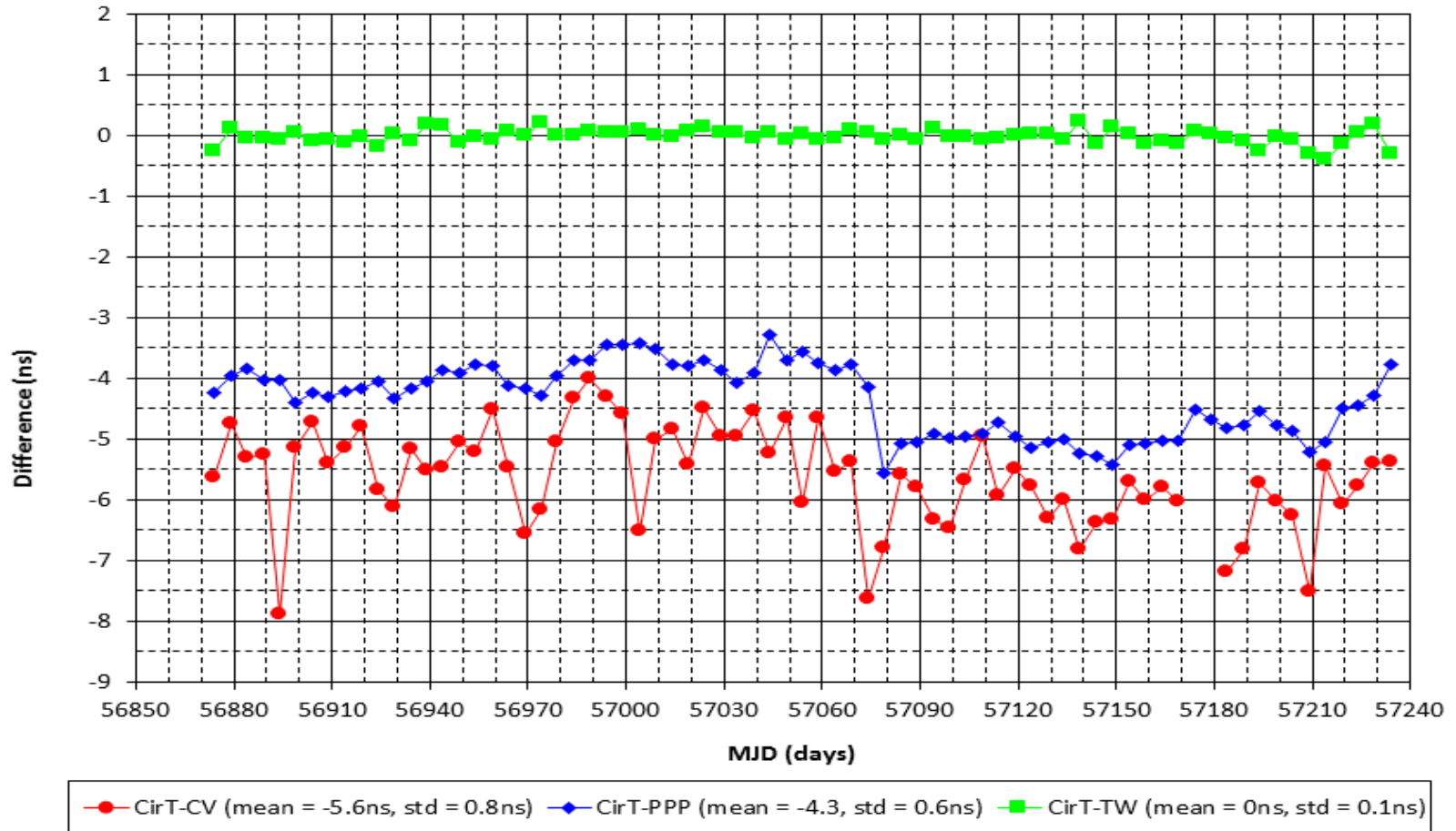


- Low cost, suitable for timing facilities with limited resource
- Used for common-view/all-in-view time and frequency transfer
- Able to survey antenna coordinates
- Data in the CGGTTS format, ready for the BIPM TAI/UTC computation
- Time transfer uncertainty $< 15\text{ns}$ ($k = 2$)
- On the NIST Standard Reference Instruments list, available to be purchased

For details about the receiver, Contact Michael Lombardi: michael.lombardi@nist.gov, and visit <http://www.nist.gov/srm/standard-reference-instruments.cfm>.

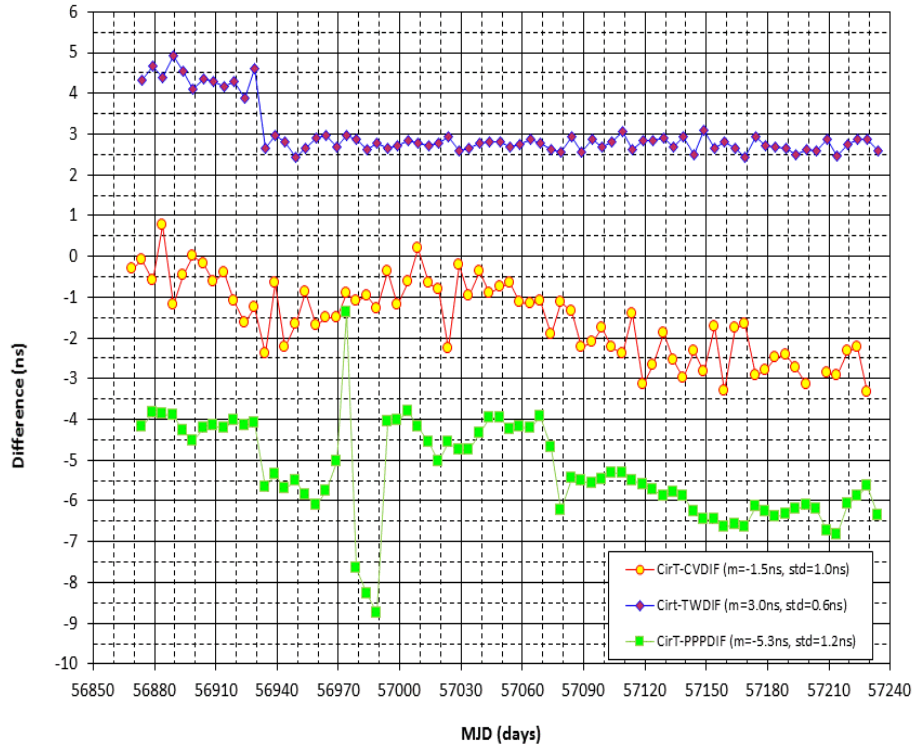
Primary Receiver Performance

Double Differences for UTC(NIST) - UTC(PTB)

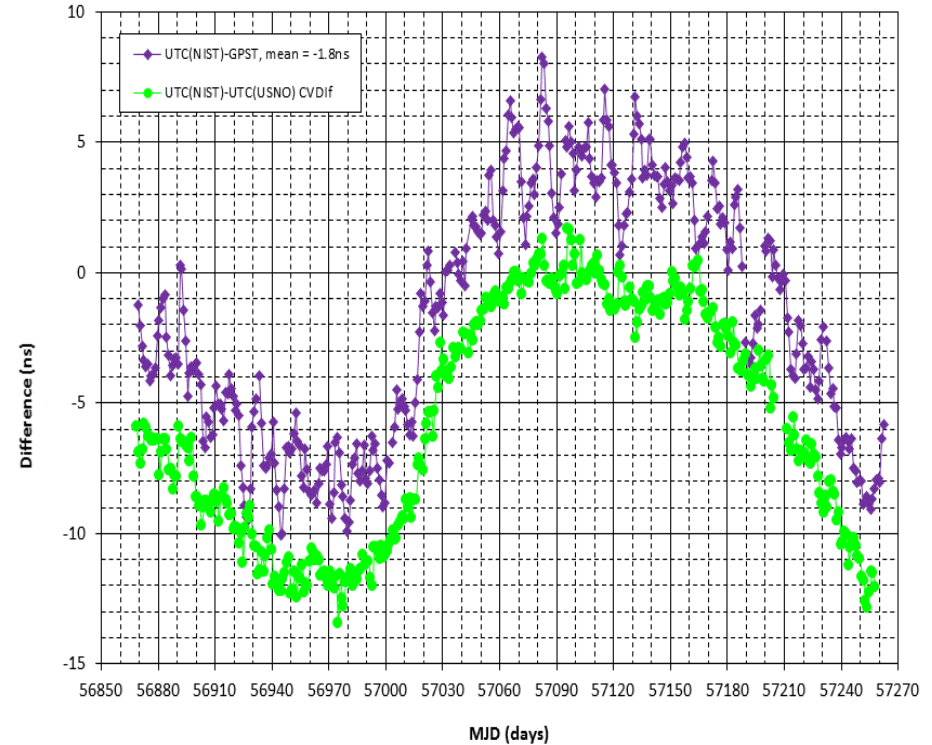


Primary Receiver Performance

Double Difference for UTC(NIST) - UTC(USNO)



UTC(NIST) - GPS Time and UTC(NIST)-UTC(USNO) via Common-view



NIST GPS Time and Frequency Transfer Service

- Frequency Measurement and Analysis Service (FMAS)
(*Service ID#76100C*)
- Time Measurement and Analysis Service (TMAS)
(*Service ID#76101C*)
- Characterization of Global Positioning System (GPS) Satellite Receivers (*Service ID#76120S*)

<http://www.nist.gov/calibrations/timeindex.cfm>

GPS Data Archive [GPS - UTC(NIST) all-in-view]

<http://www.nist.gov/pml/div688/grp40/gpsarchive.cfm>