Status Report of TL

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Status Report of TL

- **Clocks and Time scale**

  Atomic Time Scale

- **GPS Time transfer**

  GPS CV, GPS CP, GPSP3

- **TWSTFT**

  Links and Facilities

  The SASIM data analyzing

- **Future Works**

  USNO/NIST/NICT/TL TWSTFT Link via Hawaii
  PTB-Asia TWSTFT, SATRE Link
  NMIA(AUS)-TL TWSTFT, SATRE Link

Clocks and Time Scales

- **Cesium clocks :**

  Agilent 5071A high performance × 10, add Cs1104

- **Active H-masers:**

  CH1-75 × 2 (with CAT)

- **Time Scale:**

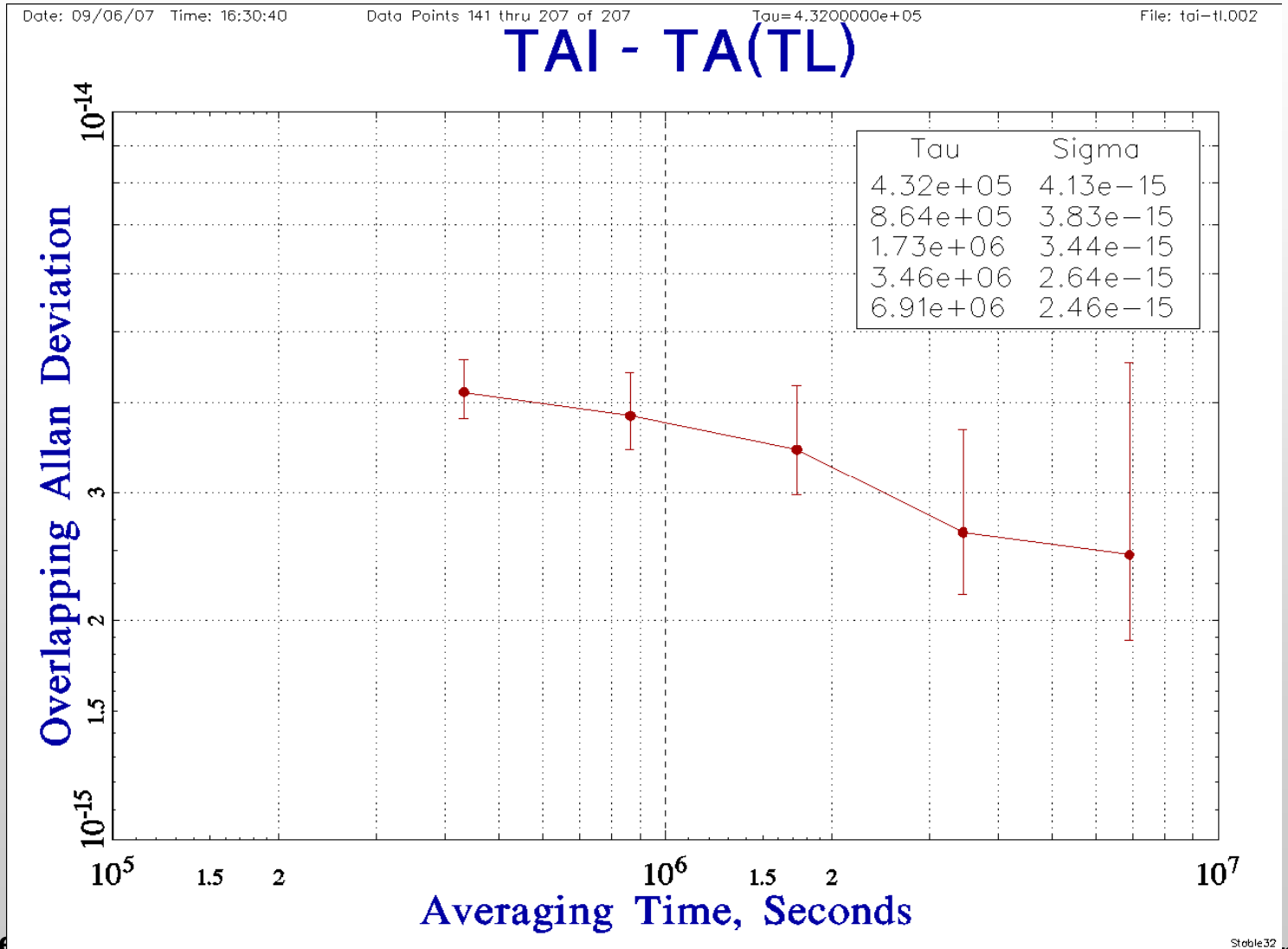
  UTC(TL):

  - **HM 6053 ➔ MPS (AOG-110)**

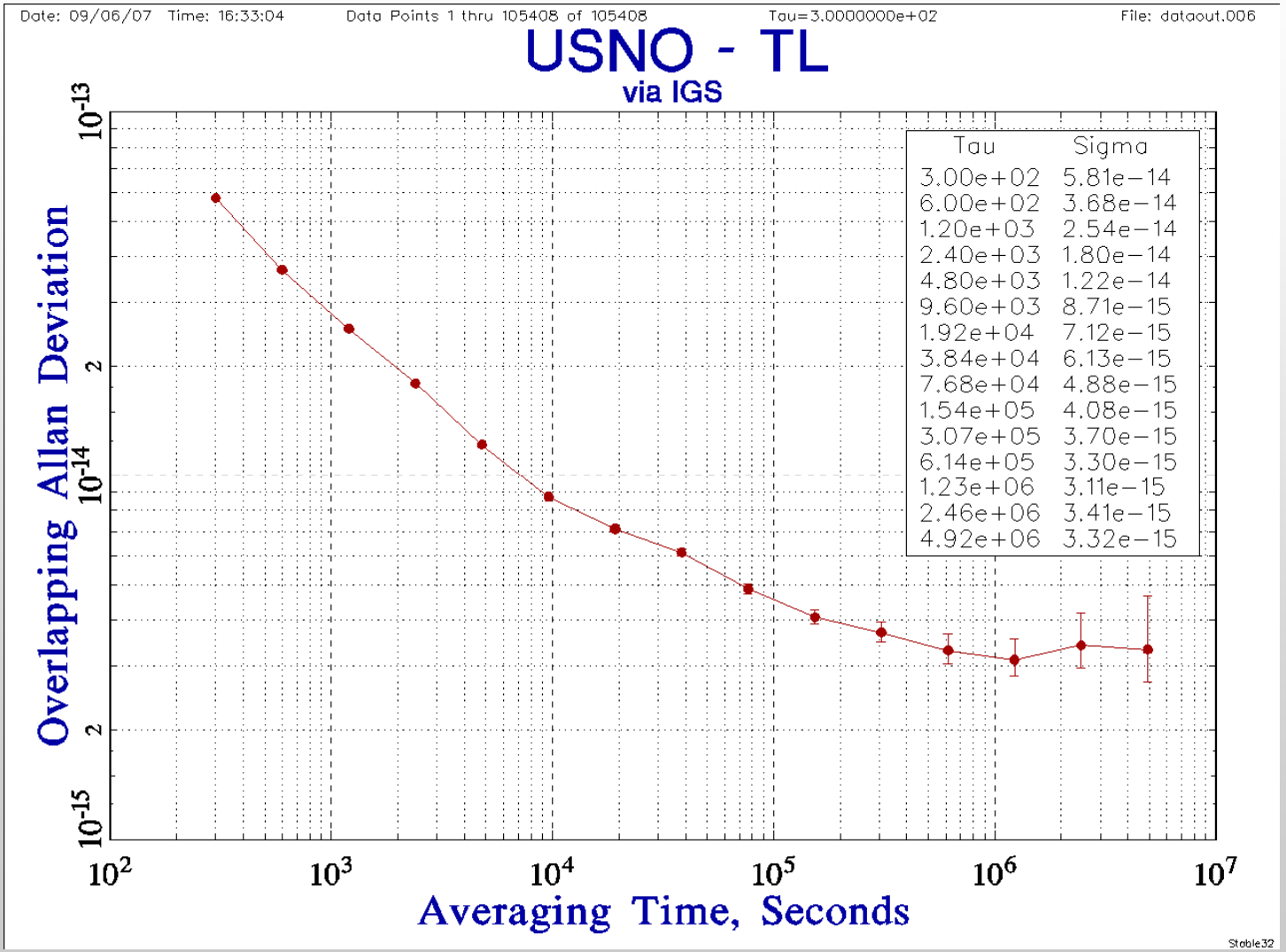
  TA(TL):

  - **10 Agilent 5071A cesium clock ensemble**
  - **Inversely exponential weighting**
  - **Will combine the hydrogen maser into TA(TL)**

TAI - TA(TL), Sep 2006 -



UTC(USNO) vs. UTC(TL), GPSCP , Sep 2006 –



GPS Time Transfer

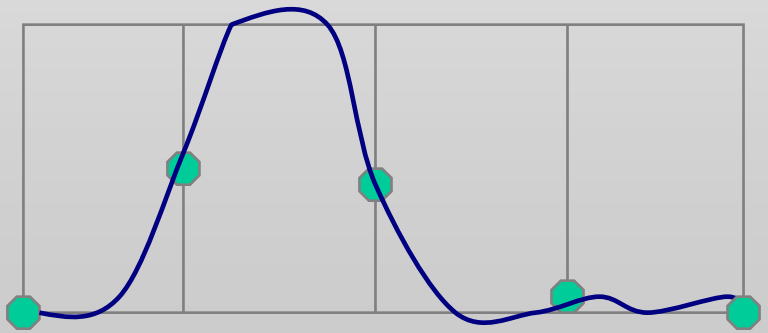
- **GPS CV**
  - **Topcon (multi channel)**
    ftp://ftp.stdtime.gov.tw/pub/gps/gpscv/topcon
- **GPS P3**
  - **Ashtech Z12-T**
    ftp://ftp2.bipm.org//pub/tai/data/2007/time_transfer
    /corrected_gps_data
- **GPS CP**
  - **Ashtech Z12-T × 2 (UTC(TL) and H-maser)**
  - **Bernese 5.0**
  - **IGS site data (TWTF)**
    ftp://ftp.stdtime.gov.tw/pub/gps/twtf/

New dual receiver SATRE Modem

New dual receiver SATRE Modem is ready for Hawaii Link

SATSIM Data Analyzing

- We had installed a satellite simulator system on an unoccupied earth station and demonstrated its capability of measuring the instabilities of transmit and receive path delays in previous works.
- We use 28 dBm transmitter power for high resolution in the SASIM Measurement. It will occupy one time slot of satellite. If we could only measure the delay every 6 hours, we'd better to develop a method for evaluating the delay away from the SATSIM measurement.



:measured by SATSIM every 6 hour

: delay fluctuations

The New Temperature Effect Model for Differential Delay

- We developed a calibration model to fit the measured differential delay (2.5 MHz chip rate) using the temperature data

Modeling the Differential delay: $D(t) \propto T(t) + a_1 T^{(1)}(t) + a_2 T^{(2)}(t) + ..$

$T(t)$: *Outside temperature at time t*

$T^{(1)}(t) = \frac{T(t+h) - T(t-h)}{2h}$, *where* $h = 3$ *hours* (first order central difference approximation)

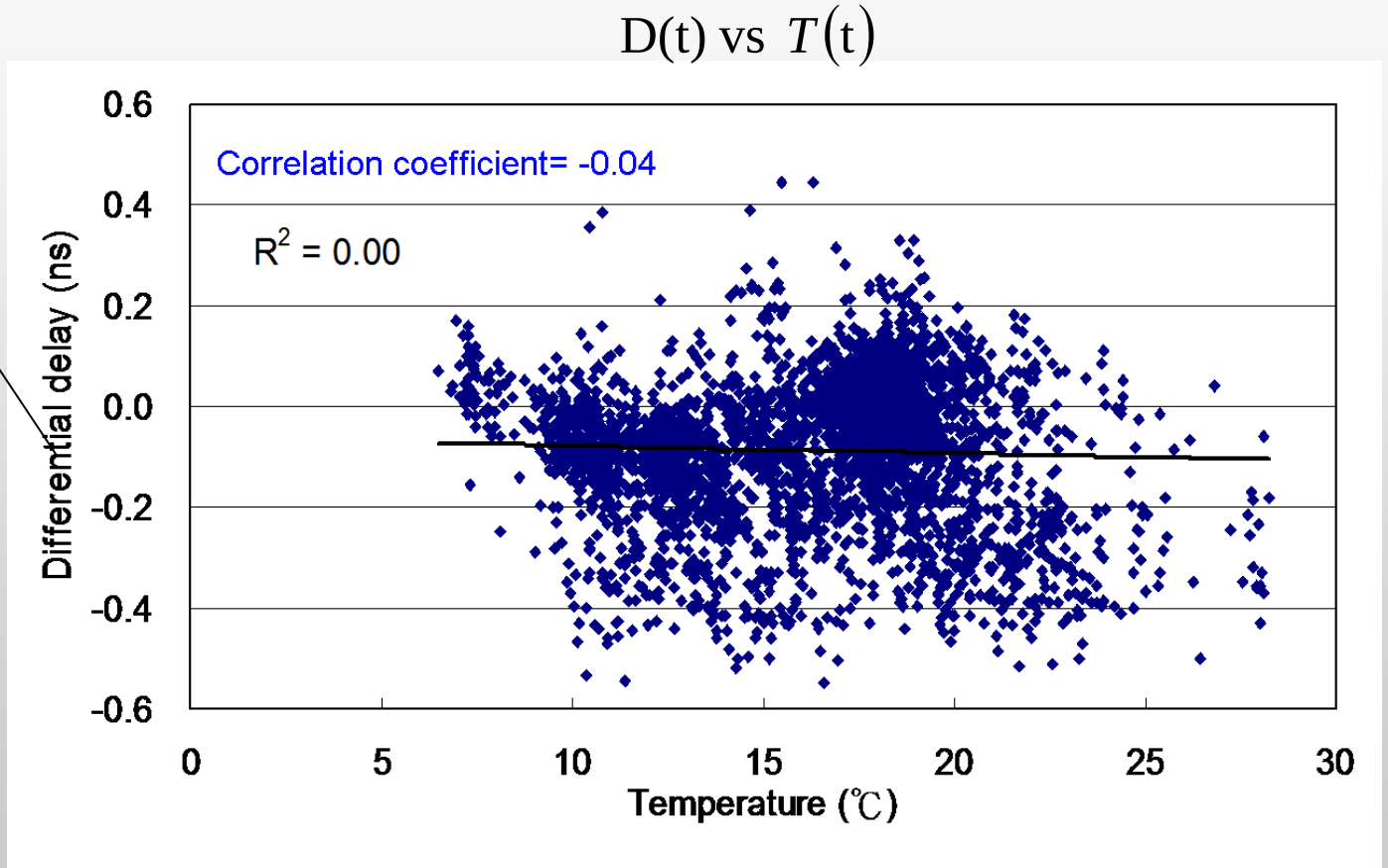
$T^{(2)}(t) = \frac{T(t+h) - 2T(t) + T(t-h)}{h^2}$, *where* $h = 7.5$ *hours* (second order central difference approx.)

$a_1 = -0.9$

$a_2 = +0.31$

Differential Delay vs. Temperature

Original temperature data

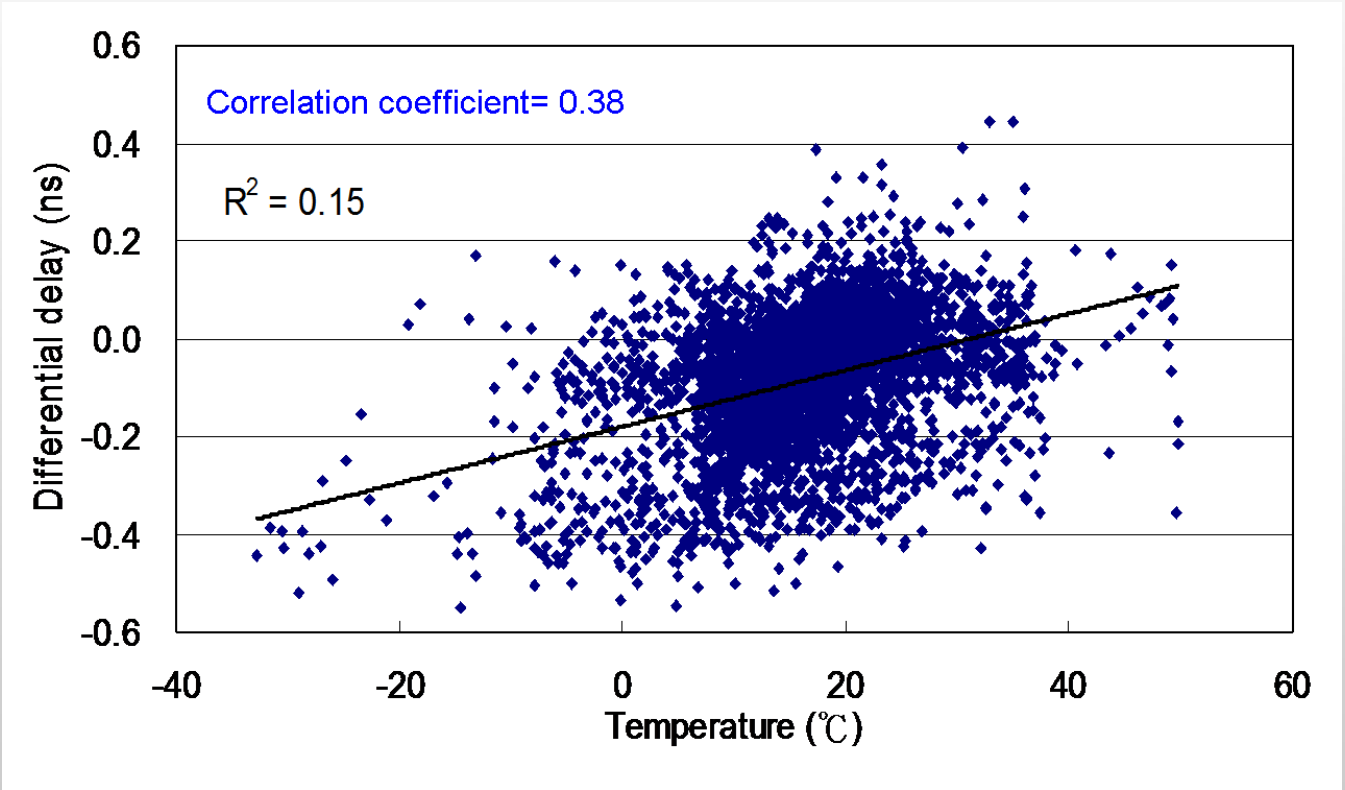


Measured by 2.5 MHz chip rate

Differential Delay vs. Temperature

plus 1st order differential

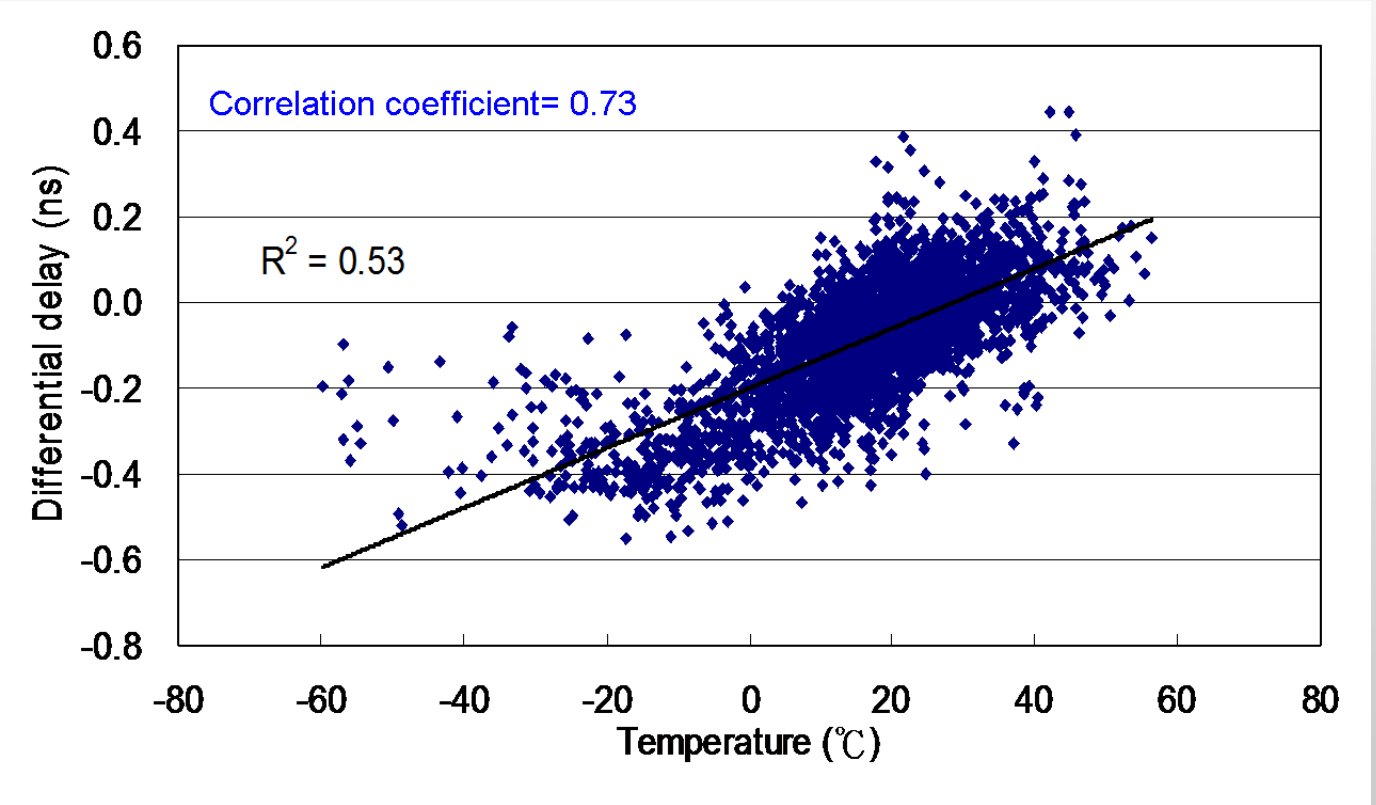
$$D(t) \text{ vs } [T(t) + a_1 T^{(1)}(t)]$$



Differential Delay vs. Temperature

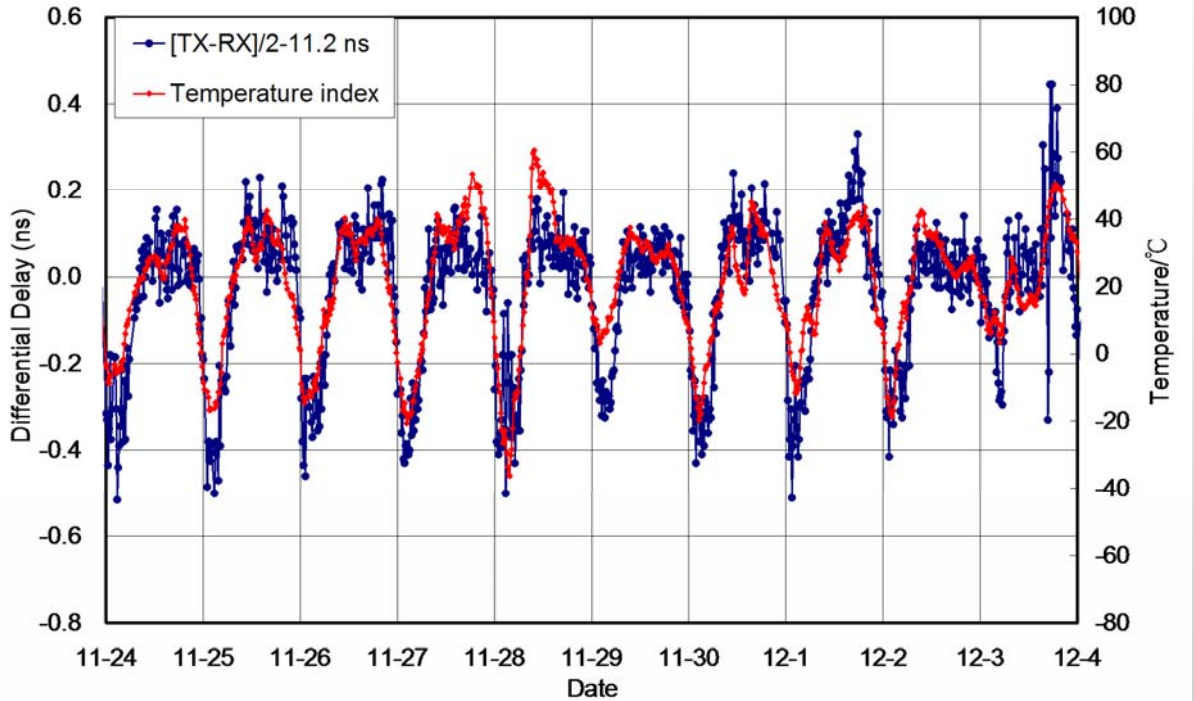
plus 1st and 2nd order differential

$$\mathrm{D(t)\ vs\ } [T(\mathrm{t}) + a_1 T^{(1)}(t) + a_2 T^{(2)}(t)]$$



The Comparison: Model vs. Measured Delay

$D(t)$ vs. $[T(t) + a_1T^{(1)}(t)+a_2T^{(2)}(t)]$



The detail will be presented in the 2007 PTTI by Bill Tseng

TWSTFT@TL, Future Works

Link With PTB (planning)

- Using PAS-4,
- Already finished the data up and down link test
- Waiting for time sharing agreement in this meeting

Link With America (planning)

- Transfer TWSTFT signal via Hawaii
- 2-channel SATRE modem is ready
- Cooperate with USNO, NICT, and NIST
- The SATRE Europe-Asia-America TWSTFT Closure Loop experiment

Link With Australia (planning)

- Cooperate with NMIA
- Using PAS-8