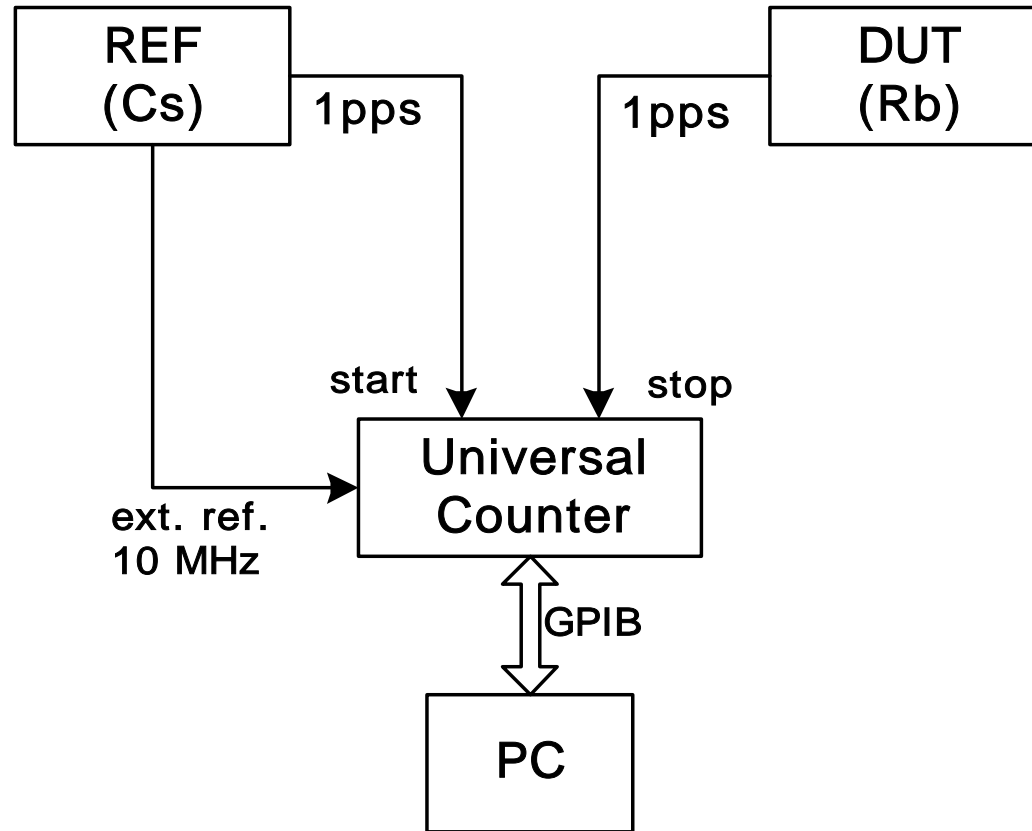

GPS

2003. 6. 10 12

(5146, *kimy@kriss.re.kr*)

General Precision Measurement





- REF 가 (NSF)

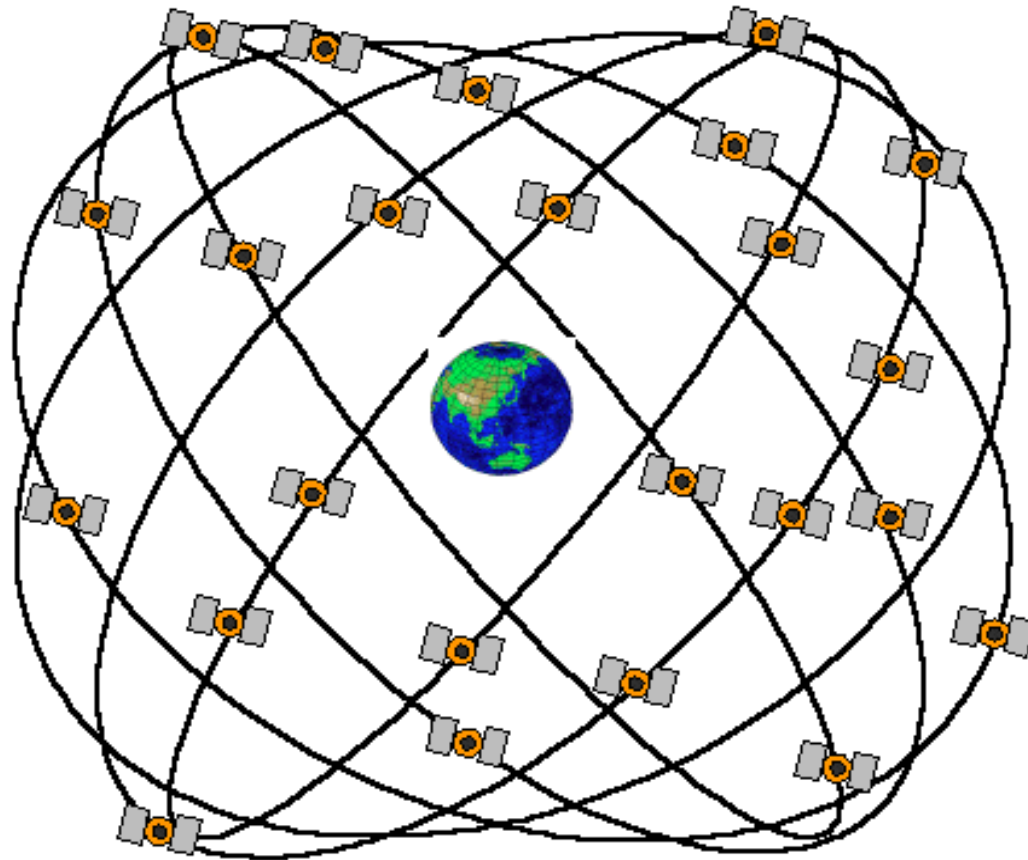
- GPS



- remotely access ()



Satellite Configuration



GPS(Global Positioning System)



- , , /



- , ,



- , , Rendezvous



- , ,



- , , Handoff



-



- , , ,



- , ,



- , , ,

(1)

- - FMAS(Freq. Meas. and Analysis Service)
 - NIST local GPS
 - single channel disciplined GPS
 - Uncertainty of $2E^{-13}$ /day
 - : 1 Hz to 120 MHz(in 1 Hz increments)
 - 5 가
 - (dedicated phone line or internet)
 - monthly report
 - local primary standard UTC

(2)



- Remote Calibration System (NMIJ)
- GPS Common-View
-
- 30 ns / day(Rb)



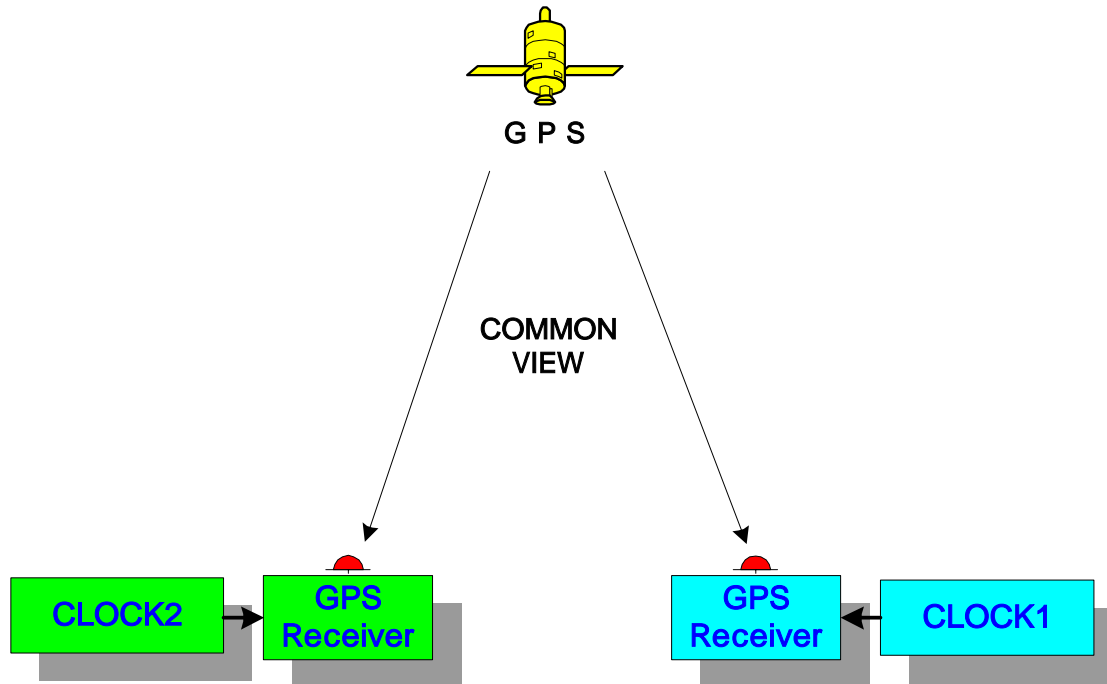
- Remote Frequency Calibration System (Chunghwa Telecom)
- GPS Carrier Phase
- : 5E-14 / day

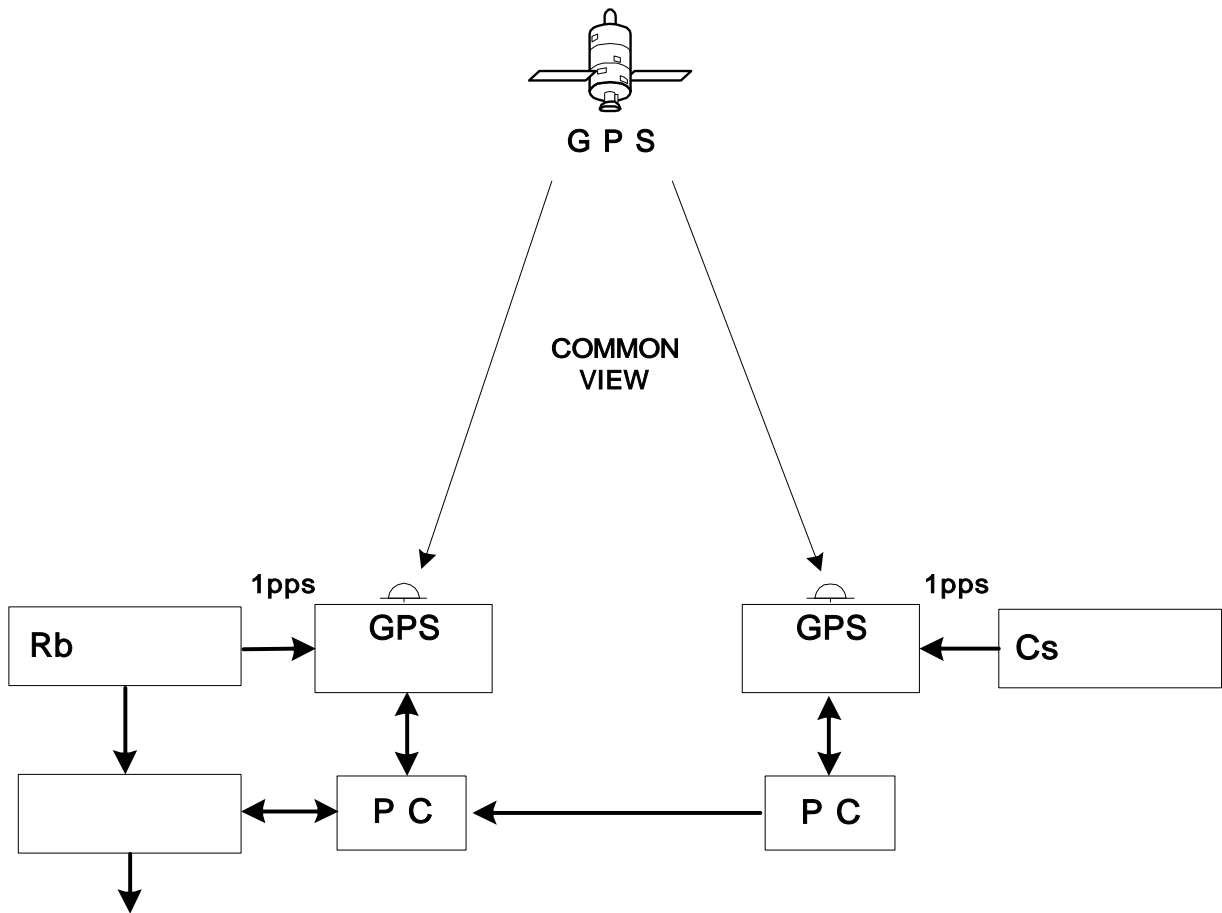
Master clock

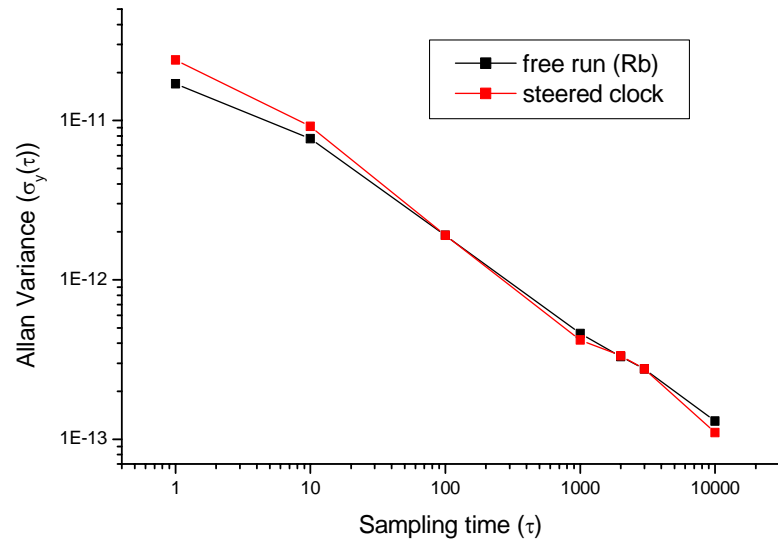
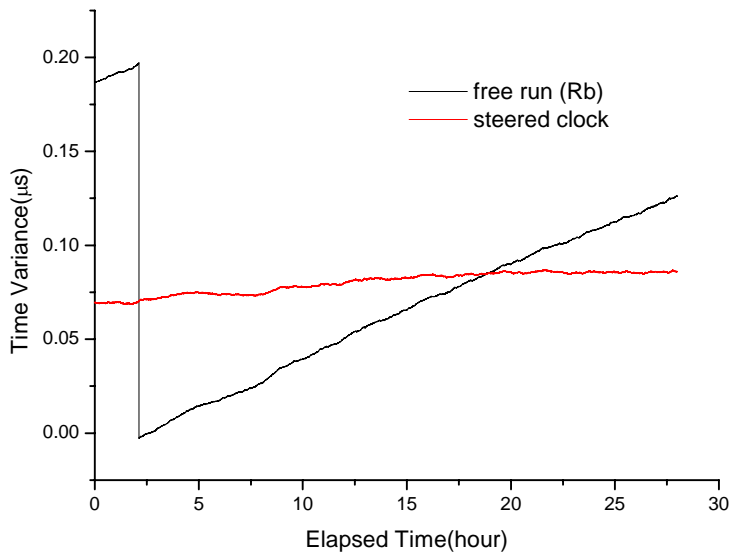
- - GPS disciplined clock(1)
 - VLF, LF, HF
 -
- GPS Common-View (GPS)
 - Phase Stepper OSC
 - PLL
 - 가
- GPS Carrier Phase
- Two-way Satellite

GPS Common-View Technique

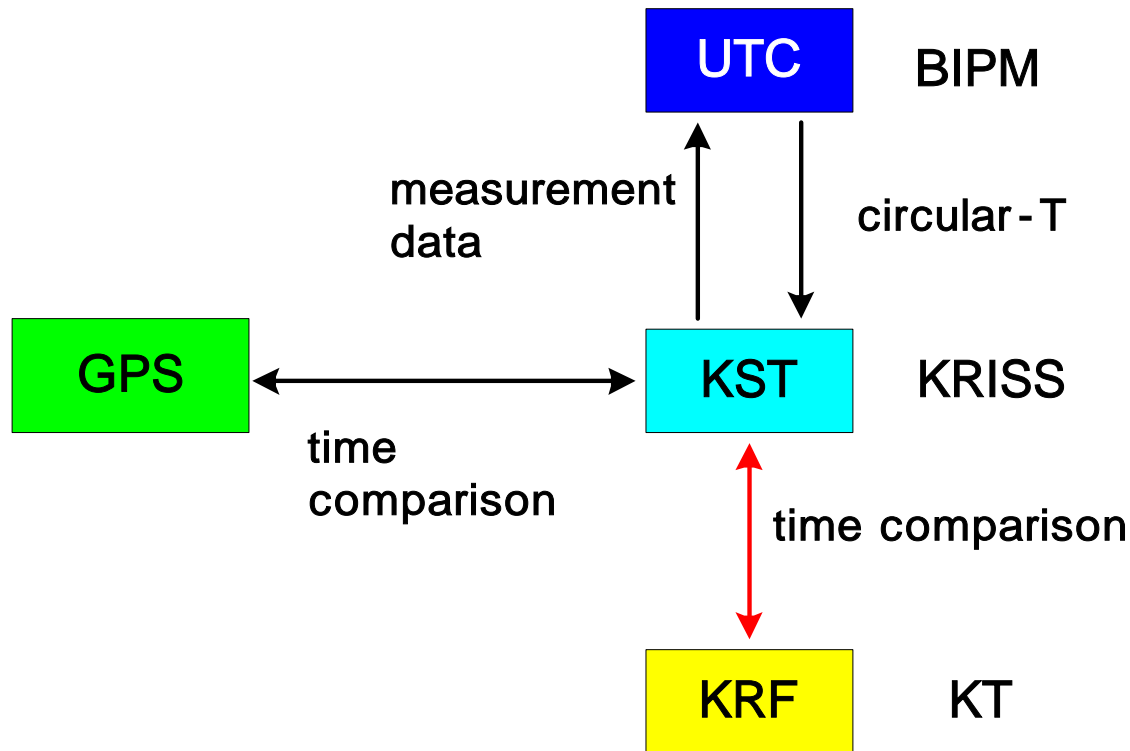
- $\text{Clock1} - \text{Clock2} = (\text{Clock1} - \text{GPS}) - (\text{Clock2} - \text{GPS})$
- Freq. Offset : $\sigma_y(\tau = 1\text{day}) \approx 1 \times 10^{-14}$
- Time sync. : 20 ~ 30 ns





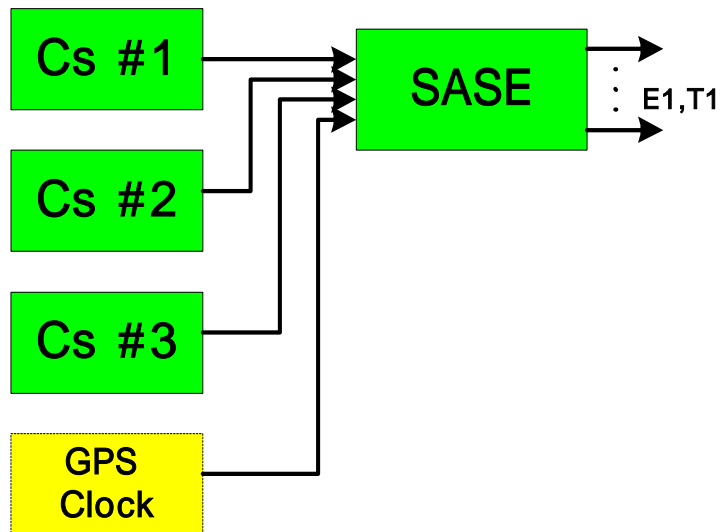


Comparison & Verification of KRF

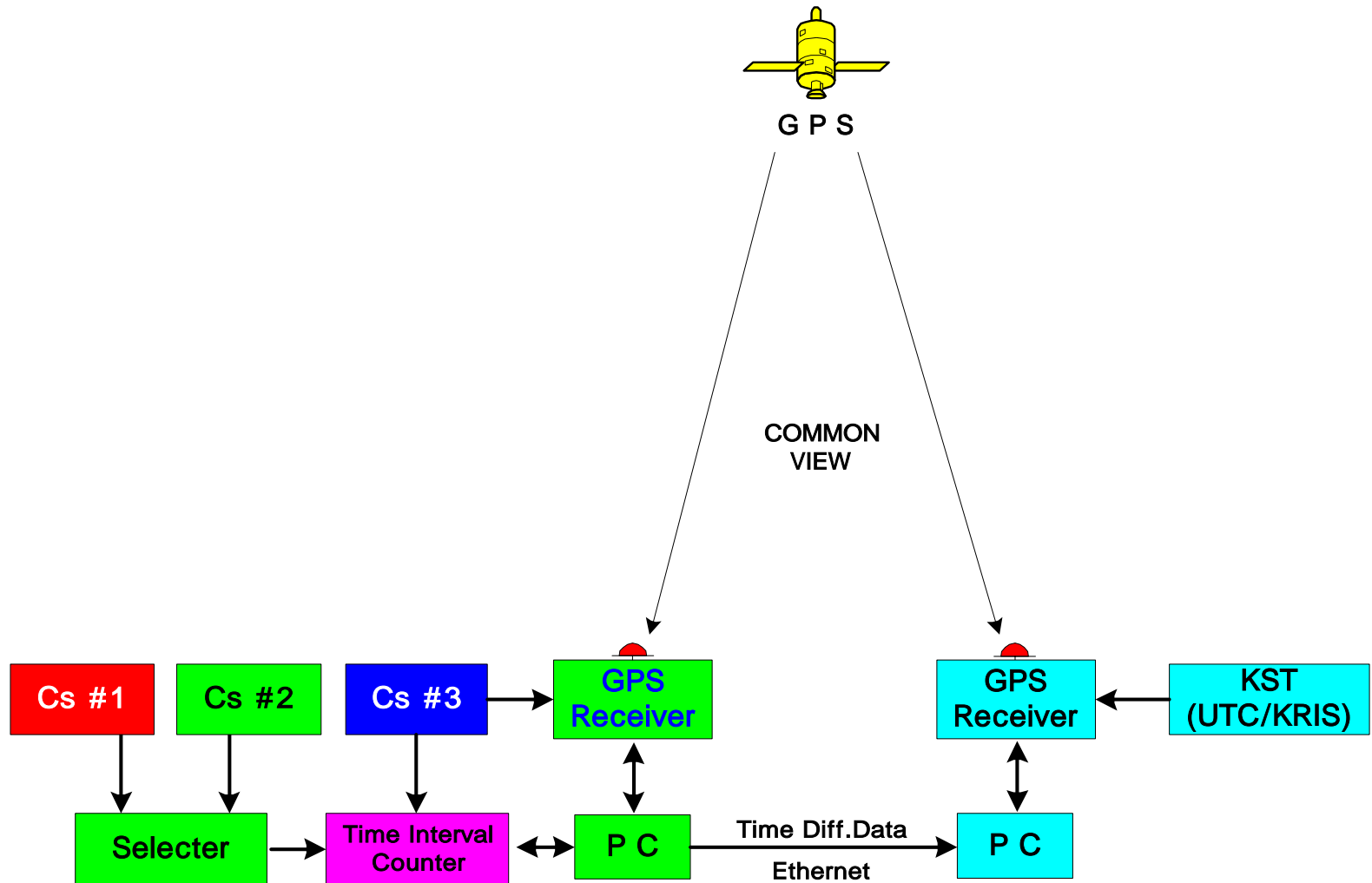


Korea Reference Frequency

- Located at 2 site(Daejeon,Seoul)
- Consists of 3 Cs atomic clocks, GPS disciplined clock, and SASE (Stand Alone Sync. Equipment)
- Manufactured by OSA,Swiss



Remote Measurement & Verification



Precision Meas. of Remote Clock

$$\text{KST- Cs \#3(KRF)} = (\text{KST-GPS}) - (\text{Cs \#3} - \text{GPS})$$



Picture of measurement system(remote site)

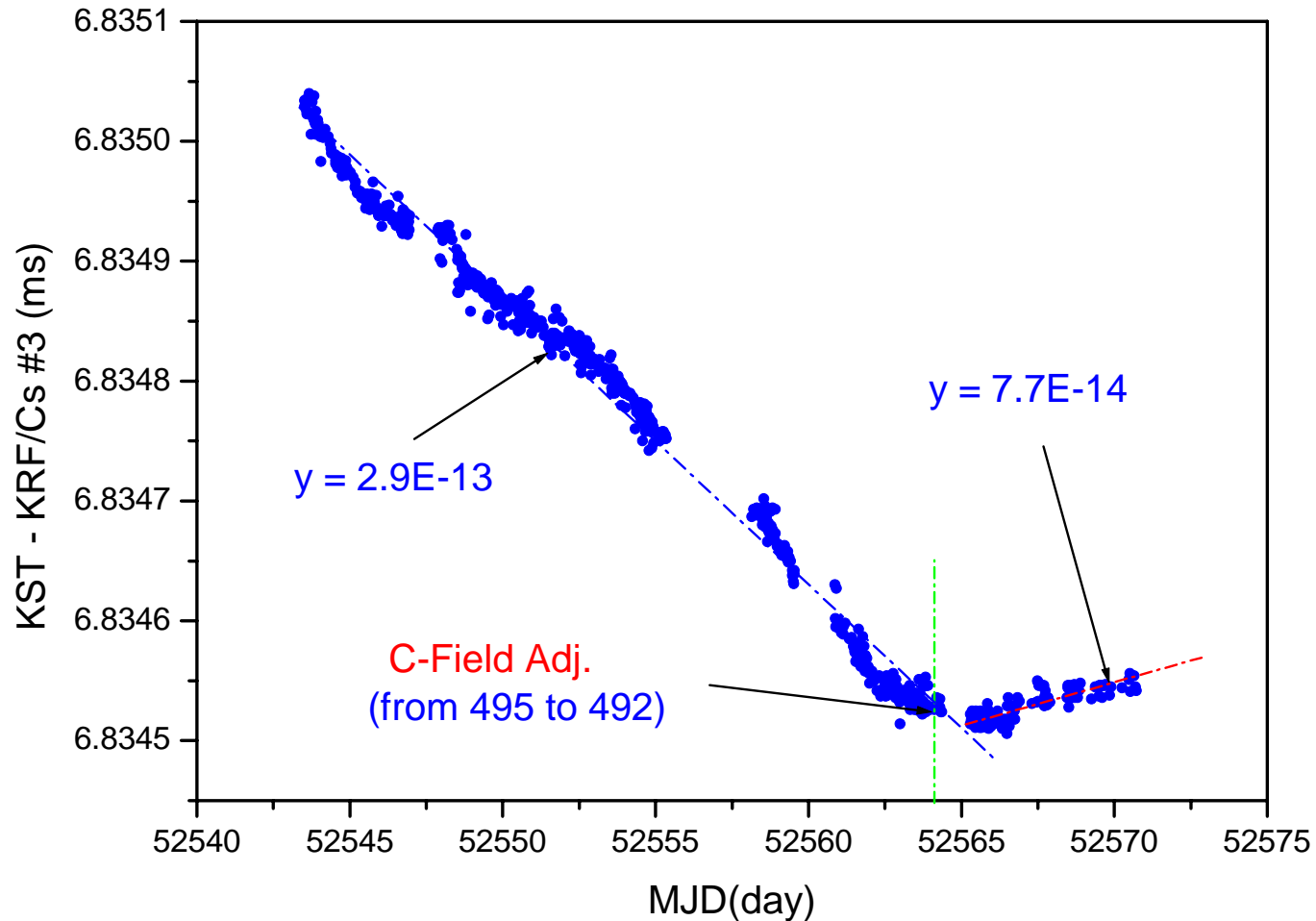
GPS Antenna (TTR-6)



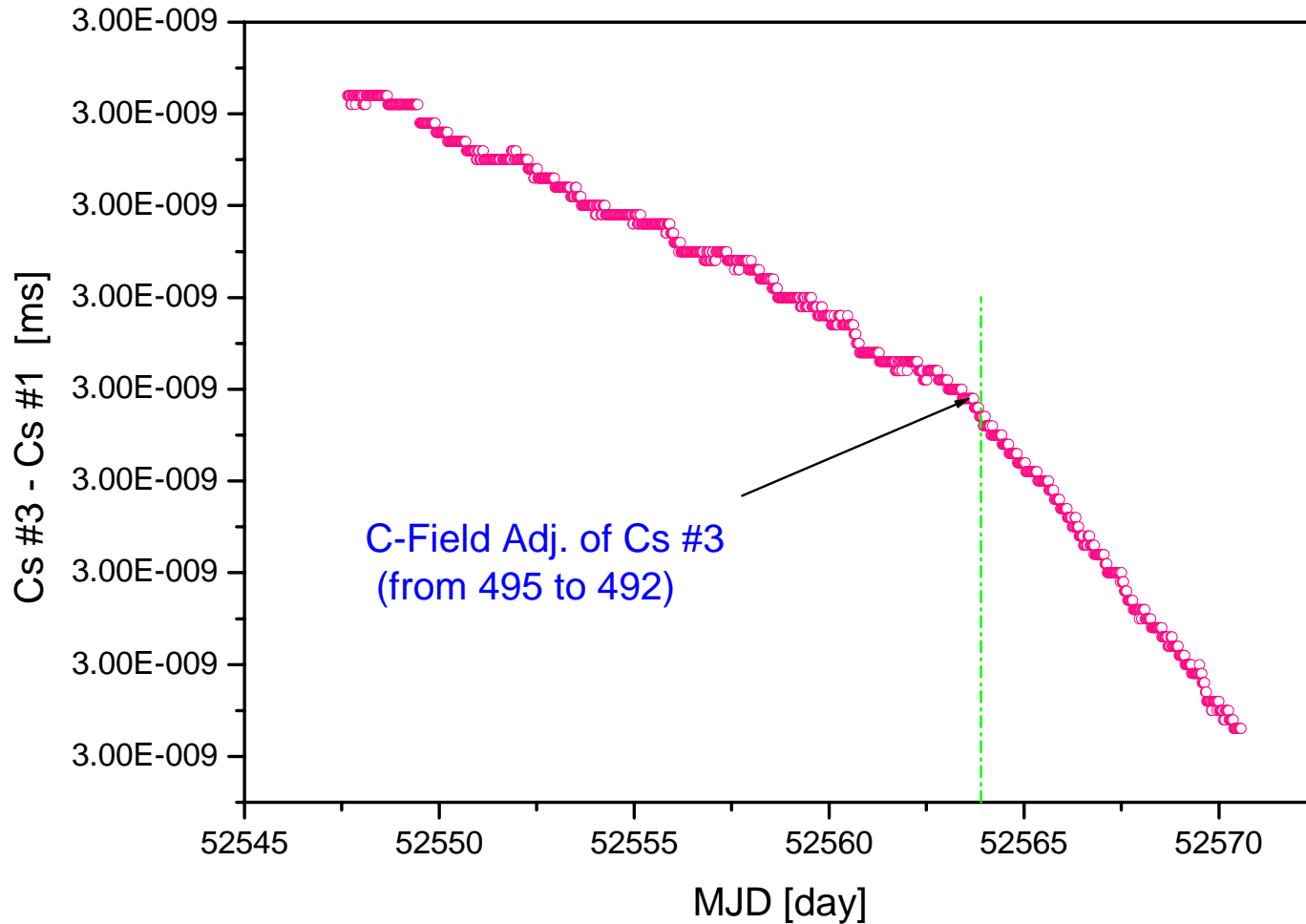
Measure the position of Antenna

Picture of the used antenna

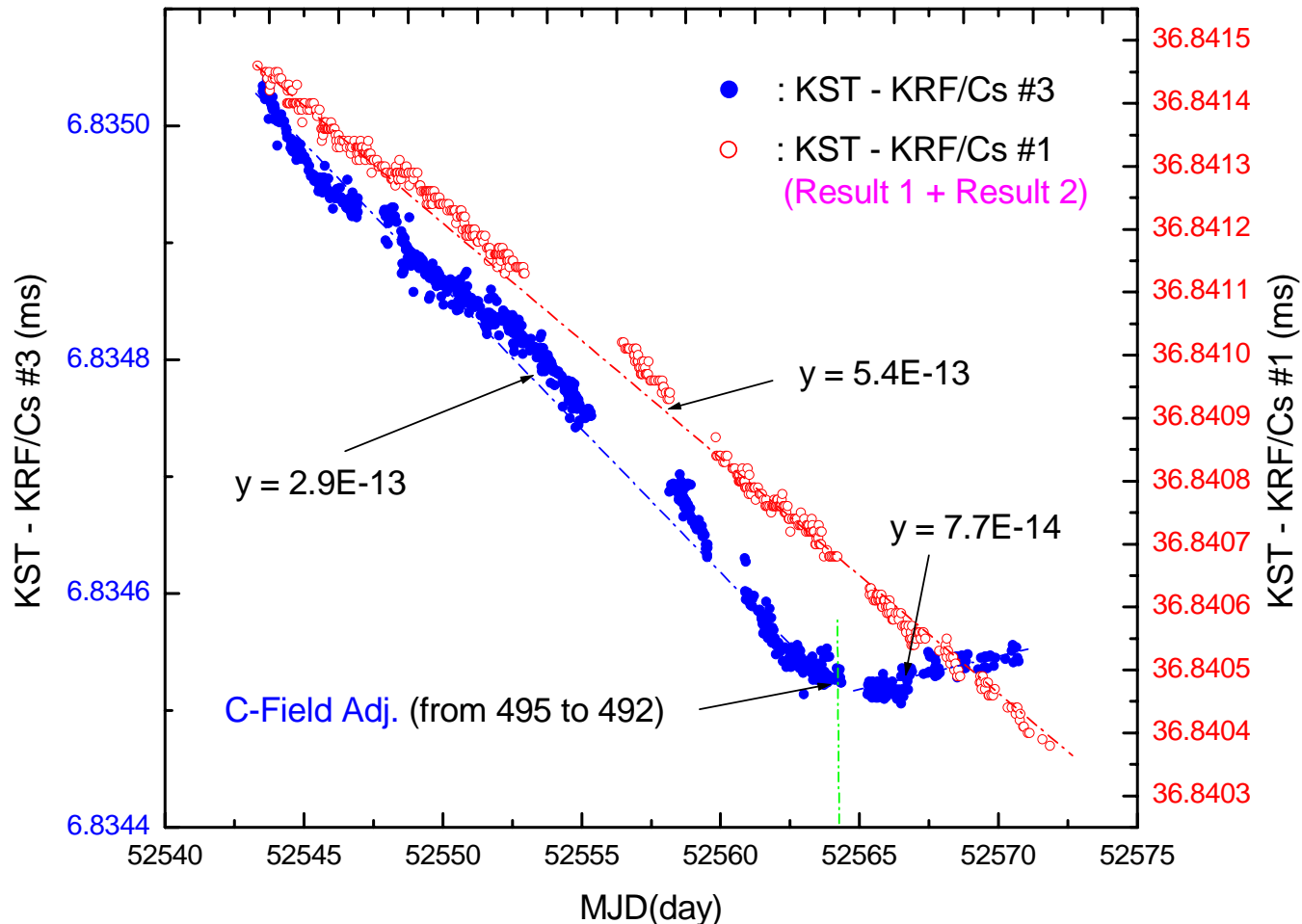
Result 1 : KST – Cs #3(KRF)



Result 2 : Cs #3(KRF) – Cs #1(KRF)



Result 3 : Cs Clocks of KRF/Daejeon



Summary

1) Remote Calibration

-
-
- ,

2)

- KRISS

3) KT PRC 가

- GPS C-V ,
- : $\sim 10^{-14}$

4) Application

- , , ● ● ●