

*Ultra-rapid dUT1 Measurements
on Japan-Fennoscandian
baselines
- Application to 24 hour session -*

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Outline

1. Ultra rapid: why, how and who
2. Past experiences
3. New challenges
4. Results from latest experiments
5. Conclusions and Future prospects

Need for Rapid dUT1

- dDUT1
 - Uniquely defined by VLBI
 - Irregular short-term variation
- Precision improvement of rapid prediction of Earth rotation (IERS Bulletin-A)
- Orbital control of satellites
- Contribution to space exploration
 - ex. Deep Impact, Mars Global Surveyor

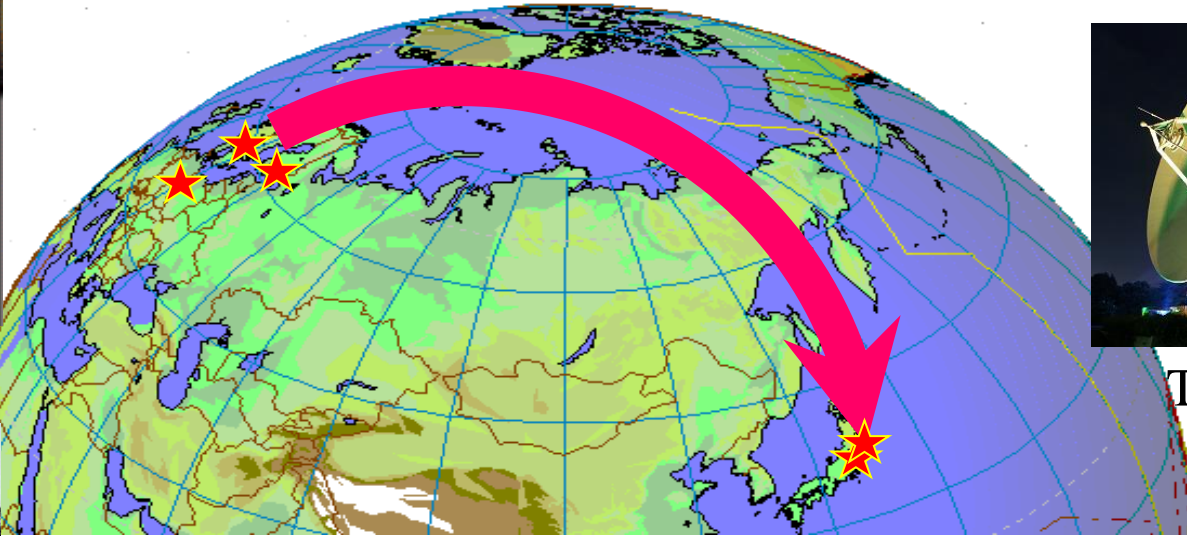
Ultra rapid Players



Onsala



Metsähovi



Tsukuba



Wetzell



Kashima

Requirements

- Connection to high-speed networks
- Environment for real-time VLBI data transfer
 - Network instrumentation for Gbps
 - Transfer servers with fast I/O and large capacity
 - Tsunami UDP Protocol for high-data rate transfer
 - PC-EVN for data senders
- Tools for automated data processing
 - Automatic correlation procedure
 - OCCAM for analysis

Ultra Rapid for Intensives

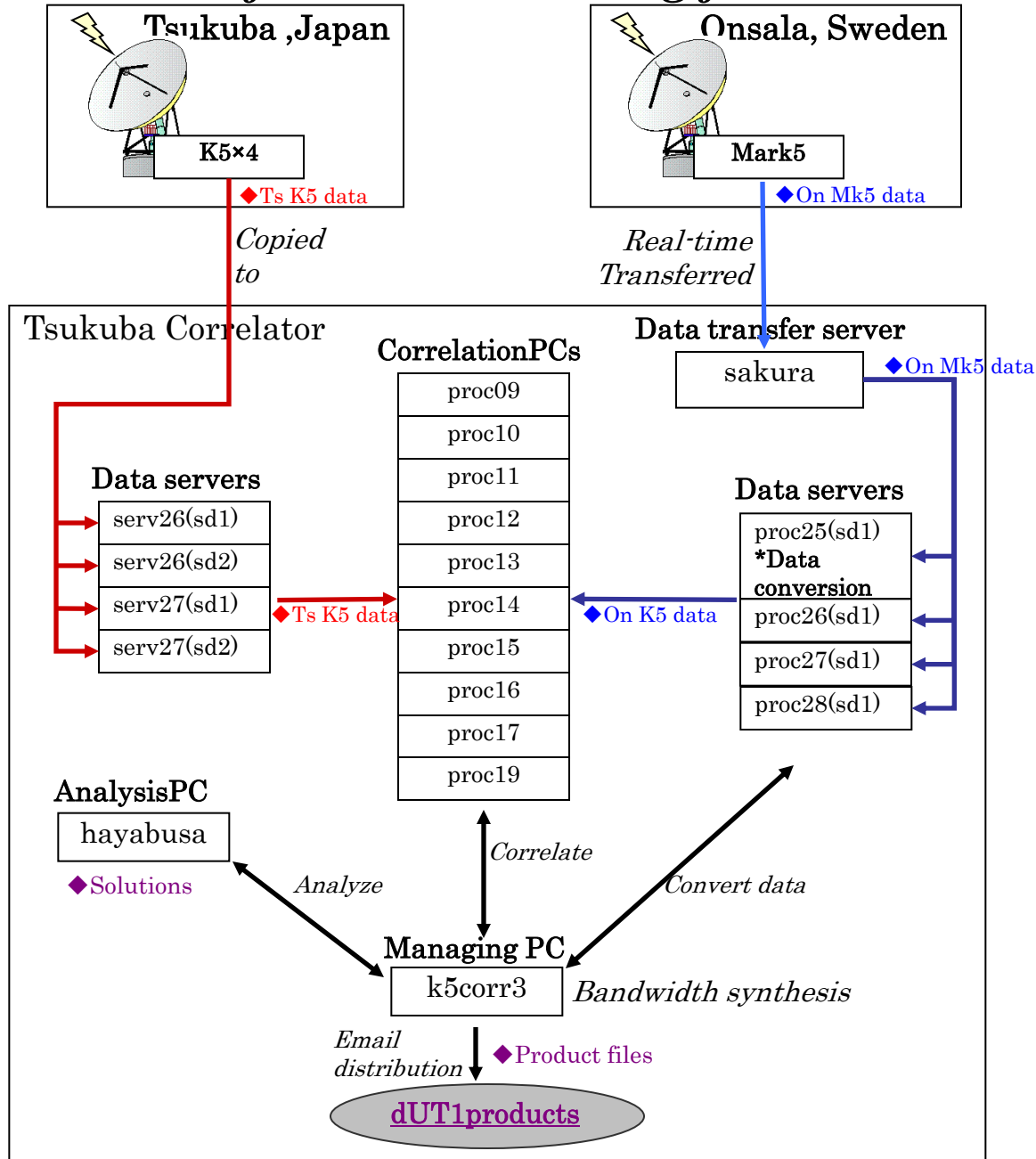
Session	Data transfer	Processing time	Stations	Correlator
INT1	By air	3 – 5 days	Kokee Wettzell	Washington
INT2	Network Post observation	1 – 3 days	Tsukuba Wettzell	Tsukuba
INT2-ultra rapid(2009-)	Network Quasi real-time	1 hour		
INT3	Network Post observation	Few hours	Tsukuba Wettzell, etc.	Bonn
Ultra Rapid experiments (2007-)	Network Real-time	Few minutes	Tsukuba Kashima Onsala Metsähovi	Tsukuba Kashima

New Challenges for regular sessions

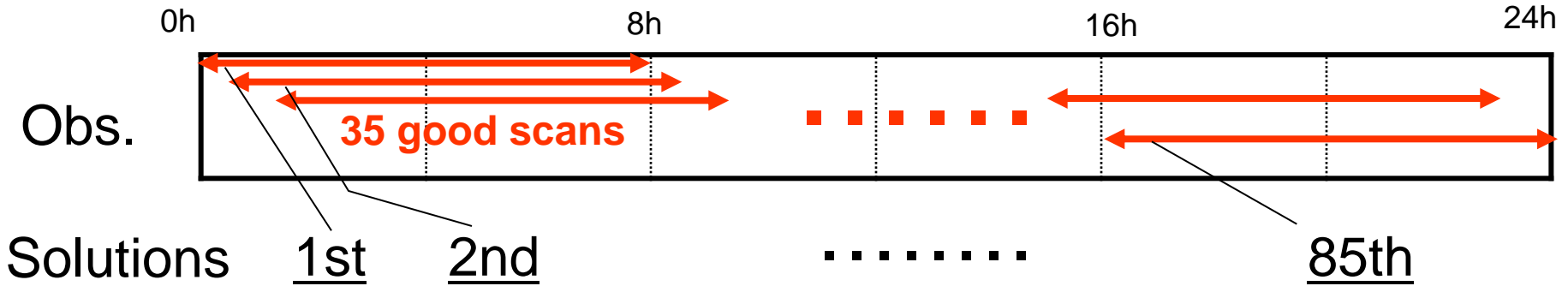
(dUT1 from On – Ts baseline)

- Modification of Intensive tools for continuous operation
 - Selection of common scans
 - Adjustment of scan length
 - Tuning of fringe search program
 - etc.
- Modifications of correlation-bandwidth synthesis and analysis strategy for automatic continuous solutions

Data transfer and Processing for 24hr session



OCCAM Analysis strategy



- Bandwidth synthesis after each scan and reject low quality scans

Experiments - From Intensives to 24hr -

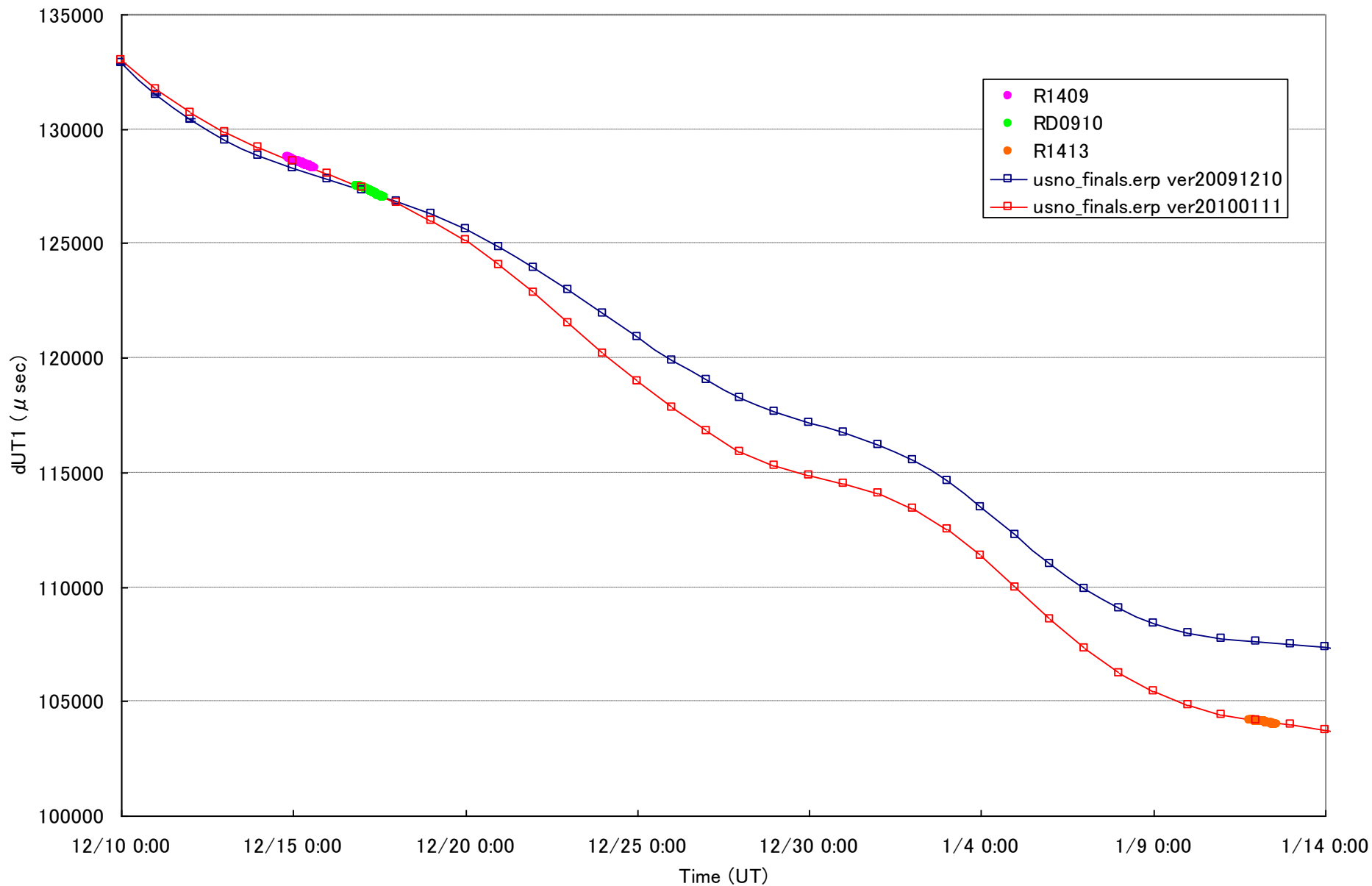
- Intensives
 - 2007-2008: Test experiments
 - 2008, May- Ultra-rapid applied to INT2
 - 2009, Apr.- Stable and routine INT2-ultra rapid
- Regular sessions
 - 2009: R1385(June29-30, First application), RD0907,R1409, RD0910
 - 2010: R1413,R1415,R1417(Feb.9-10)

Results from latest experiments

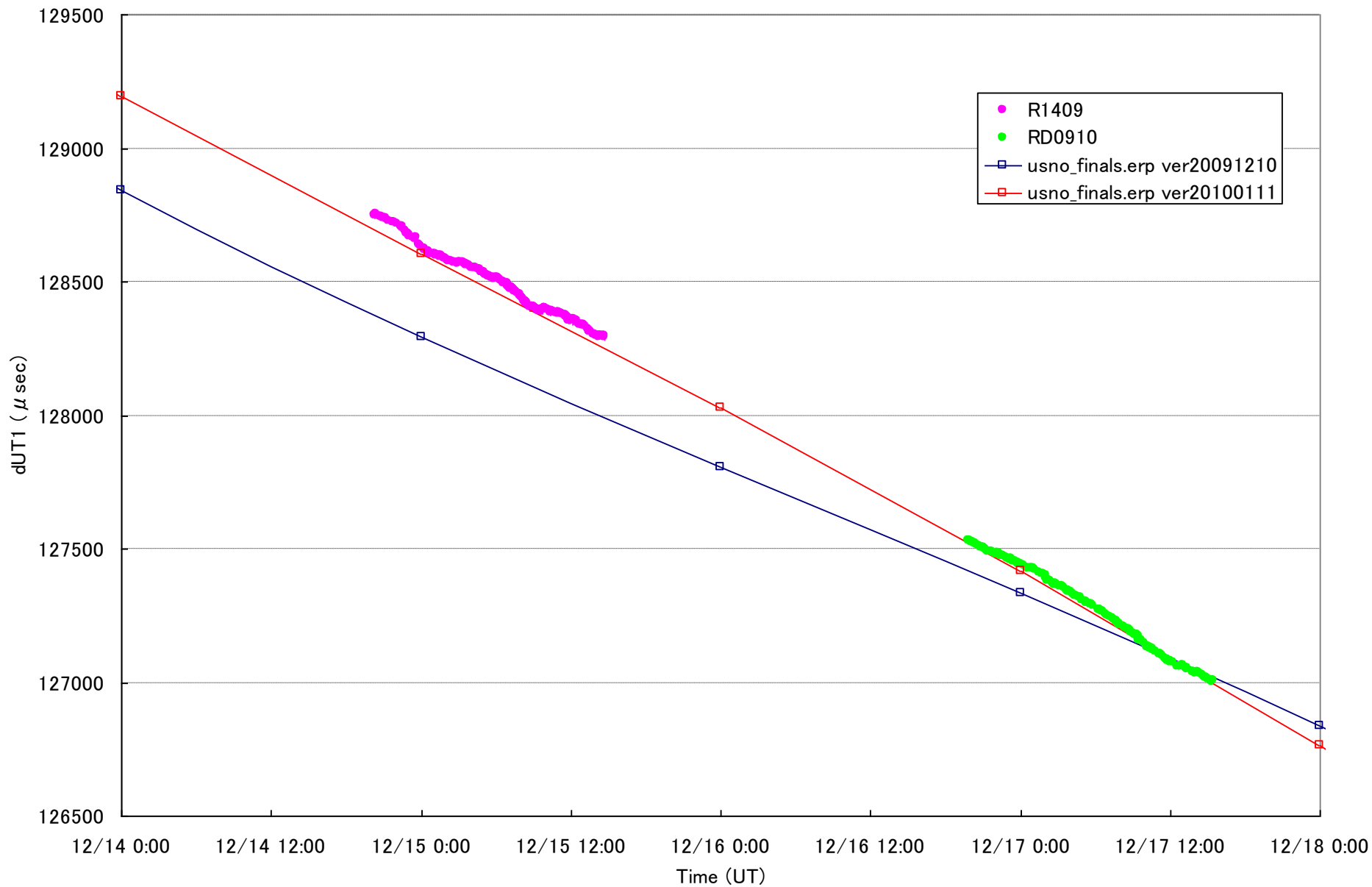
- Dec.14, 2009 - Jan.25, 2010
- Sampling: 16Mbps/ch, total:256Mbps
- Scans: ~200 (common to both Ts and On)
- Averaged s.d.: ~10us
- Detailed, short-termed behavior of dUT1 revealed
- Agreements to predictions and final values

- Results were e-mailed real-time.

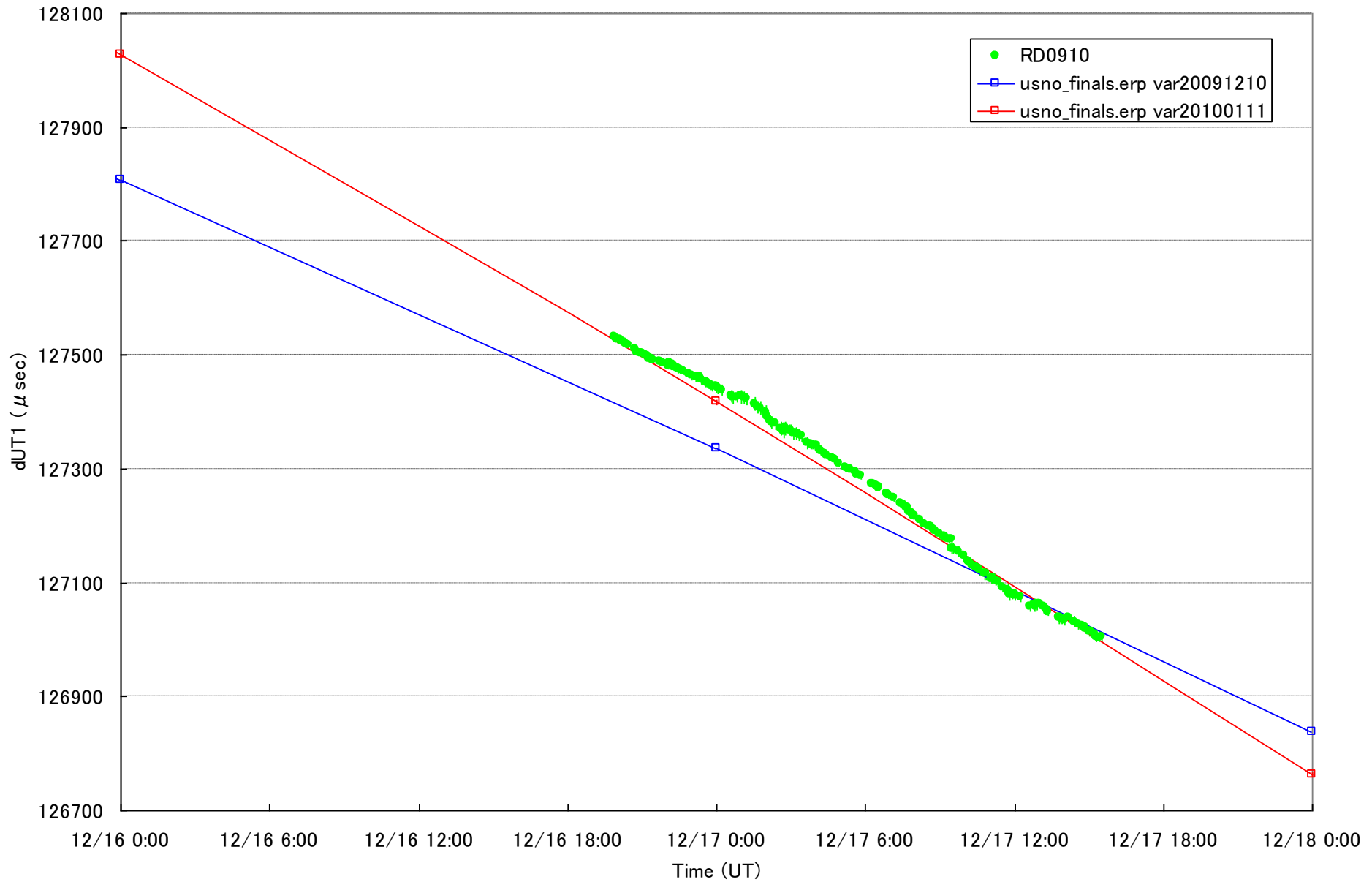
dUT1 R1409, RD0910, R1413 and usno_finals



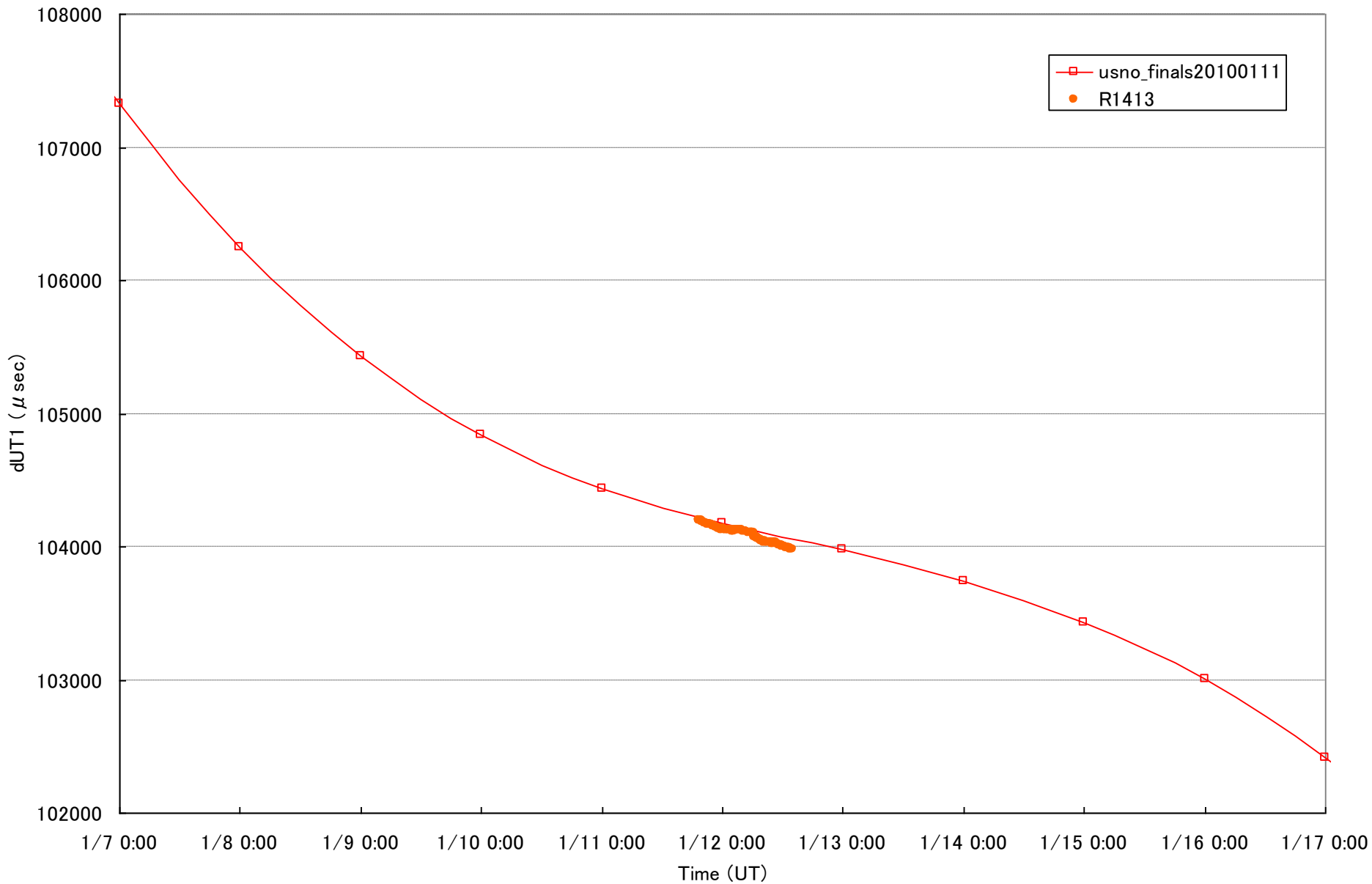
dUT1 R1409, RD0910 and usno_finals



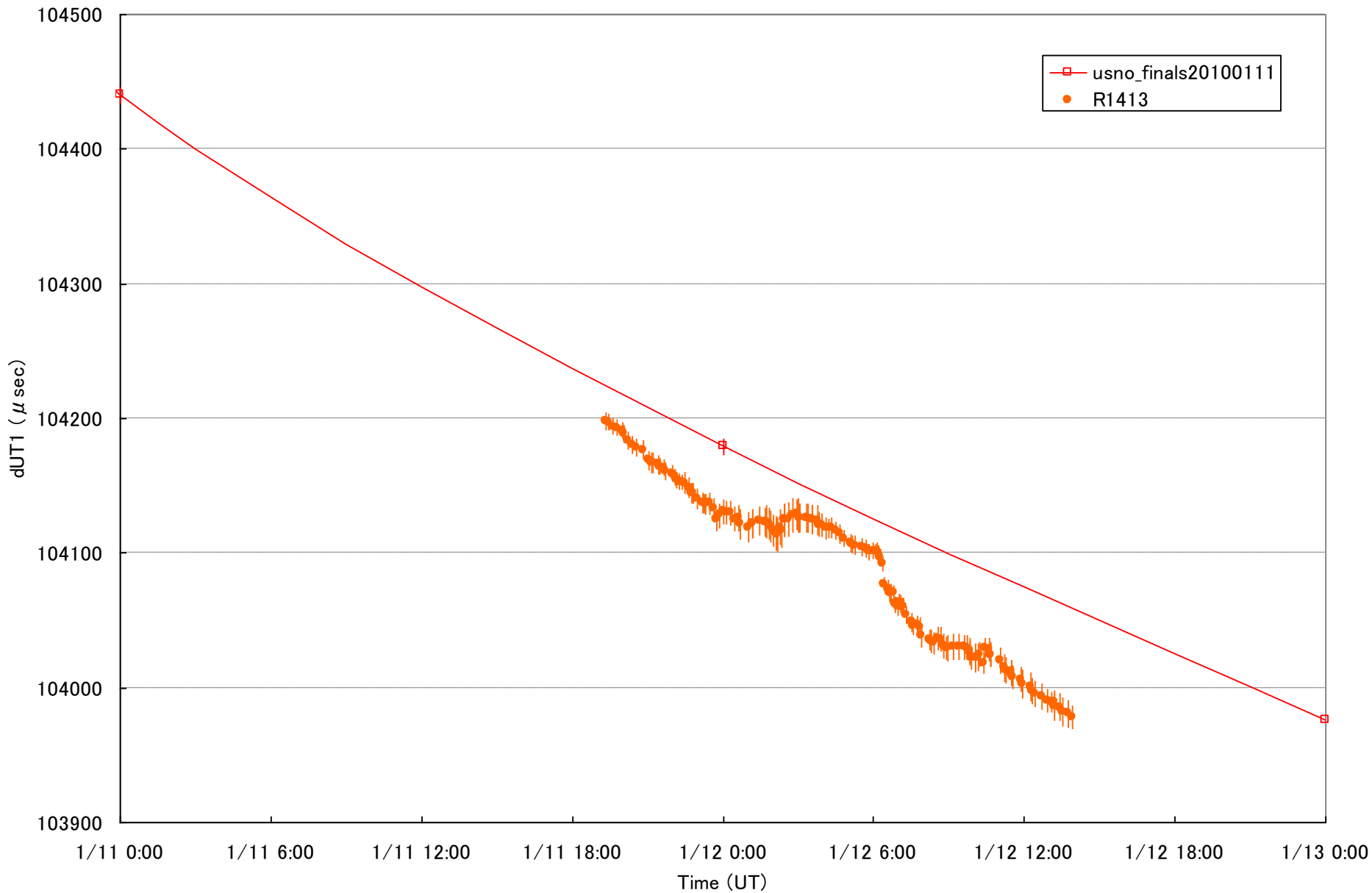
dUT1 RD0910 and usno_finals

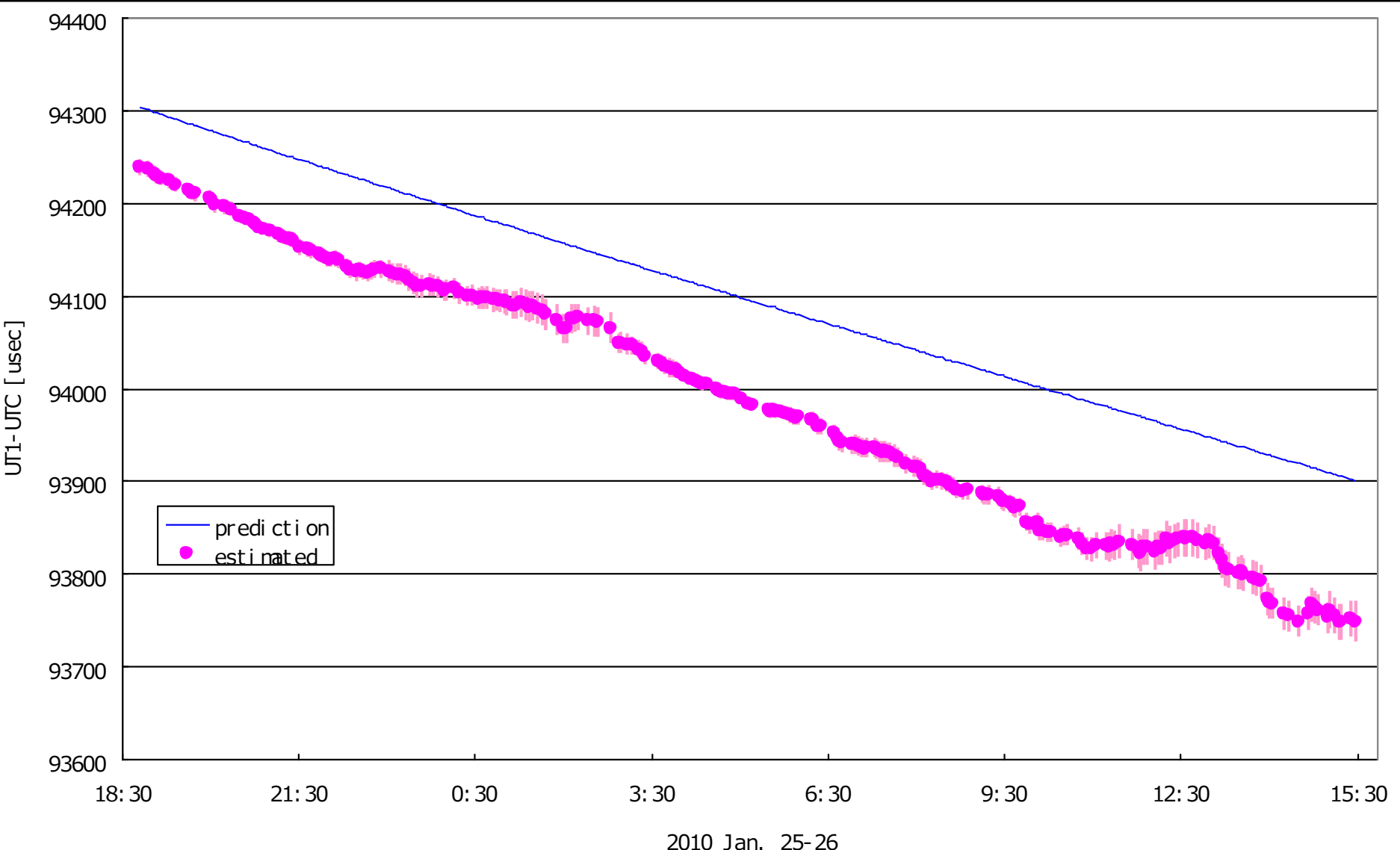


dUT1 R1413 and usno_finals

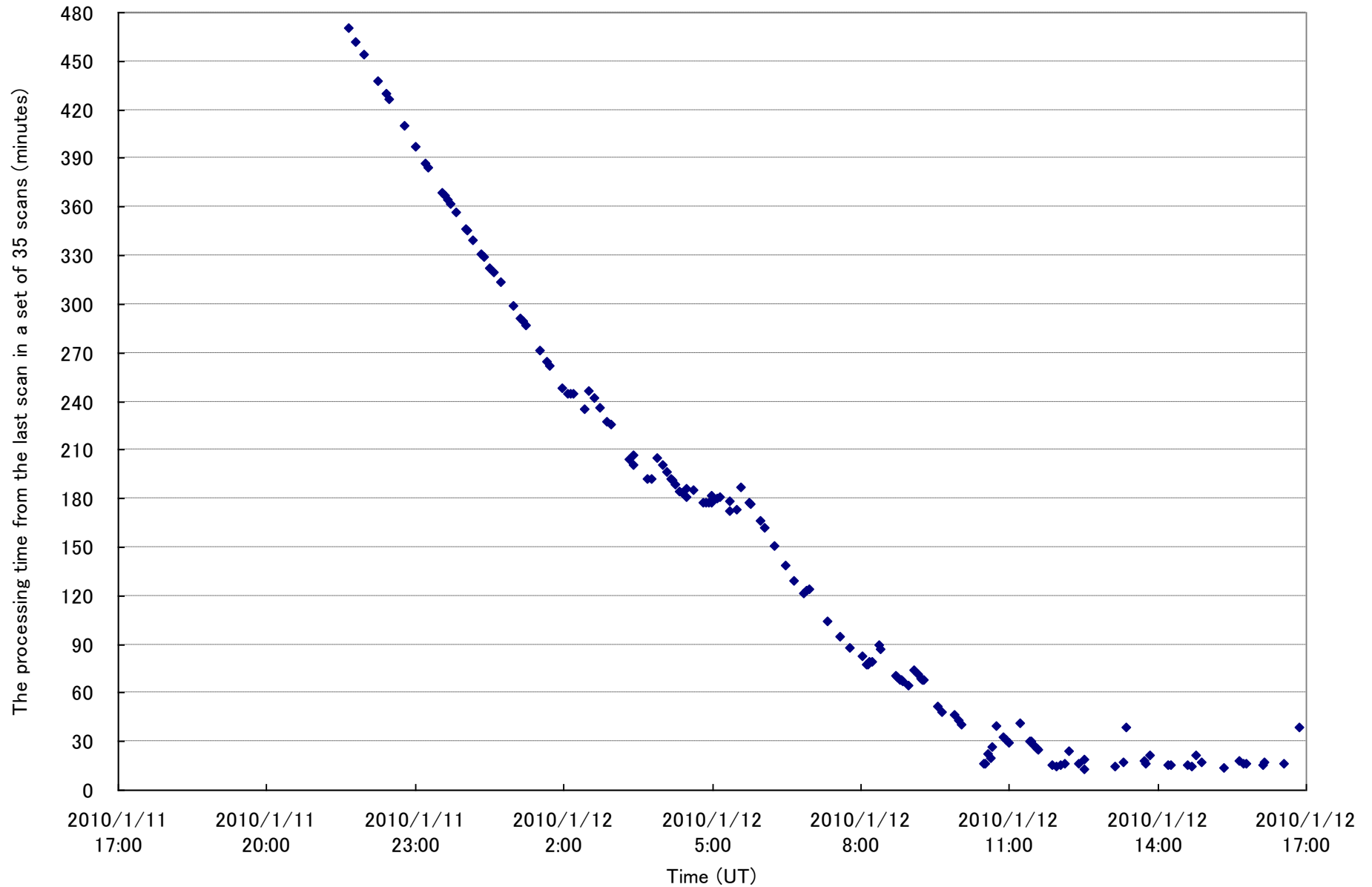


dUT1 R1413 and usno_finals





R1413 The processing time from the last scan in a set of 35 scans



Conclusions and Future Prospects (1/2)

- Implementation of ultra-rapid to INT sessions
 - INT2 sessions with real-time transfer and automatic data processing 2009 -.
- Continuous, almost real-time measurements of dUT1 from regular VLBI sessions
- One step forward to continuous EOP (one of VLBI2010 goals)

Conclusions and Future prospects (2/2)

- Continuous dUT1s from ultra rapid
 - Accuracy confirmed with comparison to post processed values
 - Hourly variation of dUT1: valuable data for scientific study
- Adding N-S baselines enables estimates of wobbles as well

Thanks for your attention

*Do not miss
our real-time demonstration*