SP Station Report

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Content

- UTC(SP) and Distributed Time Scale in Sweden
- TWSTFT-equipment
- Other TWSTFT issues

Distributed Time Scale in Sweden

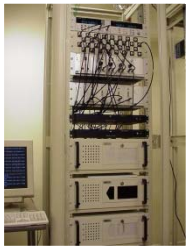
- SP currently has two sister labs where SP has placed equipment and maintains secondary time scales:
  - STUPI, Stockholm
    Consultant focusing on optical networks, National IP infrastructure, and T&F metrology
  - Onsala Space Observatory (OSO)
    VLBI-site, IGS Reference Frame (RF) station
- SP also co-maintains 3 (4) clock sites with 6 (8) national NTP-servers:
  - NETNOD
    Governmental organization operating 6 Internet Exchange Points in Sweden. Three (four) with NTP-servers: **GBG, STH, MMO, (SVL)**

Clocks and Time Scales in Sweden

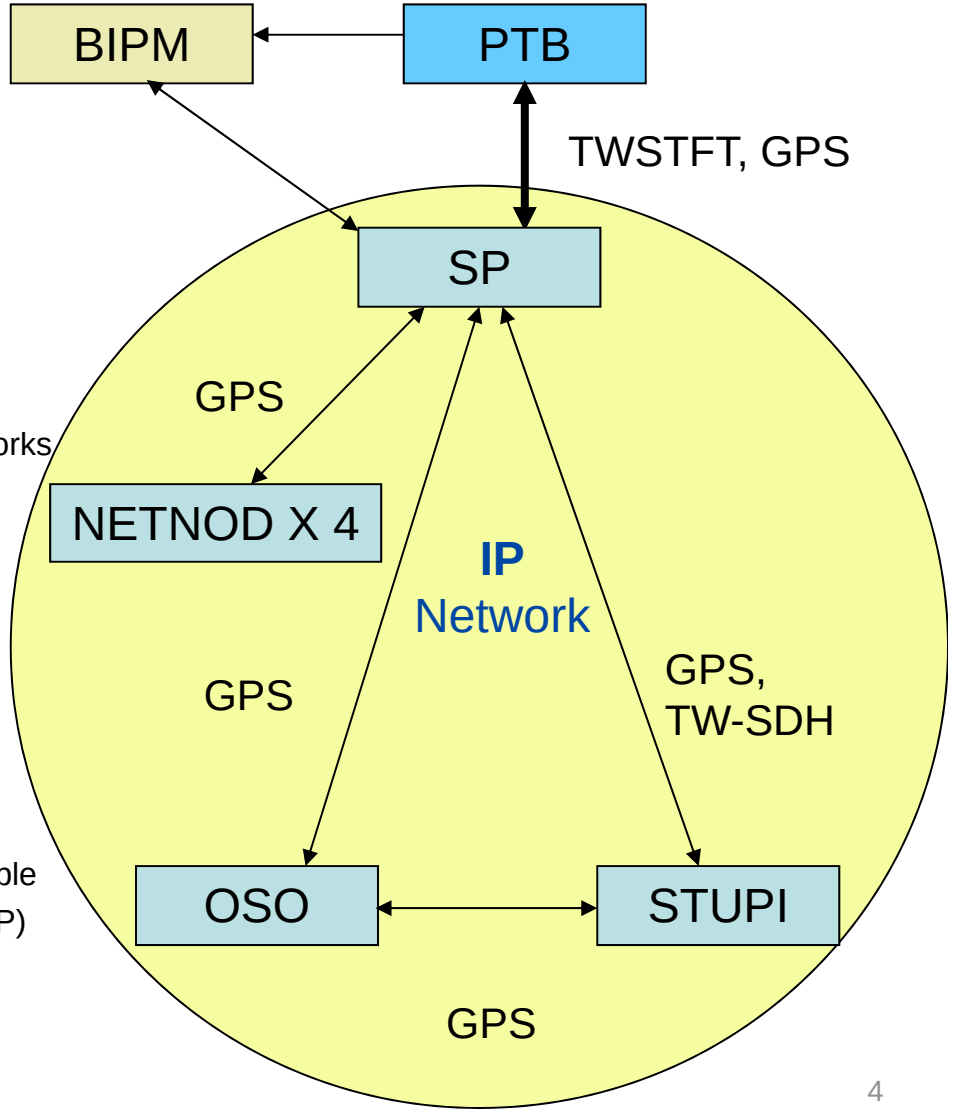
- SP
  - Maintaining UTC(SP)
  - 4 CS, 2 HM, 2 AOG
  - LINKS: GNSS, TWSTFT
  - IGS station

- STUPI
  - Maintaining realization of UTC(SP)
  - 7 CS, 3 HM, 2 AOG
  - LINK: GNSS
  - Provides access to high bandwidth com. networks

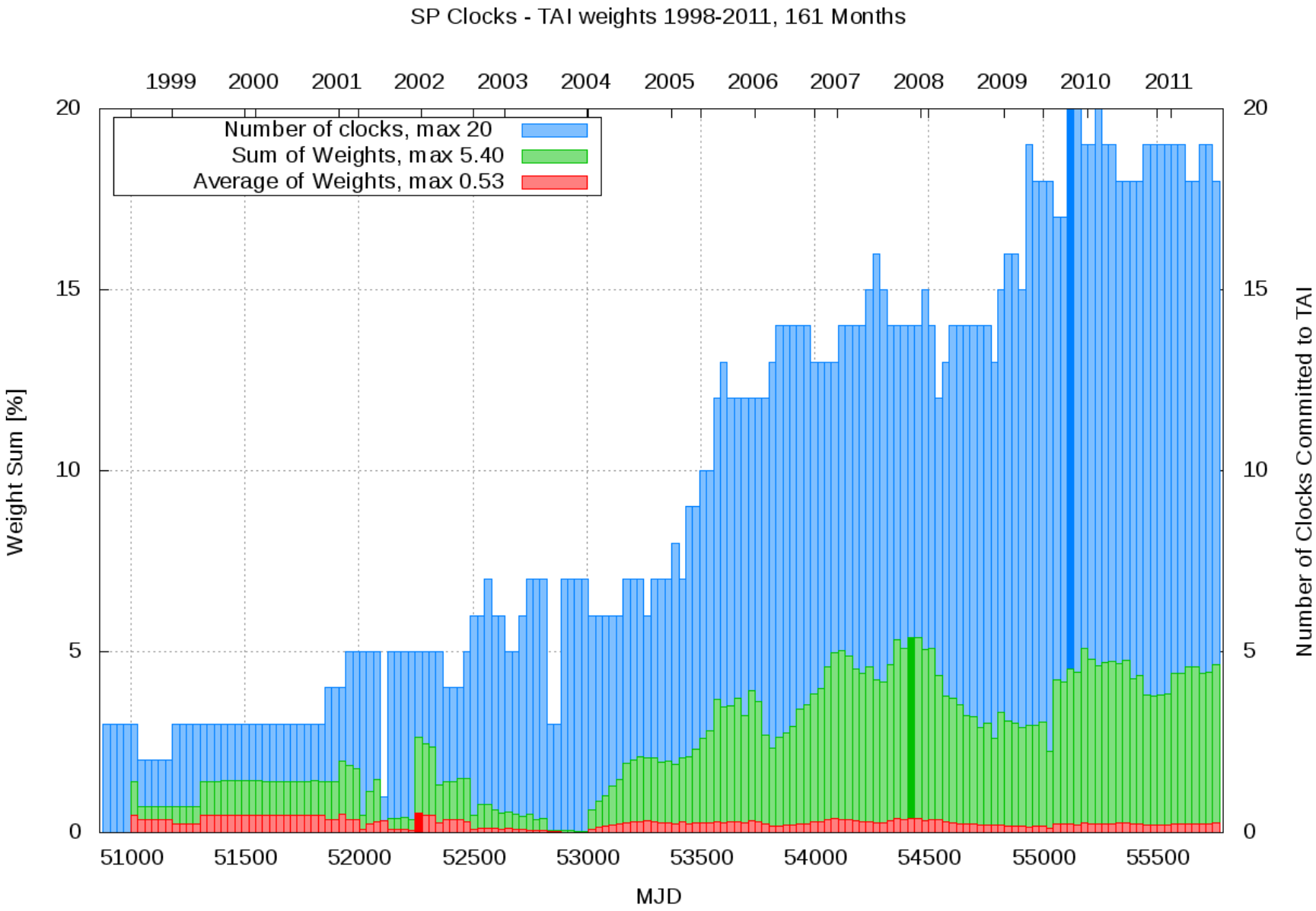
- OSO
  - Maintaining realization of UTC(SP)
  - 1 CS, 2 HM, 1 AOG
  - LINK: GNSS
  - VLBI-station, IGS RF station



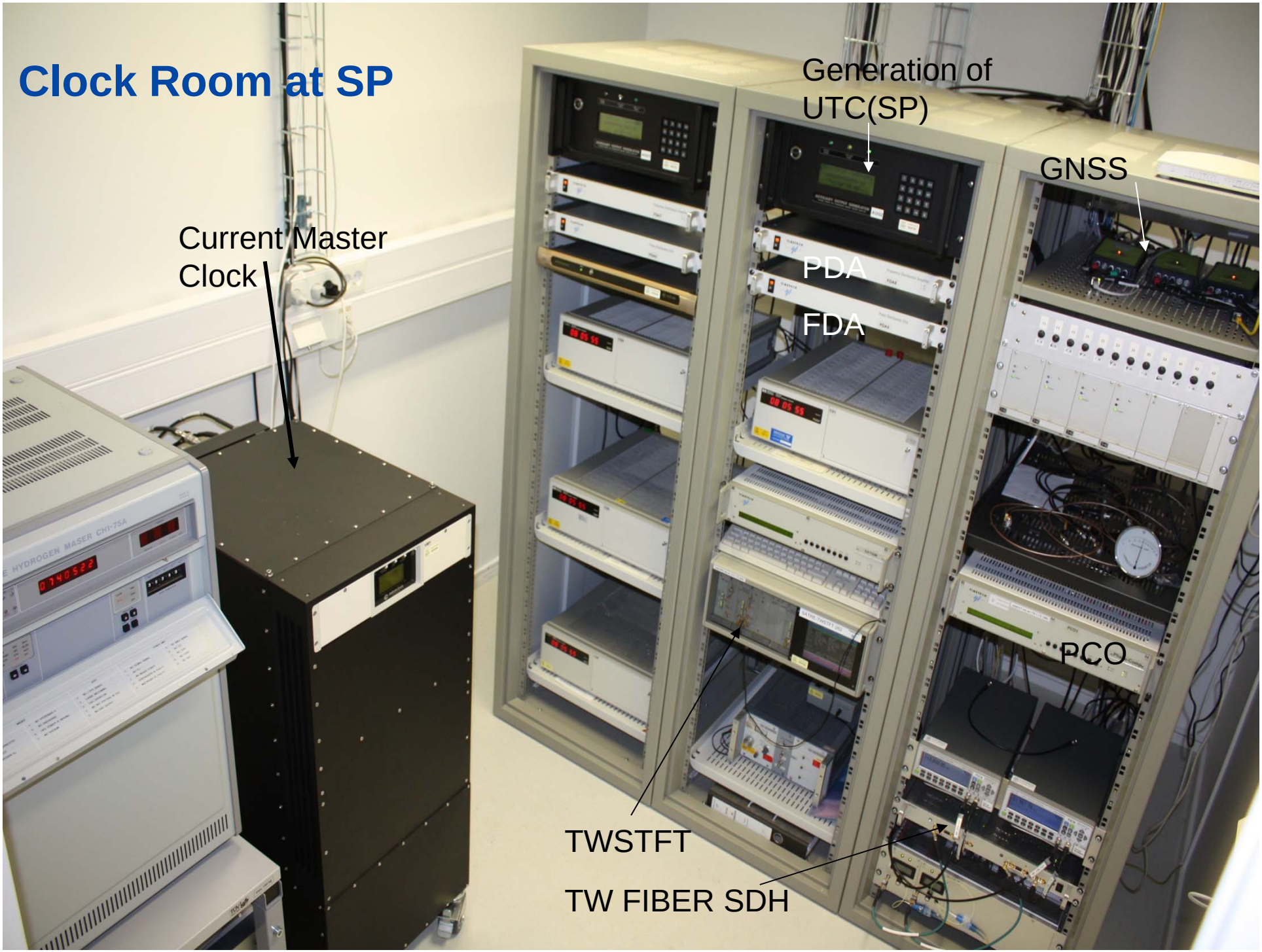
- NETNOD
  - 4 clock sites, each with:
    - national NTP-servers, E1 distribution possible
    - Independent time scales steered to UTC(SP)
    - 4 RB (will be replaced by 2 CS)
    - LINK: GNSS



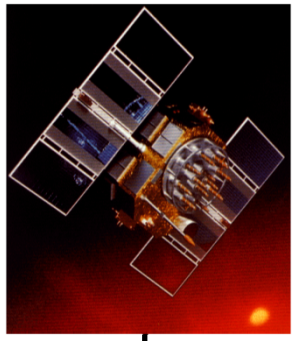
SP Clocks contributing to TAI

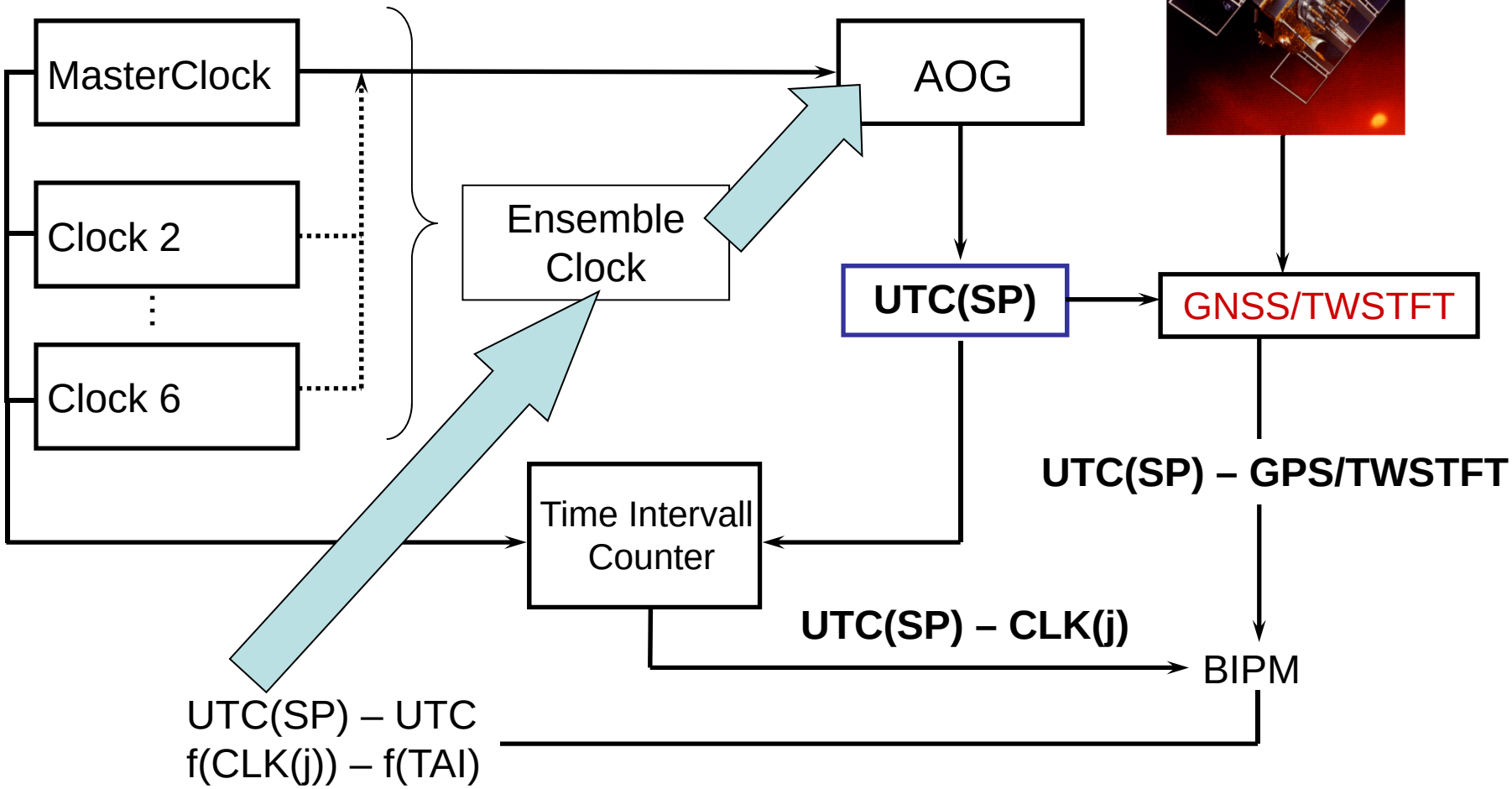


Clock Room at SP

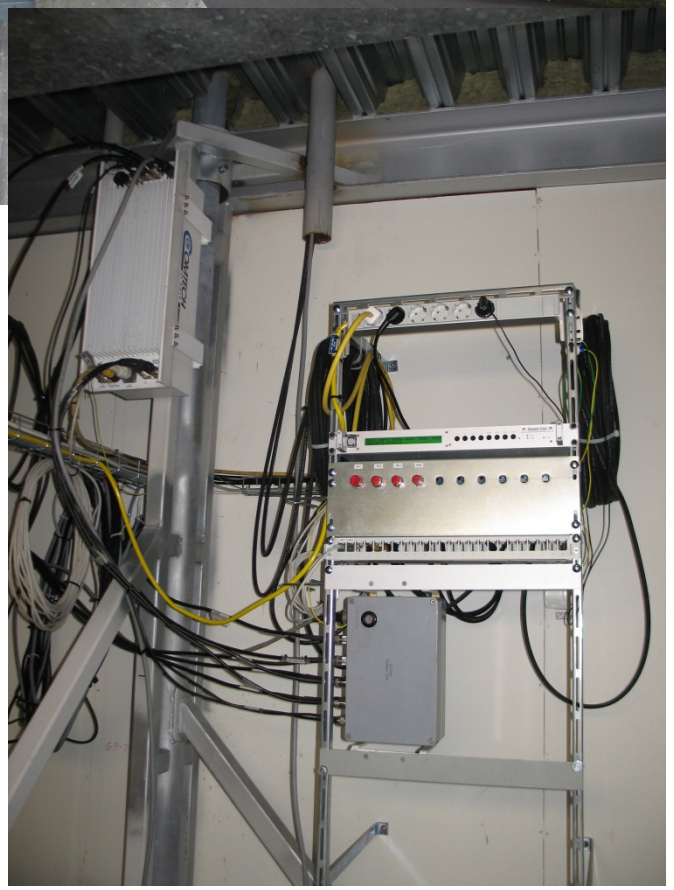


Generation of UTC(SP)





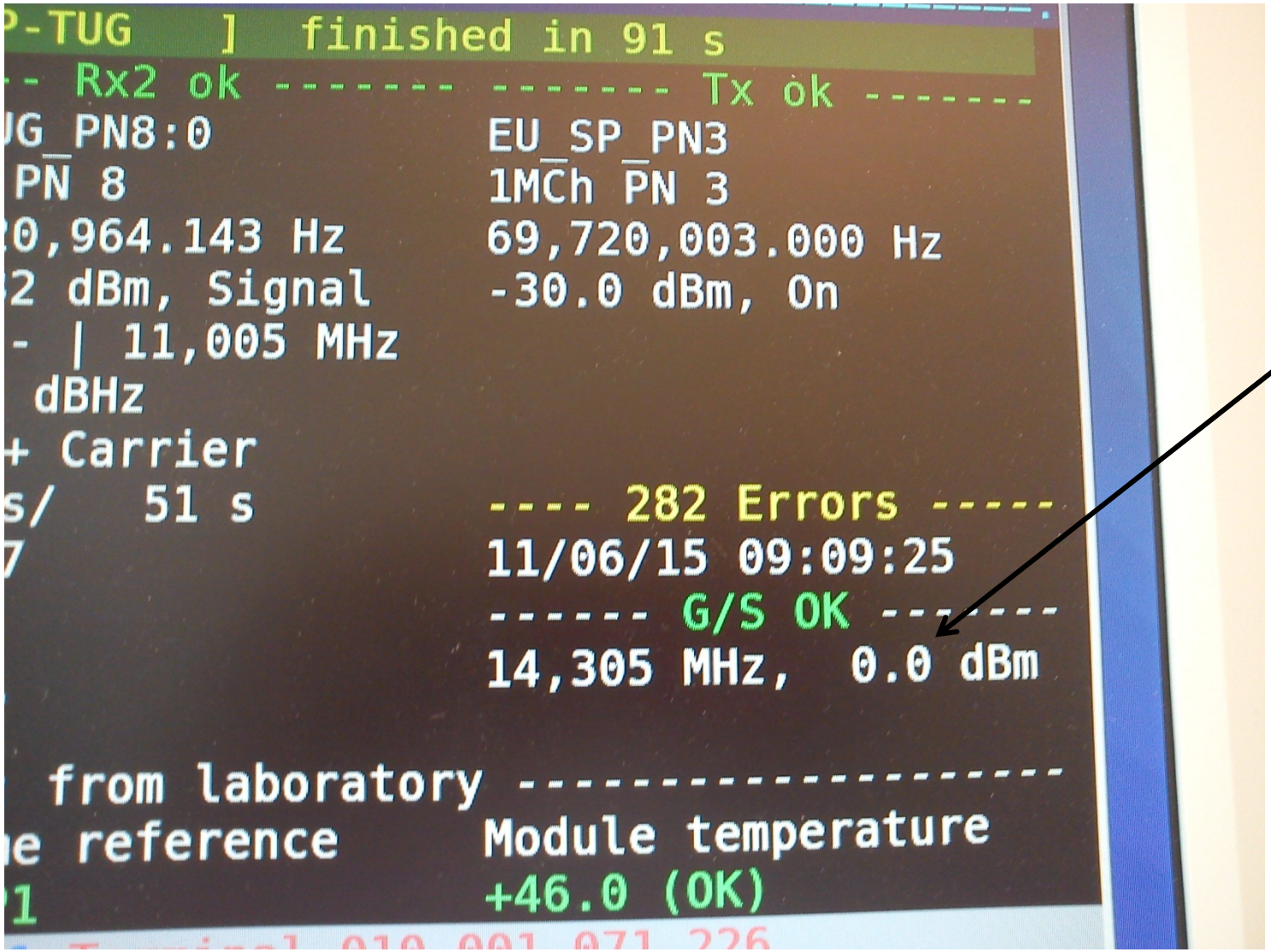
TWSTFT-equipment



- Timetech:
  - SATRE modem 262 dual Rx, referenced to UTC(SP)
  - SATSIM (presently not activated)
- Comtech: Transceiver KST-2000A, 8W SSPA, LNA
- Prodelin: 1184 1.8-meter offset dish
- Telstar 11N@37.6W
  - seen at 11.4 degrees elevation at SP
- EU and US, 12 sessions per day @1MChip

Other issues: Tx Problems #1

- Quite often, in principle daily, Tx output power stays at 0.0 dBm



Tx-problems #2

- SP Tx received by other stations during MJD 55810

```
                      00  02  04  06  08  10  12  14  16  18  20  22
55810   SP01 SP01 11: 120 120 120 120 120 120 119 119 119     120 120
55810  VSL01 SP01 11: 120 120 120 120 120 120 120 120 120     120 120
55810  NPL01 SP01 11: 120 120 120 120 120 120 120 120 120     120 120
55810   OP01 SP01  9: 105 103     106 104     105 105 104     105 107
55810  ROA01 SP01 11: 118 119 115 118 119 119 119 119 119     120 119
55810   IT02 SP01 12: 119 120 120 117 120 120 120 120 112 120 120 116
55810  OCA01 SP01
55810  PTB01 SP01 12: 120 120 120 120 120 117 116 120 109 119 120 120
55810 NIST01 SP01 11:  99 104 120 120 105 120  92 120 120 120     120
55810  TIM01 SP01
55810 USNO01 SP01  3:  96 113 118
55810   CH01 SP01  4: 120 116 120             120
55810  TUG01 SP01
55810  IPQ01 SP01  0:
55810  AOS01 SP01  4: 108 108 109             104
```

- SP Tx received by other stations during MJD 55809

```
                      00  02  04  06  08  10  12  14  16  18  20  22
55809   SP01 SP01 11: 120 119 120 120     120 120 120 120 118 120 120
55809  VSL01 SP01 11: 120 120 120 120     118 120 120 120 120 118 120
55809  NPL01 SP01 11: 120 120 120 120     120 120 120 120 120 120 120
55809   OP01 SP01 11: 104 105 104 102     105 106 105 105 103 105 101
55809  ROA01 SP01 11: 118 120 118 118     120 119 119 120 118 119 119
55809   IT02 SP01 11: 120 120 119 120     107 120 120 119 119 120 120
55809  OCA01 SP01
55809  PTB01 SP01 11: 120 120 120 120     119 120 120 120 120 120 120
55809 NIST01 SP01 12: 120 120 120 120 114 102  98 111 112 120 120 111
55809  TIM01 SP01
55809 USNO01 SP01  9: 114 114 114         104     102  93 107 115 103
55809   CH01 SP01 10:     120 120 120     120 120 120 120 120 120 120
55809  TUG01 SP01
55809  IPQ01 SP01  4: 120 120 120 120
55809  AOS01 SP01 12: 111 109 110 109 104 100 110 112 110 111 106 104
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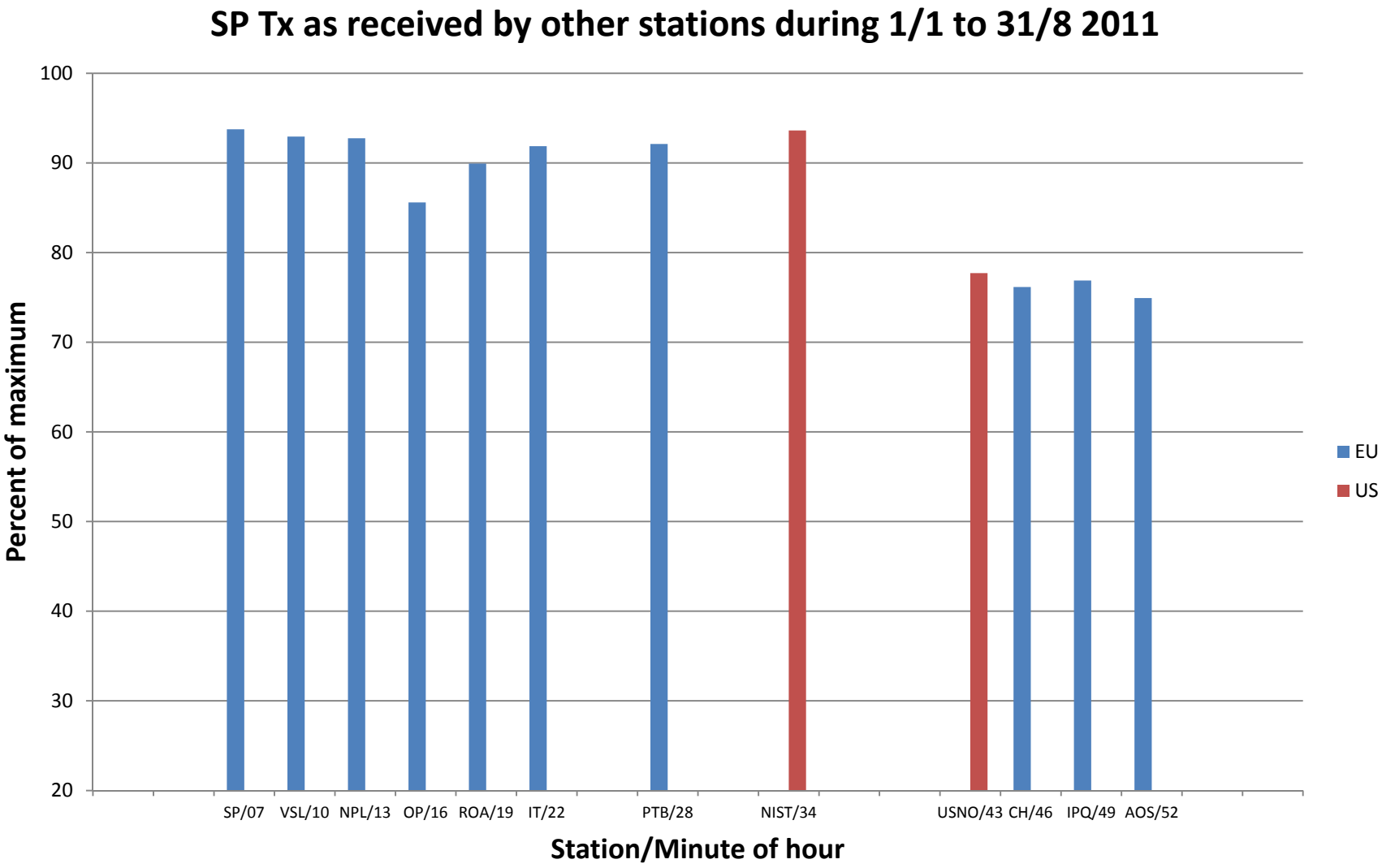
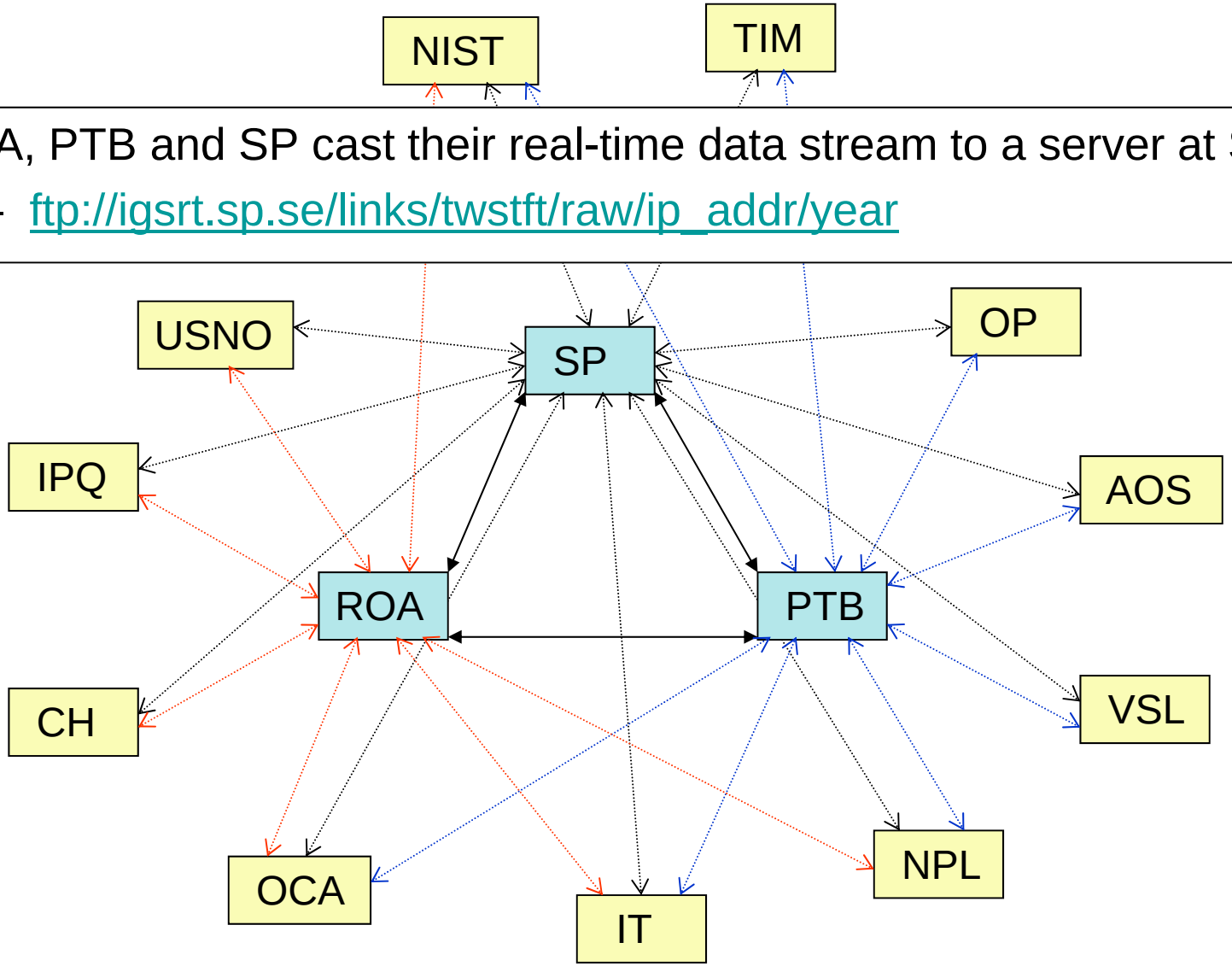
Tx-problems #3



Other issues: Real-Time project

- ROA, PTB and SP cast their real-time data stream to a server at SP
  - ftp://igsrt.sp.se/links/twstft/raw/ip_addr/year



Server: igsrt.sp.se – 193.10.7.50

- We intend to
  - use a Kalman filter in real-time for
    - RT link noise reduction, diurnal estimation
    - continues RT estimates of local clock differences of entire network
    - closure estimates – link monitoring for casting stations
  - monitor power and SNR in real-time
  - monitor satellite range in real-time
  - represent statistics via web-page
- Welcome to contribute data by setting a unicast destination of SATRE to 193.10.7.50, data will appear at ftp://igsrt.sp.se/links/raw
- We can arrange UDP/TCP forwarding of entire data stream

Example of data transfer reliability for 2011 (incl. 55815) for even hour measurements

2011	SP (62.119.40.134)	ROA (150.214.94.13)	PTB (141.25.43.106)
Rx1	254d/3027h 99.05 %	254d/3025h 99.03 %	200d/2375h 99.83 %
RX2	254d/3027h 99.05 %	254d/3025h 98.13 %	200d/2375h 98.73 %

EFTF

European Frequency and Time Forum 2012

Gothenburg, Sweden

April 23-27, 2012

SP

CHALMERS

www.eftf2012.org

Welcome!