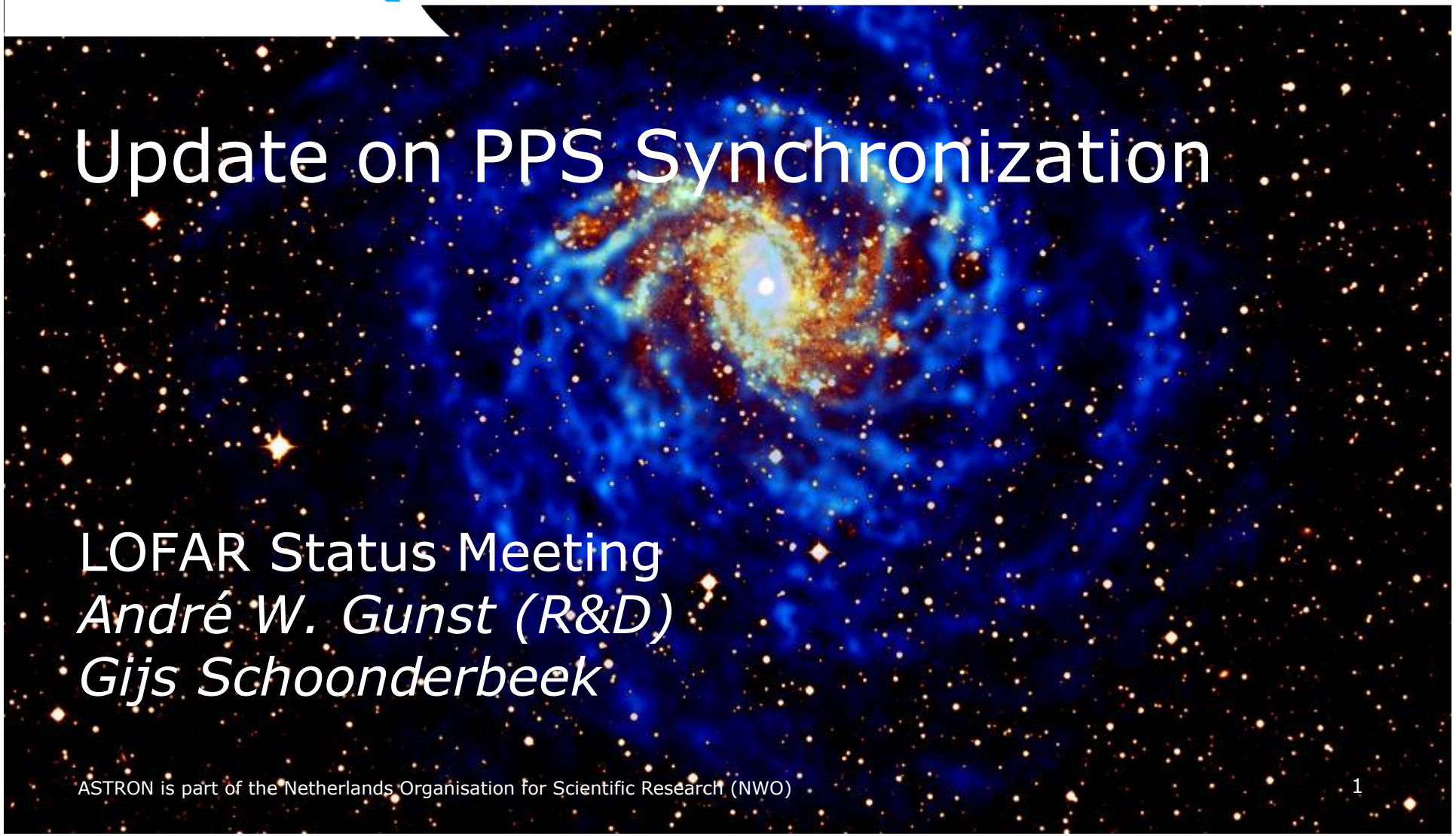
ASTRON

Netherlands Institute for Radio Astronomy



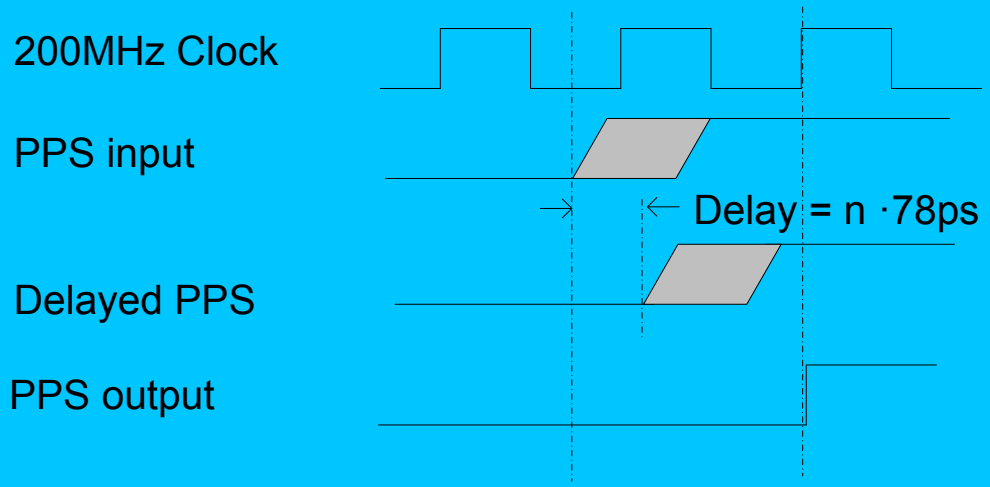
Update on PPS Synchronization

LOFAR Status Meeting

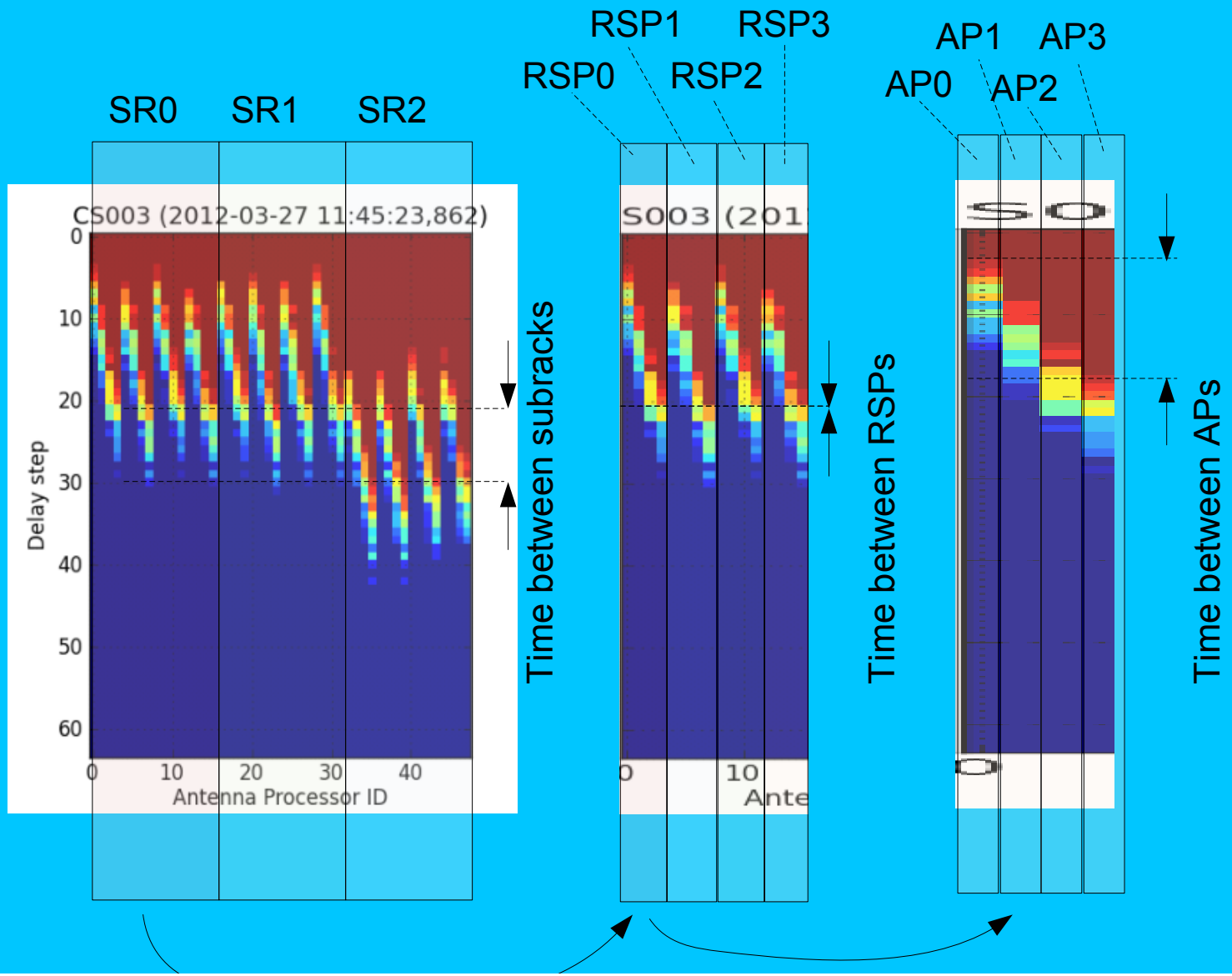
André W. Gunst (R&D)
Gijs Schoonderbeek

Problem Statement

Initial synchronization of the clock on PPS differs between RSPs and APs within a station.



Uncertainties at Subrack, Board and Chip Level

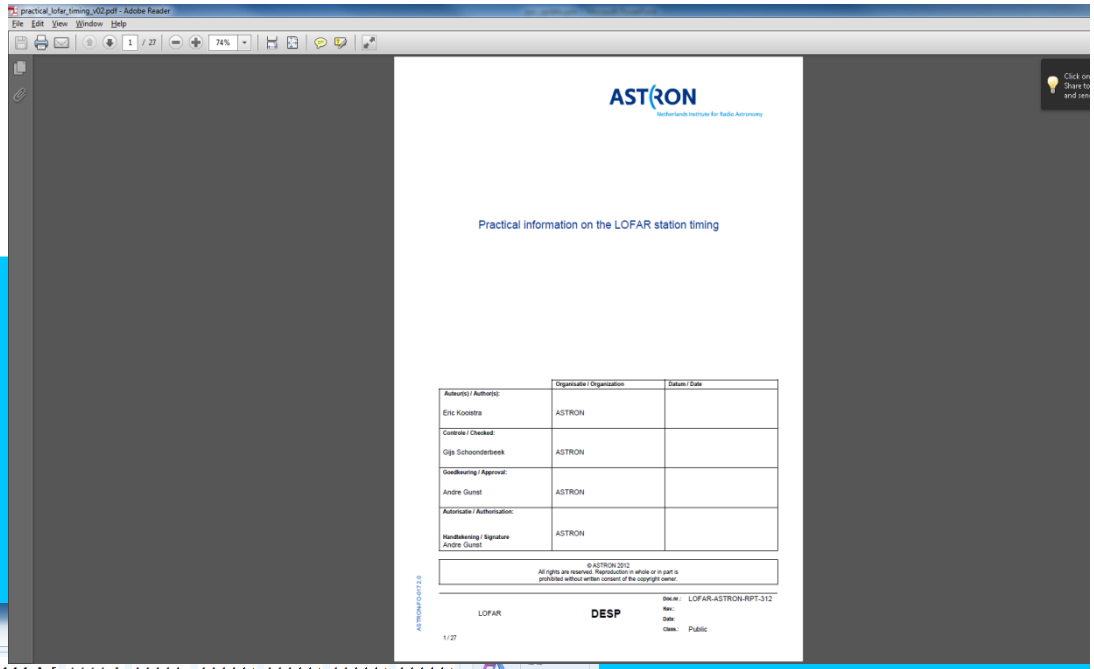


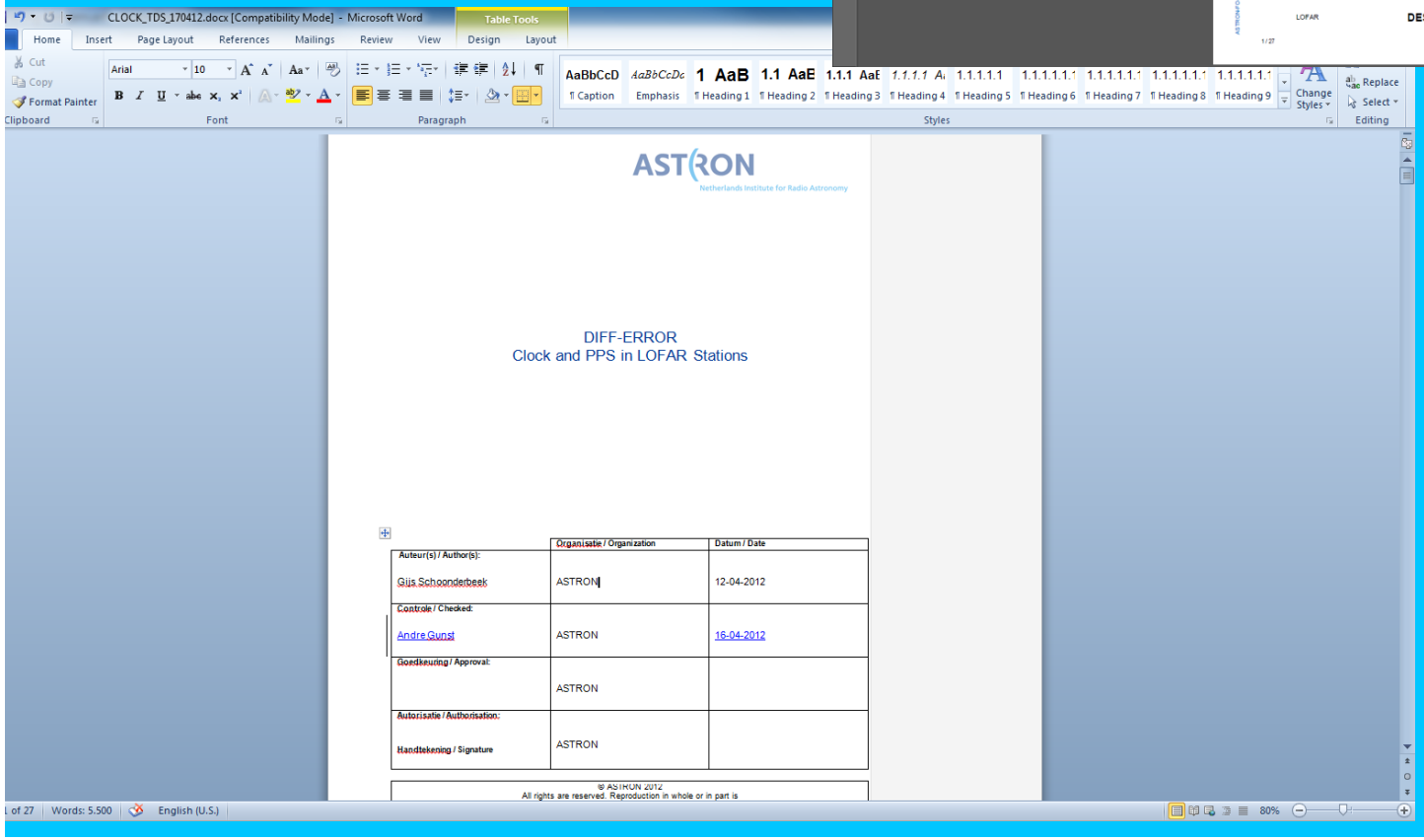
Strategy to cope with this

ASTRON

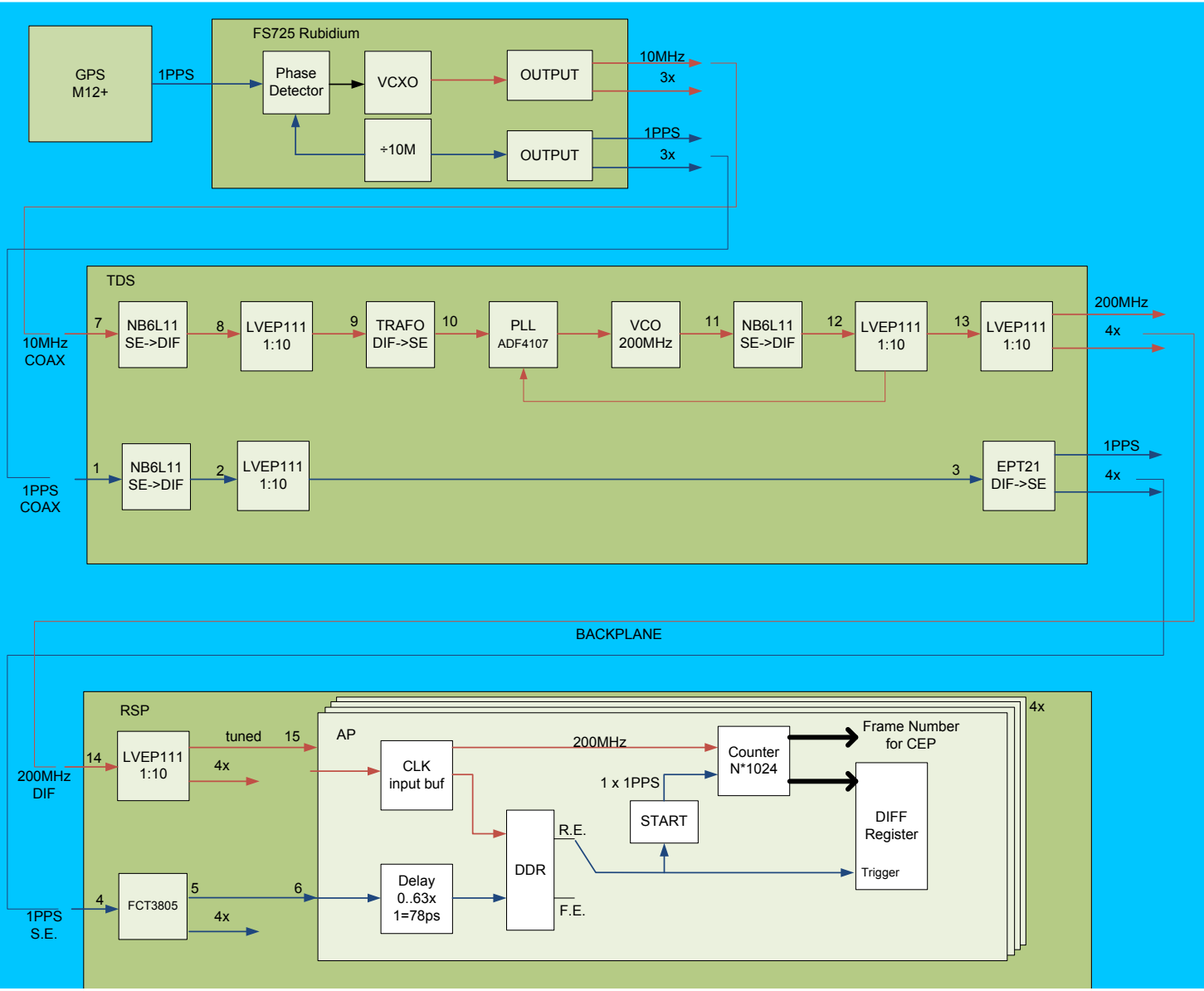
- Write down the full chain:
  - To create full understanding
  - To isolate the problem
- Measure the PPS at all possible points in the chain
- Do as well temperature measurements
- Based on the results, propose possible solutions

- LOFAR-ASTRON-RPT-323
- LOFAR-ASTRON-RPT-312





PPS Chain


GPS
M12+
1PPS
FS725 Rubidium
Phase
Detector
VCXO
OUTPUT
10MHz
3x
÷10M
OUTPUT
1PPS
3x
TDS
10MHz
COAX
7
NB6L11
SE->DIF
8
LVEP111
1:10
9
TRAFO
DIF->SE
10
PLL
ADF4107
VCO
200MHz
11
NB6L11
SE->DIF
12
LVEP111
1:10
13
LVEP111
1:10
200MHz
4x
1PPS
COAX
1
NB6L11
SE->DIF
2
LVEP111
1:10
3
EPT21
DIF->SE
1PPS
4x
BACKPLANE
RSP
200MHz
DIF
14
LVEP111
1:10
tuned
15
4x
1PPS
S.E.
4
FCT3805
5
4x
6
AP
CLK
input buf
Delay
0..63x
1=78ps
DDR
R.E.
F.E.
200MHz
1 x 1PPS
START
Counter
N*1024
Frame Number
for CEP
DIFF
Register
Trigger
4x

PPS Measurement in Temperature Chamber

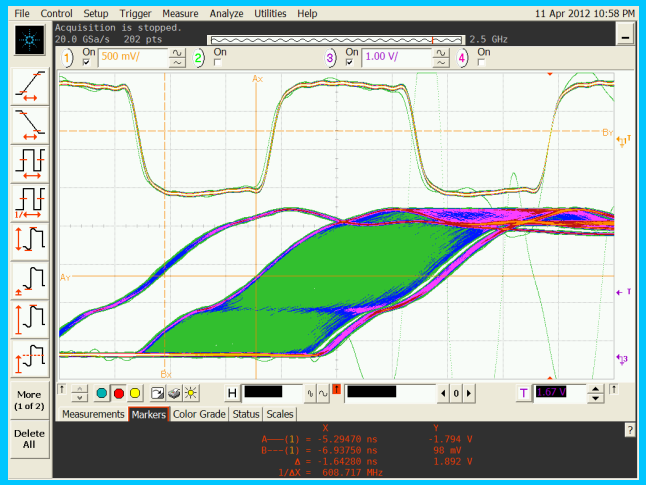
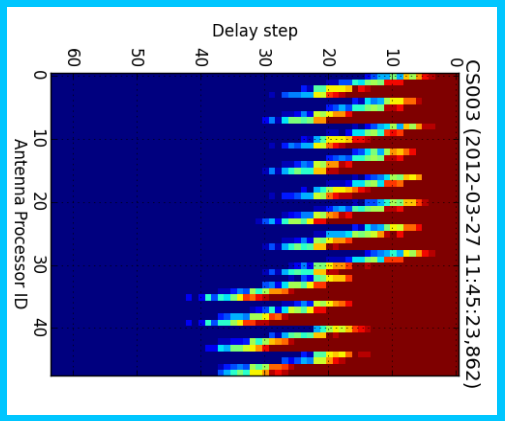


Figure 18 Clock / PPS combination with FS725 changed from 40°C to 10°C

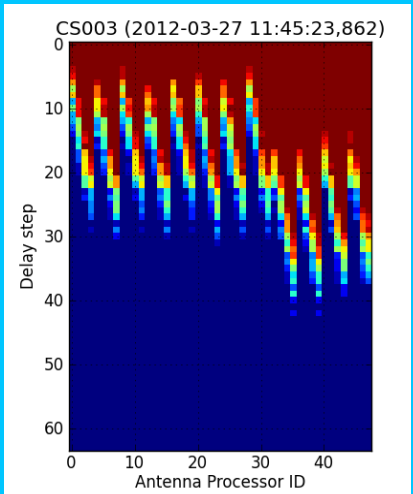


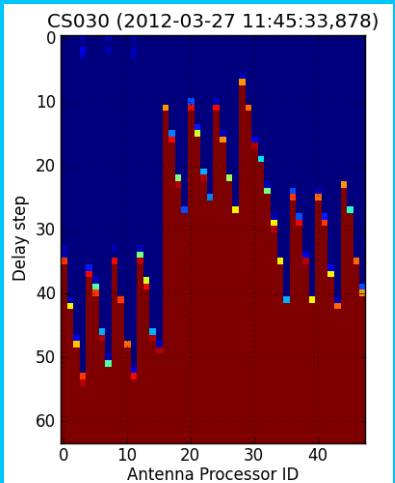
Current Status (1)

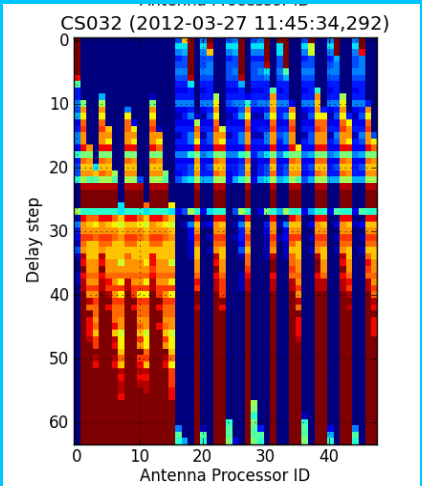
ASTRON

- Better understanding of the whole chain and effects
- Scripts of Michiel/Menno have been accordingly modified now

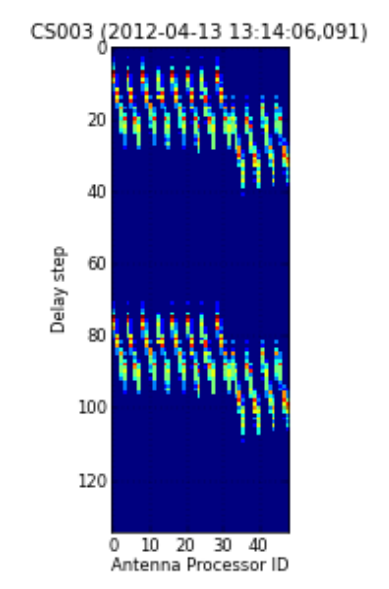
Current Status

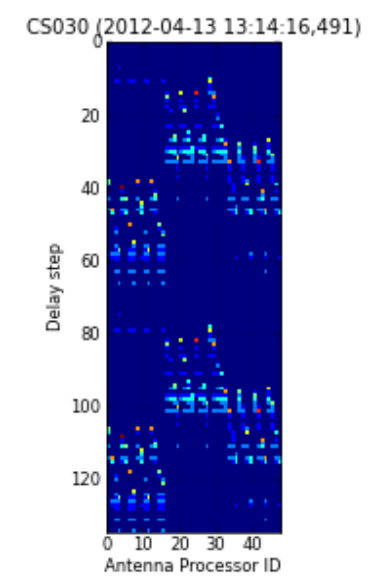


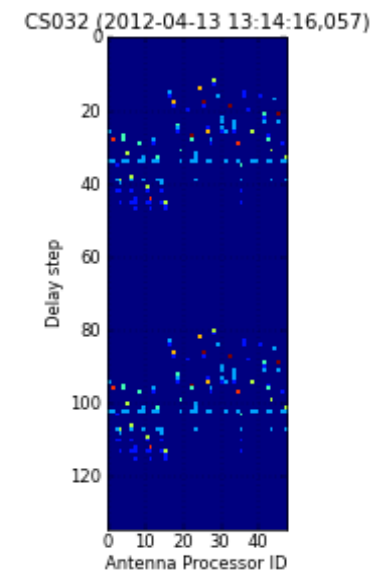




Old script







New script

Current Status (2)

- Solution 1: constant temperature in control cabinet
- Solution 2: Re-time the PPS with Synoptics board
  - Synoptics basically takes care of the PPS distribution
  - Was already planned for all core stations
  - Drawback: jitter increases (also the case on the superterp stations already)

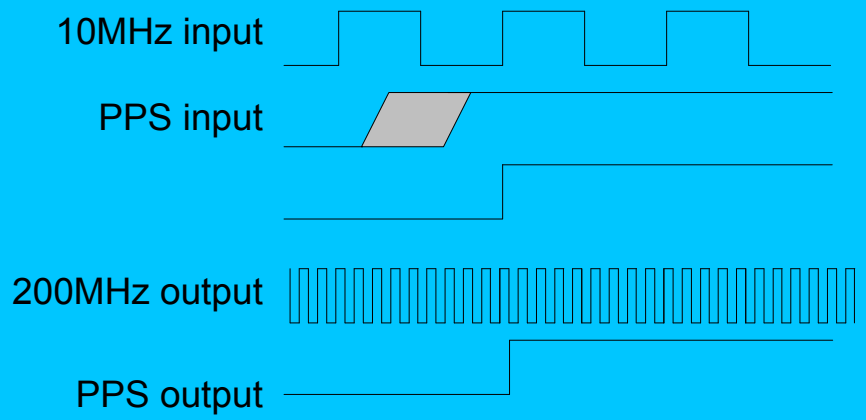
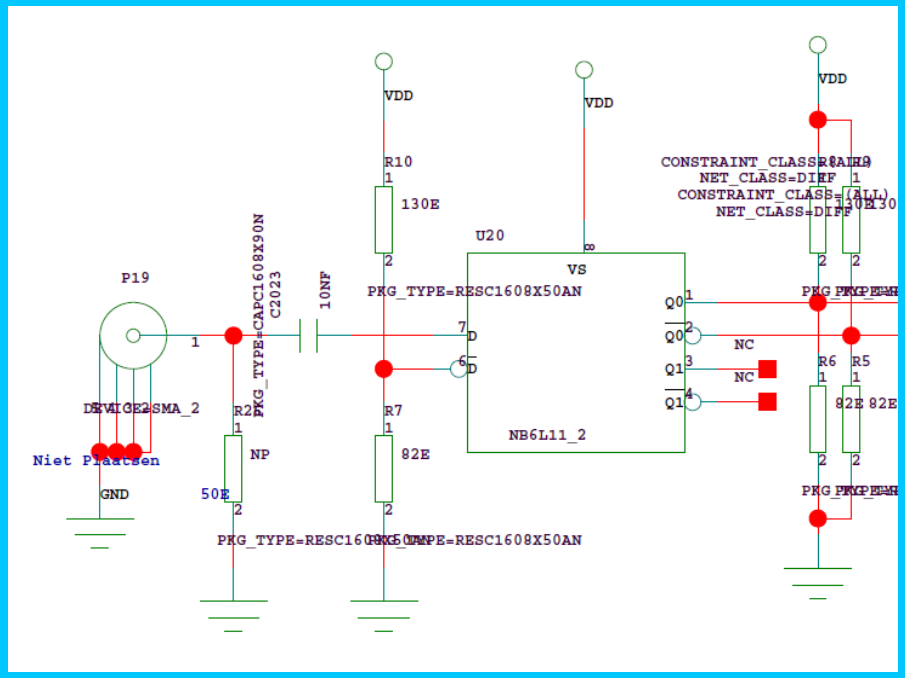


Figure 27 Effect of FS725 temperature sweep (10°C till 40°C) with SyncOptics

Current Status (3)

- Proposed modification (when necessary):
  - Change of PPS sensitivity on the TDS from 100 mV to 1.1 V



Lesson to learn: don’t panic

ASTRON

Fear cannot be banished, but it can be calm and without panic; it can be mitigated by reason and evaluation.

Vannevar Bush

http://www.brainyquote.com/quotes/keywords/panic.html#vybrPppUIMtW4DAx.99