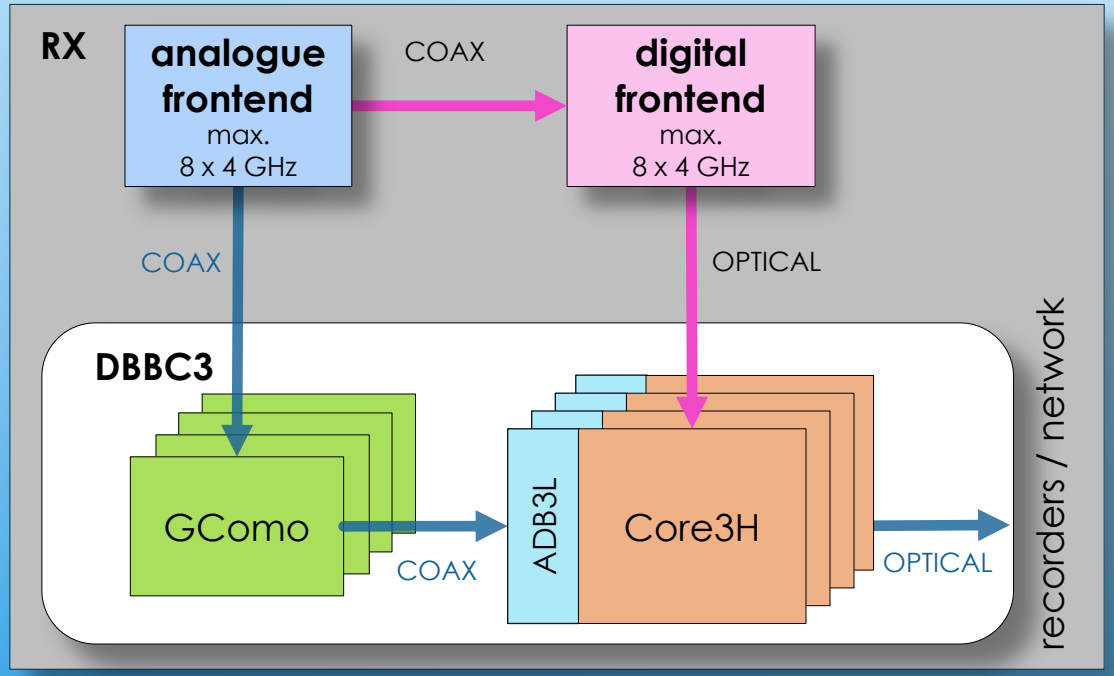
Max-Planck-Institut
für Radioastronomie

DBBC3 STATUS

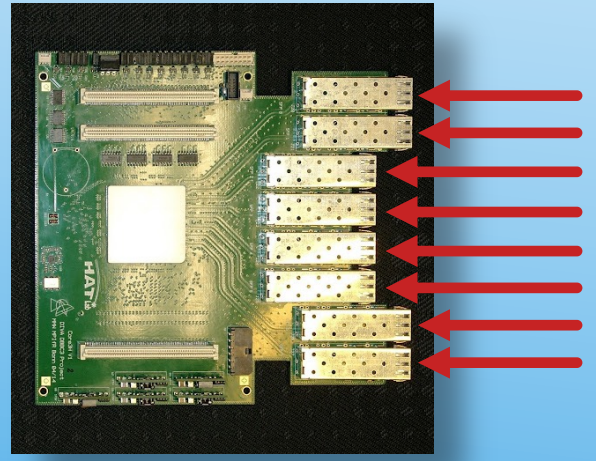
Helge Rottmann on behalf of the DBBC3 team

STATUS OVERVIEW

- Currently 36 systems deployed, 6 under construction
- No major hardware changes
- New operational “I” mode:



Feed digitized signal directly into the Core3H boards



Up to 8 inputs of 8-bit sampled VDIF

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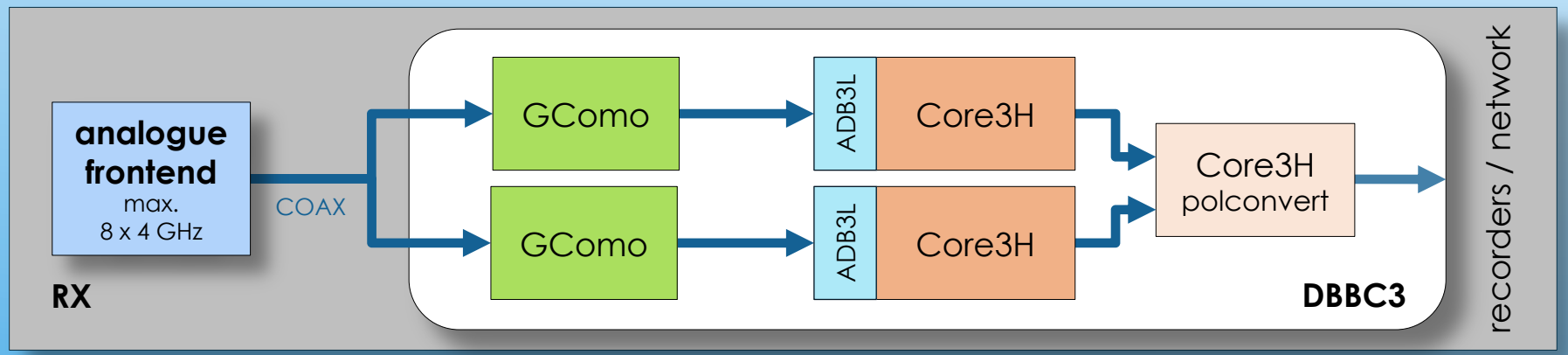
"I"-MODE USE CASES

- Frontend digitization going on at many sites (e.g. Effelsberg)
- BRAND receiver (required)
- Special firmware modes for Core3H boards, e.g. polconvert, bandpass conversion etc.



FIRMWARE STATUS

DSC mode (production version: 120)

Full broadband mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidth: 4096 GHz output bandwidth
- Output bands: 1 band per Core3H board
- USB /LSB depending on the GCoMo settings
- Supports multicast
- Max. output data rates:
  - DBBC3-2L2H: 32 Gbps
  - DBBC3-4L4H: 64 Gbps
  - DBBC3-6L6H: 96 Gbps
  - DBBC3-8L8H: 128 Gbps

FIRMWARE STATUS – CONT.

OCT_S mode (production version: 110)

Single-filter broadband mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidth: 2048,1024, 512 MHz (depending on selected filter)
- Output bands: 1 band per Core3H board
- USB /LSB depending on the GCoMo settings
- Max. output data rates:
  - DBBC3-2L2H: 16 Gbps
  - DBBC3-4L4H: 32 Gbps
  - DBBC3-6L6H: 48 Gbps
  - DBBC3-8L8H: 64 Gbps

FIRMWARE STATUS – CONT.

OCT_D mode (production version: 120)

Dual-filter broadband mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidth: 2048,1024, 512, 256 MHz (depending on selected filter)
- Output bands: 2 band per Core3H board
- USB /LSB depending on the GCoMo settings
- Supports multicast
- Max. output data rates:
  - DBBC3-2L2H: 32 Gbps
  - DBBC3-4L4H: 64 Gbps
  - DBBC3-6L6H: 96 Gbps
  - DBBC3-8L8H: 128 Gbps

FIRMWARE STATUS – CONT.

DDC_U mode (production version: 126)

Unified tunable mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidths: 128, 64, 32,16, 8, 4, 2 MHz
- Output bands: up to 32 bands per Core3H board (16 BBCs USB and LSB)
- Supports multicast
- Max. output data rates:
  - DBBC3-2L2H: input 8192 MHz, output 32 Gbps
  - DBBC3-4L4H: input 16384 MHz , output 64 Gbps
  - DBBC3-6L6H: input 24576 MHz, output 96 Gbps
  - DBBC3-8L8H: input 32768 MHz, output 128 Gbps

FIRMWARE STATUS – CONT.

DDC_V mode (production version: 125)

VGOS tunable mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidth: 32 MHz
- Output bands: up to 16 bands per Core3H board (8 BBCs USB and LSB)
- Supports multicast
- Max. output data rates:
  - DBBC3-2L2H: input 8192 MHz, output 4 Gbps
  - DBBC3-4L4H: input 16384 MHz, output 8 Gbps
  - DBBC3-6L6H: input 24576 MHz, output 12 Gbps
  - DBBC3-8L8H: input 32768 MHz, output 16 Gbps

FIRMWARE STATUS – CONT.

DDC_E mode (production version: 126)

EVN tunable mode

- Input bandwidth: 4096 GHz (in the range 0-15 GHz)
- Output bandwidths: 128, 64, 32,16, 8, 4, 2 MHz
- Output bands: up to 16 bands per Core3H board (8 BBCs USB and LSB)
- Supports multicast
- Max. output data rates:
  - DBBC3-2L2H: input 8192 MHz, output 16 Gbps
  - DBBC3-4L4H: input 16384 MHz , output 32 Gbps
  - DBBC3-6L6H: input 24576 MHz, output 48 Gbps
  - DBBC3-8L8H: input 32768 MHz, output 64 Gbps

FIRMWARE ROADMAP

- DDC_U 130
  - Large number of changes/improvements, e.g.
    - Support for 8-bit operations
    - Improvement of calibration procedure
    - New commands, e.g. bbc_bandwidth
    - etc….. check the Changelog for details
  - *Not yet* supported by FS, due to changes in the command set
  - Status: released to stations for testing
- DDC_V 126
  - will include the VDIF timestamp in the multicast broadcast (missing in Version 125)
  - Status: under development
- DDC_E 127
  - Improved filter shapes
  - Status: under development

FIRMWARE ROADMAP

- DDC_V 130
  - Compatibility to DDC_U 130
  - Status: Waiting for station feedback for DDC_U 130
- DDC_E 130
  - Compatibility to DDC_U 130
  - Status: Waiting for station feedback for DDC_U 130

- New “I”-Mode firmware
  - Corresponding “I”-version for all existing modes, e.g. DDC_UI, OCT_DI etc.

DBBC3 PYTHON INTERFACE

DBBC3 python package at github: https://github.com/mpifr-vlbi/dbbc3

- Python package for software control of the DBBC3
- Python based tools for operating, monitoring and verification of DBBC3
  - dbbc3client: command line client to the DBBC3
  - dbbc3ctl: pre-observation system validation
  - dbbc3mon: monitoring GUI

Current version: 0.2

Release of version 1.0 until end of December

- Support for all modes and versions: DDC_U, DDC_V, OCT_D, OCT_S, DSC

DBBC3CTL

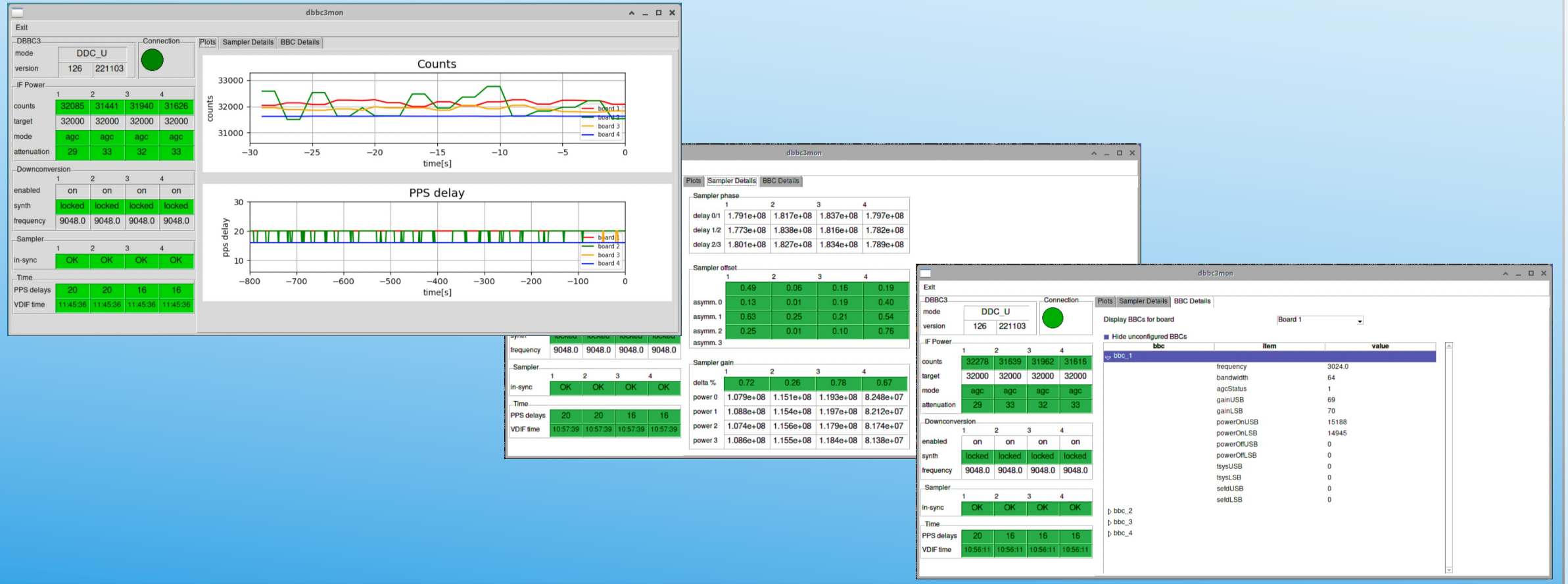
- dbbc3ctl: pre-observation system verification

```
./dbbc3ctl.py dbbc3
=== Trying to connect to dbbc3:4000
Selecting commandset version: DBBC3Commandset_DDC_V_124
=== Connected
=== DBBC3 is running: mode=DDC_V version=125(230421)
=== Using boards: [0, 1, 2, 3]
Welcome to the DBBC3.  Type help or ? to list commands
(dbbc3ctl): check system all
================================================
NOTE: the following tests should be done with
noise only fed to the IF inputs of the DBBC3.
Injecting additional tones can lead to false
results in the validation of the sampler states.
================================================
=== Doing full system validation of DDC_V mode
[OK] === Checking sampler phases -
=== Checking board 0
[OK] === Checking 1PPS synchronisation < +- 200 ns - PPS delays: [12, 12, 12, 12] ns
[OK] === Checking time synchronisation of core board A - Reported time: 2023-12-11 10:29:04
[OK] === Checking synthesizer lock state of board A - Locked
[OK] === Checking GCoMo synthesizer frequency of board A - Freq=9048.000000 MHz
[OK] === Checking IF power level on core board A - count = 32108
[OK] === Checking sampler gains for board A - sampler powers = [105659489, 106644884, 105322213, 106500668]
…
```

Do full system check

DBBC3MON

- dbbc3mon: GUI-based monitoring tool



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