DBBC Status

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EVN-TOG 2010

Hardware

- For VLBI 2 configurations are required:
  - Tunable digital downconverters
    - Emulates MK4 or VLBA terminal for astro and geodesy
  - Fixed contiguous bands
    - Wider sub-bands for mm-VLBI, VLBI2010
- Hardware has to be able to do both
- Has to be considered in the design

Hardware II

- ADB1: clock 1024 MHz, input 10 – 2200 MHz
- ADB2: clock 2048 MHz, input 10 – 3500 MHz
  - Can operate in ADB1 mode
  - Can have piggyback FILA10G board
    - Pure sampled data over 10 GE
- CORE2: processing, both functionalities possible
  - Works with ADB1 and ADB2
  - Up to 4 DDCs or
  - 15 x 32 MHz baseband channels (covers 512 MHz)

Hardware III

- CaT2 (new version):
  - generates highly flexible number of synthesized sampling clocks (e.g. 1024, 2048 MHz)
  - Phase-locked with external 10 MHz
  - Low phase noise
  - Low temperature sensitivity
  - Generates 1 PPS for all ADB boards etc.
  - Frequency selection via DBBC internal PC

Hardware IV

- FILA10G:

  - Data rates of up to 2 x 10 Gbps

  - Bidirectional, max 8192 Mbps for VLBI

  - Can be used as piggyback for ADB2 sampler

  - Also interface of DBBC output to Mark 5C or Internet

- 2 Prototypes available and tested

  - Very few modifications desired from firmware developers

Hardware V

- FILA10G has 10 GE optical connector

  - GLAPPER board has been developed for interfacing to CX4 connector of the Mark 5C

  - Alternative is a 10 Gb switch with both types of connectors

    – Expensive!

- ADB3 board has been defined

  - 2 GHz input bandwidth with 2048 MHz clock

  - Bands: 10 – 2048 and 2048 – 3500 MHz

  - Debugged prototypes are available

Hardware VI

- CORE3:
  - Evolution of CORE2
  - Will be used for polarization conversion
  - For VLBI2010 FT configurations
  - Spectrometers with very large numeber of channels
  - Prototype should be available by the end of 2010

Firmware

- The DBBC2 firmware was completely rewritten
  - Now platform independent
  - Much simpler and compacter code
  - Faster
  - Still some verification and debugging going on
- Polyphase filterbank firmware (15x32 MHz)
  - Tested OK at Haystack in comparison to DBE1

Firmware II

- Firmware developments:
  - fully tunable 1 GHz input bandwidth
  - fully tunable 2 GHz input bandwidth
  - 1 GHz FT with 31 channels 32 MHz bwd
  - 2 GHz FT with 63 channels 32 MHz bwd
  - Wishlist: 128, 256 and 512 contiguous bands
- Other projects:
  - Multichannel spectrometer
  - Linear to circular polarization converter (needs CORE3 board)
  - Polarimeter

Firmware III

- FILA10G:
  - Mark 5B and VDIF modes are under development

HAT-Lab

- INAF spin-off company produces DBBCs

  - Has agreements with IRA-NOTO and MPIfR

  - External companies manufacture e.g. boards

  - Assembly and testing is fully realized in HAT-Lab, IRA and MPI.

- IRA (before HAT-Lab) deployed 8 systems

- 8 systems are under production by HAT-Lab

  - Boards for Conditioning modules have still not been delivered by sub-contractor (ordered in Dec., delivery date now July 20)

  - Therefore systems cannot yet be delivered to the customers

Fringe Tests

- The 15x32 MHz FT configuration was tested OK

- A reduction in fringe amplitude was found in the DDC configuration

  - Traced to additional noise in the timing between Conditioning modules and ADB1 boards

  - Extensive lab tests have been conducted

  - A coming firmware upgrade will incorporate a fix for the problem

Outlook

When DBBCs will have been deployed in the EVN

- 2 Gbps will be possible with Mark 5B+ or 5C

- 4 Gbps will be tested and will become available at a subset of antennas and frequencies

- Wide sub-bands (128 MHz and wider) will allow observers new kinds of absorption studies

  - Single 512 MHz bands will become possible
    - Later even wider bands

- Compatibility issues inside the EVN!

- What about the VLBA, East Asian Array, VLBI2010?