

# MPIfR Correlator Report (November 2009)

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## MPIfR/BKG CORRELATOR

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### GENERAL

The default correlator for astronomical projects is from now on the **DiFX software correlator**. The MK IV hardware correlator is still used for geodesy, fringe searches and special DiFX verification observations. We expect to shut down the MK IV correlator some time in 2010.

### DiFX SOFTWARE CORRELATOR

- DiFX is executed on a general purpose High Performance Compute cluster. It is made up of 60 nodes with about 500 compute cores. Its characteristics are:
  - 4 TFlops
  - 4 to 24 kW power dissipation (idle - fully loaded)
  - 40 TB disk space
  - 20 Gbit Infiniband interconnect
  - 2 x 1 Gb Ethernet
- Playback is via 14 Mark 5A/B/C units. Observations with more stations can be correlated by copying data from 8-packs to the 40 TB disk arrays. The Mark 5s are connected into the cluster via 1 Gb Ethernet.
- For production correlation DiFX version 1.5 is used.
- For development work like the implementation of phase-cal various other versions of DiFX are installed.

### IMPLEMENTATION STATUS

The implementation of DiFX is kept as close as possible to the NRAO version. In a few areas the software has to be adapted to local requirements. We are in the process of developing our own production version of DiFX. Differences will be:

- Tape library
- Handling of logs
- Operator interface
- Scheduling of correlation jobs
- Inspection and summary of observations
- Archiving

At present setting up and correlating an observation requires a bit of handwork. Playback from the Mark 5s is not yet optimal and has to be improved (cannot yet use NRAO's Mark 5 software).

### CAPABILITIES

- 32 – 4096 spectral channels with full polarization (4096 is an AIPS limit) with
- 14 and more antennas with
- Integration times down to milliseconds.

- Pulsar gating
- VLBA, Mark4 and Mark5B formatted data (K5 data via conversion program), VDIF soon.
- High resolution narrow band spectral line observations

## CORRELATED EXPERIMENTS

- 96 Phase centres in a 10 station VLBA observation were correlated in one pass. Thus the positions of all known radio sources in the primary beam of the VLBA antennas were correlated. The resulting data set is 240 GB. Correlation time was about a factor of 2 slower than for 1 source position.
- Pulsar VLBI data was correlated successfully.
- A 15 station EVN observation from February at 7 mm wavelength was the first production correlation. The disks have been released. The PI is mapping the data.
- A 3 station observation is being correlated with 2 milliseconds integration time. 1 hour of data produces about 175 GB of correlated data.

## FUTURE PLANS

- Correlation of the 5 day GMVA session from October is being prepared for DiFX.
- 3 EVN observations from the October session will be correlated before the February session next year.
- Phase-cal is being implemented. The first approach tried (see last report) was not suited to DiFX.
- One of the above mentioned 3 EVN observations will also be used for a geodetic verification of DiFX. (will be correlated on both correlators and analysed by L. Petrov)
- Up to 16 Mark 5s will be connected to the software correlator in 2010.
- Interface to MK IV file format (planned for 2010).

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