



Hardware Correlator for VLBI2010

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Natural Resources
Canada

Ressources naturelles
Canada

Canada

EVLA WIDAR correlator

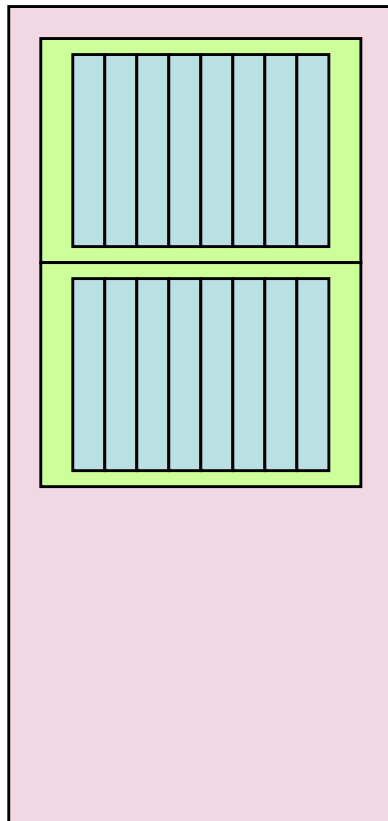


- Being built at DRAO in Penticton for the EVLA project by Brent Carlson, Dave Fort and others
- The design involves digital filtering of the input into 128 MHz sub-bands (256 MHz clock rate)
- The design is now complete and nearing the time for the final production build
- Station board
 - Handles 2 stations at 2 Gbps for 2 polarizations
- Baseline board
 - Handles 32 stations at 0.256 Gbps for 2 polarization products

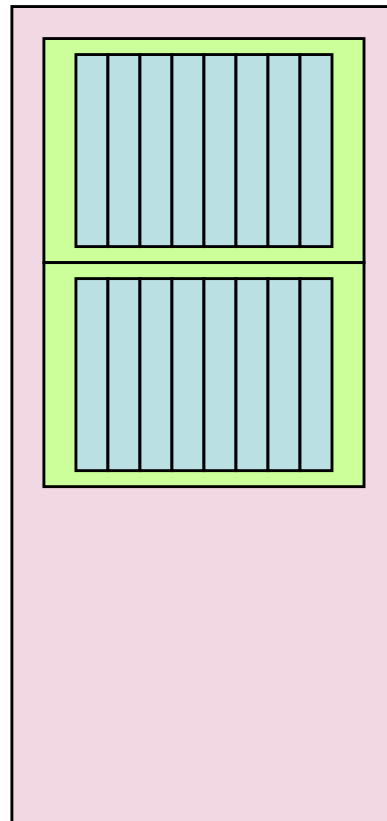
For a full 32-station correlator at 8 Gbps sustained data rate



Station Rack



Baseline Rack



Cost

Station Boards 16 @ \$20K	= \$320K
Baseline Boards 16 @ \$32K	= \$512K
Other	= \$150K
TOTAL	= \$982K

Cost assumes board production in quantity.

1500 spare custom correlator chips perhaps available for VLBI2010, with tooling charges for the chip being about \$500k if necessary

Power consumption ~ 15 kw

Advantages



- Hardware design complete and proven
- Reasonable cost
- Reasonable power consumption
- Handles 32 stations at 8 Gbps sustained data rate, which may be adequate for the foreseeable future of VLBI2010 (at least a decade?).

Disadvantages



- Significant upgrades of the hardware are essentially impossible
- Experts needed to assess and debug problems?
- Input data is broadband, i.e. full 1 GHz
 - After RFI excision, full band must be reconstructed with a reverse FFT
 - For sparse bands, data transmission is very inefficient.
 - Perhaps bands could be reconstructed at the correlator, but correlator remains inefficient in resources

Risks



- Cost of boards in smaller quantities will be higher
- May not get access to spare chips requiring a new production run @ \$500K

Conclusion



- A reasonable solution in terms of schedule, cost, and power consumption
- A few worrisome disadvantages and risks, e.g.
 - Constraints related to broadband inputs
 - Fixed capability
 - Potential need for a new production run for the custom correlator chip