Correlator Test Plan

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Testing the Prototype Correlator (PTC)

- Hardware testing at DRAO
  - Dec 2007 - Jun 2008 Dec 2007 - Nov 2008
- Critical Design Review
  - Jun 2008 Nov 2008
- Critical on-the sky tests at VLA
  - Aug 2008 - Nov 2008 Dec 2008 - Apr 2009
- Further systems integration at VLA
  - on-going (Butler)
- Commissioning of basic correlator setups
  - Jan 2009 - Sep 2009 Jun 2009 - Feb 2010

Hardware tests at DRAO

- 2 Station Boards and 2 Baseline Boards ("Stage 2 Prototypes")
  - StB, BlB Test & Verification Plans (15apr07, 19mar06) [check voltages, connections, etc.]
  - Mostly ad hoc testing
  - Develop test suites to check subsequent boards (push button pass/fail test)
  - Dec 2007 - Feb 2008 Dec 2007 - Apr 2008

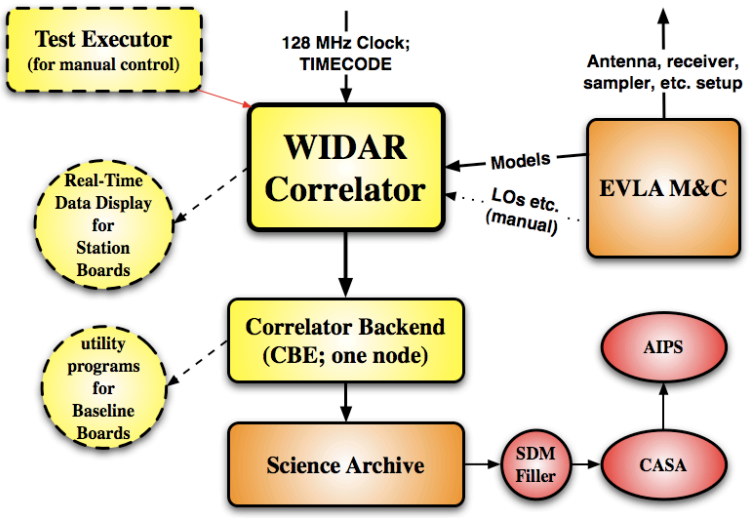
Hardware tests at DRAO

- Assemble 14 more StB, BlB ==> 16 of each, in racks
  - Check thermal emission and electricity requirements of full racks
  - Ad hoc tests: test vectors, phase models, CBE commands, …
  - Software required: real-time, *Test Executor*
  - Creates test suite, but probably one-off (doesn't match setup at EVLA/eMERLIN)
  - Feb 2008 - Jun 2008 Jul 2008 - Nov 2008
- Critical Design Review at end of this stage

Prototype Correlator at VLA site

- Cables, racks already installed
- 12 Baseline Boards, 10 Station Boards
- 3/4 quad (12 sub-bands, 1.5 GHz/pol'n at 4 bits), 10 antennas
  - 45 baselines, 3072 channels in "wideband" mode
    ==> 5 GB in 12 hours (10s integrations)
  - With maximum recirculation: 45 baselines, 750,000 channels

Initial setup at the site



DRAO tests at the site

- Subset of test suite for new correlator setup -- ensures hardware is ok, at the same level as in Penticton

NRAO Tests: in priority order

1) Critical on-the sky tests leading to signoff on final production order for correlator hardware
2) Further on-the-sky tests to check correlator software
3) Systems integration with EVLA M&C
4) EVLA hardware tests and exploration
5) Scientific/usage exploration

Primary responsibility: NRAO; key DRAO personnel available (initially on-site)

NOTE: some of this will be done in parallel

NOTE: timescales depend on results

(FTE allocation discussed in Chandler talk)

Critical On-the-Sky Tests

- Required before final procurement
  - Not done for any other correlator -- but this is the heart of the EVLA (due diligence)
  - Puts these on the critical path
- Critical ==> required tests prove the hardware works
  - Not intended to reveal all correlator software flaws
  - Not intended to cover all modes required for scientific use
- Documentation
  - May 2006: DRAO draft
  - Dec 2006: NRAO review
  - Aug 2007: NRAO re-write based on new connectivity scheme, revised schedule, revised definition of PTC (more capable, closer to final config.)

Critical On-the-Sky Tests

- The tests
  - Basic setup/connectivity checks
  - Delay tracking
  - Noise switching
  - First fringes
  - Strong source, known flux density (check corr'n coeff)
  - Deep integration on mostly blank field (corr offsets and other systematics)
  - Deep spectral line integration (bandpass stability)
  - Recirculation on narrow line(s)
  - Sub-band stitching (comes "for free")
- Preference for D configuration (esp. in summer)
- Currently scheduled to take 4 months
  - Jul 2008 - Nov 2008 Dec 2008 - Apr 2009

Further On-the-Sky Tests

- Intended to check correlator software, as well as less serious hardware flaws
- Examples:
  - Sub-band comparisons
  - Short, medium, long baselines
  - High dynamic range imaging
  - Closure tests
  - 8-bit vs. 3-bit (apart from deep integrations)
  - Real-time RFI robustness & blanking
  - Pulsar modes
  - Phasing
  - 7-bit re-sampling

Systems Integration

- Correlator setup: *Carlson, Clark, Fort, Harland, Vrcic*
  - Conversion from user inputs to definition of what to do
  - ObsPrep
  - Executor
  - VCI/Configuration Mapper
- Correlator output: *Benson, DuPlaine, Golap, Greisen, Moellenbrock, Moeser, Pokorny*
  - Correlator Backend (CBE)
  - Fast formatter
  - Data capture (including metadata) and archives
  - Filler
  - Data reduction path

EVLA Hardware Tests and Integration

- Samplers
- Wideband feeds & receivers
- Stability
- RFI response
- …

See Chandler talk (performance verification)

Scientific/usage Exploration

- End-to-end checks of a representative subset of capabilities
- Verification & review of…
  - sub-band definition, tuning, stitching
  - CBE processing: calibration, averaging, smoothing, RFI excision, …

Scientific/usage Exploration

- Exploration of RFI environment
- Documentation & setup (ObsPrep)
- Calibration timescales and requirements
- Post-processing and pipelines
- …

Final Correlator

- Note that Prototype Correlator is now part of (and a *significant* part of) the "real" correlator