Correlator Test Plan

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Testing the Prototype Correlator (PTC)

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

- **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)

- **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.)

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
  – 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
- ...

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Final Correlator

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