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Expanded Very Large Array

# Current state of hardware development/delivery

*B. Carlson*

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# Outline

- Board status.
  - Baseline Board.
  - Station Board.
  - Fanout Board.
  - Etc.

- System-level design/purchasing.

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# Board Status

- Baseline Board:
  - Mechanical sample received ~September 21st. Useful for physically checking mating with bits of metal and test bed.
  - Electrical prototype received October 24th. Testing starting…
  - Corr chip protos waiting since June…need basic first tests to pass before getting the rest of the 200 protos packaged.
  - Test vector generator FPGA+GUI (on old Timecode Board) ready to roll.

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# Board Status

- Station Board
  - Mechanical and electrical boards should arrive ~end of 1st week November.
  - All FPGA design complete and gate-level simulated.
  - Heatsink and stiffener bar are ready and waiting.

- New Fanout Board
  - Should ship to us by mid-November.
  - Contains FPGA to re-time hi-speed signals to avoid destructive jitter accumulation.
  - Also used for “External Timecode” distribution for correlator, by installing optional fiber and SMA connectors.
  - Both the hi-speed fanout and timecode distribution FPGAs are built and gate-level simulated.

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# Board Status

- New Common Backplane
  - Work order issued ~Oct. 18th.
  - Probably show up in mid Dec/Jan.
  - Still can use old one for test bed testing.

- Delay Module
  - Original designed board received…wait for Station Board to test.
  - New design (cheaper FPGA, DDR SDRAM) underway.
  - Probably here in ~March/April/07.

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# Board Status

- PCMC
  - Current board "works"…no further prototyping anticipated…minor change for board-type ID…but still have to test ADC functions.
- RPMIB
  - Development after Correlator Chip test board.
  - Simple, low-speed; diodes, resistors, opto-couplers, wire terminals.
- Correlator Chip test board
  - PAR almost complete. FPGA design+test complete; c/w 30 test cases.
  - 5 will be made.
  - Probably Feb/March delivery
  - Required for production quantity testing of Correlator Chips.

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# Board Status

- Correlator chip
  - Priority is to test the correlator chip (according to test plan), so we can give the go-ahead for production. Production qty ~12 weeks ARO, but if the past is any indication, it will likely take longer.
  - Successful test requires fully-loaded Baseline Board…for now we have only ~10 packaged chips…get the rest of the 200 chips packaged once tests indicate there are no packaging problems (I/Os work).

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# Board Status

- Terminator Board
  - Required for incremental testing wherein not all Baseline Boards are installed in a rack (unterminated Fanout Board outputs feedback and “wreck” other signal channels).
  - Develop after RPMIB.
  - Small board with 36-row hm 2 mm connector and resistors…short development time.
  - Qty TBD (maybe ~20).

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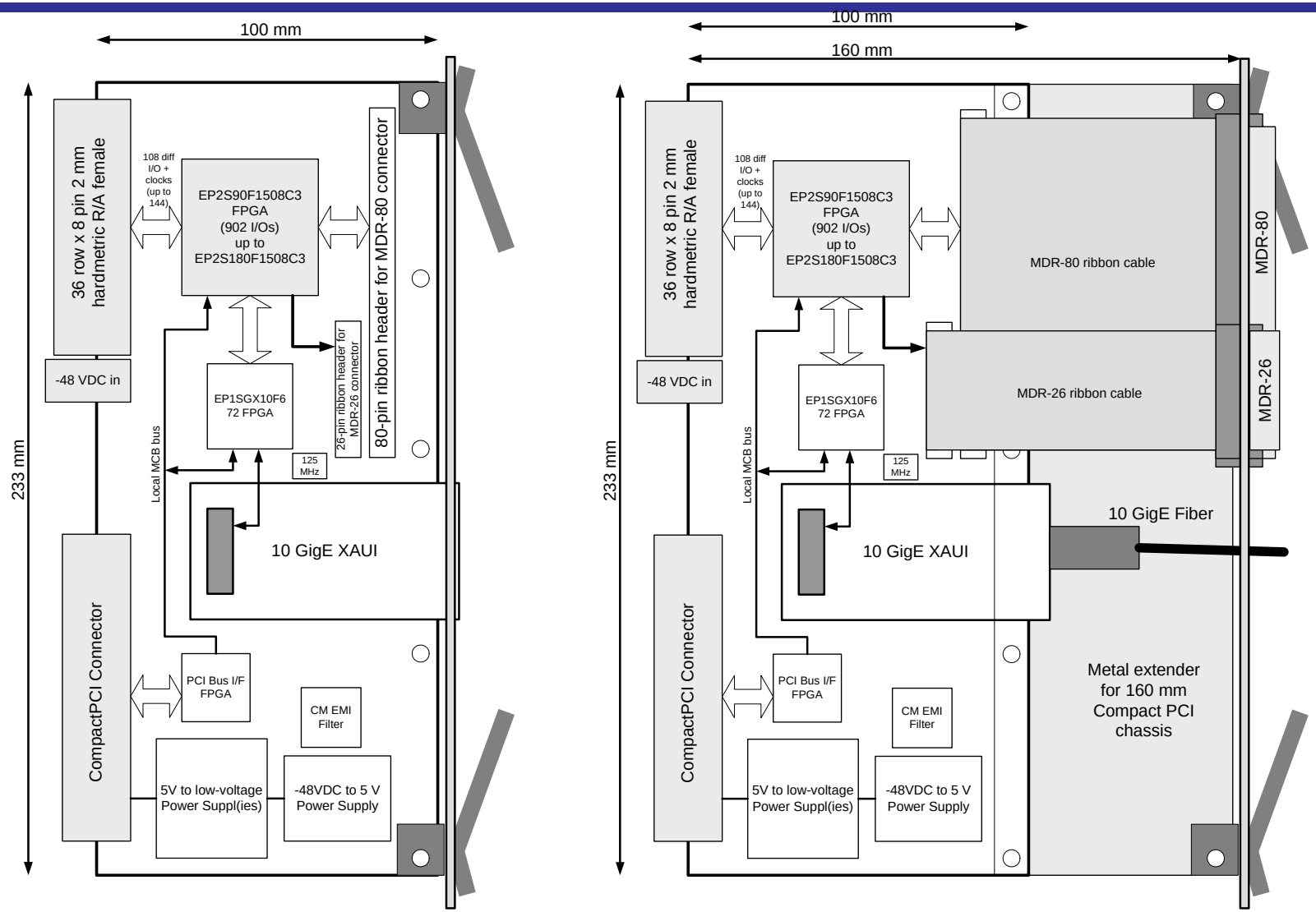
# Board Status

- Phasing Board
  - Still refining design concept…RFS review held Oct 18/06.
  - New RFS available…Jan/07? Depends on Baseline Board testing.
  - Good chunk of FPGA design required before starting board layout.
  - Probably start board layout mid 07…depending on Baseline Board testing.


100 mm
233 mm
36 row x 8 pin 2 mm hardmetric R/A female
108 diff I/O + clocks (up to 144)
EP2S90F1508C3 FPGA (902 I/Os) up to EP2S180F1508C3
80-pin ribbon header for MDR-80 connector
26-pin ribbon header for MDR-26 connector
-48 VDC in
EP1SGX10F6 72 FPGA
Local MCB bus
125 MHz
10 GigE XAUI
CompactPCI Connector
PCI Bus I/F FPGA
CM EMI Filter
5V to low-voltage Power Suppl(ies)
-48VDC to 5 V Power Supply
100 mm
160 mm
233 mm
MDR-80 ribbon cable
MDR-26 ribbon cable
MDR-80
MDR-26
10 GigE Fiber
Metal extender for 160 mm Compact PCI chassis

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# System-level design/purchasing

- -48 VDC power plant contract signed very soon. Probably delivered in Jan/07. (Currently held up on "federal employment equity requirements).

- Meritec cable contract development underway…DRAFT Contract in Meritec's hands. 12 weeks to prototype cables after contract signing.
  - All major DRAFT cabling installation plans released.
  - Still need to refine quantities or add quantities for Phasing Board.
  - Will order production quantity cables after successful end-to-end test…12 weeks ARO.

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# System-level design/purchasing

- Rack mechanical and electrical specs doc V1.0 released.
- System BOM under development
  - Based on rack elec/mech specs doc and system network diagram.
  - Purchasing is combination of COTS RFP thru PWGSC, and purchasing out of DRAO.
- Sub-racks and rack cooling mechanics SolidWorks models and drawings undergoing final development.
  - RFP/PWGSC purchase required due to cost…evaluation and production stage.

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# System-level design/purchasing

- Goal is to have all components in place for rack assembly by ~July 2007.
  - Racks.
  - Sub-racks.
  - Rack fan metal bits (duct, fan carrier, carriage assembly).
  - Common Backplanes.
  - High-speed Meritec cable + strain relief.
  - Wire, crimp terminals, screws, breaker panel, breakers, DIN rail, RPMIBs.

- Aim to complete assembly and test of racks by end of 2007.
  - Have lined-up at least one additional rack assembly person…may need another. Estimate 2 person weeks to assemble + test each rack.

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# System-level design/purchasing

- Production inter-rack Meritec cable should be delivered to DRAO by July 2007 (requires successful end-to-end test).
  - We need to kit and label all cables before shipment to VLA in ~early fall of 2007.
  - Installation at VLA site requires NRAO personnel. NRC to provide engineering assistance if requested.

| ID | Task Name | Start |
|---|---|---|
| 1 | Stage 1 Prototype Hardware in Penticton | Tue 04/10/05 |
| 2 | Stage 1 Prototype PCB Acceptance Testing | Mon 23/10/06 |
| 3 | Stage 2 Prototype Fabrication & Assembly | Mon 07/05/07 |
| 4 | Power Plant Delivered to VLA Site | Mon 05/02/07 |
| 5 | Hardware/Software Integration Testing | Mon 03/09/07 |
| 6 | Critical Design Review | Fri 28/12/07 |
| 7 | Hardware for OTS Testing Sent to VLA | Mon 31/12/07 |
| 8 | On-The-Sky Testing | Mon 28/01/08 |
| 9 | High-Speed Inter-Rack Cables Delivered to and Installed at VLA Site | Mon 02/07/07 |
| 10 | Racks Delivered to and Installed at VLA Site | Mon 31/12/07 |
| 11 | Stage 3 Production Hardware | Mon 14/01/08 |
| 12 | System Integration & Testing @ Penticton | Mon 14/04/08 |
| 13 | Limited Production Hardware Sent to VLA | Mon 01/09/08 |
| 14 | Stage 4 Production Hardware | Mon 01/09/08 |
| 15 | Final Full Production Test & Burn-in in Penticton | Mon 15/12/08 |
| 16 | Full Board Installation & Testing @ VLA | Mon 16/03/09 |
| 17 | Commissioning - Turn off old correlator | Mon 15/02/10 |
| 18 | Prototype Software | Thu 22/12/05 |
| 19 | MCCC Software | Mon 03/07/06 |
| 20 | CPCC Software | Tue 10/07/07 |
| 21 | Correlator Backend Software (V1.0 Test, V2.0) | Tue 07/11/06 |
| 22 | CMIB Production Software | Mon 21/05/07 |