EVLA Advisory Committee Meeting

System Status

Jim Jackson, Hardware Systems Engineer
System Status
Overview

• December 2004 Advisory Committee report
• Antenna status
  – Antenna 13, 14, 16, 18, 24 and 26
• Electronics status
  – Currently in or ready for production
  – Nearing production
  – On-going issues
• Front-end status
  – On-going issues
• Other system highlights
System Status
Responses to 12/04 Adv Comm.

• Solar Headroom
  – No change from last year – passed System, LO/IF and Front-End CDRs
  – Design is result of consultation w/ NRAO solar astronomer Tim Bastian
  – Could be target for descoping

• Polarization
  – EVLA polarization performance is good – Rick Perley will discuss
  – Mixed polarization performance is transition issue
    • Committee recommended not diverting effort for this
  – Circular vs. Linear – would make VLA > EVLA transition extremely difficult

• Data Transmission System (DTS) status
  – New formatter and 8-bit digitizer complete
  – DTS is working well and is in production
  – 3-Bit digitizer options under development
    • DTS module built to accommodate 3-bit digitizer assembly
System Status
Responses to 12/04 Adv Comm.

- Provide capability for redundant LO systems in test racks
  - Completed and in use
- Test LNA’s with EVLA feeds before production purchase
  - Feed design shouldn’t affect amplifier performance
  - Preliminary testing shows there is no problem
- L-Band Orthomode Transducer (OMT)
  - RF performance excellent
  - Issues with noise and cooling
  - Issues with manufacturability
System Status

Antennas

- **Antennas 13, 14 and 16**
  - Turned over to operations for initial scientific use
  - L, C, X, K and Q bands available with 4 IF’s
  - 4/P bands available on antenna 14
  - Temporary band switching arrangement
  - No Automatic Level Control (ALC) – will add soon
  - Antennas 13 has production LO hardware
  - Antennas 14 and 16 have prototype LO hardware
    - Software compatible, retrofit Mid CY 2007
  - Tests and evaluation on-going
  - Scientists being encouraged to use antennas in observations
System Status
Antennas

- Antenna 18
  - Operating since Mid-March w/ 2 IF’s at X-band
    - Fringes obtained within minutes of first power-up
  - X band now available w/ 4 IF’s
  - 4,P,L,C and K bands available mid May
  - Mostly production hardware
  - Temporary test bed for updated hardware
    - New L302 10.8-14.8 GHz synthesizer firmware
    - M301 converter interface for band switching
    - T301 with updated RF Board
    - T304 baseband converter with ALC
    - Caused minor delay in outfitting
  - Turn over to operations likely in early June
System Status
Antennas

- Antenna 24
  - Outfitting electronics now
  - First fringes expected mid May
  - M302/M303 utility modules will be added

- Antenna 26
  - In barn for azimuth bearing change
  - VLA electronics stripped
  - EVLA refit to begin by 1 June
System Status
Electronics

Electronics currently in (or ready for) production
- D301-4 DTS Module – excluding 3-bit digitizer PCB
- D351 DTS De-formatter
- F320 Front End Transition Module
- L300 Synthesizer Reference Generator
- L301 12-20 GHz Synthesizer
- L304 LO Reference Receiver
- L305 / L350 Reference Generators
- L351 Offset Generator
- L354 LO Driver
- L355 Digital Timing Distributor
- M304 Module ID
- P301/302 DC/DC Power Supplies
- T302 LSC Converter
- T303 UX Converter
- T305 Baseband Converter - Digital
- -48 VDC Power System
- Front End Card Cage
- Main Shielded Equipment Racks

Represents:
- 68% of Antenna Electronics
- 80% of Central Electronics

5/5/2006 Jim Jackson
EVLA Advisory Committee
8-9 May 2006
System Status
Electronics

Modules in final design – ready for production by 1 July 2006

- F317 Front End Controller
- L353 LO Transmitter
  - Motherboard to integrate design
- M301 Converter Interface
- M302/M303 Utility Modules
- P350/P351 DC/DC power supply
  - PCB Mod to support N+1 redundancy
- Power Dist. Board for Central LO
- T301 4/P Converter
  - Corrects 1024 MHz Isolation Issue on RF PCB
  - Solar Attenuator PCB to be developed
    - Module can be produced without this PCB
- In final testing
- PCB Revision
- In final testing
- In final testing
- PCB Revision
- New PCB Design
- PCB Revision
Modules in final design – ready for production by 1 July 2006

- **T304 Baseband Converter**
  - New Total Power Detectors
  - New Filter Arrangement
  - In final testing

- **L302 10.8-14.8 GHz Synthesizer**
  - New MIB / DDS FPGA firmware developed
  - Updated units being tested in Antenna 18
  - In final testing

Represents: 27% of antenna electronics, 20% of central electronics
System Status
Electronics – On-going Issues

L352 LO Round Trip Phase Meter
- Issues with thermal stability
- Issues with measurement repeatability
- Affects use of higher frequency bands
- New PCB’s developed – integrated motherboard
- New design being tested in system

– Low risk
– High priority
System Status
Electronics – On-going Issues

- 3-Bit digitizer for DTS – Moderate Technical Risk
  - Two design options – Moderate Priority
    - Comparable cost
    - 3 bit / 4 Gsps device being designed for ALMA
      - IC and PCB’s in development at University of Bordeaux, France
      - Some possible issues with design and performance for EVLA
    - 6 bit / 4 Gsps COTS device from Rockwell
      - IC now available
      - PCB in development at NRAO Socorro
      - Still supplies 3-bits to correlator
      - Additional bits provide flexibility and over-range indication
  - Challenging design – very high speed PCB’s (4 GHz clock)
  - Can tolerate some delay
    - Considerable EVLA capability with 8-bit device
    - WIDAR Correlator checkout does not require 3-Bit Digitizer
System Status
Electronics – On-going Issues

• Network timing – Low Risk / High Priority
  – Current scheme utilizing NTP timing not working well
  – Causing jumps in time as seen by MIB’s in L302 synthesizer
  – Researching GPS time servers to connect to M&C network at VLA
  – Currently affecting test and scientific data
System Status
Front-Ends

Front Ends
- 4 Band
  - Complete – Using existing VLA receiver
- P-Band
  - Mostly complete – Using existing VLA receiver
  - Modification required to stop LNA oscillations in S,C and X-Bands
- L-Band
  - Horn complete and in production
  - Prototype OMT and receiver in lab testing – issues as mentioned
  - Balanced amps from CDL in use on existing and prototype receivers
- S-Band
  - Half scale feed horn built and currently being tested
  - Receiver to be developed, CDL wideband amps now available
  - Wideband OMT awaiting L-Band results – S-Band will use scaled down version
- C-Band
  - Horn complete and in production
  - Interim receiver in production (final receiver minus wideband OMT)
  - OMT design complete - Awaiting L-Band results – C-Band will use scaled down version
Front Ends

- X Band
  - Currently using existing VLA receiver
  - New X-Band will be last to be developed – funding permitting

- Ku-Band
  - New feed Horn to be developed
  - New Receiver to be developed – will be based on K-Band design

- K-Band
  - Using Existing VLA Feed and Receiver
  - Added block converter and modified LO/IF chain
  - In production

- Ka-Band
  - Horn in production
  - Receiver development underway

- Q-Band
  - Using Existing VLA feed and receiver
  - New MIMIC post amp and block converter
System Status
Front-Ends – On-going Issues

- L-Band Ortho-Mode Transducer – High Risk / High Priority
  - Reviewed in recent Front-Ends CDR
  - RF performance excellent
  - Progress slower than expected
  - Affects availability of wideband L-Band receiver
  - Also delays S-Band and C-Band – based on same design
  - Delaying Front-end group progress on Ku/Ka band receivers
  - Difficult to build, assemble and test
  - Size and weight – difficult to maneuver
  - Problems with cooling
  - May need to find new materials / fabrication techniques
System Status
Other System Highlights

- New shielded room for WIDAR correlator installed & RFI tested
  - Flooring, alarms and utilities being completed now
  - Will be ready well in advance of WIDAR correlator delivery
- Cryogenic compressors & Scott-T boxes in production
- Antenna HVAC systems purchased
- Feed cone assembly in production
- Azimuth fiber cable wrap in production
- All fiber optic cable in the ground
- Fiber optic termination room complete
- Control building fiber M&C networking in place

5/5/2006  Jim Jackson
           EVLA Advisory Committee
           8-9 May 2006
Questions?