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# EVLA

## NSF Mid-Project Review

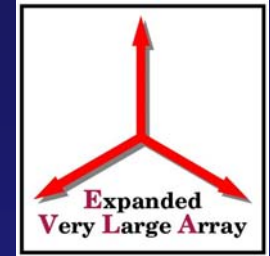
### System / Antenna Status

Jim Jackson, Hardware Systems Engineer



# System Status

## Antennas

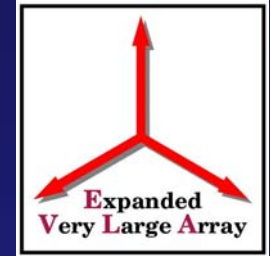


- Electronics
- System
- Antenna
- VLA Site



# 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:

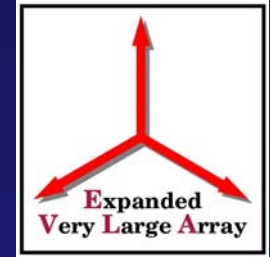
68% of Antenna Electronics

80% of Central Electronics



# System Status

## Electronics



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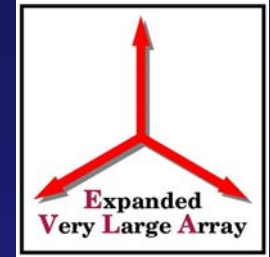
Modules in final design – ready for production by 1 July 2006

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



# System Status

## Electronics



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

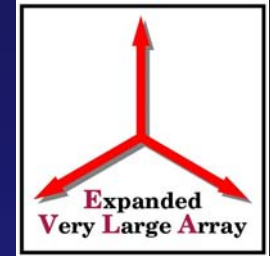
- T304 Baseband Converter
    - New Total Power Detectors
    - New Filter Arrangement
  - L302 10.8-14.8 GHz Synthesizer
    - New MIB / DDS FPGA firmware developed
    - Updated units being tested in Antenna 18
- In final testing
- In final testing

Represents: 27% of antenna electronics, 20% of central electronics



# System Status

## Front-Ends



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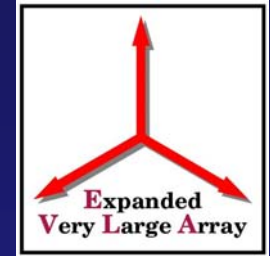
### Front Ends

- 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



# System Status

## Front-Ends



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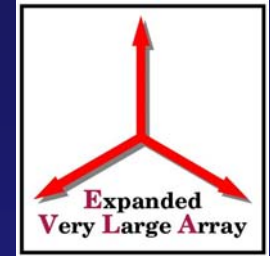
### Front Ends

- 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

## Test Racks



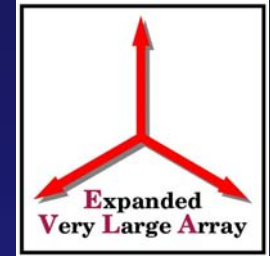
- EVLA Integration Lab in AOC
  - Two complete LO systems
  - Antenna electronics racks
  - Identical Infrastructure to site
    - Fiber Ethernet switches
    - 8/14/22Km fiber spools
    - -48 VDC power supply system with batteries
    - LO Reference from Maser Lab
- Test Capabilities
  - All Antenna LO/IF/Fiber modules
  - Antenna M&C system
  - Facilities for connection of operational front-ends (including cryogenics)
  - Actual simulation of LO round trip phase
  - Can actually run simulated observations using EVLA software





# System Status

## Central LO Racks

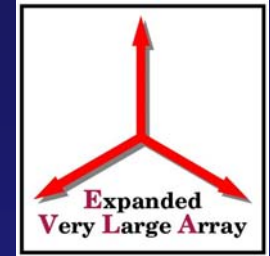


- Central LO Racks
  - 5 DoD “Tempest” certified RFI shielded equipment racks
  - Located in VLA Electronics Room
  - -48 VDC N+1 redundant power supply with batteries (1 Rack)
  - Central LO electronics common to all EVLA antennas (1 Rack)
    - Generates all reference signals for antennas and WIDAR correlator
    - Synchronizes EVLA system to VLA system during transition
    - Second redundant system not yet implemented
  - Antenna LO distribution and round-trip-phase monitoring (3 Racks)
    - Transmits LO and timing signals to 28 antennas
    - Measures LO round-trip-phase to each antenna



# System Status

## Antennas

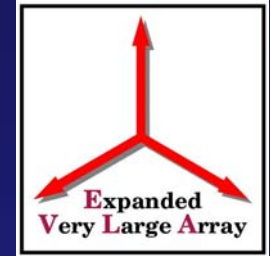


- Antenna Retrofits
  - Mechanical refit procedures
    - Site personnel have procedures established
    - Last two refits (antennas 18 & 24) have proceeded smoothly
  - New antenna component designs proven and in use
    - New upper feed cone assembly
    - Feed / receiver mounting systems
    - Electrical / HVAC upgrades
    - Cryogenic upgrades – new compressor & platform, Scott-T boxes, etc...
    - Shielded equipment racks
    - Fiber optic cable wraps
    - No adverse effects on antenna structure or performance
- Remaining antenna issue
  - Feed moisture control
    - Several options exist
    - Low cost options being explored first



# System Status

## Antennas

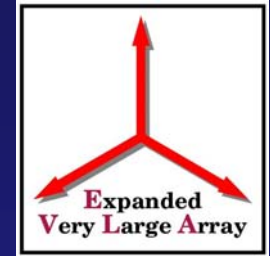


- Antennas 13, 14 and 16
  - Have received full EVLA refit
  - Turned over to operations for initial scientific use
  - Using 2Gsps 8-Bit digitizers for transition
  - L,C,X,K and Q bands available with 4 IF channels
  - 4 and P bands available on antenna 14
  - Total power detectors and ALC to be added shortly
  - Antennas 14 and 16 have prototype LO hardware
    - Software compatible, retrofit Mid CY 2007
  - Antennas 13 has production LO hardware
  - Tests and evaluation on-going
  - Scientists being encouraged to use antennas in observations



# System Status

## Antennas

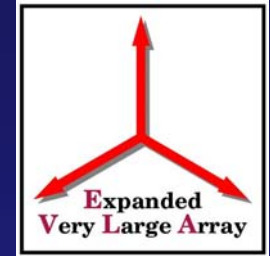


- Antenna 18
  - Operating since Mid-March w/ 2 IF's at X-band
    - Fringes obtained within minutes of first power-up
  - X band now available w/ 4 IF's
  - 4,P,L,C and K bands available mid May
  - Mostly production hardware
  - Temporary test bed for updated hardware
    - New L302 10.8-14.8 GHz synthesizer 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

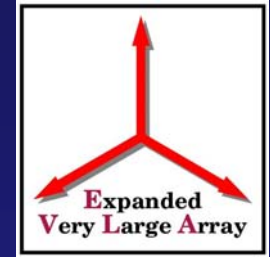


- Antenna 24
  - Mechanical refit complete late March
  - Outfitting electronics now
  - First fringes at X-Band expected mid May
  - New M302/M303 utility modules
  - First Antenna with no copper wire communication
    - All communications and safety thru Ethernet fiber
- Antenna 26
  - Currently in barn for azimuth bearing change
  - VLA electronics stripped early April
  - EVLA refit to begin by 1 June



# System Status

## Correlator Room

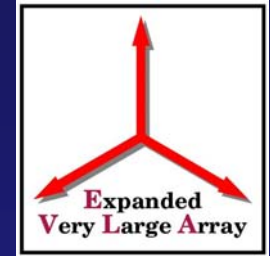


- New Screen Room for WIDAR Correlator
  - 48' x 47' 100dB shielded room
  - Power and cooling to support 250KW load of correlator & back-end
  - Room installed, RFI tested and accepted from manufacturer
  - Electric panels, fire alarm and fire suppression systems installed
  - Raised flooring currently being installed
  - Fiber/RF coax penetrations installed
  - On schedule - will be ready well in advance of WIDAR arrival
- Old correlator room
  - Deformatter and fiber racks installed and in use
  - Location of fiber optics and DTS deformaters during VLA to EVLA transition
  - Equipment to be moved into WIDAR correlator system when commissioned
  - Deformaters feed into VLA D-racks during transition
  - Location of new EVLA computing and networking equipment



# System Status

## VLA Site Infrastructure



- Fiber Optics
  - All underground cable installed
  - Antenna pad boxes installed as needed
  - Most control building fiber infrastructure in place
  - Fiber lab in place
    - Full suite of test and assembly equipment
    - Fabrication of cables and assemblies
    - Full capability & training for testing, maintenance and repair
- Power / HVAC
  - Upgraded to support new EVLA systems
- Buildings
  - New cold storage building built to support EVLA project



# Questions?

