EVLA Advisory Panel Mtg. System Overview & Status

Jim Jackson, Hardware Systems Engineer

Antenna 13

- Feed cone installed
  - Metal covered plastic core honeycomb material
  - RFI tight at seams
  - RFI gasket at base
  - Open base for access to front ends

Antenna 13

- X-Band front end installed
  - Cooled down and ready for system testing
  - Will allow testing of:
    - T304 Main downconverter
    - L301/302 Synthesizers
    - Total power digitizers
    - 8-Bit digitizers
    - Data transmission system
    - Transition hardware
    - DC power system

Antenna 13

- Racks installed
  - LO/IF & ACU Racks
    - Commercial RFI racks
    - DoD “Tempest” rated (approx 55dB @ 5GHz)
    - All I/O signals filtered or on fiber
  - Suitability for production to be evaluated

Antenna 13

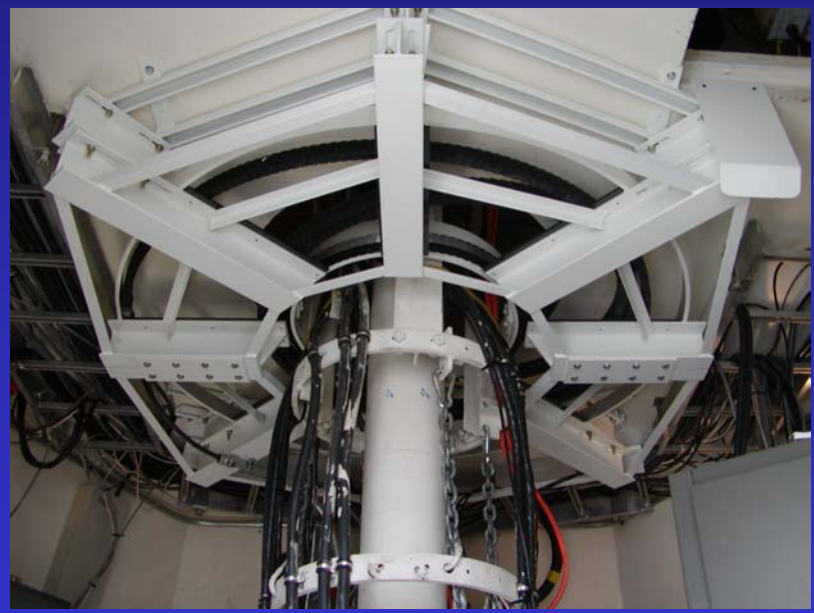
- Racks installed
  - Front end rack
    - Reuse existing VLA B/F-rack frames
    - Adding metal covered plastic core honeycomb covers

Antenna 13

- Racks installed
  - G & H–Racks
    - G-Rack houses DTS/Sampler modules
    - H-Rack houses Ethernet switch
    - NRAO designed RFI tight enclosure (approx 80dB up to 10Ghz)

Antenna 13

- Fiber optics installed
  - Two hybrid cables installed between pedestal & vertex room
  - Each contains 12 single mode and 32 multi mode fiber
  - Watch spring design for azimuth cable wrap
  - Round Trip Phase testing has begun to evaluate performance of fiber on the antenna and in the ground



Antenna 13

- New HVAC system
  - Designed to minimize RFI leakage of vertex room
  - Closed air system – air handler located completely inside vertex room
  - Uses chilled water from outdoor condenser unit
  - Can utilize cold outdoor conditions for energy savings

Antenna 13

- -48 VDC power system
  - Commercial bulk power products
  - Designed for telecom
  - 52.5 Amp cont. capacity
  - N+1 redundant design for reliability
  - Battery backup for 1 hour
  - Installed in “Tempest” rated RFI shielded rack in antenna pedestal room
  - Reuses existing Square-D “QO” breakers and panels

VLA Site

- Fiber termination room
  - All fiber from array enters the building and terminates in patch panels at this point
  - Satisfies electric code requirements for outdoor fiber terminating in the building
  - Distributed to control building patch panels from this point

VLA Site

- Correlator room fiber optic cable penetrations
  - RFI tight
  - Fiber penetration into existing correlator room
  - Ethernet fibers in penetration to electronics room
  - IF fibers in separate penetration under floor

VLA Site

- Fiber optic patch panels
  - LO, IF and M&C patch panels
  - Array re-configuration is accomplished at these panels

VLA Site

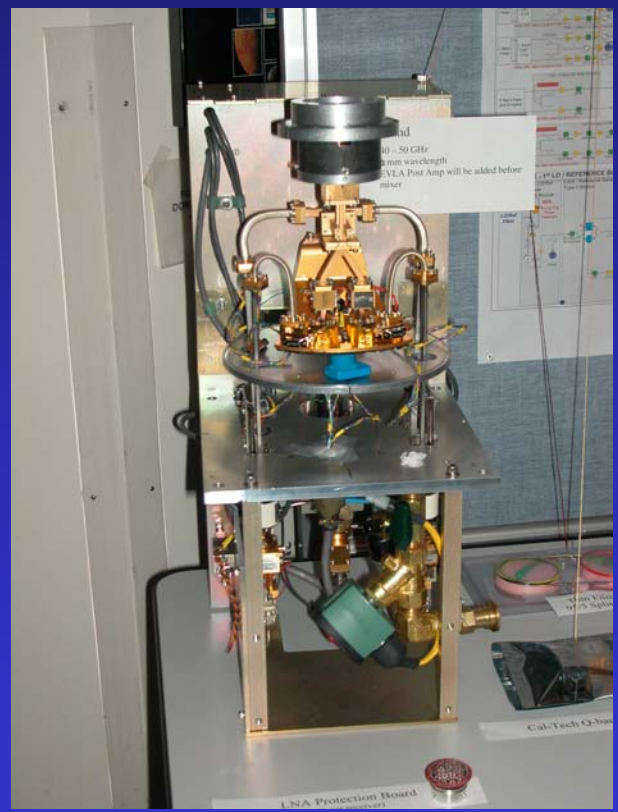
- Buried fiber optic cable
  - Burial on east and west arms complete ahead of schedule
  - Burial on north arm begins in October 03
  - Field splicing begins after burial completion

VLA Site

- Networking equipment
  - New networking equipment installed in control building and AOC for EVLA

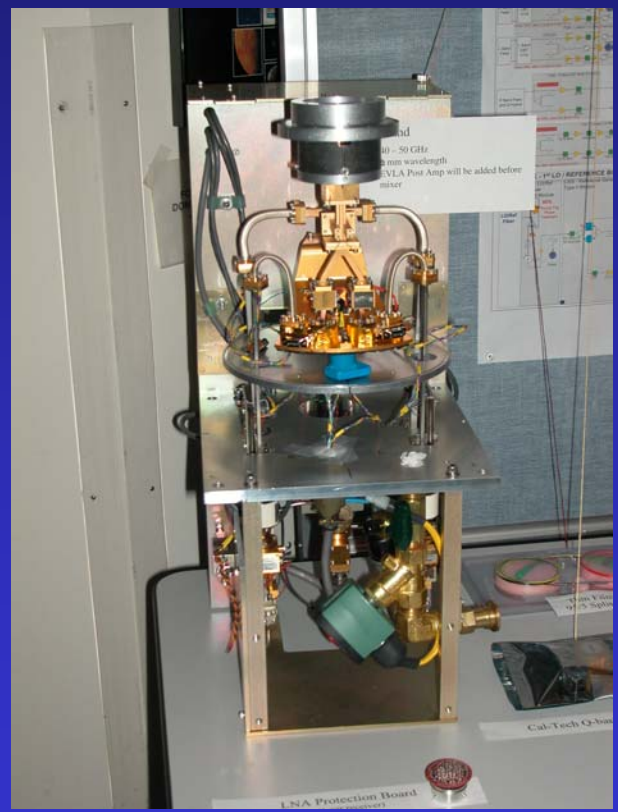
Hardware

- Front ends
  - K & Q-Band
    - Modified VLA units
      - New block downconverter
      - Q-Band – Caltech post amp
      - K-Band – new feed mount
  - Ka-Band
    - In design
    - Caltech block downconverter due in December 03
    - Scheduled for installation early summer 04



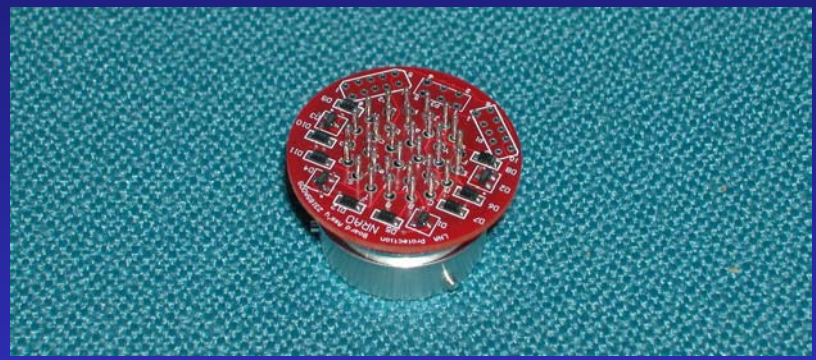
Hardware

- Front ends
  - L-Band
    - Christmas tree complete at VLA site
    - Feed components in production at VLA machine shop (90% complete)
    - Transition front end prototype to be installed Nov 03
    - Final EVLA front end to be installed May 04
  - C-Band
    - Detailed designs in drafting
    - Christmas tree complete at VLA site



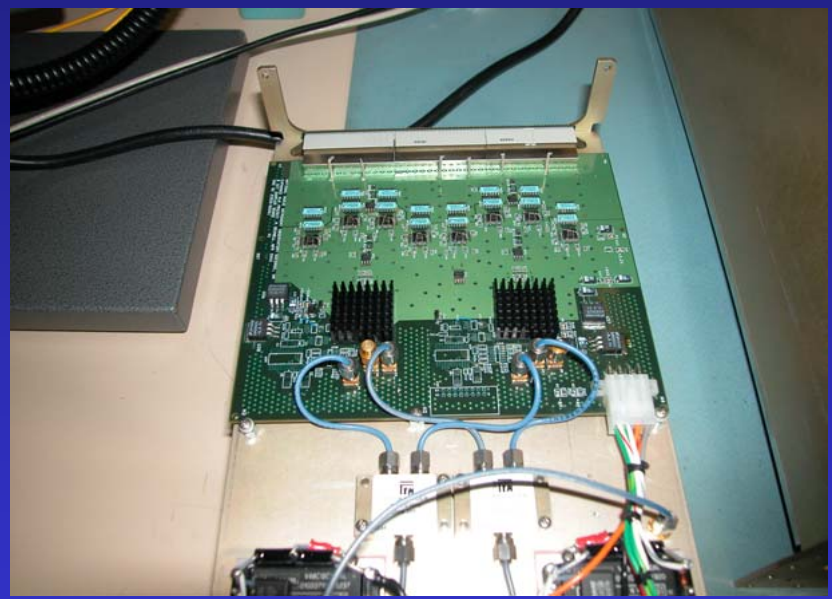
Hardware

- Front ends
  - Card cage
    - PCB's in layout
    - Mechanical packaging in design
  - Integrated harness and LNA protection board assembled and in testing



Hardware

- Digitizers
  - 8-bit, 2 Gsps digitizer
    - Dual Maxim MAX104, each running at 1Gsps
    - first prototype assembled & currently in testing
    - Installed in DTS module

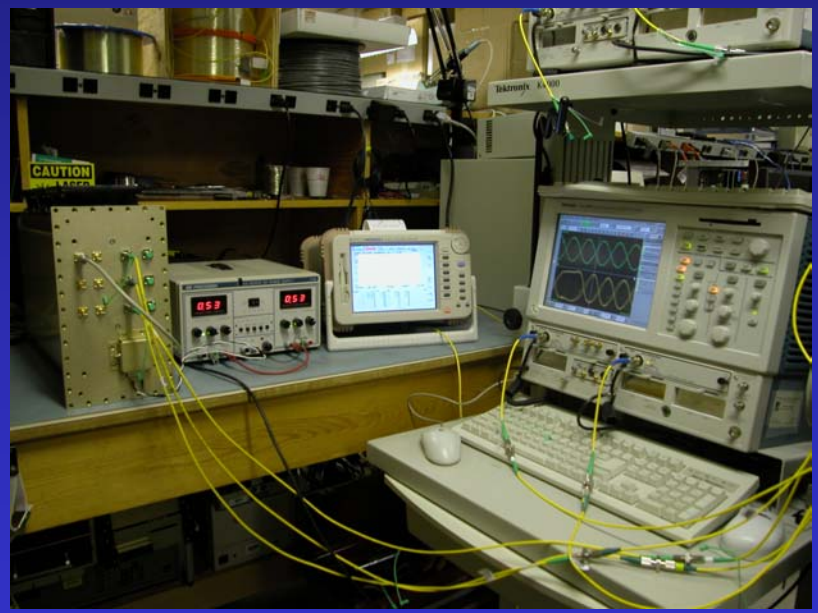


Hardware

- Digitizers
  - 3-bit, 4 Gsps digitizer
    - ALMA device under development in France
      - design review 16-17 October in Bordeaux, France
  - Potential alt source of high speed A/D's (Atmel)
    - 8 bit, 2 Gsps, 3GHz BW A/D samples available
    - 8 bit, 4 Gsps, 4GHz BW A/D in development
      - This device could replace both EVLA digitizers

Hardware

- DTS/Sampler Module
  - Prototype module assembled and in testing
  - NRAO designed RFI tight module (60-80dB shielding)
  - All digital electronics contained inside module
  - Analog IF & clocks on coax
  - Digital optical output on fiber
  - Timing & Ethernet on fiber
  - Design common with ALMA
  - Live demo in lab today

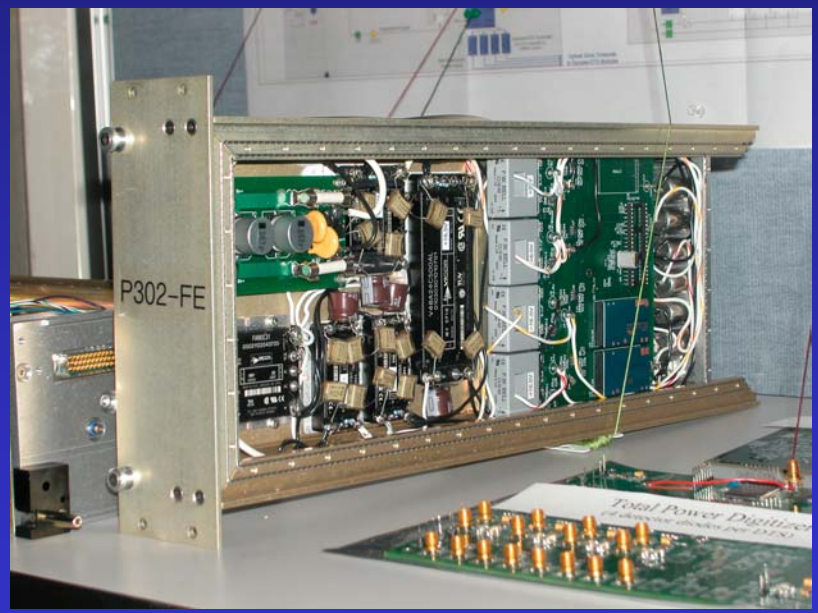


Hardware

- DTS Deformatter
  - Module mounts to WIDAR station card
  - Contains:
    - Fiber optic receivers
    - Demux / Deformatters
    - Transition FIR Filter
  - PCB assembled, FPGA code being finalized & tested
  - Housed in temporary racks in present correlator room during transition

Hardware

- P301/302 DC/DC Converter
  - Prototypes assembled and running in lab
  - Using Vicor DC-DC converters - low noise, zero switching design
  - Extensive output filtering
  - Flexible design allows for various configurations
  - Design common with ALMA

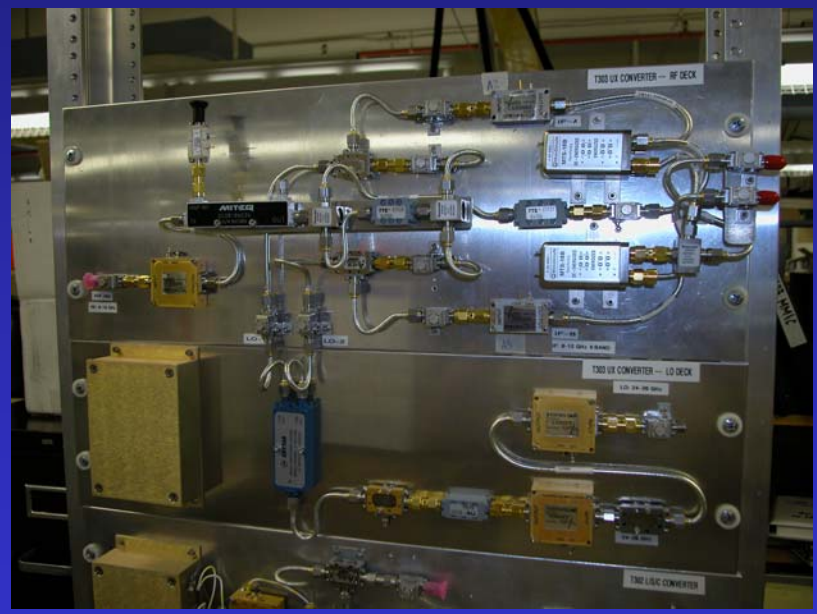


Hardware

- Converters
  - T301 – 4/P converter
    - modules in assembly
    - bench prototypes complete & tested
  - T302 – LSC converter
    - modules in assembly
    - bench prototypes complete & tested

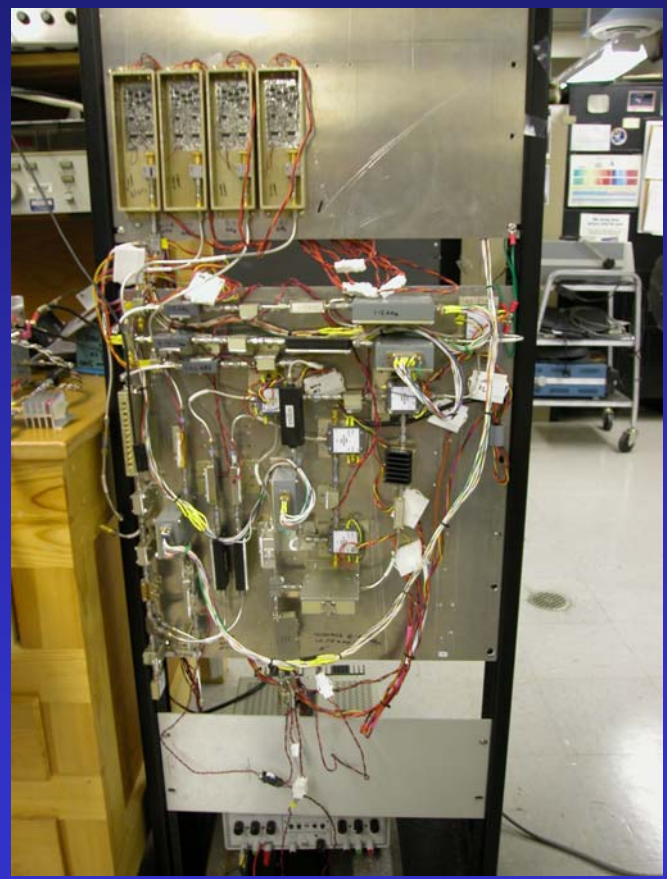
Hardware

- Converters
  - T303 – UX converter
    - bench prototype complete & tested
    - connectorized chassis version in final assembly & testing
    - contract award for integrated version in process (vendor selected)



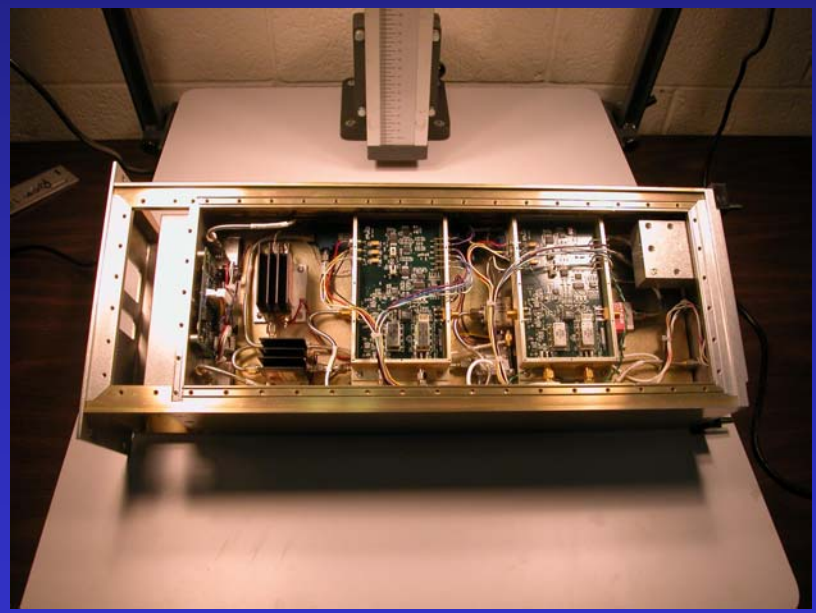
Hardware

- Converters
  - T304 – Downconverter
    - Bench prototype complete & tested
    - Connectorized chassis version for test antenna in final assembly & testing
    - Design in progress for integrated version



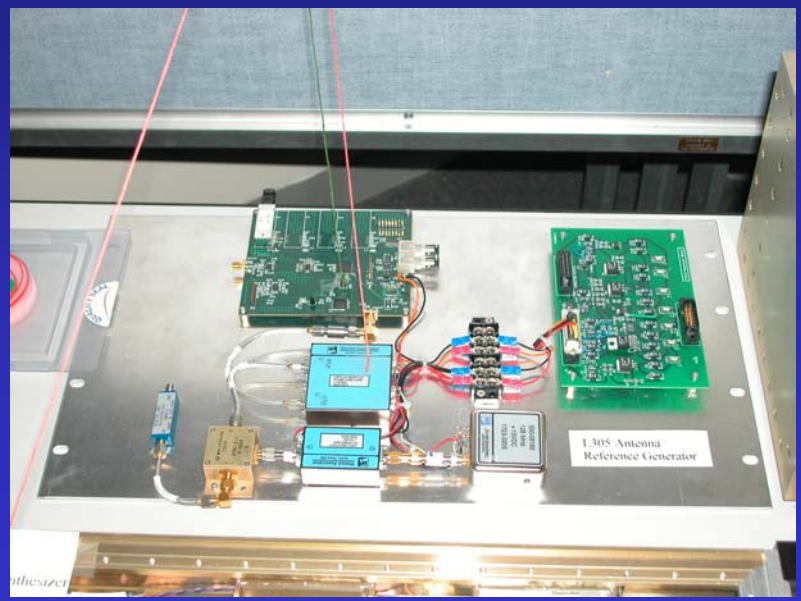
Hardware

- Synthesizers
  - L301 12-20 GHz prototype complete and functioning in lab (demo today)
  - L302 10.8-14.8 GHz electronics assembled, tested and awaiting MIB software
  - Both ready for thermal and RFI testing
  - Potential for future integrated assemblies



Hardware

- Reference generators
  - L305 / L350
    - Printed circuit boards complete
    - bench prototypes in testing and debugging
    - modules under development



Hardware

- LO transmission & round trip phase
  - L351/L352/L353/L304
    - proof of concept and data gathering tests being performed in lab and at VLA site
    - bench integration prototypes in testing and debugging
    - modules under development

Hardware

- Types I -VI Modules
  - Prototype designs complete
  - Most components fabricated and assembled
  - Initial RFI and thermal testing has begun
  - Designs also now being adopted by ALMA BE IPT

Hardware

- Bench integration
  - Most modules assembled in plate form for testing in lab

Hardware

- Antenna MCB H-Rack
  - installed in Antenna 13
  - contains Cisco Ethernet switch
  - Tripplite 1 KVA UPS
  - M&C fiber termination panel

Hardware

- MIB
  - NRAO design
  - Low RFI design
  - FO Ethernet Interface
  - Uses Infineon TC-11IB microprocessor
  - Plan to use contract assembly house – Quoted price $700 ea

System Change
(since last meeting)

- New timing synchronization scheme:
  - free running in normal operation
  - 19.2Hz and 1Hz synchronized to array central time by a pulse encoded in 512MHz optical reference
    - pulse is sent by deleting 8 clocks from 512Mhz reference
    - pulse is detected at antenna LO receiver, resets counters in FPGA
    - does not interfere with main reference signals in antenna
  - sync pulse sent only on command from M&C system
  - synchronization loss detected using DTS data stream or timing data sent back from antenna
  - network time broadcast sets time at next 1 Hz tick

Questions?