EVLA
Advisory Committee Meeting

System Status

Jim Jackson, Hardware Systems Engineer

System Status

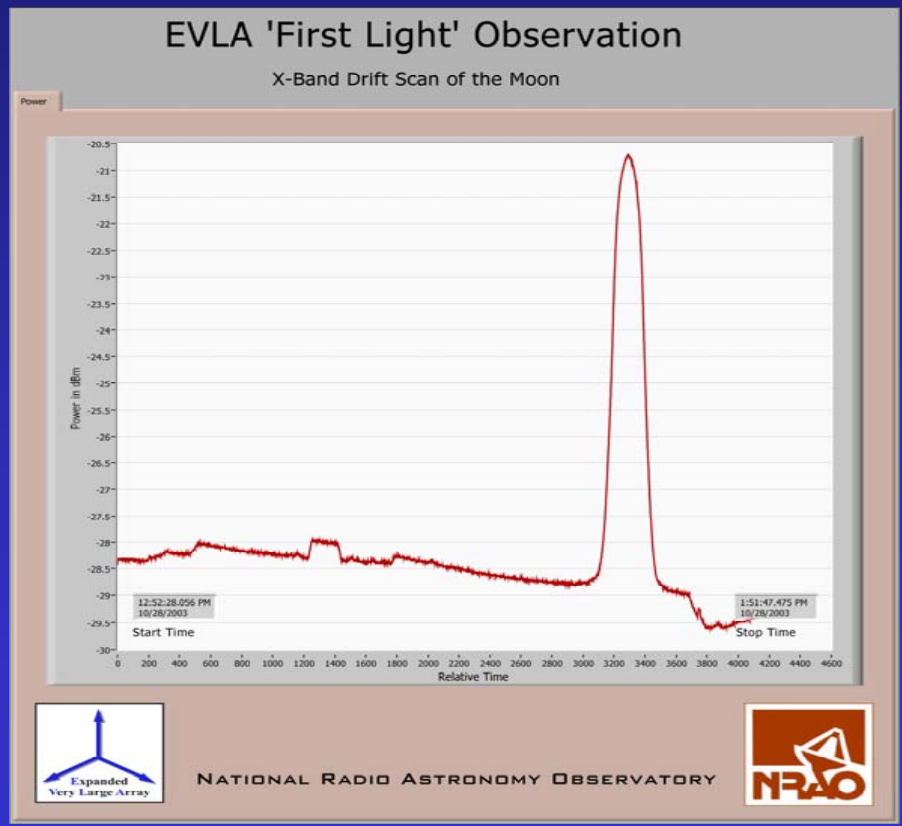
- Status of first three antennas
- Digitizer status
- Synthesizer test results
- Things to do
- System block diagrams

System Status Antenna 13

- First EVLA Prototype - Antenna 13
  - X and L bands available
  - C, K and Q band available Dec 2004
  - Equipped with two IF channels
  - Mostly prototype hardware
  - Will be updated with production hardware after 2nd and 3rd antennas (14 and 16) are completed
  - Tests and evaluation on-going

System Status
Antenna 13

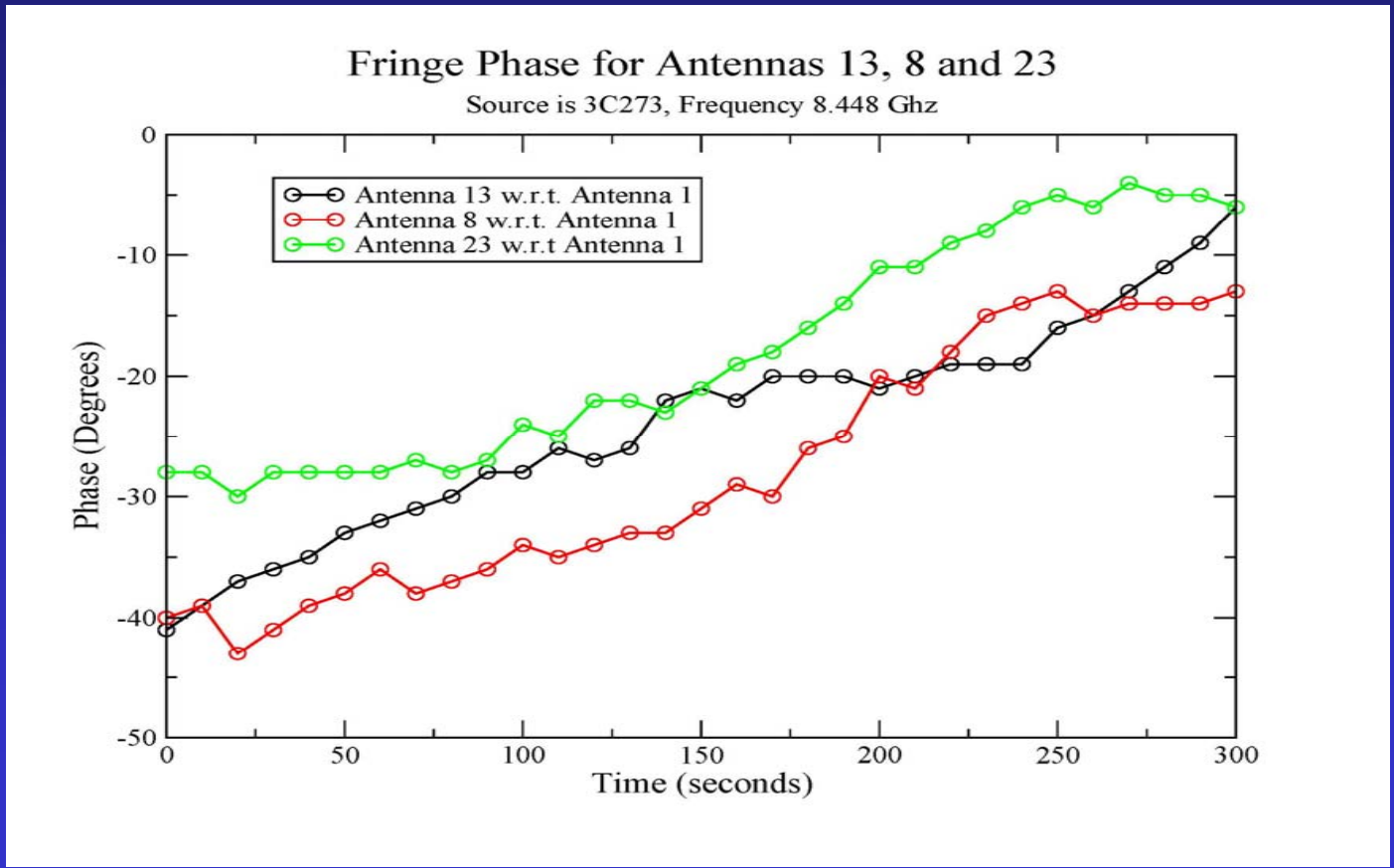
First Light
Antenna 13
(X-Band)
October 2003



System Status Antenna 13

- 1st EVLA Prototype - Antenna 13
  - First Fringes X-Band – March 2004
  - First Fringes L-Band – July 2004
  - K and Q band available Dec 2004
  - Tests and evaluation on-going
  - Will upgrade to four IF channels and production hardware in early 2005

Fringe Phase
Antenna 13 w/ VLA



System Status Antenna 14

- 2nd EVLA Prototype - Antenna 14
  - One IF at X band December 2004
  - Four IF channels available January 2005
  - L, C, K and Q bands available Jan 2005
  - Mostly prototypes of production hardware
  - Plan to begin routine observation with VLA Feb 2005

System Status Antenna 14

- 2nd EVLA Prototype - Antenna 14
  - First Fringes X-Band – Dec 2 2004
    - With VLA and 1st EVLA Prototype (Ant 13)
  - Tests and evaluation on-going

System Status Antenna 16

- 1st EVLA production antenna
  - Antenna 16
  - Currently in antenna barn
    - Bearing change completed
    - Vertex room gutting in progress
    - Fiber & electrical wiring being installed
  - Electronics hardware
    - Being fabricated in lab

Hardware Status

- Hardware currently installed and operating in the VLA control building:
  - L350 Central Reference Generator
  - L351 Master Offset Generator
  - L353 LO Transmitter
  - L354 LO Distribution
  - DTS Receiver Boards (3)
  - P301 Power Supply
  - 48 VDC Bulk Power Supply and Batteries

Hardware Status

- Hardware currently installed in Antenna 13:
  - L301(x2)/L302 Synthesizers
  - L304 LO/Reference Receiver
  - L305 Antenna Reference Generator
  - T304(x2) Downconverter
  - D301/D303 Sampler/DTS Modules
  - P301 Power Supply (x2)
  - Cisco Network Switch
  - 48 VDC Bulk Power Supply and Batteries

Hardware Status

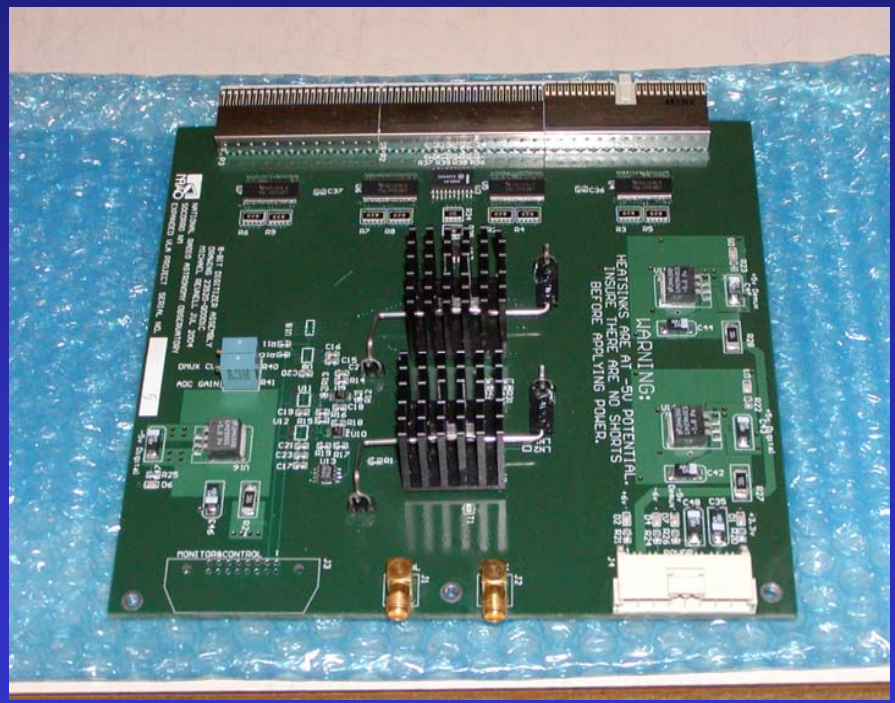
- Hardware currently installed in Antenna 14:
  - L302 Synthesizers (2nd Generation)
  - L304 LO/Reference Receiver (2nd Generation)
  - L305 Antenna Reference Generator
  - T304 Downconverter (Integrated prototype)
  - D302 Sampler/DTS Modules (2nd Generation)
  - P301 Power Supply (2nd Generation)
  - Cisco Network Switch
  - 48 VDC Bulk Power Supply and Batteries

Hardware Status

- Fiber optics
  - Fiber burial on all three arms complete
  - Antenna 14 fully connected at master pad
  - Antenna 13 fully connected at W10/CW5
  - Fiber spliced to end of west arm for round trip phase testing
  - LO/Reference fiber phase characterization continuing

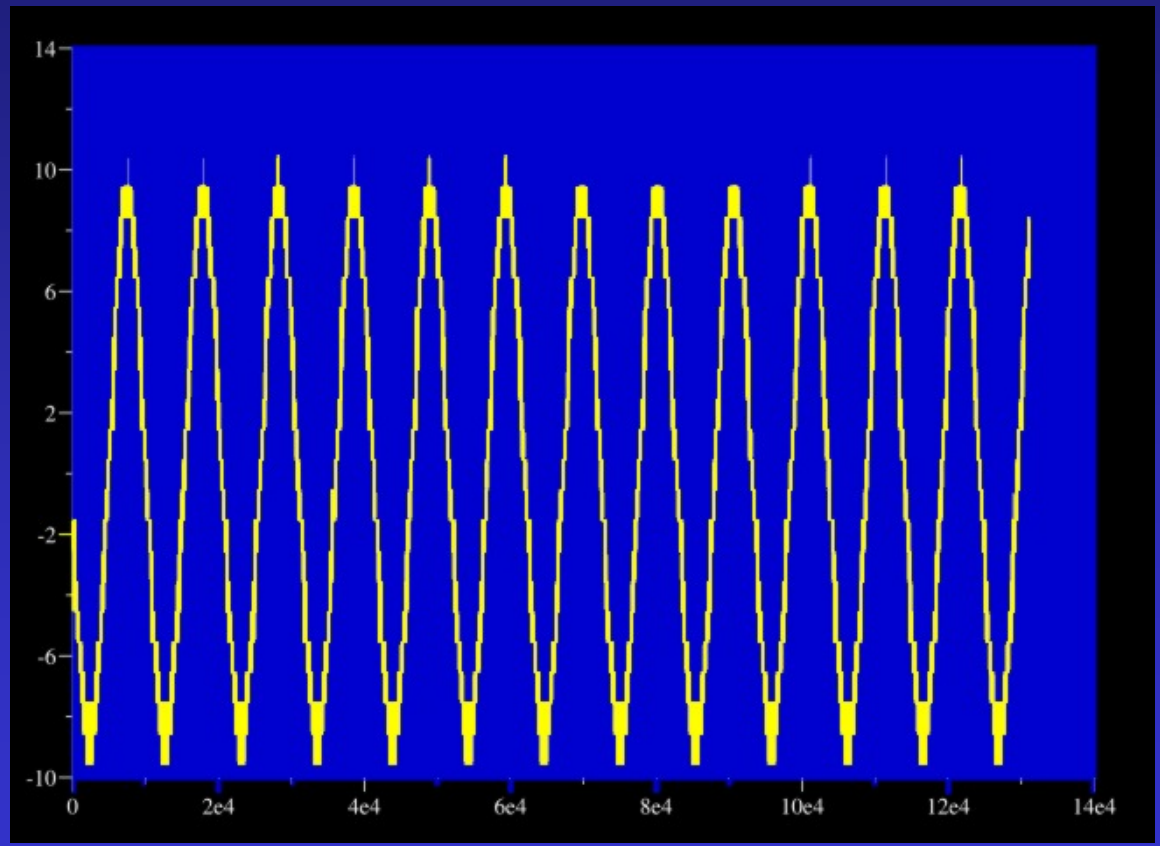
Digitizers

- 8-bit, 2 Gsps digitizer
  - New single chip design using Atmel 8 bit, 2 Gsps device
  - Installed in DTS module and in use on Antenna 14
  - Used for transition and observation in high RFI bands



Digitizers

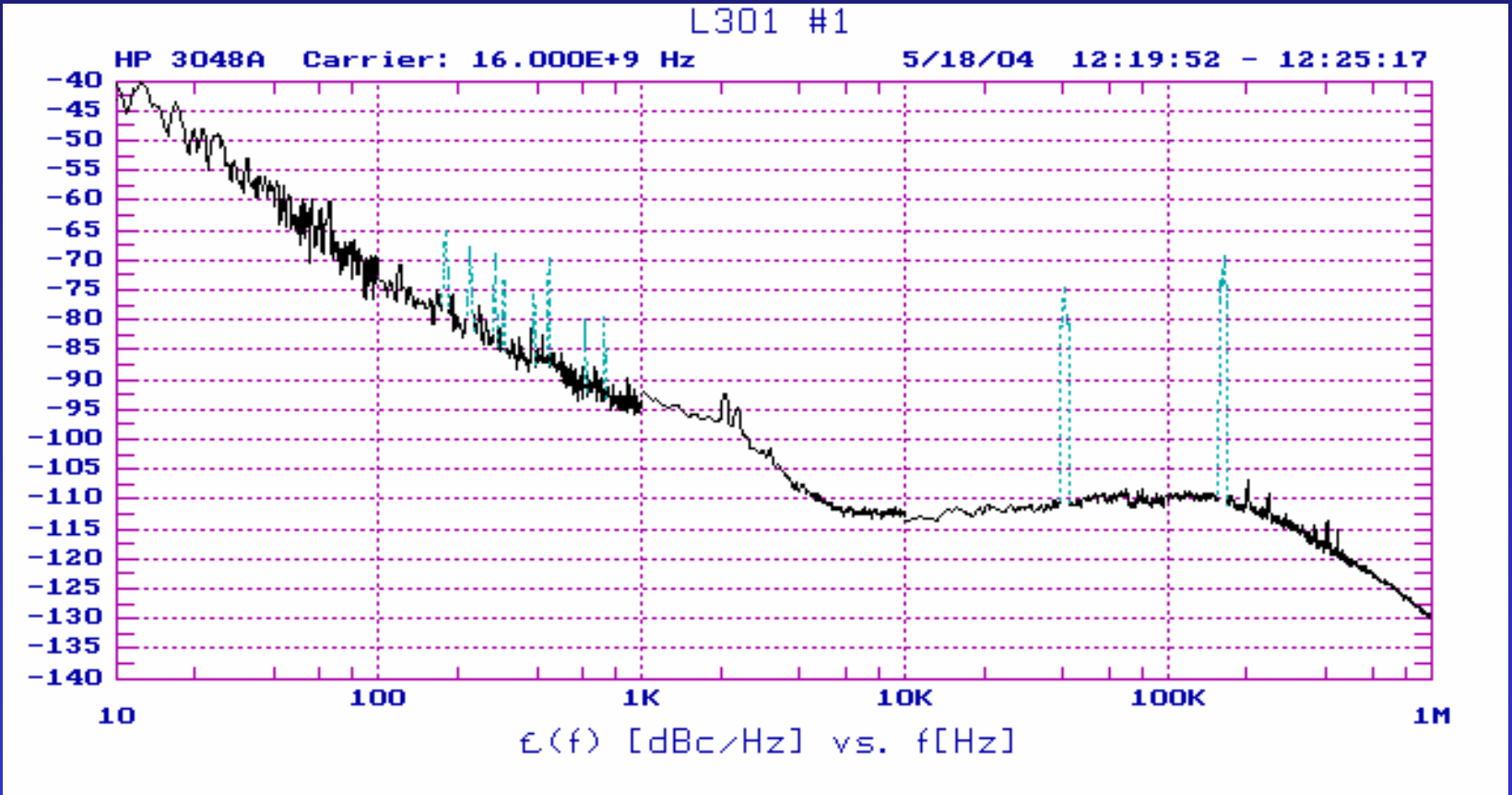
- Recreated Waveform
  - 8 Bit Digitizer
  - Processed thru fiber link and FIR filters
  - Output from D/A converter on deformatter



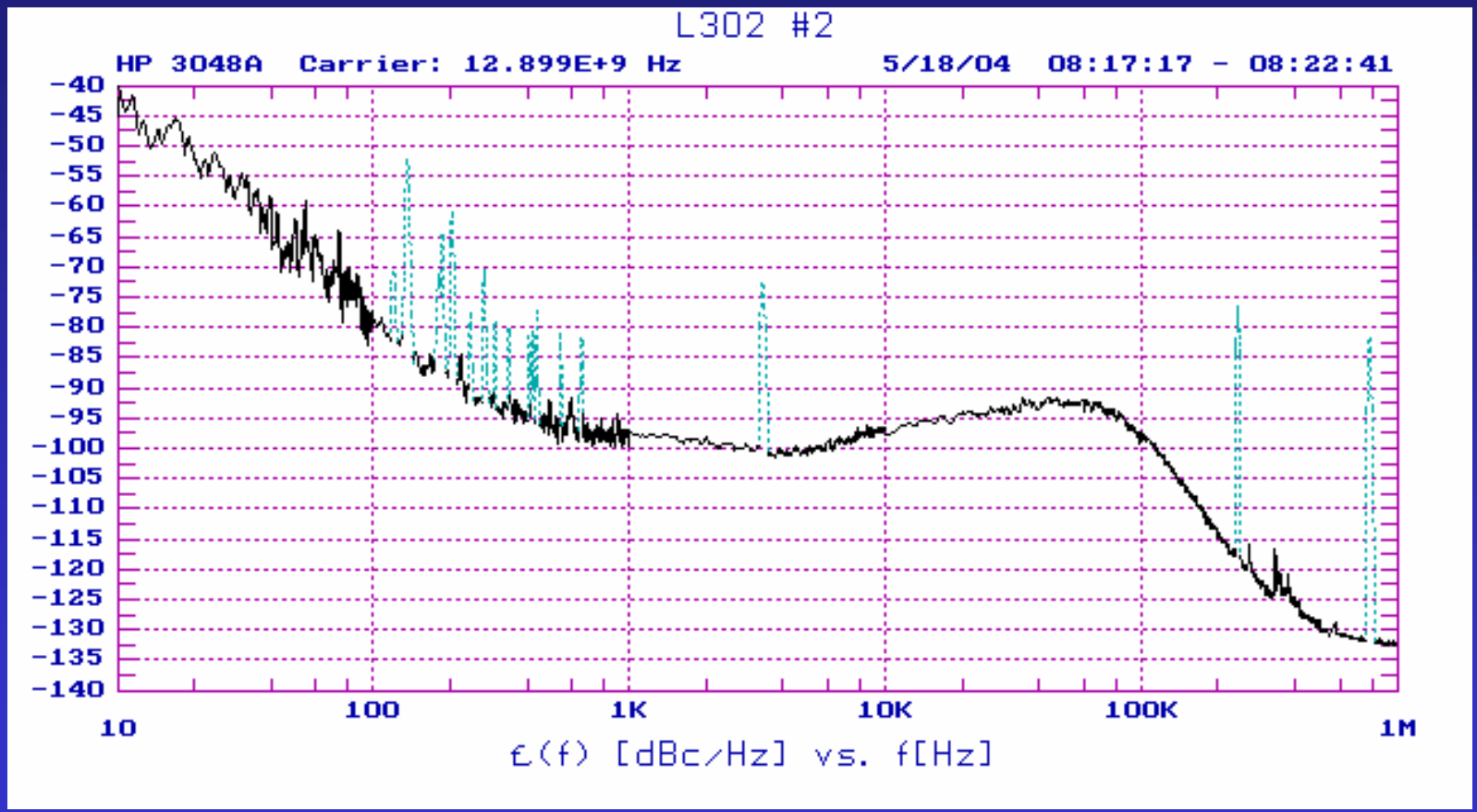
Digitizers

- 3-bit, 4 Gsps digitizer
  - ALMA – 3 bit, 4 Gsps, 4 GHz BW
    - under development in France
  - Rockwell – 6 Bit, 6 Gsps, 12 GHz BW
    - Supposedly sampling next Jan 2005
  - Atmel - 8 bit, 4 Gsps, 5 GHz BW
    - in development

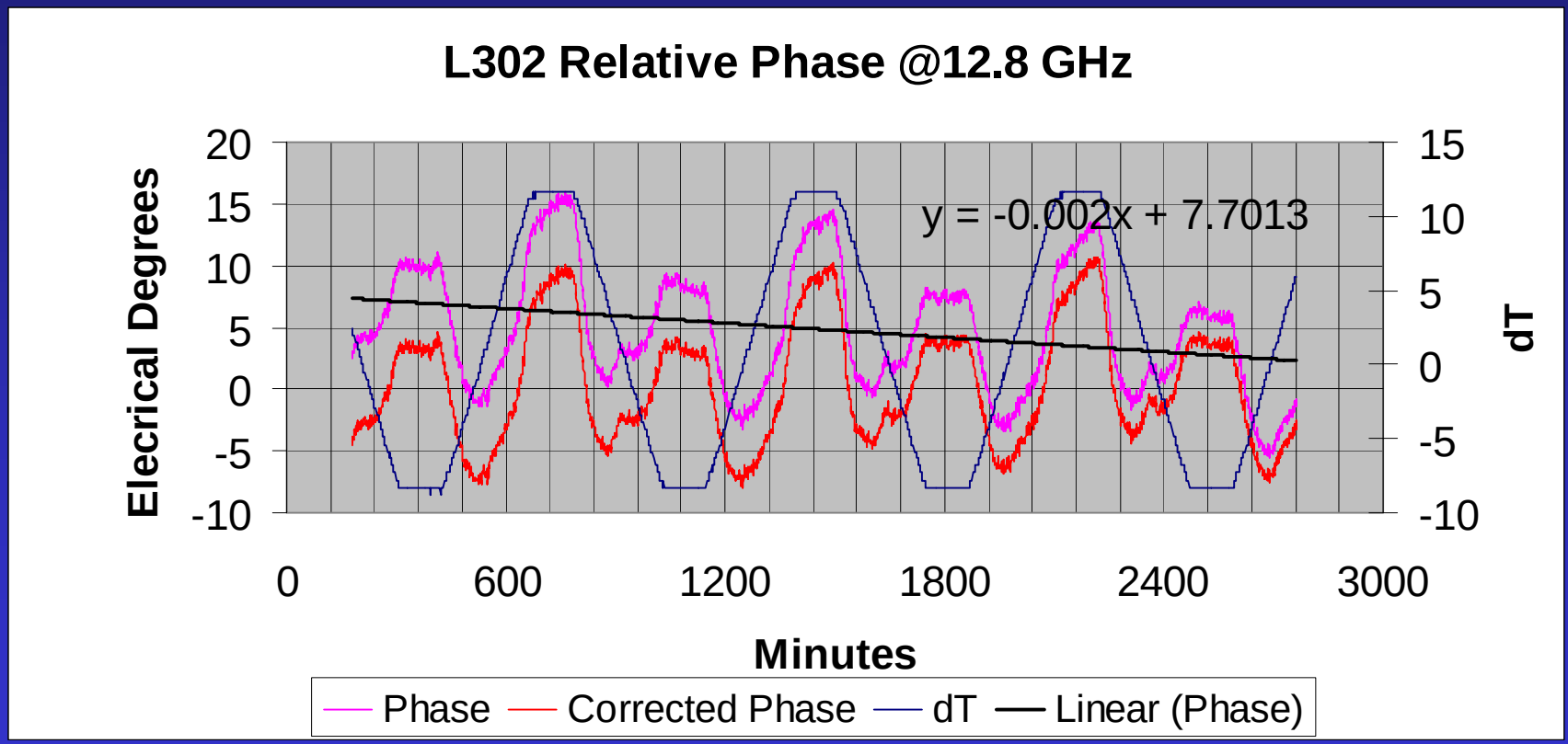
L301 Synthesizer Phase Noise



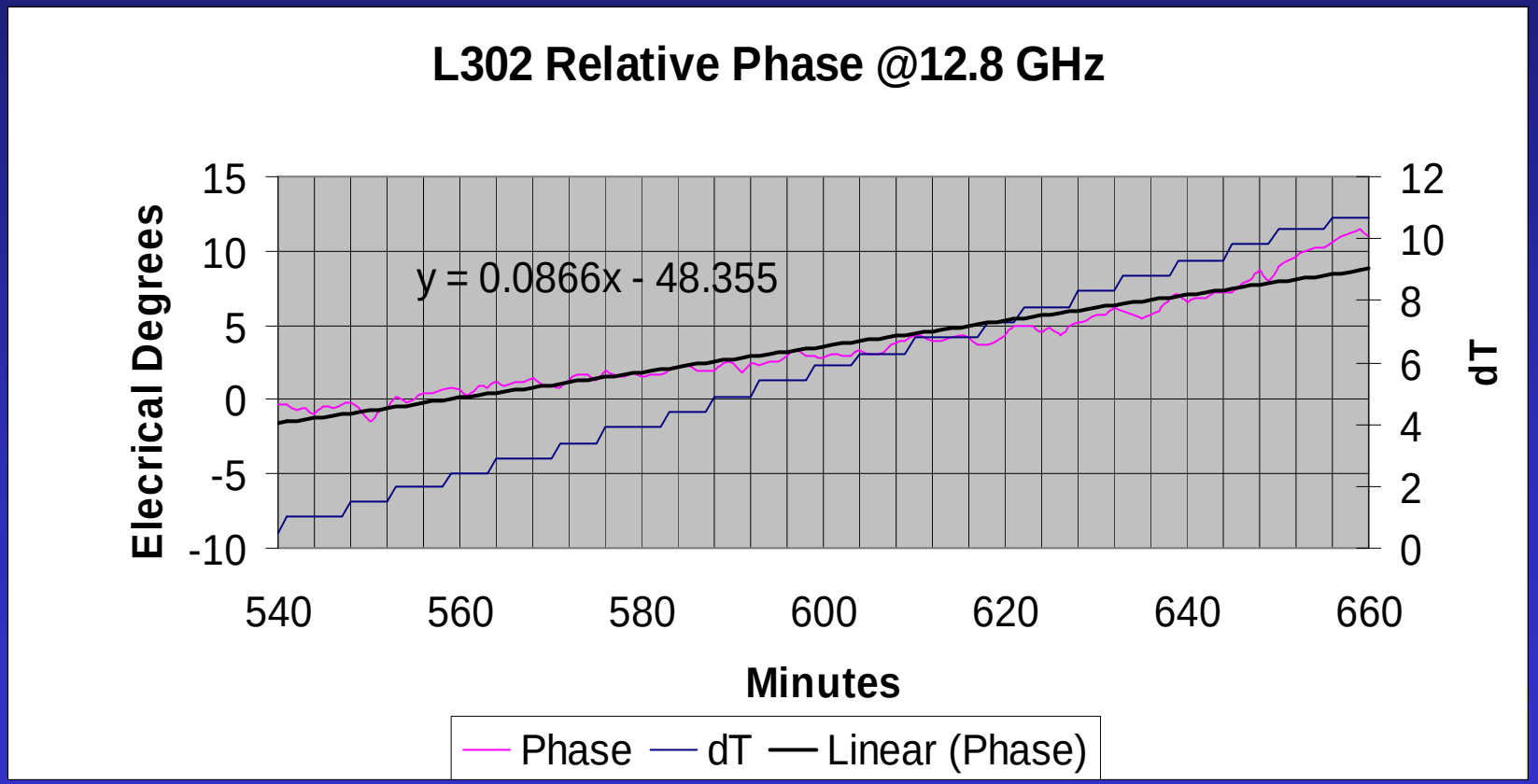
L302 Synthesizer Phase Noise



L302 Synthesizer
Long Term & dT Phase Drift



L302 Synthesizer 20 degree dT



L302 Synthesizer Stability

- Direct relation to temperature
- Long term drift at constant temperature
  - ~ 0.002 deg / min (source unknown)
  - ~ 0.00016 deg / min / GHz
  - 8x better than spec of .0013 deg / min / GHz
- Phase change with temperature
  - 0.25 deg / hr / ^{0}C
  - 0.01 deg / 30 min / GHz / ^{0}C

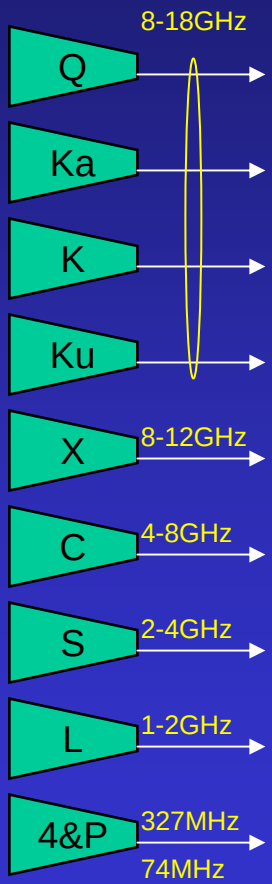
Things to Do

- Phase stability testing of LO System
  - Test two systems in one antenna through fiber
  - Test all modules in environmental chambers
  - Have been limited by time and available hardware
- Detailed analysis of LO round trip phase in fiber
  - Previous data dominated by equipment error
  - Redesigned RTP measurement system now ready
- Detailed analysis on effect of DC/DC converters
  - So far not an issue but needs closer examination

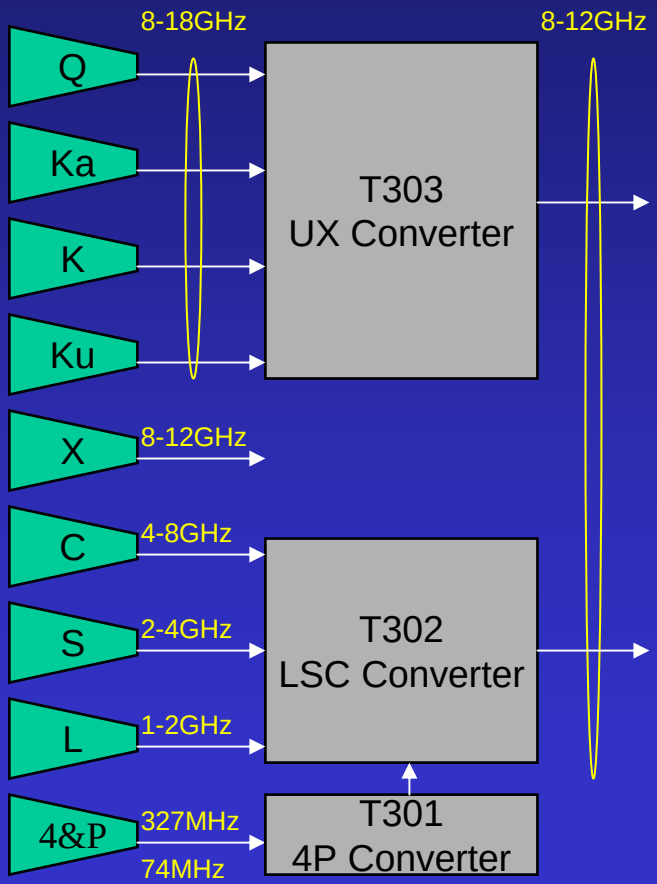
Things to Do

- Gain stability testing of IF system
  - Currently having a possible issue with this
  - Test all modules in environmental chambers
  - Have been limited by time and available hardware
- Improve repeatability in modules
  - Some modules still must be calibrated and installed as matched sets – would like to avoid this
- Detailed analysis of ground system noise
  - Seems to be issues in both antennas and building

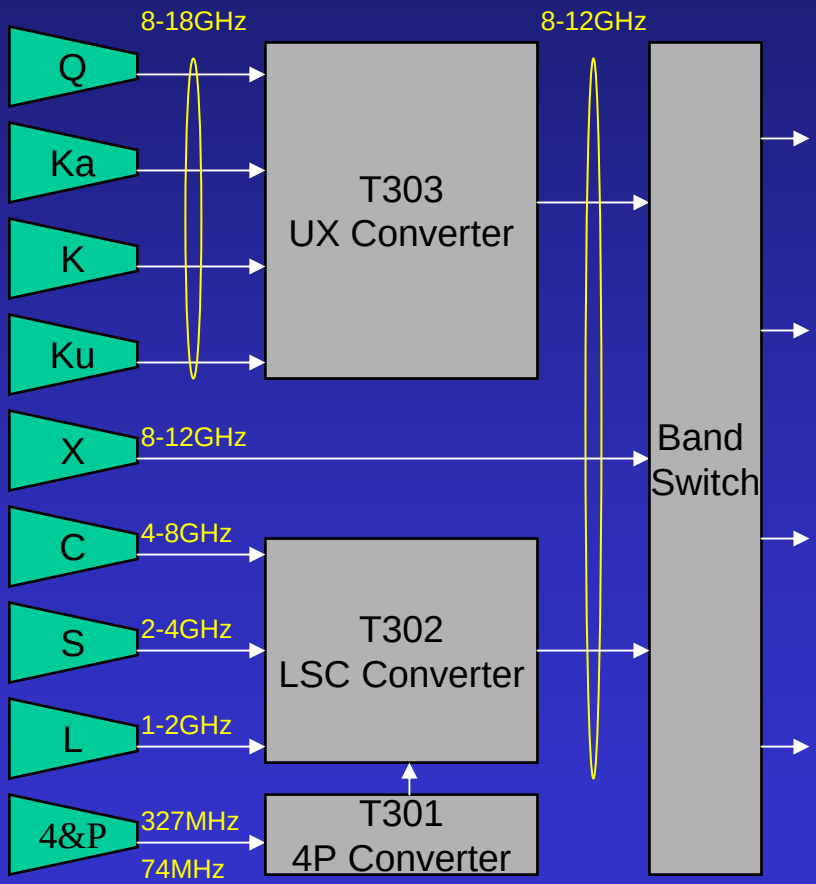
EVLA Antenna IF Diagram



EVLA Antenna IF Diagram



EVLA Antenna IF Diagram



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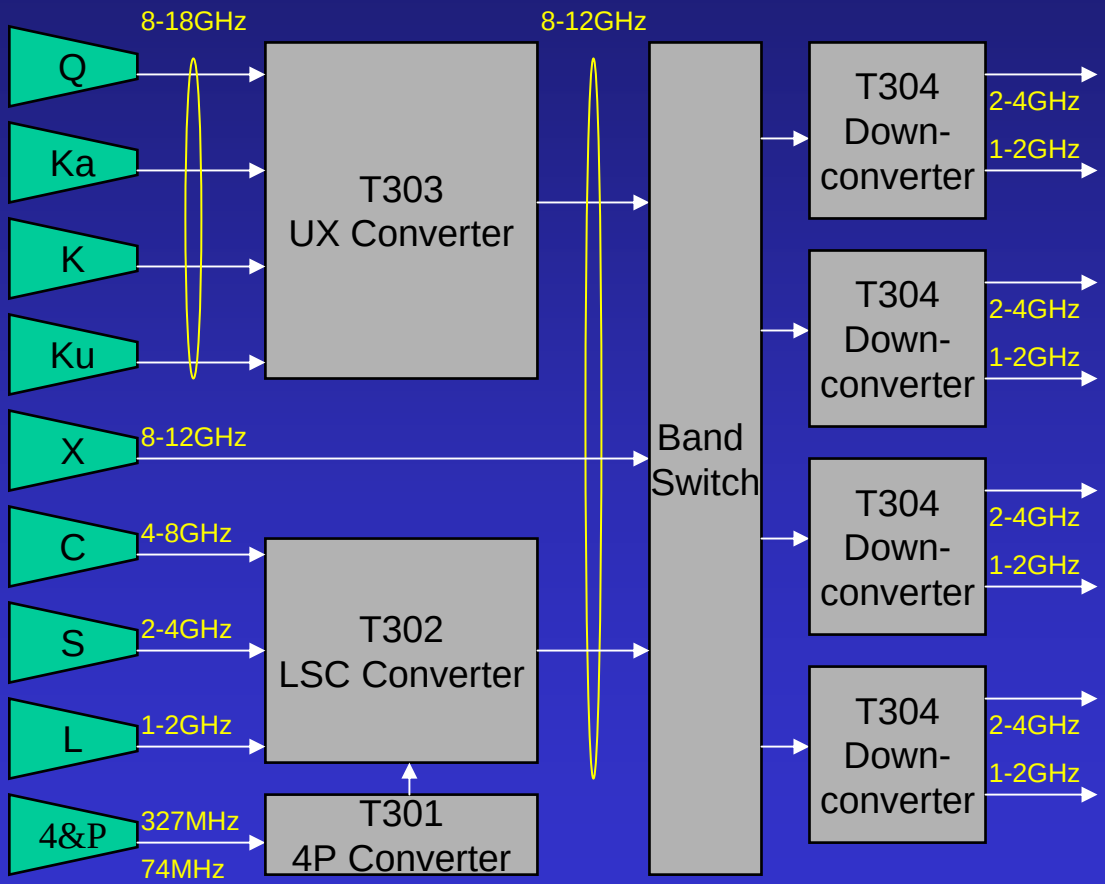

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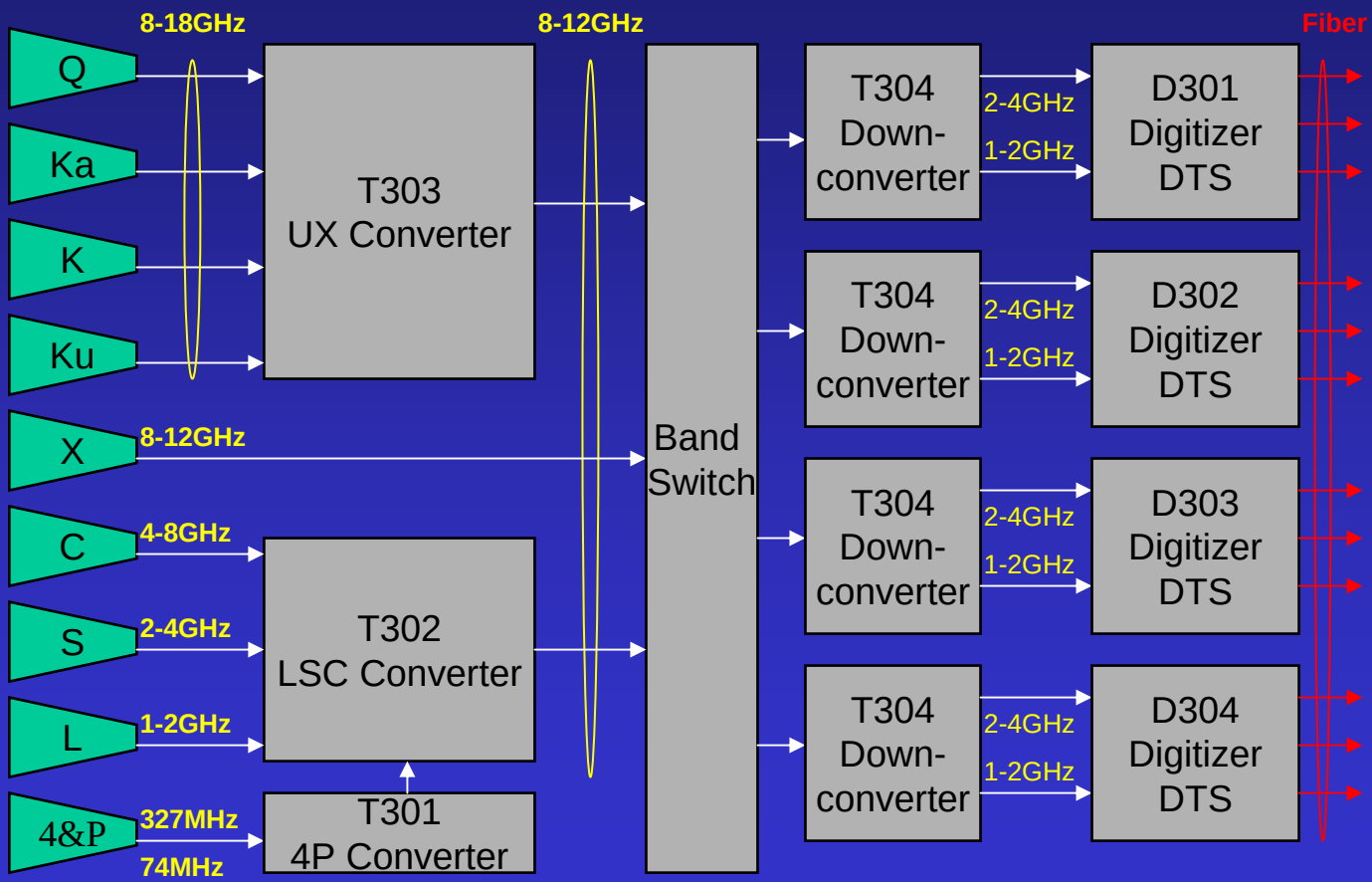
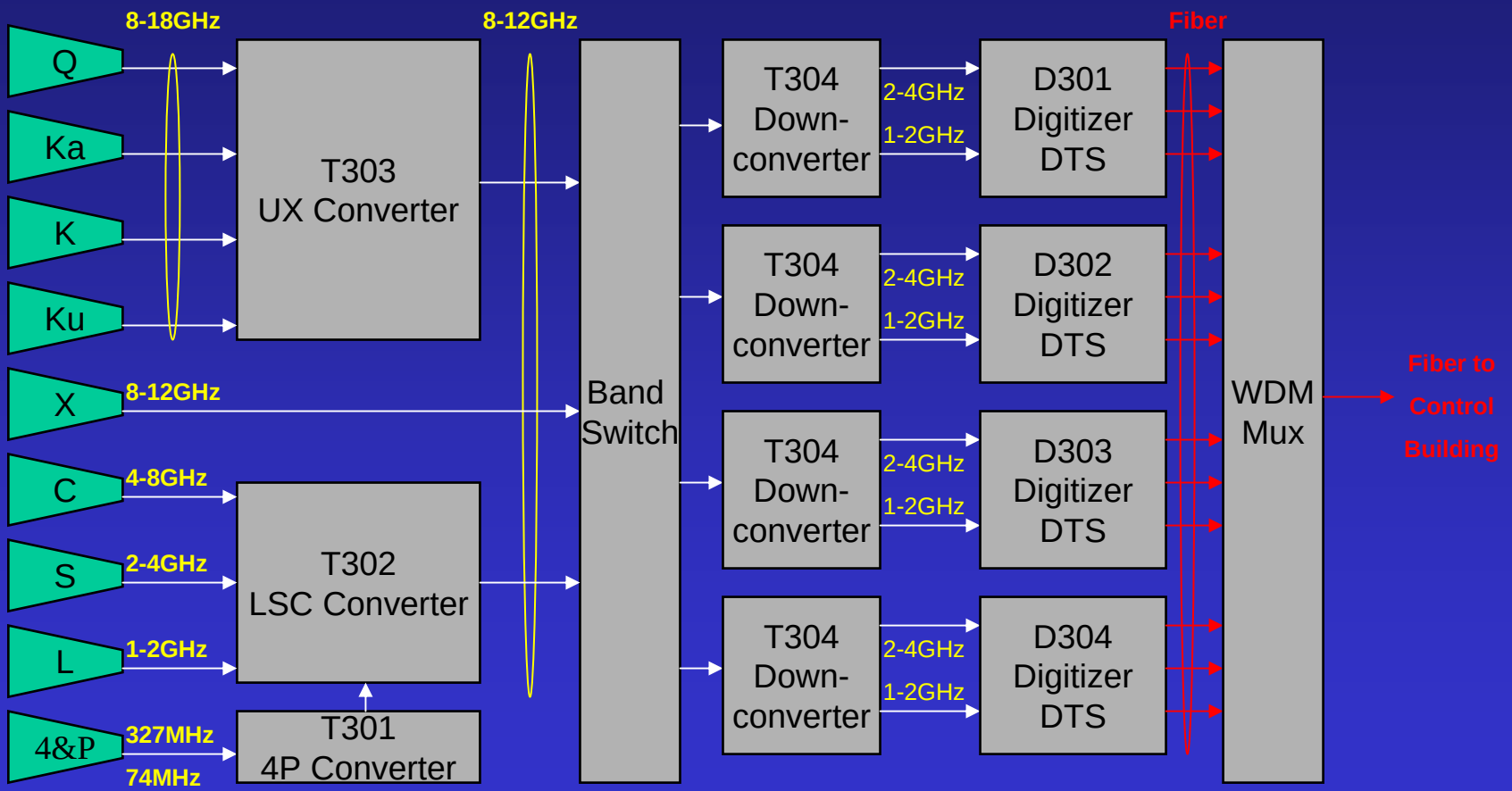
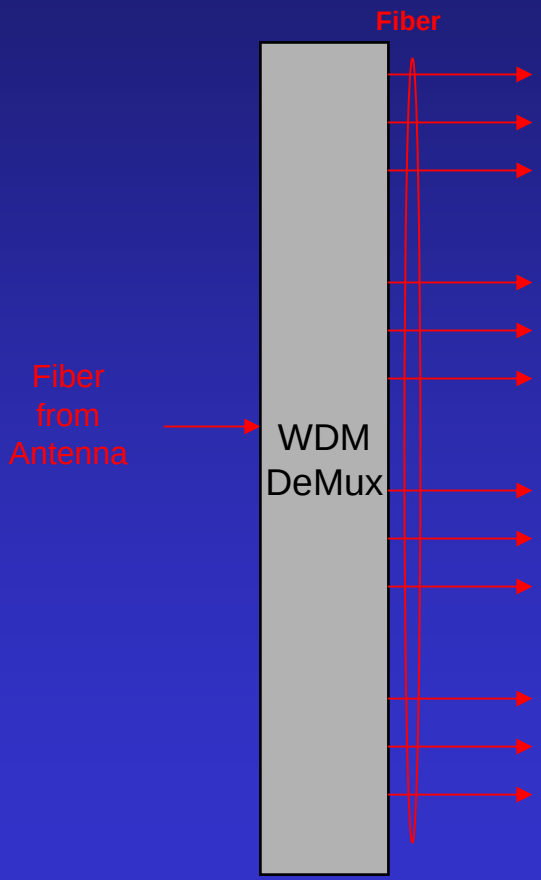


EVLA Antenna IF Diagram



EVLA Control Building IF Diagram



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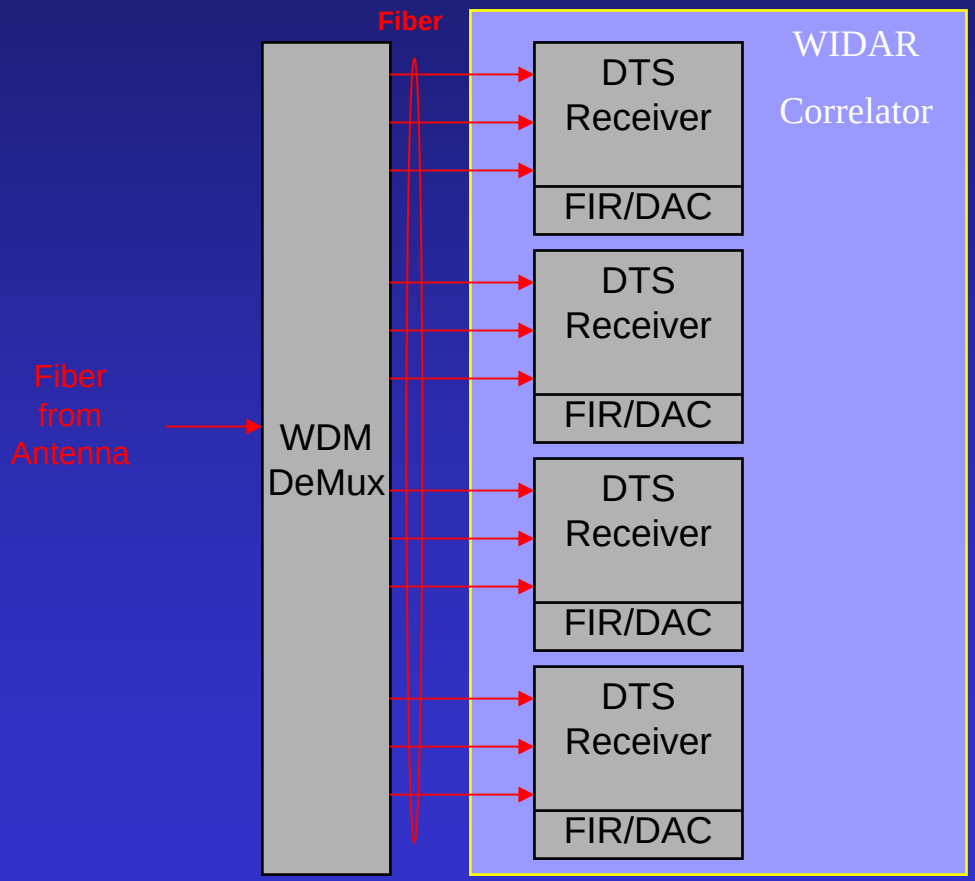

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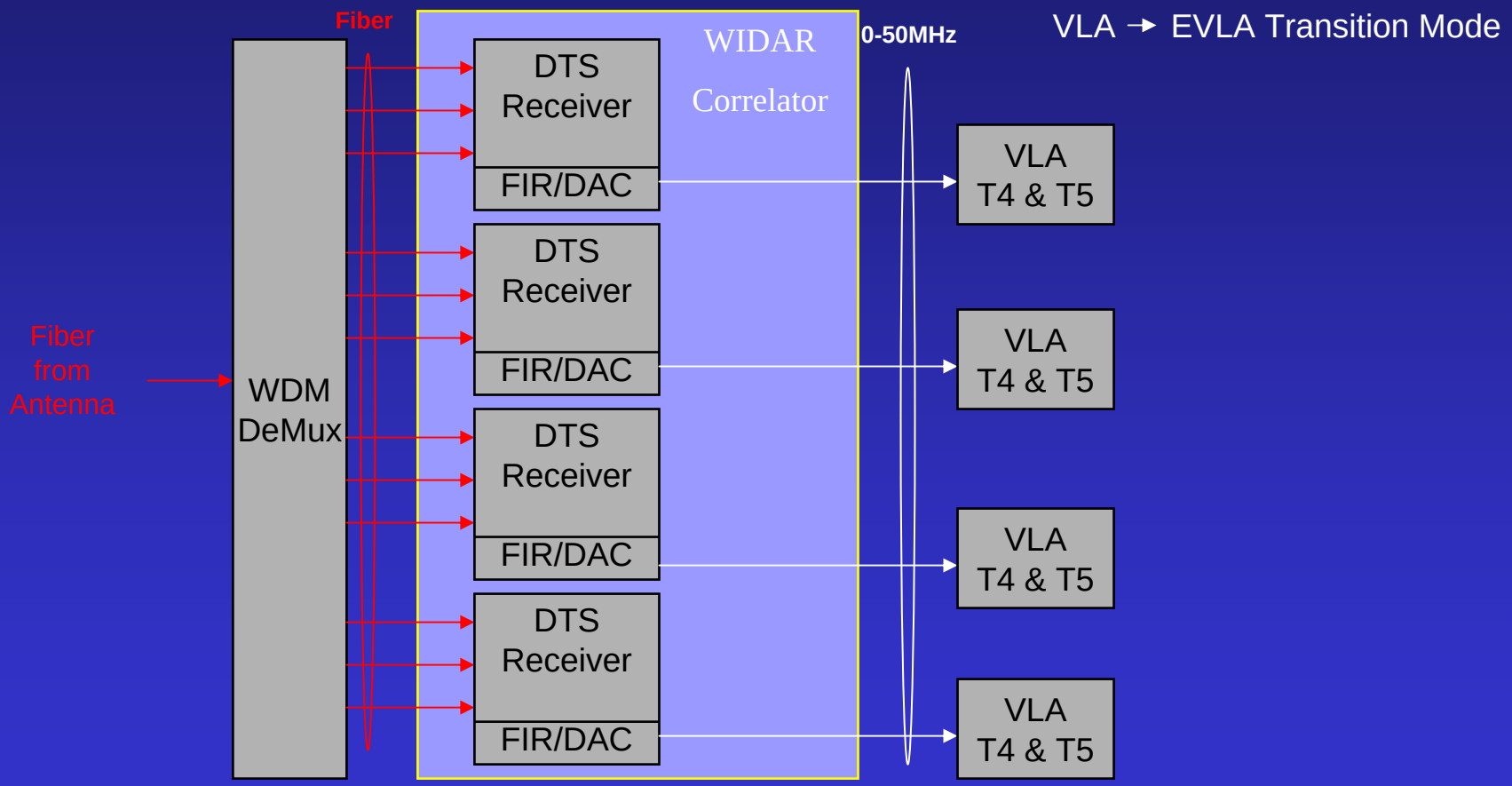

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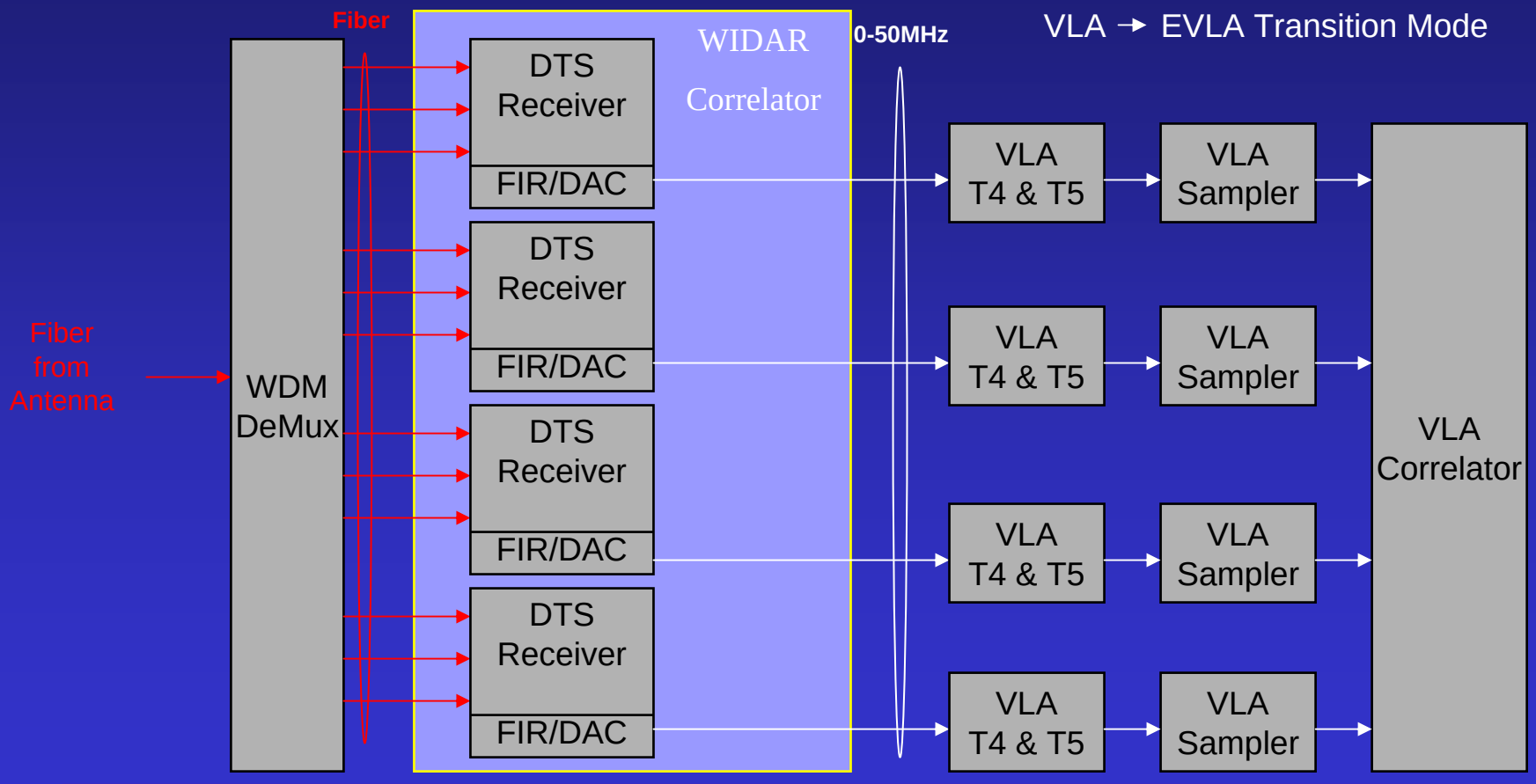
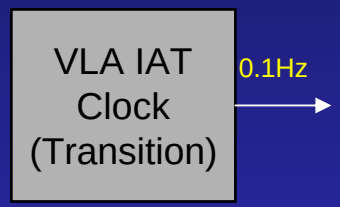
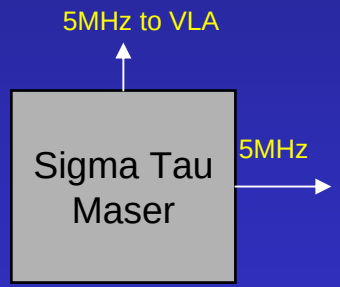
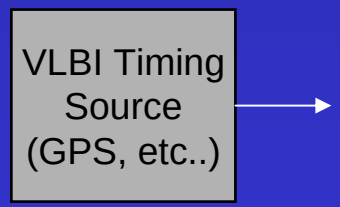


EVLA Control Building LO Diagram







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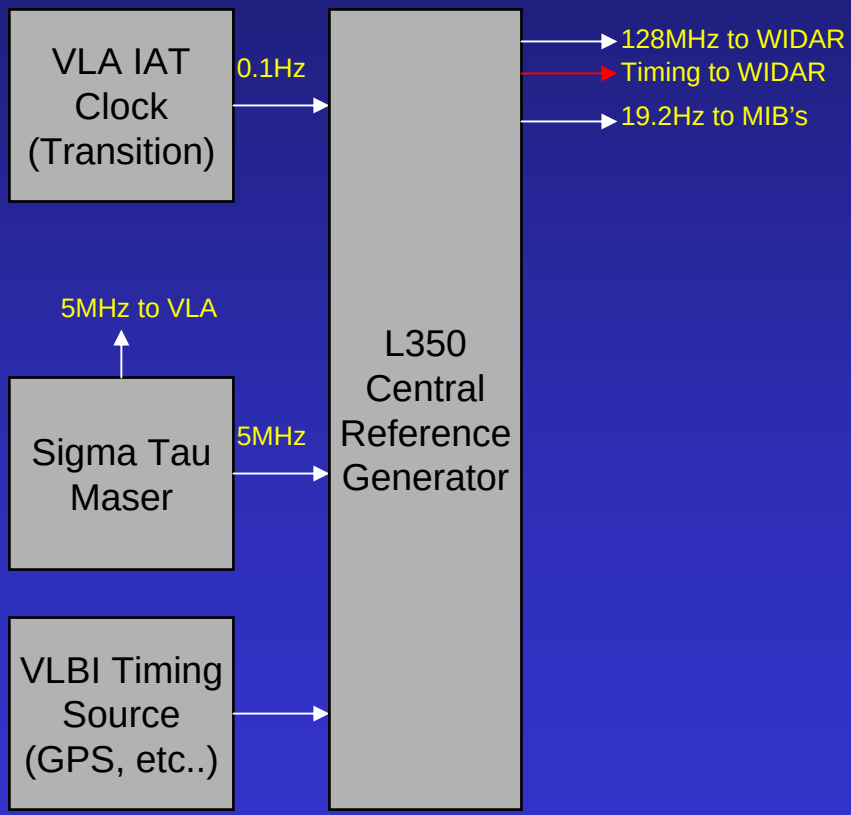

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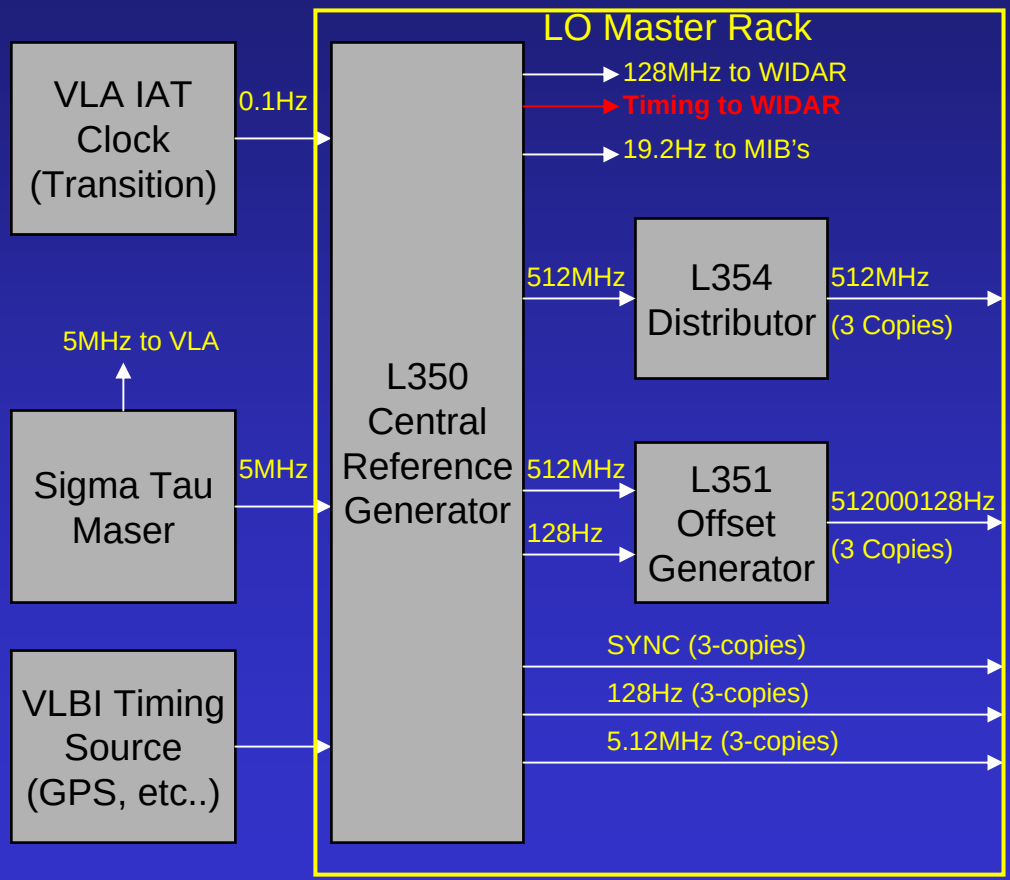

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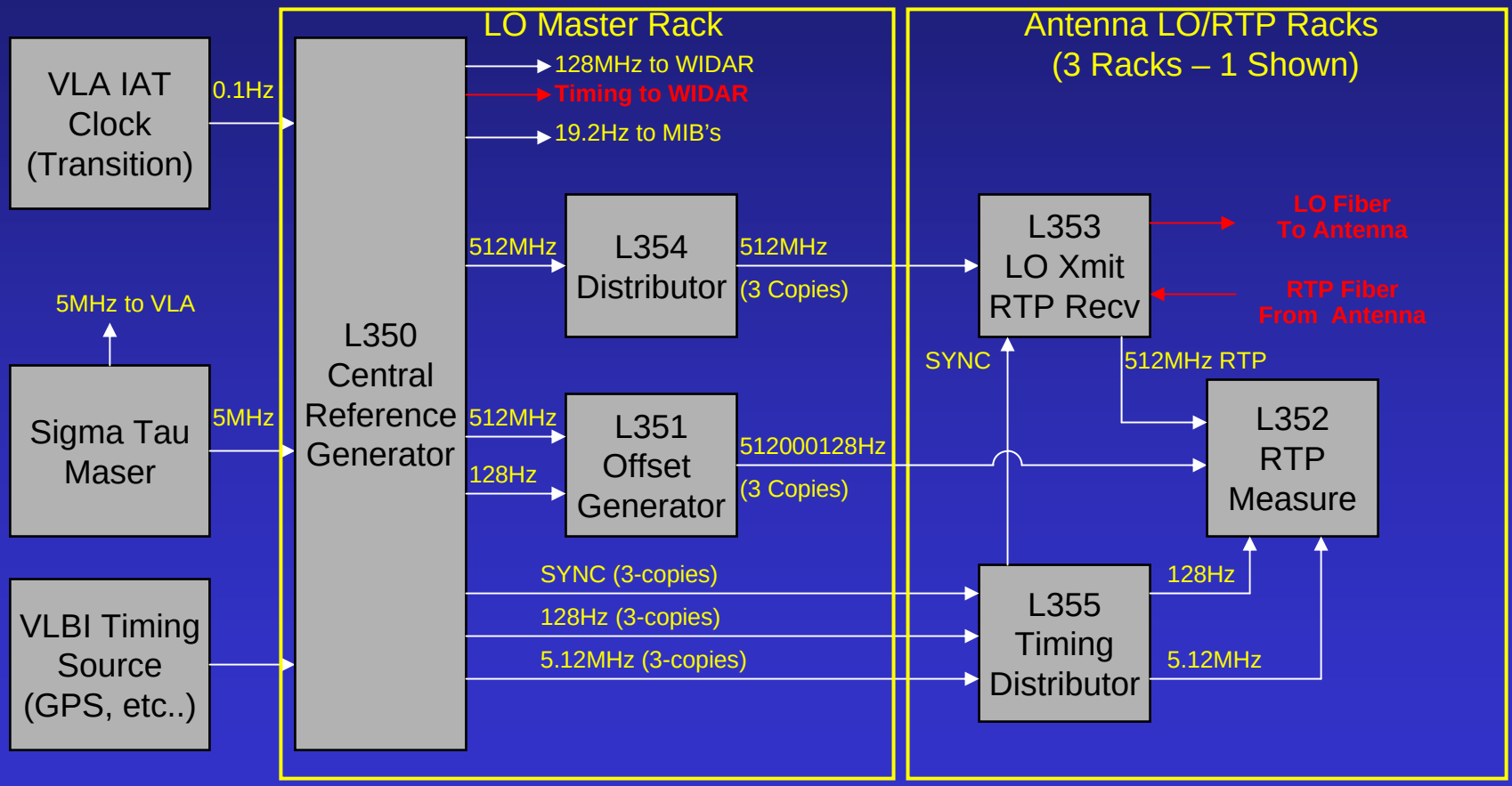
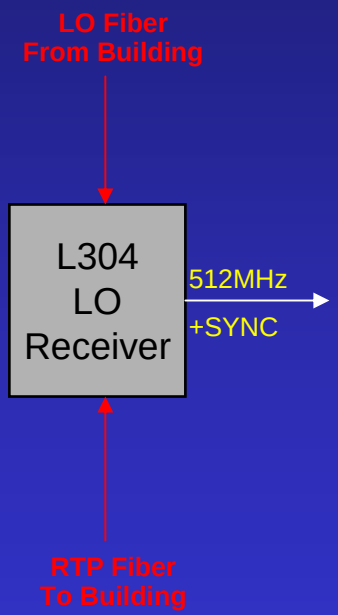


EVLA Antenna LO Diagram



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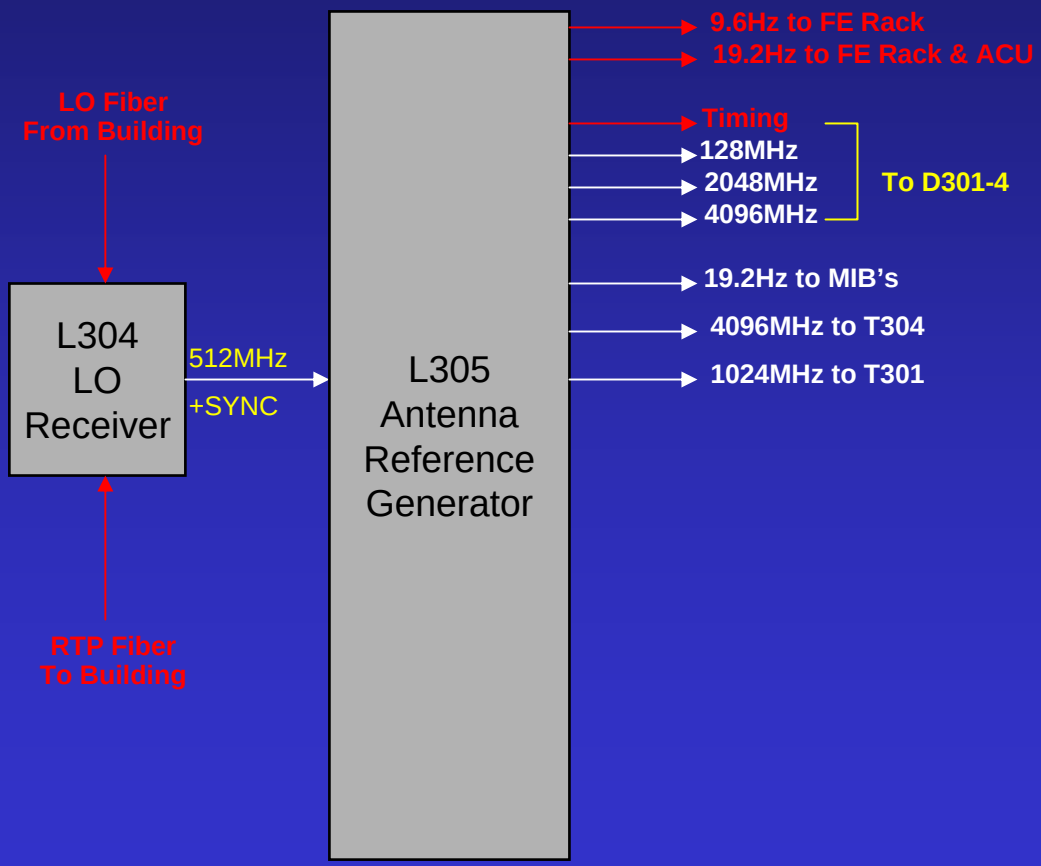

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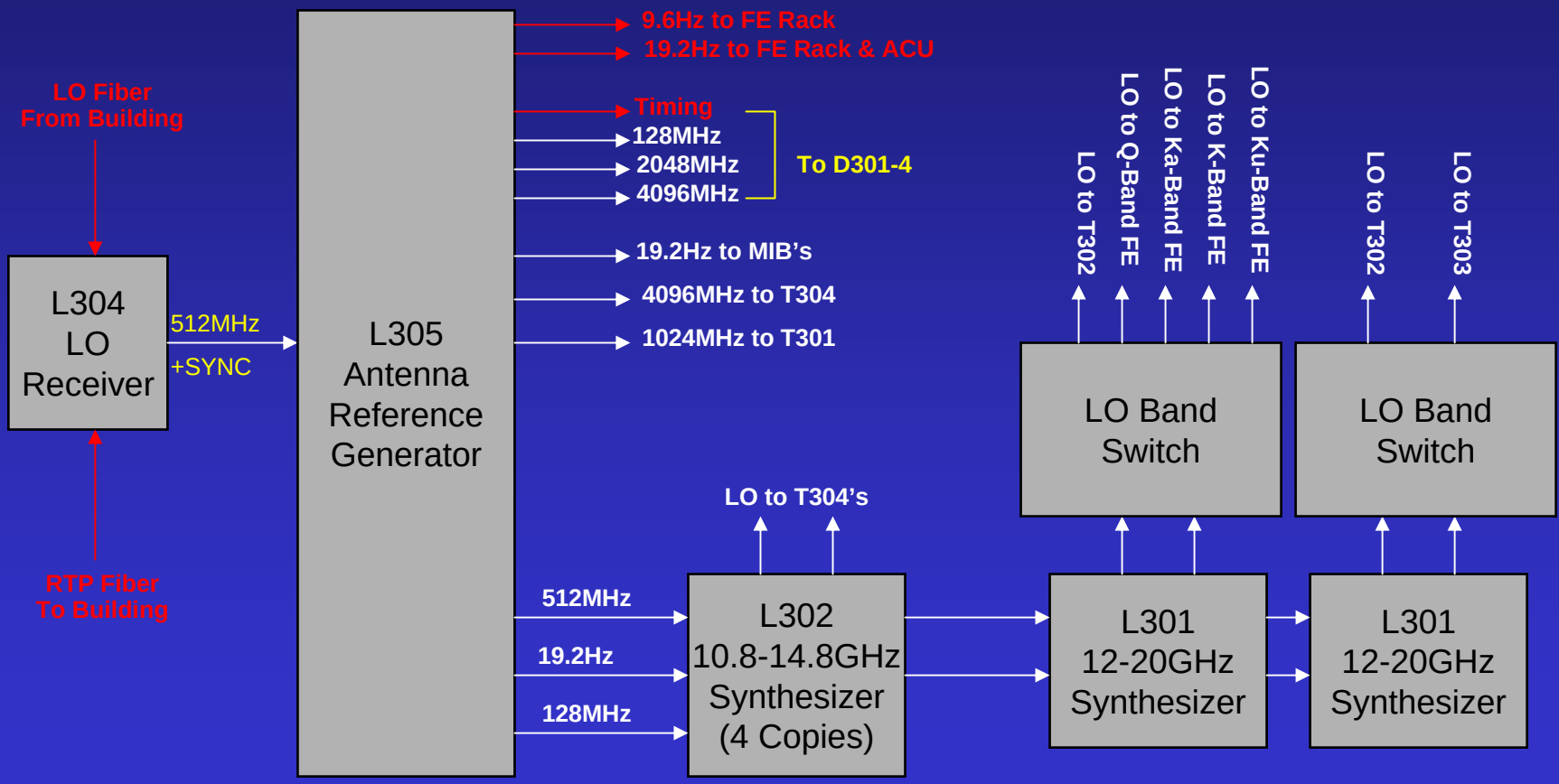

Questions?