Fiber Tasks
Preliminary Design Review
December 5, 2001
CB Main Distribution Frame

- IF Patch Panel
  - 12 WDM per Fiber
  - 73 Fibers

- LO Patch Panel
  - 73 Fibers

- M&C Patch Panel (TX & RX)
  - 146 Fibers

- Back-up Communication Patch Panel
  - 73 Fibers

- Telephone Patch Panel
  - 146 Fibers

Array FO Termination Room

- Array Termination Panel

- Space Reserved E Array Option
  - (15 Pads, 180 Fibers)
- West Arm Fiber Entrance
  - (25 Pads, 300 Fibers)
- North Arm Fiber Entrance
  - (24 Pads, 288 Fibers)
- East Arm Fiber Entrance
  - (24 Pads, 288 Fibers)
Patch Panels

- Similar to Termination Panel
- Located throughout the Control building
Phone System

• Two phones per antennas,
  – Vertex room and Pedestal
• Phone numbers remain with the antenna
• Will use the fiber system
• Will use COTS hardware

• Responsible for providing the Fiber from the Termination panel to Phone Room
Battery Backed-up Communication

- Similar to VLA WYE Monitor
- Un-interruptible power supply
MCB Network

- Standard Ethernet (two Fibers)
- COTS Network Router
- 1 Gbit/s to antennas
- 100 Mbit/s in the antennas
- Support ~48 nodes in each antenna
  - Two multi-mode fibers per node
  - Fiber to the Module
- Patch Panel will be located in the computer room
LO System

• Responsible for Lasers, Modulators, Fiber, Circulators, Receivers
  – Maybe integrated into the LO module
  – Phase stable system
• LO Patch panel
  – located in the Electronics Room
  – Fiber test equipment
• System Self-tests included
IF System

- Transmitters
- MUX-Fiber-DeMUX components
- Fiber Amplifiers
- Receivers
- Online monitoring
IF Transmitters

- Twelve Lasers – ITU spacing
- Automated Test
  - Output Power Measured at Each Laser (1% tap)
  - MCB accessible

- Manual Optical Power Measurements
  - Can be measured at the MUX output
IF Patch Panel

- Located in the Correlator room
- Includes De-MUX hardware
- Includes Fiber Amplifiers

- Manual Test Equipment
  - Full Signal Communication Analyzer
Rack Mount EDFA

- MCB adjusted Gain of each amplifier
- Also measures in/out optical power
IF Communication Analyzer

• IF Patch Panel
  – Manual measurements during reconfiguration

• Complete Diagnostic
  – Jitter
  – Q Factor
  – Noise Margin
  – Rise / Fall times
IF System On Board Tests

• Test Patterns Generated at each Transmitter
• Nine Test Patterns
  – No Sync, alternating 1/0, all Ones, all Zeros
  – Parity Errors

• MCB controlled
Divided Sync Word

• Required to Identify Correct 1/2 Sequence

• 10 Bits long,
  – 6 bit identify Start-of-Frame
  – Barker Sequence - equal Ones versus Zeros

• Three Stage Synchronization Process
Sync Implementation

![Diagram](image)

- 32 bits @ 250 MHz
- 64 bit latch
- 64 bit latch
- 16 bit partitioning and re-ordering
- multiplex by 5
- multiplex by 5
- 16 bit selector
- multiplex by 16
- 1 bit @ 10 GHz
- 160 bit Frames @ 10 GHz

- 16 Format bits @ 62.5 MHz
- 64 bits @ 62.5 MHz
- 80 bits @ 62.5 MHz
- 16 bits @ 312.5 MHz
- 16 bits @ 625 MHz
- 16 bits @ 312.5 MHz
- 16 bits @ 625 MHz
Three Stage Synchronization

• Stage 1 - Search bits for frame pattern
• Stage 2 – Monitor for “Correct” sync
• Stage 3 – If two “Bad” frames in a row or 2-out-of-8 frames are “Bad”

Then Start Search Again
Timing Signals

- Metaframe Index
- Metaframe Sequence Count
- 1 PPS
- 1 Pulse per 10 seconds
Data Valid Signal

• Initiated at the antenna
  – Toggle Switch
  – MCB controlled

• Passed to correlator
Check Sum - BER

- Each 19 bits Generate a check Sum
- Provides continuous Bit-Error-Rate Performance Monitoring
- Only odd # of errors per 19 bits Detected
- Flags Correlator when over threshold
Scrambling

- Frame Synchronous Scrambling
  - Select pattern is modulo 2 added
  - Entire frame – except sync bits

- Pattern results in
  - Equal number of Ones/Zeros providing
    - Balance ac content, sufficient transitions
    - Minimize low frequency content
Conclusion

• Five systems will be supported
• On Board Tests Incorporated (MCB)
• Patch Panels will have test equipment
• IF Data Format will support Growth
Next Topic
IF Signal Path

**Diagram Details:**
- **Module Conn.** → **Bin Conn.** → **Vtx Blkhd Conn.** → **Antenna Conn.** → **Pad Conn.** → **Termination Panel** → **Patch Panel** → **Bin Conn.** → **Module Conn.**
- **Tx (12) → MUX** → **Jumper Cord** → **22km Fiber** → **EDFA** → **DMUX → Rx (12)**
- **Vertex Room** → **Antenna Structure** → **Fiber Optics Closet** → **Correlator Room**

**Symbols:**
- **● = One Fusion Splice**