



Data Acquisition Group Fiber Optic System Review

June 10, 2002

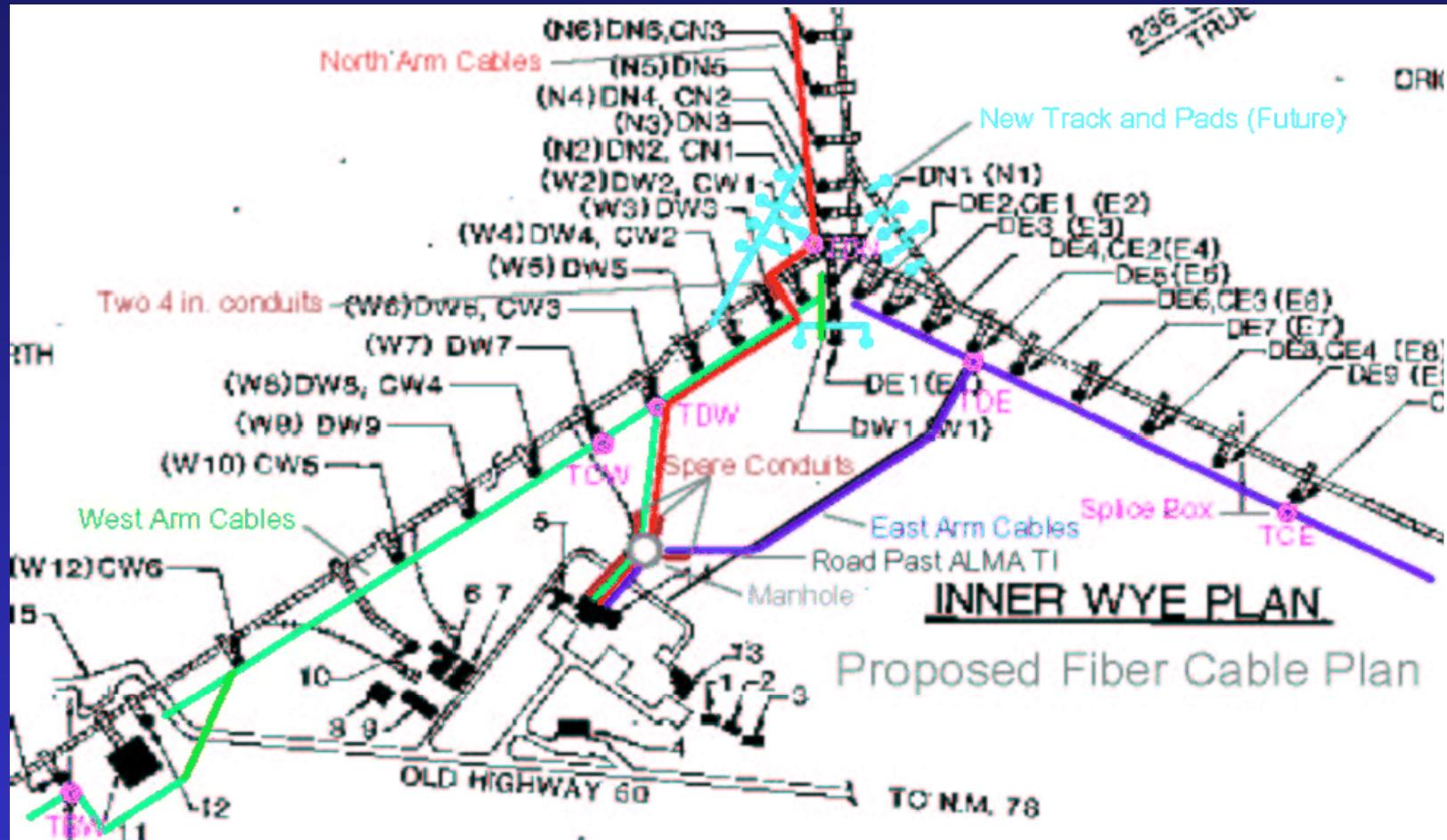


DAQ EVLA Tasks

- Fiber in the ground and in Antennas
 - Cable Wrap
- Digital Transmission System
 - Digitizer/Formatter Module
- MCB in the Antennas
- LO lasers and Receivers
- Fiber Patch Panels - IF, LO, MCB



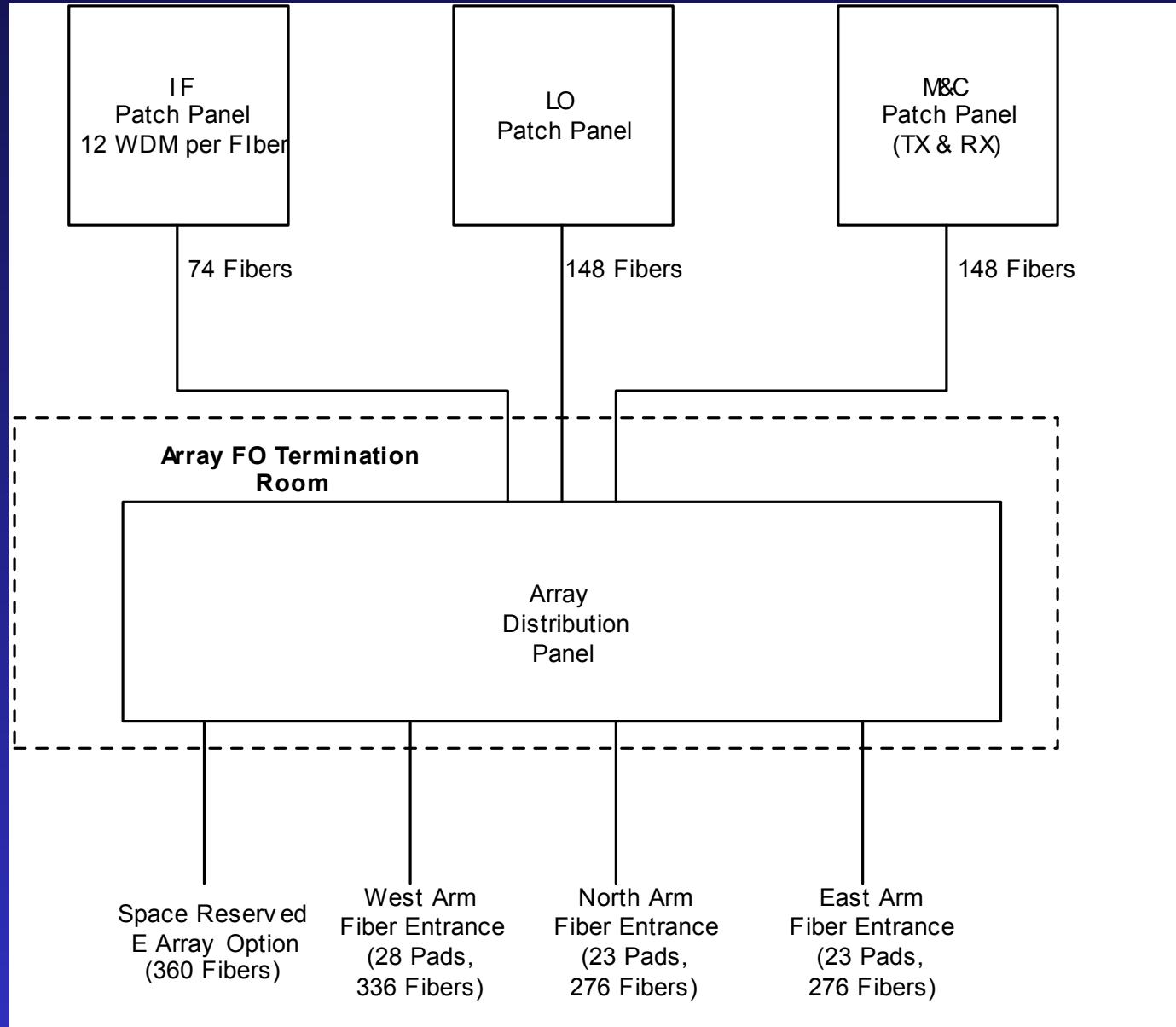
Fiber Cable Plan





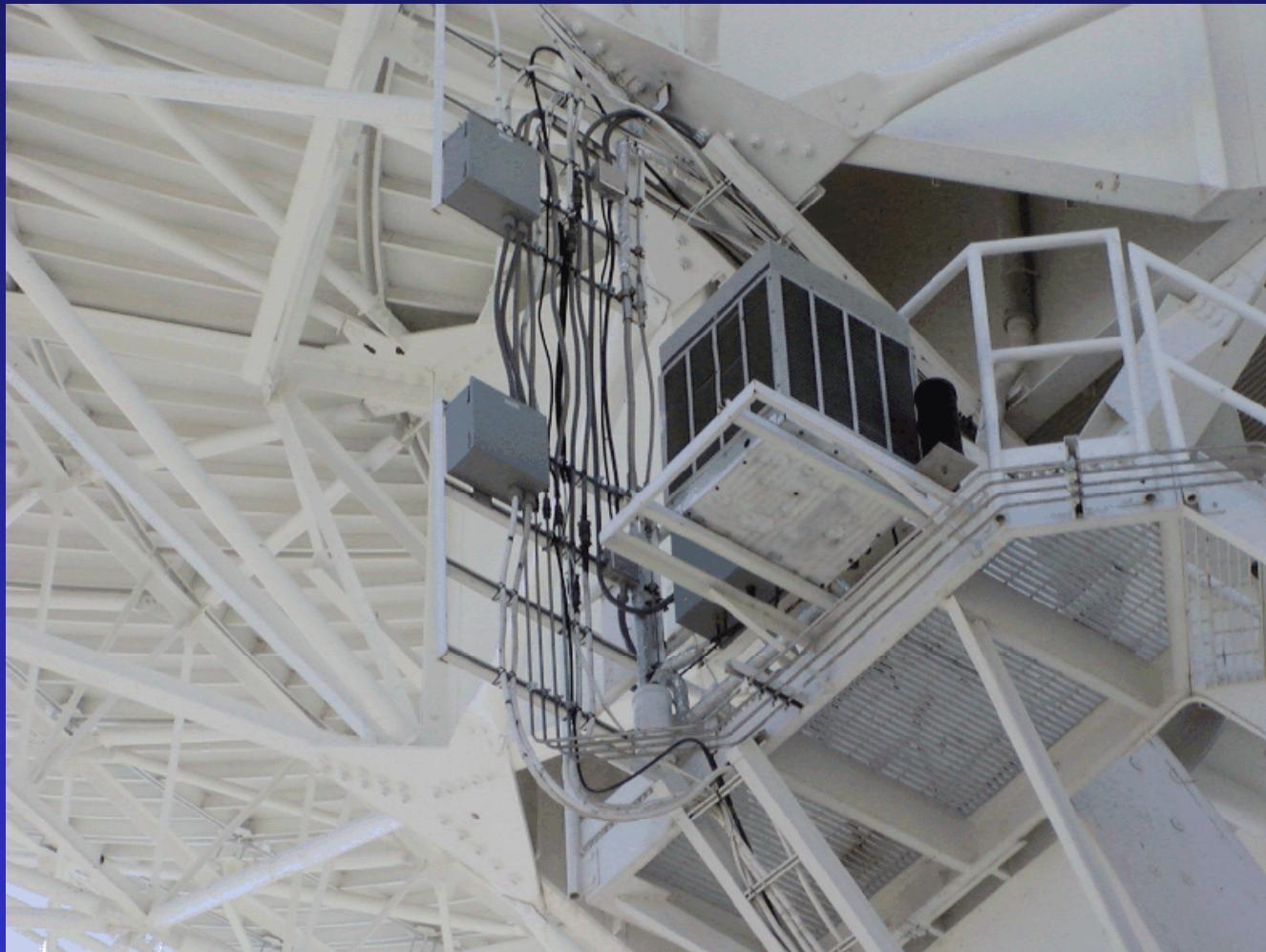
Ditchwitch Trencher





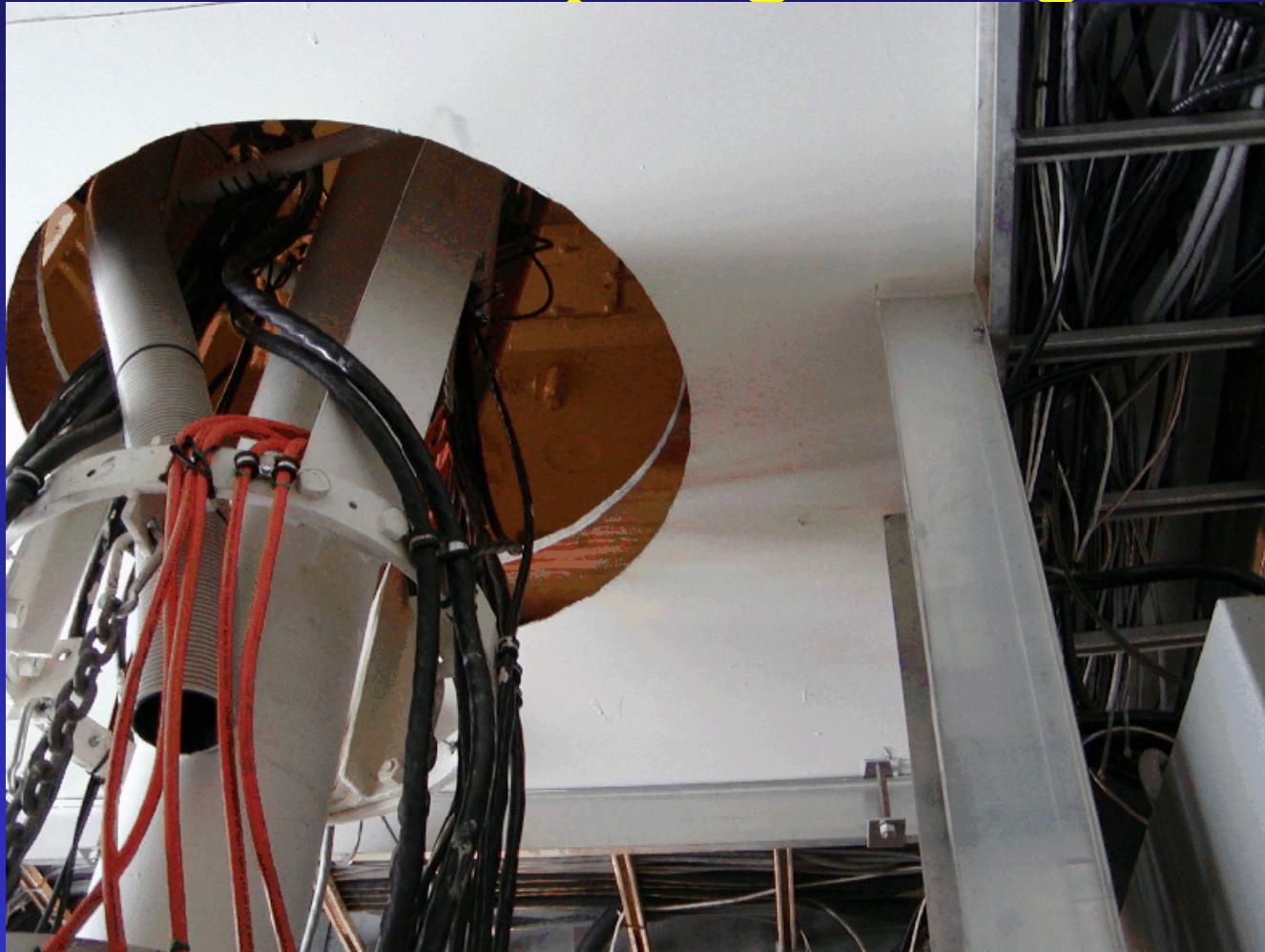
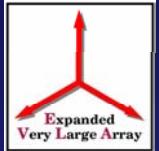


Cable-Temperature Stabilized





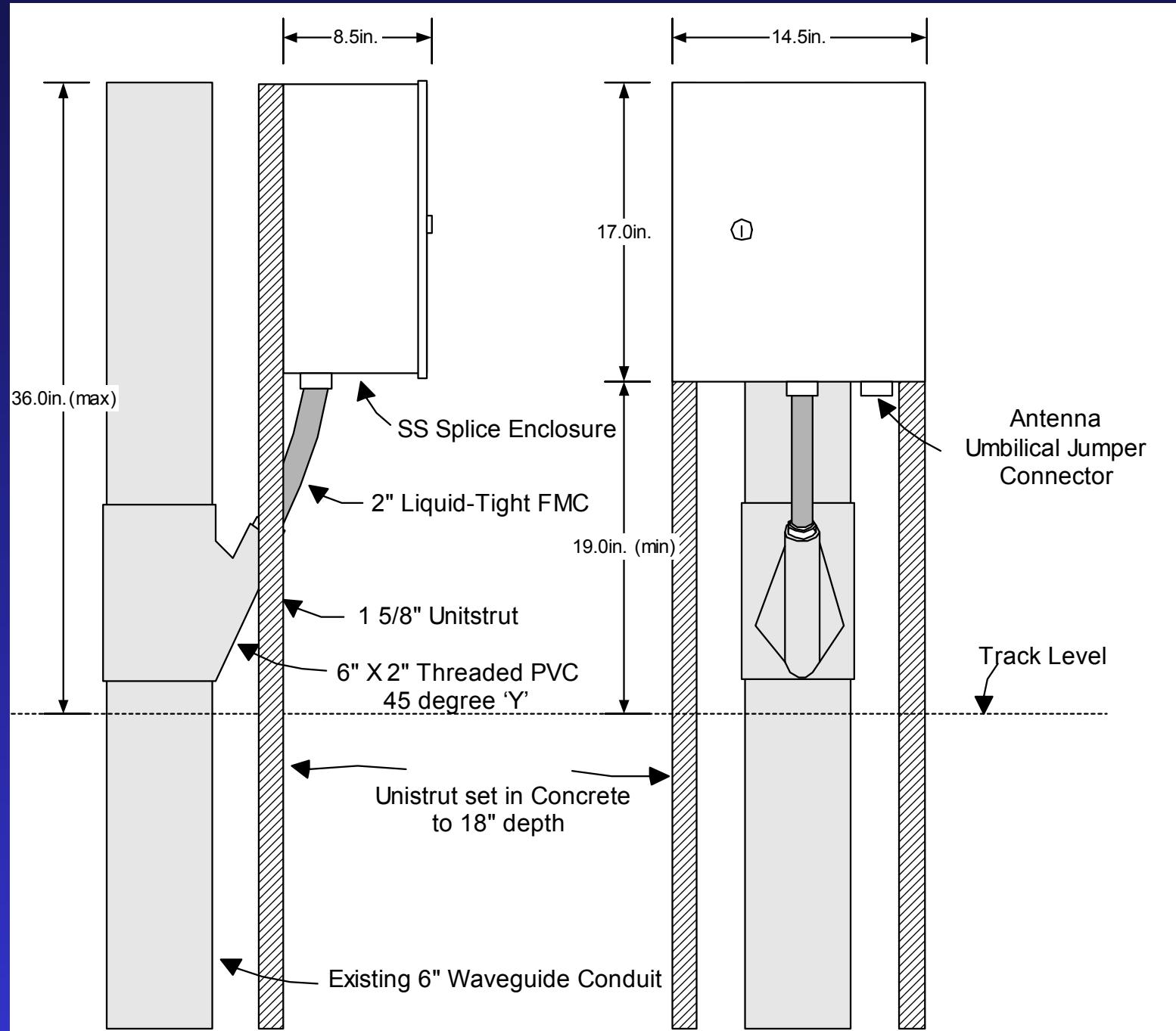
Fiber Cable Wrap Watch Spring Design





CB Main Distribution Frame





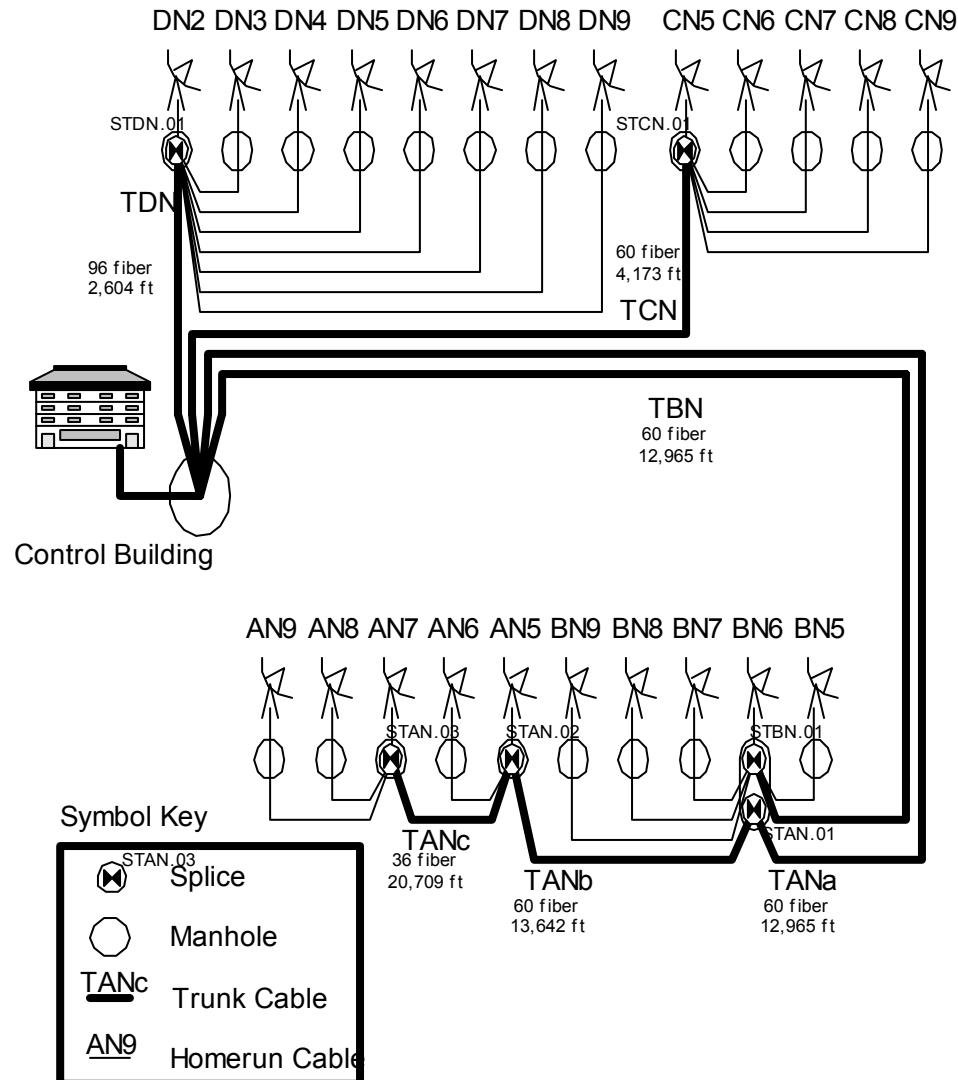


ITT Industries, Cannon 12 Single mode FOMC





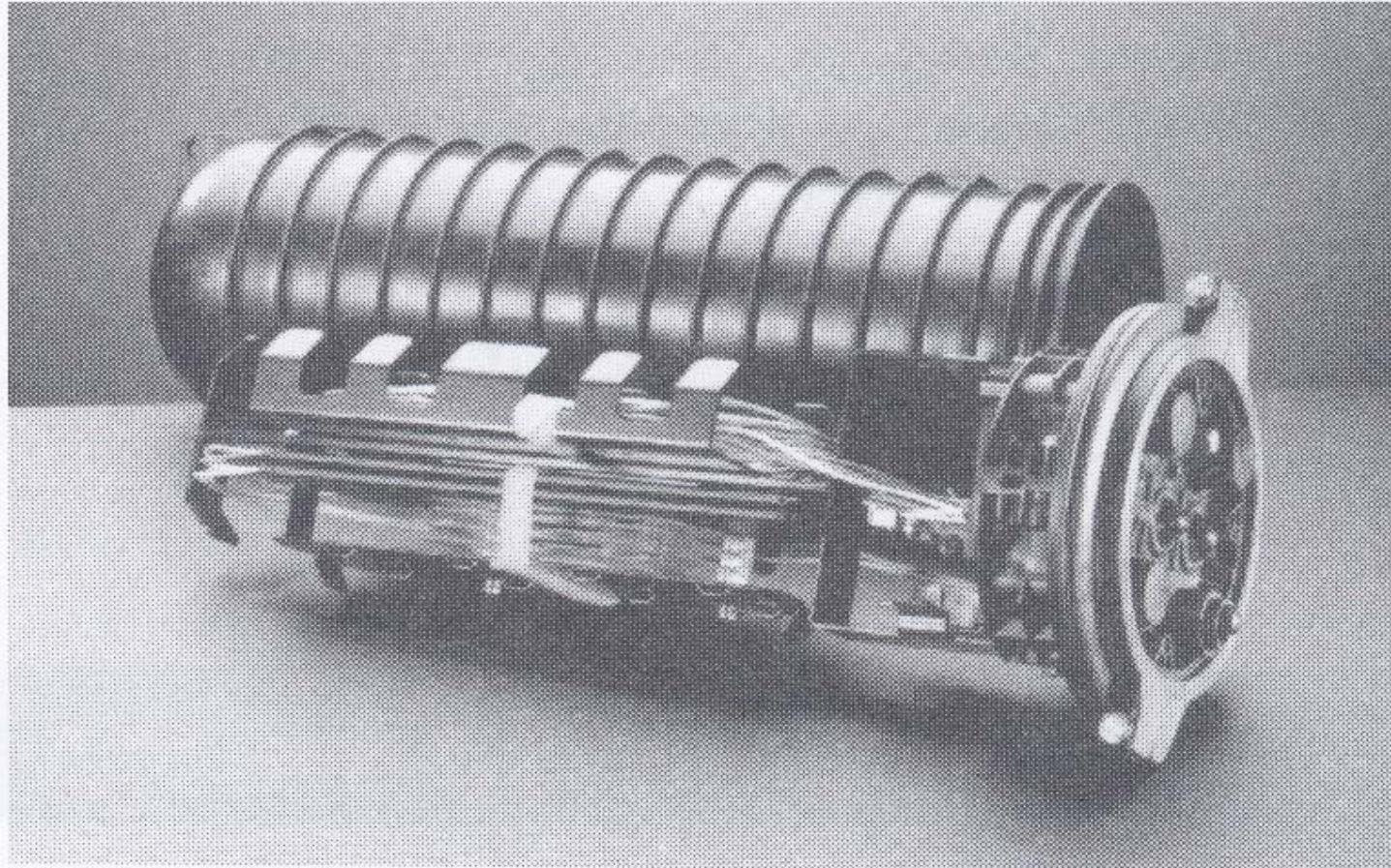
EVLA North Arm Fiber Cable Plan





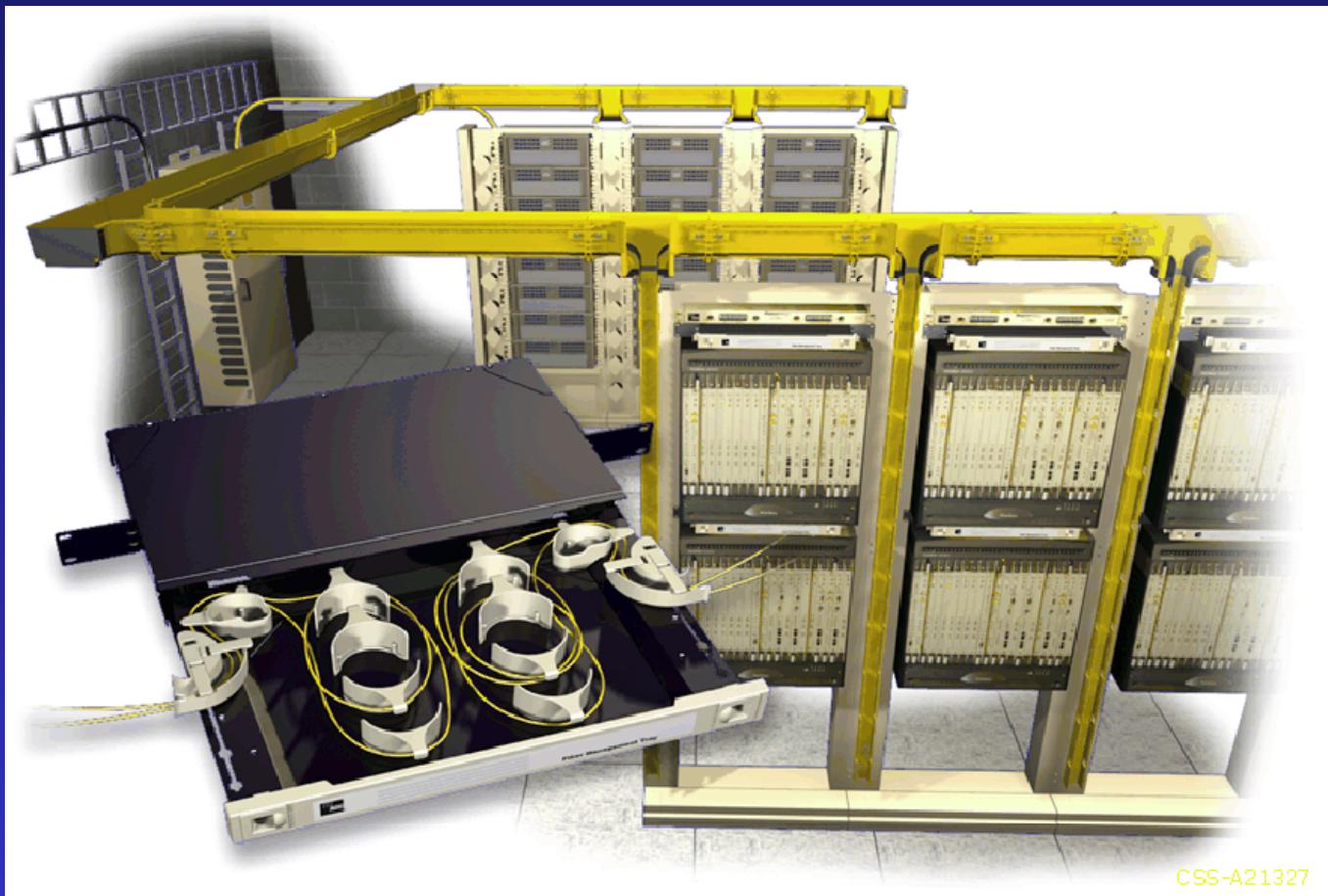
Cable Burial Plan

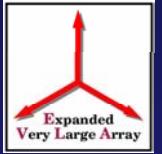
Direct Burial Splice Box



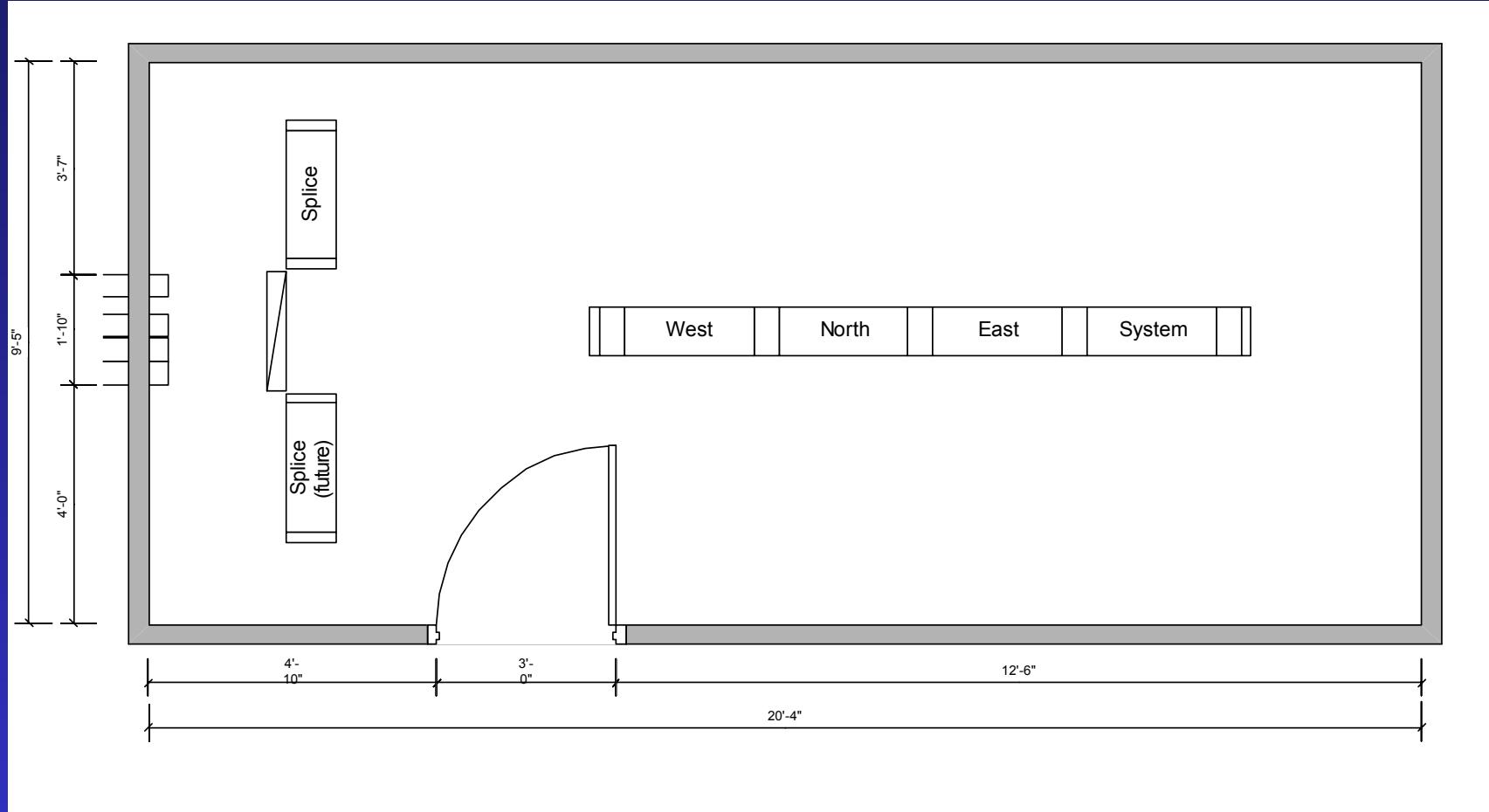


Typical Termination Room



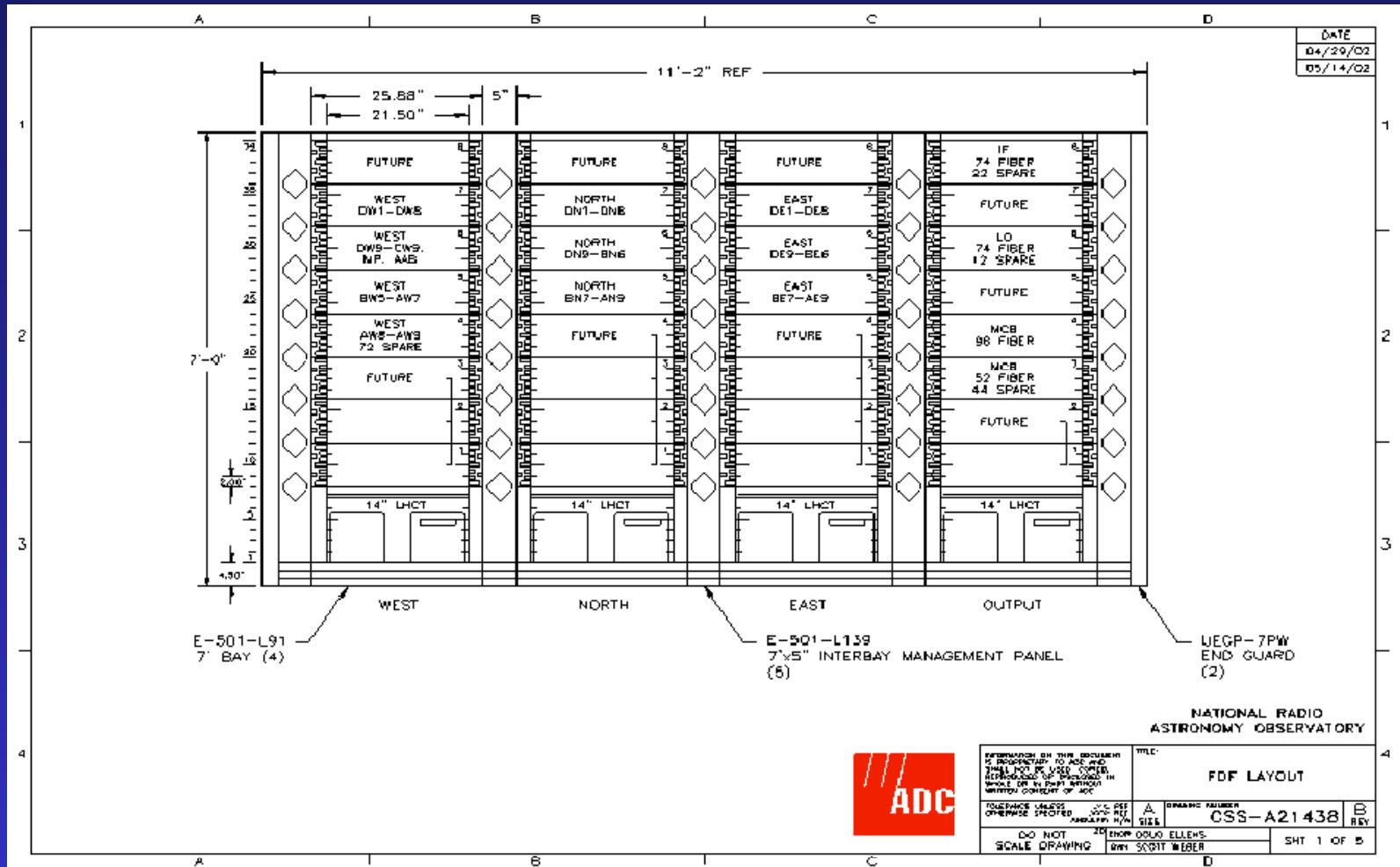


Termination Floor Plan



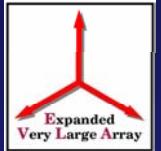


Termination Panel

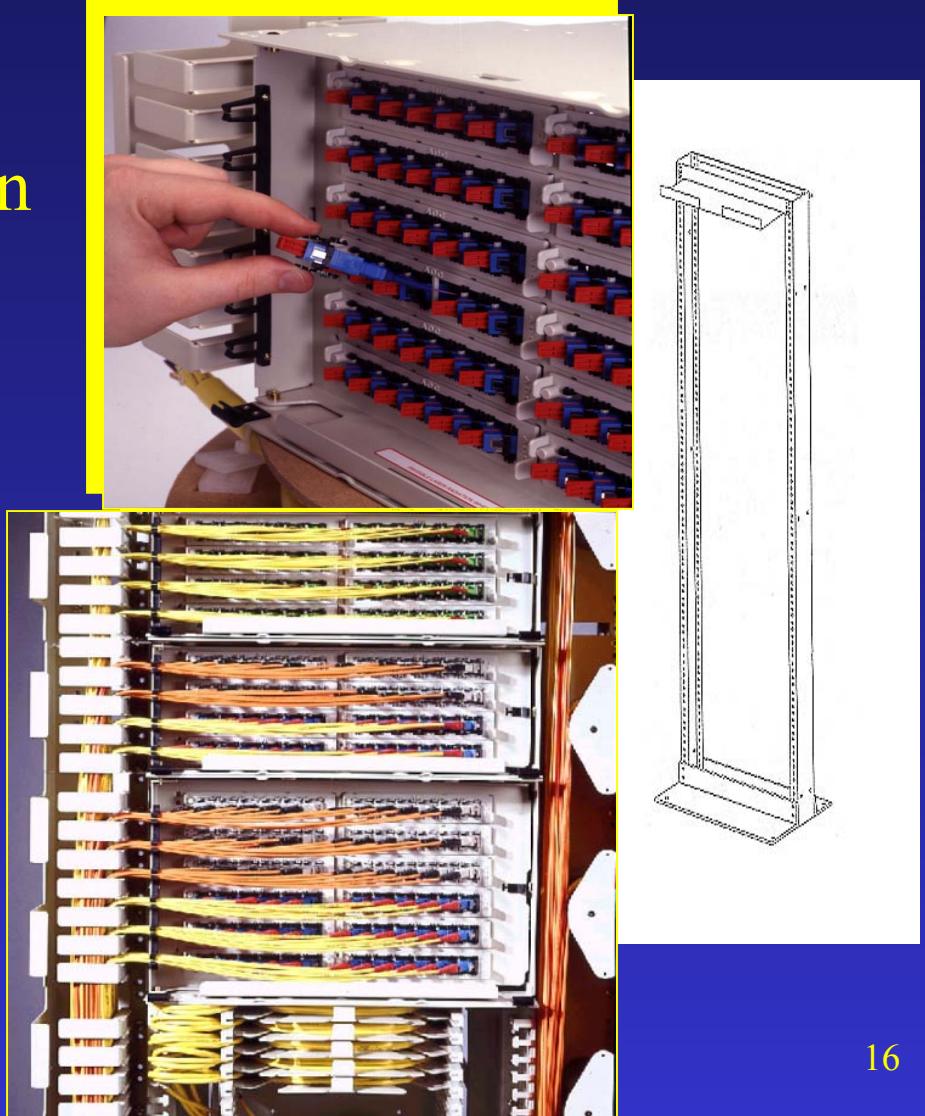


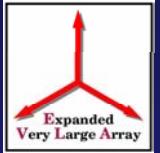


Patch Panels



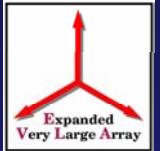
- Similar to Termination Panel
- MCB Located in Control Room
- LO Located in “Data Rack” Area
- IF Located in the Correlator Room





MCB Network

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



MCB Network Hardware

- 1 Gbit/s Transceivers
- Typical Equipment used to determine RFI
- Will be installed in shielded enclosure in the Antennas



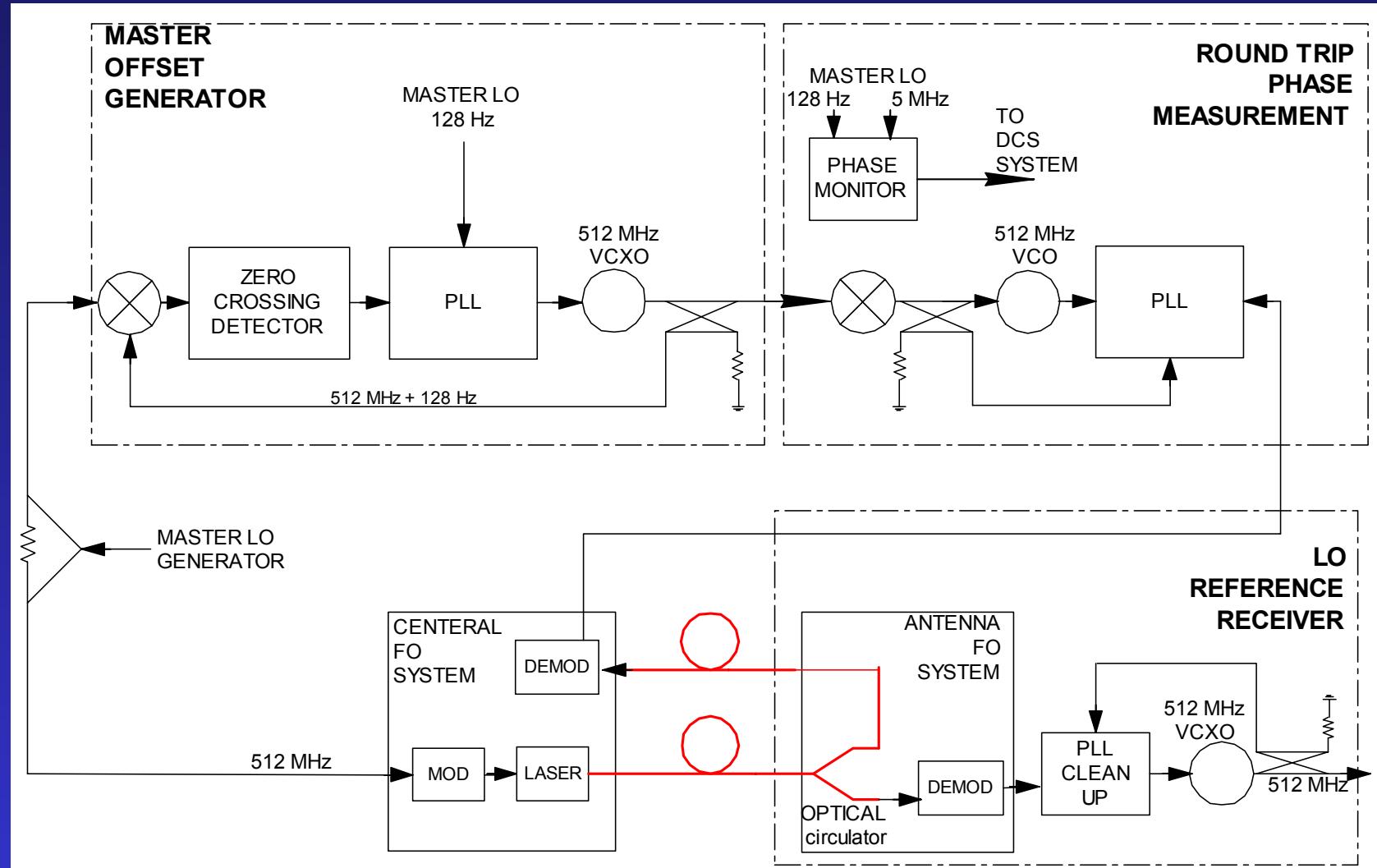


LO System

- Responsible for Lasers, Modulators, Fiber, Circulators, Receivers
 - Integrated into the LO module
 - Phase stable system
- LO Patch panel
 - located in the Data Rack Area
 - Fiber test equipment
- System Self-tests included

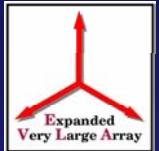


LO Block Diagram





IF Parameters



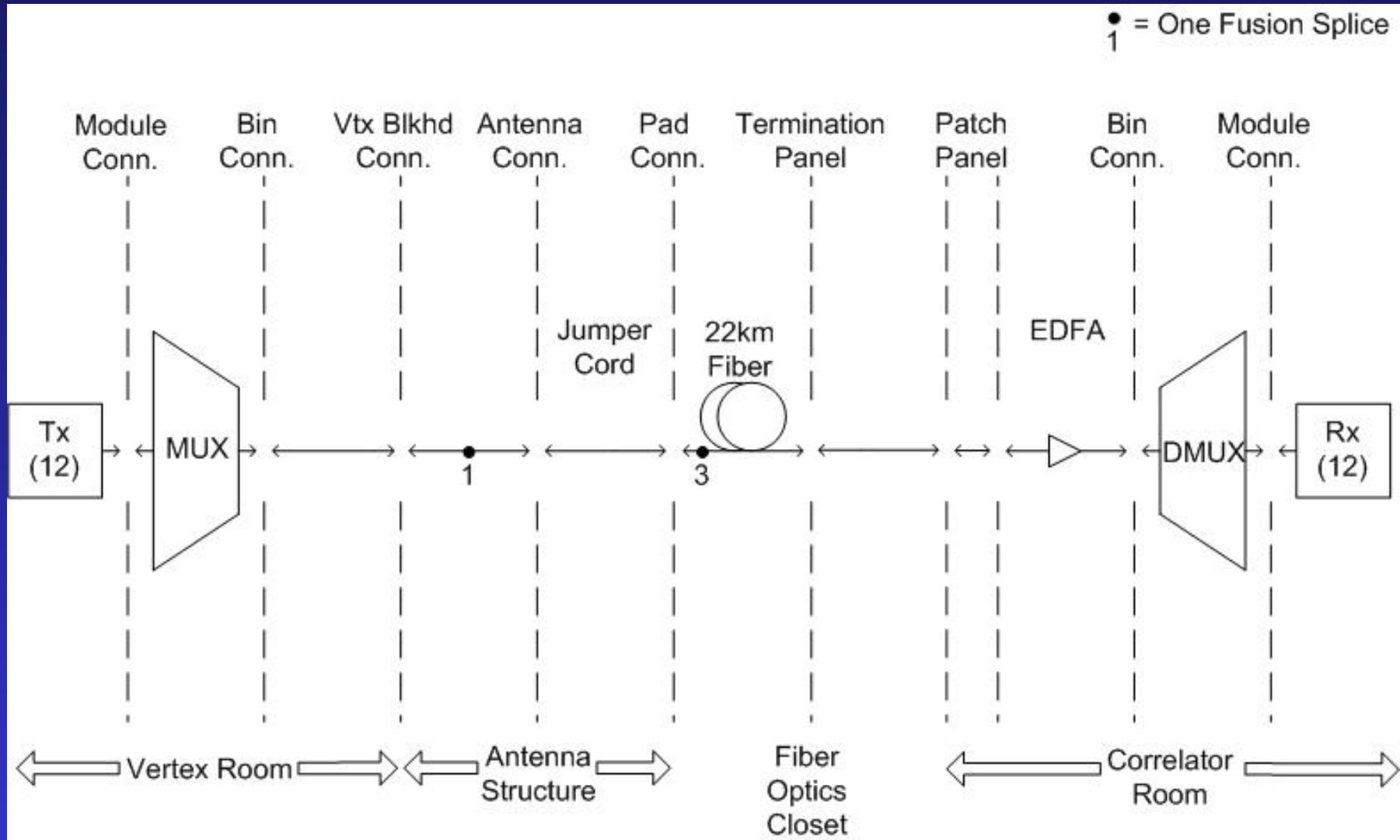
Bit Rate / Channel	10 Gbits/s
Number WDM Channels	12 Channels
Channel Spacing	200 GHz Spacing
Channel Wavelengths	C-Band
Bit Error Rate	10^{-9} Initial, 10^{-6} Final
Digital RMS SNR (Q)	6 - Initial, 4.7 - Final
Maximum Fiber Length	21.6 km
Minimum Fiber Length	625 m
Operation Temperature	-12 C to 35 C



IF Signal Path



● = One Fusion Splice
1





IF Patch Panel

- Located in the Correlator room
- Includes Fiber Amplifiers
- Provides signals for De-MUX hardware
- Manual Test Equipment
 - Full Signal Communication Analyzer
 - Optical Spectrum Analyzer



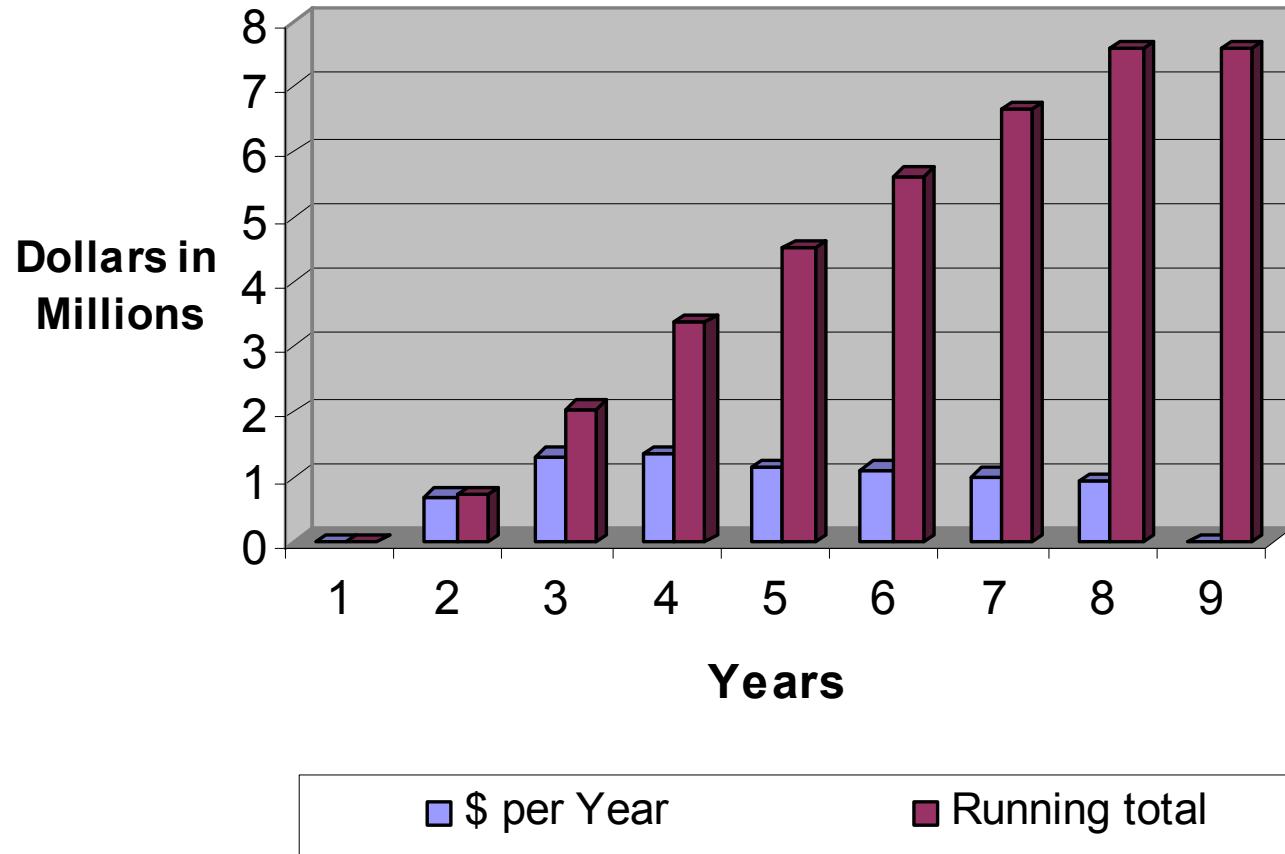
Rack Mount EDFA



- MCB adjustable Gain of each amplifier
- Also measures in/out optical power



DAQ EVLA Budget





2002 Fiber Schedule

- | | | |
|--------------------------------|------|------|
| • Conduit to Manhole | Feb | 2002 |
| • Procure Trencher | Feb | 2002 |
| • RFI of MCB hardware | Jun | 2002 |
| • Install MCB network in AOC | July | 2002 |
| • Take Delivery of Fiber Cable | Aug | 2002 |
| • Cable spool to AOC | Aug | 2002 |
| • First Fiber in the ground | Oct | 2002 |
| • Start Termination Panel | Sept | 2002 |



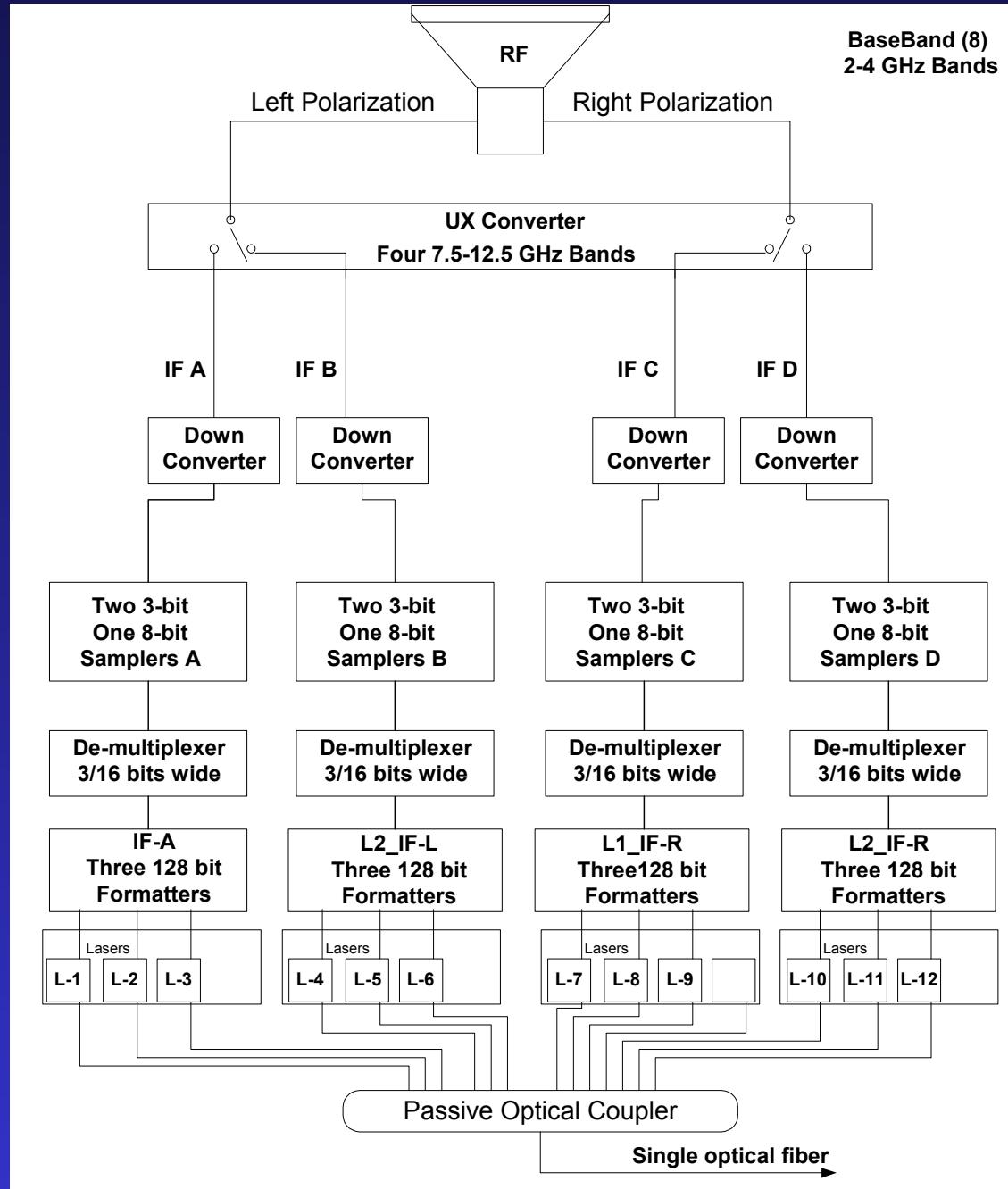
2003 Fiber Schedule

- Bench integration MCB & IF Jan 2003
- Patch Panel locations finalized Jan 2003
- Accessible MCB from AOC Feb 2003
 - To Barn, Master Pad and test Pad (CW5)
- Bench Integration LO system Mar 2003
- Install Fiber on test antenna April 2003
- Install MCB hardware on test antenna May 2003
- Install DTS & LO on test antenna June 2003
- Install de-formatter and D-to-A July 2003
- Decommission West-arm waveguide June 2006



Conclusion

- Three systems will be supported
- On Board Tests Incorporated (MCB)
- Patch Panels will have test equipment
- IF Data Format supports Growth
 - New Mexico Array and VLBA
- Fiber System supports Growth
 - E Array, New Mexico Array and VLBA





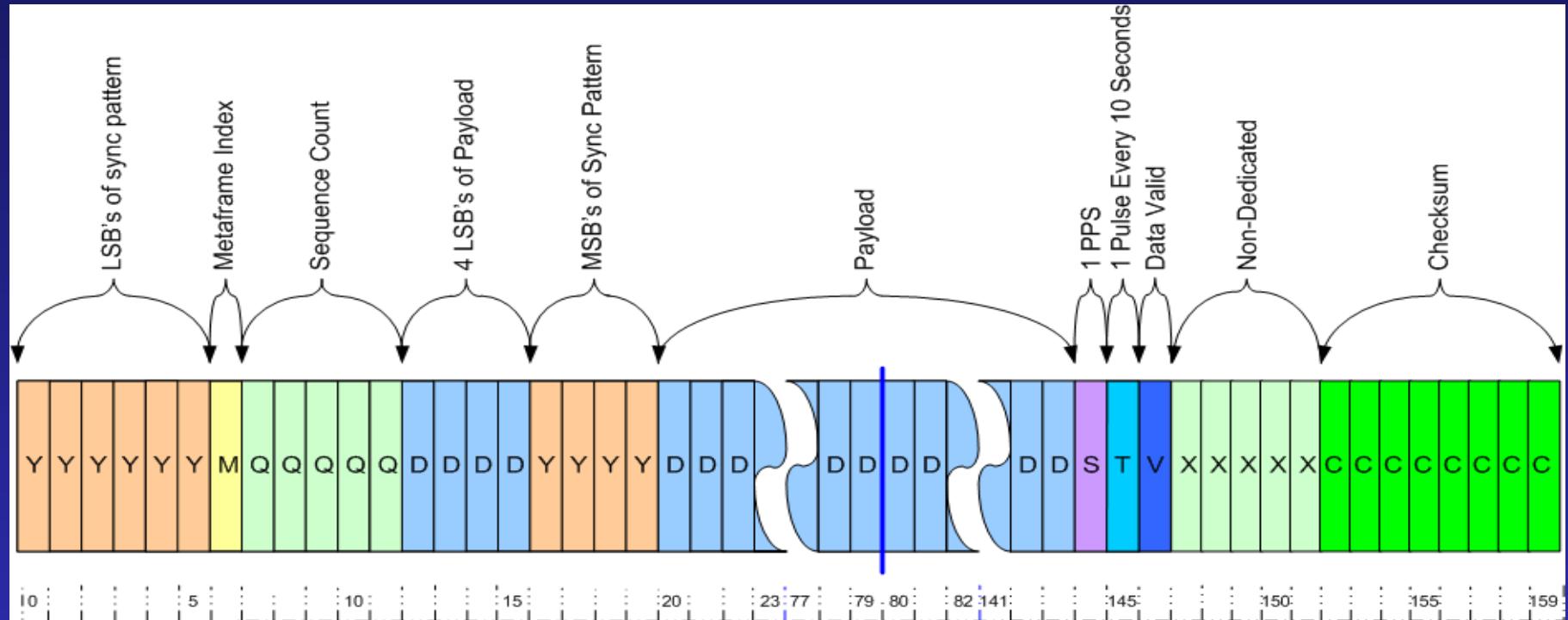
IF Transmitters



- Twelve Lasers
 - ITU Channels - 200 GHz spacing
- Automated Test
 - Output Power Measured at Each Laser
 - Test Patterns in Formatter
 - MCB accessible
- Manual Optical Power Measurements
 - Can be measured at the MUX output



Proposed Frame Format



- EVLA Memo #33