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Barriers to WDM Deployment on Military Platforms

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DARPA/MTO
WDM for Military Platforms Workshop
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Militarized (Flight-Qualified) 18 GHz Single-Mode Transmitters

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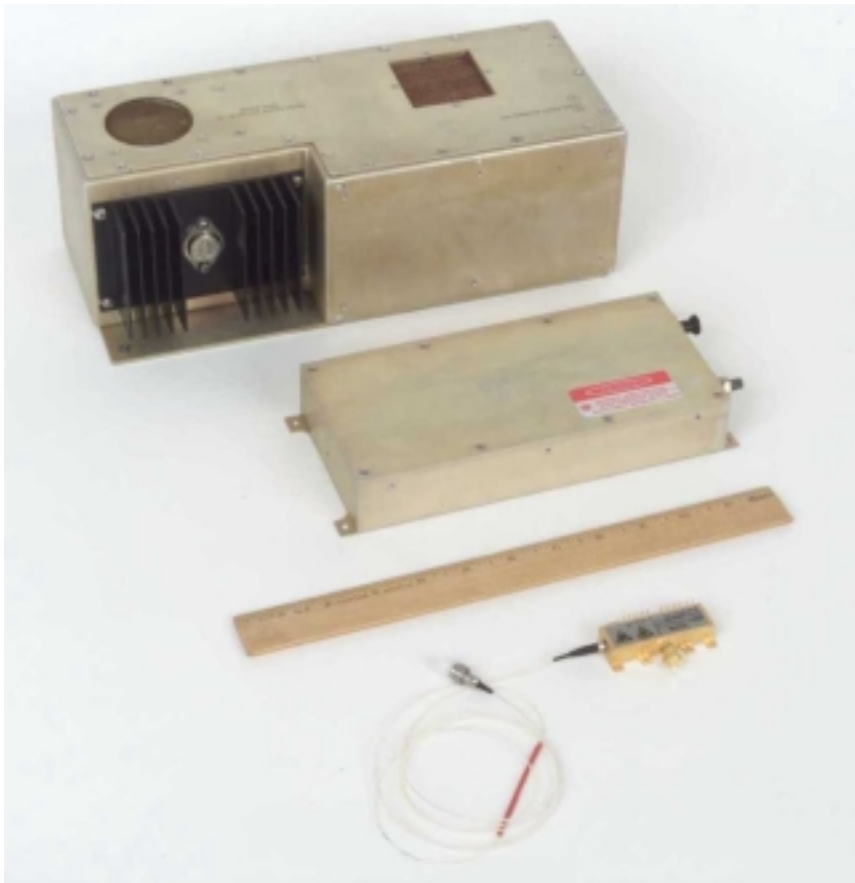

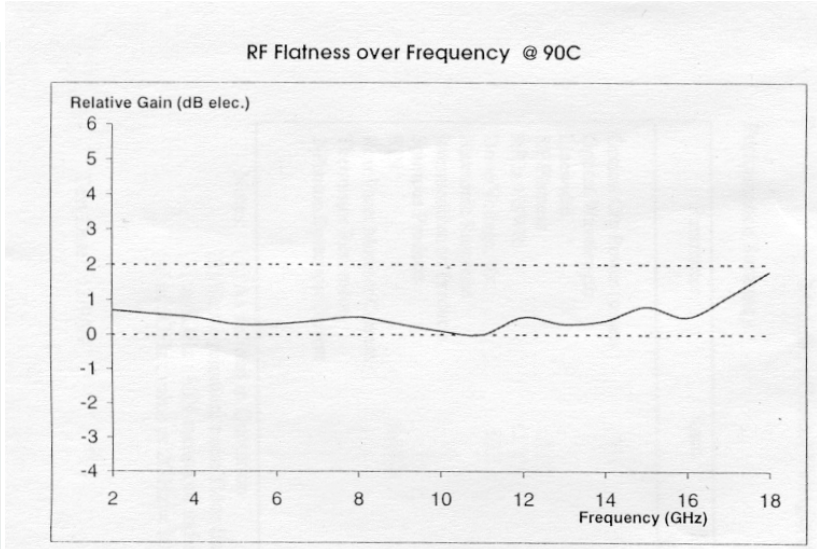

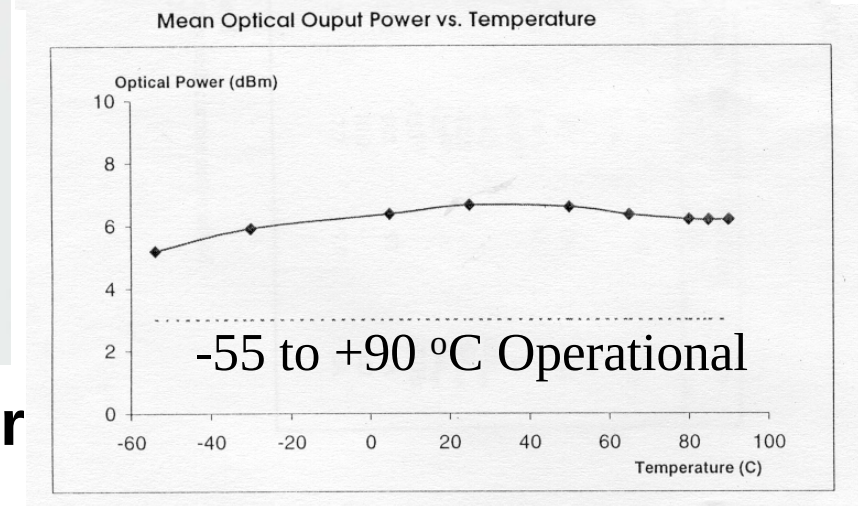

Mature, Military Hardware for Point-to-Point Applications

Generic WDM for Non-Blocking, Full Broadcast Antenna Selection

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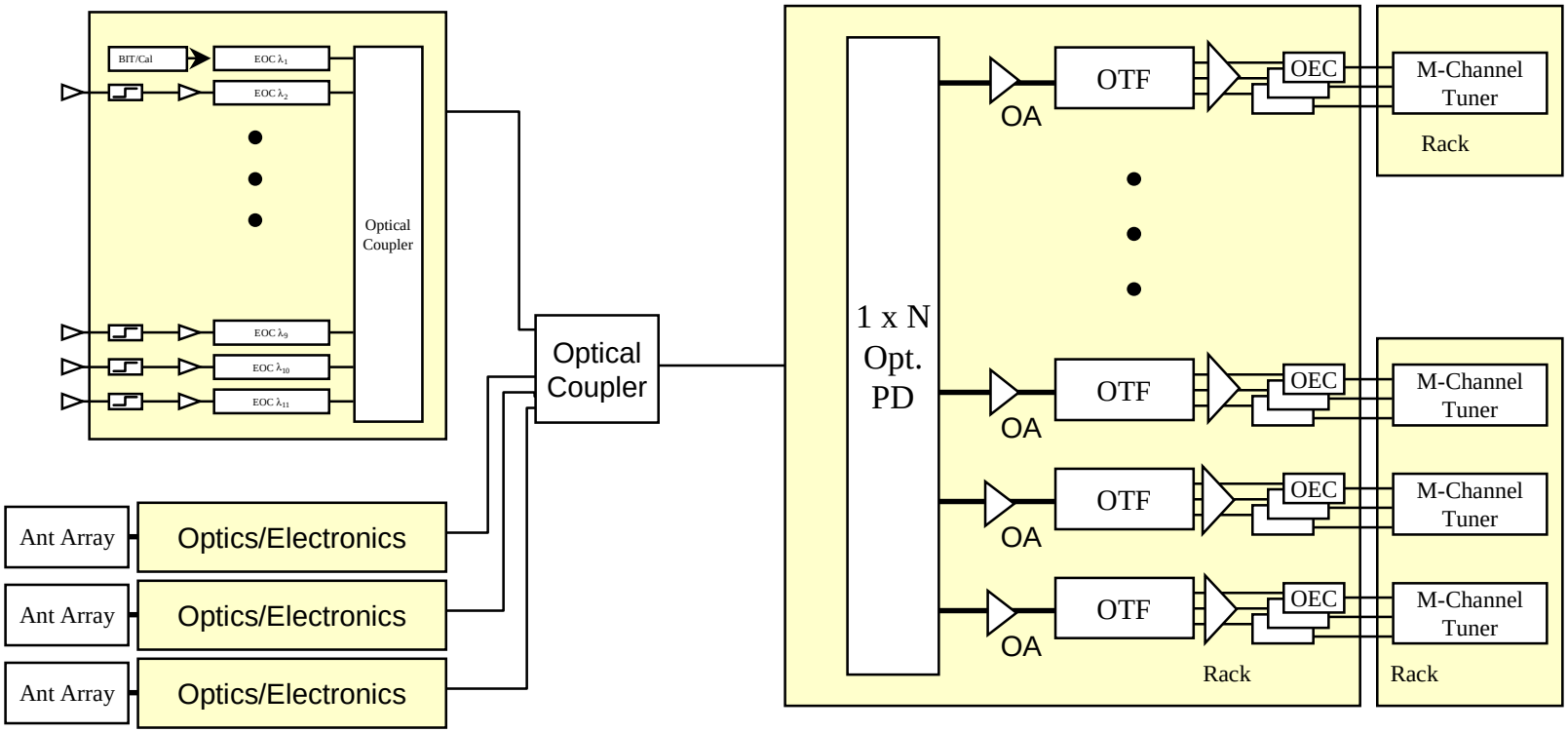

WDM Fiber Network Replacing Conventional RF Cabling, Optical Power Divider (PD) and Optical Tunable Filters (OTF) Replacing Conventional RF Switch; All Antenna Signals Available at Each Receiver

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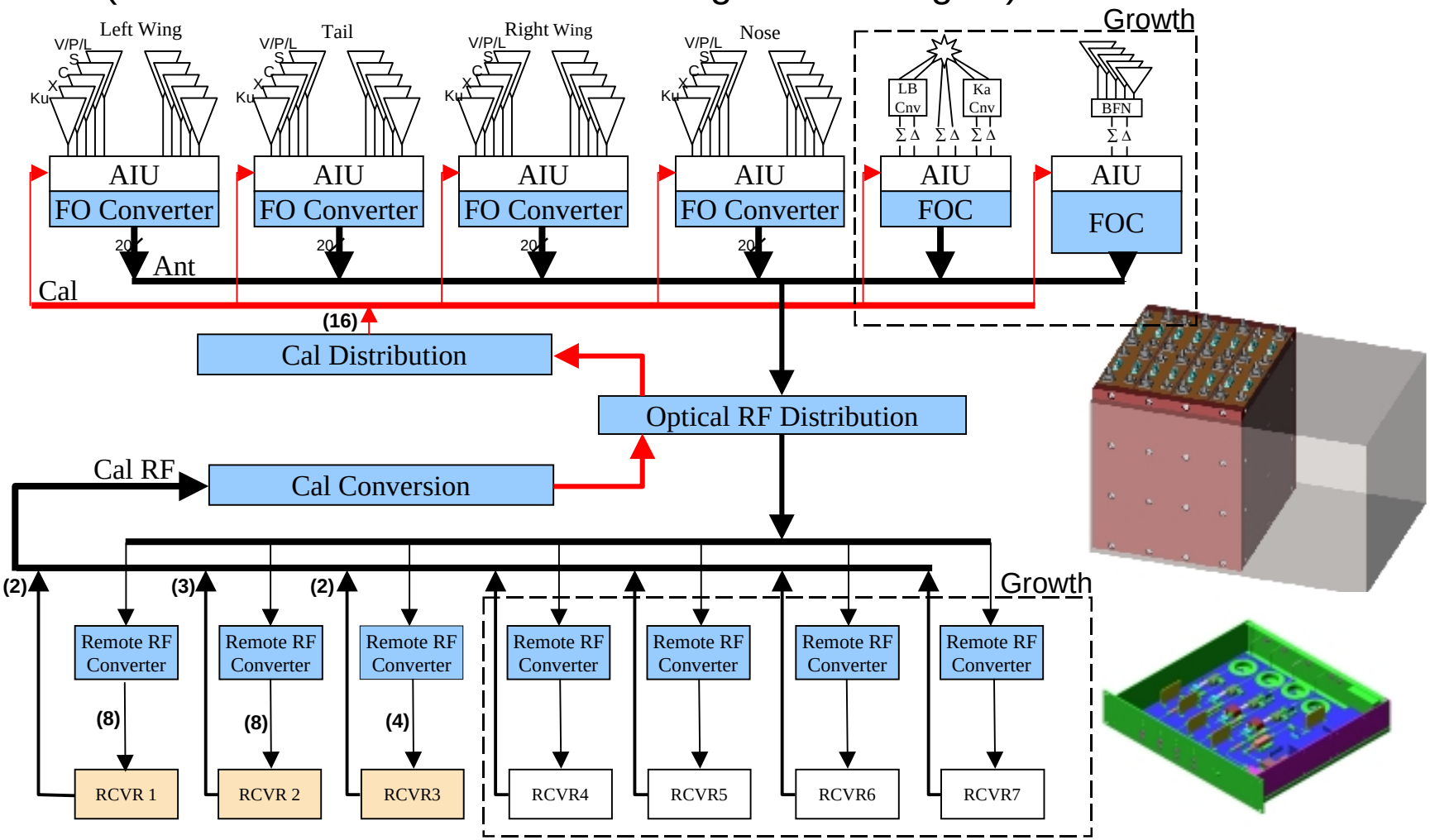
Current Analog 18 GHz Link WDM System

(80 Antennas to 16 Receivers using 4 Wavelengths)



Dual Channel (10.1 and 10.5 GHz) Switching (Optical Tunable Filter)

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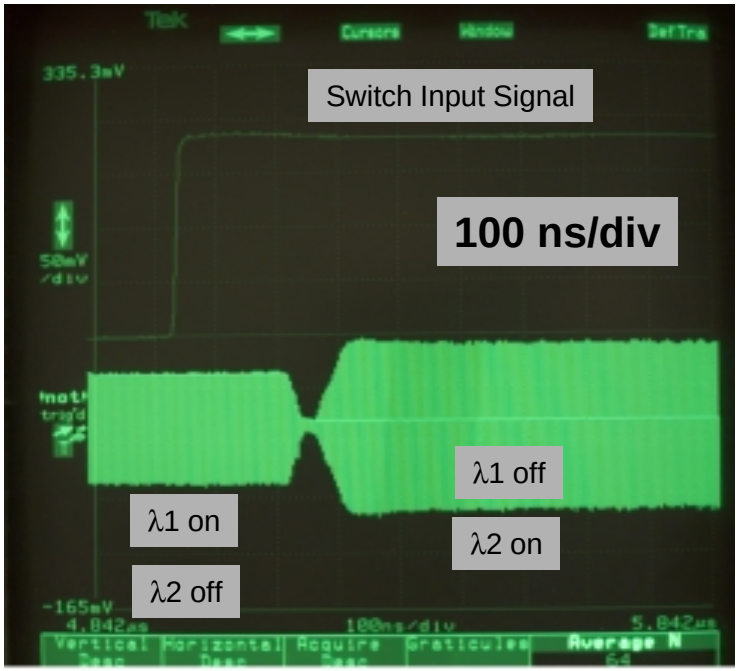

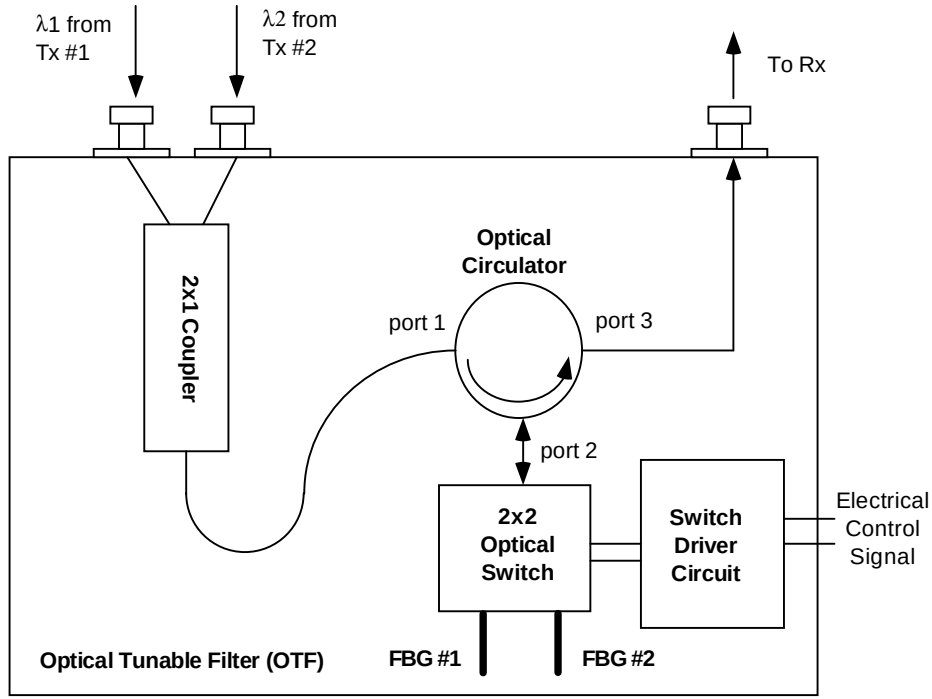

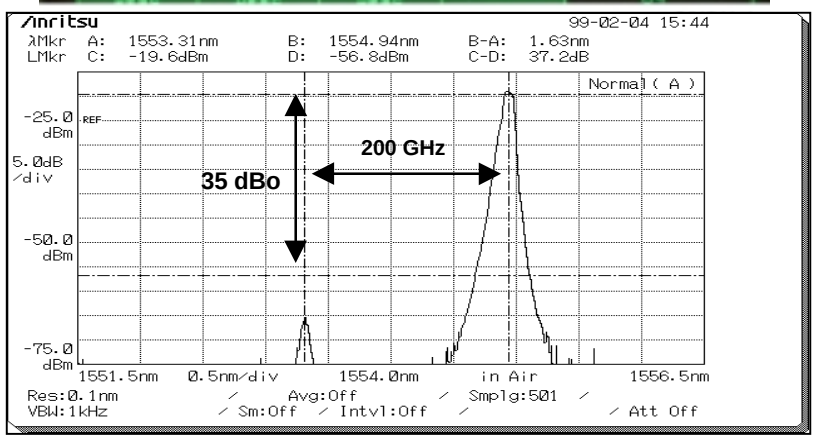

Switching Speed ~80 ns
RF Crosstalk <-76 dBe
RF Bandwidth 18 GHz
Insertion Loss ~8 dBe

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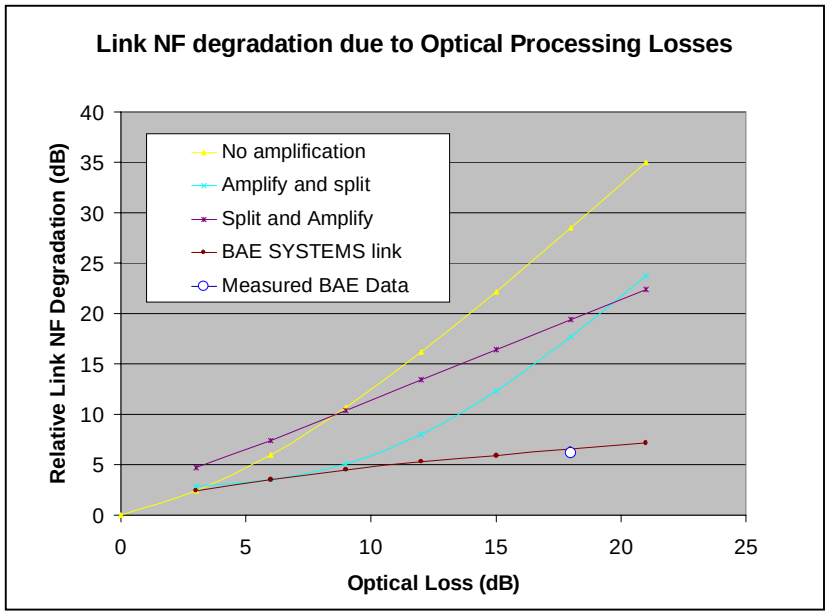
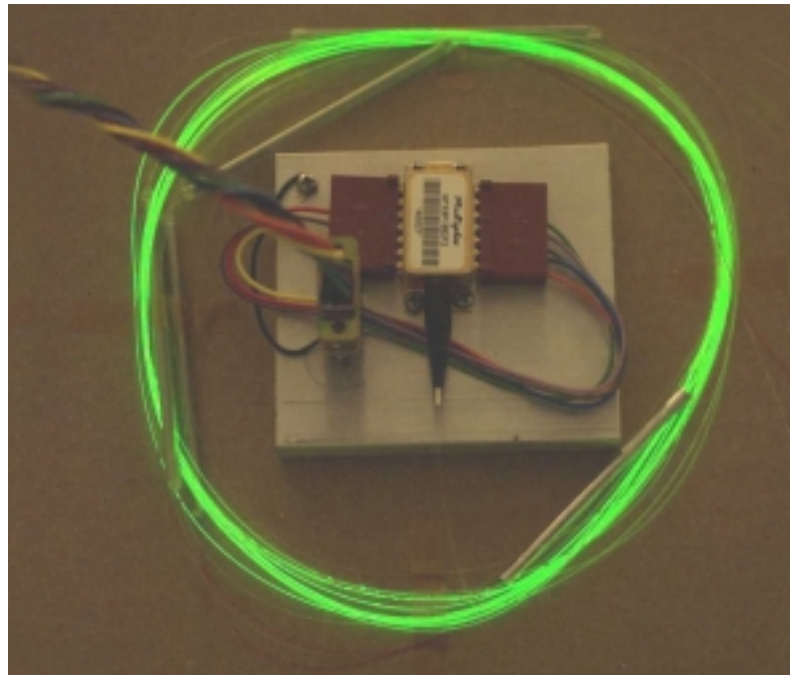
Low Noise Optically Amplified Microwave Links





BAE SYSTEMS has developed proprietary technology to reduce the noise figure (RIN ~ -157 dB/Hz) of fiber optic microwave links with high optical processing losses due to WDM, switching, and other distribution components.

Desparately Needed Developments to Enable Replacement of RF Switches

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- **Low Insertion Loss, High-Speed Switches**
  - 10 ms SONET Switching is Too Slow for Military Applications
  - <10 μs is Typical Requirement (<100 ns for High POI Appl.)
  - Narrow Bandwidth (FP), High-Speed Switches Don't Help!!
- **Low-RIN EDFAs**
  - WDM Requires Muxing and Demuxing Multiple Channels
  - EDFAs **ALWAYS** Degrade Analog Link Performance
  - EDFA RIN Must be Reduced Below -155 dB/Hz
- **High Crosstalk Suppression** Between WDM Channels (Optical Switches for Tunable λ Filtering)
  - Easy for Narrowband RF Signals (<1 GHz)
  - Difficult for 18 GHz and Higher Sidebands
    - Fiber Bragg Gratings are the Only Demonstrated Technology to Achieve > 35 dBo Crosstalk Suppression for 18 GHz Sidebands
- **High-Power WDM DFB Arrays**
  - >40 mW/Channel @ RIN <-160 dB/Hz, < 1 MHz Linewidth