

# **EPON Source Choice Drives the Fiber Choice**

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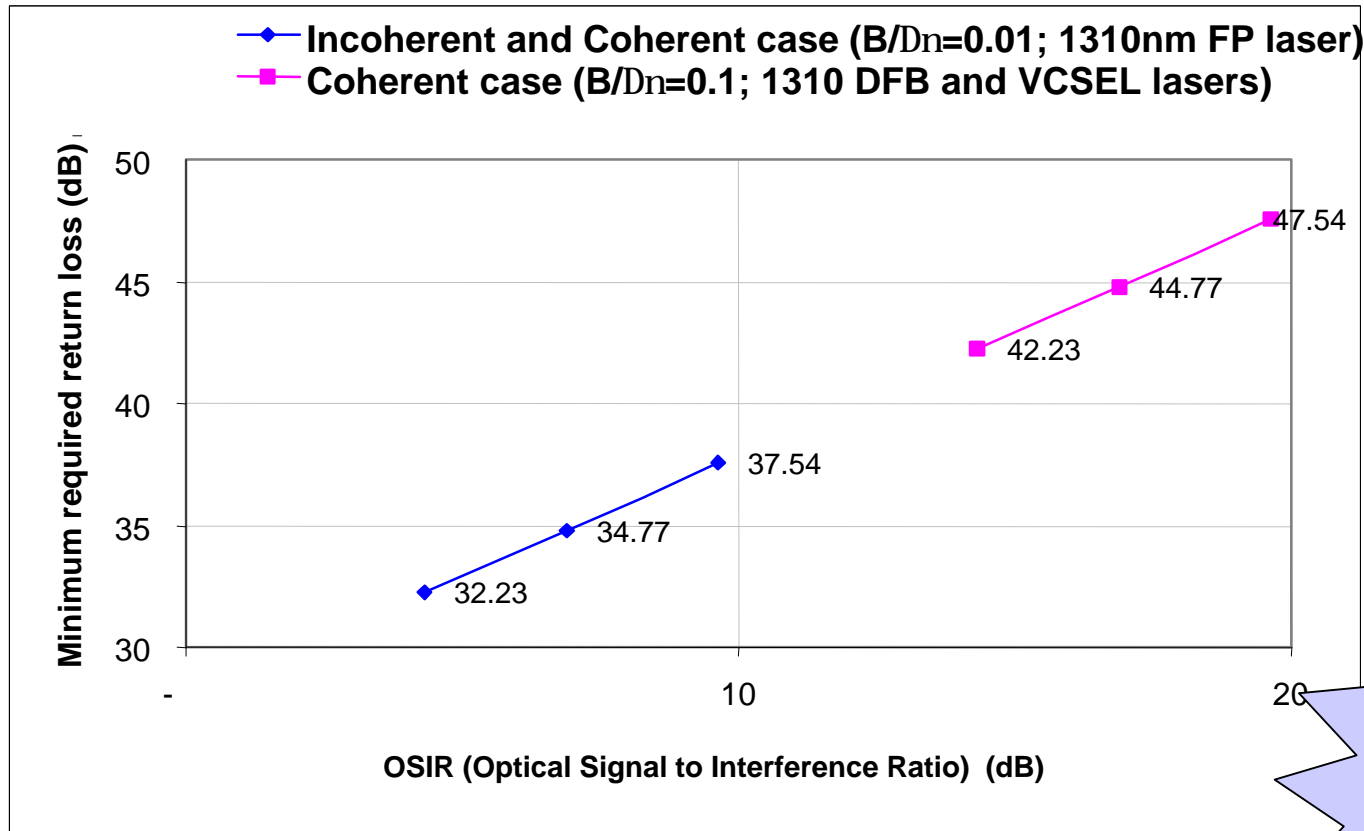
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# Source and Wavelength Considerations for Directionality

- 1310 nm FPs (and VCSELs in future) with 3-dB couplers provide lowest cost for full-duplex transmission
- But NEXT requirements (both incoherent and coherent) are severe for high facility loss typical of PON systems.

**High NEXT requirements translate to high return loss specifications in outside plant which are unattainable**

# Return Loss Requirements for Full-Duplex, Single $\lambda$ , FP and DFB/VCSELs



Typical OSP return loss 30 to 35 dB

To obtain the desired 10dB\* OSIR with FP sources, we require about 38 dB return loss isolation.  
**NEED wavelength separation for upstream and downstream !**

\* Bohn et al, J-LT, Vol. LT-5, No. 2, Feb. '87, p. 243

# 1310 FP/VCSEL is the undisputed choice for upstream

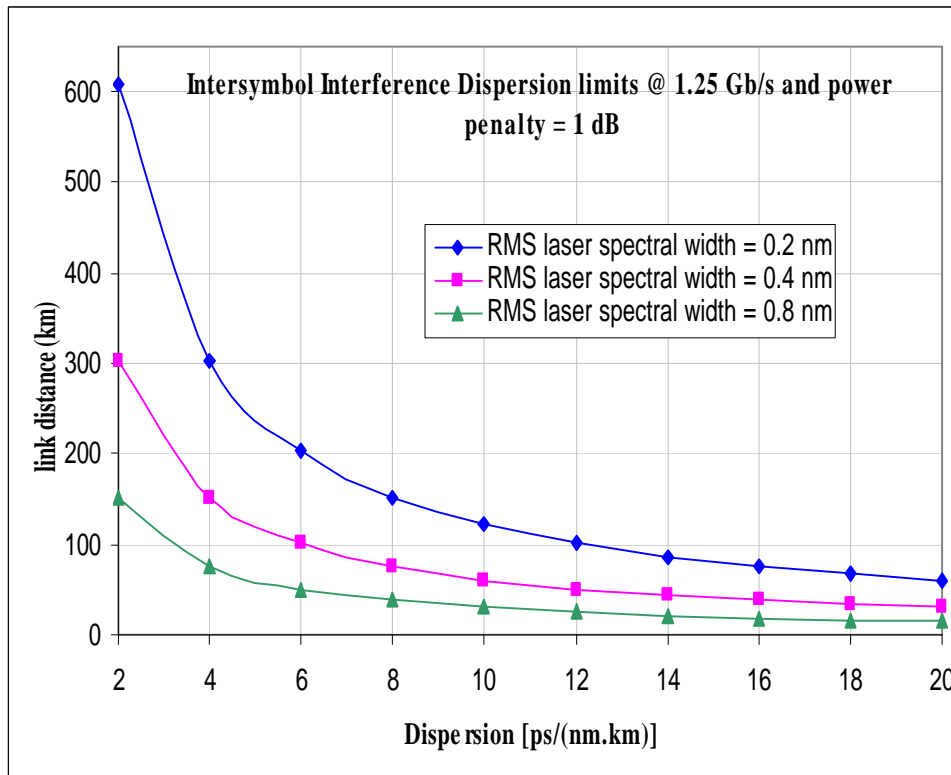
- End-user equipment not shared - lowest cost transceivers needed
- 1310 FP (VCSELs in future) are the lowest cost solution\*
- Upstream wavelength band can be fairly wide (say 1260 to 1360 nm) to relax tolerance and lower cost even further

\*Anderson, A., et al, IEEE EFM Study Group, Portland July 2001

# That leaves S- (1460 - 1530) and C- (1530 - 1565) bands for the downstream

- Data transport performance needs to be evaluated for ~ 15xx FP, DFB and VCSELs.
- Downstream source cost not as critical since cost shared over multiple ( $\geq 16$ ) users
- Video
  - special needs of digital video services need to be studied to optimize optical facility
  - broadcast enhancement in 15yy band is supported by mature optical technologies

# 15xx DFB and VCSEL performance for ISI more than adequate



- 15xx DFBs (and VCSELs in future) are the natural choices for downstream EPON data communication and afford compatibility with most fiber types

- 15xx FP power penalties from ISI and MPN limit the range unacceptably for all fiber types

# Conclusions

- Wavelength separation for PON directionality needed to support practical OSP implementation
- 1300 FP / VCSELs natural choice for upstream
- Downstream data in the S- and/or C- band
- EPON can be limited by a poor choice of laser for the OLT (i.e., downstream).
  - FP Lasers have a broad spectral width that limits their reach
  - DFB / VCSELs yield good performance with vanishing premium
- Leverage mature video technologies in the 15yy band

**Standard G.652, and G652.c (zero-water peak) single mode fibers cost-effectively support these EPON wavelength and source choices**