

# IEEE 802.3ah

## FEC Effect on MPN

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# MPN Parameters

- Parameters are according to “Laser Considerations for Link Budget” - Tom Murphy Infineon IEEE EFM Portland, OR. July 2001
- Spectral width:  $U_w = 2.8 \text{ nm}$
- Mode-partition coefficient:  $k=0.5$
- $\delta_{\text{mpn}}$  – mpn power penalty
- Dispersion Slope:  $S_0 = 0.093 \text{ ps/km*nm}^2$
- ZD wavelength:  $U_0 = 1324 \text{ nm}$
- Tx center wavelength:  $U_c = 1270 \text{ nm}$
- Dispersion:  $D = 5.35 \text{ ps/(km-nm)}$

# MPN Dispersion Penalty

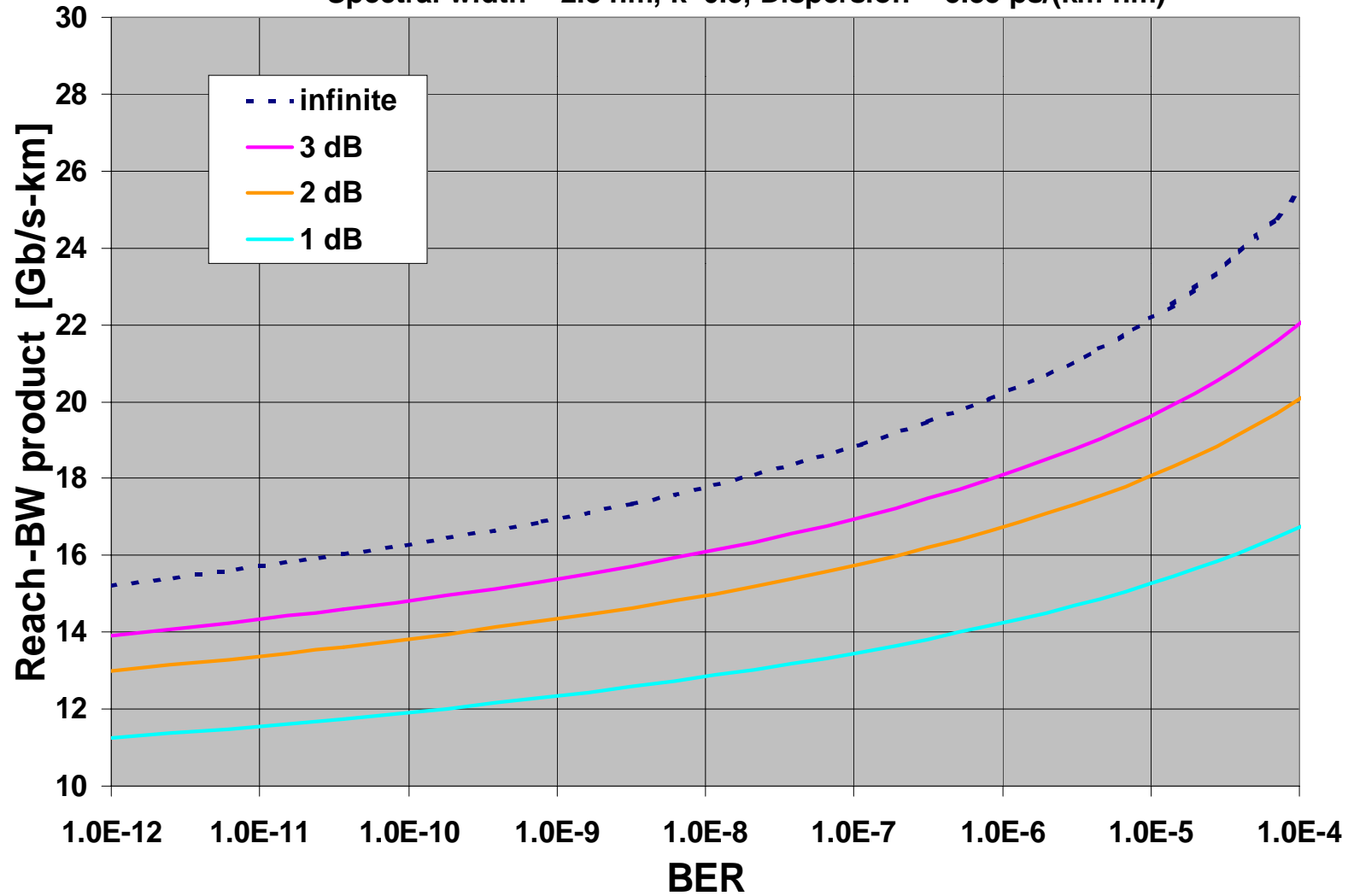
(Fiber Optic Communication Systems – Agrawal)

$$L \cdot \text{Rate} = \frac{\sqrt{-\ln \left[ 1 - \frac{\sqrt{2 \cdot (1 - 10^{-0.2\delta_{\text{mpn}})}}}{k \cdot Q} \right]}}{\pi \cdot \left[ S_0 \cdot \frac{U_c}{4} \cdot \left[ 1 - \left( \frac{U_0}{U_c} \right)^4 \right] \cdot U_w \right]}$$

$$\text{BER} = 0.5 \cdot \text{erfc} \left( \frac{Q}{\sqrt{2}} \right)$$

# Power Penalty for MPN-limited Transmission

Spectral width = 2.8 nm,  $k=0.5$ , Dispersion = 5.35 ps/(km-nm)



# FEC Benefit

- HD decoder for (255,239) RS code have a BER improvement of  $1E-4$  to  $1E-12$ .
- For MPN power penalty of 3dB:
- Improves  $L*BW$  from 14 to 22 [Km\*Gb/s]