300 meters on installed MMF

Part II: BERs and RINs

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System simulations @ 1.25 Gbaud/s

- A complete system is simulated adding the PCS of the 1000BASE-T standard.
- The TX uses convolutional encoding to generate 6 dB of coding gain (see Ref 3).
- The RX recovers the transmitted frames using Viterbi decoding

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BER and CODING GAIN

Let: Is = distance between adjacent signal current levels at the input of the transimpedance amplifier (*)

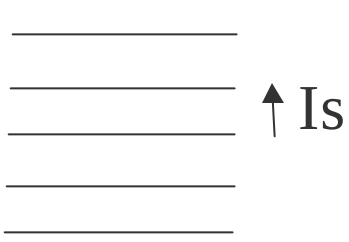
In = rms thermal noise current at the input of the TIA

Then, with Viterbi decoder disabled (no coding gain):

$$\text{1D-SER} = \frac{1}{5}\,(0.5+1+1+1+0.5) * \operatorname{erfc}\left[\frac{1}{2*\sqrt{2}} *(Is/In)\right]$$

$$\text{4D-SER} = 4*0.8*\operatorname{erfc}\left[\frac{1}{2*\sqrt{2}} *(Is/In)\right]$$

(*)



SER= Symbol Error Rate

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BER and CODING GAIN

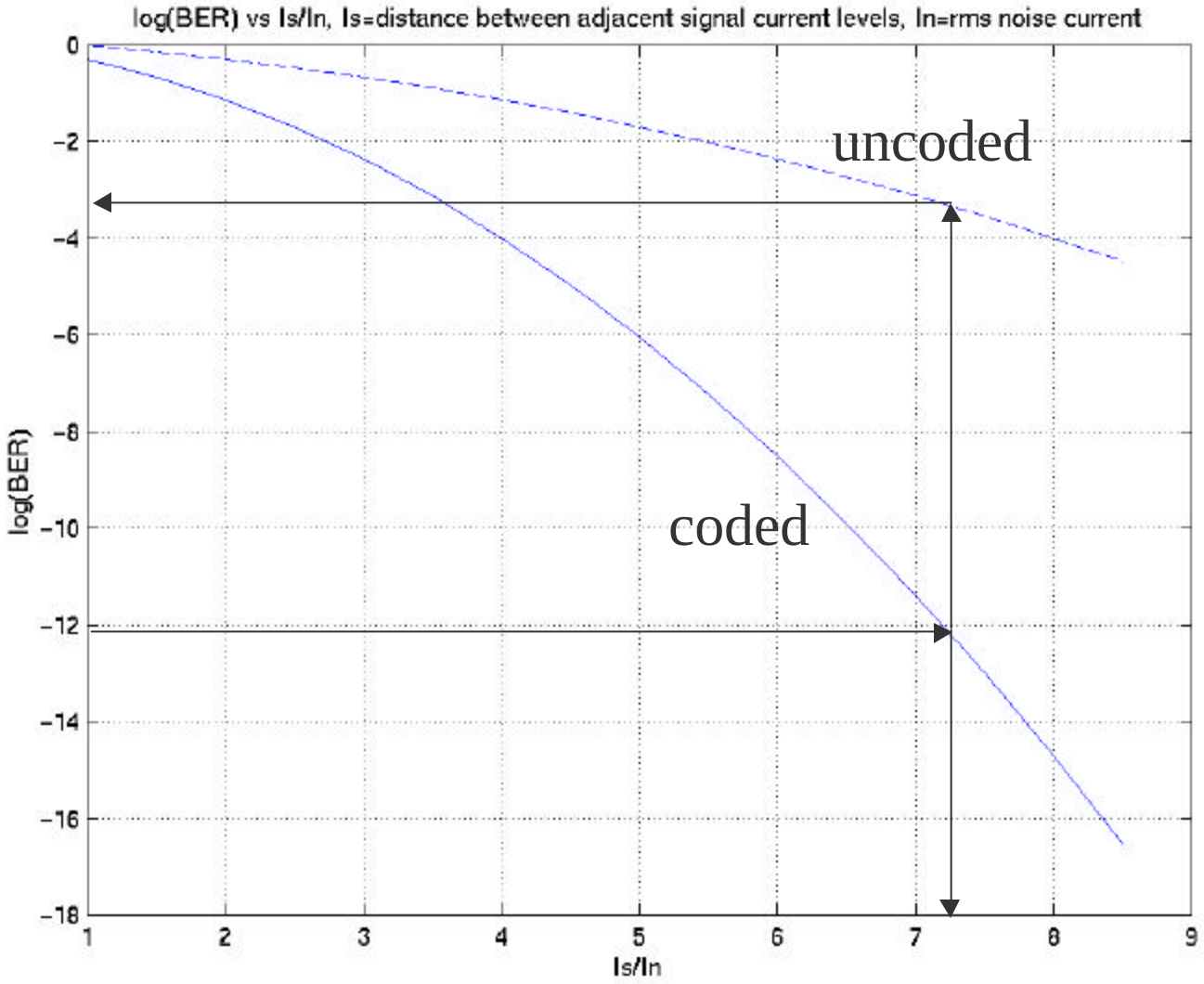
Enabling the Viterbi decoder (6 dB coding gain):

$$4D\text{-}SER = 4*0.8*erfc\left[\frac{1}{sqrt(2)} * (Is/In)\right]$$

Every 4D symbol is decoded into an octet of data bits. Assuming one incorrect 4D symbol generates 4 incorrect data bits (out of 8), we obtain the following BER:

$$BER = 1.6*erfc\left[\frac{1}{sqrt(2)} * (Is/In)\right]$$

BER vs Is/In at input of Transimpedance Amp



Is = distance between adjacent signal current levels;
In = rms thermal noise current

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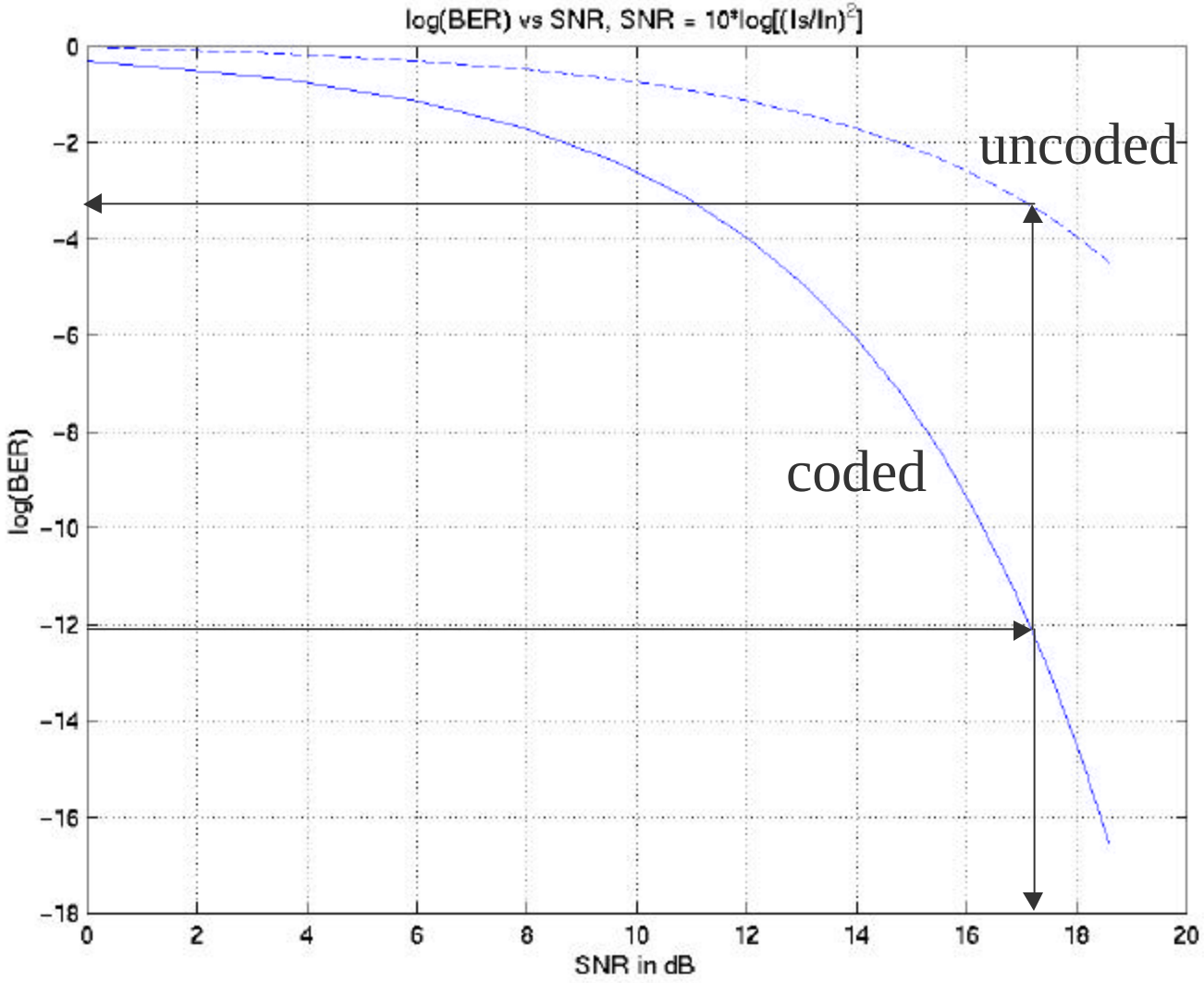
BER vs electrical SNR



SNR = 10 * log[(Is/In)^2]

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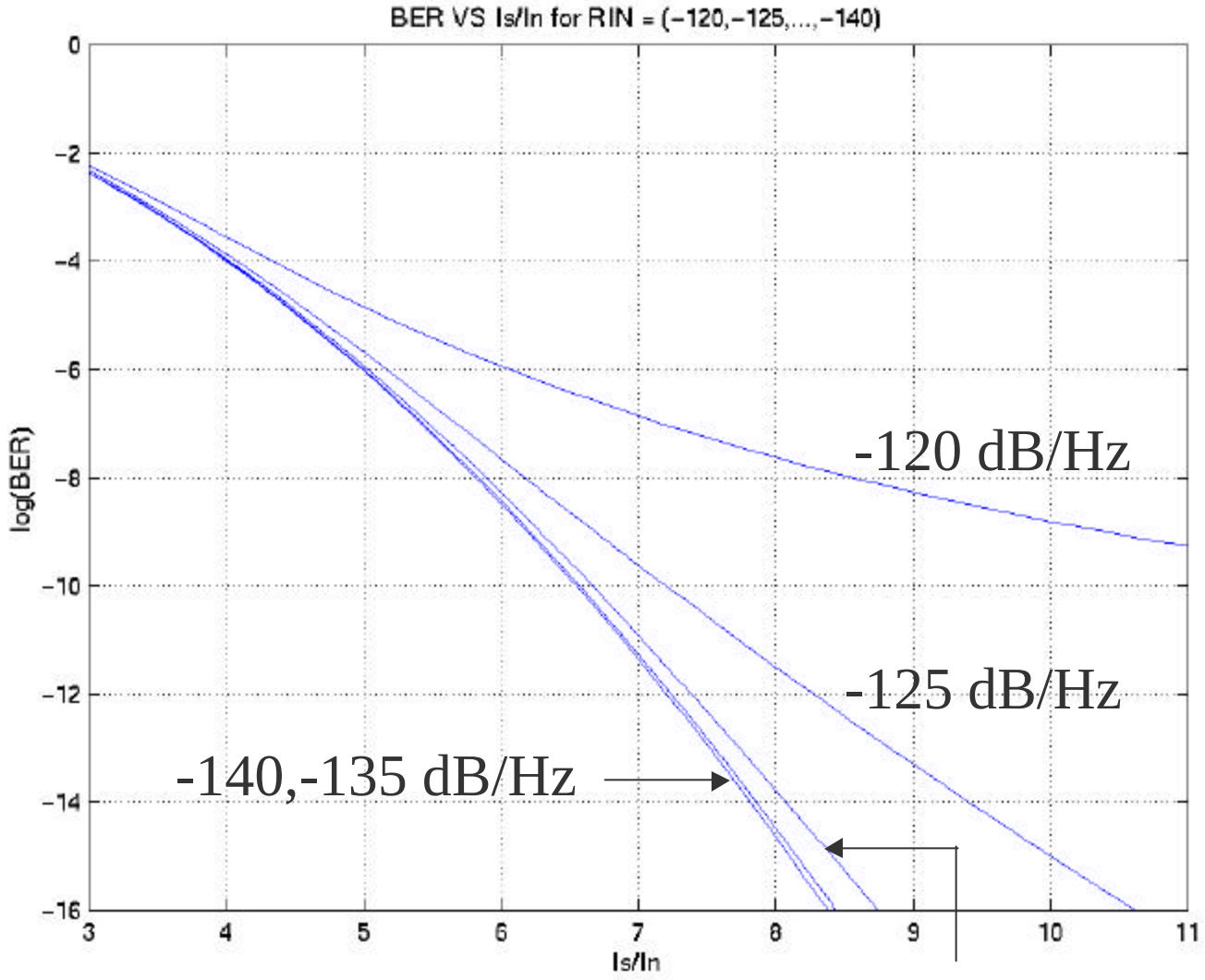
BER vs Is/In for various RIN levels



Is = distance between adjacent signal current levels;
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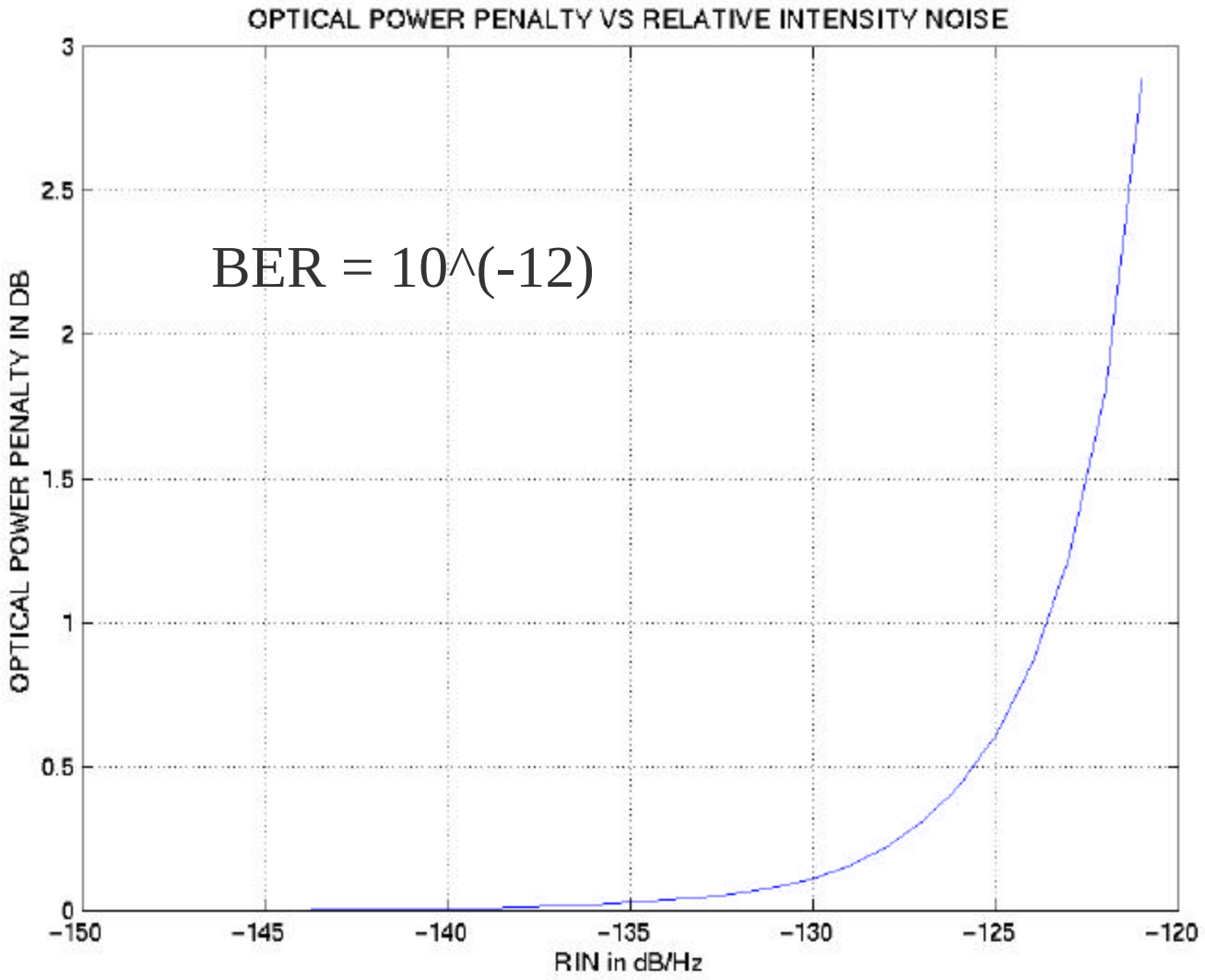
OPTICAL POWER PENALTY VS RIN



(continues in Part III)

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