

# **Optical Fiber Communications**

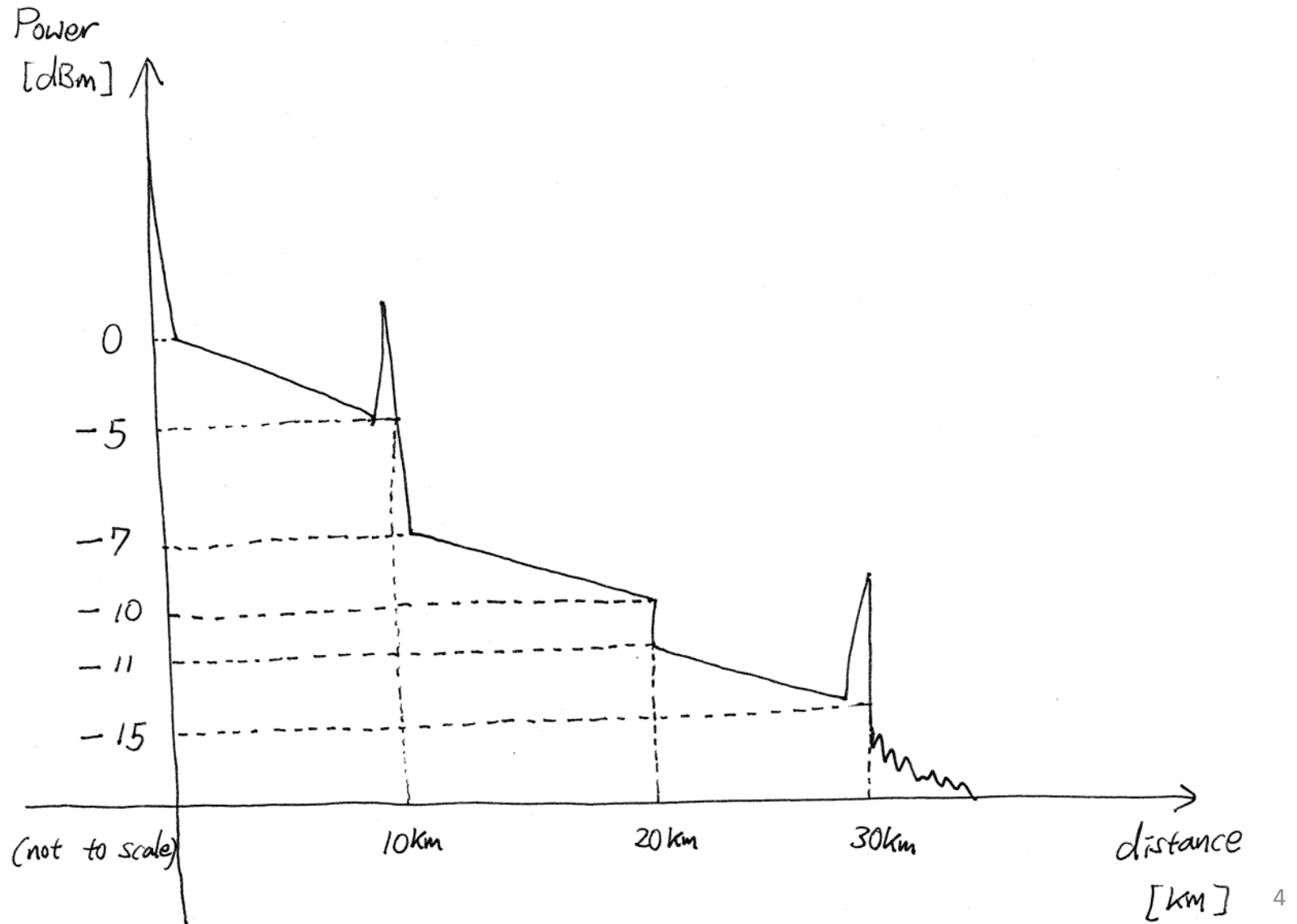
## **Mid Term Review**

# **Basic Knowledge (Analyzing OTDR)**

# [Example 1] OTDR Trace Analysis

- Predict possible fiber optic network system which will results in below figure.
  - Explain possible optical components at each point (or between two points)
  - Indicate loss [dB], attenuation parameters [dB/km] for the components.

# [Example 1] OTDR Trace Analysis



# **Basic Knowledge (Finding BER Penalty)**

# [Example 2] Finding BER Penalty

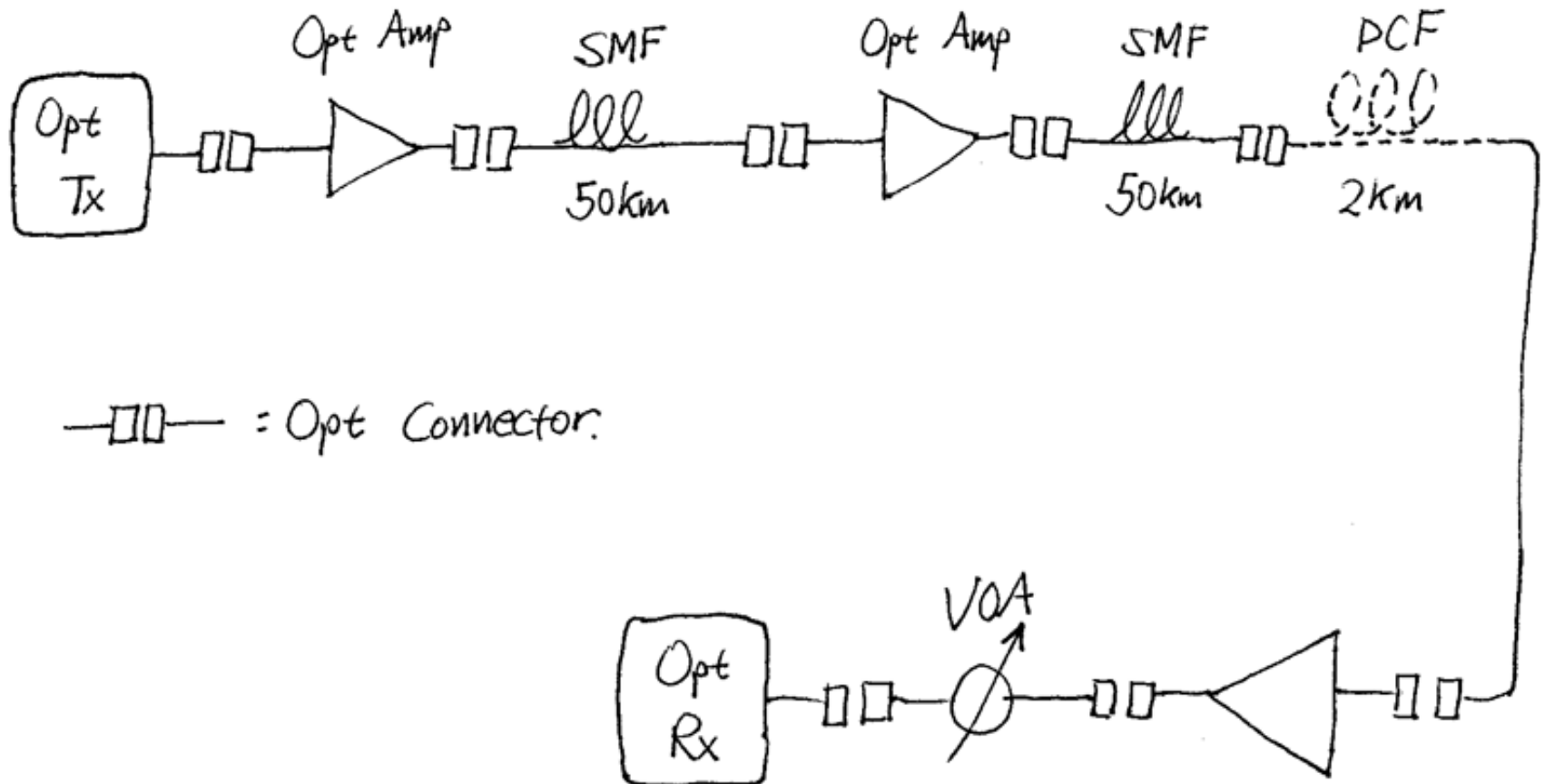
- Assume you have a fiber optic communication system as shown below.
  - Indicate “before” and “after” Optical Power for each fiber optic components using the attenuation (loss/gain) parameters shown in below table. (next page)
  - indicate the power levels (numbers in “dBm”) on the system diagram figure

# [Example 2] Finding BER Penalty

<b>Opt Tx</b>	<b>Optical Transmitter</b>	<b>Tx Power = 1 mW</b>
<b>Opt Conn</b>	Optical Connector	Loss = 0.5 dB
<b>Opt Amp</b>	Optical Amplifier	Gain = 15 dB
<b>SMF</b>	Optical Fiber (Sgl Mode)	Attenuation Parameter = 0.3 dB/km
<b>DCF</b>	Optical Fiber (Disp Comp)	Attenuation Parameter = 8 dB/km
<b>VOA</b>	Variable Optical Attenuator	Loss = Adjustable

See next page for fiber optic system diagram

# [Example 2] Finding BER Penalty





# [Example 2] Finding BER Penalty

- Calculate BER Power Penalty if the fiber optic communication system has below BER performances.
  - Fill in the table below (Fill in “Optical Rx Power”)
  - Plot BER curve on a semi-log paper.

# [Example 2] Finding BER Penalty

VOA Attenuation [dB]	Optical Rx Power [dBm]	BER [Error Rate]
13.0		$1.0 \times 10^{-4}$
12.0		$2.0 \times 10^{-5}$
11.0		$4.0 \times 10^{-6}$
10.0		$9.0 \times 10^{-7}$
9.0		$2.0 \times 10^{-7}$
8.0		$4.0 \times 10^{-8}$
7.0		$1.0 \times 10^{-8}$

