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# A PMD Class Supporting 29 dB Link Budget

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# Outline

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- ◆ Proposal for a PMD Class
  - Supporting 29dB link budget
- ◆ System Overview
- ◆ Link Budget Measurement
- ◆ Summary

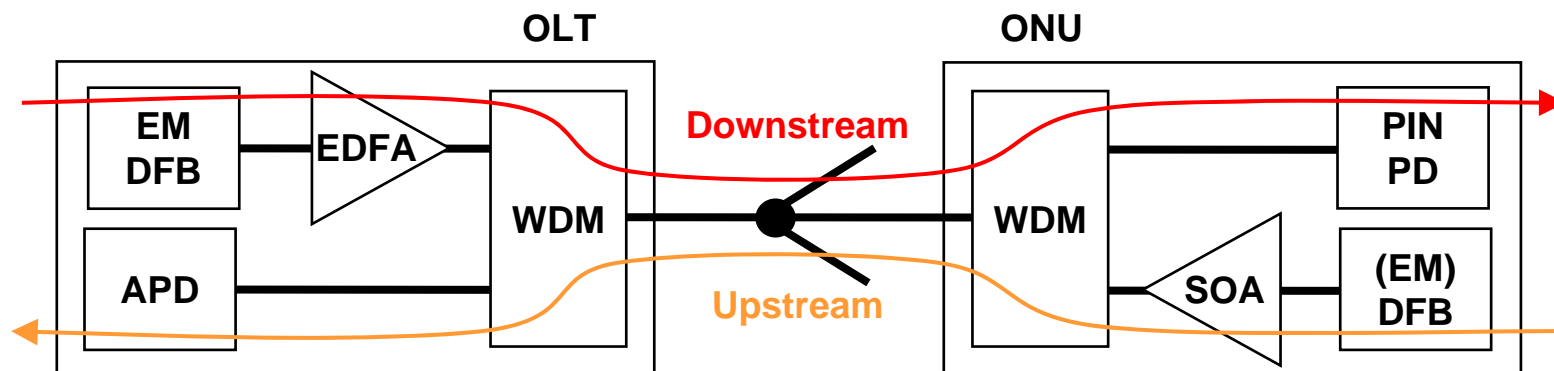
# Proposal for a PMD Class

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- ◆ **Optical link budget of 29 dB**
  - **To re-use installed PON media**
  - **Split ratio of 32 is widely used in actual deployments**
- ◆ **Without FEC**
  - **In order to maintain consistency with 802.3ah**
- ◆ **By 10G serial**
  - **Simpler and more economical from a viewpoint of optical components manufacturers**
    - ◆ **4-lane solution gives better receiver sensitivity at the sacrifice of simplicity**
  - **Higher flexibility in terms of wavelength allocation for EPON/10G EPON coexistence**

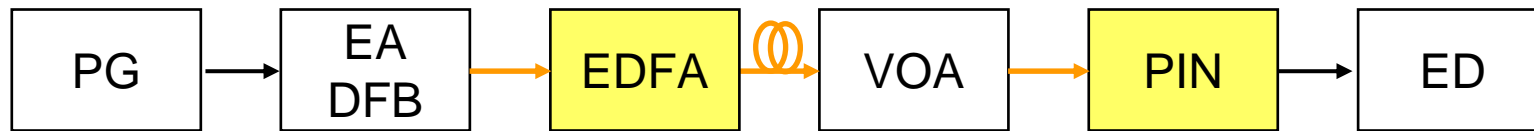
# System Overview

- ◆ Optical amplifiers to increase launch power
- ◆ Downstream: EM DFB LD + EDFA → PIN PD
  - Conventional optical fiber amplifiers can be used
- ◆ Upstream: DFB LD + SOA → APD
  - Hard to use optical fiber amplifiers in burst mode operation
  - Typical switching time of SOAs is in the order of ns

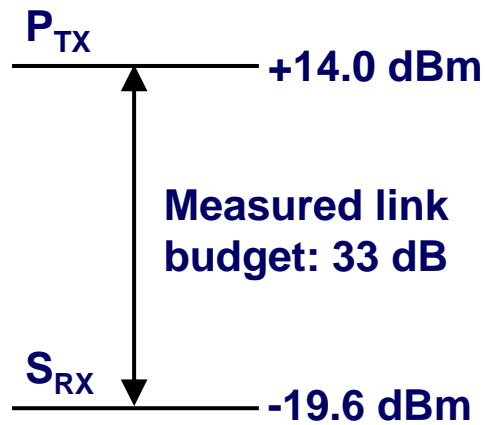


# 29dB Link Budget - Downstream Testing -

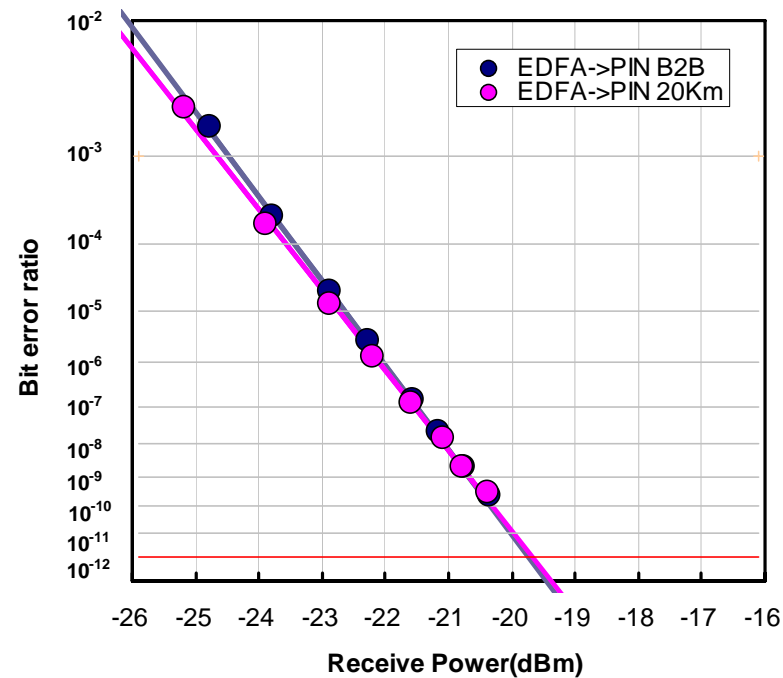
## Setup



## Result



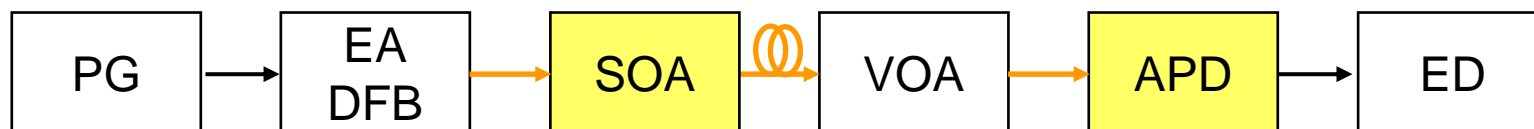
$P_{TX}$ : Launch power  
 $S_{RX}$ : Receiver Sensitivity



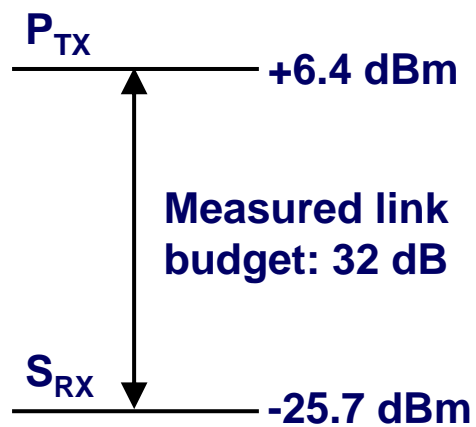
Ta: 25 degC  
 Distance: 2m, 20Km  
 Rate: 10.3125Gbps  
 Pattern: PRBS2^31-1  
 Wavelength: 1531nm  
 Extinction Ratio: 10 dB

# 29dB Link Budget - Upstream Testing -

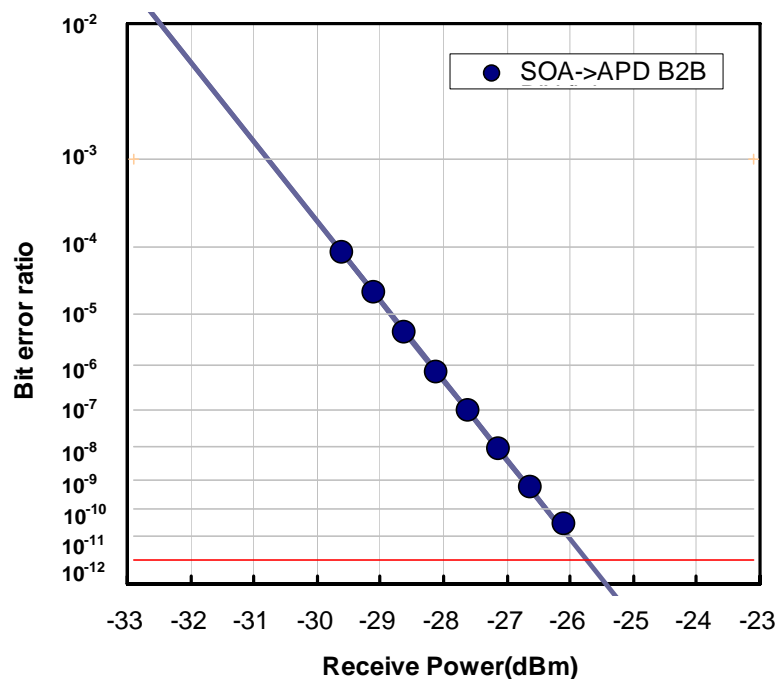
## Setup



## Result



$P_{TX}$ : Launch power  
 $S_{RX}$ : Receiver Sensitivity

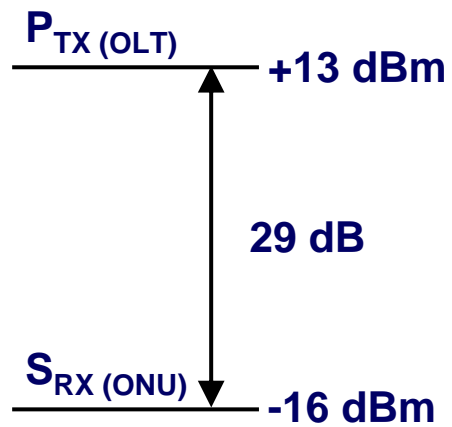


Ta: 25 degC  
Distance: 2m  
Rate: 10.3125Gbps  
Pattern: PRBS2^31-1  
Wavelength: 1541nm  
Extinction Ratio: 10 dB

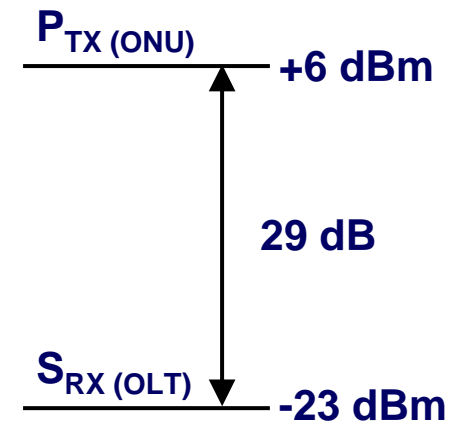
# Example Link Budget

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## Downstream



## Upstream



# Summary

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- ◆ Need a PMD class supporting link budget of 29 dB
- ◆ 10G serial is preferable from a viewpoint of implementation of optical components
- ◆ Use optical amplifiers to increase launch power
  - Downstream: EDFA → PIN PD
  - Upstream: SOA → APD
- ◆ Result of the simple test shows measured link budgets larger than 29 dB
- ◆ 10G symmetric EPON with 29 dB link budget is technically feasible with respect to optical link budget