Empowered by Innovation NEC

29dB Budget Technical Feasibility for “10Gb/s EPON”

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U can change.

Overview

- ✓ Wavelength
- ✓ Downstream Power Budget
- ✓ Upstream Power Budget

Wavelength

This presentation choose wavelengths.

- Downstream

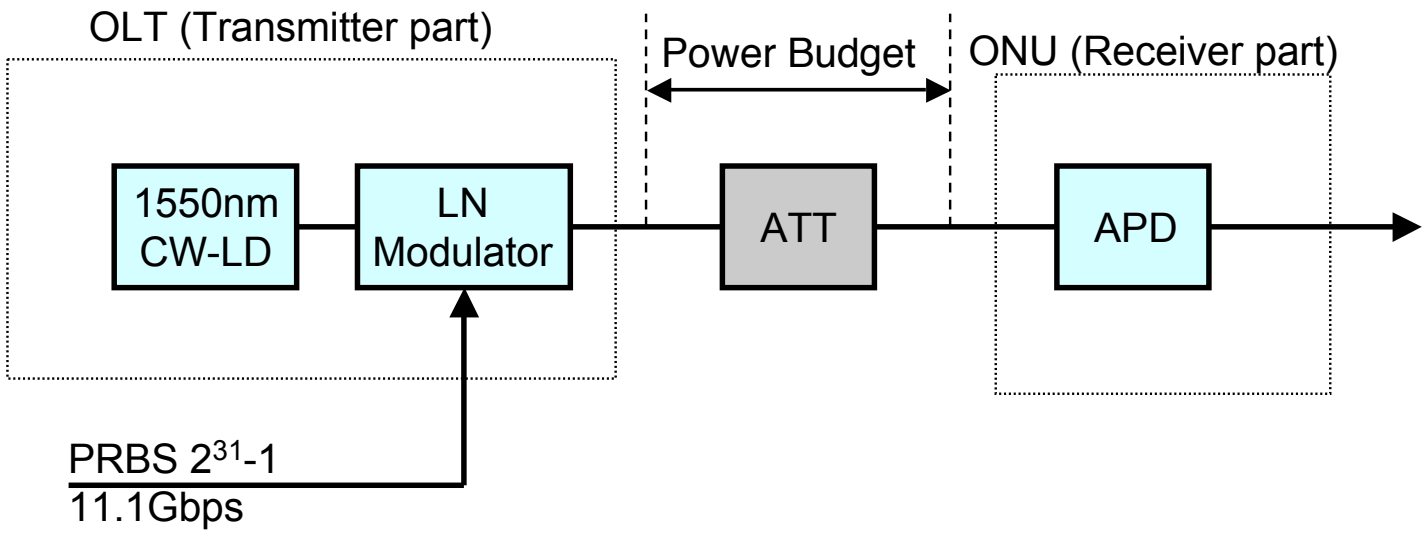
  We select 1550nm for Downstream.
  We should use 1490nm system, but we use 1550nm system for our inventory in this presentation. We believe there is not wavelength dependency in external modulation case.

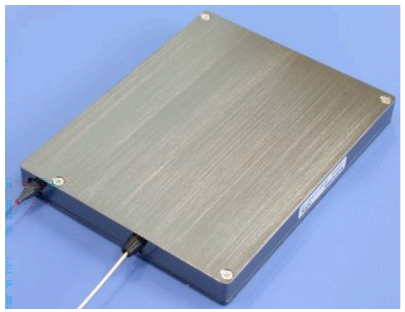
- Upstream

  We will inevitably select a direct modulation LD,
  if we consider the cost of ONU.
  A dispersion problem is occurred using direct modulation LD.
  So we should select low-dispersion 1310nm band.

Downstream Power Budget

Downstream demonstration system





NEC OD-J9424

Downstream demonstration system

Optical Module Specification

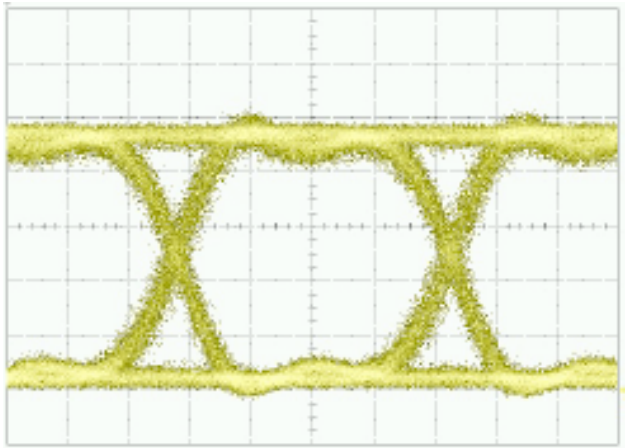
Transmitter	CW DFB LASER + MZ Modulator
Wavelength	1530 to 1565nm
Launched Power	+5 to +8 dBm
Extinction Ratio	10dB min.
Receiver	APD
Ave. Receiver Sensitivity	-24dBm (BER=1x10-12)

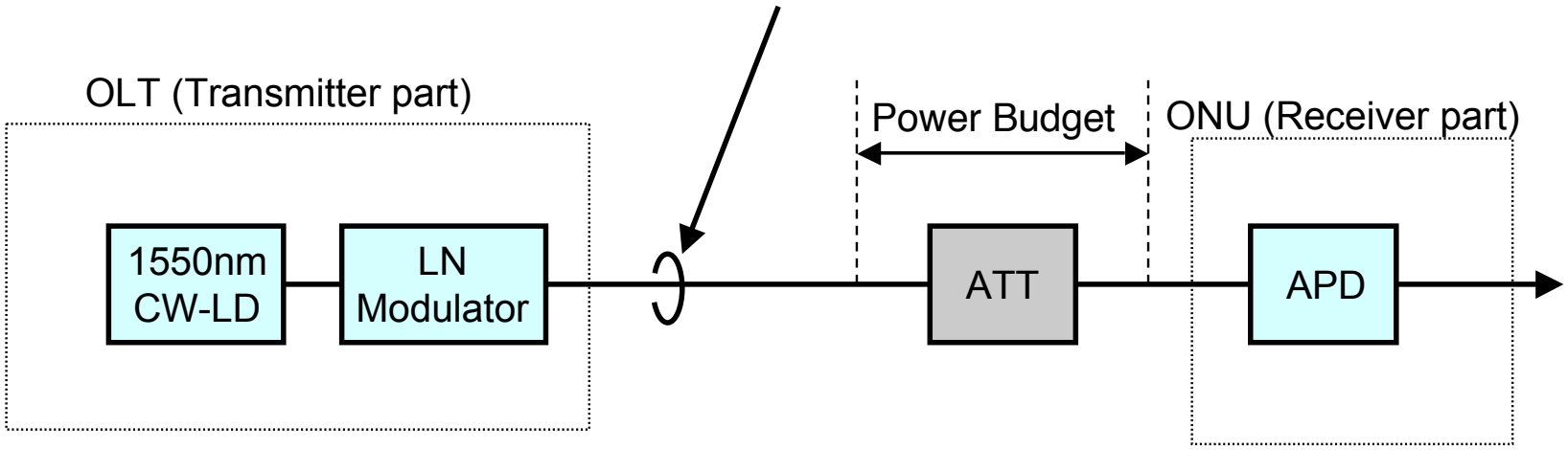
Actual Value

Transmitter	+6.1dBm
Receiver at 1e-12 BER	-26.5dBm

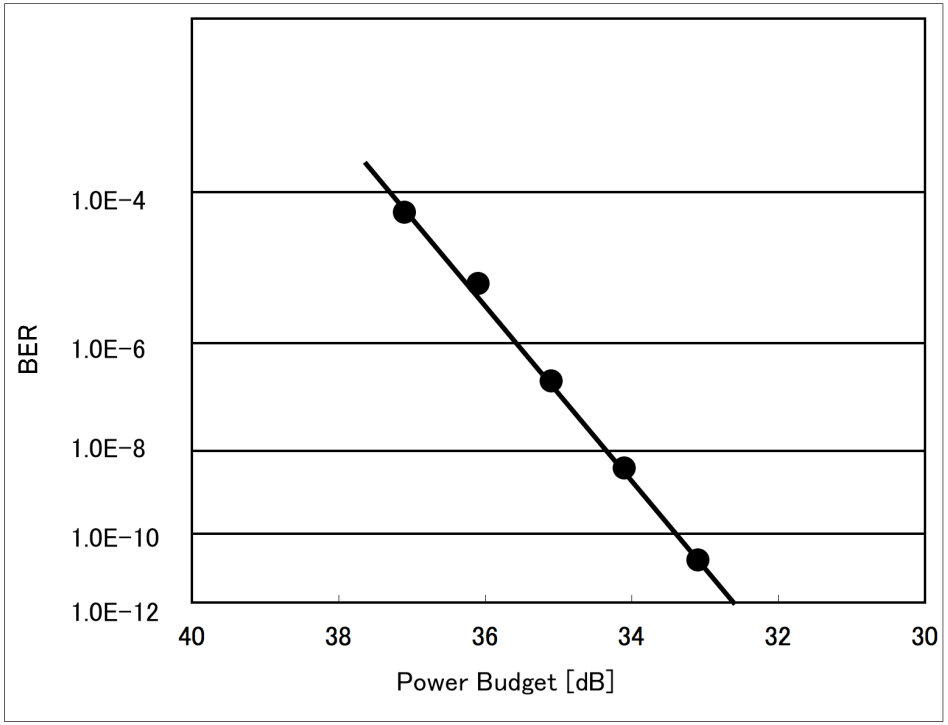
Downstream Output

11.1GHz Output wave form





Downstream Power Budget

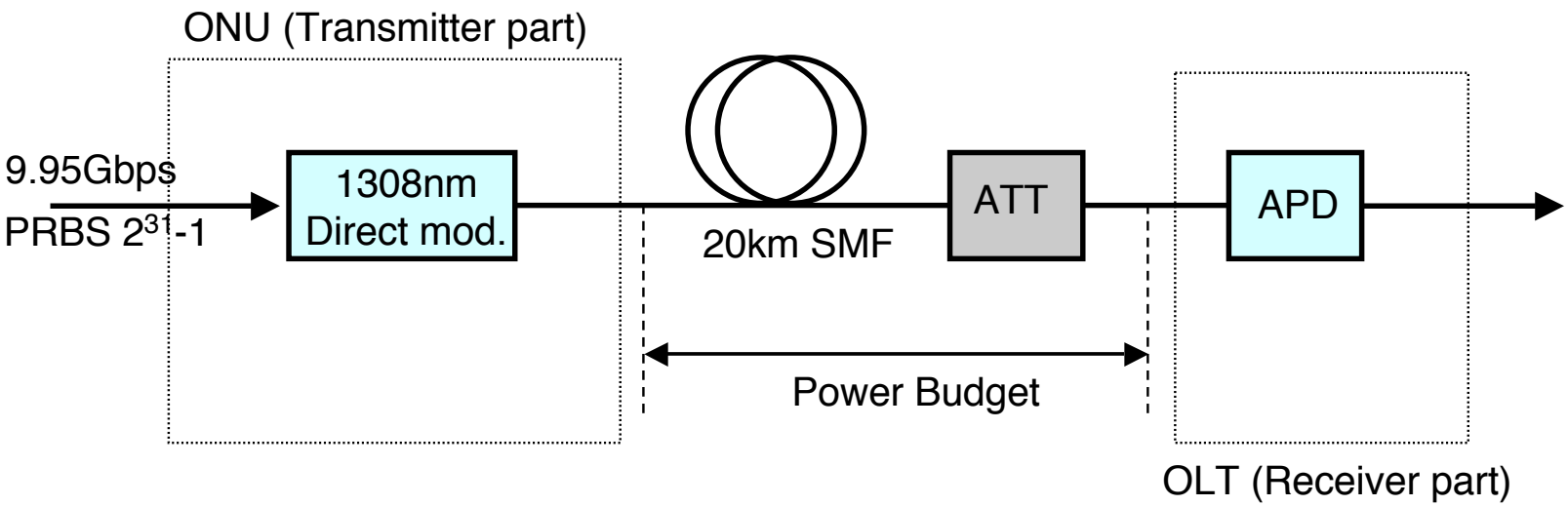


BER curve of Power Budget

Power Budget reaches **32.6dB** at 10^{-12} BER.

Upstream Power budget

Upstream demonstration system



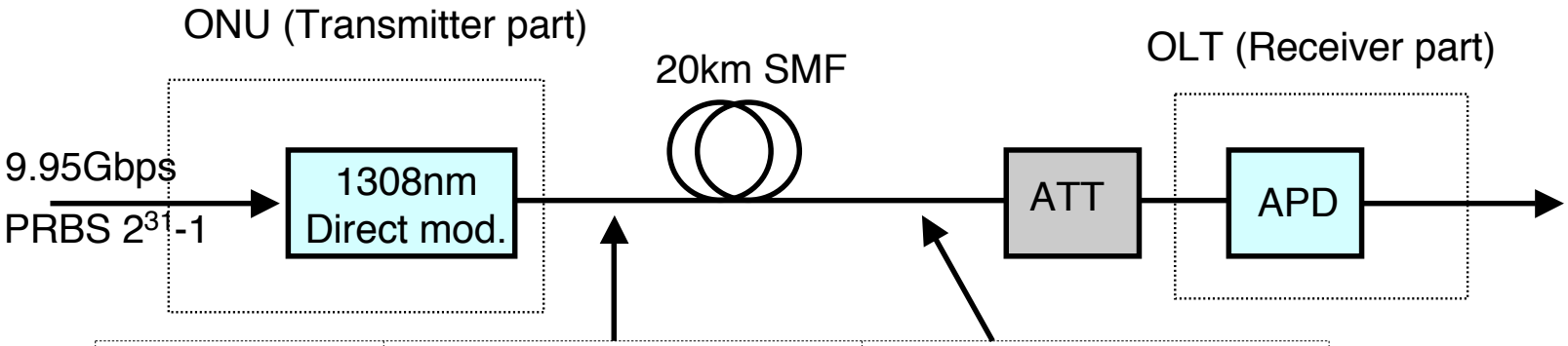
We mention the measurement and the simulation of power budget and dispersion.

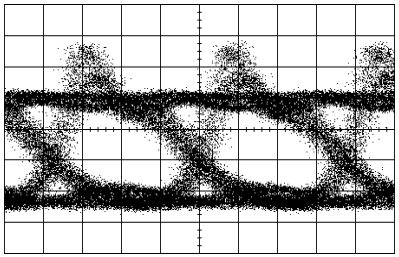
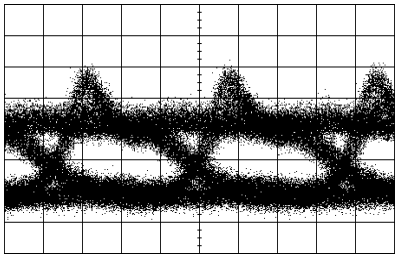
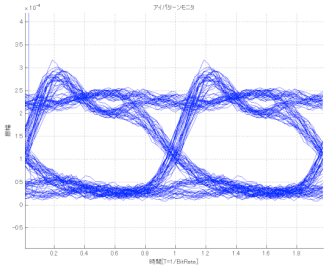
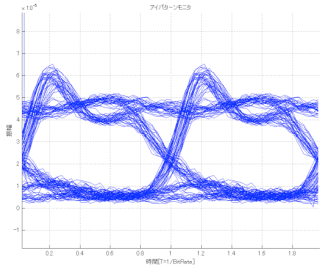
Upstream demonstration system

Optics Parameters

Tx	Transmitter	DFB LASER Direct Modulation
	Wavelength	1308.46nm
	Launched Power	+7.0dBm
	Extinction Ratio	7.4 dB
Rx	Receiver	APD
	Receiver Sensitivity	-25.1dBm at 1.3μm (BER=1x10-12)

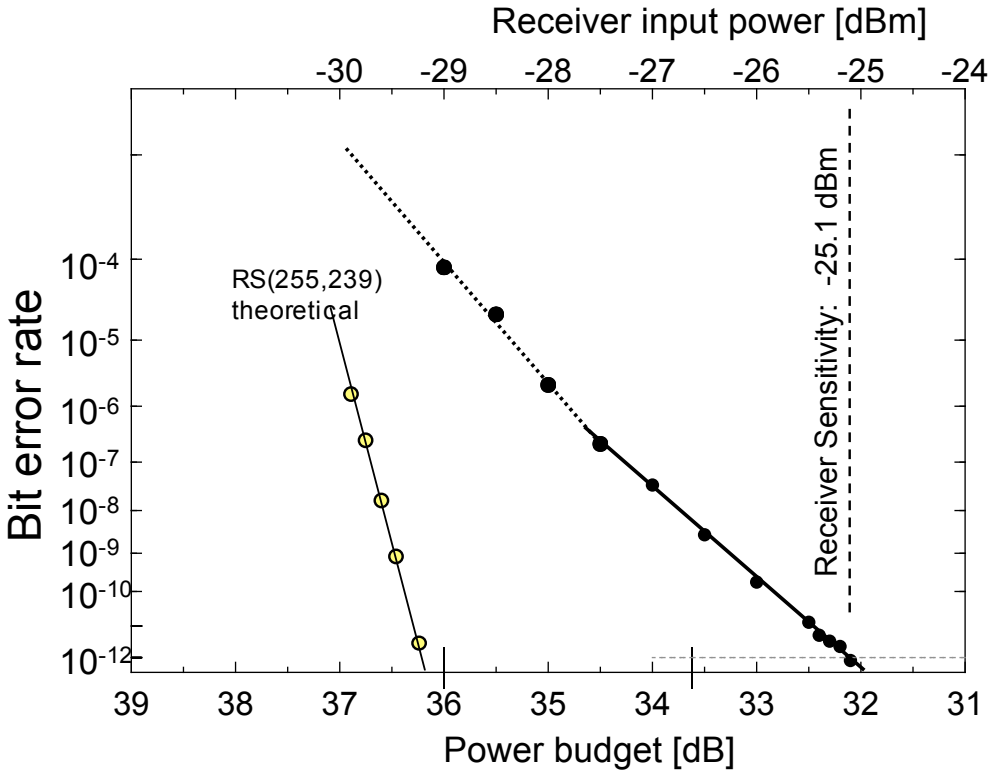
Upstream waveform



	0km	SMF 20km
Measured waveform		
Simulated waveform		

We have not seen deteriorate of dispersion.

Upstream Power Budgets



BER of Power Budget (including 20km SMF)

- We can obtain Physical Power Budget of **32.1dB** with +7.0dBm DFB-LD and APD.
- Dispersion penalty is measured 0dB.

Conclusions

✓Downstream

We can obtain the Power Budget of 32.6dB using LN external modulation and APD system.

✓Upstream

We can obtain the Power Budget of 32.1dB using high-power direct modulation DFB-LD and APD system. But we test with continuous signal, it doesn't contain Burst Penalty, so we should consider the burst signal gives Power Budget effect.

Conclusions

We measured 0dB dispersion penalty with our system, but we need to consider the specification power penalty for yield DFB-LD chirp tolerance.

The receiver sensitivity improvement is expected in using FEC and it will be obtained the more margin to Power Budget, we hope it margin will cancel Burst penalty.
We show theoretical FEC gain, but we need to discuss FEC method and redundancy rate.