Discrete Multi-Tone for 400GbE 10km reach

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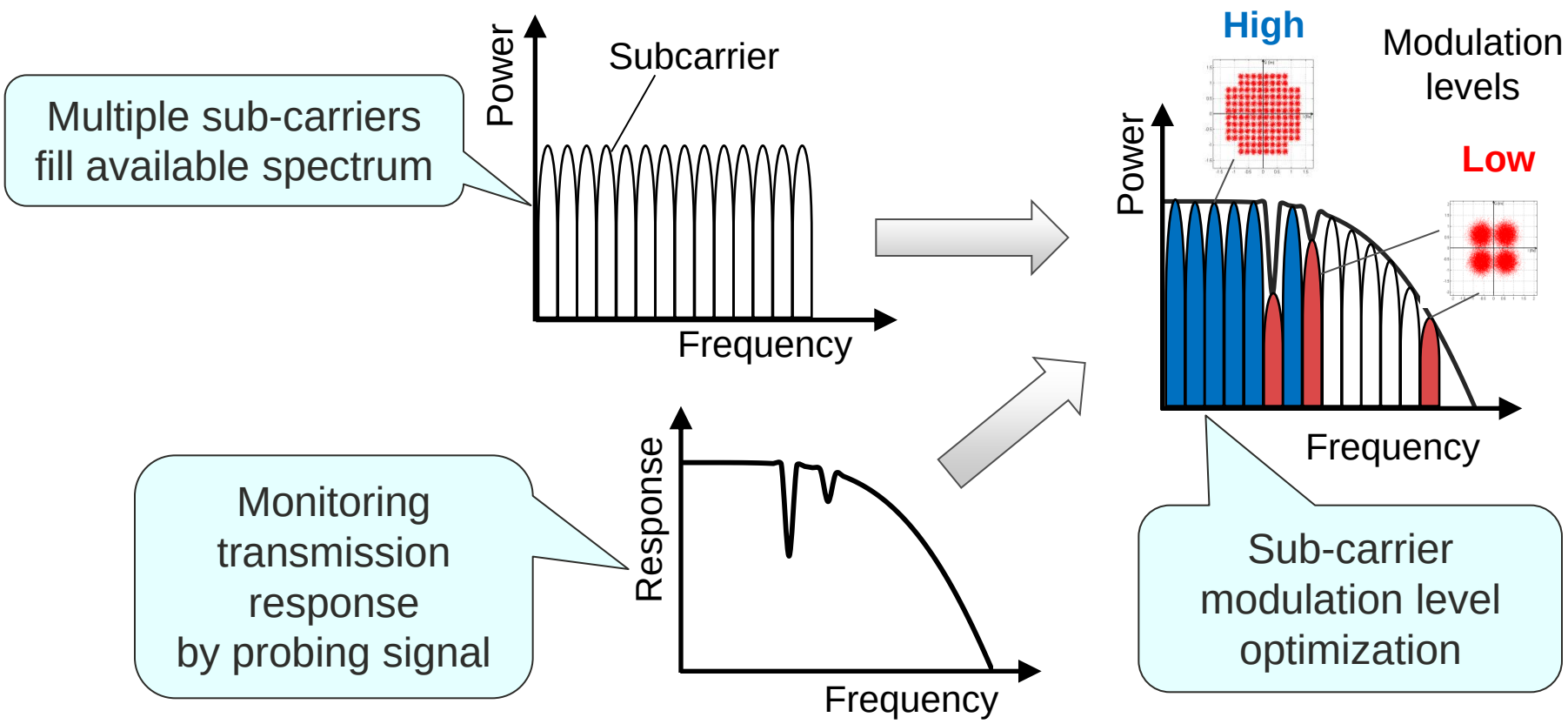
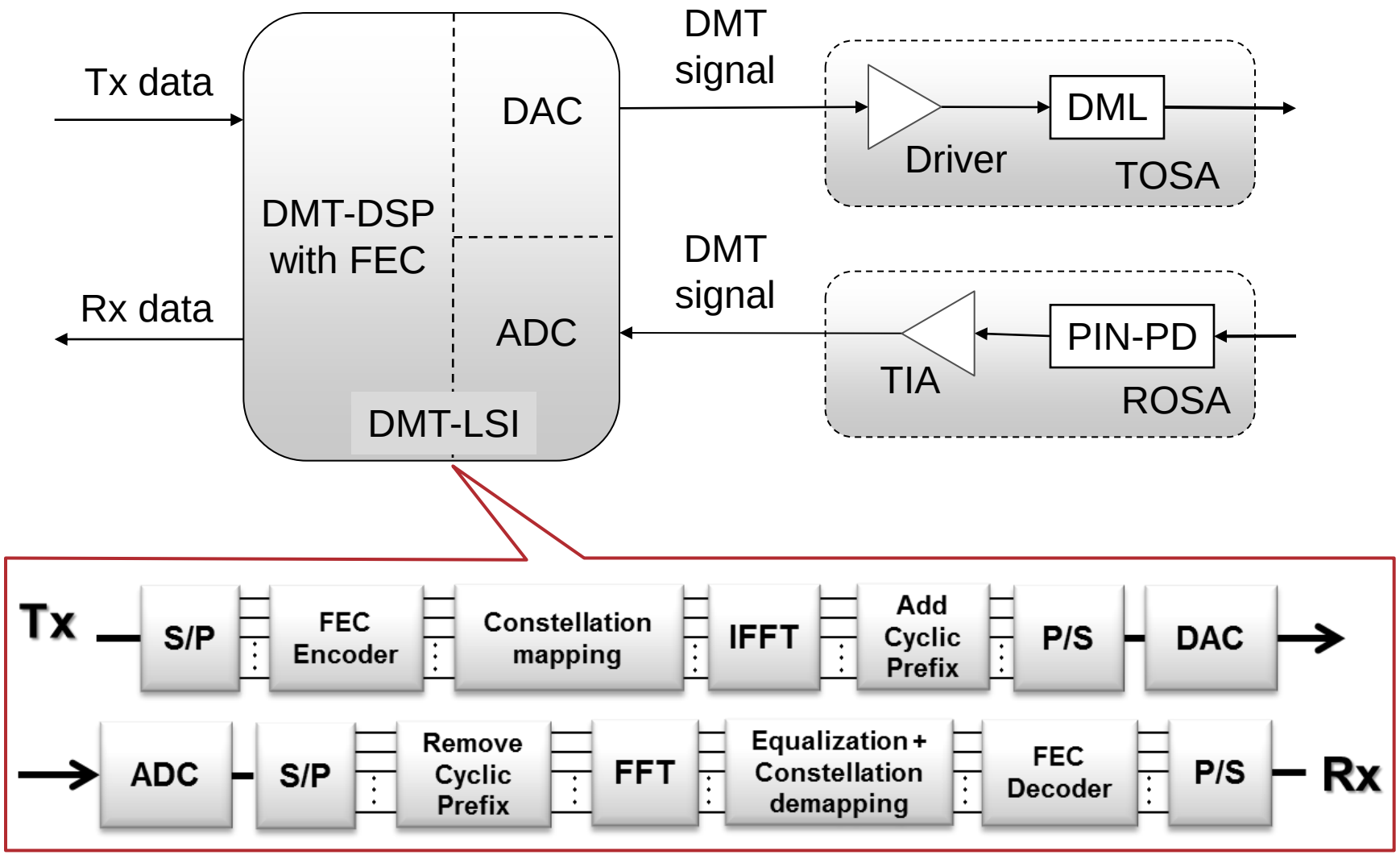
Principle of DMT (Recap)

- Widely used in xDSL systems (ADSL, HDSL)
  - High spectral efficiency and cost effectiveness
- Adaptive bit and power allocation for each subcarrier
  - Optimization from SNRs of the transmitted probing signal



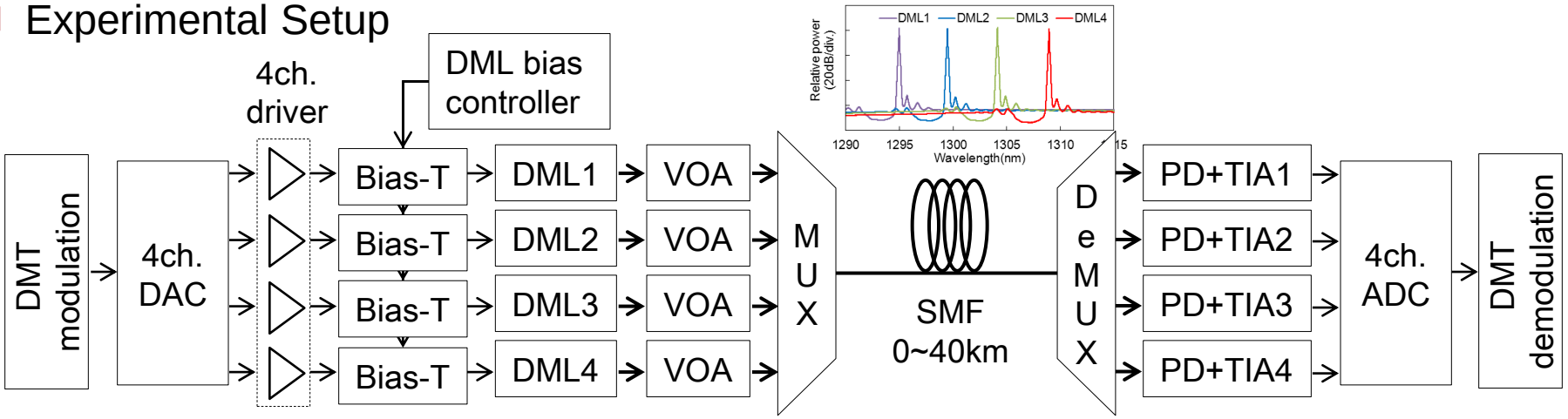
Block diagram of optical DMT transceiver (Recap)



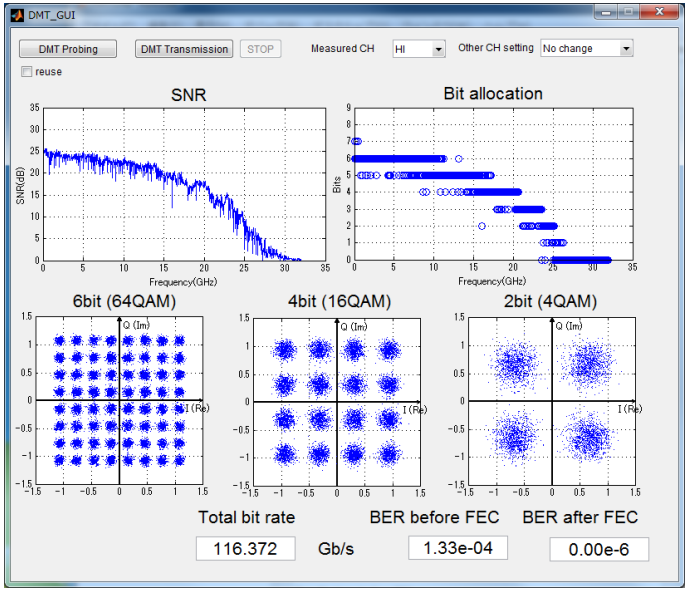
(I)FFT: (Inversed) Fast Fourier Transform

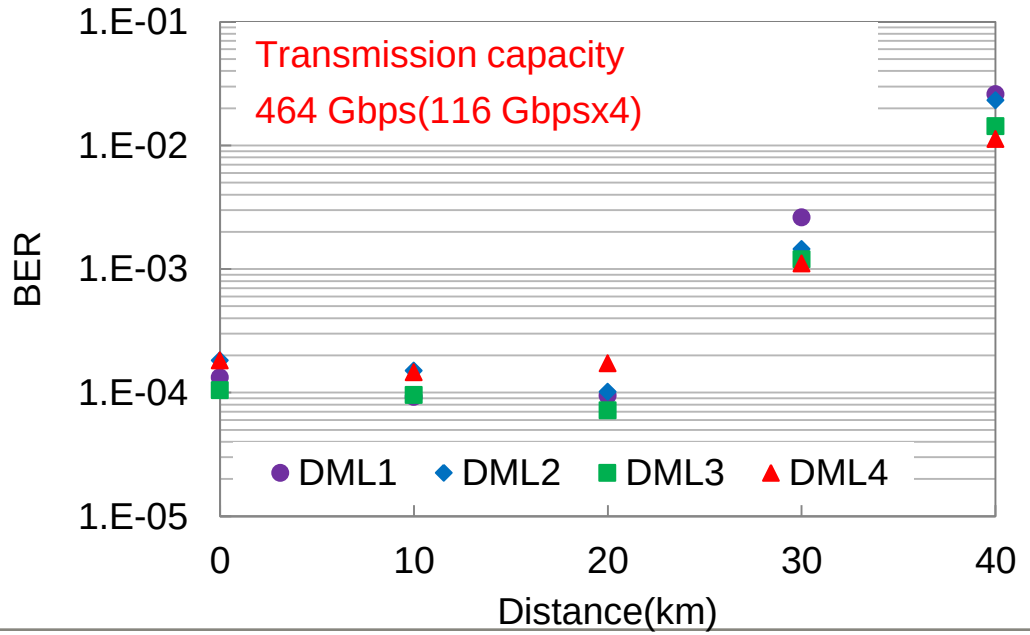
Technical feasibility
(400GbE transmission experiments)

- Experimental Setup

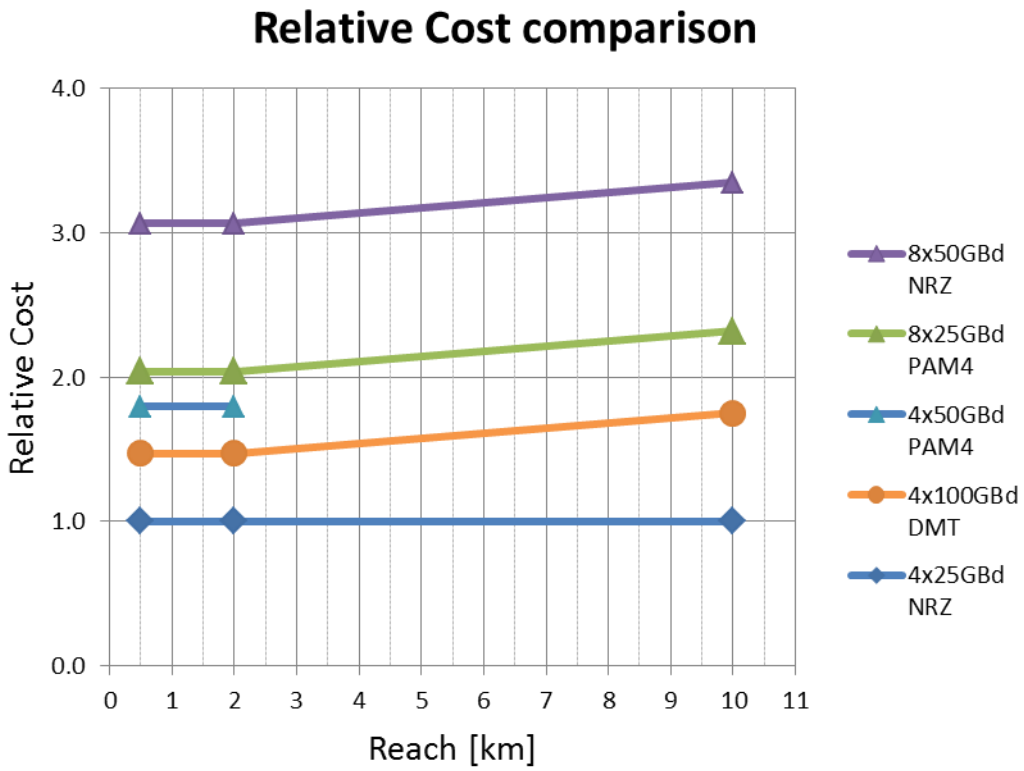


- Transmission result





Expected cost benefits of DMT



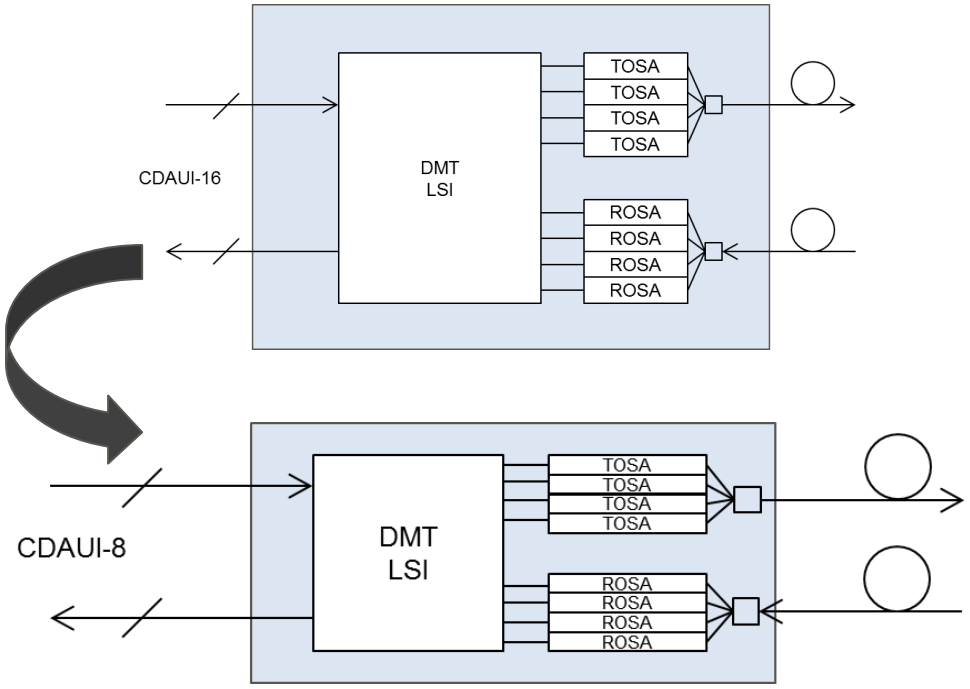
- ✓ DMT has a good potential for low cost, based on rough cost estimation. (Ref.: isono_3bs_01_0514)
- ✓ More precise cost estimation is ongoing, along with a closer examination of DMT configuration and required performance.

Two transceiver generations

A scenario of two transponder generations with backward compatibility is proposed, based on expected progress in CMOS process technology.

1st Gen Transceivers
(4x QSFP width)

2nd Gen Transceivers
(Half width of Gen.1)
Same depth
Same height



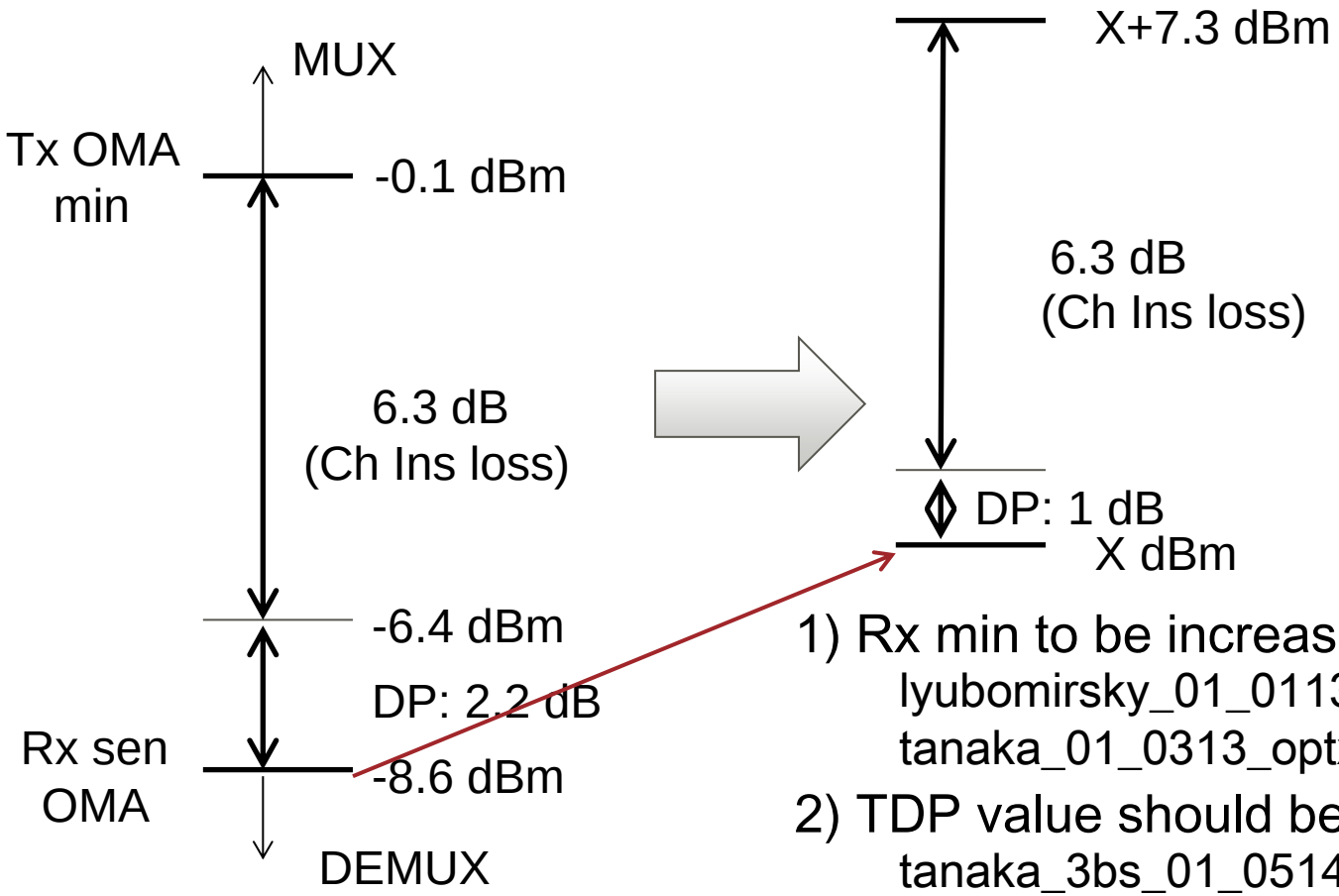
	1st Gen	2nd Gen
Form factor (width)	**4x**QSFP28 width (~CFP width)	**2x**QSFP28 width (~CFP2 width)
Optical Interface	4λ-LAN WDM	4λ-LAN WDM
Electrical Interface	CDAUI-**16x28G** (CEI-28G-VSR)	CDAUI-**8x56G** (CEI-56G-VSR)

Form factor, power cons., and pin assignment to be discussed in industrial MSA.

Link budget considerations

100GBASE-LR4 (802.3bm)

400GBASE-LR4 (**802.3bs: proposal**)



1) Rx min to be increased to X dBm
   - lyubomirsky_01_0113_optx 100G
   - tanaka_01_0313_optx 100G
2) TDP value should be revised to 1 dB
   - tanaka_3bs_01_0514
3) Ch ins loss (6.3dB) should be kept .

Summary

- ✓ Recapitulated DMT principle and basic configuration.
- ✓ In Study Group presentations we reported on the potential of DMT to become a practical product, from industry viewpoint (Technical and Economic feasibility):
  - Verified by experiment transmission over 40km SMF
  - Demonstrated feasibility with cost-effective optics
- ✓ Proposed an expected DMT transceiver technology evolution scenario considering expected progress in CMOS technology.
- ✓ Started reviewing link budget, and presented some new proposals. Continue to examine this and report the results in the future.