SUMITOMO ELECTRIC
Device Innovations USA

# Reduced Extinction Ratio Concerns

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Re-present slides from Naruto TANAKA, Daisuke UMEDA

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# Introduction

- Previous presentation from colleagues in P802.3ca, 100G EPON Task Force
- Nov. 2016, **tanaka_3ca_1_1116**

# Introduction

- 25G APD receiver sensitivity are one of concerns to consider the power budget classes.
- OMA sensitivity degradation of APD receiver should be taken into account in case to use the low ER transmitter, for example the upstream DML transmitter.

- 25G receiver sensitivities are evaluated.
  - Multiple devices of receivers and transmitters are tested.
    - Rx: PIN-PD ROSA and APD ROSAs provided by two venders
    - Tx: DML and EML TOSA
  - Transmitter's ER is tuned as parameter
- 29dB Ch.I.L. is considered based on these evaluated data.



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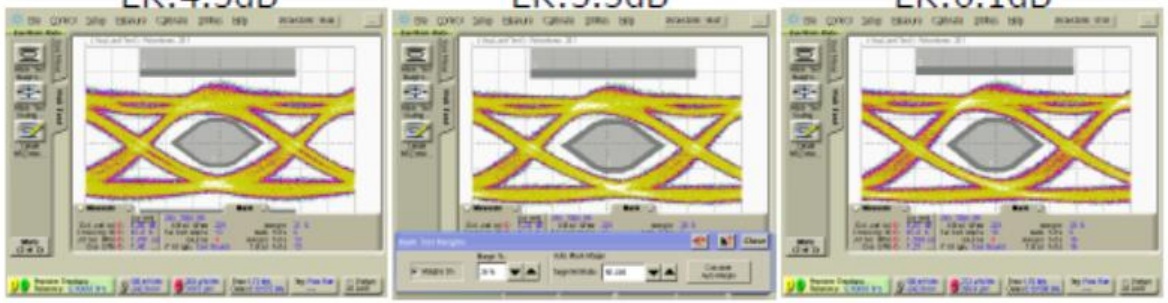
# Trasmitter's waveforms

- Transmitter's waveforms for receiver evaluation
  - Tx ER is tuned 4.5 – 6.1dB for DML and 4.9 – 9.9dB for EML.

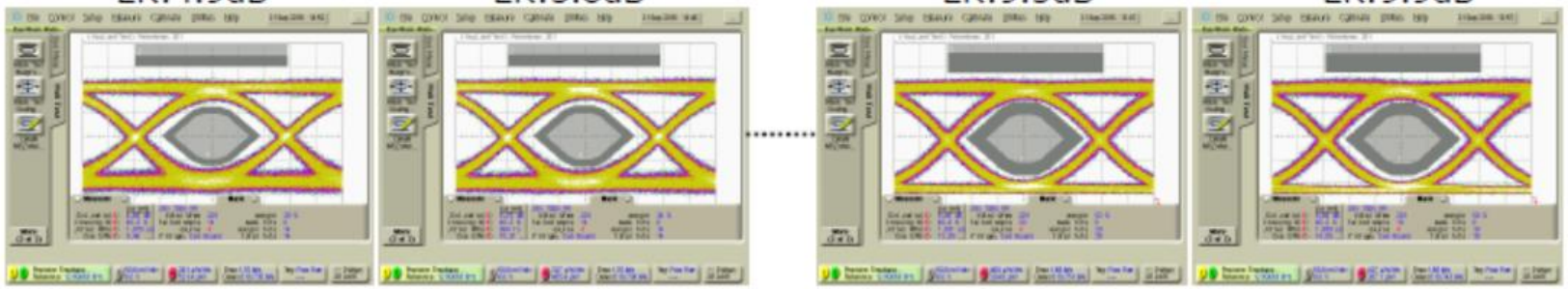
•DML

ER:4.5dB ER:5.3dB ER:6.1dB



•EML

ER:4.9dB ER:5.8dB ..... ER:9.5dB ER:9.9dB



•0 level of low ER is noisy a little.



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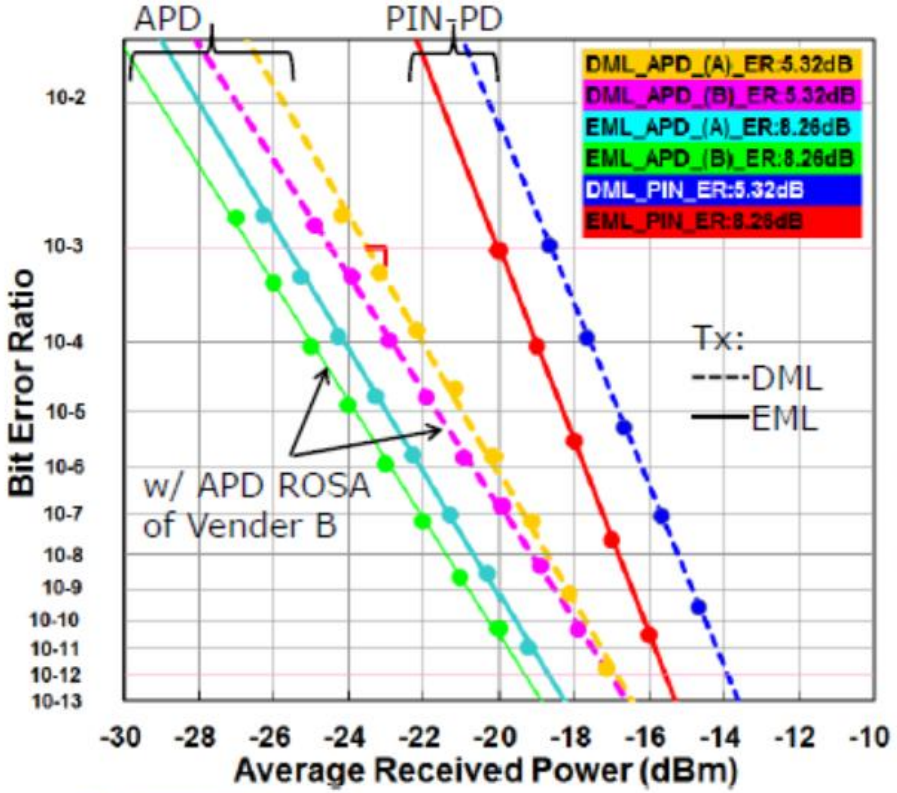
# BER results

- Simple BER results with the fixed ER for respective Tx device.
- Conditions: 1309.3nm, PRBS2^31-1, Ta25degC




Receiver sensitivities @BER:1e-3
Upper :as Average optical power(AOP)
(Lower):as Optical modulation amplitude(OMA)

| TOSA \ ROSA | APD A | APD B | PIN-PD |
|---|---|---|---|
| DML (ER:5.3dB) | -23.49 (-23.11) | -24.47 (-24.09) | -18.44 (-18.06) |
| EML (ER:8.3dB) | -25.65 (-23.95) | -26.62 (-24.91) | -20.03 (-18.32) |

- 0.8dB differences of OMA sensitivities with both APD ROSAs b/w DML and EML
- 5~6dB differences b/w PIN and APD (1dB differences of sensitivities between two venders)



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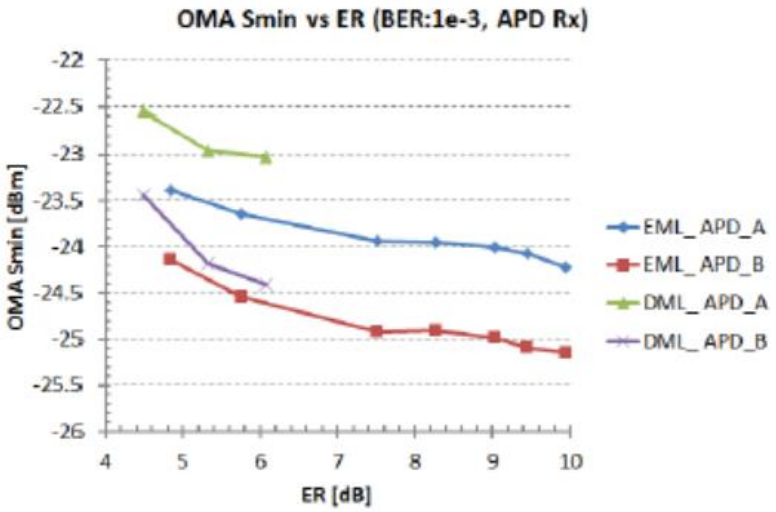
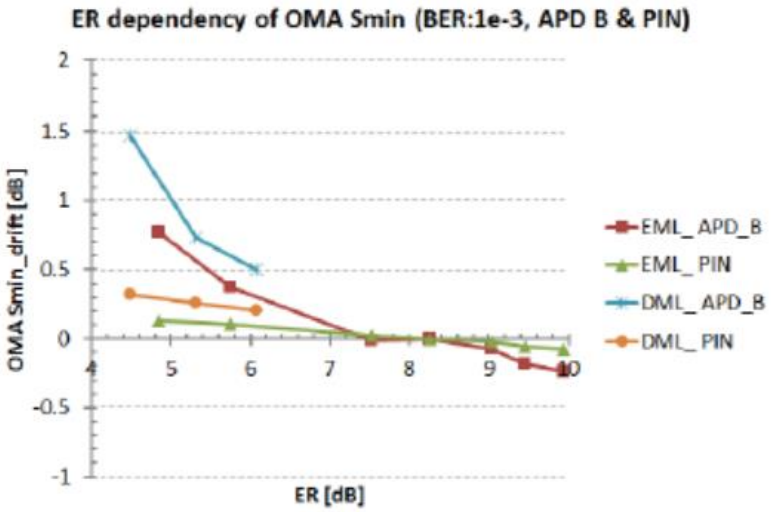
# ER dependency of OMA sensitivity

- ER dependencies of OMA sensitivity and influences of DML Tx.




- OMA sensitivities are degraded w/ low ER Tx.
- They are degraded w/ DML Tx more than EML Tx. (Both APD ROSAs have same tendencies.)

- Normalized to results w/ 8dB EML Tx.
- PIN-PD ROSA has no ER dependencies and 0.1~0.2dB difference b/w DML Tx and EML Tx. (This difference of PIN-PD ROSA's results is TP )



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# Summary

- ER dependencies of OMA sensitivities are investigated.
  - 0.5~0.7dB worse w/ low ER EML Tx than w/ 8dB ER.

➔ *Although proposed changes to minimum allowed extinction ratio are small (0.5dB reduction), further degradation of sensitivity for APD-based receivers is a concern.*

# - Thank You! -

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