Optical Modulation Amplitude (OMA) Specifications

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Previous presentations on OMA

- Donhowe et al.

  http://www.ieee802.org/3/10G_study/public/sept99/donhowe_1_0999.pdf

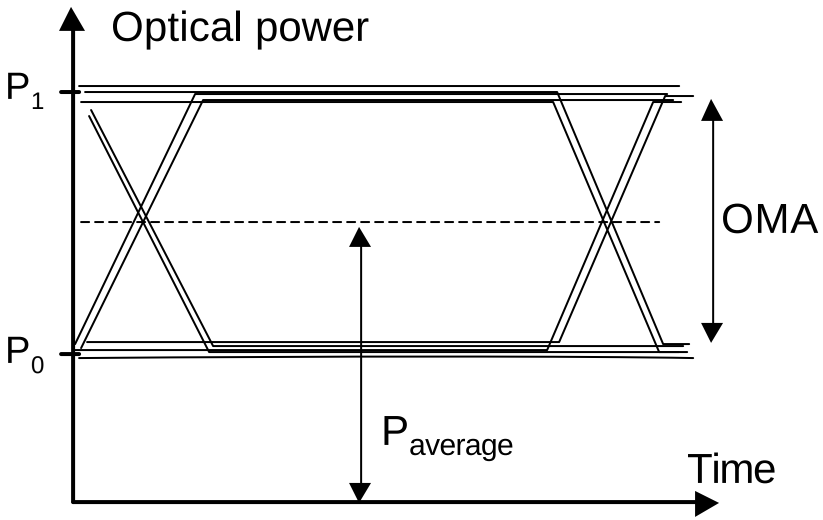
- Frojdh and Ohlen

  http://www.ieee802.org/3/ae/public/may00/frojdh_1_0500.pdf

  http://www.ieee802.org/3/ae/public/jul00/frojdh_1_0700.pdf

  http://www.ieee802.org/3/ae/public/sep00/ohlen_1_0900.pdf

What is OMA ?



$OMA = P_1 - P_0$

$P_{average} = (P_1 + P_0)/2$

$ER = P_1/P_0$

- Used by FC
- At high ER: $OMA/2 = P_{average}$
- Measurements are somewhat different
  - Changes in 52.6
- You could measure
  - $P_{average}$ & ER
  - and calculate OMA

Why use OMA ?

- At the receiver OMA matters not $P_{average}$
  - With average power, we have to consider extinction ratio penalty (2.2 dB @ ER=6dB)
- With OMA, it is possible to use low or high extinction ratio, provided that
  - eye safety is OK at the transmitter
  - we do not overload the receiver
- At this point we do not change the numbers

How to specify OMA ?

- OMA in mW:
  - + Simple measurement on oscilloscope
  - – Hard to track changes to current draft
- OMA/2 in dBm:
  - – Needs conversion if measured on oscilloscope
  - + Easy to track changes to current draft, at large extinction ratio $P_{average}$ = OMA/2
  - + All the link budgets and penalties are i dB

Introduction of OMA

- 850 serial: Spec @ 6.5 dB extinction ratio
  - ER penalty = 1.98 dB → decrease powers by 1.98 dB
- 1310 serial: Spec @ 6 dB extinction ratio
  - ER penalty = 2.23 dB → decrease powers by 2.23 dB.
- 1550 serial: Spec @ 8 dB extinction ratio
  - ER penalty = 1.39 dB → decrease powers by 1.39 dB.
- Add eye safety (Tx) and overload (Rx) specs

Changes for 850 serial

Description	Old value	New value
Tx power (min)	$P_{average}$= -5.5 dBm	OMA/2= -7.48 dBm
RIN	-125 dB/Hz	N/A
RIN_OMA	N/A	-123.02 dB/HZ
Rx sensitivity	$P_{average}$= -13 dBm	OMA/2= -14.98 dBm
Stressed Rx sensitivity (50 um MMF)	$P_{average}$= -8.5 dBm	OMA/2= -10.48 dBm
Stressed Rx sensitivity (62.5 um MMF)	$P_{average}$= -7.6 dBm	OMA/2= -9.58 dBm
Rx max. input power	$P_{average}$= -1	$P_{average}$= -1 dBm

Changes for 1310 serial

Description	Old value	New value
Tx power (max)	$P_{average}$= 1 dBm	OMA/2= -1.23 dBm
Tx power (min)	$P_{average}$= -4 dBm	OMA/2= -6.23 dBm
Average launch power for eye safety	$P_{average}$= 1 dBm	$P_{average}$= 1 dBm (TBD)
RIN	-130 dB/Hz	N/A
RIN_OMA	N/A	-127.77 dB/HZ
Rx sensitivity	$P_{average}$= -14 dBm	OMA/2= -16.23 dBm
Stressed Rx sensitivity	$P_{average}$= -11.45 dBm	OMA/2= -13.68 dBm
Rx max. input power	$P_{average}$= 1	OMA/2= -1.23 dBm

Changes for 1550 serial

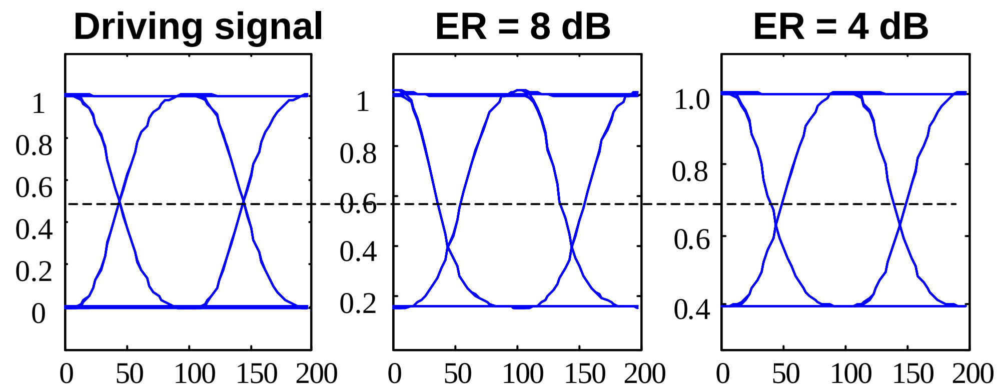
Description	Old value	New value
Tx power (max)	$P_{average}$= 2 dBm	OMA/2= 0.61 dBm
Tx power (min)	$P_{average}$= -2 dBm	OMA/2= -3.39 dBm
Average launch power for eye safety		$P_{average}$= 2 dBm (TBD)
RIN	-140 dB/Hz	N/A
RIN_OMA	N/A	-138.61 dB/HZ
Rx sensitivity	$P_{average}$= -20 dBm	OMA/2= -21.39 dBm
Stressed Rx sensitivity	$P_{average}$= -15.41 dBm	OMA/2= -16.8 dBm
Rx max. input power	$P_{average}$= -8	OMA/2= -9.39 dBm

Extinction ratio

- With OMA we can use a low or high extinction ratio to optimize a transmitter
- Proposed changes to extinction ratio:
  - 1310 nm: 6 dB → 4 dB
  - 1550 nm: 8 dB → 4 dB
  - 850 nm: 6.5 dB → 4 dB

Reasons for low ER, external modulator

- Electrical driving easier
- Easier to get symmetric eye with an electro-absorbtion modulator



- Short modulator → lower modulator loss.

Reason for low extinction ratio, directly modulated laser

BACKUP

- You want to stay well away from the threshold
  - Laser is slowest near the threshold
  - Low ER improves high-speed performance
- Simpler driving electronics
- Lower dispersion penalty, important for 1550 nm

Motion

- Specify the Optical Modulation Amplitude (OMA) as OMA/2 in dBm