spreadsheet of proposals on installed 500MHz*km MMF

# of wavelengths and type (L/S)	1-L	4WDM-L	2WDM-L	2WDM-L	4WDM-L	8WDM-S
optical modulation	PAM5	PAM5	PAM5	PAM5	on-off	on-off
PCS coding	?	1000T	?	8b/10b	8b/10b	8b/10b
Baud rate	5G	1.25G	2.5G	3.125G	3.125G	1.5625G
link length	500m	400m	1000m	800m	300m	200m
max power(eye safety) dBm	+2	+2	+2	+2	+2	-4
**********						
launched power/channel in dB	+2	-4	-1	-1	-4	-13
PAM-5 loss	-6	-6	-6	-6	0	0
optical eye open @ Rx ?	no	yes	no	no	yes	yes
ISI loss/DFE	DFE	0	DFE	DFE	2.5	0
Optical demux loss	0	-3	-2	-2	-3	-4
**********						
electrical signal power @Rx	-8	-26	-18	-18	-19	-34
electrical noise power @ Rx	-12	0	-6	-8	-8	-2
coding gain	0	+6	?	0	0	?
**********						
relative electrical SNR @ Rx in dB	-20	-20	-24	-26	-27	-36

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NOTES:

Some entries need an explanation:

1) eye safety and maximum launched power: I preferred to keep the accepted values of + 2dBm for 1300nm lasers and -4 dBm for 850 nm lasers. If a way can be found to relax these specs, as suggested by Blaze, it would probably leave the relative comparison intact.

2) ISI loss/DFE: clearly the proponents of using a DFE (equalizer) are also proposing link lengths that correspond to a complete closure of the optical eye (large ISI). I assumed that the equalizer is ideal and eliminates all the ISI.

3) Blaze has shown that much smaller losses can be attained in the optical mux (~2 dB) by a right selection of the technology and by targeting only the MMF (instead of both SM and MMF, as HP does). With respect to the optical demux I assumed that the losses are smaller when the distance between the wavelengths is larger and I arbitrarily assigned 4, 3 and 2 dB losses to the 8-WDM, 4-WDM and 2-WDM demuxes.

4) electrical noise power: the electrical noise power is proportional to the square of the bandwidth, as I showed in my presentation in Kauai. The quoted values of the noise follow this law. The thermal noise of the 1.25 Gbaud receiver was taken as reference (0 dB).

5) The spreadsheet presents a relative comparison. Hence some common losses to all approaches, like the connector losses, are not taken into account.

6) The order of the columns is irrelevant. I used the electrical SNR criterion, since it determines the BER. Other people might emphasize the advantage of having an open optical eye at the input of the Rx or of using on-off keying. Others, might emphasize the system advantage of using low baud rates (PCBs, packaging, CMOS integration)

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