MPI penalty estimation: comparison across models and methodologies.

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Background

Different contributions and models have been recently submitted to solve the MPI big ticket item for double and triple links.

This presentation (together with a separate spreadsheet file) compares the results illustrated into SMF ad-hoc area by different contributors:

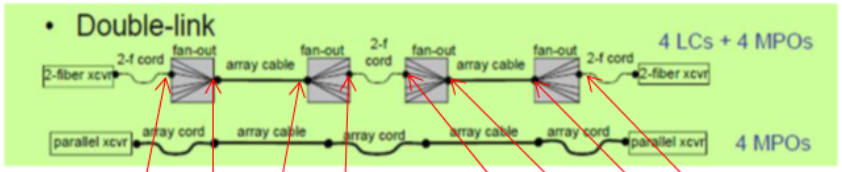
- King: MPI statistical model and results
- Bhatt: Estimating MPI penalties
- Liu: Upper Bound Based MPI Penalty Analysis

And shown comparison results over similar cases, achieved running available calculators.

- King (Jan 12): Monte Carlo MPI spreadsheet model
- Bhatt: MPI Penalty Upper Bound Calculator

All results are given assuming minimum PMD extinction ratio and 26dB TX/RX reflectance's.

Pictorial views of channel models.

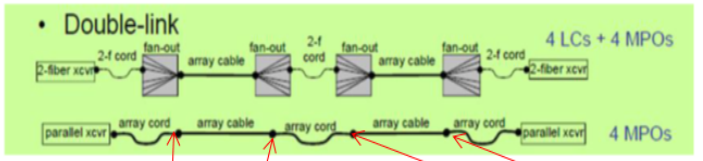


FR8/LR8

DR4

Set R6 and R7 to -1000

PMD											PMD
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
-26	-35	-55	-55	-35	-1000	-1000	-35	-55	-55	-35	-26



FR8/LR8

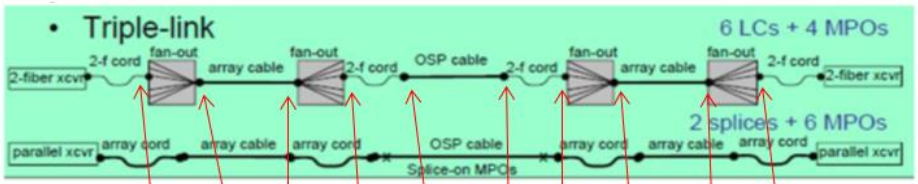
DR4

Set R2 and R5 to -1000

Set R6 and R7 to -1000

Set R8 and R11 to -1000

PMD											PMD
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
-26	-1000	-55	-55	-1000	-1000	-1000	-1000	-55	-55	-1000	-26



FR8/LR8

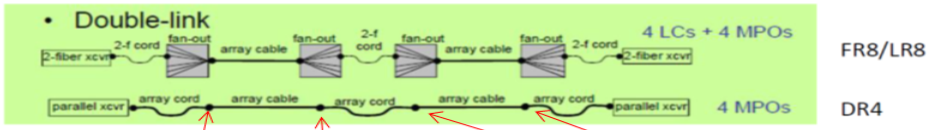
PMD											PMD
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
-26	-35	-55	-55	-35	-35	-35	-35	-55	-55	-35	-26

Double and triple links represented with 12 reflectance points R1-R12, of which R1 and R12 are the TX and RX.

For FR8/LR8 double link, R6 and R7 are assumed = -1000 into calculator.

For DR4 double link R2, R5, R6, R7, R8 and R11 are assumed = -1000 into calculator.

Double link DR4 (no loss): results comparison.



Set R2 and R5 to -1000 | Set R6 and R7 to -1000 | Set R8 and R11 to -1000

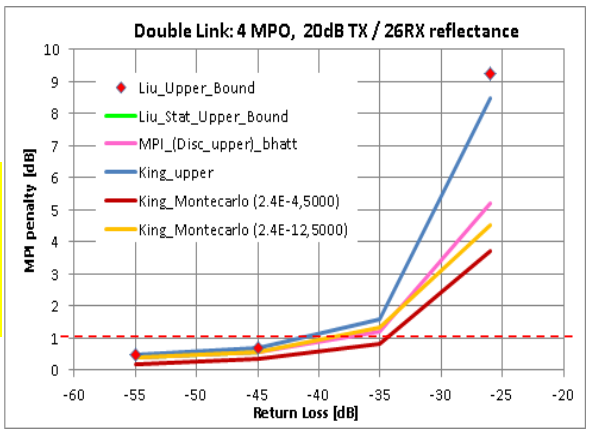
	PMD											PMD
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
	Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
Case 1	-26	-1000	-26	-26	-1000	-1000	-1000	-1000	-26	-26	-1000	-26
Case 2	-26	-1000	-35	-35	-1000	-1000	-1000	-1000	-35	-35	-1000	-26
Case 3	-26	-1000	-45	-45	-1000	-1000	-1000	-1000	-45	-45	-1000	-26
Case 4	-26	-1000	-55	-55	-1000	-1000	-1000	-1000	-55	-55	-1000	-26
Case A	-20	-1000	-26	-26	-1000	-1000	-1000	-1000	-26	-26	-1000	-26
Case B	-20	-1000	-35	-35	-1000	-1000	-1000	-1000	-35	-35	-1000	-26
Case C	-20	-1000	-45	-45	-1000	-1000	-1000	-1000	-45	-45	-1000	-26
Case D	-20	-1000	-55	-55	-1000	-1000	-1000	-1000	-55	-55	-1000	-26

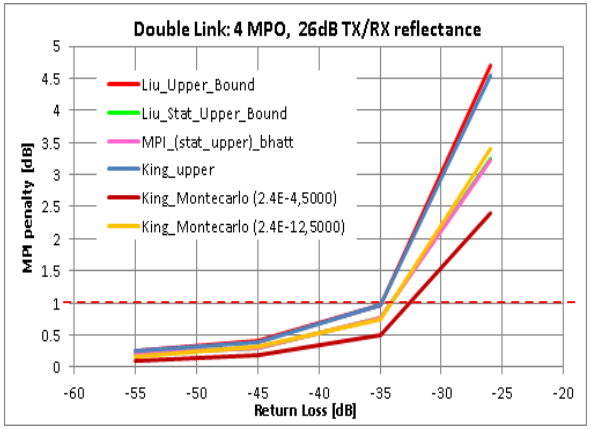
			Liu		Bhatt	King		
	ER [dB]	Liu case	Liu_Upper_Bound	Liu_Stat_Upper_Bound	Bhatt_Disc_Upper_Bound	King_Upper_Bound	King_Montecarlo (2.4E-4,5000)	King_Montecarlo (2.4E-12,5000)
Case 1	5	Case A (DR4)	4.7	3.24	3.22	4.54	2.4	3.4
Case 2	5	Case C (DR4)	0.98	0.76	0.76	0.98	0.5	0.75
Case 3	5	Case F (DR4)	0.4	0.31	0.31	0.39	0.18	0.32
Case 4	5	Case E (DR4)	0.25	0.2	0.2	0.25	0.09	0.17
Case A	5	Case B (DR4)	9.24	5.23	5.19	8.49	3.7	4.5
Case B	5				1.22	1.59	0.8	1.35
Case C	5	Case H (DR4)	0.71	0.55	0.55	0.71	0.35	0.55
Case D	5	Case G (DR4)	0.49	0.39	0.38	0.49	0.2	0.38

All Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
One between Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
All Statistical/Montecarlo results < 1dB penalty, 2dB > Upper >1dB
All results < 1dB penalty

Upper bound : Good agreement between Liu and King across cases 1-4.
Statistical/Discounted upper bound : Good agreement between Liu and Bhatt (D≈0.8) across cases 1-4.
Since Montecarlo (target BER 2.4E-4, 5000 rows, estimation at 1E-6 BER) provide more optimistics results than statistic, 2.4E-12 target BER (same rows and BER estimation) were also run, so to try to forecast statistical upper bound results when then Bhatt calculator was not used (mixed links).

>= 35dB RL needed to meet 1dB MPI penalty if connector or and mid loss are set to 0dB.





Double link DR4 (distributed and mid loss): comparison.

																Liu		Bhatt	King		
	ER [dB]	Connector Loss [dB]	R 1	R 2	R 3	R 4	R 5	R 6	Mid Loss	R 7	R 8	R 9	R 10	R 11	R 12	Liu_Upper_Bound	Liu_Stat_Upper_Bound	Bhatt_Disc_Upper_Bound	King_upper	King_Montecarlo (2.4E-4,5000)	King_Montecarlo (2.4E-12,5000)
SL Case 1	5	0.5	-26	-1000	-35	-35	-1000	-1000	0	-1000	-1000	-35	-35	-1000	-26			0.61	0.73	0.32	0.6
SL Case 1a			-26	-1000	-35	-35	-1000	-1000	1	-1000	-1000	-35	-35	-1000	-26				0.64	0.26	
SL Case 2			-26	-1000	-45	-45	-1000	-1000	0	-1000	-1000	-45	-45	-1000	-26			0.23	0.28	0.08	0.17
SL Case 2a			-26	-1000	-45	-45	-1000	-1000	1	-1000	-1000	-45	-45	-1000	-26				0.24	0.05	
SL Case 3			-26	-1000	-55	-55	-1000	-1000	0	-1000	-1000	-55	-55	-1000	-26			0.14	0.17	0.03	0.08
SL Case 3a			-26	-1000	-55	-55	-1000	-1000	1	-1000	-1000	-55	-55	-1000	-26				0.14	0.02	
SL Case A1	5	0.5	-20	-1000	-35	-35	-1000	-1000	0	-1000	-1000	-35	-35	-1000	-26			0.94	1.16	0.65	0.9
SL Case A			-20	-1000	-35	-35	-1000	-1000	1	-1000	-1000	-35	-35	-1000	-26				1	0.5	
SL Case B			-20	-1000	-45	-45	-1000	-1000	0	-1000	-1000	-45	-45	-1000	-26			0.39	0.49	0.18	0.35
SL Case B1			-20	-1000	-45	-45	-1000	-1000	1	-1000	-1000	-45	-45	-1000	-26				0.41	0.12	
SL Case C			-20	-1000	-55	-55	-1000	-1000	0	-1000	-1000	-55	-55	-1000	-26			0.25	0.32	0.1	0.21
SL Case C1			-20	-1000	-55	-55	-1000	-1000	1	-1000	-1000	-55	-55	-1000	-26				0.26	0.07	

Set 0.5dB into "per segment loss" into bhatt calculator

Forcing 0.5dB into D14, E14, J14 and K14 of King calculator

All Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB

One between Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB

All Statistical/Montecarlo results < 1dB penalty, 2dB > Upper >1dB

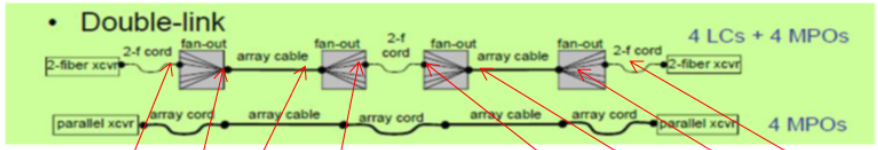
All results < 1dB penalty

MPI Upper bound penalty for 26 (20dB) TX reflectance:

- MPO connector with IL=0.5dB and 45dB RL, 1dB mid loss -> MPI penalty =< 0.28 (0.49) dB.
- MPO connector with IL=0.5dB and 55dB RL, 1dB mid loss -> MPI penalty =< 0.14 (0.26) dB.

																Liu		Bhatt	King		
	ER [dB]	Conn Loss [dB]	R 1	R 2	R 3	R 4	R 5	R 6	Mid Loss	R 7	R 8	R 9	R 10	R 11	R 12	Liu_Upper_Bound	Liu_Stat_Upper_Bound	Bhatt_Disc_Upper_Bound	King_upper	King_Montecarlo (2.4E-4,5000)	King_Montecarlo (2.4E-12,5000)
ML Case 1	5	0	-26	-1000	-35	-35	-1000	-1000	0	-1000	-1000	-35	-35	-1000	-26	0.98	0.76	0.76	0.98	0.5	0.75
			-26	-1000	-35	-35	-1000	-1000	1.5	-1000	-1000	-35	-35	-1000	-26				0.78	0.37	0.6
			-26	-1000	-35	-35	-1000	-1000	3	-1000	-1000	-35	-35	-1000	-26				0.64	0.3	0.53
ML Case 1	5	0	-26	-1000	-45	-45	-1000	-1000	0	-1000	-1000	-45	-45	-1000	-26	0.4	0.31	0.31	0.39	0.18	0.32
			-26	-1000	-45	-45	-1000	-1000	1.5	-1000	-1000	-45	-45	-1000	-26				0.3	0.09	0.22
			-26	-1000	-45	-45	-1000	-1000	3	-1000	-1000	-45	-45	-1000	-26				0.24	0.06	0.18
ML Case 1	5	0	-26	-1000	-55	-55	-1000	-1000	0	-1000	-1000	-55	-55	-1000	-26	0.25	0.2	0.2	0.25	0.09	0.17
			-26	-1000	-55	-55	-1000	-1000	1.5	-1000	-1000	-55	-55	-1000	-26				0.19	0.04	0.09
			-26	-1000	-55	-55	-1000	-1000	3	-1000	-1000	-55	-55	-1000	-26				0.14	0.02	0.07
ML Case A	5	0	-20	-1000	-35	-35	-1000	-1000	0	-1000	-1000	-35	-35	-1000	-26			1.22	1.59	0.8	1.35
			-20	-1000	-35	-35	-1000	-1000	1.5	-1000	-1000	-35	-35	-1000	-26				1.23	0.7	1.15
			-20	-1000	-35	-35	-1000	-1000	3	-1000	-1000	-35	-35	-1000	-26				1	0.5	0.75
ML Case B	5	0	-20	-1000	-45	-45	-1000	-1000	0	-1000	-1000	-45	-45	-1000	-26	0.71	0.55	0.55	0.71	0.35	0.55
			-20	-1000	-45	-45	-1000	-1000	1.5	-1000	-1000	-45	-45	-1000	-26				0.53	0.18	0.41
			-20	-1000	-45	-45	-1000	-1000	3	-1000	-1000	-45	-45	-1000	-26				0.41	0.14	0.24
ML Case C	5	0	-20	-1000	-55	-55	-1000	-1000	0	-1000	-1000	-55	-55	-1000	-26	0.49	0.39	0.38	0.49	0.2	0.38
			-20	-1000	-55	-55	-1000	-1000	1.5	-1000	-1000	-55	-55	-1000	-26				0.35	0.12	0.25
			-20	-1000	-55	-55	-1000	-1000	3	-1000	-1000	-55	-55	-1000	-26				0.26	0.07	0.17

Double link FR8/LR8 (no loss): results comparison.



Set R6 and R7 to -1000

	PMD											PMD
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
	Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
Case 5	-26	-26	-55	-55	-26	-1000	-1000	-26	-55	-55	-26	-26
Case 6	-26	-35	-35	-35	-35	-35	-35	-35	-35	-35	-35	-26
Case 7	-26	-35	-45	-45	-35	-1000	-1000	-35	-45	-45	-35	-26
Case 8	-26	-35	-55	-55	-35	-1000	-1000	-35	-55	-55	-35	-26

			Liu		Bhatt	King		
	ER [dB]	Liu case	Liu_Upper_Bound	Liu_Stat_Upper_Bound	Bhatt_Disc_Upper_Bound	King_upper	King_Montecarlo (2.4E-4,5000)	King_stat (2.4E-12,5000)
Case 5	4.5	Case C (FR8)	5.87	3.97		5.63	2.5	4.1
Case 6	4.5	Case D (FR8)	2.81	2.12	2.09	2.76	1.55	1.75
Case 7	4.5	Case E (FR8)	1.49	1.16		1.47	0.79	1.1
Case 8	4.5	Case F (FR8)	1.18	0.93		1.17	0.61	1

All Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB

One between Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB

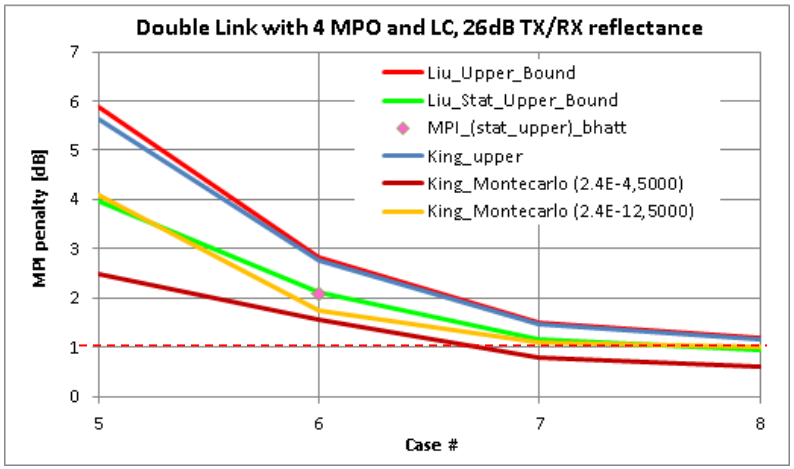
All Statistical/Montecarlo results < 1dB penalty, 2dB > Upper >1dB

All results < 1dB penalty

Upper bound : Good agreement between Liu and King across cases 5-8.

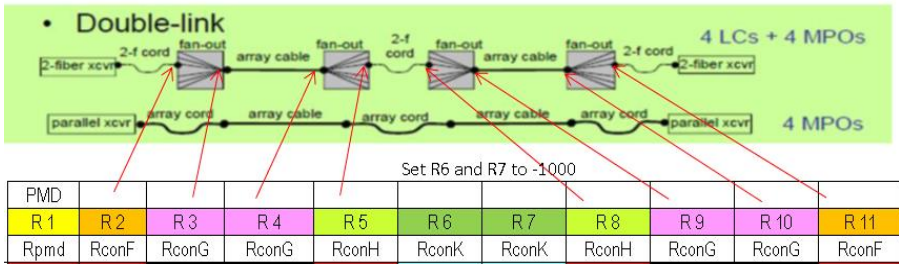
Statistical/Discounted upper bound : Good agreement between Liu and Bhatt (D≈0.8) across cases 5-8.

Since Montecarlo (target BER 2.4E-4, 5000 rows) provide more optimistics results than statistic, 2.4E-12 target BER were also run, so to try to forecast statistical upper bound results when then Bhatt calculator was not used (mixed links).



26dB LC RL (case 5) showing high penalties even with 55dB MPO.
All 35dB (case 6) also showing > 1dB MPI penalty with all models.

Double link FR8/LR8 (0 to 4dB mid-loss): comparison.



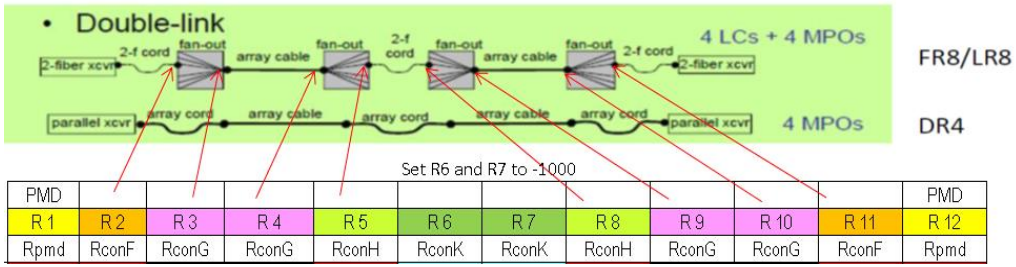
															Liu		Bhatt	King		
	ER [dB]	Liu case	R 1	R 2	R 3	R 4	R 5	R 6	Mid Loss	R 7	R 8	R 9	R 10	R 11	R 12	Upper Bound MPI	Stat Upper Bound	Bhatt_Disc_Upper_Bound	King_upper	King_stat (2.4E-4,5000)	King_stat (2.4E-12,5000)
Case 9	4.5	Case C (FR8)	-26	-26	-45	-45	-26	-1000	0	-1000	-26	-45	-45	-26	-26				7.25	3.2	4.5
		Case C (FR8)	-26	-26	-45	-45	-26	-1000	2	-1000	-26	-45	-45	-26	-26				4.43	2.2	2.6
		Case C (FR8)	-26	-26	-45	-45	-26	-1000	4	-1000	-26	-45	-45	-26	-26				3.28	1.55	2.4
Case 5a	4.5	Case C (FR8)	-26	-26	-55	-55	-26	-1000	0	-1000	-26	-55	-55	-26	-26	5.87	3.97		5.63	2.5	4.1
			-26	-26	-55	-55	-26	-1000	2	-1000	-26	-55	-55	-26	-26				3.66	1.9	2.8
			-26	-26	-55	-55	-26	-1000	4	-1000	-26	-55	-55	-26	-26				2.75	1.5	2.35
Case 7a	4.5	Case F (FR8)	-26	-35	-45	-45	-35	-1000	0	-1000	-35	-45	-45	-35	-26	1.49	1.16		1.47	0.79	1.1
			-26	-35	-45	-45	-35	-1000	2	-1000	-35	-45	-45	-35	-26				1.1	0.6	0.75
			-26	-35	-45	-45	-35	-1000	4	-1000	-35	-45	-45	-35	-26				0.88	0.3	0.7
Case 8a	4.5	Case F (FR8)	-26	-35	-55	-55	-35	-1000	0	-1000	-35	-55	-55	-35	-26	1.18	0.93		1.17	0.61	1
			-26	-35	-55	-55	-35	-1000	2	-1000	-35	-55	-55	-35	-26				0.87	0.5	0.65
			-26	-35	-55	-55	-35	-1000	4	-1000	-35	-55	-55	-35	-26				0.7	0.3	0.55

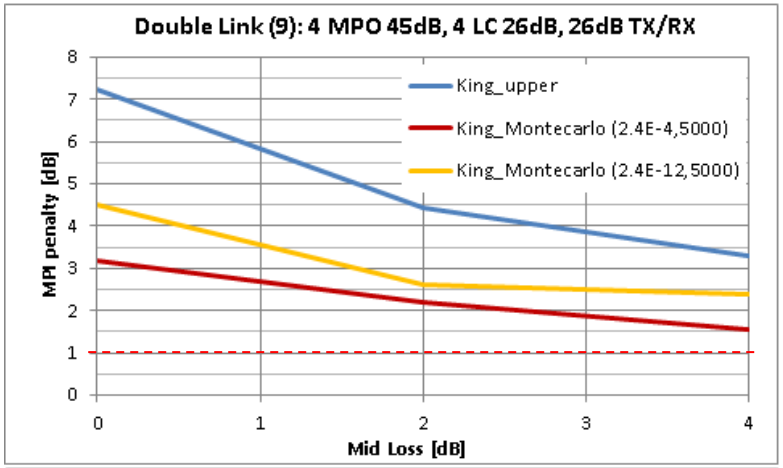
All Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
One between Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
All Statistical/Montecarlo results < 1dB penalty, 2dB > Upper >1dB
All results < 1dB penalty

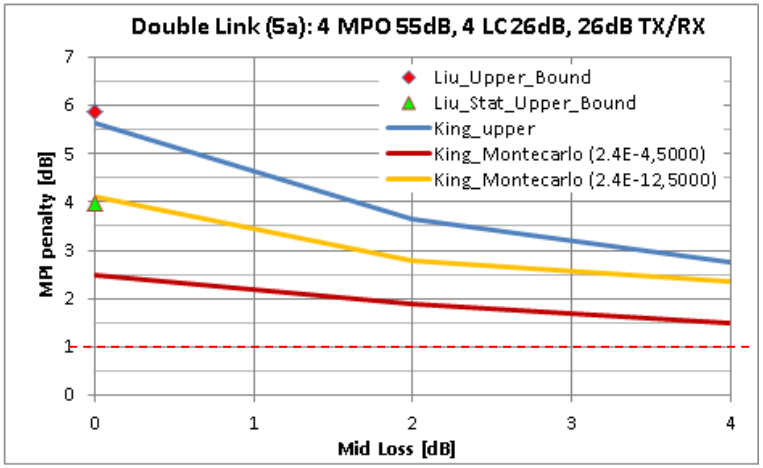
Note: bhatt_calculator doesn't currently allows mixed links and mid loss.

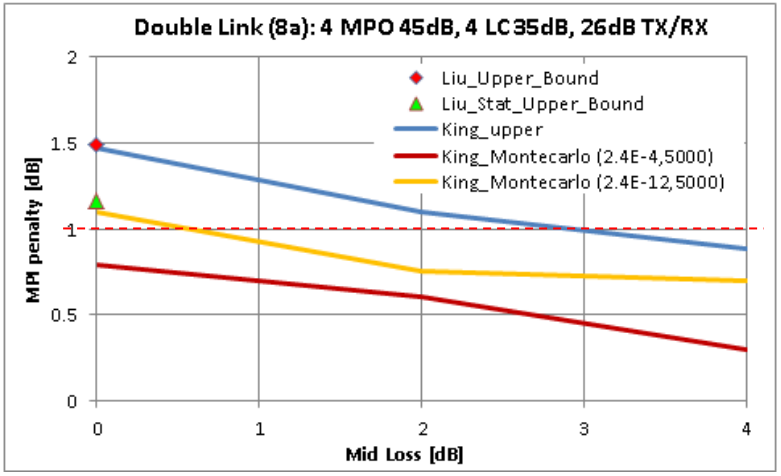
26dB RL seems not an option on LC connectors if we want penalty < 1dB.
Next slide showing trends of Cases 5a, 6a, 8a and 9.

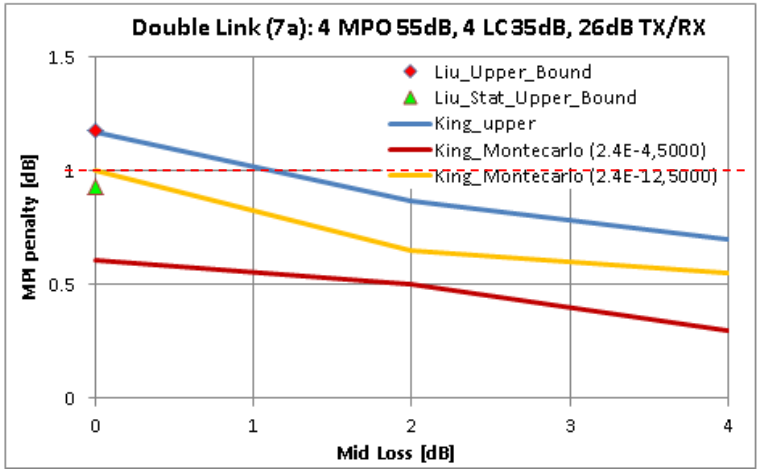
Double link FR8/LR8 (0 to 4dB mid-loss): comparison.



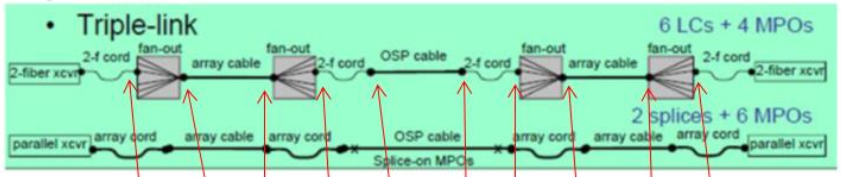








Triple link FR8/LR8 (0 to 6dB mid-loss): comparison.



FR8/LR8

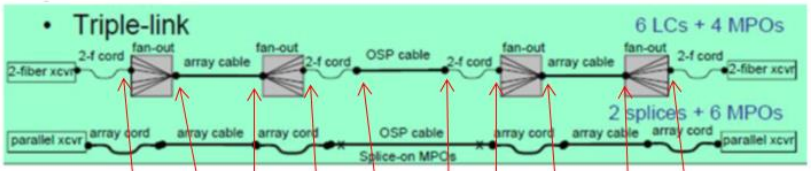
PMD											PMD
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
-26	-35	-55	-55	-35	-35	-35	-35	-55	-55	-35	-26

Results with Montecarlo at 2.4E-12 BER are similar (slightly better) than statistical upper bound.
Some odd and «scattered» Montecarlo results (see spreadsheet and slide 11).

															Liu		Bhatt	King		
	ER [dB]	Liu case	R 1	R 2	R 3	R 4	R 5	R 6	Mid Loss	R 7	R 8	R 9	R 10	R 11	R 12	Liu_Upper_Bound	Liu_Stat_Upper_Bound	Bhatt_Disc_Upper_Bound	King_upper	King_Montecarlo (2.4E-	King_Montecarlo (2.4E-
Triple Link Case 1: 26dB TX/RX refl, 35dB LC and 35dB MPO	4.5	CaseD (TL)	-26	-35	-35	-35	-35	-35	0	-35	-35	-35	-35	-35	-26	4.47	3.19	3.15	4.34	1.4	2.3
			-26	-35	-35	-35	-35	-35	1	-35	-35	-35	-35	-35	-26				3.58	1.5	2.2
			-26	-35	-35	-35	-35	-35	2	-35	-35	-35	-35	-35	-26				3.06	1.2	1.6
			-26	-35	-35	-35	-35	-35	3	-35	-35	-35	-35	-35	-26				2.68	0.9	1.45
			-26	-35	-35	-35	-35	-35	4	-35	-35	-35	-35	-35	-26				2.4	1	1.1
			-26	-35	-35	-35	-35	-35	5	-35	-35	-35	-35	-35	-26				2.2	0.85	1.1
			-26	-35	-35	-35	-35	-35	6	-35	-35	-35	-35	-35	-26				2.04	0.75	1
Triple Link Case 2: 26dB TX/RX refl, 35dB LC and 45dB MPO	4.5	CaseE (TL)	-26	-35	-45	-45	-35	-35	0	-35	-35	-45	-45	-35	-26	2.4	1.82		2.36	1.5	1.4
			-26	-35	-45	-45	-35	-35	1	-35	-35	-45	-45	-35	-26	2.03	1.56		2.01	1.1	1.3
			-26	-35	-45	-45	-35	-35	2	-35	-35	-45	-45	-35	-26	1.76	1.37		1.76	0.75	1.2
			-26	-35	-45	-45	-35	-35	3	-35	-35	-45	-45	-35	-26	1.56	1.22		1.56	0.58	1.1
			-26	-35	-45	-45	-35	-35	4	-35	-35	-45	-45	-35	-26	1.41	1.1		1.42	0.53	1
			-26	-35	-45	-45	-35	-35	5	-35	-35	-45	-45	-35	-26	1.29	1.01		1.3	0.4	0.85
			-26	-35	-45	-45	-35	-35	6	-35	-35	-45	-45	-35	-26	1.2	0.94		1.21	0.35	0.7
Triple Link Case 3: 26dB TX/RX refl, 35dB LC and 55dB MPO	4.5	CaseF (TL)	-26	-35	-55	-55	-35	-35	0	-35	-35	-55	-55	-35	-26	1.95	1.5		1.93	0.95	1.35
			-26	-35	-55	-55	-35	-35	1	-35	-35	-55	-55	-35	-26	1.66	1.29		1.65	0.9	1.05
			-26	-35	-55	-55	-35	-35	2	-35	-35	-55	-55	-35	-26	1.44	1.13		1.44	0.8	0.9
			-26	-35	-55	-55	-35	-35	3	-35	-35	-55	-55	-35	-26	1.28	1.01		1.29	0.55	0.75
			-26	-35	-55	-55	-35	-35	4	-35	-35	-55	-55	-35	-26	1.15	0.91		1.17	0.55	0.8
			-26	-35	-55	-55	-35	-35	5	-35	-35	-55	-55	-35	-26	1.06	0.83		1.07	0.45	0.72
			-26	-35	-55	-55	-35	-35	6	-35	-35	-55	-55	-35	-26	0.98	0.78		1	0.35	0.5
Triple Link Case 4: 26dB RL LC, 45dB RL	4.5		-26	-26	-45	-45	-26	-26	0	-26	-26	-45	-45	-26	-26	High	High				
			-26	-26	-45	-45	-26	-26	2	-26	-26	-45	-45	-26	-26						
			-26	-26	-45	-45	-26	-26	4	-26	-26	-45	-45	-26	-26						
Triple Link Case 5: 26dB RL LC, 55dB RL	4.5		-26	-26	-55	-55	-26	-26	0	-26	-26	-55	-55	-26	-26	High	High				
			-26	-26	-55	-55	-26	-26	2	-26	-26	-55	-55	-26	-26				????		5.3?
			-26	-26	-55	-55	-26	-26	4	-26	-26	-55	-55	-26	-26				10.03		3.7

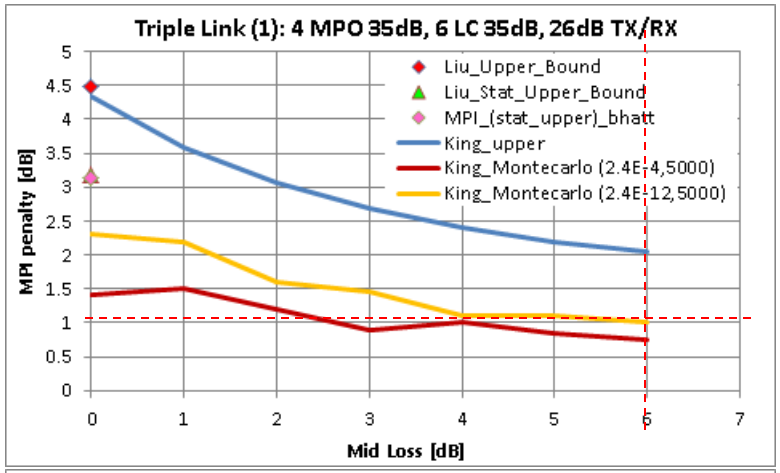
All Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
One between Statistical/Montecarlo results > 1dB penalty, 2dB > Upper >1dB
All Statistical/Montecarlo results < 1dB penalty, 2dB > Upper >1dB
All results < 1dB penalty

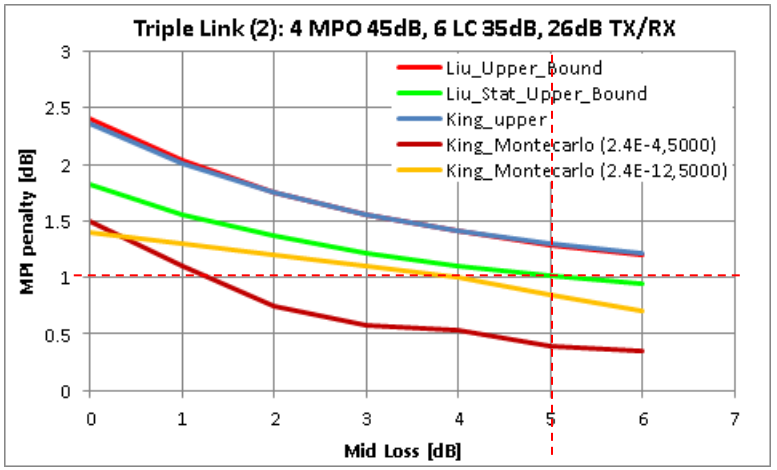
Triple link FR8/LR8 (0 to 6dB mid-loss): comparison.

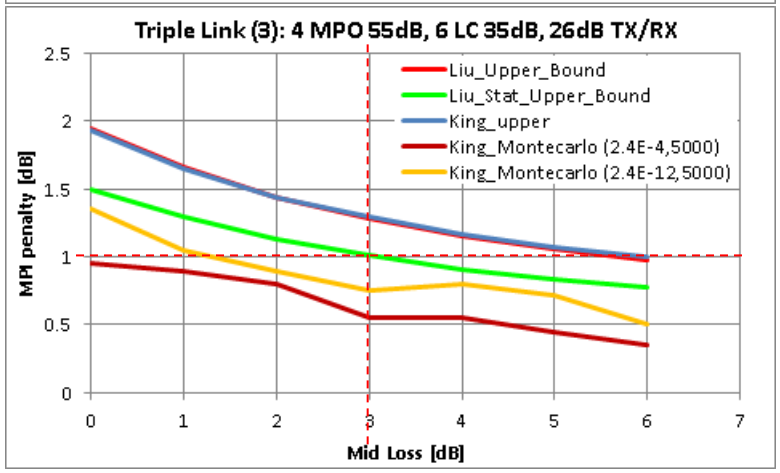


FR8/LR8

PMD											PMD
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
Rpmd	RconF	RconG	RconG	RconH	RconK	RconK	RconH	RconG	RconG	RconF	Rpmd
-26	-35	-55	-55	-35	-35	-35	-35	-55	-55	-35	-26





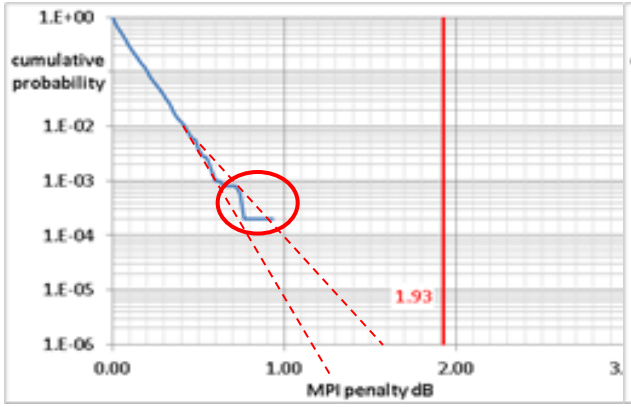


Results with Montecarlo at 2.4E-12 BER are similar (slightly better) than statistical upper bound.
With Montecarlo the estimation is sometimes harder so trends are more scattered.

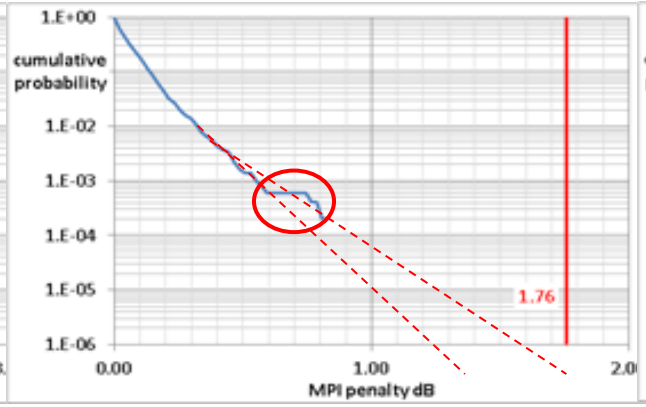
Considering only Stat Upper and Montecarlo, 1dB MPI penalty is at:

- >= 6dB mid-loss for MPO 35dB, LC 35dB RL;
- 5dB mid-loss for MPO 45dB, LC 35dB RL;
- 3dB mid-loss for MPO 55dB, LC 35dB RL.

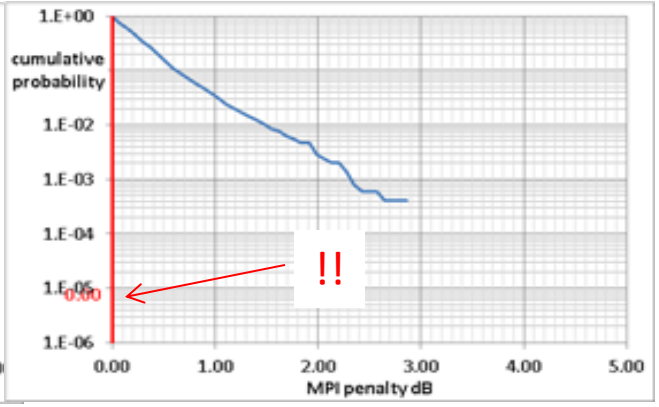
Montecarlo's odd plots (triple-link).



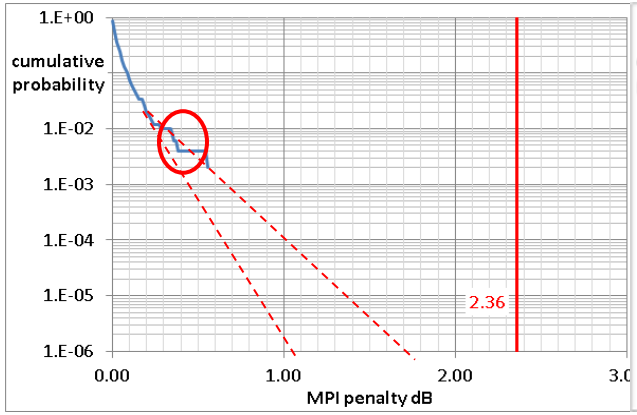
Case 2 (2dB): 2.4E-12, 5000 rows



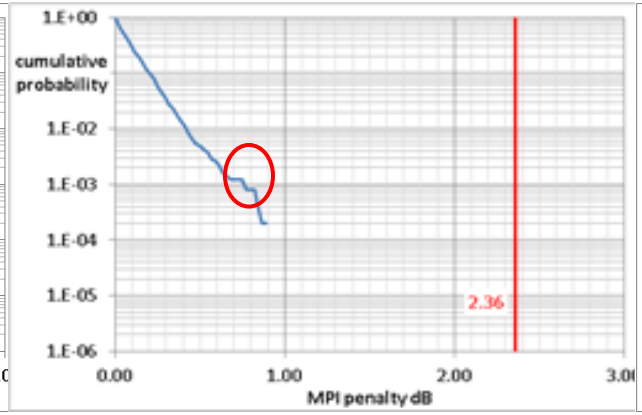
Case 2 (2dB): 2.4E-12, 5000 rows



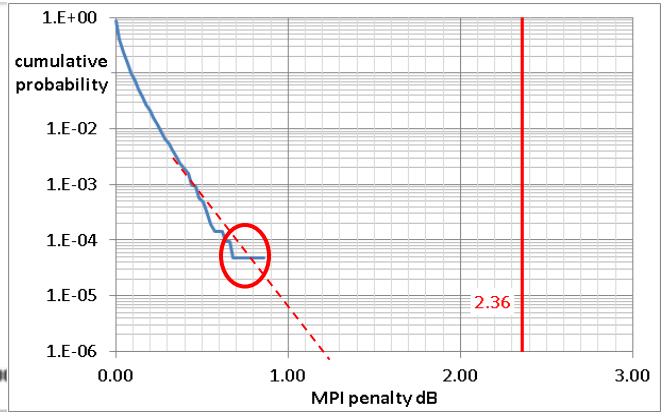
Case 5 (2dB): 2.4E-12, 5000 rows



Case2 (0dB), 2.4E-4, 500 rows



Case2 (0dB), 2.4E-4, 5000 rows



Case2 (0dB), 2.4E-4, 21000 rows

Comments

A detailed comparison of the three methods to estimate MPI penalty is given.

- Upper bound : Good agreement between Liu and King across cases.
- Statistical upper bound : Good match between Liu and Bhatt (D≈0.8) across cases.
- Montecarlo cases run (King, target BER 2.4E-4, 5000 rows) provide more optimistics results than statistic upper bound ones.
- With Montecarlo the penalty estimation becomes sometimes harder, so trends are bit more scattered; in some of the run cases the model appears to be broken.

Back-up

From kolesar_01_0413_smf...

Proposed content for Clause 96, underlined texts contain references

96.11.3.2 Medium Dependent Interface (MDI) requirements

The MDI shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-9: *MPO device receptacle, angled interface*. The plug terminating the optical fiber cabling shall meet the dimensional specifications of IEC 61754-7-1 interface 7-1-1: *MPO female plug connector, down-angled interface for 2 to 12 fibres*. The MDI shall optically mate with the plug on the optical fiber cabling. Figure 96–7 shows an MPO female plug connector with down-angled interface, and an MDI as an active device receptacle with angled interface.

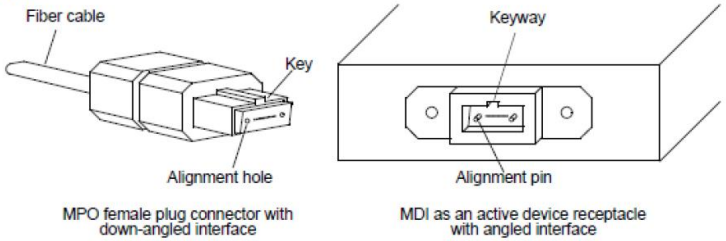


Figure 96–7—MPO female plug with down-angled interface and MDI active device receptacle with angled interface

The MDI shall meet the interface performance specifications of IEC 61793-021-2 for performance level D/1.

96.11.2.2 Maximum discrete reflectance

The maximum discrete reflectance shall be less than –55 dB.

IEC SM Connection Performance Grades

Attenuation grade	Attenuation in random mate
A	Not yet defined
B	≤ 0.12 dB mean ≤ 0.25 dB max for > 97% of samples
C	≤ 0.25 dB mean ≤ 0.50 dB max for > 97% of samples
D	≤ 0.50 dB mean ≤ 1.0 dB max for > 97% of samples

⇦ Appropriate for "un-tuned" LC

⇦ Appropriate for MPO

Return loss grade	Return loss in random mate
1	≥ 60 dB mated, ≥ 55 dB unmated
2	≥ 45 dB
3	≥ 35 dB
4	≥ 26 dB

⇦ Appropriate for APC

⇦ Aligned with present IEEE 802.3 specs