P1394b - Monterey

Jitter Review Homework

Colin Whitby-Strevens

Summary

- Reviewed Jitter specifications for both copper and optical in P1394b D0.15
  - compared with GE (902.3z) spec, FC-PHn specs, proposed new FC 2GBaud spec and FC MJS Rev 6.0 (98-055v6.pdf)
- Some of the grandfathering from Gigabit Ethernet may be based on misleading assumptions
  - jitter does not scale with Baud - need to look at the ps numbers
- Need better consistency between copper and optic than is present in GE
  - GE optical requires better copper transcievers than GE copper
- Need to review thejitter output budgets carefully
- P1394b reverts to discredited FC test patterns
  - need to develop specific test patterns, based on latest FC MJS document
- No jitter tolerance spec
  - recommend that we base one on the latest FC MJS document
- Test methods based on GE document (but with FC test patterns)
  - better to reference latest FC MJS document - DJ is definitely flawed

System block diagram

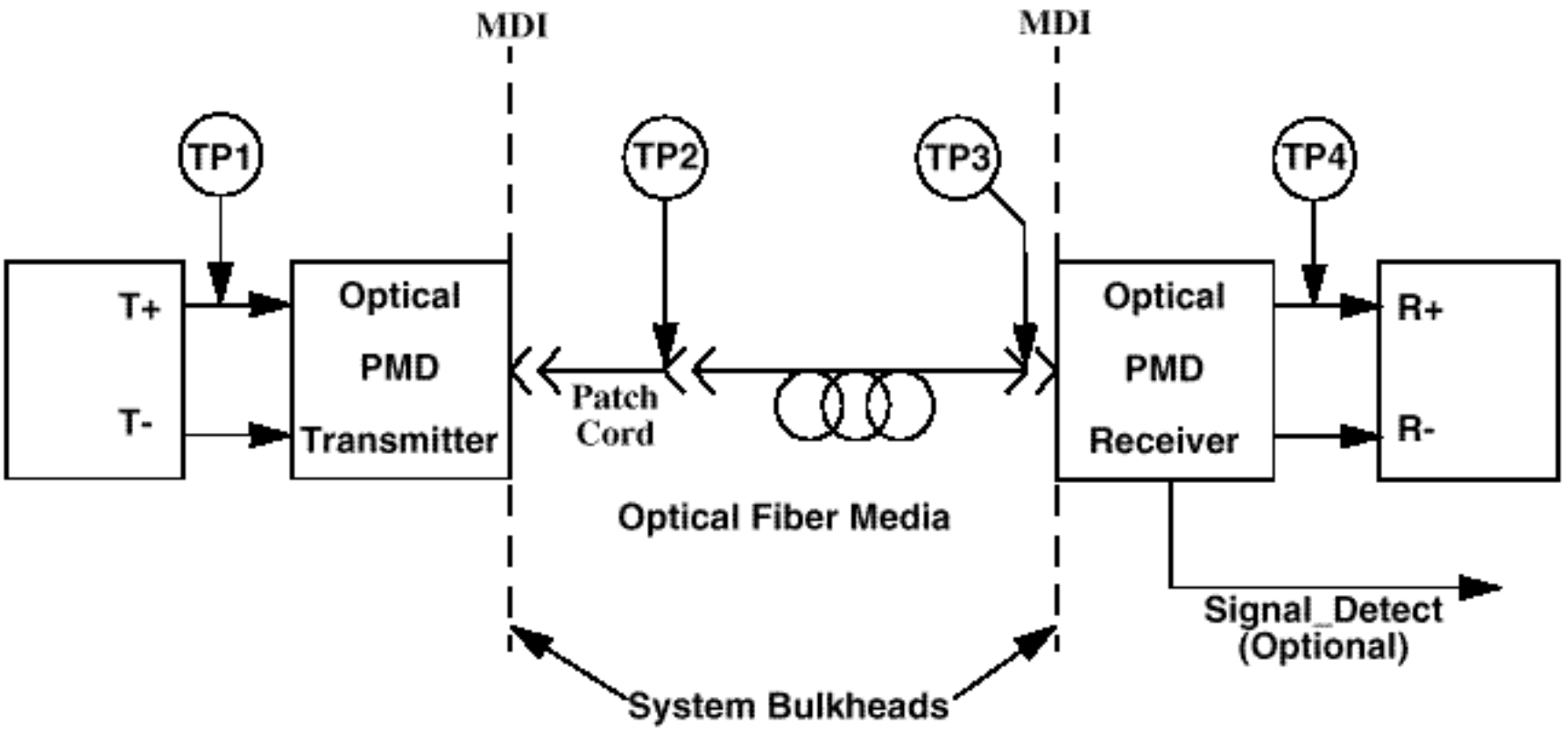


Figure 7-1—PMD block diagram

Output Total-Jitter numbers

	Bit period	TP1		TP2		TP3		TP4	
	ps	UI	ps	UI	ps	UI	ps	UI	ps
FC copper	941.00	0.21	198	0.23	216	0.58	546	0.60	565
GE copper	800.00	0.24	192	0.28	223	0.66	528	0.71	568
P1394b copper	1017.00	0.24	244	0.28	284	0.66	671	0.71	722
FC optical	941.00	0.21	198	0.43	405	0.46	433	0.60	565
GE optical	800.00	0.24	192	0.43	345	0.51	408	0.75	599
P1394b optical	1017.00	0.24	244	0.43	438	0.51	519	0.75	762
2G (approx)									
FC	470.00	0.30	141					0.60	282
P1394b	509.00	0.24	122	0.28	142	0.66	336	0.71	361

Note: there is even more variation in the DJ numbers

Typical output jitter budget worksheet

Fibre Channel example

Compliance point	DJ (ps) - pk-pk	RJ (ps) - RMS	RJ (ps) - pk-pk	TJ (ps) - pk-pk	DJ (UI) - pk-pk	RJ (UI) - RMS	RJ (UI) - pk-pk	TJ (UI) - pk-pk
TP1	**98**	6.85	96	**194**	**0.10**	0.01	0.10	**0.21**
TP1 to TP2	6	4.13	58	64	0.01	0.00	0.06	0.07
TP2	**104**	8	112	**216**	**0.11**	0.01	0.12	**0.23**
TP2 to TP3	244	11.66	163	407	0.26	0.01	0.17	0.43
TP3	**348**	14.14	198	**546**	**0.37**	0.02	0.21	**0.58**
TP3 to TP4	10	4.32	60	70	0.01	0.00	0.06	0.07
TP4	**358**	14.79	207	**565**	**0.38**	0.02	0.22	**0.60**

TP1 to TP2 and TP3 to TP4 represents the contribution of the PCB and passive components, plus the optical transceiver if any.

TP2 to TP3 represents the contribution of the cable and connectors.

Numbers in blue are the original numbers derived from the properties of the technology

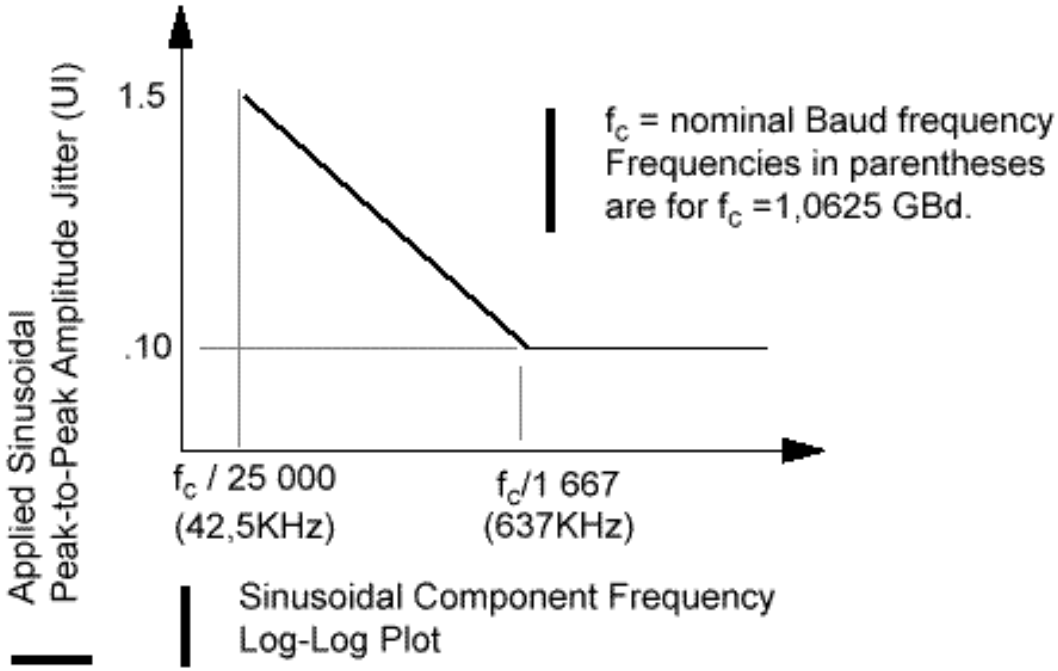
Numbers in **bold** are the normative numbers (note that GE and P1394b do not make the DJ numbers normative)

RJ pk-pk is the value equivalent to a BER of 10^{-12} for the corresponding RJ RMS

Note that you cannot add RJ pk-pk numbers, and therefore you cannot add TJ pk-pk numbers, when moving from one TP to the next.

Jitter tolerance spec example

Component	Value (UI, pk-pk)
Sinusoidal swept frequency (42.5KHz to > 5MHz)	see figure
DJ (637KHz - 531MHz)	0.38
RJ (637KHz - 531MHz)	0.22
Total (637KHz - 531MHz)	0.70



Note that the applied sinusoidal should be swept to a frequency higher than the corner frequency of the receiver's PLL.