	Intel Corporat	ion	# i-60	Dawe, Pier	SC <b>138.8.5</b> rs J G	Μ	P <b>274</b> ellanox Tecł	L <b>39</b> nnologie	# i-116
TR Com	ment Status R			Comment		Comment Sta			
ult value in Annes or the relatively loo th many lanes) ha ses, and to reduce	x 93A which is 78.2 C w value 78.2 Ohm wa ave lower impedance e the trace insertion h	ohm. as that to typical to improve their oss. This is not e	packages (especially matching to silicon and expected to change;	use en with ar remov Note tl This is	nphasis to get n unreasonable e emphasis fro ne receiver is to an issue for a	it to pass the TDEC challenge, such as m the signal, contra ested for a very slo Il the PAM4 optical	CQ test, yet I s high peak ary to what e w signal only	eave a realistic power, high cre equalizers are p y, not for any of	, compliant receiver st factor, or a need to rimarily intended to do. these abusive signals.
ackage and impro d to acknowledge kage and termina nd board are 90 C n 137.10 (Table 1 ly 136-15, and Tabl , add an exception nging the reference	ve performance (even the expected lower in ation parameters: ass Ohm (imperfect match 37-5). e 137-5, change the in to the parameter va ce impedance for cha	n if cables are 1 mpedance of pra sume packages a ning). value of Zc to 80 slues from Table	00 Ohm) actical devices in the are 80 Ohm while 0 Ohm and Rd to 45 92-12: Z_c is set to 90	1. To s Define of the Eq 212 empha TDEC accept relative procec Simila 2. To p 3. To p factor 4. To p minimu To pro	screen for noisy TDECQrms = measured sign 2-12. s is the si asis, observed Qrms accordin able, add max e limit is accep dure. rly in clauses 1 protect the TIA protect the TIA spec. protect the rece um cursor weig tect the equaliz	10*log10(A_RMS/( lal after the 13.2812 tandard deviation of through the 13.2813 g to what level of di TDECQrms row to table for all PAM4 of 39, 140. input, consider a p and any AGC and eiver from having to ght. zer from having to s	(s*3*Qt*R)) v 25 GHz filter f a fast clear 25 GHz filter inty-but-empl each transm optical PMDs eak power s TIA from unit "invert" hea support unne	where A_RMS is response, Qt a response, Qt a response (arou hasised signal v nitter table. Alte s, the limit could pec as in Claus reasonable sign wily over-empha-	nd R are as already in MA=2 and without und 0.7). Set limit for we decide is matively, if the same d be here in the TDECQ e 86. hals, consider a crest asised signals, set a us for waveforms that
Resp	onse Status U					Response Stat	tus <b>U</b>		
REJECT. The response to comment i-161 resulted in different changes than the ones in the suggested remedy.				The ne eviden A cont but ca	eed for additon ce has been p ribution is invite nnot be decode	rovided that the pro ed that demonstrate ed by a reasonable	posed reme es the proble receiver imp	dy fixes the cla em (a waveform plementation) a	imed problem. htat passes TDECQ nd that the proposed
				TDEC similar A peal not be A cres been p	Qrms spec was ly rejected. c power spec h en provided. t factor limit ha provided.	s suggested in com as not been shown Is not been shown t	ment #r02-3 to be neces to be necess	85 against 802.3 ssary, and a def sary, and a defir	3bs D3.2, which was inition and value has
	smission line cha ult value in Annex r the relatively loo h many lanes) ha les, and to reduce packages will no rmination can be ackage and impro d to acknowledge kage and termina ind board are 90 C in 137.10 (Table 1 y 136-15, and Tabl add an exception nging the reference 137.10, and COI <i>Resp</i> et to comment i-16	smission line characteristic impedance ult value in Annex 93A which is 78.2 C r the relatively low value 78.2 Ohm wa h many lanes) have lower impedance les, and to reduce the trace insertion lo packages will not have impedance cl rmination can be adjusted and board of ackage and improve performance (even d to acknowledge the expected lower if kage and termination parameters: as a board are 90 Ohm (imperfect match in 137.10 (Table 137-5). y 136-15, and Table 137-5, change the add an exception to the parameter van inging the reference impedance for char 137.10, and COM tables). <i>Response Status</i> <b>U</b> to comment i-161 resulted in different	smission line characteristic impedance is set at 90 Ohr ult value in Annex 93A which is 78.2 Ohm. r the relatively low value 78.2 Ohm was that to typical h many lanes) have lower impedance to improve their res, and to reduce the trace insertion loss. This is not el packages will not have impedance close to 100 Ohm. rmination can be adjusted and board design can be op ackage and improve performance (even if cables are 10 d to acknowledge the expected lower impedance of pra- kage and termination parameters: assume packages and board are 90 Ohm (imperfect matching). n 137.10 (Table 137-5). y 136-15, and Table 137-5, change the value of Zc to 80 add an exception to the parameter values from Table nging the reference impedance for channels from 100 f 137.10, and COM tables). <i>Response Status</i> <b>U</b> to comment i-161 resulted in different changes than th	smission line characteristic impedance is set at 90 Ohm. This is an increase ult value in Annex 93A which is 78.2 Ohm. r the relatively low value 78.2 Ohm was that to typical packages (especially h many lanes) have lower impedance to improve their matching to silicon and les, and to reduce the trace insertion loss. This is not expected to change; packages will not have impedance close to 100 Ohm. rmination can be adjusted and board design can be optimized to match lower tockage and improve performance (even if cables are 100 Ohm) d to acknowledge the expected lower impedance of practical devices in the kage and termination parameters: assume packages are 80 Ohm while d board are 90 Ohm (imperfect matching). n 137.10 (Table 137-5). y 136-15, and Table 137-5, change the value of Zc to 80 Ohm and Rd to 45 add an exception to the parameter values from Table 92-12: Z_c is set to 90 hging the reference impedance for channels from 100 Ohm to 85 Ohm 137.10, and COM tables). <i>Response Status</i> <b>U</b> to comment i-161 resulted in different changes than the ones in the	It seen use in Annex 93A which is 78.2 Ohm. This is an increase ult value in Annex 93A which is 78.2 Ohm. The relatively low value 78.2 Ohm was that to typical packages (especially h many lanes) have lower impedance to improve their matching to silicon and es, and to reduce the trace insertion loss. This is not expected to change; packages will not have impedance close to 100 Ohm. Tip is packages will not have impedance close to 100 Ohm. This is an increase with air remov Note ti This is of the Suggested 1. To se log the expected lower impedance of practical devices in the kage and termination parameters: assume packages are 80 Ohm while do baard are 90 Ohm (imperfect matching). Th 137.10 (Table 137-5). Y 136-15, and Table 137-5, change the value of Zc to 80 Ohm and Rd to 45 add an exception to the parameter values from Table 92-12: Z_c is set to 90 137.10, and COM tables). <i>Response Status</i> U Response Status U to comment i-161 resulted in different changes than the ones in the nedy. A comt but cal additic TDEC	The relatively low value 78.2 Ohm. This is an increase at you of the relatively low value 78.2 Ohm. This is an increase of the readouce the trace insertion loss. This is not expected to change; packages will not have impedance to improve their matching to silicon and es, and to reduce the trace insertion loss. This is not expected to change; packages will not have impedance close to 100 Ohm. The set of the high TDECQ list is an issue for a of the measured sign the are 90 Ohm (imperfect matching). In 137.10, and Table 137-5, change the value of Zc to 80 Ohm and Rd to 45 . To protect the TIA factor spec. A to protect the equalic can't or shouldn't ever the equalic can't or should th	It seems that it is possible to make a basis of the relatively low value 78.2 Ohm. This is an increase at the value in Annex 93.4 which is 78.2 Ohm. What have lower impedance to typical packages (especially have lower impedance to 100 Ohm. This is an ison expected to change; packages will not have impedance close to 100 Ohm. This is an texpected to change; packages will not have impedance close to 100 Ohm. This is an texpected to change; packages will not have impedance close to 100 Ohm. This is an ison expected lower impedance of practical devices in the kage and termination parameters: assume packages are 80 Ohm while of to a cknowledge the expected lower impedance of practical devices in the kage and termination parameters: assume packages are 80 Ohm while of 137.10 (Table 137-5). We can also the value of Zc to 80 Ohm and Rd to 45 and an exception to the parameter values from Table 92-12: Z_c is set to 90 Am (and comparation comparation comparation comparation comparation to the parameter values from Table 92-12: Z_c is set to 90 Am (and comparation compa	It seems that it is possible to make a bad transmitter use emphasis to get it to pass the TDECQ test, yet the relatively low value 78.2 Ohm was that to typical packages (especially have lower impedance to improve their matching to silicon task and to reduce the trace insertion loss. This is not expected to change; packages will not have impedance to improve their matching to silicon task and to reduce the trace insertion loss. This is not expected to change; packages and improve performance (even if cables are 100 Ohm. the add and termination parameters: assume packages are 80 Ohm while the board are 90 Ohm (imperfect matching). 137.10 (Table 137-5). 136-15, and Table 137-5, change the value of Zc to 80 Ohm and Rd to 45 add an exception to the parameter values from Table 92-12: Z_c is set to 90 137.10, and COM tables). <i>Response Status</i> U Response Status I Response Status U Response Status U Response Status U Response Status U Response Status I Response Status U Response Status I Response Status I Re	The relatively low value 78.2 Ohm was that to typical packages (especially have lower impedance to improve their matching to silicon and es, and to reduce the trace insertion loss. This is not expected to change: the high TDECQ limit. Suggested/Remedy the high TDECQ limit. Suggested/Remedy 1. To screen for noisy or distorted signals with heavy emphasis dear the 13.28125 GHz filter response. (Ta the high TDECQ limit. Suggested/Remedy 1. To screen for noisy or distorted signals with heavy emphasis dear the 13.28125 GHz filter response. (Ta the high TDECQ limit. Suggested/Remedy 1. To screen for noisy or distorted signals with heavy emphasis dear the 13.28125 GHz filter response. (Ta the high TDECQ limit. Suggested/Remedy 1. To screen for noisy or distorted signals with heavy emphasis of the high TDECQ limit. Suggested/Remedy 1. To screen for noisy or distorted signals with heavy emphasis dear at 90 Ohm (imperfect matching). In 137.10 (Table 137-5). We can table 137-5, change the value of Zc to 80 Ohm and Rd to 45 add an exception to the parameter values from Table 92-12: Z_c is set to 90 first, and Table 137-5, change the value of Zc to 80 Ohm and Rd to 45 add an exception to the parameter values from 100 Ohm to 85 Ohm 137.10 (Table 137-5). Response Status U Response Response Response Status U Response remedy fixes the cas a contribution is invited that demonstrates the problem (a waveform but cannot be decoded by a reasonable receiver inselever interges and the processer) and a definit TDECQT set such as been shown to be necessary, and a definit to the proceed remedy fixes the cas of the response rescina is and response remedy fixes the

ID i-116 Pa

C/ 138 SC 138.7.1 P 2		# i-119	C/ <b>138</b>	SC 138.8.5	P 276	L 33	# r01-71
Dawe, Piers J G Mella	nox Technologie		Dawe, Pier	rs J G	Mellanox Tec	hnologie	
Comment Type TR Comment Status	R		Comment	Type <b>TR</b>	Comment Status R		
A TDECQ limit of 4.9 seems very high, give receiver front-ends that should not be worse same signalling rate) without the FFE. SuggestedRemedy This needs more study. We should be able Response Response Status REJECT.	e can do 100GBASE-SI	R4 (PAM2, almost the	use en with ar remov Note ti This is of the bandw	nphasis to get it to n unreasonable cha e emphasis from th ne receiver is tested an issue for all the high TDECQ limit a	to make a bad transmitte bass the TDECQ test, yet llenge, such as high peak e signal, contrary to what d for a very slow signal on PAM4 optical PMDs, alth nd because the signal is r	leave a realistic power, high cre- equalizers are p ly, not for any of ough it may be	, compliant receiver st factor, or a need to rimarily intended to do. these abusive signals. worse for MMF because
No change to document suggested.			Suggested	Remedy			
The issue caused by a TDECQ limit of 4.9 of for this kind of transmitter quality metric to be specifications.		fications than in SMF	Define of the	TDECQrms = 10*l measured signal af	listorted signals with heav og10(A_RMS/(s*3*Qt*R)) ter the 13.28125 GHz or 1 eady in Eq 212-12. s is the	where A_RMS is 1.2 GHz filter re	sponse (before the
C/         138         SC         138.7.1         P 2           Dawe, Piers J G         Mella	73 L 22 nox Technologie	# r01-70	13.281	25 GHz, 0.6006 for		Ū.	
Comment Type TR Comment Status	R				Qrms according to what le max TDECQrms row to e		
A TDECQ limit of 4.9 seems very high, give receiver front-ends that should not be worse same signalling rate) without the FFE. D.3( Also, it seems that the TDECQ spec limit ca SuggestedRemedy Compare a minimally compliant 100GBASE accordingly. Provide a signal quality spec t	e, can do 100GBASE-S 0 comment 119. an be "gamed" (D3.0 cc E-SR4 transmitter and s	R4 (PAM2, almost the omment 116). et the TDECQ limit	here ir limit, s 2. To p minimu Simila To pro	the TDECQ proce ay here that both T protect the receiver um cursor weight, 0 rly in clauses 139, 7 tect the equalizer fr		Qrms limit the s ust meet the TD avily over-empha ecessary setting	ame as the TDECQ ECQ spec. asised signals, set a is for waveforms that
Response Response Status	U		Response		Response Status U		
REJECT.			REJEC	CT.			
No specific change to document suggested					nsmitter specs has not be ed that the proposed remo		
The issue that might be caused by a TDEC precedence for this kind of transmitter quali than in SMF specifications. To date no contribution has been made tha waveform that passes TDECQ but cannot b	ty metric to be higher ir t demonstrates the prot	MMF specifications	that pa	asses TDECQ but c	as been made that that de annot be decoded by a re al requirement prevents t	asonable receive	er implementation) and
implementation. Measured data has been presented to the t See:	·				te a TDECQrms spec was ich was similarly rejected.	suggested in co	omment #r02-35
http://www.ieee802.org/3/cd/public/Jan18/ki http://www.ieee802.org/3/cd/public/adhoc/a	S I	3cd_02_adhoc-v2.pdf		k power spec has ne en provided.	ot been shown to be nece	ssary, and a def	inition and value has
			A cres	t factor limit has no	t been shown to be neces	sary, and a defir	nition and value has not

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn SORT ORDER: Comment ID

2018-06-05 8:52:01 AM

been provided.								
been provided.			C/ 139 SC 139.7	7.5.4	P <b>301</b>	L <b>1</b>	# <u>r</u> 01-76	
The need for a limit to cursor	weight has not been established		Dawe, Piers J G Mellanox Technologie					
C/ 138 SC 138.8.5.1	P 276 L 38	# r01-73	Comment Type TR	Comment	Status R			
Dawe, Piers J G	Mellanox Technologie						Ind their associated	
Comment Type TR Con	mment Status R		significantly better				r the third tap) is never compliant signals.	
Further investigation of possib	ble minimally compliant MMF signals is that 2 pre, 2 post (making the curs			TDECQ search i	rules will avoid in	nefficiency both	in product receiver	
significantly better than 1 pre,	3 post (making it the second tap), for	or compliant signals.	SuggestedRemedy					
design, testing and operation,	earch rules will avoid inefficiency bot and in TDECQ testing.	n in product receiver	because the TDEC	Q limit is similar.	There is a sepa	arate comment	e same in 140.7.5.1 for MMF because the	
SuggestedRemedy			different TDECQ li	mit there could lea	ad to a different	conclusion.		
	3, has" to "Tap 1 or tap 2 has". There t TDECQ limit there could lead to a c		Response REJECT.	Response	Status U			
Response Resp	ponse Status U		•					
REJECT.			See response to co	omment r01-73.				
A similar proposal was made a reviewed by the Task Force.	against draft 3.0 (comments i-107 i-	117 and i120) which was	[Editor's note added after comment resolution completed:					
			For reference, the	response to comr	ment r01-73 is co	opied here:		
	limit the main tap to tap 1, tap 2, or toublic/Mar18/dawe_3cd_01a_0318.p		REJECT.					
There was no consensus to m	nake the proposed change.		A similar proposal reviewed by the Ta		t draft 3.0 (com	ments i-107 i-11	I7 and i120) which was	
The resolution to i-117 was:			The agreed resolut	tion was to limit th	e main tan to ta	n 1 tan 2 or ta	n 3	
ACCEPT IN PRINCIPLE.							was reviewed by the	
Implement the changes propo	osed in		Task Force.					
http://www.ieee802.org/3/cd/p	ublic/Jan18/king_3cd_03_0118.pdf	with editorial license	There was no cons	sensus to make th	e proposed cha	nge.		
			The resolution to i-	117 was:				
			ACCEPT IN PRING					
			http://www.ieee802			_03_0118.pdf wi	ith editorial license	

]

Comment ID r01-76

C/ 136 SC 1	36.11.4	P 232	L 28	# r02-15	C/ 136	SC 136.	1 9	P 233	L7	# r02-30
Dudek, Michael	50.11.4	Cavium	L 20	# 102-15	Ran, Adee	50 130.	1.0	Intel Corpora	-	# 102-30
Comment Type	TR Co	omment Status R			Comment 1	Type TR	Co	mment Status R		
None of the ca	bles that have hat shows that	been posted have ER a cable channel with a			The CC termina	DM paramet ations. The	ers for clau device sing	use 136 correspond to gle-ended termination	resistance is 50	
SuggestedRemedy	/				100 Oh	ım.				
Change the red CA4	quirement for	ERL of the cables to be	e 14dB. Also in t	able 136-16 and PICS				el with no reflections re within the DFE read		ble, except for the
Response REJECT.	Re	In reality things will not be so nice. Actual devices and NICs will have reflections outside of the DFE reach (limited by ERL, not not zero). These reflections are not accounted for in the COM budget - leaving a deficit.								
There was no	consensus to	implement the suggest	ted remedy.		00110	auger lour	ing a dene			
See straw polls http://www.iee		nd /public/May18/ran_3cd	_03_0518.pdf							interference tolerance fail in real life scenarios.
r					I am pl	anning a pr	esentation	with more details of th	ne problem and p	proposed solutions.
Editor's note a polls 4 and 5 a		nment resolution comp	leted. For refere	nce, the results of straw	Suggested Upcom	Remedy ing present	ation.			
"Straw poll #4:					Response		Res	ponse Status U		
		nimum in clause 136, I	would support		REJEC	CT.				
<ol> <li>2. Option c</li> <li>3. Option d</li> </ol>					There i	s no consei	isus to ma	ke a change.		
Chicago rules Results: #1: 4,	#2: 13, #3: 14	4				r to address		s presented in	010 0518 with	respect to clause 136,
<ol> <li>Accepting r0</li> <li>Rejecting r0</li> <li>Choose one</li> </ol>	For Cable assembly ERL minimum in clause 136, I would support 1. Accepting r02-23 2. Rejecting r02-23				to crea 1. Adju 2. Adju 3. Adju 4. Mak (Chicag	te a guardb st the speci st the speci	and in COI fications fo fications fo fications bo es	A I would support: or Tx and/or Rx or the cable assembly oth for the Tx/Rx, and		•
					http://w to crea 1. Adju	r to address ww.ieee802 te a guardb st the speci e no change	l.org/3/cd/p and in COI fications fo	s presented in oublic/May18/ran_3cd M, I would support: or the backplane chan		respect to clause 137,

1: 2, 2: 19

Comment ID r02-30

C/ 138	SC 138.7.1	P 270	L 22	# r02-40	C/ 138	SC 138.8.5	P 273	L 35	# r02-46
Dawe, Pier		Mellanox Tec	nnologie		Dawe, Pier		Mellanox Teo	chnologie	
comment	<i><i>y</i>1</i>	nment Status R			Comment		Comment Status A		
transm (PAM2 2.5 wit	h representative drive. Fore precise tap settings ent 70.	-ends that should not alling rate) without the The high limit in the c	be worse, can do FFE. king_3cd Iraft would requir	o 100GBASE-SR4 _02_0118 showed 1 to	or disto to impr issue i On the are too D3.0 c	orted signal) that even ove. Note the receip worse for MMF be TDECQ map (see even high up the page. comment 116, D3.1 c	o make a bad MMF trans on an equalizer better that ver is tested for a slow s cause of the high TDEC e.g. dawe_041818_3cd_ comment 71.	an the reference e ignal only, not for Q limit.	qualizer won't be able such signals. This
	ler what actual PAM4 M ASE-SR4 transmitter, a	,		<b>j</b>		IMF TDECQ limit of			
esponse	Resp	oonse Status U				TDECQ -10*log10	(Ceq) to <=4.2 dB for SM	1F PMDs.	
REJE	CT.				or: 2. Defi	ne TDECQrms = 10	*log10(A_RMS/(s*3*Qt*F	R)) where A RMS	is the standard
	ecific changes to the dra				deviati Qt and OMA= respon	on of the measured R are as already in 2 and without emphase se but before the re	signal after the 13.28125 Eq 121-12. s is the stan asis, observed through the ference equalizer (0.600	5 GHz filter respor dard deviation of a ne reference Bess 6 for 11.2 GHz).	ase (before the FFE), a fast clean signal with el-Thomson filter
ſ					Limit 3		s. This could be added	to the transmitter	tables.
Editor'	s note added after com	ment resolution comp	leted.		Response	F	Response Status U		
"REJE	-				ACCE	PT IN PRINCIPLE.			
This is	ecific change to the dra a duplicate of commen is no support to conside	nt r01-69 against draft				mment response to 2-9 (on lowering TDI	r02-27 (rise and fall time ECQ limit).	e and limiting the F	RIN of the transmitter)
Measu See: h	red data has been pres ttp://www.ieee802.org/3	ented to the task forc 3/cd/public/Jan18/king	e supporting the _3cd_02_0118.p	current specifications.	There	was no support for a	adding a limit on TDECQ	-10*log10(Ceq) o	r to define TDECQrms.
	www.ieee802.org/3/cd/p			cd_01_adhoc-v2.pdf	[				
http://v	www.ieee802.org/3/cd/p	ublic/May18/king_3cd	_03_0518.pdf"			s note added after c erence, the respons	omment resolution comp	oleted.	
1						PT IN PRINCIPLE.	e 10 102-9 15.		
						-	he updated proposal in		
					http://v	ww.ieee802.org/3/c	d/public/May18/king_3co	d_01_0518.pdf.	
							ue for "Transmitter and d		
							4.5 dB and change the p PAM4 (TDECQ), each la		5 Transmiller and
						e 138-9:			
					Chang	e value for "Stresse	d receiver sensitivity (ON	/Aouter), each lan	e (max)" from -3 to -
					3.4 dB		d ava alagura (SECO) la	no undor toot"	m 4 0 dP to 4 5 dP
							d eye closure (SECQ), la ceiver sensitivity is infor		
					with a	alue of SECQ up to 138-10:			
					Chang	e value for "Power b	oudget (for max TDECQ) on for penalties (for max		
	technical required ER/	editorial required GR	aeneral required	T/technical E/editorial (	G/general		Comm	ent ID r02-46	Page 5 of 8
				SE STATUS: O/open W/		U/unsatisfied Z/wi			2018-06-05 8:52
ORT ORI	DER: Comment ID	. ,							2010 00 00 0002

In 138.8.7 change "Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.9 dB" to "Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.5 dB"

Change the title for subclause 138.8.5 from "Transmitter and dispersion eye closure quaternary (TDECQ)" to "Transmitter and dispersion eye closure for PAM4 (TDECQ)" In Table 139-6 change value for "Transmitter and dispersion eye closure for PAM4 (TDECQ) (max)" from 3.2 dB to 2.8 dB for 50GBASE-FR and from 3.4 dB to 3 dB for 50GBASE-LR.

In Table 139-7:

Change value for "Stressed receiver sensitivity (OMAouter) (max)" from -5.1 to -5.5 dBm for 50GBASE-FR and from -6.4 dBm to -6.8 dBm for 50GBASE-LR.

Change value for "Stressed eye closure for PAM4 (SECQ)" from 3.2 dB to 2.8 dB for 50GBASE-FR and from 3.4 dB to 3 dB for 50GBASE-LR.

Change note c to read "Receiver sensitivity (OMAouter) (max) is informative and is defined for a transmitter with a value of SECQ up to 2.8 dB for 50GBASE-FR and 3 dB for 50GBASE-LR."

In Table 139-8:

Change value for "Power budget (for max TDECQ)" from 7.6 dB to 7.2 dB for 50GBASE-FR and from 10.3 dB to 9.9 dB for 50GBASE-LR.

Change value for "Allocation for penalties (for max TDECQ)" from 3.6 dB to 3.2 dB for 50GBASE-FR and from 4 dB to 3.6 dB for 50GBASE-LR.

In 139.7.8 change "For 50GBASE-FR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.2 dB" to "For 50GBASE-FR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 2.8 dB" and change "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3 dB".

In Table 140-6 change value for "Transmitter and dispersion eye closure for PAM4 (TDECQ) (max)" from 3.4 dB to 3 dB.

In Table 140-7:

Change value for "Stressed receiver sensitivity (OMAouter) (max)" from -1.9 to -2.3 dBm. Change value for "Stressed eye closure for PAM4 (SECQ)" from 3.4 dB to 3 dB.

Change note c to read "Receiver sensitivity (OMAouter) (max) is informative and is defined for a transmitter with a value of SECQ up to 3 dB."

In Table 140-8:

Change value for "Power budget (for max TDECQ)" from 6.5 dB to 6.1 dB for ER >= 5 dB and from 6.8 dB to 6.4 dB for ER < 5 dB.

Change value for "Allocation for penalties (for max TDECQ)" to "6.1 minus max channel insertion loss per Table 140-12" for ER >= 5 dB and

to "6.4 minus max channel insertion loss per Table 140-12" for ER < 5 dB.

In 140.7.8 change "a value of SECQ up to 3.4 dB" to "a value of SECQ up to 3 dB". In 138.8.5, 139.7.5.3 and 140.7.5 change "Pth1, Pth2, and Pth3 are varied from their nominal values by up to  $\pm$ 1% of OMAouter in order to optimize TDECQ." to "Pth1, Pth2, and Pth3 are varied from their nominal values by up to  $\pm$ 1% of OMAouter in order to optimize TDECQ. The same three thresholds are used for both the left and the right histogram."

With editorial license."

For reference, the response to r02-27 is: "ACCEPT IN PRINCIPLE.

TYPE: TR/technical required ER/editorial required GR/general required T/technical E/editorial G/general COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn SORT ORDER: Comment ID

The Task Force reviewed http://www.ieee802.org/3/cd/public/May18/king\_3cd\_02a\_0518.pdf and http://www.ieee802.org/3/cd/public/May18/dawe\_3cd\_01b\_0518.pdf. A straw poll #9 was taken: I would support to: 1. Introduce Tx rise-and-falltime specifications. 2. Introduce limitations to tap-weights 3. Make no change Chicago rules. 1: 24 2: 5 3: 5 Make the changes on slides 3 - 7 of http://www.ieee802.org/3/cd/public/May18/king\_3cd\_04\_0518.pdf in Clauses 138, 139 and 140, with editorial license.

C/ 138	SC 138.8.5.1	P 273	L <b>41</b>	# r02-48
Dawe, Pie	ers J G	Mellanox Tec		

Comment Type TR Comment Status R

For some equalizer architectures, precursors are much more expensive than post-cursors (sun\_3cd\_042518\_adhoc). D3.1 comment 73.

SuggestedRemedy

When we have decided what range of MMF signals are useful and allowed, continue the improvement made in king\_3cd\_03\_0118: change "Tap 1, tap 2, or tap 3, has" to "Tap 1 or tap 2 has".

There is a separate comment for SMF because the different TDECQ limit there could lead to a different conclusion.

Response Response Status U

REJECT.

Allowing just one pre-cursor in the reference EQ means the transmitted signal, when propagated through a worst case channel, cannot have a significant amount of pre-cursor response at the receiver without suffering higher TDECQ penalty.

An electrical channel typically can guarantee that, however the chromatic and modal dispersion effects of the optical channel in combination with laser performance may require the extra tap. No evidence has been provided to show otherwise.

Comment ID r02-48

## d Sponsor recirculation ballot comments

CI 139 SC	139.7.5.3	P <b>297</b>	L <b>52</b>	# r02-52	va tra
Dawe, Piers J G		Mellanox Te	chnologie		CI
o · · <del>·</del>			Ū		qu
Comment Type	TR	Comment Status A			In
		e to make a bad SMF trans			(T
		even an equalizer better th			50
		ceiver is tested for a slow s			In
	• •	e e.g. dawe_041818_3cd_	adhoc-v2) we nee	ed to stop signals that	C
are too high u	1 1 0				fo
D3.0 commer	nt 116, D3.	1 comment 71.			C
SuggestedRemed	ły				50
For a SMF TI	DECQ limit	of 3.2 or 3.4 dB: Either:			Cl
		10(Ceq) to <=2.8 dB for SM	/IF PMDs.		fo 5(
or:		· · ·			In
		10*log10(A_RMS/(s*3*Qt*			CI
		ed signal after the 13.2812			FI
		in Eq 121-12. s is the star			C
		phasis, observed through t			50
		reference equalizer (0.625			In
Limit 3 dB for	SIMF PIML	Ds. This could be added to	the transmitter tai	bles.	tra
Response		Response Status U			in
ACCEPT IN F	RINCIPLE	Ξ.			"F
	-				Va
See commen	t response	to r02-27 (rise and fall tim	e) and r02-9 (on lo	owering TDECQ limit).	de
					ln (T
There was no	support fo	or adding a limit on TDECC	2 -10*log10(Ceq) o	r to define TDECQrms.	In
					CI
[					CI
Editor's note	added afte	r comment resolution comp	pleted.		CI
For reference	the reene	and to #02.0 in:			fo
"ACCEPT IN		nse to r02-9 is:			In
		ed the updated proposal in			CI
		3/cd/public/May18/king_3c	d 01 0518 pdf		ar
		alue for "Transmitter and o		sure (TDECQ), each	CI
	0	to 4.5 dB and change the			in
· · ·		or PAM4 (TDECQ), each la	•		to
In Table 138-	9:				ln In
	e for "Stres	sed receiver sensitivity (Of	MAouter), each lar	ne (max)" from -3 to -	nc
3.4 dBm.					ar
•		sed eye closure (SECQ), la			op
		Receiver sensitivity is infor	mative and is defi	ned for a transmitter	hi
with a value of		) to 4.5 dB."			W
In Table 138-	-	or budget (for may TDECO)	" from 6 0 dP to 6	5 dB	
		er budget (for max TDECQ) ation for penalties (for max			Fo
		eiver sensitivity is informati			"A
					Th

ue of SECQ up to 4.9 dB" to "Receiver sensitivity is informative and is defined for a nsmitter with a value of SECQ up to 4.5 dB"

ange the title for subclause 138.8.5 from "Transmitter and dispersion eye closure aternary (TDECQ)" to "Transmitter and dispersion eye closure for PAM4 (TDECQ)" Table 139-6 change value for "Transmitter and dispersion eve closure for PAM4 DECQ) (max)" from 3.2 dB to 2.8 dB for 50GBASE-FR and from 3.4 dB to 3 dB for GBASE-LR.

Table 139-7:

ange value for "Stressed receiver sensitivity (OMAouter) (max)" from -5.1 to -5.5 dBm 50GBASE-FR and from -6.4 dBm to -6.8 dBm for 50GBASE-LR.

ance value for "Stressed eve closure for PAM4 (SECQ)" from 3.2 dB to 2.8 dB for GBASE-FR and from 3.4 dB to 3 dB for 50GBASE-LR.

ange note c to read "Receiver sensitivity (OMAouter) (max) is informative and is defined a transmitter with a value of SECQ up to 2.8 dB for 50GBASE-FR and 3 dB for GBASE-LR."

Table 139-8:

ange value for "Power budget (for max TDECQ)" from 7.6 dB to 7.2 dB for 50GBASEand from 10.3 dB to 9.9 dB for 50GBASE-LR.

ange value for "Allocation for penalties (for max TDECQ)" from 3.6 dB to 3.2 dB for GBASE-FR and from 4 dB to 3.6 dB for 50GBASE-LR.

139.7.8 change "For 50GBASE-FR, receiver sensitivity is informative and is defined for a nsmitter with a value of SECQ up to 3.2 dB" to "For 50GBASE-FR, receiver sensitivity is prmative and is defined for a transmitter with a value of SECQ up to 2.8 dB" and change or 50GBASE-LR, receiver sensitivity is informative and is defined for a transmitter with a ue of SECQ up to 3.4 dB" to "For 50GBASE-LR, receiver sensitivity is informative and is fined for a transmitter with a value of SECQ up to 3 dB".

Table 140-6 change value for "Transmitter and dispersion eve closure for PAM4 DECQ) (max)" from 3.4 dB to 3 dB.

Table 140-7:

ange value for "Stressed receiver sensitivity (OMAouter) (max)" from -1.9 to -2.3 dBm. ange value for "Stressed eye closure for PAM4 (SECQ)" from 3.4 dB to 3 dB. ange note c to read "Receiver sensitivity (OMAouter) (max) is informative and is defined a transmitter with a value of SECQ up to 3 dB."

Table 140-8:

ange value for "Power budget (for max TDECQ)" from 6.5 dB to 6.1 dB for ER >= 5 dB d from 6.8 dB to 6.4 dB for ER < 5 dB.

ange value for "Allocation for penalties (for max TDECQ)" to "6.1 minus max channel ertion loss per Table 140-12" for ER >= 5 dB and

'6.4 minus max channel insertion loss per Table 140-12" for ER < 5 dB. 140.7.8 change "a value of SECQ up to 3.4 dB" to "a value of SECQ up to 3 dB". 138.8.5, 139.7.5.3 and 140.7.5 change "Pth1, Pth2, and Pth3 are varied from their minal values by up to ±1% of OMAouter in order to optimize TDECQ." to "Pth1. Pth2. d Pth3 are varied from their nominal values by up to  $\pm 1\%$  of OMAouter in order to

timize TDECQ. The same three thresholds are used for both the left and the right togram."

th editorial license."

r reference, the response to r02-27 is: CCEPT IN PRINCIPLE. e Task Force reviewed

COMMENT STATUS: D/dispatched A/accepted R/rejected RESPONSE STATUS: O/open W/written C/closed U/unsatisfied Z/withdrawn SORT ORDER: Comment ID

Comment ID r02-52

Page 7 of 8 2018-06-05 8:52:01 AM

http://www.ieee802.org/3/cd/public/May18/king_3cd_02a_0518.pdf a http://www.ieee802.org/3/cd/public/May18/dawe_3cd_01b_0518.pdf.			SC 139.7.9.1	P <b>299</b>	L <b>50</b>	# r02-55	
A straw poll #9 was taken:	Γ	Dawe, Piers	JG	Mellanox T	echnologie		
I would support to: 1. Introduce Tx rise-and-falltime specifications.	(	Comment Ty	be TR	Comment Status R			
2. Introduce limitations to tap-weights 3. Make no change		The choice of "at least half of the dB value of the stressed eye closure" is not consistent with the transmitter specs.					
Chicago rules. 1: 24 2: 5 3: 5	S	other cor	have decided w nments), revise	this "at least half" to be	consistent. Add ar	ed (for left-side limit, see n "at most" limit	
Make the changes on slides 3 - 7 of		consistent with the right-side Tx limit. Also in 138 and 140.					
http://www.ieee802.org/3/cd/public/May18/king_3cd_04_0518.pdf in 140, with editorial license."	Clauses 138, 139 and	Response REJECT		Response Status U			

For some equalizer architectures, precursors are much more expensive than post-cursors (sun\_3cd\_042518\_adhoc). Further investigation of possible minimally compliant SMF signals and their associated TDECQ FFE settings indicates that 2 pre, 2 post (making the cursor the third tap) is never significantly better than 1 pre, 3 post (making it the second tap), for compliant signals. See dawe\_3cd\_01a\_0318. Further refining the TDECQ search rules will avoid inefficiency both in product receiver design, testing and operation, and in TDECQ testing. D3.1 comment 76.

## SuggestedRemedy

Continue the improvement made in king\_3cd\_03\_0118: change "Tap 1, tap 2, or tap 3, has" to "Tap 1 or tap 2 has". Do the same in 140.7.5.1 because the TDECQ limit is similar. There is a separate comment for MMF because the different TDECQ limit there could lead to a different conclusion.

Response Status U

REJECT.

Response

Allowing just one pre-cursor in the reference EQ means the transmitted signal, when propagated through a worst case channel, cannot have a significant amount of pre-cursor response at the receiver without suffering higher TDECQ penalty.

An electrical channel typically can guarantee that, however the dispersion effects of the optical channel in combination with chirp may require the extra tap. No evidence has been provided to show otherwise.

Comment ID r02-55