

802.3dj D1.3 Comment Resolution Logic Track

Gary Nicholl (Cisco), Logic Track Lead Editor
Eugene Opsasnick (Broadcom), Logic Editor
Matt Brown (Alphawave Semi), 802.3dj Chief Editor

Introduction

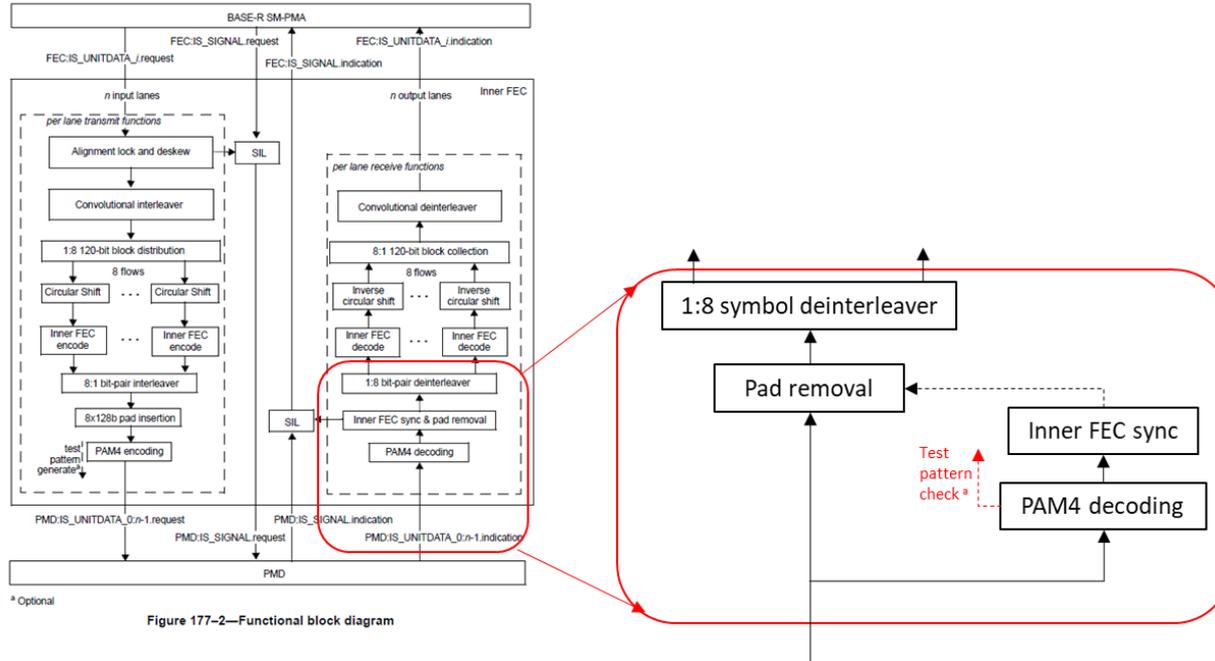
- This slide package was assembled by the 802.3dj editorial team to provide background and detailed resolutions to aid in comment resolution.
- Specifically, these slides are for the logic track comments

Decoding (Clause 177)

Comments: #274

Comment #274 - proposed changes

- Comment #274 recommended to split the receive path into two branches:
 - Main (center) branch: contains PAM4 soft information for Inner FEC decoding process
 - Side branch provides the hard-decision decoded PAM4 symbol (and bits) used for sync and test pattern checkers



Comment #274 - proposed text

177.5.1 PAM4 decoding

The PAM4 decoding function includes inverse $1/(1+D) \bmod 4$ precoding as specified in 177.5.1.1 and inverse Gray mapping as specified in 177.5.1.2. ~~Although the PAM4 decoding function is depicted as a discrete, serial function in Figure 177-2,~~ The hard-decision PAM4 decoding function is depicted as a separate branch for synchronization and test pattern checkers in Figure 177-2, the soft-decision PAM4 decoding used for Inner FEC decoding process may be implemented anywhere in the receive function providing the net behavior is the same.

177.5.2 Inner FEC synchronization

<Contains first 6 paragraphs in 177.5.2>

Insert following sentence at the beginning of 2nd paragraph:
“Inner FEC synchronization may be performed on PAM4 decoded bit-pair stream using hard-decision decoding.”

177.5.3 Pad removal

<Contains last 2 paragraphs in 177.5.2>

SM-PMA and InnerFEC Skew Constraints

Comments: <452, 26, 27>

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

Several comments received related to TBDs in skew constraints subclauses in Clause 176 (SM-PMA) and Clause 177 (IMDD InnerFEC)

Cl	SC	P	L	#
Cl 176	SC 176.9	P299	L 23	# 452
Shrikhande, Kapil Marvell				
<i>Comment Type</i> TR <i>Comment Status</i> D <i>PMA skew</i>				
Complete the subclause 176.9 on Skew Constraints of the SM-PMA.				
<i>SuggestedRemedy</i>				
A presentation will be provided to update the Skew constraints subclause				
<i>Proposed Response</i> <i>Response Status</i> W				
PROPOSED ACCEPT IN PRINCIPLE. See related slides in the following editorial contribution: <URL>/nicholl_3dj_01_2501 For task force discussion.				

Cl	SC	P	L	#
Cl 176	SC 176.9	P299	L 24	# 26
Brown, Matt Alphawave Semi				
<i>Comment Type</i> T <i>Comment Status</i> D <i>PMA skew</i>				
Skew constraints are not defined for the PMAs. However, the skew at each interface is defined in 116, 169, and 174 and thus the numbers. The PMA skew constraints may be derived from these.				
<i>SuggestedRemedy</i>				
Expect a contribution with proposals.				
<i>Proposed Response</i> <i>Response Status</i> W				
PROPOSED ACCEPT IN PRINCIPLE. Resolve using the response to comment #452.				
Cl	SC	P	L	#
Cl 177	SC 177.8	P324	L 17	# 27
Brown, Matt Alphawave Semi				
<i>Comment Type</i> T <i>Comment Status</i> D <i>Skew</i>				
Skew constraints are not defined for the PMAs. However, the skew at each interface is defined in 116, 169, and 174 and thus the numbers. The PMA skew constraints may be derived from these. Note however, that the combination of the Inner FEC and the PMA above will need to share any skew allocation.				
<i>SuggestedRemedy</i>				
Expect a contribution with proposals.				
<i>Proposed Response</i> <i>Response Status</i> W				
PROPOSED ACCEPT IN PRINCIPLE. Resolve using the response to comment #452.				

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

Clause 176 (SM-PMA)

176.9 Skew Constraints

Editor's note: This subclause will be updated in a future draft.

Clause 177 (IMDD Inner FEC))

177.8 Skew constraints

*Editor's note (to be removed prior to D2.0 or if updated with proposed values):
Need contributions proposing Skew and Skew Variation specifications.*

The Skew (relative delay) between the Inner FEC lanes is kept within limits so that the information on the lanes can be reassembled by the BASE-R SM-PMA and the BASE-R PCS.

In both cases the skew constraints subclauses need to be completed (176.9 and 177.8)

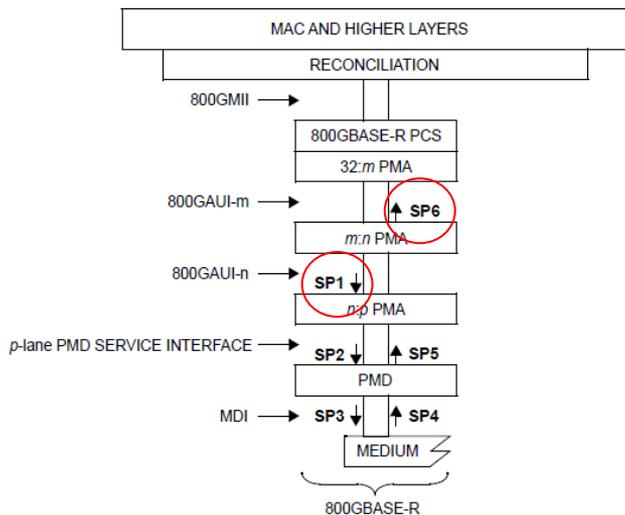
As pointed in in comment #26 and #27, the skew at each physical instantiated interface is defined in 116, 169, and 174 and also the numbers. The PMA skew constraints may be derived from these.

There is no intent to change the skew reference points and or skew numbers from what is currently in the draft.

However the description of the various skew reference points may need to be updated to reflect the more complicated stackups that are permitted in 802.3dj (e.g. co-located BM-PMA + SM-PMA + InnerFEC, etc)

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

Let's consider Clause 169 (800GbE) as an example to facilitate discussion



Skew points SP1-SP6 are defined as follows:

In the transmit direction, the Skew points are defined in the following locations:

- SP1 on the 800GAUI-n interface, at the input of the PMA closest to the PMD
- SP2 on the PMD service interface, at the input of the PMD
- SP3 at the output of the PMD, at the MDI

In the receive direction, the Skew points are defined in the following locations:

- SP4 at the MDI, at the input of the PMD
- SP5 on the PMD service interface, at the output of the PMD
- SP6 on the 800GAUI-n interface, at the output of the PMA closest to the PCS or DTE 800GXS

800GAUI-n = 800 Gb/s ATTACHMENT UNIT INTERFACE
 800GMII = 800 Gb/s MEDIA INDEPENDENT INTERFACE
 MAC = MEDIA ACCESS CONTROL
 MDI = MEDIUM DEPENDENT INTERFACE
 PCS = PHYSICAL CODING SUBLAYER
 PMA = PHYSICAL MEDIUM ATTACHMENT

PMD = PHYSICAL MEDIUM DEPENDENT
 m=8
 n=8
 p=8

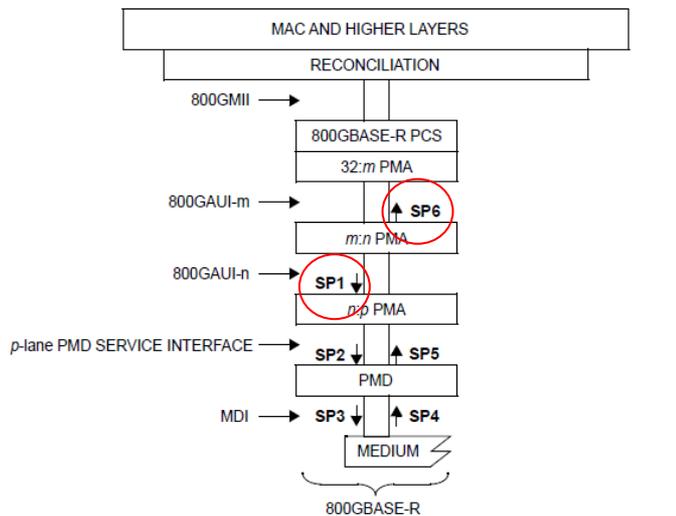
Figure 169-5—800GBASE-R Skew points for a PHY with two 800GAUI-n

Note: SP1 and SP6 are the only skew points directly related to the PMA. SP2,3,4 and 5 are all related to the PMD.

Observation: The skew definitions in 116/169 (as above) are not self-consistent with the definitions in 120/173.

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

Current skew and skew variation numbers are specified as follows:



800GAUI-n = 800 Gb/s ATTACHMENT UNIT INTERFACE
 800GMII = 800 Gb/s MEDIA INDEPENDENT INTERFACE
 MAC = MEDIA ACCESS CONTROL
 MDI = MEDIUM DEPENDENT INTERFACE
 PCS = PHYSICAL CODING SUBLAYER
 PMA = PHYSICAL MEDIUM ATTACHMENT

PMD = PHYSICAL MEDIUM DEPENDENT
 m=8
 n=8
 p=8

Figure 169-5—800GBASE-R Skew points for a PHY with two 800GAUI-n

Table 169-5—Summary of Skew constraints

Skew points	Maximum Skew (ns) ^a	Maximum Skew for 800GBASE-R PCS lane (UI) ^b	Notes ^c
SP1	16	≈ 425	See 173.5.3
SP2	25	≈ 664	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP3	36	≈ 956	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP4	116	≈ 3081	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP5	127	≈ 3373	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP6	145	≈ 3852	See 173.5.3
At PCS receive	152	≈ 4038	See 172.2.5.1

^a The Skew limit includes 1 ns allowance for PCB traces that are associated with the Skew points.

^b The symbol ≈ indicates approximate equivalent of maximum Skew in UI based on 1 UI equals 37.64706 ps at PCS lane signaling rate of 26.5625 GbD.

^c Should there be a discrepancy between this table and the Skew requirements of the relevant sublayer clause, the sublayer clause prevails.

Table 169-6—Summary of Skew Variation constraints

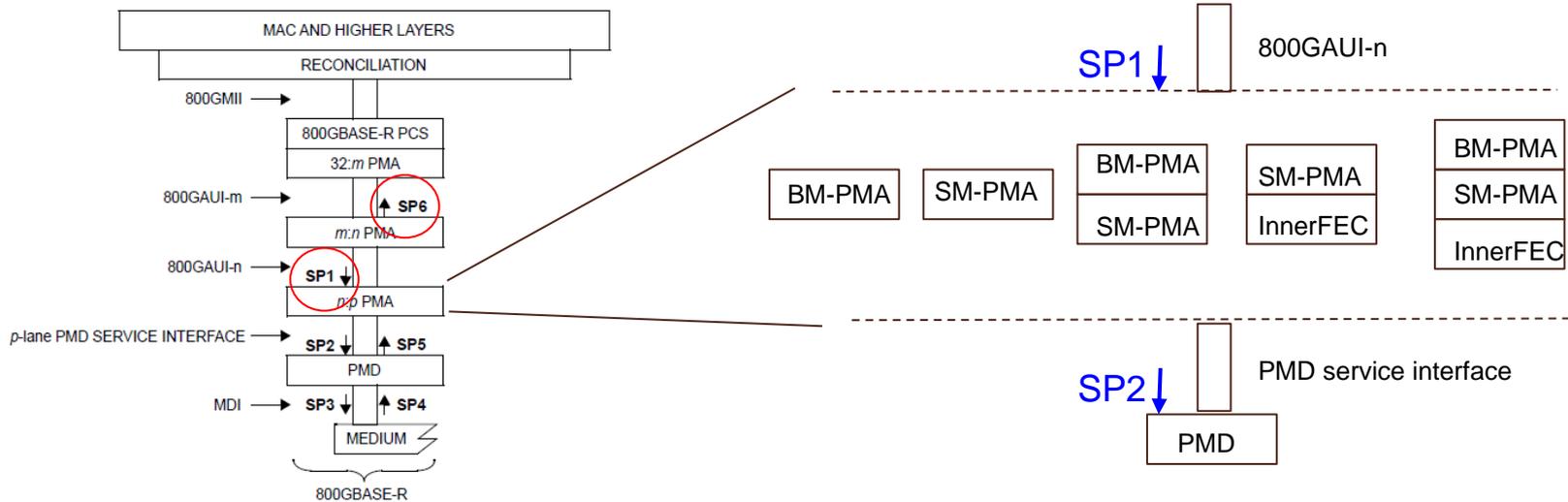
Skew points	Maximum Skew Variation (ns)	Maximum Skew Variation for 53.125 GbD PMD lane (UI) ^a	Notes ^b
SP1	0.2	≈ 11	See 173.5.3
SP2	0.4	≈ 21	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP3	0.6	≈ 32	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP4	3.4	≈ 181	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP5	3.6	≈ 191	See 173.5.3, 124.3.2.2, 162.6.3, 163.6.3, 167.3.2.2
SP6	3.8	≈ 202	See 173.5.3
At PCS receive	4	≈ 213	See 173.5.3

^a The symbol ≈ indicates approximate equivalent of maximum Skew Variation in UI based on 1 UI equals 18.82353 ps at PMD lane signaling rate of 53.125 GbD.

^b Should there be a discrepancy between this table and the Skew requirements of the relevant sublayer clause, the sublayer clause prevails.

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

The challenge is that in 3dj there is no longer just a single PMA sublayer between SP1 and SP2. There can be a combination of a number of different (but always co-located) sublayers as shown below:



800GAUI-n = 800 Gb/s ATTACHMENT UNIT INTERFACE
 800GMII = 800 Gb/s MEDIA INDEPENDENT INTERFACE
 MAC = MEDIA ACCESS CONTROL
 MDI = MEDIUM DEPENDENT INTERFACE
 PCS = PHYSICAL CODING SUBLAYER
 PMA = PHYSICAL MEDIUM ATTACHMENT

PMD = PHYSICAL MEDIUM DEPENDENT
 m=8
 n=8
 p=8

Figure 169-5—800GBASE-R Skew points for a PHY with two 800GAUI-n

However in all these cases the location of SP1 and SP2 are not be changed, and neither are the values.

SP1 is at the output of the AUI-n closest to the PMD and SP2 is at the PMD input

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

PROPOSAL

Change the definition of SP1 and SP6 in 169.5 as follows::

In the transmit direction, the Skew points are defined in the following locations:

- ~~SP1 on the 800GAUI-n interface, at the input of the PMA closest to the PMD~~ | SP1 on the output of the 800GAUI-n interface closest to the PMD
- SP2 on the PMD service interface, at the input of the PMD
- SP3 at the output of the PMD, at the MDI

In the receive direction, the Skew points are defined in the following locations:

- SP4 at the MDI, at the input of the PMD
- SP5 on the PMD service interface, at the output of the PMD
- ~~SP6 on the 800GAUI-n interface, at the output of the PMA closest to the PCS or DTE 800GX~~
SP6 on the input of the 800GAUI-n interface closest to the PCS or DTE 800GXS

Make similar changes in 116.5 and 174.5

SM-PMA / InnerFEC Skew Comments <452, 26, 27>

Changes to 177.8 “Skew constraints”

I think this section can be deleted because if the PMD service interface is physically instantiated then the skew at SP2 and SP5 are defined in the corresponding PMD clauses (because the skew is defined at input/output for the PMD). No need to duplicate this in the InnerFEC clause.

Also SP1 has nothing to do with the InnerFEC sublayer, there is no need to mention anything about that either.

SM-PMA / InnerFEC Skew

Comments <452, 26, 27>

Changes to 176.8 “Skew constraints”

This should probably be updated along the lines of 120.5 and 173.5 to capture the skew and skew variation requirements at SP1 and SP6 (as these are actually defined at the input and output of the PMA sublayer).

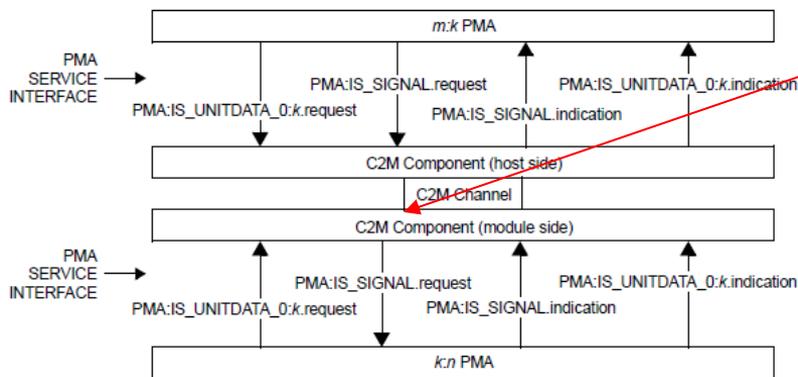
I think there is no need to include anything about SP2 or SP5 (unlike what was done in the past) as these two skew points are effectively defined at the input/output of the PMD at the PMD service interface.

SM-PMA / InnerFEC Skew

Comments <452, 26, 27>

More thoughts. Does the introduction of the XAUI Channel and XAUI Component change any of this. Maybe the skew points at SP1 and Sp6 should now be defined as part of the AUI Component and not the SM_PMA ?

FIG 176D-3—Inter-sublayer service interfaces for a 200GAUI-1, 400GAUI-2, 800GAUI-4, or 1.6TAUI-8 C2M



C2M = CHIP-TO-MODULE
PMA = PHYSICAL MEDIUM ATTACHMENT

k = NUMBER OF PARALLEL STREAMS
m = NUMBER OF PARALLEL STREAMS
n = NUMBER OF PARALLEL STREAMS

Figure 176D-3—Inter-sublayer service interfaces for a 200GAUI-1, 400GAUI-2, 800GAUI-4, or 1.6TAUI-8 C2M

Since SP1 is defined at the output of the AUI-n closest to the PMD, isn't it now defined at the input of the C2M Component and not the input of the PMA (as it used to be) .

Maybe the updated definition of SP1 I came up with earlier:
 "SP1 on the output of the 800GAUI-n interface closest to the PMD"
 Should be further refined to:
 "SP1 on the 800GAUI-n interface , at the input of the AUI Component closest to the PMD "

SM-PMA / InnerFEC Skew

Comments <452, 26, 27>

- There are issues with the skew definitions in 180/182. The skew and skew variation numbers are different for 200GbE/400GbE and 800GbE/1.6T, whereas these clauses use the same numbers for all rates. Need to update more aligned with the approach taken in clauses 178/179, i.e. different specs for 200G/400G versus 800G/1.6T
- Clause 181/183 The skew numbers are incorrect. They are based on 200G/400G (Clause 116) whereas they should be based on 800G (Clause 169)

Topic

Comments: <#s>