

IEEE P802.3an Comments

Cl 01 SC 1.4 P3 L54 # 95  
 Thaler, Pat Agilent Technologies

Comment Type E Comment Status A

We changed the text in these definitions so that the reference starts "for example" so we don't have to keep touching them to add clause numbers.

Suggested Remedy

Don't change these definitions to add the clause number.

Response Response Status C  
 ACCEPT.

Cl 22 SC P L # 17  
 Thompson, Todd SolarFlare Communica

Comment Type T Comment Status A Management

Next pages of width 48 bits are not supported by Clause 22. (Registers 7 and 8).

Suggested Remedy

Other registers in Clause 22 space must be allocated or alternate registers in another address space must be allocated to support the functionality of 48-bit next pages and Clause 22 must be updated to indicate that registers 7/8 are only to be used for 16-bit next pages.

Response Response Status C  
 ACCEPT IN PRINCIPLE.

Editors will work together to assign proper bits and registers in Clause 45 for all bits that have currently been allocated in D1.2.

The registers contained within Clause 22 have always been defined as each having only 16 bits. When a device supports extended next pages, then all transmitted and received extended next pages should be placed into the Clause 45 registers. If a device does not support extended next pages, or receives 16 bit next pages, then the Clause 22 and 28 registers should be used.

Likewise, the registers in Clause 45 also have only sixteen bits. In order to hold a 48 bit extended next page, three 16 bit registers need to be defined in Clause 45 that are analagous to Registers 7 and 8, as defined in Clause 28. Once the registers are created, this needs to be reflected in Tables 55-4 and 55-5.

Cl 28 SC P L # 13  
 Thompson, Todd SolarFlare Communica

Comment Type E Comment Status R Management

The requirements for supporting 48-bit Extended Next Pages are distributed throughout Clause 28 making it more difficult to determine the differences between the older, standard 16-bit pages and the new 16-bit base page with 48-bit next pages.

Suggested Remedy

Isolate the requirements for "Optimized FLP Bursts" and "Extended Next Pages" to a single subclause within Clause 28 defining these new terms and explaining the differences in the requirements, leaving the majority of the requirements for the current implementation unchanged.

Response Response Status C  
 REJECT.

The PICS in Clause 28 and 55 will make it clear which next pages and FLP bursts should be used. Clause 28 will list both as optional (need to pick one) but Clause 55 will state that you are required to use the extended next pages and optimized FLP bursts. Also see comment 18.

Cl 28 SC P L # 16  
 Thompson, Todd SolarFlare Communica

Comment Type T Comment Status A State diagram

Figure 28-17, Page 41:  
 Arbitration state diagram does not indicate when to change page\_size when supporting extended next pages.

Suggested Remedy

Figure 28-17, Page 41:  
 In the "COMPLETE ACKNOWLEDGE" block, add:  
 if (base\_page = true \* rx\_link\_code\_word[ENP] = 1)  
 THEN page\_size <= 48  
 This is needed to switch the page size from 16 (for the base page) to 48 for the extended next page.

Response Response Status C  
 ACCEPT IN PRINCIPLE.

Page\_size  
 16: the device does not support extended Next Pages or extended Next Page ability has not been enabled (default)

48: the device supports extended Next Pages and extended Next Page ability has been enabled.

Eric to simplify the text if possible.

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Cl 28 SC P L # 14  
Thompson, Todd SolarFlare Communica

Comment Type T Comment Status A

Table 28-1, Page 12:  
Row T4, Column Max. shows a maximum value of 97. This is not true for the standard 16-bit page format.

Suggested Remedy

For consistency, show separated entries for the 16-bit mode (33 pulses) and the 48-bit mode (97 pulses) as is done in row T5 and the rest of the document.

Response Response Status C

ACCEPT.

Cl 28 SC 28.1.4.1 P9 L15 # 12  
Thompson, Todd SolarFlare Communica

Comment Type T Comment Status D

The change to nlp\_test\_min\_timer from 5-7 msec to 6.5-7 msec for Optimized FLP Bursts is not sufficient for the worst-case timing of the transmitter. The worst-case timing for a transmit burst sending an Optimized FLP Burst is:  
 $69.5 \text{ usec} * 96 \text{ pulses} = 6.672 \text{ msec}$

This over-runs the nlp\_test\_min\_timer. A tightening of the transmit inter-pulse gap is also needed to complete transmitting before nlp\_test\_min\_timer expires.

Suggested Remedy

For implementations that support Extended Next Pages, the transmitter must transmit pulses separated by 62.5 +/- 4 usec (worst case burst time of 6.4505 msec). The following changes should be made:

Subclause 28.1.4.1 Page 9 Line 15:  
Add ", or 62.5 +/- 4 us for Optimized FLP Bursts."

Table 28-1, Page 12:  
T2 and T3 should be modified to reflect tighter tolerances for Optimized FLP Bursts (117-133 us and 58.5-66.5 us respectively).

Figure 28-10, Page 15:  
nlp\_test\_min\_timer should reflect 6.5 - 7 ms for Optimized FLP Bursts.

Subclause 28.3.2, Page 36, Lines 30-31:  
interval\_timer should add an expiration of 58.5 - 66.5 us for devices that support Extended Next Pages.

Table 28-9, Page 37:  
interval\_timer and nlp\_test\_min\_timer should have a second set of values for extended next page/optimized FLP bursts (see above).

Response Response Status Z

WITHDRAWN.

. Also see comment 98.

To be resolved as per resolution of comment #98

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CI 28 SC 28.2.1.1..2 P11 L42 # 96  
 Thaler, Pat Agilent Technologies

Comment Type TR Comment Status A

There is unnecessary text which is confusing. Delete "either" and "or 8.25 +- .25 ms interval" and "and T7". It is unnecessary for two reasons - the optimized interval is included in the intervals allowed for non-optimized and a device using the optimized interval can talk to a device using the non-optimized limits. It is confusing because a device that holds within the tighter timing is always using the optimized timing. It would be more clear to use 0.25 rather than .25. Also, the text added for optimized timing does not clearly state that it is required for devices supporting extended next pages. This is the reason for the TR.

Suggested Remedy

The first link pulse in consecutive FLP Bursts shall occur at  $16 \pm 8$  ms interval when using non-optimized FLP Burst to FLP Burst timing, see parameters T6 in (Figure 28-6). Devices supporting Extended Next Pages shall use optimized FLP Burst to FLP Burst timing. The first link pulse in consecutive FLP Bursts shall occur at a  $8.25 \pm 0.25$  ms interval when using optimized FLP Burst to FLP Burst timing, see parameter T7 in (Figure 28-6). Optimized FLP Burst to FLP Burst limits are intended to reduce negotiation time.

Response Response Status C  
 ACCEPT.

CI 28 SC 28.2.1.1.2 P11 L44 # 15  
 Thompson, Todd SolarFlare Communica

Comment Type E Comment Status A

There's a missing space character after the word "interval". "non optimized" should be "non-optimized". There's a missing period at the end of the paragraph.

Suggested Remedy

Change as suggested above.

Response Response Status C  
 ACCEPT.

CI 28 SC 28.2.3.4.13 P20 L24 # 97  
 Thaler, Pat Agilent Technologies

Comment Type T Comment Status A

"Unformatted Message Code" is not a defined name. Should be "Unformatted Code." Also the sentence structure is unnecessarily complex.

Suggested Remedy

"A Message Code can carry either a specific message or information that defines how following Unformatted Code(s) should be interpreted."

This text uses one statement to cover both unformatted codes in Unformatted pages and in Extended Next Pages.

Response Response Status C  
 ACCEPT.

Will also check and replace other instances of Unformatted Message Code.

CI 28 SC 28.3.2 P36 L59 # 98  
 Thaler, Pat Agilent Technologies

Comment Type TR Comment Status A

I made a small miscalculation when proposing the limits for nlp\_test\_min\_timer for extended bursts. At the maximum pulse spacing of 69.5 us, the maximum burst length is 6.67 ms. The minimum nlp\_test\_min\_timer must be greater than this.

Suggest we change the time for nlp\_test\_min\_timer for devices that support extended Next Pages to 6.75 - 7.25 ms. This should not affect backwards compatability as bursts are never closer together than 8 ms.

Other alternatives would be to reduce the tolerance on pulse to pulse spacing from 7 us to 5 us so that the maximum spacing is 67.5 us. or to use 6.75 to 7 ms as the nlp\_test\_min\_timer range.

Suggested Remedy

Change 6.5 - 7 ms to 6.75 - 7.25 ms.

Also, the table summarizing the timer values

Response Response Status C  
 ACCEPT.

Also see comment 12.

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Cl 28 SC 28.4 P42 L 50 # 44  
 Zimmerman, George Solarflare Communicat

Comment Type TR Comment Status D Template

For 10GBASE-T transceivers, the launch voltage will be substantially less than the nominal autoneg pulse. 10GBASE-T transceivers will never see operation on the lossy Cat3 cable that the autoneg pulse was designed for. A 10GBASE-T transceiver designed for 2Vpp won't meet the figure 14-12 template when connected to the Cat3 line load.

Suggested Remedy

Specify that for 10GBASE-T transceivers the measurement is not made when connected to the cat3 cable model. (a new cable model may need to be determined).

Response Response Status Z

WITHDRAWN.

To be revisited later when cable models are determined.

Cl 28 SC 28.5.4 P L # 18  
 Thompson, Todd SolarFlare Communica

Comment Type T Comment Status A PICS

PICS proforma tables have not been updated with extended next page requirements.

Suggested Remedy

Update requirements in subclause 28.5.4 to match other requirement changes needed when extended next pages/optimized FLP bursts are being sent.

Response Response Status C

ACCEPT IN PRINCIPLE.

Editor will add necessary items and text.

Cl 28 SC 28.5.4.3 P48 L 14 # 99  
 Thaler, Pat Agilent Technologies

Comment Type T Comment Status A PICS

Several PICS entries are not correct for devices supporting extended next page. This applies to 3, 8 in this subclause and 13 in 28.5.4.8

Suggested Remedy

For 3, delete 17 and 16 - the number isn't necessary here.  
 For the others, divide each PICS into two entries dependent on ENP and !ENP.

Response Response Status C

ACCEPT.

Cl 28C SC P64 L # 26  
 Thompson, Todd SolarFlare Communica

Comment Type TR Comment Status A State diagram

Lines 18-28:  
 "Bit M10 of the Message Code Field indicates the use of 48-bit extended next pages. When Bit M10 is a one, the next page will contain 48 bits and when Bit M10 is a zero, the next page will contain 16 bits. ..."

Bit A7 of the base page already indicates whether 48-bit next pages will be sent or 16-bit next pages will be sent. The above texts sounds as if a solution that supports Extended Next Pages may sometimes send 16-bit next pages and sometimes send 48-bit next pages in any combination. Add to this the fact that the "page\_size" variable was not added to any of the state diagrams or the functional reference diagram and it becomes unclear who is responsible for setting "page\_size" (arbitration, transmit, or receive?) and who is the consumer of the "page\_size".

The text in 28C above implies the transmitter and receiver may independently set "page\_size" based on the bit M10. This, in fact, would not achieve the desired result. Instead, two "page\_size" variables would be needed, one for the receiver and one for the transmitter. Also, the two state diagrams would have to be more complex, having their bit counts correspond to the value of the 11th bit of a next page being sent/received.

Suggested Remedy

Assuming that the text quoted above does not mean that a transmitter may intermingle 16-bit and 48-bit pages:

Change the above text to clarify what the usage of the bit M10 and/or remove the sentence which implies bit M10 is to be used to infer the page size. Consider removing this allocation of bit M10 altogether (this bit seems to be redundant information, given that bit A7 in the base page already indicates the length of all next pages to be sent/received).

Add the "page\_size" variable to the arbitration state diagram (Figure 28-17, Page 41) to show it being set based on A7 (ENP) of the base page in the "COMPLETE ACKNOWLEDGE" state.

Add "page\_size" to the functional reference diagram (Figure 28-14, Page 29) to show it is an output of the Arbitration Function and an input to the "Transmit" and "Receive" functions.

Response Response Status C

ACCEPT IN PRINCIPLE.

The reason for having bit M10 designate whether or not the next page is an extended next page is so it is not necessary to redefine each of the pre-existing next pages. For example, when a device is finished transmitting its extended next pages, it will have to transmit an extended null message page if the link partner has additional pages to transmit. Using bit M10 allows us to not have to create a new extended null message page.

The text can be improved to specify that a device will only send 16-bit or 48-bit next pages. Also, see comment 16 for state diagram changes.

IEEE P802.3an Comments

To add at the end of line 20: Devices that have negotiated extended next page support will only transmit extended next pages.

Cl 28D SC 28D.5 P68 L42 # 101  
Thaler, Pat Agilent Technologies

Comment Type T Comment Status A

With the addition of Extended Next Pages some of the statements here aren't correct.

Suggested Remedy

Change b) to "requires an ordered exchange of Next Page Messages or exchange of an Extended Next Page Message."  
In c) delete "ordered" (This should be okay since ordered is already addressed in b and it doesn't add anything to repeat it.)

Response Response Status C  
ACCEPT.

Cl 28D SC 28D.6 P70 L7 # 100  
Thaler, Pat Agilent Technologies

Comment Type TR Comment Status A

Shouldn't this table also say that Extended Next Pages support is required for 10GBASE-T?

Also, item b is not correct. 10GBASE-T requires exchange of a single next page, not an ordered exchange of next pages - we put in extended next page to avoid the need for an ordered exchange of multiple next pages.

The whole annex seems to be a rather odd historical structure. For example 28D.3 which talks about the previously reserved ability bit having been allocated for Pause. Some of this text is redundant or unnecessary. If we matched that style, we would add the allocation of the ability bit for extended next page, but I don't think we should.

Some items such as f, g and h state historical information that is unnecessary. f is incorrect as 10GBASE-T adds a single message code.

Suggested Remedy

In b replace "an ordered exchange of Next Page messages" with "exchange of an Extended Next Page Message".  
In c replace "the ordered exchange of Next Page Messages" with "the Extended Next Page Message."  
Add that Extended Next Page support is mandatory for 10GBASE-T. It would fit best after a. Delete f, g and h. If they aren't deleted, then correct f to indicate that a single message code was added.

Response Response Status C  
ACCEPT IN PRINCIPLE.

Item f will be modified and f, g, and h will be kept.

Cl 45 SC P L # 25  
McConnell, Mike KeyEye Communicatio

Comment Type T Comment Status R

No Channel Diagnostic Information discussed and approved by vote in July are included in the draft.

Suggested Remedy

Add channel diagnostic information capabilities consistent with Barrass\_1-0704.pdf to clauses 30, 45 and 55.

Response Response Status C  
REJECT.

Cl 45 SC P82 L1 # 93  
Booth, Brad Intel

Comment Type E Comment Status A

Clause needs to be written as a revision to .3REVam Clause 45 with appropriate editing instructions.

Suggested Remedy

Editor to work with chair to insert proper editing instructions and to delete irrelevant text.

Response Response Status C  
ACCEPT.

Cl 45 SC 45.2 P84 L19 # 91  
Booth, Brad Intel

Comment Type T Comment Status A

There are no registers for auto-negotiation function.

Suggested Remedy

Create a new MMD (7) for auto-negotiation. Pull in the auto-negotiation register set from 802.3ap for this new MMD.

Response Response Status C  
ACCEPT IN PRINCIPLE.

Mike McConnell will work with Eric Lynskey & Shelto Van Doorn create a new MMD (7) and add the auto negotiation registers.

IEEE P802.3an Comments

Cl 45 SC 45.2.1.10 P101 L17 # 22

Dawe, Piers Agilent

Comment Type TR Comment Status A

10GBASE-KX4 has also taken bit 1.11.1 in the 10G PMA/PMD extended ability register. There is potential for more confusion because 10GBASE-LRM nearly took it too.

Suggested Remedy

Agree the changes to this table with P802.3an and P802.3aq. My suggestion to minimise churn is as follows:

- 1.11.1 10GBASE-T
- 1.11.2 10GBASE-KR
- 1.11.3 10GBASE-LRM
- 1.11.4 10GBASE-KX4

Response Response Status C

ACCEPT IN PRINCIPLE.

A coordinated solution with .3an, ap & aq is as follows:

- 1.11.1 10GBASE-LRM
- 1.11.2 10GBASE-T
- 1.11.3 10GBASE-KX4
- 1.11.4 10GBASE-KR

See resolution to Comment #92

Cl 45 SC 45.2.1.6 P94 L6 # 23

Dawe, Piers Agilent

Comment Type TR Comment Status A

10GBASE-KX4 has also taken 1 0 0 0 in the 10G PMA/PMD control 2 register (table 45-8). There is potential for more confusion because 10GBASE-LRM nearly took it too. With the current projects, we will have a total of 12 PMDs to map into this register, so using 5 bits (32 possibilities) to keep to a reasonably logical mapping seems reasonably efficient. 'X4' PMA/PMDs end in 0 0, optical PMDs use the last two bits to represent wavelength. We then have to decide where 10GBASE-KR goes: I suggest in the '... 0 0' set as we don't know how many future EDC-enabled optical PMDs may appear. In the proposal below, bits 4 and 3 could be reversed.

Suggested Remedy

Agree the changes to this table with P802.3an and P802.3aq. My suggestion to minimise churn is as follows:

- 1.7.15:5 Reserved
- 1.7.4:0 as below:
- 0 1 0 0 0 10GBASE-KX4 (or 10GBASE-T)
- 1 0 0 0 0 10GBASE-T (or 10GBASE-KX4)
- 1 1 0 0 0 ? 10GBASE-KR
- 0 1 1 1 0 10GBASE-LRM (or 1 0 1 1 0)
- 0 0 x x x All used by 802.3ae and 802.3ak

Response Response Status C

ACCEPT IN PRINCIPLE.

A coordinated solution with .3an, ap & aq is as follows:

- Bits
- 3 2 1 0
- 1 0 1 1 10GBASE-KR
- 1 0 1 0 10GBASE-KX4
- 1 0 0 1 10GBASE-T
- 1 0 0 0 10GBASE-LRM

See response to comment #92

Cl 45 SC 45.2.1.6.1 P93 L46 # 92

Booth, Brad Intel

Comment Type T Comment Status A

Overlap with 802.3ap and 802.3aq.

Suggested Remedy

In Table 45-8, change to use code 0b1001 instead of 0b1000.

In Table 45-12, change 10GBASE-T ability to be 1.11.2.

Response Response Status C

ACCEPT.

IEEE P802.3an Comments

Cl 45 SC 45.2.1.61 P135 L55 # 65  
 McClellan, Brett SolarFlare

Comment Type E Comment Status A

"The assignment of bits for the precoder setting are shown in Table ."  
 This text is incorrect.

Suggested Remedy

change text to:  
 "The assignment of bits for the TX power level setting are shown in Table 45-51."

Response Response Status C

ACCEPT.

Cl 45 SC 45.2.3 P155 L # 24  
 McConnell, Mike KeyEye Communicatio

Comment Type T Comment Status A

Many additions were made to section 45.2.3 (MDIO PCS) for the 10GBASE-T PCS however there currently appears to be no difference between 10GBASE-T and 10GBASE-R PCS as stated. Also note that the added 10GBASE-T PCS registers in subclause 45.2.3 do not fully implement PRBS31.

Suggested Remedy

Option 1: Add PRBS31 to the 10GBASE-T PCS in clause 55 (adding the appropriate subclauses) and update the 45.2.3 and 45.5.7 sections accordingly. Correct numerous crossreferences (55.3.1.16 etc).  
 Option 2: Remove all entries associated with 10GBASE-T in subclause 45.2.3 and update subclause 45.5.7 accordingly.

Response Response Status C

ACCEPT.

Option 2  
 Mike to provide crossreferences to appropriate editors.

Cl 45 SC 45.2.3.30.3 P177 L25 # 66  
 McClellan, Brett SolarFlare

Comment Type T Comment Status D

"When read as a one, bit 3.81.1 indicates that the 64B/65B receiver is detecting a BER of = 10<sup>-4</sup>. When read as a zero, bit 3.81.1 indicates that the 64B/65B receiver is detecting a BER of < 10<sup>-4</sup>. This bit is a direct reflection of the state of the hi\_lber variable in the 64B/65B state machine and is defined in TBD (55.3.13.1)."

BER target of 1E-4 was a limitation of Clause49 PCS. I propose to make this 1E-12, and clean up the text: 64B/65B and hi\_lber.

Suggested Remedy

change text to:  
 "When read as a one, bit 3.81.1 indicates that the PCS receiver is detecting a BER of = 10<sup>-12</sup>. When read as a zero, bit 3.81.1 indicates that the PCS receiver is detecting a BER of < 10<sup>-12</sup>. This bit is a direct reflection of the state of the hi\_lfer variable in the LFER state machine and is defined in 55.3.15.2.2."

Response Response Status Z

WITHDRAWN.

Cl 45 SC 45.2.3.30.4 P177 L33 # 67  
 McClellan, Brett SolarFlare

Comment Type E Comment Status A

"45.2.3.30.4 10GBASE-T PCS lock status (3.81.0)  
 PCS lock status is the logical AND of the sync\_status variable in the LDPC state machine, defined in TBD (55.3.2), and the block\_lock variable in the 64B/65B state machine, defined in TBD (55.3.13.1). When read as a one, bit 3.81.0 indicates that the PCS receiver has lock. When read as a zero, bit 3.81.0 indicates that the receiver does not have lock."  
 Text does not match clause 55

Suggested Remedy

Change text to:  
 "45.2.3.30.4 10GBASE-T PCS status (3.81.0)  
 Indicates whether the PCS is in a fully operational state. It is only true if block\_lock is true and hi\_lfer is false, defined in 55.3.16.1. When read as a one, bit 3.81.0 indicates that the PCS receiver has lock. When read as a zero, bit 3.81.0 indicates that the receiver does not have lock."

Response Response Status C

ACCEPT.

IEEE P802.3an Comments

Cl 55 SC 55.1.3 P246 L 44-53 # 6

G. Ungerboeck Broadcom

Comment Type E Comment Status A Intro

Avoid "four-dimensional symbols". Replace "LDPC frame" by "PHY frame" (in which not all bits are LDPC encoded). Consider the alternative text suggested below.

Suggested Remedy

"The 10GBASE-T PHY employs full duplex baseband transmission over four pairs of balanced cabling. The aggregate data rate of 10Gb/s is achieved by transmitting over each wire pair 2500 Mb/s, as shown in Figure 55 2. Hybrids and cancellers are employed to enable simultaneous transmission in both directions. Baseband 16-level PAM signaling with a modulation rate of 800 Msymbols per second is used. Ethernet data and control characters are encoded at a rate of 3.125 information bits per 16-PAM symbol, along with synch and auxiliary channel bits. Two consecutively transmitted 16-PAM symbols are considered as one two-dimensional (2D) symbol. The 2D symbols are selected from a constrained constellation of 128 maximally spaced 2D symbols, called 128-DSQ (Double Square). After link start-up, PHY frames consisting of 512 128-DSQ symbols are continuously transmitted. The 128-DSQ symbols are determined by 7-bit labels, each comprising 3 uncoded bits and 4 LDPC-encoded bits. The 512 128-DSQ symbols of one PHY frame are transmitted as 4 x 256 16-PAM symbols over the four wire pairs."

Response Response Status C

ACCEPT IN PRINCIPLE.

May have to be modified for consistency throughout the draft

Cl 55 SC 55.1.3 P246 L 58 # 69

Tellado, Jose Teranetics

Comment Type T Comment Status A Intro

Autoneg reference missing

Suggested Remedy

Replace TBD with appropriate autoneg section

Response Response Status C

ACCEPT IN PRINCIPLE.

Eric Lynskey to provide reference.

Cl 55 SC 55.1.3.1 P249 L 13 # 19

Powell, Scott Broadcom

Comment Type TR Comment Status A LDPC

LDPC(1723,2048) code generator matrix is not specified. The generator matrix is required for encoder and decoder hardware implementations.

Suggested Remedy

A generator matrix (G) and suggested parity check matrix (H) for a LDPC(1723,2048) code have been sent directly to the editor (they are too large for the comment tool). These matrices should be included in the standard as an appendix (or as appropriate). Simulated performance demonstrating better than 1e-12 BER is presented in powell\_1\_01\_04.pdf.

Response Response Status C

ACCEPT.

Based on column permutations (provided by Brett McClellan) of the H matrix provided by Scott Powell.

Permuted matrix and the associated generator matrix are posted on the website (Gb.txt & Hb.tx)

To be resolved in concert with other comments on the LDPC matrices ( comment #64 and #75)



IEEE P802.3an Comments

Cl 55 SC 55.1.3.1 P249 L 6-28 # 7

G. Ungerboeck Broadcom

Comment Type E Comment Status A scrambler

Consider the alternative text suggested below.

*Suggested Remedy*

"In the transmit direction, in normal mode, the PCS receives eight Ethernet octets from the XGMII on lines TXD<31:0> during two consecutive transfers. The XGMII lines TXC<3:0> indicate Ethernet data or control octets. Each group of eight octets along with the data/control indications is transcoded into a 65-bit block. The resulting 65-bit blocks are assembled in a group of 50 blocks. Adding CRC-7 check bits yields a CRC-checked Ethernet payload of  $50 \times 65 + 7 = 3257$  bits. One synch bit and one auxiliary channel bit are added to obtain a block of 3259 bits.

The 3259 bits are divided into  $3 \times 512$  bits and 1723 bits. The  $3 \times 512$  bits, among them the synch bit and the auxiliary channel bit, remain uncoded. The 1723 bits are encoded by a systematic LDPC(1723,2048) encoder, which adds 325 LDPC check bits to form an LDPC codeword of 2048 coded bits. The  $3 \times 512$  uncoded bits and the 2048 =  $4 \times 512$  coded bits are arranged in a frame of 512 7-bit labels. Each 7-bit label comprises 3 uncoded bits and 4 coded bits.

The 512 7-bit labels are mapped into 512 2D modulation symbols selected from a constellation called 128-DSQ. The 128-DSQ symbols are obtained by concatenating two 1D 16-PAM symbols and retaining among the 256 possible combinations 128 maximally spaced 2D symbols.

The 128-DSQ constellation is partitioned into 16 subsets, each subset containing 8 maximally spaced 2D symbols. The 4 coded bits of each 7-bit label select one 128-DSQ subset, and the 3 uncoded bits of the label select one 2D symbol in this subset.

The obtained PHY frame of 512 128-DSQ symbols is passed on to the PMA as PMA\_UNITDATA.request. The PMA transmits the 128-DSQ symbols over the four wire pairs in the form of 256 constituent 16-PAM symbols per pair. Details of the PCS function are covered in 55.3.

Response Response Status C

ACCEPT IN PRINCIPLE.

Text on DSQ part is ok but text on scrambler and CRC is not because the scrambling structure was rejected.

Cl 55 SC 55.1.3.1 P249 L 8 # 47

McClellan, Brett SolarFlare

Comment Type T Comment Status A Intro

Text does not match the rest of the spec:

"In the transmit direction, in normal mode, the PCS takes eight XGMII data octets provided by two consecutive transfers on the XGMII service interface on TXD<31:0> and groups them into 64-bit blocks with the 64-bit block boundaries aligned with the XGMII start of packet boundary as indicated by the XGMII transmit control signals (TXCn = 1)."

*Suggested Remedy*

Change text to:

"In the transmit direction, in normal mode, the PCS takes eight XGMII data octets provided by two consecutive transfers on the XGMII service interface on TXD<31:0> and groups them into 64-bit blocks with the 64-bit block boundaries aligned with the boundary of the two XGMII transfers."

Response Response Status C

ACCEPT IN PRINCIPLE.

Inconsistency needs to be resolved. Clarification needed - is the error here or in the other place that it does not match?

Cl 55 SC 55.1.5 P250 L 51-54 # 8

G. Ungerboeck Broadcom

Comment Type E Comment Status A Intro

Change title to just "Interfaces" and consider the alternative text suggested below.

*Suggested Remedy*

"55.1.5 Interfaces

All 10GBASE-T PHY implementations must be compatible at the MDI and at a physically exposed XGMII, if made available. When the PHY is incorporated within the physical bounds of a single-port device or a multi-port device, physical implementation of the XGMII is optional. Designers are free ... "

Response Response Status C

ACCEPT IN PRINCIPLE.

IEEE P802.3an Comments

Cl 55 SC 55.2.1.2.1 P254 L 15 # 43  
 Zimmerman, George Solarflare Communicat

Comment Type TR Comment Status A PCS

link\_status is a variable used by all PHYs in autoneg, and has to pass to and conform with the values defined in earlier clauses. 10GBASE-T specific features, like power backoff should not be encoded into link\_status (unless autoneg is going to be completely re-written to handle it).  
 Valid values should be FAIL, READY, or OK

Suggested Remedy

Remove PB parameter here, and encode it in a management register. If a sublayer needs to request PB (for some unknown reason) and it needs to be incorporated in a primitive, make the PB status request a separate primitive.

Response Response Status C  
 ACCEPT.

Commenter will work with editorial staff to put it in the right place.

Cl 55 SC 55.2.1.2.3 P254 L 33 # 42  
 Zimmerman, George Solarflare Communicat

Comment Type E Comment Status A PCS

Fill in TBD on effect of receipt of PMA\_LINK.indicate, which should point to the link\_status in the variable section. link\_status is mentioned many times but missing from the variable section

Suggested Remedy

Add link\_status variable to variable section and reference it.

Response Response Status C  
 ACCEPT.

Cl 55 SC 55.2.2 P254 L 57 # 70  
 Tellado, Jose Teranetics

Comment Type T Comment Status A PCS

PMA\_RESET.indicate(TBD) is missing variable name

Suggested Remedy

Replace TBD with variable name 'pma\_reset'

Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.12 P274 L 23 # 53  
 McClellan, Brett SolarFlare

Comment Type T Comment Status A scrambler

The text calls for the training scrambler to reset every TBD period.  
 I propose this function be made optional such that the local PHY may choose to have the remote PHY not reset every TBD period.

Suggested Remedy

Change the text to make this an optional function.  
 An additional autoneg bit will be required.

Response Response Status C  
 ACCEPT IN PRINCIPLE.

Commenter to provide text to describe the operation of the additional autoneg bit that is required.

Cl 55 SC 55.3.14.1 P275 L 25 # 48  
 McClellan, Brett SolarFlare

Comment Type T Comment Status D startup

The task force adopted the training sequences based on polynomials presented in seki\_2\_0904.pdf. This text does not match Seki's text.

Suggested Remedy

change text to:

"Syn[3] = { g(Syn[2]) = ..... if (loc\_rcvr\_status = NG)  
 g(Syn[2]^Syn[0] else"

Response Response Status Z  
 WITHDRAWN.

Text is consistent with editor's interpretation of the motion but the editor is open to discussion on the topic by the task force.

Cl 55 SC 55.3.14.2 P276 L 7 # 54  
 McClellan, Brett SolarFlare

Comment Type T Comment Status A startup

To ensure sufficient randomness in the training signal, I propose that the info field not replace the training pattern Syn[0], but simply be XOR'd with the training pattern.

Suggested Remedy

Update text on page 275 ln 45 and page 276 ln 7 to reflect the proposal.

Response Response Status C  
 ACCEPT.

IEEE P802.3an Comments

Cl 55 SC 55.3.15.2.2 P277 L38 # 55  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status A PCS  
 "slip\_done" is defined but not used.  
 "test\_lf" is a copy of "lfer\_test\_lf" and is not used.  
 Suggested Remedy  
 Remove these items.  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.15.2.3 P278 L44 # 57  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status A PCS  
 "SLIP" is defined but not used.  
 Suggested Remedy  
 remove the item.  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.15.2.3 P278 L8 # 56  
 McClellan, Brett SolarFlare  
 Comment Type E Comment Status A PCS  
 55.3.4 should be 55.3.14  
 Suggested Remedy  
 change text as indicated  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.15.2.5 P279 L33 # 58  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status A PCS  
 "symb\_timer" is defined but not used.  
 same issue for "STD" on page 280 line 1  
 Suggested Remedy  
 remove the items  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.15.4 P280 L6 # 59  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status A startup  
 "The Lock state machine shown in Figure 55-13 determines when the PCS has obtained lock to the received data stream."  
 The Lock state machine figure does not exist.  
 Suggested Remedy  
 Remove the sentence.  
 Also remove "Lock" on line 19.  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.15.4 P281 L1 # 90  
 Seki, Katsutoshi NEC Electronics  
 Comment Type T Comment Status A PCS  
 Figure 5-13 LFER monitor state machine  
 Timer period and maximum number of invalid LDPC frames are listed as TBD.  
 10GBASE-R approach can be re-used. 10GBASE-R counts up to a maximum of 16 of the number of invalid sync headers within 125usec period. 10GBASE-R asserts hi\_ber alarm when 16 invalid sync headers are detected. This represents 4E-4 BER or more.  
 Turning to 10GBASE-T, 16 invalid LDPC frames within 125usec period corresponds to 4.1E-2 FER. 4.1E-2 FER corresponds to 4E-4 BER with an assumption of 35 bits error per error frame. 35 average error bits per error frame is a reasonable assumption as worst case.  
 Suggested Remedy  
 Change as follow  
 Timer period : 125usec  
 Maximum number of invalid LDPC frames : 16  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 Based on Clause 49 numbers.

IEEE P802.3an Comments

Cl 55 SC 55.3.16.3 P281 L55 # 60  
 McClellan, Brett SolarFlare

Comment Type T Comment Status A PCS

"In addition, the PCS shall transmit a continuous stream of TBD 1DSQ128 symbols to the PMA sublayer, and shall ignore all data presented to it by the PMA sublayer."

I propose that the PCS continue to send 65B-LDPC encoded data during loopback mode.

Suggested Remedy

change text to:

"The PCS shall continue to transmit a continuous stream of 65B-LDPC encoded 1DSQ128 symbols to the PMA sublayer, and shall ignore all data presented to it by the PMA sublayer."

Response Response Status C

ACCEPT.

Cl 55 SC 55.3.2.1 P261 L6 # 72  
 Tellado, Jose Teranetics

Comment Type T Comment Status A PCS

Missing reference for Power on

Suggested Remedy

Replace TBD with appropriate Power on section

Response Response Status C

ACCEPT IN PRINCIPLE.

Write text similar to Clause 36.2.5.1.3 into clause 55. TBD will point to this definition

Cl 55 SC 55.3.2.2 P261 L51 # 71  
 Tellado, Jose Teranetics

Comment Type E Comment Status A PCS

"If a PMA\_TXMODE.indicate message has the value SEND\_Z ..." should be in a new paragraph as in clause 40

Suggested Remedy

Keep the above sentence in separate paragraph

Response Response Status C

ACCEPT.

Cl 55 SC 55.3.2.2 P263 L1-60 # 9  
 G. Ungerboeck Broadcom

Comment Type T Comment Status A scrambler

(Figure 55-6) Order of CRC-7 checking and scrambling, and the type of scrambling, should be changed. Figure 55 6 shows self-synchronizing scrambling performed prior to CRC-7 checking. Suppose in the receiver a PHY frame is incorrectly decoded as noticed by an invalid LDPC codeword or an invalid CRC-7 check. In this case, an error condition must be signalled to the XGMII indicating that one or several of the 50 65-bit blocks may not be correctly translated into a group of eight Ethernet data or control octets. In addition, because of limited error propagation in self-synchronizing descrambling a certain number of Ethernet octets obtained from the next correctly received PHY frame must be declared as being potentially in error.

Suggested Remedy

See details in Ungerboeck presentation at Vancouver meeting. CRC-7 checking is followed by stream scrambling.

Response Response Status C

ACCEPT IN PRINCIPLE.

See resolution to comment #50

Cl 55 SC 55.3.4 P262 L24 # 64  
 McClellan, Brett SolarFlare

Comment Type T Comment Status A LDPC

The text does not specify the LDPC encoder matrix.

I propose to specify a matching parity check and generator matrix that greatly reduces the encoder complexity.

See proposal.

Suggested Remedy

Change text to reflect the proposal.

Response Response Status C

ACCEPT IN PRINCIPLE.

To be resolved in concert with other comments on the LDPC matrices ( comment #64 and #75)

See response to comment #19

IEEE P802.3an Comments

Cl 55 SC 55.3.4.2 P265 L 18 # 73  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status D PCS  
 CRC7 does not check 'aux chan bit' or 'sync bit'.  
 Suggested Remedy  
 Move CRC7 to after the scram PRNG  
 Response Response Status Z  
 WITHDRAWN.  
 Not needed. See response to comment #50

Cl 55 SC 55.3.4.2 P265 L 6 # 49  
 McClellan, Brett SolarFlare  
 Comment Type E Comment Status A PCS  
 transmit spec text refers to receive diagram  
 Suggested Remedy  
 change text to:  
 "Block bit transmission order is illustrated in Figure 55-6 and Figure 55-8."  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.3.5 P269 L # 30  
 Halder, Bijit Plato Networks  
 Comment Type T Comment Status D scrambler  
 1.The description of the novel scrambler is incomplete.  
 2.The previous scrambler description and diagram is inconsistent with the diagram in Figure 55.8 on page 265.  
 3.The diagram for the novel scrambler is confusing  
 a.The equation and definition of  $x_n$  unclear  
 b.The equation and definition of  $y_n^i$   
 Suggested Remedy  
 1.Add details in the description of the novel scrambler to match all the quantities in the diagram.  
 2.Either delete the previous scrambler or modify the diagram on page 265.  
 3.Define  $x_n$ ,  $y_n^i$  and verify the equations.  
 Response Response Status Z  
 WITHDRAWN.  
 Applicable text taken out in response to decision on comment #50  
 However decisions on other scrambler related comments may affect the suggested remedy

Cl 55 SC 55.3.6 P269 L 15 # 50  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status A scrambler  
 I propose to retain the current Clause 49 self-synchronizing scrambler.  
 See presentation.  
 Suggested Remedy  
 Change PCS scrambler/descrambler text to reflect proposal.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 As per presentation in Mcclellan\_1\_0105.pdf with the following modifications to slide #12:  
 Aux bit is retained and use CRC8  
 Yes: 20  
 No: 0  
 Abstain: 22  
 Motion passes.

Cl 55 SC 55.3.6 P269 L 29 # 51  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status D scrambler  
 scrambler initial states are TBD.  
 Suggested Remedy  
 Replace with:  
 "The master and slave scrambler initial values shall be set to ensure sufficient randomness between the remote and local device as well as adjacent devices."  
 Response Response Status Z  
 WITHDRAWN.  
 No longer needed. See response to comment #50

IEEE P802.3an Comments

Cl 55 SC 55.3.6 P270 L25 # 76  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status D scrambler  
 Typo in sync bit formula  
 Suggested Remedy  
 Change to  $x_n = x_{(n-5)} \text{ xor } x_{(n-23)}$   
 Response Response Status Z  
 WITHDRAWN.  
 Relevant text will be removed as per decision on comment #50  
 Suggested remedy may be affected by decisions on other scrambler related comments.

Cl 55 SC 55.3.6 P270 L38 # 77  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status D scrambler  
 Typo in scram bit formula  
 Suggested Remedy  
 $y_n = y_{(n-18)} \text{ xor } y_{(n-23)}$   
 Response Response Status Z  
 WITHDRAWN.  
 Relevant text will be taken out in response to the decision on comment #50.

Cl 55 SC 55.3.7 P270 L49 # 75  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status D LDPC  
 Missing generator matrix for LDPC(1723,2048)  
 Suggested Remedy  
 Generator matrix to be provided for inclusion in separate file  
 Response Response Status Z  
 WITHDRAWN.  
 See response to comment #19

Cl 55 SC 55.3.7 P271 L38 # 31  
 Halder, Bijit Plato Networks  
 Comment Type T Comment Status A DSQmapper  
 1. The operation mod16 is undefined, and the required definition is inconsistent with the mod16 definition on page 287.  
 2. The not symbol in equation for  $x_{13}$  may be confusing: it is not clear if it is applied to only  $u_0$  or the whole expression.  
 Suggested Remedy  
 1. Use a different symbol such as  $\text{int\_mod16}$  for the operation, and define it as follows:  $\text{int\_mod16}(n)$  for an integer  $n$  is a non-negative integer  $p$  such that  $n+16m=p$  for some integer  $m$ .

2. Use a parenthesis around it:  $x_{13}=(!u_0)\&u_2$   
 Response Response Status C  
 ACCEPT.  
 Cl 55 SC 55.3.8 P271 L55 # 52  
 McClellan, Brett SolarFlare  
 Comment Type T Comment Status D DSQmapper  
 The current mapping of 2D-DSQ128 to 4D-1DSQ128 is susceptible to noise correlation and impulse noise. I propose to add an interleaver.  
 See presentation.

Suggested Remedy  
 Change text to reflect the proposal.  
 Response Response Status Z  
 WITHDRAWN.  
 Will be studied further and may be resubmitted

Cl 55 SC 55.4.2 P285 L12 # 68  
 Tellado, Jose Teranetics  
 Comment Type E Comment Status A PCS  
 Change 'specified in Clause 22 CHANGE LINK TO C45'  
 Suggested Remedy  
 Fix the link  
 Response Response Status C  
 ACCEPT.

IEEE P802.3an Comments

Cl 55 SC 55.4.2.1 P285 L 20 # 79  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status A PCS  
 Reference missing for Power on  
 Suggested Remedy  
 Replace TBD with appropriate Power on section  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 See response to comment #72

Cl 55 SC 55.4.2.2 P285 L 35 # 78  
 Tellado, Jose Teranetics  
 Comment Type T Comment Status A PCS  
 In 'TBD transmit filtering' the transmit filtering can be split between digital and analog functions in an implementation specific mode as long as the TX Mask is satisfied. No specific transmit filter spec is required  
 Suggested Remedy  
 Remove 'TBD' or replace with 'optional'  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.4.3 P287 L 32 # 1  
 Vareljian, Albert KeyEye Communicatio  
 Comment Type T Comment Status D THP  
 Need to further define the THP coefficient set format  
 Suggested Remedy  
 The THP coefficients shall be selected from a predetermined set, representing a direct form FIR filter optimized to a range of length of cable. The THP coefficients shall be limited to a set of maximum twelve real values quantized to 7(8) bits, and additional bypass state.  
 Response Response Status Z  
 WITHDRAWN.  
 Task force to discuss, but there are no alternative proposals for the FIR coefficient set.

Cl 55 SC 55.4.3.1 P287 L 16-33 # 10  
 G. Ungerboeck Broadcom  
 Comment Type E Comment Status A PCS  
 Use "16-PAM" instead of "1DSQ128". Enhance clarity and notation.  
 Suggested Remedy  
 Add "TH precoding and ..." to the subclause title. Define prior to the equations a sub k as a 16-PAM symbol (-15,-13, ... 13,15) transmitted at time kT, b sub k = a sub k + 32 m sub k as an extended 16-PAM symbol, and x sub k as the TH precoder output. Define alpha(D) = 1 + alpha sub 1 D + ... as the target response of TH precoding (actually, I prefer h(D)). In the equations avoid non-standard use of "mod 16" by writing  

$$x_{sub\ k} = (a_{sub\ k} + \sum_{i=1}^{\infty} \alpha_{sub\ i} b_{sub\ k-i}) + 32 m_{sub\ k}$$
 where m sub k is an integer chosen such  $-16 \leq x_{sub\ k} < 16$ .  
 Then write the time continuous transmit signal at the MDI as  

$$s(t) = \sum_{k} x_{sub\ k} h_{sub\ T}(t-kT)$$
 Define "h sub T (t)" as the unit-symbol response (not impulse response) of the transmitter FE circuitry (comprising DAC and filters).  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.

IEEE P802.3an Comments

CI 55 SC 55.4.3.1 P287 L32 # 3  
 Vareljian, Albert KeyEye Communicatio

-0.24784 -0.25  
 0.091094 0.09375  
 0.079077 0.09375

Comment Type T Comment Status D THP

Specify the pre-optimized THP coefficient sets for cable lengths from 100 to 0 meters

Suggested Remedy

The THP pre-optimized coefficients for cable lengths from 100 to 0 meters shall be selected from the three sets outlined below (column entries in Top-Down order correspond to ascending delay direct FIR form, denominator = 1):

SET 1, 80-100 meters

Floating Point 7-bit

1.7882	1.78125
1.3886	1.375
0.51683	0.53125
-0.20361	-0.21875
-0.65657	-0.65625
-0.87095	-0.875
-0.90013	-0.90625
-0.79667	-0.78125
-0.60553	-0.59375
-0.365	-0.375
-0.14265	-0.15625
-0.031834	-0.03125

SET 2, 45-80 meters

Floating Point 7-bit

1.262	1.25
0.36757	0.375
-0.4370	-0.4375
-0.777	-0.78125
-0.76492	-0.75
-0.49457	-0.5
-0.13909	-0.125

SET 3, less than 45 meters

Floating Point 7-bit

0.59037	0.59375
-0.36938	-0.375
-0.61887	-0.625
-0.52253	-0.53125

Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Task force to discuss, but there are no alternative proposals for the FIR coefficient set.

Modify proposal as per text in powell\_2\_0105.txt

Straw poll  
 Yes: 19  
 No: 6  
 Abstain

Motion to accept the proposed response as in powell\_2\_0105.txt

Yes: 19  
 No: 9

Motion fails

CI 55 SC 55.4.3.1 P287 L32 # 2  
 Vareljian, Albert KeyEye Communicatio

Comment Type T Comment Status A THP

Determine THP configuration options

Suggested Remedy

The THP coefficient feature shall allow the link partner PHY to remotely configure a THP set selection at startup, or optionally supply the pre-determined coefficient values, subject to the format of maximum of twelve 7(8)-bit values, representing direct form FIR.

Response Response Status C

ACCEPT IN PRINCIPLE.

Add text to the draft to specify that each THP in the set of FIR THPs shall consist of a maximum of 12 taps, each specified with 8bit values.



IEEE P802.3an Comments

Cl 55 SC 55.4.3.1 P287 L33 # 33

Halder, Bijit Plato Networks

Comment Type TR Comment Status R margin

For fixed THP, the best case SNR shown with 100m Class E cable for a realistic system is 24.5dB, see vareljian\_1\_1104.pdf. Required SNR for current specification is 23.3 dB, see ungerboeck\_1\_1104.pdf. Hence, the available margin is about 1.2dB, which is extremely low for any practical implementation. Moreover, the SNR calculation does not include the effect of AFEXT. Any reasonable AFEXT will reduce the SNR below the required 23.3 dB level. Thus the current specification is inadequate for 100m class E cable, which is in violation of one of the objectives in the draft.

Suggested Remedy

Increase the system bandwidth.

Response Response Status U

REJECT.

The suggested remedy does not provide sufficient guidance to the editor.

Commenter is waiting for information from the cabling standards bodies.

Cl 55 SC 55.4.3.1 P287 L33 # 32

Halder, Bijit Plato Networks

Comment Type TR Comment Status R THP

The number of sets of fixed THP coefficients is based on analysis of that does not cover the 55m CAT6 case - cf. ungerboeck\_1\_1104.pdf and golden\_1\_1104.pdf. The current specification is inadequate for 55m CAT6 cable, which is in violation of one of the objectives in the draft.

Suggested Remedy

Increase the number of fixed THP coefficients sets to include 55m CAT6 cable or make the THP programmable.

Response Response Status U

REJECT.

Please resubmit the comment with specific text that should be put into the text.

Cl 55 SC 55.4.3.1 P287 L40-33 # 11

G. Ungerboeck Broadcom

Comment Type E Comment Status A PCS

Similar to comment on 55.4.3.1.

Suggested Remedy

Write the signal received at the MDI as

$$r(t) = \sum_k x_k h_{sub R}(t-kT) + n(t)$$

Define "h<sub>sub R</sub>(t)" as the unit-symbol response in the signal received at the MDI input. Note that at the MDI the additive noise will generally be non-white; hence use n(t) instead of w(t). Note that only after fixed FE receive filtering, T-spaced sampling, and adaptive feed-forward equalization the received signal will take the discrete-time form

$$y_{sub k} \approx \sum_{i=0}^{inf} b_{sub i} \alpha_{k-i} + w_{sub k}$$

(Observe that the sequences of TH precoder outputs {x<sub>sub k</sub>} and the sequence of extended 16-PQAM symbols {b<sub>sub k</sub>} are linearly related).

Response Response Status C

ACCEPT IN PRINCIPLE.

Cl 55 SC 55.5.2 P295 L1 # 81

Sandeep, Gupta Teranetics

Comment Type T Comment Status D PMAelec-volt

Fill in the TBD numbers for the test mode 1 waveform to test the voltage

Suggested Remedy

The TBD values can be "10" +16 and "10" -16 symbols to measure the voltage as a settled value after 8 symbol periods in the series of 10 consecutive +/-16 symbols.

Response Response Status Z

WITHDRAWN.

See response to comment #36

## IEEE P802.3an Comments

CI 55 SC 55.5.2 P295 L24 # 84  
Sandeep, Gupta Teranetics

Comment Type T Comment Status A PMAelec-lin

The methodology and the exact frequencies for linearity testing should be determined

## Suggested Remedy

Adopt the methodology and exact frequencies suggested in subclause 55.5.2, test mode 4.

Response Response Status C

ACCEPT IN PRINCIPLE.

Adopt the methodology suggested in 55.5.2, test mode 4 (not the exact frequencies)

CI 55 SC 55.5.2 P295 L47 # 88  
Sandeep, Gupta Teranetics

Comment Type T Comment Status A PMAelec-droop

The TBD sequence for test mode 6 for transmitter output droop should be decided

## Suggested Remedy

The number of symbols could be 128 +16 and 128 -16. See the presentation for this in July '04  
[http://www.ieee802.org/3/an/public/jul04/gupta\\_1\\_0704.pdf](http://www.ieee802.org/3/an/public/jul04/gupta_1_0704.pdf)

Response Response Status C

ACCEPT.

CI 55 SC 55.5.3.1 P298 L46 # 80  
Sandeep, Gupta Teranetics

Comment Type T Comment Status D PMAelec-volt

The range as decided in a motion and in the draft as 2-2.5V +/- TBD % is too broad.

## Suggested Remedy

Narrow down the peak to peak voltage range to 2V+/-10%. See the rationale and test methodology in the relevant presentation on 10GBASET transmitter spec proposal

Response Response Status Z

WITHDRAWN.

See response to comment #36

CI 55 SC 55.5.3.1 P60 L # 36  
Chris Pagnanelli Solarflare Communicat

Comment Type T Comment Status D PMAelec-volt

Transmitter peak differential output voltage needs to be completely specified.

## Suggested Remedy

Replace TBDs with actual values.

(see wording in contribution "Transmitter Electrical Specifications Proposal")

Response Response Status Z

WITHDRAWN.

CI 55 SC 55.5.3.2 P299 L11 # 27  
Babanezhad, Joseph Plato Networks

Comment Type T Comment Status A PMAelec-droop

The lower -3dB frequency (f-3dBL) for the transformer must be specified as f-3dBL <=120 kHz and not 100 kHz with a 10% margin. The latter could imply that f-3dBL < 90 kHz is not acceptable which does not make sense.

## Suggested Remedy

Specify it as f-3dBL <=120 kHz.

Response Response Status C

ACCEPT IN PRINCIPLE.

The comment is on an Editor's note which will go away when we have replaced the TBDs relating to droop.

CI 55 SC 55.5.3.2 P299 L7 # 89  
Sandeep, Gupta Teranetics

Comment Type T Comment Status A PMAelec-droop

The TBD's for the droop measurement to be decided

## Suggested Remedy

Follow the recommended values by the editor in the subclause. Measure the droop w.r.t to a voltage after a settling time of 10ns from a zero crossing to a voltage 80ns later to be less than 5.5%. for rationale see the relevant presentation in  
[http://www.ieee802.org/3/an/public/jul04/gupta\\_1\\_0704.pdf](http://www.ieee802.org/3/an/public/jul04/gupta_1_0704.pdf)

Response Response Status C

ACCEPT.

Amendment to suggested remedy: change "5.5%" to "10%"

IEEE P802.3an Comments

Cl 55 SC 55.5.3.2 P60 L # 37  
 Chris Pagnanelli Solarflare Communicat  
 Comment Type T Comment Status D PMAelec-droop  
 Maximum output droop needs to be completely specified.  
 Suggested Remedy  
 Replace TBDs with actual values.  
 (see wording in contribution "Transmitter Electrical Specifications Proposal")  
 Response Response Status Z  
 WITHDRAWN.

Cl 55 SC 55.5.4 P299 L # 29  
 Babanezhad, Joseph Plato Networks  
 Comment Type T Comment Status A PMAelec-lin  
 In section 55.5.4 and during the Transmitter linearity test the Transmitter needs to be terminated with 100 Ohm resistance.  
 Suggested Remedy  
 Add text to include the 100 Ohm termination.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 Suggest addition of text to say that the Balun in text fixture 2 has to have a 100 Ohm input impedance.

Cl 55 SC 55.5.4 P299 L # 28  
 Babanezhad, Joseph Plato Networks  
 Comment Type E Comment Status R PMAelec-lin  
 In section 55.5.4 everywhere replace the word "linearity" with the word "distortion" since it is frequency-dependent distortion that we are measuring.  
 Suggested Remedy  
 In section 55.5.4 everywhere replace the word "linearity" with the word "distortion" since it is frequency-dependent distortion that we are measuring.  
 Response Response Status C  
 REJECT.  
 See comment #38.

Cl 55 SC 55.5.4 P299 L22 # 85  
 Sandeep, Gupta Teranetics  
 Comment Type T Comment Status A PMAelec-lin  
 The SFDR, IMD formulas for frequency domain linearity testing to be defined  
 Suggested Remedy  
 Adopt the formulas for SFDR and IMD as indicated in subclause 55.5.4 with TBDs for the value.  
 Response Response Status C  
 ACCEPT.

Cl 55 SC 55.5.4 P299 L39 # 87  
 Sandeep, Gupta Teranetics  
 Comment Type T Comment Status D PMAelec-lin  
 The normative spec for linearity should be defined.  
 Suggested Remedy  
 The normative spec could be Xnonlin=42dB, Xnlslope=20dB, f1=100MHz. For the rationale in the presentation 10GBASET transmitter spec proposal.  
 Response Response Status Z  
 WITHDRAWN.

Cl 55 SC 55.5.4 P299 L42 # 86  
 Sandeep, Gupta Teranetics  
 Comment Type T Comment Status D PMAelec-lin  
 The TBD for the "recommended" linearity spec should be defined  
 Suggested Remedy  
 The "recommended" linearity spec can be defined by the formula and methodology of 55.5.4, wherein Xnonlin=65dB, Xnlslope=0. See relevant presentation on 10GBASET transmitter spec proposal  
 Response Response Status Z  
 WITHDRAWN.

IEEE P802.3an Comments

CI 55 SC 55.5.4 P61 L # 38  
Chris Pagnanelli Solarflare Communicat

Comment Type TR Comment Status D PMAelec-lin

Transmitter linearity needs to be completely specified. Linearity should be specified as a signal to noise plus distortion ratio to eliminate the need for making separate measurements of transmitter jitter, which are complicated and potentially inaccurate at 10GBASE-T baud rates and required jitter levels.

Suggested Remedy

Replace TBDs with specifications for signal to noise plus distortion.

(see wording in contribution "Transmitter Electrical Specifications Proposal")

Response Response Status W

UNRESOLVED

Task force to discuss & decide

Transmitter signal to noise plus distortion specification as per text on slide 7 and 8 from presentation pagnanelli\_2\_0105.pdf

Vote to accept in principle:

Yes: 20

No: 7

Abstain: 19

Motion fails

Vote to accept in principle:

Transmitter signal to noise plus distortion specification as per text on slide 17 and 18 from presentation pagnanelli\_3\_0105.pdf

Yes: 10

No: 6

Abstain: 22

Motion Fails.

Proposal to accept in principle:

Revised proposal as per pagnanelli\_4\_0105.pdf with one change to the table on slide 4: the power for two tone tests is 3dB below full power. Full power applies only to the single tone tests

Vote:

Yes: 16

No: 7

Abstain: 4

CI 55 SC 55.5.5 P62 L # 39  
Chris Pagnanelli Solarflare Communicat

Comment Type TR Comment Status A PMAelec-jitter

Transmitter timing jitter measurements are complicated and potentially inaccurate at 10GBASE-T baud rates and required jitter levels. The transmitter timing jitter requirement can be absorbed into a transmitter signal to noise plus distortion specification, giving PHY vendors the flexibility to optimally allocate implementation losses.

Suggested Remedy

Remove paragraph 55.5.5.

(see contribution "Transmitter Electrical Specifications Proposal")

Response Response Status C

ACCEPT IN PRINCIPLE.

Leave header, remove text in 55.5.5.

CI 55 SC 55.5.6 P300 L # 35  
Halder, Bijit Plato Networks

Comment Type T Comment Status D PMAelec-volt

With approved 2.5V peak-to-peak voltage and 5dBm of average transmit power used in most calculations, the PAR budget is not enough for implementing the PSD mask for a precoded system.

Suggested Remedy

Reduce the average transmit power.

Response Response Status Z

WITHDRAWN.

CI 55 SC 55.5.6 P300 L38 # 34  
Halder, Bijit Plato Networks

Comment Type E Comment Status A PMAelec

In the text "test mode 4," the reference to the test mode is wrong.

Suggested Remedy

Change the text to "test mode 5."

Response Response Status C

ACCEPT.

IEEE P802.3an Comments

Cl 55 SC 55.5.6 P300 L42 # 82  
 Sandeep, Gupta Teranetics  
 Comment Type T Comment Status D PSDmask  
 The complete PSD specification needs a lower mask  
 Suggested Remedy  
 The lower mask can be  
 -83 dbm/Hz for f<50MHz  
 -83-(f-50)/50 for 50<f<200MHz  
 -86-(f-200)/25 for 200<f<400MHz  
 =-inf for f> 400MHz.  
 See the rationale in the relevant presentation for 10GBASET transmitter spec proposal  
 Response Response Status Z  
 WITHDRAWN

Cl 55 SC 55.5.6 P300 L42 # 83  
 Sandeep, Gupta Teranetics  
 Comment Type T Comment Status D PSDmask  
 The upper PSD mask can be restrictive at high frequencies(~1.8-2G) for as high as just 2.2V output, which is in compliance with already decided range.  
 Suggested Remedy  
 Change the psd mask slightly to accomodate this. See relevant presentation on 10GBASET transmitter spec proposal  
 Response Response Status Z  
 WITHDRAWN.

Cl 55 SC 55.5.6 P62 L L # 40  
 Chris Pagnanelli Solarflare Communicat  
 Comment Type TR Comment Status A PSDmask  
 Transmitter PSD specification should include a lower mask, in addition to an upper mask. Output power levels need to be specified.  
 Suggested Remedy  
 Replace TBDs with actual values. Incorporate PSD lower mask.  
 (see wording in contribution "Transmitter Electrical Specifications Proposal")  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 Output power levels: 3.2dBm to 5.2dBm  
 Lower PSD mask as per slide 14 with the lower end being changed to 5MHz  
 Presentation: Pagnanelli\_2\_0105.pdf

Cl 55 SC 55.5.7 P63 L # 41  
 Chris Pagnanelli Solarflare Communicat  
 Comment Type TR Comment Status A PMAelec  
 Tolerance on symbol transmission rate needs to be specified.  
 Suggested Remedy  
 Replace TBDs with actual values.  
 (see wording in contribution "Transmitter Electrical Specifications Proposal")  
 Response Response Status C  
 ACCEPT.  
 Change TBD on symbol transmission rate to +50ppm

Cl 55 SC 55.5.9.1 P302 L21 # 46  
 Zimmerman, George Solarflare Communicat  
 Comment Type T Comment Status A PMAelec  
 The noise source for testing needs to be specified.  
 Suggested Remedy  
 Given that the combined sources of ANEXT and AFEXT produce an approximately flat noise source, and that accurately shaped noise sources represent a greater source of test error than an equivalent flat noise source, recommend testing with an equivalent flat noise source, with 3 dB bandwidth at least 10 MHz to 500 MHz, levels consistent with average ANEXT+AFEXT on the various channels. see contribution.  
 Response Response Status C  
 ACCEPT IN PRINCIPLE.  
 Replace text:  
 "The noise source shall meet the ANEXT specifications in 55.7.3.4." on page 302, line 21 with the following text:  
 "The noise source should have a flat noise spectrum, with 3 dB bandwidth at least 10 MHz to 400 MHz and a power spectral density of TBD dBm/Hz."

IEEE P802.3an Comments

CI 55 SC 55.6 P L # 104  
 Thompson, Todd SolarFlare Communica

Comment Type TR Comment Status A Management

Now that there are 48-bit next pages, the management registers and/or protocol for handling 48-bit next pages should be defined. This was previously done with Registers 7 and 8, but these Registers were only designed to handle 16-bit next pages.

Suggested Remedy

Define 3 x 16-bit registers for the equivalent functionality of register 7 and 3 x 16-bit registers for the equivalent of functionality of register 8. (If possible.) This is the most straightforward approach if the register space is available. There may need to be an additional bit defined somewhere that indicates that Extended Next Pages are being exchanged instead of the regular next pages (to indicate that the additional 32-bits of data have meaning).

Response Response Status C

ACCEPT IN PRINCIPLE.

Also see response to comment 17.

CI 55 SC 55.6.1.1 P303 L # 103  
 Thompson, Todd SolarFlare Communica

Comment Type TR Comment Status A Management

Table 55-4, Pages 303, 304, 305:  
 There are many TBD's in this table for register and bit definitions that should be able to now be resolved.

Suggested Remedy

Assign registers and bits to the TBD registers/bits in this table. Suggest assigning them as close as possible to the same register and bit positions as in 1000BASE-T, since their functionality in most cases is the same. (Those that have the same functionality such as master/slave configuration, etc., should be assigned the same register/bits.)

Response Response Status C

ACCEPT IN PRINCIPLE.

Editors will work together to assign proper bits and registers in Clause 45. Currently, there have not been proposals for all of the bits, such as how many test modes there are, or what additional counters are necessary. All bits that are defined, coming out of the meeting, will be placed in D1.3.

CI 55 SC 55.6.1.1 P303 L 46 # 102  
 Thompson, Todd SolarFlare Communica

Comment Type TR Comment Status R Management

Table 55-4, Lines 46-47:  
 The Description column for the "Auto-Negotiation link partner ability register" has a comment that does not seem to match this register. It states "10GBASE-T implementations do not use this register to store Auto-Negotiation Link Parnter Next Page Data"

Suggested Remedy

It seems this comment should be in the rows dealing with next page registers (register 7 and 8)?

Response Response Status C

REJECT.

This register is used to store the base page information from the link partner. In past implementations, some devices would use this register to also store the link partner next page data. The comment states that 10GBASE-T implementations cannot use this register to store next page data.

CI 55 SC 55.6.1.1 P305 L 6 # 61  
 McClellan, Brett SolarFlare

Comment Type T Comment Status A Management

"Idle Error Count" does not exist in 10GBASE-T.

Suggested Remedy

Remove the entry.

Response Response Status C

ACCEPT.

CI 55 SC 55.6.1.2 P305 L 25 # 62  
 McClellan, Brett SolarFlare

Comment Type E Comment Status A

Line refers to non-existent table.

Suggested Remedy

Change to Table 55-5

Response Response Status C

ACCEPT.

IEEE P802.3an Comments

Cl 55 SC 55.6.2 P308 L 27 # 63  
 McClellan, Brett SolarFlare  
 Comment Type E Comment Status A Management  
 typo "link\_status\_1GigT"  
 Suggested Remedy  
 change to "link\_status\_10GigT"  
 Response Response Status C  
 ACCEPT.  
 Also need to add definition of link\_status\_10GigT.  
 Need to add 10GigT to 28.3.1  
 10GigT; represents that the 10GBASE-T PMA is the signal source

Cl 55 SC 55.7 P L # 21  
 Bennett, Mike LBNL  
 Comment Type T Comment Status D cabling  
 The task force agreed to rewrite this using a single worst-case channel. The current draft still references multiple cable categories for PSANEXT and insertion loss on pages 315-317.  
 Suggested Remedy  
 10GBASE-T should operate on any channel better than or equal to the worst case. The text should be rewritten to reflect this.  
 Response Response Status Z  
 WITHDRAWN.  
 Commenter withdraws because same issue is covered by comment #5  
 Response:  
 I'll generate a couple of revisions of the current draft to offer as an alternative to the current wording to minimize the inference that their are multiple link segment specifications in 55.7.3.2 while still maintaining the need to address alien crosstalk specifications for the cabling objectives Class F and Class E (55m).  
 Concerning the motion to generate a single worst case link segment in the next draft.  
 M: Alan Flatman  
 S: Mike McConnell  
 14Y/3N/5A  
 Technical  
 Passes  
 The 10GBASE-T link transmission parameters ( i.e., "the channel specifications") are specified in 55.7.2 through 55.7.3.1.2.3. The "channel specifications" are the minimum requirements for a Class E channel extrapolated to 500 MHz. There is only "one" 10GBASE-T link segment specified and it is a Class E channel extrapolated to 500MHz (Class E = Class E).  
 The editor implemented the motion of 17 November 2004 to clarify that there is only "one" link segment by uniquely identifying the minimum requirements (i.e., worst case channel) as the 10GBASE-T link segment characteristics.  
 PSANEXT and insertion loss on pages 315-317.  
 Concerning your comment that the current draft still references multiple cable categories for PSANEXT and insertion loss on pages 315-317. The link segment specification is not dependent on the PSANEXT. The link segment is specified in 55.7.2 through 55.7.3.1.2.3.. However, the Class F and Class E (55m) objective implementations are based on the minimum channel IL requirement (Class E IL) and therefore not independent of the minimum channel IL (i.e., the link segment).

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Cl 55 SC 55.7.2 P309 L 39 # 20

Powell, Scott Broadcom

Comment Type T Comment Status R cabling

There is no indication about the backward compatibility of existing Class E and Class F cables to the additional requirements specified in 55.7.

*Suggested Remedy*

Add the following paragraph: "The extensions of existing transmission parameters to higher frequency and the specification of new transmission parameters were selected to permit 10Gbps operation. While the intent is to represent expected Class E and F performance, not all currently installed cabling systems will necessarily comply with these additional requirements."

Response Response Status C

REJECT.

Compatibility is ensured by the specifications of 802.3an and the PICS.

Cl 55 SC 55.7.3.2 P313-317 L # 5

Alan Flatman LAN Technologies

Comment Type TR Comment Status D cabling

The proposed specification of PS ANEXT is unnecessarily complex and should not involve the duplication of standardised cabling parameters, specifically insertion loss. 802.3an should define the requirements for a single, worst-case channel (as agreed at the November 2004 802.3an meeting) and then simply state how this may be met by different media.

*Suggested Remedy*

Refer to supporting presentation for details.  
Replace the existing formula and text for PSANEXT (page 314 lines 12-21) with the following:

$$\text{PSANEXT} > ((28.6 + \text{IL}(250))/1.04) - 10\log_{10}(f/100) \text{ dB} \quad 1 < f < 100 \text{ MHz}$$

$$> ((28.6 + \text{IL}(250))/1.04) - 15\log_{10}(f/100) \text{ dB} \quad 100 < f < 500 \text{ MHz}$$

where IL(250) is the cabling channel insertion loss at 250 MHz

The above equations accommodate a minimum insertion loss to alien crosstalk ratio and allow PSANEXT requirements to be scaled with insertion loss. Insertion loss reduction can be achieved with shorter link segments and/or the use of larger cable conductors.

Note from Chair: See comment\_1\_0105.pdf for the complete information.

Response Response Status W

PROPOSED ACCEPT IN PRINCIPLE.

Change Table 1 in 55.7.3.2.2 to add the appropriate references below table 1 when available and applicable.

Yes: 2  
No: 11  
Abstaining: 17

Proposed accept in principle as per description above fails.

Proposal to accept the suggested remedy as written:

Mover: Shimon Muller  
Seconder: Wael Diab

Yes: 11  
No: 5  
Abstaining: 15

Motion fails



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Cl 55 SC 55.7.3.2 (and subsectio P313 L28 # 45  
 Zimmerman, George Solarflare Communicat

Comment Type T Comment Status D cabling

there is no channel between the link segments, and hence the transfer function for ANEXT should not be part of the channel specification. What matters here to define the channel is a specification of the ANEXT NOISE ENVIRONMENT, not the transfer function.

Suggested Remedy

Replace transfer functions with allowable noise PSDs, these generated by using a PAM PSD under the mask at the nominal transmit level through the agreed transfer functions, and not to be exceeded when measured with a relatively coarse (e.g., 20 MHz) resolution bandwidth, or with an equivalent AWGN source, as described in contribution for testing in ANEXT.

Response Response Status Z

WITHDRAWN.

The subclause 55.7.3.1 alien crosstalk specifications are developed to limit the noise coupling between the 10GBASE-T link segments to ensure reliable operation (i.e., the objective BER).

The development of noise PSDs utilizing the alien crosstalk transfer functions and an allowable transmit PSD would be a useful step in characterizing the alien crosstalk transfer function specific to the 10GBASE-T operation with the possibility of simplification of conformance testing and field validation.

Cl 55 SC 55.7.3.2.3 P316 L41 # 74  
 Tellado, Jose Teranetics

Comment Type T Comment Status D cabling

Missing MDAFEXT

Suggested Remedy

include formulas

$$PSAELFEXT = X - 20 \cdot \log_{10}(f/100)$$

$$PSAFEXT(len) = PSAELFEXT - 10 \cdot \log_{10}(len/10) + IL$$

where  $X \geq 33$  for cat6  
 and  $X \geq 41$  for cat6a

Response Response Status Z

WITHDRAWN.

Cl 55 SC 55.7.3.2.3, 55.7.3.2.3.1 P316 L41-47 # 94  
 Chris DiMinico MC Communications

Comment Type TR Comment Status A cabling

For the purpose of completing the alien crosstalk specifications of 55.7.3.2.3 Multiple Disturber Alien Far-End Crosstalk (MDAFEXT) loss and 55.7.3.2.3.1 Multiple -Disturber Power Sum Alien Far-End Crosstalk (PS AFEXT) loss currently identified for further study insert three options for consideration in determining the PSAELFEXT for a 10GBASE-T link segment consisting of a 100 meter Class F channel and a 100 meter Augmented Category 6 channel. The basis of the options are to enable tradeoffs between PSANEXT and PSAELFEXT prior to a final determination of a single option. In addition, insert PSAELFEXT specification for Class E channel and PSAELFEXT specification for a category 6 channel of 55 meters.

Suggested Remedy

Editor please insert appropriate text at ( 55.7.3. Coupling parameters, page 317, line 45) consistent with the PSANEXT text to address the PSAELFEXT specifications for a 10GBASE-T link segment.

Where the specifications are as follows:

- For a 100 meter Class F channel and 100 meter Augmented Category 6 channel

$$PSAELFEXT(f) \leq X - 20 \cdot \log_{10}(f/100)$$

Where f=frequency MHz  
 $X = PSAELFEXT \text{ constant}$

PSAELFEXT options prior to a final determination of a single option.

- PSAELFEXT constant = 38 dB  
 PSANEXT constant = 62 dB
- PSAELFEXT constant = 39 dB  
 PSANEXT constant = 61 dB
- PSAELFEXT constant = 40 dB  
 PSANEXT constant = 60 dB

- PSAELFEXT Class E channel and PSAELFEXT for a category 6 channel of 55 meters.

$$PSAELFEXT(f,L) \leq X - 20 \cdot \log_{10}(f/100) - 10 \cdot \log_{10}(L/100)$$

Where f=frequency MHz  
 L= meters  
 $X = PSAELFEXT \text{ constant}$   
 PS AELFEXT constant = 33 dB

Note: The PS AELFEXT constants are for certification of the channel. For simulating PHY performance to estimate system margin, the PS AELFEXT constants must be increased by 2.5 dB. This represents the difference between the limit line, which is used for channel

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certification, and the average value of PS AELFEXT.  
*Response*                      *Response Status* **C**  
 ACCEPT IN PRINCIPLE.

New suggested remedy as per presentation zimmerman\_2\_0105.pdf slides 16 and 17

On slide 16, 2nd column title, change text to:  
 "PSAELFEXT loss (dB) (@ 100 MHz, min)"

Motion to accept proposed response:

Yes: 28  
 No: 3  
 Abstain: 11

Motions passes.

<i>Cl</i> <b>55</b>	<i>SC</i> <b>All</b>	<i>P</i> <b>All</b>	<i>L</i> <b>All</b>	<b>#</b> <b>4</b>
Sailesh Rao		Phyten Technologies, I		
<i>Comment Type</i>	<b>TR</b>	<i>Comment Status</i>	<b>R</b>	<i>PCS</i>

It is not feasible to implement a robust receiver for 100m Cat-6E (Model 3) line length operation using the 128 Double Square line coding scheme documented in Draft 1.2, for two main reasons:  
 1. Even assuming all noise sources are perfectly Gaussian, the input-referred rms noise budget for the receiver is 650 microvolts, using an optimum MMSE implementation (ref. vareljian\_1\_1104.pdf). This is the noise budget that must be allocated to overcome  
 a) residual Echo  
 b) residual NEXT  
 c) residual FEXT  
 d) A/D quantization noise  
 e) sampling jitter noise  
 f) circuit thermal noise  
 g) finite precision implementation noise, etc.  
 This total noise budget is inadequate and it is, in fact, 7.0dB lower than just the thermal noise budget used in the 802.3ap task force models (altmann\_01\_1104.pdf, slide 5).  
 2. Three out of seven bits in the 128DSQ line code are not protected by the LDPC code. These unprotected bits are vulnerable to isolated (non-Gaussian) noise events on the order of a few millivolts (ref. rao\_1\_1104.pdf, slide 23).

*Suggested Remedy*

Several line code alternatives were presented in rao\_2\_1104.pdf to address the second point above. Of these alternatives, I prefer the PAM8-P approach since it maximizes the input referred rms noise budget for the receiver.

*Response*                                      *Response Status* **U**  
 REJECT.

Vote taken to accept the response to reject the comment:

Yes: 24  
 No: 4  
 Abstain: 23