

Converging on Framing and Training

August 22, 2018

**Mike Tu
tum@broadcom.com**

Current 802.3ch Framing/Training Status

- Motions passed
 - PAM4
 - $R_b=5.625\text{Gbaud}$ for 10G, $\frac{1}{2} R_b$ for 5G, and $\frac{1}{4} R_b$ for 2.5G
 - RS FEC with $m=10$ bits/symbol, with interleaver if needed
 - Synchronization states (forced mode, part of PMA)
 - Supports OAM
 - Supports optional autoneg
- Decisions Needed
 - PAM4 bit to symbol mapping
 - PMA training side stream scramblers
 - PCS data mode scramblers
 - PCS block encoding 64B/65B, 128B/129B, or others
 - RS FEC parameters
 - PCS Tx bit ordering
 - PHY control – start-up sequence, training frame format, InfoField messages

“Easy” to Resolve

- Training side-stream scrambler polynomials from 97.3.4 (same as Clause 55)
 - $g_M(x) = 1 + x^{13} + x^{33}$
 - $g_S(x) = 1 + x^{20} + x^{33}$
- PCS scramblers from 55.3.2.2.16
 - MS $G_M(x) = 1 + x^{39} + x^{58}$
 - SL $G_S(x) = 1 + x^{19} + x^{58}$
 - We propose additive scrambling as in 802.3bp, instead of multiplicative (self-synchronizing) scrambling, to avoid error spreading
- PAM4 mapping from Clause 94.2.2.5 and 94.2.2.7
 - $\{0, 0\}$ maps to 0, $\{0, 1\}$ maps to 1, $\{1, 1\}$ maps to 2, and $\{1, 0\}$ maps to 3.
 - 0 maps to -1 , 1 maps to $-1/3$, 2 maps to $+1/3$, and 3 maps to $+1$.

Decisions Pending on PCS Block and FEC

- PCS block encoding 64B/65B, 128B/129B, or others
- RS FEC parameters
 - Already agreed $m=10$ bits/symbol
 - Need to define N, K values
- PCS Tx bit ordering
 - Number of PCS blocks per RS FEC frame
 - Number of OAM symbols
 - PCS encoding and RS FEC bit ordering
- PHY control – start-up sequence, training frame format, InfoField messages
 - Training frame boundary should align with RS FEC frame boundary
 - Shall it be based upon 1000BASE-T1 InfoField and state transition mechanism?

PCS Block Size Straw Poll from San Diego

Straw Poll #9

- Chicago Rules
- Which encoder do you prefer
 - A) 512/513
 - B) 256/257
 - C) 128/129
 - D) 64/65
- A: 6 B: 3 C: 15 D: 19

Version 2.6

IEEE P802.3ch Task Force – July 2018, San Diego, CA USA

Page 23

Straw Poll #10

- Pick One
- Which encoder do you prefer
 - C) 128/129
 - D) 64/65
- C: 11 D: 15

Version 2.6

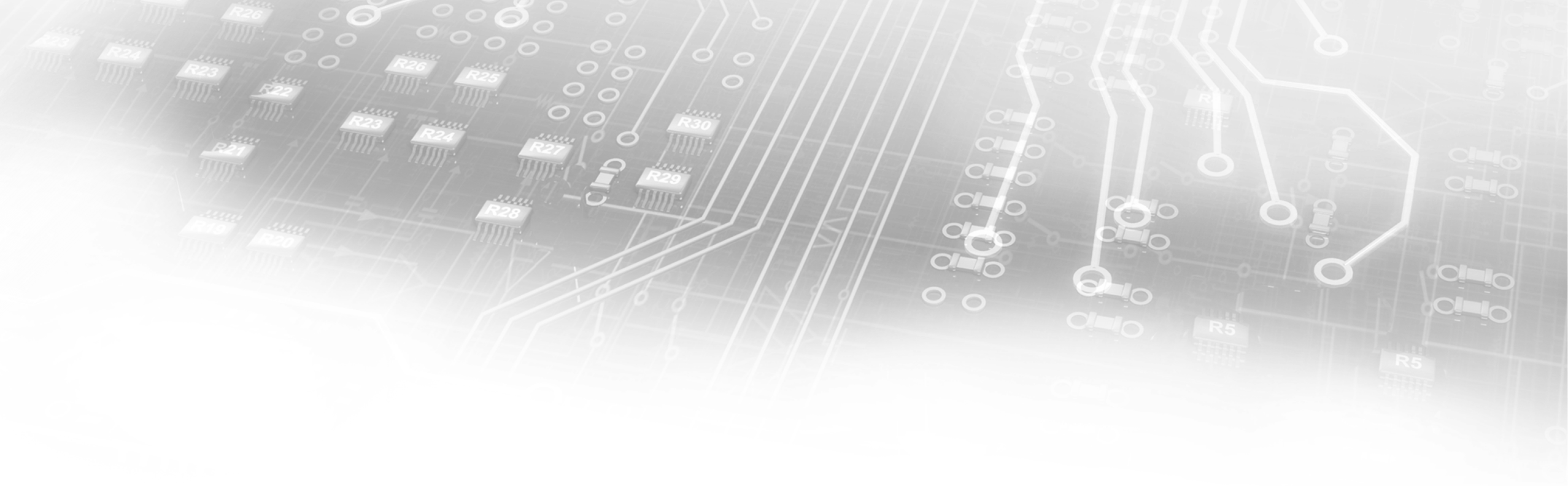
IEEE P802.3ch Task Force – July 2018, San Diego, CA USA

Page 24

- Propose to adopt 64B/65B
 - Both with low overhead and good FEC choices are available
 - Leverage Clause 55
 - Proven to work with XGMII in 10G/5G/2.5GBASE-T PHY's

FEC Proposals with $m=10$ bits/symbol

- $N=576$, $K=514$
 - http://www.ieee802.org/3/ch/public/jul18/farjarad_3ch_01d_0718.pdf
- $N=692$, $K=618$
 - http://www.ieee802.org/3/ch/public/jul18/Pandey_3ch_01a_0718.pdf
- $N=720$, $K=651$
 - http://www.ieee802.org/3/ch/public/jul18/tu_3ch_01b_0718.pdf
- Any other proposals?



THANK YOU

