

100GBASE-KR1/CR1 FEC Thoughts

IEEE P802.3ck

Hawaii November 2019

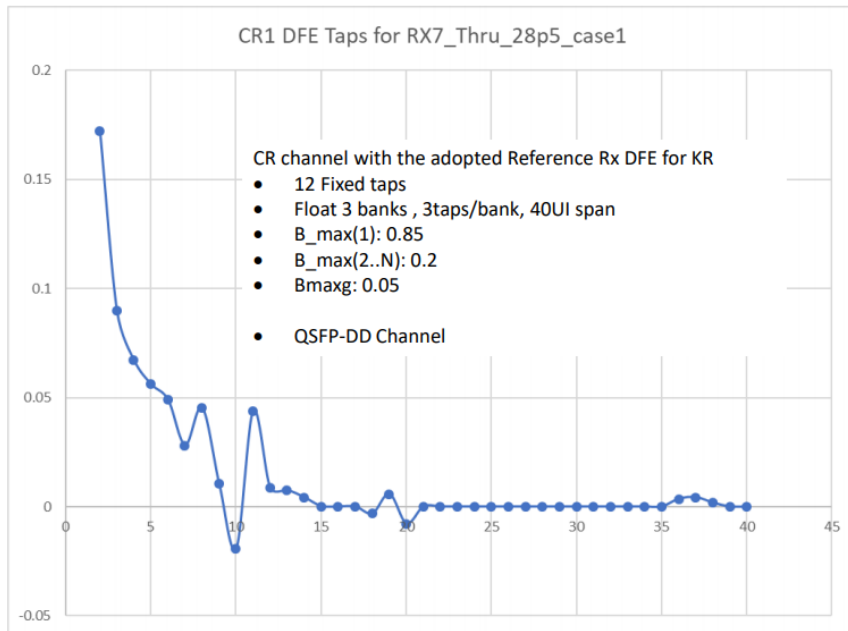
Mark Gustlin – Cisco

Introduction/Review

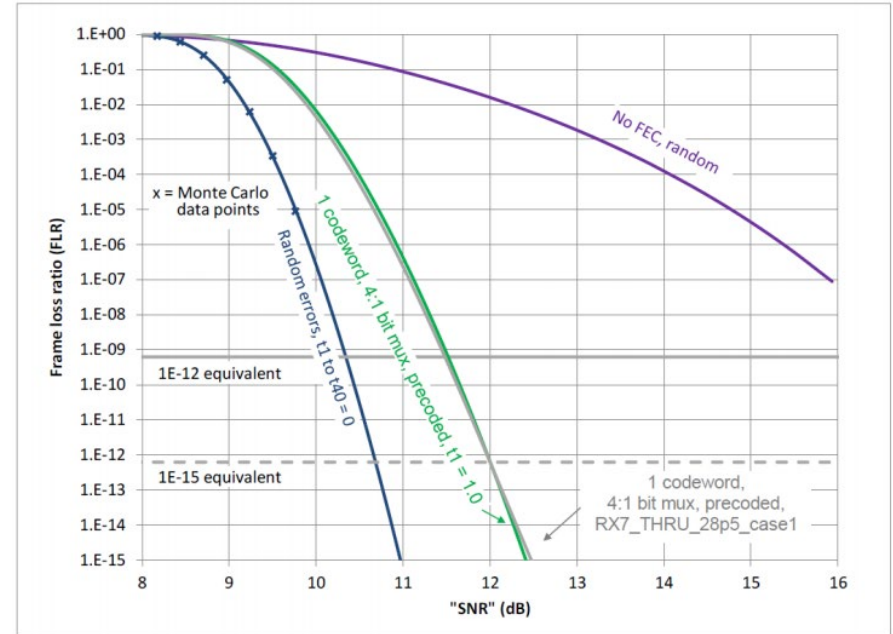
- We have several ways forward for the FEC strategy for 100GBASE-CR1/KR1
 1. Clause 91 FEC
 2. Interleaved FEC (nicholl_3ck_01a_0519)
 3. Dual FEC strategy (gustlin_3ck_01_0719)
- September 2019 straw poll #3 straw poll showed:
 - I would support the adoption of Clause 91 as the FEC for 100GBASE-CR1 and 100GBASE-KR1 Results: Y: 26, N: 18, A: 21
 - Only 59% support for those that voted
- September 2019 Straw Poll #4:
 - For the 100GBASE-KR1/CR1 PHYs, I would support the following FEC mechanism:
 - A. Single FEC, non Interleaved (Clause 91)
 - B. Single FEC, interleaved (nicholl_3ck_01b_0519)
 - C. Dual FEC, gustlin_3ck_01_0719
 - {Chicago Rules}
 - Results: A: 32, B: 3, C: 39
 - Room Count: 79
 - Strongest support for dual FEC

DFE Tap Data for a CR1 Channel

- In `gustlin_3ck_adhoc_100219` we showed that, at least for one channel, non-interleaved FEC is sufficient
 - When only considering DFE induced errors

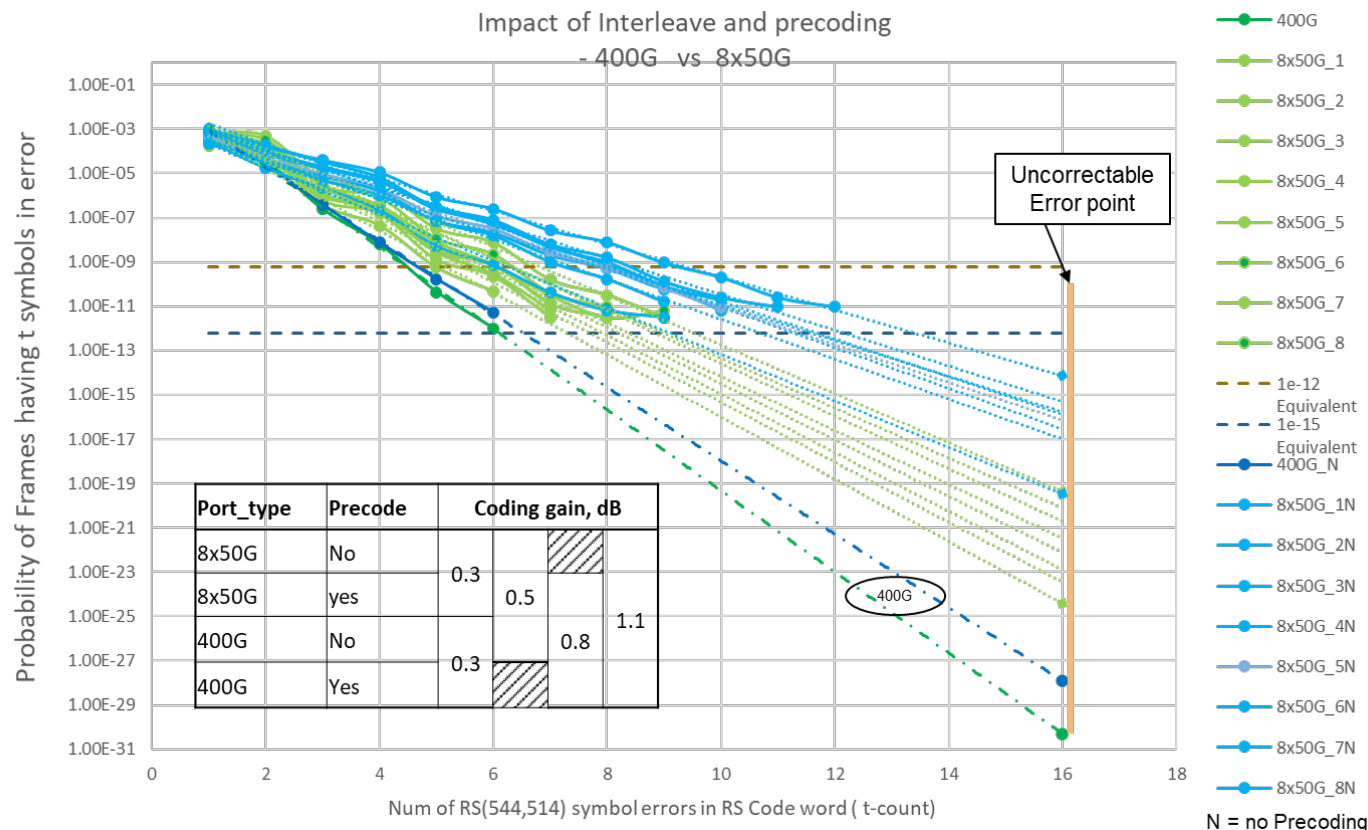


Channel 3a from `lim_3ck_01_0919`, Case 1 (12mm package)



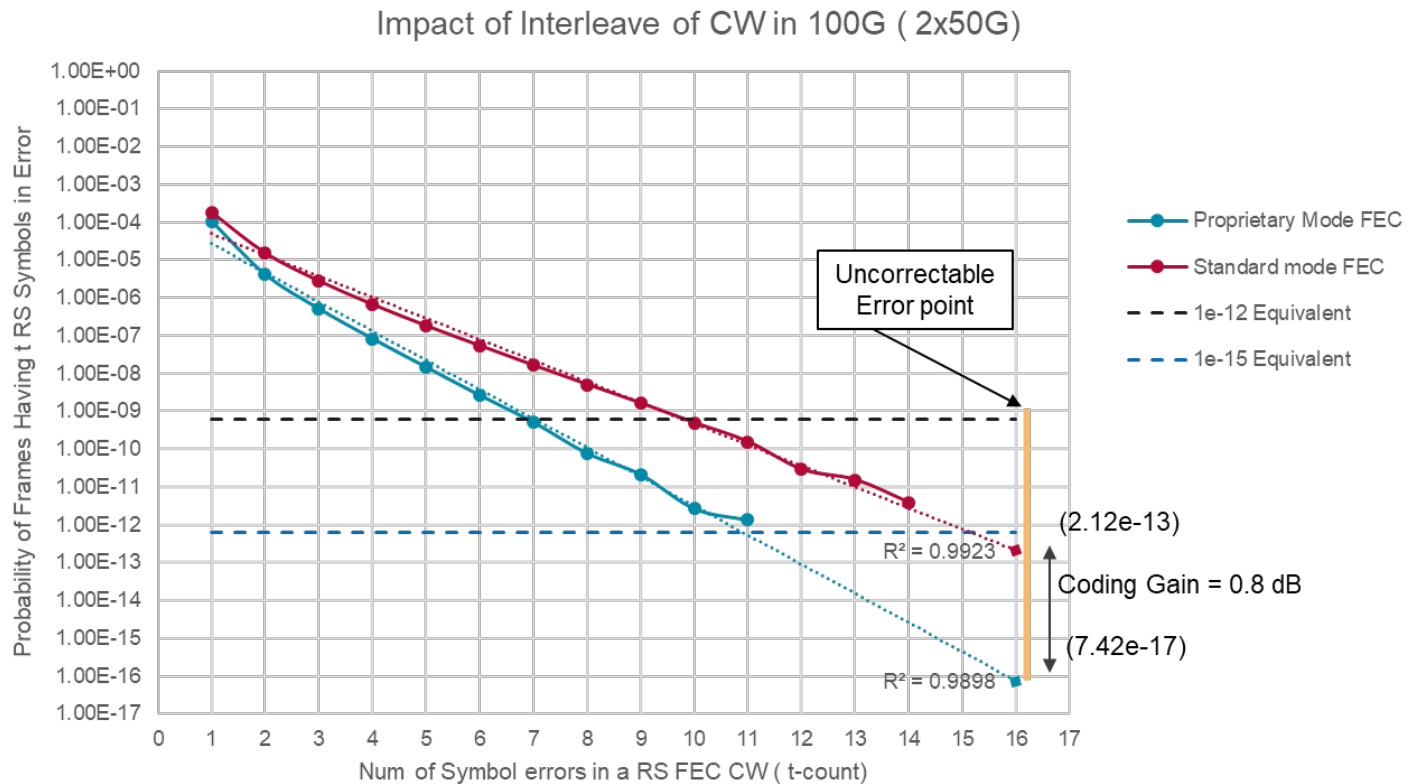
Improvements in Performance with Interleaving

- In gustlin_3ck_03_1119 we showed that, at least for one channel, interleaved FEC provides a more robust solution when compared to non-interleaved FEC
 - 100G/lane will be more difficult and have 4:1 bit muxing
 - Data presented is for nominal conditions, no PVT



Improvements in Performance with Interleaving

- In `gustlin_3ck_02_1119` we showed that, at least for this channel, interleaved FEC provides a more robust solution when compared to non-interleaved FEC
 - Same conditions, same # of lanes
 - Data presented is for nominal conditions, no PVT, no precoding, but very challenging channel



From gustlin_3ck_01_0719.pdf

100GBASE-CR1/KR1 FEC Support

- One option is to support both RS 544 FEC mechanisms:
 - Non-Interleaved RS FEC using 4:1 bit muxing (Clause 91)
 - Interleaved RS FEC based on nicholl_3ck_01b_0519
- Operation would be as follows:
 - All implementations implement both FECs for TX and RX
 - AN is used to negotiate which FEC is used for a given link
 - The chosen FEC is used in both directions on that link
 - ~~Default FEC is TBD~~ Change to: Default FEC and priority resolution is TBD
- Best of both worlds
 - Lowest latency with non-interleaved FEC for those links that don't have burst error concerns
 - More robust interleaved FEC for those links that want it
 - Minimal impact to designs

Summary

- A dual FEC strategy had the most support in the last meeting
 - September 2019 Straw Poll #4
- At least for one channel, non-interleaved FEC is sufficient for 100GBASE-CR1
 - When only considering DFE induced burst errors
- We now have two real lab data points that show some improvement with Interleaving at 50G/lane
 - This performance improvement could be more critical at 100G/lane
- I believe we need to move forward and decide on the FEC strategy for CR1/KR1 at this meeting to support D1.0 creation
 - A dual FEC strategy seems to be the lowest risk solution

Thanks!