FEC Proposal for NGEPON - update

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24 May 2017. (3 updated slide pages from laubach_3ca_1_0517.pdf)

FEC Codes Studied

From laubach_3ca_1_0517.pdf page 14. Added Normalized Die Size column.

	Length	Rate	Parity	User	Encoded	NECG[1] (dB)		Normalized Die Size [2]	Notes
						AWGN	Gilbert Burst		
Folded BCH	2kB	0.83	3272	16576	19848	2.25	1.48	n/a	bits
	4kB	0.83	6064	30784	36848	2.6	1.78	n/a	bits
LDPC	2kB	0.848	2816	15677	18493	2.46	1.8	7.7	bits (18493,15677)
	2kB	0.833	3200	16000	19200	2.82	2.12	9.1	bits (19200,16000)
RS	(255,223)	0.8745	256	1784	2040	0	0	1	S=8, T=16 (10G-EPON)
	(1023,847)	0.828	1760	8470	10230	1.34	1.35	6.9	S=10, T=88

[1] Electrical gain over RS(255,223)

[2] Relative to RS(255,223) size

Simulation Results and Summary

From laubach_3ca_1_0517.pdf page 15. Clarified “LDPC optimization” in second bullet.

- 1+D pre-coder and structured interleaver are beneficial for correcting bursty errors
- LDPC optimization ~~involves~~ used for degree distribution and deep trapping sets removal ~~(refer to appendix)~~
  - Parity code matrix is the output of the optimization. Purpose: reduce error floor.
- Hard input min-sum soft decoding, iterative decoding for the best NECG
- Folded BCH, while good for flash memory and AWGN, did not perform as well with Gilbert noise model (and also pre-coding)

- LDPC(18493,15677) 0.848 rate, using min-sum decoding and Omega 256 structured interleaver sufficiently provides a NECG that meets error performance objective using 10^{-2} raw input BER, Gilbert burst error model, and pre-coding.
  - On implementation complexity: ~15% less mm^2 than LPDC 0.83 rate code

Updated (and submitted) Proposed Motion

- Adopt LDPC as the FEC method.


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