

Latency & complexity for various 25/50/100G EPON FEC code proposals

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Comparison of recent FEC proposals

FEC code	OH (%)	FEC Gain (dBe) @ BERout = 1e-12	BERin for BERout = 1e-12	Optical Gain Δ rel to RS(255,23)	Length (bits/ usec)	Burst errors capable (bits)	Huawei		Broadcom		Nokia		
							Complexity (rel. to RS(255,223))	Latency (us)	Complexity (rel. to RS(255,223))	Latency (us)	Complexity (rel. to RS(255,223))	Latency (us)	
RS(255,223) [10G EPON, XGS-PON]	12.5	7.1	1.1e-3	0	2040/ 0.08	121	1	1.2	1	?	1	0.3	
RS(1023,847)	17	8.5	4.2e-3	1-1.3 [*] 1.4 [#]	10230 /0.40	871	7	4.5	6.9	1.1M	E+D: 0.77	Note 1	Note 1
RS(2047,1739)	15	8.5	4.1e-3	1-1.3 [*] 1.8 [#]	22517 /0.90	1684	15	7.6	-	3.3M	E+D: 1.54	Note 1	Note 1
LDPC(16000,13184) [Huawei]	18	?	1.0e-2	1.7-2.2	16000 /0.64	208	~30	6	-	-	-	-	-
LDPC(18493,15677) [Broadcom]	15	?	1e-2	2.5 [*] 1.8 [#]	18493 /0.74	?	-	-	7.7	E: <0.3M D: 1.5M	E: 2.77 D: 2.92	64	14
LDPC(19200,16000) [Broadcom]	17	9.6	1e-2	2.8*/2.1 [#]	19200 /0.77	?	-	-	9.1	-	?	-	-
LDPC(32768,16000) [Huawei]	16.7	?	1e-2	1.7-2.2	32768 /1.31	335	~33	10	-	-	-	-	-

[zhao_3ca_1_0517](#)

[laubach_3ca_4_0517](#)

Nokia FPGA estimates

[laubach_3ca_1a_0917](#)

- Optical FEC gain, latency, complexity, and burst error capability are all important

Note 1 - estimation in progress

* - AWGN noise model

- Gilbert Elliot noise model

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Discussion

- A number of FEC codes have been analyzed by different contributors over the last several months
- Areas still needing more work are:
 - noise model used for analysis
 - error distribution (i.e. - start of burst errors) and how it affects error correction at high BER levels
 - loud/soft OLT RX power levels
 - Minimum US burst size vs. FEC block size
- Extremely low evolving mobile x-haul latency requirements are an important use case for NGEPON & detailed latency analysis through the MAC and the PHY will be helpful in our FEC choice discussions
- Nokia is working on additional latency/complexity estimation for 11b and 12b RS codes

References

- [1] D. Vanveen, et. al, FEC code for 25/50/100G EPON, [vanveen_3ca_1b_0317](#), March, 2017 802.3ca Vancouver meeting
- [2] M. Laubach, et. al., Broadcom, FEC Proposal for NGEPON, [laubach_3ca_4_0517](#), May 2017 802.3ca New Orleans meeting
- [3] D. Zhao, Huawei, LDPC for 100G EPON, [zhao_3ca_1_0517](#), May, 2017 802.3ca New Orleans meeting
- [4] R. Bonk, et. al., Latency challenges for 25/50/100G EPON, [powell_3ca_1a_0917](#), September, 2017 Charlotte 802.3ca meeting
- [5] M. Laubach, et. al., FEC Proposal Status, [laubach_3ca_1a_0917](#), September 2017 802.3ca Charlotte meeting

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