

LDPC FEC gain, downstream

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LDPC FEC for downstream

LDPC(18493,15677) adopted for downstream, per Motion #6,
minutes_unapproved_3ca_1117.pdf

Motion #6			
Adopt for the LDPC FEC for the downstream channels:			
• LDPC(18493,15677) 0.848 rate parity code matrix presented in laubach_3ca_1a_1117.pdf page 3, and			
• the Omega256 structured interleaver presented in laubach_3ca_1_0517.pdf pages 10 and 11 with seed code as in laubach_3ca_2_0517.txt.			
Moved:	Mark Laubach	Second:	Duane Remein
For: 23	Against: 2	Abstain: 4	
Technical (≥ 75%) Motion Passed			

LDPC downstream FEC improvement, without and with precoding

laubach_3ca_1b_0118

	Length	Rate	Non-Zero Blocks	NECG ¹ (dB) (optical gain)	
				AWGN	Gilbert Burst
LDPC	(18493,15677) [13x75x256]	0.848	290	2.6 (1.82-2.34)	1.76 ³ (1.23 - 1.58) 2.03 ^{4,7} (1.41 - 1.82)
			286	2.63 (1.84 - 2.37)	1.87 ³ (1.31 - 1.68)
					2.12 ⁴ (1.48 - 1.91)
					1.85 ⁵ (1.3 - 1.67)
		2.11 ⁶ (1.48 - 1.9)			

IL
no IL

- Updated FEC gain simulation values from laubach_3ca_01b_0118, p.8
- (optical FEC gain) based on range of APD curves w/varying Shot/Thermal noise (dBo/dBe: 0.7-0.9)
- Minimum optical gain - 1.48 dB relative to RS(255,223) under worst case conditions (G-E noise, precoding), with or w/o Interleaver

Previous parity matrix

New parity matrix

¹ Electrical gain over RS(255,223) of 7.1 dB. Optical gain is 0.7 to 0.9 * NECG.

² Capped at 15 iterations

³ With interleaver, precoder off

⁴ With interleaver, precoder on

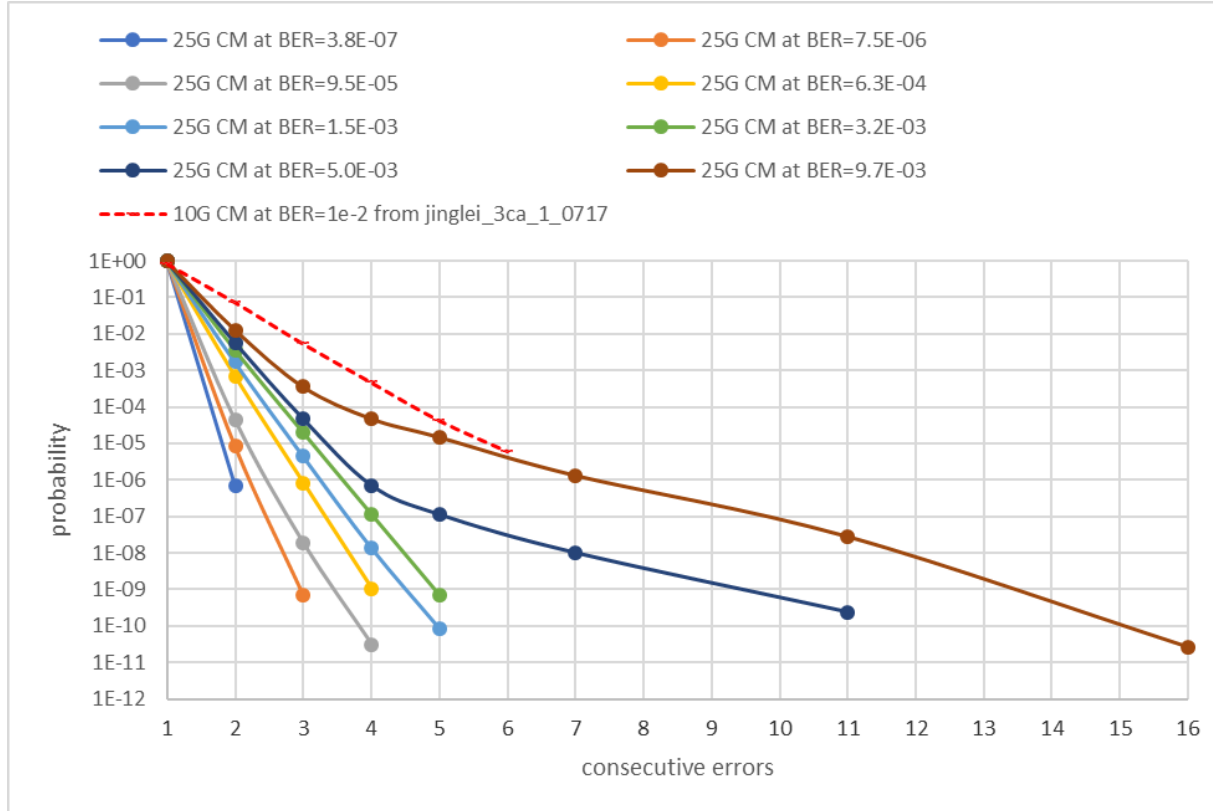
⁵ No interleaver, precoder off

⁶ No interleaver, precoder on

⁷ Omitted from laubach_3ca_1a_1117

Backup: Burst errors in continuous mode transmission-- experimental

Error statistics for 10G CM and 25G CM transmission



- In houtsma_3ca_2_1117 we showed the occurrence of bursty errors for 25G CM transmission at high BER
- Earlier, in jinglei_3ca_1_0717 it was found that errors in a 10G CM transmission experiment at BER=1e-2 are also bursty (>16% of errors are burst errors)

Choosing a FEC improvement for 25G ONU receiver sensitivity

- The impact is on **ONUs**, therefore due to all the uncertainties it is best to be conservative
 - choose the FEC gain corresponding to the Gilbert-Eliot burst model. Burst errors can be caused by
 - ISI
 - CDRs operating at high $1e-2$ BER
 - choose the value at the low end of the dBo range
- If using the Gilbert-Eliot burst model, should take advantage of the precoding improvement
- **Therefore we propose to select 1.48 dBo => ~1.5 dBo as the downstream FEC gain compared to 10G EPON RS(255,223).**
- This value will be used to adjust the ONU receiver sensitivity specification based on $1e-3$ input BER

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