
Considerations and proposals on FEC coding

Fumio Daido

Introduction

◆ Background

- In power budget adhoc, the FEC codes more than RS(255,239) coding gain are required to relax optical transmit power
- Needed FEC coding gain and the expected throughput efficiency may be different between U/S and D/S
- At Orland meeting, it was approved that the FEC codeword structures on U/S and D/S are identical

Comparison of some FEC codes (FEC codeword length of about 2000bit)

FEC Codes	Electrical Coding gain at BER:10 ⁻¹² (dB)	FEC ability to BER:10 ⁻¹²	Estimated Encoder Circuit size	Estimated Decoder Circuit size
RS(255,239) R=0.93	5.9	2x10 ⁻⁴	1	10
RS(255,223) R=0.87	7.2	1x10 ⁻³	2	20
RS(255,151) R=0.59	9.6	1x10 ⁻²	5	50
LDPC(1908, 1697) R=0.89 ●LDPC codeword length is bit order	9.1	8x10 ⁻³	10	100

- Decoder circuit size is approximately 10 times as large as encoder size
- Soft decision is needed for LDPC decoder
- It is assumed that the encoder size of RS(255,239) for 10Gbps is about 20Kgates

U/S and D/S considerations

◆ U/S considerations

- FEC codeword length should be short for upstream burst
- In general, power budget is critical compared with D/S budget

◆ D/S considerations

- High efficiency of throughput is preferable for video distribution, so overhead of FEC should be as small as possible
- FEC decoder circuit of ONU should be simple to reduce ONU power consumption and complexity

PMA loopback considerations

◆ PMA loopback

- For achieving PMA loopback, the following items must be identical between Tx and Rx in loopback mode
 - ◆ FEC Frame structure
 - ◆ FEC frame synchronization
 - ◆ PMA serial data speed

◆ PMA loopback issues

- PCS layer of OLT must have both OLT and ONU FEC frame synchronization mechanism
- In case of asymmetric 10GE-PON (D/S 10G, U/S 1G), Tx and Rx speed are different

Proposals

- ◆ Most appropriate FEC code should be applied for U/S and D/S respectively
- ◆ Different FEC code may be used for each stream (asymmetric FEC codes). This depends on power budget adhoc discussion.