

UPSTREAM FEC CODEWORD FILLING BASED ON DATA BURST SIZE



Rich Prodan

- **Long codeword:**
 - 16200 total bits
 - 14400 information bits including 40 CRC bits
 - 1800 parity bits
 - 88.9% code rate with 88.6% overall efficiency

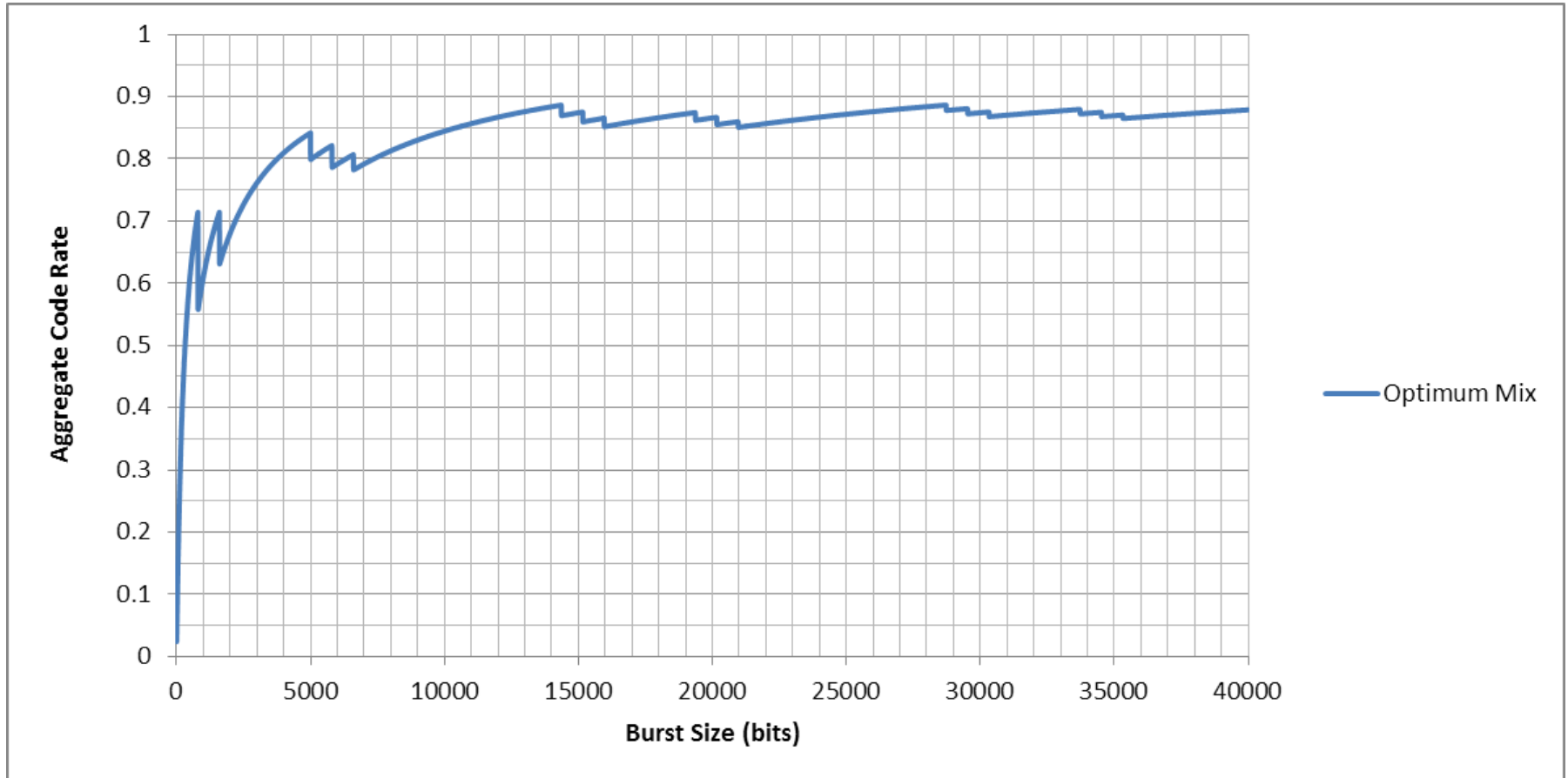
- **Medium codeword:**
 - 5940 total bits
 - 5040 information bits including 40 CRC bits
 - 900 parity bits
 - 84.8% code rate with 84.2% overall efficiency

- **Short codeword:**
 - 1120 total bits
 - 840 information bits including 40 CRC bits
 - 280 parity bits
 - 75% code rate with 71.4% overall efficiency

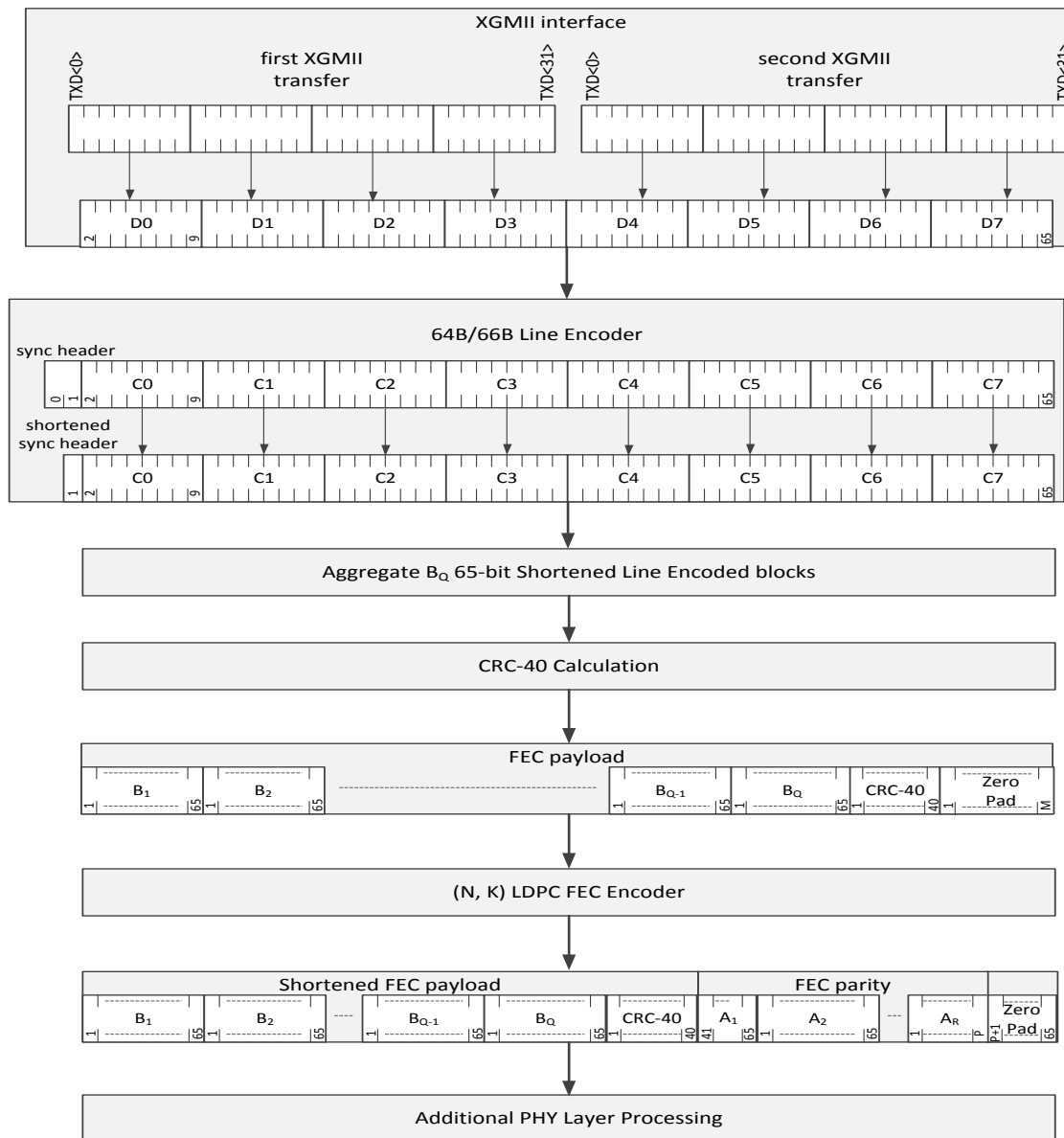
- **Choice of codeword sizes is based entirely on data burst size**
 - Unambiguous at both ends
- **Details of algorithm, including codeword sizes and thresholds for shortening, are embedded in spec**
- **Basic steps for conversion in either encode or decode side:**
 - If there are enough bits to create a full long codeword, do so. Keep doing this until there aren't enough bits left.
 - If there are now enough bits to create a shortened long codeword (subject to the thresholds above), do so, and end the burst.
 - Otherwise, if there are enough bits to create a full medium codeword, do so. Keep doing this until there aren't enough bits left.
 - If there are now enough bits left to create a shortened medium codeword (subject to the thresholds above), do so, and end the burst.
 - Otherwise, if there are enough bits to create a full short codeword, do so. Keep doing this until there aren't enough bits left.
 - Use whatever bits remain to create a shortened short codeword, and end the burst.

- Upon completion of filling the last shortened short (N,K) codeword, check if this codeword is at least half full of information bits. That is, check if the last codeword contains at least $K/2$ information bits.
- If not, then move $K/2$ information bits from the next-to-last codeword into the shortened short last codeword.
- This results in two last shortened codewords where each is at least half full.

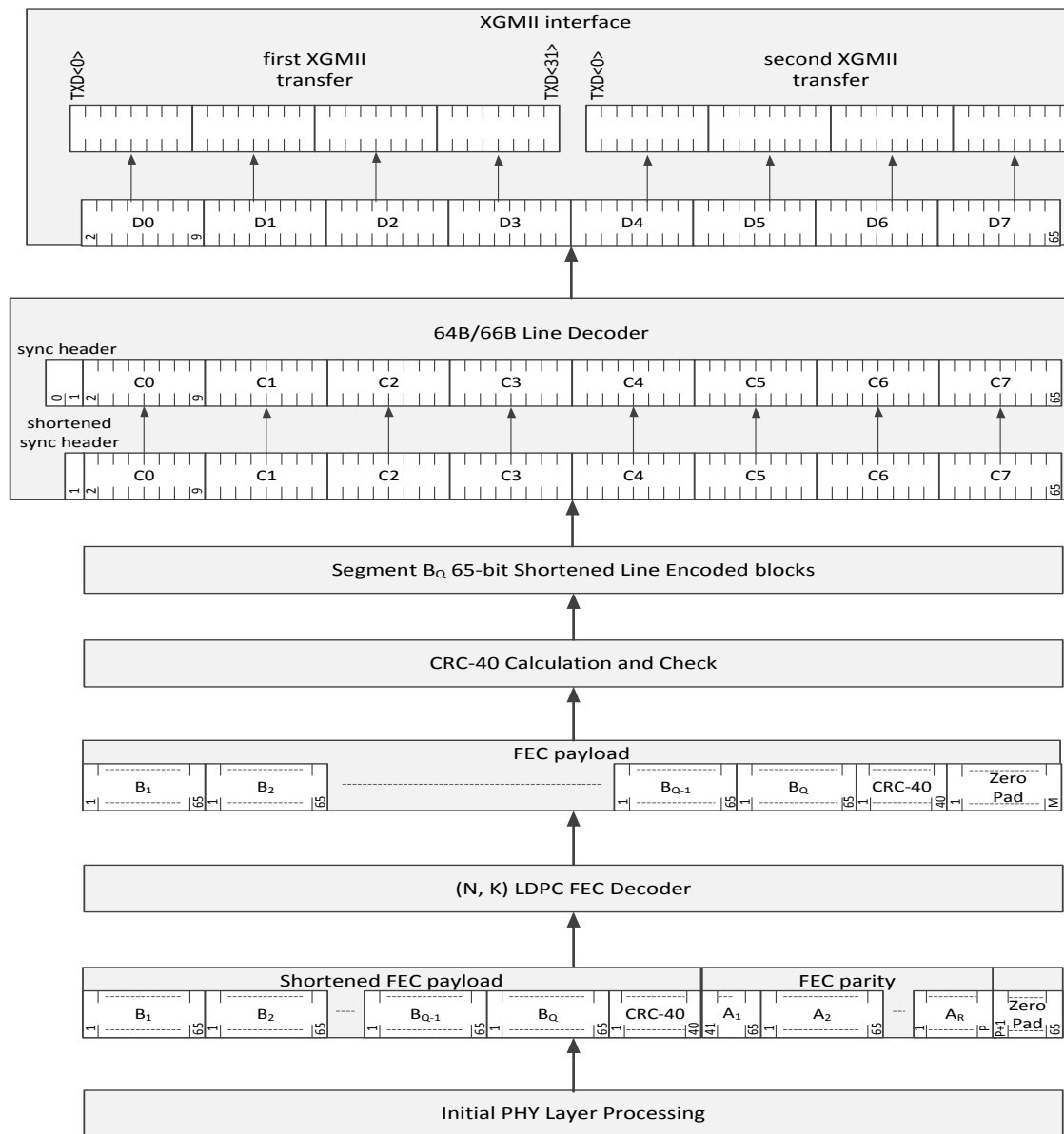
EFFICIENCY (CODE RATE) VS. BURST SIZE (INFORMATION BITS)



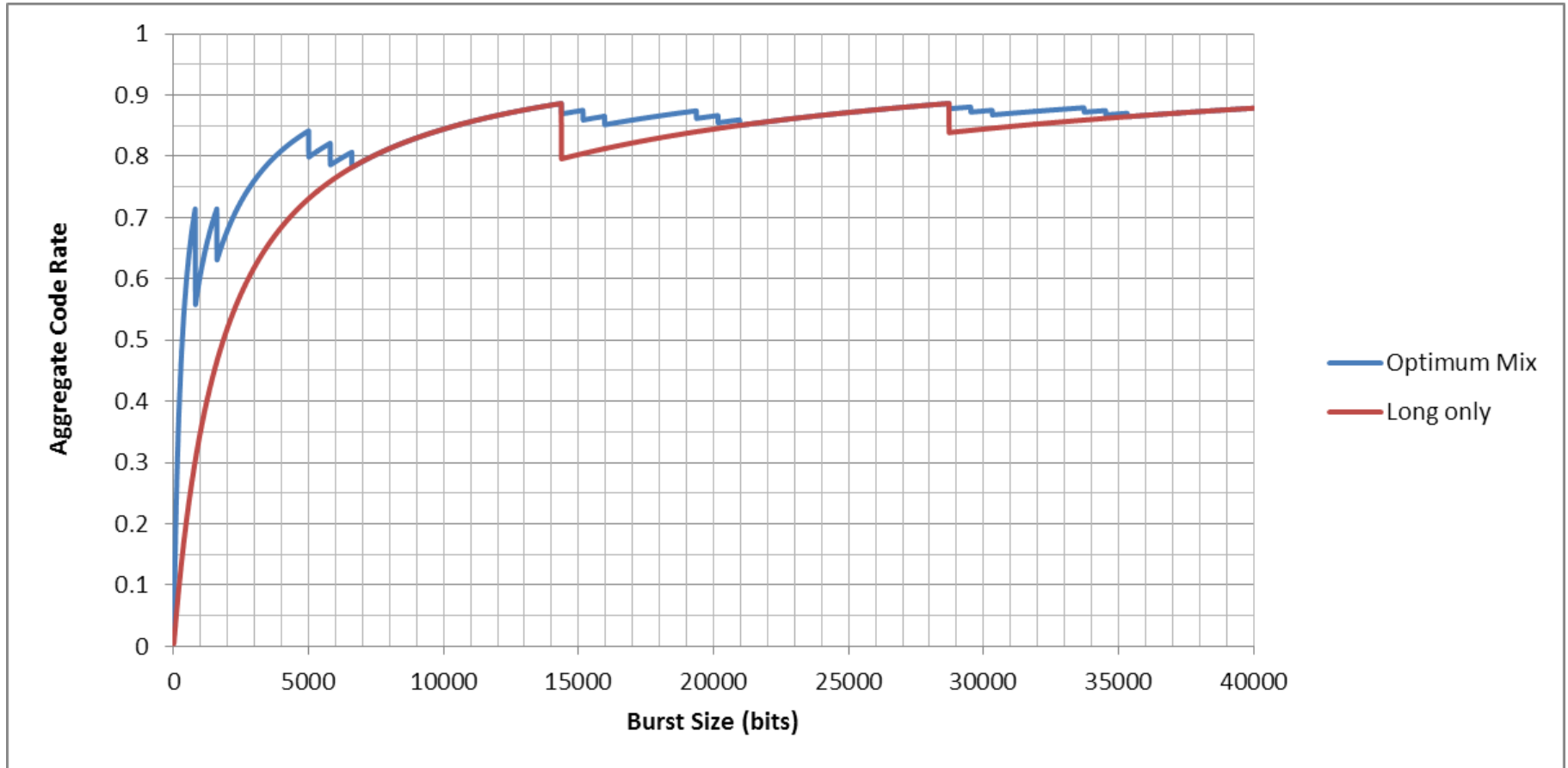
UPSTREAM FEC ENCODE PROCESS



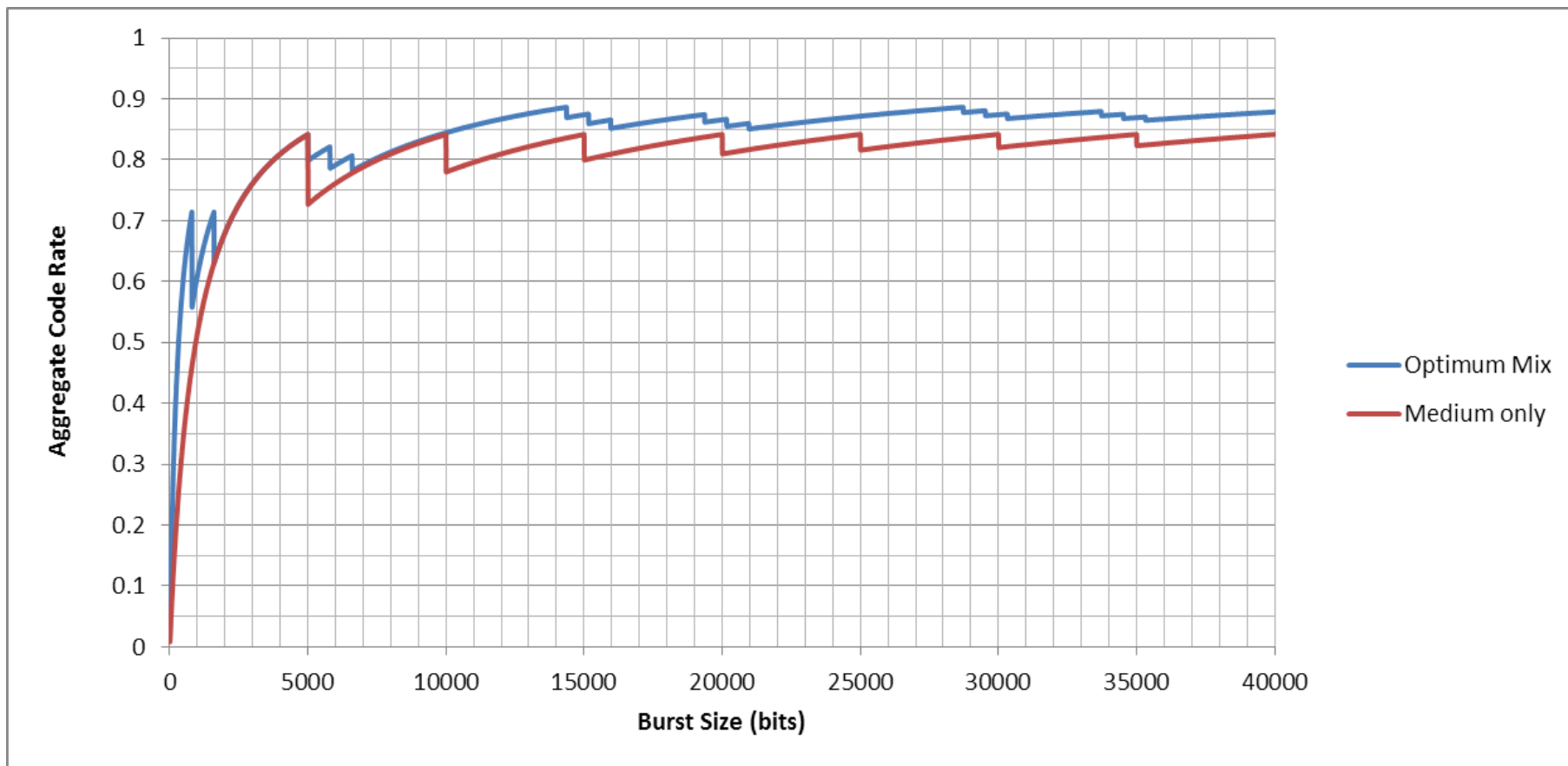
UPSTREAM FEC DECODE PROCESS



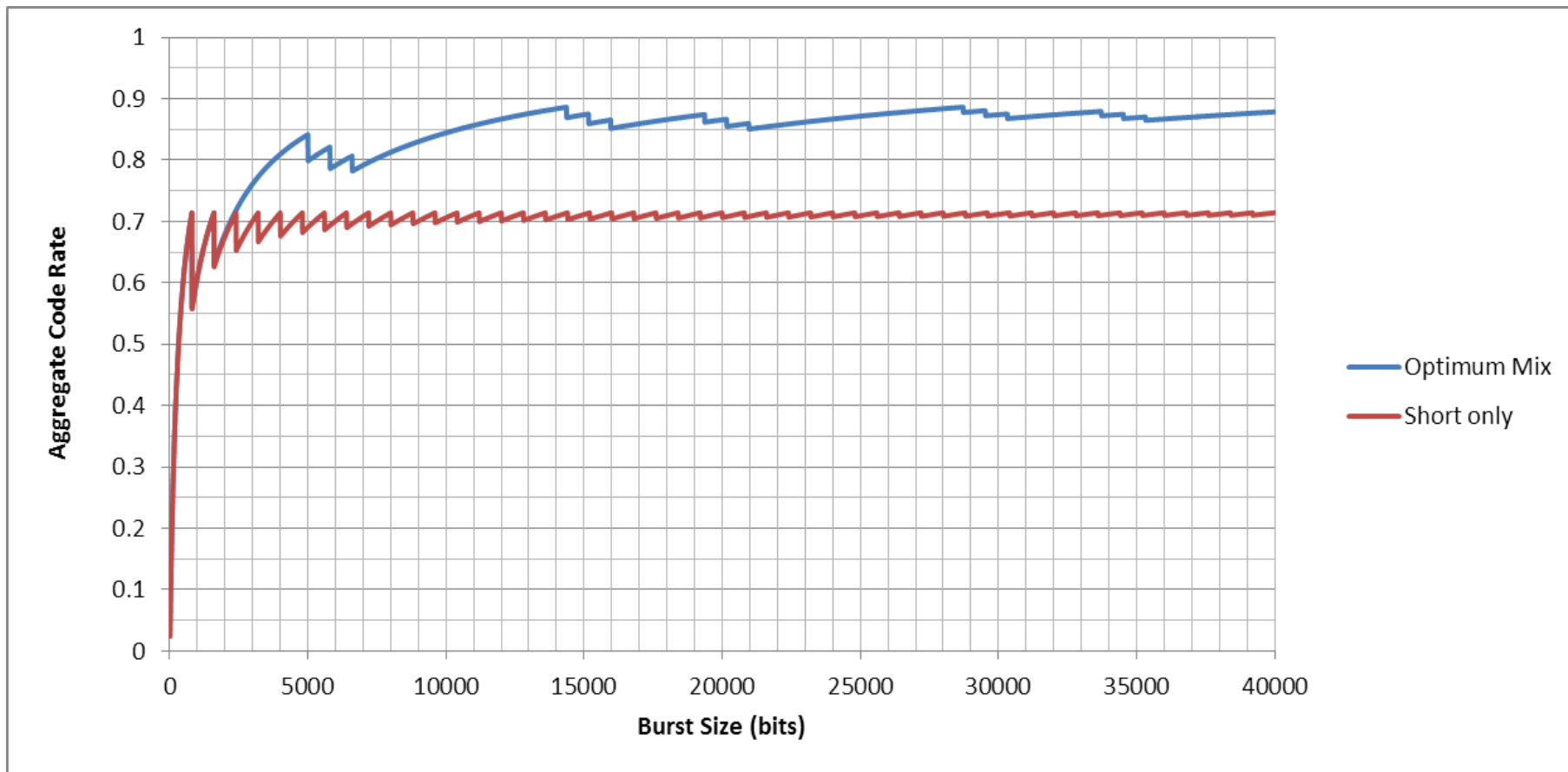
EFFICIENCY (CODE RATE) VS. BURST SIZE (INFORMATION BITS)



EFFICIENCY (CODE RATE) VS. BURST SIZE (INFORMATION BITS)



EFFICIENCY (CODE RATE) VS. BURST SIZE (INFORMATION BITS)



- **The method for selecting, combining, and shortening of multiple codeword sizes and rates that maximizes overall efficiency (aggregate code rate) is described**
- **A solution to mitigate the sparse last shortened codeword decoding problem is described which maintains the optimum efficiency**
- **Loss of efficiency for single size codewords has been shown**
- **A reversible upstream FEC encoding and decoding procedure is proposed**

Move to:

Adopt the upstream codeword filling algorithm from prodan_3bn_01_0114.pdf for EPoC.

Moved: Richard Prodan

Second:

Thank You