# Performance of Simple Burst Markers

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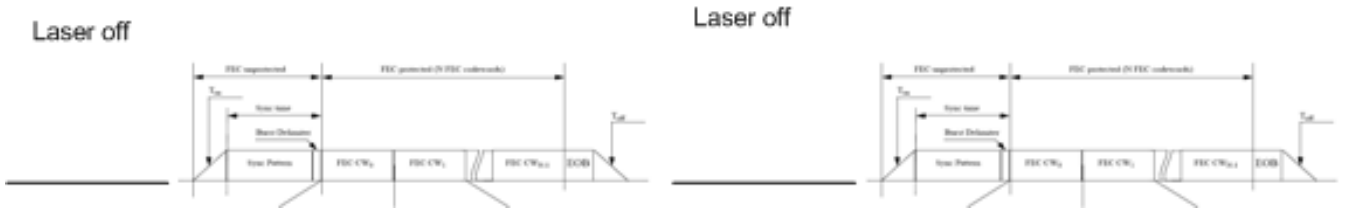
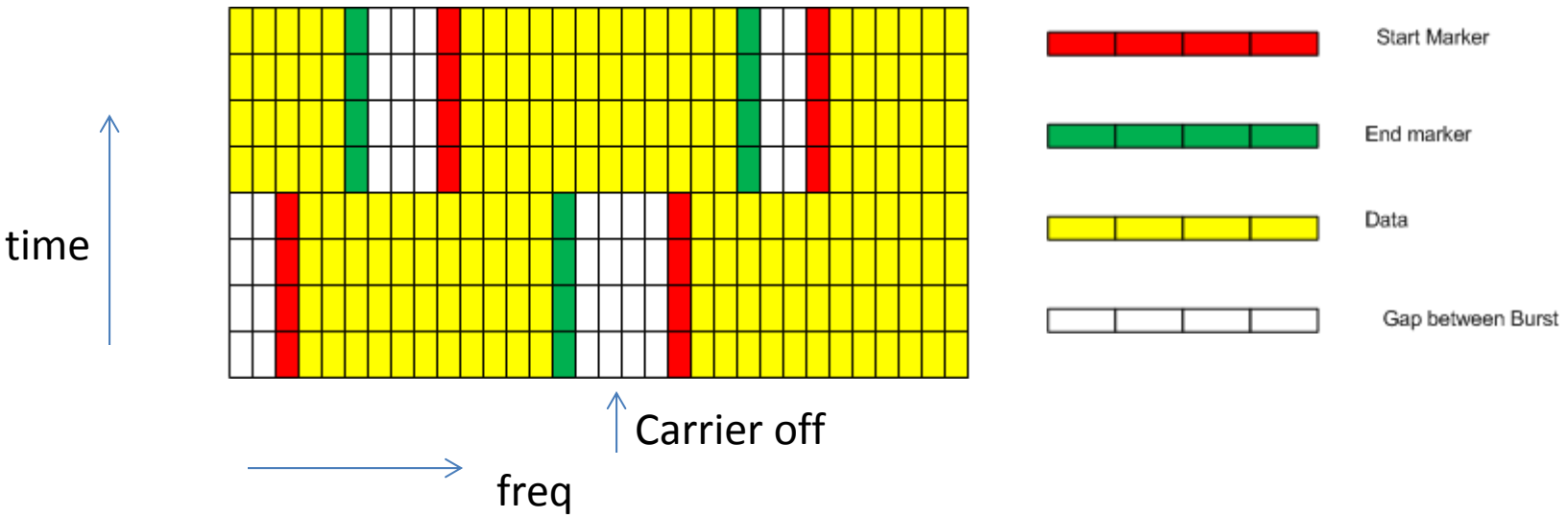
# Outlines

- Review of previous contributions.
- Propose simple 1-D burst marker.
- Simulation Results

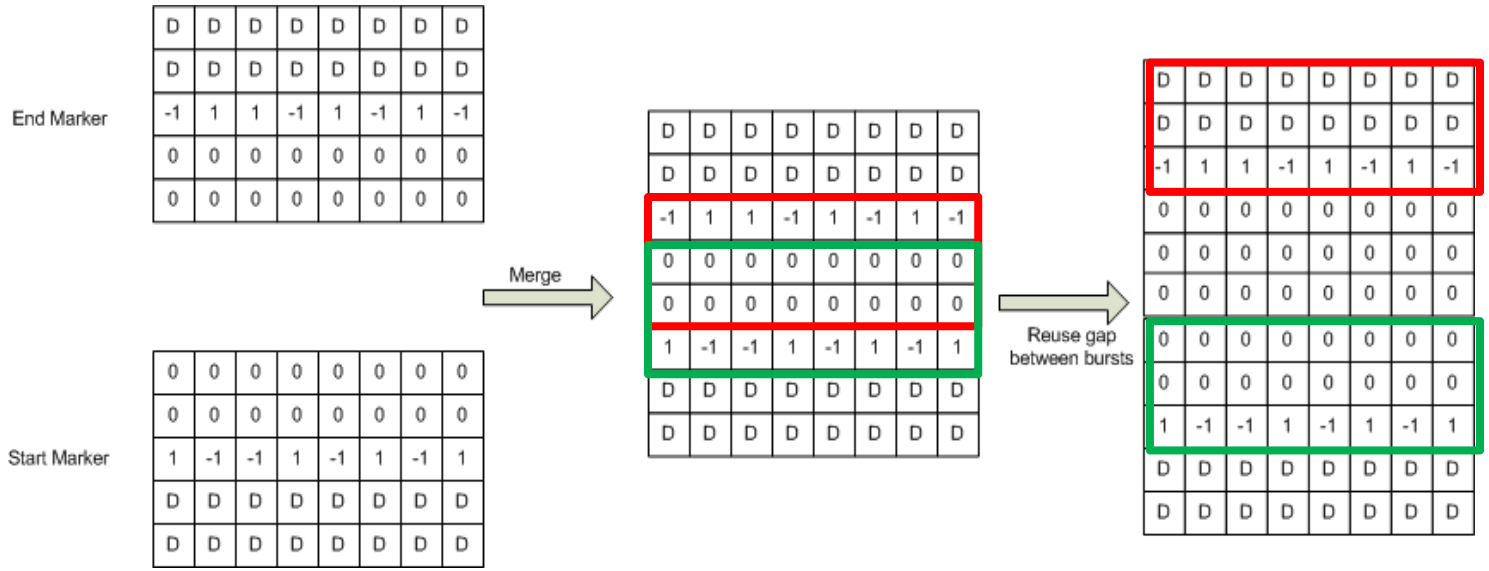
# Analogy between EPON and EPoC Burst



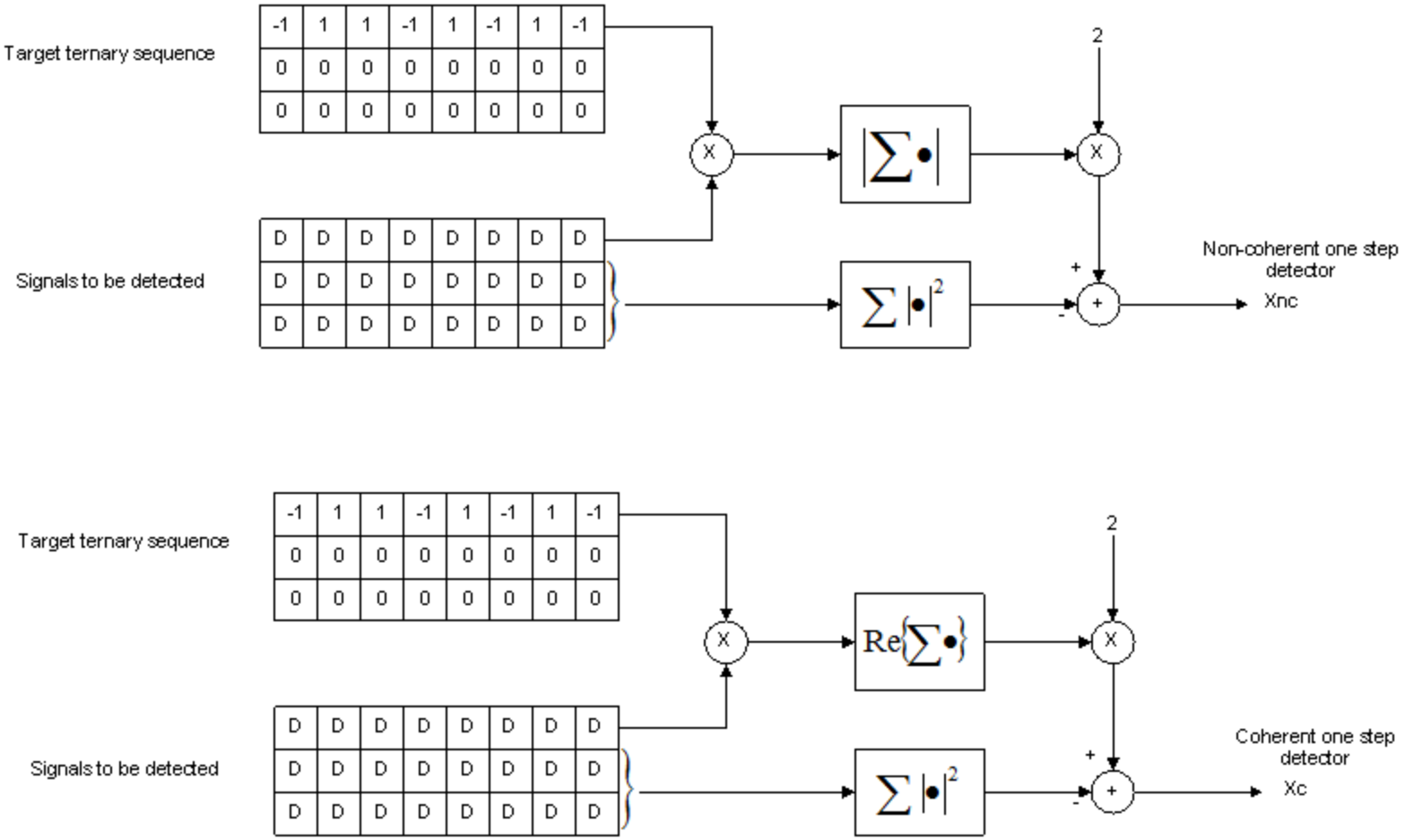



# Idea of 1-D Burst Marker

- One row of binary sequence as “non-null” symbols
- “Null” Gaps: minimum K rows of zero
- Start and end marker share same “Null” gaps
  - Slightly improve efficiency.



# One-step detector



# Proposed Burst Marker

- Np=8 non-null binary symbols taken from rows in 8x8 Walsh-Hadamard Matrix. Total 8 orthogonal vectors

$$U_2 = (8\times 8)\ Walsh - Hadamard\ \ Matrix$$

$$= \begin{bmatrix} U_2(1) \\ U_2(2) \\ U_2(3) \\ U_2(4) \\ U_2(5) \\ U_2(6) \\ U_2(7) \\ U_2(8) \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & -1 & 1 & -1 & 1 & -1 \\ 1 & 1 & -1 & -1 & 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 & 1 & -1 & -1 & 1 \\ 1 & 1 & 1 & 1 & -1 & -1 & -1 & -1 \\ 1 & -1 & 1 & -1 & -1 & 1 & -1 & 1 \\ 1 & 1 & -1 & -1 & -1 & -1 & 1 & 1 \\ 1 & -1 & -1 & 1 & -1 & 1 & 1 & -1 \end{bmatrix}$$

- Minimum of 2 rows of “Null” gaps.
- End marker is negative of start marker.
- 3dB boost for the burst marker than other data symbols

# Example

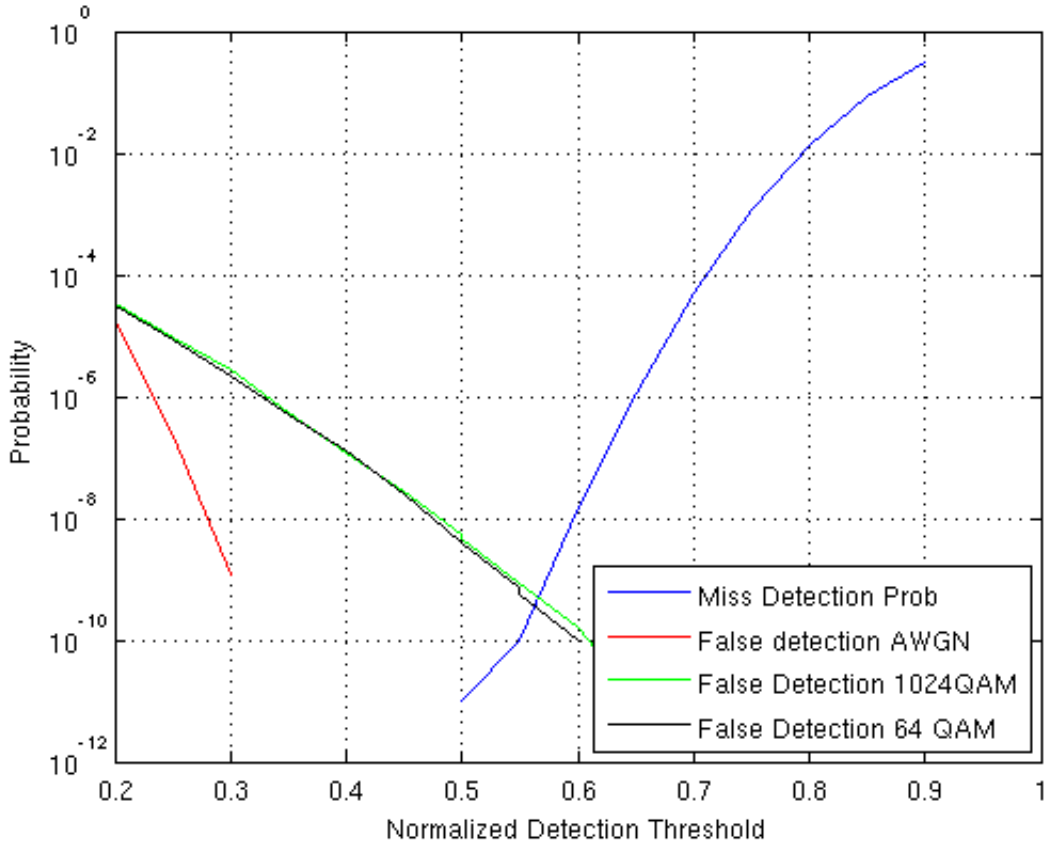
- Resource block of 8 OFDM symbols.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | D | D | D | D | D | D | D | D |
| | D | D | D | D | D | D | D | D |
| End marker | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Start marker | 1 | -1 | -1 | 1 | -1 | 1 | 1 | -1 |
| | D | D | D | D | D | D | D | D |
| | D | D | D | D | D | D | D | D |

# Example---16 Symbol Resource Blocks

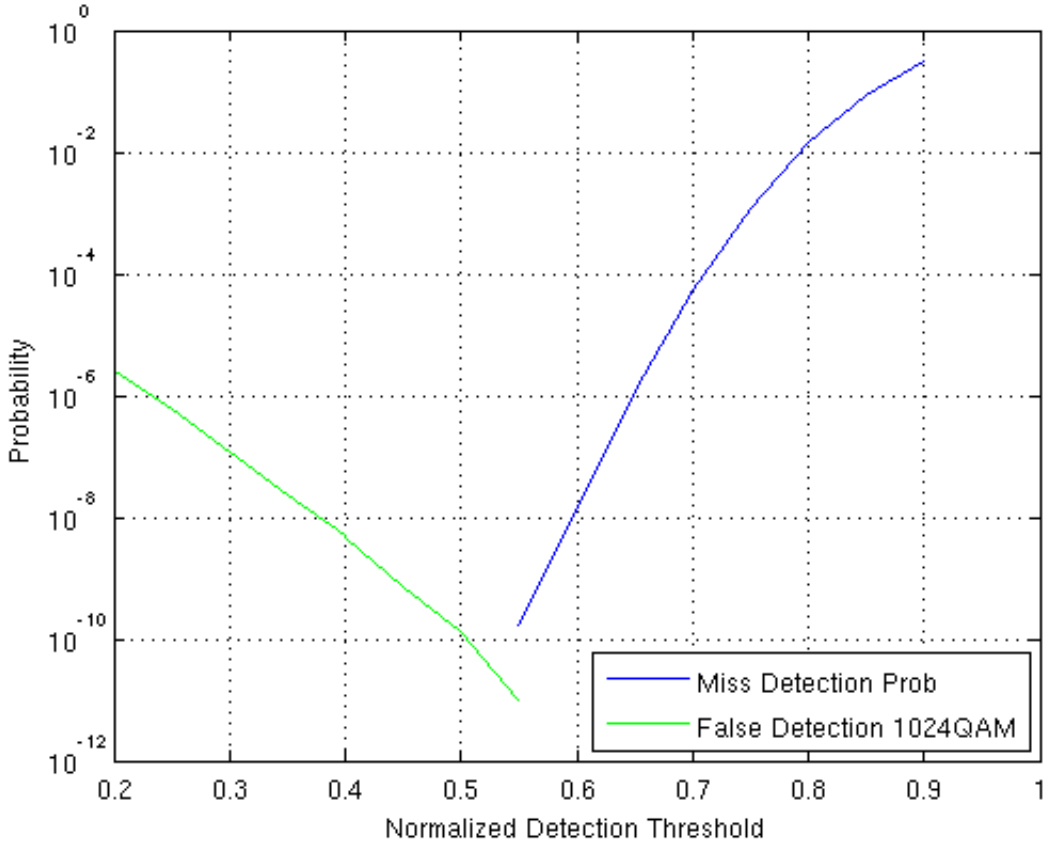
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| End marker | -1 | D | 1 | D | 1 | D | -1 | D | D | 1 | D | -1 | D | -1 | D | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Start marker | 1 | D | -1 | D | -1 | D | 1 | D | D | -1 | D | 1 | D | 1 | D | -1 |
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |

# Performance – Non-coherent Detector




Note: SNR=10dB and Burst marker with 3dB boost

# Performance—Coherent Detector (Suitable For End Marker)




Note: SNR=10dB and Burst marker with 3dB boost

# Summary

- A simple burst marker of only 1 RB is proposed.
- The one-step detector delivers performance that meets the requirement.
- Compared with the burst markers in Draft 1.0, the proposed marker has lower implementation complexity for both transmitter and receiver.