

Sounding sequence proposal for 802.16m

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Discussion and approval

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Introduction

- Sounding sequence definition is missing in the current AWD
- In this contribution we propose sounding sequence for 802.16m and details on the MSs multiplexing schemes

Sounding sequence proposal

- Binary Golay sequence of length 2048 bits from 802.16e standard
- Common for all FFT sizes, multiplexing schemes and parameters of the corresponding multiplexing schemes
- Unique sequence for each cell and sector
- Guarantees low PAPR and cross correlation values

Support of FDM and CDM

- FDM subcarrier modulation

$$b_k = \begin{cases} 2 \cdot \left(\frac{1}{2} - G([k + u + \text{offset}_D(\text{fft})] \bmod 2048) \right), & k \in B, k \neq \frac{N_{\text{used}} - 1}{2}, k \bmod D = g \\ 0 & \text{otherwise} \end{cases}$$

subcarrier symbol (arrow to b_k)
 sounding allocation (arrow to $k \bmod D = g$)
 baseline binary Golay sequence (arrow to $G(\dots)$)
 subcarrier decimation (arrow to D)

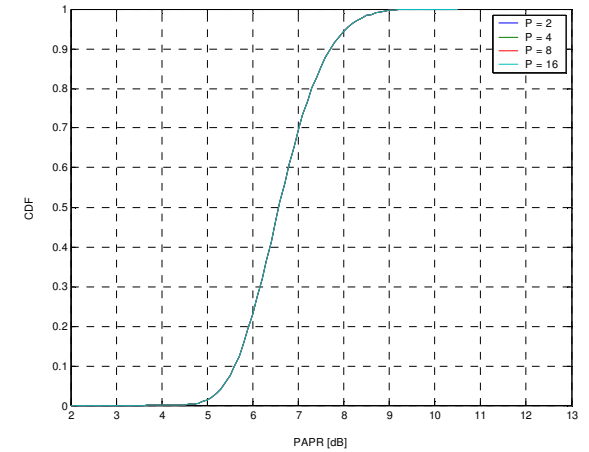
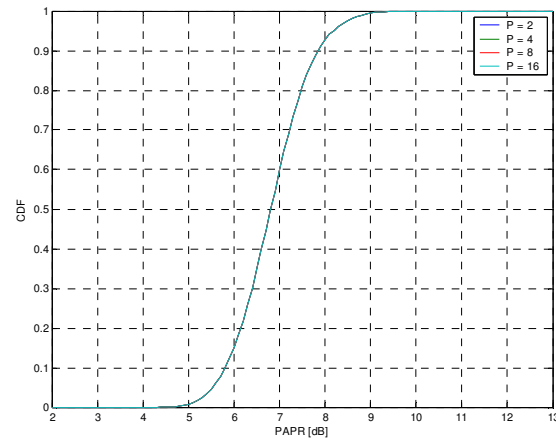
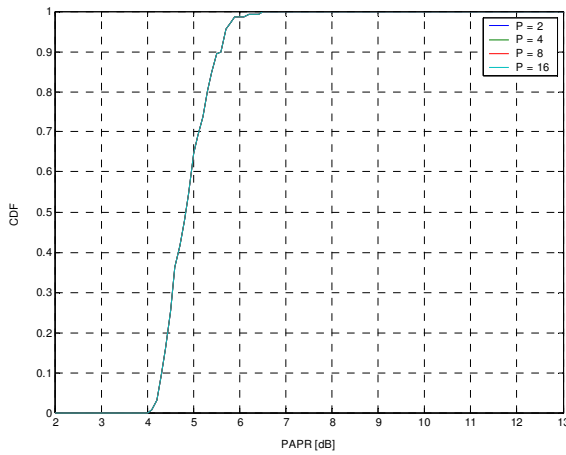
- CDM subcarrier modulation

$$b_k = \begin{cases} 2 \cdot \left(\frac{1}{2} - G([k + u + \text{offset}_D(\text{fft})] \bmod 2048) \right) \cdot e^{-j2\pi \frac{k}{P} n}, & k \in B, k \neq \frac{N_{\text{used}} - 1}{2} \\ 0 & \text{otherwise} \end{cases}$$

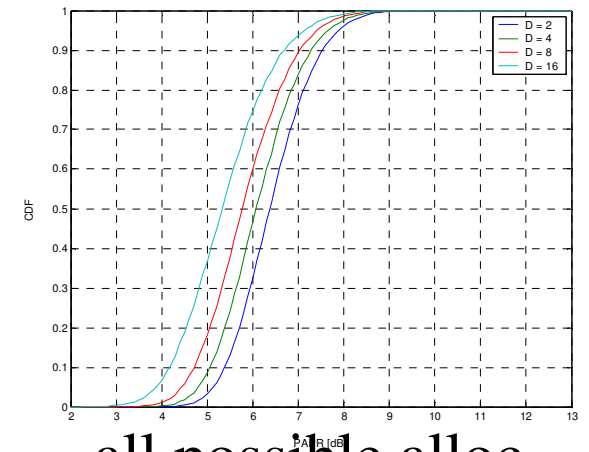
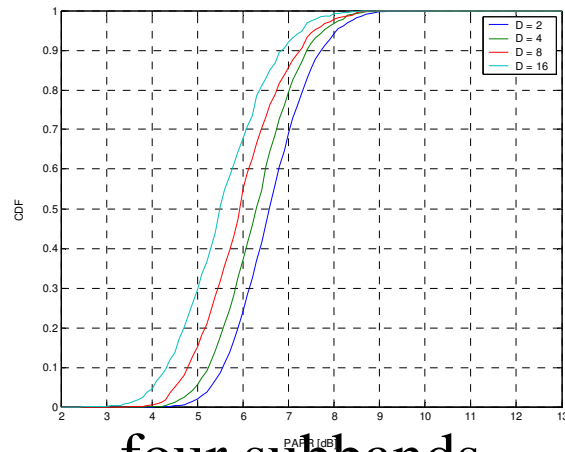
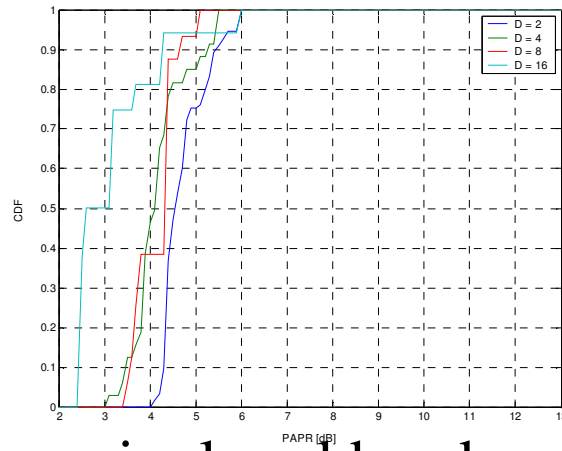
multiplexing code (arrow to $e^{-j2\pi \frac{k}{P} n}$)
 cell/sector specific offset (arrow to u)
 FFT dependent offset to min. PAPR (arrow to offset_D)

PAPR Performance

CDM



FDM

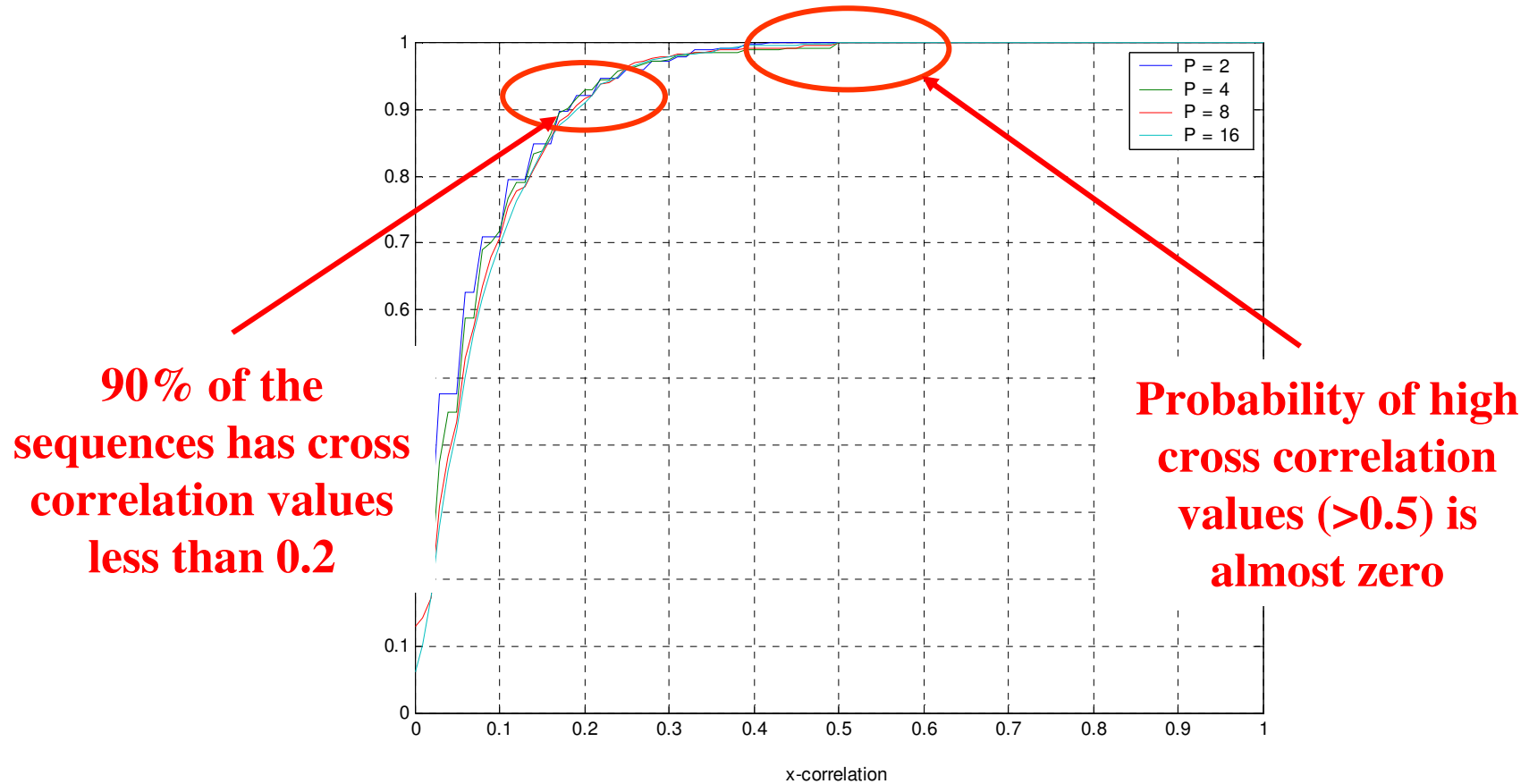


single subband

four subbands

all possible alloc.

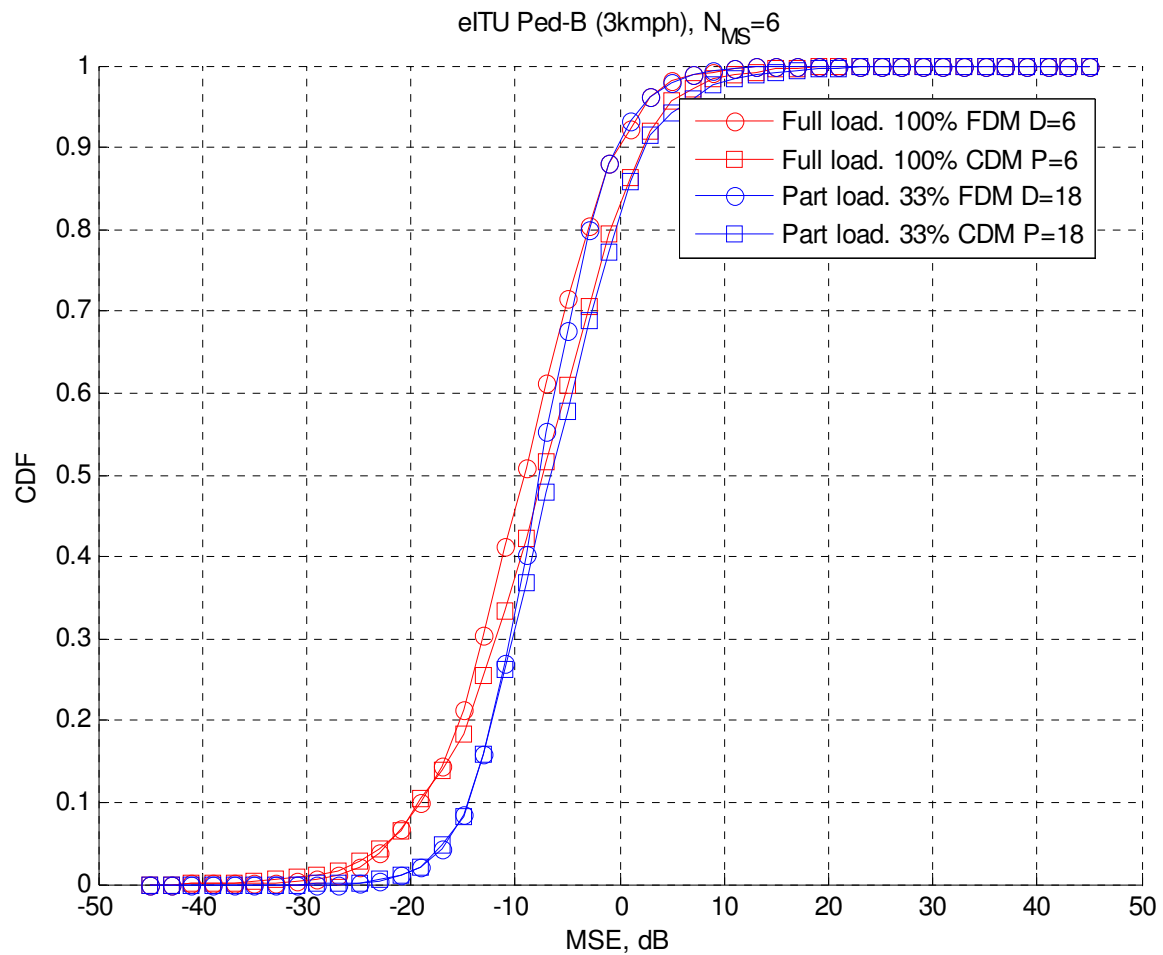
Cross correlation performance



Simulation conditions

System Parameters	1024 FFT, 10 MHz, 2.4GHz
Sounding Sequence	Golay
Loading	Full Loading (100%): $N_{MS} = D = P = 6$
	Partial Loading (33%): $N_{MS} = 6, D = P = 18$
Multiplexing	FDM (D decimation), CDM (P max. cyclic shift)
Number of interfering sources	57 sectors
Target SINR	10 dB
Estimation	LS+MMSE

System level performance analysis



Conclusion

- The proposed sequence provides low PAPR and cross correlation characteristics
- The performance of CDM and FDM have been validated using system level simulations
- The proposed sequence is the same as 802.16e sequence which is preferable in terms of implementation complexity
- Recommendation is to adopt the text provided in IEEE C80216m-09/0771 contribution or it's latest revision