

Modification of Long/short preamble of OFDM mode

IEEE 802.16 Presentation Submission Template (Rev. 8.21)

Document Number:

[S802.16a-02/93]

Date Submitted:

[2002-11-14]

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Venue:

[#22 Kauai, Hawaii, TGa session]

Base Document:

[IEEE C802.16a-02/93]

Purpose:

[Only changing preamble of 802.16a/D6]

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Preambles of 256 OFDM mode

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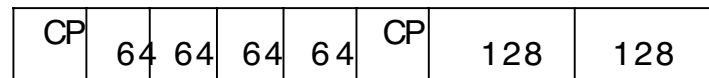
Design criteria of preamble for OFDM system

- Low PAPR
- Suitable for parameter estimation
 - Timing : need Good correlation properties
 - Frequency offset estimation(wide range ,fast , accurate)
 - Channel estimation
- Low computational complexity and low overhead.

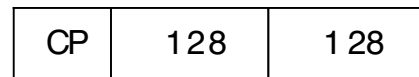
Current IEEE 802.16aD6 preamble and training sequence

- 256 OFDM mode

➤ long preamble: consists of a CP followed by 4 times 64 samples followed by a CP and 2 times 128 samples



➤ short preamble :same as the second part of long preamble



Long and short Preambles

The first part of long preamble:

$$S(-100:100)=\{+1+j,0,0,0,+1+j,0,0,0,+1+j,0,0,0,+1-j,0,0,0,-1+j,0,0,0,+1+j,0,0,0, \\ +1+j,0,0,0,+1+j,0,0,0,+1-j,0,0,0,-1+j,0,0,0,+1+j,0,0,0,+1+j,0,0,0, \\ +1+j,0,0,0,+1-j,0,0,0,-1+j,0,0,0,+1-j,0,0,0,+1-j,0,0,0,+1-j,0,0,0, \\ -1-j,0,0,0,+1+j,0,0,0,-1+j,0,0,0,-1+j,0,0,0,-1+j,0,0,0,+1+j,0,0,0, \\ -1-j,0,0,0,0,0,0,0,-1-j,0,0,0,+1-j,0,0,0,+1+j,0,0,0,-1-j,0,0,0,-1+j, \\ 0,0,0,+1-j,0,0,0,+1+j,0,0,0,-1+j,0,0,0,+1-j,0,0,0,-1-j,0,0,0,+1+j, \\ 0,0,0,-1+j,0,0,0,-1-j,0,0,0,+1+j,0,0,0,+1-j,0,0,0,-1-j,0,0,0,+1-j, \\ 0,0,0,+1+j,0,0,0,-1-j,0,0,0,-1+j,0,0,0,-1+j,0,0,0,-1-j,0,0,0,+1-j, \\ 0,0,0,-1+j,0,0,0,-1-j,0,0,0,+1+j\}*\text{sqrt}(2)*\text{sqrt}(2)$$

The short preamble or second part of long preamble

$$P(-100:100)=\{-1,0,1,0,1,0,1,0,1,0,-1,0,-1,0,1,0,-1,0,-1,0,1,0,1,0,-1,0, \\ 1,0,-1,0,1,0,-1,0,1,0,-1,0,1,0,1,0,-1,0,1,0,-1,0,-1,0,-1,0, \\ -1,0,1,0,1,0,-1,0,1,0,1,0,1,0,-1,0,1,0,1,0,-1,0,-1,0,-1,0,1,0,1,0, \\ 1,0,1,0,1,0,1,0,1,0,0,0,-1,0,-1,0,1,0,-1,0,-1,0,1,0,1,0,1,0,-1,0, \\ 1,0,1,0,1,0,-1,0,-1,0,-1,0,-1,0,-1,0,1,0,-1,0,-1,0,-1,0,-1,0,-1,0, \\ -1,0,1,0,1,0,1,0,-1,0,1,0,-1,0,1,0,1,0,-1,0,1,0,1,0,1,0,-1,0,-1,0, \\ -1,0,-1,0,-1,0,1,0,-1,0,-1,0,1,0,-1,0,-1,0,1,0,-1\}*\text{sqrt}(2)*\text{sqrt}(2)$$

The PAPR of Preamble P is 3.5805

New preamble

```
PAPR = 2.671489 dB
P[-100:100] = {
    1  0 -1  0 -1  0 -1  0  1  0  1  0      [-100:-89]
    1  0  1  0 -1  0  1  0 -1  0 -1  0 -1    [-88:-76]
    0  1  0 -1  0  1  0  1  0  1  0  1      [-75:-64]
    0 -1  0  1  0  1  0  1  0 -1  0  1  0    [-63:-51]
   -1  0  1  0  1  0 -1  0 -1  0  1  0      [-50:-39]
   -1  0  1  0 -1  0  1  0  1  0 -1  0  1   [-38:-26]
    0  1  0 -1  0 -1  0 -1  0  1  0 -1     [-25:-14]
    0 -1  0 -1  0 -1  0 -1  0  1  0  1  0   [-13:-1]
    0
    0  1  0 -1  0 -1  0  1  0 -1  0  1  0    [1:13]
    1  0  1  0  1  0 -1  0  1  0  1  0      [14:25]
    1  0  1  0 -1  0  1  0 -1  0 -1  0 -1    [26:38]
    0 -1  0  1  0  1  0 -1  0  1  0 -1     [39:50]
    0 -1  0 -1  0 -1  0 -1  0 -1  0 -1  0   [51:63]
   -1  0  1  0  1  0  1  0 -1  0 -1  0      [64:75]
   -1  0  1  0  1  0 -1  0 -1  0 -1  0  1   [76:88]
    0 -1  0 -1  0  1  0 -1  0 -1  0 -1     [89:100]
} * sqrt(2) * sqrt(2)
```

- The PAPR is 2.671489dB

Conclusion :

- If it is feasible to fix preamble of 256 FFT OFDM mode
- Without any MAC overhead
- No much big impact on the schedule of standard
- About 1 dB Lower PAPR