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Abstract	Preamble sequences are proposed.
Purpose	
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Preamble subcarrier loading for OFDM mode

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Alvarion

1. Introduction

This submission describes specific subcarrier loading for the preamble structures defined in D2 draft.
We consider two cases:

A. The 256 OFDM mode operates with 200 active subcarriers.
B. UL OFDMA proposal (See document C802.16a-02/37) is accepted and the number of active subcarriers is changed to 208.

2. Preamble structures

The proposed sequences use QPSK modulation and provide very low PAPR of 3 dB. In particular the implementation simplicity is enhanced by the fact that P_{4x64} is a subset of P_{2x128}.
For Alamouti , or MIMO applications a specific preamble is proposed, for which only the odd subcarriers are utilized. This sequence also has a PAPR of 3dB.

3. Proposed Text Change for current OFDM mode

The following text replaces section '8.3.5.5.6 Preamble structure' on page 164:

8.3.5.5.6.1 Long preamble

The first preamble in the downlink PHY transmission burst, as well the network entry (registration) preamble, is termed the long preamble. The long preamble consists of two OFDM symbols. The first symbol is composed of a cyclic prefix (CP), followed by 4 times 64 samples. The second symbol is composed of a CP and 2 times 128 samples. The CP length for both symbols is equal to that of the traffic mode.

The first and second symbols are constructed using the subcarrier loading sequences P_{4x64} and P_{2x128} respectively. The sequences are given below. The sequences provide a very low Peak to Average Power Ratio (PAPR) of 3dB. In addition, P_{4x64} is a subset of P_{2x128}.

P_{128x2}={
+1+j,0,-1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1+j,0,-1+j,0,+1+j,0,
+1+j,0,-1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1+j,0,-1+j,0,+1+j,0,
+1+j,0,-1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1+j,0,-1+j,0,+1+j,0,
+1-j,0,+1+j,0,+1-j,0,-1+j,0,+1-j,0,-1-j,0,-1-j,0,+1+j,0,+1+j,0,+1-j,0,
-1+j,0,-1-j,0,-1+j,0,+1-j,0,-1+j,0,+1+j,0,+1+j,0,-1-j,0,-1-j,0,-1+j,0,
0,
0,+1-j,0,-1-j,0,+1-j,0,+1-j,0,+1-j,0,+1+j,0,-1-j,0,-1-j,0,+1+j,0,-1+j,
0,+1+j,0,+1-j,0,+1+j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,+1-j,0,-1+j,0,-1-j,
0,-1+j,0,+1+j,0,-1+j,0,-1+j,0,-1+j,0,-1-j,0,+1+j,0,+1+j,0,-1-j,0,+1-j,
0,+1-j,0,-1-j,0,+1-j,0,+1-j,0,+1-j,0,+1+j,0,-1-j,0,-1-j,0,+1+j,0,-1+j,
0,-1-j,0,-1+j,0,-1-j,0,-1-j,0,-1-j,0,+1-j,0,-1+j,0,-1+j,0,+1-j,0,+1+j
}

P_{64x4}={
+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
}

8.3.5.5.6.2 Short preamble

The short preamble is used for uplink bursts, where no sub-channelization is employed. The short preamble is composed of a CP and 2 times 128 samples. The CP length for both symbols is equal to that of the traffic mode. The short preamble is identical to the second symbol of the long preamble and is generated using P_{2x128} given above.

8.3.5.5.7 Alamouti STC preamble

add in line 39 page 164

The preamble using odd tones is given by $P1_{28x2,odd}$ below

$P_{128x2,odd}$=
{
0,+1+j,0,+1-j,0,+1+j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,+1-j,0,-1+j,0,-1-j,

```
0,+1+j,0,+1-j,0,+1+j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,+1-j,0,-1+j,0,-1-j,
0,+1+j,0,+1-j,0,+1+j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,+1-j,0,-1+j,0,-1-j,
0,+1-j,0,-1-j,0,+1-j,0,+1-j,0,+1-j,0,+1+j,0,-1-j,0,-1-j,0,+1+j,0,-1+j,
0,-1+j,0,+1+j,0,-1+j,0,-1+j,0,-1+j,0,-1-j,0,+1+j,0,+1+j,0,-1-j,0,+1-j,
0,
-1+j,0,-1-j,0,-1+j,0,+1-j,0,-1+j,0,+1+j,0,+1+j,0,-1-j,0,-1-j,0,-1+j,0,
-1-j,0,+1-j,0,-1-j,0,+1+j,0,-1-j,0,-1+j,0,-1+j,0,+1-j,0,+1-j,0,-1-j,0,
+1-j,0,+1+j,0,+1-j,0,-1+j,0,+1-j,0,-1-j,0,-1-j,0,+1+j,0,+1+j,0,+1-j,0,
-1+j,0,-1-j,0,-1+j,0,+1-j,0,-1+j,0,+1+j,0,+1+j,0,-1-j,0,-1-j,0,-1+j,0,
+1+j,0,-1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1+j,0,-1+j,0,+1+j,0}
```

4. Proposed Text Change for if sub-channelization is accepted.

The following text replaces section '8.3.5.5.6 Preamble structure' on page 164:

8.3.5.5.6.1 Long preamble

The first preamble in the downlink PHY transmission burst, as well the network entry (registration) preamble, is termed the long preamble. The long preamble consists of two OFDM symbols. The first symbol is composed of a cyclic prefix (CP), followed by 4 times 64 samples. The second symbol is composed of a CP and 2 times 128 samples. The CP length for both symbols is equal to that of the traffic mode.

The first and second symbols are constructed using the subcarrier loading sequences P_{4x64} and P_{2x128} respectively. The sequences are given below. The sequences provide a very low Peak to Average Power Ratio (PAPR) of 3dB. In addition, P_{4x64} is a subset of P_{2x128}.

P_{2x128} ={

```
+1+j,0,+1+j,0,+1+j,0,-1-j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,
+1+j,0,+1+j,0,-1-j,0,+1+j,0,-1+j,0,-1+j,0,-1-j,0,+1+j,0,
-1-j,0,-1-j,0,-1-j,0,+1+j,0,+1+j,0,+1+j,0,-1+j,0,+1-j,0,
+1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,+1+j,0,-1-j,0,
+1+j,0,+1+j,0,+1+j,0,-1-j,0,-1-j,0,-1-j,0,+1-j,0,-1+j,0,
+1+j,0,+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,+1+j,0,-1-j,0,
-1+j,0,-1+j,0,+1-j,0,-1+j,0,    0,0,-1-j,0,+1+j,0,-1-j,0,
-1-j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1-j,0,+1+j,0,+1+j,0,
+1+j,0,+1-j,0,-1+j,0,+1+j,0,+1+j,0,+1+j,0,-1-j,0,+1+j,0,
+1+j,0,-1-j,0,+1+j,0,+1-j,0,+1-j,0,-1-j,0,+1+j,0,+1+j,0,
+1+j,0,-1+j,0,+1-j,0,-1-j,0,-1-j,0,-1-j,0,+1+j,0,-1-j,0,
-1-j,0,+1+j,0,-1-j,0,-1+j,0,-1+j,0,-1-j,0,+1+j,0,+1+j,0,
+1+j,0,-1+j,0,+1-j,0,-1-j,0,-1-j,0,+1-j,0,-1+j,0,-1+j,0,
-1+j}
```

P_{4x64} ={
+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,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}*sqrt(2)

8.3.5.5.6.2 Short preamble

The short preamble is used for uplink bursts, where no sub-channelization is employed. The short preamble is composed of a CP and 2 times 128 samples. The CP length for both symbols is equal to that of the traffic mode. The short preamble is identical to the second symbol of the long preamble and is generated using P_{2x128} given above.

8.3.5.5.6.3 Sub-channelization preamble

The sub-channelization preamble is used in uplink bursts when sub-channelization is employed. When all the sub-channels are used in a burst, (and no sub-channelization is employed) the short preamble given above is used. The sub-channelization preamble is composed of a CP, and an OFDM symbol constructed using the subcarrier sequence $P_{sub\text{-}ch}$.

$P_{sub\text{-}ch}$ = {
+1+j,+1+j,+1+j,+1-j,-1-j,+1+j,+1+j,-1+j,+1+j,-1-j,+1+j,-1+j,+1-j, subch 0
+1-j,+1-j,+1-j,-1-j,-1+j,+1-j,+1-j,+1+j,+1-j,-1+j,+1-j,+1+j,-1-j, subch 2
-1-j,-1-j,-1-j,-1+j,+1+j,-1-j,-1-j,+1-j,-1-j,+1+j,-1-j,+1-j,-1+j, subch 1
+1-j,+1-j,+1-j,-1-j,-1+j,+1-j,+1-j,+1+j,+1-j,-1+j,+1-j,+1+j,-1-j, subch 3
+1+j,+1-j,-1-j,-1-j,-1-j,+1-j,-1-j,+1+j,+1+j,-1+j,-1-j,+1+j,-1+j, subch 0
+1-j,-1-j,-1+j,-1+j,-1+j,-1-j,-1+j,+1-j,+1-j,+1+j,-1+j,+1-j,+1+j, subch 2
-1-j,-1+j,+1+j,+1+j,+1+j,-1+j,+1+j,-1-j,-1-j,+1-j,+1+j,-1-j,+1-j, subch 1
+1-j,-1-j,-1+j,-1+j,-1+j,-1-j,-1+j,+1-j,+1-j,+1+j,-1+j,+1-j,+1+j, subch 3
0
+1+j,+1+j,+1+j,+1-j,-1-j,+1+j,+1+j,-1+j,+1+j,-1-j,+1+j,-1+j,+1-j, subch 0
+1-j,+1-j,+1-j,-1-j,-1+j,+1-j,+1-j,+1+j,+1-j,-1+j,+1-j,+1+j,-1-j, subch 2
+1+j,+1+j,+1+j,+1-j,-1-j,+1+j,+1+j,-1+j,+1+j,-1-j,+1+j,-1+j,+1-j, subch 1

```
-1+j,-1+j,-1+j,+1+j,+1-j,-1+j,-1+j,-1-j,-1+j,+1-j,-1+j,-1-j,+1+j, subch 3
-1-j,-1+j,+1+j,+1+j,+1+j,-1+j,+1+j,-1-j,-1-j,+1-j,+1+j,-1-j,+1-j, subch 0
-1+j,+1+j,+1-j,+1-j,+1-j,+1+j,+1-j,-1+j,-1+j,-1-j,+1-j,-1+j,-1-j, subch 2
-1-j,-1+j,+1+j,+1+j,+1+j,-1+j,+1+j,-1-j,-1-j,+1-j,+1+j,-1-j,+1-j, subch 1
+1-j,-1-j,-1+j,-1+j,-1+j,-1-j,-1+j,+1-j,+1-j,+1+j,-1+j,+1-j,+1+j  subch 3
}/sqrt(2)
```

In the symbol construction only the subcarriers that belong to used sub-channels are energized.

```
{
+1+j,+1+j,-1+j,+1-j,+1+j,+1+j,-1-j,+1+j,+1+j,+1+j,
+1-j,-1+j,+1-j,+1-j,-1+j,+1-j,-1+j,-1+j,+1+j,-1-j,
+1+j,+1+j,-1+j,+1-j,+1+j,+1+j,-1-j,+1+j,+1+j,+1+j,
+1-j,-1+j,+1-j,+1-j,-1+j,+1-j,-1+j,-1+j,+1+j,-1-j,
+1+j,+1+j,-1+j,+1-j,+1+j,+1+j,-1-j,+1+j,+1+j,+1+j,
+1-j,-1+j,+1-j,+1-j,-1+j,+1-j,-1+j,-1+j,+1+j,-1-j,
+1-j,+1-j,+1+j,-1-j,+1-j,+1-j,-1+j,+1-j,+1-j,+1-j,
-1-j,+1+j,-1-j,-1-j,+1+j,-1-j,+1+j,+1+j,+1-j,-1+j,
-1+j,-1+j,-1-j,+1+j,-1+j,-1+j,+1-j,-1+j,-1+j,-1+j,
+1+j,-1-j,+1+j,+1+j,-1-j,+1+j,-1-j,-1-j,-1+j,+1-j,
0,
-1+j,+1-j,-1-j,-1-j,-1+j,+1-j,+1-j,+1-j,-1+j,+1-j,
+1+j,+1+j,+1+j,-1-j,-1-j,-1-j,-1-j,+1+j,-1+j,-1+j,
-1-j,+1+j,+1-j,+1-j,-1-j,+1+j,+1+j,+1+j,-1-j,+1+j,
-1+j,-1+j,-1+j,+1-j,+1-j,+1-j,+1-j,-1+j,-1-j,-1-j,
+1-j,-1+j,+1+j,+1+j,+1-j,-1+j,-1+j,-1+j,+1-j,-1+j,
-1-j,-1-j,-1-j,+1+j,+1+j,+1+j,+1+j,-1-j,+1-j,+1-j,
-1+j,+1-j,-1-j,-1-j,-1+j,+1-j,+1-j,+1-j,-1+j,+1-j,
+1+j,+1+j,+1+j,-1-j,-1-j,-1-j,-1-j,+1+j,-1+j,-1+j,
+1+j,-1-j,-1+j,-1+j,+1+j,-1-j,-1-j,-1-j,+1+j,-1-j,
+1-j,+1-j,+1-j,-1+j,-1+j,-1+j,-1+j,+1-j,+1+j,+1+j}
```