A Mixed OFDM Downlink and Single Carrier Uplink for the 2-11 GHz Licensed Bands

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Purpose:
Amendment of the current draft to allow a mixed OFDM and SCa compliance of a system with IEEE802.16a for 2-11 GHz licensed bands.

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Motivation

- OFDM – DL and SC- UL provides best of “two worlds” while keeping complexity of implementation minimal at CPE side.
- Keeping the same OFDM and SC-FDE as proposed in P802.16/D5

What do we mean by Mixed Mode?

- Not a new mode…
- Just enabling more flexibility to the draft standard based on its existing OFDM and SC-FDE modes
- Mostly MAC issue - to allow OFDM DL to carry the right configurations for UL SC-FDE

The benefits of Mixed Mode

- **Complexity reduction:** Concentrating most of the signal processing complexity at the base station. The BS has 2 IFFT, 1 FFT while SS 1 FFT only.
- **Simplifying CPE side:** SS Tx is SC, and thus is simple and inherently more efficient than an OFDM system transmitter
- **Saving PA power at CPE side**:in terms of power consumption, due to the reduced power back-off requirements of the single carrier mode. This will minimize the cost of a subscriber ’s power amplifier.

Benefits Cont.

- **OFDM at DL** eliminates multipath based on "transmitter processing" technology, brings the benefits of OFDM powerful coding and multiplexing flexibilities.
- **Improving MAC efficiency:** The uplink TDMA single carrier mode is simple and efficient;short MAC messages can be transmitted in very short-duration bursts,whereas OFDM burst lengths must be multiples of the FFT block length.
- The mixed mode is a step towards interoperable SCa and OFDM systems.
- Mixed modes with DL OFDM and UL SC-FDE are also investigated for air interface of 4G mobile systems [Fal02b].

Changes in the Draft

Addition of

"a system shall comply to the standard if its downstream complies with the OFDM PHY as described in 8.4 and its upstream with the SCa PHY as described in 8.3”

Other implications

- MAC Support of PHY layer:

  The frame control information shall contain DL-MAP, as needed for OFDM, followed by UL-MAP, as needed for SC .

  The DCD and UCD messages following the last UL-MAP will configured to DL OFDM and UL-SC

  Ranging will be based on SC – exactly the same way as defined in SC section