

SIG-A Structure in 11ax Preamble

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Introduction

- **SIG-A in 11n and 11ac are duplicated in 20MHz**
 - Contains common control information are essential for decoding of PPDU
 - 3.2 μ s DFT duration
 - Modulated with MCS 0 for reliability
- **11ax needs to support SU and MU**
 - MU includes OFDMA and MU-MIMO modes
 - MU is supported for both DL and UL
- **Each SIG-A OFDM symbol can only contain 24-26 bits when MCS 0 is applied**
 - 24 bits when 48 Tones are used for SIG-A
 - 26 bits when 52 Tones are used for SIG-A

Considerations of SIG fields in 11ax

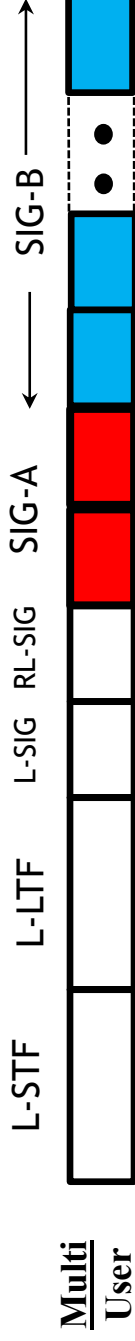
- **How many bits in HE-SIG-A is under discussion.**
 - 26-bits in HE-SIG-A are very likely not enough
 - More than one HE-SIG-A OFDM symbol is required therefore.
- **Considerations of SIG fields in 11ax**
 - Two VHT-SIG-A OFDM symbols are enough for 11ax for SU. Therefore 11ax can just use two SIG-A OFDM symbols for SU too.
 - To support DL MU operations, two HE-SIG-A OFDM symbols are not enough for
 - Each user's control information must be conveyed.
 - In 11ac, VHT-SIG-B is introduced to convey most of DL MU control information.
 - In 11ax, HE-SIG-B is also needed for supporting DL MU operations.
 - To support UL MU operations, UL trigger based packets are needed.
 - UL trigger based packets are UL packets that are triggered by a trigger frame.
 - For example, UL trigger based packets can be UL-OFDMA or UL-MU-MIMO packets.

HE-SIG-A Design

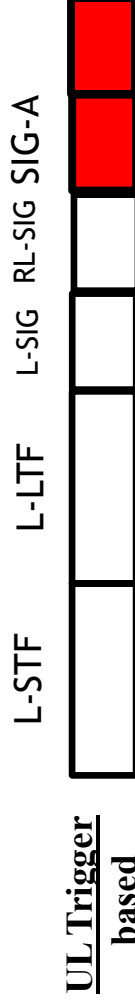
- SIG-A
 - 2 symbols
 - BCC (with 6 tail bits)
- No SIG-B



- SIG-A
 - 2 symbols
 - BCC (with 6 tail bits)
- SIG-B
 - Variable #symbols
 - Variable MCS



- SIG-A
 - 2 symbols
 - BCC (with 6 tail bits)
- No SIG-B



Advantages of proposed HE-SIG Structures

- **Only two preamble formats for 11ax**
 - Else, early indications of 11ax preamble formats become complicated.
 - The early indication method of the two preamble formats is **TBD**.
- **The encoding method of HE-SIG-A is unified**
 - HE-SIG-A in 11ax is encoded same as VHT-SIG-A in 11ac, therefore there is no extra implementation and verification works needed.
- **For DL MU operations, # of HE-SIG-B symbols and MCSs can be variable and indicated by HE-SIG-A.**
 - Reduced overhead of HE-SIG-B.
- **For UL MU operations, the control information for each STA is sent by AP via a DL trigger packet.**
 - UL trigger based packets do not need convey many control information.

Extra SIG for UL MU or not ?

- **UL OFDMA and UL MU-MIMO have to be triggered by the AP**
 - Before the UL MU reception, some information already known at the AP
 - Nsts, BW, Max duration of payload in case of UL MU-MIMO
 - Tone allocation per STA, Max duration of payload for UL OFDMA
 - It is preferred that AP has the full control for UL MU
 - MCSs, TX power and other PHY related parameters
 - Smart AP and dumb STA ease interoperability among STAs as all the intelligence shifts to the AP
 - Save on the overhead of SIG after HE-LTFs

Straw-poll #1

Do you agree to add to 11ax SFD that HE-SIG-A is present in all 11ax packets and is two OFDM symbols long when it uses MCS0?

- Information bits in HE-SIGA are jointly encoded as in VHT-SIG-A (using 48 tones or 52 tones is **TBD**).
- SU packets and UL Trigger based packets do not contain HE-SIG-B symbols.

- Y
- N
- A

Straw-poll #2

Do you agree to add to 11ax SFD that the data field in UL Multi-user transmissions shall immediately follow the HE-LTF section?

-Y
-N
-A

Motion #1

- Move to add the following text to the 11ax spec framework document in the section 3.2.1 and 3.2.2:

“HE-SIG-A is present in all 11ax packets and is two OFDM symbols long when it uses MCS0?”

- Information bits in HE-SIGA are jointly encoded as in VHT-SIG-A (using 48 tones or 52 tones is **TBD**).
- SU packets and UL Trigger based packets do not contain HE-SIG-B symbols.”

- Y
- N
- A

Motion #2

- Move to add the following text to the 11ax spec framework document in the section 3.3:

“The data field in UL Multi-user transmissions shall immediately follow the HE-LTF section”

- Y
- N
- A