

Preamble structure for 11ax system

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Authors:

| Name | Affiliation | Address | Phone | email | |
|----------------|-------------|---|--|------------------------|---------------------------------|
| Jiayin Zhang | Huawei | 5B-N8, No.2222 Xijinqiao Road, Pudong, Shanghai | +86-18601656691 | zhangjiayin@huawei.com | |
| Le Liu | | F1-17, Huawei Base, Bantian, Shenzhen | | liule@huawei.com | |
| Jun Luo | | | | jun.l@huawei.com | |
| Yi Luo | | | | Roy.luoyi@huawei.com | |
| Yingpei Lin | | | | linyiping@huawei.com | |
| Jiyong Pang | | | | pangjiyong@huawei.com | |
| Zhigang Rong | | | 10180 Telesis Court, Suite 365, San Diego, CA 92121 NA | | zhigang.rong@huawei.com |
| Rob Sun | | | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada | | Rob.Sun@huawei.com |
| David X. Yang | | | F1-17, Huawei Base, Bantian, Shenzhen | | david.yangxun@huawei.com |
| Phillip Barber | | | The Lone Star State, TX | | pbarber@broadbandmobiletech.com |
| Peter Loc | | | | | peterloc@iwirelessstech.com |

Authors (continued)

| Name | Affiliation | Address | Phone | email |
|----------------------|-------------|---|-----------------|----------------------------|
| Yunsong Yang | | 10180 Telesis Court, Suite 365, San Diego, CA 92121 NA | | yangyunsong@huawei.com |
| Zhou Lan | Huawei | F1-17, Huawei Base, Bantian, SHenzhen | +86-18565826350 | Lanzhou1@huawei.com |
| Junghoon Suh | | 303 Terry Fox, Suite 400 Kanata, Ottawa, Canada | | Junghoon.Suh@huawei.com |
| Ron Porat | | | | rporat@broadcom.com |
| Matthew Fischer | | | | mfischer@broadcom.com |
| Sriram Venkateswaran | Broadcom | | | |
| Tu Nguyen | | | | |
| Vinko Erceg | | | | |
| Robert Stacey | | 2111 NE 25th Ave, Hillsboro OR 97124, USA | +1-503-724-893 | robert.stacey@intel.com |
| Eldad Perahia | | | | eldad_perahia@intel.com |
| Shahmaz Azizi | | | | shahmaz.azizi@intel.com |
| Po-Kai Huang | | | | po-kai.huang@intel.com |
| Qinghua Li | Intel | | | qinghua.li@intel.com |
| Xiaogang Chen | | | | xiaogang.c.chen@intel.com |
| Chitto Ghosh | | | | chitabrata.ghosh@intel.com |
| Rongzhen Yang | | | | rongzhen.yang@intel.com |

Authors (continued)

| Name | Affiliation | Address | Phone | email |
|----------------|--|--|--|----------------------------|
| Fei Tong | Samsung | Innovation Park, Cambridge CB4 0DS (U.K.) | +44 1223 434633 | f.tong@samsung.com |
| Hyunjeong Kang | | Maetan 3-dong; Yongsong-Gu Suwon; South Korea | +82-31-279-9028 | hyunjeong.kang@samsung.com |
| Kaushik Josiam | | 1301, E. Lookout Dr, Richardson TX 75070 | (972) 761 7437 | k.josiam@samsung.com |
| Mark Rison | | Innovation Park, Cambridge CB4 0DS (U.K.) | +44 1223 434600 | m.rison@samsung.com |
| Rakesh Taori | | 1301, E. Lookout Dr, Richardson TX 75070 | (972) 761 7470 | rakesh.taori@samsung.com |
| Sanghyun Chang | | Maetan 3-dong; Yongsong-Gu Suwon; South Korea | +82-10-8864-1751 | s29.chang@samsung.com |
| Lei Wang | | Marvell | 5488 Marvell Lane, Santa Clara, CA, 95054 | 858-205-7286 |
| Hongyuan Zhang | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | hongyuan@marvell.com |
| Yakun Sun | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | yakunsun@marvell.com |
| Liwen Chu | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | liwenchu@marvell.com |
| Mingguan Xu | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | mxu@marvell.com |
| Jinjing Jiang | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | jinjing@marvell.com |
| Yan Zhang | 5488 Marvell Lane, Santa Clara, CA, 95054 | | | yzhang@marvell.com |

Authors (continued)

| Name | Affiliation | Address | Phone | email | |
|---------------------------|---------------|--|---|---|--------------------------------|
| Rui Cao | Marvell | 5488 Marvell Lane, Santa Clara, CA, 95054 | | ruicao@marvell.com | |
| Sudhir Srimivasa | | 5488 Marvell Lane, Santa Clara, CA, 95054 | | sudhirs@marvell.com | |
| Saga Tamhane | | 5488 Marvell Lane, Santa Clara, CA, 95054 | | sagar@marvell.com | |
| Mao Yu | | 5488 Marvell Lane, Santa Clara, CA, 95054 | | my@marvel.com | |
| Edward Au | | 5488 Marvell Lane, Santa Clara, CA, 95054 | | edwardau@marvell.com | |
| Hui-Ling Lu | | 5488 Marvell Lane, Santa Clara, CA, 95054 | | hlou@marvell.com | |
| Yasushi Takatori | | NTT | 1-1 Hikari-no-oka, Yokosuka, Kanagawa 239-0847 Japan | | takatori.yasushi@lab.ntt.co.jp |
| Yasuhiko Inoue | | | | | inoue.yasuhiko@lab.ntt.co.jp |
| Yusuke Asai | | | | asai.yusuke@lab.ntt.co.jp | |
| Koichi Ishihara | | | | ishihara.koichi@lab.ntt.co.jp | |
| Akira Kishida | NTT DOCOMO | | | kishida.akira@lab.ntt.co.jp | |
| Akira Yamada | | 3-6, Hikarinooka, Yokosuka- shi, Kanagawa, 239-8536, Japan | | yamadaakira@nttdocomo.co m | |
| Fujio Watanabe | | 3240 Hillview Ave, Palo Alto, CA 94304 | | watanabe@docomoinnovatio ns.com | |
| Haralabos Papadopoulos | | | | hpapadopoulos@docomoinno vations.com | |

Authors (continued)

| Name | Affiliation | Address | Phone | email |
|-------------------|-------------------|--|-------|---------------------------|
| Laurent cariou | Orange | | | Laurent.cariou@orange.com |
| Thomas Derham | | | | thomas.derham@orange.com |
| Wookbong Lee | LG Electronics | 19, Yangjae-daero 11gil, Seocho-gu, Seoul 137-130, Korea | | wookbong.lee@lge.com |
| Kiseon Ryu | | | | kiseon.ryu@lge.com |
| Jinyoung Chun | | | | jiny.chun@lge.com |
| Jinsoo Choi | | | | js.choi@lge.com |
| Jeongki Kim | | | | jeongki.kim@lge.com |
| Giwon Park | | | | giwon.park@lge.com |
| Dongguk Lim | | | | dongguk.lim@lge.com |
| Suhwook Kim | | | | suhwook.kim@lge.com |
| Eunsung Park | | | | esung.park@lge.com |
| HanGyu Cho | | | | hg.cho@lge.com |
| Albert Van Zelst | Qualcomm | Straatweg 66-S Breukelen, 3621 BR Netherlands | | allert@qti.qualcomm.com |
| Alfred Asterjadhi | | 5775 Morehouse Dr. San Diego, CA, USA | | aasterja@qti.qualcomm.com |
| Bin Tian | | 5775 Morehouse Dr. San Diego, CA, USA | | btian@qti.qualcomm.com |
| Carlos Aldana | | 1700 Technology Drive San Jose, CA 95110, USA | | caldana@qca.qualcomm.com |
| George Cherian | | 5775 Morehouse Dr. San Diego, CA, USA | | gcherian@qti.qualcomm.com |
| Gwendolyn Barriac | | 5775 Morehouse Dr. San Diego, CA, USA | | gbarriac@qti.qualcomm.com |

Authors (continued)

| Name | Affiliation | Address | Phone | email |
|-----------------|-------------|---|-------|---------------------------|
| Hemanth Sampath | Qualcomm | 5775 Morehouse Dr. San Diego, CA, USA | | hsampath@qti.qualcomm.com |
| Menzo Wentink | | Straatweg 66-S Breukelen, 3621 BR Netherlands | | mwentink@qti.qualcomm.com |
| Richard Van Nee | | Straatweg 66-S Breukelen, 3621 BR Netherlands | | rvanee@qti.qualcomm.com |
| Rolf De Vegt | | 1700 Technology Drive San Jose, CA 95110, USA | | rolfv@qca.qualcomm.com |
| Sameer Vermani | | 5775 Morehouse Dr. San Diego, CA, USA | | svverman@qti.qualcomm.com |
| Simone Merlin | | 5775 Morehouse Dr. San Diego, CA, USA | | smerlin@qti.qualcomm.com |
| Tevfik Yucek | | 1700 Technology Drive San Jose, CA 95110, USA | | tyucek@qca.qualcomm.com |
| VK Jones | | 1700 Technology Drive San Jose, CA 95110, USA | | vkjones@qca.qualcomm.com |
| Youhan Kim | | 1700 Technology Drive San Jose, CA 95110, USA | | youhank@qca.qualcomm.com |

Authors (continued)

| Name | Affiliation | Address | Phone | email |
|---------------|-----------------|---|-----------------|----------------------------|
| James Yee | Mediatek | No. 1 Dusing 1 st Road, Hsinchu, Taiwan | +886-3-567-0766 | james.yee@mediatek.com |
| Alan Jauh | | | | alan.jauh@mediatek.com |
| Chingwa Hu | | | | chingwa.yu@mediatek.com |
| Frank Hsu | | | | frank.hsu@mediatek.com |
| Thomas Pare | Mediatek USA | 2860 Junction Ave, San Jose, CA 95134, USA | +1-408-526-1899 | thomas.pare@mediatek.com |
| ChaoChun Wang | | | | chaochun.wang@mediatek.com |
| James Wang | | | | james.wang@mediatek.com |
| Jianhan Liu | | | | Jianhan.Liu@mediatek.com |
| Tianyu Wu | | | | tianyu.wu@mediatek.com |
| Russell Huang | | | | russell.huang@mediatek.com |

Abstract

- **In this presentation, we discuss the backward compatibility requirement for 11ax devices from the perspectives of frame structure.**
- **We propose to prepend legacy preamble duplicated on each 20 MHz for each 11ax PPDU.**
- **We also discuss the necessity of having HE-SIG-A in 11ax PPDU after legacy preamble.**

Backward compatibility and Coexistence

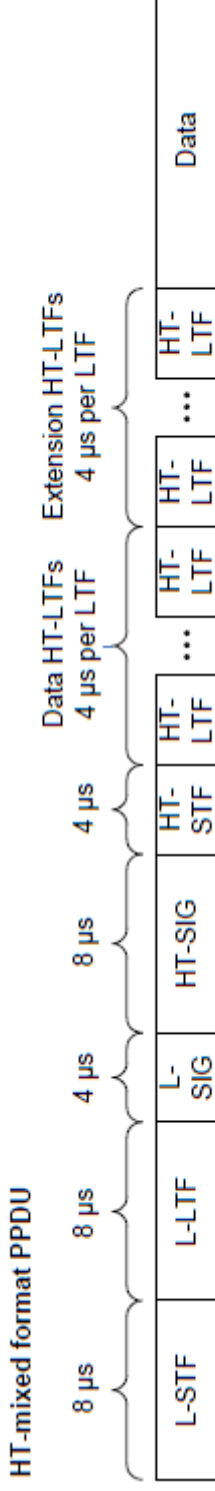
- In the PAR&CSD [1] of 11ax, the backward compatibility was defined as

*“This amendment defines operations in frequency bands between 1 GHz and 6 GHz. The new amendment shall enable **backward compatibility and coexistence with legacy IEEE 802.11 devices operating in the same band.**”*

- **11ax STA can decode legacy PPDU format operating in the same band.**
- **Legacy STAs can reliably detect 11ax preamble and defer its transmission within the packet duration**

Preamble in 11n

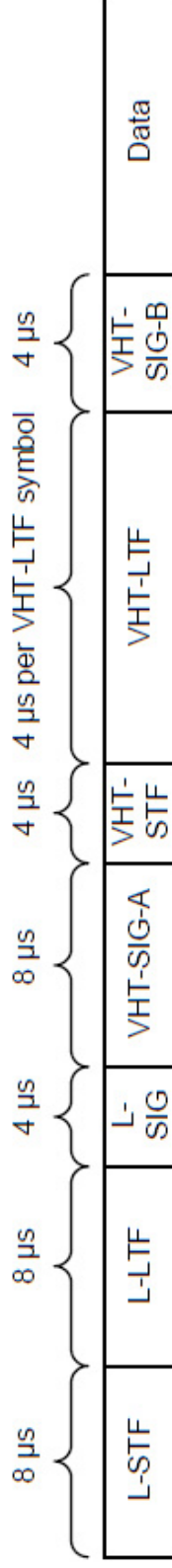
- **There is a mixed format for 11n PPDU**



- **11n receivers acquire synchronization through legacy preamble and decide whether 11n PPDU format by checking the phase rotation of the first HT-SIG symbol.**
- **Legacy receivers (11a) will detect legacy preamble and decode/defer the rest of PPDU by the time duration indicated in the L-SIG**

Preamble in 11ac

- 11ac keeps the mixed format PPDU

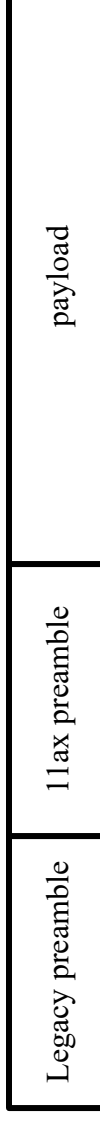


- 11ac receivers acquire synchronization and PPDU length in the legacy preamble and decide whether 11ac PPDU format by the phase rotation of 2 successive VHT-SIG-A symbols.
- Legacy receiver (11n/a) regard 11ac PPDU as 11a PPDU and decode/defer the rest of PPDU by the time duration indicated in the L-SIG

Preamble structure for 11ax PPDU

- legacy preamble

- In order to keep backward compatibility with legacy devices(11a/n/ac), it is straightforward to prepend a legacy preamble before each 11ax PPDU.
 - 11ax receiver can initially acquire synchronization through L-STF and L-LTF, and also channel estimation to decode 11ax preamble.



- Legacy STA can detect the PPDU existence and defer their transmission by the LENGTH indicated in L-SIG.
 - It is more reliable(-82dBm) and energy efficient than ED to prevent the unexpected interference from legacy STA

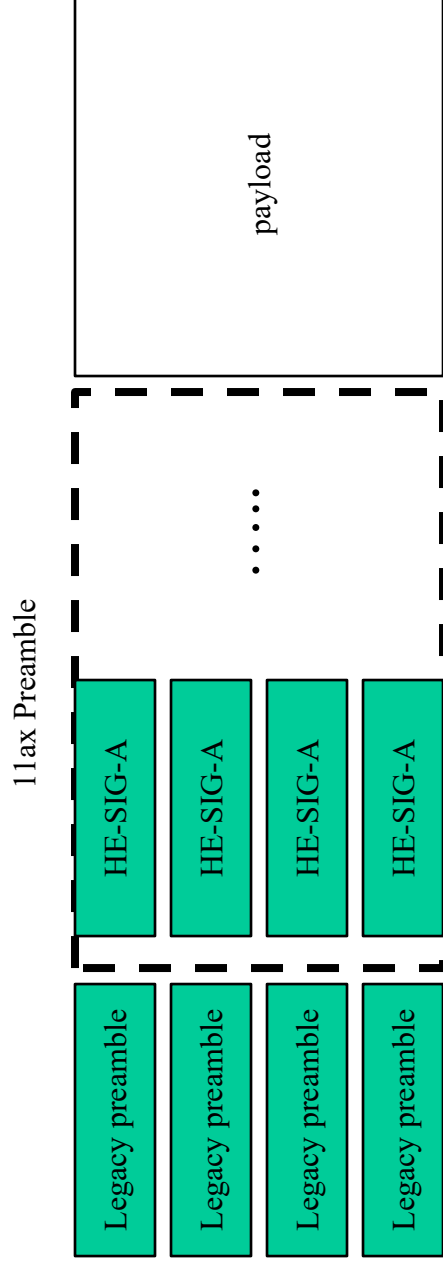
Preamble structure for 11ax PPDU

- HE-SIG-A

- **Background**
 - All intended 11n/ac receivers decode HT-SIG/VHT-SIG-A following legacy preamble to obtain common configuration information of the following PPDU.
- **11ax PPDU should also contain HE-SIG-A to carry some similar fields as in HT-SIG/VHT-SIG-A of 11n/ac, e.g. BW, GI.**
- **HE-SIG-A uses 64-FFT on each 20MHz channel**
 - Receiver can do coherent detection of HE-SIG-A based on the CSI estimation from L-LTF.
 - Legacy STA can be spoofed to receive a 11a/ac PPDU by specific design of modulation scheme.

Preamble structure for 11ax PPDU - for more than 20MHz channel

- Similar to 11n/11ac, the legacy preamble and HE-SIG-A shall be duplicated on each 20MHz in order to maintain the reliability of carrier sensing and low PAPR at transmitter.



*For illustration only

summary

- **In this presentation, we proposed to prepend legacy preamble for 11ax PPDU duplicated on each 20MHz for the backward compatibility with legacy devices.**
- **HE-SIG-A transmitted with 64-FFT duplicated on each 20MHz is used to indicate common control information.**

Straw Poll 1

- **Do you agree to add to TG Specification Framework**
x.y.z An HE PPDU shall include the legacy preamble (L-STF, L-LTF and L-SIG), duplicated on each 20 MHz, for backward compatibility with legacy devices.
- **Y**
- **N**
- **ABS**

Straw Poll 2

- Do you agree to add to the TG Specification

Framework:

x.y.z HE-SIG-A (using DFT period of 3.2 us and subcarrier spacing of 312.5 kHz) is duplicated on each 20MHz after the legacy preamble to indicate common control information.

- **Y**
- **N**
- **ABS**

Reference

- [1] IEEE 802.11-14/0165r1 “802.11 HEW SG Proposed PAR”**