

HE-SIG-B Mapping and Compression

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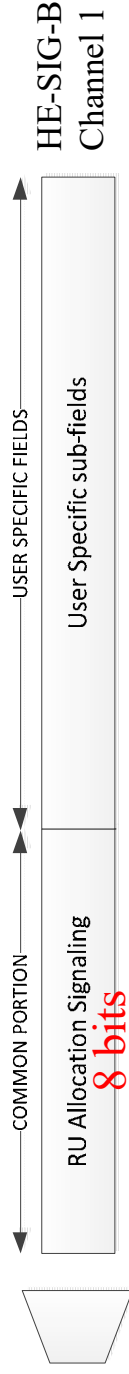
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HE-SIG-B

- **Basic structure and contents of the HE-SIG-B for MU-PPDUs were agreed in the last meeting**
 - Two HE-SIG-B channels (per 40MHz) – duplicated for BWs > 40Mhz [2]
 - The contents of the common and user specific sub-fields [3]
 - Number of bits of RU allocation signaling for different bandwidths [3]
 - Load balancing for user redistribution among HE-SIG-B channels when MU-MIMO is used in RUs > 242 tones are used.[3]
- **This presentation discusses**
 - Mapping of allocation information to the two HE-SIG-B channels.
 - Optimization of HE-SIG-B transmission and the need for indication in HE-SIG-A
 - Compression of common information for MU-MIMO

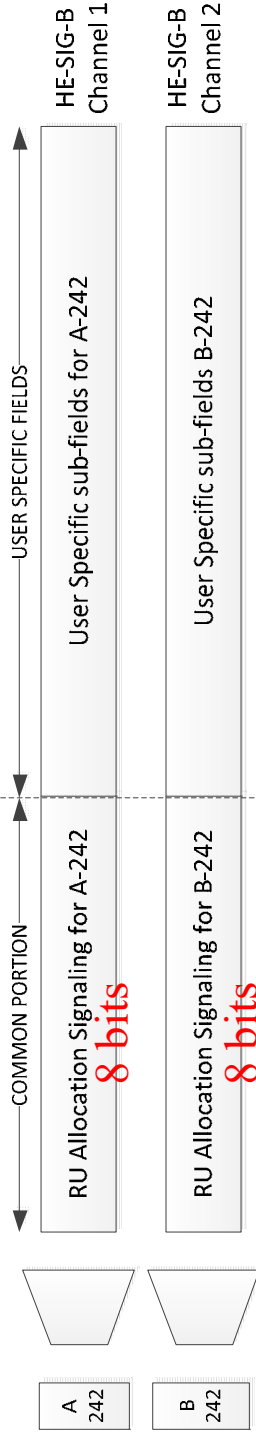
HE-SIG-B Information Mapping

- For 20MHz, the HE-SIG-B information mapping is straight forward
 - Signal the RU Allocation Signaling using 8 bits in the common information fields followed by user specific sub-fields
 - STA uses the RU allocation signaling and the position of its allocation to unambiguously identify the RU containing its data



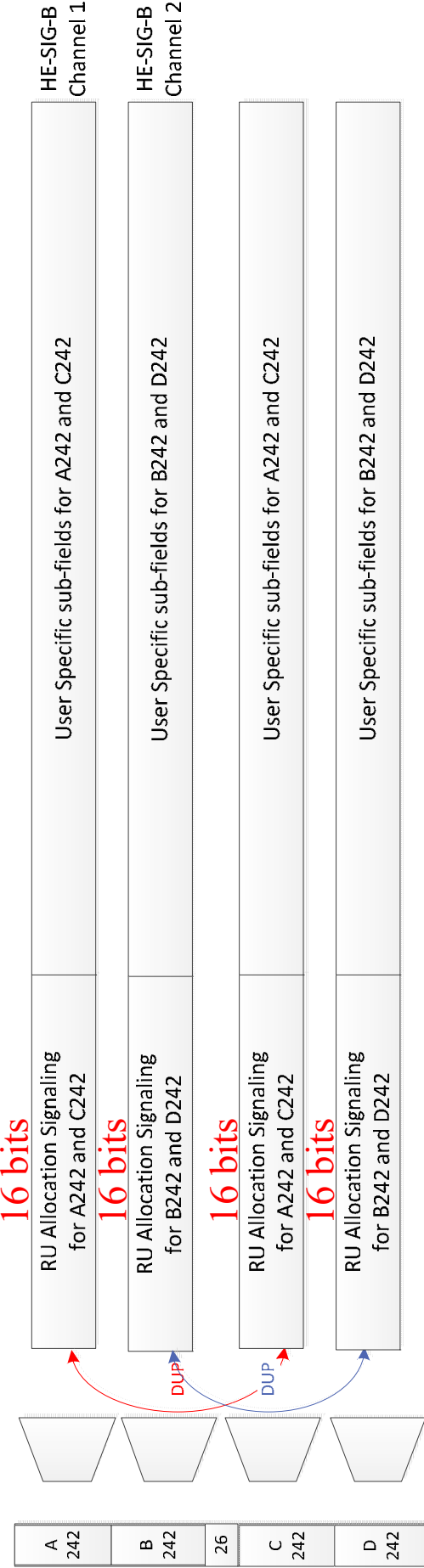
- For 40MHz, the HE-SIG-B has two channels each with different information
 - Each 20MHz channel carries control information for users scheduled in that 20MHz segment

- May require padding in either of channels for last symbol alignment



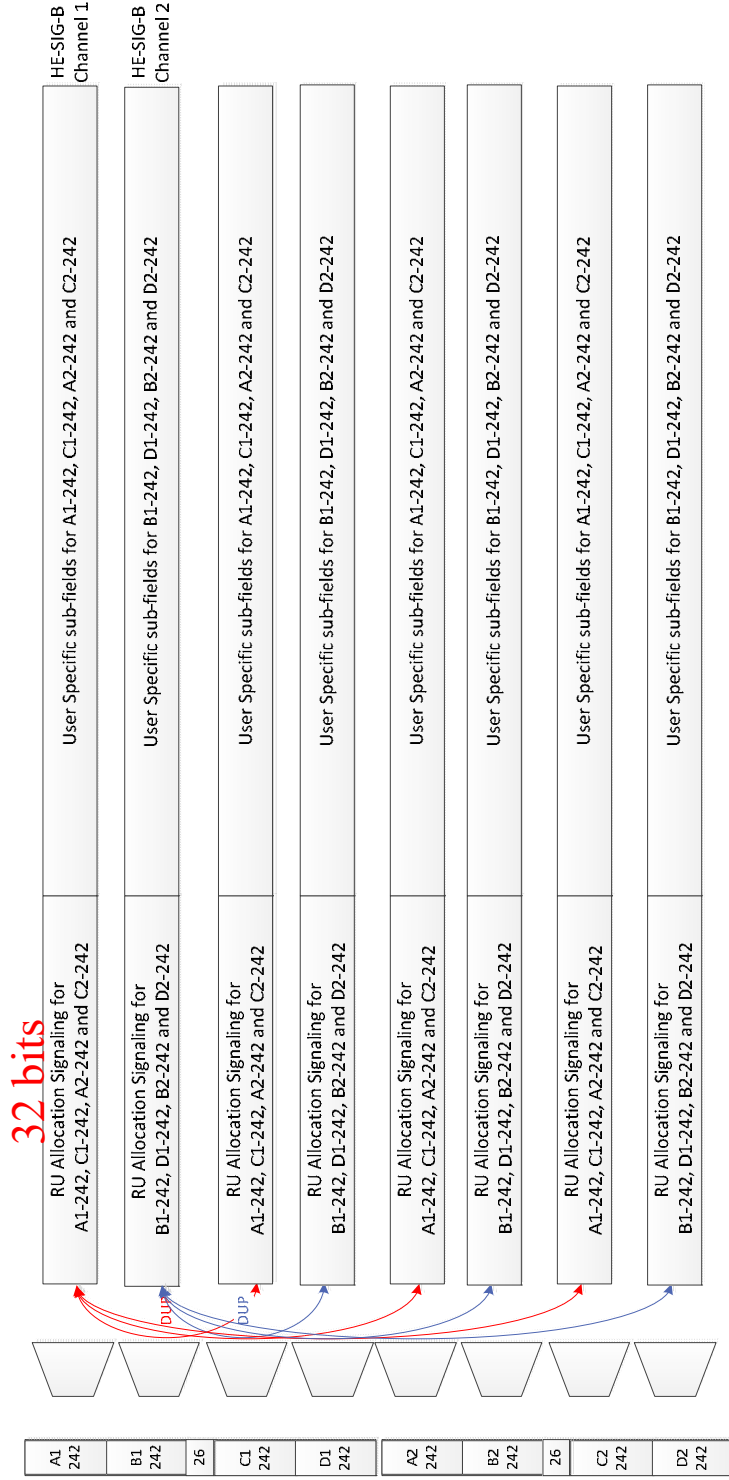
HE-SIG-B Information Mapping (80MHz)

- RU Allocation Signaling of four 20MHz segments have to be mapped to 2 HE-SIG-B channels duplicated per 40MHz [2]
 - 80MHz tone plan not aligned with 20MHz segments.
 - We refer to the 242 tones RUs that span the 20MHz segment– and can signal RU arrangements for smaller RUs with-in the 242 tone RUs - 8 bits per 242 tone RU – 16 bits of RU allocation signaling per HE-SIG-B Channel
 - The allocation signaling for the 26 tone RU around the DC is TBD as captured in the SFD.[1]
- The default mapping of the RU allocation signaling and the associated user specific sub-fields for the four 242 tone RU segments to two HE-SIG-B channels is shown below



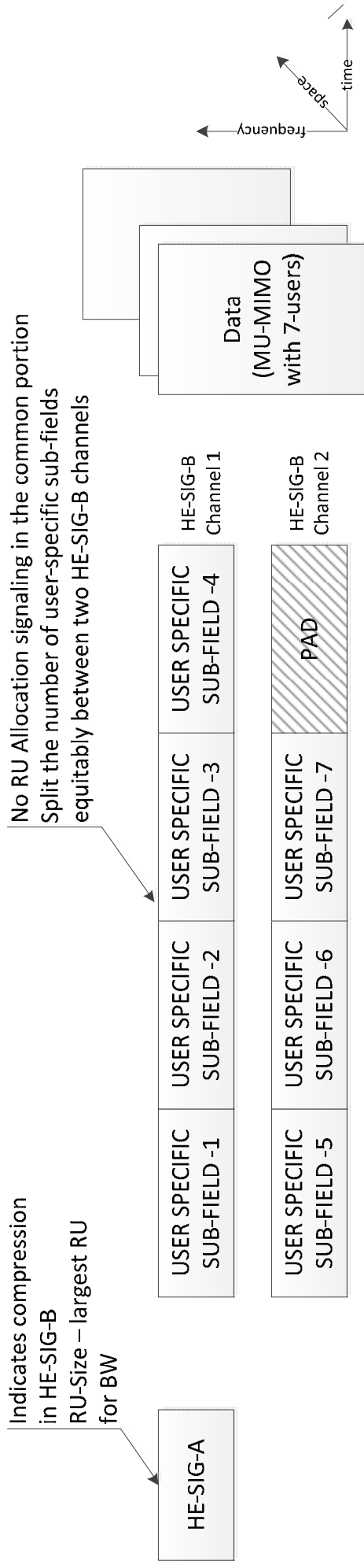
Extending Multiplexing Support to 160MHz

- 160MHz tone plan built as two concatenated 80MHz tone plans
- RU Allocation Signaling information and the associated user specific sub-fields for four 242 tones RU segments have to be added to each HE-SIG-B channels - 32 bits totally for the four channels
- The signaling of the two central 26 tone RUs in each 80MHz can be signaled separately and is currently TBD.
- The default mapping of the RU allocation signaling and the associated user specific sub-fields for the eight 242 tone RU segments to two HE-SIG-B channels is shown below



HE-SIG-B Compression for MU-MIMO

- For MU-MIMO over the entire BW, 1 bit in HE-SIG-A indicates compression.
 - No RU signaling information transmitted in HE-SIG-B
 - RU Size is set to the largest RU for the BW (20MHz – 242 tone RU, 40 – 484, 80– 996, 160 – 2x996)
- The user specific sub-fields are split equitably between the two HE-SIG-B Channels for efficient load-balancing
 - For k user MU-MIMO PPDU, $1, \dots, \left\lfloor \frac{k}{2} \right\rfloor$ user specific sub-fields in HE-SIG-B channel 1 and $\left\lceil \frac{k}{2} \right\rceil + 1, \dots, k$ user specific sub-fields in HE-SIG-B channel 2
 - Pad to end contents in both channels at same OFDM symbol



Summary

- The resource allocation signaling in the common control field and user specific subfields for an STA carried in the HE-SIG-B are transmitted in the same 20MHz sub-channel as the data for 20MHz and 40MHz PPDU.
- The default mapping of the RU allocation signaling and user-specific fields of the component 242 tone RU segments of 80MHz and 160MHz PPDU to the two HE-SIG-B channels are also defined.
- When 11ac- style MU-MIMO over the whole bandwidth is used, no RU allocation signaling is necessary in the common portion of the HE-SIG-B
 - One compression bit in the HE-SIG-A indicates full bandwidth MU-MIMO.
 - The user specific fields are split equitably between the two HE-SIG-B channels.
 - Improves efficiency by saving HE-SIG-B overhead.

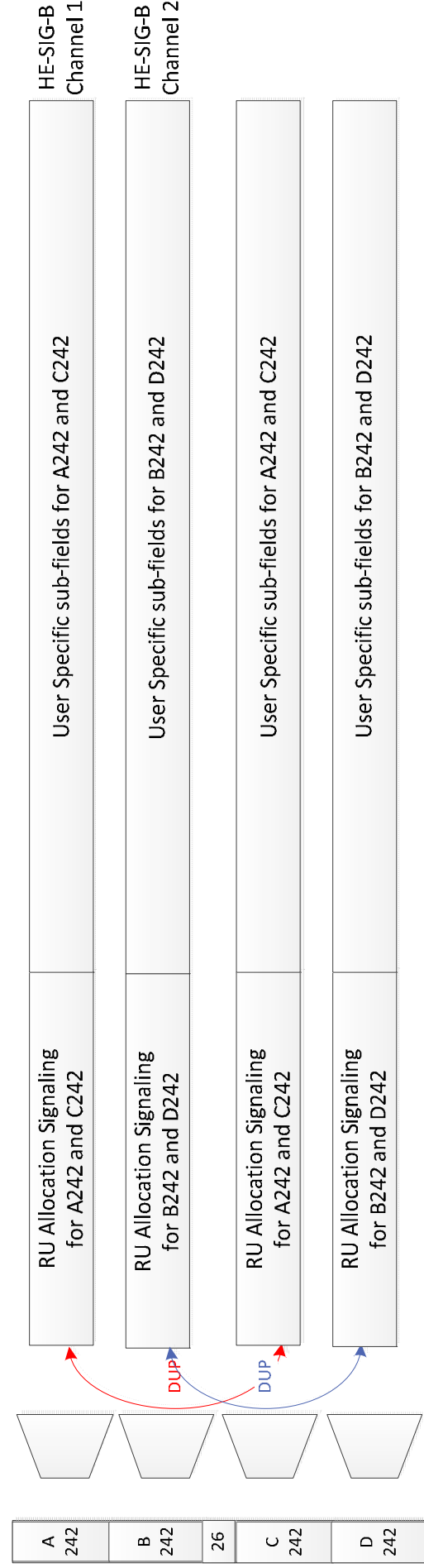
References

- [1] 11-15-0132-09-00ax-spec-framework
- [2] 11-15-0821-02-00ax-HE-SIG-B-structure
- [3] 11-15-1066-00-00ax-he-sig-b-contents

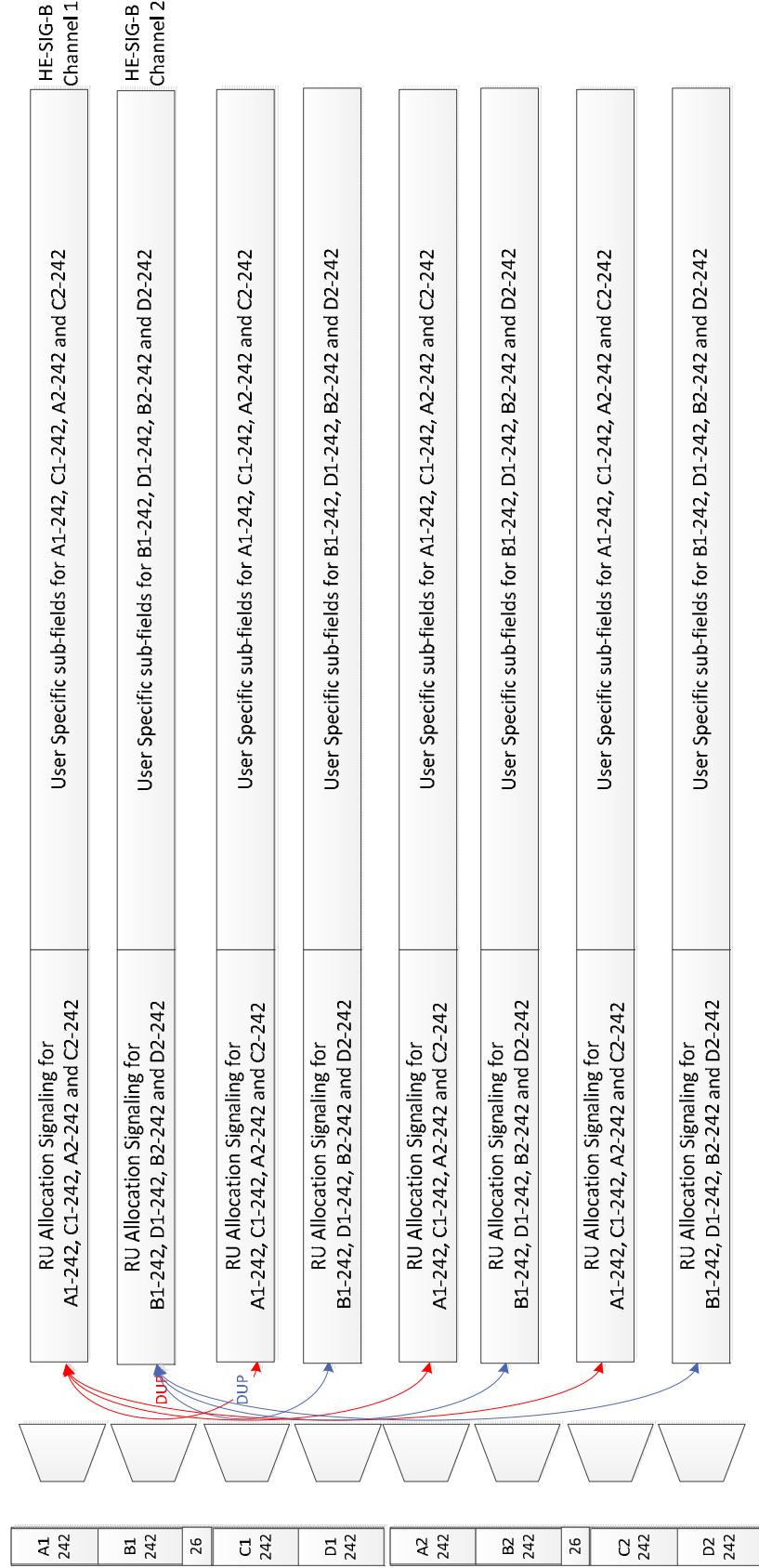
Straw Poll #1

Do you agree to add the following text to the 11ax SFD:

- The resource allocation signaling in the common control field and user specific subfields for an STA carried in the HE-SIG-B are transmitted in the same 20MHz sub-channel as the data for 20MHz and 40MHz PPDU.
- For an 80MHz PPDU, the default mapping per 20MHz as shown in the figure below.



- For a 160MHz PPDU , the default mapping per 20MHz is as shown in the figure below



Straw Poll #2

Do you agree to add the following text to the 11ax SFD:

- A compression bit is carried in the HE-SIG-A MU format to differentiate full BW MU-MIMO from OFDMA MU PPDU.
- In case of full BW MU-MIMO, the following conditions hold:
 - Only applicable for RU sizes 242,484,996,2*996
 - The RU information in HE-SIGB common is not signaled
 - For bandwidths $> 20\text{MHz}$, the user specific sub-fields are split equitably between the two HE-SIG-B Channels