Modifications to the Sub-band Partitioning Formulas (Section 16.3.5.2.1 and 16.3.8.2.1)

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Venue: Session #65 – San Diego Meeting

Re: P802.16m/D3 comments for LB30b

Area: Section 16.3.5.2.1 – DL PHY Structure

Section 16.3.8.2.1 – UL PHY Structure

Abstract:

In the PHY structure, when the maximum number of sub-band CRUs is allocated, the location of the PRUs allocated to be DRUs is not well suited for frequency diversity. We propose to slightly modify the sub-band partitioning equations to improve the location of the PRUs that are allocated to be minibands.

Purpose: Discuss and adopt

Modifications to the Sub-band Partitioning Formulas
DL: Section 16.3.5.2.1
UL: Section 16.3.8.2.1

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Problem Statement & Motivation

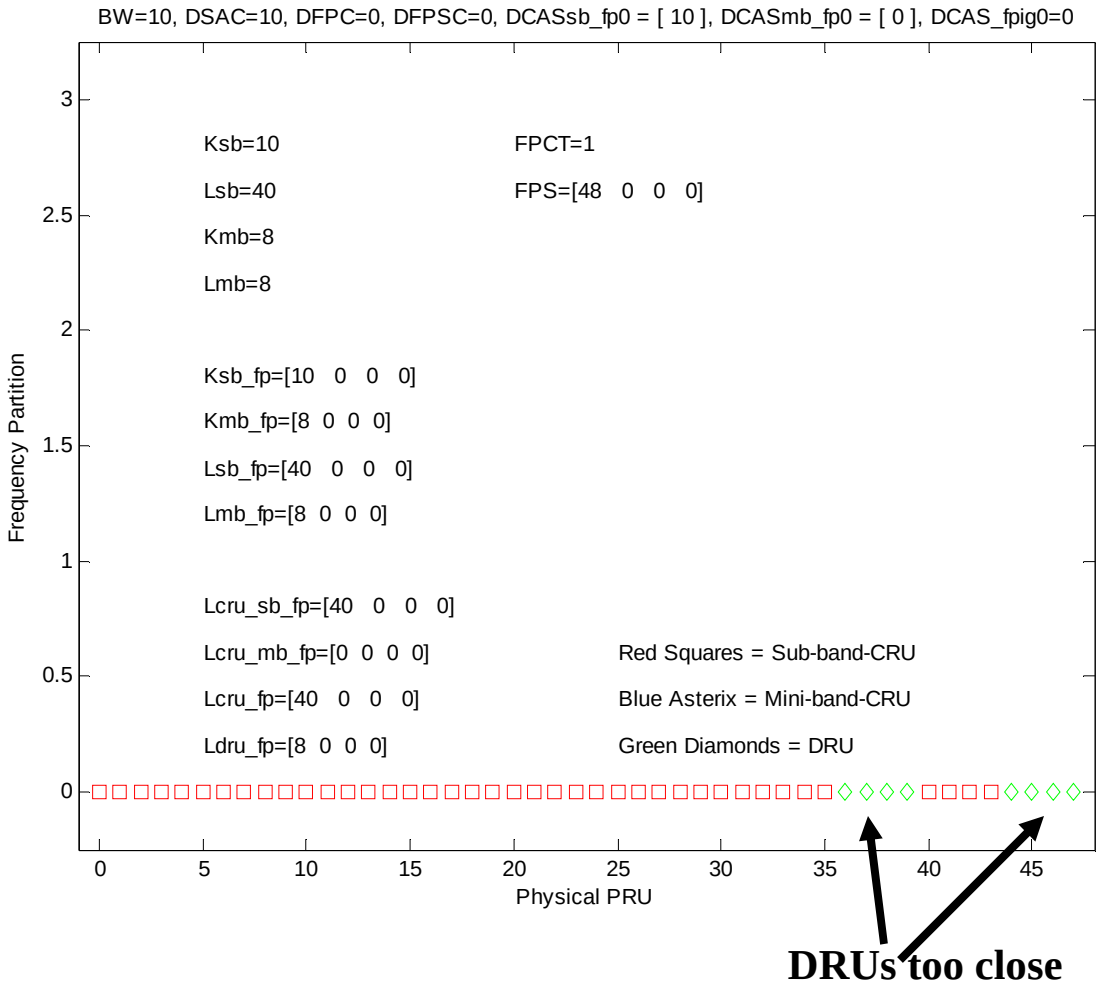
- The A-MAP is required to be transmitted in DRUs
- All subframes are required to have an A-MAP
- When the PHY structure is configured for the maximum allowable number of sub-bands (e.g., the UMi/InH configuration), only a small number of PRUs are allocated to be DRUs
- Those small number of DRUs are poorly placed given the intent to maximize diversity.

Configuring the Current PHY for Max Number of Sub-band LRUs for one Frequency Partition (10MHz)

- 10MHz → 48 PRUs → Maximum of 12 Sub-bands
- DSAC=10 → Sets the number of Sub-bands to be 10 (the maximum allowed according to Table 769)
- DFPC = 0 → One Frequency Partition (Table 772)
- DFPSC = 0 → No sub-bands in non-zero partitions
- DCASsb0 = 10 → Number of sub-band CRUs in FP0 set equal to the total number of sub-bands
- DCASmb0 = 0 → No mini-band CRUs in FP0
- DCASi = 0 → No CRUs in non-zero partitions

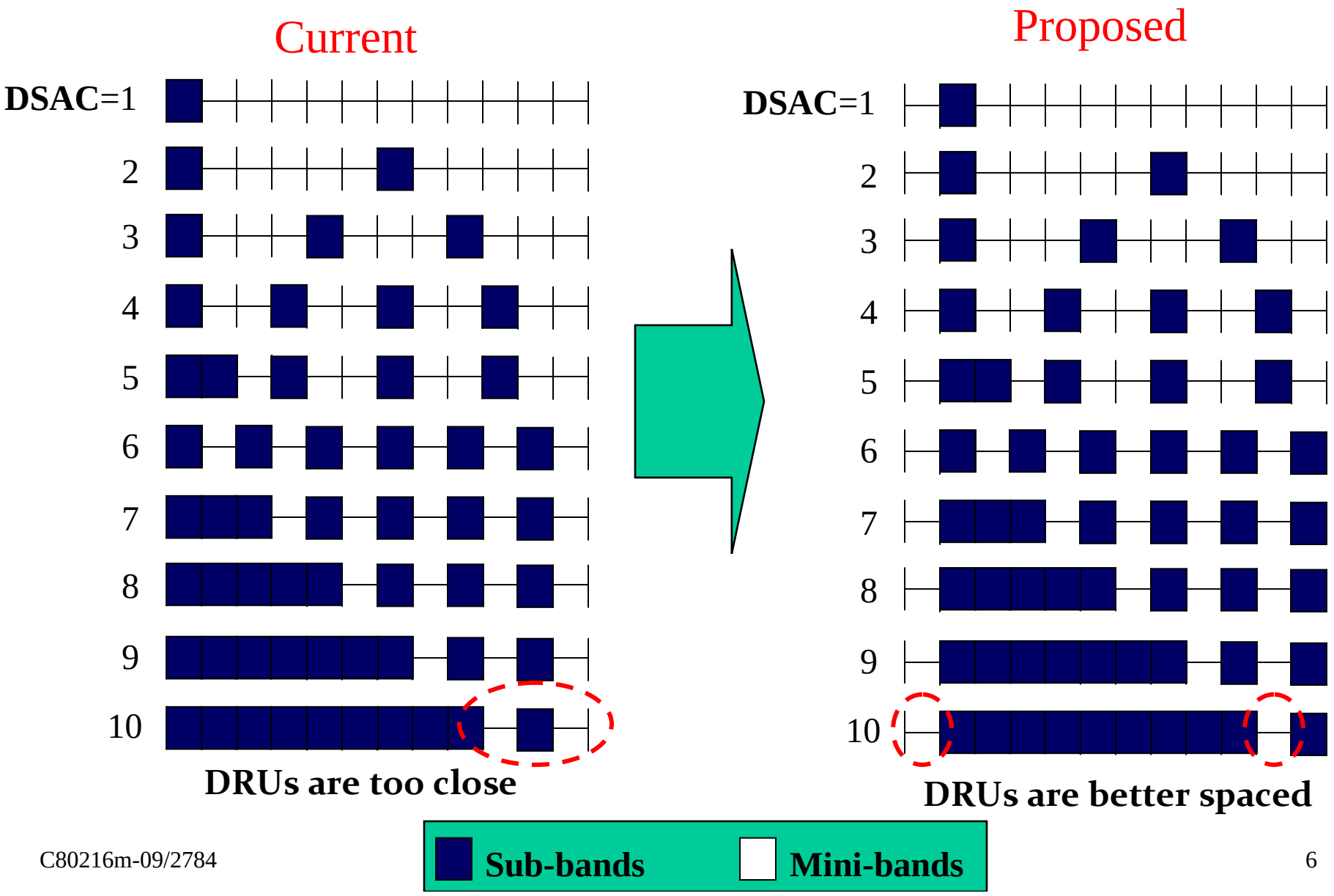
Current PHY Structure – 10 MHz
Maximum allowed number of SLRUs

- UMi /InH PHY configuration
- The A-MAP is confined to the DRUs
- **Poorly placed for Frequency Diversity**
  - Need wider separation!
- The same problem occurs on the UL for the mini-tile-based DLRUs
- How to fix?



Proposal Overview

- Perform a right circular shift on the sub-bands



Proposed Text Changes (1 of 4)

- [*Modify Equation 176 on page 318, starting on line 52 as follows:*]

$$PRU_{SB}[j] = PRU[i];\ j = 0,1,....,L_{SB} - 1 \qquad (176)$$

where

~~$$i = N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{j}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{j}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{j\} \bmod \{N_1\}$$~~

$$i = \bmod\left(N_1 + \left(N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{j}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{j}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{j\} \bmod \{N_1\} \right), N_{pru} \right)$$

Proposed Text Changes (2 of 4)

- [*Modify Equation 178 on page 319, starting on line 6 as follows:*]

$$i = \begin{cases} N_1 \cdot \left\{ \left\lfloor \frac{N_{sub}}{K_{SB}} \right\rfloor \cdot \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \right\} \bmod \{N_{sub}\} + \{k + L_{SB}\} \bmod \{N_1\}; & K_{SB} > 0 \\ k \quad ; & K_{SB} = 0 \end{cases} \quad (178)$$

$$i = \begin{cases} \bmod\left(N_1 + \left(N_1 \cdot \left\{ \left\lfloor \frac{N_{sub}}{K_{SB}} \right\rfloor \cdot \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \right\} \bmod \{N_{sub}\} + \{k + L_{SB}\} \bmod \{N_1\} \right), N_{pru} \right); & K_{SB} > 0 \\ k \quad ; & K_{SB} = 0 \end{cases} \quad (178)$$

Proposed Text Changes (3 of 4)

- [*Modify Equation 233 on page 493, starting on line 7 as follows:*]

~~$$i = N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{j}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{j}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{j\} \bmod \{N_1\} \quad (233)$$~~

$$i = \bmod \left(N_1 + \left(N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{j}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{j}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{j\} \bmod \{N_1\} \right), N_{pru} \right) \quad (233)$$

Proposed Text Changes (4 of 4)

- [*Modify Equation 235 on page 493, starting on line 18 as follows:*]

$$i = \begin{cases} N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{k + L_{SB}\} \bmod \{N_1\}; & K_{SB} > 0 \\ k \quad ; & K_{SB} = 0 \end{cases} \quad (235)$$

$$i = \begin{cases} \bmod \left(N_1 + \left(N_1 \cdot \{ \left\lceil \frac{N_{sub}}{K_{SB}} \right\rceil \cdot \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor + \left\lfloor \left\lfloor \frac{k + L_{SB}}{N_1} \right\rfloor \cdot \frac{GCD(N_{sub}, \lceil N_{sub} / K_{SB} \rceil)}{N_{sub}} \right\rfloor \} \bmod \{N_{sub}\} + \{k + L_{SB}\} \bmod \{N_1\} \right), N_{pru} \right); & K_{SB} > 0 \\ k \quad ; & K_{SB} = 0 \end{cases} \quad (235)$$