Proposed Modification to the CRU/DRU Allocation in the PHY Structure (Section 15.3.5.3.1 and 15.3.8.3.1)

IEEE 802.16 Presentation Submission Template (Rev. 9)

Document Number:

  C802.16m-09/2529

Date Submitted:

  2009-11-06

Source:

Fred Vook, Mark Cudak, Bill Hillery, Eugene Visotsky, Anup Talukdar

Motorola

*http://standards.ieee.org/faqs/affiliationFAQ.html

Venue: Session #64 - Atlanta Meeting

Re: P802.16m/D2 comments for LB30a

    Area: Section 15.3.5.3.1 – DL PHY Structure and Section 15.3.8.3.1 – UL PHY Structure.

Purpose:

  This contribution proposes a minor modification to the CRU/DRU allocation method to remove some un-necessary flexibility. Specifically, we propose that the $DCAS_{sb0}$ variable be required to be less than or equal to the K_{sb} variable in the DL PHY structure.

Proposed Modification to the CRU/DRU Allocation in the PHY Structure

Fred Vook
Motorola

Review:
Key Variables for Configuring the DL PHY structure

- **DSAC** = DL Sub-band Allocation Count
  - Determines Number of Sub-bands Ksb according to Tables 768-770
- **DFPC** = DL Frequency Partition Configuration
  - Determines number of Frequency Partitions and the split of PRUs across the partitions (Tables 771 – 773)
  - Determines Frequency Partition Count (FPCT)
    - Currently 1, 3, 4 are allowed
- **DFPSC** = DL Frequency Partition Sub-band Count
  - Determines number of sub-bands in the non-zero partitions
- **DCAS$_{SB,0}$** = Number of Sub-band CRUs in FP0 (units are sub-bands)
  - Signaled explicitly in SFH (5/4/3 bits for 20MHz/10MHz/5MHz)
- **DCAS$_{MB,0}$** = Determines Number of Mini-band CRUs in FP0
  - Signaled in SFH: table-lookup is used (Tables 774-776)
- **DCASi** = Number of allocated CRUs (SB- and MB-) in the non-zero partitions (units are sub-bands)

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

- Configuration for UMi/InH scenario
- 10MHz $\rightarrow$ 48 PRUs $\rightarrow$ Maximum of 12 Sub-bands
- DSAC=10 $\rightarrow$ Sets the number of Sub-bands to be 10 (the maximum allowed according to Table 769)
- DFPC = 0 $\rightarrow$ One Frequency Partition (Table 772)
- DFPSC = 0 $\rightarrow$ No subbands in non-zero partitions
- $DCAS_{SB,0}$ = 10 $\rightarrow$ Number of sub-band CRUs in FP0 set equal to the total number of sub-bands
- $DCAS_{MB,0}$ = 0 $\rightarrow$ No mini-band CRUs in FP0
- DCASi = 0 $\rightarrow$ No CRUs in non-zero partitions

PHY Structure with maximum allowed number of SLRUs in 10MHz, FPCT=1

BW=10, DSAC=10, DFPC=0, DFPSC=0, DCASsb_fp0 = [10], DCASmb_fp0 = [0], DCAS_fpig0=0

Ksb=10   FPCT=1

Lsb=40   FPS=[48 0 0 0]

Kmb=8

Lmb=8

Ksb_fp=[10 0 0 0]

Kmb_fp=[8 0 0 0]

Lsb_fp=[40 0 0 0]

Lmb_fp=[8 0 0 0]

Lcru_sb_fp=[40 0 0 0]

Lcru_mb_fp=[0 0 0 0]   Red Squares = Sub-band-CRU

Lcru_fp=[40 0 0 0]   Blue Asterix = Mini-band-CRU

Ldru_fp=[8 0 0 0]   Green Diamonds = DRU

Frequency Partition

Physical PRU
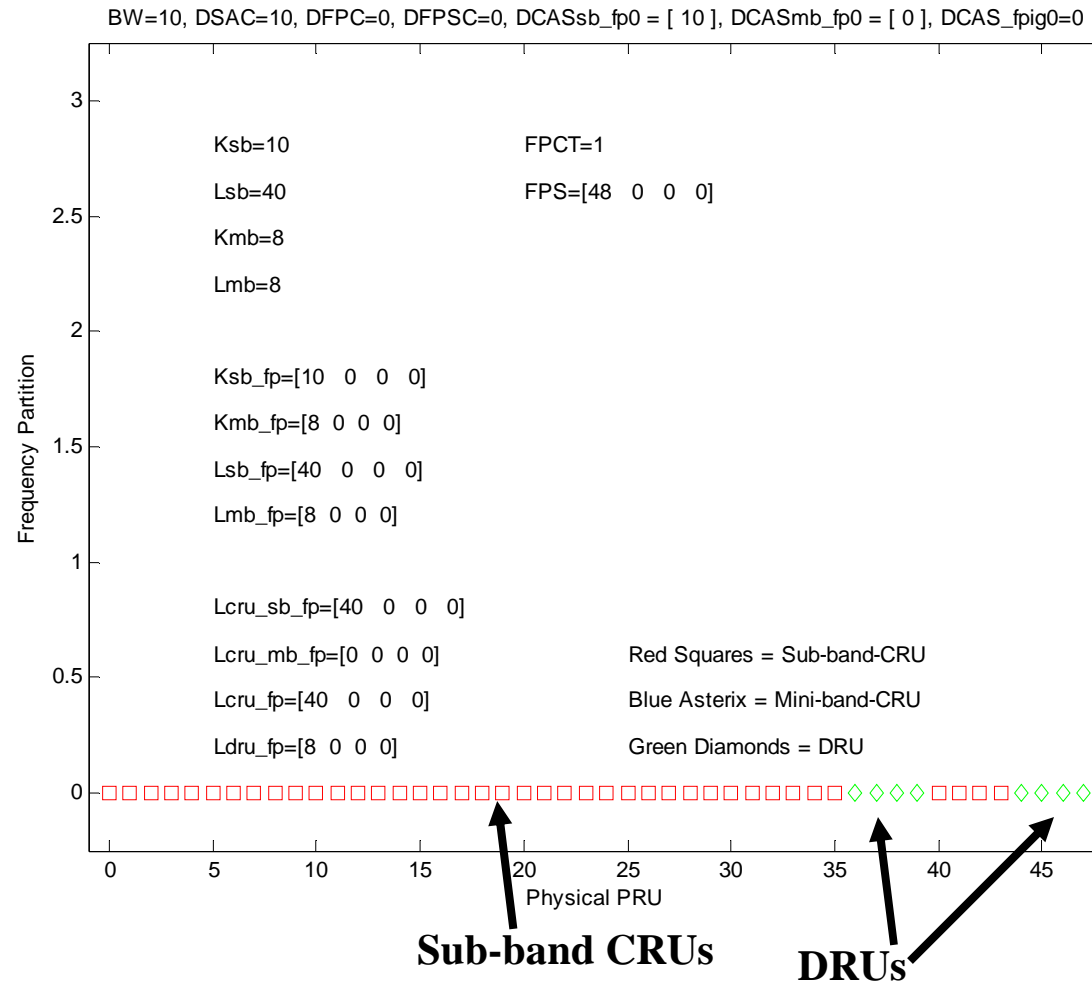
Sub-band CRUs   **DRUs**

The Trouble with DCAS$_{SB,0}$ (1 of 2)

- Consider 10MHz, one frequency partition
- Consider the previous example where the PHY was configured for maximum sub-band CRUs (SLRUs)
- Number of Sub-bands is set with the DSAC variable via a look-up table (Table 769 for 10MHz)
  - DSAC = 10 in previous example (10 sub-bands out of total of 12)
- Number of Sub-Band CRUs set with DCAS$_{SB,0}$
  - DCAS$_{SB,0}$ = 10 in previous example to make the number of Sub-band CRUs correspond to the DSAC setting
- However: Draft D2 puts no restriction on the DCAS$_{SB,0}$ variable other than the number of bits used to signal it.

The Trouble with $DCAS_{SB,0}$ (2 of 2)

- Consider the previous example where the PHY is configured for maximum SLRUs, but where the $DCAS_{SB,0}$ variable set differently:
- Case 1: If DSAC=10, but $DCAS_{SB,0}$ is 9:
  - Some DRUs exist in PRUs that are sub-bands
  - Not a problem
- Case 2: If DSAC=10, but $DCAS_{SB,0}$ is 11:
  - Some Sub-band CRUs exist in PRUs that are mini-bands!
  - This flexibility is not necessary and may create difficulties for sub-band selection
- We propose limiting $DCAS_{SB,0}$ to be no greater than K_{sb}

Case 1: DSAC=10, DCAS$_{SB,0}$ = 9

- Consider the max SLRU configuration, but set the DCAS$_{SB,0}$ variable differently:

- If DSAC=10, but DCAS$_{SB,0}$ is 9:
  - Some DLRUs exist in PRUs that are sub-bands.
  - Not a problem

BW=10, DSAC=10, DFPC=0, DFPSC=0, DCASsb_fp0 = [9], DCASmb_fp0 = [0], DCAS_fpig0=0

Ksb=10   FPCT=1
Lsb=40   FPS=[48   0   0   0]
Kmb=8
Lmb=8

Ksb_fp=[10   0   0   0]
Kmb_fp=[8 0 0 0]
Lsb_fp=[40   0   0   0]
Lmb_fp=[8 0 0 0]

Lcru_sb_fp=[36   0   0   0]
Lcru_mb_fp=[0 0 0 0]   Red Squares = Sub-band-CRU
Lcru_fp=[36   0   0   0]   Blue Asterix = Mini-band-CRU
Ldru_fp=[12   0   0   0]   Green Diamonds = DRU
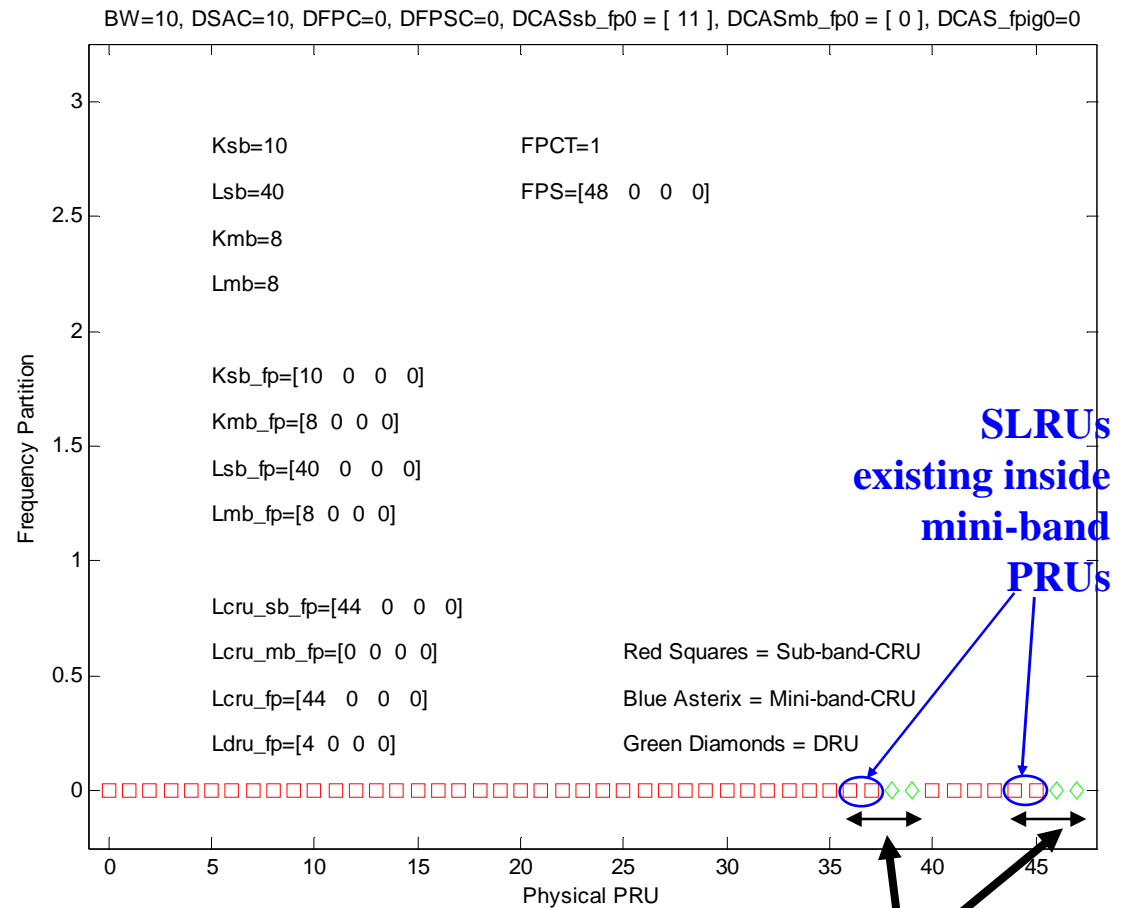
Frequency Partition / Physical PRU
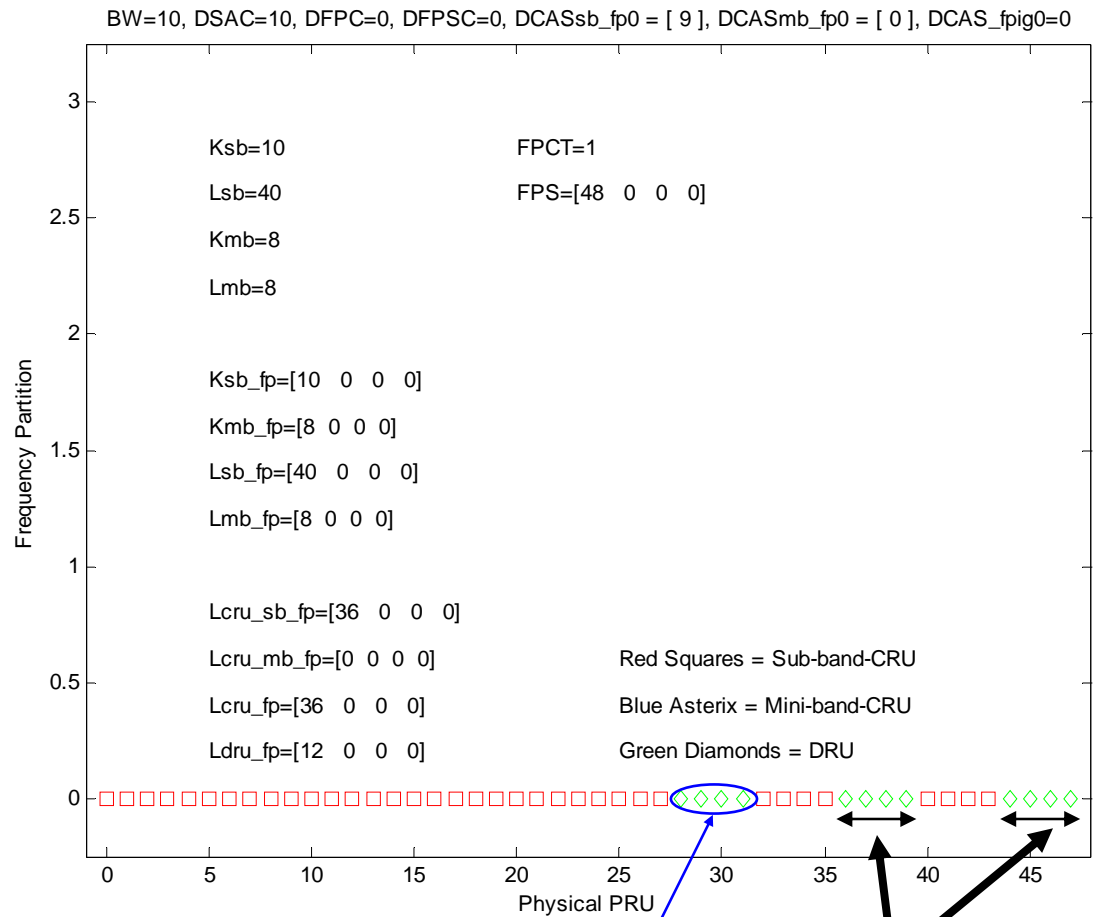
DLRUs existing inside sub-band PRUs

Mini-bands (the rest are sub-bands)

Case 2: DSAC=10, DCAS$_{SB,0}$ = 11

- Consider the max SLRU configuration, but set the DCASsb0 variable differently:

- If DSAC=10, but DCAS$_{SB,0}$ is 11:
  - Some Sub-band CRUs exist in PRUs that are mini-bands!

BW=10, DSAC=10, DFPC=0, DFPSC=0, DCASsb_fp0 = [11], DCASmb_fp0 = [0], DCAS_fpig0=0

Ksb=10   FPCT=1
Lsb=40   FPS=[48 0 0 0]
Kmb=8
Lmb=8

Ksb_fp=[10 0 0 0]
Kmb_fp=[8 0 0 0]
Lsb_fp=[40 0 0 0]
Lmb_fp=[8 0 0 0]

Lcru_sb_fp=[44 0 0 0]
Lcru_mb_fp=[0 0 0 0]   Red Squares = Sub-band-CRU
Lcru_fp=[44 0 0 0]   Blue Asterix = Mini-band-CRU
Ldru_fp=[4 0 0 0]   Green Diamonds = DRU

SLRUs existing inside mini-band PRUs

Mini-bands (the rest are sub-bands)

Proposed Text Changes

- *[Section 15.3.5.3.1, Page 297 (Downlink) : Insert this sentence after the first sentence of the paragraph that starts on line 12:]*

   $DCAS_{SB,0}$ shall be $\leq$ Ksb.

- *[Section 15.3.8.3.1, Page 454 (Uplink) : Insert this sentence after the first sentence of the paragraph that starts on line 12:]*

   $UCAS_{SB,0}$ shall be $\leq$ Ksb.