

# Updates on 802.3bn EPoC Upstream Pilot Proposal

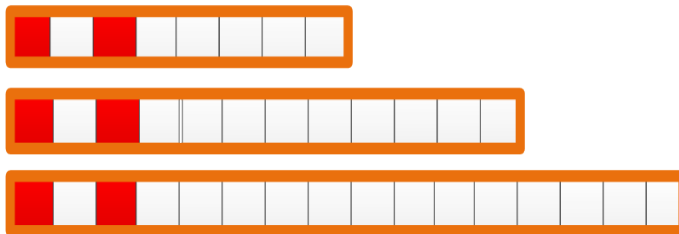
Avi Kliger, Leo Montreuil  
Broadcom

# Resource Block Rules

- RB types are fixed in frequency and set during configuration
- All RBs have a single subcarrier and the same length of 8, 12 or 16 symbols for the entire OFDMA spectrum
- Any change in configuration (type or length) requires a restart
- RBs are configured with a RB type and bit loading

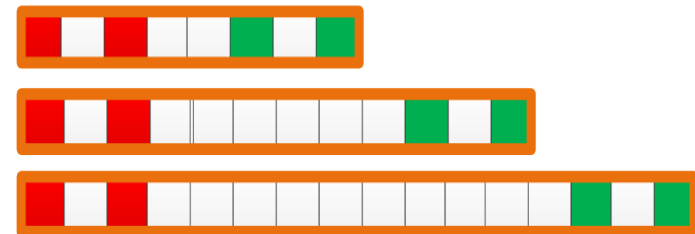
# RB Types and Pilot Patterns

- Three types of RBs
  - Type 0 – RB does not include pilots
  - Type 1 – RB includes two pilots
  - Type 2 – RB includes two pilots and two low-density data subcarriers (“LD pilots”)
    - LD density is four bits lower than data density or QPSK, the largest of the two.



RB Type 1

Two pilots on the first and third symbols



RB Type 2

Two pilots on the first and third symbols and two LD pilots on last and second to last symbols

# Exclusions Rules

- A minimum of eight contiguous used subcarriers between exclusion bands
  - If Exclusions are separated with used subcarriers there must be at least eight contiguous used subcarriers in-between

# Bursts Rules

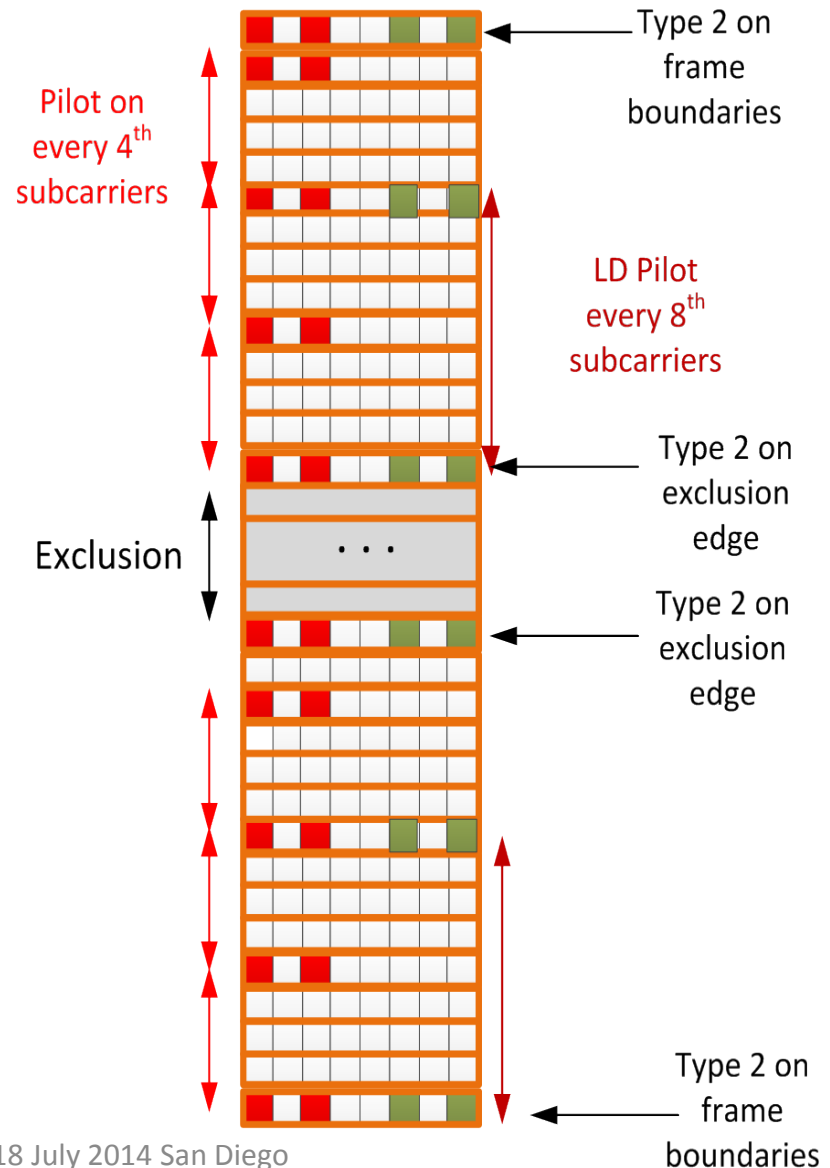
- A Burst must start with a type-2 RB followed by four contiguous subcarriers with start Burst Markers
- A Burst must end with a type-2 RB preceded by four contiguous subcarriers with end Burst Markers
- The burst may comprised of a series of RBs of different types and different bit loading

# Pilots Rules

- Configurable pilot locations
  - Pilot patterns are configurable during network initialization and constant over the entire spectrum
- Pilots on Boundaries
  - Type-2 RBs are always used on OFDMA frame boundaries and exclusions edge subcarriers
- Start of a transmission burst
  - First RB in a transmission burst is always of type #2
- End of a transmission burst
  - Last RB in a transmission burst is always of type #2

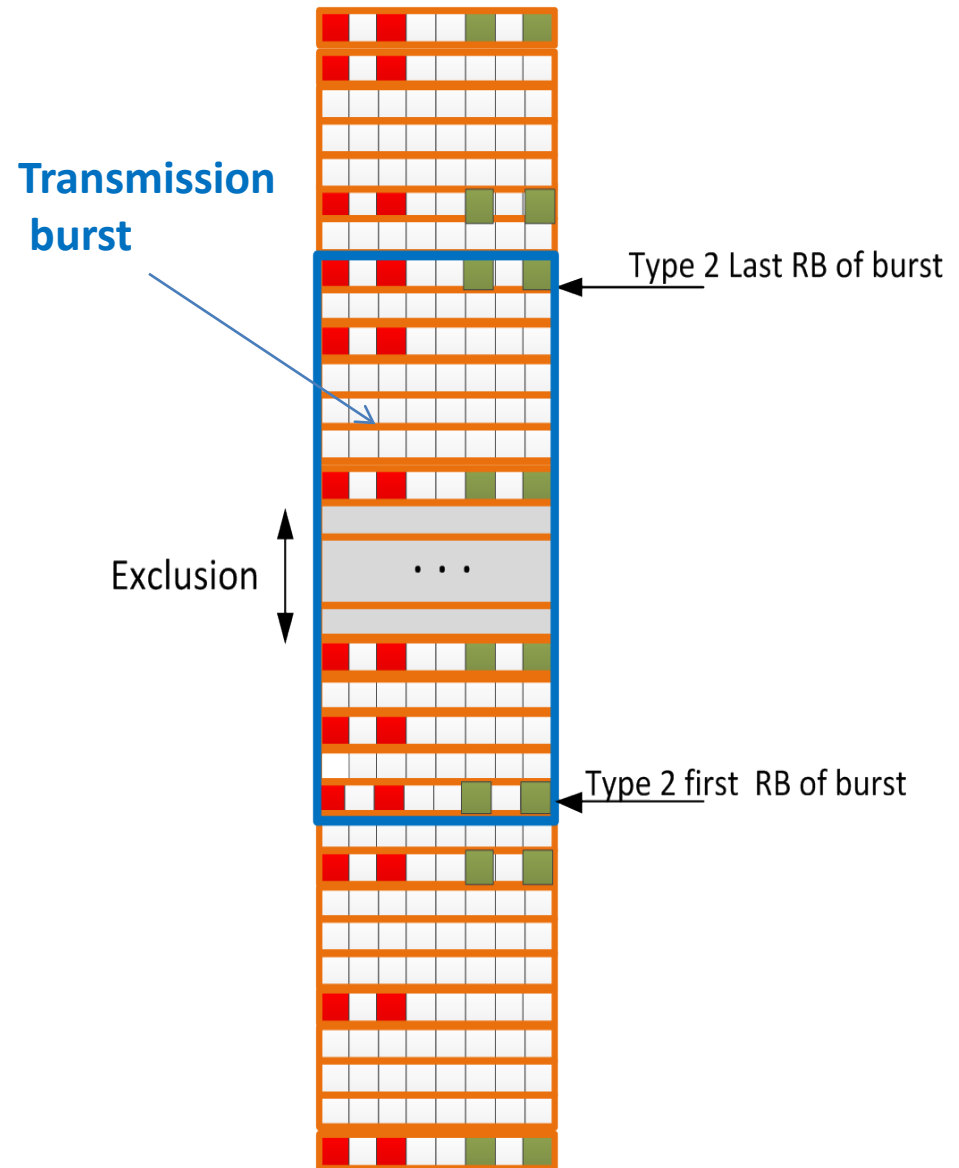
# Pilot Rules – Examples (1)

- Pilot grid example:
  - Pilots repeat every four subcarriers
  - LD pilots repeat every eight subcarriers
- This pilot pattern is configured during initialization



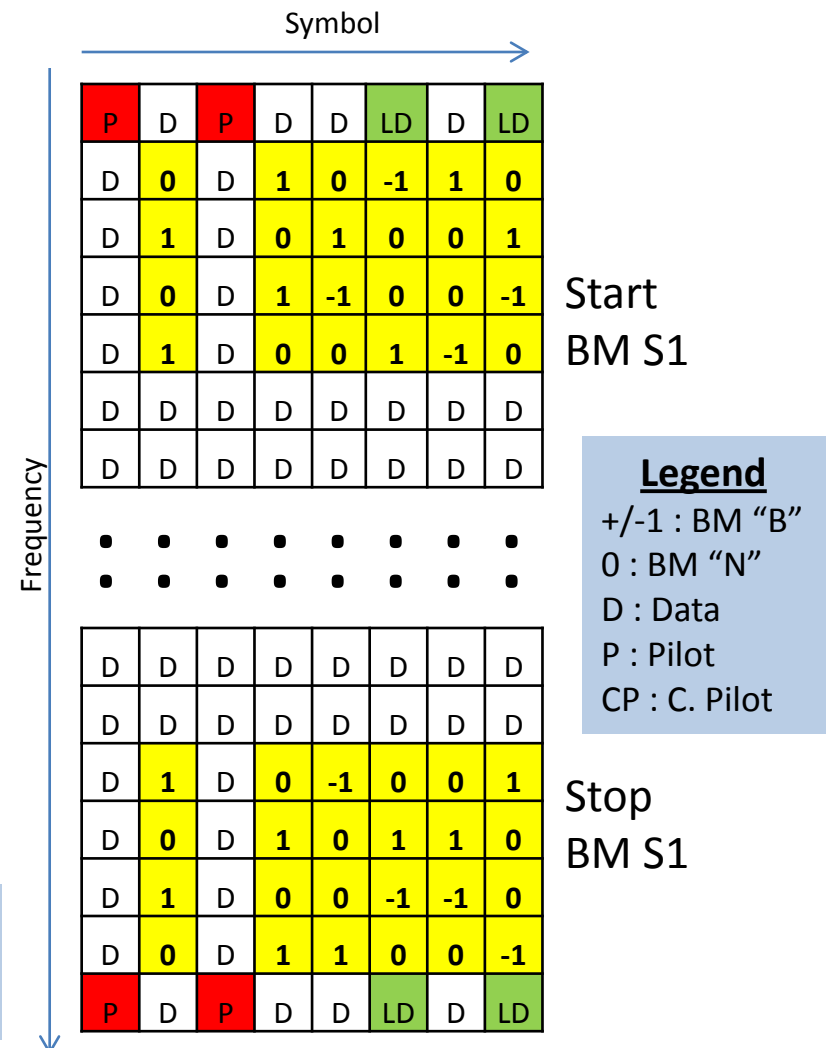
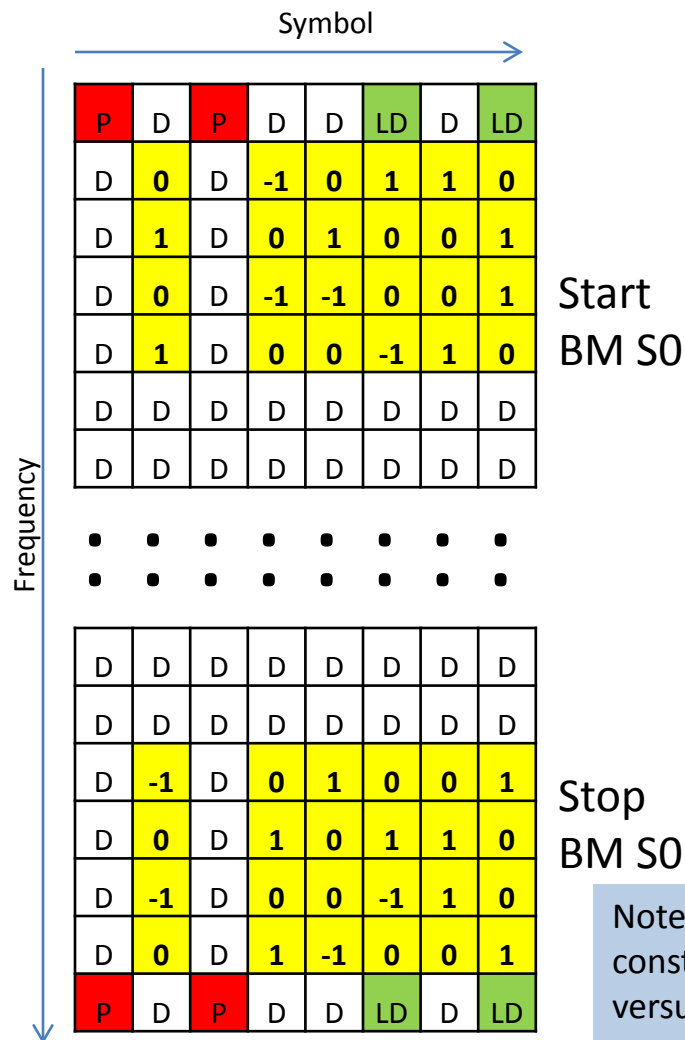
# Pilot Rules – Examples (2)

- A transmission burst starts and ends with a Type 2 RB followed by the BM
  - These pilots are added over the fixed pilot pattern
- (see following slides)

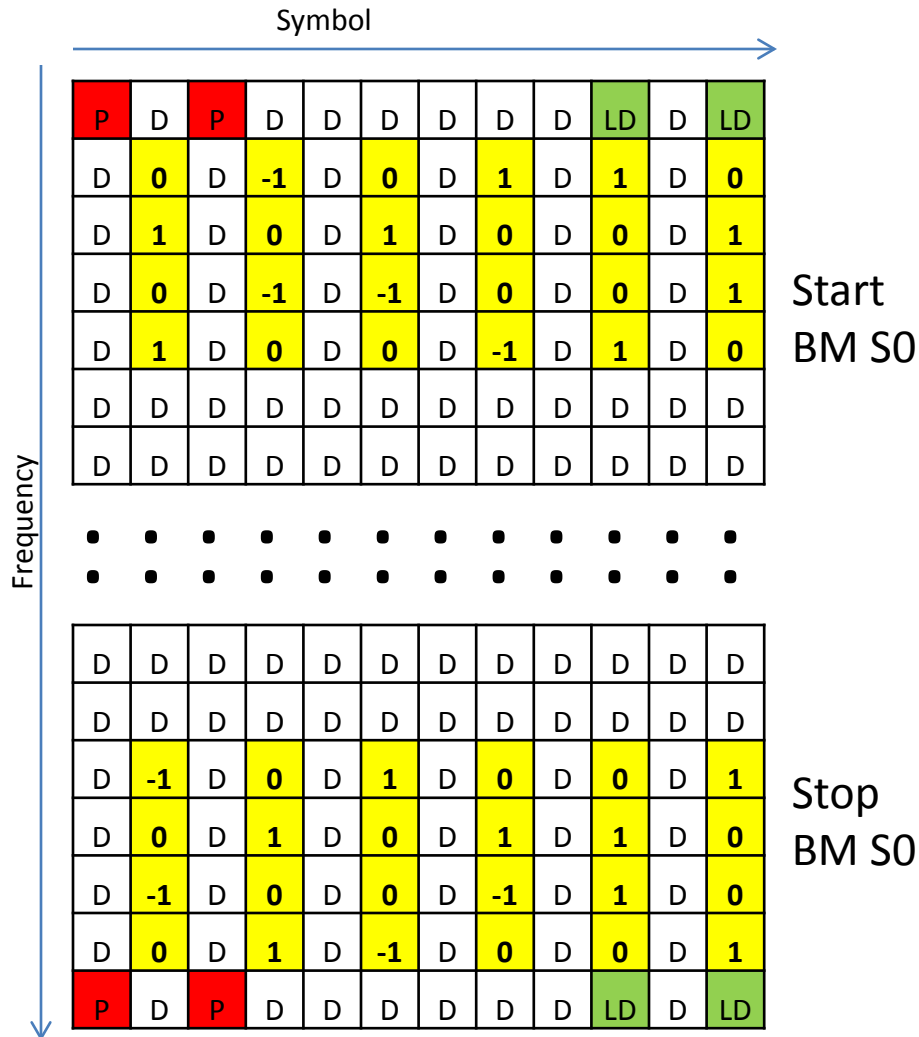




# Examples BM 4x6 in 8 symbols RB



# Examples of BM 4x6 in 12 symbols RB

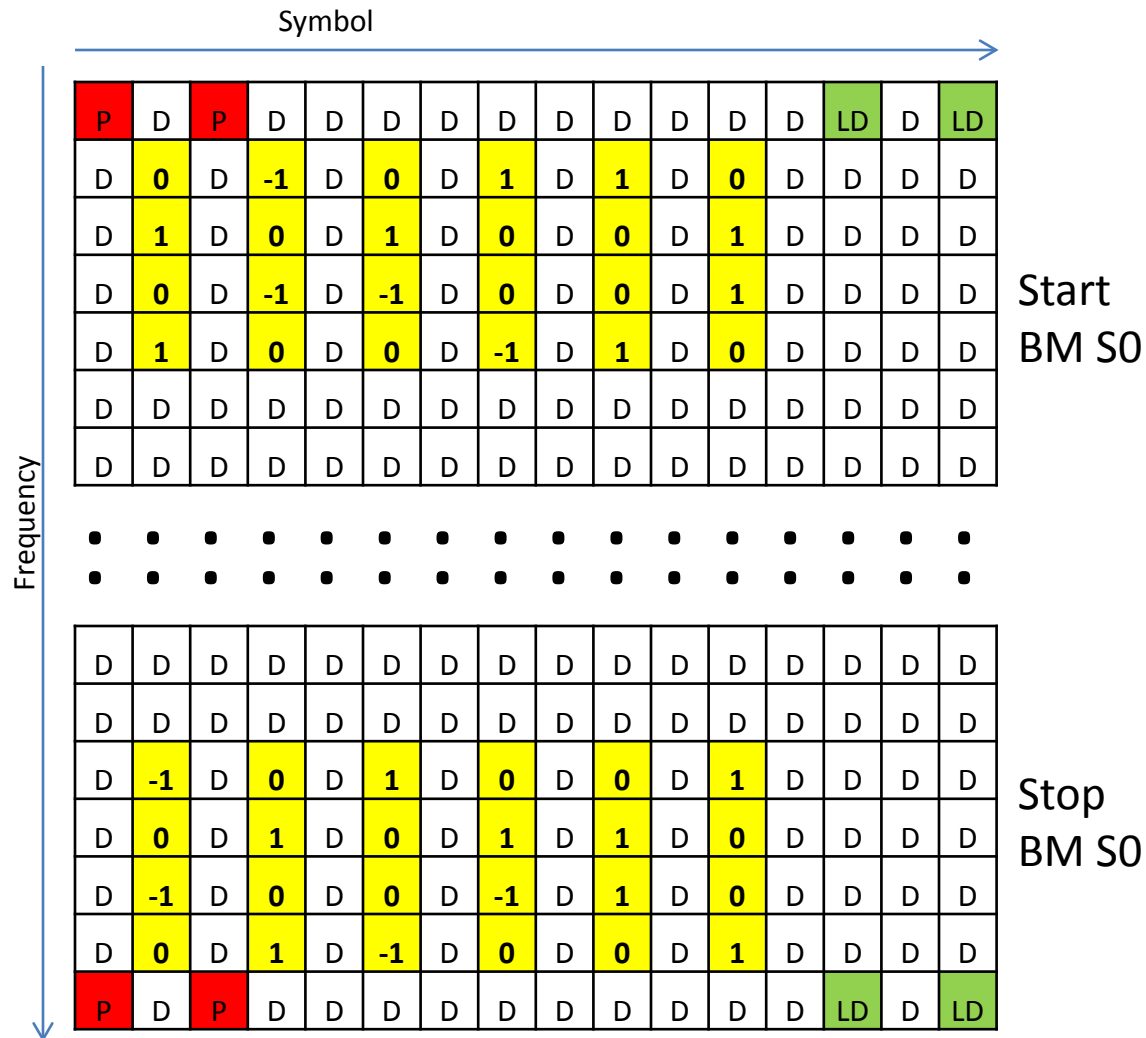


## Legend

+/-1 : BM "B"  
 0 : BM "N"  
 D : Data  
 P : Pilot  
 CP : C. Pilot

Note: Power is  
 constant versus  
 time

# Examples of BM 4x6 in 16 symbols RB



## Legend

+/-1 : BM "B"

0 : BM "N"

D : Data

P : Pilot

CP : C. Pilot

Note: Power is  
constant versus  
time

# Configuring the RB Profile

- Profile Information (PI) – 8 bits per RB
  - 2 bits for RB type
  - 4 bits for bit loading
  - 2 reserved
- RB MAP is the mapping of the PIs to subcarriers over the full bandwidth
  - Up to ~4K PIs can be defined
- RB MAP messages are sent by the CLT over the DS PLC
- Repetitions of string of PIs can be used to shorten RB MAP messages
- Up to TBD entries can be allowed in a RB MAP message

# MAP Repetitions Example

- Assume a pattern with pilots every 4<sup>th</sup> subcarrier and LD pilots every 8<sup>th</sup> subcarrier over N subcarriers.
- Bit loading fixed at 8 bits per subcarrier
- A string of PIs is defined and repeated N/8 times

PI\_0 : 8 bits / type 0

PI\_1 : 8 bits / type 1

PI\_2 : 8 bits / type 2

MAP can be defined as:

$N/8 * \{PI_2, 3*PI_0, PI_1, 3*PI_0\}$

P	P		LD	LD	type 2
					type 0
					type 0
					type 0
P	P				type 1
					type 0
					type 0
					type 0
P	P		LD	LD	type 2
					type 0
					type 0
					type 0
P	P				type 1
					type 0
					type 0
					type 0
P	P		LD	LD	type 2
					type 0
					type 0
					type 0
P	P				type 1
					type 0
					type 0
					type 0
P	P		LD	LD	type 2

# THANKS