

PHY Dependent Messages Formats for 2-11 GHz OFDM PHY

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Base Document:

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Purpose:

This document is to be presented to 802.16 TG3, TG4 and MAC groups to be considered as a change in **IEEE 802.16ab-01/01**

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PHY Dependent Messages Formats for 2-11
GHz OFDM PHY

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Why Different from SC, OFDMA

- OFDM vs. SC: Different PHY
- OFDM vs. OFDMA: One-dimensional structure of the burst instead of two-dimensional
- Scope = Licensed frequencies only?

Uplink Channel Descriptor (UCD) Message

Table 12—Uplink Channel Descriptor (UCD) Message Format

Syntax	Size	Notes
UCD_Message_Format() {		
Generic_MAC_Header()	48 bits	
Management Message Type = 0	8 bits	
Uplink channel ID	8 bits	
Configuration Change Count	8 bits	
Mini-slot size	8 bits	
Ranging Backoff Start	8 bits	
Ranging Backoff End	8 bits	
Request Backoff Start	8 bits	
Request Backoff End	8 bits	

Uplink Channel Descriptor (UCD) Message Overall Channel Parameters

TLV Encoded information for the overall channel	Variable	TLV Specific
Begin PHY Specific Section {		See applicable PHY section
for (i = 1; i <= n; i++) {		For each burst profile
Uplink_Burst_Descriptor	Variable	PHY Specific
}		
}		
}		

Uplink Channel Descriptor (UCD) Message

Overall Channel Parameters

- Symbol Rate
- Frequency
- FFT Size Code
- Tx/Rx Gap
- Rx/Tx Gap
- SS Transition Gap

Uplink Channel Descriptor (UCD) Message Burst Profile Parameters

- Modulation Type
- FEC Code Type
- Preamble Type =
e.g. None | Long | Short | Mid-amble

Downlink Channel Descriptor (DCD) Message Burst Profile Parameters

Table 13— Downlink Channel Descriptor (DCD) Message Format

Syntax	Size	Notes
DCD_Message_Format() {		
Generic_MAC_Header()	48 bits	
Management Message Type = 1	8 bits	
Downlink channel ID	8 bits	
Configuration Change Count	8 bits	
TLV Encoded information for the overall channel	Variable	TLV Specific
Begin PHY Specific Section {		See applicable PHY section
for (i = 1; i <= n; i++) {		For each burst profile 1 to n
Downlink_Burst_Descriptor		
}		
}		

Downlink Channel Descriptor (DCD) Message

Overall Channel Parameters

- Symbol Rate
- Frequency
- FFT Size Code
- Tx/Rx Gap
- Rx/Tx Gap
- SS Transition Gap
- BS Transmit Power

Downlink Channel Descriptor (DCD) Message Burst Profile Parameters

- Modulation Type
- FEC Code Type
- Preamble Type = Long | Short | Mid-amble

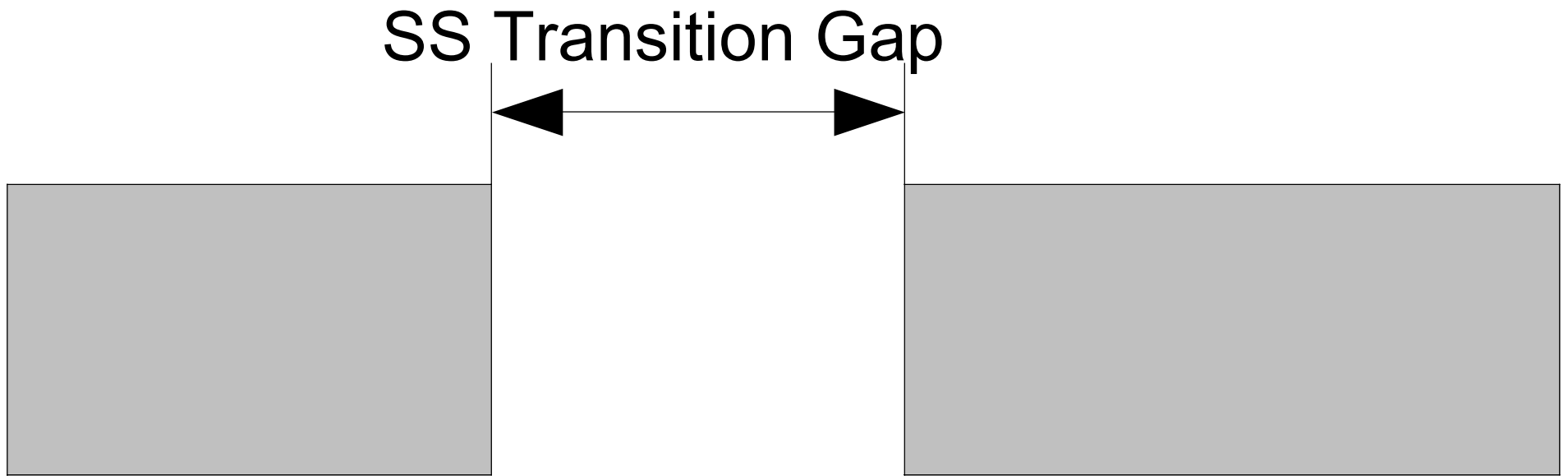
Physical Slot and Mini-slot Definition

[For UL Transmissions]

- Physical Slot (PS) is equal to $4GI$ ($GI =$ OFDM Guard Interval Size).
- The Mini-Slot Size = $PS * 2^M$ is used as the measurement unit where $M = 0 ..7$ is broadcasted by the BS in the Mini-Slot Size field of UCD messages.

Why GI?

UL Transmissions



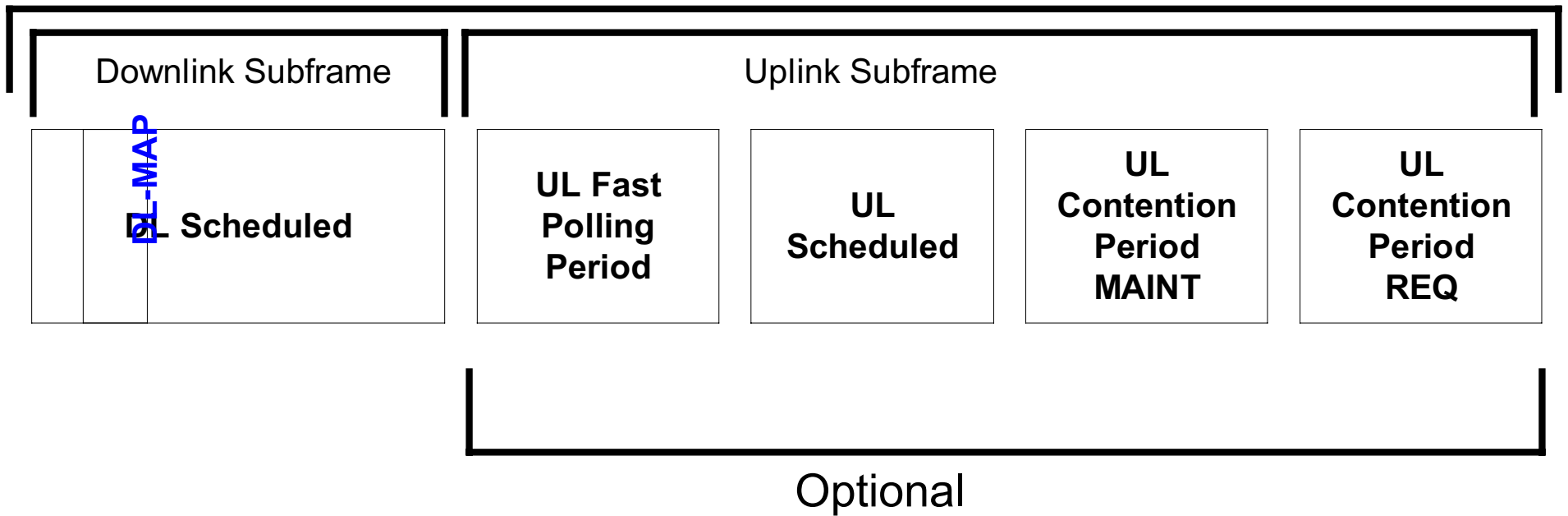
Interval between UL transmission should be minimized

Preambles

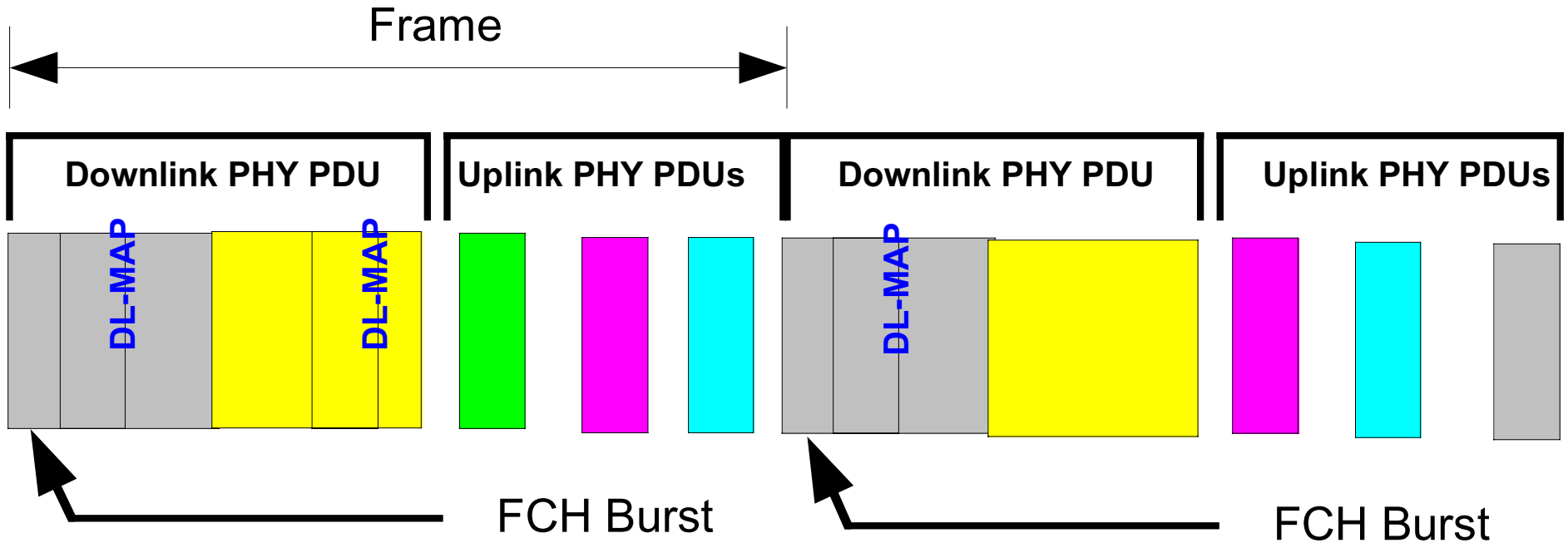
- Long
 - Used in the cases when there is no exact information on the timing of the burst's arrival e.g. when SS is transmitting first time trying to synchronize with BS
- Short
 - Used in the cases when there is exact information on the timing of the burst's arrival.
- Mid-amble
 - Inserted for synchronization purposes between consequent bursts.

Frame Structure Example (TDD)

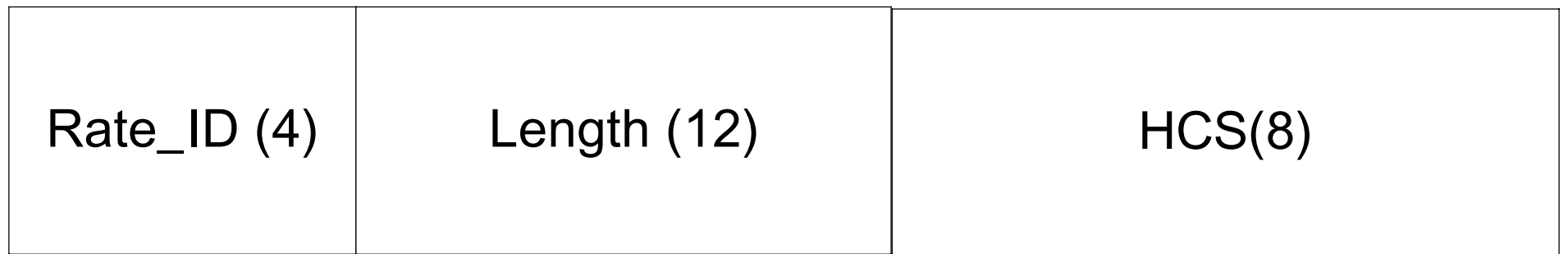
Frame



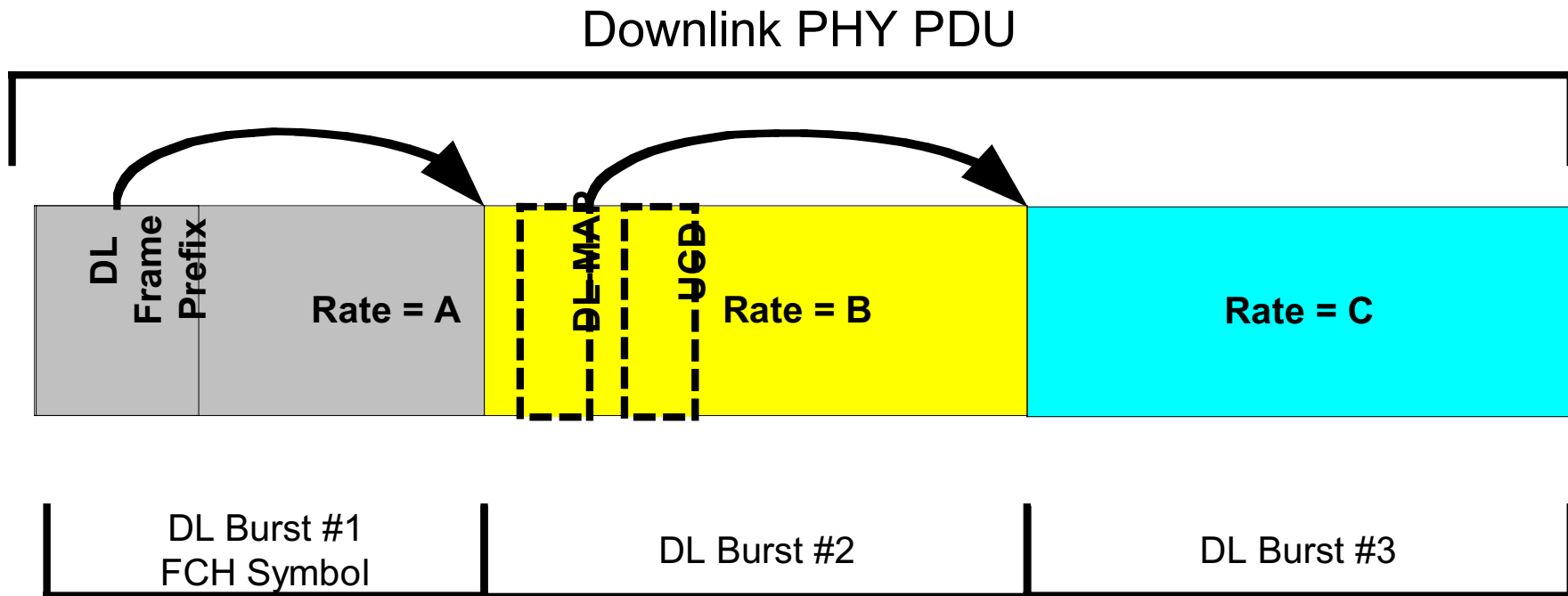
Frame Definition (TDD Example)



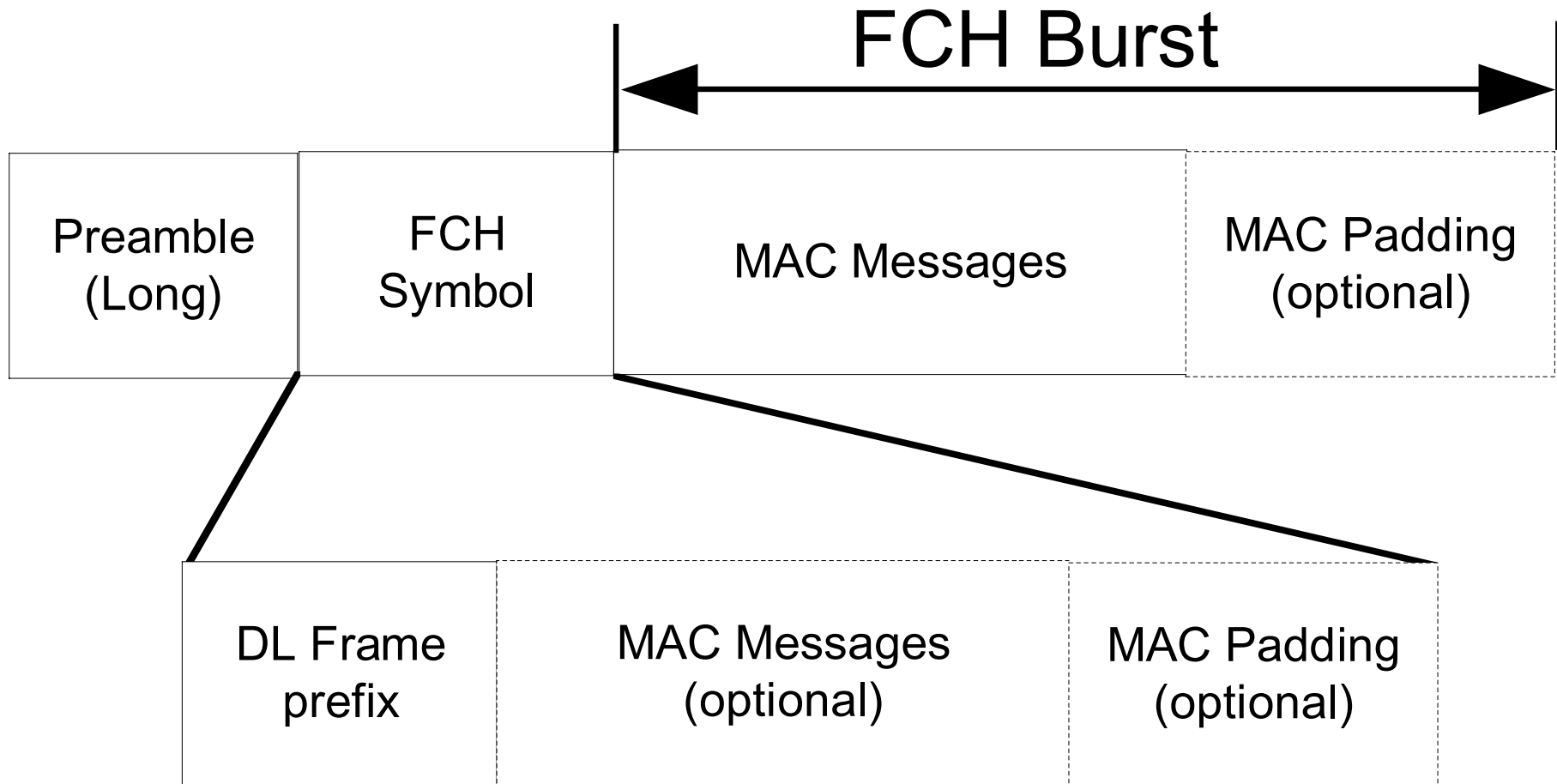
DL Frame Prefix



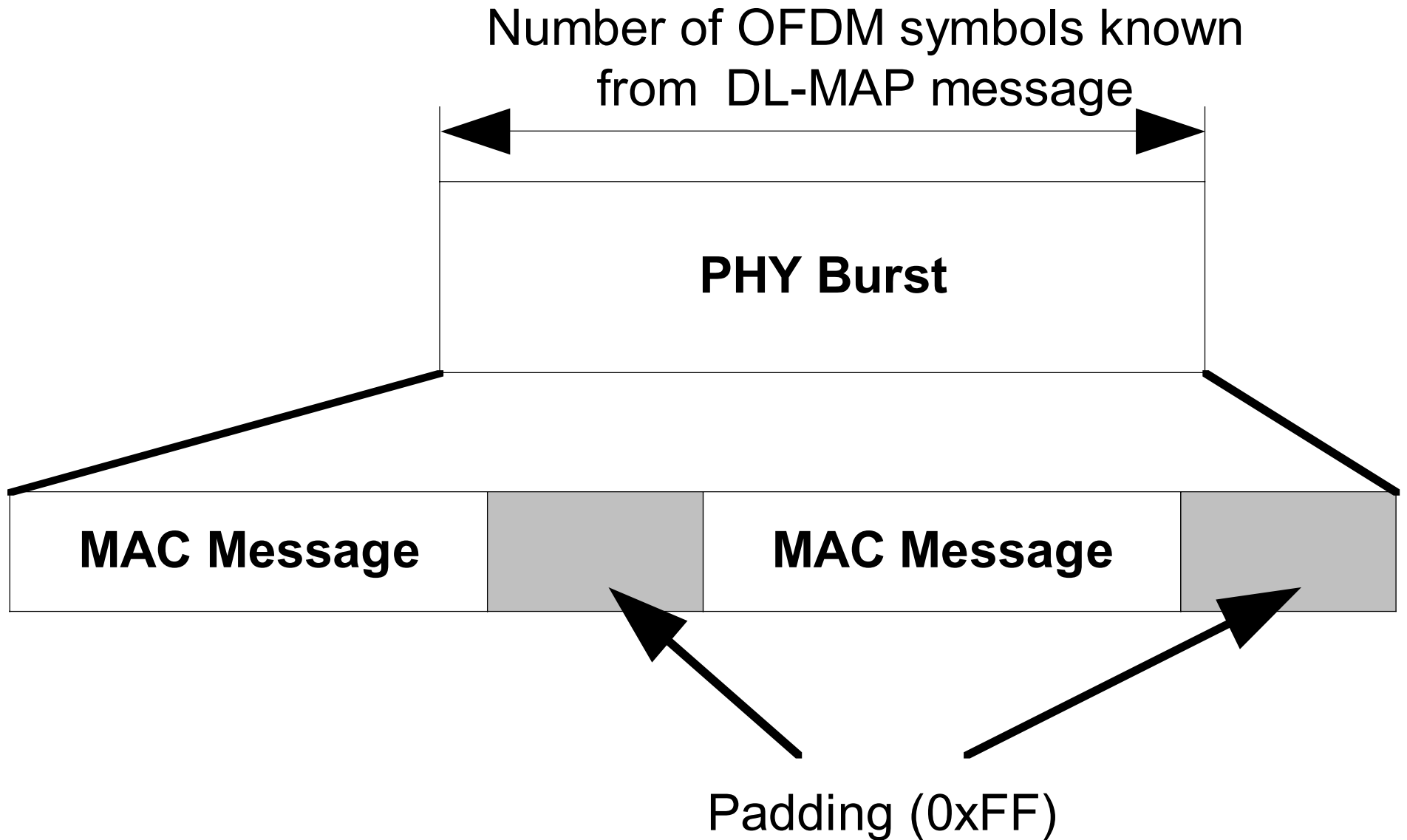
FCH Burst and DL Frame Prefix



FCH Burst and FCH Symbol



DL PHY Burst Construction



DL-MAP Message Format

Table 14— Downlink Map (DL-MAP) Message Format

Syntax	Size	Notes
DL-MAP_Message_Format() {		
Generic_MAC_Header()	48 bits	
Management Message Type = 2	8 bits	
PHY Synchronization Field	Variable	See appropriate PHY specification.
Base Station ID	64 bits	
Number of DL-MAP Elements n	16 bits	
Begin PHY Specific Section {		See applicable PHY section
for (i = 1; i < n; i++) {		For each DL-MAP element 1 to n
DL_MAP_Information_Element()		
if !byte boundary) {		
Padding Nibble	4 bits	Padding to reach byte boundary.
}		
}		
}		
}		

DL-MAP Message Synchronization Field

- Frame Duration Code (8)
 - 0: UNDEFINED. Means that the frame lasts up to the arrival of the next FCH symbol DL-MAP message
 - 1..255 Encodings for TBD sizes of the frame
- Frame Number (24)

DL-MAP Message
DL_MAP_Information_Element,
Option 1 (SC-like)

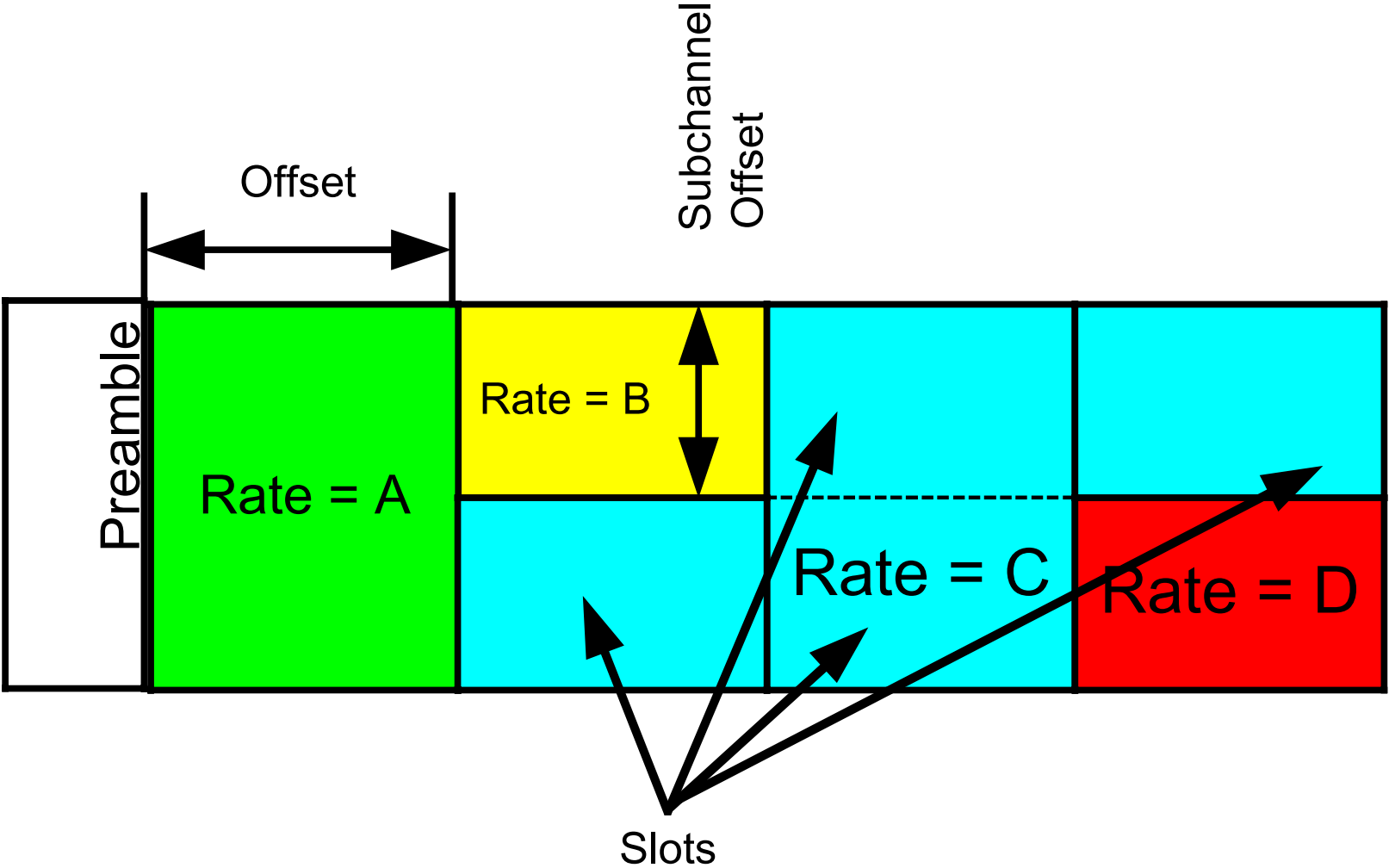
Syntax	Size	Notes
DL-MAP_Information_Element() {		
DIUC	4	
Start Time	12	
}		

DL-MAP Message DL_MAP_Information_Element, Option 2 (OFDMA-like)

Syntax	Size	Notes
DL-MAP_Information_Element() {		
DIUC	4	Downlink Interval Usage Code
Offset	12	Number of symbols
Subchannel Offset	4	Number of groups of 48 subcarriers
Number of Slots	12	
}		

DL-MAP Message

DL_MAP_Information_Element, Option 2 (OFDMA-like)



DIUC Values

DIUC	Usage
0 - 12	DL Burst Types 1-13 correspondently
13	Gap
14	End of Map
15	Extended DIUC (TBD)

UL-MAP Message Format

Table 15—Uplink Map (UL-MAP) Message Format

Syntax	Size	Notes
UL-MAP_Message_Format() {		
Generic_MAC_Header()	48 bits	
Management Message Type = 3	8 bits	
Uplink Channel ID	8 bits	
UCD Count	8 bits	
Number of UL-MAP Elements n	16 bits	
Allocation Start Time	32 bits	
Begin PHY Specific Section {		See applicable PHY section
for (i = 1; i < n; i++) {		For each UL-MAP element 1 to n
UL_MAP_Information_Element()	Variable	See corresponding PHY spec.
}		
}		
}		



UL-MAP Information Element Format

Syntax	Size	Notes
UL-MAP_Element() {		
CID	16	Connection ID
UIUC	4	Uplink Interval Usage Code
Offset	12	In the units of Mini-Slots
}		

UIUC Values

UIUC	Usage
0	Request region (REQ)
1	Initial Maintenance
2	Periodic Maintenance
3 - 12	UL Burst Types 1-10 correspondently
13	Gap
14	End of Map
15	Extended UIUC (TBD)