Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Additional comments to P802.16d/D2**
Date Submitted	**2003-07-16**
Source(s)	Itzik Kitroser Yossi Segal Yigal Leiba Zion Hadad Runcom Technologies Ltd. 2 Hachoma St. 75655 Rishon Lezion, Israel Voice: +972-3-9528440 Fax: +972-3-9528805 mailto:itzikk@runcom.co.il mailto:yossis@runcom.co.il mailto:yigall@runcom.co.il mailto:zionh@runcom.co.il
Re:	P802.16d/D2 ballot
Abstract	This contribution contains some additional changes and comments to P802.16d/D2.
Purpose	Adopt into P802.16d/D2 draft.
Notice	
Release	
Patent Policy and Procedures	

Additional Comments to P802.16d/D2

Itzik Kitroser
Yossi Segal
Yigal Leiba
Zion Hadad
Runcom Technologies Ltd.

1. General

This contribution contains some additional changes and comments to P802.16d/D2.

2. Specific changes

2.1 Changes to 802.16

Section: 6.2.2.3.22 **Page**: 73

Change:

HMAC Tuple (see 11.4.1~~2~~0)

Reason:

Wrong reference.

Section: 11.4.9.3.6.17-19 **Page**: 314

Change:

Change the numbering of 11.4.9.3.6.17-19 to 11.4.9.3.6.16.1 - 11.4.9.3.6.16.3

Reason:

Those sections contains specific parameters for PHS error parameter set, and therefore should be nested under section 11.4.9.3.6.16.

2.2 Changes to 802.16a

Section: 11.1.6 **Page**: 241

Change:

In the report parameters table, at the Basic Report entry, change Human to HUMAN

Reason:

Typo

Section: 8.5.5.3 **Page**: 190

Change:

In table 116bt, change:

“if (UIUC == <u>1</u>4) {“

Reason:

Typo

Section: 8.5.10 **Page**: 32 (Tgd document)

Change:

Move Sections 8.5.10, 8.5.10.1 to an Annex: B.4 and B.4.1

Delete 8.5.10.2

Reason:

More appropriate location for the text of the sections, 8.5.10.2 was redundent.

Section: 8.5.3.1 **Page**: 181

Change:

8.5 WirelessMAN-OFDMA PHY layer

8.5.3 OFDMA slot definition

8.5.3.1 Data region ~~and PHY burst~~

In addition to the time dimension that defines slots in other PHYs, a slot in the OFDMA PHY requires a subchannel dimension for complete definition. (Subchannels are defined in 8.5.6.)

A ~~PHY burst~~Data Region in OFDMA is a two-dimensional allocat~~ed~~ion of a group of contiguous subchannels, in a group of contiguous OFDMA symbols. This allocation may be visualized as a rectangle, such as the ~~4x3~~3x4 rectangle shown in Figure 128at. ~~This type of two-dimensional allocation is called a data region.~~

[Change figure 128at as follows]

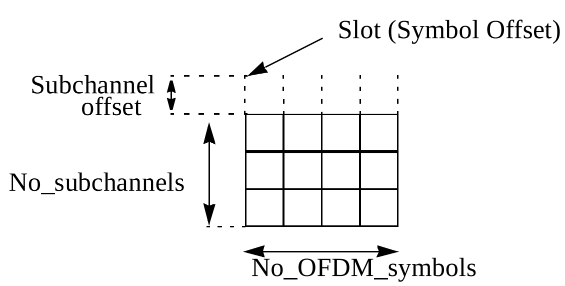

Figure 128at—Example of the data region which defines the OFDMA allocation

Such a data region can be assigned in the UL to a specific SS (or a group of subscribers) or can be transmitted in the DL by the BS as a transmission to a (group of) SS(s).

8.5.3.2 OFDMA data mapping

MAC data shall be processed as described in 8.5.9 and shall be mapped to an OFDMA Data Region (see 8.5.8.1) using the following algorithm:

1) Segment the data into blocks sized to fit into one FEC block.
2) Each FEC block spans one OFDMA subchannel in the subchannel axis and one~~three~~ OFDM symbol~~s~~ in the time axis (see Figure 128ay1). In addition, when mini-subchannels are employed for the uplink direction, each FEC block spans three OFDM symbols in the time axis. Map the FEC blocks such that the lowest numbered FEC block occupies the lowest numbered subchannel in the lowest numbered OFDM symbol.
3) Continue the mapping such that the OFDMA subchannel index is increased for each FEC block mapped. When the edge of the Data Region is reached, continue the mapping from the lowest numbered OFDMA subchannel in the next OFDM symbol.

Figure 128au and Figure 128au1 illustrates the order in which FEC blocks are mapped to OFDMA subchannels and OFDM symbols.

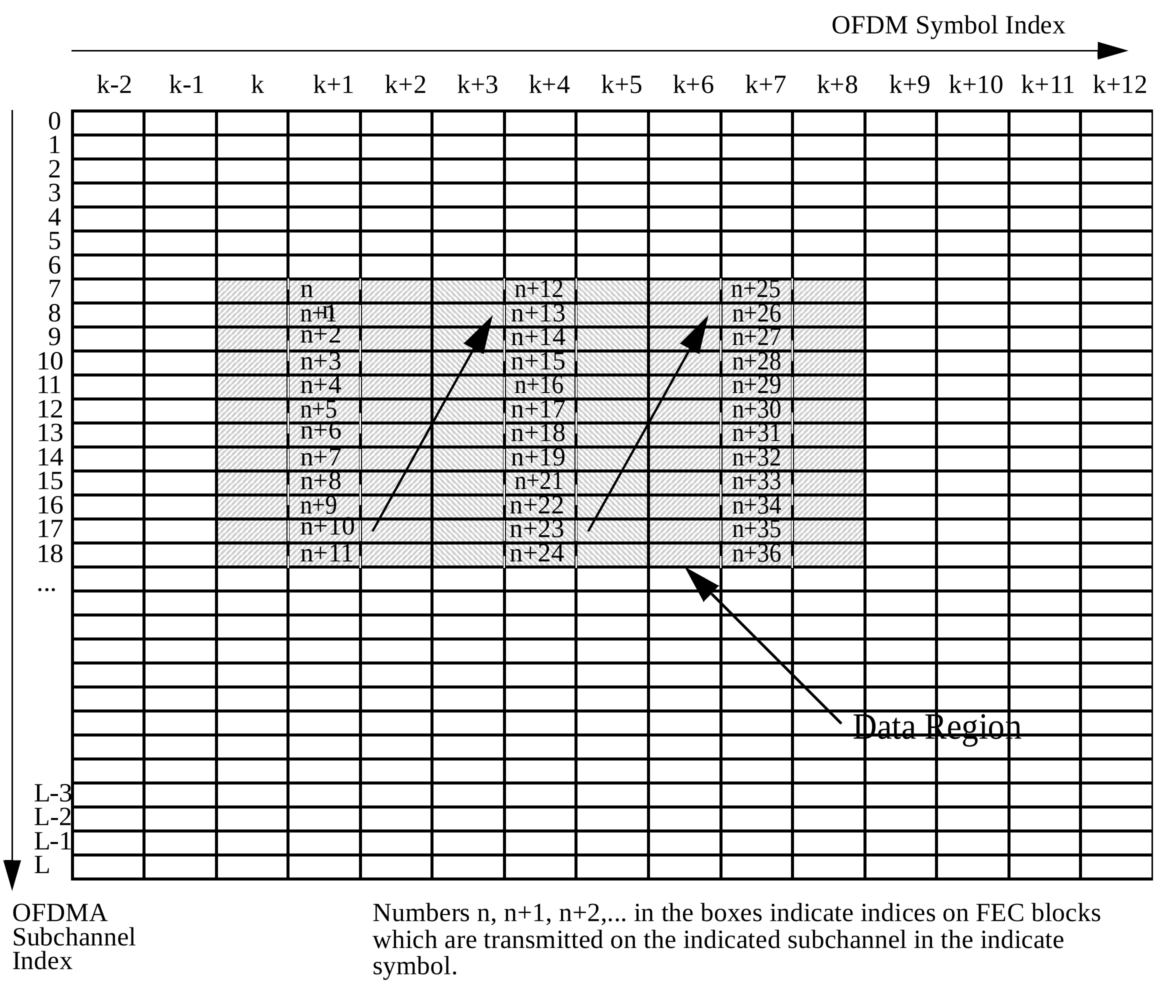

Figure 128au—Example of ~~M~~mapping ~~of~~ FEC blocks to OFDMA subchannels and symbols in the uplink when using mini-subchannels

[Add figure 128au1]

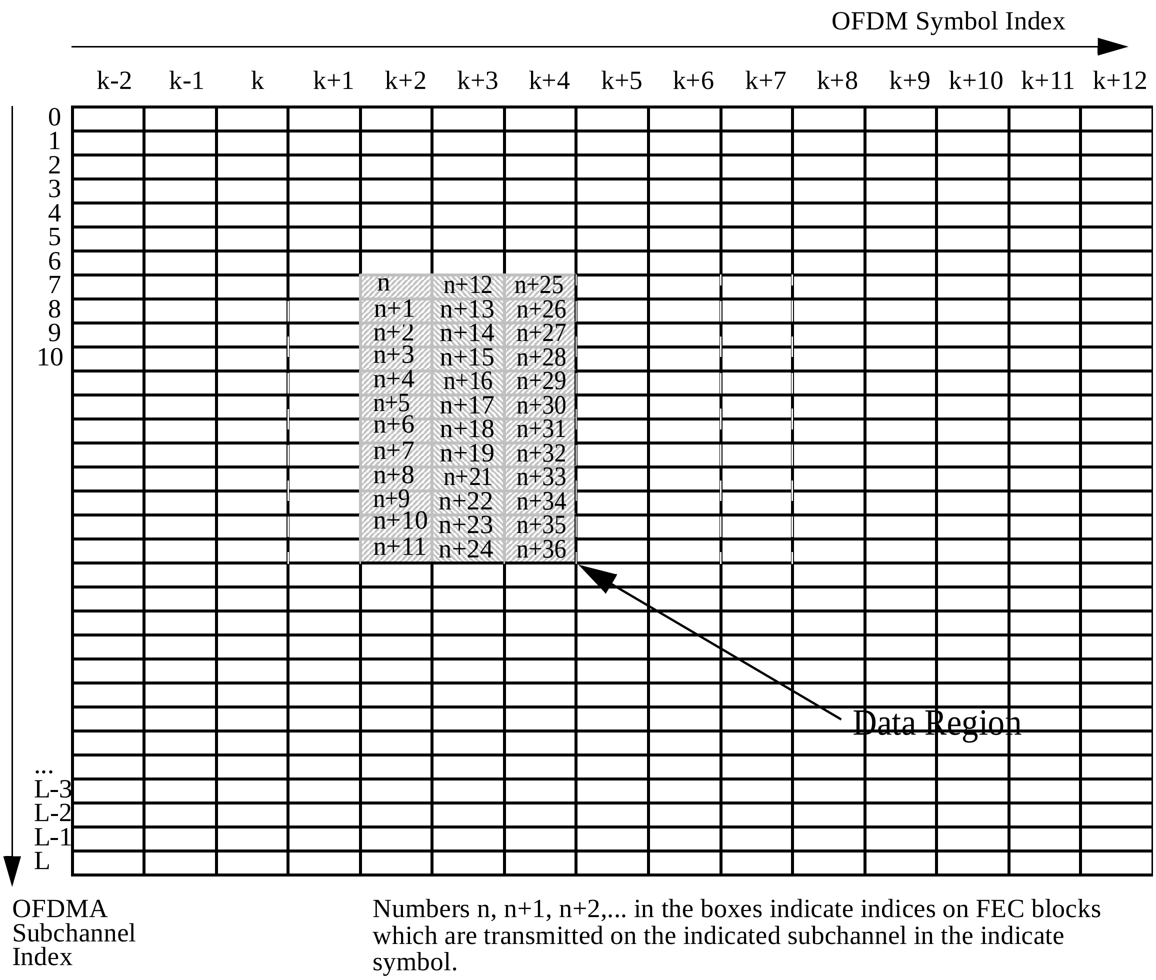

Figure 128au1—Example of mapping FEC blocks to OFDMA subchannels and symbols in the uplink and downlink

8.5.4 Frame structure

8.5.4.2 PMP frame structure

When implementing a TDD system, the frame structure is built from BS and SS transmissions. Each burst in the downlink transmission begins with a preamble and followed by~~consists of~~ multiples of ~~three~~one (or ~~six~~two, if STC used, see 8.5.8) OFDMA symbols. Each burst in the downlink transmission begins with a preamble and followed by multiples of one (or three, if mini-subchannels are used, see 8.5.6.2) OFDMA symbols. In each frame, the Tx/Rx transition gap (TTG) and Rx/Tx transition gap (RTG) shall be inserted between the downlink and uplink and at the end of each frame respectively to allow the BS to turn around.~~ TTG and RTG shall be at least 5 µs and an integer multiple of the PS in duration, and start on a PS boundary. After the TTG, the BS receiver shall look for the first symbols of a UL burst. After the RTG, the SS receivers shall look for the first symbols of QPSK modulated data in the DL burst.~~

~~There is no need for TTG and RTG as the downlink and uplink transmit on independent frequencies in FDD systems.~~In TDD and H-FDD systems the subscriber station is characterized by a transmit-receive turnaround gap SSRTG and by a receive-transmit turnaround gap SSTTG. The BS shall not transmit DL information to a station later than (SSRTG+RTD) before its scheduled UL allocation, and shall not transmit DL information to it earlier than

(SSTTG-RTD) after the end of scheduled UL allocation, where RTD denotes Round-Trip Delay. The parameters SSRTG and SSTTG are capabilities provided by the SS to BS upon request during network entry (see 11.4.1.6). The minimum SSRTG and SSTTG shall be no more than 60 μsec.

[Change figure 128av as follows]

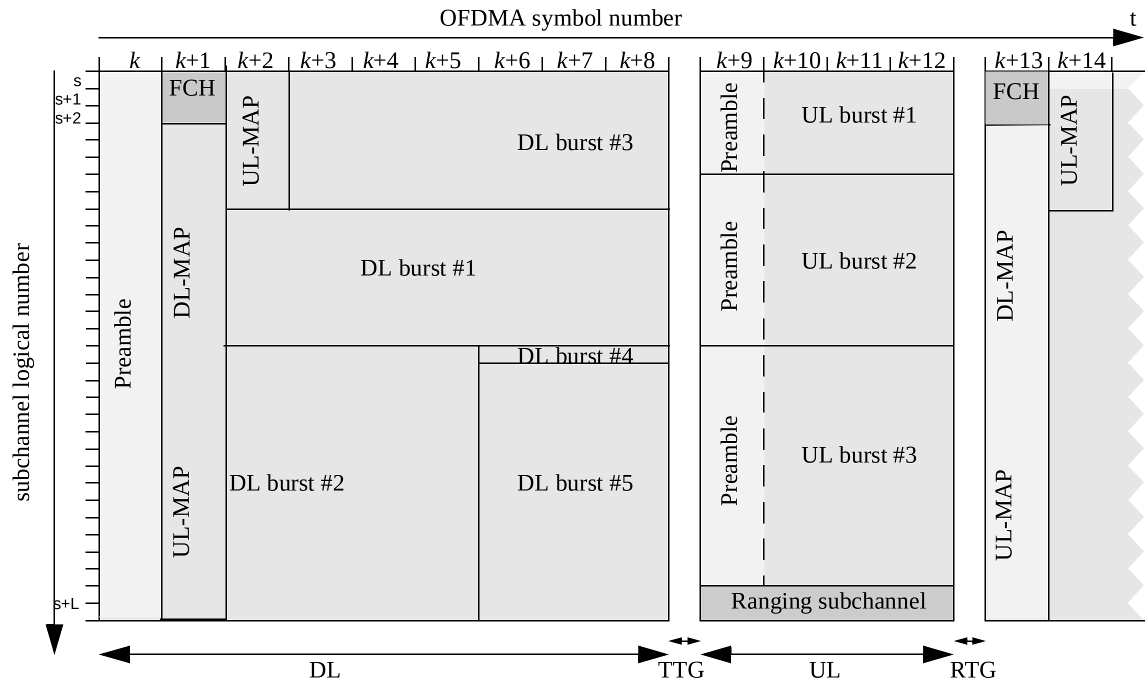

Figure 128av—Time plan - one TDD time frame

Regardless of duplexing type, the appropriate duration of the Initial Maintenance slot used for initial system access depends on the intended cell radius.

~~The framing structure used for the DL includes the transmission of a FCH, which is transmitted in the most robust burst profile of the system followed by transmission using burst profiles as defined in the FCH. The MAC layer also defines the DL transmission frame length and the length of the different transmission parts.~~

The first three transmitted sub-channels in the first data symbol of the DL is called FCH. The FCH~~are~~is transmitted using QPSK rate 1/2 with the mandatory coding scheme. The FCH contains the DL_Frame Prefix as described in section xxx, and specifies the length of the DL_MAP message that immediately follow the DL_Frame_Prefix. Note that the DL-MAP message may 'spill' over into the first DL burst. Although the first DL burst contains broadcast MAC control messages, it is not necessary to use the most robust well-know modulation/coding. A more efficient modulation/coding may be used if it is supported and applicable to all the SSs of a BS. With exception of the map messages, no MAC PDUs shall be split over multiple consequtive bursts with different burst profiles.

The transitions between modulations and coding take place on OFDMA symbol boundaries in time domain and on subchannels within an OFDM symbol in frequency domain.

A BS supporting the AAS option shall allocate at the end of the UL frame an initial ranging slot for AAS SS that have to initially alert the BS to their presence. This period shall be marked in the UL-MAP as Initial-Maintenance (UIUC=2), but shall be marked by a ~~non-used~~AAS initial ranging CID to ensure that no non-AAS subscriber (or AAS subscriber can decode the UL-MAP message) uses this interval for initial maintenance.

[Replace 8.5.4.3 with the following text]

8.5.4.3 DL_Frame_Prefix

The DL_Frame_Prefix is a data structure transmitted at the beginning of each frame and contains information regarding the current frame. Table 116bmdefines the structure of DL_Frame_Prefix.

Table 116bm—OFDMA DL Frame Prefix

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
Ranging_Change_Indication	1 bit	
DL_Map_Length	7 bits	
Sub_Channels_Bitmap	32 bits	
Prefix_CS	8 bits	
}		

DL_Map_Length
Defines the length in slots of the DL_Map message that follows immediately the DL_Frame_Prefix.

Ranging_Change_Indication
A flag that indicates whether this frame contains a change of the allocation of Periodic Ranging/BW Request UL regions comparing to the previous frame. A value of '1' means that a change has occurred, and value of '0' means that the allocations of Periodic Ranging/BW Request regions in the current frame are the same as in the previous frame.

Sub_Channel_Bitmap
A 32-bit field that defines a bitmap representing the sub-channels which are allocated to this sector. Each bit represent a sub-channel with same enumerated value, a value '1' means that the sub-channel represented by the bit is allocated to the sector.

Prefix_CS
An 8-bit checksum for the DL-Frame prefix fields, with the generator polynomial: $g(D) = D^8+D^2+D+1$.

[Replace section 8.5.4.5 with 8.5.10.3.3 with the following changes]

8.5.4.5 Allocation of sub-channels for FCH, and logical sub-channel numbering

The minimal allocation of sub-channels for a sector (if the sector is used) is 3 sub-channels. The first three transmitted sub-channels in the first data symbol of the DL conatins the FCH as defined in 8.5.4.2. For sector 1 Sub-channels 0-2 are used as the basic allocated Sub-Channels, for Sector 2 Sub-channels 11-13, for sector 3 Sub-channels 22-24, Figure 128ay1 depicts this structure:

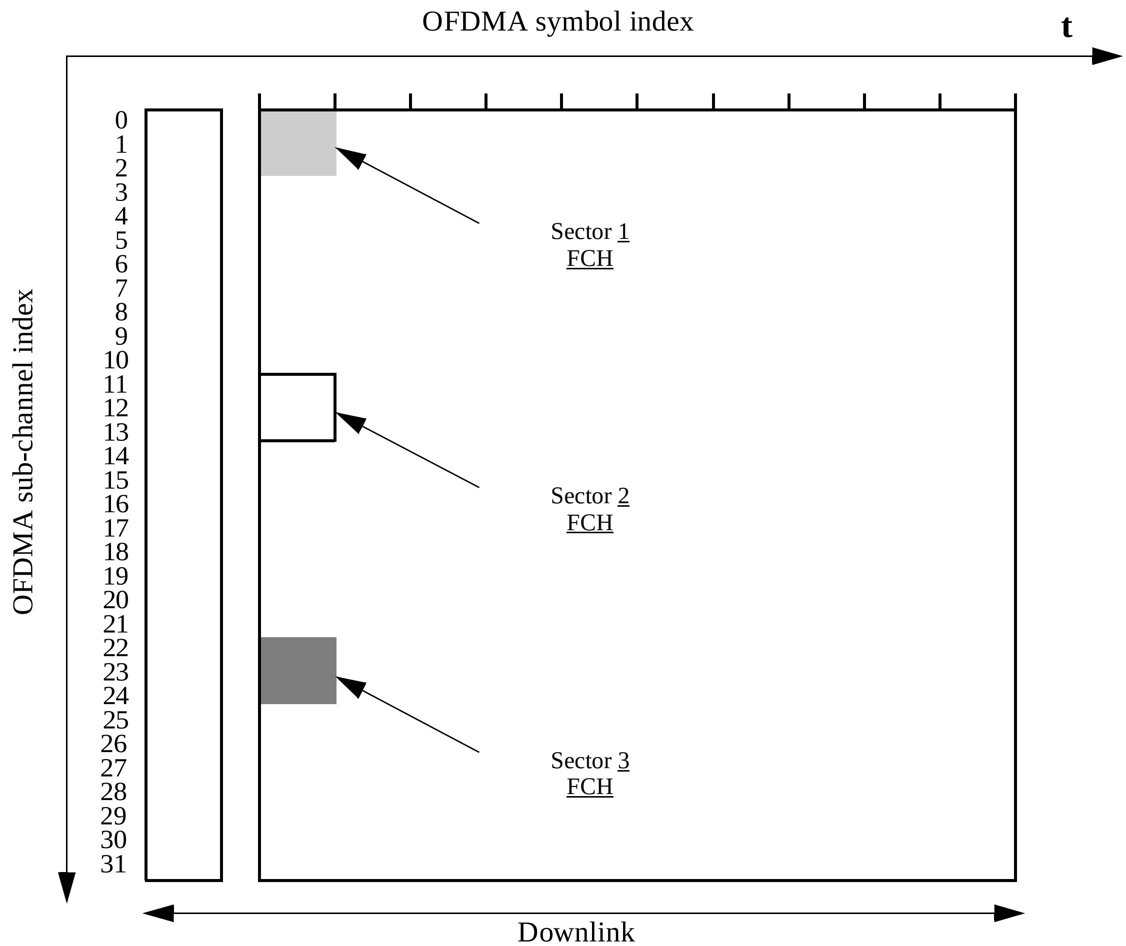

Figure 128ay1—DL Frame Prefix sub-channel allocation for all 3 sectors

After decoding the DL_Frame_Prefix message withing the FCH, the SS has the knowledge of how many and which sub-channels are allocated to the sector. In order to observe the allocation of the sub-channels as a contiguous block of allocation, the sub-channels shall be renumbered, the renumbering shall start from the FCH sub-channels (renumbered to values 0..2), then continue numbering the sub-channels in a cyclic manner to the last allocated sub-channel and from the first allocated sub-channel to the FCH Sub-Channels, Figure 128ay2 gives an example of such renumbering for sector 2.

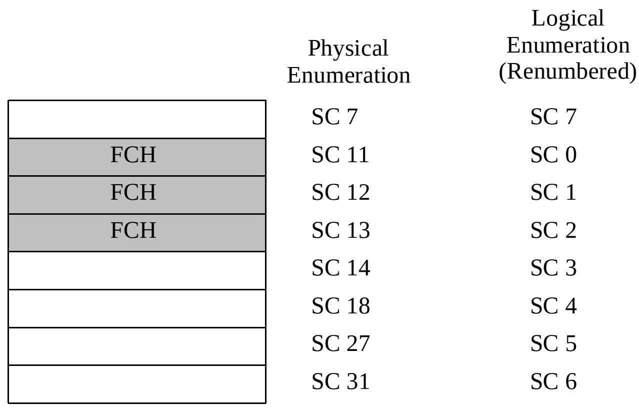

Figure 128ay2—Example of renumbering the allocated sub-channels for sector 2

[Update section 8.5.4.6 as follows]

8.5.4.6 UL transmission allocations

The allocation for a user UL transmission is a number of subchannels over a number of OFDMA symbols. The number of symbols shall be equal to 1+~~3~~N, where N is a positive integer (note: when using mini-sub-channels N shall be a multiple of 3). During the first OFDMA symbol of an allocation, the SS shall send a preamble on all its allocated subchannels. The remaining ~~3~~N symbols shall contain data.

The smallest allocation when using regular subchannels, a basic allocation, is one subchannel for a duration of ~~4~~2 times the OFDMA symbol duration T_s (N=1). Larger allocations are called extended allocations. These allocations are illustrated in Figure 128az.

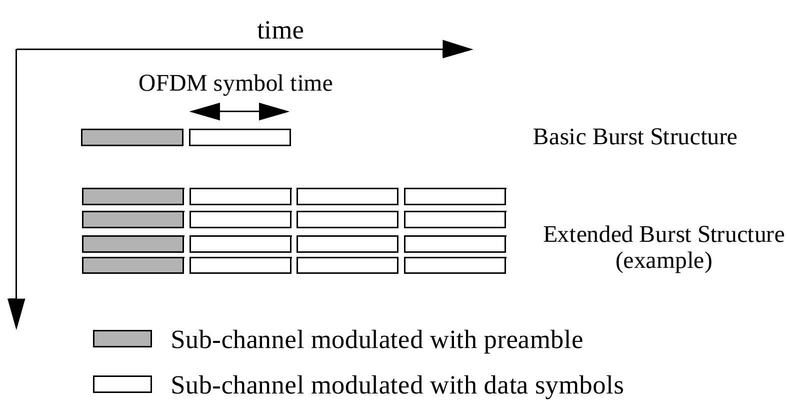

Figure 128az—Burst Structure using regular sub-channel

The smallest allocation when using mini-subchannels, a basic allocation, is one subchannel for a duration of 4 times the OFDMA symbol duration T_S (N=3). Larger allocations are called extended allocations. These allocations are illustrated in Figure 128az1.

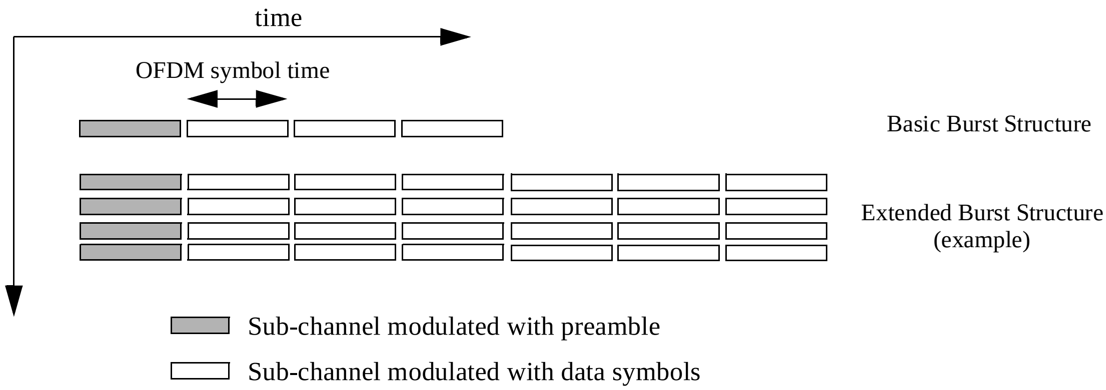

Figure 128az1—Burst structure using mini-subchannel

The framing structure used for the UL includes the transmission of a possible symbol for Jamming monitoring, an allocation for Ranging and an allocation for data transmission. The MAC sets the length of the UL framing, and the UL mapping.

The framing for these modes involve the allocation of ranging subchannels within the OFDMA symbols, while the rest of the subchannels are used for users transmission, as shown in Figure 128az and Figure 128az1. An optional Null symbol may be inserted to facilitate Jamming monitoring.

[Replace section 8.5.5.2 with section 8.5.10.3.3.2]

[Replace section 8.5.5.3 with section 8.5.10.3.3.3]

[Update section 8.5.6.2]

8.5.6.2 Uplink

The following section defines the uplink transmission and symbol structure. The uplink follows the downlink model, therefore it also supports up to 3 sectors. Two formats of transmission in the uplink are supported:

— Regular Sub-Channel of 53 carriers (32 Sub-Channels overall)
— Mini Sub-Channel of 21/22 carriers (80 mini Sub-Channels overall)

Each transmission uses 48 symbols as their minimal block of processing, each new transmission commences with a preamble (which is modulated on the allocated Sub-Channels only), allocations of sub-channels to users are done with the granularity of one Sub-Channel / mini Sub-Channel.

The N_{used} used carriers are first partitioned into subchannels, using the same procedure as in 8.5.6.1.3, including Equation (84), except that, for the uplink, the parameters are as given in Table 116cb. ~~Note that since we have not first assigned pilots,~~ $\cancel{N_{subcarriers}}$ ~~in the uplink is 53, instead of 48 as in the downlink~~.

Table 116cb—OFDMA UL Carrier Allocations

Parameter		Value	
Number of dc carriers		1	
N_{used}		1696	
Guard carriers: left, right		176	175
$\{PermutationBase_0\}$		{3, 18, 2, 8, 16, 10, 11, 15, 26, 22, 6, 9, 27, 20, 25, 1, 29, 7, 21, 5, 28, 31, 23, 17, 4, 24, 0, 13, 12, 19, 14, 30}	
Subchannels	**Mini-subchannels**		
$N_{subchannels}$	$N_{mini\text{-}subchannels}$	32	80
$N_{subcarriers}$	$N_{subcarriers}$	53	21/22
Number of data carriers per subchannel	Number of data carriers per mini-subchannel	48	16

[Change numeration of section 8.5.6.2.1 to 8.5.6.2.3 and insert new title 8.5.6.2.1 and copy 8.5.10.4.1.2 as 8.5.6.2.2]

8.5.6.2.1 Symbol Structure for Sub-Channel

Within each subchannel, there are 48 data carriers, 1 fixed-location pilot carrier, and 4 variable-location pilot carriers.

The fixed-location pilot is always at carrier-in-subchannel 26.

The variable-location pilots location changes in each symbol, repeating every 13 symbols, according to L_k where k = 0 to 12. The sequence L_k is given by L_k = {0,2,4,6,8,10,12,1,3,5,7,9,11}. The first symbol (in k=0) is produced after the all-pilot symbols (preamble), which consist of permuted carriers modulated according to 8.5.6.1. For k=0 the variable location pilots are positioned at indices: 0,13,27,40. For other k values these locations change by adding L_k to each index. For example, for k=9, L_k=5, and the variable pilots location are: 5,18, 32, 45.

The variable-location pilot locations just described will never coincide with the fixed-location pilot at carrier-in-subchannel 26.

The remaining 48 carriers are data carriers. Thus, due to the motion of the variable-location pilots, the locations of these data carriers also change with each symbol.

The partitioning of each UL subchannel just described in this subclause is illustrated in Figure 128bb.

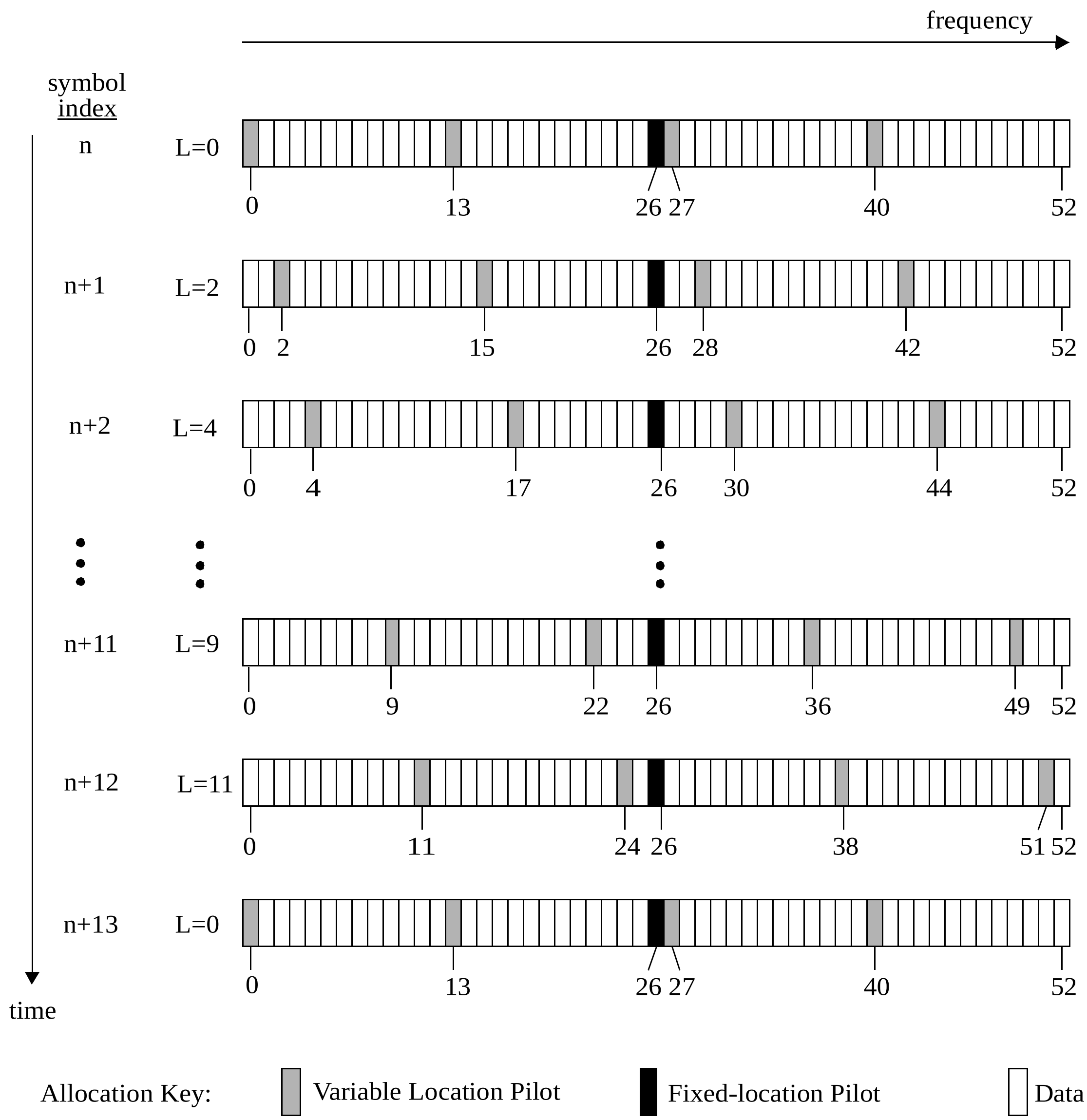

Figure 128bb—Carrier allocations within each OFDMA UL subchannel

8.5.6.2.2 Symbol Structure for mini Sub-Channel

The Sub-Channel in the DL shall be further divided to create the mini sub-channels, every two adjunct sub-channels (where the first one is the even sub-channel) shall be divided into 5 mini sub-channels. The 106 carriers are divided into 5 groups, 4 of them containing 21 carriers and the last containing 22 carriers. In each mini sub-channel 16 carriers are allocated for data and the rest are allocated as pilots.

The carriers which obey the following equation Equation (83c), are allocated to one mini sub-channel:

$$mod(Carrier(j, i), 5) = k \qquad (83c)$$

where:

Carrier(j,i) is the carrier *j* of sub-channel *i*, as defined in 8.5.6.1.2

k is the mini sub-channel $k \in \{0 \ldots 4\}$.

The overall numbering of the mini sub-channels shall start from the first two sub-channels divided into 5 mini sub-channels and follow each two adjunct sub-channels which are divided, for a total of 80 mini sub-channels numbered 0..79.

Figure 128bb1 and Figure 128bb2 depict the mini sub-channel organization:

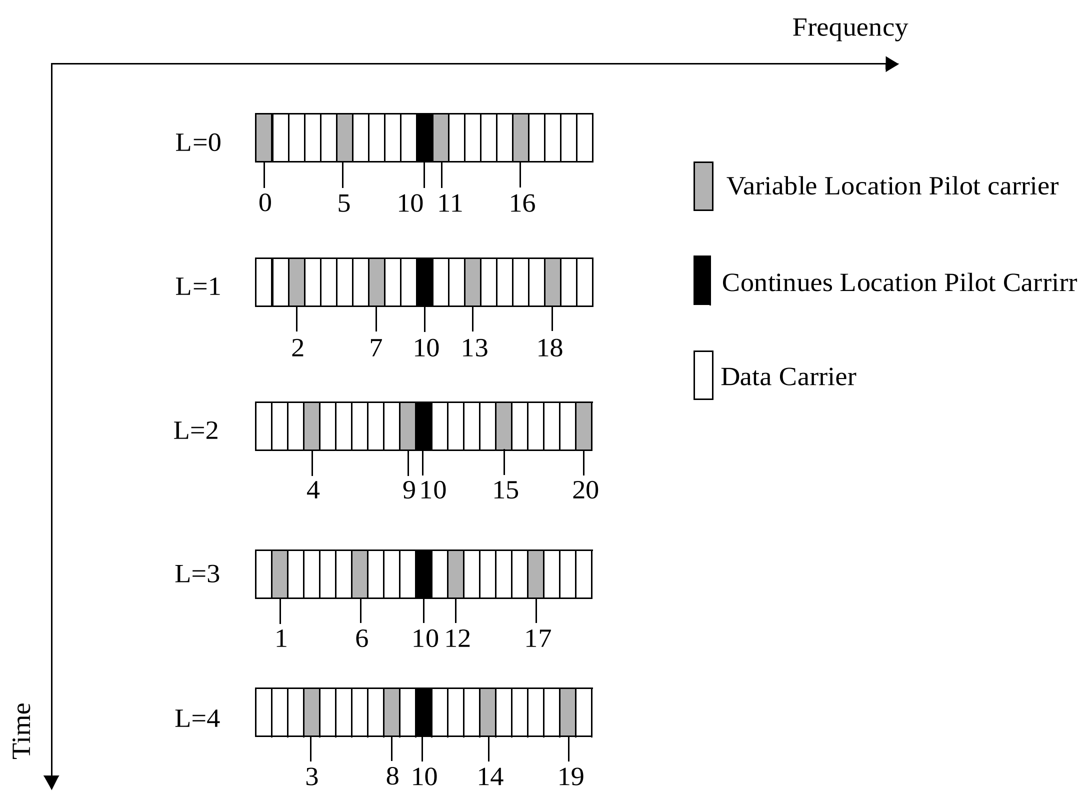

Figure 128bb1—Sub-Channel (of 21 carriers) organization and structure

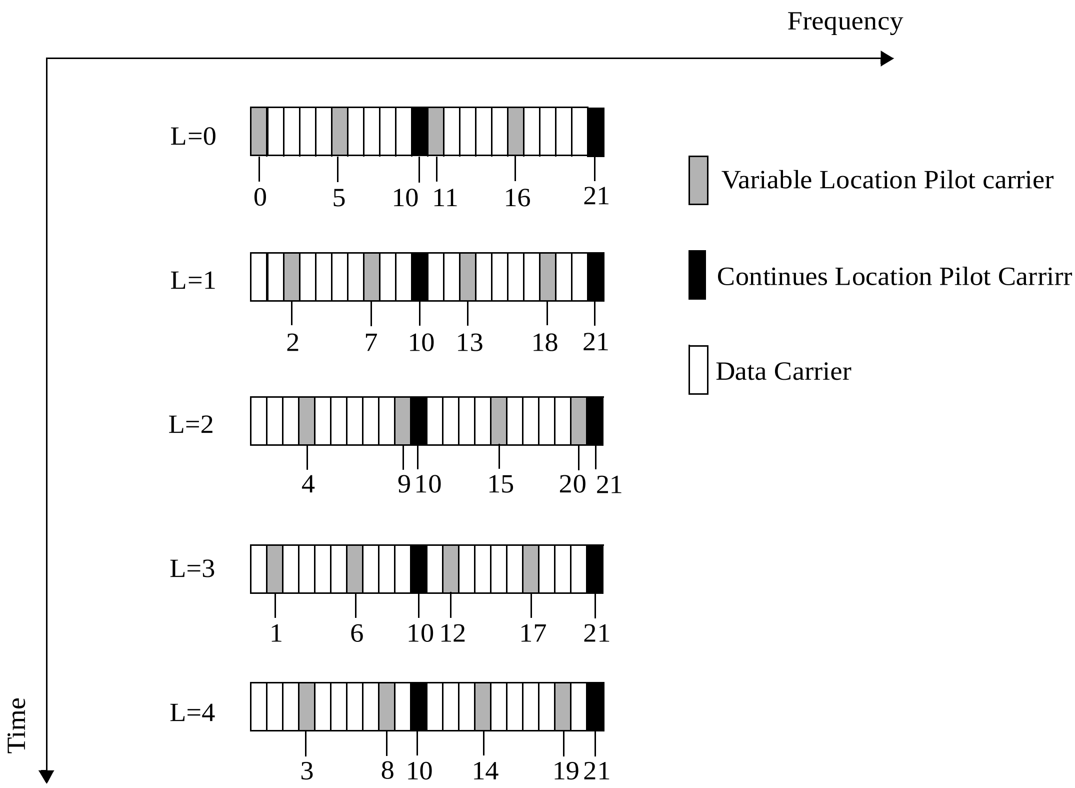

Figure 128bb2—Sub-Channel (of 22 carriers) organization and structure

The structure proposed enables a module 5 frame structure, with maximum frequency diversity.

[Replace section 8.5.6.1 with section 8.5.10.3]

[Replace section 8.5.6.1.1 with section 8.5.10.3.1 and 8.5.10.3.2 with deletion of: page 43 line 58- page 44 line 4]

[Change 8.5.6.1.2 to 8.5.6.1.3 and perform the following changes]

8.5.6.1.3 Partitioning of data carriers into subchannels in downlink

After mapping ~~the~~all sectors pilots, the remainder of the used carriers are the data subchannels. ~~Note that since the variable location pilots change location in each symbol, repeating every fourth symbol, the locations of the carriers in the data subchannels shall change also.~~Note that only the relevant pilots of the current sector are modulated, while all other pilots are zeroed.

To allocate the data subchannels, the remaining carriers are partitioned into groups of contiguous carriers. Each sub-channel consists of one carrier from each of these groups. The number of groups is therefore equal to the number of carriers per subchannel, and it is denoted $N_{subcarriers}$. The number of the carriers in a group is equal to the number of subchannels, and it is denoted $N_{subchannels}$. The number of data carriers is thus equal to $N_{subcarriers} \cdot N_{subchannels}$.

The exact partitioning into subchannels is according to Equation (84), called a permutation formula. (To clarify the operation of this formula, an example application is given subsequently in 8.5.6.2.1).

$$carrier(n, s) = N_{subchannels} \cdot n + \{p_s[n_{mod(N_{subchannels})}] + ID_{cell} \cdot ceil[(n+1) / N_{subchannels}]\}_{mod(N_{subchannels})} \tag{84}$$

where

$carrier(n, s)$ is the carrier index of carrier n in subchannel s

s is the index number of a subchannel, from the set [0..$N_{(subchannel)s}$ -1]

n is the carrier-in-subchannel index from the set [0..$N_{subcarriers}$ -1]

$N_{(subchannel)s}$ is the number of subchannels

$p_s[j]$ is the series obtained by rotating $\{PermutationBase_0\}$ cyclically to the left s times

ceil[ ] is the function that rounds its argument up to the next integer

ID_{cell} is a positive integer assigned by the MAC to identify this particular BS sector

$X_{mod(k)}$ is the remainder of the quotient X/k (which is at most k–1)

and the numerical parameters are given in ~~Table 116ca~~Table 116am2.

On initialization, a SS must search for the DL preamble for each possible value of the PNId and relevant sector, then the SS must search for each possible value of the permutation index to determine the actual index being used for the cell. An AAS-enabled SS may additionally search for preambles based on the permutations (distributed, adjacent or both) it is capable of using for AAS traffic. However, an SS shall perform this search if it intends to initiate AAS-based initial ranging (see 6.2.7.7.4). Note that an AAS-enabled SS, which does not provision the same permutation (distributed or adjacent) for AAS traffic selected by the BS for this purpose, is not capable of using its AAS capabilities with this BS.

[delete table 116ca]

[Replace section 8.5.8 with section 8.5.10.6 as updated by contribution C80216d_03/39]

[change in 8.5.9.1]

8.5.9.1 Randomization

Data randomization is performed on data transmitted on the DL and UL. The randomization is ~~performed~~initialized on each ~~allocation (DL or UL)~~burst, ~~which means that for each allocation of a data block (subchannels on the frequency domain and OFDM symbols on the time domain) the randomizer shall be used independently~~. If the amount of data to transmit does not fit exactly the amount of data allocated, padding of 0xFF ('1' only) shall be added to the end of the transmission block, up to the amount of data allocated.

~~The shift-register of the randomizer shall be initialized for each new allocation or for every 1250 bytes passed through (if the allocation is larger then 1250 bytes).~~

The Pseudo Random Binary Sequence (PRBS) generator shall be $1 + X^{14} + X^{15}$ as shown in Figure 128bh. Each data byte to be transmitted shall enter sequentially into the randomizer, msb first. Preambles are not randomized. The seed value shall be used to calculate the randomization bits, which are combined in an XOR operation with the serialized bit stream of each burst. The randomizer sequence is applied only to information bits.

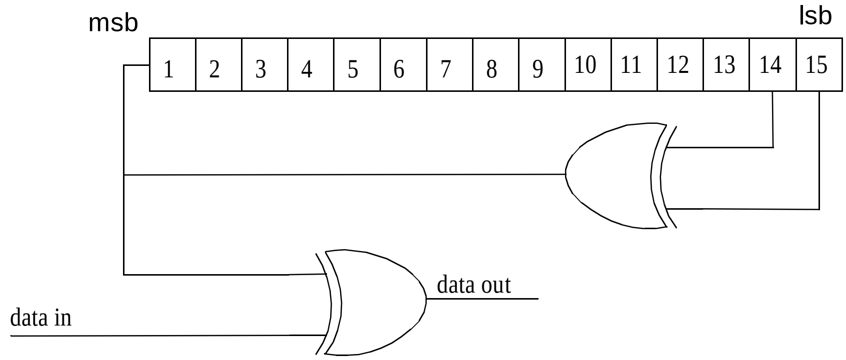

Figure 128bh—PRBS for data randomization

The bit issued from the randomizer shall be applied to the encoder.

~~In the downlink, the scrambler shall be re-initialized at the start of each frame with the sequence:~~

~~(msb) 1 0 0 1 0 1 0 1 0 0 0 0 0 0 0 (lsb)~~

~~The produced sequence from the PRBS shall start with: 0 0 0 0 0 0 1 1 1 1 1 1 0 1 1 0 ....~~

~~In the uplink, t~~The scrambler is initialized with the vector created as shown in Figure 128bi. (The subchannel offset relates to a logical subchannel, see 8.5.4.5)

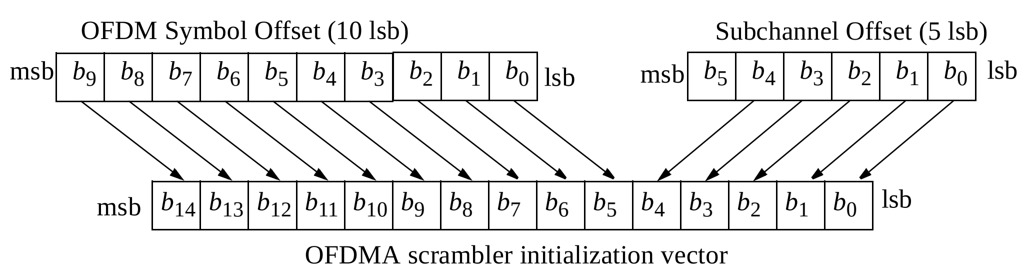

Figure 128bi—Creation of OFDMA scrambler initialization vector

[replace section 8.5.9.2 with 8.5.10.5.2]

[Replace section 8.5.9.2.1 with following text]

8.5.9.2.1 Concatenated code

Each FEC block is encoded by the binary convolutional encoder, which shall have native rate of 1/2, a constraint length equal to K=7, and shall use the following generator polynomials codes to derive its two code bits:

$$\begin{aligned} G_1 &= 171_{OCT} && FOR\ \ X \\ G_2 &= 133_{OCT} && FOR\ Y \end{aligned} \qquad (85)$$

The generator is depicted in Figure 128bj.

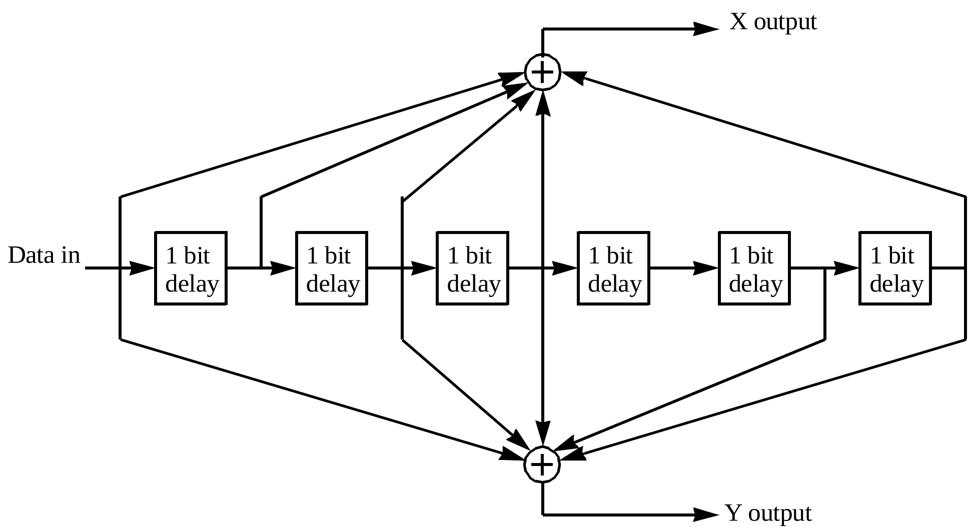

Figure 128bj—Convolutional encoder of rate 1/2

Puncturing patterns and serialization order which shall be used to realize different code rates are defined in Table 116cd. In the table, “1” means a transmitted bit and “0” denotes a removed bit, whereas X and Y are in reference to Figure 128bj.

Table 116cd—The inner convolutional code with puncturing configuration

	Code Rates			
Rate	1/2	2/3	3/4	5/6
d_{free}	*10*	6	5	4
X	1	10	101	10101
Y	1	11	110	11010
XY	X_1Y_1	$X_1Y_1Y_2$	$X_1Y_1Y_2X_3$	$X_1Y_1Y_2X_3Y_4X_5$

Each FEC block is encoded by a tail-biting convolutional encoder, which is achieved by initializing the encoders memory with the last data bits of the FEC block being encoded (the packet data bits are numbered $b_b..b_n$).

Table 116cd1 defines the basic sizes of the useful data payloads to be encoded in relation with the selected modulation type and encoding rate.

Table 116cd1—useful data payload for a sub-channel

	QPSK		16 QAM		64 QAM		
Encoding rate	R=1/2	R=3/4	R=1/2	R=3/4	R=1/2	R=2/3	R=3/4
Data payload in 48 symbols	6 bytes	9 bytes	12 bytes	18 bytes	18 bytes	24 bytes	27 bytes

[Replace table 116ci of section 8.5.9.2.3.1 with table 116am9 from 8.5.10.5.2.3]

[Replace table 116ch of section 8.5.9.2.2 with the following table]

.

Table 116ch—Optional channel coding per codulation

Modulation	Data block size (bytes)	Coded block size (bytes)	Overall coding rate	Constituent codes	Code parameters	Remarks
QPSK	6	12	1/2	(16,11)(8,7)	I_x=4,I_y=0,B=0,Q=1	
QPSK	9	12	3/4	(16,15)(8,7)	I_x=4,I_y=0,B=0,Q=5	
16-QAM	15	24	5/8	(16,11)(16,15)	I_x=0,I_y=4,B=0,Q=1	used also when concatenating 2 QPSK Bursts
16-QAM	20	24	5/6	(16,15)(16,15)	I_x=0,I_y=4,B=0,Q=5	used also when concatenating 2 QPSK Bursts
64-QAM	26	36	~3/4	(32,26)(16,15)	I_x=0,I_y=7,B=0,Q=0	used also when concatenating 3 QPSK Bursts
64-QAM	31	36	~4/5	(32,31)(16,15)	I_x=0,I_y=7,B=0,Q=0	used also when concatenating 3 QPSK Bursts

[Replace table 116cl of section 8.5.9.3 with table 116am10 from 8.5.10.5.3]

[Change first paragraph in 8.5.9.3:]

All encoded data bits shall be interleaved by a block interleaver with a block size corresponding to the number of coded bits per the encoded block size as set in 8.5.9.2 ~~specified allocation~~, N_{cbps} (see Table 116cl). The interleaver is defined by a two-step permutation. The first ensures that adjacent coded bits are mapped onto nonadjacent carriers. The second permutation insures that adjacent coded bits are mapped alternately onto less or more significant bits of the constellation, thus avoiding long runs of lowly reliable bits.

[Delete section 8.5.10 in P80216d_D2]

Reason:

Consolidate section 8.5.10 into the OFDMA mode.