

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Revised resolution to comment #9 and resolution to comment #56]

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Re: [In response to TG3c comments (IEEE P802.15-08-0020-05-003c)]

Abstract: [Revised comment resolutions]

Purpose: [To be considered in TG3C baseline document.]

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Revised Resolution to Comment #9

- Comment #9
 - How do we encode all of the supported data rates.
- Resolution
 - All of the supported data rates for each PHY case are encoded as following
 - 3 bits for SC case
 - 1 bit for AV-OFDM case
 - 3 bits for HSI-OFDM case
 - As for SC case, 10 MCSs are categorized by 6 capabilities (2 for modulation scheme and 4 for coding scheme), and encoded by 3 bits in the capability IE

Capability bits in SC case

- 10 MCSs are categorized by 6 capabilities (2 for modulation scheme and 4 for coding scheme), and encoded by 3 bits in the capability IE
 - 1 bit for 8QAM&16QAM capability
 - 2 bits for coding capability as for LDPC

- Bit mapping
 - B2 : modulation capability
 - B1-B0: coding capability

Modulation capability	[b2]
BPSK + QPSK	0
BPSK + QPSK + 8QAM + 16QAM	1
Coding capability	[b1-b0]
RS (255,239)	00
RS (255,239) + LDPC (576,288) + LDPC (576,432) + LDPC (576,504)	01
RS (255,239) + LDPC (1440,1344)	10
RS (255,239) + LDPC (576,288) + LDPC (576,432) + LDPC (576,504) + LDPC (1440,1344)	11

Data rate encoding in AV-OFDM case

- Capabilities of 11 MCSs are encoded by 1 bit
 - If all DEVs are assumed to support all modulation scheme of BPSK, QPSK, 16QAM, no bits are required to indicate the modulation capabilities
 - If all DEVs are assumed to support all coding rates (1/2, 1/3, 2/3), no bits are required to indicate the coding scheme capabilities
 - By using 1 bit, UEP capability can be indicated
- Bitmapping
 - B0: UEP capability

UEP capability	[b0]
UEP not capable	0
UEP capable	1

Data rate encoding in HSI-OFDM case

- Capabilities of 16 MCSs are encoded by 3 bits in the capability IE
- Bit mapping
 - B2: UEP capability
 - B1: 16QAM capability (when UEP not capable) or Outer RS capability (when UEP capable)
 - B0: outer RS capability (when UEP not capable) or 16 QAM capability (when UEP capable and outer RS capable), 16&64QAM capability (when UEP capable and outer RS not capable)

UEP capability	[b2]
UEP not capable	0
UEP capable	1
Modulation and outer RS capability	[b1, b0]
QPSK, with outer RS	00
QPSK, with/without outer RS	01 (when UEP not capable)
QPSK&16QAM, with outer RS	01 (when UEP capable)
QPSK&16QAM, with outer RS	10 (when UEP not capable)
QPSK&16QAM, with/without outer RS	10 (when UEP capable)
QPSK&16QAM, with/without outer RS	11 (when UEP not capable)
QPSK&16QAM&64QAM, with/without outer RS	11 (when UEP capable)

Appendix

MCSs in three PHY cases

MCSs in SC

- 000 → LR1, MR5
- 001 → LR1:3, MR1:3, MR5
- 010 → LR1, MR4:5
- 011 → LR1-3, MR1-5
- 100 → LR1, MR5, HR1:2
- 101 → LR1:3, MR1:3, MR5, HR1:2
- 110 → LR1, MR4:5, HR1:2
- 111 → LR1-3, MR1-5, HR1:2

MCS Class	MCS ID	PHY-SAP rate (Mbs)	Modulation Scheme	Spreading factor	FEC Type	FEC Rate
Class 1	LR1	50.6(CR)/379.6/ 759.2/1518.4(MLR)	p/2-BPSK/(G)MSK	32/4/2/1	RS(255,239)	0.937
	LR2	607.5/1215.0	p/2-BPSK/(G)MSK	2/1	LDPC(576,432)	0.750
	LR3	810.0	p/2-BPSK/(G)MSK	1	LDPC(576,288)	0.500
Class 2	MR1	1620.0	p/2-QPSK	1	LDPC(576,288)	0.500
	MR2	2430.0	p/2-QPSK	1	LDPC(576,432)	0.750
	MR3	2835.0	p/2-QPSK	1	LDPC(576,504)	0.875
	MR4	3024.0	p/2-QPSK	1	LDPC(1440,1344)	0.933
	MR5	3036.7	p/2-QPSK	1	RS(255,239)	0.937
Class 3	HR1	4555.1	p/2-Star 8QAM	1	RS(255,239)	0.937
	HR2	6073.4	p/2-16QAM	1	RS(255,239)	0.937
Class 4	OOK1	1518.4/759.2	OOK	1/2	RS(255,239)	0.937
	DRB1	3036.7	Dual Rail Bipolar	1	RS(255,239)	0.937

MCSs in AV-OFDM

- 0 → LRPO:3, HRPO:2
- 1 → LRPO:3, HRPO:6

Table 95—HRP data rates and coding

HRP mode index	Coding mode	Modulation	Code rate				Raw data rate (Gb/s)
			MSB		LSB		
			[7]	[6]	[5]	[4]	
0	EEP	QPSK	1/3				0.952
1		QPSK	2/3				1.904
2		16-QAM	2/3				3.807
3	UEP	QPSK	4/7	4/5		1.904	
4		16-QAM	4/7	4/5		3.807	
5	MSB-only retransmission	QPSK	1/3	N/A		0.952	
6		QPSK	2/3	N/A		1.904	

Table 96—LRP data rates and coding

LRP mode index	Modulation	FEC	Raw data rate (Mb/s)	Repetition
0	BPSK	1/3	2.5	8×
1		1/2	3.8	8×
2		2/3	5.1	8×
3		2/3	10.2	4×

MCSs in HSI-OFDM

- 000 → MCS0:MCS4
- 001 → MCS0:MCS4, MCS9:MCS10
- 010 → MCS0:MCS7
- 011 → MCS0:MCS7, MCS9:MCS11
- 100 → MCS0:MCS4, MCS12:MCS13
- 101 → MCS0:MCS7, MCS12:MCS15
- 110 → MCS0:MCS7, MCS9:MCS15
- 111 → All MCSs

MCS	Data Rate (Mbps)	Modulation scheme	Coding mode	Outer FEC rate	Inner FEC rate (R_I)		Spreading factor	Spread & coded bits/sym.	Coded bits/sym.	Data info* bits/sym.	
					MSB 8b	LSB 8b				MSB 7:4	LSB 3:0
0	59	QPSK	EEP	0.94	1/2		24	672	28	14	
1	708	QPSK		0.94	1/2		2	672	336	168	
2	1416	QPSK		0.94	1/2		1	672	672	336	
3	2124	QPSK		0.94	3/4		1	672	672	504	
4	2478	QPSK		0.94	7/8		1	672	672	588	
5	2832	16-QAM		0.94	1/2		1	1344	1344	672	
6	4248	16-QAM		0.94	3/4		1	1344	1344	1008	
7	4956	16-QAM		0.94	7/8		1	1344	1344	1176	
8	6372	64-QAM		0.94	3/4		1	2016	2016	1512	
9	1512	QPSK	EEP	1	1/2		1	672	672	336	
10	2664	QPSK		1	7/8		1	672	672	588	
11	4536	16-QAM		1	3/4		1	1344	1344	1008	
12	1770	QPSK	UEP	0.94	1/2	3/4	1	672	672	336	504
13	2301	QPSK		0.94	3/4	7/8	1	672	672	504	588
14	3540	16QAM		0.94	1/2	3/4	1	1344	1344	672	1008
15	4602	16QAM		0.94	3/4	7/8	1	1344	1344	1008	1176

Resolution to Comment #56

- Comment #56
 - The max values for M and N is not specified. Is that a problem ?
- Resolution
 - Yes, problem. Max values for M and N are defined as 256 by using 8bit field