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

Submission Title: [Memory Refreshment for SC Class 3]
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Re: [In response to IEEE802.15-08-0742-05-003c-lb47-comments]

Abstract: [This document provides suggested resolution to comments for single carrier Class 3 modes]

Purpose: [To assist in comment resolution for LB47]

Comments for Class 3 modes

CID1, 2, 102, 118, 134, 138, 142, 188 in LB47 provides comments to reinstate Class 3 modes removed at the Hawaii meeting in Sep. 2008.

However, the Class 3 modes in DF00 were also selected by removing some MCSs without any technical contribution giving any justification for removing these MCSs at the Taipei meeting in Jan. 2008.
How many people in 15.3c TG remember this procedure ?

Now we need memory refreshment for these removed MCSs, if we reinstate Class 3 modes.

12 MCSs with 8- or 16-point constellation approved at the Atlanta meeting in Nov. 2007 (08/56/r1)

#	Modulation	FEC	DCN	PHY-SAP bit rate (Mbps)	E_b/N_0 required for BER of 1e– 6 (dB)			
					AWGN	CM1.3	CM2.3	CM9.1
1	π/2 8QAM	2/3 CC & RS(63,55)	7/683/r0	2806.6	8.4	(14.8m)	N/A	N/A
2	π/2 NS8QAM	TCM(R=1/2, K=5)	7/681/r2	3214.9	11.2	N/A	N/A	N/A
3	π/2 8PSK	LDPC(576,432)	7/934/r1	3616.7	N/A	N/A	N/A	N/A
4	π/2 8QAM	RS(63,55)	7/683/r0	4210.0	N/A	N/A	N/A	N/A
5	π/2 8PSK	LDPC(576,504)	7/700/r4	4219.5	N/A	N/A	N/A	N/A
6	π/2 8PSK	LDPC(1440,1344)	7/693/r3	4500.8	9.5	9.5	16.5	9.5
7	π/2 8PSK	RS(255,239)	7/693/r3	4519.7	11.2	11.2	19.1	11.2
8	π/2 NS8QAM	RS(255,239)	7/681/r2	4519.7	N/A	N/A	N/A	N/A
9	π/2 16QAM	2/3 TCM (K=5)	7/681/r2	4822.3	16.3	N/A	N/A	N/A
10	π/2 16QAM	LDPC(576,432)	7/934/r1	4822.3	N/A	N/A	N/A	N/A
11	π/2 16QAM	LDPC(576,504)	7/934/r1	5626.0	N/A	N/A	N/A	N/A
12	π/2 16QAM	RS(255,239)	7/681/r2	6026.3	N/A	N/A	N/A	N/A

The number of MCS provided channel model simulations of CM1.3 and 2.3 was only two.

Link Budget

	mode	8PSK + (255, 239) RS				8PSK + rate-14/15 LDPC			
	Channel model	AWGN	CM1.3	CM2.3	CM9.1	AWGN	CM1.3	CM2.3	CM9.1
	frequency (GHz)	60	60	60	60	60	60	60	60
	PHY-SAP bit rate (Mbps)	4858.7	4858.7	4251.4	4858.7	4838.4	4838.4	4233.6	4838.4
TX	power	10	10	10	10	10	10	10	10
	Antenna gain (dB)	15	15	15	15	15	15	15	15
channel	distance (m)	10	10	5	10	10	10	5	10
	1m loss (dB)	68	68	68	68	68	68	68	68
	Path loss (dB)	20	20	17.47	20	20	20	17.47	20
	Propagation loss (dB)	2	2	2.5	2	2	2	2.5	2
	Rx Input level (dBm)	– 63	– 63	– 60.48	– 63	– 63	– 63	– 60.48	– 63
	Avg noise per bit (dBr)	– 77.13	– 77.13	– 77.71	– 77.13	– 77.15	– 77.15	– 77.73	– 77.15
RX	Antenna gain (dB)	15	15	15	15	15	15	15	15
	Noise figure (dB)	8	8	8	8	8	8	8	8
	Implementation loss (dB)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Shadowing margin (dB)	1	1	5	1	1	1	5	1
	Receiving E_b/N_0 (dB)	18.63	18.63	17.74	18.63	18.65	18.65	17.75	18.65
	RequiredE_b/N_0 (dB)	11.2	11.2	19.1	11.2	9.5	9.5	16.5	9.5
	margin	7.43	7.43	– 1.36	7.43	9.15	9.15	1.25	9.15

The 8PSK + rate-14/15 LDPC meets the link budget.

Proposed way forward

- Add Class 3 modes to current draft (D2):

MCS class	PHY-SAP (Mb/s)	Modulation scheme	Spreading factor	FEC type	FEC rate
Class 3	4536	Pi/2 8-PSK	1	LDPC(1440,1344)	14/15
	6048	Pi/2 16QAM	1	LDPC(1440,1344)	14/15

*) without blanking period