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

Submission Title: 64QAM extension to SUN-OFDM

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Abstract: Overview of proposed resolutions

Purpose: Discussion

Introduction:

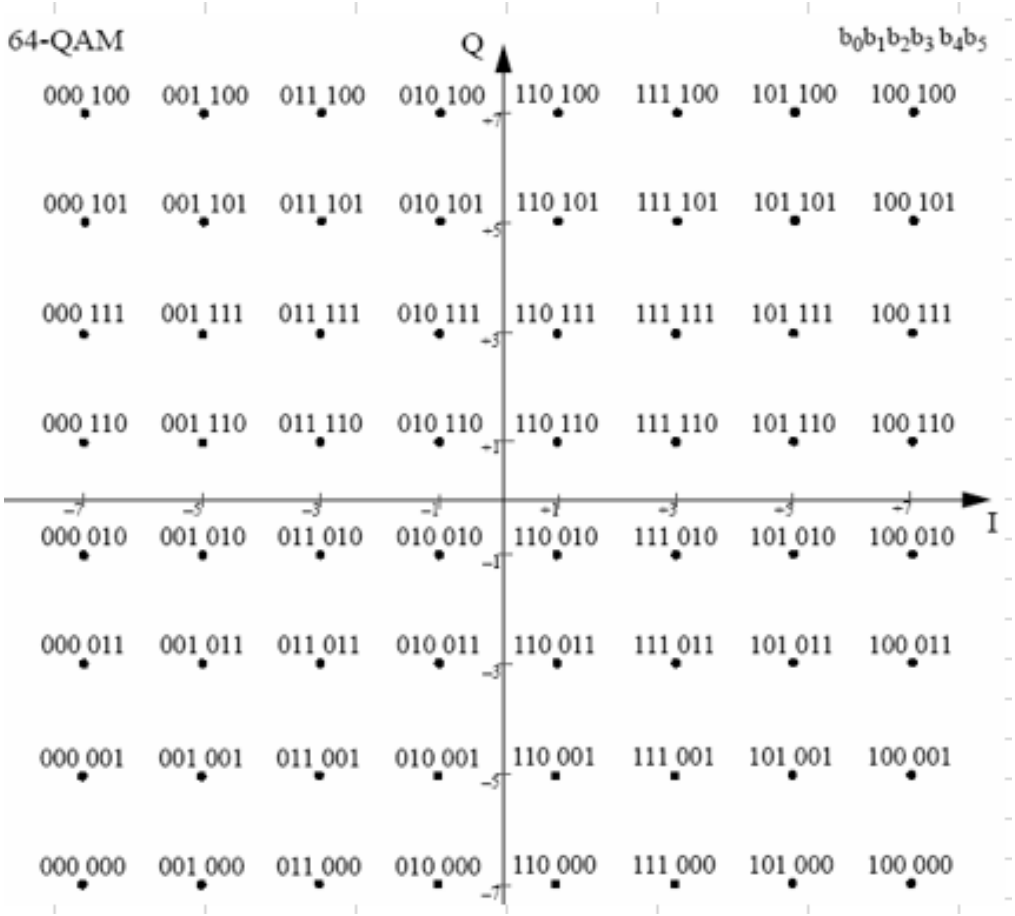
- Trend: increasing traffic in SUN
  - Increased data rates are desirable
- Extending SUN-OFDM:
  - 64-QAM, code rate ¾

Proposing to add 64QAM with code rate ¾:

Table 20-10—Data rates for SUN OFDM PHY

Parameter	OFDM Option 1	OFDM Option 2	OFDM Option 3	OFDM Option 4
Nominal bandwidth (kHz)	1094	552	281	156
Channel spacing (kHz)	1200	800	400	200
DFT size	128	64	32	16
Active tones	104	52	26	14
# Pilot tones	8	4	2	2
# Data tones	96	48	24	12
MCS0 (kb/s) (BPSK rate 1/2 with 4x frequency repetition)	100	50	25	12.5
MCS1 (kb/s) (BPSK rate 1/2 with 2x frequency repetition)	200	100	50	25
MCS2 (kb/s) (QPSK rate 1/2 and 2x frequency repetition)	400	200	100	50
MCS3 (kb/s) (QPSK rate 1/2)	800	400	200	100
MCS4 (kb/s) (QPSK rate 3/4)	1200	600	300	150
MCS5 (kb/s) (16-QAM rate 1/2)	1600	800	400	200
MCS6 (kb/s) (16-QAM rate 3/4)	2400	1200	600	300
MCS7 (kb/s) (64-QAM rate ¾)	**3600**	**1800**	**900**	**450**

64-QAM Gray mapping (same as in 802.11a):



64-QAM → using same interleaving rules:

$$i = \left(\frac{N_{\text{cbps}}}{N_{\text{row}}}\right) \times [k \bmod(N_{\text{row}})] + \text{floor}\left(\frac{k}{N_{\text{row}}}\right)$$

$$j = s \times \text{floor}\left(\frac{i}{s}\right) + \left[i + N_{\text{cbps}} - \text{floor}\left(\frac{N_{\text{row}} \times i}{N_{\text{cbps}}}\right)\right] \bmod(s)$$

- *Nrow* = 12
  - Same as SUN OFDM PHY when no spreading is used
- *Ncbps* = Number of data carriers X 6 bits
  - Option 1 → *Ncbps* = 576
  - Option 2 → *Ncbps* = 288
  - Option 3 → *Ncbps* = 144
  - Option 4 → *Ncbps* = 72

Conclusion:

- 64-QAM with code rate ¾ is proposed
  - 50% rate boost
  - Up to 3.6 Mbit/s using Option 1
  - Higher data rates in bandwidth limited regulatory domains
    - 450 kbps in 200 kHz ch-spacing, e.g. EU, India
    - 1800 kbps in 800 kHz ch-spacing, e.g JP