IEEE 802.11
Wireless Access Methods and Physical Layer Specifications

Comments and Suggestions for a Frequency Hop
Physical Layer Standard

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Introduction

At the November, 1992, 802.11 meeting, the document, 92/127r was presented . This document presents a proposed PHY layer draft from California Microwave Inc. for frequency hop systems operating in the 2.4 GHz ISM band. This paper performs the very valuable service of itemizing many important aspects of a PHY layer specification and quantifying many of these issues. In response to the author's request that this document be used as a format for comment and consideration of alternative specification proposals, Motorola presents the attached table.

In order to promote the process of discussion and comparison, this table uses the same numbering system as the previous document. Three categories of changes relative to 92/127r are apparent.

1. In several cases entries in the attached table supply additional information. For instance, specific frequency assignments are suggested.

2. With respect to some specifications, the attached table suggest that while providing interoperability, the 802.11 specification could be less restrictive, thus providing more opportunity for vendors to address special aspects of the market. For instance, rf power specifications might be left to the limits imposed by the regulatory agencies. In addition, receiver performance specifications such as sensitivity need not be specified, thus providing vendors greater flexibility to address short range, low cost opportunities. Perhaps, however, the standard should include measurements specification for consistent comparison of equipment.

3. In other cases, an alternate specification is presented. Motorola suggests that a baseline specification of 1 Mb/s with .39 GMSK modulation is quite appropriate. This is not to say, of course, that a lower data rate to provide increased range or less vulnerability to multipath may not be important product options for some markets. Conversely, higher data rates, that might be achieved with multilevel modulation, may be attractive for some applications.

	PARAMETER	PROPOSED SPEC	COMMENT
1	Frequency Range	2.4 to 2.4835 GHz USA 2.4 to 2.5 GHz ETSI 2.4 to 2.5 GHz Japan	Other bands will follow
2	Frequencies available for hop operation	(2400 + n) MHz 0<n<83, USA 0<n<100, ETSI&Japan	.
3	Hop rate	NA	This appears to be a MAC issue, subject to limits imposed by regulatory agencies.
4	Transmitted power level	Spec not required since issue is controlled by regulatory agencies	Propose that choice of transmitter power be left to vendors in order to address market issues.
5	Optional Transmitter power	Spec not required	Propose that this issue be left to the discretion of the vendors.
6	Max. Radiated EIRP	Spec not required since issue is controlled by regulatory agencies.	.
7	Transmitted power variation (tolerance)	Spec not required. In Japan issue is controlled by regulatory agency.	.
8	Frequency deviation	see #17 below	
9	Spurious output a) in band b) out of band	a) EIRP in absolute power level, level TBD b) controlled by regulatory agencies	a) Since equipment from multiple vendors may coexist, a limit may be advisable.
10	Minimum receiver sensitivity	Spec not required	See item #2 on page 1
11	Max input level	Spec not required	See item #2 on page 1
12	Adjacent channel selectivity	see #14	
13	Channel bandwidth allocated	Spec not required	

	PARAMETER	PROPOSED SPEC	COMMENT
14	Occupied channel bandwidth	Specificaion not required since issue is controlled by regulatory agencies.	.
15	Receiver center frequency acceptance range	Spec not required	Receivers must operate with expected variations of transmitter signals
16	Modulation	see #17 below	
17	Channel Data Rate	1 Mb/s / .39 GMSK	1 MB/s with binary .39 GMSK is the common baseline. Options for higher data rates with multilevel modulation may be considered for the standard now or in the future. Low data rate options may also be appropriate.
18	Fallback data rates	800, 500 & 250 kb/s	GFSK Utilizing the same splatter filter as during 1 Mb/s operation
19	Phy supplied clock jitter	TBD	
20	Adjacent channel rejection margin:	Spec not required	See item #2 on page #1
21	Preamble length	100 bit periods	
22	Clock recovery	Data whitener used to avoid long strings of 1's or 0's.	
23	Carrier detect response time	Spec not required	See item #2 on page #1
24	Spurious emissions in band	Covered by #9	
25	Spurious emissions out of band	Limited by regulatory agencies	.

	PARAMETER	PROPOSED SPEC	COMMENT
26	Switching time Tx to Rx	TBD	
27	Switching time Rx to Tx	TBD	
28	Channel switching time	300 uS	
29	Open		
30	BER at specified Eb/No	Spec not required	See item #2 on page #1
31	Channel Availablity	Propose that this be considered as a MAC issue	.
32	Tx frequency stability	30 ppm	
33	Data Line/ Clock Jitter	TBD	
34	Open		
35	Open		
36	Antenna port impedance	Spec not required	Propose that this issue be left to vendors in order to address market issues.
37	VSWR	Spec not required	See item #2 on page #1
38	Open		
39	Open		
40	Interface lines to Convergence layer	List per 92/127r, subject to future review	.
41	PHY-MAC Net Management info./control variables	List per 92/127r, subject to future review	.
42	Other PHY-MAC Net Management info./control variables	TBD	.
43	Safety Requirements	Compliant with regulatory agencies	.
44	DTE/DCE Interface	?	
45	ACk protocol support	?	