IEEE P802.11
Wireless LANs

Comments received on 802.11a in Letter Ballot 17

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We received comments from the following persons:

Voter id	Full name	Cmmt nums (when soterd by ID)	Processing Status
ah	Allen Heberling	1-12	
bo	Bob O'Hara	13-39	
bran	jkh on behalf of BRAN	40	
dk	Dean M. Kawaguchi	41	
jh	Juha Heiskala	42-44	
jkh	Jamshid Khun-Jush	45	
ko	Kazuhiro Okanoue	46-50	
mif	Michael Fischer	51	
moa	Masahiro Morikura	52-53	
nc	Naftali Chayat	54-74	
rw	Robert M. Ward Jr.	75-79	
sl	Stanley Ling	80-83	
tk	Tal Kaitz	84-93	
to	Tomoki Ohsawa	94	
vh	Victor Hayes	95-99	

(6 comments by Steve Gray appended)

The comments are provided in the following table starting on the next page:

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
1.	17.3.10.1	Ah	T	Y	This clause and its associated Table 88 provide a very concise summary of minimum sensitivity, adjacent channel rejection and non-adjacent channel rejection values. However, unlike clauses 15.4.8.1, 15.4.8.2, and 15.4.8.3 in IEEE Std 802.11-1997, clause 17.3.10.1 does not provide explicit details regarding the measurement techniques used to obtain the parameters summarized in Table 88. Table 88 title has the word requirment misspelled	Please provide a description of the desired test procedures. Change to "requirement"	See next comment by NC

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2.	17.3.10.1	nc	E		Separate the "Receiver minimum input level sensitivity, adjacent channel and non-adjacent channel rejection" into two subclauses (sensitivity and ACI) pointing to same table 88. For ACI, specify a measurement method.	The Packet Error Rate (PER) shall be less than 10% at an PSDU length of 1000 bytes for **rate-dependent** input levels specified in Table 88. Noise Figure of 10 dB and 5 dB implementation margins are assumed. The adjacent (or non-adjacent) channel rejection shall be measured by setting the desired signal's strength 3 dB above the rate-dependent sensitivity specified in Table 88 and raising the power of the interfering signal until 10% Packet Error Rate (PER) is caused for a PSDU length of 1000 bytes. The power difference between the interfering and the desired channel is the corresponding adjacent (or non-adjacent) channel rejection. The interfering signal in the adjacent (or non-adjacent) channel shall be a conformant OFDM symbol, unsynchronized with the signal in the channel under test. For a conformant OFDM PHY the corresponding rejection shall be no less than specified in Table 88.	
3.	17.3.10.3	nc	t		the paragraph specifies probability of detection within 5 microseconds, while Table 90 specifies aCCAtime<4 microseconds.	Change in Table 90 to aCCAtime<5 microseconds.	
4.	17.3.11	Ah	E	N	Figure 120 shows the SERVICE field as being part of the PLCP Header. Yet clause 17.3.2 describes it as being part of the DATA block. Figure 120 shows C-MPDU in the PHY_PMD layer.	Please indicate in Figure 120 that the SERVICE field is to be part of the C-PSDU block. Please change C-MPDU to C-PSDU.	NC- there are two boundaries- one in terms of function (PLCP header and the PSDU) and another in terms of modulation used (6 Mbit/s vs. RATE). Maybe add a clarification in the SERVICE defintion in 17.??

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5.	17.3.11	nc	e		p. 269 l. 45, change "SIGNAL (DATARATE)" to "DATARATE".		
6.	17.3.12	Ah	e	N	Figure 123, 2nd block from the top of column 2, Line 9 the word deteced	Change to detected	
7.	17.3.12	Ah	E	N	Figure 122 displays the same editorial problems as Figure 120.	Please make the same corrections for Figure 122 as were done for Figure 120.	
8.	17.3.2	Ah	E	N	Wording in paragraph needs to be improved. Line 17: …data rate destribed in … Line 18: …enable to decode the RATE and the LENGTH fields immediately after the reception of it. Line 19: The knowledge of the RATE and the Length… Line 20: In addition, the knowledge of the RATE…	… data rate described in … …enable the decoding of the RATE and the LENGTH fields immediately after the reception of the tail bits. The RATE and LENGTH fields are required for decoding the DATA part of the packet. In addition, the content of the RATE and LENGTH fields augment the CCA mechanism …	
9.	17.3.2	Ah	T	Y	Figure 107 is less clear than the diagram labeled Figure 3 in P802.11a/D2.0. I understand how the SIGNAL field was translated into the rate field. However, I do not understand why the term SIGNAL is used to label the block following the PLCP preamble. I also see how the Length field was shortened and its position in the Figure 3 diagram was changed as displayed in Figure 107. Figure 3 had both a Service field and a CRC-16 field as part of the PLCP Header. Now I see that the CRC-16 field has been eliminated and that the Service field is now considered part of the DATA block in the PPDU	Please rename the SIGNAL Block. Please clarify, why the SERVICE field is now part of the DATA Block.	NC- The service field carries information which is useless unless the PSDU is successfully decoded as well. Therefor it is located in the part which is at same modulation and coding as the PSDU, namely in DATA.
10.	17.3.2	ko	E		Line 15 says that "Replace the 6 scrambled "zero" bits following the PSDU part of DATA." This sentence seems to be mis-located.	Remove the sentence	See comment by NC on same issue.

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11.	17.3.2	nc	E		Line 14, change "bites" to "bits" Line 22, change "clause" to "clauses"		
12.	17.3.2 line 14	tk	e	No	Typo: 6 bites…	6 bits	
13.	17.3.2 (page 247 line 15)	bo	E		"most robust" is used in this description. I hope this is defined somewhere.		NC- change to (?): with the most robust combination of BPSK modulation and coding rate R=1/2.
14.	17.3.2.1	nc	E		Change the following text: 3) Calculate from RATE field of the TXVECTOR the number of "data bits per OFDM symbol", the "coding rate", the number of bits in each OFDM subcarrier ("coded bits per subcarrier") and the "coded bits per OFDM symbol". **The resulting bit string constitutes the DATA part of the packet.** Refer to 17.3.2.2 for details. 4) **Replace the 6 scrambled "zero" bits following the PSDU part of DATA.** Extend the resulting bit string with "zero" bits, at least 6 bits, so that the resulting length will be a multiple of "data bits per OFDM symbol". Refer to clause 17.3.5.3 for details.	Into: 3) Calculate from RATE field of the TXVECTOR the number of "data bits per OFDM symbol", the "coding rate", the number of bits in each OFDM subcarrier ("coded bits per subcarrier") and the "coded bits per OFDM symbol". Refer to 17.3.2.2 for details. 4) **Take the PSDU (including CRC-32) and append it to the SERVICE field of the TXVECTOR.** Extend the resulting bit string with "zero" bits, at least 6 bits, so that the resulting length will be a multiple of "data bits per OFDM symbol". **The resulting bit string constitutes the DATA part of the packet.** Refer to clause 17.3.5.3 for details.	

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15.	17.3.2.1	sl	e	yes	Describe in the draft when data is scrambled within the packet. I am assuming that data is only scrambled after the Preamble, but the text is unclear.		NC- The SIGNAL symbol contents is unscrambled (this is mentioned in 17.3.4), while the DATA contents is scrambled (this is mentioned in 17.3.2.1-5 and in 17.3.5). Add mention that SIGNAL is not scrambled at end of 17.3.2.1-2.
16.	17.3.2.1	sl	t	yes	If the data is scrambled starting after the preamble, a self-synchronizing scrambler is not necessary. A fixed pseudo-random sequence can be added to the data at the start of the PLCP header. You can avoid the error propagation of the self-synchronizing descrambler.		NC- reject. The scrambler is not self synchronizing – it is synchronous. It is stated in 17.3.5.4. Neither 17.3.2.1-5 implies that the scrambler is asynchronous
17.	17.3.2.1	sl	t	yes	If a self-synchronizing scrambler is to be used, initialize the scrambler state to a known value for the start of each packet.		The schambler is frame-synchronous. The randomization of scrambler's seed plays a role.
18.	17.3.2.1	tk	e	No	Excessive use of double quotation marks.	Define the mathematical symbol at the beginning of the section and use it throughout. E.g. : use N_{DBPS} instead of "data bits per ofdm symbol".	NC- might be acceptable, because now the N_{DBPS} etc. are defined before. On the other hand it has a destriptive value in this part.
19.	17.3.2.1 line 7	tk	e	No	Wording: would that data be at 6 Mb/s.	Change to something clearer.	
20.	17.3.2.3	nc	E		In the table 79 of timing related parameters (p. 250, line 23) delete the word "first"		
21.	17.3.2.4	ko	E		"for long OFDM symbols(=T_{G1}) and for data OFDM symbols(=T_{G2})" in line 39 and 40 seems to be error.	change the document as follows;"for long OFDM symbols(=T_{G2}) and for data OFDM symbols(=T_{G1})"	See next comment.

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22.	17.3.2.4	nc	E		In the sentence (p. 250, lines 39-40): Three kinds of T_{GUARD}, for short OFDM symbols (=0 ? s), for long OFDM symbols (=T_{GI}) and for data OFDM symbols (=T_{GI2}) are defined. The T_{GI} and T_{GI2} are interchanged. In addition, "training sequence" should be used instead of "OFDM symbols"	Three kinds of T_{GUARD}, for short **training sequence** (=0 ? s), for long **training sequence** (=$\boldsymbol{T_{GI2}}$) and for data OFDM symbols (=$\boldsymbol{T_{GI}}$) are defined.	
23.	17.3.2.4	nc	E		In the sentence (p. 251, lines 13): Change "rectangle" into "rectangular"		
24.	17.3.2.4	rw	e	N	• C_k not defined	• C_k, defined later as data, pilots or training symbols in the following sections.	
25.	17.3.2.4	tk	e	No	It should made clear that SUBFRAME stands for either one of PREAMBLE, SIGNAL or DATA.	Make it clear.	NC In fact, in terms of OFDM frame type the division is mot into PREAMBLE, SIGNAL and DATA but rather into SHORT and LONG preambles and the SIGNAL/DATA. This needs to be cleared. Also, the eq (2) does not describe division into OFDM symbols, as the sentence before claims.
26.	17.3.2.4	tk	e^2	No	The sentence beginning with "The subframes … are all constructed with…'' merits a new paragraph.	Hit carriage return	
27.	17.3.3 (17.3.5 page 258 eqn 13)	bo	T	n	This equation is normative (required by shall statement) yet it seems that one of the terms is not defined. Is $w_{TSHORT}(t)$ defined by eqn 10 for $w_T[n]$?	Be explicit as to how w_{TSHORT} is defined.	NC In mathematical notations part say that $w_{TSUBBRAME}(t)$ refers to a window of dutation $T_{SUBFRAME}$.

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28.	17.3.3 (17.3.5 page 259 eqn 16)	bo	T	n	This equation is normative (required by shall statement) yet it seems that one of the terms is not defined. Is $w_{TLONG}(t)$ defined by eqn 10 for $w_T[n]$?	Be explicit as to how w_{TLONG} is defined.	NC In mathematical notations part say that $w_{TSUBBRAME}(t)$ refers to a window of dutation $T_{SUBFRAME}$.
29.	17.3.3	nc	E		On p. 253, line 17 replace "Data" with "DATA":		
30.	17.3.3	nc	E		On p. 253, line 17 replace "T_{TSHORT}" with "T_{SHORT}":		
31.	17.3.3	nc	t		On p. 253, on lines 20 and 44 replace "phase modulated" by just "modulated". Phase modulation implies rotation by a specified angle, which is not the way the modulation is specified here. Delete the sentence "The 52 non-zero elements of *L* are used to phase rotate 52 OFDM subcarriers" on line 50. It is redundant and misleading		
32.	17.3.3 eq (9)	tk	e	No	The symbol r is missing in $r_{LONG}(t)$	Add it	
33.	17.3.4	Ah	e	N	Figure 111: Signal field bit assingment	Figure 111: Signal Field Bit Assignment	
34.	17.3.4.1	Ah	t	Y	LENGTH field is described as being an unsigned 16bit integer. Yet, the LENGTH field is defined as having 12 bits.	Please clarify the discrepancy.	
35.	17.3.4.1	ko	e		"The PLCP length field shall be an unsigned 16 bit integer" in line 42 seems to be error.	changed the document to "The PLCP length field shall be an unsigned 12 bit integer"	
36.	17.3.4.1	nc	E		On p. 253, line 17 replace "16 bit" with "12 bit"		
37.	17.3.4.1	to	T		Use CRC instead of one bit parity at PLCP header.	Change the PLCP header structure	

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38.	17.3.4.3 (17.3.6.3 page 262 lines 3,4)	bo	T	n	I believe that you want the requirements for the parity and Signal Tail bits stated here.	Use "shall"	
39.	17.3.4.3	nc	e		On p. 255, line 23 replace "Reserve" by "Reserved"		
40.	17.3.5 (17.3.7 page 262 line 9)	bo	e		"The all bits" should probably be "All bits".		NC probably yes. See previous comment
41.	17.3.5 (17.3.7 page 262 line 10)	bo	T	n	Inclusion of the ITU-T CRC-32 is required by this clause. Is this a second CRC-32 in addition to the one from the MAC?	If this is a PHY CRC-32, show it in Figure 107. If there is not another PHY CRC-32 delete the sentence from this clause.	NC delete the sentense, there is no CRC32 other than the one included in the PSDU. (Did Bob use the clause numbers from D2.1?) The DATA field contains the **SERVICE** field, **the PSDU**, the Tail bits and the Pad bits if needed as described in clause 17.3.5.2 and 17.3.5.3. **All the** bits in the **DATA** field are scrambled as described in clause 17.3.5.4.
42.	17.3.5 page 258 line 12	bo	E		The symbol "GI2" is used in figure 114 but not defined, even though symbols on either side of it are defined.		It is defined in 17.3.2.3 Table 79 and readdressed after equation 3
43.	17.3.5.1 (17.3.7.1)	bo	T	n	This is not an adequate resolution to my comment on bit ordering. There is no connection made between the stated MSB and LSB and the actual bits of this field.	It seems that a figure with the actual bits shown and numbered is necessary to unambiguously define the bit order.	NC seems that a figure is needed.

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44.	17.3.5.10	Ah	e	N	Line 45: "The" MAC …	Change to "The"	
45.	17.3.5.2 (17.3.7.4)	bo	E		Does this field really "improve the error probability of the convolutional decoder"? Or does it improve the probability of detecting/preventing/correcting errors?		NC in my view the words "error probability" imply a measure of the capability of the decoder to prevent/avoid decoding errors, and therefore no change is needed.
46.	17.3.5.3 (17.3.7.5 eqn 22)	bo	T	n	This equation seems to indicate that there are several components that sum in the numerator. Unfortunately, it is not clear what each of these components represent.	Either clearly define each of the components to the numerator or simplify the equation to be $(N_{DATA} + 6) / N_{DBPS}$	NC ?? change the numerator to $(16+8*LENGTH+6+(N_{DBPS}-1))$
47.	17.3.5.4 (17.3.7.6 page 264 line 21)	bo	T	n	The SERVICE field is not a number, it is a bit string. Hence it has no "significance" to which "most" and "least" may be applied.	Replace the reference to "least significant bits" with "bits n through m" where the bits are clearly identified in a figure where the SERVICE field is defined.	NC – accept
48.	17.3.5.5 (17.3.7.8)	bo	T	n	You missed a reference to MPDU. The CRC-32 is referred to here, but is not defined anywhere, nor does it show up in any figure.	Replace MPDU with PSDU. Either define the CRC-32 field and show where it sits in the PPDU or eliminate it if it is the one in the MPDU.	NC delete CRC32, change MPDU to PSDU
49.	17.3.5.6 (17.3.7.9)	bo	E		Suggest replacing "highest" with "largest".		NC accept
50.	17.3.5.6	tk	t	No	The proposed interleaver/deinterleaver is not optimal because runs of consecutive low reliability LSBs may occur at the output of the deinterleaver. This is discussed in document IEEE 99/47.	Change the interleaver/deinterleaver according to doc 99/47	
51.	17.3.5.7	nc	e		On p. 259, line 22 make b_1 italic b_1		

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52.	17.3.5.7	rw	T	*Y*	• Remove the square root factors and add a comment that constellation normalization is required as it was in earlier drafts.
					• With finite word sizes, the scaling may be imprecise in constellation representation or require excessive use of bits. This normalization scaling is best left elsewhere as it applies to all QAM modes, and preamble as well as data subsections. It can also be combined with square root factors for the pilots.
					• This form of the constellation encoding will also be conformance with other IEEE standards.
						• Example change for QPSK (see **Error! Reference source not found.** below)
						• As from the October draft, there was a paragraph stating that constellation power shall be normalized by the following factors. Exact implementation left up to the manufacturer.
						  • BPSK: √2
						  • QPSK: √2
						  • 16 QAM: √10
						  • 64 QAM: √42
							NC – I object to this change, because the diferent frames and sometimes even different subcarriers of same frame use different constellations, e.g. data and pilots. For this reason is is important to emphasize that the power normalization applies to each component individually, and the best way to implement it is in my view by inclusion of the factors.
							
							Finite word sizes are adressed by modulation accuracy requirements.

53.	17.3.5.7 and 17.3.5.8	tk	t	No	The receiver structure may slightly simplified by using BPSK symbols that are aligned with either I or Q coordinates.	Change symbols in Table 81 (BPSK constellation) to {-1 0} and to {1 0}. Change the multiplying factor in equation 19 (pilot symbol definition) to 1.	
54.	17.3.5.8 (17.3.7.11)	bo	E		Replace "the following subclause" with a correct subclause number.	There is no telling when someone may insert a sublclause exactly where you never imaged one could go.	
55.	17.3.5.8 17.3.5.9	moa	T	yes	The constant vector pilot tones generate line spectra at the pilot subcarriers. This may not be acceptable for the MSS parties. The ITU-R recommendation of RLAN EIRP density limit (Preliminary draft new recommendation [8A-9B-T5/AA]) states that the EIRP density limit of RLAN devices in the band 5150-5250 MHz should be no greater than 10 mW in any 1 MHz (or equivalently 0.04 mW in any 4 kHz) per transmitter.	Change Eq.(19) so that the pilot tone is modulated by scramble pattern .	

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56.	17.3.5.8	rw	T	Y	• The power of the pilots relative to the constellation are unclear. It could be interpreted as QPSK data, and therefore using the same scaling as QPSK. This would make the pilots relatively small in the larger constellations.	• Recommend that power be related to normalized average power of the constellation with an appropriate gain (example letting the gain be 4/3 of average, implies a 16/9 power gain) to support acquisition and tracking requirements	The power is clear from the normalization of the data components and the non-zero values in the vector P which are normalized to unity power. Increase of pilot power will improve phase tracking at expense of spectum nonuniformity and stealing transmit power.
57.	17.3.5.8	tk	t	No	All the pilot subcarries are modulated with constant phases. Consequently, when the power spectrum of the OFDM signal is measured with low-resolution bandwidth, spectral lines might appear.	Modulate the pilot symbols by a pseudo-random binary sequence. This is performed as follows: 1. Produce a binary sequence using the scrambler of figure 107 with the an "all ones" initial state. The number of elements of the sequence is equal to the number of OFDM symbols. 2. Replace all "0" with –1 and all "1" with 1. Let $\{b_k\}$ denote the elements of the sequence. 3. For the k'th OFDM symbol, multiply the vector P, given by equation 19, with b_k.	See similar comment by Masahiro Morikura
58.	17.3.5.9	ko	e		In equation 18, "30≤k≤43" and "44≤k≤47" seems to be error.	change "30≤k≤43" and "44≤k≤47" to "30≤k≤42" and "43≤k≤47", respectively.	NC Accept (thanks, Kazu)
59.	17.3.5.9	nc	e		On p. 260, line 35 and eq (16) replace N_S by N_{SD}		

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60.	17.3.7	nc	t		Change the text: The PLCP preamble shall be transmitted using **the uncoded 24 Mbit/s QPSK-OFDM modulation**. The 802.11 SIGNAL field shall indicate the modulation and coding rate that shall be used to transmit the MPDU. The transmitter **and receiver** shall initiate the modulation**, demodulation** and the coding rate indicated by the 802.11 SIGNAL field. The MPDU transmission rate shall be set by the DATARATE parameter in the TXVECTOR issued with the PHY-TXSTART.request primitive described in clause 17.2.2.	To: The PLCP preamble shall be transmitted using **a BPSK-OFDM modulated fixed waveform**. The 802.11 SIGNAL field**, BPSK-OFDM modulated at 6 Mbit/s,** shall indicate the modulation and coding rate that shall be used to transmit the MPDU. The transmitter **(receiver)** shall initiate the modulation **(demodulation) constellation** and the coding rate **according to the RATE** indicated **in** the 802.11 SIGNAL field. The MPDU transmission rate shall be set by the DATARATE parameter in the TXVECTOR issued with the PHY-TXSTART.request primitive described in clause 17.2.2.	
61.	17.3.8.1	nc	e		In table 85 the "Coding rate" line should be split into the "Error Correcting Code" saying "K=7 (64-state) Convilutional Code" and into "Coding Rates" line saying "R=1/2, 2/3, 3/4".		
62.	17.3.8.2 (17.3.10.2)	bo	e		Insert "the" before "5GHz".		
63.	17.3.8.3 (17.3.10.4)	bo	E		"HPA" does not seem to be defined anywhere.		NC – Add footnote?

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64.	17.3.8.3	nc	e		On page 264, line 27, move "however": In Figure 117, however, the center frequency is indicated, no subcarrier is allocated on the center frequency as described in Figure 115.	In Figure 117the center frequency is indicated, however, no subcarrier is allocated on the center frequency as described in Figure 115.	
65.	17.3.8.3 Fig 117 (17.3.10.4 Figure 128)	bo	e		It could be made clearer that the "30 MHz" and "20 MHz" above the arrows in this figure refer to distance of the center frequency of the outermost channels from the band edge.		NC add edge frequences and indicate that those are "lower (respectively upper) band edge"
66.	17.3.8.3 Informative notes 1&2	jh	E		Informative notes provide information that may change in the future after Europe and Japan specify the frequence issues. Then the standard would contain contradictory information about Europe&Japan channelization and possibly create confusion.	Remove the notes.	
67.	17.3.8.3, MIB	dk	t	Y	The channel numbers are not adequately defined. The MIB refers to a channel number. There is no channel number to actual channel defined. In addition, there is some uncertainty as to the channelization of new regulatory domains, e.g. Japan.	Define a set of unique channel numbers by taking the frequency in MHz, subtract 5000 and divide by 5. This defines unique channels at every 5 MHz spacing from 5 GHz and up. The entire band is thus represented by 8 bits. This handles all of the known regulatory domains and allows flexibility for accommodating new domains in the future.	NC recommend to accept the channel numbering scheme proposed.

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68.	17.3.8.5	ko	T		Define what is "the start of corresponding symbol". Section 10.4.3.2 in IEEE P802.11/D8.0 defines that "The start of a symbol is defined to be 1/2 symbol period prior to the center of the symbol for FH, or 1/2 chip period prior to the center of the first chip of the symbol for DS, or 1/2 slot time prior to the center of the corresponding slot for IR". The similar definition seems to be required for OFDM. Moreover, the same section in IEEE P802.11/D8.0 defines that "The end of a symbol is defined to be 1/2 symbol period after the center of the symbol for FH, or 1/2 chip period after the center of the last chip of the symbol for DS, or 1/2 slot time after the center of the corresponding slot for IR." Definition of "the end of symbol for OFDM" also seems to be required.	Define aprropriately	
69.	17.3.8.6	nc	t		Replace "RSSI detect time" with "CCA detect time". Remove the "(<4 usec)" and insert ", as specified in Table 90".		
70.	17.3.9.2	Ah	e	N	Line 33: …(dB relative to the maximal spectral density…	Change to (dB relative to the maximum spectral density…	
71.	17.3.9.2 Fig 118 (17.3.11.2 Figure 130)	bo	E		A legend should be added to this figure that identifies the function of the thick and thin lines. The X axis labeling needs to be cleaned up.		

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72.	17.3.9.4 and 17.3.9.5	BRAN	T		It is a comment to the Disposition/Rebuttal #5 in the "TGa Latter Ballot 16 Comment Resolution report" regarding the linkage of carrier frequency generation and clocking the time-base. From the BRAN's view it is a very important issue and worth considering and discussing again. In view of the growth of wireless IP applications and the fact that portability will become an important feature of 802.11a devices, the RF and baseband part of such devices will be located in the same "box" which in BRANs view is considered as THE "natural" case. Using to different sources at the transmitter for RF generation and clock timing, extensive signal processing at the receiver is needed for eliminating the drift between carrier frequency and sampling frequency. This is power consuming and additionally for +/- 20 ppm oscillator accuracy specified in IEEE/BRAN/MMAC difficult and for long packets results in high packet error rates. To prevent this un-necessary processing in "natural" cases, the use of ONE source for derivation of timing and carrier frequency is an appropriate measure. The experience of GSM has showed this. Leaving this issue as "a de facto implementation consideration" is not a right strategy, if interoperability has to be fulfilled. It does not save the needed complexity at the receiver.	Add a clause after 17.3.9.5 with the title " Requirements for derivation of timing and carrier frequency" and write "The terminals shall use the frequency source for both RF frequency generation and clocking the time-base"	A discussion issue
73.	17.3.9.6 .2	jh	t		The transmitter spectral flatness is not defined for subcarrier number –26 ,-25,25,26	Define the spectral flatness of the missing subcarriers	NC - see NC comment
74.	17.3.9.6 .2	nc	e		On page 266, line 50, replace 24 into 26 (number of subcarriers on each side)		

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
75.	17.3.9.6.2	rw	t	*Y*	• Transmitter spectral flatness does not reflect 52 subcarrier case	• Revise text to establish requirements on sub carriers beyond ± 24	
76.	17.3.9.6.3	jkh	T		In Table 87 different constellation errors have been specified for different data rates. In the case that the mode with 16QAM and r=1/2 code rate is considered as mandatory, does it make sense to specify constellation accuracy for the modes with lower data rates. A device fulfilling the constellation error for 24 Mbit/s could do it for lower data rates.	Remove the relative constellation errors for bit rates lees than 24 Mbit/s in Table 87.	NC- The table lists the constellation errors based on their impact on error probability. One may envision an implementation which adjusts the PA backoff based on the rate used for the packet. For this reasons I recommend the table as is, in order not to restrict the implementors.
77.	17.3.9.7	rw	t	*Y*	• Transmit modulation accuracy test should utilize known patterns.	• Established test patterns using random data shall be used for the symbols.	
78.	17.4.2 (17.4.3)	bo	T	n	Table 94 is said to define the MIB values. Since there is no "shall" in this clause, it appears that this information is only advisory, not normative. Also, some rates are described as mandatory, yet there is no clause in the document that says anything like "all implementations shall be capable of transmitting and receiving at the following rates…"	Make the values in the table normative. Include a clause, somewhere, that makes some rates mandatory.	
79.	17.4.3 (17.4.4)	bo	T	n	This clause also merely describes the PHY characteristics. They are not normative.	Include a "shall" in this clause, making the values in the table normative.	

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
80.	17.4.3	moa	T	yes	The number for SIFS Time is too small. This number is mainly dependent on processing delays in receiver. Practical delays in receiver (aRxRFDelay + aRxPLCPDelay) are: AFC: 4 us Serial/Parallel conversion: 4 us FFT: 4 us Decoding: 2 us This gives a SIFS = aRxRFDelay + aRxPLCPDelay + aRxTxTurnaroundTime + aMACProcessingDelay = 14 + 2 + 2 =18 us	Change parameter to following value: aSIFSTime = 18 us	
81.	17.5.1	Ah	E	N	Figure 124 needs to be made more clear.	Figure 11 in clause 5.8 of the IEEE Std 802.11-1997 provides a much clearer illustration of the interfaces among the various sublayers of the PHY.	
82.	17.5.1	mif	T	na	The PHY characteristics in Table 90 show aMPUDDurationFactor =1. This is incorrect because there are Tail bits and Pad bits appended to the MPDU (PSDU), making the duration to transmit the MPDU slightly variable with respect to the number of octets passsed from MAC to PHY. Because the Pad bits are both length and rate dependent (since they have to fill an entire OFDM symbol at the rate used for transmission), the MPDU expansion is non-uniform, and a fixed duration factor value does not work. This is one of the reasons that, at the Orlando meeting, we voted to eliminate the aMPDUDurationFactor and replace it with a new PLME-TXTIME.request/response primitive (for further details see document 99-029 from the Orlando meeting).	Delete reference to aMPUDDurationFactor in Table 90. Add the appropriate OFDM PHY-specific subclauses to 17.5.1 for PLME-TXTIME.request and PLME-TXTIME.response to calculate properly the MPDU transmission time, including tail and pad bits, and taking the transmission rate into account. Examples of how to do this for the other PHYs appear on pages 11-13 of 802.11b/D3.0, and for the high-rate DS PHY on page 31 of 802.11b/D3.0.	
83.	17.5.4.1	Ah	e	N	Table 91 PMD_DAT	Please expand the Primitive column so that PMD_DATA can be on one line.	

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
84.	17.6.6.6.2	bo	E		This clauses says that 17.3.10.7 provides information on PHY modulation rates. This is not correct.		
85.	Abstract	Vh	E		The text applies to the main standard and not to 11a	Changes and additions to IEEE Std. 802.11 to support the higher rate Physical layer for operation in the 2.45 GHz band are provided.	
86.	Annex A	VH	E		Unclear editor instructions	Make editor instructions per subclause so we know what to do with the various clauses	
87.	Annex B	VH	E		The supplement does not change anything in the annex B of the main standard, but is a new annex to be added to the main standard	Show annexes a, b, c, d as empty and add a new annex (coordinate with TGb)	
88.	Definitions	VH	E		There are no new definitions specified, which is suspicious for such a major addition	Add a clause about the addition and give all necessary definitions	
89.	General	bo	E		Is there some chance that the next revision of this document will use a more easily seen color than fluorescent green for inserted text, say dark blue?		
90.	General	nc	e		Use nonbreaking spaces between numbers and units p. 248 l 7-8: 6 Mbit/s p. 253 l 40-41: 7.2 usec p. 262 l 1: +/-2 usec		
91.	General	sl	T	yes	Draft is not described in detail enough for someone to build a solution to follow the standard.		NC-might improve if TK comment on adding appendix accepted
92.	Many	tk	E	No	The encoding and modulation described by the standard is complex. We would have a better chance to produce an interoperable 802.11a device if we would add several exemplary waveform files to the appendix of the standard. Alternatively, a pseudo code or working source code can be added.	Add exemplary waveform files or pseudo/source code.	

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
93.	OF2.13 .2	bo	T	n	Isn t 2/3 punctured coding required if certain rates are implemented?	Make this item conditional on the implementation of the associated rates. Status should be: OF1.2.7:M Also precede OF1.2.7 by an asterisk (*) to indicate that it is used as a predicate in the PICS.	
94.	OF2.13 .3	bo	T	n	Isn t ¾ punctured coding required if certain rates are implemented?	Make this item conditional on the implementation of the associated rates. Status should be: OF1.2.2 or OF1.2.4 or OF1.2.6 or OF1.2.8:M Also precede OF1.2.2, 4, 6, and 8 by an asterisk (*) to indicate that they are used as predicates in the PICS.	
95.	OF2.15 .4	bo	T	n	Isn t 64-QAM required if certain rates are implemented?	Make this item conditional on the implementation of the associated rates. Status should be: OF1.2.7 or OF1.2.8:M Also precede items OF1.2.7 and OF1.2.8 with an asterisk (*) to indicate that they are used as predicates in the PICS.	
96.	OF3.3	bo	T	n	This item indicates that an implementation that operates in more than one band is not conformant.	Delete this requirement. Status for all items in OF3.3 should be, simply, "O".	
97.	Other clauses	VH	E		Could not find changes to MAC and PHY management, which is suspicious for such a major addition	Add clauses 1-16 and show that either nothing needs to be added or add the required information	
98.	PICS	bo	T	n	Many of the clause references in the PICS are not correct.	Correct and verify all clause references in the PICS.	
99.	Table 87	jh	t		48 Mbit/s mode transmitter constellation error is –21dB, according to the decision made during the January meeting it should be –22dB	Change the number to –22dB	

Seq. #	Clause number	your voter's id code	Cmnt type E, e, T, t	Part of NO vote	Comment/Rationale	Recommended change	Disposition/Rebuttal
100.	**z17.3.2**	**sg**	**e**		**typo**	**Change "reseved" to reserved in line 14**	
101.	**z17.3.2**	**sg**	**e**		**typo**	**Change "bites" to bits in line 14**	
102.	**z17.3.2**	**sg**	**e**		**typo**	**Change "destribe" to describe in line 17**	
103.	**z17.3.5.10**	**sg**	**e**		**typo**	**"TThe" should be The in line 45**	
104.	**z17.3.8.3**	**sg**	**E**		**The text listed as Informative Note 1 & 2 is speculative and subject to change based upon activities in Japanese and European standards bodies/government commissions. Text of this nature should be added when final decision is made pertaining to IEEE802.11 operation in Japan and Europe.**	**Delete Informative note 1 and 2**	
105.	**z17.3.12**	**sg**	**e**		**Repeated phrase**	**"Any data received after the indicated data" is repeated on line 37**	