IEEE P802.11
Wireless Access Methods and Physical Layer Specifications

TITLE: Proposal For The Specification Of the FH PHY
2Mb/sec 4GFSK PMD.

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ABSTRACT

There are no words for the 4GFSK regarding the radio performance. This submission aim to close this gap.

INTRODUCTION

The proposed wording has been mostly accomodated within the current P802.11-94/068r5 document. Some input to this was taken from previous work. Some additional changes are proposed over that in the current 68r5. Justification is given where this is necessary.

THE PROPOSAL

Text in brackets [ ] is informative.

Transmitter Parameters

[Modulation specification cannot be as simple as that for 2GFSK. Firstly the 4GFSK requires relating to the 2GFSK, so that the 2GFSK preamble can be can be used to set the data recovery circuits for the 4GFSK. So the 4GFSK modulation requires relating to the deviation 'h' measured in the 2GFSK preamble (0101) in the PHY header. Note it is not proposed to have a 4GFSK preamble, just a 2GFSK header, followed by 4GFSK data...

As the 4GFSK has a relatively small deviation, it is much more susceptible to noise, therefore the error in the transmitter modulation has to be minimal. The specification can be broken down into short term error and longer term frequency drift.]

9.7.10 4 Level GFSK Modulation For a 2MB/sec conformant PMD, the modulation scheme shall be 4 level Gaussian Frequency Shift Keying (4GFSK), with a nominal bit-period bandwidth product (BT) = 0.5. The four level deviation, defined as the frequency separation of adjacent symbols, h4, shall be related to the peak to peak deviation of the 2GFSK modulation, h2, by the following equation:

$$h4/h2 = 0.45 +/- 0.01 \quad \textit{[taken from p802.11-93/210r2]}$$

The peak to peak deviation is measured at the last 8 bits of the preamble 101010 sequence prior to the unique word in the PHY header.

An incoming bit stream at 2Mb/sec will be converted to 2 bit words or Symbols, with a rate of 1MSymbol/sec. The first received bit will be encoded as the MSB, with the notation below referring to MSB first. The symbols will be encoded as deviations on the frequency carrier as indicated below:

Symbol	Carrier Deviation

11	3/2 * h4
01	1/2 * h4
10	-1/2 * h4
00	-3/2 * h4

The deviation is relative to the nominal centre frequency of the RF carrier. The **modulation eye closure** shall be less than **+/-25**kHz at the mid symbol time, from the deviations specified above. h4 should hae a minimum mean value over a slot of 140kHz.

[The modulation accuracy is modified from 'modulation error' of +/-15kHz, to a eye closure of <25kHz. This is because perfect 4GFSK has an eye closure associated with it, nominally 15kHz.. It is difficult to measure the modulation to the ideal 4GFSK. I am proposing we measure the eye closure. This error needs to allow for the normal eye closing of 4GFSK, BT=0.5, plus some allowance for noise e.t.c.]

The nominal centre frequency shall not vary greater than +/-10kHz/msec, from the start to end of the 4GFSK data word. For definition purposes, the nominal centre frequency is the mid frequency between symbols 10 and 01. Symbols and terms used within this section are illustrated in the figure 9-12 below:
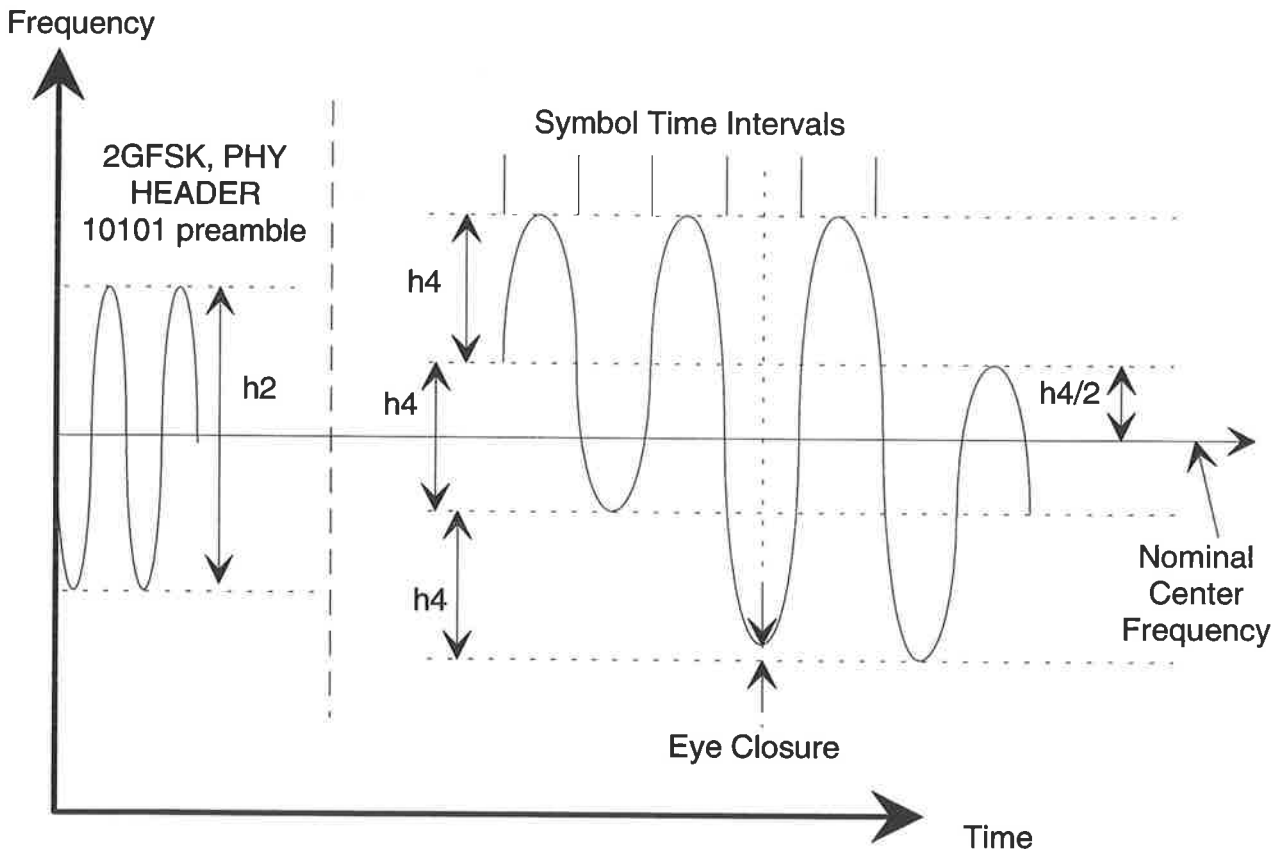
Receiver Parameters

[The receiver parameters for the 4GFSK require relaxing relative to the 2GFSK. This is due to the 6dB worse Eb/No performance. Therefore the sensitivity, adjacent channel filtering and intermodulation will require relaxation.]

9.7.11, 9.7.12 to 9.7.32 as is in 94/068r5.

9.7.32 Receiver Sensitivity   Sensitivity is defined as the minimum signal level required to produce a BER of 10-5. A conformant PMD shall have the minimum signal level be less than or equal to -75 dBm across the operating frequency range as specified in 9.6.4.

9.7.33 Intermodulation. Intermodulation protection (IMp) is defined as the ratio to measured sensitivity of the minimum amplitude of one of the two equal level interfering signals at 4 and 8 MHz removed from center frequency, both on the same side of center frequency, that cause the BER of the receiver to be **increased** to 10-5, when the desired signal is 3 dB above the specified sensitivity. Each interfering signal is modulated with the FH PMD modulation uncorrolated in time to each other or the desired signal. A conformant PMD shall have the IMp for the interfering signal at 4 and 8 MHz be greater than or equal to 30 dB.

9.7.34 Desensitization. Desensitization (Dp) is defined as the ratio to measured sensitivity of the minimum amplitude of an interfering signal that causes the BER of the receiver to be reduced to 10-5 when the desired signal is -72 dBm (3 dB above sensitivity specified in section 9.5.9.11). The interfering signal shall be modulated with the FHSS PMD modulation uncorrolated in time to the desired signal. Dp should be greater than or equal to the figures given below:

Interferer Frequency	Dp minimum
M=N	-20dB
M=N+/-1	-18dB
M=N+/-2	24dB
M=N>+/-2	35dB

M is the interferer frequency and N is the desired channel frequency.