Unique Word proposal for the 802.11 PHY Preamble

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Introduction

In IEEE-P802.11-93/209 a preamble proposal was presented. The preamble proposal was based on 80 bits of 0101 pattern followed by the Unique word 0000 1001 1010 1111. LANNAIR proposes to change the Unique Word to the 0011 0111 1000 0101 pattern, with everything else left intact.

Comparison Criteria

The Unique Word proposed in IEEE-P802.11-93/209 is based on a paper by M.W.Williard reprinted at P802.11-93/143. The criterion used by Williard is related to detection of the preamble which is preceded and followed by random data. Our situation is entirely different as the UW is preceded by a known pattern, 0101, and only the first occurrence is to be reliably detected. In this situation, the criterion dominating the misdetection probability is the maximal non-peak correlation function of the pattern (0101 +UW) and the UW correlation template.

The correlation function for the 0000 1001 1010 1111 UW (P802.11-93/209) is:
-4,4, ... , -4,4,-6,2,-8,2,-4,0,0,-2,0,2,0,2,2,0,16,1,2,3,0,1,2,-3,0,-1-2,-1,-4,-3,-2,-1.

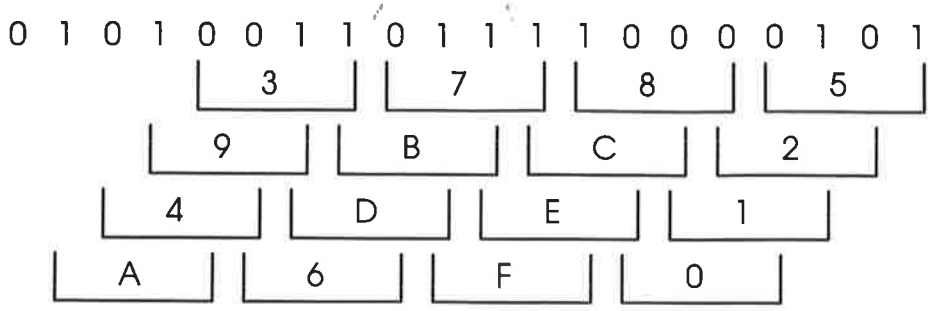
For the 0011 0111 1000 0101 UW (this proposal) the correlation function is:
-4,4, ... , -4,4,2,0,0,0,4,-2,2,-4,-2,-2,-4,0,0,0,16,1,0,-1,-4,-1,-3,0,-1,4,1,0,1,0,-1,0.

The proposed UW provides better performance through its tighter range of correlation values (-4 .. 4) than P802.11-93/209 proposal (-8 .. 4). It is also better in the vicinity of the correlation peak.

Advantages of the new UW

The proposed UW has the following enhanced properties:

- Better correlation.
- It is balanced (8 ones, 8 zeroes).
- It contains all the quadruples of consecutive bits when preceded by 0101 pattern.



The two properties mentioned are instrumental in simultaneous estimation of DC offset and of the FIR model of the channel for equalization purposes.

Summary

An alternative Unique Word is proposed, with the following advantages:

- It has better correlation properties than P802.11-93/209 proposal, in conjunction with the idle pattern
- It provides for equalizer training applications.

References

Jim McDonald, "Preamble Proposal for the 2.4 GHz Frequency Hopping Standard", IEEE P802.11-93/209r

Merwin W. Williard, "Optimum Code Patterns for PCM Synchronization", IEEE P802.11-93/143