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

Submission Title: [SFD Selection for 802.15.4g]Date Submitted: [Mar 1, 2010]Source: [Steve Shearer]Company [Independent]Address [Pleasanton California]Voice:[(925) 997 0576],FAX: [n/a],E-Mail:[Shearer_inc @ yahoo.com]Re: [SFD Selection for 802.15.4g}

Abstract: [This presentation seeks to assist the current discussions and choice of SFD pairs by providing an independent set of results]

Purpose: [This presentation seeks to assist the current discussions and choice of SFD pairs by providing an independent set of results]

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SFD Selection for 802.15.4g

Steve Shearer Mar 2010

Introduction

- This presentation seeks to assist the current discussions and choice of SFD pairs by providing an independent set of results
- Hopefully this can help reconcile/validate the other results that have been produced

SFD Requirements

- Good autocorrelation properties
- At least one orthogonal sequence which has good auto and cross correlation properties
- Performance that is not badly affected by correlating over the preamble 55
- Has the ability to reject inverses of itself and its orthogonal sequence
 - caused by the possibility that the receiver may lock onto an image where the bits are inverted.
- Ability to reject 802.15.4d bursts consisting of preamble 55 and SFD E5

Test Setup – Typical Correlator Output

Correlation output is achieved by sliding the test SFD over ۲ the test burst as shown below



Test Setup – 4d measurement



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Performance criteria

- In FEC coded transmissions it is necessary to lower the threshold for detection of the auto correlation peak so that the SFD can be detected in poorer SNR
- Lowering the threshold introduces the possibility that sidelobes can cause false detections
- Therefore the SFD should be chosen so that the sidelobes are as low as possible
 - Measure the worst peak sidelobe
 - Measure the RMS of the sidelobes

Evaluation of SFD candidate F68D Evaluation of comlimentary SFD candidate 7BC9 Auto correlation with on channel sfd a Auto correlation with on channel sfd b $\Theta \Theta \Theta \Theta$ $-\Theta\Theta$ side peak 4 sidelobe rms 1.6833 side peak 2 sidelobe rms 1.0802 -20 -20 Auto correlation with image sfd a Auto correlation with image sfd b 00000 0-0000 side peak 4 sidelobe rms 1.6833 side peak 2 sidelobe rms 1.0801 -20 -20 Cross correlation with on channel sfd b Cross correlation with on channel sfd a **P000¢** side peak 6 sidelobe rms 2.912 side peak 4 sidelobe rms 2.227 -20 -20 Cross correlation with image sfd b Cross correlation with image sfd a 0-0000 $\Phi \Theta \Theta \Theta \Theta$ $\Theta \Theta \Theta$ side peak 4 sidelobe rms 2.912 side peak 4 sidelobe rms 2.227[,] -20 -20 Cross correlation with 4d Cross correlation with 4d 0-00000000 side peak 6 sidelobe rms 2.1144 side peak 2 sidelobe rms 1.2834 -20 -20

Results for Plan A

Submission



Evaluation of SFD candidate 21F6 Evaluation of comlimentary SFD candidate C9C2 Auto correlation with on channel sfd a Auto correlation with on channel sfd b 0000 $-\Theta \Theta$ 000 side peak 4 sidelobe rms 2.0817 side peak 4 sidelobe rms 2.3094 -20 -20 Auto correlation with image sfd a Auto correlation with image sfd b Q a side peak 4 sidelobe rms 2.0817 side peak 4 sidelobe rms 2.3094 -20 -20 ົດ Cross correlation with on channel sfd b Cross correlation with on channel sfd a side peak 4 sidelobe rms 2.623 side peak 4 sidelobe rms 2 -20 -20 Cross correlation with image sfd b Cross correlation with image sfd a side peak 6 sidelobe rms 2.623 side peak 4 sidelobe rms 2 -20 -20 ้ ด Cross correlation with 4d Cross correlation with 4d side peak 6 sidelobe rms 1.8787 side peak 4 sidelobe rms 2.2752 -20 -20 ้ ด

Results for Plan C

Submission

Results for Plan D



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Conclusion

- According to several discussions this analysis appears to align with results from others
 - Any differences can be discussed in the up-coming conf call
- This analysis shows Plan B to have the best overall performance