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Title	**SFH Sub-frame Capacity**
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Re:	Call for Contributions on Project 802.16m System Description Document (SDD) IEEE 802.16m DL control
Abstract	This contribution examines the SFH sub-frame capacity needs and availability.
Purpose	Discussion and Approval
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SFH Sub-frame Capacity

Shailender Timiri and Shantidev Mohanty

1 Introduction

The DL control channel structure is described in Section 11.6 of the IEEE 802.16m System Description Document [1]. According to the envisaged DL control structure the SFH sub-frame is expected to carry the essential system information (PBCH and SBCH) at a minimum.

To meet the reliability requirements, the SFH will likely need to be transmitted using a frequency reuse of 3 while using the minimum system bandwidth of 5 MHz. This contribution examines the resulting available capacity in the SFH sub-frame.

2 SFH sub-frame capacity

Assuming QPSK-1/2, the capacity in terms of information bits of the SFH sub-frame is given by,

Capacity in information bits = (# of subchannels) * (# of subcarriers per subchannel) * (# of data symbols in SFH sub-frame) / (repetition)

For the PUSC 5 MHz bandwidth and reuse of 3,

# of subchannels = 15/3 = 5

# of subcarriers per subchannel = 24

# of data symbols in SFH sub-frame = 5 … 1 symbol is used for the preamble or DL/UL switching (depending on the location of the SFH sub-frame within its frame)

Repetition = 4 or 6

Based on the above, the capacity of the SFH sub-frame is 100 or 150 information bits for repetition 6 and 4 respectively.

The minimum SFH required minimum bandwidth [2] for the PBCH portion of the ‘essential information’ is approximately 100 information bits. Therefore, with repetition 6 there is no available resource in the SFH sub-frame to transmit other essential information such as SBCH without violating reuse 3 that is required for robustness of DL control channel.

The minimum SFH required minimum bandwidth [2] for all the ‘essential information’ (PBCH and SBCH) may be of around 150 information bits but this is a rough estimate. With repetition 4 the SFH sub-frame may have just sufficient capacity to carry 150 information bits using reuse 3.

3 Conclusion

The results of this analysis should be verified and be taken into account to ensure capacity and reliability in the IEEE 802.16m DL control channel structure and SFH design.

4 References

[1] IEEE 80216m-08_004r2, “The Draft IEEE 802.16m System Description Document”

[2] IEEE C80216m-08_489, “Proposal for IEEE 802.16m Super-frame Header Design”