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Title	**The Prediction of Required Isolation for the Coexistence of Multi-Radio Systems**
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Re:	PHY: Multi-Radio Coexistence; in response to the TGm Call for Contributions and Comments 802.16m-08/033 for Session 57
Abstract	This contribution proposes for required isolation for the coexistence of multi-radio systems
Purpose	To be discussed and adopted by TGm for the 802.16m SDD.

The Prediction of Required Isolation for the Coexistence of Multi-Radio Systems

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1. Introduction

This contribution mainly considers the problem of mutual interference due to the co-existence, especially co-located, of multi-radio systems. The interference effect of the interfering system on the interfered or victim system depends mainly on the following factors: the interfering and interfered system antenna gains, the power spectrum density distributions of these two systems and the overlapping extent of both spectrums, the coupling loss between the transmitter and receiver antennas, the receiver filter characteristic of the interfered system in the attenuation of the interfering unwanted spectrum and the receiver sensitivity etc.

This contribution provides analysis and proposes an equation to determine the required isolation filter for co-located multi-radio systems.

2. Estimation of Antenna Isolation

We will consider the situation of co-existence and co-located of 802.16m with other system, such as the point-to-point fixed microwave system, to estimate the interference level of 802.16m system on the fixed microwave system so as to design and find the receiver filtering characteristic of the fixed microwave system so that its resulting system performance still meets the minimum requirement.

2.1 Find Required Isolation between 802.16m and other system

In order to find the required isolation between the 802.16m system and the other fixed system when these two systems are co-located we need first to find the required receiver sensitivity so that it will meet certain system performance requirement.

2.1.1 Determine the required receiver sensitivity

Every radio system with different modulation format has different receiver sensitivity to meet certain system requirement such as the bit error rate (BER).

As shown in Fig. 1 is the functional block diagram to determine the receiver sensitivity when the signal to noise ratio, $(SNR)_{RX}$ for certain modulation and coding rate and the required system bit error rate, BER are available.

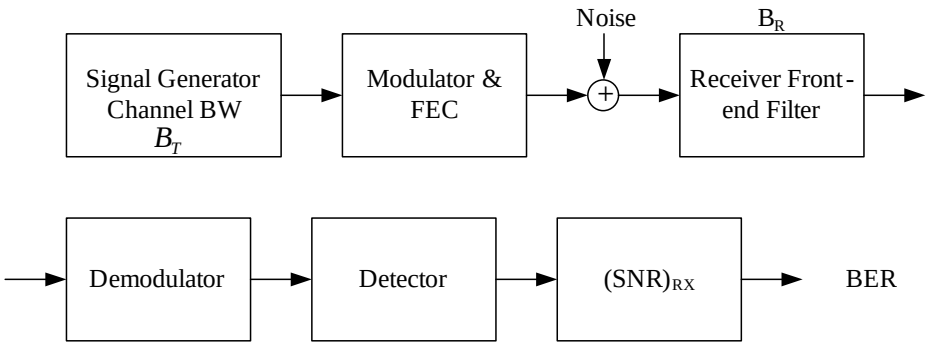


Fig. 1 Function Block Diagram to Calculate the System Requirement

It is assumed that implementation loss is 4 dB and the noise figure is 8 dB in the 802.16m system then the receiver sensitivity can be calculated for a specific case as shown in Eq. (1) [5] with the sampling frequency F_s in MHz as:

$$R_{sensitivity} = -102 + (SNR)_{RX} + 10 \cdot \log\left(F_s \cdot \frac{N_{used}}{N_{FFT}} \right) \qquad (1)$$

where F_s : Sampling frequency in $MHz = floor\left(n \cdot B_T / 8000 \right) \cdot 8000$

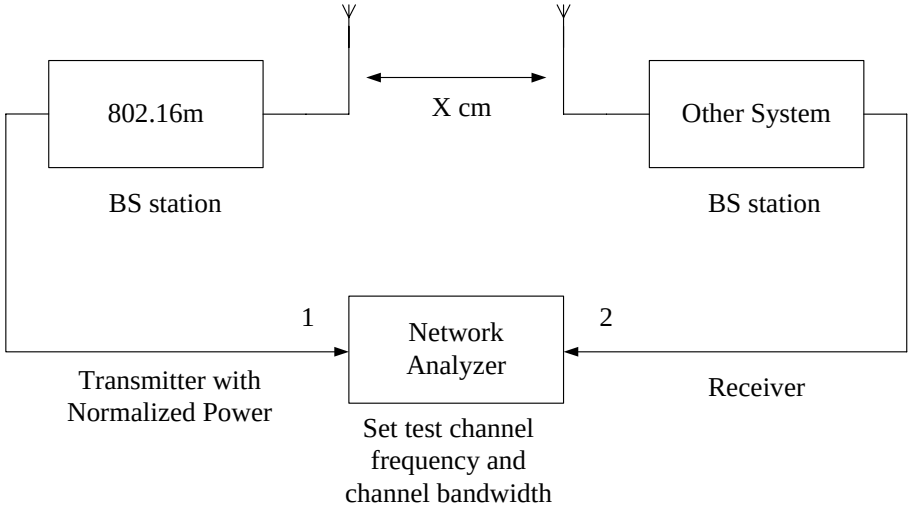
N_{used} : Number of sub-channels used

N_{FFT} : Number of FFT points used

n: Sampling factor, its value depends on the number of sub-channels implemented in the 802.16m system and the sampling frequency F_s used

2.1.2 Determine the Return loss from 802.16m onto other system

Assume the antennas of two mutually interfering and co-located systems are separated by x cm then the return loss between these two antennas can be measured with a network analyzer at the test terminal (S_{21}) as shown in Fig. (2).



Measure S_{21} to find the return loss
vs X cm for varying the separation
between BS antennas

Fig.2 Functional Block Diagram to Determine the Return Loss from 802.16m onto Other System

2.1.3 Determine the interference signal strength of 802.16m on other system

Based on the data obtained from above we can then calculate the required isolation of the isolating filter at the receiver side as shown in Fig. 3

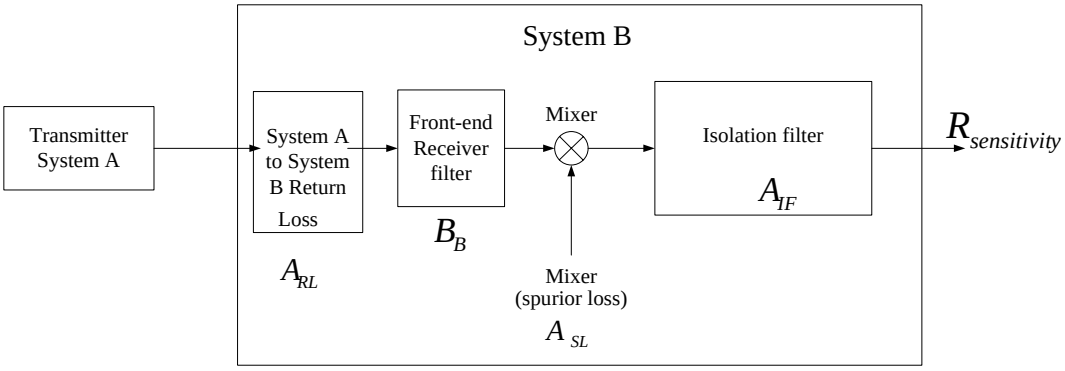


Fig. 3 Function Block Diagram to Determine the Characteristics of the Isolation Filter

The required isolation of the isolation filter can be calculated from Eq. (2):

$$A_{RL} + A_{SL} + A_{IF} = R_{sensitivity} \quad (2)$$

where

A_{RL}: Antenna returns loss between the 802.16m system and the other system
A_{SL}: Spurious radiation loss of the mixer
A_{IF}: isolation required of the isolation filter

Text Proposal for the 'Multi-Radio Coexistence'

==========*Start of Proposed Text*==========

17 Solutions for Co-deployment and Co-existence

17.x The Prediction of Required Isolation for the Coexistence of Multi-Radio Systems

From the required receiver sensitivity, the antennas return loss and the spurious radiation loss at the mixer the isolation required of the isolation filter at the interfered or victim system B can be determined as shown in the following figure where A_{RL}: Antenna returns loss between the 802.16m system and the other system, A_{SL}: Spurious radiation loss of the mixer and A_{IF}: isolation required of the isolation filter.

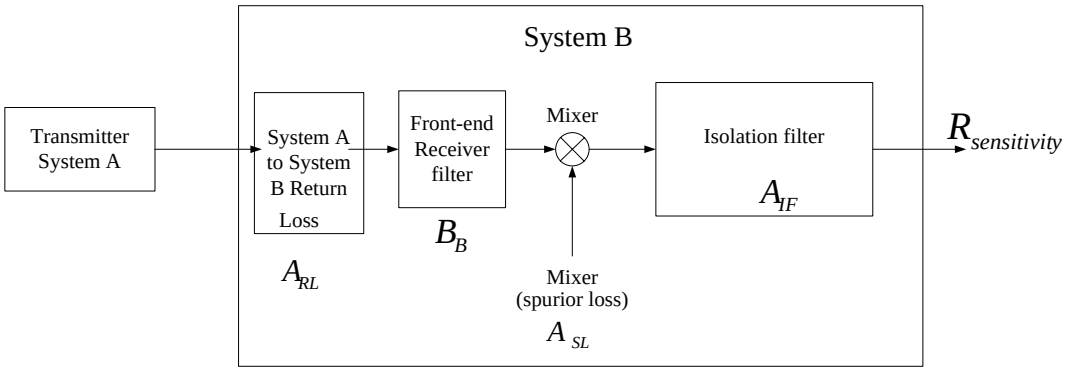


Fig. x Function Block Diagram to Determine the Isolation Required of the Isolation Filter

==========*End of Proposed Text*==========

References

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