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Re:	Session 49 discussion in support of C802.16h-07_051
Abstract	Interference Free Zones concept needs consideration in the CXCC/CSI/CMI consolidation
Purpose	Information and discussion in support of C80216-07_051
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Interference Free Zones and Propagation: Comments in Support Of Special CXCC Sub-Frames

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Introduction

Within the IEEE 802.16h documentation and analysis the terms "interference-free" zones are often used. These zones are created by the coexistence protocol when it forces neighboring systems in a coexistence community to remain silent during specific frames called either "silent", "no activity" or "slave" frames. Though there is intuitive validity to this concept, which is core to the idea of a coexistence community, radio network designers must remember that the variations in the propagation environment will often make it difficult to control interference within dedicated frames. This problem is made worse in the License Exempt environment where there is little of no control as to how interfering base stations are deployed. Identification and quantification of interference, in view of propagation variations, is always problematic and will force reliance on universally accepted notions concerning measurement that must be applied to all WirelessMAN-CX systems.

Issue

The identification and monitoring of interference is undertaken in a number of ways within the current draft standard. With systems capable of inter-system communications the OCSI are used to establish a claim and presence of a system, and a back-off procedure is used to identify close-by interference. Within the CXCC concept the use of BSD and SSURF messages is applied to achieve similar results.

Changes to the framing concepts and evolution of consolidated control channel structure have forced a number changes to the concepts surrounding interfernce detection and quantification. In preparation of the new proposals, the attached documents are provided to support discussions related to concepts involving cell size and "interference-free zones" and related issues.

Sample Propagation Scenario: Real measurements

Actual in field measurements taken in the city of Ottawa, Canada 1999. This is a typical Canadian urban area, density of ~ 4000 Homes/Square Kilometer. Summer foliage with trees. Source antenna at 25 meters, measurement antenna at 16 meters, mean building height and tree tree top height at 11meters. Frequency 5.3 GHz.

Graph shows path loss exponent (PLE) between source and measurement antenna for various distances. RHCP antennas used with 15 degree BW at source and 7 degree BW at CPE. Antennas were aligned for maximum signal reception and by GPS positioning of locations.

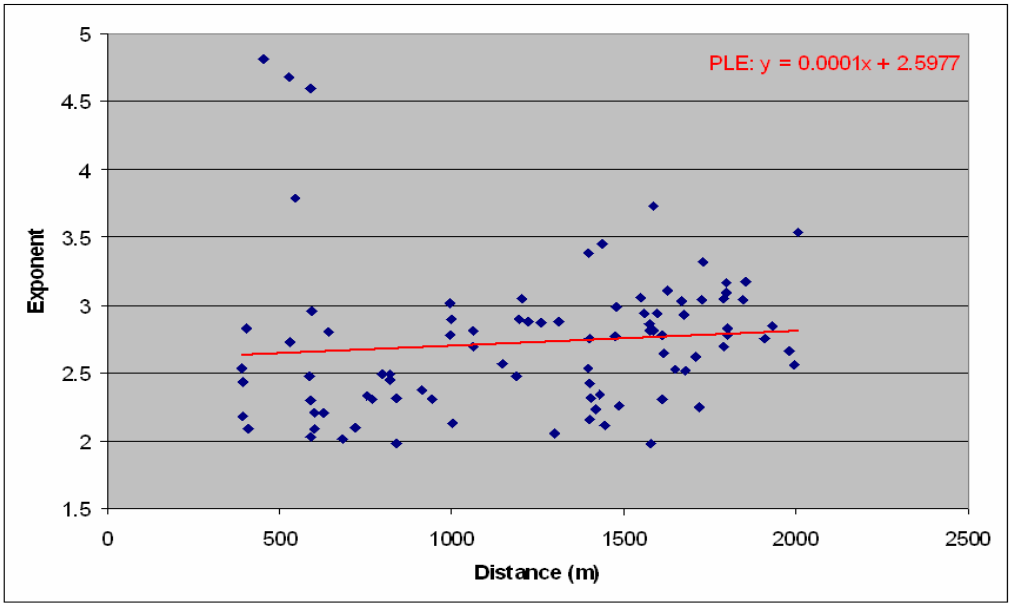

Figure 1 : In Field Measurements at 5.3 GHz Urban Canopy Measurements

PLE	Distance D (Meters)	Path Loss in dB
2.0	500	-100.91
2.5		-114.41
3.0		-127.90
2.1	1000	-109.94
2.6		-124.94
3.1		-139.94
2.3	1500	-119.99
2.7		-132.69
3.3		-151.75

Table 1: Expected Path losses for the urban canopy environment as described.

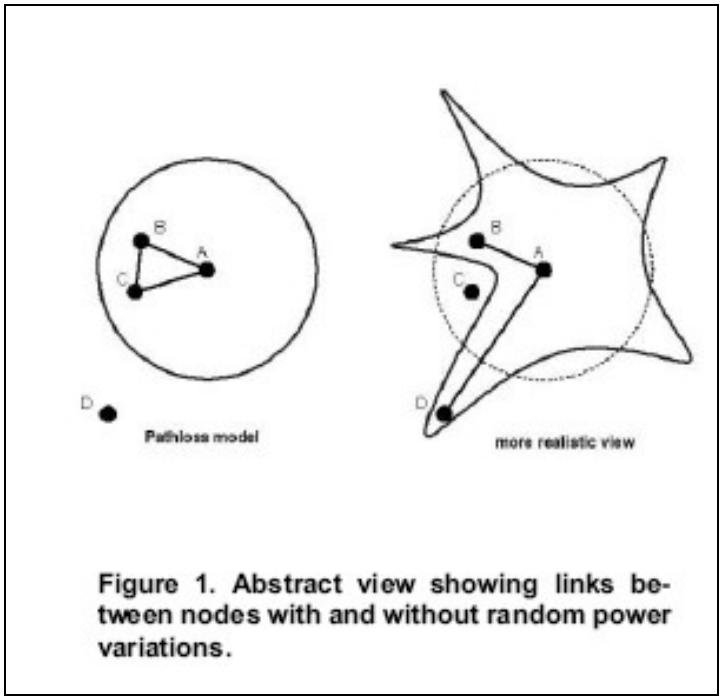

Figure 1. Abstract view showing links between nodes with and without random power variations.

Figure 2: Taken from Ref 1. Realistic model of an Omnidirectional Cell and Its distortion due to propagation conditions, etc.

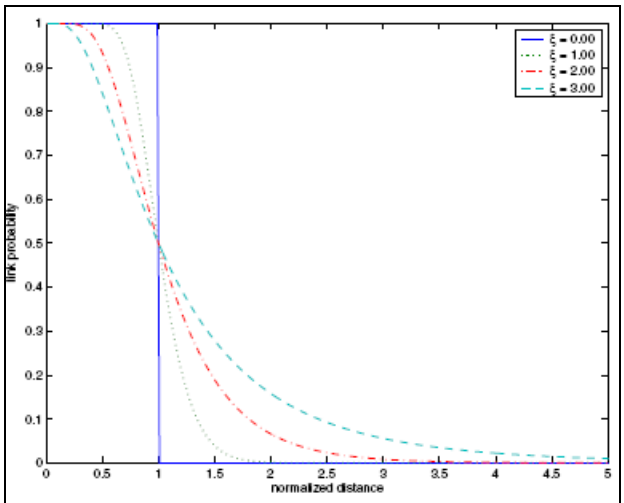

Figure 2. Link probability with log-normal shadowing radio model for some ξ values. In the case $\xi = 0$ the log-normal model reduces to the pathloss model with circular coverage per node.

Figure 3: Taken from Ref 1. Log-normal link probability showing realistic link Characteristics compared to a pure Path loss based model

Ref 1: Interference Power Sum with Log-Normal Components in Ad-Hoc and Sensor Networks. R.Hekmat & P. Van Mieghem DelftUniversity of Technology

Figure 3: Taken from Ref 1. Log-normal link probability showing realistic link Characteristics compared to a pure Path loss based model