

**Summary of  
“Two Way UHF Wireless Transceiver Path Loss Predictions With Communication Integrity  
Expectations”**

**Vincent P. McGinn, Ph.D., P.E., Brian M. Hall, MSEE  
30 August 2002**

The Wyreless Access transmitter-receiver (transceiver) system was analyzed for reliable performance. For details supporting this Summary, read the entire paper.

The transmitter in this system has a high power output, about 200mW that is equal to +23dBm. Many 900MHz portable phones use only 100mW of output power and maintain exceptionally fine communications.

The receiver in this system has high sensitivity, -90dBm. This means that the receiver's detector can discern an input signal of about 1.0 picowatt.

The margin in dB between the transmitter's output and the receiver's input, is a span of 113dB. Each 3dB doubles or halves the power. Therefore, the transmitter sends out  $2^{37.9} = 256$  billion times more power than the receiver needs.

This dB margin gets used up as the transmitter and receiver are separated from each other. At the specified 200 foot range, only 40 to 50 dB of this 113dB margin gets used. At 900 foot line-of-sight only 50 to 60 dB gets used. Therefore the 600 foot line-of-sight specification is conservative.

The 900-930 MHz range of frequencies is a good choice as can be seen by the low dB levels of signal attenuation going through a “hard or soft obstruction.” The maximum dB loss through a “hard obstruction” like a plasterboard or cinder block wall is only 2.38dB. “Soft construction” loss is only 1.39dB.

With margins at 200 feet of 63 dB (113dB – 50dB) above the -90dBm sensitivity, many walls can be inserted in between the transmitter and receiver and there will still be good communications. For example, if one “soft” wall and two “hard” walls are placed in between, only 6.47dB (worst case) of the margin will be used. Even 10 “hard” walls (plasterboard or concrete) in between will use only 23.8dB (worst case) of the 63dB margin.

The manufacturer of this system has taken many initiatives to assure that a communication link of high integrity is established. A unique feature of the system is its “-3dB linking process”. During the linking process, it acknowledges a base line of RF power output that provides excellent communications. Then from this level, the system automatically raises the power by 50% to 100% for ensuing normal operations, assuring an even better safety margin.

One common measure of transceiver performance refers to its sensitivity relative to internally generated noise. Due to the transceiver's S/N ratio of better than 19dB, and to the system's programmed “retry” scheme, only 1 failed communication in about 4 million may occur (with 50% probability).

If interference occurs on the same frequency as the Wyreless Access system is using, Wyreless Access products offer the elegant solution of Dynamic Channel Switching. This is a process whereby the Wyreless Access products can determine if the channel is busy. If so, it will automatically switch to a new frequency, about 7MHz away, three times repeatedly to find a clear channel. Through Dynamic Channel Switching, frequency spacing will exceed 3MHz affording favorable signal margins of up to 60dB.

If communications are ever lost, a trouble signal is given within minutes.

The analysis put forth for RF signal loss and Receiver Operating Characteristics indicates that the Wyreless Access system affords reliable operation for the user. Signal margins at the specified 200 feet, even with complex obstructions, provide intended performance.