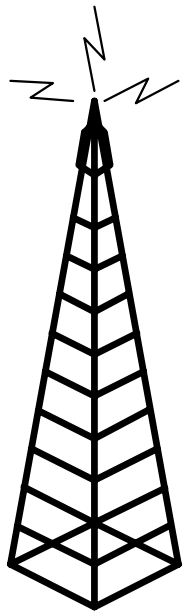


Wireless Standards and 802.11: A History and Perspective



ATHEROS[®]
COMMUNICATIONS

Bruce Himebauch

Director, Solution Product Engineering

Atheros Communications

802.11 Starts...

■ IEEE 802.11-1997

- BPSK/QPSK Modulation
- 900 MHz/2.4 GHz, Max Data Rate of 2Mbps
- Range of ~300ft

■ IEEE 802.11b-1999 Amendment

- CCK Modulation
- 2.4 GHz, Max Data Rate of 11Mbps
- Range of ~420ft

802.11a Amendment

■ IEEE 802.11a-1999 Amendment

- OFDM Modulation
- 5GHz, Max Data Rate of 54 Mbps
- Range of ~360ft

■ IEEE 802.11g-2003 Amendment

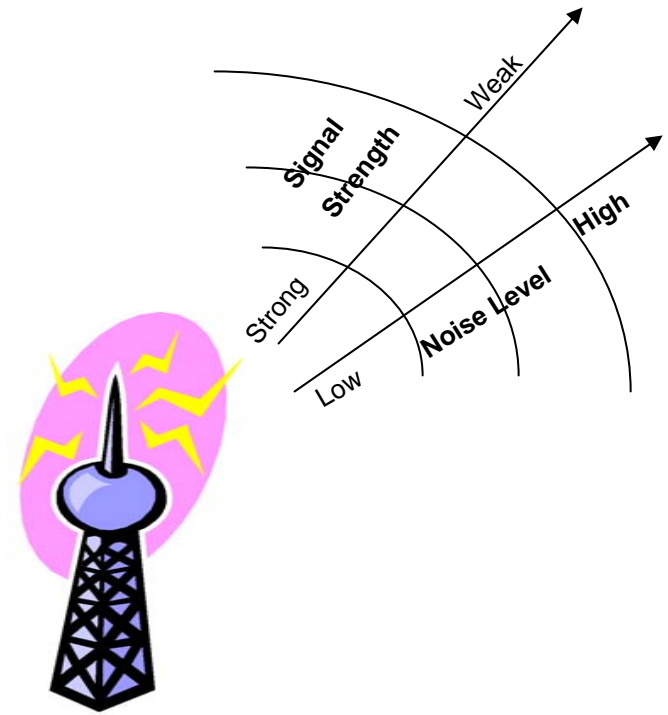
- OFDM Modulation
- 2.4 GHz, Max Data Rate of 54 Mbps
- Range of ~420ft

Modulation

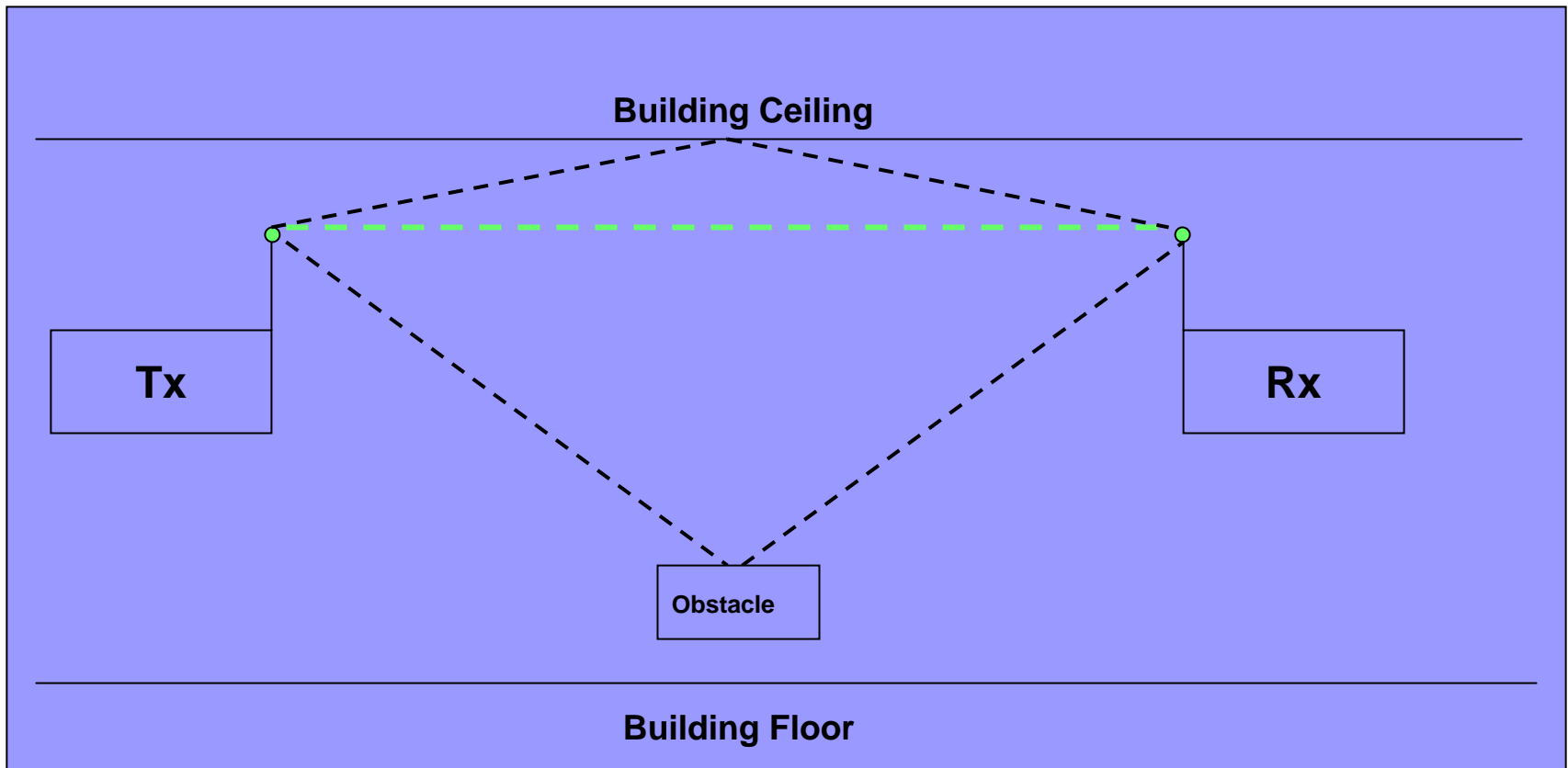
Modulation key principal in advancements

Signal to Noise ratio decreases with distance

OFDM can cope w/frequency fading due to Multipath

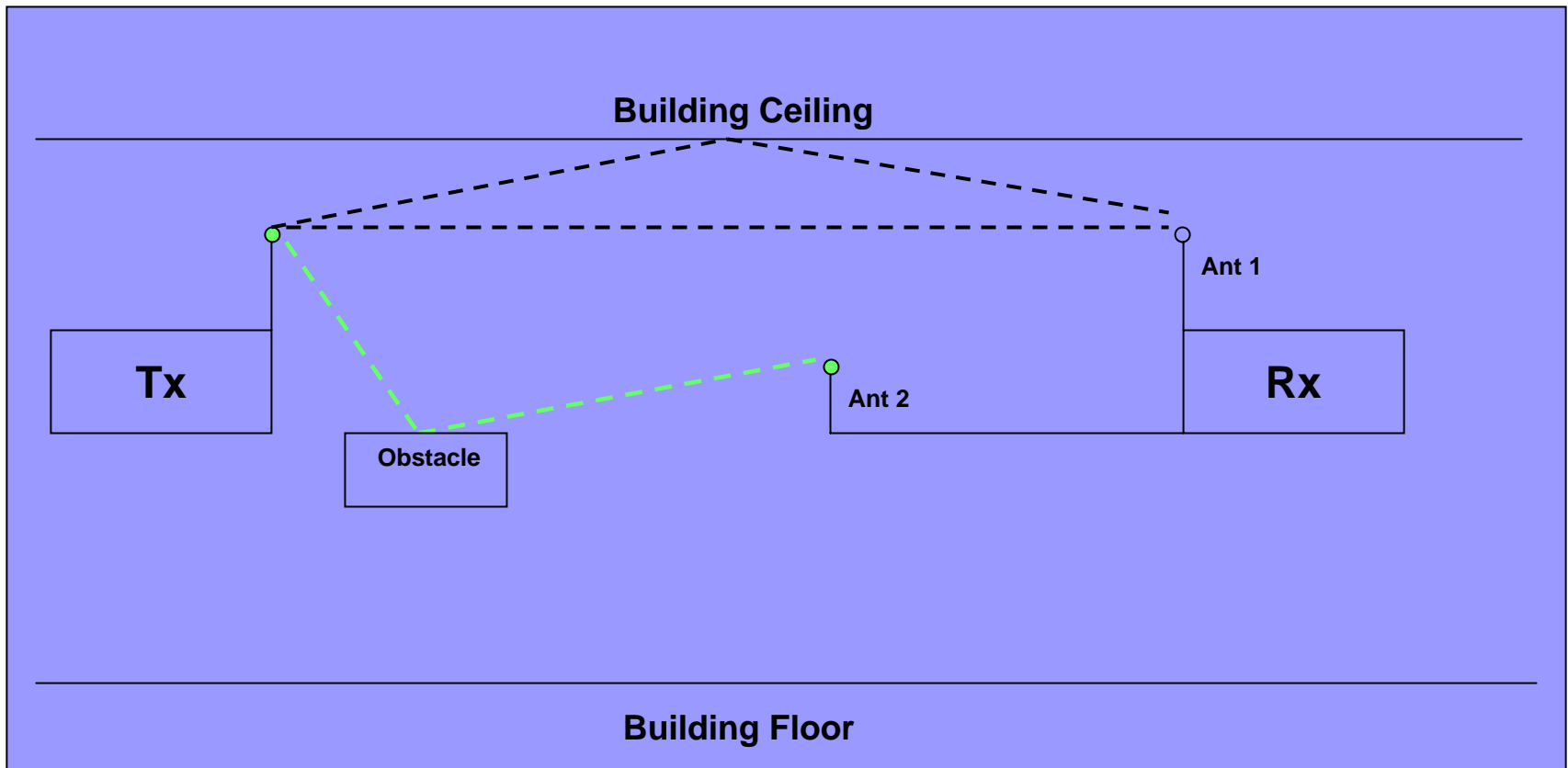


Multipath Distortion



- Multipath interference is due to multiple RF signal paths between Tx and Rx
- RF Signal is reflective

Diversity Antenna System



- Receive radio “switches” antennas and evaluates valid packet, transmit will select same antenna used successfully on last packet
- Shortest Distance between 2 points is a straight line

Latest! 802.11n Amendment

- TGn Draft 3.0 approved, Nov '07
- Ratification expected June '09
- 2.4GHz / 5GHz, Max Data Rate of 600Mbps
- MIMO OFDM
- Range of ~750ft
- Draft Products Shipping Today

802.11n Advantages MIMO

■ Improved Performance

□ Multiple In Multiple Out (MIMO)

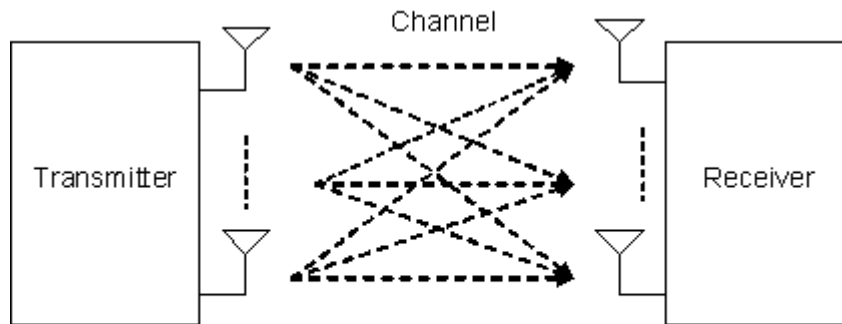


Figure 3: Diagram of a MIMO system

- Exploits radio-wave phenomenon, Multipath
- Use space-division multiplexing.
 - Transmit data splits data into multiple spatial streams, then transmits each stream through separate antennas

802.11n Advantages

- Greater Throughput w/Higher Data Rates
 - 40Mhz Channel Selection in 5GHz band
 - Improved rate control and modulation schemes translates to better use of airtime and improved SNR
 - Aggregation further improves efficiency
 - Mandatory QoS/WMM allows for multiple forms of simultaneous traffic
 - Provisions to protect legacy 802.11 a/b/g traffic

802.11n Application

