Project: IEEE P802.15 Working Group for Wireless Personal Area Networks

Submission Title: [Multipath Characteristics and Antenna Beam Width]
Date Submitted: [July 19, 2006]
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Re: []

Abstract: []

Purpose: [Contribution to 802.15 TG3c at July 2006 plenary in San Diego]

Background

- Presentations [06-216-00] and [06-216-01] showed that narrow beam circular polarized antenna suppressed multipath in all measured office and home environment
- Proposed AWGN channel model
  - Considerably simplifies system architecture
- TG requested for more measured data to compare multipath characteristics between narrow beam and broad beam antennas

Objective

- This presentation is in support of the Task Group's request
- Measurements made in an office environment
  - More hostile than residential environment

Antenna

	Gain	3 dB Beam Width	Polarization
Omni	~2 dBi	E_L = +40°, -10° A_Z = 360°	Linear (V)
Conical	23 dBi	10.5°	Linear (V)
Small Rectangular	17 dBi	24°	Circular (RH)
Big Rectangular	21 dBi	13°	Circular (RH)

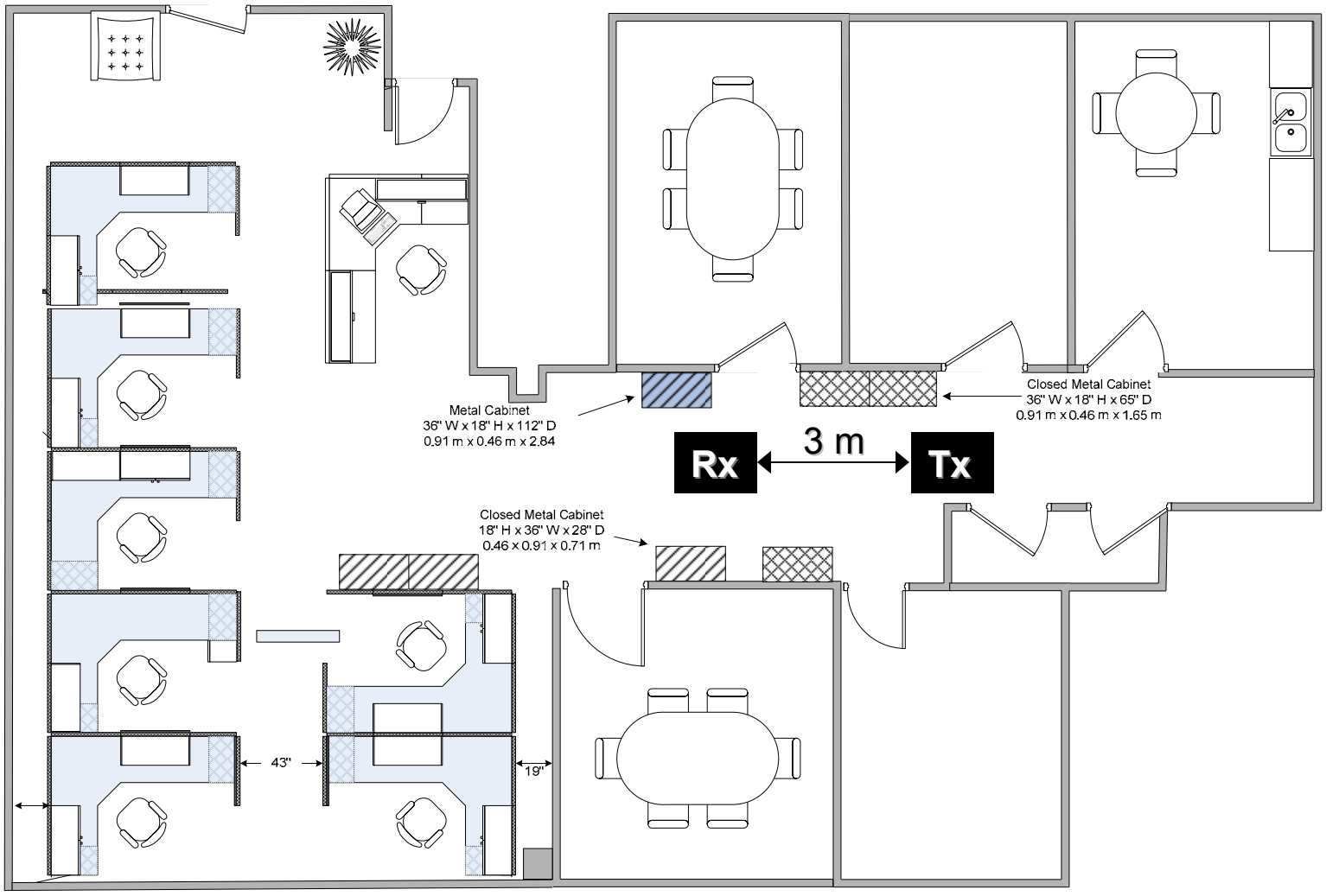
Measurement Method

	Abbreviations	Transmit Antenna	Receive Antenna
1	O[V] ►C[V]	**Omni** 3 dBi, +40°, -10°, Linear (V)	**Conical** 23 dBi, 10.5°, Linear (V)
2	C[V] ►C[V]	**Conical** 23 dBi, 10.5°, Linear (V)	**Conical** 23 dBi, 10.5°, Linear (V)
3	SR[RH] ►BR[RH]	***Small* Rectangular** 17 dBi, 24°, Circular (RH)	***Big* Rectangular** 21 dBi, 13°, Circular (RH)
4	BR[RH] ►BR[RH]	***Big* Rectangular** 21 dBi, 13°, Circular (RH)	***Big* Rectangular** 21 dBi, 13°, Circular (RH)

Note

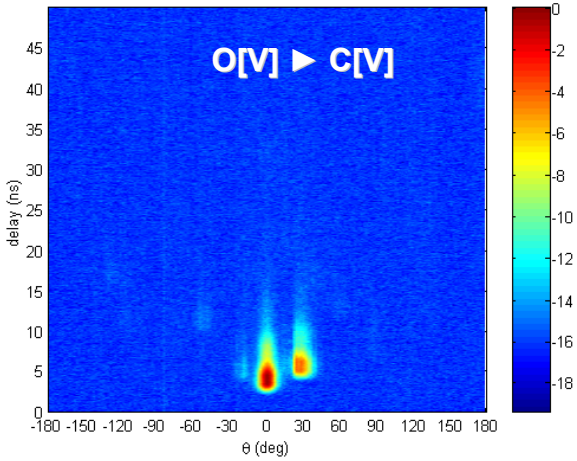
- Transmitter antenna is fixed
- Receiver antenna rotated through 360° in increments of 1.98°

Floor Plan


Metal Cabinet
36" W x 18" H x 112" D
0.91 m x 0.46 m x 2.84
Closed Metal Cabinet
36" W x 18" H x 65" D
0.91 m x 0.46 m x 1.65 m
Rx
3 m
Tx
Closed Metal Cabinet
18" H x 36" W x 28" D
0.46 x 0.91 x 0.71 m
43"
19"

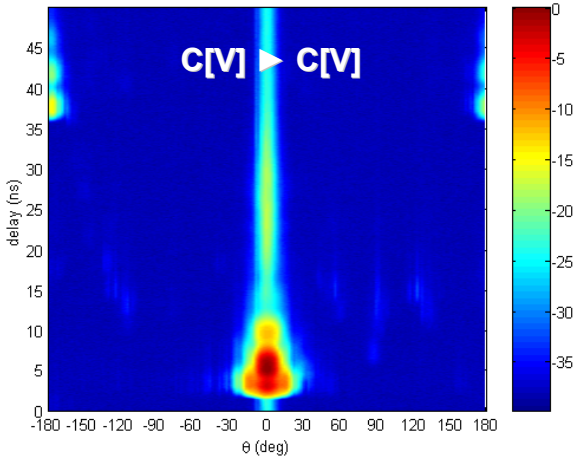
Measurement 16 Reflection Plots

16A



System Gain = 26

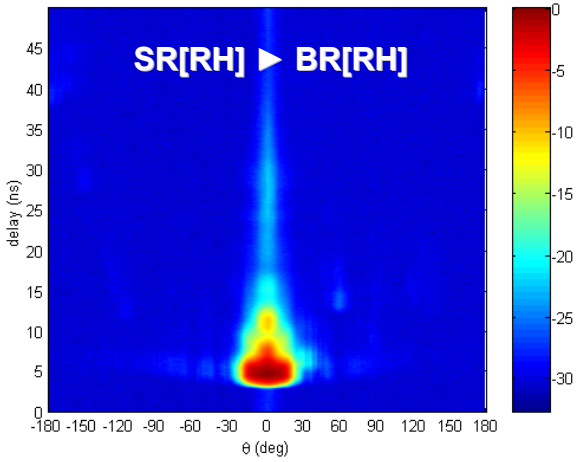
16C



System Gain = 46

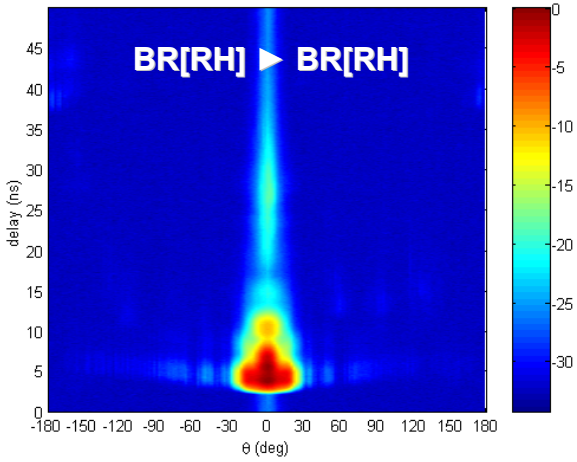
Tx - Rx distance = 3 m [122”]

16D



System Gain = 38

16E



System Gain = 42

Conclusions

Confirmation of Manabe and Sato's work

- "..circular polarization is effective in reducing BER due to multipath propagation in high speed transmission channel."
- "..use of circular polarization can reduce the reflection even if the interior parts of the structure have complicated structures."

Propose AWGN channel for circular polarization and relatively narrow beam width antennas

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  - "..circular polarization is effective in reducing BER due to multipath propagation in high speed transmission channel."
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Propose AWGN channel for circular polarization and relatively narrow beam width antennas

References

1) Manabe, Sato, Masuzano, Taira, Ihara, Kasashima, Yamaki, "*Polarization dependence of multipath propagation and high speed transmission characteristics of indoor millimeter channel at 60GHz*", *IEEE Transaction on Vehicular Technology*, Vol. 44, No. 2, May 1995.

2) Sato, Manabe, Ihara, Saito, Sato, Masuzano, Taira, Ihara, Kasashima, Yamaki, "*Measurements of reflection and transmission of office building in the 60 GHz band*", *IEEE Transaction on Antennas and Propagation*, Vol. 45, No. 12, December 1992.

3) Manabe, Taira, Sato, Ihara, Kasashima, Yamaki, "*Multipath measurement at 60 GHz for indoor wireless communication systems*", *IEEE* 1994.