

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)**Submission Title:** [Proposed reference antenna models for each Usage Model Definition]**Date Submitted:** [October, 2006]**Source:** [H.Sawada¹, Y.Shoji¹, C.S.Choi¹, K.Sato¹, R.Funada¹, H.Harada¹, S.Kato¹, M.Umehira¹, I.Toyoda², K.Kawasaki³, Y.Oishi⁴, K.Takahashi⁵]Company [NICT¹, NTT², SONY³, FUJITSU⁴, Panasonic(Matsushita)⁵]Address ¹[3-4 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan] ²[1-1 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan] ³[6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo 141-0001, Japan] ⁴[5-5 Hikari-no-Oka, Yokosuka-shi, Kanagawa 239-0847, Japan] ⁵[4-12-4, Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-8587, Japan]Voice:[+81-46-847-5096¹, +81-46-859-2366², +81-3-5795-7879³, +81-46-839-5373⁴, +81-3-6710-2029⁵]FAX: [+81-46-847-5440¹, +81-46-855-1497², +81-3-5795-7385³, +81-46-839-5560⁴, +81-3-6710-3915⁵]E-Mail:[sawahiro@nict.go.jp¹, toyoda.ichihiko@lab.ntt.co.jp², Kenichi.Kawasaki@jp.sony.com³, yasu@labs.fujitsu.com⁴, takahashi.kazu@jp.panasonic.com⁵]**Abstract:** [This contribution describes reference antenna models for each Usage Model Definition]**Purpose:** [Contribution to mmW TG3c meeting.]**Notice:** This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.**Release:** The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

Proposed reference antenna models for each Usage Model Definition

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Background

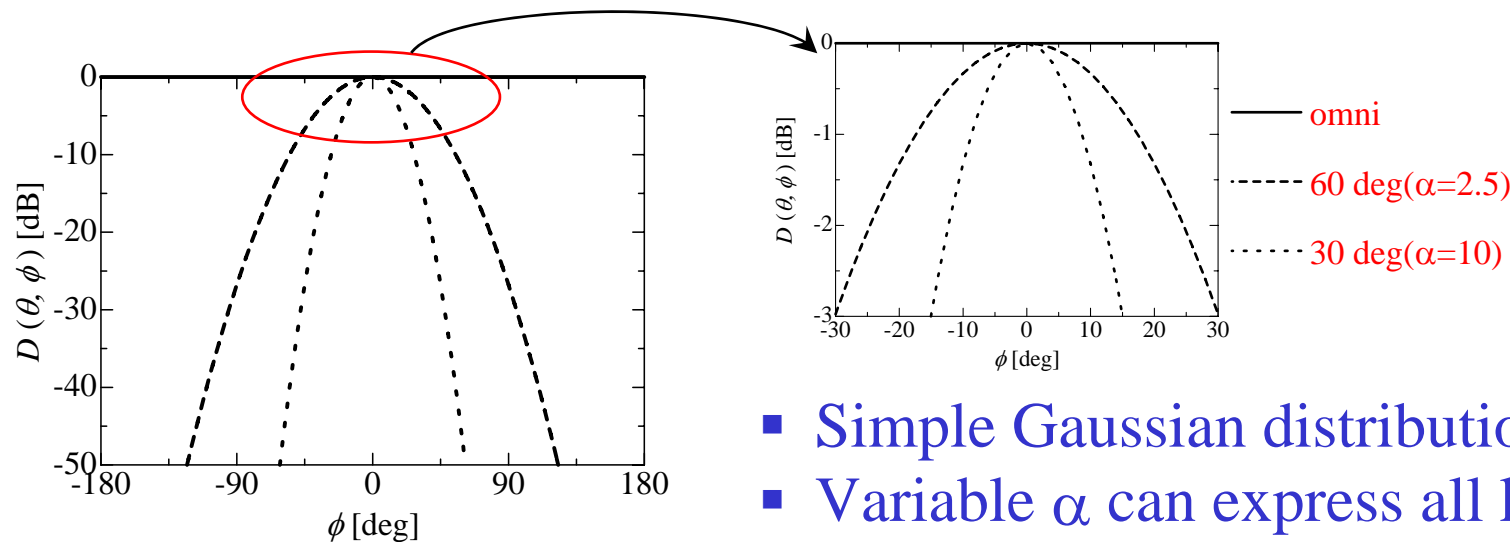
- TG3c called for reference antenna model to perform PHY/MAC simulation

- Reference antenna models are required for each usage model definition

Basic reference antenna model

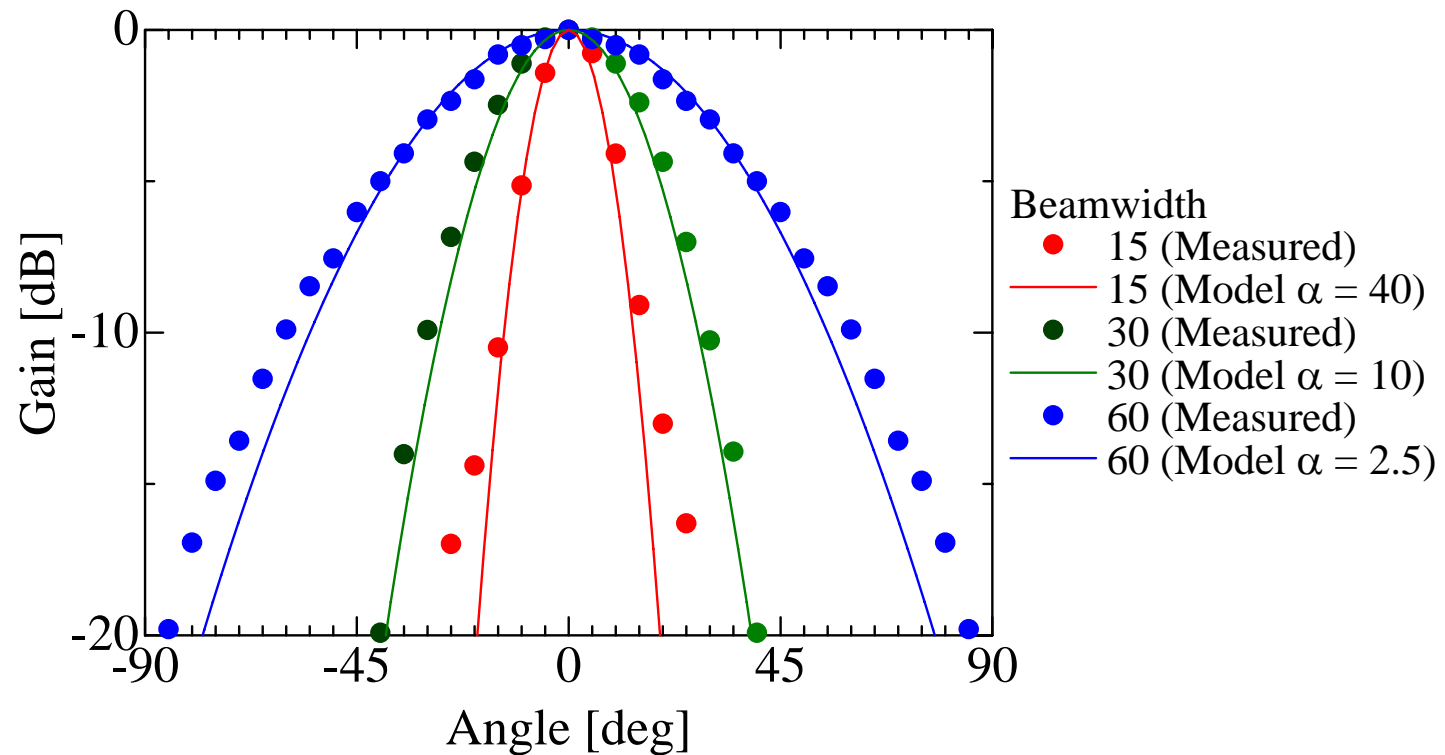
Antenna gain: $G_r(\theta, \phi) = G D(\theta, \phi)$

- Omni directional antenna: $D(0, \phi) = 1$
- Directional antenna: $D(0, \phi) = \exp(-\alpha \phi^2)$



- Simple Gaussian distribution
- Variable α can express all kinds of beam-width

Comparison of antenna patterns



Gaussian distribution well agree with actual antenna pattern

Proposed reference parameters for each UMD

	Devices	Antenna beam-width factor (α)	Correspondent 3-dB beam-width [deg]	Maximum antenna gain [dBi]	Form factor [mm]※1	Bandwidth [GHz]
UM1	TV	40	15	22	20 × 40	9 [57-66 GHz]
	STB	40	15	22	20 × 40	
UM2	TV	40	15	22	20 × 40	
	STB	40	15	22	20 × 40	
UM3	PC	2.5	60	10	4 × 1	
	Peripheral	2.5	60	10	4 × 1	
	TV	40	15	22	20 × 40	
UM4	PC	2.5	60	10	4 × 1	
	Wireless bridge	2.5	60	10	4 × 1	
	TV	40	15	22	20 × 40	
UM5	Server(STB)	2.5	60	10	4 × 1	
	PDA	10	30	16	10 × 10	

※1: Conical horn antenna: Diameter × Length

Policy used in selecting antenna parameters

- The reference antenna should be selected from the antennas used to create the channel model
- The same type of device is assumed to use the same type antenna over all usage models
- The antenna beam width should be practically reasonable

Policy used in selecting antenna parameters (cont')

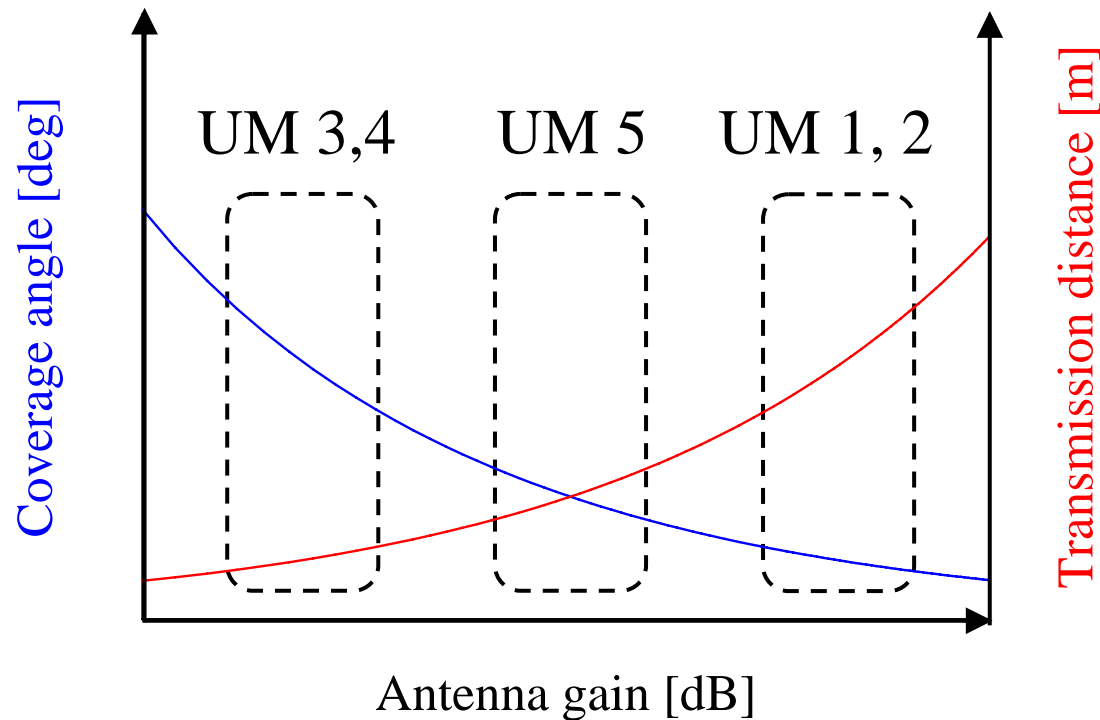


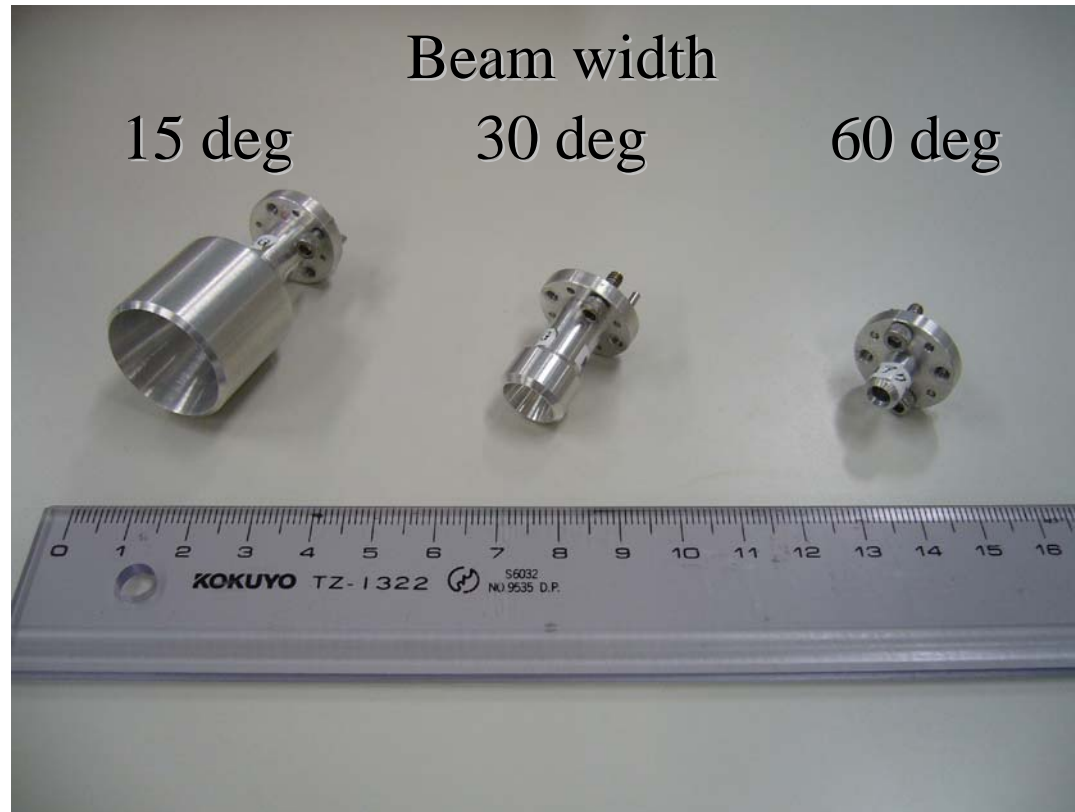
Fig. Coverage angle and transmission distance vs antenna gain

- UM 1,2 require long distance transmission
- UM 3,4 require wide coverage angle
- UM 5 requires moderate gain antenna to tolerate PDA jitter

Summary

- Gaussian pattern was proposed as reference antenna model
- Reference antenna parameters for each UMD were proposed

Appendix: Conical horn antennas



These antennas were used in channel measurement