



ACE Deliverable 2.2D3

Report on existing and evolving test techniques and standards

Project Number: FP6-IST 508009

Project Title: Antenna Centre of Excellence

Document Type: Deliverable

Document Number:

Contractual date of delivery: 31st December 2004

Actual Date of Delivery: 22nd December 2004

Workpackage: 2.2-2

Estimated Person Months:

Security (PP,PE,RE,CO): PP

Nature: Report

Version: 1.0

Total Number of Pages: 8

File name: 2.2.D3.doc

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Abstract

The present document is a review of existing and evolving test techniques and standards for small terminal antennas.

Keyword List

Terminal antenna measurement methods, SAR

ACE WP 2.2-2 “Test Techniques and Standards”

Name of standard/document	Web address/ Reference	Requirement according to the standard/document									Comments
		SAR ¹	TRP ²	MEG ³	TIS/ TRS ⁴	Gain	Rad. Eff.	Rad. Patt.	Diversity gain	MIMO capacity	
IEEE P1528(a) (SCC34) Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	http://standards.ieee.org/board/nes/projects/1528a.pdf	X									Mobile terminal SAR measurement description
EN50361 SAR, 0.3-3GHz (incl. SAM head definition)		X									Mobile terminal SAR measurement description
CTIA	www.ctia.org		X	(X)	X						Not yet standardised Widely accepted Recommendations concerning measurements setups and procedures No limits given for the different parameters Used for: AMPS/D-AMPS, PCS, CDMA, TDMA

Name of standard/document	Web address/ Reference	Requirement according to the standard/document									Comments
		SAR ¹	TRP ²	MEG ³	TIS/ TRS ⁴	Gain	Rad. Eff.	Rad. Patt.	Diversity gain	MIMO capacity	
TCO'01	www.tcodevelopment.com	X 0.8 W/kg	X 0.3 W								Recommendation for measurements TRP is called: TCP (Telephone Communication Power) SAR measured according to EN 50361, over 10g of tissue
ETSI EN 301 839 MICS standard			X								Requirements expressed as "Equivalent Dipole Radiated Power". - Anechoic chamber - Special Indoor Range - Special outdoor reflection range EDRP=-16 dBm
ANSI/IEEE Std 149-1979 Standard Test Procedures for Antennas	http://ieeexplore.ieee.org/xpl/tocresult.jsp?isNumber=768					X	X	X			Basic definitions for antenna measurements
COST 273 SWG2.2, "Measurements of Radio Performances for UMTS Terminals in Speech Mode"	http://www.lx.it.pt/cost273/		X	X	X						Pre-standard, 28th of Oct. 2004.
TSG-RAN Working Group 4 Measurements of Radio Performances for UMTS Terminals in Speech Mode	http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_33/Report/		X		X						R4-040612: 3G UE antenna evaluation methods for the 3GPP standard

Name of standard/document	Web address/ Reference	Requirement according to the standard/document								Comments	
		SAR ¹	TRP ²	MEG ³	TIS/ TRS ⁴	Gain	Rad. Eff.	Rad. Patt.	Diversity gain		MIMO capacity
Random positioner	http://itop.epfl.ch/L/EMA/		X								
Wheeler Cap measurement method	[1] – [2]						X				[1] - <i>Wheeler Cap</i> is de facto a standard radiation efficiency measurement [2] - Basis for the popular, improved Wheeler Cap Method
Spherical measurement method	[3]		X				X				Experimental spherical real-time measurement system with 32 field probes
Reverberation chamber measurement methods	[4] – [9], http://www.blutest.se		X		X		X		X	X	

¹Specific Absorption Rate, ²Total Radiated Power, ³Mean Effective Gain, ⁴Total Isotropic Sensitivity/Total Radiated Sensitivity

ACE WP 2.2-2 “Communication Standards – SAR Levels”

System	Web address for more information	Requirement according to the standard	
		SAR (Head/Body) ^{1,2}	
		Cube Averaging*	Limit [W/kg]*
AMPS/D-AMPS		1g	1.6
GT 800			
GSM850		1g/10g	1.6/2.0
E-GSM		1g/10g	1.6/2.0
DCS (GSM1800)		1g/10g	1.6/2.0
PCS (GSM1900)		1g/10g	1.6/2.0
European DECT 1.8 GHz		10g	2.0
American DECT 2.4 GHz		1g	1.6
UMTS FDD		10g	2.0
UMTS TDD			
Bluetooth ³		1g/10g	1.6/2.0
WLAN ³		1g/10g	1.6/2.0
GPS		N/A (receive only)	

¹Specific Absorption Rate, ²Values listed only for “General public”, some standards cover additional “Occupational exposure”. ³For Europe: If the averaged output power is less than 20 mW measurements are not required (EN50371)

* Depending on the country

ACE WP 2.2-2 “SAR Standards – Safety Levels”

Name of standard/Recommendation	Web address for more information	Requirement according to the standard	
		Maximum local SAR (Head/Body)*	Averaging volume of tissue
ICNIRP 1998		2	10g
European Council Recommendation 1999 519 EC		2	10g
EN50360 (Product Standard)		2	10g
ARPANSA		2	10g
FCC OET65 Supplement C		1.6	1g
IEEE C95.1		1.6	1g

*Values listed only for “General public”, some standards cover additional “Occupational exposure”.

ACE WP 2.2-2 “SAR Standards – Measurement Procedures¹”

Name of standard/Recommendation	Web address for more information	Comments
EN50361 (Basic Standard)		Head
ACA 2003		Head/Body
FCC OET65 Supplement C		Head/Body
IEEE Std 1528-2003		Head
IEC 62209 Part 1		Draft, Head
IEC 62209 Part 2		Planned, Body

¹Mobile phones and portable devices only

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