InterLab®

Final Report on

Cinterion AC75i Cellular Module
SW: Rev. 01.000 (SV03)
HW: B2.1.1

Report Reference: MDE_CINTE_0810_AC75i_FCCc

Date: Februar 17, 2009

Test Laboratory:

DAT-P-192/99-01

7 layers AG
Borsigstr. 11
40880 Ratingen
Germany

1 Administrative Data

1.1 Project Data

Project Responsible:	Holger Leutfeld
Date Of Test Report:	2009/02/17
Date of first test:	2009/02/06
Date of last test:	2009/02/12

1.2 Applicant Data

Company Name: Cinterion Wireless Modules GmbH

Street:	Siemensdamm 50
City:	13629 Berlin
Country:	Germany

Contact Person: Mr. Thorsten Liebig

Department:	Approval and Standardization
Phone:	+49 3031102 8241
Fax:	+49 30311028305
E-Mail:	thorsten.liebig@cinterion.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name :	7 layers AG
Street :	Borsigstrasse 11
City :	40880 Ratingen
Country :	Germany
Contact Person :	Mr. Michael Albert
Phone :	+49 2102 749 201
Fax :	+49 2102 749 444
E Mail :	michael.albert@7Layers.de

Laboratory Details

Lab ID	*Identification*	*Responsible*	*Accreditation Info*
Lab 1	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01
Lab 2	Radio Lab	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01

1.4 Signature of the Testing Responsible

Dr. Michael Küppers
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible

Accreditation scope responsible person
responsible for Lab 1, Lab 2

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: Cinterion AC75i Cellular Module

Type / Model / Family:	Cinterion AC75i Cellular Module SW: Rev. 01.000 (SV03) HW: B2.1.1
Product Category:	Module
Manufacturer:	
Company Name:	see applicant

Parameter List:

Parameter name	*Value*
Parameter for Scope FCC_v2:	
AC Power Supply	110 (V) for peripheral devices
Antenna gain	not specified (dBi)
DC Power Supply	12 (V)
highest channel	251 for GSM850, 810 for GSM1900
lowest channel	128 for GSM850, 512 for GSM1900
mid channel	190 for GSM850, 661 fro GSM1900
AddInfo_Internal_CTM_modem_support	True (n/a)
AMR C/I normalization factor	2 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_10dB (GSM 1800)	6 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_10dB (GSM 1900)	6 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_10dB (GSM 850)	6 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_10dB (GSM 900)	6 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_11dB (GSM 1800)	5 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_11dB (GSM 1900)	5 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_11dB (GSM 850)	5 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_11dB (GSM 900)	5 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_12dB (GSM 1800)	4 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_12dB (GSM 1900)	4 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_12dB (GSM 850)	4 (dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_12dB (GSM 900)	4 (dB)

AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_14dB (GSM 1800)	3	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_14dB (GSM 1900)	3	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_14dB (GSM 850)	3	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_14dB (GSM 900)	3	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_17dB (GSM 1800)	2	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_17dB (GSM 1900)	2	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_17dB (GSM 850)	2	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_17dB (GSM 900)	2	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_19dB (GSM 1800)	1	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_19dB (GSM 1900)	1	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_19dB (GSM 850)	1	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_19dB (GSM 900)	1	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_20dB (GSM 1800)	0	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_20dB (GSM 1900)	0	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_20dB (GSM 850)	0	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_20dB (GSM 900)	0	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_2dB (GSM 1800)	11	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_2dB (GSM 1900)	11	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_2dB (GSM 850)	11	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_2dB (GSM 900)	11	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_3dB (GSM 1800)	10	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_3dB (GSM 1900)	10	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_3dB (GSM 850)	10	(dB)

AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_3dB (GSM 900)	10	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_4dB (GSM 1800)	9	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_4dB (GSM 1900)	9	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_4dB (GSM 850)	9	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_4dB (GSM 900)	9	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_6dB (GSM 1800)	8	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_6dB (GSM 1900)	8	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_6dB (GSM 850)	8	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_6dB (GSM 900)	8	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_8dB (GSM 1800)	7	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_8dB (GSM 1900)	7	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_8dB (GSM 850)	7	(dB)
AMR C/I normalization factors (AFS, DARP): CI_NORM_AFS_DARP_8dB (GSM 900)	7	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_10dB (GSM 1800)	6	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_10dB (GSM 1900)	6	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_10dB (GSM 850)	6	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_10dB (GSM 900)	6	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_12dB (GSM 1800)	5	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_12dB (GSM 1900)	5	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_12dB (GSM 850)	5	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_12dB (GSM 900)	5	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_13dB (GSM 1800)	4	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_13dB (GSM 1900)	4	(dB)

AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_13dB (GSM 850)	4	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_13dB (GSM 900)	4	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_16dB (GSM 1800)	3	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_16dB (GSM 1900)	3	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_16dB (GSM 850)	3	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_16dB (GSM 900)	3	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_17dB (GSM 1800)	2	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_17dB (GSM 1900)	2	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_17dB (GSM 850)	2	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_17dB (GSM 900)	2	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_20dB (GSM 1800)	1	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_20dB (GSM 1900)	1	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_20dB (GSM 850)	1	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_20dB (GSM 900)	1	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_21dB (GSM 1800)	0	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_21dB (GSM 1900)	0	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_21dB (GSM 850)	0	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_21dB (GSM 900)	0	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_4dB (GSM 1800)	9	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_4dB (GSM 1900)	9	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_4dB (GSM 850)	9	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_4dB (GSM 900)	9	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_6dB (GSM 1800)	8	(dB)

AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_6dB (GSM 1900)	8	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_6dB (GSM 850)	8	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_6dB (GSM 900)	8	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_7dB (GSM 1800)	7	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_7dB (GSM 1900)	7	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_7dB (GSM 850)	7	(dB)
AMR C/I normalization factors (AHS, DARP): CI_NORM_AHS_DARP_7dB (GSM 900)	7	(dB)
Antenna Connector	True	
Auto ReAttach	false	
DISPLAY TEXT: No Response from user timeout interval	30	(s)
Early_classmark_sending	true	
GET INKEY: No response from user Timeout interval	30	(s)
GET INPUT: No response from user Timeout interval	30	(s)
GPRS Compression	false	
Length Indicator	false	
Loop C delay (RTD), in number of TCH frames for FR	4	
Loop C delay (RTD), in number of TCH frames for HR	4	
Max number of SMS Characters	160	
Maximum number of CP-DATA retransmissions	1	
MMI GPRS detach	true	
Number of MS initiated PDP contexts	2	
Number of Network initiated PDP contexts	1	
O-TCH/F C/I normalisation factor	0	(dB)
parameter_20_2_a	2.0	
parameter_20_2_b	1.5	
Preferred buffer size supported by the terminal for Open Channel command	1500	(bytes)
SELECT ITEM: No response from user Timeout interval	30	(s)
SMS over EGPRS	false	
Timer TC1M	14	
TSPC_no_XID_after_PDP_CA	false	

2.2 Detailed Description of OUT Samples

Sample : E08

OUT Identifier	Cinterion AC75i Cellular Module		
Sample Description			
Serial No.	026291		
HW Status	B2.1.2		
SW Status	Rev. 01.000 (SV03)		
Date of Receipt	2008/10/07		
Low Voltage	3.2 V	*Low Temp.*	-10 °C
High Voltage	4.5 V	*High Temp.*	55 °C
Nominal Voltage	4.5 V	*Normal Temp.*	21 °C

2.3 OUT Features

Features for OUT: Cinterion AC75i Cellular Module

Designation	*Description*	*Allowed Values*	*Supported Value(s)*
Features for scope: FCC_v2			
AC	The OUT is powered by or connected to AC Mains		
DC	The OUT is powered by or connected to DC Mains		
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz		
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz		
GSM850	EUT supports GSM850 band 824MHz - 849MHz		
PantC	permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment		
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz		

2.4 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

Setup No.	*List of OUT samples*		*List of auxiliary equipment*	
	Sample No.	*Sample Description*	*AE No.*	*AE Description*
E08_FCC24				
	Sample: E08		AE 03	ext. Antenna
			AE 02	Flex cable
			AE 04	Shielded Housing for DSB
			AE 01	Evaluation Board
			AE 06	Laptop

3 Results

3.1 General

Documentation of tested devices: Available at the test laboratory.

Interpretation of the test results: The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

Designation	*Description*
FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES	Part 24, Subpart E - Broadband PCS

3.3 List of Test Specification

Test Specification:	**FCC part 2 and 24**
Date / Version	2007/10/01 Version: 10-1-07 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 24 - PERSONAL COMMUNICATIONS SERVICES

3.4 Summary

Test Case Identifier / Name *Test (condition)*	*Result*	*Date of Test*	*Lab Ref.*	*Setup*
24.1 RF Power Output §2.1046, §24.232				
24.1; Frequency Band = 1900, Mode = EDGE, Channel = 512, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.1; Frequency Band = 1900, Mode = EDGE, Channel = 661, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.1; Frequency Band = 1900, Mode = EDGE, Channel = 810, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.1; Frequency Band = 1900, Mode = GSM, Channel = 512, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.1; Frequency Band = 1900, Mode = GSM, Channel = 661, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.1; Frequency Band = 1900, Mode = GSM, Channel = 810, Method = conducted	Passed	2009/02/06	Lab 2	E08_FCC24
24.4 Field strength of spurious radiation §2.1053, §24.238				
24.4; Frequency Band = 1900, Mode = EDGE, Channel = 661	Passed	2009/02/12	Lab 1	E08_FCC24
24.4; Frequency Band = 1900, Mode = GSM, Channel = 661	Passed	2009/02/12	Lab 1	E08_FCC24

3.5 Detailed Results

3.5.1 24.1 RF Power Output §2.1046, §24.232

Test: 24.1; Frequency Band = 1900, Mode = EDGE, Channel = 512, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 11:55

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	29.60	passed
average	maxhold	300	25.71	passed
rms	maxhold	300	26.24	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

Test: 24.1; Frequency Band = 1900, Mode = EDGE, Channel = 661, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 11:57

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	29.41	passed
average	maxhold	300	25.59	passed
rms	maxhold	300	26.13	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

Test: 24.1; Frequency Band = 1900, Mode = EDGE, Channel = 810, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 11:59

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	29.33	passed
average	maxhold	300	25.60	passed
rms	maxhold	300	25.99	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

Test: 24.1; Frequency Band = 1900, Mode = GSM, Channel = 512, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 12:00

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	30.58	passed
average	maxhold	300	30.08	passed
rms	maxhold	300	30.09	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

Test: 24.1; Frequency Band = 1900, Mode = GSM, Channel = 661, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 12:01

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	30.32	passed
average	maxhold	300	29.89	passed
rms	maxhold	300	29.92	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

Test: 24.1; Frequency Band = 1900, Mode = GSM, Channel = 810, Method = conducted

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/06 12:03

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 23°C
Air Pressure: 993hPa
Rel. Humidity: 35%

Detailed Results:

detector	trace	resolution bandwidth /kHz	conducted peak value /dBm	verdict
peak	maxhold	300	30.29	passed
average	maxhold	300	29.86	passed
rms	maxhold	300	29.89	passed

no external antenna gain is specified, the verdict is valid
for external antenna gains matching the MPE calculation

3.5.2 24.4 Field strength of spurious radiation §2.1053, §24.238

Test: 24.4; Frequency Band = 1900, Mode = EDGE, Channel = 661

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/12 17:39

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 24°C
Air Pressure: 1020hPa
Rel. Humidity: 30%

Detailed Results:

frequency /MHz	peak value /dBm	margin to limit /dB	limit /dBm	verdict
-	-	-	-13,0	Passed

no further values have been found with a margin of less than 20 dB

Test: 24.4; Frequency Band = 1900, Mode = GSM, Channel = 661

Result: Passed

Setup No.: E08_FCC24

Date of Test: 2009/02/12 14:59

Body: FCC47CFRChIPART24PERSONAL COMMUNICATIONS SERVICES

Test Specification: FCC part 2 and 24

Test Equipment Environmental Conditions

Temperature: 24°C
Air Pressure: 1019hPa
Rel. Humidity: 31%

Detailed Results:

frequency /MHz	peak value /dBm	margin to limit /dB	limit /dBm	verdict
-	-	-	-13,0	Passed

no further values have been found with a margin of less than 20 dB

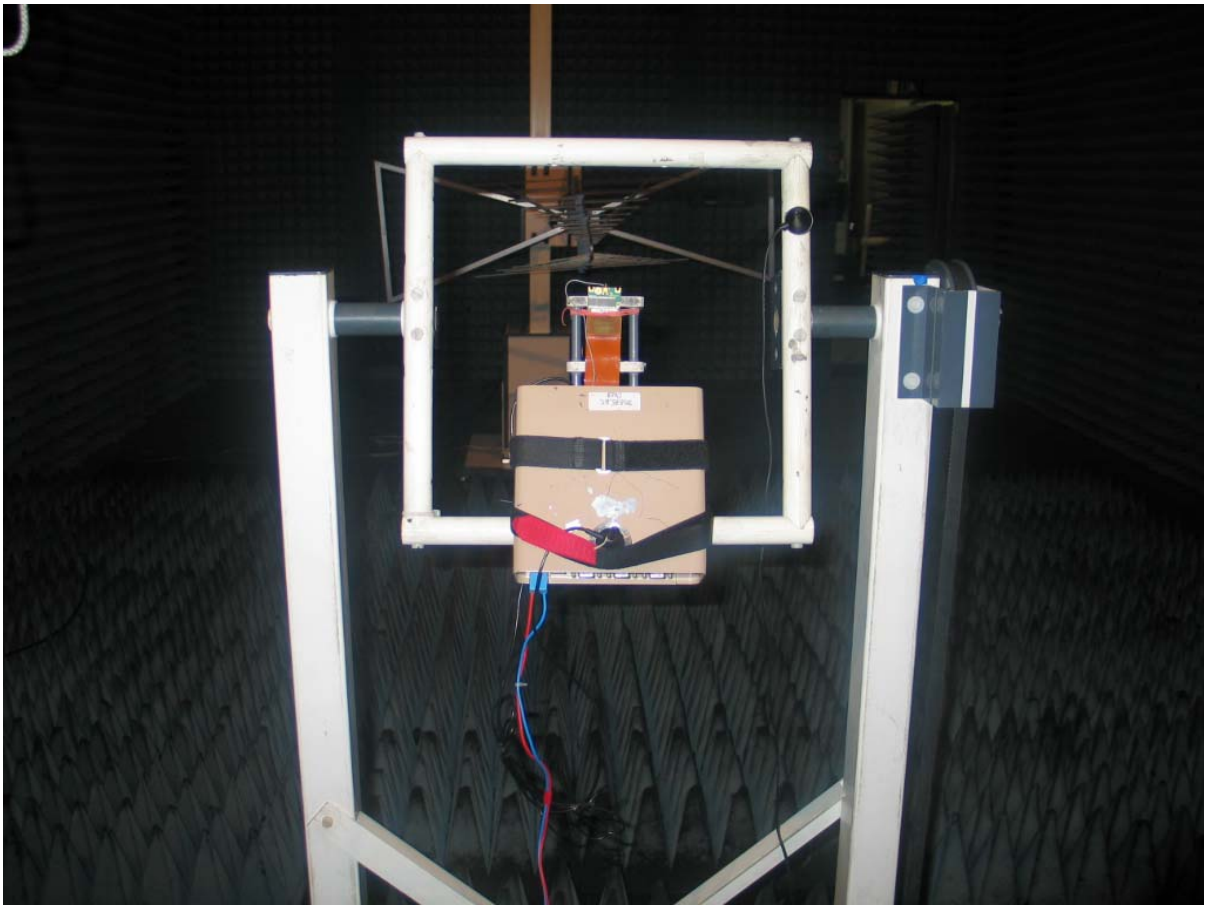
4 Annex

4.1 Additional Information for OUT Description

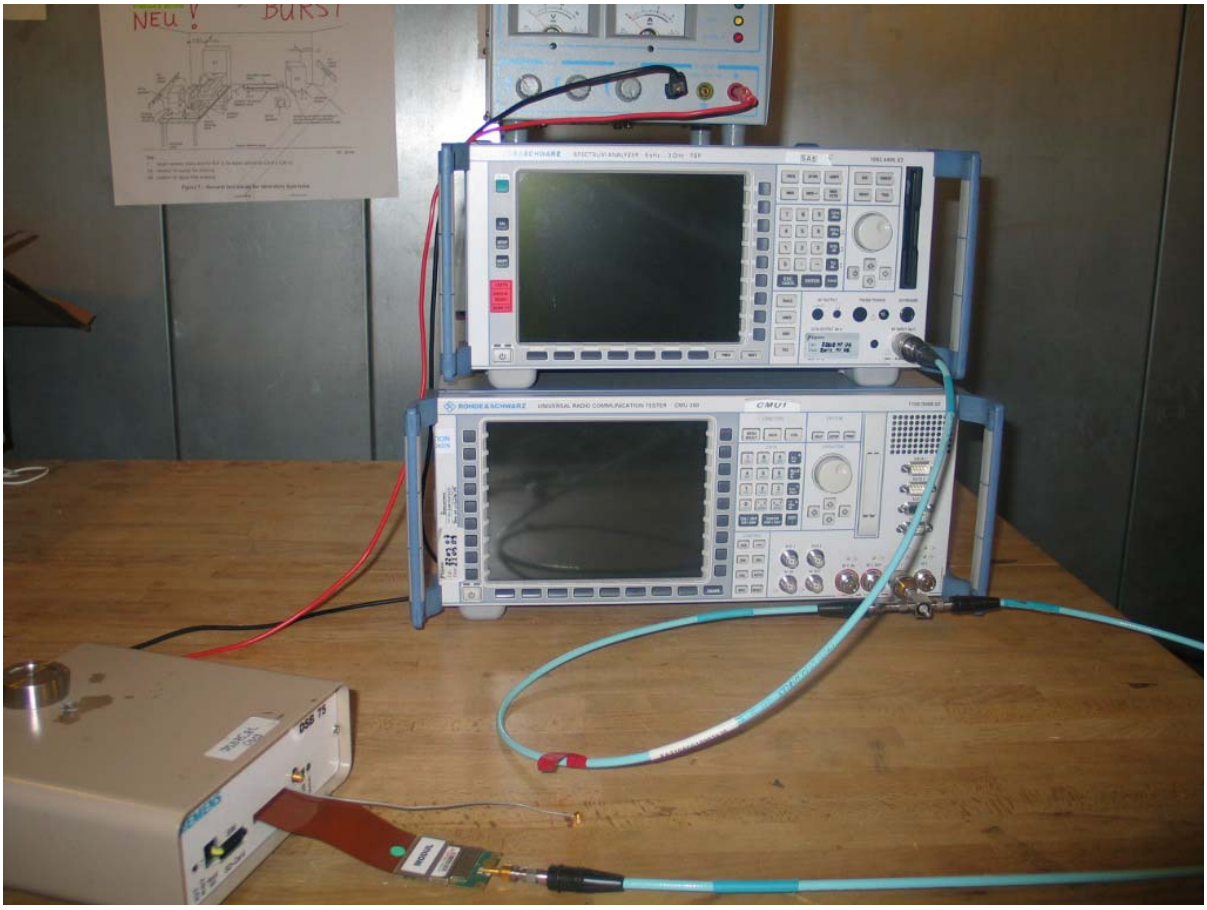
back view

front view

4.2 Additional Information for Report



setup for radiated tests



setup for conducted tests

Summary of Test Results

The EUT complied with all performed tests as listed in the summary section of this report.

Technical Report Summary

Type of Authorization :

Certification for a GSM cellular radiotelephone device

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 0 to 69. The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

§ 2.1046 Measurement required: RF power output
§ 2.1049 Measurement required: Occupied bandwidth
§ 2.1051 Measurement required: Spurious emissions at antenna terminals
§ 2.1053 Measurement required: Field strength of spurious radiation
§ 2.1055 Measurement required: Frequency stability
§ 2.1057 Frequency spectrum to be investigated

Part 24, Subpart E - Broadband PCS

§ 24.232 Power and antenna height limits
§ 24.235 Frequency stability
§ 24.236 Field strength limits
§ 24.238 Emission limitations for Broadband PCS equipment

Description of Methods of Measurements

RF Power Output

Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1046

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.

Important Settings:
- Channel (Frequency): please refer to the detailed results
4) The transmitted power of the EUT was recorded by using a spectrum analyser.

Test Requirements / Limits

§2.1046 Measurements Required: RF Power Output
(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the output terminals when this test is made shall be stated.
§24.232 Power and antenna height limits
(c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.
(d) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Emission and Occupied Bandwidth

Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1049

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.
Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
4) Important Analyser Settings:
- Resolution Bandwidth: >1% of the manufacturer’s stated occupied bandwidth
5) The maximum spectral level of the modulated signal was recorded as the reference.
6) The emission bandwidth is measured as follows:
the two furthest frequencies above and below the frequency of the maximum reference level where the spectrum is –26 dB down have to be found.
7) The occupied bandwidth (99% Bandwidth) is measured as follows:
the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 percent of the total mean power.

Test Requirements / Limits

§ 2.1049 Measurements required: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions (as applicable):

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

Spurious emissions at antenna terminals

_____

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1051

Test Description

1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.
Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
4) Important Analyser Settings
- [Resolution Bandwidth]:
a) [>=1% of wanted signal bandwidth] in the Span of 1 MHz directly below and above the Band,
b) otherwise [1 MHz]
c) [reduced resolution bandwidth] in case the curve of the analyser IF-Filter or the wanted EUT signal leads to an exceeding of the limit, in this case a correction factor was used
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
5) The spurious emissions peaks were measured in the frequency range from 9 kHz to 20 GHz (up to the 10th harmonic) during the call was established

Test Requirements / Limits

§ 2.1051 Spurious emissions at antenna terminals

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in Sec. 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in Secs. 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.
(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

§ 24.238 Emission limitations for Broadband PCS equipment

(a) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
Remark of the test laboratory: This is calculated to be -13 dBm.
(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified

band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Field strength of spurious radiation

Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §2.1053

Test Description

1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to a Digital Communication Tester which was located outside the chamber via a small signalling antenna.
2) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.
Important Settings:
- Output Power: Maximum
- Channel : please refer to the detailed results
3) A pre-calibration procedure is used so that the readings from the spectrum analyser are corrected and represent directly the equivalent radiated power (related to a lamda/2 dipole).
4) All spurious radiation measurements were made with spectrum analyser and the appropriate calibrated antennas for the frequency range of 30 MHz to 20 GHz (up to the 10th harmonic of the transmit frequency). The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the Band,
b) [10 kHz / 30 kHz] in case the curve of the analyser IF-Filter leads to an exceeding of the limit, in this case a worst case correction factor of 20 dB (1 MHz -> 10 kHz) was used
c) [1 MHz / 3 MHz] otherwise
- Sweep Time: depending on the transmitting signal, the span and the resolution bandwidth
6) The spurious emissions peaks were measured in both vertical and horizontal antenna polarisation during the call is established on the lowest channel, mid channel and on the highest channel.

Test Requirements / Limits

§ 2.1053 Measurements required: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of Sec. 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.
(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
(2) All equipment operating on frequencies higher than 25 MHz.

§ 2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in Secs. 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to

those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.
(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

§ 24.238 Emission limitations for Broadband PCS equipment

(a) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

For reporting only spurious emission levels reaching to the 20dB margin to limit were noted.

Frequency stability

Standard: FCC Part 24, Subpart E

The test was performed according to FCC §2.1055

Test Description

1) The EUT was placed inside a temperature chamber.
2) The EUT was coupled to a Digital Communication Tester. Refer to chapter "Setup Drawings".
3) The climatic chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
4) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic Channel between the EUT and the Digital Communication Tester.
Important Settings:
- Output Power: Maximum
- Mid Channel
5) The frequency error of the EUT was recorded by using an internal measurement function of the Digital Communication Tester immediately after the call was established, five minutes after the call was established and ten minutes after the call was established.
6) This measurement procedure was performed for temperature variation from –30°C to +50°C in increments of 10°C, if not otherwise stated in the detailed results.
When the EUT did not operate at certain temperature levels, these measurements were left out.

Test Requirements / Limits

§2.1055 Measurements required: Frequency stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30° to +50° centigrade for all equipment except that specified in paragraphs
(a) (2) and (3) of this section.
(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency

measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.
(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

§24.235 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

7Layers interpretation of limit:

To ensure that the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block following limit was used:

+/- 2.5 ppm = 4700 Hz for a frequency of 1880.0 MHz

in accordance with FCC Part 22, Subpart H, §22.355, table C-1: Frequency tolerance for the carrier frequency of mobile transmitters in the Public Mobile Service in the frequency range 821 to 896 MHz.

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Band edge compliance

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Standard: FCC Part 24, Subpart E

The test was performed according to: FCC §24.238

Test Description

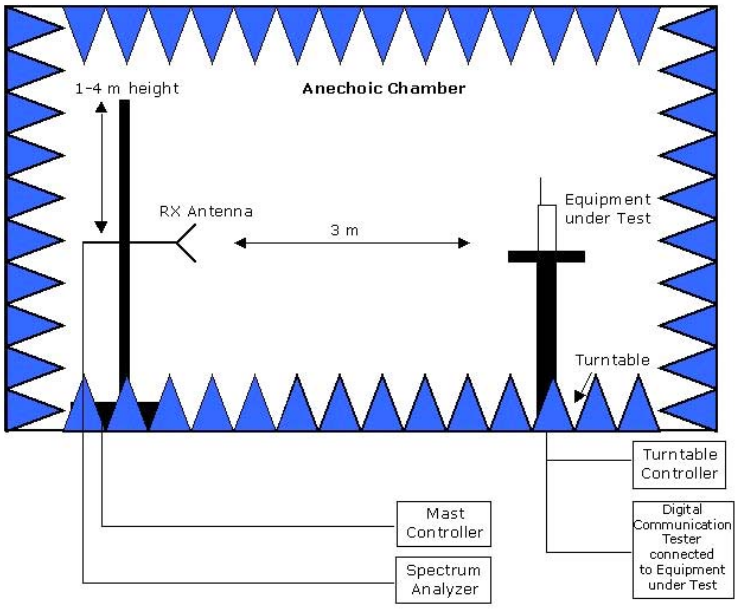
1) The EUT was coupled to a Spectrum Analyser and a Digital Communication Tester through a Power Divider. Refer to chapter "Setup Drawings".
2) The total insertion losses for signal path 1 and signal path 2 were measured. The values were used to correct the readings from the Spectrum Analyser and the Digital Communication Tester.
3) A call was established on a Traffic Channel between the EUT and the Digital Communication Tester.
Important Settings:
- Output Power: Maximum
- Channel: please refer to the detailed results
4) Important Analyser Settings:
- Resolution Bandwidth = Video Bandwidth: >1% of the manufacturer’s stated occupied bandwidth

Test Requirements / Limits

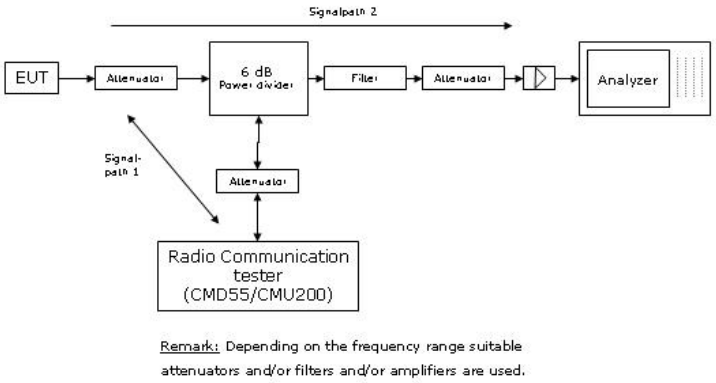
§ 24.238 Effective radiated power limits

Refer to chapter "Field strength of spurious radiation".

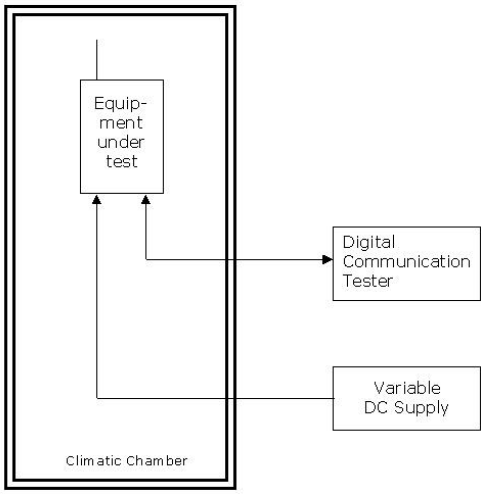
Setup Drawings



Principle set-up for radiated measurements



Principle set-up for conducted measurements under nominal conditions



Principle set-up for tests under extreme test conditions

Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	07.10.08	07.10.11
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	N/A *)
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	22.09.07	22.09.09
Universal Radio Communication Tester	CMU200	837983/052	Rohde & Schwarz	22.09.07	22.09.09
Signalling Unit for Bluetooth	CBT	100589	Rohde & Schwarz	14.08.08	N/A *)
Signalling Unit for GPS	SMU200	100912	Rohde & Schwarz	28.10.08	N/A *)

*) N/A – only used for signalling

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	06.12.09
Signal Generator	SMR 20	846834/008	Rohde & Schwarz	05.12.07	05.12.09
AC Power Source	6404	64040000B04	Croma ATE INC.	01.06.08	01.06.11

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel	-	-
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	27.10.08	27.10.13
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq	12.11.08	12.05.09
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq	12.11.08	12.05.09
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq	12.11.08	12.05.09
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	12.11.08	12.05.09
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger-Microcoax	12.11.08	12.05.09
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	12.05.09
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz	20.01.04	N/A – spare antenna
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	12.11.08	12.05.09
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	12.11.08	12.05.09
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	12.11.08	12.05.09
High Pass Filter	WHKX 7.0/18G-8SS	9	Wainwright	12.11.08	12.11.08
KUEP pre amplifier	Kuep 00304000	001	7 layers AG	-	N/A – spare antenna
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	17.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	19.08.02	N/A – only used for pre-testing
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	28.02.08	N/A (Stand. Gain Horn)
Pyramidal Horn Antenna 40 GHz	Model 3160-10	00086675	EMCO	18.12.07	N/A (Stand. Gain Horn)

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	12.11.08	12.05.09
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	13.10.08	13.10.11
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-
Four-Line Network	ENY41	838119/004	Rohde & Schwarz	06.03.08	05.03.11

Auxiliary Test Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel	-	-
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel	-	-
Digital Multimeter	177	86670383	Fluke	01.08.08	31.07.10
Digital Oscilloscope	TDS 784C	B021311	Tektronix	-	-
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis	-	-
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis	-	-
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz	-	-
Notch Filter ultra stable	WRCA800/960 -6E	24	Wainwright	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	29.02.08	28.02.09
Temperature Chamber	KWP 120/70	59226012190010	Weiss	29.02.08	28.02.09
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	06.10.08	06.10.11
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	836722/011	Rohde & Schwarz	06.10.08	05.10.11
Signal Analyzer 20 Hz to 26.5 GHz	FSIQ26	840061/005	Rohde & Schwarz	02.10.08	02.10.11

Anechoic Chamber

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Air Compressor (pneumatic)			Atlas Copco	-	-
Controller	MCU	1520506	Maturo GmbH	-	-
EMC Camera	CE-CAM/1		CE-SYS	-	-
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi	-	-
Filter ISDN	B84312-C110-E1		Siemens & Matsushita	-	-
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita	-	-
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita	-	-
Fully/Semi AE Chamber	10.58x6.38x6		Frankonia	-	-
Turntable	DS 420S	420/573/99	HD GmbH, H.Deisel	-	-
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H.Deisel	-	-
ThermoHygro Datalogger 12	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH	05.08.08	04.08.09
ThermoAirpressure Datalogger 13	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10

7 layers InterLab Bluetooth RF Test Solution - Setup C – Bluetooth BDR and EDR RF Conformance Test System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Power Meter	NRVD	832025/059	Rohde & Schwarz	17.06.08	15.06.09
Power Sensor A	NRV-Z1	832279/013	Rohde & Schwarz	18.06.08	17.06.09
Power Supply	E3632A	MY40003776	Agilent	-	-
Power Supply	PS-2403D	-	Conrad	-	-
Power Supply	NGSM 32/10	2725	Rohde & Schwarz	28.04.08	27.04.09
Rubidium Frequency Normal	MFS	002	Datum GmbH	18.06.08	17.06.09
Signal Analyzer FSIQ26	FSIQ26	832695/007	Rohde & Schwarz	23.08.07	23.08.09
Signal Generator	SMP 03	833680/003	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator	SMIQ03B	832870/017	Rohde & Schwarz	24.05.07	24.05.10
Signal Switching Unit	TOCT	030106	7 layers Inc.	-	-
Signalling Unit	CBT	100302	Rohde & Schwarz	07.05.08	06.05.09
ThermoHygro Datalogger 04	Opus10 THI (8152.00)	7481	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10
Temperature Chamber	KWP 120/70	59226012190010	Weiss	29.02.08	28.02.09

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