

TEST REPORT
No.: 2-20757077c/08

According to
FCC Regulations
Part 15.107 & 15.109
Part 15.207 & 15.209 & Part 15.247
IC Regulations:
RSS-gen, Issue 2
RSS-210e, Issue 7
RSS-310e, Issue 1

for
OPTION N.V.

GSM/EGPRS/FDD/WLAN Wireless Router GS0312
+
External Antenna Joymaxx CAF-6540FMXX





Laboratory Accreditation and Listings			
 Deutscher Akkreditierungs Rat DAT-P176/94-02	 FEDERAL COMMUNICATIONS COMMISSION FC USA Reg. No.: 99538 MRA US-EU 0003	 Industry Canada Reg. No.: IC 3465	 Reg. No.: R-2665, R-2666 C-2914, T-339
accredited according to DIN EN ISO/IEC 17025			
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1. Summary of test results

The test results apply exclusively to the test samples as presented in chapter 3.1. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

Following tests have been performed to show compliance with applicable FCC 15 of the FCC CFR 47 Rules and Canada IC-standards:

1.1. TESTS OVERVIEW Part 15.247 (WLAN-Mode), 15.205/15.209, RSS-210e, RSS-Gen

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	RSS Section	TEST LIMIT			
TX-Mode							
6dB Bandwidth	Antenna terminal	§15.247(a) (1)	RSS210, Issue 7: A8.2 (a)	At least 25kHz or 2/3 of 20dB bandwidth	--	--	Not performed 2.)
Transmitter output power (conducted)	Antenna terminal (conducted)	§15.247(b) (1)	RSS210, Issue 7: A8.4 (2)	0.125 Watt Peak	--	--	Not performed 2.)
Power spectral density	Antenna terminal (conducted)	§15.247(e)	RSS210, Issue 7: A8.3 (b)	8dBm in any 3kHz band	--	--	Not performed 2.)
Out-Of-Band RF- emissions Band-Edge emissions (conducted)	Antenna terminal (conducted)	§15.247 (d)	RSS210, Issue 7: A8.5	20 dBc	--	--	Not performed 2.)
Transmitter Output power radiated	Cabinet (radiated)	§15.247(b) (4)	RSS210, Issue 7: A8.4	< 4 Watt (EIRP) for antenna with directional gain less 6dBi	--	--	Not performed 2.)
General field strength emissions + restricted bands (radiated)	Cabinet + Interconnecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS210e, Issue 7 Annex 8.5	Emissions in restricted bands must meet the general field-strength radiated limits	1	9+12	Passed
RX Mode							
RECEIVER Spurious emissions	Cabinet + Interconnecting cables (radiated)	§15.209 §15.33 §15.35	RSS-Gen, Issue 2: Chapter 6(a)	FCC 15.109 Limits IC-Limits: Table 1, Chapter 6	--	--	Not performed 2.)

Remark: 2.) Tests were not performed, pls. compare therefore original results from Module certification. test report no. **1-0345-07-03_08** from **CETECOM ICT SERVICES GmbH** company.

1.2. TESTS OVERVIEW Part 15.107,15.109, 15.207, RSS-Gen

RX Mode							
AC-Power Lines Conducted Emissions	AC- Power lines	§15.107 §15.207	RSS-Gen, Issue 2: Chapter 7.2.2	FCC §15.107&15.209 Limits IC: Table 2, Chapter 7.2.2	3	2+3+4+5 +6+7+9	Passed
RECEIVER Spurious emissions	Cabinet + Intercon necting cables (radiated)	§15.109 §15.33 §15.35	RSS-Gen, Issue 2: Chapter 6(a)	FCC 15.109 Limits IC-Limits: Chapter 6, Table 1	1+2+3	1+3+8+9 +10	Passed

Remark: --


1.3. TESTS OVERVIEW Part 15.209/ RSS-310

TX-Mode							
RECEIVER Spurious emissions	Cabinet + Interconn ecting cables (radiated)	§15.209 §15.33 §15.35	RSS-310, Issue 1	FCC 15.209 Limits IC-Limits: Chapter 3.11, Table 4	1	6	Passed


Remark: --

ATTESTATION:

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All requirements as shown in below table are met in accordance with enumerated standards.


.....
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.....
Dipl.-Ing. C. Lorenz
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Laboratory accreditations/Listings:	DAR-Registration No. DAT-P176/94-02 FCC-Registration No. 99538, MRA US-EU 0003 IC-Registration No. 3465 VCCI Registration No. R-2665,R-2666,C-2914,T-339
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputies:	Dipl.-Ing. H. Strehlow, D. Franke

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory
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2.3. Organizational items

Order No.:	207 57077
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2008-11-01
Date(s) of test:	2008-11-05 to 2009-01-19
Date of report:	2009-01-22

Version of template:	08.08

2.4. Applicant's details

Applicant's name:	OPTION N.V.
Address:	Gastoon Geenslaan 14 3001 Leuven Belgium
Contact person:	Mr. Thomas Gulinck

2.5. Manufacturer's details

Manufacturer's name:	please see Applicant's details
Address:	please see Applicant's details

3. Equipment under test (EUT)

3.1. Additional declaration and description of main EUT

3.2. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	Ethernet RJ45	unshielded	--	--	--

3.3. EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	GSM/EGPRS/FDD/WLAN Wireless Router	GS0312	GT24878057 IMEI: 004401441050 289	2.2	R1A21
EUT B	External Antenna	Joymaxx CAF-6540FMXX	#1	2.0 dB Gain	--
EUT C	AC/DC Adapter	Phihong PSA15R-050P	P81900716A3	Input: AC100-240V AC Output: DC 5.0V 3.0A	--
EUT D	POTS Handset	Belgacom	#1	--	--

*) EUT short description is used to simplify the identification of the EUT in this test report.

3.4. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short description *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	Notebook	Dell D610	CTC	--	Windows XP + Telnet programm + Ping continuous mode

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.5.EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
Set. 1	EUT A + EUT B + EUT C + EUT D	External Antenna (EUT B) used for GSM/FDD signalling
Set. 2	EUT A + EUT C + EUT D	Internal EUT Antenna used for GSM/FDD signalling
Set. 3	EUT A + EUT B + EUT C + EUT D +AE1	External Antenna (EUT B) used for GSM/FDD signalling, Ethernet connection from EUT A to AE 1 during the tests

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.6. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	GSM 850 Idle mode BCCH 50	The mobile station is synchronized to the Broadcast Control Channel (BCCH) and listening to the Common Control Channel (CCCH). Periodic location update is disabled.
op. 2	GSM 850 TCH mode Channels 128/192/251	A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 33 dBm (power class 4; power control level 5). The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link.
op. 3	GSM 1900 Idle mode BCCH 651	The mobile station is synchronized to the Broadcast Control Channel (BCCH) and listening to the Common Control Channel (CCCH).
op. 4	GSM 1900 TCH mode Channels 512/661/810	A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 30 dBm (power class 1; power control level 0). The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link
op. 5	FDD-Mode 2 12.2 kbps RMC	A communication link is established between the mobile station (UE) and the test simulator. The transmitter is operated on its maximum rated output power class: 24dBm.
op. 6	FDD-Mode 4 12.2 kbps RMC	The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link according Table E5.1/Table E5.1A as described in 3GPP TS34.121, Annex E.
op. 7	FDD-Mode 5 12.2 kbps RMC	
op. 8	Synchronized FDD-Mode 2 (IDLE-Mode/RX-mode)	The mobile station is synchronized to the Node B station. The Node B downlink physical channels settings according Table E.5.1/E.5.1A in 3GPP TS34.121.
op. 9	Synchronized FDD-Mode 4 (IDLE-Mode/RX-mode)	
op. 10	Synchronized FDD-Mode 5 (IDLE-Mode/RX-mode)	
op. 11	Data transfer over LAN-Port (RJ45)	Data transmission was simulated by initiating of ping commands on the connected notebook AE2. The EUT device replies the received data back to the notebook.
op. 12	WLAN-Mode TX-on Channels 1/7/11	WLAN mode is activated, Mix-Mode b/g. Channels are set up over Router Web-access software.

*) EUT operating mode no. is used to simplify the test report.

3.7. Parameter Settings on mobile phone and base station CMU200

Following settings apply to the MS during the measurements in GSM/(E)GPRS-Mode only:

Parameter	Traffic Mode	Idle Mode
Traffic Channels mobile station (EUT)	GSM 850 TCH _{MS} = 128 / 192 / 251 GSM 1900 TCH _{MS} = 512 / 681 / 810	--
maximum power level (PCL)	GSM 850: PCL = 5 (2 Watt) GSM 1900: PCL = 0 (1 Watt)	--
Modulation	GSM: GMSK-Modulation Scheme EDGE: 8-PSK Modulation Scheme	--
DTX	off	--
Bitstream	PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153	
Timeslot	3	
Hopping	off	
Timeslot (slot mode)	GSM-Mode: single GPRS-Mode: maximum allowed uplink slots no. according MS class	
MS slot class	Class 12	
Maximum data transmission rate, single time slot	GSM: 17,6 kBit/s Slot EDGE: 59,2 kBit/s Slot	
Speech transcoding (Traffic Mode)	Full rate Version 1	
Mode	BCCH and TCH	
BCCH – base station (CMU,CMD)		GSM 850: 182 GSM 1900: 651
TCH – base station (CMD, CMU)	auto	
Power level TCH – base station (used timeslot level)	- 70 dBm	
Power level BCCH – base station (control channel level)	- 80 dBm	
External attenuation RF/AF-Input/Output	Accord. calibration prior to measurements	
Mobile Country Code	310	310
BS_AG_BLKS_RES		0
Paging reorganisation		Off (0)
Signalling channel	Not applicable	SDCCH
Location Update		Auto
Cell access		Disabled (barred)

Following settings apply to the UE (EUT) during the measurements in **FDD-Mode** only:

Parameter	Traffic Mode	Idle Mode
UARFCN UE Uplink (EUT) (according TS34.108)	FDD 2 = 9263/ 9400/ 9537 FDD 5 = 4133/ 4175/ 4232 FDD 4 = 1312/ 1450/ 1512	--
UARFCN Node B (downlink) (according TS34.108)	FDD 2 = 9663/ 9800/ 9937 FDD 5 = 4358/ 4040/ 4457 FDD 4 = 1538/ 1675/ 1737	
UE power class	Class 3 (+24dBm) nominal	
HSDPA UE category/ HSUPA category		
Maximum power	FDD 2/4/5 12.2kbps RMC -> all TPC bits up ("1") HSDPA-mode = accord. Subtests 1,2,3,4 defined in 3GPP TS34.121 HSUPA mode = accord. Subtests 1,2,3,4,5 defined in 3GPP TS34.121	--
Modulation	12.2kbps RMC-mode: QPSK-Modulation Scheme HSDPA/HSUPA = QPSK and 16 QAM Modulation Scheme is applicable	--
Compression mode	Off	--
Bitstream	PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153	
Maximum data transmission rate:	GSM: 17,6 kBit/s Slot EDGE: 59,2 kBit/s Slot FDD: according defined UE category	
Node B Downlink physical channels settings	According Table E.5.1/E.5.1A in 3GPP TS34.121	
External attenuation RF/AF-Input/Output	Accord. Set-up calibration prior to measurements	

Remark: detailed description of the Node B settings can be found in document 2_20757077B/08

Settings for CMU (general)

Repetition	Continuous	
Stop condition	None	
Display mode	Max./Min	
Statistic Count	1000 Bursts	
Decoder	Standard	

Additional settings on the base stations CMU200 for frequency stability measurements

4. DESCRIPTION OF TEST SET-UP'S

4.1. Test set-up for radiated measurements

The radiated emissions from the test device are measured first as exploratory measurement in a FCC recognized semi anechoic chamber or fully anechoic chamber with the dimensions of 8.05m x 6.85m x 5.48m. Very critical frequencies within a defined range, can be re-checked on CETECOM's Open Area Test side, recognized by the FCC to be compliant with ANSI 63.4: 2001 according registration no. 99538.

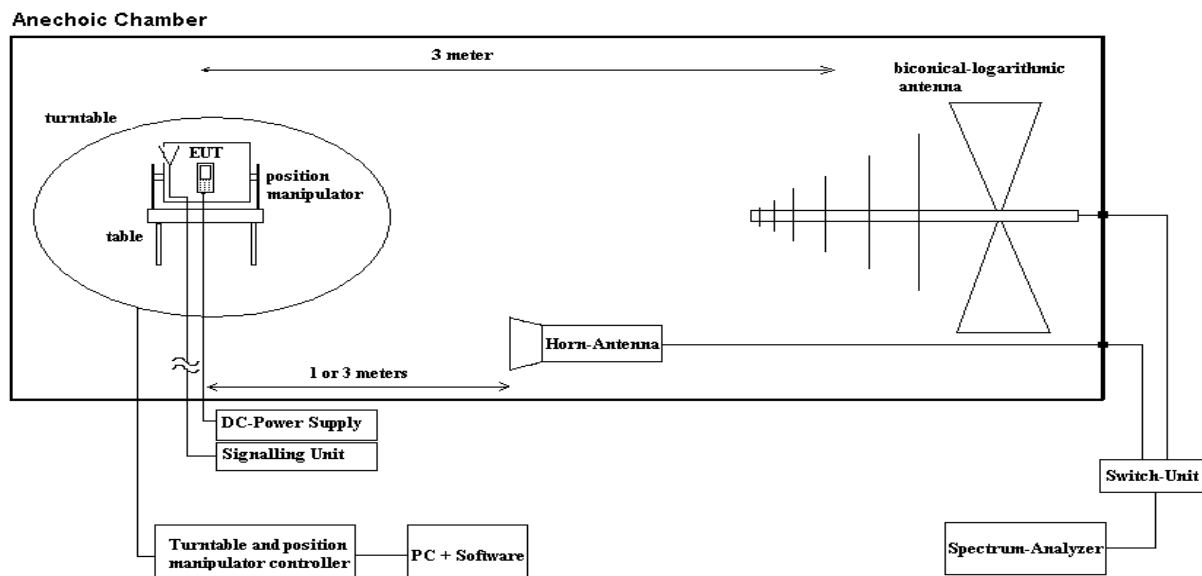
The EUT and accessories are placed on a non-conducting tipping table of 0.8 meter height (semi-anechoic chamber) or 1.55m height (fully-anechoic chamber) which is situated in the middle of the turntable. The turntable can rotate the device under test 360 degree, the position manipulator can rotate the device from laid to standing position. This way the device under test can be rotated in all three orthogonal planes in order to maximize the detected emissions. The turn- and position manipulator are controlled by a controller unit. All positions manipulations are software controlled from a operator PC.

The measurements are performed for both receiving antenna polarisations: vertical and horizontal.

Up to 18GHz a measurement distance of 3 meters is used, above 18GHz the distance is 1 meter. A biconical-logarithmic antenna up to 1 GHz and a horn antenna for frequencies above 1 GHz was used. (see equipment list)

The EUT is powered 5V DC by a external AC/DC-supply with AC nominal voltage of 110V/60Hz.

The communication signalling is performed from outside the chamber with a communication test simulator (CMU200 from Rohde&Schwarz or Anritsu MT8820).



Schematic: radiated measurements test set-up

5. Measurements

5.1. Conducted emissions on AC-Power lines

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter 2.2.1)	<input type="checkbox"/> Please see Chapter 2.2.2	<input type="checkbox"/> Please see Chapter 2.2.3
test site	<input type="checkbox"/> 333 EMI field	<input checked="" type="checkbox"/> 348 EMI cond.	<input type="checkbox"/> 334 EMS-field <input type="checkbox"/> 335 EMS cond <input type="checkbox"/> 347 Radio.lab. <input type="checkbox"/> 337 OATS
receiver	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 377 ESCS 30	<input type="checkbox"/>
LISN	<input checked="" type="checkbox"/> 005 ESH2-Z5	<input type="checkbox"/> 007 ESH3-Z6	<input type="checkbox"/> 300 ESH3-Z5 & 50Ω used for AE <input type="checkbox"/> no LISN for AE <input type="checkbox"/>
signaling	<input type="checkbox"/> 017 CMD 65	<input type="checkbox"/> 323 CMD 55	<input type="checkbox"/> 340 CMD 55
signaling	<input type="checkbox"/> 298 CMU	<input checked="" type="checkbox"/> 460 CMU	<input type="checkbox"/> 295 RACAL <input type="checkbox"/> 392 MT8820A

STANDARDS AND LIMITS: PART 15, SUBPART B, §15.107, §15.207, **KANADA: RSS-GEN:7.2.2** ANSI C63.4

Frequency [MHz]	Conducted limit [dBμV] Class B		Conducted limit [dBμV] Class A	
	QUASI-Peak	AVERAGE	QUASI-Peak	AVERAGE
0.15 – 0.5	66 to 56*	56 to 46*	79	66
0.5 – 5	56	46	73	60
5 – 30	60	50	73	60

Remark: * decreases with the logarithm of the frequency

TEST CONDITION AND MEASUREMENT PROCEDURES TEST SET-UP

link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top (40 cm distance to reference ground plane (wall))	<input type="checkbox"/> floor standing EUT stands isolated on reference ground plane (floor)	
Climatic conditions	Temperature: (22.1°C)	Rel. humidity: (20)%	Air pressure: (1024)hPa
EMI-Receiver (Analyzer) Settings	Span/Range: 150 kHz to 30 MHz RBW: 9 kHz Detector/Mode: Max PEAK-hold, repetitive scan for preliminary testing Quasi-Peak Detector and Average-Detector for final measurement according ANSI 63.4, CISPR 16		

Devices which can be connected to the public AC-power network, should be tested against the radio frequency voltage conducted back into the AC-power line in the frequency range 150kHz to 30 MHz. Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.

A 500hm/50μH line impedance stabilization network (LISN) is used therefore. The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the GND-plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on a 80 cm height over reference ground plane, floor standing equipment 10 cm raised above ground plane.

Measurements have been performed on each phase line and neutral line of the devices AC-power lines. The EUT was power supplied with 110 V/60Hz.

The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

Preliminary testing as a first step, determines the worst-case phase line (neutral or phase) as well as the most critical amplitude by changing the operating mode. A complete frequency-sweep is performed with PK-Detector.

Final testing for power phases and critical frequencies (Margin to AV- or QP limit lower than 3dB) as a second step includes measurements either on discrete frequency components with receivers detector set to Quasi-Peak and Average per frequency component or a complete sweep with corresponding detector.

MEASUREMENT RESULTS – STEP1: PRELIMINARY TESTING

Set-up no.		3					
Operating Mode		6 (FDD 4, Channel 1450)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.1	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex, positive Margin means passed result							

Set-up no.		3					
Operating Mode		5 (FDD 2, Channel 9400)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.2	X	--	--	>3dB to AV-limit	Passed No final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex, positive Margin means passed result							

Set-up no.		3					
Operating Mode		7 (FDD 5, channel 4183)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.3	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex 1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		2 (TX-GSM850, channel 192)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.4	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex 1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		4 (TX-GSM 1900, channel 661)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.5	X	--	--	> 3dB to AV-limit	Passed No final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		2 (IDLE MODE 850)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.6	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		9 (IDLE FDD Band 4)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.7	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		3 (IDLE Mode GSM1900)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N/L1	see diagram 1.8	X	--	--	< 3dB to AV-limit	final measurement necessary
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

MEASUREMENT RESULTS – STEP2: FINAL TESTING

The most critical Operating modes are re-checked with corresponding detector if margin to AVERAGE or QP limit is low.

Set-up no.		3					
Operating Mode		6 (FDD Band 4, channel 1450)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N	see diagram 1.9	--	--	X	> 25.32 dB	Passed
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		2 (TX-GSM850, middle 192)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	N	see diagram 1.10	--	--	X	> 25.85dB	Passed
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Set-up no.		3					
Operating Mode		2 (TX GSM850, middle 192)					
Frequency [MHz]	Power lead	Readings on SA. (R _R) [dBμV]	Used Detector			Margin to Limit (M) [dB]	Verdict
			PK	QP	AV		
0.15-30 MHz	L1	see diagram 1.11	--	--	X	> 26.07dB	Passed
Remarks: For more information please see diagrams enclosed in the annex1, positive Margin means passed result							

Margin to Limit for verdict: $M = L_T - R_R + C_{Loss}$

- | |
|---|
| <p>Abbreviations used:</p> <ul style="list-style-type: none"> • R_R : Receiver readings in dBμV • C_{Loss}: cable loss • L_T : Limit in dBμV |
|---|

VERDICT

Summary of measurement results for conducted emissions on AC-Power lines: Passed

5.2. Radiated emissions, below 30 MHz, §15.205 and §15.209, RSS-gen

Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2		<input type="checkbox"/> Please see Chapter. 2.2.3	
test site	<input checked="" type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS	<input type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/>
receiver	<input type="checkbox"/> 377 ESCS30	<input checked="" type="checkbox"/> 001 ESS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 381 380 FSBS	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input type="checkbox"/>	<input type="checkbox"/>
antenna	<input type="checkbox"/> 048 EMCO3143	<input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170	<input type="checkbox"/> 289 CBL 6141	<input checked="" type="checkbox"/> 030 HFH-Z2 <input type="checkbox"/> 477 GPS
signaling	<input type="checkbox"/> 298 CMU	<input type="checkbox"/> 460 CMU	<input type="checkbox"/> 295 RACAL	<input checked="" type="checkbox"/> 392 MT8820A	
power supply	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50	<input type="checkbox"/> 268 EA- 3050	<input type="checkbox"/> 494 AG6632 A <input type="checkbox"/> 498 NGPE 40
otherwise	<input type="checkbox"/> 400 FTC40x15E	<input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 110 USB LWL	<input type="checkbox"/> 482 Filter Matrix	

Standards and Limits: CFR 47, Part 15, Subpart B, §15.205, §15.209, ANSI C63.4

Frequency [MHz]	Field strength		Measurement distance [meters]	Remarks
	[μ V/m]	[dBuV/m]		
0.009 – 0.490	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3m
0.490 – 1.705	24000/f (kHz)	87.6 – 20 Log(f) (kHz)	30	Correction factor used due to measurement distance of 3m
1.705 – 30	30	29.54	30	Correction factor used due to measurement distance of 3m

Remark: * decreases with the logarithm of the frequency

Test condition and measurement test set-up

link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top		<input type="checkbox"/> floor standing
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)% Air pressure: (1000±20)hPa
EMI-Receiver (Analyzer) Settings	Span/Range: 9kHz to 150kHz; 150 kHz to 30 MHz RBW/VBW: 200Hz/auto; 10 kHz/ auto (CISPR#16) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan for exploratory measurements Quasi-Peak, for final measurement on critical frequencies (f<1GHz)		

General measurement procedures:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The **Equipment under Test** (EUT) was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

The measurement loop antenna was situated in 3m distance to the EUT. Radiated magnetic emission measurements were made with the antenna situated in 1 meter height. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions, the EUT itself either over 3-orthogonal axes (no defined usage position) or 2-orthogonal axis (defined usage position) by the position manipulator.

According the standard the compliance should be checked in 30m and 300m measurement distance. Therefore a additional extrapolation factor was used in order to normalize the measurement data. The frequency dependent extrapolation factor used for this reduced measurement distance, can be found in the chapter annexes.

Measurement Results

FDD 4 CHANNEL LOW: 1315

Set-up No.		1								
Operating Mode		6								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
3.01	8.55 ^{2.)}	10.195	10	10	1.00	--	0..360°	--	19.35	29.54
	20.59 ^{2.)}	18.91	10	10	1.00	--	0..360°	--	8.95	29.54

Remark: 1.) only amplitudes narrower than 20 dB to the limit are recorded
 2.) peaks originating from testing set-up, not EUT
 *.) see diagrams in annex 2_20757077c/08-A1

FDD 4 CHANNEL MIDDLE: 1450

Set-up No.		1								
Operating Mode		6								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
3.02	8.45	9.73	10	10	1.00	--	0..360°	--	21.09	29.54
	18.865000	20.5	10	10	1.00	--	125.0	2.7	9.04	29.54

Remark: 1.) only amplitudes narrower than 20 dB to the limit are recorded
 2.) peaks originating from testing set-up, not EUT
 *.) see diagrams in annex 2_20757077c/08-A1

FDD 4 CHANNEL HIGH: 1513

Set-up No.		1								
Operating Mode		6								
Diagram no.	Frequency (MHz)	MaxPeak (dBµV/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBµV/m) (L _T)
3.03	18.91	20.92	10	10	1.00	--	0..360°	--	10.63	20.92

Remark: 1.) only amplitudes narrower than 20 dB to the limit are recorded
 2.) peaks originating from testing set-up, not EUT
 *.) see diagrams in annex 2_20757077c/08-A1

<p>Margin to Limit:</p> $M = L_T - R_R + C_F + D_F$ $= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$ <p>Remark: positive margin means passed result</p>	<p>Abbreviations used:</p> <ul style="list-style-type: none"> • R_R : Receiver readings in dBµV/m • C_F: Transducer in dB = AF (antenna factor) + CL (cable loss) • D_F: distance correction factor (if different measurement distance used than specified in the standard) • L_T : Limit in dBµV/m
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Verdict

Summary of measurement results for radiated frequencies below 30 MHz: Passed

5.3. Radiated emissions, 30 MHz - 1 GHz, §15.109, §15.247/§15.205/15.209, RSS-gen

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
test site	<input checked="" type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS
receiver	<input checked="" type="checkbox"/> 377 ESCS30	<input type="checkbox"/> 001 ESS	<input type="checkbox"/> 347 Radio.lab.
spectr. analys.	<input type="checkbox"/> 381 380 FSBS	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK
antenna	<input checked="" type="checkbox"/> 048 EMCO3143	<input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170
signaling	<input type="checkbox"/> 298 CMU	<input type="checkbox"/> 460 CMU	<input checked="" type="checkbox"/> 289 CBL 6141
power supply	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 030 HFH-Z2
otherwise	<input type="checkbox"/> 459 EA 2032-50	<input type="checkbox"/> 268 EA- 3050	<input type="checkbox"/> 477 GPS
	<input type="checkbox"/> 400 FTC40x15E	<input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 494 AG6632A
	<input type="checkbox"/> 110 USB LWL	<input checked="" type="checkbox"/> 482 Filter Matrix	<input type="checkbox"/> 498 NGPE 40

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.4

Frequency [MHz]	Radiated emission limits [dBµV] Class B, 3 meters	
	QUASI-Peak [microvolts/meter]	QUASI-Peak [dBµV/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
above 960	500	54.0

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top 0.8m height		<input type="checkbox"/> floor standing
Climatic conditions	Temperature: (23.7°C)	Rel. humidity: (20)%	Air pressure: (1002)hPa
EMI-Receiver (Analyzer) Settings	Span/Range: 30 MHz to 1 GHz RBW/VBW: 120 kHz / (auto) Detector/ Mode: PEAK, TRACE max-hold mode, repetitive scan Quasi-Peak, for final measurement for critical measurements		

RESTRICTED BANDS OF OPERATION (§15.205)

MHz	MHZ	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	--
13.36-13.41	--	--	--

Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209

GENERAL MEASUREMENT PROCEDURES:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The *Equipment under Test* (EUT) set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

MEASUREMENT METHOD (30 MHz <math>f < 1 \text{ GHz}</math>):

A EMI analyzer together with a broadband antenna was used in order to identify the emissions from the EUT by positioning the antenna close to the EUT surfaces. The interconnecting cables and equipment position were varied in order to maximize the emissions. Then most critical frequencies are recorded for further investigations. Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's operating mode, cable position, etc. The EUT was placed on a non-conductive support of 0.8 m height. By rotating the turntable angle in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position) and the measurement antenna height from 1 meter to 4 meters, the maximized emissions are recorded. The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.

MEASUREMENT RESULTS**OPERATING MODE: WLAN on + IDLE FDD Band 4 (middle channel)**

WLAN Channel low: 1

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.01	31.32	32.5	10	120.0	100.0	V	0.0	14.3	7.5	40.0
	56.72	31.0	10	120.0	100.0	V	0.0	6.6	9.0	40.0
	239.96	32.2	10	120.0	100.0	H	270.0	13.2	7.8	46.0

Remark: *) see diagrams in annex 2_20757077c/08-A1

WLAN Channel middle: 7

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
02.02	33.80	28.3	1000.	120.0	100.0	V	123.0	12.9	11.70	40.00
	118.30	26.5	1000.	120.0	100.0	V	50.0	7.8	17.10	43.50
	239.96	33.6	1000.	120.0	100.0	H	251.0	13.2	12.40	46.00

Remark: *) see diagrams in annex 2_20757077c/08-A1

WLAN Channel high: 11

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.03	33.74	28.3	1000.	120.00	100.0	V	41.0	12.9	11.70	40.00
	250.00	36.0	1000.	120.00	100.0	H	254.0	13.9	10.00	46.00
	374.99	37.9	1000.	120.00	100.0	H	8.0	17.4	8.10	46.00

Remark: *) see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE GSM1900

Set-up No.		1								
Operating Mode		3								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.50	240.0	34.18	10	120.0	1.4m	H/V	0..360°	--	11.82	46.0 (QP)

Remark: *) see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE GSM850

Set-up No.		1								
Operating Mode		2								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.51 ^{1.)}	32.78	30.4	1000.	120.0	100.0	V	310.0	13.4	9.6	40.0 (QP)
	240.02	33.5	1000.	120.0	100.0	H	155.0	13.2	12.5	46.0 (QP)
	941.79	30.4	1000.	120.0	337.0	V	216.0	27.0	15.6	46.0 (QP)

Remark: *) see diagrams in annex 2_20757077c/08-A1

1.) BCCH carrier at 875.96MHz from base system simulator, not belonging to EUT

OPERATING MODE: IDLE FDD BAND 2

Set-up No.		2								
Operating Mode		8								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.52	240.00	32.34	10	120.0	1.4m	H/V	0..360°	--	13.66	46.0 (QP)
	908.84	42.61	10	120.0	1.4m	H/V	0..360°	--	3.39	46.0 (QP)

Remark: *) see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE FDD BAND 5

Set-up No.		2								
Operating Mode		10								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.53	33.92	29.6	1000.	120.0	100.0	V	284.0	12.8	10.4	40.0 (QP)
	111.15	25.9	1000.	120.0	114.0	V	337.0	7.3	17.6	43.5 (QP)
	240.00	32.6	1000.	120.0	100.0	H	139.0	13.2	13.4	46.0 (QP)
	625.01	38.7	1000.	120.0	100.0	H	0.0	22.5	7.3	
	881.65	36.4	1000.	120.0	267.0	H	92.0	26.9	9.6	
	898.67	31.0	1000.	120.0	212.0	V	95.0	27.4	15.0	
	994.57	31.2	1000.	120.0	345.0	V	238.0	27.4	22.8	

Remark: *.) see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE FDD BAND 5 + DATA Transfer on LAN-Port

Set-up No.		3								
Operating Mode		7+11								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.59 ^{1.)}	34.35	38.6	1000.	120.0	100.0	V	156.0	12.6	1.4	40.0 (QP)
	38.95	36.0	1000.	120.0	100.0	V	337.0	10.9	4.0	
	42.94	36.3	1000.	120.0	100.0	V	0.0	9.7	3.7	
	47.81	29.4	1000.	120.0	100.0	V	321.0	8.5	10.6	
	82.07	35.3	1000.	120.0	137.0	V	217.0	8.6	4.7	
	249.99	33.2	1000.	120.0	220.0	V	310.0	13.9	12.8	46.0 (QP)

Remark: *) see diagrams in annex 2_20757077c/08-A1

1. BCCH carrier at 871.36 MHz from base system simulator, not belonging to EUT

<p>Margin to Limit:</p> $M = L_T - R_R + C_F + D_F$ $= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$ <p>Remark: positive margin means passed result</p>	<p>Abbreviations used:</p> <ul style="list-style-type: none"> • R_R: Receiver readings in dBμV/m • C_F: Transducer in dB = AF (antenna factor) + CL (cable loss) • D_F: distance correction factor (if different measurement distance used than specified in the standard)
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VERDICT

Summary of measurement results for radiated emissions above 30 MHz and below 1 GHz : Passed

5.4. Radiated emissions, above 1GHz, §15.109, §15.205 and §15.209, RSS210, RSS132, RSS133, RSS-gen

TEST LOCATION AND EQUIPMENT (for reference numbers please see chapter 'List of test equipment')

test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 348 EMI cond.	<input checked="" type="checkbox"/> 443 EMI FARr	<input type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/> 337 OATS	<input type="checkbox"/>
equipment	<input type="checkbox"/> 331 HC 4055	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectr. analys.	<input type="checkbox"/> 138 139 FSBS	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input checked="" type="checkbox"/> 489 ESU	<input type="checkbox"/>	<input type="checkbox"/>
antenna meas	<input type="checkbox"/> 048 3143	<input checked="" type="checkbox"/> 289 CBL 6141	<input type="checkbox"/> 439 HL 562	<input checked="" type="checkbox"/> 133 EMCO3115	<input checked="" type="checkbox"/> 302 BBHA9170	<input type="checkbox"/> 477 GPS
antenna meas	<input type="checkbox"/> 123 HUF-Z2	<input type="checkbox"/> 132 HUF-Z3	<input type="checkbox"/> 030 HFH-Z2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
antenna subst	<input type="checkbox"/> 071 HUF-Z2	<input type="checkbox"/> 020 EMCO3115	<input type="checkbox"/> 063 LP 3146	<input type="checkbox"/> 303 BBHA9170	<input type="checkbox"/>	<input type="checkbox"/>
power meter	<input type="checkbox"/> 009 NRV	<input type="checkbox"/> 010 URV5-Z2	<input type="checkbox"/> 011 URV5-Z2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signalgener.	<input type="checkbox"/> 008 SMG	<input type="checkbox"/> 140 SMHU	<input type="checkbox"/> 263 SMP04	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
power meter	<input type="checkbox"/> 262 NRV-S	<input type="checkbox"/> 266 NRV-Z31	<input type="checkbox"/> 265 NRV-Z33	<input type="checkbox"/> 261 NRV-Z55	<input type="checkbox"/> 356 NRV-Z1	<input type="checkbox"/>
DC power	<input type="checkbox"/> 086 LNG50-10	<input type="checkbox"/> 087 EA3013	<input type="checkbox"/> 354 NGPE 40	<input type="checkbox"/> 349 car battery	<input type="checkbox"/> 350 Car battery	<input type="checkbox"/>
multimeter	<input type="checkbox"/> 341 Fluke 112	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
signaling	<input type="checkbox"/> 298 CMU	<input checked="" type="checkbox"/> 460 CMU	<input type="checkbox"/> 295 RACAL	<input checked="" type="checkbox"/> 392 MT8820A	<input type="checkbox"/>	<input type="checkbox"/>

STANDARDS AND LIMITS: CFR 47, PART 15, SUBPART B, §15.109 (CLASS B), §15.209, ANSI C63.4

Frequency [MHz]	Radiated emission limits [dBµV], 3 meters measurement distance			
	AV [microvolts/meter]	AV [dBµV/m]	Peak [microvolts/meter]	Peak [dBµV/m]
above 1GHz	500	54.0	5000	74.0

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top 1.5m height	<input type="checkbox"/> floor standing	
Climatic conditions	Temperature: (22±3°C)	Rel. humidity: (40±20)%	Air pressure: (1000±20)hPa
Spectrum-Analyzer settings	Span/Frequency range : 1..18 GHz +single frequencies determined in step 1 RBW/VBW: 1 MHz / 3 MHz Detector/ Mode: Peak, MAX-hold, repetitive scan for exploratory measurement PEAK/ AVERAGE, for final measurement for critical frequencies Antenna Polarisation Horizontal / Vertical		

GENERAL MEASUREMENT PROCEDURES:

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.4: 2003

The **Equipment under Test** (EUT) was placed on a non-conductive positioning table of 0.8 or 1.5 meter height depending from the frequency range. The measuring distance was set to 3 meter for frequencies up to 18GHz and 1 meter above 18GHz.

The EUT was set-up to defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

1. Step exploratory measurement: see above description as in the frequency range lower 1GHz.

2. Step Final Measurement(1 GHz <math>f < 18 GHz)</math>: On the Worst-Case EUT configuration, frequency components with a margin lower than 6 dB to the limits, will be re-measured by maintaining the EUT's operating mode, cable position, etc.. For find the worst-case emission, the turntable was changed in the range 0 to 360 degree and the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurements are performed for both polarizations of the measuring antenna: horizontal and vertical.

MEASUREMENT RESULTS:

OPERATING MODE: WLAN on + IDLE FDD Band 4

WLAN Channel low:

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.06*	1375.10	27.7	100.0	1000.0	155.0	V	317.0	-1.5	26.3	54.0 (AV)
	1625.00	25.8	100.0	1000.0	155.0	H	317.0	-0.7	28.2	54.0 (AV)
2.09	3599.40	43.35	10.0	1000.0	155.0	H	192.0	-3.0	33.1	74.0 (PK)
	8692.0	52.11	10.0	1000.00	155.0	H/V	0..360°	--	21.89	
	3216.00	33.9	100.0	1000.0	155.0	V	-12.0	-3.8	20.1	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

*) diagram is showing also WLAN carrier at 2411MHZ and downlink FDD4 channel at 2132.6MHz

WLAN Channel middle:

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.05*	1625.1	25.34	10.0	1000.0	155.0	H/V	0..360°	--	28.66	54.0 (AV)
2.08	3255.90	34.7	100.0	1000.0	155.0	H	110.0	-3.7	19.3	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

*) diagram is showing also WLAN carrier at 2443MHZ and downlink FDD4 channel at 2133MHz

WLAN Channel high:

Set-up No.		1								
Operating Mode		9+12								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.04*	1375.10	26.0	100.0	1000.0	155.0	V	85.0	-1.5	28.0	54.0 (AV)
	1124.6	24.32	10	1000.0	155.0	H/V	0..360°	--	29.68	
	1499.8	23.68	10	1000.0	155.0	H/V	0..360°	--	30.32	
	1625.1	24.93	10	1000.0	155.0	H/V	0..360°	--	29.07	
2.07	3282.3	31.35	10	1000.0	155.0	H/V	0..360°	--	22.65	
	9848.3	39.41	10.0	1000.0	155.0	H/V	0..360°	--	14.59	

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

*) diagram is showing also WLAN carrier at 2463MHZ and downlink FDD4 channel at 2133MHZ

OPERATING MODE: IDLE FDD BAND 5

Set-up No.		2								
Operating Mode		10								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.12	1125.3	24.62	10.0	1000.0	155.0	H/V	0..360°	--	29.38	54.0 (AV)
	1375.10	25.6	100.0	1000.0	155.0	V	88.0	-1.5	28.4	54.0 (AV)
	1076.3	40.62	10.0	1000.0	155.0	H/V	0..360°	--	33.38	74.0 (PK)
2.13	3948.0	43.17	10.0	1000.0	155.0	H/V	0..360°	--	30.83	74.0 (PK)

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE GSM850

Set-up No.		1								
Operating Mode		1								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.14	1200.2	24.28	10.0	1000.0	155.0	H/V	0..360°	--	29.72	54.0 (AV)
	1375.2	25.48	10.0	1000.0	155.0	H/V	0..360°	--	28.52	
	1299.6	37.36	10.0	1000.0	155.0	H/V	0..360°	--	36.64	74.0 (PK)
2.15	3600.1	29.21	10.0	1000.0	155.0	H/V	0..360°	--	24.79	54.0 (AV)
	4470.2	43.51	10.0	1000.0	155.0	H/V	0..360°	--	30.49	74.0 (PK)
	11597.6	54.68	10.0	1000.0	155.0	H/V	0..360°	--	19.32	

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

OPERATING MODE: IDLE FDD BAND 2

Set-up No.		2								
Operating Mode		8								
Diagram no.	Frequency (MHz)	MaxPeak (dB μ V/m)	Meas Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dB μ V/m) (L _T)
2.54*	1125.3	24.93	10.0	1000.0	155.0	H/V	0..360°	--	29.07	54.0 (AV)
	1375.2	25.29	10.0	1000.0	155.0	H/V	0..360°	--	28.71	54.0 (AV)
2.55	4153.1	43.48	10.0	1000.0	155.0	H	0..360°	--	30.52	74.0 (PK)
	3593.8	28.69	10.0	1000.0	155.0	H/V	0..360°	--	25.31	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1

*) diagram is showing downlink FDD2 channel at 1961.1MHz

OPERATING MODE: IDLE GSM1900

Set-up No.		1								
Operating Mode		3								
Diagram no.	Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB) (C _F)	Margin (dB) (M)	Limit (dBμV/m) (L _T)
2.56*	1125.3	24.96	10.0	1000.0	155.0	H/V	0..360°	--	29.04	54.0 (AV)
	1375.2	25.11	10.0	1000.0	155.0	H/V	0..360°	--	28.89	
2.57	3593.1	28.78	10.0	1000.0	155.0	H/V	0..360°	--	25.22	74.0 (PK)
	4025.7	43.17	10.0	1000.0	155.0	H/V	0..360°	--	30.83	
	878.4	51.42	10.0	1000.0	155.0	H/V	0..360°	--	22.58	
2.58	17999.50	51.6	100.0	1000.0	155.0	V	181.0	23.8	2.4	54.0 (AV)

Remark: 1.) diagrams shows PK/AV detector measurements see diagrams in annex 2_20757077c/08-A1
 *.) diagram is showing downlink IDLE1900 channel at 1947.8MHz

<p>Margin to Limit:</p> $M = L_T - R_R + C_F + D_F$ $= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$ <p>Remark: positive margin means passed result</p>	<p>Abbreviations used:</p> <ul style="list-style-type: none"> • R_R : Receiver readings in dBμV/m • C_F: Transducer in dB = AF (antenna factor) + CL (cable loss) • D_F : distance correction factor (if different measurement distance used than specified in the standard) • L_T : Limit in dBμV/m
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VERDICT

Summary of measurement results for radiated emissions above 1 GHz: Passed

5.5. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved.

For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
RF-Power Output conducted	9 kHz .. 20 GHz	1 dB	--
RF-Power Output radiated	30 MHz .. 4 GHz	3,17 dB	Substitution method
Conducted RF-emissions on antenna ports	9 kHz .. 20 GHz	1 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5 dB	Magnetic field
	30 MHz .. 1 GHz	4,2 dB	E-Field
	1 GHz .. 18GHz	4.8 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0,1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0,1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Frequency stability	9 kHz .. 20 GHz	0,0636 ppm	--
Conducted emissions on AC-mains port (U _{CISPR})	9 kHz .. 150 kHz	4 dB	--
	150 kHz .. 30 MHz	3.6 dB	

Table : measurement uncertainties, valid for conducted/radiated measurements

6. Instruments and Ancillary

6.1. Used equipment “CTC”

The “Ref.-No” in the left column of the following tables allows the clear identification of the laboratory equipment.

6.1.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
001	emi test receiver	ESS	825132/017	Firm.= 1.21 , OTP=2.0, GRA=2.0
012	signal generator (EMS-cond.)	SMY 01	839069/027	Firm.= V 2.02
013	power meter (EMS cond.)	NRVD	839111/003	Firm.= V 1.51
017	Communication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT Firmware D2.87
053	audio analyzer	UPA3	860612/022	Firm. V 4.3
119	RT harmonics analyser/dig. flickermeter	B10	G60547	Firm.= V 3.1DHG
120	spectrum analyzer	FSEM 30	845538/011	Bios=2.1, Analyzer-Firmware= 3.30.3
140	signal generator	SMHU	831314/006	Firm.= 3.21
261	thermal power sensor	NRV-Z55	825083/0008	EPROM-Datum 02.12.04, SE EE 1 B
262	power meter	NRV-S	825770/0010	Firm.= 2.6
263	signal generator	SMP 04	826190/0007	Firm.=3.21
264	spectrum analyzer	FSEK 30	826939/005	Bios=2.1, Analyzer= 3.20
277	Vector-Networkanalyzer	ZVC	831363/0005	Bios= 3.3, Analyzer=3.52
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04,
298	Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f.
323	Communication Tester	CMD 55	825878/034	Firm.= 3.52 .22.01.99
331	climatic test chamber -40/+80 Grad	HC 4055	43146	TSI 1.53
335	System-CTC-EMS-Conducted	System EMS Conducted	-	EMS-K1 Immunity Test-Software 1.20SR10
340	Communication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
355	power meter	URV 5	891310/027	Firm.= 1.31
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Eprom Data = 31.03.08
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10
371	Bluetooth Tester	CBT32	100153	CBT V4.6.1 + SW-Option K55
377	emi test receiver	ESCS 30	100160	Firm.= 2.30, OTP= 02.01, GRA= 02.36
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	Firm.= V.03D13
383	signal generator	SME 03	842 828 /034	Firm.= 4.61
389	digital multimeter	Keithley 2000	0583926	Firm. = A13 (Mainboard) A02 (Display)
392	Radio Communication Tester	MT8820A	6K00000788	Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001,
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	EMQuest EMQ-100 Ver. 1.05
436	Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=4.53, Mess-Software=4.52
441	System CTC-SAR-EMI	System EMI field (SAR)	-	EMC 32 Version 6.10.3, ESXS-K1 Version 2.20
442	System CTC-SAR-EMS	System EMS field (SAR)	-	EMS-K1 Immunity-Software 1.20SR10
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	Spuri 6.4a und Spuri 7.0
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	EMS-K1 Immunity-Software 1.20SR10
460	Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=4.52/Messsoftware=4.51
489	emi test receiver	ESU40	1000-30	Firmware=3.93, Bios=V5.1-16-3, Specification=01.00
491	ESD Simulator dito	ESD dito	dito307022	V 2.30
524	Voltage Drop Simulator	VDS 200	0196-16	Software Nr: 000037 Version V4.20a01
526	Burst Generator	EFT 200 A	0496-06	Software Nr. 000034 Version V2.32
527	Micro Pulse Generator	MPG 200 B	0496-05	Software-Nr. 000030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software-Nr. 000031 Version V2.35a01

6.1.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
001	emi test receiver	ESS	825132/017	Rohde & Schwarz	12 M	-	31.03.2009
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2009
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2009
009	power meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	12 M	-	31.03.2009
012	signal generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz	36/12 M	-	31.03.2011
013	power meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz	12 M	-	31.03.2009
014	insertion unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz	12 M	-	31.03.2009
015	insertion unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz	12 M	-	31.03.2009
016	line impedance simulating network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.10.2010
017	Communication Tester	CMD 60 M	844365/014	Rohde & Schwarz	12 M	-	31.03.2009
020	horn antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2010
021	loop antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2010
022	audio measurement amplifier	2636C	1537643	Brüel & Kjaer	12 M	-	31.03.2009
030	loop antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2009
031	absorbing clamp	MDS-21	863325/015	Rohde & Schwarz	24/12 M	-	31.03.2009
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	12 M	-	31.03.2009
048	bicon. - log. antenna (SAR)	3143	1108	EMCO	36/12 M	-	30.04.2011
049	current clamp (injection)	F-120-2	48	FCC	12 M	-	31.03.2009
050	3-ph coupling-decoupling-netw. (Burst)	CDN 300	176	Schaffner	12 M	-	31.03.2009
051	VHF-current probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz	12 M	-	31.03.2009
052	notch filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries	12 M	-	31.03.2009
053	audio analyzer	UPA3	860612/022	Rohde & Schwarz	36 M	-	31.03.2011
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	-	1a	30.04.2009
058	capacitive clamp (Burst)	IP 4	99	Hafelv	-	4	
059	ferrite tube	FGZ 40 X 15 E	4225	Lüthi	36 M	-	31.03.2010
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
061	ferrite tube	FGZ 40 X 15 E	4250	Lüthi	36 M	-	31.03.2010
063	log.-per. antenna (Subst 1)	3146	860941/007	EMCO	36/12 M	-	31.10.2010
065	attenuator, (6 dB) 50 Ohm, 250W	AT 50-6-250	521057	BNOS Electronics	12 M	1b	30.04.2009
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-	5	Wainwright GmbH	12 M	-	31.03.2009
067	coupling decoupling-network	CDN801-M2/M3	272	Lüthi	12 M	-	31.03.2009
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi	12 M	-	31.03.2009
069	EM - clamp	EM101	9535159	Lüthi	36 M	-	31.03.2009
070	ferrite tube	FTC101	4199	Lüthi	24/12 M	-	31.03.2010
071	biconical antenna (Subst 1)	HUF-Z2	863.029/010	Rohde & Schwarz	36/12 M	-	31.10.2010
072	coupling decoupling-network	CDN801-M2/M3	276	Lüthi	12 M	-	31.03.2009
079	4 wire T-network	EZ-10	862.939 / 011	Rohde & Schwarz	24/12 M	-	31.03.2009
083	AC - power supply, 0-10 A	EAC/MT 27010	910502096	EURO TEST	pre-m	2	
084	AC - power supply, 0-5 A	ELABO-8-34214	-	ELABO	pre-m	2	
085	AC - power supply, 0-10 A	R250	-	Schunterm.&Benningh.	pre-m	2	
086	DC - power supply, 0-10 A	LNG 50-10	-	Heinzinger Electronic	pre-m	2	
087	DC - power supply, 0-5 A	EA-3013 S	-	Elektro Automatik	pre-m	2	
090	Helmholtz coil: 2x10 coils in series	-	-	RWTÜV	pre-m	4	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
094	artificial head (No.1)	4905	1566990	Brüel & Kjaer	pre-m	2	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	12 M	-	31.03.2009
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	12 M	-	31.03.2009
110	USB-LWL-Converter	OLS-1	-	Extreme USB	-	4	
119	RT harmonics analyser/dig. flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2010
120	spectrum analyzer	FSEM 30	845538/011	Rohde & Schwarz	12 M	-	31.03.2009
121	notch filter GSM 1900	WRCB 1879,5/1880,5EE	15	Wainwright GmbH	12 M	-	31.03.2009
122	notch filter GSM 1800	WRCB 1747/1748	12	Wainwright GmbH	12 M	-	31.03.2009
123	biconical antenna (Subst 2)	HUF-Z2,	860941/007	Rohde & Schwarz	36/12 M	-	31.03.2010
131	RF-Current Probe	F-52	19	FCC	12 M	-	31.03.2009
132	log.-per. antenna (Subst 2)	HUF-Z3	860862/014	Rohde & Schwarz	36/12 M	-	31.03.2010
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36/12 M	-	31.03.2010
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	12 M	-	31.03.2009
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	12 M	-	31.03.2009
137	1000 Hz calibrator 94 dB SPL	4230 94 dB	1.594.698	Brüel & Kjaer	12 M	-	31.03.2009
140	signal generator	SMHU	831314/006	Rohde & Schwarz	24/12 M	-	31.03.2010
142	attenuator (6 dB) 2 W, 8 GHz	DGL N	-	Radiall	12 M	1b	30.04.2009
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
254	high pass GSM1800/1900/DECT	5HC 2600/12750-1.5KK	23042	Trilithic	12 M	-	31.03.2009
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	thermal power sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24/12 M	-	31.03.2010
262	power meter	NRV-S	825770/0010	Rohde & Schwarz	24/12 M	-	31.03.2010
263	signal generator	SMP 04	826190/0007	Rohde & Schwarz	36/12 M	-	31.03.2010
264	spectrum analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2009
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24/12 M	-	31.03.2010
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24/12 M	-	31.03.2010
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	12 M	-	31.03.2009
268	AC/DC power supply	EA 3050-A	9823636	-	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel	pre-m	2	
273	attenuator, (10 dB) 100 W	Model 48	BF9229	Weinschel	pre-m	2	
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel	pre-m	2	
275	DC-Block	Model 7003 (N)	C5129	Weinschel	pre-m	2	
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel	pre-m	2	
277	Vector-Networkanalyzer	ZVC	831363/0005	Rohde & Schwarz	12 M	-	31.03.2009
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
284	coupling decoupling network	CDN 801-M1	1661	Lüthi	12 M	-	31.03.2009
285	coupling decoupling network	CDN 801-S1	1642	Lüthi	12 M	-	31.03.2009
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	-	31.03.2009
289	bicon. - log. antenna (OATS)	CBL 6141	4107	Schaffner Chase	36/12 M	-	31.10.2010
290	notch filter GSM 900	WRCA 901.9/903.1SS	3RR	Wainwright GmbH	12 M	-	31.03.2009
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	-	31.03.2009
295	Racal Digital Radio Test Set	6103	1572	Racal	24/12 M	3	31.03.2009
298	Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	12 M	-	31.03.2009
299	audio microphone	134	-	Brüel & Kjaer	pre-m	2	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2009
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck	24/12 M	-	31.03.2010
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	24/12 M	-	31.03.2010
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS	24/12 M	-	31.03.2009
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS	24/12 M	-	31.03.2009
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS	24/12 M	-	31.03.2009
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS	24/12 M	-	31.03.2009
312	Switch unit	TS-RSP	1000147	R&S	12 M	1f	31.03.2009
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer	12 M	-	31.03.2009
323	Communication Tester	CMD 55	825878/034	Rohde & Schwarz	12 M	-	31.03.2009
331	climatic test chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	31.10.2009
335	System-CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz	12 M	5	30.04.2009
340	Communication Tester	CMD 55	849709/037	Rohde & Schwarz	12 M	-	31.03.2009
341	digital multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2010
342	digital multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	12 M	-	31.03.2009
344	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2009
345	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2009
347	laboratory site	radio lab.	-	-	-	3	
348	laboratory site	EMI conducted	-	-	-	3	
349	car battery 12 V	car battery 12 V	without	-	-	3	
350	car battery 12 V	car battery 12 V	without	-	-	3	
354	DC - power supply 40A	NGPE 40/40	448	Rohde & Schwarz	24 M	-	31.03.2010
355	power meter	URV 5	891310/027	Rohde & Schwarz	12 M	-	31.03.2009
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24/12 M	-	31.03.2009
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24/12 M	-	31.03.2009
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research	12 M	1b	30.04.2009
362	TOSM Calibration Kit 50 Ohm	ZV-Z21/ZV-Z11	without	Rohde&Schwarz	12 M	-	31.03.2009
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Rohde & Schwarz	24/12 M	-	31.03.2010
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test	12 M	-	31.03.2009
367	audio measurement amplifier	2636	316832/001	Brüel & Kjaer	12 M	-	31.03.2009
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz	24/12 M	-	31.03.2010
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	Rohde & Schwarz	24/12 M	-	31.03.2009
371	Bluetooth Tester	CBT32	100153	R&S	12 M	-	31.03.2009
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz	other	-	31.03.2010
374	power amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research	-	1a	30.04.2009
375	directional coupler	DC7144M1	306498	Amplifier Research	-	1a	30.04.2009
376	horn antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2009
377	emi test receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2009
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	DARE B.V.	12 M	-	31.03.2009
383	signal generator	SME 03	842 828 /034	Rohde & Schwarz	36/12 M	-	31.03.2010
386	coupling decoupling network	CDN USB/p	19397	Schaffner	12 M	-	31.03.2009
387	coupling decoupling network	CDN L-801 M2	2051	Lüthi	12 M	-	31.03.2009
388	coupling decoupling network	CDN L-801 T2	1929	Lüthi	12 M	-	31.03.2009
389	digital multimeter	Keithley 2000	0583926	Keithley	24/12 M	-	31.03.2009
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2009
394	power amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik	-	1a	30.04.2009
400	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5559	Lüthi	12 M	-	31.03.2009
401	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5560	Lüthi	12 M	-	31.03.2009
411	Test Cable Kit N 50 Ohm (male)	ZV-Z11	100200	R&S / Rosenberger	pre-m	2	
413	Quad-Ridge Horn Antenna	3164-04	00090667	ETS-Lindgren	12 M	1f	31.03.2009
414	Circularly polarized com. Antenna	3102	00033734	EMCO	-	3	
415	Antenna Position Controller	2090	00035634	ETS-Lindgren	-	4	
416	MAPS Positioner (light duty)	2010	-	ETS-Lindgren	-	4	
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	ETS-Lindgren/Cetecom	12 M	5	31.03.2009
429	MAPS-Positionier (medium duty)	2015	-	ETS-Lindgren	-	4	
430	Thermo-Hygrometer	H270	54476	Dostmann electronic	24 M	-	30.11.2009
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
432	pre-amplifier 100MHz-26GHz	JS4-00102600-38-5P	1030896	Miteq USA	12 M	-	31.03.2009
436	Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2009
439	UltraLog-Antenna	HL 562	100248	Rohde + Schwarz	12 M	-	31.03.2009
441	System CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	5	30.06.2009
442	System CTC-SAR-EMS	System EMS field (SAR)	-	ETS-Lindgren/Cetecom	12 M	5	30.04.2009
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	ETS-Lindgren/Cetecom	12 M	5	30.04.2009
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	ETS Lindgren/Cetecom	12 M	5	30.04.2009
448	notch filter WCDMA FDD II	WRCT 1850.0/2170.0-	5	Wainwright Instruments	12 M	1c	31.03.2009
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-	1	Wainwright Instruments	12 M	1c	31.03.2009
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
455	Oscilloscope	HP 54602B	US 350 336 45	Hawlett Packard	-	4	

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
456	DC-Power supply 0-5A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
457	DC-Power supply, 0-5A	EA-3013 S	9624680	Elektro Automatik	pre-m	2	
459	DC -power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2009
462	AF-Generator	MX-2020	-	Conrad	-	4	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
464	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2009
465	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2009
466	digital multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2010
467	digital multimeter	Fluke 112	89680306	Fluke USA	24 M	-	31.03.2010
468	digital multimeter	Fluke 112	90090455	Fluke USA	24 M	-	31.03.2010
470	Thermo-Hygro-Monitor	WS-9400	-	distr. by Conrad	24 M	-	30.11.2009
476	Spectrum Analyzer	FSM	840500/004	Rohde & Schwarz	24/12 M	-	31.03.2009
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
482	filtermatrix	FilterMatrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-	1244554	Miteq	12 M	-	31.03.2009
487	NSA-Verification of CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	-	31.10.2009
489	emi test receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2009
490	high pass 2,65 GHz>18GHz	6HC 2650/18000-3-KK	200709138	Trilithic	12 M	-	31.03.2009
491	ESD Simulator dito	ESD dito	dito307022	EM-Test	24 M	-	31.03.2009
494	power supply (GPIB)	Agilent 66332A	US 37474017	Agilent	24/12 M	-	31.03.2009
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz	-	2	
500	industry Acoustic System	MO 2000 Set	100048	Sennheiser	-	4	
502	band reject filter	WRCG 1709/1786-	SN 9	Wainwright	-	-	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	-	-	
517	relais swite matrix	HF Relais Box Keithley	SE 04	-	-	-	
522	electronical load	EL 9000	-	ELV	-	-	
523	Digitalmultimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2009
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test	18 M	-	31.03.2009
525	Koppelnetzwerk	CNA 200	1196-01	EM Test	18 M	-	31.03.2009
526	Burst Generator	EFT 200 A	0496-06	EM Test	18 M	-	31.03.2009
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test	18 M	-	31.03.2009
528	Load Dump Simulator	LD 200B	0496-06	EM Test	18 M	-	31.03.2009
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	-	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	2	-	
531	H-field system	Lackman System	without	Lackmann	-	2	
533	Impedance Stabilization Network	ISN T200A	25706	Teseq	12 M	-	29.04.2009
534	Impedance Stabilization Network	ISN T400A	24881	Teseq	12 M	-	29.04.2009
535	Impedance Stabilization Network	ISN T800	26321	Teseq	12 M	-	28.04.2009
536	Impedance Stabilization Network	ISN ST08	25867	Teseq	12 M	-	28.04.2009

