

TEST REPORT

No.: 2-20773496c/09

According to:
FCC/IC Regulations

Part 15.107 Un-Intentional radiators
Part 15.109 Un-Intentional radiators
Part 15.207 Intentional radiators
RSS-Gen., Issue 2
RSS-132/RSS-133

for

IREX Technologies

E-Reader with integrated Option PCI Express Mini Card DR800SG
contains FCC ID: NCMOMO0491-I
contains IC ID: 2734A-MO0491

Laboratory Accreditation and Listings			
 Deutscher Akkreditierungs Rat DAT-P176/94-02	 FEDERAL COMMUNICATIONS COMMISSION USA Reg. No.: 99538 MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-1 3462D-2	 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.

The presented device incorporates a Gobi2000 PCI Express Mini Card, already approved under ID No. NCMOMO0491-I. On NCMOMO0491-I origin is Gobi2000 Module with FCC ID J9CGOBI2000.

Only radiated test cases have been performed, due to the modular approval of the used Gobi2000 PCI Express Mini card.

In order to suppress critical radiated EMI in the range of 480 MHz, a ferrite core was used. The type used was Würth 74271142, which was attached 5cm away from the USB connector on EUT's side. The applicant was pointed to the fact that such a ferrite core must be incorporated on each USB-cable sold, in order to be compliant with relevant CFR Part 15.107 class B limits. (IC:RSS-Gen limits)

Following tests have been performed to show compliance with applicable FCC Part 15, Subpart B (Unintentional Radiators) of the FCC CFR 47 (2008-10-01) and Industry Canada RSS-Gen, Issue 2 regulations.

1.1. TESTS OVERVIEW

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	IC Standards	TEST LIMIT			
Receiver AC-Power Lines Conducted Emissions	AC-Power lines	§15.107B	RSS-Gen, Issue 2: Chapter 7.2.2	FCC §15.107 Class B	6+7	1+3+7 10+11	Passed
Transmitter AC-Power Lines Conducted Emissions	AC-Power lines	§15.207, Part C	RSS-Gen, Issue 2: Chapter 7.2.2	FCC §15.207(a)	6+7	5+6+7+8 +9	Passed
Receiver Radiated emissions	Cabinet + Interconnecting cables (radiated)	§15.109B	RSS-132, Issue 2:4.6 RSS-Gen, Issue 2:6(a) RSS-133, Issue 3:6.7(a)	FCC 15.109 Class B	2+3+4+5	1+3+7+ 10+11	Passed

Remark:



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 Responsible for test section


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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. 3462D-1, 3462D-2 VCCI Registration No. R-2665,R-2666,C-2914,T-339
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputies:	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.:	20773496
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2009-09-10
Date(s) of test:	2009-10-16 to 2009-11-09
Date of report:	2009-11-18

Version of template:	09.06 _All.Dotm

2.4. Customer's details

The test report as such refers only to the device tested, information stated are given by the company who ordered the tests, not the country approvals, as this is out of scope of the evaluation of the test lab.

Customer's name:	Option N.V.
Address:	Gaston Geenslan 14 3001 Leuven
Contact person:	Belgium Mr. Thomas Gulinck

2.5. Applicant's details (accord. FCC FORM 731 application)

Applicant's name:	IREX Technologies
Address:	High Tech Campus 9 5656 Eindhoven
Contact person:	The Netherlands Mr. Harald van Veghel

2.6. Manufacturer's details

Manufacturer's name:	Prodrive B.V.
Address:	Science Park Eindhoven 5709 5692 EP Son
	The Netherlands

3. Equipment under test (EUT)

3.1. Additional declaration and description of EUT

(Applicant's declaration, ☐ = not selected, ☒ = selected)

EUT A - EUT E		☒ table-top ☐ floor-standing ☐ wall-mounted ☐ not defined	typical use ☒ portable use ☐ fixed use	typical operating cycle. ☒ < 0,5 sec. ☐ :
Place of use		☒ Residential, commercial and light industry ☐ Industrial environment ☐ vehicular us		
Highest internal frequency generated by EUT and required upper frequency of radiated disturbance measurement		☐ less than 108 MHz ☐ between 108 MHz and 500 MHz ☒ between 500 MHz and 1 GHz		
Dimensions (L x W x H): 19.5cm x 15cm x 1cm				
Power line:		EUT-grounding:		
☐ AC	☐ L1, ☐ L2, ☐ L3, ☐ N	☒ none ☐ with power supply ☐ additional:		
____ Hz	☐ 12V, ☐ 24V, ☐ 230V, ☐ 400V			
☒ DC	☒ 5 V DC USB or internal battery	(in case of deviation during tests the single details are described on chapter 4)		
Other Ports (description of interconnecting cables)		possible total cable length	shielding	connected during test
Connector				
1. DC cable	USB	☒ < 3m ☐ > 3m ☐ : other	☐ screened ☒ unscreened	☒ yes ☐ no
Does EUT contain devices susceptible to magnetic fields, e.g. Hall elements, electrodynamics microphones, etc.?				☐ yes ☒ no
Is mounting position / usual operating position defined?				☐ yes ☒ no

3.2. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	USB cable	micro USB connection cable	--	--	Approx. 0.97m

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

(Applicant's declaration)

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	E-Reader with integrated Option PCI Express Mini Card	DR800SG	IMEI: 352111030013 527	E-Reader: 1.0 Module: Rev. D1025-STUTABGD-35741	1.0
EUT B	E-Reader with integrated Option PCI Express Mini Card	DR800SG	IMEI: 352111030013 501	E-Reader: 1.0 Module: Rev. D1025-STUTABGD-35741	1.0
EUT C	E-Reader with integrated Option PCI Express Mini Card	DR800SG	IMEI: 352111030014 210	E-Reader: 1.0 Module: Rev. D1025-STUTABGD-35741	1.0
EUT D	E-Reader with integrated Option PCI Express Mini Card	DR800SG	IMEI: 980034000002 033	E-Reader: 1.0 Module: Rev. D1025-STUTABGD-35741	1.0
EUT E	E-Reader with integrated Option PCI Express Mini Card	DR800SG	IMEI: 980034000015 901	E-Reader: 1.0 Module: Rev. D1025-STUTABGD-35741	1.0

*) 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

(Applicant's declaration)

AE short description *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	UE Switching mode adaptor	UE05WCP-050100SPA	UE80710HK ATS1-R	Input: 110-240 V AC, 50/60Hz, 0.2A max. Output: 5.0V DC, 1 A	

AE 2	USB cable	Micro USB	--	0.97m long	--
AE 3	Notebook	Dell Latitude D610	PC4	--	Windows XP+Traffic Program USB data

*) 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 + AE 1 + AE 2	Set-up with AC/DC adapter
Set. 2	EUT A + AE 2 + AE 3	Set-up with notebook, a ferrite core from WÜRTH company, type 74271142 was placed on the USB-line.
Set. 3	EUT B + AE 2 + AE 3	Set-up with notebook
Set. 4	EUT C + AE 1 + AE 2	Set-up with AC/DC adapter
Set. 5	EUT D + AE 2 + AE 3	Set-up with notebook, a ferrite core from WÜRTH company, type 74271142 was placed on the USB-line.
Set. 6	EUT E + AE 1 + AE 2	Set-up with AC/DC adapter
Set. 7	EUT A + AE 1 + AE 2	Set-up with AC/DC adapter, a ferrite core from WÜRTH company, type 74271142 was placed on the USB-line.

*) 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 not used TCH mode TCH=192	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 not used TCH mode TCH=661	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	GPRS 850 TCH Mode PCL=0 (max. power) TCH=192	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 1; power control level 0). USF_Duty CYCLE set to 100%, coding scheme CS-1 for GMSK modulation, slot 3 active, uplink gamma: 33dBm. 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. 6	GPRS 1900 TCH Mode PCL=0 (max. power) TCH=661	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). USF_Duty CYCLE set to 100%, coding scheme CS-1 for GMSK modulation, slot 3 active, uplink gamma: 3 (30dBm). 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. 7	Charging battery	Charging standard battery. This operating mode is combined with other op. modes.
op. 8	TX FDD-Mode 2 Channels 9400 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. 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. Tests have been performed in RMC99mode .
op. 9	TX FDD-Mode 5 Channels 4183 12.2 kbps RMC	
op. 10	IDLE FDD Mode 2 (RX)	The mobile station is registered to the base communication test system and ready to start the rf-communication link on request.
op. 11	IDLE FDD Mode 5 (RX)	

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

3.7. Additional declaration and description of main EUT

Main function	E-Reader with integrated wireless GSM/GPRS/UMTS/CDMA2000 PCI Express Mini card		
Type	DR800SG		
Applicant/Grant holder of the module	Option N.V., Gaston Geenslan 14, 3001 Leuven, Belgium		
Frequency ranges	GSM 850: 824 – 849MHz (Uplink), 869-894MHz (Downlink) GSM1900: 1850-1910MHz (Uplink), 1930-1990MHz (Downlink) FDD Band 1: 1920-1980 MHz (Uplink), 2110-2170 MHz (Downlink) FDD Band 2: 1852.4–1907.6 MHz (Uplink), 1930-1990MHz (Downlink) FDD Band 5: 826.4-846.6 MHz (Uplink), 869-894MHz (Downlink) FDD Band 8: 880-915 MHz (Uplink), 925-960MHz (Downlink) CDMA 2000 – 850MHz: 824 – 849MHz (Uplink) CDMA 2000 – 1900MHz: 1850 – 1910MHz (Uplink)		
Type of modulation	GSM mode: GMSK GPRS Mode: 8-PSK FDD Mode Release99: QPSK FDD Mode Release 5+6: 16QAM additionally CDMA 2000: QPSK,8-PSK, 16-QAM		
Number of channels	GSM 850: 128 – 251, 125 channels GSM1900: 512 – 810, 300 channels FDD Band 1: UARFCN range: 9612 – 9750 – 9888 FDD Band 2: UARFCN range 9262 – 9400 – 9538 FDD Band 5: UARFCN range 4132 – 4183 – 4233 FDD Band 8: UARFCN range 2712 – 2788 – 2863 CDMA2000: --		
EMISSION DESIGNATOR(S)	248KGXW (GSM/GPRS-Mode) 250KG7W (EDGE-Mode) FDD Mode: 4M19F9W CDMA2000: 1M28F9W		
Antenna Type	☒ Integrated ☐ External, no RF- connector ☐ External, separate RF-connector		
Antenna Gain	☐ conducted: Max. xxx dBi gain at GSM850 ☒ radiated: Max. 3dBi gain at GSM850/FDD 5, declared by applicant ☒ radiated: Max. 4dBi gain at GSM1900/FDD 2, declared by applicant		
MAX PEAK Output Power: GSM 1900 Radiated	28.61 dBm (726mW) - measured		
GSM 850	25.26 dBm (336mW) - measured		
MAX PEAK Output Power: GSM 1900 Conducted	Not tested, compare initial certification report 80-VN379-203 Rev. A		
EDGE1900	Not tested, compare initial certification report 80-VN379-203 Rev. A		
FCC-ID	contains FCC ID NCMOMO0491-I		
IC	contains IC ID 2734A-MO0491		
Installed option	--		
Special EMI components	Ferrite core used on USB cable: Würth type 74271142 please see photos for details		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

4. Measurements

4.1. Conducted emissions on AC-Power lines

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

test location	☒ CETECOM Essen (Chapter 2.2.1)		☐ Please see Chapter 2.2.2		☐ Please see Chapter 2.2.3	
test site	☐ 333 EMI field	☒ 348 EMI cond.	☐ 334 EMS-field	☐ 335 EMS cond	☐ 347 Radio.lab.	☐ 337 OATS
receiver	☒ 001 ESS	☐ 377 ESCS 30	☐	☐	☐	☐
LISN	☒ 005 ESH2-Z5	☐ 007 ESH3-Z6	☐ 300 ESH3-Z5 & 50Ω used for AE		☐ no LISN for AE	
signaling	☐ 017 CMD 65	☐ 323 CMD 55	☐ 340 CMD 55			
signaling	☐ 298 CMU	☐ 460 CMU	☐ 295 RACAL		☒ 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):	☒ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top (40 cm distance to reference ground plane (wall))	☐ floor standing EUT stands isolated on reference ground plane (floor)	
Climatic conditions	Temperature: (23.5°C)	Rel. humidity: (58)%	
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 500Ωm/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. The tests have been performed with a empty battery on the beginning of the tests.

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

EUT Type and S/N or EUT set-up no.		EUT set-up 6			
Diagram No.	Command or EUT operating mode or operating mode no.	Detector (Peak, CISPR AV, CISPR QP)	Power line (L1, L2, L3, N)	Additional (scan-) information (e.g. Pre-test Fast scan, Maxhold, Final measurement)	Result (passed / failed /final measurement . necessary)
1.10	EUT operating mode 6+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed
1.11	EUT operating mode 3+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed

EUT Type and S/N or EUT set-up no.		EUT set-up 7			
Diagram No.	Command or EUT operating mode or operating mode no.	Detector (Peak, CISPR AV, CISPR QP)	Power line (L1, L2, L3, N)	Additional (scan-) information (e.g. Pre-test Fast scan, Maxhold, Final measurement)	Result (passed / failed /final measurement . necessary)
1.14	EUT operating mode 10+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed

1.15	EUT operating mode 8+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed
1.16	EUT operating mode 11+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed
1.17	EUT operating mode 9+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed
1.18	EUT operating mode 1+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed
1.19	EUT operating mode 5+7	Peak, AV,QP	L1, N	The Diagram shows PK/AV detector measurements on L1 and N with maxhold mode. Final measurement QP and AV was carried out on at least one frequency (please see diagram)	passed

Remarks: The diagram contains the maximum values from L 1 + N in table format

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

Abbreviations used:

- R_R : Receiver readings in dB μ V
- C_{Loss} : cable loss
- L_T : Limit in dB μ V

VERDICT

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

Passed

4.2. Radiated emissions, 30 MHz - 1 GHz, §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 location	☒ CETECOM Essen (Chapter. 2.2.1)	☐ Please see Chapter. 2.2.2	☐ Please see Chapter. 2.2.3
test site	☒ 441 EMI SAR	☐ 487 SAR NSA	☐ 337 OATS
receiver	☒ 377 ESCS30	☐ 001 ESS	☐ 347 Radio.lab.
spectr. analys.	☐ 381 380 FSBS	☐ 120 FSEM	☐ 264 FSEK
antenna	☒ 048 EMCO3143	☐ 133 EMCO3115	☐ 302 BBHA9170
signaling	☒ 298 CMU	☐ 460 CMU	☐ 289 CBL 6141
power supply	☐ 456 EA 3013A	☐ 457 EA 3013A	☐ 295 RACAL
otherwise	☐ 400 FTC40x15E	☐ 401 FTC40x15E	☒ 392 MT8820A
		☐ 459 EA 2032-50	☐ 268 EA- 3050
			☐ 494 AG6632A
			☐ 498 NGPE 40
		☒ 110 USB LWL	☐ 482 Filter Matrix

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

Frequency [MHz]	Radiated emission limits [dB μ V] Class B, 3 meters		Radiated emission limits [dB μ V] Class A, 10 meters	
	QUASI-Peak [microvolts/meter]	QUASI-Peak [dB μ V/m]	QUASI-Peak [microvolts/meter]	QUASI-Peak [dB μ V/m]
30-88	100	40	90	39,0
88-216	150	43,5	150	43,5
216-960	200	46,0	210	46,4
above 960	500	54,0	300	59,5

TEST CONDITION AND MEASUREMENT TEST SET-UP

link to test system (if used):	☒ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top 0.8m height	☐ floor standing	
Climatic conditions	Temperature: (20.7°C)		Rel. humidity: (40)%
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		

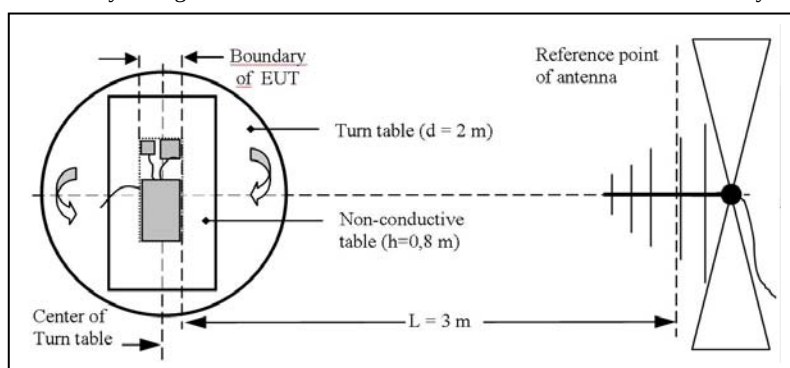
GENERAL MEASUREMENT PROCEDURES:

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<F <1 GHz):

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

Set-up No.	1
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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)
2.03	38.45	23.6	1000	120.0	100.0	V	304.0	11.1	16.4	40.0
	146.76	22.1	1000	120.0	179.0	H	72.0	13.0	21.4	43.5
	199.50	25.1	1000	120.0	137.0	H	134.0	11.5	18.4	43.5
	540.69	22.9	1000	120.0	100.0	H	201.0	21.4	23.1	46.0
	854.56	29.4	1000	120.0	287.0	H	234.0	25.9	16.6	46.0

Remark: *) see also plots enclosed in chapter diagrams

Set-up No.		1								
Operating Mode		11								
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)
2.04 ^{1.)}	146.95	16.1	1000	120.0	100.0	H	289.0	12.9	27.4	43.5
	180.00	23.4	1000	120.0	172.0	H	284.0	10.5	20.1	43.5
	199.50	26.5	1000	120.0	130.0	H	123.0	11.5	17.0	43.5

Remark: *) see also plots enclosed in chapter diagrams

1.) Signal on diagram due to base stations BCCH GSM850 Signal in downlink at 882MHz

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)
2.21	249.98	36.9	1000	120.0	100.0	H	100.0	13.9	9.1	46.0
	398.80	26.9	1000	120.0	121.0	H	257.0	18.3	19.2	46.0
	480.68	31.0	1000	120.0	180.0	H	69.0	20.0	15.0	46.0
	539.990	39.7	1000	120.0	121.0	V	62.0	21.4	6.3	46.0

Remark: *.) see also plots enclosed in chapter diagrams

Ferrite type Würth, 74271142 core used on USB line, see photo in annex A2

Set-up No.		2								
Operating Mode		1								
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)
2.23 ^{1.)}	250.01	36.3	1000	120.0	100.0	H	95.0	13.9	9.7	46.0
	299.99	37.0	1000	120.0	100.0	H	0.0	15.6	9.0	46.0
	365.44	33.0	1000	120.0	100.0	H	254.0	17.6	13.0	46.0
	480.01	33.7	1000	120.0	179.0	H	64.0	19.9	12.3	46.0
	539.99	39.3	1000	120.0	116.0	V	150.0	21.4	6.7	46.0

Remark:

see also plots enclosed in chapter diagrams

Ferrite type Würth, 74271142 core used on USB line, see photo in annex A2

1.) Signal on diagram due to base stations BCCH FDD5 Signal in downlink at 876MHz

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$

$$= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- 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)

VERDICT

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

4.3. Radiated emissions, above 1GHz, §15.109, RSS132, RSS133, RSS-gen

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

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

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):	☒ air link	☐ cable connection	☐
EUT-grounding	☒ none	☐ with power supply	☐ additional connection
Equipment set up	☒ table top 1.5m height	☐ floor standing	
Climatic conditions	Temperature: (19°C)		Rel. humidity: (46)%
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.

For the upper frequency measurement range, it was assumed that the highest frequency generated in the device is same as the highest operable TX-frequency (in GSM1900 Mode for example 1909.8 MHz). Therefore measurements have been performed up to 18GHz, depending from the used TX mode.

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

2. Step Final Measurement(1 GHz<f <18 GHz): 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

Set-up No.		3								
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)
2.01 ^(3.)	See diagrams	Max. 45.6 (PK) Max 30.28 (AV)	100	1000.0	1.0m	H/V	0..360°	See diagrams	> 20dB	See diagrams
2.02	See diagrams	Noise level PK Max. 20.0 (AV)	100	1000.0	1.0m	H/V	0..360°	See diagrams	> 20dB	See diagrams

Remark: 1.) diagrams shows PK/AV detector measurements

*) see also plots enclosed in chapter diagrams

2.) carrier at 1958.3MHz due to BCCH downlink carrier

Set-up No.		4								
Operating Mode		11								
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)
2.07	See diagrams	Max. 28.0	100	1000.0	1.0m	H/V	0..360°	See diagrams	> 20dB	See diagrams
2.08	See diagrams	Max 49.8	100	1000.0	1.0m	H/V	0..360°	See diagrams	> 20dB	

Remark: 1.) diagrams shows PK/AV detector measurements

*) see also plots enclosed in chapter diagrams

Set-up No.		5								
Operating Mode		1								
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)
2.17	1..2.8 GHz	< 43 dBμV/m (PK)	10	1000.0	1.00	H/V	0..360°	--	> 20dB	74 (PK) 54 (AV)
2.18	2.8 .. 10 GHz	< 53 dBμV/m (PK)	10	1000.0	1.00	H/V	0..360°	--	> 20dB	

Remark: 1.) diagrams shows PK/AV detector measurements

*) see also plots enclosed in chapter diagrams

Set-up No.		5								
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)
2.19	1..2.8 GHz	< 43 dBμV/m (PK)	10	1000.0	1.00	H/V	0..360°	--	> 20dB	74 (PK) 54 (AV)
2.20	2.8 .. 10 GHz	< 52 dBμV/m (PK)	10	1000.0	1.00	H/V	0..360°	--	> 20dB	

Remark: 1.) diagrams shows PK/AV detector measurements

*) see also plots enclosed in chapter diagrams

Margin to Limit:

$$M = L_T - R_R + C_F + D_F$$

$$= L_T - R_R + (AF_{ANTENNA} + Cable_{LOSS}) + D_F$$

Remark: positive margin means passed result

Abbreviations used:

- 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

VERDICT

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

4.4. 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	1.0 dB	--
RF-Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted RF-emissions on antenna ports	9 kHz .. 20 GHz	1.0 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5.0 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	4.0 dB	--
	150 kHz .. 30 MHz	3.6 dB	

Table : measurement uncertainties, valid for conducted/radiated measurements

5. Instruments and Ancillary

5.1. Used equipment “CTC”

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

5.1.1. 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	825878/0034	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 OTA 1	System CTC OTA 1	-	EMQuest EMQ-100 Ver. 1.05
436	Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.01, Mess-Software=
441	System CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.10.10
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 7.2.5
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=5.01/Messsoftware=
489	emi test receiver	ESU40	1000-30	Firmware=4.33, 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
547	Universal Radiocommunication Tester	CMU 200	835390/014	R&S Test Firmware =V5.03 (current Testsoftw. f. all

5.1.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer
001	emi test receiver	ESS	825132/017	Rohde & Schwarz
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz
009	power meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz
012	signal generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz
013	power meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz
014	insertion unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz
015	insertion unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz
016	line impedance simulating network	Op. 24-D	B6366	Spitzenberger+Spies
017	Communication Tester	CMD 60 M	844365/014	Rohde & Schwarz
020	horn antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO
021	loop antenna (H-Field)	6502	9206-2770	EMCO
022	audio measurement amplifier	2636C	1537643	Brüel & Kjaer
030	loop antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz
031	absorbing clamp	MDS-21	863325/015	Rohde & Schwarz
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz
048	bicon. - log. antenna (SAR)	3143	1108	EMCO
049	current clamp (injection)	F-120-2	48	FCC
050	3-ph coupling-decoupling-netw. (Burst)	CDN 300	176	Schaffner
051	VHF-current probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz
052	notch filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries
053	audio analyzer	UPA3	860612/022	Rohde & Schwarz
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz
058	capacitive clamp (Burst)	IP 4	99	Hafely
059	ferrite tube	FGZ 40 X 15 E	4225	Lüthi
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies
061	ferrite tube	FGZ 40 X 15 E	4250	Lüthi
063	log.-per. antenna (Subst 1)	3146	860941/007	EMCO
065	attenuator, (6 dB) 50 Ohm, 250W	AT 50-6-250	521057	BNOS Electronics
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-	5	Wainwright GmbH
067	coupling decoupling-network	CDN801-M2/M3	272	Lüthi
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi
069	EM - clamp	EM101	9535159	Lüthi
070	ferrite tube	FTC101	4199	Lüthi
071	biconical antenna (Subst 1)	HUF-Z2	863.029/010	Rohde & Schwarz
072	coupling decoupling-network	CDN801-M2/M3	276	Lüthi
083	AC - power supply, 0-10 A	EAC/MT 27010	910502096	EURO TEST
084	AC - power supply, 0-5 A	ELABO-8-34214	-	ELABO
085	AC - power supply, 0-10 A	R250	-	Schunterm.&Benningh.
086	DC - power supply, 0 -10 A	LNG 50-10	-	Heinzinger Electronic
087	DC - power supply, 0 -5 A	EA-3013 S	-	Elektro Automatik
090	Helmholtz coil: 2x10 coils in series	-	-	RWTÜV
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba
094	artificial head (No.1)	4905	1566990	Brüel & Kjaer
098	Wireless Protocol Tester	PTW70Wlan	100093	Rohde&Schwarz
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck
110	USB-LWL-Converter	OLS-1	-	Extreme USB
119	RT harmonics analyser/dig. flickermeter	B10	G60547	BOCONSULT
120	spectrum analyzer	FSEM 30	845538/011	Rohde & Schwarz
121	notch filter GSM 1900	WRCB 1879,5/1880,5EE	15	Wainwright GmbH
122	notch filter GSM 1800	WRCB 1747/1748	12	Wainwright GmbH
123	biconical antenna (Subst 2)	HUF-Z2,	860941/007	Rohde & Schwarz
131	RF-Current Probe	F-52	19	FCC
132	log.-per. antenna (Subst 2)	HUF-Z3	860862/014	Rohde & Schwarz
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO
140	signal generator	SMHU	831314/006	Rohde & Schwarz
142	attenuator (6 dB) 2 W, 8 GHz	DGL N	-	Radiall
248	attenuator	SMA 6dB 2W	-	Radiall
249	attenuator	SMA 10dB 10W	-	Radiall
252	attenuator	N 6dB 12W	-	Radiall
254	high pass GSM1800/1900/DECT	5HC 2600/12750-1,5KK	23042	Trilithic
256	attenuator	SMA 3dB 2W	-	Radiall
257	hybrid	4031C	04491	Narda
260	hybrid coupler	4032C	11342	Narda
261	thermal power sensor	NRV-Z55	825083/0008	Rohde & Schwarz
262	power meter	NRV-S	825770/0010	Rohde & Schwarz
263	signal generator	SMP 04	826190/0007	Rohde & Schwarz
264	spectrum analyzer	FSEK 30	826939/005	Rohde & Schwarz
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH
268	AC/DC power supply	EA 3050-A	9823636	-
270	termination	1418 N	BB6935	Weinschel
271	termination	1418 N	BE6384	Weinschel
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel
273	attenuator, (10 dB) 100 W	Model 48	BF9229	Weinschel

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel
275	DC-Block	Model 7003 (N)	C5129	Weinschel
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel
277	Vector-Networkanalyzer	ZVC	831363/0005	Rohde & Schwarz
279	power divider	1515 (SMA)	LH855	Weinschel
284	coupling decoupling network	CDN 801-M1	1661	Lüthi
285	coupling decoupling network	CDN 801-S1	1642	Lüthi
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq
289	bicon. - log. antenna (OATS)	CBL 6141	4107	Schaffner Chase
290	notch filter GSM 900	WRCA 901,9/903,1SS	3RR	Wainwright GmbH
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH
295	Racal Digital Radio Test Set	6103	1572	Racal
298	Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz
299	audio microphone	134	-	Brüel & Kjaer
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS
312	Switch unit	TS-RSP	1000147	R&S
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer
323	Communication Tester	CMD 55	825878/0034	Rohde & Schwarz
331	climatic test chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch
335	System-CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz
340	Communication Tester	CMD 55	849709/037	Rohde & Schwarz
341	digital multimeter	Fluke 112	81650455	Fluke
342	digital multimeter	Voltcraft M-4660A	IB 255466	Voltcraft
344	adaptor 150/50 Ohm	150/50	-	Krohne
345	adaptor 150/50 Ohm	150/50	-	Krohne
347	laboratory site	radio lab.	-	-
348	laboratory site	EMI conducted	-	-
349	car battery 12 V	car battery 12 V	without	-
350	car battery 12 V	car battery 12 V	without	-
354	DC - power supply 40A	NGPE 40/40	448	Rohde & Schwarz
355	power meter	URV 5	891310/027	Rohde & Schwarz
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research
362	TOSM Calibration Kit 50 Ohm	ZV-Z21/ZV-Z11	without	Rohde&Schwarz
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Rohde & Schwarz
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test
367	audio measurement amplifier	2636	316832/001	Brüel & Kjaer
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	Rohde & Schwarz
371	Bluetooth Tester	CBT32	100153	R&S
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz
374	power amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research
375	directional coupler	DC7144M1	306498	Amplifier Research
376	horn antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck
377	emi test receiver	ESCS 30	100160	Rohde & Schwarz
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	DARE B.V.
383	signal generator	SME 03	842 828 /034	Rohde & Schwarz
386	coupling decoupling network	CDN USB/p	19397	Schaffner
387	coupling decoupling network	CDN L-801 M2	2051	Lüthi
388	coupling decoupling network	CDN L-801 T2	1929	Lüthi
389	digital multimeter	Keithley 2000	0583926	Keithley
390	Industry Acoustic System	MO 2000 Set	2127100123	Sennheiser
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu
394	power amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik
399	Sound Calibrator	Sound Calibrator 4231	2665101	Brüel & Kjaer
400	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5559	Lüthi
401	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5560	Lüthi
411	Test Cable Kit N 50 Ohm (male)	ZV-Z11	100200	R&S / Rosenberger
413	Quad-Ridge Horn Antenna	3164-04	00090667	ETS-Lindgren
414	Circularly polarized com. Antenna	3102	00033734	EMCO
415	Antenna Position Controller	2090	00035634	ETS-Lindgren
416	MAPS Positioner (light duty)	2010	-	ETS-Lindgren
420	System CTC OTA 1	System CTC OTA 1	-	ETS-Lindgren/Cetecom
429	MAPS-Positionier (medium duty)	2015	-	ETS-Lindgren
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO
432	pre-amplifier 100MHz-26GHz	JS4-00102600-38-5P	1030896	Miteq USA
436	Radio Communication Tester	CMU 200	103083	Rohde & Schwarz
439	UltraLog-Antenna	HL 562	100248	Rohde + Schwarz
440	CDN for Datacable	CDN-UTP	CDN-UTP 029	EMC Partner AG,
441	System CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	ETS
442	System CTC-SAR-EMS	System EMS field (SAR)	-	ETS-Lindgren/Cetecom
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	ETS-Lindgren/Cetecom
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	ETS Lindgren/Cetecom
448	notch filter WCDMA FDD II	WRCT 1850.0/2170.0-	5	Wainwright Instruments
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-	1	Wainwright Instruments
456	DC-Power supply 0-5A	EA 3013 S	207810	Elektro Automatik
457	DC-Power supply, 0-5A	EA-3013 S	9624680	Elektro Automatik

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer
459	DC -power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik
460	Radio Communication Tester	CMU 200	108901	Rohde & Schwarz
462	AF-Generator	MX-2020	-	Conrad
463	Universal source	HP3245A	2831A03472	Agilent
466	digital multimeter	Fluke 112	89210157	Fluke USA
467	digital multimeter	Fluke 112	89680306	Fluke USA
468	digital multimeter	Fluke 112	90090455	Fluke USA
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz
482	filtermatrix	FilterMatrix SAR 1	-	CETECOM (Br)
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-	1244554	Miteq
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR)	-	ETS
489	emi test receiver	ESU40	1000-30	Rohde & Schwarz
490	high pass 2,65 GHz>18GHz	6HC 2650/18000-3-KK	200709138	Trilithic
491	ESD Simulator dito	ESD dito	dito307022	EM-Test
494	power supply (GPIB)	Agilent 66332A	US 37474017	Agilent
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz
500	industry Acoustic System	MO 2000 Set	100048	Sennheiser
502	band reject filter	WRCG 1709/1786-	SN 9	Wainwright
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright
523	Digitalmultimeter	L4411A	MY46000154	Agilent
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test
525	Koppelnetzwerk	CNA 200	1196-01	EM Test
526	Burst Generator	EFT 200 A	0496-06	EM Test
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test
528	Load Dump Simulator	LD 200B	0496-06	EM Test
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-
531	H-field system	Lackman System	without	Lackmann