

TEST REPORT
No.: 2-20828020a-14

FCC Regulations
Part 22, Subpart H
Part 24, Subpart E
Part 27, Subpart C

for

Sony Mobile Communications

Smartphone FCC-ID: PY7PM-0740
with
Qi-Charging Phone Cover AI-0070

Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 Federal Communications Commission Reg. No.: 736496 MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301
 AUTHORIZED RF LABORATORY	 LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			
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The listed attachments are an integral part of this report.

1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. 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 Equipment Under Test (in this report, hereinafter referred as EUT) is a passive wireless charging cover for smartphone with FCC-ID PY7PM-0740.

Spurious emission tests as required by Part 22/24/27 have been performed according KDB 648474 D03 v01r02.

A representative selection of test cases and operating modes have been selected for showing compliance also with the wireless cover activated. Based on maximum conducted RF-power values among operational modes, middle channel tests in GSM and W-CDMA Mode have been performed with wireless cover attached. Pls. check original test reports no. 2G/3G: 1-6965_13-04-02_A, LTE FDD 2: 1-6965_13-04-04_A, LTE FDD 4/7/13/17: 1-6965_13-04-05_A and LTE FDD 5: 1-6965_13-04-06_A for tests without wireless cover for reference.

Following tests have been performed to show compliance with applicable FCC Part 2, Part 22, Subpart H, Part 24, Subpart E (Broadband PCS) and Part 27 Subpart C of the FCC CFR 47 Rules, Edition 4th November 2013.

No. of Diagram group	Test case	Port	References & Limits			EUT set-up	EUT op-mode	Result
			FCC Standard		Test limit			
8	Spurious emissions	Cabinet + inter-connecting cables (radiated)	§2.1053(a) §2.1057 §22.917(a)(b) §24.238(a)(b) §27.53(g)		43+10log(P) dBc	1	1+2+3+4	passed

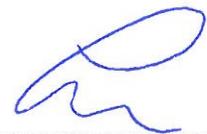
ATTESTATION:

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 above table are met in accordance with enumerated standards.



 D. Franke
 Responsible for test section





 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
Responsible for testing laboratory:	Dipl.-Ing. Niels Jeß
Deputy:	Dipl.-Ing. Rachid Acharkaoui

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.:	20828020_SQ2
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	2014-06-11
Date(s) of test:	2014-06-12 to 2014-06-13
Date of report:	2014-06-16

Version of template:	13.02 Lorenz

2.4. Applicant's details

Applicant's name:	Sony Mobile Communications AB
Address:	Nya Vattentorget 22188 Lund Sweden
Contact person:	Mr. Mikael Nilsson

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

Main function	Qi-Charging Smartphone Cover		
Type	AI-0070		
Frequency range	110kHz		
Other	WPC v1.1 communication protocol		
Type of modulation	--		
Number of channels	1		
EMISSION DESIGNATOR(S)	--		
Antenna Type	<input checked="" type="checkbox"/> Integrated <input type="checkbox"/> External, no RF- connector <input type="checkbox"/> External, separate RF-connector		
EUT sample type	<input type="checkbox"/> Production	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering

3.2. 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	Qi-Charging Phone Cover	AI-0070	1415FF2D0000 042	Prototype: SP	--
EUT B	Smartphone	FCC-ID: PY7PM- 0740	IMEI: 004402451803 435 (#CB5A1W1H QB)	Ap1.1	Android 4.4.2

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

3.3. 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	Qi-TX Charger FCC-ID: YVT- LPIC0001 IC: 9304A-LPIC0001	LPIC-L0001	SN: 070811000261	Rev: 04	--
AE 2	AC/DC Adapter for AE1	PS12K1900520U5	1115	19V DC/ 520mA	--
AE 3	USB Cable	EC803	134912A71205 832	--	--
AE 4	Headset	MH410c	12311A150001 F46	--	--

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

3.4. EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
set. 1	EUT A + EUT B + AE 1 + AE 2 + AE 3 + AE 4	Used for tests. USB cable not connected to other devices. Charging empty battery during tests in addition to wireless operation.

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

3.5. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	GSM 850 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. 2	GSM 1900 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. 3	FDD-Mode 4 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: 21 dBm. 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. 4	Charging battery	Charging empty battery with help of AE1

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

3.6. 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	
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: 180 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	Not applicable	0
Paging reorganisation		Off (0)
Signalling channel		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)	FDD4 = 1450	--
UARFCN Node B (downlink) (according TS34.108)	FDD 5 = 4040	--
UE power class	Class 4 (+21dBm) 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	--
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	

3.7. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	USB cable	EC803	134912A71205 832	--	Approx. 1.2m
Cable 2	Headset	MH410c	12311A150001 F46	--	-

3.8. Test system set-up for radiated spurious emission measurements

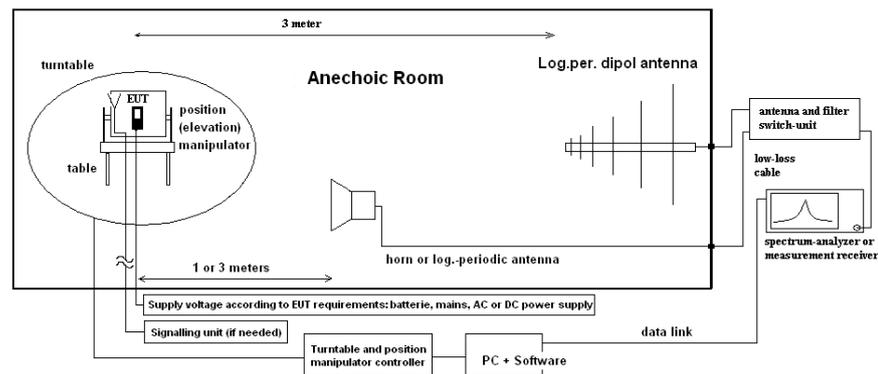
Specification:

ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.5&6.6

General Description:

Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 16-4 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 20 GHz and 1 meter above 20 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. The horn antenna is used for frequency range 1 GHz to 40 GHz. Due to use of a fully anechoic room the measurement antennas are set to fixed antenna height of 1.55 m (no height scan necessary) and the site validation criteria accord. ANSI63.10:2009 is fulfilled. The EUT is aligned within 3 dB beam width of the measurement antenna, on big EUTs several surface measurements are performed.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software. The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc. First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined. Following parameters were varied: the turntable angle continuously 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). The measurement antenna height is fixed to 1.55 m. On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out. The readings on the spectrum analyzer are corrected with conversion value between field strength and E(I)RP, so the readings shown are equivalent to ERP/EIRP values. Critical measurements near the limit are re-measured with a substitution method accord. ANSI/TIA/EIA 603 C/D

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$E_{C_{E(I)RP}} = E_C - 95.2 \text{ dB}$$

$$M = L_T - E_{C_{E(I)RP}}$$

E_C = Electrical field – corrected value

E_R = Receiver reading

M = Margin

L_T = Limit

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

G_A = Gain of pre-amplifier (if used)

$E_{C_{E(I)RP}}$ = Electrical field corrected for E(I)RP

All units are dB-units, positive margin means value is below limit.

4. Measurements

4.1. RF-Parameter - Radiated out of Band RF emissions (GSM)

4.1.1. Test location and equipments (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"/> 347 Radio.lab. 1	<input checked="" type="checkbox"/> Radio.lab. 2	
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK <input checked="" type="checkbox"/> 489 ESU
signaling	<input type="checkbox"/> 017 CMD 65	<input type="checkbox"/> 323 CMD 55	<input type="checkbox"/> 340 CMD 55
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 436 CMU	<input checked="" type="checkbox"/> 547 CMU
power supply	<input checked="" type="checkbox"/> 463 HP3245A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50 <input type="checkbox"/> 268 EA- 3050 <input type="checkbox"/> 494 AG6632A <input type="checkbox"/> 498 NGPE 40
otherwise	<input checked="" type="checkbox"/> 529 6dB divider	<input checked="" type="checkbox"/> 530 10dB Att.	<input type="checkbox"/> 431 Near field
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 060 120 V/ 60 Hz via PAS 5000

4.1.2. Requirements and limits

FCC	<input checked="" type="checkbox"/> Part 2.1053(a), Part2.1057(a)(1) <input type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205 <input checked="" type="checkbox"/> Part 22 Subpart H, §22.917(a)(b) <input checked="" type="checkbox"/> Part 24 Subpart E, §24.238(a)(b) <input checked="" type="checkbox"/> Part 27 Subpart E, §27.53(g)
Limit	-13 dBm

4.1.3. Test condition and test set-up

Climatic conditions	Temperature: (22±3°C)	Rel. humidity: (40±20)%
Test system set-up	Please see chapter "Test system set-up for conducted measurements on antenna port"	
Measurement method	<p>"§ 2.1057 Frequency spectrum to be investigated. (a) In all of the measurements set forth in § 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz"</p> <p>The spectrum was scanned from 9 kHz (depend on the equipment, s. §2.1057) to the 10th harmonic of the highest frequency generated within the equipment. A PEAK detector was used except measurements near the block-edge where a AVERAGE detector applied.</p> <p>A suitable artificial antenna or RF-connector is provided by the applicant in order to perform the conducted measurements. Any data provided with the artificial antenna or connector, have been taken in account in order to correct the measurement data. (typical 0.3dB for attenuation of antenna connector)</p>	
Spectrum-Analyzer settings	See below tables	
Mobile phone settings	<p>A call was established with settings according chapter "Parameter settings on mobile phone and base station CMU200"</p> <p>UE Power should be set to maximum, continuous transmission. DTX or other power saving techniques have been disabled</p> <p>The measurements were made at the low, middle and high carrier frequencies of each of the supported operating band. Choosing three TX-carrier frequencies of the mobile phone, should be sufficient to demonstrate compliance.</p>	

4.1.4. Spectrum-Analyzer settings for GSM/GPRS/E-GPRS 850

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att. [dB]	Detector
Sweep 1 (subrange 1)	0.009	1	0.001	0.01	10	25	MaxH-PK
Sweep 1 (subrange 2)	1	30	0.1	1	5	25	MaxH-PK
Sweep 2 (subrange 1)	30	820	1	10	10	35	MaxH-PK
Sweep 2 (subrange 2)	820	1000	1	10	2	45	MaxH-PK
Sweep 2 (subrange 3)	1000	9000	1	10	100	35	MaxH-PK
Sweep 3a (Block-Edge)	823	824	0.003	0.01	70	35	MaxH-PK
Sweep 3b (Block-Edge)	823	824	0.003	0.01	70	35	MaxH-AV
Sweep 4a (Block-Edge)	849	850	0.003	0.01	70	35	MaxH-PK
Sweep 4b (Block-Edge)	849	850	0.003	0.01	70	35	MaxH-AV

4.1.5. Spectrum-Analyzer Settings GSM/GPRS/E-GPRS 1900

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att.	Detector
Sweep 1 (subrange 1)	0.009	1	0.001	0.01	10	25	MaxH-PK
Sweep 1 (subrange 2)	1	30	0.1	1	5	25	MaxH-PK
Sweep 2 (subrange 1)	30	1000	1	10	100	35	MaxH-PK
Sweep 2 (subrange 2)	1000	2500	1	10	15	35	MaxH-PK
Sweep 2 (subrange 3)	2500	19500	1	10	150	35	MaxH-PK
Sweep 3a (Block-Edge)	1849	1850	0.003	0.01	70	35	MaxH-PK
Sweep 3b (Block-Edge)	1849	1850	0.003	0.01	70	35	MaxH-AV
Sweep 4a (Block-Edge)	1910	1911	0.003	0.01	70	35	MaxH-PK
Sweep 4b (Block-Edge)	1910	1911	0.003	0.01	70	35	MaxH-AV

4.1.6. Results

Measurements are performed on middle channel only for showing compliance of the cellular equipment with the wireless charging battery cover.

The results are presented below in summary form only. For more information please see each diagram enclosed in annex diagrams.

4.1.7. GSM850: Set-up 1

Diagram no.	Carrier Channel		Frequency range	OP-mode no.	Remark	Used detector			Result
	Range	No.				PK	AV	QP	
8.01_GSM850_Ch192	Middle	192	30MHz – 12 GHz	1+4	Carrier visible on diagram, not relevant for result	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

Remark:--

4.1.8. GSM 1900: Set-up 1

Diagram no.	Carrier Channel		Frequency range	OP-mode no.	Remark	Used detector			Result
	Range	No.				PK	AV	QP	
8.02_GSM1900_Ch661	Middle	661	30MHz – 20 GHz	2+4	Carrier visible on diagram, not relevant for result	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

4.2. RF-Parameter - Radiated out of Band RF emissions (W-CDMA)

4.2.1. Test location and equipments (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"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input checked="" type="checkbox"/> 443 FAR
receiver	<input type="checkbox"/> 377 ESCS30	<input type="checkbox"/> 001 ESS	<input type="checkbox"/> 489 ESU 40
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input checked="" type="checkbox"/> 264 FSEK
antenna	<input checked="" type="checkbox"/> 608 HL 562	<input checked="" type="checkbox"/> 549 HL 025	<input type="checkbox"/> 302 BBHA9170
signaling	<input type="checkbox"/> 017 CMD 65	<input type="checkbox"/> 323 CMD 55	<input type="checkbox"/> 340 CMD 55
signaling	<input type="checkbox"/> 392 MT8820A	<input checked="" type="checkbox"/> 546 CMU	<input type="checkbox"/> 547 CMU
power supply	<input type="checkbox"/> 611 E3636A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50
otherwise	<input type="checkbox"/> 529 6dB divider	<input type="checkbox"/> 530 6dB Att.	<input type="checkbox"/> 110 USB LWL
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 060 110 V/ 60 Hz via PAS 5000

4.2.2. Requirements and limits

FCC	§2.1053(a)-radiated , §2.1057(a)(a) , §22.917(a)(b) ; §24.238(a)(b) ; §27.53(g)
Limit	„the power of emissions shall be attenuated below the transmitter output power (p) by at least 43+10Log(P) dB“ -> Resulting limits for all power levels of the Mobile Phone: -13dBm

4.2.3. Test condition and 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)%
Test system set-up	Please see chapter “Test system set-up for radiated spurious emission measurements up to 20 GHz”		
Spectrum Analyzer Settings	Parameter: Scan Mode Span RBW VBW Sweep time Sweep mode Detector	Spectrum analyser mode 20 MHz 3 MHz 10 MHz Coupled repetitive Peak	
Measurement method	<p>The spectrum was scanned from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment. A PEAK detector was used except measurements near the block-edge where a AVERAGE detector applied for critical measurements.</p> <p>According chapter 4.2</p> <p>Valid for band-edge compliance: Due to not available exact 1% RBW of the measurement equipment, the lower available RBW was used for the FDD measurements.</p> <p>An additional correction factor of 10 Log (RBW1/ RBW2) to the result was added. RBW1 is the narrower measurement resolution bandwidth (used RBW) and RBW2 is either the 1% emissions bandwidth or 1 MHz (KDB890810).</p> <p>Formula: Band-Edge compliance correction factor for FDD bands 10log(30 kHz/50 kHz) to be used= -2.22 dB</p>		
Mobile phone settings	A call was established on highest power transmit conditions in RMC99 mode. The measurements were made at the low, middle and high carrier frequencies of each of the supported operating band. Choosing three TX-carrier frequencies of the mobile phone, should be sufficient to demonstrate compliance.		

Spectrum-analyzer settings for FDD Band 4

	Start freq. MHz	Stop freq. MHz	R-BW MHz	V-BW MHz	Sweep time sec.	Att.	Detector
Sweep 1 (subrange 1)	30	1000	1	10	10	10	MaxH-PK
Sweep 1 (subrange 2)	1000	2800	1	10	15	0	MaxH-PK
Sweep 1 (subrange 3)	2800	20000	1	10	160	10	MaxH-PK
Sweep 2a (Block-Edge)	1709	1710	0.05	0.5	30	35	MaxH-PK
Sweep 2b (Block-Edge)	1709	1710	0.05	0.5	30	35	MaxH-AV
Sweep 3a (Block-Edge)	1755	1756	0.05	0.5	30	35	MaxH-PK
Sweep 3b (Block-Edge)	1755	1756	0.05	0.5	30	35	MaxH-AV

4.2.4. Results

The results are presented below in summary form only. For more information please see each diagram enclosed in annex 4.

4.2.4.1. FDD Band 4: Op. Mode 1, Set-up 1

Diagram no.	Carrier Channel		Frequency range	OP-mode no.	Remark	Used detector			Result
	Range	No.				PK	AV	QP	
8.03	Middle	1450	30 MHz to 20 GHz	3+4	Carrier visible on diagram. Not relevant for results	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

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	Digital Radiocommunication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99
053	Audio Analyzer	UPA3	860612/022	Firm. V 4.3
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
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
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02
298	Univ. Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used
323	Digital Radiocommunication 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	CTC-EMS-Conducted	System EMS Conducted	-	EMC 32 V 8.52
340	Digital Radiocommunication 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 V5.30+ SW-Option K55, K57
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, GSM=4.41#013, W-CDMA= 4.54#004, scenario= 4.52#002
436	Univ. Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all band
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.52
442	CTC-SAR-EMS	System EMS field (SAR)	-	EMC 32 Version 8.40
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	Spuri 7.2.5 or EMC 32 Ver. 8.53
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 8.40
460	Univ. Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used,
489	EMI Test Receiver	ESU40	1000-30	Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =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
546	Univ. Radio Communication Tester	CMU 200	106436	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used
547	Univ. Radio Communication Tester	CMU 200	835390/014	R&S Test Firmware Base=V5.1403 (current Testsoftw., f. all band used, GSM = 5.14 WCDMA: = 5.14
584	Spectrum Analyzer	FSU 8	100248	2.82_SP3
597	Univ. Radio Communication Tester	CMU 200	100347	R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Firmware Bios 3.40 , Analyzer 3.40 Sp 2
620	EMI Test Receiver	ESU 26	100362	4.43_SP3
642	Wideband Radio Communication Tester	CMW 500	126089	Setup V03.26, Test programm component V03.02.20
692	Bluetooth Tester	CBT 32	100236	CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF)

5.1.2. 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	-	31.03.2015
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2015
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2015
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	31.03.2015
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	31.03.2016
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2015
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2015
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	31.03.2015
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1g	30.06.2014
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	Helmholtz coil: 2x10 coils in	-	RWTÜV	12 M	4	31.03.2015
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	31.03.2015
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	31.03.2015
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2016
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	36 M	-	31.03.2015
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	31.03.2016
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	
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 M	-	31.03.2016
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2016
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	31.03.2016
264	Spectrum Analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2015
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	31.03.2016
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	31.03.2016
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	
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	
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	30.06.2014
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	30.06.2014
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2015
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	36 M	-	31.03.2017
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	31.03.2017
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	30.11.2014
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2016
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	31.03.2015
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	31.03.2016
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24 M	-	31.03.2015
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	31.03.2015
371	Bluetooth Tester	CBT32	100153	R&S	24 M	-	31.03.2016
373	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	100535	Rohde & Schwarz	24 M	-	31.03.2016
376	Horn Antenna 6 GHz	BBHA9120 E	BBHA 9120 E.179	Schwarzbeck	12 M	-	31.03.2015
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2015
389	Digital Multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2015
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	31.03.2015
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2015
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	31.03.2017
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	31.10.2014
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	15.07.2014
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	30.06.2014

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	30.06.2014
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	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	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2015
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	31.03.2016
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	31.03.2015
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	31.03.2015
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	31.03.2015
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-10P	1244554	Miteq	12 M	-	30.06.2014
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	30.06.2015
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2015
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwright	12 M	1c	30.06.2014
517	relais switch matrix	HF Relais Box Keithley	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2015
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	12.02.2015
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	31.03.2015
548	Digital-Barometer	GBP 2300	without	Greisinger GmbH	36 M	-	30.06.2015
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.03.2015
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	30.06.2014
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	31.07.2015
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2016
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	36 M	-	31.03.2016
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Rohde & Schwarz	24 M	-	13.01.2015
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	31.03.2015
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	31.03.2015
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	31.03.2015
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	31.03.2016
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	31.03.2015
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
636	Thermal Imaging camera	Ti32	Ti32-12060213	Fluke Corporation	24 M	-	31.07.2014
637	High Speed HDMI with Ethernet 1m	HDMI cable with Ethernet 1m	-	KogiLink	-	2	
638	HDMI Kabel with Ethernet 1,5 m flach	HDMI cable with Ethernet	-	Reichelt	-	2	
640	HDMI cable 2m rund	HDMI cable 2m rund	-	Reichelt	-	2	
641	HDMI cable with Ethernet	Certified HDMI cable with	-	PureLink	-	2	
642	Wideband Radio Communication Tester	CMW 500	126089	Rohde&Schwarz	12 M	-	31.03.2015
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	12 M	-	31.03.2015
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
683	Spectrum Analyzer	FSU 26	200571	Rohde & Schwarz	12 M	-	26.11.2014
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	18.07.2015
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	27.11.2014
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	12 M	-	31.03.2015
693	TS8997	CTC-Radio Lab 1_TS8997	-	Rohde&Schwarz	12 M	5	30.11.2014

Note / remarks		Calibrated during system calibration:
	1a	System CTC-SAR-EMS (Ref.-No. 442)
	1b	System-CTC-EMS-Conducted (Ref.-No. 335)
	1c	System CTC-FAR-EMI-RSE (Ref.-No . 443)
	1d	System CTC-SAR-EMI (Ref.-No . 441)
	1e	System CTC-OATS (EMI radiated) (Ref.-No. 337)
	1 f	System CTC-CTIA-OTA (Ref.-No . 420)
	1 g	System CTC-FAR-EMS (Ref.-No . 444)
	2	Calibration or equipment check immediately before measurement
	3	Regulatory maintained equipment for functional check or support purpose
	4	Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment
	5	Test System

Interval of calibration	12 M	12 month
	24 M	24 month
	36 M	36 month
	24/12 M	Calibration every 24 months, between this every 12 months internal validation
	36/12 M	Calibration every 36 months, between this every 12 months internal validation
	Pre-m	Check before starting the measurement
	-	Without calibration