

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CNFC_RM-940_06.docx	Date of Report:	13-Sep-2013
Number of pages:	17	Customer's Contact person:	Lasse Vaattovaara
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FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-940 / AC-Charger AC-60E / Data Cable CA-190CD / Headset WH-208		
FCC ID:	PYAB	IC:	661V-B
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2009), IC standards. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test Results:	The EUT complies with the requirements in respect of all parameters subject to the test. The test results relate only to devices specified in this document		
Date and signature for the contents:			

Sami Lehtonen, Specialist, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	24-Jul-2013
Testing completed	19-Aug-2013
The customer's contact person	Lasse Vaattovaara
Test Plan referred to	T:\Projects\RM-940\TestPlan\RS_Testplan_RM-940.xlsm
Notes	-
Document name	T:\Projects\RM-940\EMC\FCC15CNFC_RM-940_06.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:

GSM/WCDMA/WLAN/Bluetooth

The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-940	004402473425829	2100	-	1026.0501.1326.10113	17596
AC-Charger	AC-60E	409049315461030285300675677	CE	-	-	17584
Data Cable	CA-190CD	-	CE	-	-	17585
Headset	WH-208	2131731	CE	-	-	17586
AC-Charger	AC-60E	409049315461030267600675677	-	-	-	17580
Headset	WH-208	2131731	-	-	-	17581
USB-Cable	CA-190CD	07304563083v2f	-	-	-	17608

1.2. Summary of Test Results

NFC:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.209	2.6	Radiated emission below 30 MHz	PASSED
15.209	A2.6	Radiated emission above 30 MHz	PASSED
15.225(a-d)	A2.6	Field strength in the 13.56 MHz band	PASSED
	4.6.1	Occupied Bandwidth	PASSED
15.225(e)	A2.6	Frequency stability, temperature variation	PASSED
15.225(e)	A2.6	Frequency stability, voltage variation	NP
15.207	7.2.2	AC power line conducted emission	PASSED

PASSED

FAILED

NP

The EUT complies with the essential requirements in the standard.

The EUT does not comply with the essential requirements in the standard.

The test was not performed by the TCC Nokia Laboratory.

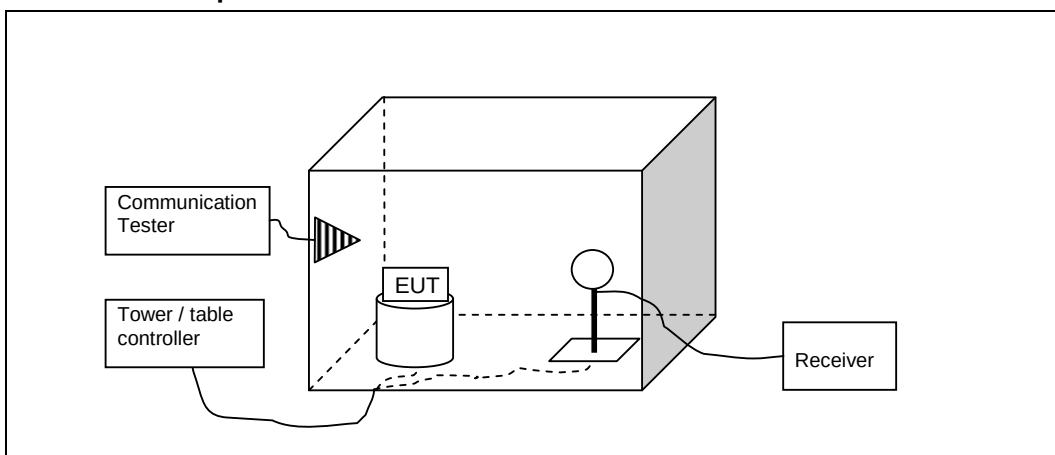
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2. Radiated Emissions below 30 MHz (FCC §15.209, RSS-GEN 7.2.5)

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	AC-60E, DUT 17580 ; WH-208, DUT 17581 ; CA-190CD, DUT 17608
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 68 / 101.8
Date of measurements	02-Aug-2013
Measured by	Jari Keto

2.1.1 Test setup



2.2. Test method and limit

The measurement is made according to ANSI C63.4-2009 and RSS-GEN as follows:

The measurement distance is 3 m.

The limit line has been adjusted with the distance correction factor (+40 dB for 30 m distance, +80 dB for 300 m distance).

The measurement is divided into the Preliminary Measurement and the Final Measurement. The suspected frequencies are searched for in Preliminary Measurement with measuring antenna at fixed height using 2-axis EUT position system, set on the turntable, which is rotated 360 degrees. For all identified emissions, the antenna is adjusted for maximum reading.

The measurement results are obtained as described below:

$$E [dB\mu V/m] = U_{RX} + 20 dB [1/m] + L_{CABLES}$$

Where U_{RX} is receiver reading, 20 dB the antenna factor of the loop antenna and L the cable attenuation.

Limits for radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu V/m$]	Distance [m]	Detector	RBW [kHz]
0.009 - 0.09	2400 / $f[kHz]$	300	Pk & Avg*	0.2
0.09 - 0.11	2400 / $f[kHz]$	300	QP	0.2

0.11 - 0.15	2400 / f[kHz]	300	Pk & Avg	0.2
0.15 - 0.49	2400 / f[kHz]	300	Pk & Avg*	9
0.49 - 1.705	24000 / f[kHz]	30	QP	9
1.705 - 30	30	30	QP	9

* These are average limits. The peak limit is 20 dB above the average limit.

2.3. NFC test results

Transmit

MaxPeak

Frequency [MHz]	Reading [dB μ V/m]	Limit [μ V/m]	Distance CF [dB]	Limit @ 3m [dB μ V/m]	Margin [dB]	Limit [dB μ V/m]	Results
0.0313	65.754	76.68	80	137.70	72	37.69	PASSED
0.0313	65.837	76.68	80	137.70	71.9	37.69	PASSED
0.0313	65.819	76.68	80	137.70	71.9	37.69	PASSED
0.0313	65.762	76.68	80	137.70	72	37.69	PASSED

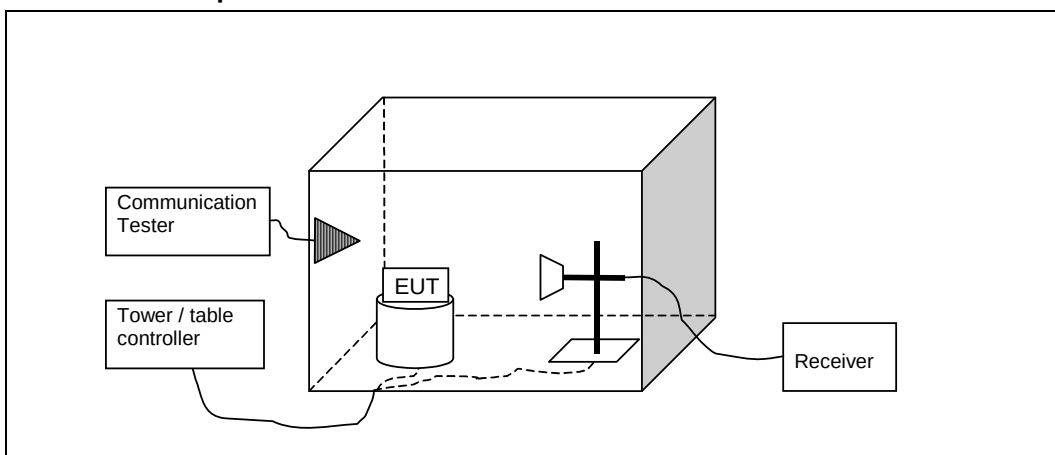
Average

Frequency [MHz]	Reading [dB μ V/m]	Limit [μ V/m]	Distance CF [dB]	Limit @ 3m [dB μ V/m]	Margin [dB]	Limit [dB μ V/m]	Results
0.0313	65.5	76.68	80	117.70	52.2	37.69	PASSED
0.0313	65.518	76.68	80	117.70	52.2	37.69	PASSED
0.0313	65.562	76.68	80	117.70	52.2	37.69	PASSED
0.0313	65.545	76.68	80	117.70	52.2	37.69	PASSED

3. Radiated emissions above 30 MHz (FCC §15.209, RSS-GEN 7.2.5)

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	AC-60E, DUT 17580 ; WH-208, DUT 17581 ; CA-190CD, DUT 17608
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 68 / 101.8
Date of measurements	02-Aug-2013
Measured by	Jari Keto

3.1.1 Test setup



3.2. Test method and limit

The measurement is made according to the ANSI C63.4-2009 and RSS-Gen as follows:
The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E \text{ [dB}\mu\text{V/m]} = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu\text{V/m}$]	Limit [dB $\mu\text{V/m}$]	Detector
30 - 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

3.3. NFC test results

Transmit

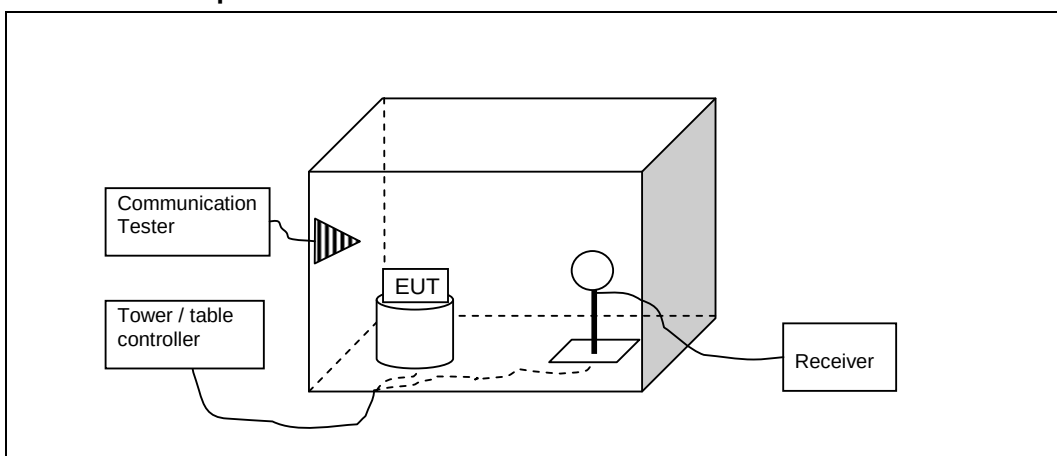
Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dB $\mu\text{V/m}$]	E [$\mu\text{V/m}$]	U_{RX} [dB μV]	A_{TOT} [dB]	Margin	Limit [dB $\mu\text{V/m}$]	Results
36.785	25.09	17.964	33.56	-8.47	14.9	40	PASSED
37.705	26.21	20.436	35.29	-9.08	13.8	40	PASSED
185.61	9.85	3.108	29.1	-19.25	33.7	43.5	PASSED

4. Field strength in the 13.56 MHz band

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	AC-60E, DUT 17580 ; WH-208, DUT 17581 ; CA-190CD, DUT 17608
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 40 / 101.0
Date of measurements	19-Aug-2013
Measured by	Jari Keto

4.1.1 Test setup

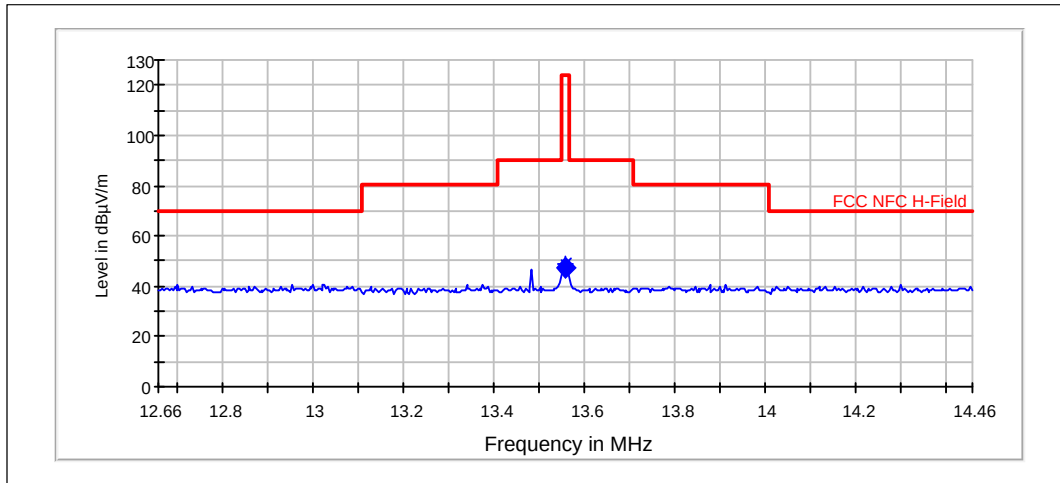


4.2. Test method and limit

The measurement is made according to EN 302 291-01, Section 7.1.1
The measuring distance was 3 meter in RF anechoic chamber.

4.3. NFC test results

Radiated H-Field, 3 meter distance



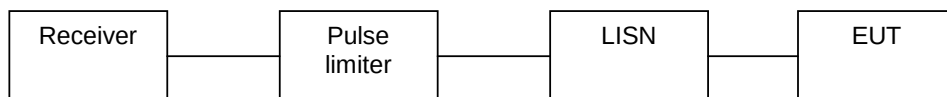
QuasiPeak

Frequency [MHz]	Reading [dBμV]	Result [dBμA/m]	Correction [dB]	Margin [dB]	Limit [dBμV/m]	Results
13.558	47.709	27.71	20	76.3	124	PASSED

5. AC powerline conducted emissions (FCC §15.207, RSS-GEN 7.2.2)

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	CA-190CD, DUT 17585 ; AC-60E, DUT 17584 ; WH-208, DUT 17586
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 50 /102
Date of measurements	05-Aug-2013
Measured by	Tomi Lipponen

5.1. Test Setup



5.2. Test method and limit

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

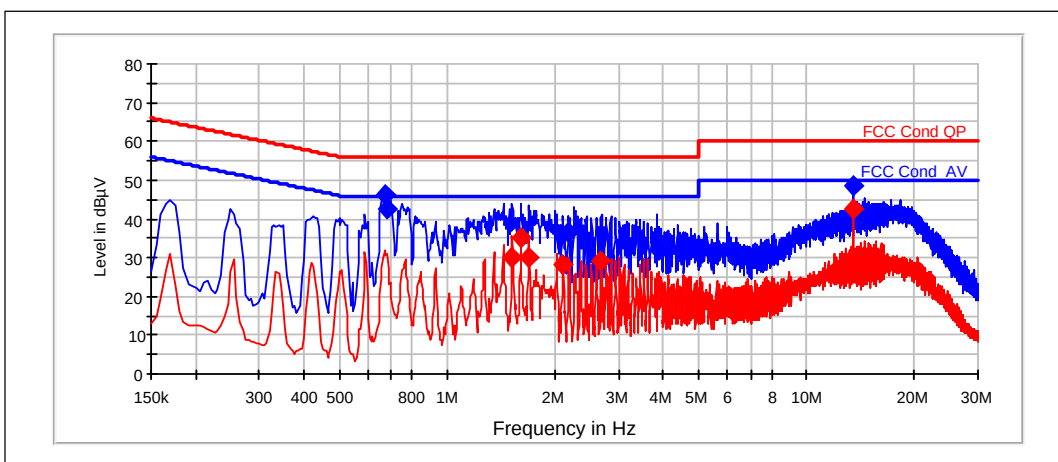
$$U [dB\mu V] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBμV]	Average limit [dBμV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

5.3. NFC Test results



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.675	46.27	N	PASSED
0.68	42.4	N	PASSED
2.175	36.56	N	PASSED
3.865	32.1	N	PASSED
13.56	48.75	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
1.52	29.83	N	PASSED
1.6	35.18	N	PASSED
1.685	30.21	N	PASSED
2.095	28.4	N	PASSED
2.685	28.97	N	PASSED
13.56	42.5	N	PASSED

6. Occupied bandwidth

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	AC-60E, DUT 17584 ; CA-190CD, DUT 17585 ; WH-208, DUT 17586
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 50 /102
Date of measurements	24-Jul-2013
Measured by	Tomi Lipponen

6.1. Test Setup

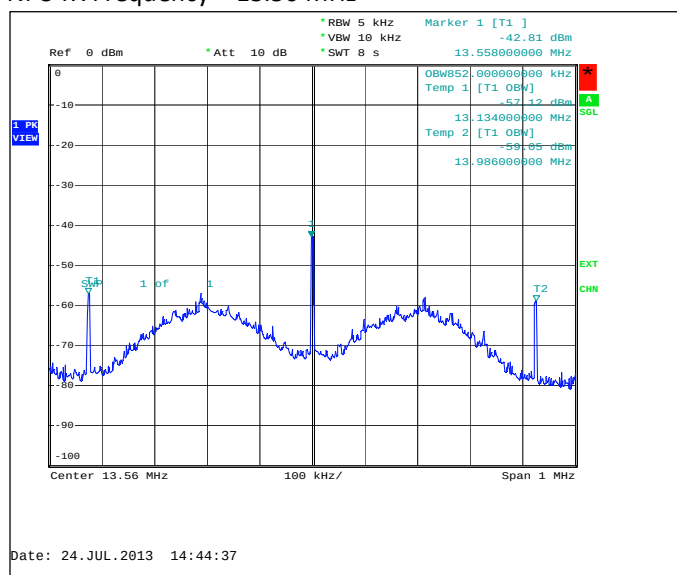
A small whip antenna was placed close to the EUT, and connected to the measuring Spectrum Analyzer.

6.2. Test method and limit

The Test was carried out with the EUT in Test mode with modulation on.

6.3. NFC Test results

NFC TX Frequency = 13.56 MHz



Operation mode (TX on)	Occupied bandwidth [kHz]
NFC, modulated	852

7. Frequency stability, temperature variation (FCC §15.225 (e) [2], RSS-210 A2.6)

EUT with DUT number	RM-940, DUT 17596
Accessories with DUT numbers	AC-60E, DUT 17584 ; CA-190CD, DUT 17585 ; WH-208, DUT 17586
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 50 /102
Date of measurements	24-Jul-2013
Measured by	Tomi Lipponen

7.1. Test Setup

The EUT was placed in a Climatic Chamber. A small whip antenna was placed close to the EUT, and connected to the measuring Spectrum Analyzer. Measurement performed without modulation on TX.

7.2. Test method and limit

The measurement is made according to FCC rules FCC 47 CFR Part 15 section 15.225 (e) [2] and RSS-210 A2.6

- The EUT is placed in the chamber in transmit mode.
- The climate chamber temperature is set to the maximum value and allowed to stabilize.
- The transmit frequency is measured.
- Temperature is lowered to the next temperature value and allowed to stabilize.
- The steps c - d is repeated for each temperature.

Limits for frequency stability, temperature variation measurements

Frequency deviation [%]
+/- 0.01

7.3. NFC Test results

NFC TX Frequency = 13.56 MHz

Temperature [°C]	Frequency [MHz]	Deviation [kHz]	Deviation [%]	Result
50	13.559856	-0.144	-0.001062	PASSED
40	13.559868	-0.132	-0.000973	PASSED
30	13.559886	-0.114	-0.000841	PASSED
20	13.559938	-0.062	-0.000457	PASSED
10	13.559972	-0.028	-0.000206	PASSED
0	13.559984	-0.016	-0.000118	PASSED
-10	13.559959	-0.041	-0.000302	PASSED
-20	13.559936	-0.064	-0.000472	PASSED
-30	13.55994	-0.060	-0.000442	PASSED

8. Test Equipment

8.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1759	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
1916	Communication Tester	CMTA84	R&S	15B
1992	Signal Generator	83630B	Agilent	15C, 15B
1999	Receiver	ESIB26	R&S	22/24/27, 15C, 15B
2039	Power Supply	PL330QMD	Thurlby	15C, 15B
2059	V-network	ESH3-Z6	R&S	-
2097	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
2156	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2180	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2206	Signal Generator	SMX	R&S	15C, 15B
2347	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2352	Spectrum Analyzer	FSP-30	R&S	22/24/27, 15C
2359	Temperature Test Chamber	VT4002	Vötsch	22/24/27
2388	Bluetooth Tester	CBT	R&S	15B
2389	Signal Generator	SMJ 100A	R&S	15B
2390	Directional Coupler	DC2600	AR	-
6009	GPS Antenna	SA-700	Chronos	15C
6010	GPS Network amplifier	NLA20FPDC	GPS Networking, Inc	15C
6011	GPS signal Splitter	LDCBS1x4	GPS Networking, Inc	15C
6012	CDN	CDN USB/c	Teseq	-
6015	Receiver	ESI	R&S	22/24, 15C, 15B
6036	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
6038	Data Logger	Testo 580	Testo	22/24/27, 15C, 15B
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B
6044	V-network	ESH3-Z6	R&S	-
6045	Power splitter	11667B	Agilent	22/24/27, 15C
6046	Attenuator 10dB	8493C	Agilent	22/24/27, 15C
6047	Attenuator 20dB	8493C	Agilent	22/24/27, 15C
6094	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
6096	EMC Analyzer	E7405A	HP	-
6098	Signal Generator	8648C	Agilent	-
6103	Bluetooth tester	CBT	R&S	15B
6113	Signal Generator	SMF100A	R&S	22/24/27, 15C 15B
6120	Thermal Chamber	WT 20/40	Weiss	22/24/27, 15C 15B
6121	Power Splitter	HP11667B	Agilent	22/24/27, 15C 15B
6122	Power Splitter	HP11667B	Agilent	22/24/27, 15C 15B
6134	Attenuator 10dB	BW-S10-2W263+	Mini-Circuits	22/24/27, 15C
6136	Attenuator 20dB	BW-S20-2W263+	Mini-Circuits	22/24/27, 15C
10479	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B

8.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
1917	Communication Tester	CMTA84	R&S	15B
1984	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C, 15B
2009	Signal Generator	SMP 22	R&S	22/24/27, 15C, 15B
2027	CDN	M2 (modified) DC1	MEB	22/24/27, 15C, 15B
2028	CDN	M3 (modified) DC2	MEB	22/24/27, 15C, 15B
2029	Power Supply	PL330	Thurlby	22/24/27, 15C
2043	Band Reject Filter	WRCA824/849-0,2-6SS	Wainwright	22
2135	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
2140	Antenna	EMCO93110B	EMCO	22/24/27, 15C
2142	Antenna	3146	EMCO	22/24/27, 15C
2156	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2176	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B
2180	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2347	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2353	Receiver	ESIB26	R&S	22/24/27, 15C, 15B
2357	Band Reject Filter	WRCG2400/2483-2390/2493-35/10SS	Wainwright	15C
2361	Anechoic Chamber	3 m Semi / Full Anechoic Chamber	Euroshield	22/24/27, 15C, 15B
2364	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	24
2384	Band Reject Filter	WRCG832/838-825/845-40/5SS	Wainwright	22
2388	Bluetooth Tester	CBT	R&S	15B
2389	Signal Generator	SMJ 100A	R&S	15B
2391	Band Reject Filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
6009	GPS Antenna	SA-700	Chronos	15C
6010	GPS Network amplifier	NLA20FPDC	GPS Networking, Inc	15C
6011	GPS signal Splitter	LDCBS1x4	GPS Networking, Inc	15C
6014	Substitute Calibration Cable	Sucoflex 104PB	Suhner	-
6017	Antenna	SBA 9113	Schwarzbeck	22 / 24 / 27
6037	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
6038	Data Logger	Testo 580	Testo	22/24/27, 15C, 15B
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B
6087	Antenna	BBHA 9120D	Scharzbeck	22/24/27, 15C
6088	Antenna	VUBA 9117	Scharzbeck	22/24/27, 15C
6089	Antenna	HFH2-Z2	R&S	15C, 15B
6094	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
6103	Bluetooth tester	CBT	R&S	15B
6113	Signal Generator	SMF100A	R&S	22/24/27, 15C 15B
6115	Open switch and control unit	OSP 130	R&S	22/24/27, 15C 15B
6116	Open switch and control unit	OSP 150	R&S	22/24/27, 15C 15B
6130	Notch Filter	WRCD1880-1.1.25/50-10SS	Wainwright	22/24/27
6131	Notch Filter	WRCT902.4-0.4/40-8SS	Wainwright	-
6135	Notch Filter	WRCJV2531/2539-2523/2547-60/12SS	Wainwright	22/24/27
10479	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	15C, 15B
-	RF immunity / Emission Software	EMC32	R&S	22/24/27, 15C, 15B