

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-937_13.docx	Date of Report:	30-Sep-2013
Number of pages:	15	Customer's Contact person:	Lasse Vaattovaara
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FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-937 / AC-Charger AC-60E / Headset WH-208		
FCC ID:	PYAC	IC:	-
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), DTS procedures KDB 558074, 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	05-Sep-2013
Testing completed	19-Sep-2013
The customer's contact person	Lasse Vaattovaara
Test Plan referred to	T:\Projects\RM-937\TestPlan\RS_testplan_RM-937.xlsm
Notes	-
Document name	T:\Projects\RM-937\EMC\FCC15CWLAN_RM-937_13.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:
GSM/WCDMA/LTE/WLAN/Bluetooth
The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-937	004402475404673	2100	-	1028.3507.1335.10170	17655
AC-Charger	AC-60E	409049315461030267600675677	-	-	-	17580
Headset	WH-208	2131731	-	-	-	17581

1.2. Summary of Test Results

5 GHz RLAN:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8.4 (4)	Conducted peak output power	NP
15.247(d), 15.205(b)	A8.5	Band edge compliance of RF emissions	PASSED
15.247(d)	A8.5	Spurious RF conducted emissions	NP
15.247(d), 15.209	A8.5	Spurious radiated emissions	PASSED
15.207	7.2.2	AC powerline conducted emissions	NP
15.247(a)(2)	A8.2 (a)	6dB(bandwidth)	NP
15.247(e)	A8.2 (b)	Power spectral density	NP

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.

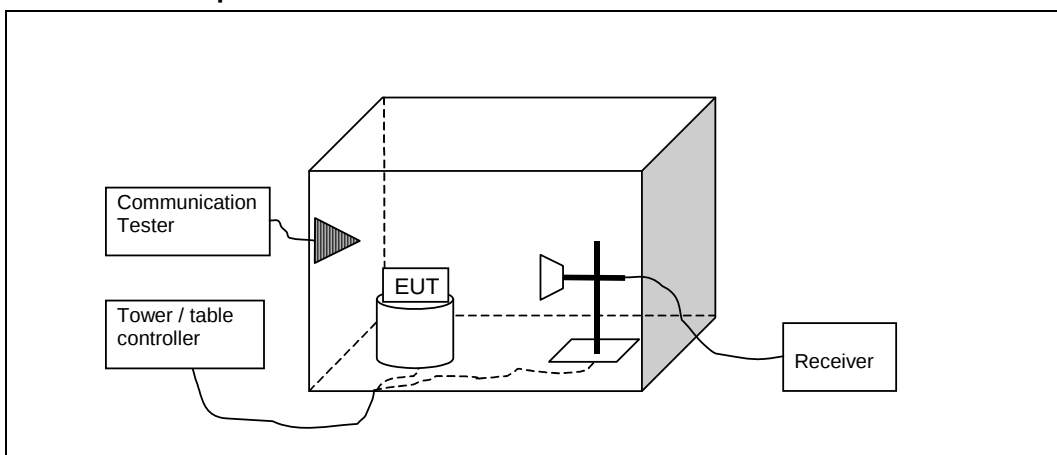
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2. Band edge compliance of RF emissions (FCC §15.247(d), 15.205(b), RSS-210 A8.5)

EUT with DUT number	RM-937, DUT 17655
Accessories with DUT numbers	AC-60E, DUT 17580 ; WH-208, DUT 17581
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 50 / 101.4
Date of measurements	12-Sep-2013
Measured by	Kalle Hannila

2.1.1 Test setup



2.2. Test method and limit

The measurement is made according to KDB558074 and IC standard RSS-210.

The limit for 5 GHz RLAN is -20 dBc.

When the fundamental value in E [dBuV/m] column is at least 20 dB higher than the out of band emission, the result is pass.

The measurement results are obtained as described below:

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

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

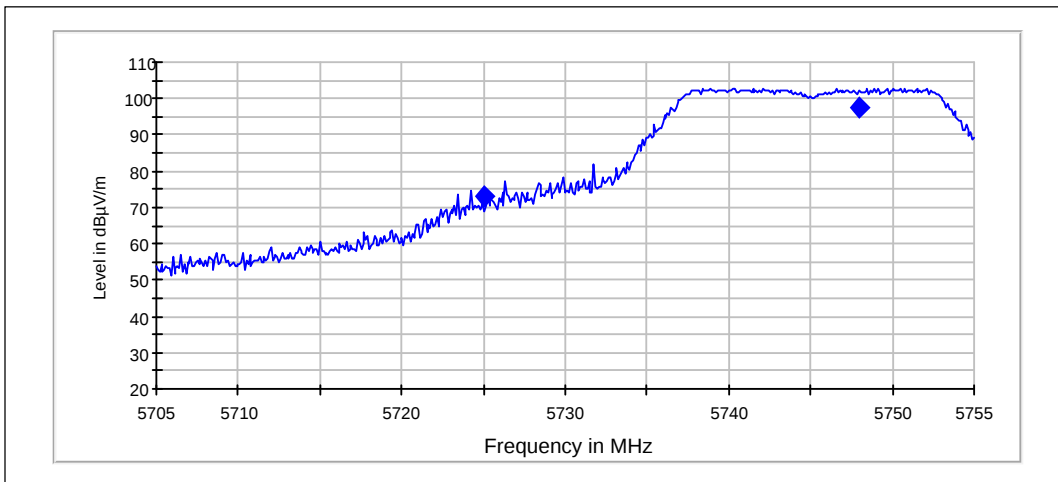
Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit
Below 2390 and above 2483.5	54 dBuV/m (avg) and 74 dBuV/m (pk)
Below 5725 and above 5825	-20dBc

2.3. 5 GHz RLAN test results

2.3.1 802.11a, BPSK modulation, 6 Mbps data rate.

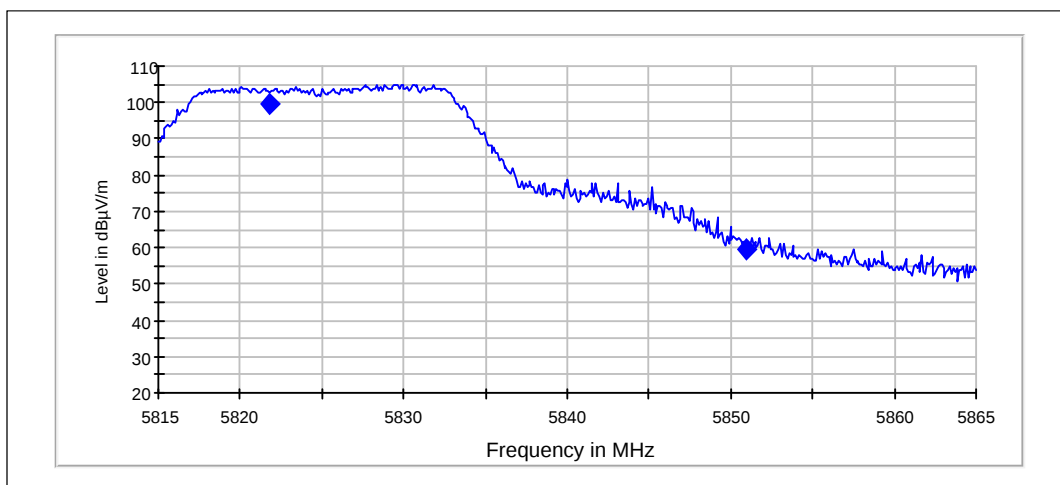
Channel 149 / 5745MHz



Peak (RBW: 1 MHz, VBW: 3 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
5725	73.2	4569.303	68.99	4.21	PASSED
5747.986	97.41	74216.42	93.28	4.13	PASSED

Channel 165 / 5825MHz

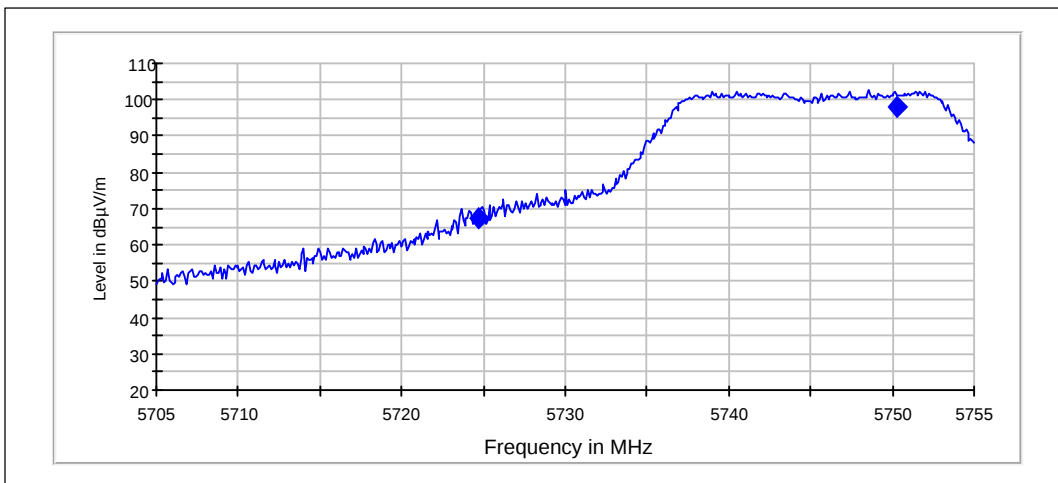


Peak (RBW: 1 MHz, VBW: 3 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
5821.814	99.84	98163.492	95.29	4.55	PASSED
5850.932	59.47	940.481	54.72	4.75	PASSED

2.3.2 802.11a, QPSK modulation, 18 Mbps data rate.

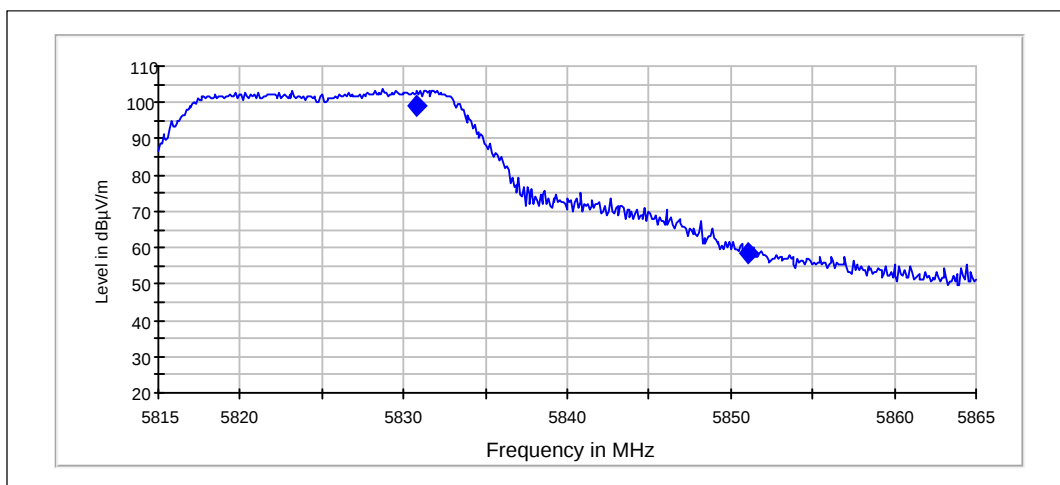
Channel 149 / 5745MHz



Peak (RBW: 1 MHz, VBW: 3 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
5724.719	67.41	2348.01	63.21	4.21	PASSED
5750.23	98.12	80528.572	94	4.12	PASSED

Channel 165 / 5825MHz



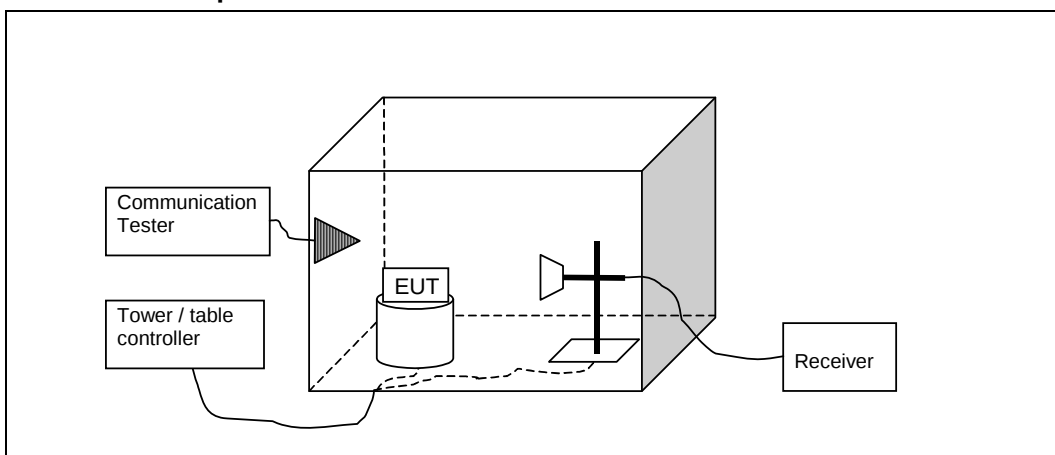
Peak (RBW: 1 MHz, VBW: 3 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
5830.752	99.17	90844.785	94.61	4.56	PASSED
5851.052	58.4	831.572	53.65	4.75	PASSED

3. Spurious radiated emissions (FCC §15.247(d), §15.209, RSS-210 A8.5)

EUT with DUT number	RM-937, DUT 17655
Accessories with DUT numbers	AC-60E, DUT 17580 ; WH-208, DUT 17581
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 55 / 101.4
Date of measurements	12-Sep-2013
Measured by	Kalle Hannila

3.1.1 Test setup



3.2. Test method and limit

The measurement is made according to ANSI C63.4 and IC standard RSS-210 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:

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

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 [$\mu V/m$]	Limit [$dB\mu V/m$]	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. 5 GHz RLAN test results

3.3.1 802.11a, BPSK modulation, 6 Mbps data rate.

Channel 149 / 5745MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11490.4	55.13	570.558	42.06	13.07	18.9	74	PASSED
17244.4	49.11	285.397	39.42	9.69	76.1	125	PASSED
22973.7	55.17	573.72	40.17	15	18.8	74	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11490.4	42.01	126.009	28.94	13.07	12	54	PASSED
17244.4	36.18	64.417	26.49	9.69	---	---	PASSED
22973.7	42.4	131.765	27.4	15	11.6	54	PASSED

Channel 157 / 5785MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11566.5	54.05	504.313	41.19	12.86	19.9	74	PASSED
17356.1	49.26	290.335	39.92	9.34	76	125	PASSED
23134	54.66	540.817	39.79	14.87	---	---	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
31.753	25.84	19.586	30.46	-4.62	14.2	40	PASSED
31.8	26.11	20.202	30.76	-4.65	13.9	40	PASSED
43.327	26.55	21.245	38.73	-12.18	13.5	40	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11566.5	40.83	110.002	27.97	12.86	13.2	54	PASSED
17356.1	36.32	65.479	26.98	9.34	---	---	PASSED
23134	41.73	122.082	26.86	14.87	---	---	PASSED

Channel 165 / 5825MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11649.9	55.81	617.519	43.52	12.29	18.2	74	PASSED
17440.5	49.81	309.207	40.44	9.37	75.4	125	PASSED
23291.5	57.05	711.623	41.94	15.11	---	---	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11649.9	44.38	165.577	32.09	12.29	9.6	54	PASSED
17440.5	36.86	69.639	27.49	9.37	---	---	PASSED
23291.5	43.97	158.016	28.86	15.11	---	---	PASSED

3.3.2 802.11a, QPSK modulation, 18 Mbps data rate.

Channel 149 / 5745MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11493.4	54.17	510.858	41.1	13.07	19.8	74	PASSED
17226.2	48.88	277.811	39.18	9.7	76.4	125	PASSED
22970	55.21	576.103	40.2	15.01	18.8	74	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11493.4	41.06	113.006	27.99	13.07	12.9	54	PASSED
17226.2	36.14	64.15	26.44	9.7	---	---	PASSED
22970	42.4	131.886	27.39	15.01	11.6	54	PASSED

Channel 157 / 5785MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11570	54.3	518.621	41.46	12.84	19.7	74	PASSED
17347.7	49.32	292.483	39.94	9.38	75.9	125	PASSED
23130.6	55.01	562.795	40.2	14.81	---	---	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
43.339	27.52	23.768	39.7	-12.18	12.5	40	PASSED
43.501	27.44	23.556	39.73	-12.29	12.6	40	PASSED
73.151	14.13	5.087	32.39	-18.26	25.9	40	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11570	41.71	121.717	28.87	12.84	12.3	54	PASSED
17347.7	36.3	65.336	26.92	9.38	---	---	PASSED
23130.6	41.68	121.297	26.87	14.81	---	---	PASSED

Channel 165 / 5825MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11650.2	55.43	591.017	43.14	12.29	18.5	74	PASSED
17440	50.08	319.227	40.71	9.37	75.1	125	PASSED
23297.8	56.78	690.558	41.7	15.08	---	---	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
11650.2	43.94	157.471	31.65	12.29	10	54	PASSED
17440	36.85	69.607	27.48	9.37	---	---	PASSED
23297.8	43.91	156.874	28.83	15.08	---	---	PASSED

4. Test Equipment

4.1. 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

4.2. 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