

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-820_38.docx	Date of Report:	14-Nov-2013
Number of pages:	27	Customer's Contact person:	Rontu Jari
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FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-820 / AC-Charger AC-60E / Headset WH-208		
FCC ID:	PYARM-820	IC:	661V-RM820
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, RSS-210 (Issue 8, December 2010). 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:			

Tomi Lipponen, Specialist, EMC and Energy

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	25-Jun-2013
Testing completed	08-Nov-2013
The customer's contact person	Rontu Jari
Test Plan referred to	T:\Projects\RM-820\TestPlan\RS_testplan_RM-820_BTLE.xlsm
Notes	-
Document name	T:\Projects\RM-820\EMC\FCC15CWLAN_RM-820_38.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-820	353653050002897	5000	-	3051.40000.1342.10262	17863
Phone	RM-820	353653050134252	6001	-	3051.40000.1342.10262	17856
AC-Charger	AC-60E	409049326462030556160675677	CE	-	-	17834
Headset	WH-208	2305471	CE	-	-	17835

1.2. Summary of Test Results

Bluetooth Low energy:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8(0.4(4))	Conducted peak output power	PASSED
15.247(d), 15.205(b)	A8(0.5)	Band edge compliance of RF emissions	PASSED
15.247(d)	A8(0.5)	Spurious RF conducted emissions	PASSED
15.247(d), 15.209	A8(0.5)	Spurious radiated emissions	PASSED
15.207	7.2.2	AC powerline conducted emissions	PASSED
15.247(a)(2)	A8(0.1(1))	6dB(bandwidth)	PASSED
15.247(e)	A8(0.1(2))	Power spectral density	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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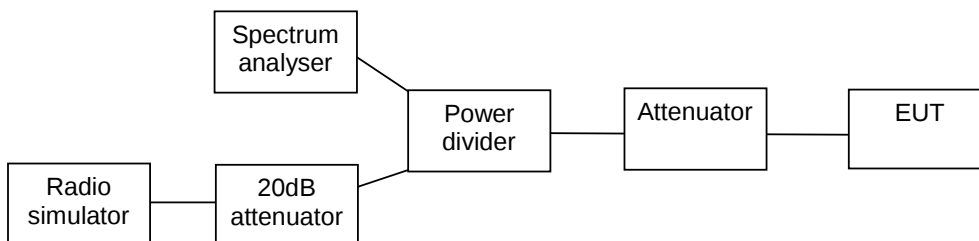
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2. Conducted peak output power (15.247(b)(1), RSS-210 A8.4 (4))

EUT with DUT number	RM-820, DUT 17863
Accessories with DUT numbers	-
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	08-Nov-2013
Measured by	Jari Keto

2.1. Test Setup



2.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

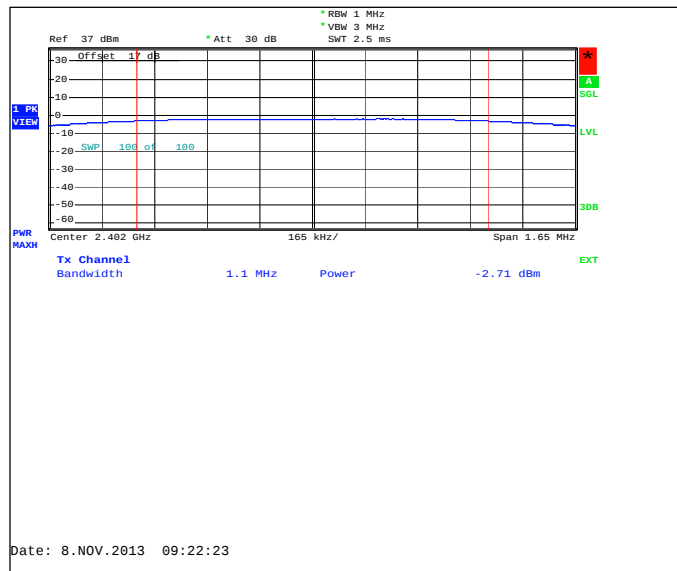
Limits for conducted peak output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5 5725 - 5850	≤ 1	≤ 30

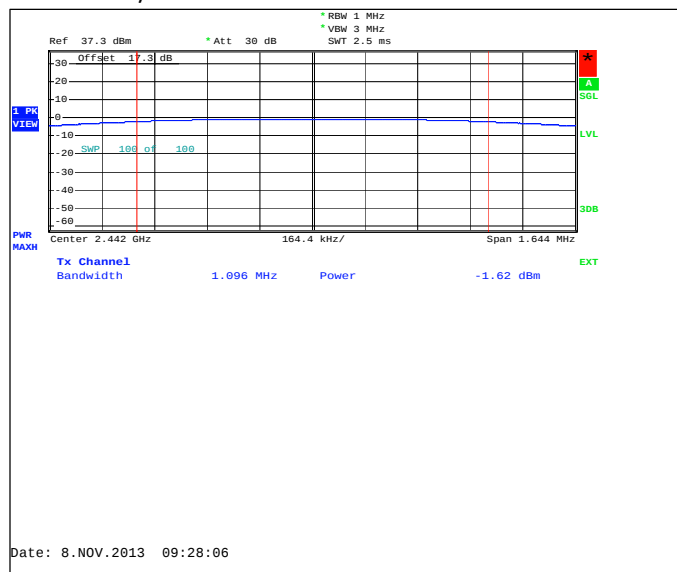
2.3. Bluetooth Low Energy Test results

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	-2.71	0.536	PASSED
20 / 2442	-1.62	0.689	PASSED
39 / 2480	-2.42	0.573	PASSED

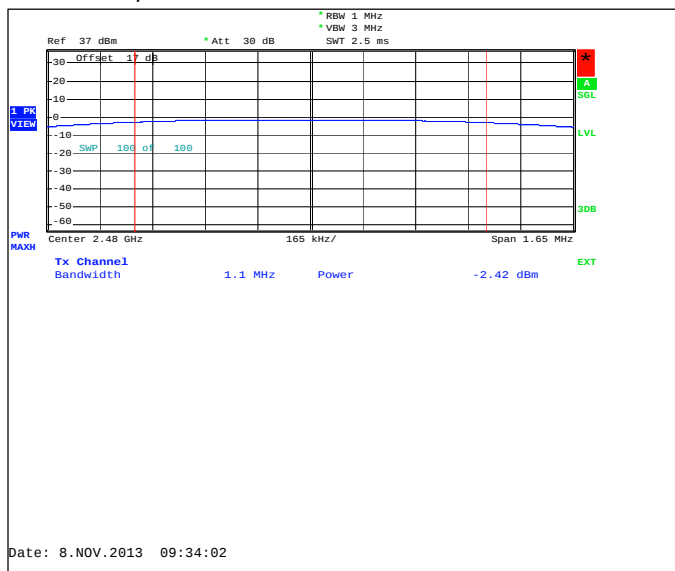
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



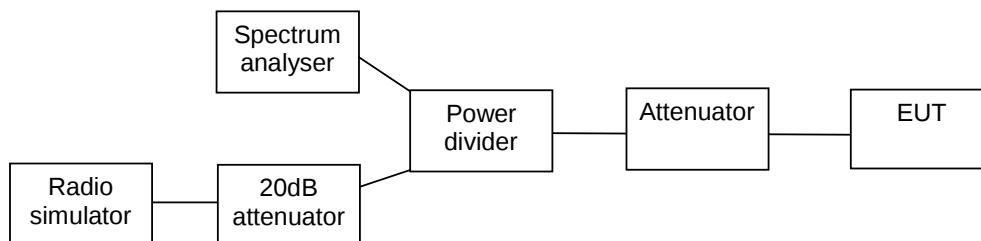
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-820, DUT 17863
Accessories with DUT numbers	-
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	08-Nov-2013
Measured by	Jari Keto

3.1. Test Setup



3.2. Test method and limit

The measurement is made according to Public notice KDB 558 074 and IC standard RSS-210.

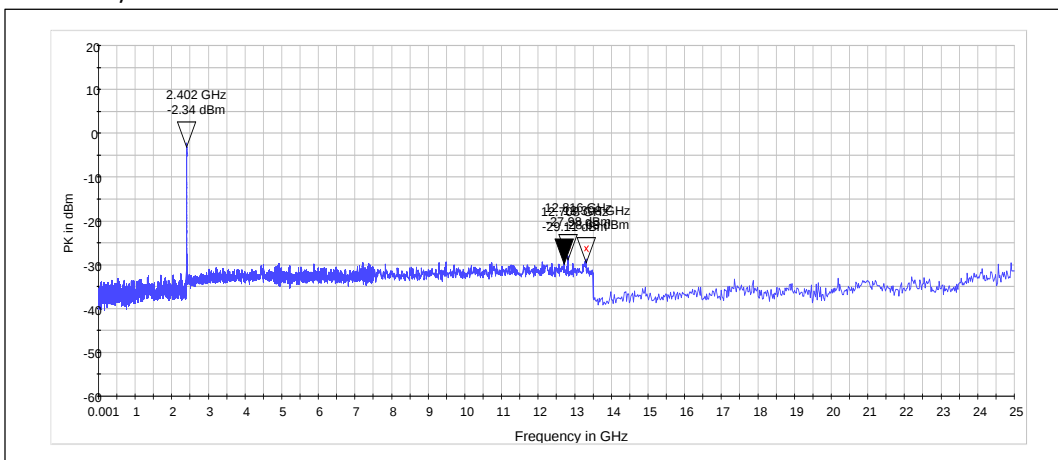
The reference level for the -20 dBc measurement was obtained as instructed in section 11.2 of the KDB 558074, using span of 1.5 times the OBW.

Limits for spurious RF conducted emissions measurements

Frequency range [MHz]	Limit [dBc]
1 – 25000	<= -20

3.3. Bluetooth Low Energy Test results

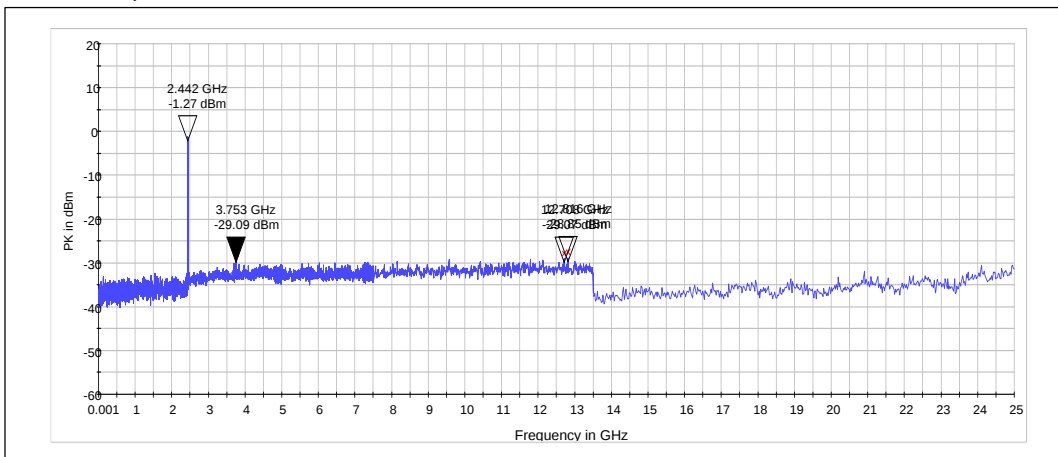
Channel 0 / 2402 MHz



Peak (RBW: 100 kHz, VBW: 300 kHz)

Frequency [MHz]	P [dBc]	Result
12816.000	-25.64	PASSED
13308.000	-26.29	PASSED
12708.000	-26.78	PASSED

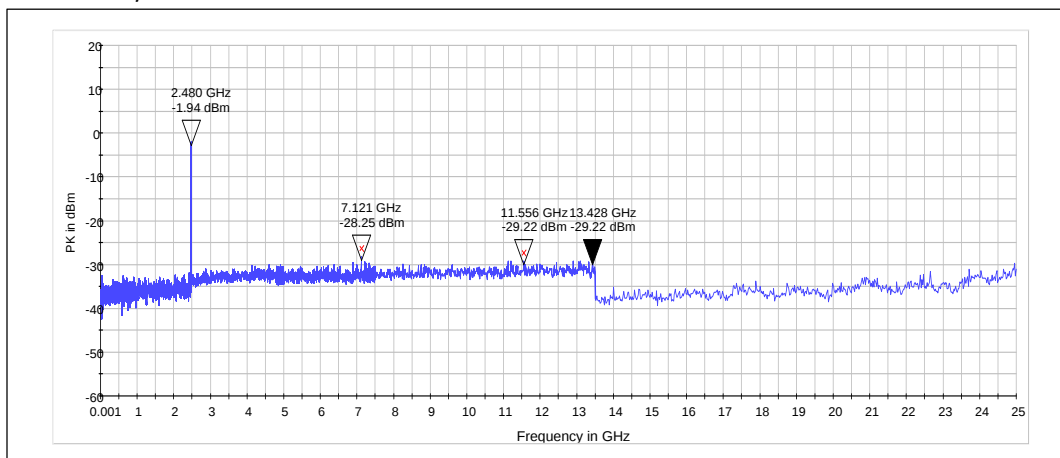
Channel 20 / 2442 MHz



Peak (RBW: 100 kHz, VBW: 300 kHz)

Frequency [MHz]	P [dBc]	Result
12816.000	-27.59	PASSED
12708.000	-27.80	PASSED
3753.492	-27.83	PASSED

Channel 39 / 2480 MHz



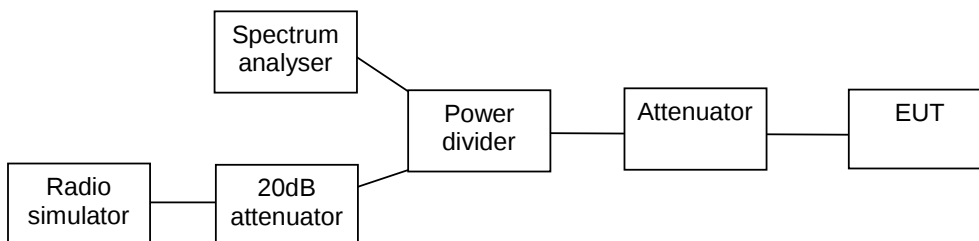
Peak (RBW: 100 kHz, VBW: 300 kHz)

Frequency [MHz]	P [dBc]	Result
7120.800	-26.31	PASSED
11556.000	-27.28	PASSED
13428.000	-27.28	PASSED

4. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))

EUT with DUT number	RM-820, DUT 17863
Accessories with DUT numbers	-
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	08-Nov-2013
Measured by	Jari Keto

4.1. Test Setup



4.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

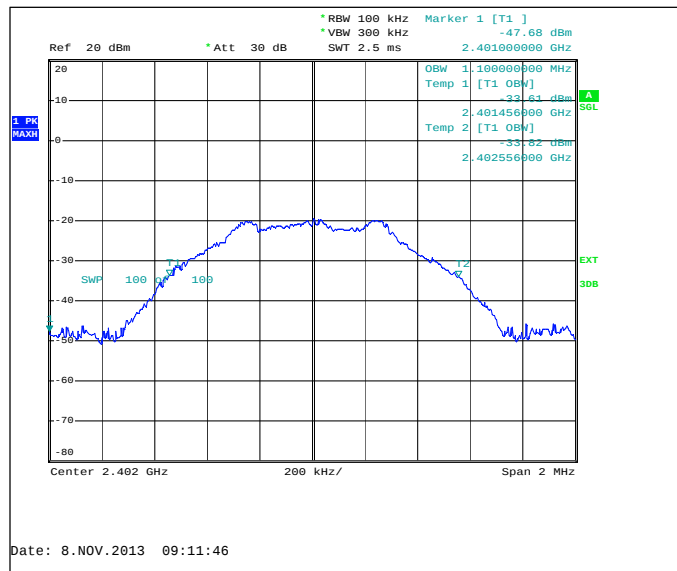
Limits for 6 dB bandwidth measurements

Limit [kHz]
>= 500

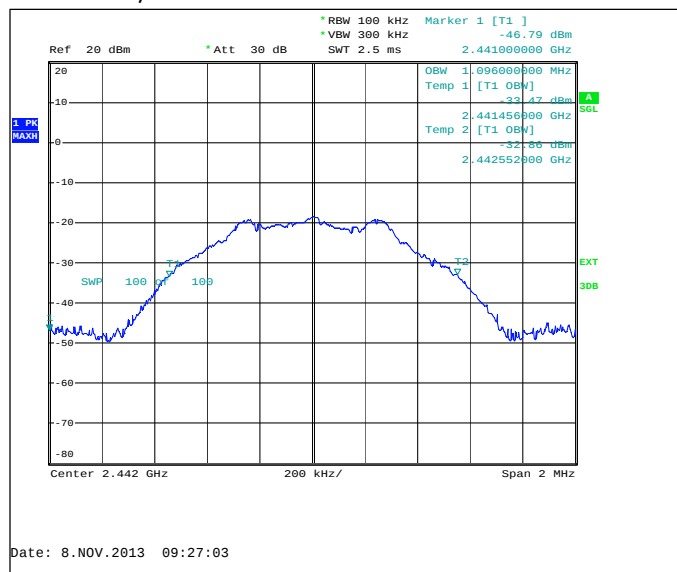
4.3. Bluetooth Low Energy Test results

Channel / f_c [MHz]	6 dB bandwidth [kHz]	Result
0 / 2402	1100	PASSED
20 / 2442	1096	PASSED
39 / 2480	1100	PASSED

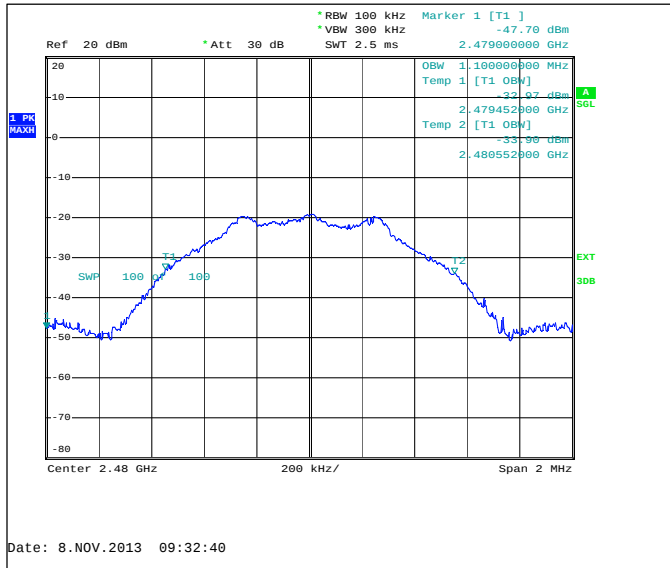
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



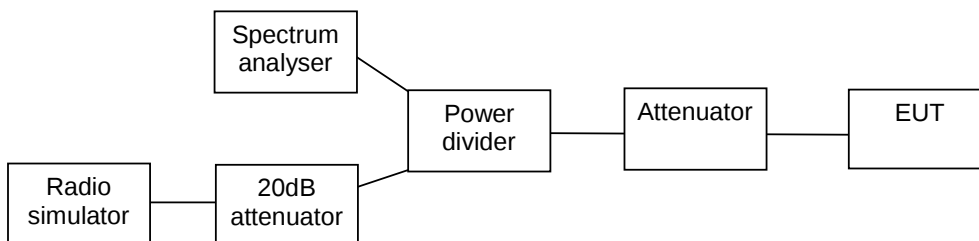
Channel 39 / 2480 MHz



5. Power spectral density (FCC §15.247(e), RSS-210 A8.2 (2))

EUT with DUT number	RM-820, DUT 17863
Accessories with DUT numbers	-
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	08-Nov-2013
Measured by	Jari Keto

5.1. Test Setup



5.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

Limits for power spectral density measurements

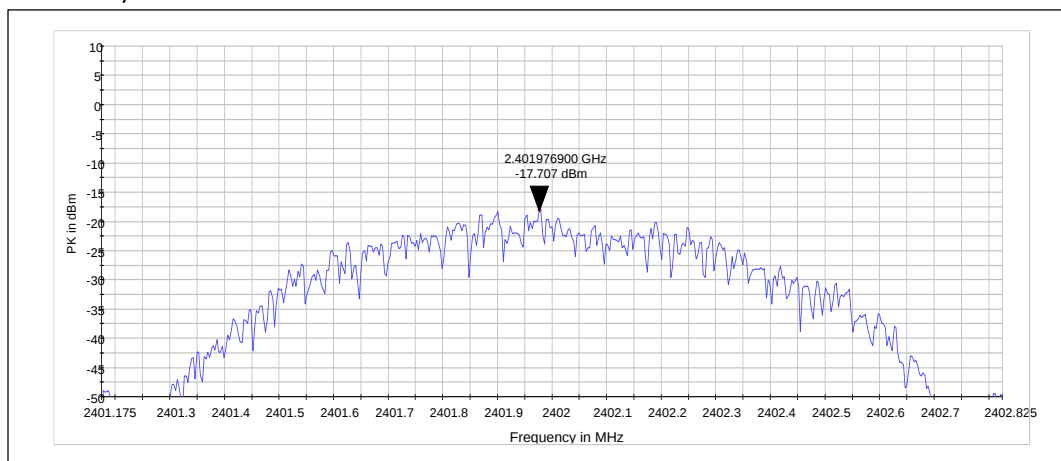
Limit [dBm] @ 3 kHz
<= 8

5.3. Bluetooth Low Energy Test results

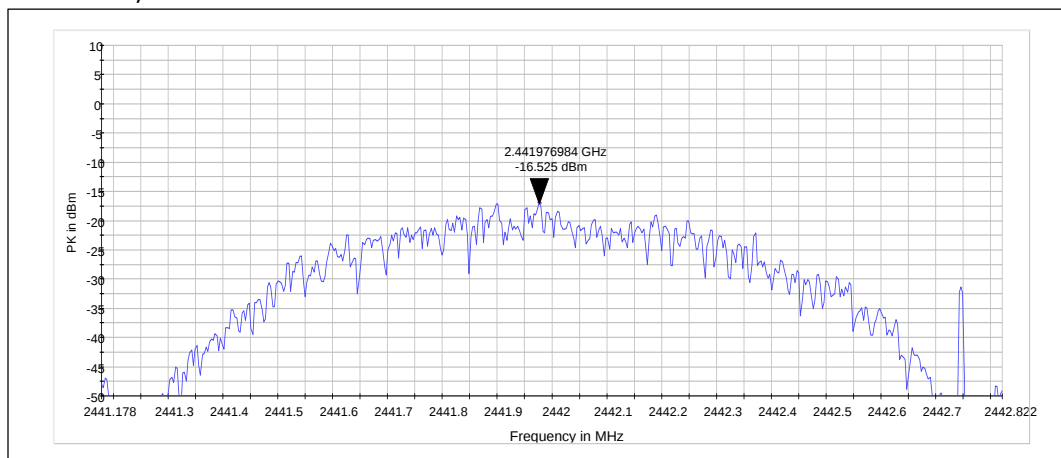
Peak (RBW: 3 kHz, VBW: 10 kHz, Max hold)

Channel / f_c [MHz]	P [dBm]	Result
0 / 2402	-17.71	PASSED
20 / 2442	-16.52	PASSED
39 / 2480	-17.35	PASSED

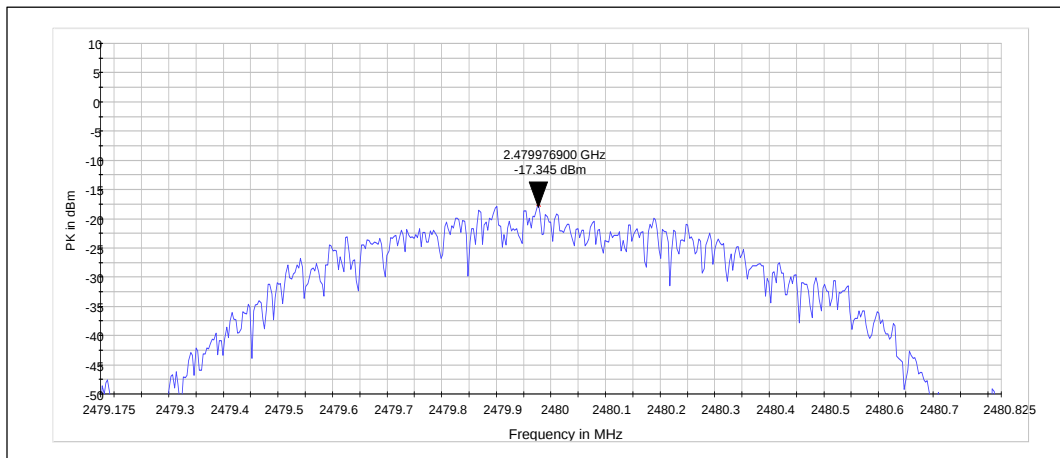
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



Channel 39 / 2480 MHz



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

EUT with DUT number	RM-820, DUT 17856
Accessories with DUT numbers	AC-60E, DUT 17834 ; WH-208, DUT 17835
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	12-Nov-2013
Measured by	Jari Keto

6.1. Test Setup



6.2. Test method and limit

The measurement is made according to procedure KDB 558074 and IC standard RSS-GEN as follows:

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:

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

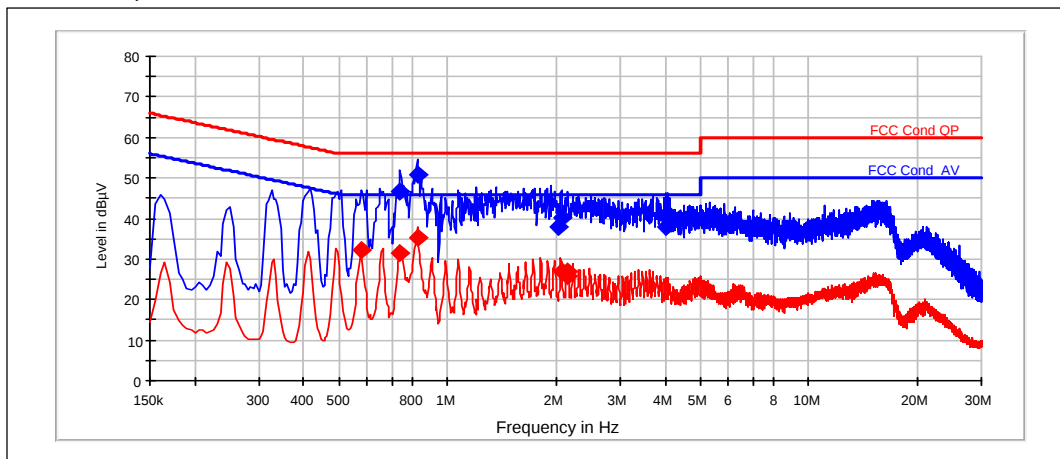
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

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

6.3. Bluetooth Low Energy Test results

Channel 20 / 2442 MHz



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
0.74	46.6	N	PASSED
0.825	50.67	N	PASSED
2.035	38.03	N	PASSED
2.075	40.13	N	PASSED
4	38.06	N	PASSED

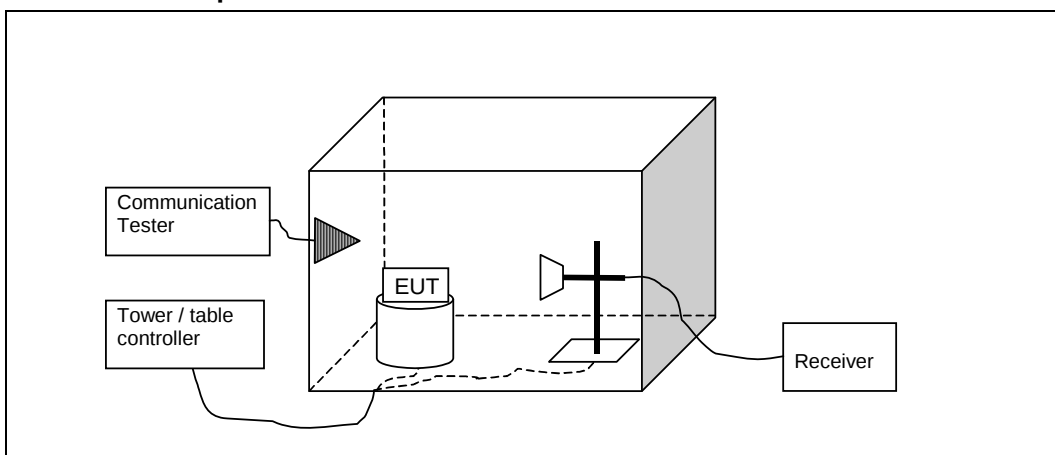
Average (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
0.575	32.16	N	PASSED
0.74	31.41	N	PASSED
0.825	35.35	N	PASSED
2.065	27.02	N	PASSED
2.145	25.97	N	PASSED
2.15	27.01	N	PASSED

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

EUT with DUT number	RM-820, DUT 17856
Accessories with DUT numbers	AC-60E, DUT 17834 ; WH-208, DUT 17835
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	11-Nov-2013
Measured by	Kalle Hannila

7.1.1 Test setup



7.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

The measurement results are obtained as described below:

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

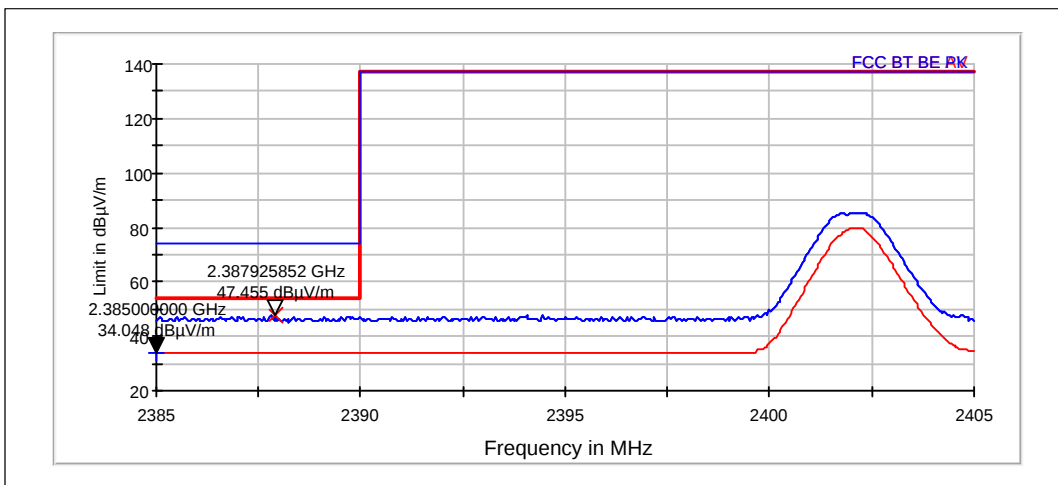
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

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)

7.3. Bluetooth Low Energy test results

Channel 0 / 2402 MHz



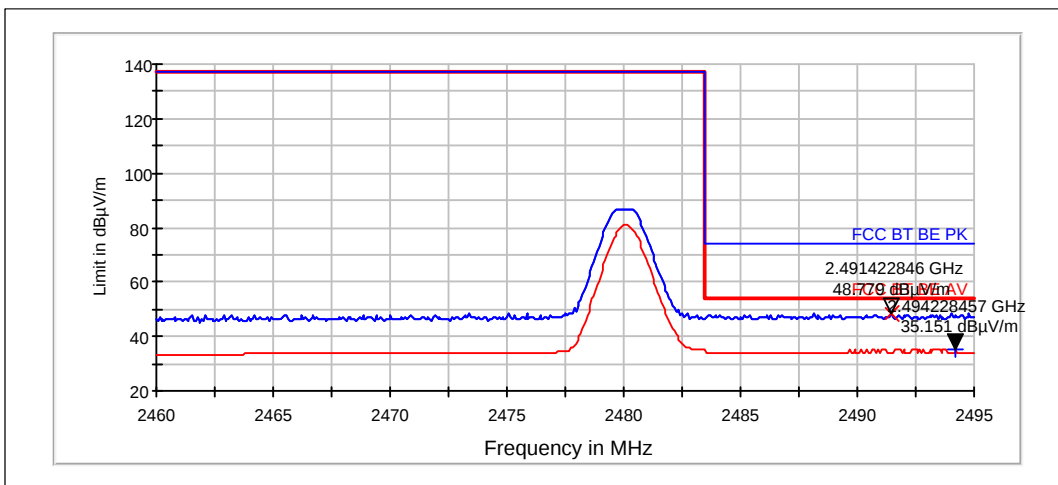
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2388	47.46	235.912	46.72	0.75	0.745	PASSED

Average (RBW: 1 MHz, VBW: 10 Hz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2385	34.05	50.396	33.31	0.75	0.745	PASSED

Channel 39 / 2480 MHz



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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2491	48.78	274.758	47.36	1.42	1.417	PASSED

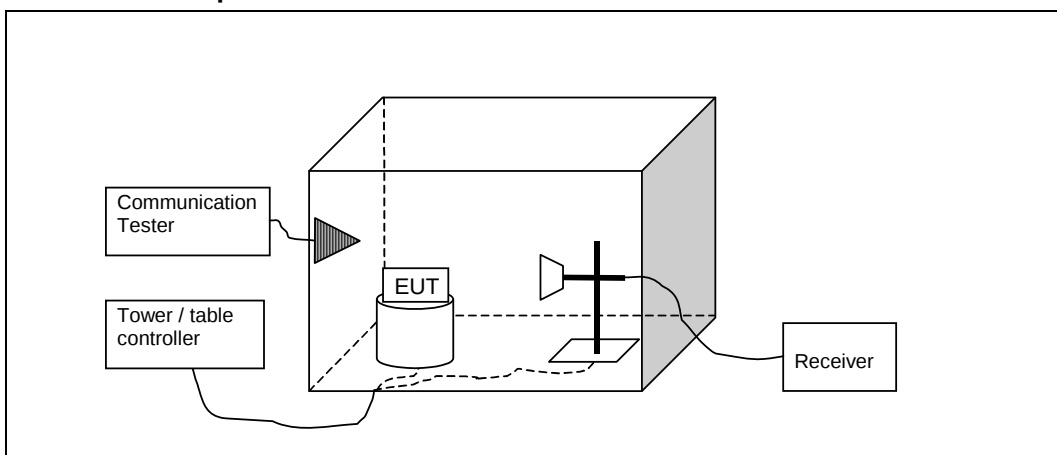
Average (RBW: 1 MHz, VBW: 10 Hz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2494	35.15	57.22	33.73	1.42	1.417	PASSED

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

EUT with DUT number	RM-820, DUT 17856
Accessories with DUT numbers	AC-60E, DUT 17834 ; WH-208, DUT 17835
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 38 / 99.7
Date of measurements	11-Nov-2013
Measured by	Kalle Hannila

8.1.1 Test setup



8.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 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

8.3. Bluetooth Low Energy test results

Channel 20 / 2442 MHz

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
4881.3	41.29	116.038	42.45	-1.16	32.7	74	PASSED
7321.9	46.82	219.255	42.1	4.72	27.2	74	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
34.858	25.49	18.808	31.93	-6.44	14.5	40	PASSED
35.986	26.38	20.845	33.53	-7.15	13.6	40	PASSED
37.899	25.36	18.544	33.71	-8.35	14.6	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
4881.3	28.57	26.832	29.73	-1.16	25.4	54	PASSED
7321.9	34.35	52.149	29.63	4.72	19.6	54	PASSED

Channel 0 / 2402 MHz

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
4824	40.99	112.06	42.22	-1.23	33	74	PASSED
7236.3	46.71	216.396	42.58	4.13	48.5	95	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
4824	27.91	24.86	29.14	-1.23	26.1	54	PASSED
7236.3	33.83	49.147	29.7	4.13	---	---	PASSED

Channel 39 / 2480 MHz

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
4925.8	41.78	122.73	42.81	-1.03	32.2	74	PASSED
7384.7	47.53	237.848	42.22	5.31	26.5	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
4925.8	28.83	27.65	29.86	-1.03	25.1	54	PASSED
7384.7	34.73	54.5	29.42	5.31	19.3	54	PASSED

9. Test Equipment

9.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
6038	Data Logger	Testo 580	Testo	-
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	-
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	-
2389	Signal Generator	SMJ 100A	R&S	-
6009	GPS Antenna	SA-700	Chronos	-
6010	GPS Network amplifier	NLA20FPDC	GPS Networking, Inc	-
6011	GPS signal Splitter	LDCBS1x4	GPS Networking, Inc	-
6015	Receiver	ESIB 40	R&S	-
2059	V-network	ESH3-Z6	R&S	-
6044	V-network	ESH3-Z6	R&S	-
2390	Directional Coupler	DC2600	AR	-
1916	Communication Tester	CMTA84	R&S	-
6012	CDN	CDN USB/c	Teseq	-
2388	Bluetooth Tester	CBT	R&S	-
6046	Attenuator 10dB	8493C	Agilent	-
6047	Attenuator 20dB	8493C	Agilent	-
6036	Data Logger	175-H2	Testo	-
6045	Power splitter	11667B	Agilent	-
6039	USB Interface	5541765	Testo	-
10479	Communication Tester	CMW500	R&S	-
6094	Communication Tester	CMW500	R&S	-
6096	EMC Analyzer	E7405A	HP	-
6016	ESD Gun	PESD1610	Haefely	-
6098	Signal Generator	8648C	Agilent	-
6103	Bluetooth tester	CBT	R&S	-
6113	Signal Generator	SMF100A	R&S	-
6120	Thermal Chamber	WT 20/40	Weiss	-
6121	Power Splitter	11667B	Agilent	-
6122	Power Splitter	11667B	Agilent	-
6134	Attenuator 10dB	BW-S10-2W263+	Mini-Circuits	-
6136	Attenuator 20dB	BW-S20-2W263+	Mini-Circuits	-
2359	Temperature Test Chamber	VT4002	Vötsch	-
2347	Communication Tester	CMU200	R&S	-
2180	Communication Tester	CMU200	R&S	-
2156	Communication Tester	CMU200	R&S	-
1999	Receiver	ESIB26	R&S	-
2352	Spectrum Analyzer	FSP-30	R&S	-
2097	Pulse Limiter	ESH3-Z2	R&S	-
2060	LISN 50 µH	ESH3-Z5	R&S	-
1759	LISN 50 µH	ESH3-Z5	R&S	-
2039	Power Supply	PL330QMD	Thurlby	-
1992	Signal Generator	83630B	Agilent	-
2206	Signal Generator	SMX	R&S	-
2156	Communication Tester	CMU200	R&S	-
2180	Communication Tester	CMU200	R&S	-
2347	Communication Tester	CMU200	R&S	-
6094	Communication Tester	CMW500	R&S	-
10479	Communication Tester	CMW500	R&S	-

9.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
6038	Data Logger	Testo 580	Testo	-
6014	Substitute Calibration Cable	Sucoflex 104PB	Suhner	-
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	-
-	BT / WLAN Antenna	SPA 2400/75/9/0/V	Huber-Suhner	-
2389	Signal Generator	SMJ 100A	R&S	-
6009	GPS Antenna	SA-700	Chronos	-
6010	GPS Network amplifier	NLA20FPDC	GPS Networking, Inc	-
6011	GPS signal Splitter	LDCBS1x4	GPS Networking, Inc	-
1988	Antenna	HL562	R&S	-
-	RF immunity / Emission Software	EMC32	R&S	-
1917	Communication Tester	CMTA84	R&S	-
2388	Bluetooth Tester	CBT	R&S	-
6037	Data Logger	175-H2	Testo	-
6039	USB Interface	5541765	Testo	-
6087	Antenna	BBHA 9120D	Scharzbeck	-
6088	Antenna	VUBA 9117	Scharzbeck	-
6089	Antenna	HFH2-Z2	R&S	-
10479	Communication Tester	CMW500	R&S	-
6094	Communication Tester	CMW500	R&S	-
6103	Bluetooth tester	CBT	R&S	-
6113	Signal Generator	SMF100A	R&S	-
6115	Open switch and control unit	OSP 130	R&S	-
6116	Open switch and control unit	OSP 150	R&S	-
2391	Band Reject Filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
6130	Notch Filter	WRCD1880-1.1.25/50-10SS	Wainwright	-
6131	Notch Filter	WRCT902.4-0.4/40-8SS	Wainwright	-
6135	Notch Filter	WRCJV2531/2539-2523/2547-60/12SS	Wainwright	-
2357	Band Reject Filter	WRCG2400/2483-2390/2493-35/10SS	Wainwright	-
2364	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	24
6158	Band Reject Filter	WRCT836.6-0.4/40-8SS	Wainwright	-
6159	Band Reject Filter	WRCD1747.8-0.4/40-5SS	Wainwright	-
2188	Preamplifier	AFS4-00100300-20-23P-6	Miteq	-
2140	Antenna	EMCO93110B	EMCO	-
2142	Antenna	3146	EMCO	-
2043	Band Reject Filter	WRCA824/849-0,2-6SS	Wainwright	22
2347	Communication Tester	CMU200	R&S	-
2180	Communication Tester	CMU200	R&S	-
2156	Communication Tester	CMU200	R&S	-
2027	CDN	M2 (modified) DC1	MEB	-
2028	CDN	M3 (modified) DC2	MEB	-
2176	CDN	CDN 801-M3	Lüthi	-
2135	CDN	CDN 801-M3	Lüthi	-
1984	Antenna	BBHA 9120 D	Schwarzbeck	-
6017	Antenna	SBA 9113	Schwarzbeck	-
2009	Signal Generator	SMP 22	R&S	-
2029	Power Supply	PL330	Thurlby	-
2361	Anechoic Chamber	3 m Semi / Full Anechoic Chamber	Euroshield	-
2353	Receiver	ESIB26	R&S	-

Eq. No	Equipment	Type	Manufacturer	Used in
2348	Controller	G-1000DXC	Yaesu	-
2349	Computer Controller	GS-232B	Yaesu	-
6160	Probe	NRP-Z22	R&S	-
6161	Probe	NRP-Z22	R&S	-
6212	Antenna Array system	-	TCC	-
2156	Communication Tester	CMU200	R&S	-
2180	Communication Tester	CMU200	R&S	-
2347	Communication Tester	CMU200	R&S	-
6094	Communication Tester	CMW500	R&S	-
10479	Communication Tester	CMW500	R&S	-