

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBTLE_RM-846_46	Date of Report:	21-May-2013
Number of pages:	26	Customer's Contact person:	Sarna Janne
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-846 / Battery BL-4J / Charger AC-50E / Data Cable CA-190CD / Headset WH-108		
FCC ID:	PDNRM-846X	IC:	661R-RM846
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:			

Jari Jantunen, System Manager, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	02-May-2013
Testing completed	08-May-2013
The customer's contact person	Sarna Janne
Test Plan referred to	T:\Projects\RM-846\TestPlan\RS_testplan_RM-846_BTLE_enabled.xlsm
Notes	-
Document name	T:\Projects\RM-846\EMC\FCC15CBTLE_RM-846_46.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-846	354636050013344;059N7C6	5000	-	3035.0000.1317.0000	43018
Phone	RM-846	354636050013302;059N7C6	5000	-	3035.0000.1317.0000	43020
Battery	BL-4J	5402433090113291;0670673	-	-	-	43019
Charger	AC-50E	4090492023260400460	-	-	-	42769
Data Cable	CA-190CD	-	-	-	-	42918
Headset	WH-108	-	4.0	4.0	-	42926

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.

The test results of PDNRM-846 are re-used for certification of the PDNRM-846X. The table above indicates the results, which will be re-used.

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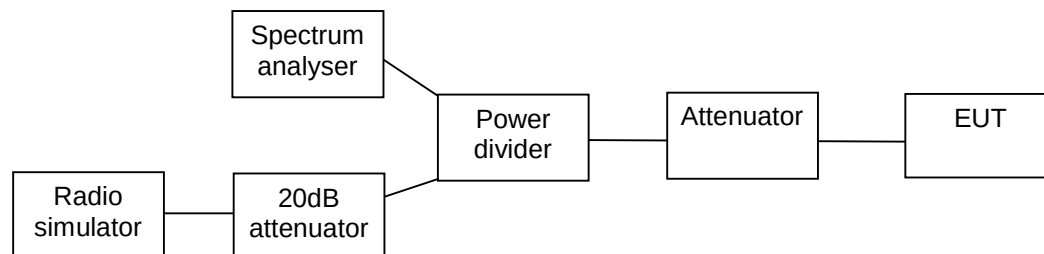
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2. Conducted peak output power (15.247(b)(1), RSS-210 A8.4 (4))

EUT with DUT number	RM-846, DUT 43018
Accessories with DUT numbers	BL-4J, DUT 43019
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 36 / 101.8
Date of measurements	03-May-2013
Measured by	Hannu Söderholm

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

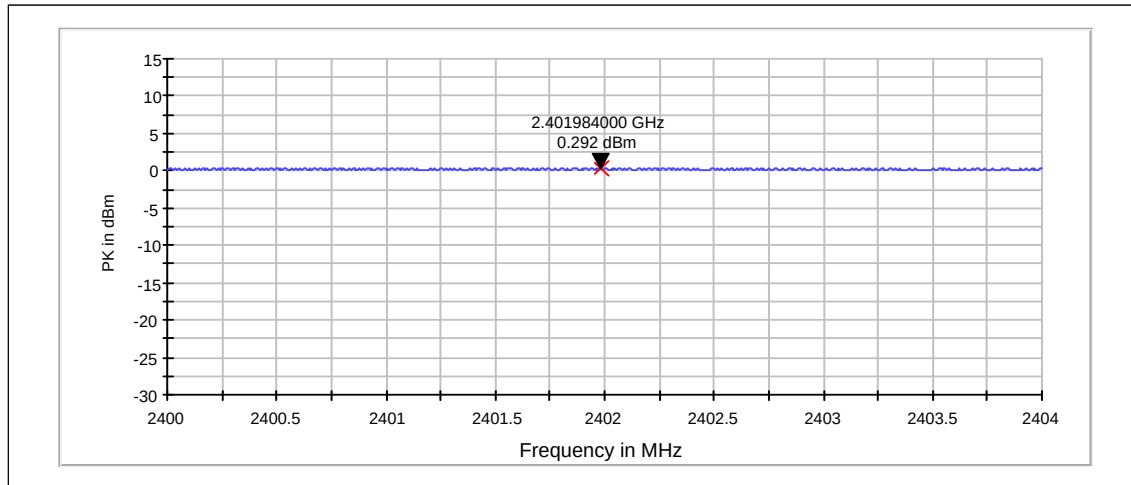
2.3. Bluetooth Low Energy Test results

2.3.1 BTLE modulation, PRBS packet type

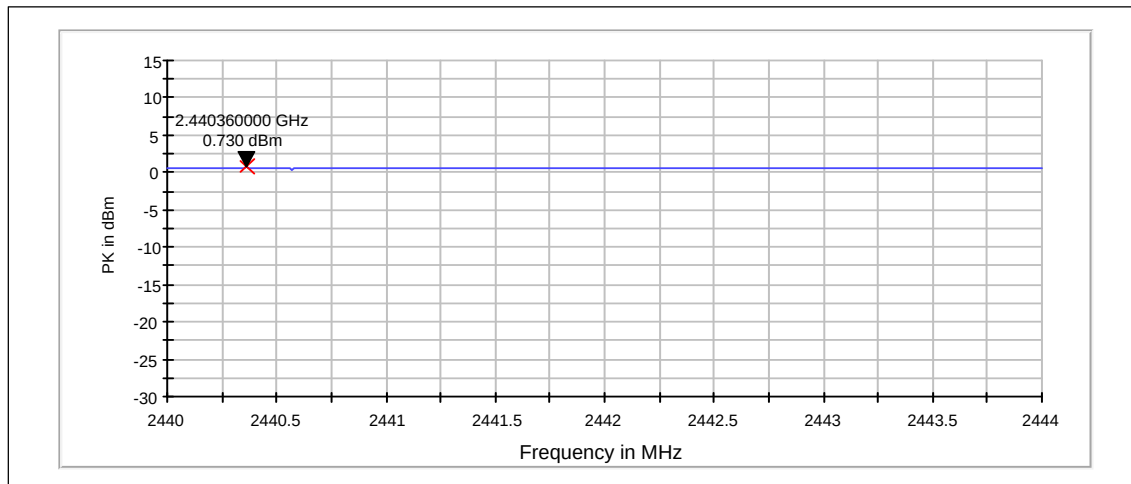
Peak (RBW: 1 MHz, VBW: 3 MHz, Max hold)

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	0.29	1.069	PASSED
20 / 2442	0.73	1.183	PASSED
39 / 2480	0.94	1.242	PASSED

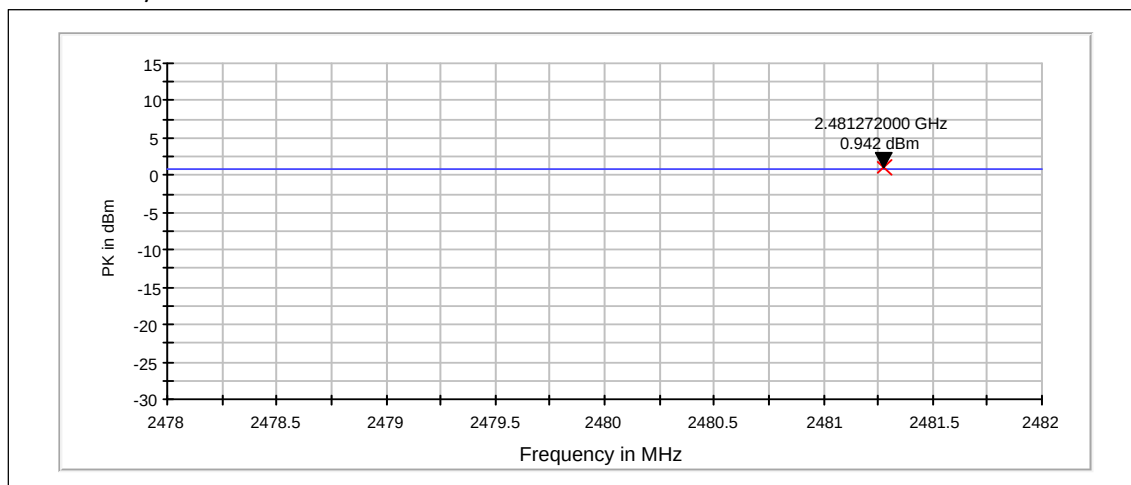
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



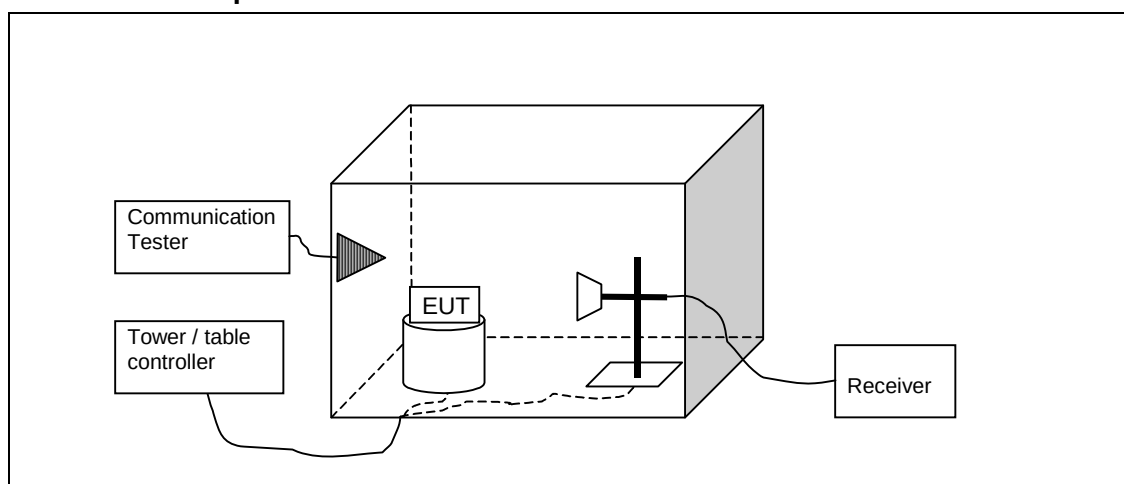
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-846, DUT 43020
Accessories with DUT numbers	BL-4J, DUT 43019 ; AC-50E, DUT 42769 ; CA-190CD, DUT 42918 ; WH-108, DUT 42926
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 98.6
Date of measurements	08-May-2013
Measured by	Jari Jantunen

3.1.1 Test setup



3.2. 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:

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

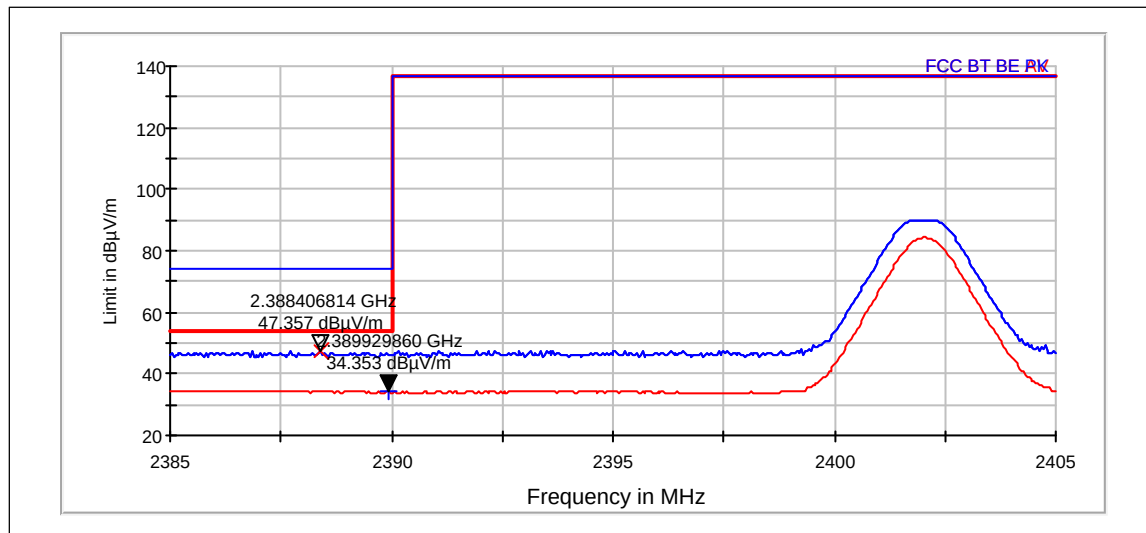
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

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)

3.3. Bluetooth Low Energy test results

Channel 0 / 2402 MHz



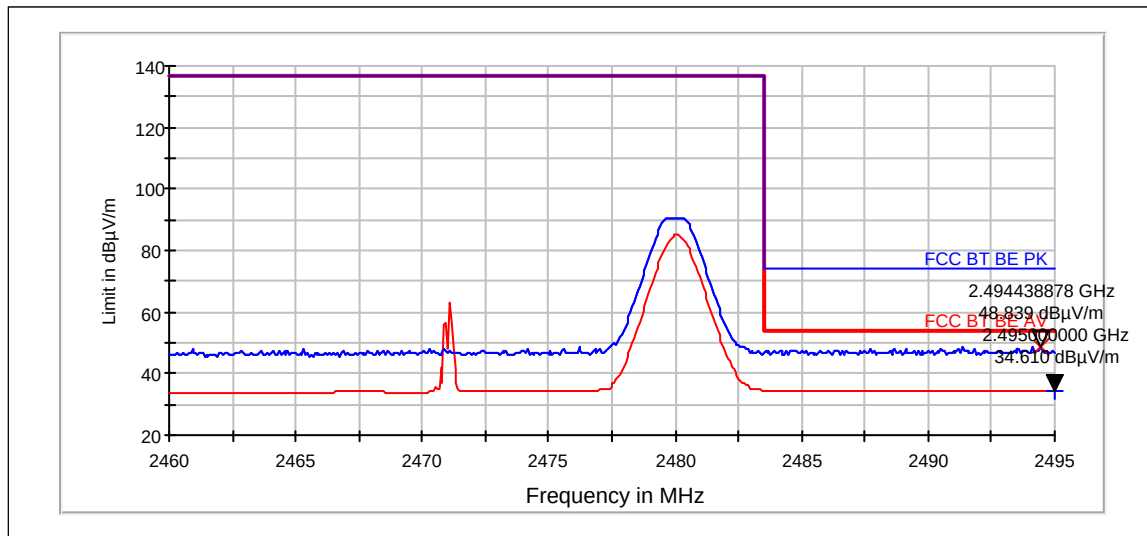
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2388	47.36	233.265	57.13	-9.77	-9.767	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
2390	34.35	52.198	44.12	-9.77	-9.767	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
2494	48.84	276.662	58.08	-9.24	-9.242	PASSED

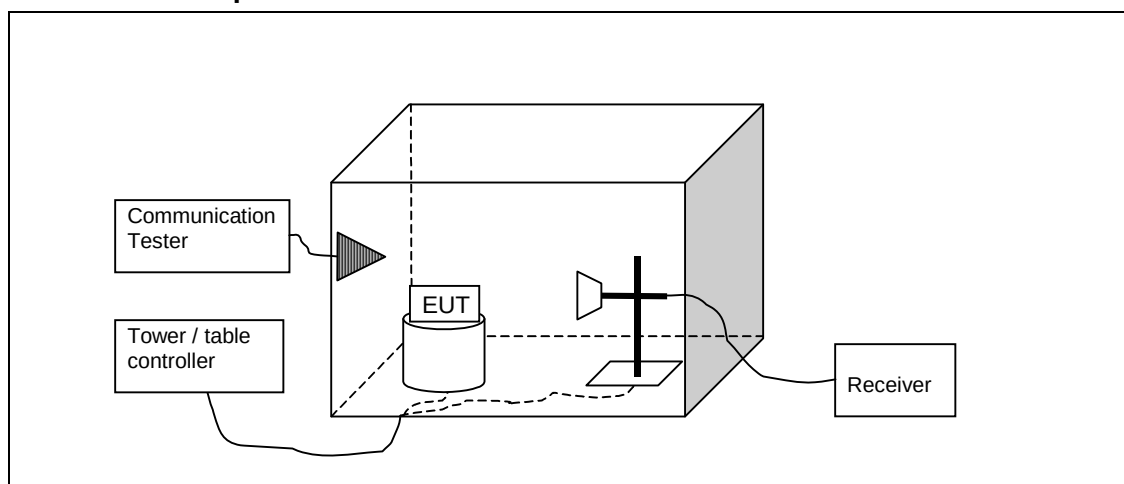
Average (RBW: 1 MHz, VBW: 10 Hz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2495	34.61	53.765	43.85	-9.24	-9.242	PASSED

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

EUT with DUT number	RM-846, DUT 43020
Accessories with DUT numbers	BL-4J, DUT 43019 ; AC-50E, DUT 42769 ; CA-190CD, DUT 42918 ; WH-108, DUT 42926
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 98.6
Date of measurements	08-May-2013
Measured by	Jari Jantunen

4.1.1 Test setup



4.2. 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

4.3. Bluetooth Low Energy test results

4.4. BTLE 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]	Margin	Limit [dBμV/m]	Results
4825.5	40.82	109.837	43.26	-2.44	33.2	74	PASSED
7234.2	43.95	157.616	42.24	1.71	30.1	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
4825.5	27.77	24.468	30.21	-2.44	26.2	54	PASSED
7234.2	31.28	36.661	29.57	1.71	22.7	54	PASSED

Channel 20 / 2442 MHz

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
30.03	18.6	8.515	38.31	-19.71	21.4	40	PASSED
30.3	18.25	8.177	38.08	-19.83	21.7	40	PASSED
913.615	20.96	11.17	37.34	-16.38	25.1	46	PASSED

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
4879.3	40.92	111.109	43.26	-2.34	33.1	74	PASSED
7318.3	44.56	168.986	42.25	2.31	29.4	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
4879.3	28.44	26.436	30.78	-2.34	25.5	54	PASSED
7318.3	31.78	38.833	29.47	2.31	22.2	54	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
4922.9	42.25	129.554	44.09	-1.84	31.8	74	PASSED
7386.7	45.14	180.717	42.73	2.41	28.9	74	PASSED

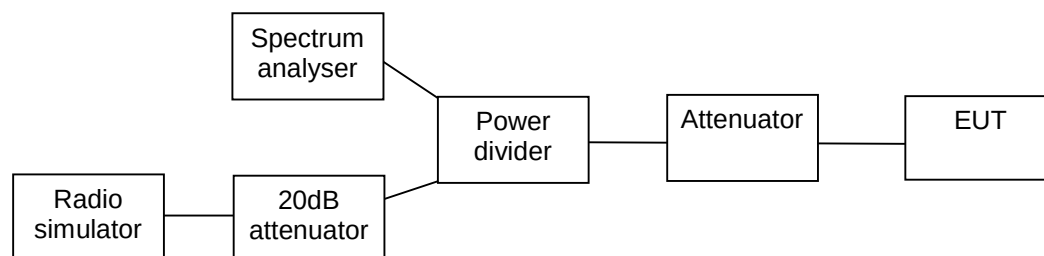
Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
4922.9	29.3	29.157	31.14	-1.84	24.7	54	PASSED
7386.7	31.57	37.897	29.16	2.41	22.4	54	PASSED

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

EUT with DUT number	RM-846, DUT 43018
Accessories with DUT numbers	BL-4J, DUT 43019
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 36 / 101.8
Date of measurements	03-May-2013
Measured by	Hannu Söderholm

5.1. Test Setup



5.2. 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 5.4.1.1 of the KDB 558074, using 5-30 % wider span than the EBW.

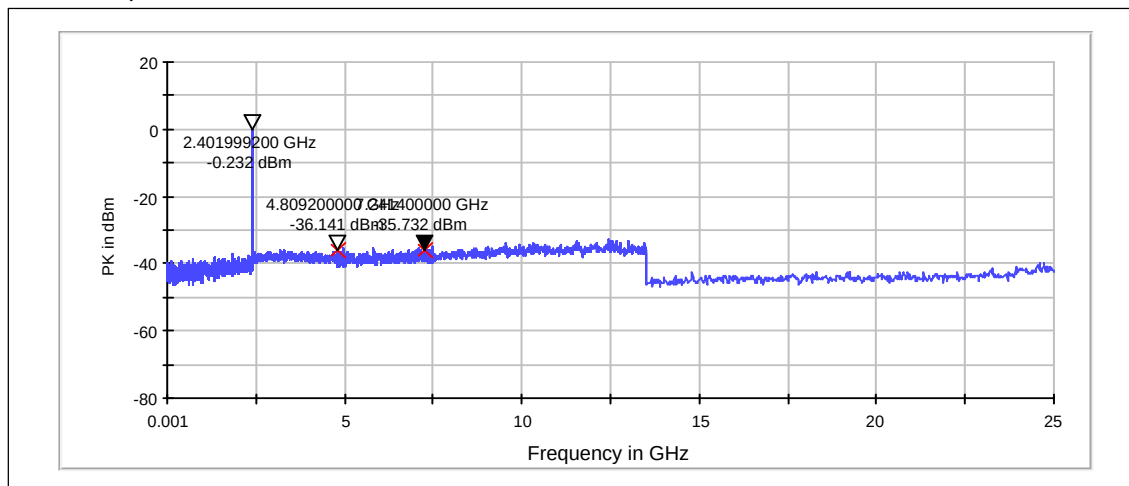
Limits for spurious RF conducted emissions measurements

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

5.3. Bluetooth Low Energy Test results

5.3.1 BTLE modulation, PRBS packet type

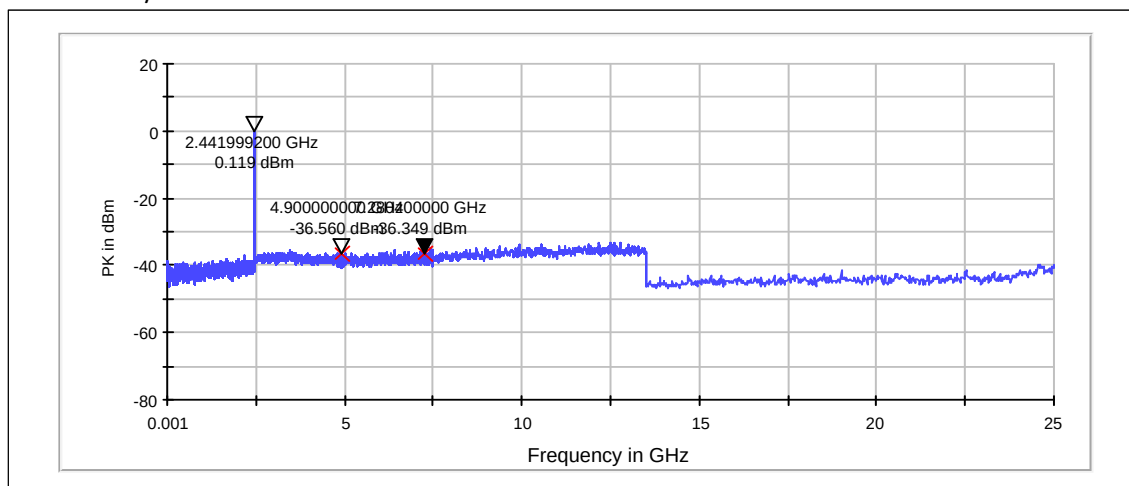
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
4809.200	-36.14	PASSED
7241.400	-35.73	PASSED

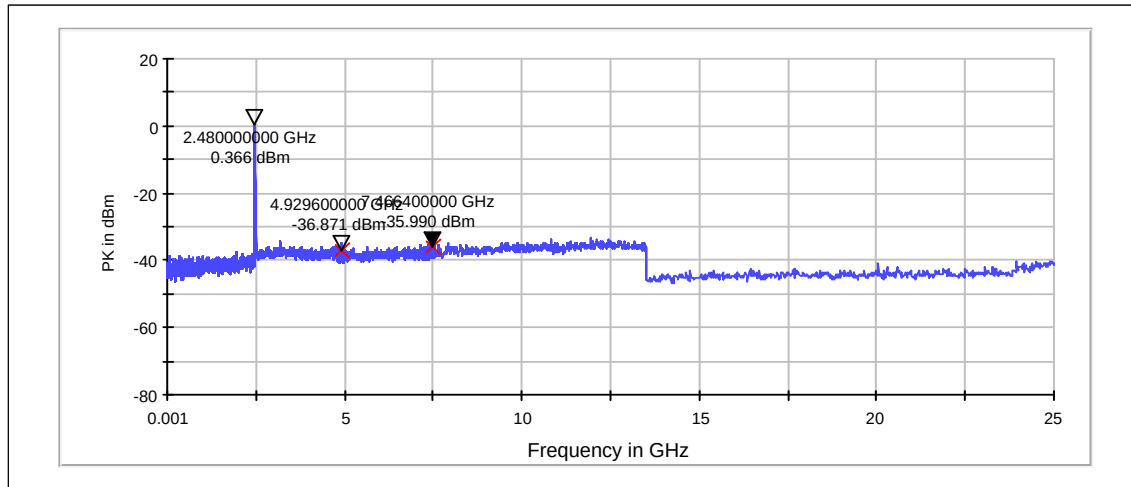
Channel 20 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
4900.000	-36.56	PASSED
7280.400	-36.35	PASSED

Channel 39 / 2480 MHz



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

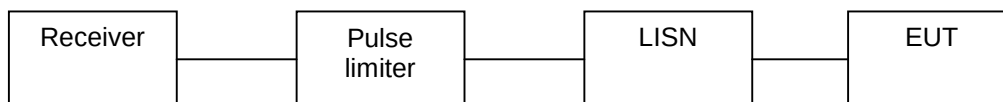
Frequency [MHz]	P [dBc]	Result
4929.600	-36.87	PASSED
7466.400	-35.99	PASSED

6. AC powerline conducted emissions

FCC §15.207, RSS-GEN 7.2.2

EUT with DUT number	RM-846, DUT 43020
Accessories with DUT numbers	BL-4J, DUT 43019 ; AC-50E, DUT 42769 ; CA-190CD, DUT 42918 ; WH-108, DUT 42926
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 99.9
Date of measurements	03-May-2013
Measured by	Hannu Söderholm

6.1. Test Setup



6.2. Test method and limit

The measurement is made according to Public notice DA 00-705 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:

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

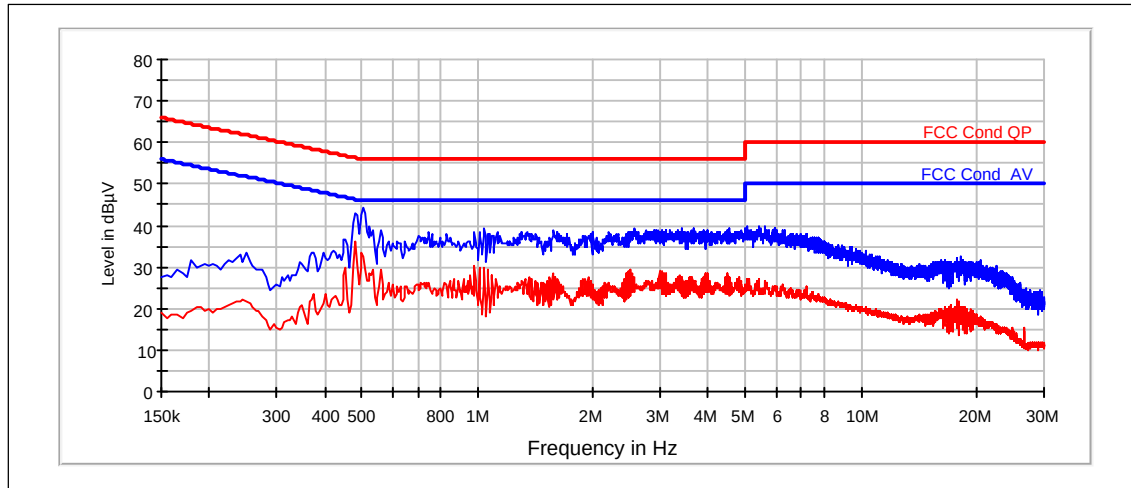
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

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

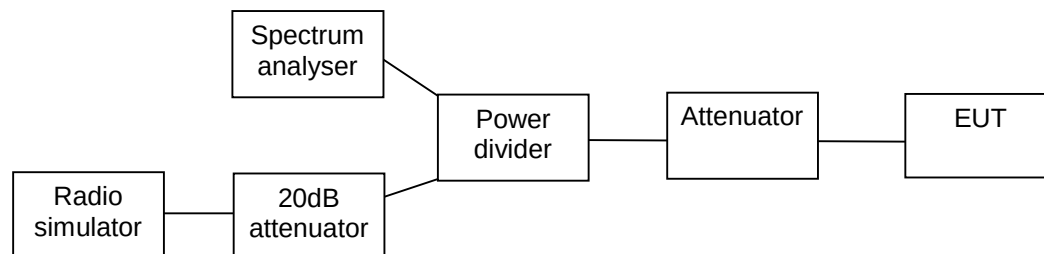
Channel 20 / 2442 MHz



7. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))

EUT with DUT number	RM-846, DUT 43018
Accessories with DUT numbers	BL-4J, DUT 43019
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 36 / 101.8
Date of measurements	03-May-2013
Measured by	Hannu Söderholm

7.1. Test Setup



7.2. 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

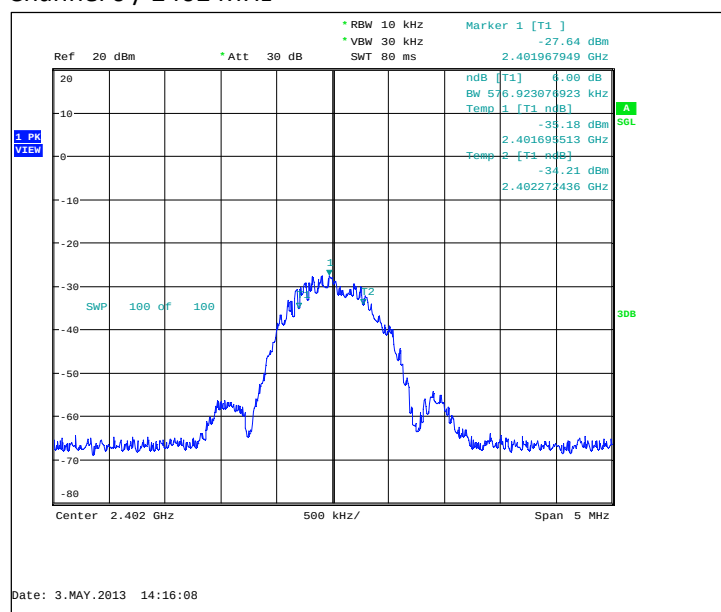
Limit [kHz]
>= 500

7.3. Bluetooth Low Energy Test results

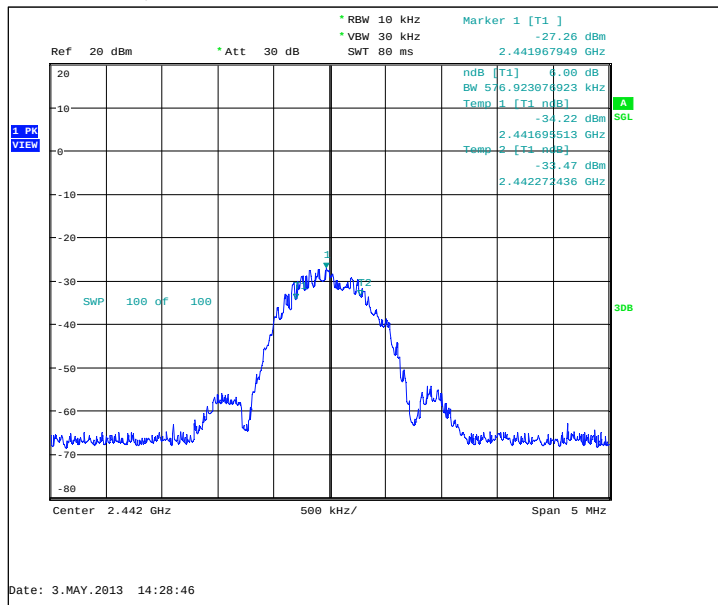
7.3.1 BTLE modulation, PRBS packet type

Channel / f _c [MHz]	6 dB bandwidth [kHz]	Result
0 / 2402	576.9	PASSED
20 / 2442	576.9	PASSED
39 / 2480	576.9	PASSED

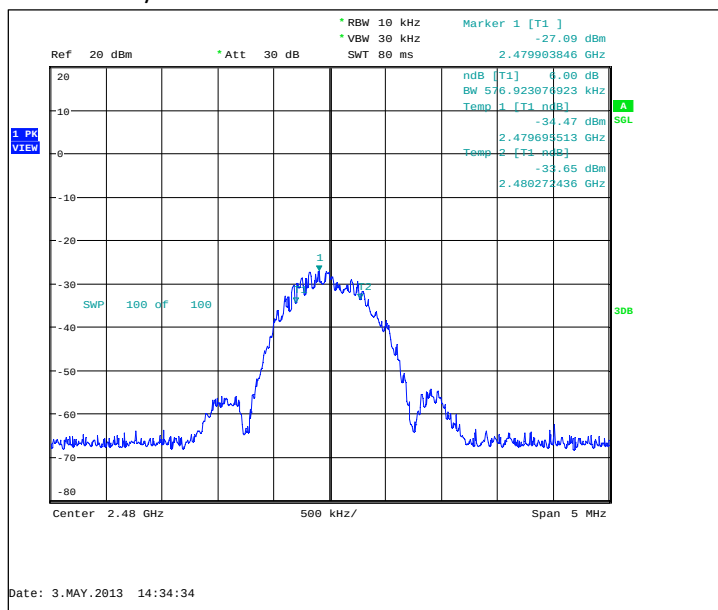
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



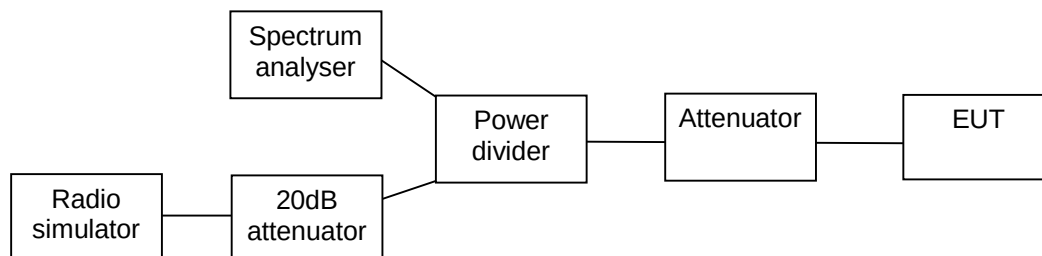
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-846, DUT 43018
Accessories with DUT numbers	BL-4J, DUT 43019
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 36 / 101.8
Date of measurements	03-May-2013
Measured by	Hannu Söderholm

8.1. Test Setup



8.2. Test method and limit

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

Result is corrected by bandwidth correction factor -15.2dB (BWCF = $10\log(3\text{ kHz}/100\text{kHz}) = -15.2\text{dB}$).

Limits for power spectral density measurements

Limit [dBm] @ 3 kHz
≤ 8

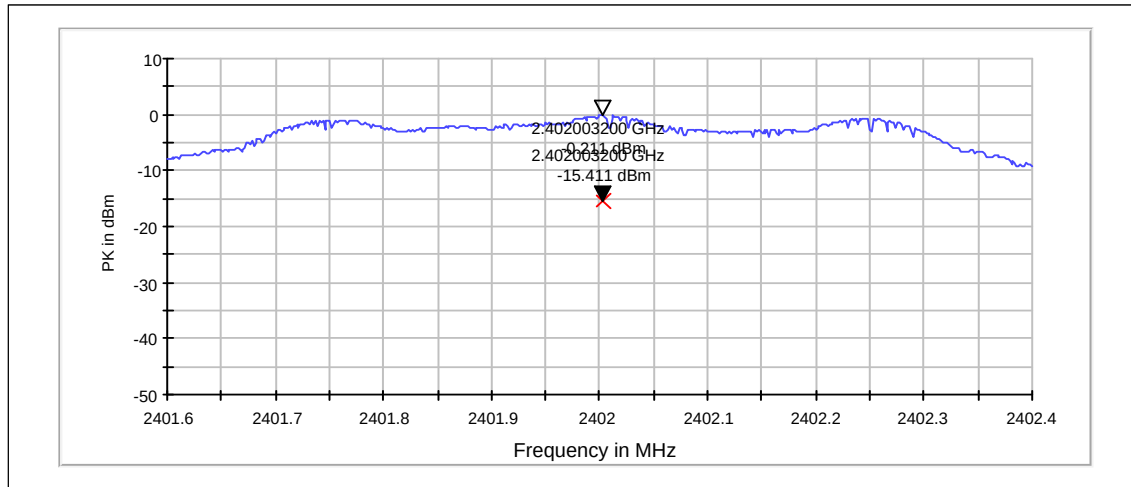
8.3. Bluetooth Low Energy Test results

8.3.1 BTLE modulation, PRBS packet type

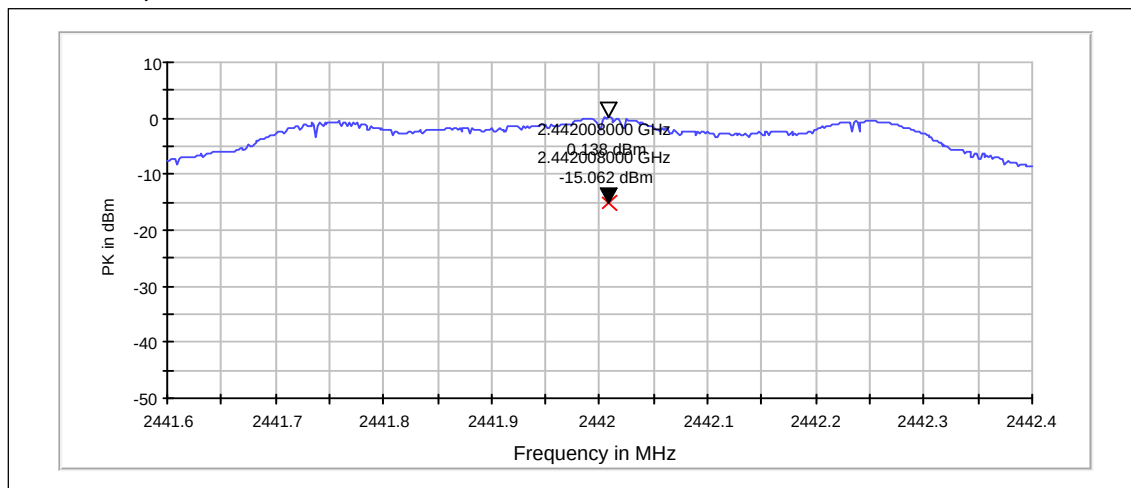
Peak (RBW: 100 kHz, VBW: 300 kHz, Max hold)

Channel / f_c [MHz]	P [dBm]	Result
0 / 2402	-15.41	PASSED
20 / 2442	-15.06	PASSED
39 / 2480	-14.8	PASSED

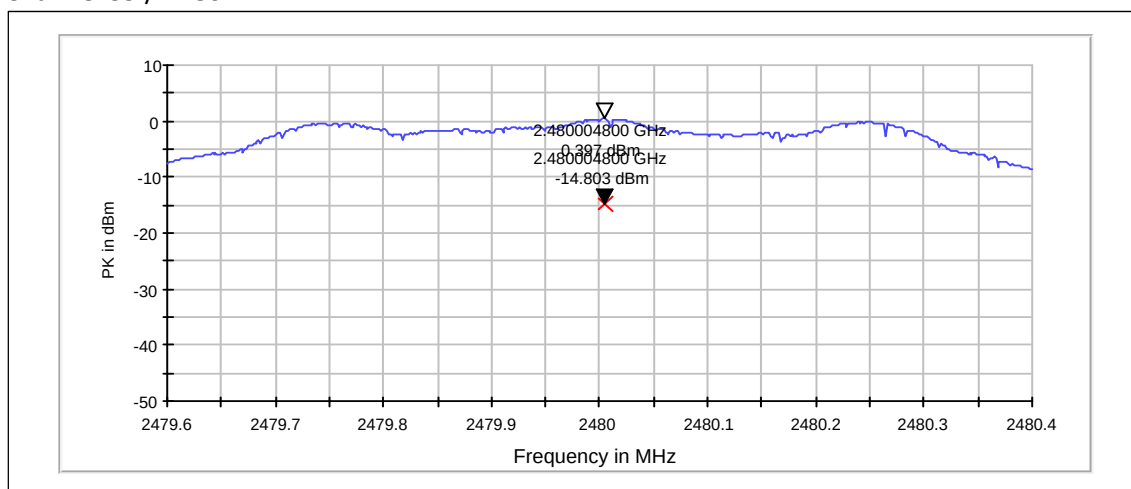
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



Channel 39 / 2480 MHz



9. Test Equipment

9.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15E, 15B
TM37678	Communication Tester	CMU200	R&S	15C, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum Analyzer	FSU26	R&S	22/24/27, 15C, 15E
TM23007	Oscilloscope	TDS684B	Tektronix	15E
TM22806	Battery	BAT 20/E	Fiskars	15C, 15B
TM22805	UPS	PS 20/1.2	Fiskars	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
-	Temperature test chamber	VT 4002	Vötsch	22/24/27
2058	Receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	15C, 15B
2002	Communication Tester	CMU200	R&S	22/24/27, 15C
2009	LISN 50 μ H	ENV216	R&S	15C, 15B
2010	LISN 50 μ H	ENV216	R&S	15C, 15B
2012	Power splitter	11667B	Agilent	22/24/27, 15C
2013	Attenuator	8493C	Agilent	22/24/27, 15C
2014	Attenuator	8493C	Agilent	22/24/27, 15C
2019	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2020	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2021	Communication Tester	CMW500	R&S	22/24/27
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C

9.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15E, 15B
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM26497	Antenna	3115	Emco	22/24/27, 15C, 15B
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15B
TM38845	Receiver	ESIB 26	R&S	22/24/27, 15C, 15E, 15B
-	Antenna	HL562	R&S	22/24/27, 15C, 15E, 15B
-	Turntable	2188	EMCO	22/24/27, 15C, 15E, 15B
-	Turntable controller	2090	EMCO	22/24/27, 15C, 15E, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15E, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15E, 15B
-	Mini mast	2075-2	ETS Lindgren	22/24/27, 15C, 15B
TM38843	Mini mast	2075	Emco	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	Emco	22/24/27, 15C, 15B
TM30643	LISN 50 μ H	LISN-5-20-2	FCC	22/24/27, 15C, 15B
TM30644	LISN 50 μ H	LISN-5-20-2	FCC	22/24/27, 15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C, 15B
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	Miteq	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	Miteq	22/24/27, 15C, 15B
TM30599	Semi anechoic chambre	UNKNOWN	TDK	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	-	22/24/27, 15C, 15E, 15B
TM38066	High pass filter	WHKX3.0/18G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
2028	High pass filter	WHKX 1.0/15G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
TM37545	Tunable notch filter	800.0/960.0-0.2/40-8SSK	Wainwright	22
TM26512	Tunable notch filter	WRCD1850/1910-0.2/40-10SSK	Wainwright	24
-	Band reject filter	WRCG1877/1883-1870/1890-40/6EE	Wainwright	24
-	Band reject filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
-	Band reject filter	WRCG832/838-825/848-40/5SS	Wainwright	22
TM23892	Controller	G-1000SDX	Yaesu	22/24/27
2001	Bluetooth tester	CBT	R&S	15C, 15B
6023	Antenna	VUBA 9117	Schwarzbeck	22/24/27
2021	Communication Tester	CMW500	R&S	22/24/27
2025	Antenna	HFH2-Z2	R&S	15C