

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBTLE_RM-845_47.docx	Date of Report:	31-Oct-2013
Number of pages:	28	Customer's Contact person:	Jerry Williams
Testing laboratory:	TCC Nokia San Diego Laboratory 16620 West Bernardo Drive San Diego, CA 92127 USA Tel. +1 858 831 5000 Fax. +1 858 831 6500	Customer:	Nokia, Inc. 16620 West Bernardo Drive San Diego, CA 92127 USA Tel. +1 858 831 5000 Fax. +1 858 385 1598
FCC listing no.:	586140		
IC recognition no.:	10162A-1		
Tested devices/ accessories:	Phone RM-845 / Dummy Battery SD-112R / Battery BP-4W / Headset WH-902 / Data Cable CA-190 / Charger AC-50U		
FCC ID:	QMNRM-845	IC:	661X-RM845
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:			

Feng You, Sr. Specialist

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	24-Oct-2013
Testing completed	30-Oct-2013
The customer's contact person	Jerry Williams
Test Plan referred to	T:\Projects\RM-845\TestPlan\RS_testplan_RM-845 BTLE.xlsm
Notes	-
Document name	T:\Projects\RM-845\EMC\FCC15CBTLE_RM-845_47.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:

GSM/CDMA/WCDMA/WLAN/Bluetooth

The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-845	352423050061850	0410	-	3051.40000.1342.0036	30802
Dummy Battery	SD-112R	20025	0.1	-	-	30803
Phone	RM-845	352423050060118	0410	-	3051.4000.1342.0036	30809
Battery	BP-4W	3932132342150100702:0670671	-	-	-	30812
Headset	WH-902	-	-	-	-	30813
Data Cable	CA-190	-	-	-	-	30814
Charger	AC-50U	4040492186270500361;0675620	-	-	-	30816

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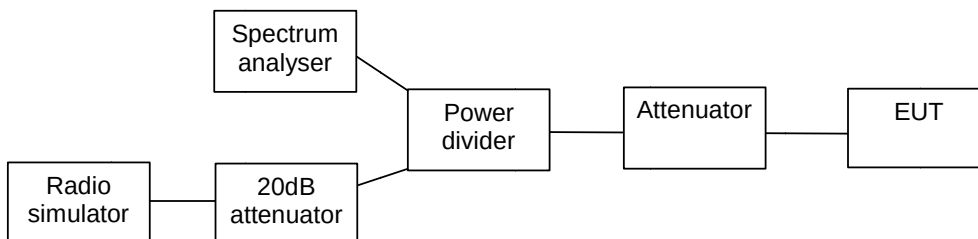
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2. Conducted peak output power (15.247(b)(1), RSS-210 A8.4 (4))

EUT with DUT number	RM-845, DUT 30802
Accessories with DUT numbers	SD-112R, DUT 30803
Operation Voltage [V] / [Hz]	3.7V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	48.8 / 21.8 / 1050
Date of measurements	28-Oct-2013
Measured by	Tyrone Hawes

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.

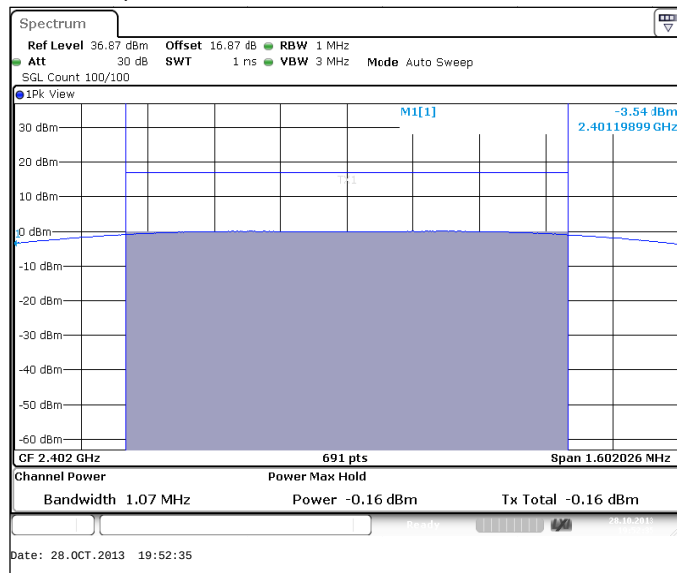
Limits for conducted peak output power measurements

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

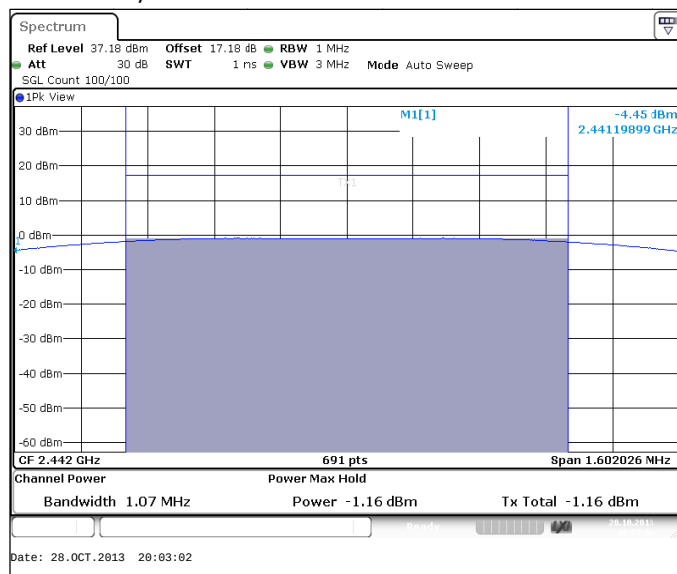
2.3. Bluetooth Low Energy Test results

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	-0.16	0.964	PASSED
20 / 2442	-1.16	0.766	PASSED
39 / 2480	-0.95	0.804	PASSED

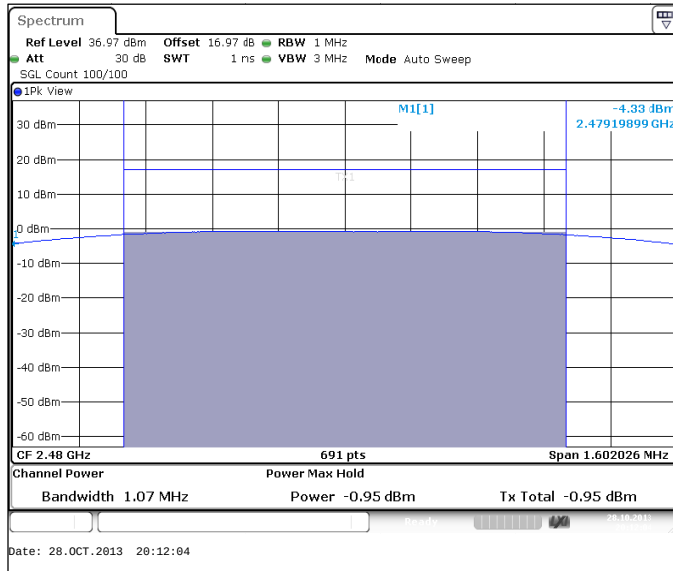
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



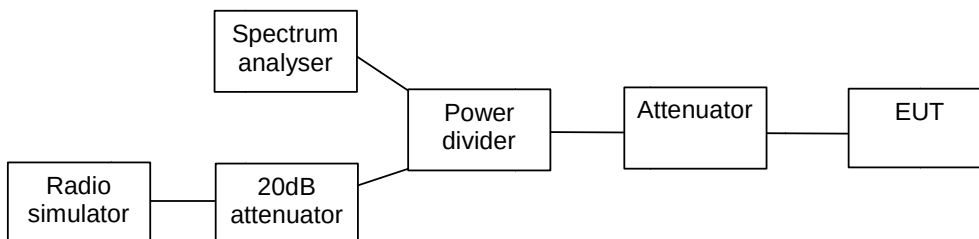
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-845, DUT 30802
Accessories with DUT numbers	SD-112R, DUT 30803
Operation Voltage [V] / [Hz]	3.7V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	48.8 / 21.8 / 1050
Date of measurements	28-Oct-2013
Measured by	Tyrone Hawes

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.

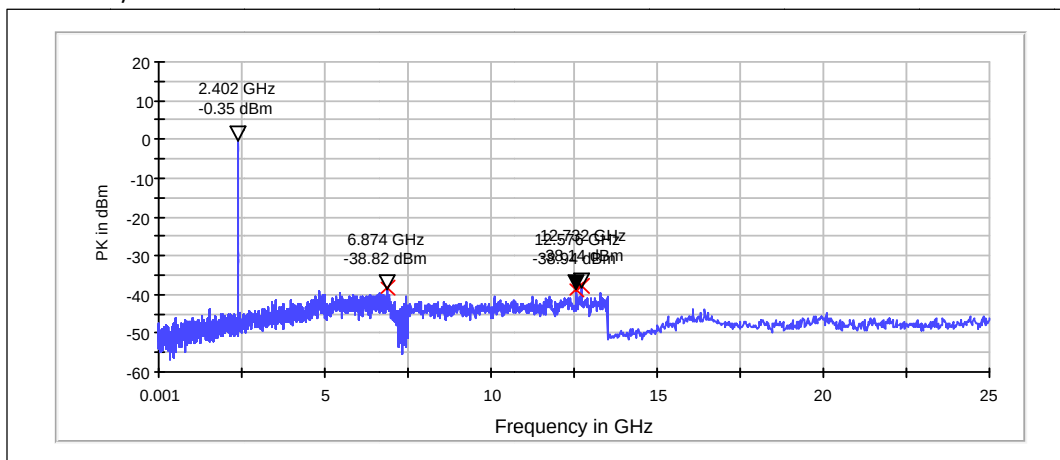
The reference level for the -20 dBc measurement was obtained as instructed in section 11.2 of the KDB 558074, using span of 1.5 times the OBW.

Limits for spurious RF conducted emissions measurements

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

3.3. Bluetooth Low Energy Test results

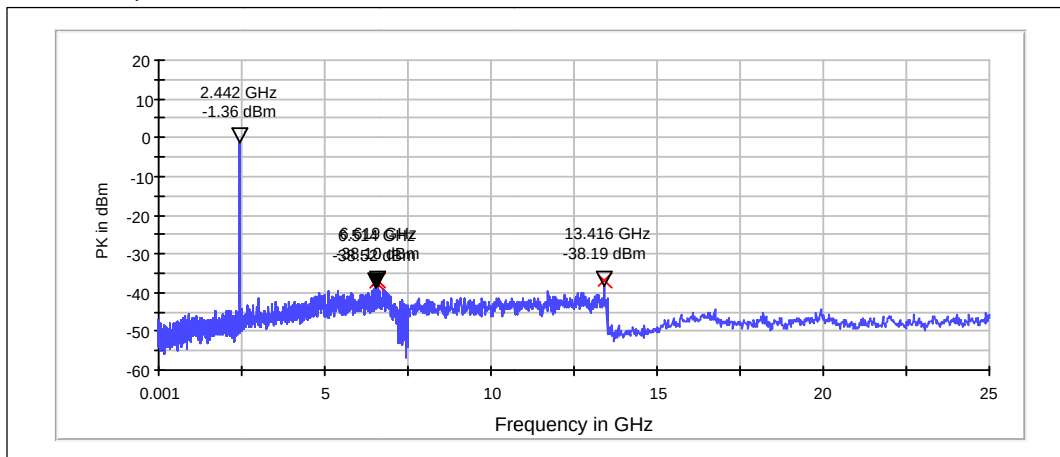
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
12732.000	-37.79	PASSED
6874.400	-38.47	PASSED
12576.000	-38.59	PASSED

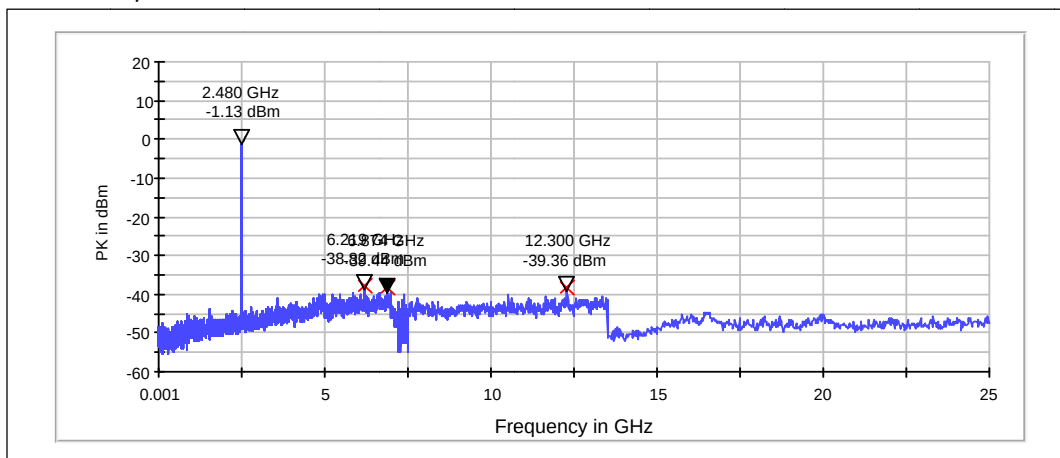
Channel 20 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
6619.200	-36.75	PASSED
13416.000	-36.84	PASSED
6513.600	-37.16	PASSED

Channel 39 / 2480 MHz



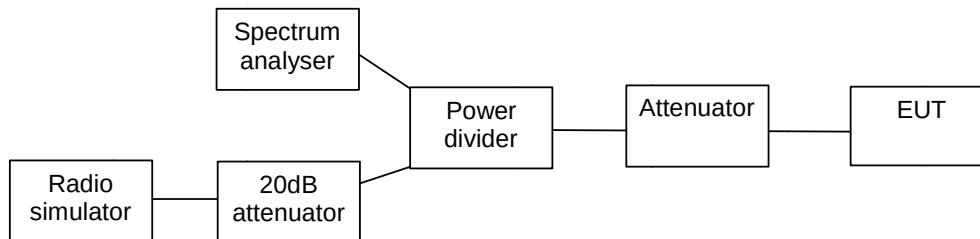
Peak (RBW: 100 kHz, VBW: 300 kHz)

Frequency [MHz]	P [dBc]	Result
6218.800	-37.69	PASSED
12300.000	-38.23	PASSED
6874.400	-38.31	PASSED

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

EUT with DUT number	RM-845, DUT 30802
Accessories with DUT numbers	SD-112R, DUT 30803
Operation Voltage [V] / [Hz]	3.7V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	48.8 / 21.8/1050
Date of measurements	28-Oct-2013
Measured by	Tyrone Hawes

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.

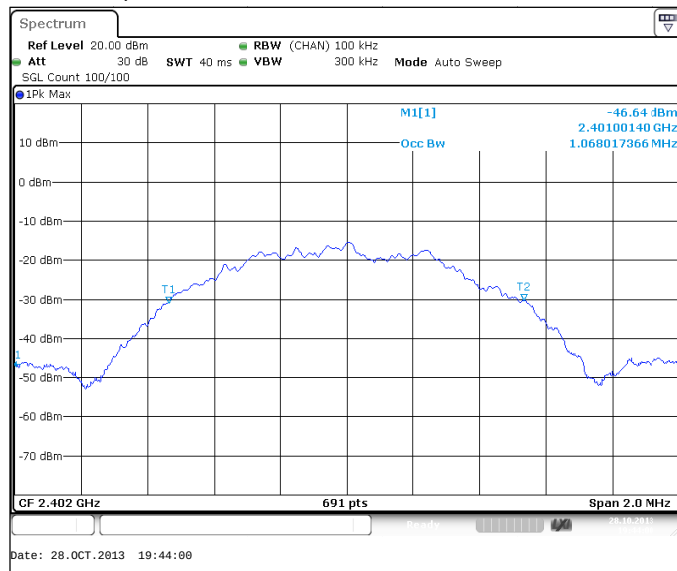
Limits for 6 dB bandwidth measurements

Limit [kHz]
>= 500

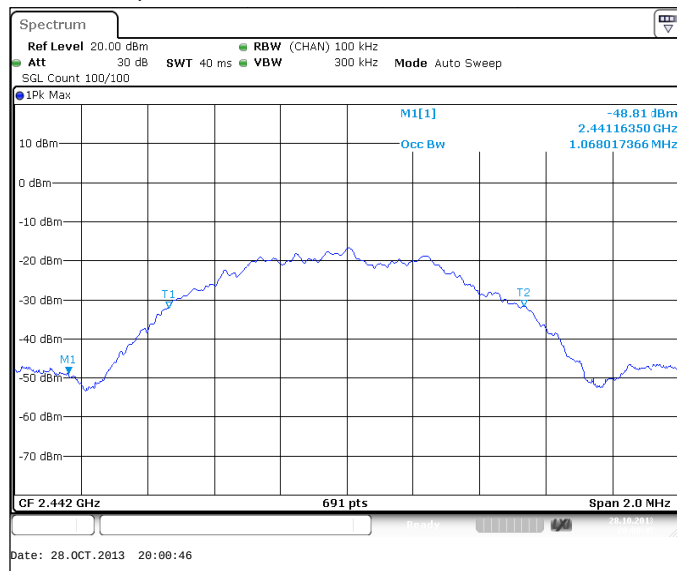
4.3. Bluetooth Low Energy Test results

Channel / f_c [MHz]	6 dB bandwidth [kHz]	Result
0 / 2402	1068	PASSED
20 / 2442	1068	PASSED
39 / 2480	1068	PASSED

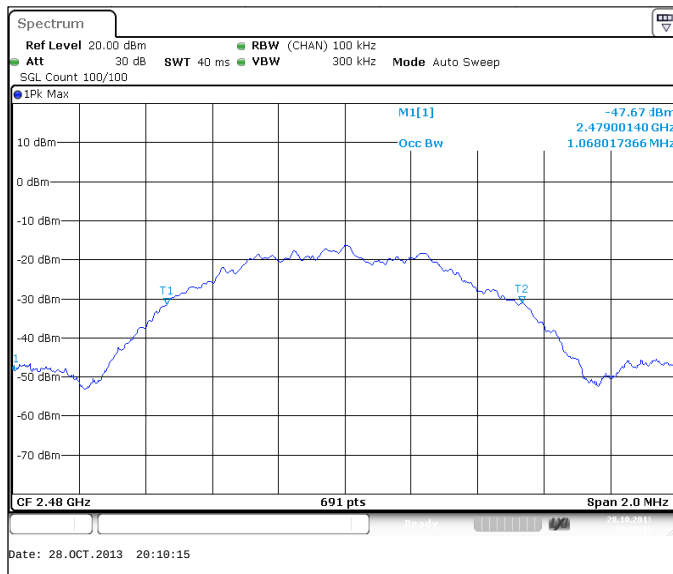
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



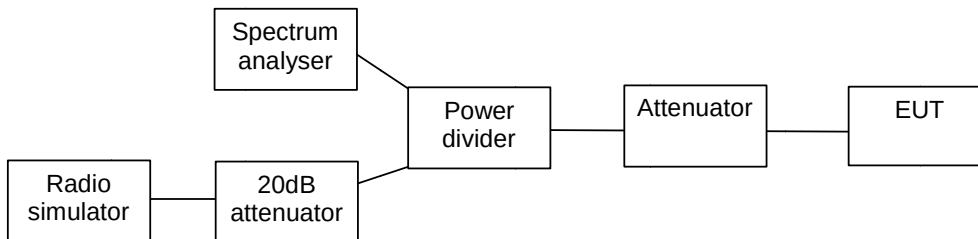
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-845, DUT 30802
Accessories with DUT numbers	SD-112R, DUT 30803
Operation Voltage [V] / [Hz]	3.7V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	48.8 / 21.8 / 1050
Date of measurements	28-Oct-2013
Measured by	Tyrone Hawes

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

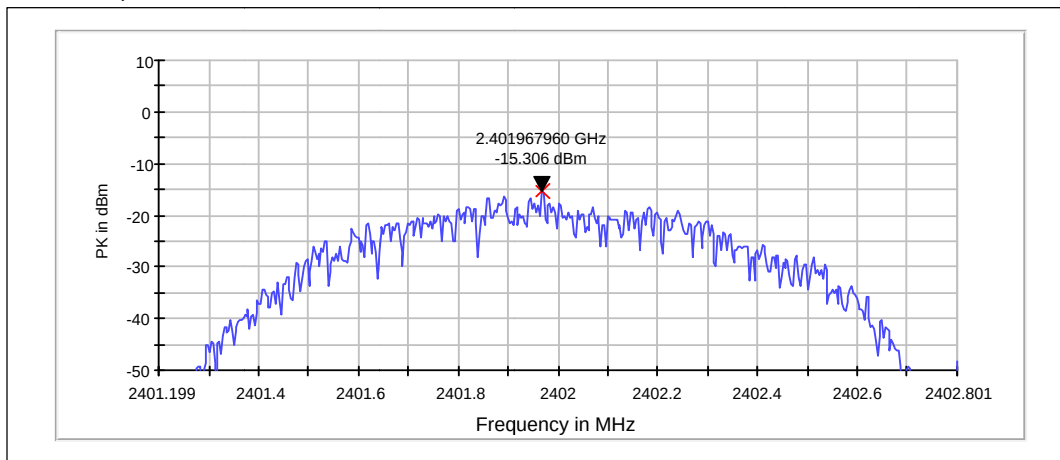
Limit [dBm] @ 3 kHz
<= 8

5.3. Bluetooth Low Energy Test results

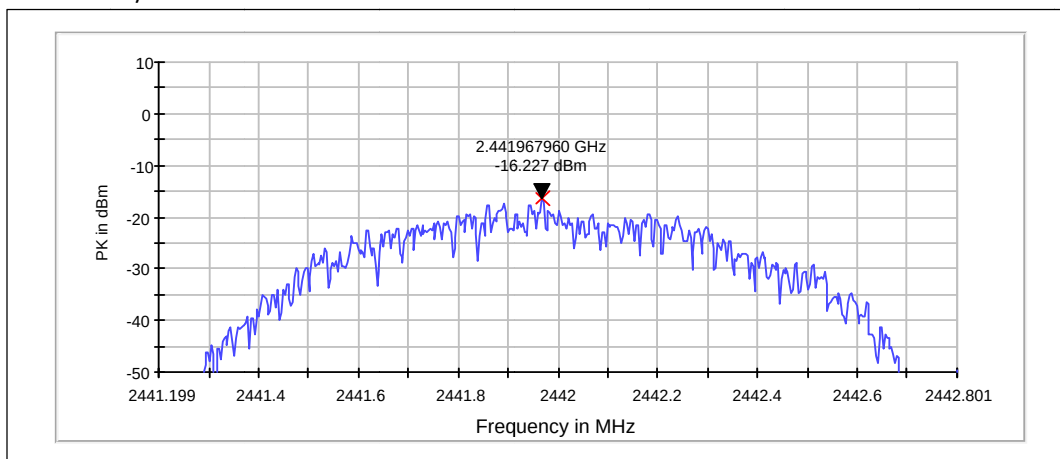
Peak (RBW: 3 kHz, VBW: 10 kHz, Max hold)

Channel / f_c [MHz]	P [dBm]	Result
0 / 2402	-15.31	PASSED
20 / 2442	-16.23	PASSED
39 / 2480	-16.03	PASSED

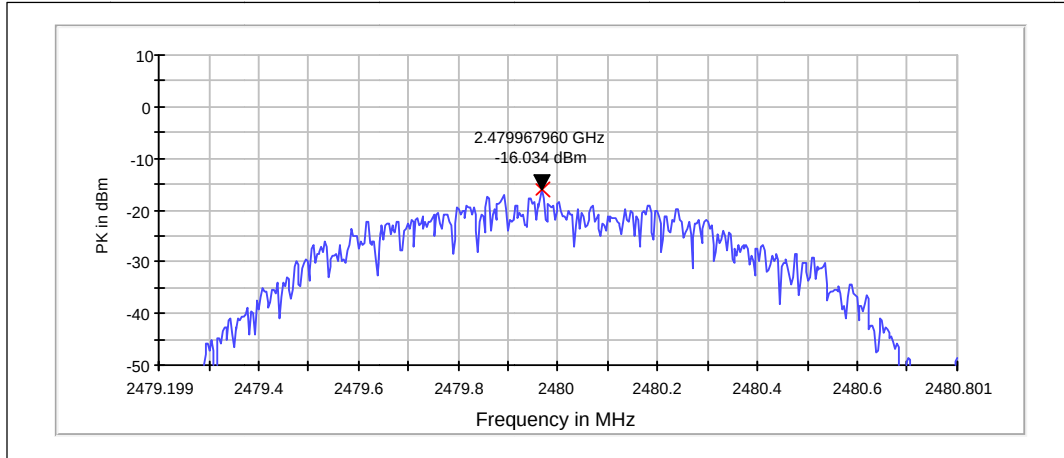
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



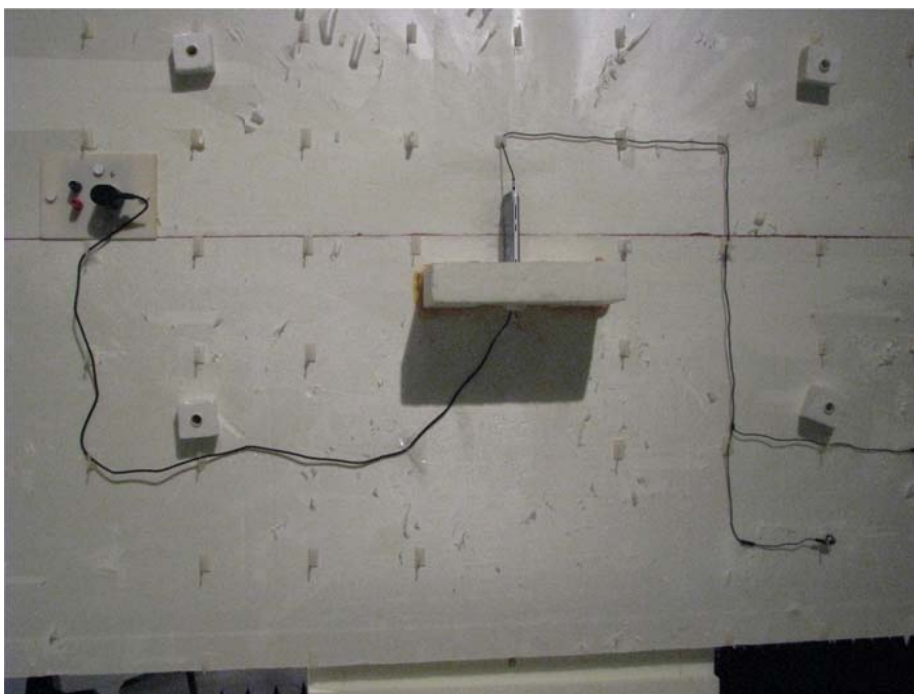
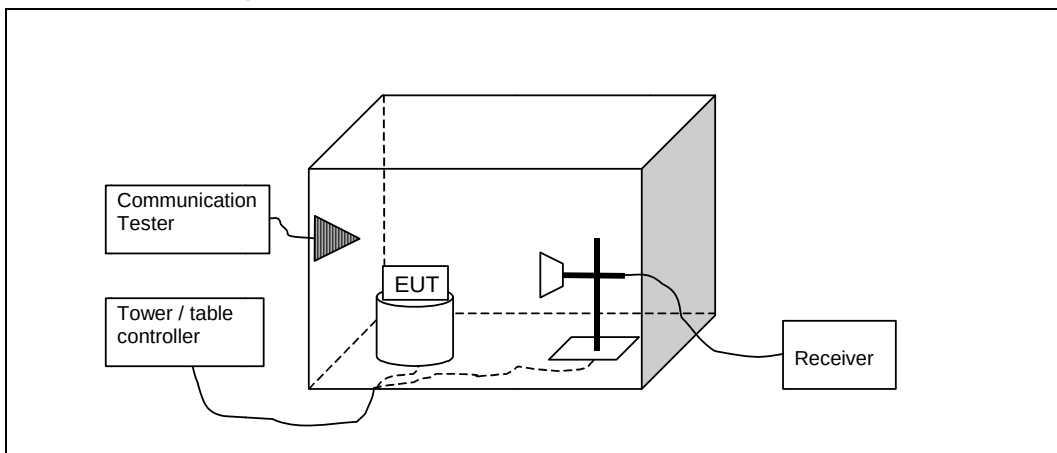
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-845, DUT 30809
Accessories with DUT numbers	BP-4W, DUT 30812 ; WH-902, DUT 30813 ; CA-190, DUT 30814 ; AC-50U, DUT 30816
Operation Voltage [V] / [Hz]	115V / 60Hz
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18.1 / 49.9 /1050
Date of measurements	25-Oct-2013
Measured by	Tyrone Hawes

6.1. Test setup



6.2. 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:

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

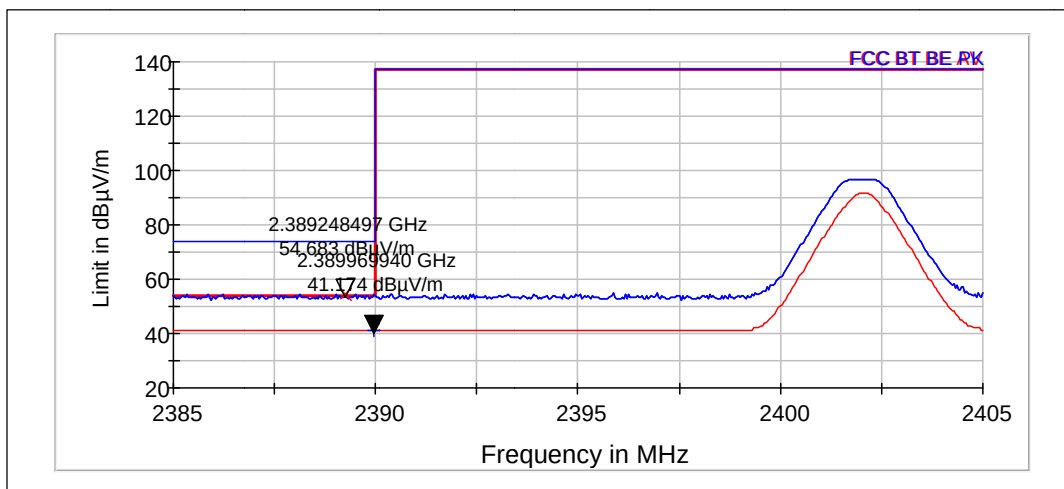
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

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)

6.3. Bluetooth Low Energy test results

Channel 0 / 2402 MHz



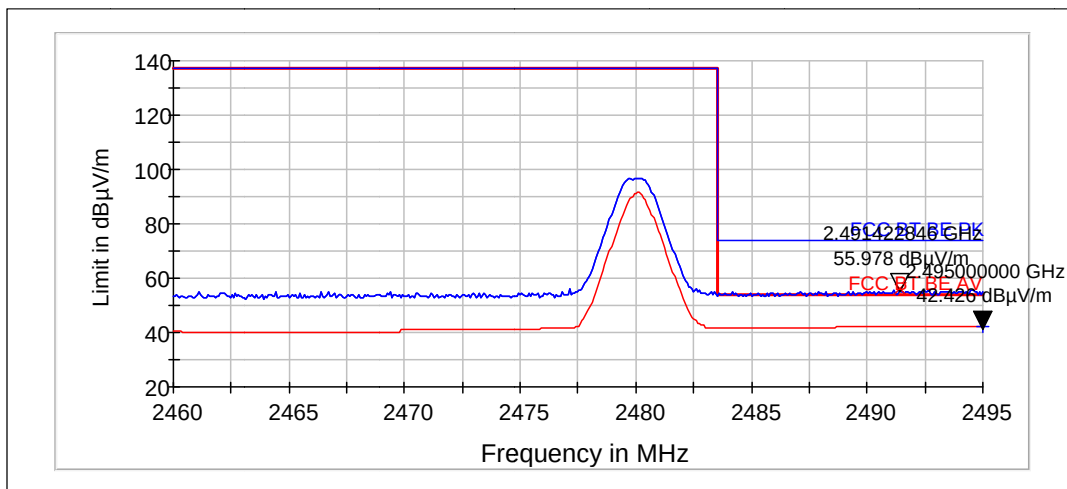
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2389	54.68	542.188	46.22	8.46	8.464	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	41.17	114.472	32.71	8.46	8.464	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	55.98	629.361	47.02	8.96	8.96	PASSED

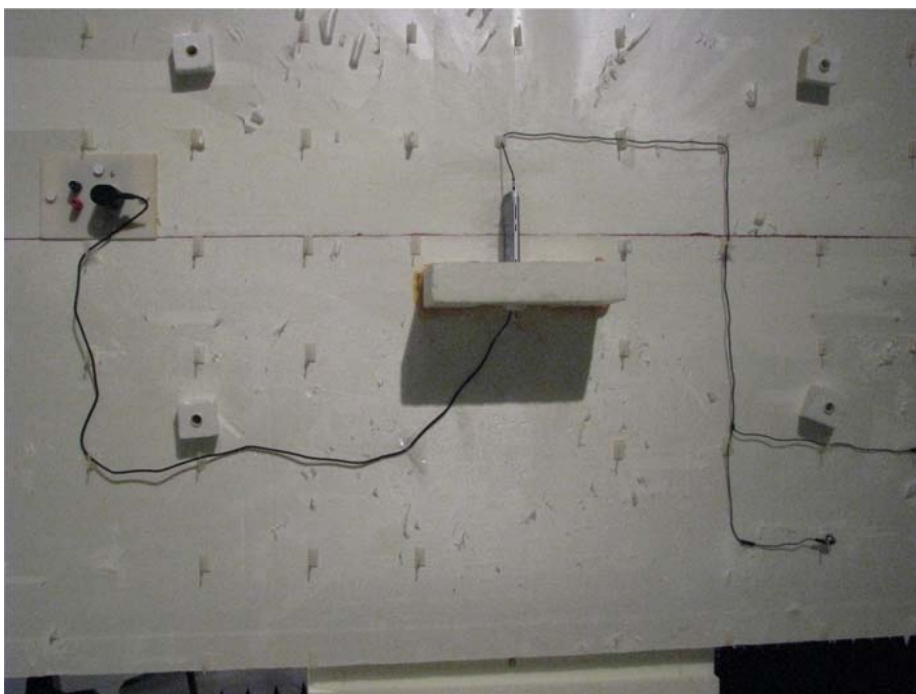
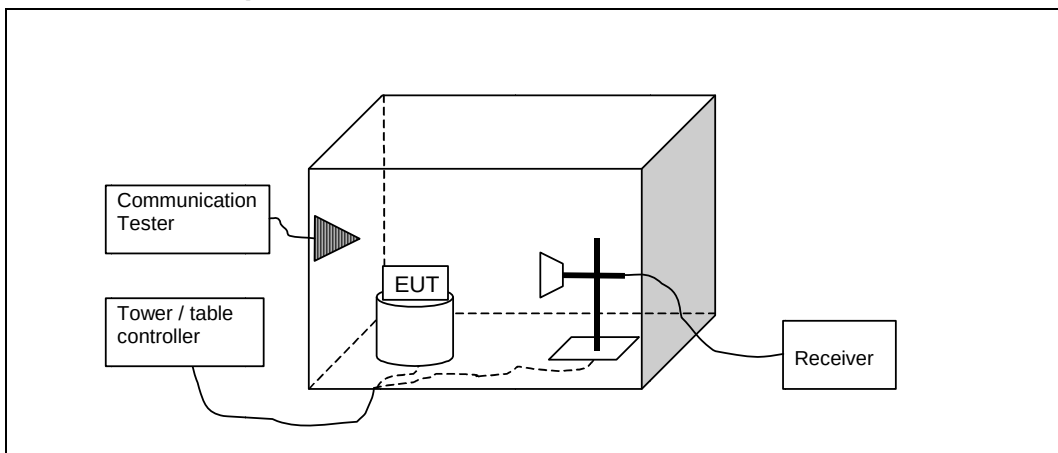
Average (RBW: 1 MHz, VBW: 10 Hz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2495	42.43	132.221	33.47	8.96	8.96	PASSED

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

EUT with DUT number	RM-845, DUT 30809
Accessories with DUT numbers	BP-4W, DUT 30812 ; WH-902, DUT 30813 ; CA-190, DUT 30814 ; AC-50U, DUT 30816
Operation Voltage [V] / [Hz]	115V / 60Hz
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18.1 / 49.8 / 1050
Date of measurements	25-Oct-2013
Measured by	Tyrone Hawes

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 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

7.3. 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
4879.9	44.39	165.844	44.89	-0.5	29.6	74	PASSED
7319.2	46.52	211.909	42.81	3.71	27.5	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
911.761	25.5	18.845	22.38	3.12	20.5	46	PASSED
937.152	25.83	19.568	22.16	3.67	20.2	46	PASSED
938.849	25.82	19.537	22.17	3.65	20.2	46	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
4879.9	31.34	36.885	31.84	-0.5	22.6	54	PASSED
7319.2	33.78	48.854	30.07	3.71	20.2	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
4824.6	44.85	174.763	45.18	-0.33	29.1	74	PASSED
7237.7	46.45	210.063	42.95	3.5	48.8	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
4824.6	31.03	35.616	31.36	-0.33	22.9	54	PASSED
7237.7	33.85	49.278	30.35	3.5	---	---	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
4922.7	44.82	174.241	45.45	-0.63	29.2	74	PASSED
7387.8	47.68	242.047	43.77	3.92	26.3	74	PASSED

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

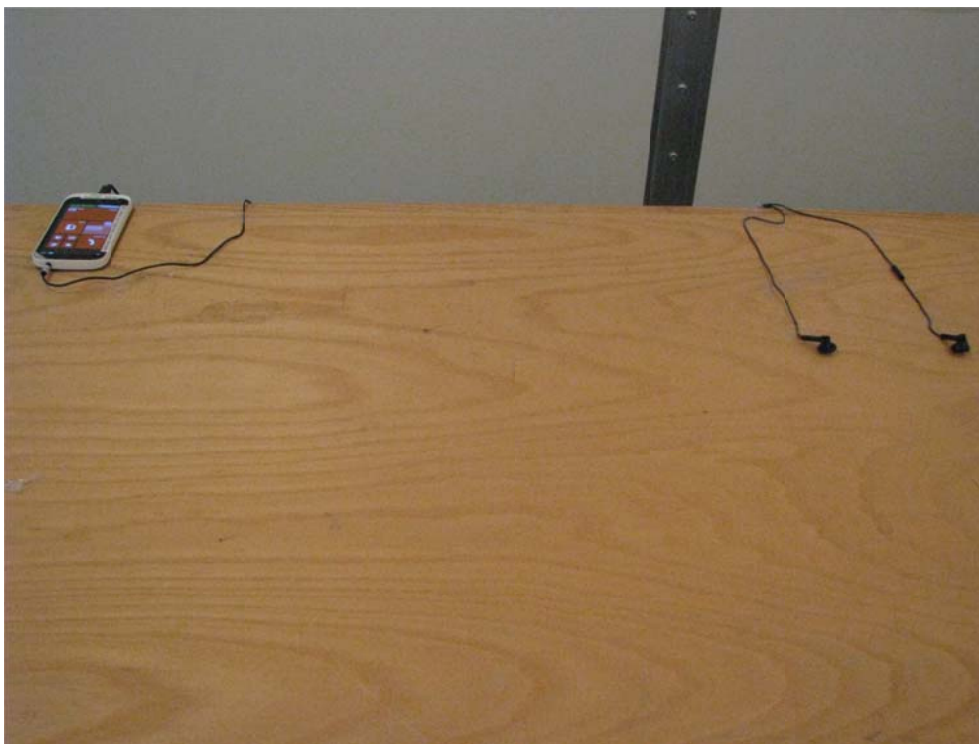
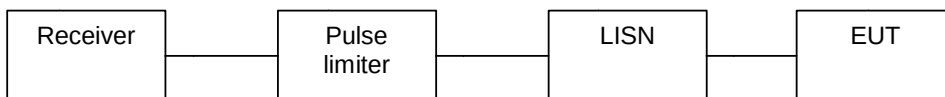
Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
4922.7	31.06	35.719	31.69	-0.63	22.9	54	PASSED
7387.8	33.82	49.108	29.91	3.92	20.2	54	PASSED

8. AC powerline conducted emissions

FCC §15.207, RSS-GEN 7.2.2

EUT with DUT number	RM-845, DUT 30809
Accessories with DUT numbers	BP-4W, DUT 30812 ; WH-902, DUT 30813 ; CA-190, DUT 30814 ; AC-50U, DUT 30816 ; -, DUT ; -, DUT
Operation Voltage [V] / [Hz]	115V / 60Hz
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20.8 / 50.8 / 1050
Date of measurements	28-Oct-2013
Measured by	Tyrone Hawes

8.1. Test Setup



8.2. 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.

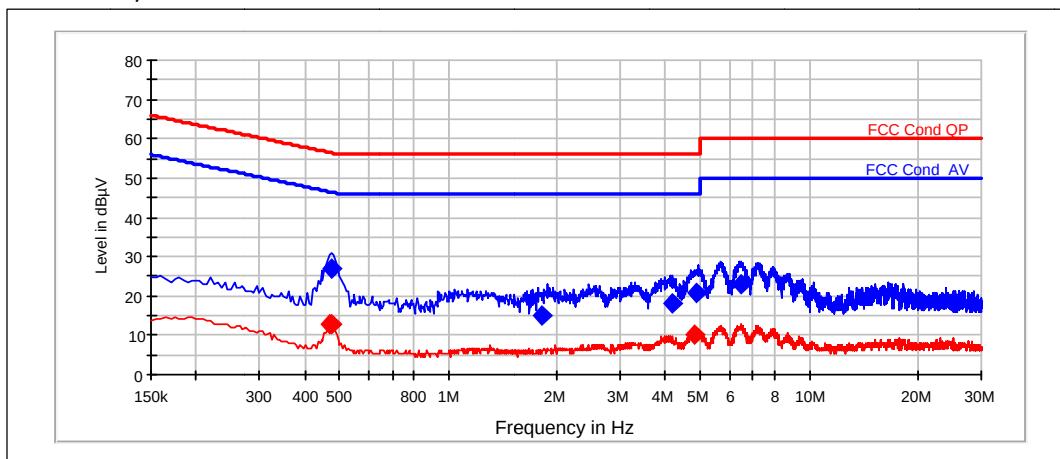
CISPR 22 Class B limits

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

8.3. Bluetooth Low Energy Test results

8.3.1 GFSK modulation, PRBS packet type

Channel 20 / 2442 MHz



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.475	26.75	L1	PASSED
1.825	14.81	L1	PASSED
4.185	18.28	L1	PASSED
4.865	20.87	L1	PASSED
6.51	23.05	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.47	12.81	L1	PASSED
0.475	13.03	L1	PASSED
4.805	9.97	L1	PASSED

9. Test Equipment

9.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
4406	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
7602	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
7151	Bluetooth Tester	CBT	R&S	15B
-	GPS RX Antenna w/AMP	L1A-PM-NF	GPS Source	15C
-	GPS Inline amplifier	A11M-V-NF-NM	GPS Source	15C
-	GPS signal Splitter	S12-P110/5-NF	GPS Source	15C
-	GPS TX Antenna	L1P-PV-NF	GPS Source	15C
7912	Spectrum Analyzer	FSV-30	R&S	22/24/27, 15C
-	Thermal Chamber	VT-4002	Vötsch	22/24/27, 15C
-	Power splitter	11667B	Agilent	22/24/27, 15C
3396	EMC Analyzer	E7405A	HP	-
7451	EMI Receiver	ESU-26	R&S	22/24/27, 15C, 15B
4188	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
6981	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
-	Pulse Limiter	ESH3-Z2	R&S	15C, 15B
7582	Signal Generator	SMB100A	R&S	15C, 15B

9.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
7591	Antenna	HL562	R&S	22/24/27, 15C, 15B
7572	Double Ridge Horn Antenna	3117	ETS-Lindgren	22/24/27, 15C
7607	Standard Gain HornAntenna	SAS 586	A.H. System	22/24/27, 15C
7624	Standard Gain HornAntenna	SAS 587	A.H. System	22/24/27, 15C
7561	Antenna	HFH2-Z2	R&S	15C, 15B
5715	Antenna	MBA-3030	EMC Automation	22/24/27, 15C
5712	Antenna	PLP3003	EMC Automation	22/24/27, 15C
7457	Relay Switch Unit	TS-RSP	R&S	22/24/27, 15C, 15B
7459	Relay Switch Unit	TS-RSP	R&S	22/24/27, 15C, 15B
5729	Relay Switch Unit	TS-RSP	R&S	22/24/27, 15C, 15B
5728	EMI Receiver	ESIB26	R&S	22/24/27, 15C, 15B
4406	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
7602	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
7151	Bluetooth Tester	CBT	R&S	15B
3406	Controller	Sc99V	Sunol	22/24/27, 15C, 15B
-	Controller	G-1000DXC	Yaesu	22/24/27, 15C, 15B
-	Computer Controller	GS-232B	Yaesu	22/24/27, 15C, 15B
7040	Preamplifier	TS-PR3	R&S	22/24/27, 15C, 15B
-	Preamplifier	AMF-6D-020180-29-20P	Miteq	22/24/27, 15C, 15B
-	Preamplifier	AMF-4D-01000800-30-29P	Miteq	22/24/27, 15C, 15B
-	Preamplifier	AMF-5F-18002650-25-10P	Miteq	22/24/27, 15C, 15B
-	High Pass Filter	4HC1700-1-KK	R&S	22
-	High Pass Filter	F-15041	RLC	22/24/27, 15C
-	Band Reject Filter	WRCA824/849-0,2-6SS	Wainwright	22
-	Band Reject Filter	WRCC1800/2000-0.2-10SS	Wainwright	24
-	Band Reject Filter	WRCG2400/2483-2390/2493-35/10SS	Wainwright	15C
-	Band Reject Filter	WRCG832/838-825/845-40/5SS	Wainwright	22
-	Band Reject Filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27

Eq. No	Equipment	Type	Manufacturer	Used in
-	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	24
-	Notch Filter	WRCD1880-1.1.25/50-10SS	Wainwright	22/24/27
-	Notch Filter	WRCT902.4-0.4/40-8SS	Wainwright	-
Planned	Notch Filter	WRCJV2531/2539-2523/2547-60/12SS	Wainwright	22/24/27
-	GPS RX Antenna w/AMP	L1A-PM-NF	GPS Source	15C
-	GPS Inline amplifier	A11M-V-NF-NM	GPS Source	15C
-	GPS signal Splitter	S12-P110/5-NF	GPS Source	15C
-	GPS TX Antenna	L1P-PV-NF	GPS Source	15C