

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBTLE_RM-860_31.docx	Date of Report:	31-Oct-13
Number of pages:	29	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-860 / Dummy Battery SD-119V / Charger AC-50u / Headset WH-902 / Data Cable CA-190		
FCC ID:	QMNRM-860	IC:	661X-RM860
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, Senior Specialist

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	24-Oct-2013
Testing completed	30-Oct-13
The customer's contact person	Jerry Williams
Test Plan referred to	T:\Projects\RM-860\TestPlan\RS_testplan_RM-860_BTLE.xlsm
Notes	-
Document name	T:\Projects\RM-860\EMC\FCC15CBTLE_RM-860_31.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-860	354106050015475	0200	-	3051.40000.1342.0053	30782
Dummy Battery	SD-119V	50508	0.2	-	-	30783
Phone	RM-860	354106050015632	0200	-	3051.40000.1342.0053	30808
Charger	AC-50u	4090492154270501431;0675620	-	-	-	30810
Headset	WH-902	-	-	-	-	30811
Data Cable	CA-190	-	-	-	-	30815

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.

CONTENTS

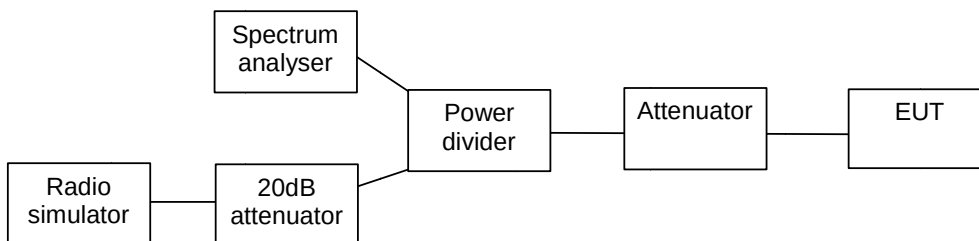
1. Summary for FCC Part 15C Compliance Test Report.....	2
1.1. EUT and Accessory Information.....	2
1.2. Summary of Test Results.....	2
2. Conducted peak output power (15.247(b)(1), RSS-210 A8.4 (4))	5
2.1. Test Setup.....	5
2.2. Test method and limit.....	5
2.3. Bluetooth Low Energy Test results.....	6
3. Band edge compliance of RF emissions (FCC §15.247(d), 15.205(b), RSS-210 A8.5).....	8
3.2. Test method and limit.....	9
3.3. Bluetooth Low Energy test results.....	10
3.4. Bluetooth Low Energy test results.....	11
4. Spurious RF conducted emissions (FCC §15.247(d), RSS-210 A8.5).....	12
4.1. Test Setup.....	12
4.2. Test method and limit.....	12
4.3. Bluetooth Low Energy Test results.....	13
5. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1)).....	15
5.1. Test Setup.....	15
5.2. Test method and limit.....	15
5.3. Bluetooth Low Energy Test results.....	16
6. Spurious radiated emissions (FCC §15.247(d), §15.209, RSS-210 A8.5)	18
6.2. Test method and limit.....	19
6.3. Bluetooth Low Energy test results.....	20
7. Power spectral density (FCC §15.247(e), RSS-210 A8.2 (2))	22
7.1. Test Setup.....	22
7.2. Test method and limit.....	22
7.3. Bluetooth Low Energy Test results.....	23
8. AC powerline conducted emissions FCC §15.207, RSS-GEN 7.2.2	25
8.1. Test Setup.....	25
8.2. Test method and limit.....	25

8.3.	Bluetooth LE Test results	27
9.	Test Equipment.....	28
9.1.	Conducted measurements	28
9.2.	Radiated measurements	28

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

EUT with DUT number	RM-860, DUT 30782
Accessories with DUT numbers	SD-119V, DUT 30783
Operation Voltage [V] / [Hz]	3.8V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21.3/49.6/1050
Date of measurements	24-Oct-2013
Measured by	Feng You

2.1. Test Setup



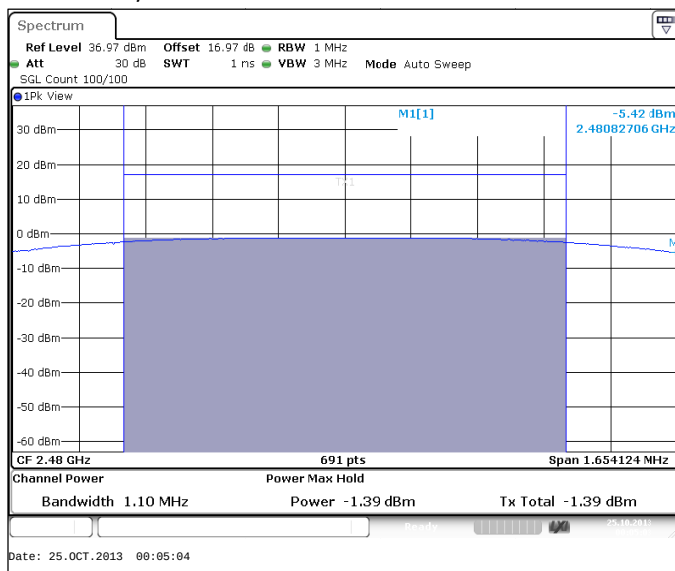
2.2. Test method and limit

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

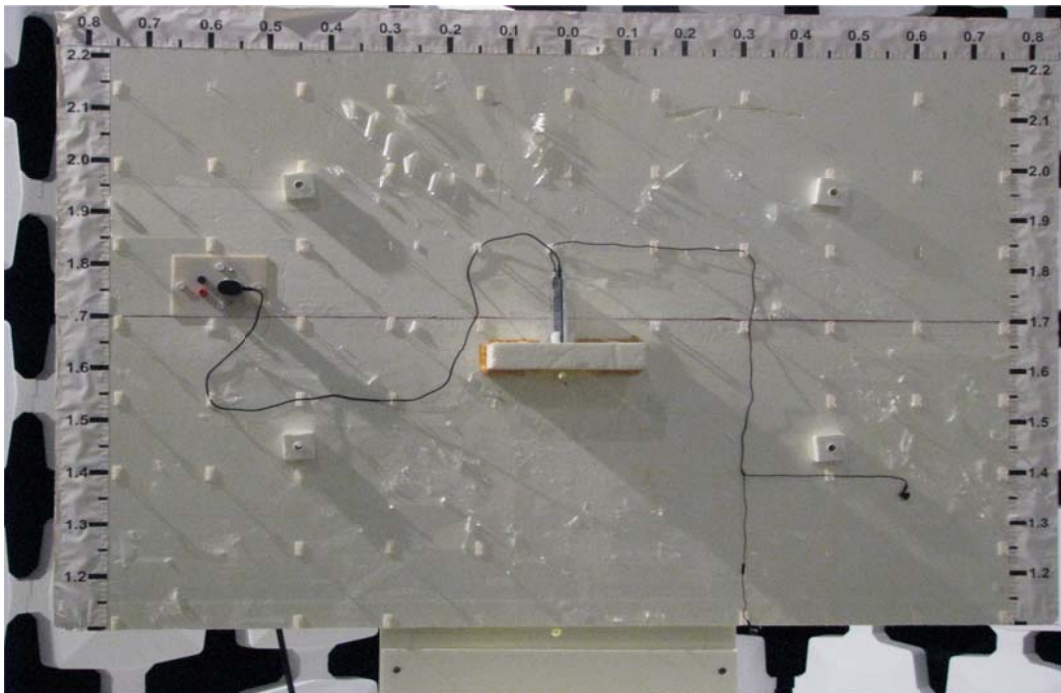
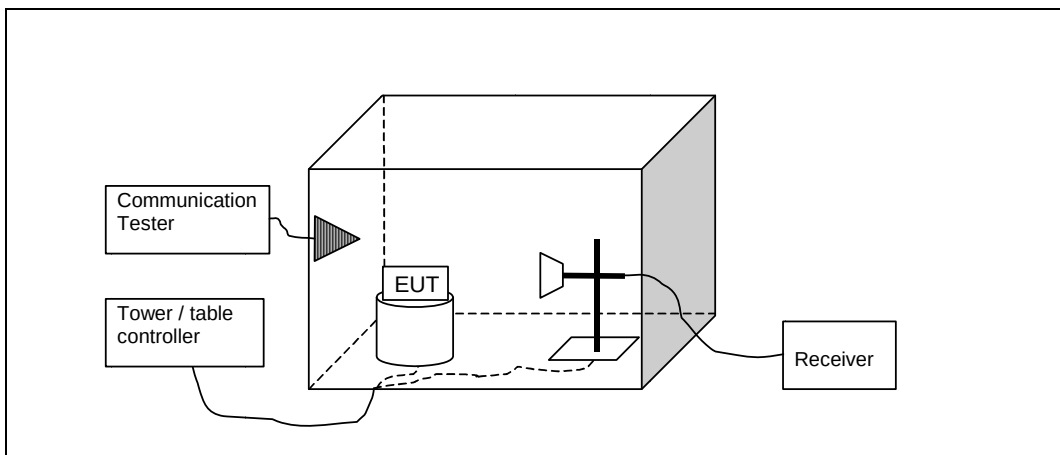
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-860, DUT 30808
Accessories with DUT numbers	AC-50u, DUT 30810 ; WH-902, DUT 30811 ; CA-190, DUT 30815
Operation Voltage [V] / [Hz]	120V/60Hz
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH]	17.7/51.00
Date of measurements	29-Oct-2013
Measured by	Paul Grossberg

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:

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

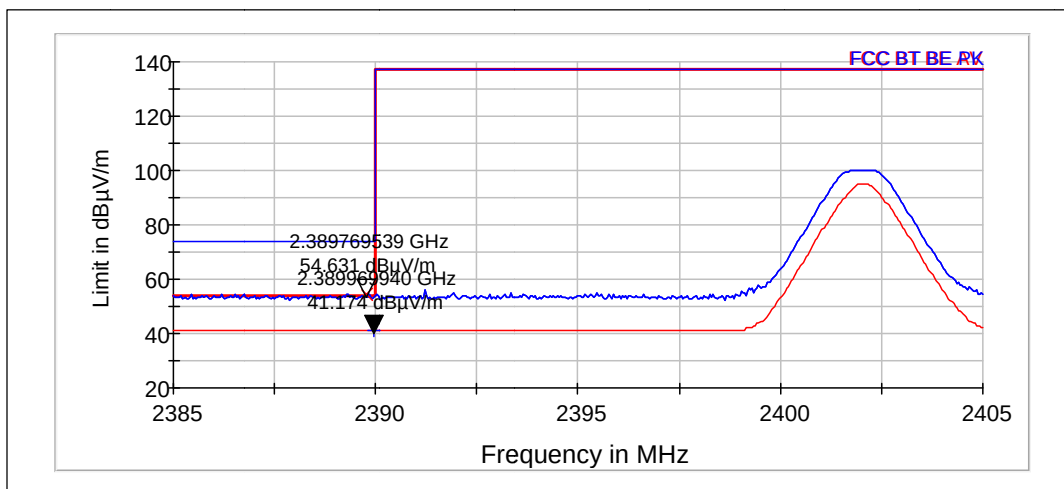
Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

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)

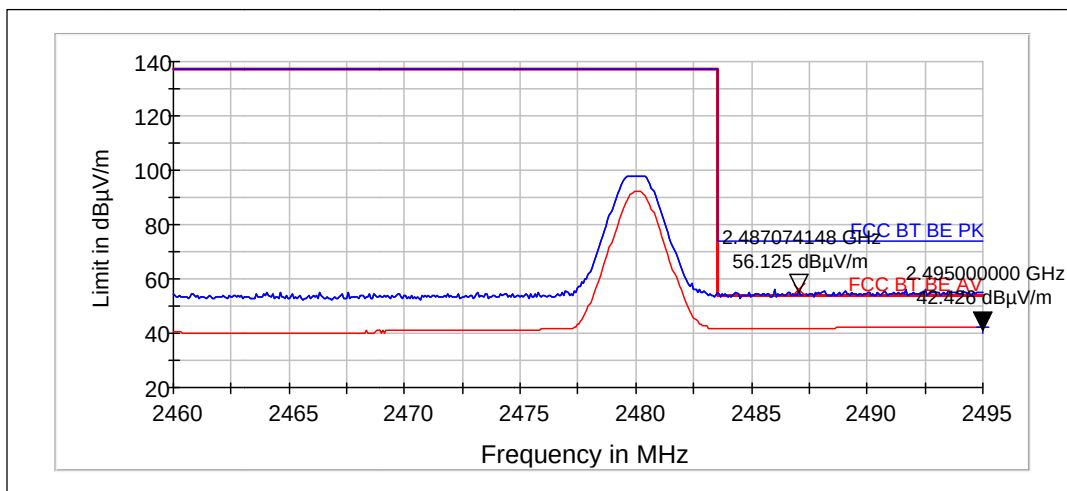
Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2390	54.63	538.952	46.17	8.46	8.464	PASSED

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

3.4. Bluetooth Low Energy test results

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
2487	56.13	640.103	47.17	8.96	8.96	PASSED

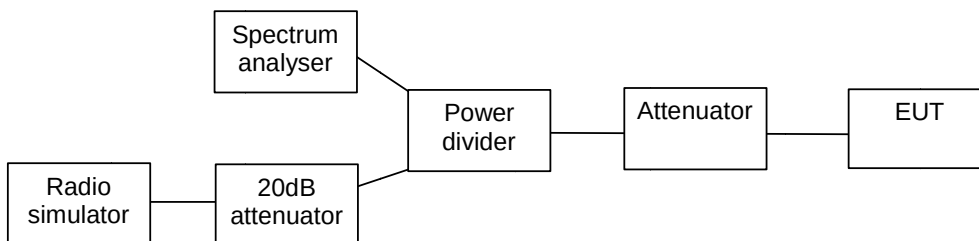
Average (RBW: 1 MHz, VBW: 10 Hz)

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

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

EUT with DUT number	RM-860, DUT 30782
Accessories with DUT numbers	SD-119V, DUT 30783
Operation Voltage [V] / [Hz]	3.8V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21.3/49.6/1050
Date of measurements	24-Oct-2013
Measured by	Feng You

4.1. Test Setup



4.2. Test method and limit

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

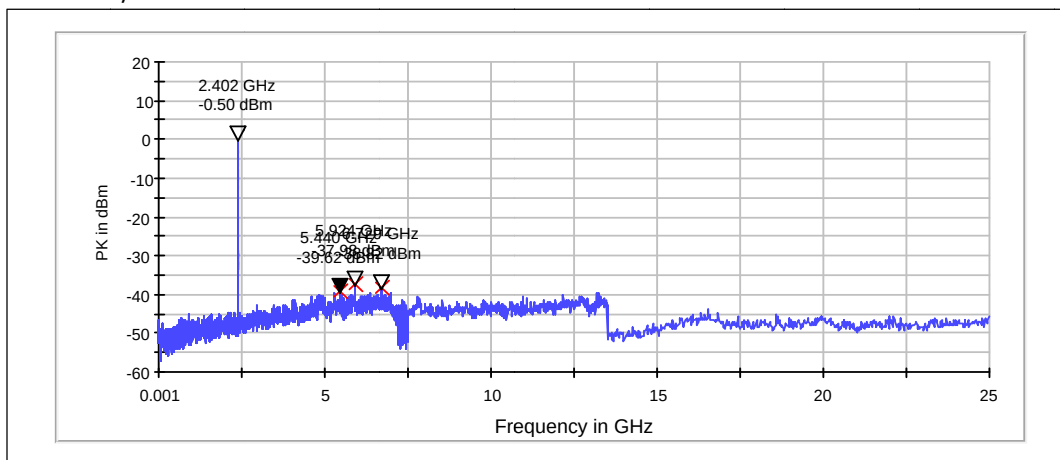
The reference level for the -20 dBc measurement was obtained as instructed in section 11.2 of the KDB 558074, using span of 1.5 times the OBW.

Limits for spurious RF conducted emissions measurements

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

4.3. Bluetooth Low Energy Test results

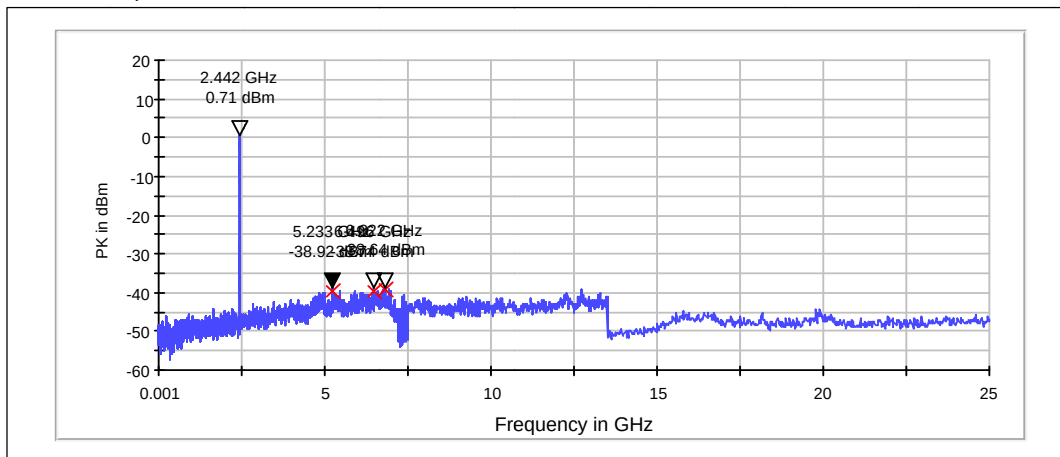
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
5924.000	-37.48	PASSED
6729.200	-38.32	PASSED
5440.000	-39.12	PASSED

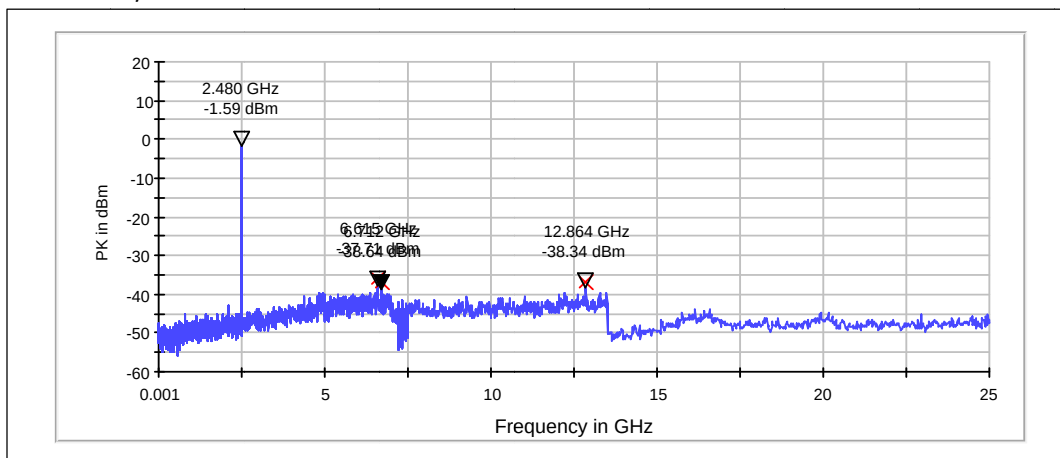
Channel 20 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
6821.600	-39.35	PASSED
6496.000	-39.45	PASSED
5233.200	-39.63	PASSED

Channel 39 / 2480 MHz



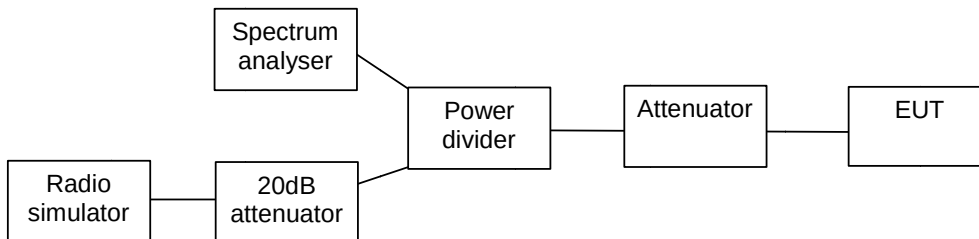
Peak (RBW: 100 kHz, VBW: 300 kHz)

Frequency [MHz]	P [dBc]	Result
6614.800	-36.12	PASSED
12864.000	-36.75	PASSED
6711.600	-37.05	PASSED

5. 6 dB bandwidth (FCC §15.247(a)(2), RSS-210 A8.2 (1))

EUT with DUT number	RM-860, DUT 30782
Accessories with DUT numbers	SD-119V, DUT 30783
Operation Voltage [V] / [Hz]	3.8V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21.3/49.6/1050
Date of measurements	24-Oct-2013
Measured by	Feng You

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.

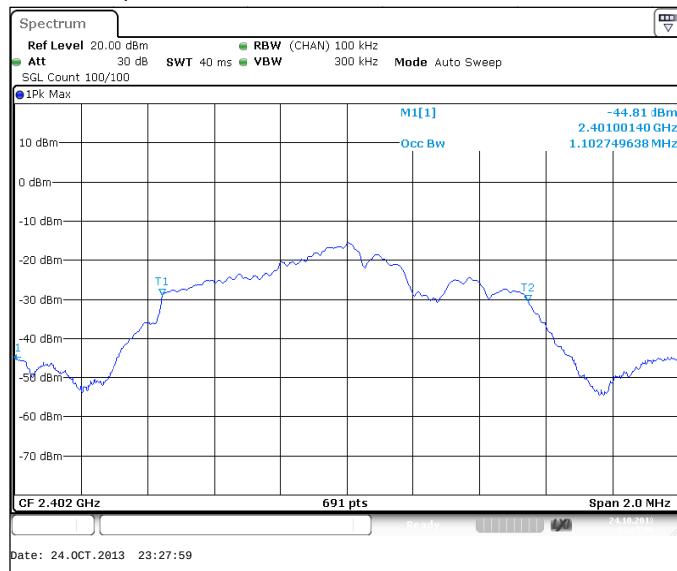
Limits for 6 dB bandwidth measurements

Limit [kHz]
>= 500

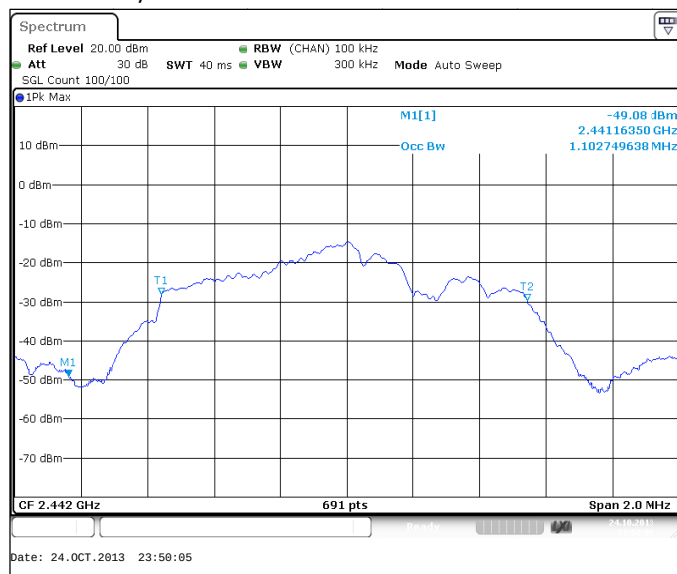
5.3. Bluetooth Low Energy Test results

Channel / f_c [MHz]	6 dB bandwidth [kHz]	Result
0 / 2402	1102.7	PASSED
20 / 2442	1102.7	PASSED
39 / 2480	1102.7	PASSED

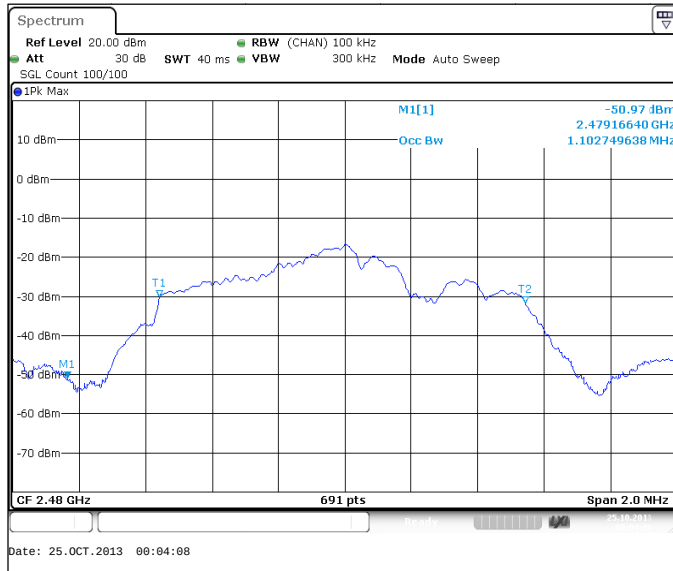
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



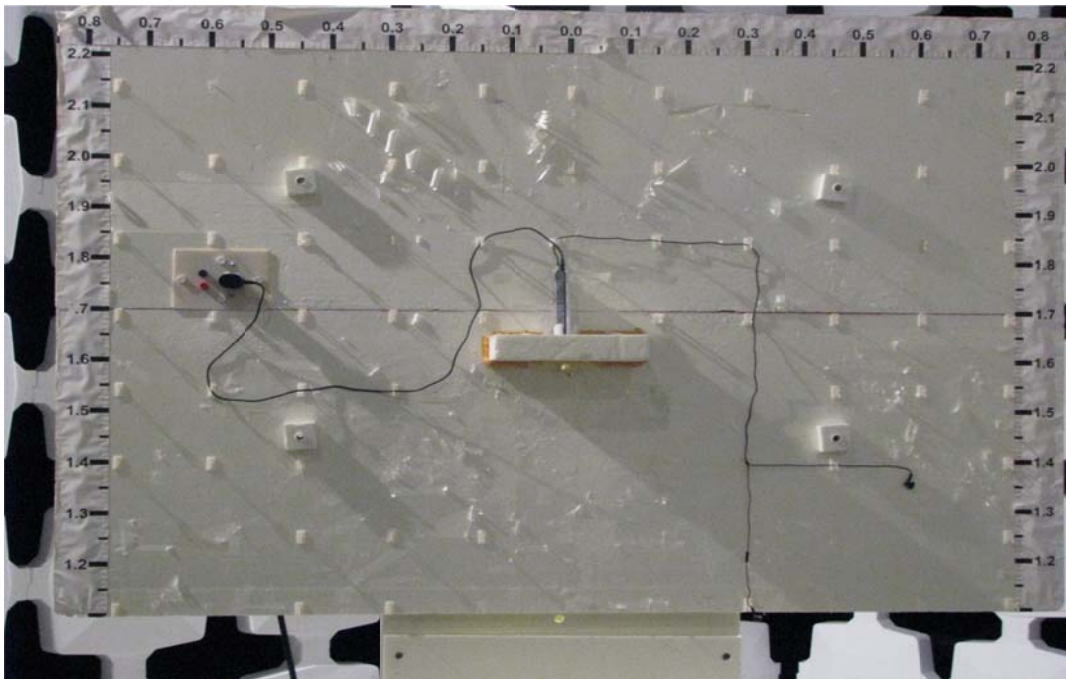
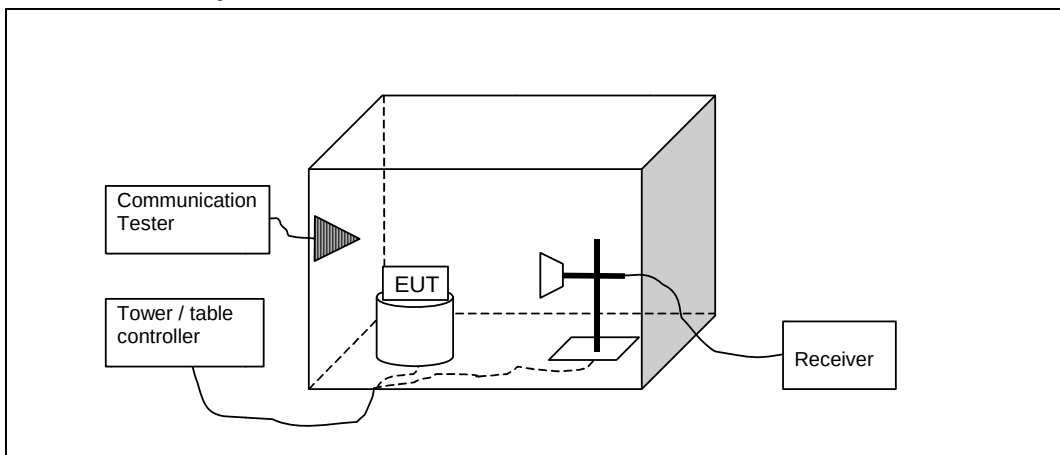
Channel 39 / 2480 MHz



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

EUT with DUT number	RM-860, DUT 30808
Accessories with DUT numbers	AC-50u, DUT 30810 ; WH-902, DUT 30811 ; CA-190, DUT 30815
Operation Voltage [V] / [Hz]	120V/60Hz
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	18.9/53.4
Date of measurements	30-Oct-2013
Measured by	Paul Grossberg

6.1.1 Test setup



6.2. 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

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]	Margin	Limit [dBμV/m]	Results
4824.4	44.34	164.721	44.66	-0.32	29.6	74	PASSED
7236.8	46.62	214.289	43.13	3.49	48.6	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
4824.4	31.15	36.112	31.47	-0.32	22.8	54	PASSED
7236.8	33.92	49.642	30.43	3.49	---	---	PASSED

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
4878.4	44.53	168.519	45.07	-0.54	29.4	74	PASSED
7320.4	46.85	220.09	43.13	3.72	27.1	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
926.142	25.96	19.861	22.39	3.57	20.1	46	PASSED
931.464	26.08	20.137	22.39	3.69	19.9	46	PASSED
958.288	25.81	19.512	22.39	3.42	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
4878.4	31.4	37.145	31.94	-0.54	22.6	54	PASSED
7320.4	33.84	49.21	30.12	3.72	20.1	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
4923	43.54	150.349	44.79	-1.25	30.4	74	PASSED
7385.7	46.79	218.399	42.87	3.92	27.2	74	PASSED

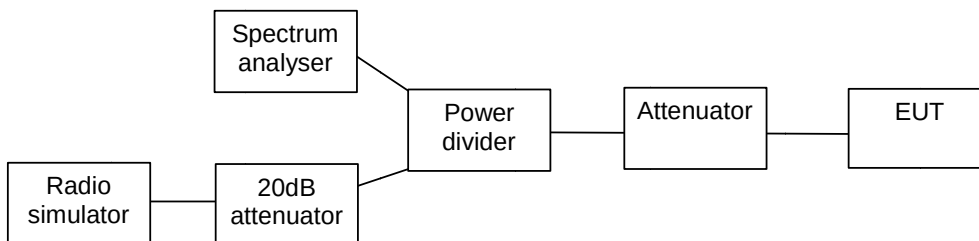
Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
4923	30.53	33.624	31.78	-1.25	23.4	54	PASSED
7385.7	33.78	48.843	29.86	3.92	20.2	54	PASSED

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

EUT with DUT number	RM-860, DUT 30782
Accessories with DUT numbers	SD-119V, DUT 30783
Operation Voltage [V] / [Hz]	3.8V / DC
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21.3/49.6/1050
Date of measurements	24-Oct-2013
Measured by	Feng You

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 power spectral density measurements

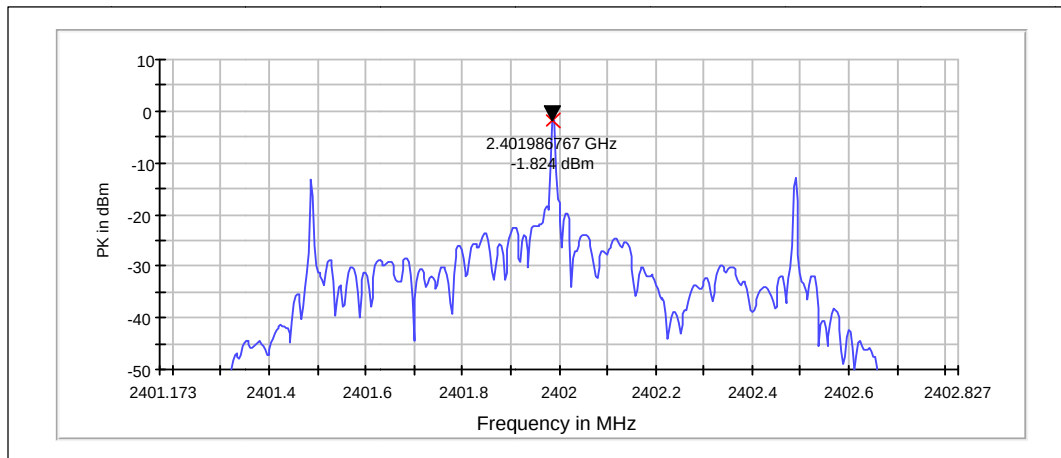
Limit [dBm] @ 3 kHz
<= 8

7.3. Bluetooth Low Energy Test results

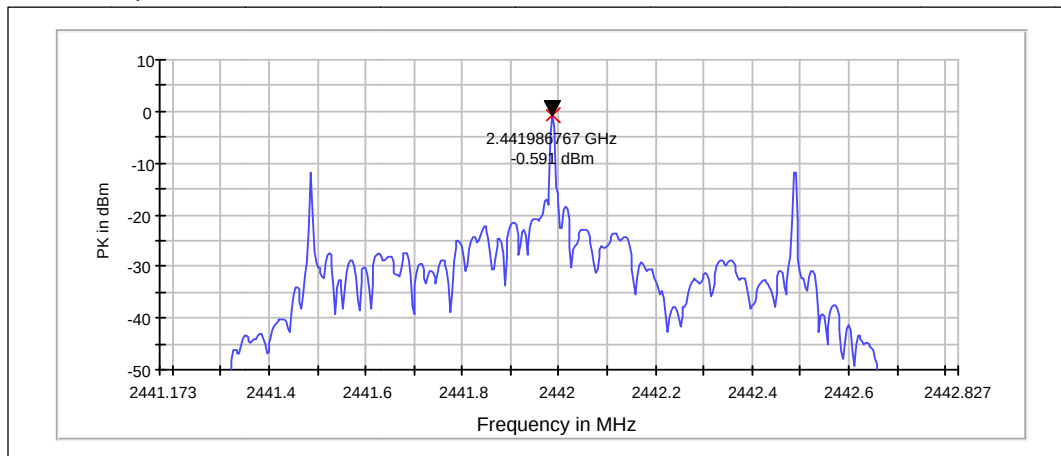
Peak (RBW: 3 kHz, VBW: 10 kHz, Max hold)

Channel / f_c [MHz]	P [dBm]	Result
0 / 2402	-1.82	PASSED
20 / 2442	-0.59	PASSED
39 / 2480	-2.9	PASSED

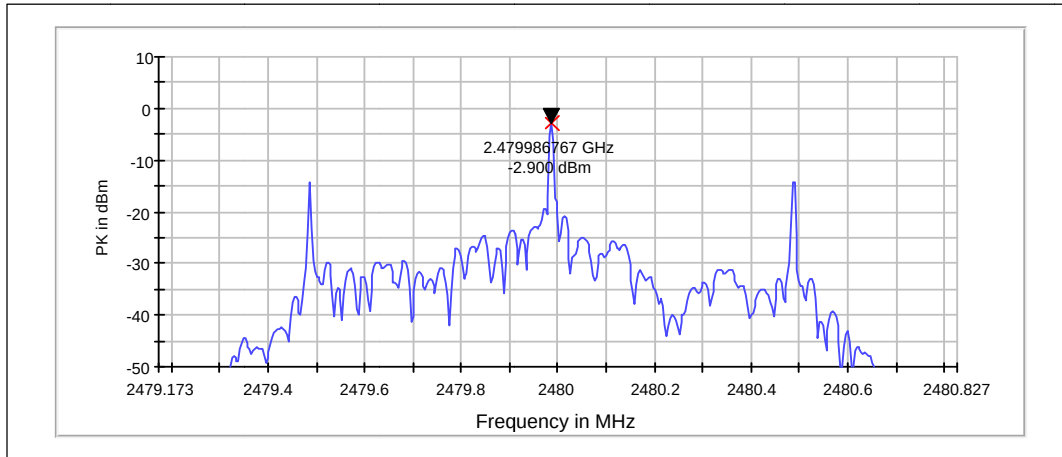
Channel 0 / 2402 MHz



Channel 20 / 2442 MHz



Channel 39 / 2480 MHz

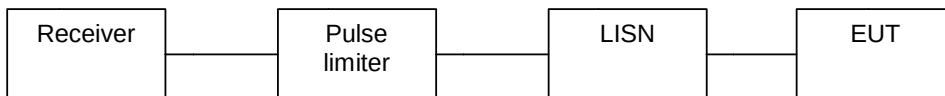


8. AC powerline conducted emissions

FCC §15.207, RSS-GEN 7.2.2

EUT with DUT number	RM-860, DUT 30808
Accessories with DUT numbers	AC-50u, DUT 30810 ; WH-902, DUT 30811 ; CA-190, DUT 30815
Operation Voltage [V] / [Hz]	120V/60HZ
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH]	18.9/44.2
Date of measurements	25-Oct-2013
Measured by	Paul Grossberg

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.

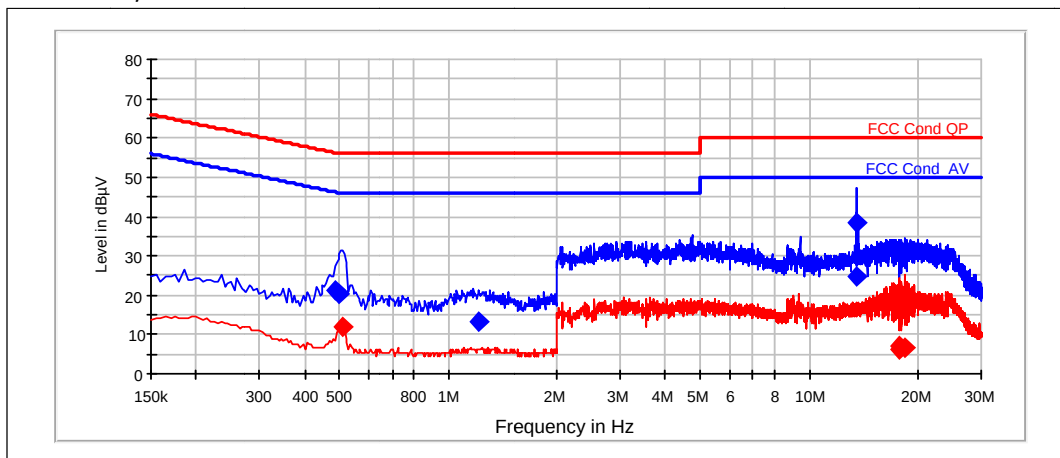
CISPR 22 Class B limits

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 LE Test results

8.3.1 GFSK modulation, PRBS packet type

Channel 40 / 2442 MHz



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.485	21.3	L1	PASSED
0.5	20.39	N	PASSED
1.215	13.37	L1	PASSED
4.695	30.84	L1	PASSED
13.55	38.24	L1	PASSED
13.59	24.72	L1	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.51	11.9	L1	PASSED
17.77	6.25	N	PASSED
17.795	6.95	L1	PASSED
18.38	6.55	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