

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBT_RM-1105_11.docx	Date of Report:	23-Sep-2015
Number of pages:	46	Customer's Contact person:	Jari Rontu
Testing laboratory:	TCC Microsoft Salo Laboratory P.O.Box(86) Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 71 80 44122	Customer:	Microsoft P.O.Box(86) Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 71 80 44122
FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-1105 / Dummy Battery SD-244R / Battery (Samsung) BV-T5E / Charger AC-100E / Headset WH-308		
FCC ID:	PYARM-1105	IC:	661X-RM1105
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2014), Public Notice DA 00-705, 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 Microsoft.		
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:			

Hannu Söderholm, Engineer, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	15-Jun-2015
Testing completed	21-Jul-2015
The customer's contact person	Tia Melava
Test Plan referred to	T:\Projects\RM-1104\TestPlan\RS_TestPlan_RM-1104_EMC_FCC.xlsm
Notes	-
Document name	T:\Projects\RM-1105\EMC\FCC15CBT_RM-1105_11.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-1104	0044027421788606059X034	2012	-	01062.00000.15233.39000	100006
Dummy Battery	SD-244R	-	V.1	-	-	100023
Phone	RM-1104	004402742178605;059X034	2012	S2	01066.00001.15257.14000	100205
Battery (Samsung)	BV-T5E	4181575182S10605022;0670775	V6	-	-	100210
Charger	AC-100E	4090495125580301585;0675758	0.3	B2.0	-	100026
Headset	WH-308	51251B1	-	-	-	100028
Phone	RM-1104	004402742176864;059X034	2012	S2	01066.00001.15257.14000	100206
Battery (Samsung)	BV-T5E	4181575182S10605359;0670775	V6	-	-	100208
Charger	AC-100E	409049512558030174860675758	0.3	B2.0	-	100196
Headset	WH-308	-	-	-	-	100195

1.2. Summary of Test Results

Bluetooth:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8.4(2)	Conducted peak output power	PASSED
15.247(d), 15.205(b)	A8.5	Band edge compliance of RF emissions	PASSED
15.247(d)	A8.5	Spurious RF conducted emissions	PASSED
15.247(d), 15.209	A8.5	Spurious radiated emissions	PASSED
15.207	7.2.4	AC powerline conducted emissions	PASSED
15.247(a)(1)	A8.1(a)	20dB(bandwidth)	PASSED
15.247(a)(1)	A8.1(b)	Carrier frequency separation	PASSED
15.247(a)(1)(iii)	A8.1(d)	Number of hopping frequencies	PASSED
15.247(a)(1)(iii)	A8.1(d)	Time of occupancy	PASSED

The test results of RM-1104 are re-used for certification of the RM-1105. The table above indicates the results, which will be re-used.

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 Microsoft Laboratory.

CONTENTS

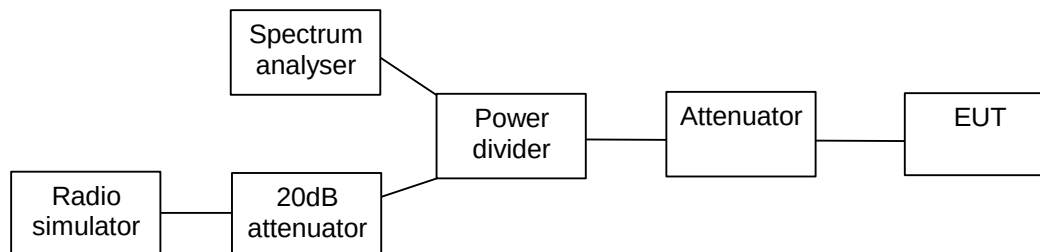
1. Summary for FCC Part 15C Compliance Test Report.....	2
1.1. EUT and Accessory Information	2
1.2. Summary of Test Results	2
2. Conducted peak output power (FCC §15.247(b)(1), RSS-210 A8.4(2))	5
2.1. Test Setup	5
2.2. Test method and limit	5
2.3. Bluetooth Test results	6
3. Band edge compliance of RF emissions (FCC 15.247(d), 15.205(b), RSS-210 A8.5)	9
3.2. Test method and limit	9
3.3. Bluetooth test results	10
4. Spurious RF conducted emissions (FCC §15.247(d), RSS-210 A8.5)	18
4.1. Test Setup	18
4.2. Test method and limit	18
4.3. Bluetooth Test results	19
5. Spurious radiated emissions (FCC 15.247(d), 15.209, RSS-210 A8.5)	23
5.2. Test method and limit	23
5.3. Bluetooth test results	25
6. AC powerline conducted emissions (FCC §15.207, RSS-210 7.2.4)	29
6.1. Test Setup	29
6.2. Test method and limit	29
6.3. Bluetooth Test results	30
7. 20dB(bandwidth) (FCC §15.247(a)(1), RSS-210 A8.1(a))	31
7.1. Test Setup	31
7.2. Test method and limit	31
7.3. Bluetooth Test results	32
8. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 A8.1(b))	35
8.1. Test Setup	35
8.2. Test method and limit	35
8.3. Bluetooth Test results	36

9. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 A8.1(d))	38
9.1. Test Setup	38
9.2. Test method and limit	38
9.3. Bluetooth Test results	39
10. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 A8.1(d))	41
10.1. Test Setup	41
10.2. Test method and limit	41
10.3. Bluetooth Test results	42
11. Test Equipment.....	45
11.1. Conducted measurements	45
11.2. Radiated measurements	45

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

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

2.1. Test Setup



2.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for conducted peak output power measurements

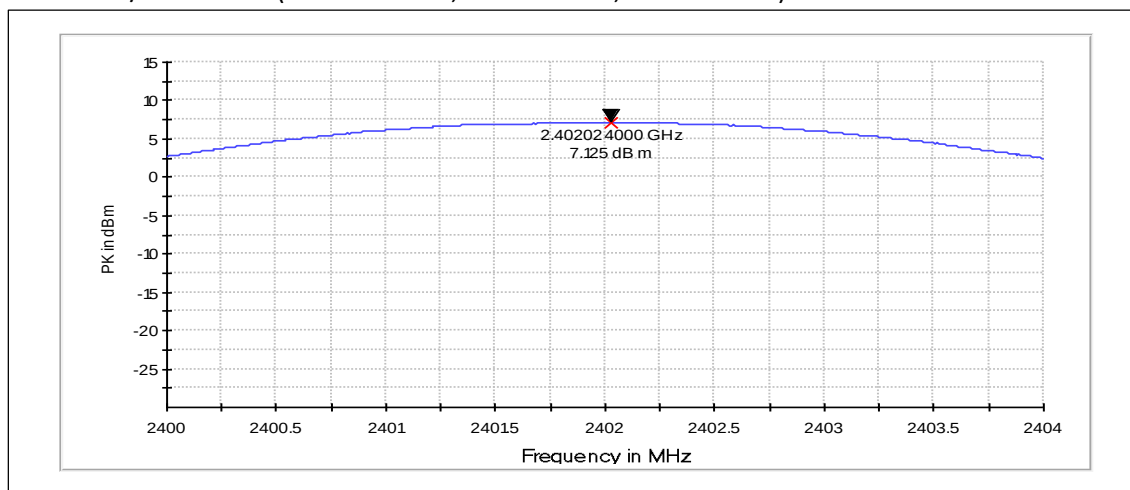
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5 5725 - 5850	≤ 1	≤ 30

2.3. Bluetooth Test results

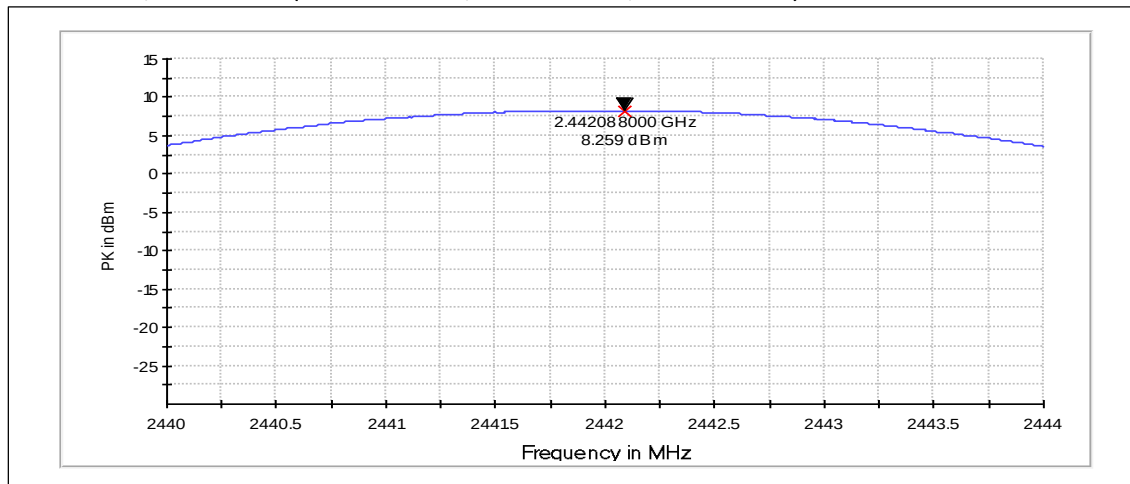
2.3.1 GFSK modulation, PRBS packet type

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	7.13	5.164	PASSED
40 / 2442	8.26	6.699	PASSED
78 / 2480	7.24	5.297	PASSED

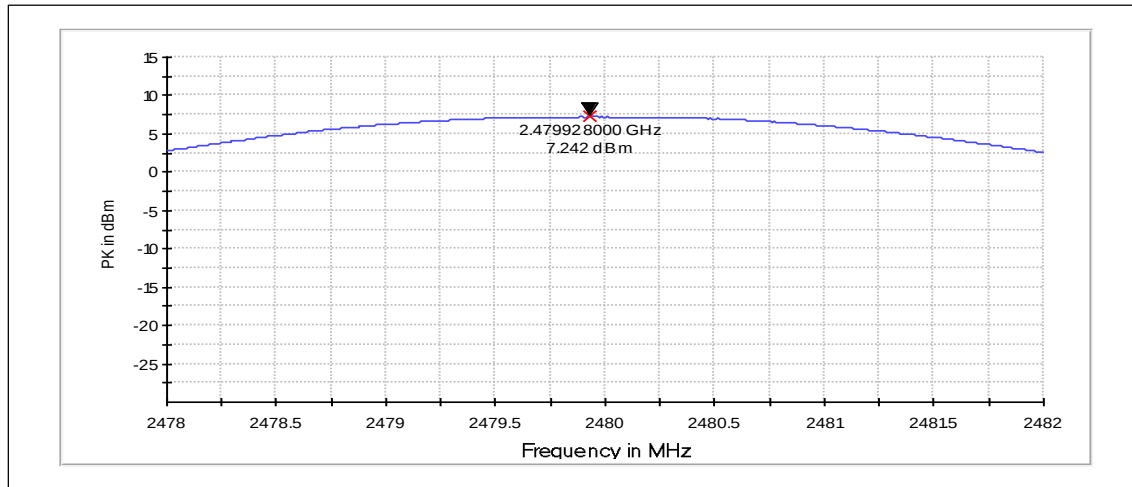
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



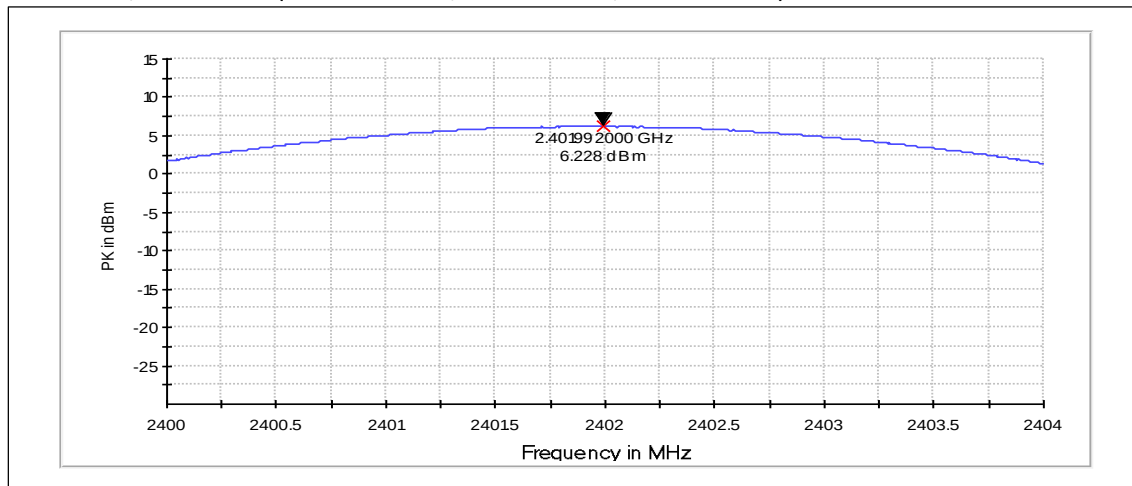
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



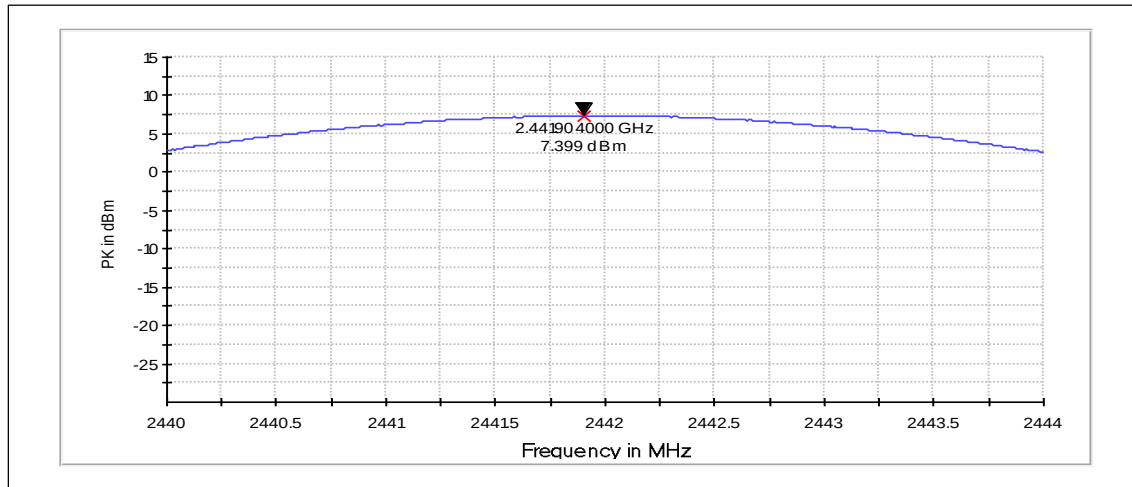
2.3.2 8DPSK modulation, PRBS packet type

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	6.23	4.198	PASSED
40 / 2442	7.4	5.495	PASSED
78 / 2480	6.36	4.325	PASSED

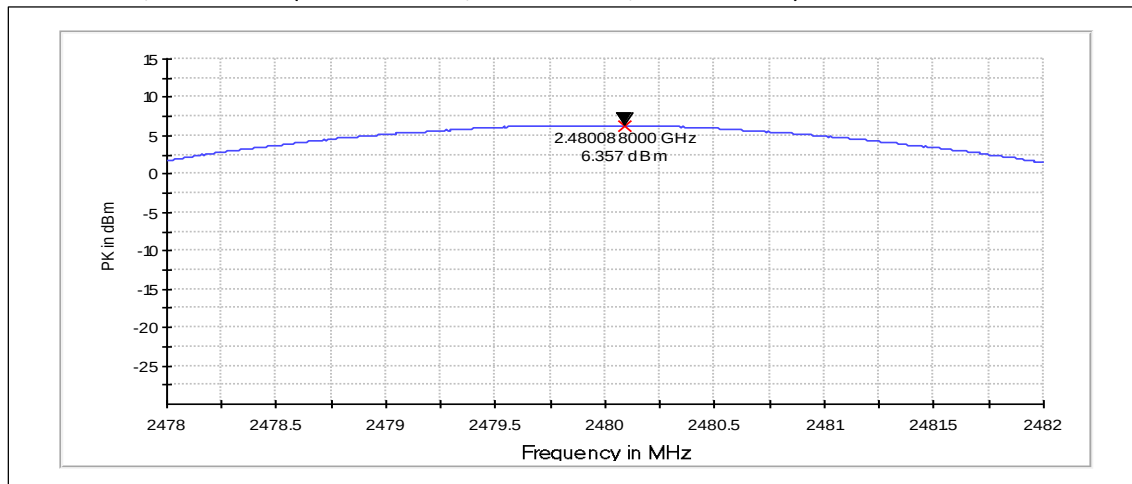
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



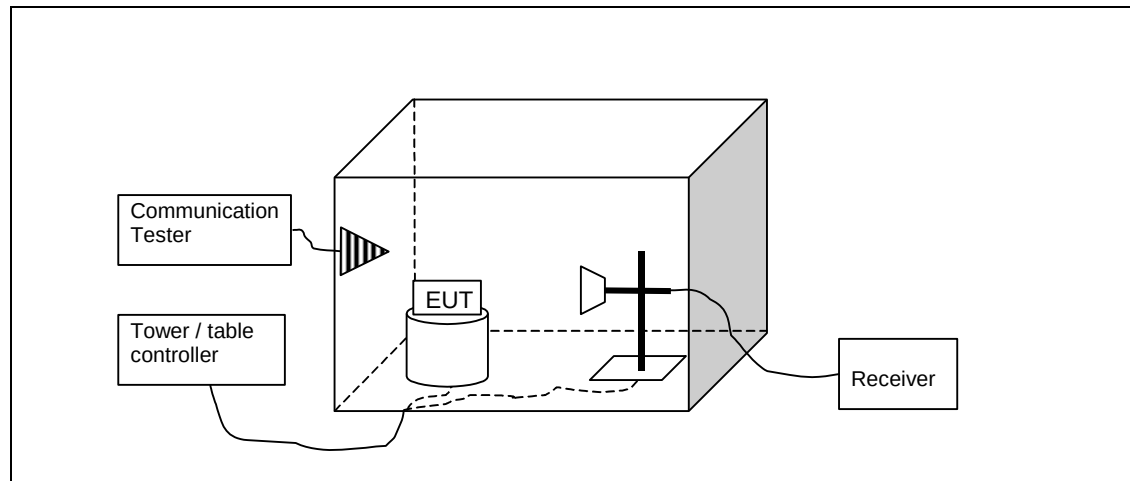
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



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

EUT with DUT number	RM-1104, DUT 100206
Accessories with DUT numbers	BV-T5E, DUT 100208 ; AC-100E, DUT 100196 ; WH-308, DUT 100195
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 45 / 100.6
Date of measurements	21-Jul-2015
Measured by	Kalle Hannila / Ville Mannermaa

3.1.1 Test setup



3.2. Test method and limit

The measurement is made according to Public notice DA 00-705 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 ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

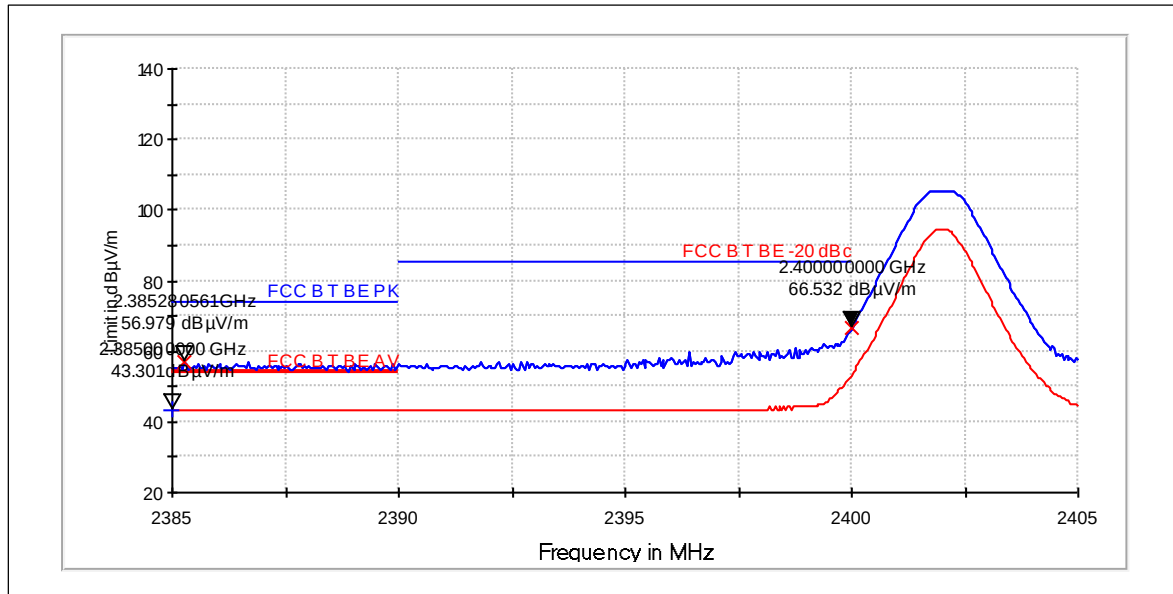
Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit
Below 2390 and above 2483.5	54 dBuV/m (avg) and 74 dBuV/m (pk)
2390 - 2400	-20 dBc (pk)

3.3. Bluetooth test results

3.3.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



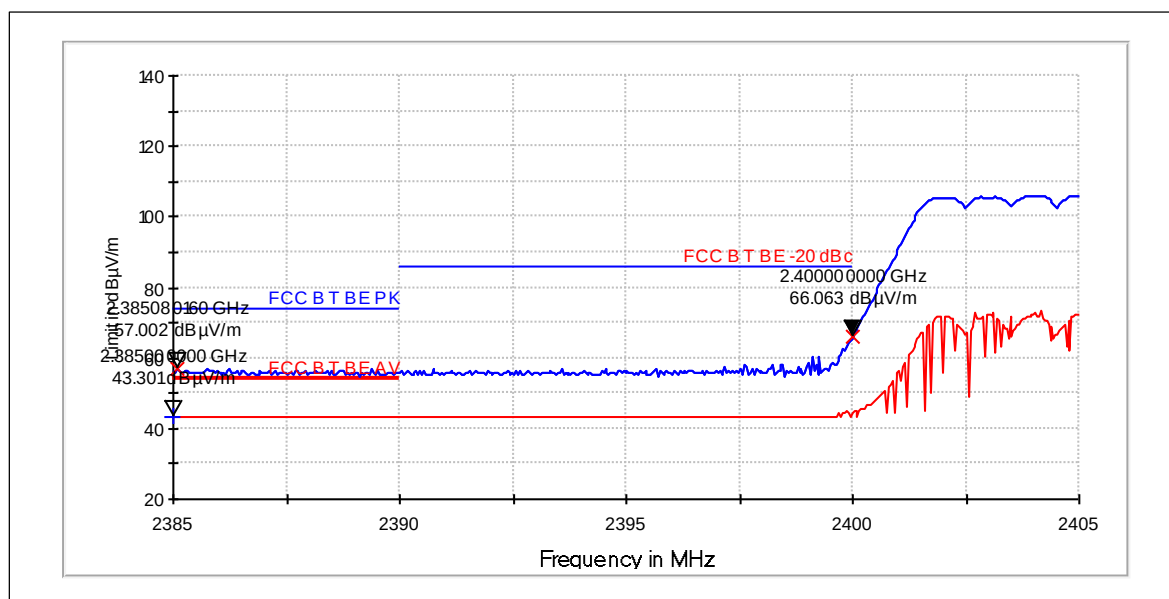
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	56.98	706.236	57.07	-0.09	PASSED
2400	66.53	2121.29	0	66.53	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	43.3	146.235	43.39	-0.09	PASSED

Hopping on. Low end.



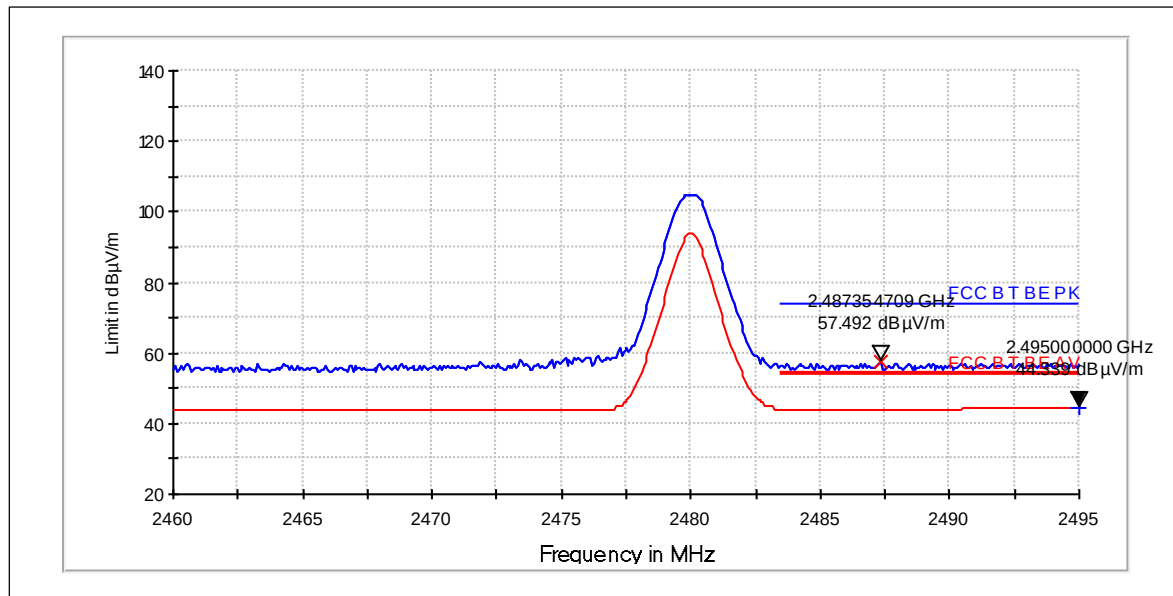
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	57	708.109	57.09	-0.09	PASSED
2400	66.06	2009.787	0	66.06	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	43.3	146.235	43.39	-0.09	PASSED

Channel 78 / 2480 MHz



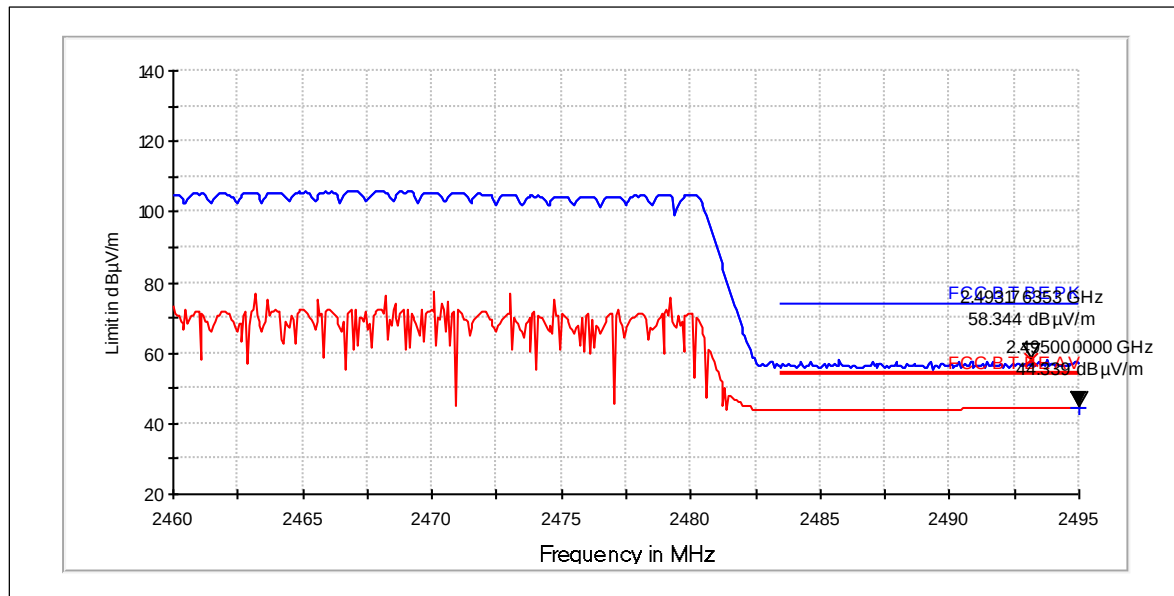
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2487	57.49	749.204	56.85	0.64	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2495	44.34	164.797	43.7	0.64	PASSED

Hopping on. High end.



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

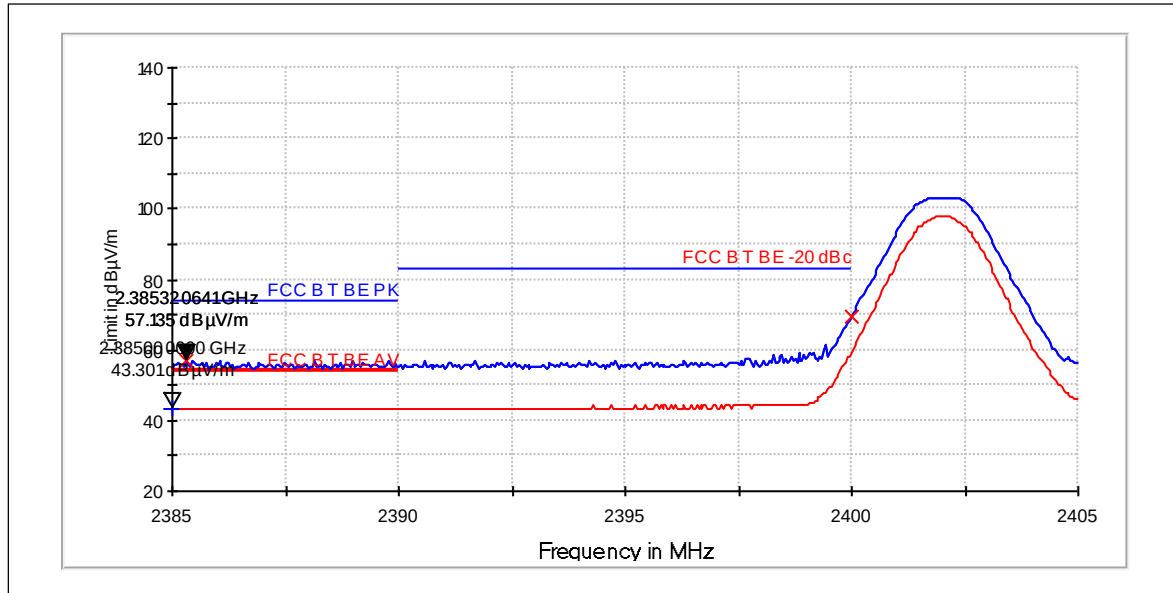
Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2493	58.34	826.418	57.7	0.64	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2495	44.34	164.797	43.7	0.64	PASSED

3.3.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



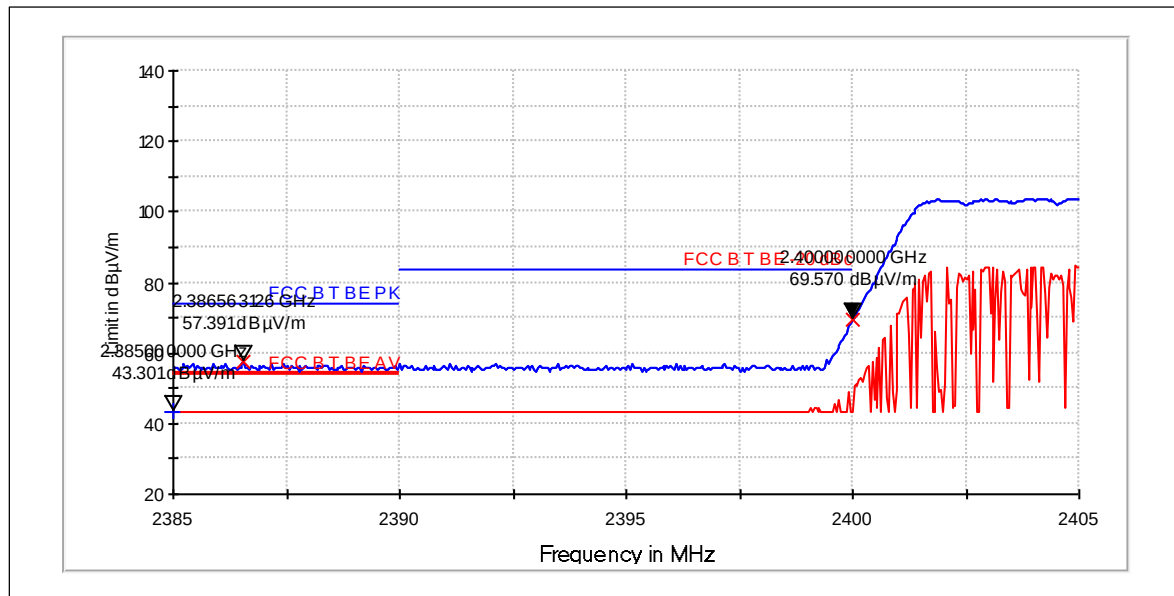
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	57.14	719.035	57.23	-0.09	PASSED
2400	69.75	3070.789	0	69.75	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	43.3	146.235	43.39	-0.09	PASSED

Hopping on. Low end.



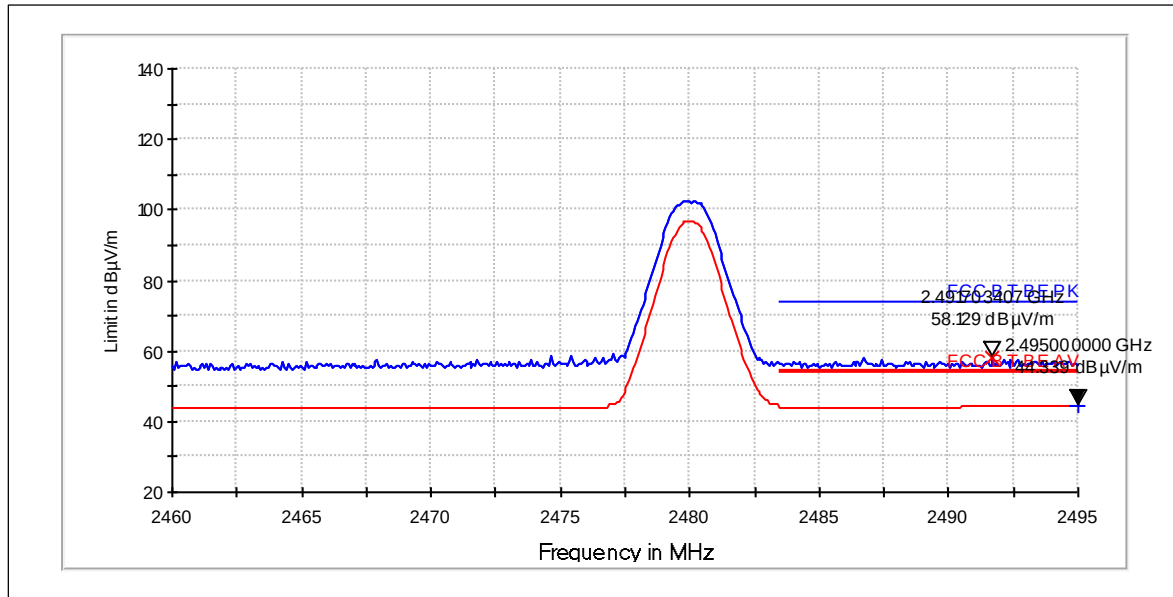
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2387	57.39	740.543	57.48	-0.09	PASSED
2400	69.57	3009.539	69.66	-0.09	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2385	43.3	146.235	43.39	-0.09	PASSED

Channel 78 / 2480 MHz



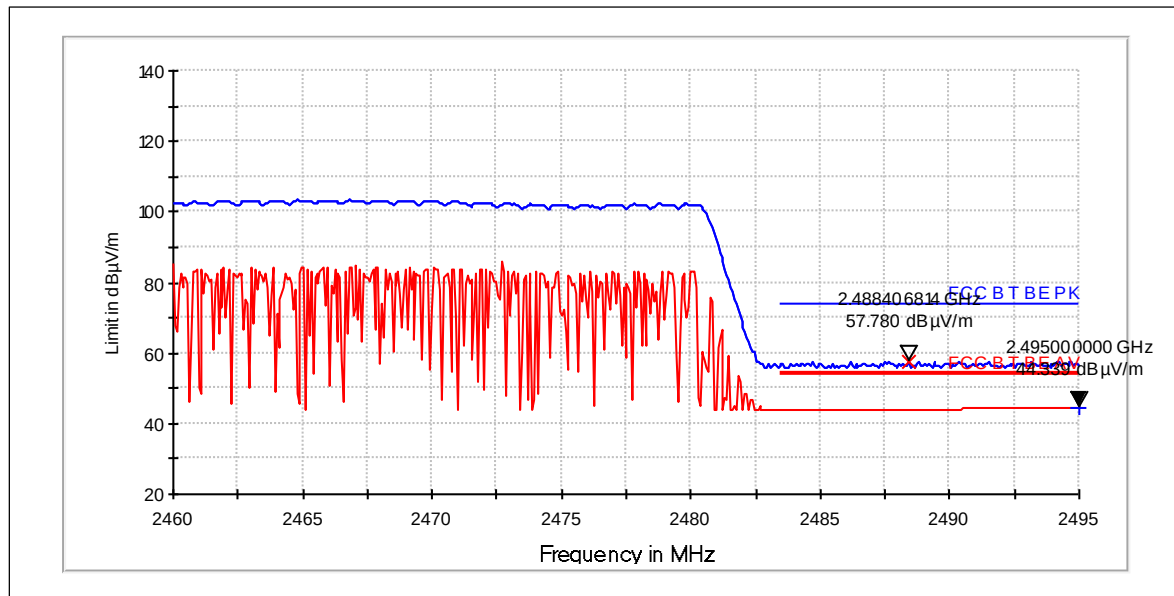
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2492	58.13	806.213	57.49	0.64	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2495	44.34	164.797	43.7	0.64	PASSED

Hopping on. High end.



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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2488	57.78	774.462	57.14	0.64	PASSED

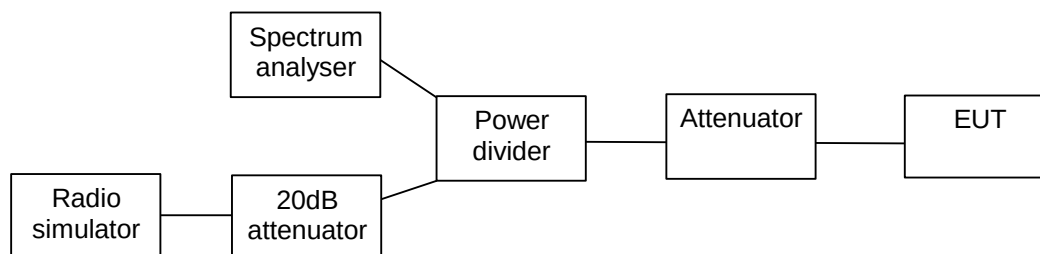
Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Results
2495	44.34	164.797	43.7	0.64	PASSED

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

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

4.1. Test Setup



4.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

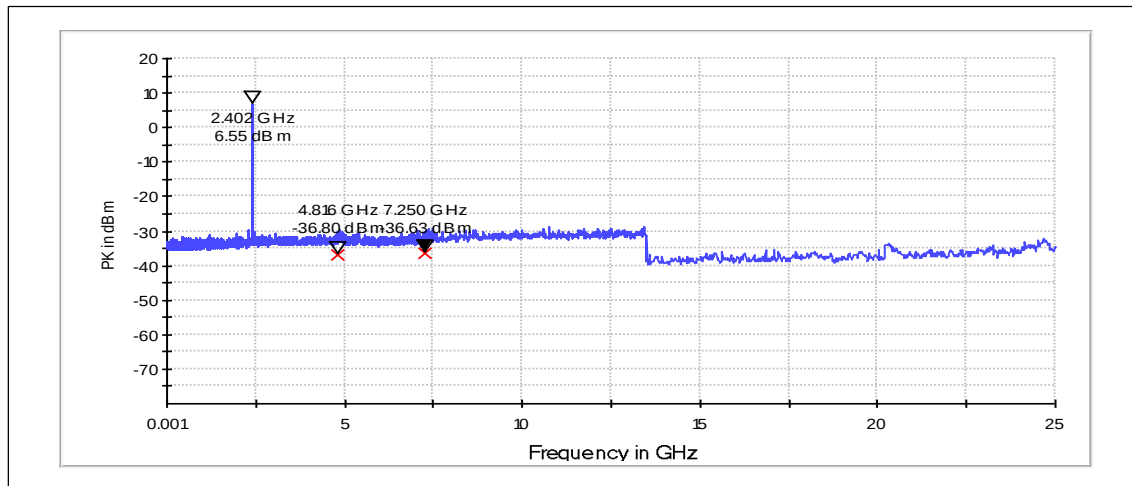
Limits for spurious RF conducted emissions measurements

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

4.3. Bluetooth Test results

4.3.1 GFSK modulation, PRBS packet type

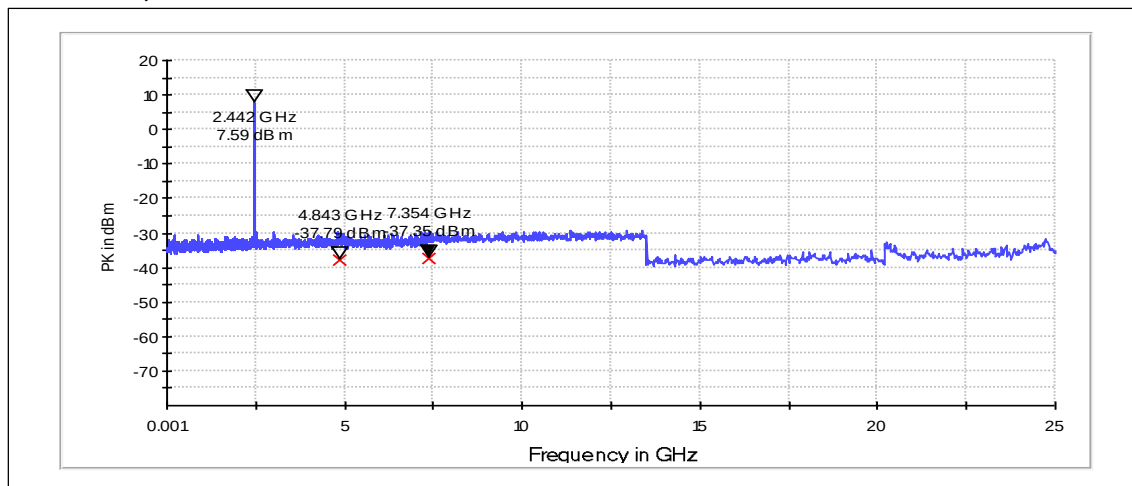
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
4816.400	-36.80	PASSED
7249.800	-36.63	PASSED

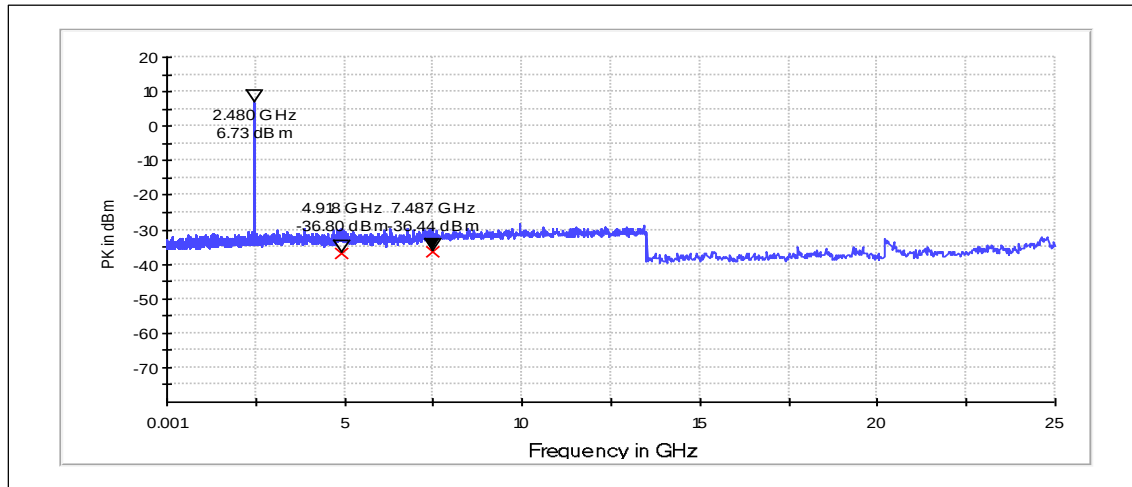
Channel 40 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
4843.200	-37.79	PASSED
7354.200	-37.35	PASSED

Channel 78 / 2480 MHz

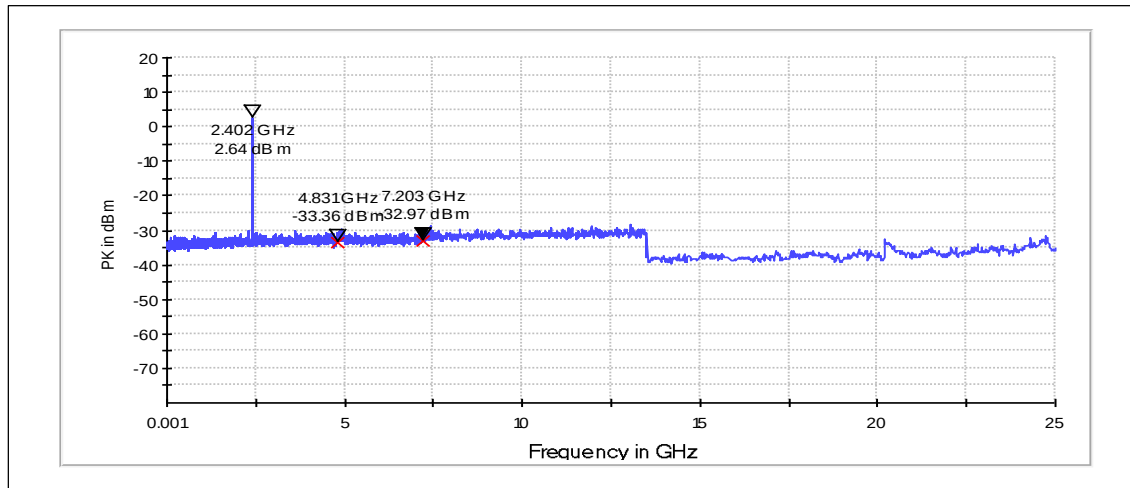


Peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	P [dBc]	Result
4918.400	-36.80	PASSED
7487.400	-36.44	PASSED

4.3.2 8DPSK modulation, PRBS packet type

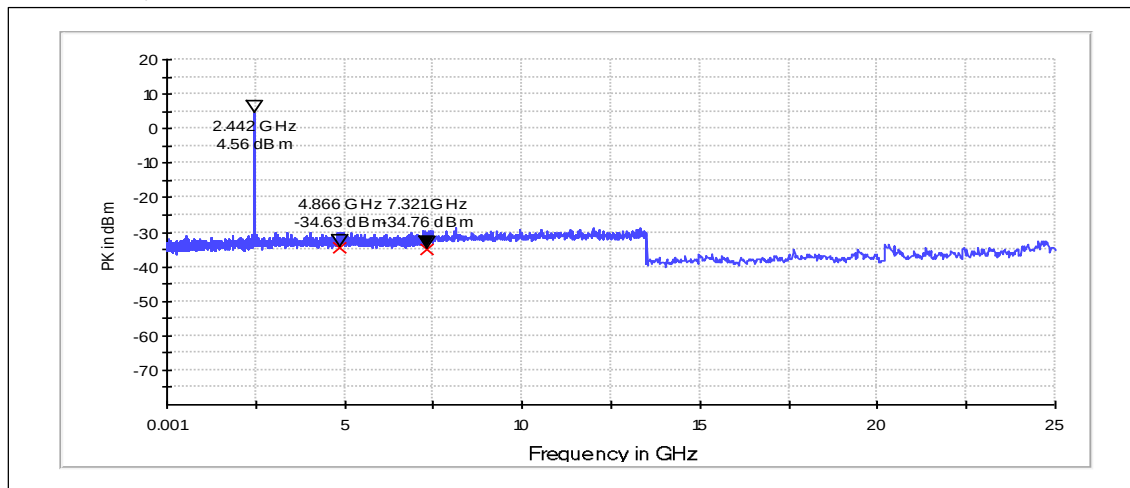
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
4830.800	-33.36	PASSED
7203.000	-32.97	PASSED

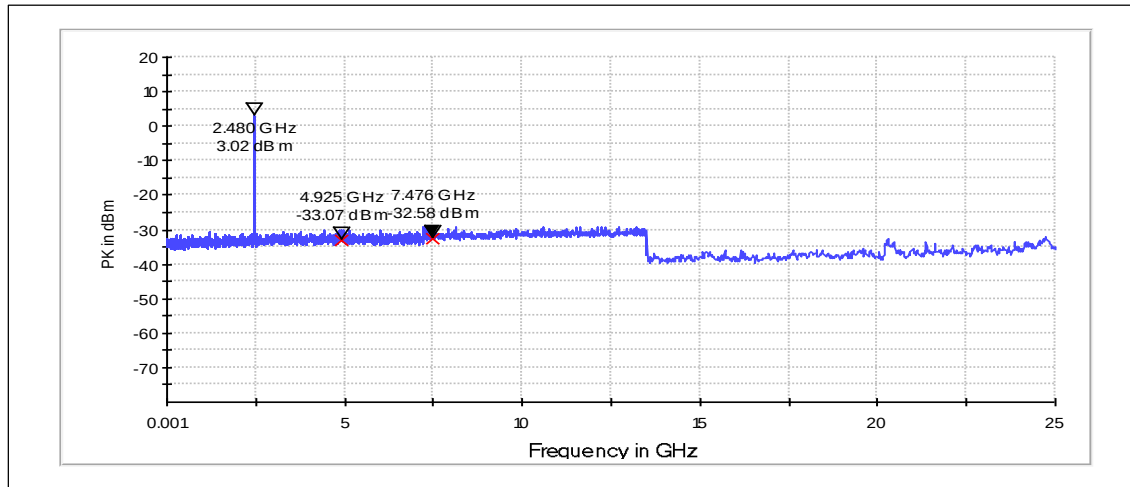
Channel 40 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
4866.400	-34.63	PASSED
7321.200	-34.76	PASSED

Channel 78 / 2480 MHz



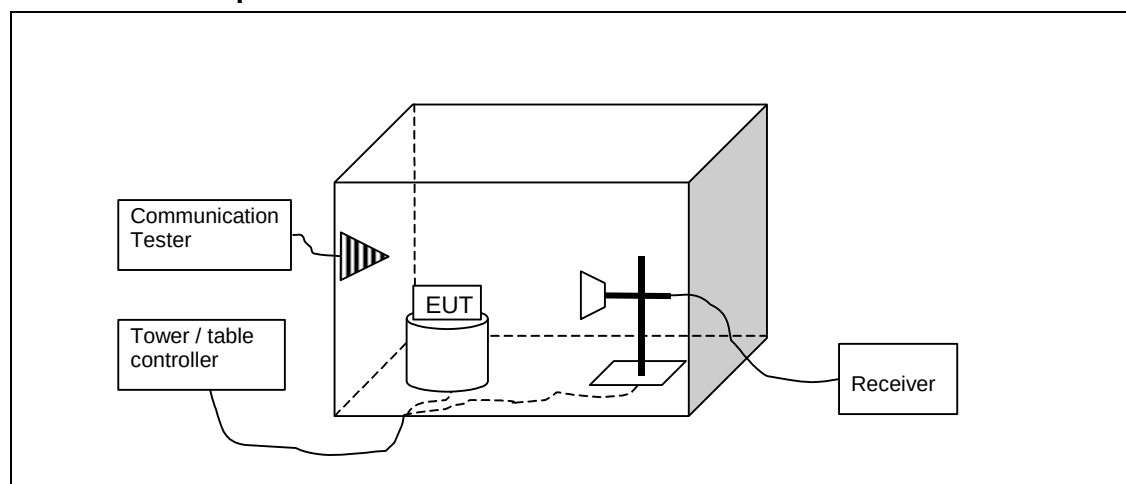
Peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	P [dBc]	Result
4925.200	-33.07	PASSED
7476.000	-32.58	PASSED

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

EUT with DUT number	RM-1104, DUT 100206
Accessories with DUT numbers	BV-T5E, DUT 100208 ; AC-100E, DUT 100196 ; WH-308, DUT 100195
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 45 / 100.6
Date of measurements	21-Jul-2015
Measured by	Kalle Hannila / Ville Mannermaa

5.1.1 Test setup



5.2. Test method and limit

The measurement is made according to Public notice DA 00-705 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 is made up to 10th harmonic of the EUT highest TX channel.

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

5.3. Bluetooth test results

5.3.1 GFSK modulation, PRBS packet type

Channel 40 / 2442 MHz

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
30.09	21.83	12.345	24.83	-3	40	18.17	PASSED
30.3	21.36	11.695	24.56	-3.2	40	18.64	PASSED
34.138	19.89	9.874	25.59	-5.7	40	20.11	PASSED
34.522	19.71	9.672	25.61	-5.9	40	20.29	PASSED
40.203	19.93	9.92	29.53	-9.6	40	20.07	PASSED
40.749	19.75	9.716	29.75	-10	40	20.25	PASSED
53.193	19.38	9.311	36.88	-17.5	40	20.62	PASSED
916.453	24.45	16.692	26.95	-2.5	46	21.57	PASSED
932.964	24.51	16.807	26.71	-2.2	46	21.51	PASSED
953.441	24.6	16.982	26.8	-2.2	46	21.42	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4879.7	42.32	130.617	43.82	-1.5	74	31.66	PASSED
7318.4	46.02	199.986	42.22	3.8	74	27.96	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4879.7	28.5	26.607	30	-1.5	54	25.48	PASSED
7318.4	32.62	42.756	28.82	3.8	54	21.36	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]	Limit [dBμV/m]	Margin	Results
4802.8	40.19	102.212	41.99	-1.8	74	33.79	PASSED
7207.7	45.89	197.015	42.19	3.7	95	49.34	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4802.8	27.62	24.044	29.42	-1.8	54	26.36	PASSED
7207.7	33.05	44.926	29.35	3.7	---	---	PASSED

Channel 78 / 2480 MHz

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4961.1	41.06	112.98	42.66	-1.6	74	32.92	PASSED
7441.3	46.49	211.106	41.89	4.6	74	27.49	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4961.1	28.53	26.699	30.13	-1.6	54	25.45	PASSED
7441.3	33.54	47.534	28.94	4.6	54	20.44	PASSED

5.3.2 8DPSK modulation, PRBS packet type

Channel 40 / 2442 MHz

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
30.63	21.06	11.298	24.46	-3.4	40	18.94	PASSED
30.93	20.86	11.041	24.46	-3.6	40	19.14	PASSED
32.098	20.26	10.304	24.56	-4.3	40	19.74	PASSED
34.012	20.12	10.139	25.72	-5.6	40	19.88	PASSED
40.389	20.09	10.104	29.79	-9.7	40	19.91	PASSED
40.563	20.47	10.556	30.37	-9.9	40	19.53	PASSED
53.193	17.45	7.456	34.95	-17.5	40	22.55	PASSED
884.667	23.94	15.74	26.74	-2.8	46	22.08	PASSED
913.339	24.43	16.653	27.03	-2.6	46	21.59	PASSED
943.817	24.66	17.1	26.76	-2.1	46	21.36	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4880.3	41.51	118.987	43.11	-1.6	74	32.47	PASSED
7320.9	45.94	198.153	42.04	3.9	74	28.04	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4880.3	28.59	26.884	30.19	-1.6	54	25.39	PASSED
7320.9	32.63	42.806	28.73	3.9	54	21.35	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]	Limit [dBμV/m]	Margin	Results
4803.6	40.46	105.439	42.36	-1.9	74	33.52	PASSED
7207.2	46.04	200.447	42.34	3.7	95	49.19	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4803.6	27.46	23.605	29.36	-1.9	54	26.52	PASSED
7207.2	33.07	45.03	29.37	3.7	---	---	PASSED

Channel 78 / 2480 MHz

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4961.8	41.71	121.759	43.31	-1.6	74	32.27	PASSED
7440	46.09	201.604	41.49	4.6	74	27.89	PASSED

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

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4961.8	28.58	26.853	30.18	-1.6	54	25.4	PASSED
7440	33.5	47.315	28.9	4.6	54	20.48	PASSED

6. AC powerline conducted emissions (FCC §15.207, RSS-210 7.2.4)

EUT with DUT number	RM-1104, DUT 100205
Accessories with DUT numbers	BV-T5E, DUT 100210 ; AC-100E, DUT 100026 ; WH-308, DUT 100028
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19.4 / 66.5 / 102.3
Date of measurements	03-Jul-2015
Measured by	Tomi Lipponen

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.

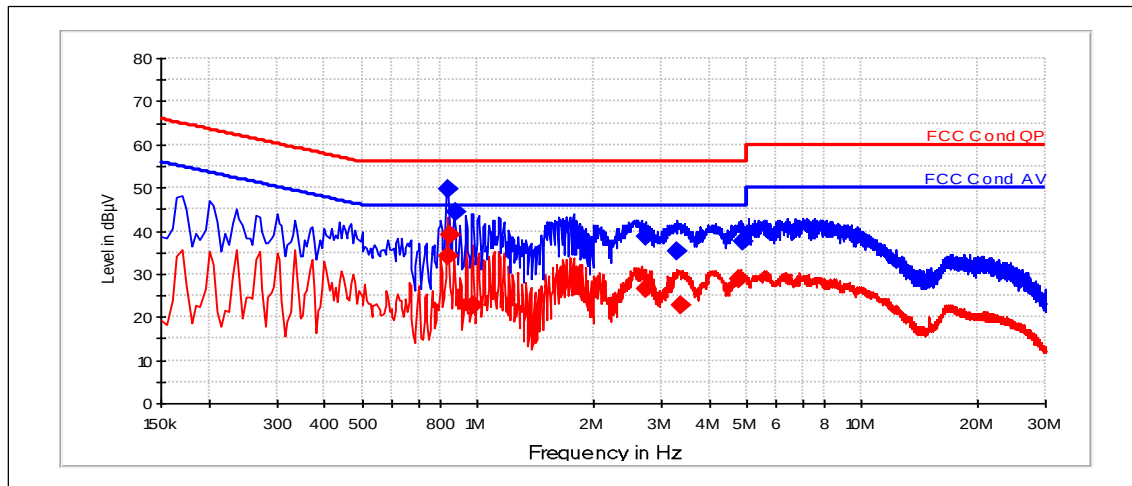
CISPR 22 Class B limits

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 Test results

6.3.1 GFSK modulation, PRBS packet type

Channel 40 / 2442 MHz



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.84	49.5	N	PASSED
0.88	44.26	N	PASSED
2.75	38.5	N	PASSED
3.315	35.31	N	PASSED
4.91	37.44	N	PASSED

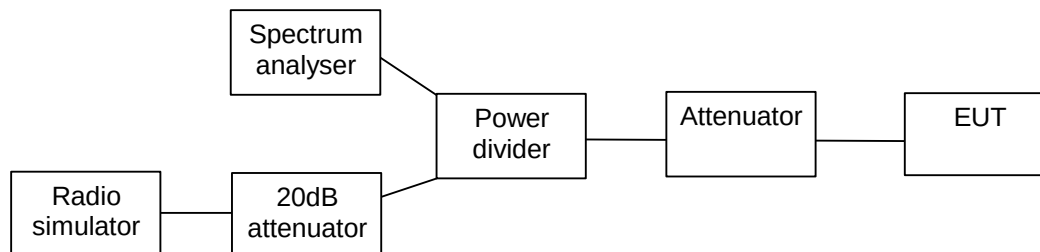
Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.84	34.05	N	PASSED
0.845	38.87	N	PASSED
0.975	22.92	N	PASSED
2.73	26.55	N	PASSED
3.38	22.87	N	PASSED
4.77	28.67	N	PASSED

7. 20dB(bandwidth) (FCC §15.247(a)(1), RSS-210 A8.1(a))

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

7.1. Test Setup



7.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

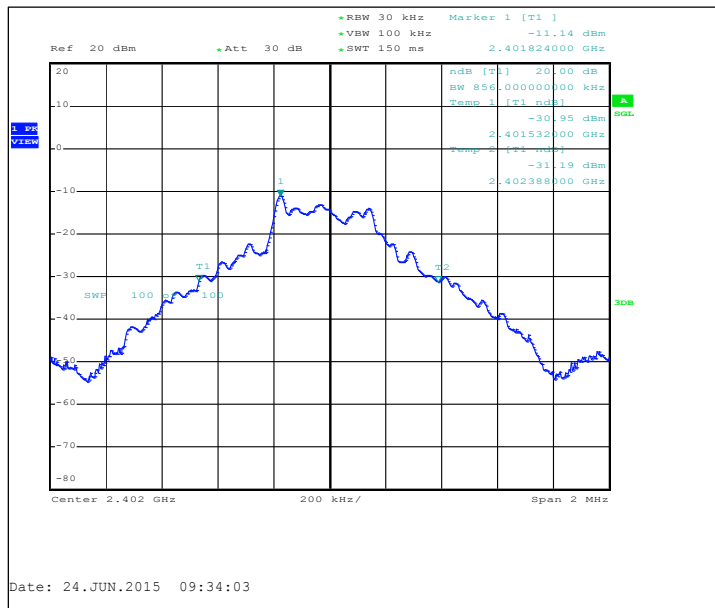
Limit [MHz]
N/A

7.3. Bluetooth Test results

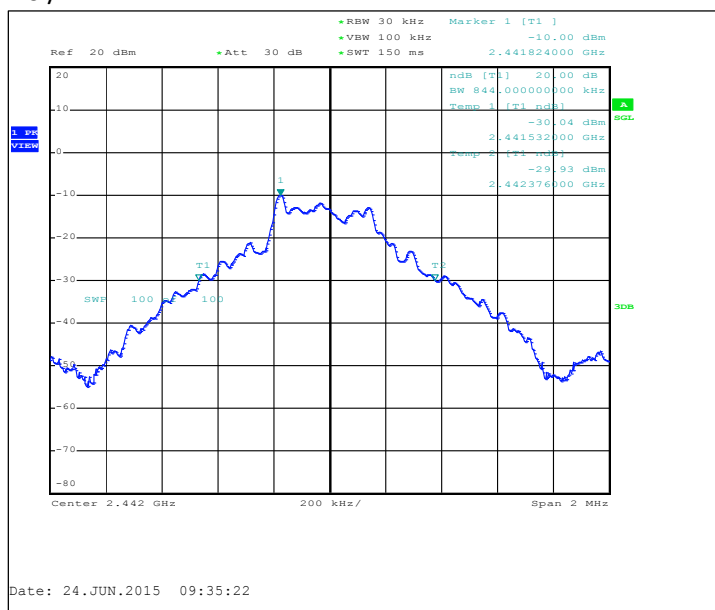
7.3.1 GFSK modulation, PRBS packet type

Channel / f_c [MHz]	20 dB bandwidth [kHz]
0 / 2402	856
40 / 2442	844
78 / 2480	844

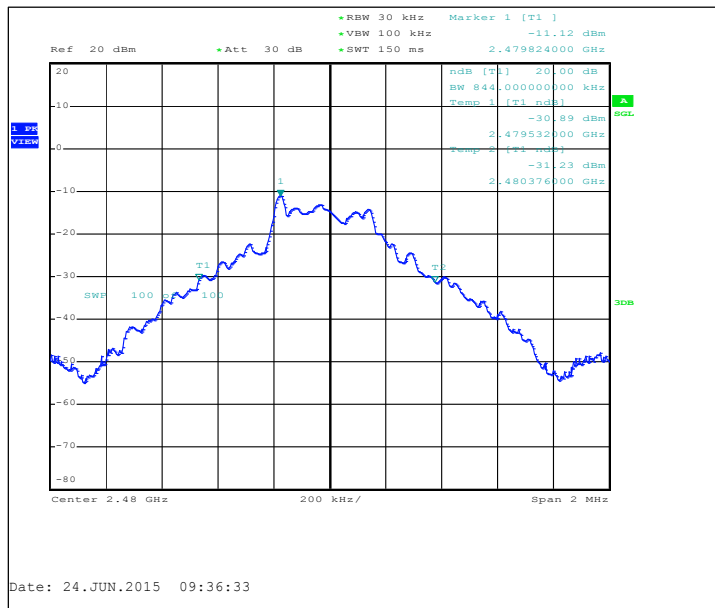
0 / 2402



40 / 2442



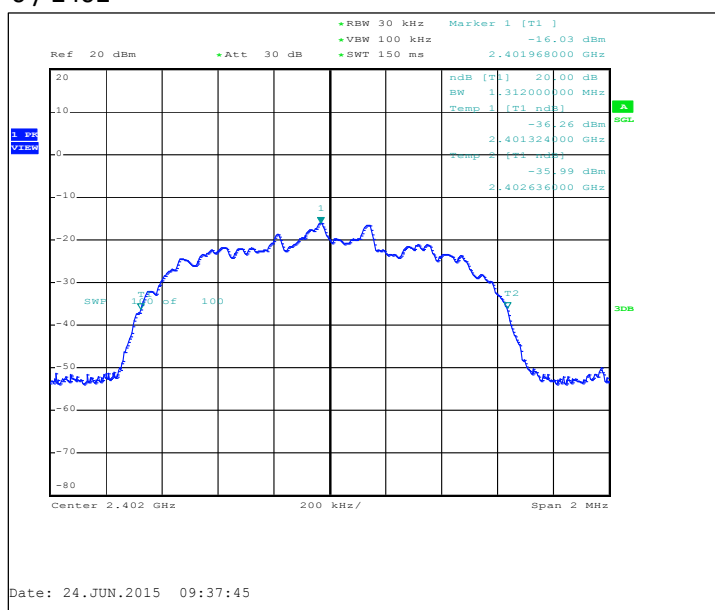
78 / 2480



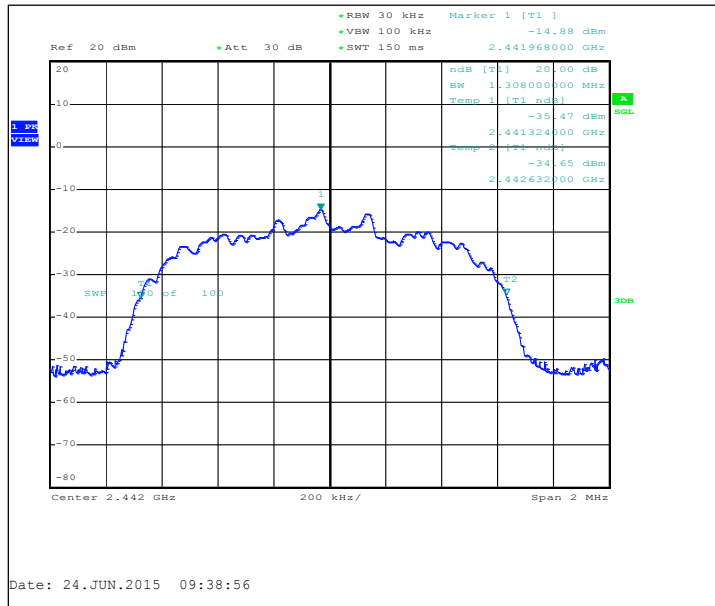
7.3.2 8DPSK modulation, PRBS packet type

Channel / f _c [MHz]	20 dB bandwidth [kHz]
0 / 2402	1312
40 / 2442	1308
78 / 2480	1308

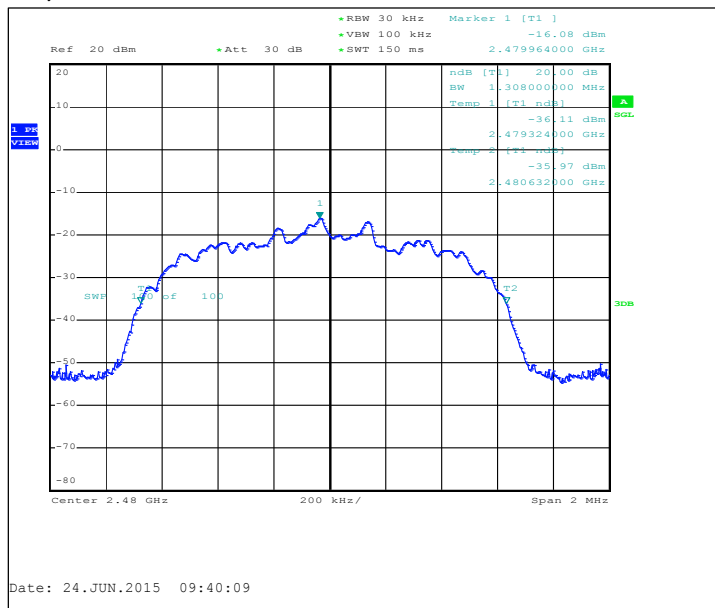
0 / 2402



40 / 2442



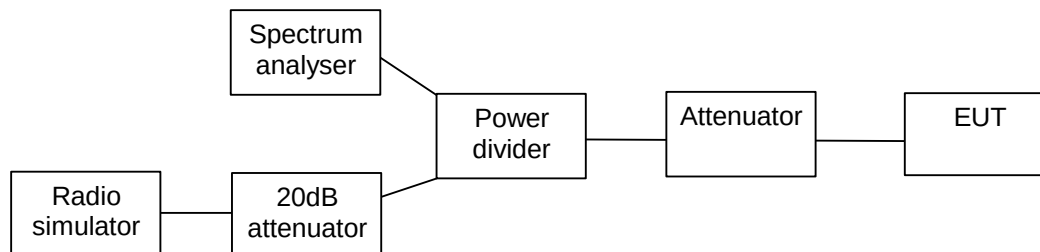
78 / 2480



8. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 A8.1(b))

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

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-210.

Limits for carrier frequency separation measurements

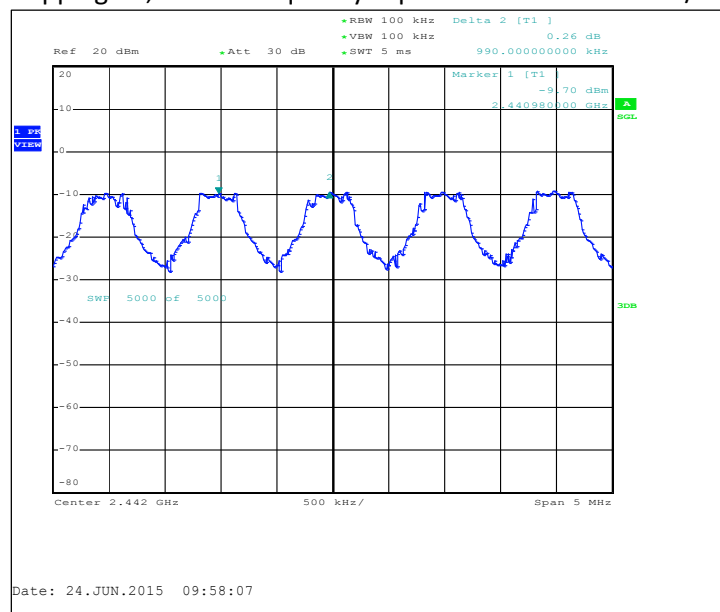
Limit [MHz]
≥ 0.025 or $2/3$ of the 20 dB bandwidth

8.3. Bluetooth Test results

8.3.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
990	PASSED

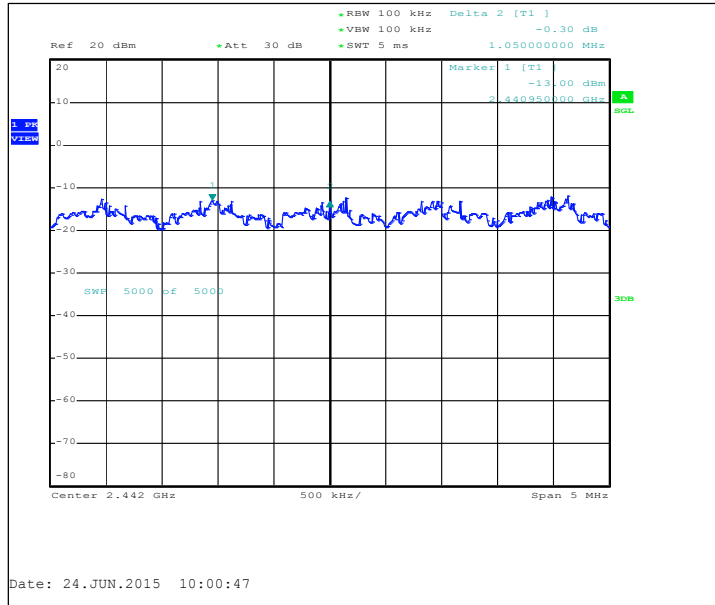
Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



8.3.2 8DPSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
1050	PASSED

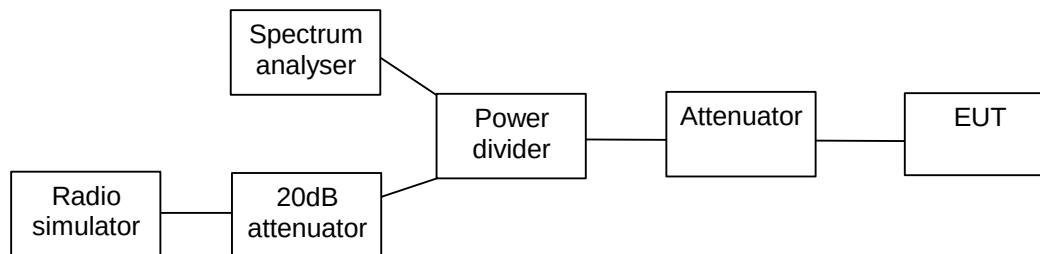
Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



9. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 A8.1(d))

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

9.1. Test Setup



9.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

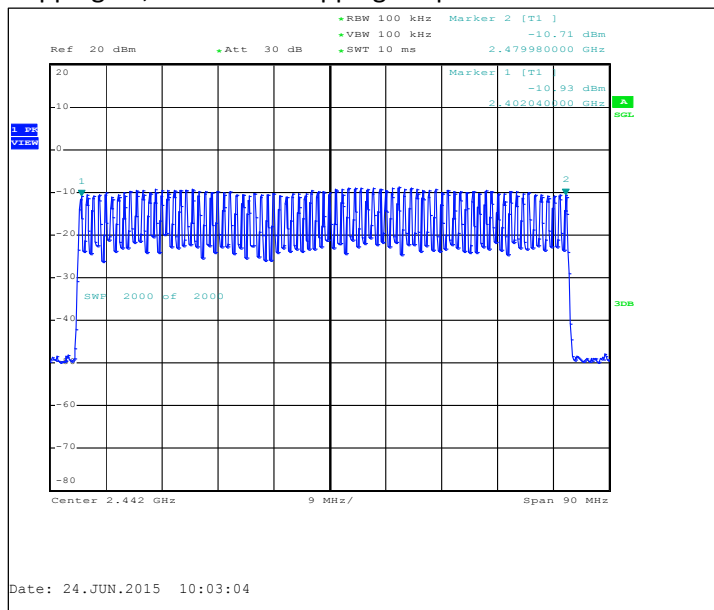
Limit [number]
≥ 15

9.3. Bluetooth Test results

9.3.1 GFSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
78	PASSED

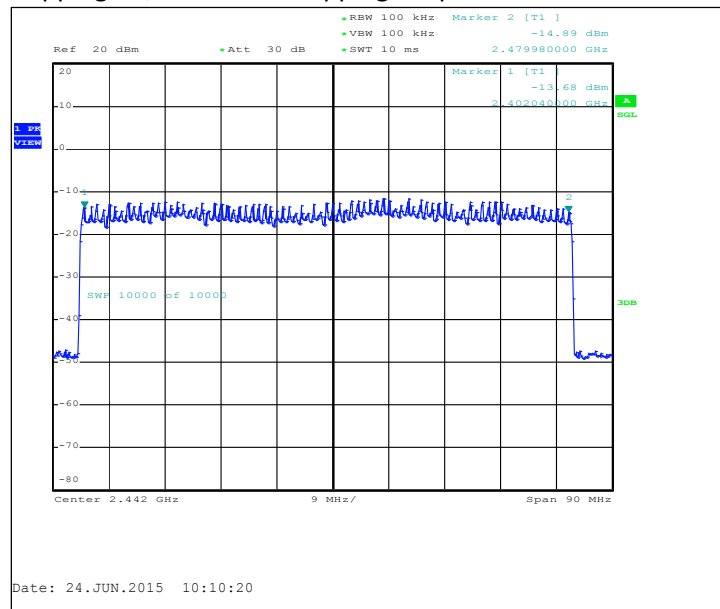
Hopping on, number of hopping frequencies



9.3.2 8DPSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
78	PASSED

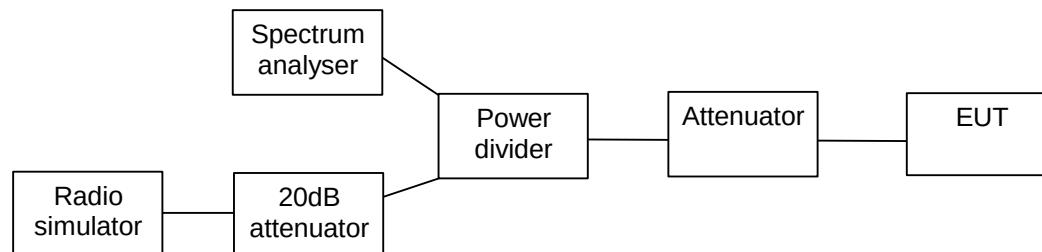
Hopping on, number of hopping frequencies



10. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 A8.1(d))

EUT with DUT number	RM-1104, DUT 100006
Accessories with DUT numbers	SD-244R, DUT 100023
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 45 / 100.4
Date of measurements	24-Jun-2015
Measured by	Kalle Hannila

10.1. Test Setup



10.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

The total time of occupancy is get by multiplying the measured number of transmissions occurred during 31.6 second period with the duration of one transmission.

Limits for time of occupancy measurements

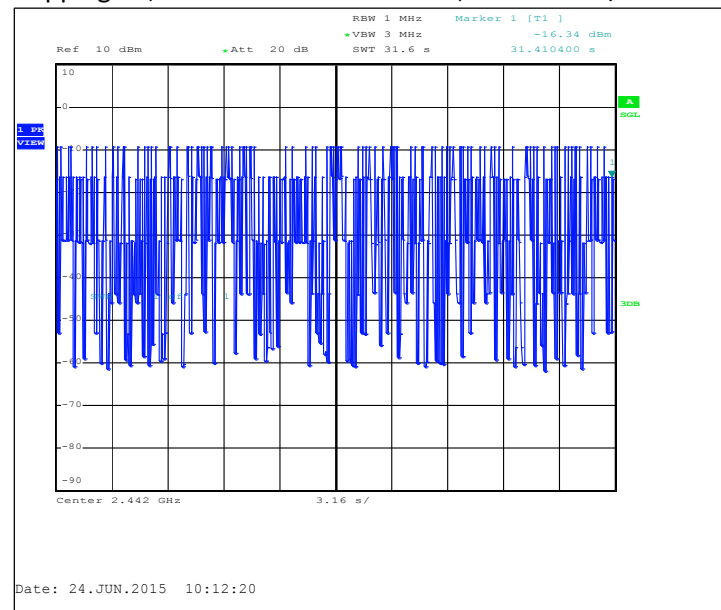
Limit [s]
<= 0.4

10.3. Bluetooth Test results

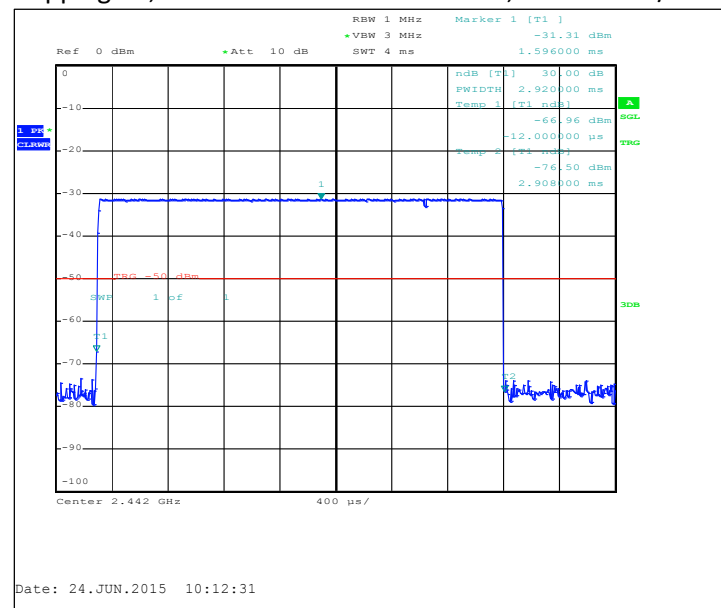
10.3.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [ms]	Time of occupancy [s]	Result
89	2.92	0.26	PASSED

Hopping on, number of transmissions, channel 40 / 2442 MHz



Hopping on, duration of one transmission, channel 40 / 2442 MHz



Measured number of transmissions	Duration of one transmission [ms]	Time of occupancy [s]	Result
120	2.92	0.35	PASSED

Ref 10 dBm Att 20 dB SWT 31.6 s

RBW 1 MHz Marker 1 [T1] -10.41 dBm
 VBW 3 MHz
 31.536800 s

dB

10
 0
 -10
 -20
 -30
 -40
 -50
 -60
 -70
 -80
 -90

2.442 GHz 3.16 s/

SGI

3dB

Date: 24.JUN.2015 10:14:33

RBW 1 MHz Marker 1 [T1]
VBW 3 MHz -31.36 dBm
SWT 4 ms 1.492000 ms

Ref 0 dBm +Att 10 dB

ndB [T1]	30.00 dB
PWIDTH	2.920000 ms
Temp 1 [T1 ndB]	-48.23 dBm
	-4.000000 μs
Temp 2 [T1 ndB]	-77.79 dBm
	2.916000 ms

S21

Center 2.442 GHz 400 μs/

Date: 24.JUN.2015 10:14:43

11. Test Equipment

11.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B
6044	V-network	ESH3-Z6	R&S	-
2059	V-network	ESH3-Z6	R&S	-
1759	LISN 50 μ H	ESH3-Z5	R&S	22/24/27, 15C, 15B
2097	Pulse Limiter	ESH3-Z2	R&S	22/24/27, 15C, 15B
1999	Receiver	ESIB26	R&S	22/24/27, 15C, 15B
2180	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2390	Directional Coupler	DC2600	AR	-
-	RF immunity / Emission Software	EMC32	R&S	22/24/27, 15C, 15B
2060	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
1759	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
2039	Power Supply	PL330QMD	Thurlby	15C, 15B
6036	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
2359	Temperature Test Chamber	VT4002	Vötsch	22/24/27
2352	Spectrum Analyzer	FSP-30	R&S	22/24/27, 15C
6109	Communication Tester	CMU200	R&S	22/24/27, 15C
6246	Power Supply	66332A	HP	22/24/27, 15C
1992	Signal Generator	83630B	Agilent	15C, 15B
6098	Signal Generator	8648C	Agilent	-
6046	Attenuator 10dB	8493C	Agilent	22/24/27, 15C
6047	Attenuator 20dB	8493C	Agilent	22/24/27, 15C
6045	Power splitter	11667B	Agilent	22/24/27, 15C
6247	Communication Tester	CBT	R&S	22/24/27, 15C 15B
6052	Communication Tester	CMU200	R&S	22/24/27, 15C 15B
6248	Power Supply	6632B	-	22/24/27, 15C 15B
6106	Spectrum Analyzer	FSP-30	R&S	22/24/27, 15C 15B
6113	Signal Generator	SMF100A	R&S	22/24/27, 15C 15B
6202	Temperature Test Chamber	VT4002	Vötsch	22/24/27, 15C 15B
6122	Power Splitter	11667B	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
6103	Bluetooth tester	CBT	R&S	22/24/27, 15C 15B
6250	Power Supply	6651A	Agilent	22/24/27, 15C 15B
6108	Communication Tester	CMU200	R&S	22/24/27, 15C 15B
6105	Spectrum Analyzer	FSV-30	R&S	22/24/27, 15C 15B
6251	Temperature Test Chamber	VT4002	Vötsch	22/24/27, 15C 15B
6243	Power Splitter	1167B	Agilent	22/24/27, 15C 15B
6245	Attenuator 10dB	BW-S10-2W263+	Mini-Circuits	22/24/27, 15C 15B
6244	Attenuator 20dB	BW-S20-2W263+	Mini-Circuits	22/24/27, 15C 15B

11.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
2388	Bluetooth Tester	CBT	R&S	15B
10479	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
2347	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2009	Signal Generator	SMP 22	R&S	22/24/27, 15C, 15B
2348	Controller	G-1000DXC	Yaesu	22/24/27, 15C, 15B
2349	Computer Controller	g-1000DXC	Yaesu	22/24/27, 15C, 15B
2116	Controller	EMCO 2090	ETS	22/24/27, 15C, 15B
2109	Power Supply	PL330QMD	Thurlby	22/24/27, 15C, 15B
2353	Receiver	ESIB26	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

Eq. No	Equipment	Type	Manufacturer	Used in
6117	Open switch and control unit	OSP 150	R&S	22/24/27, 15C, 15B
6131	Notch Filter	WRCT902.4-0.4/40-8SS	Wainwright	22/24/27, 15C, 15B
6130	Notch Filter	WRCD1880-1.1.25/50-10SS	Wainwright	22/24/27
6159	Band Reject Filter	WRCD1747.8-0.4/40-5SS	Wainwright	22/24/27, 15C, 15B
6158	Band Reject Filter	WRCT836.6-0.4/40-8SS	Wainwright	22/24/27, 15C, 15B
6197	Band Reject Filter	WRCJV2531/2539-2523/2547-60/12SS	Wainwright	22/24/27, 15C, 15B
2231	Band Reject Filter	WRCG1947/1953-1940/1960-40/6SS	Wainwright	22/24/27, 15C, 15B
2391	Band Reject Filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
2386	Band Reject Filter	WRCG1764.4/1770.4-1760.4/1774.4-40/6SS	Wainwright	22/24/27, 15C, 15B
2385	Band Reject Filter	WRCG1744.4/1750.4-1740.4/1754.4-40/6SS	Wainwright	22/24/27, 15C, 15B
2357	Band Reject Filter	WRCG2400/2483-2390/2493-35/10SS	Wainwright	15C
2188	Preamplifier	AFS4-00100300-20-23P-6	Miteq	22/24/27, 15C, 15B
6195	High Pass Filter	-	Wainwright	22/24/27, 15C, 15B
2364	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	24
2361	Anechoic Chamber	3 m Semi / Full Anechoic Chamber	Euroshield	22/24/27, 15C, 15B
6212	Antenna Array system	-	TCC	22/24/27, 15C, 15B
-	RF immunity / Emission Software	EMC32	R&S	22/24/27, 15C, 15B
6089	Antenna	HFH2-Z2	R&S	15C, 15B
2027	CDN	M2 (modified) DC1	MEB	22/24/27, 15C, 15B
2028	CDN	M3 (modified) DC2	MEB	22/24/27, 15C, 15B
2176	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B
2135	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B
2029	Power Supply	PL330	Thurlby	22/24/27, 15C
6038	Data Logger	Testo 580	Testo	22/24/27, 15C, 15B
6037	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B

END OF REPORT