

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBT_RM-978_04	Date of Report:	07-Mar-2014
Number of pages:	38	Customer's Contact person:	Juha Paukku
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-978 / Battery BL-5H / Charger AC-20E / Headset WH-108 / Dummy Battery SD-128		
FCC ID:	PDNRM-978	IC:	661R-RM978
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, 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:			

Jari Jantunen, System Manager, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	16-Jan-2014
Testing completed	27-Jan-2014
The customer's contact person	Juha Paukku
Test Plan referred to	T:\Projects\RM-977\TestPlan\RS_testplan_RM-977.xlsm
Notes	-
Document name	T:\Projects\RM-977\EMC\FCC15CBT_RM-977_07.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-977	004402476801257	2205		1052.0000.1351.10049	43137
Phone	RM-977	004402476801331	2205	-	1052.0000.1351.10049	43141
Dummy Battery	SD-128	-	v0.1	-	-	43138
Battery	BL-5H LGC	4955403494010105372;0670699	V3.0 PWB ver 2.0	-	-	43139
AC charger	AC-20E	4868673411351126865;0675628	-	-	-	43140
Headset	WH-108	2376171	-	-	-	43142
Phone	RM-977	00442476801315	2205		1052.0000.1351.10049	43133
Battery	BL-5H		LGC V3.0		-	43134
Charger	AC-20E Phihong	-	-	-	-	43135
Headset	WH-108	-	-	-	-	43136

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(0.4(2))	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)(1)	A8(0.1(1))	20dB(bandwidth)	PASSED
15.247(a)(1)	A8(0.1(2))	Carrier frequency separation	PASSED
15.247(a)(1)(iii)	A8(0.1(4))	Number of hopping frequencies	PASSED
15.247(a)(1)(iii)	A8(0.1(4))	Time of occupancy	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-977 are re-used for certification of the PDNRM-978.

The table above indicates the results, which will be re-used.

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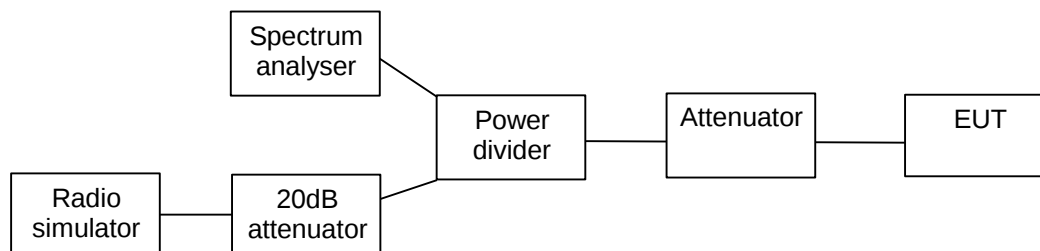
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2. Conducted peak output power (15.247(b)(1), RSS-210 A8.4 (2))

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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

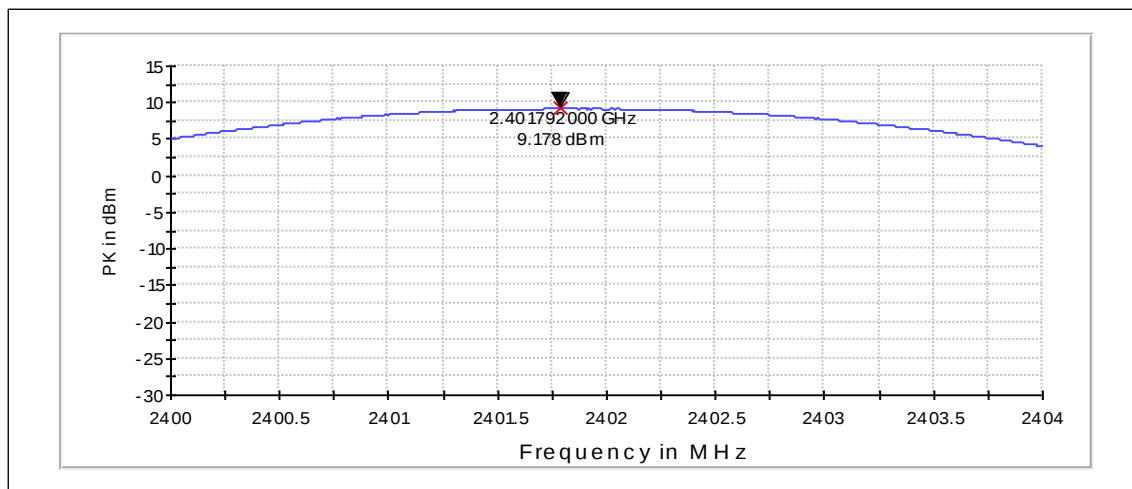
Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5 5725 - 5850	≤ 1	≤ 30

2.3. Bluetooth Test results

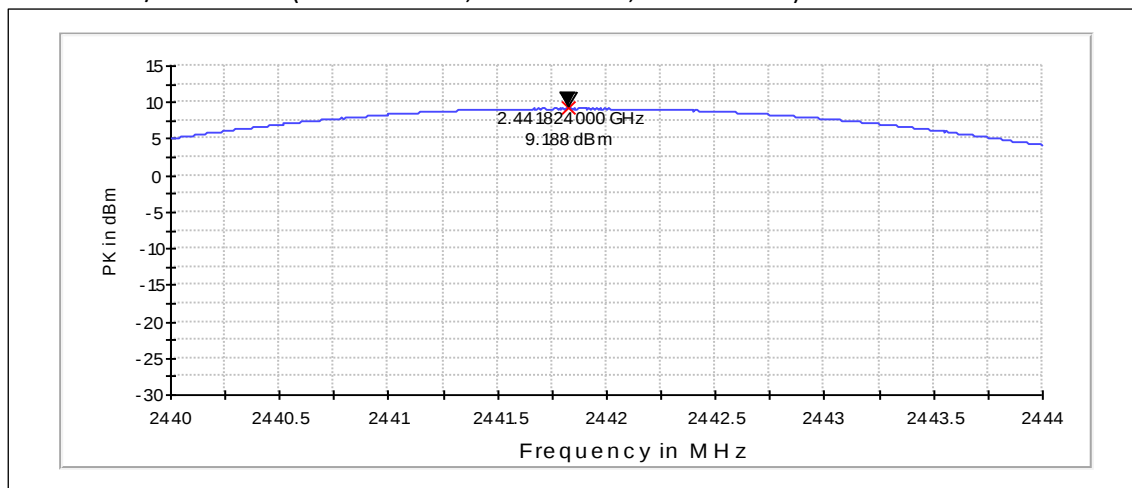
2.3.1 GFSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	9.18	8.279	PASSED
40 / 2442	9.19	8.299	PASSED
78 / 2480	9.18	8.279	PASSED

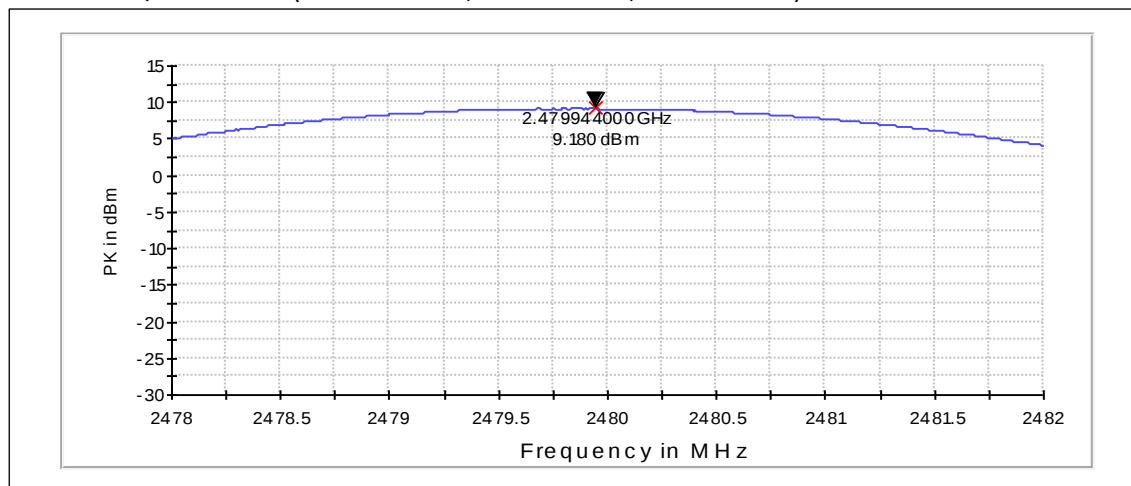
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



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



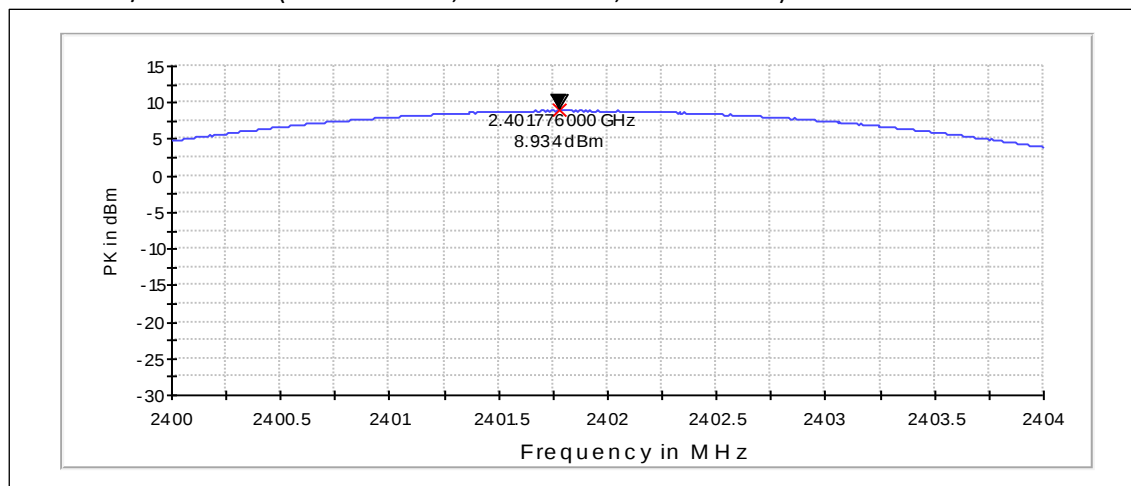
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



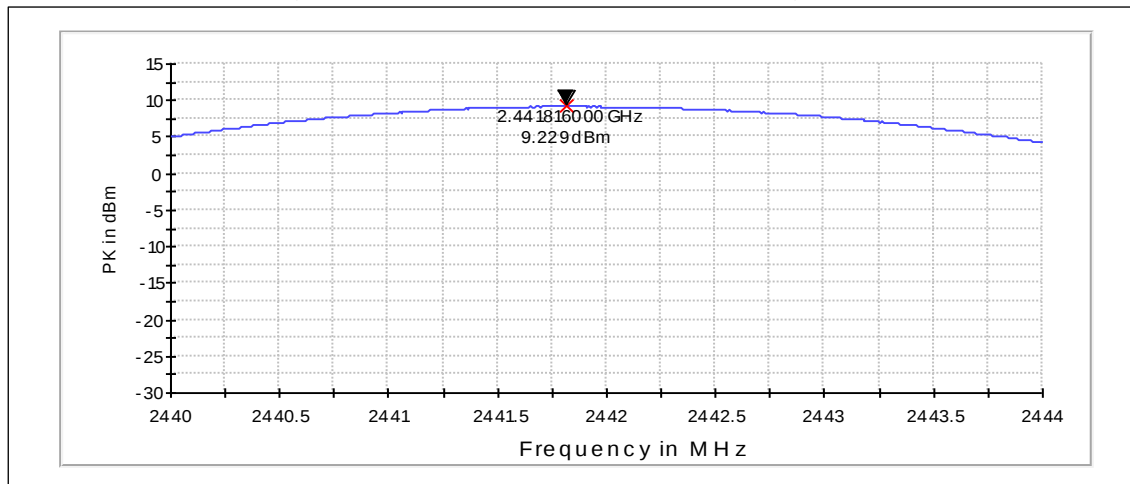
2.3.2 8DPSK modulation, PRBS packet type

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
0 / 2402	8.93	7.816	PASSED
40 / 2442	9.23	8.375	PASSED
78 / 2480	9.2	8.318	PASSED

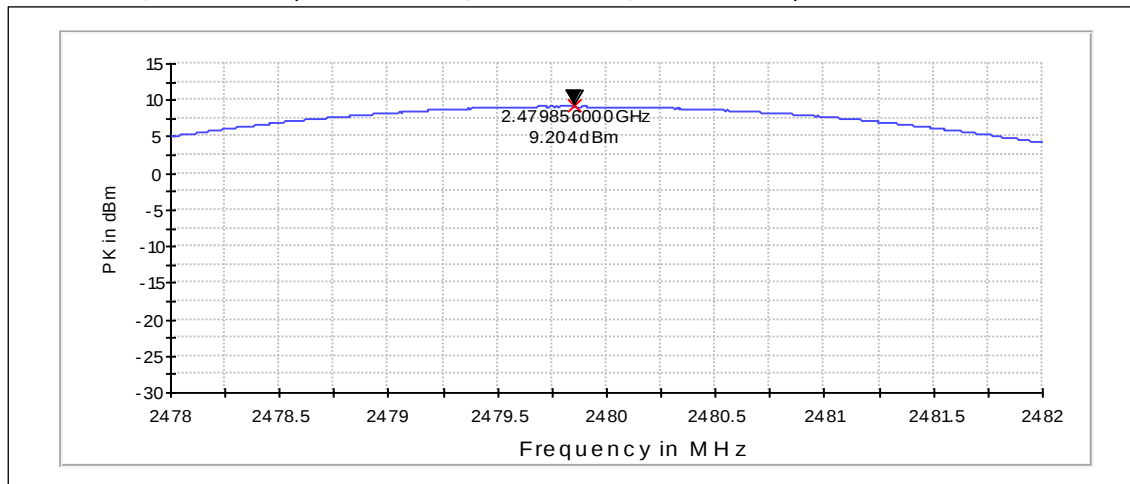
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



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



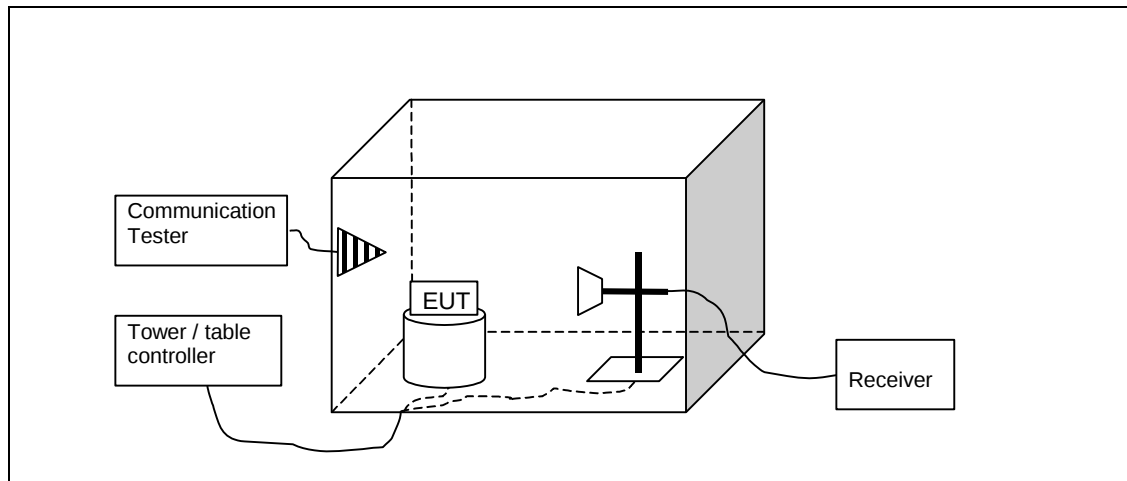
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



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

EUT with DUT number	RM-977, DUT 43133
Accessories with DUT numbers	BL-5H, DUT 43134 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24 / 47 / 103
Date of measurements	27-Jan-2014
Measured by	Hannu Söderholm

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 ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

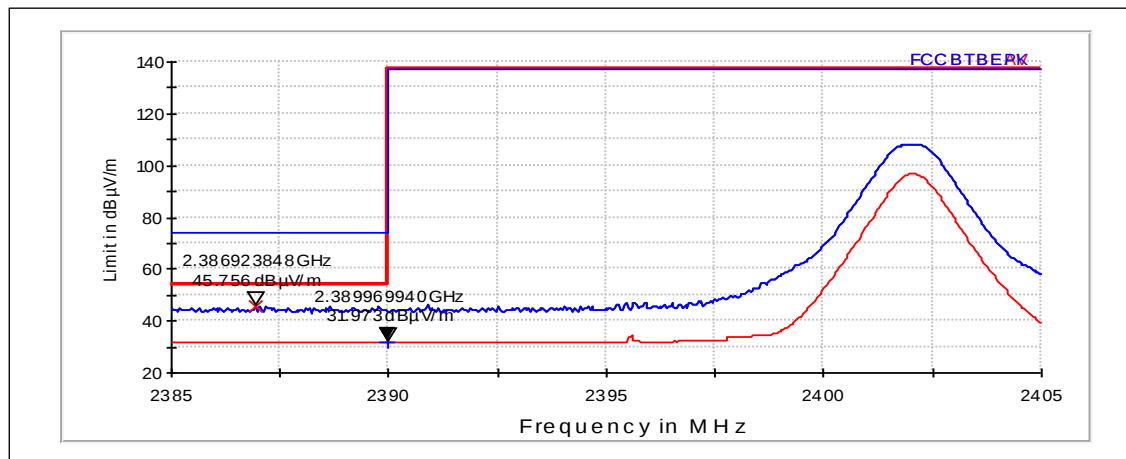
Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

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

3.3. Bluetooth test results

3.3.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



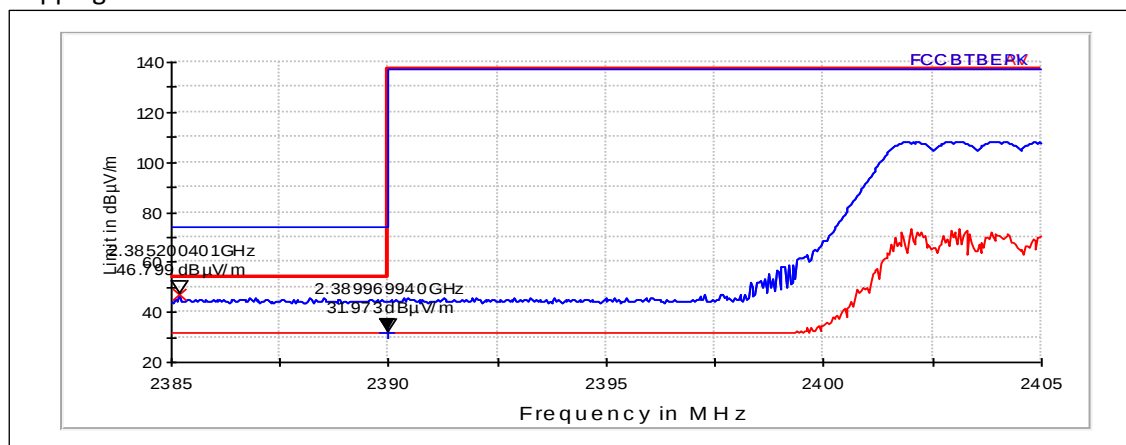
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U _{RX} [dBµV]	A _{TOT} [dB]	Correction [dB]	Results
2387	45.76	193.999	58.16	-12.4	-12.399	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	31.97	39.687	44.37	-12.4	-12.399	PASSED

Hopping on. Low end.



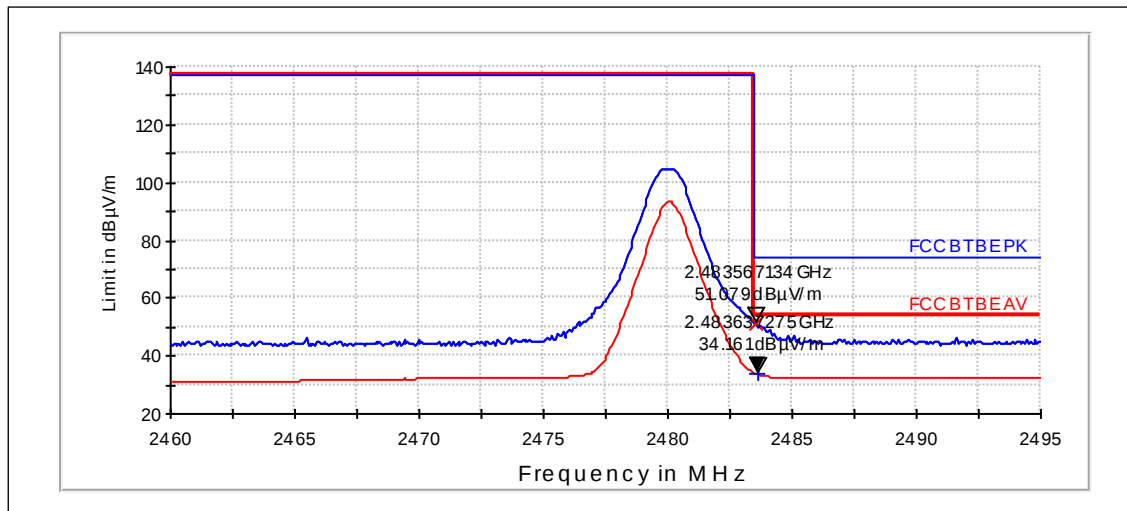
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U _{RX} [dBµV]	A _{TOT} [dB]	Correction [dB]	Results
2385	46.8	218.751	59.2	-12.4	-12.399	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	31.97	39.687	44.37	-12.4	-12.399	PASSED

Channel 78 / 2480 MHz



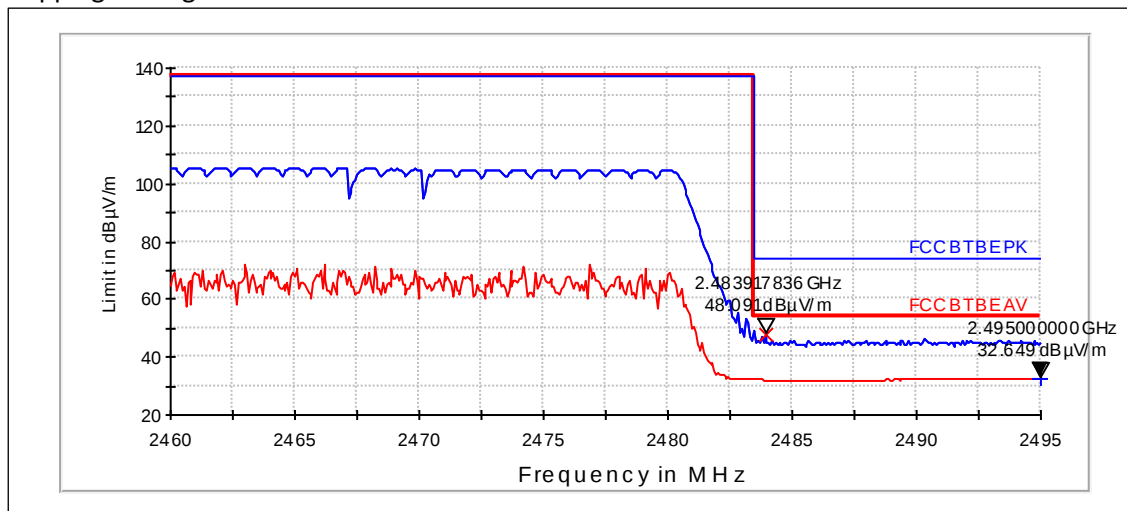
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2484	51.08	358.055	62.97	-11.89	-11.891	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
2484	34.16	51.056	46.05	-11.89	-11.891	PASSED

Hopping on. High end.



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

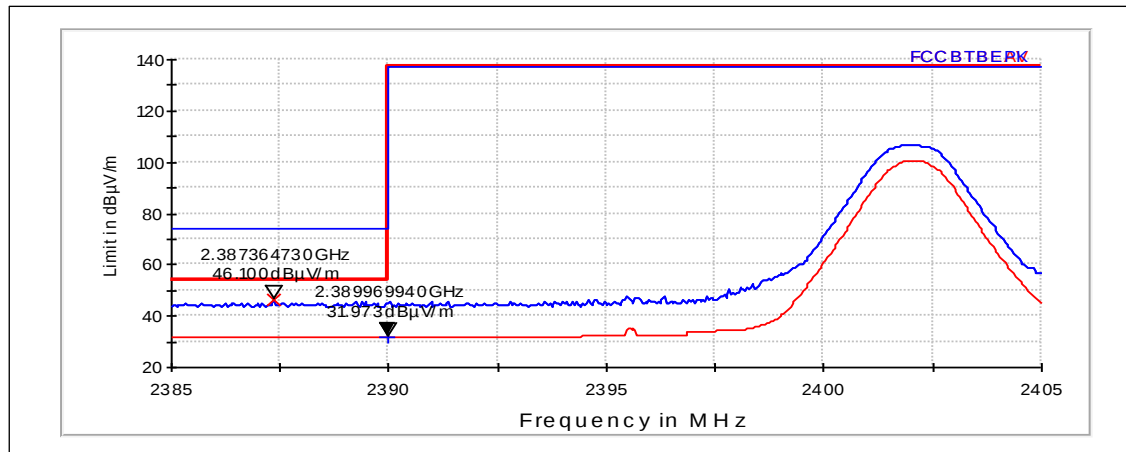
Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2484	48.09	253.834	59.98	-11.89	-11.891	PASSED

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	32.65	42.899	44.54	-11.89	-11.891	PASSED

3.3.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



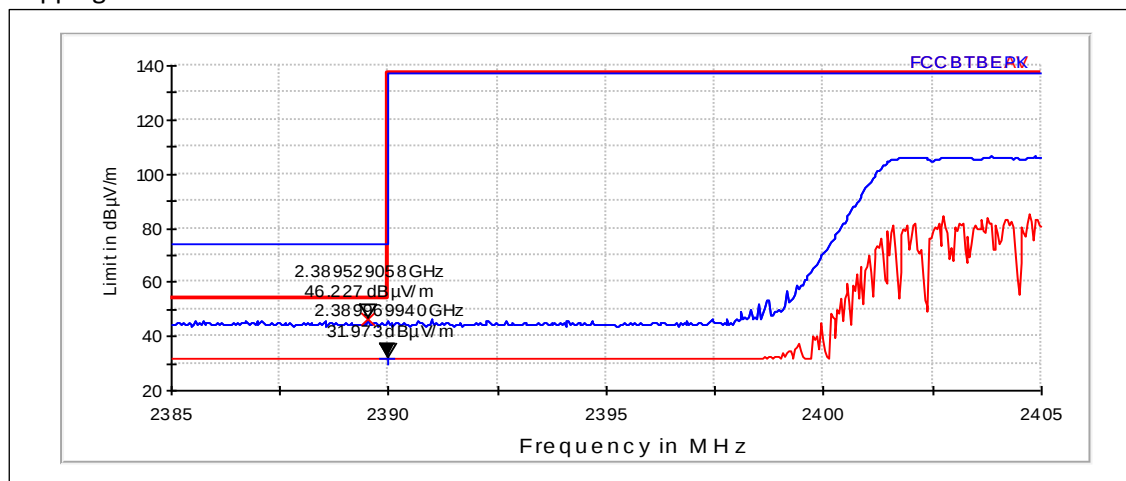
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2387	46.1	201.837	58.5	-12.4	-12.399	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	31.97	39.687	44.37	-12.4	-12.399	PASSED

Hopping on. Low end.



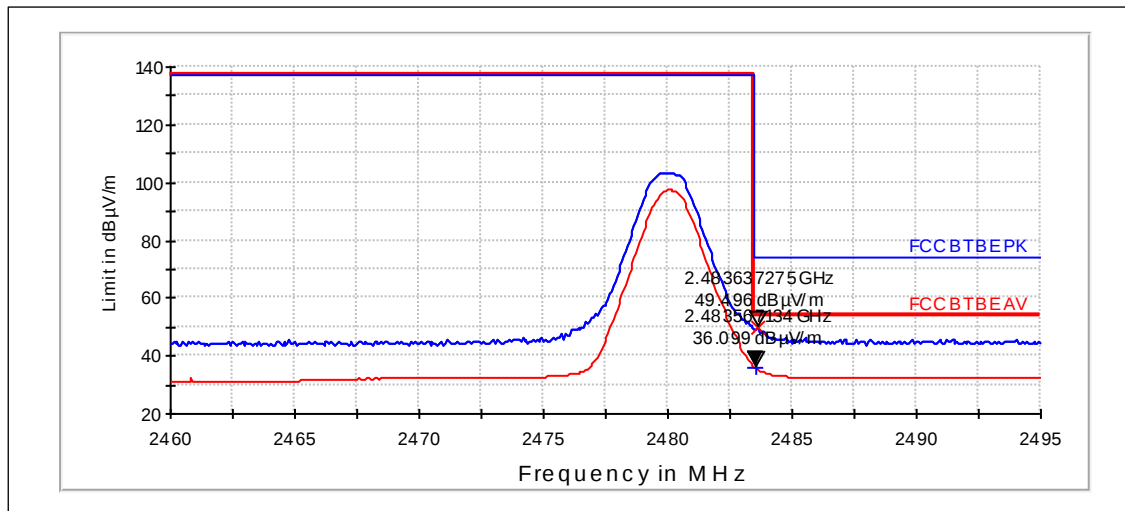
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2390	46.23	204.809	58.63	-12.4	-12.399	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	31.97	39.687	44.37	-12.4	-12.399	PASSED

Channel 78 / 2480 MHz



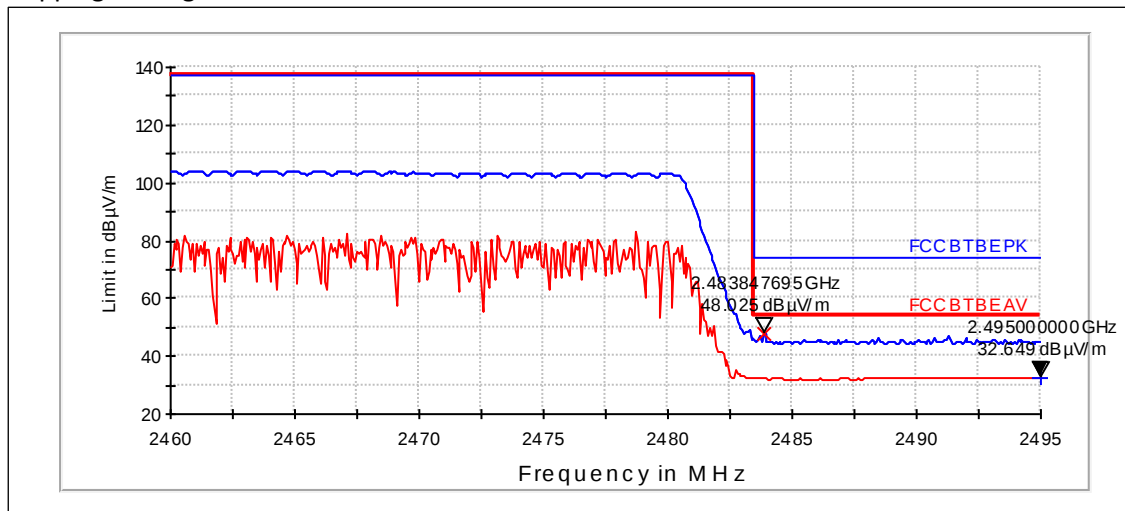
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2484	49.5	298.401	61.39	-11.89	-11.891	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
2484	36.1	63.819	47.99	-11.89	-11.891	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]	Correction [dB]	Results
2484	48.03	251.913	59.92	-11.89	-11.891	PASSED

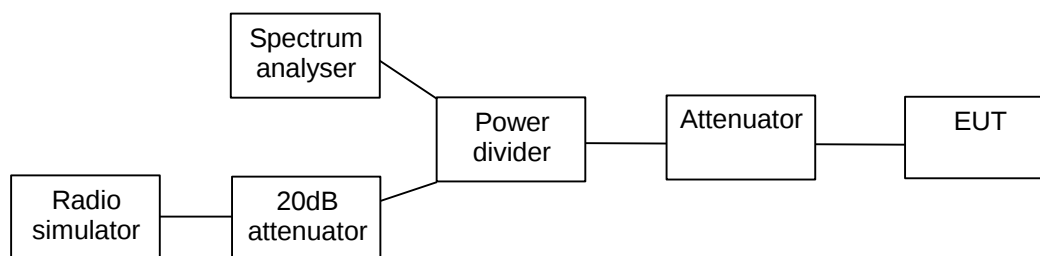
Average (RBW: 1 MHz, VBW: 10 Hz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Correction [dB]	Results
2495	32.65	42.899	44.54	-11.89	-11.891	PASSED

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

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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.

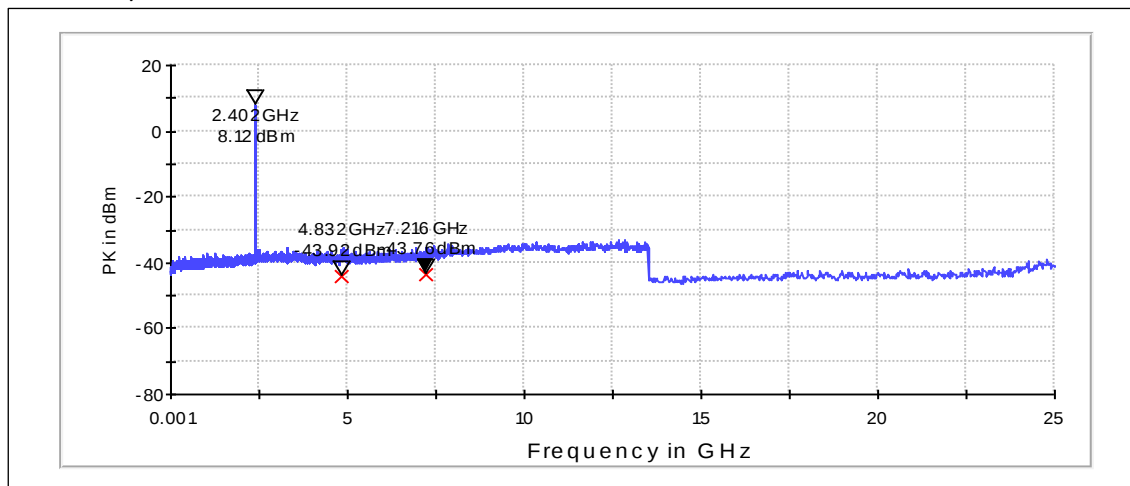
Limits for spurious RF conducted emissions measurements

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

4.3. Bluetooth Test results

4.3.1 GFSK modulation, PRBS packet type

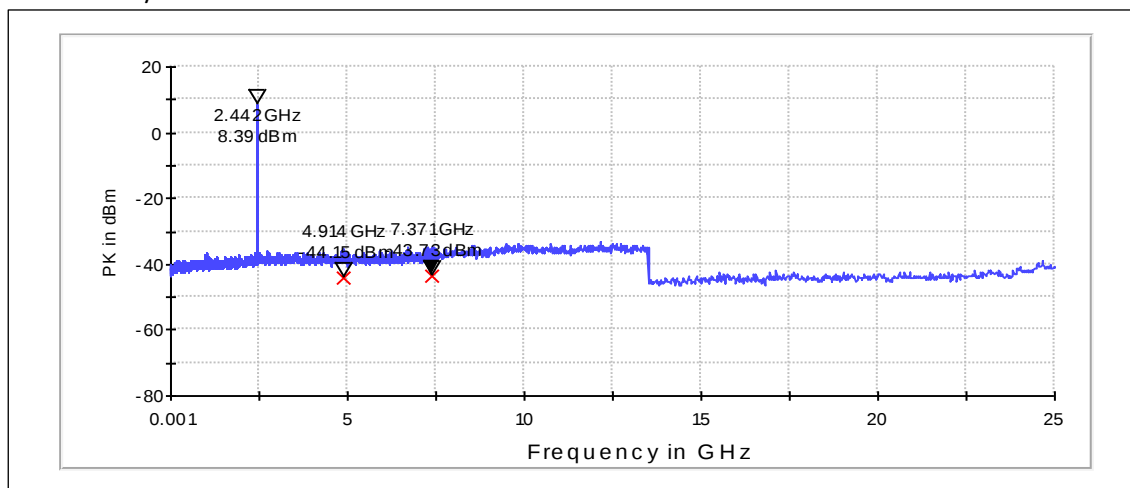
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
4831.600	-43.92	PASSED
7215.600	-43.76	PASSED

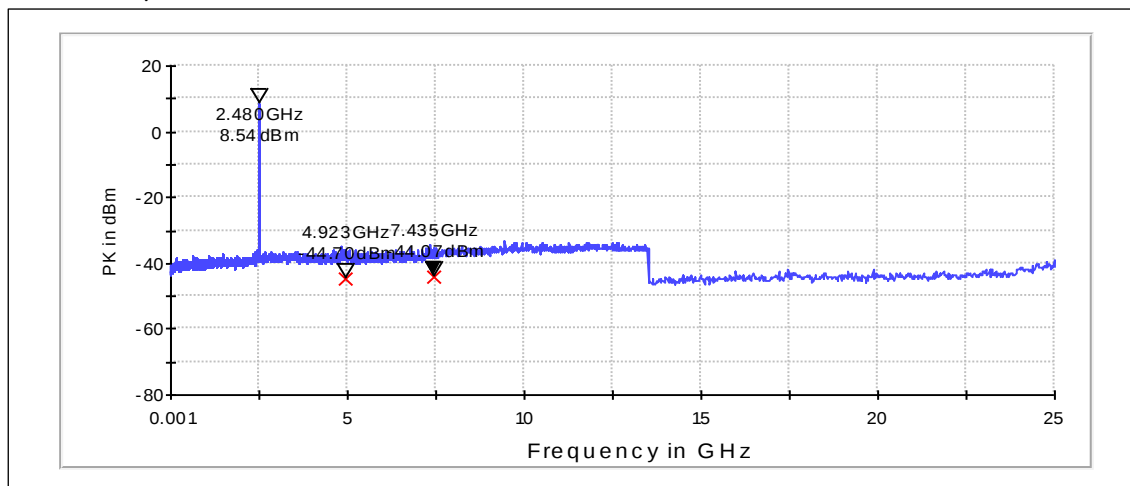
Channel 40 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
4914.000	-44.15	PASSED
7371.000	-43.73	PASSED

Channel 78 / 2480 MHz

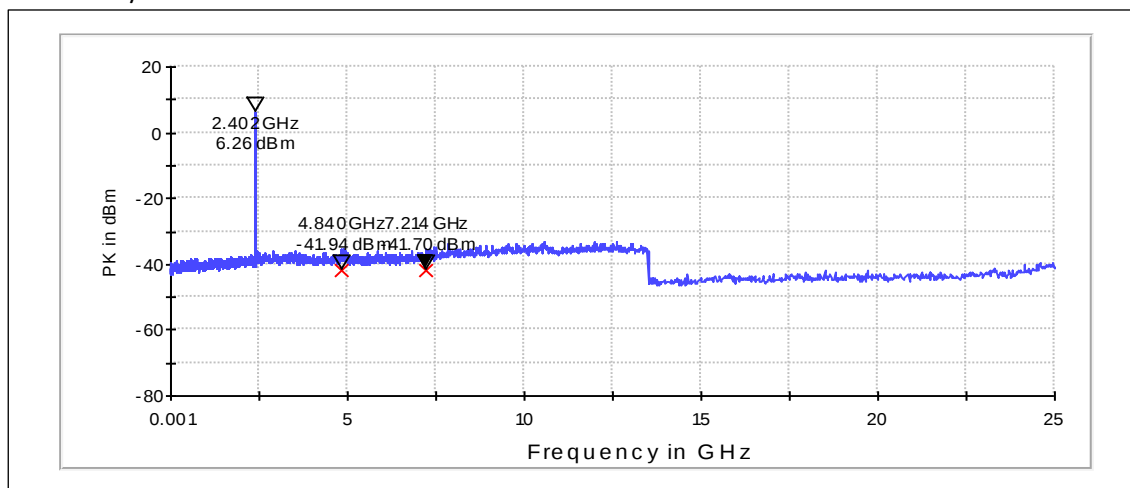


Peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	P [dBc]	Result
4923.200	-44.70	PASSED
7435.200	-44.07	PASSED

4.3.2 8DPSK modulation, PRBS packet type

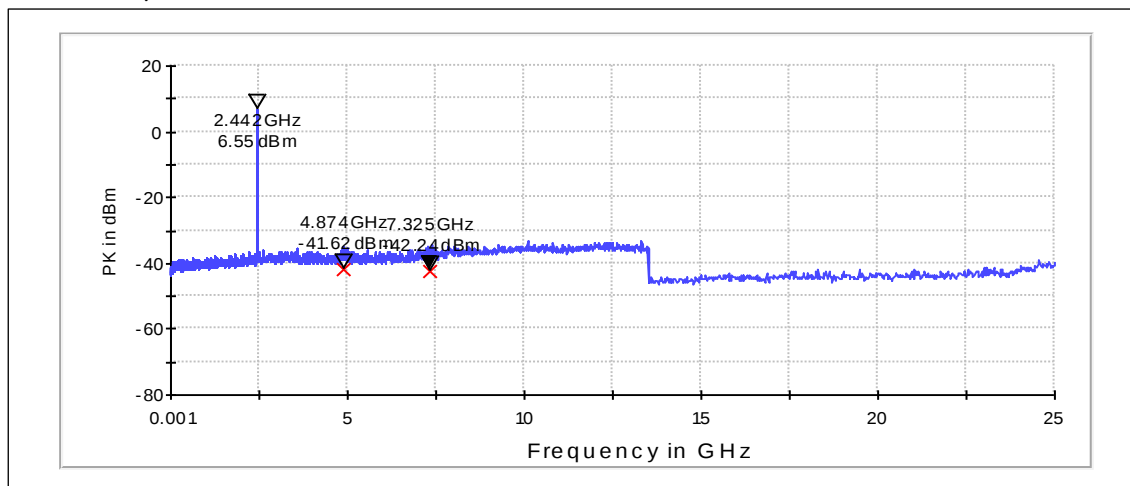
Channel 0 / 2402 MHz



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

Frequency [MHz]	P [dBc]	Result
4840.400	-41.94	PASSED
7213.800	-41.70	PASSED

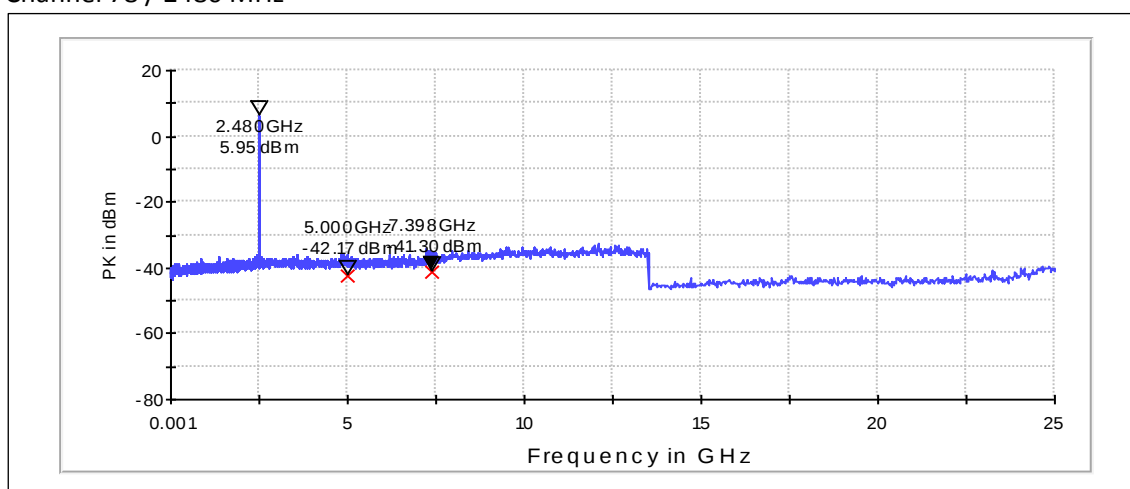
Channel 40 / 2442 MHz



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

Frequency [MHz]	P [dBc]	Result
4874.000	-41.62	PASSED
7324.800	-42.24	PASSED

Channel 78 / 2480 MHz



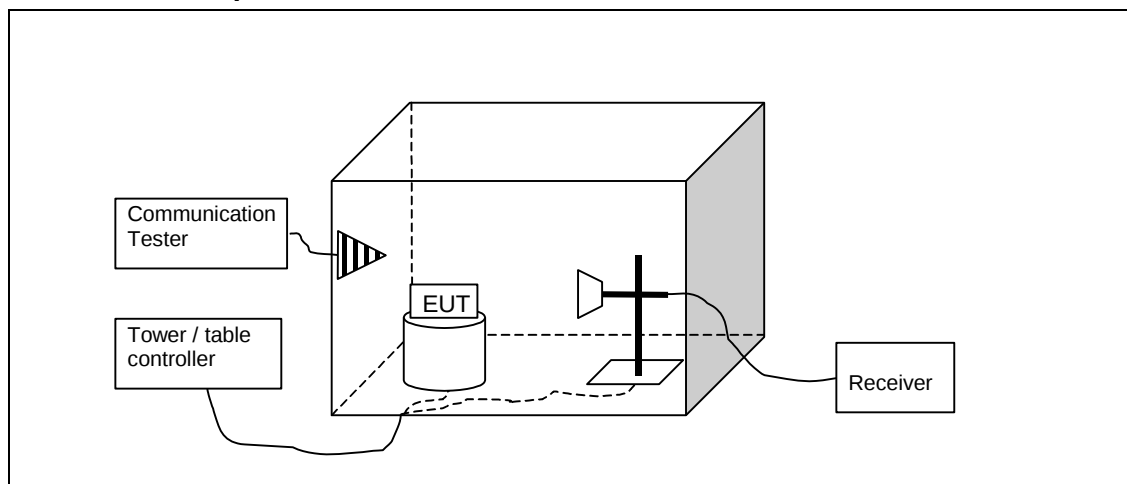
Peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	P [dBc]	Result
4999.600	-42.17	PASSED
7398.000	-41.30	PASSED

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

EUT with DUT number	RM-977, DUT 43133
Accessories with DUT numbers	BL-5H, DUT 43134 ; AC-20E Pihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	24 / 47 / 103
Date of measurements	27-Jan-2014
Measured by	Hannu Söderholm

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 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 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
4803.5	42.9	139.653	47.48	-4.58	31.1	74	PASSED
7206.2	48.33	260.916	47.36	0.97	46.9	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
4803.5	29.12	28.582	33.7	-4.58	24.9	54	PASSED
7206.2	34.33	52.071	33.36	0.97	---	---	PASSED

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]	Margin	Limit [dBμV/m]	Results
30	19.6	9.553	39.41	-19.81	20.4	40	PASSED
31.05	33.4	46.763	53.68	-20.28	6.6	40	PASSED
34.378	17.67	7.645	39.42	-21.75	22.3	40	PASSED
35.722	29.25	29.007	51.56	-22.31	10.8	40	PASSED
36.796	16.17	6.431	38.91	-22.74	23.8	40	PASSED
37.749	12.87	4.399	35.99	-23.12	27.1	40	PASSED
43.551	12.15	4.049	37.71	-25.56	27.9	40	PASSED
945.995	27.75	24.415	44.76	-17.01	18.3	46	PASSED
948.269	39.49	94.341	56.53	-17.04	6.5	46	PASSED
955.984	38.94	88.522	55.99	-17.05	7.1	46	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]	Margin	Limit [dBμV/m]	Results
4959.6	41.98	125.632	46.38	-4.4	32	74	PASSED
7440.1	46.59	213.575	44.74	1.85	27.4	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
4959.6	28.7	27.23	33.1	-4.4	25.3	54	PASSED
7440.1	32.96	44.468	31.11	1.85	21	54	PASSED

5.3.2 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]	Margin	Limit [dBμV/m]	Results
4803.9	41.56	119.715	46.14	-4.58	32.4	74	PASSED
7205.6	47.83	246.434	46.87	0.96	47.4	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
4803.9	28.15	25.565	32.73	-4.58	25.8	54	PASSED
7205.6	33.04	44.869	32.08	0.96	---	---	PASSED

Channel 40 / 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
3909.818	37.59	75.762	45.02	-7.43	36.4	74	PASSED
9772.143	47.26	230.781	41.57	5.69	48	95	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
31.23	31.96	39.619	52.32	-20.36	8	40	PASSED
31.44	33.18	45.593	53.63	-20.45	6.8	40	PASSED
32.308	31.48	37.476	52.31	-20.83	8.5	40	PASSED
35.482	31.2	36.291	53.41	-22.21	8.8	40	PASSED
35.776	30.07	31.879	52.4	-22.33	9.9	40	PASSED
947.909	20.58	10.688	37.62	-17.04	25.4	46	PASSED
956.014	38.97	88.848	56.02	-17.05	7	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
3909.818	25.04	17.859	32.47	-7.43	28.9	54	PASSED
9772.143	34.58	53.598	28.89	5.69	---	---	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]	Margin	Limit [dBμV/m]	Results
4961.9	40.9	110.917	45.27	-4.37	33.1	74	PASSED
7439.2	44.22	162.48	42.35	1.88	29.8	74	PASSED

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

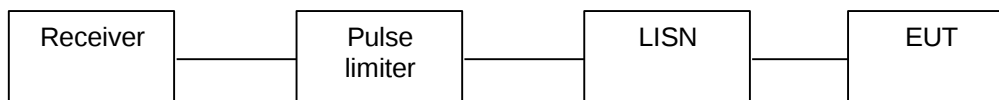
Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Margin	Limit [dBμV/m]	Results
4961.9	27.61	24.027	31.98	-4.37	26.4	54	PASSED
7439.2	31.41	37.175	29.54	1.88	22.6	54	PASSED

6. AC powerline conducted emissions

FCC §15.207, RSS-GEN 7.2.2

EUT with DUT number	RM-977, DUT 43141
Accessories with DUT numbers	BL-5H LGC, DUT 43139 ; AC-20E, DUT 43140 ; WH-108, DUT 43142
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 34 / 100.4
Date of measurements	20-Jan-2014
Measured by	Jari Jantunen

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.

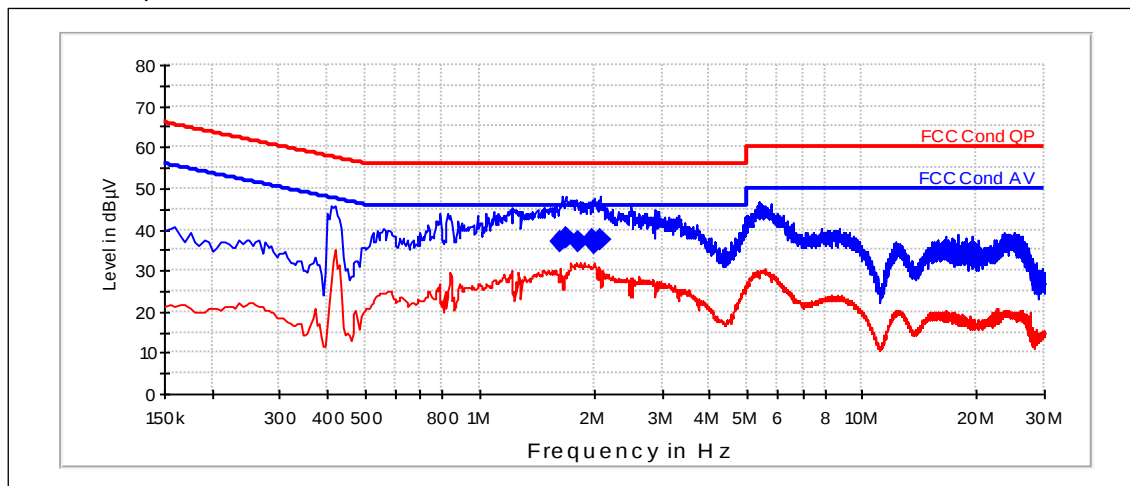
CISPR 22 Class B limits

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



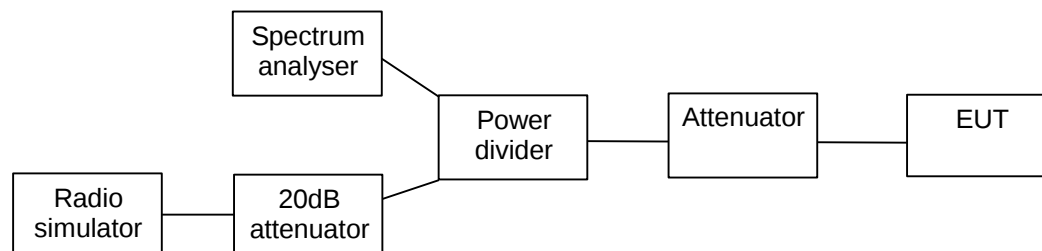
QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
1.63	37.12	L1	PASSED
1.69	37.73	L1	PASSED
1.81	36.79	L1	PASSED
1.965	37.34	L1	PASSED
2.005	36.61	L1	PASSED
2.06	37.35	L1	PASSED

7. 20 dB bandwidth 15.247(a)(1), A8.1 (a)

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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

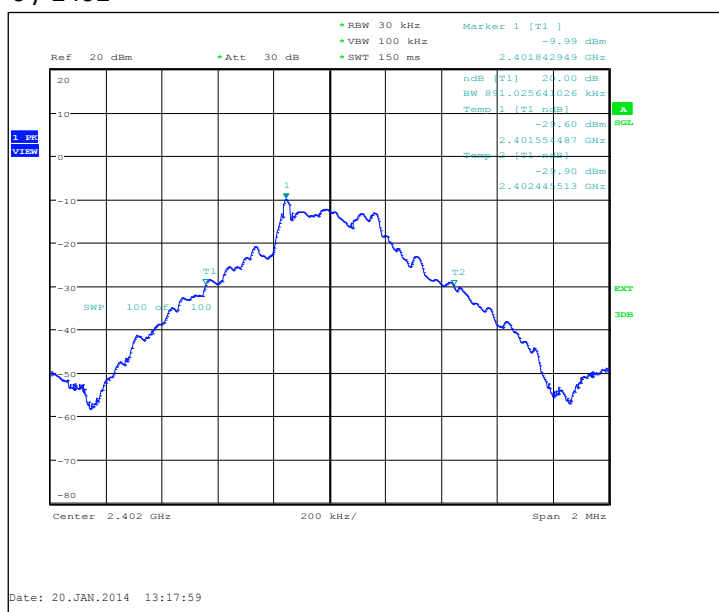
Limit [MHz]
N/A

7.3. Bluetooth Test results

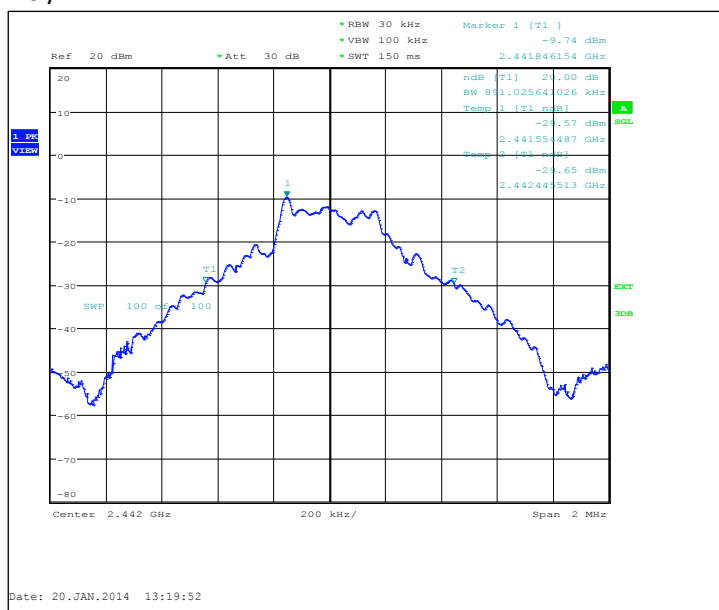
7.3.1 GFSK modulation, PRBS packet type

Channel / f _c [MHz]	20 dB bandwidth [kHz]
0 / 2402	891
40 / 2442	891
78 / 2480	836.5

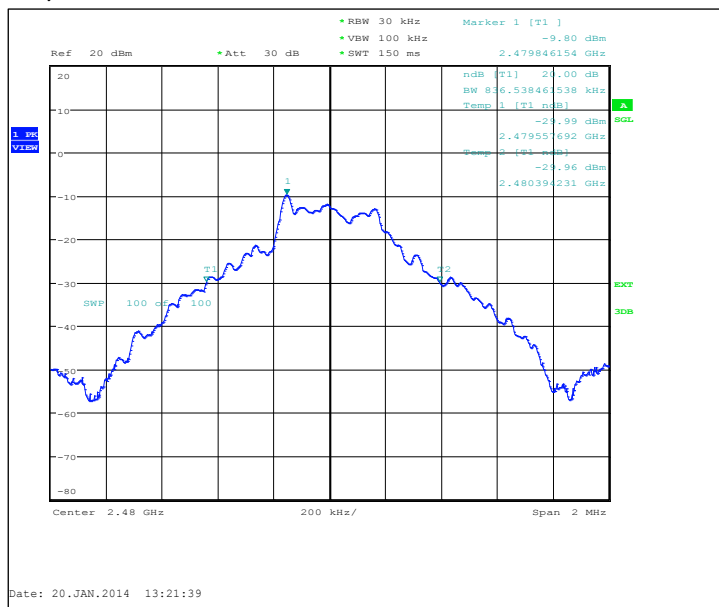
0 / 2402



40 / 2442



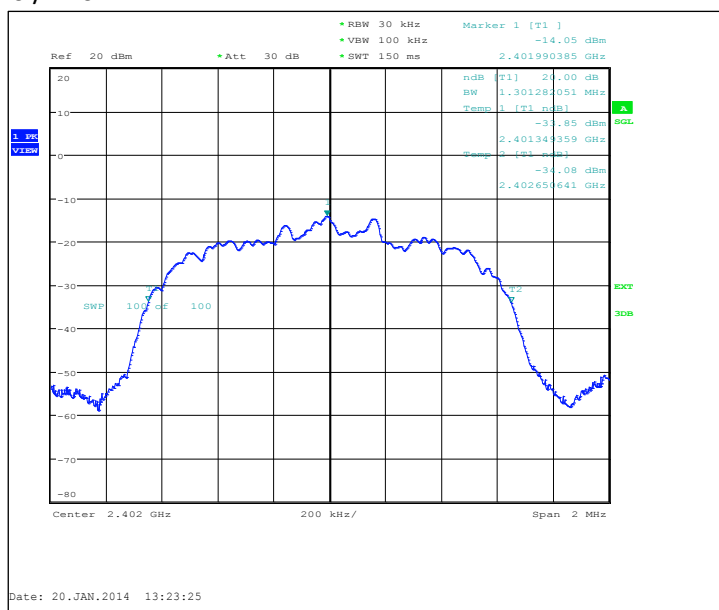
78 / 2480



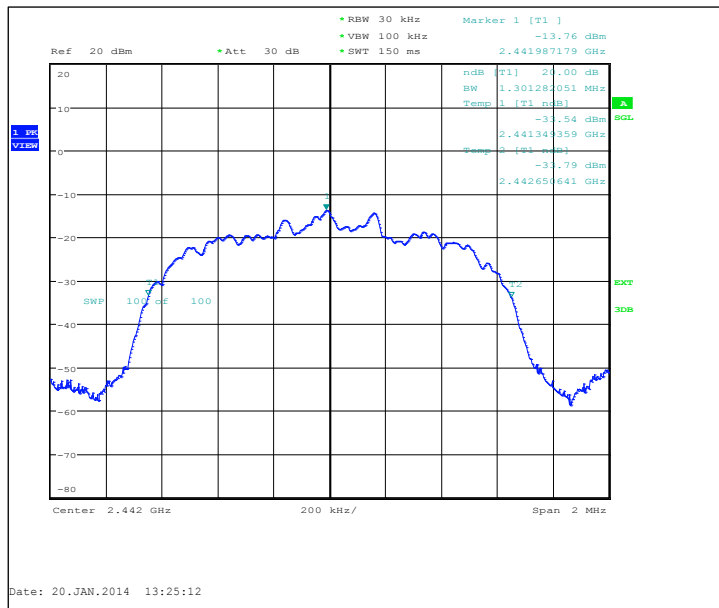
7.3.2 8DPSK modulation, PRBS packet type

Channel / f_c [MHz]	20 dB bandwidth [kHz]
0 / 2402	1301.3
40 / 2442	1301.3
78 / 2480	1301.3

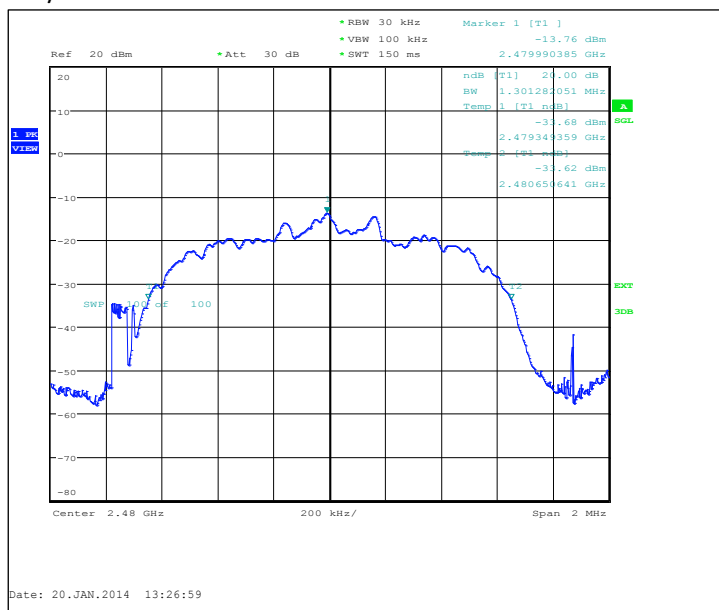
0 / 2402



40 / 2442



78 / 2480

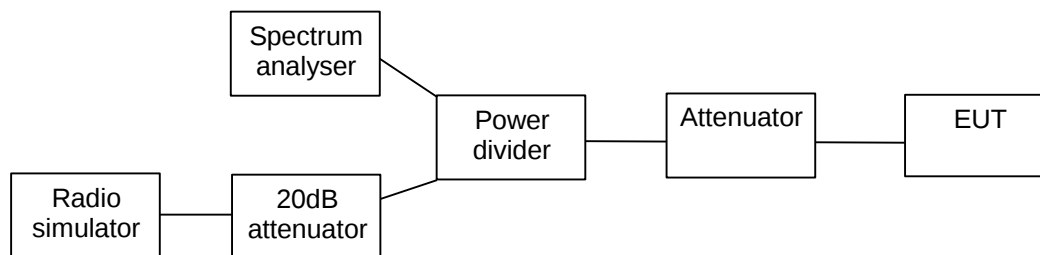


8. Carrier frequency separation

15.247(a)(1), A8.1 (b)

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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

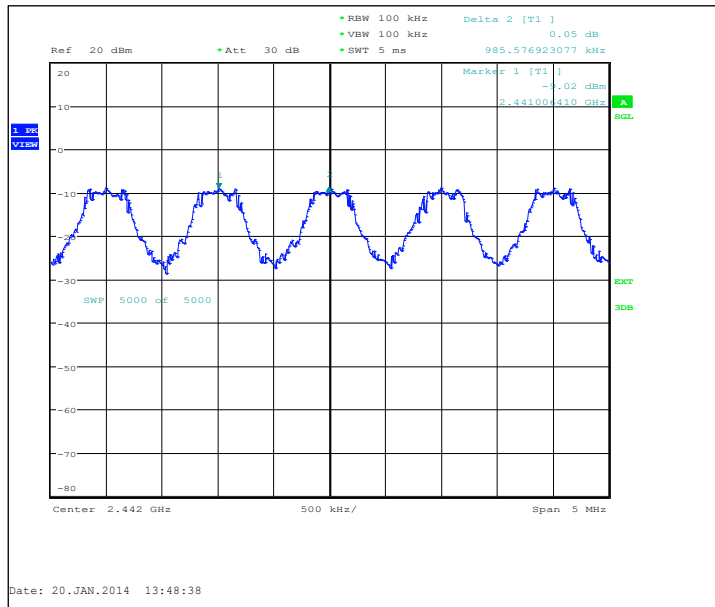
Limit [MHz]
≥ 0.025 or $2/3$ of the 20 dB bandwidth

8.3. Bluetooth Test results

8.3.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
985.6	PASSED

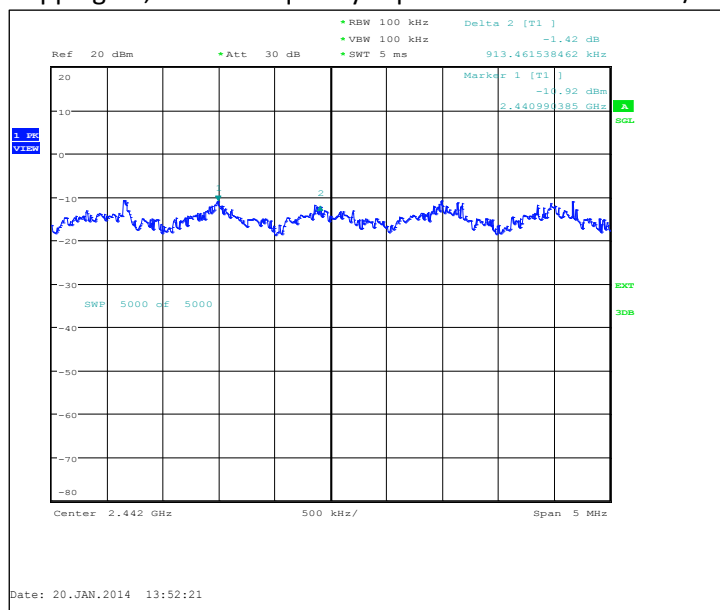
Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



8.3.2 8DPSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
913.5	PASSED

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

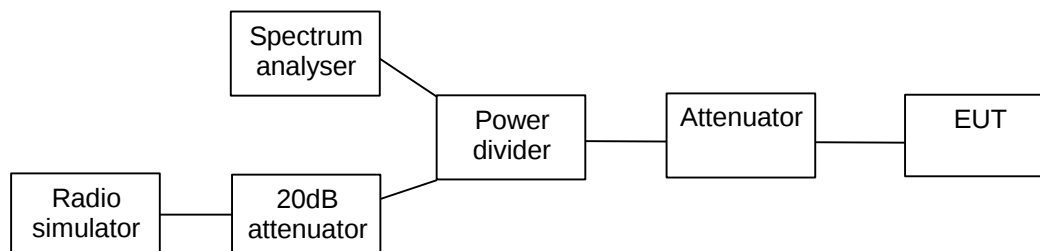


9. Number of hopping frequencies

15.247(a)(1)(iii), A8.1 (d)

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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

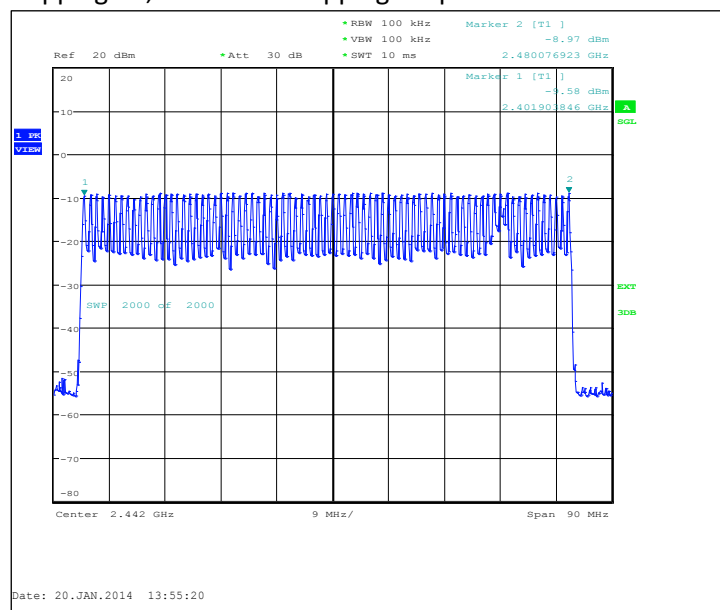
Limit [number]
≥ 15

9.3. Bluetooth Test results

9.3.1 GFSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
78	PASSED

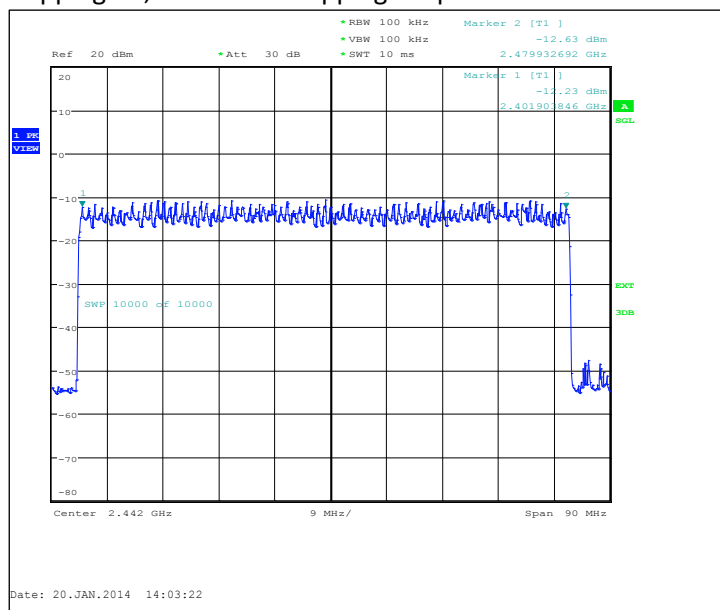
Hopping on, number of hopping frequencies



9.3.2 8DPSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
73	PASSED

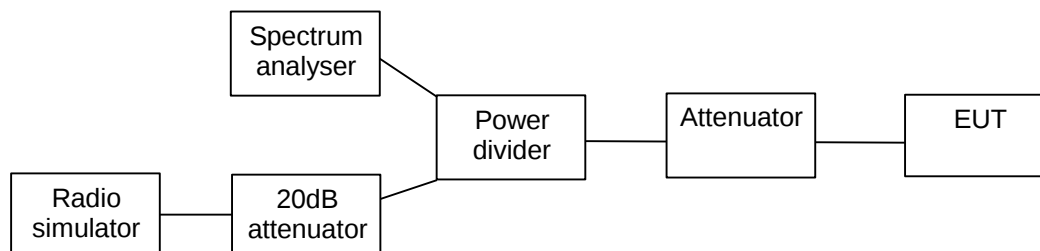
Hopping on, number of hopping frequencies



10. Time of occupancy 15.247(a)(1)(iii), A8.1 (d)

EUT with DUT number	RM-977, DUT 43137
Accessories with DUT numbers	SD-128, DUT 43138
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 31 / 100.4
Date of measurements	20-Jan-2014
Measured by	Timo Raiskio

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

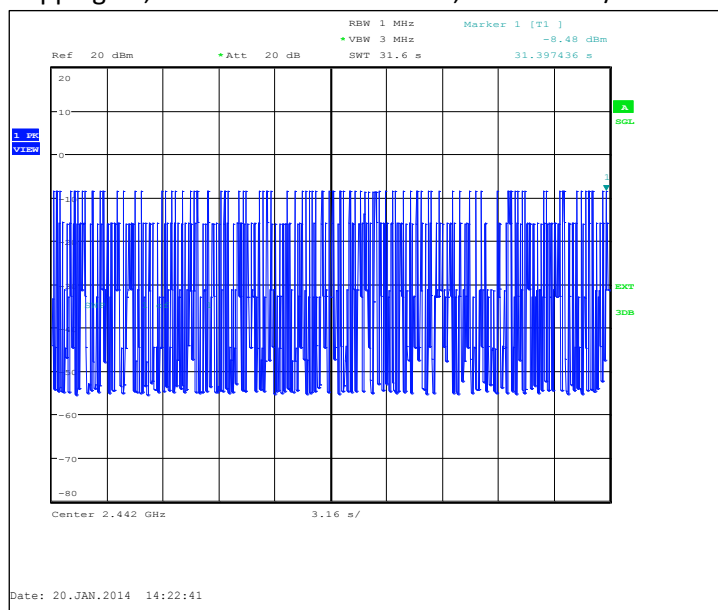
Limit [s]
≤ 0.4

10.3. Bluetooth Test results

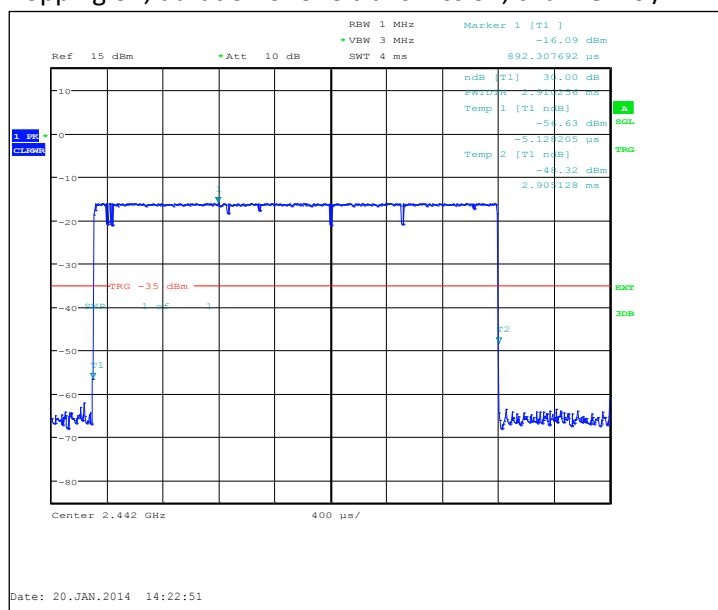
10.3.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [ms]	Time of occupancy [s]	Result
87	2.91	0.253	PASSED

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



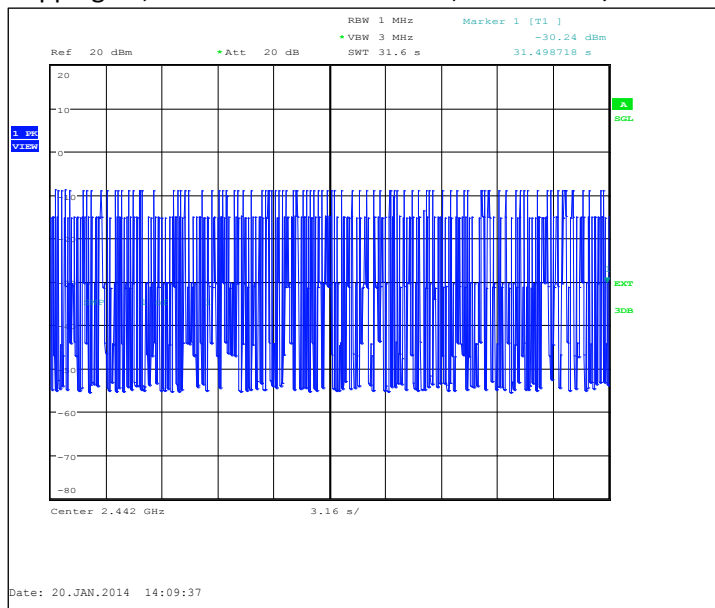
Hopping on, duration of one transmission, channel 40 / 2442 MHz



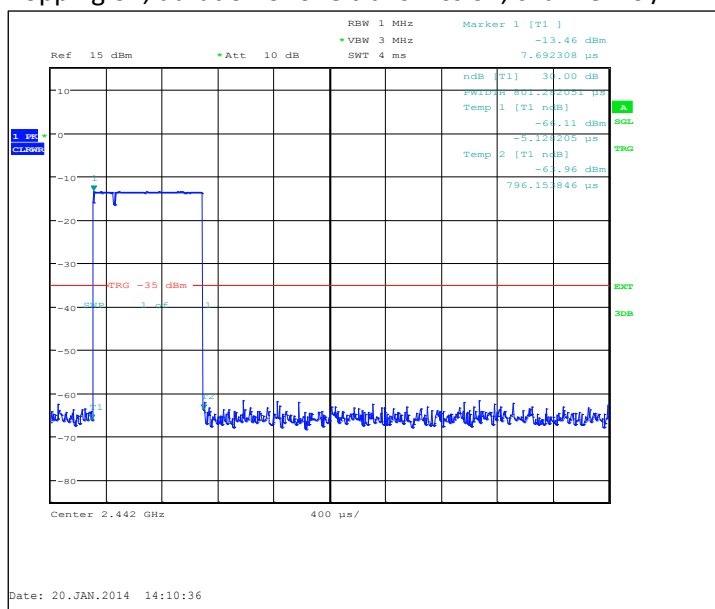
10.3.2 8DPSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [ms]	Time of occupancy [s]	Result
92	0.801	0.074	PASSED

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



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



11. Test Equipment

11.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37773	Communication Tester	CMU200	R&S	22/24/27, 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
2001	Bluetooth tester	CBT	R&S	15C, 15B
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
2022	Communication Tester	CMU200	R&S	22/24/27
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B

11.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM37678	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	OSP130	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

Eq. No	Equipment	Type	Manufacturer	Used in
-	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 chamber	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
TM23892	Controller	G-1000SDX	Yaesu	22/24/27, 15C, 15E
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
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B
2052	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C, 15B, 15E
-	Antenna	QSH18S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E