


**REPORT: FCC / IC Radio Frequency (RF) test report**

**PRODUCT:**

Test item description:	Mobile computer for data collection
Trade Mark:	NordicID Morphic
Model/Type reference:	HTB00015
Serial number:	K110205255 K103904107
Customer:	NordicID Oy Myllyojankatu 2A 24100 SALO FINLAND
Contact person:	Hannu Heino
Manufacturer:	NordicID Oy Myllyojankatu 2A 24100 SALO FINLAND

**DATE:** 6.5.2011

**TESTED BY:**   
Matti Virkki ; Test engineer

**APPROVED BY:**   
Tuomo Hahl ; Test engineer


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## 1 LABORATORY INFORMATION

<b>Test Laboratory</b>	Intertek ETL Semko OY Koneenkatu 12 / K17 05830 Hyvinkää FINLAND
<b>FCC registration number: IC file number:</b>	910391 (January 27, 2003) IC 2042C-1 (May 14, 2003)
<b>Quality and Environmental :</b>	

## 2 SUMMARY OF TEST RESULTS

The tests listed in this report have been done to demonstrate compliance to the FCC rules section §15.107, §15.109, §15.247 and IC standard RSS-GEN / RSS-210.

### Transmitter measurements

Section in CFR 47	Section in RSS-210	Test	Result
15.247, a 1	A8.1 (b)	Carrier frequency separation	PASS
15.247, a 1 i	A8.1 (c)	Number of hopping frequencies	PASS
15.247, a 1 i	A8.1 (c)	Time of occupancy	PASS
15.247, a 1 i	A8.1 (c)	20dB bandwidth	PASS
15.247, b 2	A8.4 (1)	Peak output power	PASS
15.247, d	A8.5	Band-edge compliance of RF emissions	PASS
	RSS-GEN 4.6.1	99% bandwidth	PASS
15.247, d	A8.5	Spurious RF conducted emissions	PASS
		Field strength of fundamental	X
15.247, d	A8.5	Spurious radiated emissions	PASS

PASS Pass  
 FAIL Fail  
 X Measured, but there is no applicable performance criteria  
 - Not done

### 3 EUT INFORMATION

The EUT and accessories used in the tests are listed below. Later in this report only EUT numbers are used as reference.

	Device	Type	S/N	EUT number
<b>EUT</b>	NordicID Morphic	HTB00015	K110205255	1
	NordicID Morphic	HTB00012	K103803973	2 *
<b>Accessories</b>	Nordic Power switching adapter	SA115C-05	-	3

Notes:

\* Antenna replaced with SMA-connector

#### 3.1 EUT description

EUT is a battery operated mobile computer for data collection purposes. Battery can be charged with charger.

The EUT has 902-928 MHz RFID radio, 2402 -2480 MHz BT 2.1 +EDR radio and 2412 – 2462 MHz 802. 11 b/g wlan radio module (FCC ID: TWG-SDCMSD30AG).

EUT Bluetooth radio was commanded to different modes with customer's program Morphic Radio Tester.exe and WLAN module with module manufacturer's program SRU\_30AG\_3\_1\_34.exe

RFID radio test results are in separate test report 100310A-RF.

The EUT was not modified during the tests.

#### 4 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

Two different test setups were used: one for conducted measurements, another for radiated measurements. One EUT was equipped with an external antenna connector for conductive measurements.

The test setup photographs are in the document referenced in section 17.

#### 5 APPLICABLE STANDARDS

The tests were performed in guidance of:

CFR 47 Part:

- §15.107
- §15.109
- §15.209
- §15.247
- ANSI C63.4 (2003)

IC standard:

- RSS-GEN, Issue 3
- RSS-210, Issue 8
- CISPR 22, 2006

Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

## 6 CARRIER FREQUENCY SEPARATION

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	March 31 and April 29, 2011		
<b>FCC rule part</b>	15.247, a 1		
<b>RSS-210 section</b>	A8.1 (b)		
<b>Measured by</b>	Matti Virkki		

### 6.1 Test setup and testing method

EUT software was used to:

- set the EUT channel (0 – 78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 1: Test setup for carrier frequency separation measurement

Spectrum analyzer was set to sweep the BT operating band 2400 – 2483,5 MHz. 30 kHz resolution bandwidth and maximum hold function was used to measure the EUT transmission over sufficient time. Carrier frequency separation was read from the screen.

## 6.2 EUT operation mode

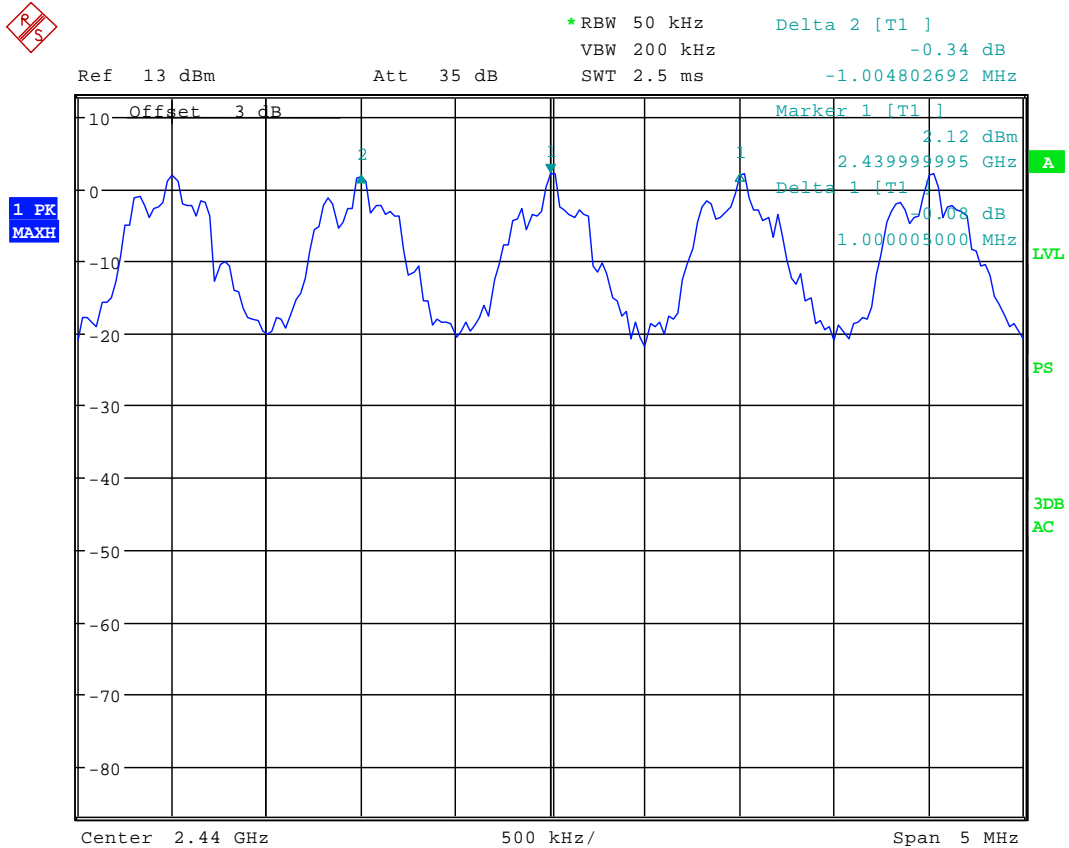
<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping
<b>EUT TX power level</b>	TX level 0 (=max)

## 6.3 Results

Table 1: Carrier frequency separation measurement results

Limit	Result
>20dB Bandwidth	1 MHz

## 6.4 Screen shots



Date: 31.MAR.2011 12:48:54

Picture 2: Carrier frequency separation, Channels 41-43



## 6.5 EUT operation mode

<b>EUT operation mode</b>	Modulation ON, 8-QPSK modulation Bit pattern all 0 and all 1
<b>EUT channel</b>	0,1,2
<b>EUT TX power level</b>	TX level 0 (=max)

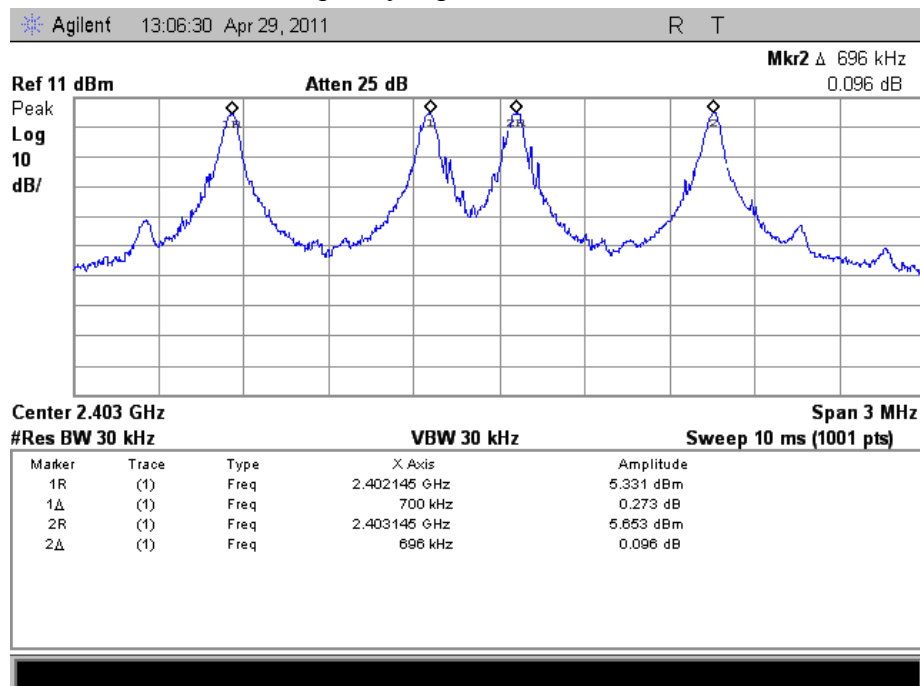
## 6.6 Results

Table 2: Carrier frequency separation measurement results

Limit	Result
>20dB Bandwidth	700 kHz

## 6.7 Screen shots

Picture 3: Carrier frequency separation, Channels 0-2



## 7 NUMBER OF HOPPING FREQUENCIES

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	March 31, 2011		
<b>FCC rule part</b>	15.247, a 1 i		
<b>RSS-210 section</b>	A8.1 (c)		
<b>Measured by</b>	Matti Virkki		

### 7.1 Test setup

EUT software was used to:

- set the EUT channel (0-78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 4: Test setup for measurement of number of hopping frequencies

Spectrum analyzer was set to sweep the BT operating band 2400 – 2483,5 MHz. 30 kHz resolution bandwidth and maximum hold function was used to measure the EUT transmission over sufficient time. Number of hopping frequencies was calculated from the screen.

## 7.2 EUT operation mode

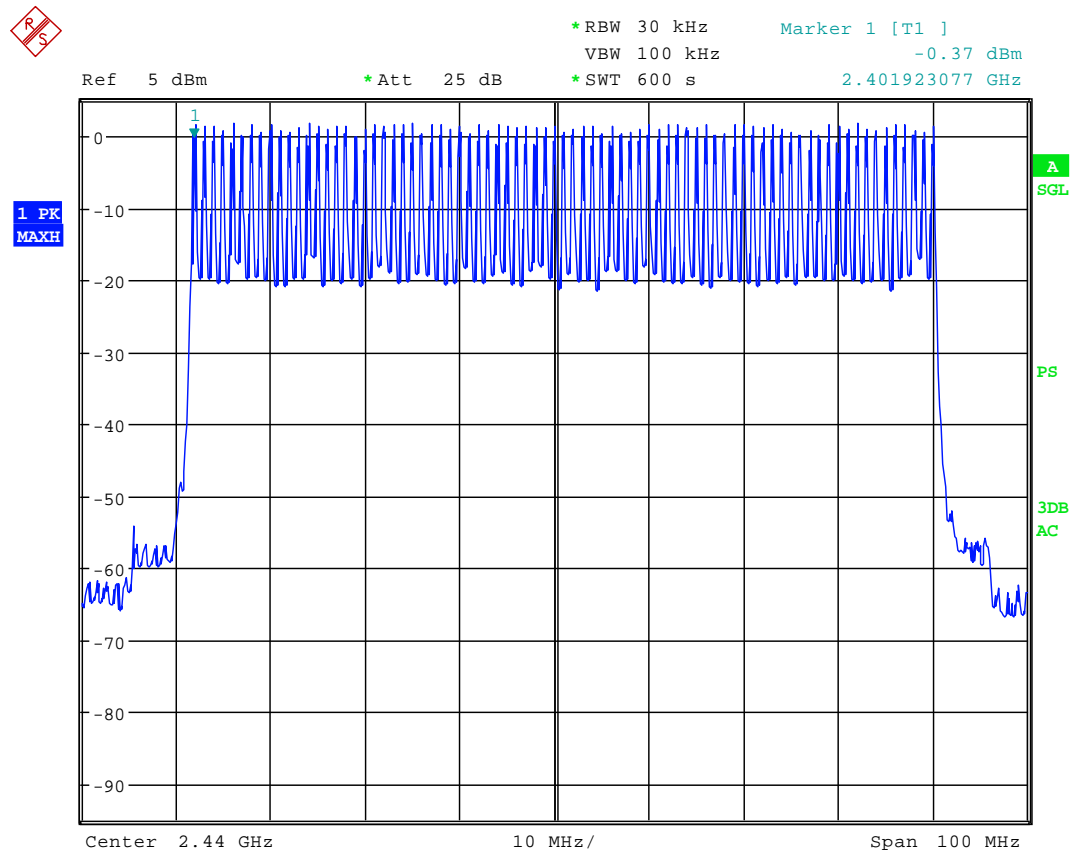
<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping
<b>EUT TX power level</b>	TX level 0 (=max)

## 7.3 Results

Table 3: Number of hopping frequencies measurement results

Limit	Result
$\geq 15$	79

## 7.4 Screen shots



Picture 5: Number of hopping frequencies measurement

## 8 TIME OF OCCUPANCY

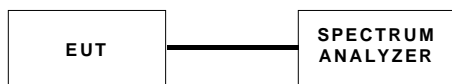
<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	21 °C	25 %RH	1004 hPa
<b>Date of measurement</b>	March 31 , 2011		
<b>FCC rule part</b>	15.247, a 1 iii		
<b>RSS-210 section</b>	A8.1 (c)		
<b>Measured by</b>	Matti Virkki		

### 8.1 Test setup and testing method

EUT software was used to:

- set the EUT to TX mode
- enable frequency hopping

Spectrum analyzer with single sweep and 0 Hz span was used to monitor the transmitter operation over time.



Picture 6: Test setup for time of occupancy measurement

### 8.2 EUT operation mode

<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping
<b>EUT TX power level</b>	TX level 0 (=max)

### 8.3 Results

Table 4: Time of occupancy during connection mode measurement results

Limit	Result
≤ 0,4 s over 31,6 s period	0,05s

**Limit:**

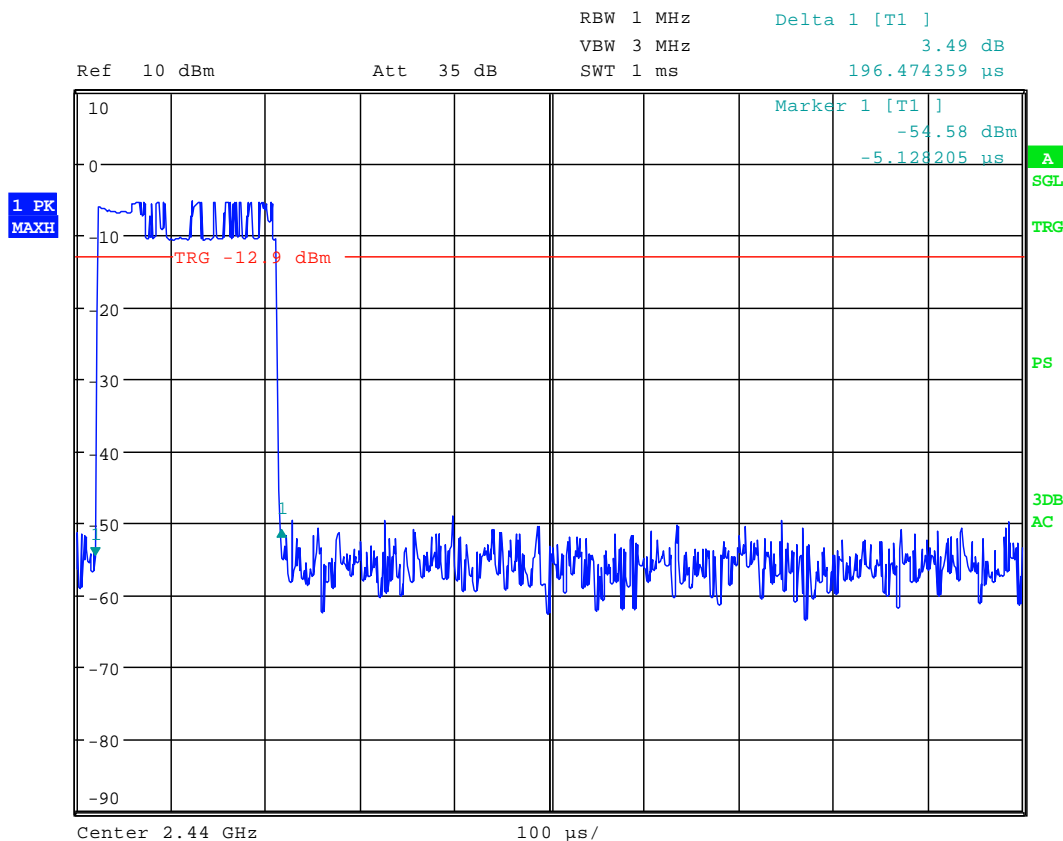
In the connection mode Bluetooth uses 79 channels. As defined in 15.247, a 1 iii, the limit for time of occupancy is 0,4s within a 0,4s x 79 period.

**Results:**

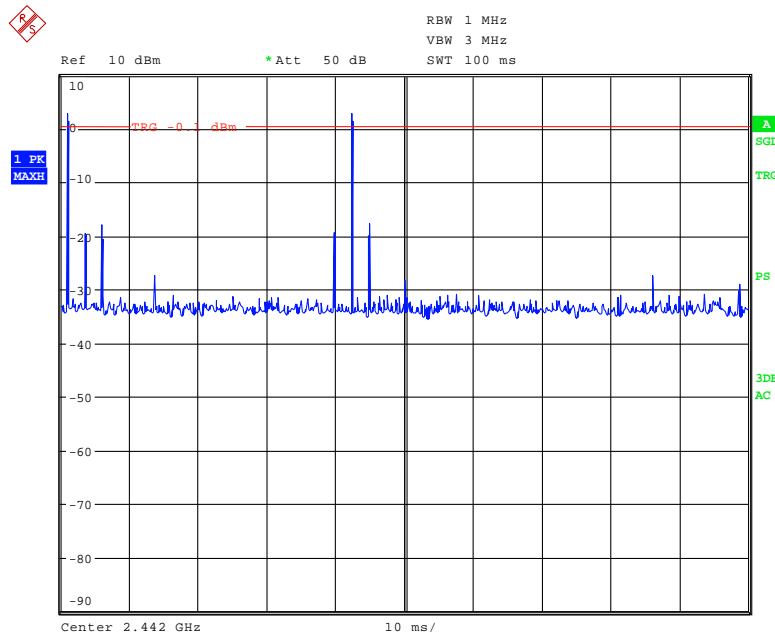
In measurement time of 31,6 s, total of 243 transmissions occurred. The duration of one transmission was 200µs. Based on these measurements the transmitter operated ms = 0,049 s during the 31,6 s period

### 8.4 Screen shots

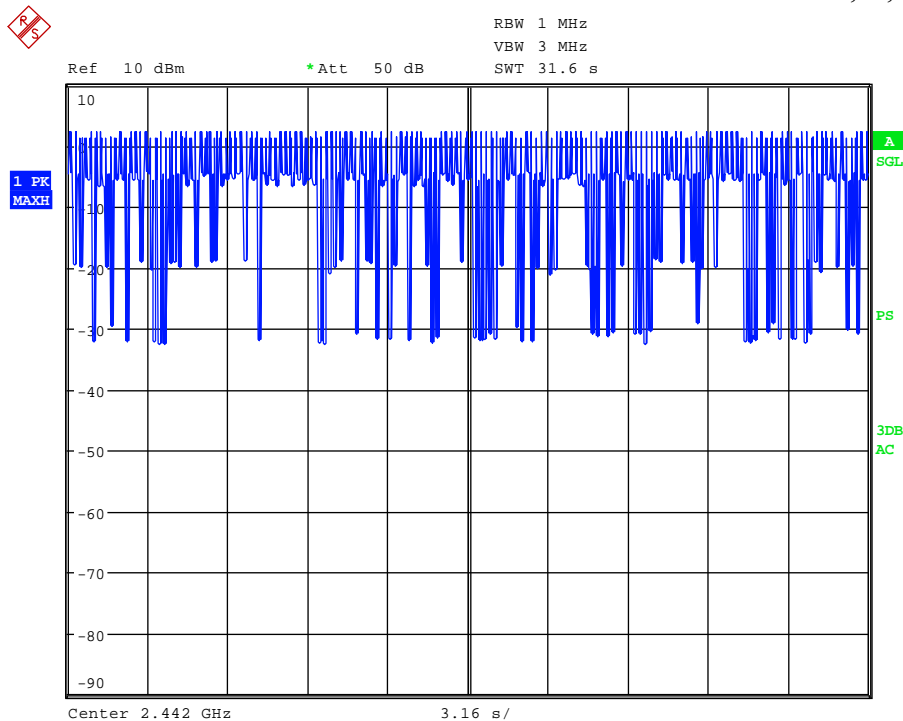
Picture 7: Duration of one transmission on connection state, channel 44



Picture 8: Number of transmissions on connection state in 100ms, channel 44



Picture 9: Number of transmissions on connection state in 31,6s,



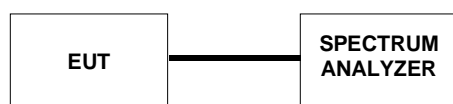
## 9 20 dB BANDWIDTH

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	March, 31 2011		
<b>FCC rule part</b>	15.247, a 1		
<b>RSS-210 section</b>	A8.1 (c)		
<b>Measured by</b>	Matti Virkki		

### 9.1 Test setup and measurement method

EUT software was used to:

- set the EUT channel (1 – 52)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 10: Test setup for 20 dB bandwidth measurement

The 20dB bandwidth was measured using 30 kHz resolution bandwidth and maximum hold function of the spectrum analyzer. 20dB bandwidth was defined by measuring the maximum level on the measured channel and by placing delta markers 20 dB below this value and read the value.

### 9.2 EUT operation mode

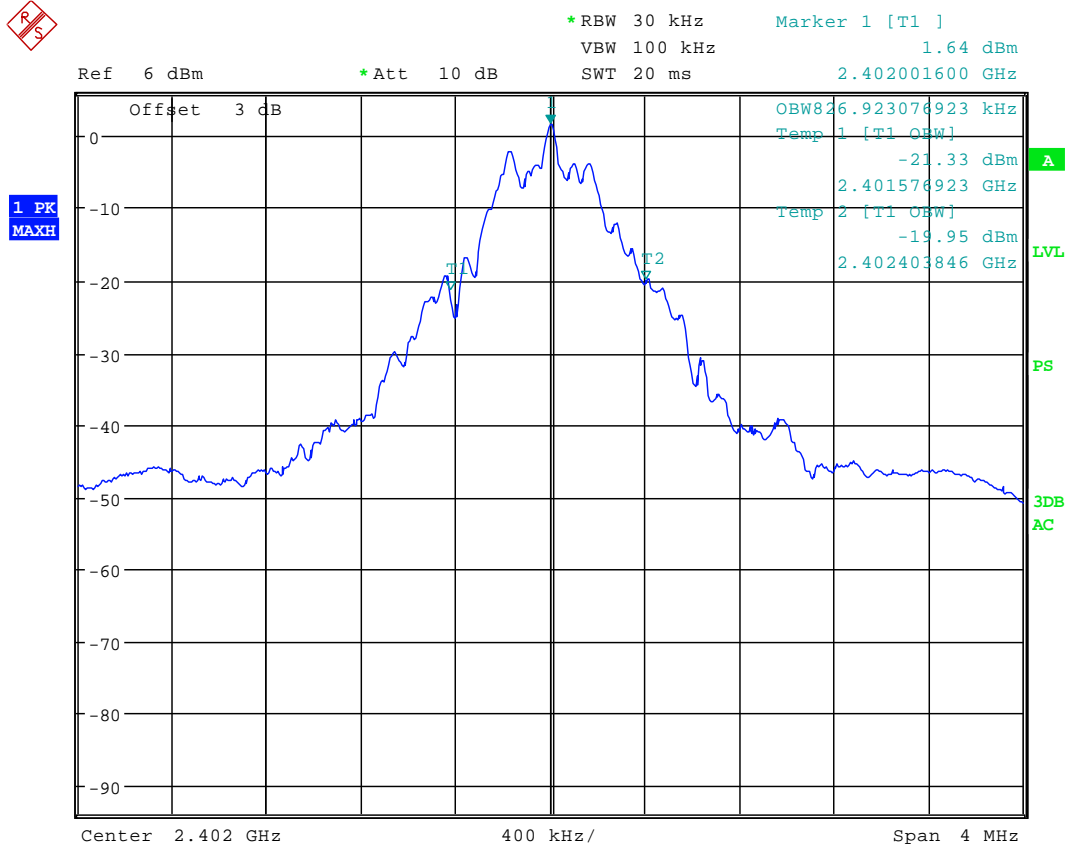
<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping on one channel
<b>EUT TX power level</b>	TX level 0 (=max)

### 9.3 Results

Table 5: 20dB bandwidth measurement results

EUT Channel	Limit (kHz)	Measured value (kHz)
0	≤ 1000	826,92
44		839,74
78		852,56

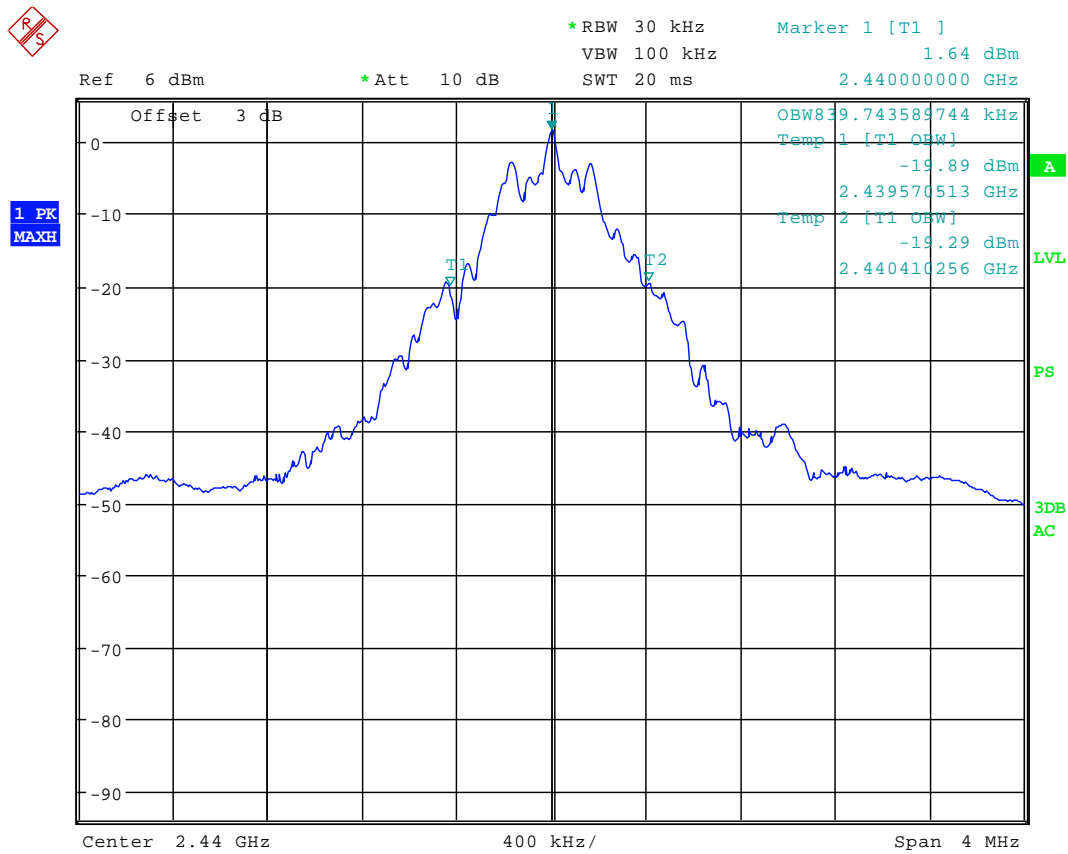
### 9.4 Screen shots



Date: 31.MAR.2011 11:42:51

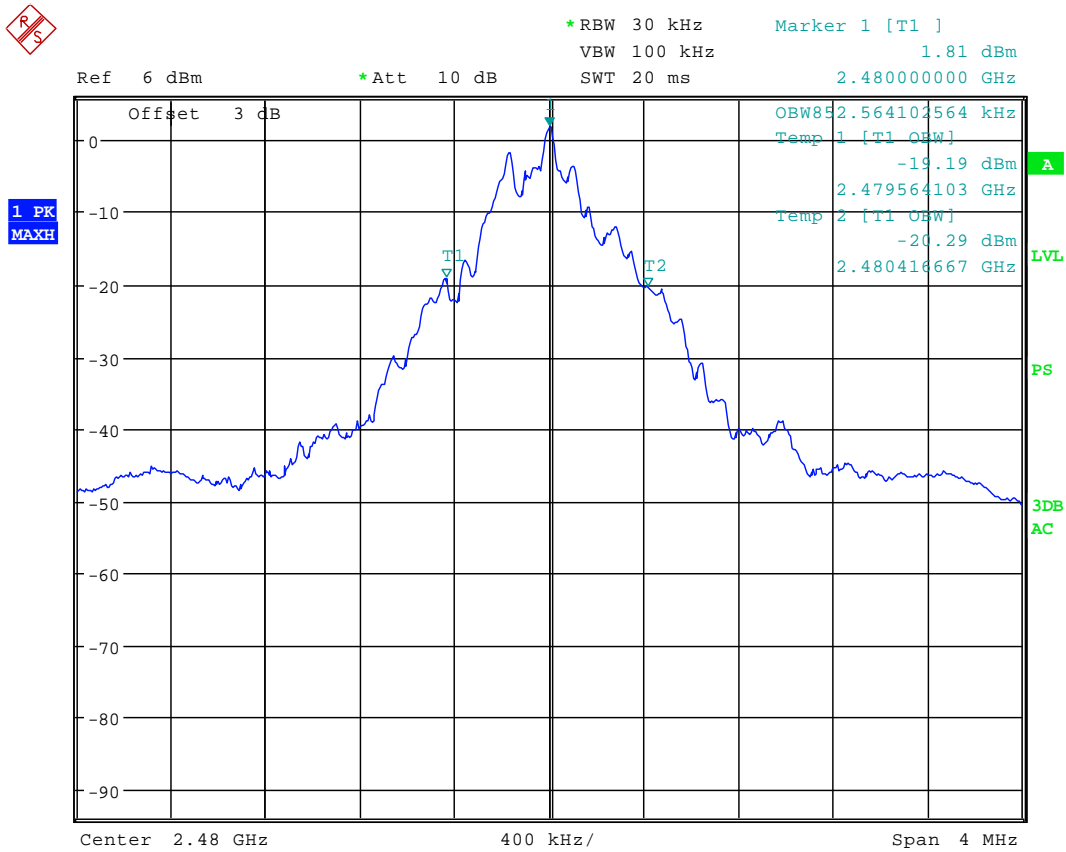
Picture 11: 20dB Bandwidth measurement result, Channel 0





Date: 31.MAR.2011 11:46:00

Picture 12: 20dB Bandwidth measurement result, Channel 44



Date: 31.MAR.2011 11:47:19

Picture 13: 20dB Bandwidth measurement result, Channel 78

### 9.5 EUT operation mode

<b>EUT operation mode</b>	8-QPSK modulation, All 0 and all 1 data bit patterns
<b>EUT channel</b>	Hopping disabled
<b>EUT TX power level</b>	TX level 0F (=max)

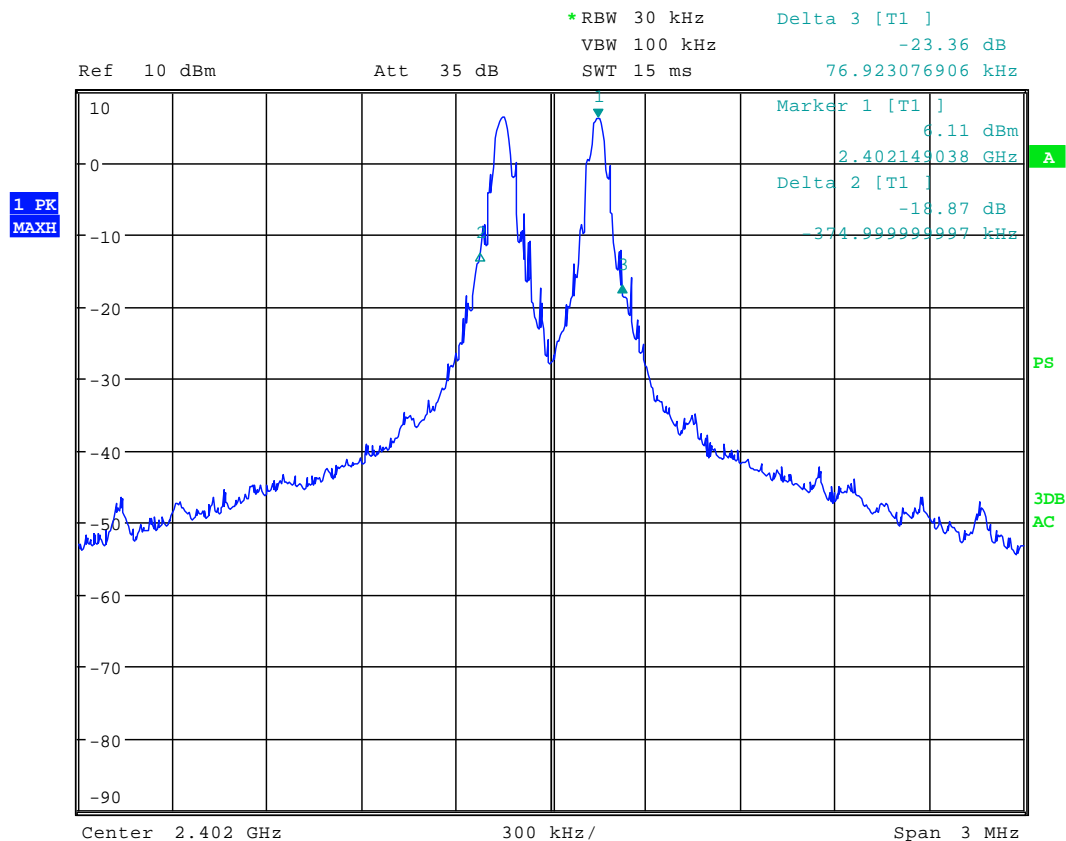
### 9.6 Results

Table 6: 20dB bandwidth measurement results

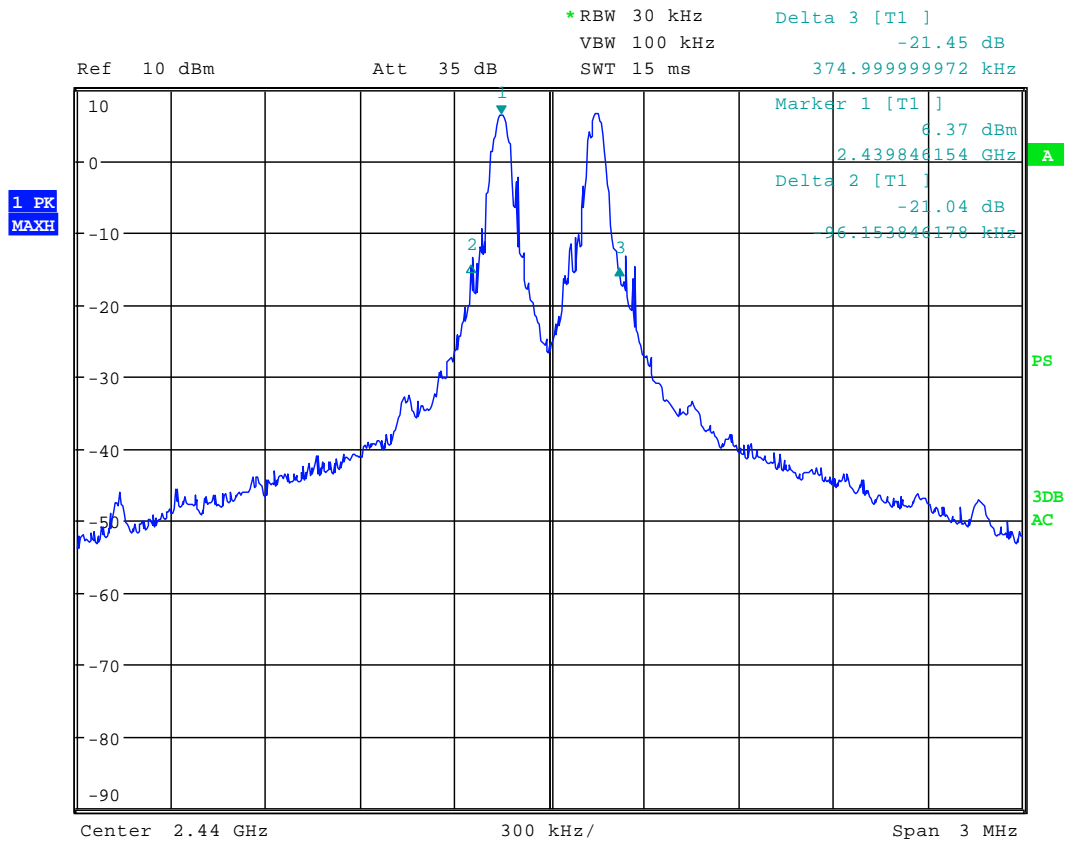
EUT Channel	Limit (kHz)	Measured value (kHz)
0	≤ 1000	451.9
44		471.1
78		480.8

### 9.7 Screen shots

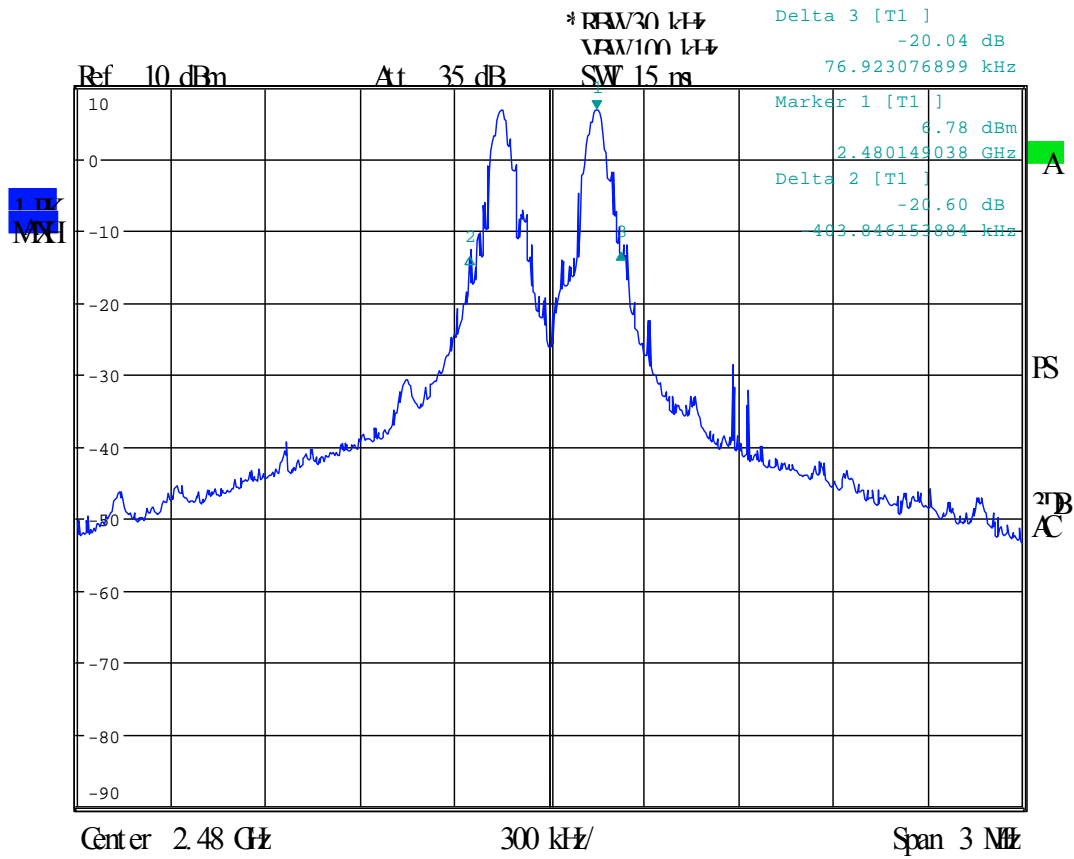
Picture 14: 20dB Bandwidth measurement result, Channel 0



Picture 15: 20dB Bandwidth measurement result, Channel 44



Picture 16: 20dB Bandwidth measurement result, Channel 78



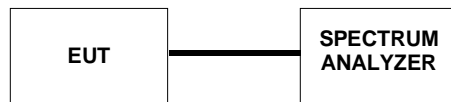
## 10 PEAK OUTPUT POWER

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	March 31, 2011		
<b>FCC rule part</b>	15.247, b 1		
<b>RSS-210 section</b>	A8.4 (1)		
<b>Measured by</b>	Matti Virkki		

### 10.1 Test setup and measurement method

EUT software was used to:

- set the EUT channel (0-78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 17: Test setup for conducted RF output power measurement

In the peak output power measurement the cable attenuation was measured prior to the power measurement and set as parameter for external gain in the spectrum analyzer to correct the reading of the peak output power. Spectrum analyzer subtracts the set attenuation value from the measured reading.

The measurement was made using 1 MHz resolution bandwidth and 1 MHz video bandwidth and maximum hold function to record the maximum peak output power.

### 10.2 EUT operation mode

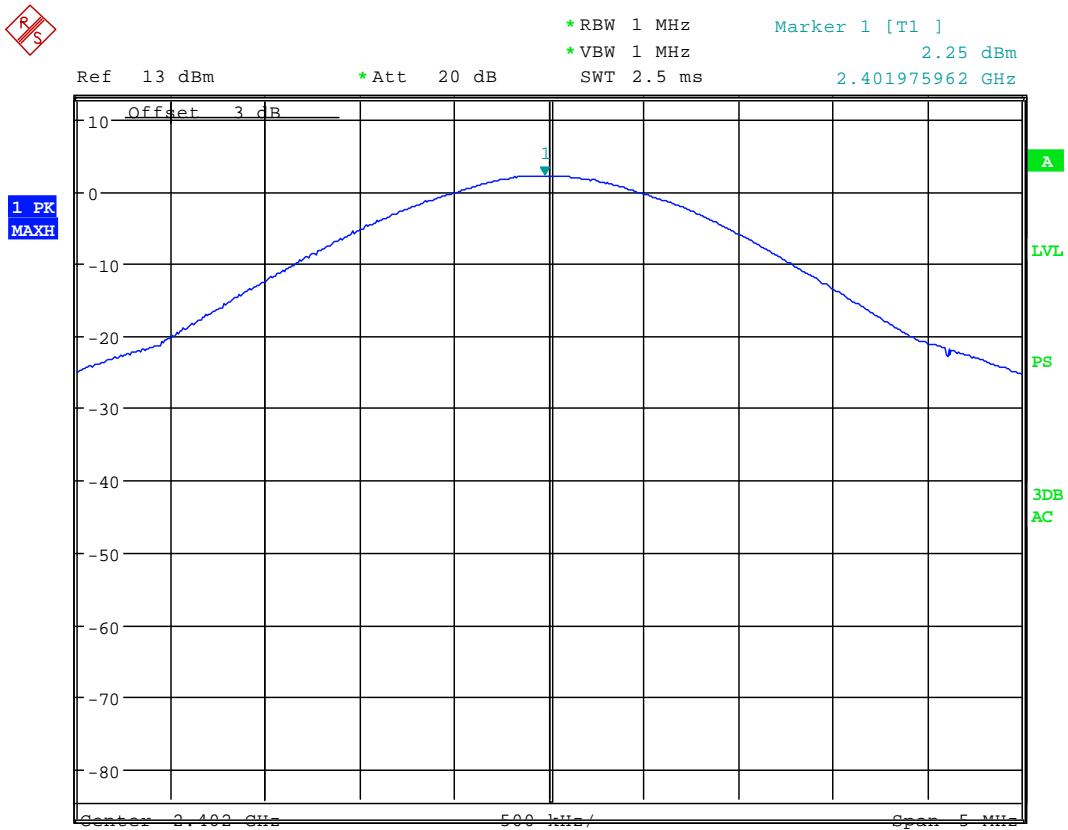
<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping on single channel
<b>EUT TX power level</b>	TX level 0 (=max)

### 10.3 Results

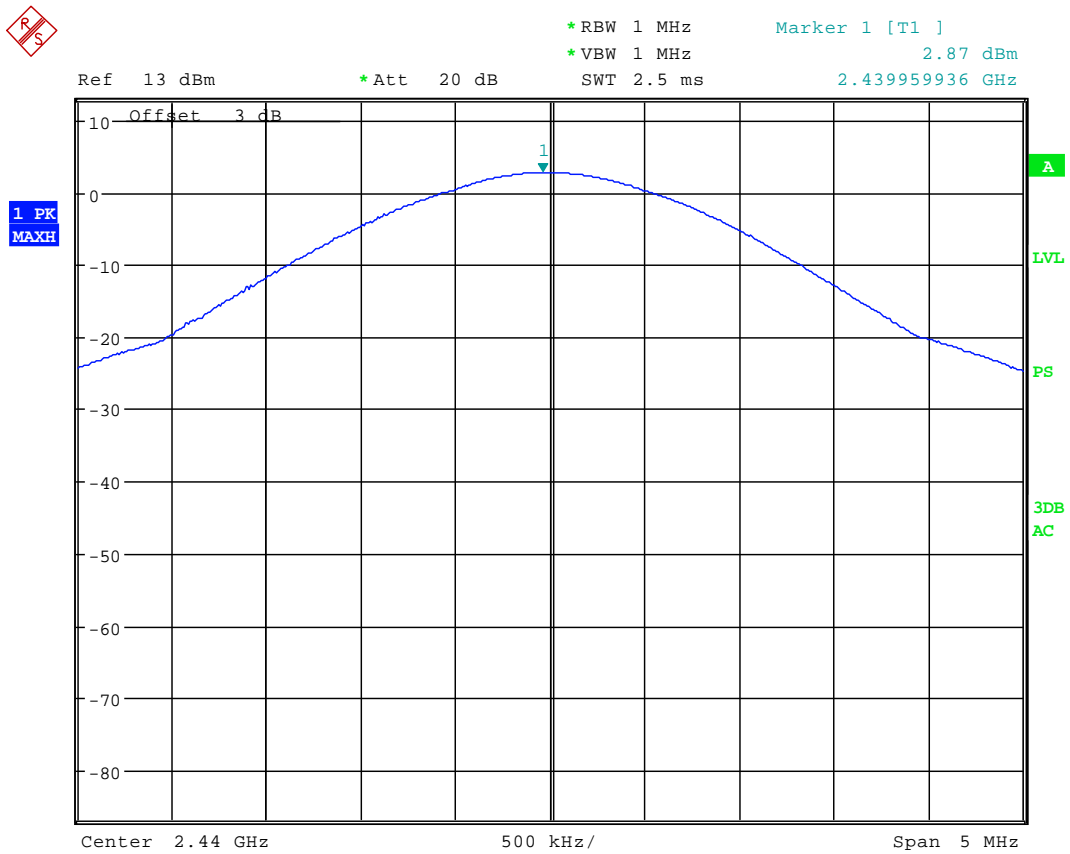
Table 7: Peak output power measurement results

EUT Channel	Limit (mW)	Test result (mW)	Limit (dBm)	Test result (dBm)
0	≤ 1000	1,68	≤ 30	2,25
44		1,94		2,87
80		2,00		3,00

### 10.4 Screen shots

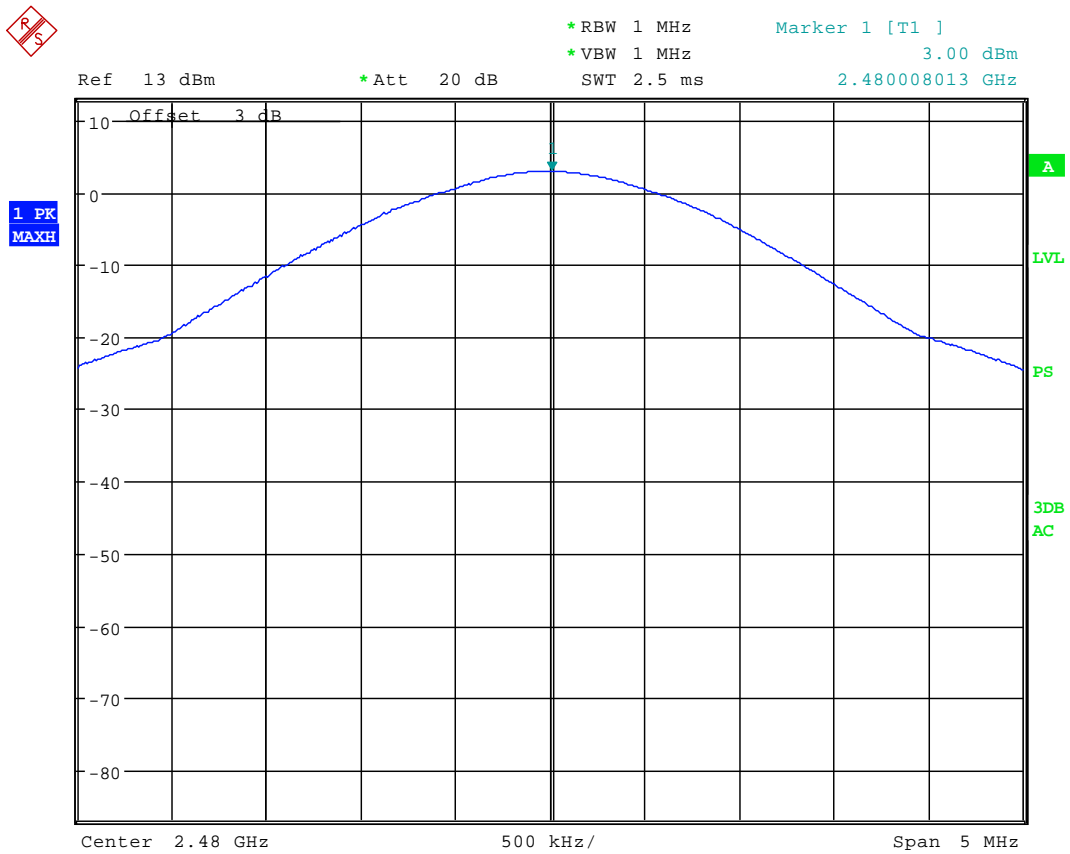


Picture 18: Peak output power, channel 0



Picture 19: Peak output power, channel 44





Picture 20: Peak output power, channel 78

### 10.5 EUT operation mode

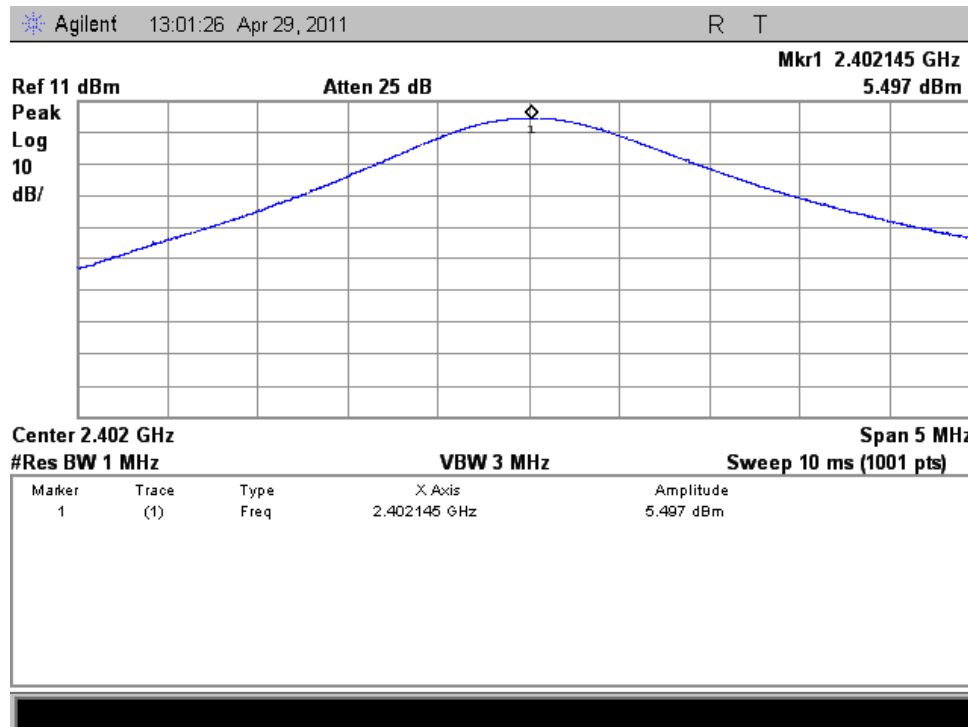
<b>EUT operation mode</b>	Modulation ON, 8-QPSK modulation
<b>EUT channel</b>	Continuous on single channel
<b>EUT TX power level</b>	Max

### 10.6 Results

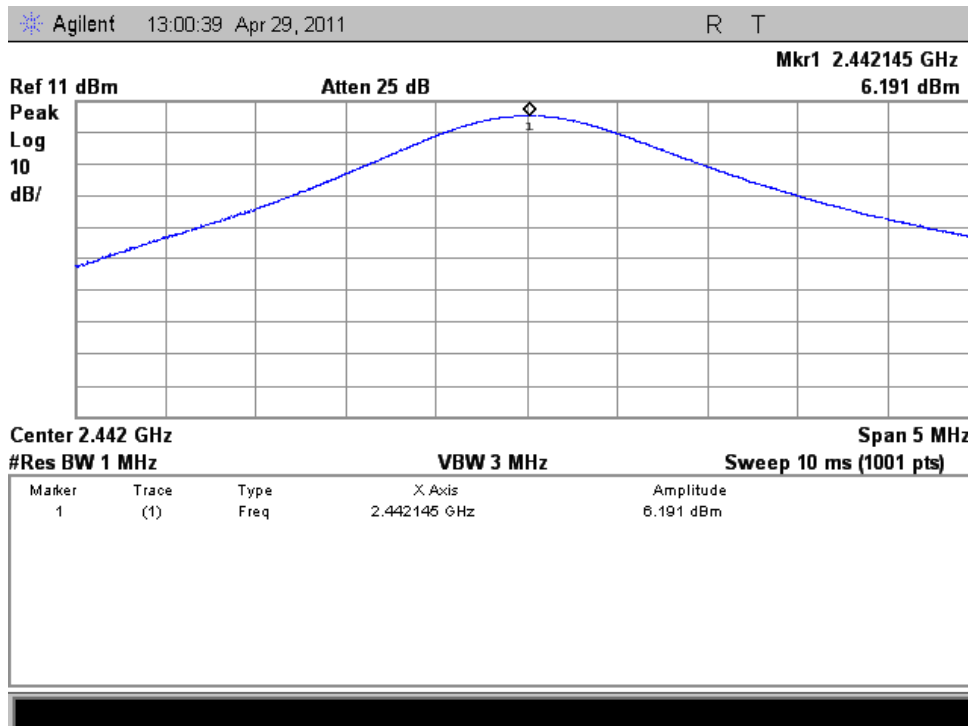
Table 8: Peak output power measurement results

EUT Channel	Limit (mW)	Test result (mW)	Limit (dBm)	Test result (dBm)
0	≤ 1000	3,55	≤ 30	5,50
44		4,16		6,19
78		4,32		6,36

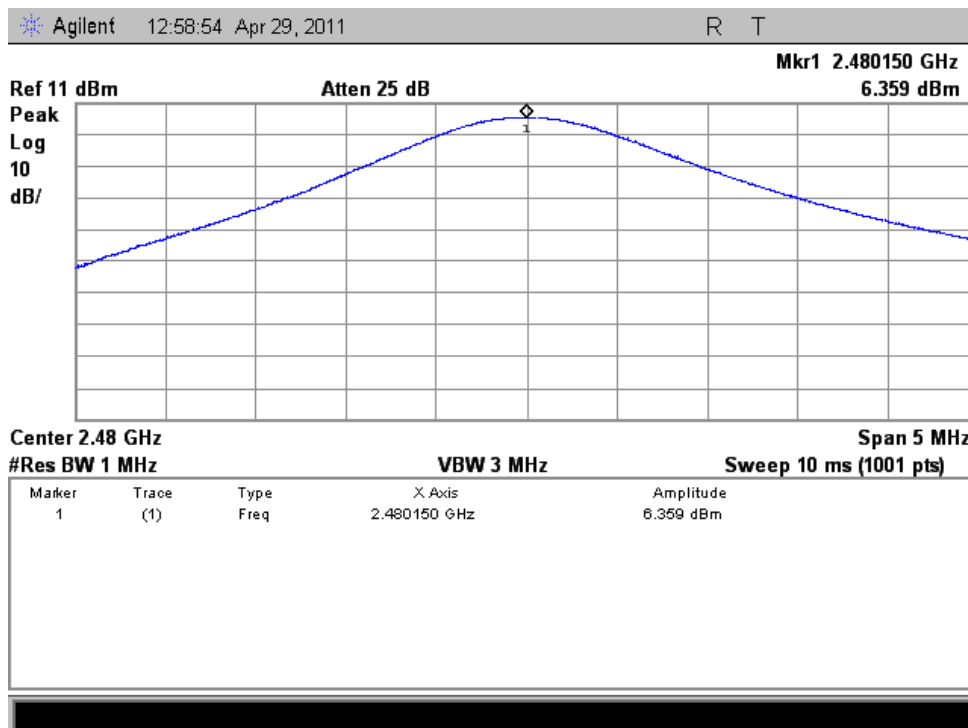
### 10.7 Screen shots



Picture 21: Peak output power, channel 0



Picture 22: Peak output power, channel 44



Picture 23: Peak output power, channel 78

## 11 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	31 March, 2011		
<b>FCC rule part</b>	15.247, d		
<b>RSS-210 section</b>	A8.5		
<b>Measured by</b>	Matti Virkki		

### 11.1 Test setup and measurement method

EUT software was used to:

- set the EUT channel (0-78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 24: Test setup for band edge compliance measurement

Band edge compliance of RF-conducted emissions was measured by setting the band edge as center frequency in the spectrum analyzer and measuring the power on the transmission on channels 0 and 78. The measured power and power on the band edge was then compared.

## 11.2 Hopping enabled

### 11.2.1 EUT operation mode

<b>EUT operation mode</b>	Modulation ON, QFSK modulation
<b>EUT channel</b>	Hopping
<b>EUT TX power level</b>	TX level 0 (=max)

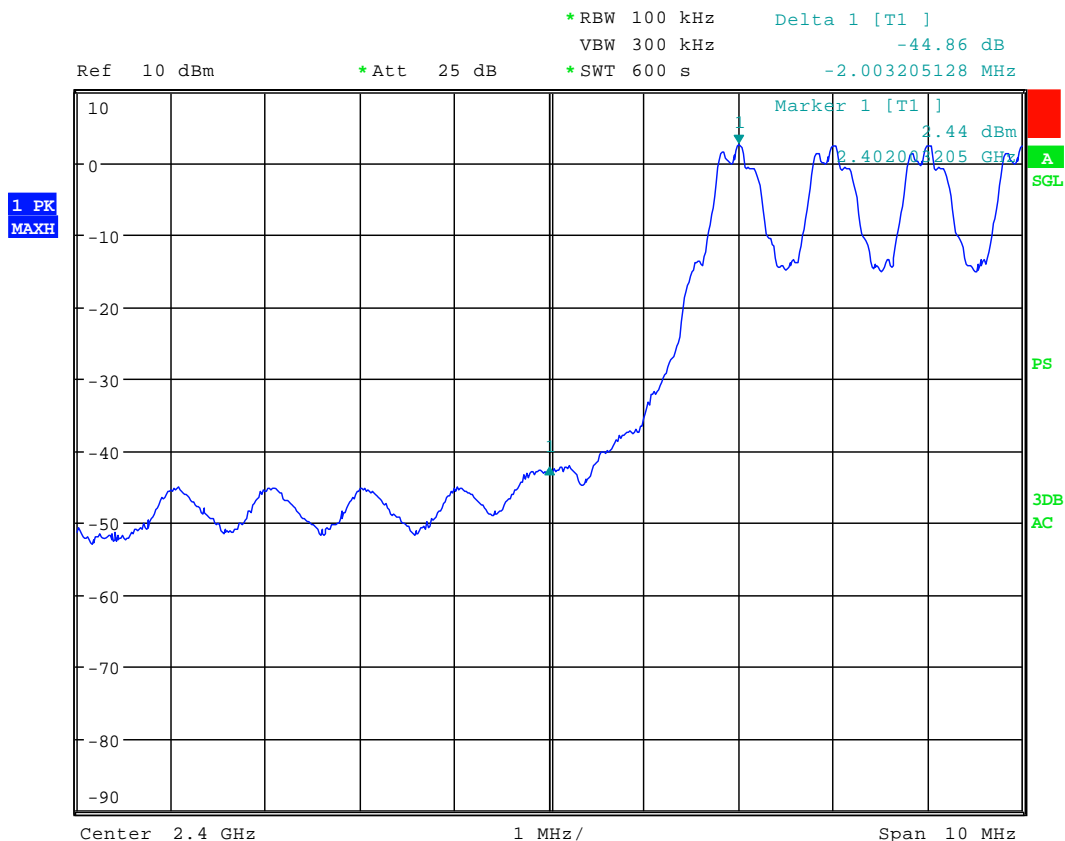
### 11.2.2 Results

Table 9: Number of hopping frequencies measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-44,8
78		-48,6

### 11.2.3 Screen shots

Picture 25: Band edge compliance, channel 0, hopping enabled





11.2.4 EUT operation mode

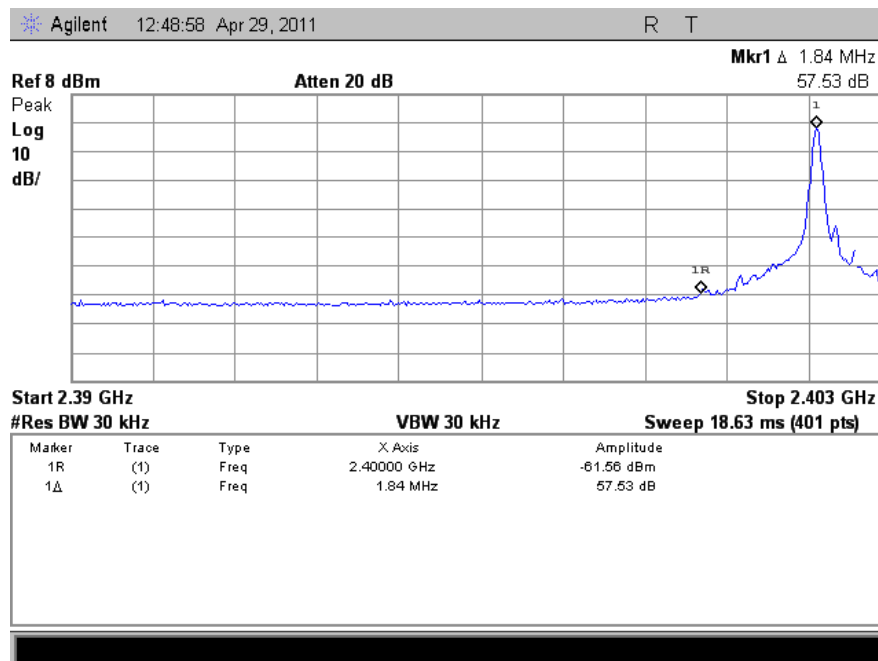
<b>EUT operation mode</b>	Modulation, 8-QPSK
<b>EUT channel</b>	Hopping disabled
<b>EUT TX power level</b>	TX level 0 (=max)

11.2.5 Results

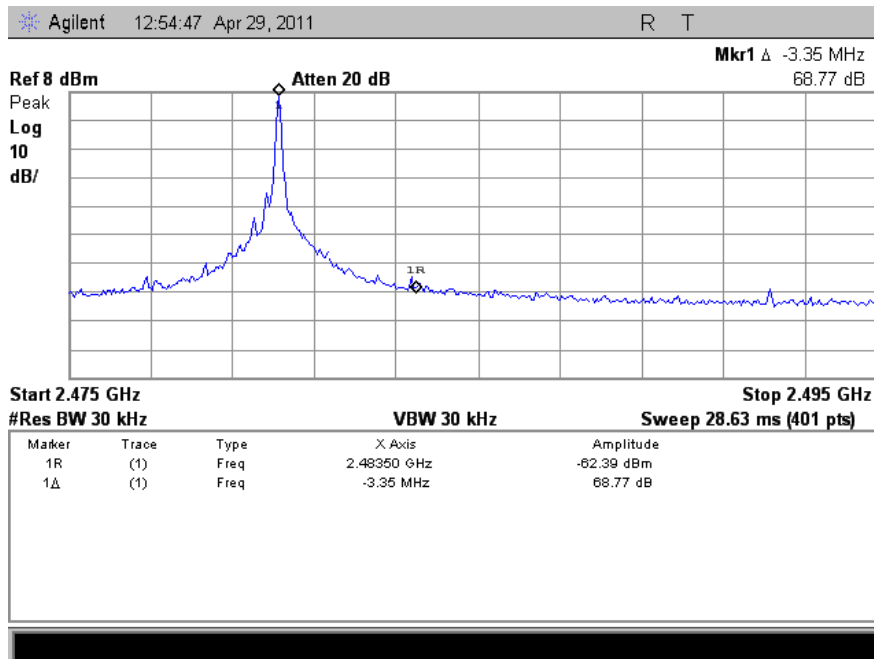
Table 10: Number of hopping frequencies measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-57,5
78		-68,8

11.2.6 Screen shots



Picture 27: Band edge compliance, channel 0, hopping disabled all 0 Bit pattern



Picture 28: Band edge compliance, channel 78, hopping disabled all 1 bit pattern.



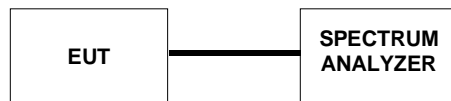
## 12 99 % BANDWIDTH

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	23 °C	14 %RH	1022 hPa
<b>Date of measurement</b>	April 29, 2011		
<b>FCC rule part</b>			
<b>RSS-GEN section</b>	4.6.1		
<b>Measured by</b>	Matti Virkki		

### 12.1 Test setup and measurement method

EUT software was used to:

- set the EUT channel (0 – 78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 29: Test setup for 99% bandwidth measurement

The 99% occupied bandwidth was calculated from spectrum analyzer measurements. The measurement data was read from the analyzer to computer. Software in computer calculated the total power from the measurement data and defined the frequency band containing 99% of the total power. Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power band in the screenshots.

### 12.2 EUT operation mode

<b>EUT operation mode</b>	Modulation QFSK modulation
<b>EUT frequency</b>	Ch0 (2402 MHz), ch44 (2442 MHz) and Ch78 (2480 MHz)
<b>EUT TX power level</b>	TX level 0 (=max)

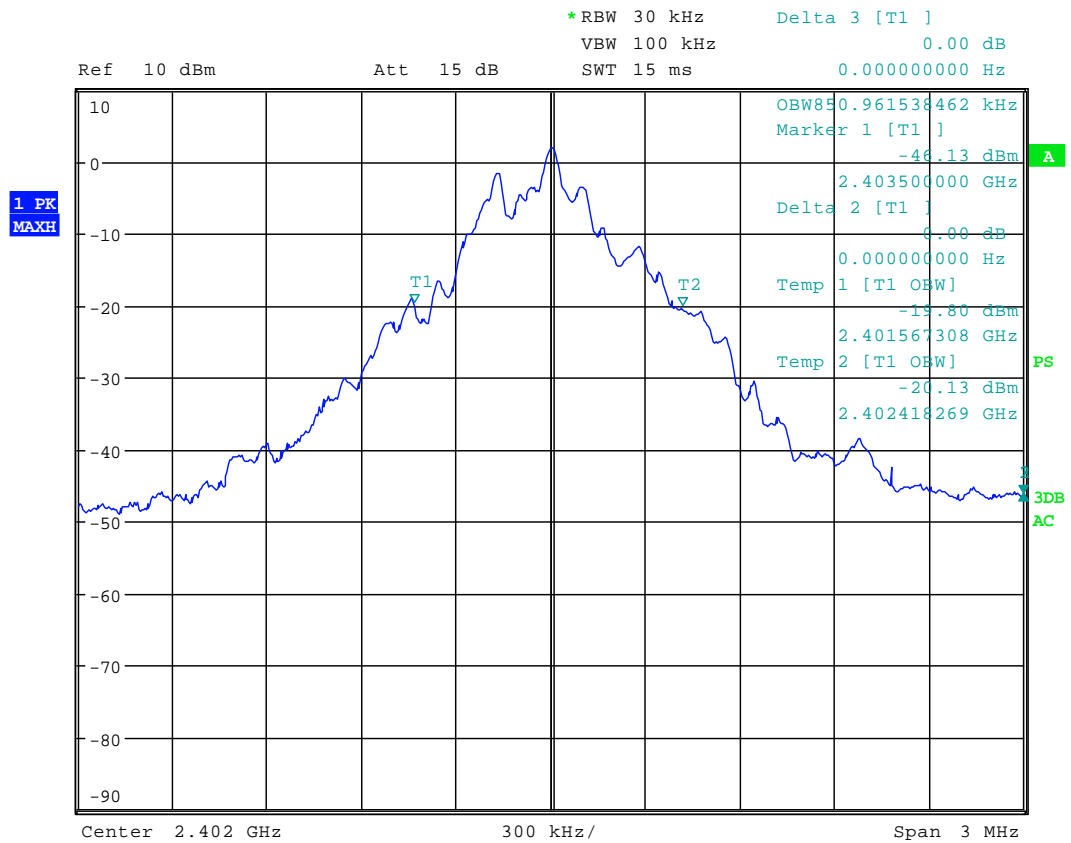
### 12.3 Results

Table 11: 99% bandwidth measurement results

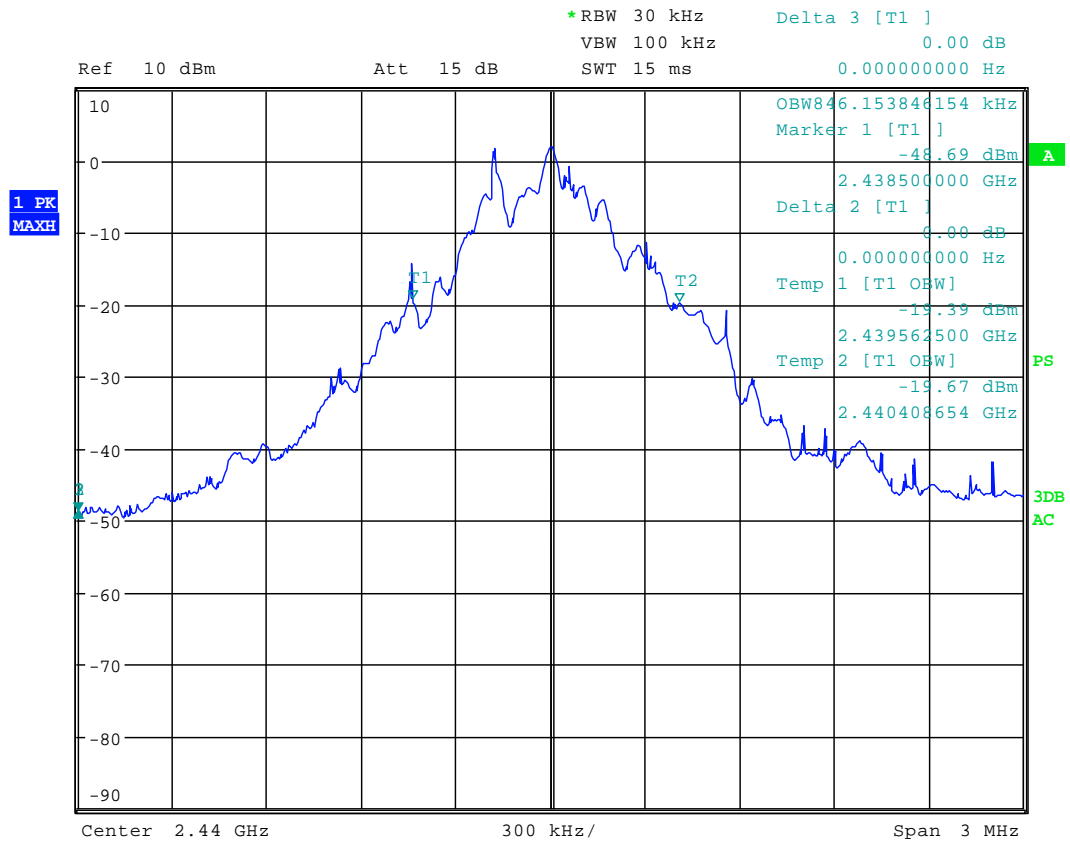
EUT Frequency MHz	Limit kHz	Measured value kHz
2402	-	850.9
2442	-	846.2
2480	-	817.3

### 12.4 Screen shots

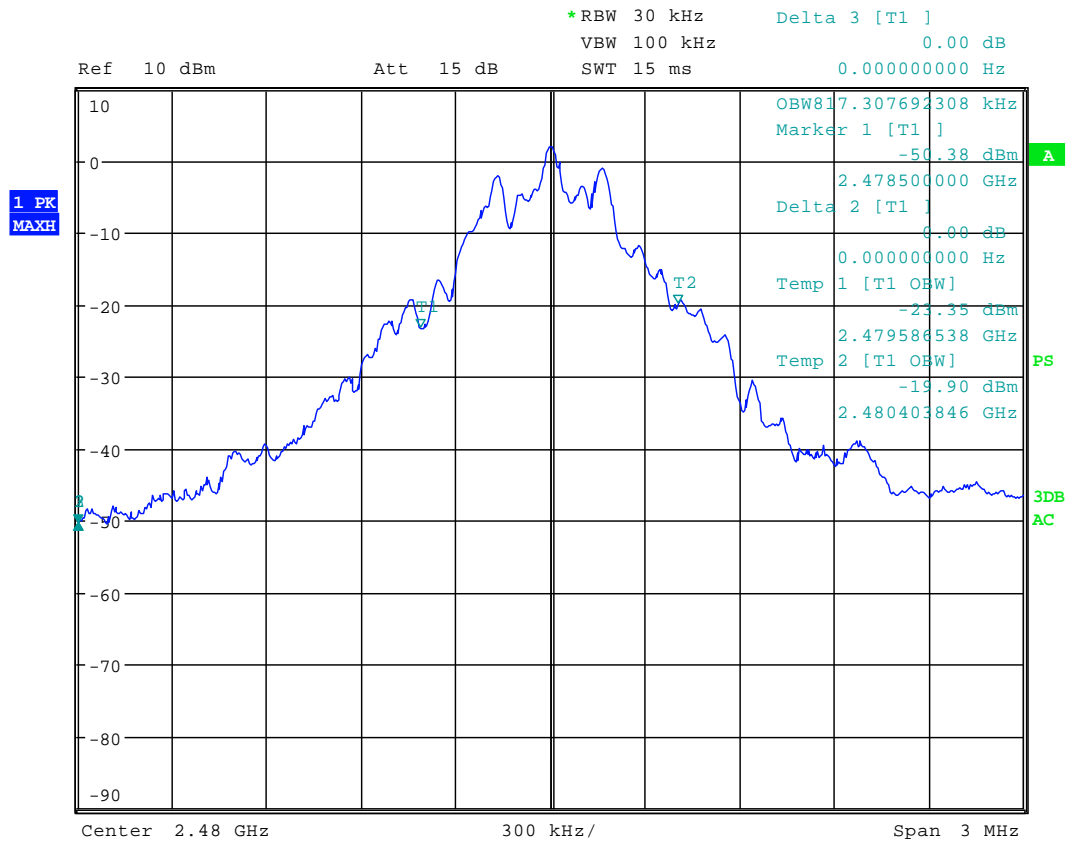
Picture 30: 99% Bandwidth measurement result, ch 0



Picture 31: 99% Bandwidth measurement result, ch 44



Picture 32: 99% Bandwidth measurement result, ch 78



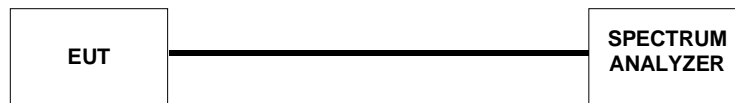
### 13 SPURIOUS RF CONDUCTED EMISSIONS

<b>EUT</b>	2		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	22 °C	16 %RH	1028 hPa
<b>Date of measurement</b>	April 29, 2011		
<b>FCC rule part</b>	15.247, d		
<b>RSS-210 section</b>	A8.5		
<b>Measured by</b>	Matti Virkki		

#### 13.1 Test setup and measurement method

EUT software was used to:

- set the EUT channel (0-78)
- set the EUT to TX or RX mode
- enable/disable frequency hopping
- select modulation type



Picture 33: Test setups for conducted spurious emission measurement

Spectrum analyzer and automated software were used to record conducted spurious emissions on frequency range 30 MHz – 25 GHz. Frequency range was scanned using 100 kHz resolution bandwidth and 50 kHz steps. Spurious emissions levels relative to the carrier level were read from the measured results.

### 13.2 EUT operation mode

<b>EUT operation mode</b>	Continous transmission (8-QPSK modulation)
<b>EUT channel</b>	0 (2402 MHz), 39(2440 MHz) and 78 (2480 MHz)
<b>EUT TX power level</b>	TX level 0 (=max)

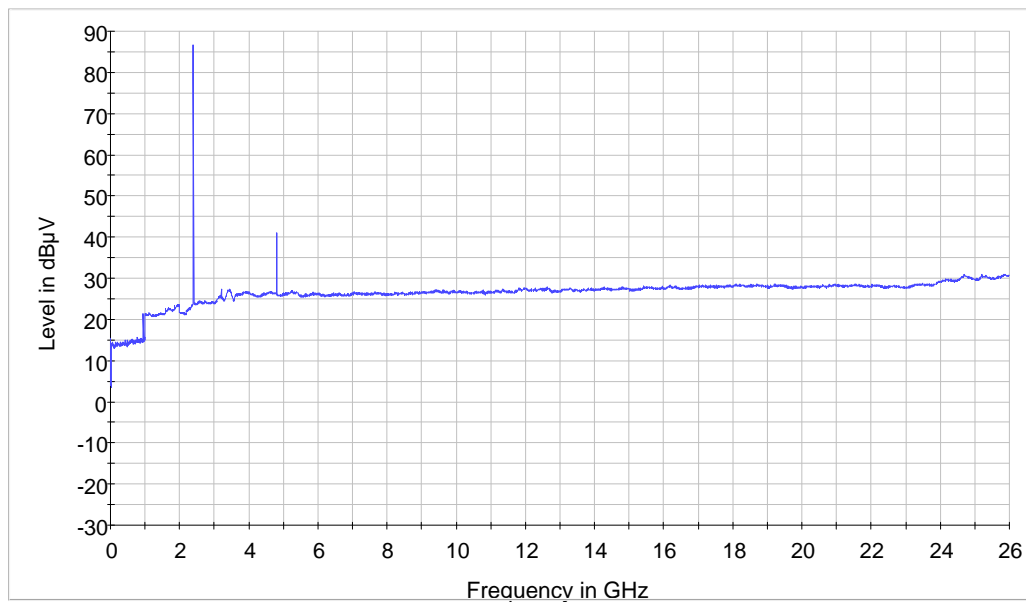
### 13.3 Limit

EUT Channel	Limit (dBc)
0	≤ -20
39	
78	

### 13.4 Results

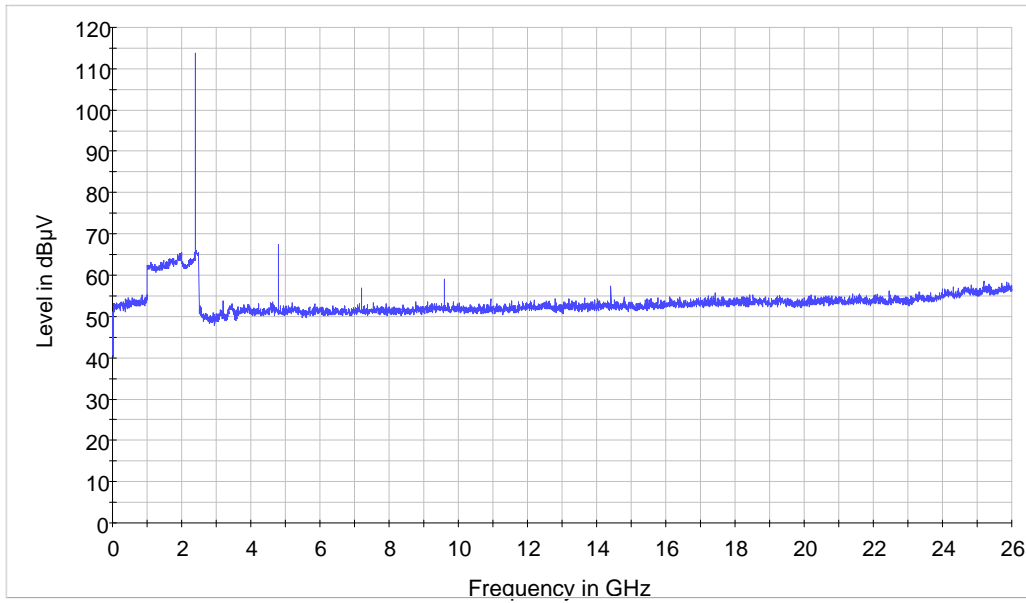
All spurious emissions measured were least 40dB below the carrier level.

Johtuva spurri 15.247



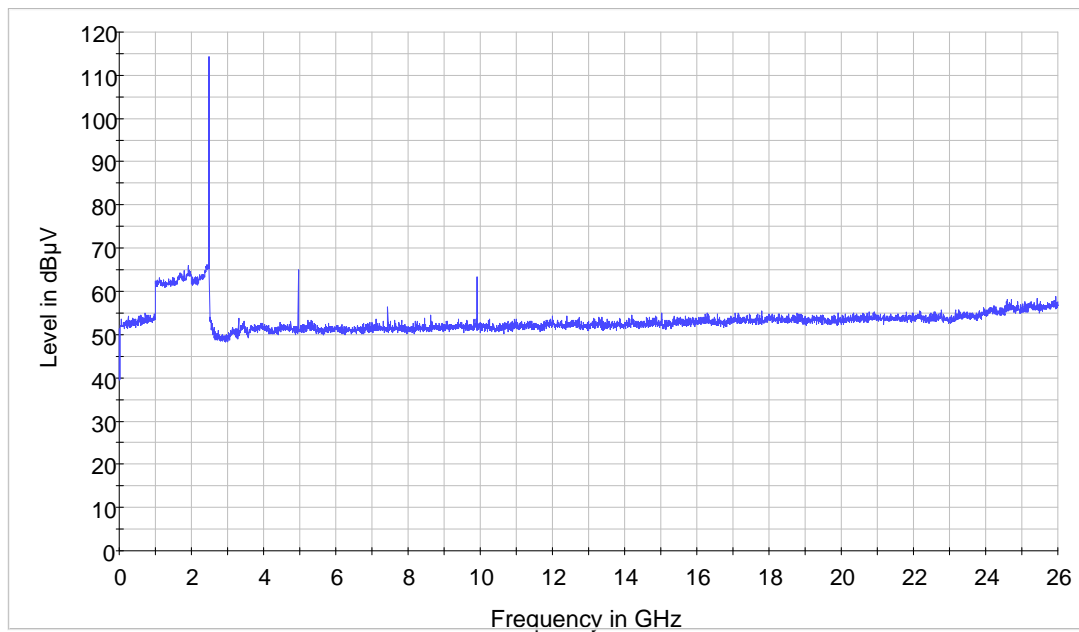
Picture 34: Conducted spurious emissions on BT antenna port, Channel 0,

Johtuva spurri 15.247



Picture 35: Conducted spurious emissions on BT antenna port, Channel 39,

Johtuva spurri 15.247



Picture 36: Conducted spurious emissions on antenna port, Channel 78,

## 14 FIELD STRENGTH OF FUNDAMENTAL

<b>EUT</b>	1		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	22 °C	16 %RH	1028 hPa
<b>Date of measurement</b>	April 29, 2011		
<b>FCC rule part</b>			
<b>RSS-210 section</b>			
<b>Measured by</b>	Matti Virkki		

### 14.1 Test setup and measurement method

The EUT was set on a non-conductive turntable in a semi-anechoic chamber. The EUT was set at 0,8m height. Measuring antenna was scanned 1 – 4 m in height. The measurements were repeated in three EUT orientations and two antenna polarizations. The measured signal was routed from the measuring antenna to the spectrum analyzer. The measurement was made using 1 MHz resolution bandwidth and 1 MHz video bandwidth and maximum hold function to record the maximum peak output power.

### 14.2 EUT operation mode

<b>EUT operation mode</b>	Continous transmission, 8-QPSK modulation
<b>EUT frequency</b>	0 (2402MHZ), 40 (2442 MHz) and 78 (2480 MHz)
<b>EUT TX power level</b>	TX level 0 (=max)

### 14.3 Results

Table 12: Maximum field strength of fundamental (Peak value)

Freq MHz	Measured Value dB $\mu$ V	Correction Factor dB	Result dBuV/m	EUT orientation	Antenna Pol.	Antenna height	Turntable angle
2402	53,2	37,7	90,9	1	H	100	172
2442	56,6	37,9	94,5	1	V	100	42
2480	59,6	38,2	97,8	1	V	150	180



## 15 RADIATED SPURIOUS EMISSIONS

<b>EUT</b>	1		
<b>Accessories</b>	3		
<b>Temp, Humidity, Air Pressure</b>	22 °C	26 %RH	1001 hPa
	22 °C	16 %RH	1028 hPa
<b>Date of measurement</b>	April 21, April 29 2011		
<b>FCC rule part</b>	15.247, d		
<b>RSS-210 section</b>	A8.5		
<b>Measured by</b>	Matti Virkki		

### 15.1 Test setup

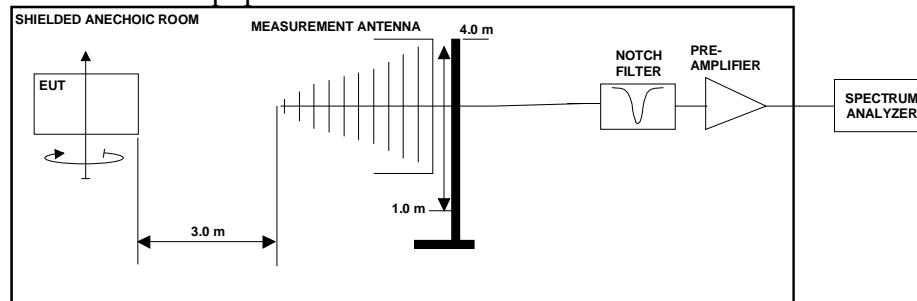
EUT software was used to control WLAN settings:

- set the EUT channel (1-11)
- set the EUT to TX mode

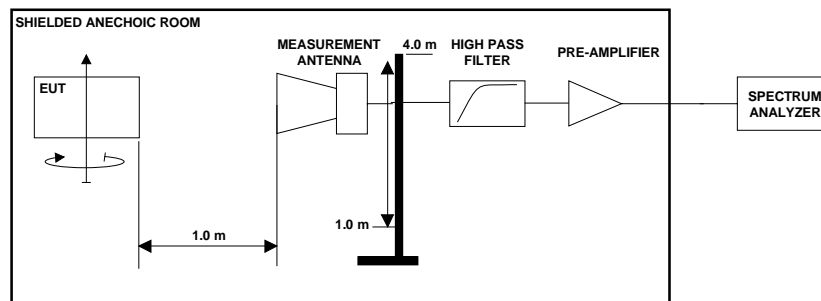
Also Bluetooth settings was controlled by EUT software:

- set the EUT channel (0 – 78)
- set the EUT to TX mode
- disable frequency hopping

The test was done using an automated test system, where a computer controlled the measurement equipment.



Picture 37: Test setup for radiated spurious emissions measurement  
30 MHz - 3 GHz frequencies



Picture 38: Test setup for radiated spurious emissions measurement  
3 GHz – 25 GHz frequencies

## 15.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and height and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the measurement antenna factor, cable attenuations and filter attenuation.
4. The corrected values, giving the EUT radiated spurious emission levels as dB $\mu$ V/m at 3 m distance, are reported.

## 15.3 EUT operation mode

<b>EUT WLAN mode</b>	Continuous transmission, DSSS mode
<b>EUT WLAN channel</b>	1 (2412MHz), 6 (2442MHz) and 11 (2462MHz)
<b>EUT BT mode</b>	Continuous transmission, 8-QPSK modulation,
<b>EUT BT channel</b>	0 (2402 MHz), 39 (2441 MHz) and 78 (2480 MHz)
<b>EUT TX power level</b>	max

## 15.4 Limit

Table 13: Radiated spurious emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit ( $\mu$ V/m)	3m Limit (dB $\mu$ V/m)	Detector
30 – 88	100	40	QP
88 -216	150	43,5	QP
216 - 960	200	46	QP
960 - 1000	500	54,0	QP
1000 - 25000	500	54,0	AVG
1000 - 25000	5000	74,0	PEAK

As default, all emissions were compared against the general limits. If any emission exceeded that limit, it was further checked, if it was outside the restricted band thus complying with the -20dBc requirement.

## 15.5 Results

Measurement system noise level was at least 15 dB below the spurious emission limit. Only levels of suspicious signals and transmitter harmonic frequencies, which were above the measurement system noise, are reported.

Table 14: Emission levels PEAK detector, wlan channel 1, BT channel 0

Freq MHz	Measured Value dB $\mu$ V	Correction Factor dB	Result dB $\mu$ V/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
4824.16	57.6	-16.0	41.6	12.4	1	V	1
7245.96	55.3	-16.9	38.4	15.6	1	V	1
9642.87	55.3	-16.8	38.5	15.5	3	V	1
4803.71	69.3	-16.0	53.3	0.7	3	H	1
7205.37	49.3	-9.9	39.4	14.6	2	V	1

Table 15: Emission levels PEAK detector, wlan channel 6, BT channel 40

Freq MHz	Measured Value dB $\mu$ V	Correction Factor dB	Result dB $\mu$ V/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
4876.95	56.8	-15.8	41.0	13.0	1	V	1
7321.28	50.3	-10.0	40.3	13.7	1	V	1
9742.69	54.0	-17.2	36.8	17.2	1	V	1
12171.3	44.3	-14.1	30.2	23.8	3	V	1
4879.71	70.0	-15.8	54.2	-0.2	1	H	1
7319.58	49.2	-10.0	39.2	34.7	1	H	1

Table 16: Emission levels PEAK detector, wlan channel 11, BT channel 78

Freq MHz	Measured Value dB $\mu$ V	Correction Factor dB	Result dB $\mu$ V/m	Marginal dB	EUT Position	Ant Pol.	Ant height m
4925.28	57.1	-15.6	41.5	12.5	1	V	1
7396.03	59.6	-16.8	42.8	11.2	2	V	1
9845.32	52.6	-9.2	43.4	10.6	1	V	1
12300.3	47.1	-5.3	41.8	12.2	3	V	1
4959.68	68.4	-15.6	52.8	1.2	1	H	1

WLAN spurious emission peak values are under average limit.

Bluetooth measured transmission time in clause 8.3 was 200µs. 2 transmissions occurred in 100ms period.

Therefore,

$$\text{Average level} \leq \text{Peak level} + 20 \log (2 \cdot 200\mu\text{s} / 100\text{ms})$$

$$\text{Average level} \leq \text{Peak level} - 24.0\text{dB}$$

Table 17: Emission levels calculated average, BT channel 0

Freq MHz	Peak Result dBµV/m	Average Result dBµV/m	Marginal dB
4803.71	53.3	29.3	24.7
7205.37	39.4	15.4	38.6

Table 18: Emission levels calculated average, BT channel 40

Freq MHz	Peak Result dBµV/m	Average Result dBµV/m	Marginal dB
4879.71	54.2	34.2	19.8
7319.58	39.2	15.2	38.8

Table 19: Emission levels calculated average, BT channel 78

Freq MHz	Peak Result dBµV/m	Average Result dBµV/m	Marginal dB
4959.68	52.8	28.8	25.2

## 16 TEST EQUIPMENT

### 16.1 Conducted measurements

DEVICE	MANUFACTURER	SPKTT	SERIAL
Spectrum analyser	Agilent E7405A	131	MY42000072
Measuring receiver / Spectrum analyser	Rohde & Schwarz ESU 26	219	100173

### 16.2 Radiated measurements

DEVICE	MANUFACTURER	SPKTT	SERIAL
Measuring receiver / Spectrum analyser	Rohde & Schwarz ESU 26	219	100173
Horn Antenna	Schwarzbeck BBHA9120D	138	365
X-wing BiLog antenna	Teseq CBL6143A	221	29611
Horn Antenna	Schwarzbeck BBHA9170	194	313
3 dB attenuator	Huber+Suhner 3dB/2W	214	-
Pre-amplifier	Agilent 87405B	143	MY39500154
Pre-amplifier	JCA 118-400	142	-
Pre-amplifier	Miteq AMF-6F-18002650-2	191	1128879
High pass filter	Wainwright Instruments WHK3.0/18GST	141	3
Band reject filter	Wainwright Instruments WRCT2400/2483	196	2
3m Semi-anechoic chamber	ETS Euroshield	081	-
Measuring software	Rohde & Schwarz EMC 32	-	Ver 8.40

## 17 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document

100310B-RF\_PHOTOS