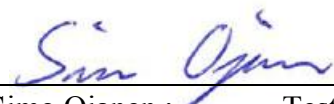


REPORT: Electromagnetic Compatibility (EMC) test report**PRODUCT:**

Test item description:	Bluetooth headset
Trade Mark:	NOKIA
Model/Type reference:	HS-123W
Serial number:	-
Customer:	NOKIA CORPORATION Joensuunkatu 7E 24100 Salo Finland
Contact person:	Mr Tero Lahti
Manufacturer:	- - - -

DATE: 12.9.2008**TESTED BY:**
Simo Ojanen ; Test engineer**APPROVED BY:**
Tuomo Hahl ; Test engineer

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Test results are valid for the tested unit only.

The report may be copied only in its entirety

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1 LABORATORY INFORMATION

Test Laboratory	Intertek ETL Semko OY EMC Laboratory Koneenkatu 12 / K17 05830 Hyvinkää FINLAND Tel: +358 10 424 6200 Fax: +358 10 424 6201 e-mail: firstname.surname@intertek.com
FCC registration number: IC file number:	910391 (January 27, 2003) IC 2042C-1 (May 14, 2003)

2 CUSTOMER INFORMATION

Client	NOKIA CORPORATION Joensuunkatu 7E 24100 Salo Finland
Contact person:	Mr Tero Lahti NOKIA CORPORATION Joensuunkatu 7E 24100 Salo Finland
Receipt of EUT:	July 29, 2008
Testing date:	August 01, 2008 – September 11, 2008
Report date:	September 11, 2008

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.

3 SUMMARY OF TEST RESULTS

Transmitter measurements

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

Receiver measurements

Section in CFR 47	Section in RSS-GEN	Section in ICES-003	Test	Result
§15.107	7.2.2	5.3	Conducted emissions to AC-power lines	PASS
§15.109	7.2.3	5.5	Radiated emissions	PASS

PASS Pass

FAIL Fail

X Measured, but there is no applicable performance criteria

- Not done

4 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
EUT	Bluetooth headset	HS-123W	-	1
	Bluetooth headset	HS-123W	-	2 *
Accessories	Charger	Nokia AC-5E	-	3
	BT communication tester	Agilent N4010A	GB46170528	4

Notes:

* Antenna replaced with SMA-connector

4.1 EUT description

EUT is battery powered Bluetooth headset. Battery can be charged with charger

The EUT was not modified during the tests.

5 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 18.

6 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 1

RSS-210, Issue 7

CISPR 22, 2002

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

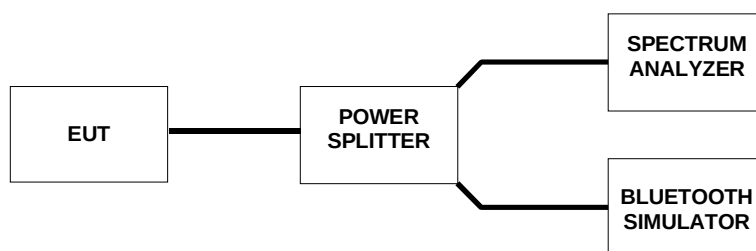
7 CARRIER FREQUENCY SEPARATION

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, a 1		
RSS-210 section	A8.1 (2)		
Measured by	Simo Ojanen		

7.1 Test setup and testing method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 1: Test setup for carrier frequency separation measurement

Spectrum analyzer was set to sweep the Bluetooth operating band 2,40 – 2,483 GHz.

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.

7.2 EUT operation mode

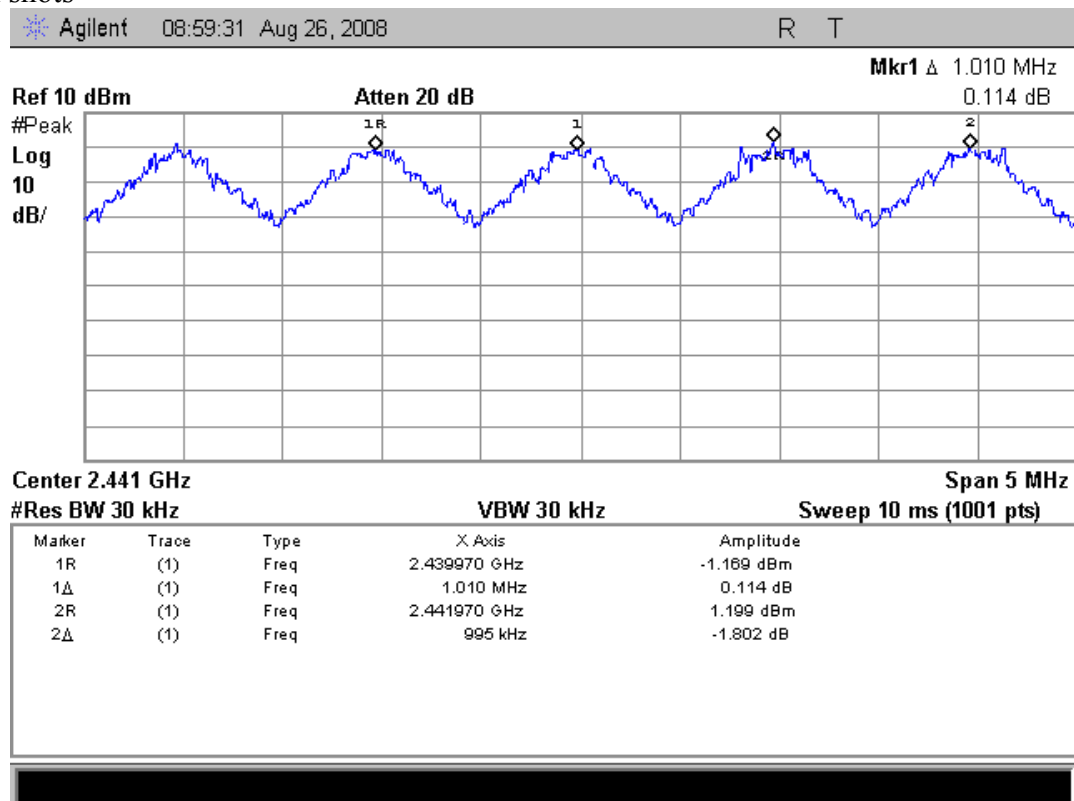
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

7.3 Results

Table 1: Carrier frequency separation measurement results

Limit	Result
2/3 * 20dB bandwidth	1,00 MHz

7.4 Screen shots



Picture 2: Carrier frequency separation, Channels 38 and 39

7.5 EUT operation mode

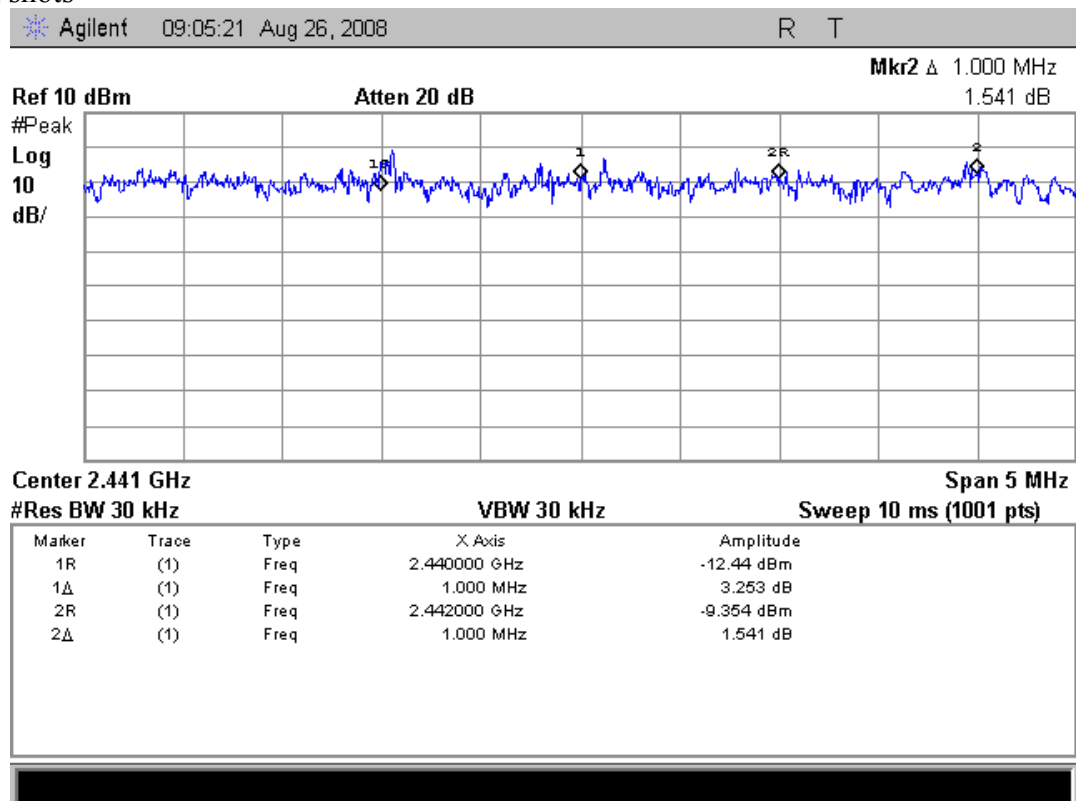
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

7.6 Results

Table 2: Carrier frequency separation measurement results

Limit	Result
2/3 * 20dB bandwidth	1,00 MHz

7.7 Screen shots



Picture 3: Carrier frequency separation, Channels 38 and 39

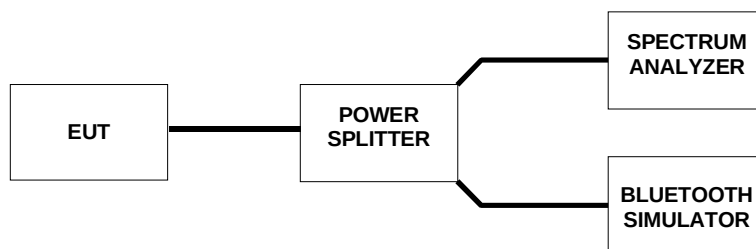
8 NUMBER OF HOPPING FREQUENCIES

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, a 1 iii		
RSS-210 section	A8.1 (4)		
Measured by	Simo Ojanen		

8.1 Test setup

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



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

Spectrum analyzer was set to sweep the Bluetooth operating band 2,40 – 2,483 GHz.

300 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.

8.2 EUT operation mode

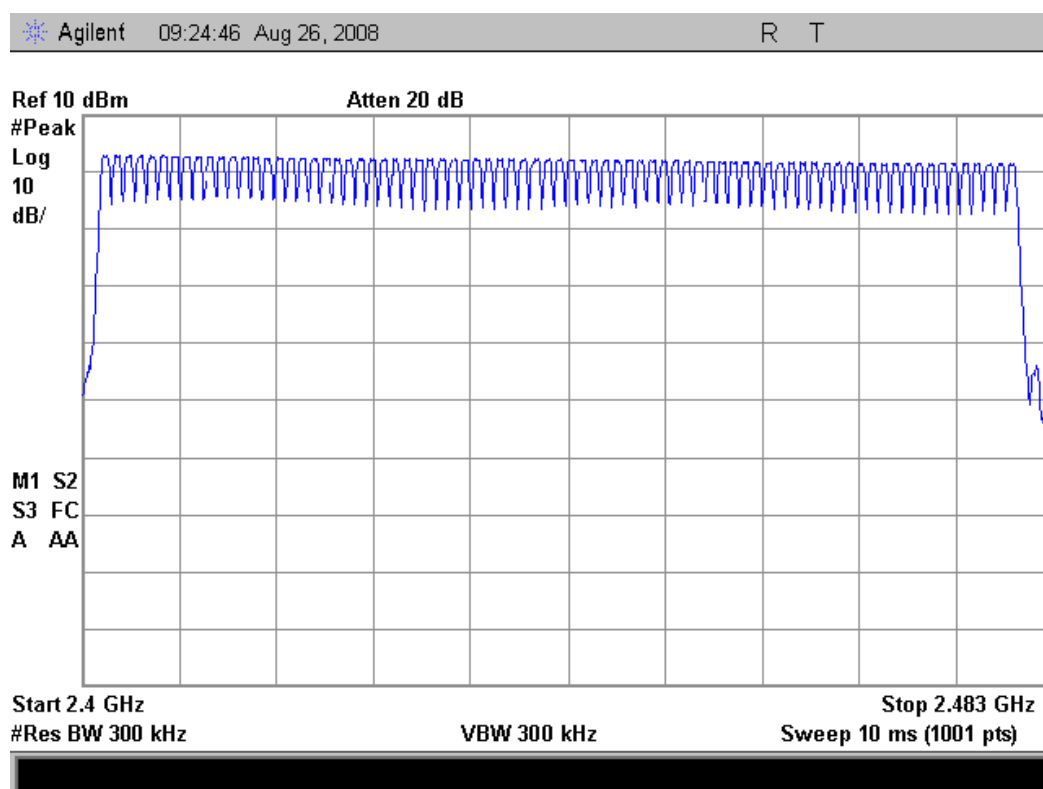
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

8.3 Results

Table 3: Number of hopping frequencies measurement results

Limit	Result
≥ 75	79

8.4 Screen shots



Picture 5: Number of hopping frequencies measurement

8.5 EUT operation mode

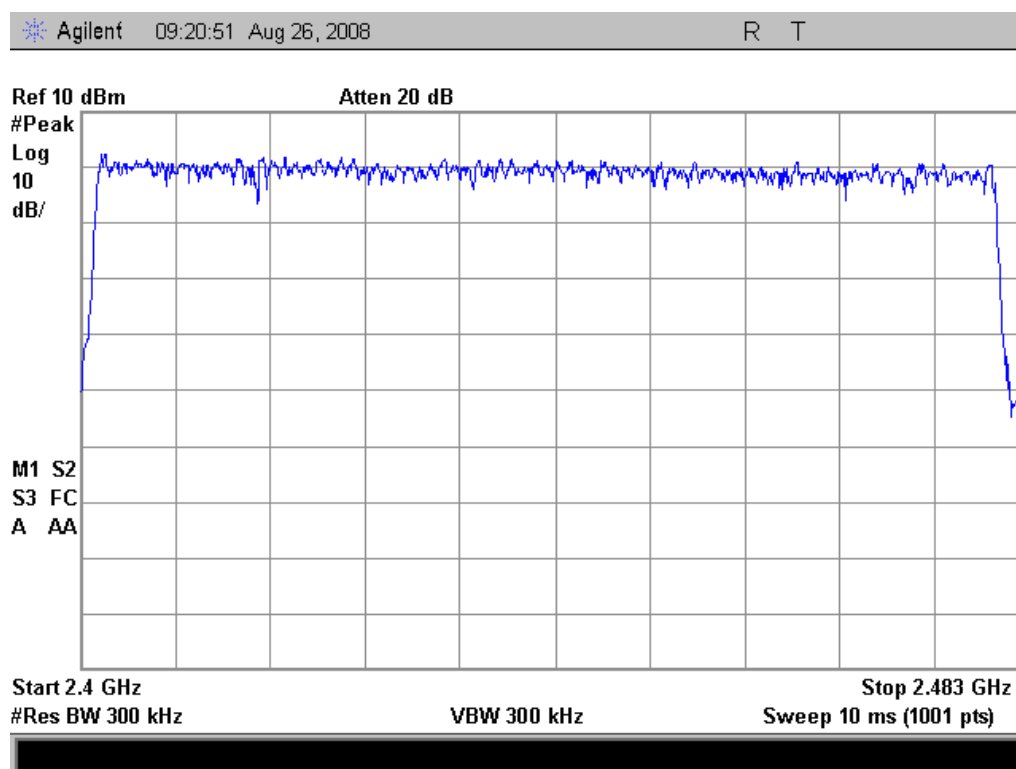
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

8.6 Results

Table 4: Number of hopping frequencies measurement results

Limit	Result
≥ 75	79

8.7 Screen shots



Picture 6: Number of hopping frequencies measurement

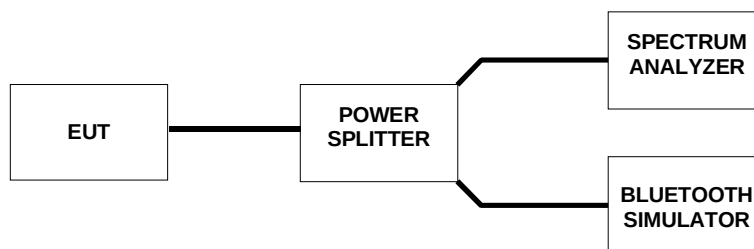
9 TIME OF OCCUPANCY

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, a 1 iii		
RSS-210 section	A8.1 (4)		
Measured by	Simo Ojanen		

9.1 Test setup and testing method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 7: Test setup for conducted RF output power measurement

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

9.2 Connection mode

9.2.1 EUT operation mode

EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

9.2.2 Results

Table 5: Time of occupancy during connection mode measurement results

Limit	Result
$\leq 0,4 \text{ s over } 31,6 \text{ s period}$	0,190 s

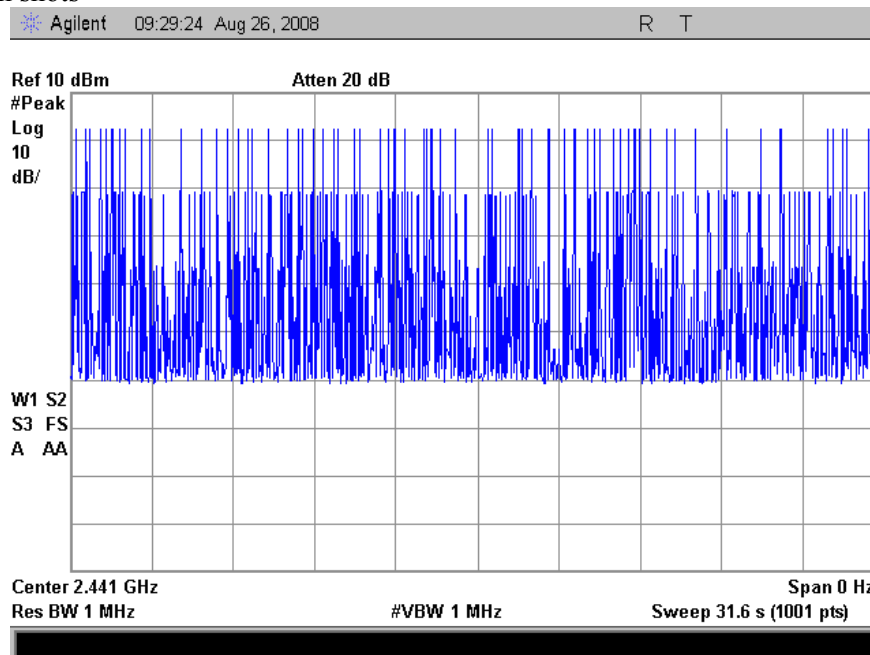
Limit:

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 over time of number of channels multiplied with 0,4s ($79 * 0,4\text{s} = 31,6 \text{ s}$).

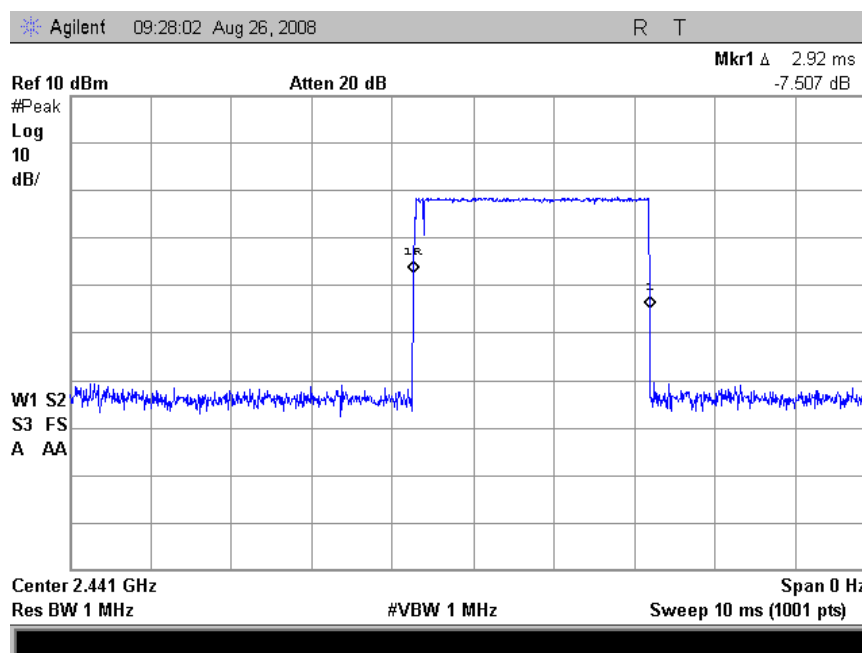
Results:

In measurement time of 31,6 s, total of 65 transmissions occurred. The duration of one transmission was 2,92ms. Based on these measurements the transmitter operated $73 * 2,92 \text{ ms} = 0,190 \text{ s}$ during the 31,6 s period

9.2.3 Screen shots



Picture 8: Number of transmissions on connection state, channel 39



Picture 9: Duration of one transmission on connection state, channel 39

9.2.4 EUT operation mode

EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

9.2.5 Results

Table 6: Time of occupancy during connection mode measurement results

Limit	Result
≤ 0,4 s over 31,6 s period	0,106 s

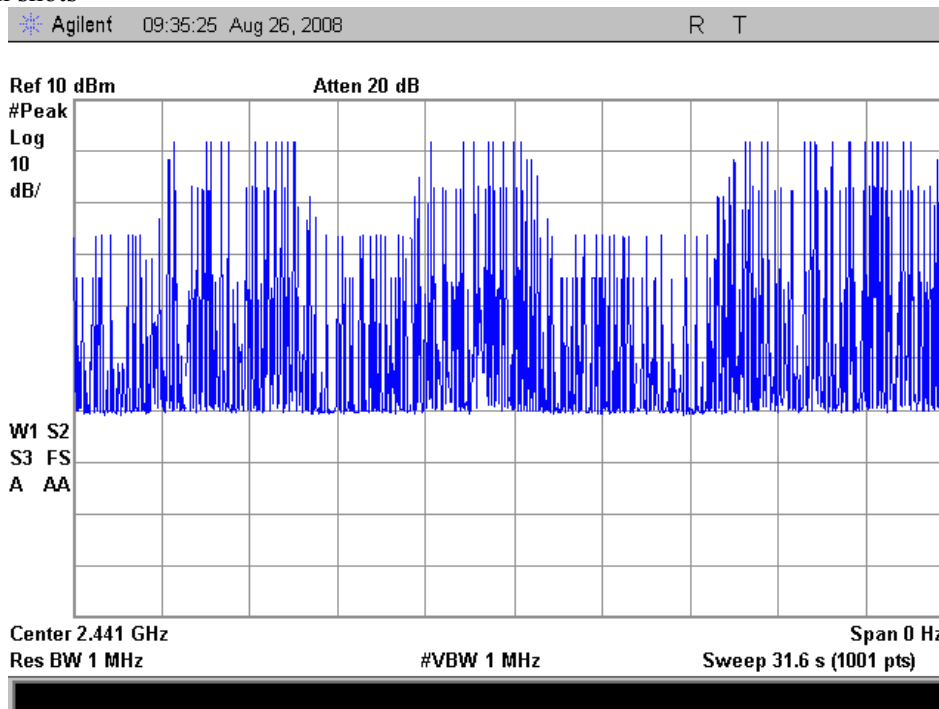
Limit:

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 over time of number of channels multiplied with 0,4s ($79 * 0,4s = 31,6 s$).

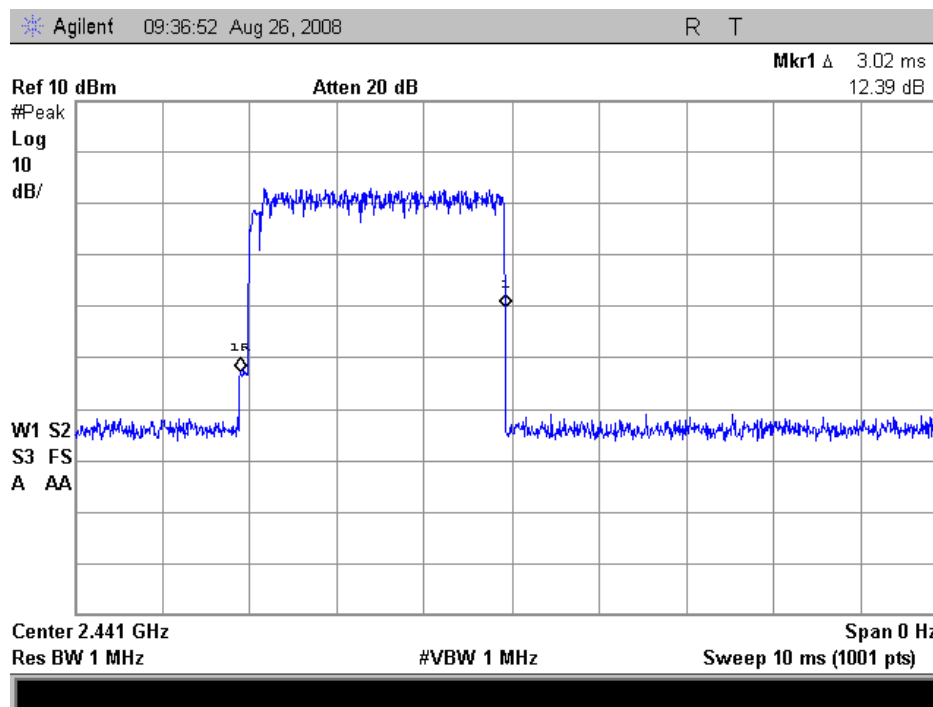
Results:

In measurement time of 31,6 s, total of 35 transmissions occurred. The duration of one transmission was 3,02ms. Based on these measurements the transmitter operated $35 * 3,02 ms = 0,106 s$ during the 31,6 s period

9.2.6 Screen shots



Picture 10: Number of transmissions on connection state, channel 39



Picture 11: Duration of one transmission on connection state, channel 39

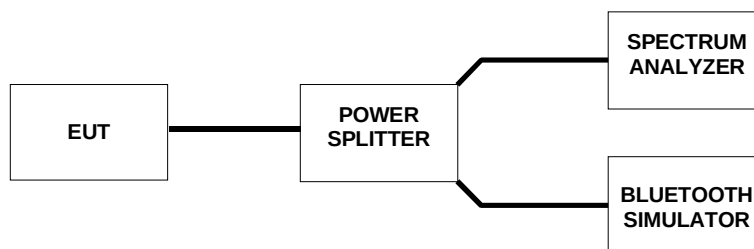
10 20 dB BANDWIDTH

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, a		
RSS-210 section	A8.1 (1)		
Measured by	Simo Ojanen		

10.1 Test setup and measurement method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 12: Test setup for conducted RF output power measurement

The 20dB bandwidth was measured using 10 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 display line 20 dB below this value and by reading the bandwidth from the intersection of the measured trace and display line.

10.2 EUT operation mode

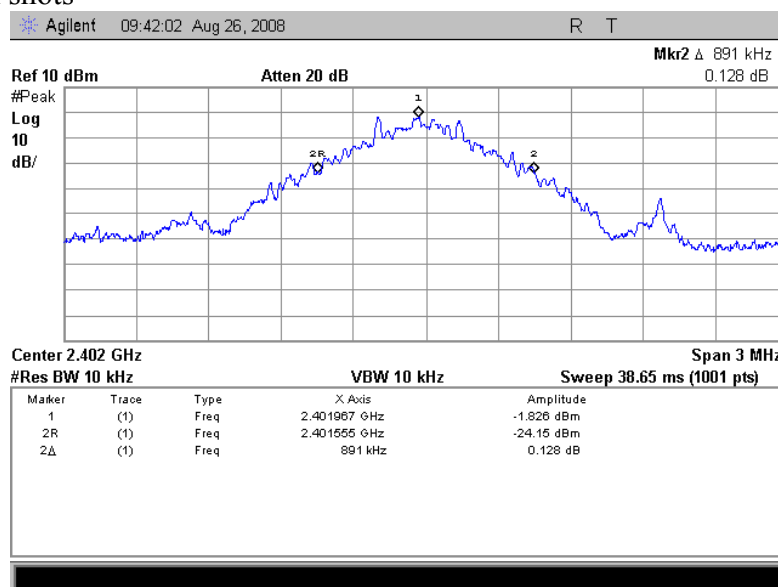
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	0, 39 and 78
EUT TX power level	max

10.3 Results

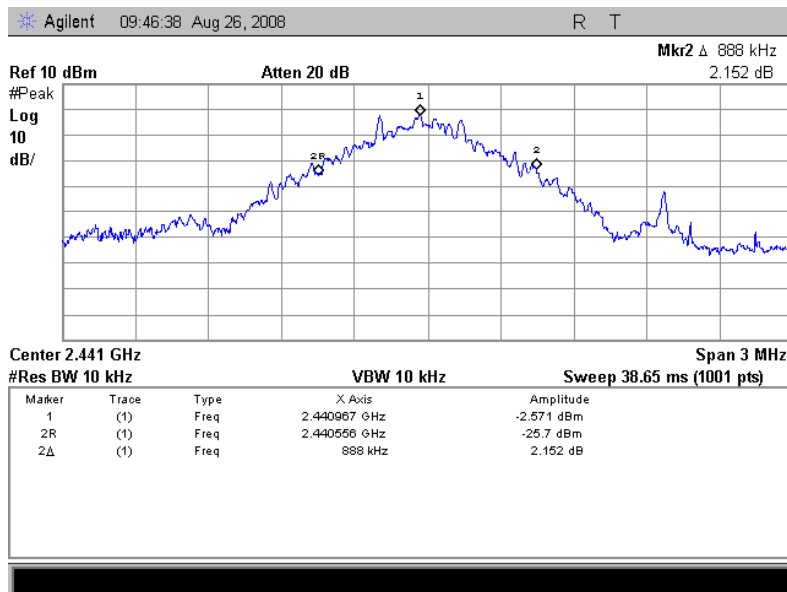
Table 7: 20dB bandwidth measurement results

EUT Channel	Limit (MHz)	Measured value (MHz)
0	$\leq 1,0$	0,891
39		0,888
78		0,885

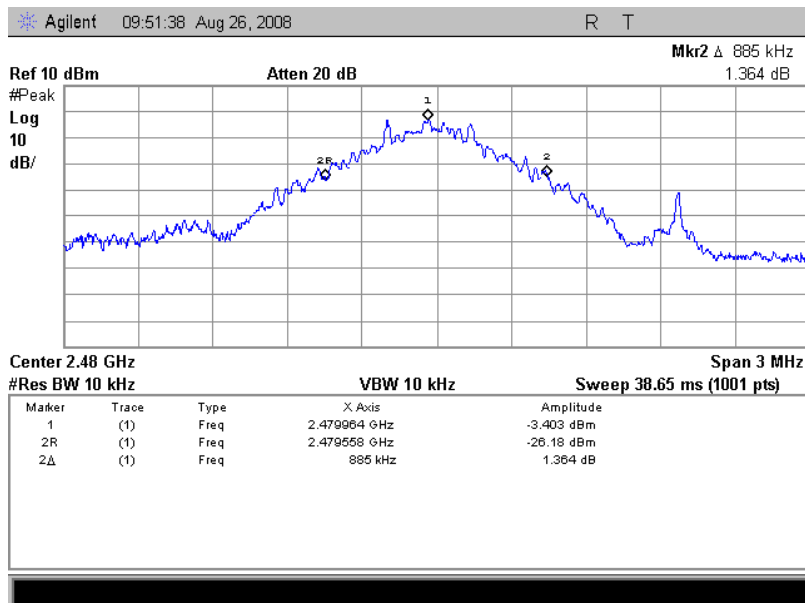
10.4 Screen shots



Picture 13: 20dB Bandwidth measurement result, Channel 0



Picture 14: 20dB Bandwidth measurement result, Channel 39



Picture 15: 20dB Bandwidth measurement result, Channel 78

10.5 EUT operation mode

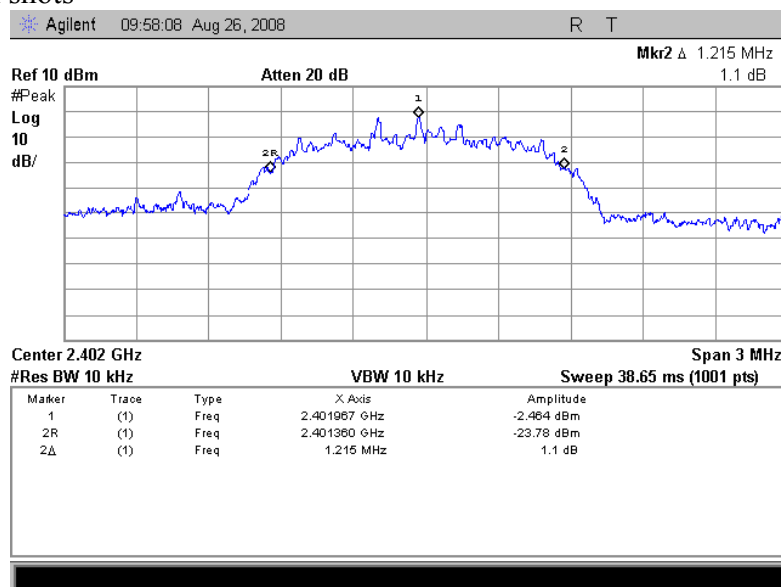
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	0, 39 and 78
EUT TX power level	max

10.6 Results

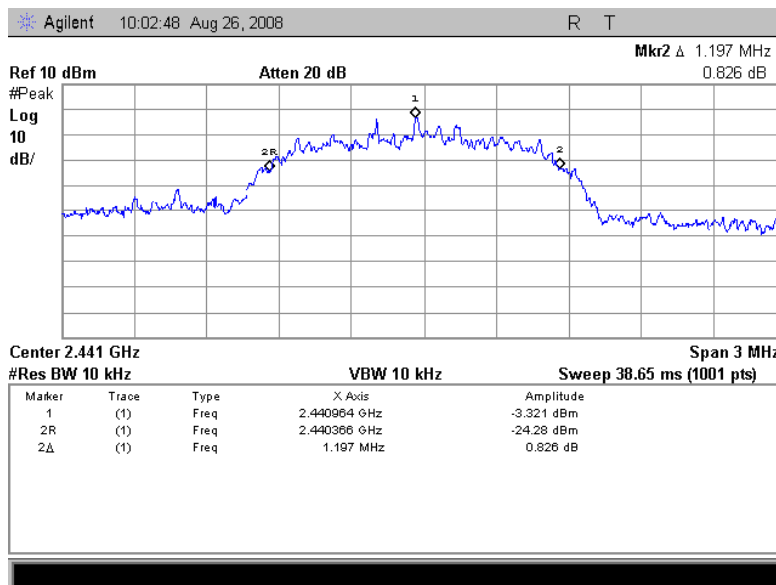
Table 8: 20dB bandwidth measurement results

EUT Channel	Limit (MHz)	Measured value (MHz)
0	$\leq 1,3$	1,215
39		1,197
78		1,209

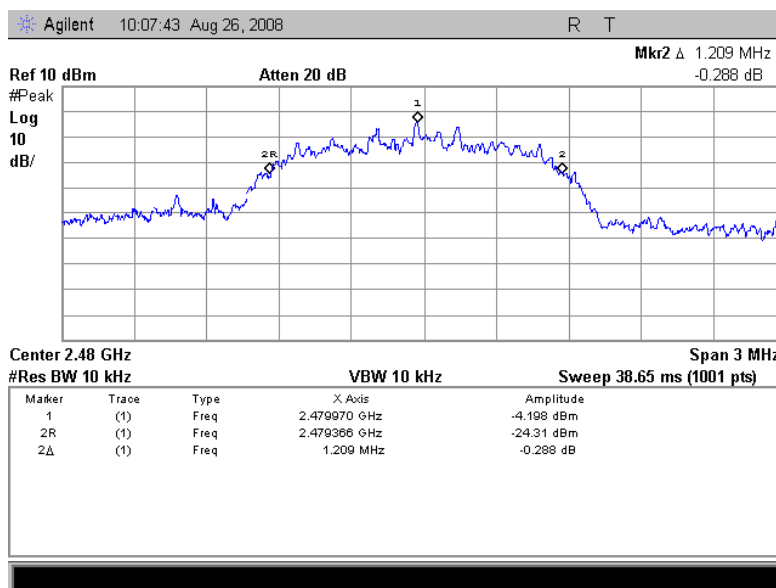
10.7 Screen shots



Picture 16: 20dB Bandwidth measurement result, Channel 0



Picture 17: 20dB Bandwidth measurement result, Channel 39



Picture 18: 20dB Bandwidth measurement result, Channel 78

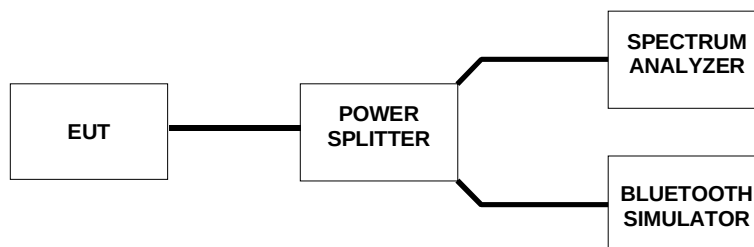
11 PEAK OUTPUT POWER

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, b 1		
RSS-210 section	A8.4 (2)		
Measured by	Simo Ojanen		

11.1 Test setup and measurement method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 19: Test setup for conducted RF output power measurement

In the peak output power measurement the power splitter, attenuator and cable attenuations were measured prior to the power measurement and set as parameter for cable loss 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 3 MHz resolution bandwidth and 3 MHz video bandwidth and maximum hold function to record the maximum peak output power.

11.2 EUT operation mode

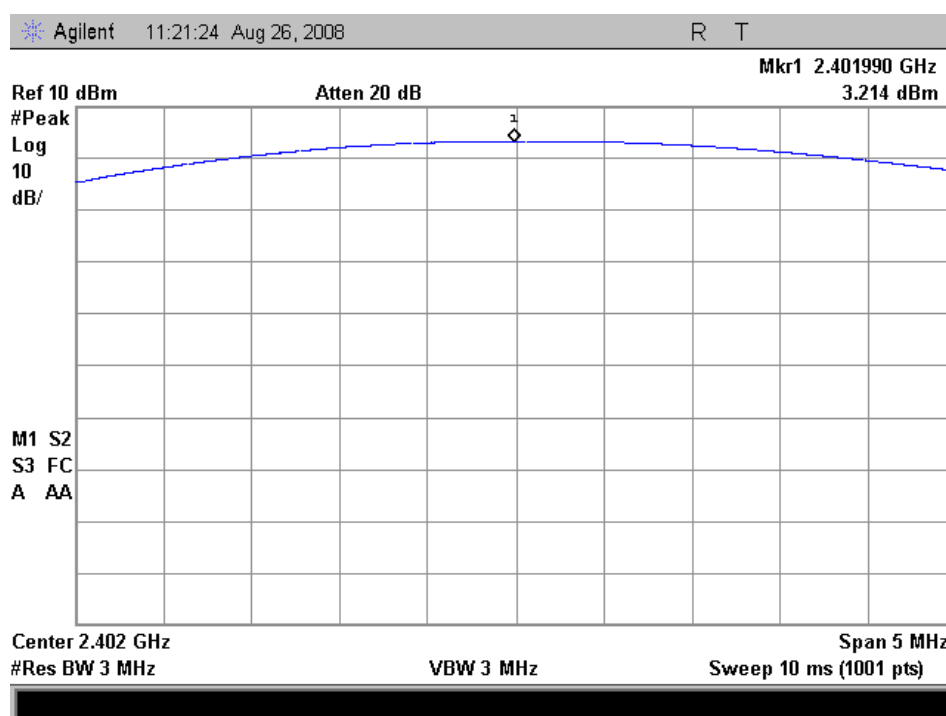
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	0, 39 and 78
EUT TX power level	0 dBm

11.3 Results

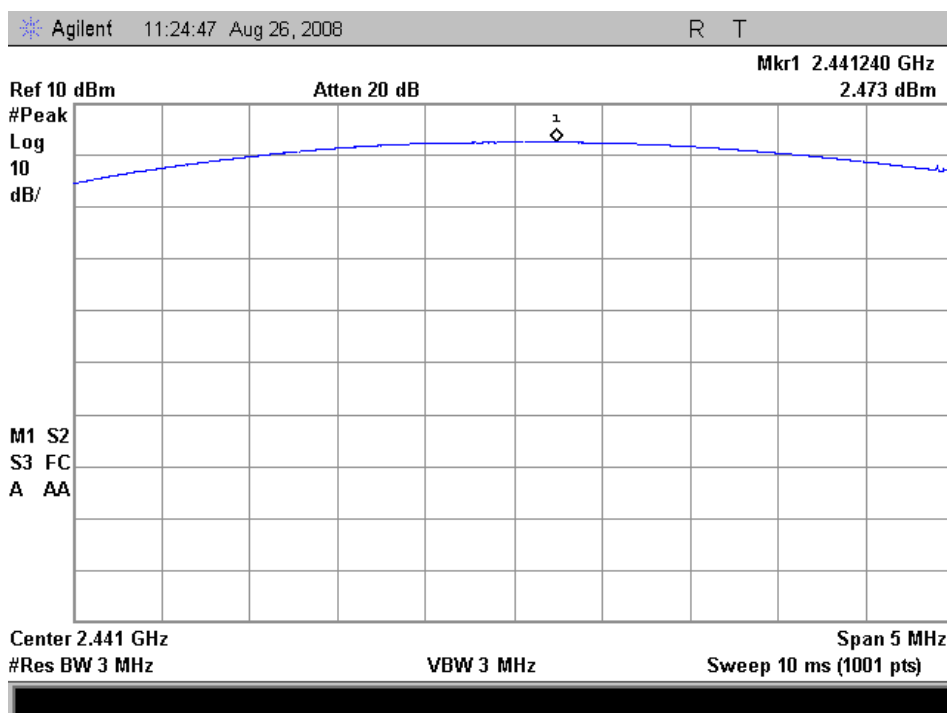
Table 9: Peak output power measurement results

EUT Channel	Limit (W)	Test result (W)	Limit (dBm)	Test result (dBm)
0	≤ 1	0,00210	≤ 30	3,2
39		0,00177		2,4
78		0,00149		1,7

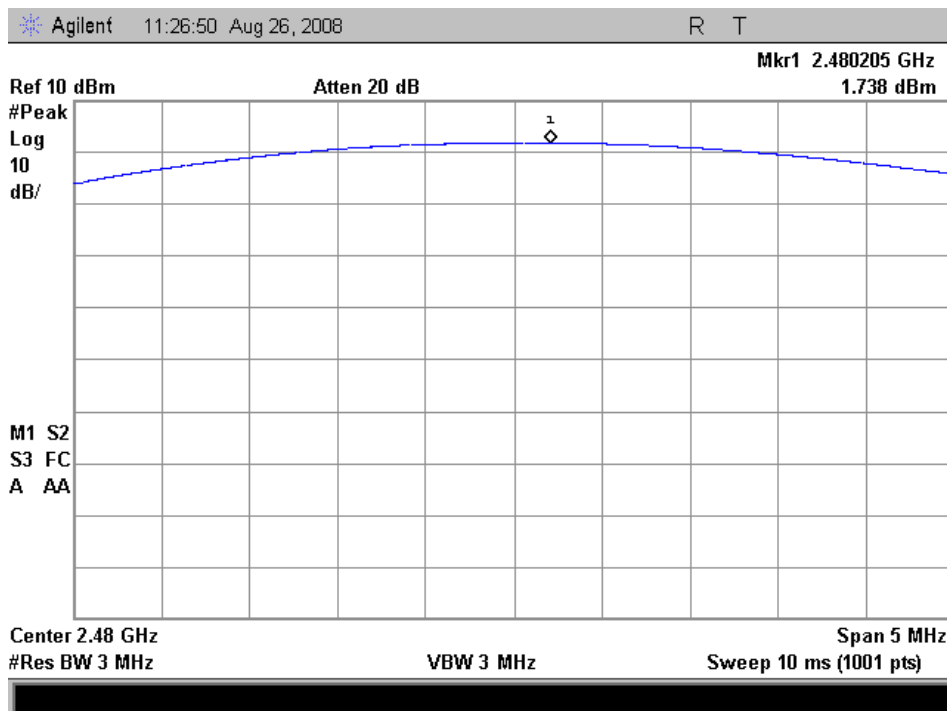
11.4 Screen shots



Picture 20: Peak output power, channel 0



Picture 21: Peak output power, channel 39



Picture 22: Peak output power, channel 78

11.5 EUT operation mode

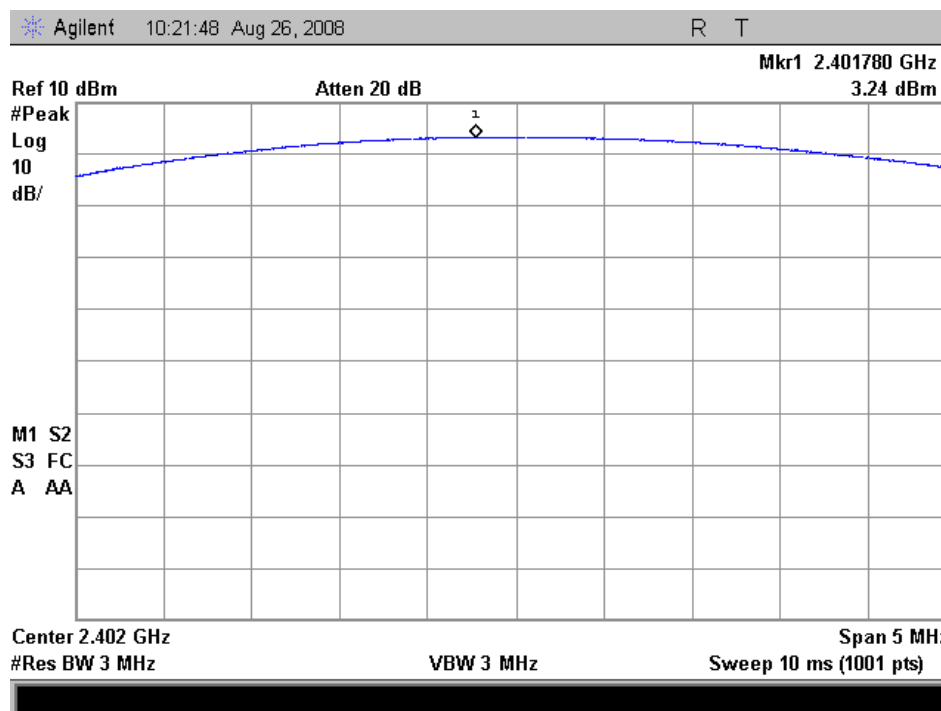
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	0, 39 and 78
EUT TX power level	0 dBm

11.6 Results

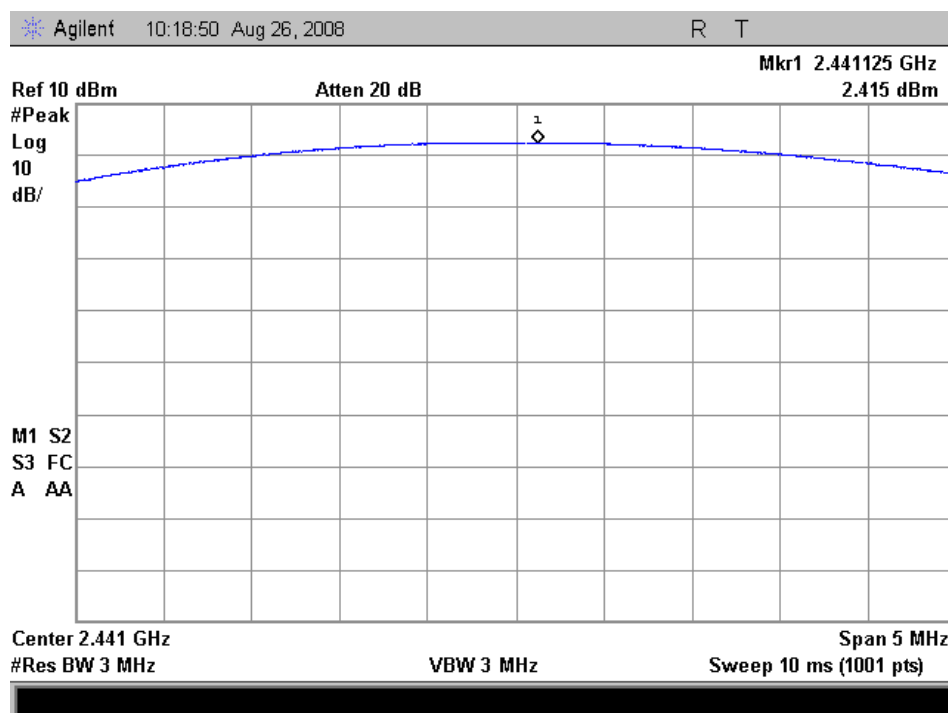
Table 10: Peak output power measurement results

EUT Channel	Limit (W)	Test result (W)	Limit (dBm)	Test result (dBm)
0	≤ 1	0,00211	≤ 30	3,2
39		0,00174		2,4
78		0,00145		1,6

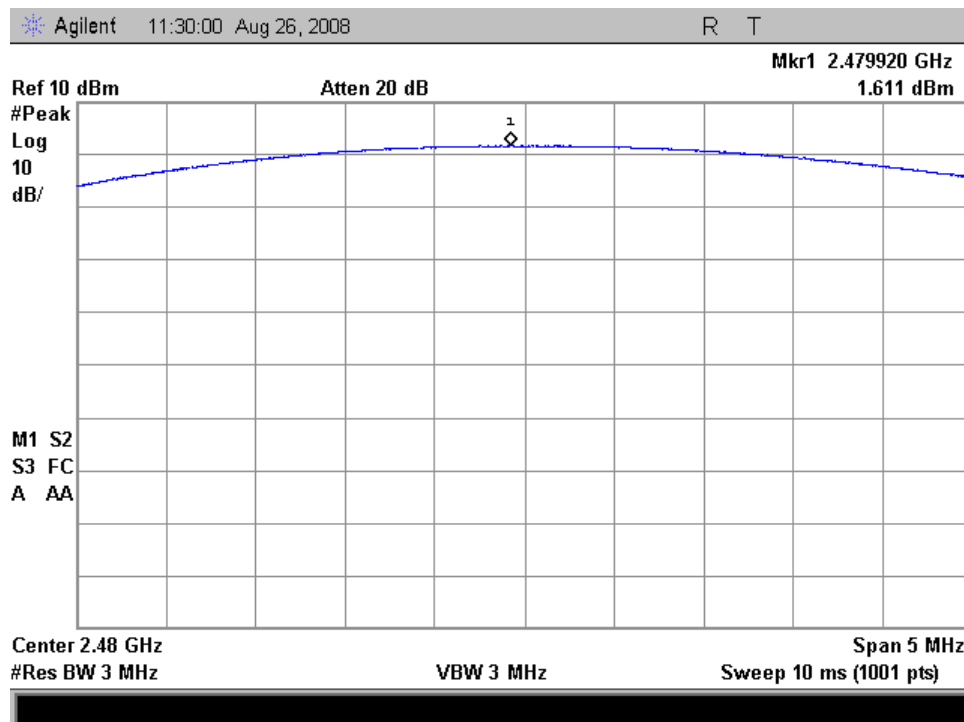
11.7 Screen shots



Picture 23: Peak output power, channel 0



Picture 24: Peak output power, channel 39



Picture 25: Peak output power, channel 78

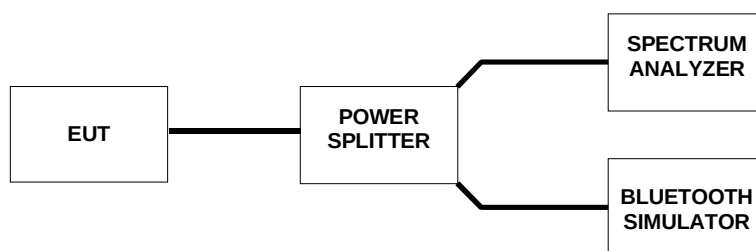
12 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	21 °C	47 RH%	997 hPa
Date of measurement	August 26, 2008		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Simo Ojanen		

12.1 Test setup and measurement method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 26: 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 79. The measured power and power on the band edge was then compared.

12.2 Hopping enabled

12.2.1 EUT operation mode

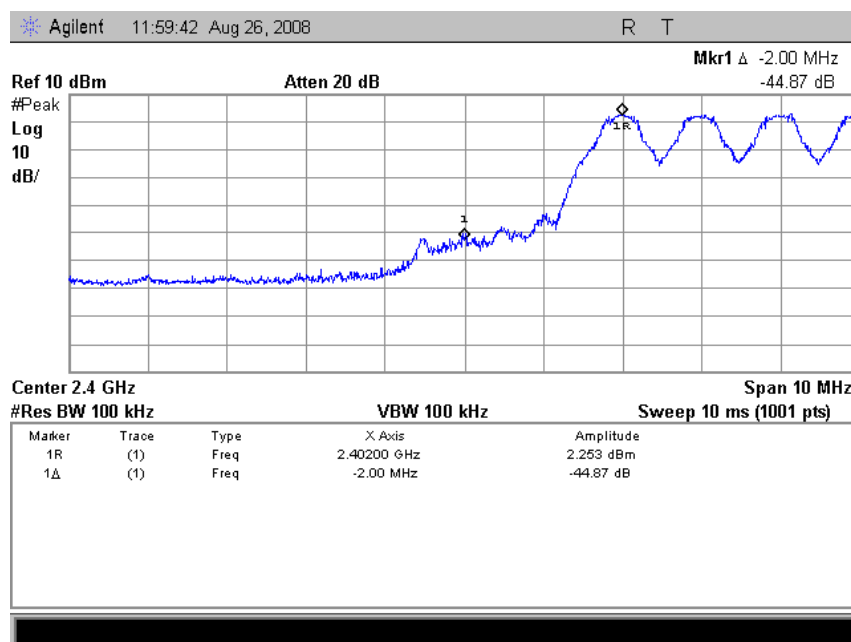
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

12.2.2 Results

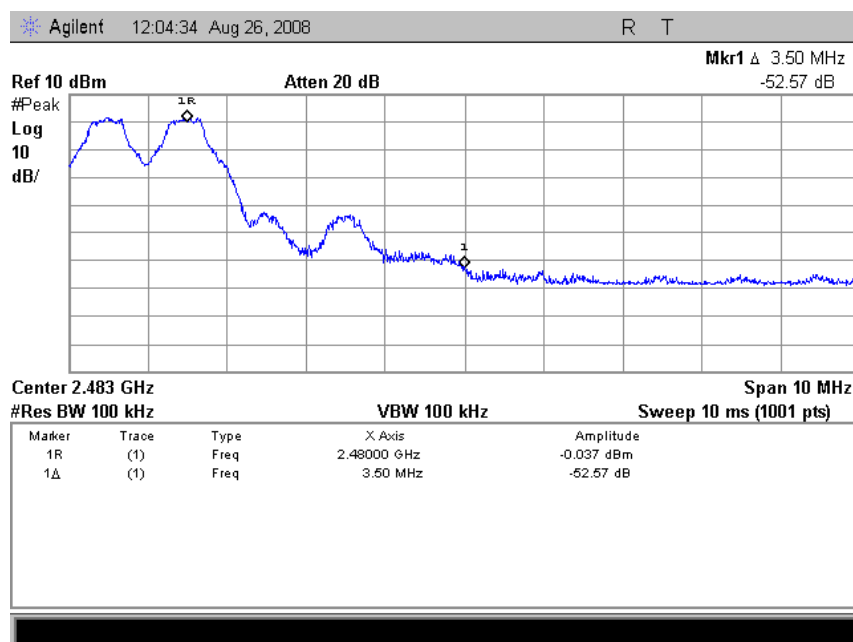
Table 11: Number of hopping frequencies measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-44,8
78		-52,5

12.2.3 Screen shots



Picture 27: Band edge compliance, channel 0, hopping enabled



Picture 28: Band edge compliance, channel 78, hopping enabled

12.2.4 EUT operation mode

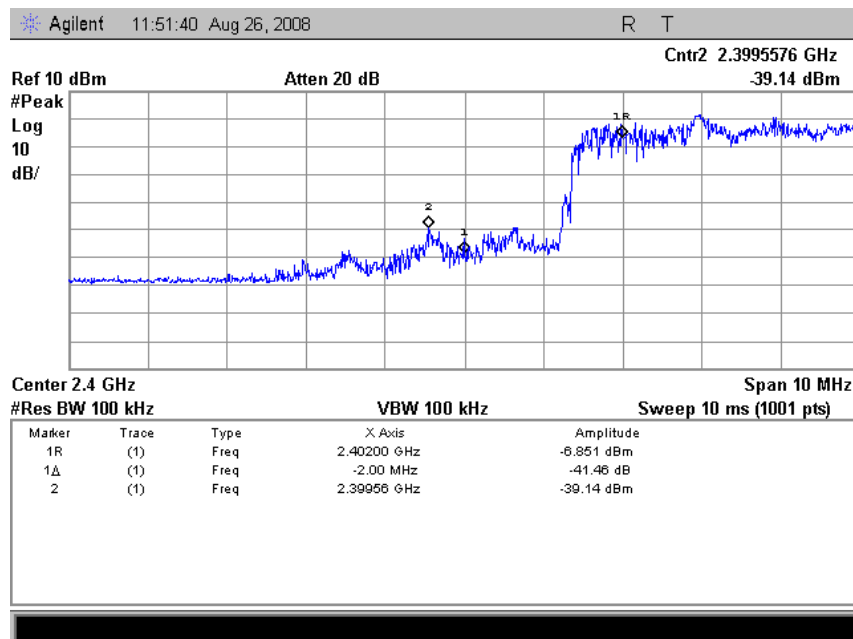
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	Hopping
EUT TX power level	max

12.2.5 Results

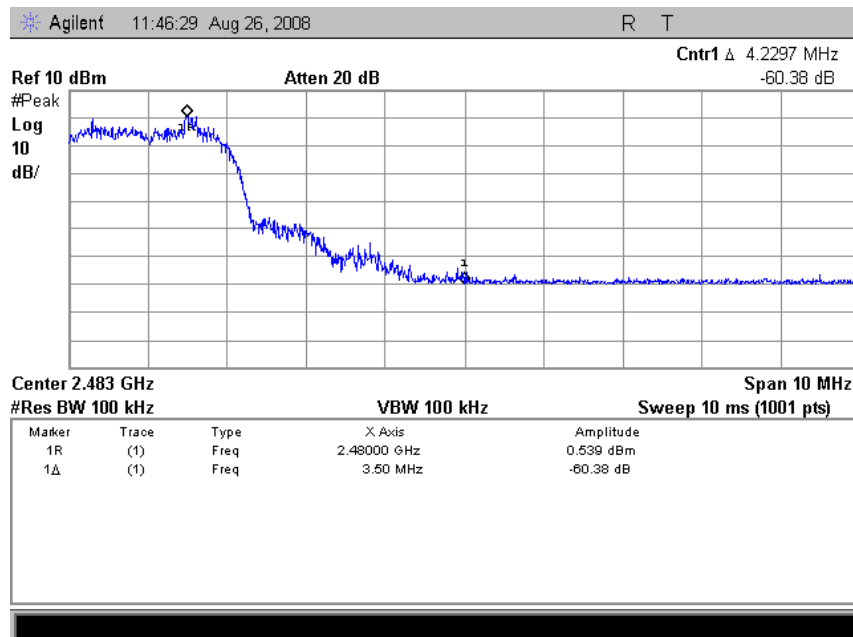
Table 12: Number of hopping frequencies measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-32,2
78		-60,3

12.2.6 Screen shots



Picture 29: Band edge compliance, channel 0, hopping enabled



Picture 30: Band edge compliance, channel 78, hopping enabled

12.3 Hopping disabled

12.3.1 EUT operation mode

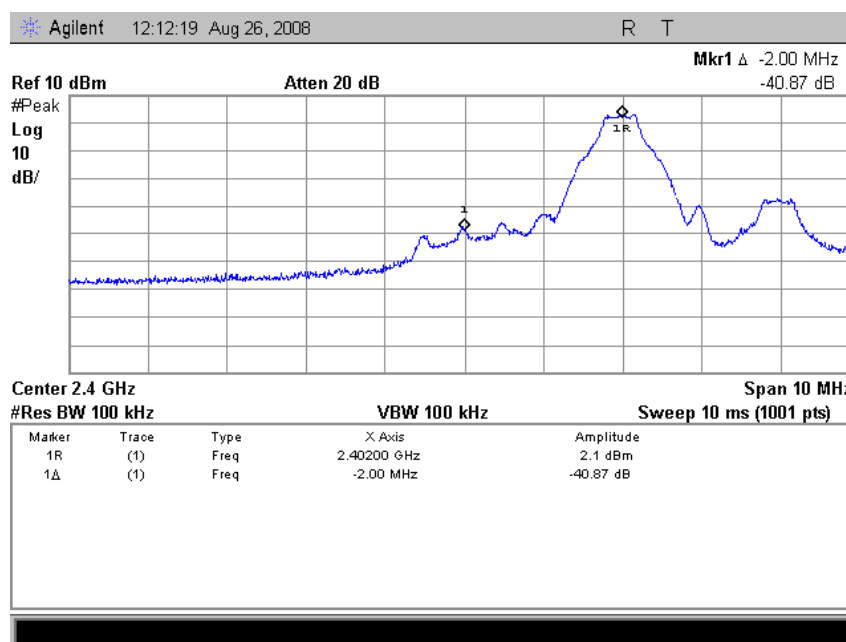
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	0 (2402 MHz), 78 (2480 MHz)
EUT TX power level	max

12.3.2 Results

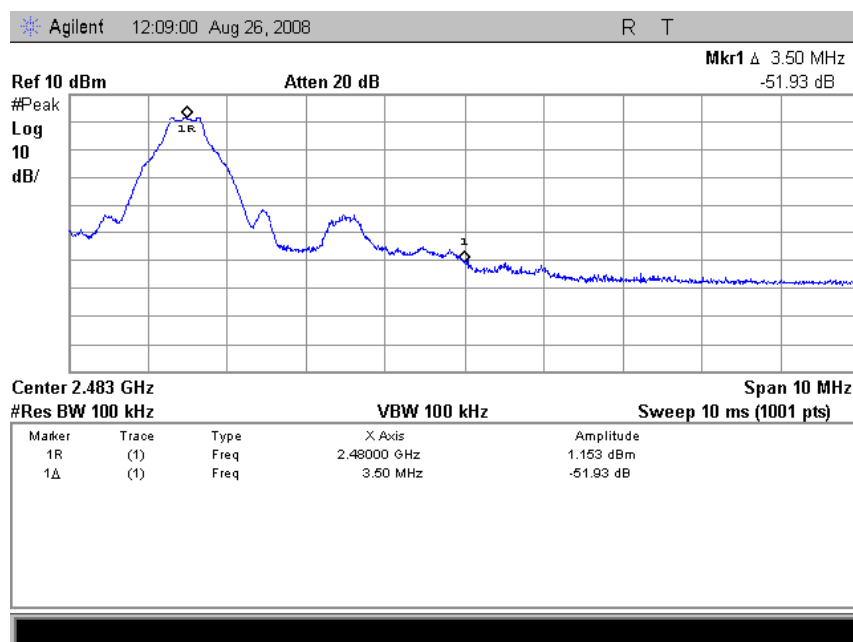
Table 13: Band edge compliance measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-40,8
79		-51,9

12.3.3 Screen shots



Picture 31: Band edge compliance, channel 0, hopping disabled



Picture 32: Band edge compliance, channel 78, hopping disabled

12.3.4 EUT operation mode

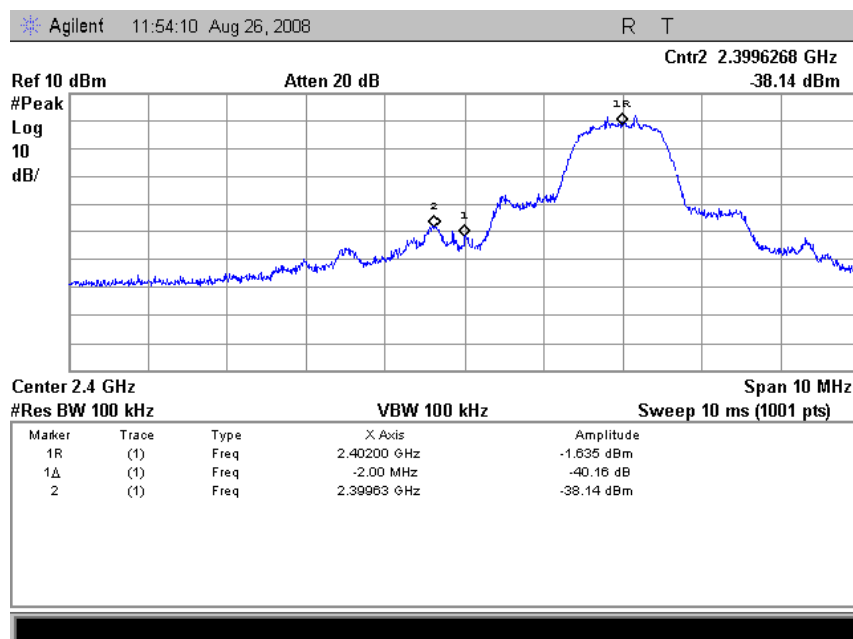
EUT operation mode	Connection, 8DPSK modulation, PRBS packet type
EUT channel	0 (2402 MHz), 78 (2480 MHz)
EUT TX power level	max

12.3.5 Results

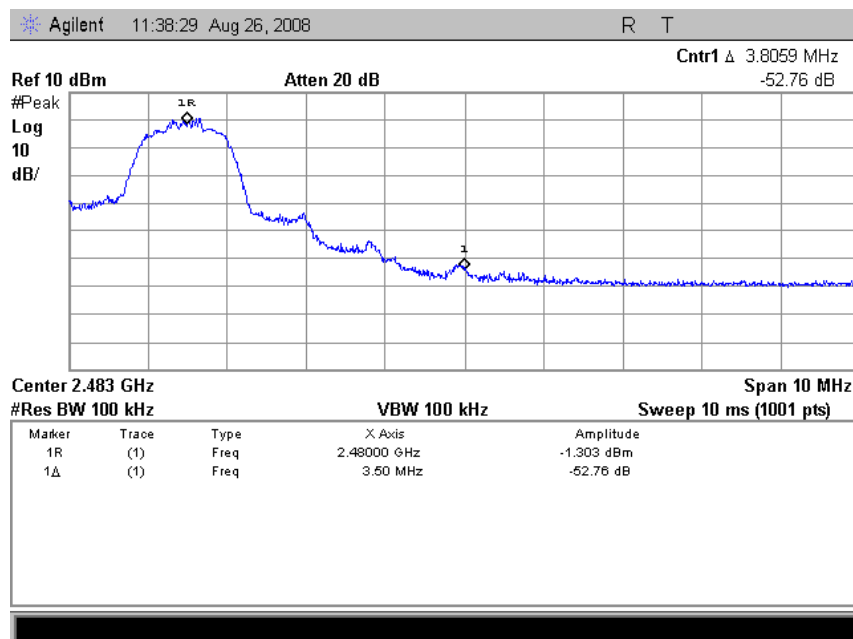
Table 14: Band edge compliance measurement results

EUT Channel	Limit (dBc)	Test result (dBc)
0	≤ -20	-36,5
79		-52,7

12.3.6 Screen shots



Picture 33: Band edge compliance, channel 0, hopping disabled



Picture 34: Band edge compliance, channel 78, hopping disabled

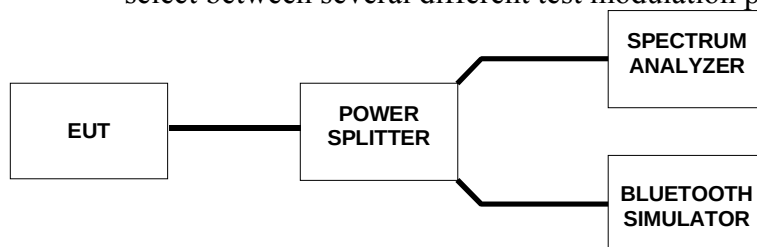
13 SPURIOUS RF CONDUCTED EMISSIONS

EUT	2		
Accessories	4		
Temp, Humidity, Air Pressure	23 °C	31 RH%	1009 hPa
Date of measurement	September 9, 2008		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Simo Ojanen		

13.1 Test setup and measurement method

The Bluetooth simulator was used to:

- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping
- select between several different test modulation patterns



Picture 35: Test setup for band edge compliance 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

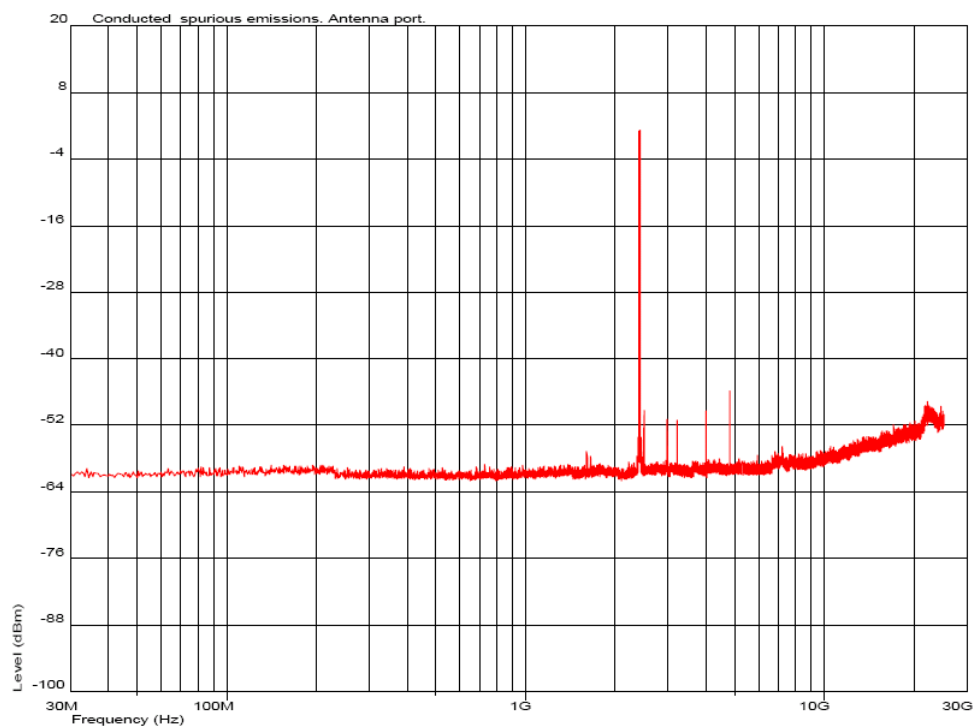
EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	0 (2402 MHz), 39 (2441 MHz) and 78 (2480 MHz)
EUT TX power level	max

13.3 Limit

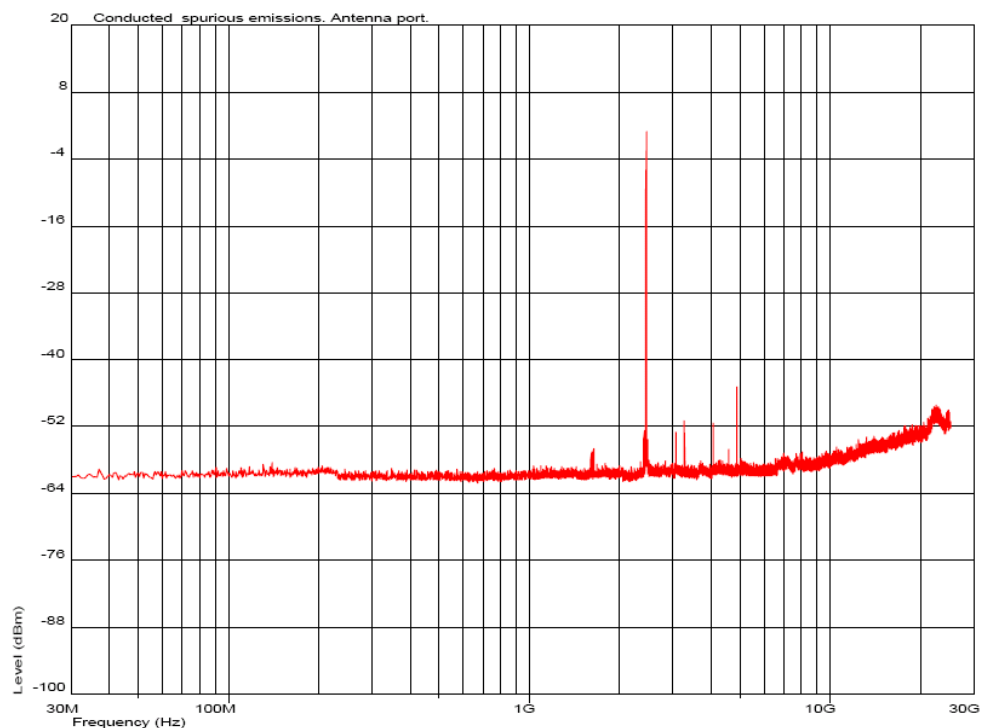
EUT Channel	Limit (dBc)
0	≤ -20
39	
78	

13.4 Results

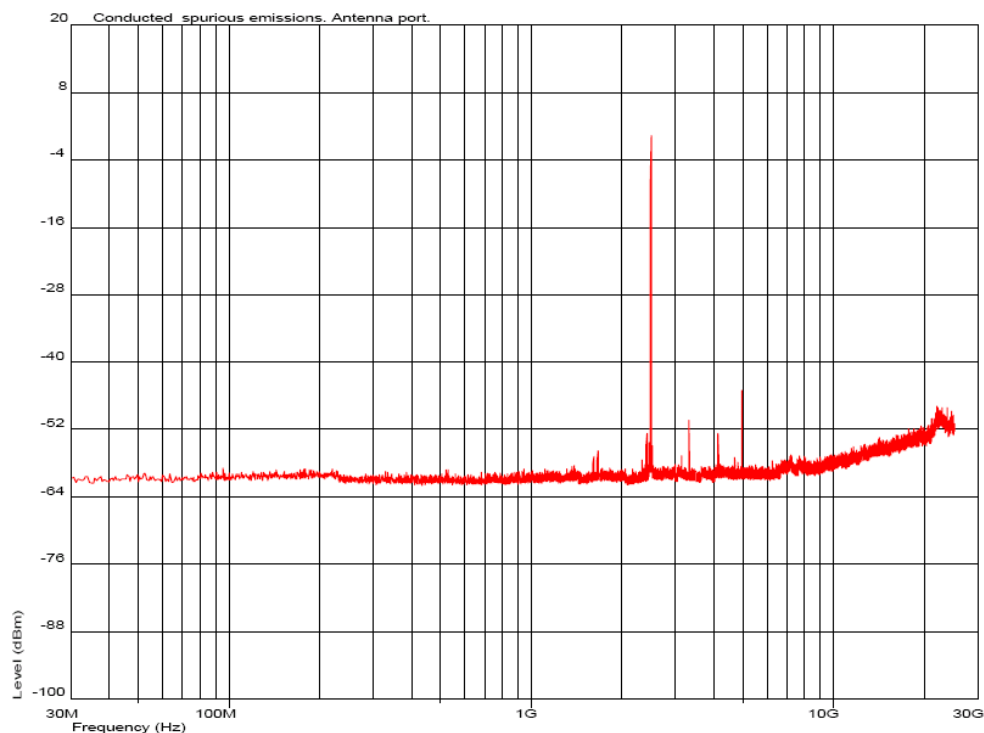
All spurious emissions measured were least 35 dB below the carrier level.



Picture 36: Conducted spurious emissions on antenna port, Channel 0



Picture 37: Conducted spurious emissions on antenna port, Channel 39



Picture 38: Conducted spurious emissions on antenna port, Channel 78

14 RADIATED SPURIOUS EMISSIONS

EUT	1		
Accessories	3		
Temp, Humidity, Air Pressure	27 °C	40 RH%	992 hPa
Date of measurement	August 11 – August 14, 2008		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Simo Ojanen		

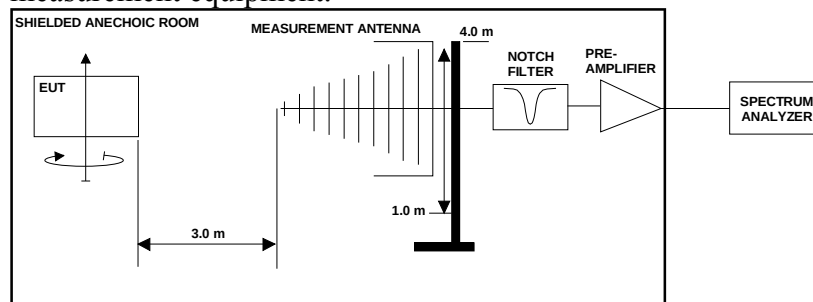
14.1 Test setup

The Bluetooth simulator was used to:

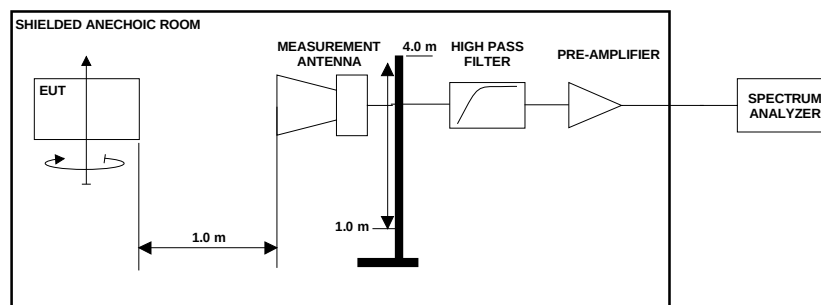
- set the EUT channel (0 – 78)
- set the number of EUT TX slots (1, 3, 5)
- set the EUT to TX, RX and TX/RX mode
- enable/disable frequency hopping

select between several different test modulation patterns

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



Picture 39: Test setup for radiated spurious emissions measurement
30 MHz - 3 GHz frequencies



Picture 40: Test setup for radiated spurious emissions measurement
3 GHz – 25 GHz frequencies

14.2 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 μ V/m at 3 m distance, are reported.

14.3 EUT operation mode

EUT operation mode	Connection, GFSK modulation, PRBS packet type
EUT channel	0 (2402 MHz), 39 (2441 MHz) and 78 (2480 MHz)
EUT TX power level	max

14.4 Limit

Table 15: Radiated spurious emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit (μ V/m)	3m Limit (dB μ 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.

14.5 Results

Measurement system noise level was 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 16: Emission levels PEAK (QP) detector, channel 0

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4804	64,2	-14,8	49,3	24,6	Pos 1	Hor	1,2 m

Table 17: Emission levels PEAK (QP) detector, channel 39

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4882	64,3	-14,6	49,6	24,3	Pos 1	Hor	1,05 m

Table 18: Emission levels PEAK (QP) detector, channel 78

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4960	61,5	-14,4	47,0	26,9	Pos 1	Hor	1,2 m

Table 19: Emission levels AVERAGE detector, channel 0

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4804	54,1	-14,8	39,2	14,7	Pos 1	Hor	1,2 m

Table 20: Emission levels AVERAGE detector, channel 39

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4882	53,9	-14,6	39,2	14,7	Pos 1	Hor	1,0 m

Table 21: Emission levels AVERAGE detector, channel 78

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
4960	50,6	-14,4	36,1	17,8	Pos 1	Hor	1,2 m

15 CONDUCTED EMISSIONS TO AC-MAINS

EUT	1		
Accessories	3		
Temp, Humidity, Air Pressure	23 °C	31 RH%	1009 hPa
Date of measurement	September 10, 2008		
FCC rule part	§15.107		
RSS-GEN section	7.2.2		
ICES-003 section	5.3		
Measured by	Simo Ojanen		

15.1 Test setup

Charger was connected to line impedance stabilization network and conducted emissions to AC-mains were measured using measurement receiver.

15.2 EUT operation mode

EUT was at idle mode.

15.3 Limits

Frequency of emission [MHz]	FCC / IC	
	Limit [dBμV] Quasi peak	Limit [dBμV] Average
0,15 – 0,50	66 – 56*	56 – 46*
0,50 – 5	56	46
5 – 30	60	50

* The limit decreases linearly with the logarithm of the frequency

15.4 Results

The measured interference values using peak and average detectors are shown in the Picture 41 and Picture 42 below.

All signals closer than 6 dB to the limit have been measured using quasi peak and average detectors and reported in tables 22 - 25.

Table 22: Quasi peak detector measurement results, AC live

Frequency [MHz]	Measured value [dBμV]	Limit [dBμV]	Margin to limit [dB]
N/A			

Table 23: Average detector measurement results, AC live

Frequency [MHz]	Measured value [dBμV]	Limit [dBμV]	Margin to limit [dB]
N/A			

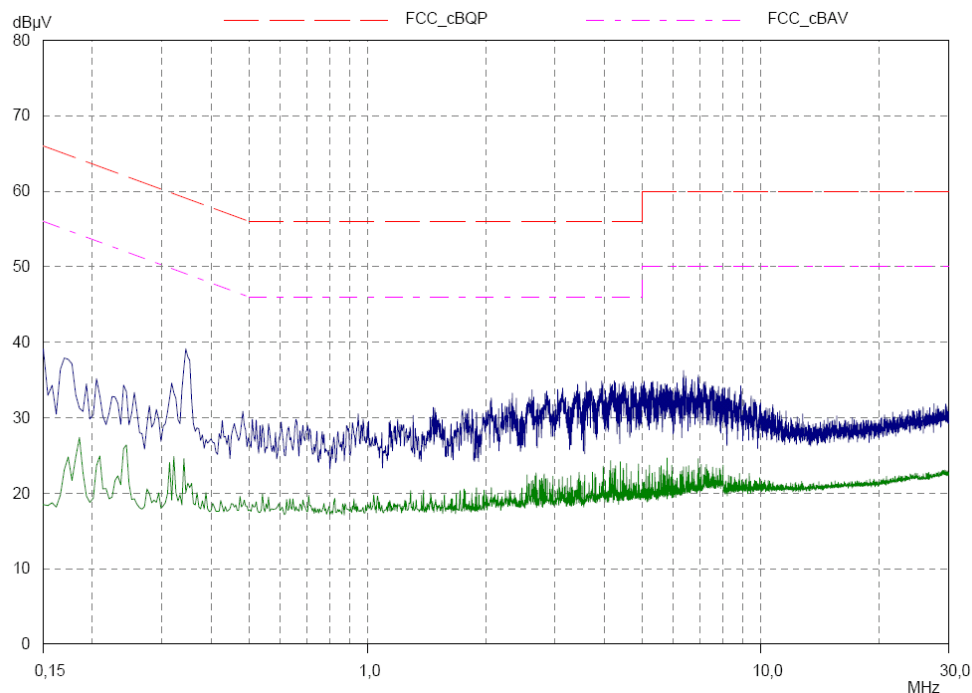
Table 24: Quasi peak detector measurement results, AC neutral

Frequency [MHz]	Measured value [dBμV]	Limit [dBμV]	Margin to limit [dB]
N/A			

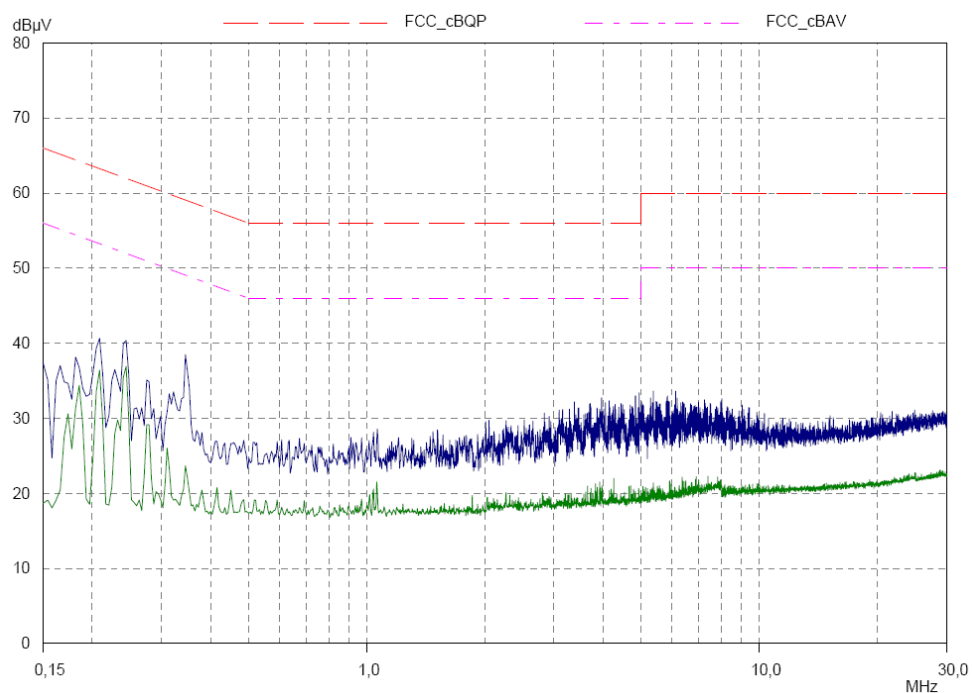
Table 25: Average detector measurement results, AC neutral

Frequency [MHz]	Measured value [dBμV]	Limit [dBμV]	Margin to limit [dB]
N/A			

15.5 Screen shots



Picture 41: AC-mains conducted emission measurement results, AC live



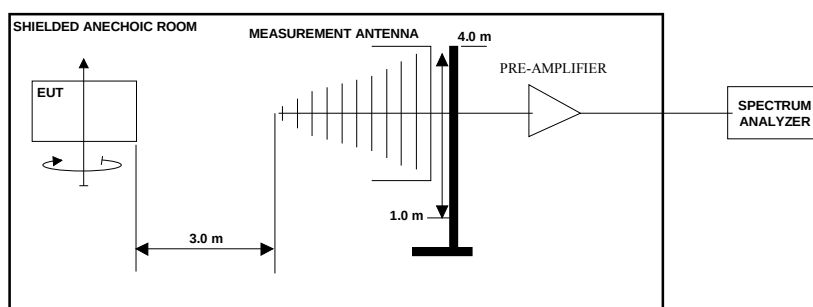
Picture 42: AC-mains conducted emission measurement results, AC neutral

16 RECEIVER RADIATED EMISSION

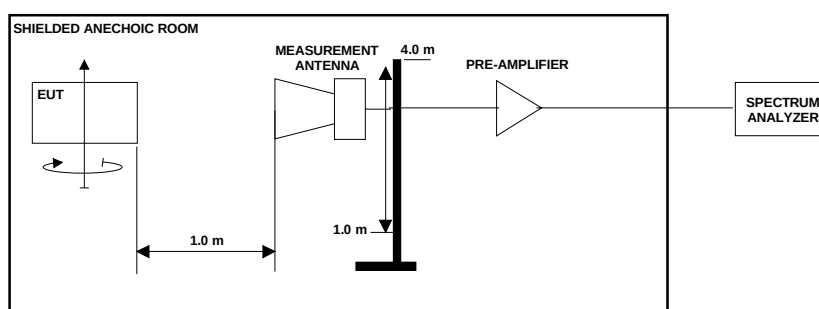
EUT	1		
Accessories	3		
Temp, Humidity, Air Pressure	22 °C	42 RH%	1004 hPa
Date of measurement	September 09, 2008		
FCC rule part	§15.109		
RSS-GEN section	7.2.3		
ICES-003 section	5.5		
Measured by	Simo Ojanen		

16.1 Test setup

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



Picture 43: Test setup for radiated spurious emissions measurement
30 MHz - 1 GHz frequencies



Picture 44: Test setup for radiated spurious emissions measurement
1 GHz – 12,4 GHz frequencies

16.2 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 μ V/m at 3 m distance, are reported.

16.3 EUT operation mode

EUT operation mode	Receiver mode
EUT frequency	Na
EUT TX power level	Na

16.4 Limit

Table 26: Radiated spurious emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit (μV/m)	3m Limit (dBμV/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 - 12400	500	54,0	AVG
1000 - 12400	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.

16.5 Results

The measured interference values using Quasi peak and average detectors are shown in the pictures below.

All signals closer than 6 dB to the limit below 1 GHz have been measured using quasi peak or average detector and reported in the table 27, 28 and 29.

Table 27: Radiated emissions using Quasi peak detector

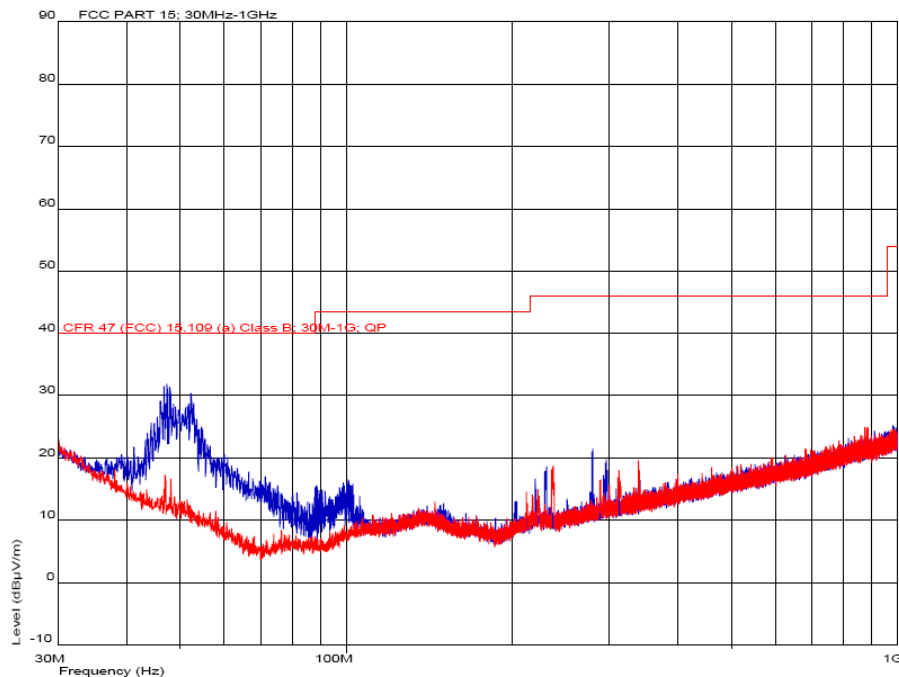
Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height	TT angle
N/A								

Table 28: Radiated emissions using Peak detector

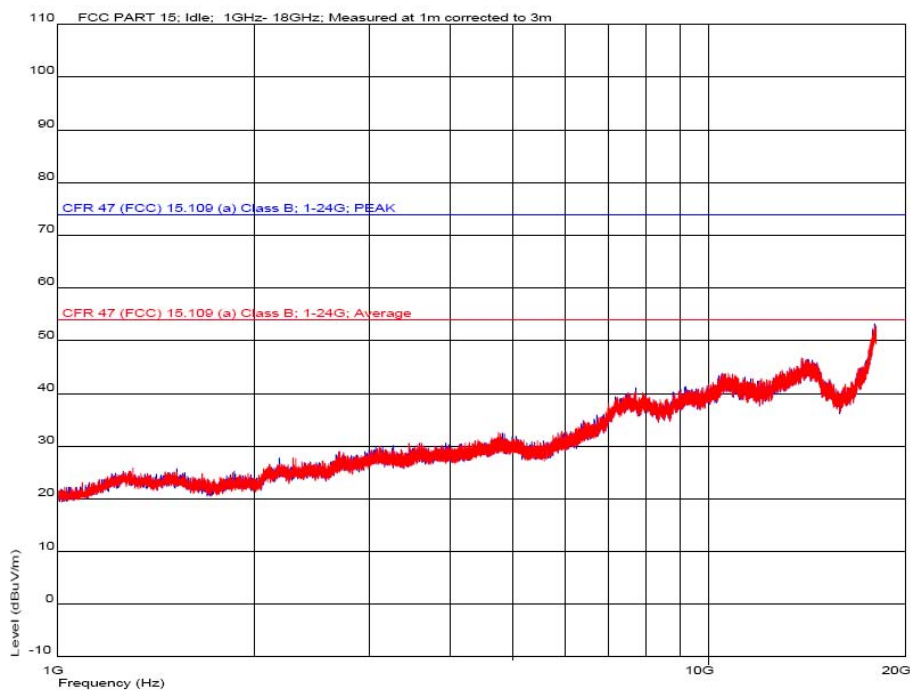
Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height	TT angle
N/A								

Table 29: Radiated emissions using Average detector

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height	TT angle
N/A								



Picture 45: radiated emission results, 30 – 1000 MHz,
Red= horizontal polarization, blue = vertical polarization



Picture 46: radiated emission results, 1 – 12,4 GHz,
Red= horizontal polarization, blue = vertical polarization

17 TEST EQUIPMENT

All testing and measurement equipment has been calibrated once a year, except the antennas which are calibrated every two years.

17.1 Conducted measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A
Bluetooth Simulator	Agilent	N4010A
Measurement receiver	Rohde & Schwarz	ESCS 30
Power splitter	Narda	4426-2
Transient limiter / 10 dB attenuator	Chase	CFL 9206
Line Impedance Stabilization Network (LISN)	Rohde & Schwarz	ESH 3-Z5

17.2 Radiated measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A
Bluetooth simulator	Agilent	N4010A
Antenna	Chase	CBL 6141
Antenna	Schwarzbeck	BBHA 9120D
Antenna	Schwarzbeck	BBHA 9170
High pass filter	Wainwright Instruments	WHK3.0/18GST
Pre-amplifier	JCA	118-400
Pre-amplifier	Miteq	AMF-6F-18002650-25-10P
Turn table / antenna mast controller	EMCO	2090
Antenna mast	EMCO	2075-2

18 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document

T08-668C-EMC_PHOTOS.doc