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TEST REPORT

Part 15 Subpart B&C 15.247

Equipment under test Portable SKIN/HAIR Diagnosis System

Model name ASNII

FCC ID XYCASNII

Applicant Aram Huvis Co., Ltd.

Manufacturer Aram Huvis Co., Ltd.

Date of test(s) 2012.11.17 ~ 2012.12.21

Date of issue 2012.12.21

Issued to

Aram Hubis Co., Ltd.

801 Byucksan Technopia, 434-6 Sangdaewon-dong, Sungnam-City, Kyungki-do, Korea

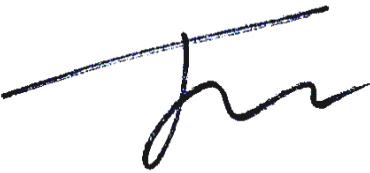
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477-6, Hageo-ri, Yeoju-eup, Yeoju-gun, Gyeonggi-do, 469-803, Korea

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Revision history

Revision	Date of issue	Test report No.	Description
-	2012.12.21	KES-RF-120087	Initial



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TABLE OF CONTENTS

1.0	General product description	4
1.1	Test frequency	4
1.2	Information about variant model	4
1.3	Device modifications	4
1.4	Device Information	4
1.4	Test facility	5
1.5	Laboratory accreditations and listings	5
2.0	Summary of tests	6
2.1	Test data	7
2.1.1	Pre-scanned output power	7
2.1.2	Peak power output power	7
2.1.3	Conducted spurious emission & band edge	12
2.1.4	20 dB bandwidth	22
2.1.5	Frequency separation	27
2.1.6	Number of hopping frequency	29
2.1.7	Time of occupancy (Dwell time)	32
2.1.8	Radiated spurious emission & band edge	37
2.1.9	AC conducted emissions	52
Appendix A.	Test equipment used for test	55
Appendix B.	Test setup photo	56



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1.0 General product description

Equipment under test	Portable SKIN/HAIR Diagnosis System
Model name	ASNII
Serial number	N/A
Frequency Range	2 412 MHz ~ 2 462 MHz(802.11 b/g/n_HT20) // 2 422 MHz ~ 2 452 MHz(802.11 n_HT40) 2 402 MHz ~ 2 480 MHz(Bluetooth BDR & EDR)
Modulation technique	DSSS, OFDM, GFSK, 8DPSK
Number of channels	11(802.11 b/g/n_HT20) // 7(802.11 n_HT40) // 79(Bluetooth BDR & EDR)
Antenna type & gain	Fixed type(Chip antenna) // 0.9 dBi
Power source	DC 3.7 V

1.1 Test frequency

	Low channel	Middle channel	High channel
Frequency (MHz)	2 402	2 441	2 480

1.2 Information about variant model

N/A

1.3 Device modifications

N/A

1.4 Device Information

- The average output power is < 60/f(GHz) calculated result and RF exposure evaluation is passed.
- The device transmits simultaneously for WiFi & Bluetooth.



1.4 Test facility

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477-6, Hageo-ri, Yeoju-eup, Yeoju-gun, Gyeonggi-do, 469-803, Korea

The open area test site is constructed in conformance with the requirements ANSI C63.4-2003/2009.

1.5 Laboratory accreditations and listings

Country	Agency	Scope of accreditation	Certificate No.
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	343818
KOREA	KC	EMI (10 meter Open Area Test Site and two conducted sites) Radio (3 & 10 meter Open Area Test Sites and one conducted site)	KR0100
CANADA	IC	3 & 10 meter Open Area Test Sites and one conducted site	4769B-1



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2.0 Summary of tests

Section in FCC Part 15	Parameter	Status
15.247(b)(1)	Peak output power	C
15.247(d)	Conducted spurious emission and band edge	C
15.247(a)(1)	20 dB bandwidth	C
15.247(a)(1)	Frequency separation	C
15.247(a)(1)(iii)	Number of hopping frequency	C
15.247(a)(1)(iii)	Time of occupancy(Dwell time)	C
15.205 15.209	Radiated spurious emission and band edge	C
15.207	AC conducted emission	C

Note 1: C=Complies NC=Not complies NT=Not tested NA=Not applicable

Statement:

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) and the guidance provided in FCC OET Public notice DA 00-705 were used in the measurement of the DUT.

2.1 Test data

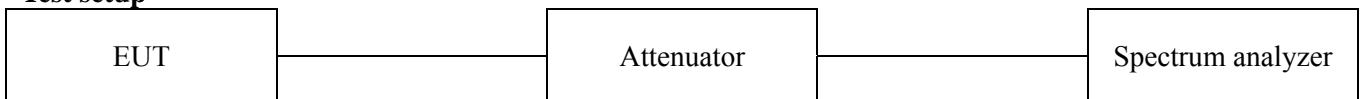
2.1.1 Pre-scanned output power

Preliminary tests were performed in different data rate as below table and the highest power data rates(1 Mbps, 2 Mbps, 3Mbps) were chosen for full test in the following section to demonstrate compliance to the FCC limit line.

Data rate	1 Mbps(GFSK)	2 Mbps($\pi/4$ -DQPSK)	3 Mbps(8DPSK)
Output power(dBm)	5.69	4.80	5.39

2.1.2 Peak power output power

Test setup



Test procedure

1. Use the following spectrum analyzer setting

Center frequency: Lowest, middle and highest channels

Span = 5 MHz (Approximately 5 times the 20 dB bandwidth, centered on a hopping channel)

RBW = 3 MHz

VBW = 3 MHz (\geq RBW)

Sweep = auto

Detector function = peak

Trace = max hold

2. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.

The indicated level is the peak output power.

Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2 400 ~ 2 483.5 MHz, and 5 725 ~ 5 850 MHz band: 1 Watt.

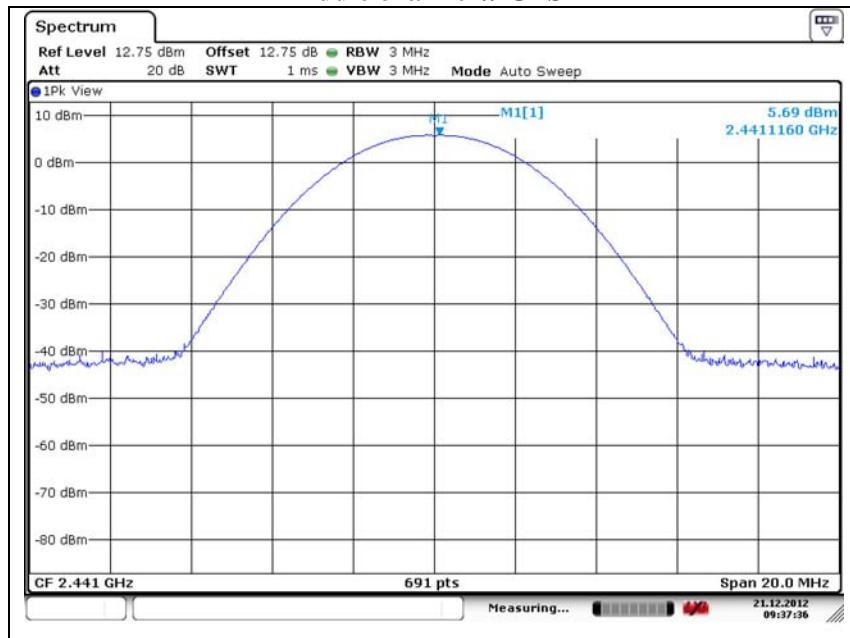
Test results

Operation mode	Frequency(MHz)	Output power (dBm)	Limit (dBm)
GFSK	2 402	5.38	30
	2 441	5.69	30
	2 480	6.40	30
Operation mode	Frequency(MHz)	Output power (dBm)	Limit (dBm)
8DPSK	2 402	5.02	30
	2 441	5.39	30
	2 480	6.15	30

Low channel // GFSK



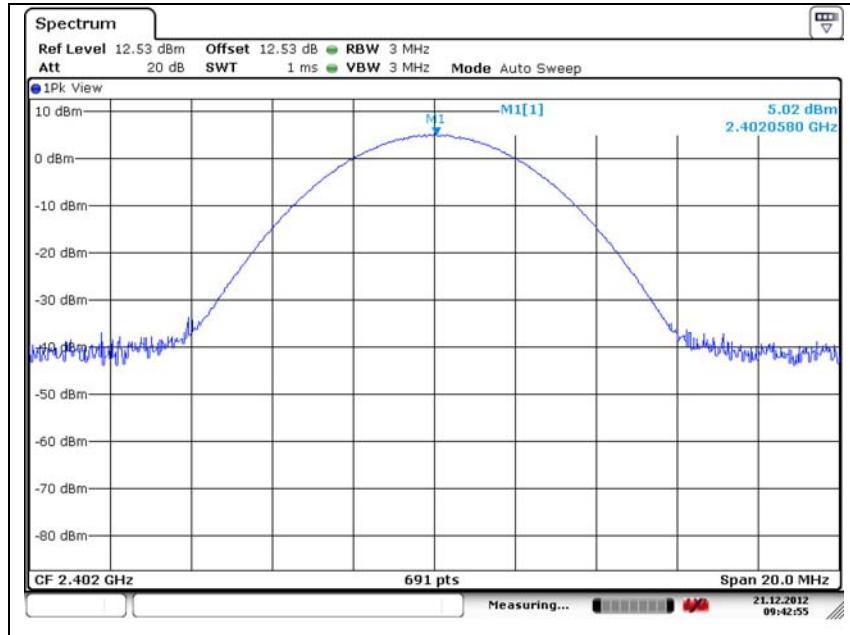
Middle channel // GFSK



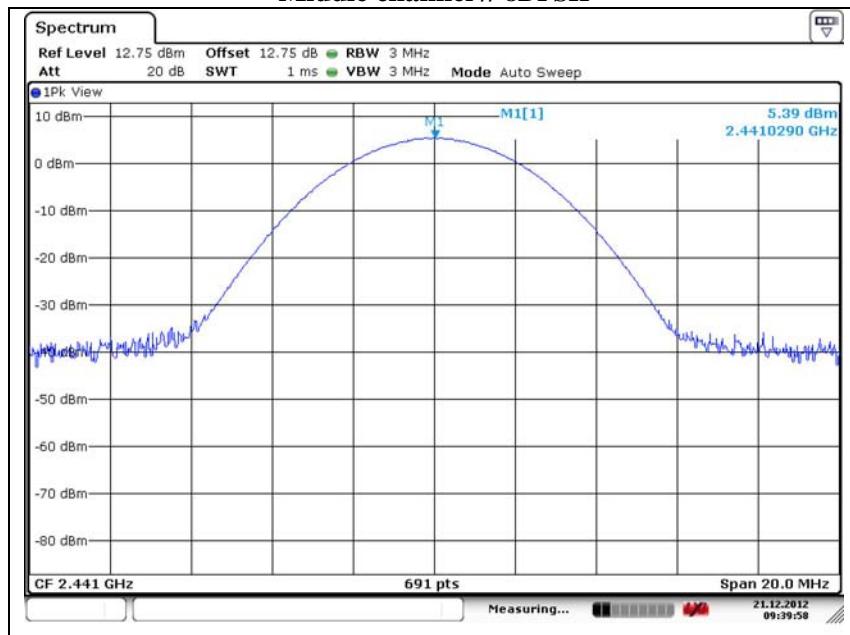
High channel // GFSK



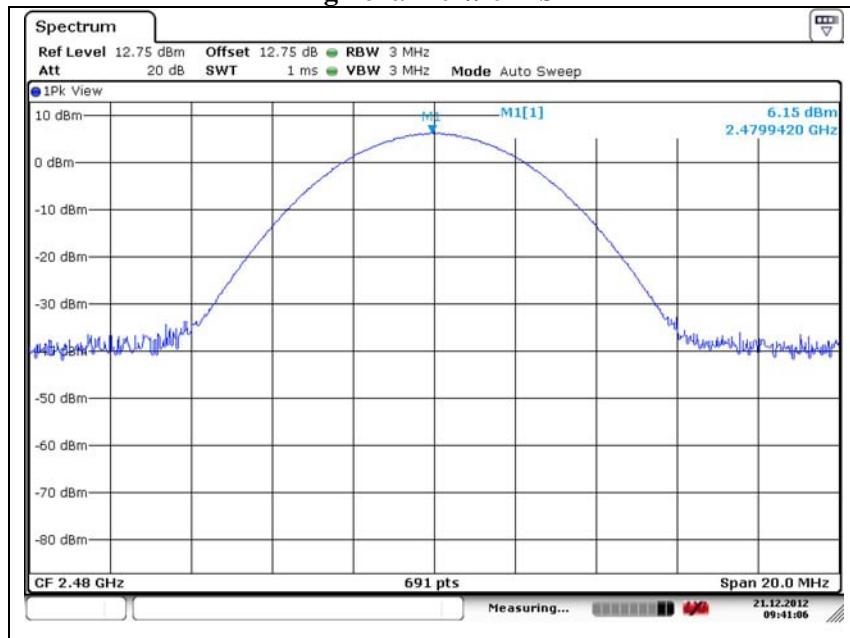
Low channel // 8DPSK



Middle channel // 8DPSK

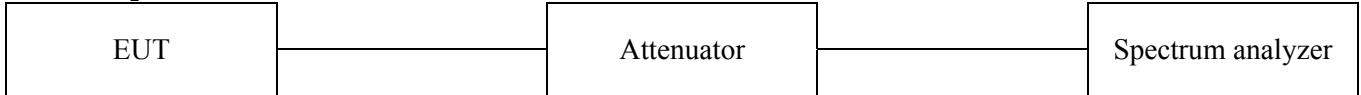


High channel // 8DPSK



2.1.3 Conducted spurious emission & band edge

Test setup



Test procedure for band edge

1. Use the following spectrum analyzer setting
 Center frequency: Low, middle and high channel.
 Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
 RBW = 100 kHz
 VBW = 100 kHz (\geq RBW)
 Sweep = auto
 Detector function = peak
 Trace = max hold
2. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation on product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission

Test procedure for spurious emission

1. Use the following spectrum analyzer setting
 Center frequency: Low, middle and high channel.
 Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
 RBW = 100 kHz
 VBW = 100 kHz (\geq RBW)
 Sweep = auto
 Detector function = peak
 Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.



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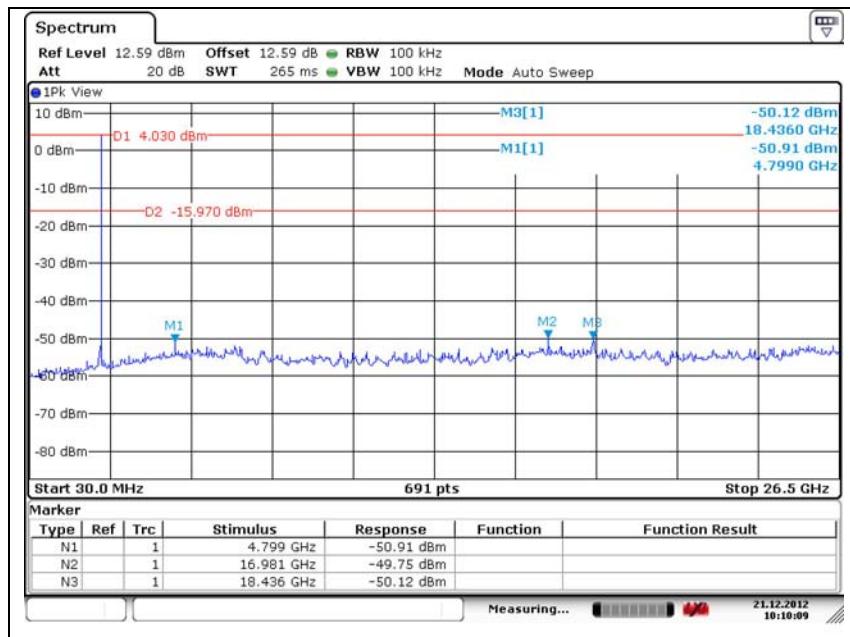
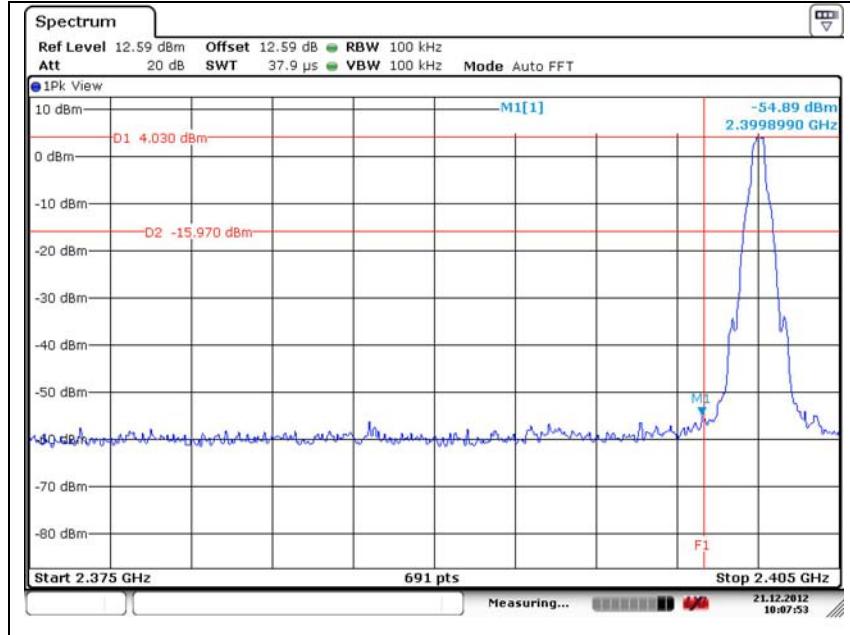
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Limit

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))

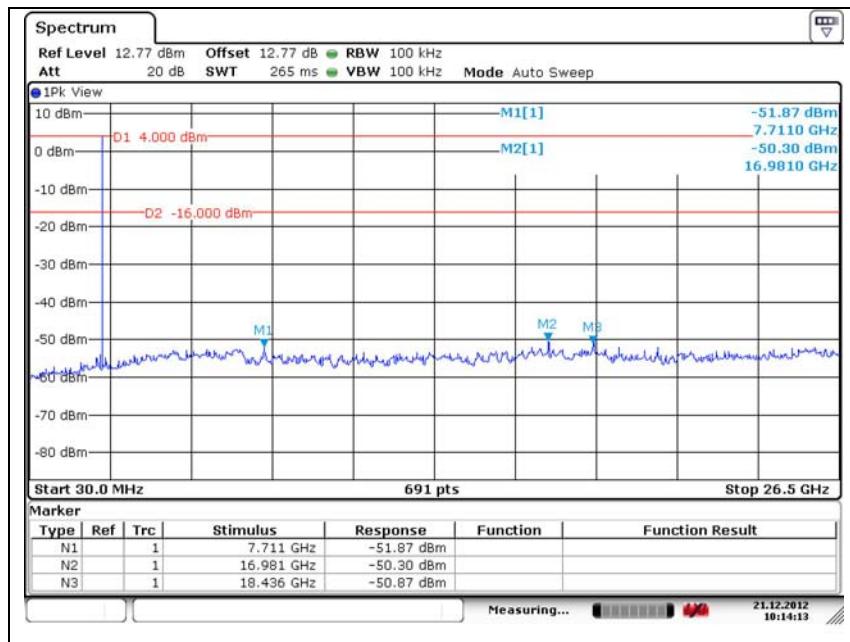
Test results

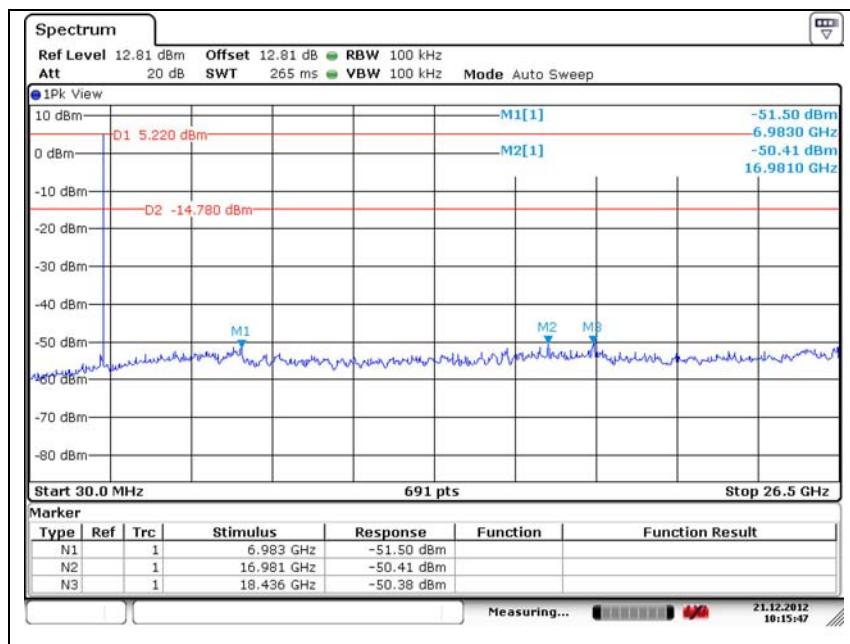
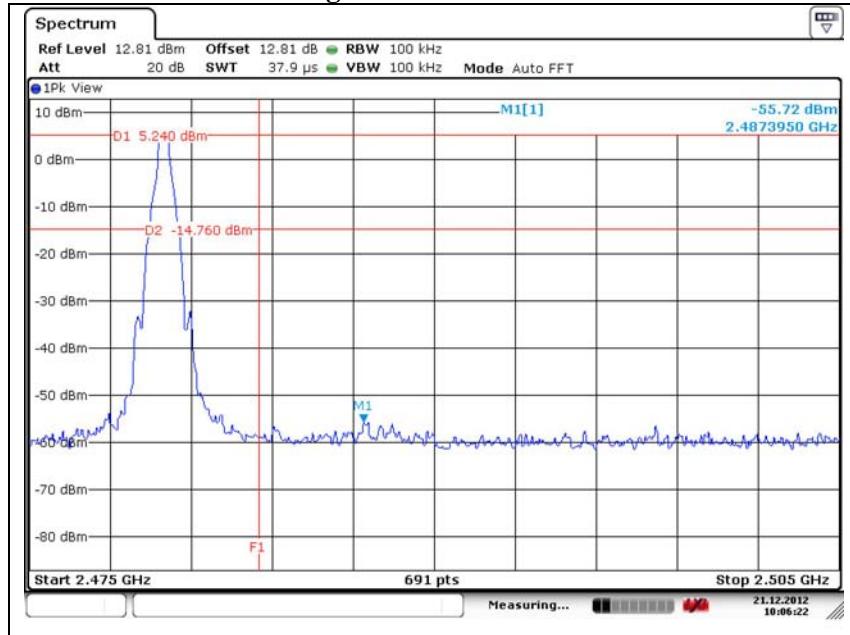
Low channel // GFSK



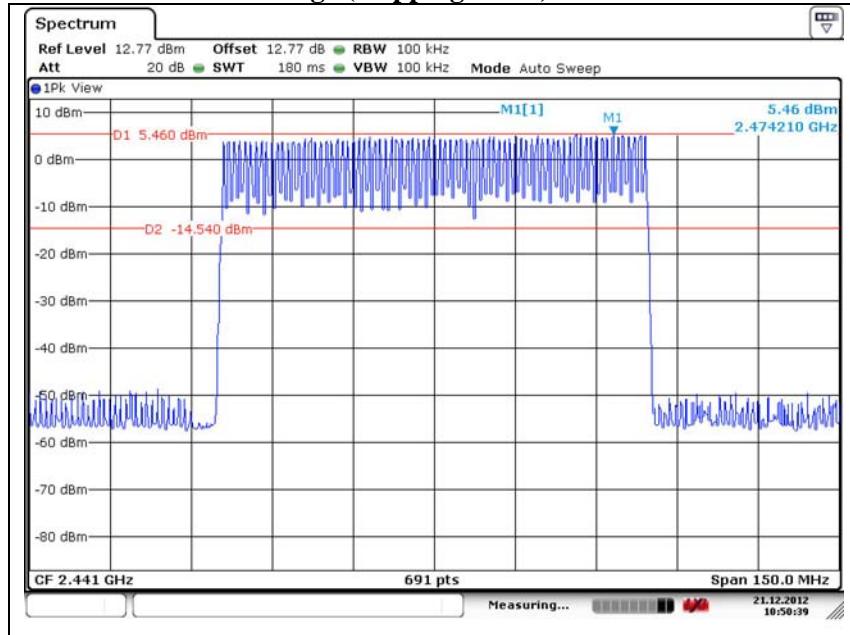
Middle channel // GFSK

N/A

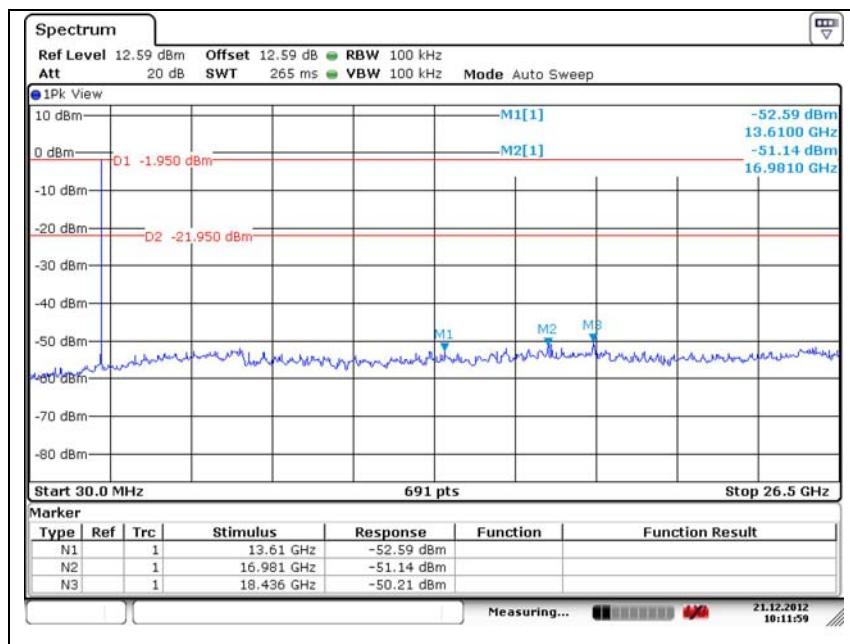
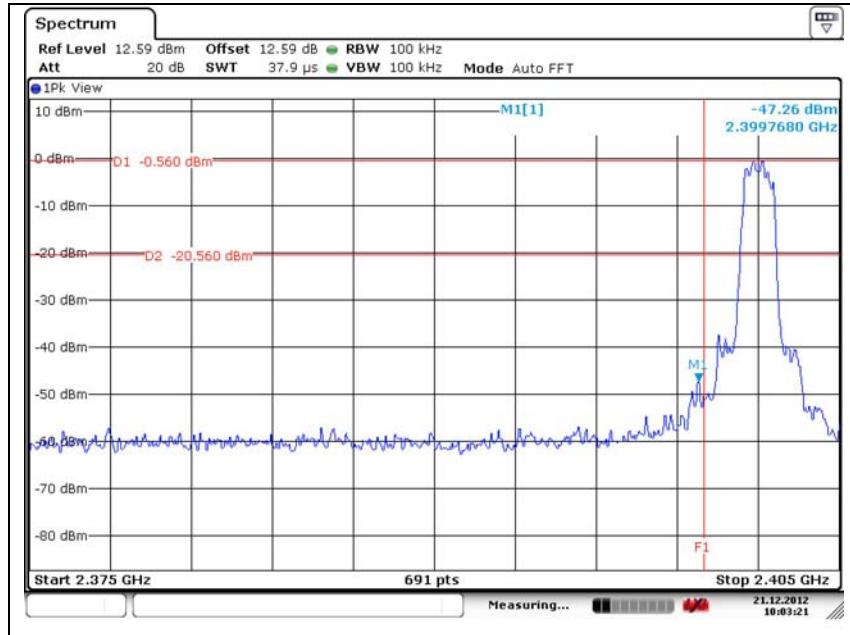


High channel // GFSK


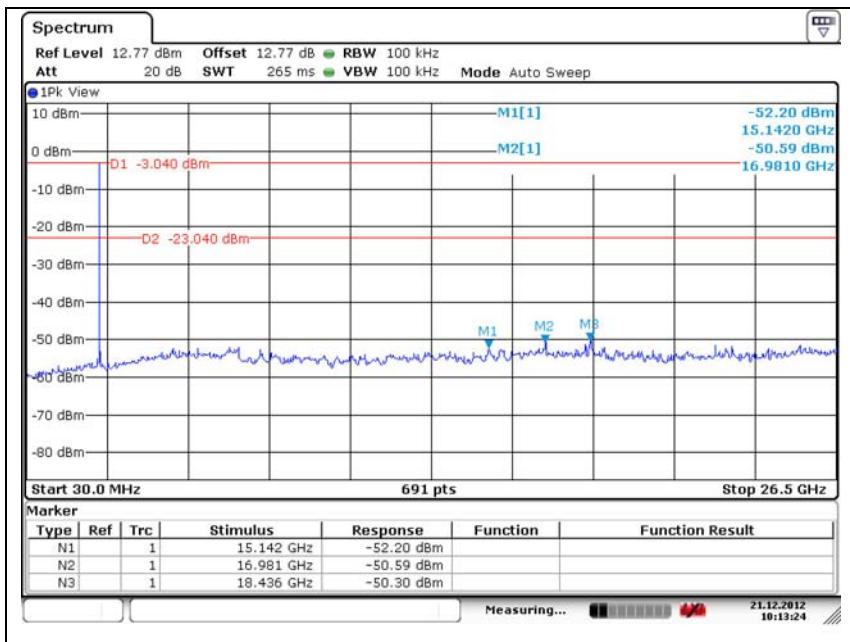
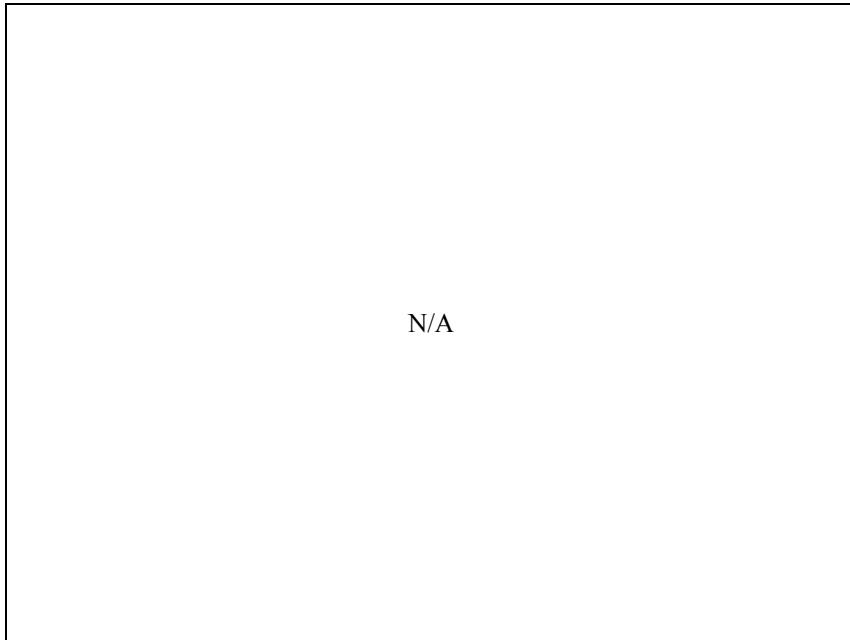
Band edge (Hopping mode) // GFSK



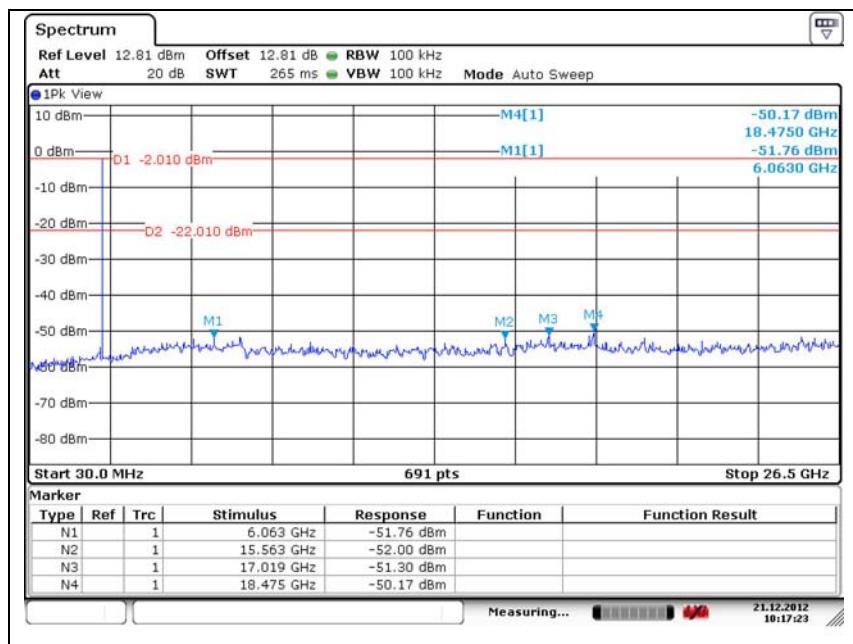
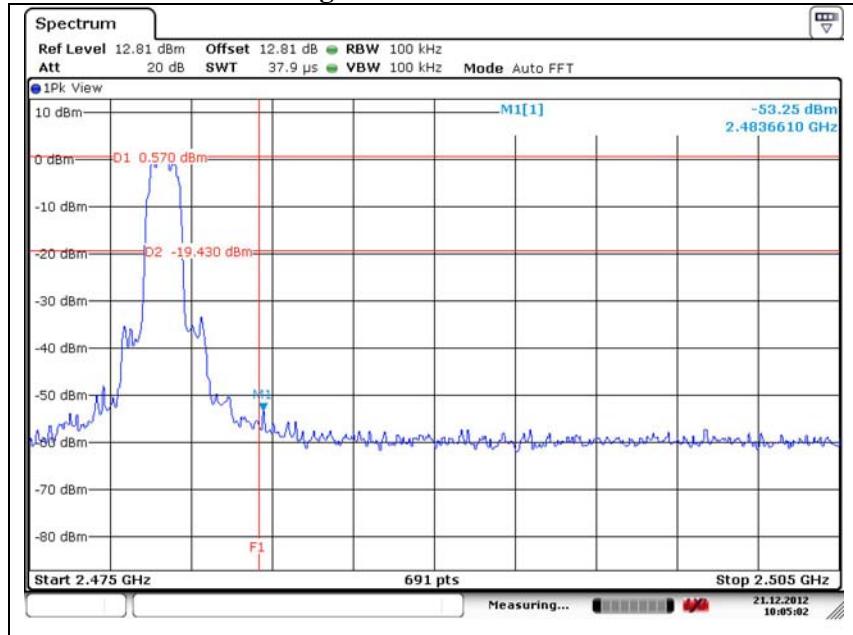
Low channel // 8DPSK



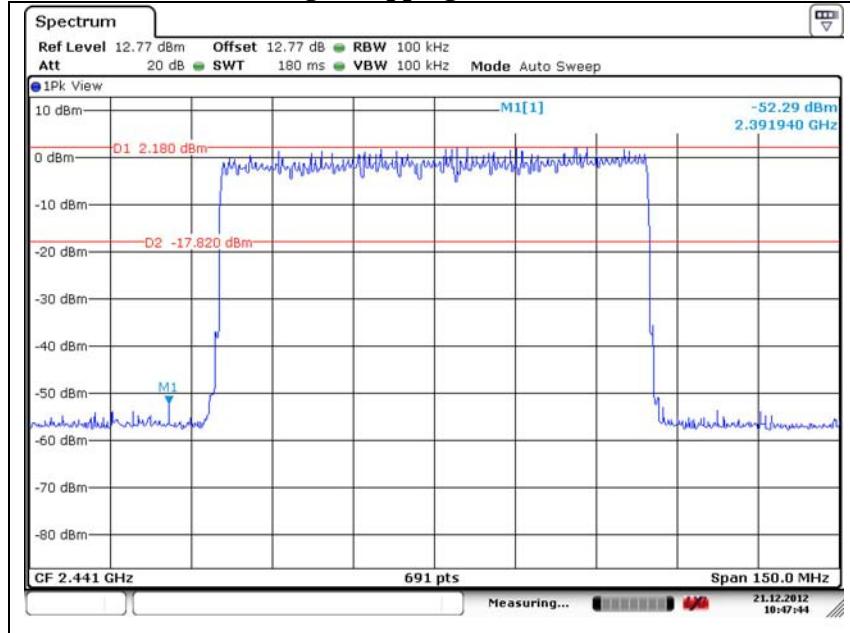
Middle channel // 8DPSK



High channel // 8DPSK

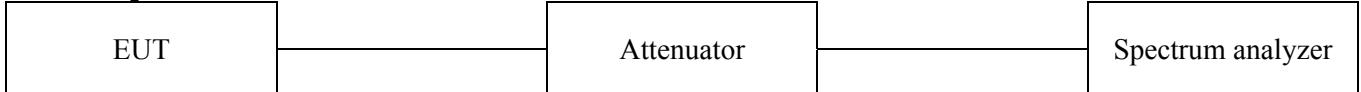


Band edge (Hopping mode) // 8DPSK



2.1.4 20 dB bandwidth

Test setup



Test procedure

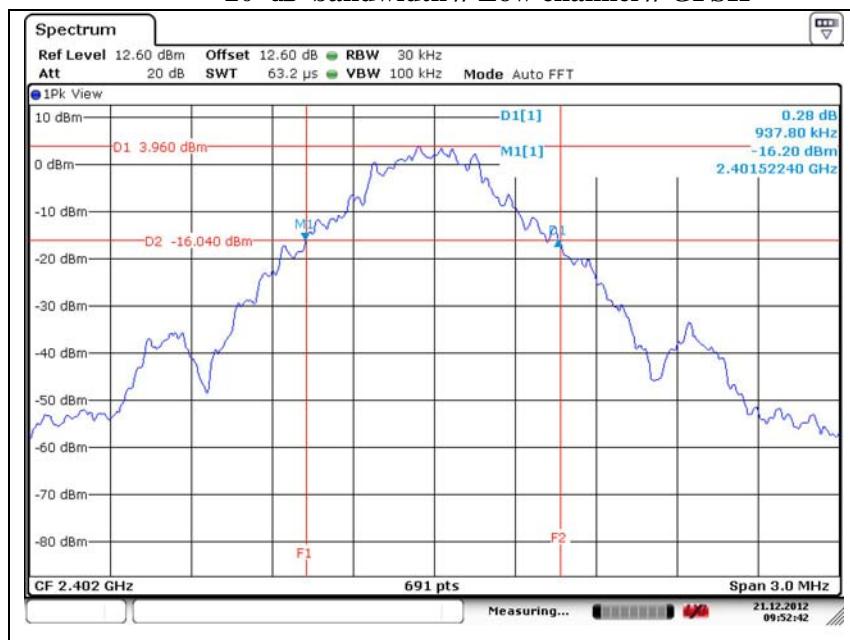
1. Use the following spectrum analyzer setting
 - Center frequency: Lowest, middle and highest channels
 - Span = 3 MHz (Approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel)
 - RBW = 30 kHz (\geq 1% of the span)
 - VBW = 100 kHz (\geq RBW)
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold
2. The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down on side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level.

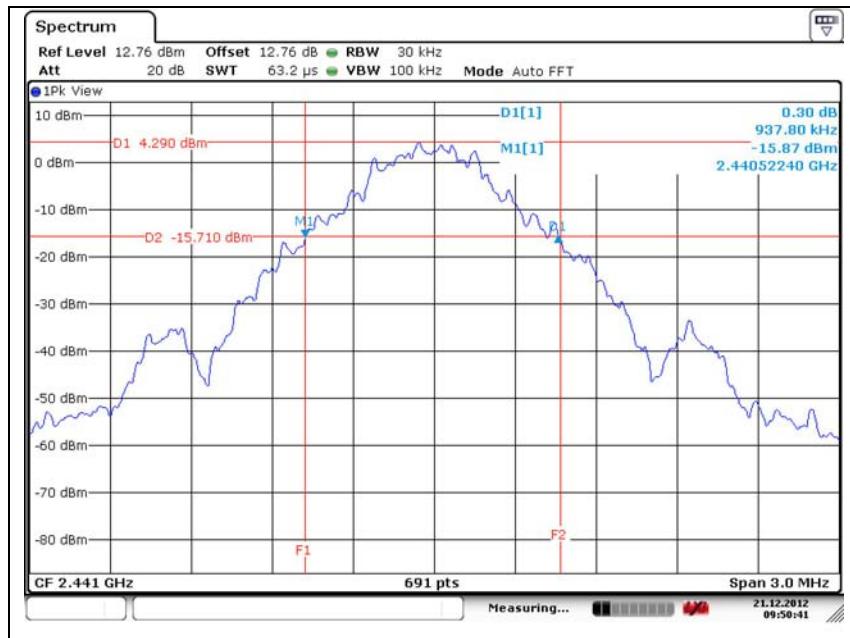
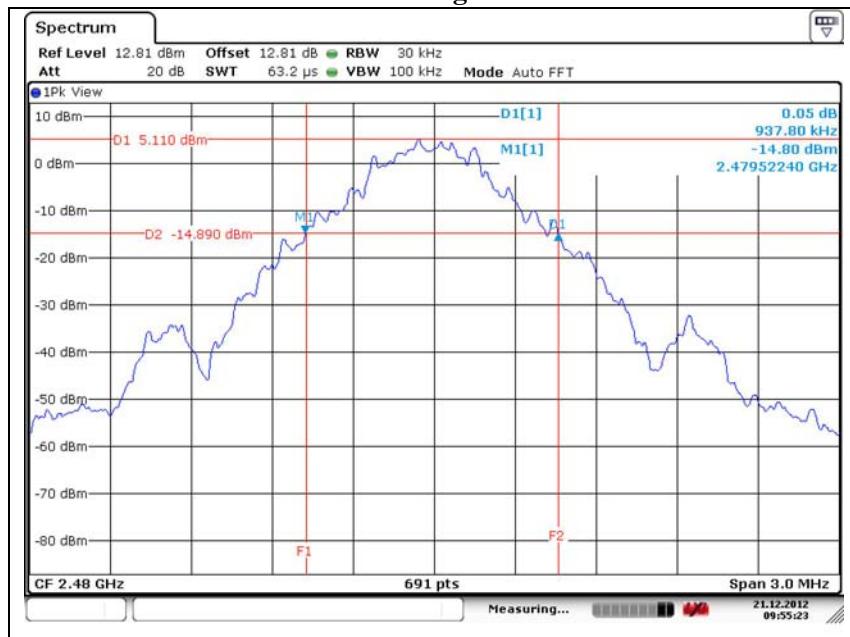
Limit

Not applicable

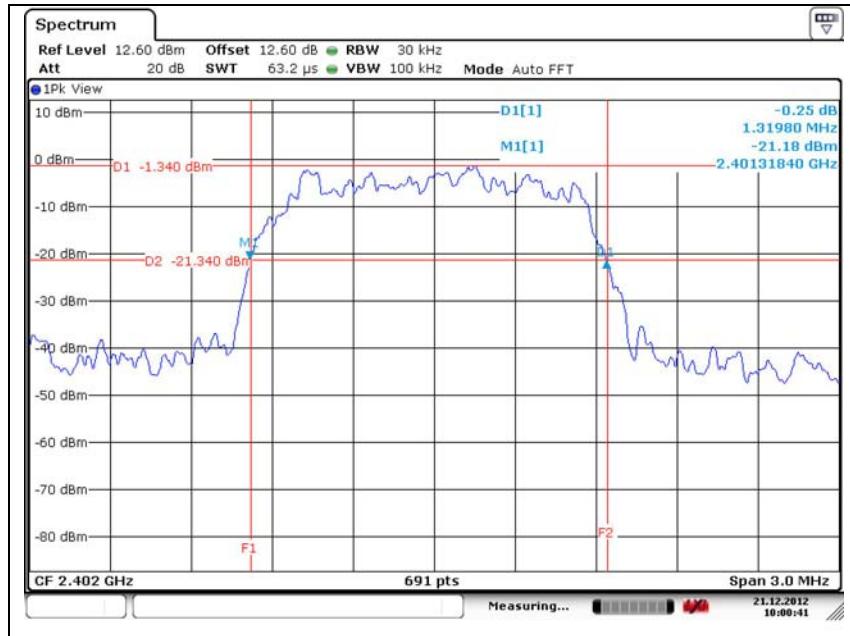
Test results

Operation mode	Frequency(MHz)	20 dB bandwidth(MHz)
GFSK	2 402	0.937
	2 441	0.937
	2 480	0.937
Operation mode	Frequency(MHz)	20 dB bandwidth(MHz)
8DPSK	2 402	1.319
	2 441	1.319
	2 480	1.324

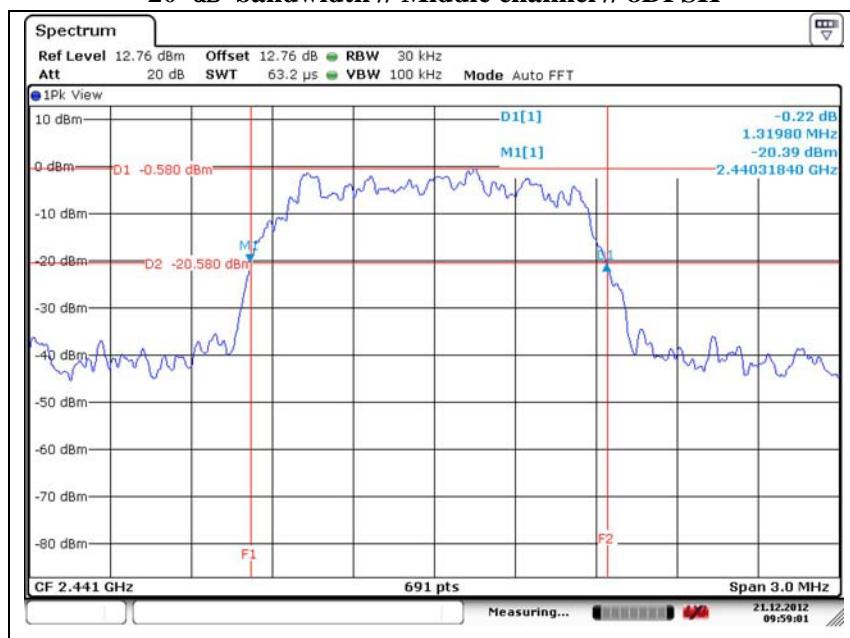
20 dB bandwidth // Low channel // GFSK


20 dB bandwidth // Middle channel // GFSK

20 dB bandwidth // High channel // GFSK


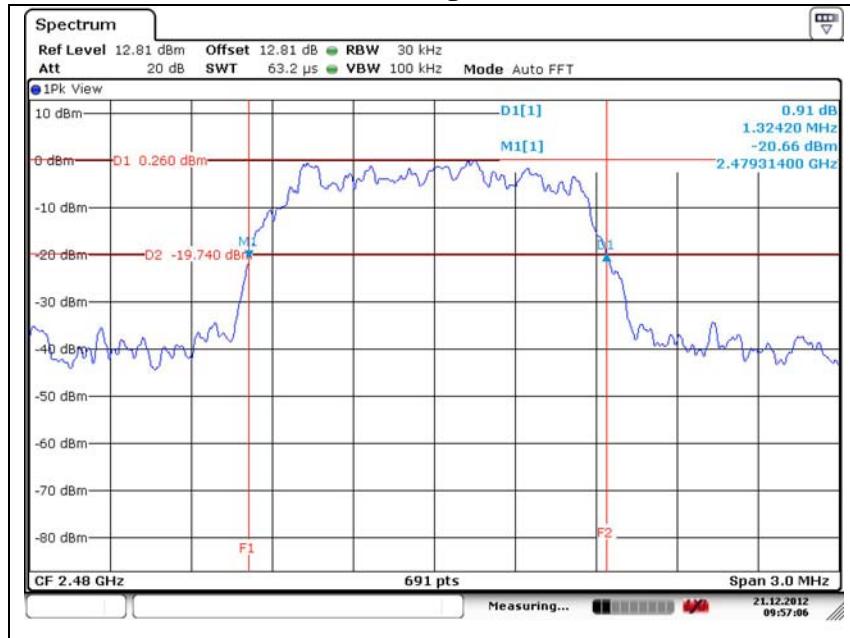
20 dB bandwidth // Low channel // 8DPSK



20 dB bandwidth // Middle channel // 8DPSK

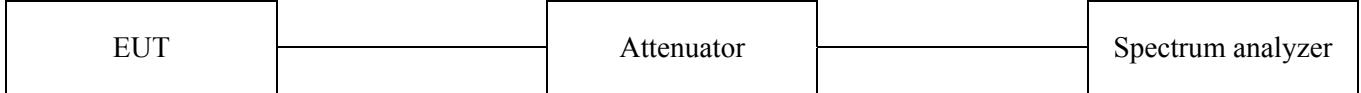


20 dB bandwidth // High channel // 8DPSK



2.1.5 Frequency separation

Test setup



Test procedure

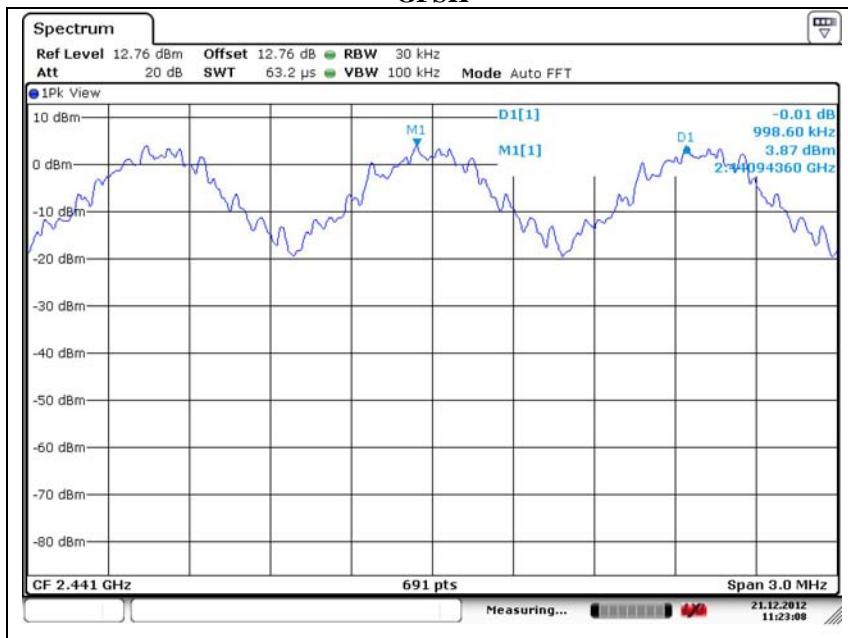
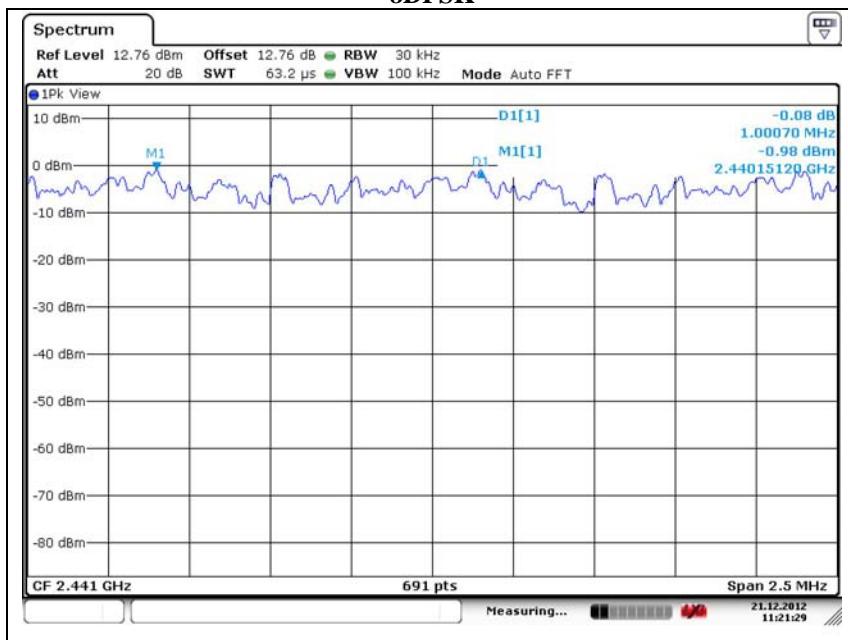
1. The EUT must have its hopping function enabled.
2. Use the following spectrum analyzer setting
Span = 3 MHz (wide enough to capture the peaks of two adjacent channels)
RBW = 30 kHz (\geq 1% of the span)
VBW = 100 kHz (\geq RBW)
Sweep = auto
Detector function = peak
Trace = max hold
3. All the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Limit

According to 15.247(a)(1), frequency hopping system operating in 2 400 ~ 2 483.5 MHz. Band may have hopping channel carrier frequencies that are separated by 25 kHz or two-third of 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

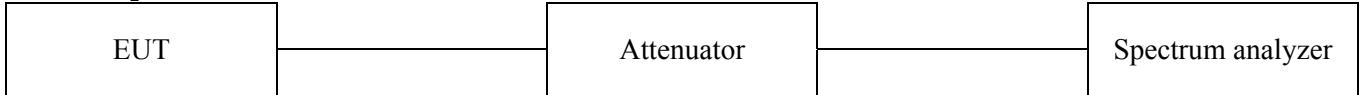
Test results

Operation mode	Frequency (MHz)	Adjacent hopping channel separation(kHz)	Two-third of 20 dB bandwidth (kHz)	Minimum bandwidth (kHz)
GFSK	2.441	0.998	0.624	25
8DPSK	2.441	1.000	0.879	25

GFSK

8DPSK


2.1.6 Number of hopping frequency

Test setup



Test procedure

1. The EUT must have its hopping function enabled.

2. Use the following spectrum analyzer setting

Frequency range: 2 400 MHz ~ 2 441.5 MHz, 2 441.5 MHz ~ 2 483.5 MHz

Span = the frequency band of operation

RBW = 1 MHz ($\geq 1\%$ of the span)

VBW = 1 MHz (\geq RBW)

Sweep = auto

Detector function = peak

Trace = max hold

3. All the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

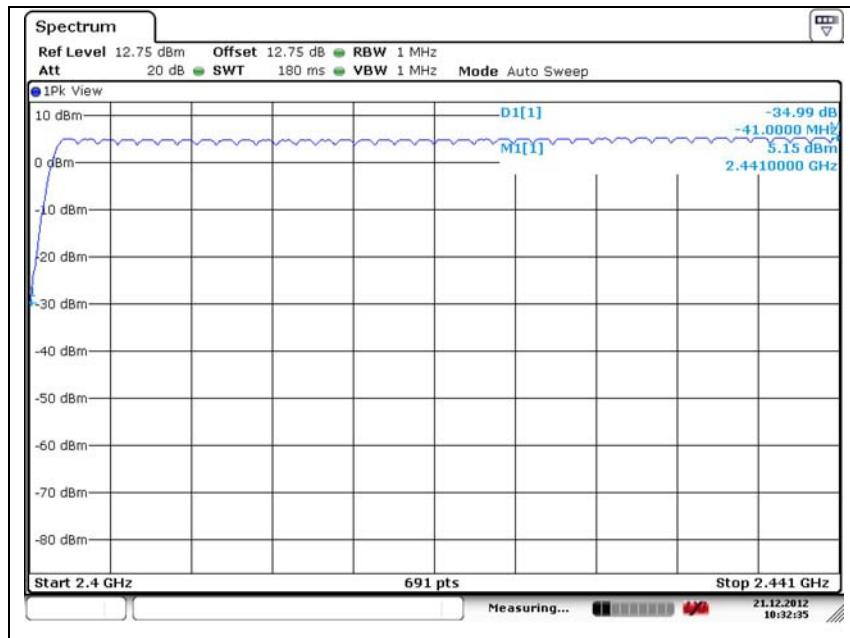
Limit

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2 400 ~ 2 483.5 MHz bands shall use at least 15 hopping frequencies.

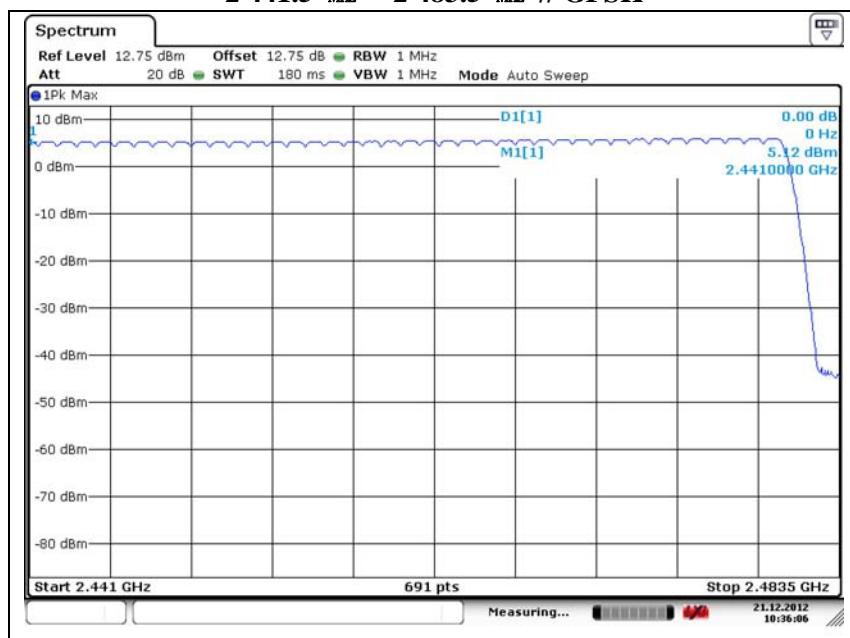
Test results

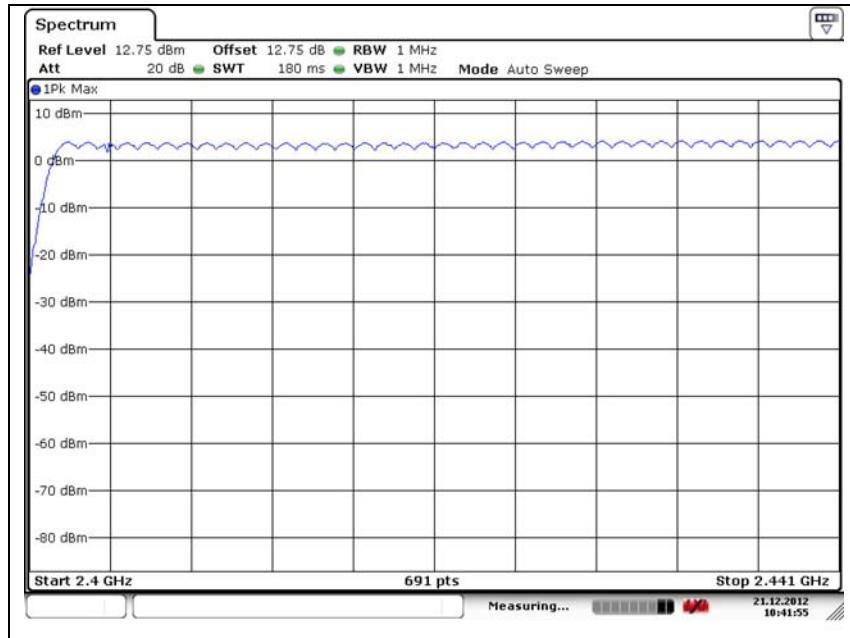
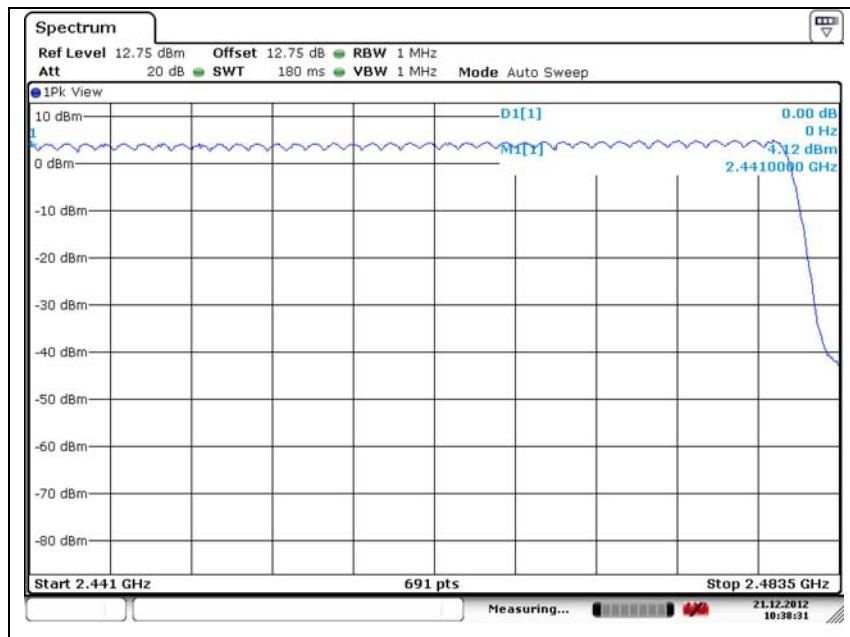
Operation mode	Number of hopping frequency	Limit
GFSK	79	≥ 15
8DPSK	79	≥ 15

2 400 MHz ~ 2 441.5 MHz // GFSK



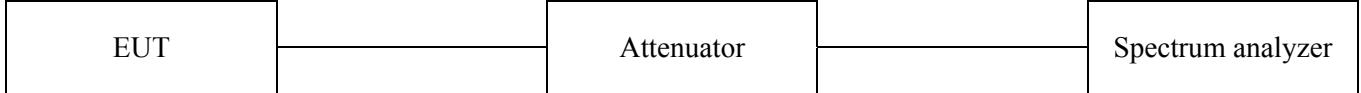
2 441.5 MHz ~ 2 483.5 MHz // GFSK



2 400 MHz ~ 2 441.5 MHz // 8DPSK

2 441.5 MHz ~ 2 483.5 MHz // 8DPSK


2.1.7 Time of occupancy (Dwell time)

Test setup



Test procedure

1. Use the following spectrum analyzer setting

Center frequency: 2 441 MHz

Span = Zero span, centered on a hopping channel

RBW = 1 MHz

VBW = 3 MHz (\geq RBW)

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

2. If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., date rate, modulation format, etc.), repeat this test for each variation.

3. The Bluetooth has 3 type of payload DH1, DH3, DH5. The hopping rate is 1 600 per second.

Limit

According to 15.247(a)(1)(iii), for frequency hopping system operating in the 2 400 ~ 2 483.5 MHz band, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

A period time = $0.4(s) \times 79 = 31.6(s)$

Test results

Time of occupancy on the TX channel in 31.6 sec

= time domain slot length \times (hop rate \div number of hop per channel) \times 31.6

Operation mode: GFSK , 8DPSK

Packet type	Frequency (MHz)	Dwell time (ms)	Time of occupancy on the Tx channel in 31.6 sec (ms)	Limit for time of occupancy on the Tx channel in 31.6 sec (ms)
DH1	2 441	0.373	119.36	400
DH3	2 441	1.637	261.92	400
DH5	2 441	2.869	306.02	400
3-DH1	2 441	0.373	119.36	400
3-DH3	2 441	1.623	259.68	400
3-DH5	2 441	2.884	307.62	400

※ Remark:

DH1: Dwell time (ms) \times [(1 600 \div 2) \div 79] \times 31.6(s) = 119.36 (ms)

DH3: Dwell time (ms) \times [(1 600 \div 4) \div 79] \times 31.6(s) = 261.92 (ms)

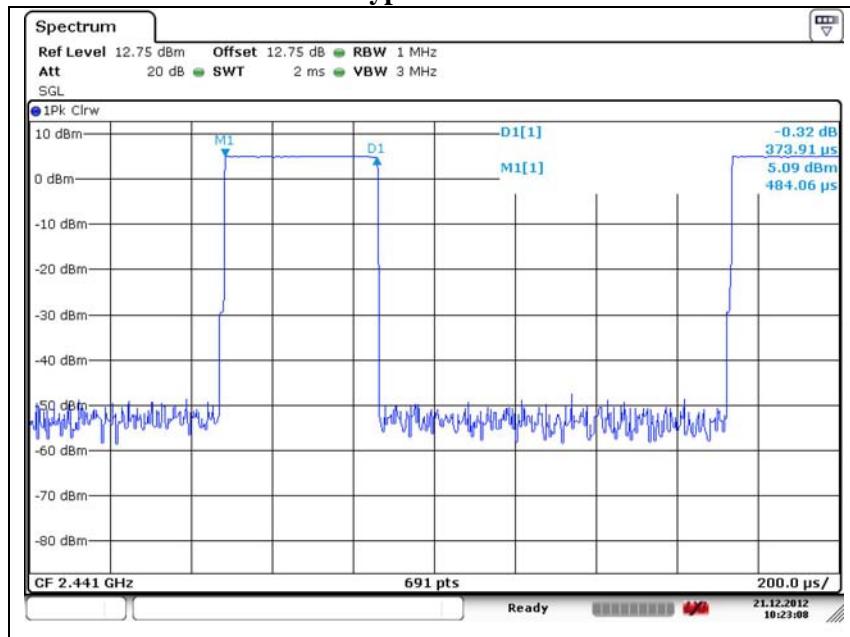
DH5: Dwell time (ms) \times [(1 600 \div 6) \div 79] \times 31.6(s) = 306.02 (ms)

3-DH1: Dwell time (ms) \times [(1 600 \div 2) \div 79] \times 31.6(s) = 119.36 (ms)

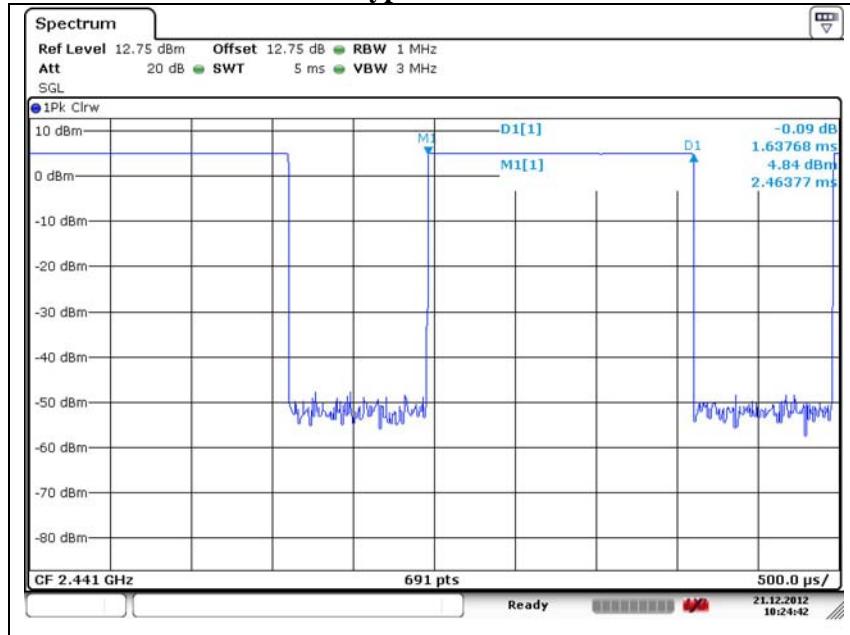
3-DH3: Dwell time (ms) \times [(1 600 \div 4) \div 79] \times 31.6(s) = 259.68 (ms)

3-DH5: Dwell time (ms) \times [(1 600 \div 6) \div 79] \times 31.6(s) = 307.62 (ms)

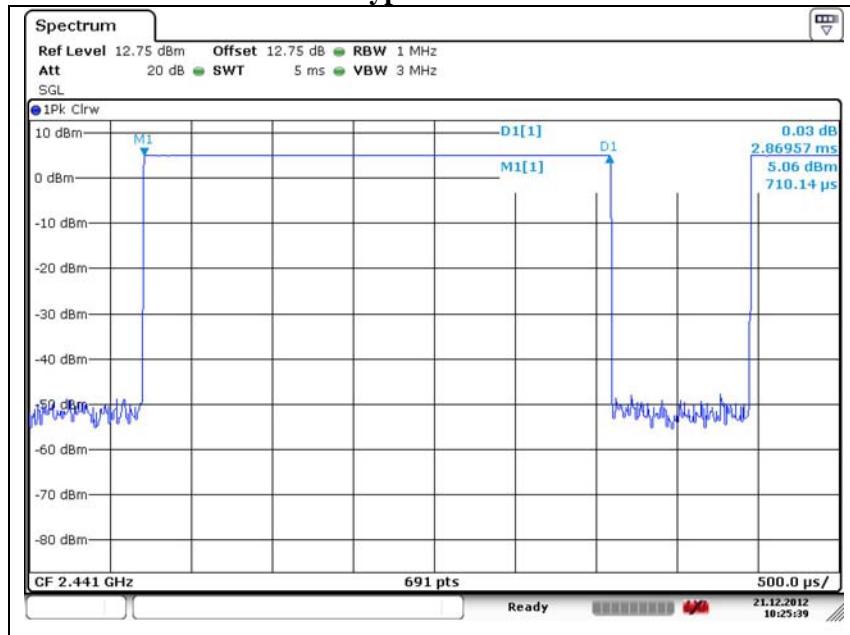
Packet type: DH1 // GFSK



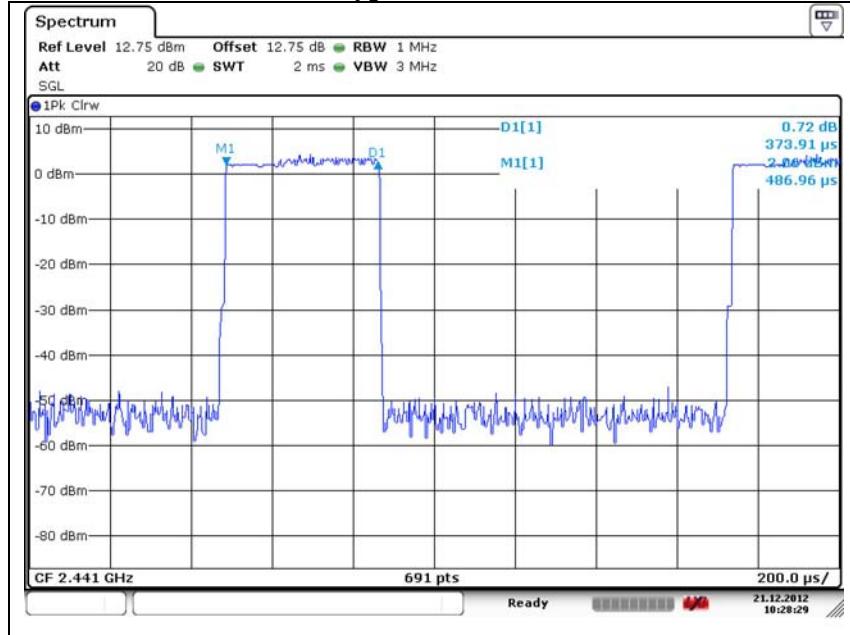
Packet type: DH3 // GFSK



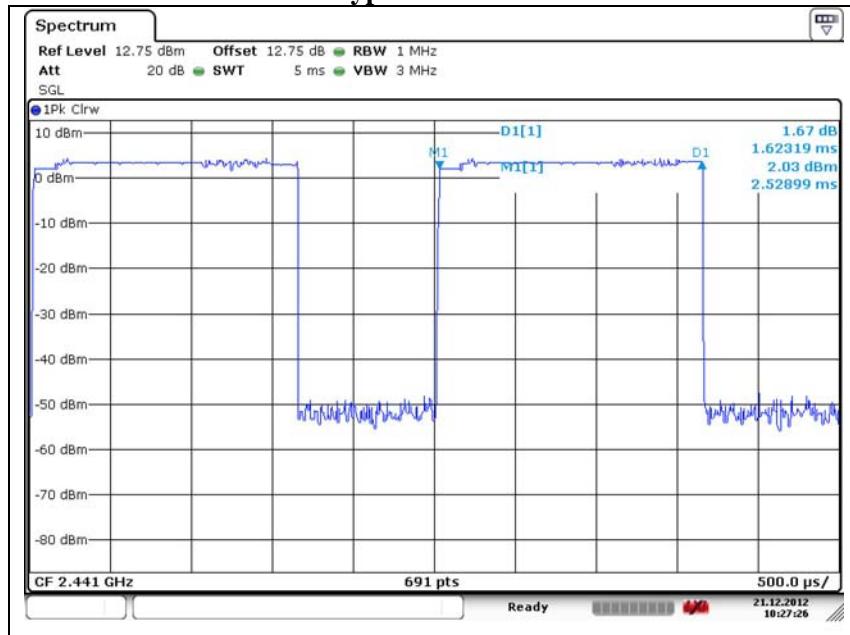
Packet type: DH5 // GFSK



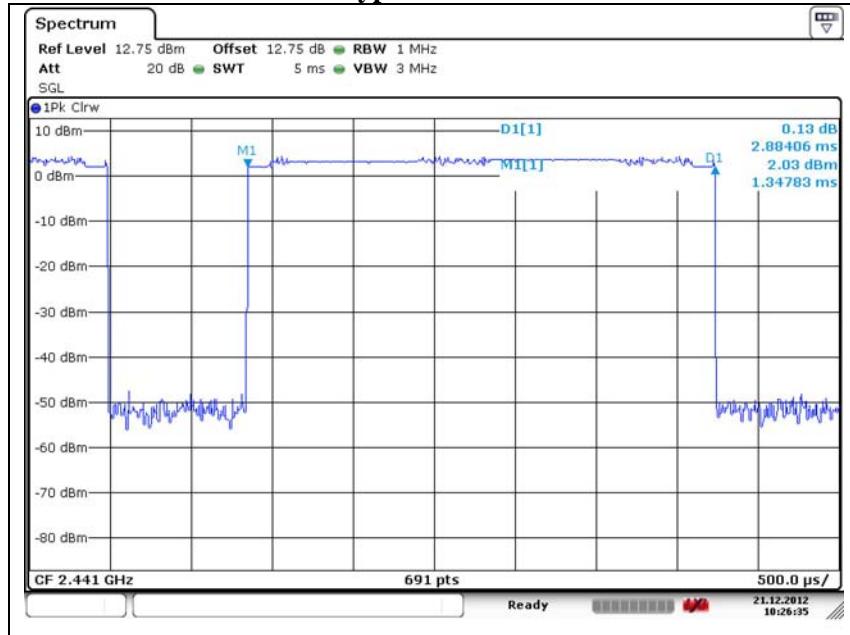
Packet type: 3-DH1// 8DPSK



Packet type: 3-DH3 // 8DPSK



Packet type: 3-DH5 // 8DPSK



2.1.8 Radiated spurious emission & band edge

Test location

Testing was performed at a test distance of 3 meter Open Area Test Site

Test procedures

[9 kHz to 30 MHz]

The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Quasi-peak function and specified bandwidth with maximum hold mode.

The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 200 Hz for Quasi-peak detection (QP) at frequency below 9 kHz~ 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 9 kHz for Quasi-peak detection (QP) at frequency below 150 kHz~ 30 MHz.

[30 MHz to 1 GHz and 1 GHz to 24 GHz]

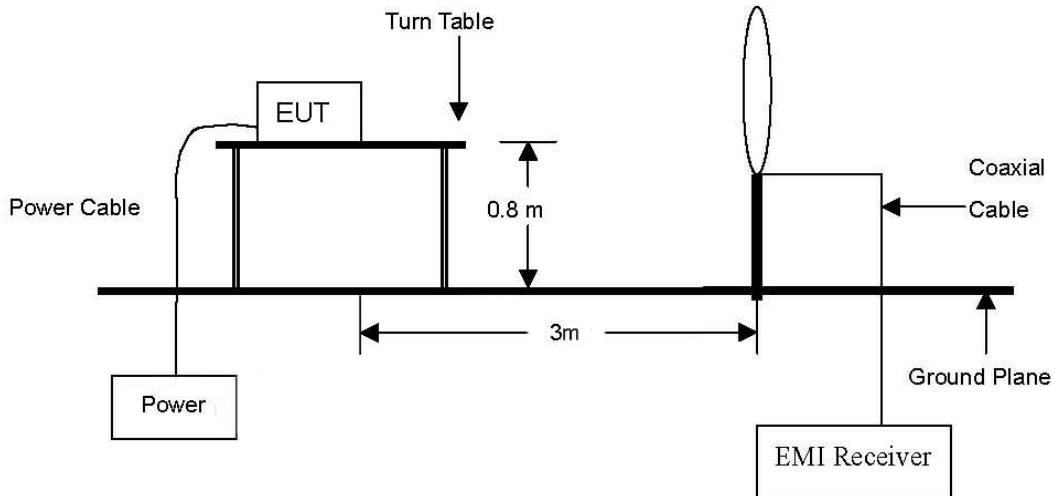
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

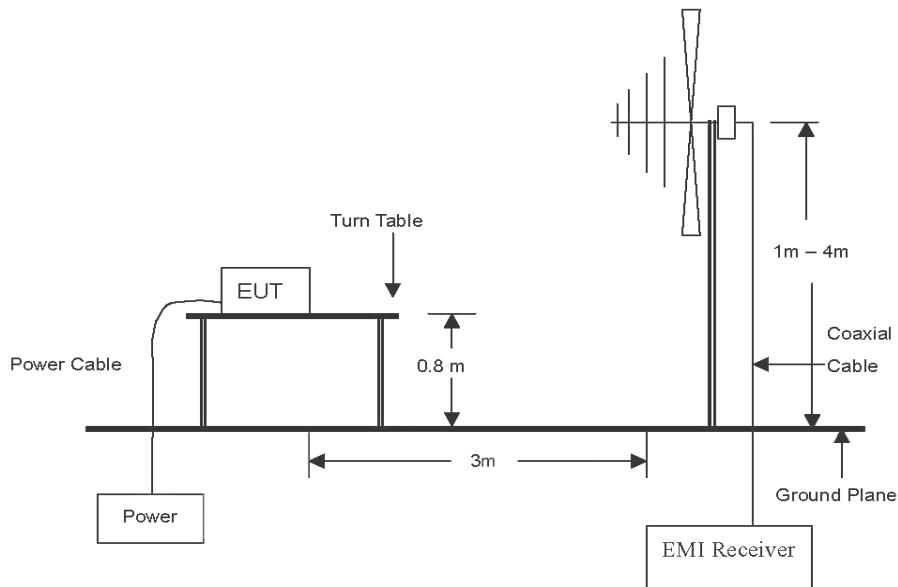
The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

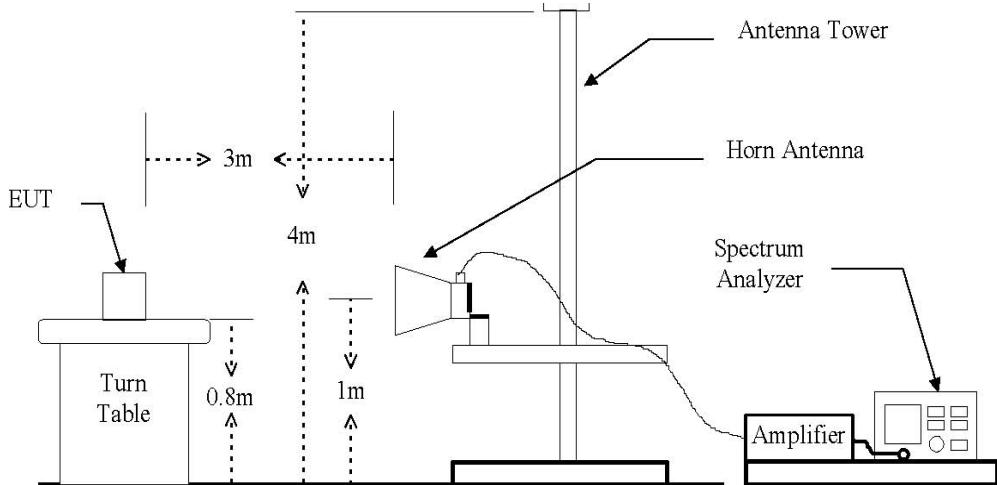
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz emissions.



Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (MHz)	Distance (Meters)	Radiated (μ V/m)
0.009 ~ 0.490	300	2400 / F(kHz)
0.490 ~ 1.705	30	24000 / F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.



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Test results (Below 30 MHz) – Worst case configuration: GFSK

The frequency spectrum from 9 kHz to 30 MHz was investigated.

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	F _d (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
Below 30	Not detected							

* Remark

1. All spurious emission at channels are almost the same below 30 MHz, so that high channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss + F_d
3. F_d = 40log(D_m / D_s)

Where:

F_d = Distance factor in dB
D_m = Measurement distance in meters
D_s = Specification distance in meters

Test results (Below 1 000 MHz) – Worst case configuration: GFSK

The frequency spectrum from 30 MHz to 1 000 MHz was investigated.

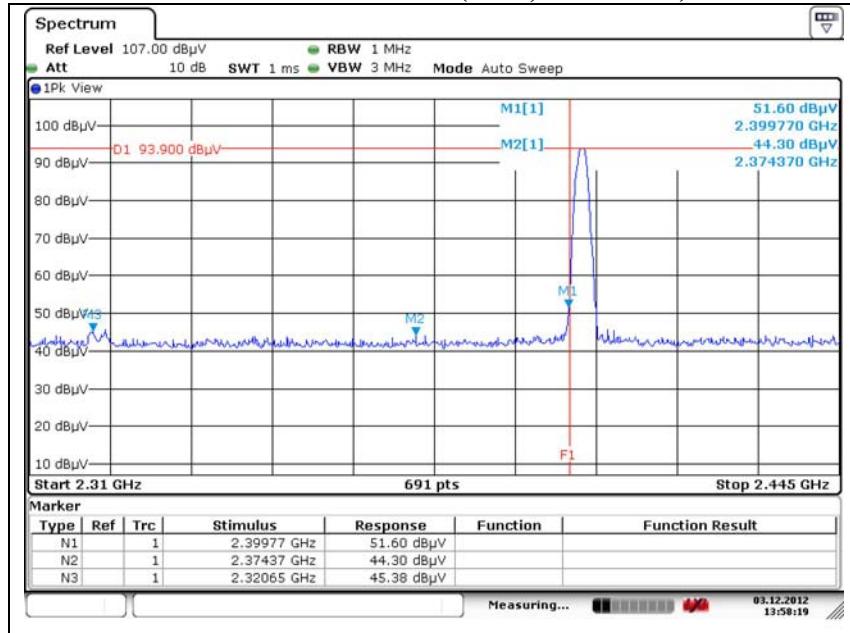
Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
90.6	5.65	H	7.79	1.19	14.63	40.00	25.37
129.4	6.73	V	11.91	1.31	19.95	43.50	23.55
161.0	5.99	H	13.23	1.61	20.83	43.50	22.67
161.0	7.71	V	13.23	1.61	22.55	43.50	20.95
199.8	6.82	H	9.66	1.77	18.25	43.50	25.25
224.0	6.27	V	10.77	1.83	18.87	46.00	27.13
350.1	7.94	V	14.49	2.09	24.52	46.00	21.48
401.0	12.46	H	15.63	2.19	30.28	46.00	15.72
401.0	7.95	V	15.63	2.19	25.77	46.00	20.23
456.8	10.09	H	16.81	2.40	29.30	46.00	16.70
599.9	8.74	H	19.73	2.86	31.33	46.00	14.67
599.9	9.51	V	19.73	2.86	32.10	46.00	13.90

*** Remark**

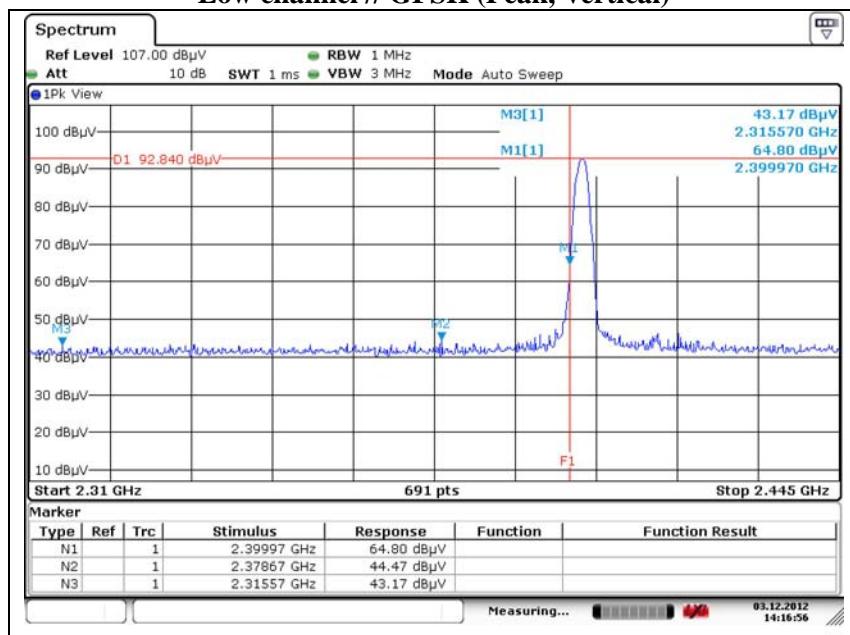
1. All spurious emission at channels are almost the same below 1 GHz, so that middle channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Test results (Above 1 000 MHz)

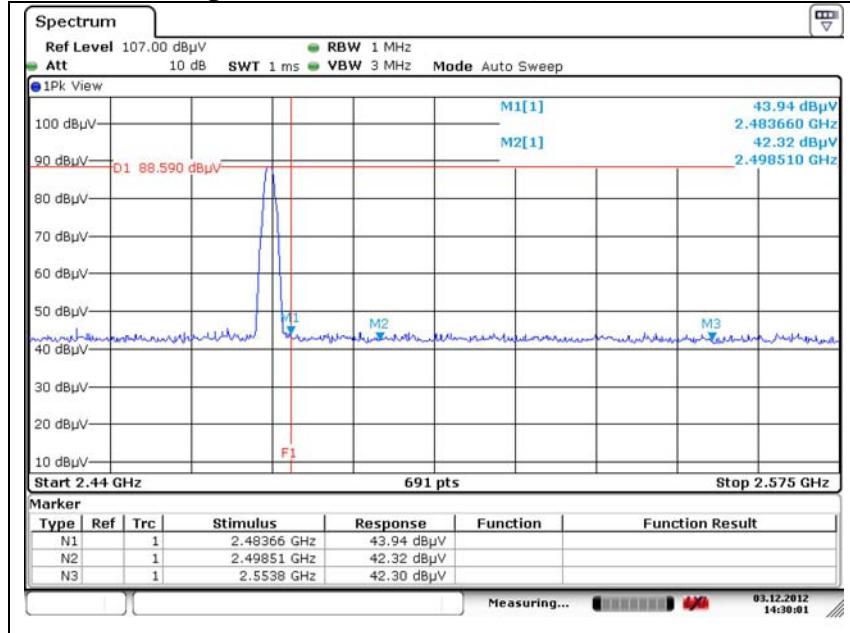
Low channel // GFSK (Peak, Horizontal)



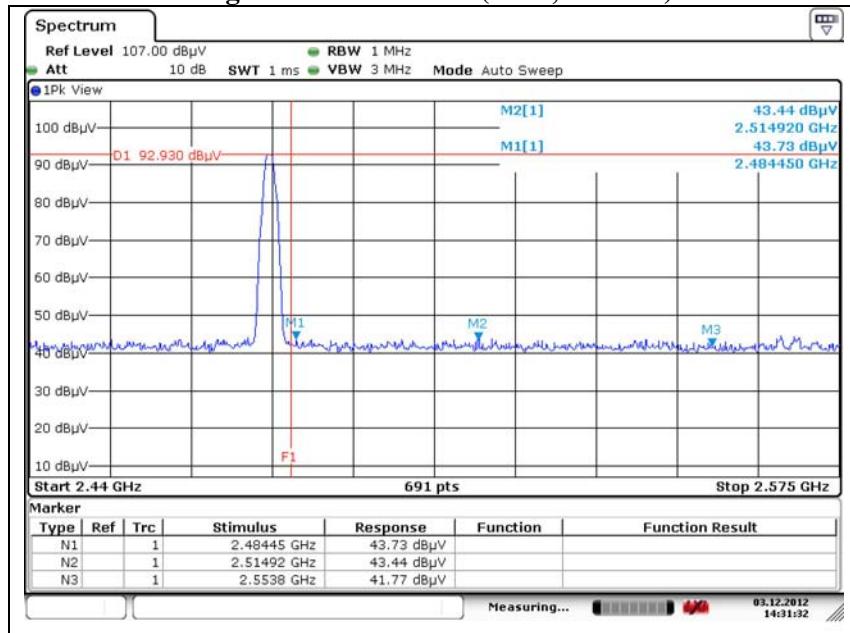
Low channel // GFSK (Peak, Vertical)



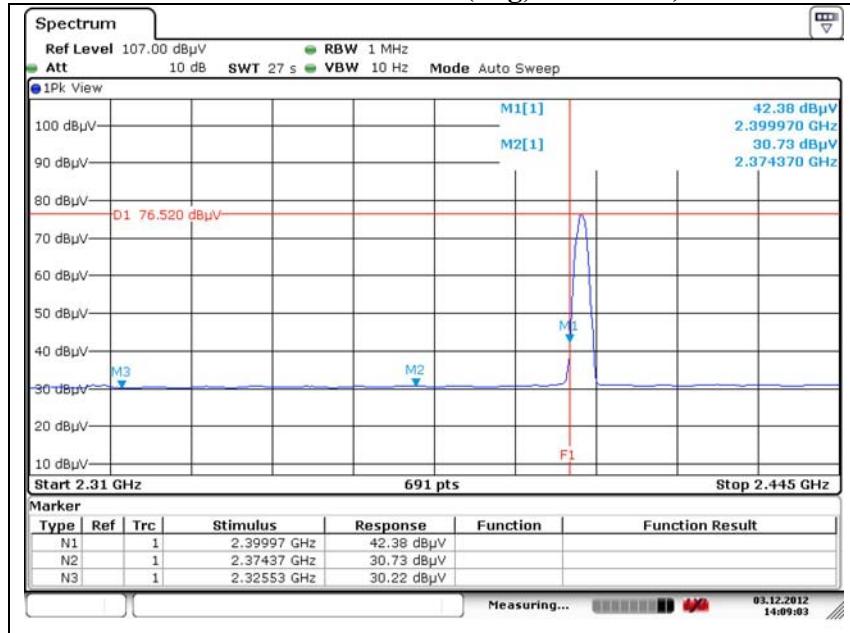
High channel // GFSK (Peak, Horizontal)



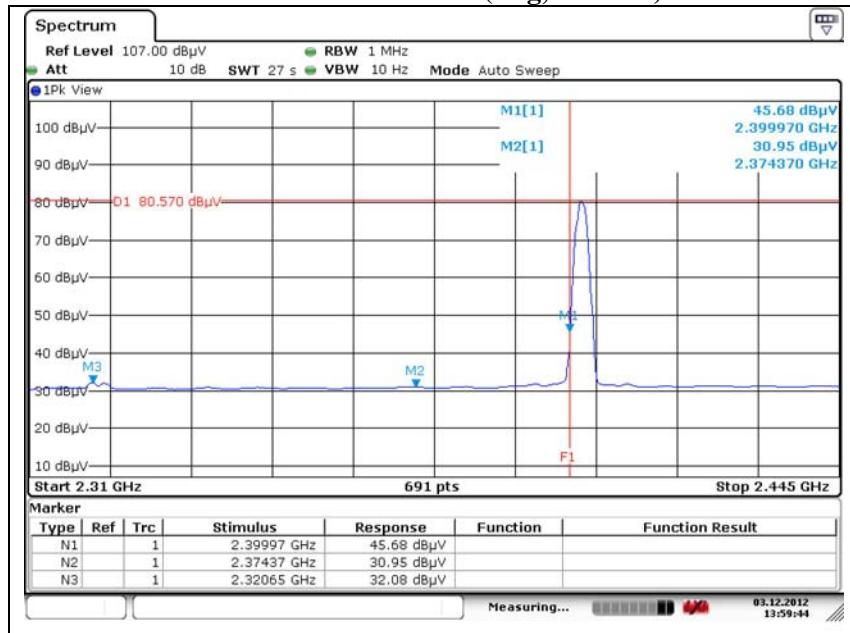
High channel // GFSK (Peak, Vertical)



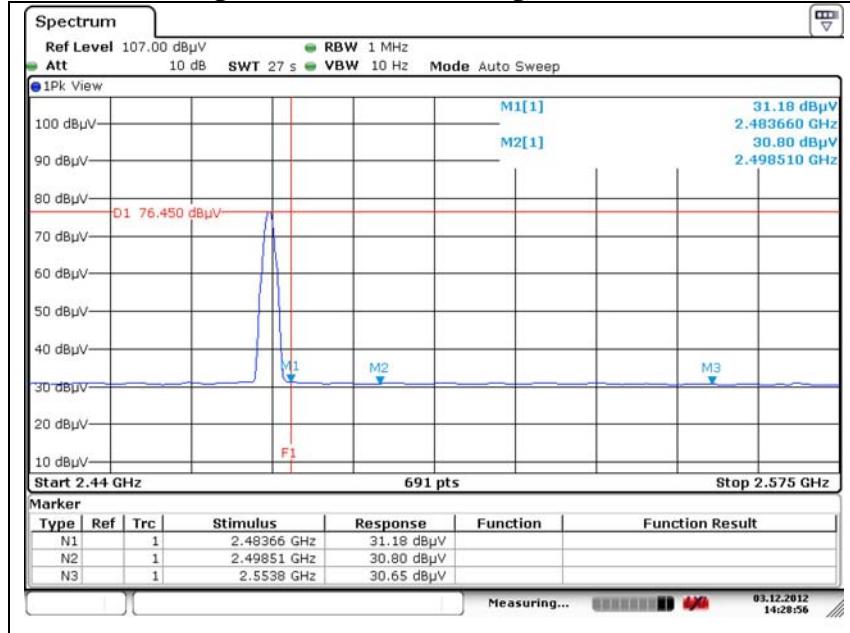
Low channel // GFSK (Avg, Horizontal)



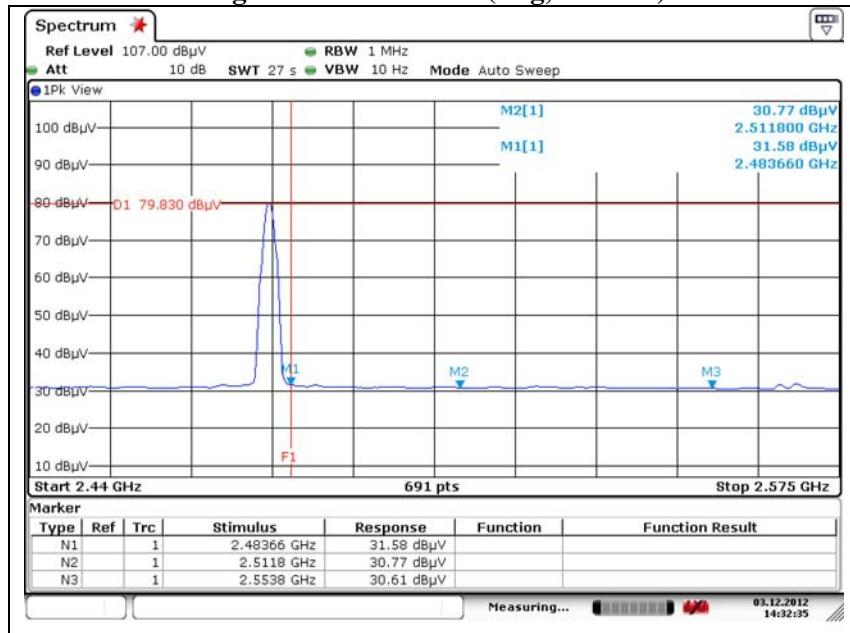
Low channel // GFSK (Avg, Vertical)



High channel // GFSK (Avg, Horizontal)



High channel // GFSK (Avg, Vertical)



The frequency spectrum from 1 GHz to 25 GHz was investigated. No Emissions were found above 20 dB below the limit.

Low channel // GFSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
2 312.5	43.17	Peak	V	28.15	-39.02	32.30	74.00	41.70
2 320.6	45.38	Peak	H	28.17	-39.00	34.55	74.00	39.45
2 374.3	44.30	Peak	H	28.28	-38.91	33.68	74.00	40.32
2 378.6	44.47	Peak	V	28.29	-38.90	33.86	74.00	40.14
2 399.7	51.60	Peak	H	28.33	-38.86	41.07	74.00	32.93
2 399.9	64.80	Peak	V	28.33	-38.86	54.27	74.00	19.73
2 399.9	42.38	Average	H	28.33	-38.86	31.85	54.00	22.15
2 399.9	45.68	Average	V	28.33	-38.86	35.15	54.00	18.85

Middle channel // GFSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
Above 1 000	Not detected							

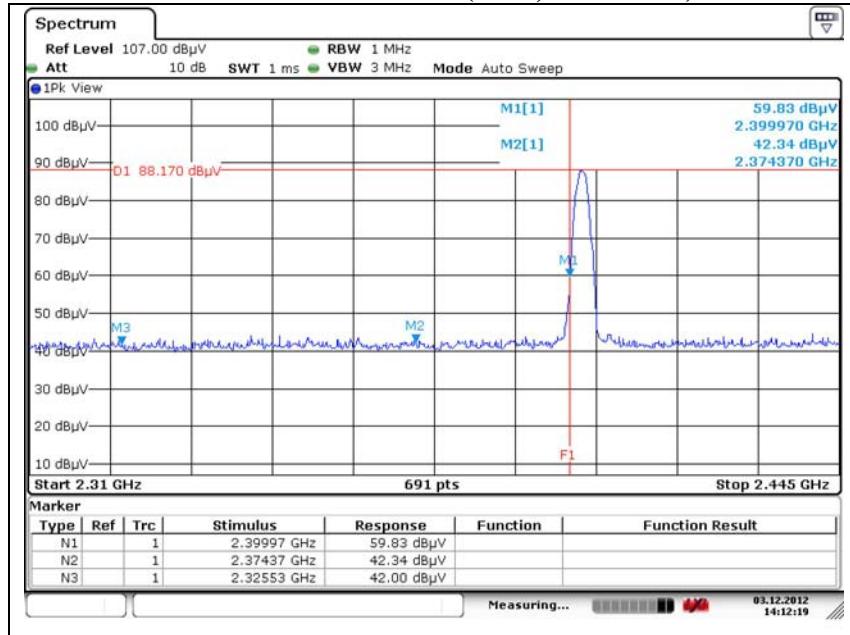
High channel // GFSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
2 553.8	41.77	Peak	V	28.64	-38.63	31.78	74.00	42.22
2 553.8	42.30	Peak	H	28.64	-38.63	32.31	74.00	41.69
2 498.5	42.32	Peak	H	28.53	-38.71	32.14	74.00	41.86
2 514.9	43.44	Peak	V	28.57	-38.69	33.32	74.00	40.68
2 484.4	43.73	Peak	V	28.50	-38.73	33.50	74.00	40.50
2 483.6	43.94	Peak	H	28.50	-38.73	33.71	74.00	40.29
2 483.6	31.18	Average	H	28.50	-38.73	20.95	54.00	33.05
2 483.6	31.58	Average	V	28.50	-38.73	21.35	54.00	32.65

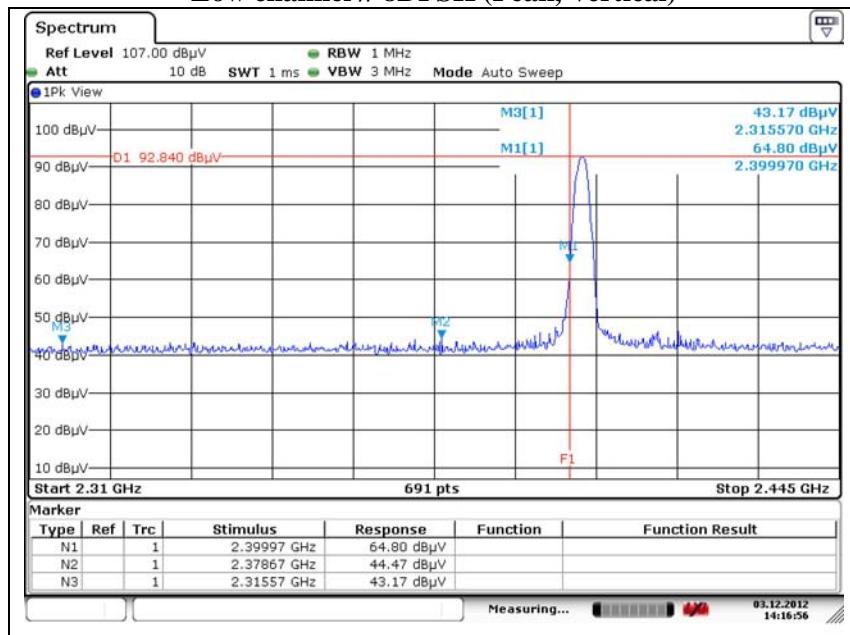
*** Remark**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

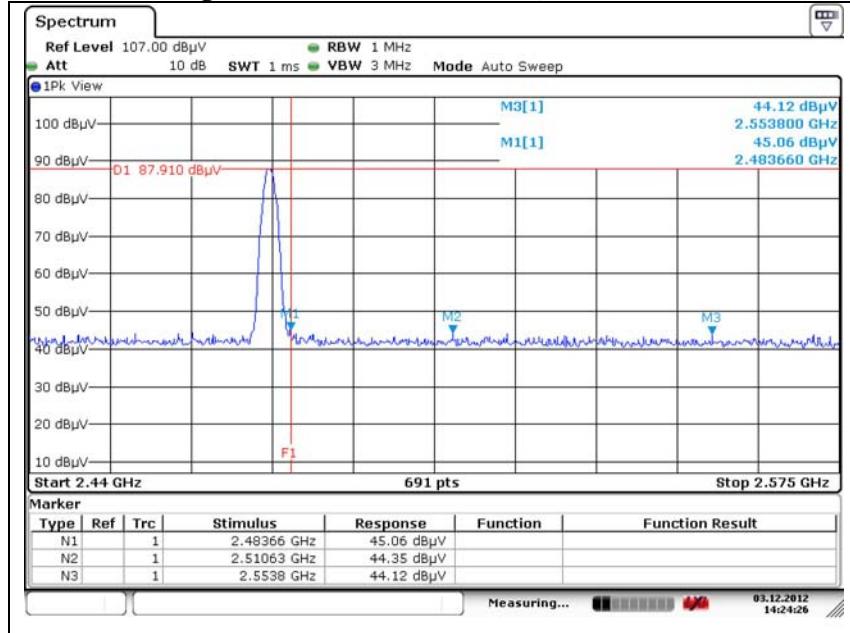
Low channel // 8DPSK (Peak, Horizontal)



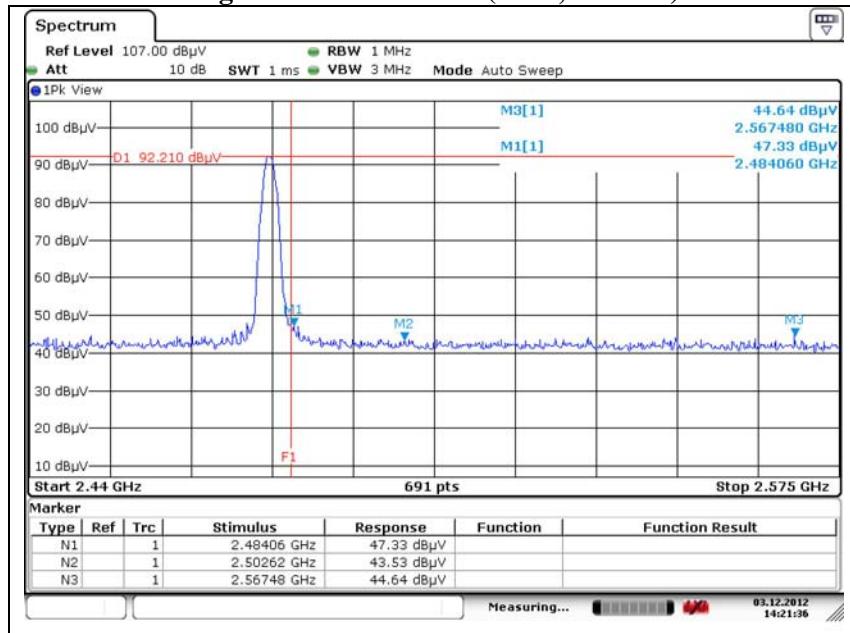
Low channel // 8DPSK (Peak, Vertical)



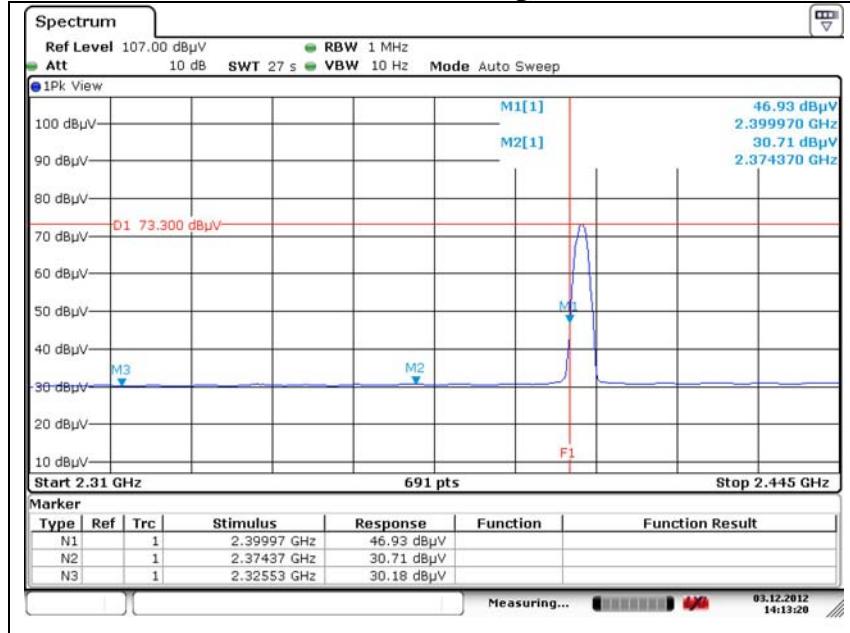
High channel // 8DPSK (Peak, Horizontal)



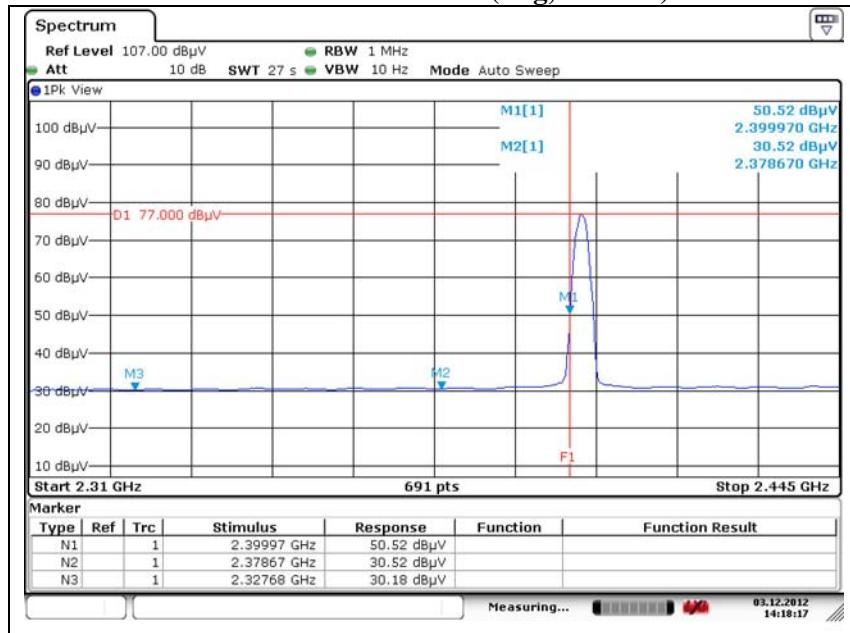
High channel // 8DPSK (Peak, Vertical)



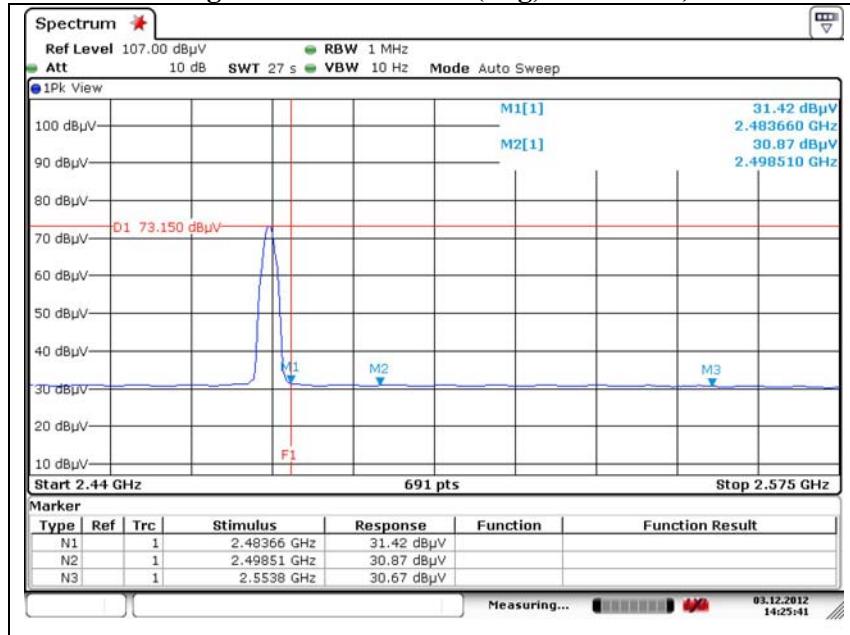
Low channel // 8DPSK (Avg, Horizontal)



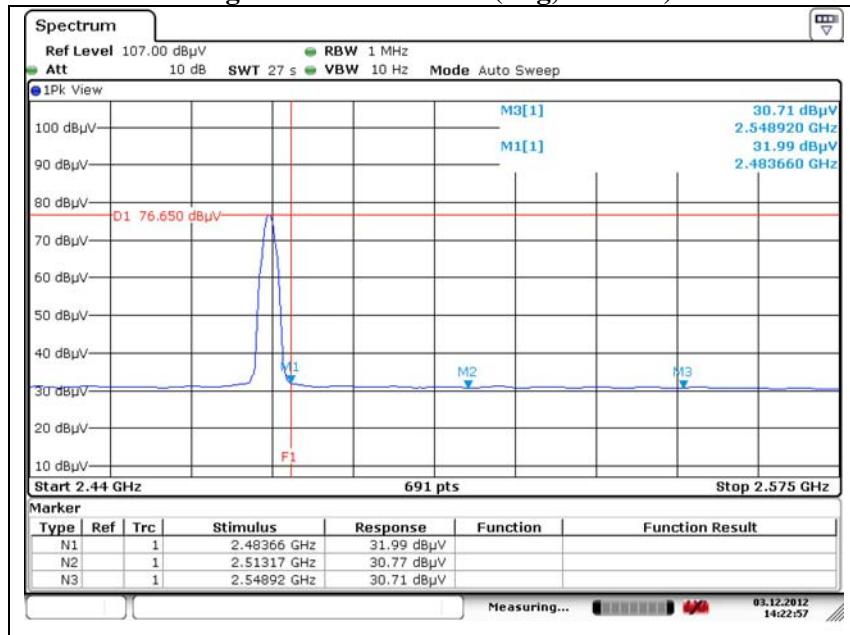
Low channel // 8DPSK (Avg, Vertical)



High channel // 8DPSK (Avg, Horizontal)



High channel // 8DPSK (Avg, Vertical)





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The frequency spectrum from 1 GHz to 25 GHz was investigated. No Emissions were found above 20 dB below the limit.

Low channel // 8DPSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
2 315.5	43.17	Peak	V	28.16	-39.01	32.32	74.00	41.68
2 325.5	42.00	Peak	H	28.18	-38.99	31.19	74.00	42.81
2 374.3	42.34	Peak	H	28.28	-38.91	31.71	74.00	42.29
2 378.6	44.47	Peak	V	28.29	-38.90	33.86	74.00	40.14
2 399.9	59.83	Peak	H	28.33	-38.86	49.30	74.00	24.70
2 399.9	64.80	Peak	V	28.33	-38.86	54.27	74.00	19.73
2 399.9	46.93	Average	H	28.33	-38.86	36.40	54.00	17.60
2 399.9	50.52	Average	V	28.33	-38.86	39.99	54.00	14.01

Middle channel // 8DPSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
Above 1 000	Not detected							

High channel // 8DPSK

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
2 483.6	45.06	Peak	H	28.50	-38.73	34.83	74.00	39.17
2 484.0	47.33	Peak	V	28.50	-38.73	37.10	74.00	36.90
2 502.6	43.53	Peak	V	28.54	-38.70	33.37	74.00	40.63
2 510.6	44.35	Peak	H	28.56	-38.69	34.21	74.00	39.79
2 553.8	44.12	Peak	H	28.64	-38.63	34.14	74.00	39.86
2 567.4	44.64	Peak	V	28.67	-38.61	34.71	74.00	39.29
2 483.6	31.42	Average	H	28.50	-38.73	21.19	54.00	32.81
2 483.6	31.99	Average	V	28.50	-38.73	21.76	54.00	32.24

* Remark

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

2.1.9 AC conducted emissions

Frequency range of measurement

150 kHz to 30 MHz

Instrument settings

IF Band Width: 9 kHz

Test procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

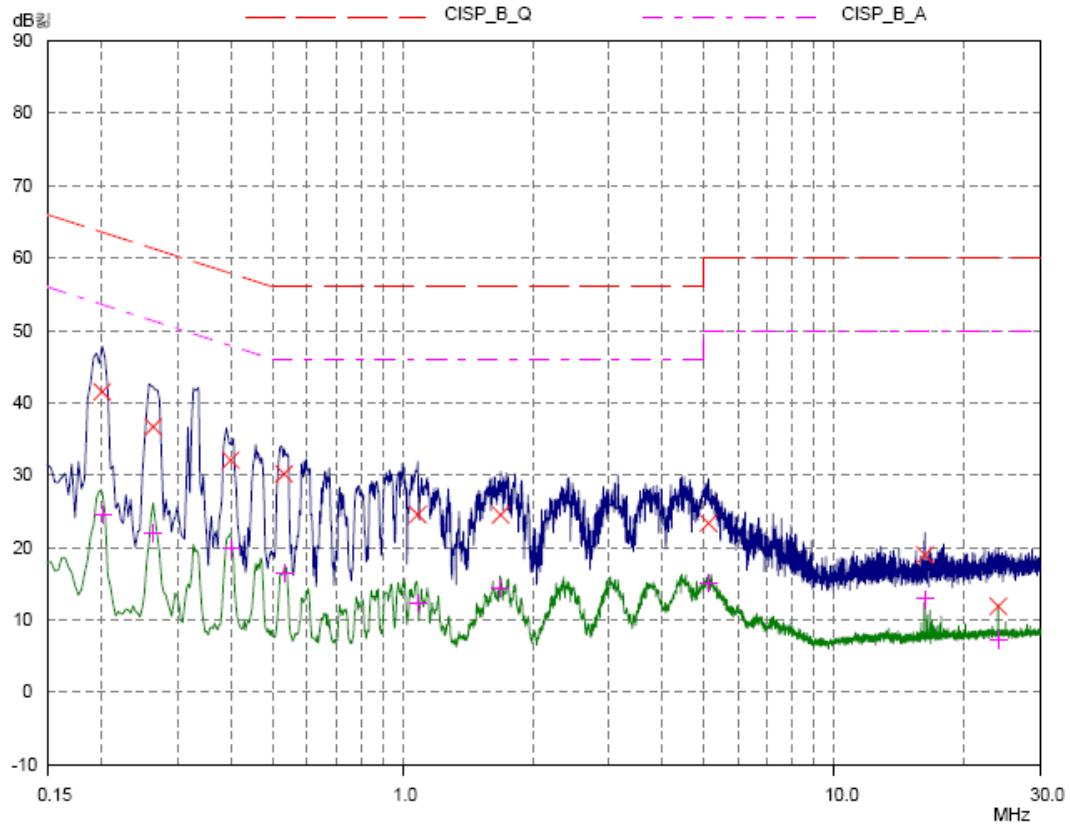
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dB μ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

* Remark

Decreases with the logarithm of the frequency.

Test results



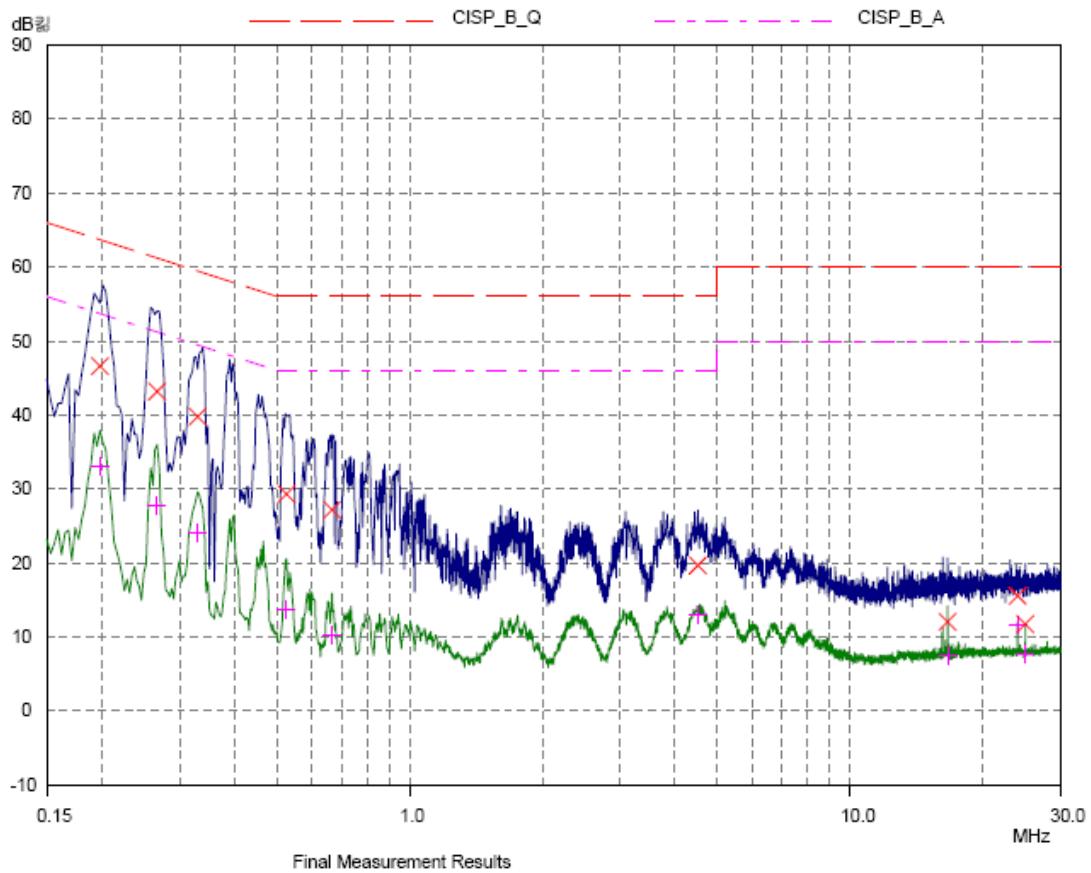
Final Measurement Results

Frequency MHz	QP Level dB _{RF}	QP Limit dB _{RF}	QP Delta dB
0.201	41.51	63.57	22.06
0.264	36.66	61.30	24.64
0.399	32.07	57.87	25.80
0.531	30.15	56.00	25.85
1.083	24.52	56.00	31.48
1.686	24.51	56.00	31.49
5.115	23.34	60.00	36.66
16.23	18.95	60.00	41.05
24.015	11.84	60.00	48.16

Frequency MHz	AV Level dB _{RF}	AV Limit dB _{RF}	AV Delta dB
0.201	24.46	53.57	29.11
0.264	22.05	51.30	29.25
0.399	19.88	47.87	27.99
0.531	16.48	46.00	29.52
1.083	12.23	46.00	33.77
1.686	14.43	46.00	31.57
5.115	15.13	50.00	34.87
16.23	12.87	50.00	37.13
24.015	7.28	50.00	42.72

Note;

Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



Frequency MHz	QP Level dB _{AV}	QP Limit dB _{AV}	QP Delta dB
------------------	------------------------------	------------------------------	----------------

0.198	46.59	63.69	17.10
0.267	43.18	61.21	18.03
0.33	39.77	59.45	19.68
0.525	29.31	56.00	26.69
0.666	27.17	56.00	28.83
4.512	19.66	56.00	36.34
16.65299	12.03	60.00	47.97
23.997	15.55	60.00	44.45
24.996	11.71	60.00	48.29

Frequency MHz	AV Level dB _{AV}	AV Limit dB _{AV}	AV Delta dB
------------------	------------------------------	------------------------------	----------------

0.198	33.12	53.69	20.57
0.267	27.83	51.21	23.38
0.33	24.00	49.45	25.45
0.525	13.74	46.00	32.26
0.666	10.19	46.00	35.81
4.512	12.95	46.00	33.05
16.65299	7.40	50.00	42.60
23.997	11.68	50.00	38.32
24.996	7.64	50.00	42.36

Note;

Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).



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Appendix A. Test equipment used for test

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSV30	2013.01.10
8360B Series Swept Signal Generator	HP	83630B	2013-06-06
Attenuator	HP	8495B	2013.05.04
Attenuator	HP	8494B	2013.05.04
AC POWER SOURCE ANALYZER	HP	6813A	2013.07.06
Loop Antenna	R&S	HFH2-Z2.335.4711.52	2013.03.10
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	2013.10.25
Horn Antenna	A.H. System	SAS-571	2013.03.22
High Pass Filter	Wainwright Instrument	WHJS3000-10TT	2013.01.10
Preamplifier	A.H. System	PAM-0118	2013.05.04
EMC Analyzer	Agilent	E7405A	2012.08.16
EMI TEST Receiver	R & S	ESHS10	2013.05.04
LISN	R & S	ENV216	2013.02.27
LISN	EMCO	3810/2	2013.04.18

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook(Laptop)	Samsung Electronics	NT-R410Y	Z9YJ93CS300631H

Appendix B. Test setup photo**Radiated field emissions**

AC conducted emission