FCC 47 CFR PART 15 SUBPART C

Product Type	:	Smart watch
Applicant	:	KRONOZ LLC
Address	:	Route De Valavran 96,1294 Genthod,Switzerland.
Model Number	:	ZeNano
Trade Name	:	MyKronoz
Test Specification	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2012 Canada RSS-210 ISSUE 8: Dec., 2010 Canada RSS-Gen ISSUE 3: Dec., 2010 ANSI C63.4:2009
Receive Date	:	10 , December 2013
Test Period	:	12 to 20, December 2013
Issue Date	:	24, December 2013

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	24, December 2013	Initial Issue	

Verification of Compliance

Issued Date: 12/24/2013

Product Type	:	Smart watch
Applicant	:	KRONOZ LLC
Address	:	Route De Valavran 96,1294 Genthod,Switzerland.
Model Number	:	ZeNano
Trade Name	:	MyKronoz
FCC ID	:	2AA7D-ZENO1
EUT Rated Voltage	:	DC 3.7V battery, DC 5.0V USB charge, AC120V/60Hz adapter
Test Voltage	:	DC 3.7V,AC120V/60Hz
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C: Oct., 2012 ANSI C63.4:2009
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade City, Taoyuan County 334, Taiwan R.O.C. Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

The above equipment was tested by A Test Lab Techno Corp. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 .

The test results of this report relate only to the tested sample identified in this report.

Approved By	:	Reviewed By	:	
(Manager)	(Cran Yang)	(Testing Engineer)		(Fly Lu)

TABLE OF CONTENTS

1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark
FCC 15.207&FCC15.247			
15.207	AC Power Conducted Emission	PASS	-----
15.247(b)(1)	Max. Output Power	PASS	-----
15.247(c)	Transmitter Radiated Emissions	PASS	-----
15.247(a)(1)	20dB RF Bandwidth	PASS	-----
15.247(a)(1)(iii)	Carrier Frequency Separation	PASS	-----
15.247(a)(1)(iii)	Number of Hopping	PASS	-----
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	PASS	-----
15.247(c)	Out of Band Conducted Spurious Emission	PASS	-----
15.247(c)	Band Edge Measurement	PASS	-----
15.247(c)	Occupied Bandwidth Measurement	PASS	-----
15.203	Antenna Requirement	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Test Item	Frequency Range		Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz		± 2.02
Radiated Emission	30MHz ~ 1000MHz	Horizontal	± 3.98
		Vertical	± 3.62
	1000MHz ~ 18000MHz	Horizontal	± 3.11
		Vertical	± 3.07
	18000MHz ~ 40000MHz	Horizontal	± 3.66
		Vertical	± 3.54

2 EUT Description

Product	Smart watch
Trade Name	MyKronoz
Model Number	ZeNano
Applicant	KRONOZ LLC Route De Valavran 96,1294 Genthod,Switzerland.
Manufacturer	Wirelessme Limited B210 Languang Building NO.7 Xinxi Road High-tech Park Nanshan District Shenzhen P.R.China
FCC ID	2AA7D-ZENO1
Frequency Range	2402 ~ 2480 MHz
Modulation Type	GFSK for 1Mbps
	π/4-DQPSK for 2Mbps
	8DPSK for 3Mbps
Antenna Type	Monopole
Antenna Gain	2dBi
RF Output Power (Conducted)	GFSK for 1Mbps 2.28 dBm / 1.69 mW π/4-DQPSK for 2Mbps 1.34 dBm / 1.36 mW 8DPSK for 3Mbps 1.31 dBm / 1.35 mW
20dB Bandwidth	GFSK: 1.295MHz 8DPSK: 1.317MHz
Emission Designator	GFSK: 1M30D1D 8DPSK: 1M32D1D

3 Test Methodology

3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: IDLE Mode
Mode 2: Normal Operation Mode
Mode 3: GFSK Link Mode
Mode 4: π/4-DQPSK Link Mode
Mode 5: 8DPSK Link Mode
Mode 6: Receiver Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

Description of Test Modes

Preliminary tests were performed in different modulation to find the worst case. The modulation has shown the worst-case in section 6.5. Investigation has been done on all the possible configurations for searching the worst cases.

Tested System Details

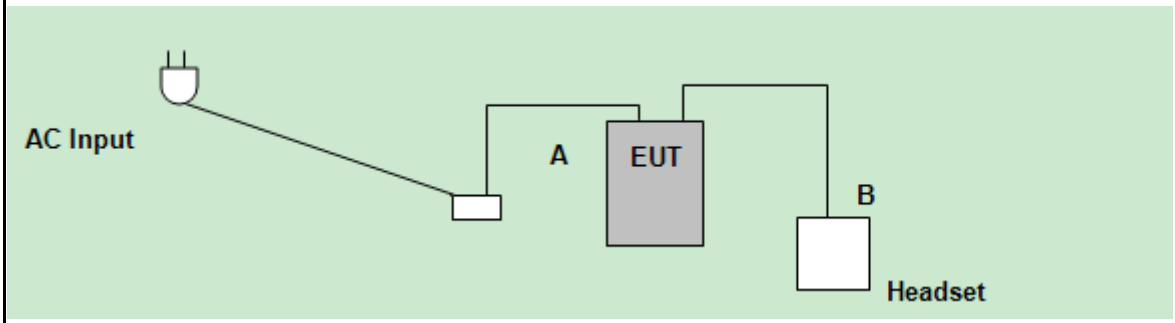
The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model Number	Serial Number	Power Cord
1.	Bluetooth Tester	R & S	CBT	100350	NA

3.2. EUT Exercise Software

1	Setup the EUT and Bluetooth Tester (CBT) as shown on 3.3.
2	Turn on the power of all equipment.
3	EUT run test program.
4	Open Bluetooth function link to CBT.

3.3. Configuration of Test System Details



Signal Cable Type		Signal Cable Description
A	DC USB Power Cable	Non-Shielded, 0.18 m
B	Headset Cable	Non-Shielded, 1.2 m

3.4. Test Site Environment

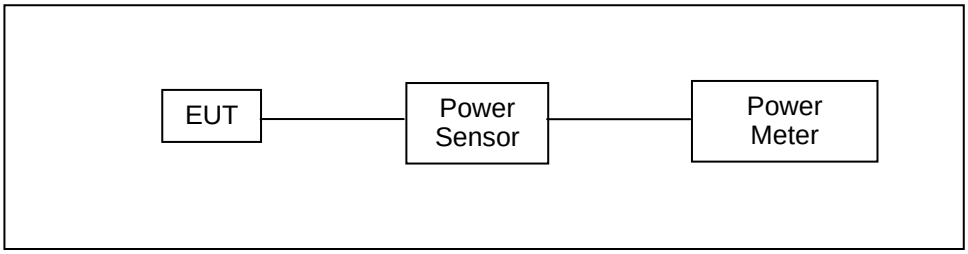
Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Maximum Conducted Output Power Measurement

4.1. Limit

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels < 1 watt.

4.2. Test Setup



4.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Single Channel PK Power Sensor	Agilent	N1911A	MY45101619	12/19/2012	(1)
Wideband Power Meter	Agilent	N1921A	MY45241957	12/19/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

4.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

4.5. Test Result

Model Number	ZeNano					
Test Item	Maximum Conducted Output Power					
Test Mode	Mode 3: GFSK Link Mode					
Date of Test	12/12/2013			Test Site	TE02	
Frequency (MHz)	Packet Type	Average Power		Peak Power		Limit (mW)
		(dBm)	(mW)	(dBm)	(mW)	
2402	DH1	1.47	1.40281	1.58	1.43880	< 1000
	DH3	1.99	1.58125	2.21	1.66341	
	DH5	2.08	1.61436	2.28	1.69044	
2441	DH1	1.18	1.31220	1.33	1.35831	
	DH3	1.62	1.45211	1.68	1.47231	
	DH5	1.63	1.45546	1.72	1.48594	
2480	DH1	1.49	1.40929	1.62	1.45211	
	DH3	2.07	1.61065	2.21	1.66341	
	DH5	2.12	1.62930	2.28	1.69044	

Model Number	ZeNano					
Test Item	Maximum Conducted Output Power					
Test Mode	Mode 4: π/4-DQPSK Mode					
Date of Test	12/12/2013			Test Site	TE02	
Frequency (MHz)	Packet Type	Average Power		Peak Power		Limit (mW)
		(dBm)	(mW)	(dBm)	(mW)	
2402	DH1	0.91	1.23285	1.12	1.29351	< 1000
	DH3	1.05	1.27236	1.25	1.33324	
	DH5	1.09	1.28464	1.29	1.34586	
2441	DH1	0.45	1.10897	0.64	1.15993	
	DH3	0.57	1.14100	0.73	1.18420	
	DH5	0.58	1.14386	0.74	1.18577	
2480	DH1	1.03	1.26762	1.20	1.31792	
	DH3	1.13	1.29619	1.31	1.35300	
	DH5	1.14	1.29874	1.34	1.36144	

Model Number	ZeNano					
Test Item	Maximum Conducted Output Power					
Test Mode	Mode 5: 8DPSK Link Mode					
Date of Test	12/12/2013			Test Site	TE02	
Frequency (MHz)	Packet Type	Average Power		Peak Power		Limit (mW)
		(dBm)	(mW)	(dBm)	(mW)	
2402	DH1	0.90	1.23086	1.22	1.32402	< 1000
	DH3	0.99	1.25513	1.23	1.32818	
	DH5	1.02	1.26499	1.27	1.33968	
2441	DH1	0.56	1.13832	0.63	1.15497	
	DH3	0.65	1.16276	0.67	1.16591	
	DH5	0.66	1.16293	0.70	1.17490	
2480	DH1	1.05	1.27341	1.25	1.33404	
	DH3	1.06	1.27702	1.29	1.34550	
	DH5	1.09	1.28558	1.31	1.35207	

5 Conducted Emission Measurement

5.1. Limit

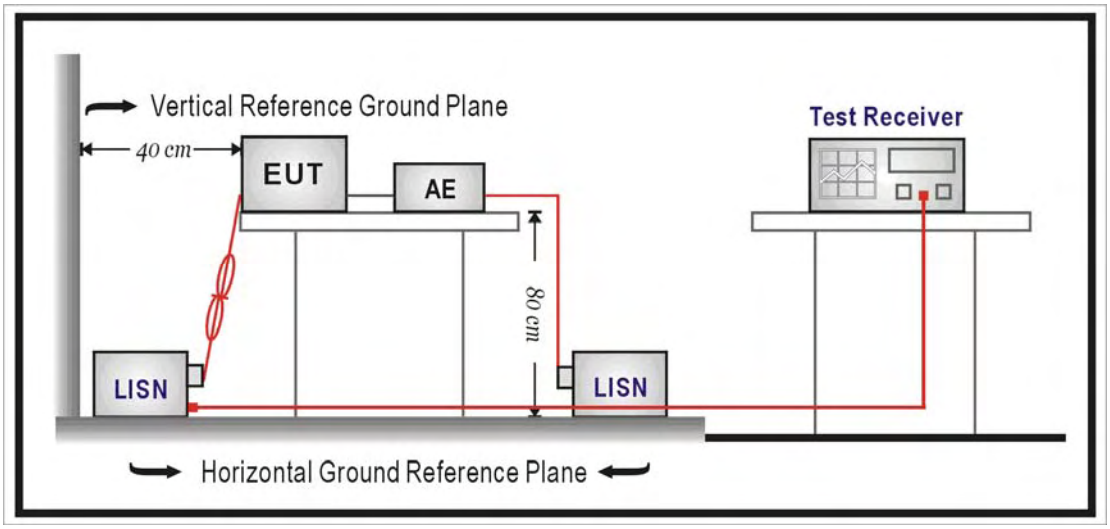
Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

5.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/06/2013	(1)
LISN	R&S	ENV216	101040	03/04/2013	(1)
LISN	R&S	ENV216	101041	03/04/2013	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

5.3. Test Setup



5.4. Test Procedure

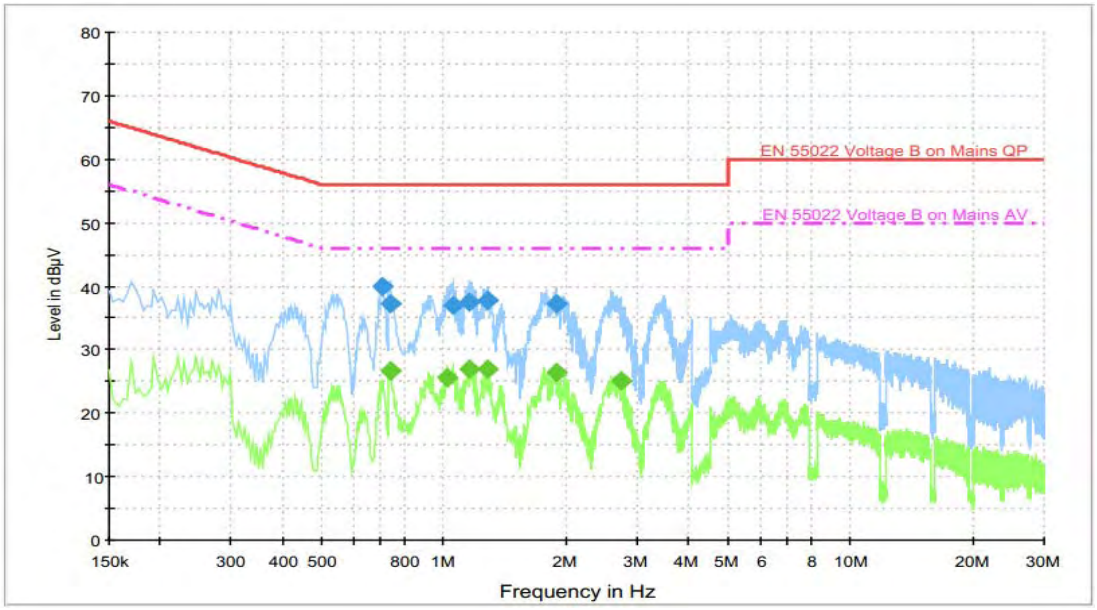
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

5.5. Test Result

Standard:	FCC Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	12/13/2011
		Test By:	Fly Lu
Description:			



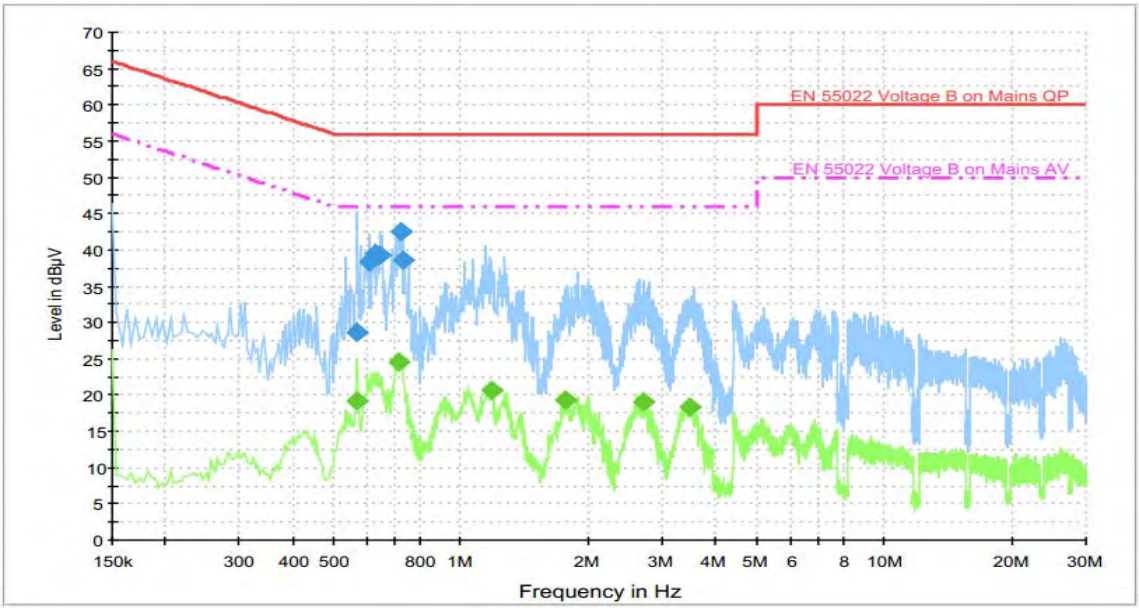
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.706000	40.2	FLO	L1	10.0	15.8	56.0
0.738000	37.1	FLO	L1	10.0	18.9	56.0
1.050000	36.9	FLO	L1	10.1	19.1	56.0
1.158000	37.5	FLO	L1	10.1	18.5	56.0
1.274000	37.7	FLO	L1	10.1	18.3	56.0
1.882000	37.3	FLO	L1	10.1	18.7	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.738000	26.5	FLO	L1	10.0	19.5	46.0
1.014000	25.1	FLO	N	10.1	20.9	46.0
1.150000	26.8	FLO	L1	10.1	19.2	46.0
1.282000	26.9	FLO	L1	10.1	19.1	46.0
1.898000	26.5	FLO	L1	10.1	19.5	46.0
2.718000	25.1	FLO	L1	10.2	20.9	46.0

Standard:	FCC Part 15C	Line:	N
Test item:	Conducted Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	12/13/2011
		Test By:	Fly Lu
Description:			



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.570000	28.7	FLO	L1	10.1	27.3	56.0
0.610000	38.5	FLO	L1	10.0	17.5	56.0
0.626000	39.6	FLO	L1	10.0	16.4	56.0
0.646000	39.3	FLO	L1	10.0	16.7	56.0
0.718000	42.5	FLO	L1	10.0	13.5	56.0
0.734000	38.7	FLO	L1	10.0	17.3	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.570000	19.1	FLO	L1	10.1	26.9	46.0
0.710000	24.9	FLO	L1	10.0	21.1	46.0
1.178000	20.8	FLO	L1	10.0	25.2	46.0
1.774000	19.2	FLO	L1	10.1	26.8	46.0
2.710000	18.5	FLO	L1	10.2	27.5	46.0
3.474000	17.7	FLO	L1	10.2	28.3	46.0

6 Radiated Interference Measurement

6.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meters)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** 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.

6.2. Test Instruments

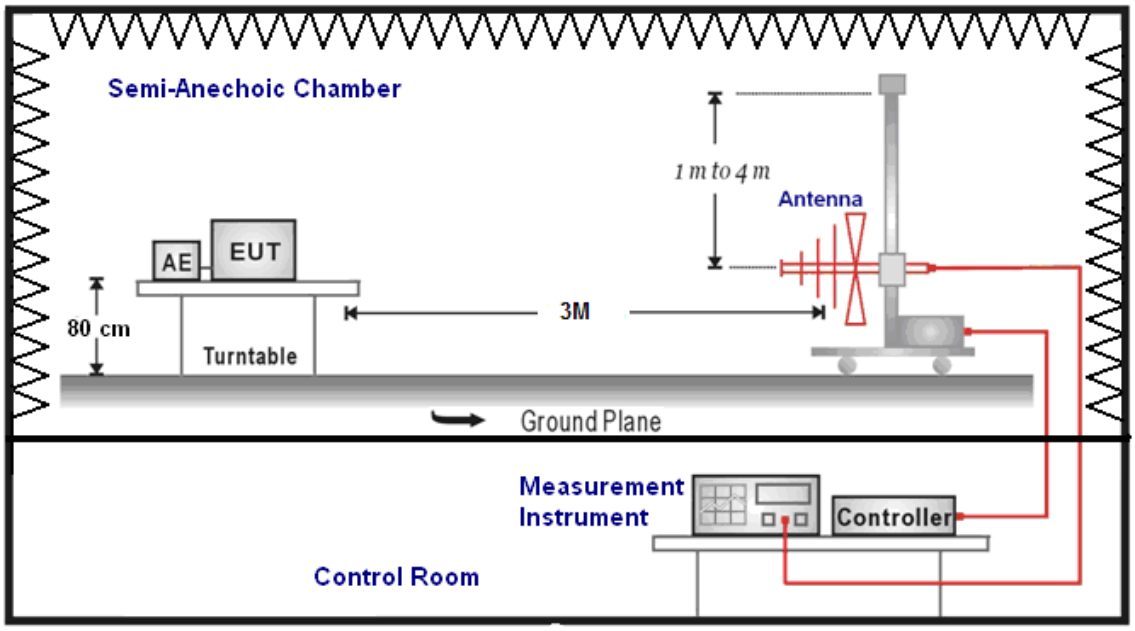
3 Meter Chamber (966-A)					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/21/2013	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/21/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/21/2013	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/01/2013	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/10/2013	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2013	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	08/14/2013	(3)
Test Site	ATL	TE01	888001	08/28/2013	(1)

3 Meter Chamber (966-B)					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/10/2013	(1)
Amplifier	Mini-Circuits	ZKL-1R5+	072010	05/29/2013	(1)
Amplifier	Mini-Circuits	ZVA-213-S+	467900926	05/29/2013	(1)
RF Pre-selector	Agilent	N9039A	MY46520255	01/21/2013	(1)
Double-Ridged Waveguide Horn	ETS-Lindgren	3117	00128055	08/24/2013	(1)
Trilog-Broadband Antenna	Schwarzbeck Mess-Elektronik	SB AC VULB	9168-419	05/10/2013	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	08/14/2013	(3)
Test Site	ATL	TE09	TE09	05/10/2013	(1)

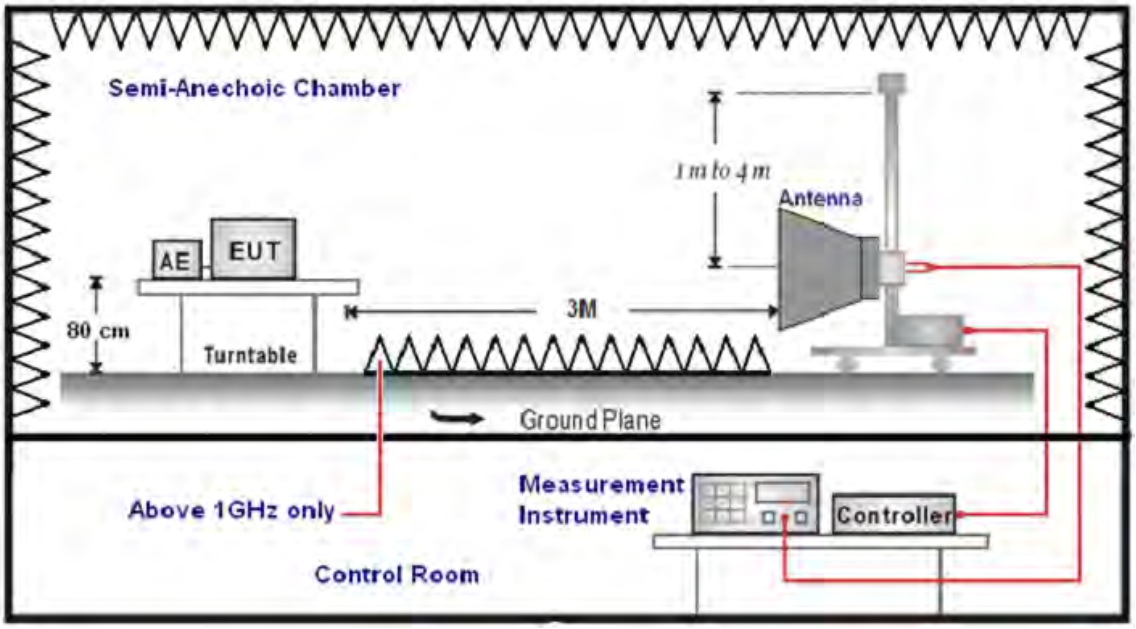
Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
NOTE: N.C.R. = No Calibration Request.

6.3. Setup

Below 1GHz



Above 1GHz



6.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

6.5. Test Result

Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	12/16/2013
		Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dB	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
44.25	47.6	-33.4	14.2	40.0	25.8	QP	H
67.89	54.5	-36.9	17.6	40.0	22.4	QP	H
154.68	62.3	-39.7	22.6	43.5	20.9	QP	H
158.24	63.2	-39.5	23.7	43.5	19.8	QP	H
214.35	60.4	-35.9	24.5	43.5	19.0	QP	H
496.63	51.6	-28.8	22.8	46.0	23.2	QP	H
44.22	51.8	-34.6	17.2	40.0	22.8	QP	V
56.21	50.5	-34.7	15.8	40.0	24.2	QP	V
114.37	51.2	-35.7	15.5	43.5	28.0	QP	V
153.26	60.8	-39.5	21.3	43.5	22.2	QP	V
156.72	61.8	-39.4	22.4	43.5	21.1	QP	V
675.84	51.5	-26.3	25.2	46.0	20.8	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).

Above 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804	36.5	5.8	42.3	74.0	31.7	peak	H
4804	26.7	5.8	32.5	54.0	21.5	Average	H
7206	41.6	6.8	48.4	74.0	25.6	peak	H
7206	30.0	6.8	36.8	54.0	17.2	Average	H
4804	39.1	5.8	44.9	74.0	29.1	peak	V
4804	27.3	5.8	33.1	54.0	20.9	Average	V
7206	38.4	6.8	45.2	74.0	28.8	peak	V
7206	28.9	6.8	35.7	54.0	18.3	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2441 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4882	38.3	5.9	44.2	74.0	29.8	peak	H
4882	27.7	5.9	33.6	54.0	20.4	Average	H
7323	42.9	6.8	49.7	74.0	24.3	peak	H
7323	28.7	6.8	35.5	54.0	18.5	Average	H
4882	39.6	5.9	45.5	74.0	28.5	peak	V
4882	28.8	5.9	34.7	54.0	19.3	Average	V
7323	41.3	6.8	48.1	74.0	25.9	peak	V
7323	29.1	6.8	35.9	54.0	18.1	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	38.9	5.9	44.8	74.0	29.2	peak	H
4960	26.2	5.9	32.1	54.0	21.9	Average	H
7440	40.6	6.8	47.4	74.0	26.6	peak	H
7440	27.1	6.8	33.9	54.0	20.1	Average	H
4960	37.9	5.9	43.8	74	30.2	peak	V
4960	26.5	5.9	32.4	54	21.6	Average	V
7440	38.4	6.8	45.2	74	28.8	peak	V
7440	27.7	6.8	34.5	54	19.5	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804	35.7	5.8	41.5	74.0	32.5	peak	H
4804	26.2	5.8	32.0	54.0	22.0	Average	H
7206	41.0	6.8	47.8	74.0	26.2	peak	H
7206	29.4	6.8	36.2	54.0	17.8	Average	H
4804	38.7	5.8	44.5	74.0	29.5	peak	V
4804	27.2	5.8	33.0	54.0	21.0	Average	V
7206	38.1	6.8	44.9	74.0	29.1	peak	V
7206	28.4	6.8	35.2	54.0	18.8	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2441 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4882	38.1	5.9	44.0	74.0	30.0	peak	H
4882	27.7	5.9	33.6	54.0	20.4	Average	H
7323	42.7	6.8	49.5	74.0	24.5	peak	H
7323	28.0	6.8	34.8	54.0	19.2	Average	H
4882	39.6	5.9	45.5	74.0	28.5	peak	V
4882	28.4	5.9	34.3	54.0	19.7	Average	V
7323	40.7	6.8	47.5	74.0	26.5	peak	V
7323	29.0	6.8	35.8	54.0	18.2	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	38.4	5.9	44.3	74.0	29.7	peak	H
4960	25.8	5.9	31.7	54.0	22.3	Average	H
7440	39.9	6.8	46.7	74.0	27.3	peak	H
7440	26.8	6.8	33.6	54.0	20.4	Average	H
4960	37.8	5.9	43.7	74	30.3	peak	V
4960	26.0	5.9	31.9	54	22.1	Average	V
7440	38.2	6.8	45.0	74	29.0	peak	V
7440	27.2	6.8	34.0	54	20.0	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4804	35.5	5.8	41.3	74.0	32.7	peak	H
4804	26.0	5.8	31.8	54.0	22.2	Average	H
7206	40.8	6.8	47.6	74.0	26.4	peak	H
7206	29.4	6.8	36.2	54.0	17.8	Average	H
4804	38.2	5.8	44.0	74.0	30.0	peak	V
4804	26.8	5.8	32.6	54.0	21.4	Average	V
7206	37.8	6.8	44.6	74.0	29.4	peak	V
7206	27.8	6.8	34.6	54.0	19.4	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2441 MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4882	37.8	5.9	43.7	74.0	30.3	peak	H
4882	27.0	5.9	32.9	54.0	21.1	Average	H
7323	42.2	6.8	49.0	74.0	25.0	peak	H
7323	28.1	6.8	34.9	54.0	19.1	Average	H
4882	39.4	5.9	45.3	74.0	28.7	peak	V
4882	27.6	5.9	33.5	54.0	20.5	Average	V
7323	40.1	6.8	46.9	74.0	27.1	peak	V
7323	28.1	6.8	34.9	54.0	19.1	Average	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu

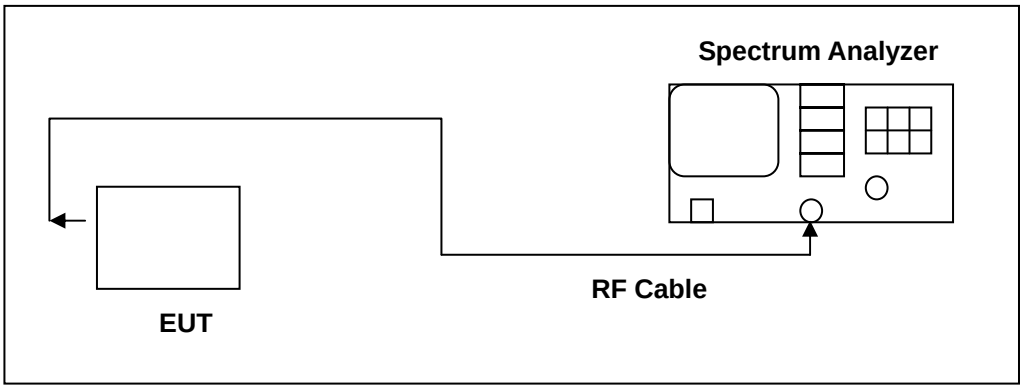
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
4960	38.5	5.9	44.4	74.0	29.6	peak	H
4960	24.9	5.9	30.8	54.0	23.2	Average	H
7440	39.5	6.8	46.3	74.0	27.7	peak	H
7440	26.1	6.8	32.9	54.0	21.1	Average	H
4960	37.3	5.9	43.2	74	30.8	peak	V
4960	25.5	5.9	31.4	54	22.6	Average	V
7440	37.5	6.8	44.3	74	29.7	peak	V
7440	27.0	6.8	33.8	54	20.2	Average	V

7 20dB RF Bandwidth Measurement

7.1. Limit

N/A

7.2. Test Setup



7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

7.4. Test Procedure

20dB RF Bandwidth

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

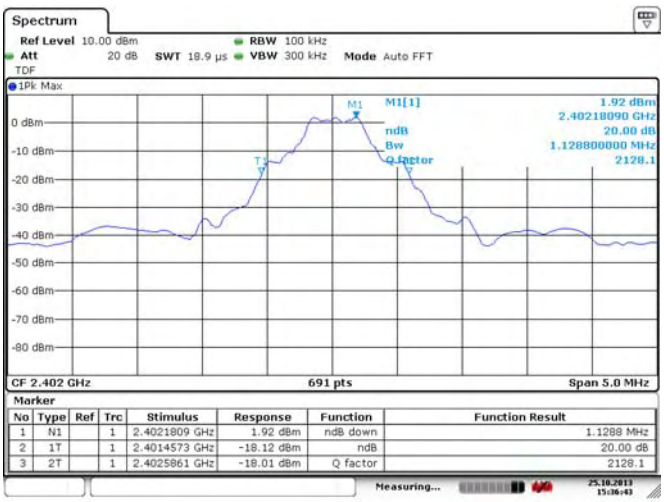
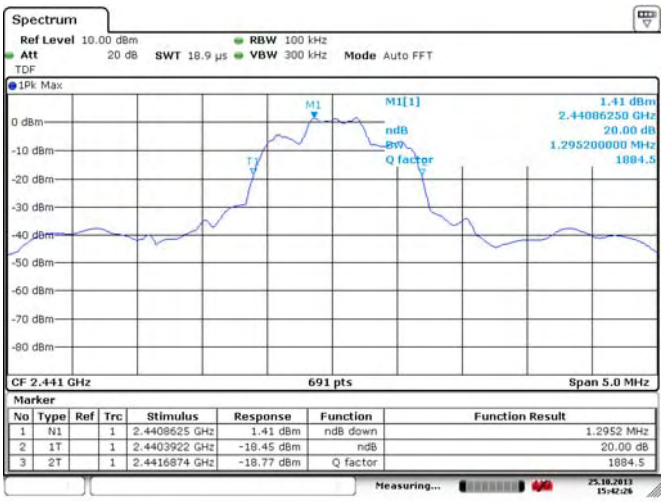
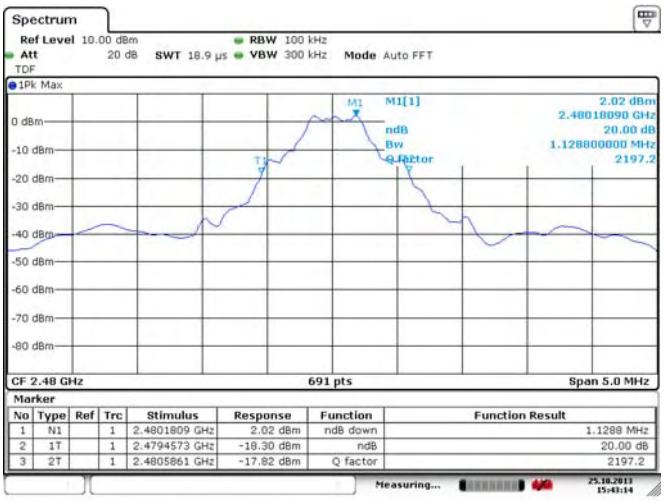
7.5. Test Result

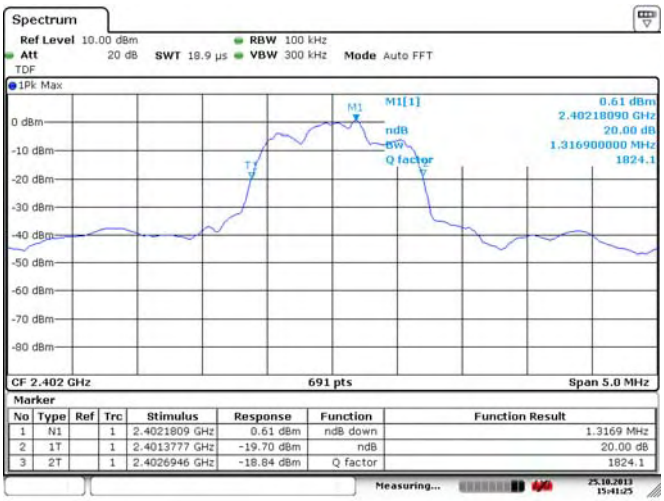
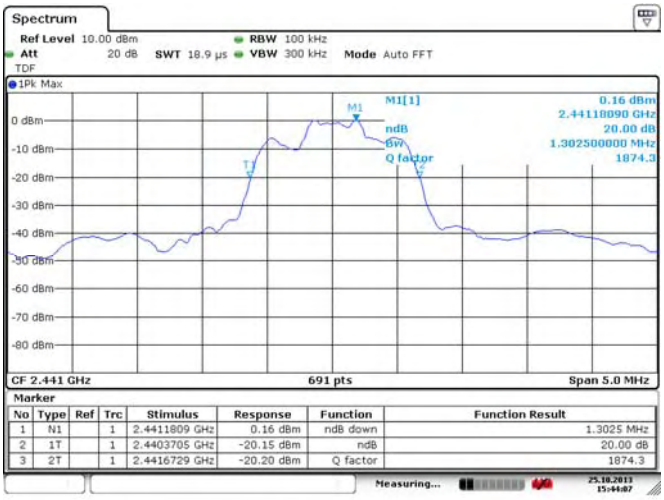
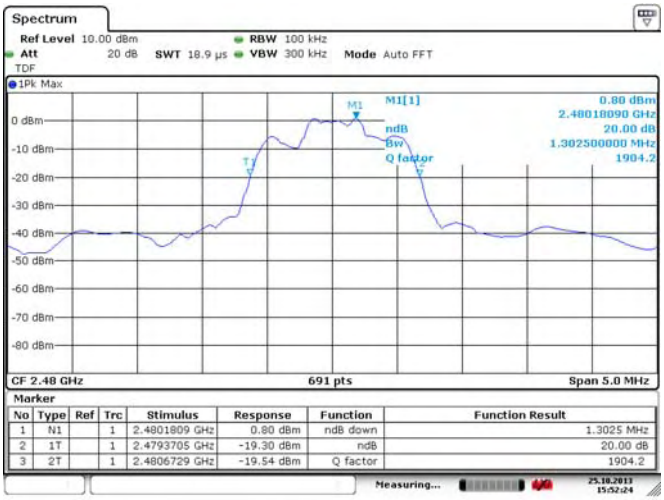
Model Number			
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth		
Test Mode	Mode 3: GFSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	20dB RF Bandwidth (MHz)	Limit (MHz)	
2402	1.129	-----	
2441	1.295	-----	
2480	1.129	-----	

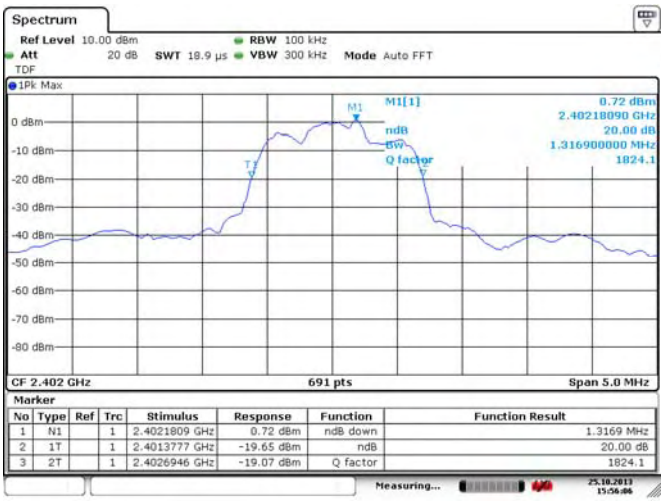
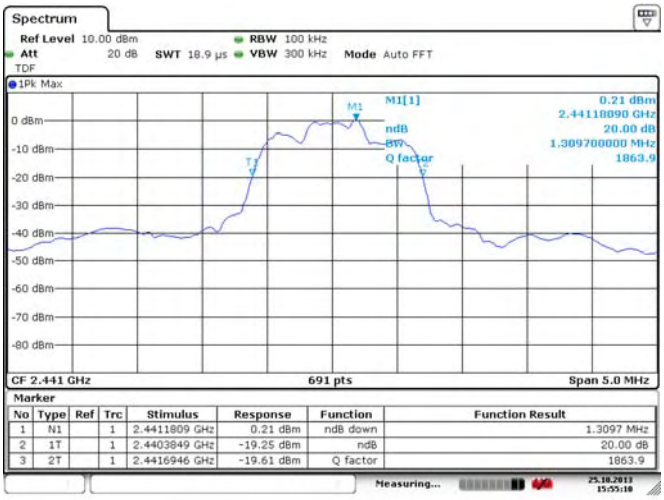
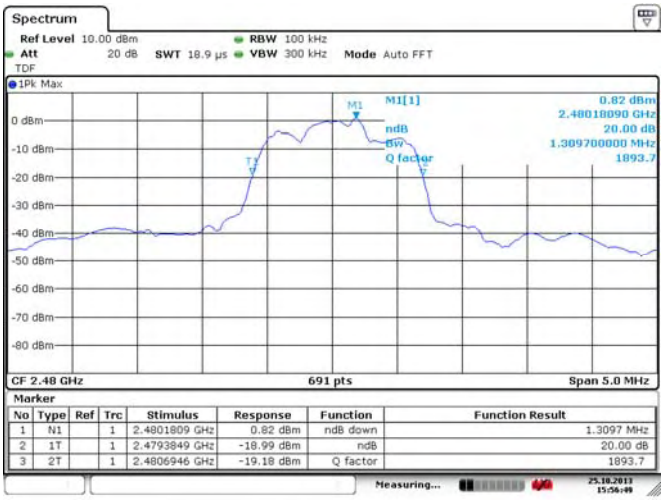
Model Number			
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth		
Test Mode	Mode 4: π/4-DQPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	20dB RF Bandwidth (MHz)	Limit (MHz)	
2402	1.317	-----	
2441	1.303	-----	
2480	1.303	-----	

Model Number			
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth		
Test Mode	Mode 5: 8DPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	20dB RF Bandwidth (MHz)	Limit (MHz)	
2402	1.317	-----	
2441	1.310	-----	
2480	1.310	-----	

7.6. Test Graphs

Mode 2: GFSK Link Mode	
2402	
2441	
2480	

Mode 4: π/4-DQPSK Link Mode	
2402	
2441	
2480	

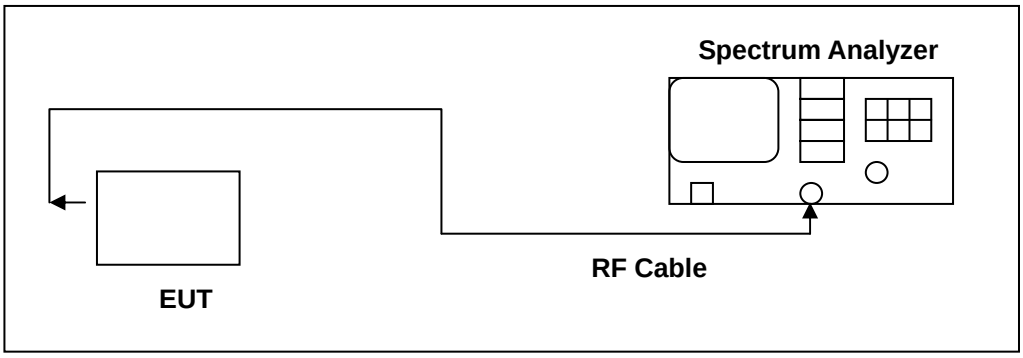
Mode 5: 8DPSK Link Mode	
2402	
2441	
2480	

8 Carrier Frequency Separation Measurement

8.1. Limit

Title 47 of the CFR, Part 15 Subpart (c) 15.247(a)(1)(i) requires the measurement of the bandwidth of the transmission between the -20 dB points on the transmitted spectrum. The results of this test determine the limits for channel spacing. The channel spacing shall be a minimum of 25 kHz or the 20 dB bandwidth.

8.2. Test Setup



8.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

8.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth transmitter of the V6 had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
3. Video (or Average) Bandwidth (VBW) ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

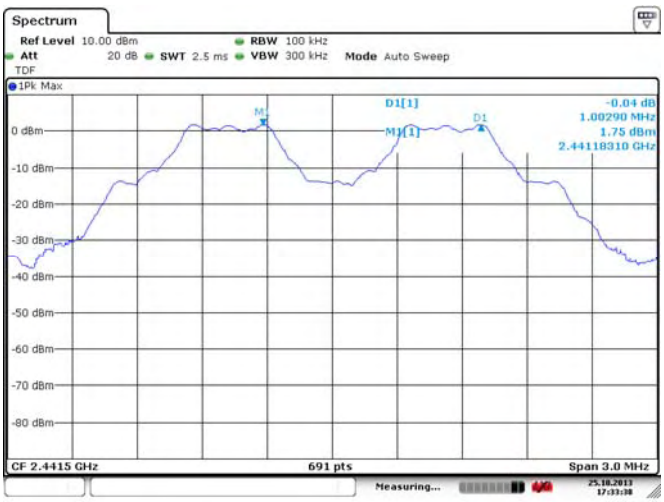
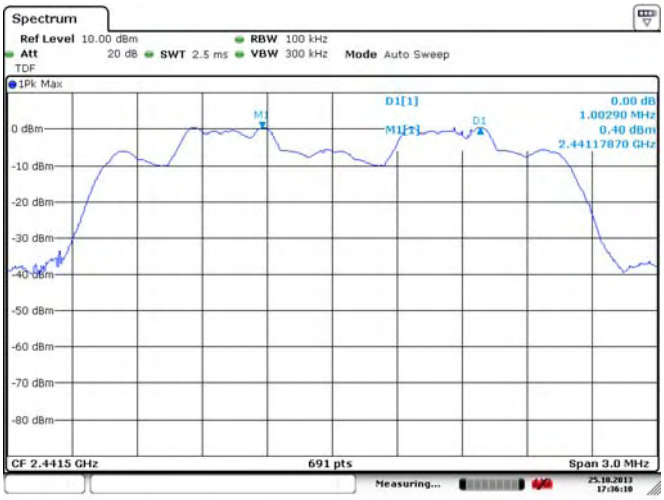
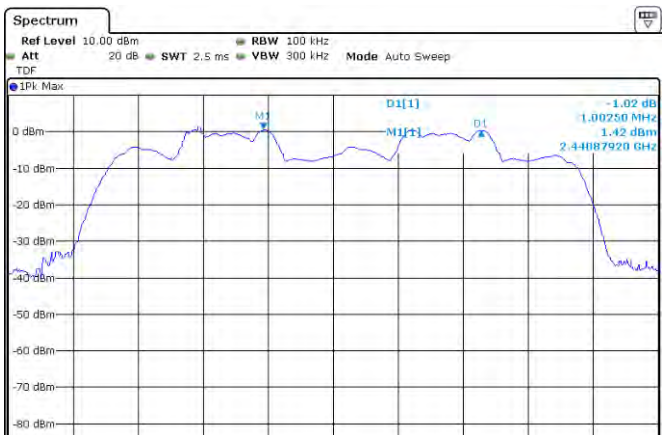
8.5. Test Result

Model Number			
Test Item	Carrier Frequency Separation		
Test Mode	Mode 3: GFSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	Measurement (MHz)	Limit (MHz)	
2441	1.003	> 0.863	

Model Number			
Test Item	Carrier Frequency Separation		
Test Mode	Mode 4: π/4-DQPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	Measurement (MHz)	Limit (MHz)	
2441	1.003	> 0.878	

Model Number			
Test Item	Carrier Frequency Separation		
Test Mode	Mode 5: 8DPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency (MHz)	Measurement (MHz)	Limit (MHz)	
2441	1.003	> 0.878	

8.6. Test Graphs

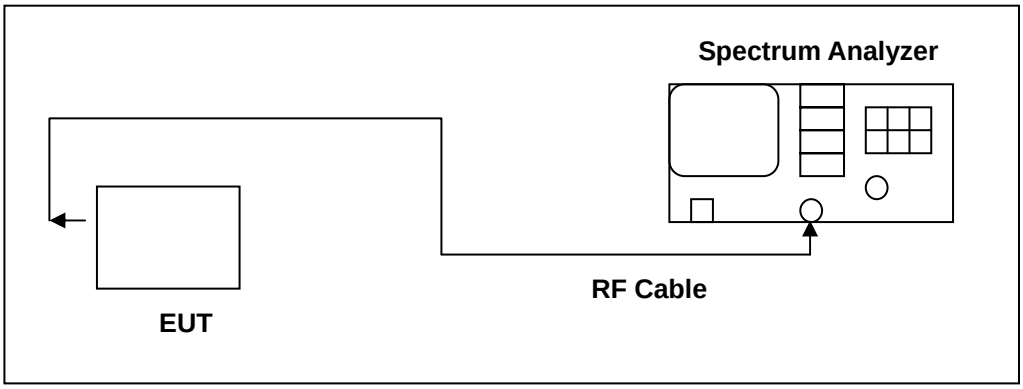
Mode 3: GFSK Link Mode	
2441	
Mode 4: π/4-DQPSK Link Mode	
2441	
Mode 5: 8DPSK Link Mode	
2441	

9 Number of Hopping Measurement

9.1. Limit

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

9.2. Test Setup



9.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

9.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW ≥ 1% of the span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize.

9.5. Test Result

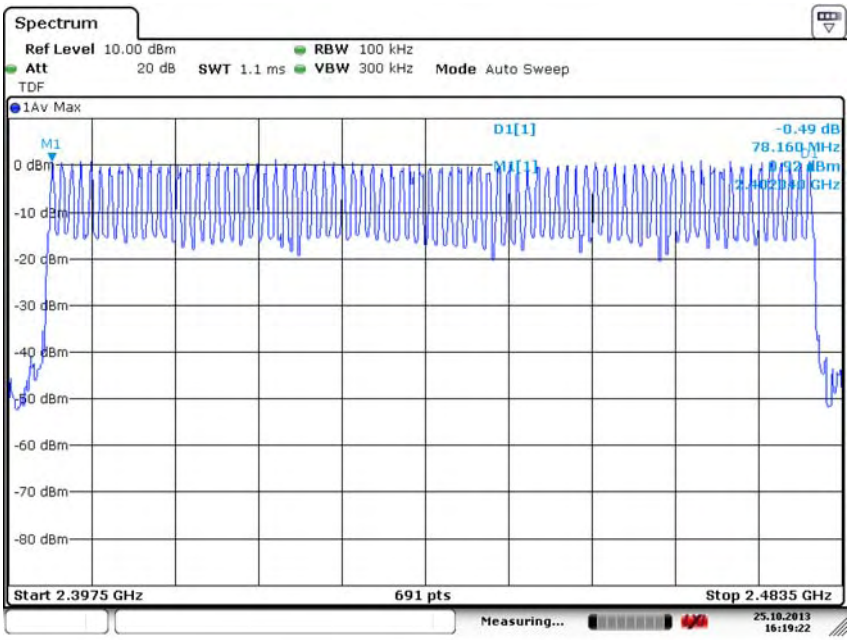
Model Number			
Test Item	Number of Hopping		
Test Mode	Mode 3: GFSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency Range (MHz)	Measurement (ch)	Limit (ch)	
2402 - 2480	79	> 15	

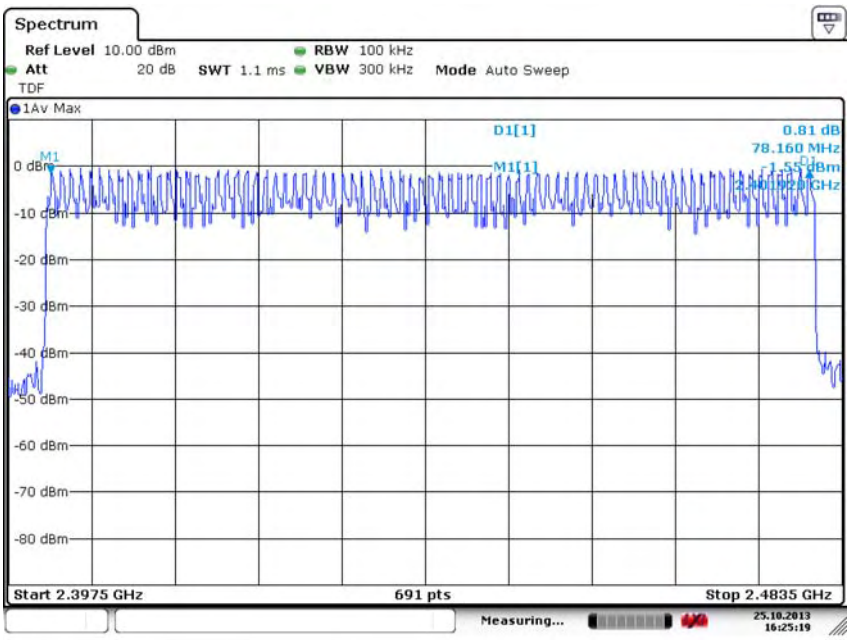
Model Number			
Test Item	Number of Hopping		
Test Mode	Mode 4: π/4-DQPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency Range (MHz)	Measurement (ch)	Limit (ch)	
2402 - 2480	79	> 15	

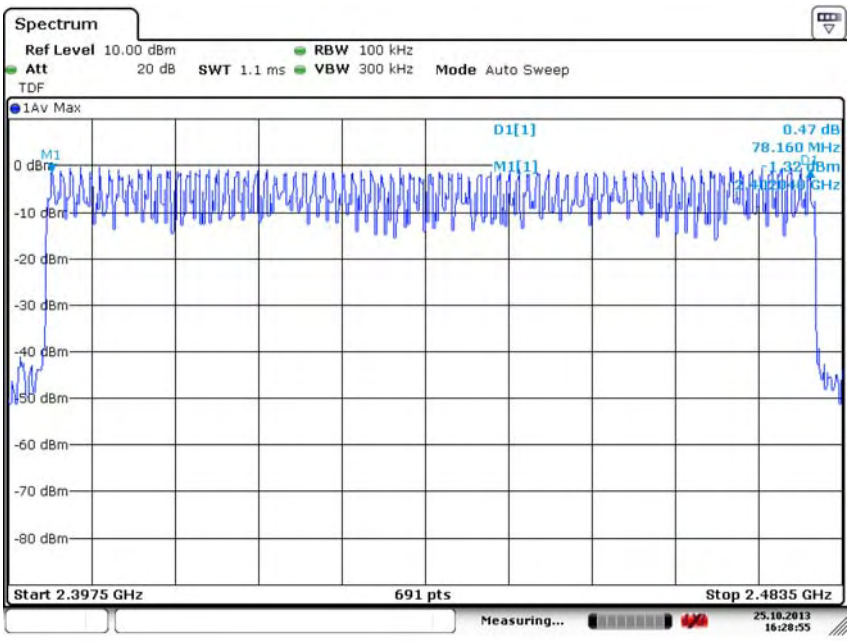
Model Number			
Test Item	Number of Hopping		
Test Mode	Mode 5: 8DPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
Frequency Range (MHz)	Measurement (ch)	Limit (ch)	
2402 - 2480	79	> 15	

9.6. Test Graphs

Mode 3: GFSK Link Mode



Mode 3: GFSK Link Mode


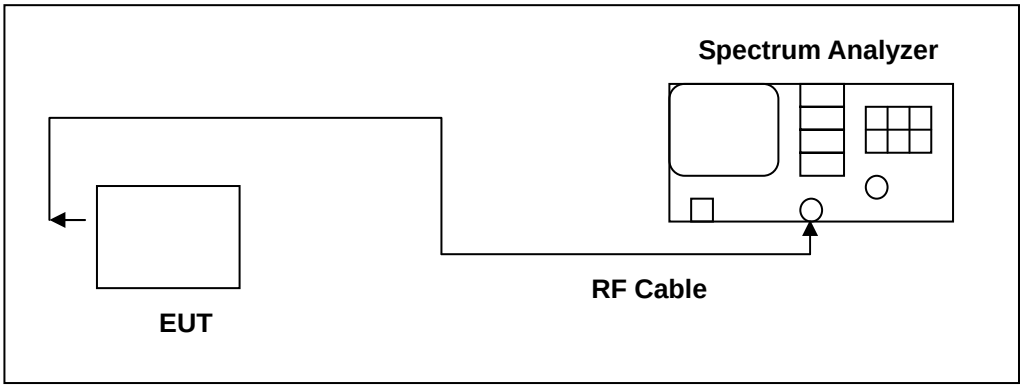
Mode 3: GFSK Link Mode


10 Time of Occupancy (Dwell Time) Measurement

10.1. Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

10.2. Test Setup



10.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

10.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW ≥ RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

The marker-delta function was used to determine the dwell time.

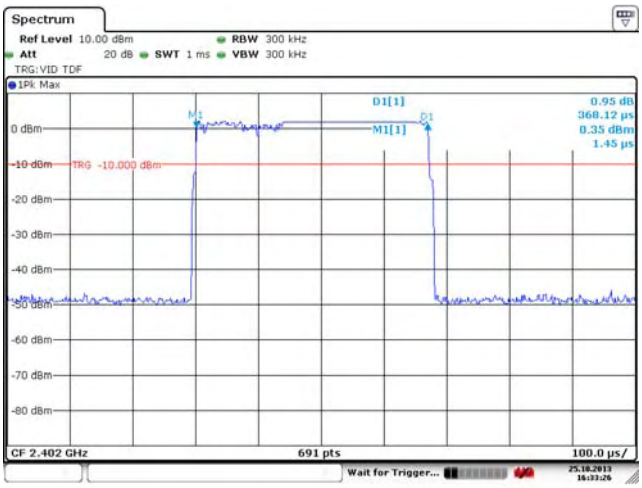
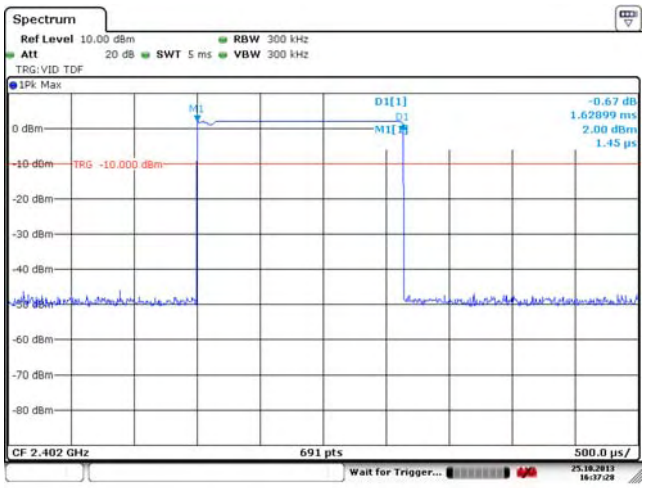
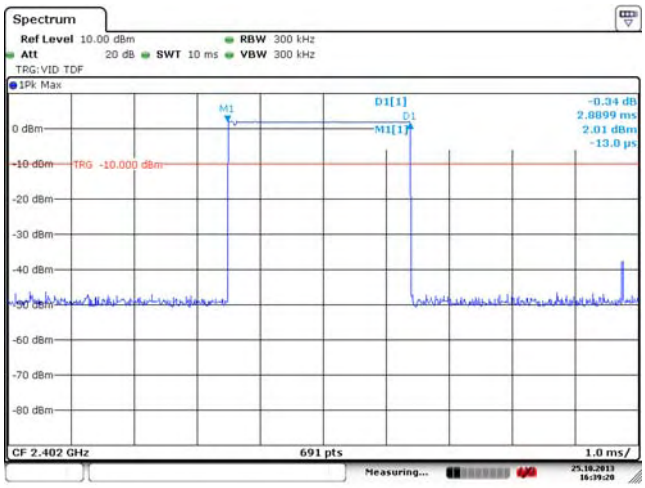
10.5. Test Result

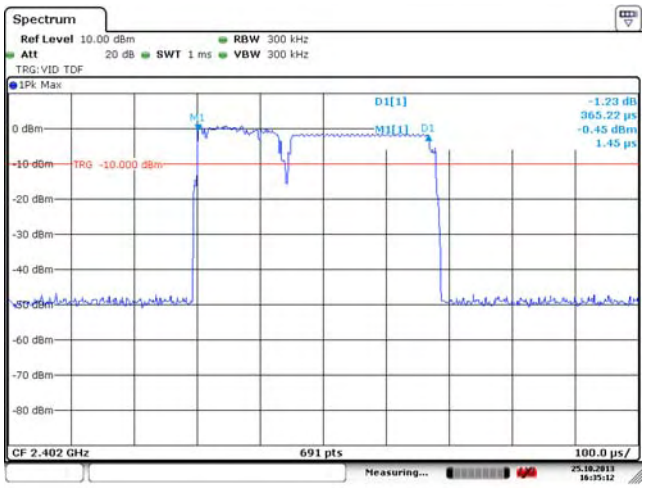
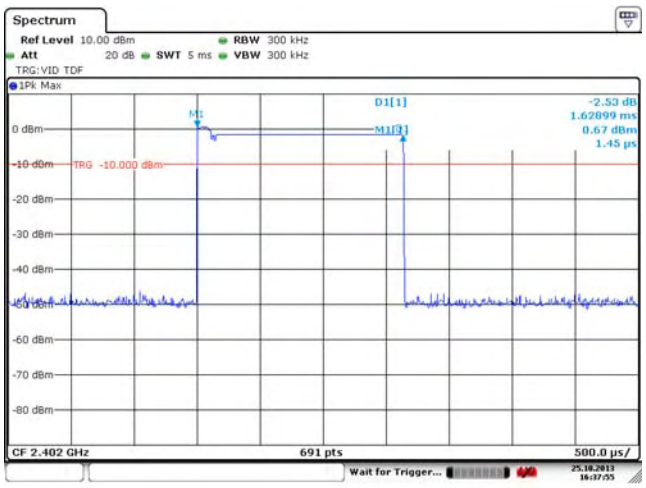
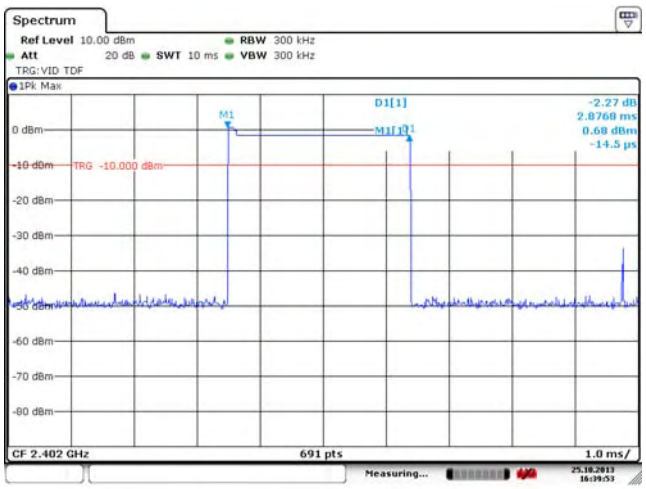
Model Number			
Test Item	Time of Occupancy (Dwell Time)		
Test Mode	Mode 3: GFSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
DH1			
Cycle Calculate	79CH * 0.4 = 31.6 (sec)		
The EUT Hopping Number per Sec	1600 times/sec		
Each Channel Dwell Times per Sec	800/79CH = 10.13(times/sec)		
Each Channel Dwell Times (1)	0.368 ms (sec)		
Each Channel Dwell Times on Cycle(2)	31.6 * 10.13 = 320.108(times)		
Dwell Times on Cycle (1) * (2)	117.7997 ms (sec)		
LIMIT(msec)	< = 400		
DH3			
Cycle Calculate	79CH * 0.4 = 31.6 (sec)		
The EUT Hopping Number per Sec	1600 times/sec		
Each Channel Dwell Times per Sec	400/79CH = 5.1(times/sec)		
Each Channel Dwell Times (1)	1.629 ms (sec)		
Each Channel Dwell Times on Cycle(2)	31.6 * 5.1 = 161.16(times)		
Dwell Times on Cycle (1) * (2)	262.5296 ms (sec)		
LIMIT(msec)	< = 400		
DH5			
Cycle Calculate	79CH * 0.4 = 31.6 (sec)		
The EUT Hopping Number per Sec	1600 times/sec		
Each Channel Dwell Times per Sec	266.7/79CH = 3.37(times/sec)		
Each Channel Dwell Times (1)	2.890 ms (sec)		
Each Channel Dwell Times on Cycle(2)	31.6 * 3.37 = 106.492(times)		
Dwell Times on Cycle (1) * (2)	307.7619 ms (sec)		
LIMIT(msec)	< = 400		

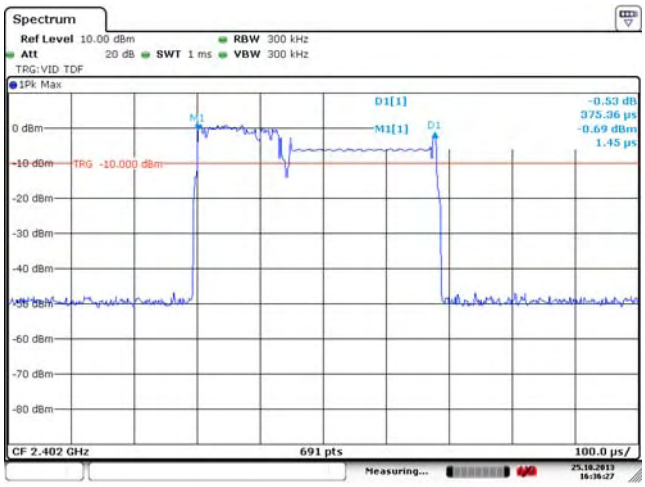
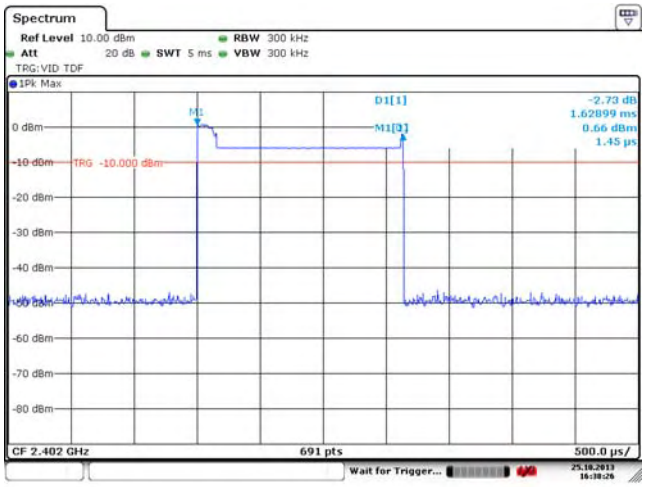
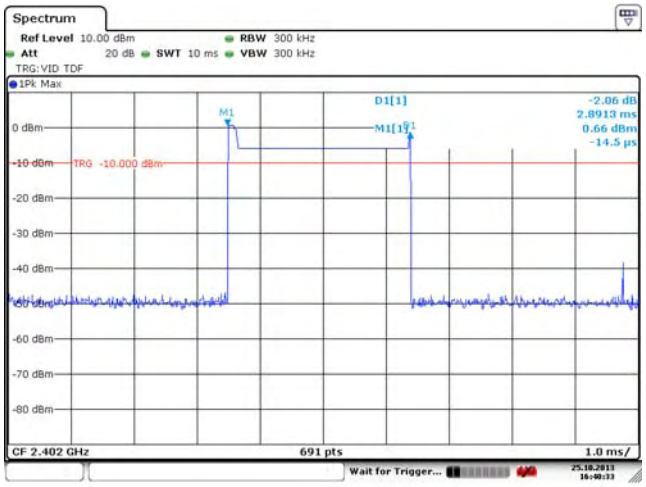
Model Number			
Test Item	Time of Occupancy (Dwell Time)		
Test Mode	Mode 4: π/4-DQPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
2DH1			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		800/79CH = 10.13(times/sec)	
Each Channel Dwell Times (1)		0.365ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 10.13 = 320.108(times)	
Dwell Times on Cycle (1) * (2)		116.8394 ms (sec)	
LIMIT(msec)		< = 400	
2DH3			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		400/79CH = 5.1(times/sec)	
Each Channel Dwell Times (1)		1.629ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 5.1 = 161.16(times)	
Dwell Times on Cycle (1) * (2)		262.5296 ms (sec)	
LIMIT(msec)		< = 400	
2DH5			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		266.7/79CH = 3.37(times/sec)	
Each Channel Dwell Times (1)		2.877ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 3.37 = 106.492(times)	
Dwell Times on Cycle (1) * (2)		306.3775 ms (sec)	
LIMIT(msec)		< = 400	

Model Number			
Test Item	Time of Occupancy (Dwell Time)		
Test Mode	Mode 5: 8DPSK Link Mode		
Date of Test	12/12/2013	Test Site	TE02
3DH1			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		800/79CH = 10.13(times/sec)	
Each Channel Dwell Times (1)		0.3754 ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 10.13 = 320.108(times)	
Dwell Times on Cycle (1) * (2)		120.1685 ms (sec)	
LIMIT(msec)		< = 400	
3DH3			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		400/79CH = 5.1(times/sec)	
Each Channel Dwell Times (1)		1.629 ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 5.1 = 161.16(times)	
Dwell Times on Cycle (1) * (2)		262.5296 ms (sec)	
LIMIT(msec)		< = 400	
3DH5			
Cycle Calculate		79CH * 0.4 = 31.6 (sec)	
The EUT Hopping Number per Sec		1600 times/sec	
Each Channel Dwell Times per Sec		266.7/79CH = 3.37(times/sec)	
Each Channel Dwell Times (1)		2.891 ms (sec)	
Each Channel Dwell Times on Cycle(2)		31.6 * 3.37 = 106.492(times)	
Dwell Times on Cycle (1) * (2)		307.8684 ms (sec)	
LIMIT(msec)		< = 400	

10.6. Test Graphs

Mode 3: GFSK Link Mode	
DH1	
DH3	
DH5	

Mode 4: π/4-DQPSK Link Mode	
2DH1	
2DH3	
2DH5	

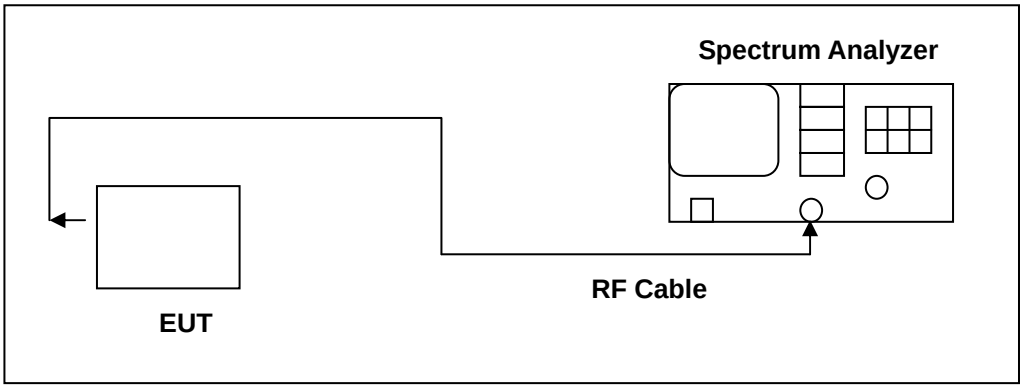
Mode 5: 8DPSK Link Mode	
3DH1	
3DH3	
3DH5	

11 Out of Band Conducted Emissions Measurement

11.1. Limit

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

11.2. Test Setup



11.3. Test Instruments

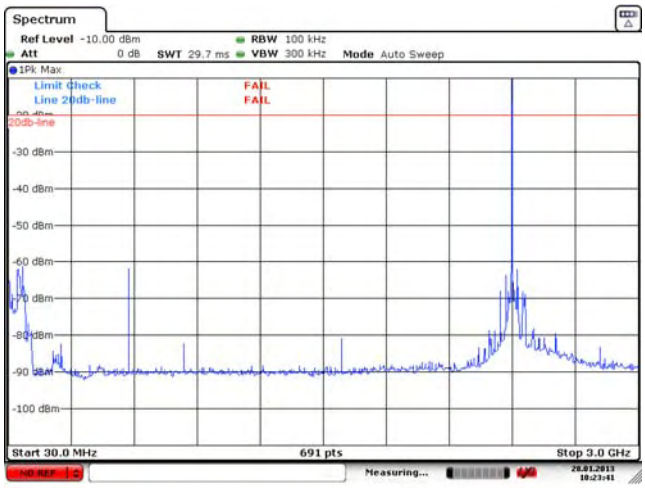
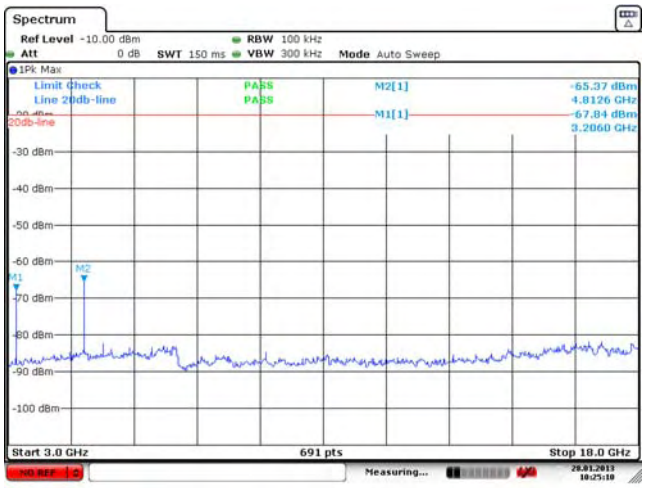
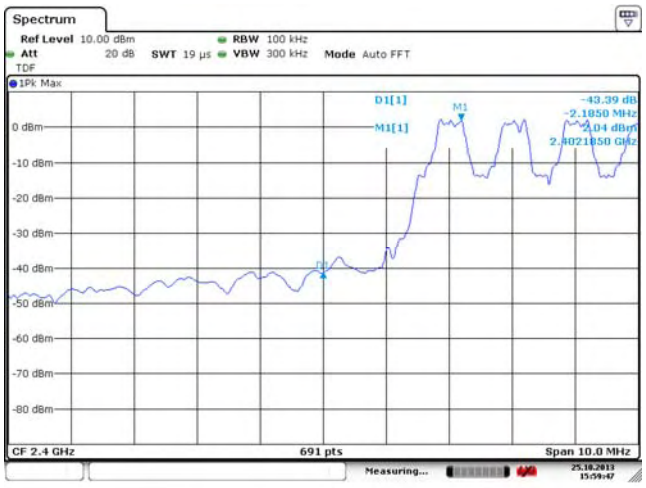
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/19/2012	(1)
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/09/2012	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

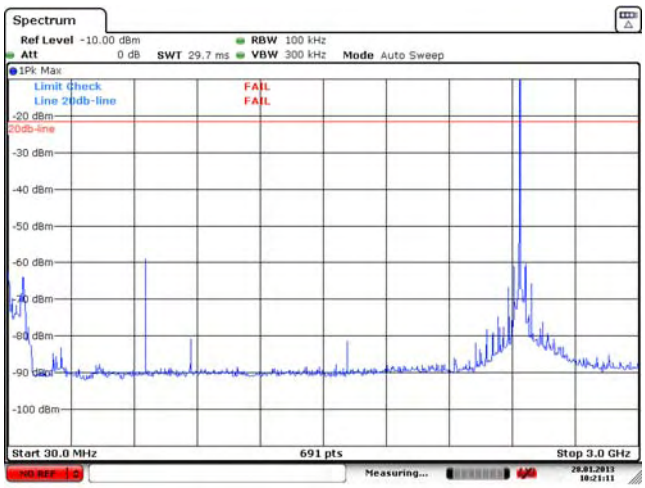
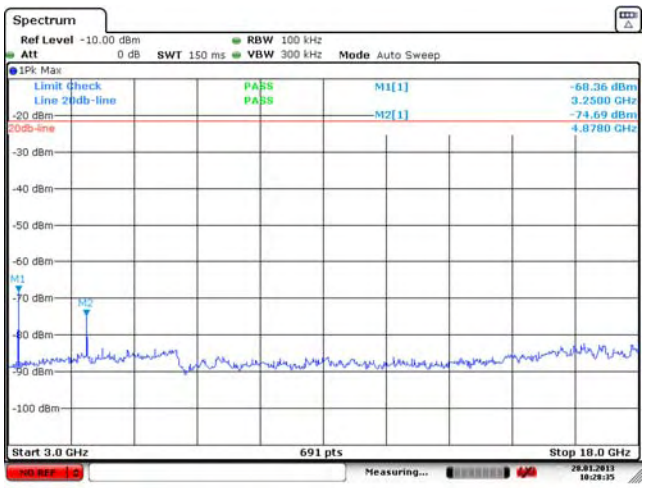
Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

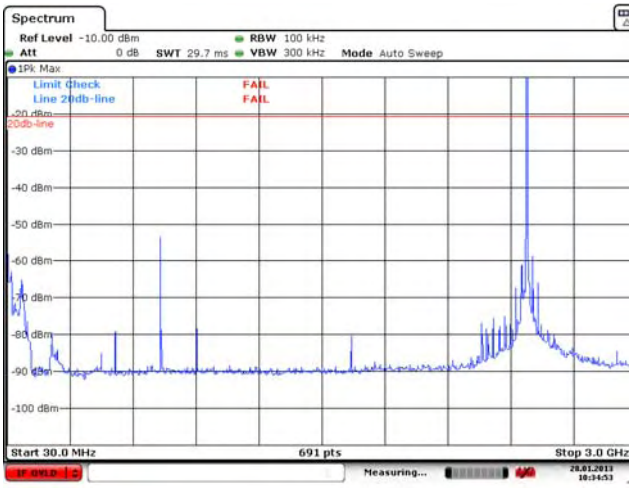
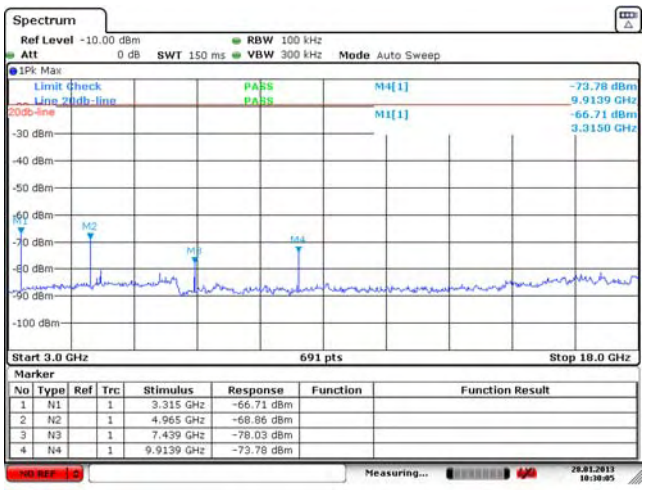
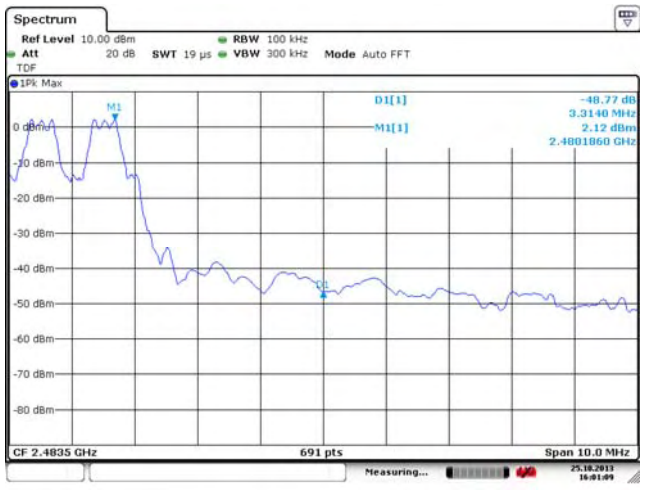
11.4. Test Procedure

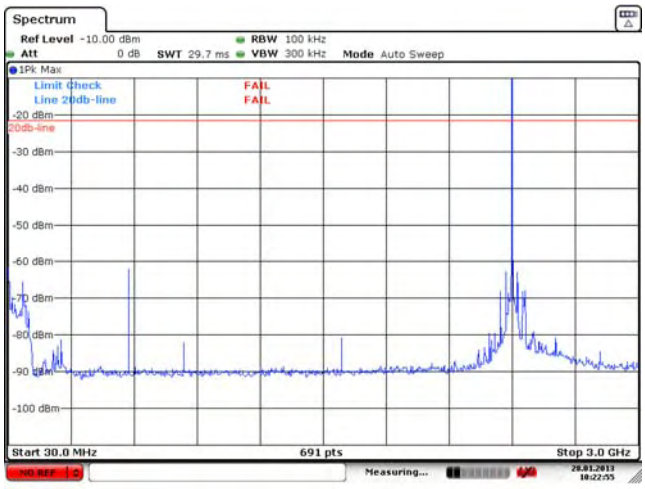
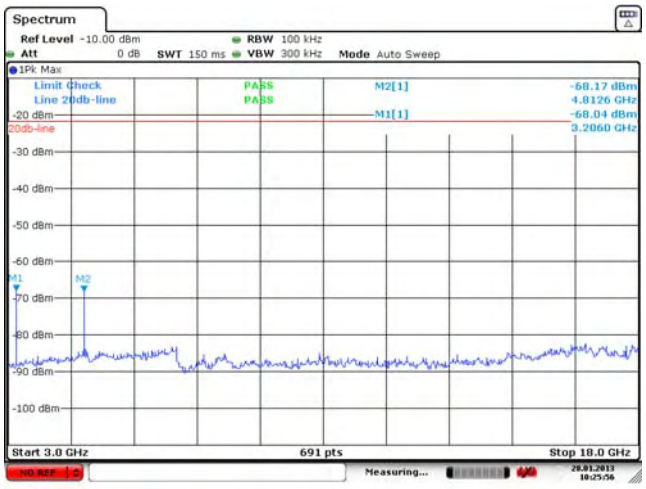
Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels (Channel 0, 39, 78)

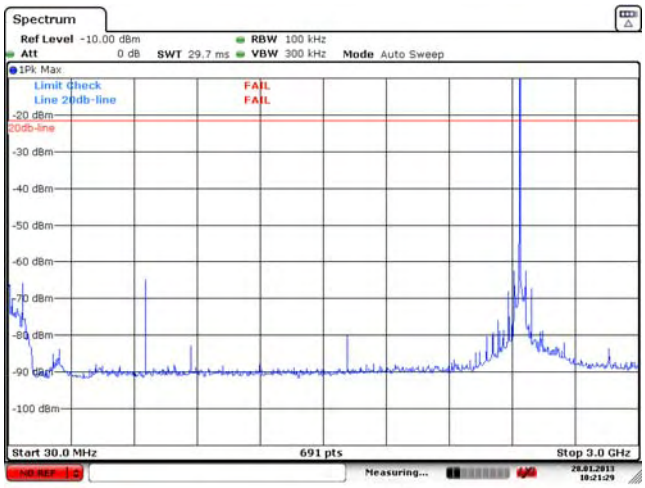
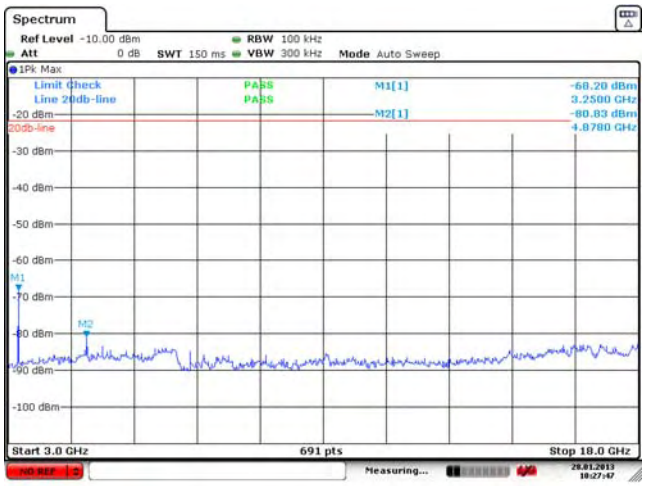
11.5. Test Graphs

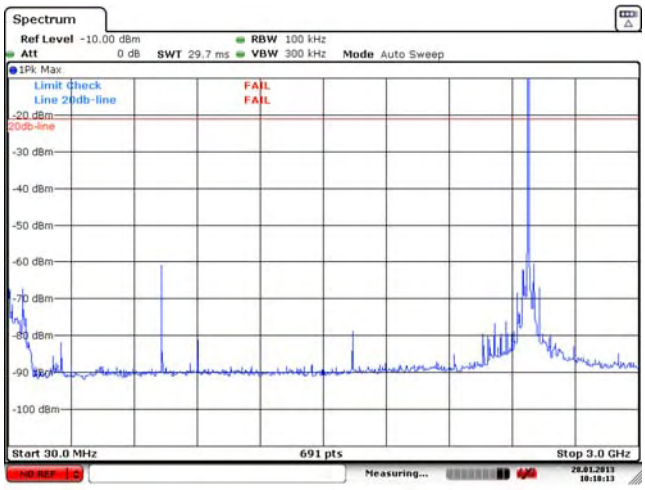
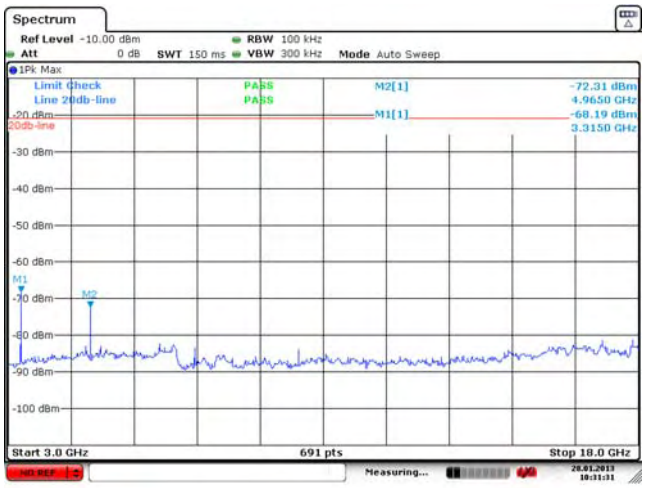
Mode 3: GFSK Link Mode	
2402	
	
	

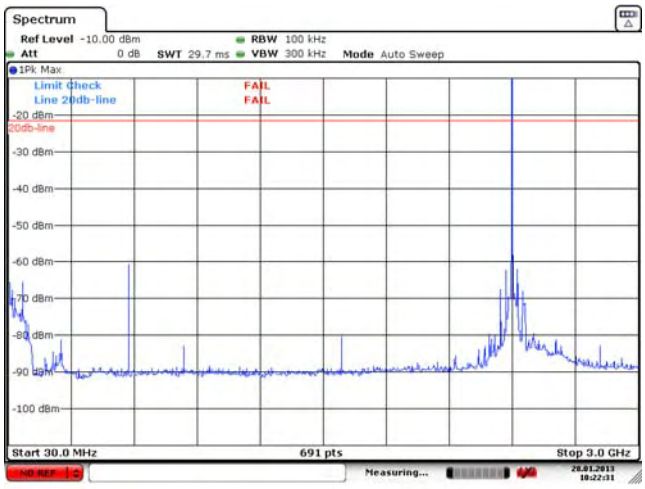
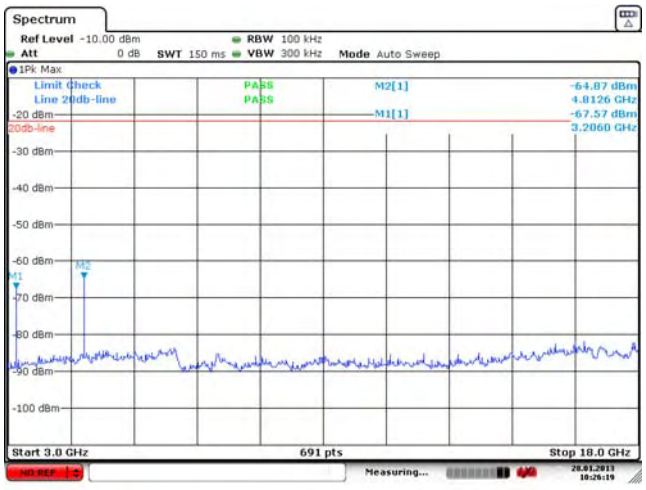
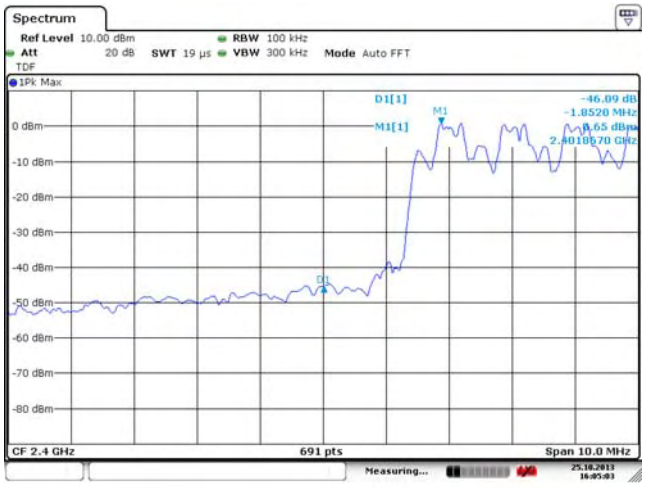
Mode 3: GFSK Link Mode	
2441	
	

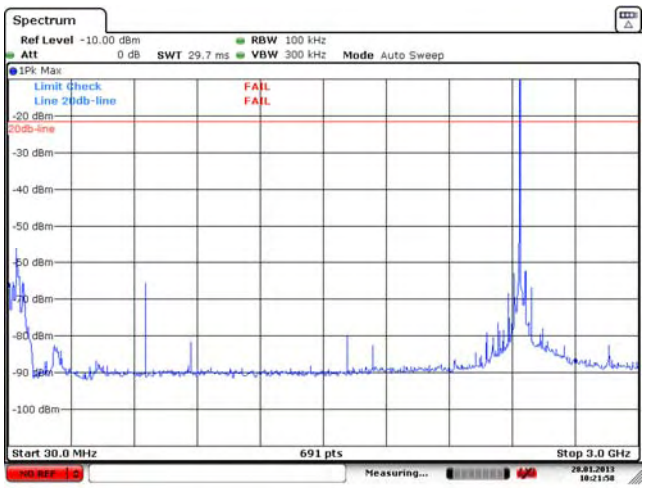
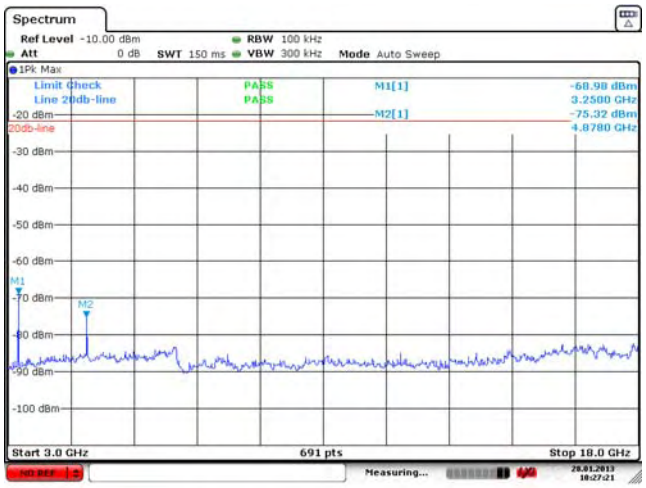
Mode 3: GFSK Link Mode	
2480	
	
	

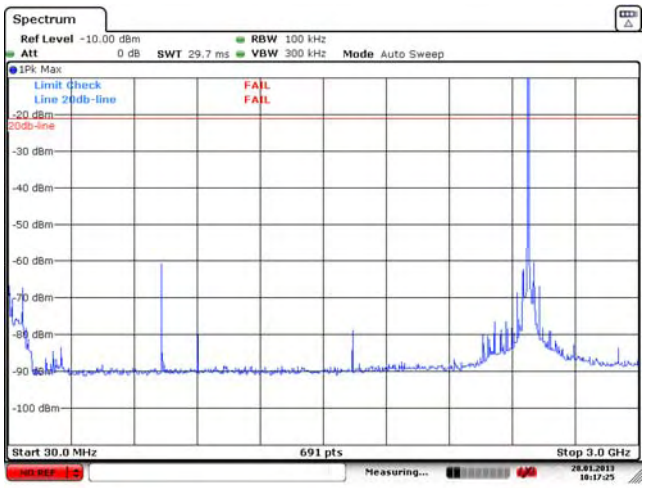
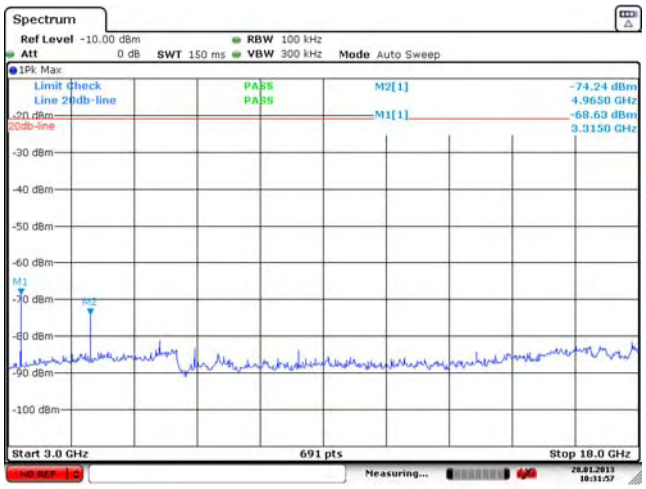
Mode 4: π/4-DQPSK Link Mode	
2402	
	
	

Mode 4: π/4-DQPSK Link Mode	
2441	
	

Mode 4: π/4-DQPSK Link Mode	
2480	  

Mode 5: 8DPSK Link Mode	
2402	
	
	

Mode 5: 8DPSK Link Mode	
2441	 

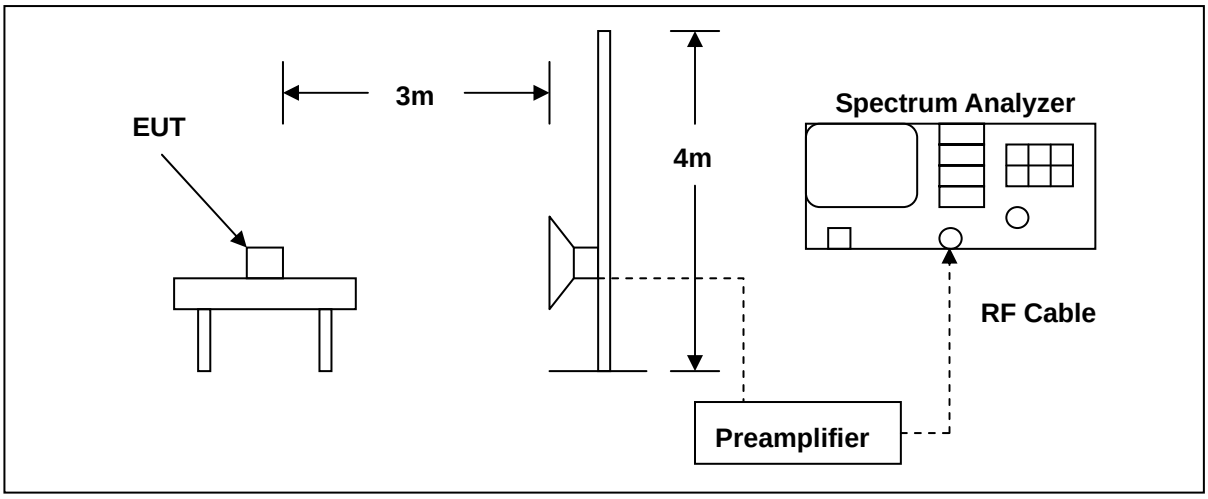
Mode 5: 8DPSK Link Mode	
2480	  

12 Band Edges Measurement

12.1. Limit

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

12.2. Test Setup



12.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/09/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	9120D	9120D-550	06/15/2013	(1)
Test Site	ATL	TE01	888001	08/28/2013	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request.

12.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

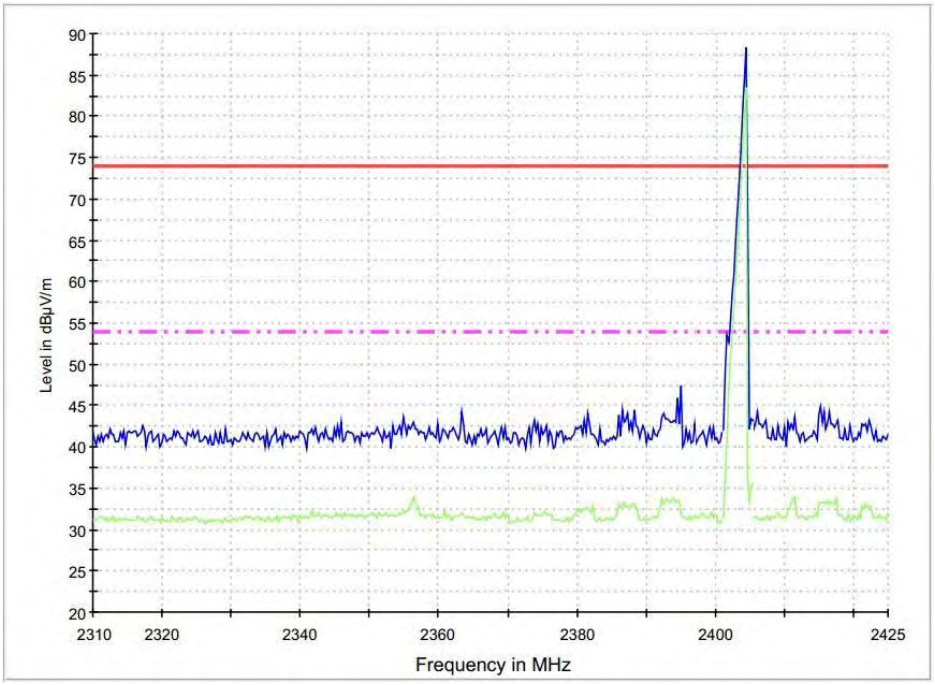
The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

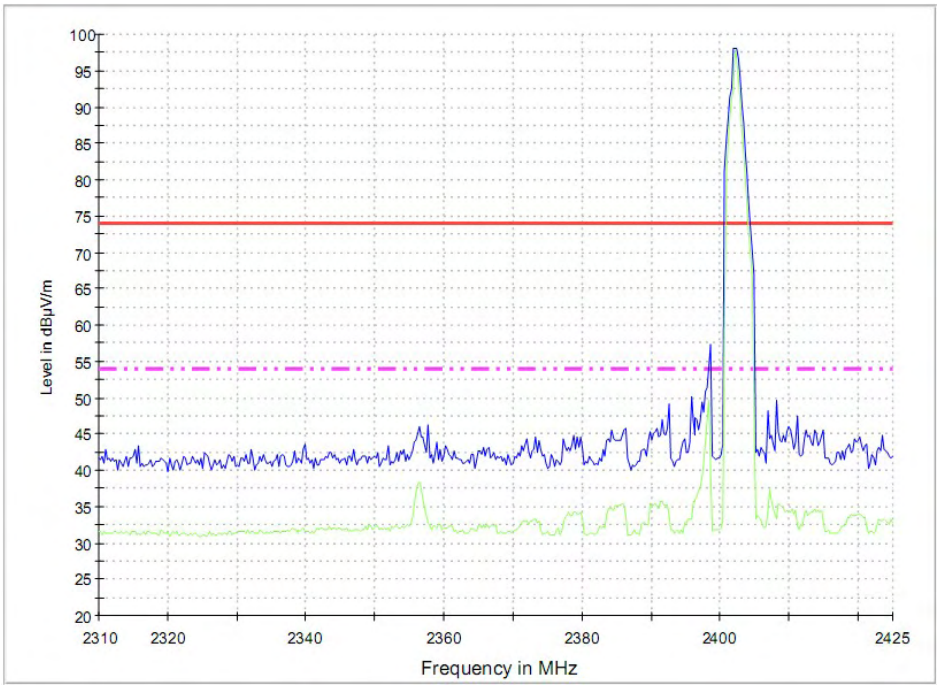
12.5. Test Result

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



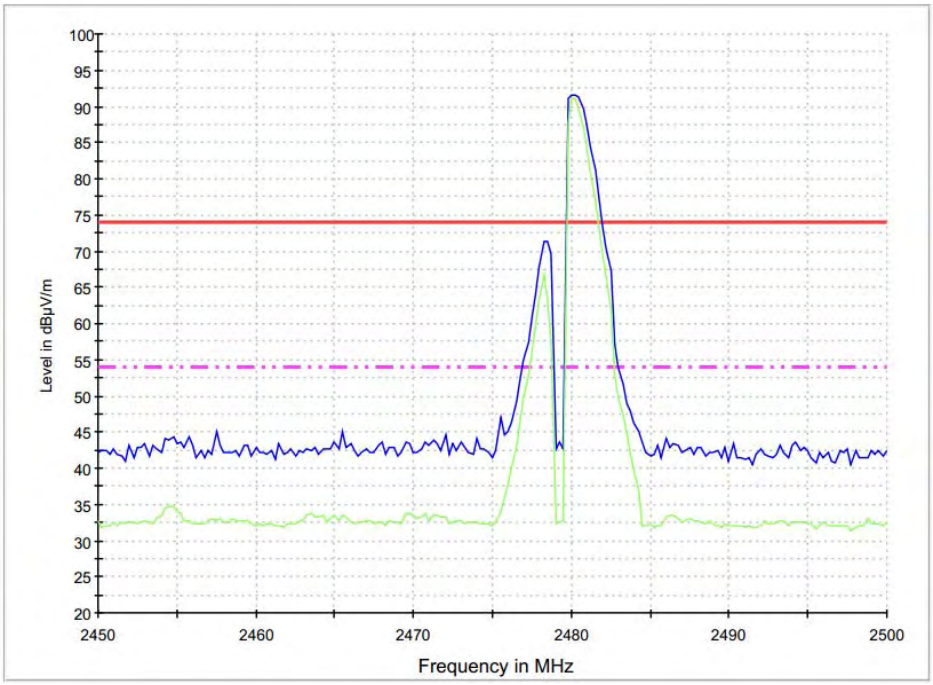
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	39.5	1.8	41.3	74.0	32.7	peak
2	2400	30.3	1.8	32.1	54.0	21.9	AVG
3	2390	39.8	1.8	41.6	74.0	32.4	peak
4	2390	30.0	1.8	31.8	54.0	22.2	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



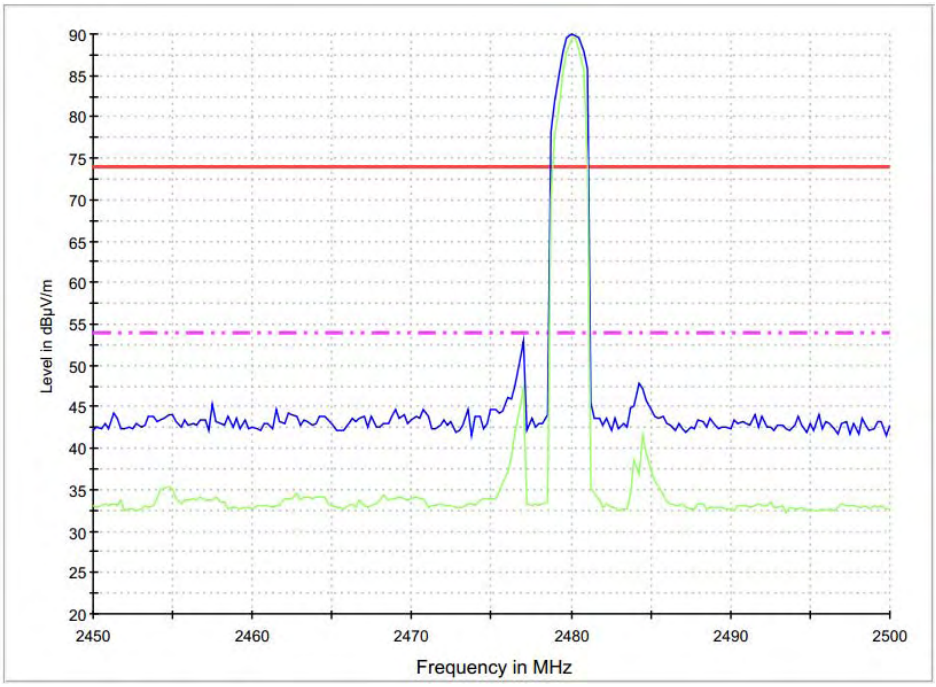
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	40.6	1.8	42.4	74.0	31.6	peak
2	2400	30.5	1.8	32.3	54.0	21.7	AVG
3	2390	43.0	1.8	44.8	74.0	29.2	peak
4	2390	33.2	1.8	35.0	54.0	19.0	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



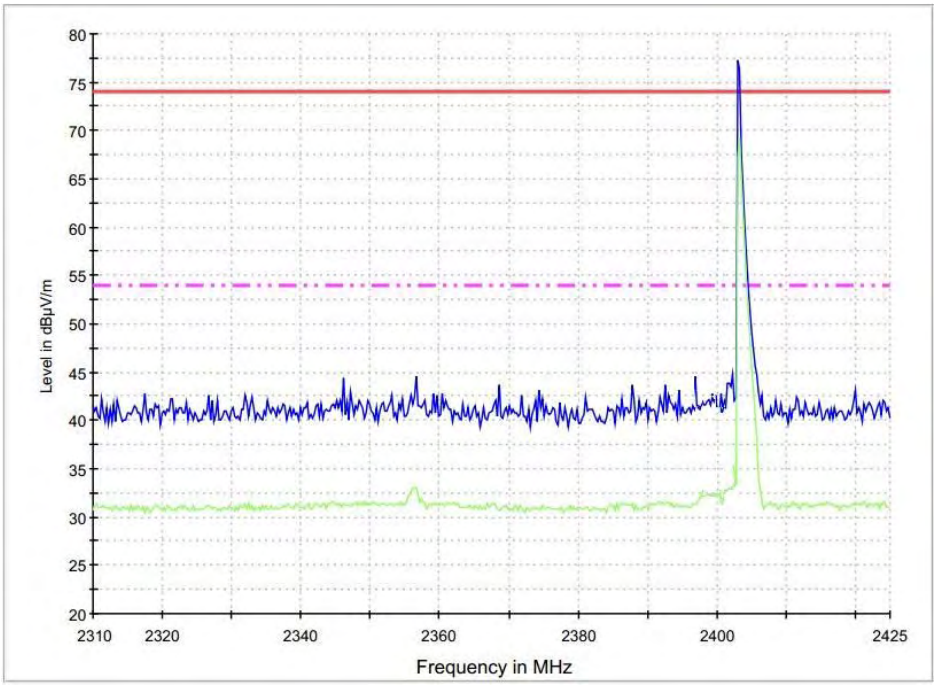
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	51.3	1.9	53.2	74.0	20.8	peak
2	2483.5	45.4	1.9	47.3	54.0	6.7	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 3	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



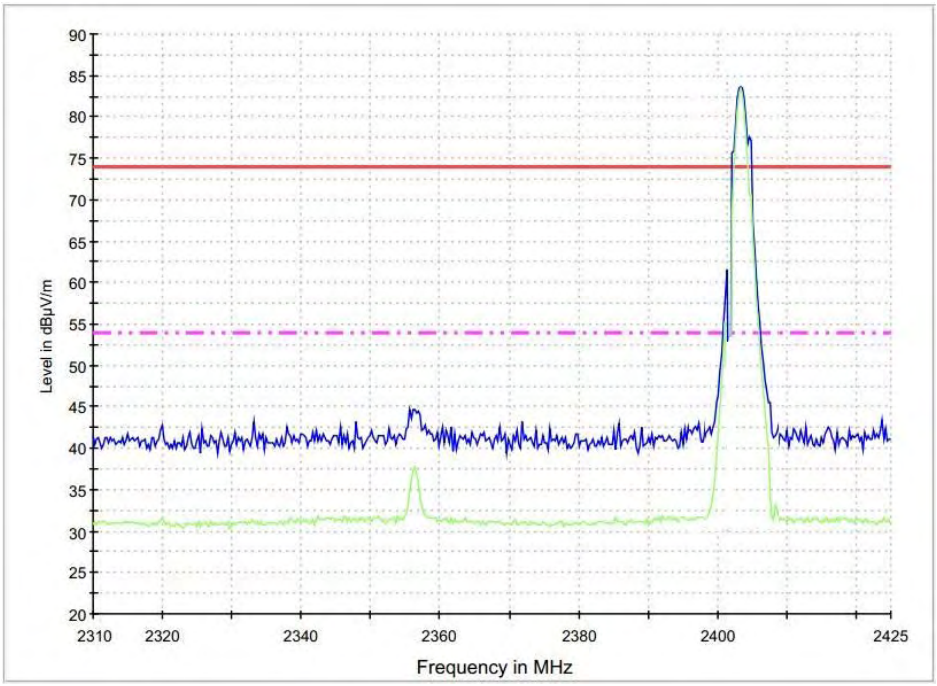
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	44.2	1.9	46.1	74.0	27.9	peak
2	2483.5	36.0	1.9	37.9	54.0	16.1	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



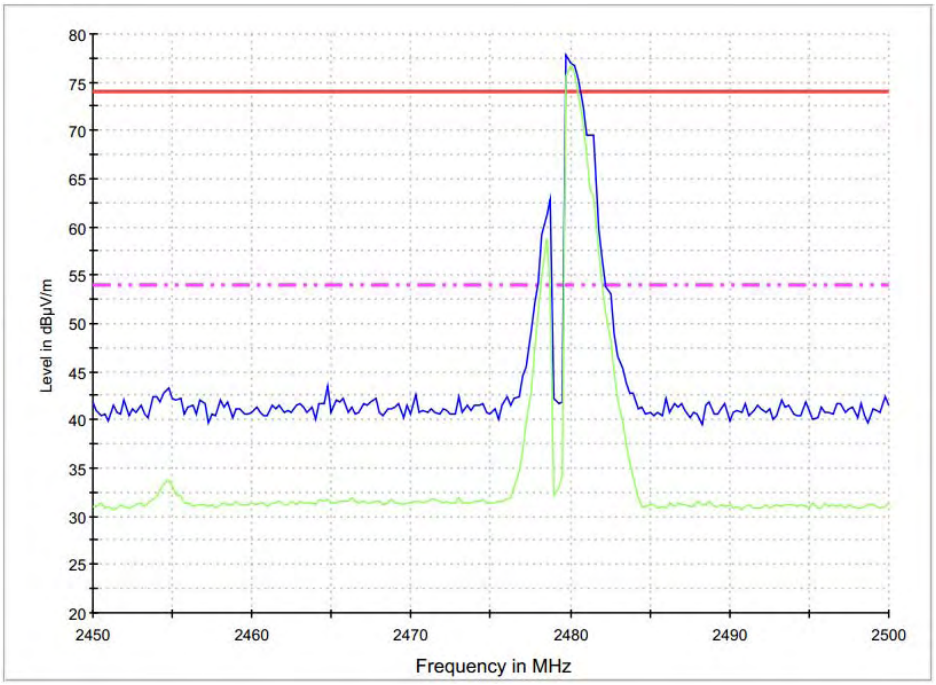
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	40.7	1.8	42.5	74.0	31.5	peak
2	2400	31.0	1.8	32.8	54.0	21.2	AVG
3	2390	40.0	1.8	41.8	74.0	32.2	peak
4	2390	29.4	1.8	31.2	54.0	22.8	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



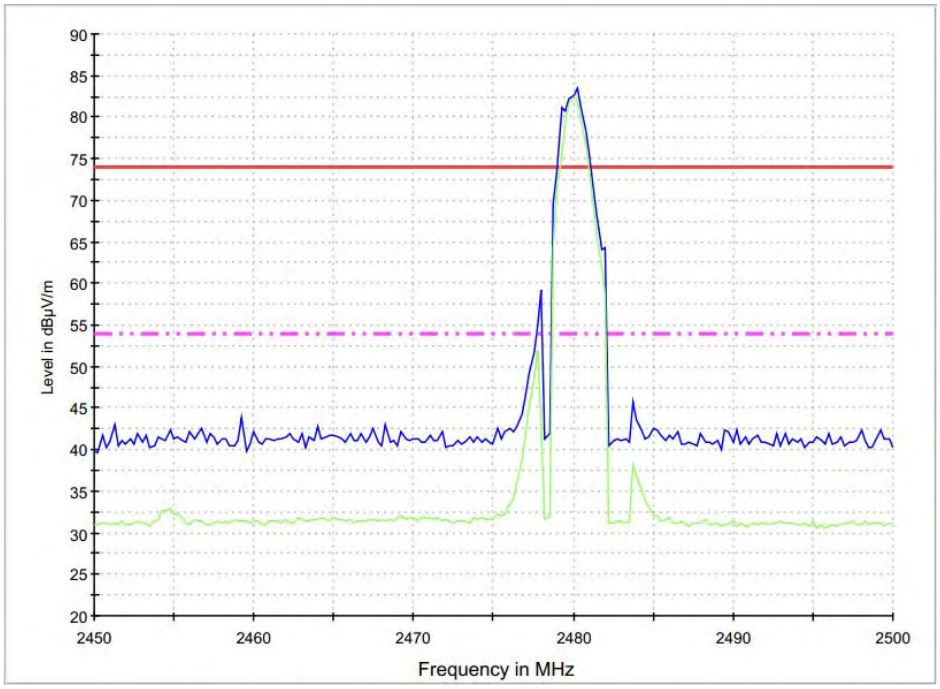
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	43.0	1.8	44.8	74.0	29.2	peak
2	2400	34.3	1.8	36.1	54.0	17.9	AVG
3	2390	38.9	1.8	40.7	74.0	33.3	peak
4	2390	29.4	1.8	31.2	54.0	22.8	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



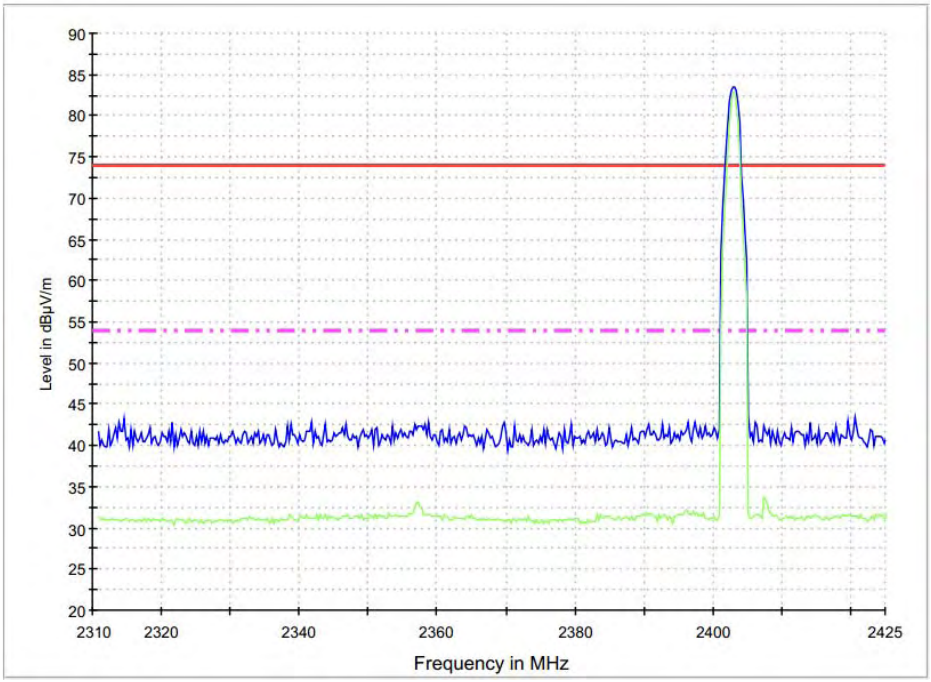
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	44.9	1.9	46.8	74.0	27.2	peak
2	2483.5	35.5	1.9	37.4	54.0	16.6	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 4	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



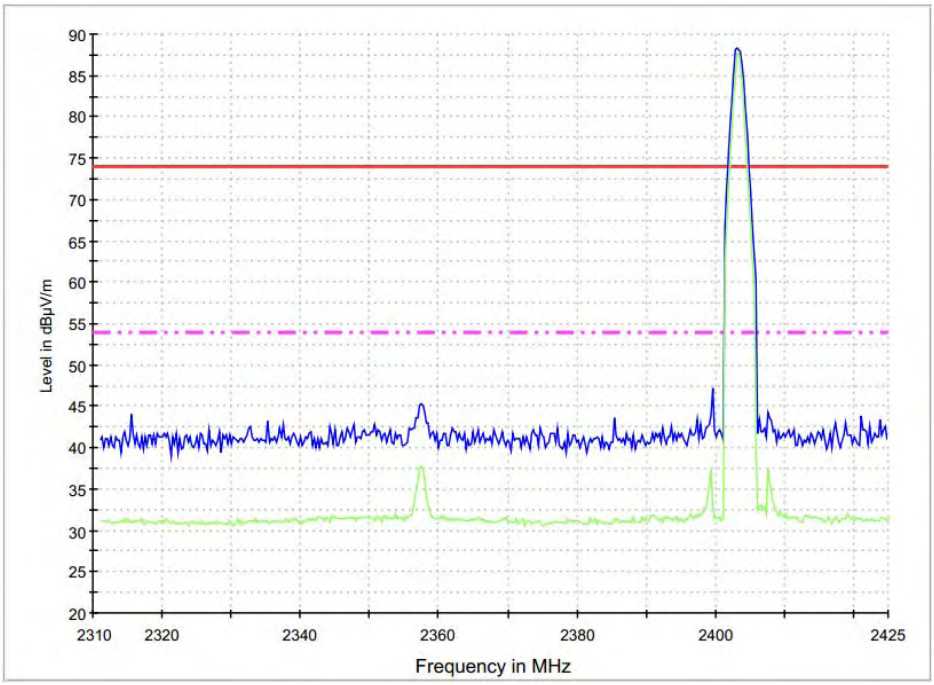
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	43.3	1.9	45.2	74.0	28.8	peak
2	2483.5	33.3	1.9	35.2	54.0	18.8	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



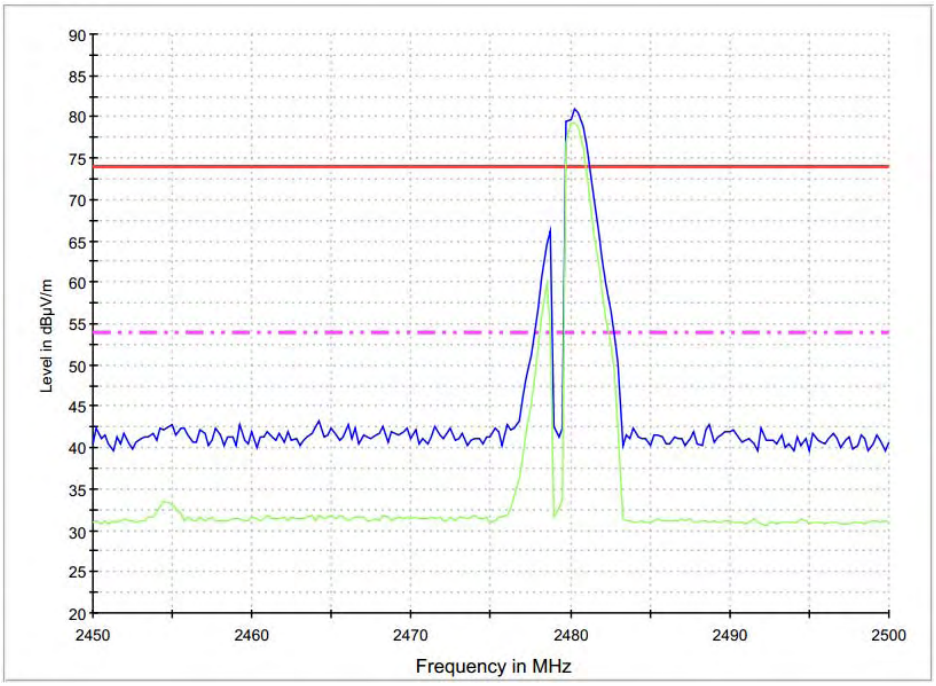
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	40.0	1.8	41.8	74.0	32.2	peak
2	2400	30.1	1.8	31.9	54.0	22.1	AVG
3	2390	40.5	1.8	42.3	74.0	31.7	peak
4	2390	29.8	1.8	31.6	54.0	22.4	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2402 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



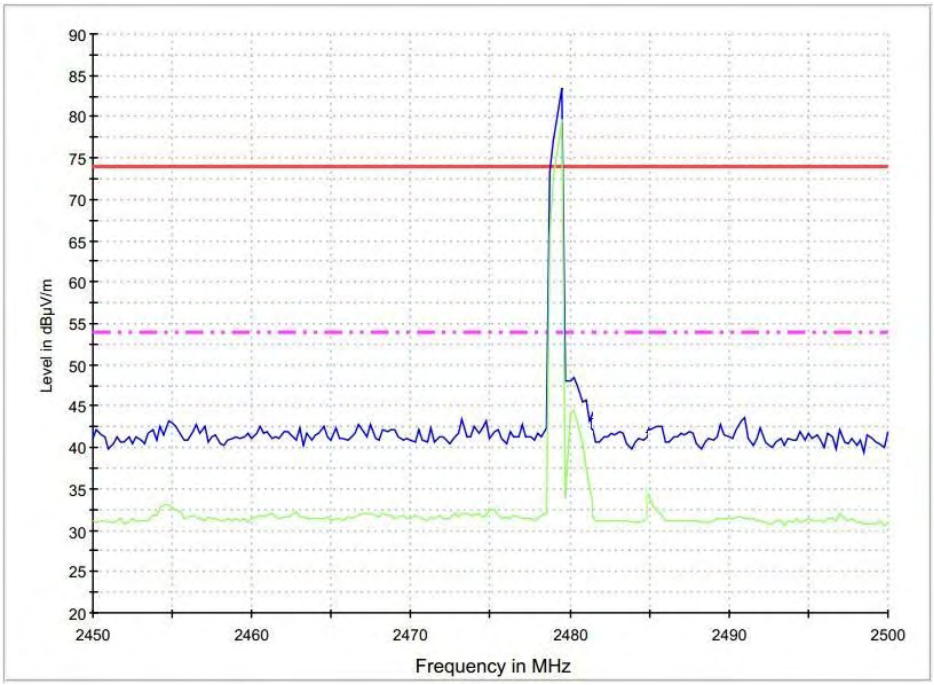
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2400	40.8	1.8	42.6	74.0	31.4	peak
2	2400	30.3	1.8	32.1	54.0	21.9	AVG
3	2390	38.9	1.8	40.7	74.0	33.3	peak
4	2390	29.1	1.8	30.9	54.0	23.1	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	40.9	1.9	42.8	74.0	31.2	peak
2	2483.5	29.4	1.9	31.3	54.0	22.7	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 120V/60Hz
Model Number:	ZeNano	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 5	Date:	12/16/2013
Frequency:	2480 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	39.7	1.9	41.6	74.0	32.4	peak
2	2483.5	29.2	1.9	31.1	54.0	22.9	AVG

13 Antenna Measurement

13.1. Limit

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

13.2. Antenna Connector Construction

The antenna used in this product is Internal monopolar antenna. And the maximum Gain of this antenna is 2.0 dBi.