



FCC PART 15C TEST REPORT

Issued to

SZ DJI TECHNOLOGY CO.,LTD

For

2.4G Bluetooth Datalink

Model Name: LK24-BT
 Trade Name: DJI
 Brand Name: DJI
 FCC ID: SS3-201309002
 Standard: 47 CFR Part 15 Subpart C
 Test date: 2013-9-16 to 2013-10-27
 Issue date: 2013-10-30

By

Shenzhen MORLAB Communication Technology Co., Ltd.



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Change History		
Issue	Date	Reason for change
1.0	October 30, 2013	First edition

1. General Information

1.1. EUT Description

EUT Type: 2.4G Bluetooth Datalink
Serial No.....: (n.a, marked #1 by test site)
Hardware Version.....: V1
Software Version: 1.0
Applicant: SZ DJI TECHNOLOGY CO.,LTD
Room 613、 614, 6/F, HKUST SZ IER Bldg, No.9 Yuexing 1st Rd
Hi-Tech Park(South), Nanshan District, Shenzhen, Guangdong,
China
Manufacturer: SZ DJI TECHNOLOGY CO.,LTD
6F, HKUST SZ IER Bldg. No.9 Yuexing 1st Rd. Hi-Tech
Park(South), Nanshan Dist. Shenzhen, Guangdong, China
Frequency Range.....: The frequency range used is 2405.376MHz – 2477.056MHz
(36channels, at intervals of 2.048MHz);
The frequency block is 2400MHz to 2483.5MHz.
Modulation Type: FHSS
Antenna Type.....: Internal Antenna
Antenna Gain.....: 2.0dBi

Note 1: The EUT is 2.4G Bluetooth Datalink, it operating at 2.4GHz ISM band, the frequencies allocated is $F \text{ (MHz)} = 2405.376 + 2.048 * (n - 1)$ ($1 \leq n \leq 36$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2405.376MHz), 18 (2440.192MHz) and 36 (2477.056MHz).

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-12 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.247(a)	Number of Hopping Frequency	PASS
3	15.247(b)	Peak Output Power	PASS
4	15.247(a)	20dB Bandwidth	PASS
5	15.247(a)	Carrier Frequency Separation	PASS
6	15.247(a)	Time of Occupancy (Dwell time)	PASS
7	15.247(d)	Conducted Spurious Emission	PASS
8	15.247(d)	Restricted Frequency Bands	PASS
9	15.207	Conducted Emission	N/A
10	15.209 15.247(d)	Radiated Emission	PASS
11	15.247(i), 1.1307&2.1093	RF exposure evaluation	PASS

NOTE:

The tests were performed according to the method of measurements prescribed in DA-00-705.

1.3. Facilities and Accreditations

1.3.1. Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at FL.1, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10 2009, ANSI C63.4 2009 and CISPR Publication 22; the FCC registration number is 695796.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

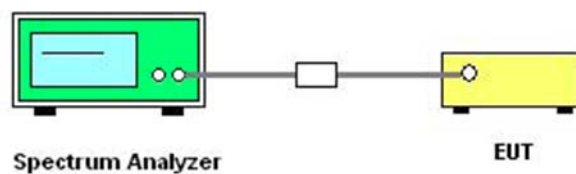
2.2. Number of Hopping Frequency

2.2.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.2.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05.12	2014.05.11
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Power Splitter	Weinschel	1506A	NW521	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.2.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW \geq 1% of the span

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

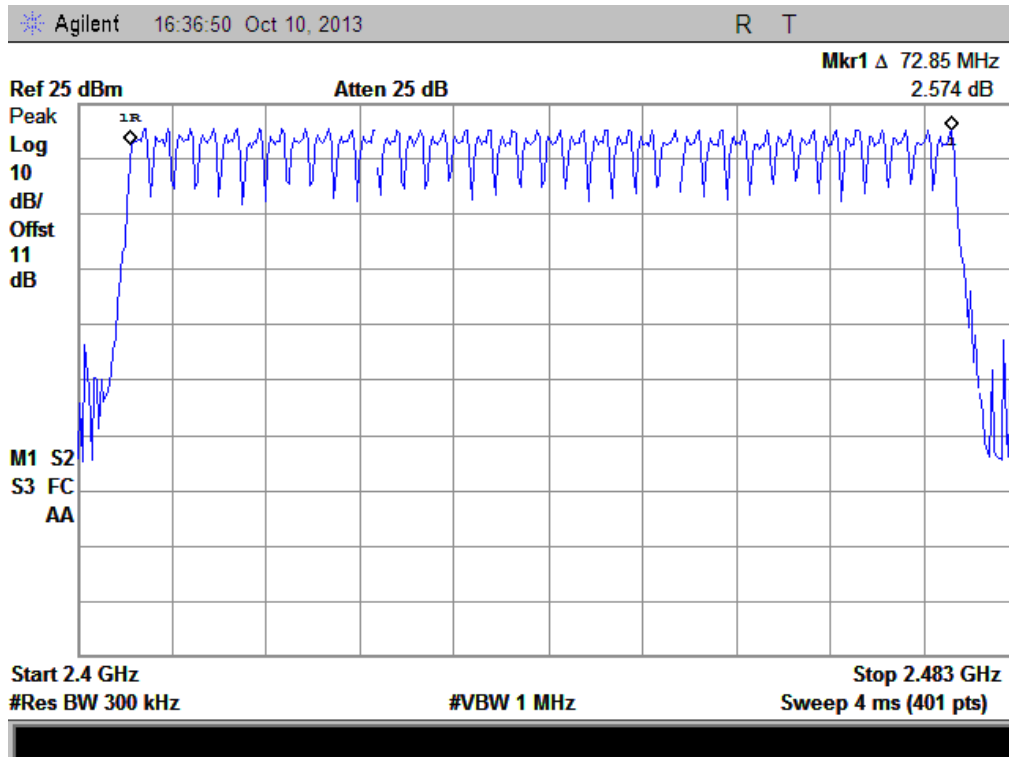
2.2.4. Test Result

The EUT operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

Test Verdict:

Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
2400 - 2483.5	36	15	Plot A	PASS

Test Plots:



(Plot A)

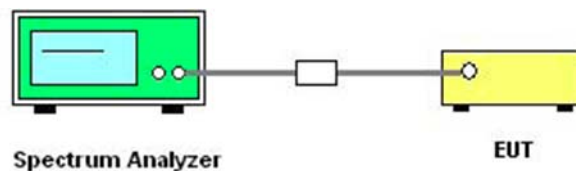
2.3. Peak Output Power

2.3.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

2.3.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power meter	Agilent	E4418B	GB44318055	2013.05.12	2014.05.11
Power Sensor	Agilent	8482A	MY41091706	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.3.3. Test Result

The EUT operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. The lowest, middle and highest channel were tested by Power meter.

Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2405.376	20.43	0.110408	20.97	0.125	PASS
18	2440.192	19.88	0.097275			PASS
36	2477.056	19.82	0.095940			PASS

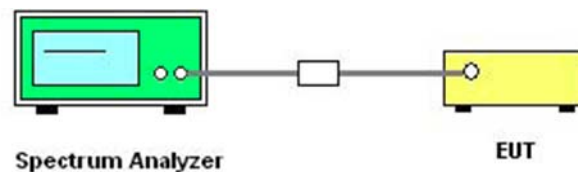
2.4. 20dB Bandwidth

2.4.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

2.4.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Power Splitter	Weinschel	1506A	NW521	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.4.1. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW \geq 1% of the 20 dB bandwidth

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

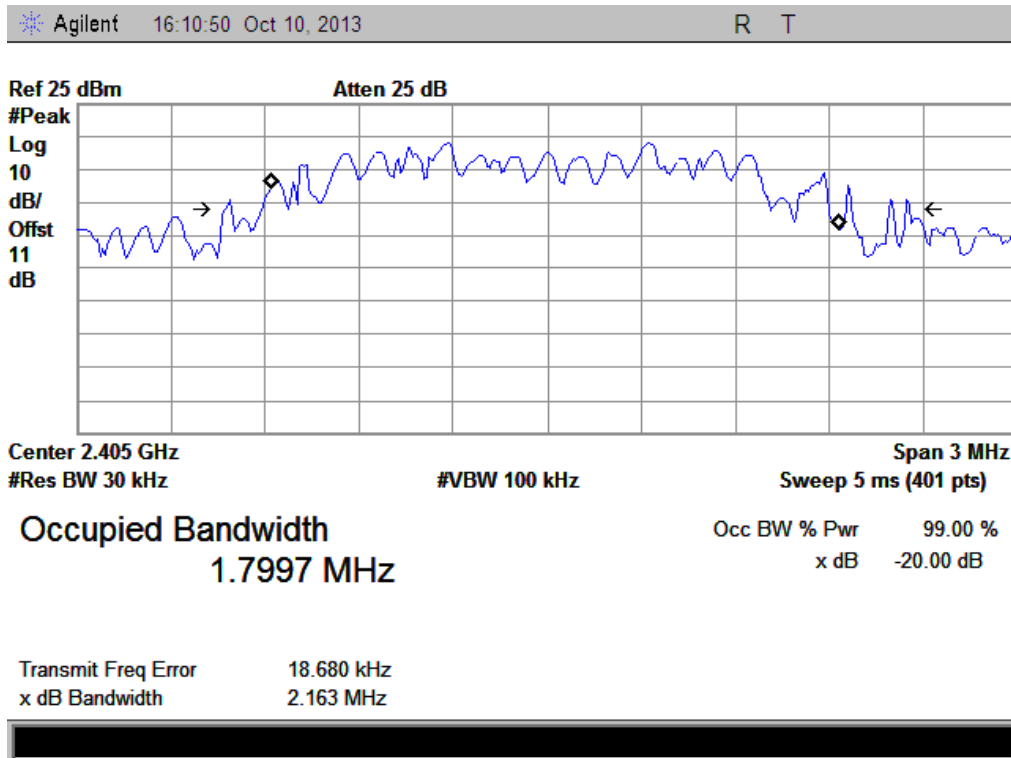
2.4.2. Test Result

The EUT operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

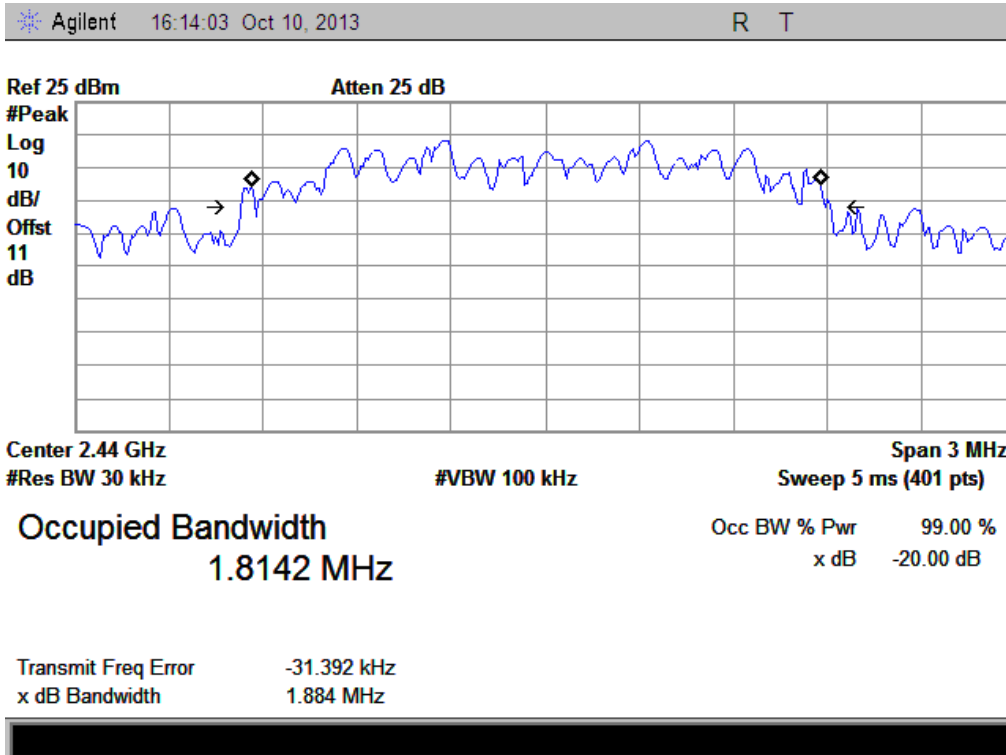
A. Test Verdict:

The maximum 20dB bandwidth measured is 2.392MHz according to the table below.

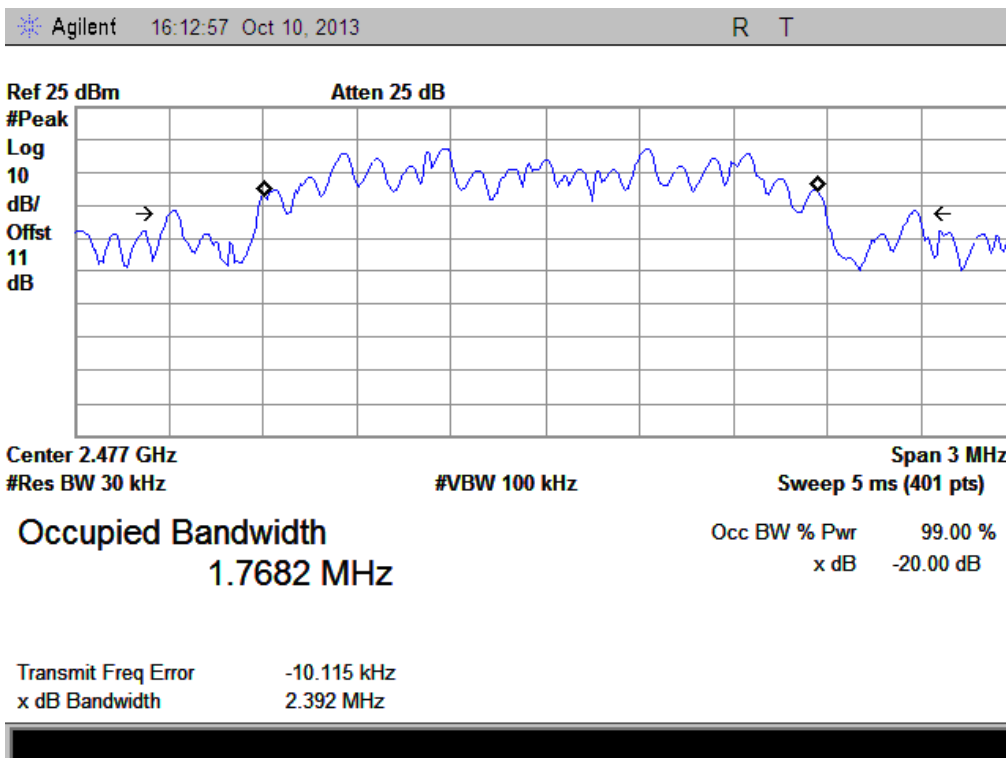
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2405.376	2.163	Plot A
18	2440.192	1.884	Plot B
36	2477.056	2.392	Plot C

Test Plots:


(Plot A)



(Plot B)



(Plot C)

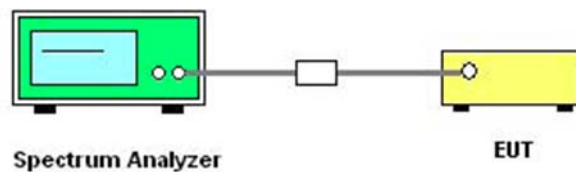
2.5. Carried Frequency Separation

2.5.1. Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

2.5.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05.12	2014.05.11
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Power Splitter	Weinschel	1506A	NW521	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.5.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) \geq 1% of the span

Video (or Average) Bandwidth (VBW) \geq RBW

Sweep = auto

Detector function = peak

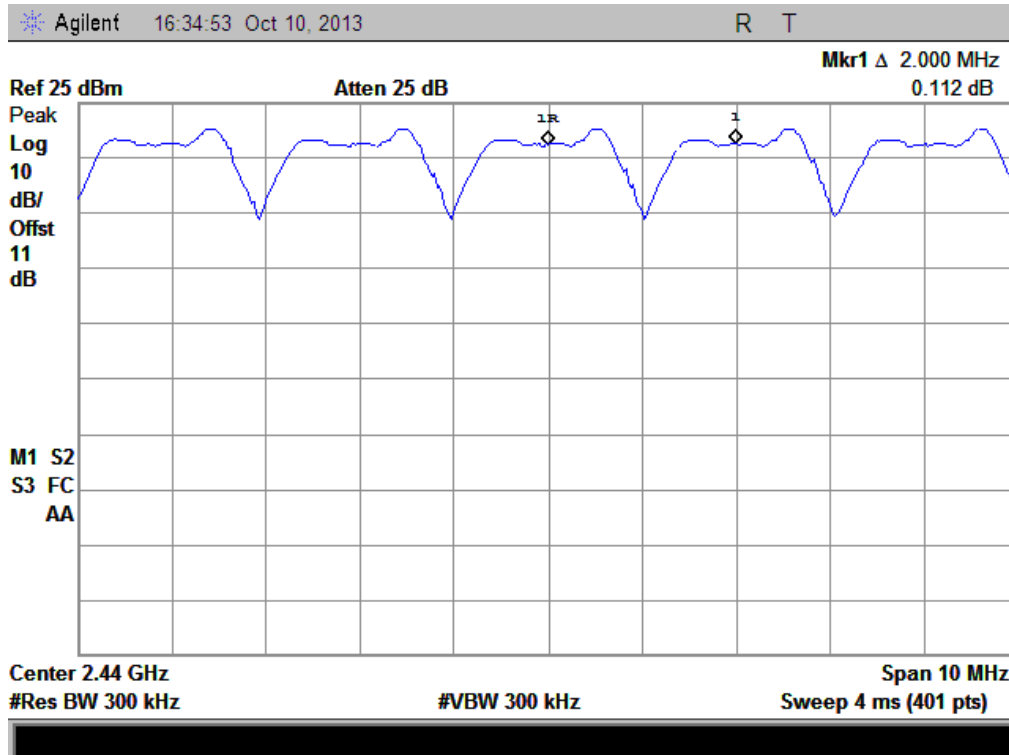
Trace = max hold

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

2.5.4. Test Result

The EUT operates at hopping-on test mode.

For any adjacent channels (e.g. the channel 18 and 19 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (2.392MHz refer to section 2.4.1), whichever is greater. So, the verdict is PASSING



(Plot A)

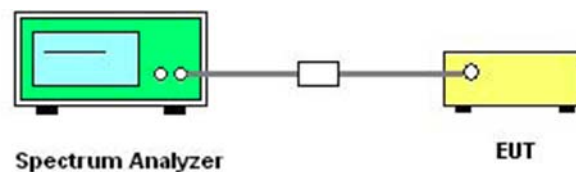
2.6. Time of Occupancy (Dwell time)

2.6.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.6.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05.12	2014.05.11
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Power Splitter	Weinschel	1506A	NW521	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.6.3. Test Procedure

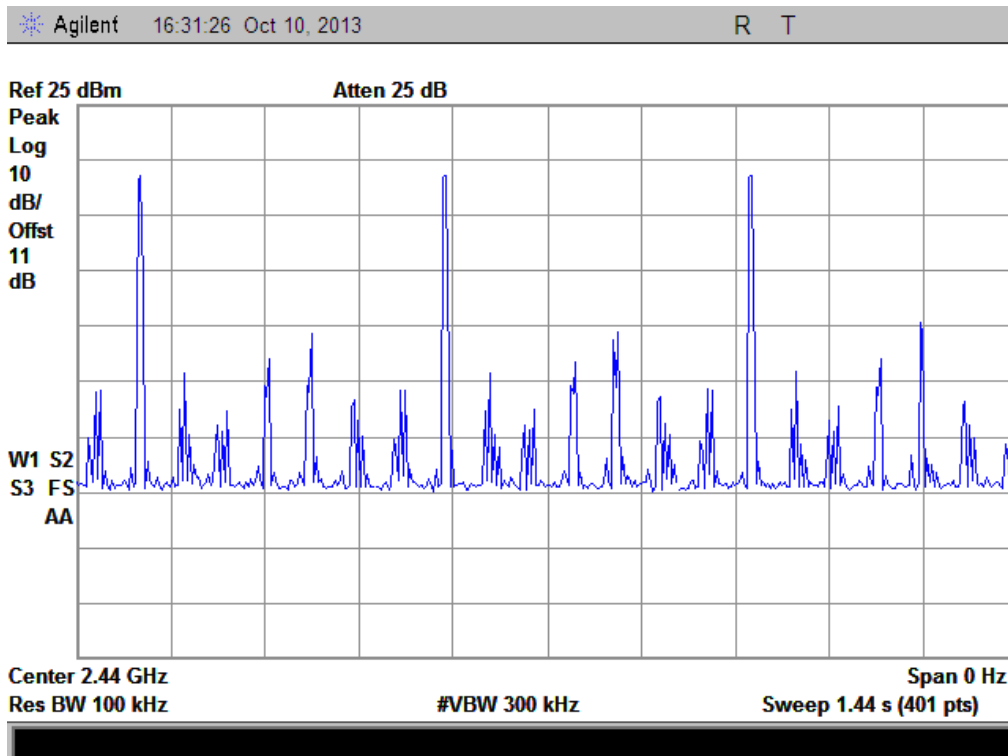
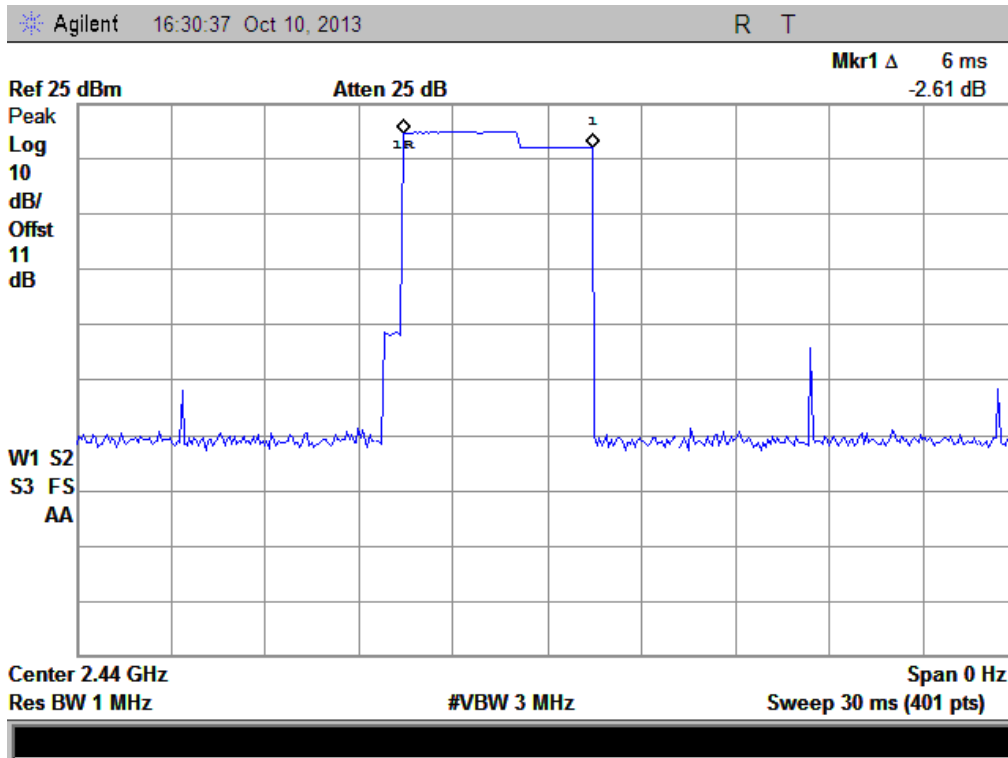
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 14.4 second period (36 channel * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 1.44 \text{ s}) * \text{ pulse width}$.

2.6.4. Test Result

A. Test Verdict:

Pulse Width (msec)	Number of pulse in 1.44 seconds	Refer to Plot	Average Time of Occupancy (sec)	Limit (sec)	Verdict
6	3	Plot A	0.18	0.4	PASS

Test Plots:


(Plot A)

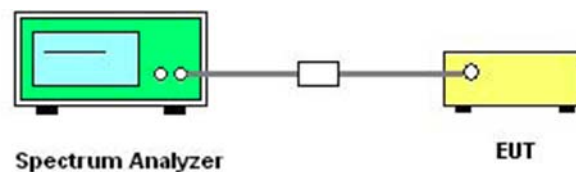
2.7. Conducted Spurious Emissions

2.7.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.7.2. Test Description

A. Test Setup:



The RF Module of the EUT is coupled to the Spectrum Analyzer (SA) Attenuators; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Anritsu	MT8852B	6K00006210	2013.05.12	2014.05.11
Spectrum Analyzer	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Power Splitter	Weinschel	1506A	NW521	2013.05.12	2014.05.11
Attenuator 1	Resnet	10dB	(n.a.)	2013.05.12	2014.05.11
Attenuator 2	Resnet	3dB	(n.a.)	2013.05.12	2014.05.11

2.7.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.7.4. Test Result

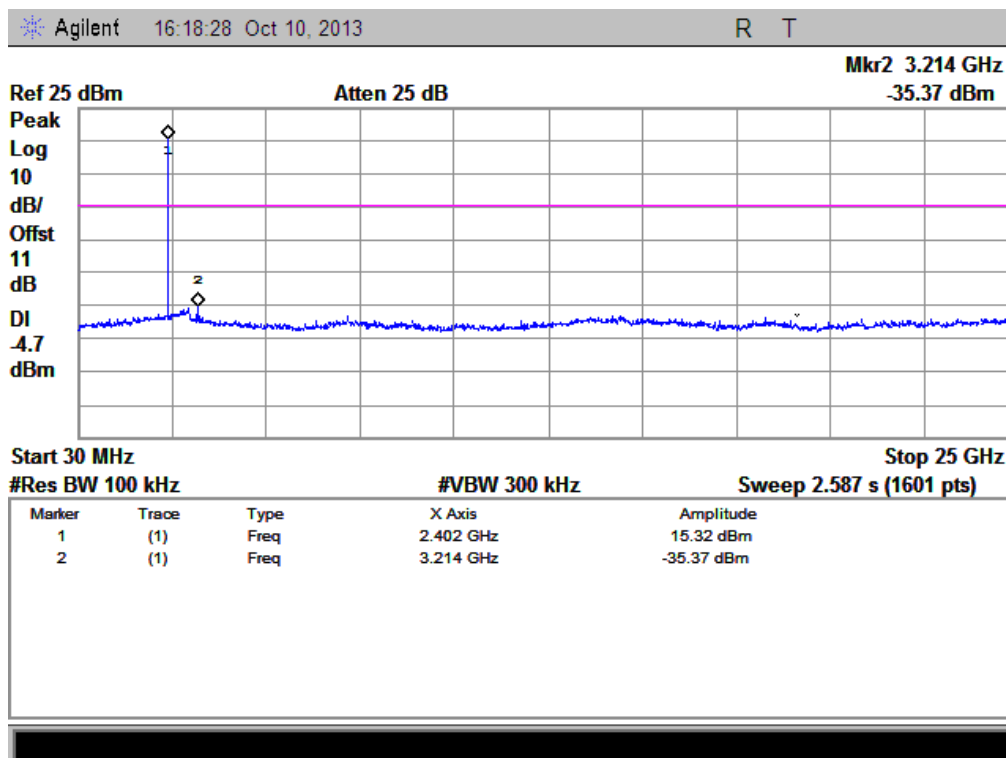
The EUT operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

A. Test Verdict:

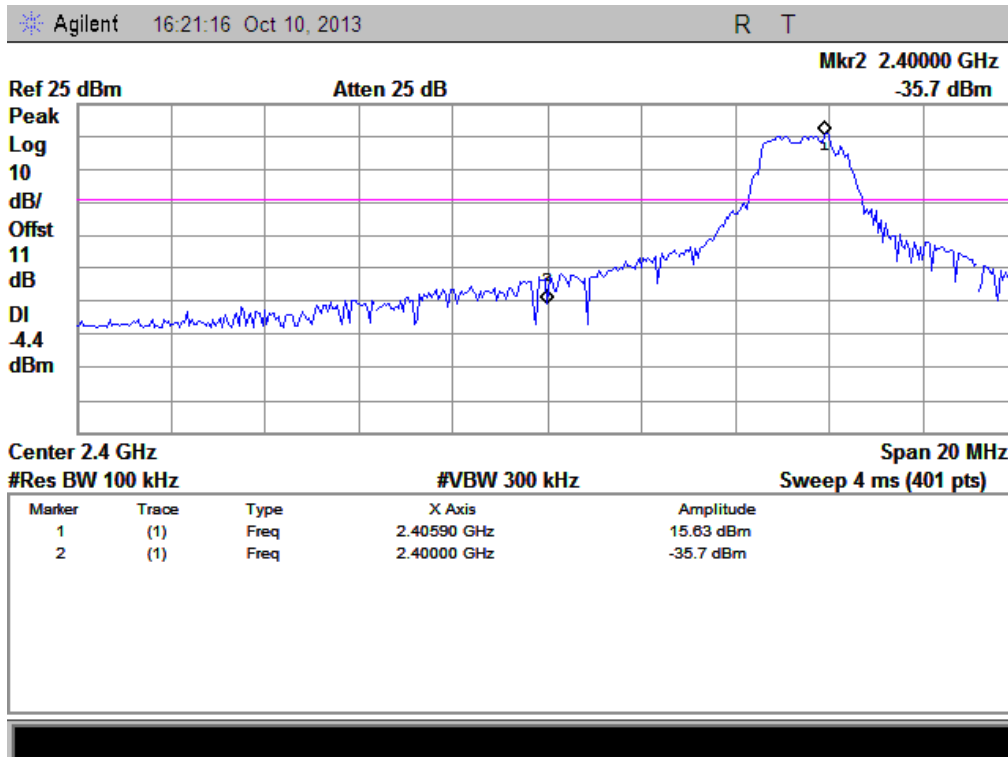
Channel	Frequency (MHz)	Measured Max. Out of Band Emission(dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
1	2405.376	-35.37	Plot A.1	15.32	-4.7	PASS
18	2440.192	-34.74	Plot B.1	14.86	-5.1	PASS
36	2477.056	-35.18	Plot C.1	13.99	-6.0	PASS

B. Test Plots:

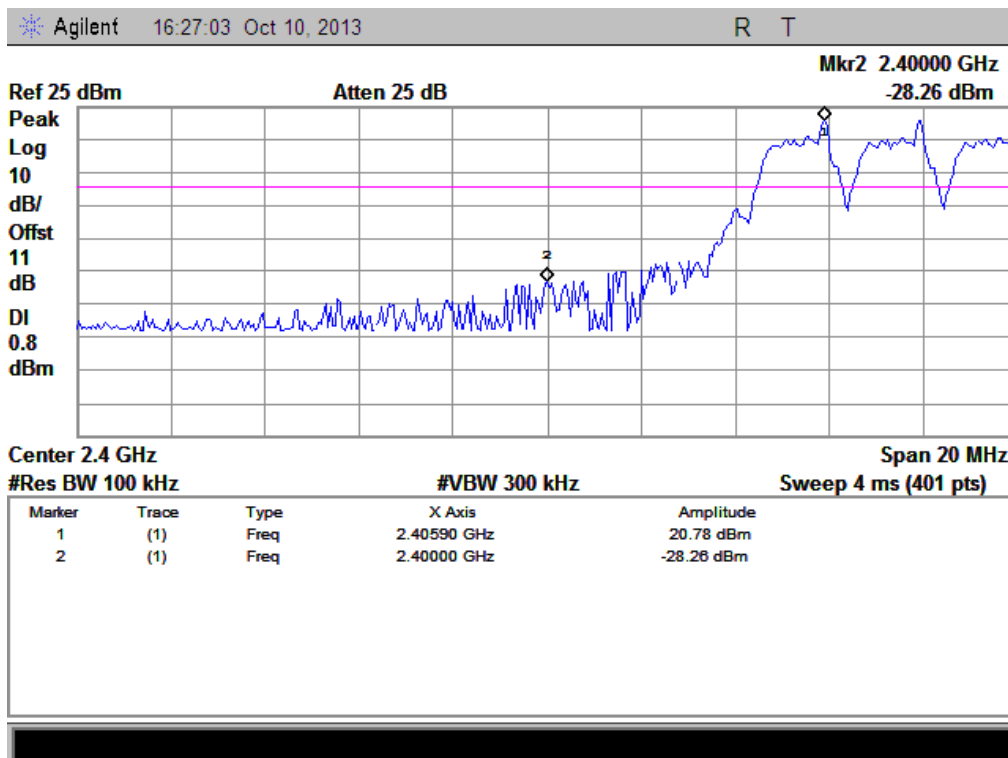
Note: the power of the Module transmitting frequency should be ignored.



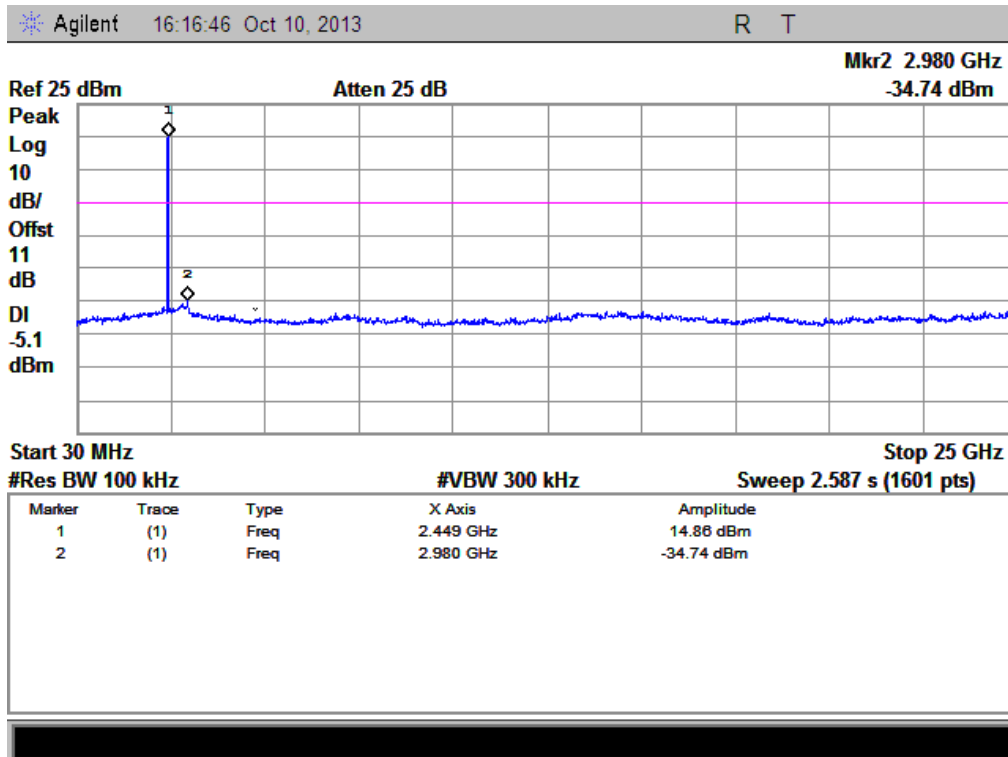
(Plot A.1: Channel = 1, 30MHz to 25GHz)



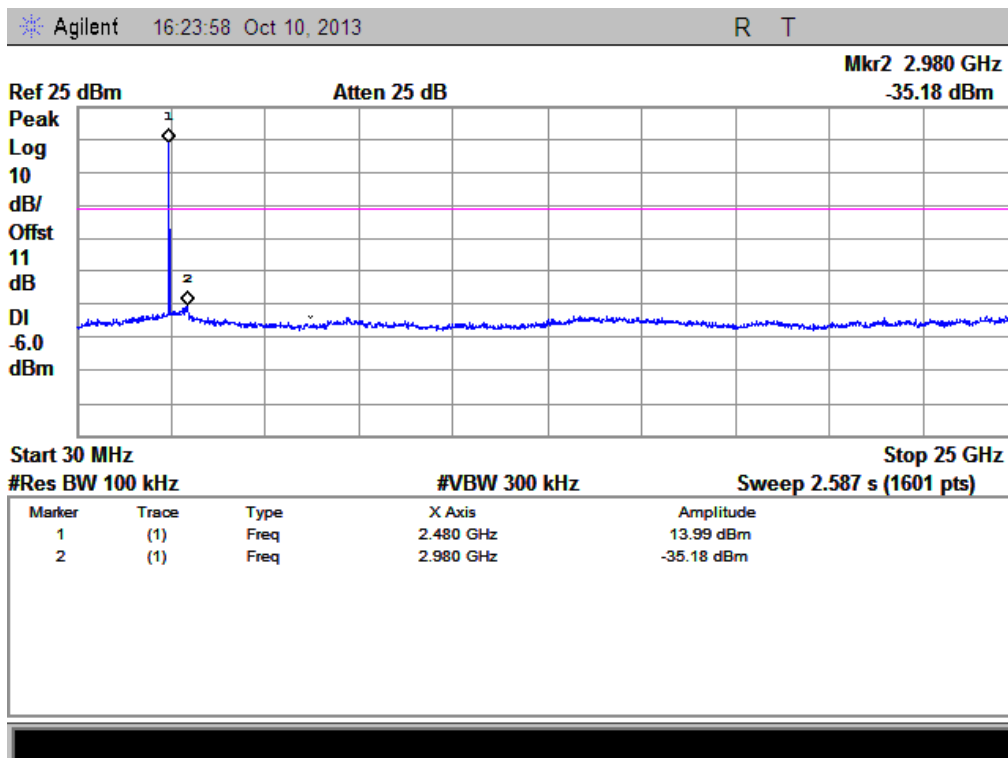
(Channel = 1, Band edge)



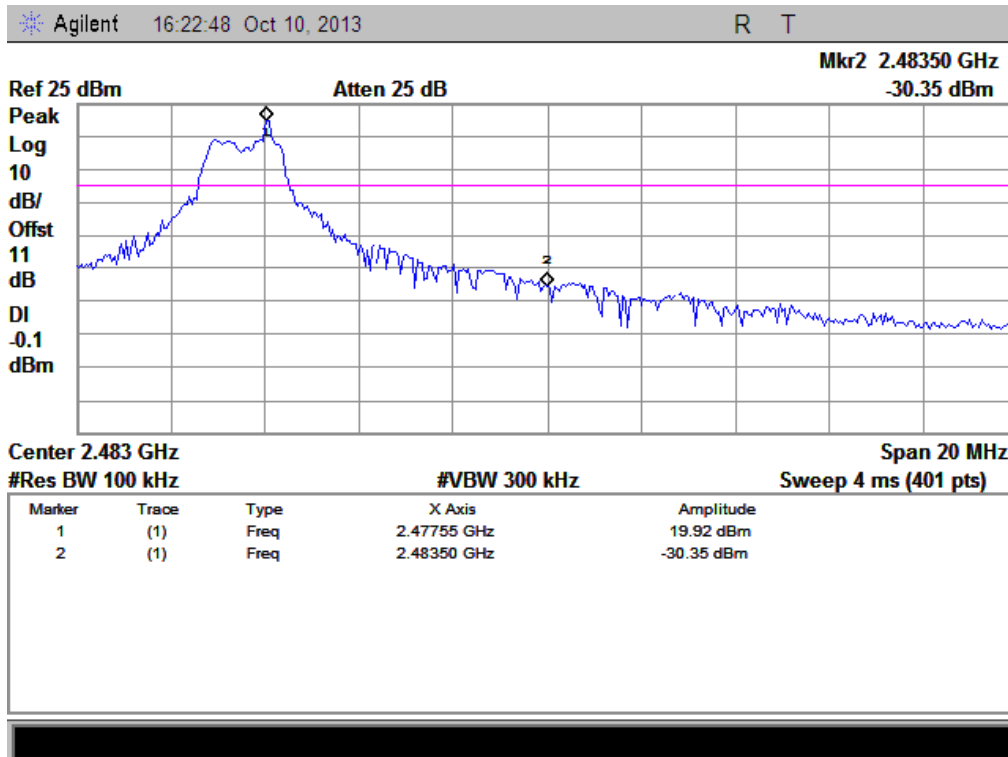
(Channel = 1, Band edge with hopping on)



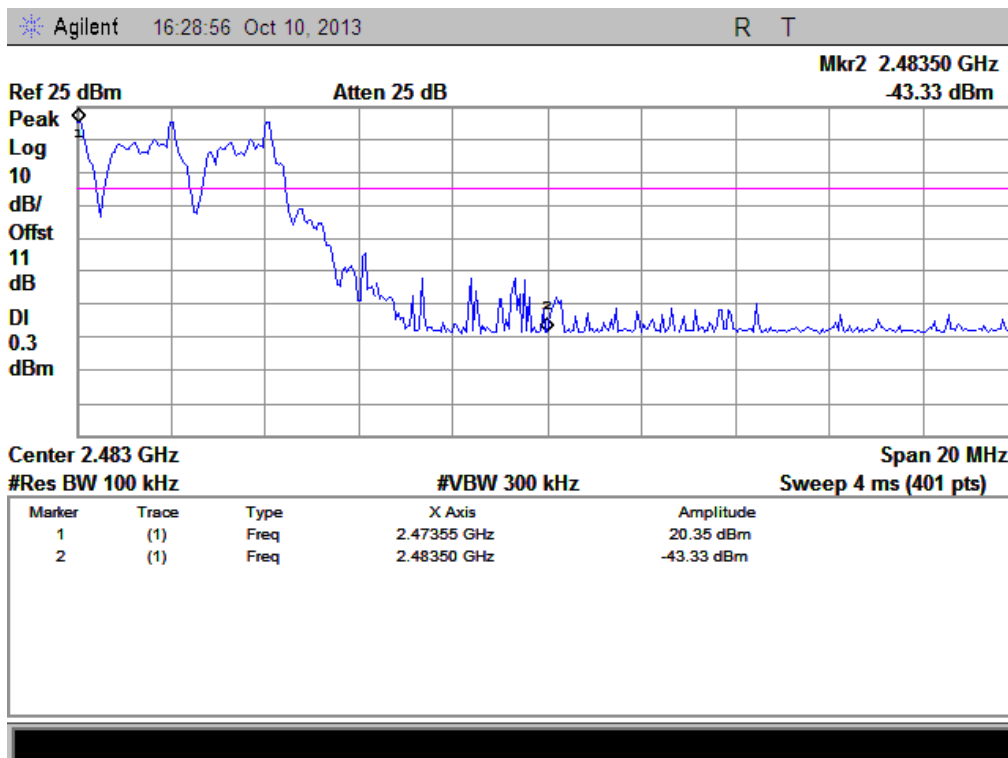
(Plot B.1: Channel = 18, 30MHz to 25GHz)



(Plot C.1: Channel = 36, 30MHz to 25GHz)



(Channel = 36)



(Channel = 36, Band edge with hopping on)

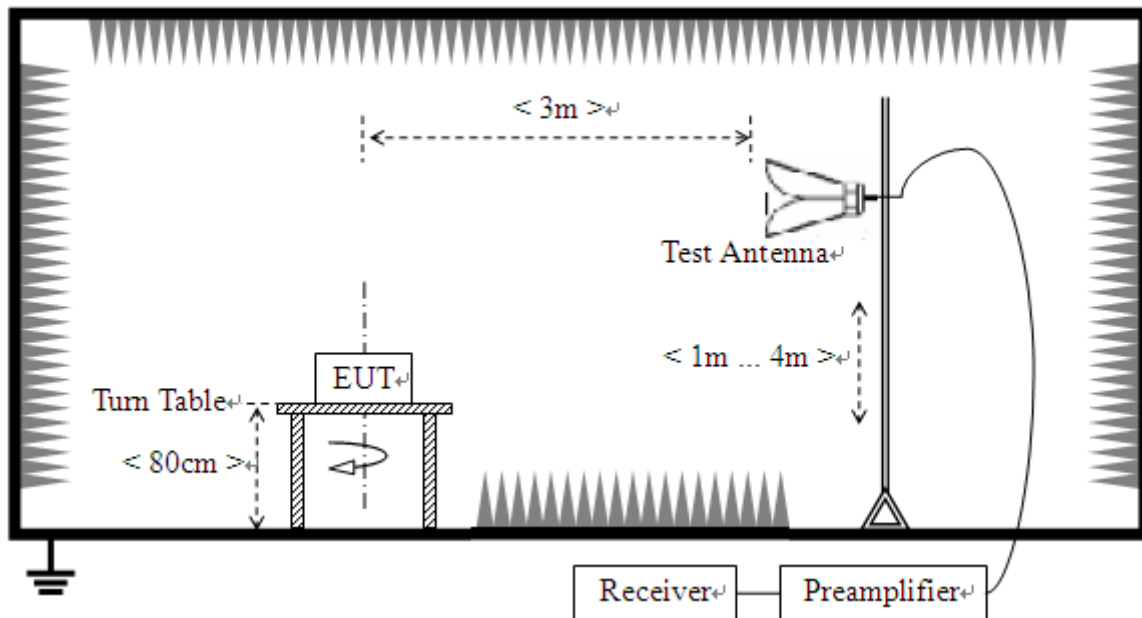
2.8. Restricted Frequency Bands

2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2. Test Description

A. Test Setup:



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05.12	2014.05.11
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2013.05.12	2014.05.11
Test Antenna - Horn	Schwarzbeck	BBHA	9120D-963	2013.05.12	2014.05.11

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
		9120D			

2.8.3. Test Procedure

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 KHz for $f < 1\text{GHz}$

VBW = 3 MHz for peak and 10Hz for average

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.8.4. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

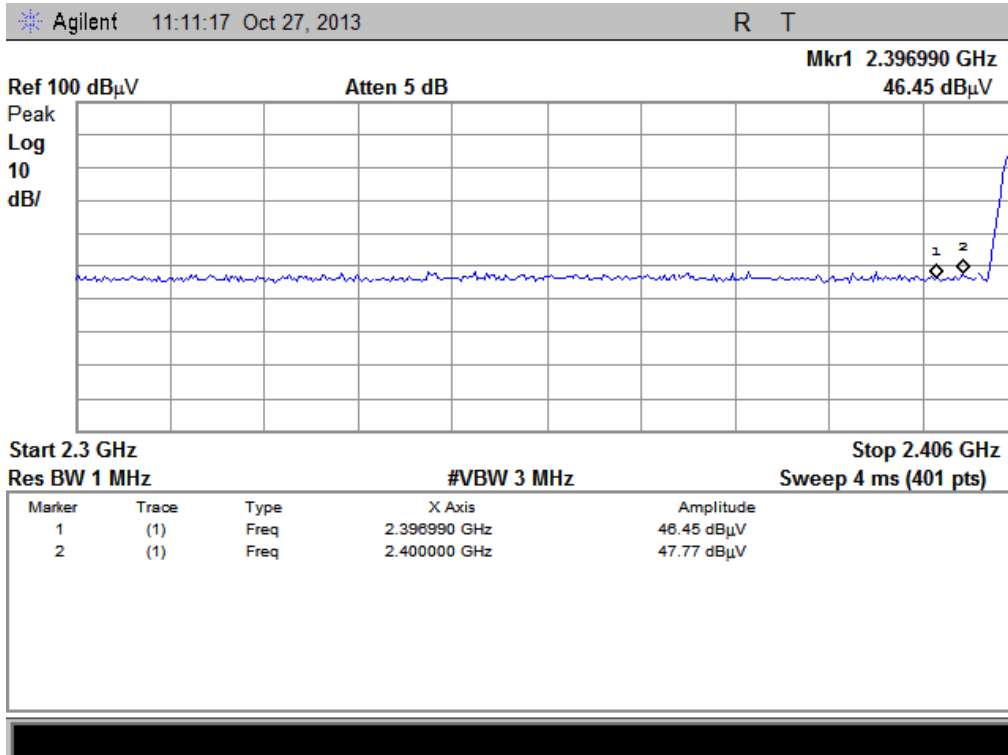
A_{Factor} : Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

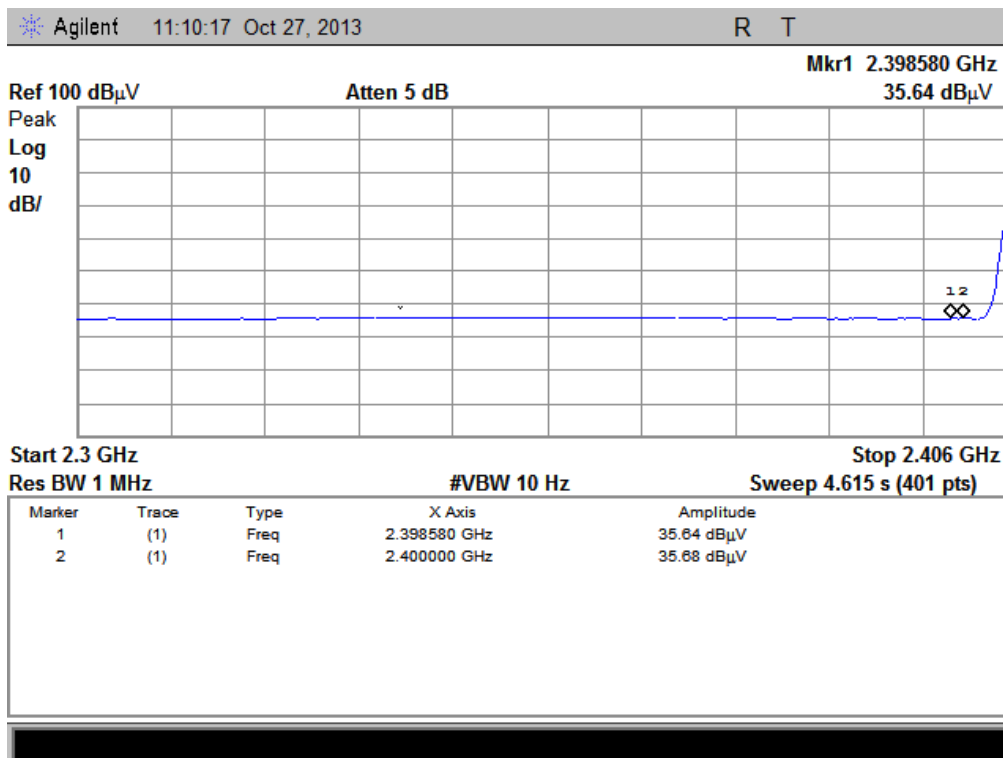
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2396.99	PK	46.45	-30.93	32.56	48.05	74	Pass
1	2398.58	AV	35.64	-30.93	32.56	37.27	54	Pass
36	2483.97	PK	46.38	-29.05	32.50	49.83	74	Pass
36	2484.73	AV	35.61	-29.05	32.50	39.06	54	Pass

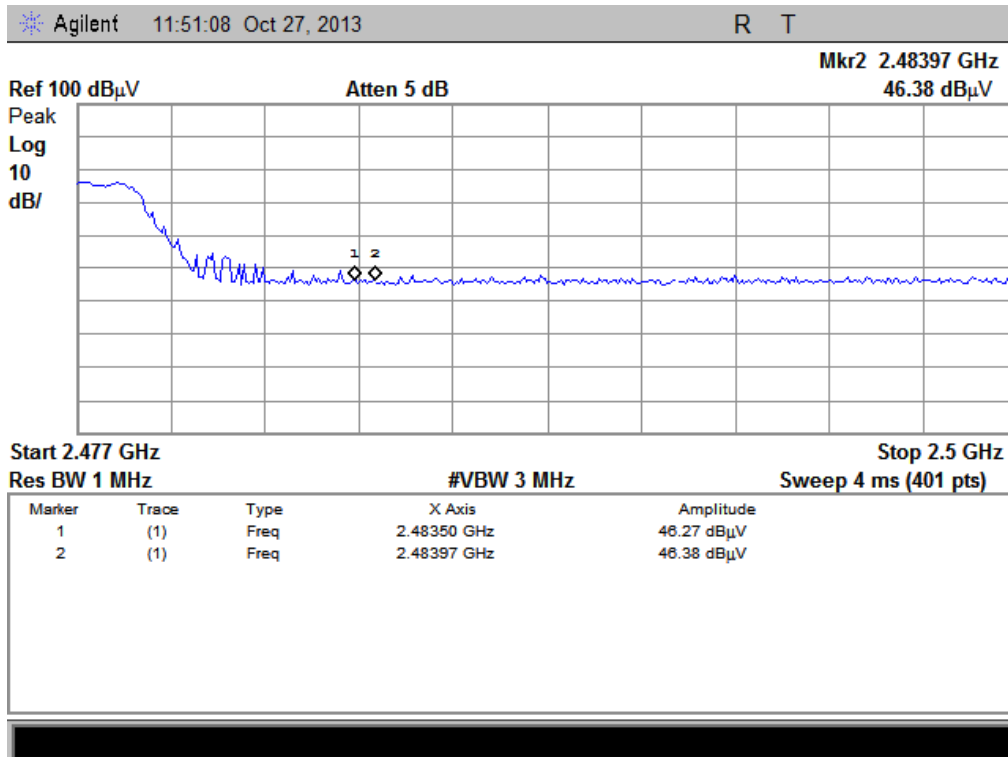
B. Test Plots:



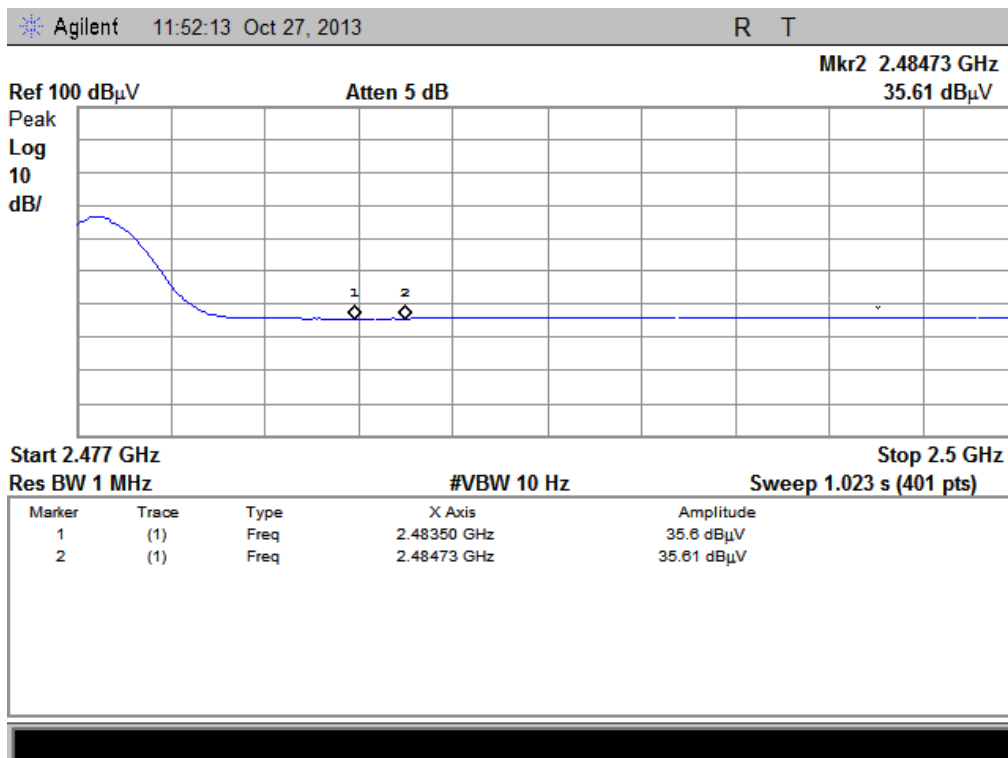
(Plot A1: Channel = 1 PEAK)



(Plot A2: Channel = 1 AVERAGE)



(Plot B1: Channel = 36 PEAK)



(Plot B2: Channel = 36 AVERAGE)

2.9. Conducted Emission

2.9.1. Requirement

According to FCC section 15.207, 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

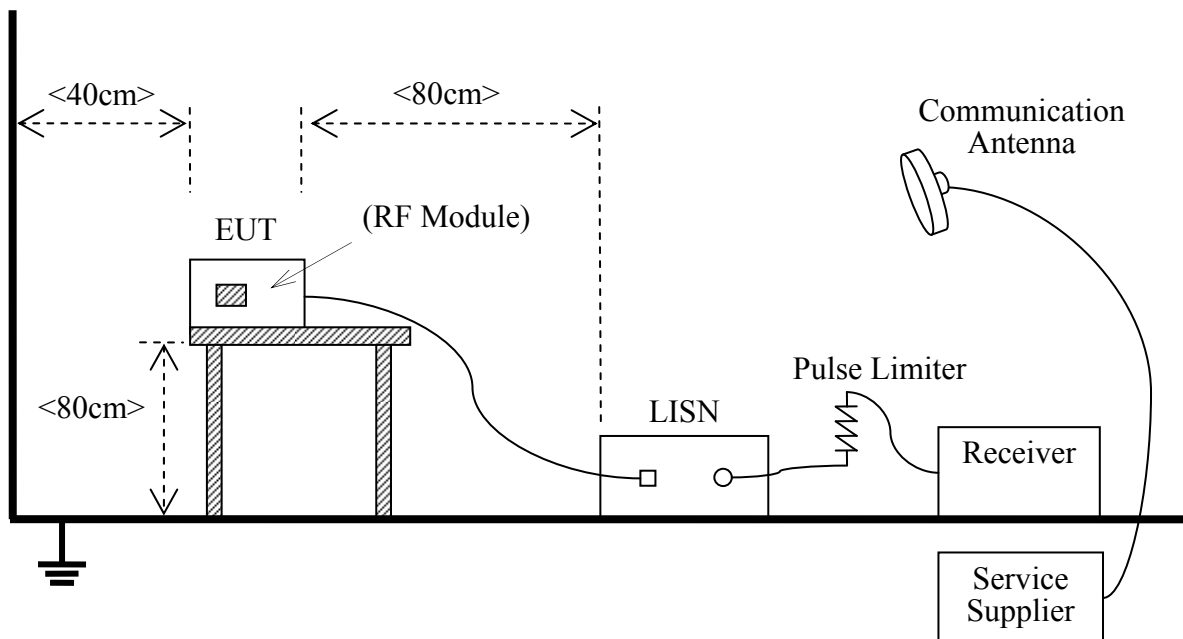
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5- 30	60	50

NOTE:

- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.9.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
LISN	Schwarzbeck	NSLK 8127	812744	2013.05.12	2014.05.11
Service Supplier	R&S	CMU200	100448	2013.05.12	2014.05.11
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	2013.05.12	2014.05.11

2.9.3. Test Result

The EUT is powered by battery, this item is not applicable.

2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(d) and RSS-A8.5, radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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 ($\mu\text{V}/\text{m}$)	Measurement Distance (m)
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

Note:

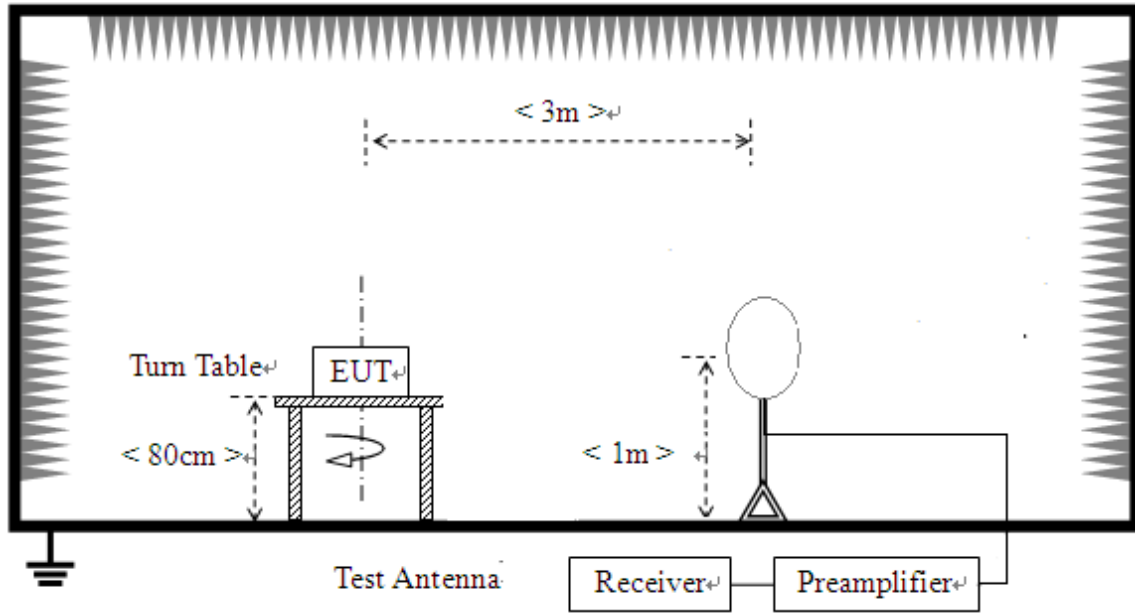
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

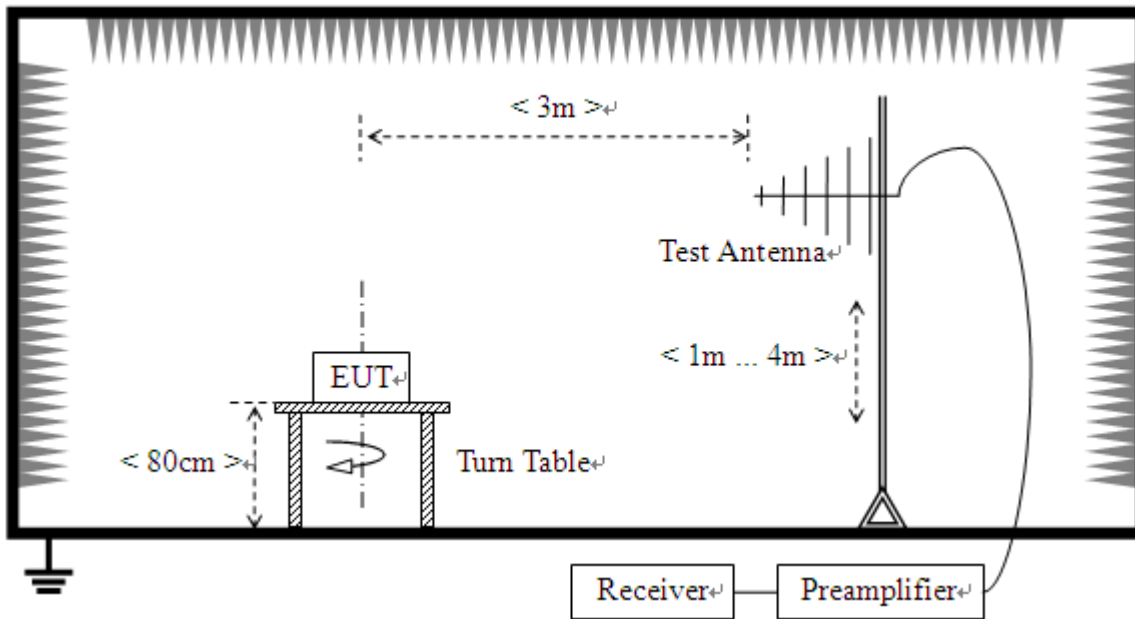
2.10.2. Test Description

A. Test Setup:

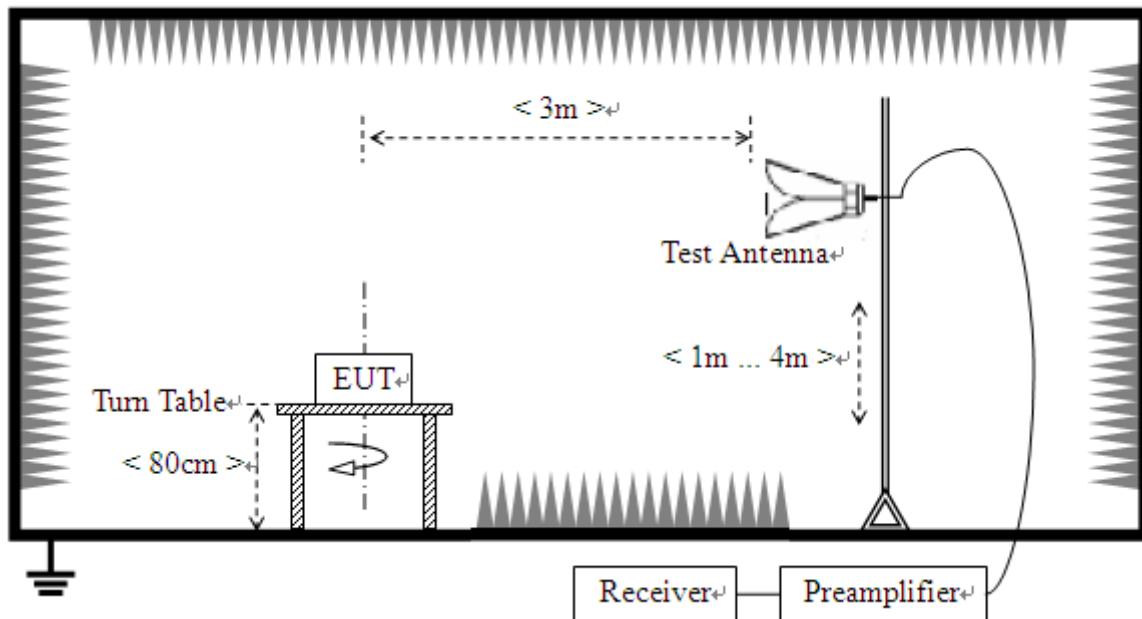
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The RF Module of the EUT is powered by the Battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

- In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2013.05.12	2014.05.11
Receiver	Agilent	E7405A	US44210471	2013.05.12	2014.05.11
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2013.05.12	2014.05.11
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2013.05.12	2014.05.11
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2013.05.12	2014.05.11
Test Antenna - Horn	R&S	HL050S7	71688	2013.05.12	2014.05.11

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Test Antenna - Loop	Schwarzbeck	FMZB 1519	1519-022	2013.05.12	2014.05.11

2.10.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.10.4. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

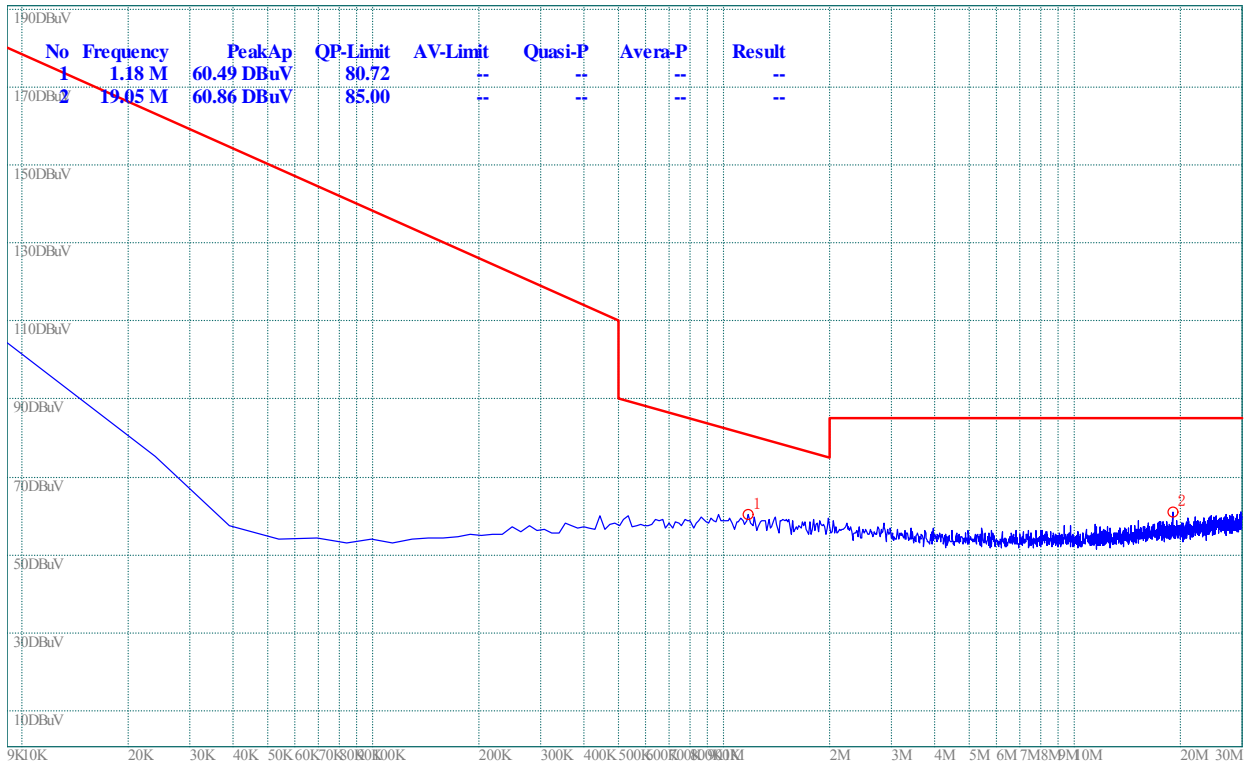
A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

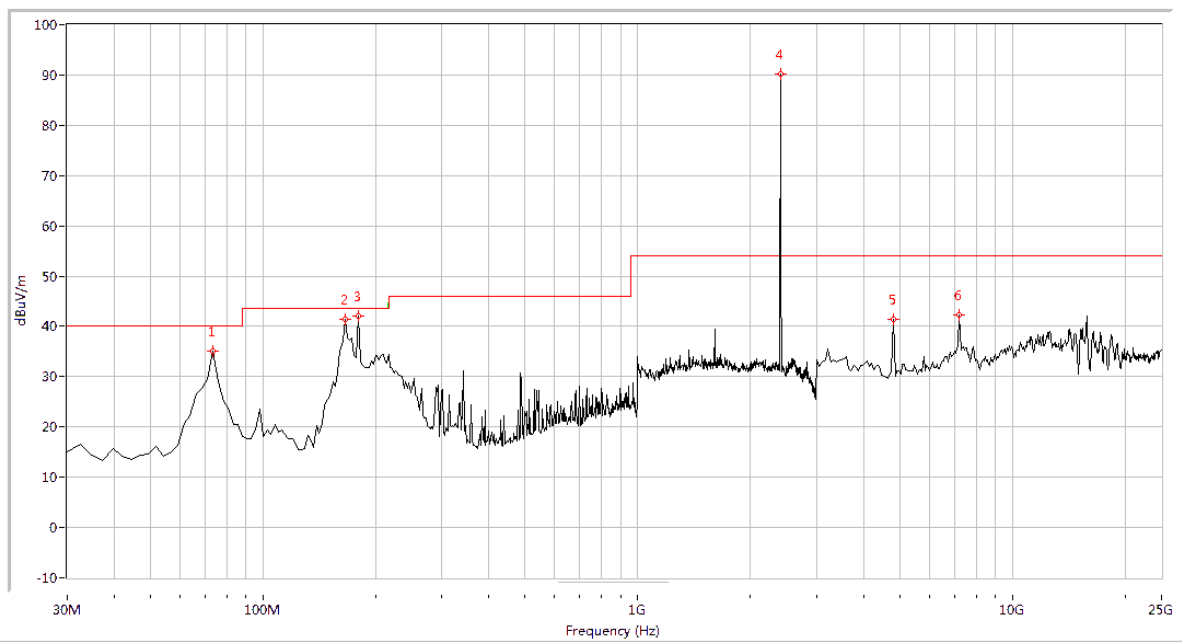
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1

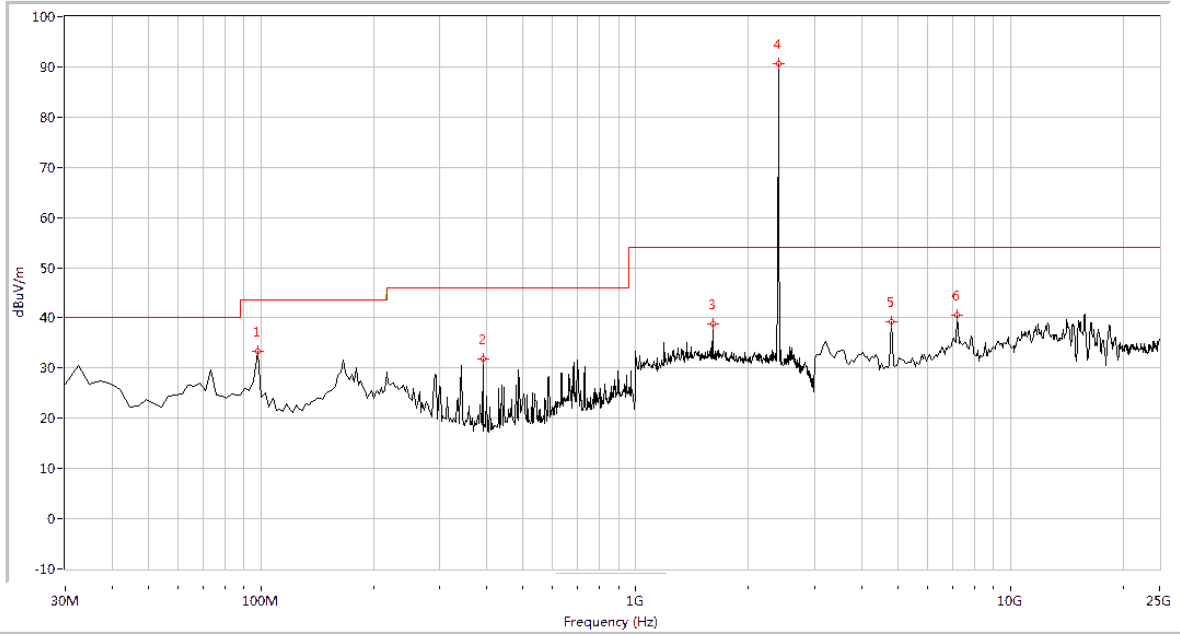


(Plot A.0: 9kHz to 30MHz, channel 1)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
73.541	35.13	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
165.461	41.35	33.89	33.44	N.A	43.5	N.A	Horizontal	PASS
179.975	42.03	39.11	35.31	N.A	43.5	N.A	Horizontal	PASS
2405.375	90.21	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
4810.474	41.42	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7224.439	42.29	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

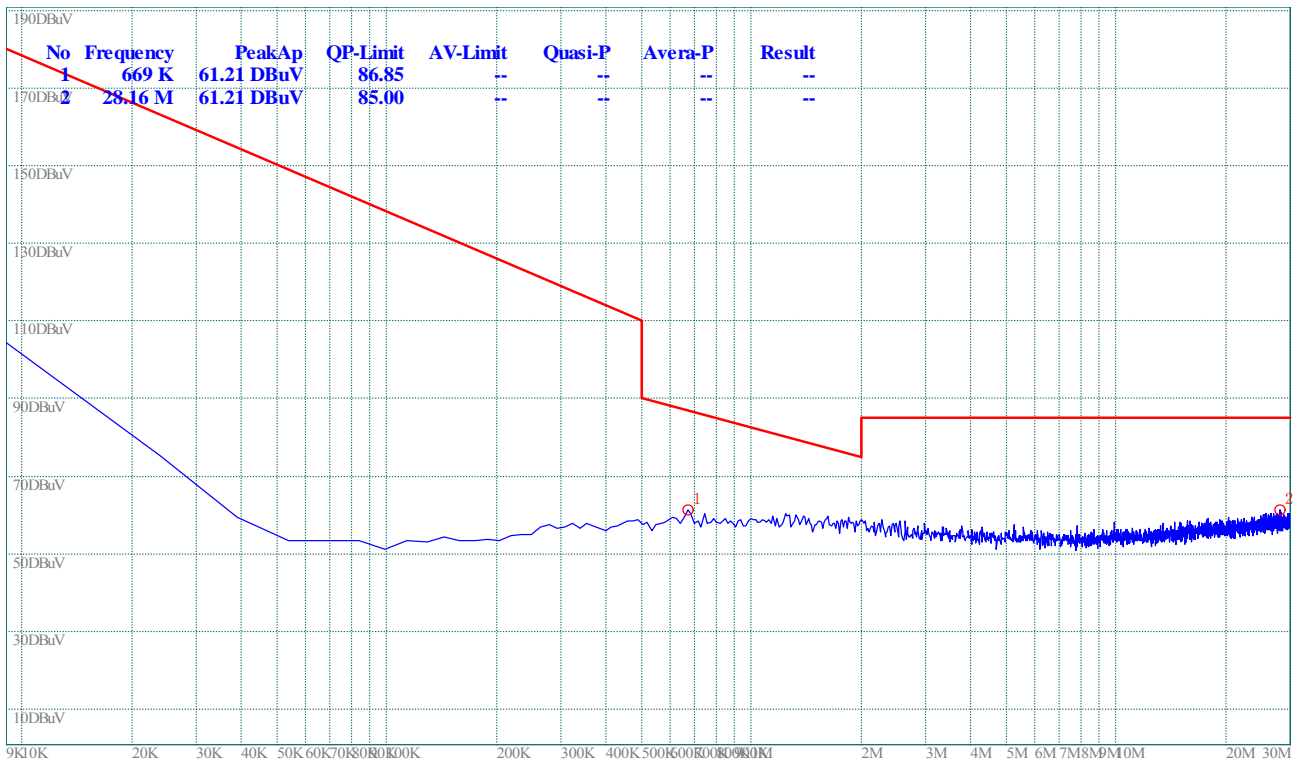
(Plot A.1: 30MHz to 25GHz, Antenna Horizontal, channel 1)



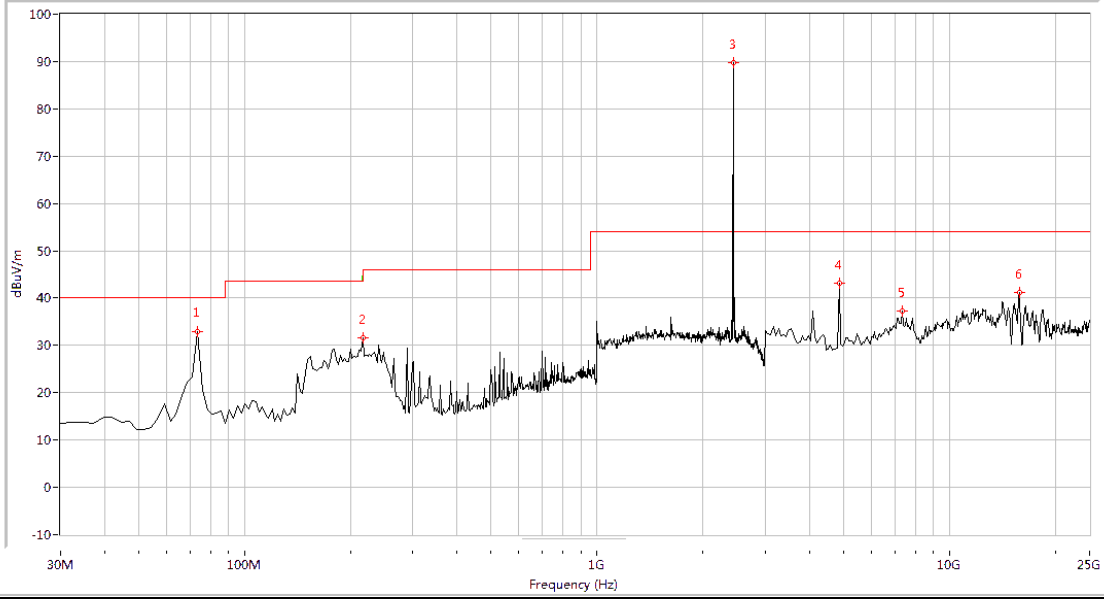
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
97.731	33.28	N.A	N.A	N.A	43.5	N.A	Vertical	PASS
390.424	31.84	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
1603.491	38.82	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
2405.375	90.69	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
4810.474	39.27	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7224.439	40.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot A.2: 30MHz to 25GHz, Antenna Vertical, channel 1)

Plot for Channel = 18

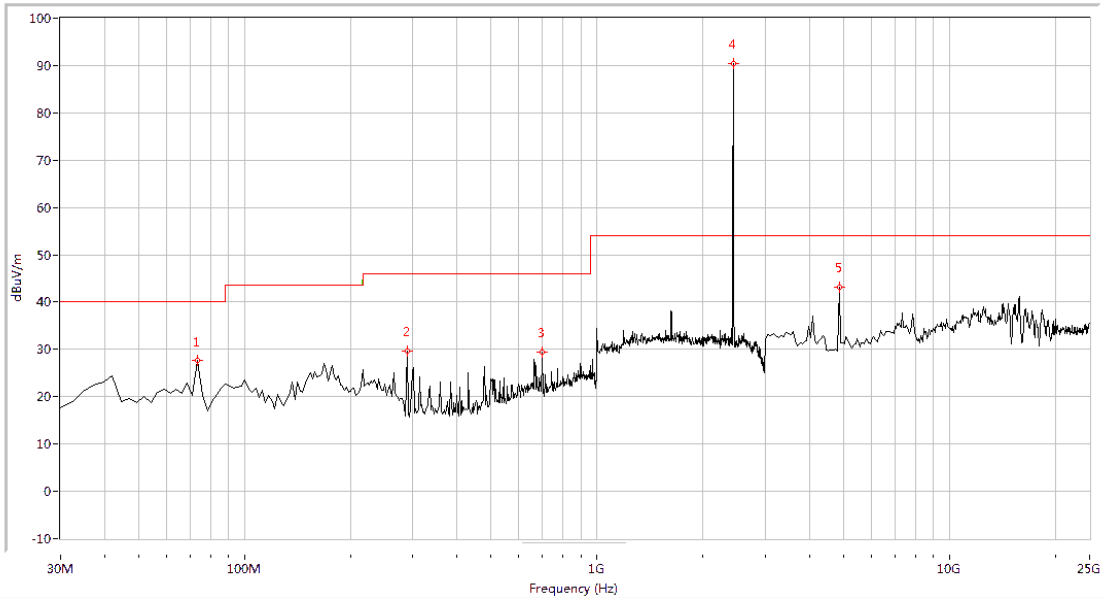


(Plot B.0: 9kHz to 30MHz, channel 18)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
73.541	32.96	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
216.259	31.50	N.A	N.A	N.A	46.0	N.A	Horizontal	PASS
2440.192	89.71	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
4865.337	43.10	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7334.165	37.33	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15783.042	41.14	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

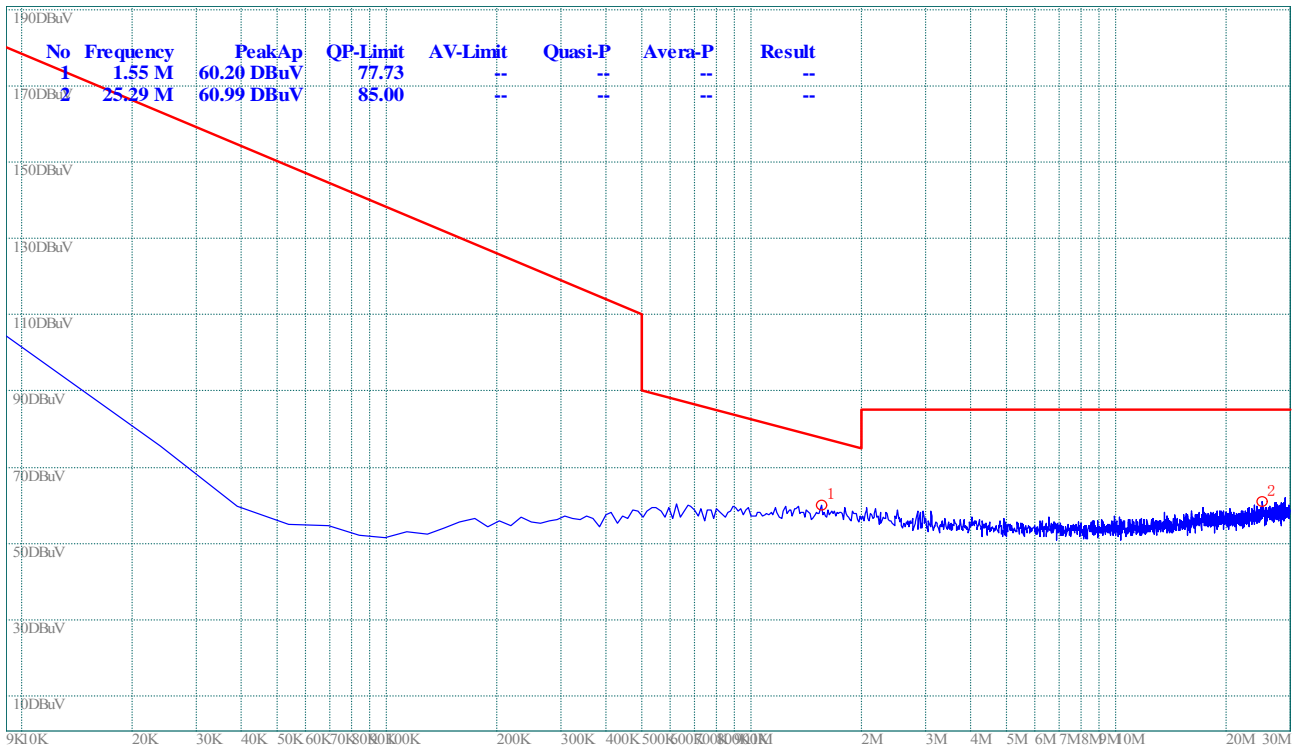
(Plot B.1: 30MHz to 25GHz, Antenna Horizontal, channel 18)



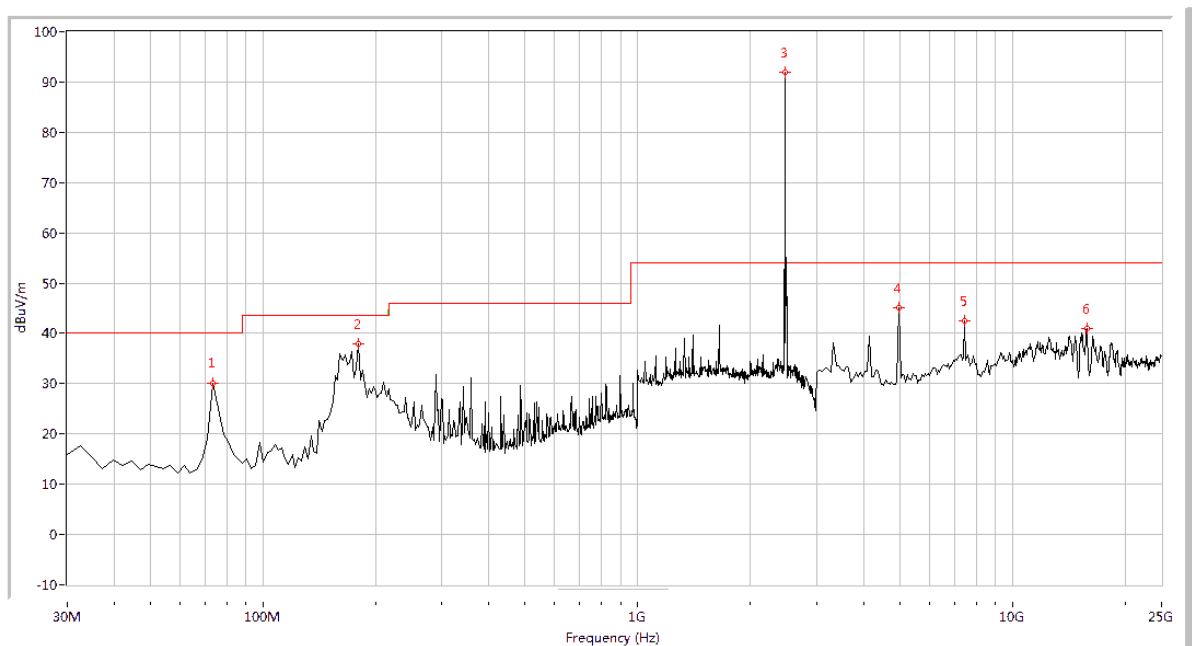
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
73.541	27.71	N.A	N.A	N.A	40.0	N.A	Vertical	PASS
288.828	29.73	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
700.050	29.32	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2440.192	90.42	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
4865.337	43.06	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot B.2: 30MHz to 25GHz, Antenna Vertical, channel 18)

Plot for Channel = 36

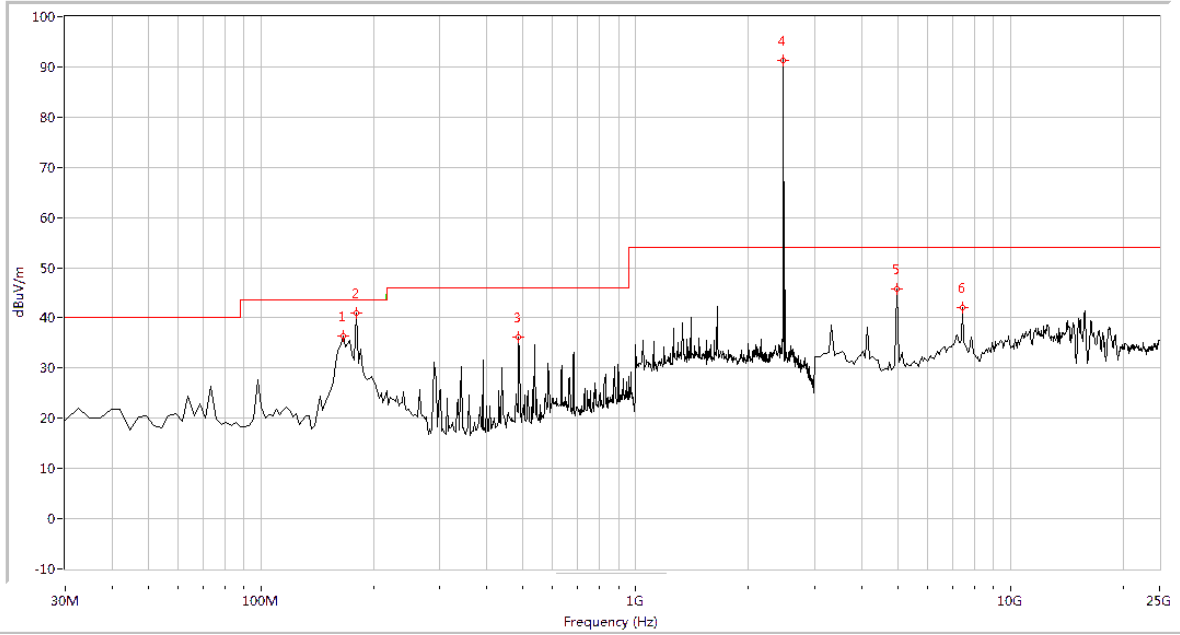


(Plot C.0: 9kHz to 30MHz, channel 36)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
73.541	30.05	N.A	N.A	N.A	40.0	N.A	Horizontal	PASS
179.975	37.83	N.A	N.A	N.A	43.5	N.A	Horizontal	PASS
2477.056	91.89	N.A	N.A	N.A	N.A	N.A	Horizontal	N.A
4975.062	45.06	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7443.890	42.57	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15783.042	40.89	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Plot C.1: 30MHz to 25GHz, Antenna Horizontal, channel 36)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
165.461	36.36	29.92	29.33	N.A	43.5	N.A	Vertical	PASS
179.975	41.00	37.47	38.82	N.A	43.5	N.A	Vertical	PASS
487.182	36.16	N.A	N.A	N.A	46.0	N.A	Vertical	PASS
2477.056	91.22	N.A	N.A	N.A	N.A	N.A	Vertical	N.A
4975.062	45.85	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7443.890	42.01	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Plot C.2: 30MHz to 25GHz, Antenna Vertical, channel 36)

2.11. RF exposure evaluation

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4 \pi R^2}$$

Where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

2.11.1. Limits for Maximum Permissible Exposure

According to FCC Part 1.1307, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the commission's guidelines.

According to FCC Part 1.1310 RF exposure is calculated.

Limits for General Population/ Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength (H)(A/m)	Power Density (S)(mW/cm ²)
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f ²)*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0

2.11.2. Test result

Maximum peak output power at antenna input terminal(dBm):	20.43
Maximum peak output power at antenna input terminal(mW):	110.408
Source-based time-averaged output power:	--
Prediction distance(cm):	20
Predication frequency(MHz):	2405.376
Antenna Gain (typical) (dBi):	2.0
Power density at predication frequency at <u>20</u> cm(mW/cm ²):	0.034812
MPE limit for RF exposure at prediction frequency(mW/cm ²):	1.0

2.11.3. Conclusion

Since the test result is passed, the SAR measurement is not required.

** END OF REPORT **

** END OF REPORT **