



REPORT No.: SZ15010124W01

FCC RF TEST REPORT

APPLICANT : SHENZHEN KEWEITAI ENTERPRISE
DEVELOPMENT CO., LTD

PRODUCT NAME : T460 UAV HD VIDEO TRANSMITTER

MODEL NAME : T460

TRADE NAME : ALLTECH

BRAND NAME : ALLTECH

FCC ID : 2AD5L-T460

STANDARD(S) : 47 CFR Part 15 Subpart C

ISSUE DATE : 2016-07-29



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

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Change History		
Issue	Date	Reason for change
1.0	2016-07-29	First edition



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TEST REPORT DECLARATION

Applicant	SHENZHEN KEWEITAI ENTERPRISE DEVELOPMENT CO., LTD
Applicant Address	2F,BUILDING C3, Hengfeng Industrial Area, Baoan District, Shenzhen, 518126 P.R.C
Manufacturer	SHENZHEN KEWEITAI ENTERPRISE DEVELOPMENT CO., LTD
Manufacturer Address	2F,BUILDING C3, Hengfeng Industrial Area, Baoan District, Shenzhen, 518126 P.R.C
Product Name	T460 UAV HD VIDEO TRANSMITTER
Model Name	T460
Brand Name	ALLTECH
HW Version	V2
SW Version	V1.5
Test Standards	47 CFR Part 15 Subpart C
Test Date	2015-08-20 to 2015-08-26
Test Result	PASS

Tested by : Zou Jian
Zou Jian

Reviewed by : Qiu Xiaojun
Qiu Xiaojun

Approved by : Peng Huarui
Peng Huarui



1. TECHNICAL INFORMATION

Note: Provide by applicant.

1.1 Applicant Information

Company:	SHENZHEN KEWEITAI ENTERPRISE DEVELOPMENT CO., LTD
Address:	2F,BUILDING C3, Hengfeng Industrial Area, Baoan District, Shenzhen, 518126 P.R.C

1.2 Equipment under Test (EUT) Description

Brand Name:	ALLTECH
Trade Name:	ALLTECH
Model Name:	T460
Frequency Range:	The frequency range used is 2420MHz - 2440MHz (21 channels, at intervals of 1MHz);
Modulation Type:	COFDM
Bandwidth:	1.5/2/3MHz, 4MHz, 6/7/8MHz ^{Note 2}
Antenna Type:	Dedicated Antenna
Antenna Gain:	5 dBi

NOTE:

1. The EUT operates at 2.4GHz ISM band; the frequencies allocated for the EUT is $F(\text{MHz})=2420+(n-1)$ ($1 \leq n \leq 21$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2420MHz), 11 (2430MHz) and 21 (2440MHz).
2. The EUT contains a variety of different bandwidths, and only the worst bandwidth of test data, which are 1.5MHz, 4MHz, 8MHz, is recorded in the report.
3. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2.1 Identification of all used EUTs

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
01	V2	V1.5



1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (2.4GHz ISM band radiators) for the EUT FCC ID Certification:

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

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

No.	Section	Description	Test Date	Result
1	15.203	Antenna Requirement	N.A	<u>PASS</u>
2	15.247(b)	Peak Output Power	August 26,2015	<u>PASS</u>
3	15.247(a)	Bandwidth	August 26,2015	<u>PASS</u>
4	15.247(d)	Conducted Spurious Emission and Band Edge	August 26,2015	<u>PASS</u>
5	15.247(d)	Restricted Frequency Bands	August 24,2015	<u>PASS</u>
6	15.207	Conducted Emission	August 24,2015	<u>PASS</u>
7	15.209 ,15.247(d)	Radiated Emission	August 20,2015	<u>PASS</u>
8	15.247(e)	Power spectral density (PSD)	August 26,2015	<u>PASS</u>

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

1.3.1 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 Peak Output Power

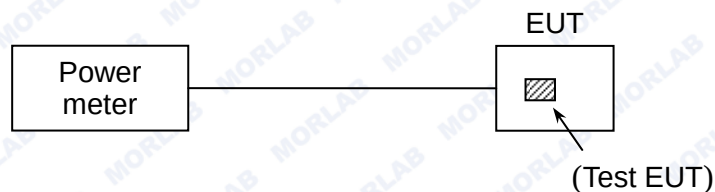
2.2.1 Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

2.2.2 Test Description

The measured output power was calculated by the reading of the Power Meter and calibration.

A. Test Setup:



The EUT (Equipment under the test) which is coupled to the Power Meter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in power meter.

**B. Equipments List:**

Please reference ANNEX A(1.4).

2.2.3 Test Result

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the EUT.

2.2.3.1 1.5MHz Bandwidth

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	28.24	0.666807	30	1	PASS
11	2430	28.07	0.641210			PASS
21	2440	28.21	0.662217			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	20.83	0.121060	30	1	PASS
11	2430	21.13	0.129718			PASS
21	2440	20.98	0.125314			PASS

2.2.3.2 4MHz Bandwidth

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	28.53	0.712853	30	1	PASS
11	2430	28.21	0.662217			PASS
21	2440	28.35	0.683912			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	20.89	0.122744	30	1	PASS
11	2430	21.18	0.131220			PASS
21	2440	20.99	0.125603			PASS



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2.2.3.3 8MHz Bandwidth

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	28.21	0.662217	30	1	PASS
11	2430	28.45	0.699842			PASS
21	2440	28.35	0.683912			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2420	20.83	0.121060	30	1	PASS
11	2430	21.16	0.130617			PASS
21	2440	20.91	0.123310			PASS

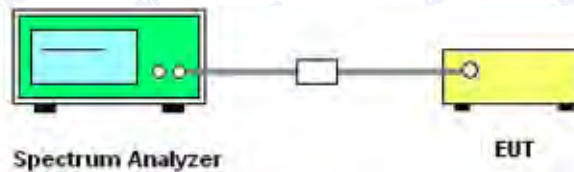
2.3 6dB Bandwidth

2.3.1 Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2 Test Description

A. Test Set:



The EUT which is powered by the battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please reference ANNEX A(1.5).

2.3.3 Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the EUT.

2.3.3.1 1.5MHz Bandwidth

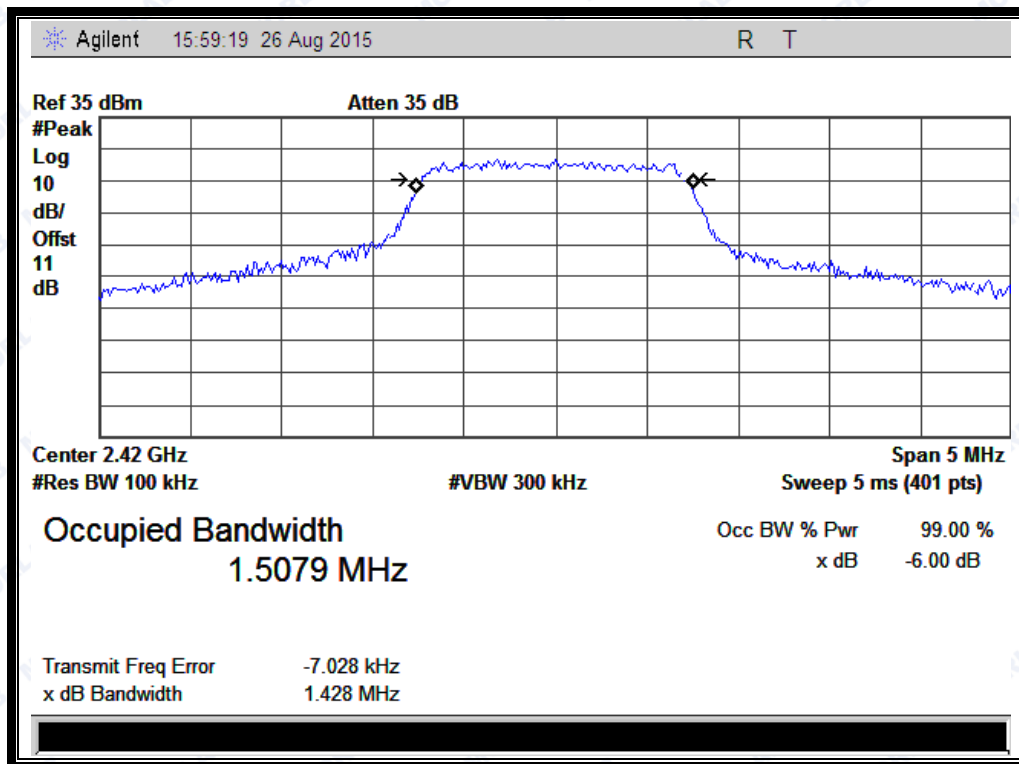
A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2420	1.428	≥500	PASS
11	2430	1.423	≥500	PASS
21	2440	1.468	≥500	PASS

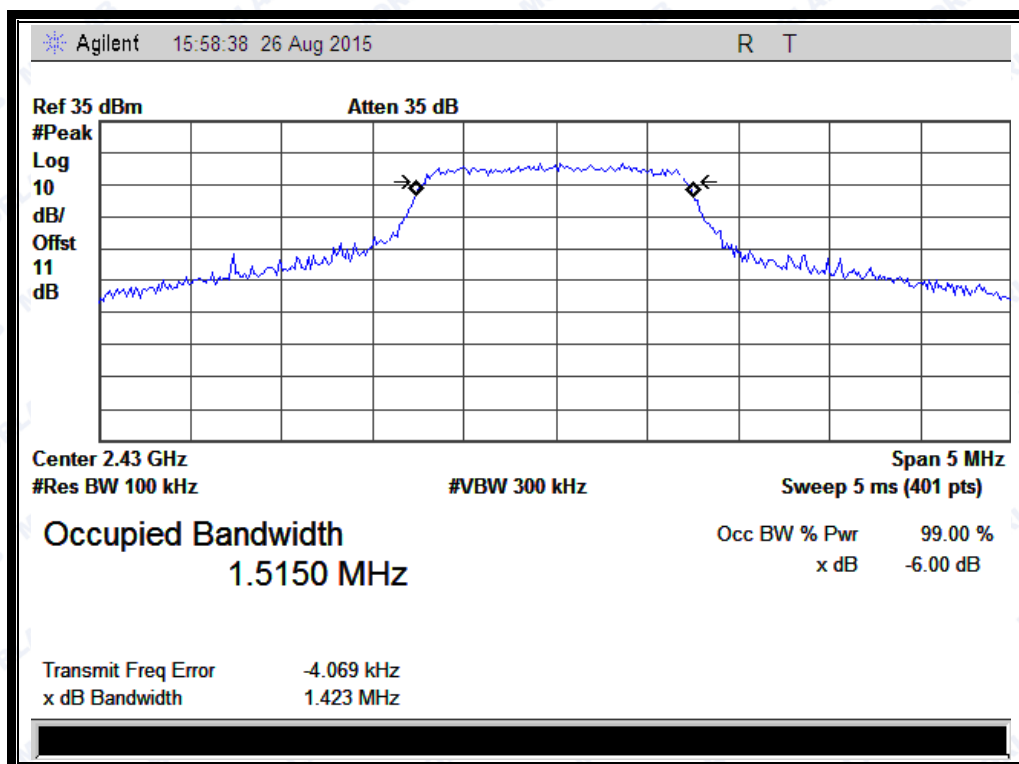
B. Test Plots



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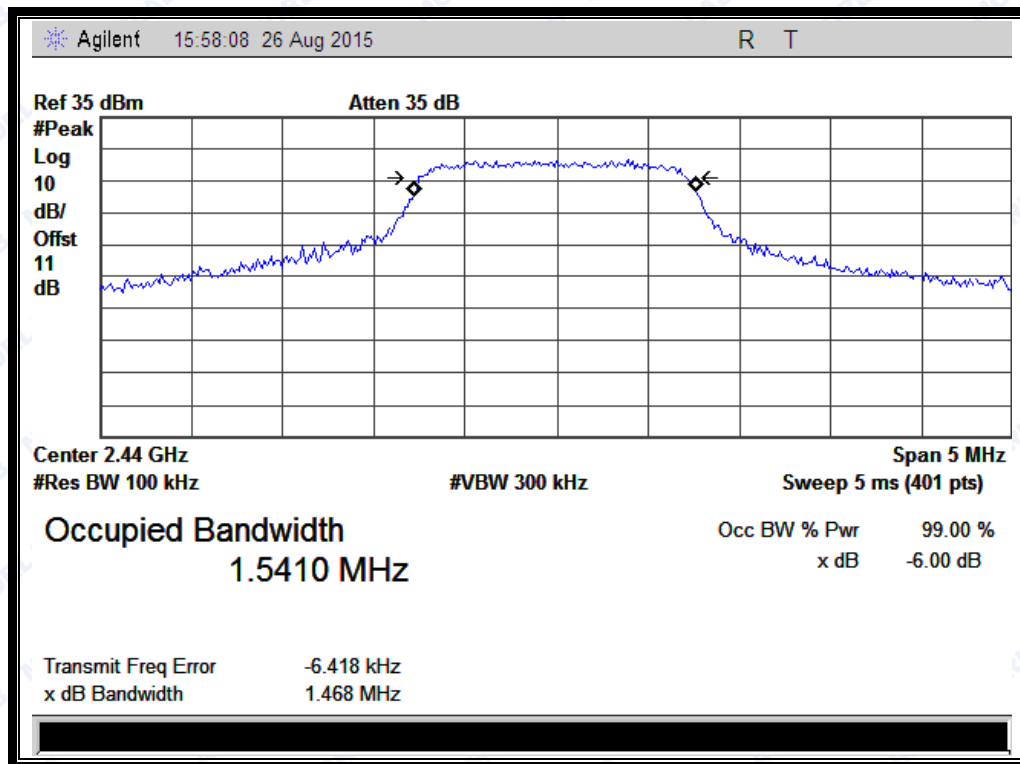
(Channel 1: 2420MHz @ 1.5MHz Bandwidth)



(Channel 11: 2430MHz @ 1.5MHz Bandwidth)



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(Channel 21: 2440MHz @ 1.5MHz Bandwidth)

2.3.3.2 4MHz Bandwidth

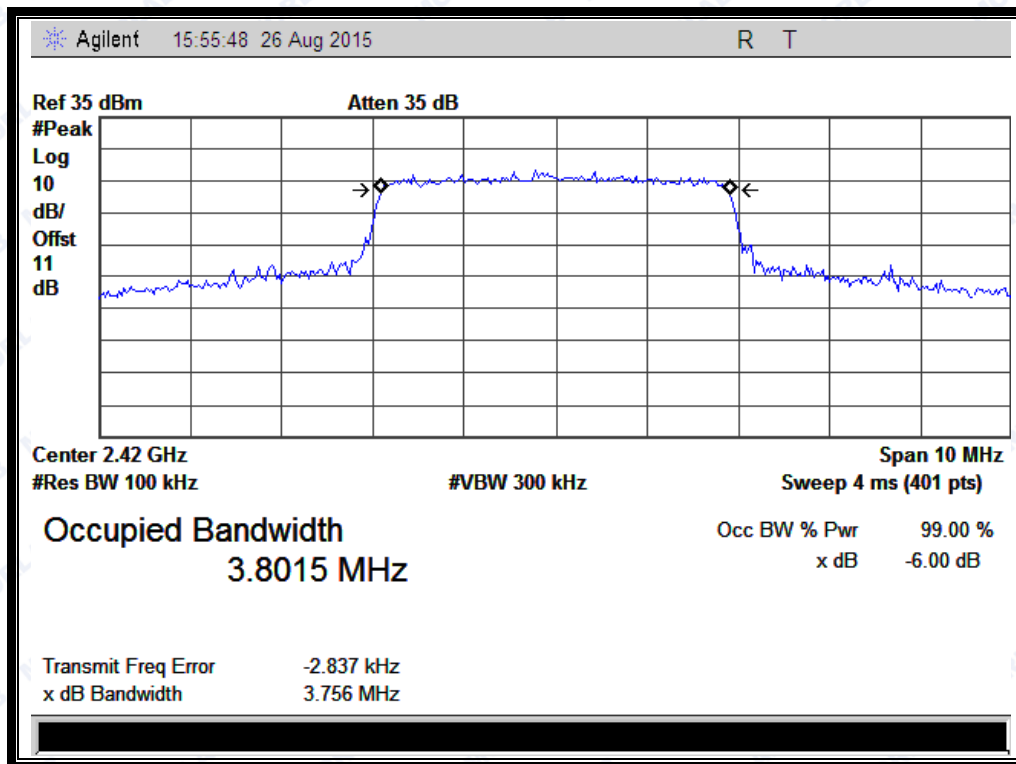
C. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2420	3.756	≥500	PASS
11	2430	3.813	≥500	PASS
21	2440	3.765	≥500	PASS

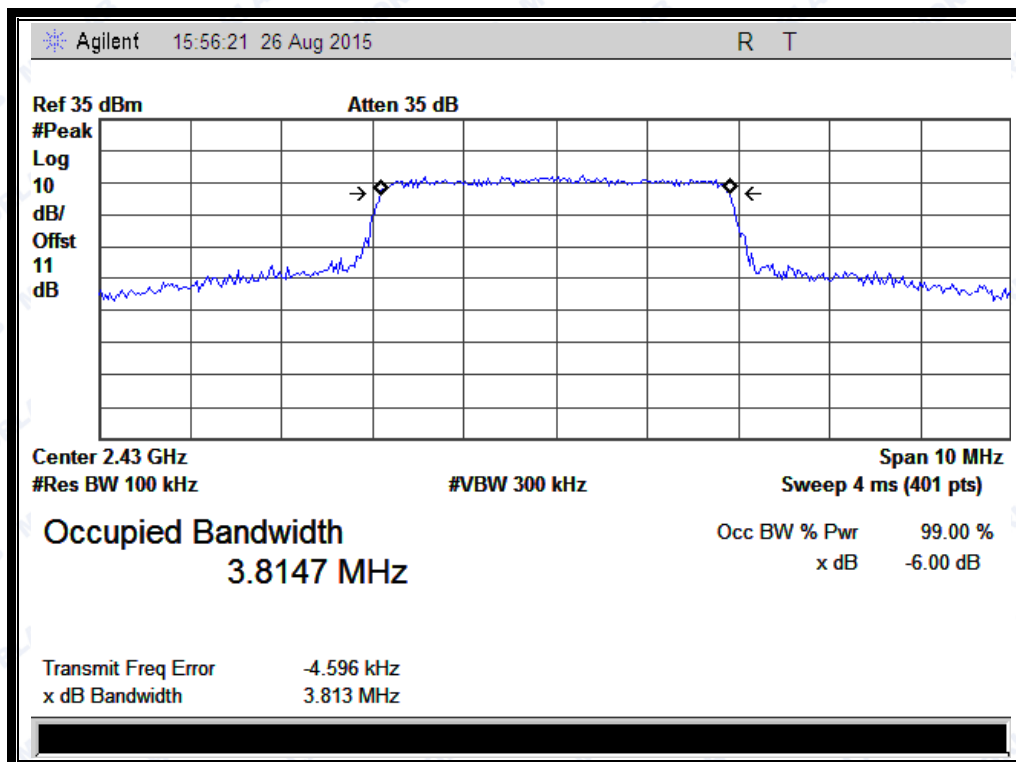
D. Test Plots:



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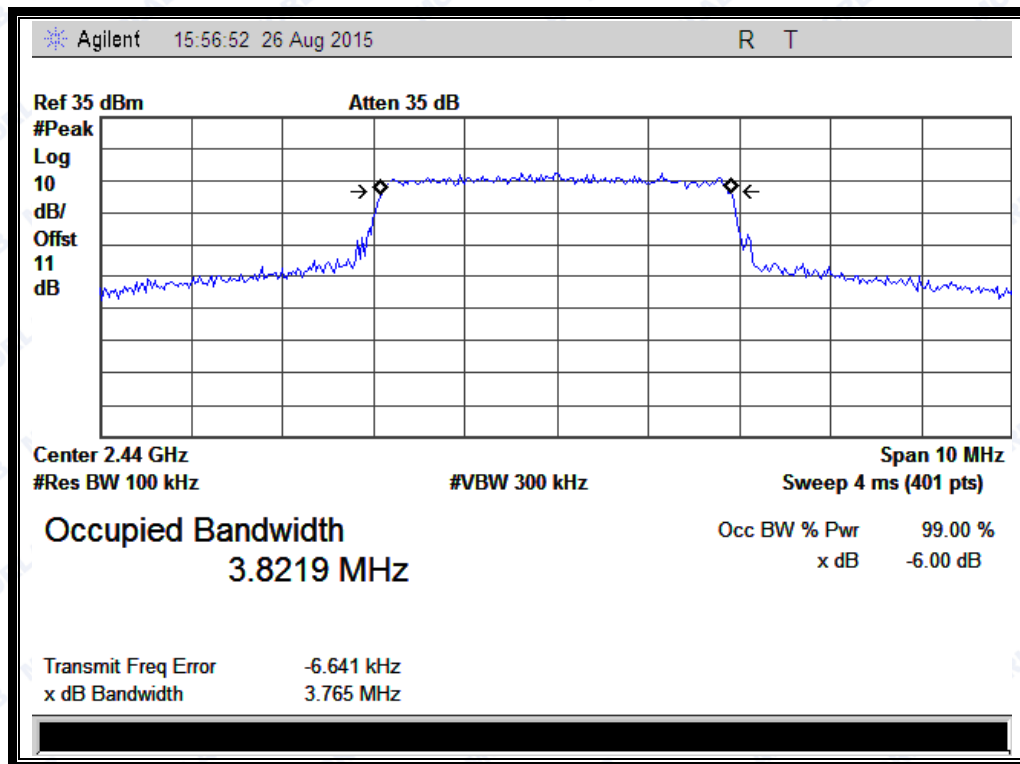
(Channel 1: 2420MHz @ 4MHz Bandwidth)



(Channel 11: 2430MHz @ 4MHz Bandwidth)



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(Channel 21: 2440MHz @ 4MHz Bandwidth)

2.3.3.3 8MHz Bandwidth

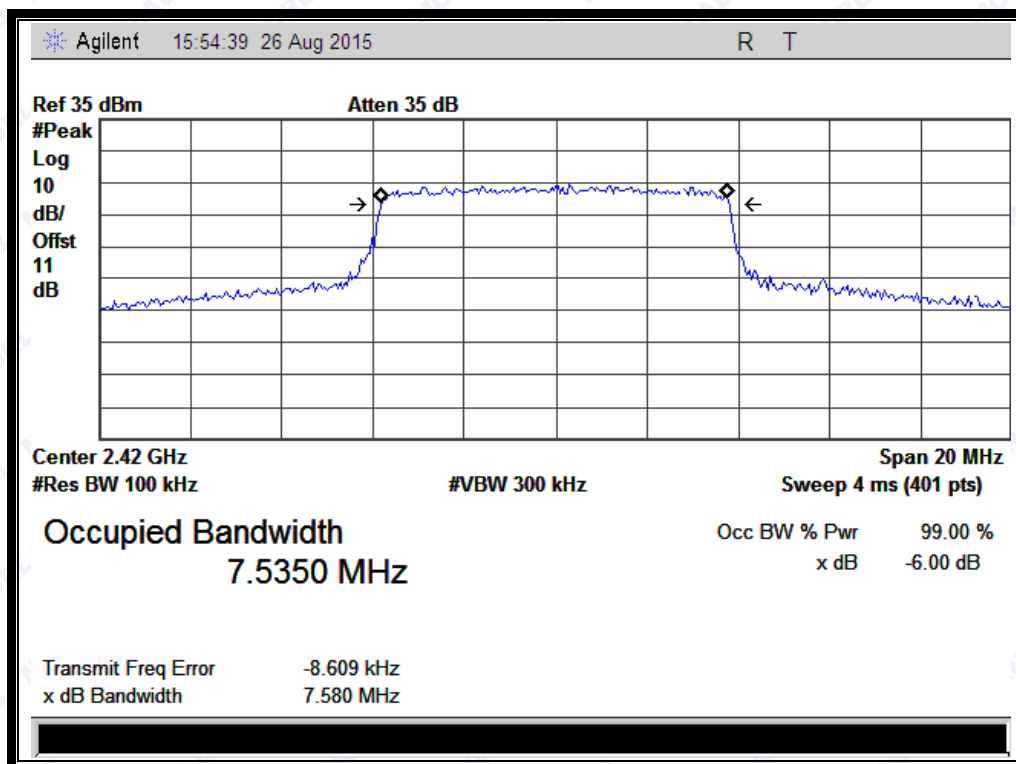
E. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2420	7.580	≥500	PASS
11	2430	7.624	≥500	PASS
21	2440	7.631	≥500	PASS

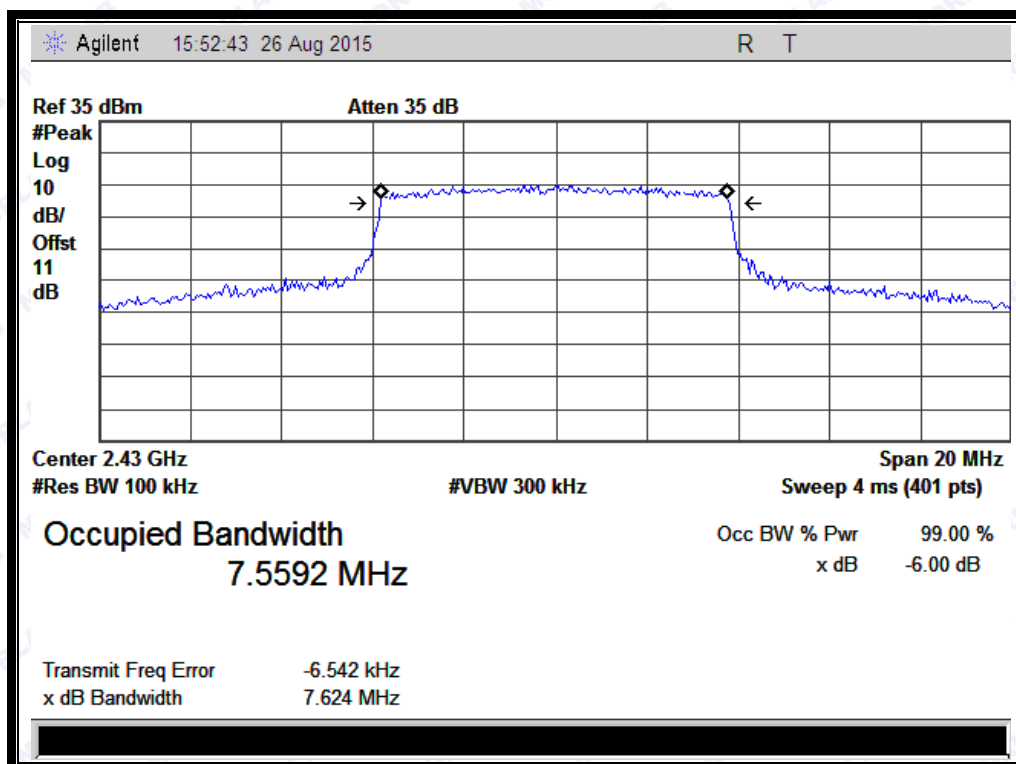
F. Test Plots:



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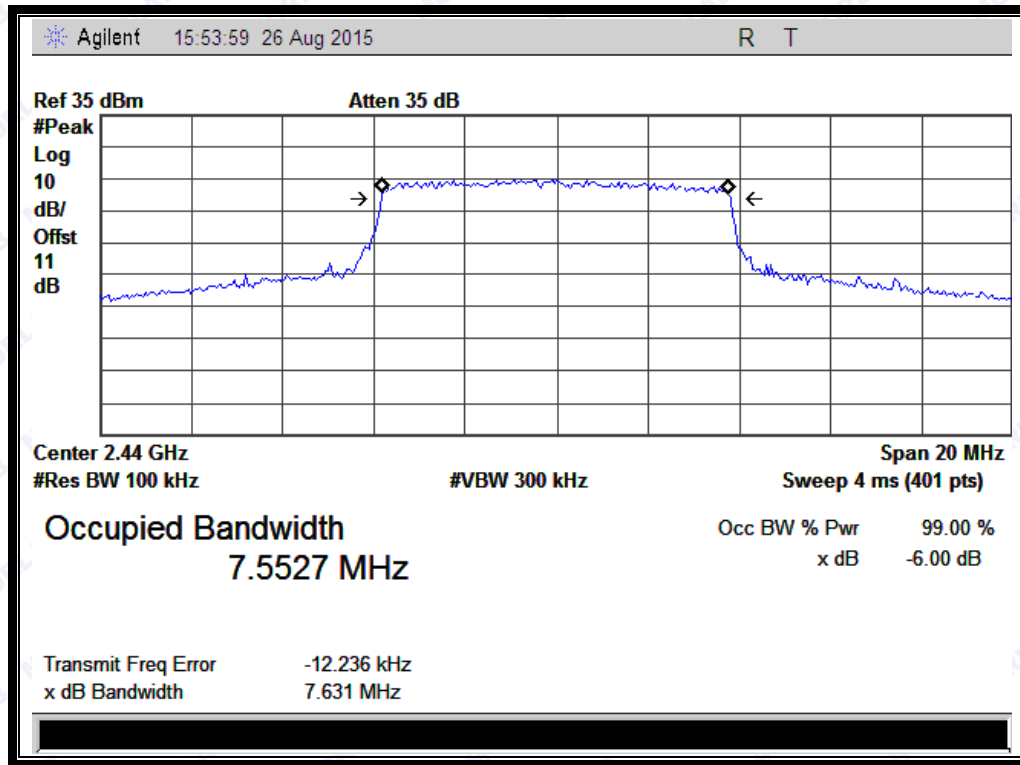
(Channel 1: 2420MHz @ 8MHz Bandwidth)



(Channel 11: 2430MHz @ 8MHz Bandwidth)



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(Channel 21: 2440MHz @ 8MHz Bandwidth)

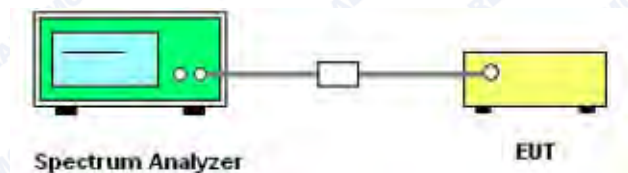
2.4 Conducted Spurious Emissions and Band Edge

2.4.1 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, based on either an RF conducted or a radiated measurement.

2.4.2 Test Description

A. Test Set:



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

B. Equipments List:

Please reference ANNEX A (1.5).

2.4.3 Test Result

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.



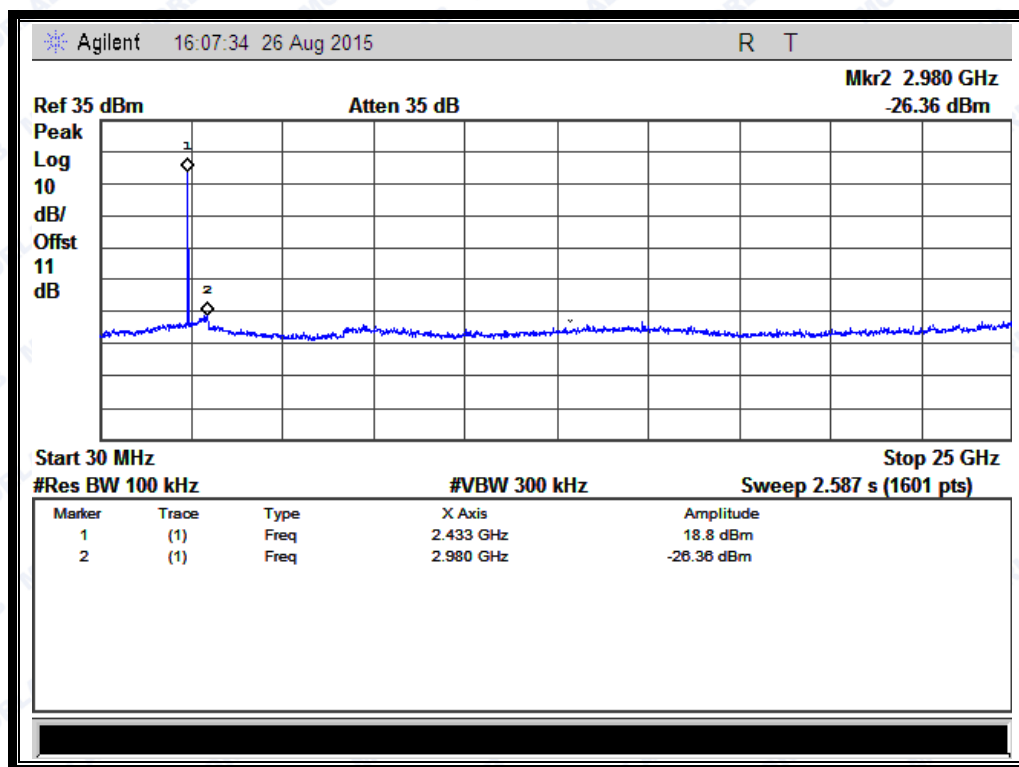
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2.4.3.1 1.5MHz Bandwidth**A. Test Verdict:**

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2420	-26.36	18.8	-1.2	PASS
11	2430	-26.23	18.69	-1.31	PASS
21	2440	-28.00	19.4	-0.6	PASS

B. Test Plots:

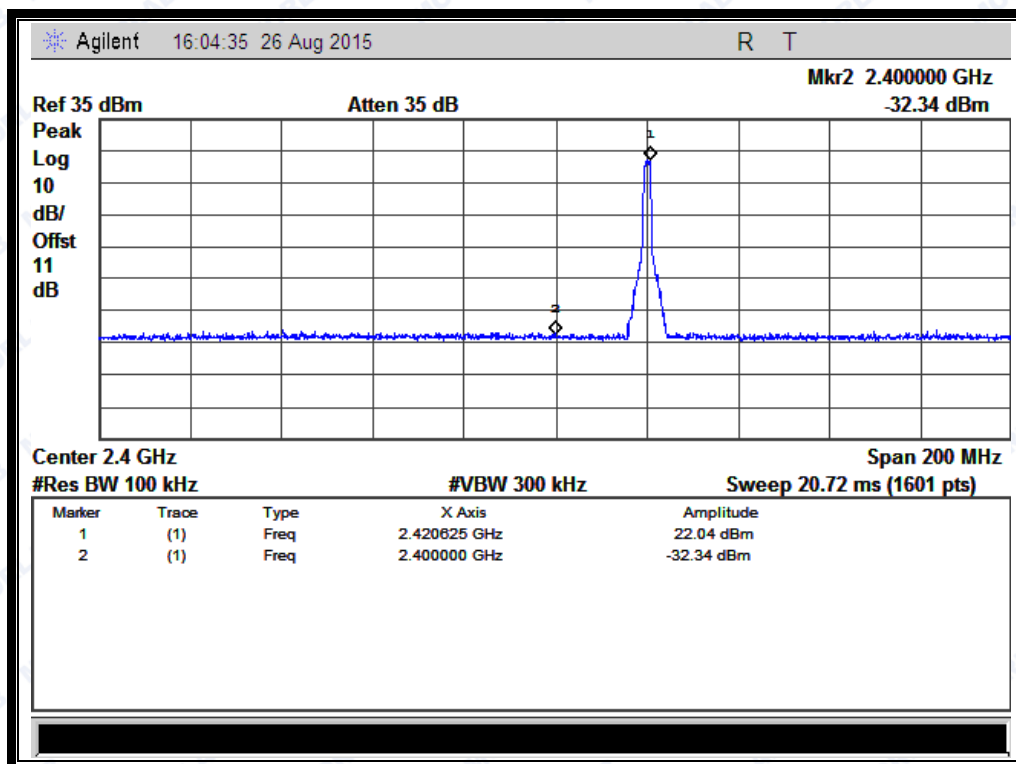
Note: the power of the EUT transmitting frequency should be ignored.



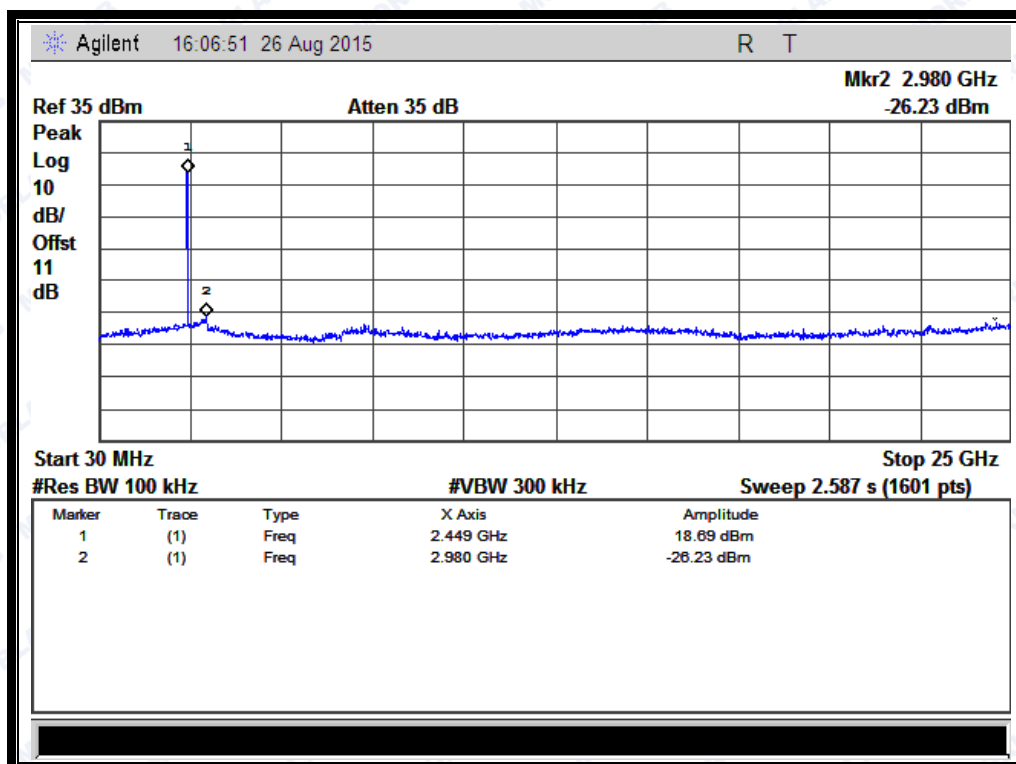
(Channel = 1, 30MHz to 25GHz)



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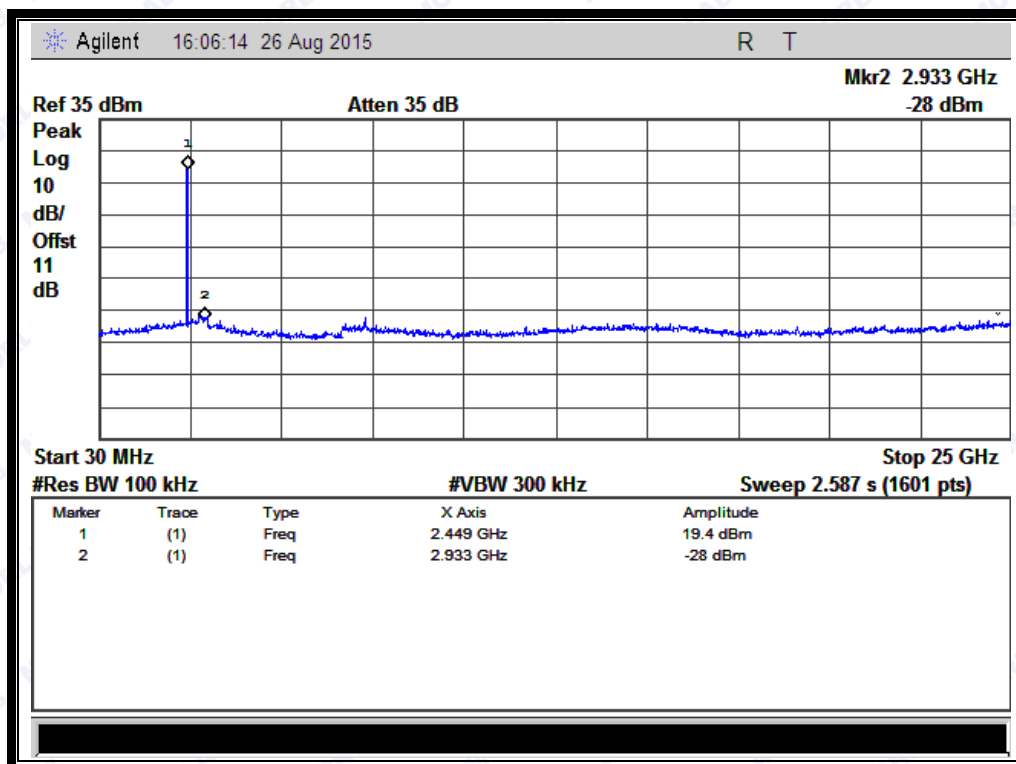
(Band Edge @ Channel = 1)



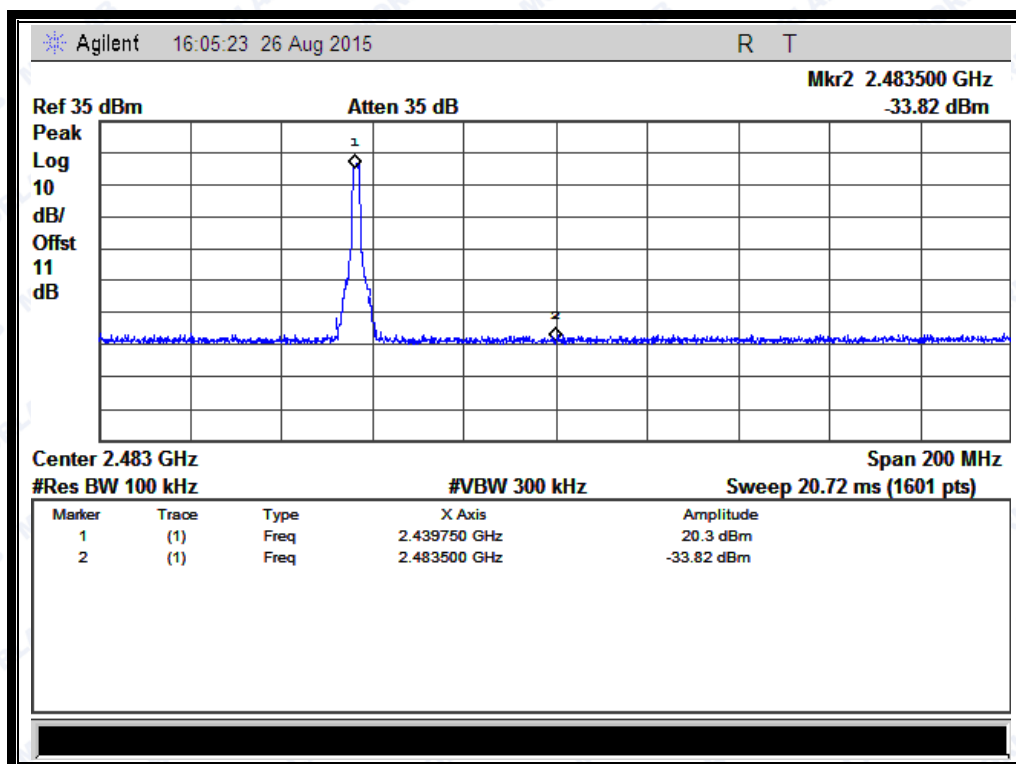
(Channel = 11, 30MHz to 25GHz)



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(Channel = 21, 30MHz to 25GHz)



(Band Edge @ Channel = 21)



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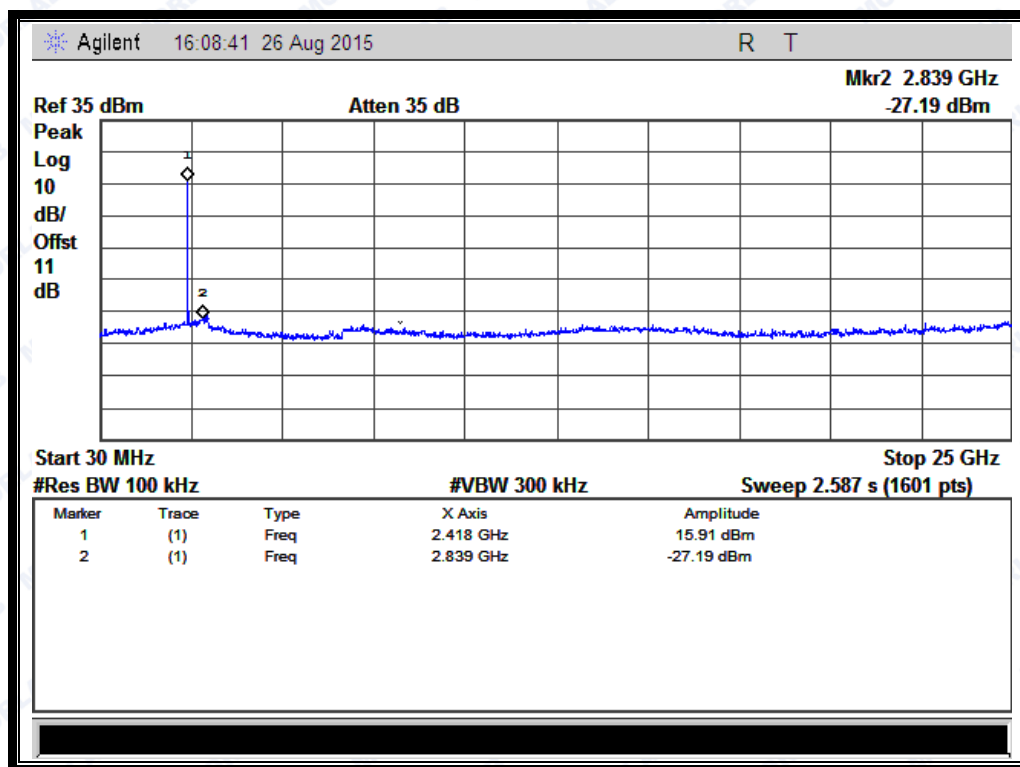
2.4.3.2 4MHz Bandwidth

C. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2420	-27.19	15.91	-4.09	PASS
11	2430	-27.75	14.46	-5.54	PASS
21	2440	27.19	15.91	-4.09	PASS

D. Test Plots:

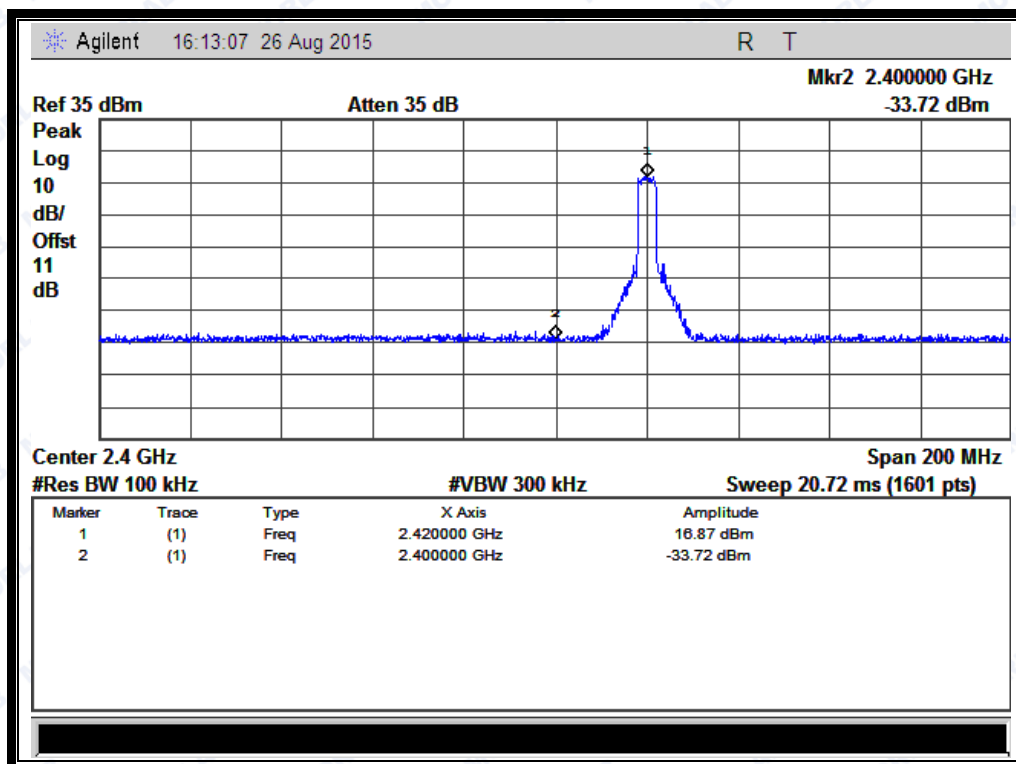
Note: the power of the EUT transmitting frequency should be ignored.



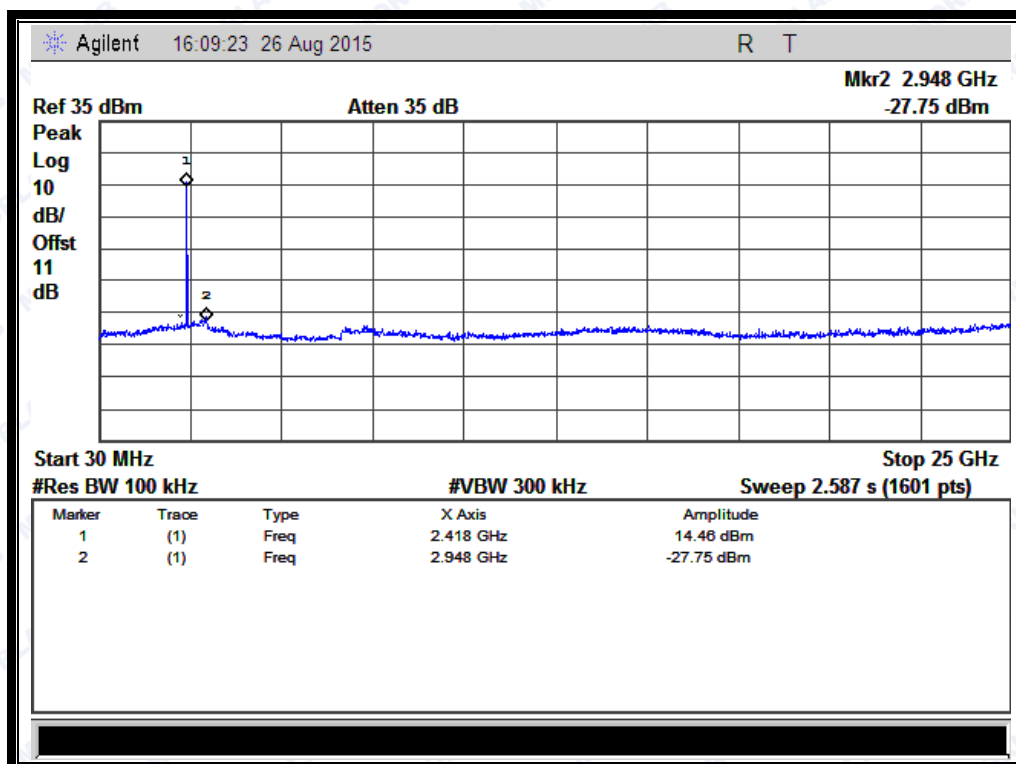
(Channel = 1, 30MHz to 25GHz)



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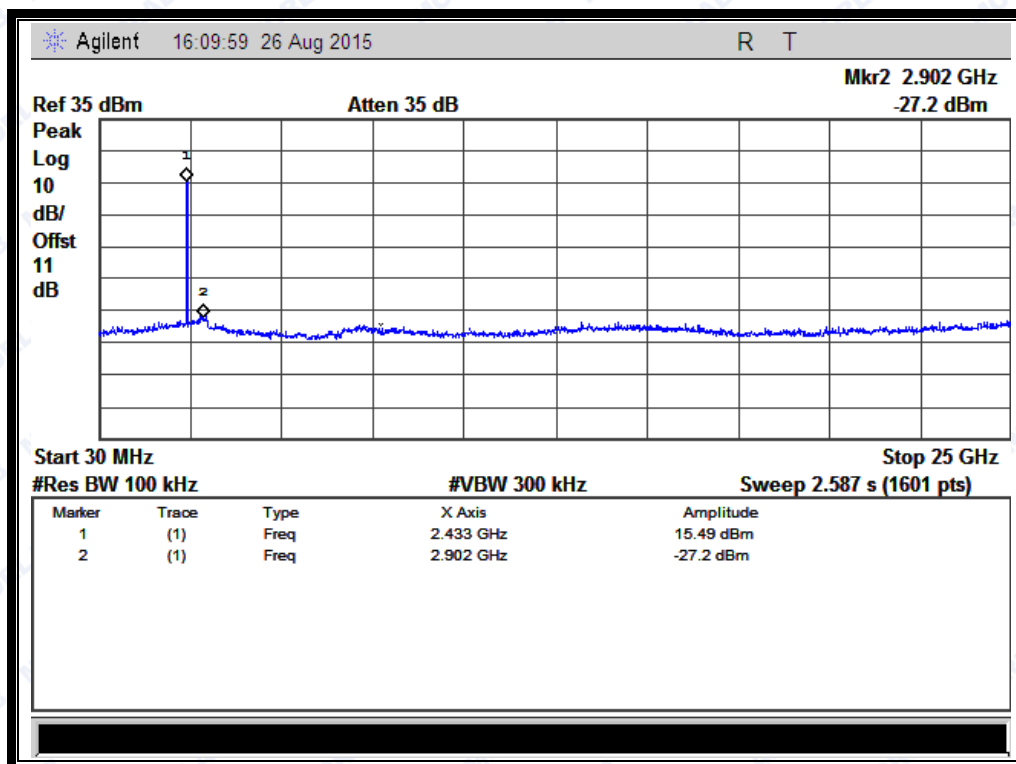
(Band Edge @ Channel = 1)



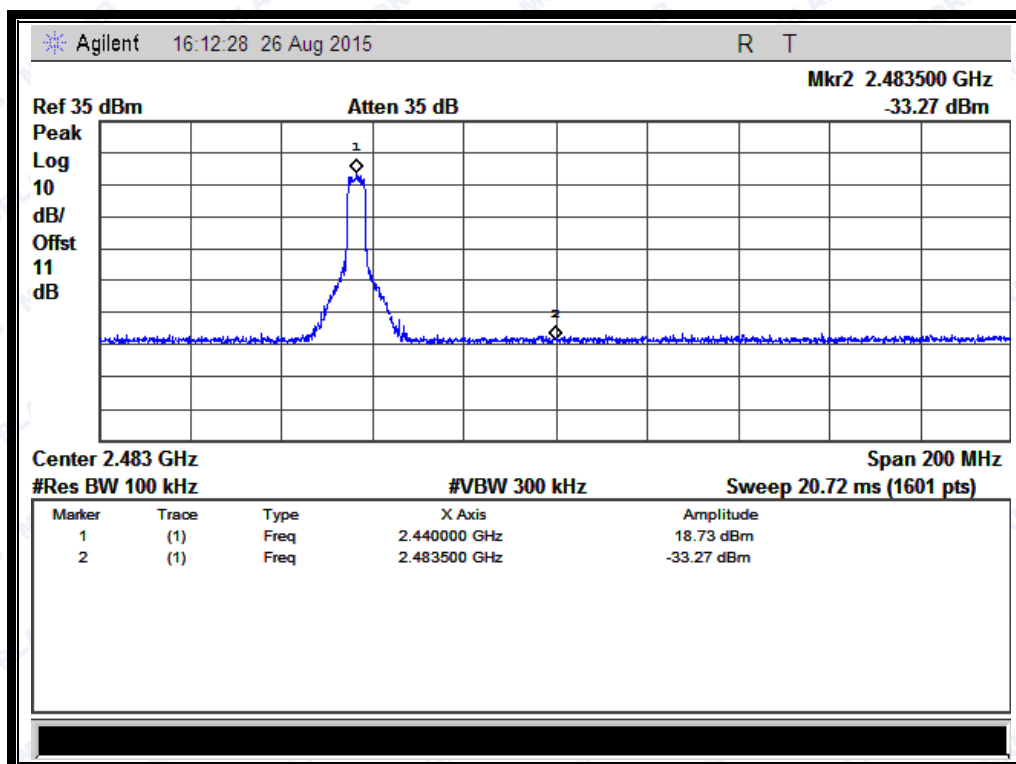
(Channel = 11, 30MHz to 25GHz)



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(Channel = 21, 30MHz to 25GHz)



(Band Edge @ Channel = 21)



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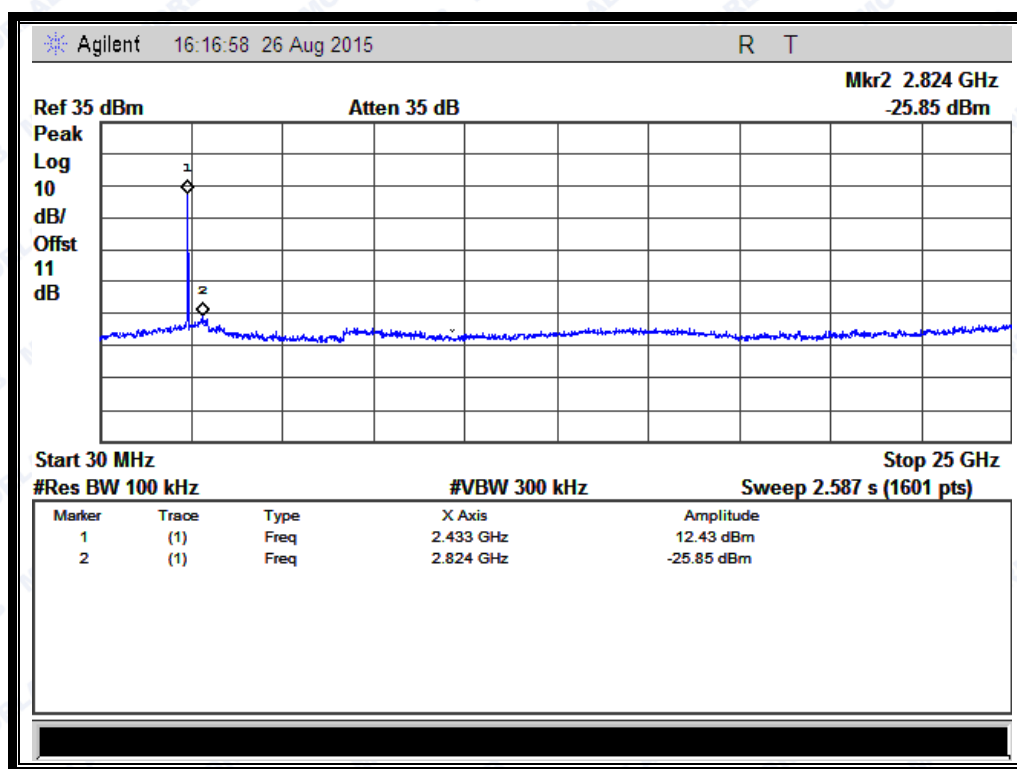
2.4.3.3 8MHz Bandwidth

E. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
1	2420	-25.85	12.43	-7.57	PASS
11	2430	-27.20	14.1	-5.9	PASS
21	2440	-28.28	13.5	-6.5	PASS

F. Test Plots:

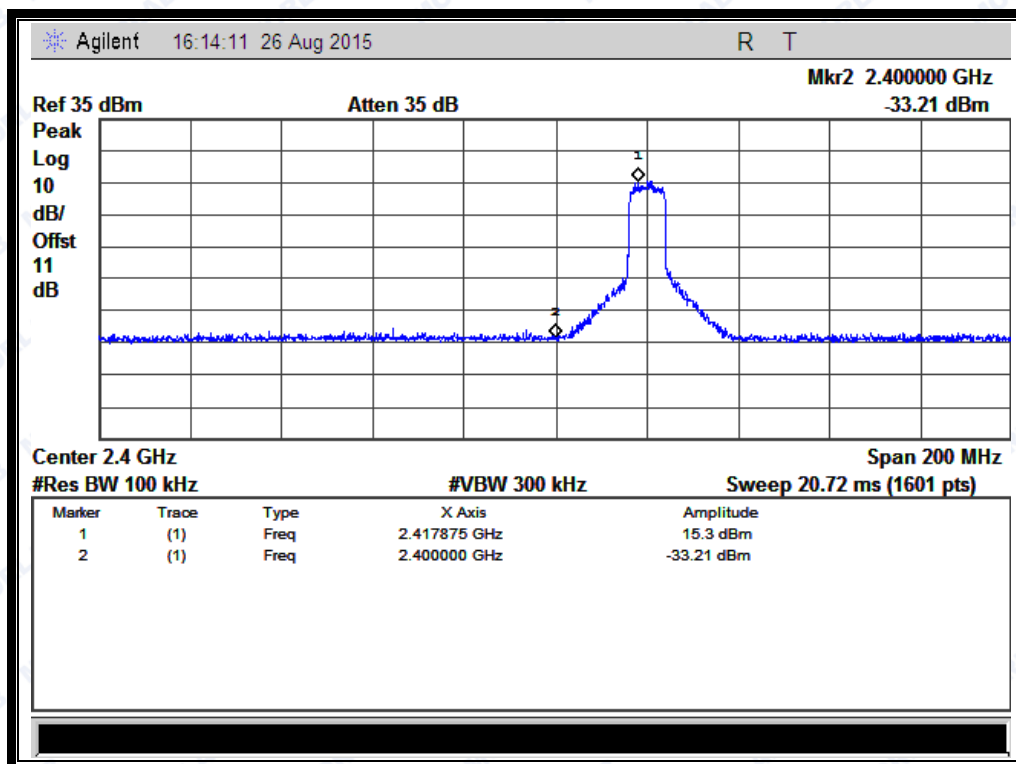
Note: the power of the EUT transmitting frequency should be ignored.



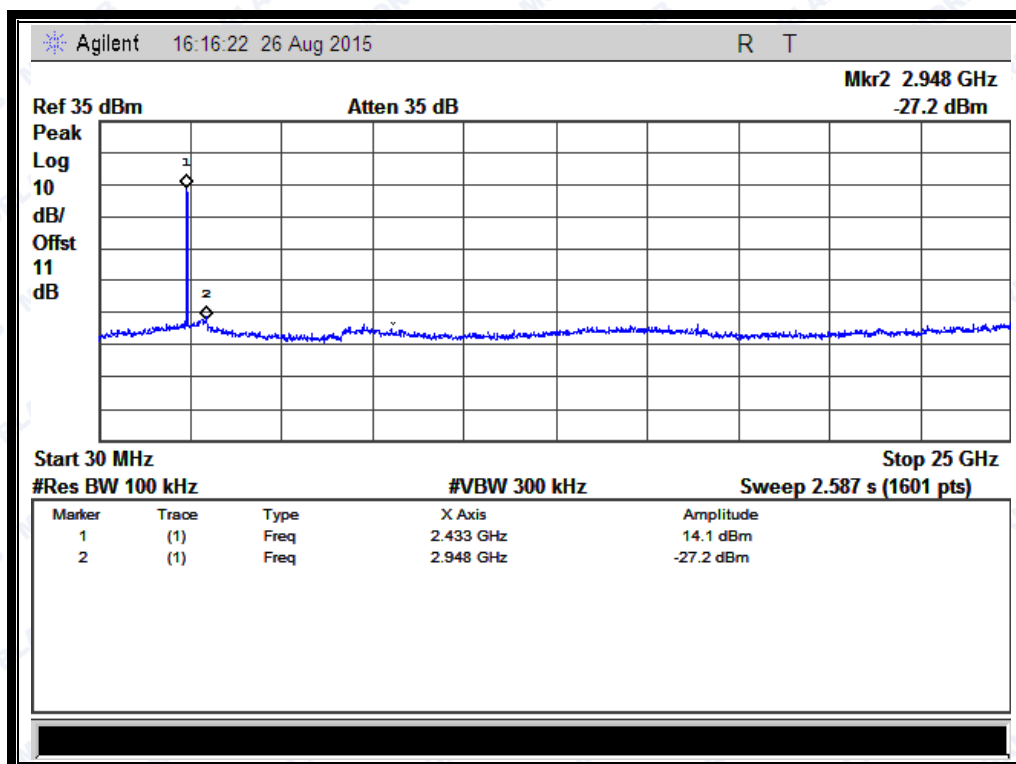
(Channel = 1, 30MHz to 25GHz)



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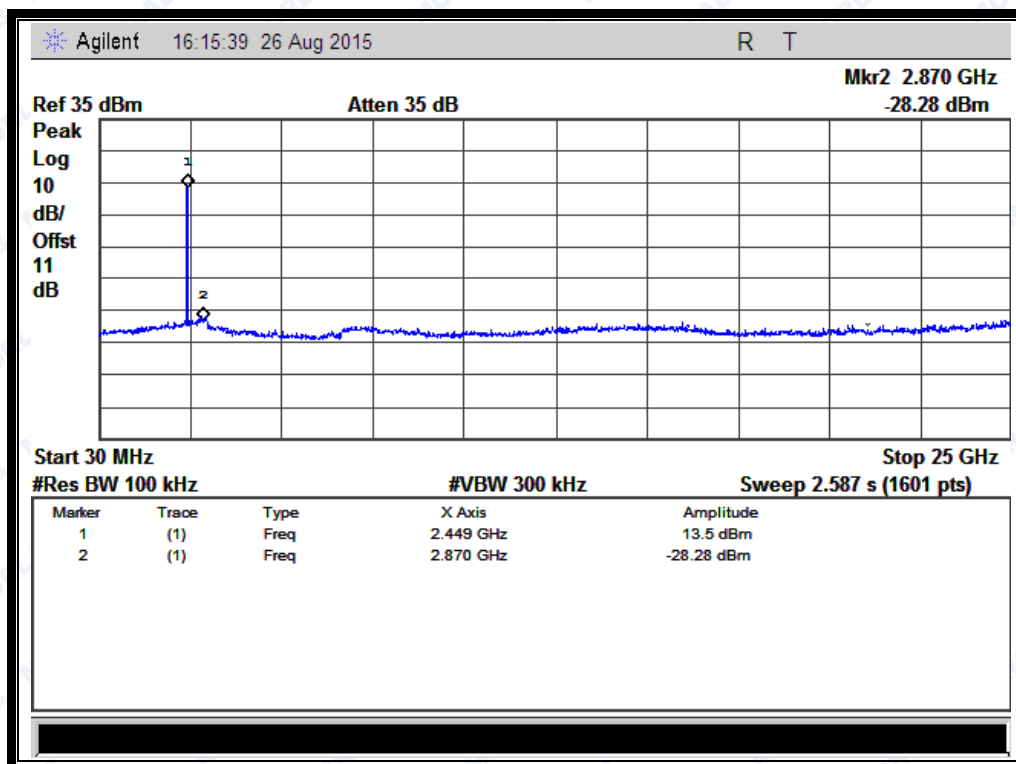
(Band Edge @ Channel = 1)



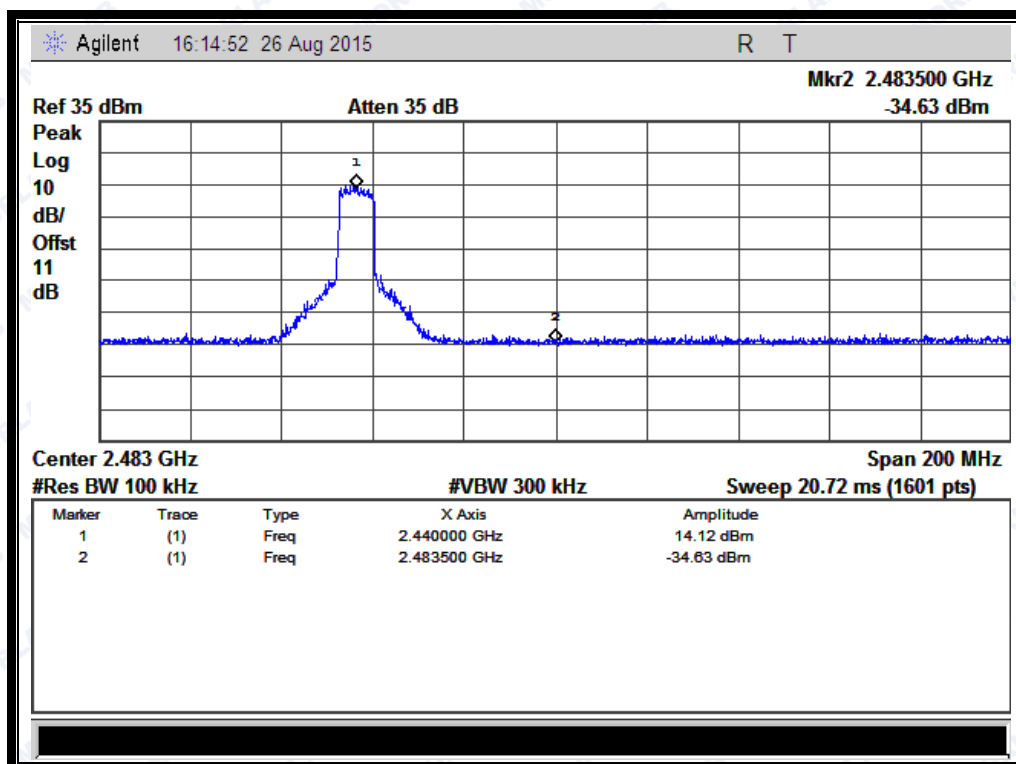
(Channel = 11, 30MHz to 25GHz)



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(Channel = 21, 30MHz to 25GHz)



(Band Edge @ Channel = 21)

2.5 Power spectral density (PSD)

2.5.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

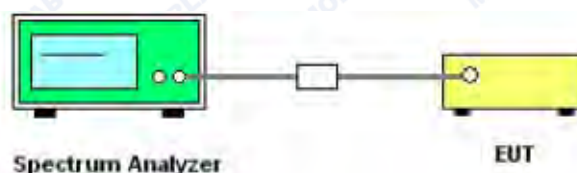
2.5.2 Test Description

A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

- Set analyzer center frequency to channel center frequency.
- Set the span to 3MHz
- Set the RBW to 3 kHz
- Set the VBW to 10KHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

B. Test Set:



The EUT which is powered by the battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

C. Equipments List:

Please reference ANNEX A (1.5).



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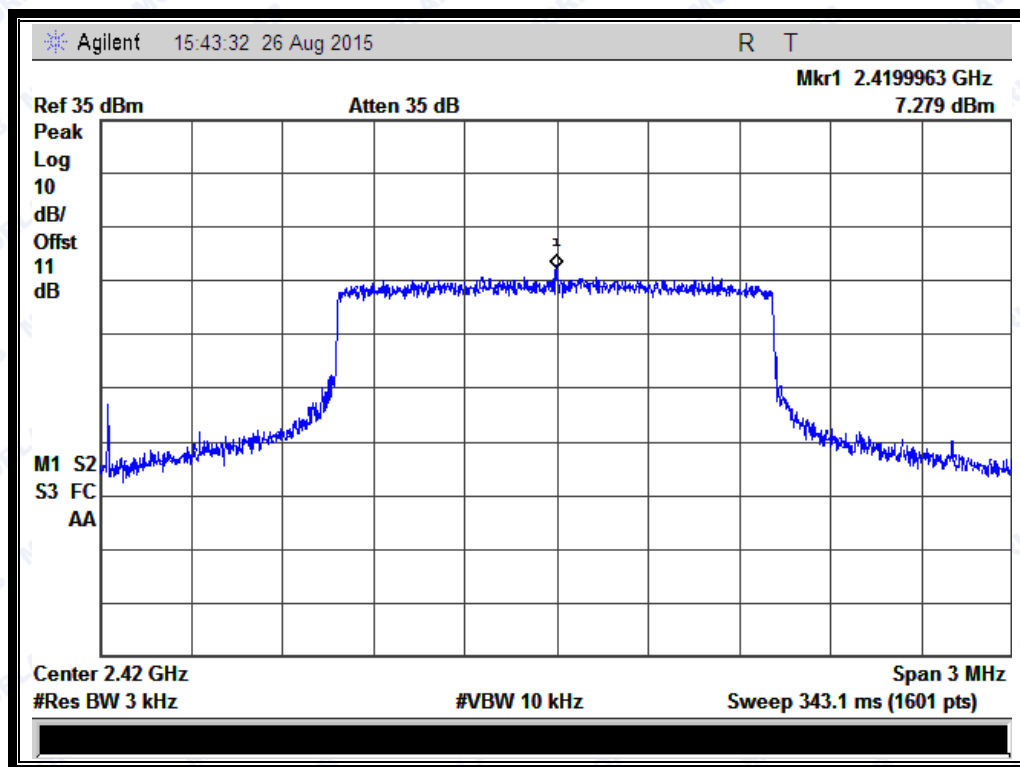
2.5.3 Test Result

2.5.3.1 1.5MHz Bandwidth

A. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2420	7.279	8	PASS
11	2430	6.134	8	PASS
21	2440	7.952	8	PASS
Measurement uncertainty: ± 1.3 dB				

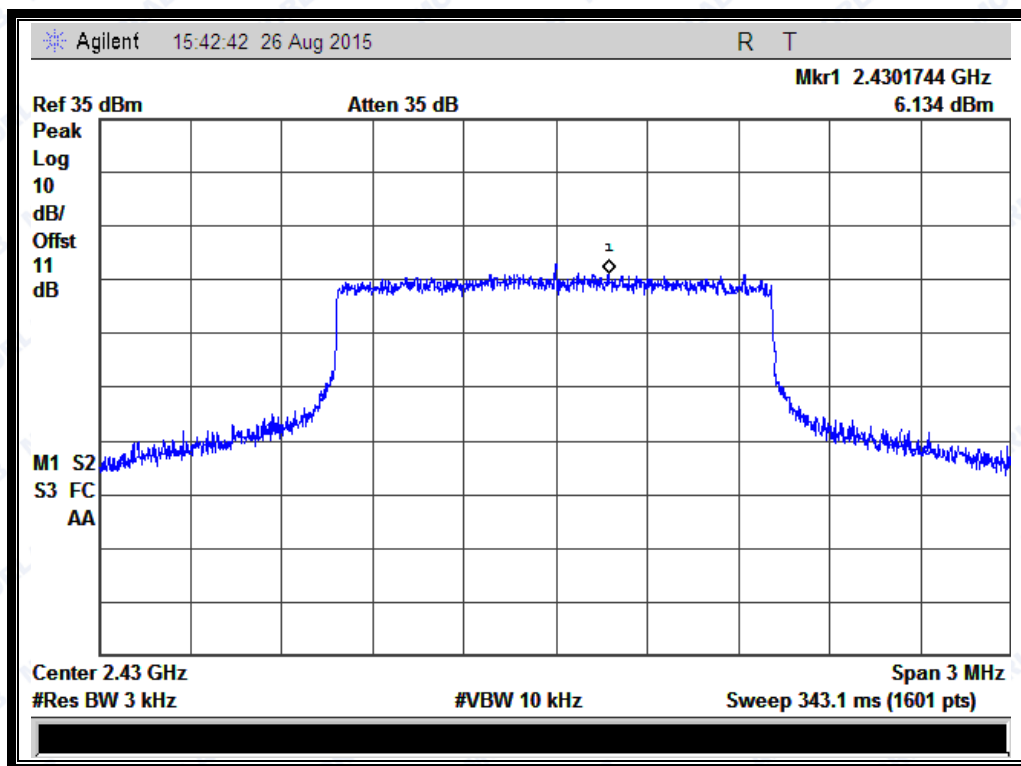
B. Test Plots:



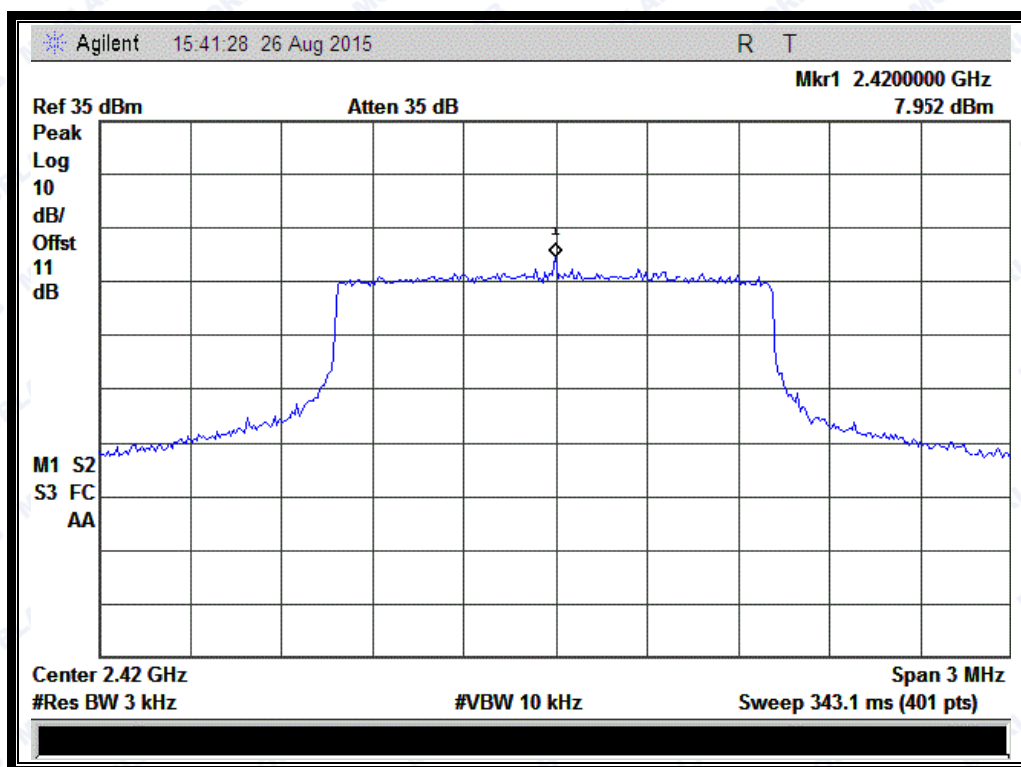
(Channel = 1 @ 1.5MHz Bandwidth)



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(Channel = 11 @ 1.5MHz Bandwidth)



(Channel = 21 @ 1.5MHz Bandwidth)



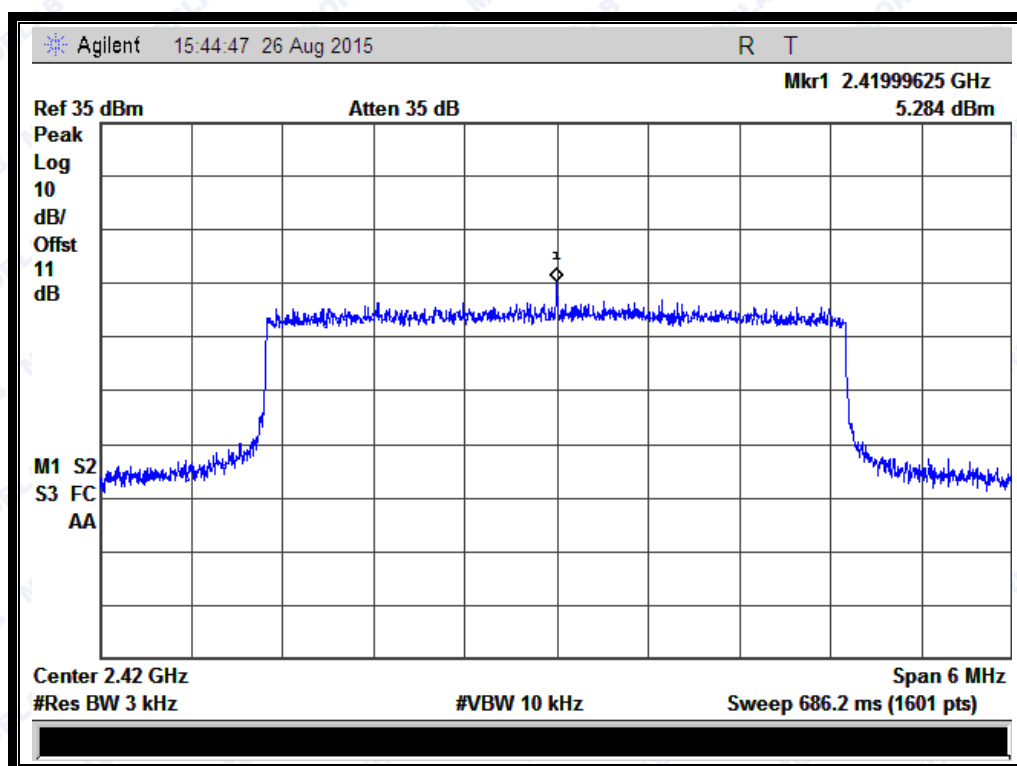
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2.5.3.2 4MHz Bandwidth

C. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2420	5.284	8	PASS
11	2430	4.888	8	PASS
21	2440	4.484	8	PASS
Measurement uncertainty: ± 1.3 dB				

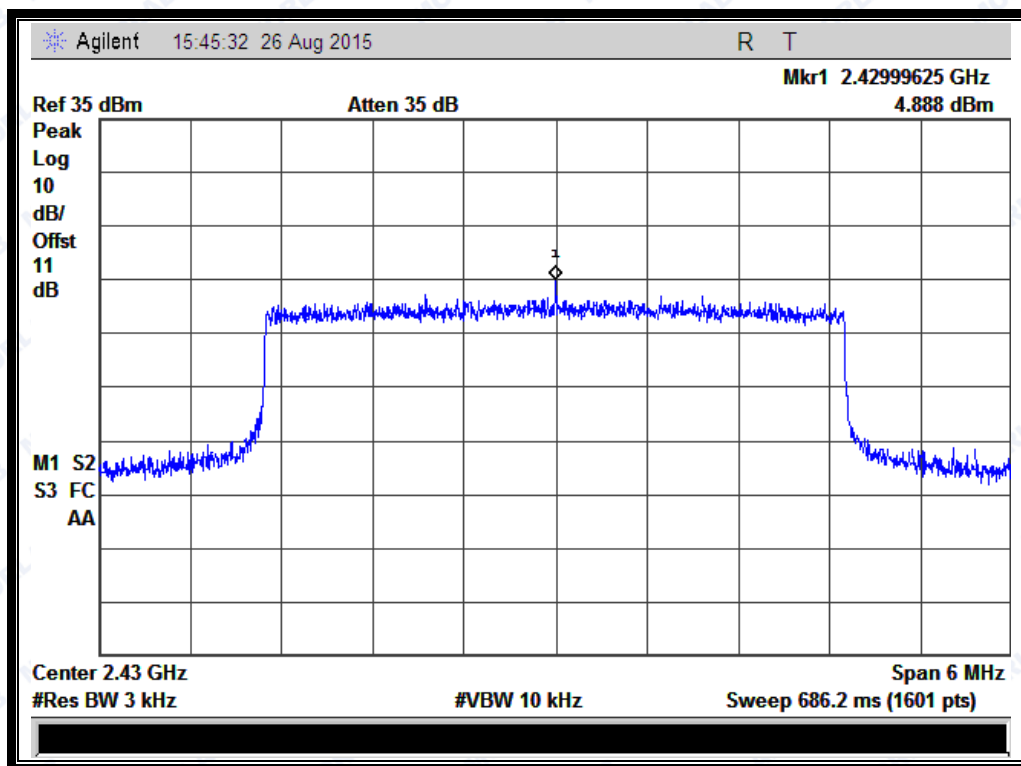
D. Test Plots:



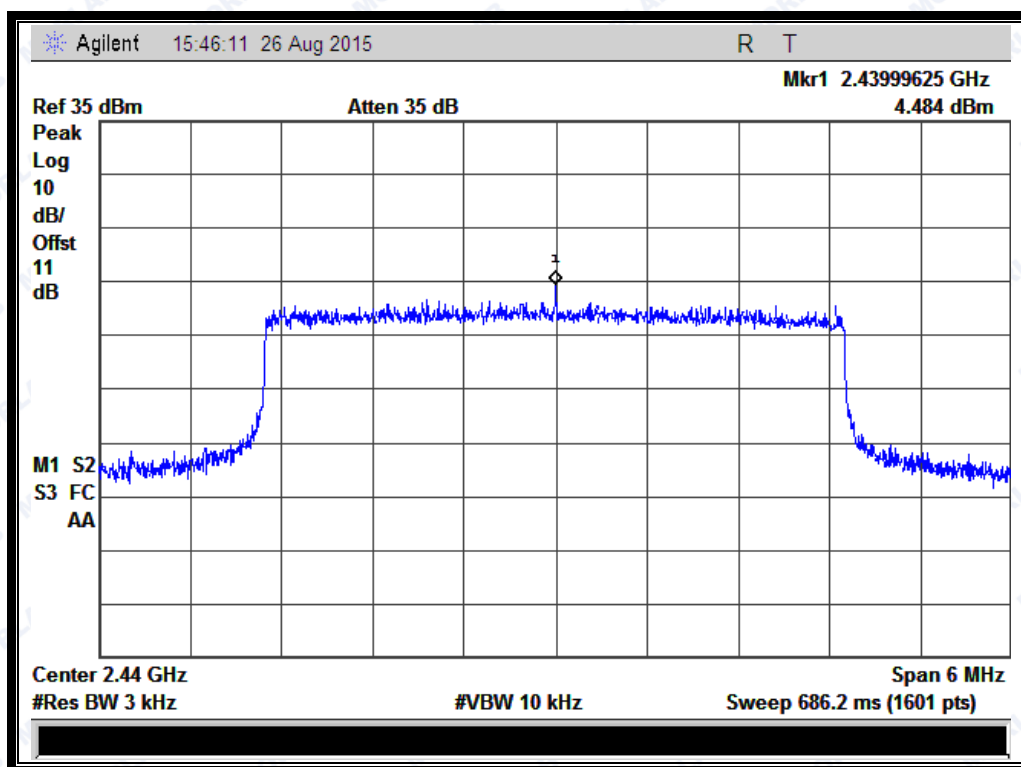
(Channel = 1 @ 4MHz Bandwidth)



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(Channel = 11 @ 4MHz Bandwidth)



(Channel = 21 @ 4MHz Bandwidth)



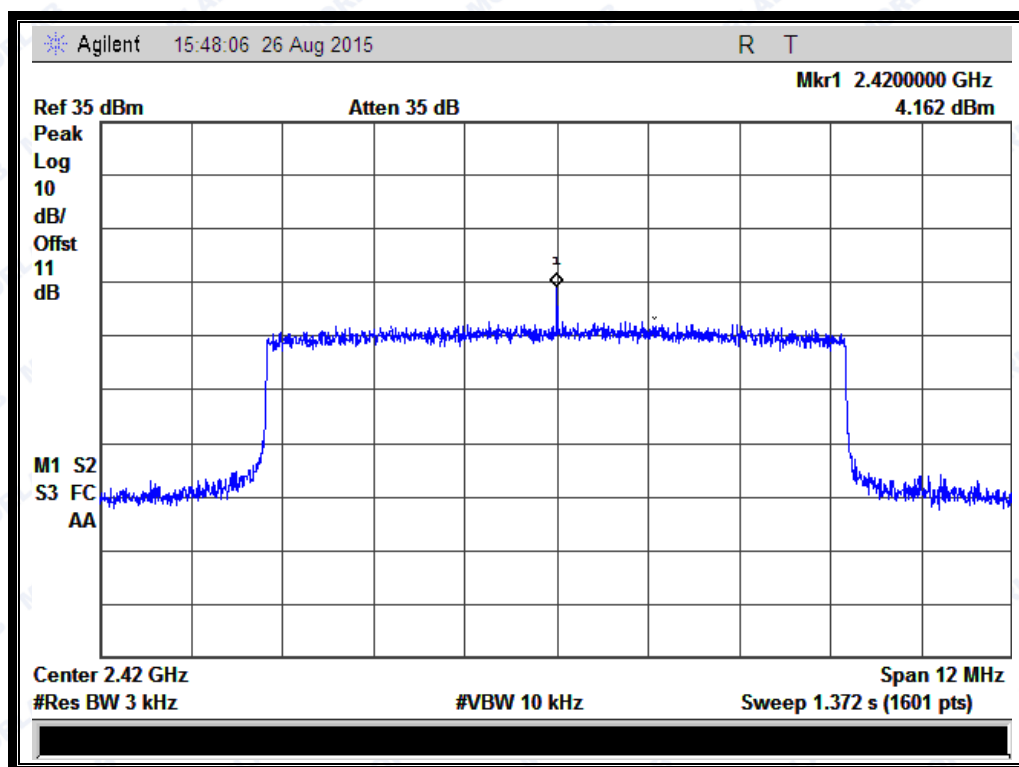
REPORT No.: SZ15010124W01

2.5.3.3 8MHz Bandwidth

E. Test Verdict:

Spectral power density (dBm/3kHz)				
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2420	4.162	8	PASS
11	2430	3.367	8	PASS
21	2440	3.581	8	PASS
Measurement uncertainty: $\pm 1.3\text{dB}$				

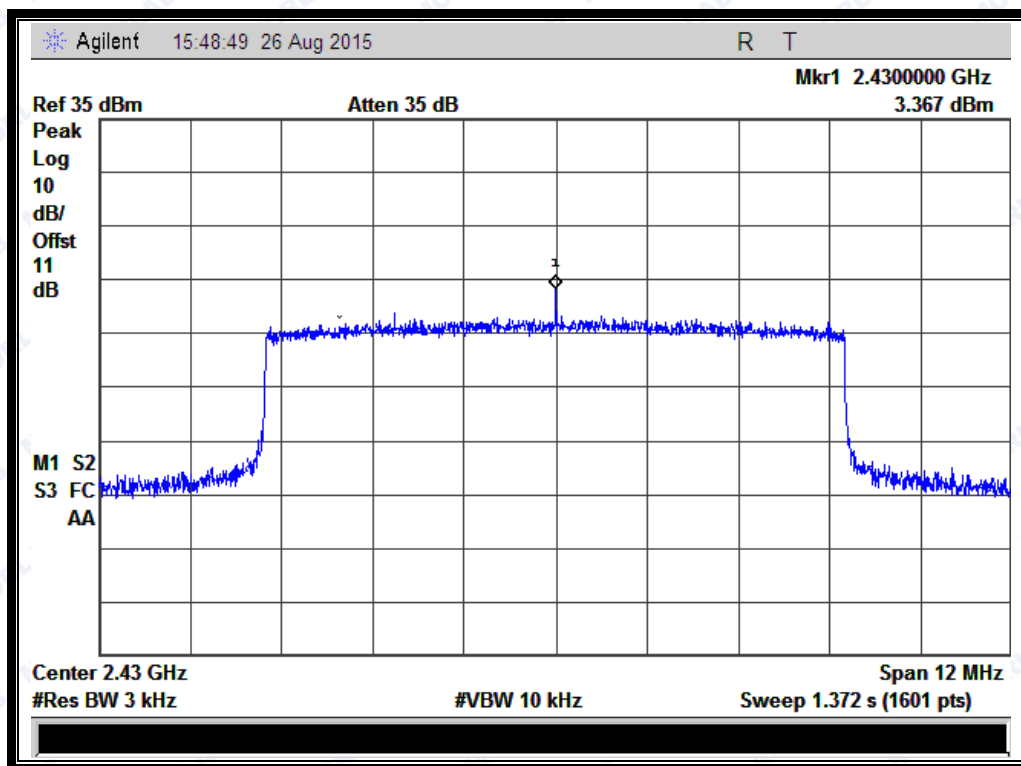
F. Test Plots:



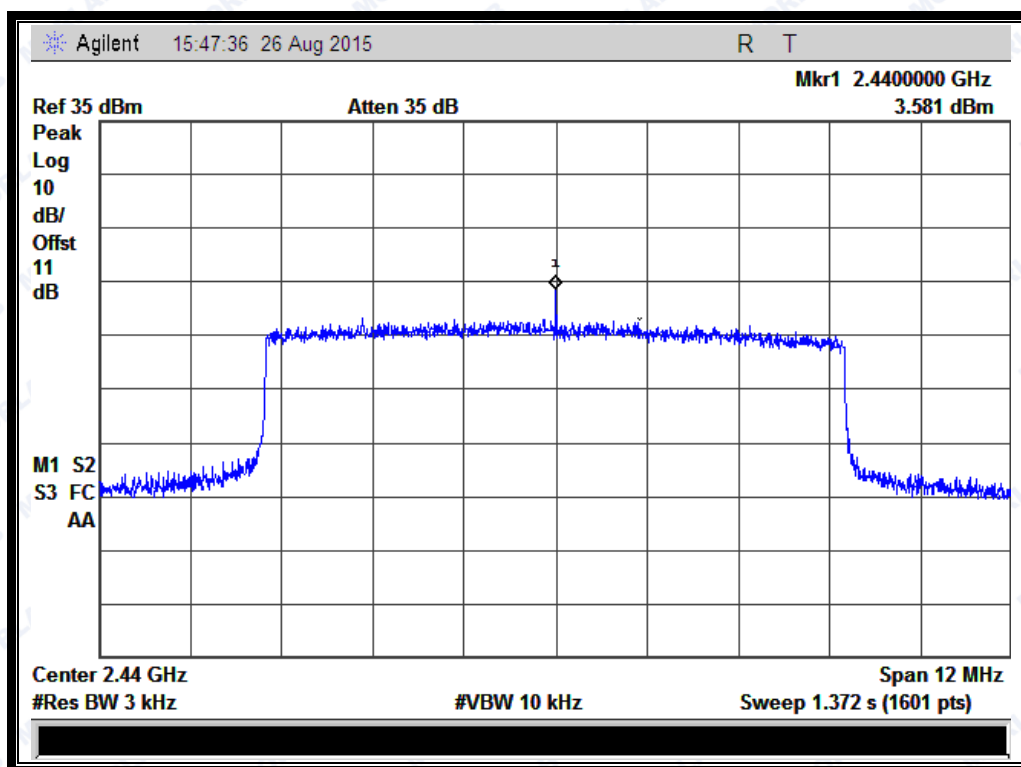
(Channel = 1 @ 8MHz Bandwidth)



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(Channel = 11 @ 8MHz Bandwidth)



(Channel = 21 @ 8MHz Bandwidth)

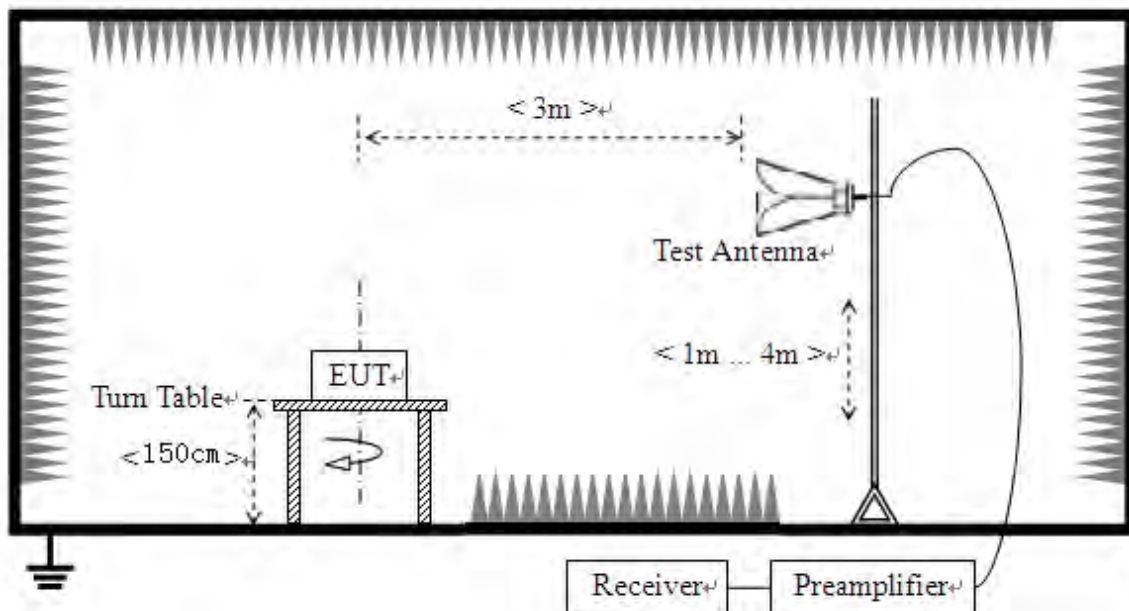
2.6 Restricted Frequency Bands

2.6.1 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).

2.6.2 Test Description

A. Test Setup



The EUT 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:

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:

Please reference ANNEX A(1.5).



2.6.3 Test Result

The lowest and highest channels are tested to verify the 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.

2.6.3.1 1.5MHz Bandwidth

The lowest and highest channels are tested to verify the band edge emissions.

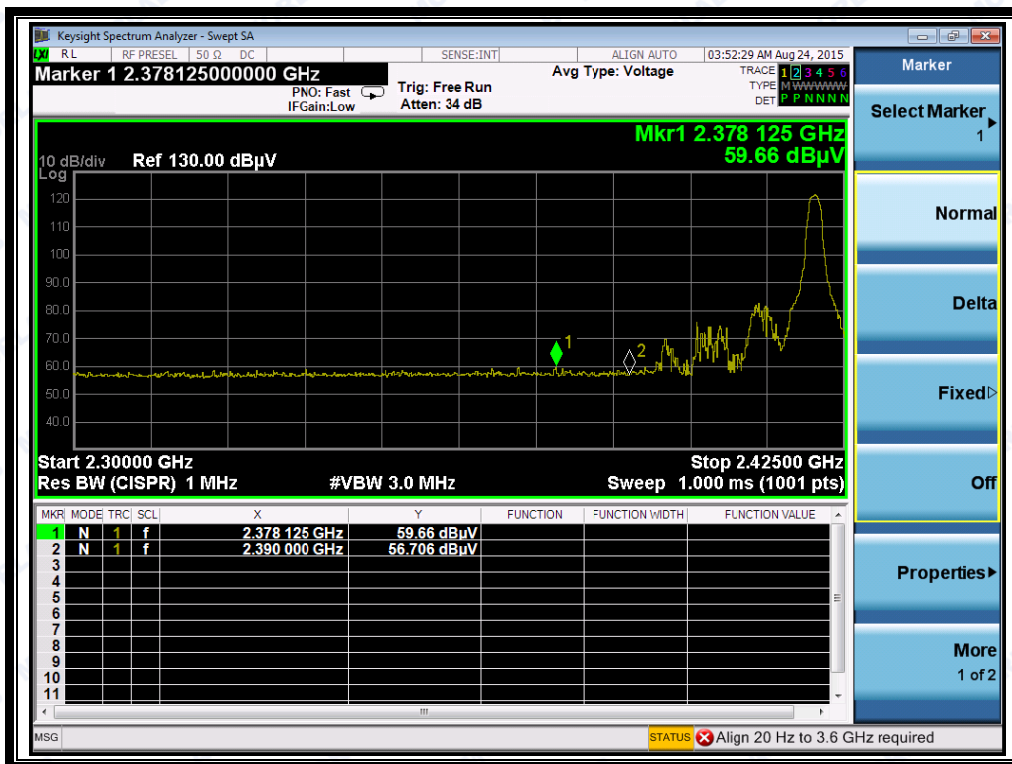
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
1	2378.13	PK	59.66	-33.63	32.56	58.59	74	Pass
1	2386.88	AV	46.26	-33.63	32.56	45.19	54	Pass
21	2498.18	PK	59.04	-33.18	32.5	58.36	74	Pass
21	2485.38	AV	46.29	-33.18	32.5	45.61	54	Pass

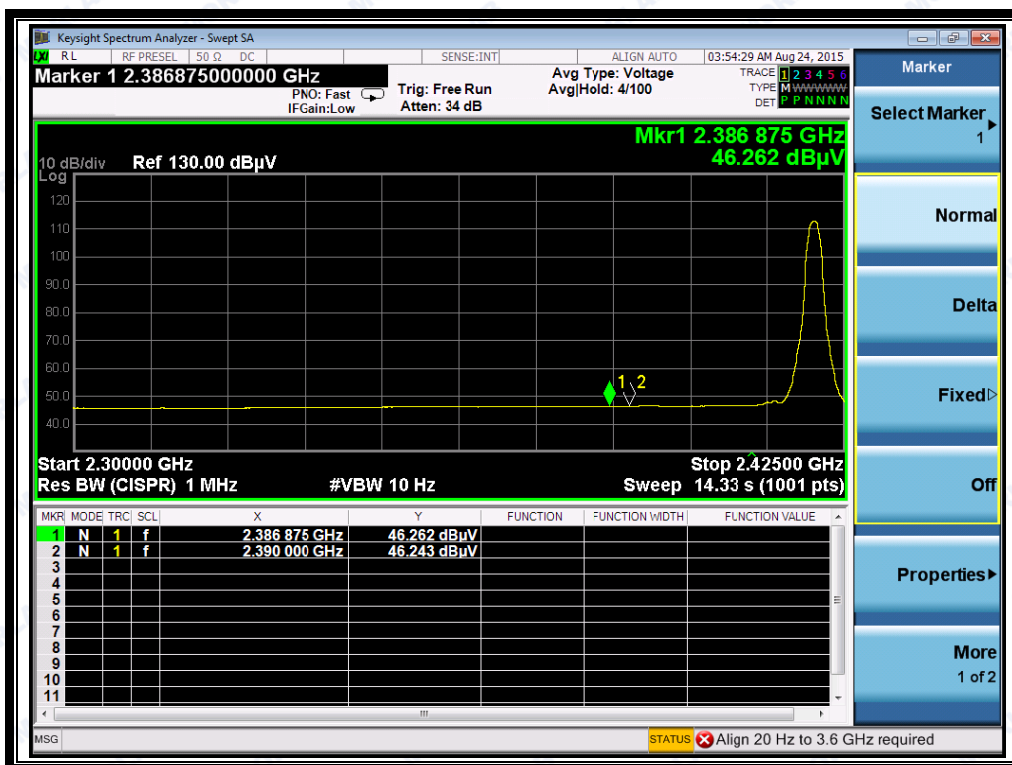
B. Test Plots:



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(Plot A1: Channel = 1 PEAK @ 1.5MHz Bandwidth)



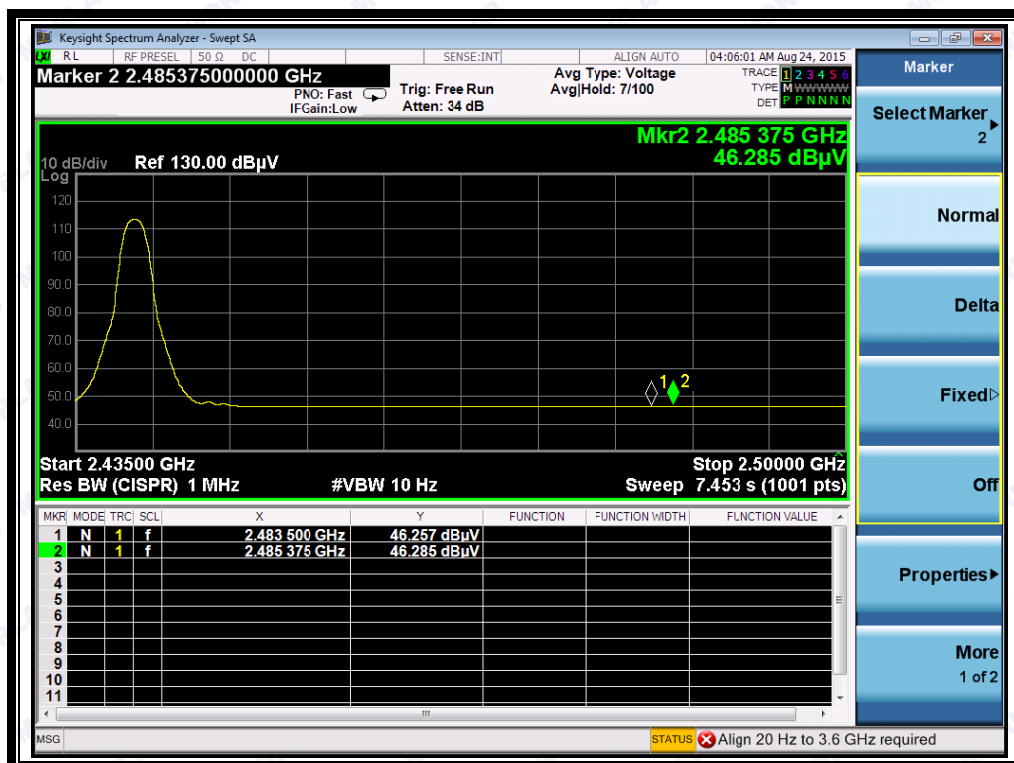
(Plot A2: Channel = 1 AVG @ 1.5MHz Bandwidth)



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(Plot B1: Channel = 21 PEAK @ 1.5MHz Bandwidth)



(Plot B2: Channel = 21 AVG @ 1.5MHz Bandwidth)



2.6.3.2 4MHz Bandwidth

The lowest and highest channels are tested to verify the band edge emissions.

C. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2326.50	PK	59.17	-33.63	32.56	58.1	74	Pass
1	2388.00	AV	46.16	-33.63	32.56	45.09	54	Pass
21	2490.71	PK	58.63	-33.18	32.5	57.95	74	Pass
21	2485.57	AV	46.27	-33.18	32.5	45.59	54	Pass

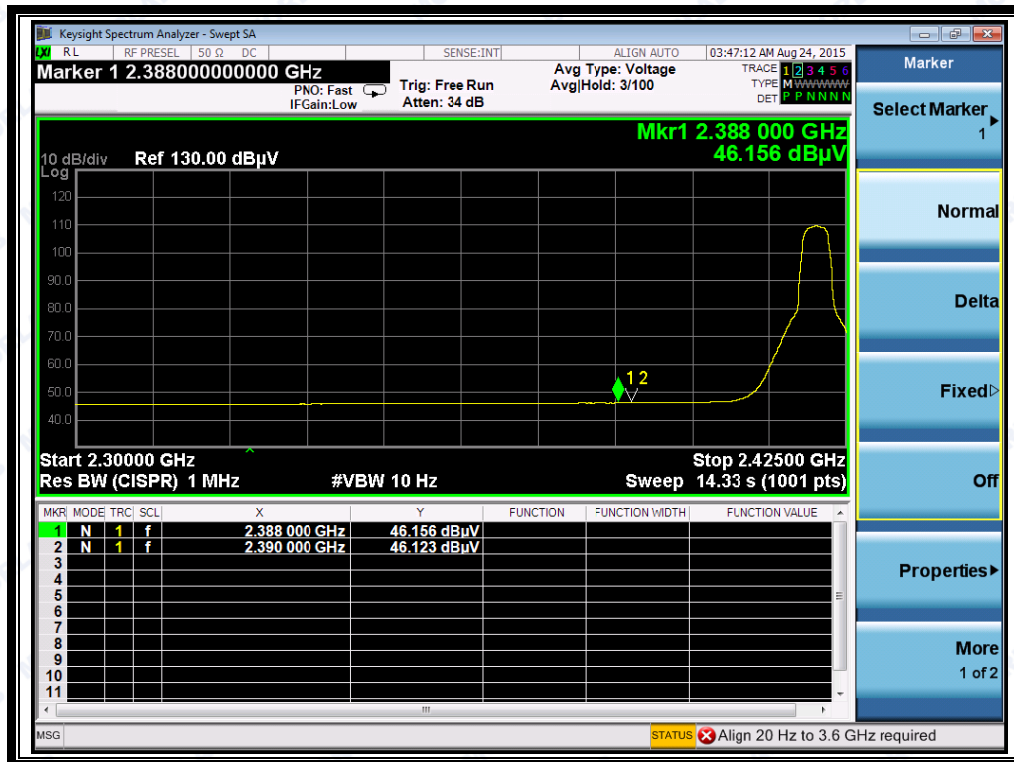
D. Test Plots:



(Plot C1: Channel = 1 PEAK @ 4MHz Bandwidth)



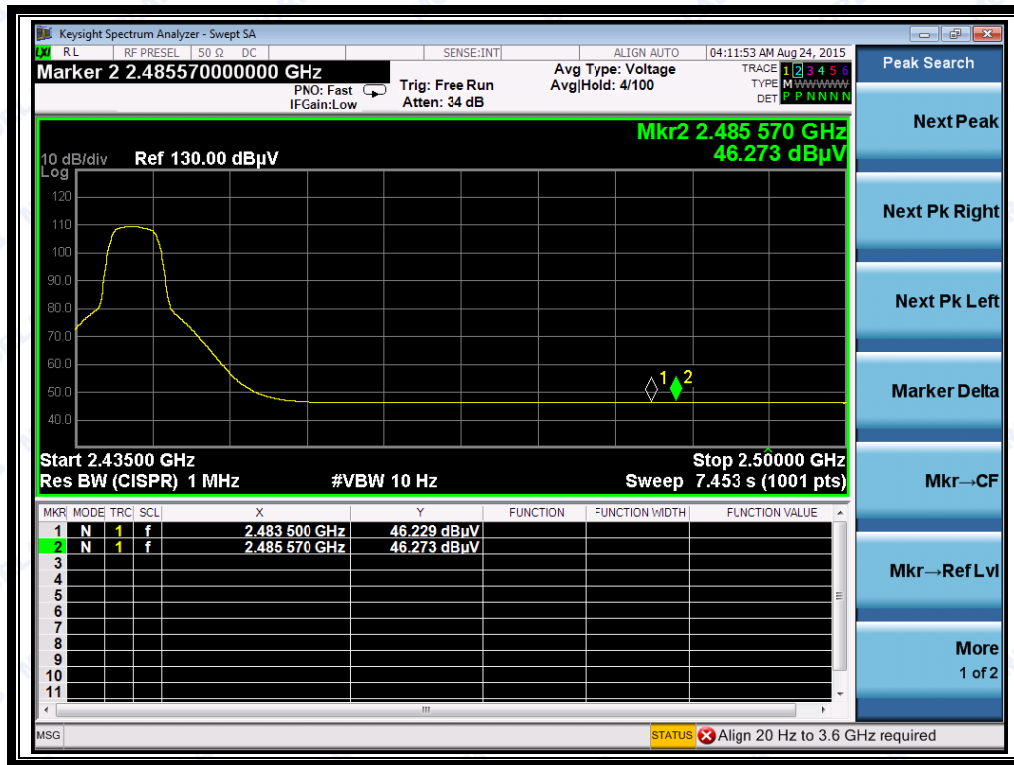
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(Plot C2: Channel = 1 AVG @ 4MHz Bandwidth)



(Plot D1: Channel = 21 PEAK @ 4MHz Bandwidth)



(Plot D2: Channel = 21 AVG @ 4MHz Bandwidth)

2.6.3.3 8MHz Bandwidth

The lowest and highest channels are tested to verify the band edge emissions.

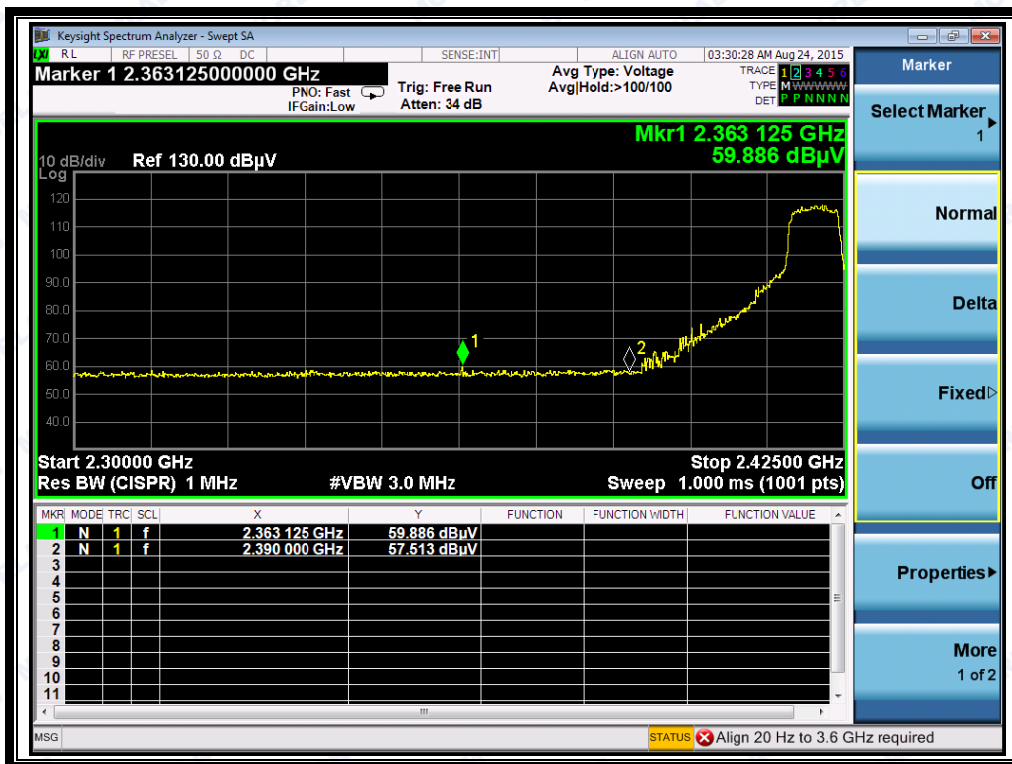
E. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
1	2363.13	PK	59.89	-33.63	32.56	58.82	74	Pass
1	2386.88	AV	47.19	-33.63	32.56	46.12	54	Pass
21	2492.79	PK	58.39	-33.18	32.5	57.71	74	Pass
21	2486.42	AV	46.28	-33.18	32.5	45.6	54	Pass

F. Test Plots:



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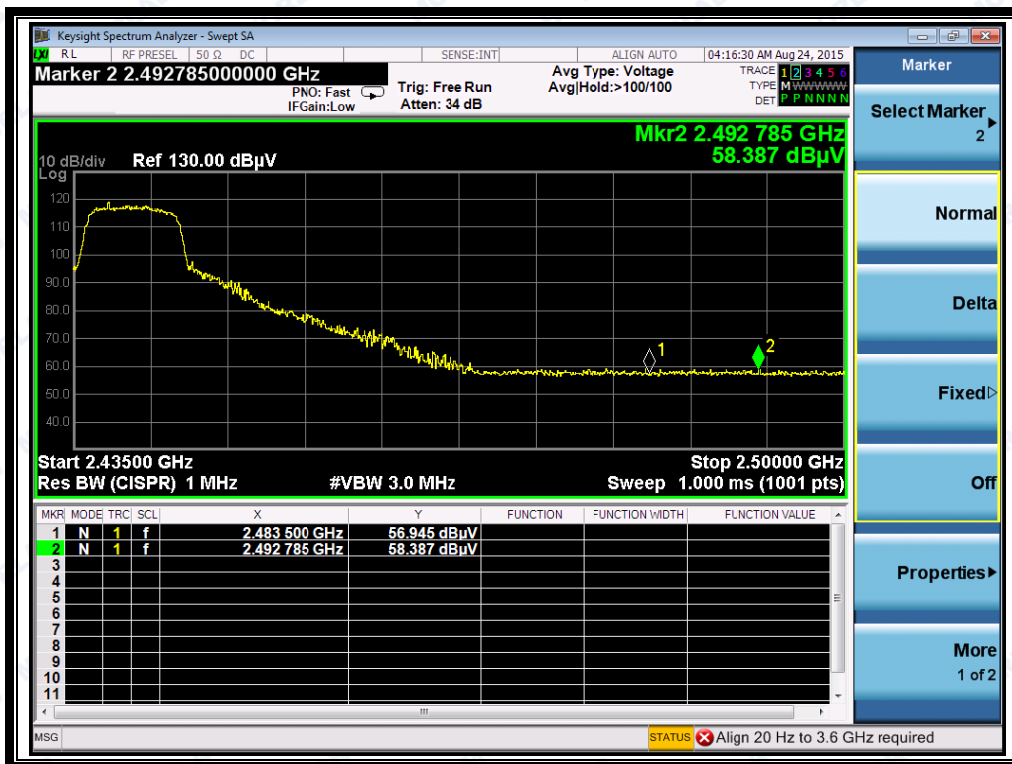
(Plot E1: Channel = 1 PEAK @ 8MHz Bandwidth)



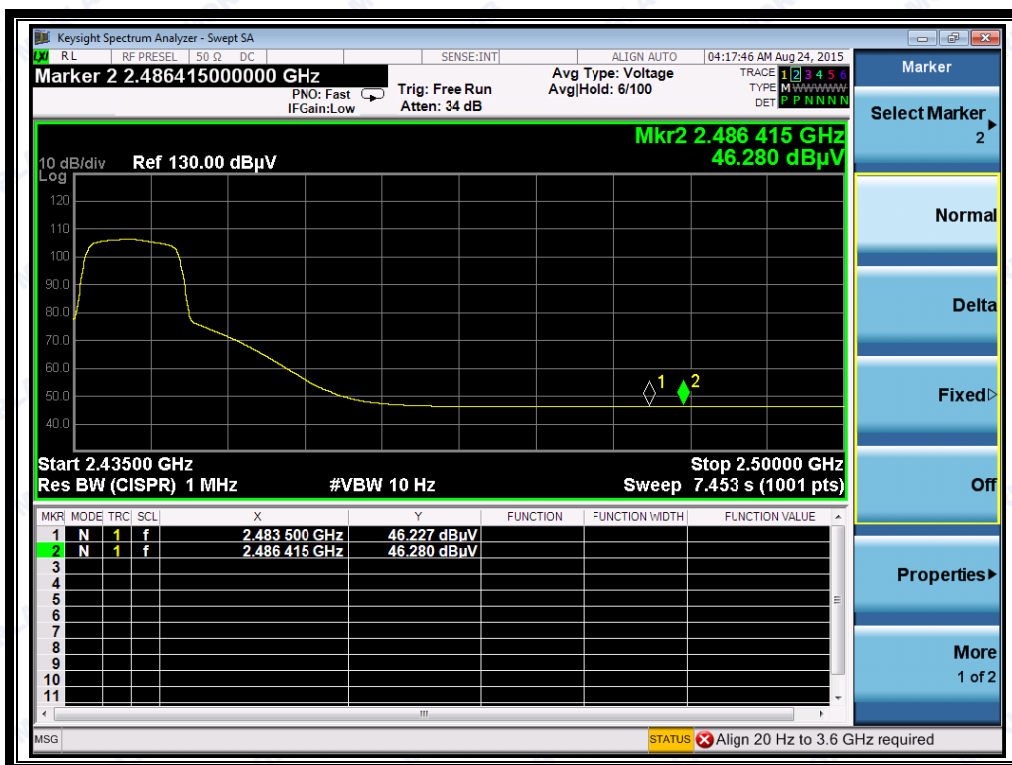
(Plot E2: Channel = 1 AVG @ 8MHz Bandwidth)



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(Plot F1: Channel = 21 PEAK @ 8MHz Bandwidth)



(Plot F2: Channel = 21 AVG @ 8MHz Bandwidth)

2.7 Conducted Emission

2.7.1 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).

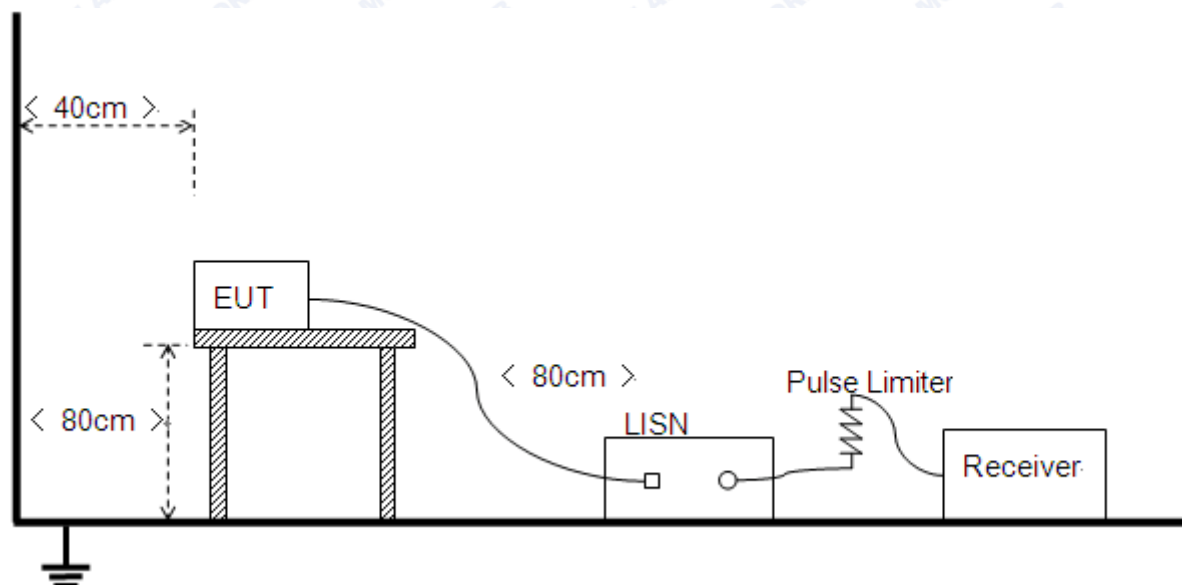
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

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.

2.7.2 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 C63.10 2013.

B. Equipments List:

Please reference ANNEX A(1.5).



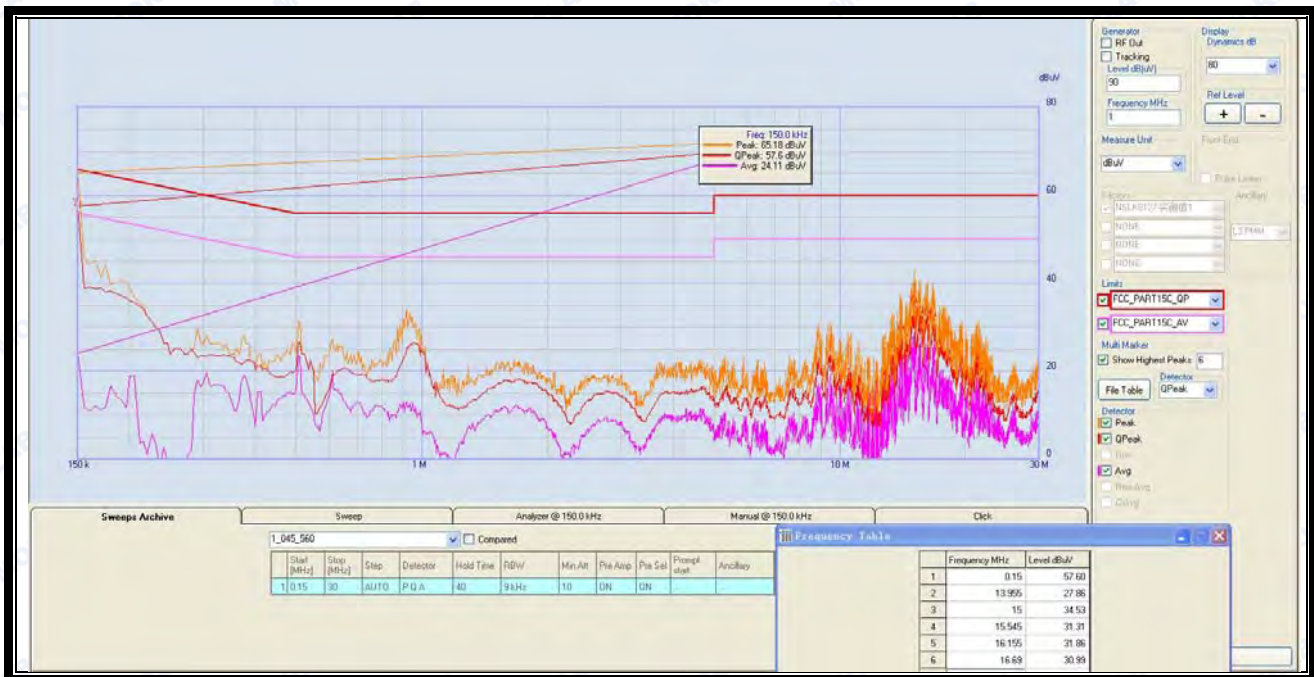
2.7.3 Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

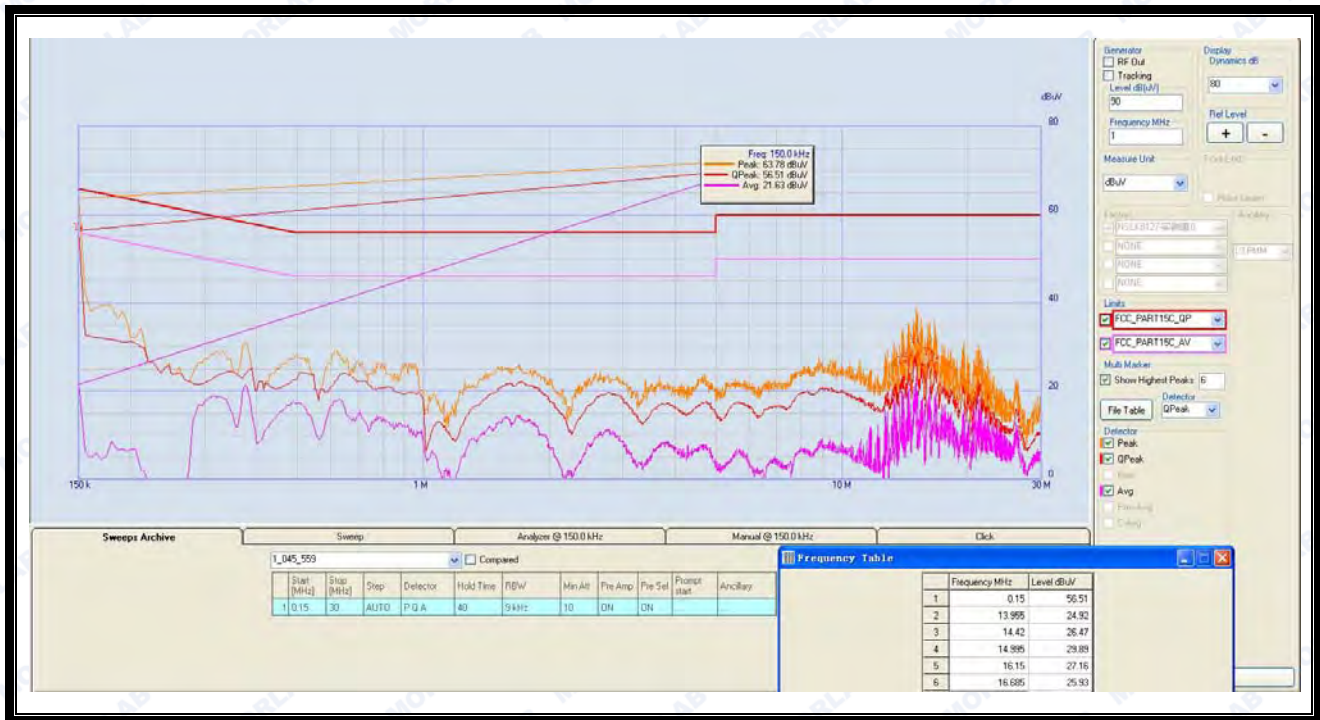
B. Test Plots:



(Plot A: L Phase)



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(Plot B: N Phase)



2.8 Radiated Emission

2.8.1 Requirement

According to FCC section 15.247(d), 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 ($\mu\text{V/m}$)	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:

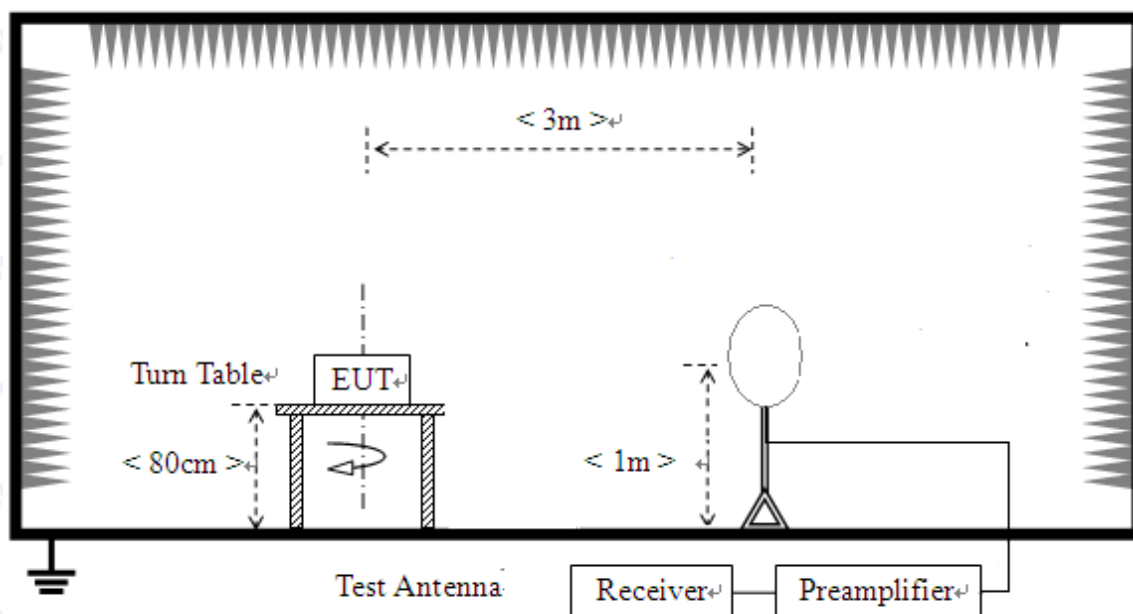
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength 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)

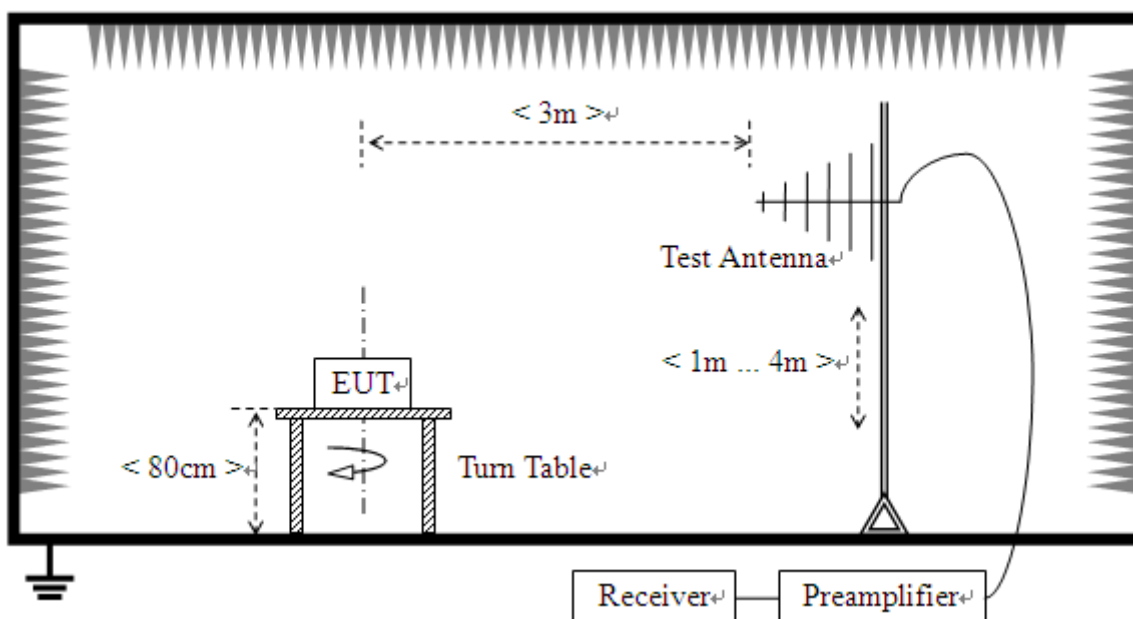
2.8.2 Test Description

A. Test Setup:

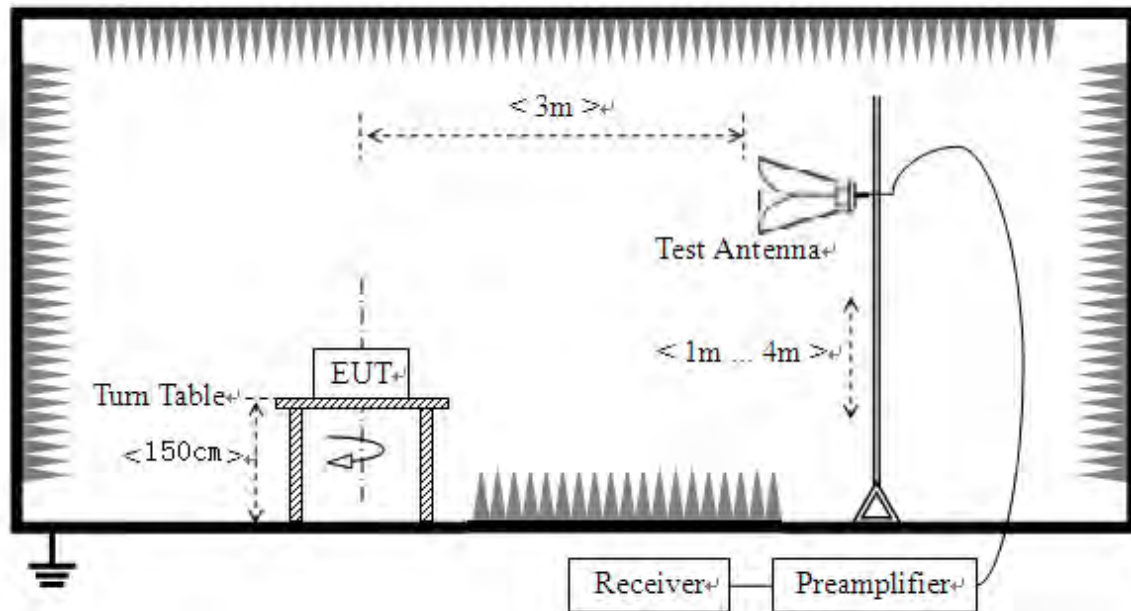
- 1) For radiated emissions from 9kHz to 30MHz



- 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 C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

The EUT 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:

(a) 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.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) 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:

Please reference ANNEX A(1.5).

2.8.3 Test Result

According to ANSI C63.10, 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.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.



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2.8.3.1 1.5MHz Bandwidth

A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



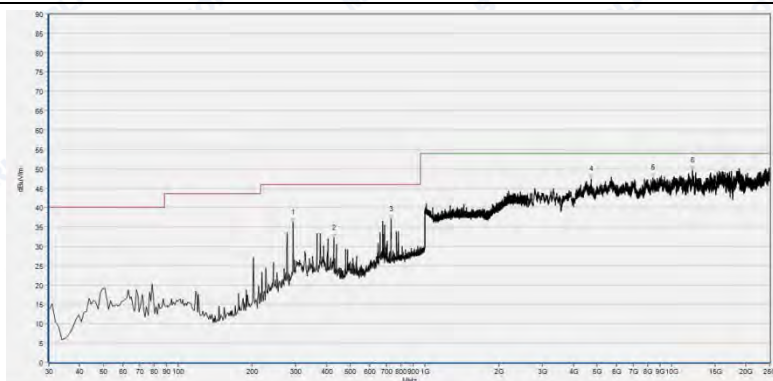
Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	35.39	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
377.260	34.24	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
675.050	37.28	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3019.567	44.72	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5655.101	48.13	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11785.670	49.23	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre. (MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
118.270	22.09	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	28.12	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
688.630	30.93	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2190.236	44.22	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5655.101	48.16	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12188.943	49.50	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 11

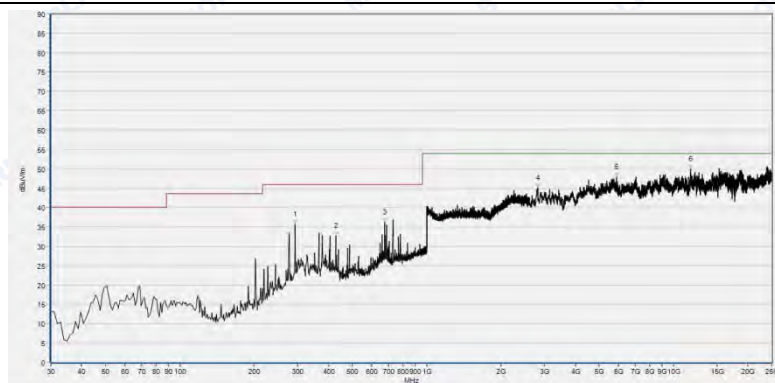
Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	36.26	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	32.18	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
729.370	37.11	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
4714.130	47.47	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
8380.251	47.71	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12140.062	49.56	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	22.93	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
292.870	28.30	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
675.050	31.14	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
3879.069	45.29	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
6547.190	48.33	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12209.311	50.35	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)

Plot for Channel = 21

Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	35.63	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	32.76	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
675.050	36.15	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2819.967	45.13	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5875.068	47.91	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11736.789	49.97	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	21.59	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
292.870	28.33	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
688.630	30.63	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2803.673	45.30	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
5683.615	47.65	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12286.707	49.87	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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2.8.3.2 4MHz Bandwidth

B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	35.59	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	32.31	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
675.050	37.14	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2193.437	44.38	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5675.468	48.59	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
9027.932	49.61	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
118.270	21.17	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	29.18	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
675.050	31.34	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
4180.506	46.05	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
6526.823	47.68	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12127.841	50.08	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	35.34	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
377.260	33.53	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
729.370	36.91	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
5598.072	49.19	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11732.715	49.88	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
18861.284	50.59	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	22.79	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
292.870	28.45	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
675.050	31.18	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
3308.783	45.87	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
9007.565	48.95	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
15610.656	49.70	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 21



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	36.03	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	32.02	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
729.370	37.59	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3333.224	45.22	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7989.198	47.52	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
12197.090	50.28	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	22.55	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
118.270	22.16	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
427.700	30.13	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
3003.273	44.83	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7007.492	47.36	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
11740.862	49.62	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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2.8.3.3 8MHz Bandwidth

C. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	36.44	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	33.27	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
675.050	37.29	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
3031.788	45.28	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
7899.582	49.13	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
16034.297	50.47	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	22.84	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
118.270	21.87	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	30.51	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2807.747	45.02	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
4893.362	47.45	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12184.870	49.74	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 11



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	36.59	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	33.12	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
729.370	37.14	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2999.200	45.75	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5390.326	48.65	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
11749.009	49.53	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	23.33	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
118.270	22.28	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	29.40	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
2180.632	44.51	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7883.288	48.58	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12164.503	49.85	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 21



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
292.870	36.42	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
427.700	33.31	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
675.050	38.00	N.A	N.A	N.A	46.00	N.A	Horizontal	PASS
2366.947	44.80	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
5035.934	46.92	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS
15447.718	50.97	N.A	N.A	74.0	N.A	54.0	Horizontal	PASS

(Antenna Horizontal, 30MHz to 25GHz)



Fre.(MHz)	Pk	QP	AV	Limit-PK	Limit-QP	Limit-AV	Antenna	Verdict
44.550	23.10	N.A	N.A	N.A	40.00	N.A	Vertical	PASS
118.270	22.00	N.A	N.A	N.A	43.50	N.A	Vertical	PASS
292.870	28.62	N.A	N.A	N.A	46.00	N.A	Vertical	PASS
3797.600	45.24	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
7854.774	47.60	N.A	N.A	74.0	N.A	54.0	Vertical	PASS
12518.894	49.24	N.A	N.A	74.0	N.A	54.0	Vertical	PASS

(Antenna Vertical, 30MHz to 25GHz)



ANNEX A GENERAL INFORMATION

1.1 Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

1.3 Facilities and Accreditations

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 2013 and CISPR Publication 22; the FCC registration number is 695796.

1.4 Maximum measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Measurements	Frequency	Uncertainty
Conducted emissions	9KHz~30MHz	2.44dB
Radiated emissions	9KHz~30MHz	2.44dB
	30MHz~200MHz	2.93dB
	200MHz~1000MHz	2.95dB
	1GHz~18GHz	2.26dB
	18GHz~40GHz	1.94dB



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This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

1.5 Test Equipments Utilized

1.5.1 Conducted Test Equipments

Conducted Test Equipment

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
1	Spectrum Analyzer	MY45101810	E4407B	Agilent	2015.03.28	2016.03.27
2	USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2015.03.28	2016.03.27
3	EXA Signal Analyzer	MY53470838	N9010A	Agilent	2015.08.16	2016.08.15
4	RF cable	CB01	RF01	Morlab	N/A	N/A
5	Attenuator	(n.a.)	10dB	Resnet	N/A	N/A
6	SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.5.2 Conducted Emission Test Equipments

Conducted Emission Test Equipments

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
1	Receiver	595WX11007	PMM9010	Narda S.T.S/PMM	2015.05.07	2016.05.06
2	LISN	812744	NSLK 8127	Schwarzbeck	2015.06.18	2016.06.17
3	Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2015.05.07	2016.05.06
4	Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A

1.5.3 Auxiliary Test Equipment

Auxiliary Test Equipment

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Computer	N.A	N.A	Asus	N.A	N.A



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1.5.4 Radiated Test Equipments

Radiated Test Equipments

No	Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal.Due Date
1	System Simulator	GB4536084 6	8960-E5515 C	Agilent	2015.05.07	2016.05.06
2	Receiver	MY5413001 6	N9038A	Agilent	2015.05.07	2016.05.06
3	Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2015.05.14	2016.05.13
4	Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2015.03.31	2016.03.30
5	Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2015.02.26	2016.02.25
6	Test Antenna - Horn	71688	BBHA 9120D	Schwarzbeck	2015.02.26	2016.02.25
7	Coaxial cable(N male)	CB02	EMC02	Morlab	N/A	N/A
8	Coaxial cable(N male)	CB03	EMC03	Morlab	N/A	N/A
9	1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde&Schwarz	2015.02.26	2016.02.25
10	18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde&Schwarz	2015.02.26	2016.02.25

1.5.5 Climate Chamber

Climate Chamber

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Climate Chamber	2004012	HL4003T	Yinhe	2015.02.26	2016.02.25

1.5.6 Vibration Table

Vibration Table

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Vibration Table	N/A	ACT2000-S015L	CMI-COM	2015.02.26	2016.02.25

1.5.7 Anechoic Chamber

Anechoic Chamber

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	Anechoic Chamber	N/A	9m*6m*6m	Changning	2015.05.14	2016.05.13

***** END OF REPORT *****