



Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No..... : GTSR18070292-WLAN

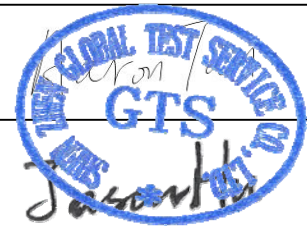
FCC ID..... : ZXZWF150A

Compiled by

(position+printed name+signature)..: File administrators Jimmy Wang

Supervised by

(position+printed name+signature)..: Test Engineer Aaron Tan



Approved by

(position+printed name+signature)..: Manager Jason Hu

Date of issue.....: Aug. 01, 2018

Representative Laboratory Name. : Shenzhen Global Test Service Co.,Ltd.

Address.....: No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

Applicant's name.....: Dayton Audio Division of Parts Express

Address.....: 725 Pleasant Valley Drive, Springboro OH 45066

Test specification..... :

Standard.....: **FCC Part 15.247**

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF.....: Dated 2014-12

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Test item description.....: Wi-Fi INTEGRATED AMPLIFIER

Trade Mark.....: /

Manufacturer.....: Vistron (Dong Guan) Audio Equipment Co.,Ltd

Model/Type reference.....: WF150A

Listed Models: /

Difference: /

Modulation Type.....: 802.11b/802.11g/802.11n

Operation Frequency.....: From 2412MHz to 2462MHz

Hardware Version: WF150A

Software Version: V1.0

Rating.....: AC 110-120V/60Hz 150W

Result.....: **PASS**

TEST REPORT

Test Report No. :	GTSR18070292-WLAN	Aug. 01, 2018
		Date of issue

Equipment under Test : Wi-Fi INTEGRATED AMPLIFIER

Model /Type : WF150A

Listed Models : /

Applicant : **Dayton Audio Division of Parts Express**

Address : 725 Pleasant Valley Drive, Springboro OH 45066

Manufacturer : **Vistron (Dong Guan) Audio Equipment Co.,Ltd**

Address : NO.17 Ji Cai Street, Song Gang District, Qing Xi Town, Dong Guan City, Guang Dong Province, China

Test Result:	PASS
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 V04](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jul. 23, 2018
Testing commenced on	:	Jul. 24, 2018
Testing concluded on	:	Jul. 31, 2018

2.2. Product Description

Name of EUT	Wi-Fi INTEGRATED AMPLIFIER
Trade Mark:	/
Model Number	WF150A
Listed Models	/
FCC ID	ZXZWF150A
WLAN	Supported 802.11b/802.11g/802.11n
Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz
Antenna Type	External antenna
Antenna gain	2dBi

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 230V / 50 Hz	<input checked="" type="radio"/> 120V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input type="radio"/> Other (specified in blank below)	

—/

2.4. Short description of the Equipment under Test (EUT)

This is a Wi-Fi INTEGRATED AMPLIFIER.

For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The application provider specific test software to control sample in continuous TX and RX (Duty Cycle >98%) for testing meet KDB558074 test requirement.

IEEE 802.11b/g/n: Thirteen channels are provided to the EUT.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457

4	2427	11	2462
5	2432		
6	2437		
7	2442		

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: ZXZWF150A** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 165725

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

A2LA-Lab Cert. No.: 4758.01

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions radiated	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	802.11b 802.11g 802.11n HT20	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	802.11b	-/-	802.11b	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11b	-/-	802.11b	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
Maximum Peak Conducted Output Power Power Spectral Density 6dB Bandwidth Spurious RF conducted emission Radiated Emission 9KHz~1GHz& Radiated Emission 1GHz~10 th Harmonic	11b/DSSS	1 Mbps	1/6/11
	11g/OFDM	6 Mbps	1/6/11
	11n(20MHz)/OFDM	6.5Mbps	1/6/11
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	6.5Mbps	1/11

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6. Equipment Used during the Test

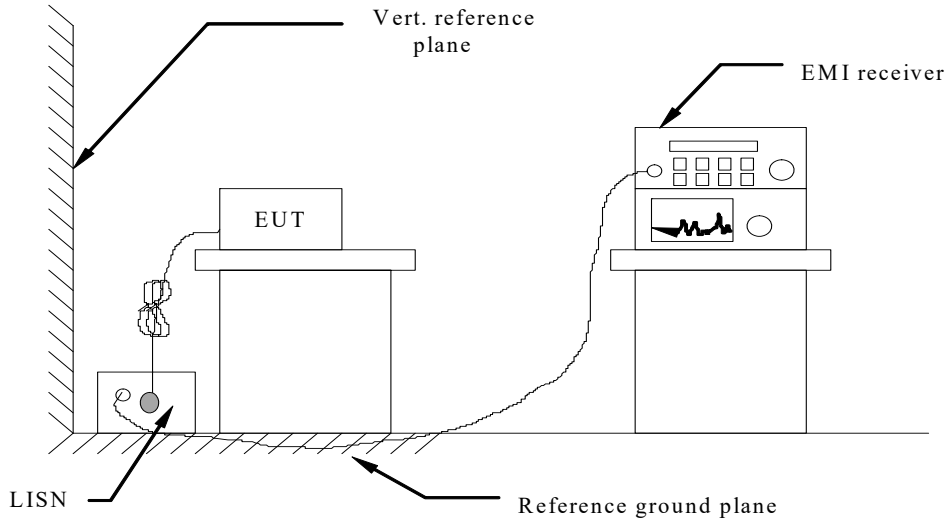
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2017/09/20	2018/09/19
LISN	R&S	ESH2-Z5	893606/008	2017/09/20	2018/09/19
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2017/09/20	2018/09/19
EMI Test Receiver	R&S	ESCI	101102	2017/09/20	2018/09/19
Spectrum Analyzer	Agilent	N9020A	MY48010425	2017/09/20	2018/09/19
Controller	EM Electronics	Controller EM 1000	N/A	2017/09/20	2018/09/19
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2017/09/20	2018/09/19
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2017/09/20	2018/09/19
Amplifier	Agilent	8349B	3008A02306	2017/09/20	2018/09/19
Amplifier	Agilent	8447D	2944A10176	2017/09/20	2018/09/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2017/09/20	2018/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2017/09/20	2018/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2017/09/20	2018/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2017/09/20	2018/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2017/09/20	2018/09/19
RF Cable	HUBER+SUHNER	RG214	N/A	2017/09/20	2018/09/19

Note: The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipment received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

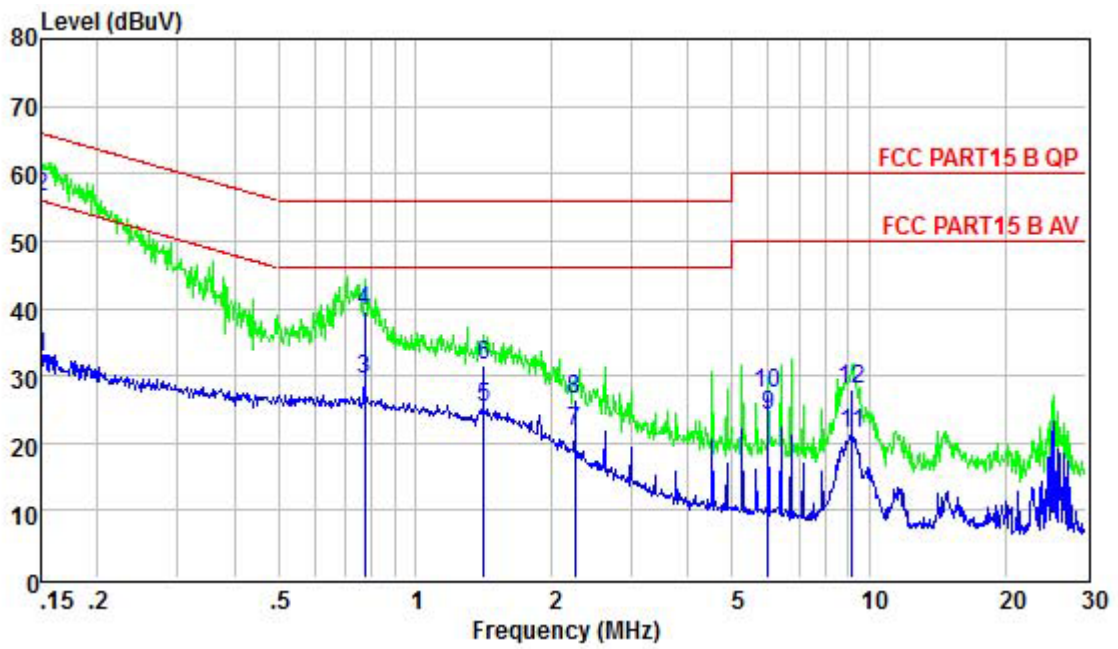
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST RESULTS

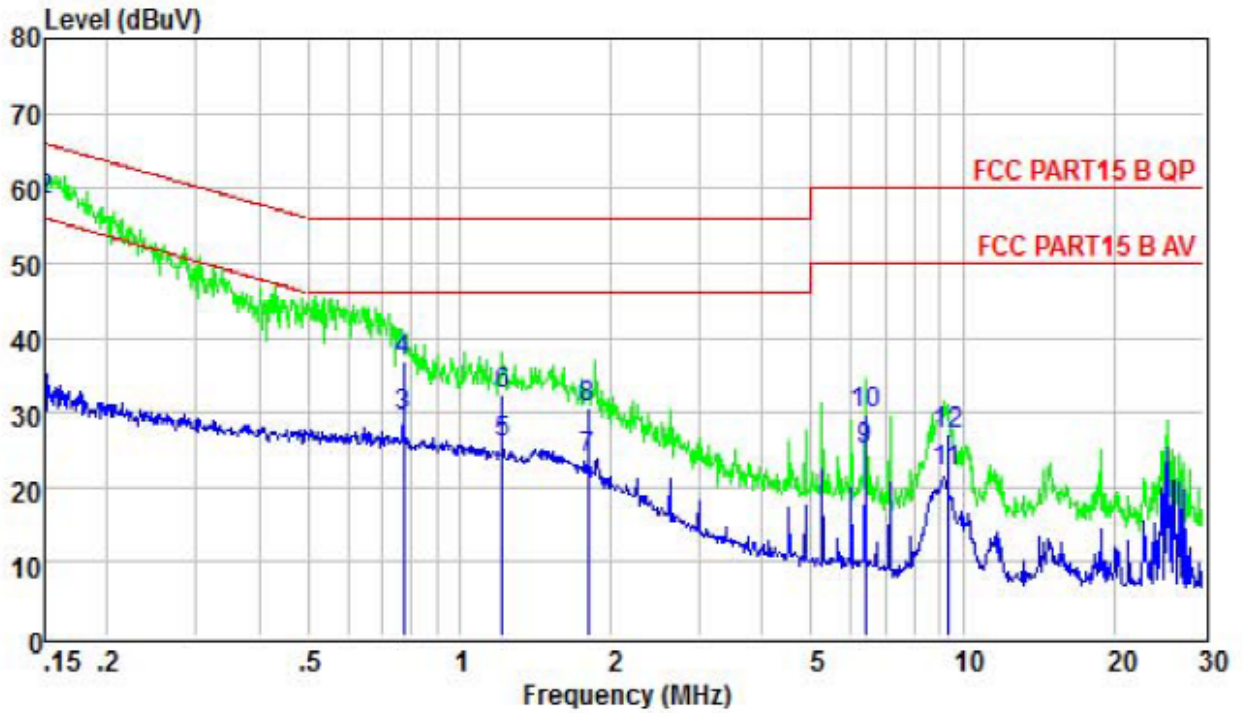
Remark: We measured Conducted Emission at 802.11b/802.11g/802.11n HT20 mode in AC 120V/60Hz, the worst case was recorded .

Power supply: AC 120V/60Hz Polarization L



	Read Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	22.92	9.70	0.24	32.86	56.00	-23.14	Average
2	0.150	46.64	9.70	0.24	56.58	66.00	-9.42	QP
3	0.775	19.54	9.60	0.26	29.40	46.00	-16.60	Average
4	0.775	29.68	9.60	0.26	39.54	56.00	-16.46	QP
5	1.418	15.35	9.60	0.27	25.22	46.00	-20.78	Average
6	1.418	21.71	9.60	0.27	31.58	56.00	-24.42	QP
7	2.249	11.96	9.61	0.28	21.85	46.00	-24.15	Average
8	2.249	16.65	9.61	0.28	26.54	56.00	-29.46	QP
9	5.993	13.97	9.65	0.32	23.94	50.00	-26.06	Average
10	5.993	17.27	9.65	0.32	27.24	60.00	-32.76	QP
11	9.156	11.25	9.68	0.38	21.31	50.00	-28.69	Average
12	9.156	17.79	9.68	0.38	27.85	60.00	-32.15	QP

Power supply: AC 120V/60Hz Polarization N

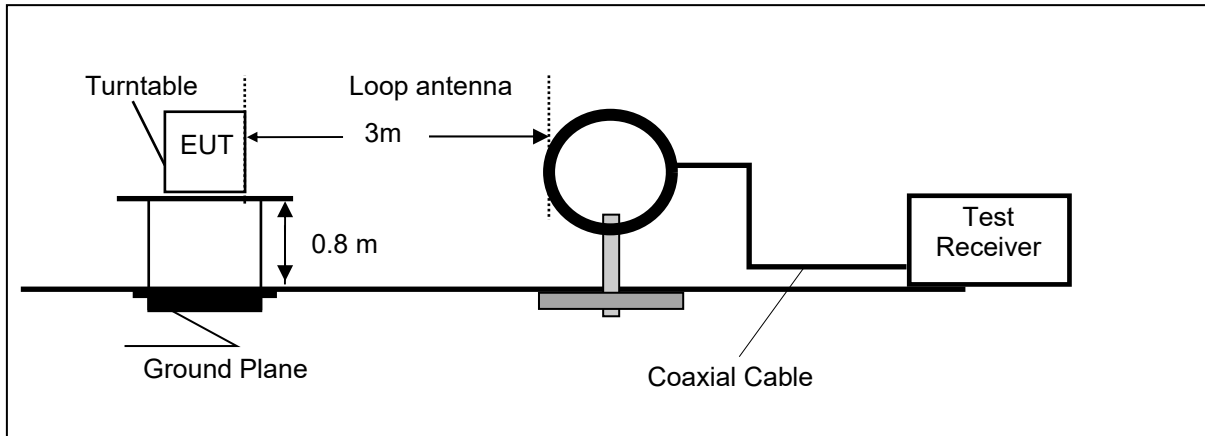


	Read Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	21.86	9.45	0.24	31.55	56.00	-24.45	Average
2	0.150	48.56	9.45	0.24	58.25	66.00	-7.75	QP
3	0.775	19.50	9.60	0.26	29.36	46.00	-16.64	Average
4	0.775	26.99	9.60	0.26	36.85	56.00	-19.15	QP
5	1.216	15.88	9.59	0.27	25.74	46.00	-20.26	Average
6	1.216	22.61	9.59	0.27	32.47	56.00	-23.53	QP
7	1.800	14.01	9.57	0.27	23.85	46.00	-22.15	Average
8	1.800	20.70	9.57	0.27	30.54	56.00	-25.46	QP
9	6.386	15.06	9.66	0.32	25.04	50.00	-24.96	Average
10	6.386	19.67	9.66	0.32	29.65	60.00	-30.35	QP
11	9.302	11.84	9.68	0.38	21.90	50.00	-28.10	Average
12	9.302	16.92	9.68	0.38	26.98	60.00	-33.02	QP

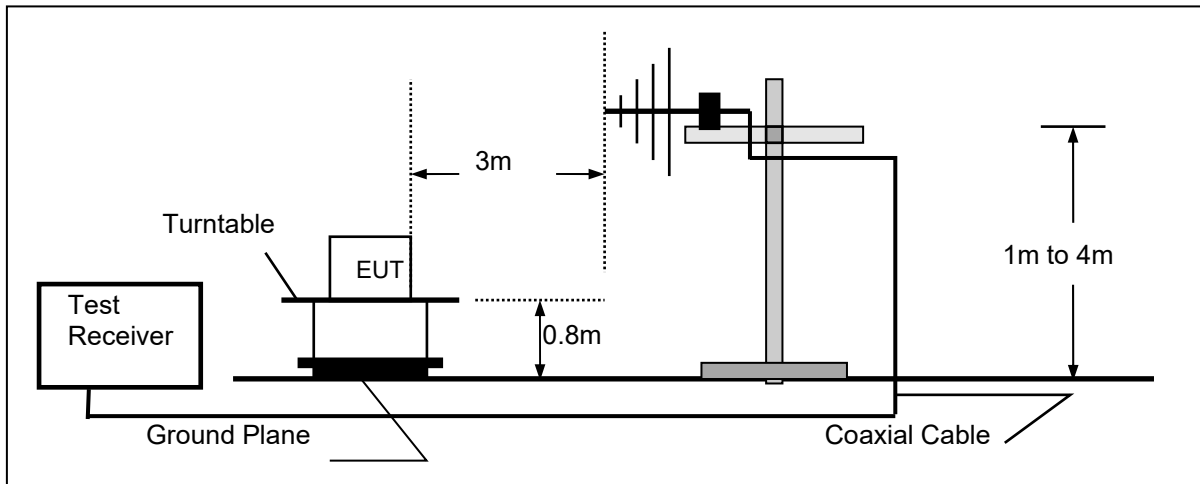
4.2. Radiated Emission

TEST CONFIGURATION

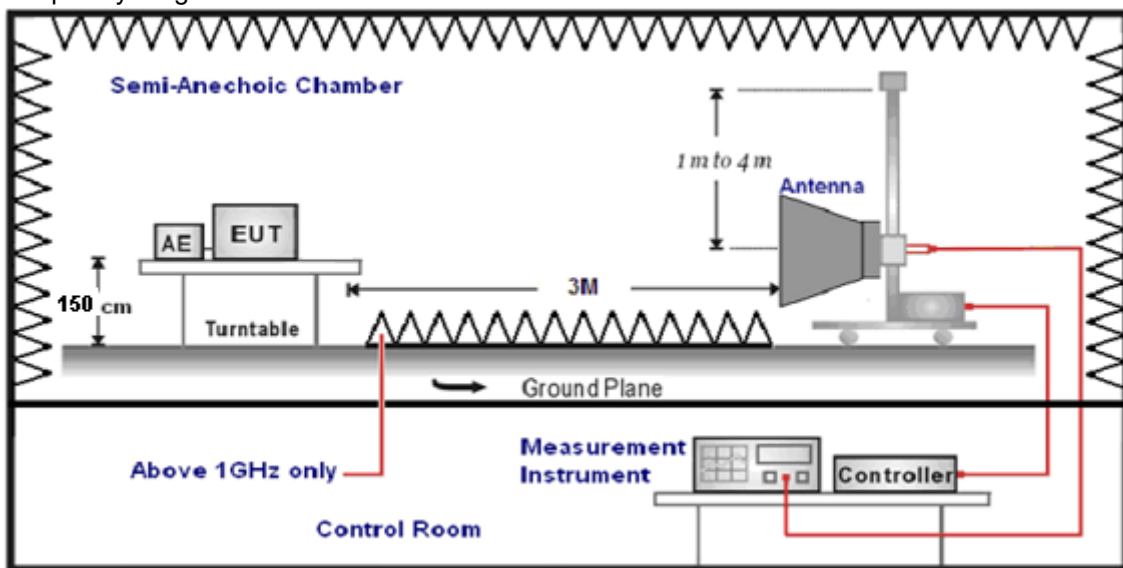
Frequency range 9 kHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

$$Transd=AF +CL-AG$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Remark: We tested at all modes at the antenna single transmitting mode in AC 120V/60Hz, and recorded the worst data at the antenna single transmitting mode.

For 9 KHz-30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

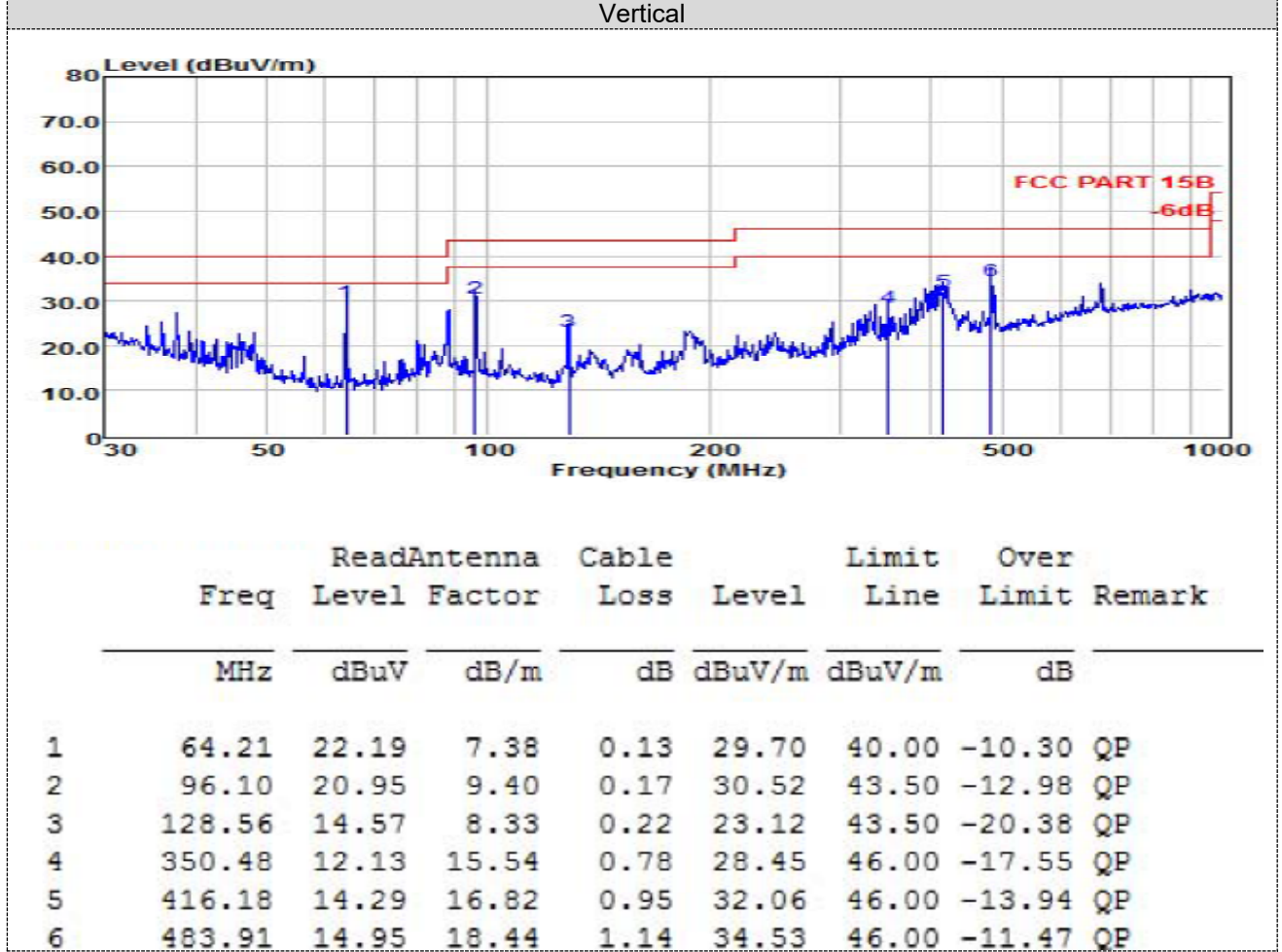
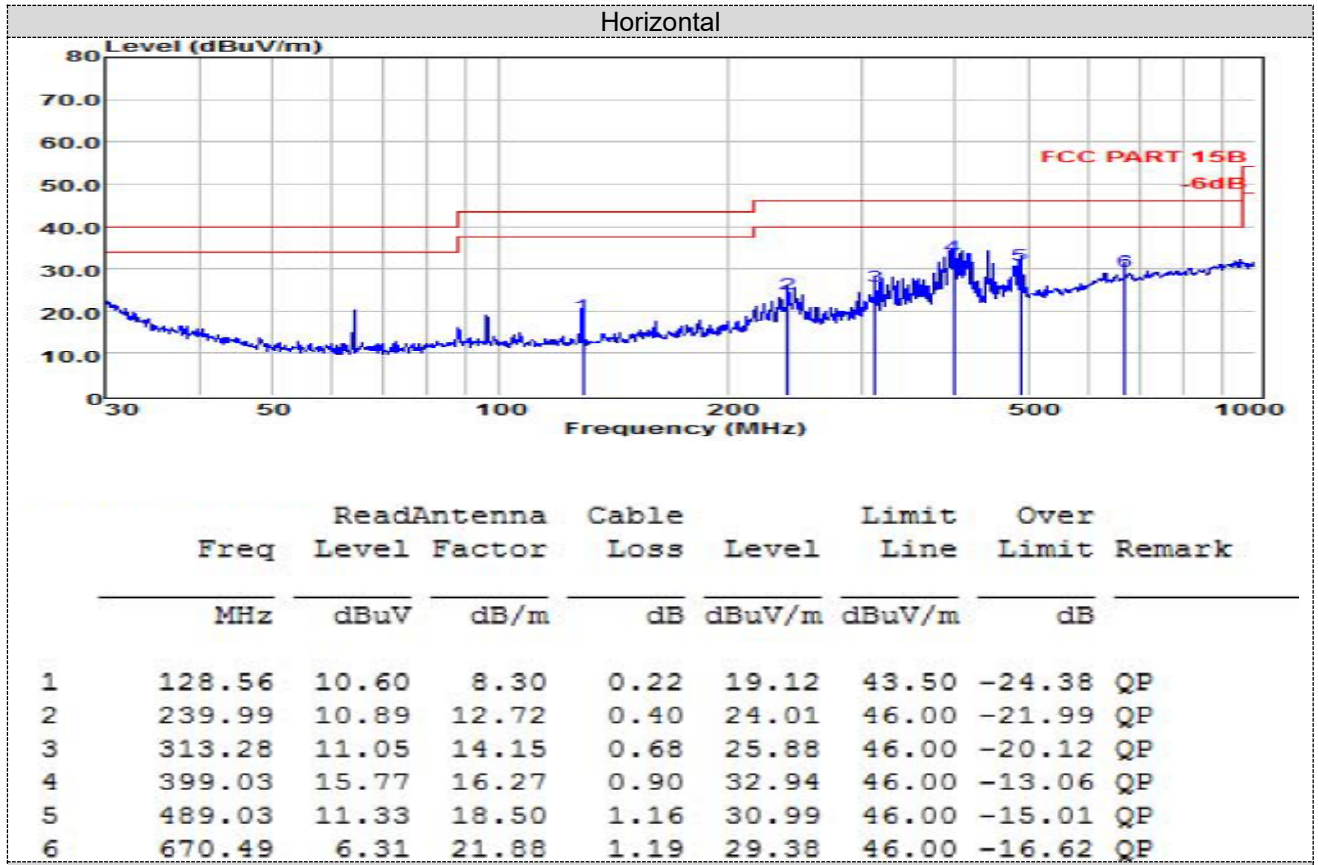
Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

For 30MHz-1GHz



For 1GHz to 25GHz

Polar (H/V)	Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
802.11b-2412MHz									
V	4824	35.56	30.28	7.01	26.63	46.22	74	-27.78	Pk
H	4824	34.36	30.28	7.01	26.63	45.02	74	-28.98	PK
V	7236	27.13	36.59	8.91	24.98	47.65	74	-26.35	Pk
H	7236	26.45	36.59	8.91	24.98	46.97	74	-27.03	PK
802.11b-2437MHz									
V	4874	35.12	30.36	7.62	26.63	46.47	74	-27.53	Pk
H	4874	34.28	30.36	7.62	26.63	45.63	74	-28.37	PK
V	7311	27.38	36.61	8.84	24.98	47.85	74	-26.15	Pk
H	7311	27.86	36.61	8.84	24.98	48.33	74	-25.67	PK
802.11b-2462MHz									
V	4924	36.24	30.43	7.94	26.63	47.98	74	-26.02	Pk
H	4924	35.26	30.43	7.94	26.63	47.00	74	-27.00	PK
V	7386	27.96	36.78	8.45	24.98	48.21	74	-25.79	Pk
H	7386	26.58	36.78	8.45	24.98	46.83	74	-27.17	PK

Polar (H/V)	Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
802.11g-2412MHz									
V	4824	33.54	30.28	7.01	26.63	44.20	74	-29.80	Pk
H	4824	32.69	30.28	7.01	26.63	43.35	74	-30.65	PK
V	7236	28.04	36.59	8.91	24.98	48.56	74	-25.44	Pk
H	7236	25.48	36.59	8.91	24.98	46.00	74	-28.00	PK
802.11g-2437MHz									
V	4874	34.12	30.36	7.62	26.63	45.47	74	-28.53	Pk
H	4874	33.21	30.36	7.62	26.63	44.56	74	-29.44	PK
V	7311	26.59	36.61	8.84	24.98	47.06	74	-26.94	Pk
H	7311	26.41	36.61	8.84	24.98	46.88	74	-27.12	PK
802.11g-2462MHz									
V	4924	35.47	30.43	7.94	26.63	47.21	74	-26.79	Pk
H	4924	33.18	30.43	7.94	26.63	44.92	74	-29.08	PK
V	7386	25.42	36.78	8.45	24.98	45.67	74	-28.33	Pk
H	7386	25.18	36.78	8.45	24.98	45.43	74	-28.57	PK

Polar (H/V)	Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
802.11n20-2412MHz									
V	4824	31.96	30.28	7.01	26.63	42.62	74	-31.38	Pk
H	4824	32.48	30.28	7.01	26.63	43.14	74	-30.86	PK
V	7236	27.59	36.59	8.91	24.98	48.11	74	-25.89	Pk
H	7236	26.32	36.59	8.91	24.98	46.84	74	-27.16	PK
802.11n20-2437MHz									
V	4874	35.48	30.36	7.62	26.63	46.83	74	-27.17	Pk
H	4874	33.32	30.36	7.62	26.63	44.67	74	-29.33	PK
V	7311	26.94	36.61	8.84	24.98	47.41	74	-26.59	Pk
H	7311	25.86	36.61	8.84	24.98	46.33	74	-27.67	PK
802.11n20-2462MHz									
V	4924	34.18	30.43	7.94	26.63	45.92	74	-28.08	Pk
H	4924	33.27	30.43	7.94	26.63	45.01	74	-28.99	PK
V	7386	25.85	36.78	8.45	24.98	46.10	74	-27.90	Pk
H	7386	26.18	36.78	8.45	24.98	46.43	74	-27.57	PK

REMARKS:

1. Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor
2. Margin value = Emission level-Limits
3. -- Mean the PK detector measured value is below average limit.
4. The other emission levels were very low against the limit.
5. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power, 9.1.2. and Average conducted output power, 9.2.3.1.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple detector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

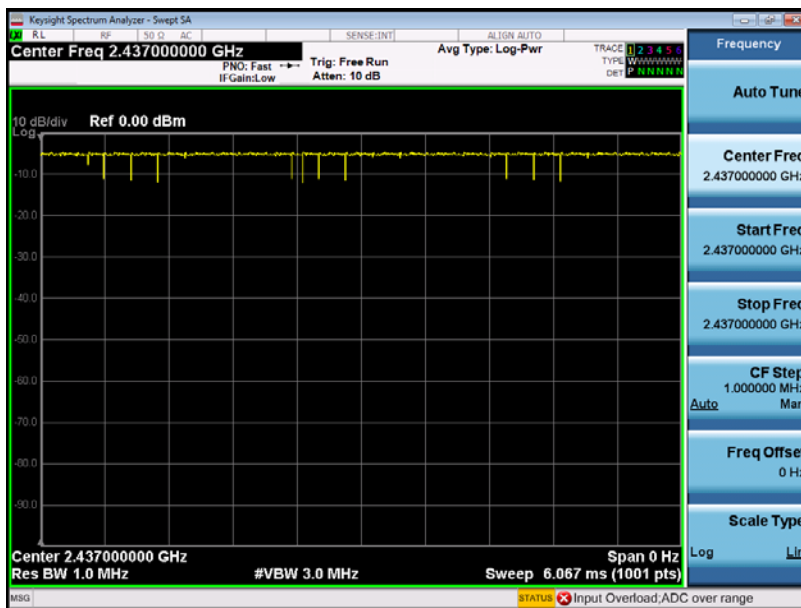
LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

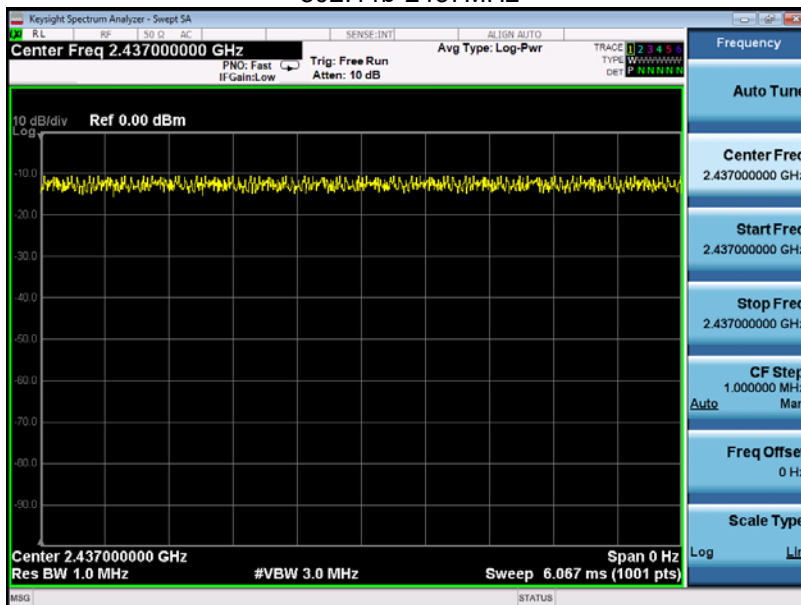
TEST RESULTS

Type	Channel	Output power PK (dBm)	Limit (dBm)	Result
802.11b	01	12.69	30.00	Pass
	06	13.57		
	11	13.68		
802.11g	01	10.81	30.00	Pass
	06	10.94		
	11	10.48		
802.11n(HT20)	01	9.75	30.00	Pass
	06	10.49		
	11	10.12		

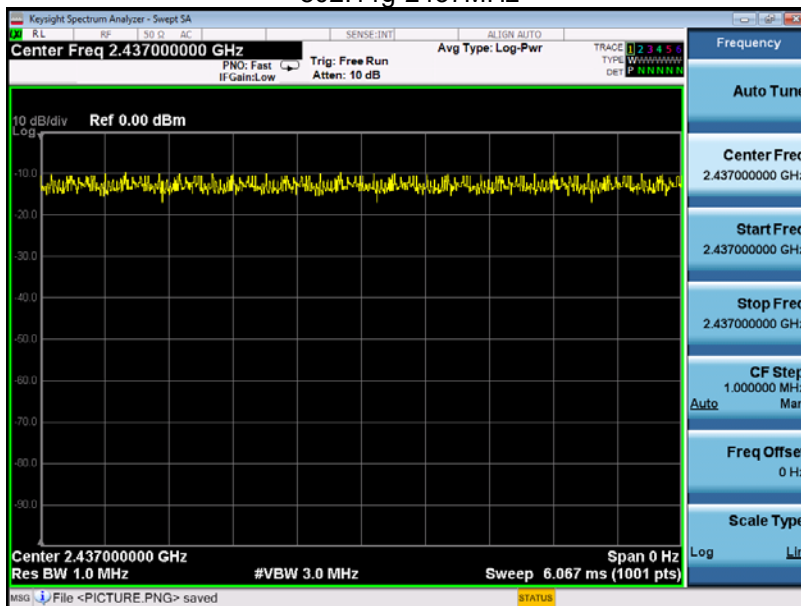
Note: 1.The test results including the cable lose.
Duty cycle used in all test items: 100%.



802.11b-2437MHz



802.11g-2437MHz



802.11n20-2437MHz

4.4. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 Method PKPSD (peak PSD) This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \text{ RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

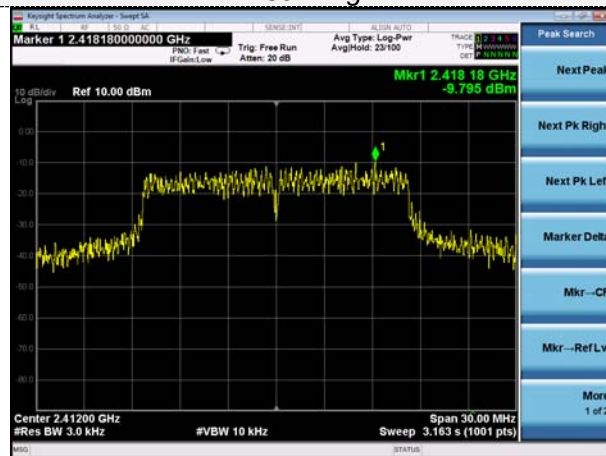
TEST RESULTS

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	01	-5.329	8.00	Pass
	06	-5.762		
	11	-5.076		
802.11g	01	-9.795	8.00	Pass
	06	-9.548		
	11	-11.510		
802.11n(HT20)	01	-8.503	8.00	Pass
	06	-9.549		
	11	-10.194		

802.11b



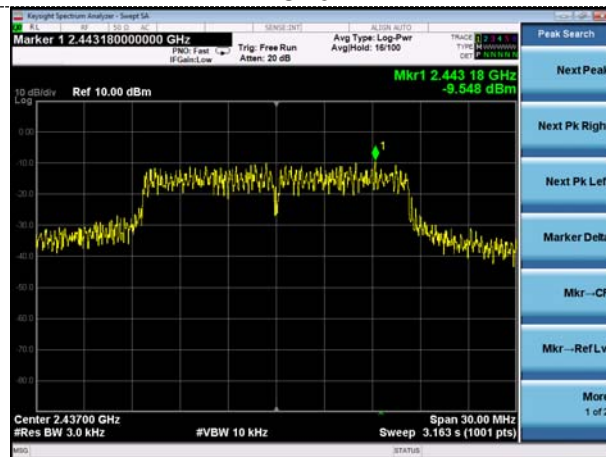
802.11g



CH01



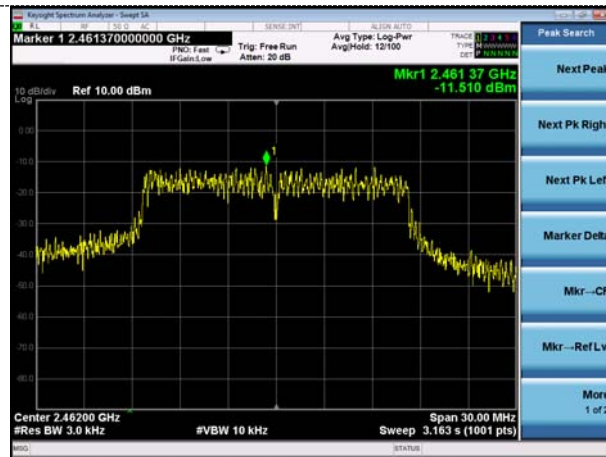
CH01



CH06



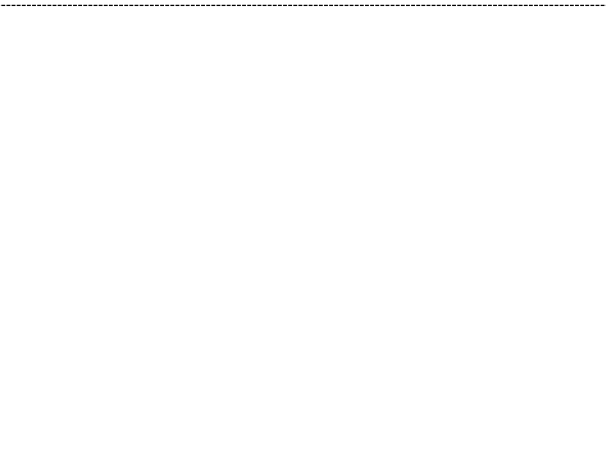
CH06



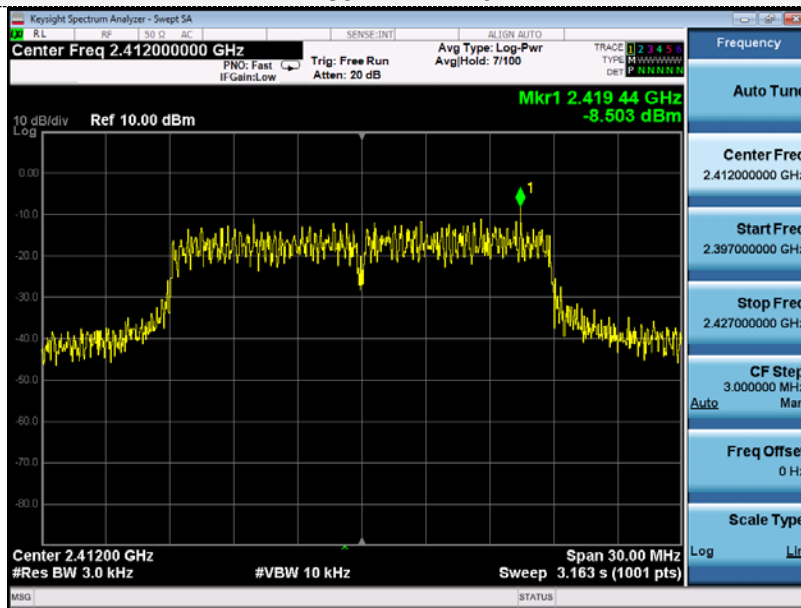
CH11



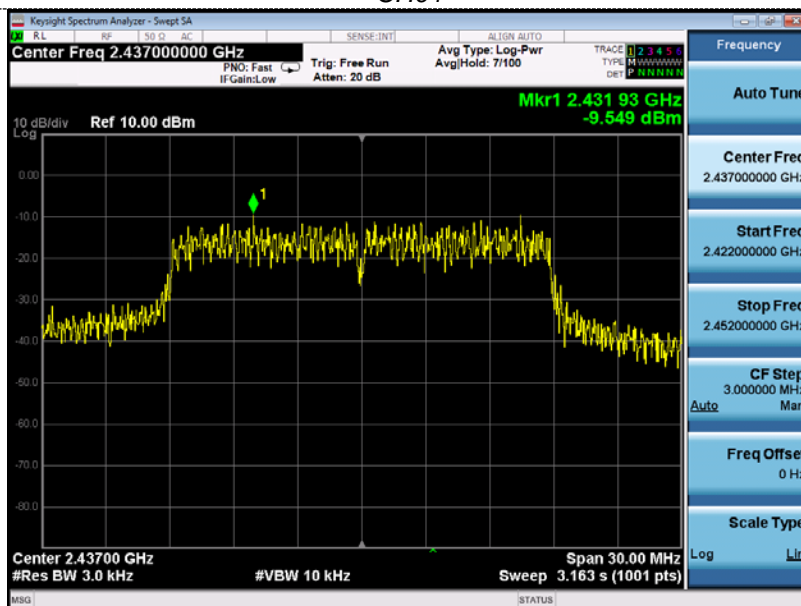
CH11



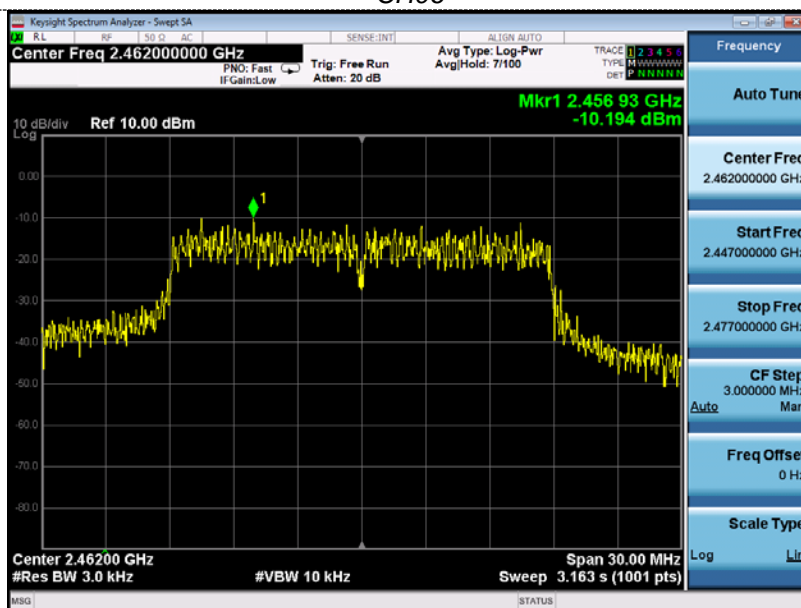
802.11 nHT20



CH01



CH06



CH11

4.5. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 kHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 D01 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

TEST RESULTS

Antenna 1

Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
802.11b	01	10.09	≥500	Pass
	06	10.09		
	11	10.09		
802.11g	01	16.61	≥500	Pass
	06	16.61		
	11	16.61		
802.11nHT20	01	17.84	≥500	Pass
	06	17.83		
	11	17.83		

802.11b



CH01

802.11g



CH01



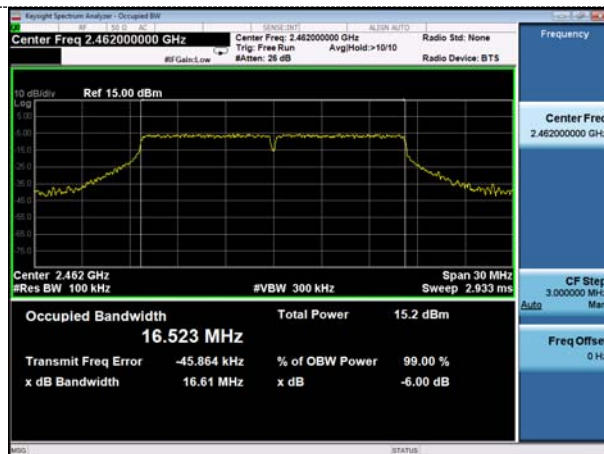
CH06



CH06

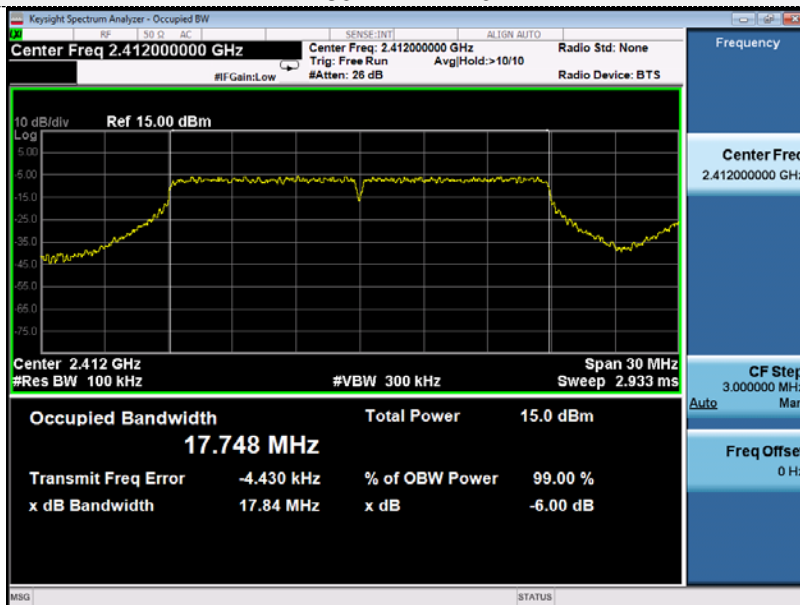


CH11

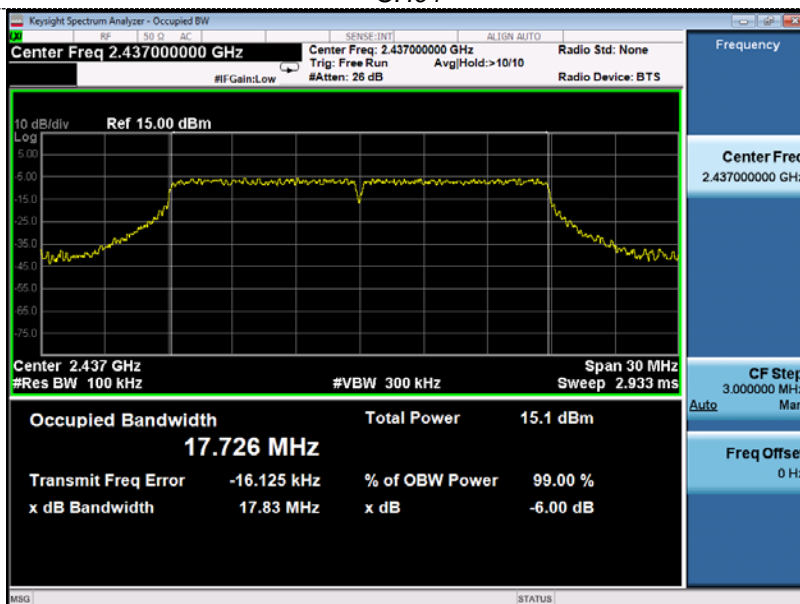


CH11

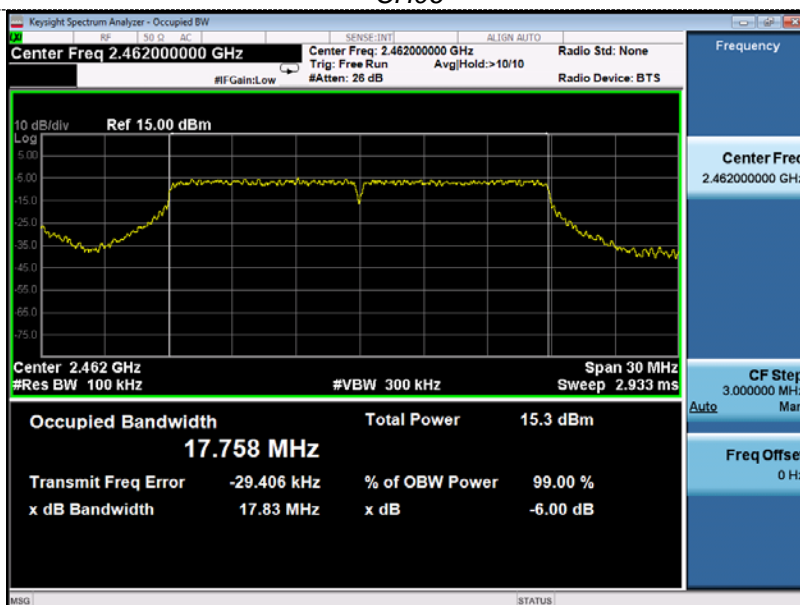
802.11 nHT20



CH01



CH06



CH11

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

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

TEST PROCEDURE

According to KDB 558074 D01 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=10Hz for average detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies \leq 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies $>$ 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20\log D + 104.8$$

where:

E = electric field strength in dB μ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

11. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12. Compare the resultant electric field strength level to the applicable regulatory limit.
13. Perform radiated spurious emission test dures until all measured frequencies were complete.

LIMIT

Below -20dB of the highest emission level in operating band.

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).

TEST RESULTS

Remark: We tested all modes at the antenna single transmitting mode , and recored the worst data at the antenna single transmitting mode.

4.6.1 For Radiated Bandedge Measurement

Frequency	Meter Reading	antenna Factor	cable loss	preamp factor	Level	Limit	Margin	Polar	Result
(MHz)	(dB μ V)	(dB)	(dB)	(dB)	(dB μ V/m)	(dB μ V/m)	[dB]	(H/V)	
802.11b									
2390	44.85	27.72	3.36	26.32	49.61	74	-24.39	V	Pass
2483.5	45.32	27.79	3.48	26.34	50.25	74	-23.75	V	Pass
2390	43.29	27.72	3.36	26.32	48.05	74	-25.95	H	Pass
2483.5	42.76	27.79	3.48	26.34	47.69	74	-26.31	H	Pass
802.11g									
2390	42.52	27.72	3.36	26.32	47.28	74	-26.72	V	Pass
2483.5	43.58	27.79	3.48	26.34	48.51	74	-25.49	V	Pass
2390	41.19	27.72	3.36	26.32	45.95	74	-28.05	H	Pass
2483.5	40.26	27.79	3.48	26.34	45.19	74	-28.81	H	Pass
802.11n20									
2390	40.25	27.72	3.36	26.32	45.01	74	-28.99	V	Pass
2483.5	40.07	27.79	3.48	26.34	45.00	74	-29.00	V	Pass
2390	41.08	27.72	3.36	26.32	45.84	74	-28.16	H	Pass
2483.5	40.86	27.79	3.48	26.34	45.79	74	-28.21	H	Pass

4.6.2 For Conducted Bandedge Measurement

Modulation		Frequency Band	Delta Peak to band emission (dBc)	>Limit (dBc)	Result
Band Edge	802.11b	Left Band	37.58	20	Pass
		Right Band	58.51	20	Pass
	802.11g	Left Band	31.54	20	Pass
		Right Band	41.98	20	Pass
	802.11n(20M)	Left Band	31.27	20	Pass
		Right Band	39.54	20	Pass



802.11b-2412



802.11b-2462



802.11g-2412



802.11g-2462



802.11n HT20-2412



802.11n HT20-2462

4.7. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz;For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz;For 10MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and measure frequency range from 9KHz to 25GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.
3. For below 30MHz, For 9KHz-150kHz, 150K-10MHz, We use the RBW 1KHz, 10KHz, So the limit need to be calculated by " $10\lg(BW1/BW2)$ ". for example For 9KHz-150kHz, RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

TEST RESULTS

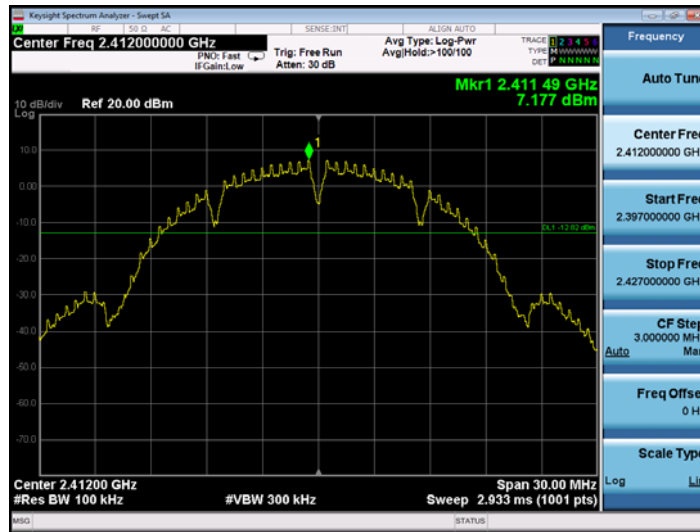
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and high channels were tested, the worst was the 802.11b mode and record the test plot at this report.

Test Mode:

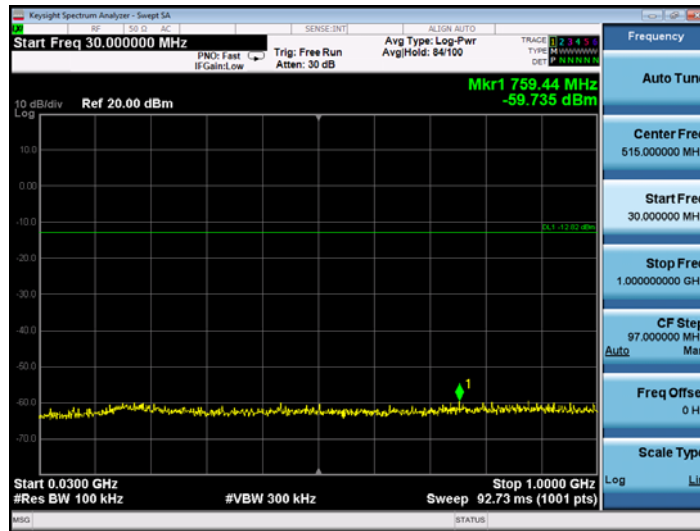
802.11b

Test channel :

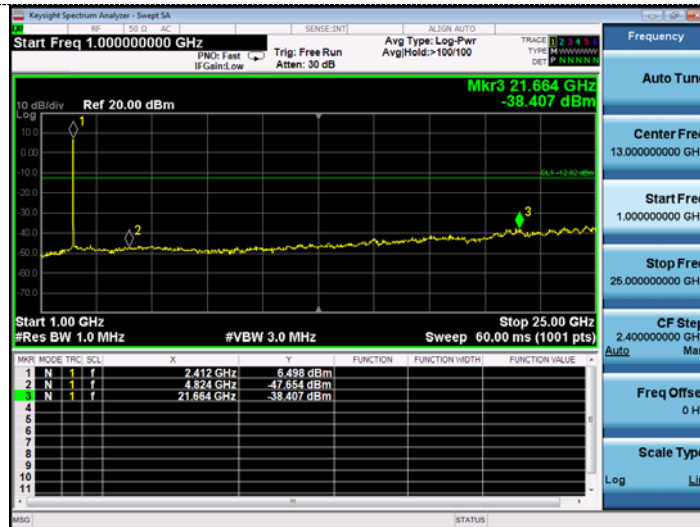
01



Channel 01



30MHz ~1GHz



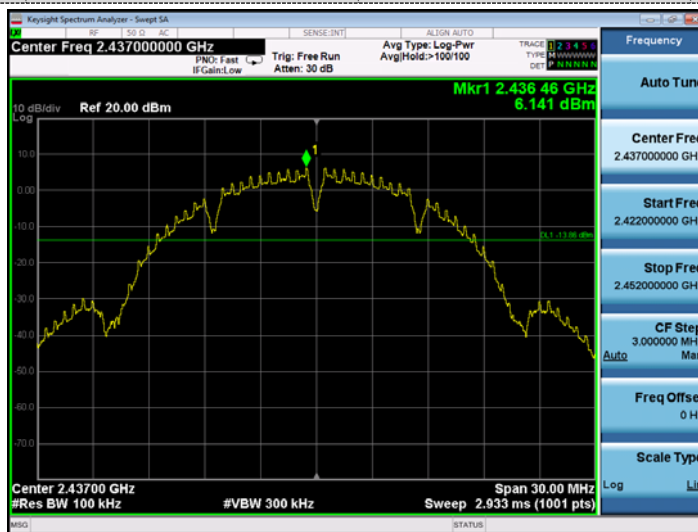
1GHz~25GHz

Test Mode:

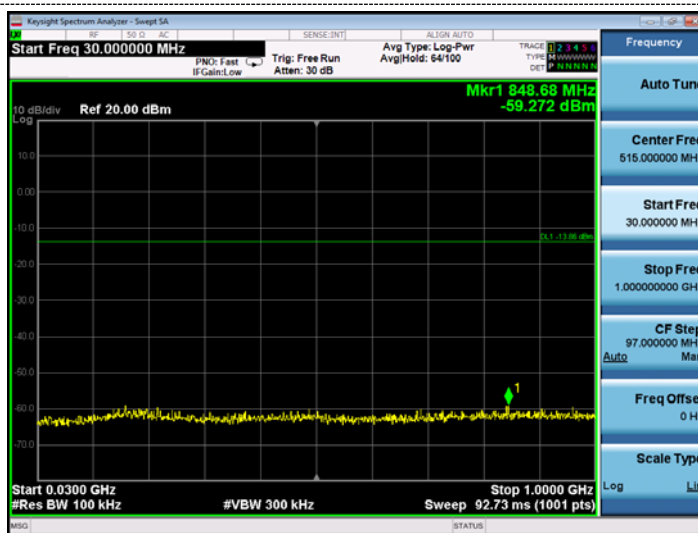
802.11b

Test channel :

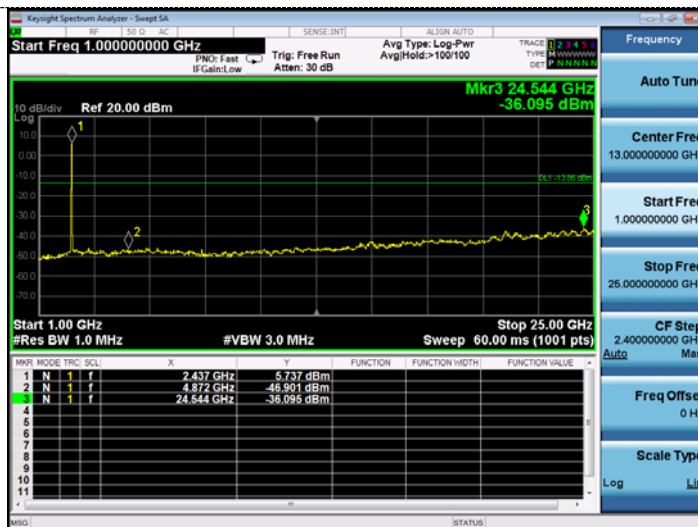
06



Channel 06



30MHz ~1GHz



1GHz~25GHz

Test Mode:

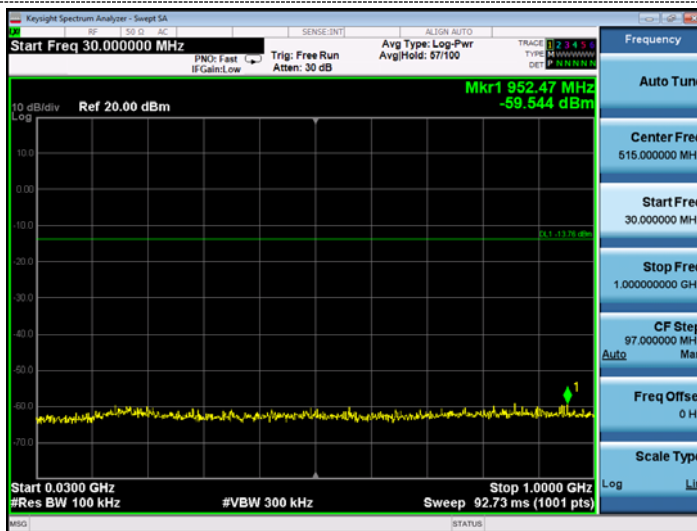
802.11b

Test channel :

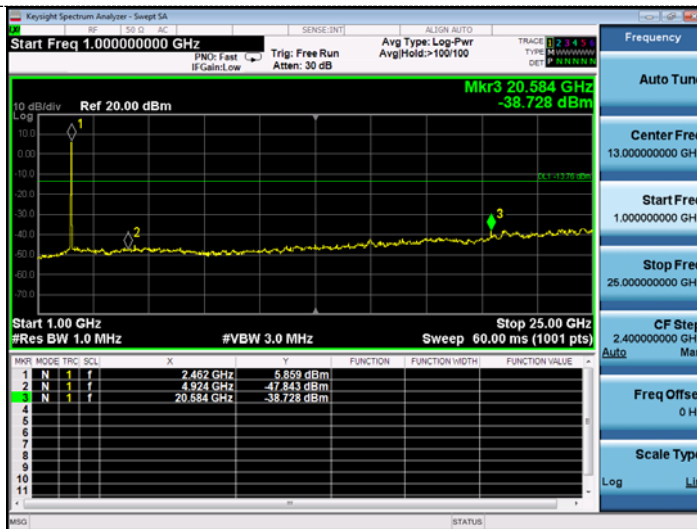
11



Channel 11



30MHz ~1GHz



1GHz~25GHz

4.8. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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 FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

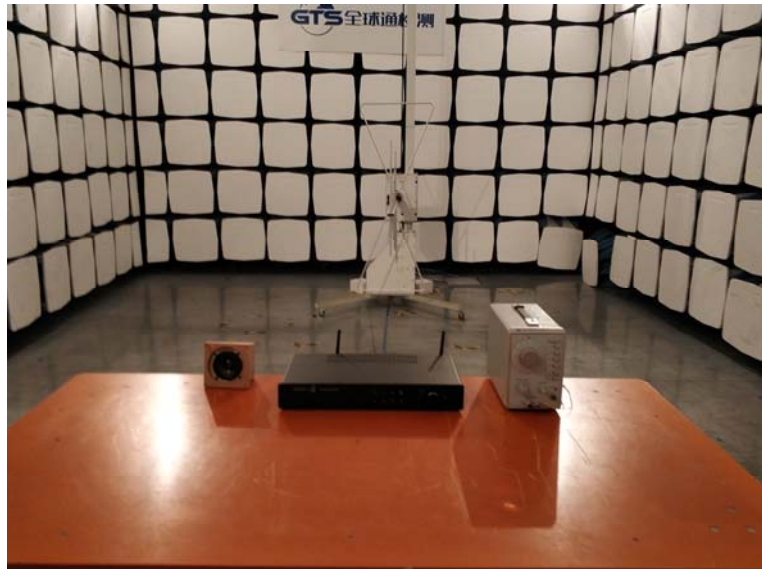
Test Result

The antenna used for this product is external Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2dBi.

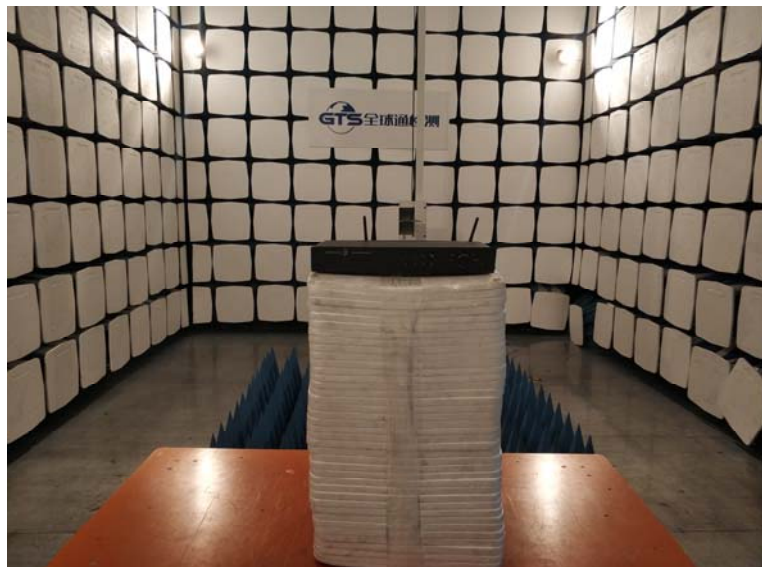


5. Test Setup Photos of the EUT

Radiated Emission
(Below 1G)



Radiated Emission
(Above 1G)



Conducted Emission



6. External and Internal Photos of the EUT

See the attachment GTSR18070292-EUT photo for details.

.....**End of Report**.....