FCC RADIO TEST REPORT
FCC ID: 2AQ6C-SG01

Product： SHADOW GHOST
Trade Mark： SHADOW GHOST
Model Name： SG01
Serial Model： N/A
Report No.： SER180712704003E

Prepared for

BLADE SAS

38 rue du Sentier, 75002 Paris, France

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name ..... : BLADE SAS

Address ..... : 38 rue du Sentier, 75002 Paris, France

Manufacturer's Name ..... : BLADE SAS

Address ..... : 38 rue du Sentier, 75002 Paris, France

Product description

Product name..... : SHADOW GHOST

Model and/or type reference : SG01

Serial Model ..... : N/A

Standards ..... : FCC Part15.407

Test procedure ..... ANSI C63.10-2013
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements/ the Industry Canada requirements.. And it is applicable only to the tested sample identified in the report.

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Date of Test .....

Date (s) of performance of tests..... 03 Aug. 2018 ~ 19 Sep. 2018

Date of Issue..... 26 Sep. 2018

Test Result..... **Pass**

Testing Engineer : Eileen Liu.
(Eileen Liu)

Technical Manager : Jason chen
(Jason Chen)

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(Sam Chen)

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Revision History

Report No.	Version	Description	Issued Date
SER180712704003E	Rev.01	Initial issue of report	Sep 26, 2018

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.207	AC Power Line Conducted Emissions	PASS	
15.209(a), 15.407 (b)(1) 15.407 (b)(4) 15.407 (b)(6)	Spurious Radiated Emissions	PASS	
15.407 (a)(1) 15.407 (a)(3) 15.1049	26 dB and 99% Emission Bandwidth	PASS	
15.407(e)	Minimum 6 dB bandwidth	PASS	
15.407 (a)(1) 15.407 (a)(3)	Maximum Conducted Output Power	PASS	
2.1051, 15.407(b)(1) 15.407(b)(4)	Band Edge	PASS	
15.407 (a)(1) 15.407 (a)(3)	Power Spectral Density	PASS	
2.1051, 15.407(b)	Spurious Emissions at Antenna Terminals	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 FACILITIES AND ACCREDITATIONS

FACILITIES

All measurement facilities used to collect the measurement data are located at

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

CNAS-Lab.	:	The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L5516.
IC-Registration		The Certificate Registration Number is 9270A-1.
FCC- Accredited		Test Firm Registration Number: 463705. Designation Number: CN1184
A2LA-Lab.		The Certificate Registration Number is 4298.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).
Name of Firm	:	Shenzhen NTEK Testing Technology Co., Ltd.
Site Location	:	1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.80dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated(30MHz~1GHz)	±2.64dB
5	All emissions, radiated(1GHz~6GHz)	±2.40dB
6	All emissions, radiated(＞6GHz)	±2.52dB
7	Temperature	±0.5℃
8	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	SHADOW GHOST	
Trade Mark	SHADOW GHOST	
Model Name	SG01	
FCC ID	2AQ6C-SG01	
Product Description	IEEE 802.11 WLAN Mode Supported	☒802.11a(20MHz channel bandwidth) ☒802.11n/ac(20MHz channel bandwidth) ☒802.11n/ac(40MHz channel bandwidth) ☒802.11ac(80MHz channel bandwidth)
	Data Rate	802.11 a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20):MCS0-MCS15; 802.11n(HT40):MCS0-MCS15; 802.11ac: NSS1,MCS0-MCS9,NSS2,MCS0-MCS9;
	Modulation	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n/ac;
	Operating Frequency Range	☒5180-5240MHz for 802.11a/n(HT20)/ac20; 5190-5230MHz for 802.11n(HT40)/ac40; 5210MHz for 802.11 ac80; ☒5745-5825 MHz for 802.11a/n(HT20)/ac20; 5755-5795 MHz for 802.11a/n(HT40)/ac40; 5775MHz for 802.11 ac80;
	Number of Channels	☒4 channels for 802.11a/n20/ac20 in the 5180-5240MHz band ; 2 channels for 802.11 n40/ac40 in the 5190-5230MHz band 1 channels for 802.11 ac80 in the 5210MHz band; ☒5 channels for 802.11a/n20/ac20 in the 5745-5825MHz band ; 2 channels for 802.11 n40/ac40 in the 5755-5795MHz band 1 channels for 802.11 ac80 in the 5775MHz band;
	Antenna Type	The EUT has two types of antenna AUX Antenna A: FPCB Antenna(For WLAN 2.4G/5G and BT) Main Antenna B: FPCB Antenna(For WLAN 2.4G/5G)
	Smart system	☒SISO for 802.11a/n/ac ☐MIMO
	Antenna Gain	See Table for Filed Antenna
	Based on the application, features, or specification exhibited in User's Manual, More details of EUT technical specification, please refer to the User's Manual.	
Ratings	DC 12V from Adapter	
Adapter	Model:ICP36-120-3000 Input: 100-240V~50/60Hz 1.3A Output: 12V⎓3000mA	
Battery	N/A	
Connecting I/O Port(s)	Please refer to the User's Manual	
HW Version	RK3399_BLADE_V1.4	
SW Version	SWSG01	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Frequency and Channel list for 802.11a/n(20MHz) band I (5180-5240MHz):

802.11a/n/ac(20MHz) Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220	-	-	-	-
40	5200	48	5240	-	-	-	-

Frequency and Channel list for 802.11n(40MHz) band I (5190-5230MHz):

802.11n /ac(40MHz) Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	-	-	-	-	-	-
46	5230	-	-	-	-	-	-

802.11ac (80MHz) Carrier Frequency Channel	
Channel	Frequency (MHz)
42	5210

Frequency and Channel list for 802.11a/n(20 MHz) band IV (5745-5825MHz):

802.11a/n/ac(20 MHz) Carrier Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	153	5765	157	5785	161	5805
165	5825	-	-	-	-	-	-

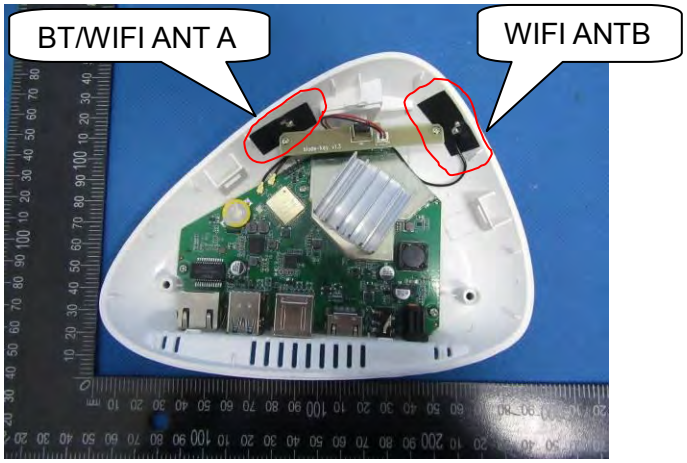
Frequency and Channel list for 802.11n(40MHz) band IV (5755-5795MHz):

802.11n/ac 40MHz Carrier Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795	-	-

802.11ac 80MHz Carrier Frequency Channel	
Channel	Frequency (MHz)
155	5775

The EUT has two types of antenna.

Antenna	Brand	Model Name (P/N)	Antenna Type	Connector	Antenna Gain(dBi)	
					5.2G	5.8G
B(main)	N/A	N/A	FPCB	I-PEX	3	3
A(aux)	N/A	N/A	FPCB	I-PEX	3	3



EUT has two antennas, and different modes support different transmit mode what describe as Following form:

Mode	Tx/Rx
802.11a/n/ac	1TX, 1RX

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a/n/ac 20 CH36/ CH40/ CH 48 802.11a /n/ac 20 CH149/ CH157/ CH 165
Mode 3	802.11n/ac40 CH38/ CH 46 802.11n/ac40 CH 151 / CH 159
Mode 4	802.11ac80 CH 42/CH 155

For Radiated Emission	
Final Test Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a/n/ac 20 CH36/ CH40/ CH 48 802.11a /n/ac 20 CH149/ CH157/ CH 165
Mode 3	802.11n/ac40 CH38/ CH 46 802.11n/ac40 CH 151 / CH 159
Mode 4	802.11 ac80 CH 42/CH 155

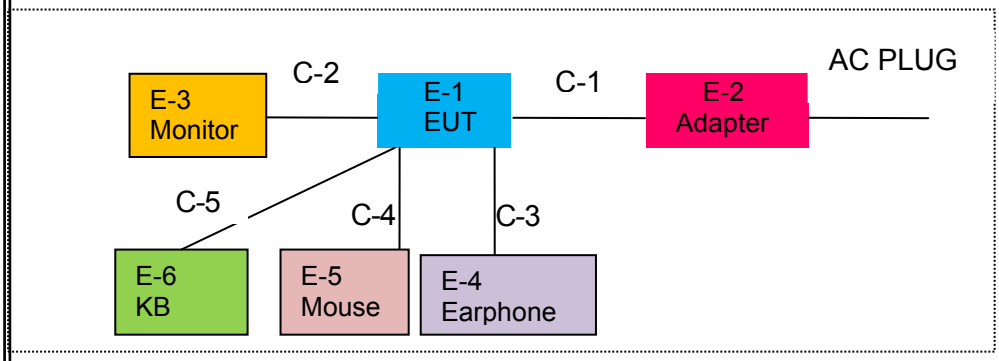
Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

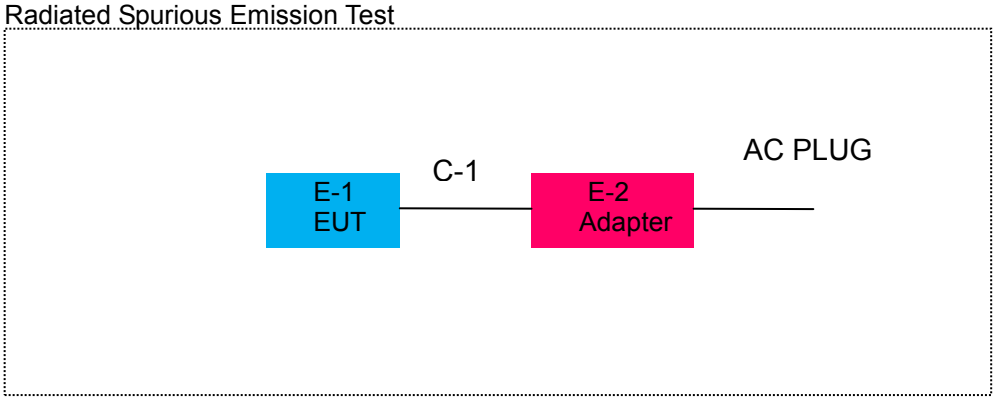
(2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

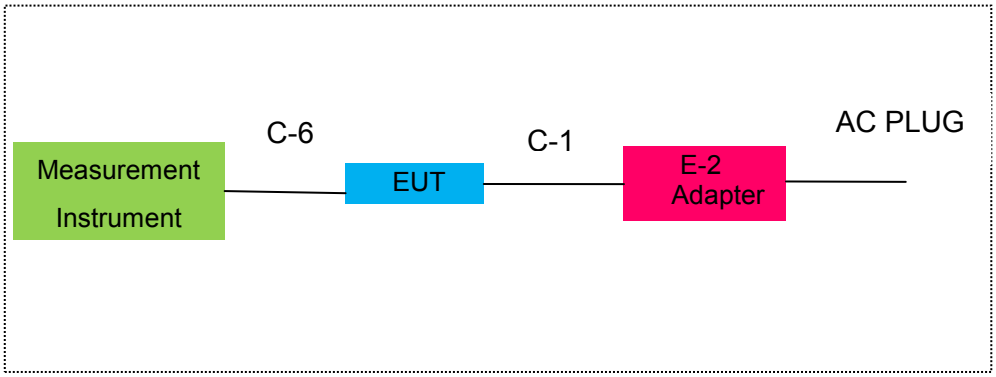
For AC Conducted Emission Mode



Radiated Spurious Emission Test



For Conducted Test Cases



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	SHADOW GHOST	SHADOW GHOST	SG01	N/A	EUT
E-2	Adapter	N/A	ICP36-120-3000	N/A	Peripherals
E-3	Monitor	SHARP	LCD-32MS46A	N/A	Peripherals
E-4	Earphone	N/A	2688	N/A	Peripherals
E-5	Mouse	DELL	MS111-P	N/A	Peripherals
E-6	Keyboard	DELL	SK-8185	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length	Note
C-1	Power Cable	NO	NO	1.2m	
C-2	HDMI Cable	YES	NO	1.2m	
C-3	Earphone Cable	NO	NO	1.0m	
C-4	Mouse Cable	NO	NO	1.0m	
C-5	Keyboard Cable	NO	NO	1.0m	
C-6	RF Cable	YES	NO	0.1m	

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation& Conducted Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Aglient	E4407B	MY45108040	2018.05.19	2019.05.18	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2017.10.26	2018.10.25	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2017.10.26	2018.10.25	1 year
4	Test Receiver	R&S	ESPI7	101318	2018.05.19	2019.05.18	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2018.04.08	2019.04.07	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2018.05.19	2020.05.18	2 year
7	Horn Antenna	EM	EM-AH-10180	2011071402	2018.04.08	2019.04.07	1 year
8	Amplifier	EMC	EMC051835SE	980246	2018.08.05	2019.08.04	1 year
9	Active Loop Antenna	SCHWARZBECK	FMZB 1519 B	055	2017.12.06	2018.12.06	1 year
10	Power Meter	DARE	RPR3006W	15I00041SNO84	2018.08.05	2019.08.04	1 year
11	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2017.04.21	2020.04.20	3 year
12	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2017.04.21	2020.04.20	3 year
13	High Test Cable(1G-40GHz)	N/A	R-03	N/A	2017.04.21	2020.04.20	3 year
14	High Test Cable(1G-40GHz)	N/A	R-04	N/A	2017.04.21	2020.04.20	3 year
15	Filter	TRILTHIC	2400MHz	29	2017.04.19	2020.04.18	3 year
16	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:
We will use the temporary antenna connector (soldered on the FPCB board) When conducted test
And this temporary antenna connector is listed within the instrument list

AC Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2018.05.19	2019.05.18	1 year
2	LISN	R&S	ENV216	101313	2018.04.18	2019.04.19	1 year
3	LISN	SCHWARZBECK	NNLK 8129	8129245	2018.05.19	2019.05.18	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2018.05.19	2020.05.18	3 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2017.04.21	2020.04.20	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2017.04.21	2020.04.20	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2017.04.21	2020.04.20	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable which is scheduled for calibration every 3 years.

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Conducted Emission Limit		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC/ RSS-247
0.50 -5.0	56.00	46.00	FCC/ RSS-247
5.0 -30.0	60.00	50.00	FCC/ RSS-247

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

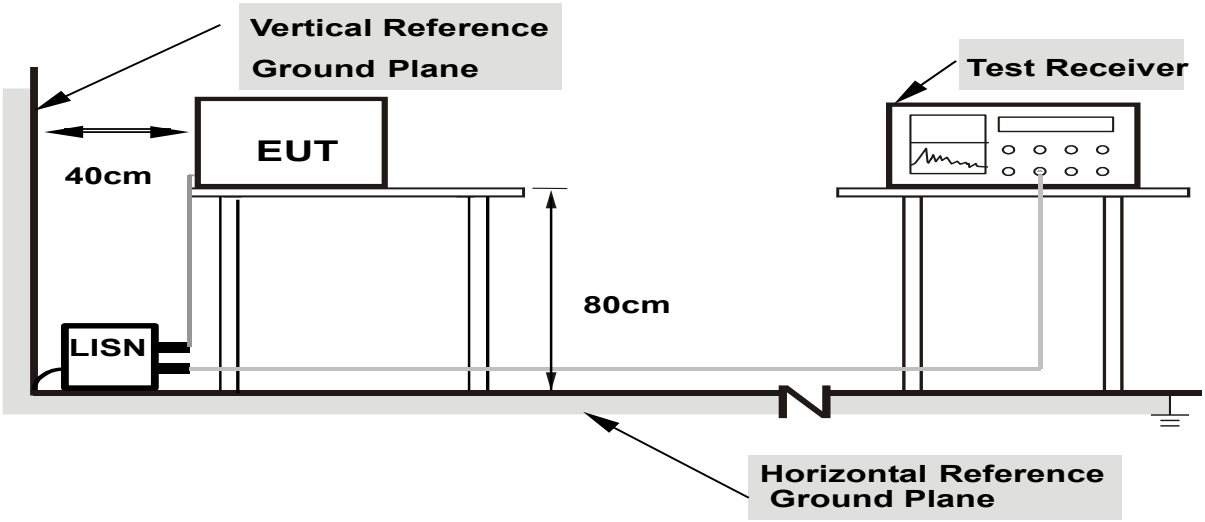
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

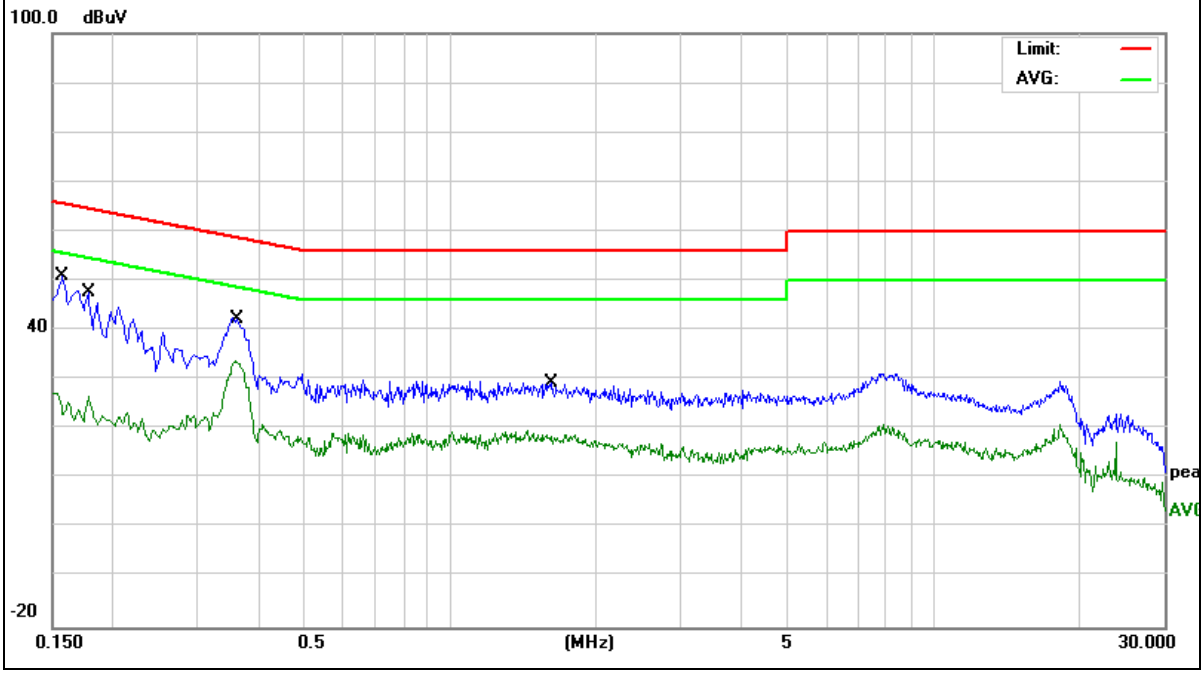
3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 12V from Adapter AC 120V/60Hz	Test Mode：	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1580	41.24	9.75	50.99	65.56	-14.57	QP
0.1580	17.51	9.75	27.26	55.56	-28.30	AVG
0.1780	37.80	9.76	47.56	64.57	-17.01	QP
0.1780	16.97	9.76	26.73	54.57	-27.84	AVG
0.3580	32.73	9.74	42.47	58.77	-16.30	QP
0.3580	23.98	9.74	33.72	48.77	-15.05	AVG
1.6260	19.69	9.77	29.46	56.00	-26.54	QP
1.6260	9.15	9.77	18.92	46.00	-27.08	AVG

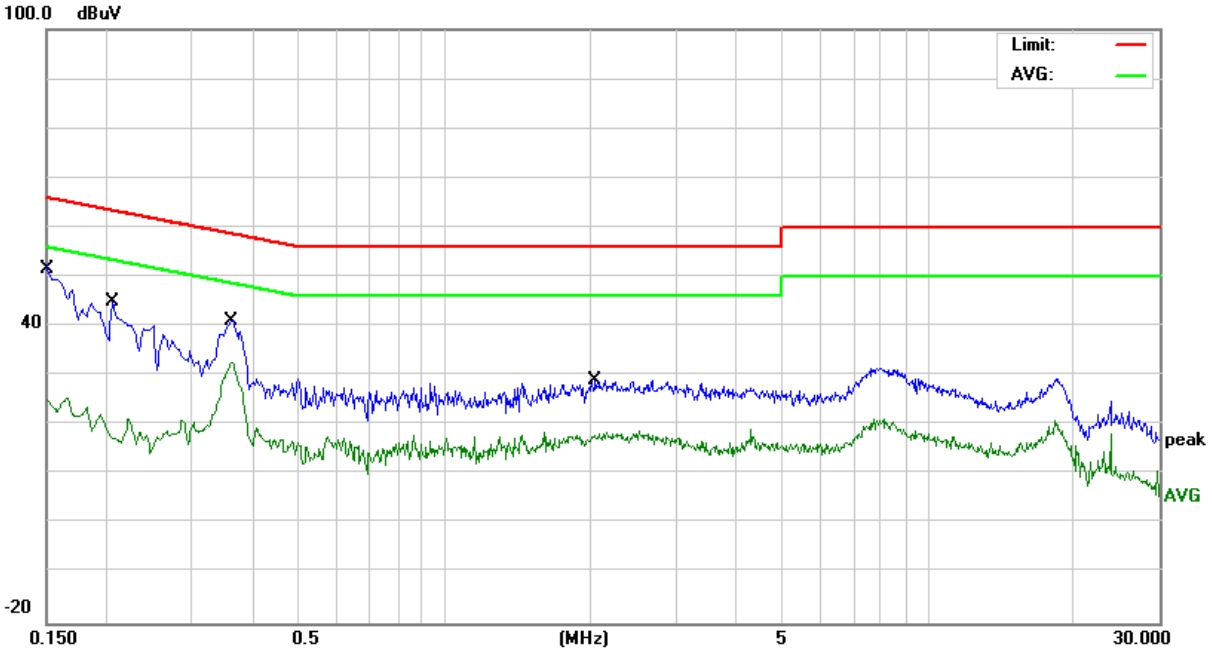
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 12V from Adapter AC 120V/60Hz	Test Mode：	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1524	40.56	9.74	50.30	65.86	-15.56	QP
0.1524	15.80	9.74	25.54	55.86	-30.32	AVG
0.2059	35.24	9.73	44.97	63.37	-18.40	QP
0.2059	11.58	9.73	21.31	53.37	-32.06	AVG
0.3619	31.36	9.75	41.11	58.68	-17.57	QP
0.3619	22.80	9.75	32.55	48.68	-16.13	AVG
2.0499	19.32	9.79	29.11	56.00	-26.89	QP
2.0499	8.65	9.79	18.44	46.00	-27.56	AVG

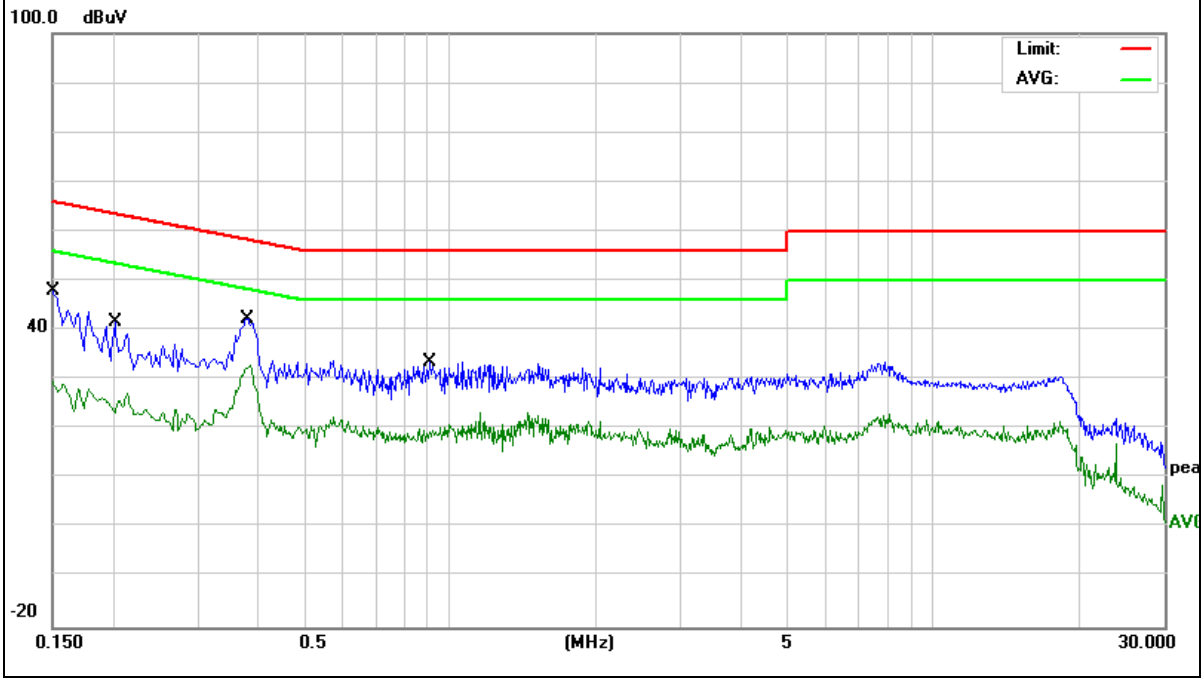
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 12V from Adapter AC 240V/60Hz	Test Mode：	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1500	38.08	9.75	47.83	65.99	-18.16	QP
0.1500	19.86	9.75	29.61	55.99	-26.38	AVG
0.2020	31.83	9.76	41.59	63.52	-21.93	QP
0.2020	17.59	9.76	27.35	53.52	-26.17	AVG
0.3860	32.61	9.74	42.35	58.15	-15.80	QP
0.3860	23.07	9.74	32.81	48.15	-15.34	AVG
0.9060	23.88	9.74	33.62	56.00	-22.38	QP
0.9060	11.09	9.74	20.83	46.00	-25.17	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

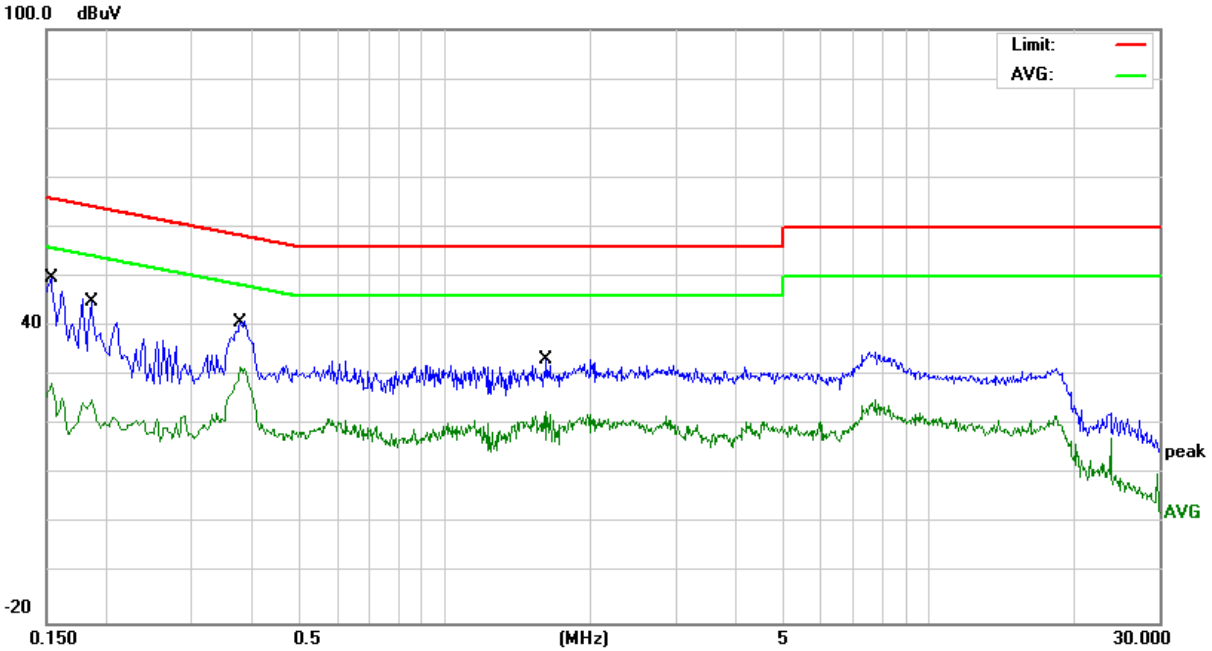


EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 12V from Adapter AC 240V/60Hz	Test Mode：	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1539	39.97	9.74	49.71	65.78	-16.07	QP
0.1539	17.27	9.74	27.01	55.78	-28.77	AVG
0.1859	35.21	9.73	44.94	64.21	-19.27	QP
0.1859	15.34	9.73	25.07	54.21	-29.14	AVG
0.3780	31.19	9.75	40.94	58.32	-17.38	QP
0.3780	21.94	9.75	31.69	48.32	-16.63	AVG
1.6257	23.50	9.78	33.28	56.00	-22.72	QP
1.6257	13.06	9.78	22.84	46.00	-23.16	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 APPLICABLE STANDARD

According to FCC Part 15.407(d) and 15.209

3.2.2 CONFORMANCE LIMIT

According to FCC Part 15.407(b)(7): 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)).
According to FCC Part15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	2400/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

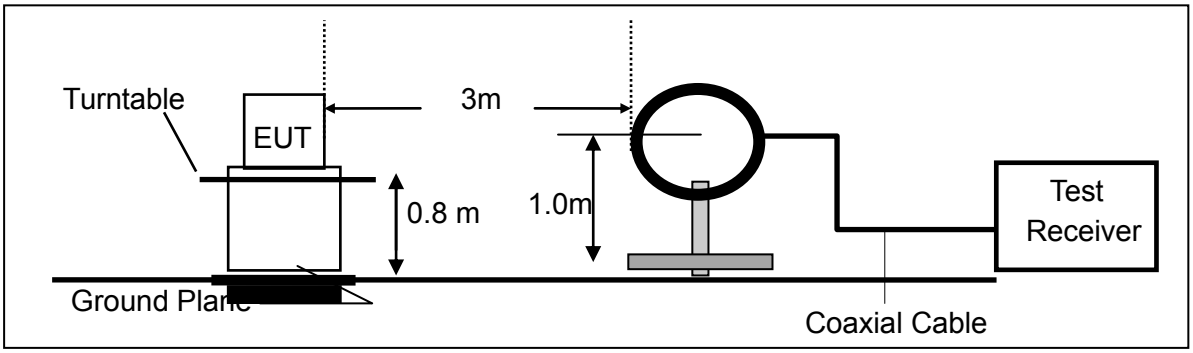
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. For Frequency 9kHz~30MHz:
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.
For Frequency above 30MHz:
Distance extrapolation factor =20log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

3.2.3 MEASURING INSTRUMENTS

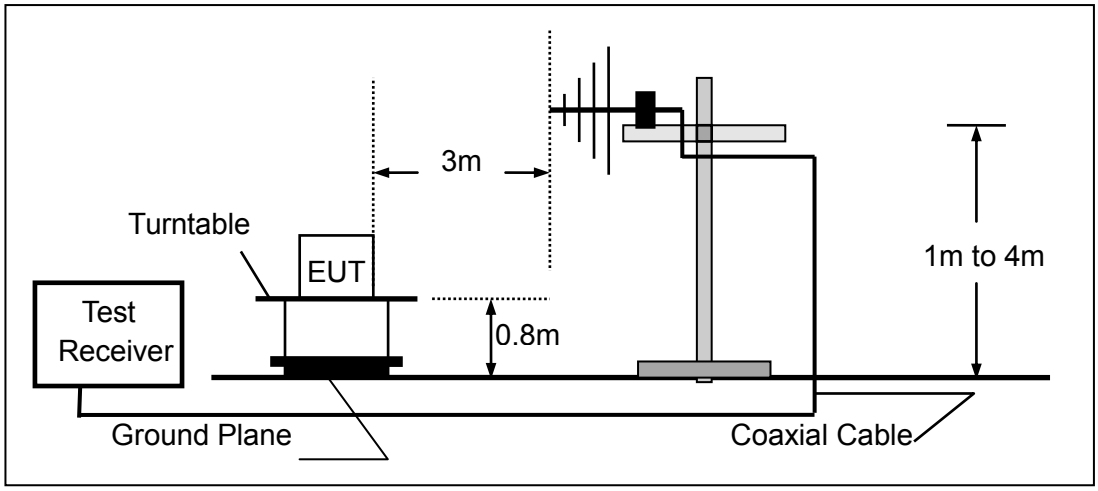
The Measuring equipment is listed in the section 6.3 of this test report.

3.2.4 TEST CONFIGURATION

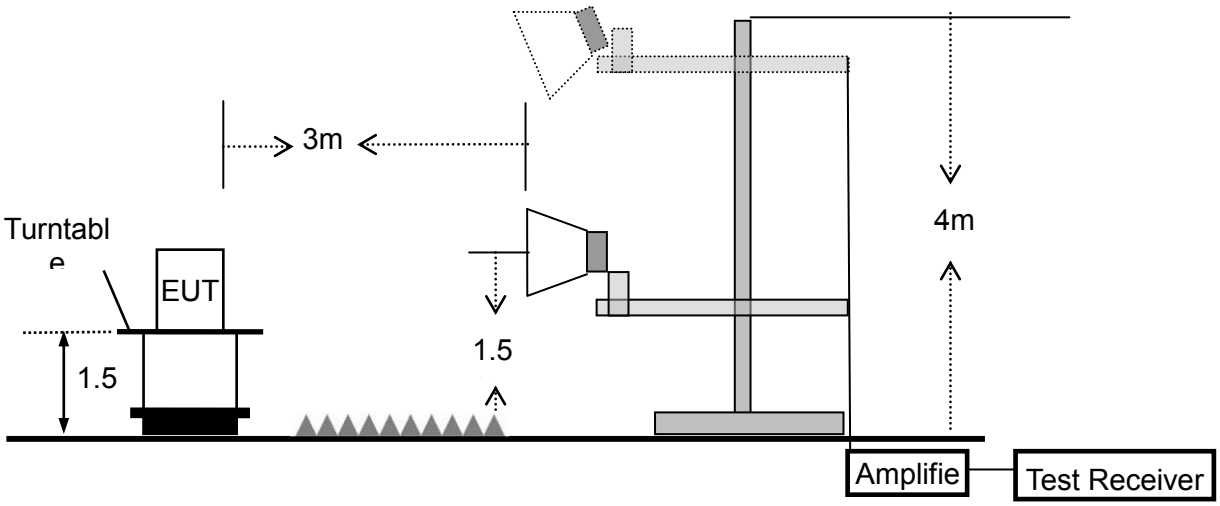
(a) For radiated emissions below 30MHz



(b) For radiated emissions from 30MHz to 1000MHz



(c) For radiated emissions above 1000MHz



3.2.5 TEST PROCEDURE

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.
This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205.
It must be performed with the highest gain of each type of antenna proposed for use with the EUT.
Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

3.2.6 TEST RESULTS (9KHZ – 30 MHZ)

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX	Polarization :	--

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

NOTE:

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

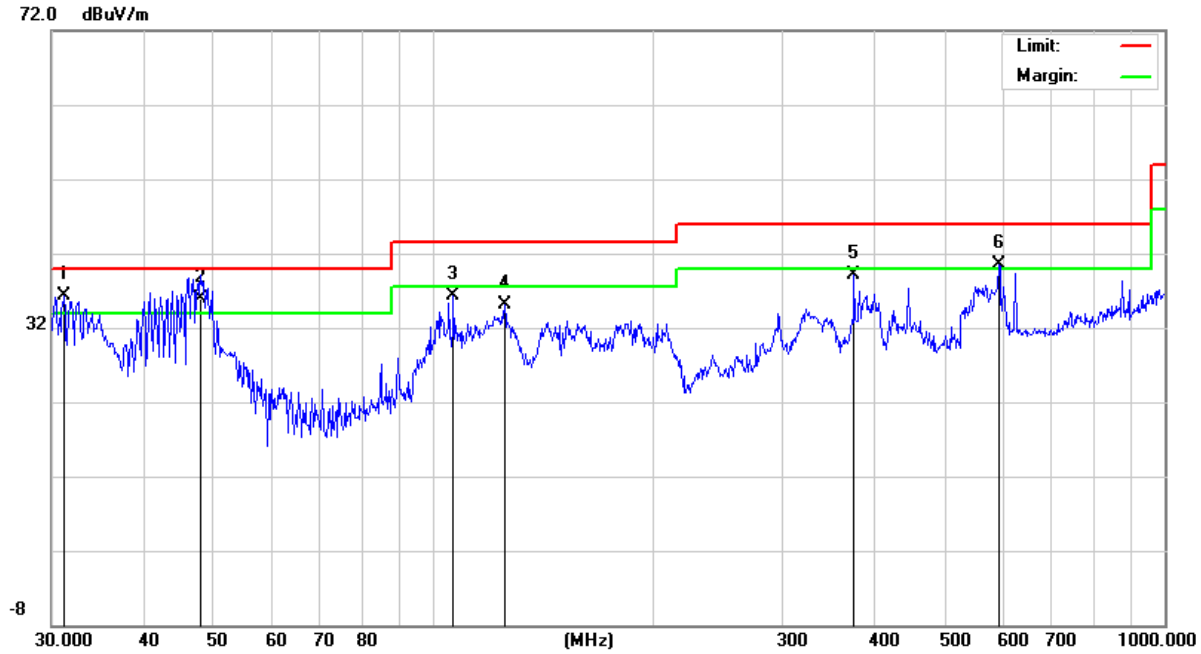
3.2.7 TEST RESULTS (30MHZ – 1GHZ)

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX(5.2G)		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	31.1798	17.74	18.48	36.22	40.00	-3.78	QP
V	47.9938	24.57	11.33	35.90	40.00	-4.10	QP
V	106.3850	24.10	12.18	36.28	43.50	-7.22	QP
V	125.0066	21.72	13.32	35.04	43.50	-8.46	QP
V	375.9384	20.64	18.42	39.06	46.00	-6.94	QP
V	593.0497	16.88	23.60	40.48	46.00	-5.52	QP

Remark:

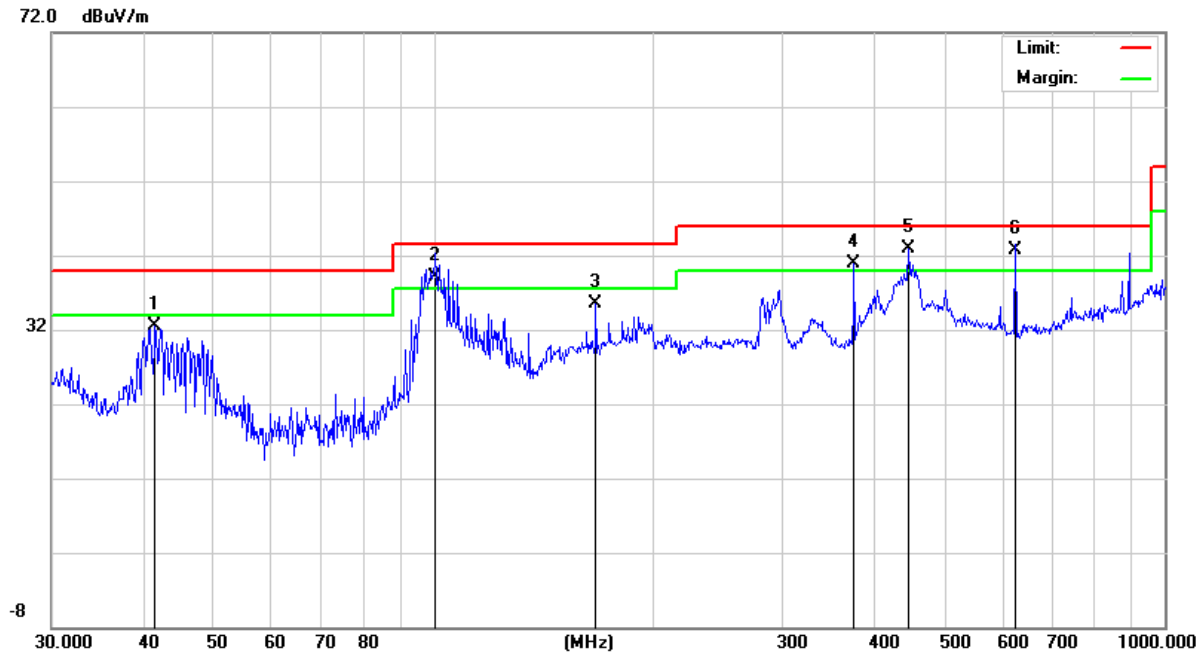
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	41.5670	19.21	13.38	32.59	40.00	-7.41	QP
H	100.5806	27.28	11.82	39.10	43.50	-4.40	QP
H	166.6511	24.15	11.40	35.55	43.50	-7.95	QP
H	375.9384	22.50	18.42	40.92	46.00	-5.08	QP
H	446.4141	22.52	20.34	42.86	46.00	-3.14	QP
H	625.0778	17.93	24.77	42.70	46.00	-3.30	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

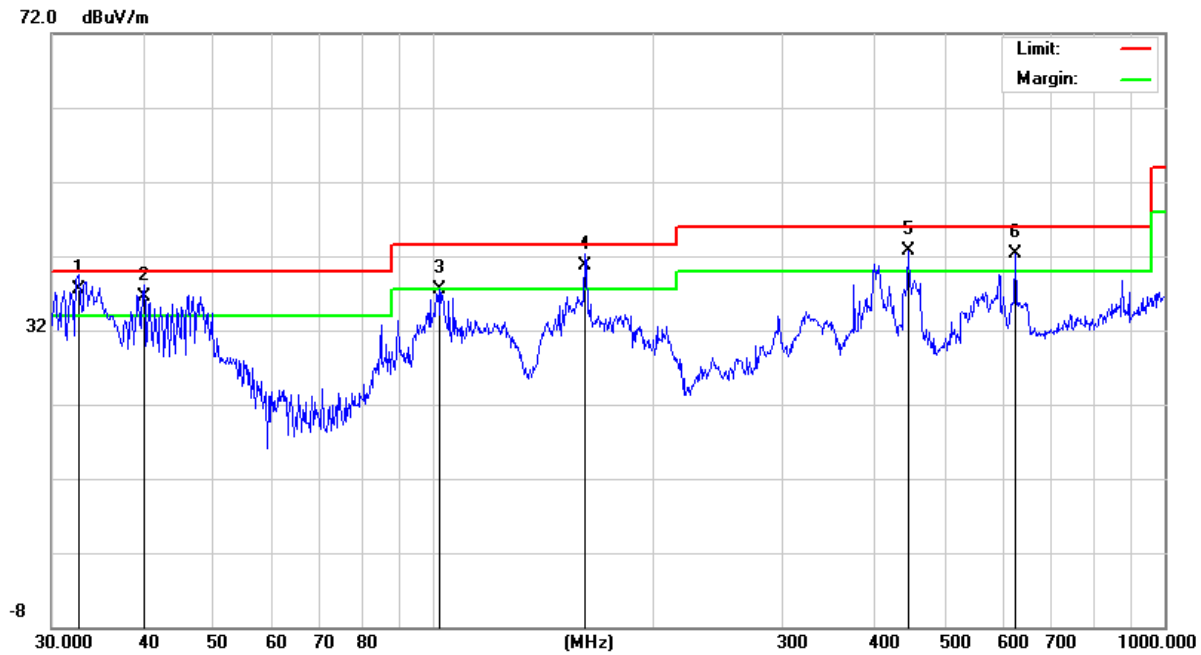


EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX(5.8G)		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	32.6340	19.75	17.85	37.60	40.00	-2.40	QP
V	40.1347	22.14	14.36	36.50	40.00	-3.50	QP
V	101.6443	25.62	11.90	37.52	43.50	-5.98	QP
V	160.9088	29.16	11.54	40.70	43.50	-2.80	QP
V	446.4141	22.36	20.34	42.70	46.00	-3.30	QP
V	625.0778	17.61	24.77	42.38	46.00	-3.62	QP

Remark:

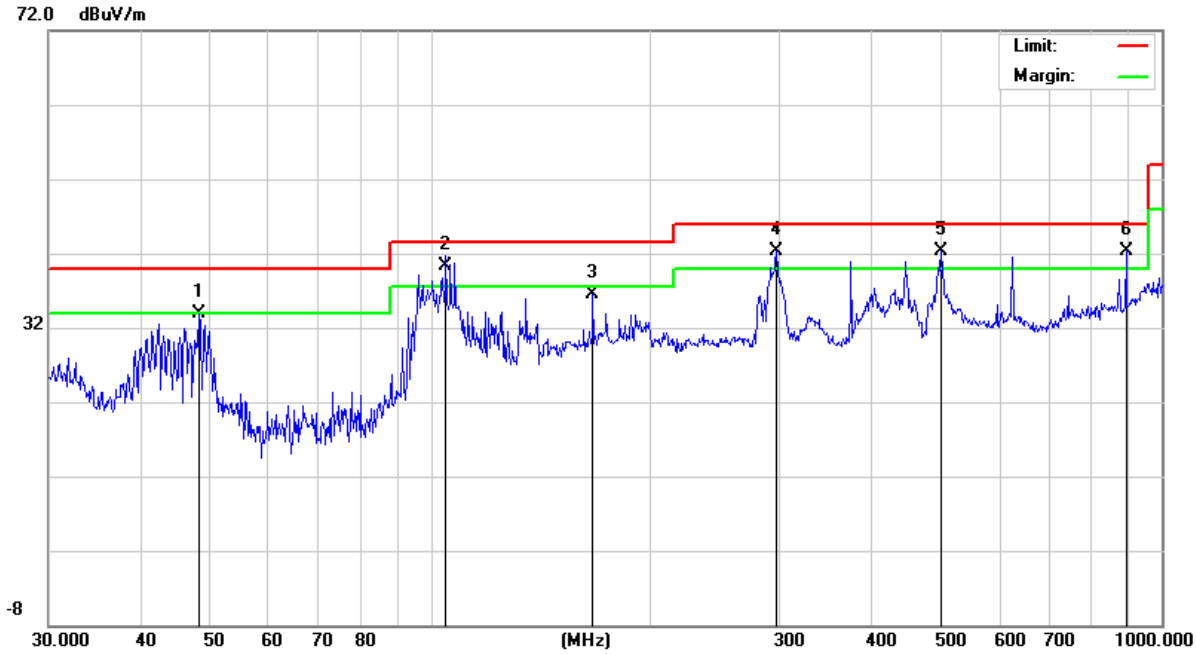
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	48.1625	22.81	11.16	33.97	40.00	-6.03	QP
H	104.9033	28.18	12.12	40.30	43.50	-3.20	QP
H	166.6511	25.15	11.40	36.55	43.50	-6.95	QP
H	297.2241	26.44	15.79	42.23	46.00	-3.77	QP
H	499.4245	20.12	22.14	42.26	46.00	-3.74	QP
H	893.8567	13.66	28.64	42.30	46.00	-3.70	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



3.2.8 TEST RESULTS (1GHz-26GHz)

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX(5.2G)- 802.11a		

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)
Low Channel (5180 MHz)-Above 1G								
Vertical	2859.641	61.52	5.94	35.40	44.00	58.86	74.00	-15.14
Vertical	2859.641	45.23	5.94	35.40	44.00	42.57	54.00	-11.43
Vertical	10360.000	61.41	8.46	39.75	44.50	65.12	74.00	-8.88
Vertical	10360.000	44.21	8.46	39.75	44.50	47.92	54.00	-6.08
Vertical	15540.000	58.97	10.12	38.80	44.10	63.79	74.00	-10.21
Vertical	15540.000	40.11	10.12	38.80	42.70	46.33	54.00	-7.67
Horizontal	2901.345	65.15	5.94	35.18	44.00	62.27	74.00	-11.73
Horizontal	2901.345	43.26	5.94	35.18	44.00	40.38	54.00	-13.62
Horizontal	10360.000	59.97	8.46	38.71	44.50	62.64	74.00	-11.36
Horizontal	10360.000	42.65	8.46	38.71	44.50	45.32	54.00	-8.68
Horizontal	15540.000	57.14	10.12	38.38	44.10	61.54	74.00	-12.46
Horizontal	15540.000	40.23	10.12	38.38	44.10	44.63	54.00	-9.37
Middle Channel (5200 MHz)-Above 1G								
Vertical	4062.387	62.59	6.48	36.35	44.05	61.37	74.00	-12.63
Vertical	4062.387	44.14	6.48	36.35	44.05	42.92	54.00	-11.08
Vertical	10400.000	63.59	8.47	37.88	44.51	65.43	74.00	-8.57
Vertical	10400.000	42.87	8.47	37.88	44.51	44.71	54.00	-9.29
Vertical	15600.000	58.64	10.12	38.80	44.10	63.46	74.00	-10.54
Vertical	15600.000	39.12	10.12	38.80	42.70	45.34	54.00	-8.66
Horizontal	4162.239	63.64	6.48	36.37	44.05	62.44	74.00	-11.56
Horizontal	4162.239	45.57	6.48	36.37	44.05	44.37	54.00	-9.63
Horizontal	10400.000	59.98	8.47	38.64	44.50	62.59	74.00	-11.41
Horizontal	10400.000	41.15	8.47	38.64	44.50	43.76	54.00	-10.24
Horizontal	15600.000	59.98	10.12	38.38	44.10	64.38	74.00	-9.62
Horizontal	15600.000	41.13	10.12	38.38	44.10	45.53	54.00	-8.47
High Channel (5240 MHz)-Above 1G								
Vertical	3906.623	61.13	7.10	37.24	43.50	61.97	74.00	-12.03
Vertical	3906.623	42.57	7.10	37.24	43.50	43.41	54.00	-10.59
Vertical	10480.000	63.25	8.46	37.68	44.50	64.89	74.00	-9.11
Vertical	10480.000	40.11	8.46	37.68	44.50	41.75	54.00	-12.25
Vertical	15720.000	59.98	10.12	38.80	44.10	64.80	74.00	-9.20
Vertical	15720.000	37.64	10.12	38.80	42.70	43.86	54.00	-10.14
Horizontal	3812.104	62.65	7.10	37.24	43.50	63.49	74.00	-10.51
Horizontal	3812.104	43.11	7.10	37.24	43.50	43.95	54.00	-10.05
Horizontal	10480.000	60.52	8.46	38.57	44.50	63.05	74.00	-10.95
Horizontal	10480.000	41.12	8.46	38.57	44.50	43.65	54.00	-10.35
Horizontal	15720.000	61.28	10.12	38.38	44.10	65.68	74.00	-8.32
Horizontal	15720.000	41.03	10.12	38.38	44.10	45.43	54.00	-8.57

Note:"802.11a (5.2G)" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value

has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX (5.8G)- 802.11a		

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5745 MHz)-Above 1G									
Vertical	2814.431	65.52	5.94	35.40	44.00	62.86	74.00	-11.14	Pk
Vertical	2814.431	46.59	5.94	35.40	44.00	43.93	54.00	-10.07	AV
Vertical	11490.000	61.13	8.46	39.75	44.50	64.84	74.00	-9.16	Pk
Vertical	11490.000	42.87	8.46	39.75	44.50	46.58	54.00	-7.42	AV
Vertical	17235.000	48.97	10.12	38.80	44.10	53.79	74.00	-20.21	Pk
Vertical	17235.000	38.63	10.12	38.80	42.70	44.85	54.00	-9.15	AV
Horizontal	3126.629	66.25	5.94	35.18	44.00	63.37	74.00	-10.63	Pk
Horizontal	3126.629	44.12	5.94	35.18	44.00	41.24	54.00	-12.76	AV
Horizontal	11490.000	61.01	8.46	38.71	44.50	63.68	74.00	-10.32	Pk
Horizontal	11490.000	40.11	8.46	38.71	44.50	42.78	54.00	-11.22	AV
Horizontal	17235.000	60.28	10.12	38.38	44.10	64.68	74.00	-9.32	Pk
Horizontal	17235.000	41.23	10.12	38.38	44.10	45.63	54.00	-8.37	AV
middle Channel (5785 MHz)-Above 1G									
Vertical	3429.967	62.24	6.48	36.35	44.05	61.02	74.00	-12.98	Pk
Vertical	3429.967	44.45	6.48	36.35	44.05	43.23	54.00	-10.77	AV
Vertical	11570.000	61.27	8.47	37.88	44.51	63.11	74.00	-10.89	Pk
Vertical	11570.000	43.85	8.47	37.88	44.51	45.69	54.00	-8.31	AV
Vertical	17355.000	61.27	10.12	38.80	44.10	66.09	74.00	-7.91	Pk
Vertical	17355.000	40.86	10.12	38.80	42.70	47.08	54.00	-6.92	AV
Horizontal	4462.359	62.53	6.48	36.37	44.05	61.33	74.00	-12.67	Pk
Horizontal	4462.359	44.47	6.48	36.37	44.05	43.27	54.00	-10.73	AV
Horizontal	11570.000	60.92	8.47	38.64	44.50	63.53	74.00	-10.47	Pk
Horizontal	11570.000	44.32	8.47	38.64	44.50	46.93	54.00	-7.07	AV
Horizontal	17355.000	61.17	10.12	38.38	44.10	65.57	74.00	-8.43	Pk
Horizontal	17355.000	42.15	10.12	38.38	44.10	46.55	54.00	-7.45	AV
High Channel (5825 MHz)-Above 1G									
Vertical	6041.157	61.23	7.10	37.24	43.50	62.07	74.00	-11.93	Pk
Vertical	6041.157	43.25	7.10	37.24	43.50	44.09	54.00	-9.91	AV
Vertical	11650.000	61.74	8.46	37.68	44.50	63.38	74.00	-10.62	Pk
Vertical	11650.000	44.48	8.46	37.68	44.50	46.12	54.00	-7.88	AV
Vertical	17475.000	61.39	10.12	38.80	44.10	66.21	74.00	-7.79	Pk
Vertical	17475.000	40.27	10.12	38.80	42.70	46.49	54.00	-7.51	AV
Horizontal	6039.203	60.98	7.10	37.24	43.50	61.82	74.00	-12.18	Pk
Horizontal	6039.203	44.42	7.10	37.24	43.50	45.26	54.00	-8.74	AV
Horizontal	11650.000	61.23	8.46	38.57	44.50	63.76	74.00	-10.24	Pk
Horizontal	11650.000	41.14	8.46	38.57	44.50	43.67	54.00	-10.33	AV
Horizontal	17475.000	59.85	10.12	38.38	44.10	64.25	74.00	-9.75	Pk
Horizontal	17475.000	43.62	10.12	38.38	44.10	48.02	54.00	-5.98	AV

Note:"802.11a (5.8G)" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value

has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

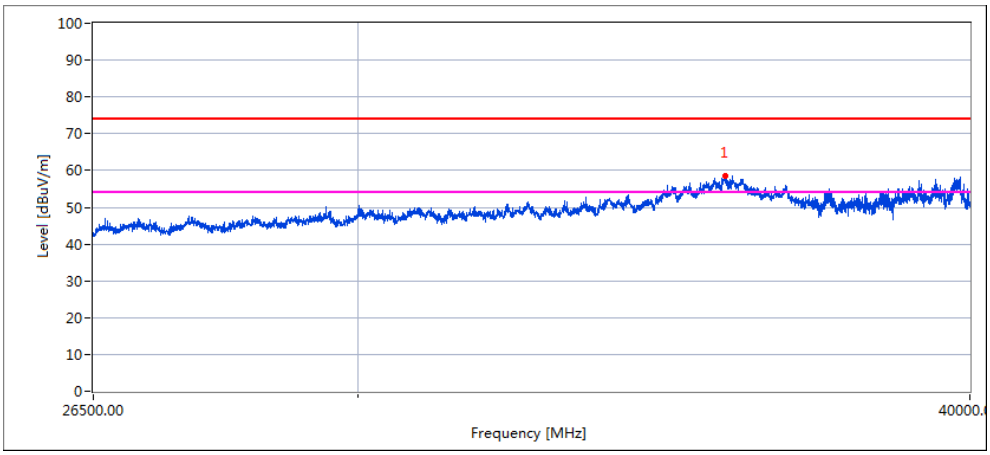
3.2.9 TEST RESULTS (26GHZ-40GHZ)

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX (5.2G)-802.11a 5180MHz~5240MHz , TX (5.8G)-802.11a 5745MHz~5825MHz		

All the modulation modes have been tested, and the worst result was report as below:

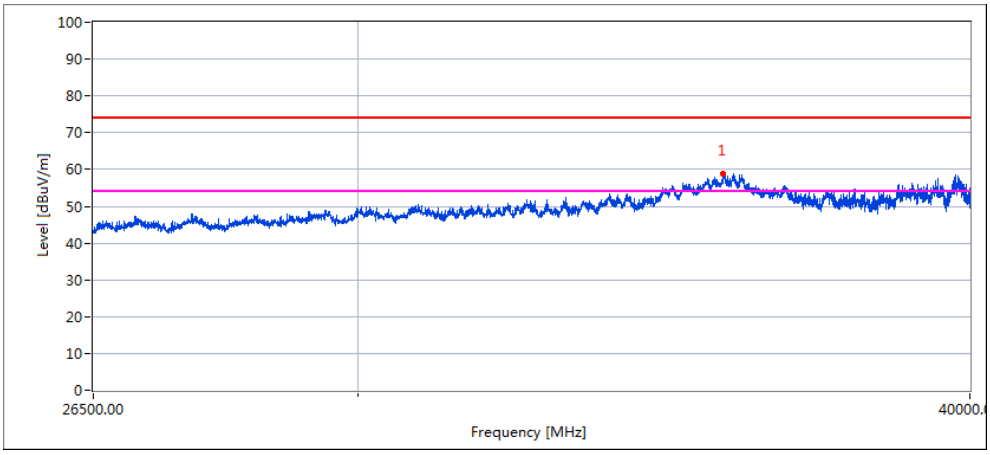
Low Channel (5180 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35662.495	58.5	48.5	74.0	25.5
35662.495	42.8	35.8	54	18.2

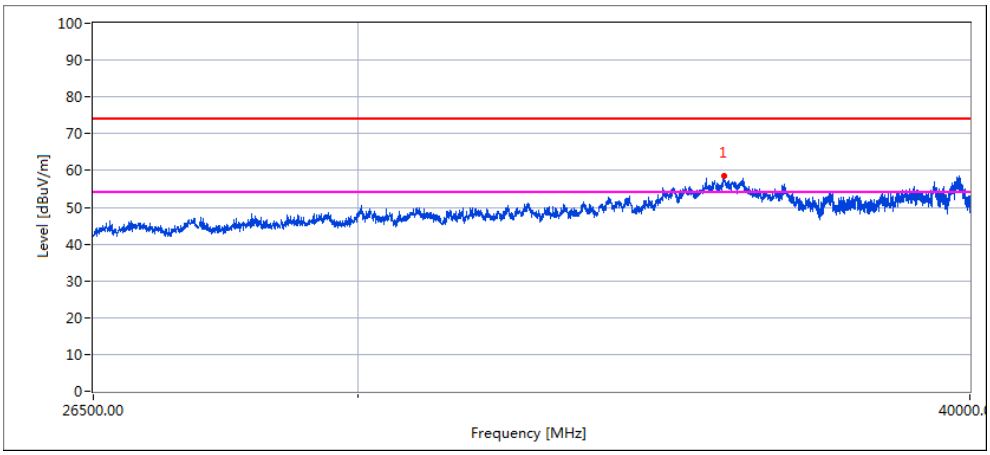
Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35632.835	58.7	54.7	74.0	19.3
35632.835	45.9	37.1	54	16.9

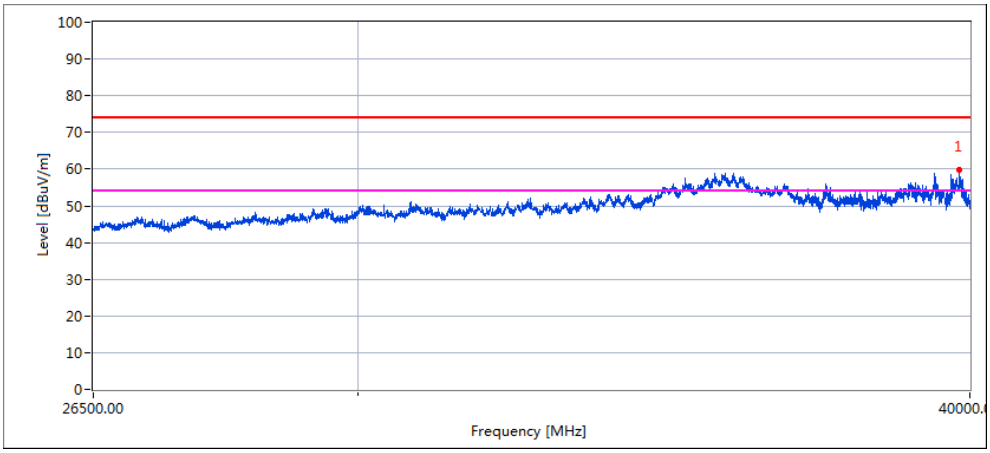
Middle Channel (5200 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35642.512	58.6	56.1	74.0	17.9
35642.512	44.7	36.5	54	17.5

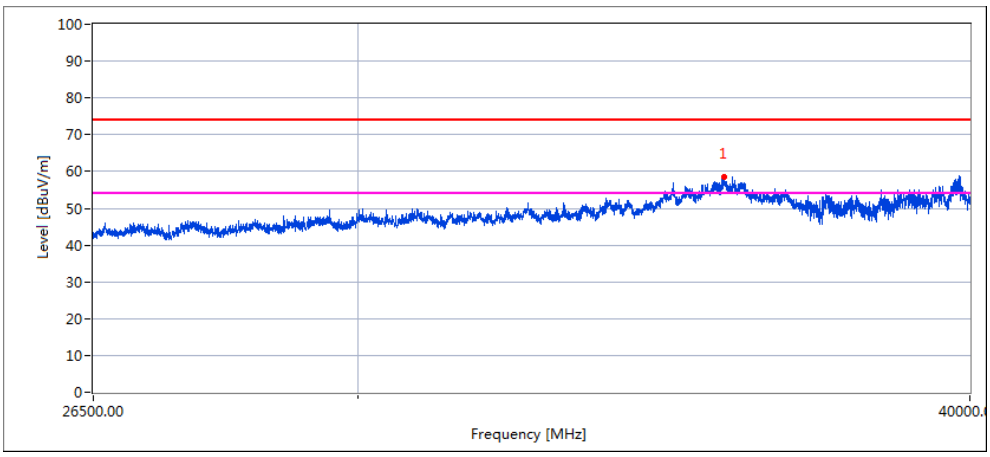
Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
39797.630	59.7	55.4	74.0	18.6
39797.630	46.2	39.7	54	14.3

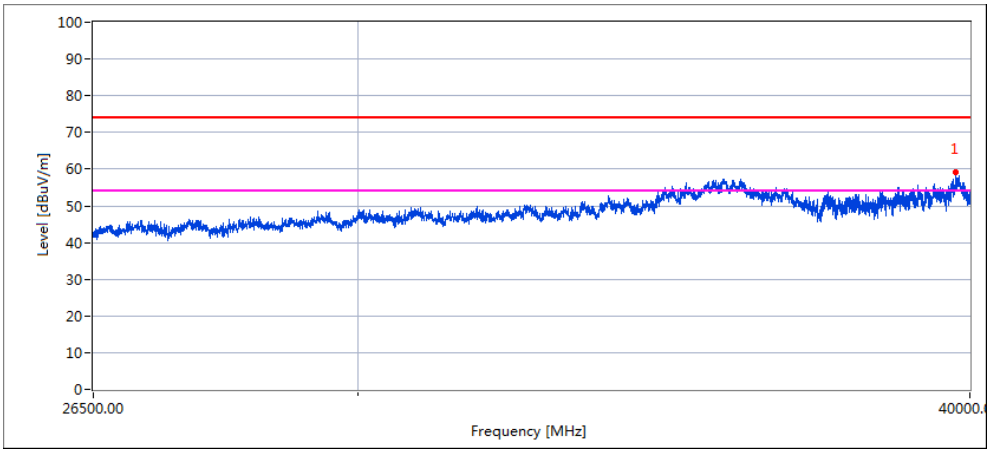
High Channel (5240 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35647.067	58.5	55.6	74.0	18.4
35647.067	47.0	40.2	54	13.8

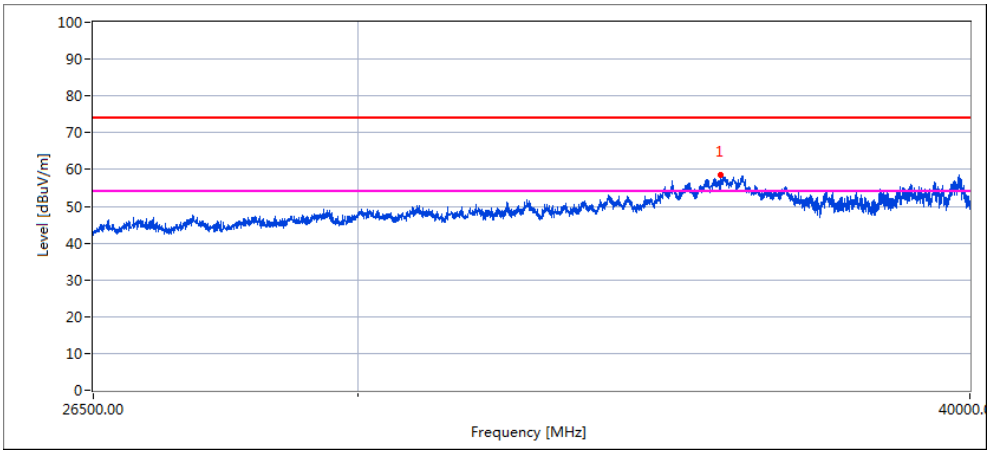
Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
39744.672	59.2	56.3	74.0	17.7
39744.672	47.5	41.4	54	12.6

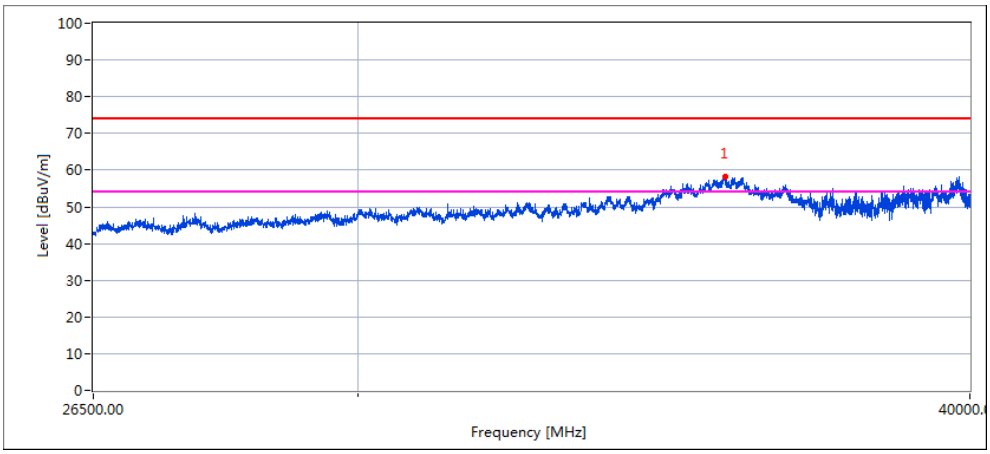
Low Channel (5745 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35590.347	58.5	54.2	74.0	19.8
35590.347	46.2	39.1	54	14.9

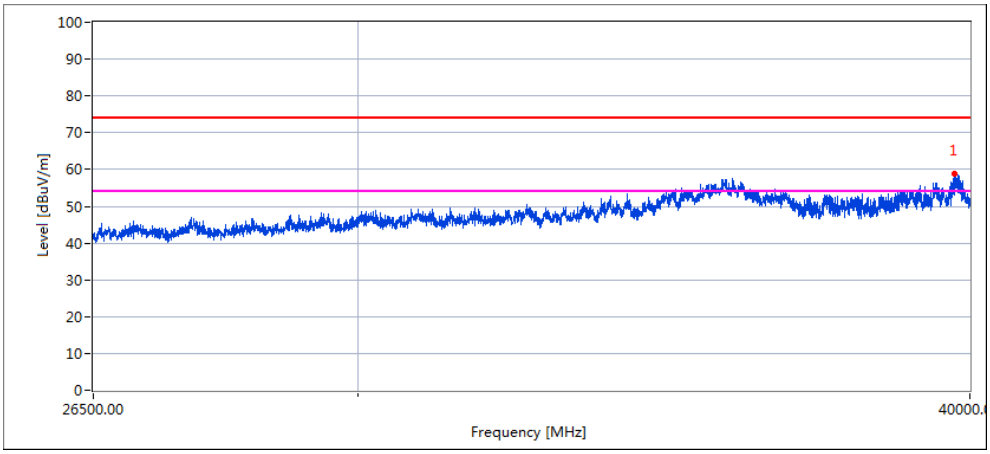
Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35656.826	58.4	55.9	74.0	18.1
35656.826	46.4	38.7	54	15.3

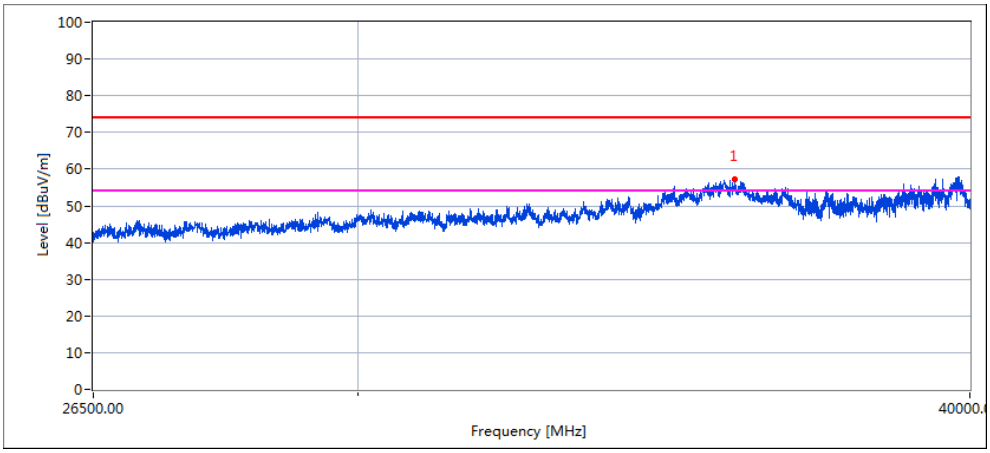
Middle Channel (5785 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
39712.914	59.0	53.0	74.0	21.0
39712.914	46.9	39.8	54	14.2

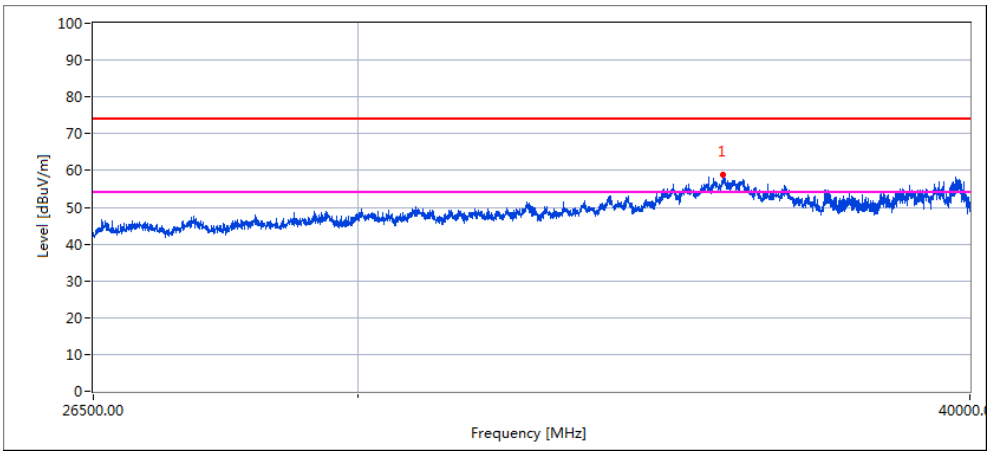
Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35811.975	57.2	53.3	74.0	20.7
35811.975	45.8	37.6	54	16.4

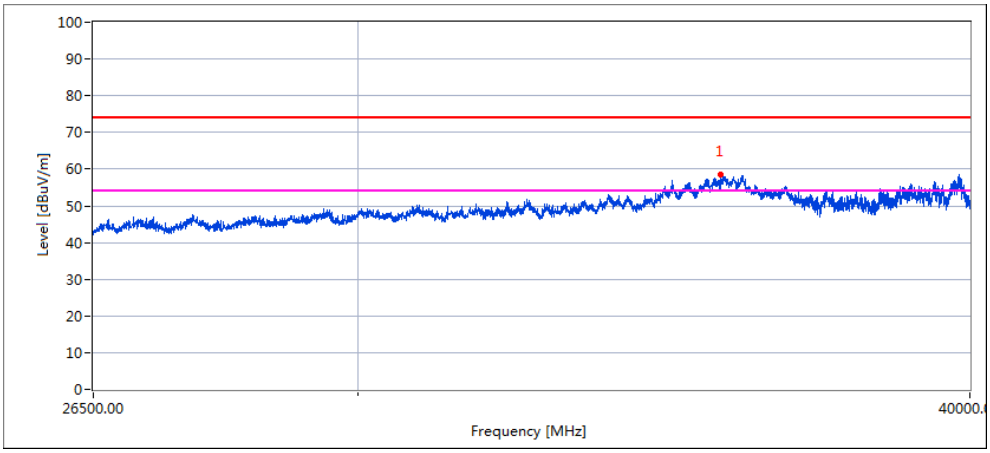
High Channel (5825 MHz)-Above 1G

Horizontal



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35626.491	58.9	56.3	74.0	17.7
35626.491	46.1	38.6	54	15.4

Vertical



Frequency MHz	Pre-scan Level MaxPeak(Average) dBuV/m	Final Test Level MaxPeak(Average) dBuV/m	Limit MaxPeak(Average) dBuV/m	Margin dB
35590.347	58.5	54.2	74.0	19.8
35590.347	46.8	38.1	54	15.9

4. POWER SPECTRAL DENSITY TEST

4.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(a)(3)

For the band 5.15-5.25 GHz,

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz

(3)For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

,

4.2 TEST PROCEDURE

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

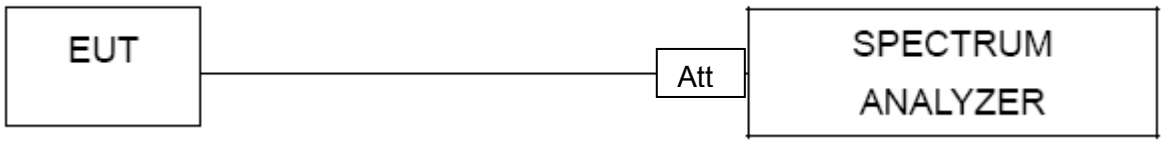
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band I (5150-5250MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Mode	Frequency	Measured Power Density (dBm)		Limit (dBm)	Result
		ANT A	ANT B		
802.11 a	5185 MHz	6.403	4.52	11	PASS
	5200 MHz	5.915	4.51	11	PASS
	5240 MHz	6.137	3.83	11	PASS
802.11 n20	5185 MHz	5.594	4.33	11	PASS
	5200 MHz	5.118	4.61	11	PASS
	5240 MHz	5.323	2.95	11	PASS
802.11 n40	5190 MHz	2.326	1.49	11	PASS
	5230 MHz	2.654	0.07	11	PASS
802.11 ac20	5185 MHz	3.290	2.30	11	PASS
	5200 MHz	2.854	1.06	11	PASS
	5240 MHz	3.024	0.79	11	PASS
802.11 ac40	5190 MHz	-0.138	-0.01	11	PASS
	5230 MHz	-1.243	-0.59	11	PASS
802.11 ac80	5210 MHz	-3.501	-4.18	11	PASS

(802.11a) PSD plot on channel 36

(802.11n20) PSD plot on channel 36

(802.11a) PSD plot on channel 40

(802.11n20) PSD plot on channel 40

(802.11a) PSD plot on channel 48

(802.11n20) PSD plot on channel 48

(802.11n40) PSD plot on channel 38

(802.11ac20) PSD plot on channel 36

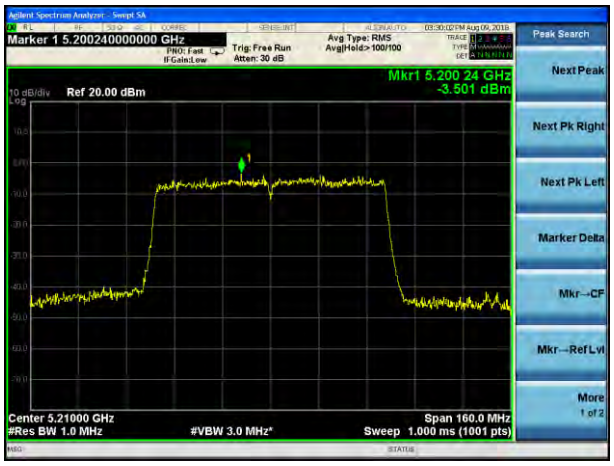
(802.11n40) PSD plot on channel 46

(802.11ac20) PSD plot on channel 40

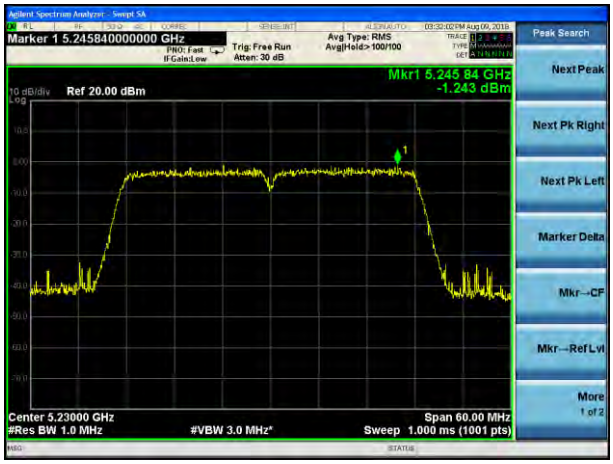
(802.11ac20) PSD plot on channel 48

(802.11ac40) PSD plot on channel 38

(802.11ac80) PSD plot on channel 42



(802.11ac40) PSD plot on channel 46



EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band IV (5725-5850MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Mode	Frequency	Measured Power Density (dBm)		Calculate power density (dBm)(Note 1)		Limit (dBm)	Result
		ANT A	ANT B	ANT A	ANT B		
802.11 a	5745 MHz	3.783	3.293	3.697	3.207	30	PASS
	5785 MHz	3.518	3.168	3.432	3.082	30	PASS
	5825 MHz	3.300	3.208	3.214	3.122	30	PASS
802.11 n20	5745 MHz	4.052	3.349	3.966	3.263	30	PASS
	5785 MHz	3.579	3.228	3.493	3.142	30	PASS
	5825 MHz	3.660	3.528	3.574	3.442	30	PASS
802.11 n40	5755 MHz	-0.470	-0.202	-0.556	-0.288	30	PASS
	5795 MHz	1.153	-0.095	1.067	-0.181	30	PASS
802.11 ac20	5745 MHz	2.994	2.078	2.908	1.992	30	PASS
	5785 MHz	2.200	1.485	2.114	1.399	30	PASS
	5825 MHz	2.913	1.943	2.827	1.857	30	PASS
802.11 ac40	5755 MHz	-1.372	-2.795	-1.458	-2.881	30	PASS
	5795 MHz	-1.883	-1.527	-1.969	-1.613	30	PASS
802.11 ac80	5775 MHz	-4.946	-5.349	-5.032	-5.435	30	PASS

Note:

(1) Calculate power density= Measured Power Density+10log(500kHz/RBW)= Measured Power Density+(-0.086)
RBW=0.51MHz

(802.11a) PSD plot on channel 149

(802.11n20) PSD plot on channel 149

(802.11a) PSD plot on channel 157

(802.11n20) PSD plot on channel 157

(802.11a) PSD plot on channel 165

(802.11n20) PSD plot on channel 165

(802.11n40) PSD plot on channel 151

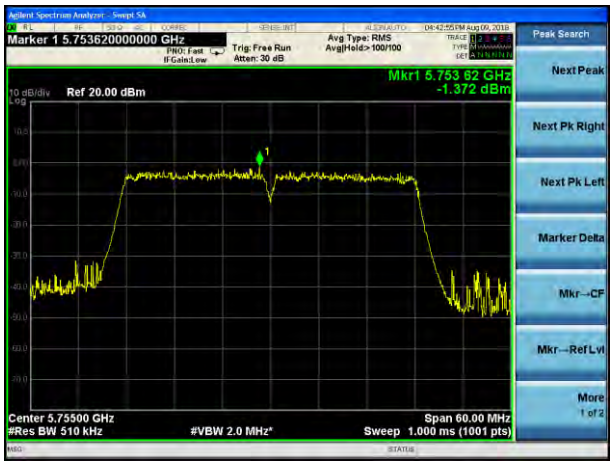
(802.11ac20) PSD plot on channel 149

(802.11n40) PSD plot on channel 159

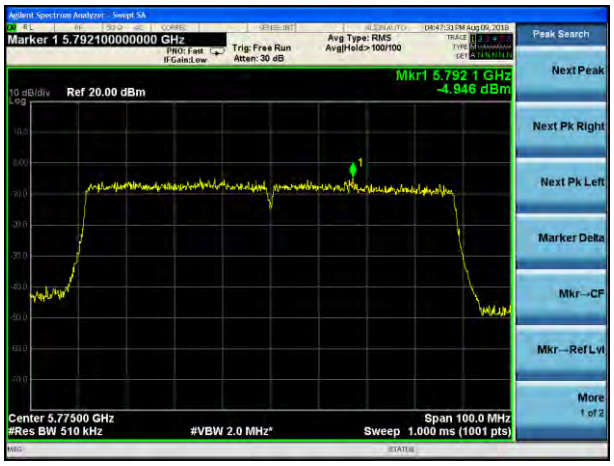
(802.11ac20) PSD plot on channel 157

(802.11ac20) PSD plot on channel 165

(802.11ac40) PSD plot on channel 151



(802.11ac80) PSD plot on channel 155



(802.11ac40) PSD plot on channel 159

5. 26DB & 99% EMISSION BANDWIDTH

5.1 APPLIED PROCEDURES / LIMIT

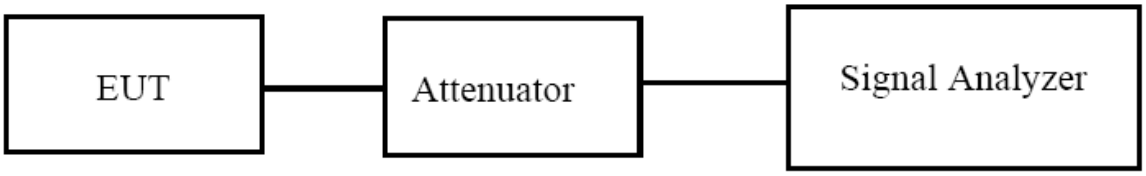
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

5.2 TEST PROCEDURE

a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.



5.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.4 TEST RESULTS

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band I (5150-5250MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

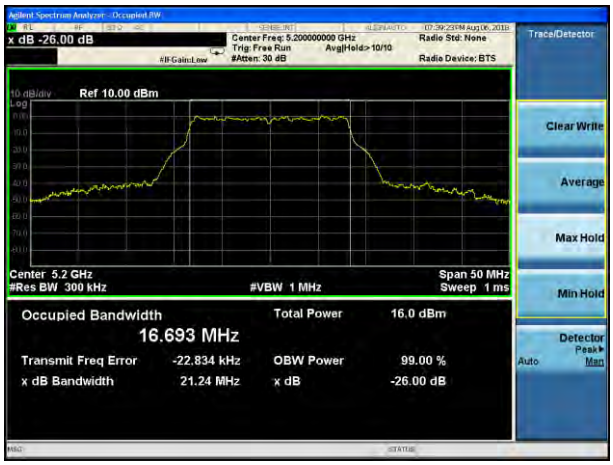
Mode	Channel	Frequency (MHz)	99% bandwidth(MHz)	99% bandwidth(MHz)	26dB bandwidth (MHz)	26dB bandwidth (MHz)	Result
			Antenna A	Antenna B	Antenna A	Antenna B	
802.11a	CH36	5180	16.684	16.698	21.26	21.24	Pass
	CH40	5200	16.696	16.693	21.22	21.24	Pass
	CH48	5240	16.695	16.702	21.24	21.25	Pass
802.11 n20	CH36	5180	18.021	17.998	21.64	21.44	Pass
	CH40	5200	18.022	18.003	21.63	21.54	Pass
	CH48	5240	18.008	18.006	21.51	21.43	Pass
802.11 n40	CH 38	5190	36.406	36.272	39.87	39.40	Pass
	CH 46	5230	36.400	36.286	39.71	39.35	Pass
802.11 ac20	CH36	5180	18.018	18.017	21.66	21.53	Pass
	CH40	5200	17.998	17.995	21.51	21.66	Pass
	CH48	5240	18.031	18.045	21.70	21.57	Pass
802.11 ac40	CH 38	5190	36.595	36.531	40.29	40.35	Pass
	CH 46	5230	36.528	36.573	40.29	40.39	Pass
802.11 ac80	CH 42	5210	75.811	75.920	81.44	81.34	Pass

Test plot

(802.11a) -26dB&99%Bandwidth plot on channel 36

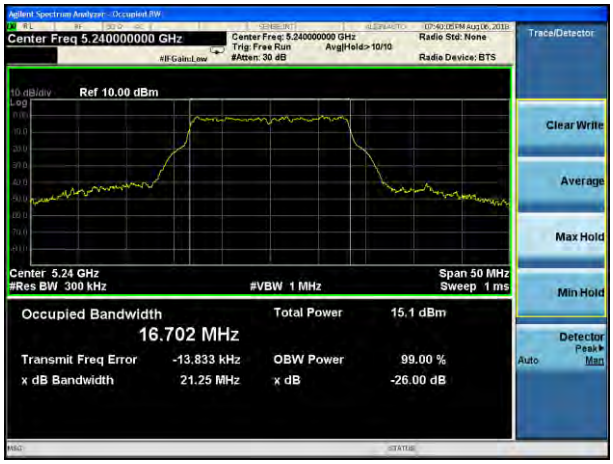
(802.11 n20) -26dB&99%Bandwidth plot on channel 36

(802.11a) -26dB&99%Bandwidth plot on channel 40

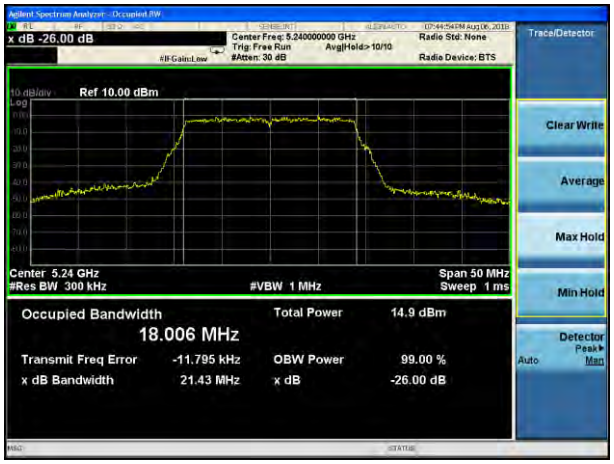


(802.11 n20) -26dB&99%Bandwidth plot on channel 40

(802.11a) -26dB&99%Bandwidth plot on channel 48

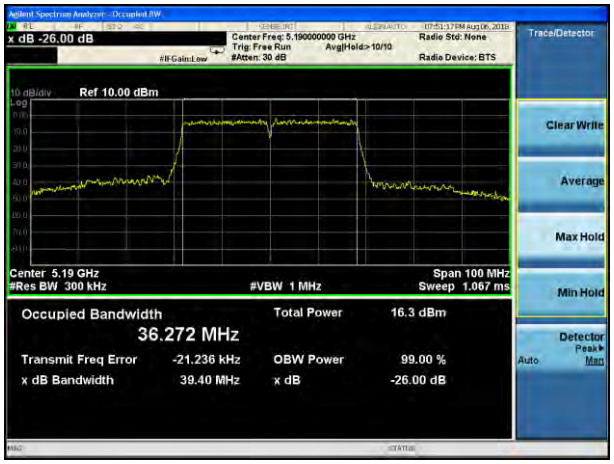


(802.11 n20) -26dB&99%Bandwidth plot on channel 48

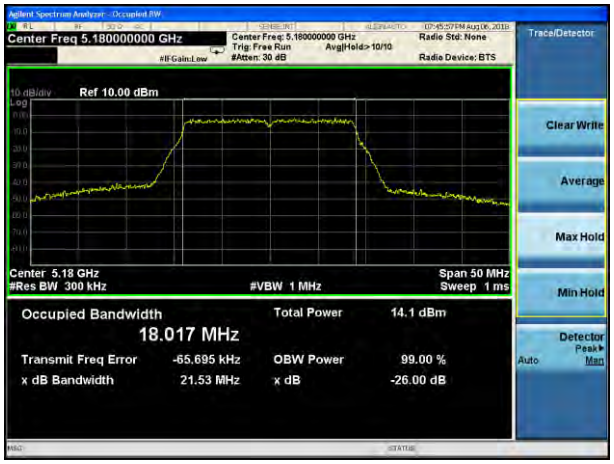


Test plot

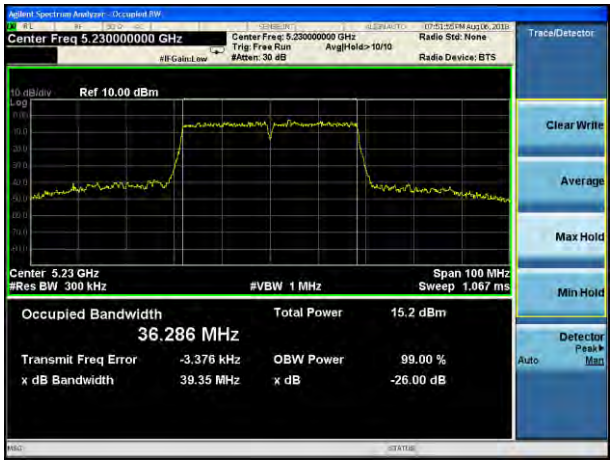
(802.11 n40) -26dB&99%Bandwidth plot on channel 38



(802.11 ac20) -26dB&99%Bandwidth plot on channel 36

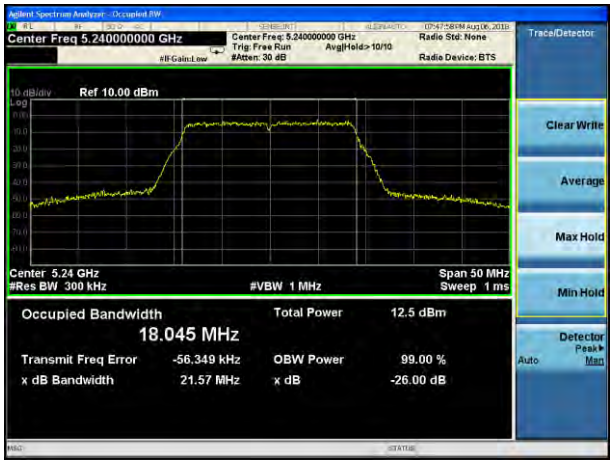


(802.11 n40) -26dB&99%Bandwidth plot on channel 46



(802.11 ac20) -26dB&99%Bandwidth plot on channel 40

(802.11 ac20) -26dB&99%Bandwidth plot on channel 48



Test plot

(802.11 ac40) -26dB&99%Bandwidth plot on channel 38

(802.11 ac80) -26dB&99%Bandwidth plot on channel 42

(802.11 ac40) -26dB&99%Bandwidth plot on channel 46

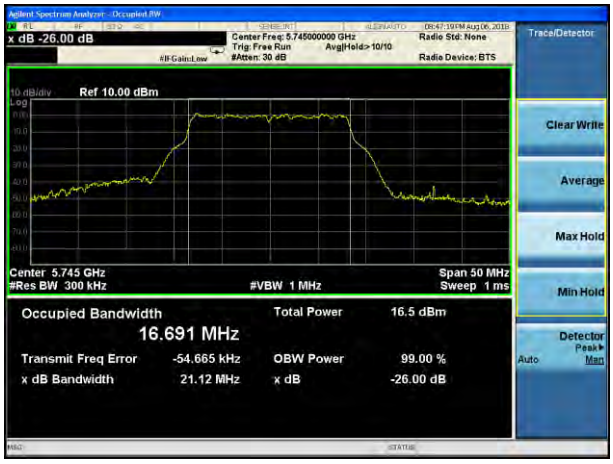
EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band IV(5725-5850MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

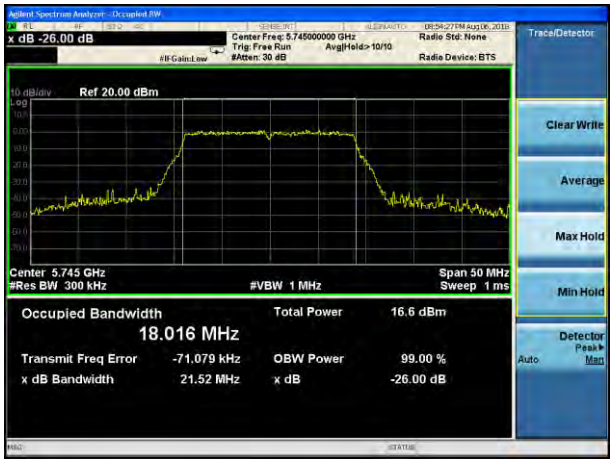
Mode	Channel	Frequency (MHz)	99% bandwidth(MHz)	99% bandwidth(MHz)	26dB bandwidth (MHz)	26dB bandwidth (MHz)	Result
			Antenna A	Antenna B	Antenna A	Antenna B	
802.11a	CH149	5745	16.687	16.691	21.21	21.12	Pass
	CH157	5785	16.698	16.701	21.21	21.16	Pass
	CH165	5825	16.701	16.705	21.20	21.20	Pass
802.11 n20	CH149	5745	18.017	18.016	21.51	21.52	Pass
	CH157	5785	18.049	18.006	21.64	21.54	Pass
	CH165	5825	18.020	18.032	21.50	21.51	Pass
802.11 n40	CH151	5755	36.339	36.463	39.63	39.64	Pass
	CH159	5795	36.356	36.491	39.82	39.95	Pass
802.11 ac20	CH149	5745	17.997	18.035	21.61	21.63	Pass
	CH157	5785	18.086	18.028	21.53	21.72	Pass
	CH165	5825	17.944	18.075	21.49	21.89	Pass
802.11 ac40	CH151	5755	36.496	36.520	40.11	40.34	Pass
	CH159	5795	36.586	36.509	40.33	40.24	Pass
802.11 ac80	CH155	5775	75.825	75.884	81.50	81.23	Pass

Test plot

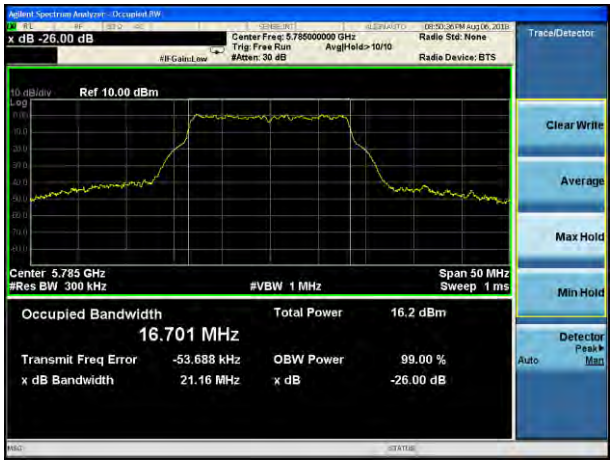
(802.11a) -26dB&99%Bandwidth plot on channel 149



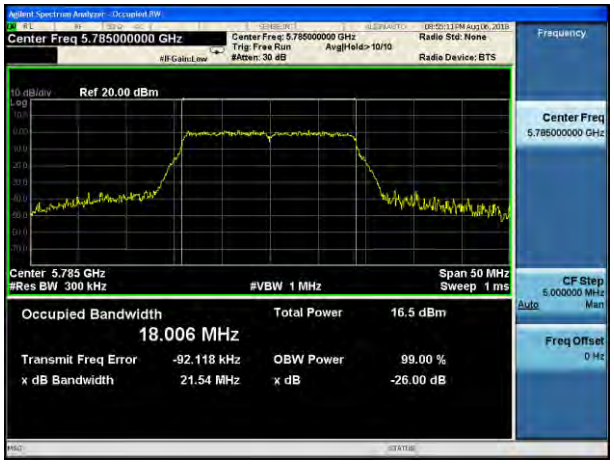
(802.11 n20) -26dB&99%Bandwidth plot on channel 149



(802.11a) -26dB&99%Bandwidth plot on channel 157

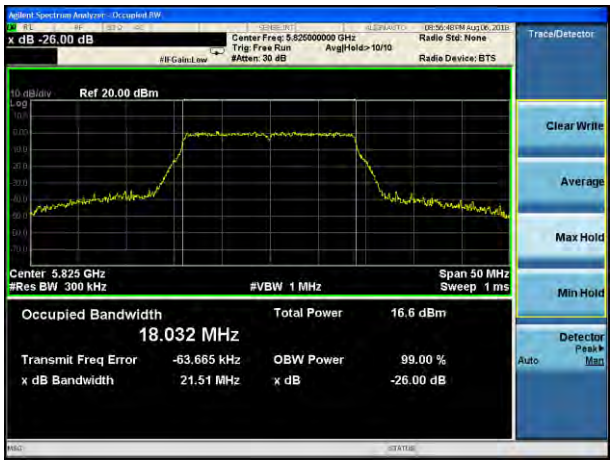


(802.11 n20) -26dB&99%Bandwidth plot on channel 157



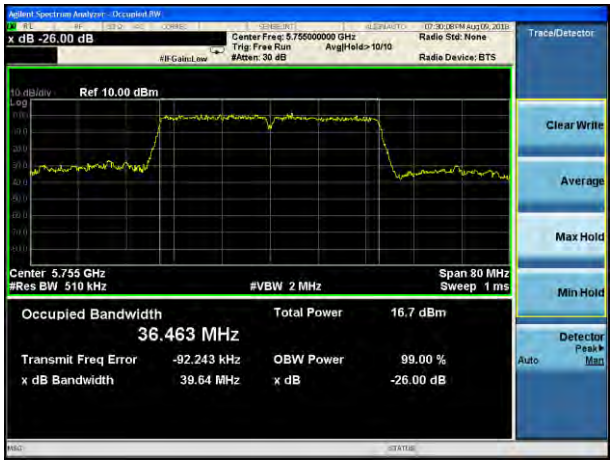
(802.11a) -26dB&99%Bandwidth plot on channel 165

(802.11 n20) -26dB&99%Bandwidth plot on channel 165

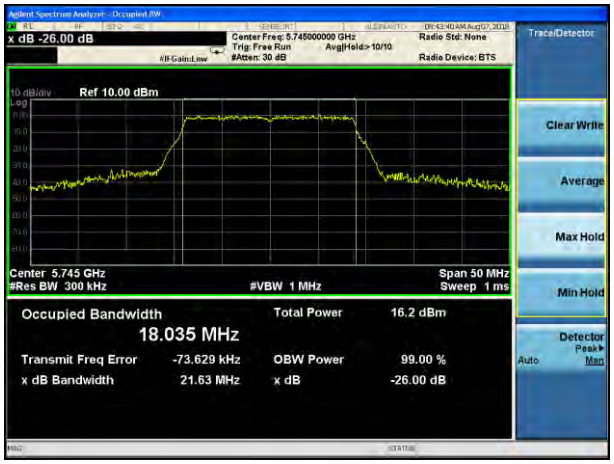


Test plot

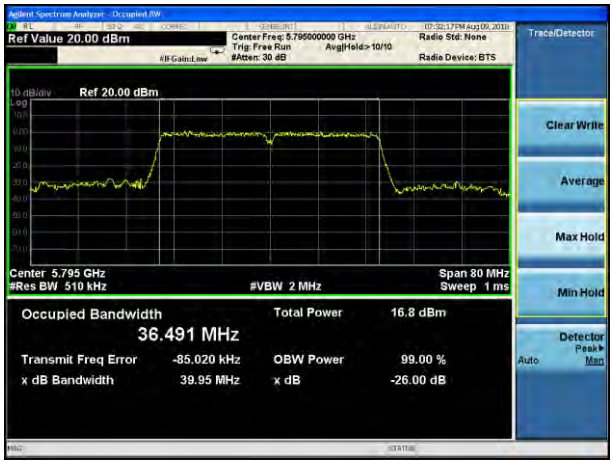
(802.11 n40) -26dB&99%Bandwidth plot on channel 151



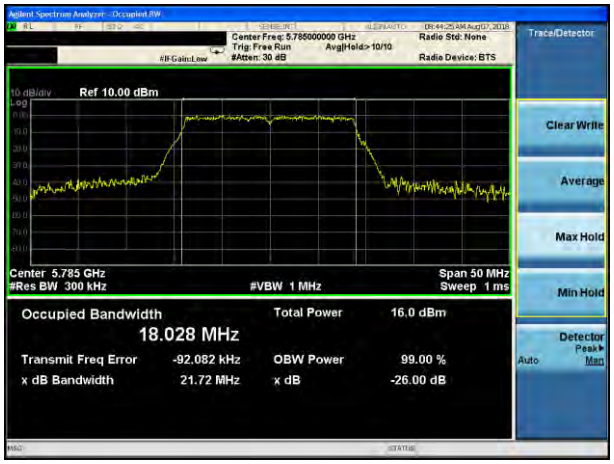
(802.11 ac20) -26dB&99%Bandwidth plot on channel 149



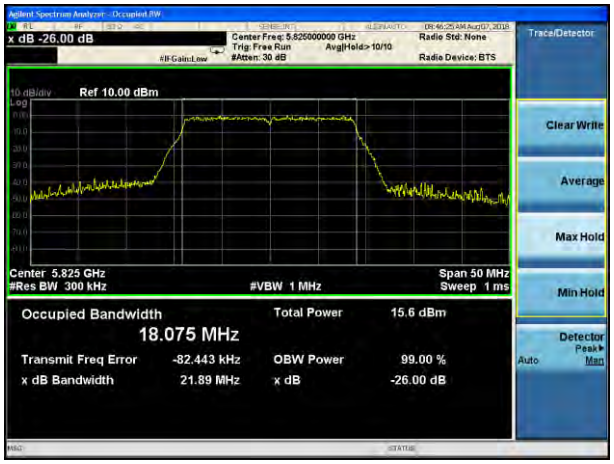
(802.11 n40) -26dB&99%Bandwidth plot on channel 159



(802.11 ac20) -26dB&99%Bandwidth plot on channel 157

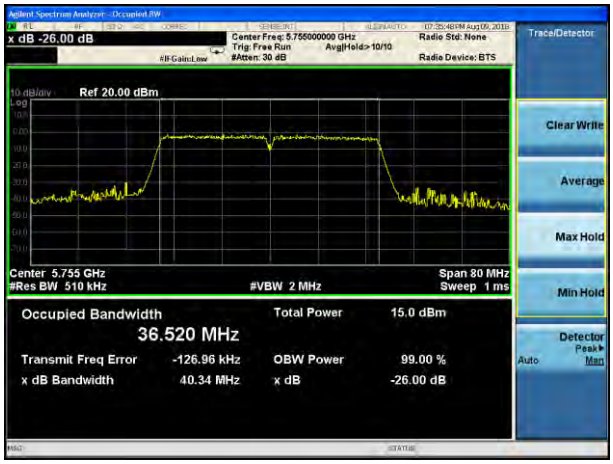


(802.11 ac20) -26dB&99%Bandwidth plot on channel 165



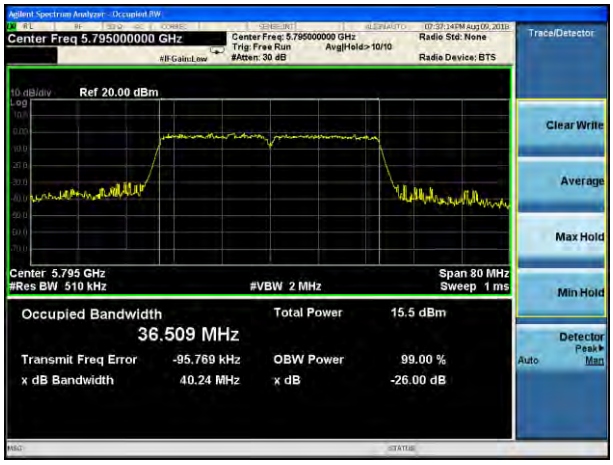
Test plot

(802.11 ac40) -26dB&99%Bandwidth plot on channel 151



(802.11 ac80) -26dB&99%Bandwidth plot on channel 155

(802.11 ac40) -26dB&99%Bandwidth plot on channel 159



6. MINIMUM 6 DB BANDWIDTH

6.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(e)
(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

6.2 TEST PROCEDURE

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW = 100 kHz.

b) Set the video bandwidth (VBW) ≥ 3 × RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

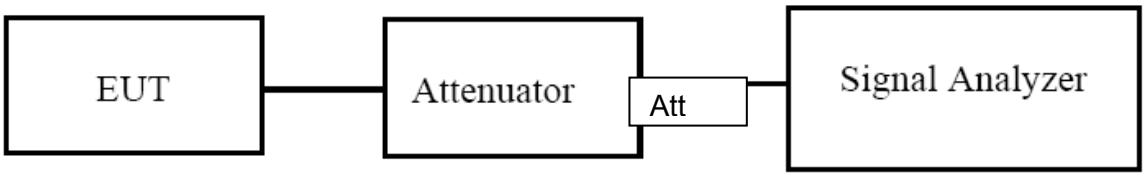
f) Allow the trace to stabilize.

g) 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.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

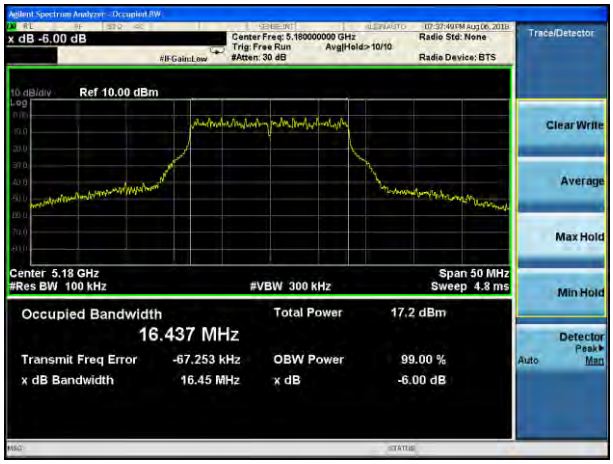
EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band I (5150-5250MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna B, only shown Antenna B Plot.

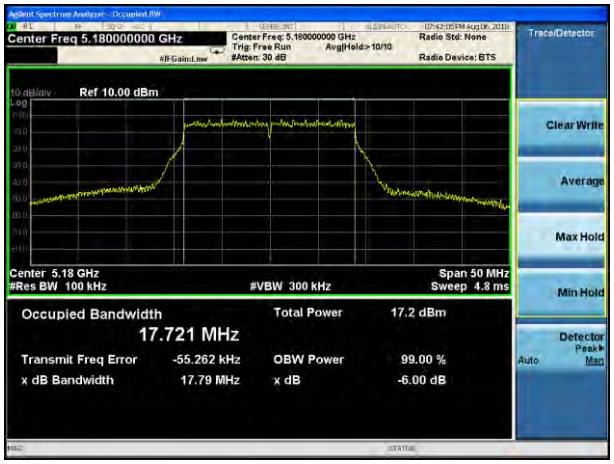
Mode	Channel	Frequency (MHz)	6dB bandwidth (MHz)	6dB bandwidth (MHz)	Limit (KHz)	Result
			Antenna A	Antenna B		
802.11a	CH36	5180	16.46	16.45	≧500	Pass
	CH40	5200	16.46	16.46	≧500	Pass
	CH48	5240	16.46	16.46	≧500	Pass
802.11 n20	CH36	5180	17.79	17.79	≧500	Pass
	CH40	5200	17.76	17.77	≧500	Pass
	CH48	5240	17.77	17.76	≧500	Pass
802.11 n40	CH 38	5190	36.56	36.56	≧500	Pass
	CH 46	5230	36.58	36.56	≧500	Pass
802.11 ac20	CH36	5180	17.77	17.77	≧500	Pass
	CH40	5200	17.77	17.77	≧500	Pass
	CH48	5240	17.76	17.77	≧500	Pass
802.11 ac40	CH 38	5190	36.56	36.49	≧500	Pass
	CH 46	5230	36.57	36.54	≧500	Pass
802.11 ac80	CH 42	5210	76.25	76.43	≧500	Pass

Test plot

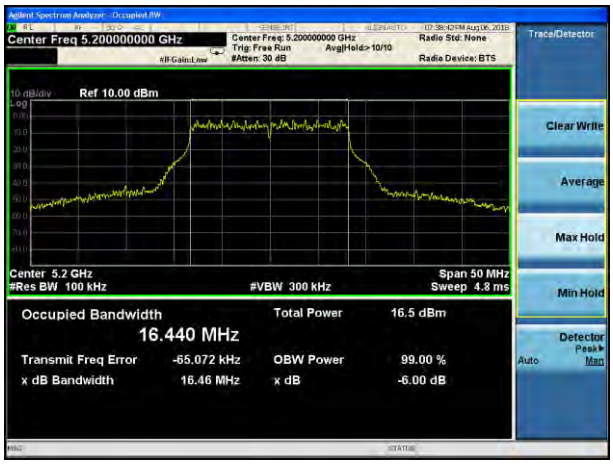
(802.11a) 6dB Bandwidth plot on channel 36



(802.11 n20) 6dB Bandwidth plot on channel 36



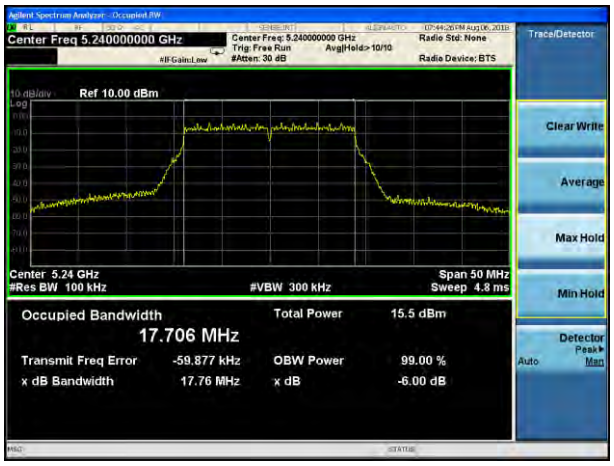
(802.11a) 6dB Bandwidth plot on channel 40



(802.11 n20) 6dB Bandwidth plot on channel 40

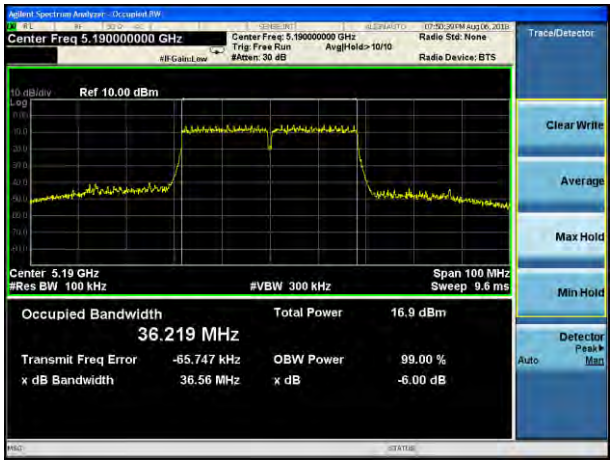
(802.11a) 6dB Bandwidth plot on channel 48

(802.11 n20) 6dB Bandwidth plot on channel 48

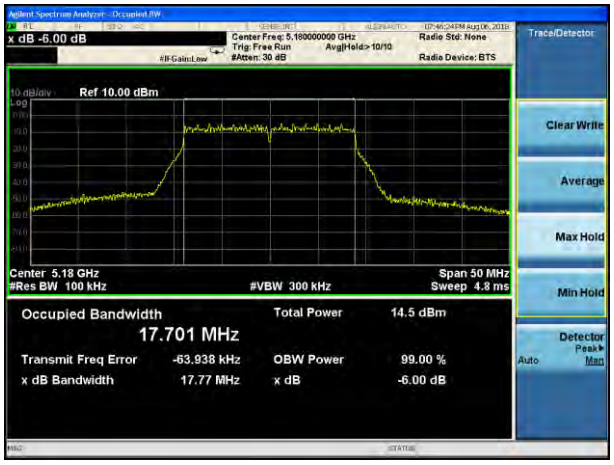


Test plot

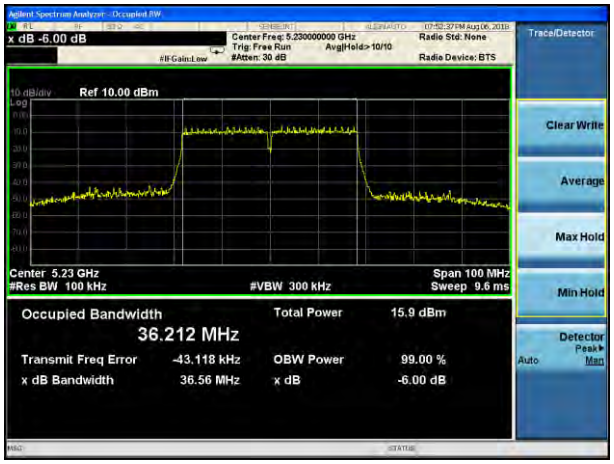
(802.11 n40) 6dB Bandwidth plot on channel 38



(802.11 ac20) 6dB Bandwidth plot on channel 36



(802.11 n40) 6dB Bandwidth plot on channel 46

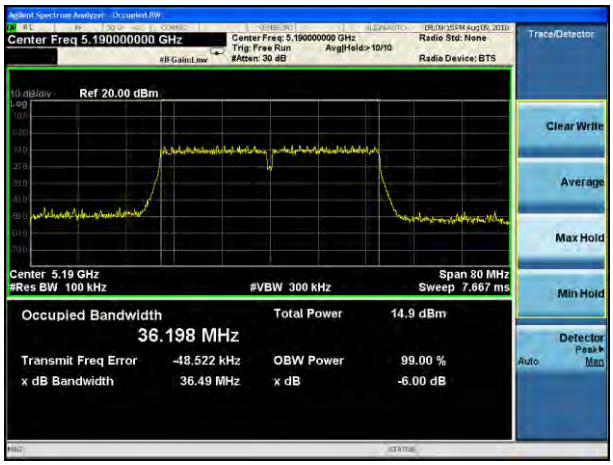


(802.11 ac20) 6dB Bandwidth plot on channel 40

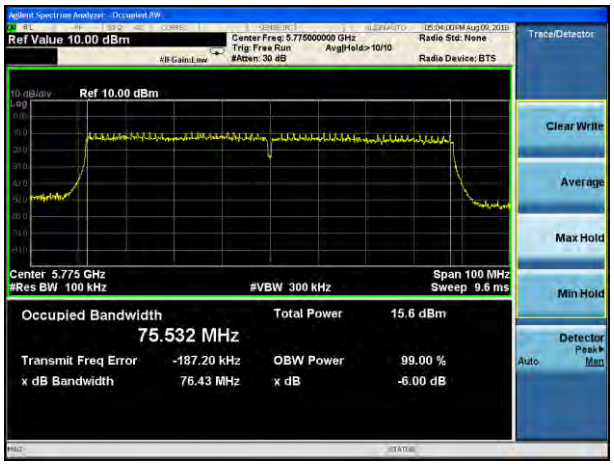
(802.11 ac20) 6dB Bandwidth plot on channel 48

Test plot

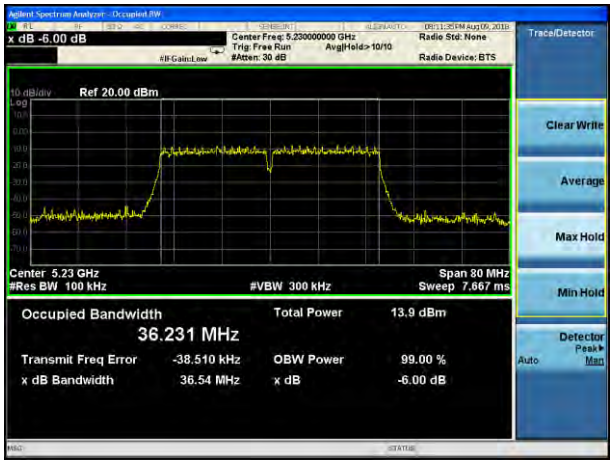
(802.11 ac40) 6dB Bandwidth plot on channel 38



(802.11 ac80) 6dB Bandwidth plot on channel 42



(802.11 ac40) 6dB Bandwidth plot on channel 46



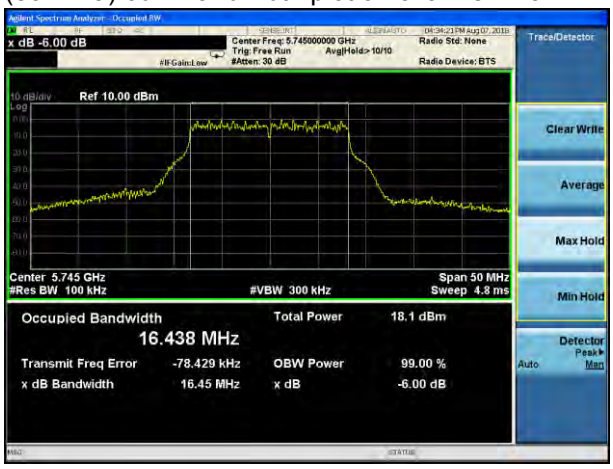
EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX (5G) Mode Frequency Band IV (5725-5850MHz)		

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

Mode	Channel	Frequency (MHz)	-6dB bandwidth (MHz)	-6dB bandwidth (MHz)	Limit (KHz)	Result
			Antenna A	Antenna B		
802.11a	149	5745	16.45	16.45	≧500	Pass
	157	5785	16.45	16.44	≧500	Pass
	165	5825	16.44	16.44	≧500	Pass
802.11 n20	149	5745	17.79	17.80	≧500	Pass
	157	5785	17.79	17.75	≧500	Pass
	165	5825	17.76	17.78	≧500	Pass
802.11 n40	151	5755	36.53	36.54	≧500	Pass
	159	5795	36.50	36.53	≧500	Pass
802.11 ac20	149	5745	17.78	17.78	≧500	Pass
	157	5785	17.77	17.79	≧500	Pass
	165	5825	17.76	17.78	≧500	Pass
802.11 ac40	149	5745	36.47	36.53	≧500	Pass
	157	5785	36.51	36.53	≧500	Pass
802.11 ac80	155	5775	75.88	75.87	≧500	Pass

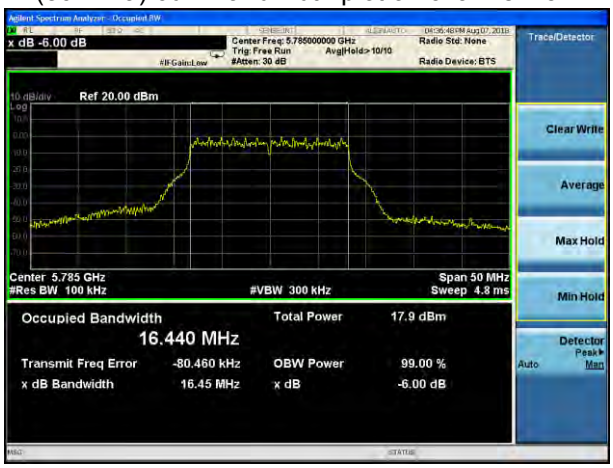
Test plot

(802.11a) 6dB Bandwidth plot on channel 149



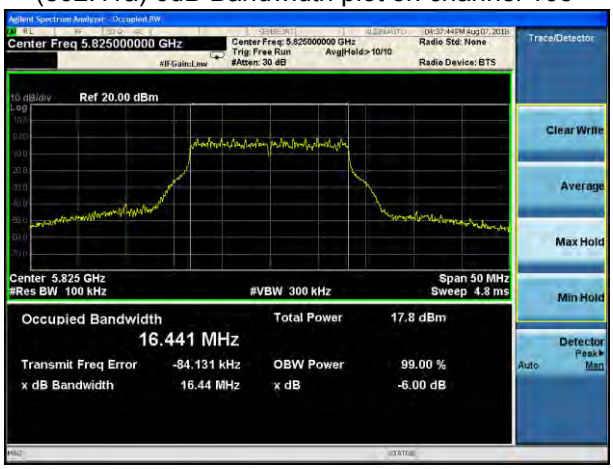
(802.11 n20) 6dB Bandwidth plot on channel 149

(802.11a) 6dB Bandwidth plot on channel 157

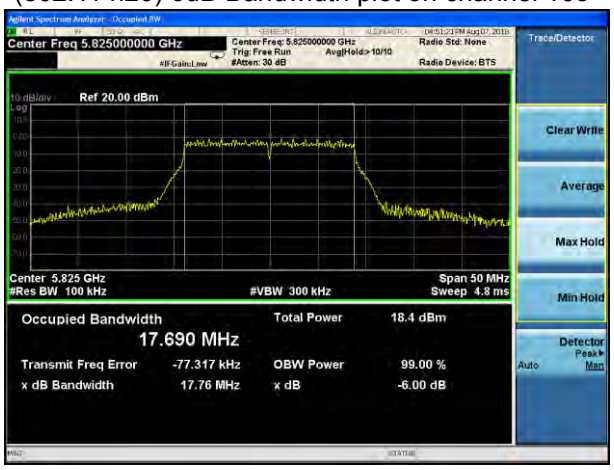


(802.11 n20) 6dB Bandwidth plot on channel 157

(802.11a) 6dB Bandwidth plot on channel 165

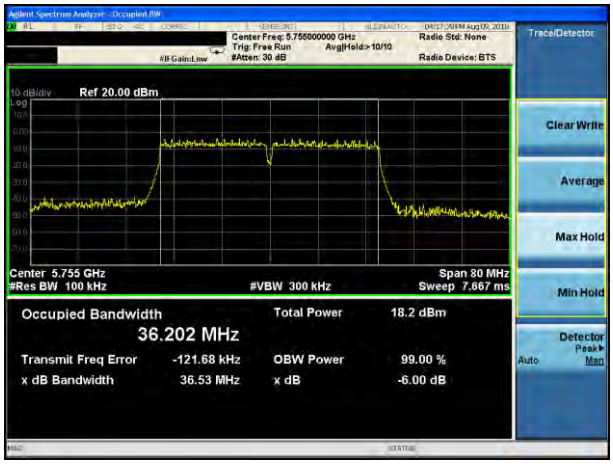


(802.11 n20) 6dB Bandwidth plot on channel 165

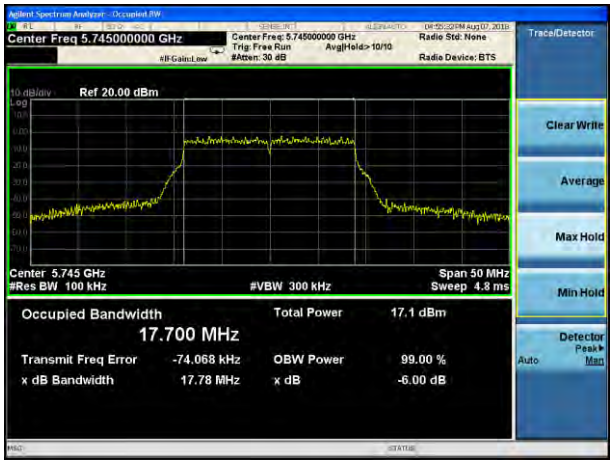


Test plot

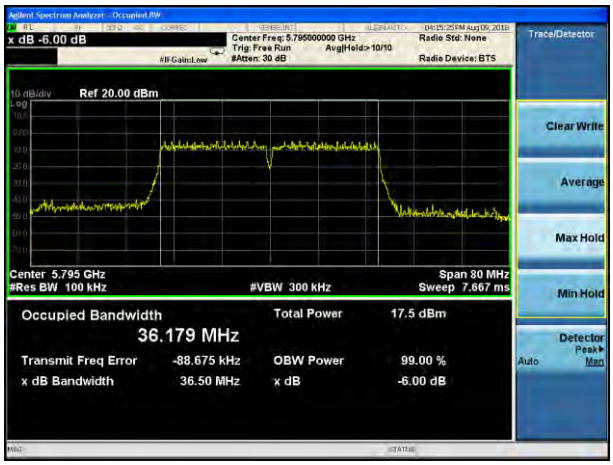
(802.11 n40) 6dB Bandwidth plot on channel 151



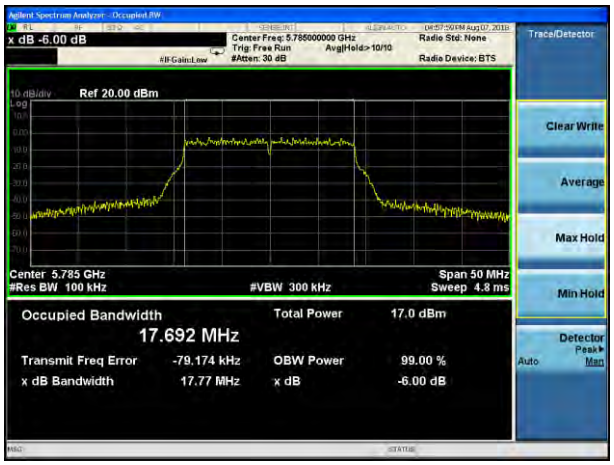
(802.11 ac20) 6dB Bandwidth plot on channel 149



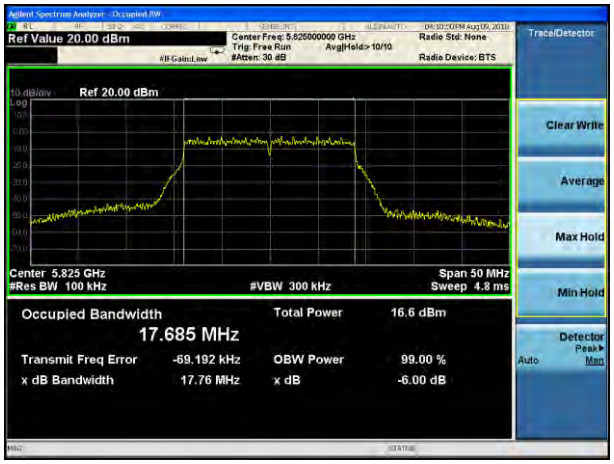
(802.11 n40) 6dB Bandwidth plot on channel 159



(802.11 ac20) 6dB Bandwidth plot on channel 157

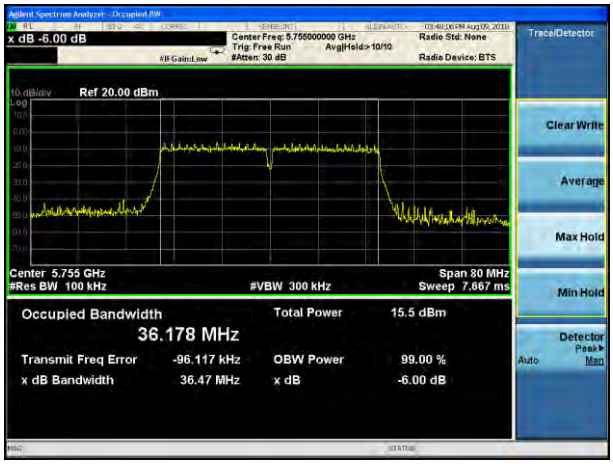


(802.11 ac20) 6dB Bandwidth plot on channel 165

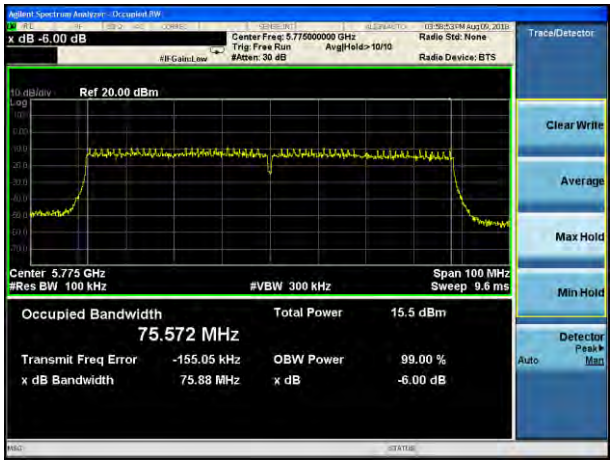


Test plot

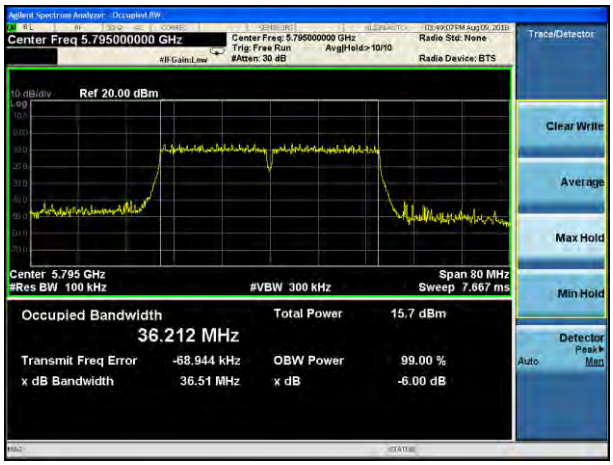
(802.11 ac40) 6dB Bandwidth plot on channel 151



(802.11 ac80) 6dB Bandwidth plot on channel 155



(802.11 ac40) 6dB Bandwidth plot on channel 159



7. MAXIMUM CONDUCTED OUTPUT POWER

7.1 PPLIED PROCEDURES / LIMIT

According to FCC §15.407

The maximum conduced output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	250mW
5725~5850	1W

7.2 TEST PROCEDURE

· Maximum conducted output power may be measured using a spectrum analyzer/EMI receiver or an RF power meter.

1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

• The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".

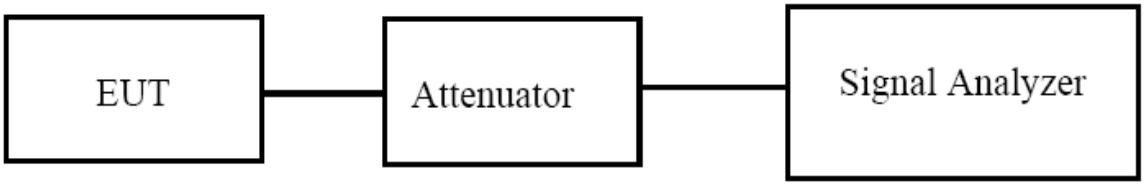
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX (5G) Mode Frequency Band I (5150-5250MHz)		

Test Channel	Frequency	Maximum output power. Antenna port (AV) (dBm)		LIMIT	Result
	(MHz)	ANT A	ANT B	dBm	
TX 802.11a Mode					
CH36	5180	10.8	11.1	23.98	Pass
CH40	5200	10.3	10.6	23.98	Pass
CH48	5240	10.9	10.1	23.98	Pass
TX 802.11 n20M Mode					
CH36	5180	9.8	10.0	23.98	Pass
CH40	5200	9.4	9.6	23.98	Pass
CH48	5240	9.9	9.0	23.98	Pass
TX 802.11 n40M Mode					
CH38	5190	9.1	9.7	23.98	Pass
CH46	5230	8.6	8.8	23.98	Pass
TX 802.11 ac20M Mode					
CH36	5180	7.3	7.5	23.98	Pass
CH40	5200	7.2	7.4	23.98	Pass
CH48	5240	7.4	7.1	23.98	Pass
TX 802.11 ac40M Mode					
CH38	5190	7.2	7.3	23.98	Pass
CH46	5230	7.3	7.1	23.98	Pass
TX 802.11 ac80M Mode					
CH42	5210	7.4	7.1	23.98	Pass

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX (5G) Mode Frequency Band IV (5725-5850MHz)		

Test Channel	Frequency	Maximum output power. Antenna port (AV) (dBm)		LIMIT	Result
	(MHz)	ANT A	ANT B	dBm	
TX 802.11a Mode					
CH 149	5745	11.6	11.4	30	Pass
CH 157	5785	11.7	11.5	30	Pass
CH 165	5825	11.8	11.5	30	Pass
TX 802.11 n20M Mode					
CH 149	5745	11.0	10.7	30	Pass
CH 157	5785	11.1	10.7	30	Pass
CH 165	5825	11.2	10.9	30	Pass
TX 802.11 n40M Mode					
CH 151	5755	11.2	10.2	30	Pass
CH 159	5795	11.0	10.5	30	Pass
TX 802.11 ac20M Mode					
CH 149	5745	9.6	9.4	30	Pass
CH 157	5785	9.7	9.4	30	Pass
CH 165	5825	9.8	9.5	30	Pass
TX 802.11 ac40M Mode					
CH 151	5755	10.7	9.1	30	Pass
CH 159	5795	9.8	8.2	30	Pass
TX 802.11 ac80M Mode					
CH 155	5775	8.1	8.0	30	Pass

8. OUT OF BAND EMISSIONS

8.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

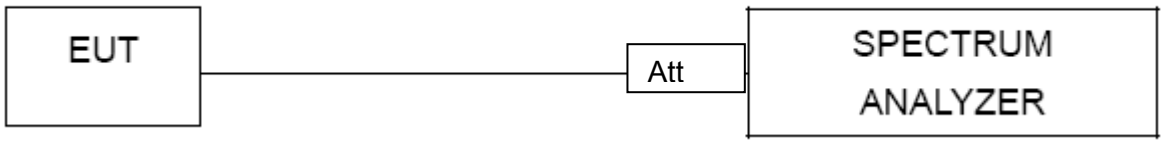
8.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
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.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A, only shown Antenna A Plot.

5.2G

5.15~5.25 GHz

(802.11a) Band Edge, Left Side

(802.11n20) Band Edge, Left Side

(802.11a) Band Edge, Right Side

(802.11n20) Band Edge, Right Side

5.15~5.25 GHz

(802.11n40) Band Edge, Left Side

(802.11ac20) Band Edge, Left Side

(802.11n40) Band Edge, Right Side

(802.11ac20) Band Edge, Right Side

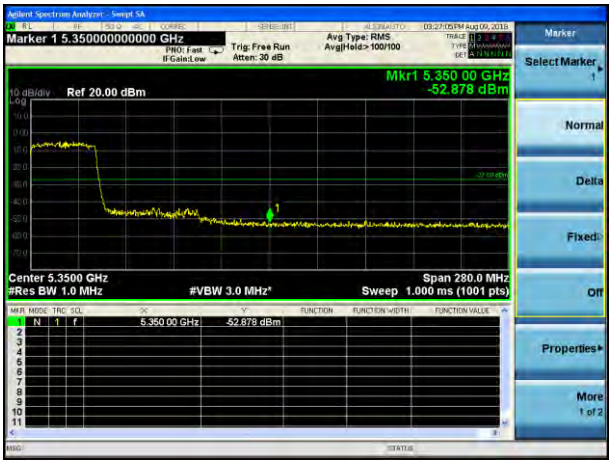
5.15~5.25 GHz

(802.11ac40) Band Edge, Left Side

(802.11ac80) Band Edge, Left Side

(802.11ac40) Band Edge, Right Side

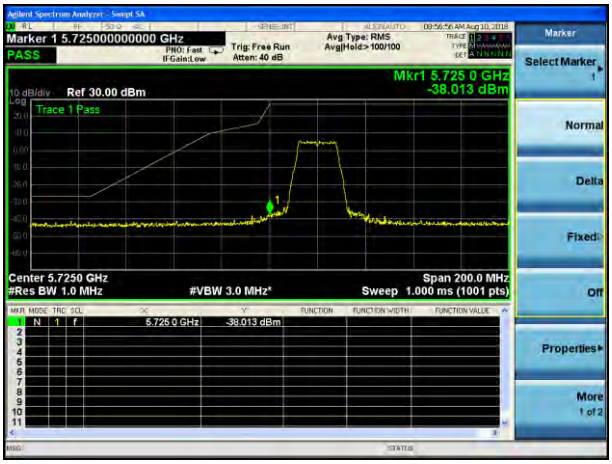
(802.11ac80) Band Edge, Right Side



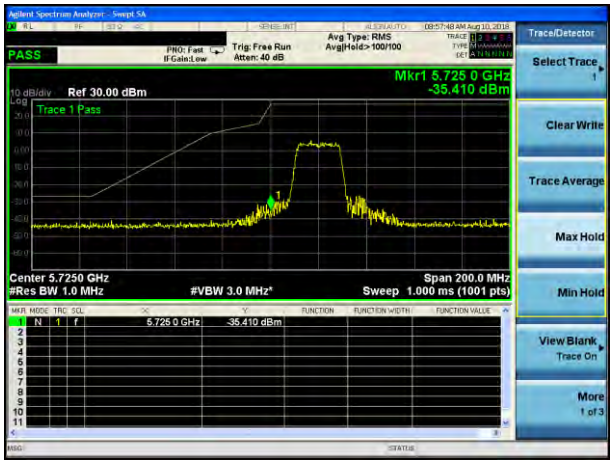
5.8G

5.75~5.85 GHz

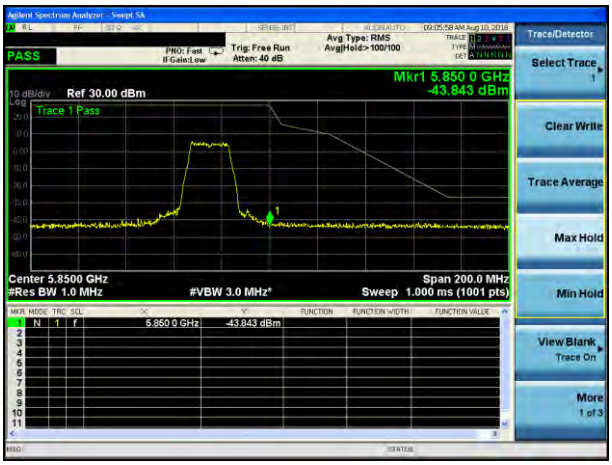
(802.11a) Band Edge, Left Side



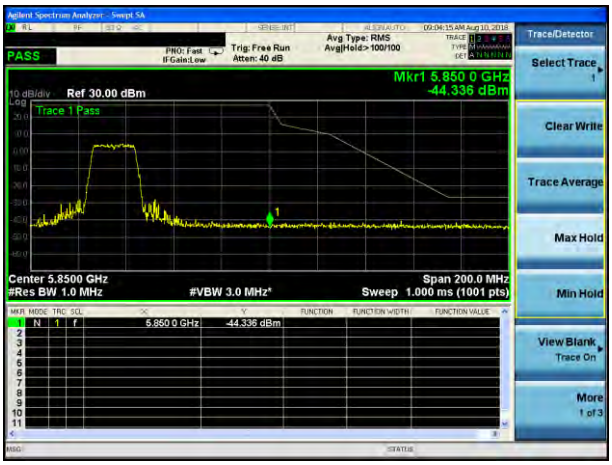
(802.11n20) Band Edge, Left Side



(802.11a) Band Edge, Right Side

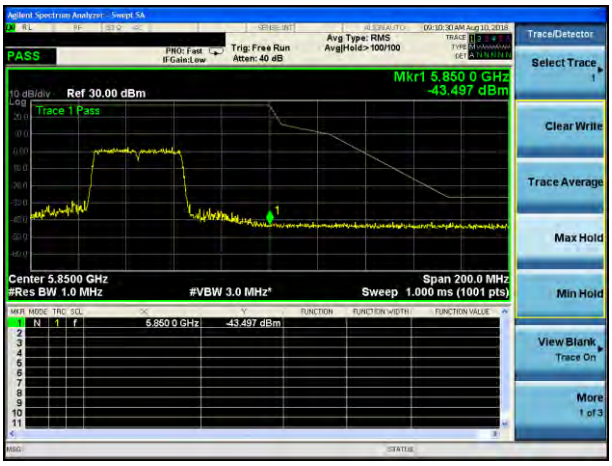


(802.11n20) Band Edge, Right Side

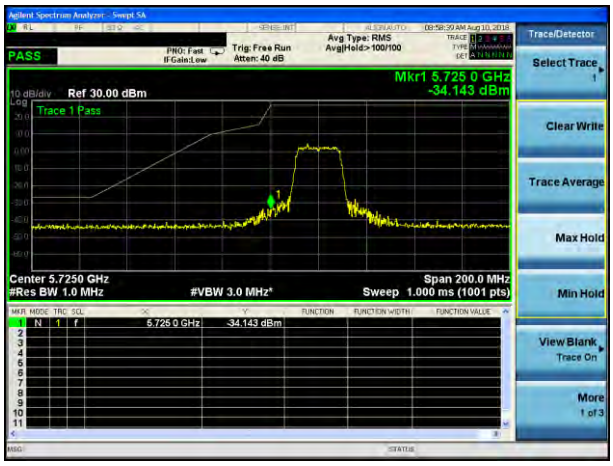


5.75~5.85 GHz

(802.11n40) Band Edge, Left Side



(802.11ac20) Band Edge, Left Side

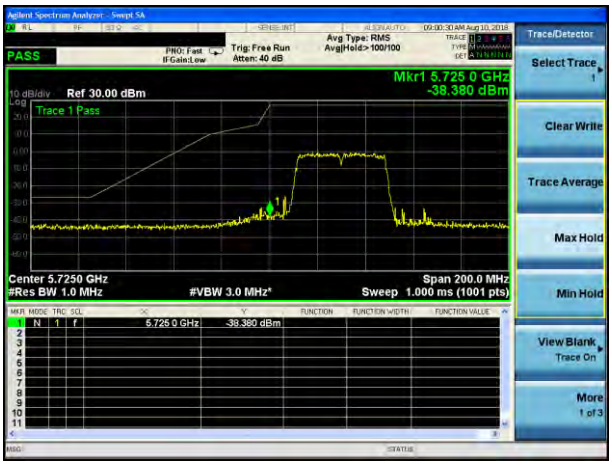


(802.11n40) Band Edge, Right Side

(802.11ac20) Band Edge, Right Side

5.75~5.83 GHz

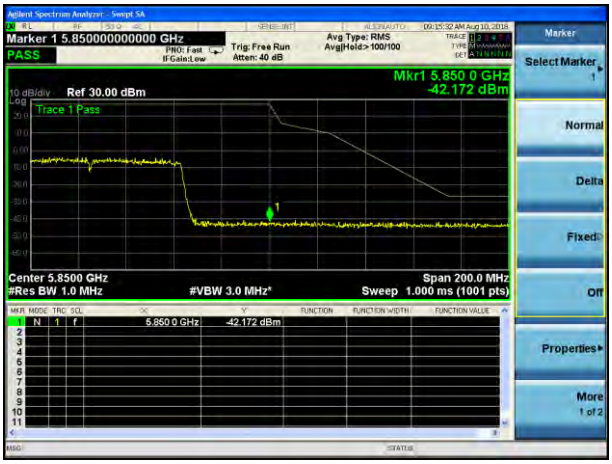
(802.11ac40) Band Edge, Left Side



(802.11ac80) Band Edge, Left Side

(802.11ac40) Band Edge, Right Side

(802.11ac80) Band Edge, Right Side



9.SPURIOUS RF CONDUCTED EMISSIONS

9.1CONFORMANCE 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.

9.2MEASURING INSTRUMENTS

The Measuring equipment is listed in the section 6.3 of this test report.

9.3TEST SETUP

Please refer to Section 6.1 of this test report.

9.4TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 26.5GHz.

9.5TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

Note: A(B) Represent the value of antenna A and B, The worst data is Antenna A ,only shown Antenna A Plot.

5.2G

Test Plot

802.11a on channel 36

802.11a on channel 40

802.11a on channel 36

802.11a on channel 40

Test Plot

802.11a on channel 48

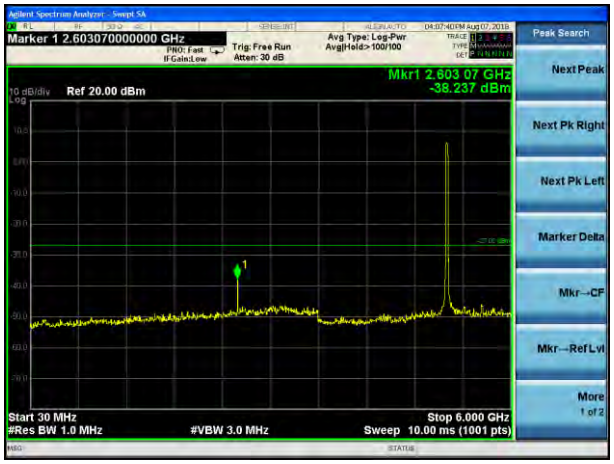
802.11n20 on channel 36

802.11a on channel 48

802.11n20 on channel 36

Test Plot

802.11n20 on channel 40



802.11n20 on channel 48

802.11n20 on channel 40

802.11n20 on channel 48

Test Plot

802.11n40 on channel 38

802.11n40 on channel 46

802.11n40 on channel 38

802.11n40 on channel 46

Test Plot

802.11ac20 on channel 36

802.11ac20 on channel 40

802.11ac20 on channel 36

802.11ac20 on channel 40

Test Plot

802.11ac20 on channel 48

802.11ac40 on channel 38

802.11ac20 on channel 48

802.11ac40 on channel 38

Test Plot

802.11ac40 on channel 46

802.11ac80 on channel 42

802.11 ac40 on channel 46

802.11 ac80 on channel 42

5.8G

Test Plot

802.11a on channel 149

802.11a on channel 157

802.11a on channel 149

802.11a on channel 157

Test Plot

802.11a on channel 165

802.11n20 on channel 149

802.11a on channel 165

802.11n20 on channel 149

Test Plot

802.11n20 on channel 157

802.11n20 on channel 165

802.11n20 on channel 157

802.11n20 on channel 165

Test Plot

802.11n40 on channel 151

802.11n40 on channel 159

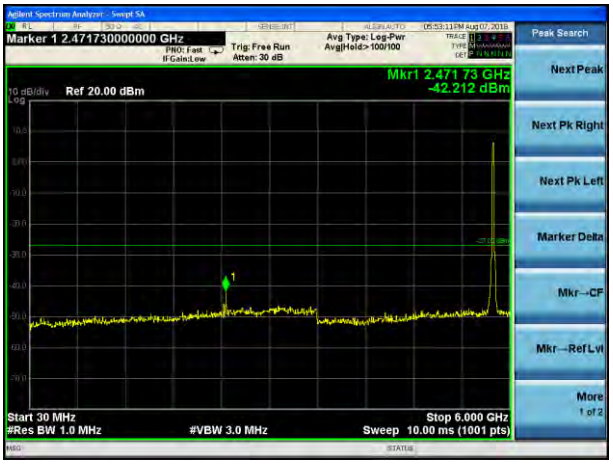
802.11n40 on channel 151

802.11n40 on channel 159

Test Plot

802.11ac20 on channel 149

802.11ac20 on channel 157



802.11ac20 on channel 149

802.11ac20 on channel 157

Test Plot

802.11ac20 on channel 165

802.11ac40 on channel 151

802.11ac20 on channel 165

802.11ac40 on channel 151

Test Plot

802.11ac40 on channel 159

802.11ac80 on channel 155

802.11 ac40 on channel 159

802.11 ac80 on channel 155

10. Frequency Stability Measurement

10.1 LIMIT

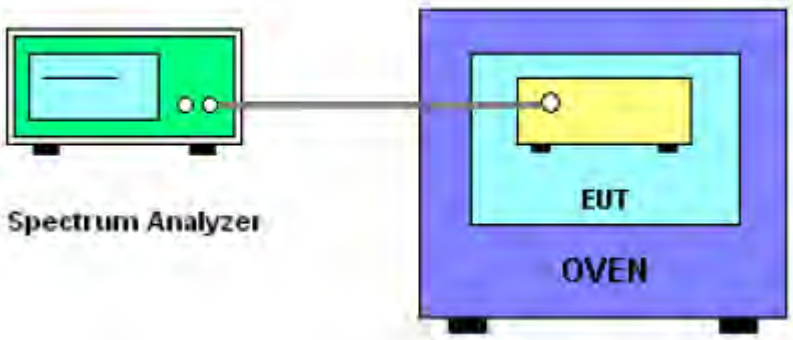
Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

10.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10_6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is -20°C~70°C.

10.3 TEST SETUP LAYOUT



10.4 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously un-modulation transmitting mode.

10.5 TEST RESULTS

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency Band I (5150-5250MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5180.0125	5180	0.0125	-2.4131
		V max (V)	13.80	5180.0119	5180	0.0119	-2.2973
		V min (V)	10.20	5180.0136	5180	0.0136	-2.6255
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5180.0142	5180	0.0142	-2.7413
		T (°C)	-10	5180.0136	5180	0.0136	-2.6255
		T (°C)	0	5180.0133	5180	0.0133	-2.5676
		T (°C)	10	5180.0149	5180	0.0149	-2.8764
		T (°C)	20	5180.0157	5180	0.0157	-3.0309
		T (°C)	30	5180.0109	5180	0.0109	-2.1042
		T (°C)	40	5180.0265	5180	0.0265	-5.1158
		T (°C)	50	5180.0144	5180	0.0144	-2.7799
		T (°C)	60	5180.0121	5180	0.0121	-2.3359
		T (°C)	70	5180.0136	5180	0.0136	-2.6255
Limits				± 20 ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5200.0156	5200	0.0156	-3.0000
		V max (V)	13.80	5200.0144	5200	0.0144	-2.7692
		V min (V)	10.20	5200.0159	5200	0.0159	-3.0577
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5200.0169	5200	0.0169	-3.2500
		T (°C)	-10	5200.0174	5200	0.0174	-3.3462
		T (°C)	0	5200.0149	5200	0.0149	-2.8654
		T (°C)	10	5200.0152	5200	0.0152	-2.9231
		T (°C)	20	5200.0123	5200	0.0123	-2.3654
		T (°C)	30	5200.0162	5200	0.0162	-3.1154
		T (°C)	40	5200.0224	5200	0.0224	-4.3077
		T (°C)	50	5200.0126	5200	0.0126	-2.4231
		T (°C)	60	5200.0142	5200	0.0142	-2.7308
		T (°C)	70	5200.0167	5200	0.0167	-3.2115
Limits				± 20 ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5240.0198	5240	0.0198	-3.7786
		V max (V)	13.80	5240.0202	5240	0.0202	-3.8550
		V min (V)	10.20	5240.0223	5240	0.0223	-4.2557
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5240.0206	5240	0.0206	-3.9313
		T (°C)	-10	5240.0189	5240	0.0189	-3.6069
		T (°C)	0	5240.0196	5240	0.0196	-3.7405
		T (°C)	10	5240.0201	5240	0.0201	-3.8359
		T (°C)	20	5240.0213	5240	0.0213	-4.0649
		T (°C)	30	5240.0179	5240	0.0179	-3.4160
		T (°C)	40	5240.0185	5240	0.0185	-3.5305
		T (°C)	50	5240.0193	5240	0.0193	-3.6832
		T (°C)	60	5240.0203	5240	0.0203	-3.8740
		T (°C)	70	5240.0222	5240	0.0222	-4.2366
Limits				± 20 ppm			
Result				Complies			

EUT：	SHADOW GHOST	Model Name. ：	SG01
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 12V
Test Mode ：	TX Frequency(5745-5825MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5745.00241	5745	0.00241	-0.4202
		V max (V)	13.80	5745.00532	5745	0.00532	-0.9263
		V min (V)	10.20	5745.00573	5745	0.00573	-0.9979
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5745.00379	5745	0.00379	-0.6590
		T (°C)	-10	5745.00135	5745	0.00135	-0.2344
		T (°C)	0	5745.00464	5745	0.00464	-0.8077
		T (°C)	10	5745.00401	5745	0.00401	-0.6980
		T (°C)	20	5745.00730	5745	0.00730	-1.2715
		T (°C)	30	5745.00887	5745	0.00887	-1.5447
		T (°C)	40	5745.00702	5745	0.00702	-1.2221
		T (°C)	50	5745.01104	5745	0.01104	-1.9218
		T (°C)	60	5745.00252	5745	0.00252	-0.4381
		T (°C)	70	5745.00374	5745	0.00374	-0.6507
Limits				± 20 ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5785.01191	5785	0.01191	-2.0585
		V max (V)	13.80	5785.00787	5785	0.00787	-1.3605
		V min (V)	10.20	5785.01141	5785	0.01141	-1.9730
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5785.00472	5785	0.00472	-0.8162
		T (°C)	-10	5785.00608	5785	0.00608	-1.0511
		T (°C)	0	5785.00322	5785	0.00322	-0.5570
		T (°C)	10	5785.01093	5785	0.01093	-1.8894
		T (°C)	20	5785.01011	5785	0.01011	-1.7484
		T (°C)	30	5785.01278	5785	0.01278	-2.2091
		T (°C)	40	5785.01182	5785	0.01182	-2.0424
		T (°C)	50	5785.00100	5785	0.00100	-0.1730
		T (°C)	60	5785.01085	5785	0.01085	-1.8759
		T (°C)	70	5785.00207	5785	0.00207	-0.3579
Limits				± 20 ppm			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5825.00480	5825	0.00480	-0.8233
		V max (V)	13.80	5825.00107	5825	0.00107	-0.1845
		V min (V)	10.20	5825.00756	5825	0.00756	-1.2980
Limits				± 20 ppm			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5825.01065	5825	0.01065	-1.8277
		T (°C)	-10	5825.00623	5825	0.00623	-1.0690
		T (°C)	0	5825.01215	5825	0.01215	-2.0851
		T (°C)	10	5825.00800	5825	0.00800	-1.3734
		T (°C)	20	5825.00792	5825	0.00792	-1.3594
		T (°C)	30	5825.00617	5825	0.00617	-1.0596
		T (°C)	40	5825.00185	5825	0.00185	-0.3170
		T (°C)	50	5825.01195	5825	0.01195	-2.0518
		T (°C)	60	5825.00061	5825	0.00061	-0.1052
		T (°C)	70	5825.00942	5825	0.00942	-1.6171
Limits				± 20 ppm			
Result				Complies			

11. ANTENNA REQUIREMENT

11.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

11.2 EUT ANTENNA

Antenna	Brand	Model Name (P/N)	Antenna Type	Connector	Antenna Gain(dBi)	
					5.2G	5.8G
B(main)	N/A	N/A	FPCB	I-PEX	3	3
A(aux)	N/A	N/A	FPCB	I-PEX	3	3

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

END OF REPORT