FCC Part 15E Test Report

FCC ID: 2ADZC-9842C

Product Name:	WIRELESS VIDEO TRANSMISSION SYSTEM
Trademark:	N/A
Model Name :	SYSCOM 421 SYSCOM 421 PRO, SYSCOM 421Lite, SYSCOM 421 SE, SYSCOM 221, SYSCOM 221 SE
Prepared For : Address :	Shenzhen Hollyland Technology Co., Ltd 8F, Building 5D, Skyworth Innovation Valley, Tangtou Road. Shiyan Street, Baoan District Shenzhen, China 518055
Prepared By : Address :	Shenzhen BCTC Testing Co., Ltd. BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
Test Date:	Jun. 15, 2020 – Jul. 09, 2020
Date of Report :	Jul. 09, 2020
Report No.:	BCTC2006000664E

TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Hollyland Technology Co., Ltd
Address	:	8F, Building 5D, Skyworth Innovation Valley, Tangtou Road. Shiyan Street, Baoan District Shenzhen, China 518055
Manufacture's Name	:	Shenzhen Hollyland Technology Co., Ltd
Address	:	8F, Building 5D, Skyworth Innovation Valley, Tangtou Road. Shiyan Street, Baoan District Shenzhen, China 518055
Product description		
Product name	:	WIRELESS VIDEO TRANSMISSION SYSTEM
Trademark	:	N/A
Model and/or type reference	:	SYSCOM 421 SYSCOM 421 PRO, SYSCOM 421Lite, SYSCOM 421 SE, SYSCOM 221, SYSCOM 221 SE
Standards	:	FCC Part15 15.407 ANSI C63.10-2013 KDB 662911 D01 v02r01 KDB 789033 D02 v02r01

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

This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

Prepared by(Engineer):	Sam zeng	Sam Zeng
Reviewer(Supervisor):	Eric Yang	Eric Yang
Approved(Manager):	Zero Zhou	Zero Zhou

Table of Contents

Page

Table of Contents

Page

Revision History

Report No.	Version	Description	Issued Date
BCTC2006000664E	Rev.01	Initial issue of report	Jul. 09, 2020

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.209(a), 15.407 (b)(1) 15.407 (b)(4) 15.407 (b)(6)	Spurious Radiated Emissions	PASS	
15.207	Conducted Emission	PASS	
15.407 (a)(5) 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 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.
Add. : BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
FCC Test Firm Registration Number: 712850
IC Registered No.: 23583

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	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59 ℃

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	WIRELESS VIDEO TRANSMISSION SYSTEM	
Trade Name	N/A	
Model Name	SYSCOM 421 SYSCOM 421 PRO, SYSCOM 421Lite, SYSCOM 421 SE, SYSCOM 221, SYSCOM 221 SE	
Model Difference	All the model are the same circuit and RF module, except model names.	
Product Description	Data Rate	802.11n(HT40):MCS0-MCS15;
	Modulation	HT40 with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11n
	Operating Frequency Range	☒ 5190-5230 MHz for 802.11n(HT40) ☒ 5755-5795 MHz for 802.11n(HT40)
	Number of Channels	☒ 2 channels in the 5190-5230MHz band ; ☒ 2 channels in the 5755-5795MHz band ;
	Antenna Type	External antenna*4
	Antenna Gain	Antenna A:5dBi, Antenna B: 5dBi Antenna C:5dBi, Antenna D: 5dBi
Channel List	Please refer to the Note 2.	
Type of device	indoor	
Power Supply	AC 120V/60Hz	
Adapter	MODEL: GME72C-200350FDR INPUT: 100-240V~50-60Hz 1.5A OUTPUT: 20V 3.5A	
hardware version	H1.0	
Software version	S1.0	
Connecting I/O Port(s)	Please refer to the User's Manual	

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

Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5190	2	5230	3	5755	4	5795

Antenna A gain:5dBi, Antenna B gain: 5dBi, Antenna C gain: 5dBi, Antenna D gain: 5dBi,
For MIMO mode, Directional gain=[10log(G_A+ G_B+ G_C+ G_D)] dbi =11.02dB

Tx Antenna

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)	NOTE
A	N/A	N/A	External antenna	5	
B	N/A	N/A	External antenna	5	
C	N/A	N/A	External antenna	5	
D	N/A	N/A	External antenna	5	

2.2 DESCRIPTION OF TEST MODES

Pretest Mode	Description
Mode 1	HT40（transmitting）
Mode 2	Link Mode

Conducted Emission	
Final Test Mode	Description
Mode 2	Link Mode

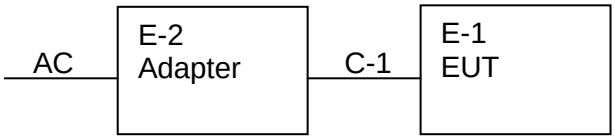
For Radiated Emission	
Final Test Mode	Description
Mode 1	HT40（transmitting）

Note:

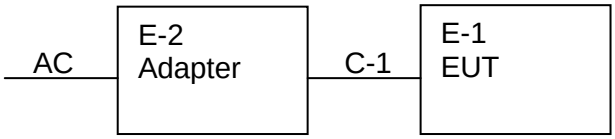
(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Radiated Spurious Emission



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	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	WIRELESS VIDEO TRANSMISSION SYSTEM	N/A	SYSCOM 421	N/A	EUT
E-2	Adapter	N/A	GME72C-200350FDR	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.2M	DC cable unshielded
HDMI	NO	NO	0.6M	DC cable unshielded

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 Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	Jun. 08, 2020	Jun. 07, 2021
2	Test Receiver (9kHz-7GHz)	R&S	ESR7	101154	Jun. 08, 2020	Jun. 07, 2021
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	VULB9163-942	Jun. 08, 2020	Jun. 07, 2021
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	Jun. 10, 2020	Jun. 09, 2021
5	Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	Jun. 10, 2020	Jun. 09, 2021
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	Jun. 04, 2020	Jun. 03, 2021
7	Amplifier (0.5GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	Jun. 04, 2020	Jun. 03, 2021
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	Jun. 08, 2020	Jun. 07, 2021
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Jun. 08, 2020	Jun. 07, 2021
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 08, 2020	Jun. 07, 2021
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	Jun. 08, 2020	Jun. 07, 2021
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	Jun. 08, 2020	Jun. 07, 2021
13	Power Metter	Keysight	E4419B	\	Jun. 08, 2020	Jun. 07, 2021
14	Power Sensor (AV)	Keysight	E9 300A	\	Jun. 08, 2020	Jun. 07, 2021
15	Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	Jun. 04, 2020	Jun. 03, 2021
16	Spectrum Analyzer 9kHz-40GHz	Agilent	FSP40	100363	Jun. 13, 2020	Jun. 12, 2021
17	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
18	Software	Frad	EZ-EMC	FA-03A2 RE	\	\

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESR3	102075	Jun. 08, 2020	Jun. 07, 2021
2	LISN	SCHWARZBECK	NSLK8127	8127739	Jun. 13, 2020	Jun. 12, 2021
3	LISN	R&S	ENV216	101375	Jun. 04, 2020	Jun. 03, 2021
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 08, 2020	Jun. 07, 2021
5	Software	Frad	EZ-EMC	EMC-CON 3A1	\	\

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)	Class B (dBuV)		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

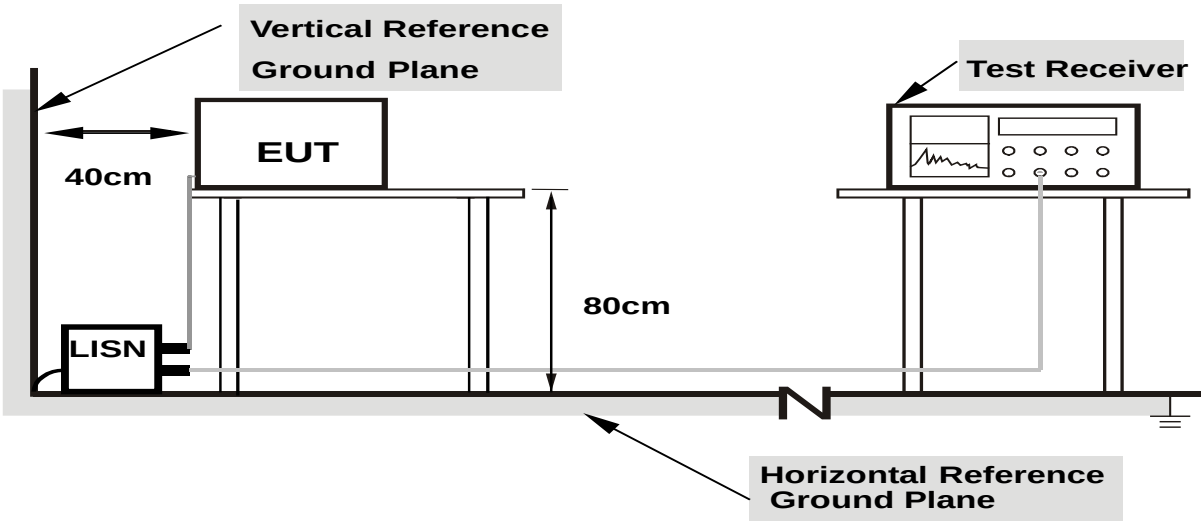
3.1.2 TEST PROCEDURE

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



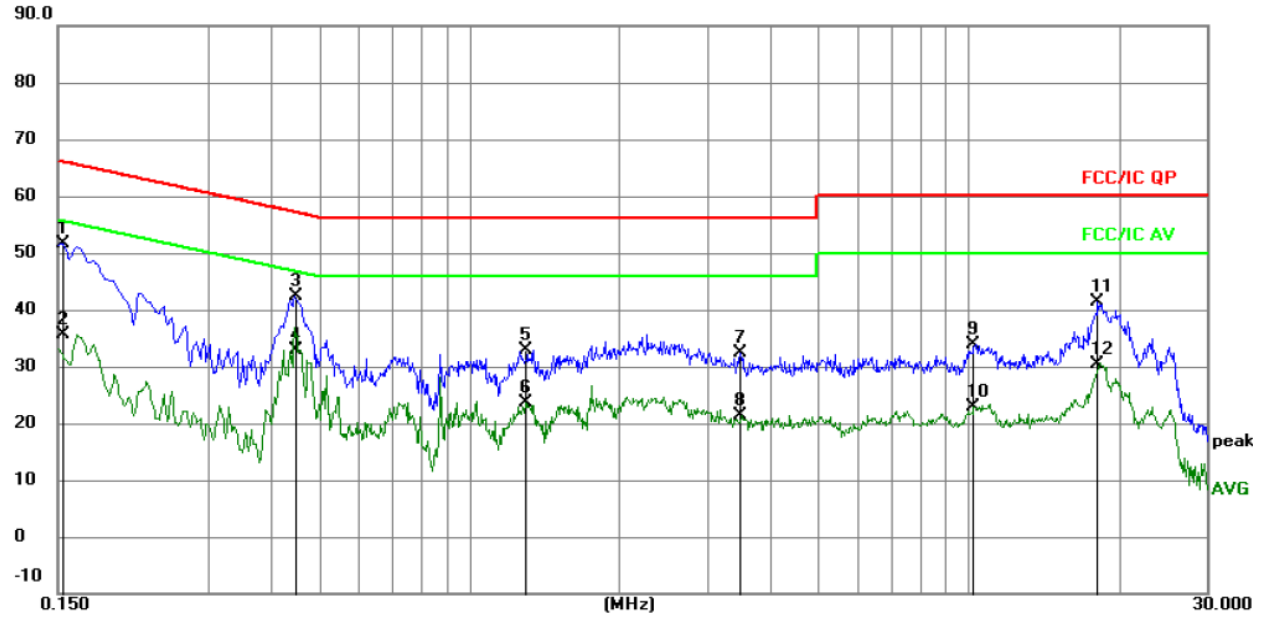
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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.

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

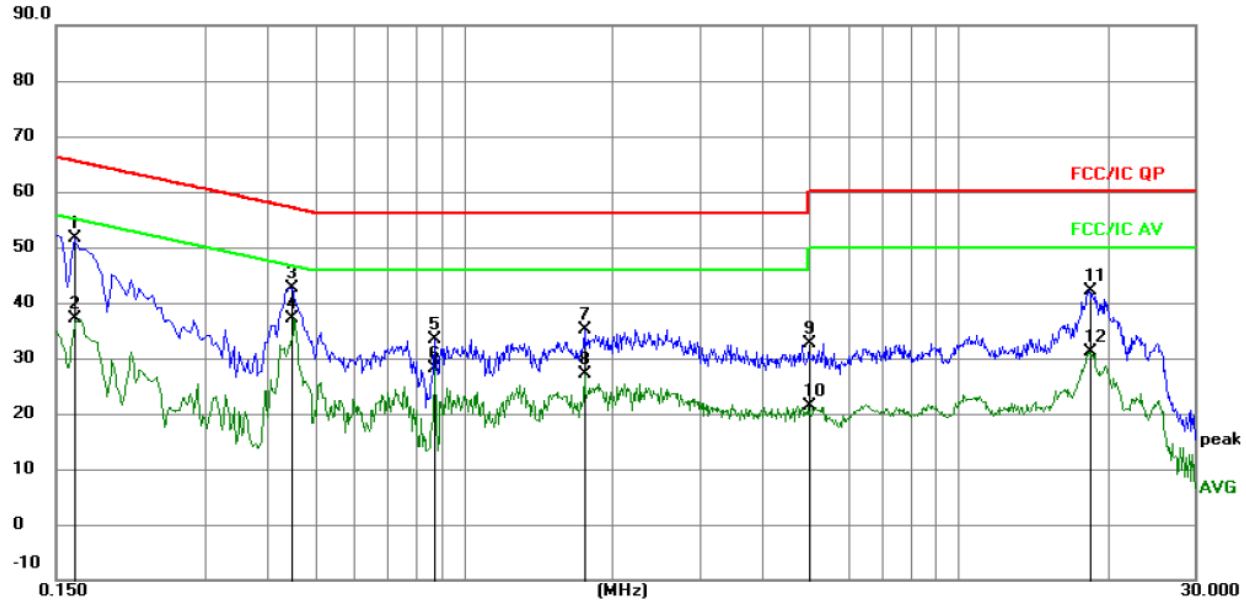
Temperature：	23 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 2



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz		dB	dBuV	dBuV	dB	Detector	Comment
1		0.1539	42.13	9.52	51.65	65.79	-14.14	QP	
2		0.1539	26.19	9.52	35.71	55.79	-20.08	AVG	
3		0.4468	32.80	9.54	42.34	56.93	-14.59	QP	
4	*	0.4468	23.44	9.54	32.98	46.93	-13.95	AVG	
5		1.2960	23.38	9.58	32.96	56.00	-23.04	QP	
6		1.2960	14.00	9.58	23.58	46.00	-22.42	AVG	
7		3.4906	22.77	9.69	32.46	56.00	-23.54	QP	
8		3.4906	11.70	9.69	21.39	46.00	-24.61	AVG	
9		10.2332	24.23	9.69	33.92	60.00	-26.08	QP	
10		10.2332	13.26	9.69	22.95	50.00	-27.05	AVG	
11		18.1352	31.57	9.76	41.33	60.00	-18.67	QP	
12		18.1352	20.74	9.76	30.50	50.00	-19.50	AVG	

Temperature：	23 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 2



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz		dB	dBuV	dBuV	dB	Detector	Comment
1		0.1635	42.01	9.50	51.51	65.28	-13.77	QP	
2		0.1635	27.74	9.50	37.24	55.28	-18.04	AVG	
3		0.4470	33.08	9.54	42.62	56.93	-14.31	QP	
4	*	0.4470	27.62	9.54	37.16	46.93	-9.77	AVG	
5		0.8745	23.83	9.61	33.44	56.00	-22.56	QP	
6		0.8745	18.53	9.61	28.14	46.00	-17.86	AVG	
7		1.7610	25.63	9.59	35.22	56.00	-20.78	QP	
8		1.7610	17.42	9.59	27.01	46.00	-18.99	AVG	
9		4.9785	22.72	9.80	32.52	56.00	-23.48	QP	
10		4.9785	11.62	9.80	21.42	46.00	-24.58	AVG	
11		18.4155	32.34	9.76	42.10	60.00	-17.90	QP	
12		18.4155	21.35	9.76	31.11	50.00	-18.89	AVG	

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	24000/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

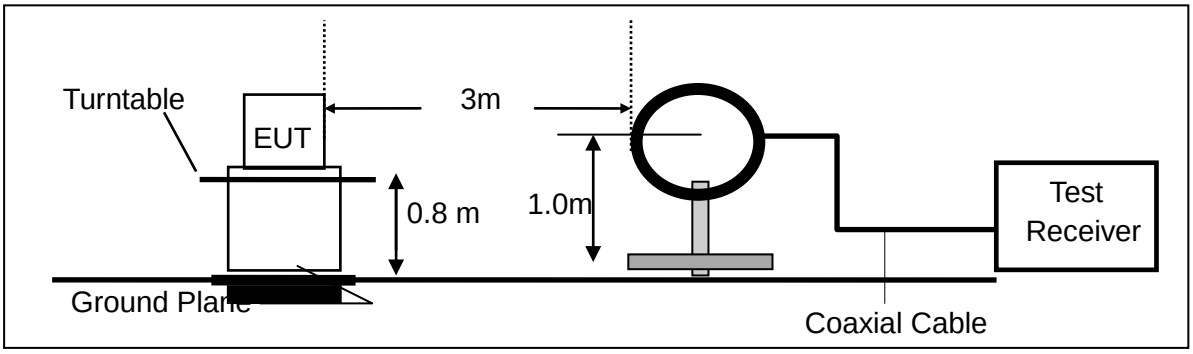
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

3.2.3 MEASURING INSTRUMENTS

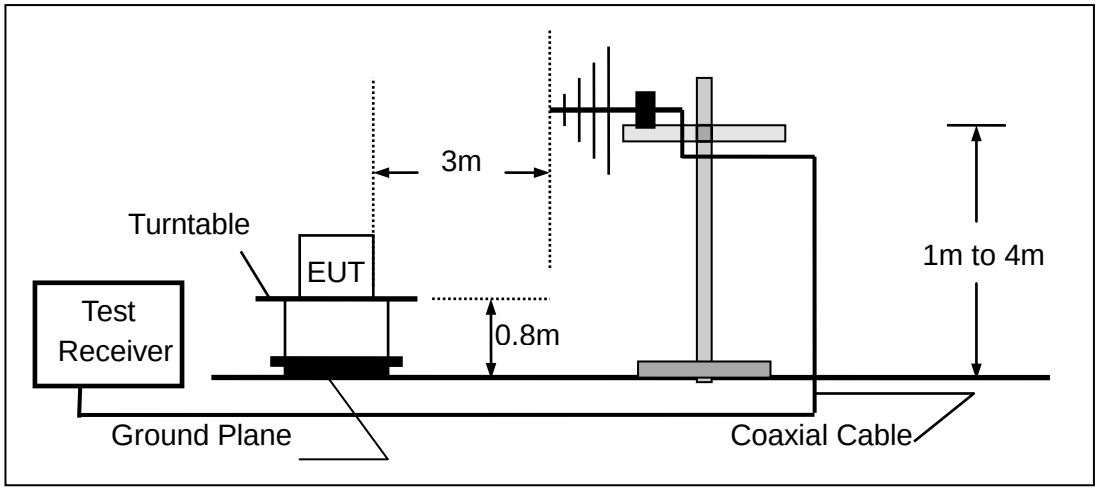
The Measuring equipment is listed in the section 6.3 of this test report.

3.2.4 TEST CONFIGURATION

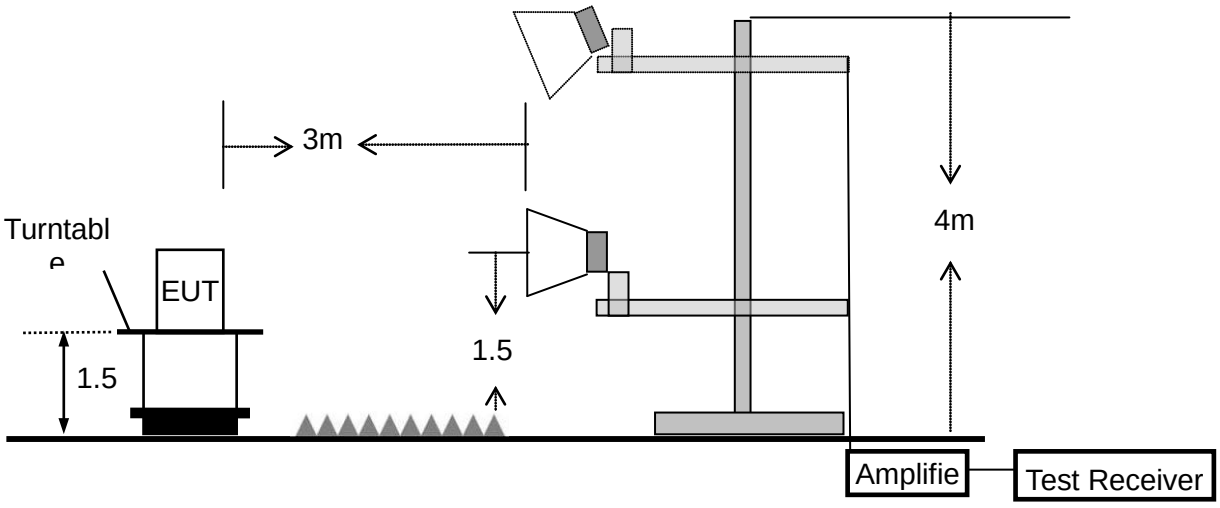
(a) For radiated emissions below 30MHz



(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)

Temperature：	26℃	Relative Humidtity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	Mode 2	Polarization :	--

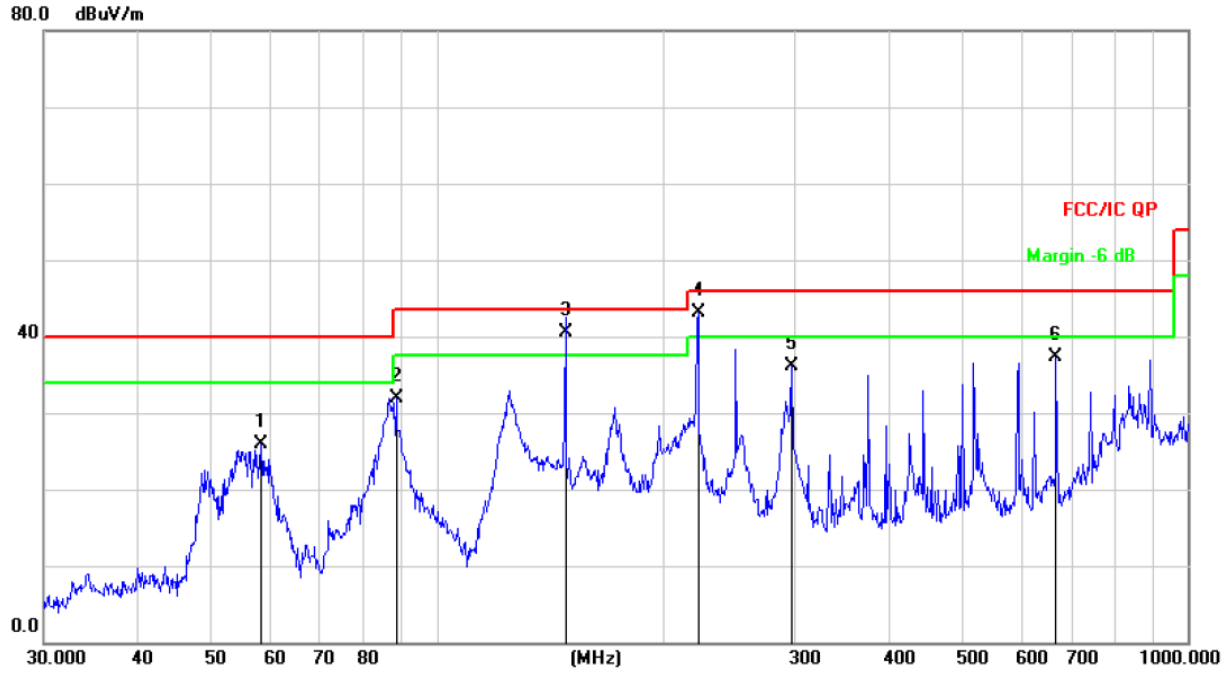
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (30MHZ – 1GHZ)

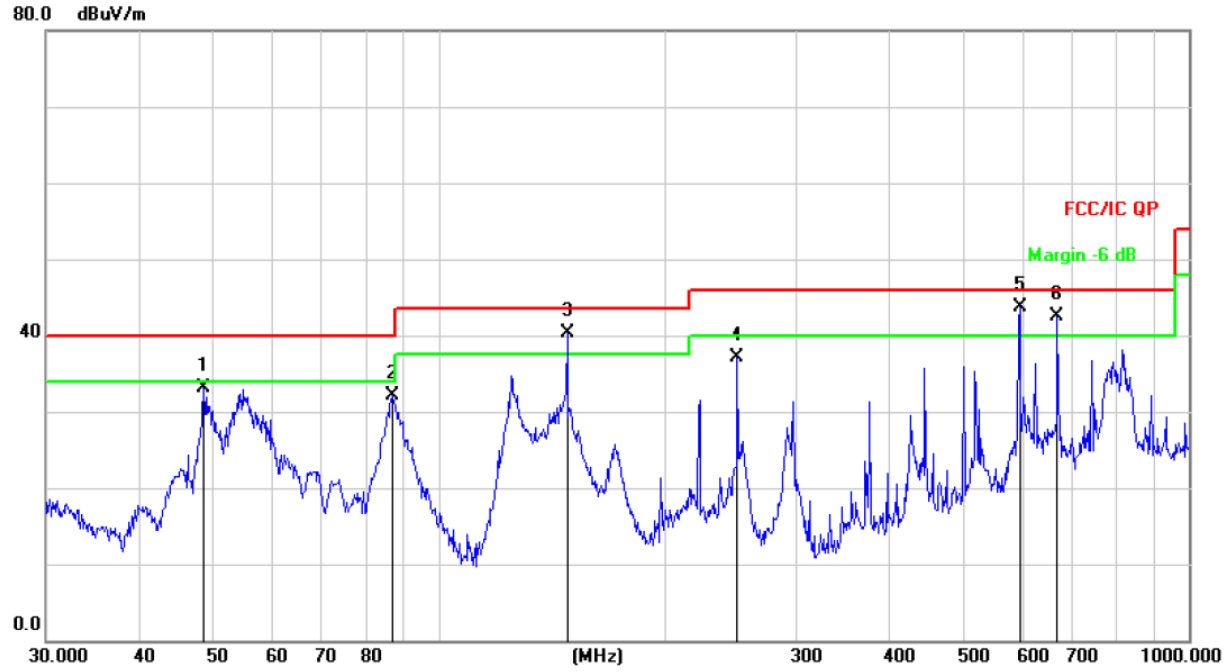
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 2



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		58.4074	41.59	-15.74	25.85	40.00	-14.15	QP
2		88.3421	50.47	-18.48	31.99	43.50	-11.51	QP
3	!	148.4410	59.91	-19.40	40.51	43.50	-2.99	QP
4	*	222.9502	58.94	-15.77	43.17	46.00	-2.83	QP
5		297.2241	49.71	-13.69	36.02	46.00	-9.98	QP
6		668.1423	43.52	-6.20	37.32	46.00	-8.68	QP

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		48.6719	47.94	-14.92	33.02	40.00	-6.98	QP
2		86.8067	50.91	-18.84	32.07	40.00	-7.93	QP
3	!	148.4410	59.77	-19.40	40.37	43.50	-3.13	QP
4		250.3011	52.32	-15.14	37.18	46.00	-8.82	QP
5	*	595.1329	50.38	-6.63	43.75	46.00	-2.25	QP
6	!	668.1422	48.77	-6.20	42.57	46.00	-3.43	QP

3.2.8 TEST RESULTS (1GHz-40GHz)

Test Mode :	TX(5.2G) - HT40

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 (5190 MHz)-Above 1G									
Vertical	4434.157	62.25	5.94	35.40	44.00	59.59	74.00	-14.41	Pk
Vertical	4434.157	46.53	5.94	35.40	44.00	43.87	54.00	-10.13	AV
Vertical	10380.362	60.46	8.46	39.75	44.50	64.17	68.20	-4.03	Pk
Vertical	10380.362	42.92	8.46	39.75	44.50	46.63	54.00	-7.37	AV
Vertical	15570.196	61.43	10.12	38.80	44.10	66.25	74.00	-7.75	Pk
Vertical	15570.196	37.54	10.12	38.80	42.70	43.76	54.00	-10.24	AV
Horizontal	4434.521	66.52	5.94	35.18	44.00	63.64	74.00	-10.36	Pk
Horizontal	4434.521	44.24	5.94	35.18	44.00	41.36	54.00	-12.64	AV
Horizontal	10380.623	58.82	8.46	38.71	44.50	61.49	68.20	-6.71	Pk
Horizontal	10380.623	41.06	8.46	38.71	44.50	43.73	54.00	-10.27	AV
Horizontal	15570.865	56.92	10.12	38.38	44.10	61.32	74.00	-12.68	Pk
Horizontal	15570.865	38.87	10.12	38.38	44.10	43.27	54.00	-10.73	AV
High Channel (5230 MHz)-Above 1G									
Vertical	4739.246	61.33	7.10	37.24	43.50	62.17	74.00	-11.83	Pk
Vertical	4739.246	44.47	7.10	37.24	43.50	45.31	54.00	-8.69	AV
Vertical	10460.371	60.25	8.46	37.68	44.50	61.89	68.20	-6.31	Pk
Vertical	10460.371	40.47	8.46	37.68	44.50	42.11	54.00	-11.89	AV
Vertical	15690.359	61.63	10.12	38.8	44.10	66.45	74.00	-7.55	Pk
Vertical	15690.359	39.67	10.12	38.8	42.70	45.89	54.00	-8.11	AV
Horizontal	4739.352	62.26	7.10	37.24	43.50	63.1	74.00	-10.9	Pk
Horizontal	4739.352	43.16	7.10	37.24	43.50	44	54.00	-10	AV
Horizontal	10460.111	62.28	8.46	38.57	44.50	64.81	68.20	-3.39	Pk
Horizontal	10460.111	43.31	8.46	38.57	44.50	45.84	54.00	-8.16	AV
Horizontal	15690.357	60.72	10.12	38.38	44.10	65.12	74.00	-8.88	Pk
Horizontal	15690.357	42.27	10.12	38.38	44.10	46.67	54.00	-7.33	AV

Note: PK value is lower than the Average value limit, So average didn't record.

The 26.5-40G 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.

Test Mode is MIMO Mode.

Test Mode :	TX (5.8G) -- HT40

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 (5755 MHz)-Above 1G									
Vertical	4679.195	59.84	5.94	35.40	44.00	57.18	74.00	-16.82	Pk
Vertical	4679.195	39.65	5.94	35.40	44.00	36.99	54.00	-17.01	AV
Vertical	11510.364	59.52	8.46	39.75	44.50	63.23	74.00	-10.77	Pk
Vertical	11510.364	42.27	8.46	39.75	44.50	45.98	54.00	-8.02	AV
Vertical	17265.101	55.54	10.12	38.80	44.10	60.36	68.20	-7.84	Pk
Vertical	17265.101	38.43	10.12	38.80	42.70	44.65	54.00	-9.35	AV
Horizontal	4679.332	57.65	5.94	35.18	44.00	54.77	74.00	-19.23	Pk
Horizontal	4679.332	44.52	5.94	35.18	44.00	41.64	54.00	-12.36	AV
Horizontal	11510.164	56.63	8.46	38.71	44.50	59.3	74.00	-14.7	Pk
Horizontal	11510.164	40.14	8.46	38.71	44.50	42.81	54.00	-11.19	AV
Horizontal	17265.196	58.62	10.12	38.38	44.10	63.02	68.20	-5.18	Pk
Horizontal	17265.196	42.27	10.12	38.38	44.10	46.67	54.00	-7.33	AV
High Channel (5795 MHz)-Above 1G									
Vertical	6039.199	55.25	7.10	37.24	43.50	56.09	68.20	-12.11	Pk
Vertical	6039.199	43.22	7.10	37.24	43.50	44.06	54.00	-9.94	AV
Vertical	11590.562	52.31	8.46	37.68	44.50	53.95	74.00	-20.05	Pk
Vertical	11590.562	43.14	8.46	37.68	44.50	44.78	54.00	-9.22	AV
Vertical	17385.128	54.57	10.12	38.8	44.10	59.39	68.20	-8.81	Pk
Vertical	17385.128	45.33	10.12	38.8	42.70	51.55	54.00	-2.45	AV
Horizontal	6039.232	55.87	7.10	37.24	43.50	56.71	68.20	-11.49	Pk
Horizontal	6039.232	43.36	7.10	37.24	43.50	44.2	54.00	-9.8	AV
Horizontal	11590.319	52.24	8.46	38.57	44.50	54.77	74.00	-19.23	Pk
Horizontal	11590.319	40.13	8.46	38.57	44.50	42.66	54.00	-11.34	AV
Horizontal	17385.062	57.72	10.12	38.38	44.10	62.12	68.20	-6.08	Pk
Horizontal	17385.062	40.38	10.12	38.38	44.10	44.78	54.00	-9.22	AV

Note: PK value is lower than the Average value limit, So average didn't record.

The 26.5-40G 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.

Test Mode is MIMO Mode.

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.l.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.

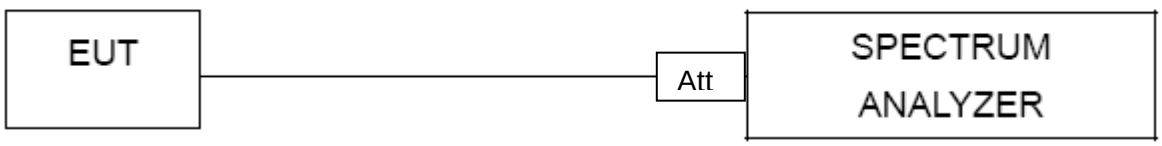
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

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

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX Frequency (5190-5230MHz)		

Note: Represent the value of antenna A ,B ,C, D, The worst data is Antenna A, only shown Antenna A Plot.

Antenna A gain:5dBi, Antenna B gain: 5dBi, Antenna C gain: 5dBi, Antenna D gain: 5dBi,
For MIMO mode, Directional gain=[10log(G_A+ G_B+ G_C+ G_D)] dbi =11.02dB

Limit =17.00-(11.02-6.00)=11.98

Mode	Frequency	Measured Power Density (dBm/MHz)					Limit (dBm/MHz)	Result
		ANT A	ANT B	ANT C	ANT D	Total		
HT40	5190 MHz	4.946	4.673	4.190	4.523	10.61	11.98	PASS
	5230 MHz	4.532	4.170	4.492	4.246	10.38	11.98	PASS

HT40 PSD Channel 1

HT40 PSD Channel 2

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX Frequency (5755-5795MHz)		

Note: Represent the value of antenna A ,B ,C,D, The worst data is Antenna D, only shown Antenna D Plot.

Antenna A gain:5dBi, Antenna B gain: 5dBi, Antenna C gain: 5dBi, Antenna D gain: 5dBi,
For MIMO mode, Directional gain=[10log(G_A+ G_B+ G_C+ G_D)] dbi =11.02dB

Limit =30.00-(11.02-6.00)=24.98

Mode	Frequency	Measured Power Density (dBm/500kHz)					Limit (dBm/500kHz)	Result
		ANT A	ANT B	ANT C	ANT D	Total		
HT40	5755 MHz	3.686	3.007	4.061	3.835	9.69	24.98	PASS
	5795 MHz	3.751	3.863	3.991	3.624	9.83	24.98	PASS

HT40 PSD Channel 3

HT40 PSD Channel 4

5. 26DB & 6DB & 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.

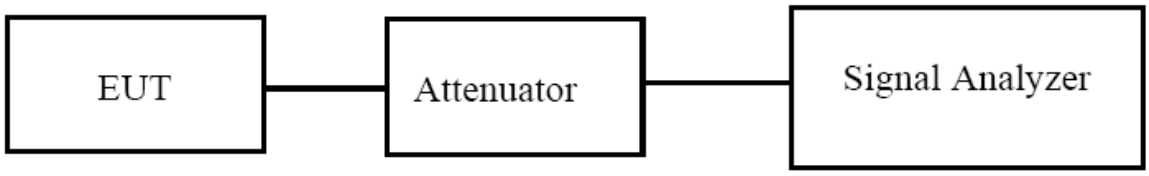
c) Detector = Peak.

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

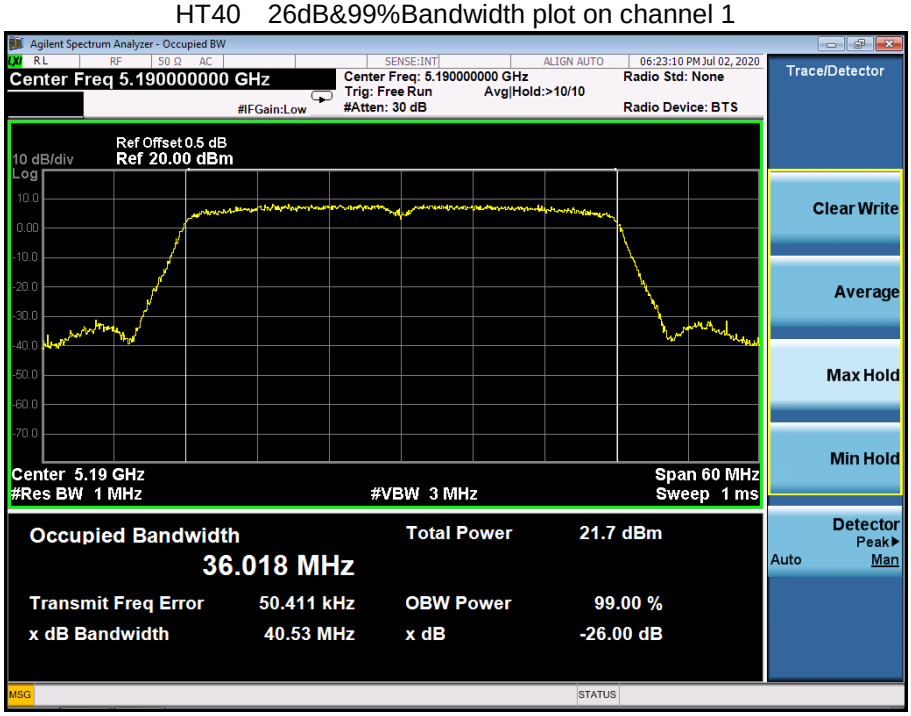
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Frequency HT40 (5190-5230MHz)		

Note: Represent the value of antenna A ,B,C,D, The worst data is Antenna A ,only shown Antenna A Plot.

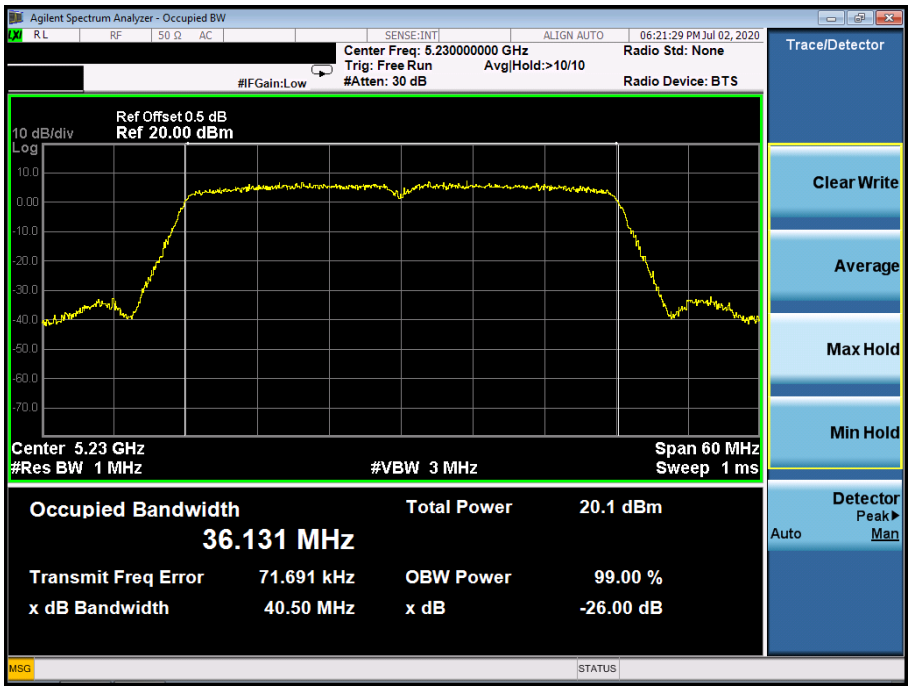
Mode	ANT	bandwidth(MHz)	Frequency (MHz)	Frequency (MHz)	Limit MHz	Result
			5190	5230		
HT40	A	99%	36.018	36.131	N/A	Pass
		26dB	40.53	40.50	N/A	Pass
	B	99%	36.011	36.128	N/A	Pass
		26dB	40.19	40.62	N/A	Pass
	C	99%	36.001	36.107	N/A	Pass
		26dB	40.24	40.33	N/A	Pass
	D	99%	35.987	36.073	N/A	Pass
		26dB	40.33	40.30	N/A	Pass

Test plot

HT40 26dB&99%Bandwidth plot on channel 1



OHT40 26dB&99%Bandwidth plot on channel 2



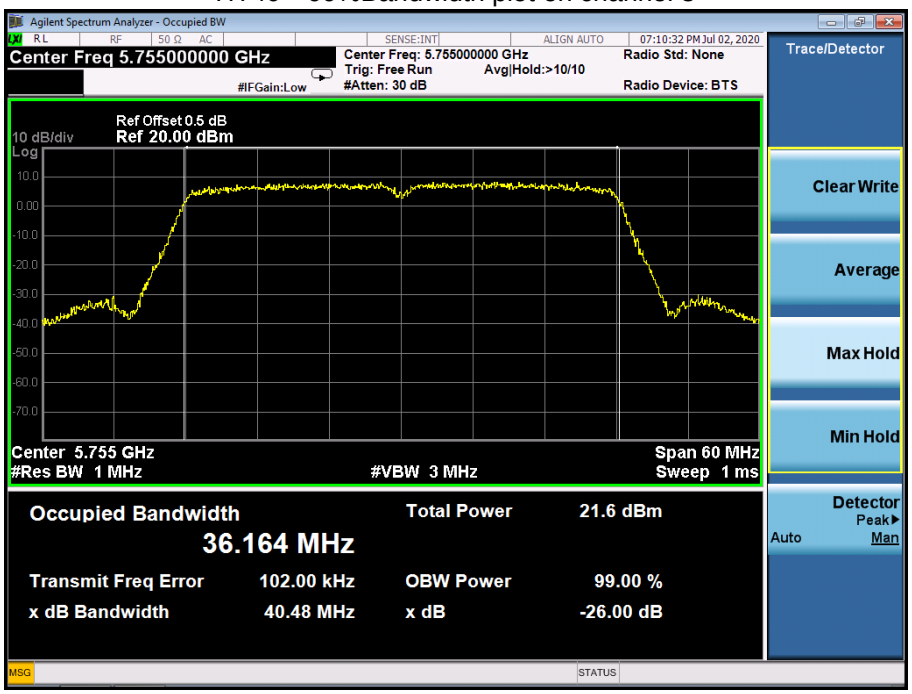
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX Frequency HT40 (5755-5795MHz)		

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

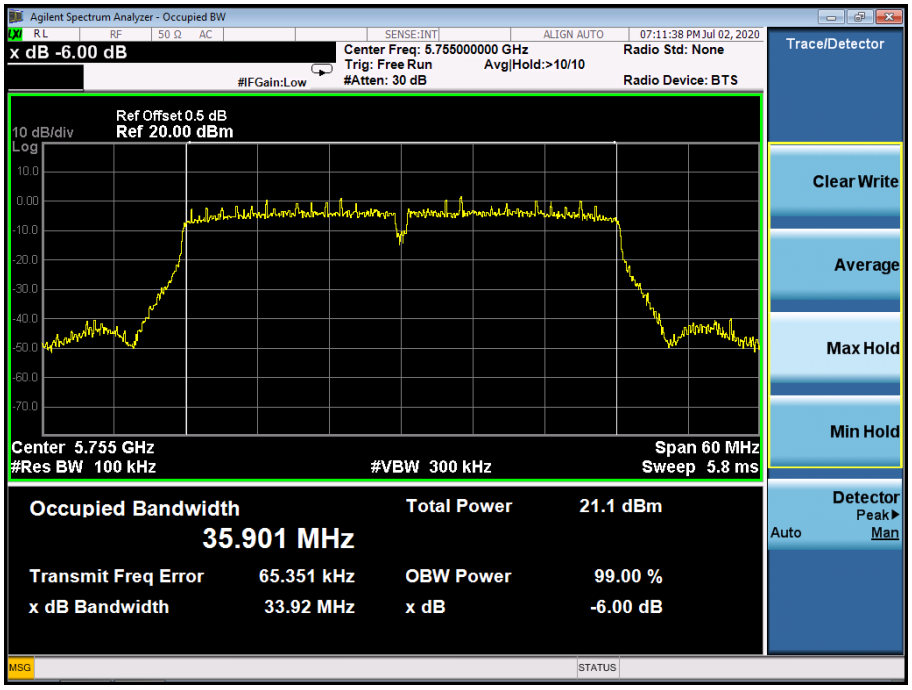
Mode	ANT	bandwidth(MHz)	Frequency (MHz)	Frequency (MHz)	Limit kHz	Result
			5755	5795		
HT40	A	99%	36.164	36.082	≥500	Pass
		6dB	35.901	35.845	≥500	Pass
	B	99%	36.146	36.064	≥500	Pass
		6dB	35.929	35.845	≥500	Pass
	C	99%	36.104	36.043	≥500	Pass
		6dB	35.937	35.831	≥500	Pass
	D	99%	36.104	36.057	≥500	Pass
		6dB	35.930	35.846	≥500	Pass

Test plot

HT40 99%Bandwidth plot on channel 3

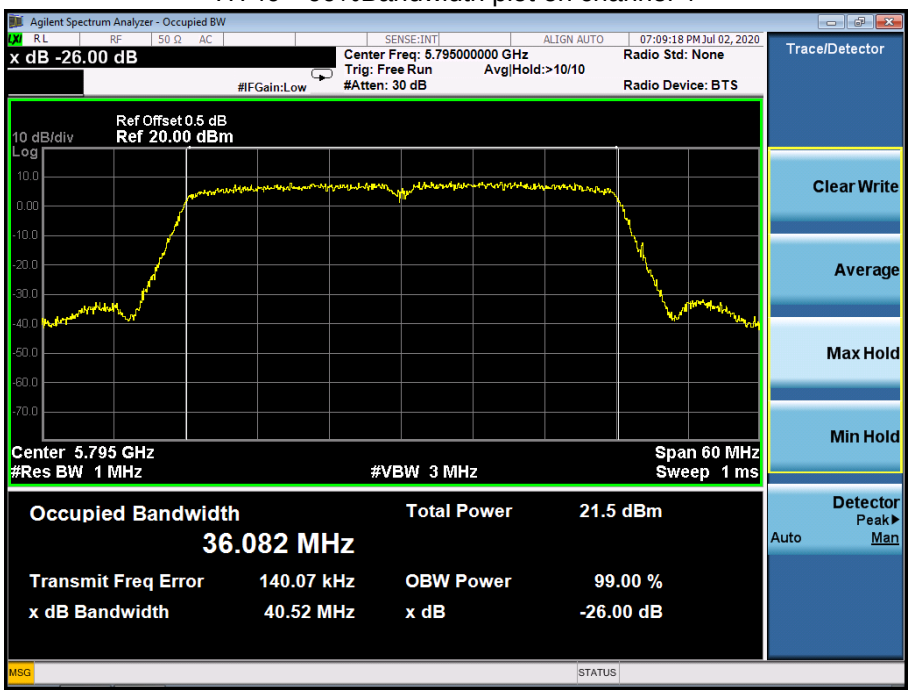


HT40 6dB Bandwidth plot on channel 3

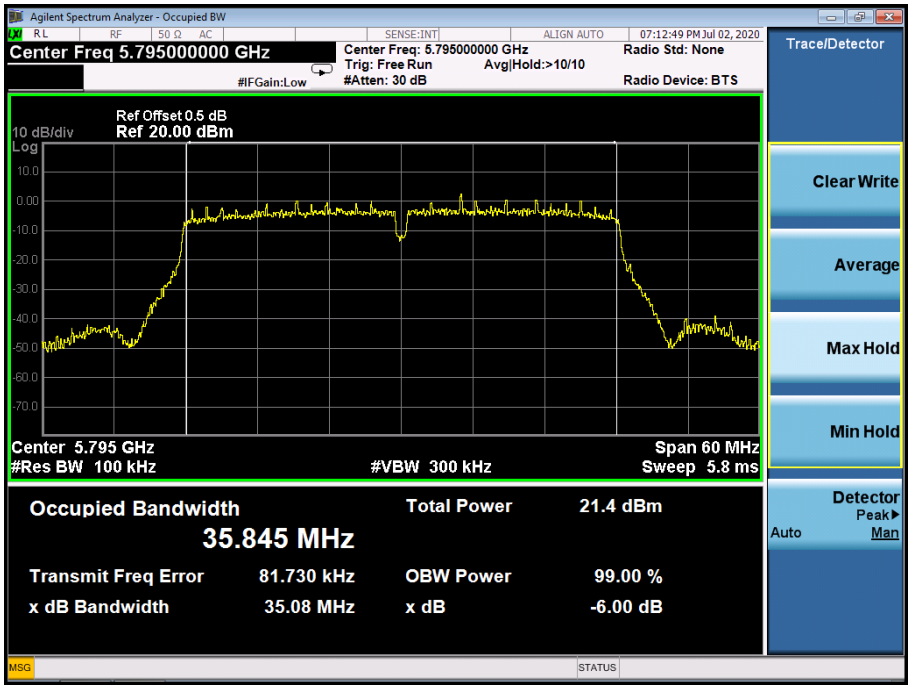


Test plot

HT40 99%Bandwidth plot on channel 4



HT40 6dB Bandwidth plot on channel 4



6. MAXIMUM CONDUCTED OUTPUT POWER

6.1 PPLIED PROCEDURES / LIMIT

According to FCC §15.407

The maximum conduced output power should not exceed:

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

6.2 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".

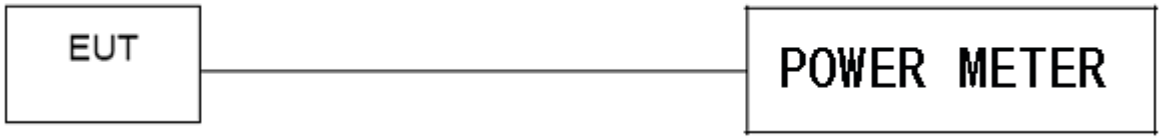
(viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

(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

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

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX (5G) Mode Frequency HT40 (5190-5230MHz)		

Mode	Frequency	Maximum output power. Antenna port (AV)					Limit (dBm)	Result
		ANT A (dBm)	ANTB (dBm)	ANT C (dBm)	ANT D (dBm)	Total (dBm)		
HT40	5190 MHz	14.754	14.574	14.233	14.618	20.57	30	PASS
	5230 MHz	13.105	13.373	13.558	13.561	19.42	30	PASS

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX (5G) Mode Frequency HT40 (5755-5795MHz)		

Mode	Frequency	Maximum output power. Antenna port (AV)					Limit (dBm)	Result
		ANT A (dBm)	ANTB (dBm)	ANT C (dBm)	ANT D (dBm)	Total (dBm)		
HT40	5755 MHz	14.281	14.388	14.468	14.316	20.38	30	PASS
	5795 MHz	14.428	14.525	14.318	14.213	20.39	30	PASS

7. OUT OF BAND EMISSIONS

7.1 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) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

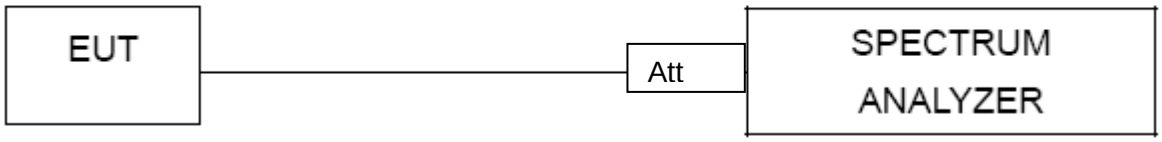
7.2 TEST PROCEDURE

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.

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

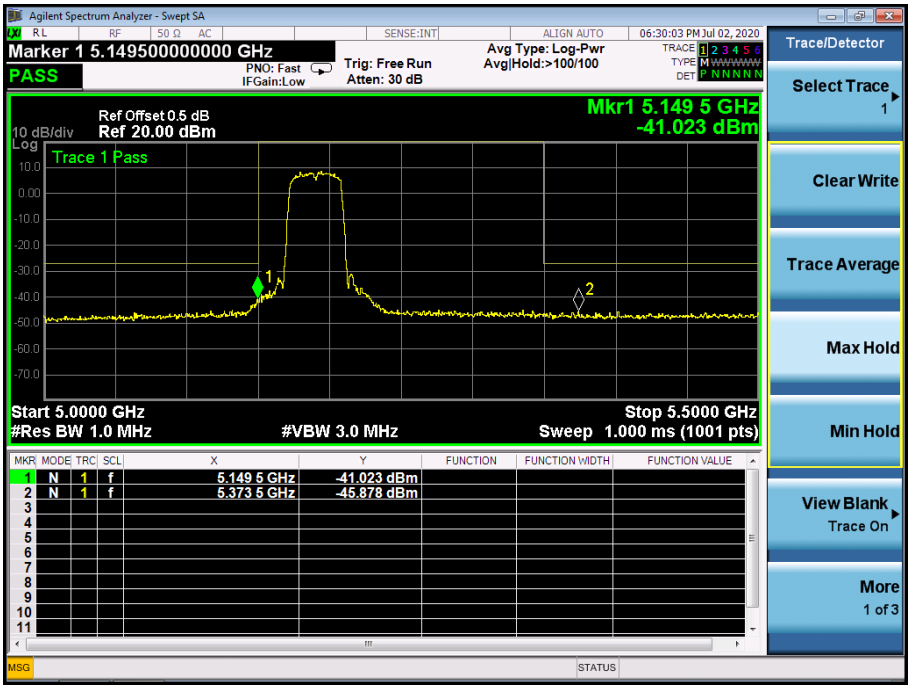
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz

Note: A(B,C,D) Represent the value of antenna A, B,C,D, The worst data is Antenna A ,only shown Antenna A . Plot. Antenna A: 5190-5230MHz

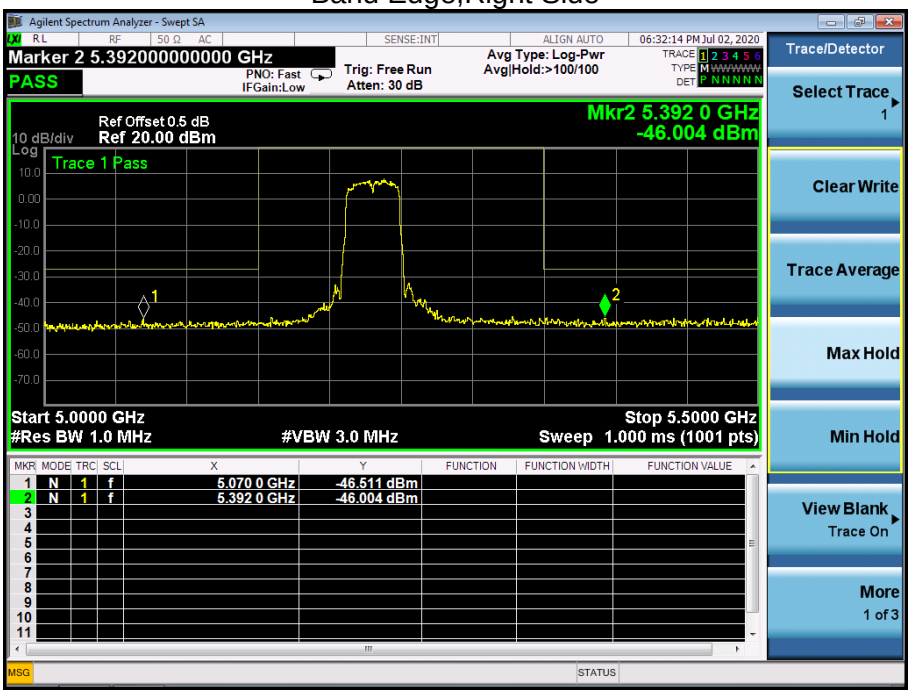
5.2G

5.190~5.230 GHz

Band Edge, Left Side

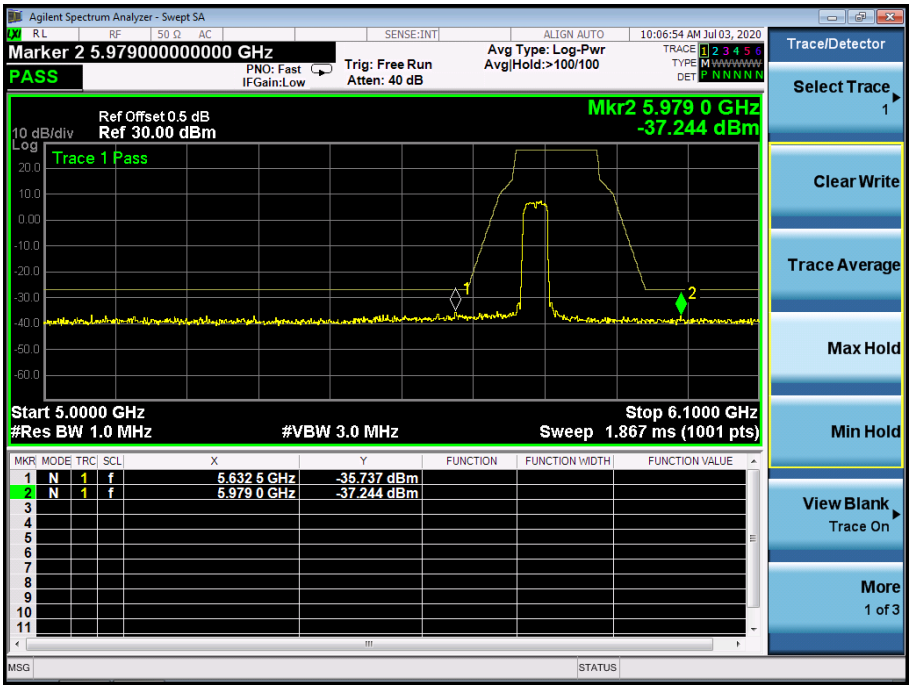


Band Edge,Right Side

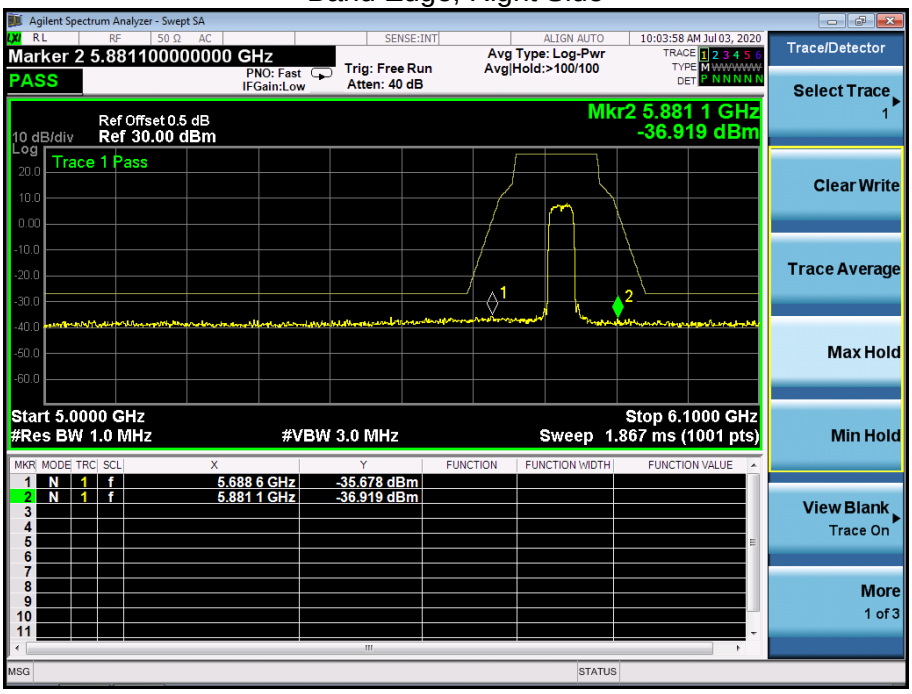


5.755~5.795 GHz

Band Edge, Left Side



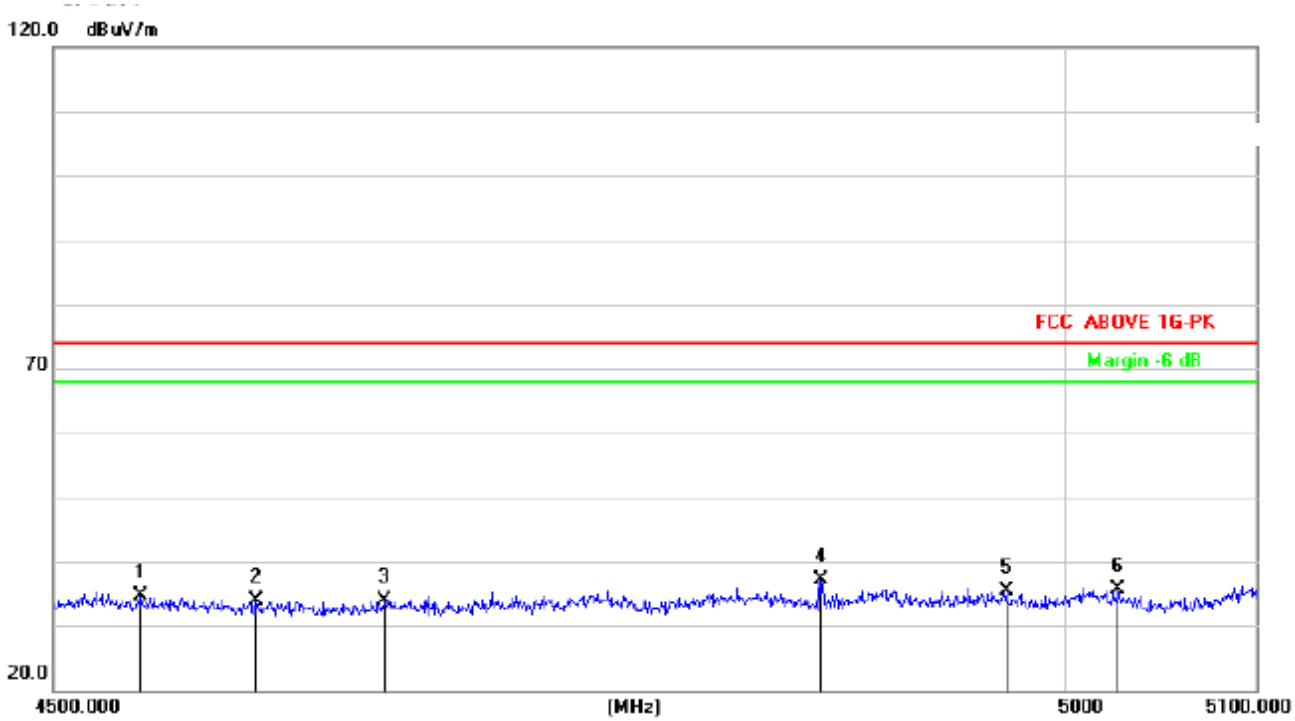
Band Edge, Right Side



For the frequency band 5190-5230MHz

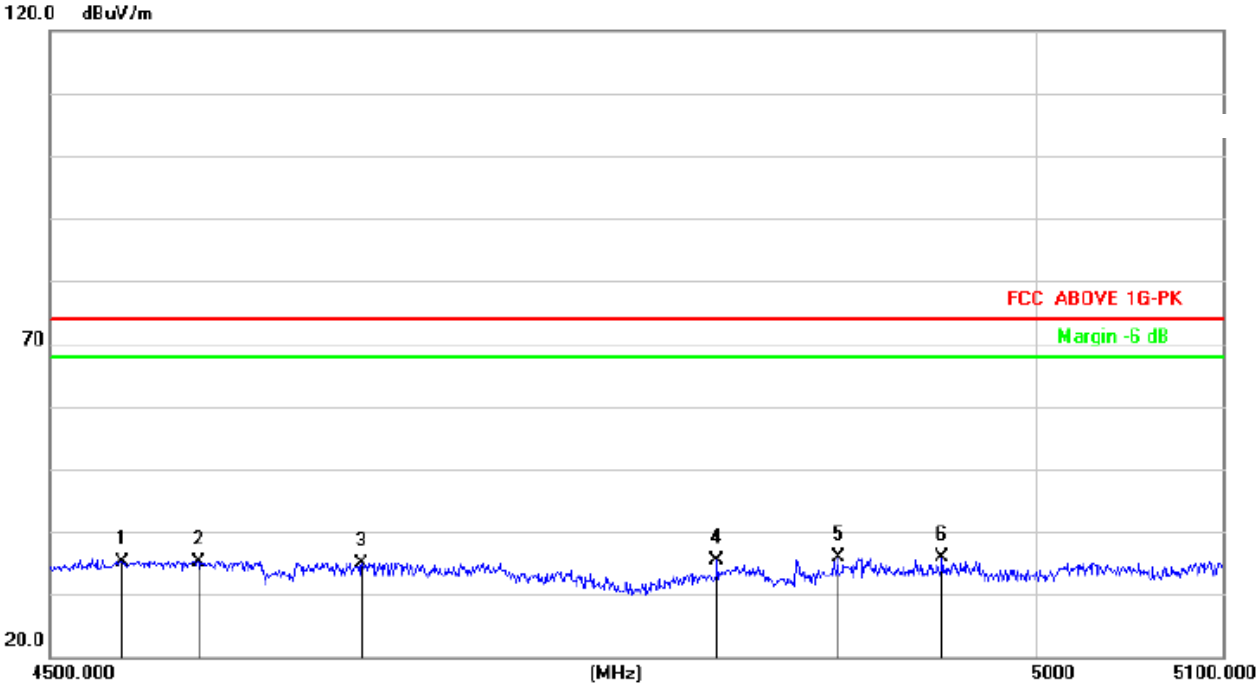
Radiated bandedge

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Horizontal
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2



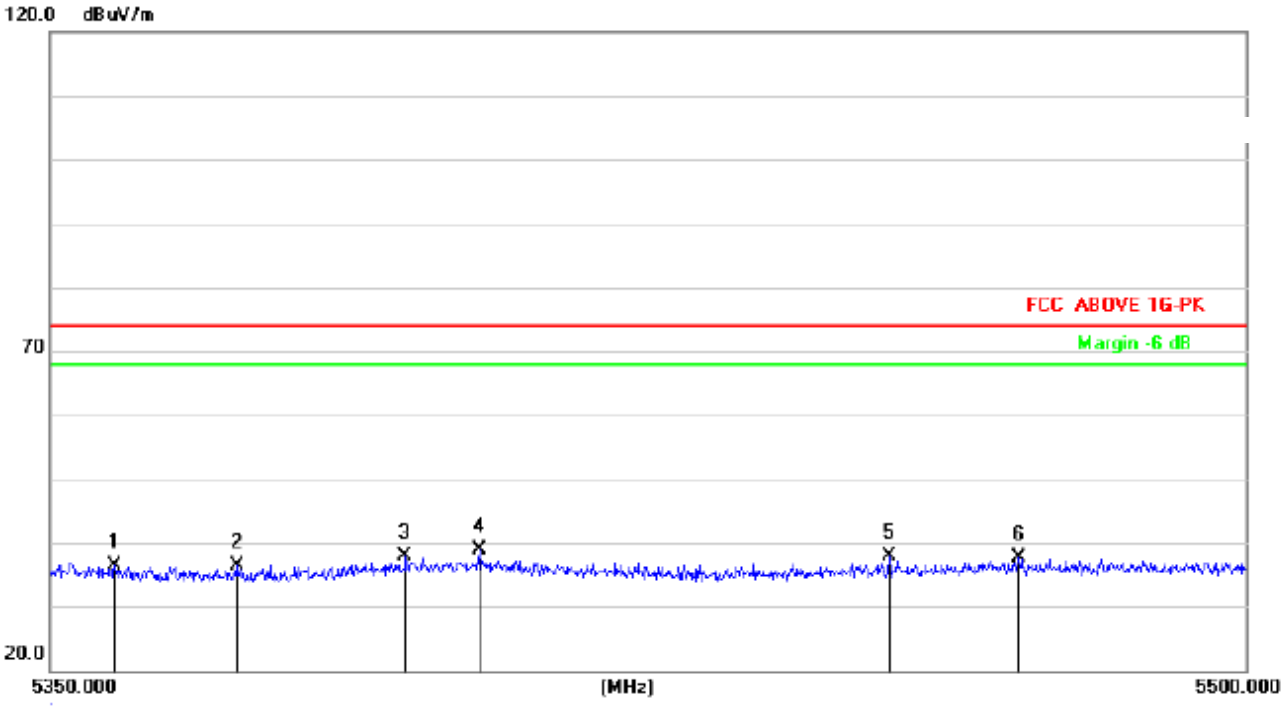
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		4541.400	35.14	-0.62	34.52	74.00	-39.48	peak			
2		4596.600	34.52	-0.58	33.94	74.00	-40.06	peak			
3		4657.800	34.52	-0.54	33.98	74.00	-40.02	peak			
4	*	4874.400	37.58	-0.38	37.20	74.00	-36.80	peak			
5		4969.200	35.78	-0.31	35.47	74.00	-38.53	peak			
6		5027.400	35.92	-0.17	35.75	74.00	-38.25	peak			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2



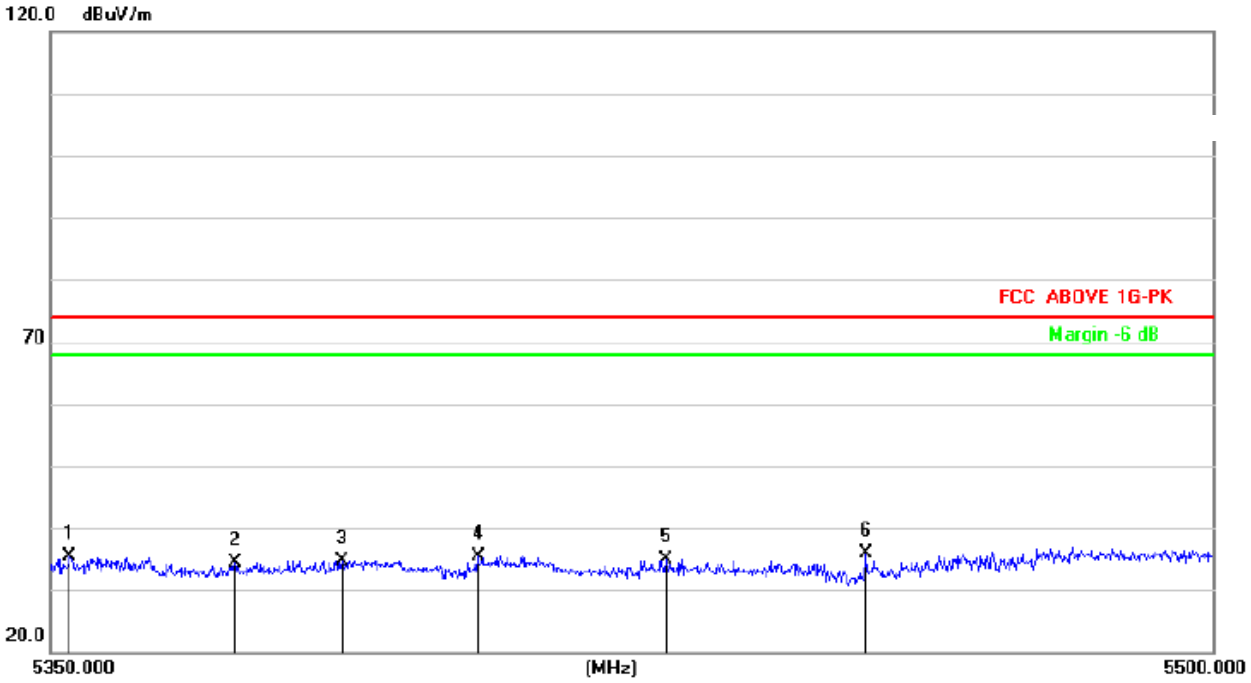
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		4535.400	35.81	-0.62	35.19	74.00	-38.81	peak			
2		4572.600	35.78	-0.60	35.18	74.00	-38.82	peak			
3		4652.400	35.49	-0.54	34.95	74.00	-39.05	peak			
4		4832.400	35.89	-0.41	35.48	74.00	-38.52	peak			
5	*	4895.400	36.35	-0.37	35.98	74.00	-38.02	peak			
6		4950.000	36.10	-0.33	35.77	74.00	-38.23	peak			

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 2



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		5358.100	35.17	1.23	36.40	74.00	-37.60	peak			
2		5373.250	35.07	1.30	36.37	74.00	-37.63	peak			
3		5394.250	36.40	1.39	37.79	74.00	-36.21	peak			
4	*	5403.400	37.41	1.42	38.83	74.00	-35.17	peak			
5		5455.000	36.30	1.64	37.94	74.00	-36.06	peak			
6		5471.200	35.81	1.71	37.52	68.20	-30.68	peak			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2

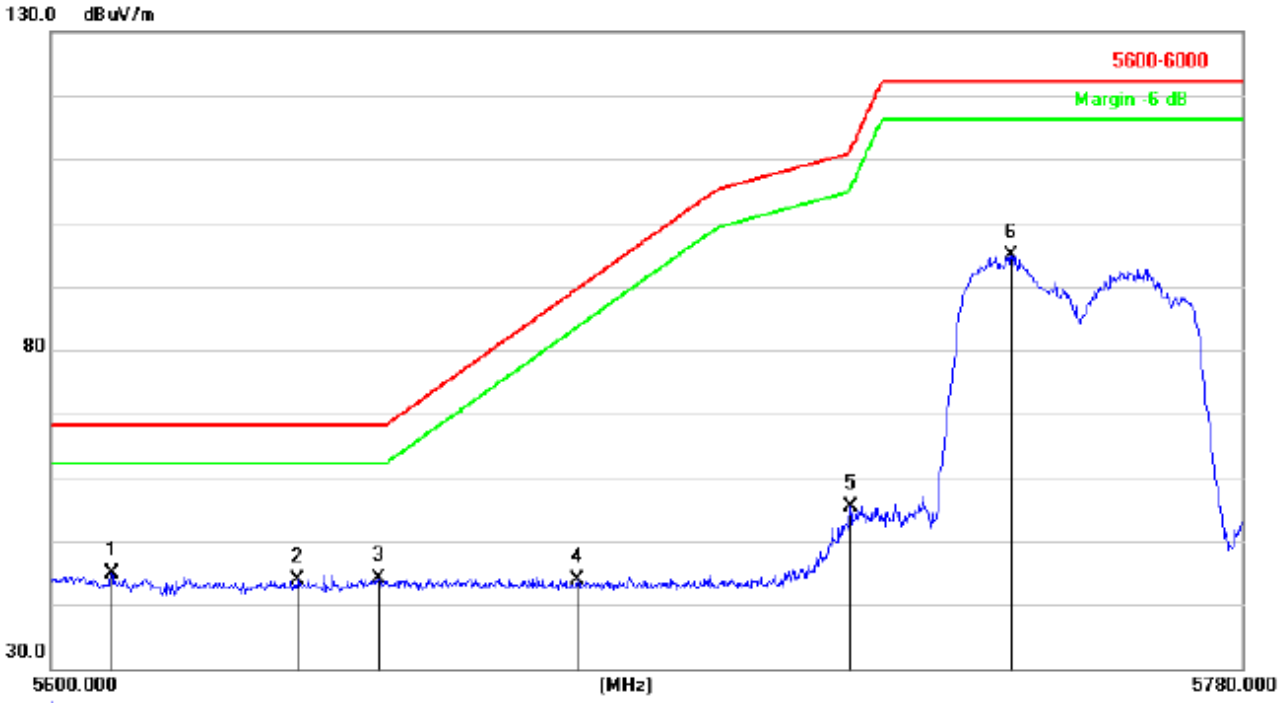


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		5352.550	34.20	1.21	35.41	74.00	-38.59	peak			
2		5373.700	33.17	1.30	34.47	74.00	-39.53	peak			
3		5387.350	33.32	1.36	34.68	74.00	-39.32	peak			
4		5404.750	33.88	1.43	35.31	74.00	-38.69	peak			
5		5429.050	33.45	1.53	34.98	74.00	-39.02	peak			
6	*	5455.000	34.30	1.64	35.94	74.00	-38.06	peak			

For the frequency band 5755-5795MHz

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Horizontal
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2

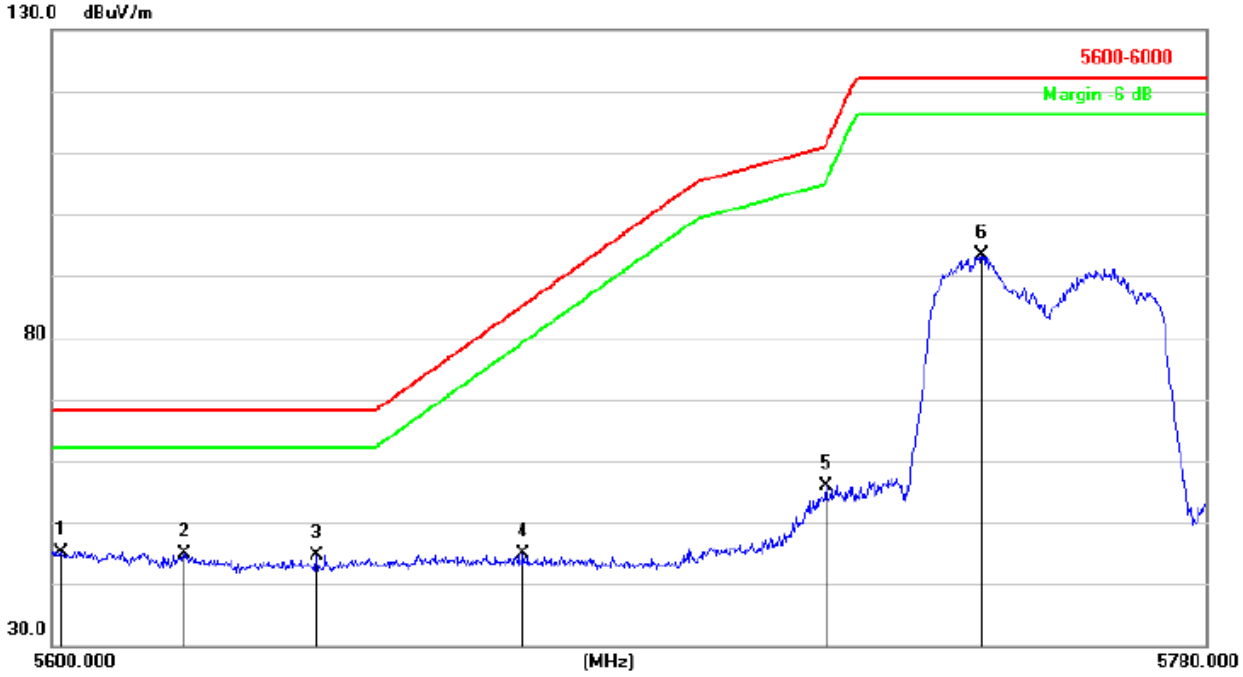
Low Channel



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	*	5609.180	42.65	2.30	44.95	68.20	-23.25	peak			
2		5636.900	41.44	2.42	43.86	68.20	-24.34	peak			
3		5648.960	41.55	2.47	44.02	68.20	-24.18	peak			
4		5679.020	41.17	2.60	43.77	89.71	-45.94	peak			
5		5720.240	52.72	2.77	55.49	111.3	-55.86	peak			
6		5744.720	91.93	2.88	94.81	122.2	-27.39	peak			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2

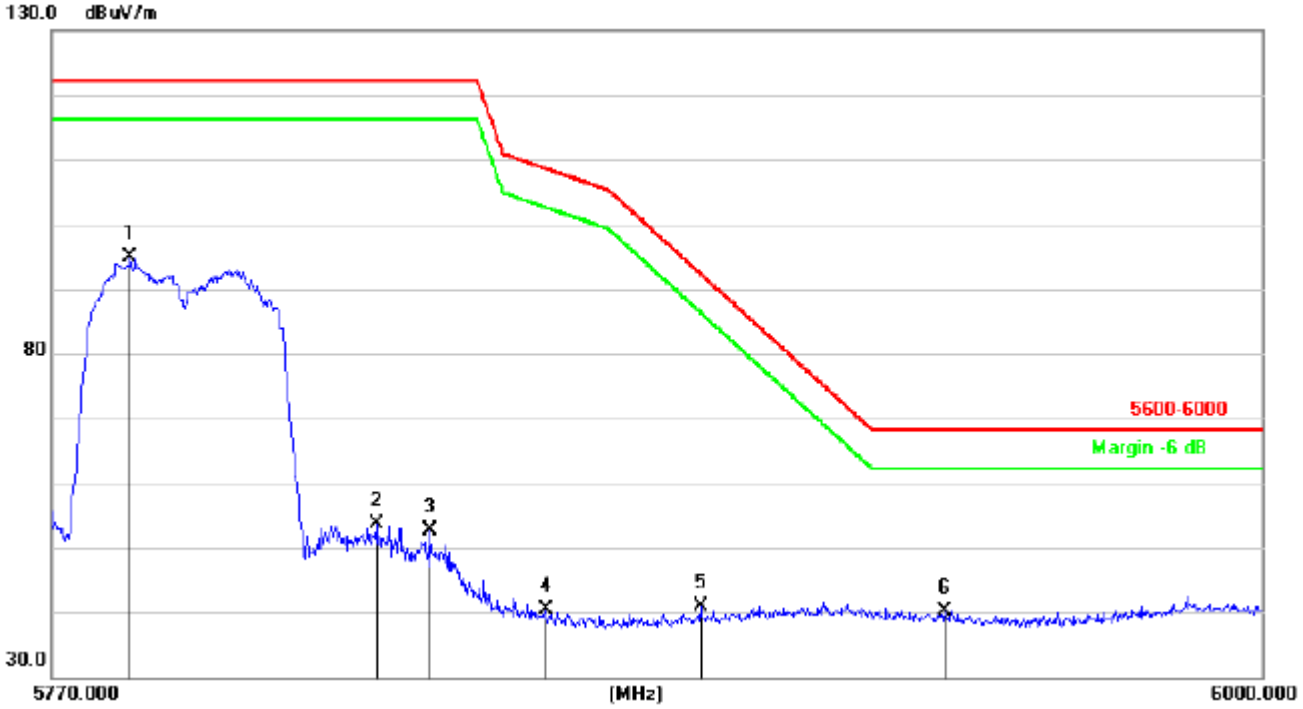
Low Channel



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	*	5601.440	42.98	2.27	45.25	68.20	-22.95	peak			
2		5620.520	42.59	2.35	44.94	68.20	-23.26	peak			
3		5641.040	42.14	2.43	44.57	68.20	-23.63	peak			
4		5673.080	42.20	2.57	44.77	85.32	-40.55	peak			
5		5720.240	53.22	2.77	55.99	111.30	-55.36	peak			
6		5744.720	90.43	2.88	93.31	122.00	-28.89	peak			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Horizontal
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2

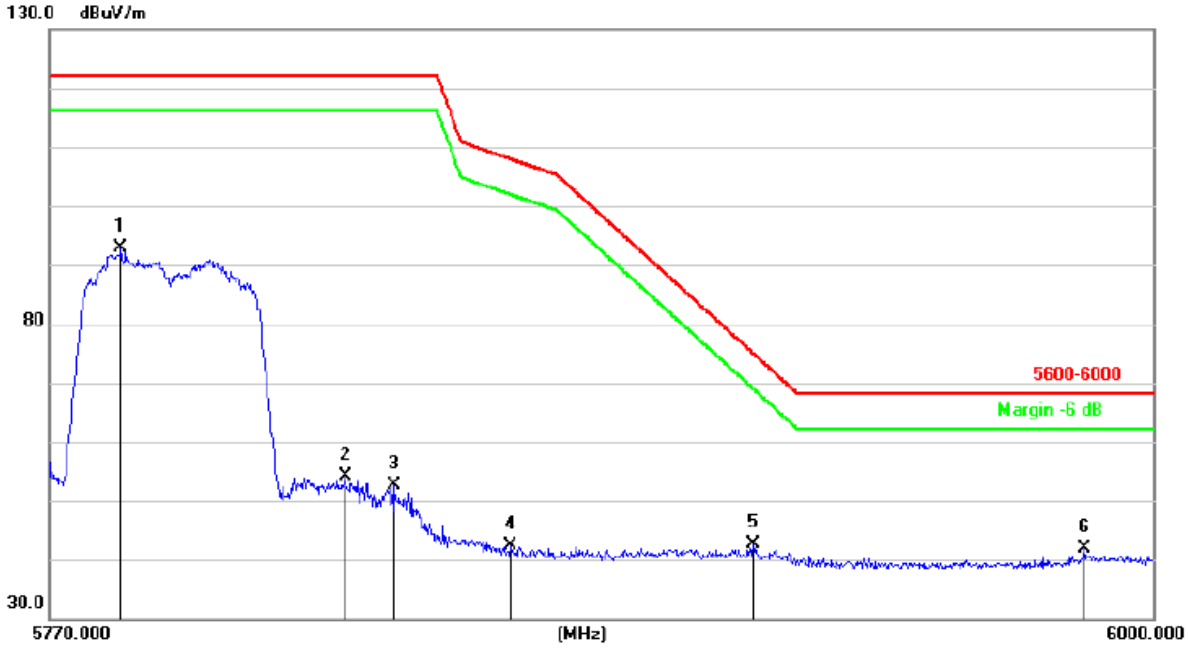
High Channel



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	*	5784.720	91.89	3.05	94.94	122.2	-27.26	peak			
2		5830.950	50.47	3.24	53.71	122.2	-68.49	peak			
3		5841.070	49.46	3.28	52.74	122.2	-69.46	peak			
4		5862.920	36.98	3.38	40.36	108.5	-68.22	peak			
5		5892.360	37.30	3.50	40.80	92.32	-51.52	peak			
6		5939.050	36.40	3.70	40.10	68.20	-28.10	peak			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz	Test Mode ：	Mode 2

High Channel



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		5784.720	89.89	3.05	92.94	122.2	-29.26	peak			
2		5830.950	50.97	3.24	54.21	122.2	-67.99	peak			
3		5841.070	49.46	3.28	52.74	122.2	-69.46	peak			
4		5865.220	38.91	3.39	42.30	107.9	-65.64	peak			
5		5915.820	39.04	3.60	42.64	74.97	-32.33	peak			
6	*	5985.510	38.03	3.90	41.93	68.20	-26.27	peak			

8.SPURIOUS RF CONDUCTED EMISSIONS

8.1CONFORMANCE LIMIT

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(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

8.2MEASURING INSTRUMENTS

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

8.3TEST SETUP

Please refer to Section 6.1 of this test report.

8.4TEST 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.

8.5TEST RESULTS

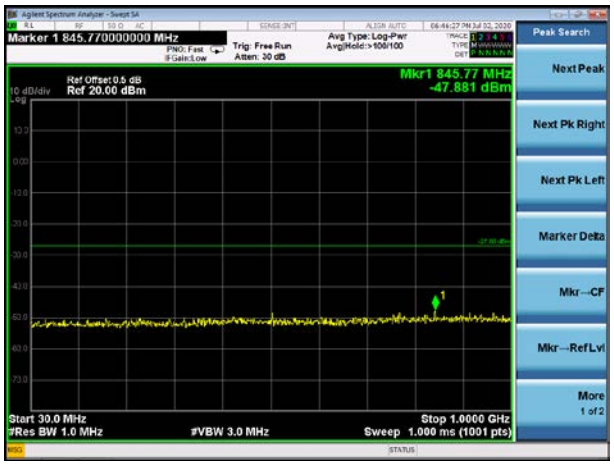
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

About:26.5GHz-40GHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

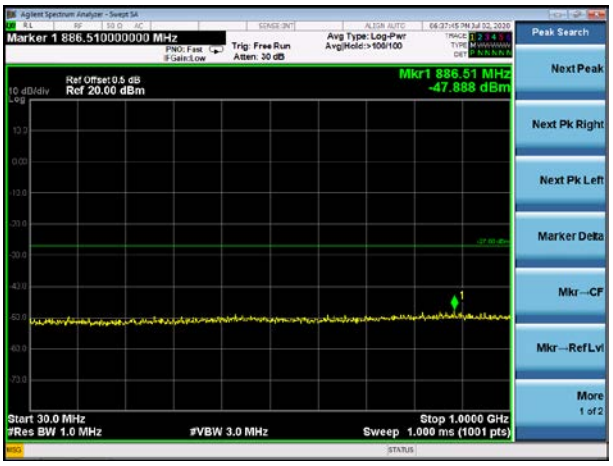
Note: Represent the value of antenna A and B,C,D, The worst data is Antenna B ,only shown Antenna B Plot.

Test Plot

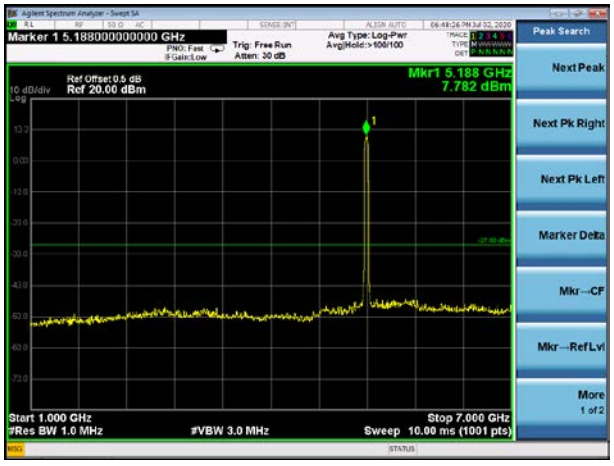
HT40 on 5190 (ANTB)



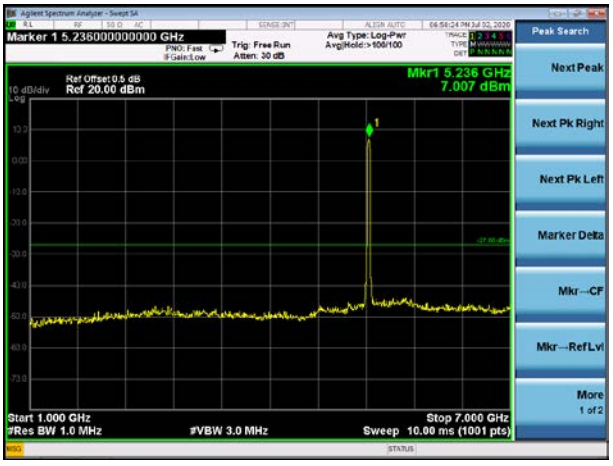
HT40 on 5230 (ANTB)



HT40 on 5190 (ANTB)



HT40 on 5230 (ANTB)

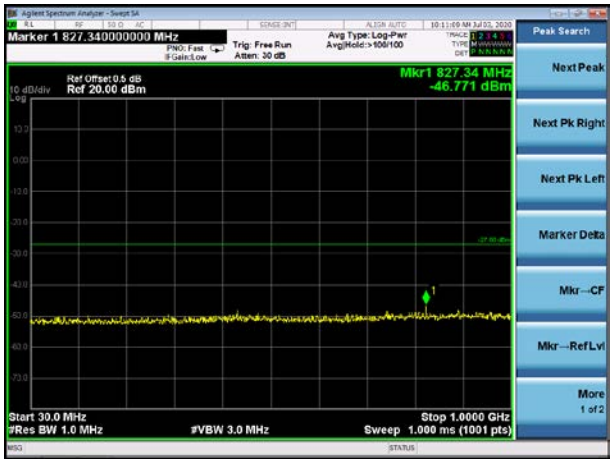


HT40 on 5190 (ANTB)

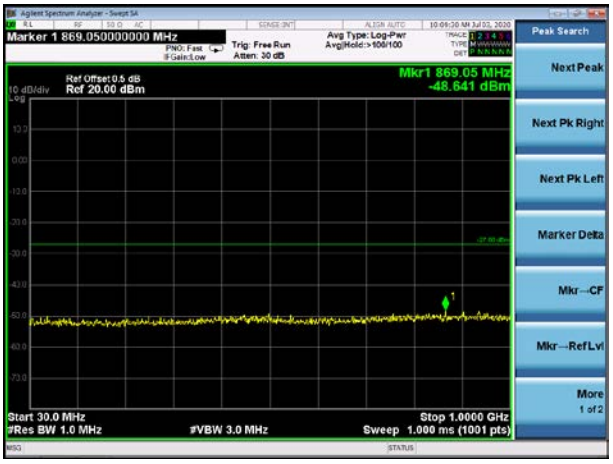
HT40 on 5230 (ANTB)

Test Plot

HT40 on 5755 (ANTB)



HT40 on 5795 (ANTB)



HT40 on 5755 (ANTB)

HT40 on 5795 (ANTB)

HT40 on 5755 (ANTB)

HT40 on 5795 (ANTB)

9. Frequency Stability Measurement

9.1 LIMIT

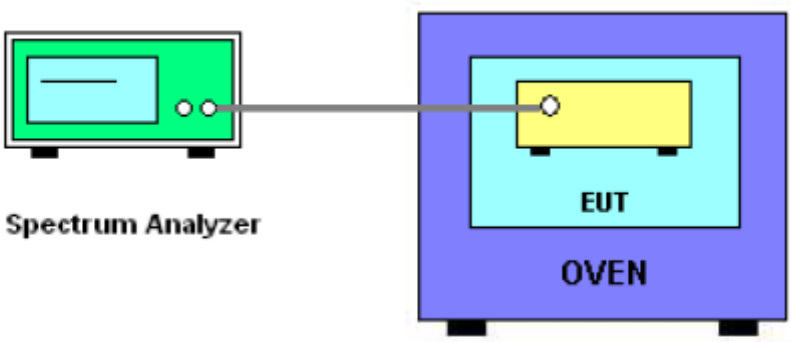
Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

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

9.2 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.

9.3 TEST SETUP LAYOUT



9.4 EUT OPERATION DURING TEST

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

9.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Frequency HT40 (5190-5230MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5190MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.70	5190.0535	5190	0.0535	10.3083
		V max (V)	4.26	5190.0365	5190	0.0365	7.0328
		V min (V)	3.15	5190.0285	5190	0.0285	5.4913
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5190MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.7	T (°C)	-20	5190.0055	5190	0.0055	1.0597
		T (°C)	-10	5190.0108	5190	0.0108	2.0809
		T (°C)	0	5190.0363	5190	0.0363	6.9942
		T (°C)	10	5190.0347	5190	0.0347	6.6859
		T (°C)	20	5190.0292	5190	0.0292	5.6262
		T (°C)	30	5190.0218	5190	0.0218	4.2004
		T (°C)	40	5190.0123	5190	0.0123	2.3699
		T (°C)	50	5190.0097	5190	0.0097	1.8690
		T (°C)	60	5190.0415	5190	0.0415	7.9961
		T (°C)	70	5190.0698	5190	0.0698	13.4489
Limits				5150-5250 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5230MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.70	5230.0252	5230	0.0252	4.8184
		V max (V)	4.26	5230.0424	5230	0.0424	8.1071
		V min (V)	3.15	5230.0693	5230	0.0693	13.2505
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5230MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.7	T (°C)	-20	5230.0632	5230	0.0632	12.0841
		T (°C)	-10	5230.0528	5230	0.0528	10.0956
		T (°C)	0	5230.0434	5230	0.0434	8.2983
		T (°C)	10	5230.0527	5230	0.0527	10.0765
		T (°C)	20	5230.0633	5230	0.0633	12.1033
		T (°C)	30	5230.0127	5230	0.0127	2.4283
		T (°C)	40	5230.0736	5230	0.0736	14.0727
		T (°C)	50	5230.0417	5230	0.0417	7.9732
		T (°C)	60	5230.0329	5230	0.0329	6.2906
		T (°C)	70	5230.0424	5230	0.0424	8.1071
Limits				5150-5250 MHz			
Result				Complies			

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	AC 120V/60Hz
Hzst Mode ：	TX Frequency(5755-5795MHz)		

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5755MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (° C)	20	V nom (V)	3.70	5755.01014	5755	0.01014	1.7626
		V max (V)	4.26	5755.00717	5755	0.00717	1.2453
		V min (V)	3.15	5755.00207	5755	0.00207	0.3593
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5755MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.7	T (°C)	-20	5755.00889	5755	0.00889	1.5454
		T (°C)	-10	5755.00561	5755	0.00561	0.9752
		T (°C)	0	5755.00829	5755	0.00829	1.4410
		T (°C)	10	5755.00098	5755	0.00098	0.1696
		T (°C)	20	5755.00569	5755	0.00569	0.9889
		T (°C)	30	5755.00221	5755	0.00221	0.3848
		T (°C)	40	5755.00191	5755	0.00191	0.3321
		T (°C)	50	5755.00450	5755	0.00450	0.7822
		T (°C)	60	5755.00725	5755	0.00725	1.2604
		T (°C)	70	5755.00518	5755	0.00518	0.8998
Limits				5725-5850 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5795MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.70	5795.00204	5795	0.00204	0.3524
		V max (V)	4.26	5795.01105	5795	0.01105	1.9074
		V min (V)	3.15	5795.00400	5795	0.00400	0.6897
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency：5795MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.7	T (°C)	-20	5795.01299	5795	0.01299	2.2417
		T (°C)	-10	5795.00341	5795	0.00341	0.5887
		T (°C)	0	5795.00413	5795	0.00413	0.7135
		T (°C)	10	5795.00799	5795	0.00799	1.3789
		T (°C)	20	5795.00207	5795	0.00207	0.3569
		T (°C)	30	5795.00477	5795	0.00477	0.8234
		T (°C)	40	5795.01118	5795	0.01118	1.9296
		T (°C)	50	5795.00070	5795	0.00070	0.1215
		T (°C)	60	5795.01285	5795	0.01285	2.2177
		T (°C)	70	5795.00176	5795	0.00176	0.3036
Limits				5725-5850 MHz			
Result				Complies			

10. ANTENNA REQUIREMENT

10.1 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.

10.2 EUT ANTENNA

The EUT antenna is External antenna (antenna gain (A): 5dBi; antenna gain (B) : 5dBi, antenna gain (C): 5dBi; antenna gain (D) :5dBi). It comply with the standard requirement.

11. EUT TEST PHOTO

Conducted Measurement Photos

Radiated Measurement Photos


倍测检测
BCTC TEST

12. EUT PHOTO

S※※※※ END OF REPORT ※※※※※

i