FCC TEST REPORT
FCC ID:2A5NM-X38

Report Number	ZKT-230626L4812E
Date of Test	Jun. 18, 2023 to Jun. 29, 2023
Date of issue	Jun. 29, 2023
Total number of pages	65
Test Result	PASS
Testing Laboratory	Shenzhen ZKT Technology Co., Ltd.
Address	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name	CHENGHAI LISHI PLASTIC TOYS FACTORY
Address	HONGCHI DONGHU INDUSTRIAL ZONE, FENGXIANG CHENGHAI DISTRICT SHANTOU CITY, GUANGDONG, CHINA
Manufacturer's name	CHENGHAI LISHI PLASTIC TOYS FACTORY
Address	HONGCHI DONGHU INDUSTRIAL ZONE, FENGXIANG CHENGHAI DISTRICT SHANTOU CITY, GUANGDONG, CHINA
Test specification:	
Standard	FCC CFR Title 47 Part 15 Subpart E Section 15.407 ANSI C63.10:2013 KDB 789033 D02 v01r02
Test procedure	/
Non-standard test method	N/A
Test Report Form No.	TRF-EL-113_V0
Test Report Form(s) Originator	ZKT Testing
Master TRF	Dated: 2020-01-06

This device described above has been tested by ZKT, 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.
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Product name	**RC Quadcopter**
Trademark	N/A
Model/Type reference	X38, X39, X50, X55, X51, X52, X53, X56, X60, X66, L608, HK22, HK33, HK55, HK66
Ratings	Input: DC 5V DC 7.6V from battery

Testing procedure and testing location:

Testing Laboratory ..... :	Shenzhen ZKT Technology Co., Ltd.
Address ..... :	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Tested by (name + signature) ..... :	Jim Liu
Reviewer (name + signature)..... :	Tom Zou
Approved (name + signature) ..... :	Lake Xie

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1. VERSION

Report No.	Version	Description	Approved
ZKT-230626L4812E	Rev.01	Initial issue of report	Jun. 29, 2023

2.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)(9)	Spurious Radiated Emissions	PASS	
15.207	Conducted Emission	PASS	
15.407 (a)(12)	26 dB and 99% Emission Bandwidth	PASS	
15.407 (a)(1)	Maximum Conducted Output Power	PASS	
15.407 (a)(1)	Power Spectral Density	PASS	
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

2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.
Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225
Designation Number: CN1299
IC Registered No.: 27033
CAB identifier: CN0110

2.2 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(9KHz-30MHz)	U=4.5dB
2	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59℃

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Product Name:	RC Quadcopter	
Model No.:	X38, X39, X50, X55, X51, X52, X53, X56, X60, X66, L608, HK22, HK33, HK55, HK66	
Model Different.:	All the model are the same circuit and RF module, Only the model name and color are different.	
Sample ID	ZKT-230626L4812 -1	
Sample(s) Status:	Engineer sample	
Product Description	IEEE 802.11 WLAN Mode Supported	☒802.11a/ac/n (20MHz channel bandwidth) ☒802.11ac/n (40MHz channel bandwidth) ☒802.11ac(80MHz channel bandwidth)
	Data Rate	802.11a 802.11/ac/n(HT20/HT40):MCS0-MCS15; 802.11ac(VHT80):NSS1, MCS0-MCS9
	Modulation	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n/ac;
	Operating Frequency Range	☒5180-5240MHz for 802.11a/ac/n(HT20); 5190-5230MHz for 802.11ac/n(HT40); 5210MHz for 802.11 ac80;
	Number of Channels	☒4 channels for 802.11a/ac/n20 in the 5180-5240MHz band ; 2 channels for 802.11 ac/n40 in the 5190-5230 MHz band ; 1 channels for 802.11 ac80 in the 5210MHz band ;
Channel List	Please refer to the Note 2.	
Antenna Type:	Brass tube antenna	
Antenna gain:	The 5G WIFI 802.11a, working in SISO model, then the antenna gain as below: 802.11a: Brass tube antenna 1: 2.71dBi 802.11a: Brass tube antenna 2: 2.66dBi	
	The 5G WIFI 802.11n20, 802.11n40 802.11ac20 802.11ac40 802.11ac80 can MIMO model, then the antenna gain as below: Directional gain=2.71dBi+10×log(2/1)dB=5.72dBi < 6dBi	
Power supply:	INPUT: DC5V DC 7.6V from battery	

Note:

For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Nss=1, According to KDB 662911 D01 Multiple Transmitter Output v02r01.

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

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

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

3.2 DESCRIPTION OF TEST MODES

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the duty cycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Pretest Mode	Description
Mode 1	802.11a /ac / n 20 CH36/ CH40/ CH 48
Mode 2	802.11ac / n 40 CH38/ CH 46
Mode 3	802.11 ac80 CH 42
Mode 4	Link Mode

Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11a /ac / n 20 CH36/ CH40/ CH 48
Mode 2	802.11ac / n 40 CH38/ CH 46
Mode 3	802.11 ac80 CH 42

Note:

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

Test Software	SecureCRT
Power level setup	60

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission

AC Line — EUT

Radiated Emission

EUT

Conducted Spurious

EUT

3.4 DESCRIPTION OF SUPPORT UNITS

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	RC Quadcopter	N/A	X38	N/A	EUT
A-1	Adapter	BSY	BSY01J3050200U U	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note

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.

3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation emissions& Radio Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY55370835	A.17.05	Oct. 28, 2022	Oct. 27, 2023
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Oct. 28, 2022	Oct. 27, 2023
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	101169	4.32	Oct. 28, 2022	Oct. 27, 2023
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	N/A	N/A	Nov. 02, 2022	Nov. 01, 2023
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Nov. 01, 2022	Oct. 31, 2023
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Oct. 28, 2022	Oct. 27, 2023
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Nov. 01, 2022	Oct. 31, 2023
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	060747	N/A	Nov. 15, 2022	Nov. 14, 2023
9	Amplifier (1GHz-26.5GHz)	Agilent	8449B	3008A00315	N/A	Oct. 28, 2022	Oct. 27, 2023
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Oct. 28, 2022	Oct. 27, 2023
11	Test Cable	N/A	R-01	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
12	Test Cable	N/A	R-02	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
13	Test Cable	N/A	R-03	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
14	Test Cable	N/A	RF-01	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
15	Test Cable	N/A	RF-02	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
16	Test Cable	N/A	RF-03	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
17	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Oct. 21, 2022	Oct. 20, 2023
18	Signal Generator	Agilent	N5182A	N/A	A.01.87	Oct. 21, 2022	Oct. 20, 2023
19	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	N/A	Nov. 15, 2022	Nov. 14, 2023
20	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Oct. 28, 2022	Oct. 27, 2023
21	MWRF Power Meter Test system	MW	MW100-RF CB	N/A	N/A	Oct. 21, 2022	Oct. 20, 2023
22	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
23	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	N/A	\	\
24	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\
25	Turntable	MF	MF-7802BS	N/A	N/A	\	\
26	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

Conducted emissions Test

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	N/A	Oct. 21, 2022	Oct. 20, 2023
2	LISN	CYBERTEK	EM5040A	E1850400149	N/A	Oct. 21, 2022	Oct. 20, 2023
3	Test Cable	N/A	C-01	N/A	N/A	Oct. 21, 2022	Oct. 20, 2023
4	Test Cable	N/A	C-02	N/A	N/A	Oct. 21, 2022	Oct. 20, 2023
5	Test Cable	N/A	C-03	N/A	N/A	Oct. 21, 2022	Oct. 20, 2023
6	EMI Test Receiver	R&S	ESCI3	101393	4.42 SP3	Oct. 28, 2022	Oct. 27, 2023
7	Triple-Loop Antenna	N/A	RF300	N/A	N/A	Oct. 28, 2022	Oct. 27, 2023
8	Absorbing Clamp	DZ	ZN23201	15034	N/A	Oct. 31, 2022	Oct. 30, 2023
9	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\

4.EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

4.1.1 POWER LINE CONDUCTED EMISSION Limits

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

Note:

(1) *Decreases with the logarithm of the frequency.

4.1.2 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.

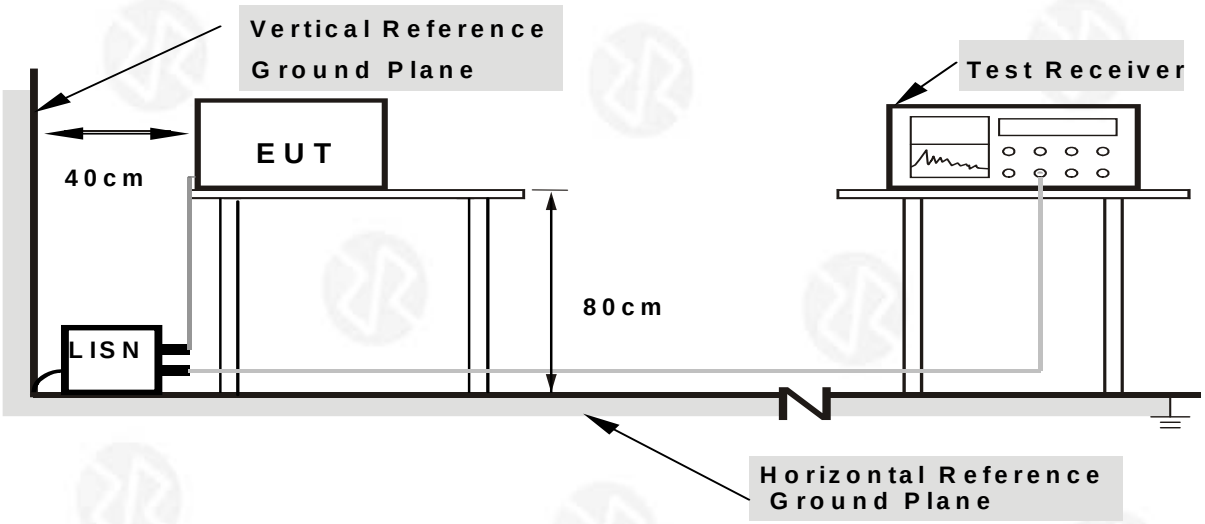
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 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

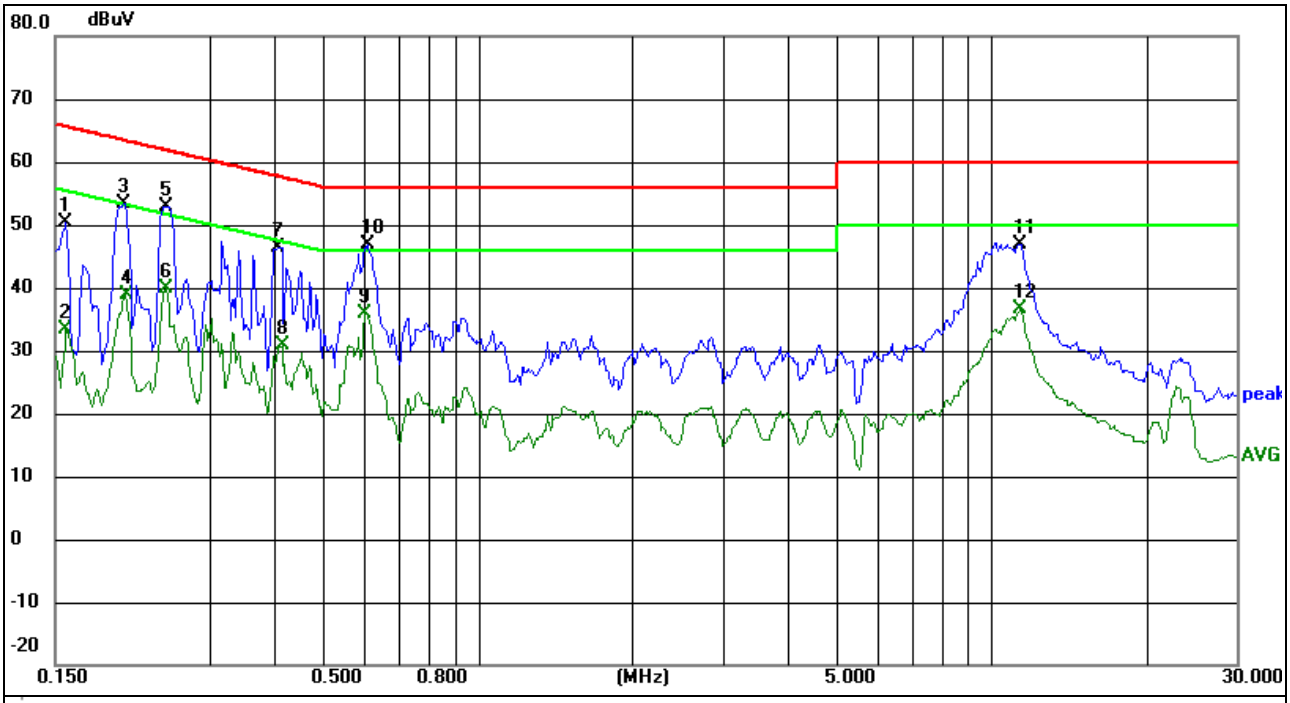
4.1.5 EUT OPERATING CONDITIONS

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 230V, the worst voltage was AC 120V and the data recording in the report.

4.1.6 TEST RESULT

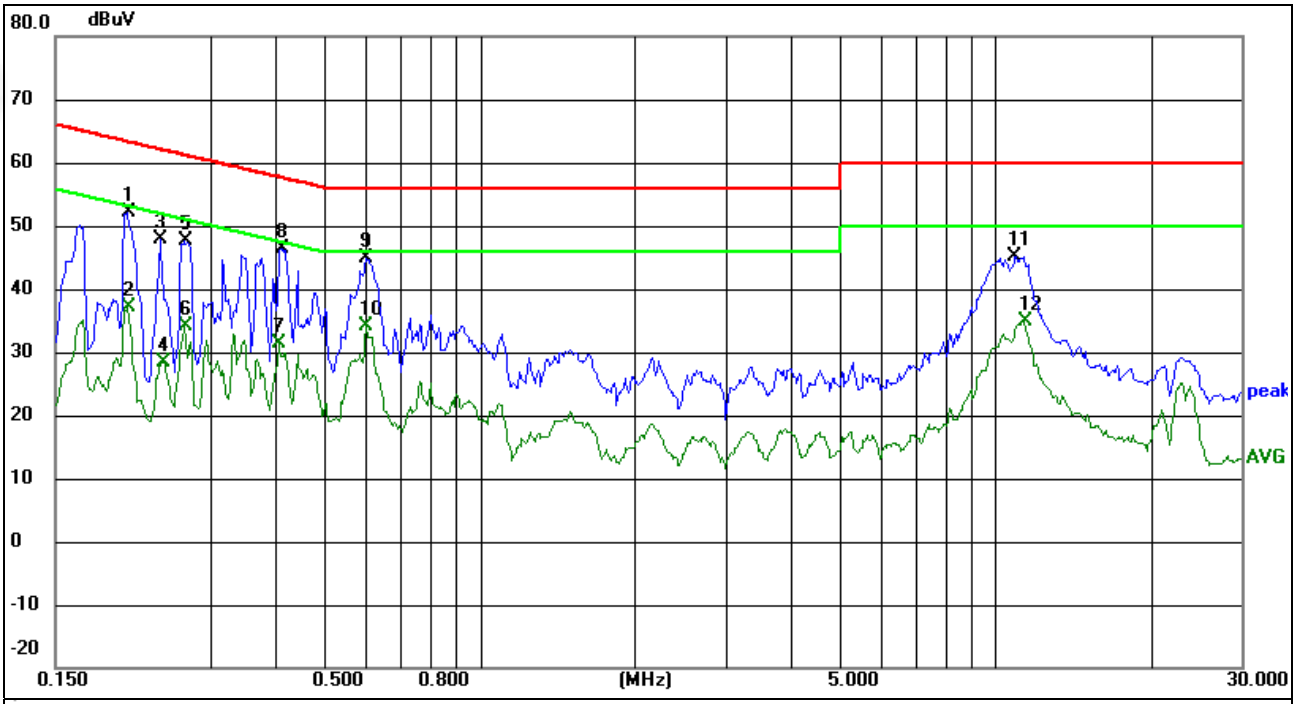
Temperature：	26℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	L
Test Voltage ：	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1577	40.56	9.78	50.34	65.58	-15.24	peak	P
2	0.1577	23.54	9.78	33.32	55.58	-22.26	AVG	P
3	0.2046	43.64	9.75	53.39	63.42	-10.03	peak	P
4	0.2050	29.06	9.75	38.81	53.41	-14.60	AVG	P
5 *	0.2474	43.23	9.75	52.98	61.84	-8.86	peak	P
6	0.2474	30.13	9.75	39.88	51.84	-11.96	AVG	P
7	0.4073	36.70	9.76	46.46	57.70	-11.24	peak	P
8	0.4152	21.09	9.76	30.85	47.54	-16.69	AVG	P
9	0.6023	26.15	9.77	35.92	46.00	-10.08	AVG	P
10	0.6101	37.10	9.78	46.88	56.00	-9.12	peak	P
11	11.4318	25.30	21.65	46.95	60.00	-13.05	peak	P
12	11.4318	14.90	21.65	36.55	50.00	-13.45	AVG	P

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

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



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2072	42.26	9.75	52.01	63.32	-11.31	peak	P
2	0.2072	27.39	9.75	37.14	53.32	-16.18	AVG	P
3	0.2396	38.10	9.75	47.85	62.11	-14.26	peak	P
4	0.2436	18.69	9.75	28.44	51.97	-23.53	AVG	P
5	0.2672	37.82	9.75	47.57	61.20	-13.63	peak	P
6	0.2672	24.28	9.75	34.03	51.20	-17.17	AVG	P
7	0.4073	21.65	9.76	31.41	47.70	-16.29	AVG	P
8	0.4126	36.59	9.76	46.35	57.60	-11.25	peak	P
9 *	0.6023	35.22	9.77	44.99	56.00	-11.01	peak	P
10	0.6023	24.46	9.77	34.23	46.00	-11.77	AVG	P
11	10.9365	24.00	21.14	45.14	60.00	-14.86	peak	P
12	11.3888	13.30	21.61	34.91	50.00	-15.09	AVG	P

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 APPLICABLE STANDARD

According to FCC Part 15.407(d) and 15.209

4.2.2 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			

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

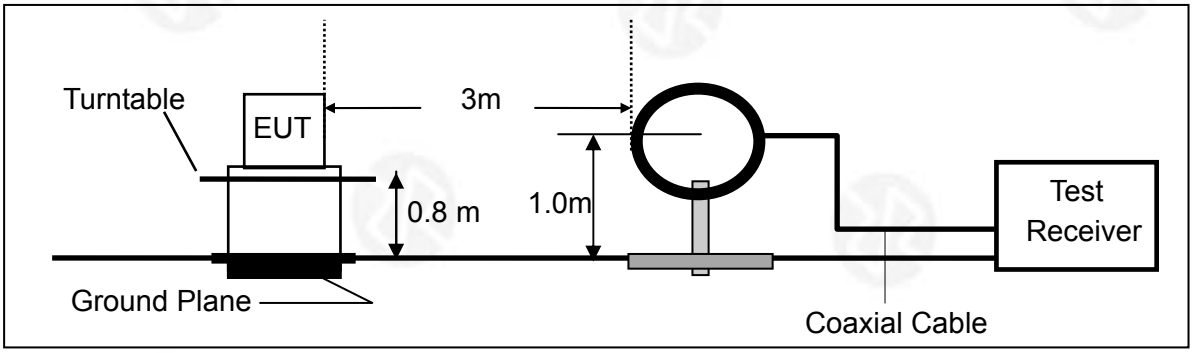
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

4.2.3 MEASURING INSTRUMENTS

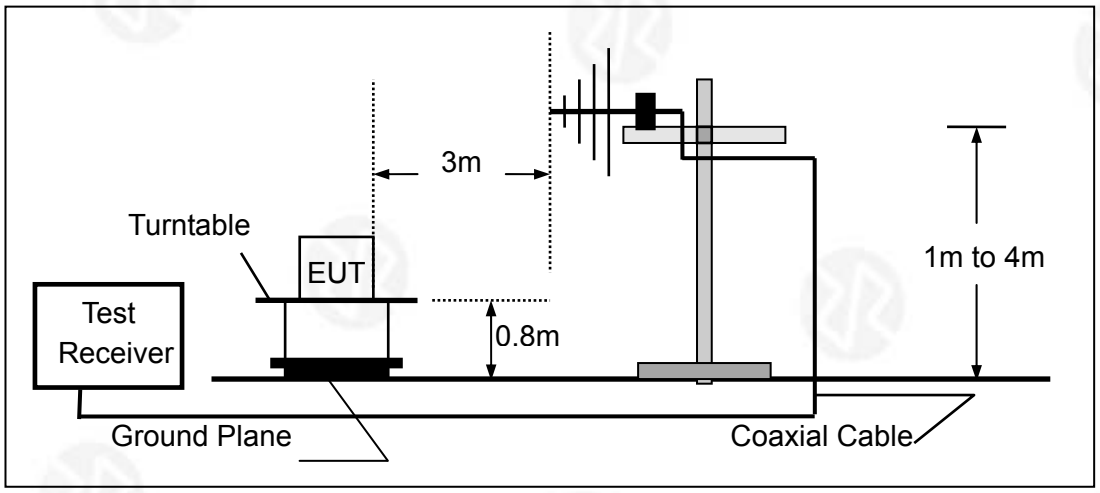
The Measuring equipment is listed in the section 6.3 of this test report.

4.2.4 TEST CONFIGURATION

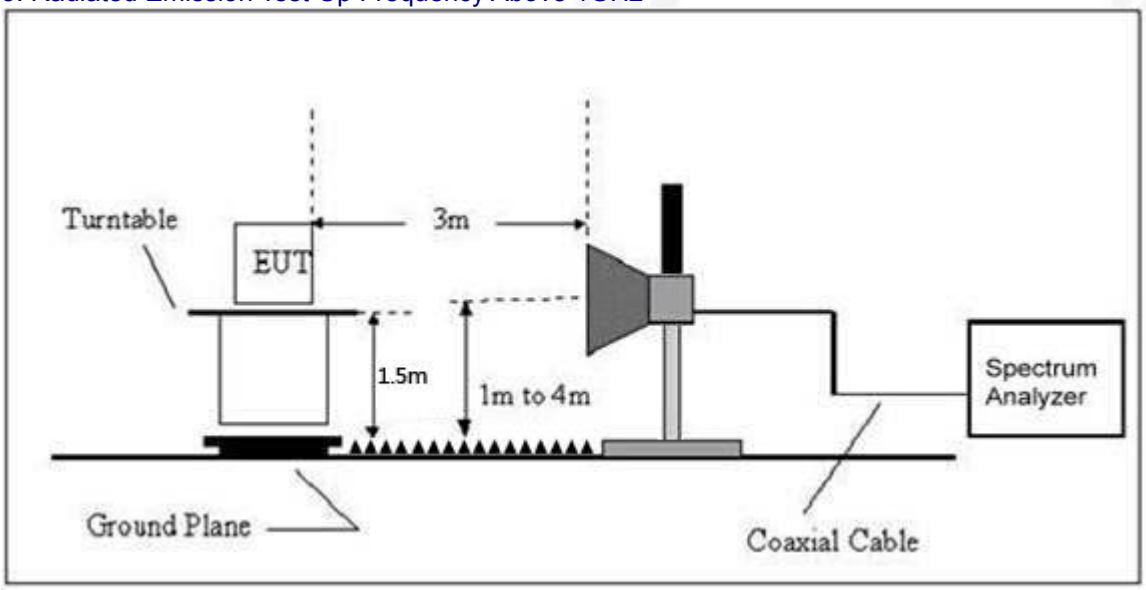
1.For radiated emissions below 30MHz



2.For radiated emissions from 30MHz to 1000MHz



3. Radiated Emission Test-Up Frequency Above 1GHz



4.2.5 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.

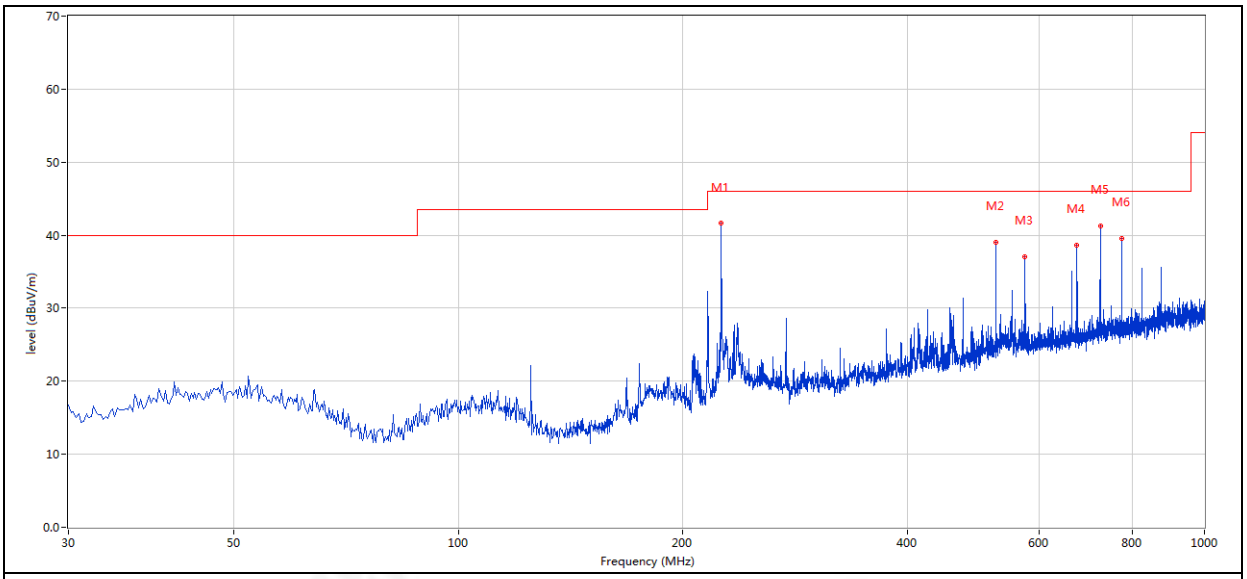
4.2.6 TEST RESULT

Between 9KHz – 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

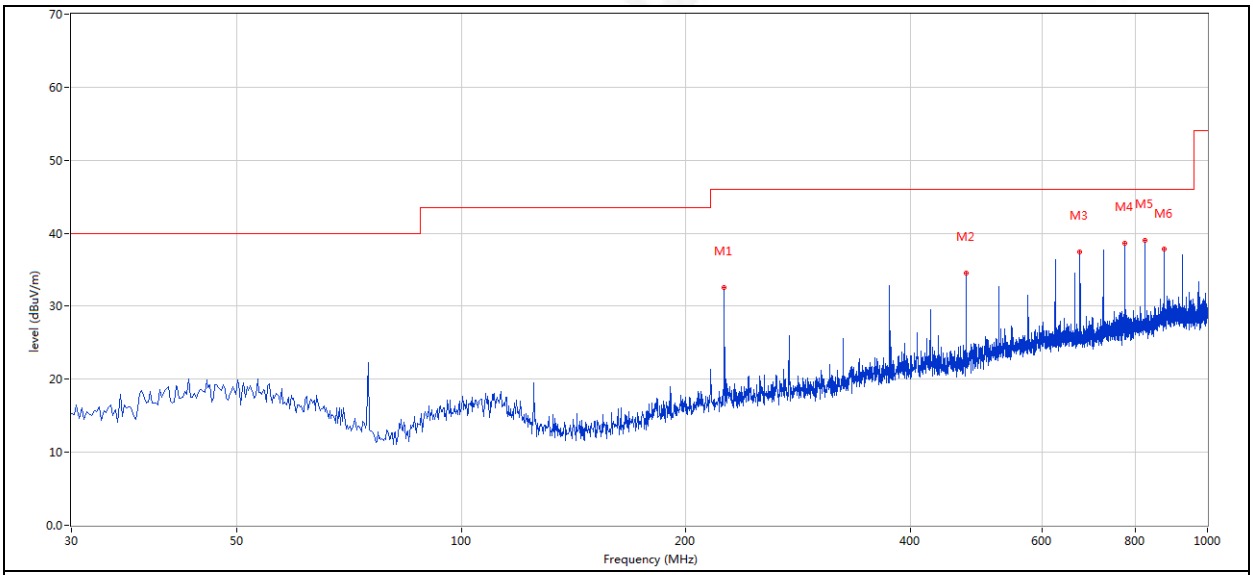
Between 30MHz – 1GHz

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



No.	Frequency (MHz)	Results (dBuV/m)	Correct Factor(dB/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	225.164	41.60	-12.91	46.0	-4.40	QP
2	525.061	39.01	-6.55	46.0	-6.99	QP
3	575.004	37.06	-5.77	46.0	-8.94	QP
4	674.889	38.66	-4.37	46.0	-7.34	QP
5	725.074	41.23	-3.71	46.0	-4.77	QP
6	775.016	39.58	-3.32	46.0	-6.42	QP

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



No.	Frequency (MHz)	Results (dBuV/m)	Correct Factor(dB/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	225.164	32.51	-12.91	46.0	-13.49	QP
2	474.876	34.57	-7.39	46.0	-11.43	QP
3	674.889	37.46	-4.37	46.0	-8.54	QP
4	775.016	38.60	-3.32	46.0	-7.40	QP
5	824.959	39.06	-2.91	46.0	-6.94	QP
6	875.144	37.78	-2.17	46.0	-8.22	QP

Remarks:
1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2.The emission levels of other frequencies are very lower than the limit and not show in test report.
3.The test data shows only the worst case 802.11n20 MIMO mode

Between 1GHz – 40GHz

Temperature：	26℃	Relative Humidity：	54%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	5.2G TX- 802.11n20 MIMO		

802.11n20 MIMO

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:5180MHz									
V	5150.00	43.52	30.45	8.77	38.66	60.5	74.00	-13.5	PK
V	5150.00	30.59	30.45	8.77	38.66	47.57	54.00	-6.43	AV
V	10360.00	54.22	30.55	5.77	24.66	54.1	74.00	-19.9	PK
V	10360.00	42.78	30.55	5.77	24.66	42.66	54.00	-11.34	AV
V	15540.00	53.98	30.33	6.32	24.55	54.52	74.00	-19.48	PK
V	15540.00	44.71	30.33	6.32	24.55	45.25	54.00	-8.75	AV
V	20720.00	50.63	30.85	7.45	24.69	51.92	74.00	-22.08	PK
V	20720.00	41.19	30.85	7.45	24.69	42.48	54.00	-11.52	AV
V	25900.00	51.79	31.02	8.99	25.57	55.33	74.00	-18.67	PK
V	25900.00	40.52	31.02	8.99	25.57	44.06	54.00	-9.94	AV
H	5150.00	41.78	30.45	8.77	38.66	58.76	74.00	-15.24	PK
H	5150.00	30.51	30.45	8.77	38.66	47.49	54.00	-6.51	AV
H	10360.00	55.78	30.55	5.77	24.66	55.66	74.00	-18.34	PK
H	10360.00	44.92	30.55	5.77	24.66	44.8	54.00	-9.2	AV
H	15540.00	54.99	30.33	6.32	24.55	55.53	74.00	-18.47	PK
H	15540.00	41.26	30.33	6.32	24.55	41.8	54.00	-12.2	AV
H	20720.00	53.69	30.85	7.45	24.69	54.98	74.00	-19.02	PK
H	20720.00	42.88	30.85	7.45	24.69	44.17	54.00	-9.83	AV
H	25900.00	50.89	31.02	8.99	25.57	54.43	74.00	-19.57	PK
H	25900.00	42.11	31.02	8.99	25.57	45.65	54.00	-8.35	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:5200MHz									
V	5150.00	41.59	30.45	8.77	38.66	58.57	74.00	-15.43	PK
V	5150.00	30.77	30.45	8.77	38.66	47.75	54.00	-6.25	AV
V	10400.00	55.78	30.55	5.77	24.66	55.66	74.00	-18.34	PK
V	10400.00	44.95	30.55	5.77	24.66	44.83	54.00	-9.17	AV
V	15600.00	54.78	30.33	6.32	24.55	55.32	74.00	-18.68	PK
V	15600.00	42.16	30.33	6.32	24.55	42.7	54.00	-11.3	AV
V	20800.00	52.16	30.85	7.45	24.69	53.45	74.00	-20.55	PK
V	20800.00	45.06	30.85	7.45	24.69	46.35	54.00	-7.65	AV
V	26000.00	52.36	31.02	8.99	25.57	55.9	74.00	-18.1	PK
V	26000.00	41.58	31.02	8.99	25.57	45.12	54.00	-8.88	AV
H	5150.00	42.17	30.45	8.77	38.66	59.15	74.00	-14.85	PK
H	5150.00	31.25	30.45	8.77	38.66	48.23	54.00	-5.77	AV
H	10400.00	54.19	30.55	5.77	24.66	54.07	74.00	-19.93	PK
H	10400.00	43.59	30.55	5.77	24.66	43.47	54.00	-10.53	AV
H	15600.00	52.78	30.33	6.32	24.55	53.32	74.00	-20.68	PK
H	15600.00	43.44	30.33	6.32	24.55	43.98	54.00	-10.02	AV
H	20800.00	55.04	30.85	7.45	24.69	56.33	74.00	-17.67	PK
H	20800.00	44.78	30.85	7.45	24.69	46.07	54.00	-7.93	AV
H	26000.00	51.16	31.02	8.99	25.57	54.7	74.00	-19.3	PK
H	26000.00	41.02	31.02	8.99	25.57	44.56	54.00	-9.44	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:5240MHz									
V	5350.00	40.52	30.45	8.77	38.66	57.5	74.00	-16.5	PK
V	5350.00	30.15	30.45	8.77	38.66	47.13	54.00	-6.87	AV
V	10480.00	51.77	30.55	5.77	24.66	51.65	74.00	-22.35	PK
V	10480.00	41.19	30.55	5.77	24.66	41.07	54.00	-12.93	AV
V	15720.00	55.08	30.33	6.32	24.55	55.62	74.00	-18.38	PK
V	15720.00	42.77	30.33	6.32	24.55	43.31	54.00	-10.69	AV
V	20960.00	51.18	30.85	7.45	24.69	52.47	74.00	-21.53	PK
V	20960.00	44.59	30.85	7.45	24.69	45.88	54.00	-8.12	AV
V	26200.00	51.11	31.02	8.99	25.57	54.65	74.00	-19.35	PK
V	26200.00	42.51	31.02	8.99	25.57	46.05	54.00	-7.95	AV
H	5350.00	43.66	30.45	8.77	38.66	60.64	74.00	-13.36	PK
H	5350.00	31.16	30.45	8.77	38.66	48.14	54.00	-5.86	AV
H	10480.00	52.77	30.55	5.77	24.66	52.65	74.00	-21.35	PK
H	10480.00	42.16	30.55	5.77	24.66	42.04	54.00	-11.96	AV
H	15720.00	52.89	30.33	6.32	24.55	53.43	74.00	-20.57	PK
H	15720.00	40.12	30.33	6.32	24.55	40.66	54.00	-13.34	AV
H	20960.00	52.32	30.85	7.45	24.69	53.61	74.00	-20.39	PK
H	20960.00	41.16	30.85	7.45	24.69	42.45	54.00	-11.55	AV
H	26200.00	51.77	31.02	8.99	25.57	55.31	74.00	-18.69	PK
H	26200.00	40.94	31.02	8.99	25.57	44.48	54.00	-9.52	AV

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. The worst mode is 802.11n20 MIMO mode, only the worst data is recorded.

TEST RESULTS (RESTRICTED BANDS REQUIREMENTS)

Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	802.11a		
Note :	1. The transmitter was setup to transmit at the lowest channel (CH36). Then the field strength was measured at 4500-5150 MHz. 2. The transmitter was setup to transmit at the highest channel (CH48). Then the field strength was measured at 5190-5410 MHz. 3. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.00	V	40.6	4.78	45.38	68.20	CH36
5185.51	V	86.91	4.67	---	---	CH36
5150.00	H	40.24	4.78	45.02	68.20	CH36
5184.44	H	89.93	4.67	---	---	CH36
5247.36	V	87.94	4.51	---	---	CH48
5350.00	V	38.83	4.30	43.13	68.20	CH48
5247.46	H	93.71	4.51	---	---	CH48
5350.00	H	40.58	4.30	44.88	68.20	CH48

Remark :

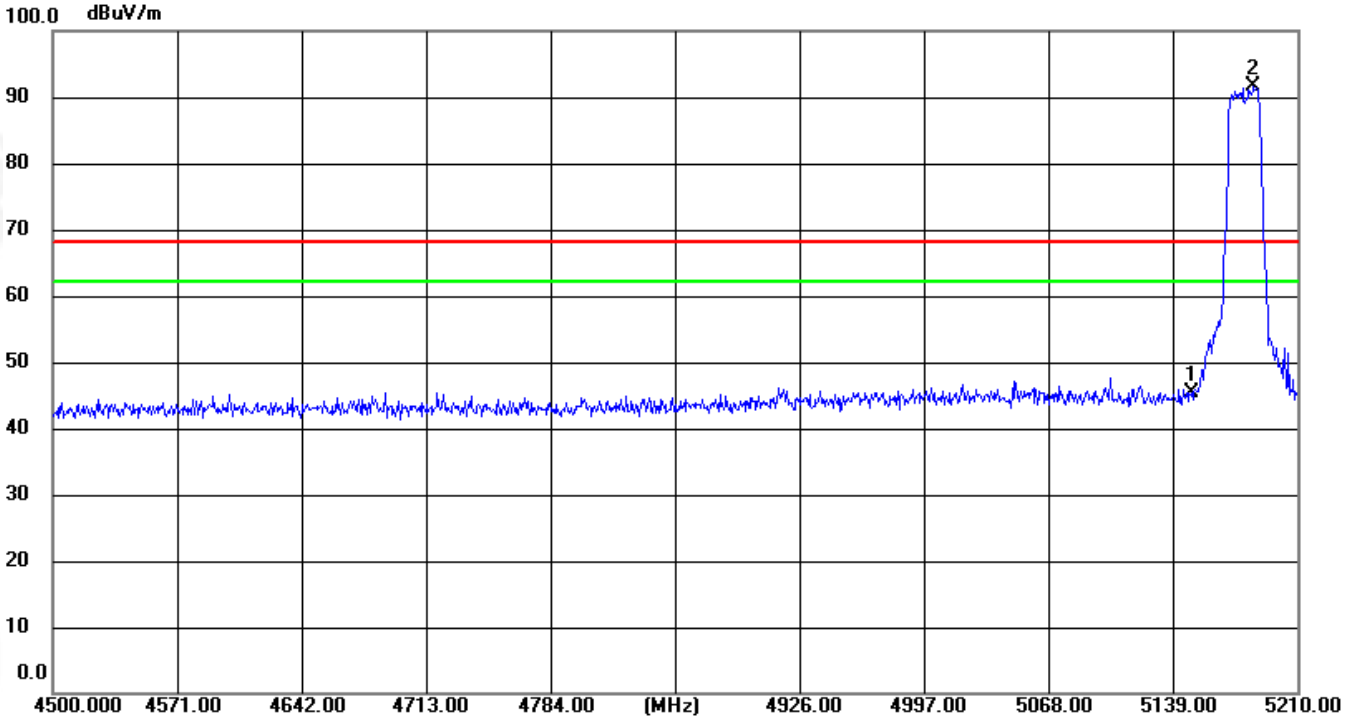
(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

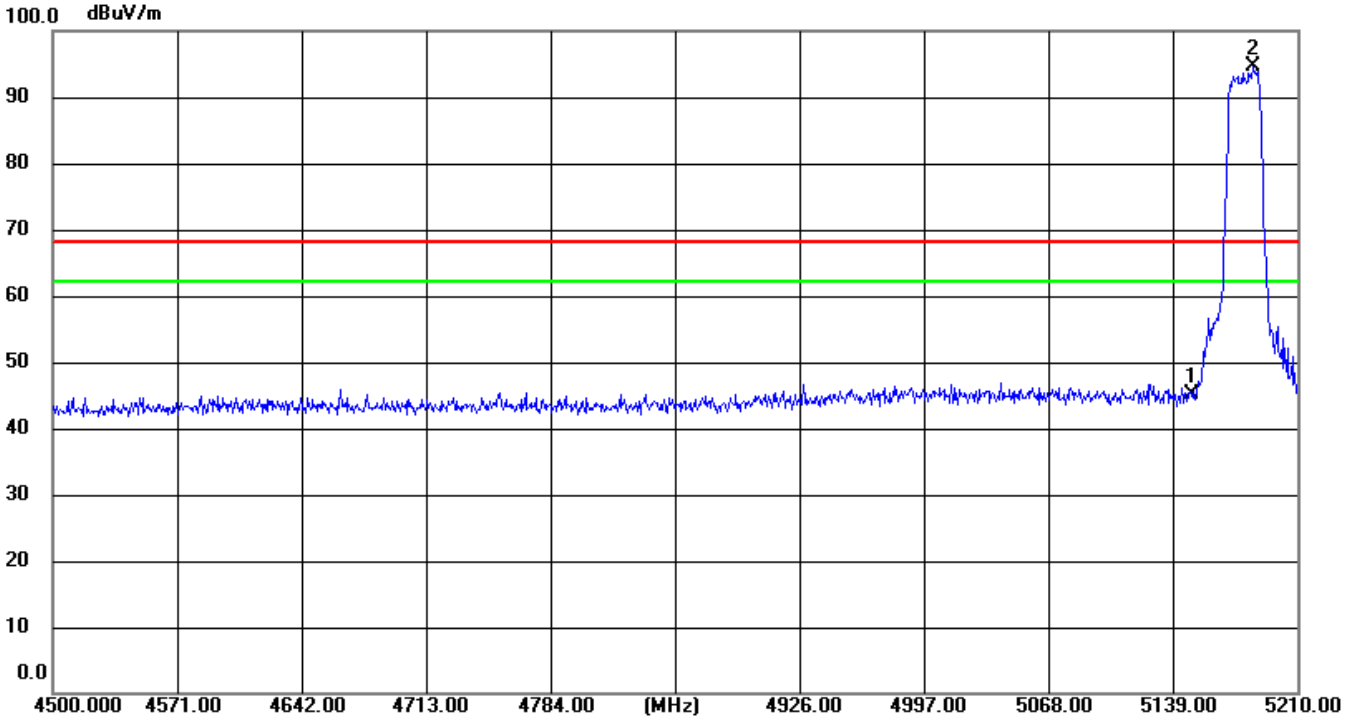
(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

802.11a (5.15GHz-5.25GHz)
CH 36 (Lower) Data rate 6Mbps

Detector mode: Peak Polarity: Vertical

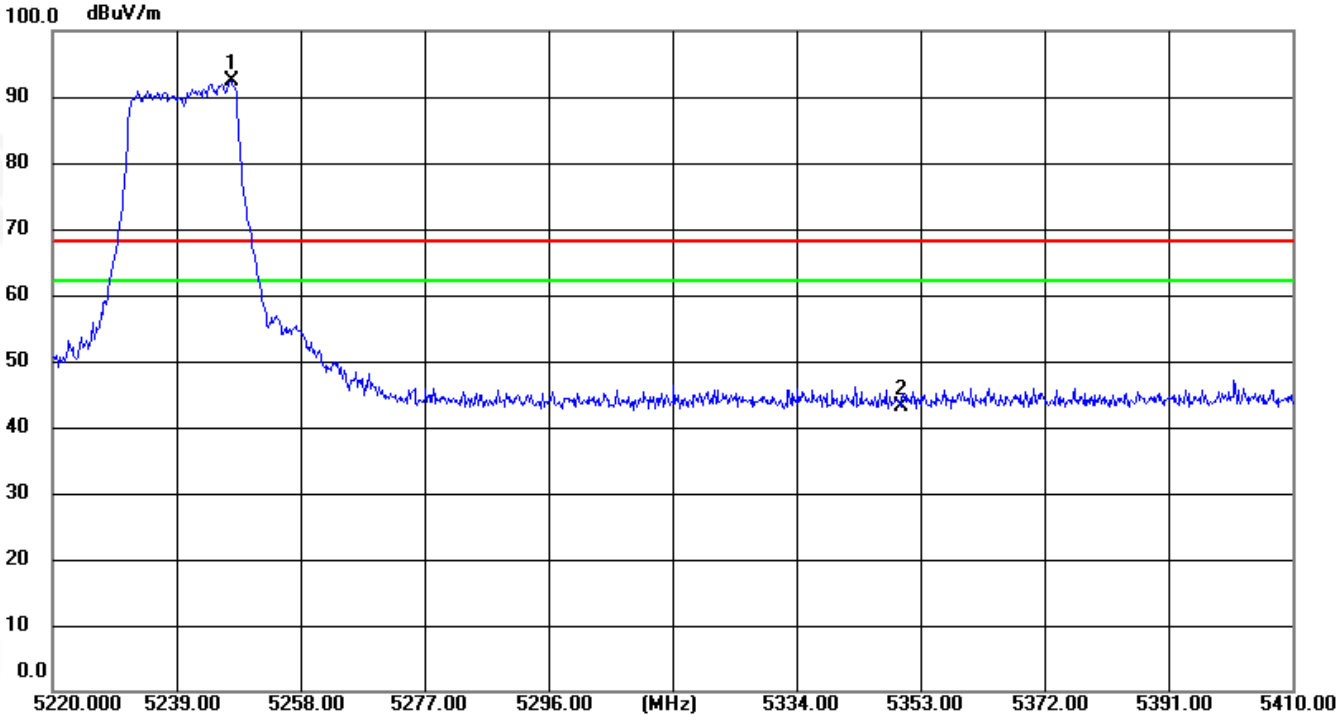


Detector mode: Peak **Polarity: Horizontal**

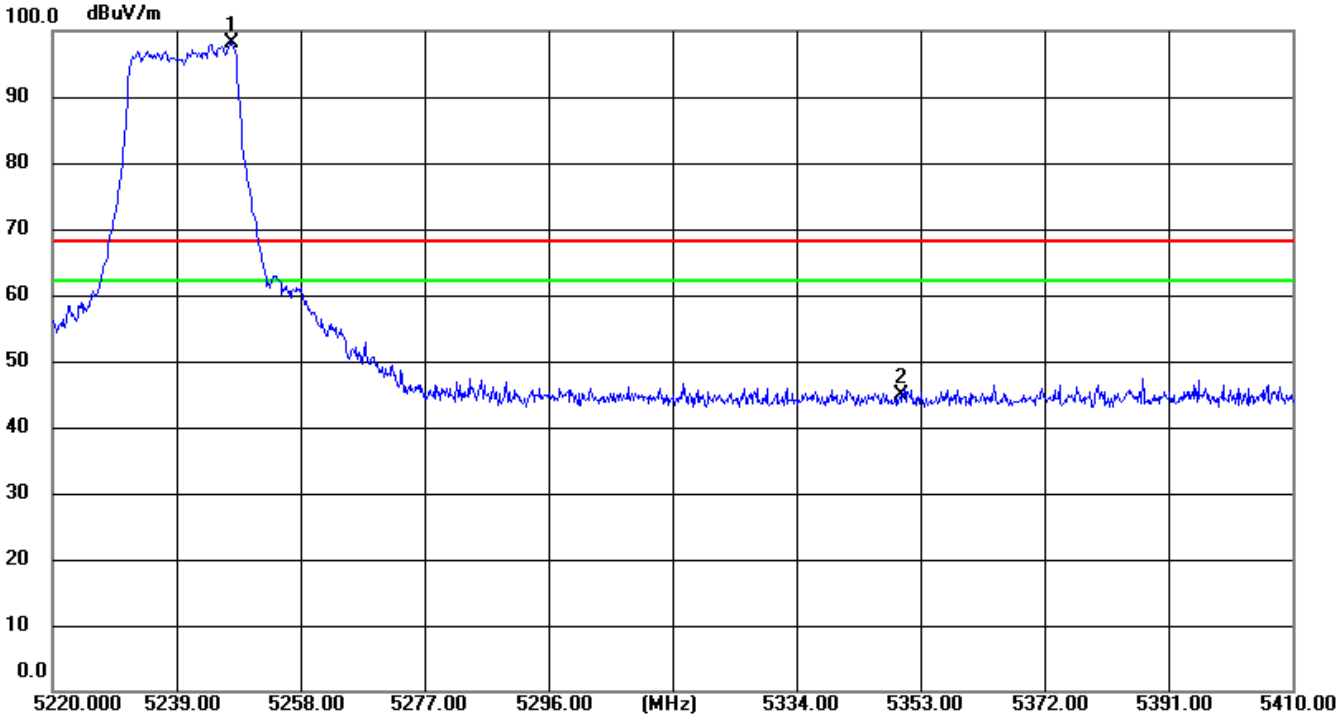


802.11a (5.15GHz-5.25GHz)
CH 48 (Upper) Data rate 6Mbps

Detector mode: Peak Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Temperature：	26℃	Relative Humidity：	54%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	802.11n BW20MHz		
Note：	1. The transmitter was setup to transmit at the lowest channel (CH36). Then the field strength was measured at 4500-5150 MHz. 2. The transmitter was setup to transmit at the highest channel (CH48). Then the field strength was measured at 5190-5410 MHz. 3. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.00	V	41.42	4.78	46.20	68.20	CH36
5185.15	V	87.56	4.67	---	---	CH36
5150.00	V	41.81	4.78	46.59	68.20	CH36
5185.15	V	92.17	4.67	---	---	CH36
5244.99	V	86.37	4.52	---	---	CH48
5350.00	V	41.01	4.30	45.31	68.20	CH48
5245.08	H	90.99	4.51	---	---	CH48
5350.00	H	41.26	4.30	45.56	68.20	CH48

Remark：

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

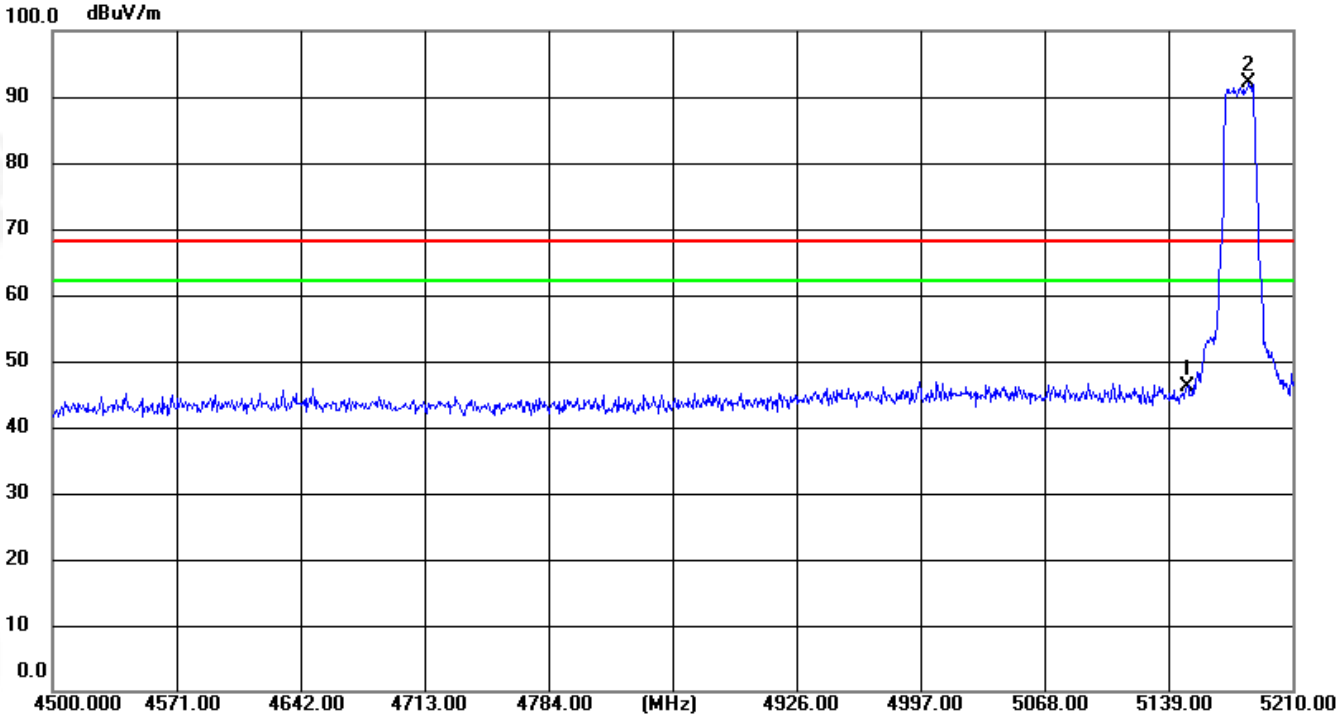
(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

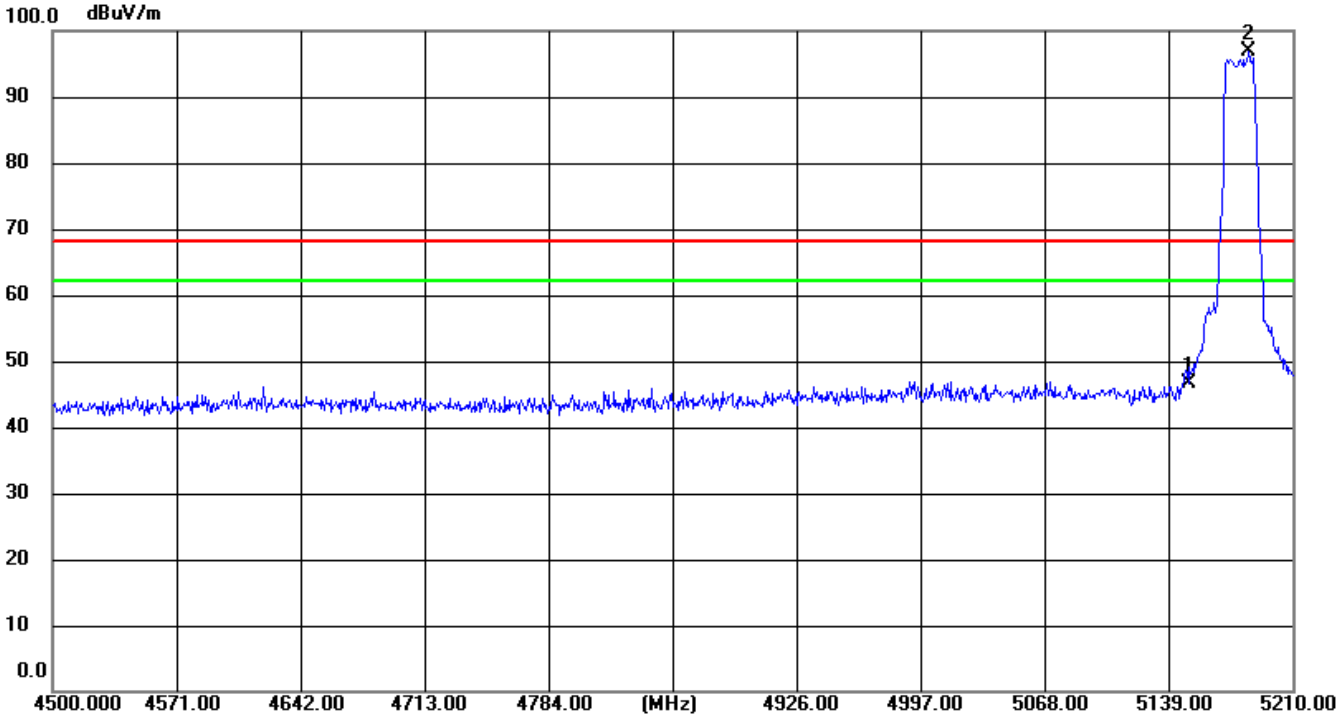
(4) The worst mode is 802.11 n BW20MHz MIMO mode, only the worst data is recorded.

802.11n(20M) (5.15GHz-5.25GHz)
CH 36 (Lower) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical

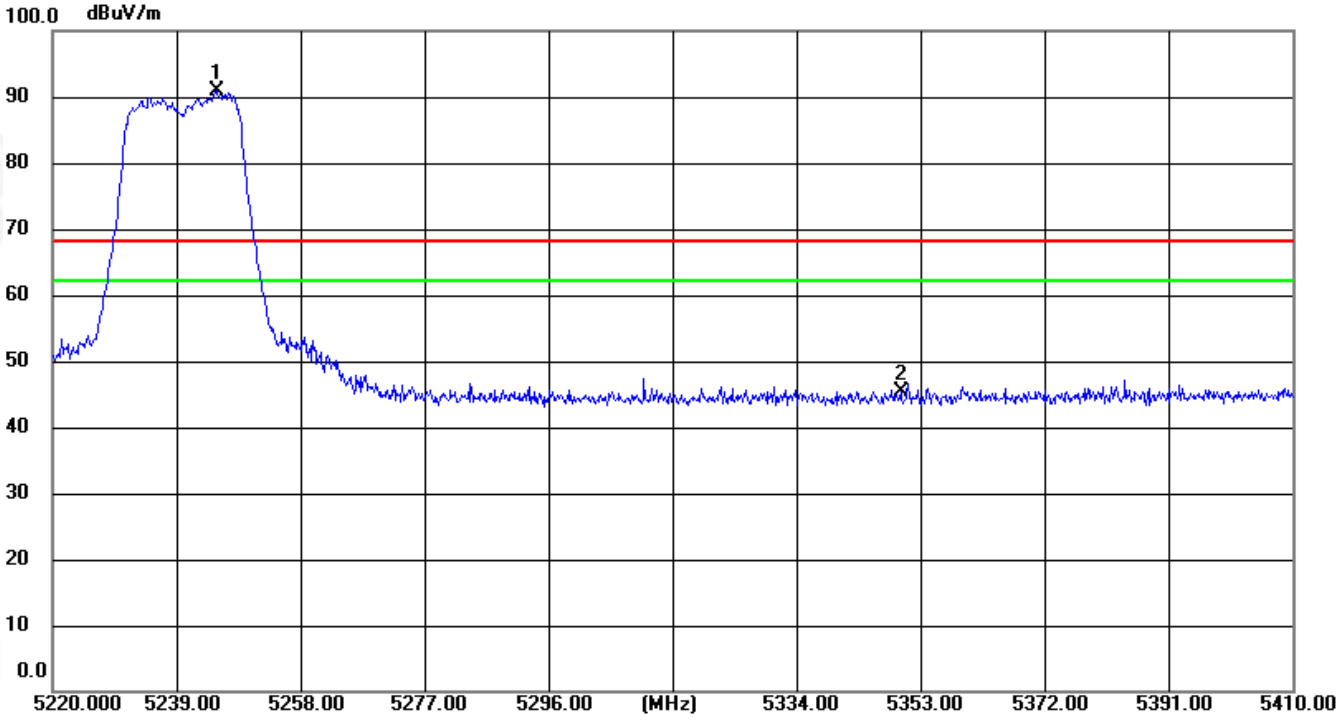


Detector mode: Peak **Polarity: Horizontal**

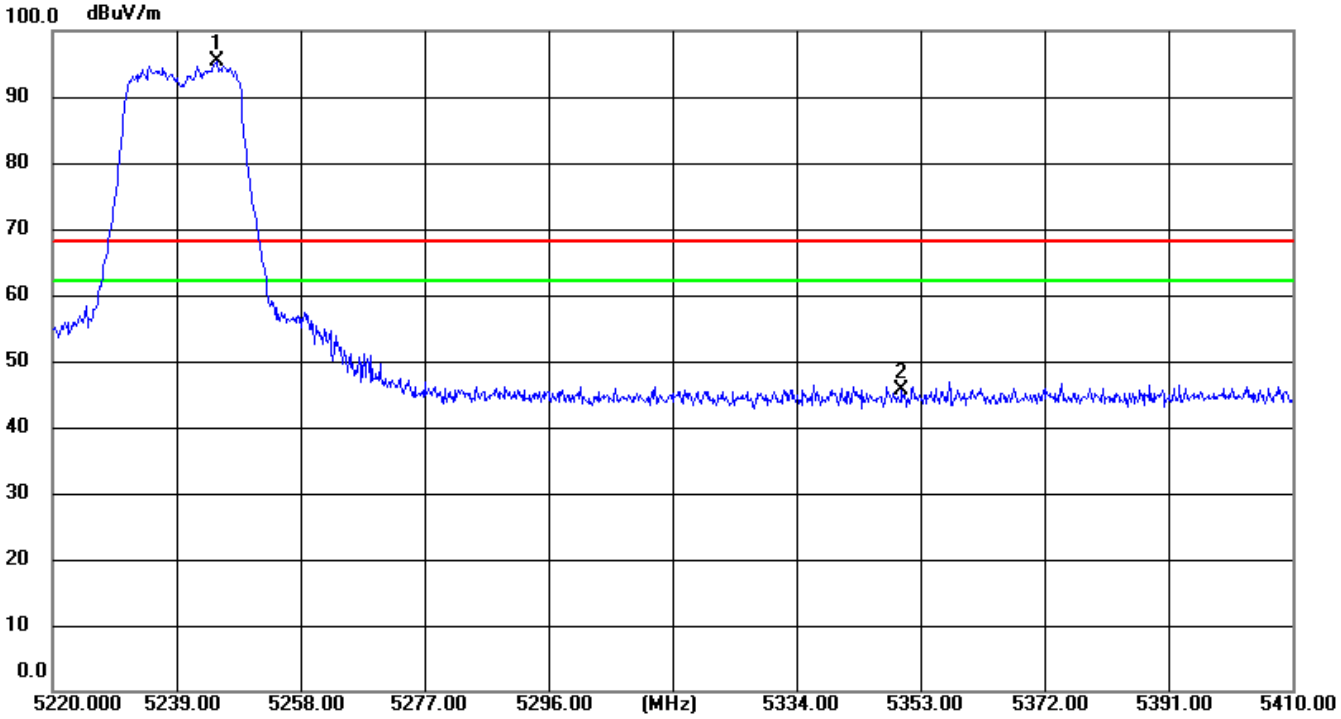


802.11n(20M) (5.15GHz-5.25GHz)
CH 48(Upper) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	802.11ac BW20MHz		
Note :	1. The transmitter was setup to transmit at the lowest channel (CH36). Then the field strength was measured at 4500-5150 MHz. 2. The transmitter was setup to transmit at the highest channel (CH48). Then the field strength was measured at 5190-5410 MHz. 3. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.00	V	40.93	4.78	45.71	68.20	CH36
5183. 38	V	84.22	4.67	---	---	CH36
5150.00	H	41.98	4.78	46.76	68.20	CH36
5183. 38	H	91.64	4.67	---	---	CH36
5246.69	V	85.19	4.51	---	---	CH48
5350.00	V	39.53	4.30	43.83	68.20	CH48
5246.60	H	90.3	4.51	---	---	CH48
5350.00	H	40.68	4.30	44.98	68.20	CH48

Remark :

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

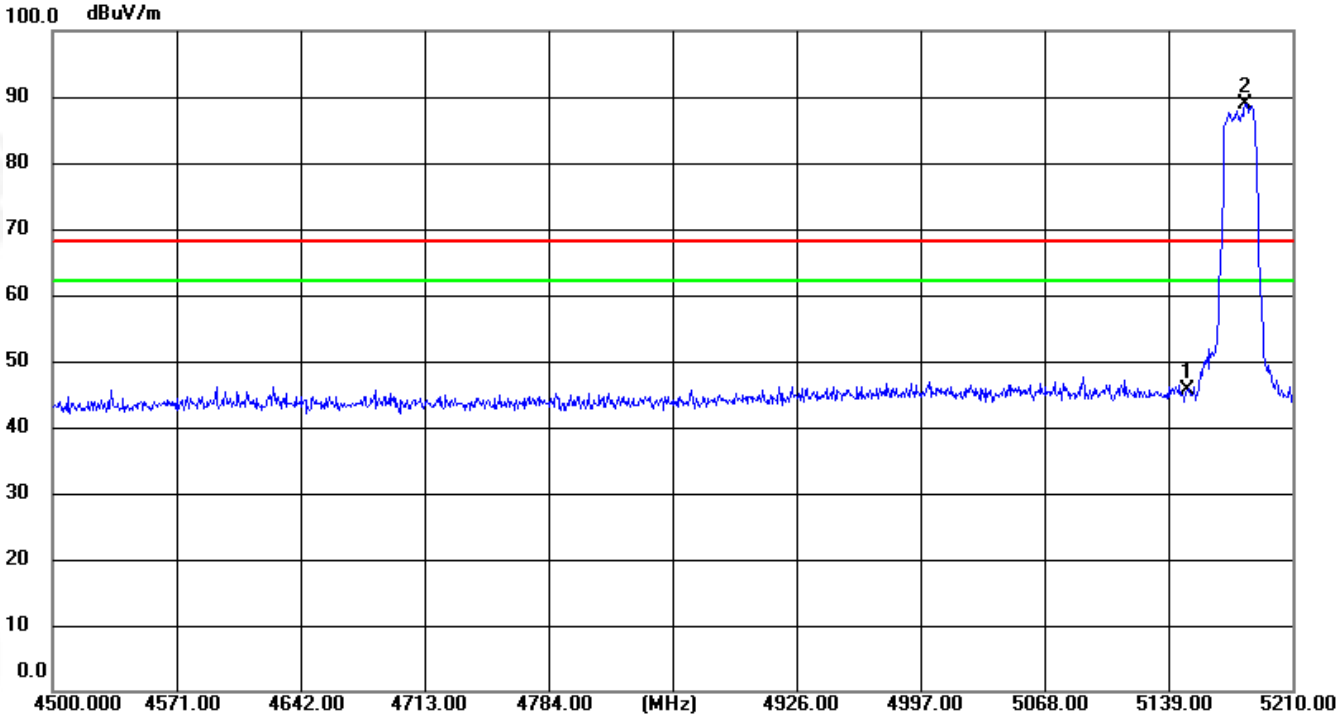
(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

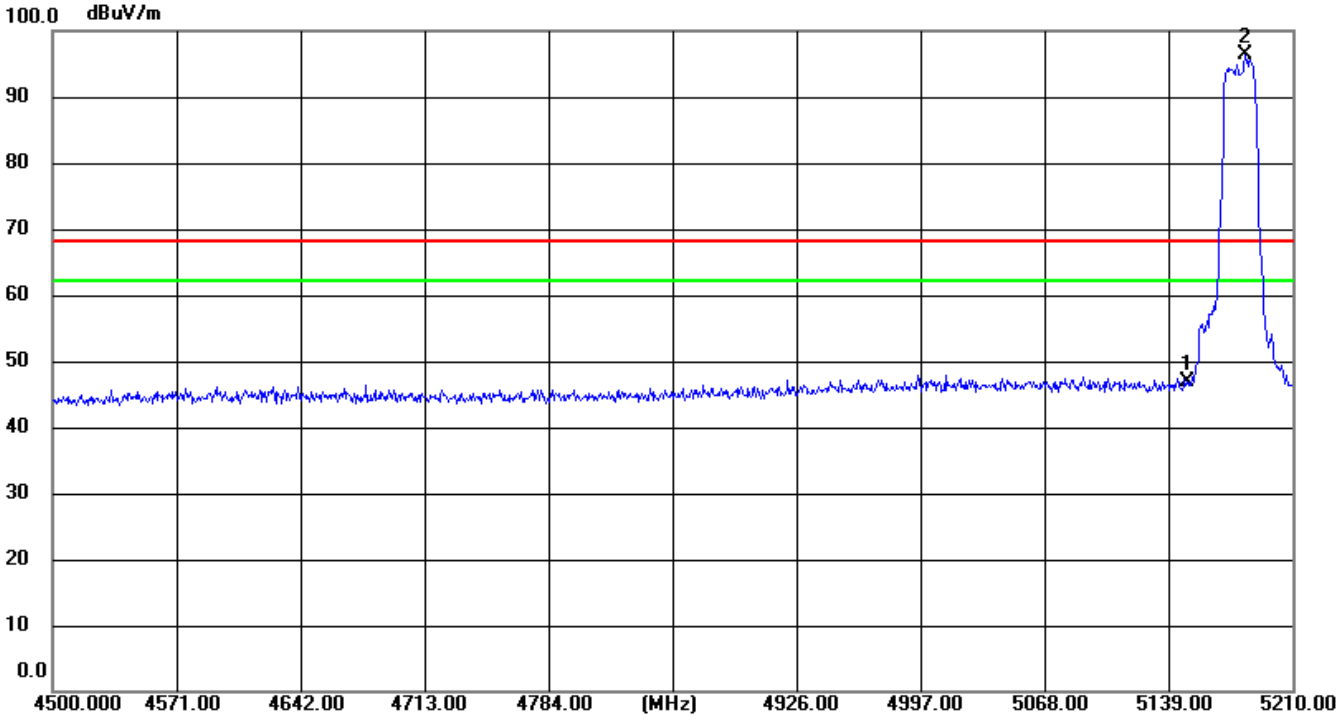
(4) The worst mode is 802.11ac BW20MHz MIMO mode, only the worst data is recorded.

802.11ac(20M) (5.15GHz-5.25GHz)
CH 36 (Lower) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical

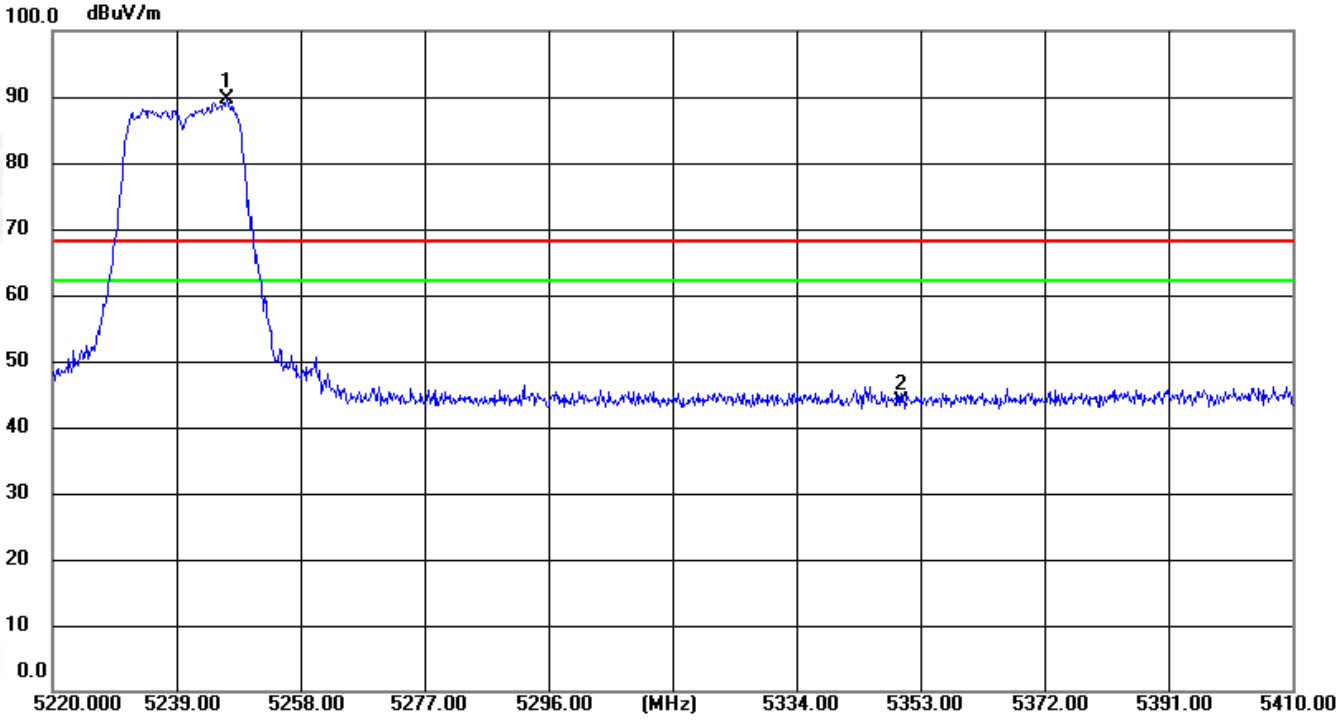


Detector mode: Peak **Polarity: Horizontal**

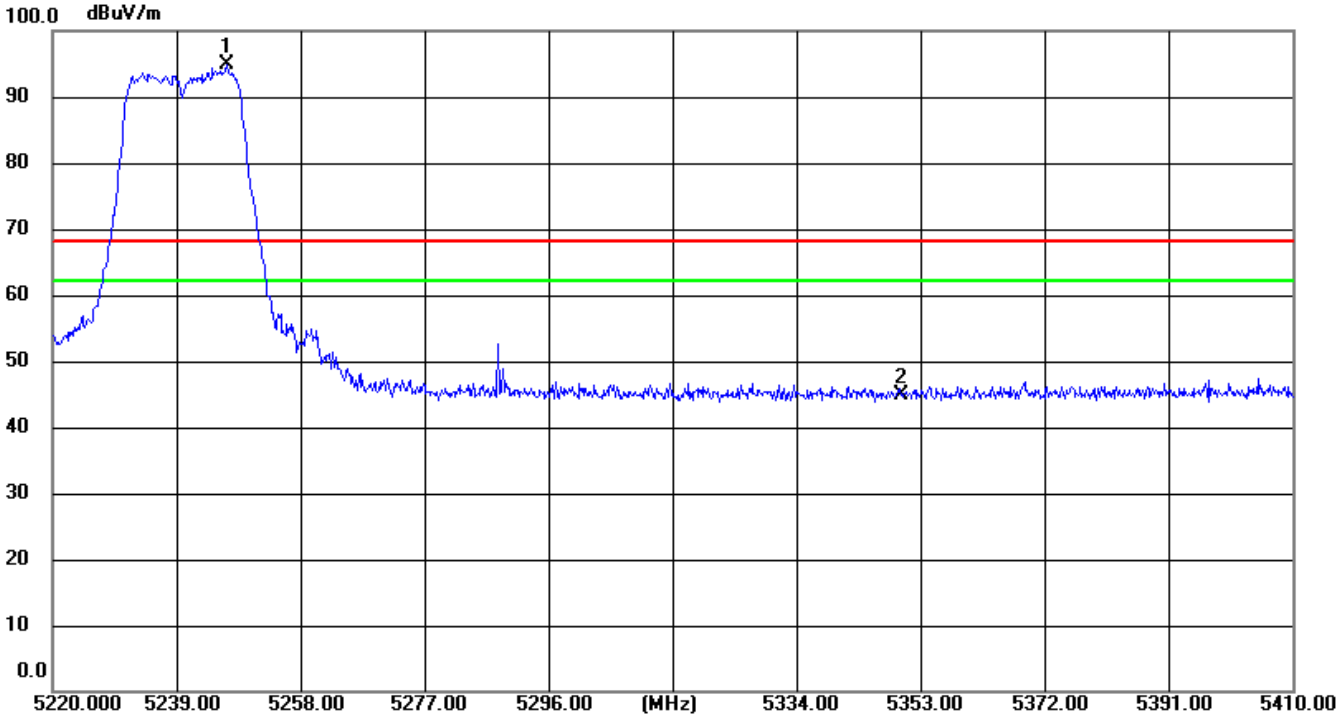


802.11 ac(20M) (5.15GHz-5.25GHz)
CH 48(Upper) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	802.11n BW40MHz		
Note :	1. The transmitter was setup to transmit at the lowest channel (CH38). Then the field strength was measured at 4500-5150 MHz. 2. The transmitter was setup to transmit at the highest channel (CH46). Then the field strength was measured at 5190-5410 MHz. 3. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.00	V	46.65	4.78	51.43	68.20	CH38
5203.80	V	86.65	4.60	---	---	CH38
5150.00	H	51.87	4.78	56.65	68.20	CH38
5205.96	H	90.15	4.60	---	---	CH38
5242.63	V	81.22	4.52	---	---	CH46
5350.00	V	40.7	4.30	45.00	68.20	CH46
5242.63	H	85.31	4.52	---	---	CH46
5350.00	H	39.85	4.30	44.15	68.20	CH46

Remark :

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

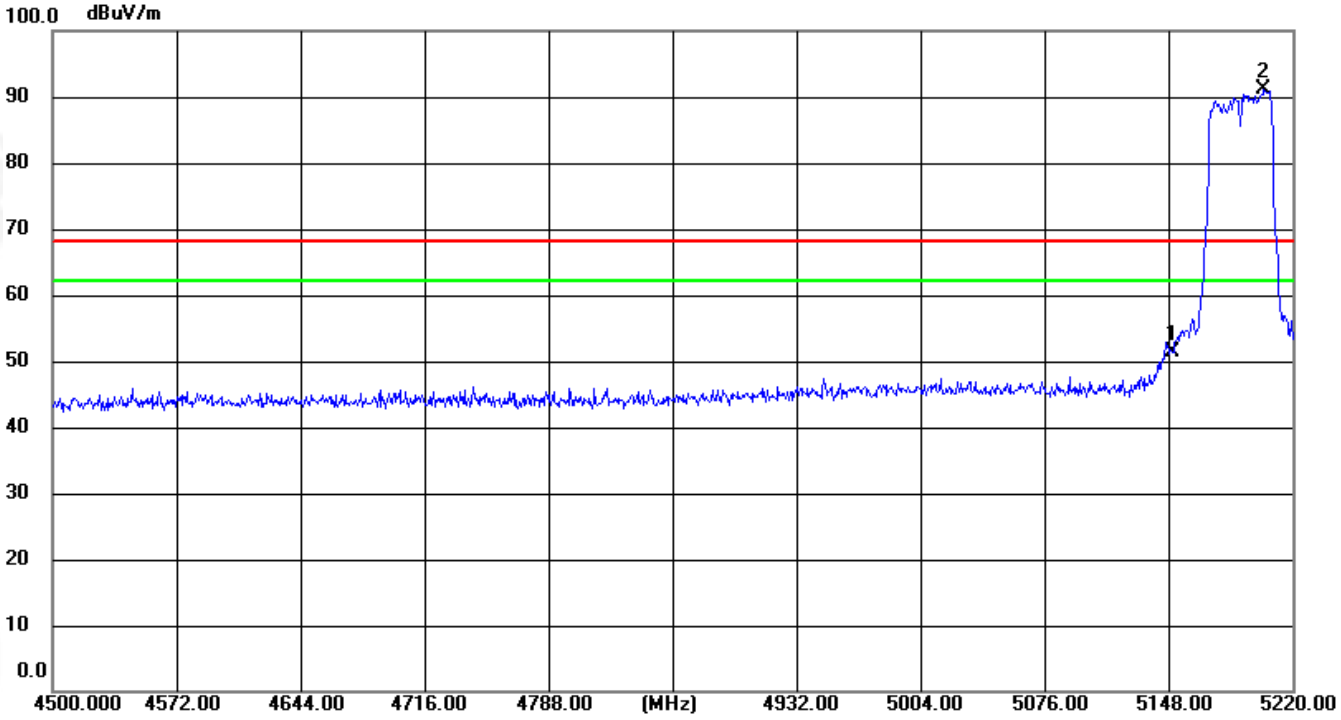
(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

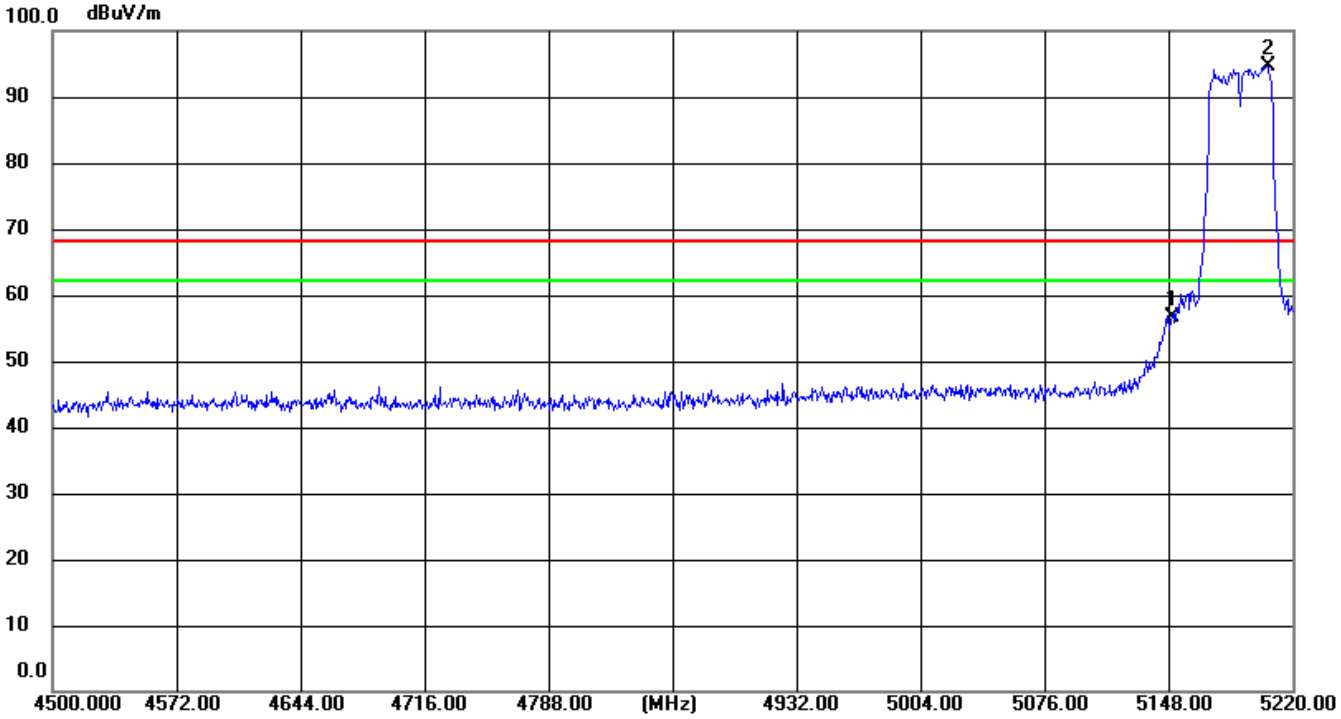
(4) The worst mode is 802.11n BW40MHz MIMO mode, only the worst data is recorded.

802.11n(40M) (5.15GHz-5.25GHz)
CH 38 (Lower) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical

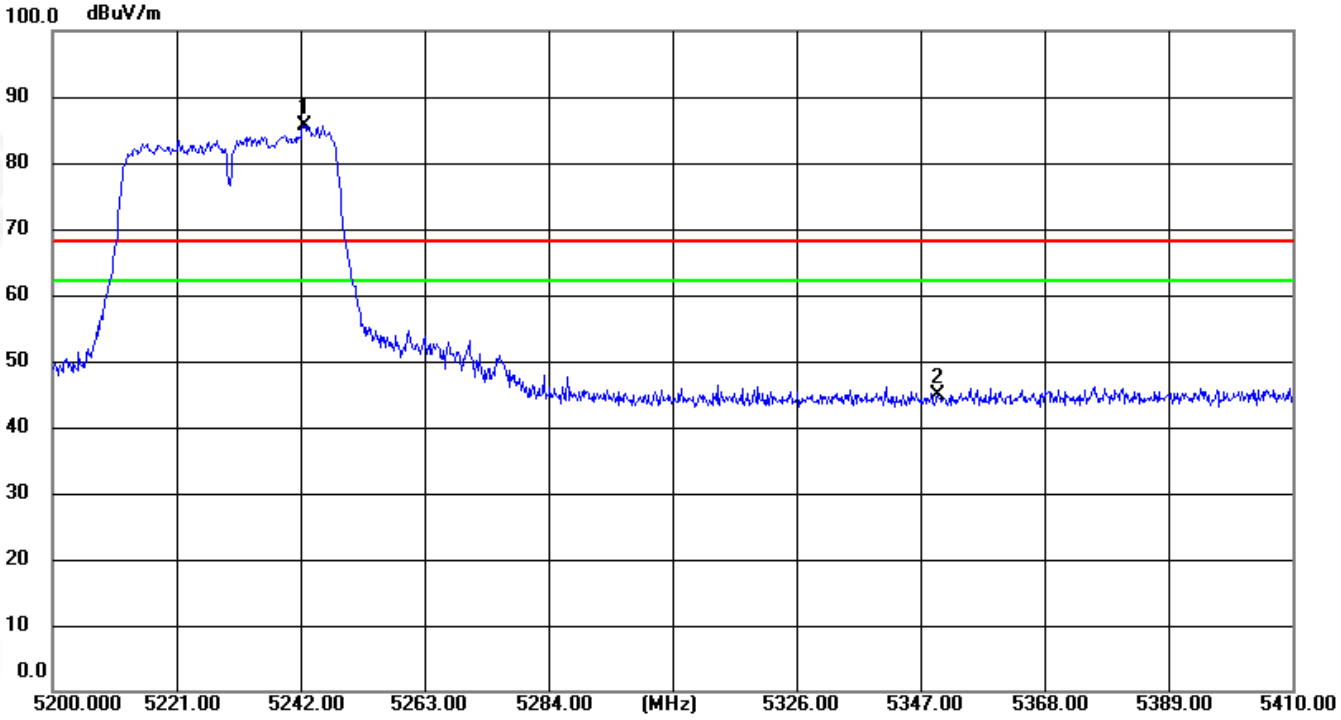


Detector mode: Peak **Polarity: Horizontal**

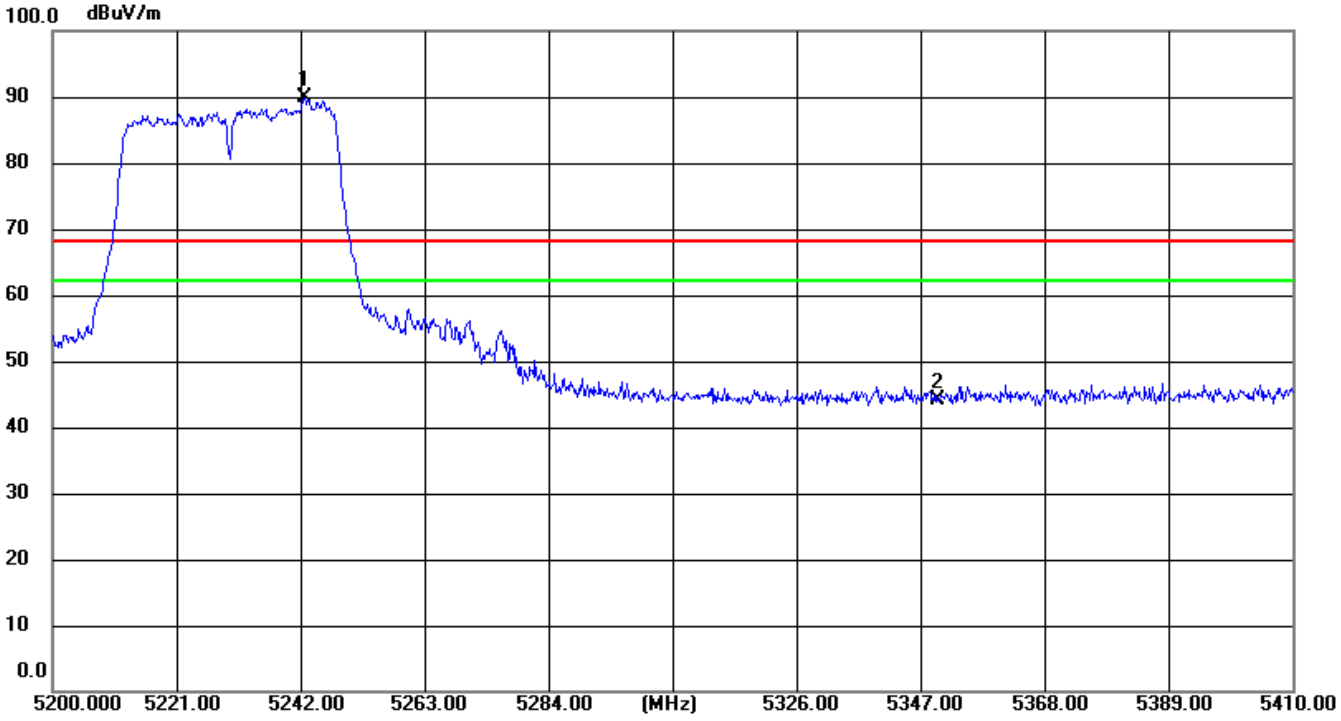


802.11n(40M) (5.15GHz-5.25GHz)
CH 46(Upper) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	802.11 ac BW40MHz		
Note :	1. The transmitter was setup to transmit at the lowest channel (CH38). Then the field strength was measured at 4500-5150 MHz. 2. The transmitter was setup to transmit at the highest channel (CH46). Then the field strength was measured at 5190-5410 MHz. 3. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.00	V	44.87	4.78	49.65	68.20	CH38
5187.24	V	85.3	4.66	---	---	CH38
5150.00	H	47.29	4.78	52.07	68.20	CH38
5187.24	H	89.01	4.66	---	---	CH38
5243.47	V	79.24	4.52	---	---	CH46
5350.00	V	40.02	4.30	44.32	68.20	CH46
5243.47	H	87	4.52	---	---	CH46
5350.00	H	40.06	4.30	44.36	68.20	CH46

Remark :

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

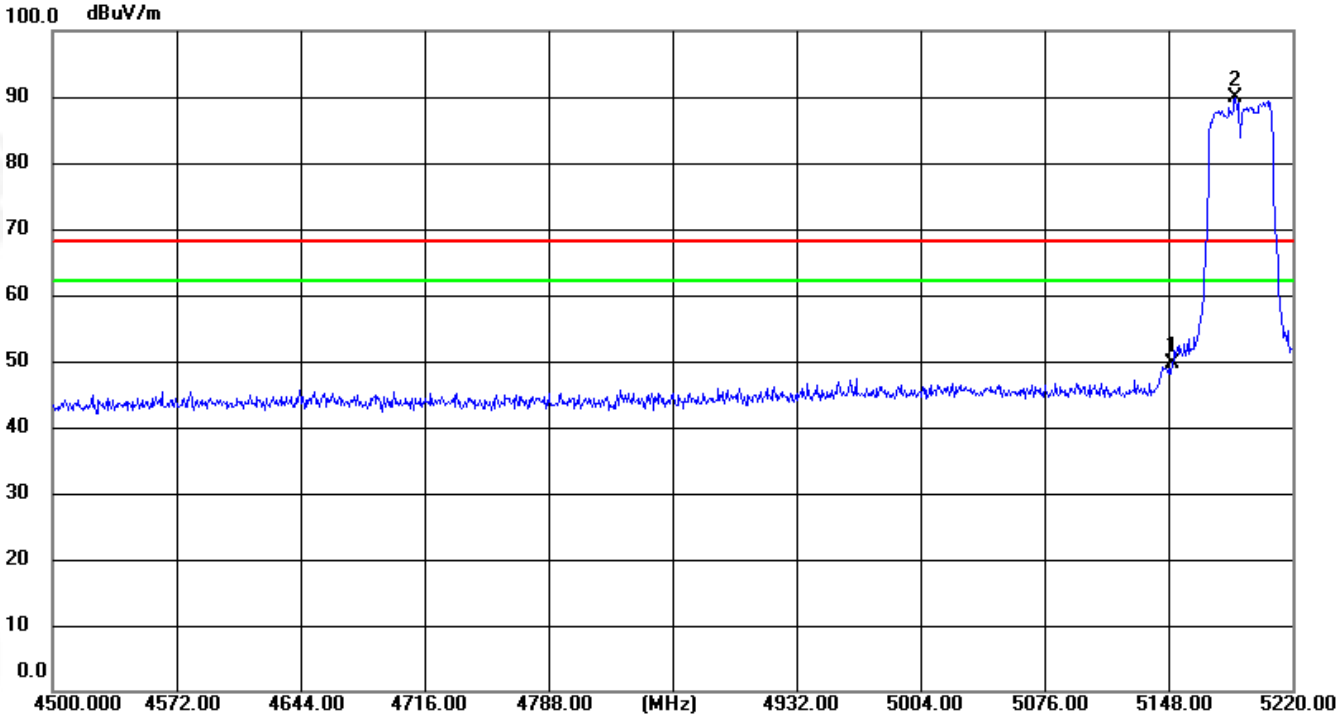
(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

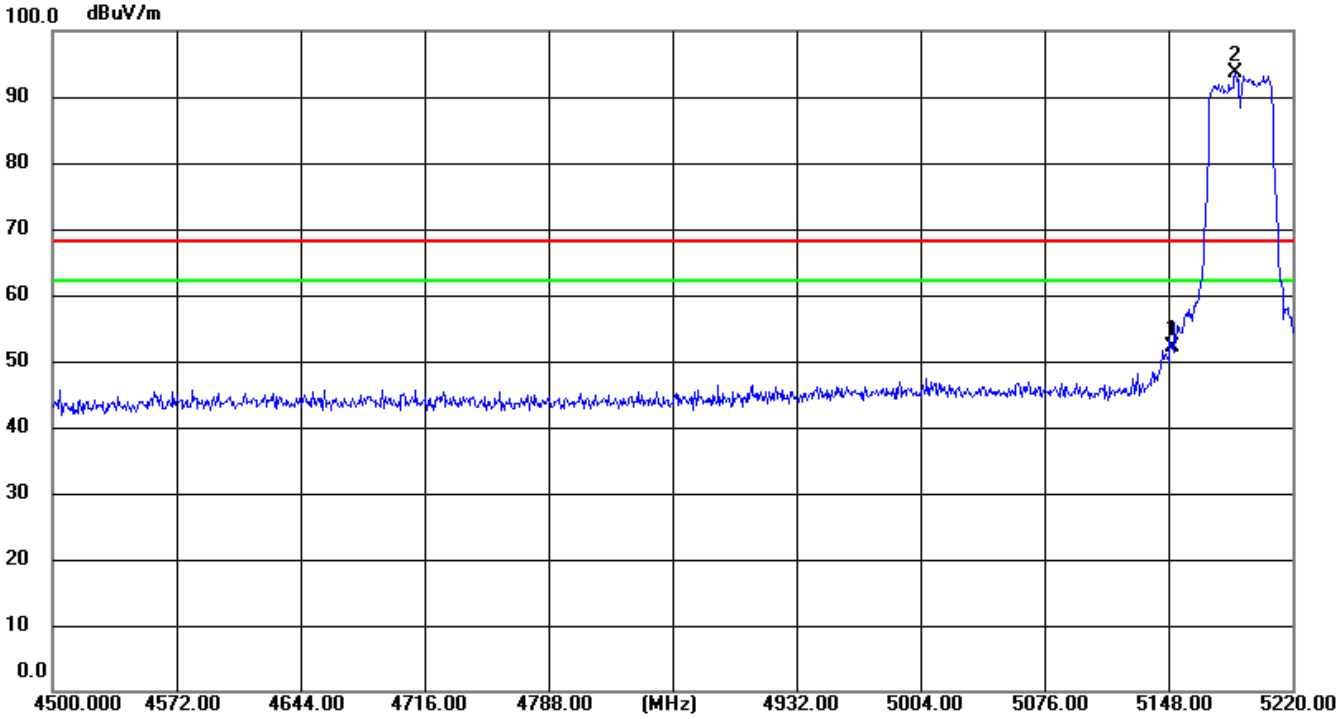
(4) The worst mode is 802.11ac BW40MHz MIMO mode, only the worst data is recorded.

802.11ac(40M) (5.15GHz-5.25GHz)
CH 38 (Lower) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical

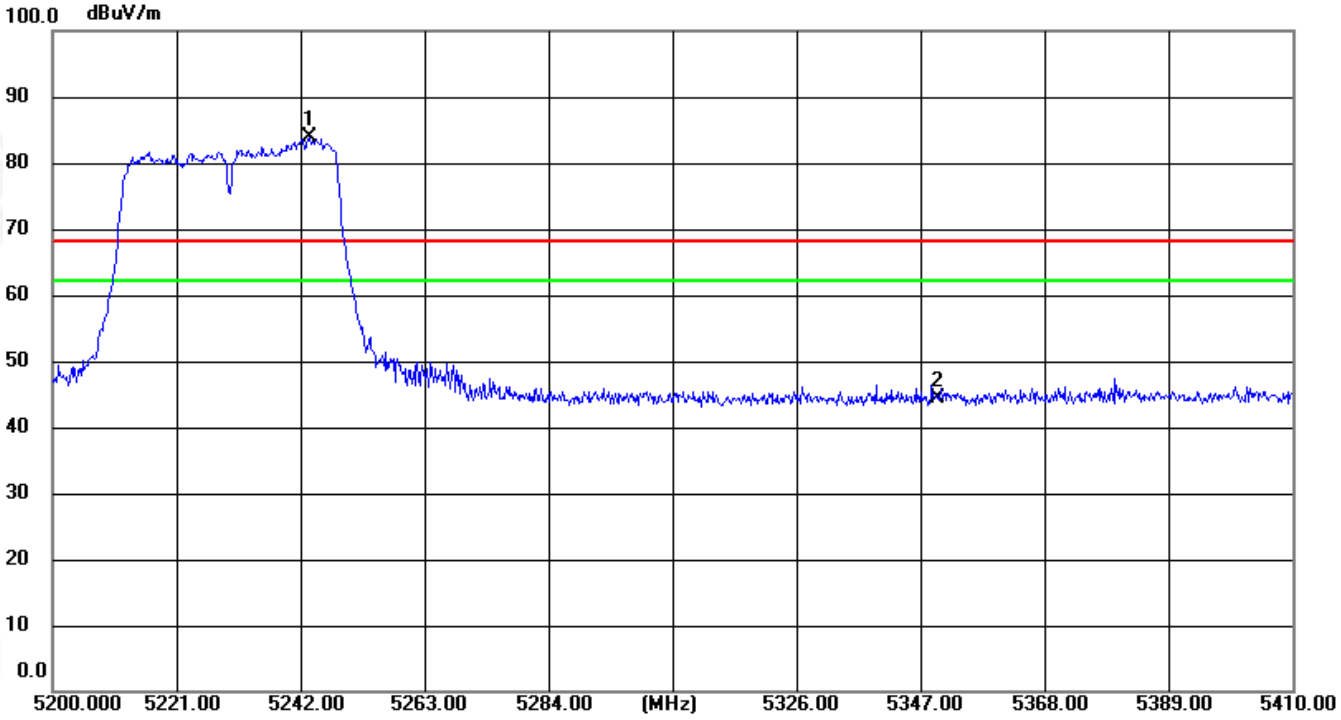


Detector mode: Peak **Polarity: Horizontal**

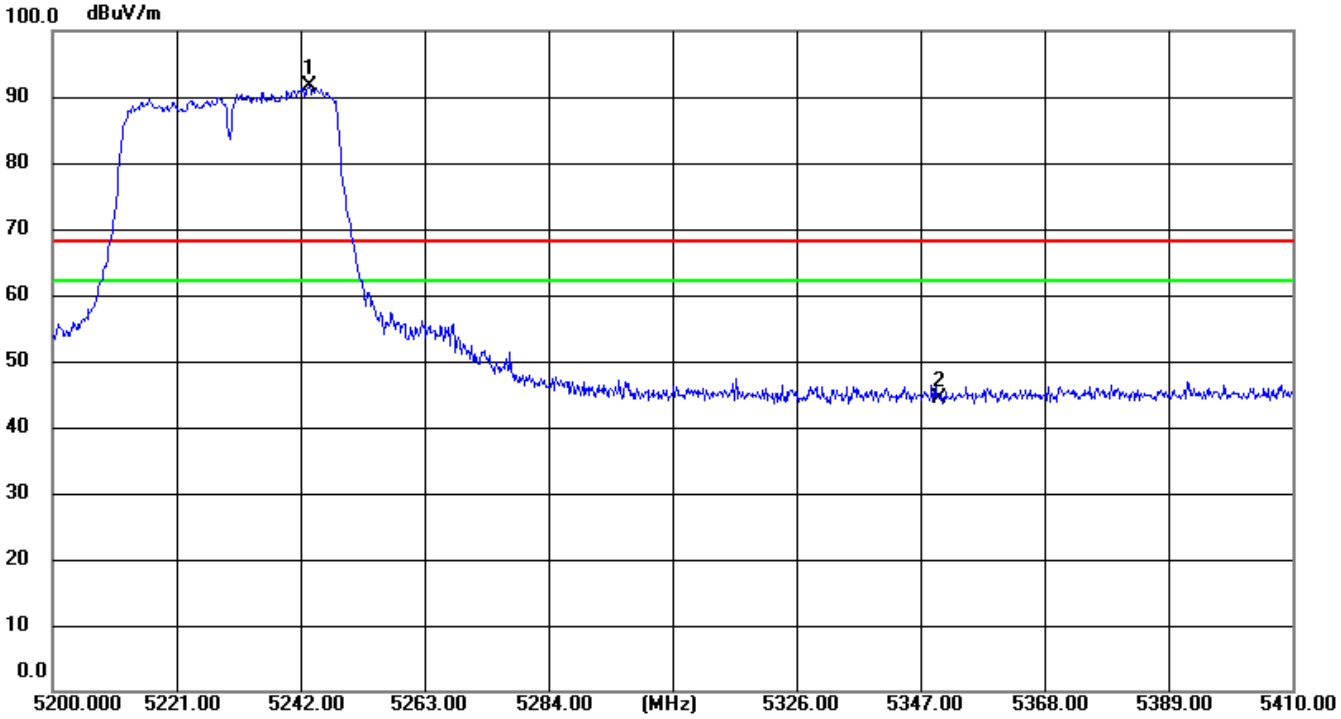


802.11ac(40M) (5.15GHz-5.25GHz)
CH 46(Upper) Data rate 7.2Mbps

Detector mode: Peak Polarity: Vertical



Detector mode: Peak **Polarity: Horizontal**



Temperature：	26℃	Relative Humidity：	54%
Pressure：	1010 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	802.11 ac BW80MHz		
Note：	1. The transmitter was setup to transmit at the lowest channel (CH42). Then the field strength was measured at 4960-5460 MHz. 2. The data of 5150MHz and 5350MHz was the worst.		

Freq. (MHz) (Peak)	Ant.Pol. H/V	Reading	Ant/CF	Act	Limit	Note
		Peak (dBuv)	Peak (dB)	Peak (dBuv/m)	Peak (dBuv/m)	
5150.000	V	46.77	4.78	51.55	68.20	CH42
5209.000	V	77.48	4.59	---	---	CH42
5350.000	V	34.58	4.30	38.88	68.20	CH42
5150.000	H	48.79	4.78	53.57	68.20	CH42
5193.000	H	80.53	4.64	---	---	CH42
5350.000	H	34.48	4.30	38.78	68.20	CH42

Remark：

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode

(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

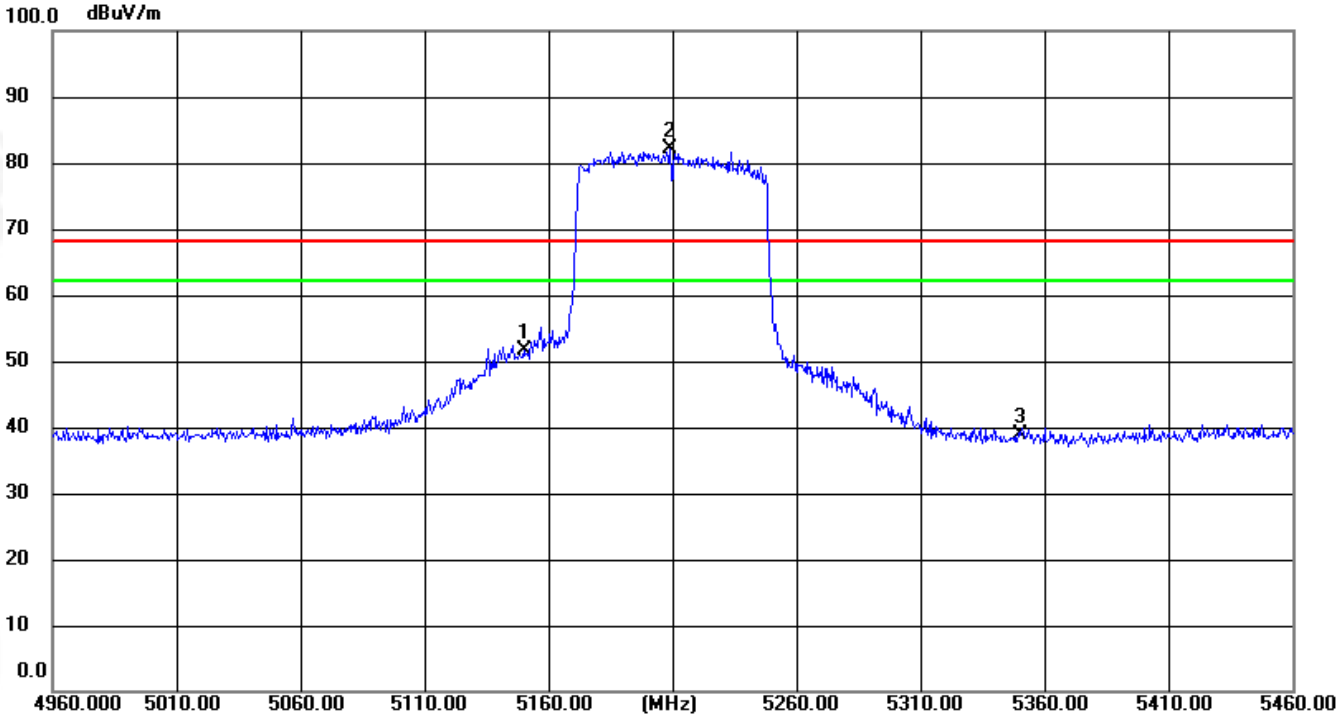
(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

(4) The worst mode is 802.11ac BW80MHz MIMO mode, only the worst data is recorded.

802.11ac(80M) (5.15GHz-5.25GHz)
CH 42 Data rate 7.2Mbps

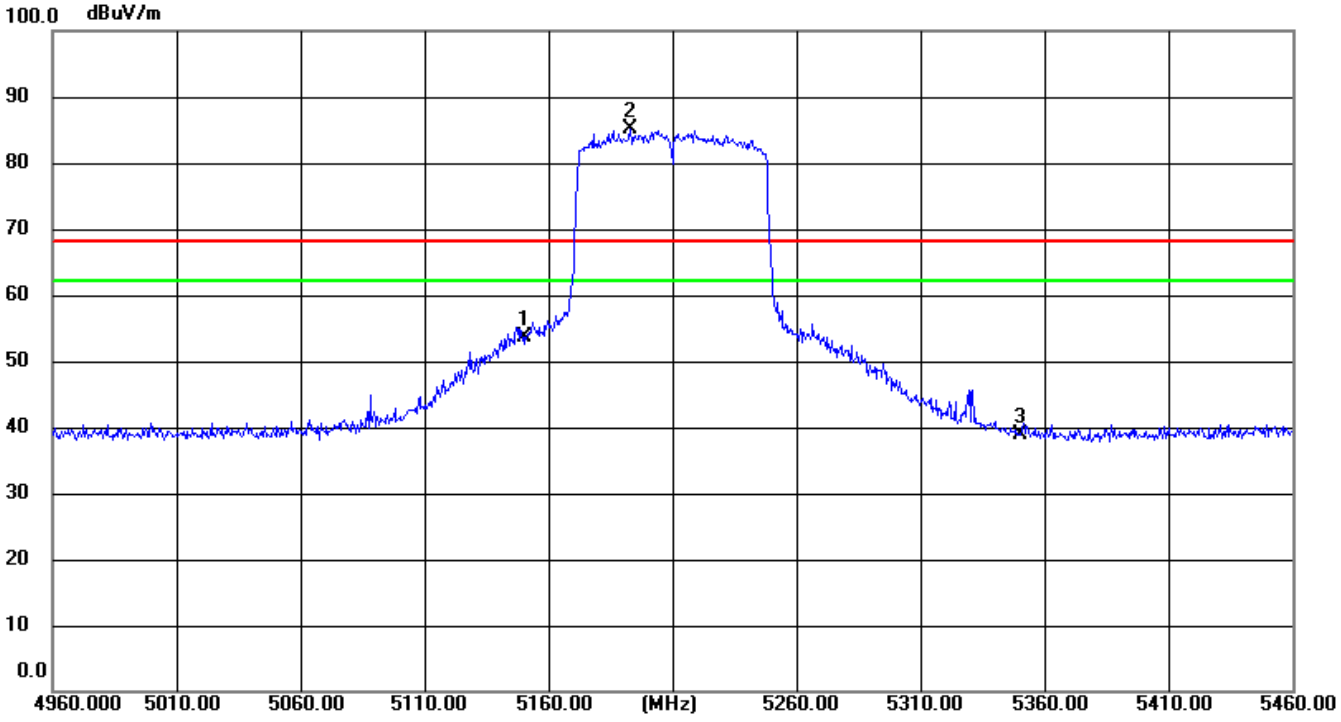
Detector mode: Peak

Polarity: Vertical



Detector mode: Peak

Polarity: Horizontal



5.POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(3)

Power limits:

(1) 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, 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.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. 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.

5.2 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.

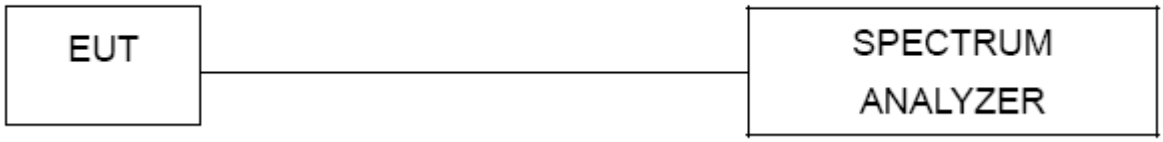
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

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.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 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.

5.6 TEST RESULTS

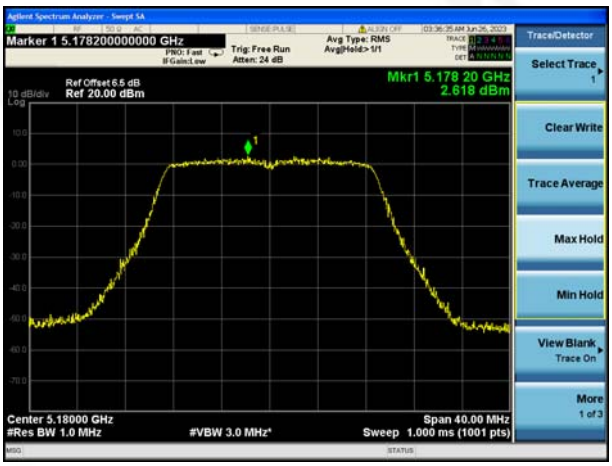
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1015 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	TX		

Test mode	Test Channel (MHz)	PSD [dBm/MHz]			Limit (dBm/MHz)	Result
		ANT1	ANT2	Total		
802.11a	5180	5.320	4.958	\	11	Pass
	5200	5.304	5.023	\	11	Pass
	5240	5.541	4.865	\	11	Pass
802.11n(HT20)	5180	2.618	1.201	4.98	11	Pass
	5200	2.336	1.562	4.98	11	Pass
	5240	2.729	1.006	4.96	11	Pass
802.11n(HT40)	5190	0.409	-0.258	3.10	11	Pass
	5230	0.651	-1.065	2.89	11	Pass
802.11ac(VH20)	5180	3.087	1.095	5.21	11	Pass
	5200	1.906	0.326	4.20	11	Pass
	5240	2.799	1.011	5.01	11	Pass
802.11ac(VH40)	5190	0.370	-1.258	2.64	11	Pass
	5230	0.134	-1.689	2.33	11	Pass
802.11ac(VH80)	5210	-1.915	-2.965	0.60	11	Pass

ANT 1(2) Represent the value of antenna 1 and antenna 2, The worst data is Antenna 1 , only shown Antenna 1 Plot.

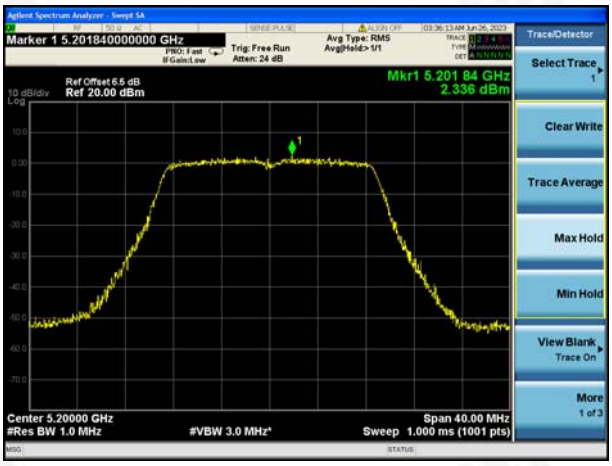
ANT1 (802.11a) PSD plot on channel 36

ANT1 (802.11n20) PSD plot on channel 36



(802.11a) PSD plot on channel 40

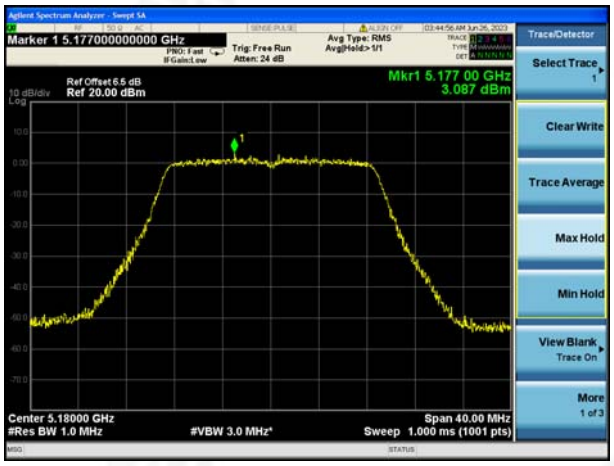
(802.11n20) PSD plot on channel 40



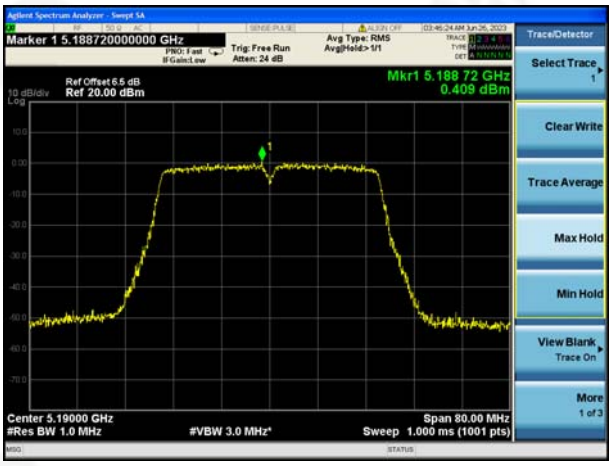
(802.11a) PSD plot on channel 48

(802.11n20) PSD plot on channel 48

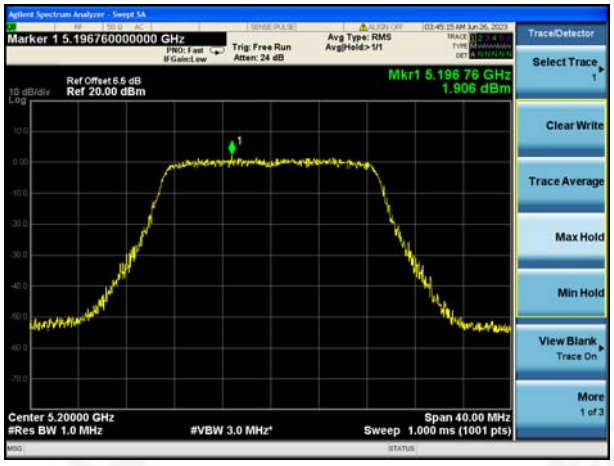
ANT1 (802.11ac20) PSD plot on channel 36



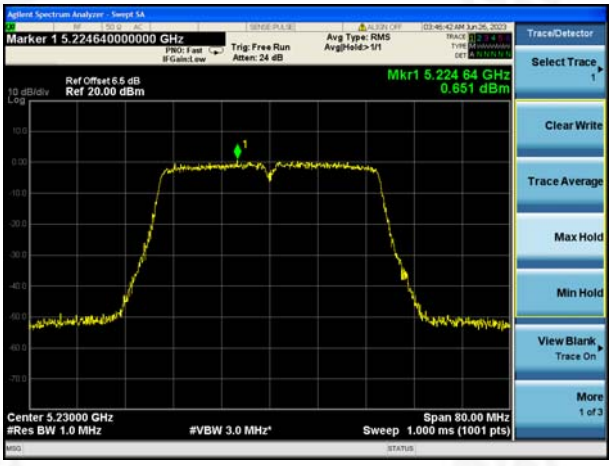
ANT1 (802.11n40) PSD plot on channel 38



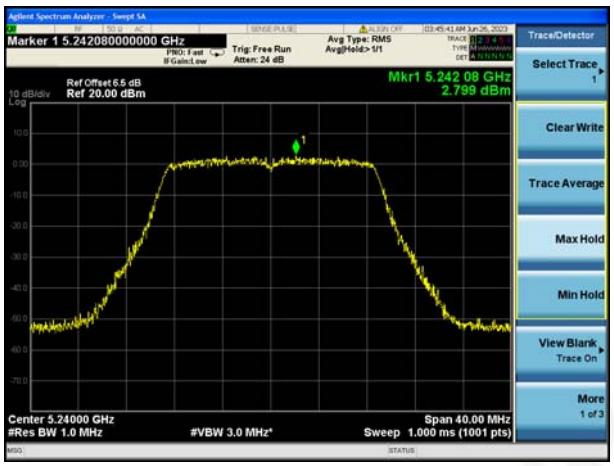
(802.11ac20) PSD plot on channel 40



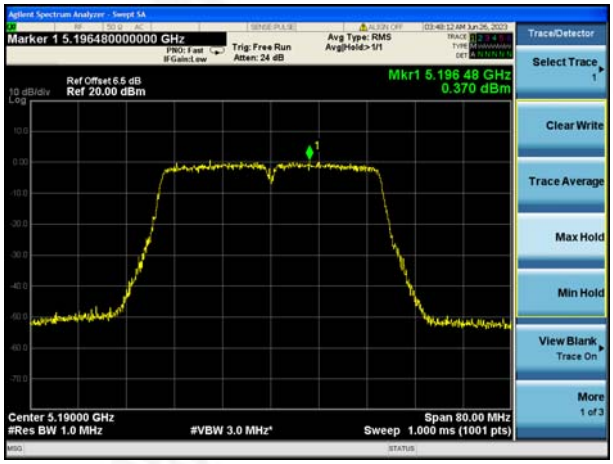
(802.11n40) PSD plot on channel 46



(802.11ac20) PSD plot on channel 48

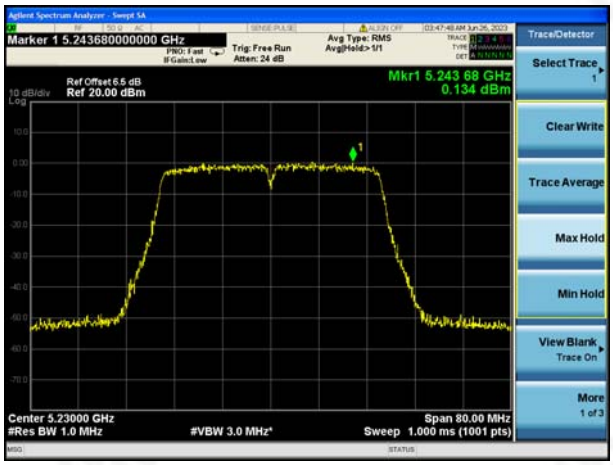


ANT1 (802.11ac40) PSD plot on channel 38



ANT1 (802.11ac80) PSD plot on channel 42

(802.11ac40) PSD plot on channel 46



6. 26DB & 99% EMISSION BANDWIDTH

6.1 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, the minimum bandwidth 6 dB bandwidth of U-NII devices shall be at least 500KHz. 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.

6.2 TEST PROCEDURE

a) Set RBW = 100KHz.

b) Set the VBW > RBW.

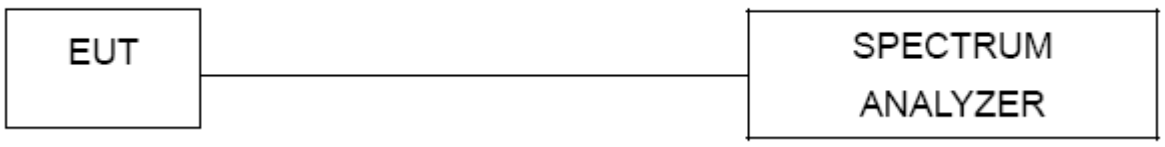
c) Detector = Peak.

d) Trace mode = max hold.

e) 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.

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.



6.3 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.

6.4 TEST RESULTS

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

ANT1

Test CH	-26dB Channel Bandwidth (MHz)			Limit(KHz)	Result
	802.11a	802.11n(HT20)	802.11n(HT40)		
Lowest	19.42	20.52	40.34	>500	Pass
Middle	19.35	20.37	/		
Highest	19.40	20.25	40.06		

Test CH	-26dB Channel Bandwidth (MHz)			Limit(KHz)	Result
	802.11ac(HT20)	802.11ac(HT40)	802.11ac(HT80)		
Lowest	20.48	40.32	81.99	>500	Pass
Middle	20.82	/			
Highest	20.40	40.17			

ANT2

Test CH	-26dB Channel Bandwidth (MHz)			Limit(KHz)	Result
	802.11a	802.11n(HT20)	802.11n(HT40)		
Lowest	19.23	20.42	40.25	>500	Pass
Middle	19.27	20.30	/		
Highest	19.35	20.11	40.03		

Test CH	-26dB Channel Bandwidth (MHz)			Limit(KHz)	Result
	802.11ac(HT20)	802.11ac(HT40)	802.11ac(HT80)		
Lowest	20.27	40.15	81.75	>500	Pass
Middle	20.55	/			
Highest	20.26	40.07			

ANT 1(2) Represent the value of antenna 1 and antenna 2, The worst data is Antenna 1, only shown Antenna 1 Plot.

Test plot

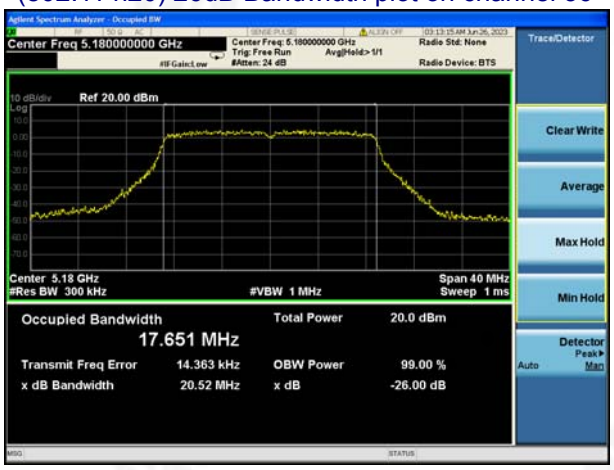
(802.11 a) 26dB Bandwidth plot on channel 36

(802.11 a) 26dB Bandwidth plot on channel 40

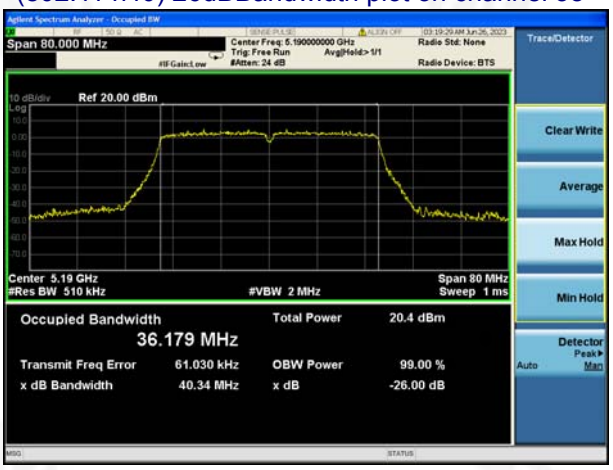
(802.11 a) 26dB Bandwidth plot on channel 48

Test plot

(802.11 n20) 26dB Bandwidth plot on channel 36

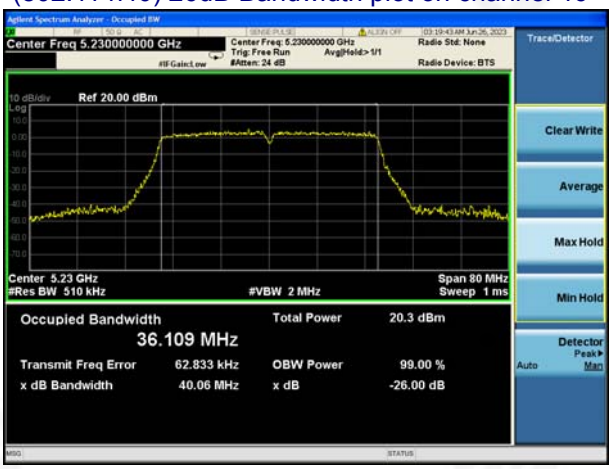


(802.11 n40) 26dBBandwidth plot on channel 38

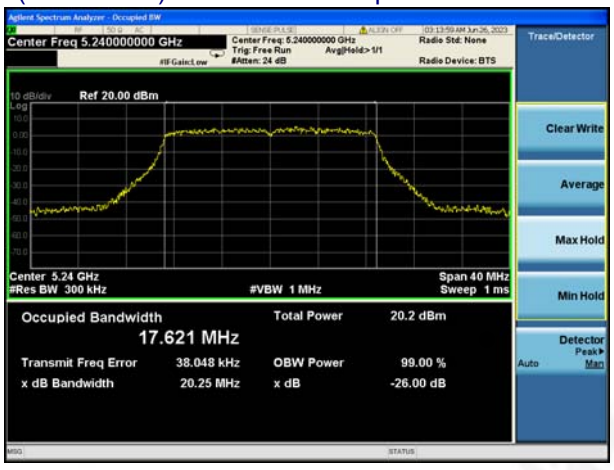


(802.11 n20) 26dB Bandwidth plot on channel 40

(802.11 n40) 26dB Bandwidth plot on channel 46

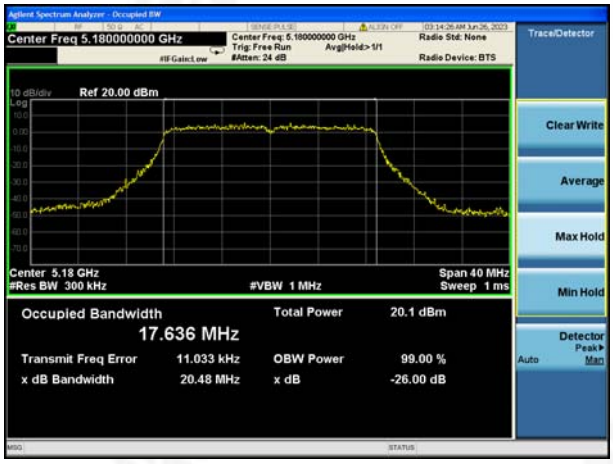


(802.11 n20) 26dB Bandwidth plot on channel 48

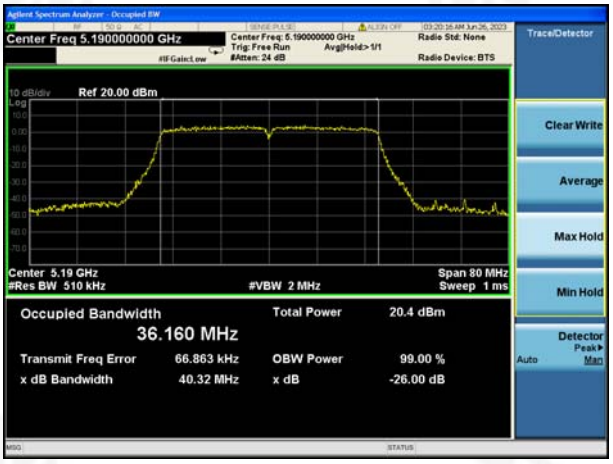


Test plot

(802.11ac20) 99%Bandwidth plot on channel 36

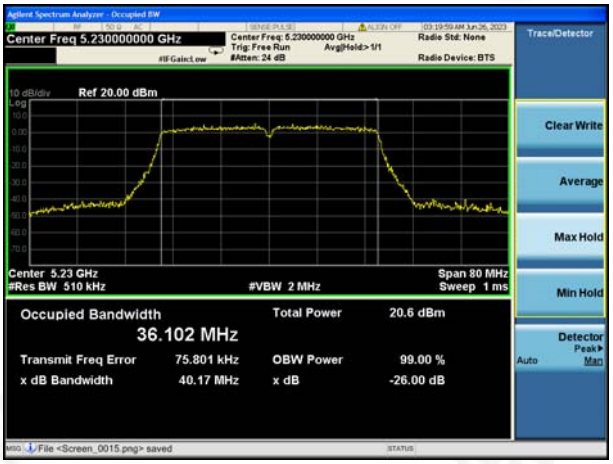


(802.11 ac40) 99% Bandwidth plot on channel 42

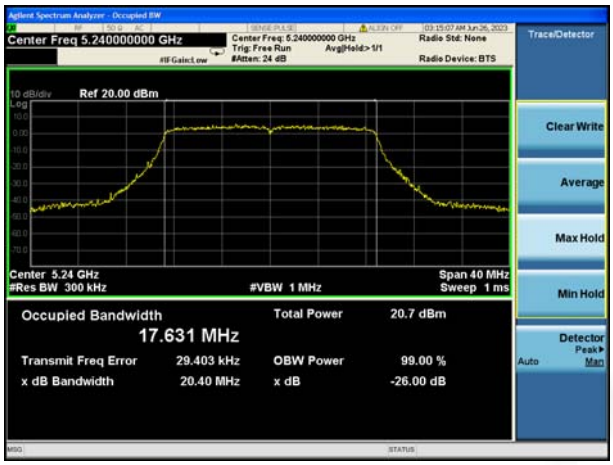


(802.11ac20) 99%Bandwidth plot on channel 40

(802.11 ac40) 99% Bandwidth plot on channel 42



(802.11ac20) 99%Bandwidth plot on channel 48



(802.11 ac80) 26dB Bandwidth plot on channel 42

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

The EUT was directly connected to the 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.

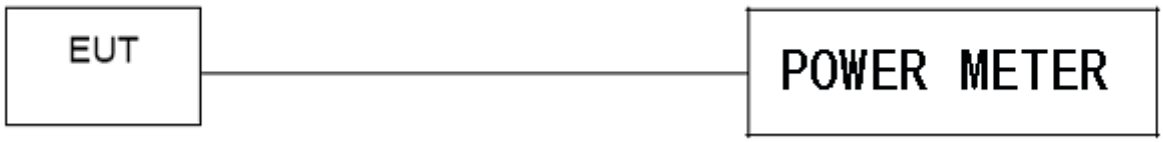
2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)
Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, 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

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX		

Test Channel	Frequency	Maximum output power			LIMIT	Result
	(MHz)	(dBm)			dBm	
TX 802.11 a Mode		ANT1	ANT2	Total		
CH36	5180	16.35	16.11	\	23.98	Pass
CH40	5200	16.13	16.02	\	23.98	Pass
CH48	5240	16.27	15.97	\	23.98	Pass
TX 802.11 n20M Mode						
CH36	5180	14.77	14.52	17.66	23.98	Pass
CH40	5200	14.51	14.16	17.35	23.98	Pass
CH48	5240	14.33	14.17	17.26	23.98	Pass
TX 802.11 n40M Mode						
CH38	5190	14.02	13.92	16.98	23.98	Pass
CH46	5230	13.84	13.77	16.82	23.98	Pass
TX 802.11 ac20M Mode						
CH36	5180	14.55	14.26	17.42	23.98	Pass
CH40	5200	14.21	14.07	17.15	23.98	Pass
CH48	5240	14.05	13.94	17.01	23.98	Pass
TX 802.11 ac40M Mode						
CH38	5190	13.97	13.81	16.90	23.98	Pass
CH46	5230	13.75	13.67	16.72	23.98	Pass
TX 802.11 ac80M Mode						
CH42	5210	13.26	13.12	16.20	23.98	Pass

8.Frequency Stability Measurement

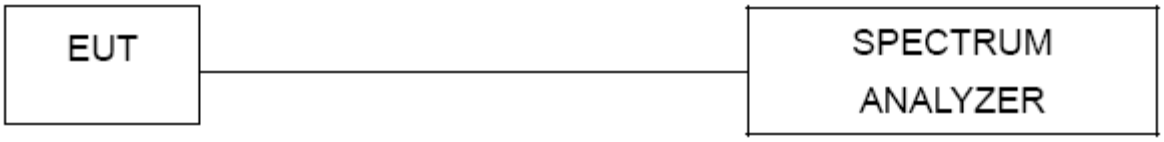
8.1 LIMIT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over a temperature variation of –30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees

8.2 TEST PROCEDURES

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

8.3 TEST SETUP LAYOUT



8.4 EUT OPERATION DURING TEST

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

8.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX		

5.2G
802.11a

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5180.0236	4.56
40	7.6	5180.0231	4.46
30	7.6	5180.0222	4.29
20	7.6	5180.0216	4.17
10	7.6	5180.0233	4.50
0	7.6	5180.0226	4.36
-10	7.6	5180.0211	4.07
-20	7.6	5180.0242	4.67
-30	7.6	5180.0233	4.50

802.11n_HT20

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5180.0241	4.65
40	7.6	5180.0237	4.58
30	7.6	5180.0229	4.42
20	7.6	5180.0221	4.27
10	7.6	5180.0239	4.61
0	7.6	5180.0222	4.29
-10	7.6	5180.0214	4.13
-20	7.6	5180.0252	4.86
-30	7.6	5180.0247	4.77

802.11n_HT40

Reference Frequency(Middle Channel): 5190MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5190.0255	4.91
40	7.6	5190.0247	4.76
30	7.6	5190.0232	4.47
20	7.6	5190.0228	4.39
10	7.6	5190.0258	4.97
0	7.6	5190.0244	4.70
-10	7.6	5190.0235	4.53
-20	7.6	5190.0227	4.37
-30	7.6	5190.0251	4.84

802.11 ac20

Reference Frequency(Middle Channel): 5180MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5180.0257	4.96
40	7.6	5180.0242	4.67
30	7.6	5180.0233	4.50
20	7.6	5180.0227	4.38
10	7.6	5180.0231	4.46
0	7.6	5180.0228	4.40
-10	7.6	5180.0221	4.27
-20	7.6	5180.0242	4.67
-30	7.6	5180.0236	4.56

802.11ac40

Reference Frequency(Middle Channel): 5190MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5190.0247	4.76
40	7.6	5190.0252	4.86
30	7.6	5190.0257	4.95
20	7.6	5190.0241	4.64
10	7.6	5190.0239	4.61
0	7.6	5190.0242	4.66
-10	7.6	5190.0243	4.68
-20	7.6	5190.0233	4.49
-30	7.6	5190.0229	4.41

802.11ac80

Reference Frequency(Middle Channel): 5210MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
50	7.6	5210.0311	5.97
40	7.6	5210.0295	5.66
30	7.6	5210.0298	5.72
20	7.6	5210.0287	5.51
10	7.6	5210.0281	5.39
0	7.6	5210.0296	5.68
-10	7.6	5210.0304	5.83
-20	7.6	5210.0317	6.08
-30	7.6	5210.0288	5.53

So, Frequency Stability Versus Input Voltage is:

802.11a

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	5180.0211	4.07
	8.74	5180.0239	4.61
	6.46	5180.0228	4.40

802.11n_HT20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	5180.0225	4.34
	8.74	5180.0217	4.19
	6.46	5180.0244	4.71

802.11n_HT40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	5190.0221	4.26
	8.74	5190.0214	4.12
	6.46	5190.0228	4.39

802.11ac20

Reference Frequency(Middle Channel): 5180 MHz			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	5210.0287	5.51
	8.74	5210.0245	4.70
	6.46	5210.0266	5.11

802.11ac40

Reference Frequency(Middle Channel): 5190 MHz			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	5190.0235	4.53
	8.74	5190.0225	4.34
	6.46	5190.0217	4.18

802.11ac80

Reference Frequency(Middle Channel): 5210 MHz			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Measurement Frequency (MHz)	Error (ppm)
20	7.6	33	0.00570
	8.74	44	0.00762
	6.46	42	0.00727

ANT 1(2) Represent the value of antenna 1 and antenna 2, The worst data is Antenna 1, only shown Antenna 1 data.

9.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
EUT Antenna:	
The antenna is Brass tube antenna, the gain of the antenna is antenna 1: 2.71dBi , antenna 2: 2.66dBi, reference to the appendix II for details	

10. TEST SETUP PHOTO

Reference to the appendix I for details.

11. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

※※※※※ END OF REPORT ※※※※※