FCC Part 15C Test Report

FCC ID: 2AUUR-VI88TR

Product Name:	UHF RFID Integrated reader
Trademark:	万全 VANCH
Model Name :	VI-88TR VI-88TR, VI-83TR, VI-89R
Prepared For :	Shenzhen VanchIOT Technology Co.,Ltd.
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Test Date:	Jul. 22, 2019 – Aug. 02, 2019
Date of Report :	Aug. 02, 2019
Report No.:	BCTC-FY190502768E

TEST RESULT CERTIFICATION

Applicant's name ..... : Shenzhen VanchIOT Technology Co.,Ltd.

Address ..... : 4/F, the West of Building B, Fuanna Industrial Park, No.1 Qingning Road, Longhua District, Shenzhen City-518109, Guangdong Province, China

Manufacture's Name..... : Shenzhen VanchIOT Technology Co.,Ltd.

Address ..... : 4/F, the West of Building B, Fuanna Industrial Park, No.1 Qingning Road, Longhua District, Shenzhen City-518109, Guangdong Province, China

Product description

Product name ..... : UHF RFID Integrated reader

Trademark ..... : 万全 VANCH

Model and/or type reference : VI-88TR
VI-88TR, VI-83TR, VI-89R

Standards ..... : FCC Part15.247
ANSI C63.10-2013

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.

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Compiled by:	Reviewed by:	Approved by:
Willem Wang	Eric Yang	Zero Zhou/Manager

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen BCTC Technology Co., Ltd.

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.247(a)(iii)	Number of Hopping Frequency	PASS	
15.247(a)(iii)	Dwell Time	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.205	Band Edge Emission	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

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>UHF RFID Integrated reader</td></tr>
<tr><td>Trade Name</td><td>万全 YANCH</td></tr>
<tr><td>Model Name</td><td>VI-88TR
VI-88TR, VI-83TR, VI-89R</td></tr>
<tr><td>Model Difference</td><td>All the model are the same circuit and RF module, except model names .</td></tr>
<tr><td>Product Description</td><td>The EUT is a UHF RFID Integrated reader
<table>
<tr><td>Operation Frequency:</td><td>902.50-927.0MHz</td></tr>
<tr><td>Modulation Type:</td><td>FHSS(GFSK)</td></tr>
<tr><td>Number Of Channel</td><td>50CH</td></tr>
<tr><td>Antenna type:</td><td>Internal antenna</td></tr>
<tr><td>Antenna Gain (dBi)</td><td>12dBi</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Power</td><td>DC 9V from adapter</td></tr>
<tr><td>Adapter</td><td>Input: AC 100-240V 50/60Hz 1A Max
Output: DC 9V 3A</td></tr>
<tr><td>hardware version</td><td>--</td></tr>
<tr><td>Software version</td><td>--</td></tr>
<tr><td>Serial number</td><td>--</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

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

2.	Channel List							
	CH	Center frequency (MHz)	CH	Center frequency (MHz)	CH	Center frequency (MHz)	CH	Center frequency (MHz)
	1	902.50	14	909.00	27	915.50	39	921.50
	2	903.00	15	909.50	28	916.00	40	922.00
	3	903.50	16	910.00	29	916.50	41	922.50
	4	904.00	17	910.50	30	917.00	42	923.00
	5	904.50	18	911.0	31	917.50	43	923.50
	6	905.00	19	911.50	32	918.00	44	924.00
	7	905.50	20	912.00	33	918.50	45	924.50
	8	906.00	21	912.50	34	919.00	46	925.00
	9	906.50	22	913.00	35	919.50	47	925.50
	10	907.00	23	913.50	36	920.00	48	926.00
	11	907.50	24	914.00	37	920.50	49	926.50
	12	908.00	25	914.50	38	921.00	50	927.00
	13	908.50	26	915.00				

2.2 DESCRIPTION OF TEST MODES

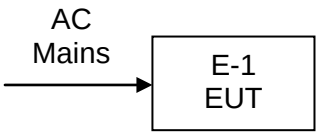
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration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

Pretest Mode	Description	
Mode 1	CH01	
Mode 2	CH25	
Mode 3	CH50	
Mode 4	Link Mode	
For Conducted & Radiated Emission		
Final Test Mode	Description	
Mode 1	CH01	
Mode 2	CH25	
Mode 3	CH50	
Mode 4	Link Mode	

Note:
(1) The measurements are performed at the highest, middle, lowest available channels.
(2) Directional Gain=0dBi+10log(4)=6.0dBi

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated & Conducted Spurious Emission Test



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	UHF RFID Integrated reader	N/A	VI-88TR	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) 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, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	Jun. 13, 2019	Jun. 12, 2020
2	Test Receiver (9kHz-7GHz)	R&S	ESR7	101154	Jun. 13, 2019	Jun. 12, 2020
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	VULB9163-942	Jun. 22, 2019	Jun. 21, 2020
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	Jun. 22, 2019	Jun. 21, 2020
5	Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	Jun. 22, 2019	Jun. 21, 2020
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	Jun. 25, 2019	Jun. 24, 2020
7	Amplifier (0.5GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	Jun. 25, 2019	Jun. 24, 2020
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	Jun. 17, 2019	Jun. 16, 2020
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Jun. 25, 2019	Jun. 24, 2020
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 25, 2019	Jun. 24, 2020
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	Jun. 25, 2019	Jun. 24, 2020
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	Jun. 25, 2019	Jun. 24, 2020
13	Power Metter	Keysight	E4419	\	Jun. 17, 2019	Jun. 16, 2020
14	Power Sensor (AV)	Keysight	E9 300A	\	Jun. 17, 2019	Jun. 16, 2020
15	Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	Jun. 13, 2019	Jun. 12, 2020
16	Spectrum Analyzer 9kHz-40GHz	Aglient	FSP40	100363	Jun. 13, 2019	Jun. 12, 2020
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. 13, 2019	Jun. 12, 2020
2	LISN	SCHWARZBECK	NSLK8127	8127739	Jun. 13, 2019	Jun. 12, 2020
3	LISN	R&S	ENV216	101375	Jun. 13, 2019	Jun. 12, 2020
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 25, 2019	Jun. 24, 2020
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)	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) 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.

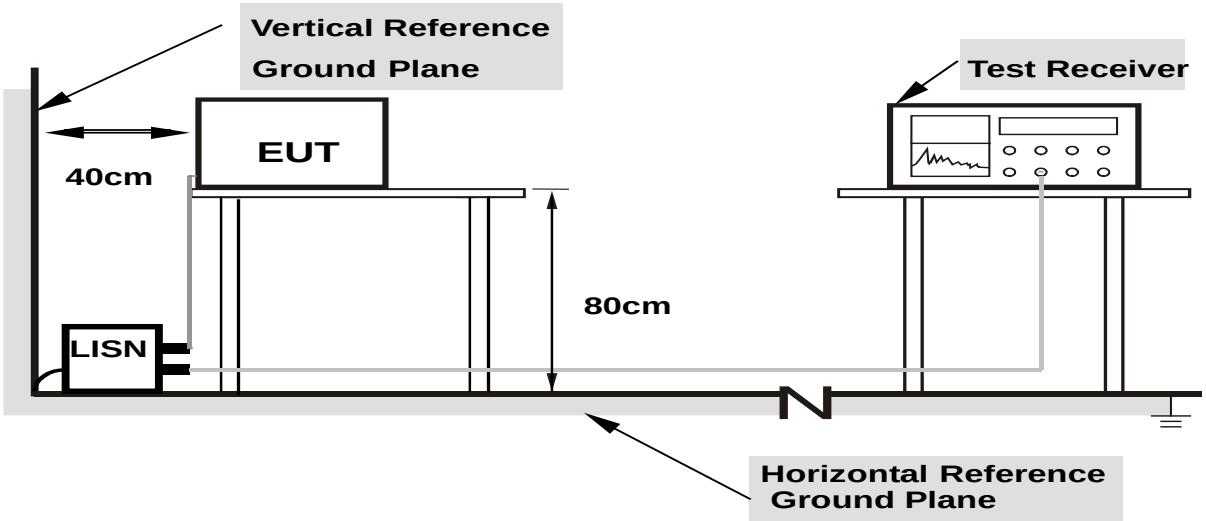
d. LISN at least 80 cm from nearest part of EUT chassis.

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



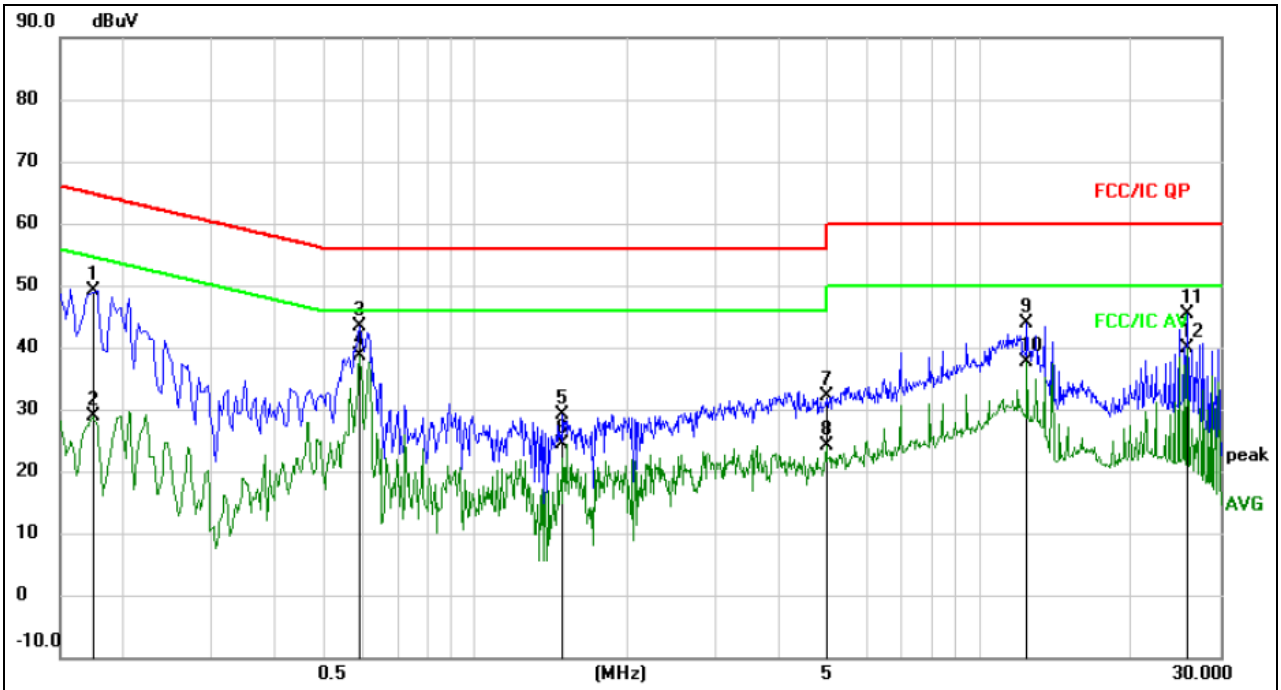
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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.

3.1.6 TEST RESULTS

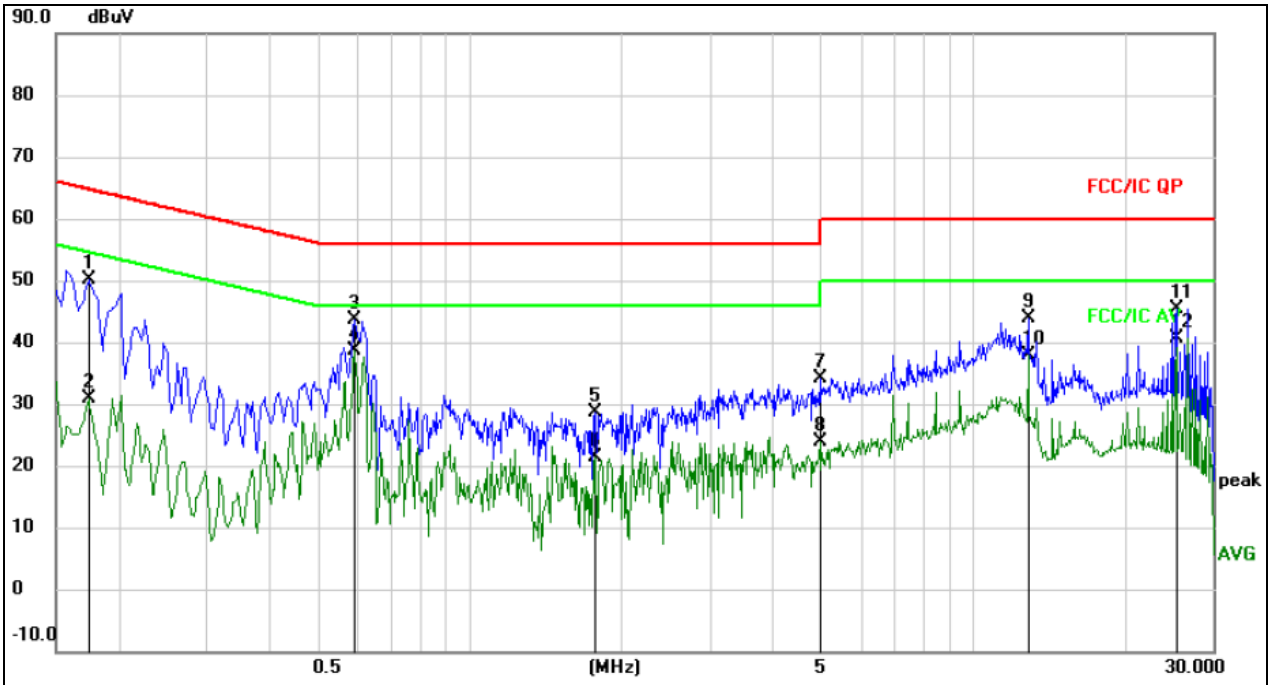
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 4



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	dBuV		dBuV	dBuV	dB	Detector	Comment
1		0.1740	39.59	9.49	49.08	64.77	-15.69	QP	
2		0.1740	19.40	9.49	28.89	54.77	-25.88	AVG	
3		0.5899	33.37	9.96	43.33	56.00	-12.67	QP	
4	*	0.5899	28.76	9.96	38.72	46.00	-7.28	AVG	
5		1.4900	19.52	9.58	29.10	56.00	-26.90	QP	
6		1.4900	14.73	9.58	24.31	46.00	-21.69	AVG	
7		4.9660	22.24	9.80	32.04	56.00	-23.96	QP	
8		4.9660	14.42	9.80	24.22	46.00	-21.78	AVG	
9		12.4300	34.11	9.69	43.80	60.00	-16.20	QP	
10		12.4300	27.94	9.69	37.63	50.00	-12.37	AVG	
11		25.8500	35.56	9.74	45.30	60.00	-14.70	QP	
12		25.8500	30.07	9.74	39.81	50.00	-10.19	AVG	

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 4



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	dBuV		dBuV	dBuV	dB	Detector	Comment
1		0.1740	40.71	9.49	50.20	64.77	-14.57	QP	
2		0.1740	21.38	9.49	30.87	54.77	-23.90	AVG	
3		0.5899	33.71	9.96	43.67	56.00	-12.33	QP	
4	*	0.5899	28.76	9.96	38.72	46.00	-7.28	AVG	
5		1.7780	19.09	9.59	28.68	56.00	-27.32	QP	
6		1.7780	11.72	9.59	21.31	46.00	-24.69	AVG	
7		4.9620	24.35	9.80	34.15	56.00	-21.85	QP	
8		4.9620	14.06	9.80	23.86	46.00	-22.14	AVG	
9		12.9060	34.14	9.70	43.84	60.00	-16.16	QP	
10		12.9060	28.17	9.70	37.87	50.00	-12.13	AVG	
11		25.3220	35.69	9.74	45.43	60.00	-14.57	QP	
12		25.3220	30.99	9.74	40.73	50.00	-9.27	AVG	

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

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.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
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

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

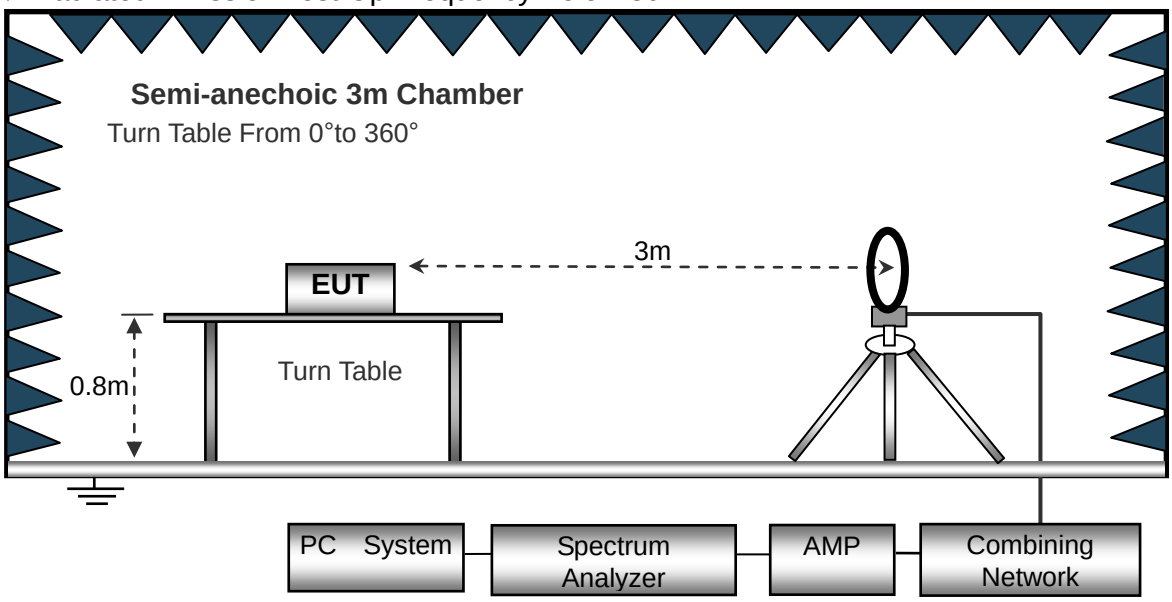
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

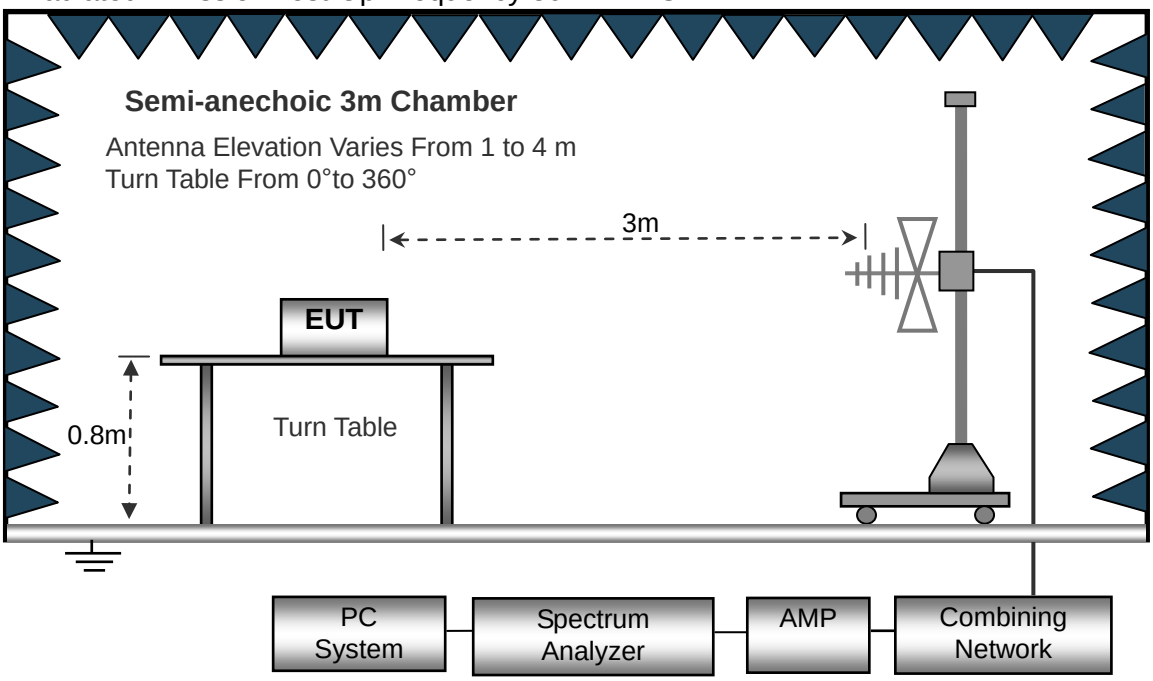
No deviation

3.2.4 TEST SETUP

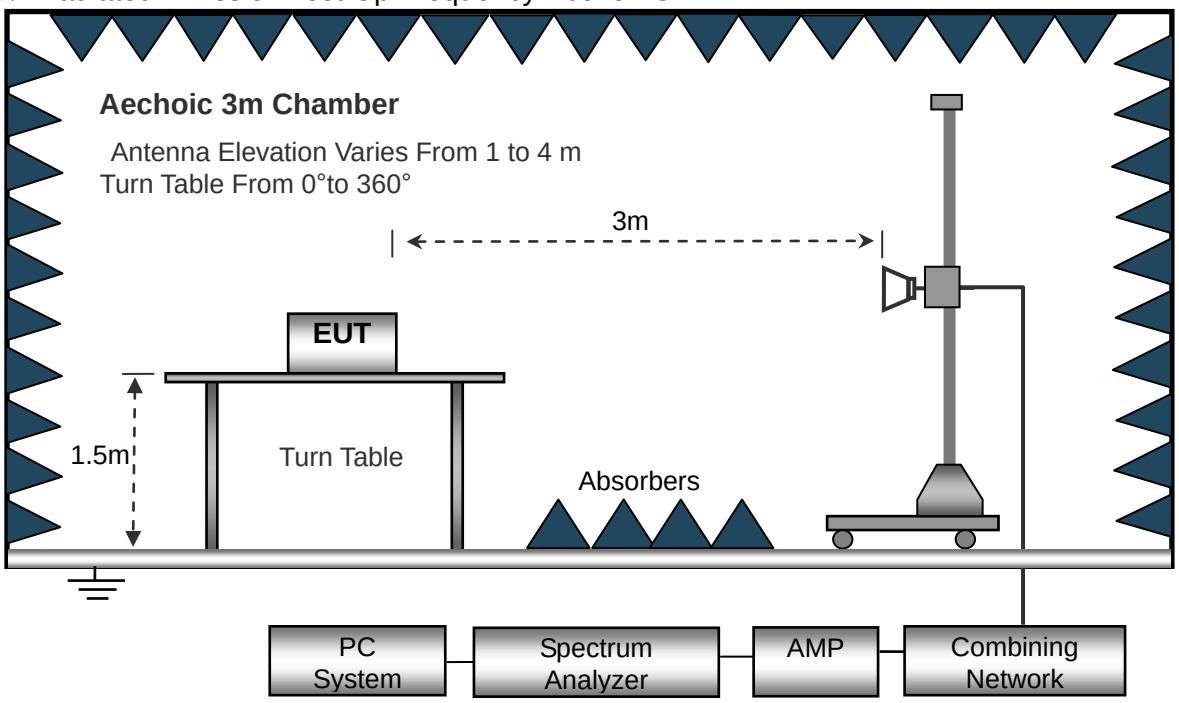
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	26℃	Relative Humidtity:	54%
Pressure:	101 kPa	Test Voltage :	DC 9V from adapter input AC 120V/60Hz
Test Mode :	Mode 4	Polarization :	--

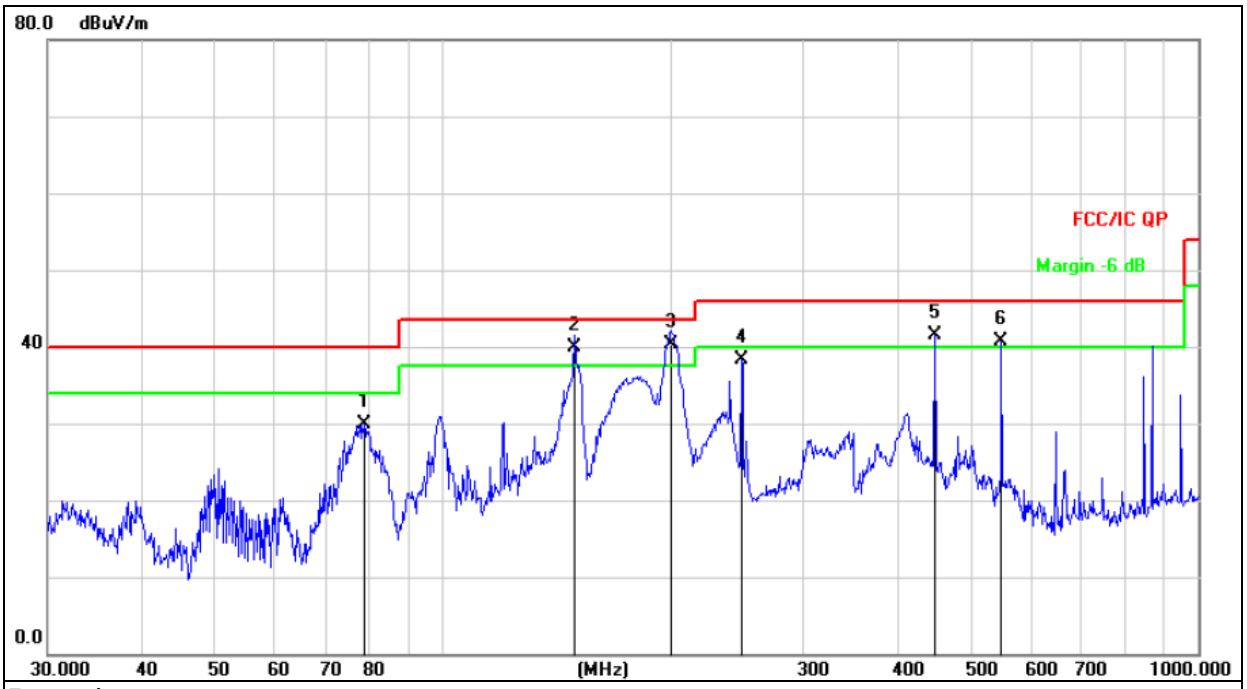
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

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 (BETWEEN 30MHZ – 1GHZ)

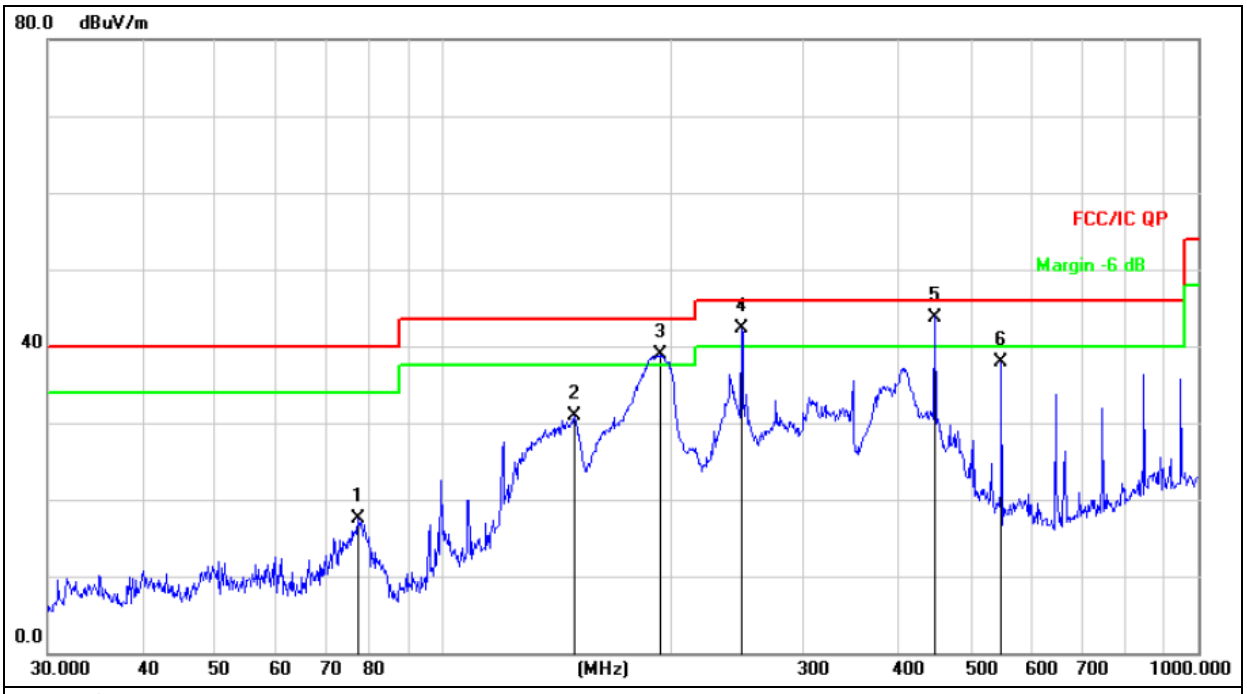
Temperature :	26℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 4		



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		78.6888	50.00	-20.12	29.88	40.00	-10.12	QP
2	!	149.4857	59.36	-19.47	39.89	43.50	-3.61	QP
3	*	200.6879	56.53	-16.28	40.25	43.50	-3.25	QP
4		248.5517	53.54	-15.18	38.36	46.00	-7.64	QP
5	!	447.9821	51.48	-10.02	41.46	46.00	-4.54	QP
6	!	549.0193	48.44	-7.70	40.74	46.00	-5.26	QP

Temperature :	26℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Vertical
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 4		



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		77.3212	37.33	-19.82	17.51	40.00	-22.49	QP
2		149.4857	50.38	-19.47	30.91	43.50	-12.59	QP
3	!	194.4533	55.64	-16.65	38.99	43.50	-4.51	QP
4	!	248.5518	57.56	-15.18	42.38	46.00	-3.62	QP
5	*	447.9821	53.82	-10.02	43.80	46.00	-2.20	QP
6		549.0193	45.51	-7.70	37.81	46.00	-8.19	QP

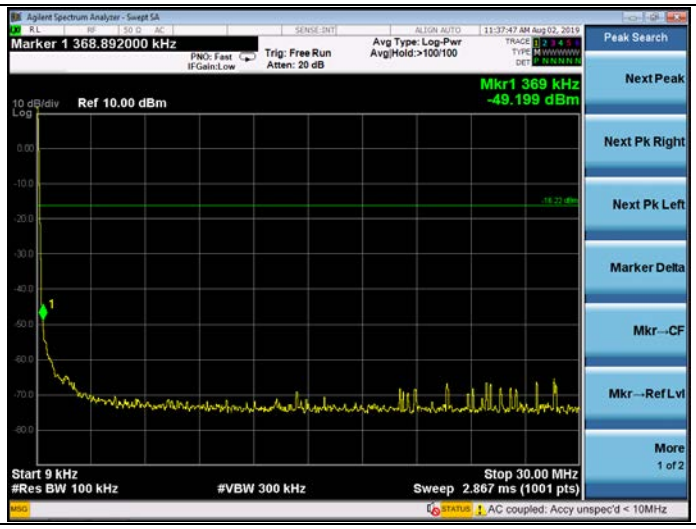
3.2.8 TEST RESULTS (1GHZ~11GHZ)

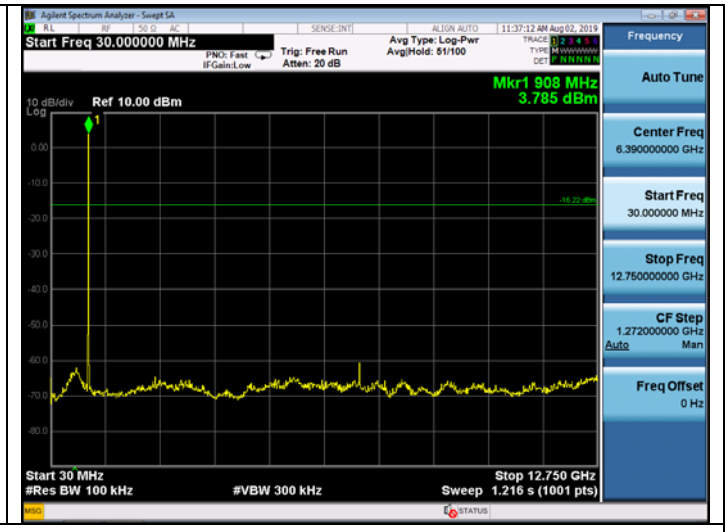
Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:902.50									
V	1805.00	55.36	33.75	5.38	20.46	47.45	74.00	-26.55	PK
V	1805.00	44.34	33.75	5.38	20.46	36.43	54.00	-17.57	AV
V	2707.50	56.25	34.45	6.61	21.57	49.98	74.00	-24.02	PK
V	2707.50	44.15	34.45	6.61	21.57	37.88	54.00	-16.12	AV
V	10830.00	52.36	36.29	9.16	24.57	49.80	74.00	-24.20	PK
H	1805.00	54.67	33.75	5.38	20.46	46.76	74.00	-27.24	PK
H	1805.00	44.14	33.75	5.38	20.46	36.23	54.00	-17.77	AV
H	2707.50	55.01	34.45	6.61	21.57	48.74	74.00	-25.26	PK
H	2707.50	43.33	34.45	6.61	21.57	37.06	54.00	-16.94	AV
H	10830.00	53.47	36.29	9.16	24.57	50.91	74.00	-23.09	PK
operation frequency:914.50									
V	1829.00	53.67	33.75	5.38	20.46	45.76	74.00	-28.24	PK
V	1829.00	42.19	33.75	5.38	20.46	34.28	54.00	-19.72	AV
V	2743.50	52.71	34.45	6.61	21.57	46.44	74.00	-27.56	PK
V	2743.50	44.81	34.45	6.61	21.57	38.54	54.00	-15.46	AV
V	10830.00	51.07	36.29	9.16	24.57	48.51	74.00	-25.49	PK
H	1829.00	51.64	33.75	5.38	20.46	43.73	74.00	-30.27	PK
H	1829.00	42.38	33.75	5.38	20.46	34.47	54.00	-19.53	AV
H	2743.50	53.67	34.45	6.61	21.57	47.40	74.00	-26.60	PK
H	2743.50	42.16	34.45	6.61	21.57	35.89	54.00	-18.11	AV
H	10830.00	51.36	36.29	9.16	24.57	48.80	74.00	-25.20	PK
operation frequency:927.00									
V	1854.00	53.69	33.75	5.38	20.46	45.78	74.00	-28.22	PK
V	1854.00	44.39	33.75	5.38	20.46	36.48	54.00	-17.52	AV
V	2781.00	52.36	34.45	6.61	21.57	46.09	74.00	-27.91	PK
V	2781.00	44.04	34.45	6.61	21.57	37.77	54.00	-16.23	AV
V	10830.00	52.39	36.29	9.16	24.57	49.83	74.00	-24.17	PK
H	1854.00	53.04	33.75	5.38	20.46	45.13	74.00	-28.87	PK
H	1854.00	44.36	33.75	5.38	20.46	36.45	54.00	-17.55	AV
H	2781.00	55.04	34.45	6.61	21.57	48.77	74.00	-25.23	PK
H	2781.00	44.07	34.45	6.61	21.57	37.80	54.00	-16.20	AV
H	10830.00	53.68	36.29	9.16	24.57	51.12	74.00	-22.88	PK

Remark:

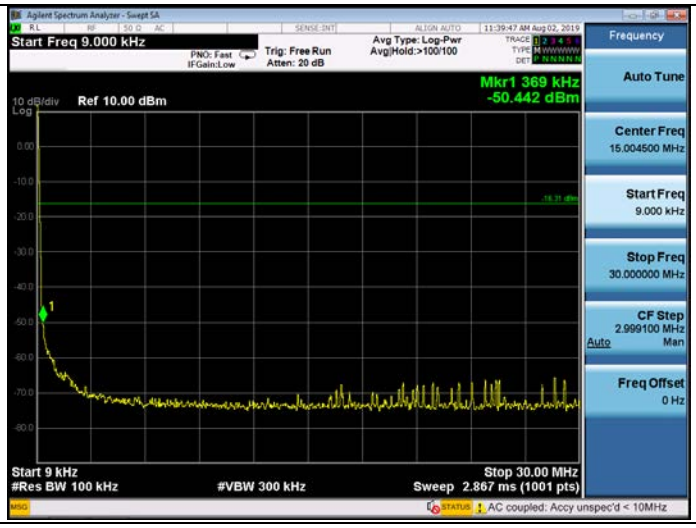
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to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

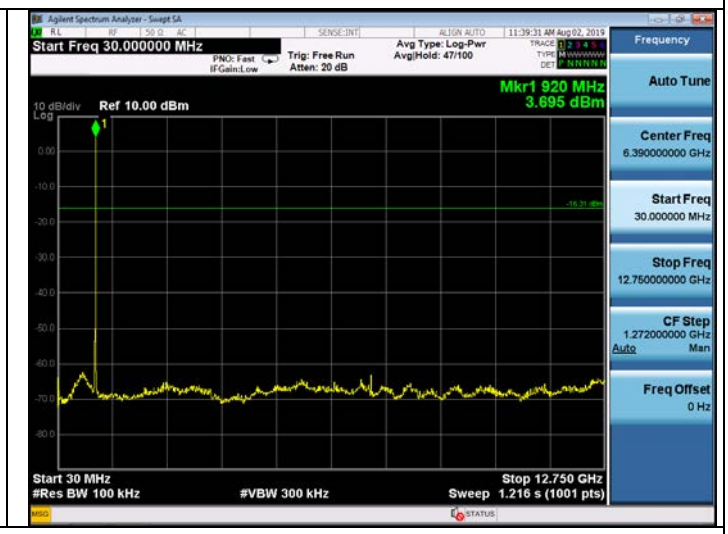
For Conducted



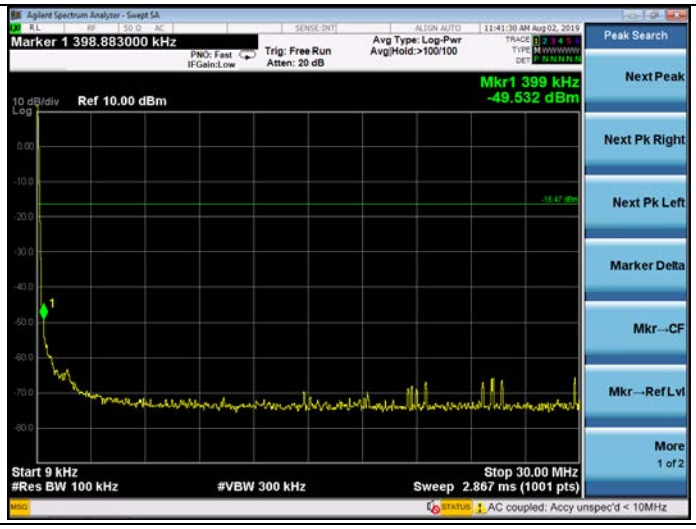


Lowest channel





Middle channel



Highest channel

3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

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

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

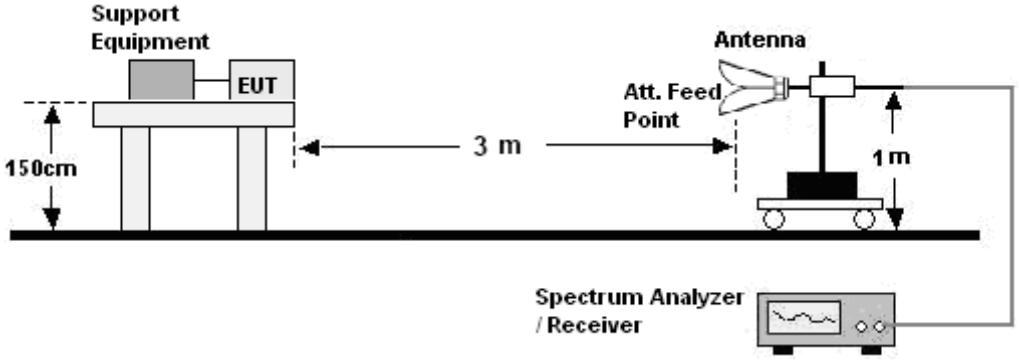
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz

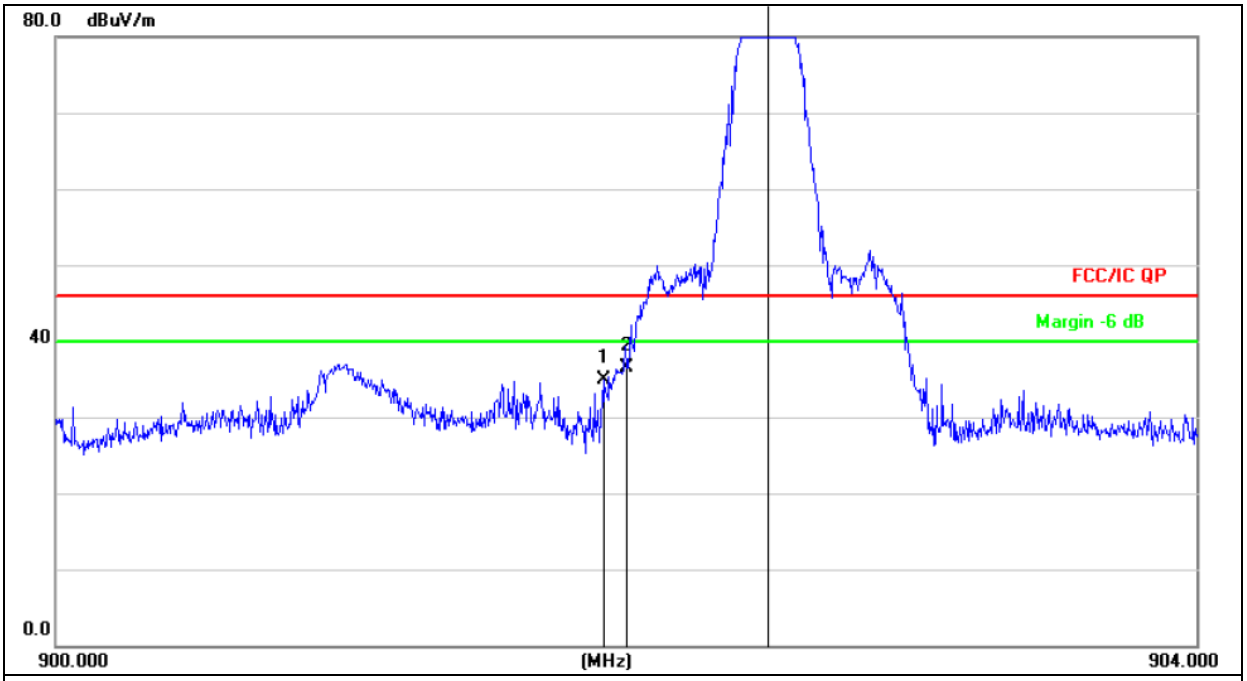


3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.6 TEST RESULT

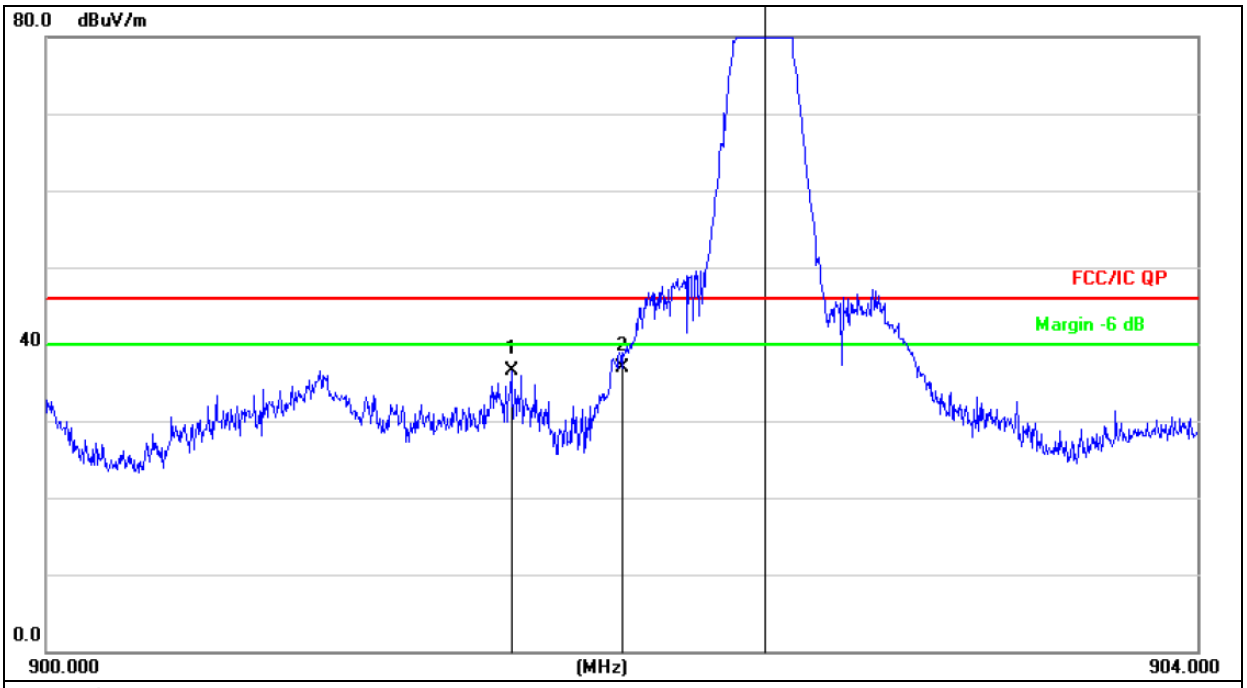
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 1		



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

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	901.9240	36.30	-1.48	34.82	46.00	-11.18	peak
2	902.0000	38.02	-1.48	36.54	46.00	-9.46	peak
3	902.4960	93.57	-1.48	92.09	46.00	46.09	peak

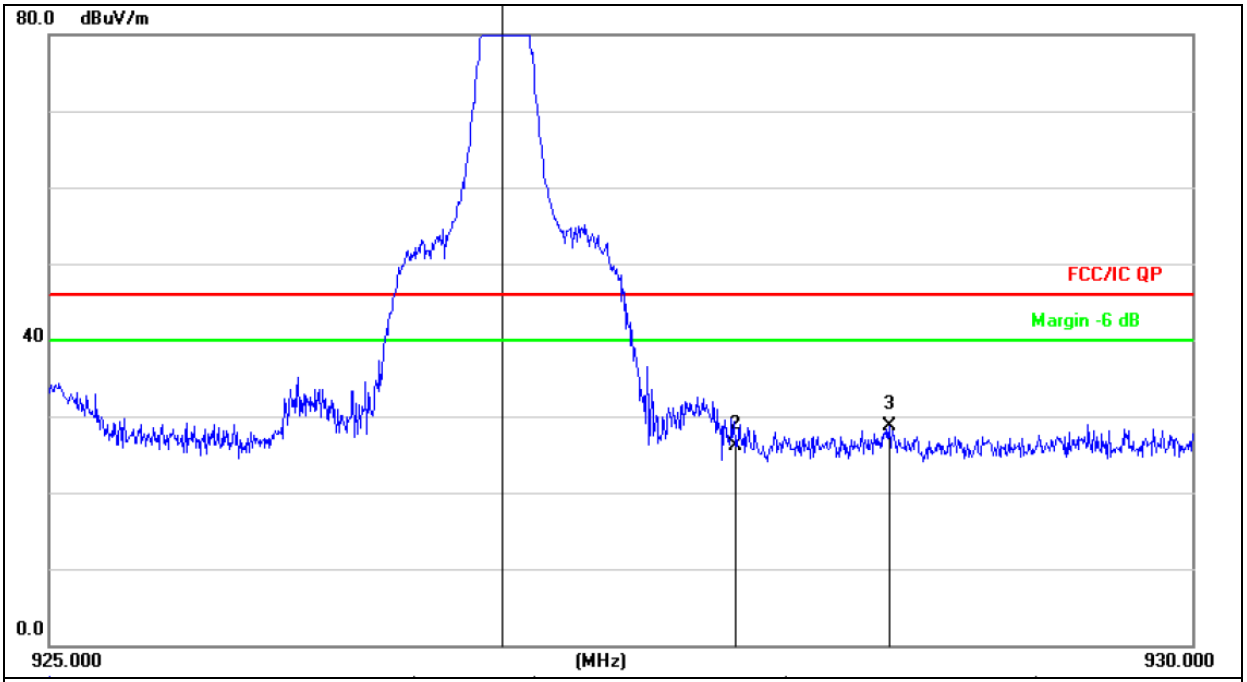
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Vertical
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 1		



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

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	901.6160	37.94	-1.49	36.45	46.00	-9.55	peak
2	902.0000	38.37	-1.48	36.89	46.00	-9.11	peak
3	902.4960	94.82	-1.48	93.34	46.00	47.34	peak

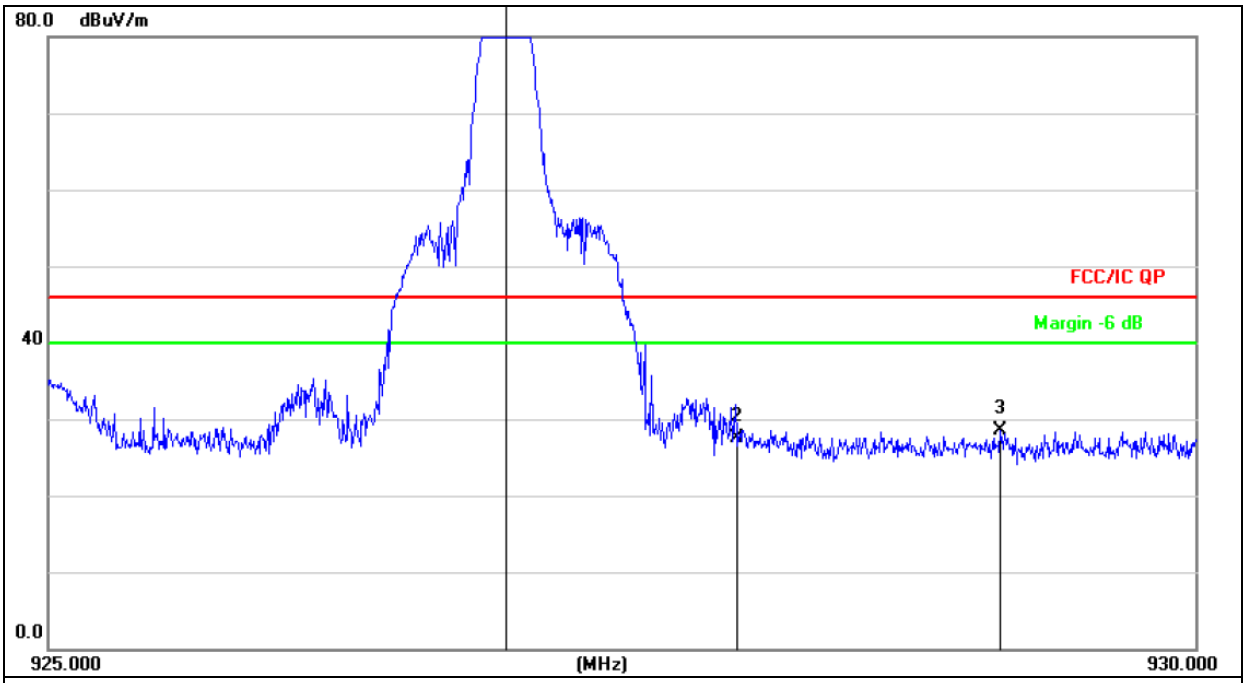
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 4		



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

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	926.9850	93.62	-1.29	92.33	46.00	46.33	peak
2	928.0000	27.47	-1.28	26.19	46.00	-19.81	peak
3	928.6750	30.02	-1.28	28.74	46.00	-17.26	peak

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Vertical
Test Voltage :	DC 9V from adapter input AC 120V/60Hz		
Test Mode :	Mode 4		

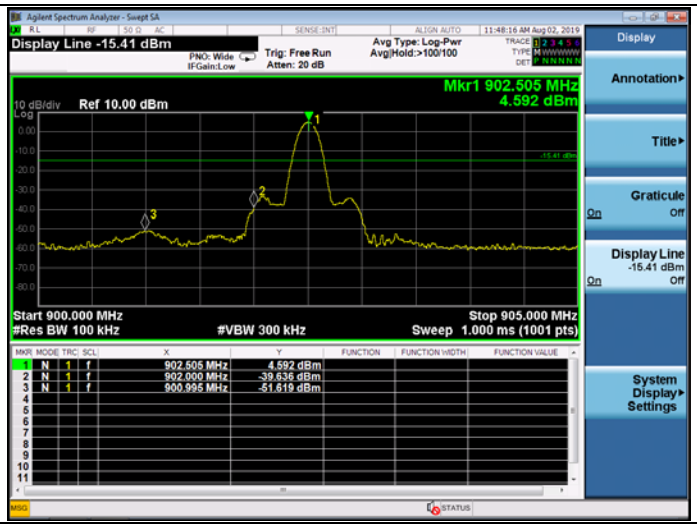


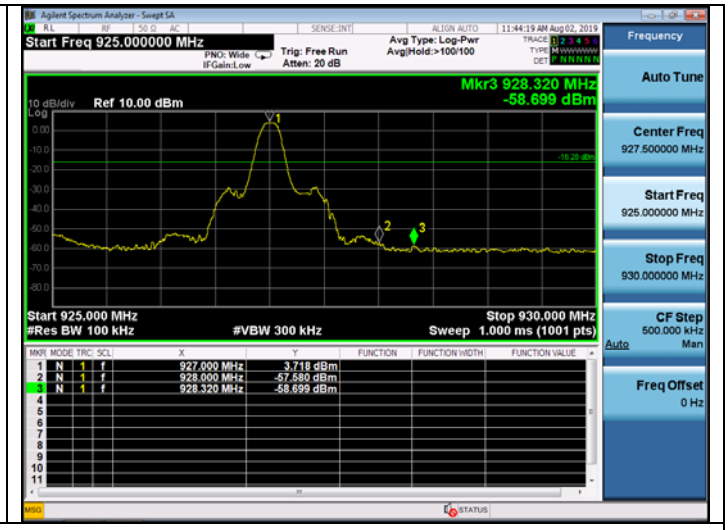
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	926.9950	93.64	-1.29	92.35	46.00	46.35	peak
2	928.0000	28.80	-1.28	27.52	46.00	-18.48	peak
3	929.1500	29.84	-1.27	28.57	46.00	-17.43	peak

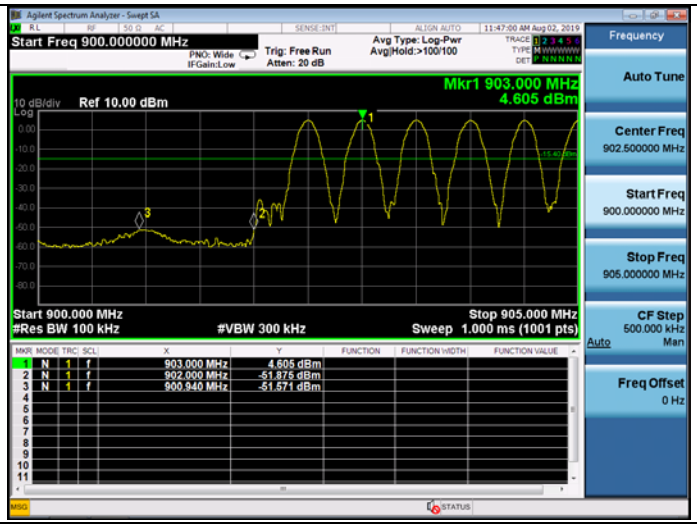
For Conducted

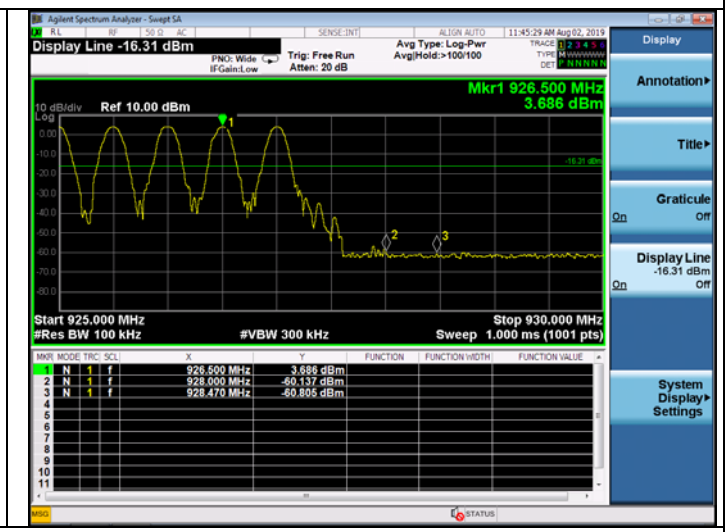
Unhopping





Ant1





Hopping

4. BANDWIDTH TEST

4.1 APPLIED PROCEDURES / LIMIT

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.
The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

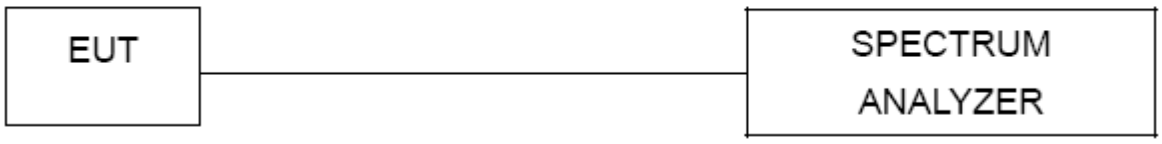
4.1.1 TEST PROCEDURE

1. Set RBW = 1%-5%OBW.
2. Set the video bandwidth (VBW) ≥3*RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

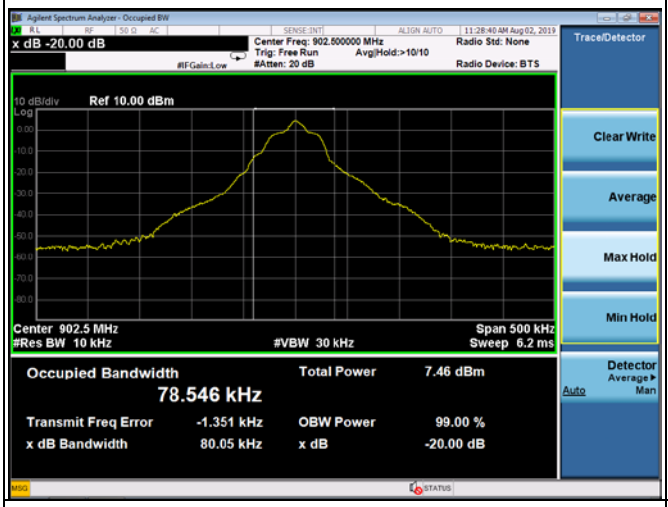
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

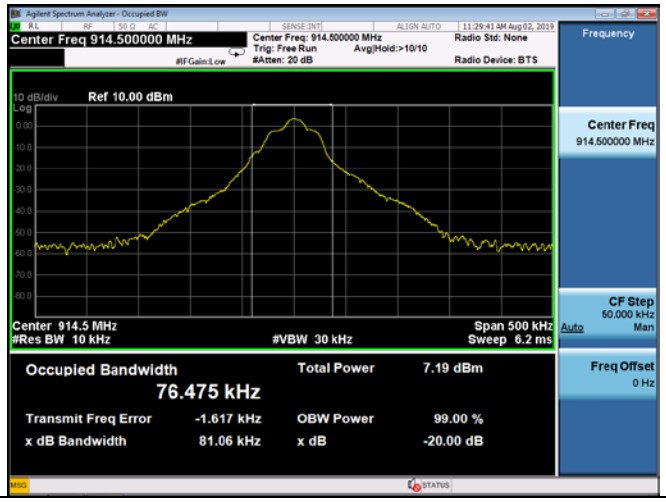
Temperature：	26℃	Relative Humidity：	54%
Pressure：	1012 hPa	Test Voltage ：	DC 9V from adapter input AC 120V/60Hz
Test Mode ：	TX Mode /CH01, CH25, CH50		

	Frequency (MHz)	20dB Bandwidth (kHz)	Result
Ant	902.5	80.05	Pass
	914.5	81.06	Pass
	927.0	89.10	Pass

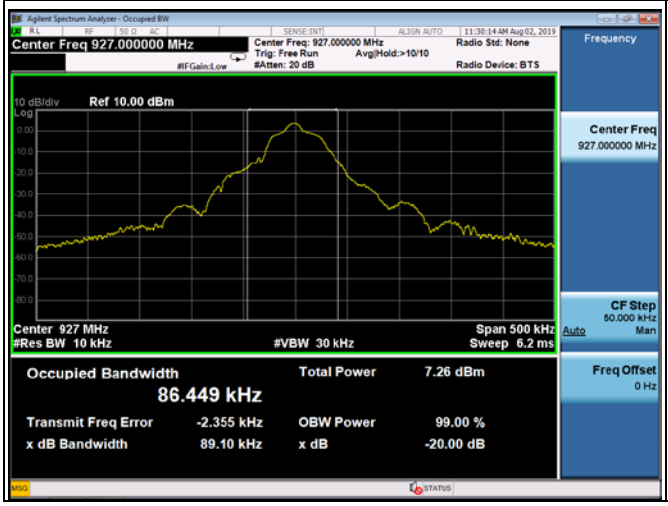
TX CH 01



TX CH 25



TX CH 50



5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥50	902-928	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 1% of the span
VB	VBW ≥ RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

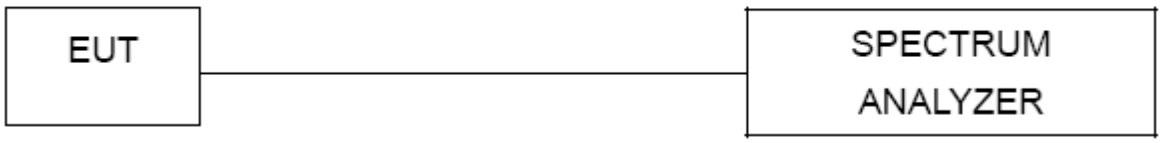
5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=3fere3rddrrnryyt566tryiugmj00KHz, Sweep time = Auto.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

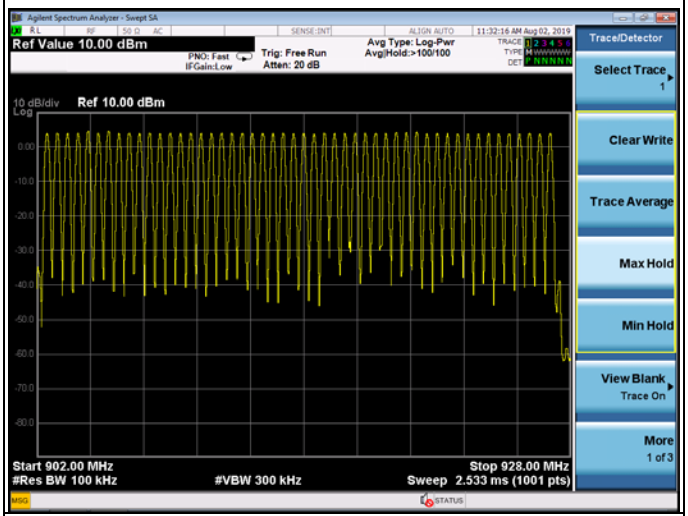
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Test Voltage ：	DC 9V from adapter input AC 120V/60Hz
Test Mode ：	Hopping Mode		

Number of Hopping Channel	Limit	Result
50	⩾50	PASS

Ant1



6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	902-928	PASS

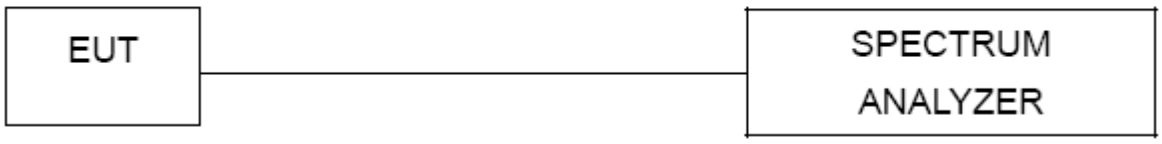
6.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



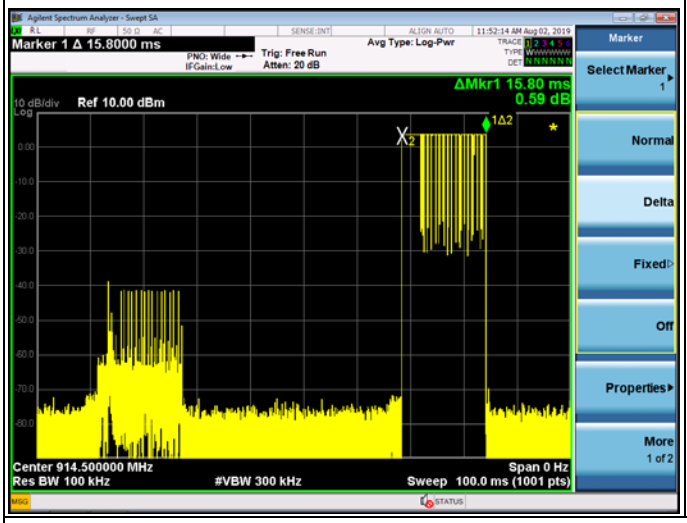
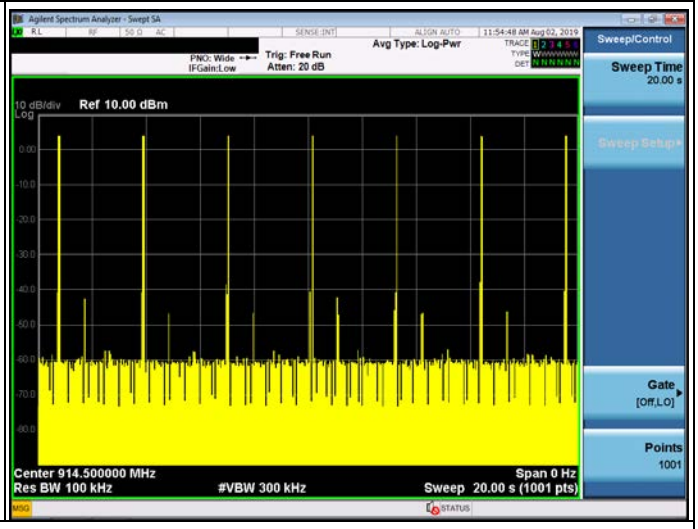
6.1.4 EUT OPERATION CONDITIONS

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.

6.1.5 TEST RESULTS

Frequency	Dwell time(ms)	Limit(ms)	Result
914.75MHz	110.6	400	Pass

Within 10 s period, the average time of occupancy = Time slot length（ms）* hops number / channel @ 20s

Plot 1: Time slot length = 15.8 ms	Plot 2: hops / channel @ 20s = 7
	

7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 902-928 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	100 kHz (Channel Separation)
VB	300 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.1.1 TEST PROCEDURE

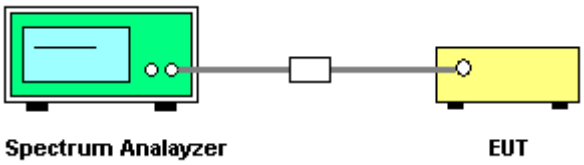
a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

b. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



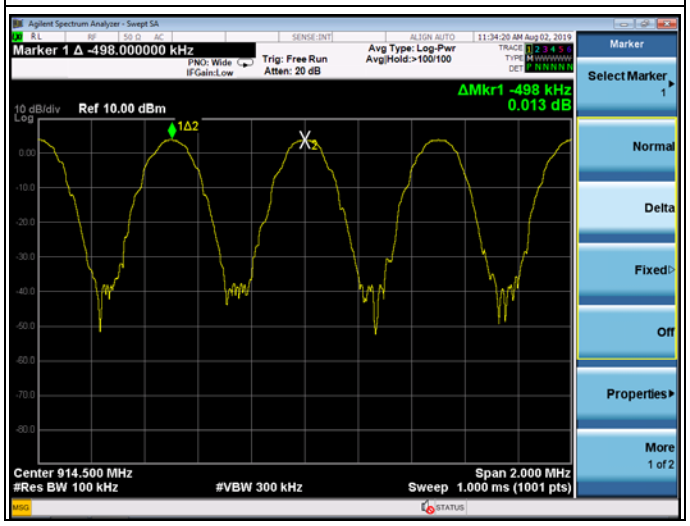
7.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.1.5 TEST RESULTS

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Test Voltage ：	DC 9V from adapter input AC 120V/60Hz
Test Mode ：	Tx Mode		

Test Mode	Ch. Separation (MHz)	Limit (MHz)	Result
TX	0.498	0.091	Complies



8. PEAK OUTPUT POWER

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	30Bm or 20.96dBm	902-928	PASS

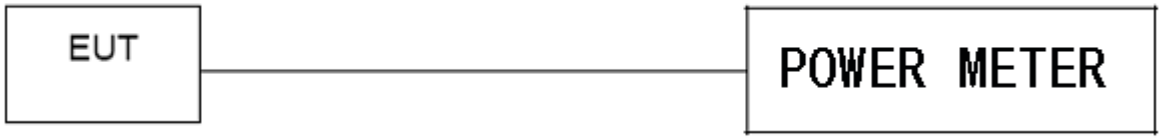
8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the Power meter

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

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

8.1.5 TEST RESULTS

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101 kPa	Test Voltage ：	DC 9V from adapter input AC 120V/60Hz
Test Mode ：	CH01/ CH25 /CH50		

Test Channel	Peak Output Power (dBm)	LIMIT (dBm)*
CH00	4.35	24.00
CH25	4.51	24.00
CH78	4.15	24.00

*NOTE:$P_{OUT}=P_{LIMIT}-(G_{TX}-6)$

9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

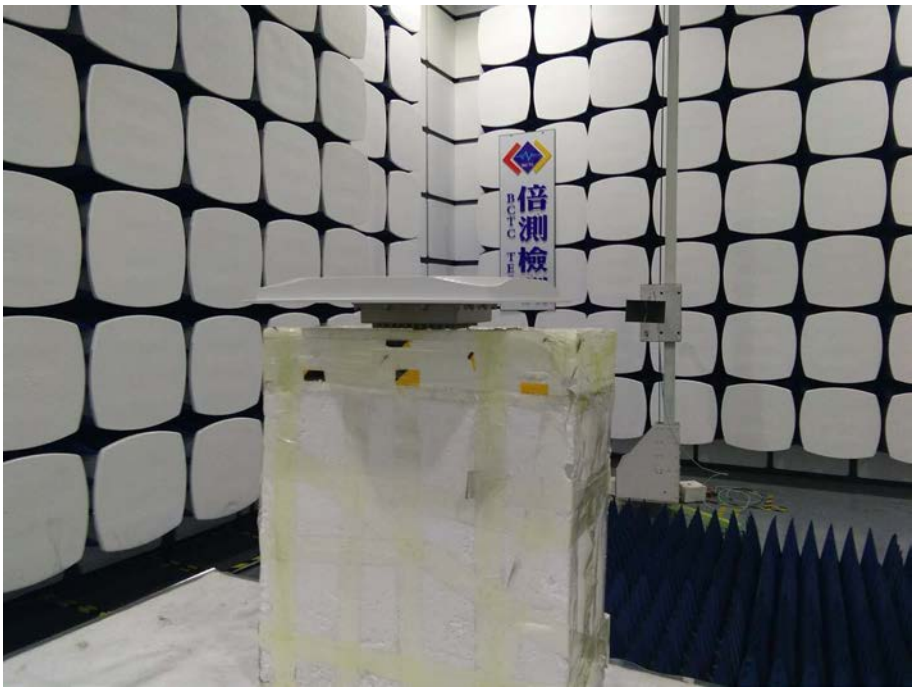
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

9.2 EUT ANTENNA

The EUT antenna is Internal antenna,. It comply with the standard requirement.

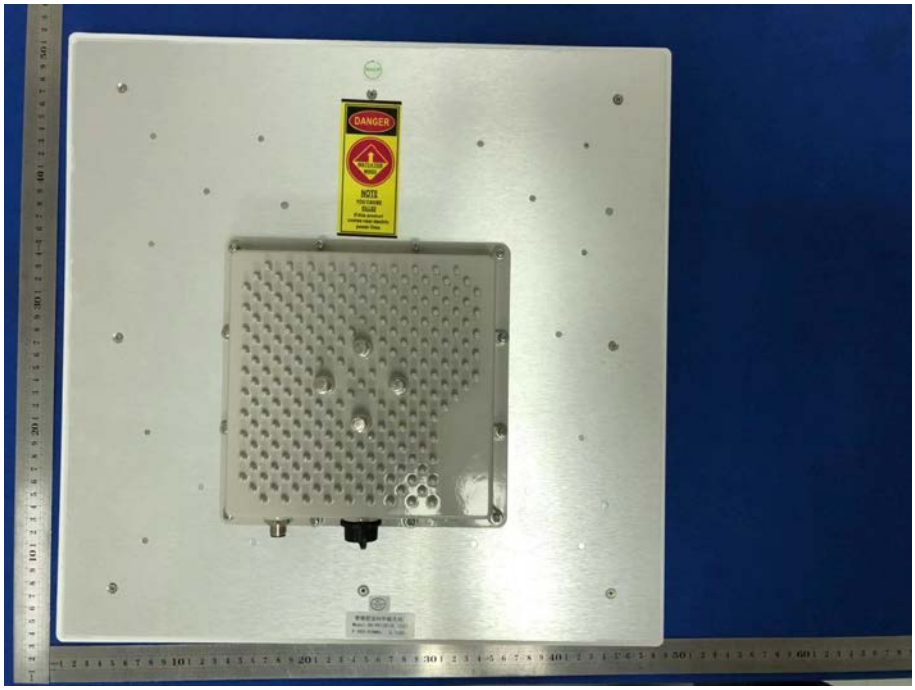
10. TEST SEUUP PHOTO

Radiated Measurement Photos



Conducted Measurement Photos

11. EUT PHOTO



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