



RADIO TEST REPORT

Report No.: STS2004273W12

Issued for

Orbit Irrigation Products, LLC

845 Overland Road, North Salt Lake, Utah 84058

Product Name:	B-HYVE XR
Brand Name:	Orbit/b-hyve
Model Name:	WT26
Series Model:	N/A
FCC ID:	ML6WT26
IC	3330A-WT26
Test Standard:	FCC Part 15.247 RSS-247 Issue 2, February 2017

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TEST RESULT CERTIFICATION

Applicant's Name..... : Orbit Irrigation Products, LLC
 Address : 845 Overland Road, North Salt Lake, Utah 84058
Manufacture's Name..... : Wise Ally Holdings
 Address : Units 3203-3207, Tower 1, Enterprise Square Five, 38 Wang Chiu Road Kowloon Bay

Product Description

Product Name : B-HYVE XR
 Brand Name : Orbit/b-hyve
 Model Name : WT26
 Series Model : N/A

FCC Part15.247
Test Standards..... : RSS-247 Issue 2, February 2017
 RSS-Gen Issue 5 ,March 2019

Test Procedure : ANSI C63.10-2013

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

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Date of Test..... :
 Date of receipt of test item : 28 Apr. 2020
 Date (s) of performance of tests..... : 28 Apr. 2020 ~ 10 July 2020
 Date of Issue..... : 10 July 2020
 Test Result..... : **Pass**

Testing Engineer : *Chris Chen*

 (Chris Chen)

Technical Manager : *Sean She*

 (Sean she)

Authorized Signatory : *Vita Li*

 (Vita Li)





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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	10 July 2020	STS2004273W12	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

FCC Part 15.247, Subpart C RSS-247 Issue 2			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen 8.8	Conducted Emission	PASS	--
15.247 (a)(2) RSS-Gen 6.7 RSS-247 5.2 a)	6dB Bandwidth	PASS	--
15.247 (b)(3) RSS-247 5.4 d)	Output Power	PASS	--
15.247 (c) RSS-Gen 8.9 8.10	Radiated Spurious Emission	PASS	--
15.247 (d) RSS-247 5.5 RSS-Gen 8.9 8.10	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e) RSS-247 5.2 b)	Power Spectral Density	PASS	--
15.205 RSS-Gen 8.9 8.10	Restricted bands of operation	PASS	--
Part 15.247(d)/part 15.209(a) RSS-247 5.5 RSS-Gen 8.9 8.10	Band Edge Emission	PASS	--
15.203 RSS-Gen 6.8	Antenna Requirement	PASS	--
RSS-Gen 6.11 8.11	Frequency Stability	PASS	--

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report.
- (2) All tests are according to ANSI C63.10-2013.



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded 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	RF output power, conducted	$\pm 0.68\text{dB}$
2	Unwanted Emissions, conducted	$\pm 2.988\text{dB}$
3	All emissions, radiated 30-1GHz	$\pm 5.6\text{dB}$
4	All emissions, radiated 1G-6GHz	$\pm 5.5\text{dB}$
5	All emissions, radiated >6G	$\pm 5.8\text{dB}$
6	Conducted Emission (9KHz-150KHz)	$\pm 3.37\text{dB}$
7	Conducted Emission (150KHz-30MHz)	$\pm 3.83\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	B-HYVE XR																									
Trade Name	Orbit/b-hyve																									
Model Name	WT26																									
Model Differences	<table border="1"> <thead> <tr> <th>Model #</th> <th>Part #</th> <th>STATION</th> <th>Region</th> <th>Certificates</th> </tr> </thead> <tbody> <tr> <td rowspan="4">WT26</td> <td>57984</td> <td>8 STATION</td> <td>US/CA</td> <td>FCC</td> </tr> <tr> <td>57994</td> <td>16 STATION</td> <td>US/CA</td> <td>FCC</td> </tr> <tr> <td>57985</td> <td>8 STATION</td> <td>US/CA</td> <td>FCC</td> </tr> <tr> <td>57995</td> <td>16 STATION</td> <td>US/CA</td> <td>FCC</td> </tr> </tbody> </table>				Model #	Part #	STATION	Region	Certificates	WT26	57984	8 STATION	US/CA	FCC	57994	16 STATION	US/CA	FCC	57985	8 STATION	US/CA	FCC	57995	16 STATION	US/CA	FCC
	Model #	Part #	STATION	Region	Certificates																					
	WT26	57984	8 STATION	US/CA	FCC																					
		57994	16 STATION	US/CA	FCC																					
		57985	8 STATION	US/CA	FCC																					
57995		16 STATION	US/CA	FCC																						
<p>57995 and 57994 are sprinkler irrigation controllers that control up to 16 sprinkler irrigation stations. 57985 and 57984 are sprinkler irrigation controllers that use the same identical hardware, except that for the components for control of 8 stations have been removed, allowing 57985 and 57984 to only control up to 8 stations.</p>																										
Product Description	The EUT is a B-HYVE XR																									
	Operation Frequency:	Uplink: 902.3~914.9MHz Downlink: 923.3~927.5MHz																								
	Modulation Type:	GFSK																								
	Radio Technology:	Lora																								
	Number Of Channel:	Uplink: CH 8 Downlink: CH 8																								
	Antenna Designation:	Please refer to the Note 3.																								
	Antenna Gain (dBi)	5dBi																								
Channel List	Please refer to the Note 2.																									
Power Rating	Input: AC 120V/60Hz Output: AC 24 V/ 1A																									
Hardware version number	N/A																									
Software version number	N/A																									
Connecting I/O Port(s)	Please refer to the Note 1.																									

Note:

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



2.

Channel List for Uplink							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
64	902.30	65	903.90	66	905.50	67	907.10
68	908.70	69	910.30	70	911.90	71	914.90

Channel List for Downlink							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	923.30	01	923.90	02	905.50	67	907.10
68	908.70	69	910.30	70	911.90	71	914.90

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Orbit/b-hyve	WT26	PCB	N/A	5dBi	ANT





2.2 DESCRIPTION OF THE TEST MODES

For conducted test items and radiated spurious emissions
Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively.

Uplink

Worst Mode	Description	Operation mode
Mode 1	TX CH65(903.9MHz)	Uplink
Mode 2	TX CH68(908.7MHz)	Uplink
Mode 3	TX CH71(914.9MHz)	Uplink
Mode 4	TX CH00(2402MHz)	Downlink
Mode 5	TX CH19(2440MHz)	Downlink
Mode 6	TX CH39(2480MHz)	Downlink

Note:

- (1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.
- (2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/60Hz is shown in the report.
- (3) Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission mode and to select the test channels, data rates and modulation schemes as required.

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 7: Keeping TX

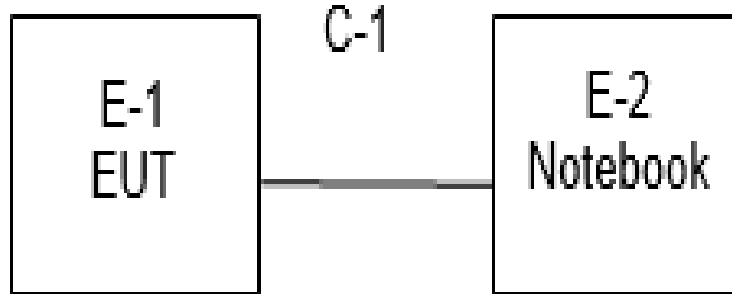
2.3 TEST SOFTWARE AND POWER LEVEL

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

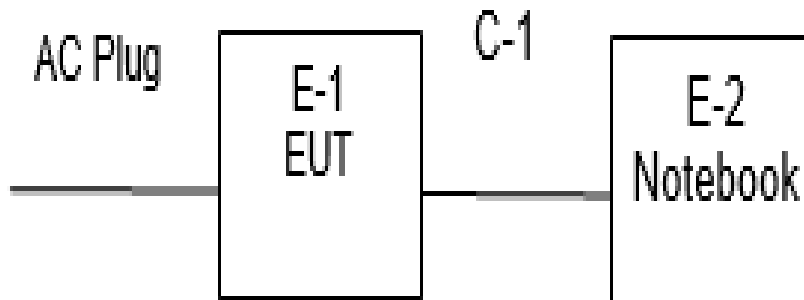
RF Function	Type	Mode Or Modulation type	Ant Gain(dBi)	Power Class	Software For Testing
LORA	902.3-914.9MHz	902.3-914.9MHz	5	Uplink: 22 Downlink: 16	PM Comm Gui Version:0001

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test





2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND 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.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	DELL	VOSTRO.3800	N/A	N/A
C-1	DC Cable	N/A	100cm	N/A	N/A

Note:

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



2.6 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.07.29	2020.07.28
Signal Analyzer	Agilent	N9020A	MY51110105	2020.03.05	2021.03.04
Active loop Antenna	ZHINAN	ZN30900C	16035	2018.03.11	2021.03.10
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	SCHWARZBECK	BBHA 9120D(1201)	9120D-1343	2018.10.19	2021.10.18
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2021.03.10
Pre-Amplifier(0.1M-3G Hz)	EM	EM330	060665	2019.10.09	2020.10.08
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK201808090 1	2019.10.12	2020.10.11
Pre-Amplifier (18G-40G)	SKET	LNPA_1840-50	SK201810180 1	2019.10.22	2020.10.21
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.07.29	2020.07.28
LISN	R&S	ENV216	101242	2019.10.09	2020.10.08
LISN	EMCO	3810/2NM	23625	2019.10.09	2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2019.10.09	2020.10.08
Signal Analyzer	Agilent	N9020A	MY49100060	2019.10.09	2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	LZ-RF /LzRf-3A3			



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a)&RSS-Gen Issue 5 limit in the table below has to be followed.

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

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.

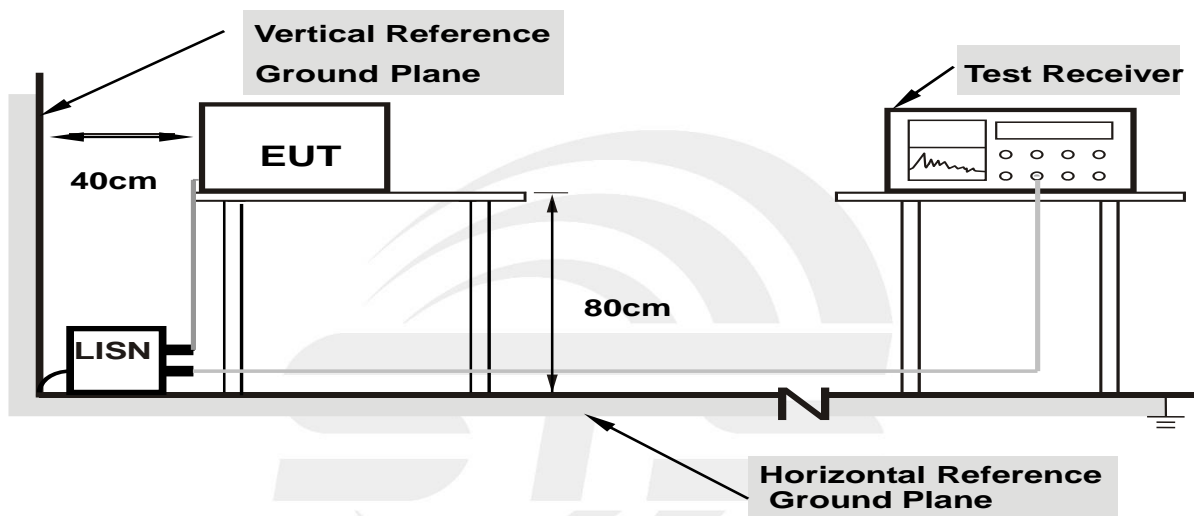
The following table is the setting of the receiver

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

3.2 TEST PROCEDURE

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical 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.

3.3 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

3.4 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.



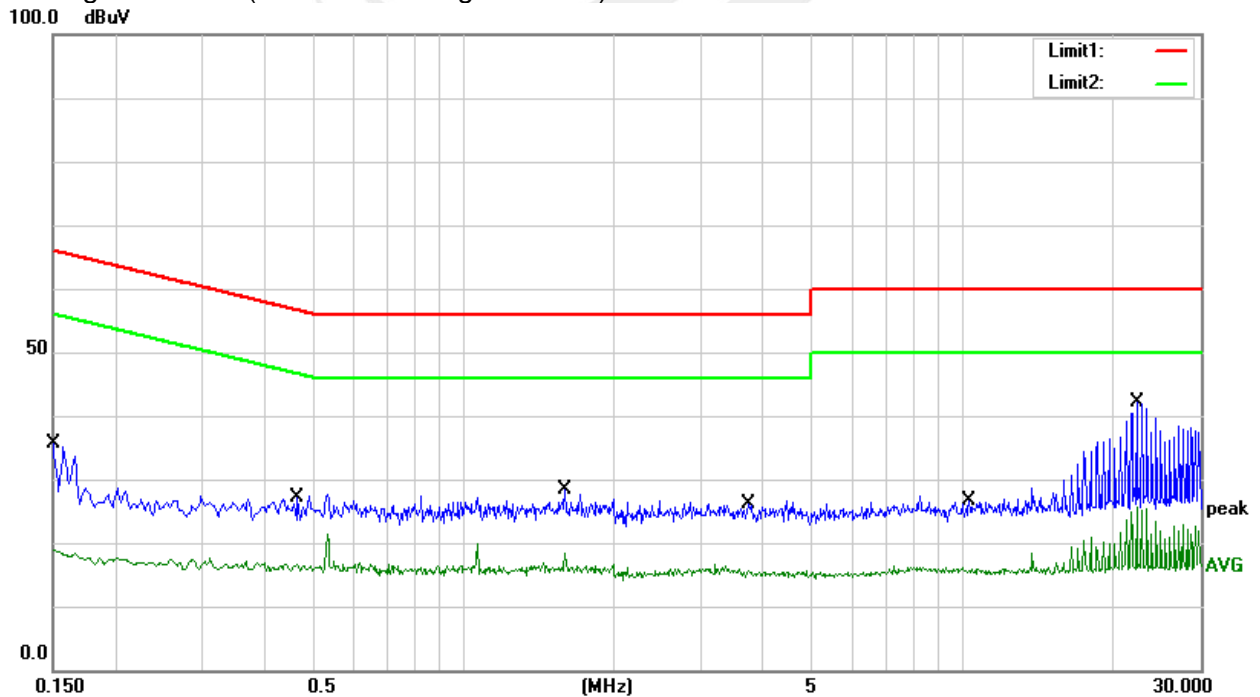
3.5 TEST RESULTS

Temperature:	26.4(C)	Relative Humidity:	68%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 7		

No.	Frequen cy (MHz)	Reading (dBUV)	Correct Factor(d B)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	0.1500	15.94	19.72	35.66	66.00	-30.34	QP
2	0.1500	-0.86	19.72	18.86	56.00	-37.14	AVG
3	0.4660	7.10	19.97	27.07	56.58	-29.51	QP
4	0.4660	-4.24	19.97	15.73	46.58	-30.85	AVG
5	1.5940	8.69	19.79	28.48	56.00	-27.52	QP
6	1.5940	-3.65	19.79	16.14	46.00	-29.86	AVG
7	3.7260	6.20	19.87	26.07	56.00	-29.93	QP
8	3.7260	-4.90	19.87	14.97	46.00	-31.03	AVG
9	10.2980	6.77	19.84	26.61	60.00	-33.39	QP
10	10.2980	-4.20	19.84	15.64	50.00	-34.36	AVG
11	22.3460	21.87	20.20	42.07	60.00	-17.93	QP
12	22.3460	-3.97	20.20	16.23	50.00	-33.77	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



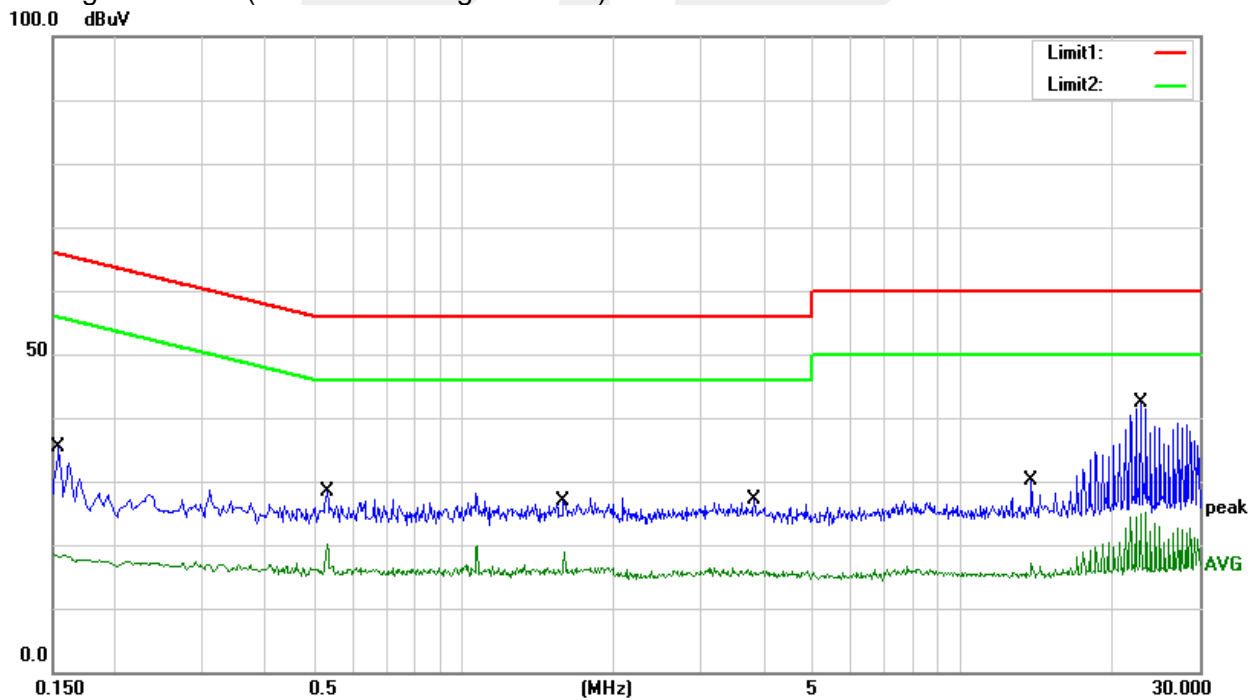


Temperature:	26.4(C)	Relative Humidity:	68%RH
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 7		

No.	Frequen cy (MHz)	Reading (dBuV)	Correct Factor(d B)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1540	15.60	19.73	35.33	65.78	-30.45	QP
2	0.1540	-1.57	19.73	18.16	55.78	-37.62	AVG
3	0.5340	8.38	19.92	28.30	56.00	-27.70	QP
4	0.5340	-3.47	19.92	16.45	46.00	-29.55	AVG
5	1.5900	7.13	19.79	26.92	56.00	-29.08	QP
6	1.5900	-3.75	19.79	16.04	46.00	-29.96	AVG
7	3.8340	7.17	19.88	27.05	56.00	-28.95	QP
8	3.8340	-4.33	19.88	15.55	46.00	-30.45	AVG
9	13.8380	10.16	19.91	30.07	60.00	-29.93	QP
10	13.8380	-4.97	19.91	14.94	50.00	-35.06	AVG
11	22.8780	22.24	20.17	42.41	60.00	-17.59	QP
12	22.8780	4.96	20.17	25.13	50.00	-24.87	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit





4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a), RSS-Gen Issue 5, Amendment 1, March 2019 and RSS-247 Issue 2, February 2017 (5.5) limit in the table and according to ANSI C63.10-2013 below has to be followed.

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

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)	(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).

LIMITS OF RESTRICTED FREQUENCY BANDS

FCC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	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	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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	Above 38.6
13.36-13.41			



IC:

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		



For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz(Peak/QP/AV)
Stop Frequency	150KHz/30MHz(Peak/QP/AV)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

For Restricted band

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2310 to 2410 MHz Upper Band Edge: 2475 to 2500 MHz
RB / VB	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)



Receiver Parameter	Setting
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2 TEST PROCEDURE

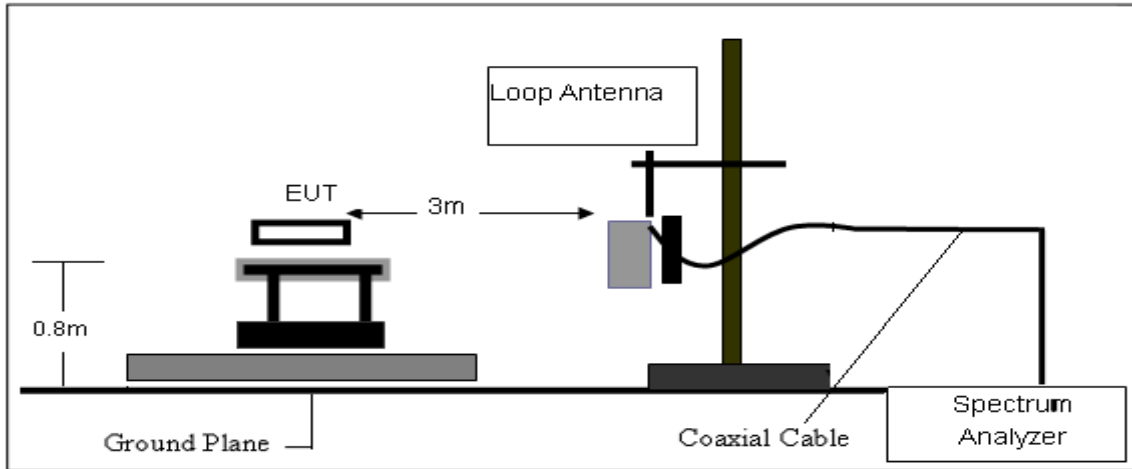
- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. 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:

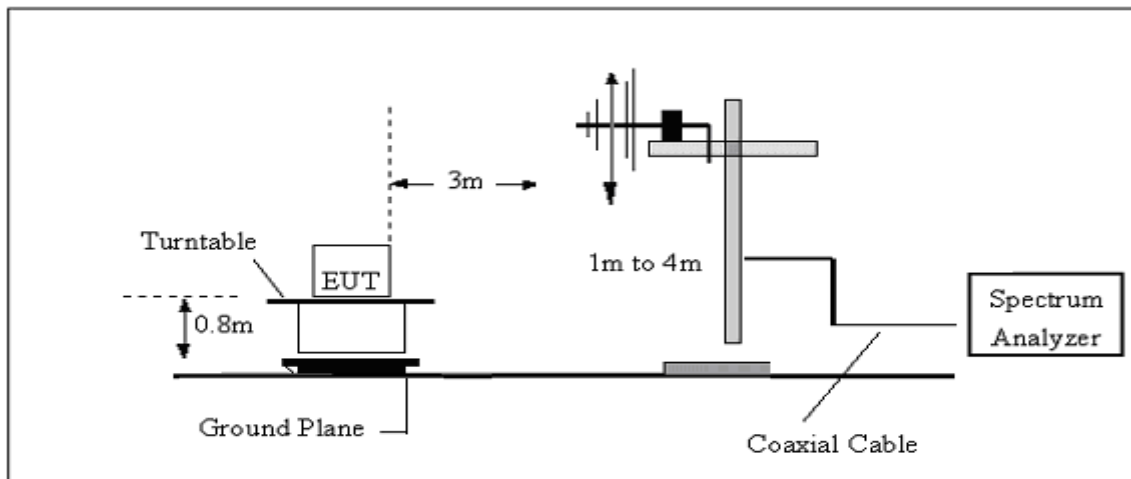
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

4.3 TEST SETUP

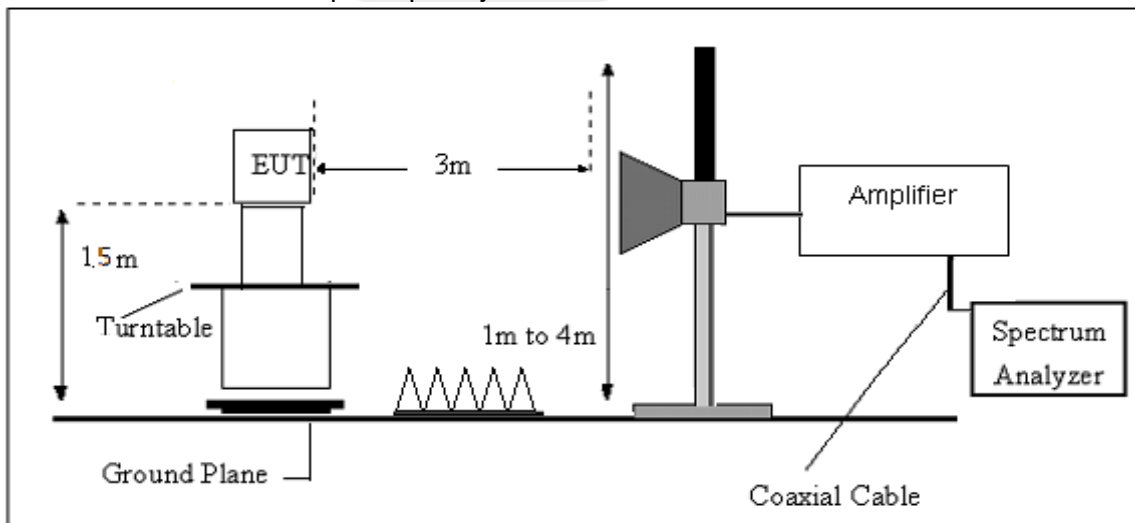
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.4 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.



4.5 FIELD STRENGTH CALCULATION

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

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

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency (MHz)	FS (dB μ V/m)	RA (dB μ V/m)	AF (dB)	CL (dB)	AG (dB)	Factor (dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





4.6 TEST RESULTS

(Between 9KHz – 30 MHz)

Temperature:	23.4(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Polarization:	--
Test Mode:	TX Mode		

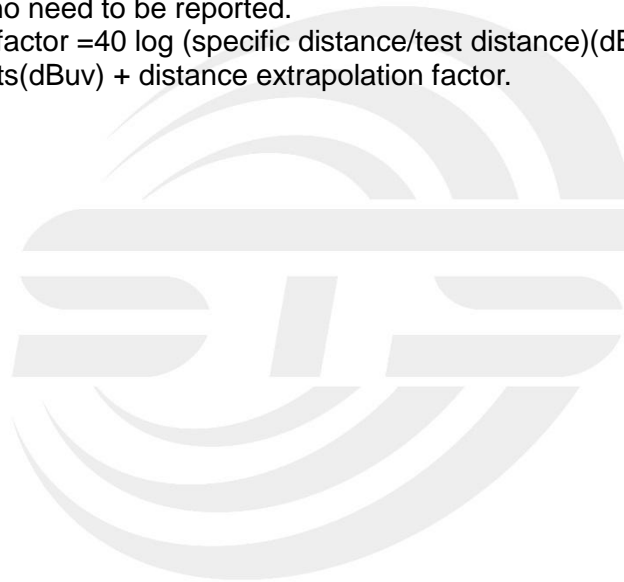
Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State P/F
--	--	--	--	PASS
--	--	--	--	PASS

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

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





(30MHz -1000MHz)

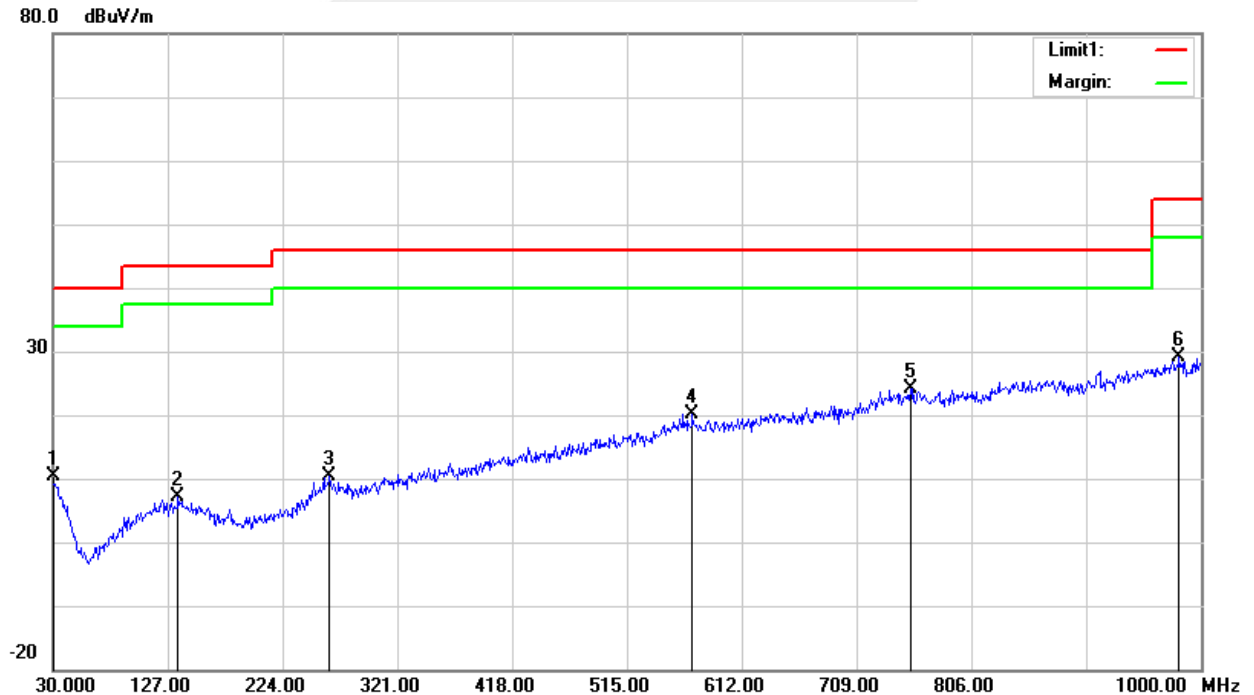
Uplink

Temperature:	23.4(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 1/2/3 (Mode 1 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	23.17	-12.85	10.32	40.00	-29.68	QP
2	135.7300	25.17	-18.09	7.08	43.50	-36.42	QP
3	263.7700	25.09	-14.75	10.34	46.00	-35.66	QP
4	570.2900	25.70	-5.61	20.09	46.00	-25.91	QP
5	754.5900	26.24	-2.16	24.08	46.00	-21.92	QP
6	981.5700	26.58	2.57	29.15	54.00	-24.85	QP

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit



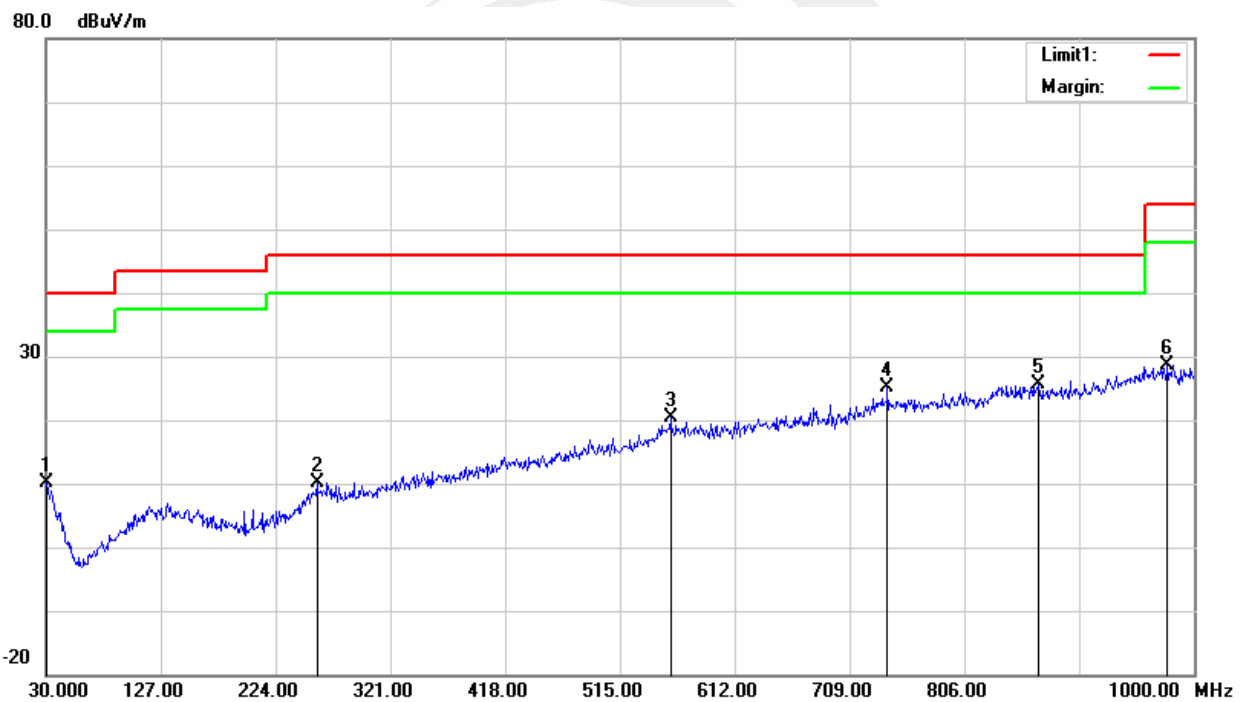


Temperature:	23.4(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 1/2/3 (Mode 1 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	23.48	-13.35	10.13	40.00	-29.87	QP
2	258.9200	25.06	-14.90	10.16	46.00	-35.84	QP
3	557.6800	25.85	-5.55	20.30	46.00	-25.70	QP
4	741.0100	27.15	-2.11	25.04	46.00	-20.96	QP
5	869.0500	26.14	-0.52	25.62	46.00	-20.38	QP
6	977.6900	26.20	2.52	28.72	54.00	-25.28	QP

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit





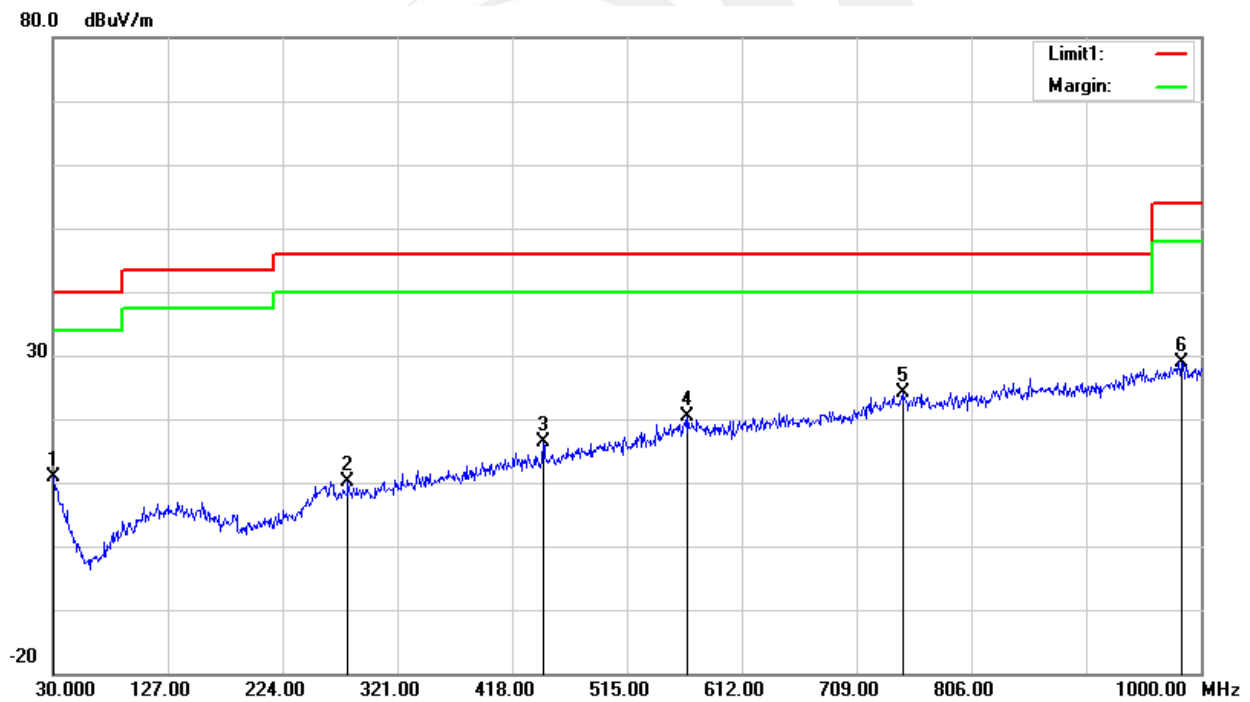
Downlink

Temperature:	23.4(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal
Test Mode:	Mode 4/5/6 (Mode 4 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	24.23	-13.35	10.88	40.00	-29.12	QP
2	279.2900	25.80	-15.58	10.22	46.00	-35.78	QP
3	444.1900	26.20	-9.92	16.28	46.00	-29.72	QP
4	566.4100	26.00	-5.57	20.43	46.00	-25.57	QP
5	747.8000	26.18	-2.15	24.03	46.00	-21.97	QP
6	983.5100	26.49	2.46	28.95	54.00	-25.05	QP

Remark:

1. Margin = Result (Result = Reading + Factor) - Limit



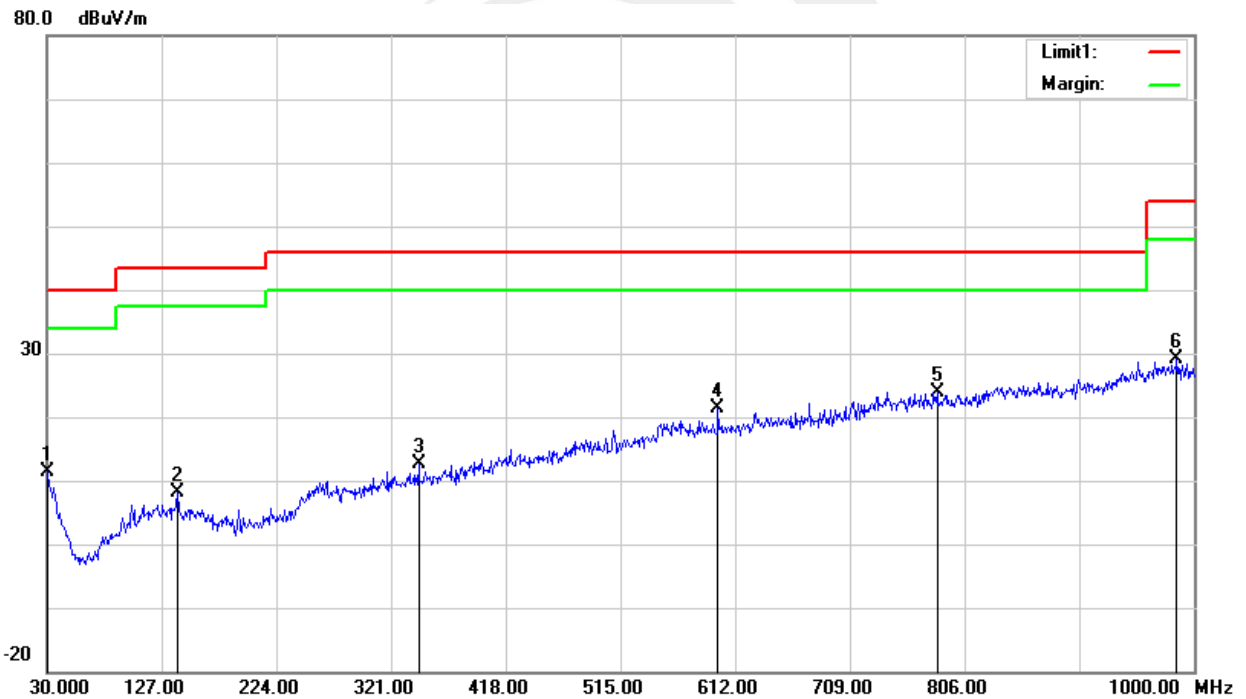


Temperature:	23.4(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Vertical
Test Mode:	Mode 4/5/6 (Mode 4 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	24.63	-13.35	11.28	40.00	-28.72	QP
2	140.5800	26.16	-18.05	8.11	43.50	-35.39	QP
3	344.2800	25.77	-13.26	12.51	46.00	-33.49	QP
4	597.4500	27.33	-5.85	21.48	46.00	-24.52	QP
5	782.7200	26.11	-2.14	23.97	46.00	-22.03	QP
6	985.4500	26.76	2.33	29.09	54.00	-24.91	QP

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit





(1GHz-25GHz)Restricted band and Spurious emission Requirements

Uplink
GFSK

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Orrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (903.9 MHz)										
1228.61	62.12	44.70	6.70	28.20	-9.80	52.32	74.00	-21.68	PK	Vertical
1228.61	51.53	44.70	6.70	28.20	-9.80	41.73	54.00	-12.27	AV	Vertical
1228.53	61.71	44.70	6.70	28.20	-9.80	51.91	74.00	-22.09	PK	Horizontal
1228.53	50.39	44.70	6.70	28.20	-9.80	40.59	54.00	-13.41	AV	Horizontal
1808.01	58.32	44.20	9.04	31.60	-3.56	54.76	74.00	-19.24	PK	Vertical
1808.01	50.37	44.20	9.04	31.60	-3.56	46.81	54.00	-7.19	AV	Vertical
1807.97	58.69	44.20	9.04	31.60	-3.56	55.13	74.00	-18.87	PK	Horizontal
1807.97	50.32	44.20	9.04	31.60	-3.56	46.76	54.00	-7.24	AV	Horizontal
2016.93	49.43	44.20	9.86	32.00	-2.34	47.09	74.00	-26.91	PK	Vertical
2016.93	39.19	44.20	9.86	32.00	-2.34	36.85	54.00	-17.15	AV	Vertical
2016.93	47.67	44.20	9.86	32.00	-2.34	45.33	74.00	-28.67	PK	Horizontal
2016.93	38.95	44.20	9.86	32.00	-2.34	36.61	54.00	-17.39	AV	Horizontal
2711.61	53.86	43.50	11.40	35.50	3.40	57.26	74.00	-16.74	PK	Vertical
2711.61	43.92	43.50	11.40	35.50	3.40	47.32	54.00	-6.68	AV	Vertical
2711.59	53.89	43.50	11.40	35.50	3.40	57.29	74.00	-16.71	PK	Horizontal
2711.59	44.81	43.50	11.40	35.50	3.40	48.21	54.00	-5.79	AV	Horizontal
Middle Channel (908.7 MHz)										
1215.90	60.83	44.70	6.70	28.20	-9.80	51.03	74.00	-22.97	PK	Vertical
1215.90	50.63	44.70	6.70	28.20	-9.80	40.83	54.00	-13.17	AV	Vertical
1215.80	61.05	44.70	6.70	28.20	-9.80	51.25	74.00	-22.75	PK	Horizontal
1215.80	51.21	44.70	6.70	28.20	-9.80	41.41	54.00	-12.59	AV	Horizontal
1817.57	58.17	44.20	9.04	31.60	-3.56	54.61	74.00	-19.39	PK	Vertical
1817.57	49.47	44.20	9.04	31.60	-3.56	45.91	54.00	-8.09	AV	Vertical
1817.53	58.26	44.20	9.04	31.60	-3.56	54.70	74.00	-19.30	PK	Horizontal
1817.53	50.26	44.20	9.04	31.60	-3.56	46.70	54.00	-7.30	AV	Horizontal
1996.09	49.26	44.20	9.86	32.00	-2.34	46.92	74.00	-27.08	PK	Vertical
1996.09	40.24	44.20	9.86	32.00	-2.34	37.90	54.00	-16.10	AV	Vertical
1996.03	47.54	44.20	9.86	32.00	-2.34	45.20	74.00	-28.80	PK	Horizontal
1996.03	38.42	44.20	9.86	32.00	-2.34	36.08	54.00	-17.92	AV	Horizontal
2726.42	54.64	43.50	11.40	35.50	3.40	58.04	74.00	-15.96	PK	Vertical
2726.42	43.87	43.50	11.40	35.50	3.40	47.27	54.00	-6.73	AV	Vertical
2726.36	54.68	43.50	11.40	35.50	3.40	58.08	74.00	-15.92	PK	Horizontal
2726.36	44.89	43.50	11.40	35.50	3.40	48.29	54.00	-5.71	AV	Horizontal



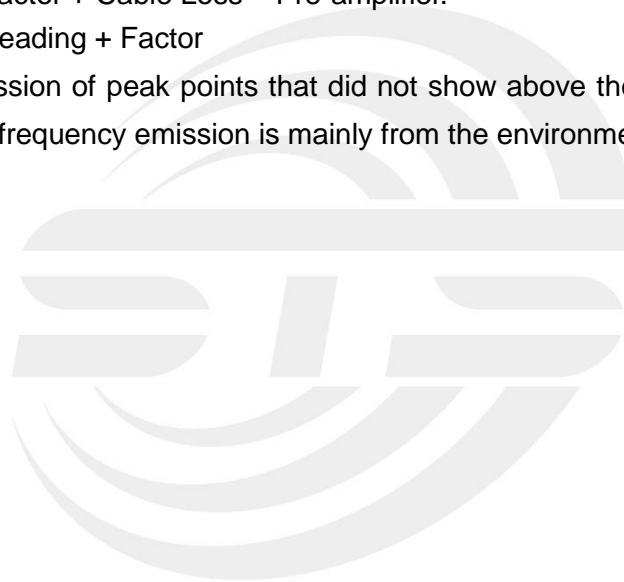
High Channel (914.9 MHz)										
1204.37	61.02	44.70	6.70	28.20	-9.80	51.22	74.00	-22.78	PK	Vertical
1204.37	49.89	44.70	6.70	28.20	-9.80	40.09	54.00	-13.91	AV	Vertical
1204.36	62.25	44.70	6.70	28.20	-9.80	52.45	74.00	-21.55	PK	Horizontal
1204.36	50.58	44.70	6.70	28.20	-9.80	40.78	54.00	-13.22	AV	Horizontal
1829.96	59.47	44.20	9.04	31.60	-3.56	55.91	74.00	-18.09	PK	Vertical
1829.96	50.48	44.20	9.04	31.60	-3.56	46.92	54.00	-7.08	AV	Vertical
1829.97	58.44	44.20	9.04	31.60	-3.56	54.88	74.00	-19.12	PK	Horizontal
1829.97	50.26	44.20	9.04	31.60	-3.56	46.70	54.00	-7.30	AV	Horizontal
1977.24	48.90	44.20	9.86	32.00	-2.34	46.56	74.00	-27.44	PK	Vertical
1977.24	39.26	44.20	9.86	32.00	-2.34	36.92	54.00	-17.08	AV	Vertical
1977.23	48.07	44.20	9.86	32.00	-2.34	45.73	74.00	-28.27	PK	Horizontal
1977.23	39.35	44.20	9.86	32.00	-2.34	37.01	54.00	-16.99	AV	Horizontal
2744.61	54.08	43.50	11.40	35.50	3.40	57.48	74.00	-16.52	PK	Vertical
2744.61	43.81	43.50	11.40	35.50	3.40	47.21	54.00	-6.79	AV	Vertical
2744.63	53.52	43.50	11.40	35.50	3.40	56.92	74.00	-17.08	PK	Horizontal
2744.63	44.12	43.50	11.40	35.50	3.40	47.52	54.00	-6.48	AV	Horizontal

Note:

1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

2) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.





Downlink GFSK

Frequency (MHz)	Meter Reading (dBμV)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Orrected Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (923.3 MHz)										
1254.91	61.55	44.70	6.70	28.20	-9.80	51.75	74.00	-22.25	PK	Vertical
1254.91	50.55	44.70	6.70	28.20	-9.80	40.75	54.00	-13.25	AV	Vertical
1254.90	61.59	44.70	6.70	28.20	-9.80	51.79	74.00	-22.21	PK	Horizontal
1254.90	50.41	44.70	6.70	28.20	-9.80	40.61	54.00	-13.39	AV	Horizontal
1846.81	58.10	44.20	9.04	31.60	-3.56	54.54	74.00	-19.46	PK	Vertical
1846.81	50.49	44.20	9.04	31.60	-3.56	46.93	54.00	-7.07	AV	Vertical
1846.80	58.33	44.20	9.04	31.60	-3.56	54.77	74.00	-19.23	PK	Horizontal
1846.80	50.47	44.20	9.04	31.60	-3.56	46.91	54.00	-7.09	AV	Horizontal
2060.19	48.08	44.20	9.86	32.00	-2.34	45.74	74.00	-28.26	PK	Vertical
2060.19	40.00	44.20	9.86	32.00	-2.34	37.66	54.00	-16.34	AV	Vertical
2060.15	47.53	44.20	9.86	32.00	-2.34	45.19	74.00	-28.81	PK	Horizontal
2060.15	38.14	44.20	9.86	32.00	-2.34	35.80	54.00	-18.20	AV	Horizontal
2769.89	53.80	43.50	11.40	35.50	3.40	57.20	74.00	-16.80	PK	Vertical
2769.89	44.72	43.50	11.40	35.50	3.40	48.12	54.00	-5.88	AV	Vertical
2769.87	54.33	43.50	11.40	35.50	3.40	57.73	74.00	-16.27	PK	Horizontal
2769.87	43.64	43.50	11.40	35.50	3.40	47.04	54.00	-6.96	AV	Horizontal
Middle Channel (925.1 MHz)										
1237.80	61.93	44.70	6.70	28.20	-9.80	52.13	74.00	-21.87	PK	Vertical
1237.80	49.88	44.70	6.70	28.20	-9.80	40.08	54.00	-13.92	AV	Vertical
1237.73	60.86	44.70	6.70	28.20	-9.80	51.06	74.00	-22.94	PK	Horizontal
1237.73	50.74	44.70	6.70	28.20	-9.80	40.94	54.00	-13.06	AV	Horizontal
1850.40	59.34	44.20	9.04	31.60	-3.56	55.78	74.00	-18.22	PK	Vertical
1850.40	49.17	44.20	9.04	31.60	-3.56	45.61	54.00	-8.39	AV	Vertical
1850.38	58.75	44.20	9.04	31.60	-3.56	55.19	74.00	-18.81	PK	Horizontal
1850.38	49.36	44.20	9.04	31.60	-3.56	45.80	54.00	-8.20	AV	Horizontal
2032.11	47.98	44.20	9.86	32.00	-2.34	45.64	74.00	-28.36	PK	Vertical
2032.11	39.87	44.20	9.86	32.00	-2.34	37.53	54.00	-16.47	AV	Vertical
2032.06	47.85	44.20	9.86	32.00	-2.34	45.51	74.00	-28.49	PK	Horizontal
2032.06	38.47	44.20	9.86	32.00	-2.34	36.13	54.00	-17.87	AV	Horizontal
2775.56	54.69	43.50	11.40	35.50	3.40	58.09	74.00	-15.91	PK	Vertical
2775.56	44.02	43.50	11.40	35.50	3.40	47.42	54.00	-6.58	AV	Vertical
2775.66	54.83	43.50	11.40	35.50	3.40	58.23	74.00	-15.77	PK	Horizontal
2775.66	44.08	43.50	11.40	35.50	3.40	47.48	54.00	-6.52	AV	Horizontal



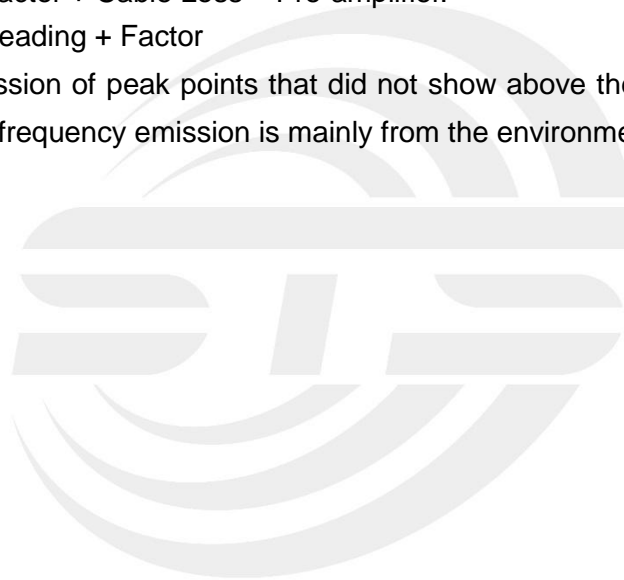
High Channel (926.9 MHz)										
1220.16	60.83	44.70	6.70	28.20	-9.80	51.03	74.00	-22.97	PK	Vertical
1220.16	50.84	44.70	6.70	28.20	-9.80	41.04	54.00	-12.96	AV	Vertical
1220.19	62.06	44.70	6.70	28.20	-9.80	52.26	74.00	-21.74	PK	Horizontal
1220.19	50.89	44.70	6.70	28.20	-9.80	41.09	54.00	-12.91	AV	Horizontal
1853.91	58.52	44.20	9.04	31.60	-3.56	54.96	74.00	-19.04	PK	Vertical
1853.91	49.89	44.20	9.04	31.60	-3.56	46.33	54.00	-7.67	AV	Vertical
1853.98	58.24	44.20	9.04	31.60	-3.56	54.68	74.00	-19.32	PK	Horizontal
1853.98	49.86	44.20	9.04	31.60	-3.56	46.30	54.00	-7.70	AV	Horizontal
2003.25	48.54	44.20	9.86	32.00	-2.34	46.20	74.00	-27.80	PK	Vertical
2003.25	40.40	44.20	9.86	32.00	-2.34	38.06	54.00	-15.94	AV	Vertical
2003.23	48.39	44.20	9.86	32.00	-2.34	46.05	74.00	-27.95	PK	Horizontal
2003.23	38.46	44.20	9.86	32.00	-2.34	36.12	54.00	-17.88	AV	Horizontal
2780.68	54.27	43.50	11.40	35.50	3.40	57.67	74.00	-16.33	PK	Vertical
2780.68	44.50	43.50	11.40	35.50	3.40	47.90	54.00	-6.10	AV	Vertical
2780.62	53.95	43.50	11.40	35.50	3.40	57.35	74.00	-16.65	PK	Horizontal
2780.62	44.04	43.50	11.40	35.50	3.40	47.44	54.00	-6.56	AV	Horizontal

Note:

1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

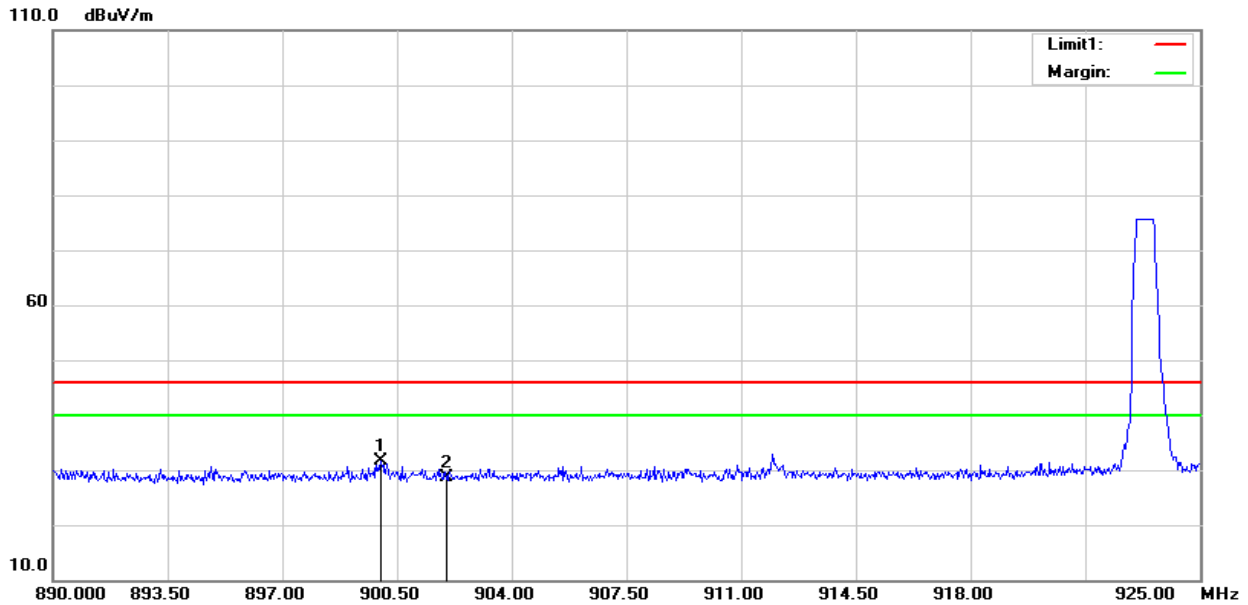
2) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.





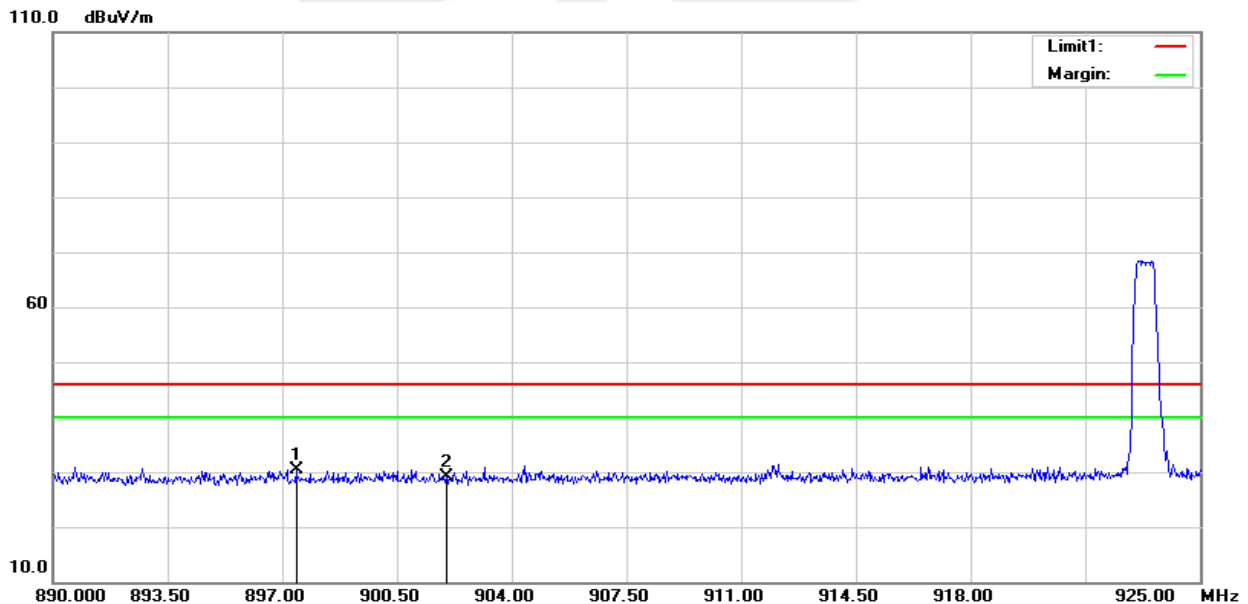
4.6 TEST RESULTS (Restricted Bands Requirements)

**Uplink
GFSK-Low
Horizontal**



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	900.0100	32.08	-0.45	31.63	46.00	-14.37	peak
2	902.0000	29.03	-0.40	28.63	46.00	-17.37	peak

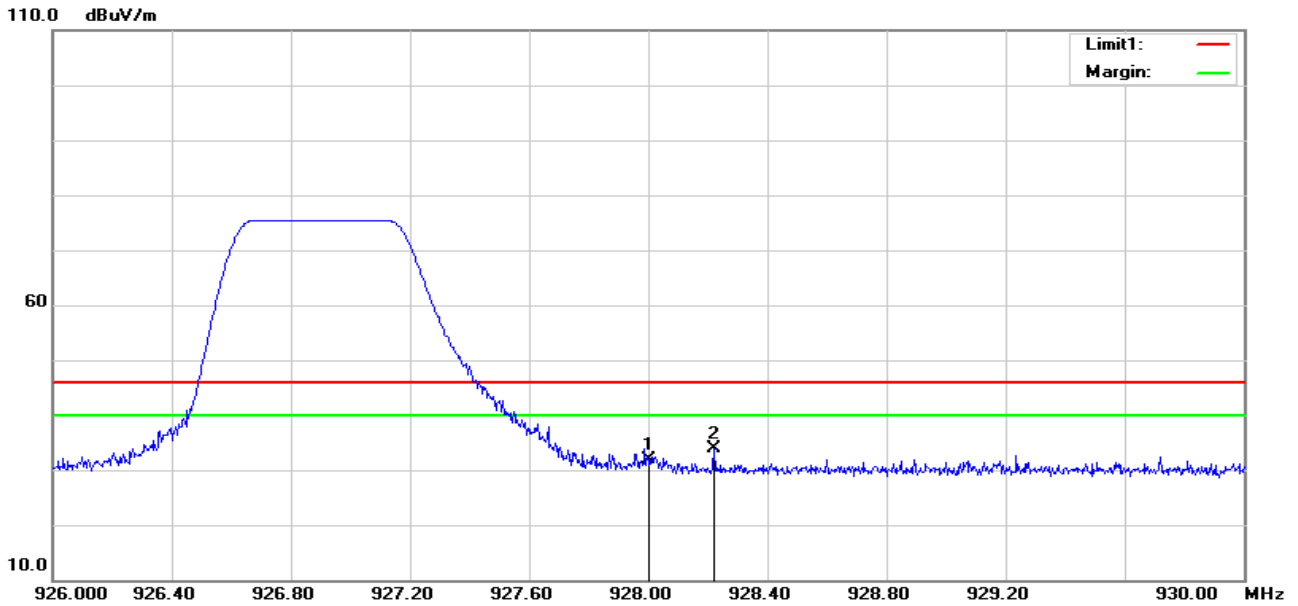
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	897.4200	30.99	-0.51	30.48	46.00	-15.52	peak
2	902.0000	29.61	-0.40	29.21	46.00	-16.79	peak

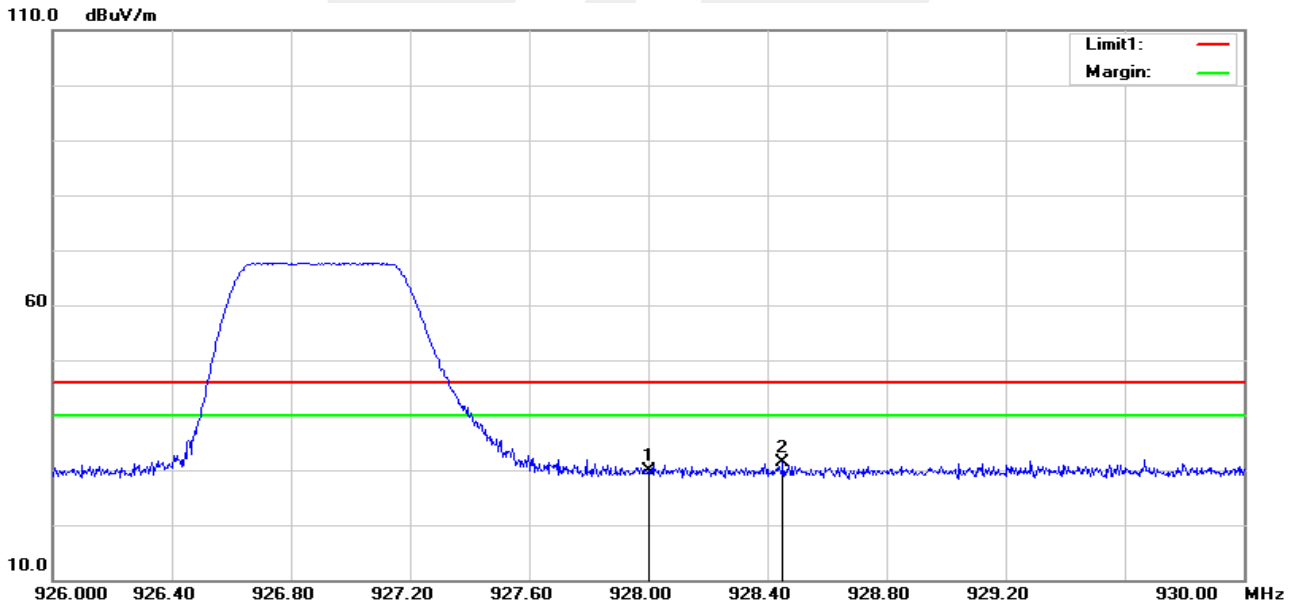


GFSK-High
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	928.0000	31.34	0.43	31.77	46.00	-14.23	peak
2	928.2200	33.42	0.44	33.86	46.00	-12.14	peak

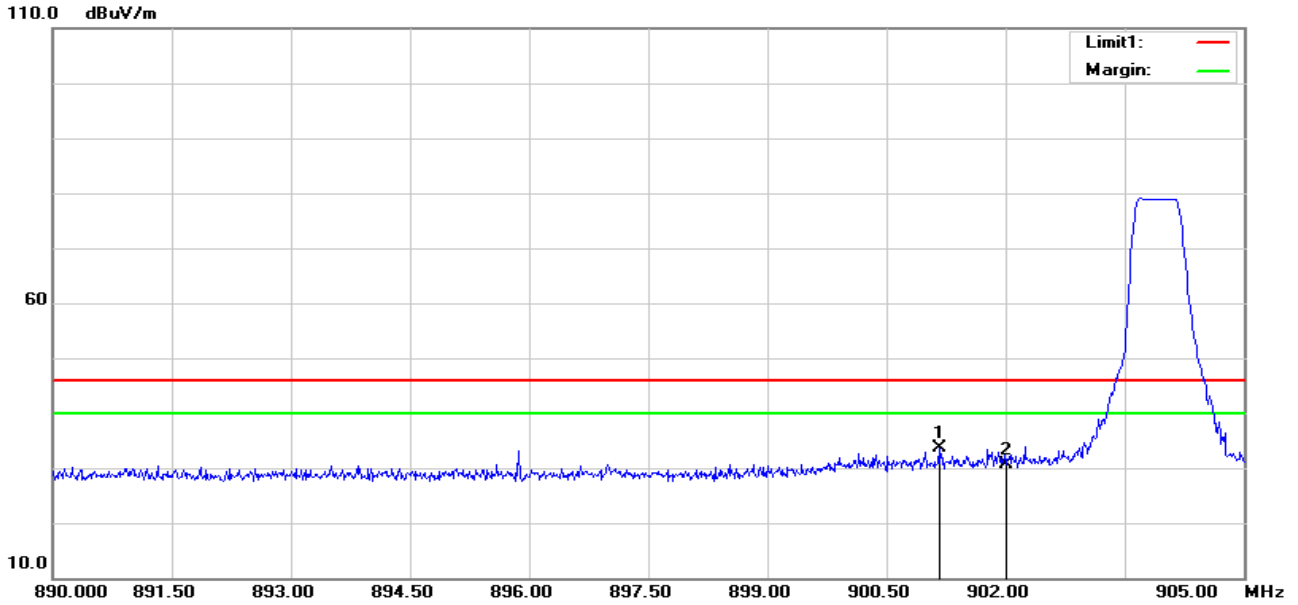
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	928.0000	29.50	0.43	29.93	46.00	-16.07	peak
2	928.4520	30.96	0.45	31.41	46.00	-14.59	peak

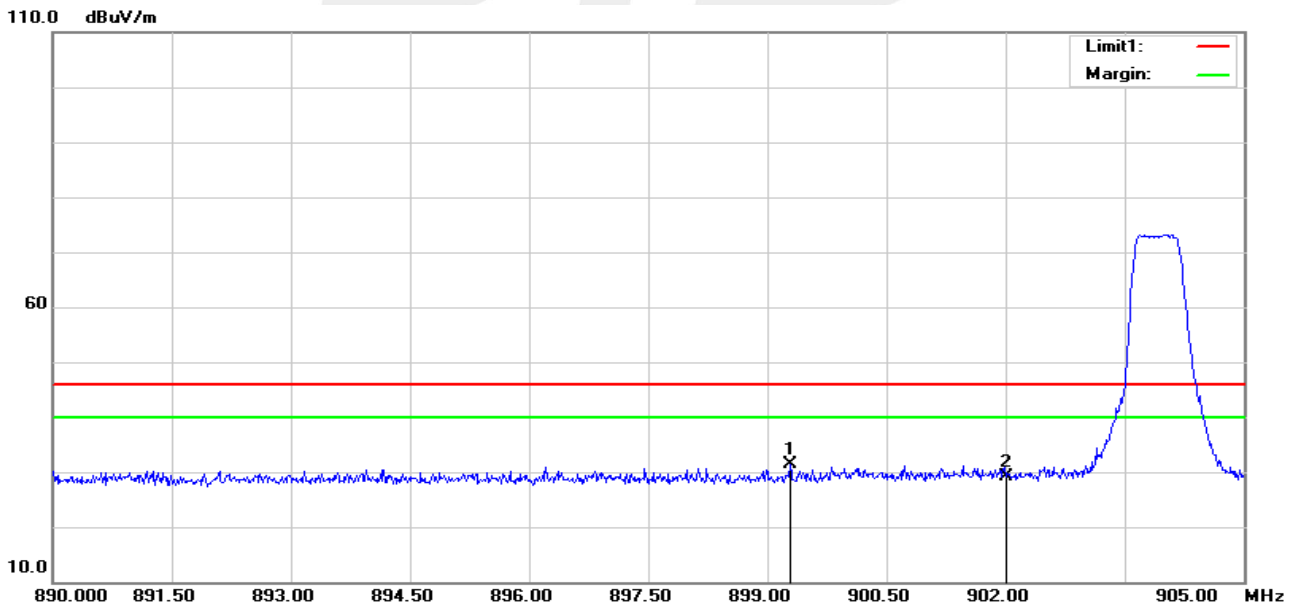


Downlink
GFSK-Low
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	901.1600	33.93	-0.41	33.52	46.00	-12.48	peak
2	902.0000	30.99	-0.40	30.59	46.00	-15.41	peak

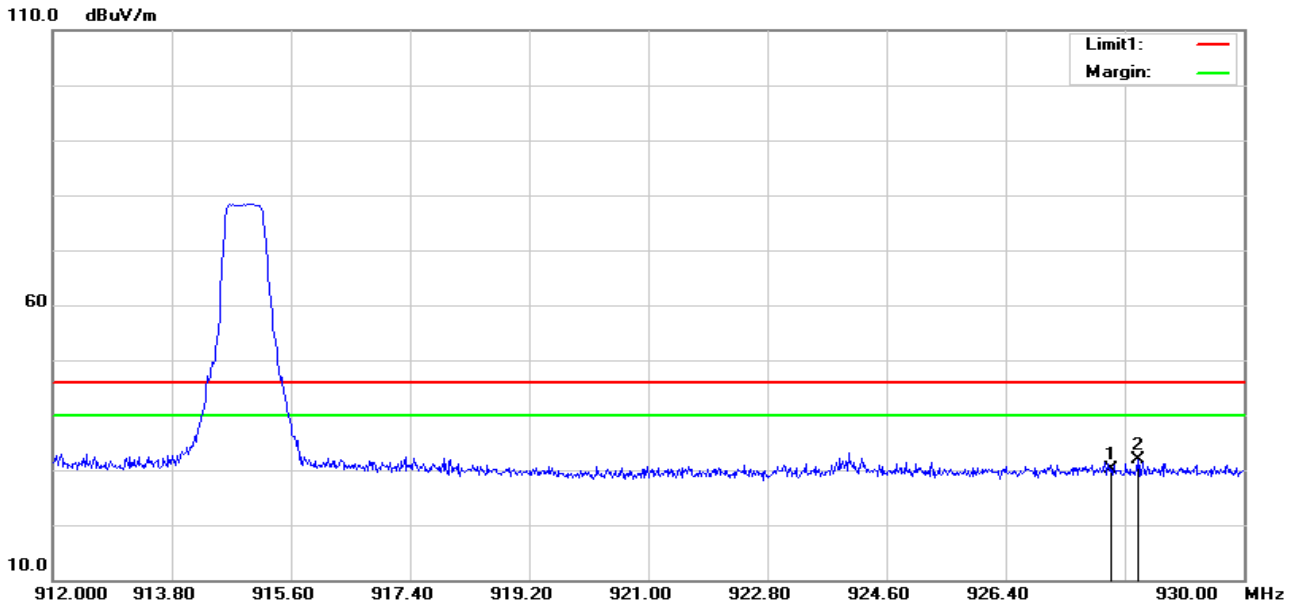
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	899.2850	31.86	-0.47	31.39	46.00	-14.61	peak
2	902.0000	29.41	-0.40	29.01	46.00	-16.99	peak

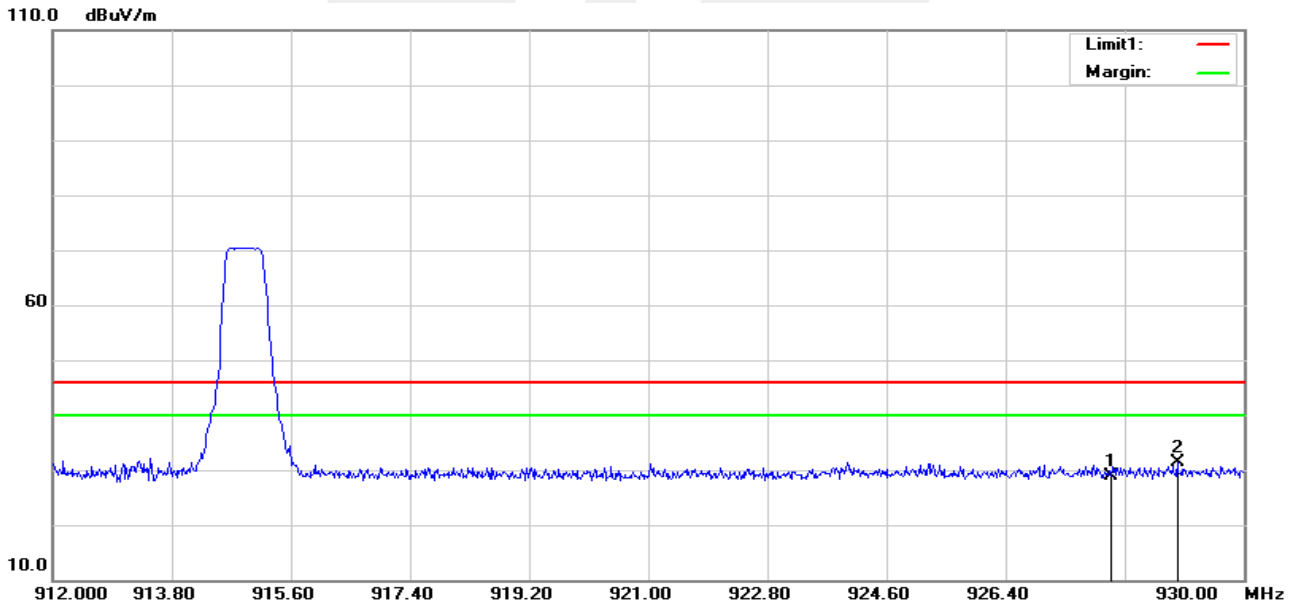


GFSK-High
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	928.0000	29.60	0.43	30.03	46.00	-15.97	peak
2	928.3980	31.40	0.45	31.85	46.00	-14.15	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	928.0000	28.56	0.43	28.99	46.00	-17.01	peak
2	928.9920	30.83	0.49	31.32	46.00	-14.68	peak

5. CONDUCTED SPURIOUS & BAND EDGE EMISSION

5.1 LIMIT

According to FCC section 15.247(d)&RSS-247 Issue 2, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

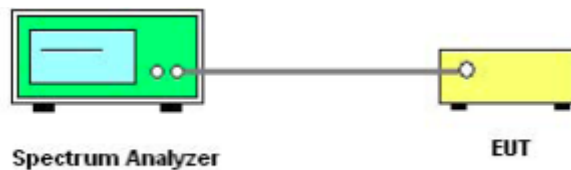
5.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Span	Measure to the appropriate range of Band edge
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

5.3 TEST SETUP



The EUT which is powered by the DC Power, is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

5.4 EUT OPERATION CONDITIONS

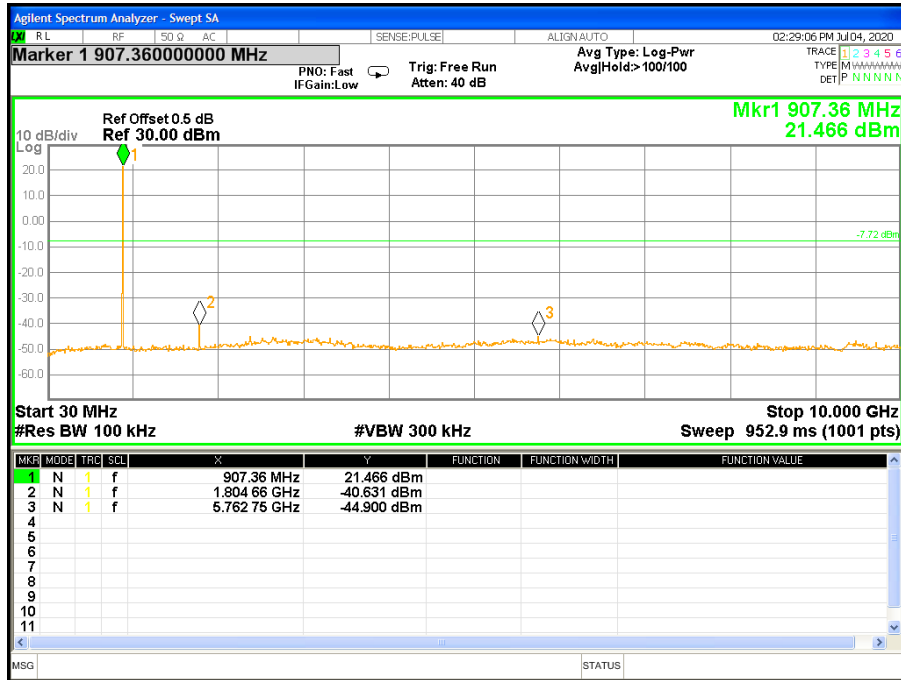
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

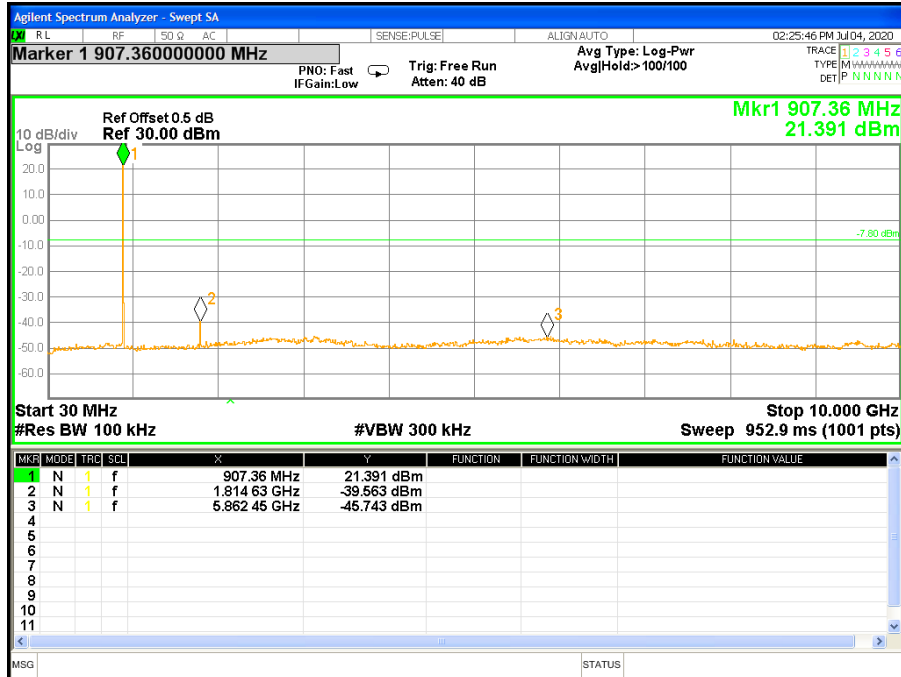
Temperature:	25 °C	Relative Humidity:	50%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH65, CH68, CH71

65 CH

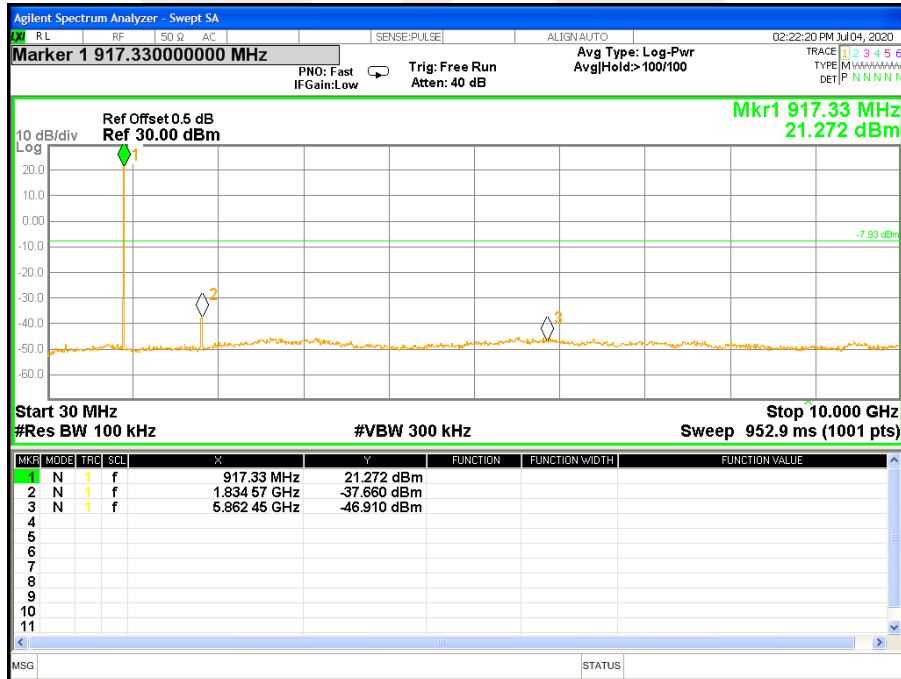




68 CH



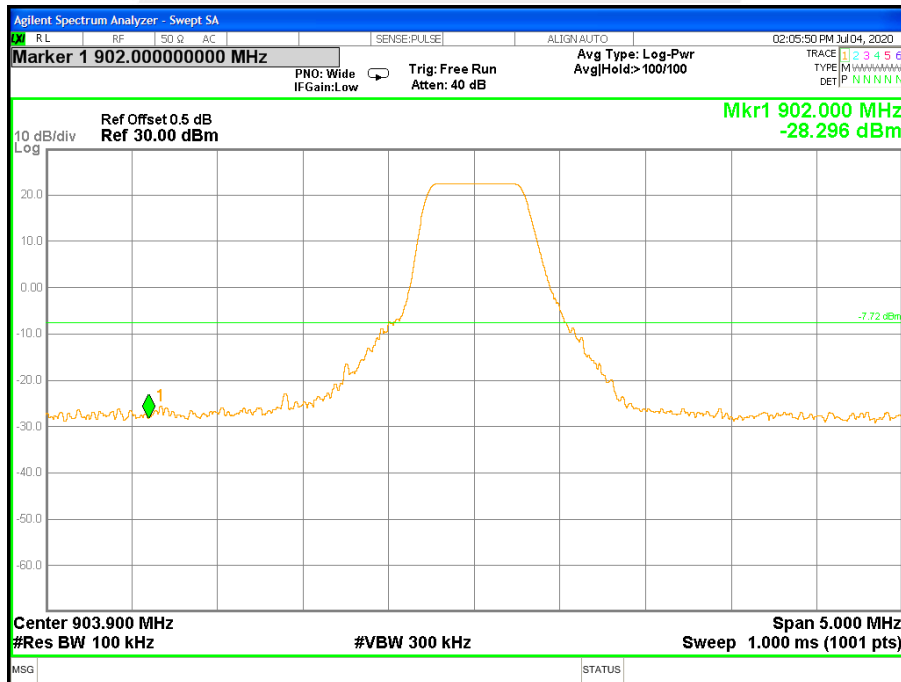
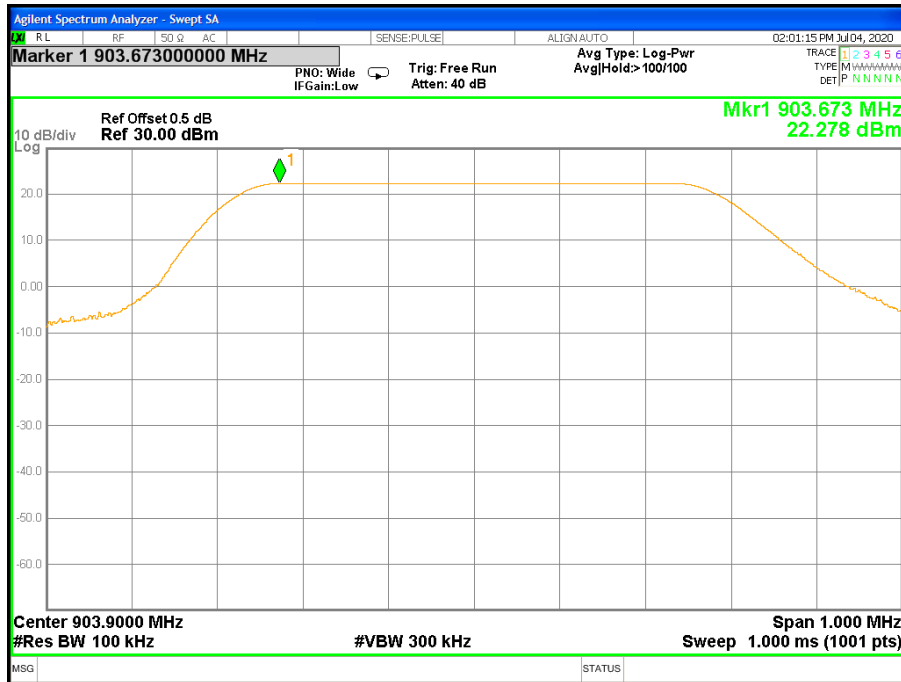
71 CH





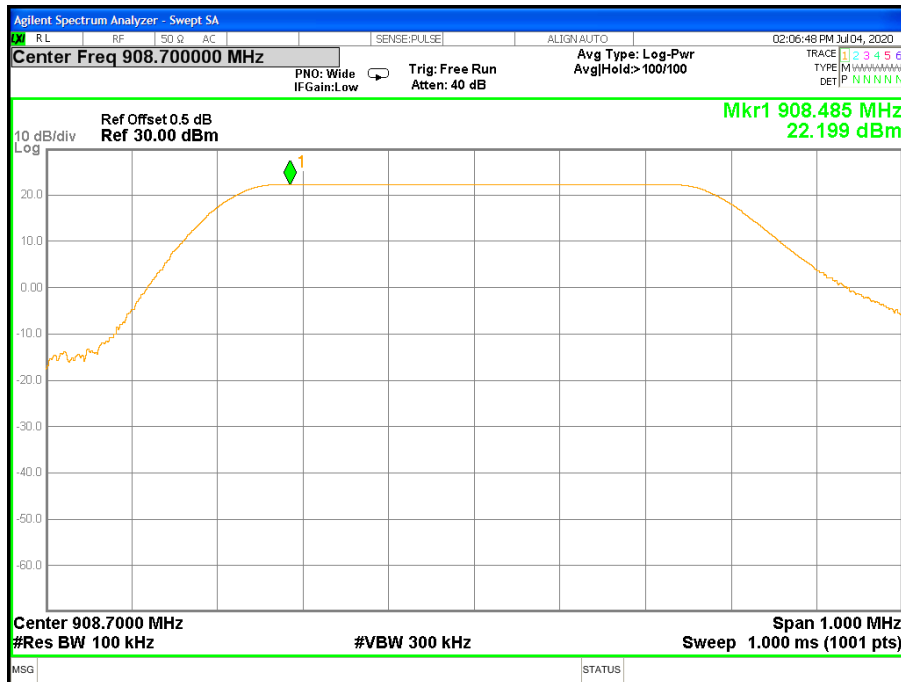
For Band edge(it's also the reference level for conducted spurious emission)

65 CH

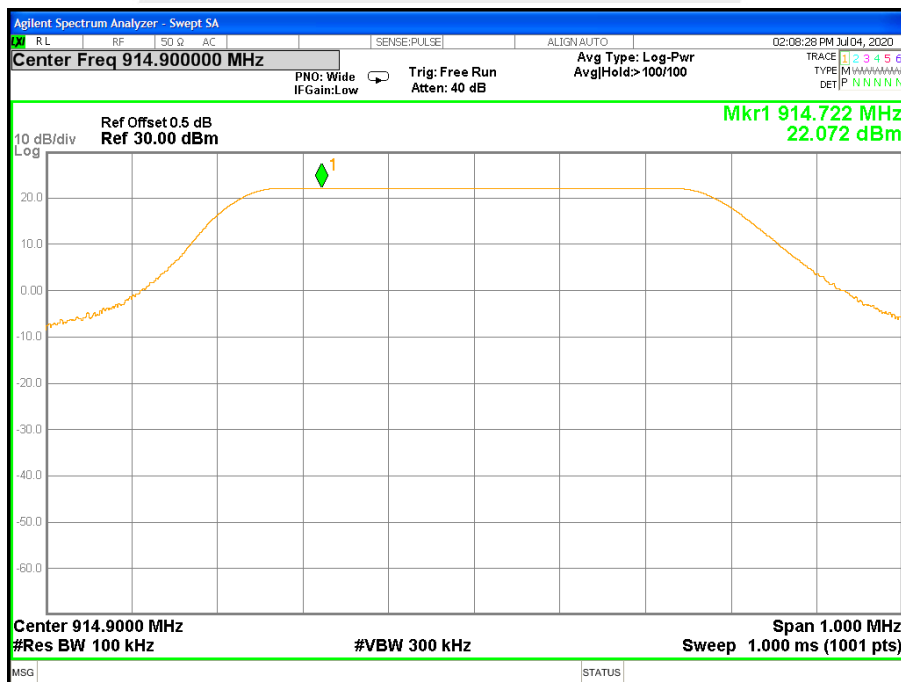


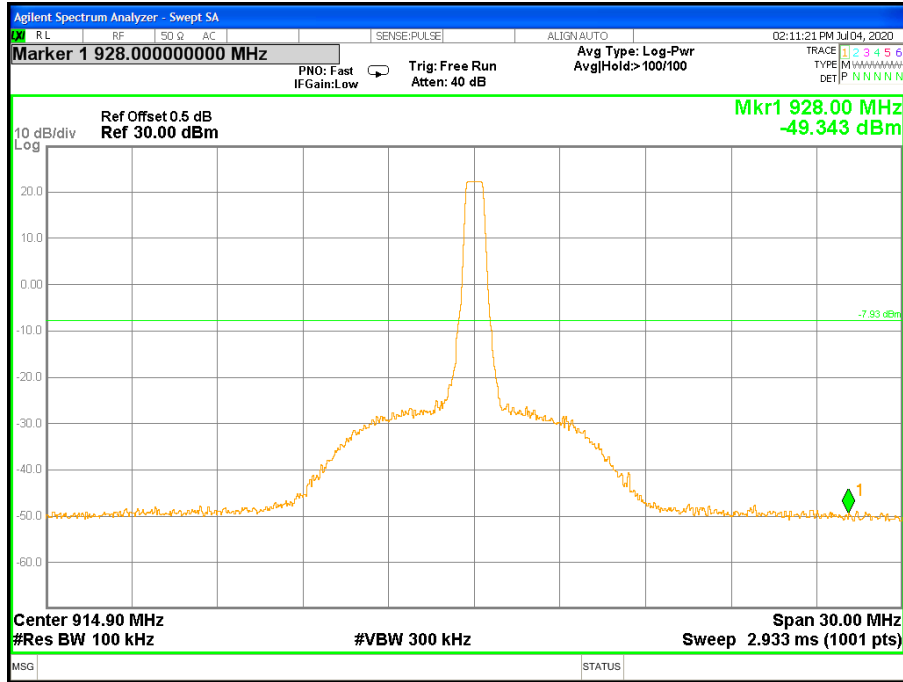


68 CH



71 CH

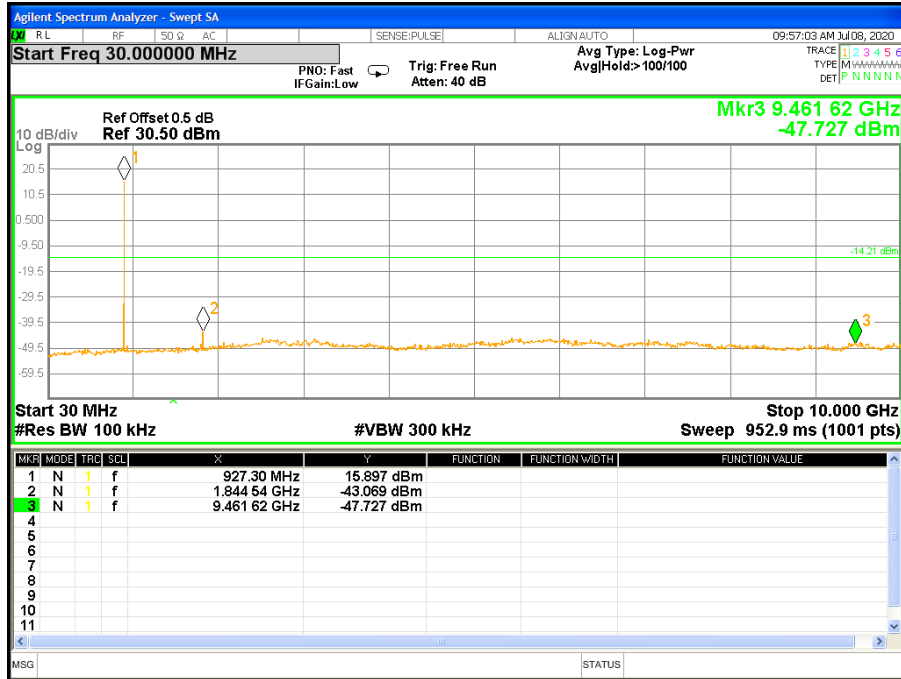






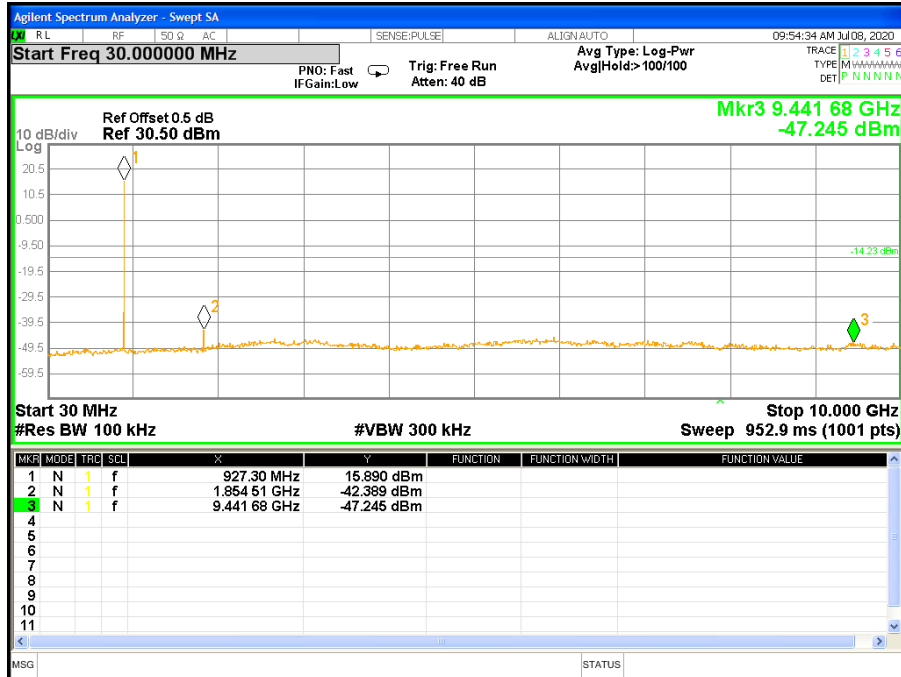
Temperature:	25 °C	Relative Humidity:	50%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH00, CH03, CH06

00 CH

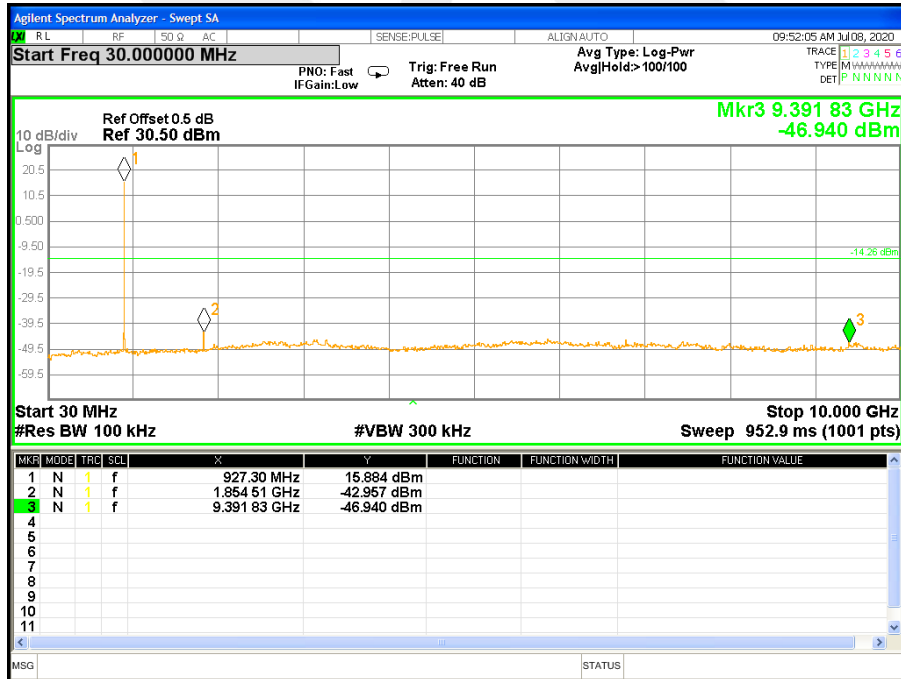




03 CH



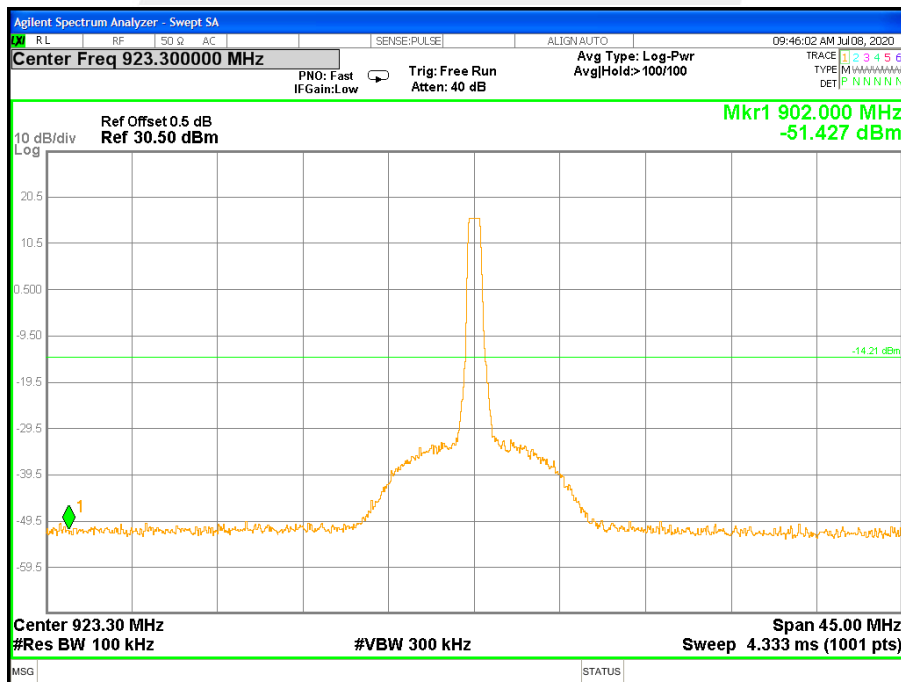
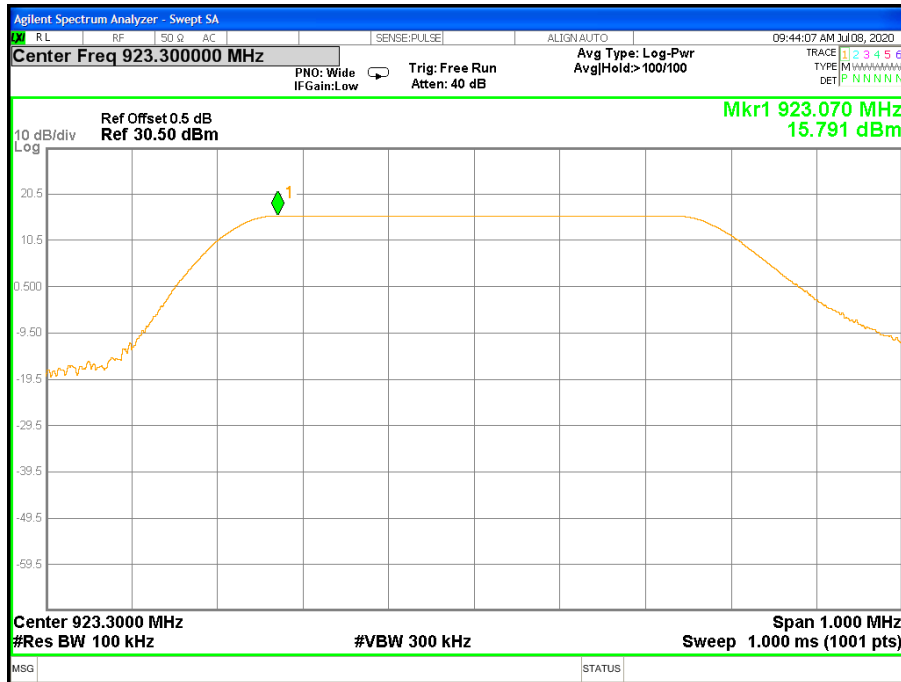
06 CH





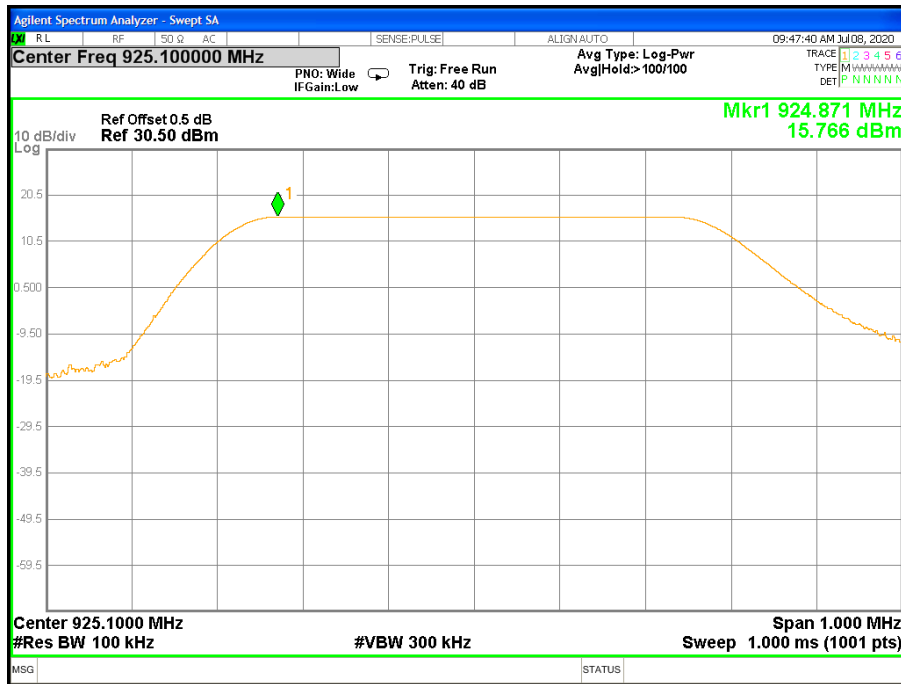
For Band edge(it's also the reference level for conducted spurious emission)

00 CH

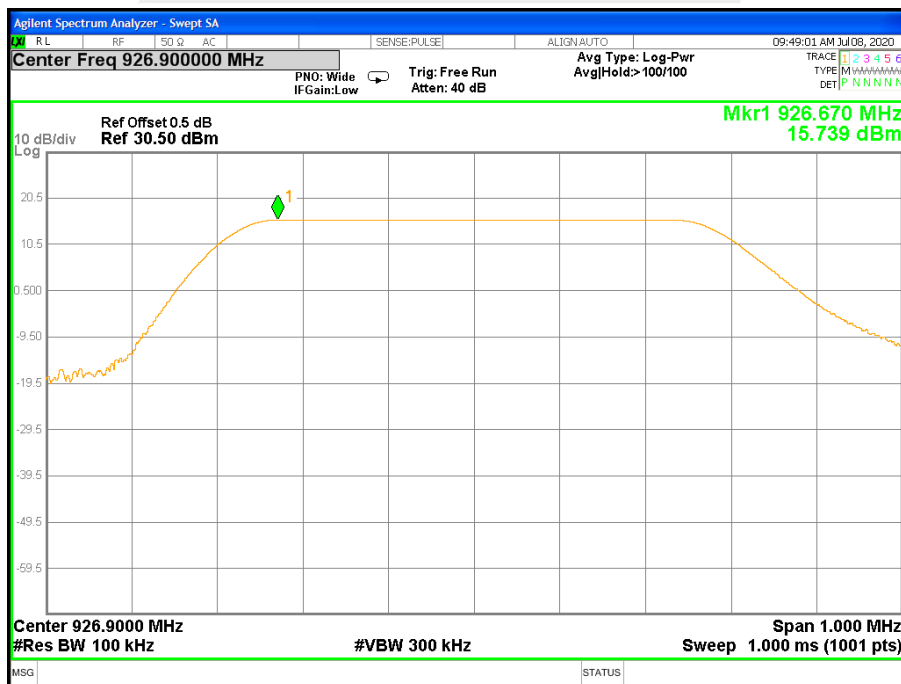


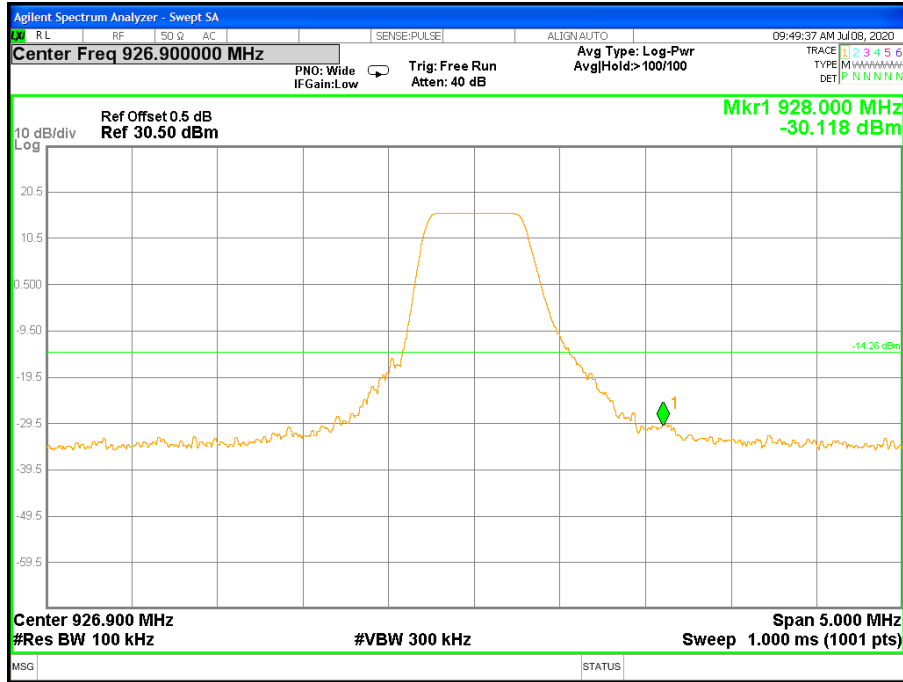


03 CH



06 CH







6. POWER SPECTRAL DENSITY TEST

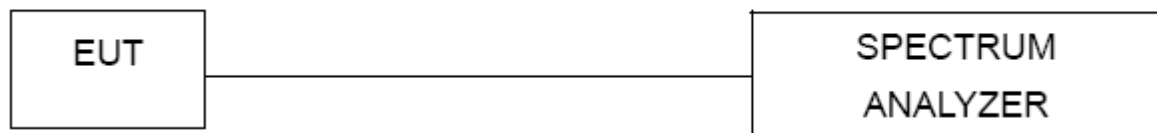
6.1 LIMIT

FCC Part 15.247, Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e) RSS-247 Issue 2	Power Spectral Density	≤ 8 dBm (RBW ≥ 3 KHz)	2400-2483.5	PASS

6.2 TEST PROCEDURE

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

6.3 TEST SETUP



6.4 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.

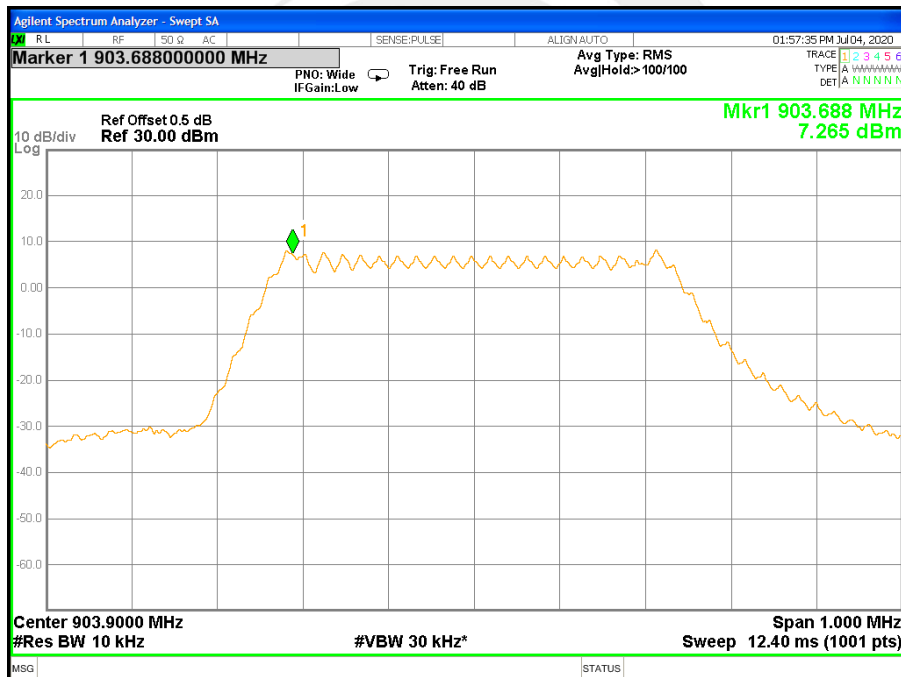


6.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH65, CH68, CH71

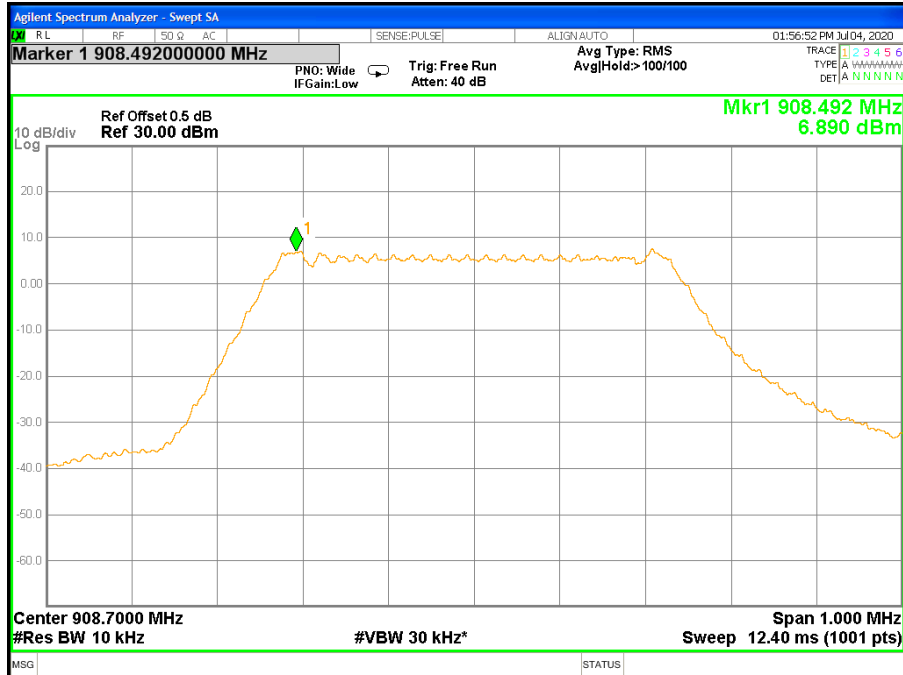
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
903.9 MHz	7.265	≤8	PASS
908.7 MHz	6.89	≤8	PASS
914.9 MHz	6.253	≤8	PASS

TX CH65

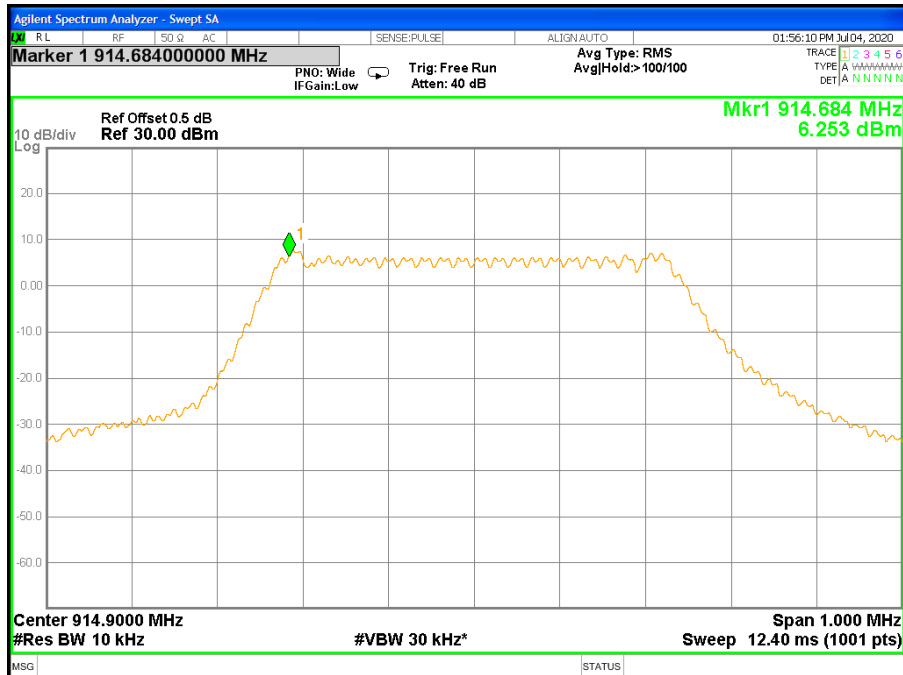




TX CH68



TX CH71

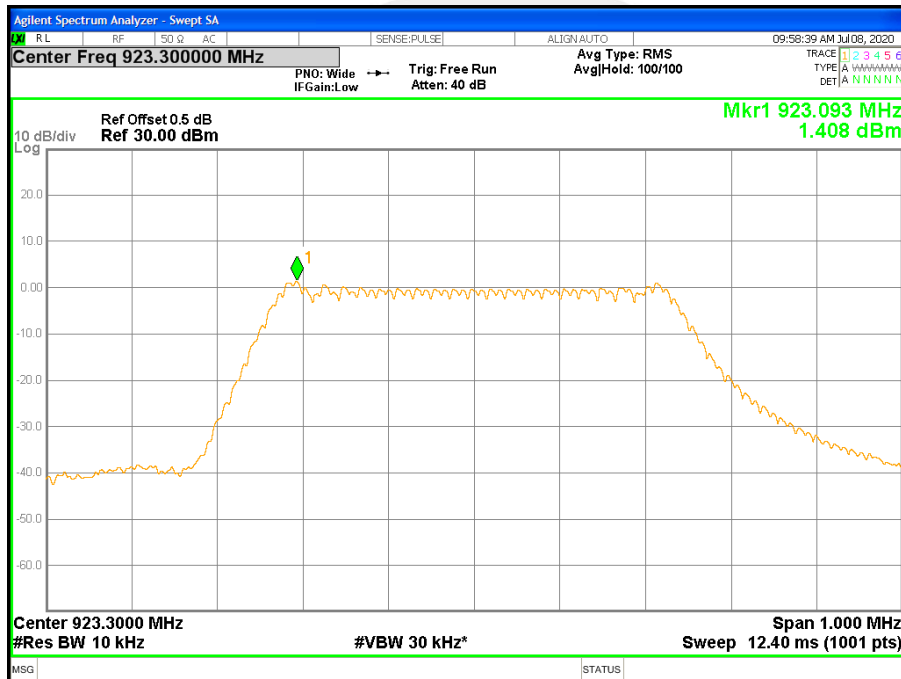




Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH00, CH03, CH06

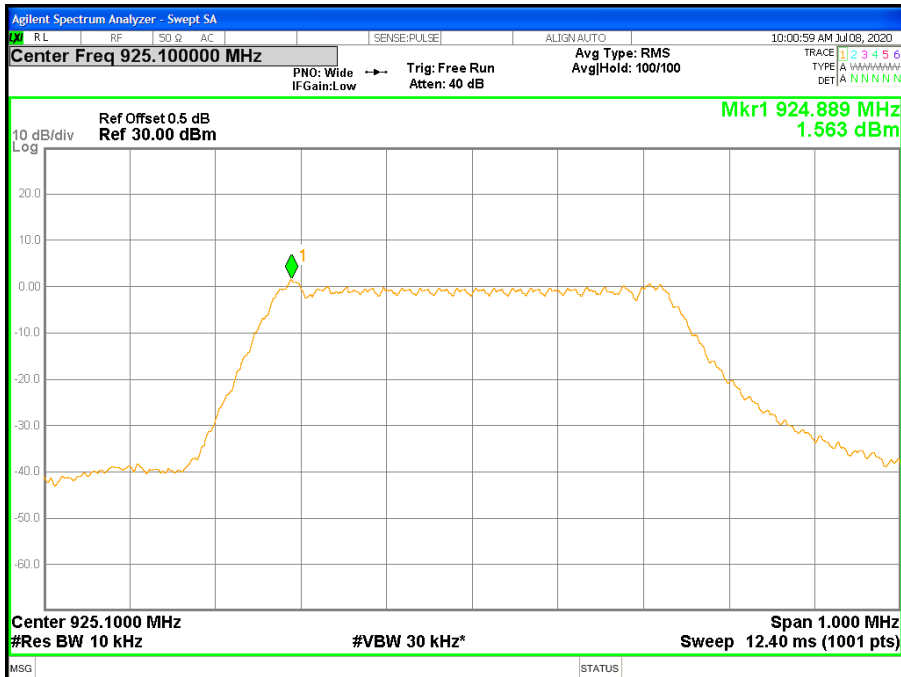
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
923.3 MHz	1.408	≤8	PASS
925.1 MHz	1.563	≤8	PASS
926.9 MHz	1.737	≤8	PASS

TX CH00

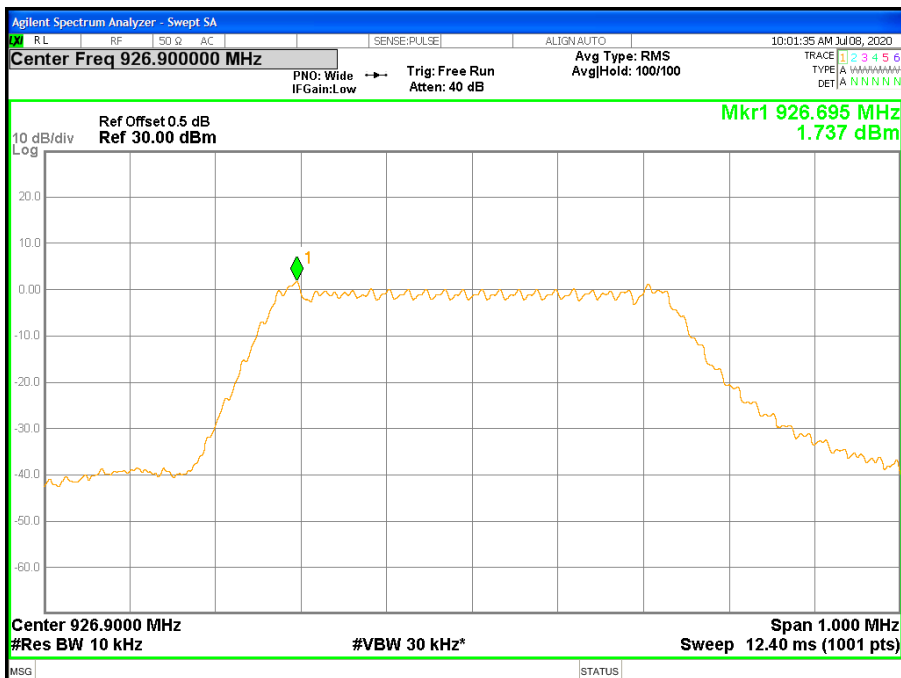




TX CH19



TX CH39



7. BANDWIDTH TEST

7.1 LIMIT

FCC Part 15.247, Subpart C RSS-Gen Clause 6.7				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2) RSS-Gen Clause 6.7	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.	2400-2483.5	PASS

7.2 TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth : 100KHz For 99% Bandwidth : 1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$ For 99% Bandwidth : approximately $3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto

Allow the trace to stabilize and 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 and 99% relative to the maximum level measured in the fundamental emission.

7.3 TEST SETUP



7.4 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.

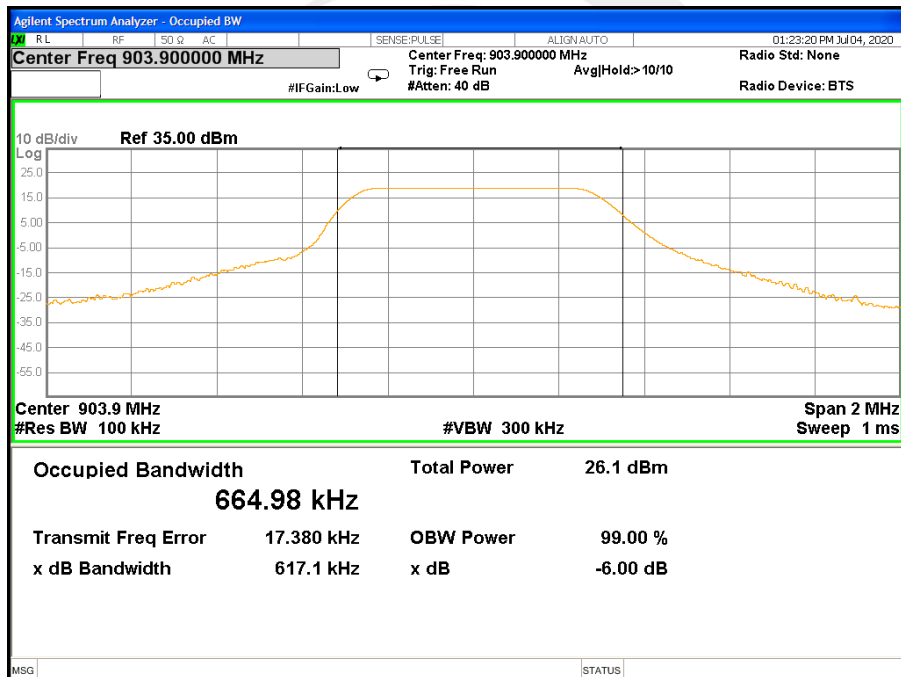


7.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH65, CH68, CH71

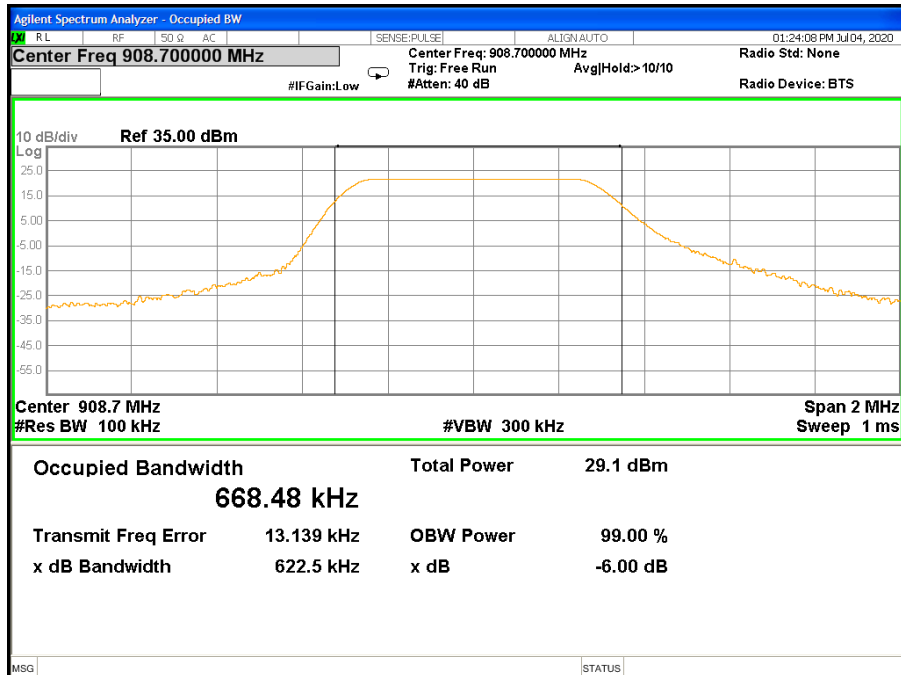
Frequency	6dB Bandwidth (KHz)	99% Bandwidth (KHz)	Channel Separation (KHz)	Result
903.9 MHz	617.100	503.960	≥500KHz	PASS
908.7 MHz	622.500	507.210	≥500KHz	PASS
914.9 MHz	616.500	504.580	≥500KHz	PASS

6dB Bandwidth TX CH 65

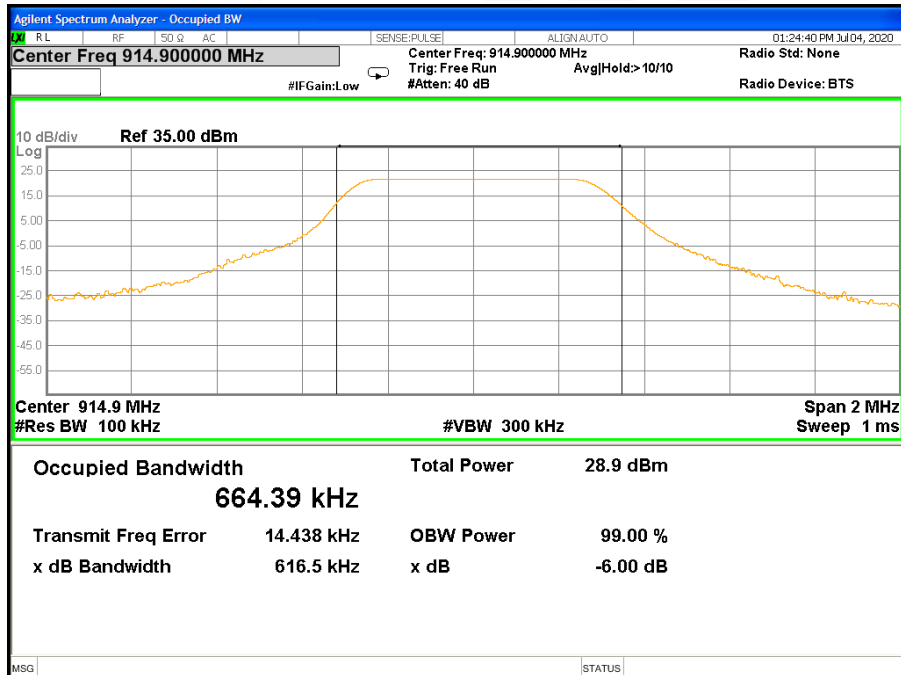




6dB Bandwidth TX CH 68

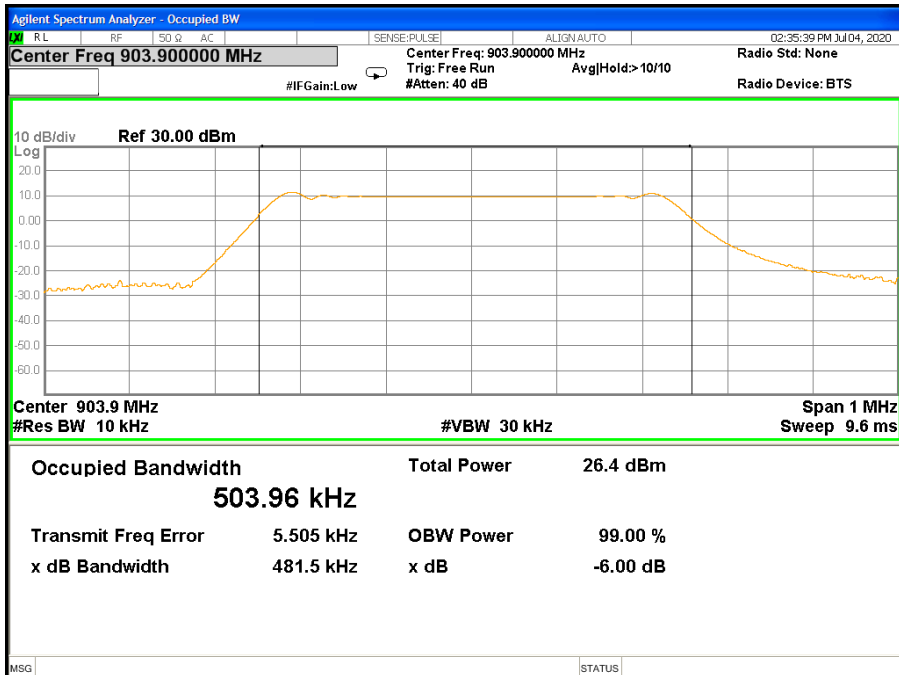


6dB Bandwidth TX CH 71

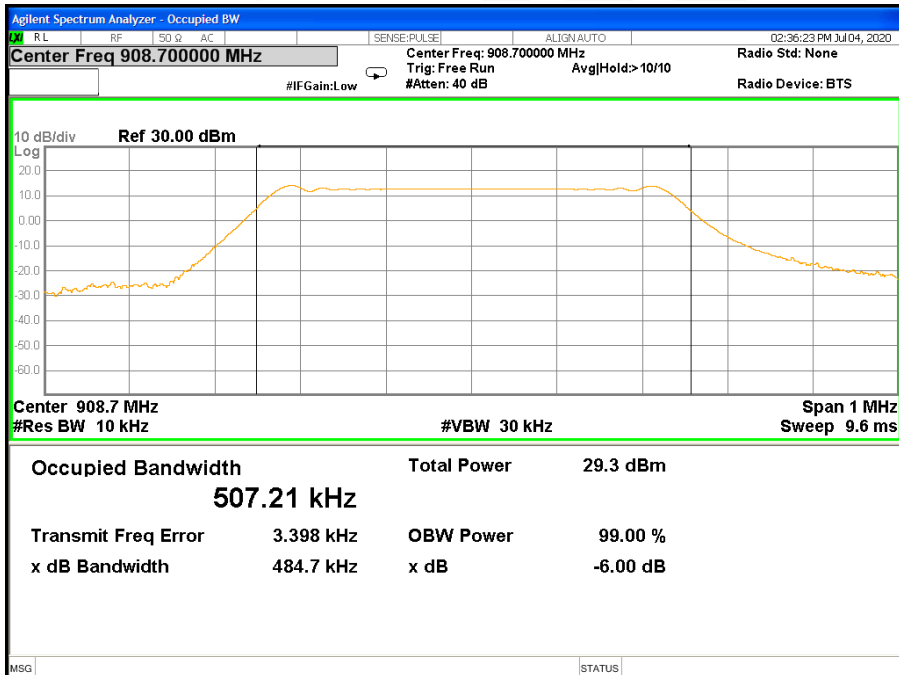




99% Bandwidth TX CH 65

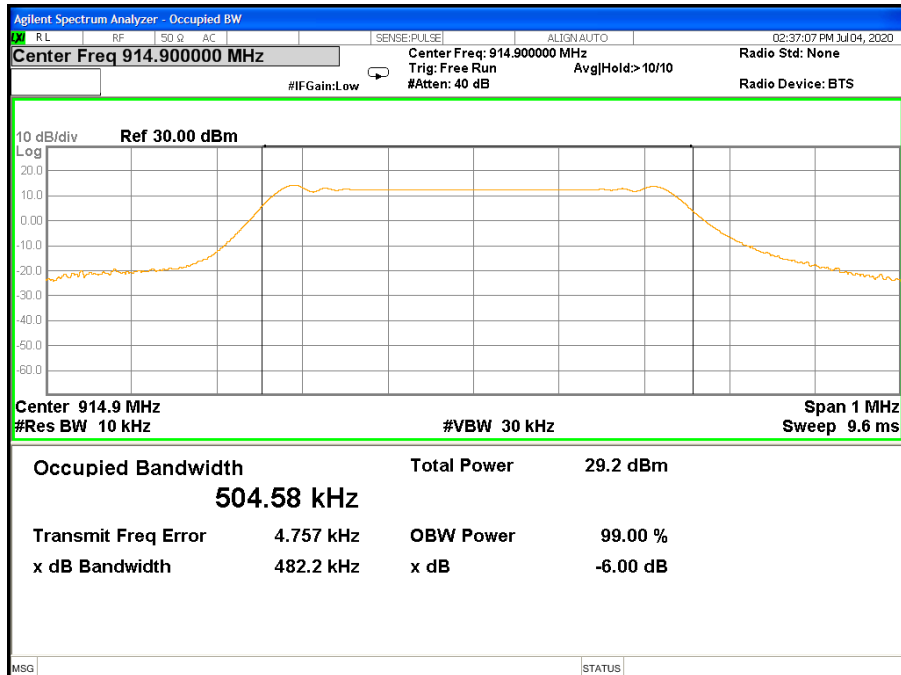


99% Bandwidth TX CH 68





99% Bandwidth TX CH 71

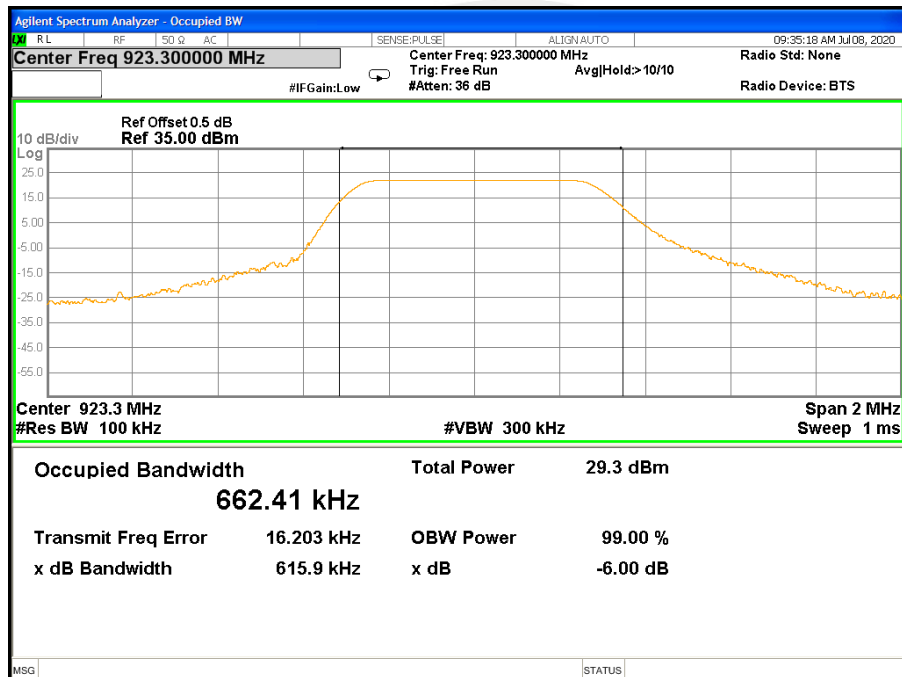




Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH00, CH03, CH06

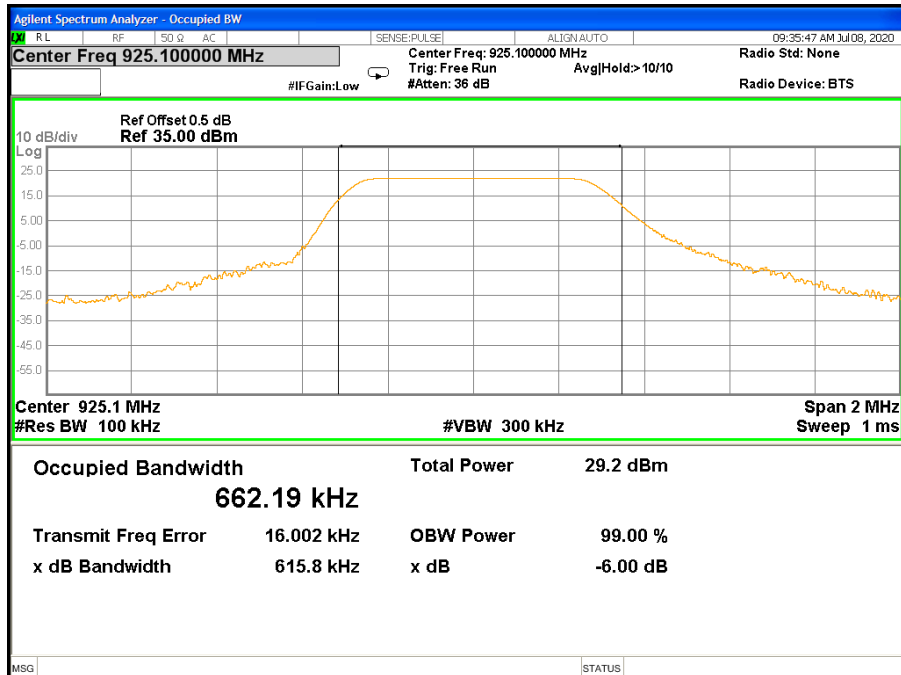
Frequency	6dB Bandwidth (KHz)	99% Bandwidth (KHz)	Channel Separation (KHz)	Result
923.3 MHz	615.900	501.980	≥500KHz	PASS
925.1 MHz	615.800	502.300	≥500KHz	PASS
926.9 MHz	616.100	502.790	≥500KHz	PASS

6dB Bandwidth TX CH 00

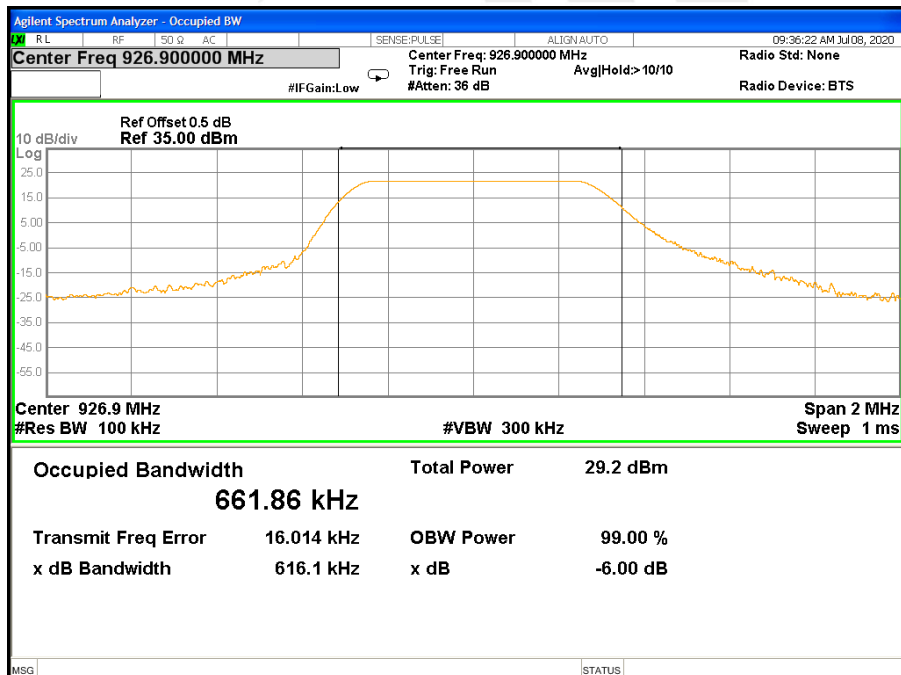




6dB Bandwidth TX CH 03

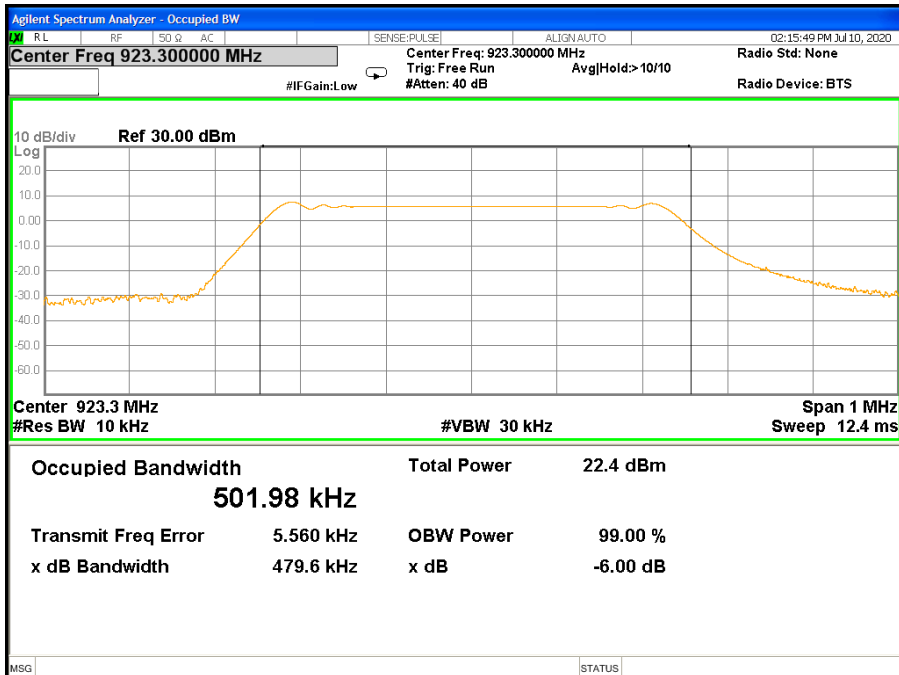


6dB Bandwidth TX CH 06

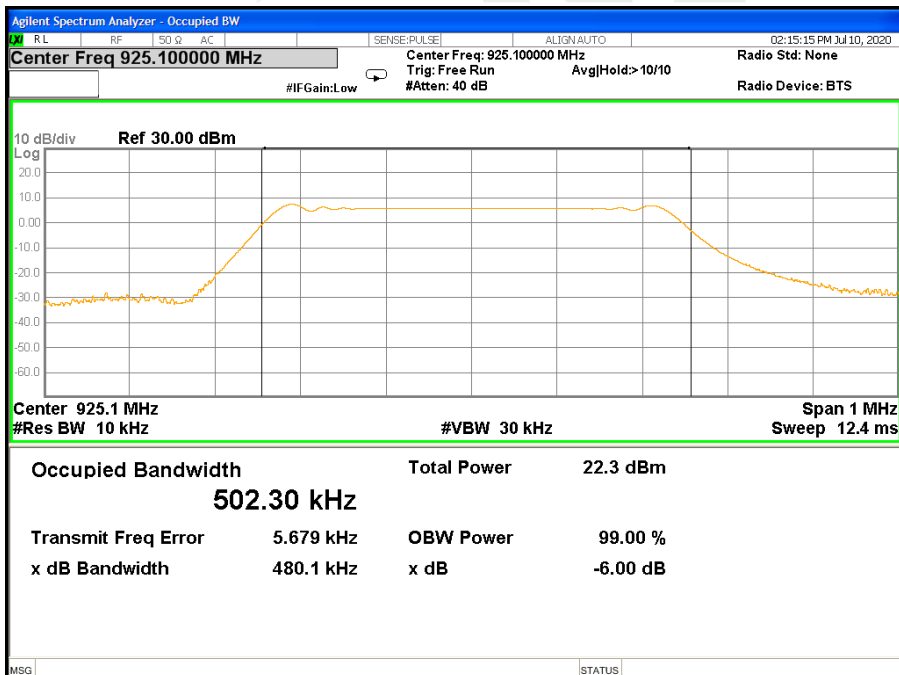




99% Bandwidth TX CH 00

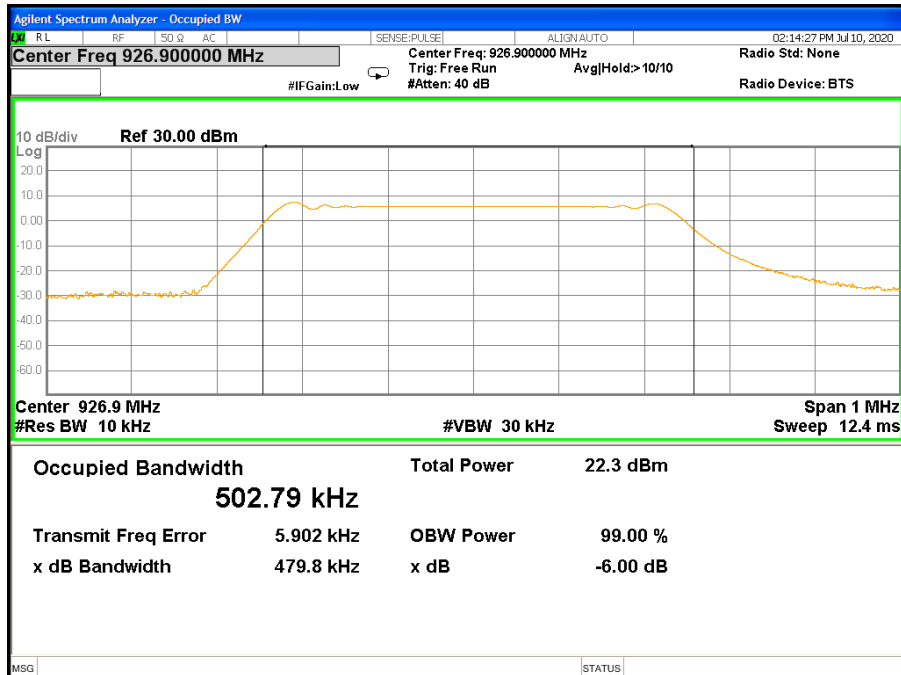


99% Bandwidth TX CH 03





99% Bandwidth TX CH 06



8. PEAK OUTPUT POWER TEST

8.1 LIMIT

FCC Part 15.247, Subpart C RSS-247 Issue 2				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3) RSS 247 Issue 2	Output Power	1 watt or 30dBm	2400-2483.5	PASS
RSS-247	EIRP	4W	2400-2483.5	PASS

8.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW \geq DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- Set the RBW \geq DTS bandwidth.
- Set VBW \geq [3 \times RBW].
- Set span \geq [3 \times RBW].
- Sweep time = auto couple.
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use peak marker function to determine the peak amplitude level.

Integrated band power method:

The following procedure can be used when the maximum available RBW of the instrument is less than the

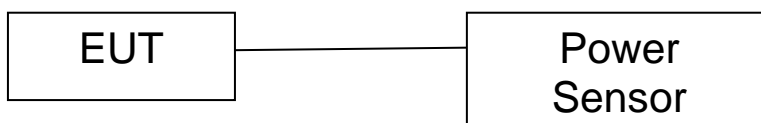
DTS bandwidth:

- Set the RBW = 1 MHz.
- Set the VBW \geq [3 \times RBW].
- Set the span \geq [1.5 \times DTS bandwidth].
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

PKPM1 Peak power meter method:

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

8.3 TEST SETUP



8.4 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.



8.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH65, CH68, CH71

Test Channe	Frequency	Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH65	903.9	22.16	30
CH68	908.7	22.09	30
CH71	914.9	21.91	30

Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz	Test Mode:	TX Mode /CH00, CH03, CH06

Test Channe	Frequency	Conducted Output Power	LIMIT
	(MHz)	(dBm)	dBm
CH0	923.3	22.92	30
CH3	925.1	22.90	30
CH6	926.9	22.89	30

Note: Our power sensor test AVG power has no duty cycle display. The power sensor measures AVG power is Burst power. The software has considered the factor of the duty cycle factor, so it is unnecessary to add it again.

EIRP Power
Uplink

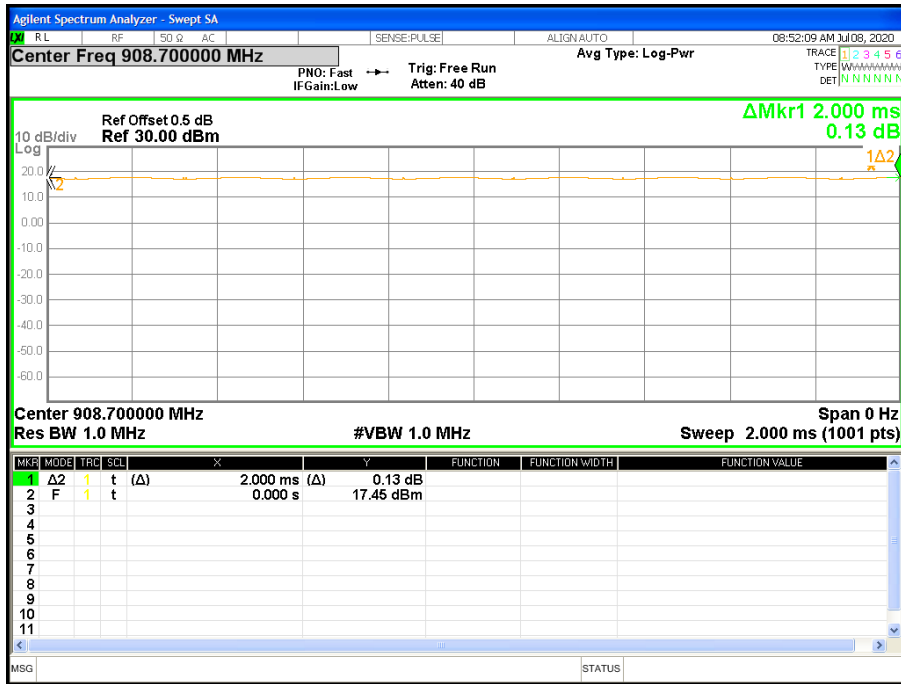
Test Channe	Frequency	Conducted Output Power	Antenna Gain	EIRP Power	LIMIT
	(MHz)	(dBm)	(dBi)	(dBm)	dBm
CH65	903.9	22.16	5.00	27.16	36.02
CH68	908.7	22.09	5.00	27.09	36.02
CH71	914.9	21.91	5.00	26.91	36.02

Downlink

Test Channe	Frequency	Conducted Output Power	Antenna Gain	EIRP Power	LIMIT
	(MHz)	(dBm)	(dBi)	(dBm)	dBm
CH0	923.3	22.92	5.00	27.92	36.02
CH3	925.1	22.90	5.00	27.90	36.02
CH6	926.9	22.89	5.00	27.89	36.02



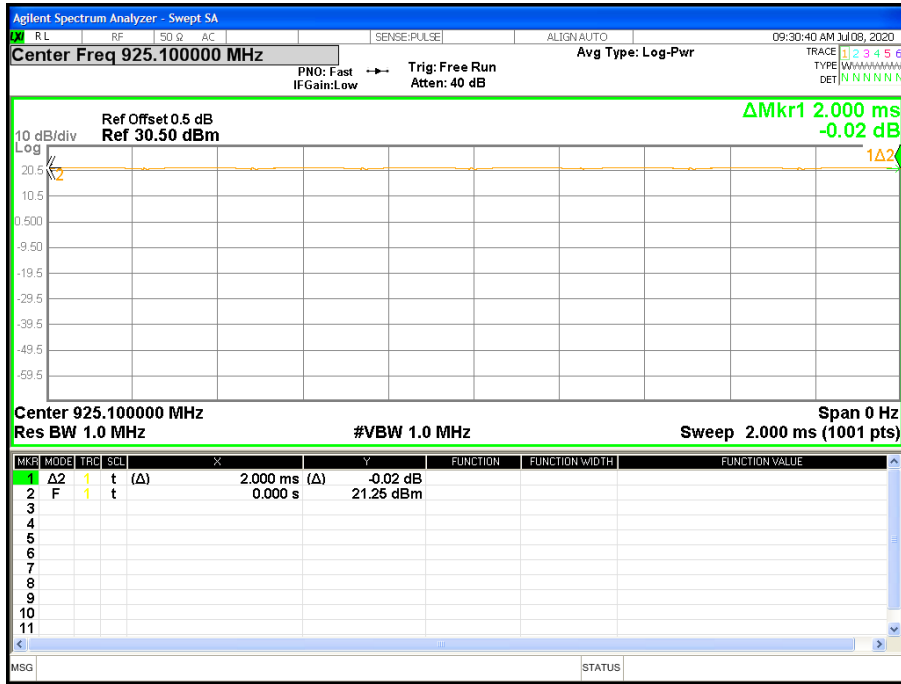
Duty cycle
Uplink



Ton	Tp	Duty cycle(%)	Duty factor(dB)
2.000	2.000	100.00%	0.00



Downlink



Ton	Tp	Duty cycle(%)	Duty factor(dB)
2.000	2.000	100.00%	0.00



9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

15.203&RSS GEN requirement: For intentional device, according to 15.203&RSS GEN: an intentional ra 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 PCB Antenna. It comply with the standard requirement.





10. FREQUENCY STABILITY

10.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

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 primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees.

10.2 TEST PROCEDURE

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 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.

10.3 TEST RESULT

Uplink

Channel 68 (908.7MHz)

Voltage vs. Frequency Stability

Voltage(V)	Measurement Frequency(MHz)
138	908.7002
120	908.6994
102	908.7000
Max.Deviation(MHz)	0.0002
Max.Deviation(ppm)	0.22

Rated working voltage: AC 120V/60Hz

Temperature vs. Frequency Stability

Temperature(°C)	Measurement Frequency(MHz)
-30	908.7022
-20	908.7021
-10	908.7018
0	908.7016
10	908.7022
20	908.7019
30	908.7016
40	908.7017
50	908.7012
Max.Deviation(MHz)	0.0022
Max.Deviation(ppm)	2.42



Downlink

Channel 03 (925.1MHz)

Voltage vs. Frequency Stability

Voltage(V)	Measurement Frequency(MHz)
138	925.1003
120	925.0997
102	925.0997
Max.Deviation(MHz)	0.0003
Max.Deviation(ppm)	0.32

Rated working voltage: AC 120V/60Hz

Temperature vs. Frequency Stability

Temperature(°C)	Measurement Frequency(MHz)
-30	925.1021
-20	925.1016
-10	925.1016
0	925.1020
10	925.1018
20	925.1011
30	925.1016
40	925.1019
50	925.1015
Max.Deviation(MHz)	0.0021
Max.Deviation(ppm)	2.27



11. EUT TEST PHOTO

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

*****END OF THE REPORT*****

