

S

T

S

L

A

B



RADIO TEST REPORT

Report No:STS1810201W01

Issued for

Radio Engineering Industries Inc.

6534 L Street Omaha, Nebraska, United States 68117

Product Name:	wireless microphone
Brand Name:	REI
Model Name:	WM70
Series Model:	BP70, R70
FCC ID:	SZRWM70
IC	24544-WM70
Test Standard:	FCC Part 74Rules
	RSS 210 Issue 9

Any reproduction of this document must be done in full. No single part of this document may be reproduced without permission from STS, All Test Data Presented in this report is only applicable to presented Test sample.

Shenzhen STS Test Services Co., Ltd.
1/F, Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail: sts@stsapp.com





TEST RESULT CERTIFICATION

Applicant's name: Radio Engineering Industries Inc.

Address: 6534 L Street Omaha, Nebraska, United States 68117

Manufacture's Name: Enping Hengda Electronic Industry Co., Ltd.

Address: No.8, B District, Individual & Foreign Capital Industry Zone, Enping City, Guangdong, P. R. China

Product description

Product Name: wireless microphone

Brand Name: REI

Model Name: WM70

SeriesModel: BP70, R70

Test Standards: FCC Part 74 Rules
RSS 210 Issue 9

ANSI C63.4:2014;TIA/EIA 603

Test procedure: ANSI C63.10-2013; RSS-Gen Issue 5 April 2018; EN 300 422-1 v1.4.2 (2011-08)

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 requirements. And it is applicable only to the tested sample identified in the report.

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

Date of Test

Date of performance of tests 25 Oct. 2018 ~12 Nov. 2018

Date of Issue 13 Nov. 2018

Test Result..... Pass

Testing Engineer :

(Chris chen)

Technical Manager :

(Sunday Hu)

Authorized Signatory :

(Vita Li)





Table of Contents	Page
1. SUMMARY OF TEST RESULTS	5
1.1 TEST FACTORY	6
1.2 MEASUREMENT UNCERTAINTY	6
2. GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF THE EUT	7
2.2 DESCRIPTION OF THE TEST MODES	10
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS	11
2.5 TEST EQUIPMENT	12
3.TEST METHODOLOGY	13
3.1 GENERAL TEST PROCEDURES	13
3.2 DESCRIPTION OF TEST MODES	13
3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS	13
4. FCC PART 74 & RSS 210 ANNEX G REQUIREMENTS	14
4.1 RADIATED SPURIOUS EMISSION	14
4.2 EMISSION MASK I	15
4.3 EMISSION MASK II	15
4.4 FREQUENCY STABILITY VS. TEMPERATURE&VOLTAGE	28
4.5 OCCUPIED BANDWIDTH	32
4.6 AUDIO FREQUENCY RESPONSE	35
4.7 MODULATION DEVIATION	37
4.8 RF OUTPUT POWER	39
5. ANTENNA REQUIREMENT	43
6.1 STANDARD REQUIREMENT	43
5.2 EUT ANTENNA	43
PHOTOS OF TEST SETUP	44

**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	13 Nov. 2018	STS1810201W01	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Emission			
Standard	Item	Limit	Result
FCC 2.1053; 74.861(e)(b)	Radiated Spurious Emission	Refer to 74.861e(6)	PASS
RSS 210 Issue 9(G.3.4)	Radiated Spurious Emission	Refer to 8.4 of EN 300 422-1 v1.4.2 (2011-08)	PASS
FCC 2.1046 (a), 74.861(e)(1) RSS 210 Issue 9(G.3.1)	RF Output Power	250 mW	PASS
FCC 2.1047 (b), 74.861(e)(3) RSS 210 Issue 9(G.3.5)	Modulation Deviation	Refer to 74.861e(2)	PASS
FCC 2.1047 (a)	Audio Frequency Response	Refer to 2.1047(a)	PASS
FCC 74.861 (e)(5) RSS 210 Issue 9(G.3.1)(G.3.2) RSS-Gen Issue 5 April 2018	Occupied Bandwidth	< 200 KHz	PASS
FCC 74.861 (e)(6)(i) (ii); FCC 2.1049 RSS 210 Issue 9(G.3.4)	Emission Mask	Refer to 74.861e(6) Refer to 8.3 of EN 300 422-1 v1.4.2 (2011-08)	PASS
2.1055(a)(1)&(b); 74.861 e(4) RSS 210 Issue 9(G.3.1)(G.3.3) RSS-Gen Issue 5 April 2018	Frequency Stability vs. Voltage&Temperature	Refer to 74.861e(4)	PASS
FCC 15.207 RSS-Gen Issue 5 April 2018	Line Conducted Emissions	--	N/A
15.203 RSS-Gen Issue 5 April 2018	Antenna Requirement	PASS	--

NOTE:

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



1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.

Add.: 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

FCC Registration No.: 625569

IC Registration No.: 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	$\pm 0.71\text{dB}$
2	Unwanted Emissions,conducted	$\pm 0.63\text{dB}$
3	All emissions, radiated 30-200MHz	$\pm 3.43\text{dB}$
4	All emissions, radiated 200MHz-1GHz	$\pm 3.57\text{dB}$
5	All emissions, radiated >1G	$\pm 4.13\text{dB}$
6	Conducted Emission(9KHz-150KHz)	$\pm 3.18\text{dB}$
7	Conducted Emission(150KHz-30MHz)	$\pm 2.70\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name:	wireless microphone
Brand Name:	REI
Model Name:	WM70
Series Model :	BP70, R70
Model Difference description:	Only model names are different
Emission Bandwidth:	67.511KHz
Battery:	Rated Voltage: 1.5*2V
Operation Frequency Range	530.15 MHz-569.85 MHz
Maximum Transmitter Power:	3.320dBm
Modulation mode / type:	FM
Frequency Tolerance	0.000403%
Temperature Range:	-30℃-50℃
Test frequency list:	See Note 6
Software version number:	N/A
Hardware version number:	N/A

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Note: The product has the same digital working characters when operating in both two digitized voice/datamode. So only one set of test results for digital modulation modes are provided in this test report.
3. Please refer to Appendix B for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.



Channel list:

Channel	Frequency/ MHz	Channel	Frequency/ MHz
a-01	530.15	b-01	550.25
a-02	530.55	b-02	550.65
a-03	530.95	b-03	551.05
a-04	531.35	b-04	551.45
a-05	531.75	b-05	551.85
a-06	532.15	b-06	552.25
a-07	532.55	b-07	552.65
a-08	532.95	b-08	553.05
a-09	533.35	b-09	553.45
a-10	533.75	b-10	553.85
a-11	534.15	b-11	554.25
a-12	534.55	b-12	554.65
a-13	534.95	b-13	555.05
a-14	535.35	b-14	555.45
a-15	535.75	b-15	555.85
a-16	536.15	b-16	556.25
a-17	536.55	b-17	556.65
a-18	536.95	b-18	557.05
a-19	537.35	b-19	557.45
a-20	537.75	b-20	557.85
a-21	538.15	b-21	558.25
a-22	538.55	b-22	558.65
a-23	538.95	b-23	559.05
a-24	539.35	b-24	559.45
a-25	539.75	b-25	559.85
a-26	540.15	b-26	560.25
a-27	540.55	b-27	560.65
a-28	540.95	b-28	561.05
a-29	541.35	b-29	561.45
a-30	541.75	b-30	561.85
a-31	542.15	b-31	562.25
a-32	542.55	b-32	562.65
a-33	542.95	b-33	563.05
a-34	543.35	b-34	563.45
a-35	543.75	b-35	563.85
a-36	544.15	b-36	564.25
a-37	544.55	b-37	564.65
a-38	544.95	b-38	565.05
a-39	545.35	b-39	565.45
a-40	545.75	b-40	565.85
a-41	546.15	b-41	566.25
a-42	546.55	b-42	566.65
a-43	546.95	b-43	567.05
a-44	547.35	b-44	567.45
a-45	547.75	b-45	567.85
a-46	548.15	b-46	568.25
a-47	548.55	b-47	568.65
a-48	548.95	b-48	569.05
a-49	549.35	b-49	569.45
a-50	549.75	b-50	569.85

Note: the frequency of a total of 100 CH



5. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	REI	WM70	PCB Antenna	NA	0	Antenna

The EUT antenna is PCB Antenna. no antenna other than that furnished by the responsible party shall be used with the device.

6. Test frequency list

Test Channel List		
Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH a-01	530.15
middle	CH b-01	550.25
highest	CH b-50	569.85

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middlefrequency, and the highest frequency of channel were selected to perform the test,please see the abovelisted frequency for testing.



2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly 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	Low Channel
Mode 2	Middle Channel
Mode 3	High Channel

For Radiated Emission	
Final Test Mode	Description
Mode 1	Low Channel
Mode 2	Middle Channel
Mode 3	High Channel

Note:

(1) Due to the different configuration and test, in this list only some worse mode. The worst test data of the worse mode is reported by this report.



2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

E-1
EUT

2.4 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	Shielded Type	Ferrite Core	Length	Note
N/A	N/A	N/A	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.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



2.5 TEST EQUIPMENT

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2017.10.27	2020.10.26
Pre-mpplier (0.1M-3GHz)	EM	EM330	060665	2018.03.09	2019.03.08
PreAmplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2018.10.13	2019.10.12
Signal Analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
trun table	EM	SC100_1	60531	N/A	N/A
Antnna mast	EM	SC100	N/A	N/A	N/A
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R

RF Connected Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2018.10.13	2019.10.12
Signal Generator	Agilent	N5182A	MY46240556	2018.10.16	2019.10.15
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12
Universal Radio communication tester	R&S	CMU200	11764	2018.10.13	2019.10.12
Audio analyzer	R&S	UPL	N/A	2018.03.08	2019.03.07
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
programmable power supply	Agilent	E3642A	MY40002025	N.C.R	N.C.R
Attenuator	HP	8494B	DC-18G	2018.05.07	2019.05.06
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R



3. TEST METHODOLOGY

3.1 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirement in Section 13.1.4.1 of ANSI C63.4:2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Not Applicable (Since the EUT is powered by battery)

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4:2013.

3.2 DESCRIPTION OF TEST MODES

The EUT has been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 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	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



4. FCC PART 74 & RSS 210 Annex G REQUIREMENTS

4.1 RADIATED SPURIOUS EMISSION

TEST LIMITS

FCC PART 74

According to CFR 47 section 74.861 e (6)(iii), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log(P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm.}$$

According RSS-210 Issue 9 (G.3.4)

The transmitter unwanted emissions shall meet the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08)

Frequency range	Maximum power, e.r.p(≤1 GHz) e.i.r.p(> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 KHz
47 MHz to 74 MHz	-54 dBm	100 KHz
74 MHz to 87.5 MHz	-36 dBm	100 KHz
87.5 MHz to 118 MHz	-54 dBm	100 KHz
118 MHz to 174 MHz	-36 dBm	100 KHz
174 MHz to 230 MHz	-54 dBm	100 KHz
230 MHz to 470 MHz	-36 dBm	100 KHz
470 MHz to 862 MHz	-54 dBm	100 KHz
862 MHz to 1 GHz	-36 dBm	100 KHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz



4.2 EMISSION MASK I

TEST LIMITS

- According to CFR 47 section 74.861 e (6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
 - (1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
 - a. (2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
 - (3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43 + 10 \log 10 \cdot (\text{mean output power in watts})$ dB;

4.3 EMISSION MASK II

TEST LIMITS

- According to ETSI EN 300 422-1 V1.5.1 Clause 8.3.1.2,
- a. The transmitter output spectrum shall be within the mask defined in figure 3 where B is the declared channel bandwidth





TEST PROCEDURE

FCC PART 74

- a. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- b. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- c. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- d. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- h. The maximum signal level detected by the measuring receiver shall be noted.
- i. The measurement shall be repeated with the test antenna set to horizontal polarization.
- j. Replace the antenna with a proper Antenna (substitution antenna).
- k. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- l. The substitution antenna shall be connected to a calibrated signal generator.
- m. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- n. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- o. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- p. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- q. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

RSS 210

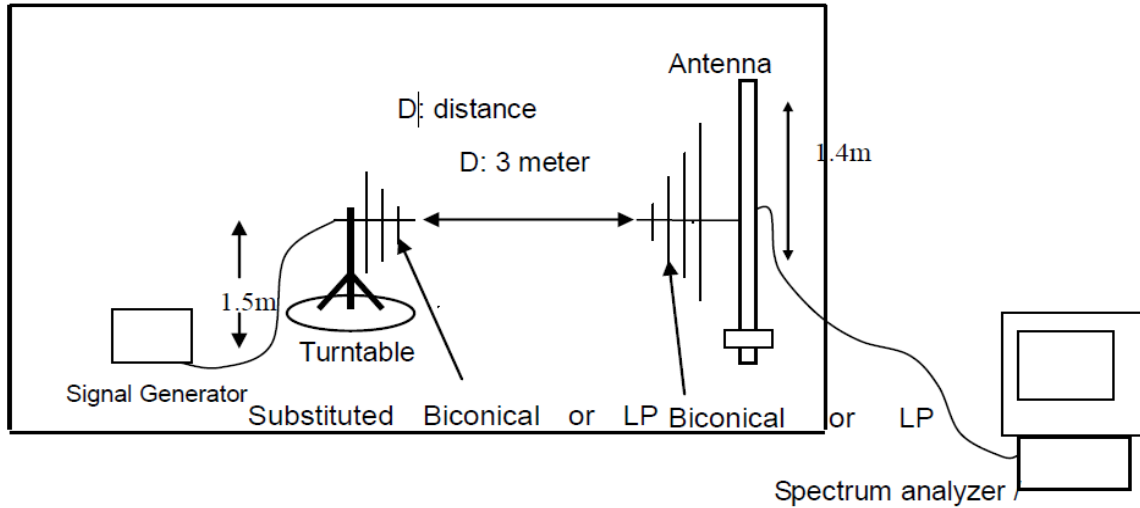
1. Please refer to ETSI EN 300 422-1 (V1.4.1) clause 6.1 for the test conditions.
2. Please refer to ETSI EN 300 422-1 (V1.4.1) clause 8.4.2 for the measurement method.

TEST CONFIGURATION

FCC PART 74

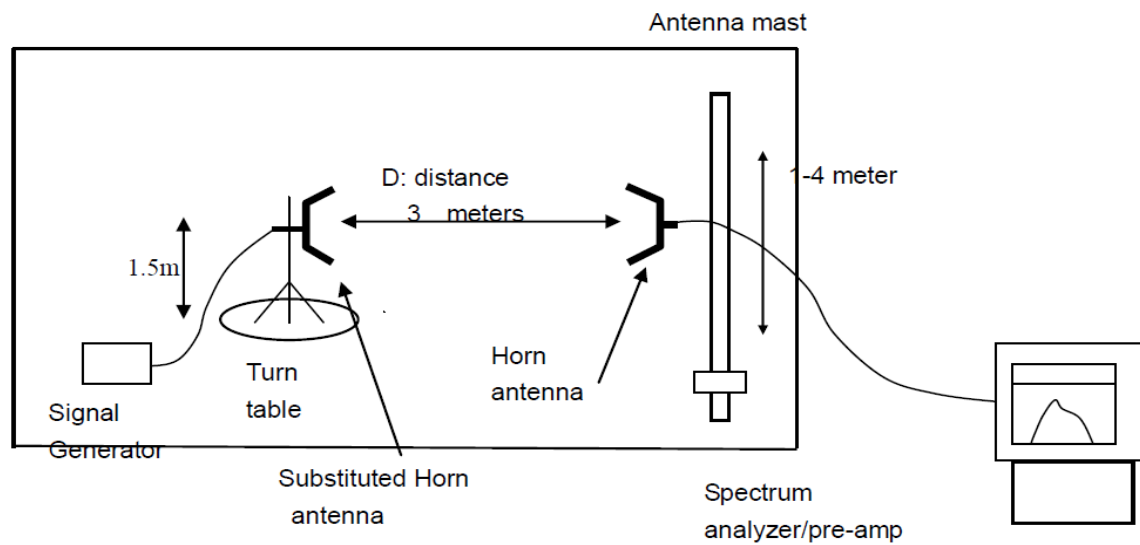
(A) Radiated Emission Test-Up Frequency Above 30MHz

Ground Plane

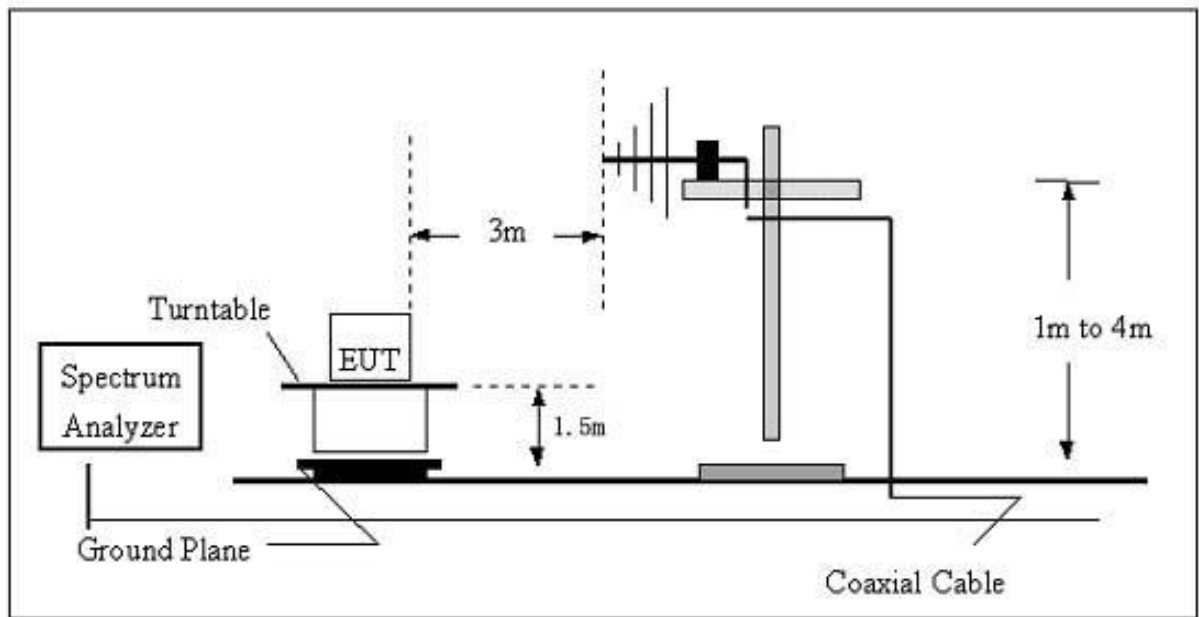


(B) Radiated Emission Test-Up Frequency Above 1GHz

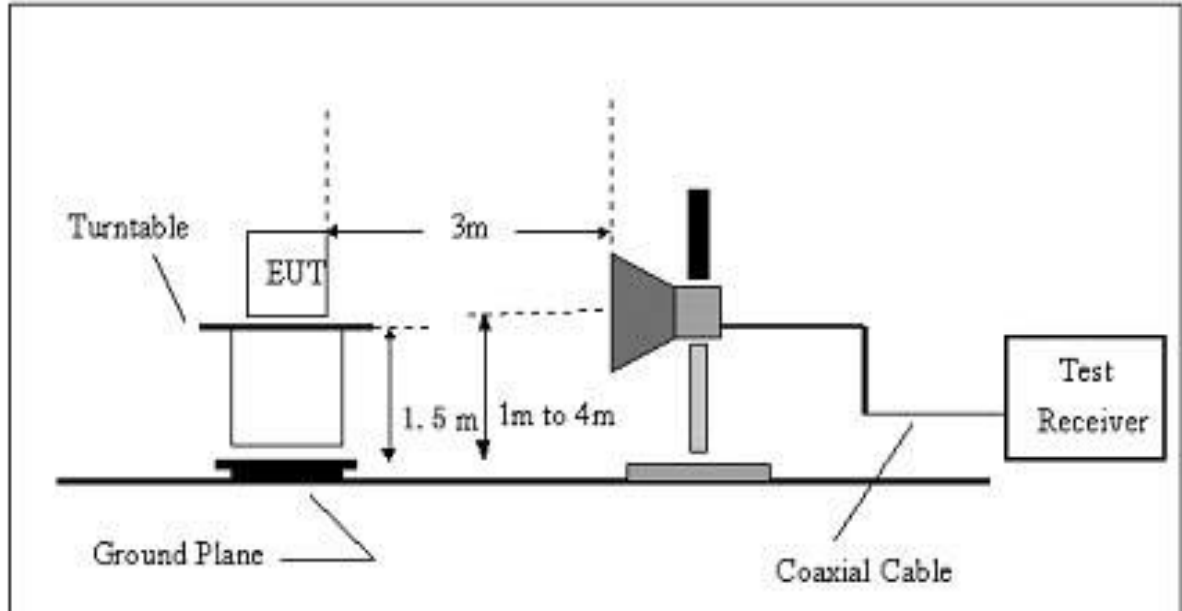
Ground plane



(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz





TEST RESULTS

FCC part 74

Note: the set-up and operating modes are the same for FCC and IC, they can share all the things, except for the limits and here list the data with strict limit only.

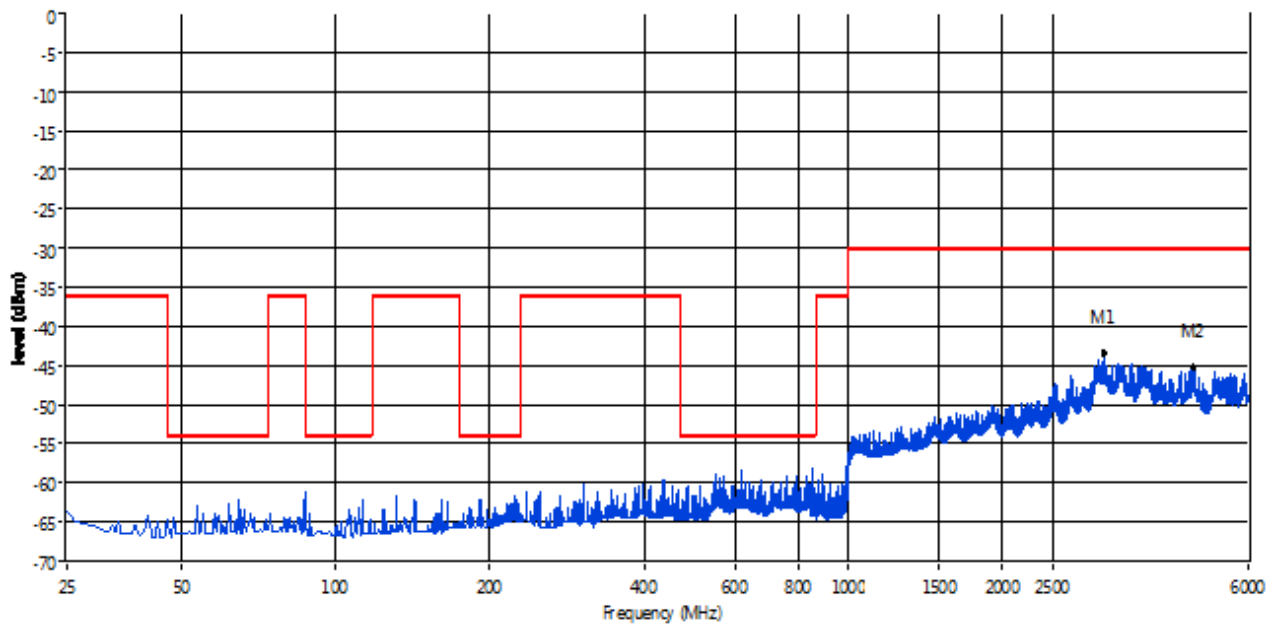




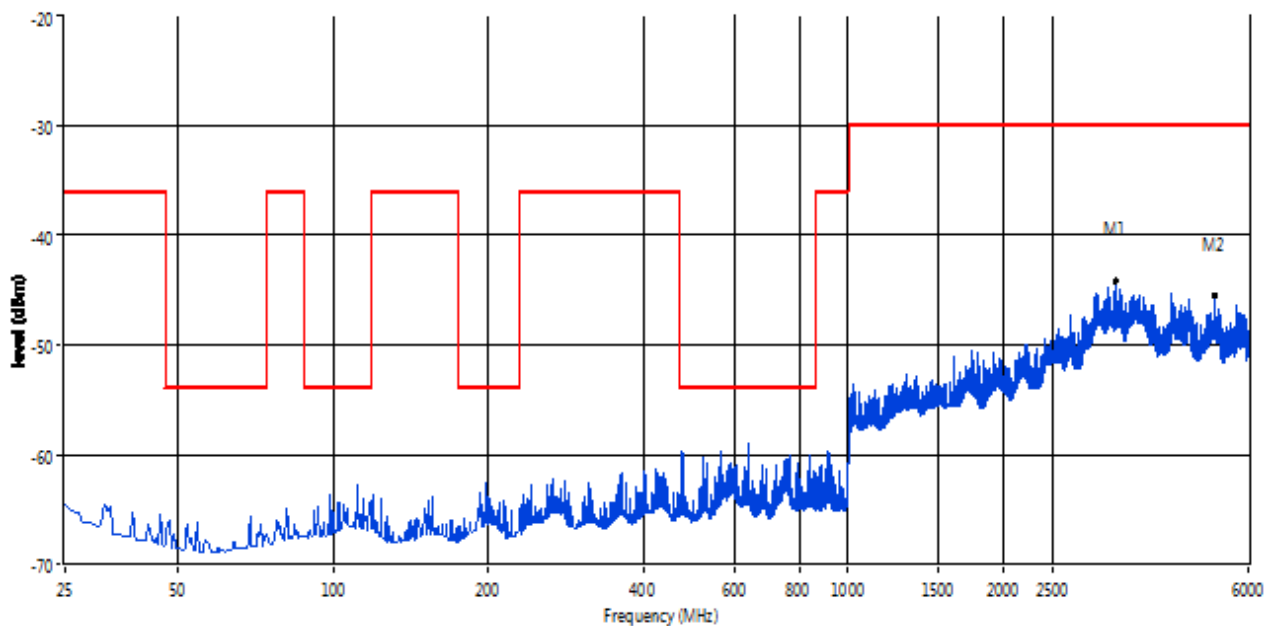
RSS 210

TEST RESULT (30MHz ~ 6000MHz)

Low CH- Horizontal

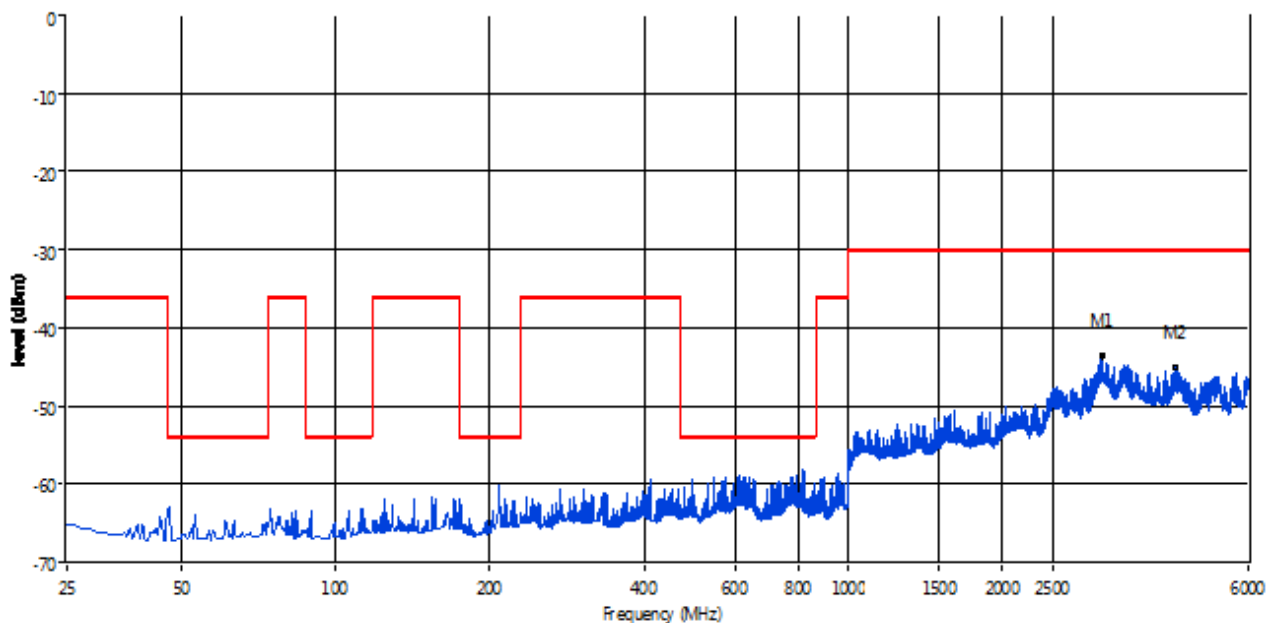


Low CH -Vertical

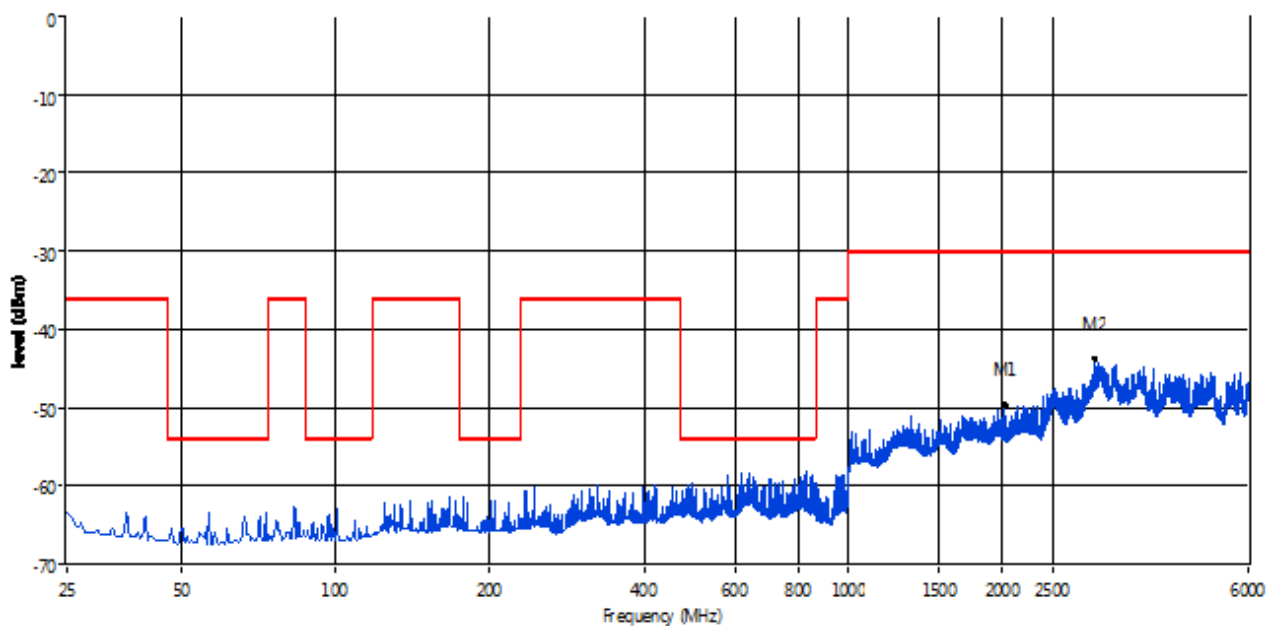




Mid CH- Horizontal

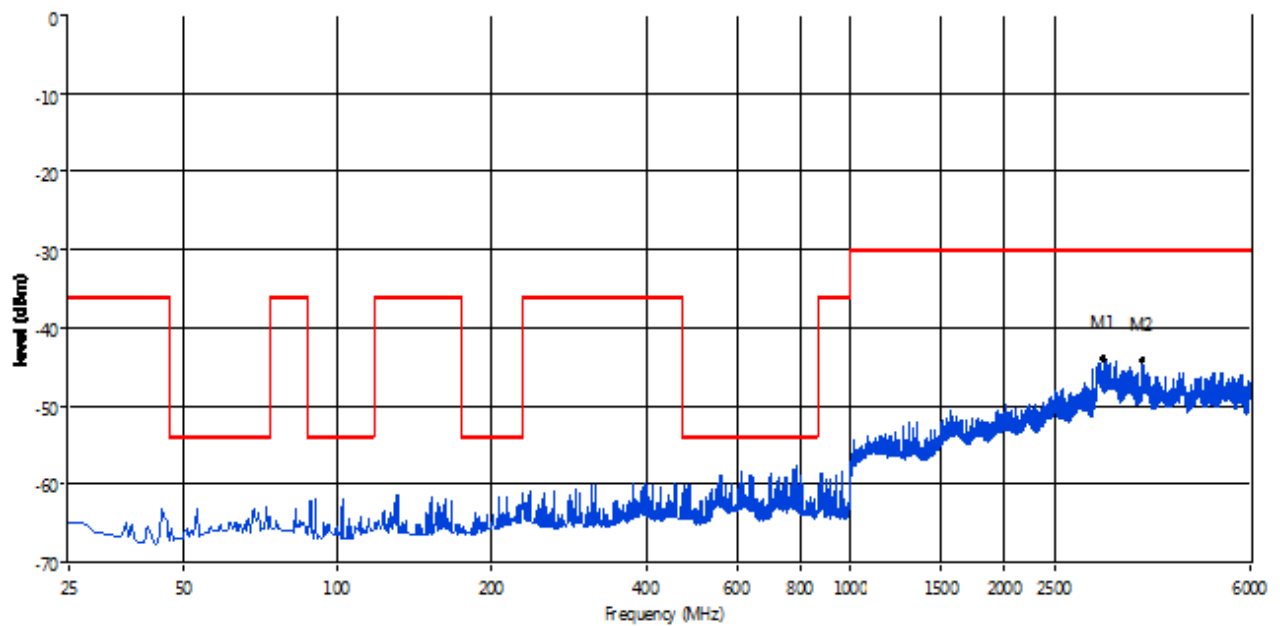


Mid CH -Vertical

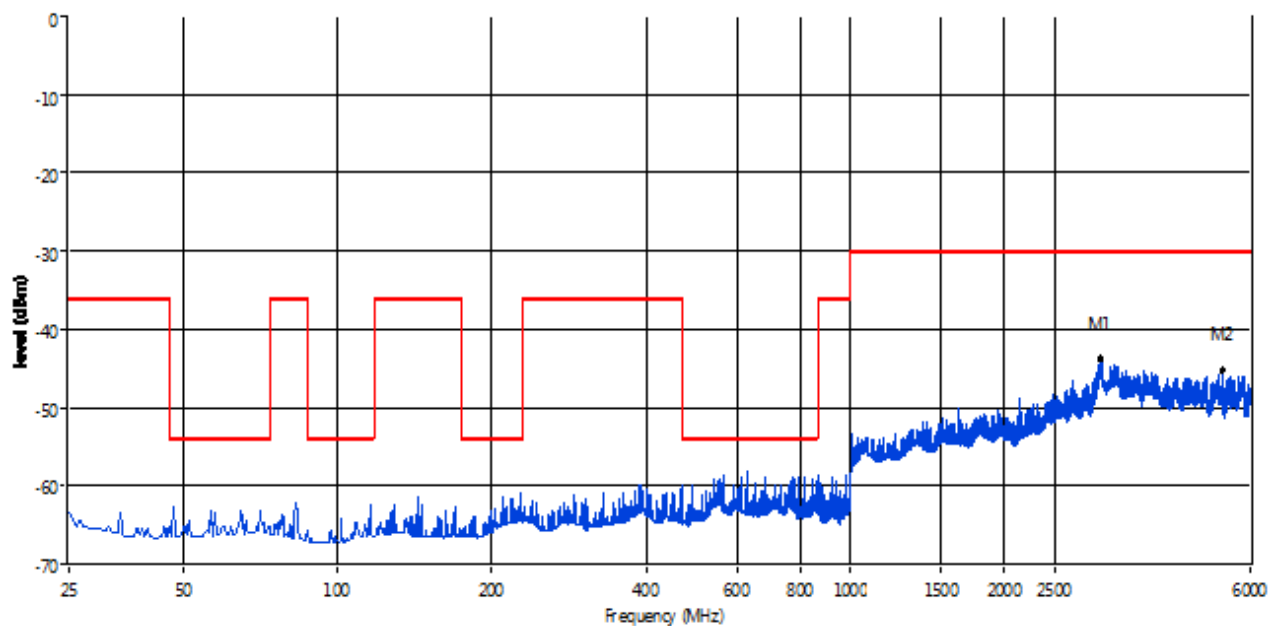




High CH- Horizontal



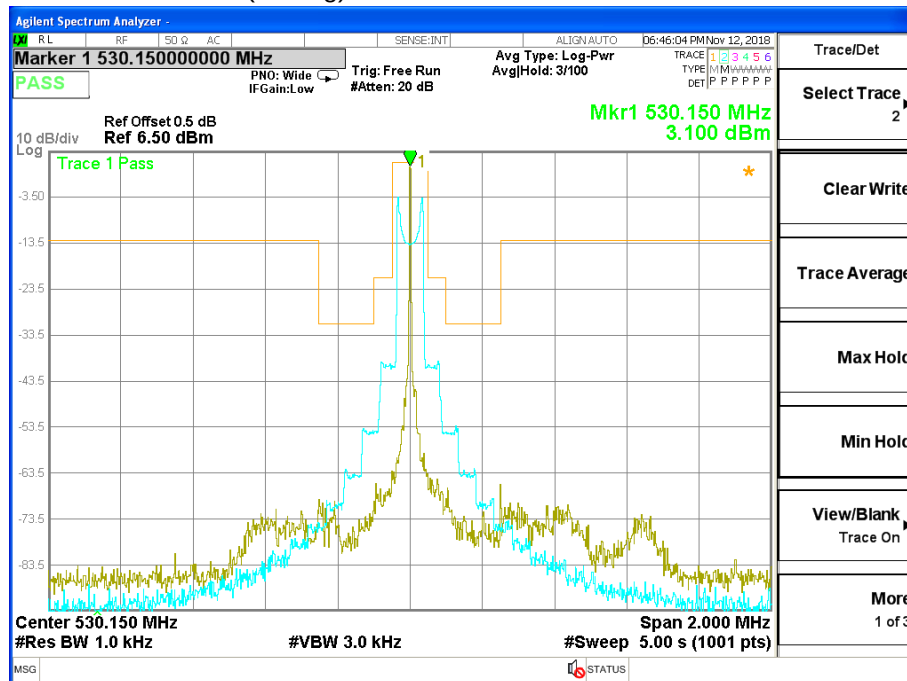
High CH -Vertical



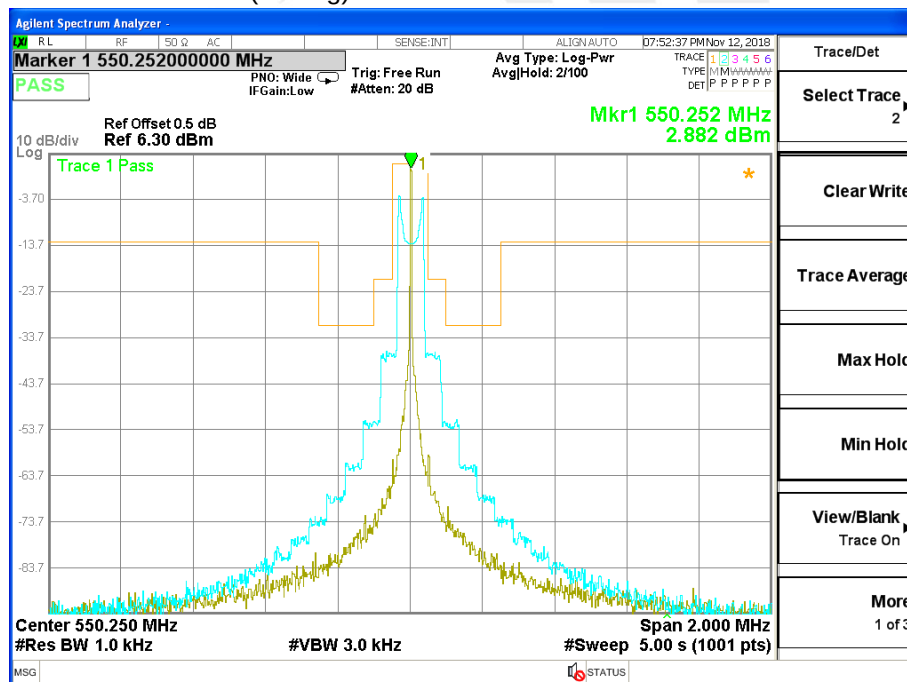


Emission Mask I

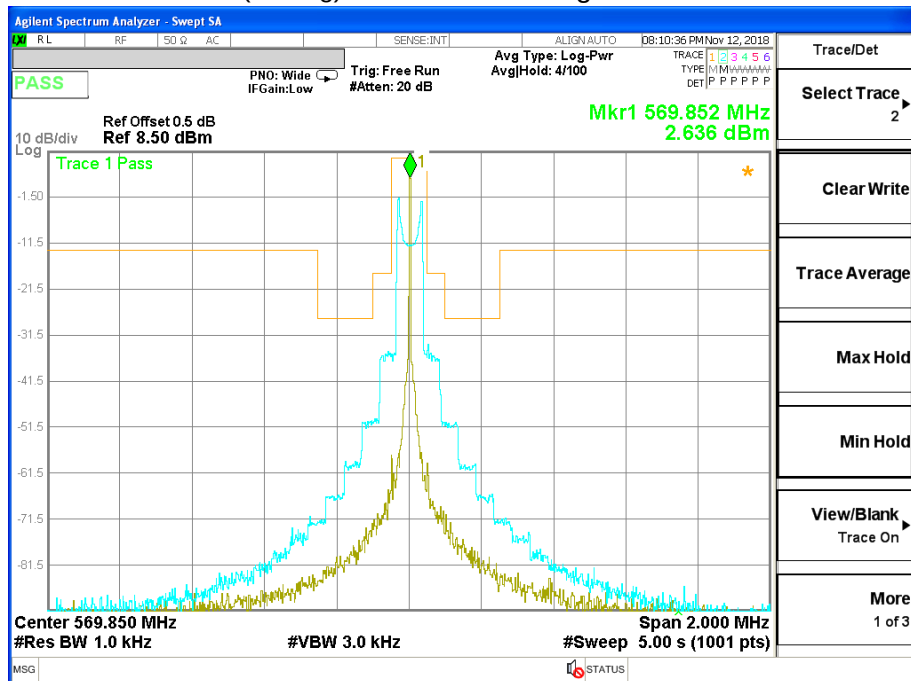
FM (Analog)Emission Mask Low Channel



FM (Analog)Emission Mask Mid Channel



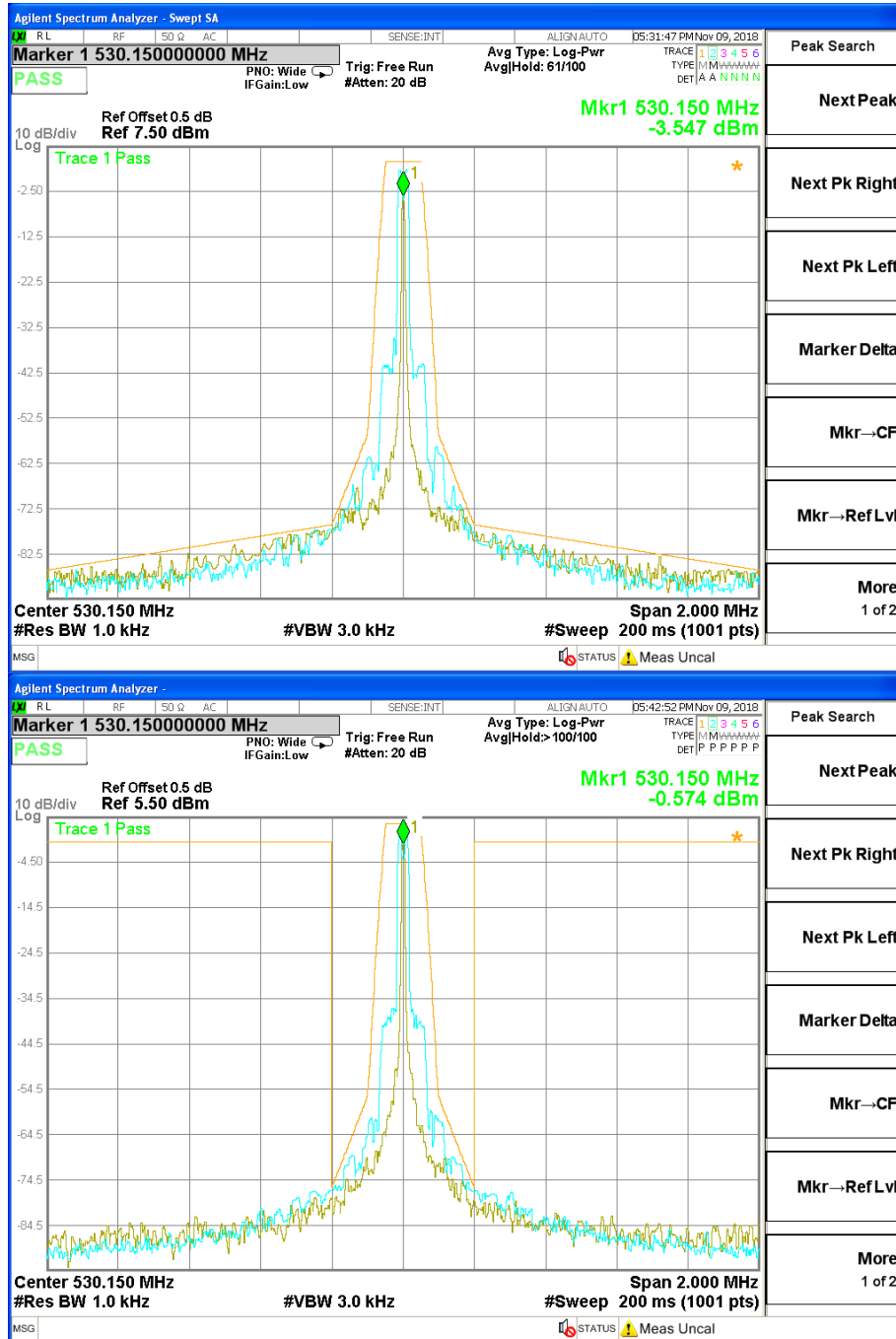
FM (Analog)Emission Mask High Channel



**Emission Mask II**

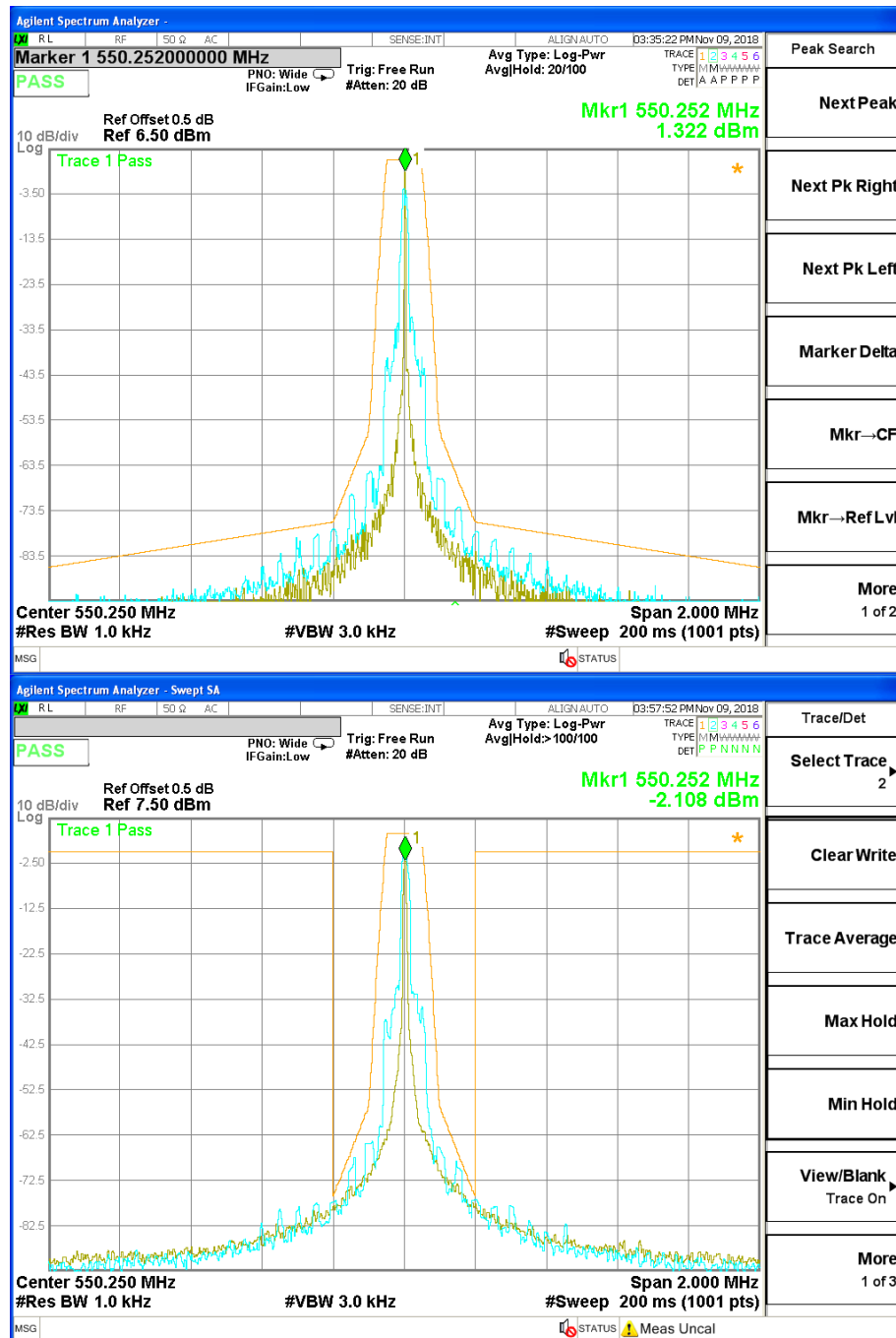
ETSI EN 300 422-1 V1.5.1 Clause 8.3.1.2 The Maximum Measurement of Necessary Bandwidth Test Plot:

Frequency	DeclaredBandwidth	B/2	0.35B
530.15 MHz	100K	50K	35K
550.25 MHz	100K	50K	35K
569.85 MHz	100K	50K	35K

Low CH

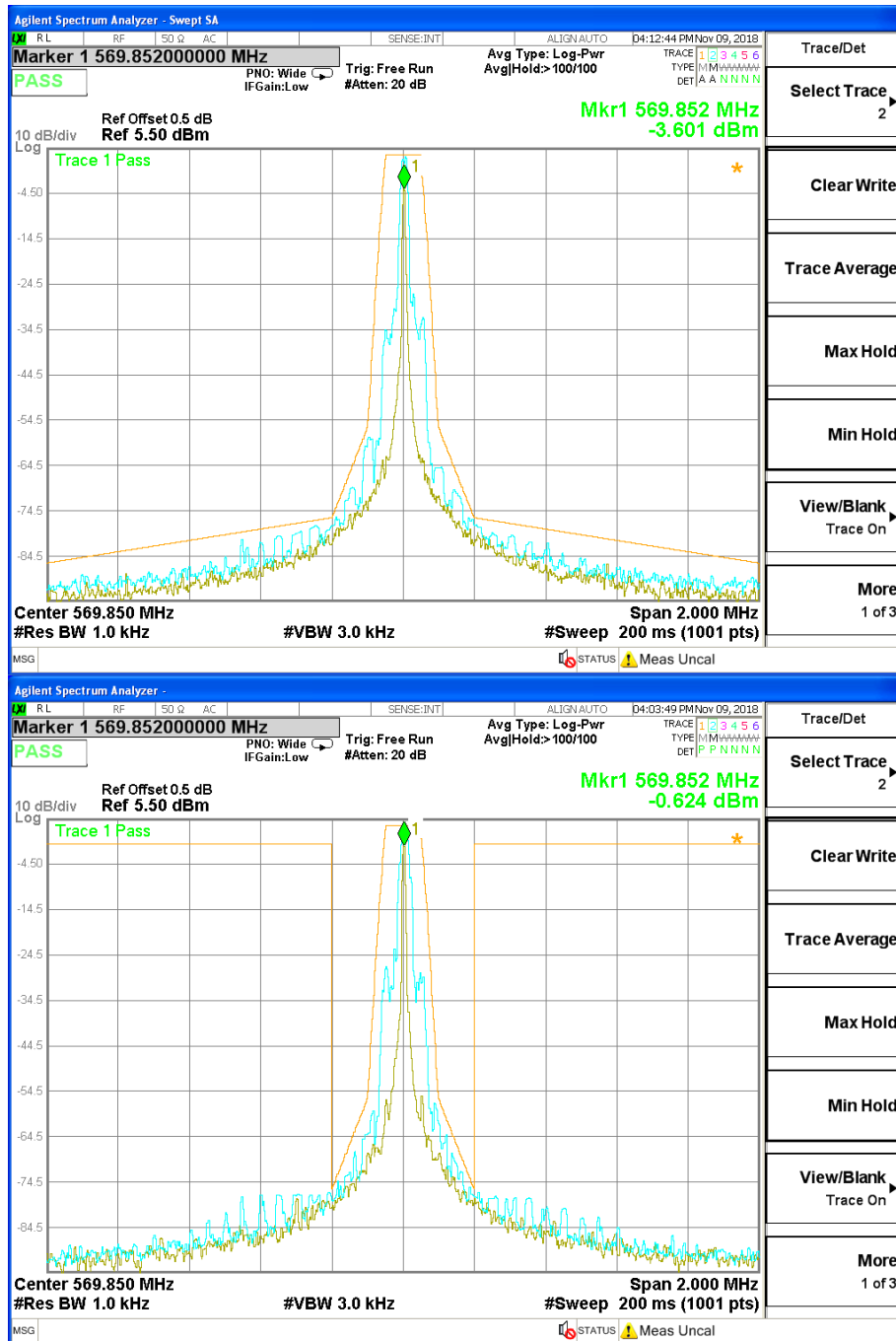


Mid CH





High CH

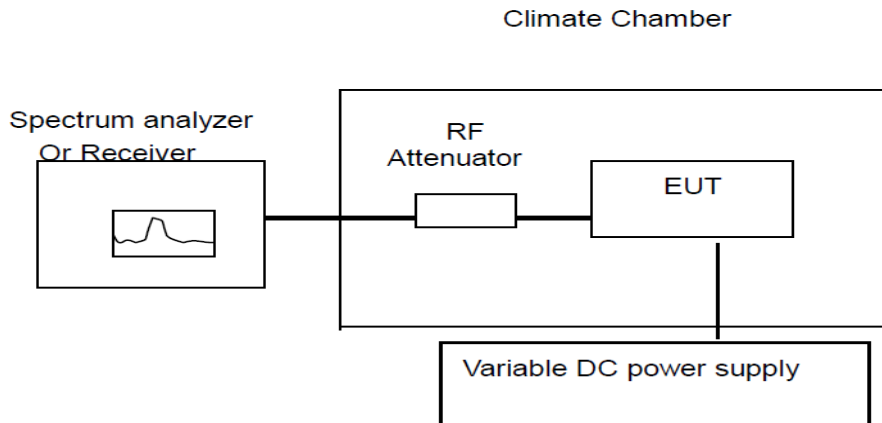


4.4 FREQUENCY STABILITY VS. TEMPERATURE&VOLTAGE

TEST LIMIT

According to CFR 47 section 74.861 e (4) RSS 210 Issue 9(G.3.1)(G.3.3)、RSS-Gen Issue 5 April 2018, the frequency tolerance of the transmitter shall be 0.005 percent.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and the RF output cable, exited the chamber through an opening made for that purpose.

After the temperature stabilized the frequency output was recorded from the counter.

An external variable DC power supply was connected to the battery terminals of the equipment under test.

- a.
- b. For hand carried, battery powered equipment primary supply voltage was reduced to the battery operating end point as specified by the manufacturer. The output frequency was recorded for each battery voltage.

**TEST RESULTS**

- (1) Frequency stability versus input voltage (Supply Nominal voltage is DC 1.5*2V)
(2) Frequency stability versus input voltage (Supply battery operating end point which shall be specified by the manufacturer DC 2.6V)

Reference Frequency: 530.15MHz			
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
2.7V,DC	20	1001	0.000189
3.0V,DC	20	1003	0.000189
3.3V, DC	20	1002	0.000189
BEP	20	1001	0.000189

Reference Frequency: 530.15MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	1000	0.000189	0.00500	PASS
40	998	0.000188		
30	1003	0.000189		
20	1003	0.000189		
10	1001	0.000189		
0	1001	0.000189		
-10	1000	0.000189		
-20	1002	0.000189		
-30	1003	0.000189		



Reference Frequency: 550.25MHz			
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
2.7V,DC	20	3004	0.000546
3.0V,DC	20	3000	0.000545
3.3V, DC	20	2998	0.000545
BEP	20	2999	0.000545

Reference Frequency: 550.25MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	3000	0.000545	0.00500	PASS
40	2998	0.000545		
30	3001	0.000545		
20	3000	0.000545		
10	3003	0.000546		
0	2997	0.000545		
-10	3002	0.000546		
-20	2996	0.000544		
-30	3004	0.000546		



Reference Frequency: 569.85MHz			
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
2.7V,DC	20	2997	0.000526
3.0V,DC	20	3000	0.000526
3.3V, DC	20	3002	0.000527
BEP	20	3001	0.000527

Reference Frequency: 569.85MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	3000	0.000526	0.00500	PASS
40	3001	0.000527		
30	3000	0.000526		
20	3000	0.000526		
10	3002	0.000527		
0	3003	0.000527		
-10	2998	0.000526		
-20	2999	0.000526		
-30	2998	0.000526		

4.5 OCCUPIED BANDWIDTH

TEST LIMIT

According to CFR 47 section 74.861 e (5)、RSS 210 Issue 9(G.3.1)(G.3.2)RSS-Gen Issue 5 April 2018, the operating bandwidth shall no exceed 200 KHz.Near the carrier an emission mask is defined by the standard.

TEST CONFIGURATION



TEST PROCEDURE

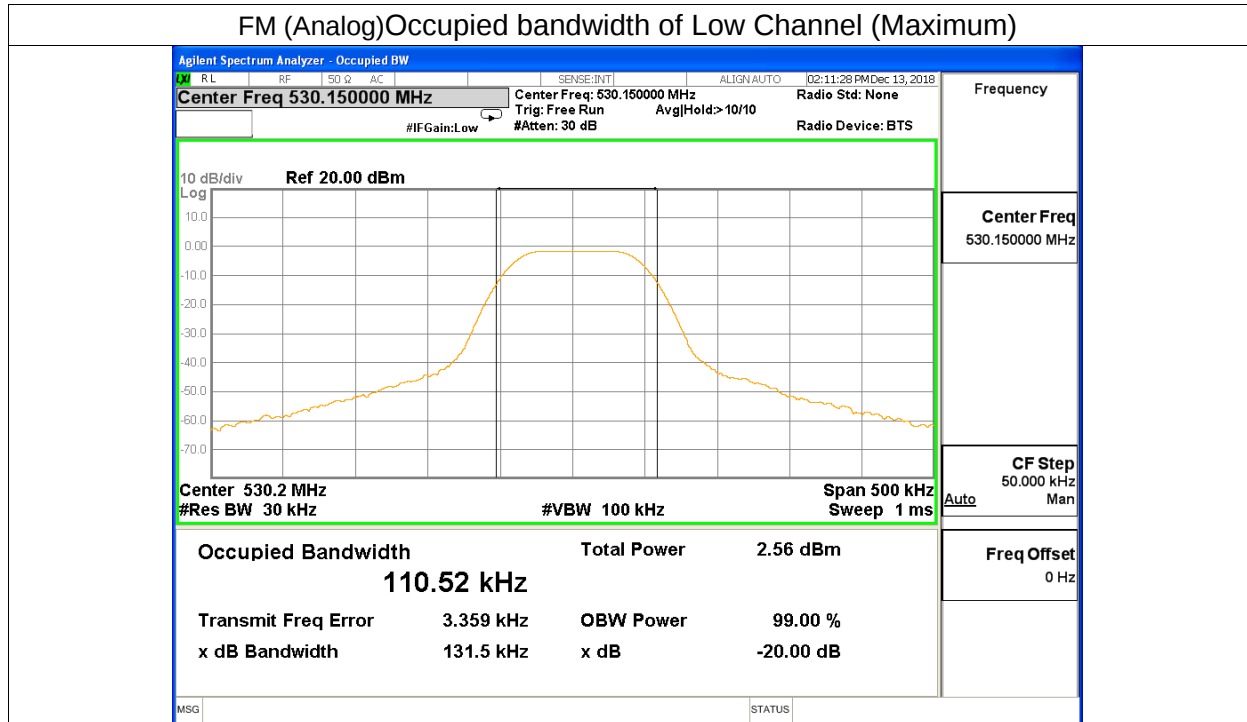
- a. The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.
SetOccupied Bandwidth was measured with a occupied bandwidth function of the analyzer.
- b. The near the carrier emissions are measured by normal power measurement function of the analyzer.
- c. Set SPA Max hold. Mark peak, 99%.



TEST RESULT

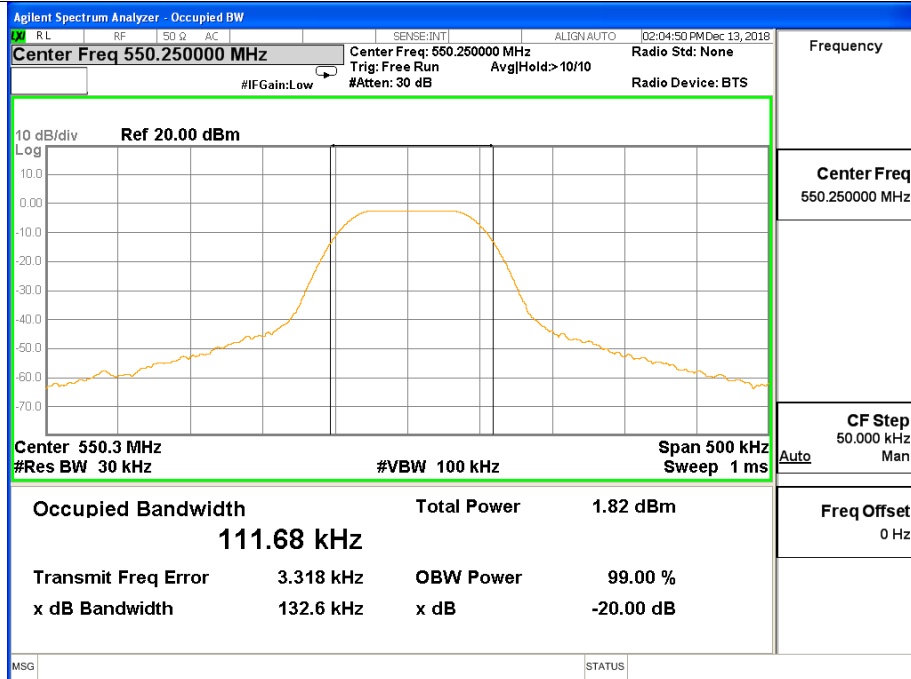
Frequency(MHz)	Occupied Bandwidth(KHz)	Limit(KHz)
530.15	110.52	200
550.25	111.68	200
569.85	110.35	200

FM (Analog)Occupied bandwidth of Low Channel (Maximum)

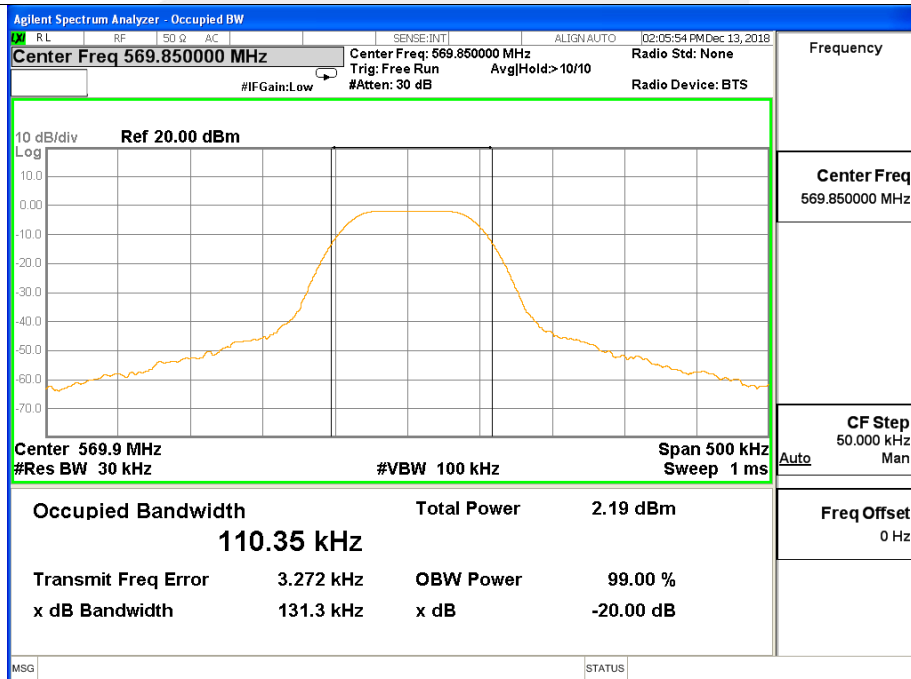




FM (Analog) Occupied bandwidth of Mid Channel (Maximum)



FM (Analog) Occupied bandwidth of High Channel (Maximum)



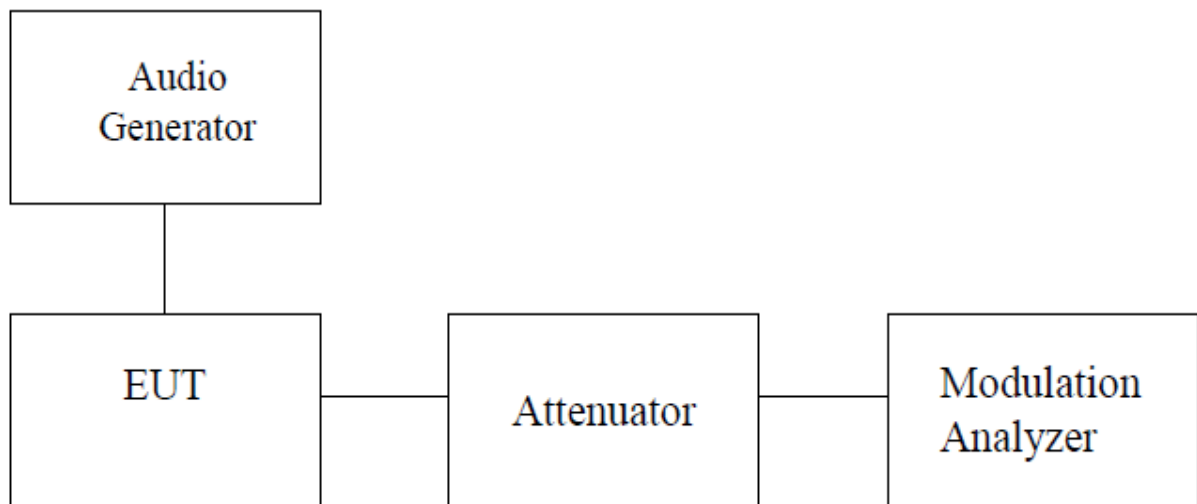
4.6 AUDIO FREQUENCY RESPONSE

TEST LIMIT

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic. The frequency response of the audio modulation part is measured over a frequency range of 100 Hz to 5000 Hz.

According to CFR 47 section 74.861 e (1), any form of modulation may be used. A maximum deviation of ± 75 KHz is permitted when frequency modulation is employed.

TEST CONFIGURATION



TEST PROCEDURE

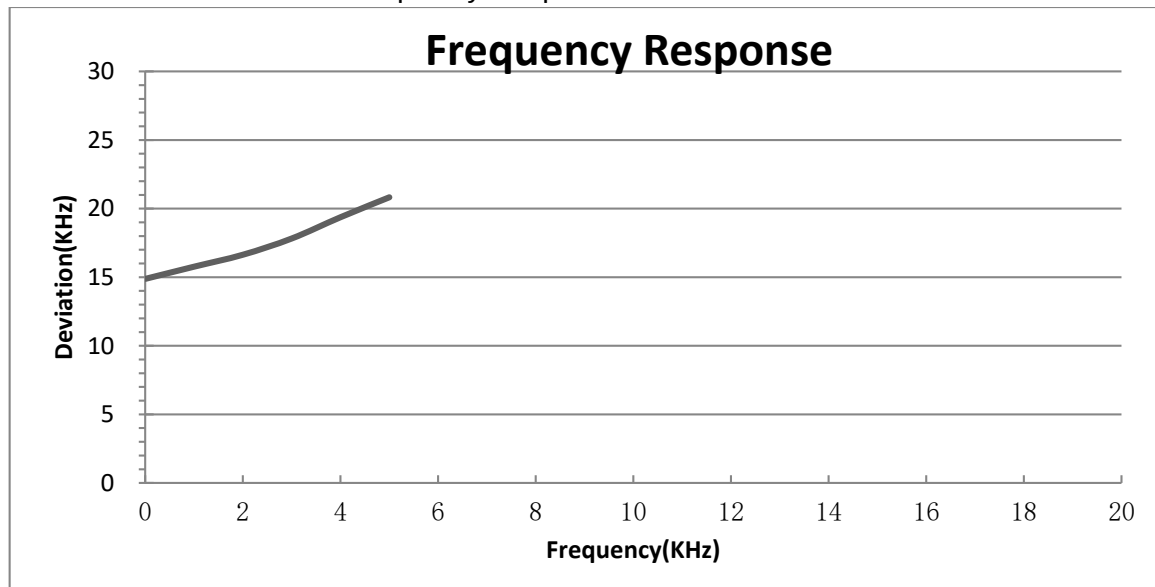
- The audio frequency response is the degree of the closeness to which the frequency deviation of the transmitter follows prescribed characteristics.
- The frequency response of the audio modulation part is measured over a frequency range of 100 Hz to 5000 Hz.
- For 1000 Hz tone reference signal the audio generator level is adjusted to get 20% of the rated system deviation.
The deviations obtained over the frequency range from 100 Hz to 5000 Hz are recorded and
- compared with the reference deviation as follows:
$$\text{Audio Frequency Response} = 20 \log (\text{DEV freq} / \text{Dev ref})$$

**TEST RESULT**

Audio Frequency Response:

Frequency(KHz)	Deviation(KHz)
0.01	14.89
1	15.77
2	16.64
3	17.82
4	19.37
5	20.82

Frequency Response of Mid Channel



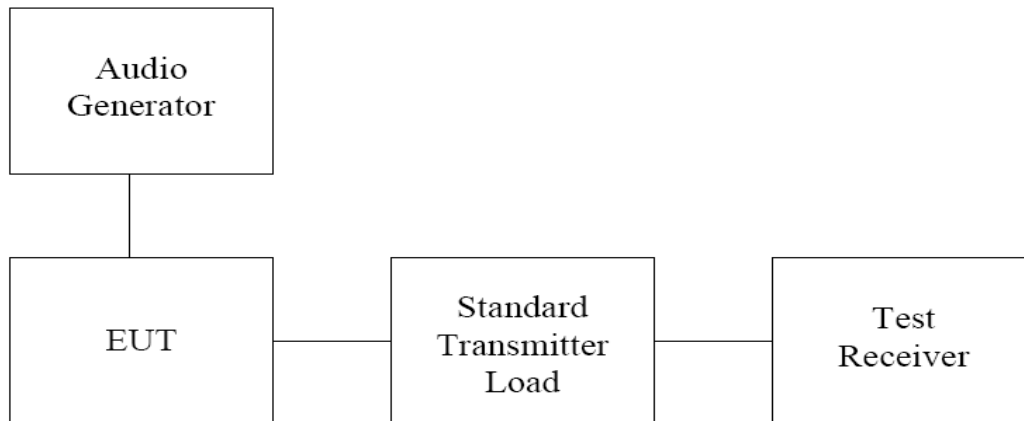
4.7 MODULATION DEVIATION

TEST LIMIT

According to CFR 47 section 2.1047 a, for Voice modulation communication equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000 Hz shall be measured.

According to CFR 47 section 74.861 e (3)、RSS 210 Issue 9(G.3.5), any form of modulation may be used. A maximum deviation of ± 75 KHz is permitted when frequency modulation is employed.

TEST CONFIGURATION



TEST PROCEDURE

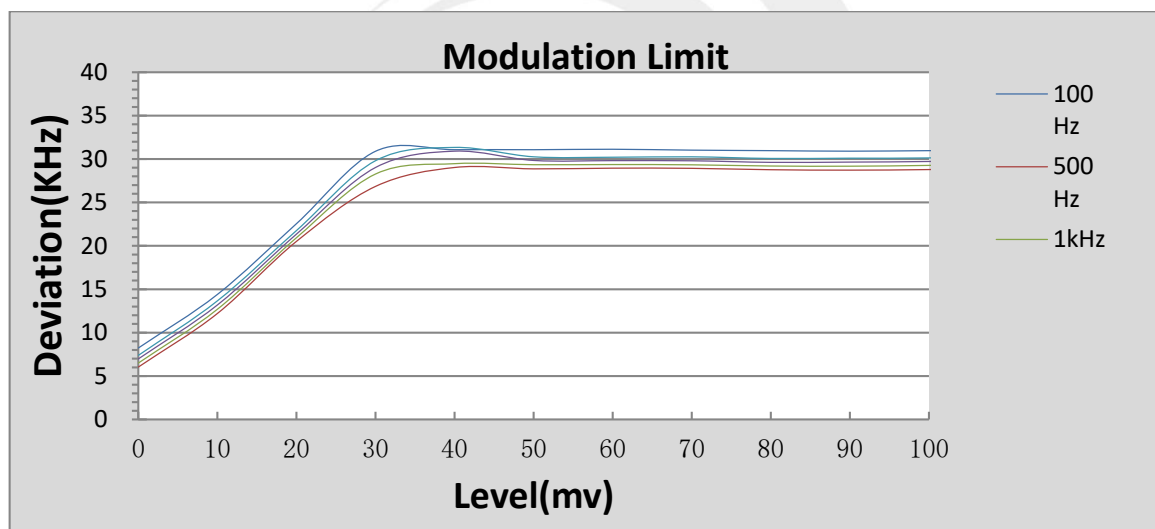
- Modulation limits is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.
- The audio signal generator is connected to the audio input of the EUT with its full rating.
- The modulation response is measured at certain modulation frequencies, related to 1000 Hz reference signal.
- Tests are performed for positive and negative modulation.

**TEST RESULT**

Modulation Deviation

Level(mv)	100Hz	500Hz	1kHz	2.5kHz	5kHz
0	8.23	6.04	6.50	6.98	7.39
10	14.40	12.21	12.70	13.19	13.67
20	22.55	20.52	20.94	21.35	21.77
30	30.89	26.85	28.28	29.02	29.81
40	31.07	29.03	29.47	30.90	31.34
50	31.07	28.87	29.35	29.83	30.26
60	31.12	28.95	29.37	29.81	30.21
70	31.02	28.93	29.34	29.79	30.26
80	30.96	28.77	29.20	29.61	30.07
90	30.90	28.72	29.18	29.64	30.10
100	30.96	28.79	29.27	29.71	30.13
110	31.01	28.96	29.43	29.90	30.38

Modulation Deviation of Mid Channel



4.8 RF OUTPUT POWER

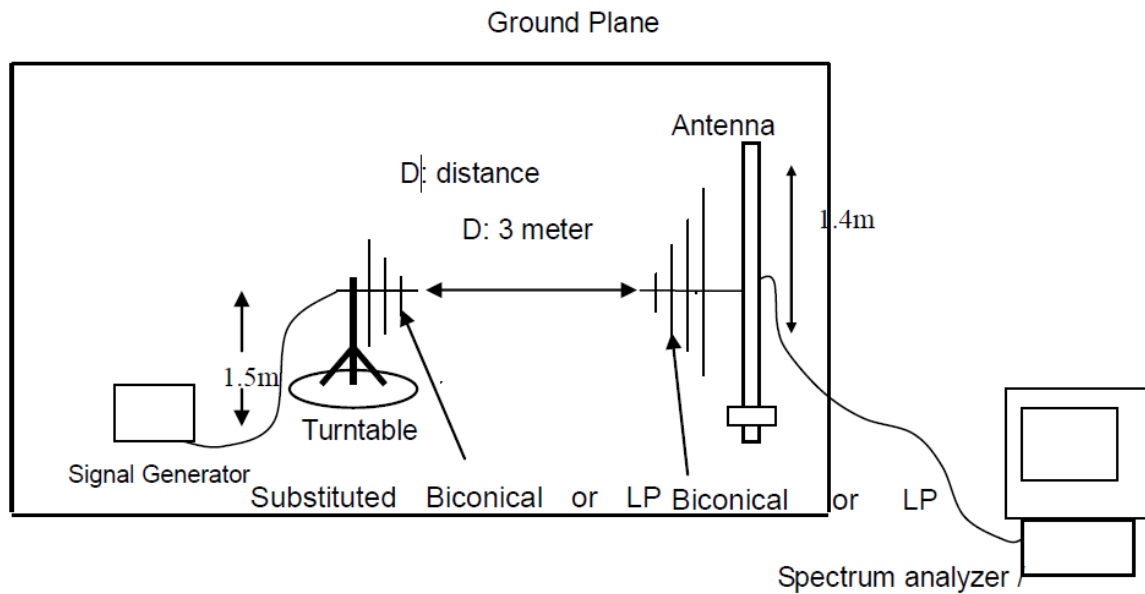
TEST LIMIT

According to CFR 47 section 74.861 e (1)、RSS 210 Issue 9(G.3.1), the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following:

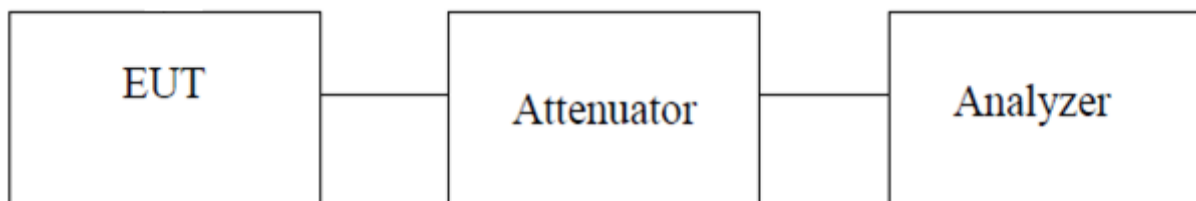
- (i) 54-72, 76-88, and 174-216 MHz bands: 50 mW EIRP
- (ii) 470-608 and 614-698: 250 mW conducted power
- (iii) 600 MHz duplex gap: 20 mW EIRP

TEST CONFIGURATION

Radiation



Conduction



TEST PROCEDURE(Radiation)

- a. On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- b. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- c. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- d. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- e. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- g The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.



- h The maximum signal level detected by the measuring receiver shall be noted.
- i The measurement shall be repeated with the test antenna set to horizontal polarization.
- j Replace the antenna with a proper Antenna (substitution antenna).
- k The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- l The substitution antenna shall be connected to a calibrated signal generator.
- m If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- n The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- o The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- p The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- q The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

TEST PROCEDURE (Conduction)

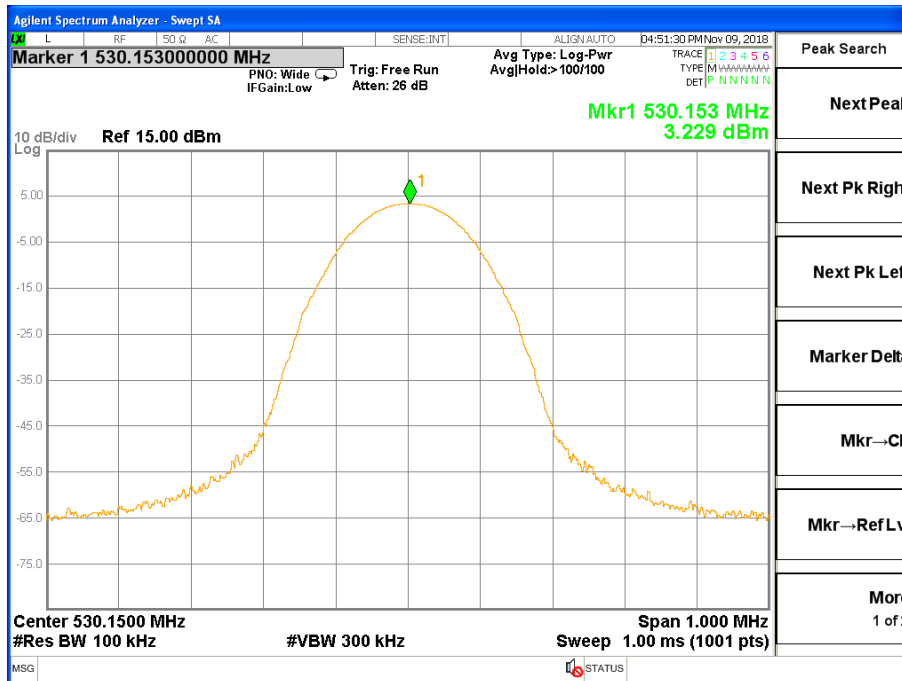
- a. The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.
- b. Set the $RBW > 20BW$, $VBW > 3 \times RBW$.
- c. Detector = peak.
- d. Sweep time = auto couple.
- e. Trace mode = max hold.
- f. Allow trace to fully stabilize.
- g. Use the peak marker function to determine the maximum amplitude level.



TEST RESULT

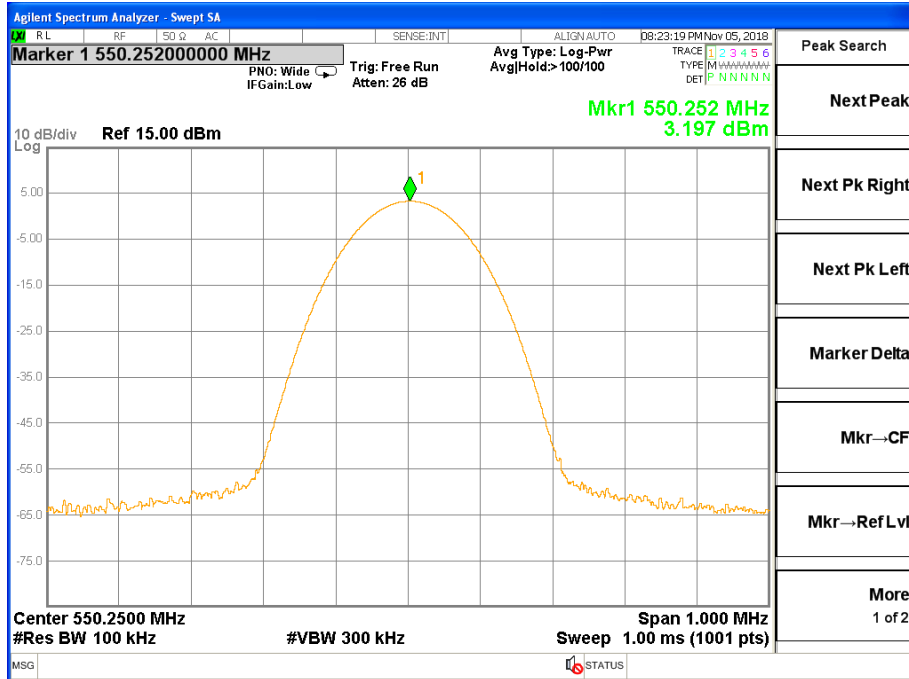
Frequency Channel (MHz)	Peak Output Power (dBm)	Transmitter Power (mW)	Limits (mW)
530.15	3.229	2.103	250
550.25	3.197	2.088	250
569.85	3.320	2.148	250

Low Channel

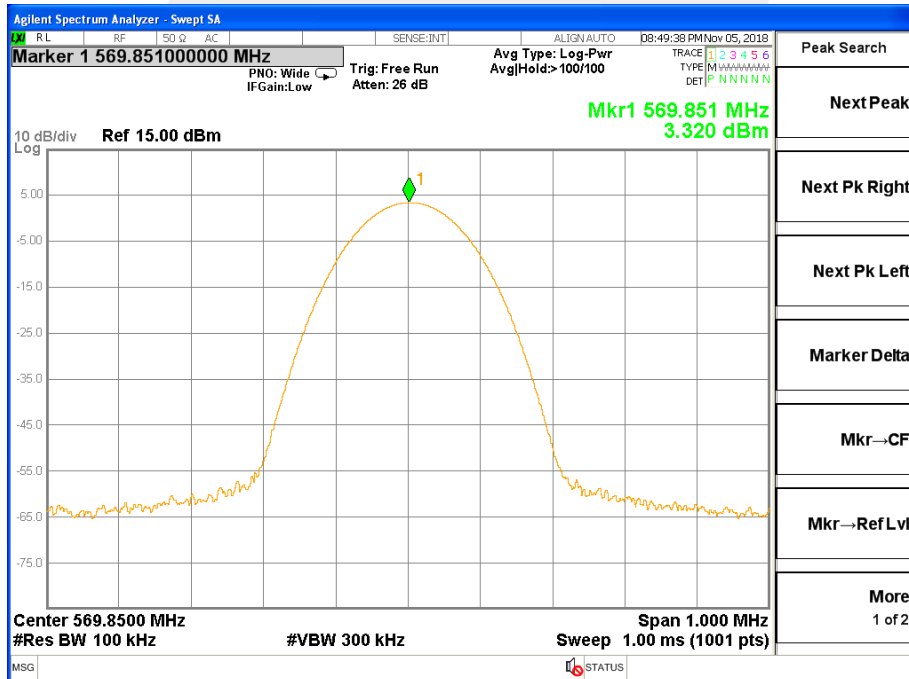




MidChannel



High Channel





5. ANTENNA REQUIREMENT

6.1 STANDARD REQUIREMENT

15.203 and RSS-Gen Issue 5 requirement: For intentional device, according to 15.203 and RSS-Gen Issue 5: 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.

5.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.





PHOTOS OF TEST SETUP

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

※※※※※END OF THE REPORT※※※※※

