



RADIO TEST REPORT

FCC ID : 2AWQ3-WM500X1
Product : Wireless microphone
TradeMark : YICHUANG
Model Name : YC-WM500X1
Applicant : ShenZhen Quandao Technology Co.,Ltd.
Date of Issue : June 04, 2020
Standard(s) : FCC Part 74 Rules
Report No : S20080703502001

Prepared for

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Room 701, Mingjun business center, Dalang street, Longhua Town,
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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name.....: ShenZhen Quandao Technology Co.,Ltd.
Address.....: Room 701, Mingjun business center, Dalang street,
Longhua Town, Shenzhen,Guangdong, P.R.China

Manufacturer's Name.....: ShenZhen Quandao Technology Co.,Ltd.
Address.....: Room 701, Mingjun business center, Dalang street,
Longhua Town, Shenzhen,Guangdong, P.R.China

Product description

Product name.....: Wireless microphone

Trademark.....: YICHUANG

Model and/or type reference: YC-WM500X1

Serial Model.....: YC-WM500X2,YC-WM500C1,YC-WM500C2,YC-WM500A1
, YC-WM500A2,YC-WM500XCA,YC-WM100,YC-WM200,
YC-WM300,YC-WM400,YC-WM700, YC-WM900

Differences.....: The same components, electrical, mechanical & electronic
construction, circuit, PCB layout, material...etc. Model
number and appearance colour different.

Rating(s).....: TX: DC 3.7V by Li-on battery, DC 5V from USB Port

Standards.....: FCC Part 74 Rules

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

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Date of Test.....:

Date (s) of performance of tests.....: 05 May. 2020 ~ 04 June. 2020

Date of Issue.....: 04 June. 2020

Test Result.....: **Pass**

Testing Engineer : Leo.Zhu
(Leo. Zhu)

Technical Manager : Eder.Zhan
(Eder Zhan)

Authorized Signatory : Sam. Chen
(Sam Chen)

Revision History

Report No.	Version	Description	Issued Date
S20080703502001	Rev.01	Initial issue of report	04 June, 2020

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

The EUT has been tested according to FCC CFR 47:

Part 2: Frequency Allocations and Radio Treaty Matters: General Rules and Regulations (10-1-05 Edition)

Part 74: Experimental Radio, Auxiliary, Special Broadcast and other program distributional services.

Emission			
Standard	Item	Limit	Result
Part 74.861(e)(7)	Radiated Spurious Emission	Refer to 74.861e(6)	PASS
FCC 2.1046 (a), 74.861(e)(1)	RF Output Power	250 mW	PASS
FCC 2.1047 (b), 74.861(e)(3)	Modulation Deviation	Refer to 74.861e(2)	PASS
FCC 2.1047 (a)	Audio Frequency Response	Refer to 2.1047(a)	N/A
FCC 74.861 (e)(5)	Occupied Bandwidth	< 200 KHz	PASS
FCC 74.861 (e)(6)(i) (ii); FCC 2.1049, Part 74.861(e)(7)	Emission Mask	Refer to 74.861e(6)	PASS
2.1055(b); 74.861 e(4)	Frequency Stability vs. Temperature	Refer to 74.861e(4)	PASS
2.1055(a)(1); 74.861 e(4)	Frequency Stability vs. Voltage	Refer to 74.861e(4)	PASS
FCC 15.207	Line Conducted Emissions	--	N/A

NOTE:

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

1.1. TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd.

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China

FCC Registered No.: 463705 IC Registered No.:9270A-1

CNAS Registration No.:L5516

1.2. MEASUREMENT UNCERTAINTY

The accumulated measurement uncertainties of the test system in use for the parameters to be measured shall not exceed those given in following table. This is in order to ensure that the measurements remain within an acceptable standard.

Uncertainty values for the RF parameters are valid to 1 GHz unless otherwise stated.

No.	Parameter	Uncertainty
1	RF frequency	$\pm 1 \times 10^{-7}$
2	Audio Output power	$\pm 0,5$ dB
3	Radiated RF power	± 6 dB
4	Conducted RF power Variations using a test fixture	$\pm 0,75$ dB
5	Maximum frequency deviation:	
	- within 300 Hz and 6 kHz of audio frequency < ± 5 %	± 5 %
	- within 6 kHz and 25 kHz of audio frequency	± 3 dB
6	Deviation limitation	± 5 %
7	Radiated emission of transmitter, valid up to 12,75 GHz	± 6 dB
8	Radiated emission of receiver, valid up to 12,75 GHz	± 6 dB

2. GENERAL INFORMATION

2.1. GENERAL DESCRIPTION OF EUT

Equipment	Wireless microphone	
Test Model	YC-WM500C1	
Serial Model	YC-WM500X1,YC-WM500X2,YC-WM500C2,YC-WM500A1 ,YC-WM500A2,YC-WM500XCA,YC-WM100,YC-WM200,Y C-WM300,YC-WM400,YC-WM700,YC-WM900	
Model Difference	All the model are the same circuit and RF module, except the model name.	
Product Description	Operation Frequency:	499-510MHz
	Modulatin Type:	Pi/4 DQPSK
	Equipment category	☐ Analogue systems ☒ Digital systems ☐ WMAS
	Declared channel Bandwidth (B)	300kHz
	Receiver category	A
	Number Of Channel	11CH
	Channel list	Refer to Note 2
	Operating Mode	Point-to-Point
	Antenna Designation:	TX: Cable Antenna
	Antenna Gain(Peak)	TX: 1.0dBi
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an microphone system. More details of EUT technical specification, please refer to the User's Manual.	
Adapter	N/A	
Battery Specification:	TX: DC 3.7V	
Power Supply	TX: DC 3.7V or DC 5V from USB Port	
Hardware Version	V1.0	
Software Version	V1.0	

Note:

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

Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	499.1	--	--		507.1
02	500.1	6	505.1	10	508.1
03	501.1	--	--	11	509.1

Test frequency list

Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH01	499.1
middle	CH6	505.1
highest	CH11	509.1

Note:

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

2.2. Description of the test mode

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

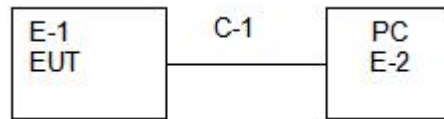
Pretest Mode	Description
Mode 1	Low Channel
Mode 2	Middle Channel
Mode 3	High Channel
Mode 4	Link Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	Low Channel
Mode 2	Middle Channel
Mode 3	High Channel
Mode 4	Link Mode

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. Description of Test Conditions



2.4. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 45°C Note(1)
Relative Humidity	20% - 75%	N/A
Supply Voltage- TX	DC 3.7V	DC 3.3V- DC 4.1V Note(2)

Note:

- (1) The extreme test voltages for equipment to be connected to an ac mains source shall be the nominal mains voltage +10 %.
- For equipment using other power sources, or capable of being operated from a variety of power sources, the extreme test voltages shall be those agreed between the equipment manufacturer and the testing laboratory and shall be recorded with the results.

2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1-1	Wireless microphone (TX)	N/A	YC-WM500C1	N/A	TX
Item	Shielded Type	Ferrite Core	Length	Note	

Note:

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

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

EQUIPMENT TYPE	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
EMI Test Receiver	R&S	ESPI7	101318	2020.05.13	2021.05.12	1 year
Bilog Antenna	TESEQ	CBL6111D	31216	2020.04.11	2021.04.10	1 year
Turn Table	EM	SC100_1	60531	N/A	N/A	N/A
Antnna Mast	EM	SC100	N/A	N/A	N/A	N/A
Horn Antenna	EM	EM-AH-10180	2011071402	2020.04.11	2021.04.10	1 year
Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2020.04.11	2021.04.10	1 year
Test Cable (30MHz-1GHz)	N/A	R-01	N/A	2018.04.21	2021.04.20	3 year
Test Cable (1-18GHz)	N/A	R-02	N/A	2018.04.21	2021.04.20	3 year
50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.19	2021.05.18	1 year
Pre-Amplifier	EMC	EMC051835S E	980246	2019.05.19	2021.05.18	2 year
Spectrum Analyzer	Agilent	E4407B	MY45108040	2020.05.13	2021.05.12	1 year
Filter	TRILTHIC	2400MHz	29	2020.04.19	2021.04.18	1 year
Attenuator	Weinschel	33-10-33	AR4010	2020.04.19	2021.04.18	1 year
Attenuator	Weinschel	24-20-34	BP4485	2020.04.19	2021.04.18	1 year
MXA Signal Analyzer	Agilent	N9020A	MY49100060	2019.08.28	2020.08.27	1 year
ESG VETCTOR SIGNAL GENERAROR	Agilent	E4438C	MY45093347	2020.05.13	2021.05.12	1 year
PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2020.08.06	2021.08.05	1 year
Power Splitter	Mini-Circuits/USA	ZN2PD-63-S+	SF025101428	2018.04.19	2021.04.18	3 year
Coupler	Mini-Circuits	ZADC-10-63-S+	SF794101410	2018.04.19	2021.04.18	3 year
Directional Coupler	MCLI/USA	CB11-20	0D2L51502	2017.08.16	2020.08.15	3 year
RF Communications Test Set	HP	8920B	US39225517	2020.04.19	2021.04.18	1 year
Wideband Radio Communication Tester Specifications	R&S	CMW500	148500	2019.08.06	2020.08.05	1 year
Audio Test System	Audio precision	ATS-1	41128	2020.05.13	2021.05.12	1 year
temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

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 C63.4:2003. 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 C63.4:2003.

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 REQUIREMENTS

4.1. Radiated Spurious Emission

TEST LIMITS

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)

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

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

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

4.2. EMISSION MASK I

TEST LIMITS

- According to CFR 47 section Part 74.861(e)(7), 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

- 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 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

4.4. TEST PROCEDURE

- 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.

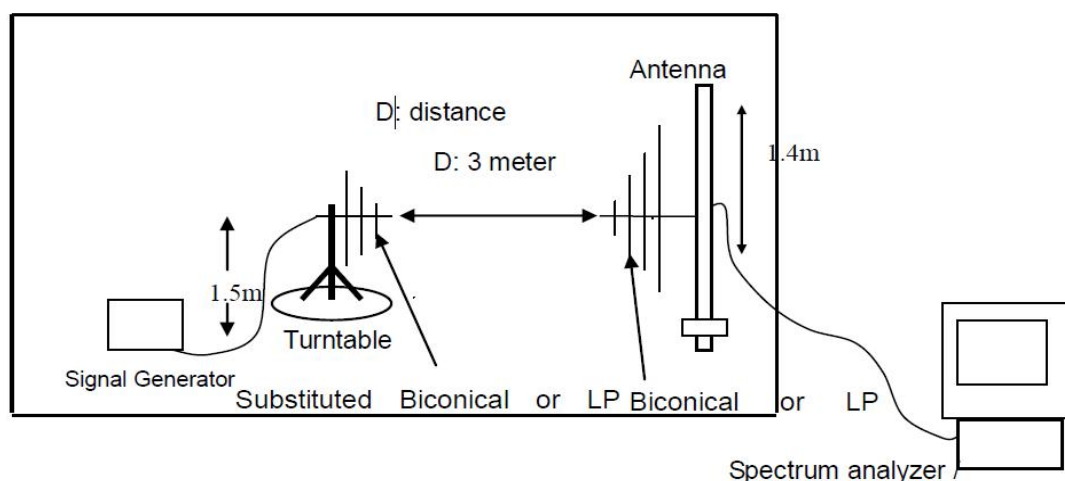
p The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

q The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

TEST CONFIGURATION

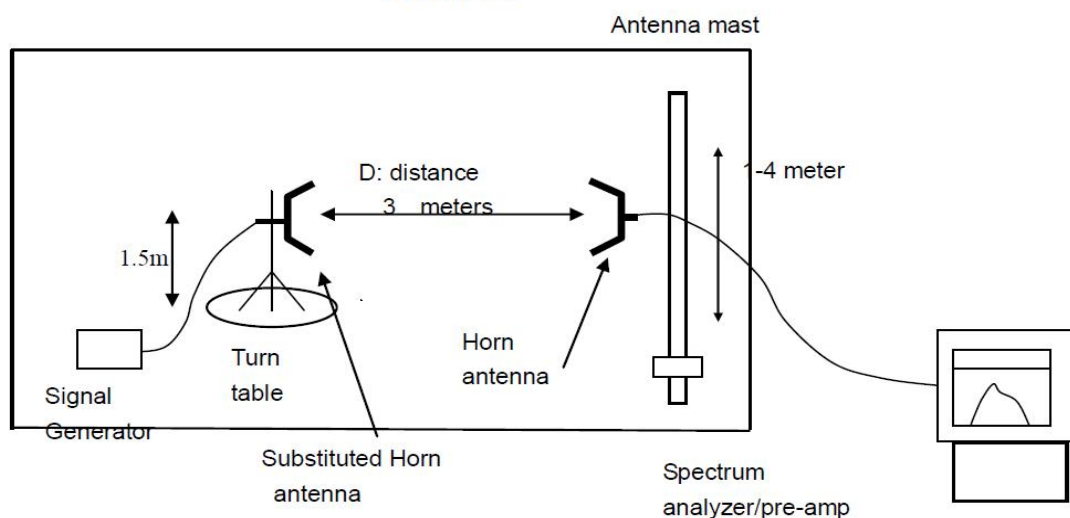
(A) Radiated Emission Test-Up Frequency Above 30MHz

Ground Plane



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

Ground plane



4.4. TEST RESULTS

The EUT was programmed to be in continuously transmitting mode.

(30-1000)MHz							
The Worst Test Results Low Channel 499.1 MHz							
Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea (dBm)	Limit (dBm)	Margin (dBm)	Polarity
51.06	-78.04	7.45	4.75	-70.59	-54	-16.59	H
75.81	-73.16	10.91	9.01	-53.24	-36	-17.24	H
120.71	-75.39	10.2	11.9	-65.19	-54	-11.19	H
168.14	-72.30	7.05	5.28	-59.97	-36	-23.97	V
312.73	-69.47	10.82	8.43	-50.21	-36	-14.21	V
666.23	-73.42	10.13	10.94	-63.29	-54	-9.29	V
The Worst Test Results Mid Channel 505.1 MHz							
Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea (dBm)	Limit (dBm)	Margin (dBm)	Polarity
59.93	-77.42	7.49	5.11	-69.93	-54	-15.93	H
79.80	-72.64	10.22	8.95	-53.47	-36	-17.48	H
121.96	-82.59	10.12	12.41	-72.47	-54	-18.47	H
169.71	-71.79	7.26	5.01	-59.52	-36	-23.52	V
315.10	-69.16	10.79	8.92	-49.450	-36	-13.45	V
895.81	-68.37	9.88	10.86	-47.62	-36	-11.63	V
The Worst Test Results High Channel 509.1 MHz							
Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea (dBm)	Limit (dBm)	Margin (dBm)	Polarity
62.92	-77.31	7.02	5.08	-70.29	-54	-16.29	H
76.06	-72.50	10.35	8.79	-53.37	-36	-17.37	H
102.22	-75.17	10	11.8	-65.17	-54	-11.17	H
178.13	-71.95	7.53	4.87	-59.55	-54	-5.55	V
837.71	-78.25	10.15	8.97	-68.1	-54	-14.1	V
865.91	-67.79	9.75	11.47	-46.57	-36	-10.57	V

(1000-6000)MHz

The Worst Test Results Low Channel 499.1 MHz

Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea	Limit	Margin	Polarity
				(dBm)	(dBm)	(dBm)	
1015.28	-69.55	6.88	4.72	-57.95	-30	-27.95	H
1497.35	-68.42	10.13	8.32	-49.97	-30	-19.97	H
2495.53	-68.67	9.65	11.72	-47.3	-30	-17.3	H
1098.28	-53.89	6.88	4.72	-42.29	-30	-12.29	V
1497.35	-61.12	10.13	8.32	-42.67	-30	-12.67	V
2495.55	-65.58	9.65	10.72	-45.21	-30	-15.21	V

The Worst Test Results Mid Channel 505.1 MHz

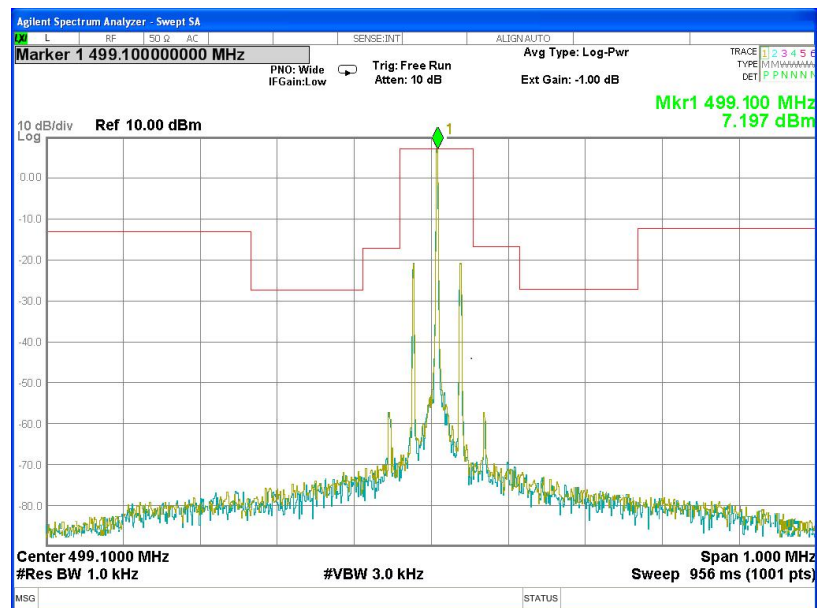
Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea	Limit	Margin	Polarity
				(dBm)	(dBm)	(dBm)	
1010.23	-66.49	6.88	4.72	-54.89	-30	-24.89	H
1515.36	-63.32	10.13	8.32	-44.87	-30	-14.87	H
2020.41	-68.18	9.65	11.72	-46.81	-30	-16.81	H
1010.26	-67.28	6.88	4.72	-55.68	-30	-25.68	V
1515.36	-61.17	10.13	8.32	-42.72	-30	-12.72	V
2020.43	-66.93	9.65	11.72	-45.56	-30	-15.56	V

The Worst Test Results High Channel 509.1 MHz

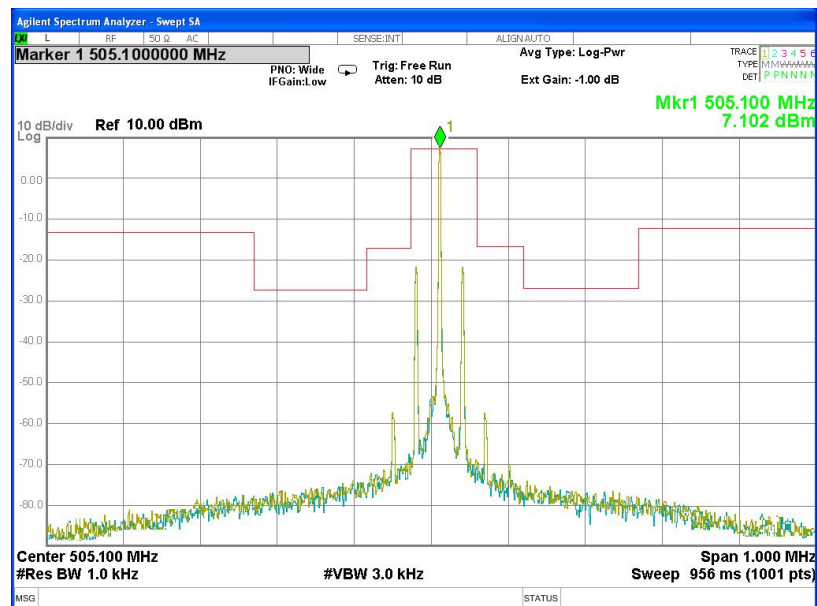
Frequency(MHz)	S G.Lev (dBm)	Ant(dBi)	Loss	PMea	Limit	Margin	Polarity
				(dBm)	(dBm)	(dBm)	
1018.25	-66.67	6.88	4.72	-55.07	-30	-25.07	H
1527.33	-63.18	10.13	8.32	-44.73	-30	-14.73	H
2036.47	-68.14	9.65	11.72	-46.77	-30	-16.77	H
1018.21	-67.41	6.88	4.72	-55.81	-30	-25.81	V
1527.33	-61.58	10.13	8.32	-43.13	-30	-13.13	V
2036.49	-66.74	9.65	11.72	-45.37	-30	-15.37	V

Emission Mask I

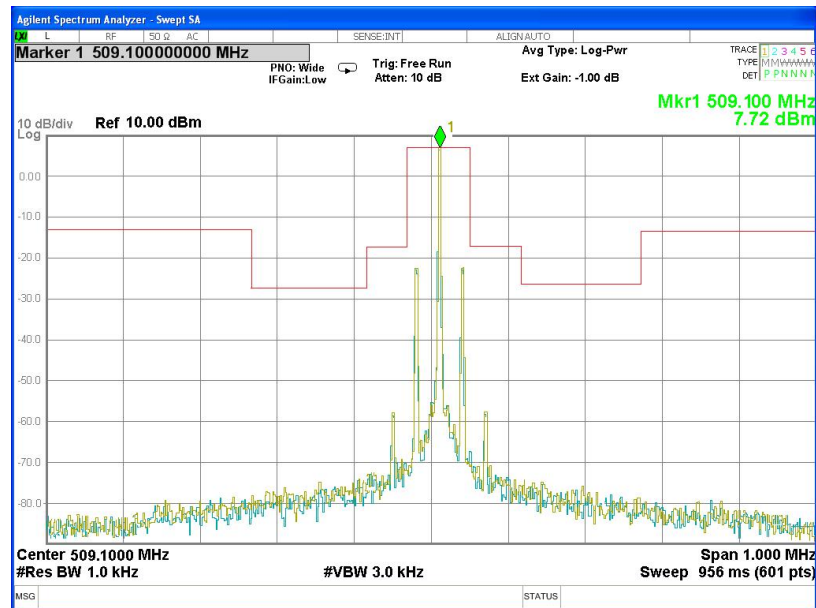
Emission Mask Low Channel



Emission Mask Mid Channel



Emission Mask High Channel

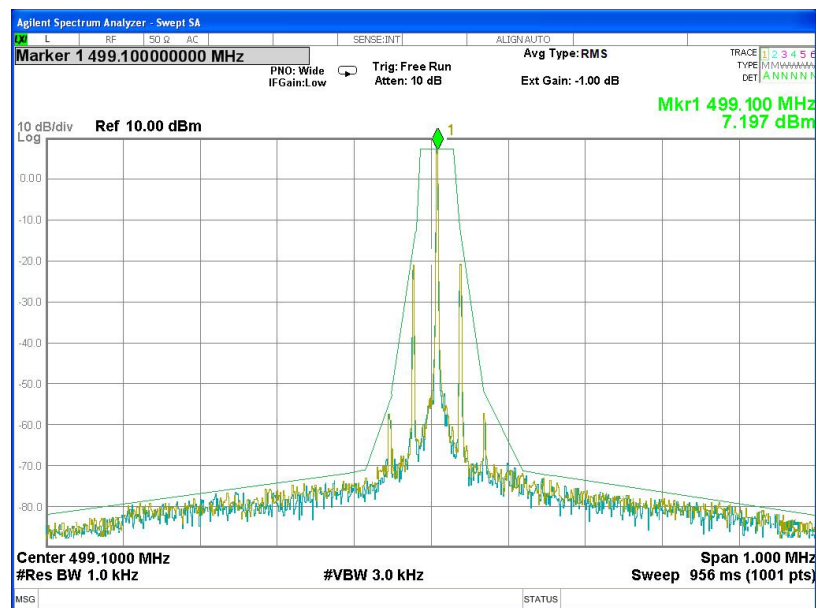


Emission Mask II

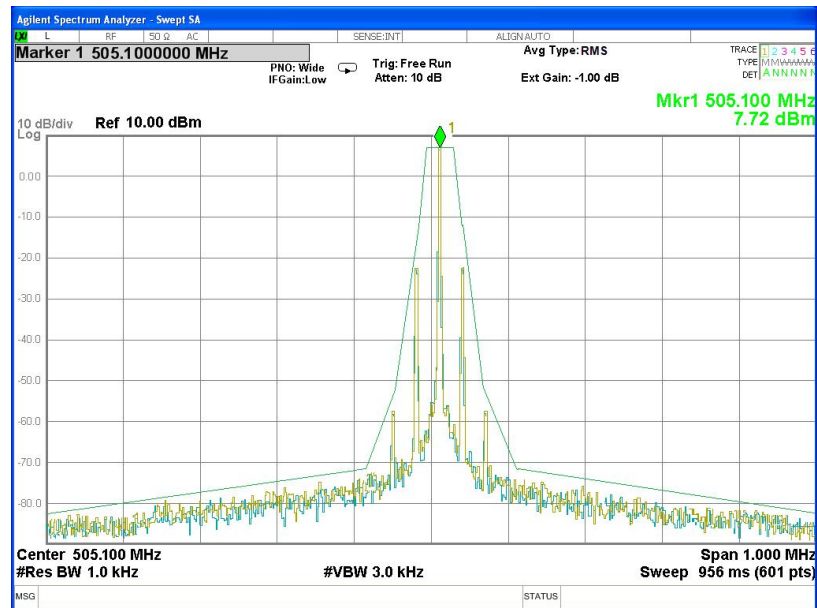
ETSI EN 300 422-1 V1.5.1 Clause 8.3.1.2 The Maximum Measurement of Necessary Bandwidth Test Plot:

Frequency	Declared Bandwidth	B/2	0.35B
499.10 MHz	100K	50K	35K
505.10 MHz	100K	50K	35K
509.10 MHz	100K	50K	35K

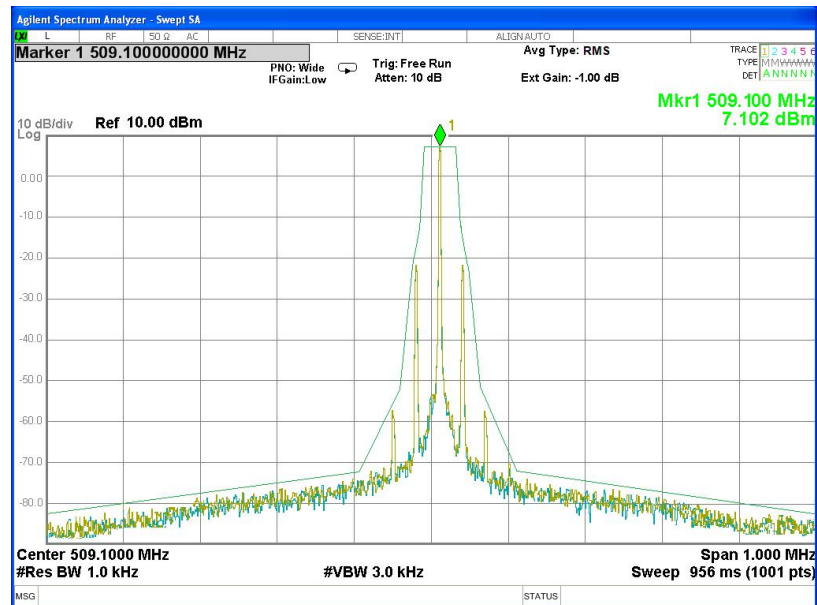
Low Channel



Mid Channel



High Channel

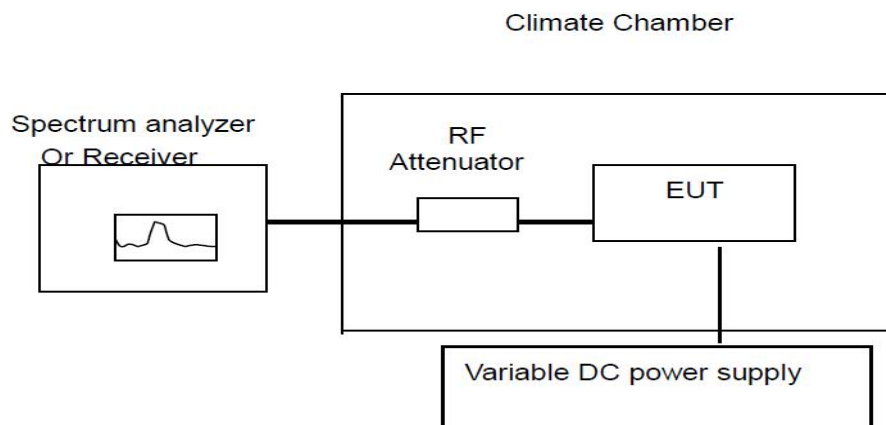


4.5. FREQUENCY STABILITY VS. TEMPERATURE & VOLTAGE

TEST LIMIT

According to CFR 47 section 74.861 e (4), 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.
- 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 3.7V)
 (2) Frequency stability versus input voltage (Supply battery operating end point which shall be specified by the manufacturer DC 3.7V)

Reference Frequency: 499.10MHz				
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	
3.3V, DC	20	7555	0.001468	
3.7V, DC	20	7500	0.001458	
4.1V, DC	20	7532	0.001464	
BEP	20	7561	0.001469	
Reference Frequency: 499.10MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	7534	0.001464	0.00500	PASS
40	7526	0.001463		
30	7570	0.001471		
20	7500	0.001458		
10	7537	0.001465		
0	7522	0.001462		
-10	7531	0.001464		
-20	7573	0.001472		
-30	7569	0.001471		

Reference Frequency: 505.10MHz			
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
3.3V, DC	20	10523	0.001901
3.7V, DC	20	10500	0.001897
4.1V, DC	20	10555	0.001907
BEP	20	10542	0.001905

Reference Frequency: 505.10MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	10523	0.001901	0.00500	PASS
40	10522	0.001901		
30	10517	0.001900		
20	10500	0.001897		
10	10566	0.001909		
0	10562	0.001908		
-10	10559	0.001908		
-20	10571	0.001910		
-30	10563	0.001908		

Reference Frequency: 509.10MHz			
Power Supply	Environment Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)
3.3V, DC	20	11532	0.000194
3.7V, DC	20	11500	0.000193
4.1V, DC	20	11519	0.000193
BEP	20	11565	0.000194

Reference Frequency: 509.10MHz				
Environment Temperature(°C)	Frequency Deviation measured with time Elapse(30 minutes)			
	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Results
50	11523	0.000194	0.00500	PASS
40	11534	0.000194		
30	11514	0.000193		
20	11500	0.000193		
10	11565	0.000194		
0	11553	0.000194		
-10	11511	0.000193		
-20	11578	0.000194		
-30	11532	0.000194		

4.6.OCCUPIED BANDWIDTH

TEST LIMIT

According to CFR 47 section 74.861 e (5), the operating bandwidth shall no exceed 200 KHz.
Near the carrier an emission mask is defined by the standard.

TEST CONFIGURATION



TEST PROCEDURE

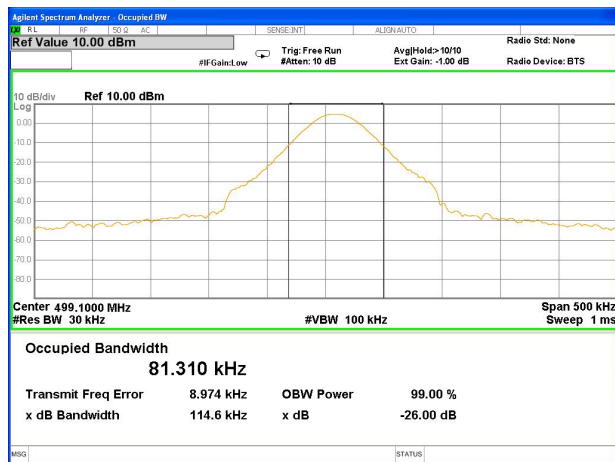
- The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation.
Set Occupied Bandwidth was measured with a occupied bandwidth function of the analyzer.
- The near the carrier emissions are measured by normal power measurement function of the analyzer.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

TEST RESULT

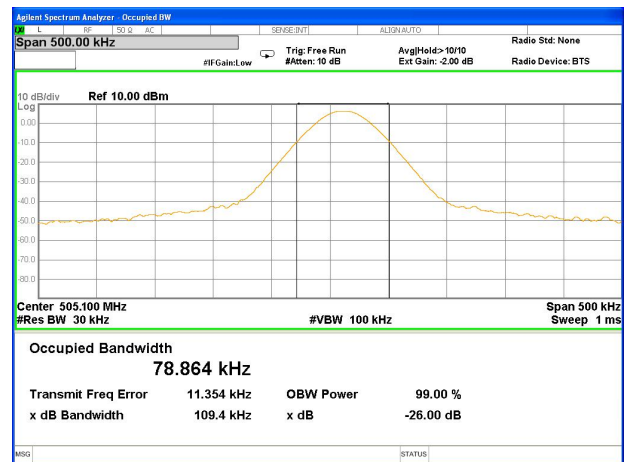
Frequency(MHz)	Occupied Bandwidth(KHz)	Limit(KHz)
499.10	81.310	200
505.10	78.864	200
509.10	78.747	200

Test Plot-CH01

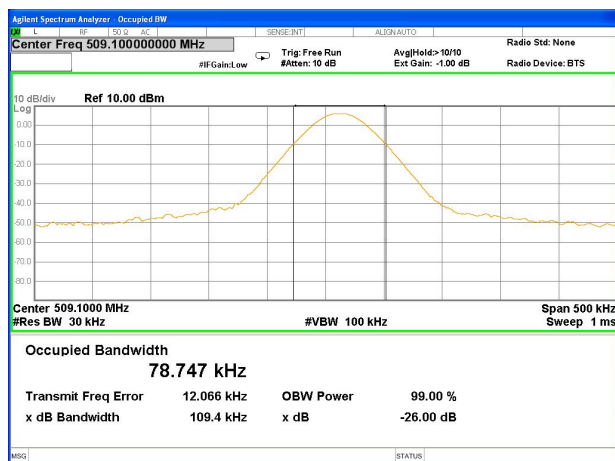
Low Channel



Mid Channel



High Channel



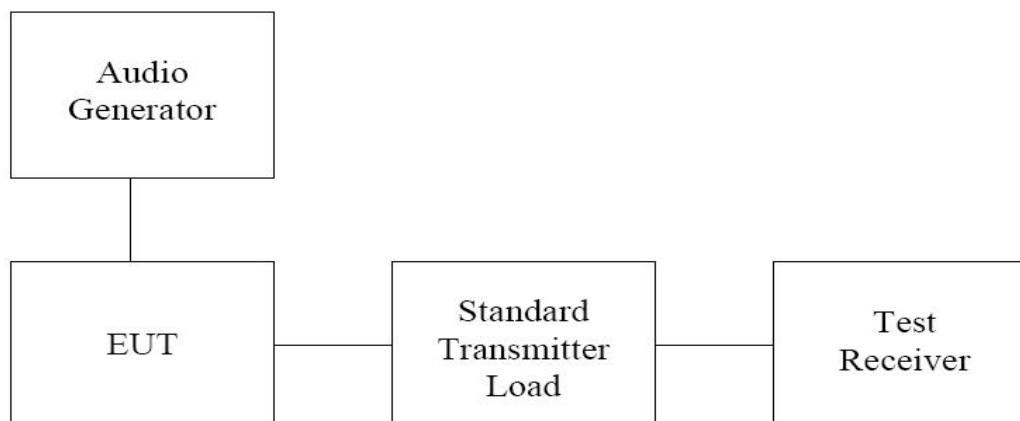
4.7.Modulation Deviation

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), any form of modulation may be used. A maximum deviation of ± 75 KHz is permitted when frequency modulation is employed.

TEST CONFIGURATION



TEST PROCEDURE

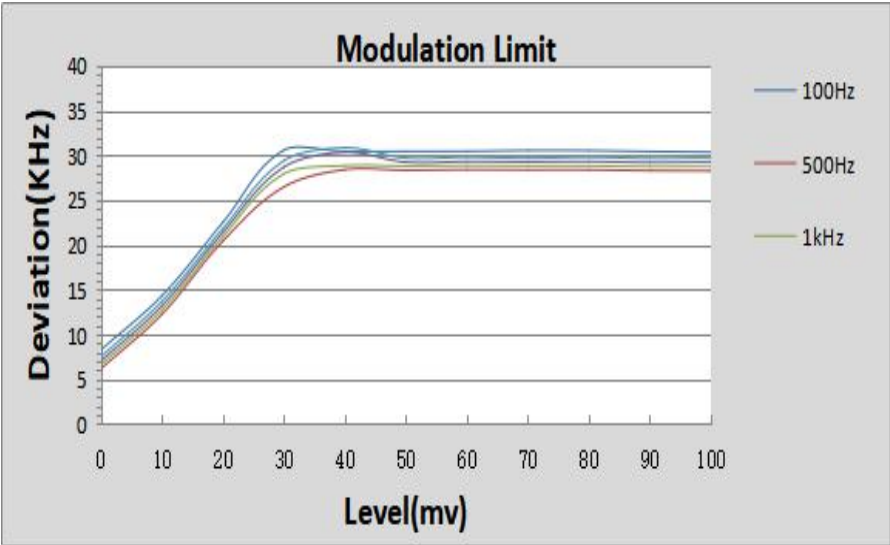
- Modulation limits is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.
- The audio signal generator is connected to the audio input of the EUT with its full rating.
- The modulation response is measured at certain modulation frequencies, 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	8.31	6.20	6.64	7.06	7.53
10	14.34	12.27	12.75	13.22	13.72
20	22.54	20.45	20.94	21.42	21.85
30	30.59	26.49	27.95	28.70	29.41
40	30.45	28.42	28.87	30.36	30.85
50	30.46	28.36	28.82	29.25	29.70
60	30.47	28.42	28.87	29.32	29.81
70	30.55	28.40	28.84	29.28	29.69
80	30.54	28.40	28.84	29.32	29.81
90	30.44	28.30	28.75	29.21	29.66
100	30.37	28.27	28.75	29.24	29.69
110	30.29	28.18	28.61	29.07	29.49

Modulation Deviation of Mid Channel



4.8.RF Output Power

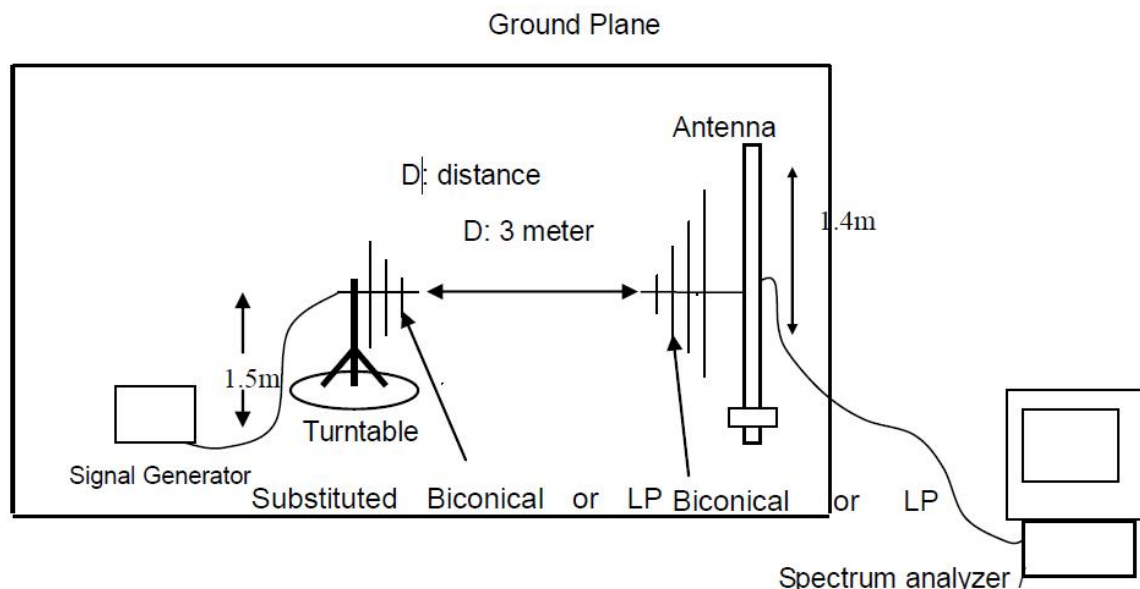
TEST LIMIT

According to CFR 47 section 74.861 e (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:

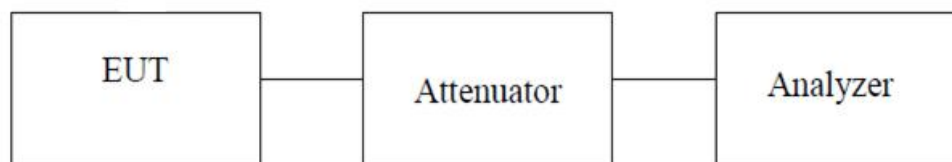
- (i) 54-72, 76-88, and 174-216 MHz bands: 50 mW EIRP
- (ii) 470-608 and 614-698: 250 mW conducted power
- (iii) 600 MHz duplex gap: 20 mW EIRP

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 $>20\text{BW}$, VBW $>3\text{RBW}$.
- 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.

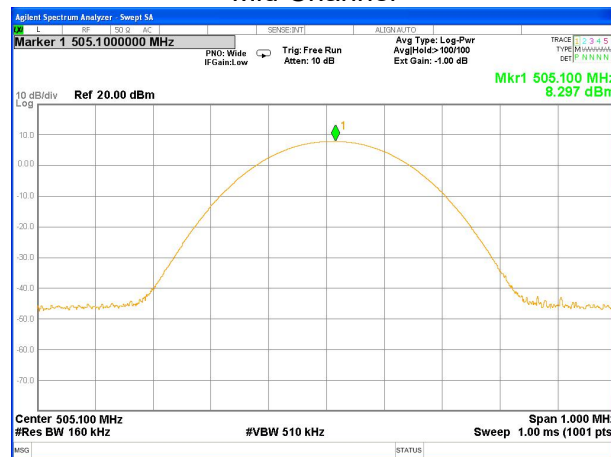
TEST RESULT

Frequency Channel (MHz)	Peak Output Power (dBm)	Transmitter Power (mW)	Limits (mW)
499.10	9.870	8.705	250
505.10	8.297	6.756	250
509.10	8.374	6.877	250

Low Channel



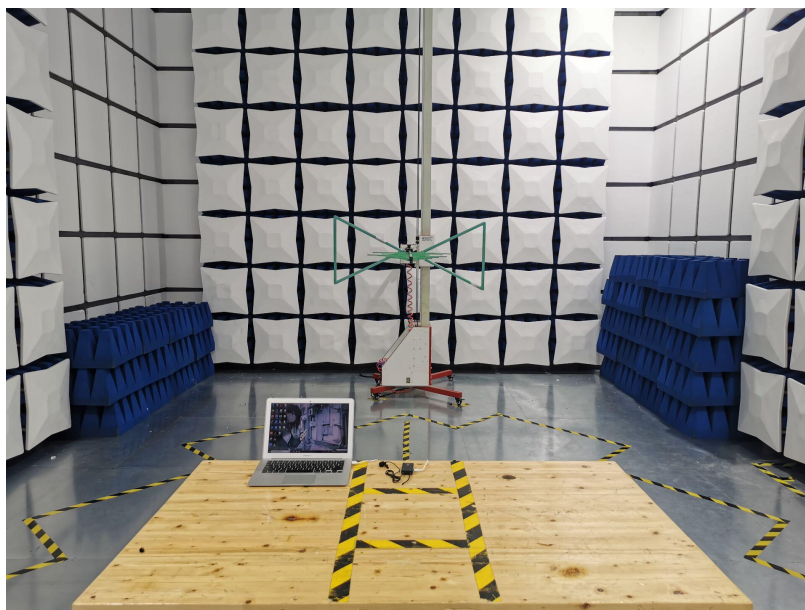
Mid Channel



High Channel



5. EUT TEST PHOTO

Radiated Measurement Photos
30MHz- 1GHz

Above 1GHz

