

FCC RADIO TEST REPORT

FCC ID: 2A6DC-BF-U88

Sample : Microphone

Trade Name : N/A

Main Model : BF-U88

Additional Model : BF02, BF03, BF06, BF07, BF08, BF09,
BF33, BF66, BF77, BF99, BF100, BF101,
BF102, BF103, BF106, BF107, BF108,
BF200, BF300, BF500, BF600, BF700,
BF800, BF900

Report No. : UNIA22041117ER-61

Prepared for

ENPING MALUS AUDIO ELECTRONIC TECHNOLOGY CO., LTD
XINPING NORTH ROAD, PINGSHI INDUSTRIAL ZHONG, ENPING CITY,
GUANGDONG PROVINCE, CHINA

Prepared by

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TEST RESULT CERTIFICATION

Applicant : ENPING MALUS AUDIO ELECTRONIC TECHNOLOGY CO., LTD
Address : XINPING NORTH ROAD, PINGSHI INDUSTRIAL ZHONG,
 ENPING CITY, GUANGDONG PROVINCE, CHINA

Manufacturer : ENPING MALUS AUDIO ELECTRONIC TECHNOLOGY CO.,LTD
Address : XINPING NORTH ROAD, PINGSHI INDUSTRIAL ZHONG,
 ENPING CITY, GUANGDONG PROVINCE, CHINA

Product description

Product..... : Microphone

Trade Name..... : N/A

Model Name : BF-U88, BF02, BF03, BF06, BF07, BF08, BF09,
 BF33, BF66, BF77, BF99, BF100, BF101,
 BF102, BF103, BF106, BF107, BF108, BF200, BF300, BF500,
 BF600, BF700, BF800, BF900

Test Methods..... : FCC Rules and Regulations Part 15 Subpart C Section 15.236,
 ANSI C63.10:2013

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

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Date of Test..... :

Date (s) of performance of tests: April 15, 2022 to April 27, 2022

Date of Issue.....: April 28, 2022

Test Result.....: Pass

Prepared by:



Jackson Fang/Editor
kahn.yang

Reviewer:

Kahn yang/Supervisor

Approved & Authorized Signer:



Liuze/Manager

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

ITEM	STANGARD	RESULT
Conducted Emissions	FCC Part 15.207	Not Applicant
Maximum Output Power	FCC Part 15.236 (d)	Compliant
Occupied Bandwidth	FCC Part 15.236(f)(2)	Compliant
Necessary Bandwidth	FCC Part 15.236(g)	Compliant
Transmitter Spurious Emissions	FCC Part 15.236(g)	Compliant
Frequency Stability	FCC Part 15.236(f)(3)	Compliant

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.
 Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

A2LA Certificate Number: 4747.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

1.3 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 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 150kHz	2.96	
		150kHz ~ 30MHz	2.44	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 30MHz	2.50	
		30MHz ~ 1000MHz	4.80	
		Above 1000MHz	4.13	

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product:	Microphone
Trade Name:	N/A
Main Model:	BF-U88
Additional Model:	BF02, BF03, BF06, BF07, BF08, BF09, BF33, BF66, BF77, BF99, BF100, BF101, BF102, BF103, BF106, BF107, BF108, BF200, BF300, BF500, BF600, BF700, BF800, BF900
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: BF-U88
FCC ID:	2A6DC-BF-U88
Frequency Range:	540-580MHz
Channel Separation:	250kHz
Modulation Type:	FM
Antenna Type:	Integral Antenna
Antenna Gain:	2.0dBi
Battery:	2pcs AA batteries
Adapter:	N/A
Rating:	DC3.0V

2.2 CARRIER FREQUENCY OF CHANNELS

Channel List	
Channel	Frequency (MHz)
00	540.00
01	540.25
02	540.50
03	540.75
04	541.00
.....
29	547.25
.....
149	577.25
150	577.50
151	577.75
152	578.00
.....
159	579.75
160	580.00

Note: Channel k (MHz): $540+0.25*k$ (k=0, 1, 2.....160)

2.3 TEST MODE

The EUT was programmed to be in continuously transmitting mode.

Channel List	
Test Channel	Test Frequency (MHz)
03	540.75
29	547.25
151	577.75

2.4 TEST SETUP

Operation of EUT during Spurious Radiated Emissions testing:



2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

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.	Note
E-1	Microphone	N/A	BF-U88	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column.
3. “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2022.09.22
3	AAN	TESEQ	T8-Cat6	38888	2022.09.22
4	Pulse Limiter	CYBRTEK	EM5010	E115010056	2022.05.17
5	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2022.09.22
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2022.09.27
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2024.02.26
4	PREAMP	HP	8449B	3008A00160	2022.09.22
5	PREAMP	HP	8447D	2944A07999	2022.05.17
6	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2022.09.22
7	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2022.09.22
8	Signal Generator	Agilent	E4421B	MY4335105	2022.09.22
9	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2022.09.22
10	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2022.09.22
11	Discretion temperature exchange metabolic humidity hot cabinet	Guangzhou HaiZhu HanDi test equipment factory	GDJS-500C	2004040	2022.09.22
12	Modulation Analyzer	HP	8901B	3104A03367	2022.09.22
13	Noise Generator	SEMKO	NG8280	189	2022.09.22
14	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2022.09.22
15	Active Loop Antenna	Com-Power	AL-130R	10160009	2022.07.25
16	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2022.09.22
17	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2022.05.23
18	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2022.09.22
19	Signal Generator	Agilent	N5183A	MY47420153	2022.09.22
20	Spectrum Analyzer	Rohde&Schwarz	FSP 40	100501	2022.09.22
21	Power Meter	KEYSIGHT	N1911A	MY50520168	2022.09.22
22	Frequency Meter	VICTOR	VC2000	997406086	2022.09.22
23	DC Power Source	HYELEC	HY5020E	055161818	2022.09.22

3 CONDUCTED EMISSION

3.1 TEST LIMIT

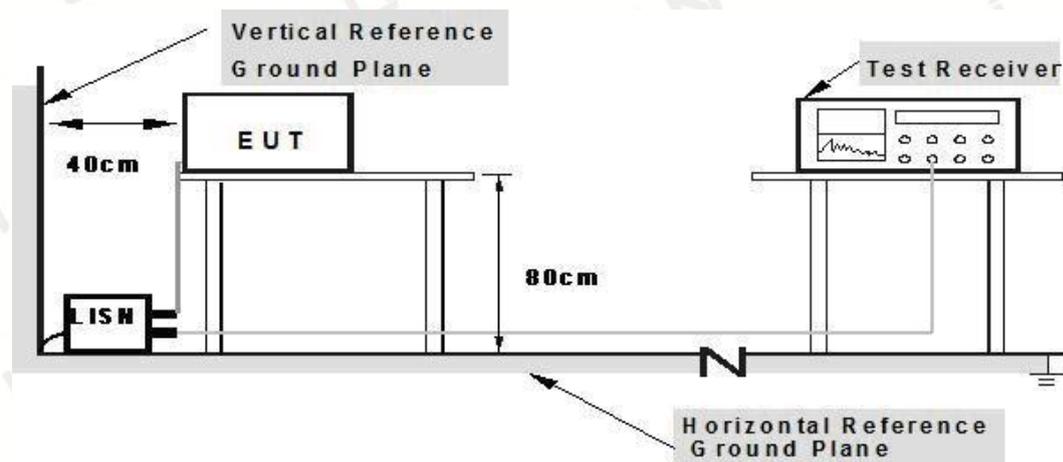
For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)	
	Q.P.	Ave.
0.15~0.50	66~56*	56~46*
0.50~5.00	56	46
5.00~30.0	60	50

* Decreasing linearly with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 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

3.3 TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is placed on a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

3.4 TEST RESULT

N/A

Remark: EUT powered by AA battery, this test item not applicable.

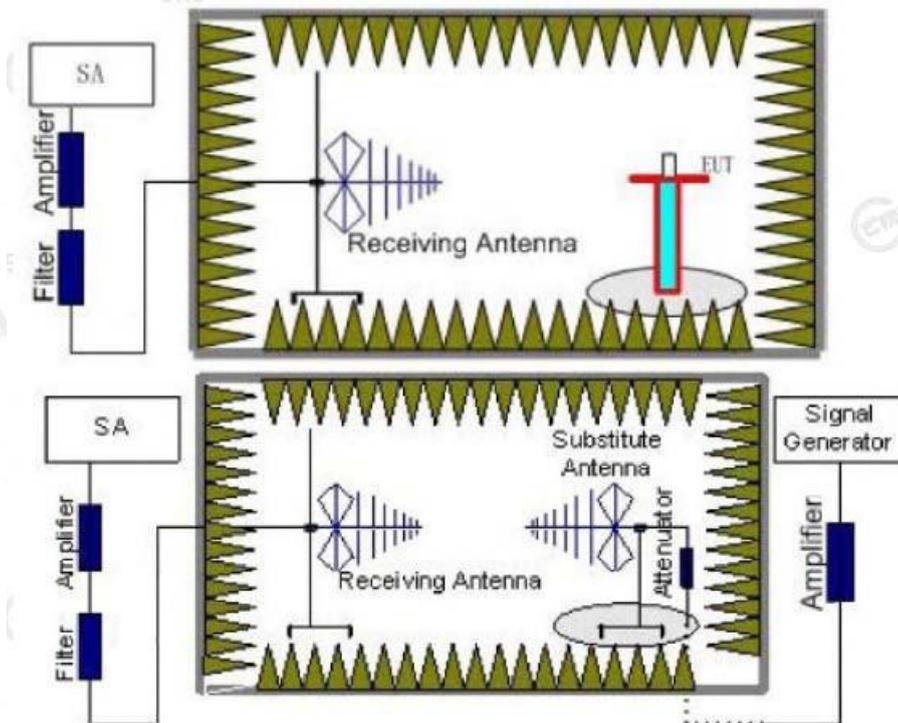
4 Maximum Output Power

4.1 TEST LIMIT

The maximum radiated power shall not exceed the following values:

- 1) In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP
- 2) In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

4.2 TEST SETUP



4.3 TEST PROCEDURE

1. EUT was placed on a 1.5-meter-high non-conductive stand at a 3-meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier may be connected to the Signal Source output port. And the cable should be connected between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{\text{Mea}} + P_{\text{Ag}} - P_{\text{cl}} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

4.4 TEST RESULT

Test Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dBi)	P _{Ag} (dB)	EIRP (dBm)	EIRP (mW)	Limit (mW)
540.75	-30.65	1.69	9.75	25.3	2.71	1.87	50
547.25	-30.53	1.69	9.78	25.3	2.86	1.93	50
577.75	-30.41	1.81	9.82	25.3	2.90	1.95	50

Remark: EIRP=P_{Mea}(dBm) +P_{Ag}(dB) -P_{cl}(dB) +G_a(dBi)

The field strength of radiation emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of H axis and receiver antenna at vertical polarization was reported.

5 Occupied Bandwidth

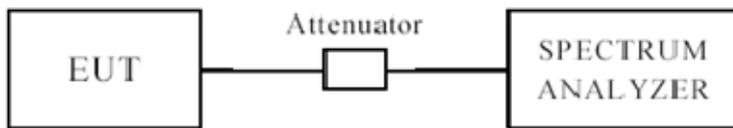
5.1 TEST LIMIT

One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200kHz.

5.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3 kHz RBW and 10 kHz VBW.

5.3 TEST PROCEDURE

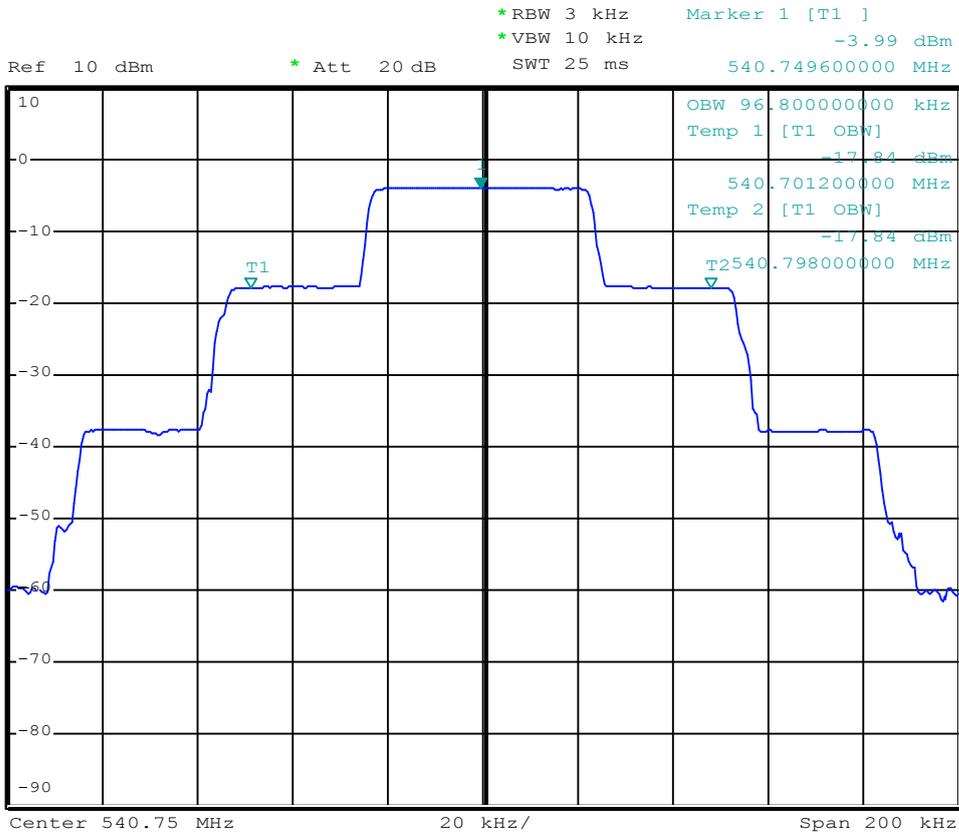


5.4 TEST RESULT

Frequency (MHz)	99% OBW (kHz)	Limit (kHz)	Result
540.75	96.80	200	Pass
547.25	96.00	200	Pass
577.75	96.00	200	Pass

Test Plots:

Ch 03 (540.75MHz)



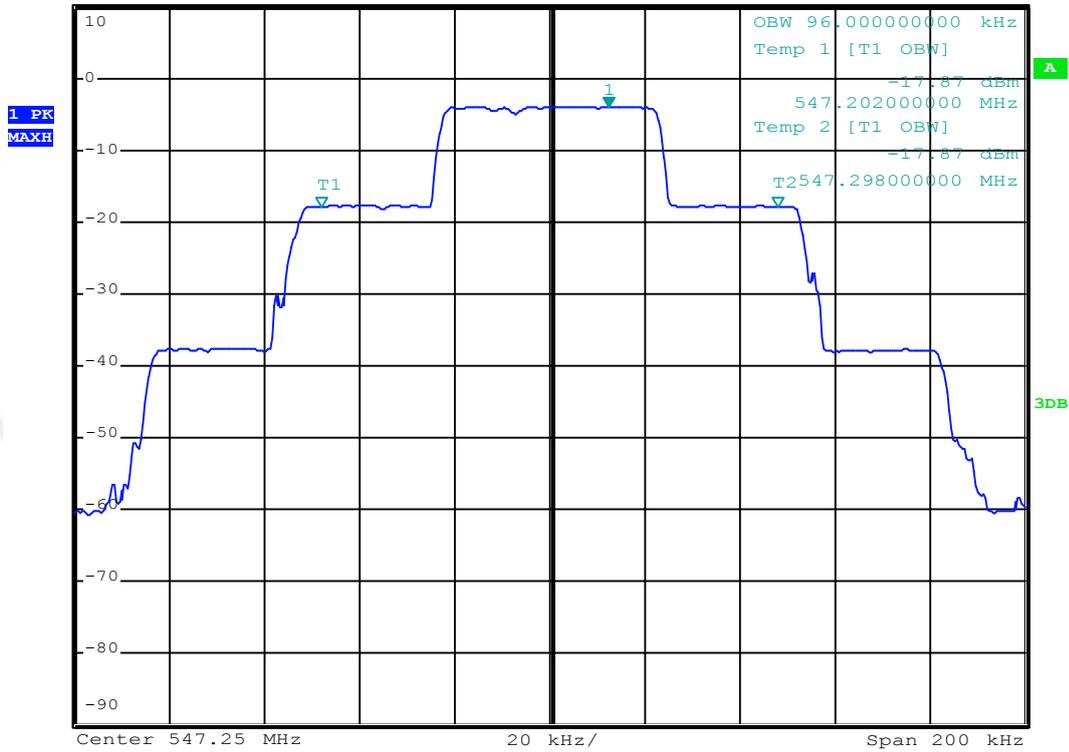
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Ch 29 (547.25MHz)



Ref 10 dBm * Att 20 dB * RBW 3 kHz Marker 1 [T1] -3.96 dBm
 * VBW 10 kHz SWT 25 ms 547.262400000 MHz



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Ch 151 (577.75MHz)

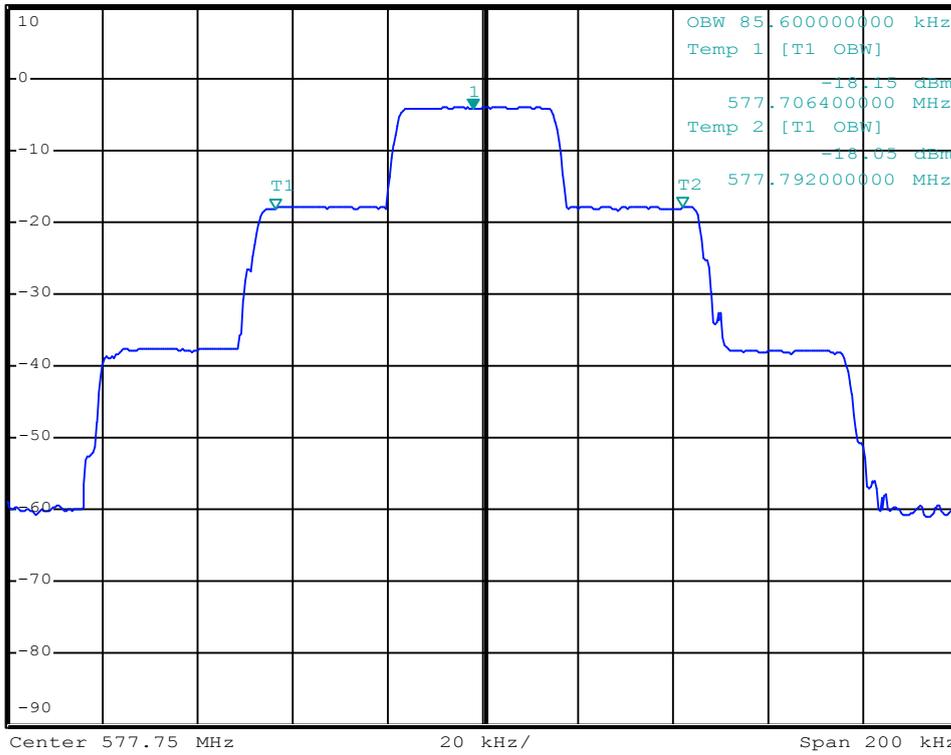


*RBW 3 kHz Marker 1 [T1]
 *VBW 10 kHz -4.22 dBm
 SWT 25 ms 577.748000000 MHz

Ref 10 dBm

Att 30 dB

1 PK
MAXH



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6 Necessary Bandwidth

6.1 Limit

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) as below:

The transmitter output spectrum shall be within the mask defined in figure below where B is the declared channel bandwidth

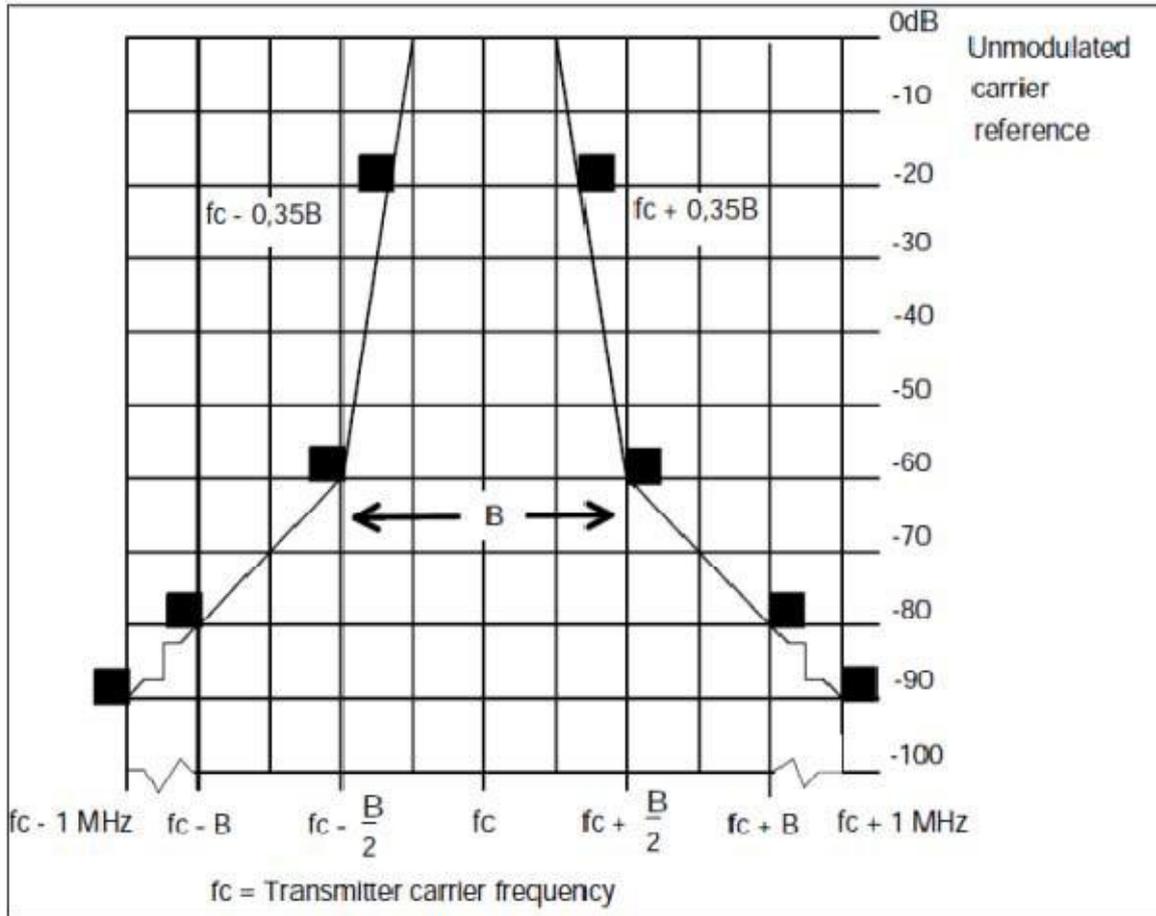


Figure 3: Spectrum mask for analogue systems in all bands

Figure 3 shows the spectrum mask for all analogue systems in the band. The -90 dBc point shall be ± 1 MHz from f_c measured with an average detector. To comply, a measured value shall fall below the mask limit as shown in figure 3.

6.2 TEST PROCEDURE

1. The arrangement of test equipment as shown in figure B.1 shall be used. Note that the noise meter conforms to (quasi peak) without weighting filter (flat).
2. With the Low Frequency (LF) audio signal generator set to 500 Hz, the audio input level to the EUT shall be adjusted to 8 dB below the limiting threshold (-8 dB (lim)) as declared by the manufacturer.
3. The corresponding audio output level from the demodulator shall be measured and recorded.
4. The input impedance of the noise meter shall be sufficiently high to avoid more than 0,1 dB change in input level when the meter is switched between input and output.

5. The audio input level shall be increased by 20 dB, i.e. to +12 dB (lim), and the corresponding change in output level shall be measured.
6. It shall be checked that the audio output level has increased by ≤ 10 dB.
7. If this condition is not met, the initial audio input level shall be increased from -8 dB (lim) in 1 dB steps until the above condition is fulfilled, and the input level recorded in the test report. This level replaces the value derived from the manufacturer's declaration and is defined as -8 dB (lim).
8. Measure the input level at the transmitter required to give +12 dB (lim).

The LF generator shall be replaced with the weighted noise source to Recommendation ITU-R BS.559-2 [i.3], band-limited to 15 kHz as described in IEC 60244-13 [2], and the level shall be adjusted such that the measured input to the transmitter corresponds to +12 dB (lim).

If the transmitter incorporates any ancillary coding or signalling channels (e.g. pilot-tones), these shall be enabled prior to any spectral measurements.

If the transmitter incorporates more than one audio input, e.g. stereo systems, the second and subsequent channels shall be simultaneously driven from the same noise source, attenuated to a level of -6 dB (lim).

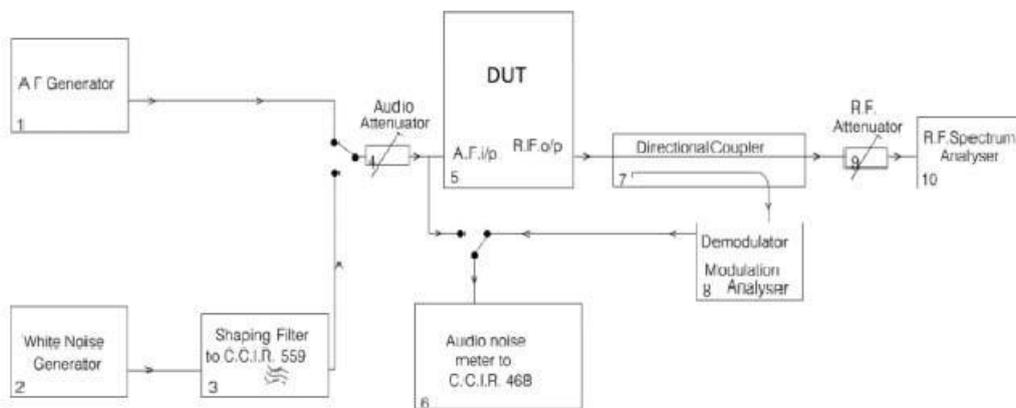
The transmitter RF output spectrum shall be measured, using a spectrum analyzer with following settings:

- 1) Center frequency: f_c Transmitter (Tx) nominal frequency
- 2) Dispersion (Span): $f_c - 1\text{MHz}$ to $f_c + 1\text{MHz}$;
- 3) Resolution Bandwidth (RBW): 1kHz;
- 4) Video Bandwidth (VBW): 1kHz;
- 5) Detector: Peak hold.

6.3 TEST Setup

B.1 Test configuration for measurement of the Necessary Bandwidth (B) for analogue systems

See figure B.1.



NOTE: If the DUT incorporates ancillary coding or signalling channels, for example, pilot tone, etc. these should be switched on prior to measuring the transmitter RF output spectrum.

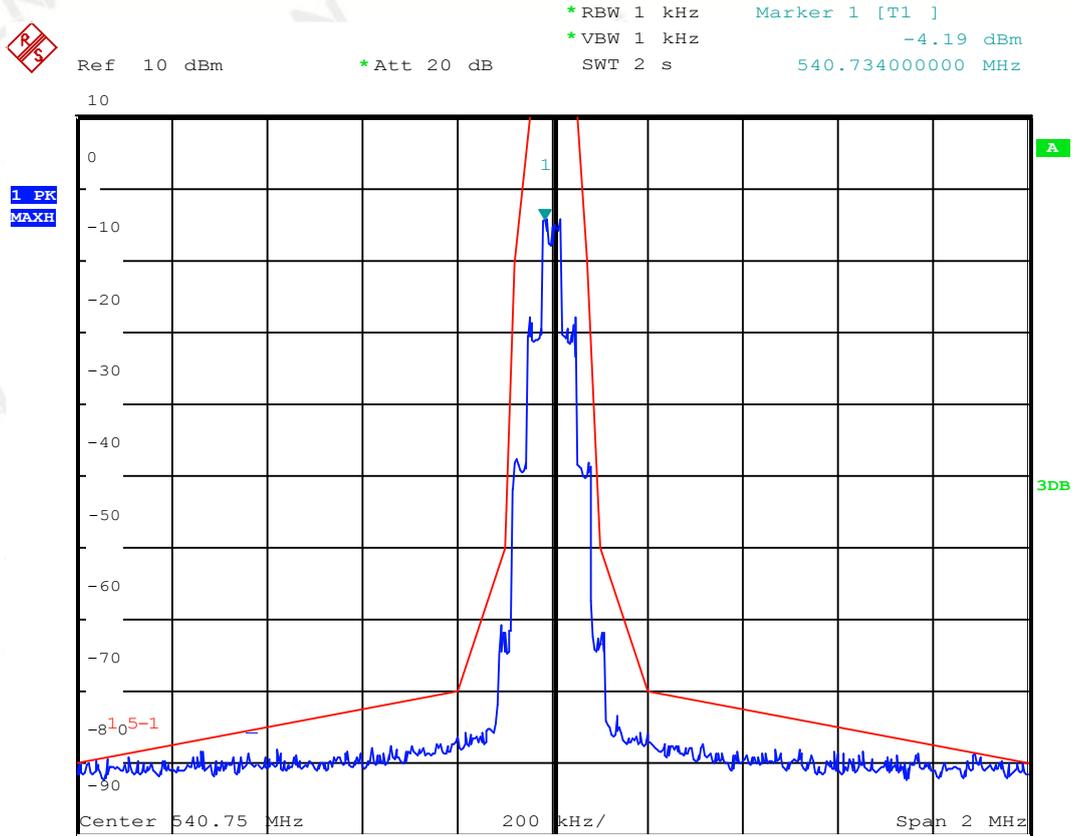
Figure B.1

6.4 TEST RESULT

	Bandwidth (B)	B/2	0.35B
Manufacturer Declaration	200kHz	100kHz	70kHz

Test Plots:

Ch 03 (540.75MHz)

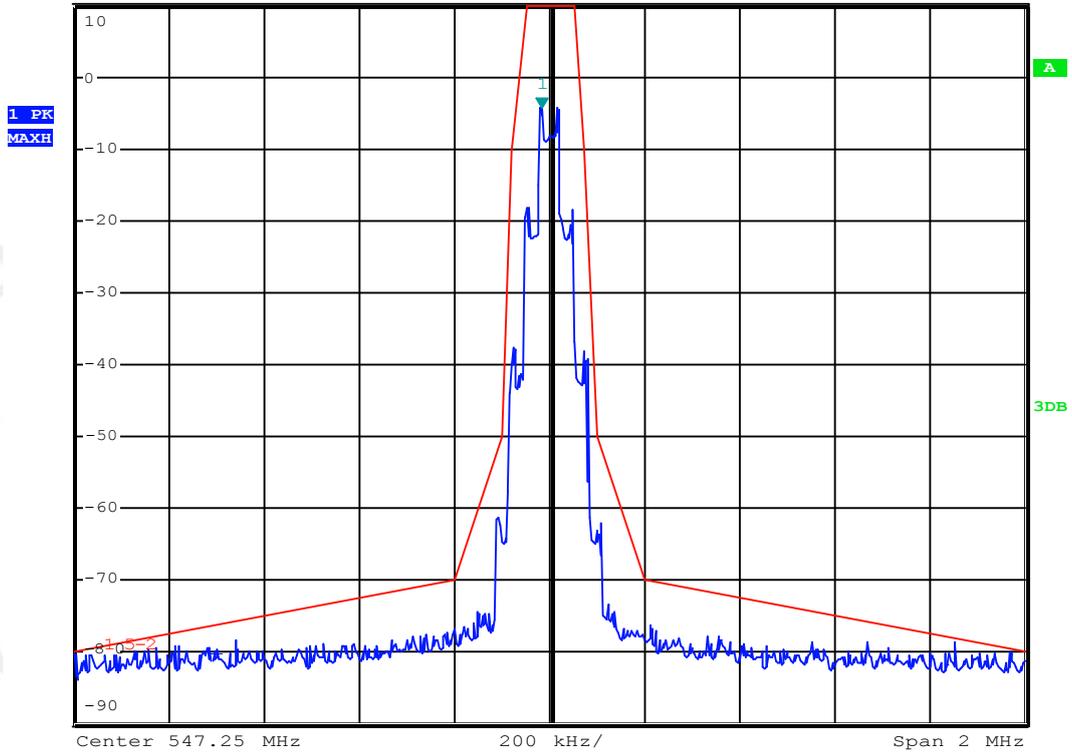


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Ch 29 (547.25MHz)



Ref 10 dBm *Att 20 dB *RBW 1 kHz Marker 1 [T1] *VBW 1 kHz -4.34 dBm *SWT 2 s 547.23400000 MHz



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Ch 151 (577.75MHz)

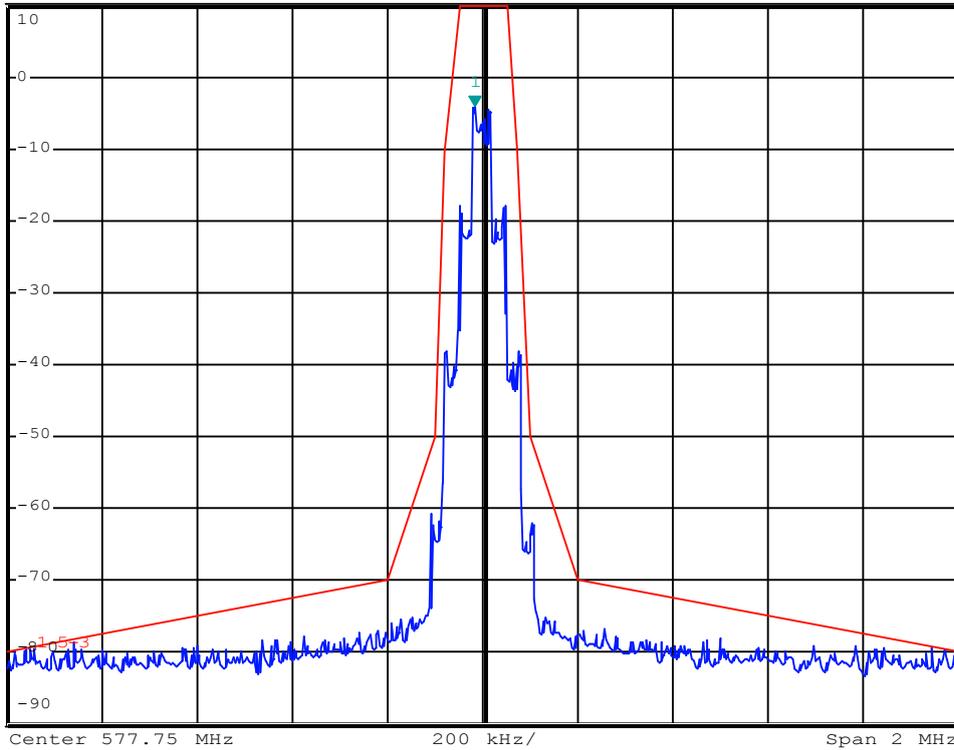


*RBW 1 kHz Marker 1 [T1]
*VBW 1 kHz -4.06 dBm
SWT 2 s 577.73400000 MHz

Ref 10 dBm

*Att 20 dB

1 PK
MAXH



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7 Transmitter spurious emissions

7.1 Limit

Spurious emissions are emissions outside the frequency range(s) of the equipment. The power of the spurious emissions shall not exceed the limits of table as below:

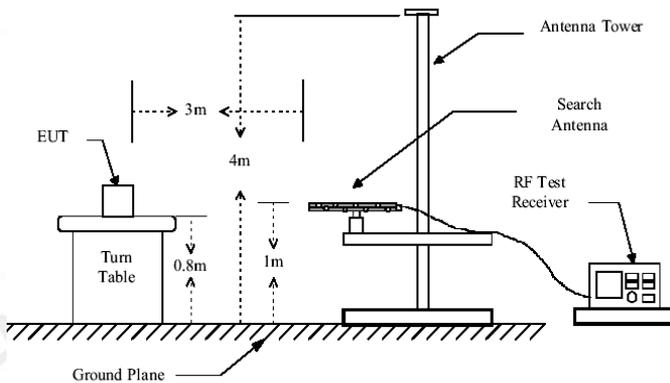
State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 μW
Standby	2 nW	2 nW	20 nW

7.2 Test Procedure

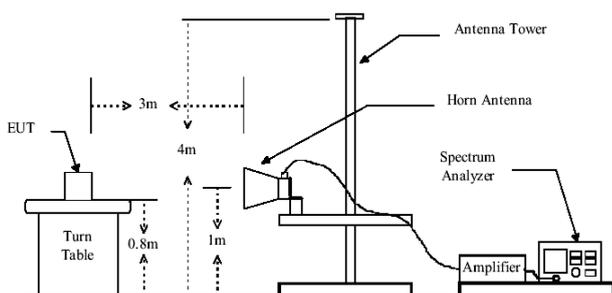
1. The EUT was placed on a turntable with 1.5m height.
2. The test distance between the receiving antenna and the EUT is 3 meter, while the receiving (test) antenna is kept at 1.5 meter height.
3. Set EUT in continuous transmitting with maximum output power at test frequency.
4. The table was rotated from 0 to 360 degree to search the highest radiated emission.
5. Repeat step 3 to 4 for each polarization and test channel to find the worst emission level.
6. The results obtained are compared to the limits in order to prove compliance with the requirement.

7.3 Test Setup

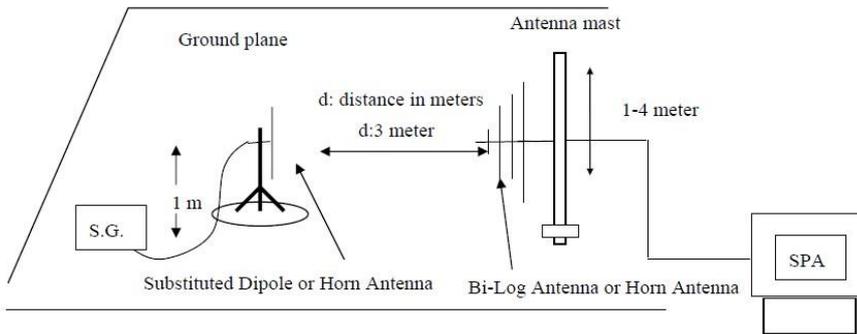
Below 1GHz



Above 1GHz



Substituted method:



7.4 Test Result

Low Channel (540.75MHz)			Middle Channel (547.25MHz)		
F(MHz)	Band-Width(kHz)	Level(dBm)	F(MHz)	Band-Width(kHz)	Level(dBm)
Horizontal					
1081.5	1000	-39.63	1094.5	1000	-38.85
1622.25	1000	-44.18	1641.75	1000	-43.51
Vertical					
1081.5	1000	-42.29	1094.5	1000	-41.93
1622.25	1000	-47.31	1641.75	1000	-46.56
Measurement Uncertainly					

High Channel (577.75MHz)			--		
F(MHz)	Band-Width(kHz)	Level(dBm)	F(MHz)	Band-Width(kHz)	Level(dBm)
Horizontal					
1155.5	1000	-38.27	--	--	--
1733.25	1000	-43.08	--	--	--
Vertical					
1155.5	1000	-41.35	--	--	--
1733.25	1000	-45.28	--	--	--
Measurement Uncertainly					

Remark:

The test frequency ranges from 25MHz to 6GHz, RBW/VBW: 100 kHz/300kHz below 1GHz, RBW/VBW: 1000 kHz/3000kHz above 1GHz.

8 Frequency Stability

8.1 Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.005\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

8.2 Test Procedure

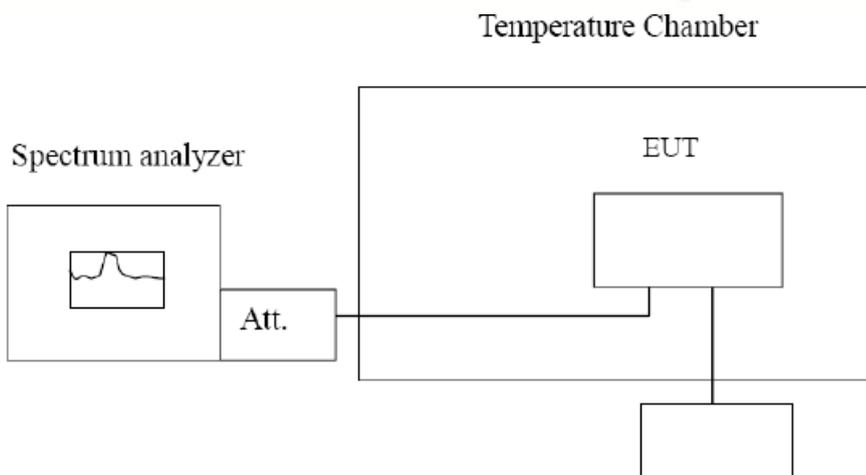
Frequency stability versus environmental temperature

1. Setup as Test Configuration for frequencies measured at ambient temperature if it is within 15°C to 25°C . Otherwise, an environmental chamber set for a temperature of 20°C shall be used.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 3 kHz, VBW to 10kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Set the temperature of chamber to 50°C . Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -20°C is measured, record all measurement frequencies.

Frequency stability versus input voltage

1. Setup as Test Configuration for frequencies measured at ambient temperature if it is within 15°C to 25°C . Otherwise, an environmental chamber set for a temperature of 20°C shall be used. Install new batteries in the EUT.
2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 3kHz, VBW to 10kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. For non-hand carried, battery operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.

8.3 Test Setup



8.4 Test Result

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
DC3.0V	547.25206
DC3.5V	547.25189
DC2.6V	547.25235
Nominal Frequency	547.25
Max. Deviation	0.00235
Max. Deviation (%)	0.000429
Limit (%)	±0.005

Rated working voltage: DC3.0V

Temperature vs. Frequency Stability

Temperature (°C)	Measurement Frequency (MHz)
-20	547.25175
-10	547.25202
0	547.25215
10	547.25227
20	547.25193
30	547.25218
40	547.25209
50	547.25231
Nominal Frequency	547.25
Max. Deviation	0.00231
Max. Deviation (%)	0.000422
Limit (%)	±0.005

9 PHOTOS OF TEST

9.1 Spurious Radiated Emissions



End of Report