FCC TEST REPORT

Test report
On Behalf of
Shenzhen Minghan Technology Co., Ltd.
For
Wireless Microphone
Model No.: M1,M5,M6,M7,M8,M9,M10,M11,M12,M13,M14,M15,
MF05,MF06,MF07,MF08,MF09,MF10,MF11,MF12,MF13,MF14,MF15

FCC ID: 2A3C6-MS

Prepared for :	Shenzhen Minghan Technology Co., Ltd. No. 2A15, Min Tai Building, Minzhi Road Longhua New District,Shenzhen, Guangdong, China
Prepared By :	Shenzhen Tongzhou Testing Co.,Ltd 1th Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China
Date of Test:	2021/9/22 ~ 2021/10/08
Date of Report:	2021/10/08
Report Number:	TZ210902564-E

The test report apply only to the specific sample(s) tested under stated test conditions
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Minghan Technology Co., Ltd.
Address	:	No. 2A15, Min Tai Building, Minzhi Road Longhua New District,Shenzhen, Guangdong, China
Manufacture's Name	:	Shenzhen Minghan Technology Co., Ltd.
Address	:	No. 2A15, Min Tai Building, Minzhi Road Longhua New District,Shenzhen, Guangdong, China
Product description		
Trade Mark	:	N/A
Product name	:	Wireless Microphone
Model and/or type reference	:	M1,M5,M6,M7,M8,M9,M10,M11,M12,M13,M14,M15,MF05,MF06,MF07,MF08,MF09,MF10,MF11,MF12,MF13,MF14,MF15
Standards	:	FCC Rules and Regulations Part 15.236 ANSI C63.10:2013

Date of Test	:	
Date (s) of performance of tests	:	2021/9/22 ~ 2021/10/08
Date of Issue	:	2021/10/08
Test Result	:	Pass

Testing Engineer : Anna Hu

(Anna Hu)

Technical Manager : Hugo Chen

(Hugo Chen)

Authorized Signatory : Andy Zhang

(Andy Zhang)

Revision History

Revision	Issue Date	Revisions	Revised By
000	2021/10/08	Initial Issue	Andy Zhang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Wireless Microphone
Model Number	:	M1,M5,M6,M7,M8,M9,M10,M11,M12,M13,M14,M15,MF05,MF06,MF07,MF08,MF09,MF10,MF11,MF12,MF13,MF14,MF15
Model Declaration	:	All the same except for the model name
Test Model	:	M1
Power Supply	:	DC 3.7V by battery
Hardware version	:	M1-TX REV:1.0 20210415
Software version	:	V01
Sample ID	:	TZ210902564–1#
Wireless Microphone		
Frequency Range	:	Band A: 551.225-565.925 MHz Band B: 573.325-588.025 MHz
Channel Number	:	Band A: 50 Band B: 50 *Note:Channel list shows in table 1.1.1*
Modulation Technology	:	FM
Antenna Type And Gain		Integral Antenna, 0.0dBi (Max.)

Note1: Antenna position refer to EUT Photos.

Table 1.1.1

Band A				Band B			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	551.225	26	558.725	1	573.325	26	580.825
2	551.525	27	559.025	2	573.625	27	581.125
3	551.825	28	559.325	3	573.925	28	581.425
4	552.125	29	559.625	4	574.225	29	581.725
5	552.425	30	559.925	5	574.525	30	582.025
6	552.725	31	560.225	6	574.825	31	582.325
7	553.025	32	560.525	7	575.125	32	582.625
8	553.325	33	560.825	8	575.425	33	582.925
9	553.625	34	561.125	9	575.725	34	583.225
10	553.925	35	561.425	10	576.025	35	583.525
11	554.225	36	561.725	11	576.325	36	583.825
12	554.525	37	562.025	12	576.625	37	584.125
13	554.825	38	562.325	13	576.925	38	584.425
14	555.125	39	562.625	14	577.225	39	584.725
15	555.425	40	562.925	15	577.525	40	585.025
16	555.725	41	563.225	16	577.825	41	585.325
17	556.025	42	563.525	17	578.125	42	585.625
18	556.325	43	563.825	18	578.425	43	585.925
19	556.625	44	564.125	19	578.725	44	586.225
20	556.925	45	564.425	20	579.025	45	586.525
21	557.225	46	564.725	21	579.325	46	586.825
22	557.525	47	565.025	22	579.625	47	587.125
23	557.825	48	565.325	23	579.925	48	587.425
24	558.125	49	565.625	24	580.225	49	587.725
25	558.425	50	565.925	25	580.525	50	588.025

1.2. Objective

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

1.3. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:
- Temperature: 15-35ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

1.4. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate

1.5. External I/O Cable

I/O Port Description	Quantity	Cable

1.6. Description of Test Facility

FCC
Designation Number: CN1275
Test Firm Registration Number: 167722
Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA
Certificate Number: 5463.01
Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC
ISED#: 22033
CAB identifier: CN0099
Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010

1.7. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd’s quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.8. Measurement Uncertainty

Test	Range	Measurement	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.70 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	-	(1)
Frequency Error	9KHz~40GHz	1×10^{-7}	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.9. Description of Test Modes

The EUT was placed in a RF test mode for testing of the transmitter and in normal mode of operation for testing the digital circuitry or receiver. In both modes the carrier current device within the EUT was operational.

1.10. Antenna System

The directional gains of antenna used for transmitting refer to section 1.1 of this report, and EUT uses an integral antenna which is permanently attached.

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen Tongzhou Testing Co.,Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the normal operating mode. The TX frequency that was fixed which was for the purpose of the measurements.
According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.236 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 1.5 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 6.3 of ANSI C63.10-2013

2.4. Instrument Calibration

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

2.5. Test Mode

The EUT has been tested under engineering mode. The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).
The worst case of X axis was reported.

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen Tongzhou Testing Co.,Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Rules	Description of test	Sample ID	Result
§15.236(d)	RF Power Output	TZ210902564–1#	Compliant
§15.236(f)(2)	Occupied Bandwidth	TZ210902564–1#	Compliant
§15.236(g)	Necessary Bandwidth	TZ210902564–1#	Compliant
§15.236(g)	Spurious emissions	TZ210902564–1#	Compliant
§15.236(f)(3)	Frequency Stability	TZ210902564–1#	Compliant
§15.207	Conducted Emissions	TZ210902564–1#	Compliant

Remark: The measurement uncertainty is not included in the test result.

5. TEST ITEMS and RESULTs

5.1. Maximum Output Power

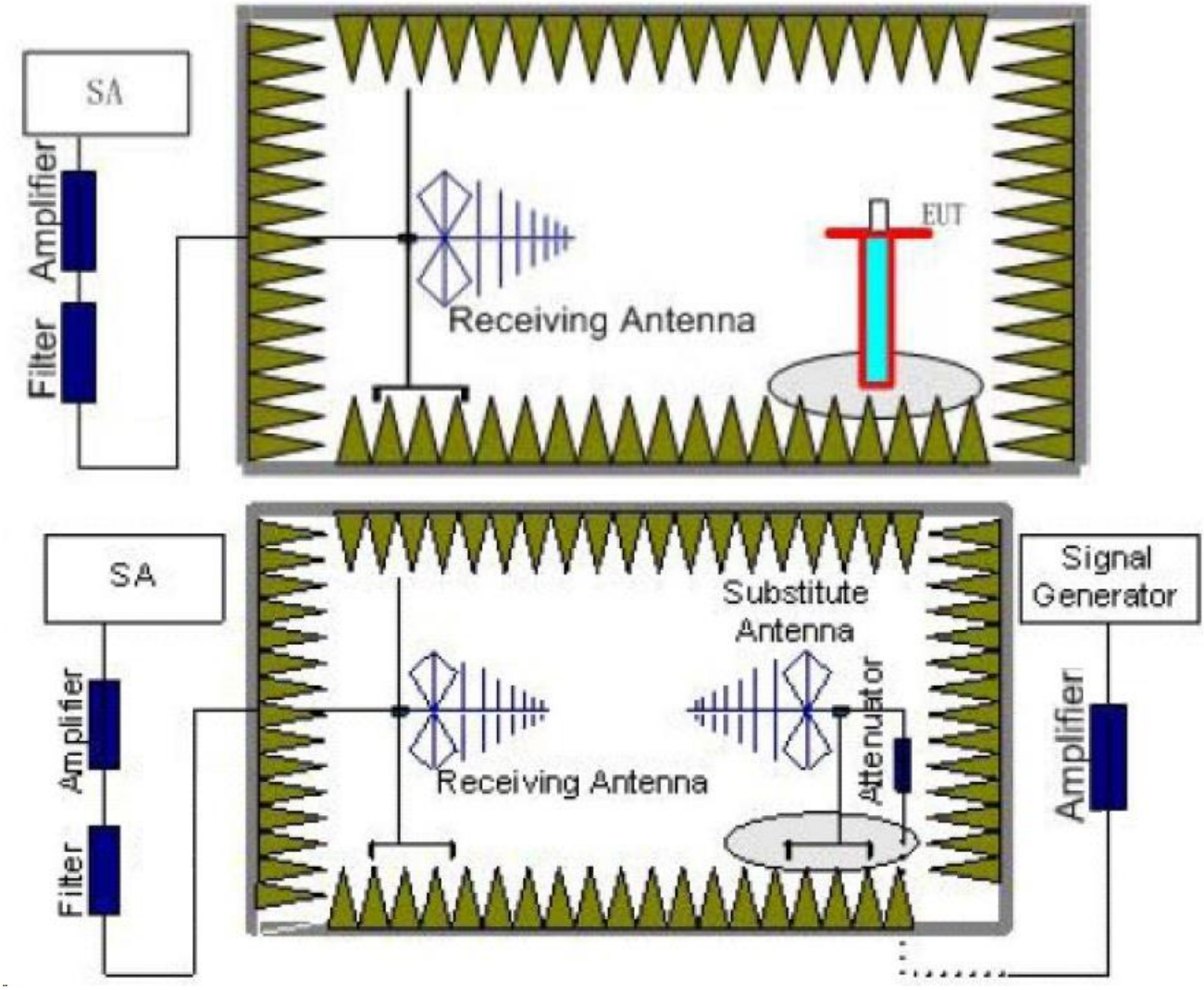
5.1.1. Limit

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.

5.1.2. 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, an 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 connect 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:
   Power(EIRP)=$P_{Mea+}P_{Ag\,-}\,P_{cl}$ + G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

5.1.1. Test Setup



5.1.2. Test Result

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

Remark;
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 Z axis and receiver antenna at vertical polarization was reported.

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain (dB)	P_{Ag} (dB)	Correction (dB)	Burst Avergae ERP (dBm)	Burst Avergae ERP (mW)	Limit (mW)	Polarization
551.225	-32.41	0.48	7.05	33.61	2.15	5.62	3.65	50	V
558.425	-32.88	0.48	7.06	33.62	2.15	5.17	3.29	50	V
565.925	-32.73	0.48	7.07	33.62	2.15	5.33	3.41	50	V
573.325	-33.55	0.49	7.07	33.62	2.15	4.50	2.82	50	V
580.525	-32.35	0.49	7.08	33.62	2.15	5.71	3.72	50	V
588.025	-33.66	0.49	7.09	33.62	2.15	4.41	2.86	50	V

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

5.2. Occupied Bandwidth

5.2.1. 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 200 kHz.

5.2.2. Test Procedure

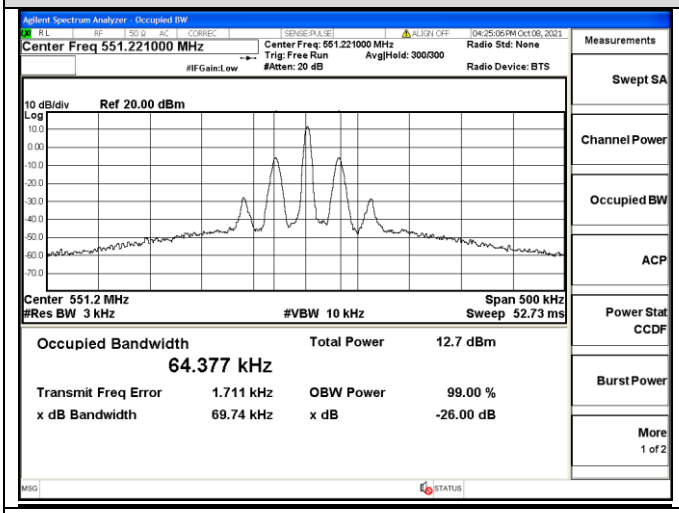
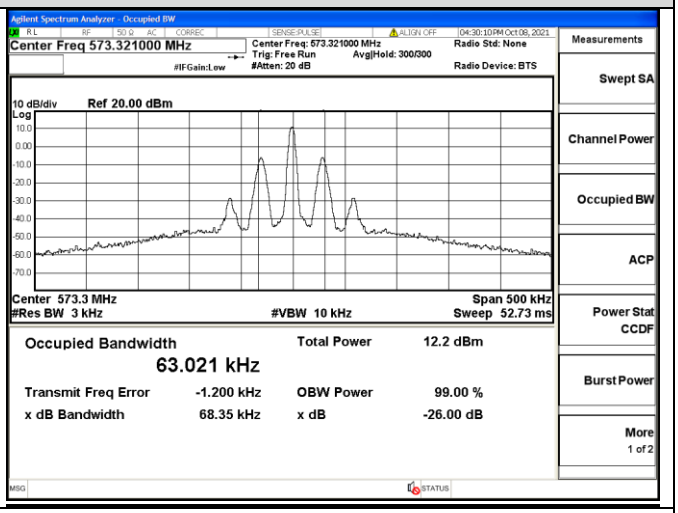
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3 KHz RBW and 10 KHz VBW.

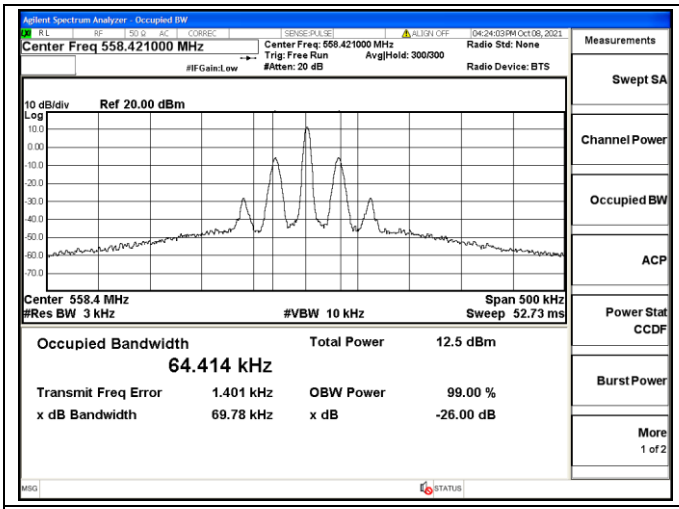
5.2.3. Test Result

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

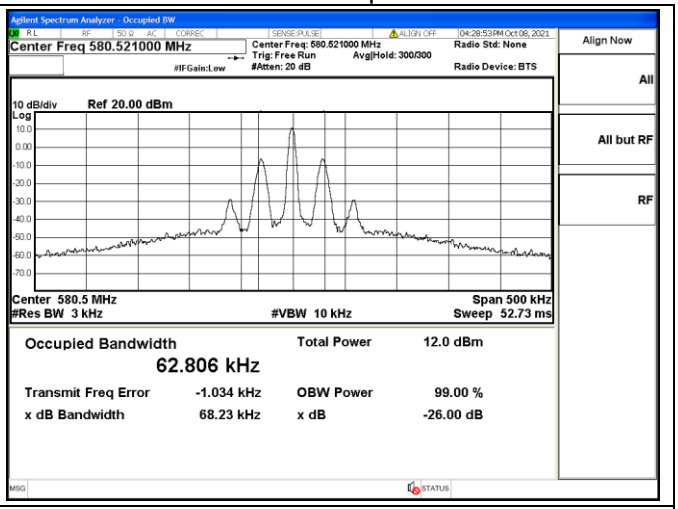
Modulation	Frequency (MHz)	99% OBW (KHz)	Limit (KHz)	Result
FM	551.225	64.377	200	Pass
	558.425	64.414	200	
	565.925	63.045	200	
FM	573.325	63.021	200	Pass
	580.525	62.806	200	
	588.025	64.248	200	

Test plot as follows:

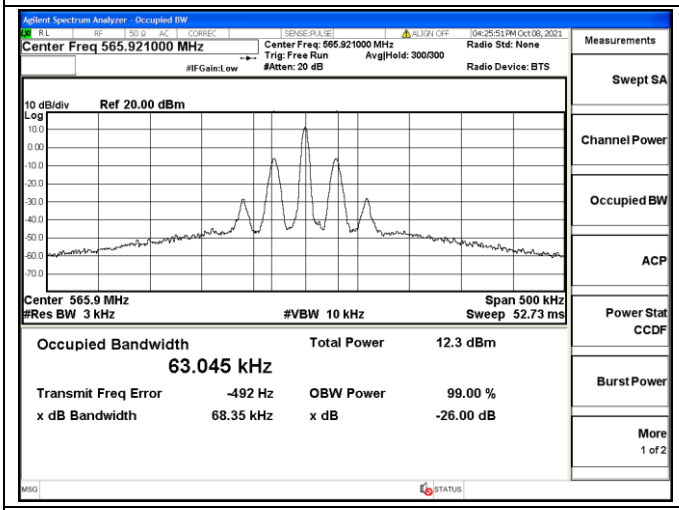
Band A	Band B
	
551.225MHz	573.325MHz



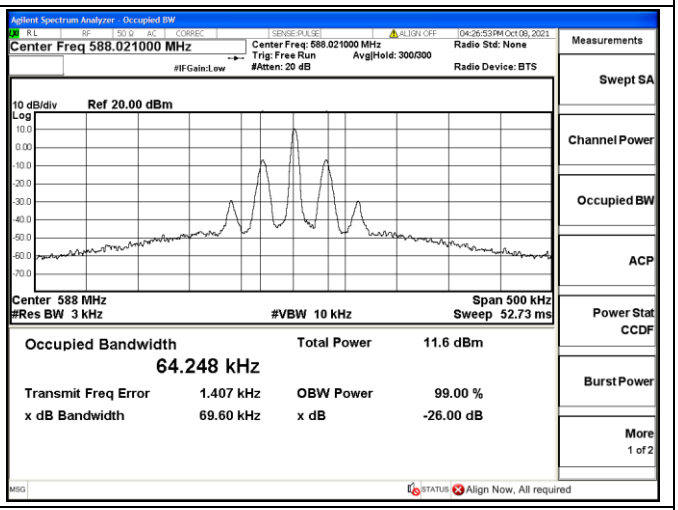
558.425MHz



580.525MHz



565.925MHz



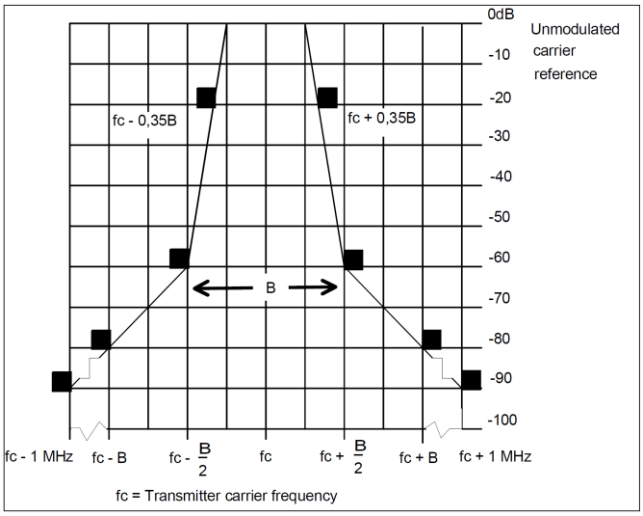
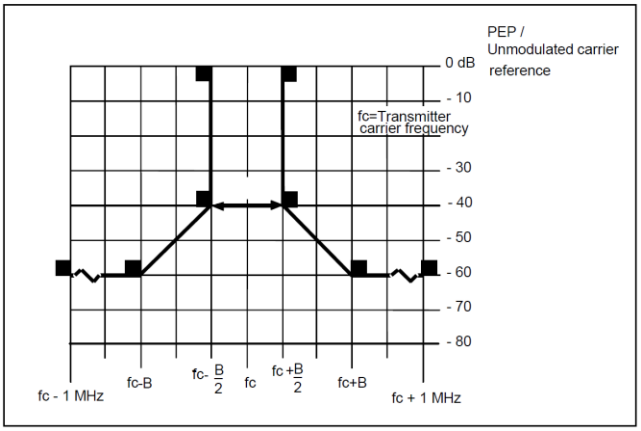
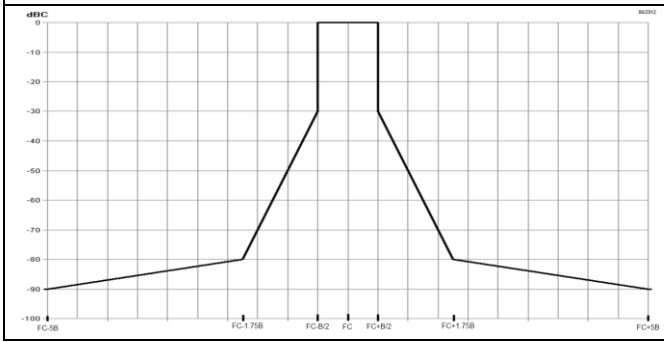
588.025MHz

5.3. Necessary Bandwidth

5.3.1. 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

Spectrum mask for analogue systems in all bands	Spectrum mask for digital systems above 2 GHz
	
Spectrum mask for digital systems below 2 GHz	
	

5.3.2. Test Procedure

For analogue systems:

1. 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 (-8dB limit) as declared by the manufacturer.
2. The corresponding audio output level from the demodulator shall be measured and recorded.
3. The input impedance of the noise meter shall be sufficiently high to avoid more than 0.1 dB changes in input level when the meter is switched between input and output.
4. 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.
5. It shall be checked that the audio output level has increased by ≤10 dB.
6. If the step 5 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 -8dB (lim).

7. Measure the input level at the transmitter required to give +12 dB (lim) and record the EUT output level test plots by the spectrum analyzer.
8. The transmitter RF output spectrum shall be measured, using a spectrum analyser with the following settings:

- centre frequency: fc: Transmitter (Tx) nominal frequency;
- dispersion (Span): fc - 1 MHz to fc + 1 MHz;
- Resolution BandWidth (RBW): 1 kHz;
- Video BandWidth (VBW): 1 kHz;
- detector: Peak hold.

For digital systems:

Step 1: Measure the "Carrier Power" with the spectrum analyzer setup:

- Center Frequency = fc
- Span = Zero span
- Detector = RMS
- Trace Mode = Average
- RBW&VBW = 5 x B
- Sweep time ⩾ 2 s

- Step 2: Measure the "Maximum Relative Level (dBc) at Specified Carrier Offsets" with the following spectrum analyzer setup:

- Center Frequency = fc
- Span ⩾ 5 x B
- Detector = RMS
- Trace Mode = Peak Hold
- RBW&VBW = 1 kHz
- Sweep time ⩾ 2 s

Limits: Mask shall not be exceeded.

- Step 3: Measure the "transmitter wide band noise floor":

The measurement of transmitter broad band noise floor shall be carried out according to clause 8.3.1.1.

- Start Frequency = fc + 1,75B and fc - 1 MHz below 1 GHz,

Start Frequency = fc + B and fc - 1 MHz above 1 GHz.

- Stop Frequency = fc + 1 MHz and fc - 1,75 B below 1 GHz,

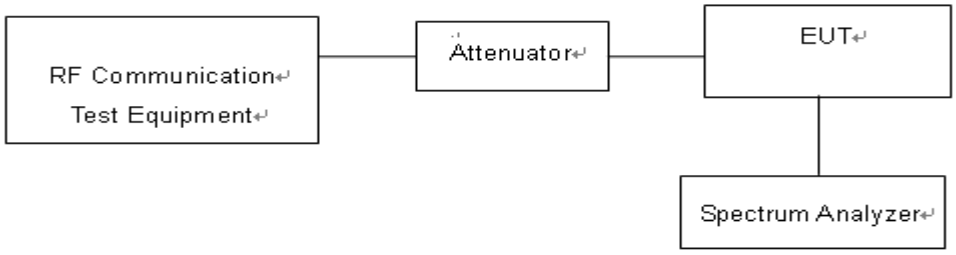
Stop Frequency = fc + 1 MHz and fc -B above 1 GHz.

- Detector = RMS
- Trace Mode = Average
- RBW&VBW = 1 kHz
- Sweep time ⩾ 2 s

NOTE 2: Two spectrum ranges are to be measured!

Limits: Mask shall not be exceeded.

5.3.3. Test Configuration

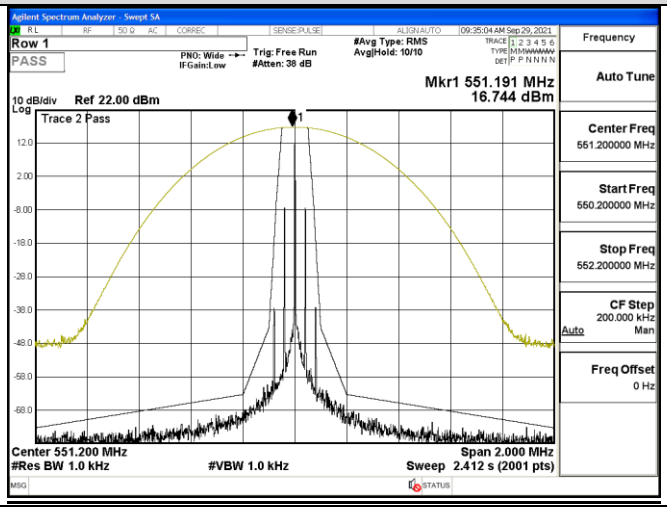
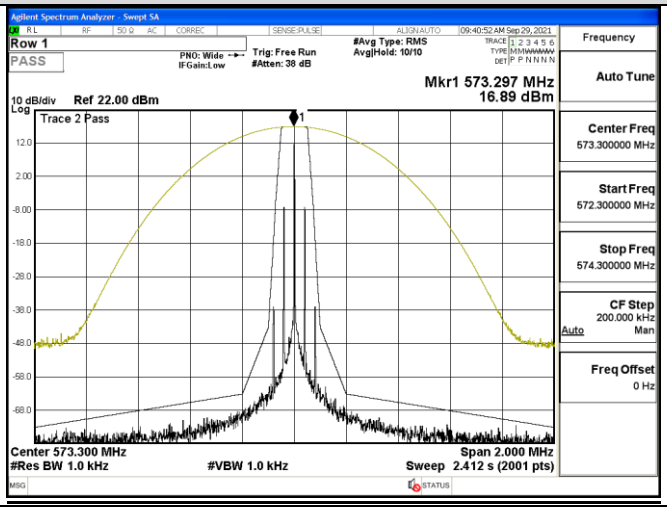
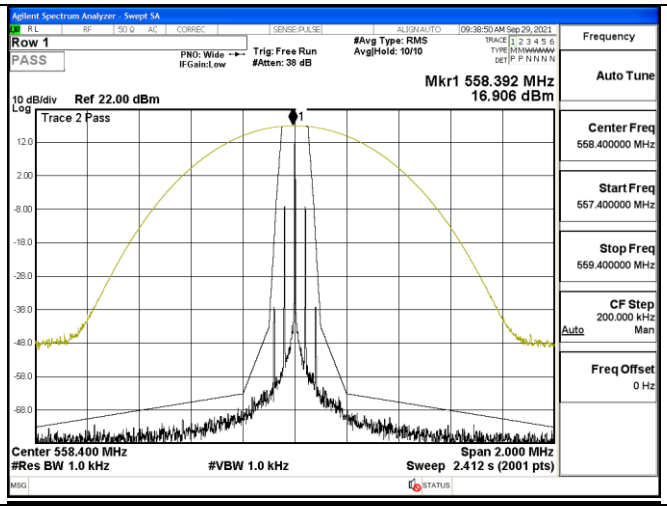
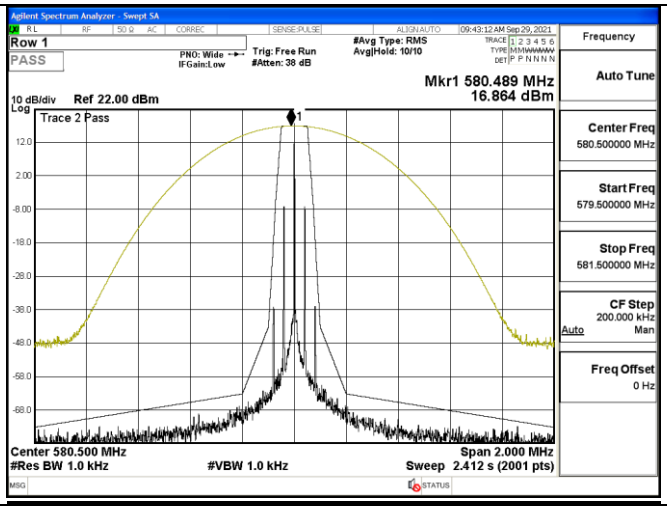
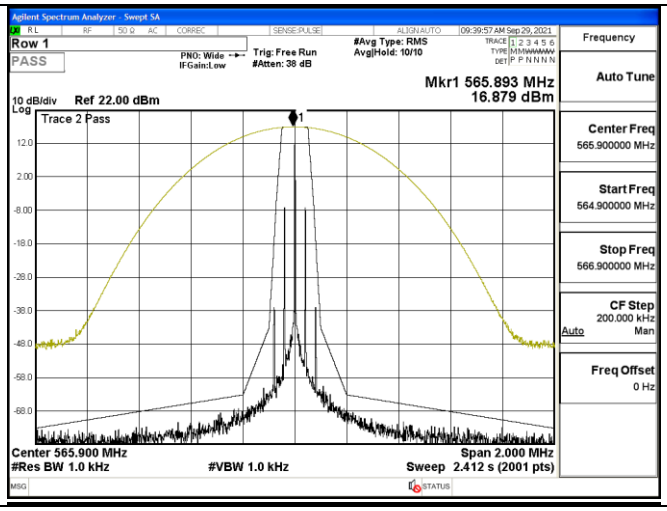
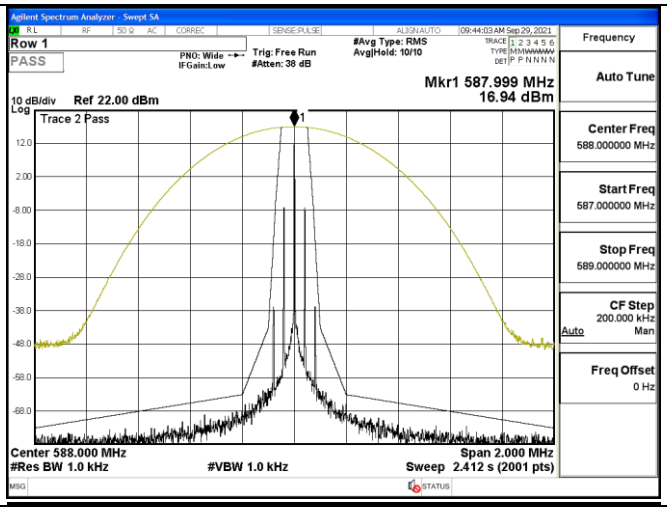


5.3.4. Test Result

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

Note:

	Bandwidth(B)	B/2	0.35B
Manufacturer declared	200 KHz	100KHz	70KHz

Band A	Band B
	
551.225MHz	573.325MHz
	
558.425MHz	580.525MHz
	
565.925MHz	588.025MHz

5.4. Transmitter spurious emissions

5.4.1. 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:

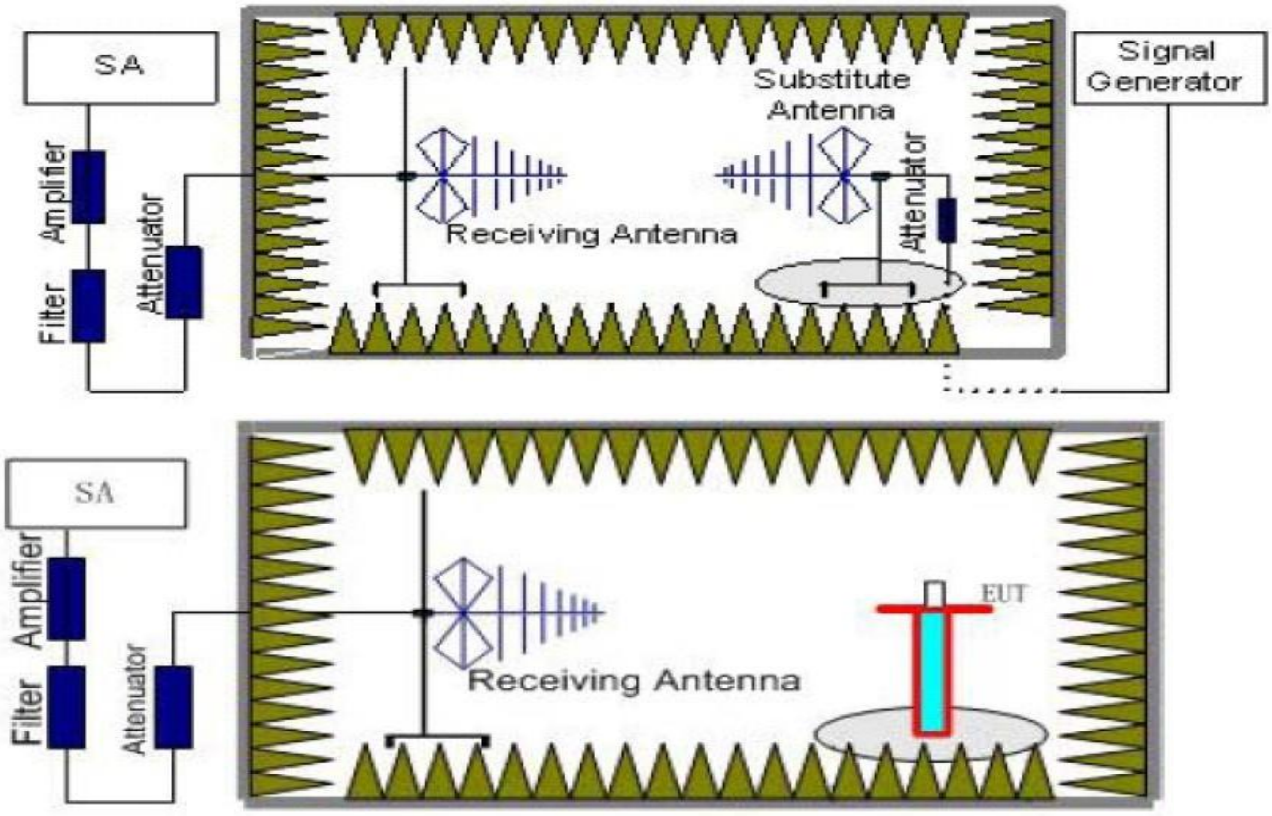
State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

5.4.2. Test Procedure

Same with 5.1.2 of this report

5.4.3. Test Configuration

Effective Radiated Power measurement



5.4.4. Test Procedure

1. Please refer to ETSI EN 300 422-1 V1.4.2 (2011-08) clause 6.1 for the test conditions.
2. Please refer to ETSI EN 300 422-1 V1.4.2 (2011-08) clause 8.4.2 for the measurement method.

5.4.5. Test Result

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

The test frequency range from 25MHz to 4GHz and recorded worst at below:

Test mode: TX (551.225MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1102.45	-47.68	0.72	3	6.24	-42.16	-30	12.16	H
1102.45	-51.91	0.72	3	6.24	-46.39	-30	16.39	H
1653.675	-45.73	0.83	3	8.61	-37.95	-30	7.95	V
1653.675	-50.15	0.83	3	8.61	-42.37	-30	12.37	V

Test mode: TX (558.425MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1116.85	-49.52	0.72	3	6.3	-43.94	-30	13.94	H
1116.85	-49.75	0.72	3	6.3	-44.17	-30	14.17	H
1675.275	-46.42	0.84	3	8.7	-38.56	-30	8.56	V
1675.275	-53.01	0.84	3	8.7	-45.15	-30	15.15	V

Test mode: TX (565.925MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1131.85	-51.41	0.73	3	6.37	-45.77	-30	15.77	H
1131.85	-52.47	0.73	3	6.37	-46.83	-30	16.83	H
1697.775	-46.53	0.84	3	8.8	-38.57	-30	8.57	V
1697.775	-56.24	0.84	3	8.8	-48.28	-30	18.28	V

Test mode: TX (573.325MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1146.65	-49.32	0.73	3	6.43	-43.62	-30	13.62	H
1146.65	-51.91	0.73	3	6.43	-46.21	-30	16.21	H
1719.975	-45.84	0.84	3	8.9	-37.78	-30	7.78	V
1719.975	-55.90	0.84	3	8.9	-47.84	-30	17.84	V

Test mode: TX (580.525MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1161.05	-51.69	0.73	3	6.49	-45.93	-30	15.93	H
1161.05	-53.76	0.73	3	6.49	-48.00	-30	18.00	H
1741.575	-49.32	0.85	3	8.99	-41.18	-30	11.18	V
1741.575	-52.14	0.85	3	8.99	-44.00	-30	14.00	V

Test mode: TX (588.025MHz)

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1176.05	-52.15	0.74	3	6.56	-46.33	-30	16.33	H
1176.05	-50.18	0.74	3	6.56	-44.36	-30	14.36	H
1764.075	-48.13	0.85	3	9.09	-39.89	-30	9.89	V
1764.075	-52.27	0.85	3	9.09	-44.03	-30	14.03	V

Remark:

1. *The test frequency range from 25MHz to 4GHz, RBW/VBW: 100 KHz/300KHz below 1GHz, RBW/VBW: 1000 KHz/3000KHz above 1GHz.*
   "--"Other emission levels were very low against the limit and not reported.
2. *Peak EIRP=PMea(dBm) -Pcl(dB) +Ga(dBi)*
3. *This device is a transmitter and it will operating after switching on, so no standby mode available and no measurement was performed*

5.5. Frequency Stability

5.5.1. Limit

The frequency tolerance of the carrier signal shall be maintained within ±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.

5.5.2. Test Procedure

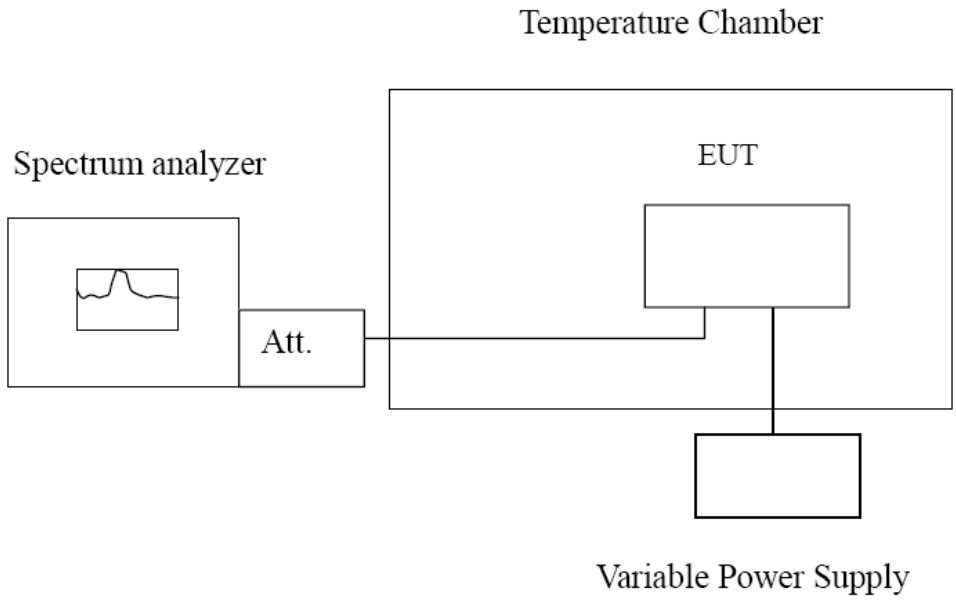
a) Frequency stability versus environmental temperature

1. Setup asTest Configuration for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃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℃. 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℃decreased per stage until the lowest temperature -20℃is measured, record all measurement frequencies.

b) Frequency stability versus input voltage

1. Setup asTest Configuration for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃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.

5.5.3. Test Configuration



5.5.4. Test Result

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

Reference Frequency: 551.025MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0052138	0.00095	±0.005	PASS
	-10	0.004083	0.00074		
	0	0.0047094	0.00085		
	10	0.0057968	0.00105		
	20	0.0048621	0.00088		
	30	0.0056473	0.00102		
	40	0.0052592	0.00095		
	50	0.0051369	0.00093		
4.25	20	0.0047864	0.00087		
3.15	20	0.0052917	0.00096		

Reference Frequency: 558.425MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0053918	0.00097	±0.005	PASS
	-10	0.0057666	0.00103		
	0	0.0041654	0.00075		
	10	0.0051459	0.00092		
	20	0.0054286	0.00097		
	30	0.0052282	0.00094		
	40	0.0051571	0.00092		
	50	0.0046744	0.00084		
4.25	20	0.0044561	0.00080		
3.15	20	0.0051141	0.00092		

Reference Frequency: 565.925MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0040032	0.00071	±0.005	PASS
	-10	0.0051325	0.00091		
	0	0.0058162	0.00103		
	10	0.005634	0.00100		
	20	0.0048511	0.00086		
	30	0.0048866	0.00086		
	40	0.004335	0.00077		
	50	0.005649	0.00100		
4.25	20	0.0052496	0.00093		
3.15	20	0.0059385	0.00105		

Reference Frequency: 573.325MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0053355	0.00093	±0.005	PASS
	-10	0.0046031	0.00080		
	0	0.0052055	0.00091		
	10	0.0059611	0.00104		
	20	0.0056397	0.00098		
	30	0.0052538	0.00092		
	40	0.0043142	0.00075		
	50	0.0050903	0.00089		
4.25	20	0.0047148	0.00082		
3.15	20	0.0054512	0.00095		

Reference Frequency: 580.525MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0044982	0.00077	±0.005	PASS
	-10	0.0041684	0.00072		
	0	0.0051308	0.00088		
	10	0.0052876	0.00091		
	20	0.0059066	0.00102		
	30	0.0041195	0.00071		
	40	0.0054487	0.00094		
	50	0.0059259	0.00102		
4.25	20	0.0046995	0.00081		
3.15	20	0.0059206	0.00102		

Reference Frequency: 588.025MHz					
Voltage (V)	Temperature (℃)	Frequency error (MHz)	Frequency Tolerance (%)	Limit (%)	Result
3.7	-20	0.0059479	0.00101	±0.005	PASS
	-10	0.0048707	0.00083		
	0	0.0046516	0.00079		
	10	0.0049998	0.00085		
	20	0.0053195	0.00090		
	30	0.0043851	0.00075		
	40	0.0044659	0.00076		
	50	0.0041398	0.00070		
4.25	20	0.00452	0.00077		
3.15	20	0.0047691	0.00081		

5.6. AC Power line conducted emissions

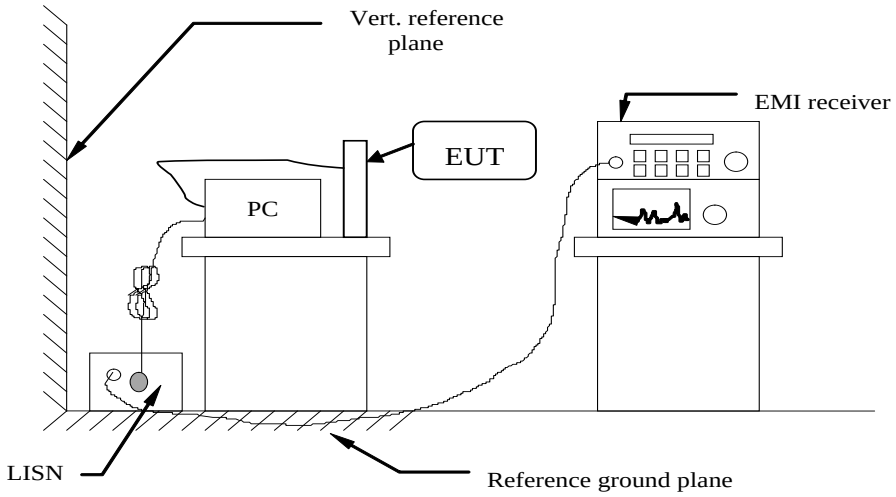
5.6.1. Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.6.2. Block Diagram of Test Setup



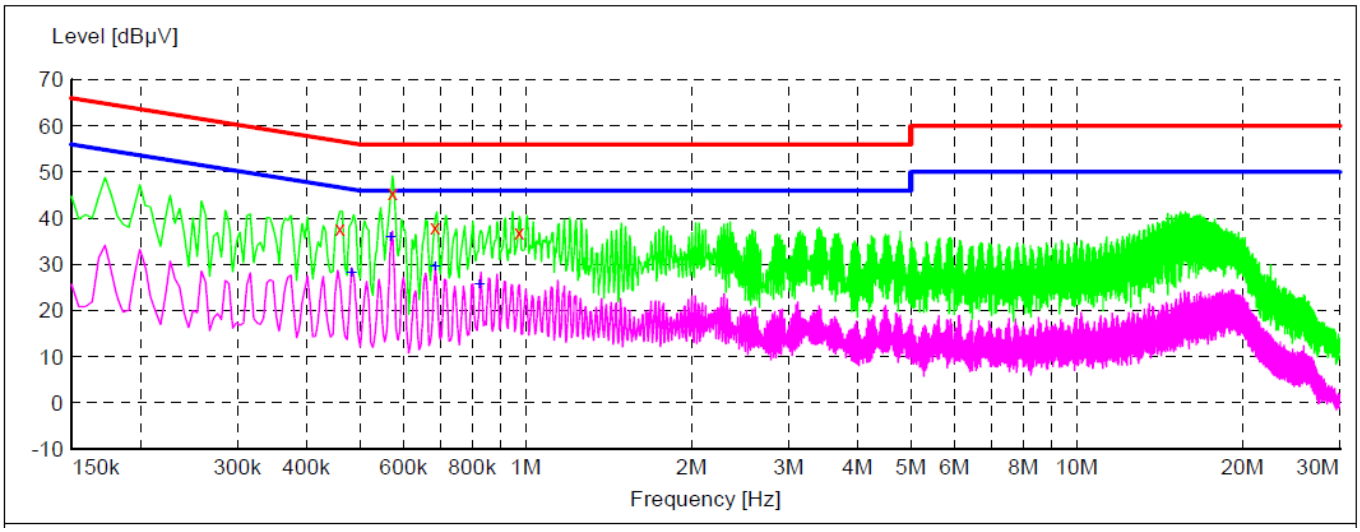
5.6.3. Test Results

Temperature	22.8℃	Humidity	56%
Test Engineer	Anna Hu	Configurations	TX

Pass

Note: Pre-test all modes, list the worst case in this item.

Neutral Line



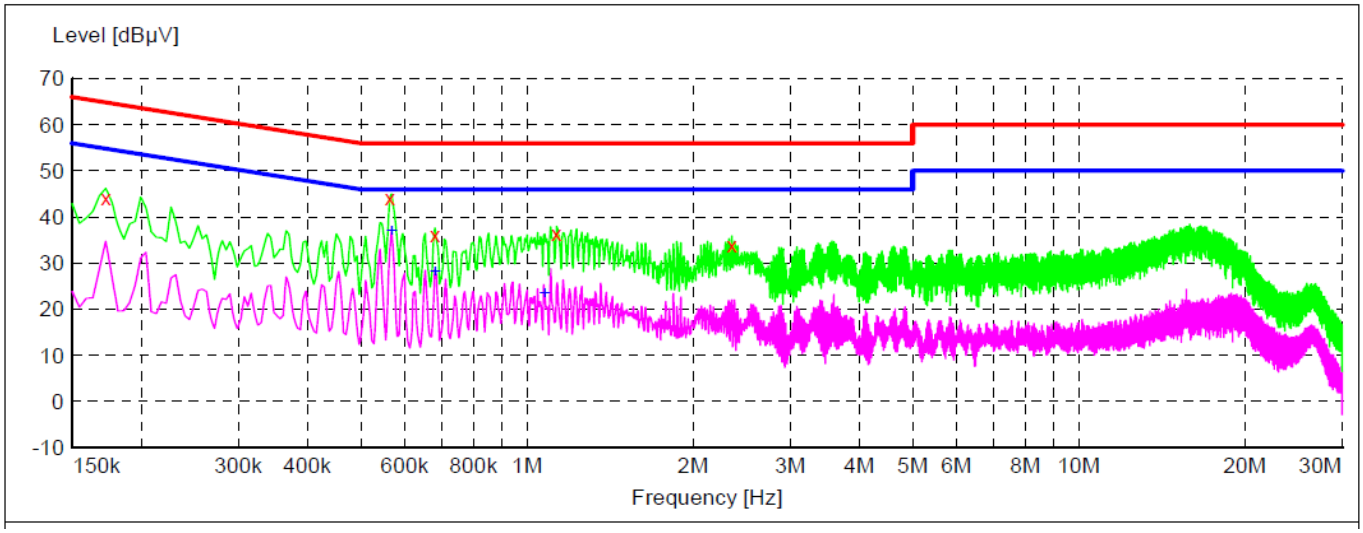
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.460500	37.70	10.0	57	19.0	QP	N	GND
0.573000	45.40	9.9	56	10.6	QP	N	GND
0.685500	38.10	9.9	56	17.9	QP	N	GND
0.973500	36.90	9.8	56	19.1	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.483000	28.00	10.0	46	18.3	AV	N	GND
0.568500	35.70	9.9	46	10.3	AV	N	GND
0.685500	29.60	9.9	46	16.4	AV	N	GND
0.825000	25.50	9.8	46	20.5	AV	N	GND

Note:

1. Margin(dB)= Limit(dBµV) - -Level(dBµV)
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report

Live Line



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.172500	44.00	10.2	65	20.8	QP	L1	GND
0.564000	44.20	9.9	56	11.8	QP	L1	GND
0.681000	36.00	9.9	56	20.0	QP	L1	GND
1.131000	36.50	9.8	56	19.5	QP	L1	GND
2.350500	33.90	9.7	56	22.1	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.568500	37.00	9.9	46	9.0	AV	L1	GND
0.681000	28.00	9.9	46	18.0	AV	L1	GND
1.077000	23.50	9.8	46	22.5	AV	L1	GND

Note:

1. Margin(dB)= Limit(dBµV) - -Level(dBµV)
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report

6. LIST OF MEASURING EQUIPMENTS

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2021/1/4	2022/1/3
2	Power Sensor	Agilent	U2021XA	MY5365004	2021/1/4	2022/1/3
3	Power Meter	Agilent	U2531A	TW53323507	2021/1/4	2022/1/3
4	Wideband Antenna	schwarzbeck	VULB 9163	958	2019/11/16	2022/11/15
5	Horn Antenna	schwarzbeck	9120D-1141	1574	2019/11/16	2022/11/15
6	EMI Test Receiver	R&S	ESCI	100849/003	2021/1/4	2022/1/3
7	Controller	MF	MF7802	N/A	N/A	N/A
8	Amplifier	schwarzbeck	BBV 9743	209	2021/1/4	2022/1/3
9	Amplifier	Tonscend	TSAMP-0518SE	--	2021/1/4	2022/1/3
10	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2021/1/4	2022/1/3
11	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2021/1/4	2022/1/3
12	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71	N/A	N/A
12	RE test software	Tonscend	JS32-RE	V2.0.2.0	N/A	N/A
14	Test Software	Tonscend	JS1120-2	V2.5.77.0418	N/A	N/A

7. TEST SETUP Photographs of EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. Exterior Photographs of the EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR Photographs of the EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------