



FCC TEST REPORT

FCC ID: 2A8SC-TSL42

Product	:	TeslaMic
Model Name	:	TSL42
Brand	:	Tesla
Report No.	:	PTC22090501401E-FC01
Prepared for		
Beijing Thunderstone Technology Co., LTD		
3rd Floor of Building 8, Tianchang Garden, Media Village, Beiyuan North Road, Chaoyang District, Beijing, China		
Prepared by		
Precise Testing & Certification Co., Ltd.		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		



1 TEST RESULT CERTIFICATION

Applicant's name : Beijing Thunderstone Technology Co., LTD
Address : 3rd Floor of Building 8, Tianchang Garden, Media Village, Beiyuan
North Road, Chaoyang District, Beijing, China
Manufacture's name : Beijing Thunderstone Technology Co., LTD
Address : 3rd Floor of Building 8, Tianchang Garden, Media Village, Beiyuan
North Road, Chaoyang District, Beijing, China
Product name : TeslaMic
Model name : TSL42
Standards : FCC CFR47 Part 15 Section 15.236
Test procedure : ANSI C63.10:2013
Test Date : Sep. 16, 2022 to Oct. 18, 2022
Date of Issue : Sep. 30, 2022
Test Result : Pass

This device described above has been tested by PTC, 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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Test Engineer:

A handwritten signature in black ink, appearing to read 'Simon Pu'.

Simon Pu / Engineer

Technical Manager:

A handwritten signature in black ink, appearing to read 'Ronnie Liu'.

Ronnie Liu / Manager



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2 Test Summary

Test Items	Test Requirement	Result
Output Power Measurement	§15.236(d)	PASS
Occupied Bandwidth Emission	§15.236(f)	PASS
Radiated Spurious Emission	§15.236(g)	PASS
Emission mask	§15.236(g)	PASS
Frequency Stability	§ 15.236(f)(3)	PASS

3 TEST FACILITY

Precise Testing & Certification Co., Ltd.

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A



4 General Information

4.1 General Description of E.U.T.

Product Name	:	TeslaMic
Model Name	:	TSL42
Additional model	:	N/A
Operation Frequency	:	657MHz-663MHz
Number of Channel	:	13 channels for FM
Type of Modulation	:	FM
Antenna installation	:	PCB antenna
Antenna Gain	:	-10.1 dBi
Rated Power Supply	:	Input: DC 5V/2A
Test Power Supply	:	Li-ion Battery :1S1P1865LD Rated Voltage: 3.6V Capacity: 2500mAh
Hardware Version	:	v1.0
Software Version	:	v1.0



4.2 Test Mode

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	657	7	660
2	657.5	8	660.5
3	658	9	661
4	658.5	10	661.5
5	659	11	662
6	659.5	12	662.5
		13	663

Channel	Frequency(MHz)
1	657
7	660
13	663



5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug. 21, 2023	1 year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug. 21, 2023	1 year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug. 21, 2023	1 year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug. 21, 2023	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2023	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug. 21, 2023	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 21, 2023	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Aug. 21, 2023	1 year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 21, 2023	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Aug. 21, 2023	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 21, 2023	1 year



Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 21, 2023	1 year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Aug. 21, 2023	1 year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Aug. 21, 2023	1 year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 21, 2023	1 year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 21, 2023	1 year

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2023	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Aug. 21, 2023	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Aug. 21, 2023	1 year

5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C



Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9kHz~30MHz)	±3.15dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

5.3 Description of Support Units

Equipment	Model No.	Series No.	Parameters
Notebook	TPN-C126	N/A	N/A

6 Conducted Emission

Test Requirement:	: FCC CFR 47 Part 15 Section 15.207
Test Method:	: ANSI C63.10:2013
Test Result:	: PASS
Frequency Range:	: 150kHz to 30MHz
Class/Severity:	: Class B
Detector:	: Peak for pre-scan (9kHz Resolution Bandwidth)

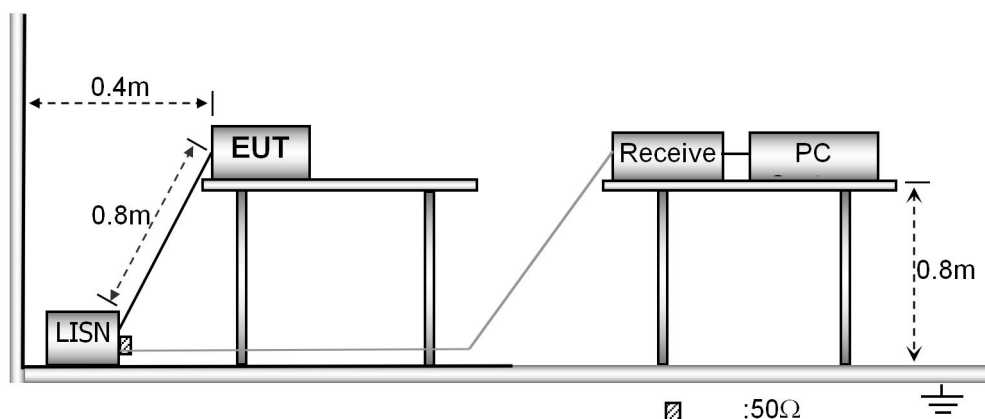
6.1 E.U.T. Operation

Operating Environment :

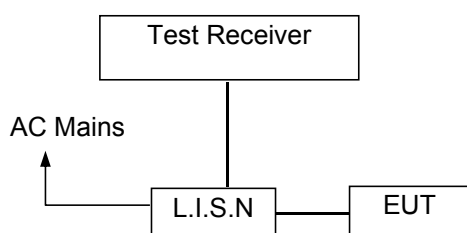
Temperature:	: 23.2°C
Humidity:	: 51 % RH
Atmospheric Pressure:	: 101.12 kPa
Test Voltage	: AC 120V/60Hz

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



6.3 Test SET-UP (Block Diagram of Configuration)





6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

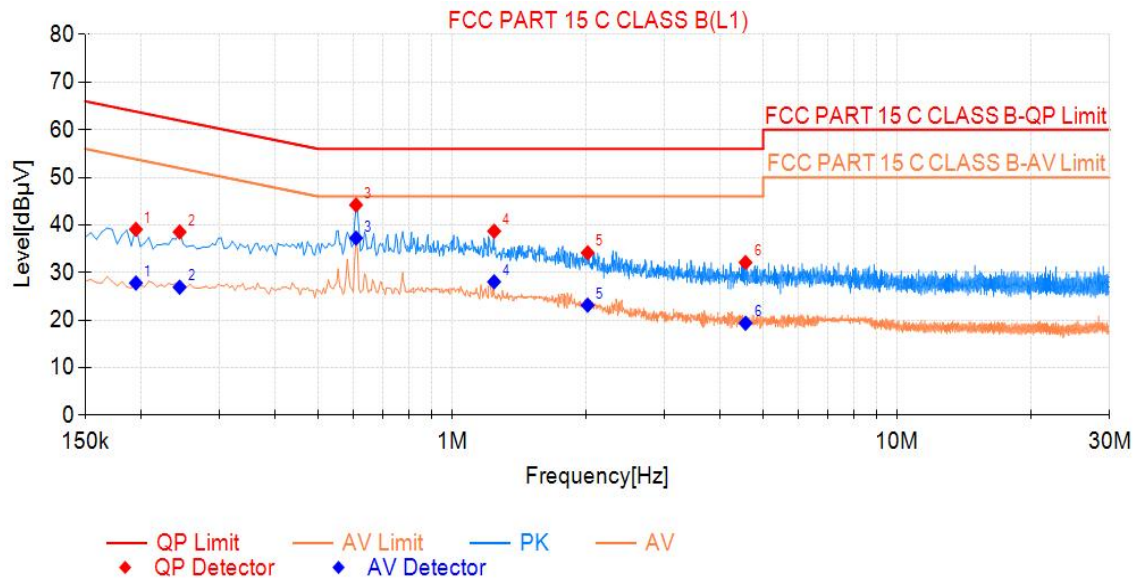
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass

Test model:Charging

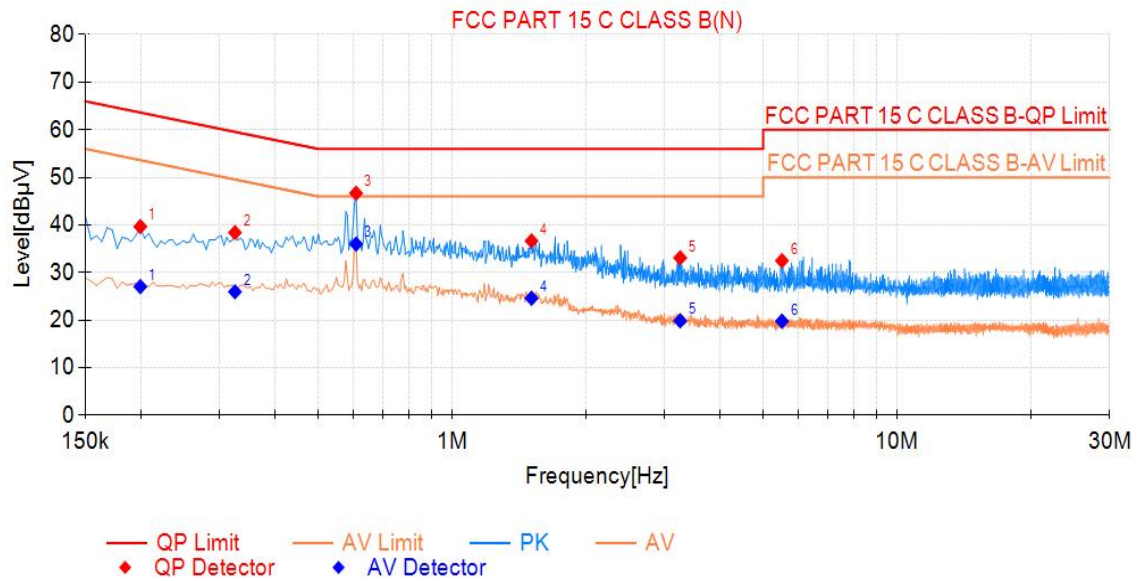
Line -120V/60Hz:



Final Data List

NO.	Freq. [MHz]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.195	39.08	63.82	24.74	27.81	53.82	26.01	PASS
2	0.245	38.53	61.94	23.41	26.92	51.94	25.02	PASS
3	0.609	44.21	56.00	11.79	37.25	46.00	8.75	PASS
4	1.244	38.71	56.00	17.29	28.06	46.00	17.94	PASS
5	2.018	34.16	56.00	21.84	23.15	46.00	22.85	PASS
6	4.565	32.11	56.00	23.89	19.36	46.00	26.64	PASS

Neutral -120V/60Hz:



Final Data List

NO.	Freq. [MHz]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.200	39.67	63.63	23.96	27.05	53.63	26.58	PASS
2	0.326	38.41	59.57	21.16	25.96	49.57	23.61	PASS
3	0.609	46.68	56.00	9.32	35.99	46.00	10.01	PASS
4	1.509	36.66	56.00	19.34	24.61	46.00	21.39	PASS
5	3.255	33.10	56.00	22.90	19.87	46.00	26.13	PASS
6	5.510	32.50	60.00	27.50	19.79	50.00	30.21	PASS



7 Transmitter spurious emissions

Test Requirement	:	FCC CFR47 Part 15 Section 15.236(g)
Test Method	:	ANSI C63.10:2013
Test Result	:	PASS
Measurement Distance	:	3m
Limit	:	See the follow table

Limits for spurious emissions

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 μ W
Standby	2 nW	2 nW	20 nW

7.1 EUT Operation

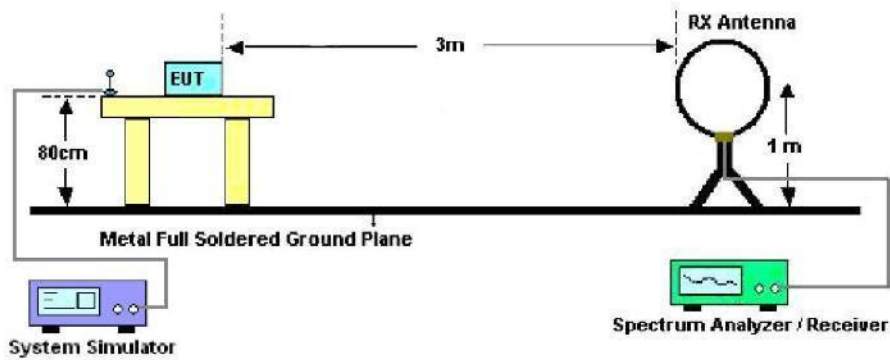
Operating Environment :

Temperature	:	24.5 °C
Humidity	:	55.5% RH
Atmospheric Pressure	:	101.3kPa
Test Voltage	:	AC 120V60Hz

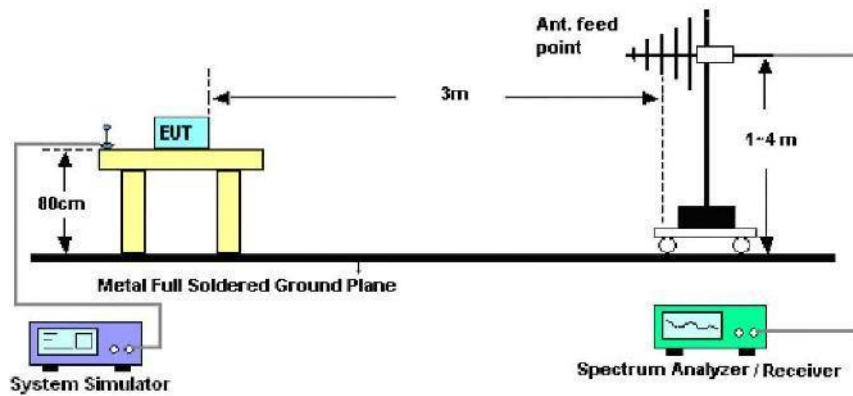
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

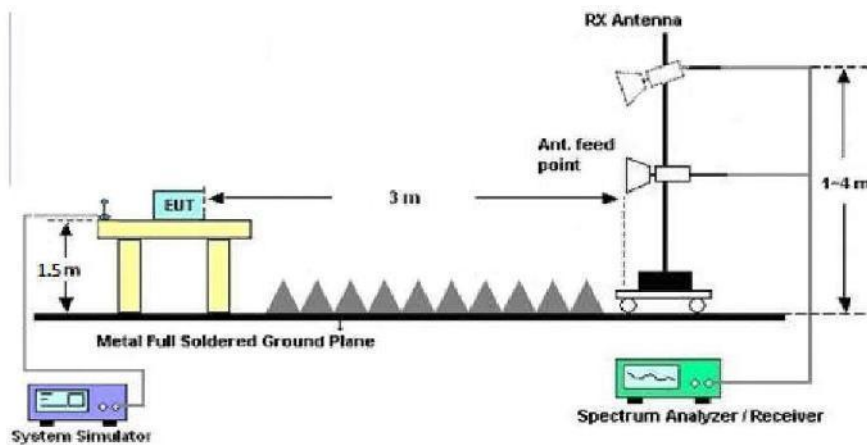
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.





7.3 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.

7.4 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over Limit (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);
Limit line = Specific limits (dBuV) + distance extrapolation factor.

Spurious Emission from 30MHz to 1GHz

Test mode:Low Channel (657MHz)					
Frequency (MHz)	Pol./Ant	Measurement (dBm)	Limit (dBm)	Margin (dB)	Result
30.4289	H	-67.88	-36	-31.88	PASS
43.1559	H	-72.99	-36	-36.99	
55.7562	H	-72.81	-54	-18.81	
102.3896	H	-70.98	-54	-16.98	
483.8471	H	-74.88	-54	-20.88	
30.1947	V	-76.12	-54	-22.12	
98.1077	V	-79.79	-36	-43.79	
218.6922	V	-78.05	-54	-24.05	
241.8443	V	-73.81	-54	-19.81	
383.6169	V	-72.86	-36	-36.86	
969.8162	V	-71.73	-36	-35.73	

Remark: All the modes have been investigated, and only worst mode is presented in this report.



Spurious Emission from 1GHz to 7GHz

Test mode:Low Channel (657MHz)					
Frequency (MHz)	Pol./Ant	Measurement (dBm)	Limit (dBm)	Margin (dB)	Result
1314.00	V	-40.15	-30	10.15	PASS
1971.00	V	-43.23	-30	13.23	
--	V	--	--	--	
1314.00	H	-41.63	-30	11.63	
1971.00	H	-42.35	-30	13.35	
--	H	--	--	--	

Test mode: Middle Channel (660MHz)					
Frequency (MHz)	Pol./Ant	Measurement (dBm)	Limit (dBm)	Margin (dB)	Result
1320.00	V	-39.81	-30	9.81	PASS
1980.00	V	-42.76	-30	12.76	
--	V	--	--	--	
1320.00	H	-40.35	-30	10.35	
1980.00	H	-43.29	-30	13.29	
--	H	--	--	--	



Test mode: High Channel (663MHz)					
Frequency (MHz)	Pol./Ant	Measurement (dBm)	Limit (dBm)	Margin (dB)	Result
1325.97	V	-41.33	-30	11.33	PASS
1987.96	V	-44.12	-30	14.12	
--	V	--	--	--	
1325.97	H	-41.92	-30	11.92	
1987.96	H	-42.16	-30	12.16	
--	H	--	--	--	

Remark: 1. The test frequency range from 25MHz to 3GHz, RBW/VBW: 100 KHz/300KHz below 1GHz, RBW/VBW:1000 KHz/3000KHz above 1GHz.

2. "-- "Other emission levels were very low against the limit and not reported.

8 Bandwidth Test

8.1 Test Standard and Limit

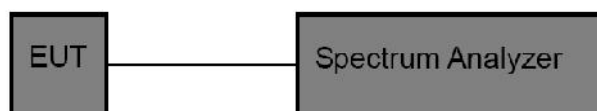
Limits from Part 2.1046 ,15.236 and test procedure from ANSI C63.10.

According to FCC 15.236(f), The operating frequency within a permissible band of operation as defined in

paragraph (c) must comply with the following requirements.

- (1) The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.
- (2) 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. Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in Section 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08) (incorporated by reference, see §15.38). Emissions outside this band shall comply with the limit specified at the edges of the ETSI mask

8.2 Test Setup



8.3 Test Procedure

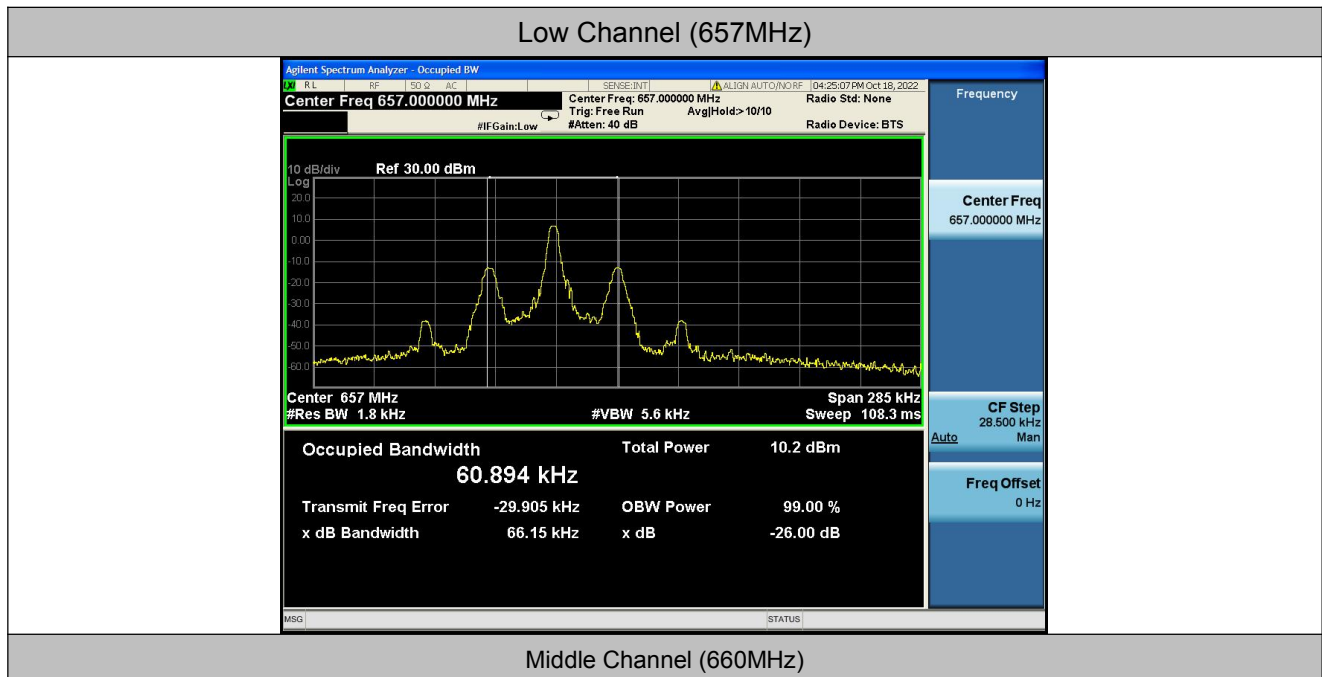
According to ANSI C63.10-2013 section 6.9 for additional Test Set-Up procedures, the occupied bandwidth of emission was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. Then mark the -26dB Bandwidth and record it.

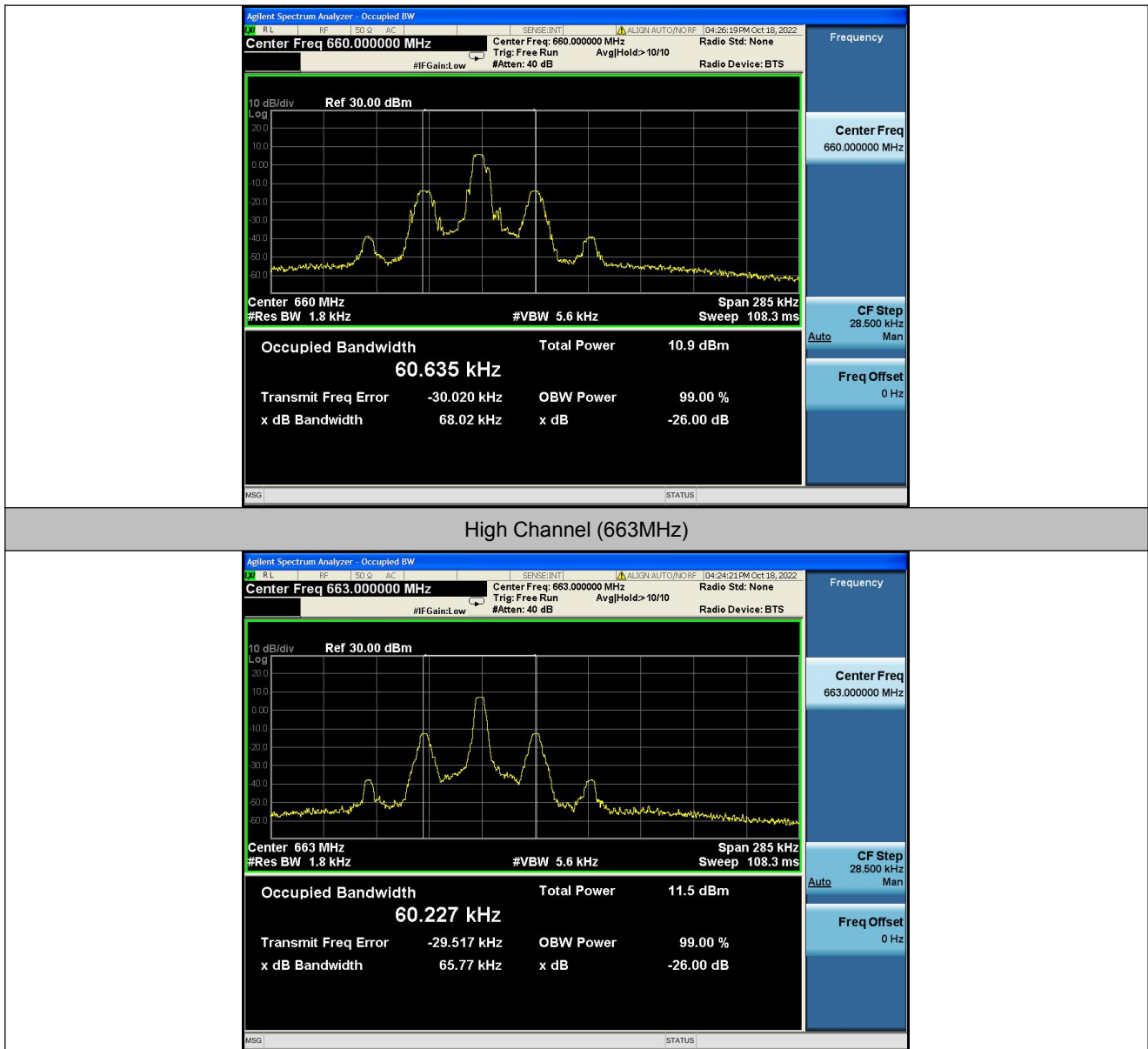


8.4 Test Data

Test Item	: Bandwidth Test	Test Mode	: CH Low ~ CH High
Test Voltage	: DC 5V	Temperature	: 24.5°C
Test Result	: PASS	Humidity	: 55%RH

Test Channel	Frequency (MHz)	-26dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
Low	657	66.15	60.894	200
Middle	660	68.02	60.635	200
High	663	65.77	60.227	200





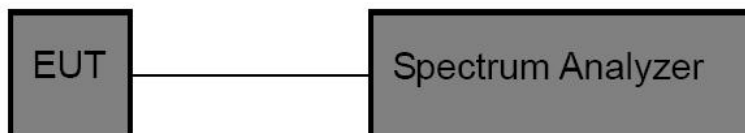
9 RF POWER OUTPUT Test

9.1 Test Standard

Test Standard	Maximum Conducted Output power at Antenna Terminals, FCC Rules 15.236(d)
---------------	---

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

9.2 Test Setup



9.3 Test Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 1.0MHz.
3. Set the VBW = 3.0MHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.



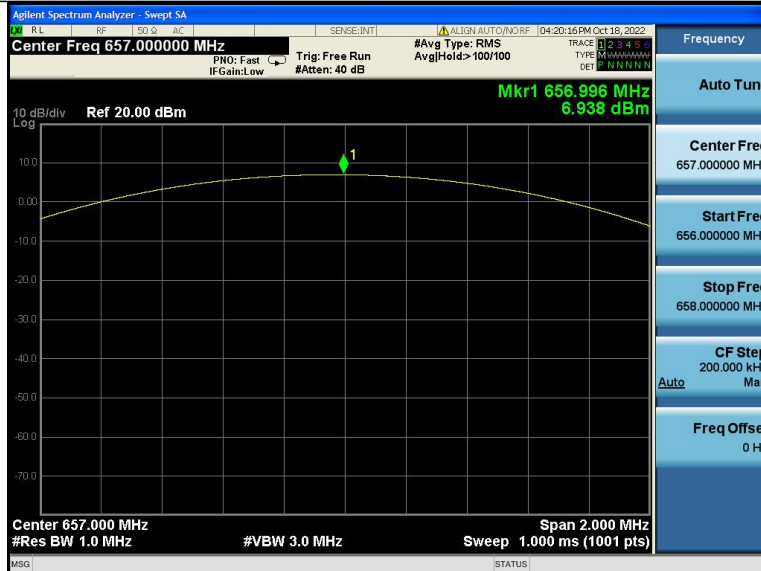
9.4 Test Data

Test Item	:	RF POWER OUTPUT Test	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 5V	Temperature	:	24.5°C
Test Result	:	PASS	Humidity	:	55%RH

Test Channel	Frequency (MHz)	Peak Output Power (dBm)	EIRP (dBm)	Limit (dBm) 20mW EIRP
Low	657	6.938	-3.162	13
Middle	660	5.992	-4.108	13
High	663	7.443	-2.657	13



Low Channel (657MHz)



Middle Channel (660MHz)



High Channel (663MHz)



Report No.: PTC22090501401E-FC01

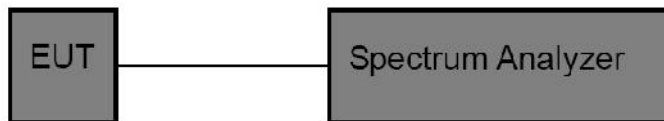


10 Necessary Bandwidth Test

10.1 Test Standard and Limit

Test Standard	Limits from Part FCC Part 15.236 (g) and test procedure from ANSI C63.10.
---------------	---

10.2 Test Setup



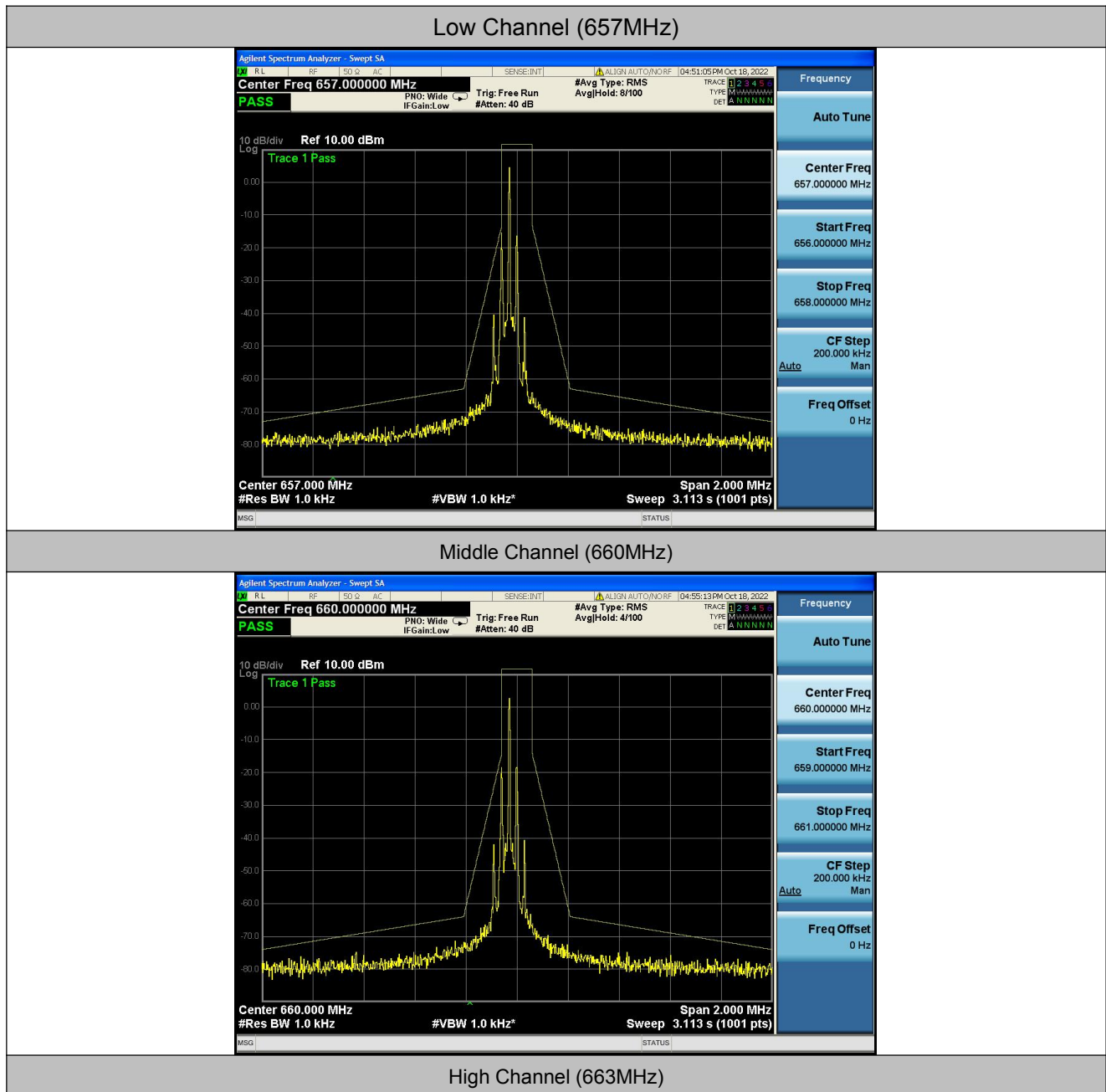
10.3 Test Procedure

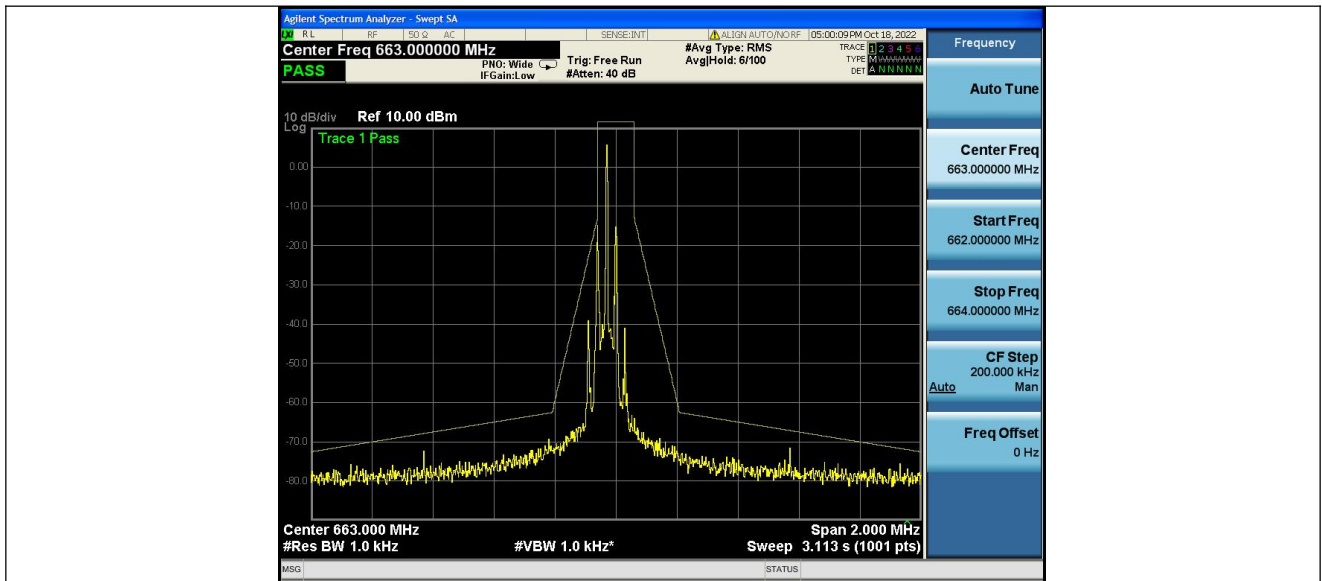
According to ETSI EN 300 422-1 V2.1.2 (2017-01) §8.3.2.1, conducted method.

10.4 Test Data

Test Item	:	Necessary Bandwidth	Test Mode	:	CH Low,CH Mid,CH High
Test Voltage	:	DC 5V	Temperature	:	24.5℃
Test Result	:	PASS	Humidity	:	55%RH

Test data:



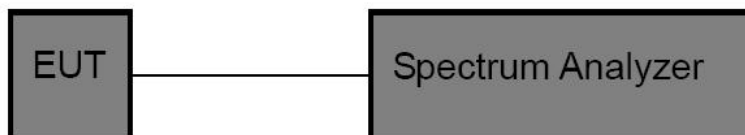


11 Frequency Stability

11.1 Test Standard and Limit

According to FCC 15.236(f)(3), 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.

11.2 Test Setup



11.3 Test Procedure

1. Setup the configuration of the ambient temperature from -20°C to 50°C with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Set frequency counter center frequency to the right frequency needs to be measured.



11.4 Test Data

Test Item : Frequency Stability
 Test Voltage : DC 5V
 Test Result : PASS

Test Mode : CH Low ~CH High
 Temperature : 24.5°C
 Humidity : 55%RH

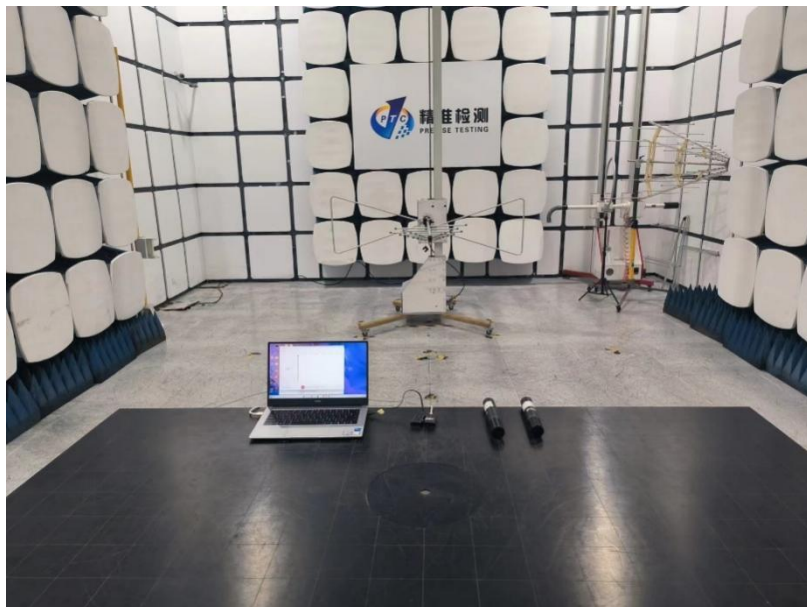
Test conditions		Frequency Error		
		657 MHz	660 MHz	663 MHz
T(-20°C)	V _{max} (3.6V)	656.9714	659.9711	662.9711
T(-10°C)	V _{nor} (3.6V)	656.9714	659.9710	662.9710
T(0°C)	V _{nor} (3.6V)	656.9711	659.9708	662.9705
T(10°C)	V _{nor} (3.6V)	656.9707	659.9705	662.9702
T _{nom} (20°C)	V _{nor} (3.6V)	656.9703	659.9701	662.9701
T(30°C)	V _{nor} (3.6V)	656.9700	659.9699	662.9701
T(40°C)	V _{nor} (3.6V)	656.9698	659.9695	662.9700
T(50°C)	V _{nor} (3.6V)	656.9697	659.9693	662.9697
T _{nom} (20°C)	V _{min} (3.06V)	656.9692	659.9691	662.9693
	V _{max} (4.14V)	656.9690	659.9689	662.9693
Max. frequency error (ppm)		-47.2123	-47.1250	-46.3701
Limit (ppm)		± 50ppm		

15 APPENDIX I -- TEST SETUP PHOTOGRAPH

Conducted Emissions



Radiated Emissions
From 30M-1GHz



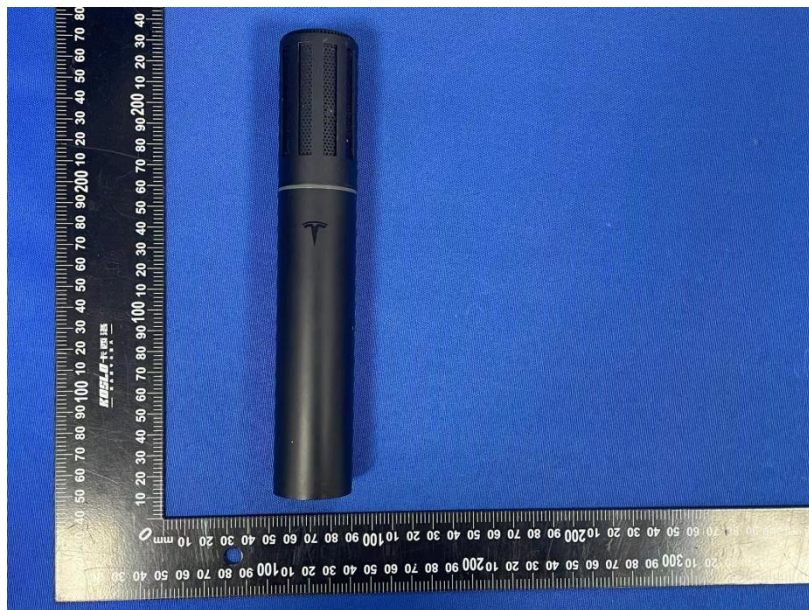
Above 1GHz

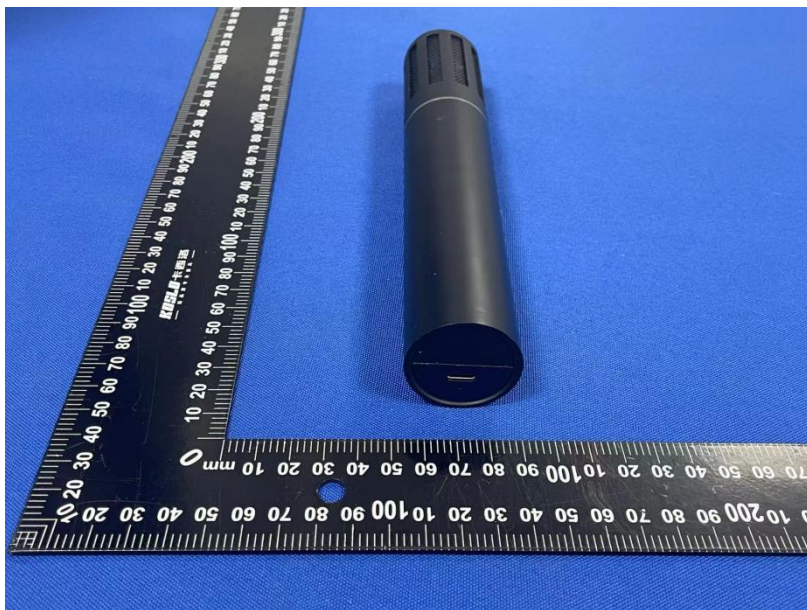
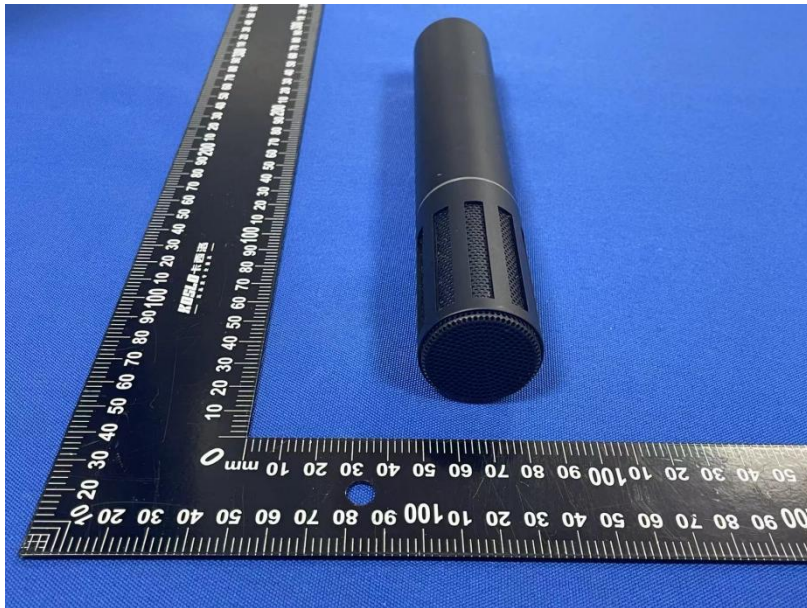


16 APPENDIX II -- EUT PHOTOGRAPH

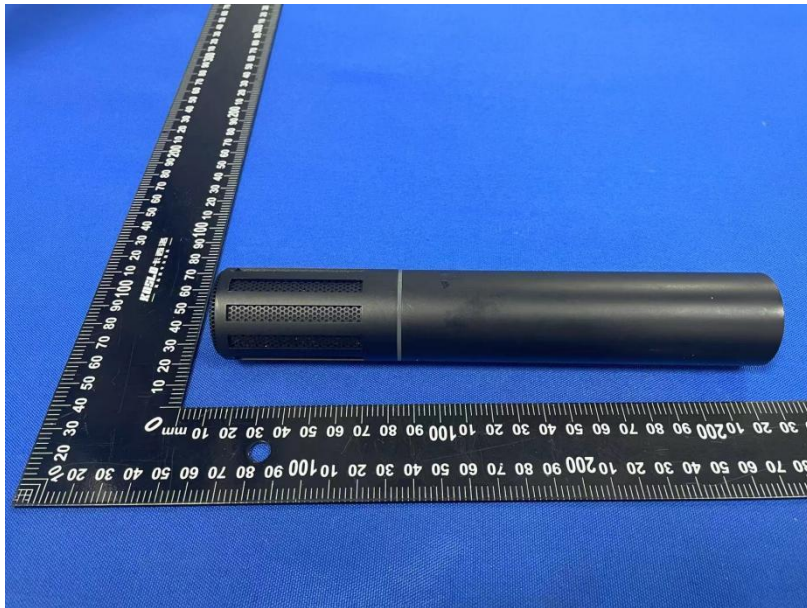


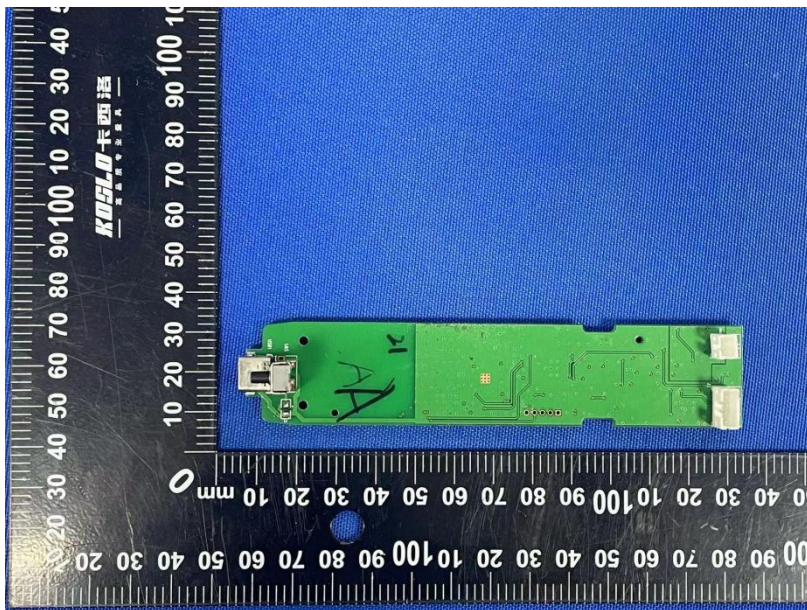
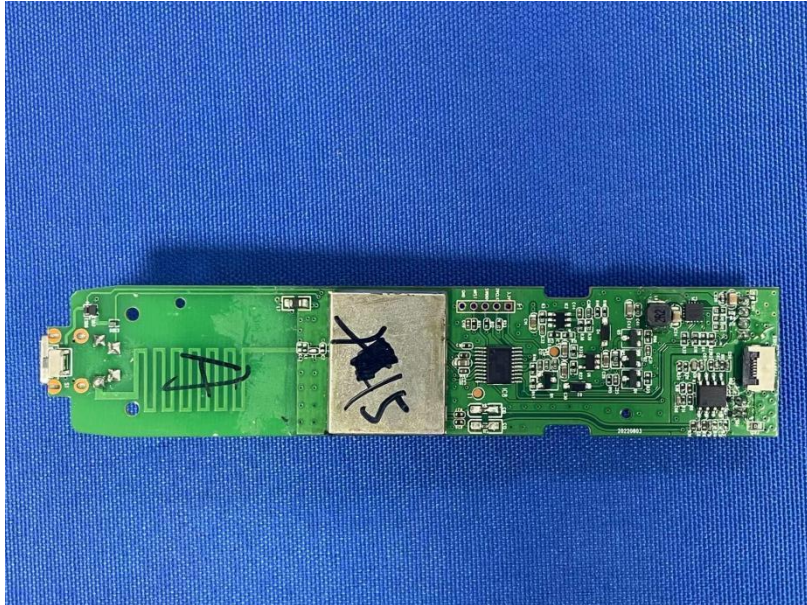


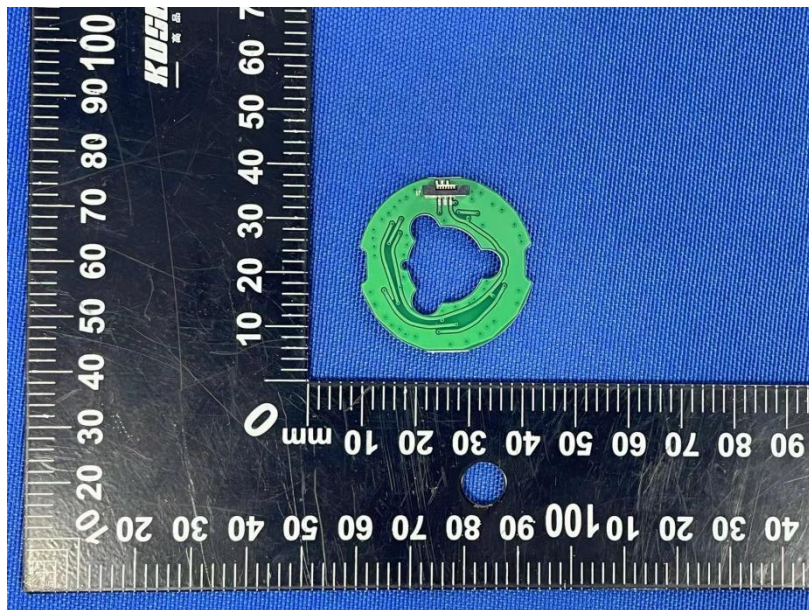
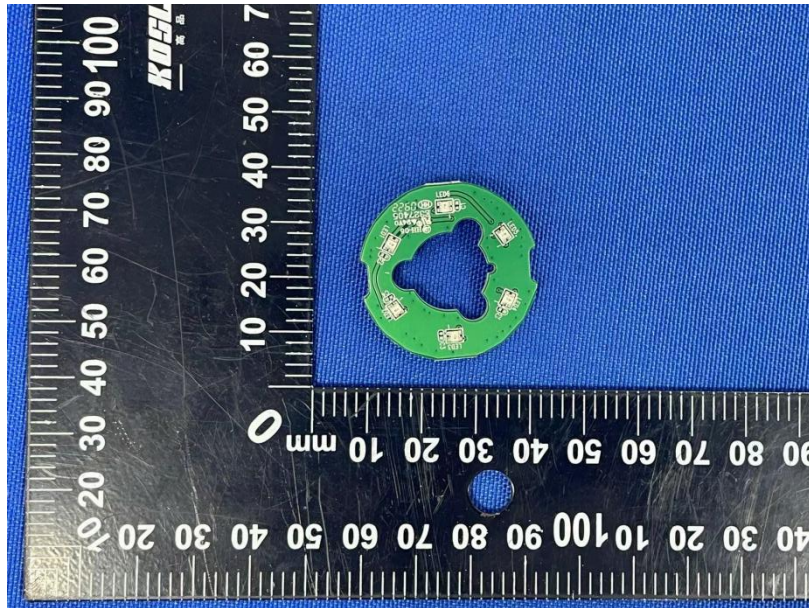


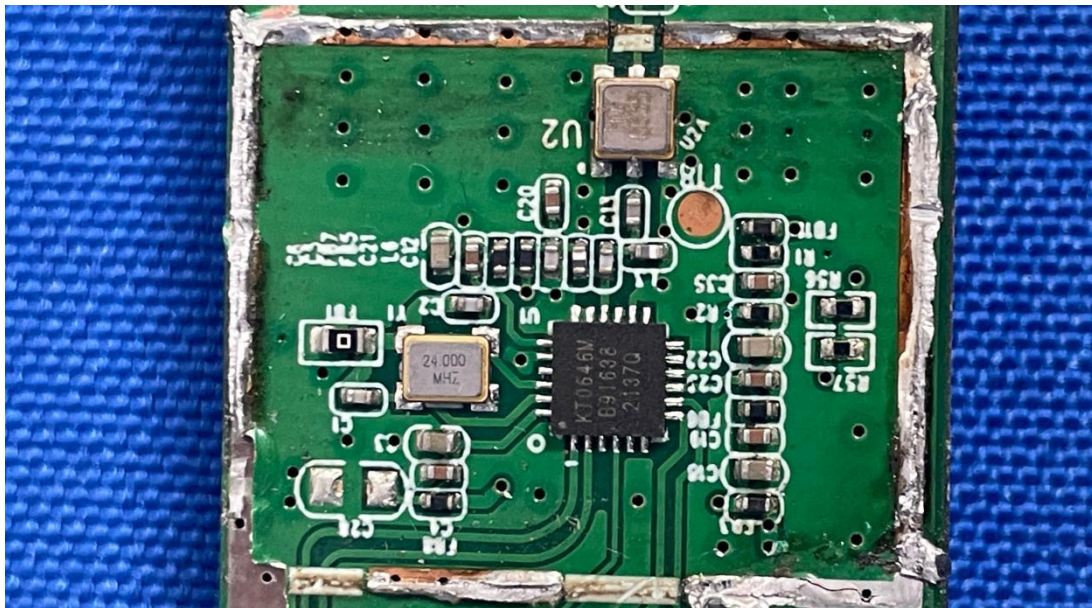
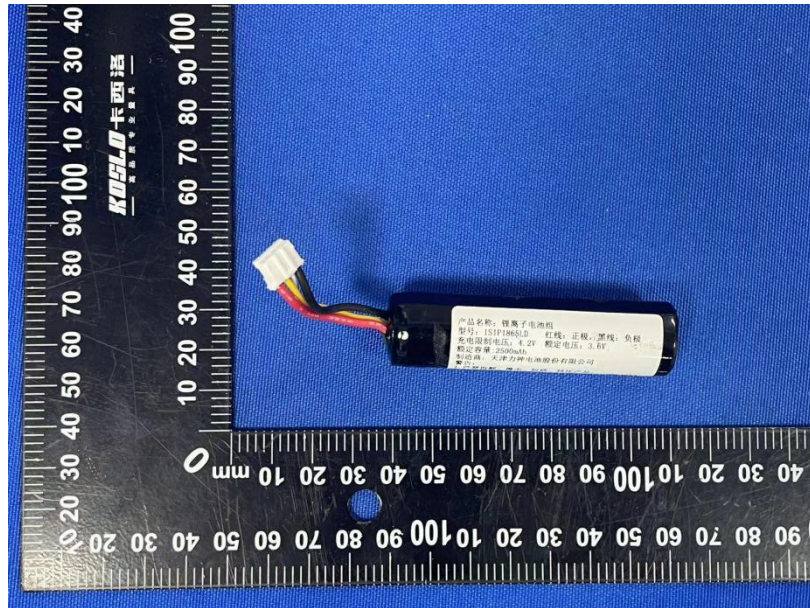












*****THE END REPORT*****