NVLAP TESTING
LABORATORY CODE 600341-0

BACL Bay Area Compliance Labs Corp.

TEST REPORT

Applicant:	**Aputure Imaging Industries Co.,Ltd.**
Address:	**3rd Floor, Building 21, Longjun industrial estate, Longhua, Bao'an, Shenzhen Guangdong 518131 China**
Product Name:	**THEOS Digital Wireless 2ch Kit**
FCC ID:	**2AABZ-DE253TX**
IC:	**28850-DE253TX**
HVIN:	**Deity DBTX Bodypack Transmitter**
Standard(s):	**47 CFR Part 15, Subpart C(15.236) RSS-210 Issue 10, December 2019, Amendment (April 2020) RSS-Gen, Issue 5, February 2021 Amendment 2 ANSI C63.10-2013**
Report Number:	**XMTN1240126-06151E-RF-00A**
Report Date:	**2024/2/21**

The above device has been tested and found compliant with the requirement of the relative standards by Bay Area Compliance Laboratories Corp. (Dongguan).

Reviewed By: Gavin Xu	**Approved By:** Ivan Cao
Title: RF Engineer	Title: EMC Manager

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	XMTN1240126-06151E-RF-00A	Original Report	2024/2/21

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	THEOS Digital Wireless 2ch Kit
EUT Model:	Deity DBTX Bodypack Transmitter
Operation Frequency:	550-607.9 MHz
Maximum Output Power (EIRP):	9.80 dBm
Modulation Type:	GFSK
Rated Input Voltage:	DC 3V from Battery
Serial Number:	2H7R-1 (For RF Conducted Test) 2H7R-3 (For Radiated Spurious Emissions Test)
EUT Received Date:	2024/1/26
EUT Received Status:	Good

1.2 Accessory Information

Manufacturer	Description	Model	Length (m)
Aputure Imaging Industries Co., Ltd	Microphone	Unknown	1.53
Aputure Imaging Industries Co., Ltd	USB	Unknown	0.36

1.3 Antenna Information Detail▲

Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain
Monopole	50	550~714MHz	1.62 dBi
The design of compliance with §15.203:			
☐ Antenna was permanently attached to the unit.			
☐ Antenna uses a unique type of connector to attach to the EUT.			
☐ Unit was professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.			
☒ This requirement does not apply to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or **§15.236**			

1.4 Equipment Modifications

No modifications are made to the EUT during all test items.

2. DESCRIPTION OF TEST CONFIGURATION

2.1 Operation Frequency Detail

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**550**	291	**579**
2	550.1	292	579.1
3	550.2	293	579.2
~	~	~	~
~	~	~	~
~	~	~	~
289	578.8	579	607.8
290	578.9	580	**607.9**

2.2 EUT Operation Condition

The system was configured for testing in Engineering Mode, which was provided by the manufacturer. The test modes and channel can be switched by keys in this Engineering Mode sample. The following summary table is showing all test modes to demonstrate in compliance with the standard:

Test Items	Test Modes
RF Conducted	Mode 1: Transmitting
Radiated Emission	Mode 1: Transmitting
AC Line Conducted Emission	Not Applicable, the device was powered by battery.
Note: Mode 1 was tested with the frequencies in bold in section 2.1.	

2.3 EUT Exercise Software

No.

2.4 Support Equipment List and Details

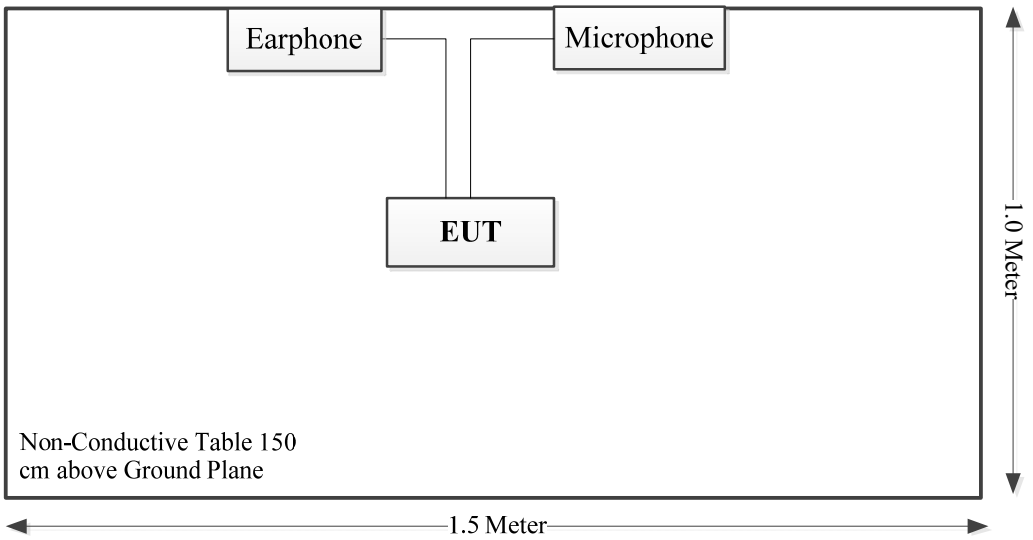
Manufacturer	Description	Model	Serial Number
/	/	/	/

2.5 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Earphone Cable	No	No	1.2	Earphone	EUT
Microphone Cable	No	No	1.53	Microphone	EUT

2.6 Block Diagram of Test Setup

Spurious emissions:



2.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 829273, the FCC Designation No. : CN5044.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

2.7 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	9kHz~30MHz: 3.3dB, 30MHz~200MHz: 4.55 dB, 200MHz~1GHz: 5.92 dB, 1GHz~6GHz: 4.98 dB, 6GHz~18GHz: 5.89 dB, 18GHz~26.5GHz:5.47 dB, 26.5GHz~40GHz:5.63 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.11 dB (150 kHz to 30 MHz)

3. SUMMARY OF TEST RESULTS

Standard(s)/Rule(s)	Description of Test	Result
§15.207(a) RSS-Gen Clause 8.8	AC Line Conducted Emissions	Not Applicable
§15.236(d) RSS-210 Annex G G.1	RF Output Power	Compliant
§15.236(f)(2) RSS-210 Annex G G.2	Operating Bandwidth	Compliant
§15.236(g) RSS-210 Annex G G.4	Emission Mask	Compliant
§15.236(f)(3) RSS-210 Annex G G.3	Frequency Tolerance	Compliant
§15.236(g) RSS-210 Annex G G.4	Spurious Emission	Compliant
§15.203 RSS-Gen Clause 6.8	Antenna Requirement	Compliant

4. REQUIREMENTS AND TEST RESULTS

4.1 AC Line Conducted Emissions

Not Applicable, the device was powered by battery.

4.2 RF Output Power

4.2.1 Applicable Standard

FCC§15.236(d)

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.

RSS-210 Annex G G.1

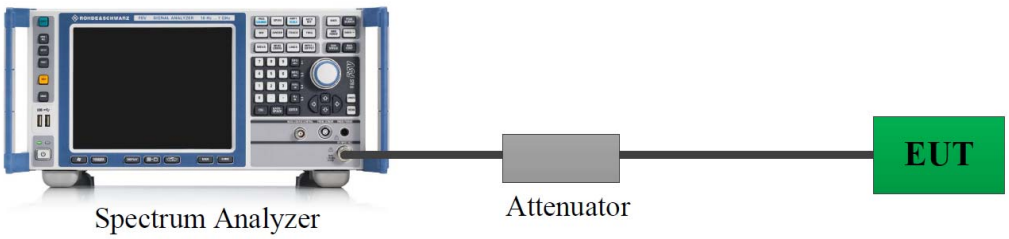
The transmit power shall be measured in average value as a conducted emission over any period of continuous transmission.

The frequency bands, transmit e.i.r.p., authorized bandwidth and frequency stability limits for devices are provided in table G1.

Table G1 — Specifications for wireless microphones

Frequency bands (MHz)	Transmit e.i.r.p. (mW)	Authorized bandwidth (kHz)	Frequency stability (± ppm)
54-72 76-88 174-216	50	200	50
470-608	250		
614-616 653-663	20		

4.2.2 EUT Setup



4.2.3 Test Procedure

Use the following spectrum analyzer settings:
1) Span: Approximately five times the 20 dB bandwidth.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.
b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
e) A plot of the test results and setup description shall be included in the test report.

EIRP = P +G
P is the transmitter output power, in dBm(power over a specified reference bandwidth)
G is the gain of the transmitting antenna, in dBi (EIRP)

4.2.4 Test Result

Serial Number:	2H7R-1	Test Date:	2024/1/31-2024/2/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Stu Song	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	21.8-24.6	Relative Humidity: (%)	65-67	ATM Pressure: (kPa)	100.8-101.3

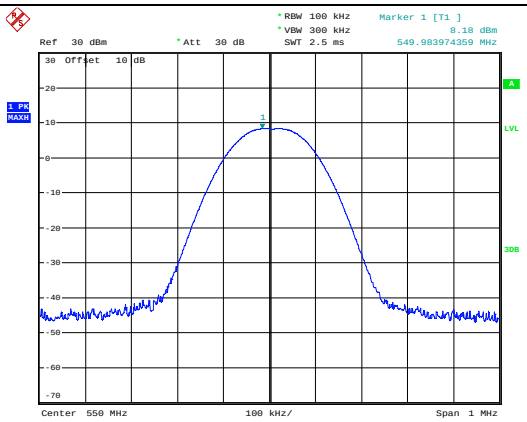
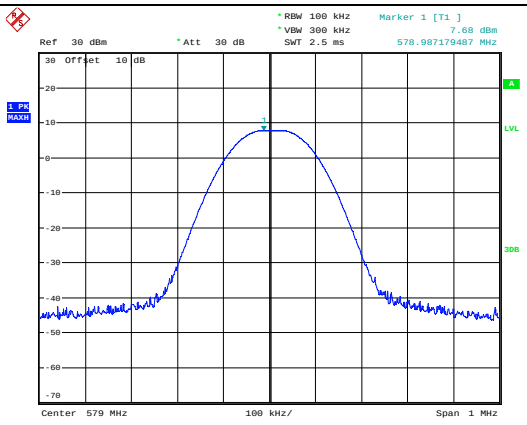
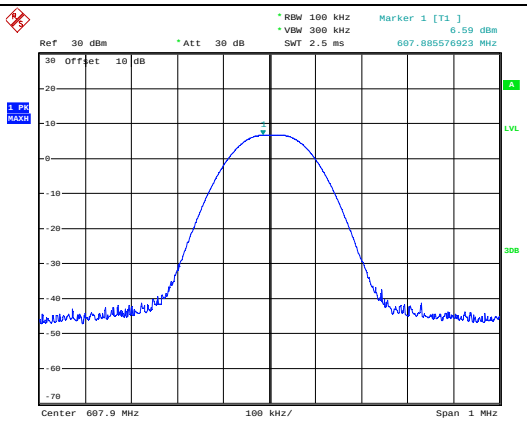
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200160/026	2023/10/18	2024/10/17
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010012	2023/9/1	2024/8/31
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2023/9/1	2024/8/31

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	FCC Limit (dBm)	IC Limit (dBm)
550	8.18	1.62	9.80	17.0	24.0
579	7.68	1.62	9.30	17.0	24.0
607.9	6.59	1.62	8.21	17.0	24.0

Conducted Output Power	
Low Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 31.JAN.2024 13:08:57
Middle Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 31.JAN.2024 13:10:11
High Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 20.FEB.2024 11:56:35

4.3 Operating Bandwidth

4.3.1 Applicable Standard

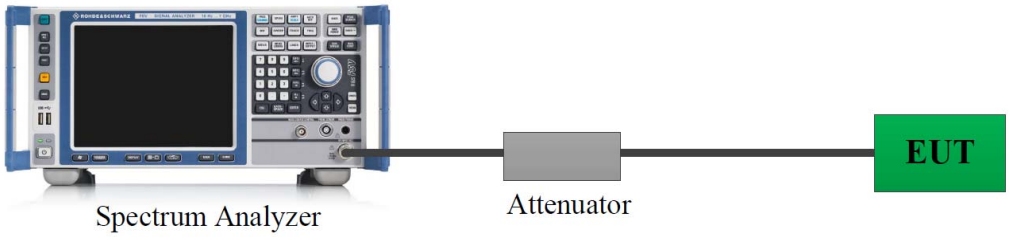
FCC§15.236(f)(2)

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.

RSS-210 Annex G G.2

The occupied bandwidth for wireless microphones shall not exceed the authorized bandwidth specified in table G1

4.3.2 EUT Setup



4.3.3 Test Procedure

According to ANSI C63.10-2013 Section 6.9.2

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2
d) Steps a) through c) might require iteration to adjust within the specified tolerances.
e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
f) Set detection mode to peak and trace mode to max hold.
g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "−xx dB down
amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

According to ANSI C63.10-2013 Section 6.9.3

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:
a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

4.3.4 Test Result

Serial Number:	2H7R-1	Test Date:	2024/1/31-2024/2/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Stu Song	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	21.8-24.6	Relative Humidity: (%)	65-67	ATM Pressure: (kPa)	100.8-101.3

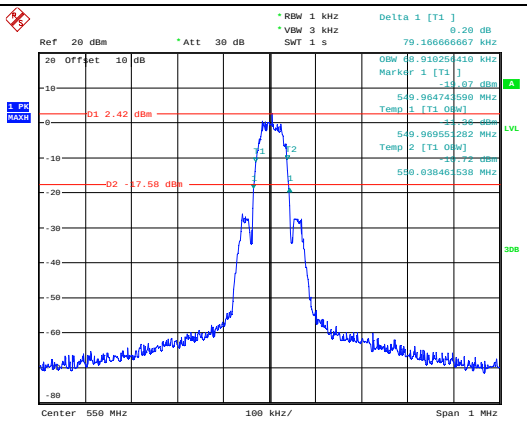
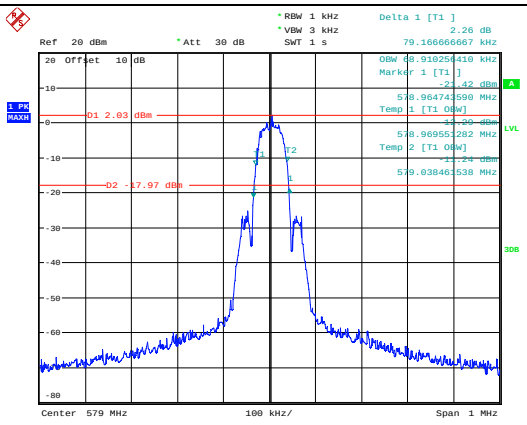
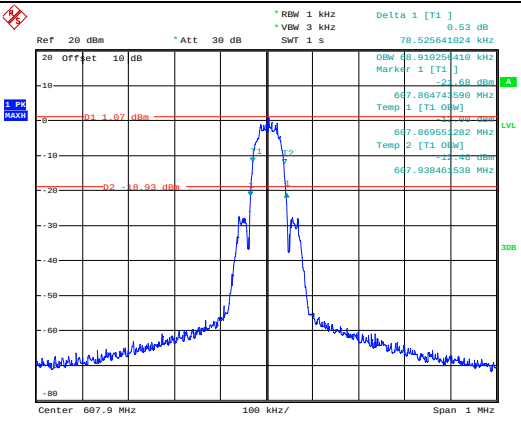
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200160/026	2023/10/18	2024/10/17
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010012	2023/9/1	2024/8/31
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2023/9/1	2024/8/31

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Frequency (MHz)	99% Occupied Bandwidth (kHz)	20 dB Bandwidth (kHz)	Limit (kHz)
550	68.910	79.167	200
579	68.910	79.167	200
607.9	68.910	78.526	200
Note: the Necessary Bandwidth is 100kHz			

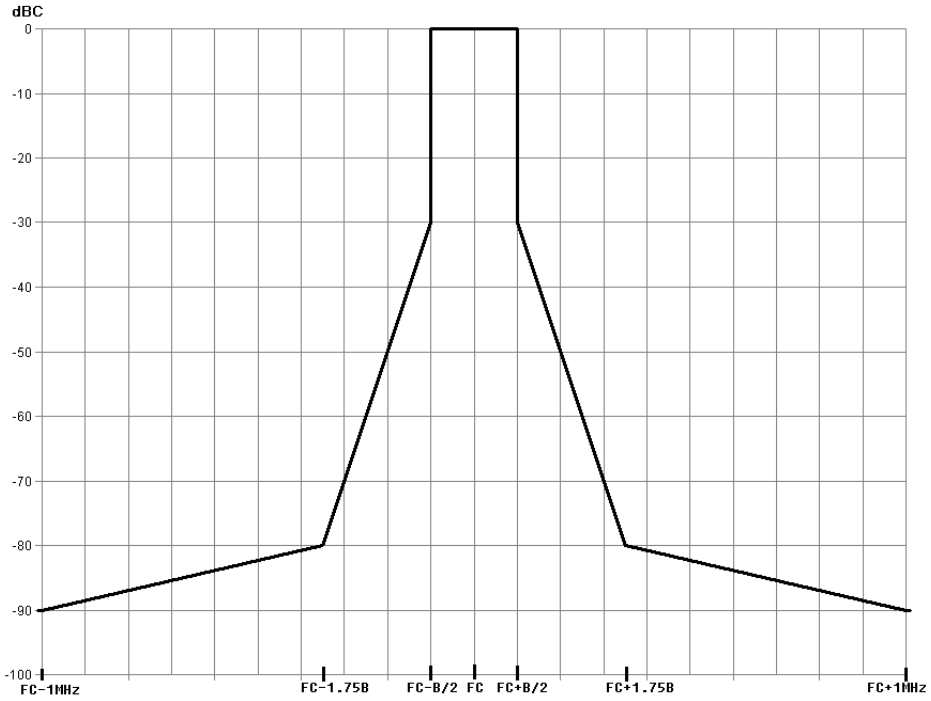
99% Occupied Bandwidth&20 dB Bandwidth	
Low Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 20.FEB.2024 13:03:11
Middle Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 20.FEB.2024 13:05:18
High Channel	 ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song Date: 20.FEB.2024 13:10:51

4.4 Emission Mask

4.4.1 Applicable Standard

FCC§15.236(g)

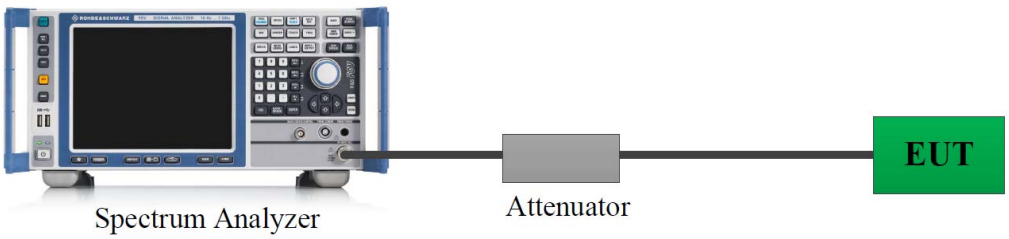
Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).



RSS-210 Annex G G.4

The transmitter unwanted emissions shall meet and be measured according to the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1.

4.4.2 EUT Setup



4.4.3 Test Procedure

According to sections 8.3.2.1 of ETSI EN 300 422-1 V1.4.2 (2011-08)

Principal Spectrum Mask measuring method for digital transmitters:

Spectrum mask below 1 GHz, see figure 4, for the spectrum mask above 1 GHz, see figure 5

The transmitter shall be modulated with the test signals defined in clause 7.1.2. In any case the mask shall not be exceeded.

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.

4.4.4 Test Result

Serial Number:	2H7R-1	Test Date:	2024/1/31-2024/2/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Stu Song	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	21.8-24.6	Relative Humidity: (%)	65-67	ATM Pressure: (kPa)	100.8-101.3

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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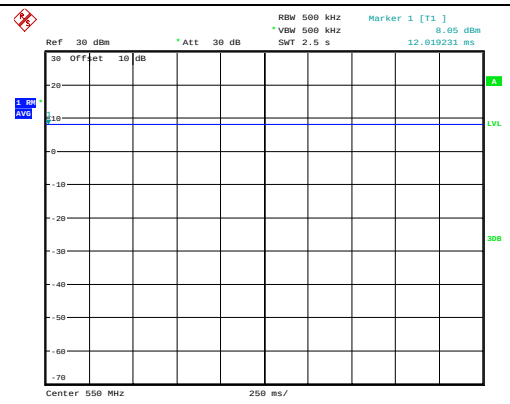
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010012	2023/9/1	2024/8/31
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2023/9/1	2024/8/31

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Note: the Necessary Bandwidth is 100kHz

550MHz



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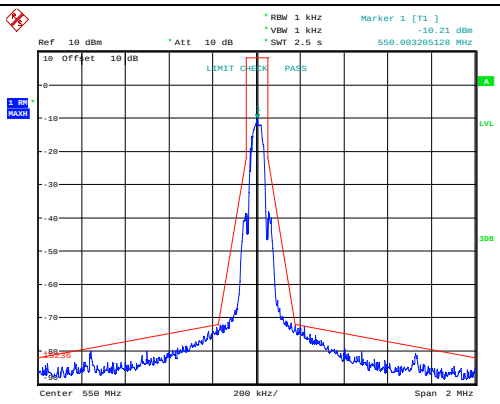

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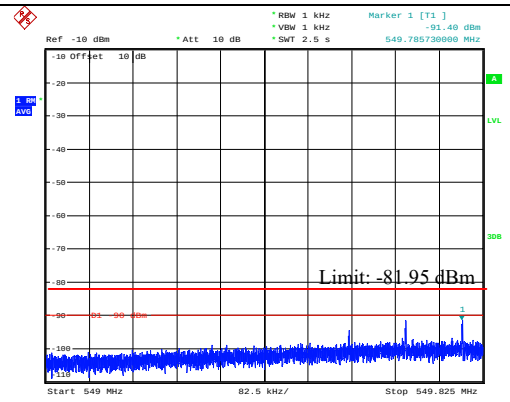

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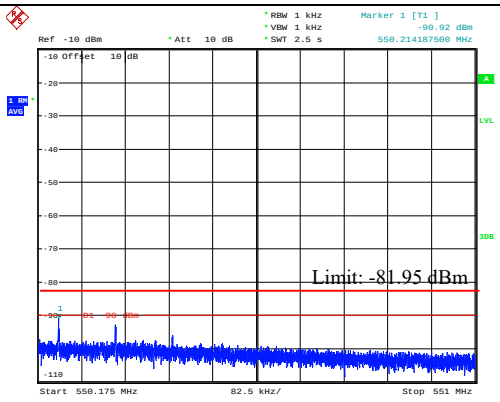

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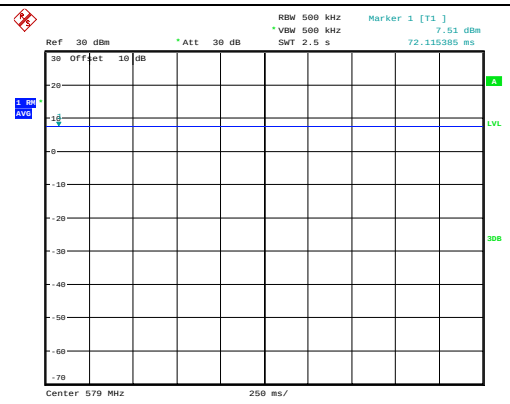

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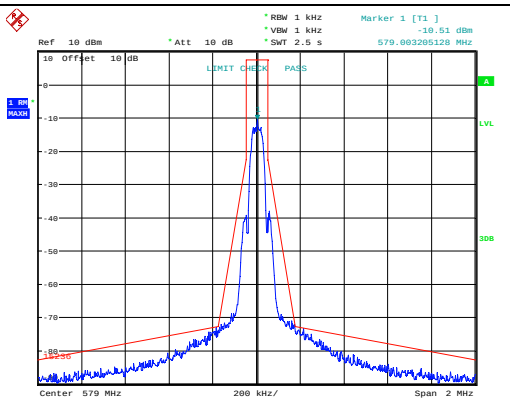

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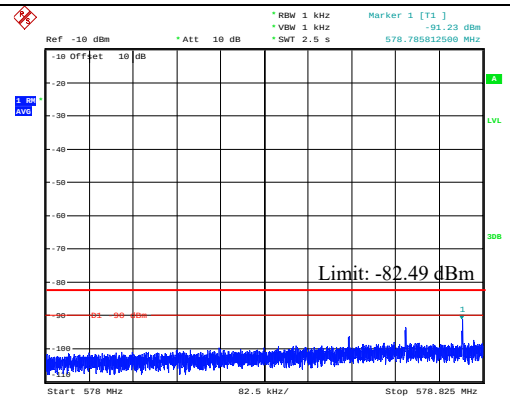

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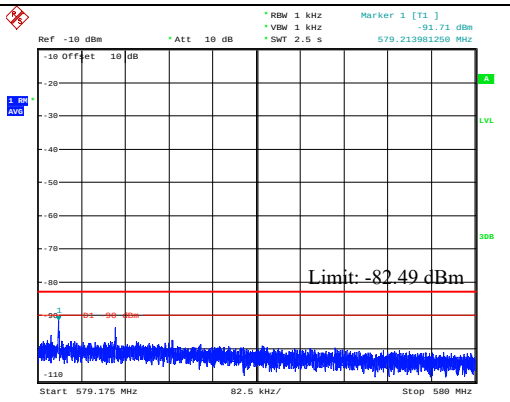

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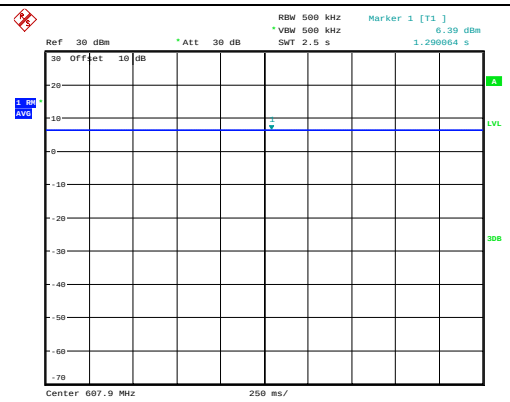
607.9MHz



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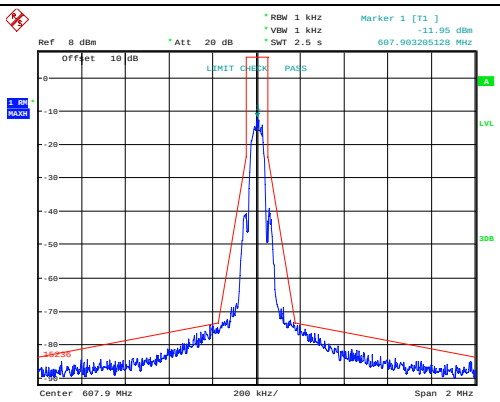

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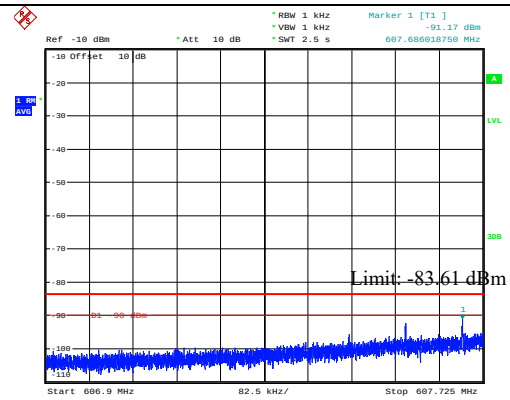

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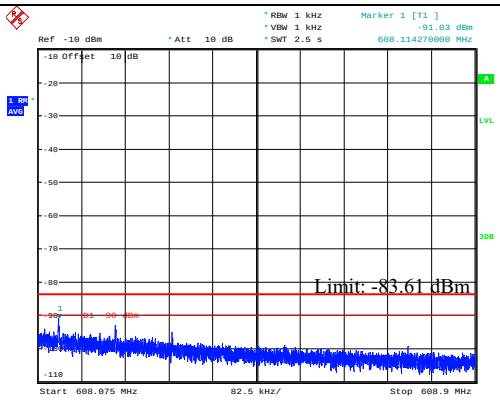
Date: 20.FEB.2024 14:34:31



ProjectNo.:XMTN1240126-06151E-RF Tester:Stu Song
Date: 20.FEB.2024 14:37:51

4.5 Spurious Emissions

4.5.1 Applicable Standard

FCC§15.236(g)

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), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).

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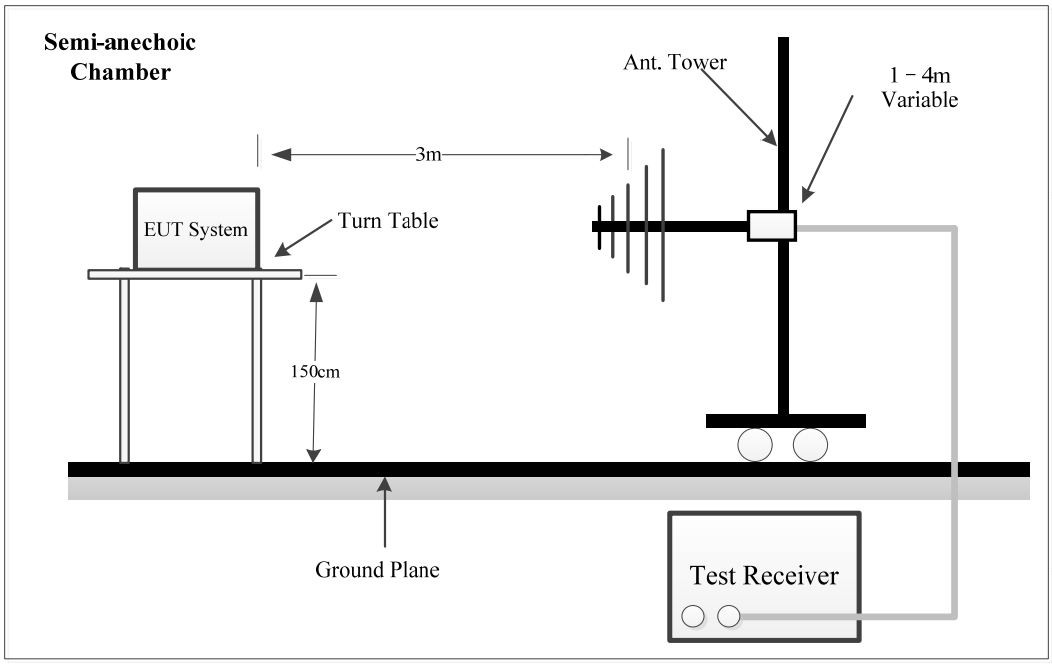
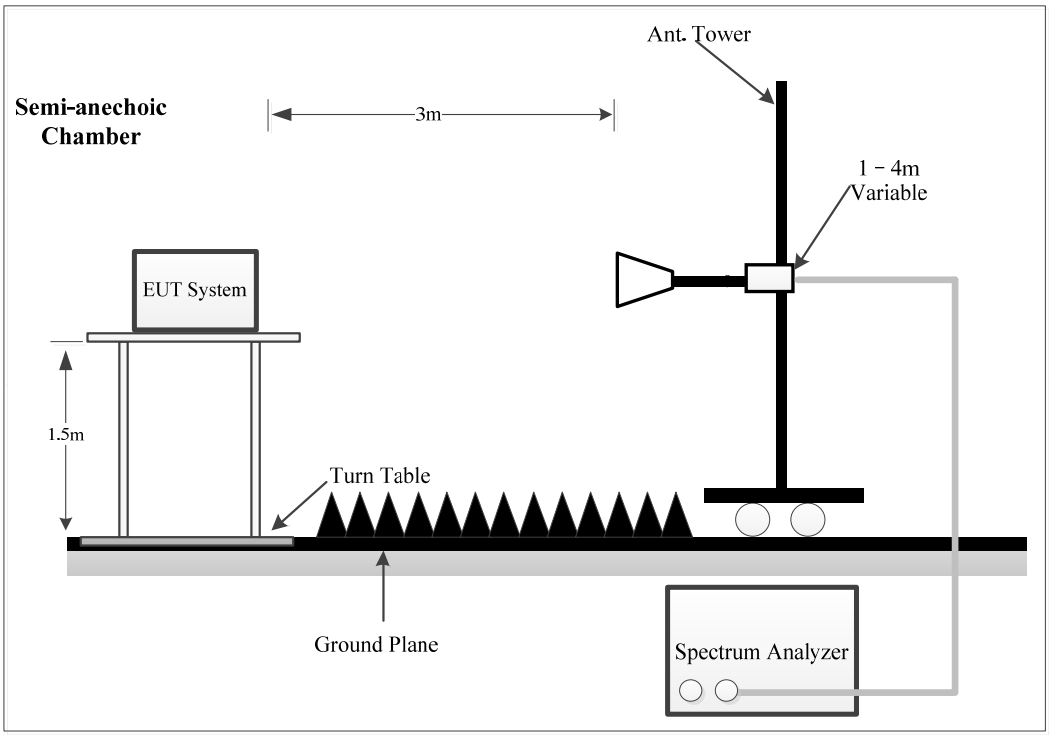
The transmitter unwanted emissions shall meet and be measured according to the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1.

4.5.2 EUT Setup
25MHz~1GHz:



Above 1GHz:



4.5.3 Test Procedure

As Per section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08)
On a test site, the sample shall be placed at the specified height on a non-conducting support. The transmitter shall be operated at the power as specified under clause 8.2, delivered to the antenna (see clause 5.1.1).
Radiation of any spurious components shall be detected by the test antenna and receiver, over the frequency range specified below, excluding the 250 % (out of band region) band of frequencies centred on the channel on which the transmitter is intended to operate.
NOTE: The 250 % (out of band region) exclusion is covered by measurements carried out in clauses 8.3.1 and 8.3.2.
The measuring receiver, as defined in table 4, shall be tuned over the frequency range 25 MHz to 4 GHz for equipment operating on frequencies below 1 GHz or in the frequency range of 25 MHz to 12,75 GHz for equipment operating on frequencies above 1 GHz.
At each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement.
The measurement shall be repeated with the test antenna in the orthogonal polarization plane.
If the transmitter allows for standby operation, the tests shall be repeated with the transmitter in standby mode.

4.5.4 Test Result

Serial Number:	2H7R-3	Test Date:	Below 1GHz: 2024/2/29 Above 1GHz: 2024/2/2
Test Site:	Chamber A, Chamber B	Test Mode:	Transmitting
Tester:	Bill Yang, Joe Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	22.1	Relative Humidity: (%)	55.0~65.0	ATM Pressure: (kPa)	101.1

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
25MHz~1000MHz					
Sunol Sciences	Hybrid Antenna	JB3	A060611-1	2023/9/6	2024/9/5
Narda	Attenuator	779-6dB	04269	2023/9/6	2024/9/5
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-04	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2023/8/1	2024/7/31
Sonoma	Amplifier	310N	185914	2023/8/1	2024/7/31
R&S	EMI Test Receiver	ESCI	100224	2023/8/18	2024/8/17
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2023/9/4	2024/9/3
Agilent	Signal Generator	E8247C	MY43321350	2023/10/18	2024/10/17
Above 1GHz					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2023/9/7	2024/9/6
AH	Horn Antenna	SAS-571	1177	2023/2/22	2026/2/22
Xinhang Macrowave	Coaxial Cable	XH750A-N/J-SMA/J-10M	20231117004 #0001	2023/11/17	2024/11/16
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2023/9/4	2024/9/3
AH	Preamplifier	PAM-0118P	469	2023/8/19	2024/8/18
Agilent	Spectrum Analyzer	E4440A	MY44303352	2023/10/18	2024/10/17
Agilent	Signal Generator	E8247C	MY43321350	2023/10/18	2024/10/17
Mini-Circuits	High Pass Filter	VHF-1200+	31102	2023/8/1	2024/7/31

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Please refer to the below table and plots.

After pre-scan in the X, Y and Z axes of orientation, the worst case is below:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
frequency:550MHz								
479.86	H	47.62	-58.07	0.00	0.25	-58.32	-54.00	4.32
608.41	V	42.37	-57.43	0.00	0.24	-57.67	-54.00	3.67
1100.00	H	76.05	-41.56	7.40	1.02	-35.18	-30.00	5.18
1100.00	V	76.95	-41.06	7.40	1.02	-34.68	-30.00	4.68
1650.00	H	69.05	-49.04	10.45	0.72	-39.31	-30.00	9.31
1650.00	V	71.58	-47.11	10.45	0.72	-37.38	-30.00	7.38
2200.00	H	64.98	-51.52	10.80	1.14	-41.86	-30.00	11.86
2200.00	V	67.95	-48.45	10.80	1.14	-38.79	-30.00	8.79
2750.00	H	51.62	-64.05	13.10	1.31	-52.26	-30.00	22.26
2750.00	V	52.66	-63.16	13.10	1.31	-51.37	-30.00	21.37
3300.00	H	50.16	-62.84	13.60	1.59	-50.83	-30.00	20.83
3300.00	V	50.48	-62.52	13.60	1.59	-50.51	-30.00	20.51
3850.00	H	50.69	-60.07	13.50	1.51	-48.08	-30.00	18.08
3850.00	V	51.78	-58.84	13.50	1.51	-46.85	-30.00	16.85
4400.00	H	50.64	-60.17	13.90	1.86	-48.13	-30.00	18.13
4400.00	V	51.99	-58.68	13.90	1.86	-46.64	-30.00	16.64
frequency:579MHz								
477.21	H	47.38	-58.34	0.00	0.24	-58.58	-54.00	4.58
609.83	V	40.98	-58.79	0.00	0.24	-59.03	-54.00	5.03
1158.00	H	75.62	-41.54	7.34	1.06	-35.26	-30.00	5.26
1158.00	V	78.95	-39.02	7.34	1.06	-32.74	-30.00	2.74
1737.00	H	65.85	-51.68	10.91	0.72	-41.49	-30.00	11.49
1737.00	V	68.52	-49.61	10.91	0.72	-39.42	-30.00	9.42
2316.00	H	62.35	-53.25	11.38	1.24	-43.11	-30.00	13.11
2316.00	V	68.84	-46.71	11.38	1.24	-36.57	-30.00	6.57
2895.00	H	48.95	-65.47	13.86	1.35	-52.96	-30.00	22.96
2895.00	V	49.05	-65.66	13.86	1.35	-53.15	-30.00	23.15
3474.00	H	49.62	-62.79	13.88	1.62	-50.53	-30.00	20.53
3474.00	V	50.23	-62.21	13.88	1.62	-49.95	-30.00	19.95
4053.00	H	50.33	-61.18	13.84	1.39	-48.73	-30.00	18.73
4053.00	V	50.66	-60.95	13.84	1.39	-48.50	-30.00	18.50
4632.00	H	49.21	-61.67	14.26	1.79	-49.20	-30.00	19.20
4632.00	V	50.31	-60.67	14.26	1.79	-48.20	-30.00	18.20

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
frequency:607.9MHz								
480.17	H	48.06	-57.62	0.00	0.25	-57.87	-54.00	3.87
607.44	V	41.27	-58.56	0.00	0.24	-58.80	-54.00	4.80
1215.80	H	77.14	-39.79	7.46	1.11	-33.44	-30.00	3.44
1215.80	V	80.12	-37.88	7.46	1.11	-31.53	-30.00	1.53
1823.70	H	68.55	-48.97	11.27	0.76	-38.46	-30.00	8.46
1823.70	V	69.85	-48.20	11.27	0.76	-37.69	-30.00	7.69
2431.60	H	57.24	-58.63	12.55	1.27	-47.35	-30.00	17.35
2431.60	V	59.62	-56.38	12.55	1.27	-45.10	-30.00	15.10
3039.50	H	49.62	-63.76	13.68	1.63	-51.71	-30.00	21.71
3039.50	V	50.32	-63.18	13.68	1.63	-51.13	-30.00	21.13
3647.40	H	49.66	-62.57	14.05	1.66	-50.18	-30.00	20.18
3647.40	V	50.41	-61.81	14.05	1.66	-49.42	-30.00	19.42
4255.30	H	50.32	-60.81	13.94	1.12	-47.99	-30.00	17.99
4255.30	V	50.78	-60.36	13.94	1.12	-47.54	-30.00	17.54
4863.20	H	49.35	-60.22	14.05	1.50	-47.67	-30.00	17.67
4863.20	V	50.29	-58.69	14.05	1.50	-46.14	-30.00	16.14

Note 1:The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.
Note 2:
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

4.6 Frequency Tolerance

4.6.1 Applicable Standard

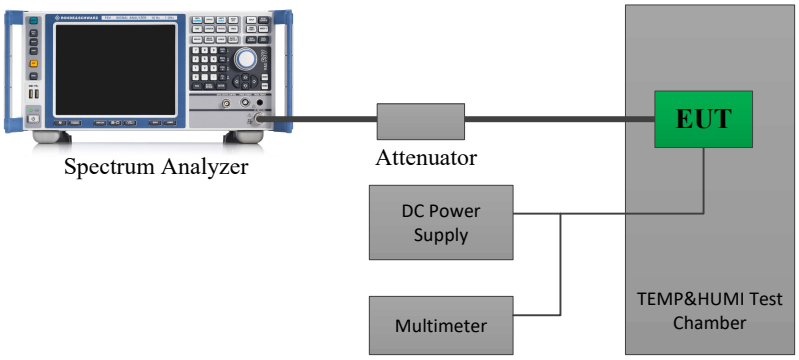
FCC§15.236(f)(3)

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.

RSS-210 Annex G G.3

The frequency stability of equipment shall comply with the limits specified in table G1 (above), when tested under the frequency stability testing conditions specified in RSS-Gen.

4.4.2 EUT Setup



4.6.2 Test Procedure

According to ANSI C63.10-2013 Section 6.8

Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory agency is the recommended measuring instrument.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10 °C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15 °C to +25 °C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory agency is the recommended measuring instrument.

b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

c) Measure the frequency at each of the frequencies specified in 5.6.

d) Repeat the above procedure at 85% and 115% of the nominal supply voltage as described in 5.13.

4.6.3 Test Result

Serial Number:	2H7R-1	Test Date:	2024/1/31-2024/2/20
Test Site:	RF	Test Mode:	Transmitting
Tester:	Stu Song	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	21.8-24.6	Relative Humidity: (%)	65-67	ATM Pressure: (kPa)	100.8-101.3

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200160/026	2023/10/18	2024/10/17
yzjingcheng	Coaxial Cable	KTRFBU-141-50	41010012	2023/9/1	2024/8/31
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2023/9/1	2024/8/31
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2023/10/18	2024/10/17
All-sun	Multimeter	EM305A	8348897	2023/8/3	2024/8/2
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

		fc =	**579**	**MHz**
Temperature (℃)	**Voltage (Vdc)**	**Reading (MHz)**	**Frequency Error (%)**	**Limit (%)**
-20	3	579.0169048	0.0029	±0.005
-10		579.0137942	0.0024	
0		579.0102245	0.0018	
10		579.0068427	0.0012	
20		579.0040064	0.0007	
30		579.0008451	0.0001	
40		578.9972499	-0.0005	
50		578.9943256	-0.0010	
20	2.55	579.0099452	0.0017	
20	3.45	578.9983473	-0.0003	

4.7 Antenna Requirement

4.7.1 Applicable Standard

FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen Clause 6.8

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.
The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.
For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:
This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

4.7.2 Judgment

Compliant. Please refer to the Antenna Information detail in Section 1.3.

APPENDIX A - EUT PHOTOGRAPHS

Please refer to the attachment XMTN1240126-06151E-RF-EXP EUT EXTERNAL PHOTOGRAPHS and XMTN1240126-06151E-RF-INP EUT INTERNAL PHOTOGRAPHS

APPENDIX B - TEST SETUP PHOTOGRAPHS

Please refer to the attachment XMTN1240126-06151E-RF-00A-TSP TEST SETUP PHOTOGRAPHS.

APPENDIX C - RF EXPOSURE EVALUATION

RF Exposure

Applicable Standard

According to§1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

4.3.1. Standalone SAR test exclusion considerations

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

4.3.2. Simultaneous transmission SAR test exclusion considerations

When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) [(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)]·[$\sqrt{f_{(GHz)}}/x$] W/kg, for *test separation distances* ≤ 50 mm;
where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distance* is > 50 mm

Measurement Result

Standalone SAR test exclusion considerations

For UHF Microphone:
The max conducted power including tune-up tolerance is 9 dBm (7.94 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
=7.94/5*(√0.608) = 1.2< 3.0

For 2.4G SRD:
The max conducted power including tune-up tolerance is 4.0dBm (2.51 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
=2.51/5*(√2.440) = 0.8< 3.0

Simultaneous transmission SAR test exclusion considerations:

Estimated SAR(UHF Microphone)+ Estimated SAR(2.4G SRD)
1.2/7.5+0.8/7.5=0.27
< 0.4

Result: Compliant. The stand-alone SAR evaluation and Simultaneous transmission SAR is not necessary.

Exemption Limits for Routine Evaluation – SAR Evaluation

Applicable Standard

According to RSS-102 Clause 2.5.1

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

According to Notice 2016-DRS001

The estimate SAR value is calculated based the following equation:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg

Measurement Result:

For UHF Microphone:

The max tune-up conducted power is 9dBm(1mW), Antenna Gain:1.62 dBi, EIRP=10.62dBm(11.53mW)

The exemption power(P) limits for routine evaluation in 550-608MHz is:
(608-835)/(450-835)=(P -17)/(52-17)
=>P=37.64 mW@608 MHz
> 11.53 mW

For 2.4G SRD:

The max tune-up conducted power is 4.0dBm(2.51mW), Antenna Gain:-2.207 dBi

The exemption power(P) limits for routine evaluation in 2440MHz is:
(2440-2450)/(1900-2450)=(P -4)/(7-4)
=>P=4.1 mW@2440 MHz
> 2.51 mW

So the stand-alone SAR evaluation can be exempted.

Simultaneous transmission SAR test exclusion considerations:

P_{UHF}/P_{UHF_Limit} *0.4 + $P_{2.4G}/P_{2.4G\_Limit}$*0.4

=11.53/37.64*0.4+2.51/4.1*0.4

=0.37 (W/kg)

<1.6 (W/kg)

So the Simultaneous transmission SAR evaluation can be exempted.

===== END OF REPORT ====