RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL18072702-LEC-005A1-HMA-A1 Rev_2.0
Supersede Report No.: FCC_IC_RF_SL18072702-LEC-005A1-HMA-A1 Rev_1.0

Applicant	Lectrosonics, Inc
Product Name	Wideband Plug-On Transmitter
FCC Model No.	HMA-A1
IC Model No.	HMA/E07-A1
Test Standard	FCC part 74H RSS-210 Issue 9
Test Method	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015
FCC ID	DBZHMAA1A
IC	8024A-HMAA1A
Date of test	07/18/2018 - 07/19/2018
Issue Date	09/28/2018
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

Deon Dai	Chen Ge
Test Engineer	Engineer Reviewer

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Test result presented in this test report is applicable to the tested sample only

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL18072702-LEC-005A1-HMA-A1	Original	NONE	08/24/2018
FCC_IC_RF_SL18072702-LEC-005A1-HMA-A1 Rev_1.0	Rev_1.0	Update per review	08/31/2018
FCC_IC_RF_SL18072702-LEC-005A1-HMA-A1 Rev_2.0	Rev_2.0	Update per review	09/28/2018

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Lectrosonics, Inc.
Product: Wideband Plug-On Transmitter
Model: HMA-A1

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Lectrosonics, Inc.
Applicant Address	581 Laser Road, N.E., P.O. Box 15900, Rio Rancho, NM 87124, United States of America
Manufacturer Name	Lectrosonics, Inc.
Manufacturer Address	581 Laser Road, N.E., P.O. Box 15900, Rio Rancho, NM 87124, United States of America

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
1	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	Wideband Plug-On Transmitter
Model No.	HMA-A1
Trade Name	Lectrosonic, Inc.
Serial No.	N/A
Input Power	3VDC By battery
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Date of EUT received	07/12/2018
Operating Frequencies	TX (470.100MHz-537.575MHz)
Port/Connectors	-
Remark	N/A

6.2 Radio Description

Item	UHF
Operating Band /Radio Type	UHF band
Modulation	FM
Antenna Type	External dipole antenna
Antenna Gain	2.15 dBi
Frequency TX(MHz)	470.100-537.575

6.3 EUT test modes/configuration Description

Final Test Mode		Note
Final_test_mode_1	Continuous transmission	-
Remark: NONE		

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note

7.2 Test Software Description

Test Item	Software	Description
-	-	-

8 Test Summary

Emissions			
Test Item	**Test standard**	**Test Method/Procedure**	**Pass / Fail**
Transmitter Power Output	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass
Frequency Stability	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass
Modulation Characteristics	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass
Occupied Bandwidth and Emission Mask	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass
Spurious Emissions at Antenna Terminal	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass
Field Strength of Spurious Radiated	FCC part74, RSS-210	KDB 971168 v03r01 ANSI/TIA-603-E 2016 ANSI C63.10-2013 ANSI C63.26-2015	Pass

9 Measurement Uncertainty

9.1 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					**6.0118262**

The total derived measurement uncertainty is +/- 6.00 dB.

9.2 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					**8.4726**

The total derived measurement uncertainty is +/- 8.47 dB.

9.3 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

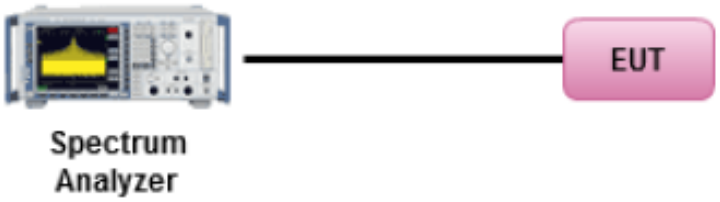
Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
Expanded Uncertainty (K=2)					**0.952174**

The total derived measurement uncertainty is +/- 0.95 dB.

10 Measurements, examination and derived results

10.1 Transmitter Power Output

Requirement(s):

<table>
<tr><td>Spec</td><td>Requirement</td><td>Applicable</td></tr>
<tr><td rowspan="2">FCC part74(e)
RSS-210</td><td>FCC §74.861 (e) :(1) The power may not exceed the following values.
(i) 54-72, 76-88, and 174-216 MHz bands: 50 mW EIRP
(ii) 470-608 and 614-698: 250 mW conducted power.</td><td>☒</td></tr>
<tr><td>RSS-210 Issue 9 August 2016 G3.1 Table G1
<table>
<tr><th>Freq Bands (MHz)</th><th>Transmit e.i.r.p (mW)</th><th>Authorized Bandwidth (kHz)</th><th>Freq Stability (ppm)</th></tr>
<tr><td>54-72
76-88
174-216</td><td>50</td><td>200</td><td>± 50</td></tr>
<tr><td>470-608
614-698</td><td>250</td><td>200</td><td>± 50</td></tr>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="2"> 
</td></tr>
<tr><td>Procedure</td><td colspan="2">Connect the EUT to spectrum analyzer and set the spectrum analyzer as follow:
-Center frequency: channel frequency under test;
- Resolution BandWidth (RBW): 1 MHz;
- Video BandWidth (VBW): ⩾1MHz;
- Detector: Peak hold;
- Span: 1MHz
Max hold the trace and record the peak value once the trace stabilized.</td></tr>
<tr><td>Test Date</td><td>08/10/2018-08/22/2018</td><td>Environmental condition
Temperature 24°C
Relative Humidity 48%
Atmospheric Pressure 1009mbar</td></tr>
<tr><td>Remark</td><td colspan="2">NONE</td></tr>
<tr><td>Result</td><td colspan="2">☒ Pass ☐ Fail</td></tr>
</table>

Test Data ☐ Yes (See below) ☒ N/A

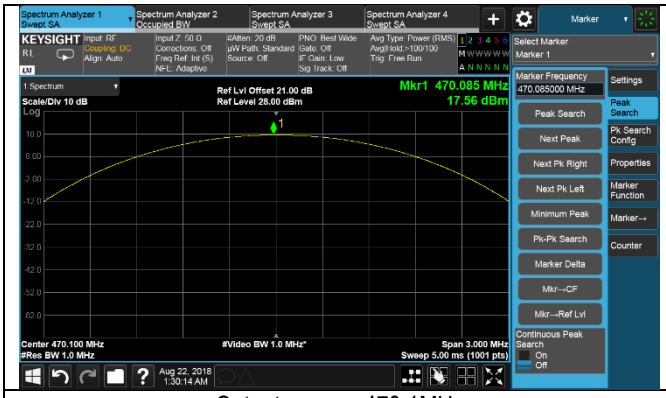
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Deon Dai* at *RF test site*.

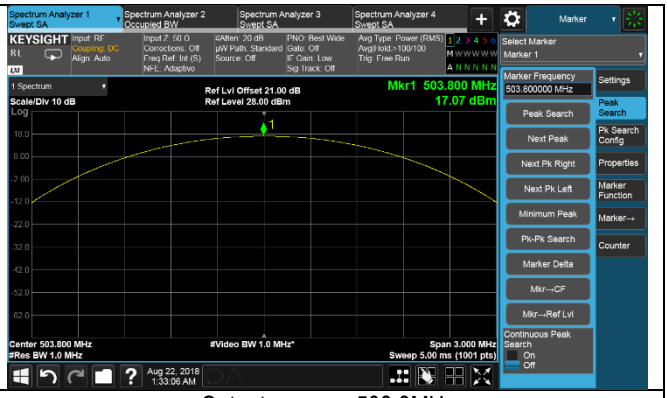
Output Power measurement results

Type	Freq (MHz)	CH	Rated power	Conducted power (dBm)	Limit (dBm)	Result
Output power	470.1	Low	50mW	17.56	24	Pass
			100mW	20.21	24	Pass
	503.8	Mid	50mW	17.07	24	Pass
			100mW	20.06	24	Pass
	537.5	High	50mW	17.35	24	Pass
			100mW	20.12	24	Pass

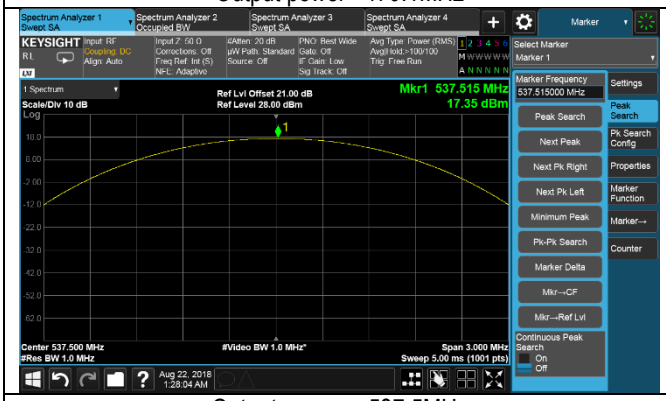
50mW power setting



Output power –470.1MHz

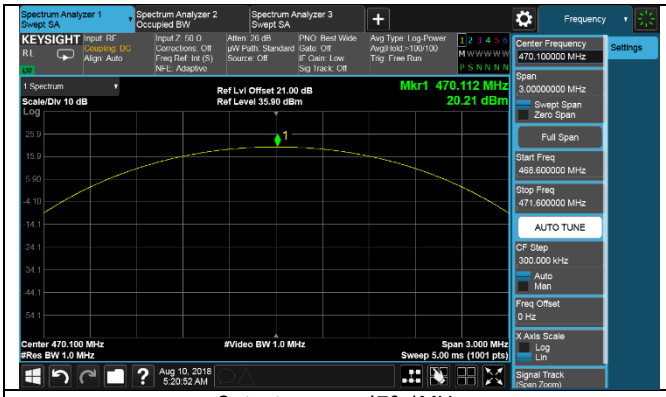


Output power – 503.8MHz

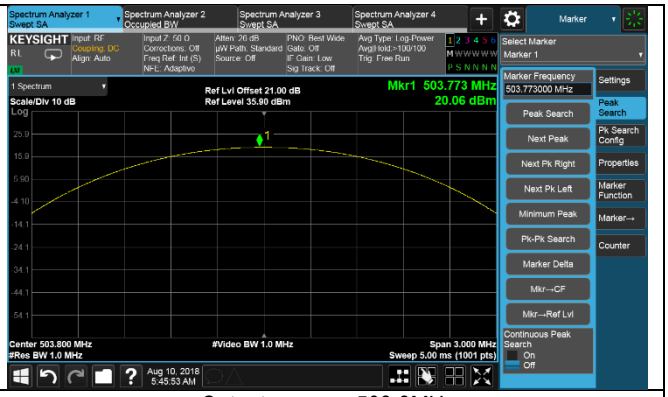


Output power - 537.5MHz

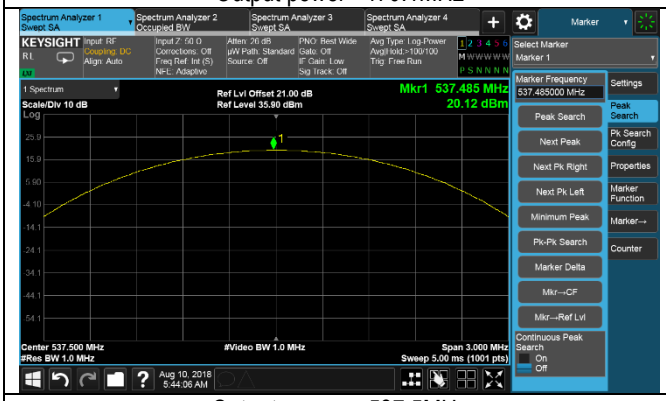
100mW power setting



Output power –470.1MHz



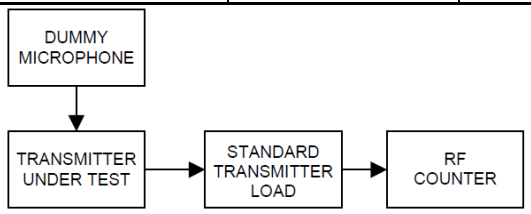
Output power – 503.8MHz



Output power - 537.5MHz

10.2 Frequency Stability

Requirement(s):

<table>
<tr><td>Spec</td><td>Requirement</td><td>Applicable</td></tr>
<tr><td>FCC part74(e)
RSS-210</td><td>FCC §74.861(e) :(4) The frequency tolerance of the transmitter shall be 0.005 percent.</td><td>☒</td></tr>
<tr><td></td><td>RSS-210 Issue 9 August 2016 G3.1 Table G1
<table>
<tr><th>Freq Bands (MHz)</th><th>Transmit e.i.r.p (mW)</th><th>Authorized Bandwidth (kHz)</th><th>Freq Stability (ppm)</th></tr>
<tr><td>54-72
76-88
174-216</td><td>50</td><td>200</td><td>± 50</td></tr>
<tr><td>470-608
614-698</td><td>250</td><td>200</td><td>± 50</td></tr>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td> 
</td><td></td></tr>
<tr><td>Procedure</td><td>According ANSI/TIA-603-E 2016 Section 2.2.2
-Connect the equipment as illustrated.
-Operate the equipment in standby conditions for 15 minutes before proceeding.
- Record the carrier frequency of the transmitter as MCF_{MHz}
-Calculate the ppm frequency error by the following:
ppm error =(MCF_{MHz}/ ACF_{MHz}-1)*10^6
where
MCF_{MHz} is the Measured Carrier Frequency in MHz
ACF_{MHz} is the Assigned Carrier Frequency in MHz
-The value recorded in step d) is the carrier frequency stability.

According RSS GEN issue 5 April 2018 section 6.11:
-The reference temperature for radio transmitters is +20°C (+68°F).
-A hand-held device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage, and again at the battery's operating end-point voltage, which shall be specified by the equipment manufacturer. For this test, either a battery or an external power supply can be used.
-The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determining circuit element shall be made subsequent to this initial set-up.</td><td></td></tr>
<tr><td>Test Date</td><td>08/10/2018</td><td>Environmental condition</td><td>Temperature 24°C
Relative Humidity 48%
Atmospheric Pressure 1009mbar</td></tr>
<tr><td>Remark</td><td colspan="3">NONE</td></tr>
<tr><td>Result</td><td colspan="3">☒ Pass ☐ Fail</td></tr>
</table>

Test Data ☐ Yes (See below) ☒ N/A

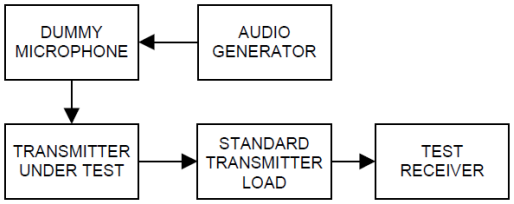
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Deon Dai* at *RF test site*.

Type	Temperature	Voltage	Nominal Frequency (MHz)	Measured Frequency (MHz)	Measured frequency Error (PPM)	Limit (PPM)
Frequency Stability	-20	Vnorm	503.8	503.80012	0.23819	±50
	-10	Vnorm	503.8	503.80008	0.15879	±50
	0	Vnorm	503.8	503.80004	0.07940	±50
	10	Vnorm	503.8	503.79991	-0.17864	±50
	20	Vmin	503.8	503.79995	-0.09925	±50
		Vnorm	503.8	503.80009	0.17864	±50
		Vmax	503.8	503.79989	-0.21834	±50
	30	Vnorm	503.8	503.80011	0.21834	±50
	40	Vnorm	503.8	503.80006	0.11909	±50
	50	Vnorm	503.8	503.79992	-0.15879	±50

10.3 Modulation Characteristics

Requirement(s):

Spec	Requirement	Applicable
FCC part74H RSS-210	FCC §74.861 (e) (3): A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.	☒
	RSS-210 Issue 9 August 2016 G.3.5.2 Equipment employing frequency measurement (FM) modulation shall have a frequency deviation that does not exceed ±75 kHz	☒
Test Setup		
Procedure	According ANSI/TIA-603-E 2016 Section 2.2.3 a. Connect the equipment as illustrated. b. Adjust the transmitter per the manufacturer's procedure for full rated system deviation. c. Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ⩽0.25 Hz to ⩾15,000 Hz. Turn the de-emphasis function off. d. Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation. e. Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum). f. Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level. g. With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000Hz and observe the steady-state deviation. Record the maximum deviation. h. Set the test receiver to measure peak negative deviation and repeat steps d) through g). i. The values recorded in steps g) and h) are the modulation limiting.	
Test Date	08/18/2018	Environmental condition: Temperature 24°C; Relative Humidity 48%; Atmospheric Pressure 1009mbar
Remark	NONE	
Result	☒ Pass ☐ Fail	

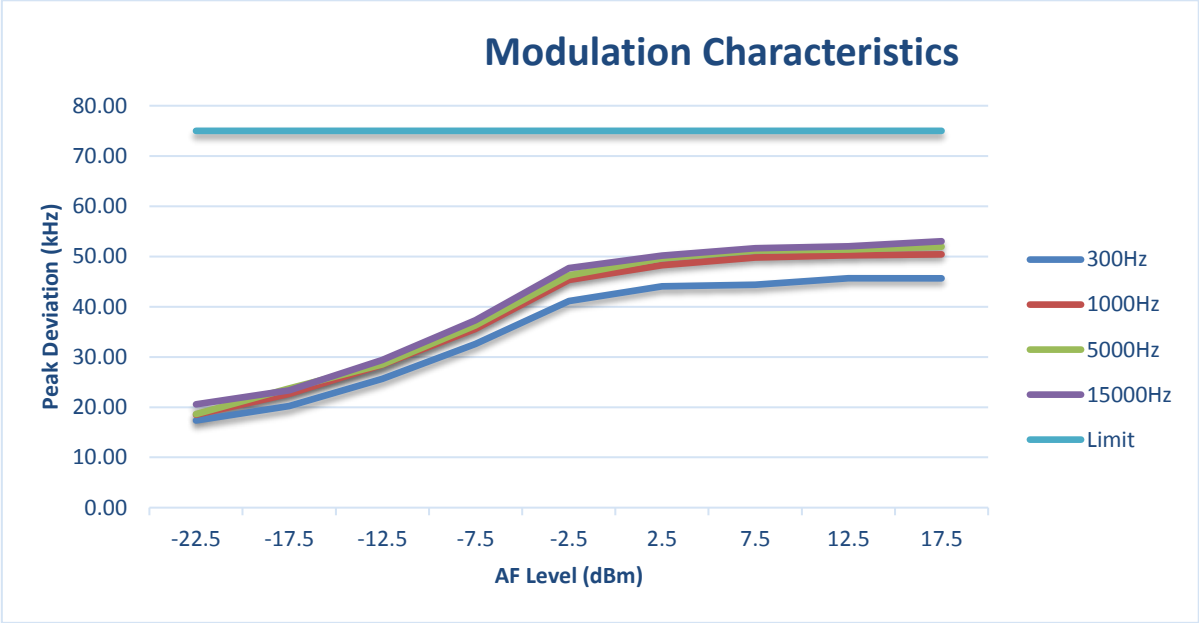
Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Deon Dai* at *RF test site*.

Modulation Characteristics Test results Middle channel

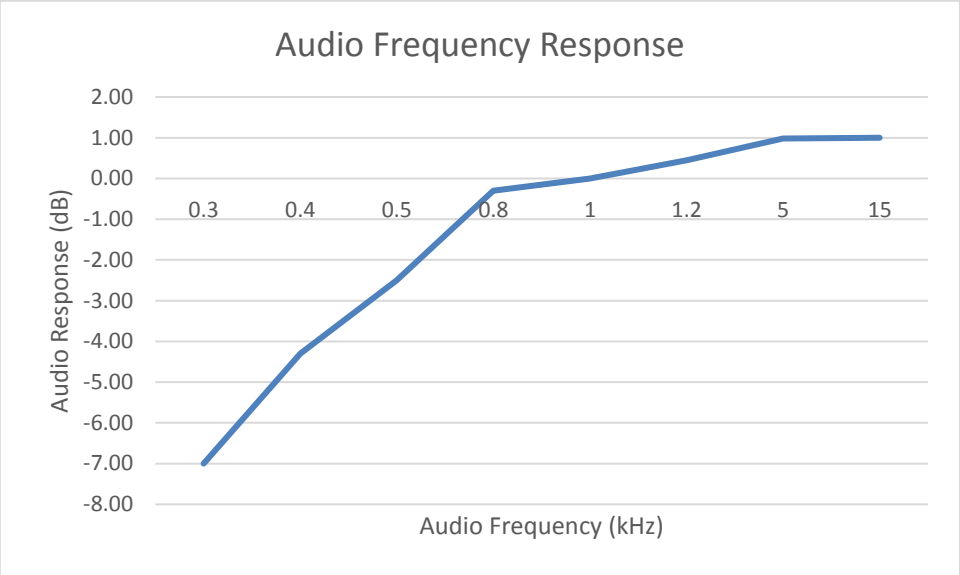
AF Level (dBm)	Peak Deviation(kHz)				limit
	300Hz	1000Hz	5000Hz	15000Hz	
-22.5	17.35	18.49	18.63	20.56	±75
-17.5	20.23	22.62	23.72	23.36	±75
-12.5	25.61	28.46	28.52	29.39	±75
-7.5	32.60	35.57	36.29	37.27	±75
-2.5	41.15	45.33	46.22	47.66	±75
2.5	44.05	48.26	49.69	50.17	±75
7.5	44.40	49.77	51.18	51.64	±75
12.5	45.66	50.22	51.35	52.03	±75
17.5	45.62	50.42	51.95	53.02	±75



Audio Frequency Response – Middle Channel

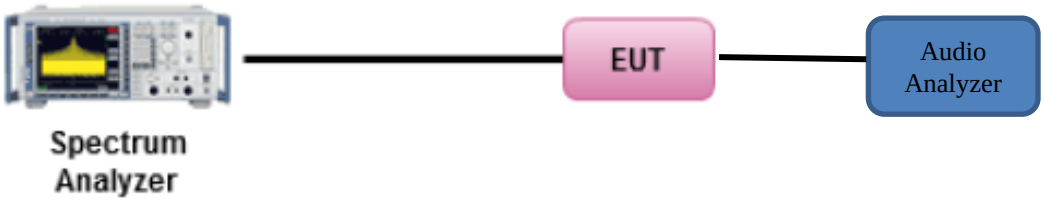
AF Frequency (kHz)	AF Level (uW)	AF Response (dB)
0.3	898.45	-7.0
0.5	688.3	-2.5
1.0	524.3	0
5.0	511.2	0.98
15	502.6	1.0

Note: AF Response=20*log(AF Level of 1kHz/AF Level)



10.4 Occupied Bandwidth and Emission Mask

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td rowspan="2">FCC part74H
RSS-210</td><td>FCC §74.861 (e) (5) The operating bandwidth shall not exceed 200 kHz.
FCC §74.861 (e) (6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
(i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
(ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
(iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log10 (mean output power in watts) dB.
FCC §74.861 (e) (7) Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard 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. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard 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. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.</td><td>☒</td></tr>
<tr><td>RSS-210 Issue 9 August 2016 G3.1 Table G1 Occupied bandwidth:
<table><tr><th>Freq Bands (MHz)</th><th>Transmit e.i.r.p (mW)</th><th>Authorized Bandwidth (kHz)</th><th>Freq Stability (ppm)</th></tr><tr><td>54-72
76-88
174-216</td><td>50</td><td>200</td><td>± 50</td></tr><tr><td>470-608
614-698</td><td>250</td><td>200</td><td>± 50</td></tr></table>The transmitter output spectrum shall be within the mask defined in EN 300 422 Clause 8.3.2.2.</td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="2"> 
</td></tr>
<tr><td>Procedure</td><td colspan="2">KDB 971168 D01 Power Meas License Digital Systems v03r01 - Section4
<u>Occupied Bandwidth</u>
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
e) Set the detection mode to peak, and the trace mode to max hold.</td></tr>
</table>

	f) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth. Emission Mask EN 300 422 Clause 8.3.2.1		
Test Date	08/10/2018-08/22/2018	Environmental condition	Temperature 24°C Relative Humidity 48% Atmospheric Pressure 1009mbar
Remark	NONE		
Result	☒ Pass ☐ Fail		

Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

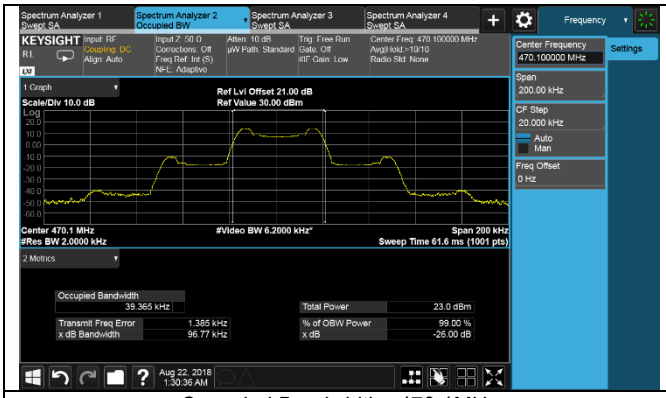
Test was done by *Deon Dai* at *RF test site*.

Bandwidth measurement results

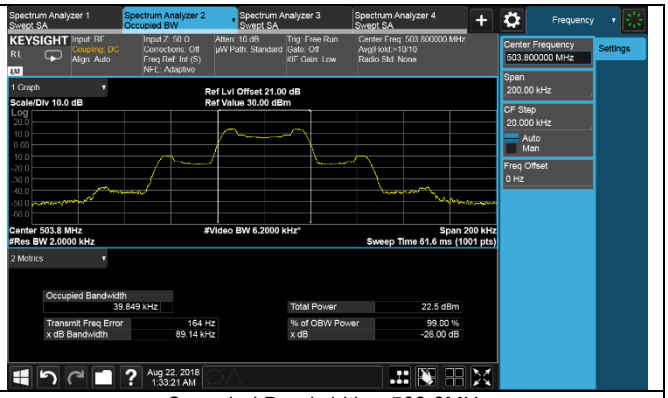
Type	Frequency (MHz)	CH	Rated power	99% bandwidth (kHz)	Limit (kHz)
Occupied bandwidth	470.1	Low	50mW	39.36	200
			100mW	38.88	200
	503.8	Mid	50mW	39.85	200
			100mW	43.90	200
	537.5	High	50mW	40.02	200
			100mW	44.33	200

Bandwidth Measurement test plots

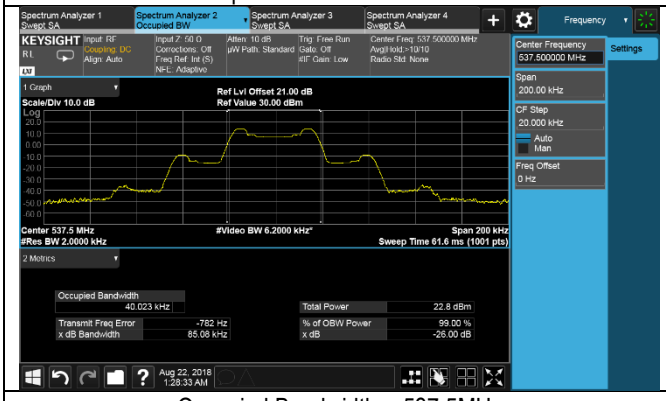
50mW power setting



Occupied Bandwidth –470.1MHz

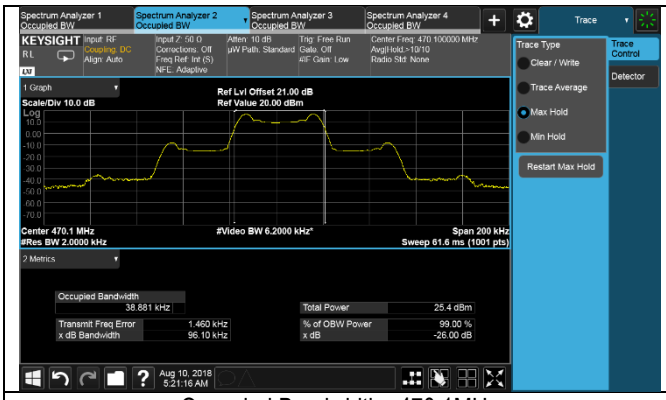


Occupied Bandwidth – 503.8MHz

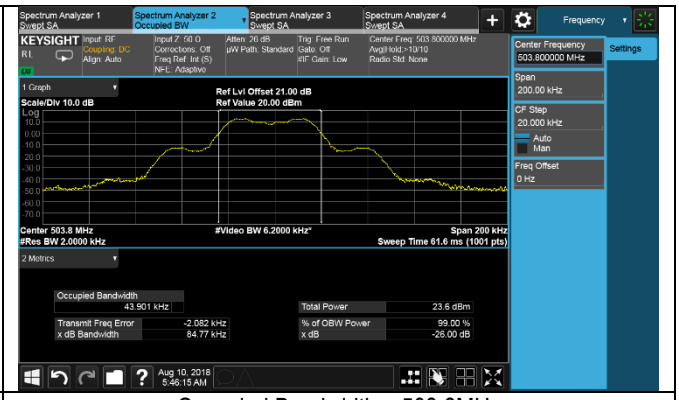


Occupied Bandwidth - 537.5MHz

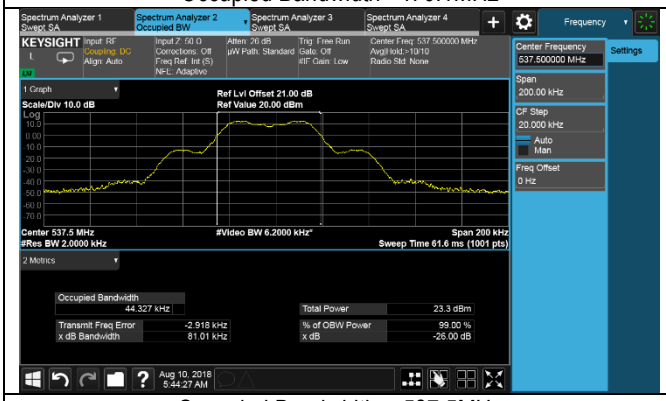
100mW power setting



Occupied Bandwidth –470.1MHz

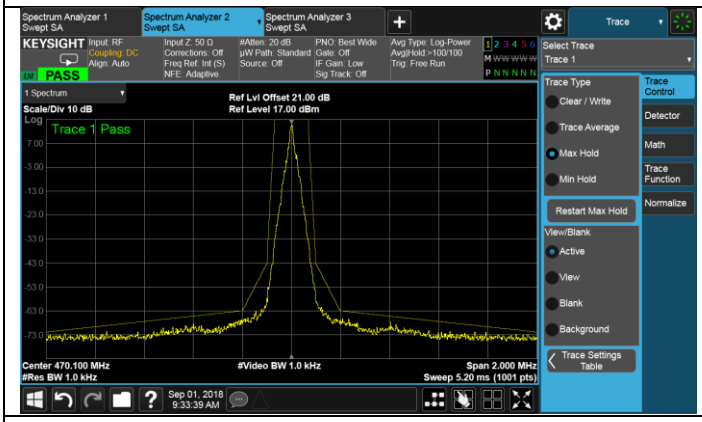
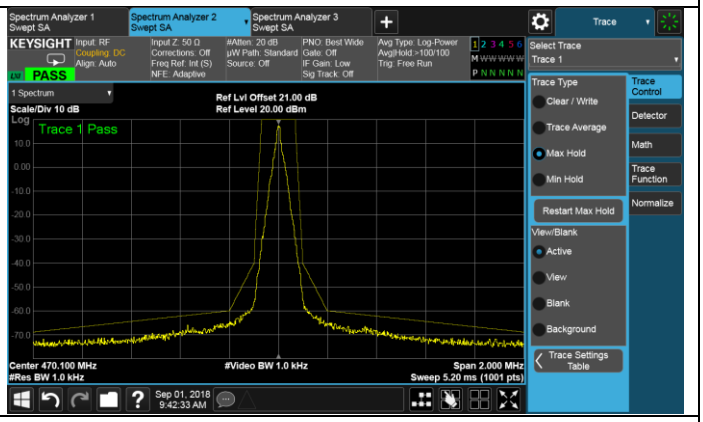
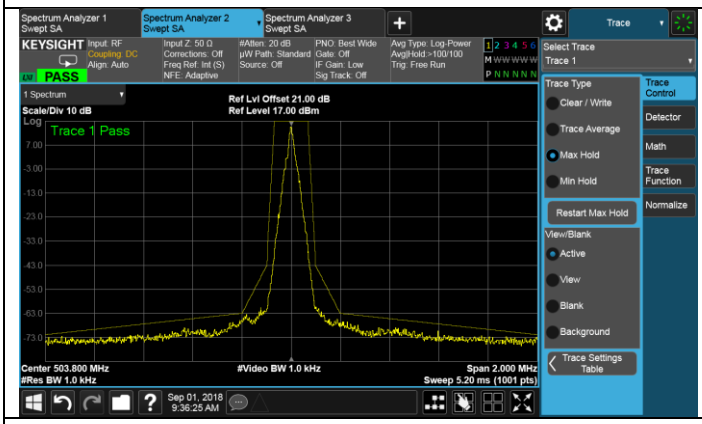
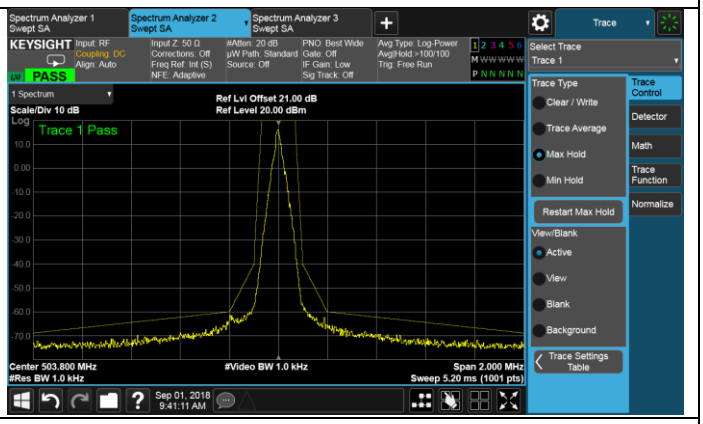
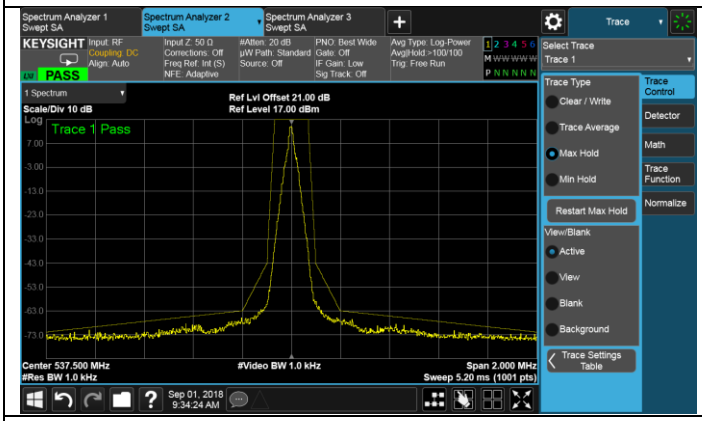
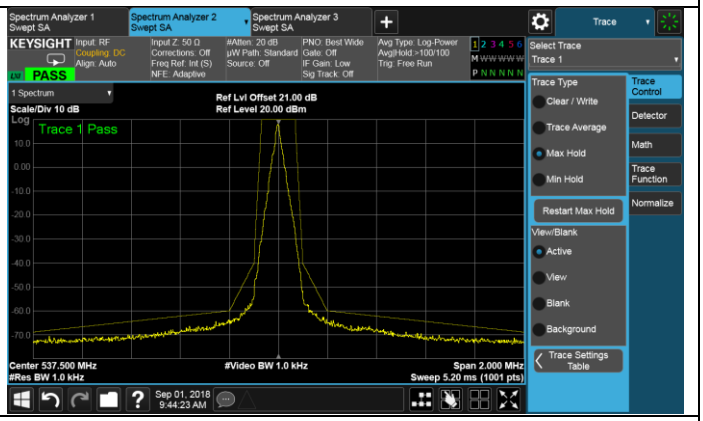


Occupied Bandwidth – 503.8MHz



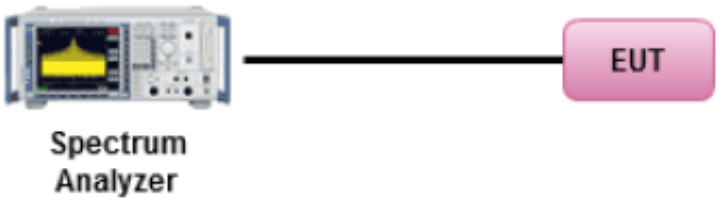
Occupied Bandwidth - 537.5MHz

Emission Mask test Plot

50mW Power Setting	100mW Power Setting
	
Low Channel, Mask	Low Channel, Mask
	
Middle Channel, Mask	Middle Channel, Mask
	
High Channel, Mask	High Channel, Mask

10.5 Spurious Emissions at Antenna Terminal

Requirement(s):

Spec	Requirement	Applicable
FCC part74H RSS-210	FCC §74.861 (e) (6) (iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log10 (mean output power in watts) dB. FCC §74.861 (e) (7) Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard 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. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard 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. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.	☒
	Per RSS-210, Annex G, the transmitter unwanted emissions shall meet the requirements of ETSI EN 300 422-1 V1.4.2 (2011-08) section 8.4	☒
Test Setup		
Procedure	a) Connect the equipment as illustrated, with the notch filter by-passed. b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line. c) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the Method of Measurement for Transmitters audio modulating circuit. d) Adjust the spectrum analyzer for the following settings: 1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz. 2) Video Bandwidth ⩾3 times the resolution bandwidth. 3) Sweep Speed ⩽2000 Hz per second. 4) Detector Mode = mean or average power. e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from: 1) The lowest radio frequency generated in the equipment to the carrier frequency minus the test bandwidth (see 1.3.4.4). 2) The carrier frequency plus the test bandwidth to a frequency less than 2 times the carrier frequency. f) Record the frequencies and levels of spurious emissions from step e). g) Unkey the transmitter. Replace the transmitter under test with the signal generator and adjust the signal level to reproduce the frequencies and levels of every spurious emission recorded in step f). Record the signal generator levels in dBm. h) Insert the notch filter. i) Adjust the spectrum analyzer for the following settings:	

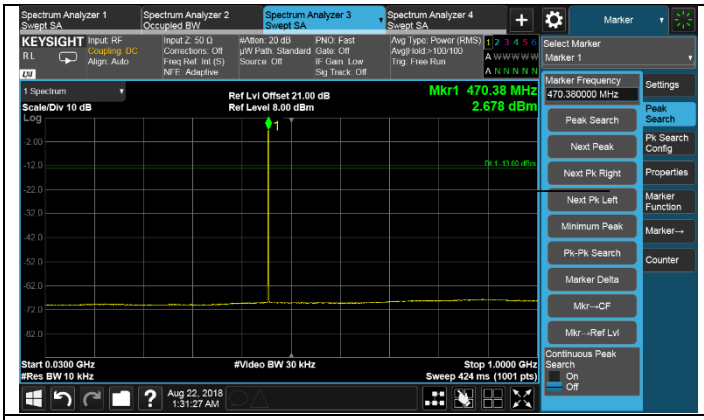
	1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz. 2) Video Bandwidth ≥3 times the resolution bandwidth. 3) Sweep Speed ≤2000 Hz per second. 4) Detector Mode = mean or average power. j) Key the transmitter. Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from a frequency equal to 2 times the carrier frequency and to the tenth harmonic of the carrier frequency. k) Record the frequencies and levels of spurious emissions from step j). l) Unkey the transmitter. Replace the transmitter under test with the signal generator and adjust the signal level to reproduce the frequencies and levels of every spurious emission recorded in step k). Record the signal generator levels in dBm. m) The levels recorded in steps g) and l) are the absolute levels of conducted spurious emissions in dBm. The conducted spurious attenuation can be calculated by the following: Spurious attenuation (dB) =10 $\log_{10}$(TX Power in watts/0.001)-the levels in steps g) and l)		
Test Date	08/10/2018-08/22/2018	Environmental condition	Temperature 24°C Relative Humidity 48% Atmospheric Pressure 1009mbar
Remark	NONE		
Result	☒ Pass ☐ Fail		

Test Data ☐ Yes (See below) ☒ N/A

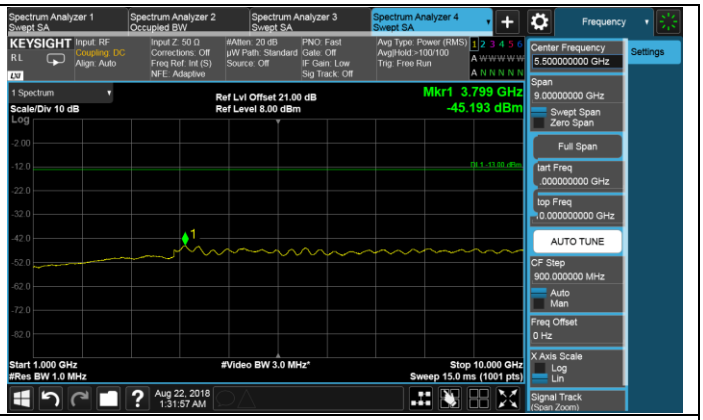
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Deon Dai* at *RF test site*.

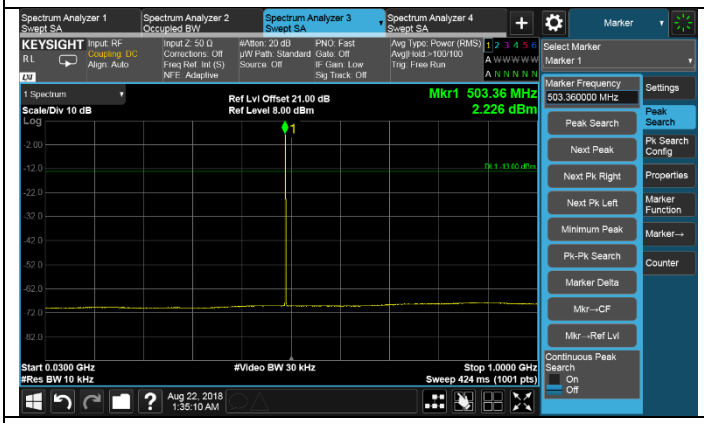
50mW Power Setting Test Plots



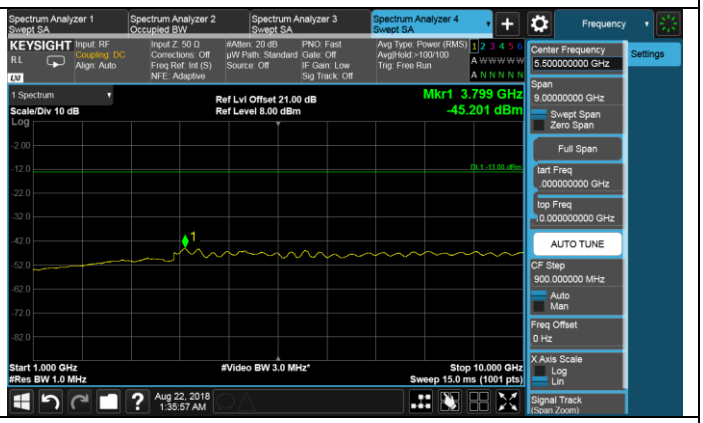
Low CH-Spurious Emission-Low



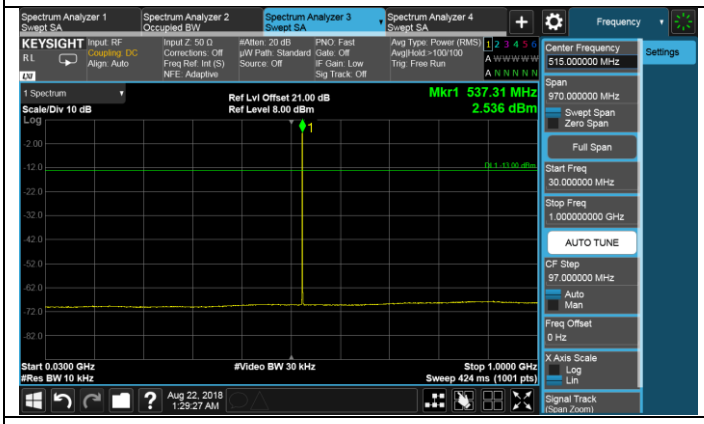
Low CH-Spurious Emission-High



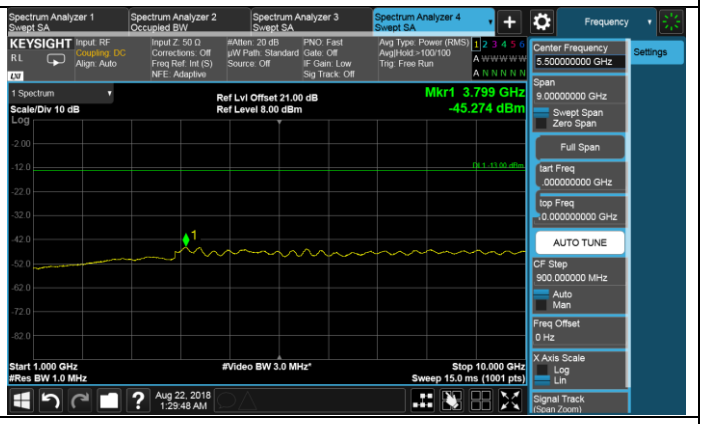
Mid CH-Spurious Emission-Low



Mid CH-Spurious Emission-High

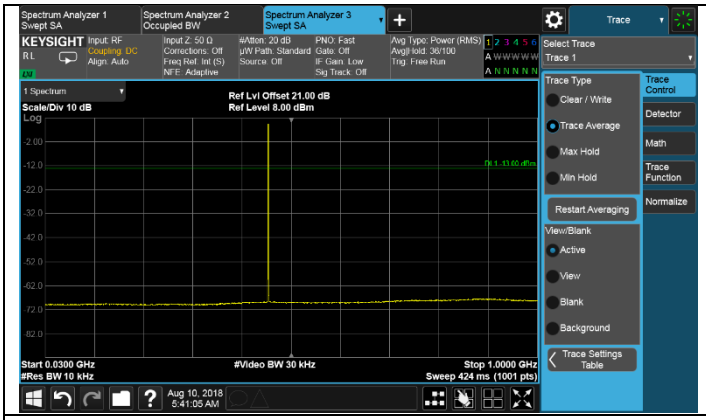


High CH-Spurious Emission-Low

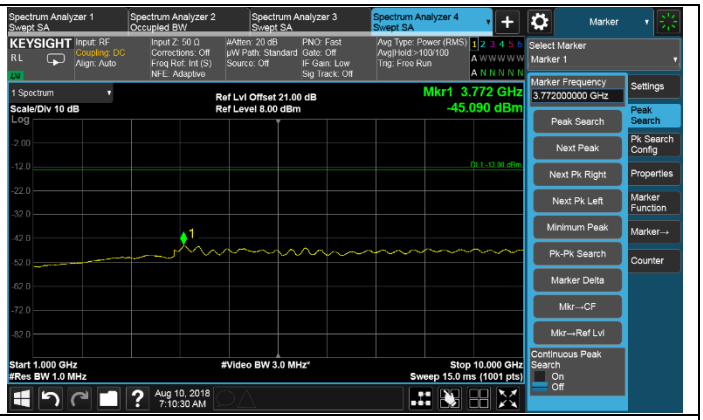


High CH-Spurious Emission-High

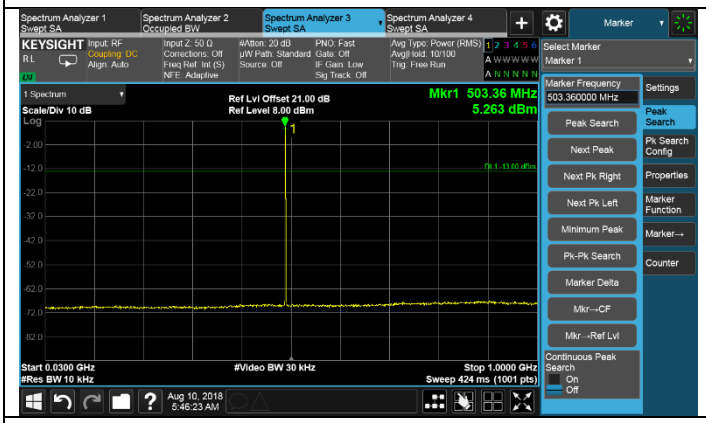
100mW Power Setting Test Plots



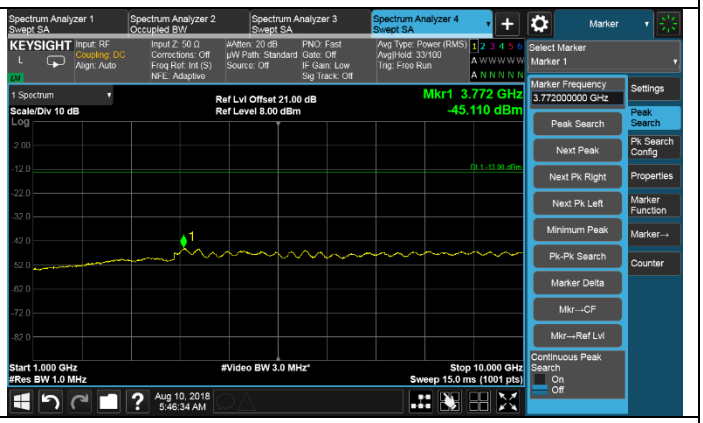
Low CH-Spurious Emission-Low



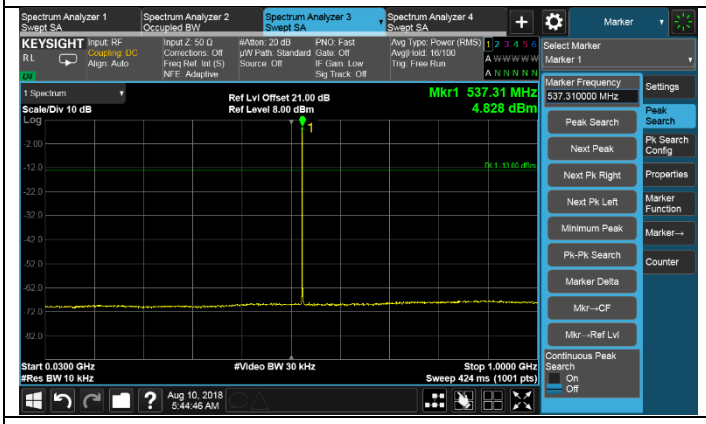
Low CH-Spurious Emission-High



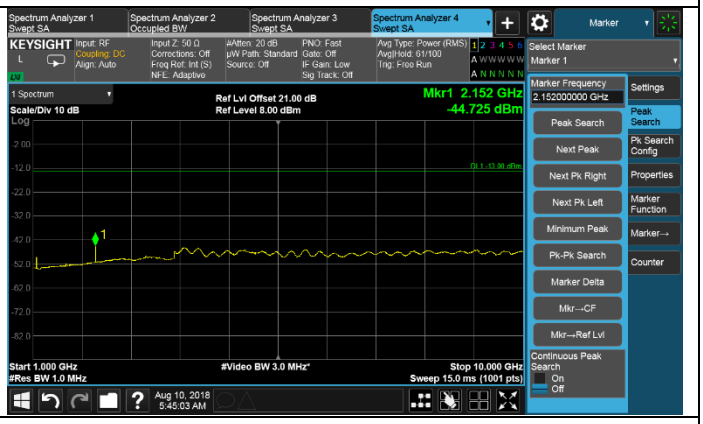
Mid CH-Spurious Emission-Low



Mid CH-Spurious Emission-High



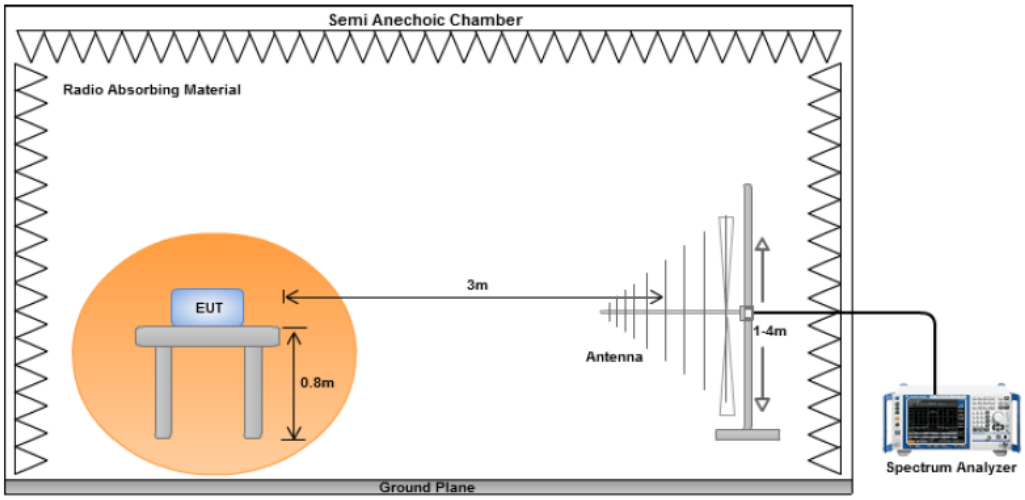
High CH-Spurious Emission-Low

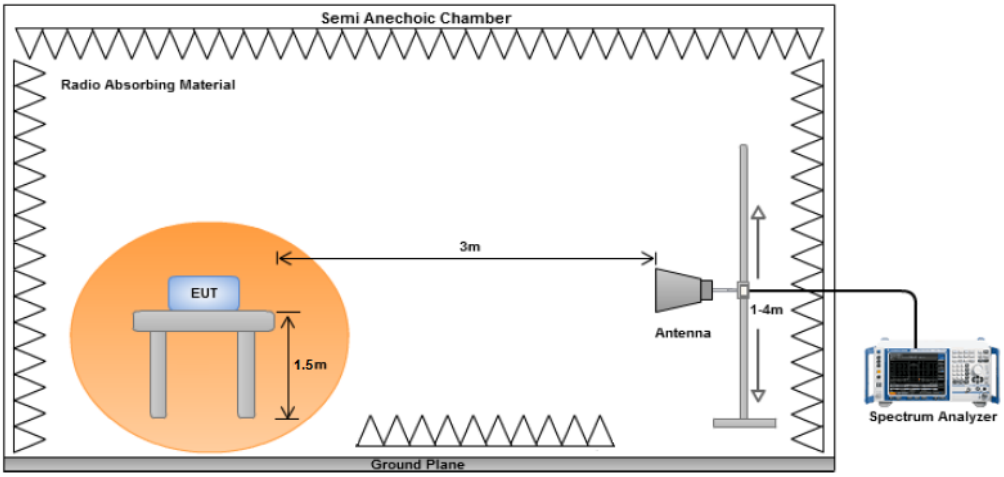


High CH-Spurious Emission-High

10.6 Field Strength of Spurious Radiated

Requirement(s):

Spec	Requirement	Applicable
FCC part74H RSS-210	FCC §74.861 (e) (6) (iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log10 (mean output power in watts) dB. FCC §74.861 (e) (7) Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard 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. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard 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. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.	☒
	Per RSS-210, Annex G, the transmitter unwanted emissions shall meet the requirements of ETSI EN 300 422-1 V1.4.2 (2011-08) section 8.4	☒
Test Setup	**Below 1G set up**  **Above 1G set up**	

<table>
<tr><td></td><td colspan="4"> 
</td></tr>
<tr><td>Procedure</td><td colspan="4">Substitution method:
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
b. The EUT was then rotated to the direction that gave the maximum emission.
c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The centre of the substitution antenna should be approximately at the same location as the centre of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.</td></tr>
<tr><td>Test Date</td><td>07/18/2018-07/19-2018</td><td>Environmental condition</td><td>Temperature
Relative Humidity
Atmospheric Pressure</td><td>24°C
48%
1009mbar</td></tr>
<tr><td>Remark</td><td colspan="4">EUT was configured to high power setting</td></tr>
<tr><td>Result</td><td colspan="4">☒ Pass ☐ Fail</td></tr>
</table>

Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Deon Dai* at *RF test site*.

Radiated Emission Test Results

Below 1G

Continue transmit mid channel

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
344.25	-60.83	146	102	V	344.25	-54.05	0	0.31	-54.36	-36	-18.36
673.52	-63.54	254	189	V	673.52	-57.58	0	0.73	-58.31	-36	-22.31
344.25	-72.85	194	144	H	344.25	-65.43	0	0.31	-65.74	-36	-29.74
673.52	-74.89	24	182	H	673.52	-67.95	0	0.73	-68.68	-36	-32.68

Note: Absolute Level (dBm) = Level (dBm) + Ant Gain (dBi) - Cable Loss (dB).

FCC limit is -13dBm, which is higher than RSS limit.

Above 1G

Low CH

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1410.3	-54.61	211	159	V	1410.3	-47.26	6.9	1.21	-41.57	-30	-11.57
1880.4	-58.75	295	166	V	1880.4	-51.55	7.82	1.76	-45.49	-30	-15.49
1410.3	-56.87	314	154	H	1410.3	-50.1	6.9	1.21	-44.41	-30	-14.41
1880.4	-61.33	214	158	H	1880.4	-52.95	7.82	1.76	-46.89	-30	-16.89

Mid CH

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1007.6	-50.9	24	164	V	1007.6	-46.24	4.83	0.98	-42.39	-30	-12.39
1511.4	-52.26	149	150	V	1511.4	-49.71	7.82	1.51	-43.4	-30	-13.4
1007.6	-54.26	59	164	H	1007.6	-48.86	4.83	0.98	-45.01	-30	-15.01
1511.4	-56.57	73	155	H	1511.4	-51.64	7.82	1.51	-45.33	-30	-15.33

High CH

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1075	-53.2	259	173	V	1075	-47.5	5.27	1.15	-43.38	-30	-13.38
1612.5	-59.8	184	165	V	1612.5	-53.15	8.13	1.18	-46.2	-30	-16.2
1075	-56.19	193	149	H	1075	-50.64	5.27	1.15	-46.52	-30	-16.52
1612.5	-60.04	294	150	H	1612.5	-54.64	8.13	1.18	-47.69	-30	-17.69

Note: Absolute Level (dBm) = Level (dBm) + Ant Gain (dBi) - Cable Loss (dB).

FCC limit is -13dBm, which is higher than RSS limit.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
EMI Test Receiver	ESIB 40	100179	06/03/2018	1 Year	06/03/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	03/05/2018	1 Year	03/05/2020	☑
Horn Antenna (1-18GHz)	3115	10SL0059	11/09/2017	1 Year	11/09/2018	☑
Pre-Amplifier	LPA-6-30	11140711	02/19/2018	1 Year	07/19/2019	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY51440112	10/27/2017	1 Year	10/27/2018	☑
Temperature/Humidity Chamber	1007H	61201	07/31/2017	1 Year	07/31/2018	☑
Waveform generator	33220A	MY50210206	09/22/2017	1 Year	09/22/2018	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radio communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2