FCC RF Test Report

APPLICANT	:	Motorola Solutions Inc.
EQUIPMENT 1	:	1)EVOLVE SMART HANDHELD W STD BATTERY 2)EVOLVE SMART HANDHELD W HICAP BATT
EQUIPMENT 2	:	EVOLVE-i IS SMART HANDHELD W IS HICAP BATT
BRAND NAME	:	Motorola Solutions
MODEL NAME 1	:	EVOLVE
MODEL NAME 2	:	EVOLVE-i
MODEL NUMBER 1	:	1)HK2136A 2)HK2156A
MODEL NUMBER 2	:	HK2137A
FCC ID	:	AZ489FT7134
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Sep. 19, 2021 ~ Sep. 24, 2021

We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR052616-24B	Rev. 01	Initial issue of report	Dec. 21, 2021
FR052616-24B	Rev. 02	Update the Equipment 1's name	Jun. 07, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	1
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	1
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	1
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 11.08 dB at 69.770 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.36 dB at 0.252 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	Pass	1
Note 1: The Test was covered under other test reports, FR052616-02E, except 11ac mode					

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Motorola Solutions Inc.
8000 West Sunrise Boulevard, Fort Lauderdale, Florida

1.2 Manufacturer

Motorola Solutions Malaysia Sdn. Bhd.
Plot 2A, Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment 1	1)EVOLVE SMART HANDHELD W STD BATTERY 2)EVOLVE SMART HANDHELD W HICAP BATT
Equipment 2	EVOLVE-i IS SMART HANDHELD W IS HICAP BATT
Brand Name	Motorola Solutions
Model Name 1	EVOLVE
Model Name 2	EVOLVE-i
Model Number 1	1)HK2136A 2)HK2156A
Model Number 2	HK2137A
FCC ID	AZ489FT7134
IMEI Code	Conducted: 352366195005870 Conduction: 354850210041802/354850215041807 Radiation: 354850210041950/354850215041955
HW Version	PVT
SW Version	EVOLVE-userdebug 10 QKQ1.200623.002 D01.01.43 release-keys
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report. The purpose is to add 802.11ac VHT20/VHT40/VHT80 by software, for sample change note from HW P2.2 to HW PVT Stage, please refer the Product Equality Declaration as Appendix F. Based on the similarity between current and previous project, only the related test cases of 802.11 ac mode were verified from Original test report which can be found on FCC website under original application.
3. According to the Product Equality Declaration as Appendix F about the difference between EVOLVE and EVOLVE-i, the test result is not affected by two samples, we only performed testing about adding 802.11ac mode with EVOLVE sample.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	**<5745 MHz ~ 5825 MHz>** 802.11ac VHT20: 11.41 dBm / 0.0138 W 802.11ac VHT40: 10.45 dBm / 0.0111 W 802.11ac VHT80: 10.44 dBm / 0.0111 W
99% Occupied Bandwidth	802.11ac VHT20 : 18.22 MHz 802.11ac VHT40 : 36.52 MHz 802.11ac VHT80 : 75.92 MHz
Type of Modulation	802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Antenna Type / Gain	IFA Antenna with gain 1.0 dBi

Note: The maximum power of 802.11ac VHT20/VHT40 modes is lower than 802.11n HT20/HT40 from original test report. Thus, the RSE data of 802.11ac VHT20/VHT40 mode is covered by 802.11n HT20/HT40 mode, we only evaluate 802.11ac VHT80 mode for RSE testing.

1.5 Specification of Accessory

Accessories Information				
MUC Charger base	**Brand Name**	Motorola	**Model Name**	PMPN4563A
	Description	CHGR DESKTOP MULTI UNIT EXT PS BASE		
AC Adapter MUC (US)	**Brand Name**	Motorola	**Model Name**	PMPN4564A
	Power Rating	I/P: 100 - 240Vac, 1.3A, O/P: 15Vdc, 6A		
AC Adapter 1 (US) Micro-USB rapid-rate plug-in charger	**Brand Name**	Motorola	**P/N**	PS000150A11
	Power Rating	I/P: 100 - 240Vac, 0.25A, O/P: 5Vdc, 1.5A		
DC Adapter 2 Vehicular Power Adapter (VPA)	**Brand Name**	Motorola	**P/N**	PMPN4169A
	Power Rating	I/P: 10.8 – 33.0Vac, 1.1A, O/P: 5Vdc, 1.5A		
Battery 1	**Brand Name**	Motorola Solutions	**P/N**	BT000593A01
	Rated	5800mAh		
Battery 2	**Brand Name**	Motorola Solutions	**P/N**	BT000592A01
	Rated	2900mAh		
Battery 3	**Brand Name**	Motorola Solutions	**P/N**	BT000594A01
	Rated	5800mAh		
Earpiece	**Brand Name**	Motorola Solutions	**P/N**	PMLN8191A
	Signal Line	1.128meter, non-shielded cable, without ferrite core		
Remote Speaker Microphone 1	**Brand Name**	Motorola Solutions	**P/N**	PMMN4125B
	Signal Line	0.54 meter(normal), 2.5 meter (stretch) shielded cable, without ferrite core		
BT Wired Speaker Mic (WM500)	**Brand Name**	Motorola Solutions	**P/N**	PMMN4127A

Bluetooth Earpiece	**Brand Name**	Motorola Solutions	**P/N**	PMLN7851A(EP900)
Belt Clip Holster	**Brand Name**	Motorola Solutions	**Model Name**	PMLN6970A
Belt Clip Holster (Short)	**Brand Name**	Motorola Solutions	**Model Name**	NTN8266B
Belt Clip Holster (Long)	**Brand Name**	Motorola Solutions	**Model Name**	PMLN7965A

Remark: Battery 1 and Battery 2 are for EVOLVE sample, Battery 3 is for EVOLVE-i Sample.

1.6 Modification of EUT

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

1.7 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH06-KS TH01-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH06-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

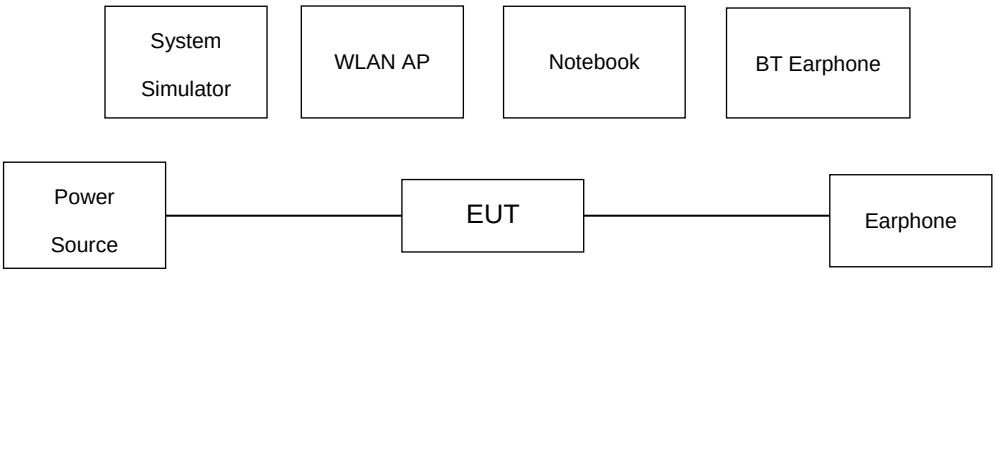
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11ac VHT80	**MCS0**

AC Conducted Emission	Mode 1 : WCDMA Band V Link + WLAN (5G) Link + BT Link(EP900) + Charging From Adapter 1(Earphone Connect to EUT)
Remark: For Radiated Test Cases, The tests were performed with Adapter 1.	

2.3 Connection Diagram of Test System

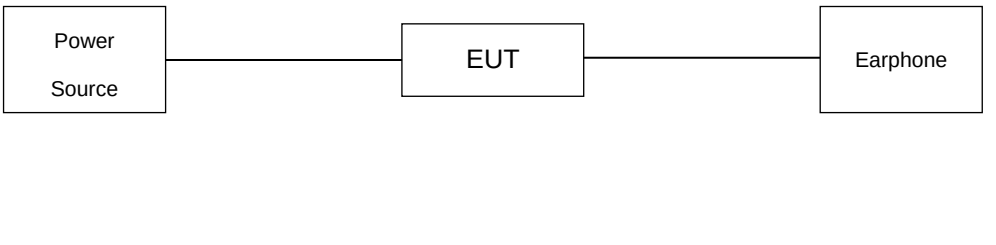
For Conducted Emission:



This example is connection diagram of EUT test configurations.

For detail, please refer to test mode configuration and setup photographs for each test item.

For Radiated Emission:



This example is connection diagram of EUT test configurations.

For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	SD Card	Kingston	8GB	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 7.0 dB.

Offset(dB) = RF cable loss(dB).

= 7.0 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

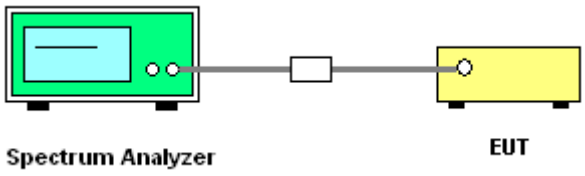
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

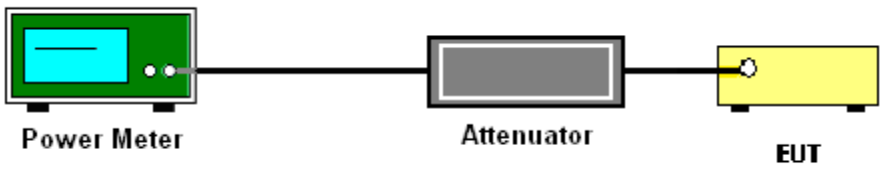
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

U-NII-3									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail
VHT20	MCS 0	1	149	5745	0.08	11.41	30.00	1.00	Pass
VHT20	MCS 0	1	157	5785	0.08	11.32	30.00	1.00	Pass
VHT20	MCS 0	1	165	5825	0.08	11.27	30.00	1.00	Pass
VHT40	MCS 0	1	151	5755	0.16	10.41	30.00	1.00	Pass
VHT40	MCS 0	1	159	5795	0.16	10.45	30.00	1.00	Pass
VHT80	MCS 0	1	155	5775	0.35	10.44	30.00	1.00	Pass

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section F) Maximum power spectral density.

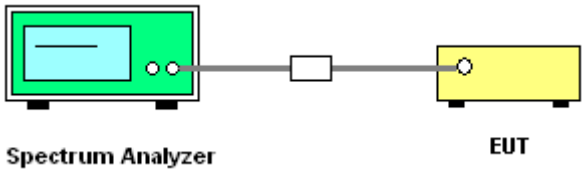
 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500 kHz.
- Set VBW ≥ 2 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

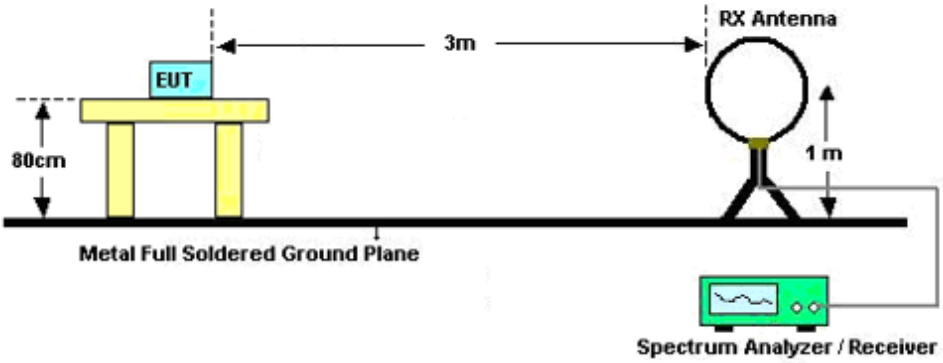
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.

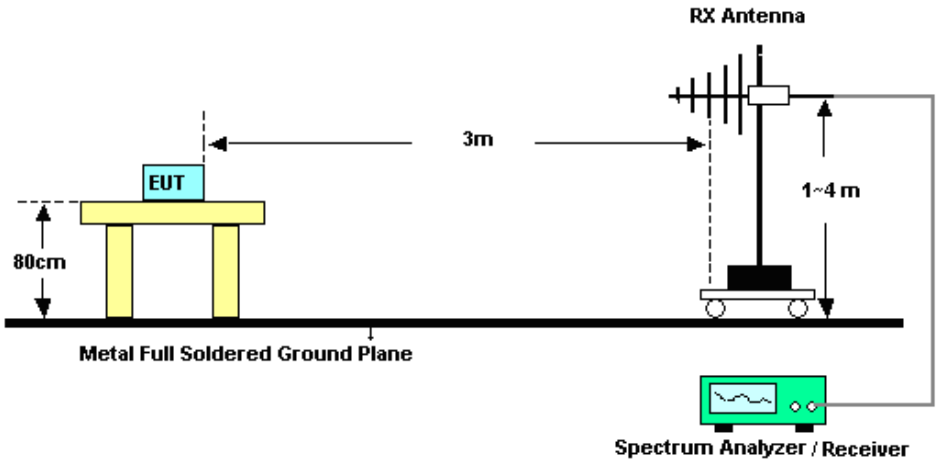
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

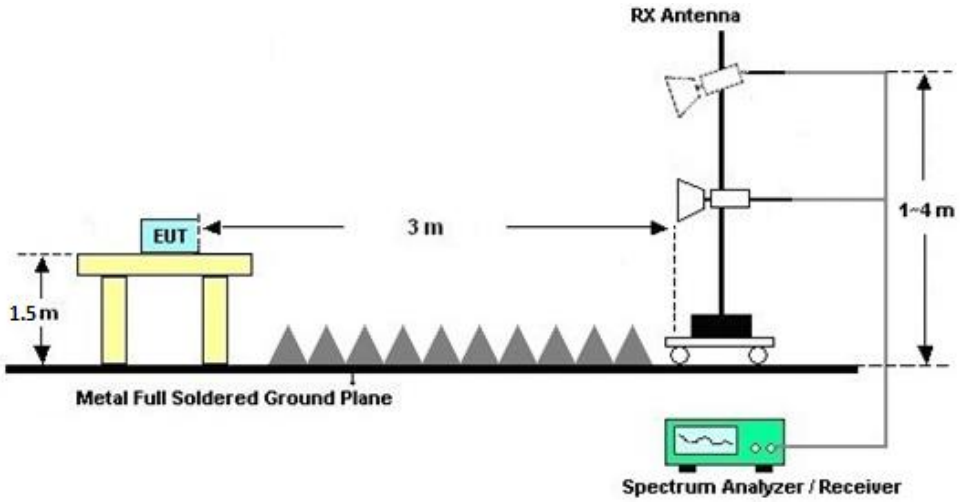
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

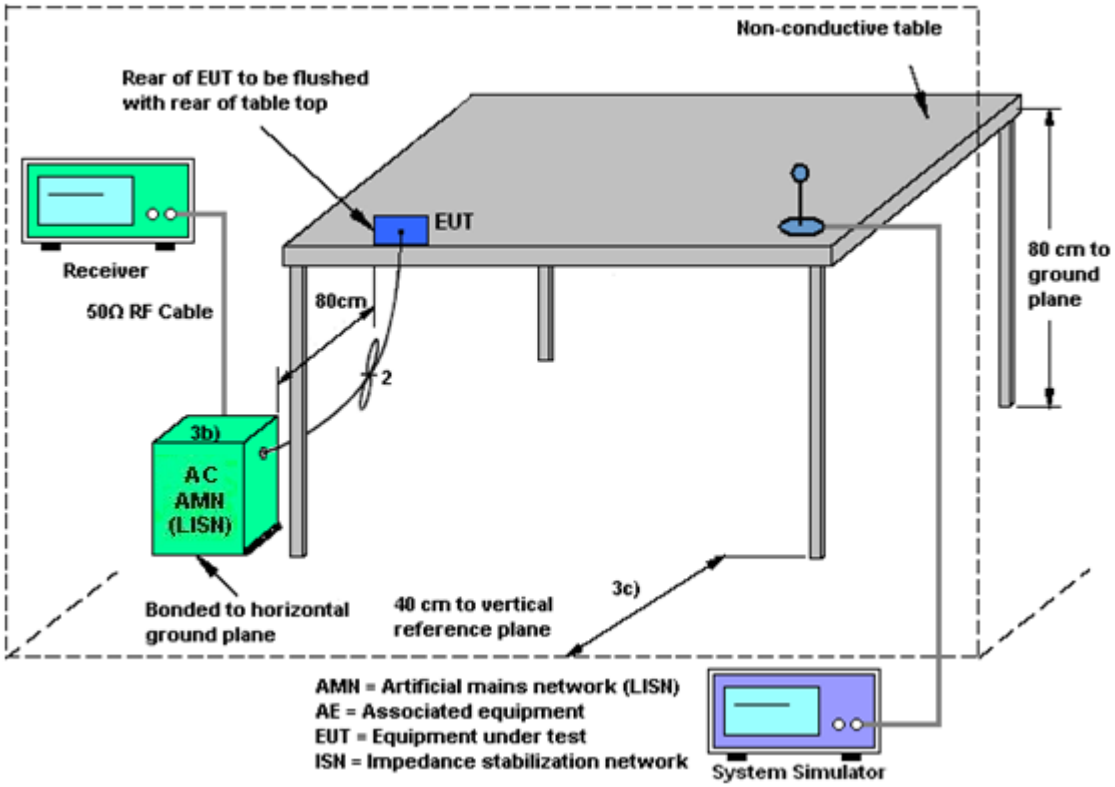
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Nov. 01, 2020	Sep. 19, 2021~ Sep. 24. 2021	Oct. 31, 2021	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 07, 2021	Sep. 19, 2021~ Sep. 24. 2021	Jan. 06, 2022	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 07, 2021	Sep. 19, 2021~ Sep. 24. 2021	Jan. 06, 2022	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 17, 2020	Sep. 23. 2021	Oct. 16, 2021	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz-44GHz	Apr. 12, 2021	Sep. 23. 2021	Apr. 11, 2022	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 01, 2020	Sep. 23. 2021	Oct. 31, 2021	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	May 27, 2021	Sep. 23. 2021	May 26, 2022	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 25, 2021	Sep. 23. 2021	Apr. 24, 2022	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2020	Sep. 23. 2021	Nov. 09, 2021	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	187289	9KHz ~1GHZ	Apr. 12, 2021	Sep. 23. 2021	Apr. 11, 2022	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 06, 2021	Sep. 23. 2021	Jan. 05, 2022	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jan. 06, 2021	Sep. 23. 2021	Jan. 05, 2022	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270203	500MHz~26.5GHz	Apr. 13, 2021	Sep. 23. 2021	Apr. 12, 2022	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Sep. 23. 2021	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Sep. 23. 2021	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Sep. 23. 2021	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 21, 2021	Sep. 24. 2021	Apr. 20, 2022	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 17, 2020	Sep. 24. 2021	Oct. 16, 2021	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	Oct. 17, 2020	Sep. 24. 2021	Oct. 16, 2021	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 17, 2020	Sep. 24. 2021	Oct. 16, 2021	Conduction (CO01-KS)

NCR: No Calibration Required.

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.94dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

---------- THE END ----------

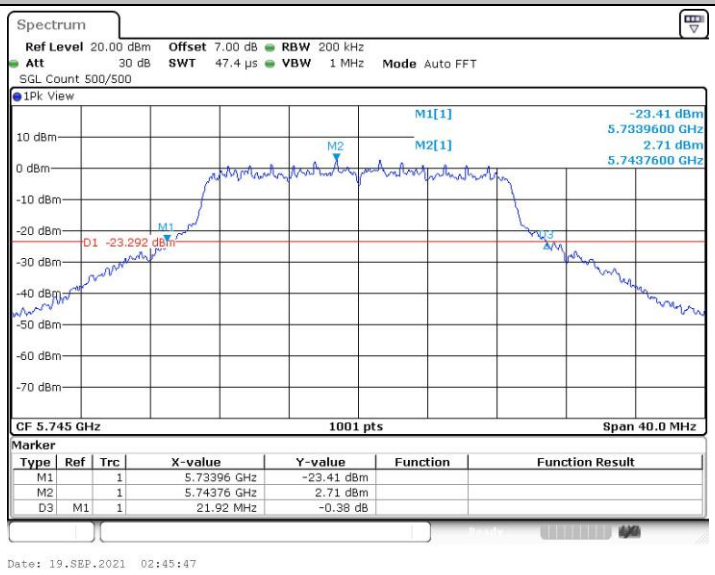
Appendix A. Conducted Test Results

26dB Emission Bandwidth Test Result

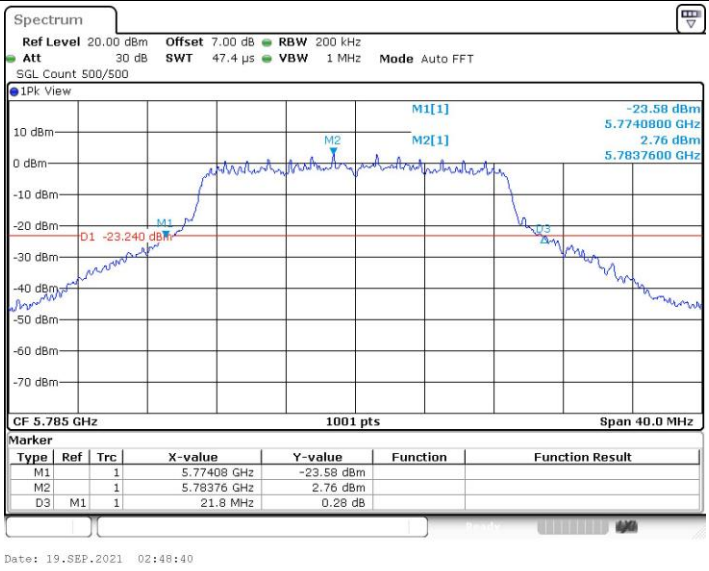
TestMode	Antenna	Frequency [MHz]	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AC20SISO	Ant1	5745	21.920	5733.960	5755.880	---	---
		5785	21.800	5774.080	5795.880	---	---
		5825	22.680	5813.640	5836.320	---	---
11AC40SISO	Ant1	5755	42.240	5734.040	5776.280	---	---
		5795	41.840	5774.360	5816.200	---	---
11AC80SISO	Ant1	5775	83.680	5733.400	5817.080	---	---

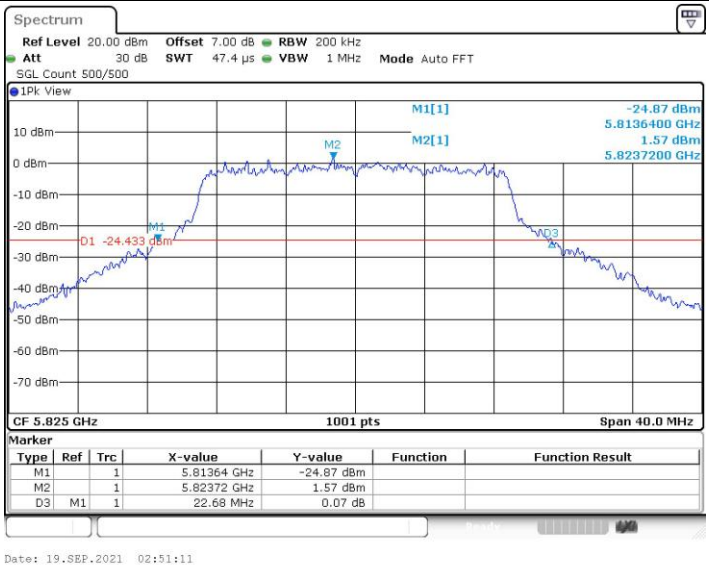
Test Graphs

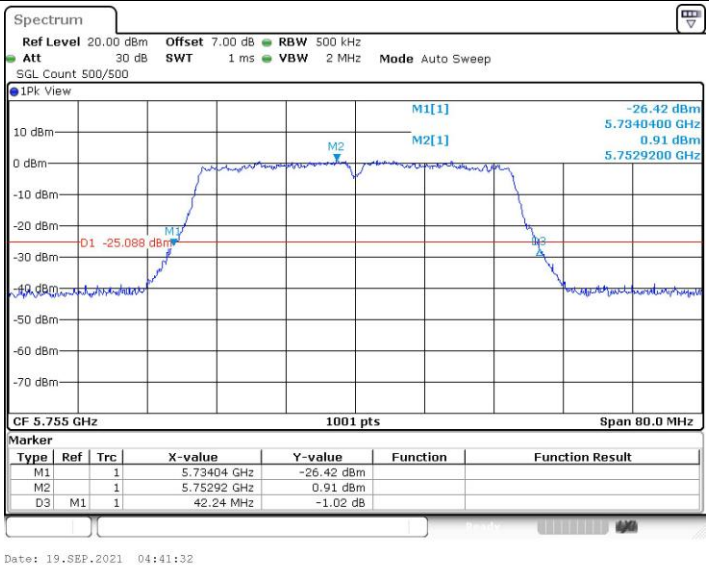
11AC20SISO_Ant1_5745

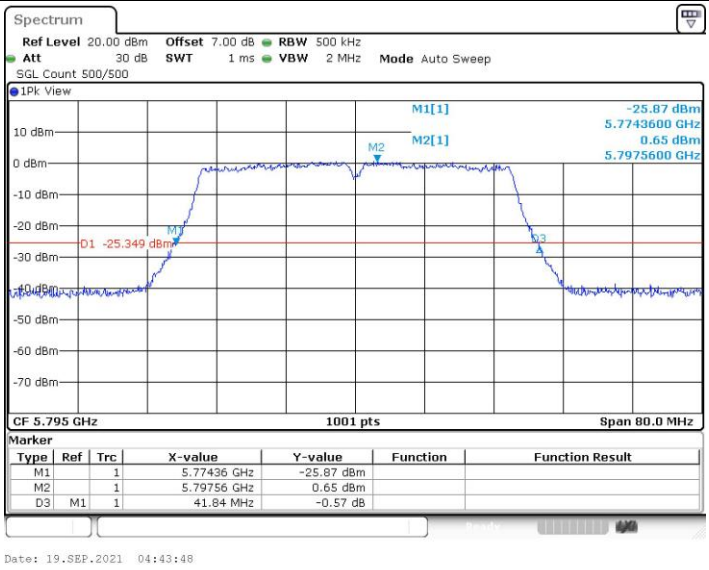


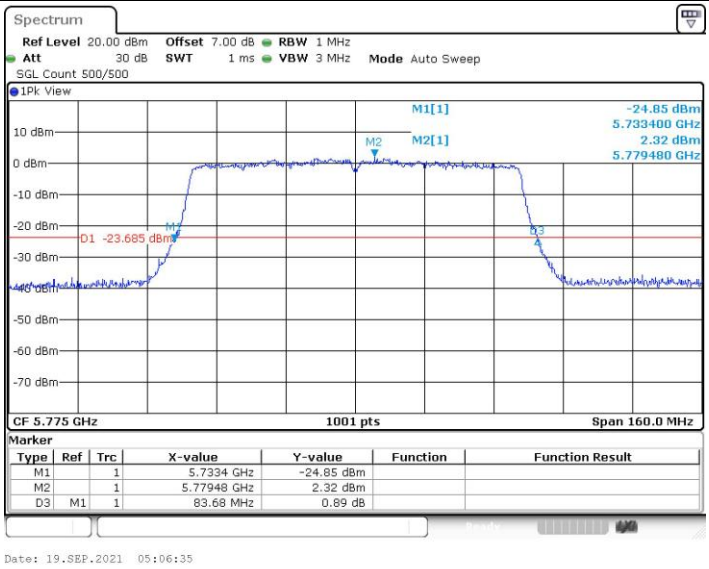
11AC20SISO_Ant1_5785



11AC20SISO_Ant1_5825


11AC40SISO_Ant1_5755


11AC40SISO_Ant1_5795


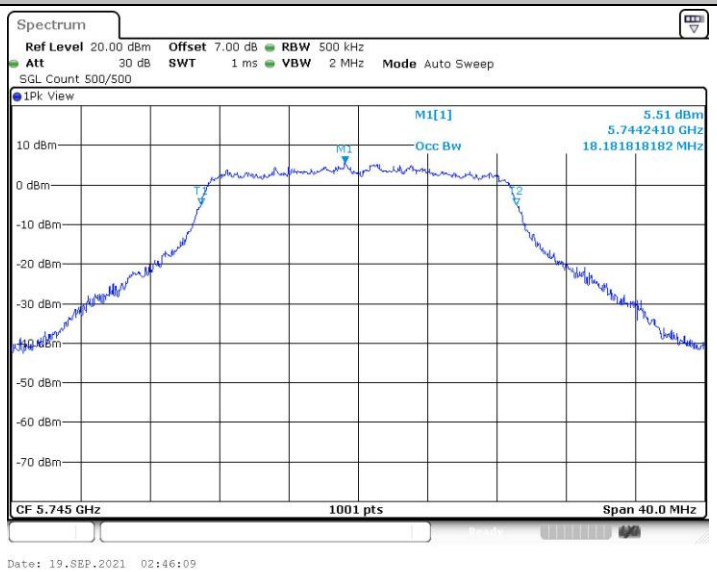
11AC80SISO_Ant1_5775


Occupied channel bandwidth Test Result

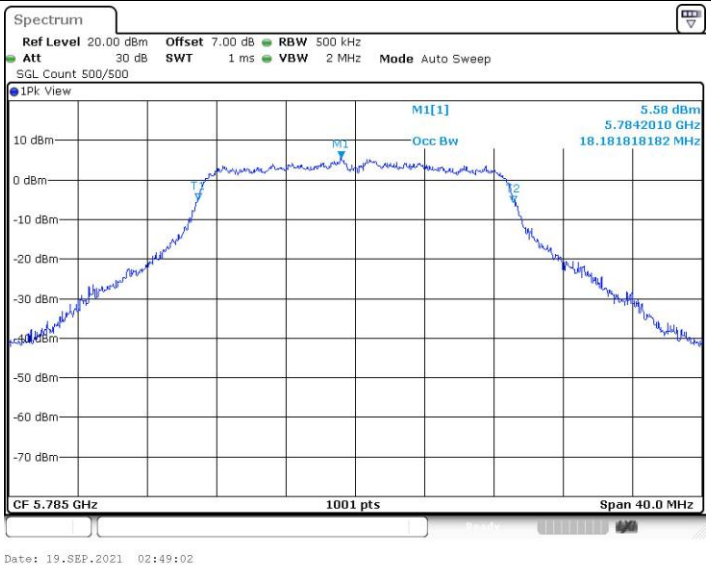
TestMode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AC20SISO	Ant1	5745	18.182	5735.929	5754.111	---	---
		5785	18.182	5775.929	5794.111	---	---
		5825	18.222	5815.929	5834.151	---	---
11AC40SISO	Ant1	5755	36.523	5736.778	5773.302	---	---
		5795	36.523	5776.778	5813.302	---	---
11AC80SISO	Ant1	5775	75.924	5737.118	5813.042	---	---

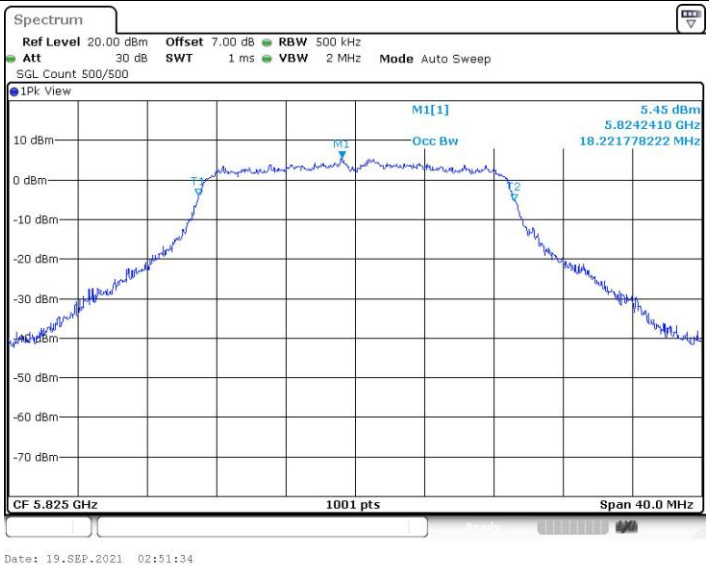
Test Graphs

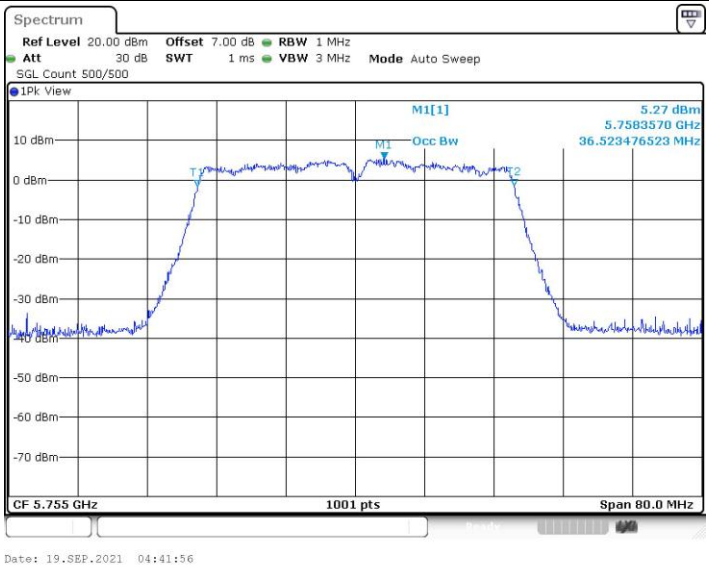
11AC20SISO_Ant1_5745

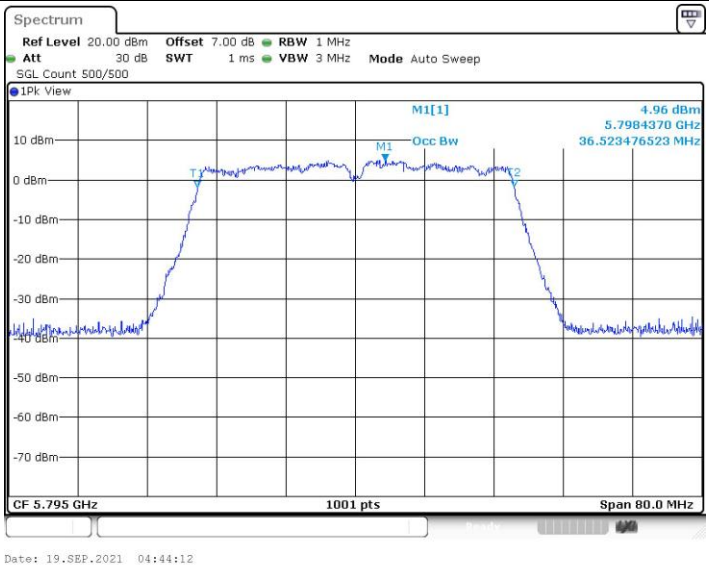


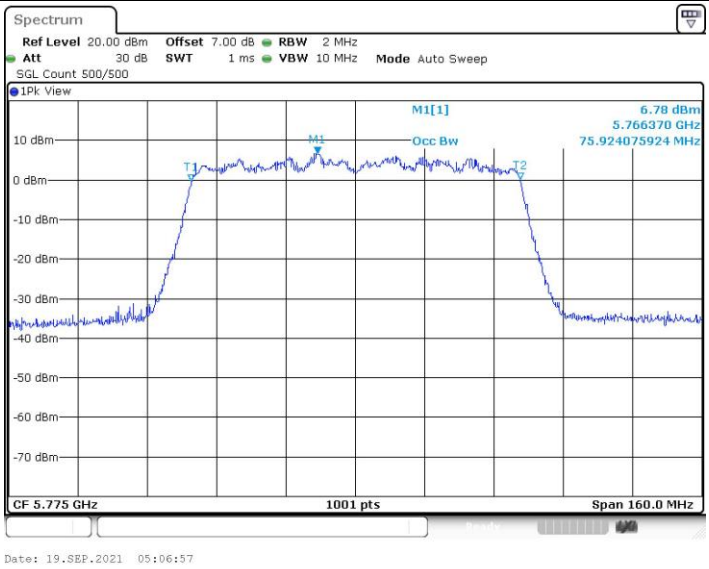
11AC20SISO_Ant1_5785



11AC20SISO_Ant1_5825


11AC40SISO_Ant1_5755


11AC40SISO_Ant1_5795


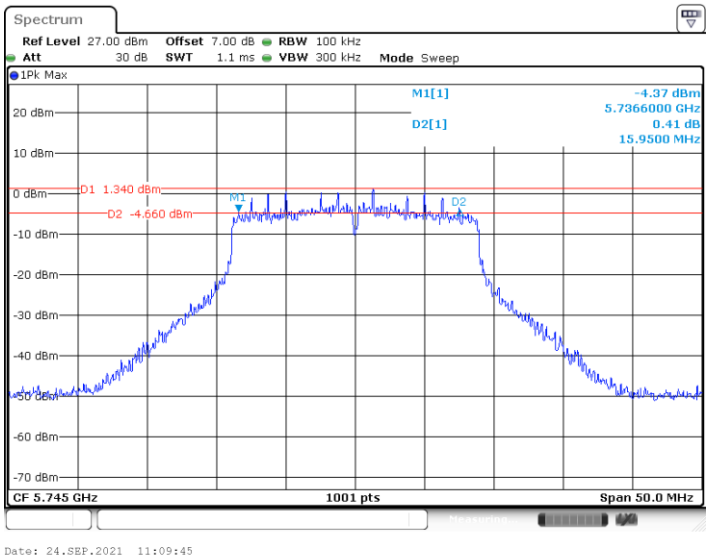
11AC80SISO_Ant1_5775


6dB emission bandwidth Test Result

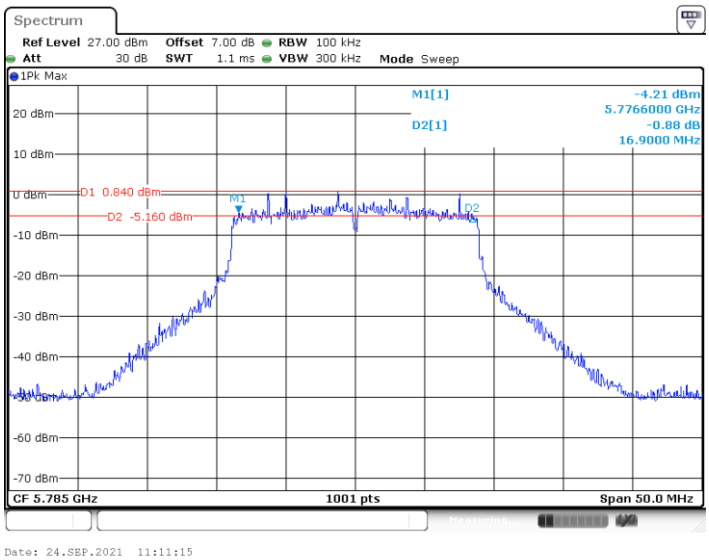
TestMode	Antenna	Frequency [MHz]	6dB EBW [MHz]	Limit[MHz]	Verdict
11AC20SISO	Ant1	5745	15.950	0.5	PASS
		5785	16.900	0.5	PASS
		5825	15.100	0.5	PASS
11AC40SISO	Ant1	5755	35.280	0.5	PASS
		5795	35.280	0.5	PASS
11AC80SISO	Ant1	5775	75.200	0.5	PASS

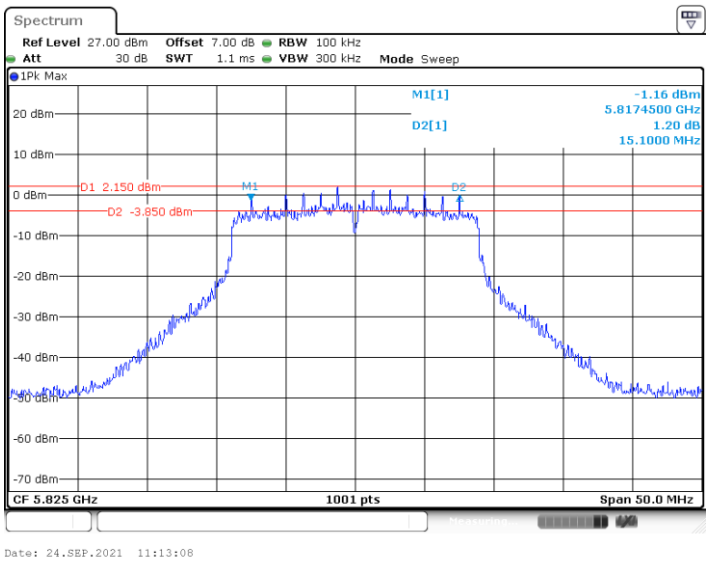
Test Graphs

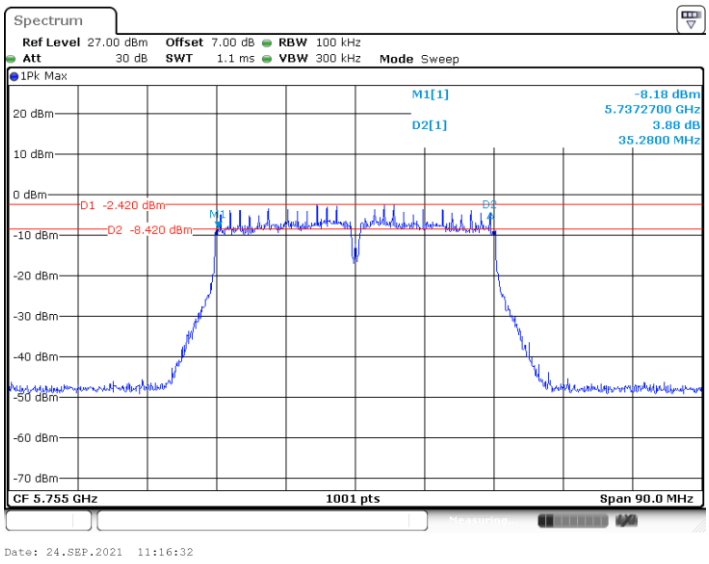
11AC20SISO_Ant1_5745

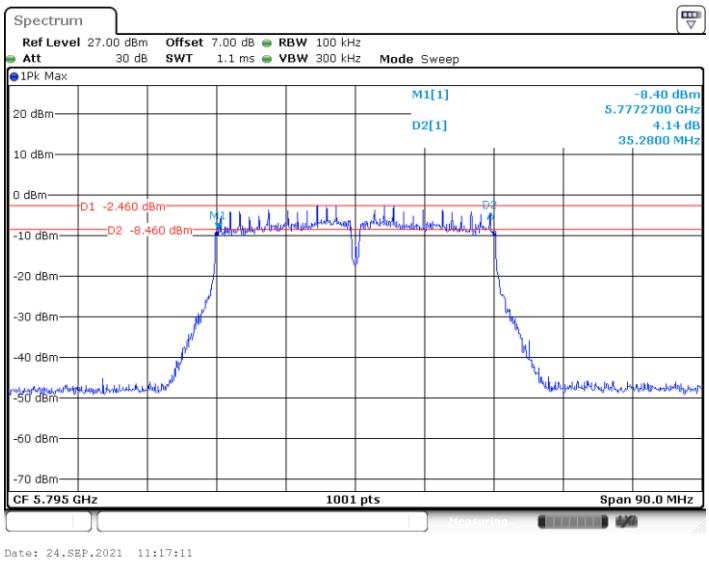


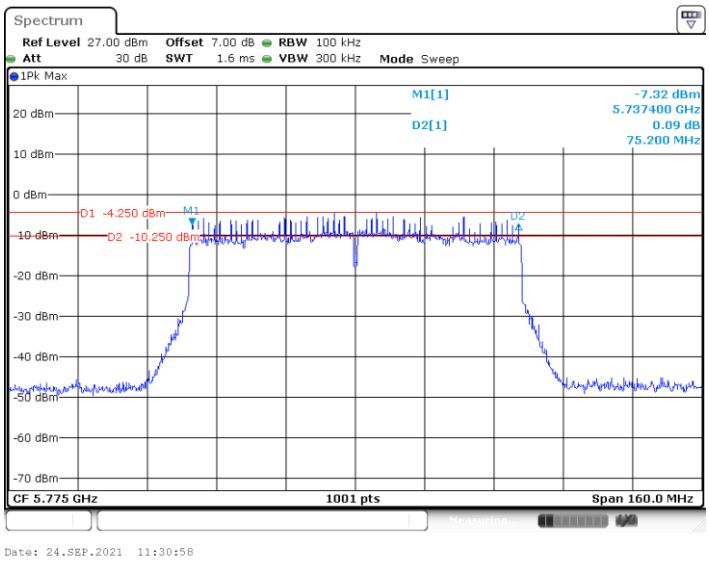
11AC20SISO_Ant1_5785



11AC20SISO_Ant1_5825


11AC40SISO_Ant1_5755


11AC40SISO_Ant1_5795


11AC80SISO_Ant1_5775


Maximum power spectral density Test Result

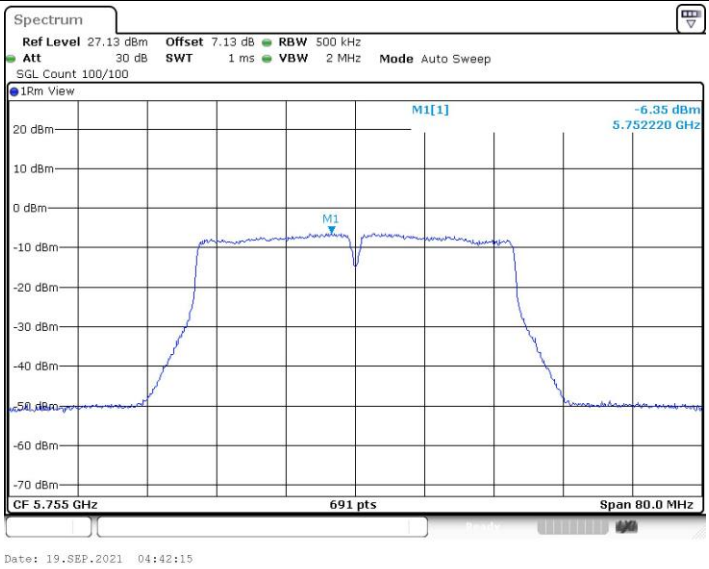
TestMode	Antenna	Frequency [MHz]	Result [dBm/500kHz]	Limit[dBm/500kHz]	Verdict
11AC20SISO	Ant1	5745	-2.4	≤30	PASS
		5785	-2.17	≤30	PASS
		5825	-2.43	≤30	PASS
11AC40SISO	Ant1	5755	-6.35	≤30	PASS
		5795	-6.28	≤30	PASS
11AC80SISO	Ant1	5775	-9.75	≤30	PASS

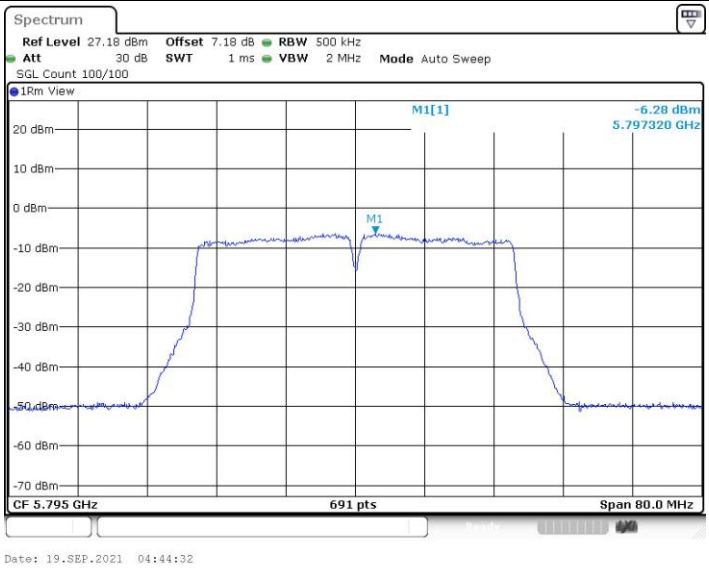
Test Graphs

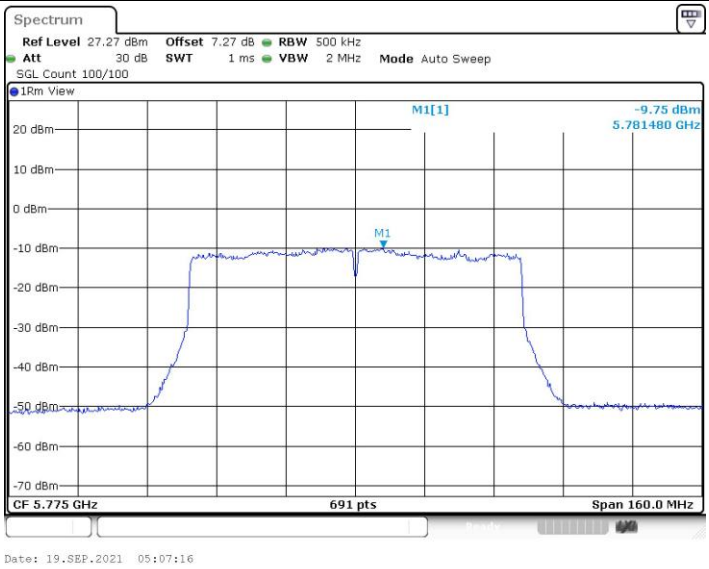
11AC20SISO_Ant1_5745

11AC20SISO_Ant1_5785

11AC20SISO_Ant1_5825

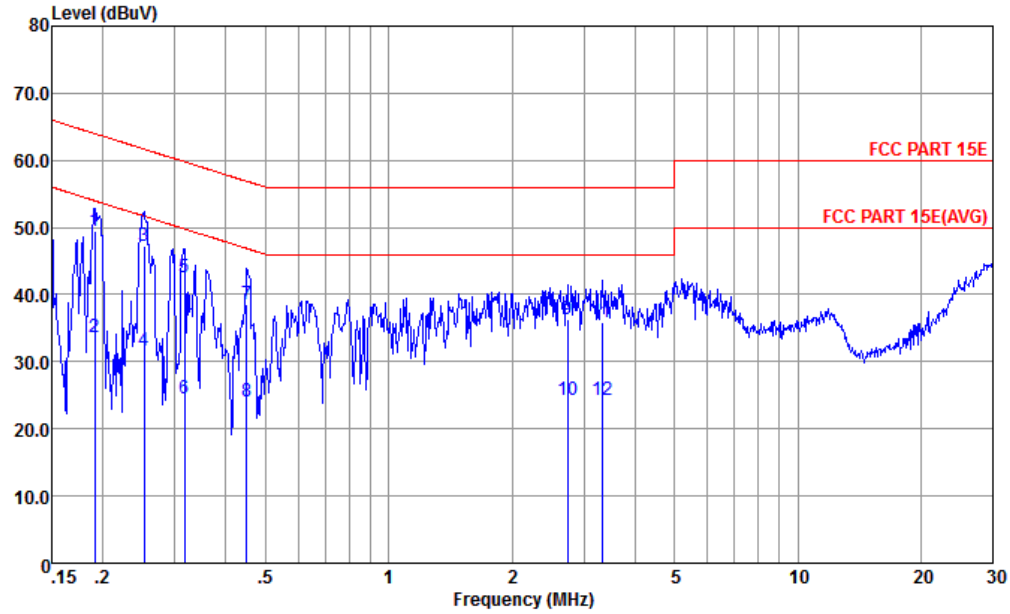

11AC40SISO_Ant1_5755


11AC40SISO_Ant1_5795


11AC80SISO_Ant1_5775


Appendix B. AC Conducted Emission Test Results

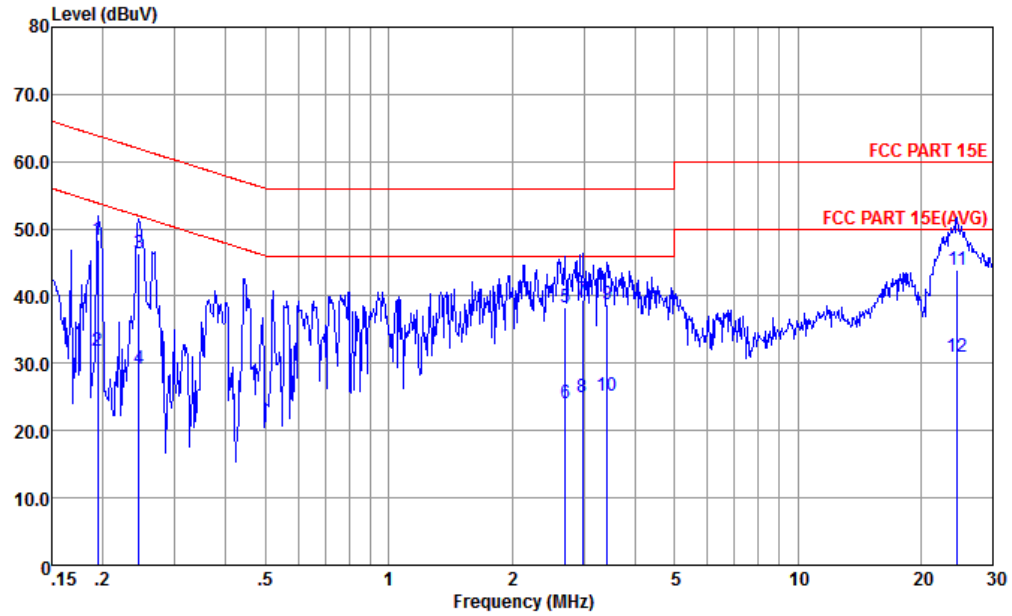
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15E LISN-L-060105-CN02 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.191	49.57	-14.41	63.98	39.11	0.08	10.38	QP
2		0.191	33.67	-20.31	53.98	23.21	0.08	10.38	Average
3	*	0.252	47.33	-14.36	61.69	36.90	0.10	10.33	QP
4		0.252	31.73	-19.96	51.69	21.30	0.10	10.33	Average
5		0.317	42.51	-17.29	59.80	32.10	0.11	10.30	QP
6		0.317	24.51	-25.29	49.80	14.10	0.11	10.30	Average
7		0.449	38.57	-18.32	56.89	28.19	0.13	10.25	QP
8		0.449	23.97	-22.92	46.89	13.59	0.13	10.25	Average
9		2.736	36.33	-19.67	56.00	25.60	0.49	10.24	QP
10		2.736	24.23	-21.77	46.00	13.50	0.49	10.24	Average
11		3.328	35.89	-20.11	56.00	25.10	0.54	10.25	QP
12		3.328	24.29	-21.71	46.00	13.50	0.54	10.25	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15E LISN-N-060105-CN02 NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.194	48.34	-15.50	63.84	37.80	0.17	10.37	QP
2		0.194	31.84	-22.00	53.84	21.30	0.17	10.37	Average
3	*	0.246	46.42	-15.49	61.91	35.90	0.18	10.34	QP
4		0.246	29.12	-22.79	51.91	18.60	0.18	10.34	Average
5		2.707	38.36	-17.64	56.00	27.50	0.62	10.24	QP
6		2.707	24.16	-21.84	46.00	13.30	0.62	10.24	Average
7		2.978	39.50	-16.50	56.00	28.61	0.65	10.24	QP
8		2.978	25.00	-21.00	46.00	14.11	0.65	10.24	Average
9		3.417	38.85	-17.15	56.00	27.90	0.70	10.25	QP
10		3.417	25.15	-20.85	46.00	14.20	0.70	10.25	Average
11		24.529	43.98	-16.02	60.00	30.20	3.22	10.56	QP
12		24.529	30.98	-19.02	50.00	17.20	3.22	10.56	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV

Appendix C. Radiated Spurious Emission

UNII 3 - 5725~5850MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac VHT80 CH 155 5775MHz		5604.4	55.91	-12.39	68.3	41.84	35.58	11.13	32.64	105	280	P	H
		5689.2	55.46	-41.88	97.34	41.27	35.67	11.22	32.7	105	280	P	H
		5718.4	55.31	-55.14	110.45	41.08	35.7	11.25	32.72	105	280	P	H
		5724.8	55.93	-65.91	121.84	41.68	35.72	11.25	32.72	105	280	P	H
		5764	94.08	-	-	79.76	35.78	11.29	32.75	105	280	P	H
		5764	86.65	-	-	72.33	35.78	11.29	32.75	105	280	A	H
		5854.4	53.75	-58.52	112.27	39.28	35.9	11.38	32.81	105	280	P	H
		5872.4	54.6	-51.43	106.03	40.13	35.9	11.39	32.82	105	280	P	H
		5897.2	55.36	-33.47	88.83	40.9	35.89	11.41	32.84	105	280	P	H
		5977.2	56.17	-12.13	68.3	41.68	35.89	11.48	32.88	105	280	P	H
		5648.4	54.32	-13.98	68.3	40.43	35.4	11.16	32.67	100	201	P	V
		5681.6	55.05	-36.67	91.72	41.17	35.37	11.2	32.69	100	201	P	V
		5710.4	55.18	-53.03	108.21	41.33	35.34	11.23	32.72	100	201	P	V
		5724	54.04	-65.98	120.02	40.19	35.32	11.25	32.72	100	201	P	V
		5782	94.18	-	-	80.36	35.28	11.3	32.76	100	201	P	V
		5782	87.35	-	-	73.53	35.28	11.3	32.76	100	201	A	V
		5852	53.01	-64.73	117.74	39.24	35.22	11.36	32.81	100	201	P	V
		5868.8	54.75	-52.28	107.03	40.98	35.2	11.38	32.81	100	201	P	V
		5915.6	54.83	-20.4	75.23	41.03	35.21	11.43	32.84	100	201	P	V
		5976.8	55.38	-12.92	68.3	41.55	35.23	11.48	32.88	100	201	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 3 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT80 CH 155 5775MHz		11550	46.51	-27.49	74	52.33	39.31	16.37	61.5	300	0	P	H
		11550	45.58	-28.42	74	51.07	38.66	16.37	60.52	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 3 5725~5850MHz

Emission below 1GHz

5GHz WIFI 802.11ac VHT80 (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11ac VHT80 LF		119.24	29.87	-13.63	43.5	44.4	16.56	1.77	32.86	-	-	P	H
		217.21	31.12	-14.88	46	45.63	16.21	2.38	33.1	-	-	P	H
		260.86	26.45	-19.55	46	38.23	18.67	2.61	33.06	-	-	P	H
		379.2	27.89	-18.11	46	36.24	21.32	3.17	32.84	-	-	P	H
		766.23	30.61	-15.39	46	30.41	28.33	4.5	32.63	-	-	P	H
		872.93	31.76	-14.24	46	30.25	29.24	4.82	32.55	-	-	P	H
		44.55	28.79	-11.21	40	43.89	17	0.8	32.9	-	-	P	V
		69.77	28.92	-11.08	40	48.16	12.6	1.16	33	-	-	P	V
		77.53	28.88	-11.12	40	47.16	13.33	1.29	32.9	-	-	P	V
		221.09	25.58	-20.42	46	39.8	16.48	2.4	33.1	-	-	P	V
		265.71	29.08	-16.92	46	40.74	18.75	2.63	33.04	-	-	P	V
		910.76	32.1	-13.9	46	28.63	29.52	4.92	30.97	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

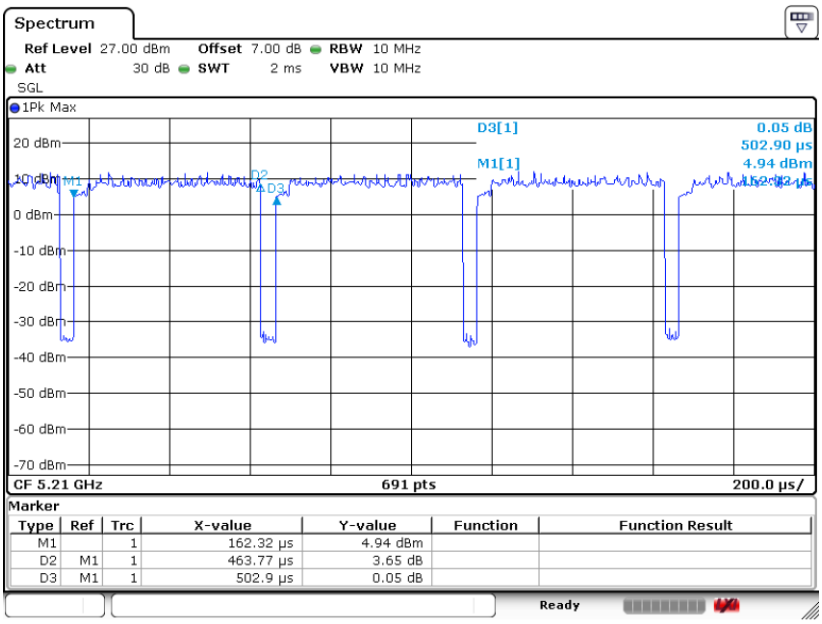
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11ac VHT80	92.22	0.464	2.156	2.2KHz

802.11 ac VHT80



Appendix F. Product Equality Declaration

Date: March 25, 2021

Product Equality Declaration

We, Motorola Solutions Malaysia Sdn Bhd, declare on our sole responsibility for the product of EVOLVE-i as below:
From hardware vintage P2.2 EVOLVE-i SKU to hardware vintage P3 EVOLVE-i SKU,

	Main Changes
1	Increase LDO as MIC_BIAS power supplier, to solve EU RED Cert-Radio Frequency, Common mode(CS) test issue.
2	Optimize GPS routing, from inner layer to bottom layer.
3	Due to above changes, the PCB will update the part number.
4	Add a new Battery

Except listings above, the others are all the same.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,

Contact Person: Mahen Kirubakaran
COMPANY: Motorola Solutions Malaysia Sdn Bhd
Tel: +60 (4) 2241218
Fax: N/A
E-Mail: mahen@motorolasolutions.com

Date: October 22, 2021

Product Equality Declaration

We, Motorola Solutions Inc. CORPORATION, declare on our sole responsibility for the product of EVOLVE and EVOLVE-i as below:
There is no difference between P3 and PVT HW version, and, the difference of EVOLVE-i and EVOLVE is RF section is same only with extra protection components in EVOLVE-i.

i) Both SKUs share the same PCB with all traces.
ii) EVOLVE-i SKU will have protection circuits with fuse and Zener diode (BOM different).
iii) EVOLVE SKU the fuse will become 0 ohm and Zener diodes will be not populated.
iv) The RF sections are the same for both EVOLVE-i and EVOLVE SKUs.

Except listings above, the others are all the same.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,

Contact Person: Hasrolnizam Bin Mohd Mokhtar
COMPANY: Motorola Solutions Malaysia Sdn Bhd
Tel: +60(4) 2241066
Fax: N/A
E-Mail: hasrolnizam.mohdmokhtar@motorolasolutions.com