

FCC ID TEST REPORT

Under:

FCC 15 Subpart C, Paragraph 15.247

Operation within the band

☒2400-2483.5MHz

☒DTS - Digital Transmission System ☒Limited single-modular

Prepared For :

Sensor Maestros LLC

9878 W. Belleview Ave #124 Littleton CO 80123

FCC ID: 2A7JO-SMB1110

EUT: smB1110

Model: smB1110

June 28, 2022

Issue Date:

Original Report

Report Type:



Test Engineer: Jacky Huang



Review By: Apollo Liu / Manager

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Report Revision History

Report #	Version	Description	Issued Date
KSZ2021060901J03	Rev.01	Initial issue of report	June 28, 2022

1. General Information

1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.6. The Ke Mei Ou Laboratory does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the Ke Mei Ou Laboratory.

1.2 Testing Laboratory

Test Firm Name:	Ke Mei Ou Lab Co., Ltd.
Test Firm Address:	2013-2016, 20th Floor, Business Center, Jiahui Xin Cheng, No 3027, Shen Nan Road, Fu Tian, Shen Zhen, Guang Dong, P. R. China
FCC Designation Number:	CN1532
Test Firm Registration Number:	344480
Internet:	www.kmolab.com
Email:	kmo@kmolab.com
ANSI-ASQ National Accreditation Board/ACLASS ISO/IEC 17025 Accredited Lab for telecommunication standards. The Registration Number is AT-1532. The testing quality system meets with ISO/IEC-17025 requirements. This approval results is accepted by MRA of ILAC.	

1.3 Details of Applicant

Name	Sensor Maestros LLC
Address	9878 W. Belleview Ave #124 Littleton CO 80123

1.4 Application Details

Date of Receipt of Application	: June 9, 2021
Date of Receipt of Test Item	: August 13, 2021
Date of Test	: August 30, 2021 ~ June 28, 2022

1.5 Details of Factory

Name	Hana Microelectronics Public Co., Ltd.
Address	Saha Group Industrial Park Lamphun 123 Moo 5, T.Pasak, A.Muang, Lamphun 51000, Thailand

1.6 Test Item

EUT Feature	
EUT Description:	smB1110
Brand Name:	Sensor Maestros
Basic Mode:	smB1110
Family Model:	smB1111
EUT RF Technology:	<input checked="" type="checkbox"/> Bluetooth v4.2 LE
Equipment Class:	<input checked="" type="checkbox"/> DTS - Digital Transmission System <input checked="" type="checkbox"/> Limited single-modular
HW Version:	v1.1.0
SW Version:	-
EUT Stage:	<input checked="" type="checkbox"/> Identical Prototype
Note: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

Additional Information

Standard Product Specification				
Tx/Rx Frequency Range	☑2400-2483.5MHz			
Number of Channels	40 (37 hopping + 3 advertising channel)			
Carrier Frequency of Each Channel	f=2402+k MHz (k=0,2,4...,39)			
Antenna Type / Gain	Chain Number	Antenna Gain	Internal	External
Antenna Type / Gain	1	3.3dBi	☑PCB	☐Dipole
Type of Modulation	☑GFSK			
EUT Operational Condition	☐AC → ☐Other			
	☑DC → ☑Other → ☐From Battery ☑2.0~3.3Vdc			
Specification of Accessory				
☐AC/DC Adapter # (Charger)	Brand Name	N/A	Model Name	N/A
	Power Rating	N/A		

1. 7 Applicable Standards

Applicable Standards	
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards: FCC Part 15 Subpart C 15.247 FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02 FCC KDB 414788 D01 Radiated Test Site v01r01 ANSI C63.10-2013	
Note:	1)All test items were verified and recorded according to the standards and without any deviation during the test. 2)This EUT has also been tested and complied with the requirements of FCC 15 Part 15, Subpart B, recorded in a separate test report.

2. Technical Test

2.1 Summary of Test Results

The EUT has been tested according to the following specifications:

FCC Rules	Test Type	Limit	Result	Notes
15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	Complies.
-	99% Bandwidth	-	Pass	Complies.
15.247(b)(3)	Peak Output Power	$\leq 30\text{dBm}$	Pass	Complies.
15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	Complies
15.247(d)	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	Complies
15.247(d)	Radiated Band Edges and Spurious Emission	FCC 15.209(a) & 15.247(d)	Pass	Complies
15.247(d)	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	Complies
15.207	AC Conducted Emission	FCC15.207(a)	Pass	Complies
15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	Complies
15.247(i) & 1.1307(b)(1) & 2.1091	Maximum Permissible Exposure (MPE)	$< 1\text{mW}/\text{cm}^2$	Pass	Complies

IC Rules	Test Type	Limit	Result	Notes
RSS-247 5.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	Complies.
RSS-Gen 6.7	99% Bandwidth	-	Pass	Complies.
RSS-247 5.4(d)	Peak Output Power	$\leq 30\text{dBm}$	Pass	Complies.
RSS-247 5.2(b)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	Complies
RSS-247 5.5	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	Complies
RSS-247 5.5	Radiated Band Edges and Spurious Emission	FCC 15.209(a) & 15.247(d)	Pass	Complies
RSS-GEN 8.8	AC Conducted Emission	FCC15.207(a)	Pass	Complies
N/A	Antenna Requirement	N/A	Pass	Complies
RSS-102 section 2.5.2	RF Exposure exemption	-	Pass	Complies

2.2 Antenna Requirement

Regulation

Per § 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.

Result

☒ EUT has one internal PCB antenna, which was permanently attached and the gain is 3.3 dBi.

☒ EUT has not any provisions for connect to an external antenna.

Therefore the EUT complies with Section 15.203 of the FCC rules.

2.3 Measurement Uncertainty

Measurement	Frequency	Uncertainty
Conducted emissions	0.15MHz ~ 30MHz	3.20
Radiated emissions	9kHz ~ 30MHz	4.20
Radiated emissions	30MHz ~ 300MHz	4.62
Radiated emissions	300MHz ~ 1000MHz	4.62
Radiated emissions	1GHz ~ 18GHz	4.86
Radiated emissions	18GHz ~ 40GHz	3.80

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

2.4 Test Configuration

Tx Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

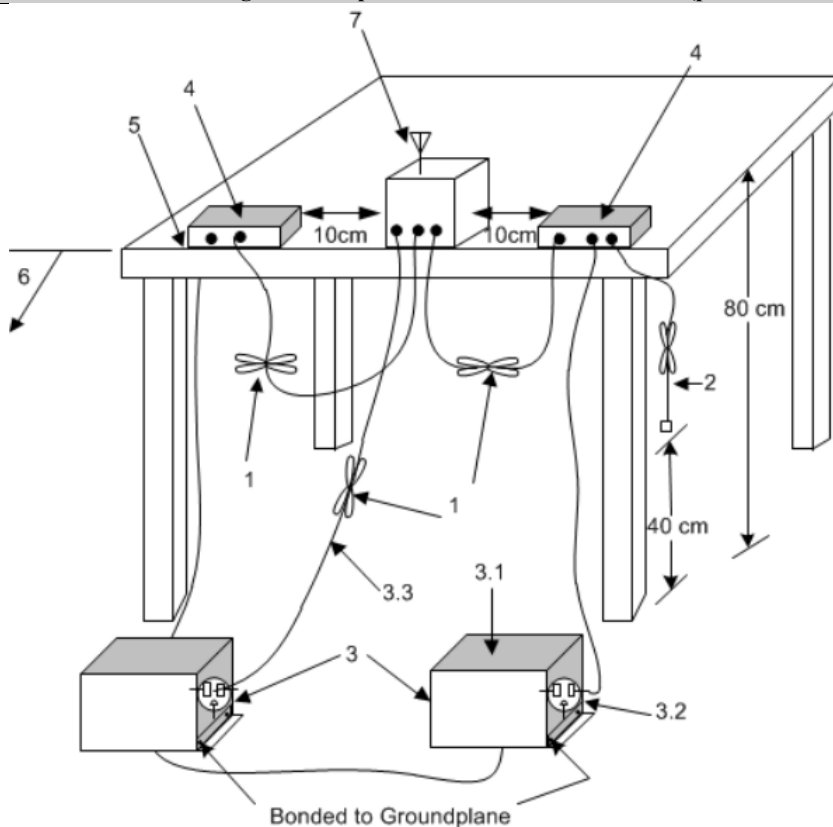
The following summary table is showing an test modes to be conducted in compliance with the standard.

Summary Tables of Test Mode			
Test Item	Modulation	Data Rate	Channel Plan
Conducted Cases	<input checked="" type="checkbox"/> GFSK	<input checked="" type="checkbox"/> 1Mbps	Mode 1: CH00 Mode 2: CH19 Mode 3: CH39
Radiated Cases	<input checked="" type="checkbox"/> GFSK	<input checked="" type="checkbox"/> 1Mbps	Mode 1: CH00 Mode 2: CH19 Mode 3: CH39
AC Conducted Emission	Test Mode: EUT link with Controller (DC Power)		
Note:			
1)The worst case of conducted emission is channel 1; only the worst case was reported.			
2)For Radiated case, the tests were performed with PCB antenna.			

EUT Operation Test Setup		
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations. Only the worst test mode data was reported.		
For Tx function, the engineering test program was provided and enabled to make EUT link with controller to continuous transmit/receive.		
For AC power line conducted emissions, the EUT was set to working normal.		
Pre-Scan Mode		
Test Mode	Operating Description	
1	EUT with 1Mbps GFSK	
2	EUT with 1Mbps GFSK	
3	EUT with 1Mbps GFSK	
Conducted Emissions → Final		
FCC Part 15.247 Requirements for DTS Systems	Test Mode	1,2,3
☒AC Conducted Emissions → Final		
Test Mode	1	
☒Radiated Emissions → Final		
Test Mode	1	
Note: The test modes were carried out for all operation modes (include link and idle).		
The final test mode of the EUT was the worst test mode for Mode 1, and its test data was reported.		

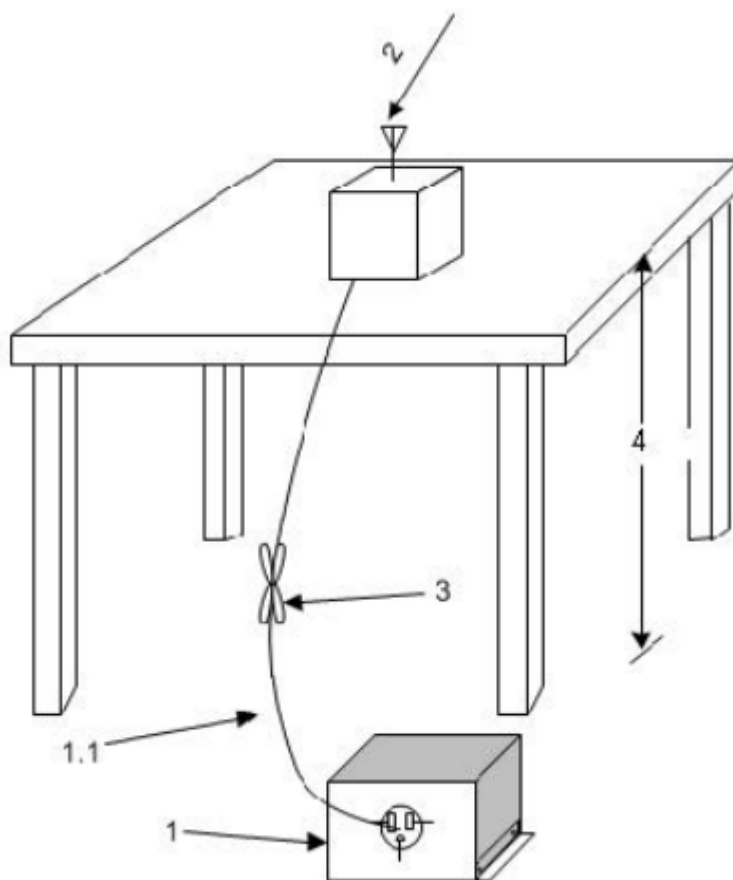
Support Unit				
Device	Manufacturer	Model # Serial #	FCC ID/ DoC	Cable
Notebook	LENOVO	20195	DoC	1.5m unshielded power cord
-	-	-	-	-

☒ **ANSI C63.10:2013 - Test arrangement for power-line conducted emissions (product with accessories)**



- 1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
- 3.1—All other equipment powered from additional LISN(s).
- 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
- 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

☒ ANSI C63.10:2013 - Test arrangement for radiated emissions (tabletop product)



1—A LISN is optional for radiated measurements between 30 MHz and 1000 MHz but not allowed for measurements below 30 MHz and above 1000 MHz. If used, then connect EUT to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. The LISN may be placed on top of, or immediately beneath, the reference ground plane.

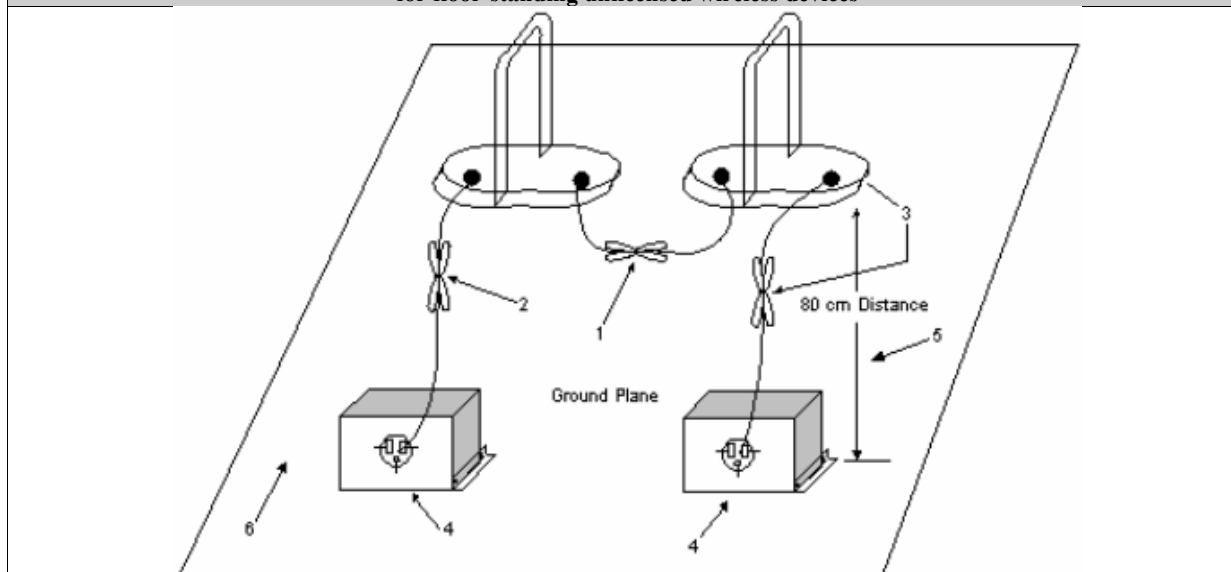
1.1—LISN spaced at least 80 cm from the nearest part of the EUT chassis.

2—Antenna can be integral or detachable, depending on the EUT.

3—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

4—For emission measurements at or below 1 GHz, the table height shall be 80 cm. For emission measurements above 1 GHz, the table height shall be 1.5 m for measurements, except as otherwise specified.

□ ANSI C63.10:2013 - Test arrangement for radiated and conducted emissions
for floor-standing unlicensed wireless devices



3. EUT Modifications

No modification by test lab.

4. Conducted Power Line Test

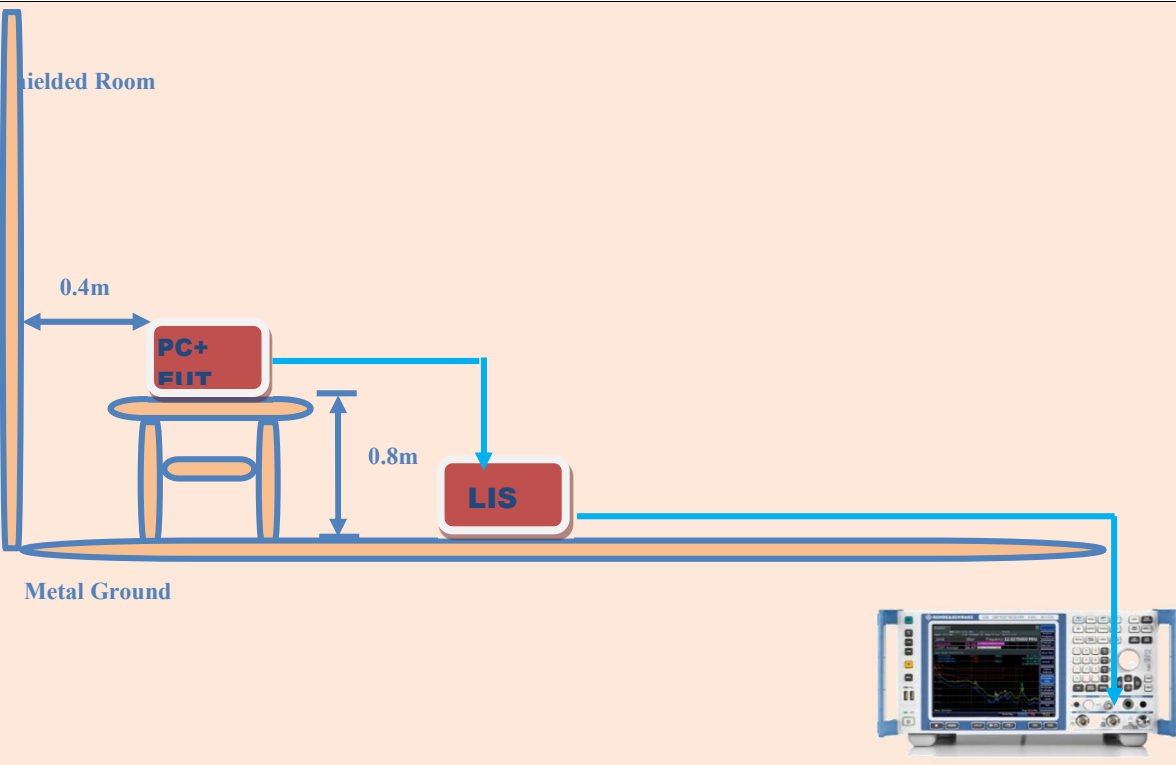
4.1 Test Equipment

Please refer to Section 10 this report.

4.2 Test Procedure

Test Method	
<input checked="" type="checkbox"/>	<p>The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.</p> <p>Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission., the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.</p>

4.3 Test Setup

Test Setup	
AC Line Conducted Emissions	
 <p>The diagram illustrates the test setup for AC Line Conducted Emissions within a shielded room. A PC+ELIT (Equipment Under Test) is placed on a stand, positioned 0.4m from the shielded room wall and 0.8m from the metal ground. A LISN (Line Impedance Stabilization Network) is connected to the PC+ELIT and the metal ground. The LISN is also connected to a spectrum analyzer, which is used to measure the conducted emissions. The spectrum analyzer is connected to the LISN and the metal ground.</p>	
<p>This test is applicable for radio equipment and/or ancillary equipment for fixed use powered by the AC mains. This test shall be performed on a representative configuration of the radio equipment, the associated ancillary equipment, or a representative configuration of the combination of radio and ancillary equipment. This test assesses the level of internally generated electrical noise present on the AC power input/output ports.</p>	

4. 4 Configuration of the EUT

Refer to section 2.4 of this test report.

4. 5 EUT Operating Condition

Refer to section 2.4 of this test report.

4. 6 Conducted Power Line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)	
Frequency Range (MHz)	QP/AV
0.15 – 0.5	66-56/56-46
0.5 – 5.0	56/46
5.0 - 30	60/50

Note: In the above table, the tighter limit applies at the band edges.

4.7 Conducted Power Line Test Result

Test Results:	Refer to Appendix
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5. FCC Part 15.247 Requirements for DTS Systems

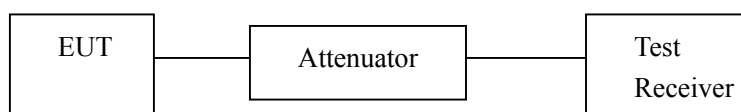
5.1 Test Equipment

Please refer to Section 10 this report.

5.2 Test Procedure

6 dB & 99% Bandwidth	Refer to FCC 15.247(a)(2), ANSI C63.10:2013
Test Method:	FCC KDB Publication No.558074 D01 DTS Meas Guidance v05r02 – 8.2
a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize.	g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. *For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
Peak Power:	Refer to FCC 15.247(b)(3), ANSI C63.10:2013
Test Method:	FCC KDB Publication No.558074 D01 DTS Meas Guidance v05r02 – 8.3 PKPM1 Peak power meter method
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.	
Peak Power Spectral Density:	Refer to FCC 15.247(e), ANSI C63.10:2013
Test Method:	FCC KDB Publication No.558074 D01 DTS Meas Guidance v05r02 – 8.4 Method PKPSD
a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the DTS bandwidth. c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. d) Set the VBW $\geq 3 \times$ RBW. e) Detector = peak. f) Sweep time = auto couple.	g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum amplitude level within the RBW. j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
Band Edges Measurement:	Refer to FCC 15.247(d), ANSI C63.10:2013
Test Method:	FCC KDB Publication No.558074 D01 DTS Meas Guidance v05r02 & 15.247
a. The transmitter output was connected to the spectrum analyzer via a low lose cable. b. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge. c. The band edges was measured and recorded.	

5.3 Test Setup



5.4 Configuration of the EUT

Same as section 4.4 of this report

5.5 EUT Operating Condition

Same as section 4.5 of this report.

5. 6 Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~ 928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

5. 7 Test Result

A. 6 dB Bandwidth_DTS Bandwidth _

Refer to Appendix_DTS_BLE.

B. Occupied Channel Bandwidth

Refer to Appendix_DTS_BLE.

C. Peak Power_ Maximum conducted output power

Refer to Appendix_DTS_BLE.

D. Peak Power Spectral Density_ Maximum power spectral density

Refer to Appendix_DTS_BLE.

E. Band Edges Measurement

Refer to Appendix_DTS_BLE.

F. Conducted Spurious Emission

Refer to Appendix_DTS_BLE.

G. Duty Cycle

Refer to Appendix_DTS_BLE.

6. Radiated Emission Radiated Emission at 3 Meters

6.1 Test Equipment

Please refer to Section 10 this report.

6.2 Test Procedure

The radiated emissions test below 30 MHz is performed in the following steps:					
Frequency (MHz)	RBW(kHz)	Step Size(kHz)	Pre-Scan	Pre-Scan with FFT	Final Scan
0.009 ~ 0.15	0.2	≤0.1	Peak, Average	Peak Quasi-Peak, Average	Peak Quasi-Peak, Average
0.15 ~ 30	9	≤4.5	Peak, Average	Peak Quasi-Peak, Average	Peak Quasi-Peak, Average

The EUT was tested according to ANSI C63.10:2013.

a) The loop antenna is positioned with its plane perpendicular to the ground with the lowest height of the antenna 1 m above the ground.

b) The EUT is placed in its standard position on a turntable capable of rotation through 360° in the horizontal plane and arranged as tabletop or floor-standing equipment, as applicable. The EUT is switched on.

c) The measurement equipment is connected to the loop antenna and set-up according to the specifications of the test.

d) The EUT is turned to a position likely to get the maximum and the test antenna is rotated to detect the maximum of the fundamental in this EUT position.

e) Then the EUT is rotated in a horizontal plane through 360° in steps of 45°. Starting at 0°, at each table position the spectrum for the full frequency range is recorded. If the emission at a certain frequency is higher than the levels already recorded, the current table position is noted as the maximum position.

f) After the last pre-scan, the significant maximum emissions and their table positions are determined and collected in a list.

g) With the test receiver set to the first frequency of the list, the EUT is rotated by ±45° around the table position found during pre-scans while measuring the emission level continuously. For final scan, the worst-case table position is set and the maximum emission level is recorded.

h) Step g) is repeated for all other frequencies in the list.

i) Finally, for frequencies with critical emissions the loop antenna is rotated again to find the maximum of emission. At least, frequency and level of the six highest emissions relative to the limit have to be recorded. However, emissions more than 20 dB below the limit do not need to be reported.

If the EUT may be used in various positions, steps a) to i) are repeated in two other orthogonal positions. If the EUT may be used in one position only, steps a) to i) are repeated in one orthogonal position.

The radiated emissions test from 30 MHz to 960 MHz is performed in the following steps:					
Frequency (MHz)	RBW(kHz)	Step Size(kHz)	Pre-Scan	Pre-Scan with FFT	Final Scan
30 ~ 960	120	≤60	Peak	Quasi-Peak	Quasi-Peak

The EUT was tested according to ANSI C63.10:2013.

a) The measurement antenna is oriented initially for vertical polarization.

b) The EUT is placed in its standard position on a turntable capable of rotation through 360° in the horizontal plane and arranged as tabletop or floor-standing equipment, as applicable. The EUT is switched on.

c) The measurement equipment is connected to the measurement antenna and set-up according to the specifications of the test

d) The table position is set to 0°.

e) The antenna height is set to 1 m.

f) The spectrum for the full frequency range is recorded. If the emission at a certain frequency is higher than the levels already recorded, the polarization and height of the measurement antenna as well as the current table position are noted as the maximum position.

g) The antenna height is increased to 4 m in steps of 50 cm. At each height, step f) is repeated.

h) The polarization of the measurement antenna is changed to horizontal.

i) The antenna height is decreased from 4 m to 1 m in steps of 50 cm. At each height, step f) is repeated.

j) The EUT is rotated in a horizontal plane through 360° in steps of 60°. At each table position, steps e) to i) are repeated.

k) After the last pre-scan, the significant maximum emissions with their polarizations and heights of the measurement antenna as well as their table positions are determined and collected in a list.

l) With the test receiver set to the first frequency of the list, the measurement antenna is set to the polarization and height and the table is moved to the position as determined during pre-scans.

m) The antenna is moved by ±50 cm around this height and the EUT is rotated by ±60° around this table position while measuring the emission level continuously.

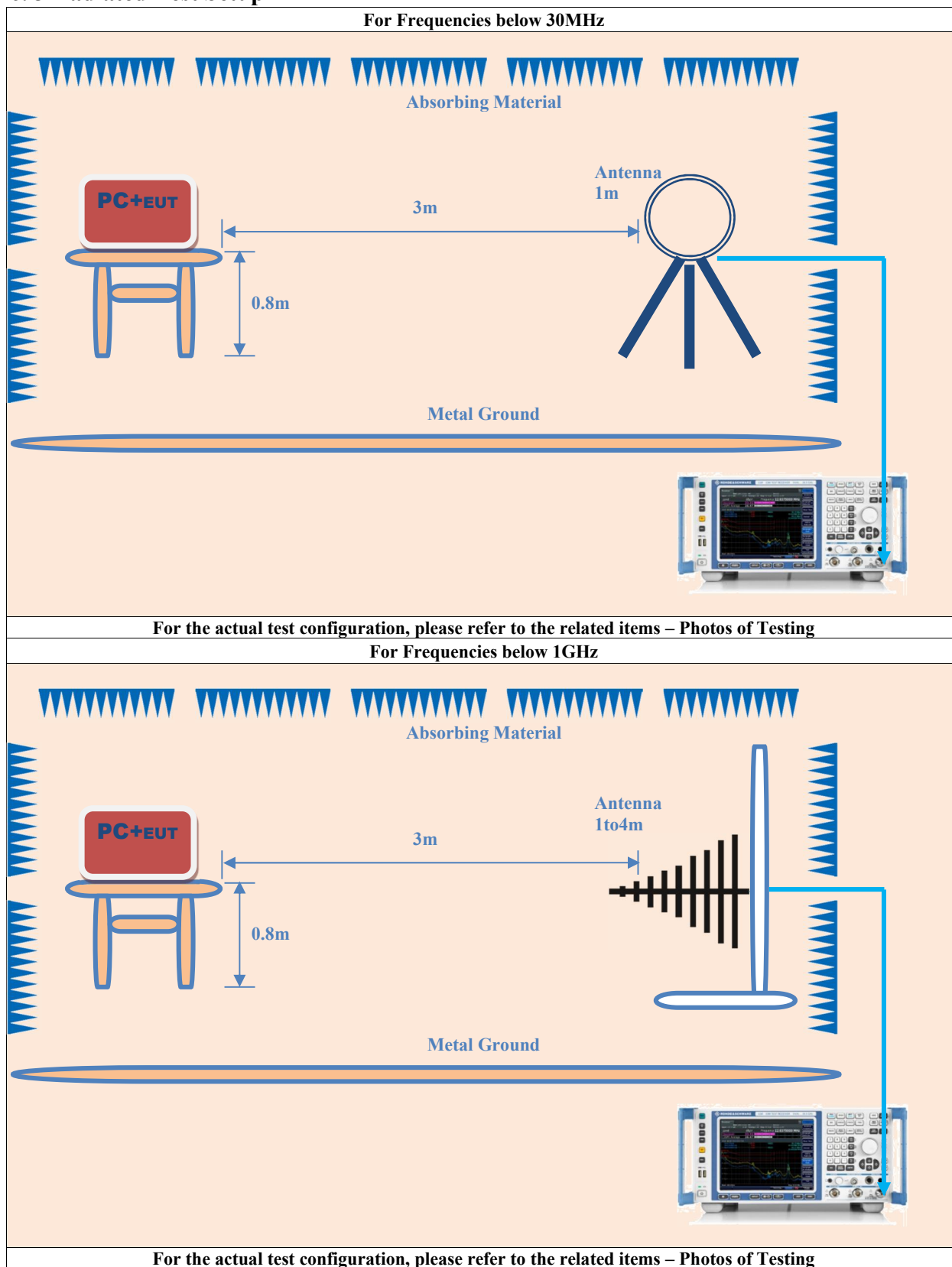
n) For final scan, the worst-case positions of antenna and table are set and the maximum emission level is recorded.

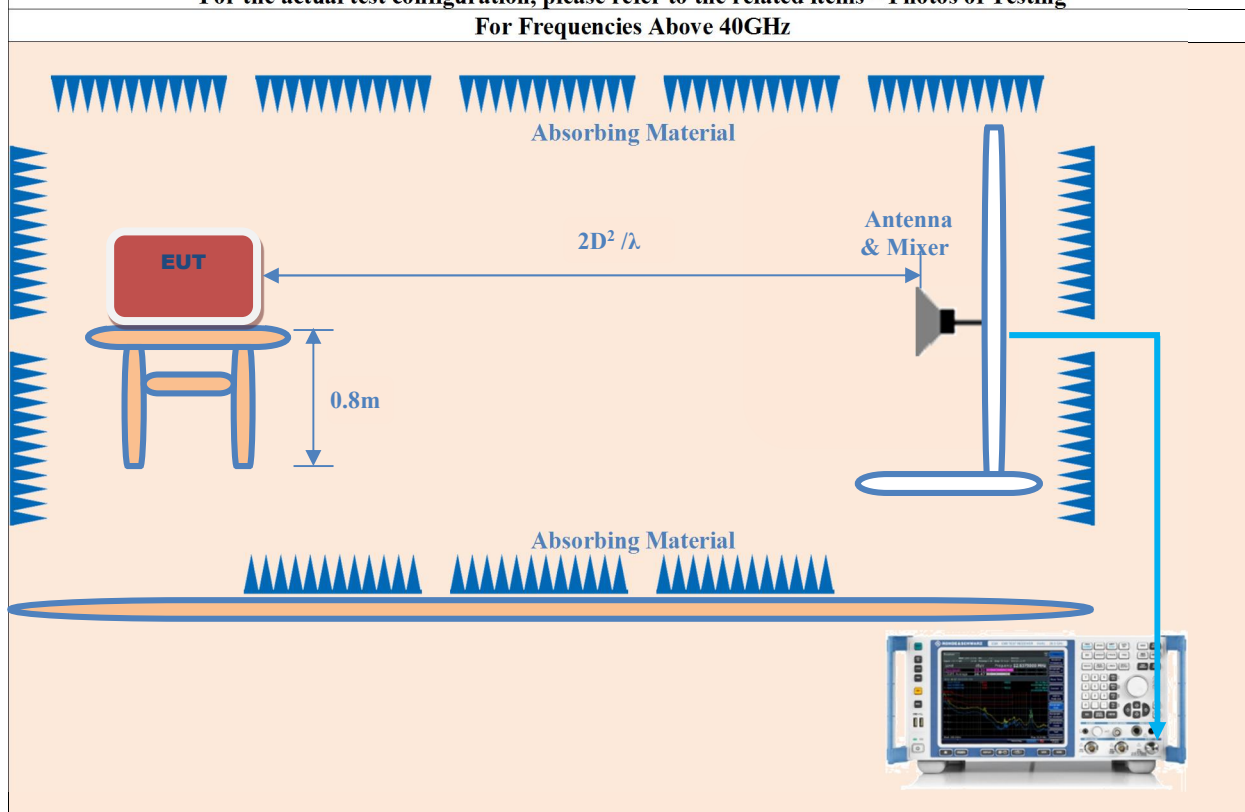
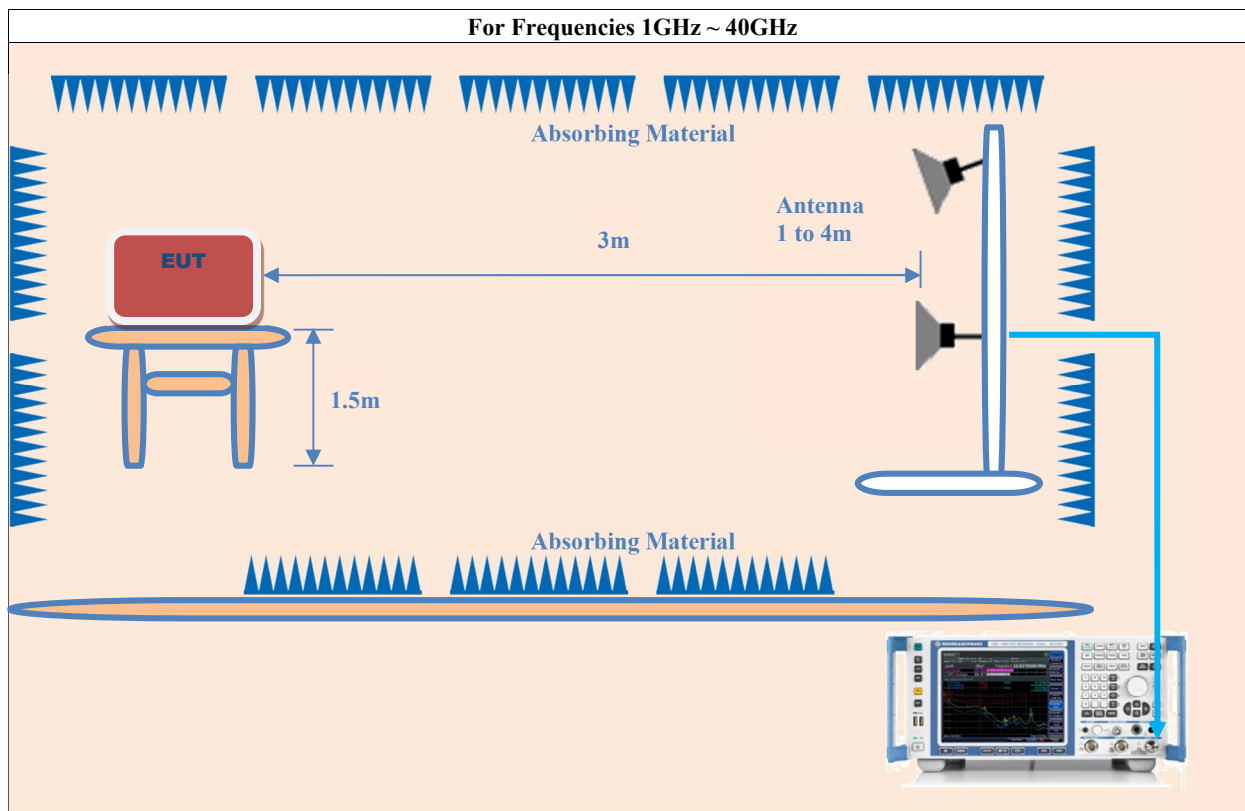
o) Steps l) to n) are repeated for all other frequencies in the list. At least, frequency and level of the six highest emissions relative to the limit have to be recorded. However, emissions more than 20 dB below the limit do not need to be reported.

If the EUT may be used in various positions, steps a) to o) are repeated in two other orthogonal positions.

The radiated emissions test above 960 MHz is performed in the following steps:					
Frequency (MHz)	RBW(kHz)	VBW(kHz)	Sweep Time	Detector	Trace Mode
>960	1000	3000	AUTO	PK/AV	Max Hold
<p>Radiated emissions above 960 MHz are measured according to clause 6.6 of ANSI C63.10 by conducting exploratory and final radiated emission tests. According to clause 6.6.4.1 of ANSI C63.10, measurements may be performed at a distance closer than that specified in the requirements. However, an attempt shall be made to avoid making final measurements in the near field of both the measurement antenna and the EUT.</p> <p>Final radiated emissions above 1 GHz are measured in a semi-anechoic chamber (SAC) with RF absorbing material on the floor between measurement antenna and EUT. The measurement distance is shown in the appropriate tests. The emissions of the EUT are recorded with an EMI test receiver.</p>					

6.3 Radiated Test Setup





Although it is preferred that measurements are made in the far field or at the distance at which the applicable limit is specified (e.g., 3 m), this is not always practicable. The far-field boundary distance formula ($\lambda/2\pi$) presented elsewhere in this document for measurements below 30 MHz is applicable where D (largest antenna dimension) $\ll \lambda$ (wavelength). For many mm-wave measurements, $D \gg \lambda$ and a more suitable formula for the far-field boundary distance is $2D^2/\lambda$. Even for mm-wave measurements not made in the far field, a linear distance attenuation factor (field strength decay of 20 dB/decade of distance) has been determined to be generally representative and is the default specified by regulatory authorities.

6. 4 Configuration of the EUT

Same as section 2.4 of this report

6. 5 EUT Operating Condition

Same as section 2.4 of this report

6. 6 Radiated Emission Limit

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in section 15.209(a), which lesser attenuation.

All other emissions inside restricted bands specified in section 15.205(a) shall not exceed the general radiated emission limits specified in section 15.209(a)

Note:

Applies to harmonics/spurious emissions that fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

47 CFR §15.237(c): The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41	--	--	--

¹Until February 1, 1999, this restricted band shall be 0.490-0.510MHz.
²Above 38.6

FCC 47 CFR, Part 15.209(a) – Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength (μV/m)	Field Strength @3m (dBuV/m)
0.009 ~ 0.490	2,400/F (F in kHz)	128.5 ~ 93.8
0.490 ~ 1.705	24,000/F (F in kHz)	73.8 ~ 63
1.705 ~ 30	30	69.5
30 ~ 88	100	40
88 ~ 216	150	43.5
216 ~ 960	200	46
Above 960	500	53.9

FCC 47 CFR, Part 15.33 – Frequency range of radiated measurements.

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:	
<input checked="" type="checkbox"/>	(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
<input type="checkbox"/>	(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
<input type="checkbox"/>	(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
<input type="checkbox"/>	(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
<input type="checkbox"/>	(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

6.7 Radiated Emission Test Result

Test Results:	Refer to Appendix
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7. Photos of Testing

Refer to Exhibits _External Test Setup Photos

8. Photographs – EUT

Refer to Exhibits _External Photos & Internal Photos

9. FCC ID Label

Refer to Exhibits _ ID Label & Location Info

10. Test Equipment

Equipment/ Facilities	Manufacturer	Model #	Serial No.	Cal/Char Date	Due Date
Artificial Mains: Two Line V-Network	Rohde & Schwarz	EM5040A	KMO-SZ009M	2021/11/24	2023/11/24
EMI Test Receiver	Rohde & Schwarz	ESR7	KMO-SZ026M	2021/11/22	2023/11/22
Test Software	Rohde & Schwarz	ESR7	N/A	NCR	NCR
Loop Antenna	SCHWARZBECK	FMZB1519B	KMO-SZ354	2021/11/5	2024/11/5
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB 9163	KMO-SZ314	2021/11/21	2024/11/21
Broad-Band Horn Antenna 1-18 GHz	SCHWARZBECK	BBHA 9120D	KMO-SZ329	2019/12/20	2022/12/20
Pre-Amplifier 1-18 GHz	SCHWARZBECK	BBV9718	KMO-SZ330	2021/11/10	2023/11/10
Pre-Amplifier 18-40 GHz	SCHWARZBECK	BBV9721	KMO-SZ331	2021/11/10	2023/11/10
Broad-Band Horn Antenna 18-40 GHz	SCHWARZBECK	BBHA 9170	KMO-SZ332	2021/11/7	2024/11/7
Spectrum Analyzer	Rohde & Schwarz	FSP40	KMO-SZ003	2020/12/14	2022/12/14
Temperature & Humidity Chamber	HNLX	SPX-150-B	KMO-SZ296	2022/1/14	2024/1/14
3m Anechoic Chamber	SAEMC	966	KMO-SZ316	2021/5/12	2024/5/12

-----End of Report -----