RADIO TEST REPORT

FCC ID	:	ACQ-HC200
Equipment	:	HC200
Brand Name	:	HomeSight
Model Name	:	HC200
Applicant	:	ARRIS 101 Tournament Drive, Horsham Pennsylvania,United States,19044
Manufacturer	:	Hon Lin Technology Co Ltd. 4-1, Min Sheng St., Tu Cheng Industrial District, Tucheng Dist., New Taipei City 236, Taiwan R.O.C.
Standard	:	47 CFR FCC Part 15 Subpart C § 15.249

The product was received on Dec. 10, 2021, and testing was started from Dec. 17, 2021 and completed on Feb. 21, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 , 47 CFR FCC Part 15 Subpart C and shown 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 Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR1O0629	01	Initial issue of report	Feb. 15, 2022
FR1O0629	02	1. Revising 2.3.7 Test Result of 20dB Spectrum Bandwidth and 2.4.11 Results for Radiated Emissions. 2. Adding 2.4.12 Results for Harmonic Emissions.	Feb. 22, 2022
FR1O0629	03	Changing Photographs version to “v02” from “v01” (Reason: change adapter rating)	Feb. 25, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2.1	15.207	AC Power Line Conducted Emissions	PASS	-
2.2	15.249(a)	Field Strength of Fundamental Emissions	PASS	-
2.3	15.215(c)	20dB Spectrum Bandwidth	PASS	-
2.4	15.249(a)/(d)	Radiated Emissions	PASS	-
2.5	15.249(d)	Band Edge Emissions	PASS	-
2.6	15.203	Antenna Requirements	PASS	-

Declaration of Conformity:
1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to report "Measurement Uncertainty".
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.

Reviewed by: Sam Chen

Report Producer: Penny Kao

1 General Information

1.1 Product Details

Items	Description
Power Type	From Power Adapter
Modulation	FMCW
Frequency Range	24000 ~ 24250 MHz
Operation Frequency Range	24050 ~ 24250 MHz
Test Frequency	24150 MHz
Channel Bandwidth (99%)	180 MHz
Max. Field Strength	51.55 dBuV/m at 3m(Average) / 61.09 dBuV/m at 1m (Average) 99.51 dBuV/m at 3m(Peak) / 109.05 dBuV/m at 1m (Peak)
Carrier Frequencies	Please refer to section 1.3
Antenna	Type: Patch Antenna Connector: IPEX Gain: 2 dBi

Note: The above information was declared by manufacturer.

1.2 Accessories

No.	Equipment Name	Brand	Model	Rating
1	Adapter	NetBit	NPD20AD5	INPUT: 100-240V~,50/60Hz, 0.5A OUTPUT: 20.04W 12.0V, 1.67A 5.0V, 3.0A
2	Remote Control	Omni Remotes	RC463050/01BRP	-
Others				
HDMI cable*1: 1.73m, non-shielded, without core USB type-C cable*1: 1.8m, non-shielded, without core Plug*1				

1.3 Table for Test Modes

The following table is a list of the test modes shown in this test report.

Test Items	Mode
AC Power Line Conducted Emissions Test Voltage: 120Vac / 60Hz	CTX
Field Strength of Fundamental Emissions	CTX
20dB Spectrum Bandwidth	CTX
Radiated Emissions 30MHz~1GHz	CTX
Radiated Emissions 1GHz~40GHz	CTX
Radiated Emissions 40GHz~100GHz	CTX
Band Edge Emissions	CTX
Radiated Emission Co-location	Normal Link

Note: CTX=continuously transmitting

For Radiated Emissions Below 1GHz:

The EUT was performed at X axis, Y axis and Z axis position for Radiated emission above 1GHz test, and the worst case was found at X axis. So the measurement will follow this same test configuration.

For Radiated Emissions Above 1GHz:

The EUT was performed at X axis, Y axis and Z axis position. The worst case was found at X axis, thus the measurement will follow this same test configuration.

For Radiated Emission Co-location:

The EUT was performed at X axis, Y axis and Z axis position for Radiated emission above 1GHz test, and the worst case was found at X axis. So the measurement will follow this same test configuration.

Mode 1: 24GHz + WLAN 5GHz + Bluetooth

Mode 2: 24GHz + WLAN 2.4GHz

For operating mode 1 is the worst case and it was record in this test report.

1.4 Applicable Standards

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

- ANSI C63.10-2013
- 47 CFR FCC Part 15 Subpart C

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 414788 D01 v01r01

1.5 Table for Testing Locations

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated (Below 1GHz)	03CH05-CB	Eason Chen	19.9~20.5 / 63~64	Dec. 17, 2021~ Feb. 21, 2022
Radiated (Above 1GHz)	03CH05-CB	Eason Chen	19.8~20.7 / 61~65	Dec. 17, 2021~ Feb. 21, 2022
AC Conduction	CO01-CB	Peter Wu	20~21 / 53~55	Jan. 26, 2022

1.6 Table for Supporting Units

For AC Power Line Conducted Emissions Test

No.	Support Unit	Brand	Model	FCC ID
A	LAN NB	DELL	E6430	N/A
B	TV	SONY	KLV-32U300A	N/A

For Radiated Test

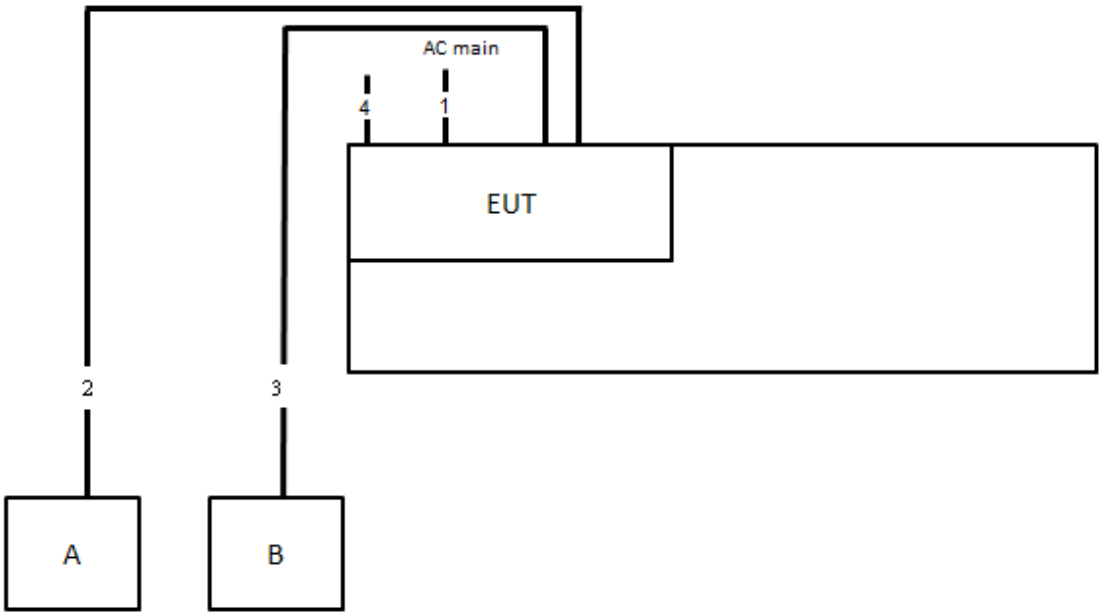
No.	Support Unit	Brand	Model	FCC ID
A	Notebook	DELL	E4300	N/A
B	WLAN AP	ASUS	RT-AX88U	MSQ-RTAXHP00

1.7 Duty Cycle

On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
0.4	10000	0.004%	43.98	2.50

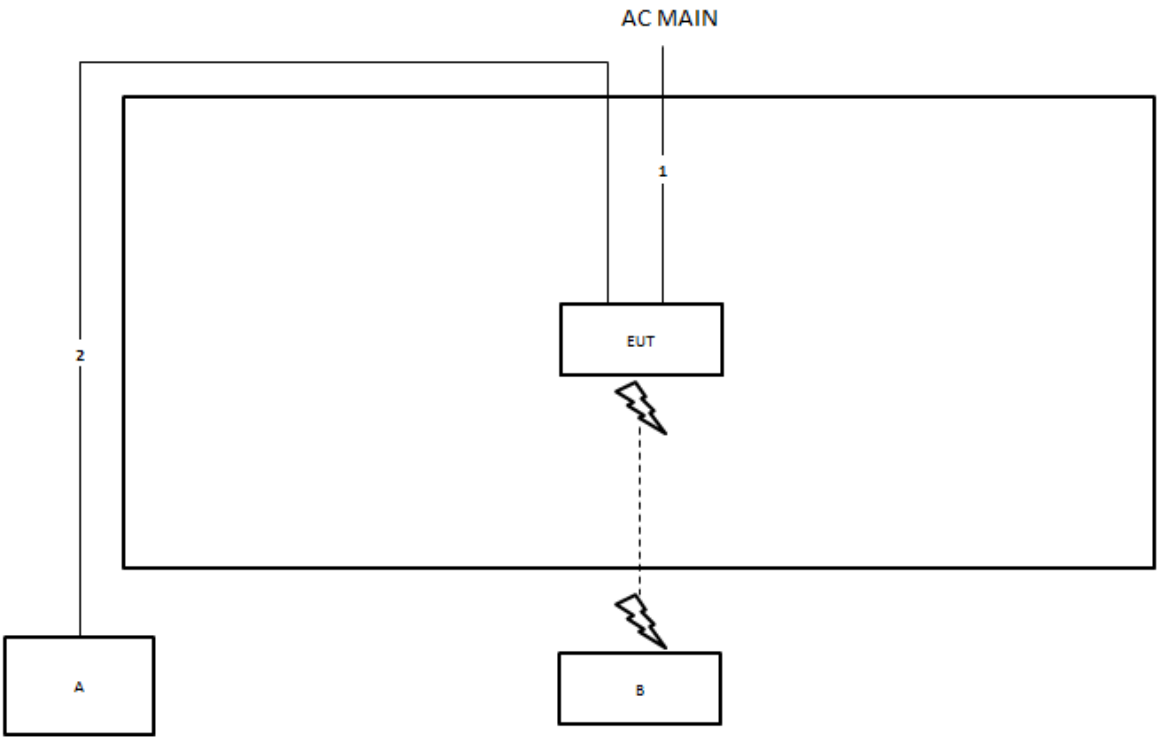
1.8 Test Configurations

1.8.1 AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	Yes	1.8m
2	RJ-45 cable	No	10m
3	HDMI cable	Yes	3m
4	HDMI cable	Yes	1.73m

1.8.2 Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	Yes	1.8m
2	RJ-45 cable	No	10m

2 Test Result

2.1 AC Power Line Conducted Emissions Measurement

2.1.1 Limit

For this product which is designed to be connected to the 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 below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

2.1.2 Measuring Instruments and Setting

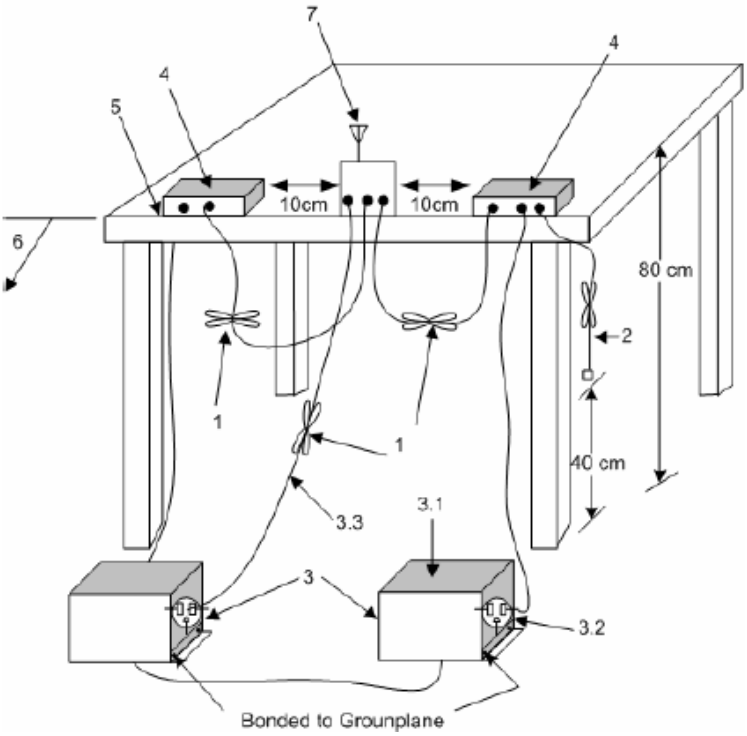
Refer a test equipment and calibration data table in this test report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

2.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

2.1.4 Test Setup Layout



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.

2.1.5 Test Deviation

There is no deviation with the original standard.

2.1.6 EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

2.1.7 Measurement Results Calculation

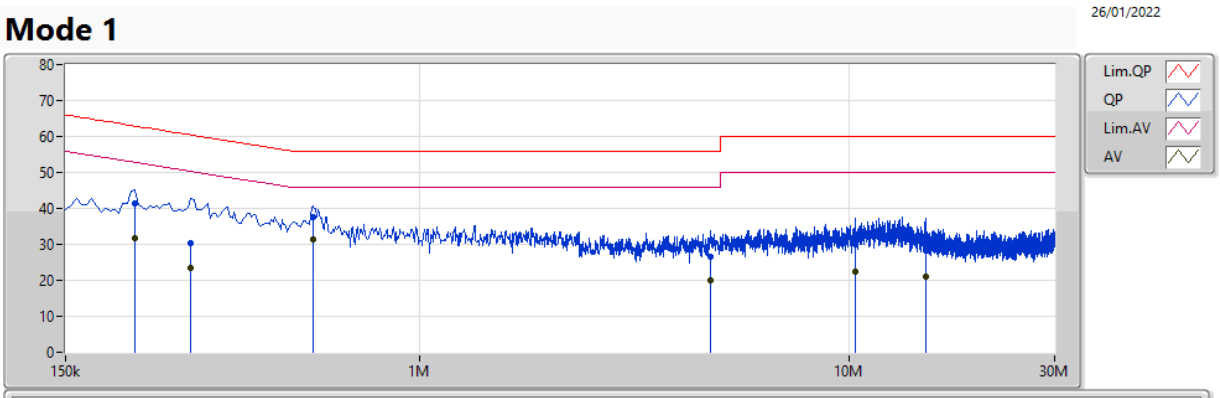
The measured Level is calculated using:

a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level

b. Margin = -Limit + Level

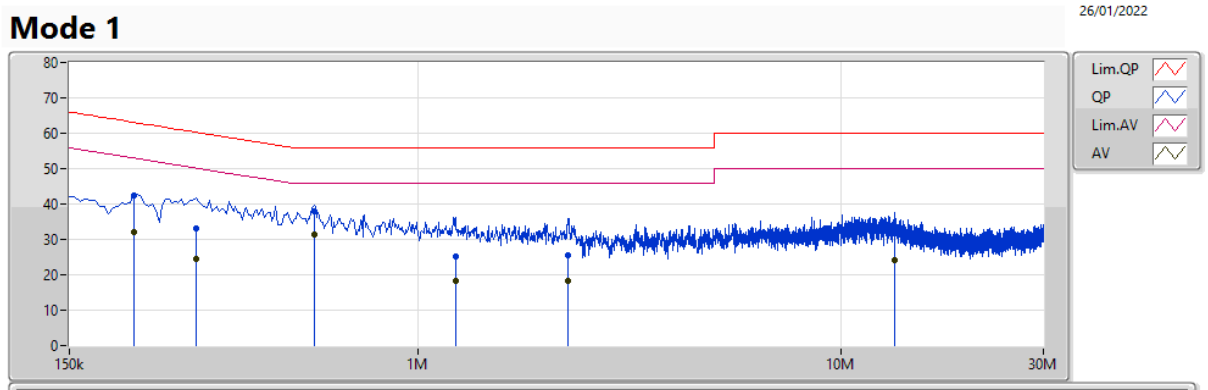
2.1.8 Results of AC Power Line Conducted Emissions Measurement

Configuration	CTX	Phase	Line



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	217.5k	41.32	62.92	-21.60	9.89	Line	-	31.43	0.04	0.04	9.81
AV	217.5k	31.62	52.92	-21.30	9.89	Line	-	21.73	0.04	0.04	9.81
QP	294k	30.42	60.42	-30.00	9.90	Line	-	20.52	0.04	0.04	9.82
AV	294k	23.52	50.42	-26.90	9.90	Line	-	13.62	0.04	0.04	9.82
QP	564k	37.66	56.00	-18.34	9.91	Line	-	27.75	0.05	0.04	9.82
AV	564k	31.27	46.00	-14.73	9.91	Line	"Worst"	21.36	0.05	0.04	9.82
QP	4.763M	26.70	56.00	-29.30	10.16	Line	-	16.54	0.15	0.13	9.88
AV	4.763M	20.11	46.00	-25.89	10.16	Line	-	9.95	0.15	0.13	9.88
QP	10.32M	30.11	60.00	-29.89	10.28	Line	-	19.83	0.22	0.16	9.90
AV	10.32M	22.40	50.00	-27.60	10.28	Line	-	12.12	0.22	0.16	9.90
QP	15.005M	28.27	60.00	-31.73	10.36	Line	-	17.91	0.28	0.17	9.91
AV	15.005M	20.90	50.00	-29.10	10.36	Line	-	10.54	0.28	0.17	9.91

Configuration	CTX	Phase	Neutral



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	213k	42.27	63.09	-20.82	9.88	Neutral	-	32.39	0.03	0.04	9.81
AV	213k	32.06	53.09	-21.03	9.88	Neutral	-	22.18	0.03	0.04	9.81
QP	298.5k	33.02	60.28	-27.26	9.89	Neutral	-	23.13	0.03	0.04	9.82
AV	298.5k	24.35	50.28	-25.93	9.89	Neutral	-	14.46	0.03	0.04	9.82
QP	568.5k	37.80	56.00	-18.20	9.90	Neutral	-	27.90	0.04	0.04	9.82
AV	568.5k	31.43	46.00	-14.57	9.90	Neutral	"Worst"	21.53	0.04	0.04	9.82
QP	1.226M	25.21	56.00	-30.79	9.94	Neutral	-	15.27	0.06	0.05	9.83
AV	1.226M	18.34	46.00	-27.66	9.94	Neutral	-	8.40	0.06	0.05	9.83
QP	2.256M	25.36	56.00	-30.64	9.99	Neutral	-	15.37	0.08	0.08	9.83
AV	2.256M	18.29	46.00	-27.71	9.99	Neutral	-	8.30	0.08	0.08	9.83
QP	13.367M	31.68	60.00	-28.32	10.32	Neutral	-	21.36	0.24	0.17	9.91
AV	13.367M	24.09	50.00	-25.91	10.32	Neutral	-	13.77	0.24	0.17	9.91

2.2 Field Strength of Fundamental Emissions Measurement

2.2.1 Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band	Fundamental Emissions Limit Average/Peak (dBuV/m) at 3m
24000 ~ 24250 MHz	107.96/127.96

Note 1: 107.96 dBuV/m rounding to 108dBuV/m and 127.96 dBuV/m rounding to 128dBuV/m

Note 2: Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

Average limit = 108dBuV/m + distance extrapolation factor (9.54 dB) =117.54dBuV/m.

Peak limit = 128dBuV/m + distance extrapolation factor (9.54 dB) =137.54dBuV/m.

2.2.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Power Meter Parameter	Setting
RBW	1 MHz Peak / 3MHz Average
VBW	1 MHz Peak / 1/T Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

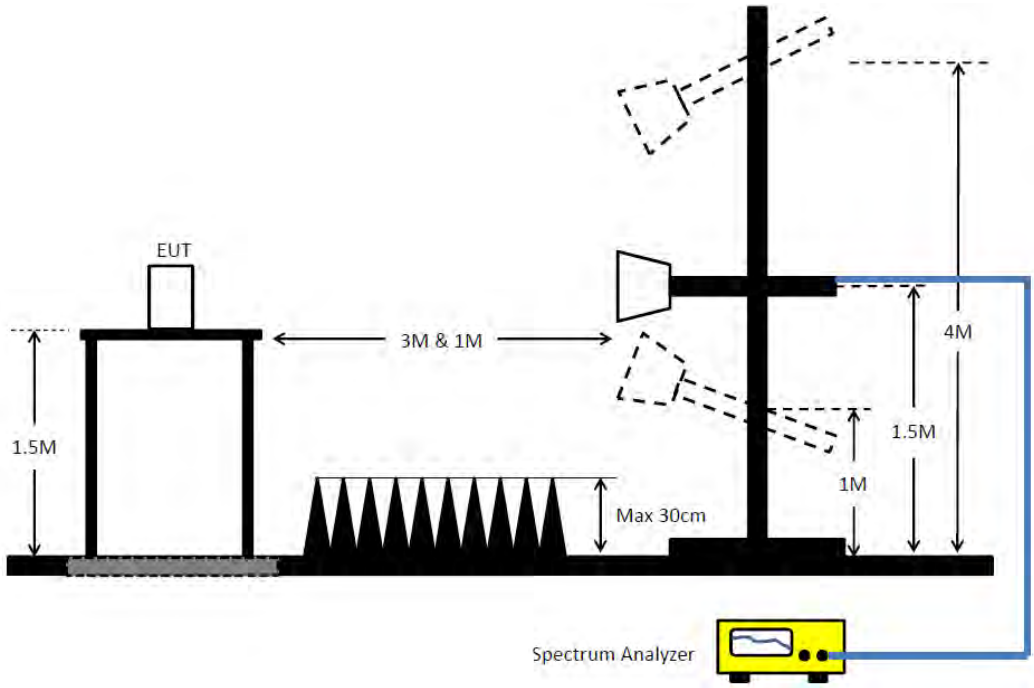
2.2.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For Fundamental emissions, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW

and 1/T VBW for average reading in spectrum analyzer.

6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

2.2.4 Test Setup Layout



2.2.5 Test Deviation

There is no deviation with the original standard.

2.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

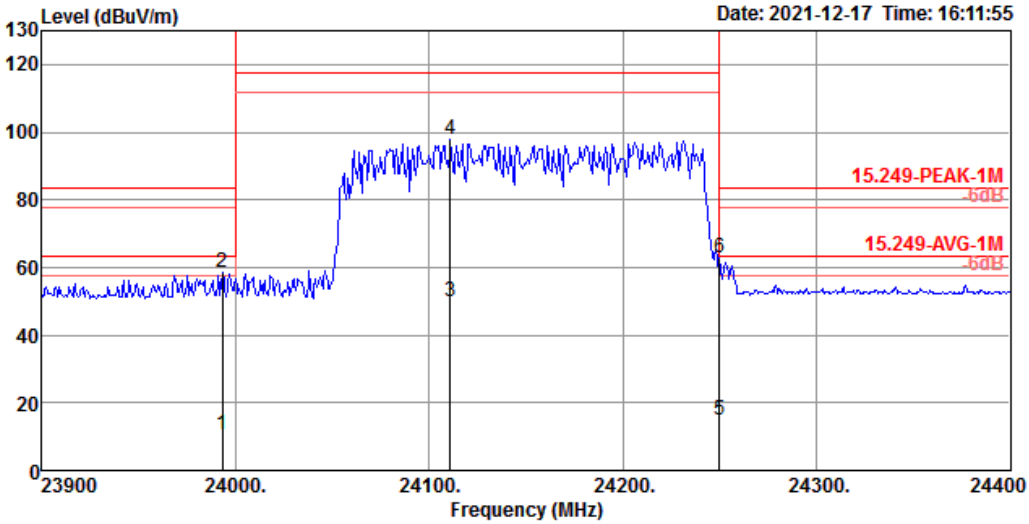
2.2.7 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

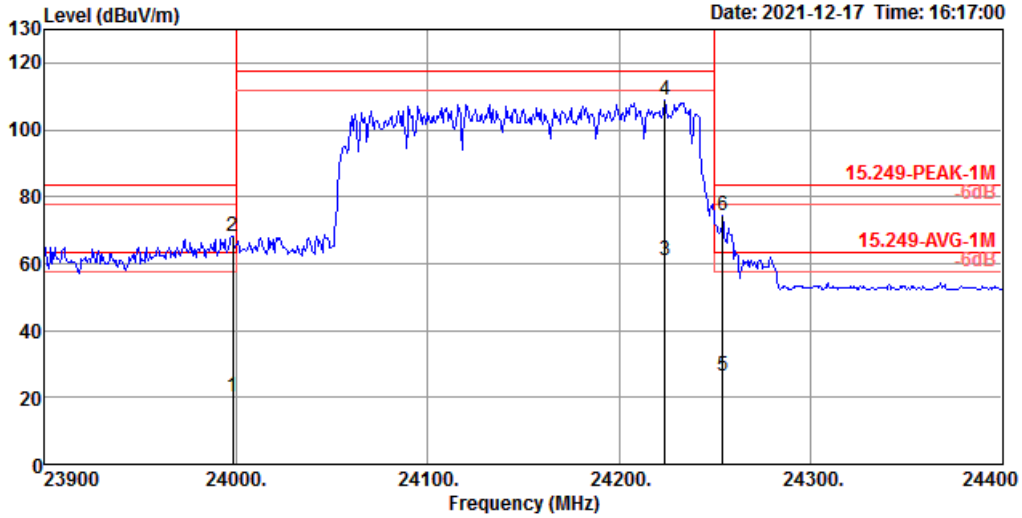
2.2.8 Test Result of Field Strength of Fundamental Emissions

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	23993.00	10.36	63.54	-53.18	3.50	16.46	38.80	48.40	150	360	Average	HORIZONTAL
2	23993.00	58.32	83.54	-25.22	51.46	16.46	38.80	48.40	150	360	Peak	HORIZONTAL
3	24111.00	49.79	117.54	-67.75	42.72	16.55	38.85	48.33	150	360	Average	HORIZONTAL
4	24111.00	97.75	137.54	-39.79	90.68	16.55	38.85	48.33	150	360	Peak	HORIZONTAL
5	24250.00	14.89	63.54	-48.65	7.64	16.60	38.90	48.25	150	360	Average	HORIZONTAL
6	24250.00	62.85	83.54	-20.69	55.60	16.60	38.90	48.25	150	360	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	23998.00	20.24	63.54	-43.30	13.34	16.50	38.80	48.40	150	0	Average	VERTICAL
2	23998.00	68.20	83.54	-15.34	61.30	16.50	38.80	48.40	150	0	Peak	VERTICAL
3	24224.00	61.09	117.54	-56.45	53.86	16.60	38.89	48.26	150	0	Average	VERTICAL
4	24224.00	109.05	137.54	-28.49	101.82	16.60	38.89	48.26	150	0	Peak	VERTICAL
5	24254.00	26.27	63.54	-37.27	19.02	16.60	38.90	48.25	150	0	Average	VERTICAL
6	24254.00	74.23	83.54	-9.31	66.98	16.60	38.90	48.25	150	0	Peak	VERTICAL

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.3 20dB Spectrum Bandwidth Measurement

2.3.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (24000 ~ 24250 MHz).

2.3.2 Measuring Instruments and Setting

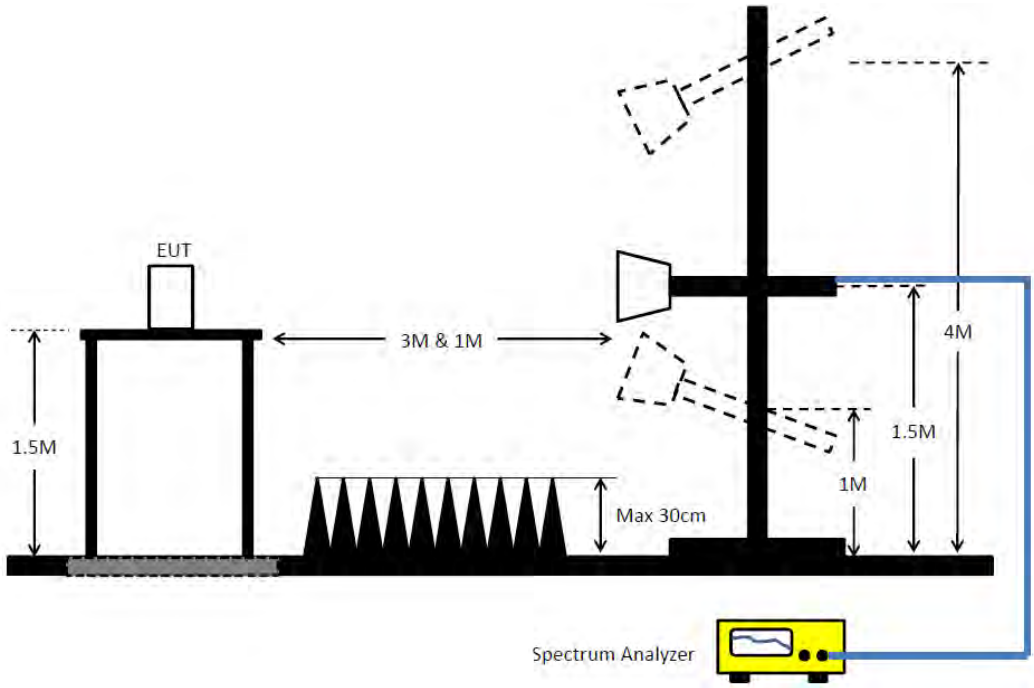
Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

2.3.3 Test Procedures

1. The test procedure is the same as section 2.4.3.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

2.3.4 Test Setup Layout



2.3.5 Test Deviation

There is no deviation with the original standard.

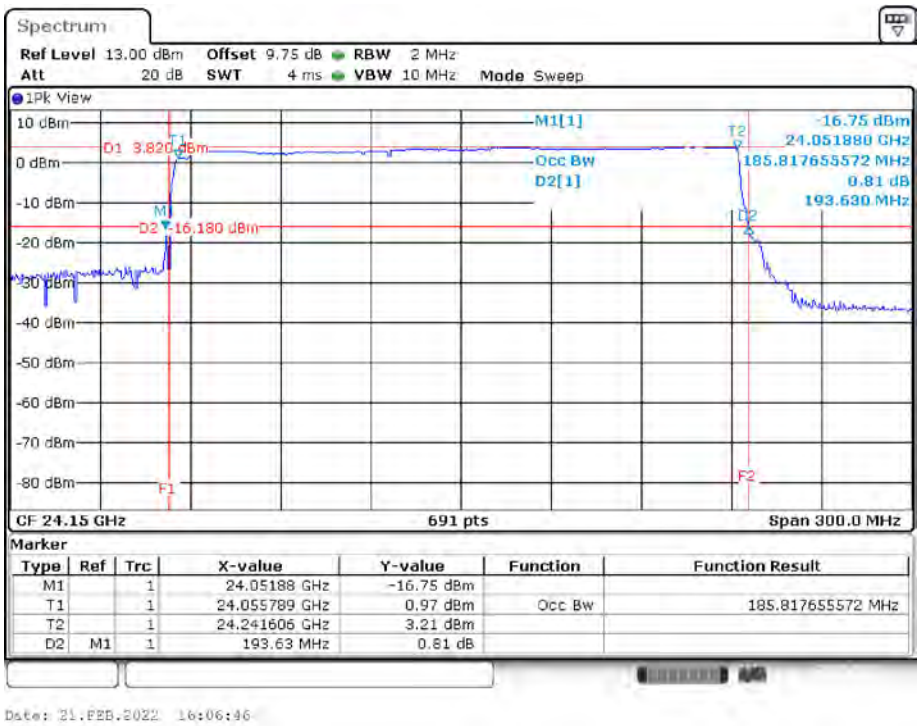
2.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3.7 Test Result of 20dB Spectrum Bandwidth

Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 24000MHz	Frequency range (MHz) f_H < 24250MHz	Test Result
24150 MHz	189.29	181.476	24059.2620	24240.7380	**PASS**

20 dB Bandwidth and 99% Bandwidth Plot on 24150 MHz



2.4 Radiated Emissions Measurement

2.4.1 Limit

For 9kHz~40GHz

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

For 40GHz~100GHz

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 47 CFR Part 15.249, whichever is the lesser attenuation.

Operating Frequencies	Harmonics Strength (micorvolts/meter)	Harmonics Strength (dBuV/m) at 3m
24000 ~ 24250 MHz	2500 at 3m	68 (Average)
24000 ~ 24250 MHz	2500 at 3m	88 (Peak)

2.4.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

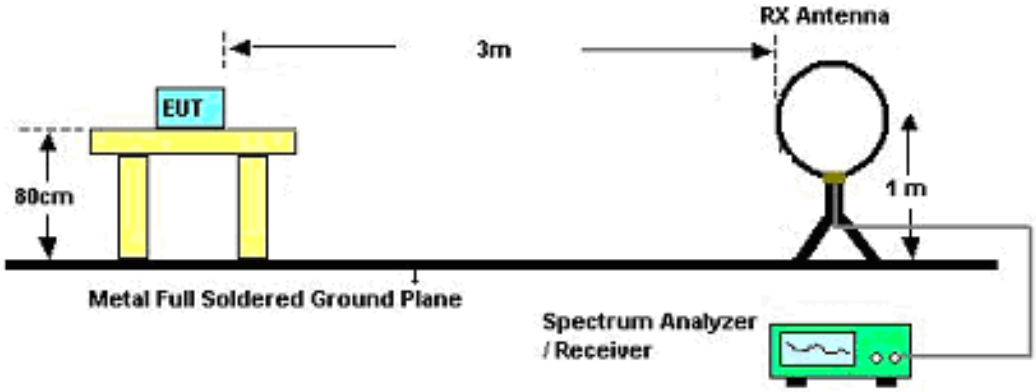
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

2.4.3 Test Procedures

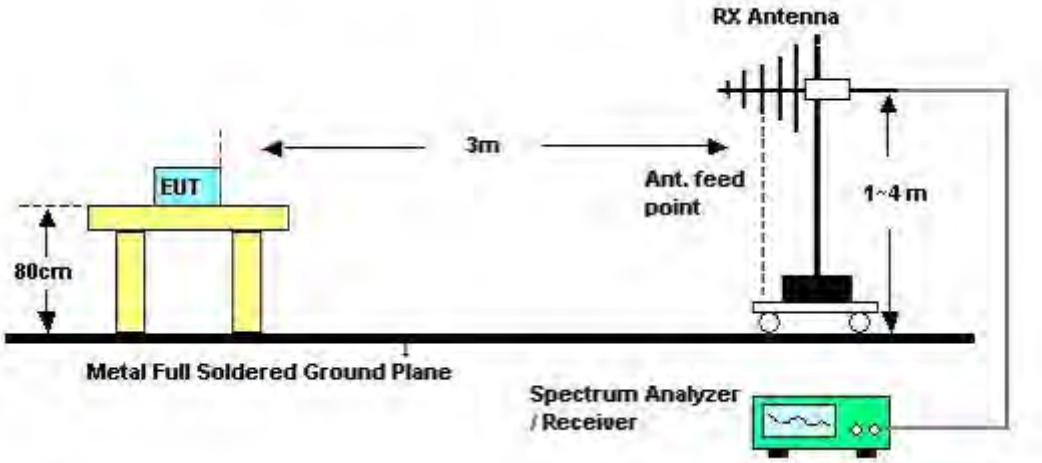
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

2.4.4 Test Setup Layout

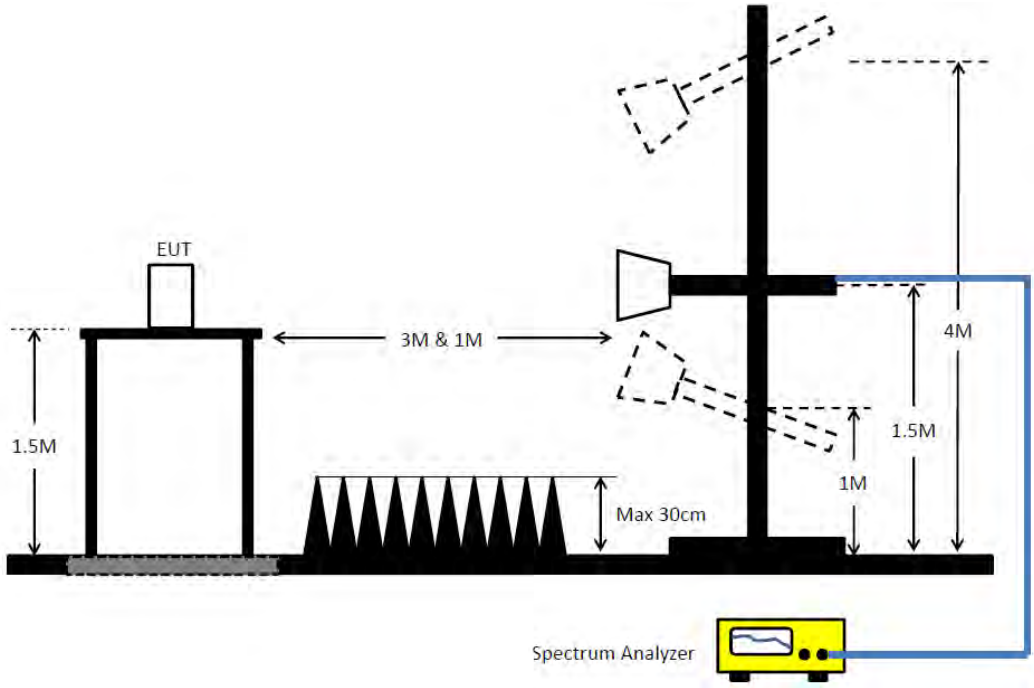
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For radiated emissions: 1GHz~40GHz

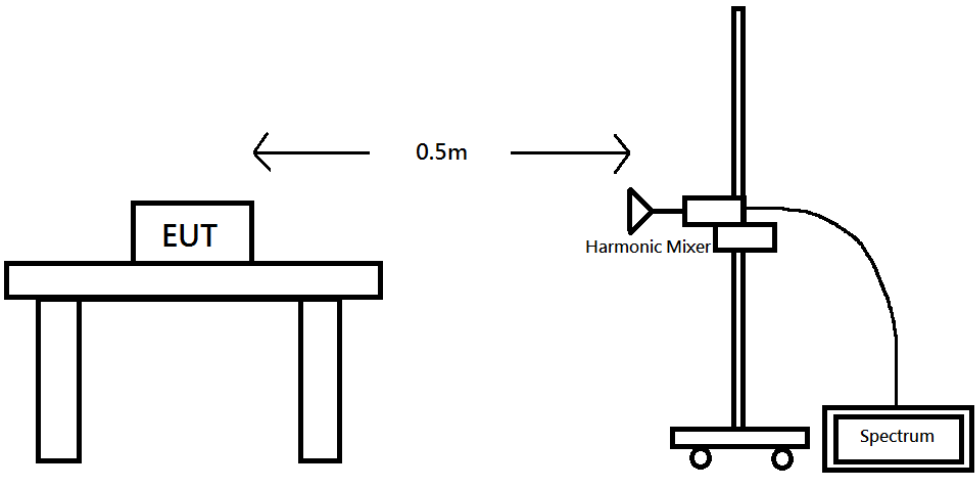


Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

For radiated emissions: 40GHz~100GHz



2.4.5 Test Deviation

There is no deviation with the original standard.

2.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4.7 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

For above 40GHz

EIRP = Meas. Level - RX Antenna Gain + 20*log(4*Pi(3.14159)*D/(300/(Frequency*1000)))

2.4.8 Results of Radiated Emissions (9kHz~30MHz)

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

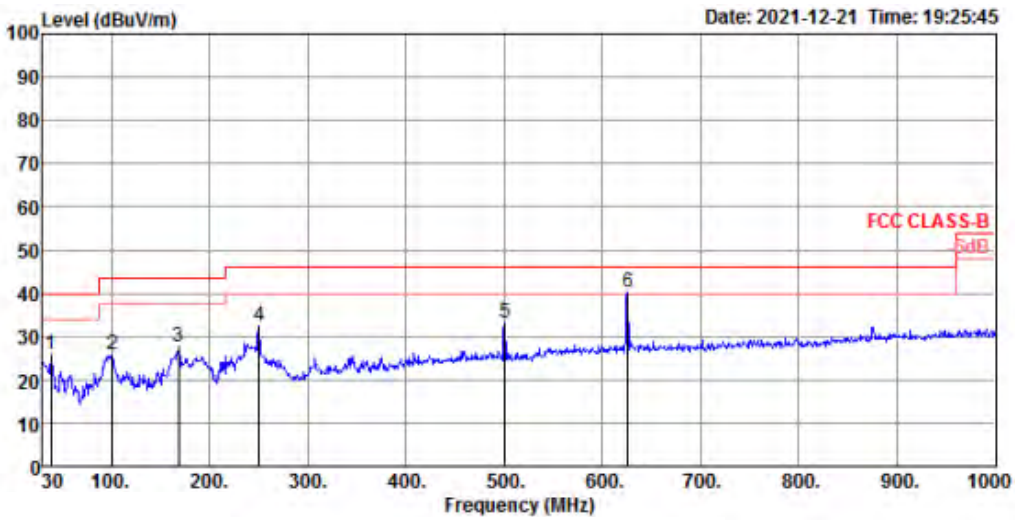
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

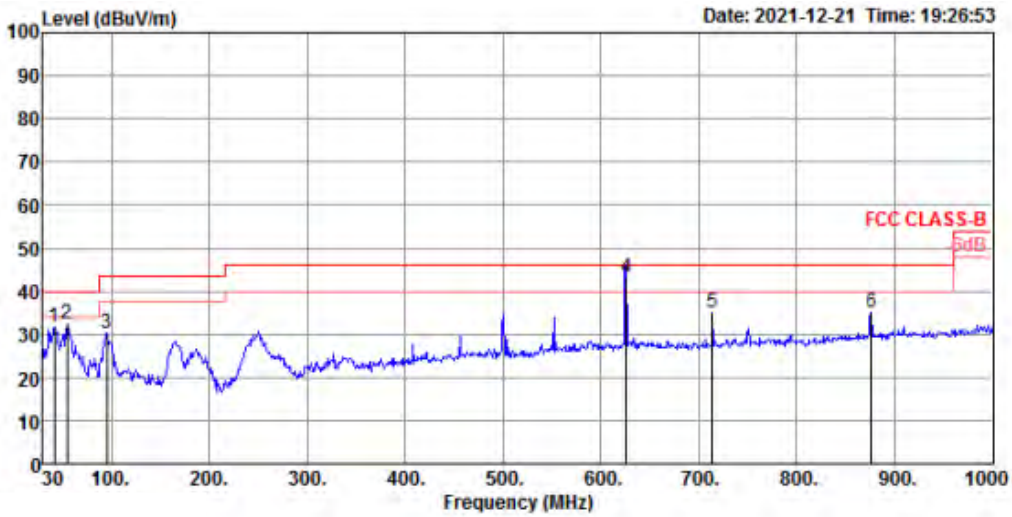
2.4.9 Results of Radiated Emissions (30MHz~1GHz)

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	38.73	25.97	40.00	-14.03	37.35	0.90	19.36	31.64	125	208	Peak	HORIZONTAL
2	100.81	25.66	43.50	-17.84	39.24	1.51	16.78	31.87	300	298	Peak	HORIZONTAL
3	168.71	27.55	43.50	-15.95	42.11	1.99	15.41	31.96	200	279	Peak	HORIZONTAL
4	250.19	32.38	46.00	-13.62	43.83	2.40	18.16	32.01	125	89	Peak	HORIZONTAL
5	500.45	33.09	46.00	-12.91	38.74	3.51	23.18	32.34	125	164	Peak	HORIZONTAL
6	625.58	40.06	46.00	-5.94	44.17	3.90	24.51	32.52	150	229	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit				pr	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	41.64	31.72	40.00	-8.28	44.69	0.94	17.77	31.68	150	266	Peak	VERTICAL
2	54.25	32.57	40.00	-7.43	50.62	1.09	12.66	31.80	100	2	Peak	VERTICAL
3	94.99	30.40	43.50	-13.10	45.00	1.50	15.79	31.89	150	324	Peak	VERTICAL
4	625.58	42.99	46.00	-3.01	47.10	3.90	24.51	32.52	100	307	QP	VERTICAL
5	713.85	34.98	46.00	-11.02	38.81	4.23	24.61	32.67	100	62	Peak	VERTICAL
6	875.84	34.95	46.00	-11.05	36.65	4.85	26.09	32.64	125	68	Peak	VERTICAL

Note:

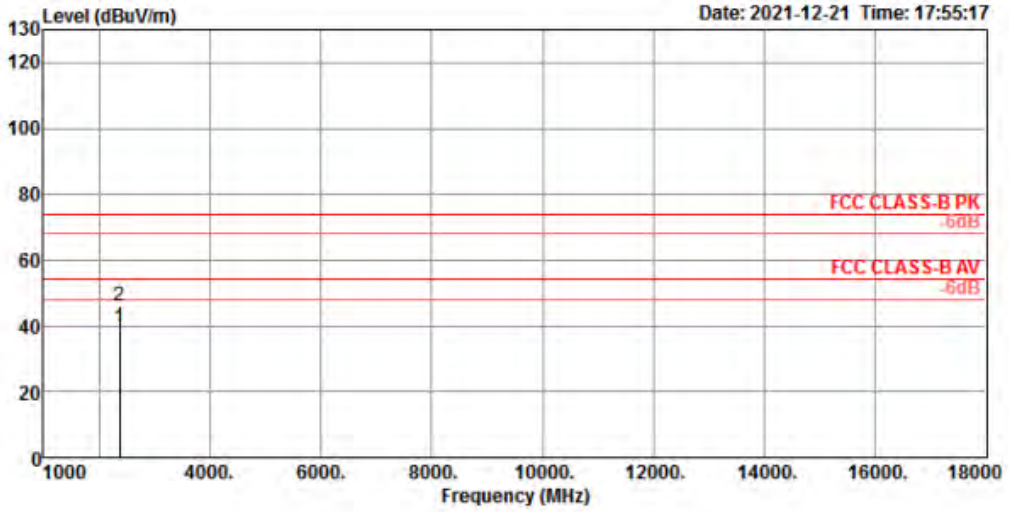
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.4.10 Results for Radiated Emissions (1GHz~40GHz)

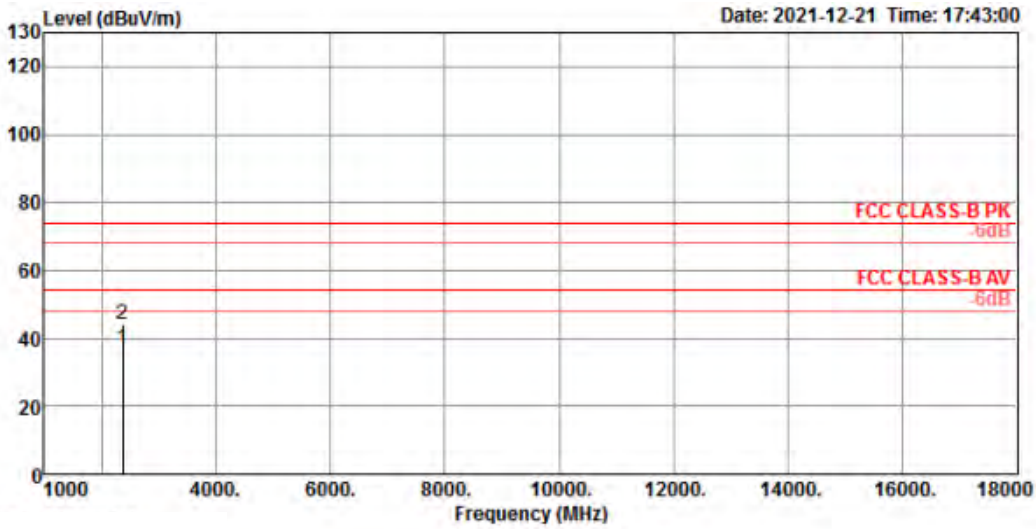
Test Range	1~18G

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2375.07	39.39	54.00	-14.61	43.30	5.26	27.91	37.08	163	266	Average	HORIZONTAL
2	2375.31	45.81	74.00	-28.19	49.72	5.26	27.91	37.08	163	266	Peak	HORIZONTAL

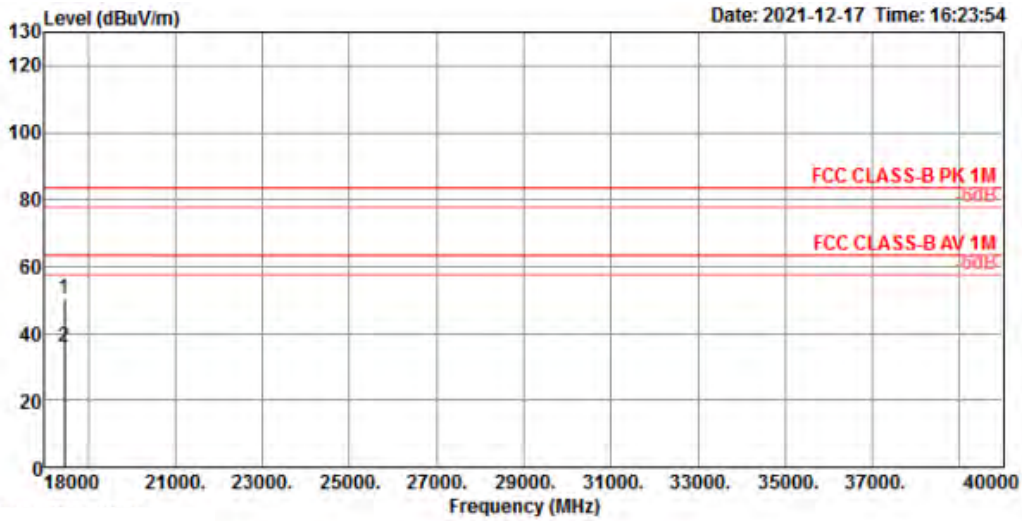
Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2375.05	37.01	54.00	-16.99	40.92	5.26	27.91	37.08	217	243	Average	VERTICAL
2	2375.28	44.29	74.00	-29.71	48.20	5.26	27.91	37.08	217	243	Peak	VERTICAL

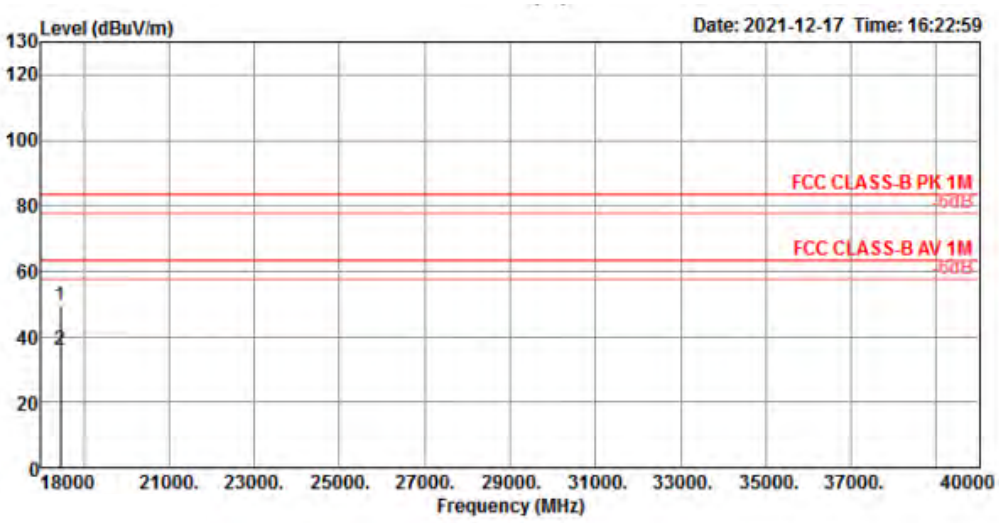
Test Range	18~40G

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	18440.51	50.50	83.54	-33.04	48.97	13.92	37.73	50.12	150	335	Peak	HORIZONTAL
2	18443.08	35.87	63.54	-27.67	34.34	13.92	37.73	50.12	150	335	Average	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	18441.89	49.25	83.54	-34.29	47.72	13.92	37.73	50.12	150	151	Peak	VERTICAL
2	18443.33	35.84	63.54	-27.70	34.31	13.92	37.73	50.12	150	151	Average	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.4.11 Results for Radiated Emissions (40GHz~100GHz)

Test Range	40~60G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
41.635	0.5	-76.14	23.9	69.61	89.56	-19.96	Peak	Pass
41.317	0.5	-84.54	23.9	61.14	69.56	-8.42	Average	Pass

Test Range	60~90G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
89.805	0.5	-79.55	23.9	72.87	89.56	-16.69	Peak	Pass
89.978	0.5	-88.63	23.9	63.81	69.56	-5.75	Average	Pass

Test Range	90~100G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
91.975	0.5	-84.29	23.9	68.34	89.56	-21.22	Peak	Pass
91.498	0.5	-94.55	23.9	58.04	69.56	-11.53	Average	Pass

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [0.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [15.56 dB].

EIRP = PT * GT = (PR / GR) * (4 * Pi * D / λ)^2

2.4.12 Results for Harmonic Emissions (40GHz~100GHz)

Test Range	40~60G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
48.209	0.5	-80.65	23.9	66.37	103.56	-37.19	Peak	Pass
48.272	0.5	-87.43	23.9	59.60	83.56	-23.96	Average	Pass

Test Range	60~90G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
72.461	0.5	-83.11	23.9	67.45	103.56	-36.11	Peak	Pass
72.513	0.5	-90.20	23.9	60.37	83.56	-23.20	Average	Pass

Test Range	90~100G

Frequency (GHz)	Measurement Distance (m)	Read Level (dBm)	Rx Antenna Gain (dBi)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
96.521	0.5	-87.62	23.9	65.43	103.56	-38.13	Peak	Pass
96.667	0.5	-95.60	23.9	57.46	83.56	-26.10	Average	Pass

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [0.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [15.56 dB].

EIRP = PT * GT = (PR / GR) * (4 * Pi * D / λ)^2

2.5 Band Edge Emissions Measurement

2.5.1 Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

2.5.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

2.5.3 Test Procedures

The test procedure is the same as section 2.4.3.

2.5.4 Test Setup Layout

This test setup layout is the same as that shown in section 2.4.4

2.5.5 Test Deviation

There is no deviation with the original standard.

2.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

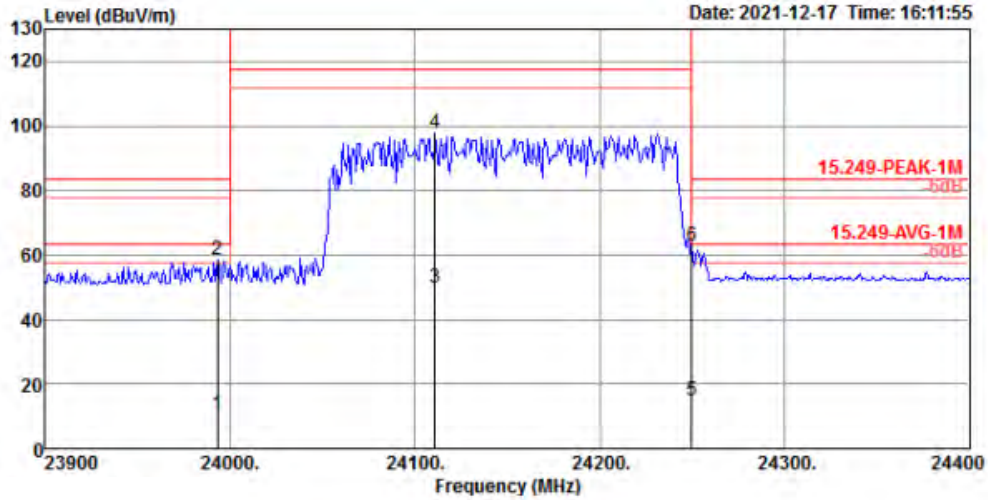
2.5.7 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

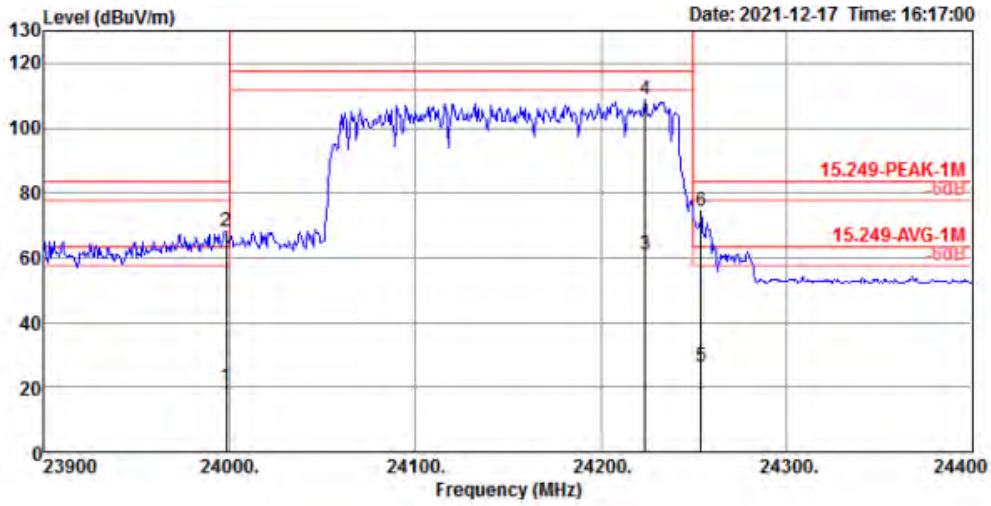
2.5.8 Test Result of Band Edge and Fundamental Emissions

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	23993.00	10.36	63.54	-53.18	3.50	16.46	38.80	48.40	150	360	Average	HORIZONTAL
2	23993.00	58.32	83.54	-25.22	51.46	16.46	38.80	48.40	150	360	Peak	HORIZONTAL
3	24111.00	49.79	117.54	-67.75	42.72	16.55	38.85	48.33	150	360	Average	HORIZONTAL
4	24111.00	97.75	137.54	-39.79	90.68	16.55	38.85	48.33	150	360	Peak	HORIZONTAL
5	24250.00	14.89	63.54	-48.65	7.64	16.60	38.90	48.25	150	360	Average	HORIZONTAL
6	24250.00	62.85	83.54	-20.69	55.60	16.60	38.90	48.25	150	360	Peak	HORIZONTAL

Vertital



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	23998.00	20.24	63.54	-43.30	13.34	16.50	38.80	48.40	150	0	Average	VERTICAL
2	23998.00	68.20	83.54	-15.34	61.30	16.50	38.80	48.40	150	0	Peak	VERTICAL
3	24224.00	61.09	117.54	-56.45	53.86	16.60	38.89	48.26	150	0	Average	VERTICAL
4	24224.00	109.05	137.54	-28.49	101.82	16.60	38.89	48.26	150	0	Peak	VERTICAL
5	24254.00	26.27	63.54	-37.27	19.02	16.60	38.90	48.25	150	0	Average	VERTICAL
6	24254.00	74.23	83.54	-9.31	66.98	16.60	38.90	48.25	150	0	Peak	VERTICAL

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.6 Antenna Requirements

2.6.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

2.6.2 Antenna Connector Construction

The antenna connector complied with the requirements.

3 List of Measuring Equipments

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Mar. 03, 2021	Mar. 02, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Dec. 22, 2021	Dec. 21, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Mar. 07, 2021	Mar. 06, 2022	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 30, 2021	Jan. 29, 2022	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 19, 2021	May 18, 2022	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH05-CB	1GHz ~18GHz 3m	Nov. 07, 2021	Nov. 06, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 26, 2021	Mar. 25, 2022	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120 D-1291	1GHz~18GHz	Oct. 14, 2021	Oct. 13, 2022	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 27, 2021	Apr. 26, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz – 26.5GHz	Jul. 02, 2021	Jul. 01, 2022	Radiation (03CH05-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101903	9kHz ~ 40GHz	Mar. 22, 2021	Mar. 21, 2022	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH05-CB)
Test Software	Audix	E3	6.120210m	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)
*Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Nov. 02, 2020	Nov. 01, 2022	Radiation (03CH05-CB)
*Mixer	OML	M15HWA	V91113-1	50 ~ 75 GHz	Nov. 13, 2020	Nov. 12, 2022	Radiation (03CH05-CB)
*Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020	Nov. 13, 2022	Radiation (03CH05-CB)
*Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Nov. 02, 2020	Nov. 01, 2022	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)

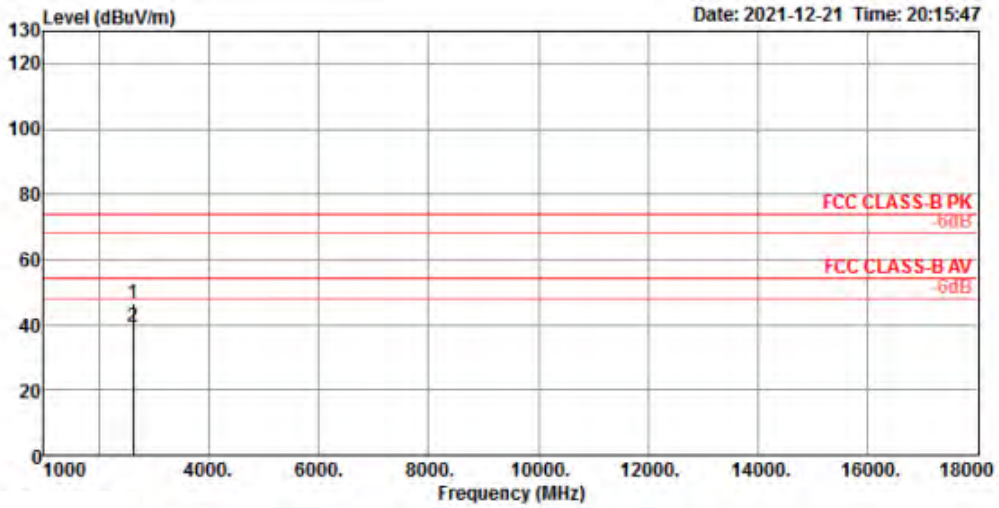
Note: Calibration Interval of instruments listed above is one year.
* Calibration Interval of instruments listed above is two year.
N.C.R. means Non-Calibration required.

4 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	5.1 dB	Confidence levels of 95%
Conducted Emission	2.5 dB	Confidence levels of 95%

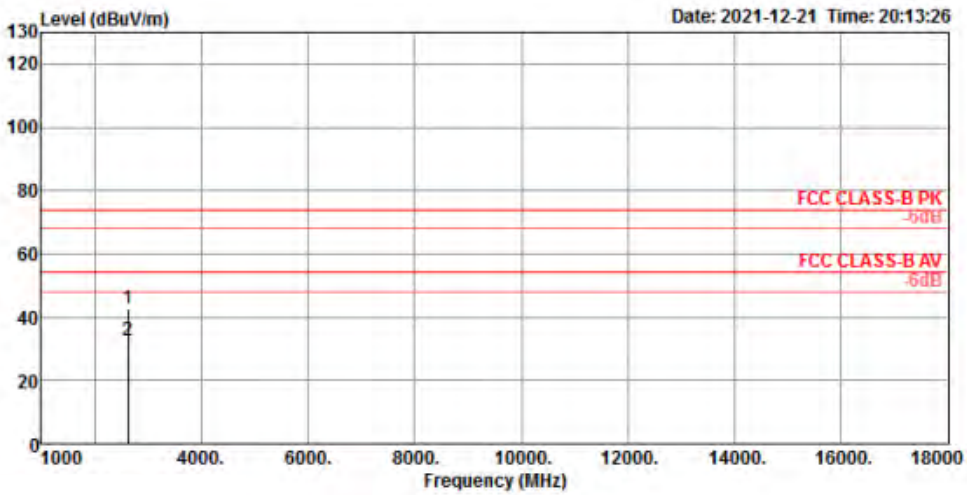
Test Mode	Mode 1	Test Range	1~18G

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2623.71	46.42	74.00	-27.58	50.36	5.51	27.60	37.05	193	278	Peak	HORIZONTAL
2	2625.13	39.29	54.00	-14.71	43.23	5.51	27.60	37.05	193	278	Average	HORIZONTAL

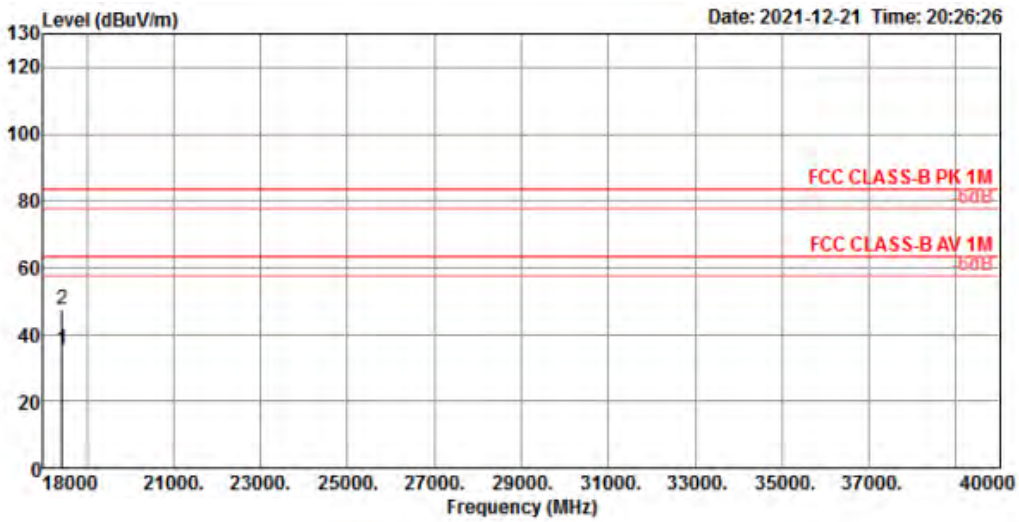
Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2624.49	42.63	74.00	-31.37	46.57	5.51	27.60	37.05	137	274	Peak	VERTICAL
2	2624.52	32.78	54.00	-21.22	36.72	5.51	27.60	37.05	137	274	Average	VERTICAL

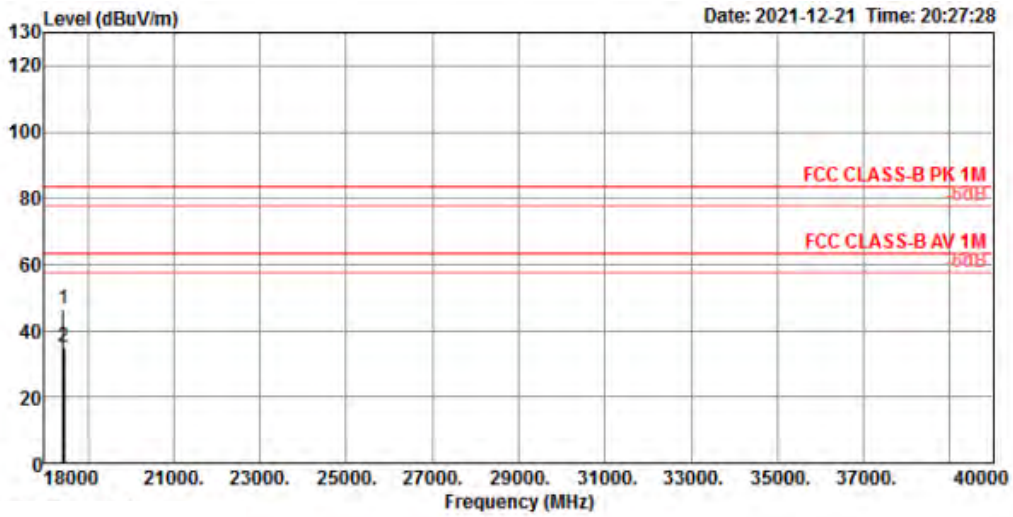
Test Mode	Mode 1	Test Range	18~40G

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	18431.54	35.60	63.54	-27.94	33.12	14.87	37.73	50.12	124	200	Average	HORIZONTAL
2	18434.89	47.27	83.54	-36.27	44.79	14.87	37.73	50.12	124	200	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	18436.02	46.63	83.54	-36.91	44.15	14.87	37.73	50.12	155	49	Peak	VERTICAL
2	18442.33	35.21	63.54	-28.33	32.73	14.87	37.73	50.12	155	49	Average	VERTICAL