RF TEST REPORT

Test Equipment	:	IRON-MD Transmitter
Model Name	:	IRON-MD-TD
FCC ID	:	2BHL8-IRON-MD-TD
IC	:	32779-IRONMDTD
Date of receipt	:	2024-06-14
Test duration	:	2024-07-18 ~ 2024-08-13
Date of issue	:	2024-08-23

Applicant : DAS Co., Ltd

61, Jipyeongseonsandan 3-gil, Gimje-si, Jeollabuk-do, Korea

Test Laboratory : Lab-T, Inc.

2182-42, Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si
Gyeonggi-do 17036, Korea (Republic of)

Test specification	:	FCC Part 15 Subpart C 15.231 RSS-210 Issue 10 A1(2020-04) RSS-GEN Issue 5 A2(2021-02)
RF Output Power	:	94.60 dBμV/m
Test result	:	Pass

The above equipment was tested by Lab-T Testing Laboratory for compliance
with the requirements of FCC,IC Rules and Regulations.
The test results presented in this test report are limited only to the sample supplied by applicant
and the use of this test report is inhibited other than its purpose.
This test report shall not be reproduced except in full, without the written approval of Lab-T, Inc
This test report is not related to KOLAS.

Tested by:

Engineer
HyunWoo Lee

Reviewed by:

Technical Manager
SangHoon Yu

Copyright © 2024 Lab-T, Inc.

CONTENTS

1. Revision history **3**

2. Information **4**

2.1 Applicant Information 4
2.2 Test Laboratory information 4
2.3 Test Site 4

3. Information About Test Equipment **5**

3.1 Equipment Information 5
3.2 Antenna Information 5
3.3 Test Frequency 5
3.4 Operating conditions for the EUT 5

4. Test Report **6**

4.1 Summary 6
4.2 Measurement Uncertainty 6
4.4 Transmitter Requirements 7
4.4.1 Antenna Requirement 7
4.4.2 Transmitter Deactivation 8
4.4.3 Field Strength of Emissions 11
4.4.4 Emission Bandwidth 13
4.4.5 Spurious Emission and Restricted bands 17
4.4.6 Conducted Emission 24
4.4.7 Duty cycle 25

APPENDIX I **26**

Copyright ⓒ 2024 Lab-T, Inc.

1. Revision history

Test Report No.	Date	Description
TRRFCC24-0013	2024-08-13	Initial issue
TRRFCC24-0013(1)	2024-08-23	IC Number Corrected Bluetooth Module Information Added

Copyright ⓒ 2024 Lab-T, Inc.

2. Information

2.1 Applicant Information

Applicant name	DAS Co., Ltd
Address	61, Jipyeongseonsandan 3-gil, Gimje-si, Jeollabuk-do, Korea
Telephone No.	+82-63-548-9420
Person in charge	Doosik Joo / rnd3@das-co.com
Manufacturer	DAS Co., Ltd
Address	61, Jipyeongseonsandan 3-gil, Gimje-si, Jeollabuk-do, Korea

2.2 Test Laboratory information

Corporate name	Lab-T, Inc.
Representative	Duke (Jongyoung) Kim
Address	2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)
Telephone	+82-31-322-6767
Fax	+82-31-322-6768
E-mail	info@lab-t.net
FCC Designation No.	KR0159

2.3 Test Site

Test Site	used	Address
Building L	☒	2182-40 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)
Building T	☒	2182-42 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)
Building A	☐	2182-44 Baegok-daero, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17036, Korea(Republic of)

Copyright ⓒ 2024 Lab-T, Inc.

3. Information About Test Equipment

3.1 Equipment Information

Equipment type	IRON-MD Transmitter
Model name	IRON-MD-TD
Variant model name	-
Frequency	433.125 MHz ~ 434.375 MHz Bluetooth : 2 402 MHz ~ 2 480 MHz[NOTE2]
Modulation type	FSK Bluetooth : GFSK, π/4-DQPSK, 8DPSK[NOTE2]
Power supply	DC 3.7 V
H/W version	1.0
S/W version	1.0

NOTE1: The above EUT information was declared by the manufacturer.
NOTE2: pre-certified module used. (FCC ID : S7A-IW05 / IC : 8154A-IW05)
Report No. : DRTFCC1612-0159(1)

3.2 Antenna Information

Type	Model No.	Gain	Note.
Dipole Antenna	HW-447H-MSMA	-1.94 dBi	-

3.3 Test Frequency

Test mode	Test frequency (MHz)		
	Lowest frequency	Middle frequency	Highest frequency
FSK	433.125	433.725	434.375

3.4 Operating conditions for the EUT

Firmware state		1.0
Test software name(version)		Used native test mode(-)
Test power setting		default
Serial number (Setup mode)	EUT #1	#1 (Conducted Emission)
	EUT #2	#2 (Radiated Emission)
	EUT #3	#3 (Normal Operation for Transmitter Deactivation)

Copyright ⓒ 2024 Lab-T, Inc.

4. Test Report

4.1 Summary

FCC Part 15 & RSS-GEN Issue 5 A2 & RSS-210 Issue 10 A1				
FCC Rule	IC Rule	Parameter	Clause	Status
Transmitter Requirements				
15.203	-	Antenna Requirement	4.4.1	C
15.231(a)(1)	RSS-210 A.1.1(a)	Transmitter Deactivation	4.4.2	C
15.231(b)	RSS-210 A.1.2(b)	Field Strength of Emissions	4.4.3	C
15.231(c)	RSS-210 A.1.3	Emission Bandwidth	4.4.4	C
15.231(b) 15.205(a) 15.209(a)	RSS-210 A.1.2(b) RSS-GEN 8.9 RSS-GEN 8.10	Spurious Emission and Restricted bands	4.4.5	C
15.207(a)	RSS-GEN 8.8	Conducted Emissions	4.4.6	N/A[Note2]
-	-	Duty cycle	4.4.7	-
Note 1 : C = Comply N/C = Not Comply N/T = Not Tested N/A = Not Applicable Note 2 : This device gets power supply from only battery(DC 3.7V)				

* The general test methods used to test this device is ANSI C63.10:2020

4.2 Measurement Uncertainty

Mesurement items	Expanded Uncertainty	
Occupied Channel Bandwidth	6.95 kHz	(The confidence level is about 95 %, *k*=2)
Conducted Spurious Emissions	0.47 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (1 GHz under)	4.78 dB	(The confidence level is about 95 %, *k*=2)
Radiated Spurious Emissions (Above 1 GHz)	5.96 dB	(The confidence level is about 95 %, *k*=2)

Copyright ⓒ 2024 Lab-T, Inc.

4.4 Transmitter Requirements

4.4.1 Antenna Requirement

4.4.1.1 Regulation

According to §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.

4.4.1.2 Result

Comply
(The transmitter has a Dipole Antenna. The directional peak gain of the antenna is -1.94 dBi.)

Copyright ⓒ 2024 Lab-T, Inc.

4.4.2 Transmitter Deactivation

4.4.2.1 Regulation

According to §15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

According to RSS-210 A.1.1(a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.

According to §15.231(a)(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

According to RSS-210 A1.1(c) Periodic transmissions at regular, predetermined intervals are not permitted, except as specified in section A.1.4. However, polling or supervision transmissions that determine system integrity of transmitters used in security or safety applications are permitted, provided the total duration of transmission does not exceed 2 seconds per hour for each transmitter.

4.4.2.2 Measurement Procedure

ANSI C63.10 § 7.4 determining compliance of unlicensed wireless devices having periodic operation

4.4.2.3 Result

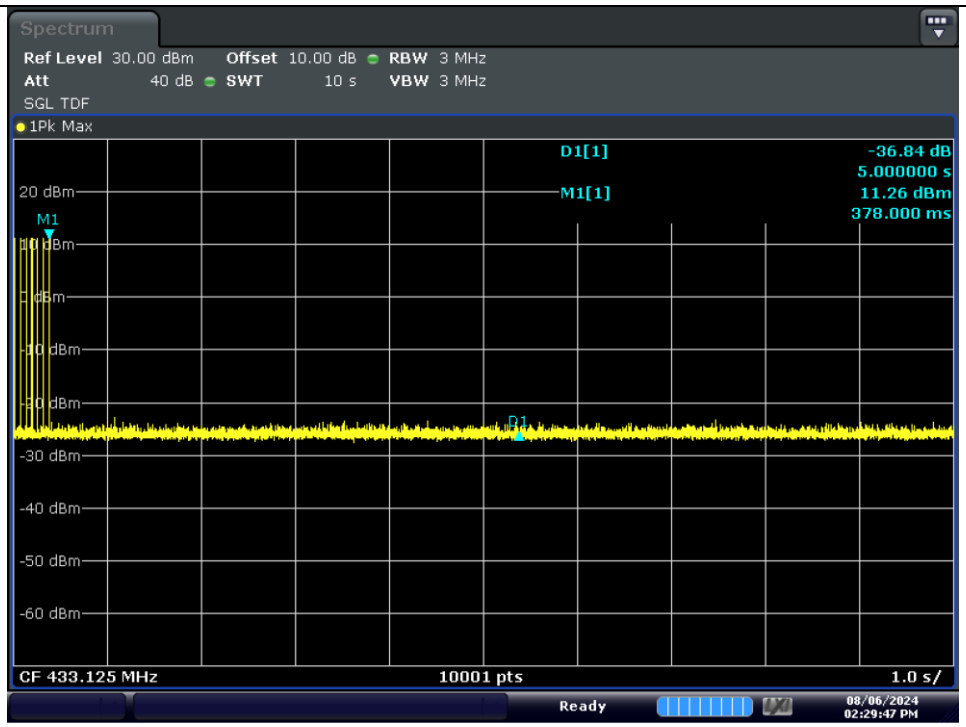
Comply

Copyright ⓒ 2024 Lab-T, Inc.

4.4.2.4 Measurement data

Test mode : FSK

Frequency(MHz)	Condition	Limit(s)
433.725	Manually operation	< 5



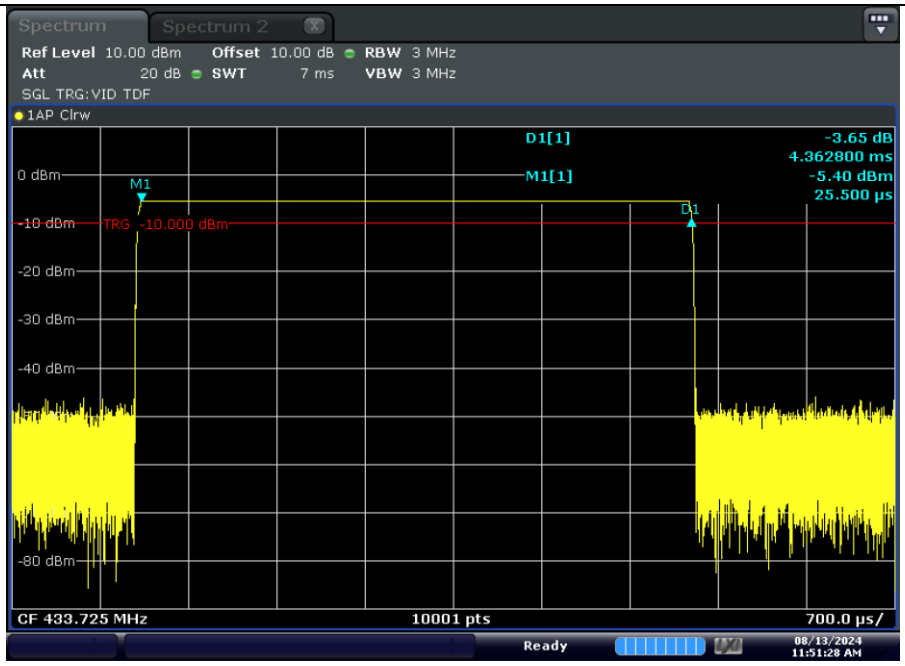
Copyright ⓒ 2024 Lab-T, Inc.

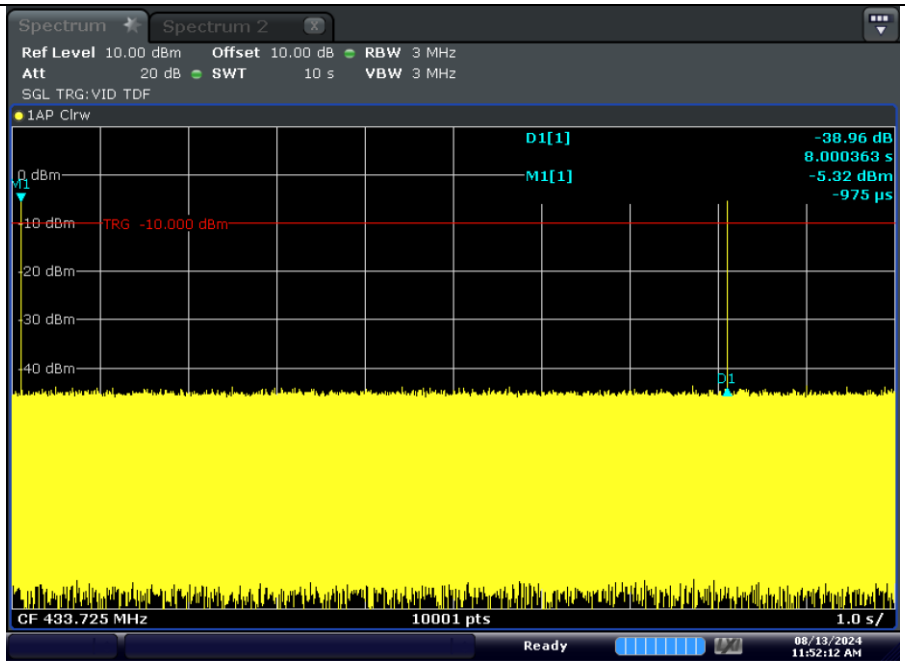
Test mode : FSK

Frequency(MHz)	Condition	Limit
433.725	Periodic transmission	< 2 s per hour

on time(s)	period(s)	Number of TX	Result (s)
0.004 36	8.00	450	1.96

Note 1 : Number of TX = 3600 s / period
Result = on time * Number of TX





Copyright ⓒ 2024 Lab-T, Inc.

4.4.3 Field Strength of Emissions

4.4.3.1 Regulation

According to §15.231(b) In addition to the provisions of § 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1] 1,250 to 3,750	[1] 125 to 375
174-260	3,750	375
260-470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

[1] Linear interpolations.

According to RSS-210 A.1.2 Following are the requirements for field strength of emissions::

Fundamental frequency (MHz), excluding restricted frequency bands specified in RSS-Gen	Field strength of the fundamental emissions (μV/m at 3 m)
70-130	1,250
130-174	1,250 to 3,750*
174-260**	3,750
260-470**	3,750 to 12,500*
Above 470	12,500

* Linear interpolation with frequency, f, in MHz:
- For 130-174 MHz: Field Strength (μV/m) = (56.82 x f)-6136
- For 260-470 MHz: Field Strength (μV/m) = (41.67 x f)-7083

** Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

4.4.3.2 Measurement Procedure

ANSI C63.10 § 4.1.4 FFT-based measurement instrument
ANSI C63.10 § 6.5 Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz

4.4.3.3 Result

Comply (measurement data : refer to the next page)

Copyright ⓒ 2024 Lab-T, Inc.

4.4.3.4 Measurement data

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Duty factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
433.125	PK	H	99.00	-4.50	-	94.50	100.83	6.33
	AV	H	99.00	-4.50	-22.78	71.72	80.83	9.11
	PK	V	94.20	-4.50	-	89.70	100.83	11.13
	AV	V	94.20	-4.50	-22.78	66.92	80.83	13.91
433.725	PK	H	99.10	-4.50	-	94.60	100.83	6.23
	AV	H	99.10	-4.50	-22.78	71.82	80.83	9.01
	PK	V	90.30	-4.50	-	85.80	100.83	15.03
	AV	V	90.30	-4.50	-22.78	63.02	80.83	17.81
434.375	PK	H	98.90	-4.50	-	94.40	100.83	6.43
	AV	H	98.90	-4.50	-22.78	71.62	80.83	9.21
	PK	V	93.60	-4.50	-	89.10	100.83	11.73
	AV	V	93.60	-4.50	-22.78	66.32	80.83	14.51

Note 1 : Measured distance : 3 m
Note 2 : Peak Result : Peak Reading + Factor
Duty factor : 20 x Log(Duty cycle) dB, refer to 4.4.7
Average Reasult : Peak Reading + Factor + Duty factor

Copyright ⓒ 2024 Lab-T, Inc.

4.4.4 Emission Bandwidth

4.4.4.1 Regulation

According to §15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

According to RSS-210 A.1.3 The occupied bandwidth of momentarily operated devices shall be less than or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the centre frequency.

4.4.4.2 Measurement Procedure

ANSI C63.10 § 6.9.2 Occupied bandwidth-relative measurement procedure
ANSI C63.10 § 6.9.2 Occupied bandwidth-power bandwidth (99%) measurement procedure

4.4.4.3 Result

Comply

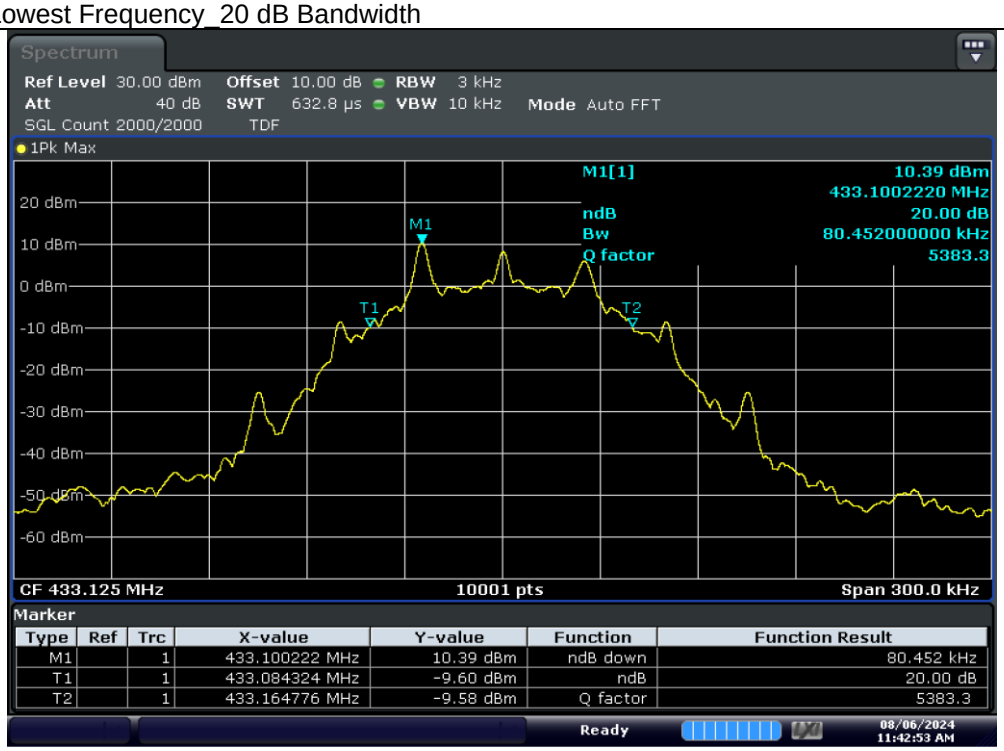
4.4.4.4 Measurement data

Frequency (MHz)	20 dB Bandwidth (kHz)	Occupied Bandwidth (99 % Bandwith)(kHz)	Limit (MHz)
433.125	80.45	93.26	1.083
433.725	81.35	93.14	1.084
434.375	84.74	93.65	1.086

Copyright ⓒ 2024 Lab-T, Inc.

4.4.4.5 Test Plot

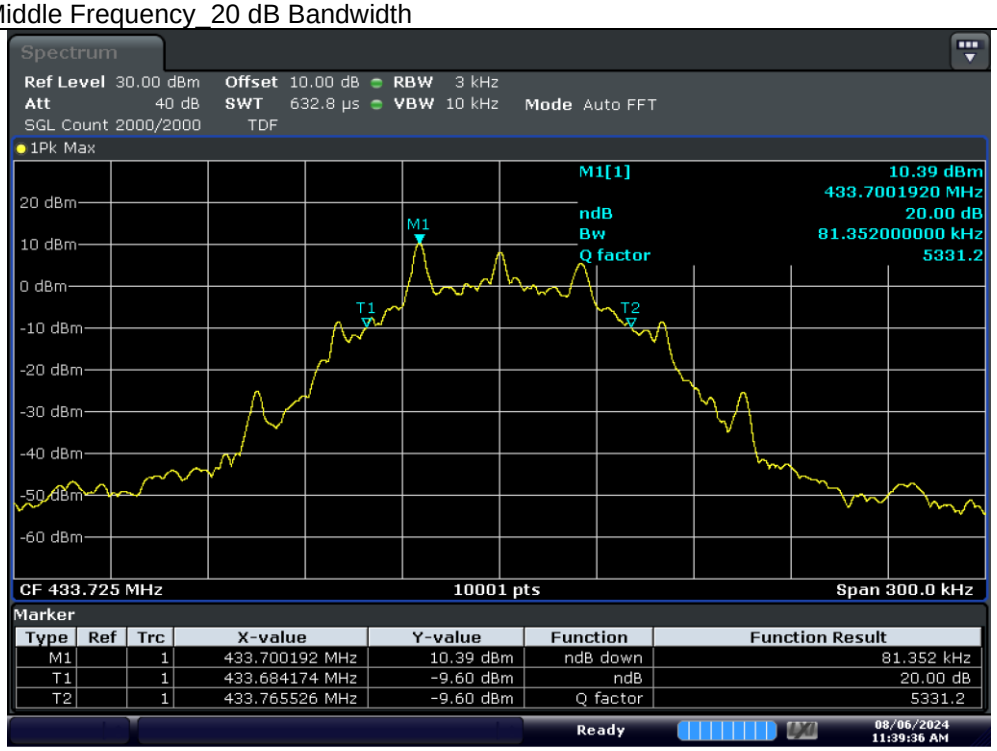
Lowest Frequency_20 dB Bandwidth



Lowest Frequency_Occupied Bandwidth(99 % Bandwith)

Copyright ⓒ 2024 Lab-T, Inc.

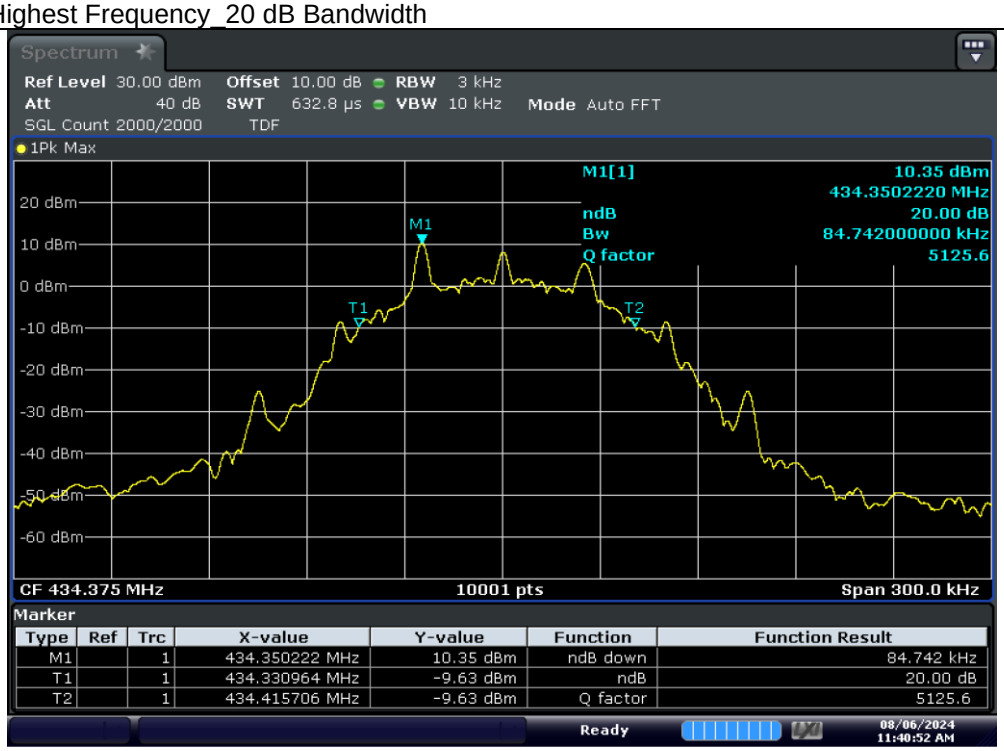
Middle Frequency_20 dB Bandwidth



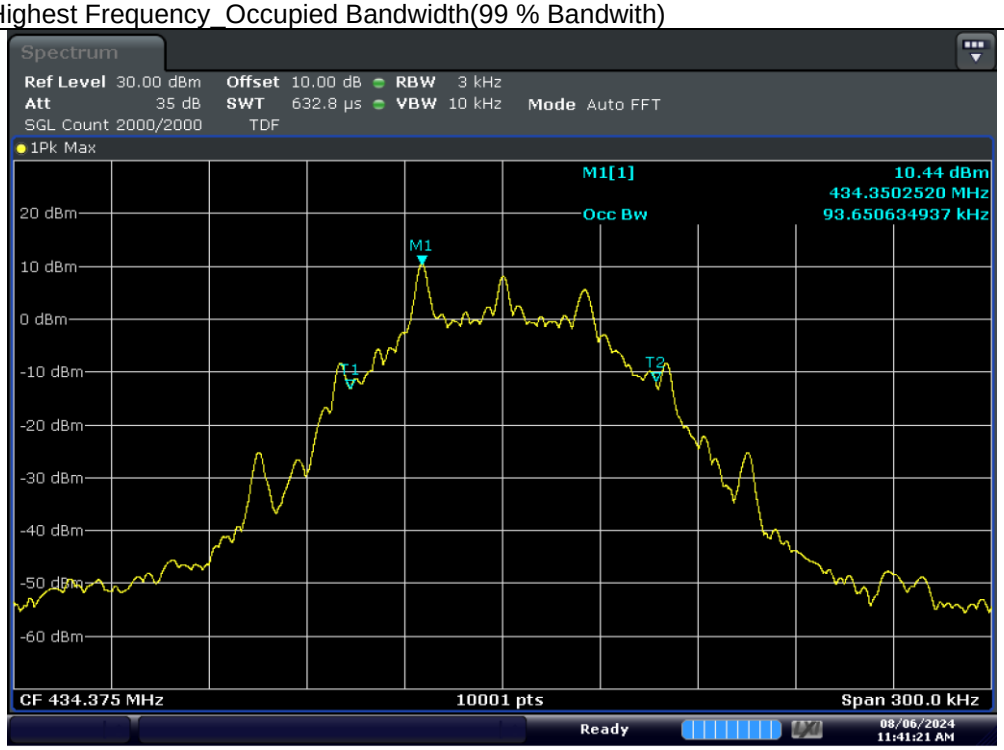
Middle Frequency_Occupied Bandwidth(99 % Bandwith)

Copyright ⓒ 2024 Lab-T, Inc.

Highest Frequency_20 dB Bandwidth



Highest Frequency_Occupied Bandwidth(99 % Bandwith)



Copyright ⓒ 2024 Lab-T, Inc.

4.4.5 Spurious Emission and Restricted bands

4.4.5.1 Regulation

According to §15.231(b) In addition to the provisions of § 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1] 1,250 to 3,750	[1] 125 to 375
174-260	3,750	375
260-470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

[1] Linear interpolations.

(1)The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in § 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of § 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.
According to RSS-210 A.1.2(b) Unwanted emissions shall be 10 times below the fundamental emissions field strength limits in table A1 or comply with the limits specified in RSS-Gen, whichever is less stringent.

Table A1— Permissible field strength limits for momentarily operated devices

Fundamental frequency (MHz), excluding restricted frequency bands specified in RSS-Gen	Field strength of the fundamental emissions (μV/m at 3 m)
70-130	1,250
130-174	1,250 to 3,750*
174-260**	3,750
260-470**	3,750 to 12,500*
Above 470	12,500

* Linear interpolation with frequency, f, in MHz:
- For 130-174 MHz: Field Strength (μV/m) = (56.82 x f)-6136
- For 260-470 MHz: Field Strength (μV/m) = (41.67 x f)-7083

** Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

Copyright ⓒ 2024 Lab-T, Inc.

According to §15.209(a) and RSS-GEN §8.9 Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall notexceed the field strength levels specified in the following table:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shallnot be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permltted under other sections of this part, e.g., §§15.231 and 15.241.

According to §15.205(a),(b) and RSS-GEN §8.10 only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 – 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurement

Copyright ⓒ 2024 Lab-T, Inc.

4.4.5.2 Measurement Procedure

ANSI C63.10 § 6.4 Radiated emissions from unlicensed wireless devices below 30 MHz
ANSI C63.10 § 6.5 Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
ANSI C63.10 § 6.6 Radiated emissions from unlicensed wireless devices from 1 GHz to 40 GHz

4.4.5.3 Result

Comply

4.4.5.4 Measurement data

Test mode : Lowest Frequency 433.125 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Duty factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
166.51	QP	H	40.50	-9.60	-	30.90	43.50	12.60
175.49	QP	V	45.70	-10.40	-	35.30	43.50	8.20
652.54	QP	V	38.80	-0.60	-	38.20	46.00	7.80

Test mode : Middle Frequency 433.725 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Duty factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
197.79	QP	V	41.10	-10.90	-	30.20	43.50	13.30
715.47	QP	V	34.60	0.00	-	34.60	46.00	11.40

Test mode : Highest Frequency 434.375 MHz

Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Duty factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
148.49	QP	V	42.00	-8.80	-	33.20	43.50	10.30
184.47	QP	V	45.10	-11.00	-	34.10	43.50	9.40
634.44	QP	V	35.20	-0.60	-	34.60	46.00	11.40

Copyright ⓒ 2024 Lab-T, Inc.

Test mode : Simultaneous operation (FSK + Bluetooth)NOTE7

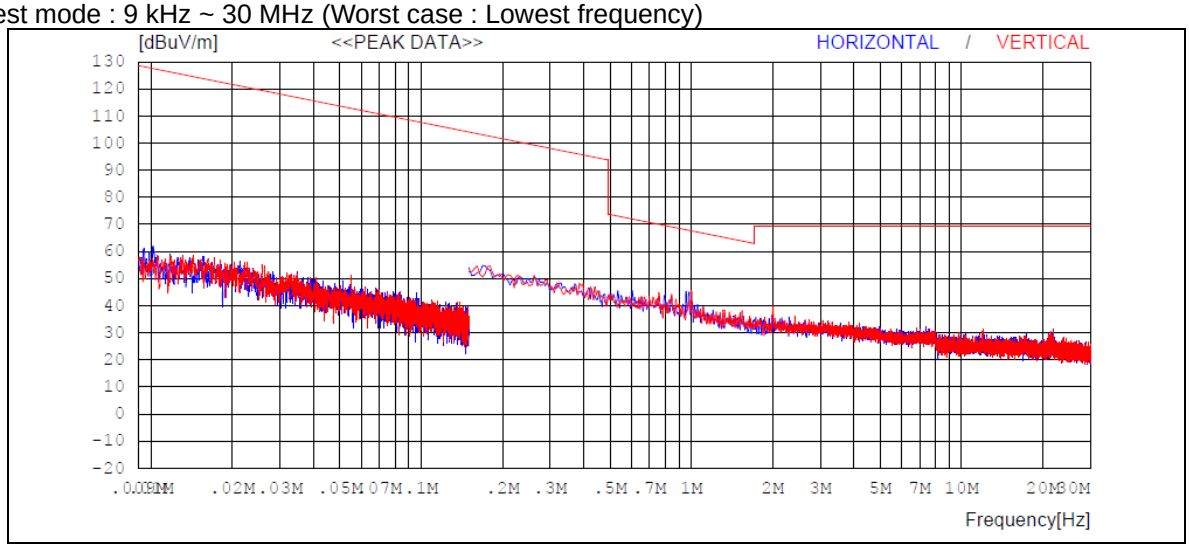
Frequency (MHz)	Detector	Pol. (V/H)	Reading (dBµV)	Factor (dB)	Duty factor (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
197.93	QP	V	40.10	-10.90	-	29.20	43.50	14.30
688.53	QP	V	32.20	-0.10	-	32.10	43.50	11.40
1 601.60	PK	H	56.60	-8.54	-	48.06	74.00	25.94
1 601.60	PK	V	55.30	-8.54	-	46.76	74.00	27.24
9 607.91	PK	H	46.60	9.46	-	56.06	74.00	17.94
	AV	H	46.60	9.46	-24.70	31.36	54.00	22.64
12 009.41	PK	H	41.80	14.06	-	55.86	74.00	18.14
	AV	H	41.80	14.06	-24.70	31.16	54.00	22.84
12 009.41	PK	V	39.50	14.06	-	53.56	74.00	20.44
	AV	V	39.50	14.06	-24.70	28.86	54.00	25.14

NOTE1 : The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 GHz.
NOTE2 : The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1 GHz.
NOTE3 : EUT height : 0.8 m is for below 1 GHz testing, and 1.5 m is for above 1 GHz testing
NOTE4 : Below 1 GHz Measured distance : 3 m, Above 1 GHz Measured distance : 1 m
Above 1 GHz Distance Factor = 20log(1 / 3) = -9.54
NOTE5 : Factor : Ant Factor + Cable loss - Amp gain + Distance Factor
NOTE6 : Peak Result : Peak Reading + Factor
Average Reasult : Peak Reading + Factor + Duty factor
Duty factor : Refer to Report No. : DRTFCC1612-0159(1)
NOTE7 : Tested under FSK and BT simultaneous operation conditions.

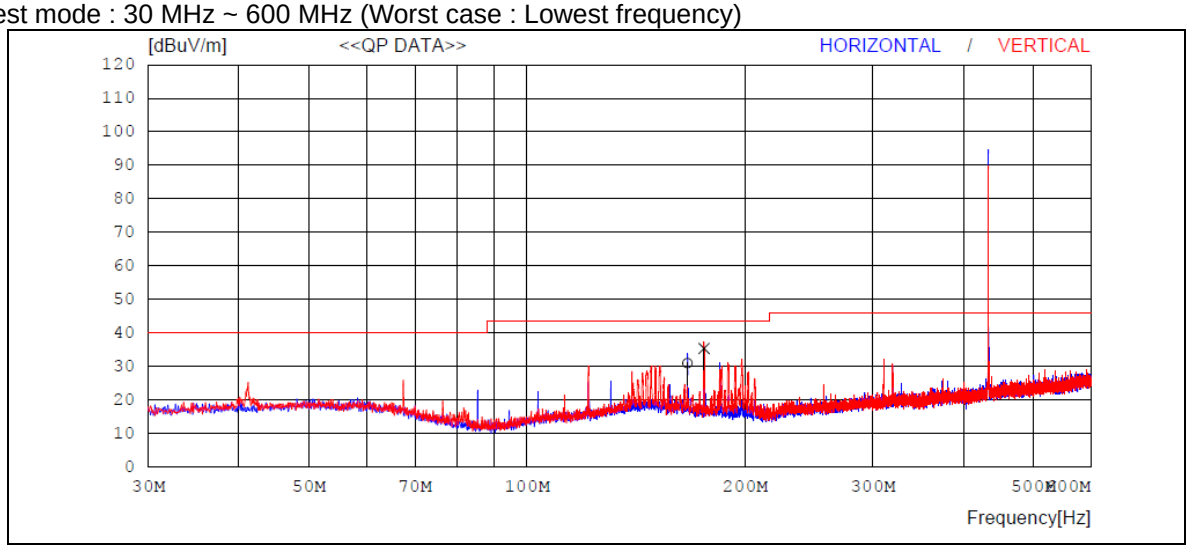
Copyright ⓒ 2024 Lab-T, Inc.

4.4.5.5 Measurement Plot

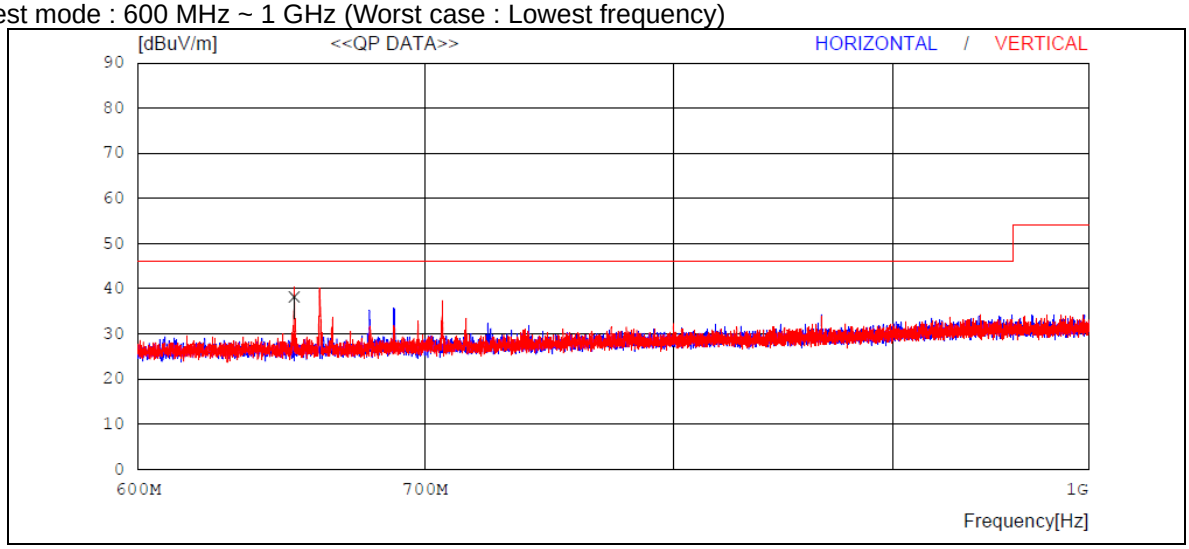
Test mode : 9 kHz ~ 30 MHz (Worst case : Lowest frequency)



Test mode : 30 MHz ~ 600 MHz (Worst case : Lowest frequency)

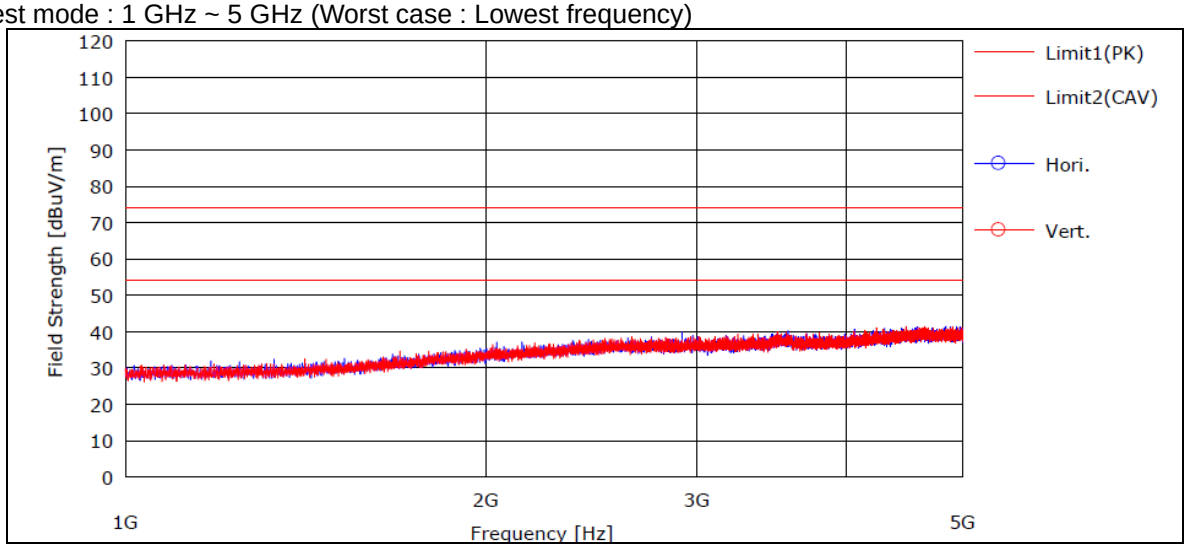


Test mode : 600 MHz ~ 1 GHz (Worst case : Lowest frequency)

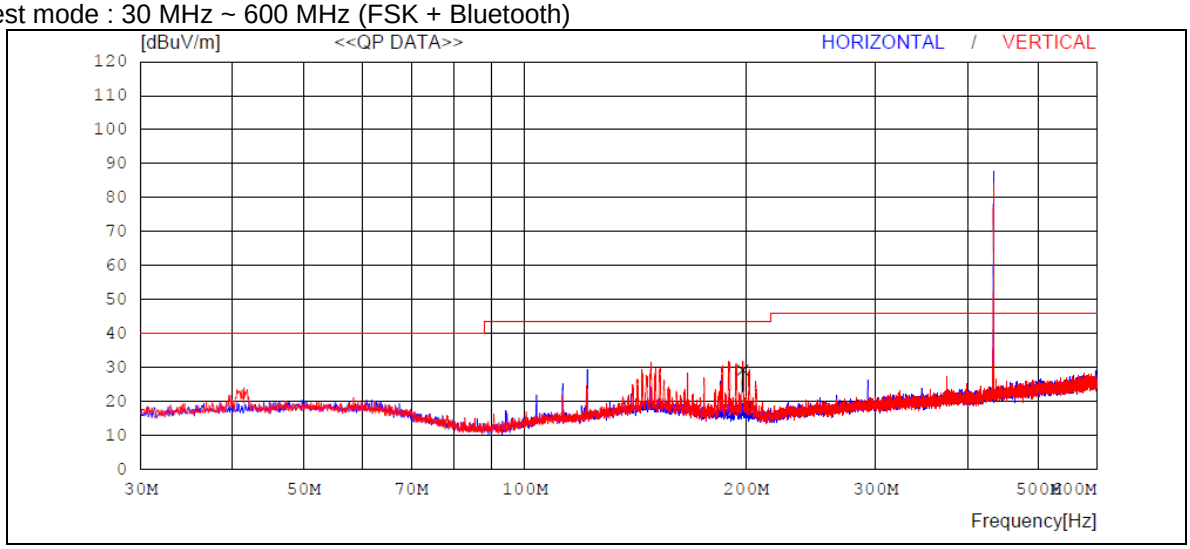


Copyright ⓒ 2024 Lab-T, Inc.

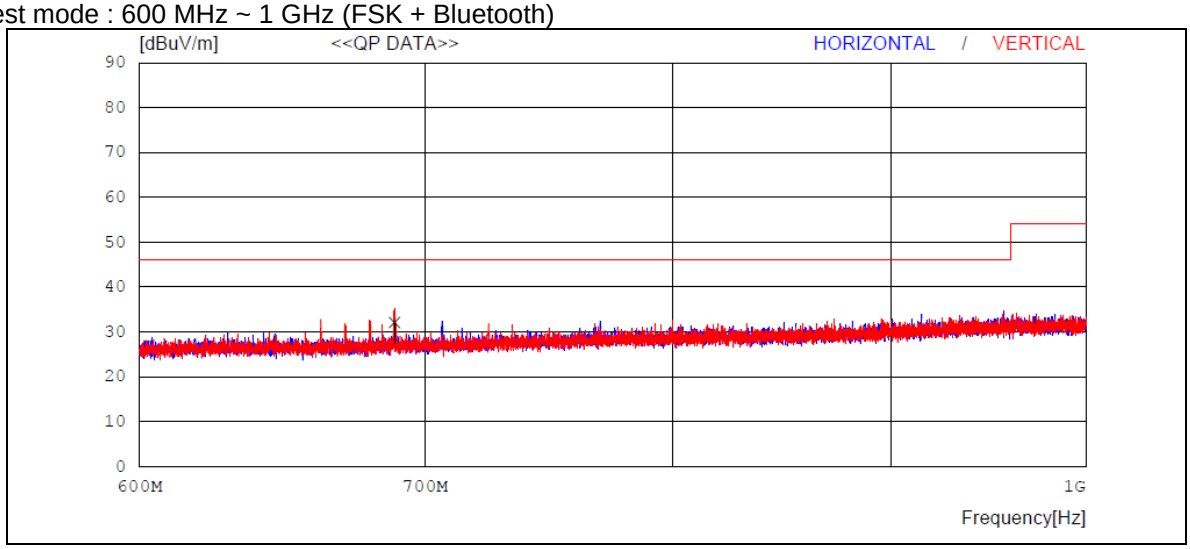
Test mode : 1 GHz ~ 5 GHz (Worst case : Lowest frequency)



Test mode : 30 MHz ~ 600 MHz (FSK + Bluetooth)

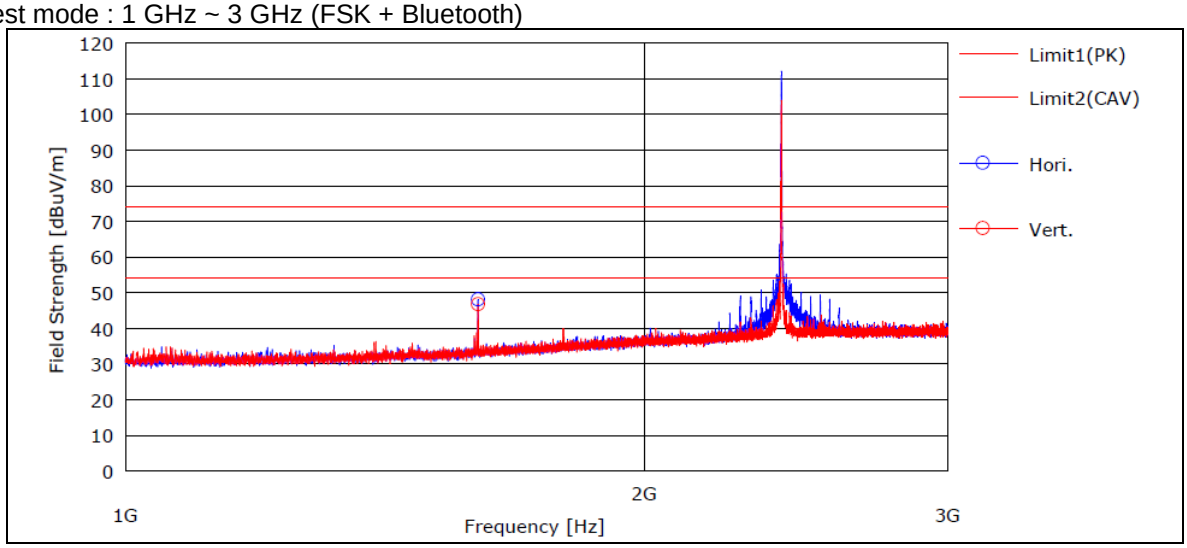


Test mode : 600 MHz ~ 1 GHz (FSK + Bluetooth)

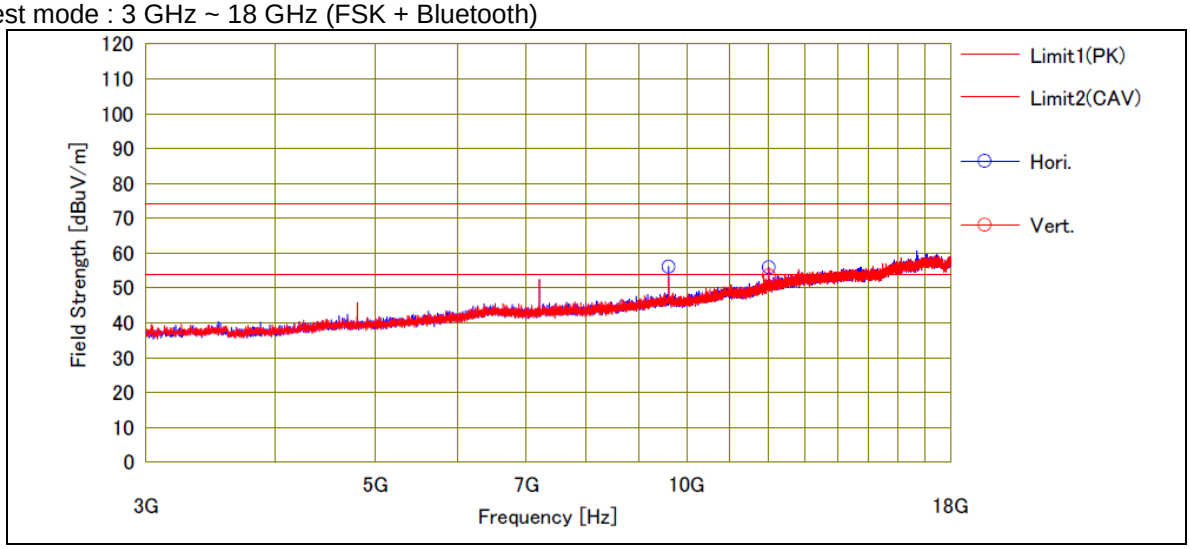


Copyright ⓒ 2024 Lab-T, Inc.

Test mode : 1 GHz ~ 3 GHz (FSK + Bluetooth)



Test mode : 3 GHz ~ 18 GHz (FSK + Bluetooth)



Copyright ⓒ 2024 Lab-T, Inc.

4.4.6 Conducted Emission

4.4.6.1 Regulation

According to §15.207(a) and RSS-GEN §8.8 for an intentional radiator 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, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN).
Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Qausi-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.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

4.4.6.2 Measurement Procedure

1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5 m away from the side wall of the shielded room.

2) Each current-carrying conductor of the EUT power cord was individually connected through a 50 Ω/50 µH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.

3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.

4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.

5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASIPEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

4.4.6.3 Result

Not Applicable (This device gets power supply from only battery(DC 3.7V))

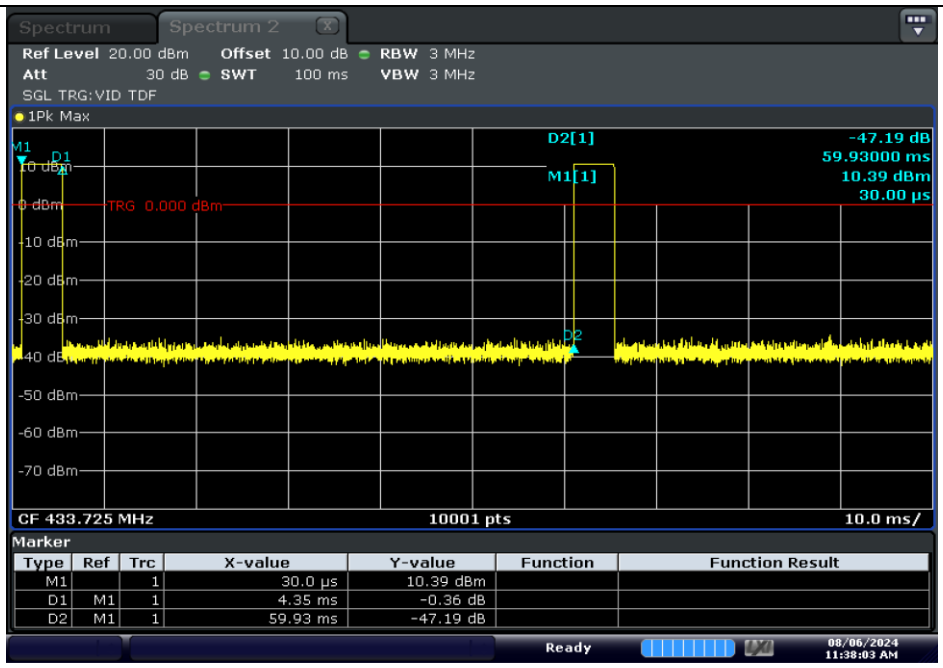
Copyright ⓒ 2024 Lab-T, Inc.

4.4.7 Duty cycle

The duty cycle de-rating factor used in the calculation of average radiated limits (per CFR 15.209 and 15.35(c)) is described below.

Period(ms)	Ontime(ms)	Duty cycle(%)	Duty cycle factor(dB)
59.93	4.35	7.26	-22.78

Duty cycle factor(dB) : 20log(on time/period)



Copyright ⓒ 2024 Lab-T, Inc.

APPENDIX I

TEST EQUIPMENT USED FOR TESTS

Copyright ⓒ 2024 Lab-T, Inc.

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Equipment	Manufacturer	Model	Serial No.	Cal. Date (yy.mm.dd)	Next Cal.Date (yy.mm.dd)
FSV Signal Analyzer	ROHDE&SCHWARZ	FSV30	103370	2023-10-11	2024-10-11
Power Supply	KIKUSUI	PWX1500L	SM002050	2023-08-16	2024-08-16
Temp & Humi Test Chamber	SJ SCIENCE	SJ-TH-S50	170719	2024-04-01	2025-04-01
Digital MultiMeter	HP	34401A	US36025428	2024-01-04	2025-01-04
Signal Generator	ROHDE&SCHWARZ	SMB100A	178384	2023-10-11	2024-10-11
ATTENUATOR	WEINSCHEL	54A-10	69672	2023-10-11	2024-10-11
EMI Test Receiver	ROHDE&SCHWARZ	ESU40	100445	2023-09-05	2024-09-05
BiLog Antenna	Schwarzbeck	VULB9168	00821	2023-03-29	2025-03-29
Attenuator	JFW	50F-006	6 dB-3	2024-04-01	2025-04-01
Preamplifier	TSJ	MLA-10k01-b01-27	1870367	2024-04-01	2025-04-01
Antenna Mast(10 m)	TOKIN	5977	-	-	-
Antenna Mast(10 m)	Innco	MA4640-XPET-0800	578	-	-
Controller(10 m)	TOKIN	5909L	141909L-1	-	-
Controller(10 m)	Innco	CO3000	40040217	-	-
Turn Table(10 m)	TOKIN	5983-1.5	-	-	-
FSV Signal Analyzer	ROHDE&SCHWARZ	FSV30	103370	2023-10-11	2024-10-11
Double Ridege Horn Antenna	ETS	3117	00168719	2023-08-10	2024-08-10
				2024-08-05	2025-08-05
PREAMPLIFIER	Agilent	8449B	3008A02110	2024-01-08	2025-01-08
High pass filter	Wainwright Instruments GmbH	WHJ10-516-600-4000-60SS	1	2023-08-16	2024-08-16
High pass filter	Wainwright Instruments GmbH	WHKX10-2580-3000-18000-60SS	14	2024-01-08	2025-01-08

Copyright ⓒ 2024 Lab-T, Inc.