



TEST REPORT

Report No. : AB0046722(0) Date : 31 Aug 2022

Application No. : LB026967(8)

Applicant : Gatekeeper Systems (HK) Ltd.
36/F, Tower 2, Times Square 1 Matheson Street, Causeway Bay,
Hong Kong

Sample Description : One(1) item of submitted sample stated to be :

Sample Description	Model number
Remote Controlled Locking Wheel	W-9470B

Radio Frequency : 2403MHz – 2478MHz (MSK)

: 2402MHz – 2452MHz (FSK)

Rating : DC3V battery

No. of submitted sample : One (1) piece (s)

Date Received : 11 Aug 2022

Test Period : 11 Aug 2022 to 19 Aug 2022.

Test Requested : FCC Certification for FCC Part 15, subpart C
ISED Certification for License-exempt Device

Test Method : 47 CFR Part 15 (10-1-20 Edition),
ANSI C63.10 – 2013,
ANSI C63.4 – 2014,
RSS-210 Issue 10,
RSS-Gen Issue 5

Test Engineer : Mr. LEUNG Shu-kan, Ken

Test Result : See attached sheet(s) from page 2 to 28.

Conclusion : The submitted sample was found to comply with requirement of FCC Part 15
Subpart C section 15.249 and ISED Canada Radio Standards Specification RSS-
210 Issue 10.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____

Wong Lap Pong / Andrew
Deputy Technical Manager

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FCC ID: W3Z-W9470B
IC: 6817C-W9470B

The conformity statement stated in Conclusion above is based on the decision rule agreed with applicant and listed in www.cmateesting.org/qac/statement-of-conformity.pdf.
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This document shall not be reproduced except in full without written approval by CMA Testing. The results apply to the sample as received unless otherwise specified. The observations and test results in this report are relevant only to the sample tested.

CMA Industrial Development Foundation Limited

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1 General Information

1.1 General Description

The equipment under test (EUT) is a wireless control wheel with 2.4GHz transceiver. RSL10 wheel contains a microprocessor (Onsemi RSL10) with a 2.4 GHz transceiver, an 8 kHz receiver, a DC motor drive and a TMR switch. The RSL10 uses the external 48 MHz and 32.766 KHz crystal oscillators. The 8 kHz receiver uses an LC oscillator to set its resonant frequency. The F antenna is internal to the wheel.

The brief circuit description is listed as follows:

- U6 and its associated circuit act as MCU with RF circuit
- Y2, Y3 and its associated circuit act as oscillator
- Q12, Q13, Q14, Q15 and its associated circuit act as motor control circuit



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1.2 Location of the test site

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

FCC Accredited Lab (Designation Number: HK0004)

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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date	Calibration Period
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	14 Dec 2022	1Year
Spectrum Analyzer	R&S	FSV40	100964	14 Oct 2022	1Year
Log Periodic Antenna	TESEQ	UPA6109	43666	29 Nov 2022	2Years
Biconical Antenna	Rohde & Schwarz	HK116	837414/004	29 Nov 2022	2Years
Loop Antenna	EMCO	6502	56620	27 Oct 2022	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	02 Feb 2023	3Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	02 Feb 2023	3Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	16 Nov 2023	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	08 Dec 2023	2Years
Coaxial Cable	Suhner	Sucoflex 106	N/A	31 May 2023	1Year
Coaxial Cable	Suhner	Sucoflex_104	N/A	14 Dec 2022	2Years
LISN	Rohde & Schwarz	ENV216	101323	14 Dec 2022	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	19 Oct 2022	1Year

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1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U_{lab})
30MHz ~ 200MHz (Horizontal)	4.59dB
30MHz ~ 200MHz (Vertical)	4.49dB
200MHz ~1000MHz (Horizontal)	4.94dB
200MHz ~1000MHz (Vertical)	4.97dB
1GHz ~6GHz	4.52dB
6GHz ~18GHz	4.58dB

1.5 Test Summary

TEST ITEM	FCC REFERANCE	RSS REFERENCE	RESULT
Radiated emission	15.249(a)	RSS-210 Annex B.10	Comply
Out-band emission	15.249(d)	RSS-210 Annex B.10	Comply
Peak Limit	15.249(e)	RSS-210 Annex B.10	Comply
Bandwidth	15.215(c)	RSS-Gen 6.7	Comply

1.6 Equipment Units Tested (EUT)

Product Description : Remote Controlled Locking Wheel
 Model : W-9470B
 PMN : W-9470B
 HVIN : W-9470B
 FVIN : N/A
 HMN : N/A
 Serial No. : Not labelled
 Sample Type : Pre-production type
 Rationale of selection : One single model



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2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

A non-conductive turntable with dimensions of 1.5m x 0.4m x 0.8m (L x W x H) placed above the reference ground plane. The equipment under test (EUT) was placed at 0.8m height for below 1GHz measurement and 1.5m height for above 1GHz measurement. The test distance is 3m between EUT and receiving antenna. A broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated. Additional absorbing material will be placed between the EUT and receiving antenna for above 1GHz measurement.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

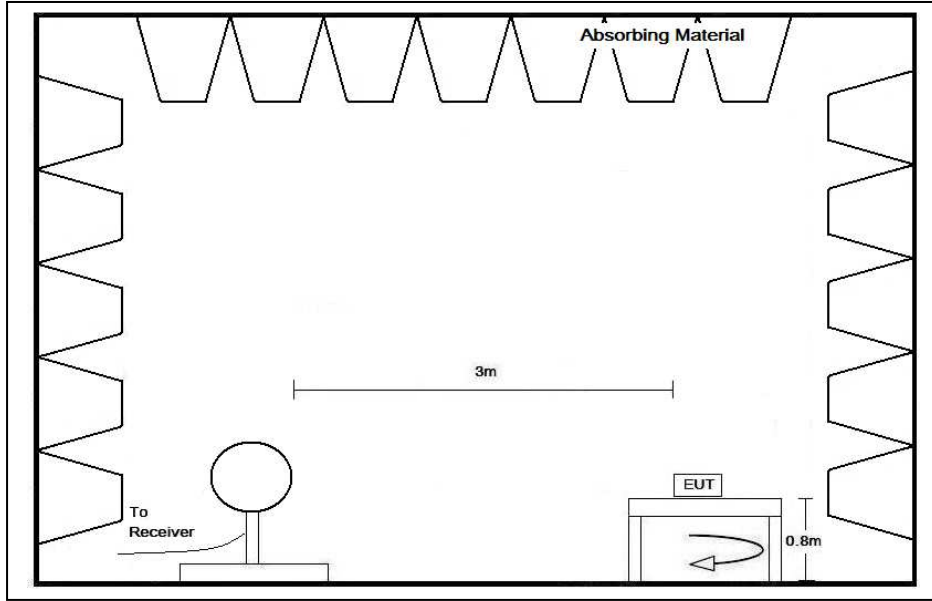
The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement.

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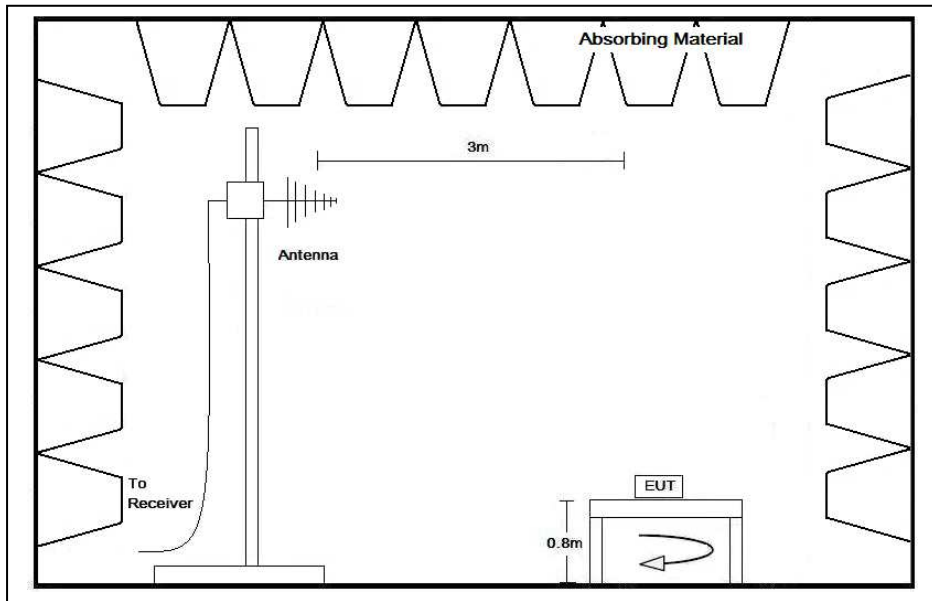
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2.2 Test Setup



Below 30MHz



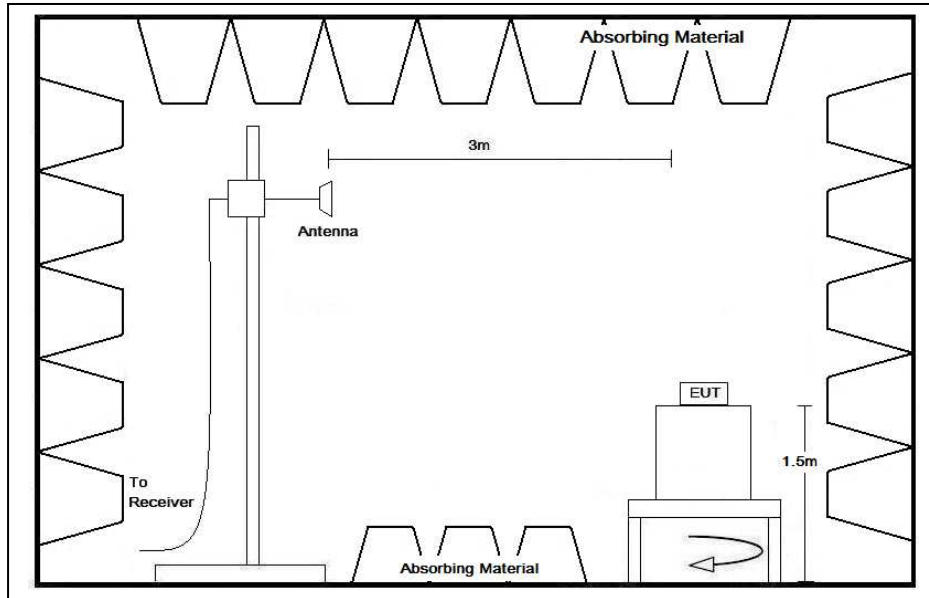
30MHz – 1GHz

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2.2 Test Setup



Above 1GHz



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2.3 Test Result

Peak Detector data was measured unless otherwise stated.

The radiated emissions are measured from 9kHz to 26GHz (the tenth harmonics)

The worst case configuration is shown on the worst case configuration of test setup photo.

“#” means emissions appearing within the restricted bands of 47 CFR Part 15 section 15.

“*” means emissions appearing within the restricted bands of RSS-Gen section 8.10.

The frequencies from fundamental up to tenth harmonics were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next pages.

The EUT has been tested in Transmission mode.

It was found that the EUT meet the FCC and RSS requirement.



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2.4 Radiated Emission Measurement Data

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	24.3	° C
Relative humidity:	52.7	%

Channel: 2403MHz (MSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2403.386	94.7	-4.7	90.0	114.0	-24.0	Peak
V	2403.366	100.4	-4.7	95.7	114.0	-18.3	Peak
V	2403.699	92.0	-4.7	87.3	94.0	-6.7	Average
H	2400.000	69.5	-6.6	62.9	74.0	-11.1	Peak
H	2400.000	49.4	-6.6	42.8	54.0	-11.2	Average
V	2400.000	67.3	-6.6	60.7	74.0	-13.3	Peak
V	2400.000	51.4	-6.6	44.8	54.0	-9.2	Average
H	^{**} 4807.272	59.4	3.8	63.2	74.0	-10.8	Peak
H	^{**} 4807.214	49.9	3.8	53.7	54.0	-0.3	Average
V	^{**} 4807.208	58.1	3.8	61.9	74.0	-12.1	Peak
V	^{**} 4807.208	45.2	3.8	49.0	54.0	-5.0	Average
H	7210.183	47.3	11.2	58.5	74.0	-15.5	Peak
H	7210.696	36.7	11.2	47.9	54.0	-6.1	Average
V	¹⁾ 7210.690	41.6	11.2	52.8	74.0	-21.2	Peak
H	9613.546	41.3	14.4	55.7	74.0	-18.3	Peak
H	9614.002	29.5	14.4	43.9	54.0	-10.1	Average
V	9613.517	41.8	14.4	56.2	74.0	-17.8	Peak
V	9614.002	29.9	14.4	44.3	54.0	-9.7	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.



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Channel: 2441MHz (MSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2441.067	92.4	-4.7	87.7	114.0	-26.3	Peak
V	2441.093	99.1	-4.7	94.4	114.0	-19.6	Peak
V	2441.399	90.7	-4.7	86.0	94.0	-8.0	Average
H	*4882.134	56.2	3.8	60.0	74.0	-14.0	Peak
H	*4882.633	47.0	3.8	50.8	54.0	-3.2	Average
V	*4882.230	57.1	3.8	60.9	74.0	-13.1	Peak
V	*4882.621	47.3	3.8	51.1	54.0	-2.9	Average
H	*7323.397	43.6	11.2	54.8	74.0	-19.2	Peak
H	*7323.811	32.4	11.2	43.6	54.0	-10.4	Average
V	¹⁾ *7323.296	42.5	11.2	53.7	74.0	-20.3	Peak
H	9764.417	40.6	14.4	55.0	74.0	-19.0	Peak
H	9764.842	27.9	14.4	42.3	54.0	-11.7	Average
V	9765.132	42.5	14.4	56.9	74.0	-17.1	Peak
V	9764.848	30.5	14.4	44.9	54.0	-9.1	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.



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Channel: 2478MHz (MSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2478.452	94.2	-4.7	89.5	114.0	-24.5	Peak
V	2478.472	96.6	-4.7	91.9	114.0	-22.1	Peak
V	2478.793	88.4	-4.7	83.7	94.0	-10.3	Average
H	¹⁾ **2483.500	56.3	-4.7	51.6	74.0	-22.4	Peak
V	**2483.500	64.6	-4.7	59.9	74.0	-14.1	Peak
V	**2483.500	51.8	-4.7	47.1	54.0	-6.9	Average
H	**4957.031	59.1	3.8	62.9	74.0	-11.1	Peak
H	**4957.404	49.9	3.8	53.7	54.0	-0.3	Average
V	**4957.022	56.3	3.8	60.1	74.0	-13.9	Peak
V	**4957.404	47.2	3.8	51.0	54.0	-3.0	Average
H	**7436.255	43.4	11.2	54.6	74.0	-19.4	Peak
H	**7435.971	31.8	11.2	43.0	54.0	-11.0	Average
V	**7435.951	43.2	11.2	54.4	74.0	-19.6	Peak
V	**7435.977	30.9	11.2	42.1	54.0	-11.9	Average
H	9914.232	41.3	14.4	55.7	74.0	-18.3	Peak
H	9914.405	29.4	14.4	43.8	54.0	-10.2	Average
V	9914.715	41.3	14.4	55.7	74.0	-18.3	Peak
V	9914.414	28.7	14.4	43.1	54.0	-10.9	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.



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Channel: 2402MHz (FSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2401.949	96.1	-4.7	91.4	114.0	-22.6	Peak
V	¹⁾ 2401.949	93.2	-4.7	88.5	114.0	-25.5	Peak
H	2400.000	71.0	-6.6	64.4	74.0	-9.6	Peak
H	2400.000	46.8	-6.6	40.2	54.0	-13.8	Average
V	2400.000	70.8	-6.6	64.2	74.0	-9.8	Peak
V	2400.000	45.5	-6.6	38.9	54.0	-15.1	Average
H	[#] 4803.956	61.6	3.8	65.4	74.0	-8.6	Peak
H	[#] 4804.180	44.1	3.8	47.9	54.0	-6.1	Average
V	[#] 4803.949	64.5	3.8	68.3	74.0	-5.7	Peak
V	[#] 4804.166	46.2	3.8	50.0	54.0	-4.0	Average
H	¹⁾ 7205.992	42.1	11.2	53.3	74.0	-20.7	Peak
V	7205.949	44.1	11.2	55.3	74.0	-18.7	Peak
V	7206.137	28.7	11.2	39.9	54.0	-14.1	Average
H	9608.057	40.9	14.4	55.3	74.0	-18.7	Peak
H	9608.123	25.5	14.4	39.9	54.0	-14.1	Average
V	9607.985	39.9	14.4	54.3	74.0	-19.7	Peak
V	9608.159	24.0	14.4	38.4	54.0	-15.6	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.



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Channel: 2426MHz (FSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2426.586	92.5	-4.7	87.8	114.0	-26.2	Peak
V	¹⁾ 2426.564	96.7	-4.7	92.0	114.0	-22.0	Peak
H	[#] 4853.136	62.8	3.8	66.6	74.0	-7.4	Peak
H	[#] 4853.353	44.8	3.8	48.6	54.0	-5.4	Average
V	[#] 4853.092	61.9	3.8	65.7	74.0	-8.3	Peak
V	[#] 4853.374	44.1	3.8	47.9	54.0	-6.1	Average
H	[#] 7279.800	42.9	11.2	54.1	74.0	-19.9	Peak
H	[#] 7279.930	27.8	11.2	39.0	54.0	-15.0	Average
V	[#] 7279.801	45.7	11.2	56.9	74.0	-17.1	Peak
V	[#] 7279.968	30.0	11.2	41.2	54.0	-12.8	Average
H	9706.386	44.1	14.4	58.5	74.0	-15.5	Peak
H	9706.524	28.2	14.4	42.6	54.0	-11.4	Average
V	9706.256	43.3	14.4	57.7	74.0	-16.3	Peak
V	9706.546	27.6	14.4	42.0	54.0	-12.0	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.



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Channel: 2452MHz (FSK)

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
H	¹⁾ 2451.797	94.4	-4.7	89.7	114.0	-24.3	Peak
V	¹⁾ 2451.754	90.5	-4.7	85.8	114.0	-28.2	Peak
H	¹⁾ 2483.500	44.7	-4.7	40.0	74.0	-34.0	Peak
V	¹⁾ 2483.500	43.8	-4.7	39.1	74.0	-34.9	Peak
H	^{**} 4903.560	59.9	3.8	63.7	74.0	-10.3	Peak
H	^{**} 4903.742	42.8	3.8	46.6	54.0	-7.4	Average
V	^{**} 4903.586	62.4	3.8	66.2	74.0	-7.8	Peak
V	^{**} 4903.771	44.7	3.8	48.5	54.0	-5.5	Average
H	¹⁾ ^{**} 7355.329	42.1	11.2	53.3	74.0	-20.7	Peak
V	¹⁾ ^{**} 7355.358	38.6	11.2	49.8	74.0	-24.2	Peak
H	9807.240	41.2	14.4	55.6	74.0	-18.4	Peak
H	9807.363	26.4	14.4	40.8	54.0	-13.2	Average
V	9807.081	42.0	14.4	56.4	74.0	-17.6	Peak
V	9807.334	26.7	14.4	41.1	54.0	-12.9	Average

Remark: 1) The peak detector value is below the average limit, so no additional average measurement is needed.

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3 Description of the Line-conducted Test

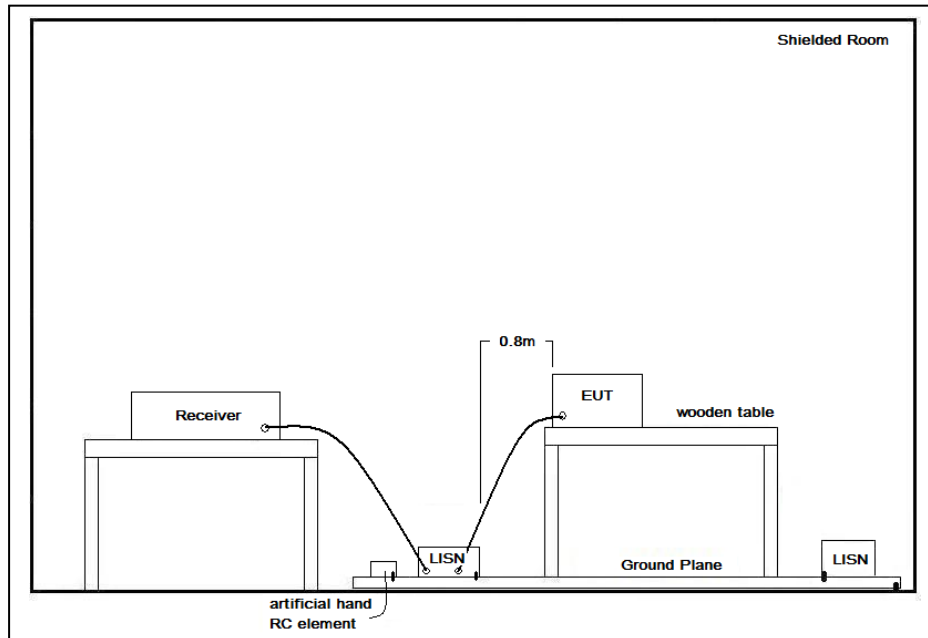
3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

No measurement is required as the EUT is a battery-operated product.

3.3 Test Setup



3.4 Graph and Table of Conducted Emission Measurement Data

Not Applicable



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4 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

Document	Filename
ID Label/Location	Label Artwork and Location.pdf
Block Diagram	Block Diagram.pdf
Schematic Diagram	Schematic.pdf
Users Manual	User Manual.pdf
Operational Description	Operation Description.pdf

4.1 Bandwidth

Appendices A2 is shown the fundamental emission is confined in the specified band. 20dB bandwidth is 564.4kHz for MSK and 65.7kHz for FSK. It also shows that the EUT met the FCC Part 15.215(c).

Appendices A3 is shown the fundamental emission is confined in the specified band. 99% bandwidth is 645.441kHz for MSK and 68.017kHz for FSK. It also shows that the EUT met the RSS-Gen 6.7.

MSK

Frequency	20dB bandwidth	99% OBW
2403MHz	564.400kHz	645.441kHz
2441MHz	547.100kHz	555.716kHz
2478MHz	544.200kHz	564.399kHz

FSK

Frequency	20dB bandwidth	99% OBW
2402MHz	65.700kHz	68.017kHz
2426MHz	65.700kHz	67.438kHz
2452MHz	66.000kHz	67.438kHz



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5 Appendices

A1	External photo	1	page
A2	20dB Bandwidth Plot	4	pages
A3	99% Bandwidth Plot	4	pages

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A1. External photo



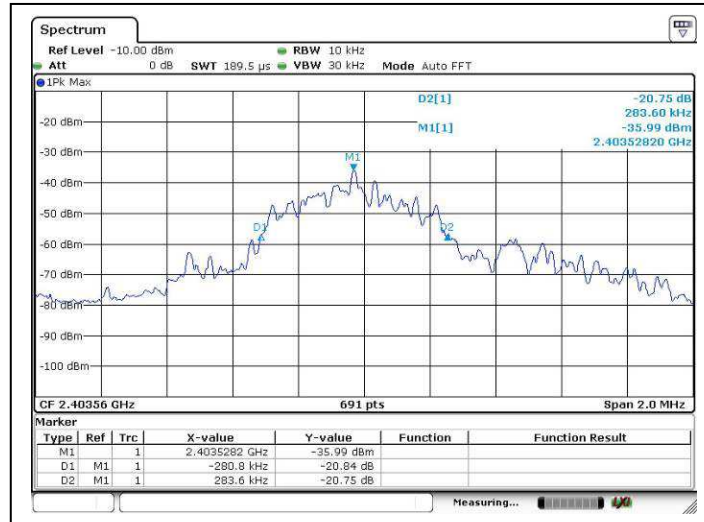


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A2. 20dB Bandwidth Plot



Channel: 2403MHz (MSK)



Channel: 2441MHz (MSK)

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IC: 6817C-W9470B

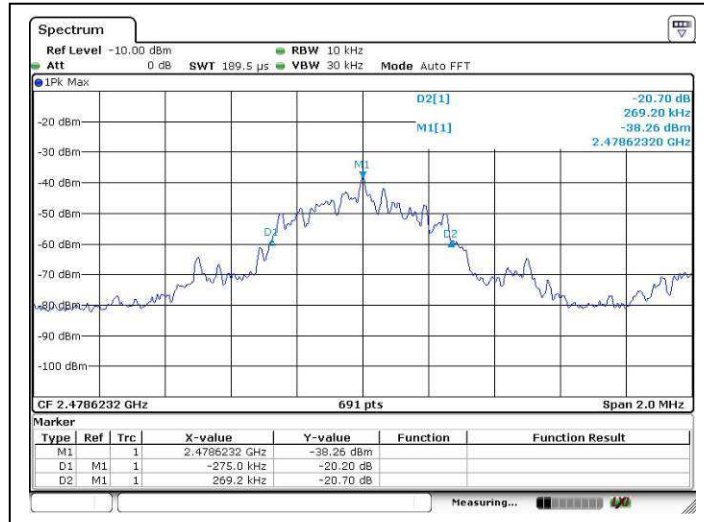


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A2. 20dB Bandwidth Plot



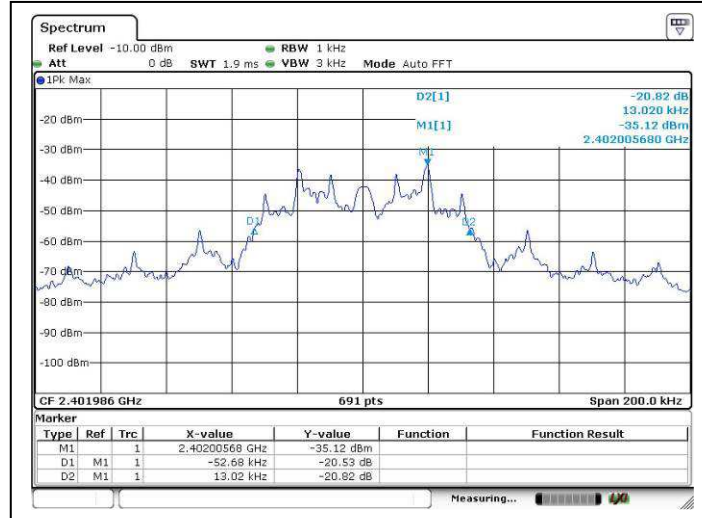
Channel: 2478MHz (MSK)

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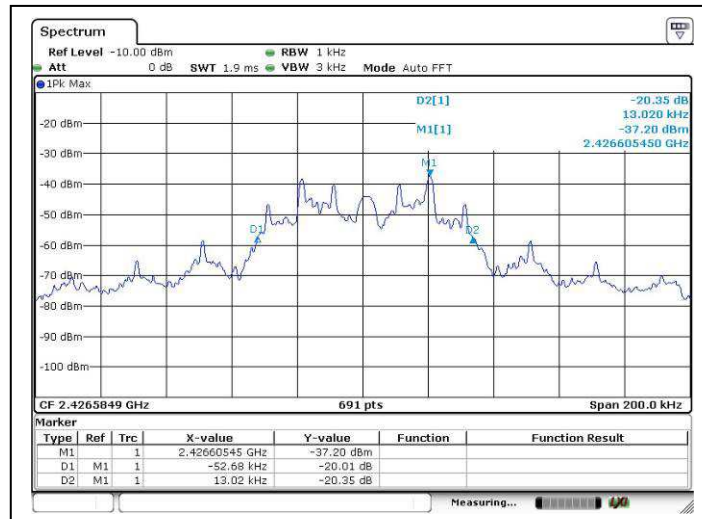
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A2. 20dB Bandwidth Plot



Channel: 2402MHz (FSK)



Channel: 2426MHz (FSK)

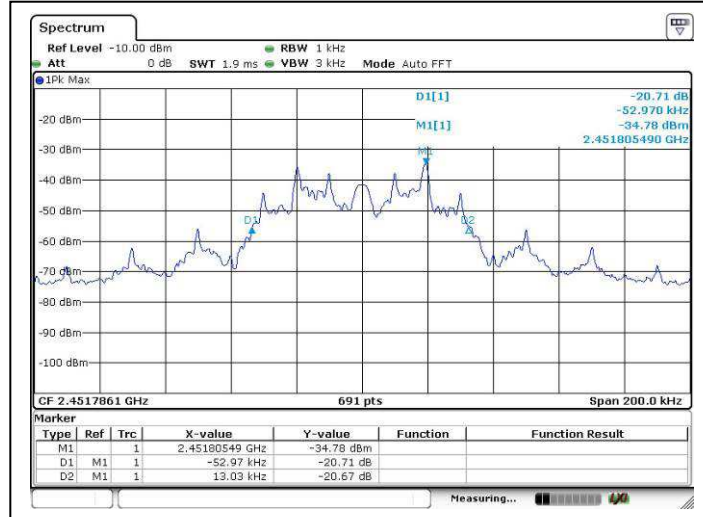


TEST REPORT

Report No. : AB0046722(0)

Date : 31 Aug 2022

A2. 20dB Bandwidth Plot



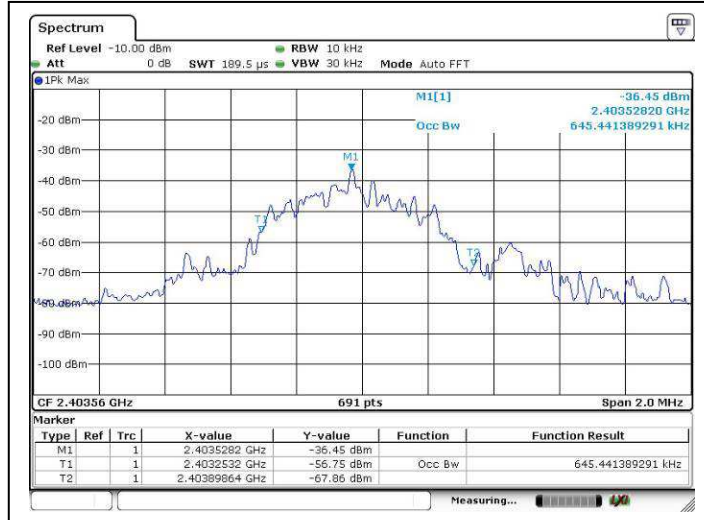
Channel: 2452MHz (FSK)

TEST REPORT

Report No. : AB0046722(0)

Date : 31 Aug 2022

A3. 99% Bandwidth Plot



Channel: 2403MHz (MSK)



Channel: 2441MHz (MSK)



TEST REPORT

Report No. : AB0046722(0)

Date : 31 Aug 2022

A3. 99% Bandwidth Plot



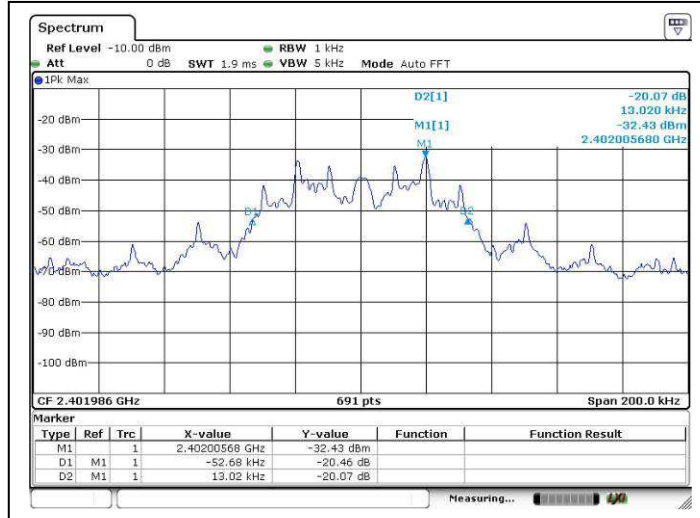
Channel: 2478MHz (MSK)

TEST REPORT

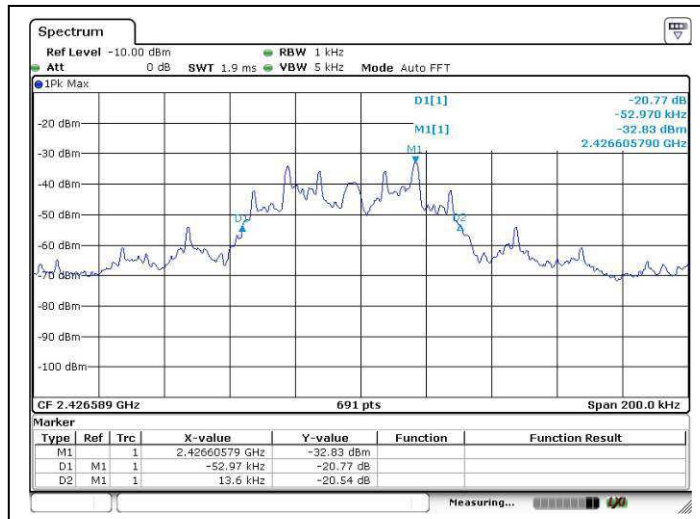
Report No. : AB0046722(0)

Date : 31 Aug 2022

A3. 99% Bandwidth Plot



Channel: 2402MHz (FSK)



Channel: 2426MHz (FSK)

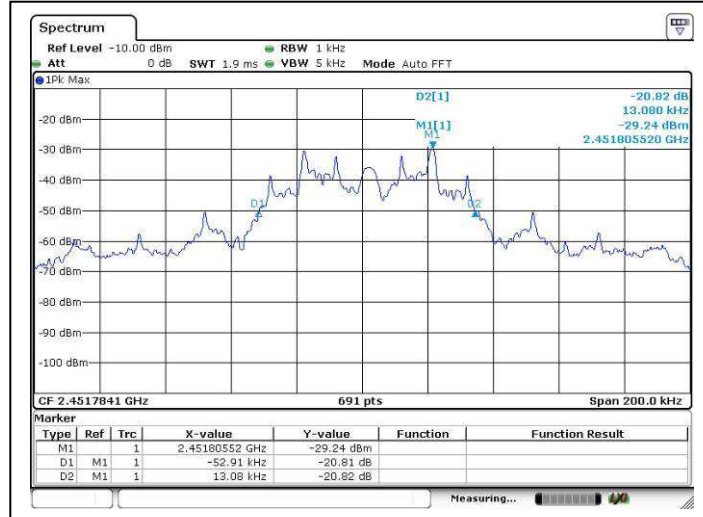


TEST REPORT

Report No. : AB0046722(0)

Date : 31 Aug 2022

A3. 99% Bandwidth Plot



Channel: 2452MHz (FSK)

***** End of Report *****