

# TEST REPORT

## CERTIFICATE OF CONFORMITY

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.249)

**Report No.:** RFCLJA-WTW-P24080703

**FCC ID:** Q3V-GSM1

**Product:** Jam Protection RF Module for Motorized Shade

**Model No.:** GSM1

**Received Date:** 2024/9/3

**Test Date:** 2024/9/10 ~ 2024/10/8

**Issued Date:** 2024/11/7

**Applicant:** Nien Made Enterprise Co., Ltd.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

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**FCC Registration /**

**Designation Number(1):** 788550 / TW0003

**FCC Registration /**

**Designation Number(2):** 281270 / TW0032

**Approved by:**



, **Date:**

2024/11/7

Jeremy Lin / Project Engineer

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Prepared by : Pettie Chen / Senior Specialist



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## Release Control Record

Issue No.	Description	Date Issued
RFCLJA-WTW-P24080703	Original release.	2024/11/7

## 1 Certificate

**Product:** Jam Protection RF Module for Motorized Shade

**Test Model:** GSM1

**Sample Status:** Engineering sample

**Applicant:** Nien Made Enterprise Co., Ltd.

**Test Date:** 2024/9/10 ~ 2024/10/8

**Standard:** 47 CFR FCC Part 15, Subpart C (Section 15.249)

**Measurement Procedure:** ANSI C63.10-2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
Standard / Clause	Test Item	Result	Remark
15.207	AC Power Conducted Emissions	N/A	Power supply is from battery.
15.209 / 15.249(d)	Radiated Emissions below 1 GHz	Pass	Minimum passing margin is -14.65 dB at 802.12 MHz
15.209 / 15.249(a) / 15.249(d) / 15.249(e)	Radiated Emissions above 1 GHz	Pass	Minimum passing margin is -8.20 dB at 2390.00 MHz
15.215 (c)	20 dB Bandwidth	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Specification	Uncertainty ( $\pm$ )
Radiated Emissions below 1 GHz	9 kHz ~ 30 MHz	2.51 dB
	30 MHz ~ 1 GHz	2.69 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.75 dB
	18 GHz ~ 40 GHz	1.76 dB
20 dB Bandwidth	-	206.5 Hz

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

### 2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

### 3 General Information

#### 3.1 General Description

Product	Jam Protection RF Module for Motorized Shade		
Test Model	GSM1		
Status of EUT	Engineering sample		
Power Supply Rating	3Vdc from battery		
Modulation Type	GFSK		
Transfer Rate	1 Mbps		
Operating Frequency	2.415 GHz ~ 2.459 GHz		
Number of Channel	3		
Field Strength Of Fundamental	71.5 dBuV/m (Average) at 3 meters		

Note: The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

#### 3.2 Antenna Description of EUT

1. The antenna information is listed as below.

Brand	Model	Gain (dBi)	Antenna Type	Connector Type
Unictron	AA055U	1.8	Chip	NA

\* Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.

### 3.3 Channel List

3 channels are provided to this EUT:

Channel	Frequency (MHz)
15	2415
39	2439
59	2459

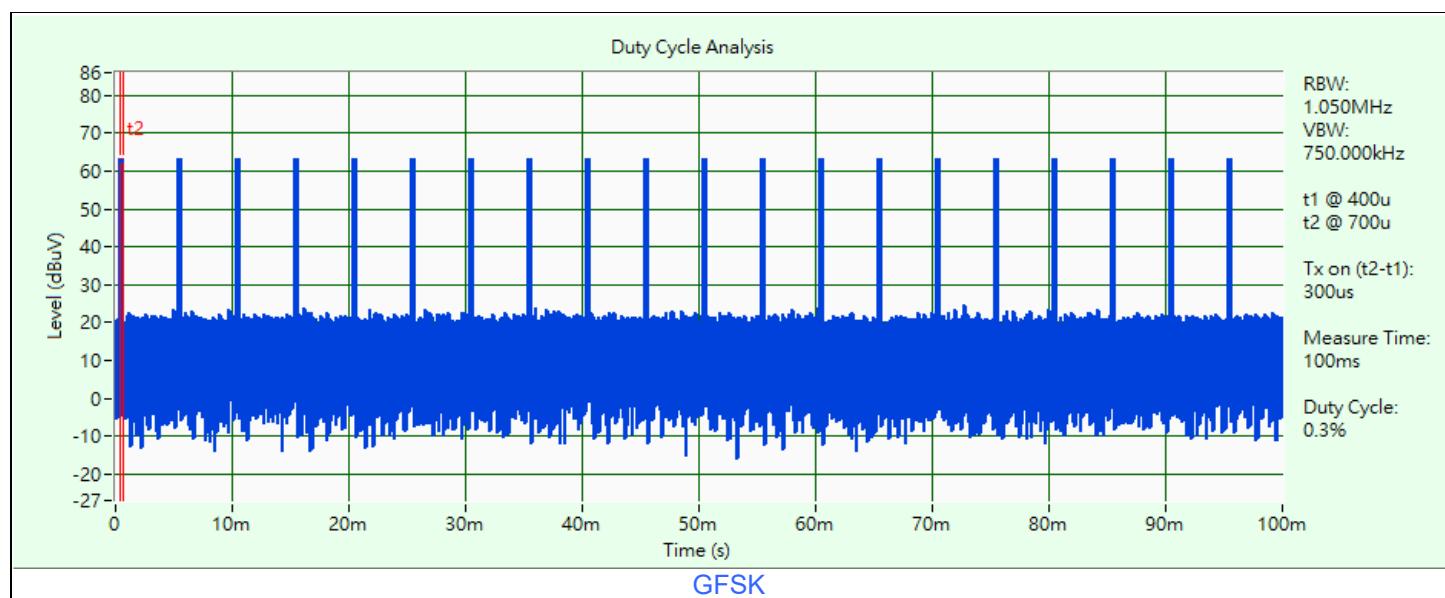
### 3.4 Test Mode Applicability and Tested Channel Detail

Following channel(s) was (were) selected for the final test as listed below:

Test Item	Tested Channel	Modulation	Data Rate Parameter
20 dB Bandwidth	15, 39, 59	GFSK	1Mb/s
Radiated Emissions below 1 GHz	39	GFSK	1Mb/s
Radiated Emissions above 1 GHz	15, 39, 59	GFSK	1Mb/s

### 3.5 Duty Cycle of Test Signal

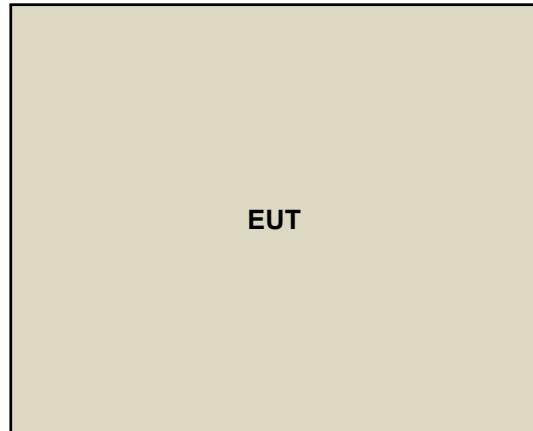
**GFSK:** Duty cycle =  $0.3 \times 20 \text{ ms} / 100 \text{ ms} \times 100\% = 6\%$



### 3.6 Test Program Used and Operation Descriptions

Set the EUT under transmission condition continuously at specific channel frequency.

### 3.7 Connection Diagram of EUT and Peripheral Devices



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**Remote Site**

## 4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.1 Radiated Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower KaiTuo	NA	NA	NA	NA
Antenna Tower Controller KaiTuo	KT-2000	NA	NA	NA
Turn Table Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208675	NA	NA
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
PXA Signal Analyzer Keysight	N9030B	MY57140488	2024/3/6	2025/3/5
Loop Antenna TESEQ	HLA 6121	45745	2024/8/21	2025/8/20
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
Preamplifier EMCI	EMC330N	980783	2024/1/15	2025/1/14
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-995	2023/10/16	2024/10/15
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-9000	201252(with PAD)	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-3000	201250	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-500	201245	2024/1/15	2025/1/14

Notes:

1. The test was performed in WM - 966 chamber 7.
2. Tested Date: 2024/9/11

#### 4.2 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
MXE EMI Receiver Agilent	N9038A	MY52260177	2023/9/15	2024/9/14
EXA Signal Analyzer Agilent	N9010A	MY52220207	2023/12/28	2024/12/27
Horn Antenna RFSPIN	DRH18-E	210104A18E	2023/11/12	2024/11/11
Preamplifier Agilent	83017A	MY39501357	2024/6/12	2025/6/11
RF Coaxial Cable EMCI	EMC104-SM-SM-3000	201241	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC104-SM-SM-1000	210103	2024/1/15	2025/1/14
Preamplifier EMCI	EMC184045SE	980788	2024/1/15	2025/1/14
Horn Antenna Schwarzbeck	BBHA 9170	9170-1049	2023/11/12	2024/11/11
RF Coaxial Cable EMCI	EMC101G-KM-KM-5000	201261	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC101G-KM-KM-3000	201258	2024/1/15	2025/1/14
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2024/1/15	2025/1/14

Notes:

1. The test was performed in WM - 966 chamber 9.
2. Tested Date: 2024/9/10

#### 4.3 20 dB Bandwidth

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer Keysight	N9030B	MY57140938	2024/3/20	2025/3/19
Signal Analyzer R&S	FSV40	100980	2024/5/6	2025/5/5
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

##### Notes:

1. The test was performed in Oven room.
2. Tested Date: 2024/10/8

## 5 Limits of Test Items

### 5.1 Radiated Emissions below 1 GHz

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

### 5.2 Radiated Emissions above 1 GHz

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
2400 ~ 2483.5 MHz	50	500

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 as below table, whichever is the lesser attenuation

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

### 5.3 20 dB Bandwidth

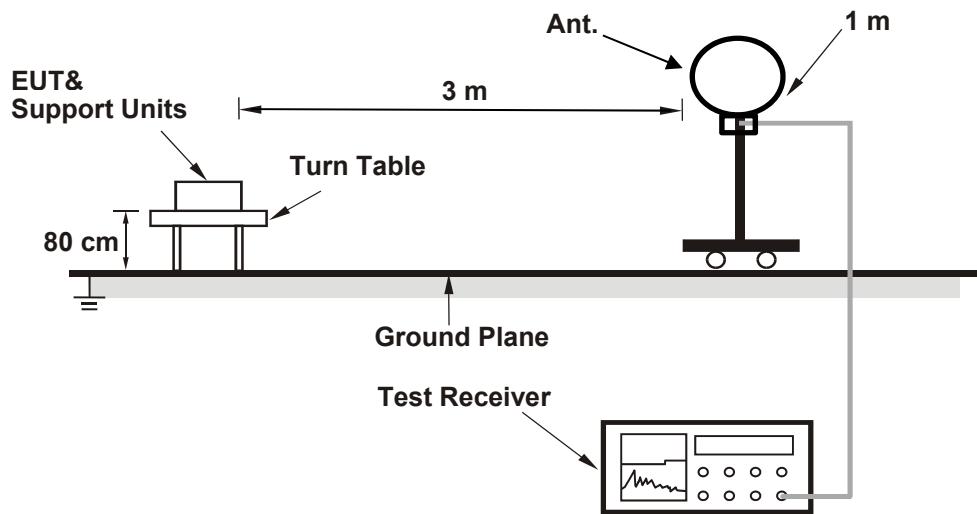
The 20dB bandwidth shall be specified in operating frequency band.

## 6 Test Arrangements

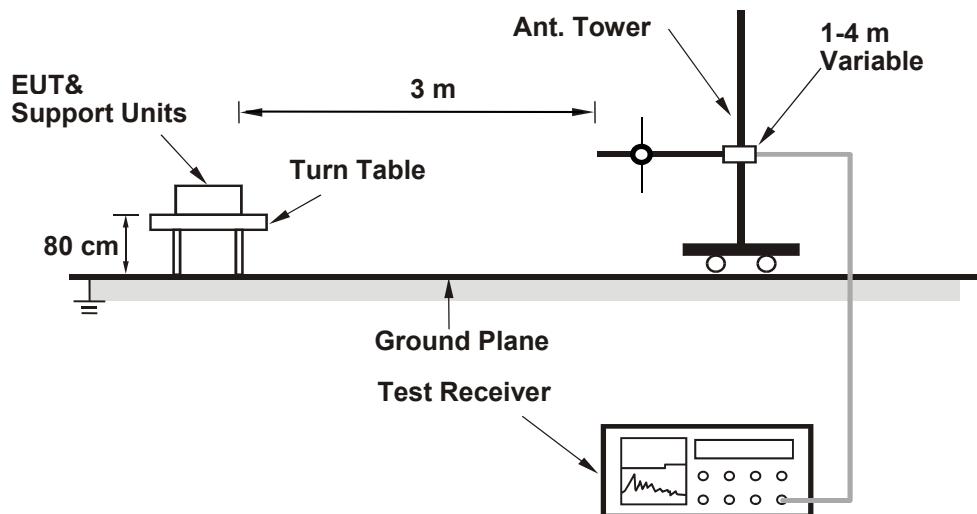
### 6.1 Radiated Emissions below 1 GHz

#### 6.1.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

## 6.1.2 Test Procedure

### For Radiated emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

### For Radiated emission above 30 MHz

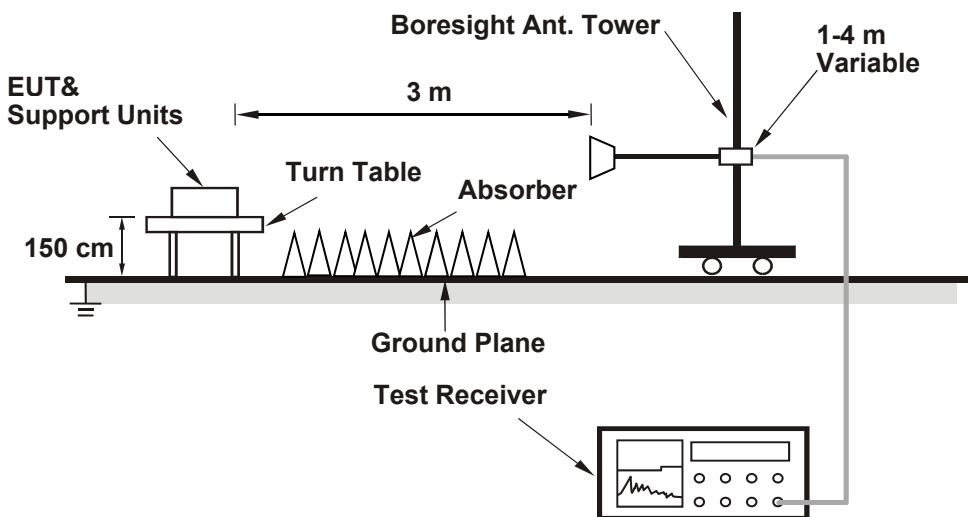
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

## 6.2 Radiated Emissions above 1 GHz

### 6.2.1 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 6.2.2 Test Procedure

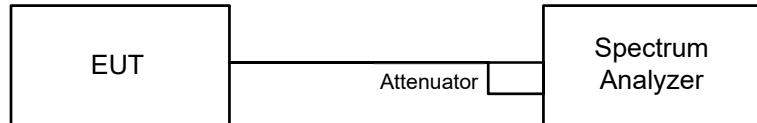
- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Notes:

1. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
2. According to ANSI C63.10 section 6.6.4 and 4.1.4.2.2. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. For duty cycle correction factor values, see the Test Signal Duty Cycle section in this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

## 6.3 20 dB Bandwidth

### 6.3.1 Test Setup



### 6.3.2 Test Procedure

- a. Set resolution bandwidth (RBW) = 1% to 5% of the OBW.
- b. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

## 7 Test Results of Test Item

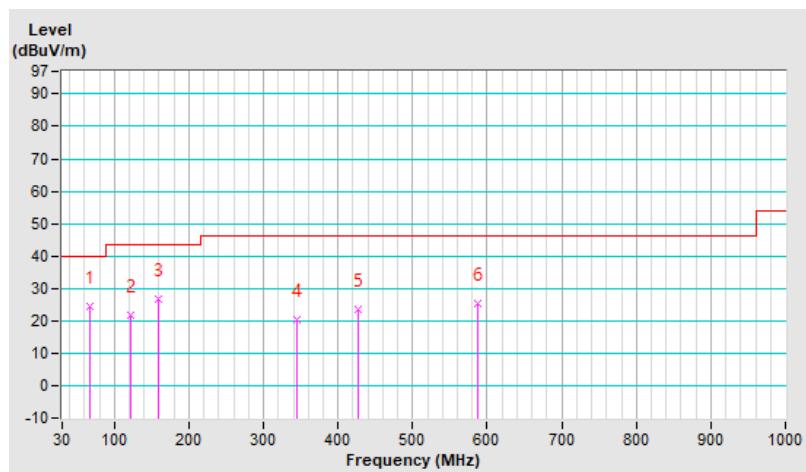
### 7.1 Radiated Emissions below 1 GHz

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 39 : 2439 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	3 Vdc	<b>Environmental Conditions</b>	19.1 °C, 72.8 % RH
<b>Tested By</b>	Edison Lee		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.86	24.28 QP	40.00	-15.72	1.01 H	19	39.06	-14.78
2	122.15	21.75 QP	43.50	-21.75	1.50 H	358	36.98	-15.23
3	159.98	26.79 QP	43.50	-16.71	1.50 H	333	39.88	-13.09
4	344.28	20.49 QP	46.00	-25.51	1.01 H	218	31.95	-11.46
5	427.70	23.37 QP	46.00	-22.63	1.50 H	18	32.58	-9.21
6	586.78	25.55 QP	46.00	-20.45	1.50 H	18	31.26	-5.71

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

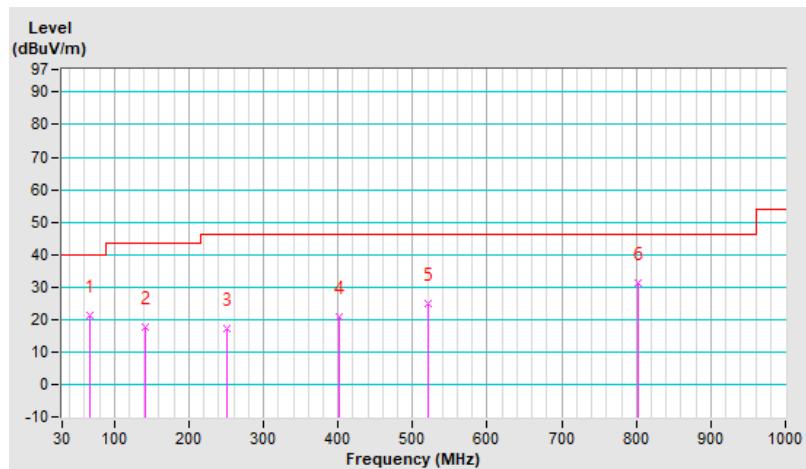


<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 39 : 2439 MHz
<b>Frequency Range</b>	30 MHz ~ 1 GHz	<b>Detector Function &amp; Bandwidth</b>	QP: RB=120kHz, DET=Quasi-Peak
<b>Input Power</b>	3 Vdc	<b>Environmental Conditions</b>	19.1 °C, 72.8 % RH
<b>Tested By</b>	Edison Lee		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.86	21.46 QP	40.00	-18.54	1.50 V	348	36.24	-14.78
2	140.58	17.48 QP	43.50	-26.02	1.00 V	61	31.03	-13.55
3	250.19	17.15 QP	46.00	-28.85	1.49 V	13	31.26	-14.11
4	402.48	20.98 QP	46.00	-25.02	2.00 V	284	30.90	-9.92
5	521.79	24.75 QP	46.00	-21.25	1.00 V	111	31.84	-7.09
6	802.12	31.35 QP	46.00	-14.65	1.49 V	230	33.53	-2.18

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



## 7.2 Radiated Emissions above 1 GHz

RF Mode	GFSK	Channel	CH 15 : 2415 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	3 Vdc	Environmental Conditions	22 °C, 67 % RH
Tested By	Edison Lee		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	58.30 PK	74.00	-15.70	1.22 H	294	26.00	32.30
2	<b>2390.00</b>	<b>45.80 AV</b>	<b>54.00</b>	<b>-8.20</b>	<b>1.22 H</b>	<b>294</b>	<b>13.50</b>	<b>32.30</b>
3	*2415.00	92.10 PK	114.00	-21.90	1.22 H	294	59.70	32.40
4	*2415.00	67.70 AV	94.00	-26.30	1.22 H	294	35.30	32.40
5	4830.00	47.00 PK	74.00	-27.00	1.55 H	208	43.60	3.40
6	4830.00	22.60 AV	54.00	-31.40	1.55 H	208	19.20	3.40
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	58.20 PK	74.00	-15.80	3.81 V	164	25.90	32.30
2	2390.00	45.60 AV	54.00	-8.40	3.81 V	164	13.30	32.30
3	*2415.00	90.60 PK	114.00	-23.40	3.81 V	164	58.20	32.40
4	*2415.00	66.20 AV	94.00	-27.80	3.81 V	164	33.80	32.40
5	4830.00	46.50 PK	74.00	-27.50	2.08 V	133	43.10	3.40
6	4830.00	22.10 AV	54.00	-31.90	2.08 V	133	18.70	3.40

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(0.3 \text{ ms} * 20 / 100 \text{ ms}) = -24.4 \text{ dB}$$



BUREAU  
VERITAS

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 39 : 2439 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	3 Vdc	<b>Environmental Conditions</b>	19.1 °C, 72.8 % RH
<b>Tested By</b>	Edison Lee		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2439.00	95.90 PK	114.00	-18.10	1.23 H	270	63.50	32.40
2	*2439.00	71.50 AV	94.00	-22.50	1.23 H	270	39.10	32.40
3	4878.00	47.20 PK	74.00	-26.80	1.51 H	212	43.70	3.50
4	4878.00	22.80 AV	54.00	-31.20	1.51 H	212	19.30	3.50
5	7317.00	63.50 PK	74.00	-10.50	1.00 H	306	54.00	9.50
6	7317.00	39.10 AV	54.00	-14.90	1.00 H	306	29.60	9.50
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2439.00	89.80 PK	114.00	-24.20	3.77 V	165	57.40	32.40
2	*2439.00	65.40 AV	94.00	-28.60	3.77 V	165	33.00	32.40
3	4878.00	47.00 PK	74.00	-27.00	1.99 V	128	43.50	3.50
4	4878.00	22.60 AV	54.00	-31.40	1.99 V	128	19.10	3.50
5	7317.00	60.70 PK	74.00	-13.30	1.00 V	278	51.20	9.50
6	7317.00	36.30 AV	54.00	-17.70	1.00 V	278	26.80	9.50

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(0.3 \text{ ms} * 20 / 100 \text{ ms}) = -24.4 \text{ dB}$$



BUREAU  
VERITAS

<b>RF Mode</b>	GFSK	<b>Channel</b>	CH 59 : 2459 MHz
<b>Frequency Range</b>	1 GHz ~ 25 GHz	<b>Detector Function &amp; Bandwidth</b>	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
<b>Input Power</b>	3 Vdc	<b>Environmental Conditions</b>	19.1 °C, 72.8 % RH
<b>Tested By</b>	Edison Lee		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2459.00	95.50 PK	114.00	-18.50	1.22 H	275	63.00	32.50
2	*2459.00	71.10 AV	94.00	-22.90	1.22 H	275	38.60	32.50
3	2483.50	44.60 PK	74.00	-29.40	1.22 H	275	48.50	-3.90
4	2483.50	20.20 AV	54.00	-33.80	1.22 H	275	24.10	-3.90
5	4918.00	47.40 PK	74.00	-26.60	1.53 H	207	44.00	3.40
6	4918.00	23.00 AV	54.00	-31.00	1.53 H	207	19.60	3.40
7	7377.00	64.10 PK	74.00	-9.90	1.00 H	300	54.60	9.50
8	7377.00	39.70 AV	54.00	-14.30	1.00 H	300	30.20	9.50

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2459.00	89.50 PK	114.00	-24.50	3.67 V	168	57.00	32.50
2	*2459.00	65.10 AV	94.00	-28.90	3.67 V	168	32.60	32.50
3	2483.50	44.10 PK	74.00	-29.90	3.67 V	168	48.00	-3.90
4	2483.50	19.70 AV	54.00	-34.30	3.67 V	168	23.60	-3.90
5	4918.00	47.10 PK	74.00	-26.90	2.02 V	130	43.70	3.40
6	4918.00	22.70 AV	54.00	-31.30	2.02 V	130	19.30	3.40
7	7377.00	61.50 PK	74.00	-12.50	1.03 V	282	52.00	9.50
8	7377.00	37.10 AV	54.00	-16.90	1.03 V	282	27.60	9.50

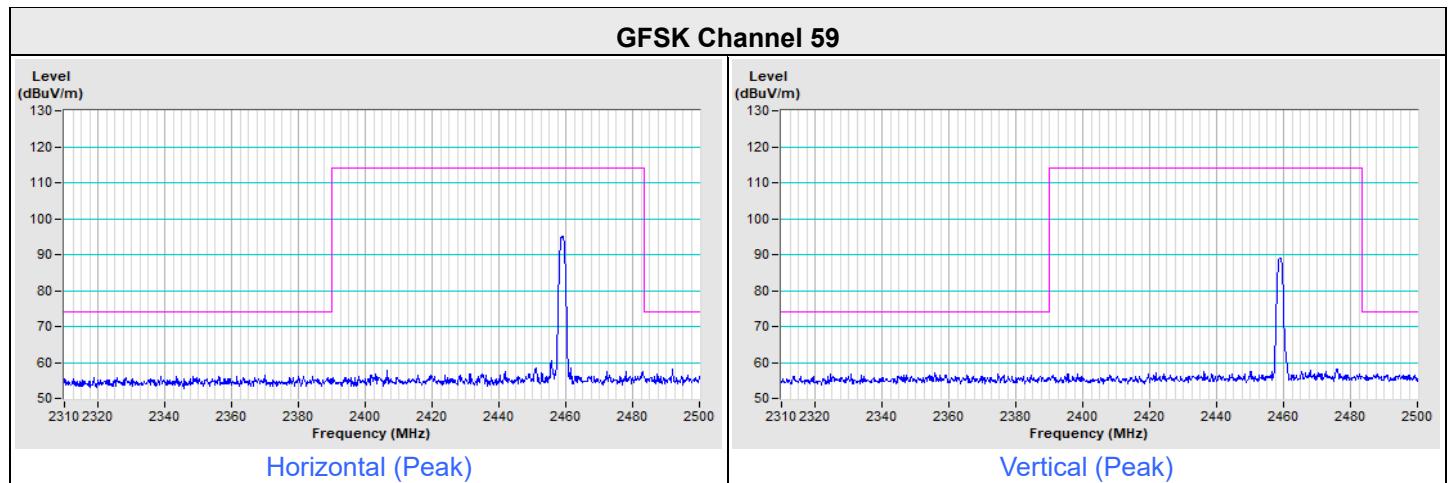
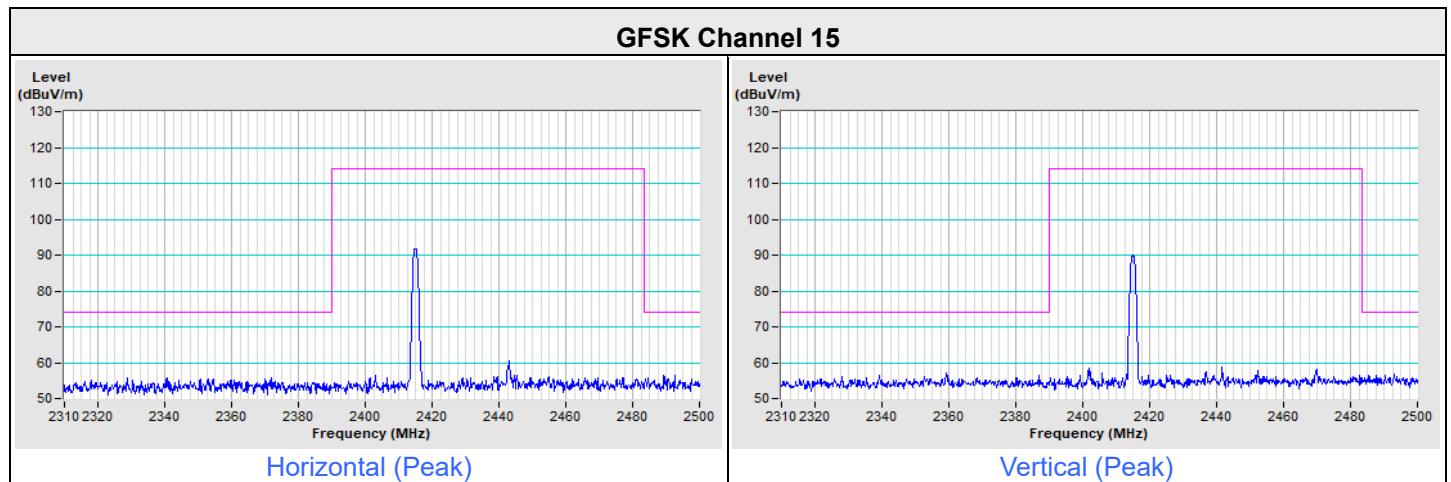
**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " \* ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:  

$$20 \log(\text{Duty cycle}) = 20 \log(0.3 \text{ ms} * 20 / 100 \text{ ms}) = -24.4 \text{ dB}$$

## Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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### 7.3 20 dB Bandwidth

Input Power:	3 Vdc	Environmental Conditions:	25°C, 76% RH	Tested By:	Edison Lee
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Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)	Measured Frequencies		Operating Frequency Band (MHz)	Test Result
			FL (MHz)	FH (MHz)		
15	2415	1.011	2414.481	2415.492	2400 ~ 2483.5	Pass
39	2439	1.008	2438.484	2439.492	2400 ~ 2483.5	Pass
59	2459	1.008	2458.484	2459.492	2400 ~ 2483.5	Pass

#### Notes:

1. FL is the lowest frequency of the 20 dB bandwidth of power envelope.
2. FH is the highest frequency of the 20 dB bandwidth of power envelope.



## 8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

## 9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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The address and road map of all our labs can be found in our web site also.

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