

# **FCC Test Report**

Report No.: AGC01559200722FE02

FCC ID : 2AANZMAX2

APPLICATION PURPOSE : Original Equipment

**PRODUCT DESIGNATION**: HOVER-1 - MAX - SELF-BALANCING HOVERBOARD

**BRAND NAME** : N/A

**MODEL NAME** : H1-MAX-NVY-20G(Series model name please see page 5)

**APPLICANT** : DGL Group, Ltd.

**DATE OF ISSUE** : Aug. 19, 2020

**STANDARD(S)** : FCC Part 15.247

**REPORT VERSION**: V1.0

# Attestation of Global Compliance (Shenzhen) Co., Ltd



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# **REPORT REVISE RECORD**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	1	Aug. 19, 2020	Valid	Initial Release

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APPENDIX B: PHOTOGRAPHS OF EUT .......5

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# 1. VERIFICATION OF COMPLIANCE

Applicant	DGL Group, Ltd.
Address	195 Raritan Center Parkway Edison, NJ 08837
Manufacturer DGL Group, Ltd.	
Address	195 Raritan Center Parkway Edison, NJ 08837
Factory	DGL Group, Ltd.
Address	195 Raritan Center Parkway Edison, NJ 08837
Product Designation	HOVER-1 - MAX - SELF-BALANCING HOVERBOARD
Brand Name	N/A
Test Model	H1-MAX-NVY-20G
H1-MAX-XXX-20G, H1-MAX-20G, DSA-H1-MAX-NVY-20G, DSA-H1-MAX-XXX-20G, DSA-H1-MAX-20G, DSA-AH-MAX-NV DSA-AH-MAX-XXX-20G, DSA-AH-MAX-20G	
Difference Description	All the same except for the model name and color.
Date of test	Jul. 24,2020 to Aug. 19,2020
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BLE/RF

# We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC part 15.247.

Prepared By	Donor. Auomg	6
No. 12	Donjon Huang Project Engineer	Aug. 19,2020
Reviewed By	Max Zhang	
	Max Zhang Reviewer	Aug. 19,2020
Approved By	Formesties	
CC T	Forrest Lei Authorized Officer	Aug. 19,2020

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# 2. GENERAL INFORMATION

#### 2.1. PRODUCT DESCRIPTION

The EUT is designed as a "HOVER-1 - MAX - SELF-BALANCING HOVERBOARD". It is designed by way of utilizing the GFSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
RF Output Power	1.862dBm (Max)
Bluetooth Version	V 4.0
Modulation	BR □GFSK, EDR □π /4-DQPSK, □8DPSK BLE ☑GFSK 1Mbps ☑GFSK 2Mbps
Number of channels 40 Channel	
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	0dBi
Hardware Version	V1.0
Software Version	V1.0
Power Supply	DC 25.2V by battery

#### Note:

H1-MAX-NVY-20G has two Bluetooth modules, one is JL AC20BP00972 and supports ER+EDR Bluetooth version V5.0. The other is 13P10OAT TJC2QA101 and supports BLE Bluetooth version V4.0.

# 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
100 a.C.	0	2402 MHz
	0 1	2404 MHz
2400~2483.5MHz	10 : 20	
GO GO	38	2478 MHz
	39	2480 MHz

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# 2.3. RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2AANZMAX2** filing to comply with the FCC Part 15.247 requirements.

#### 2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

#### 2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

#### 2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

#### 2.7. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device. For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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#### 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8 dB
- Uncertainty of RF power density, conducted, Uc = ±2.6 dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7 dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

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#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX

#### Note:

- 1. Only the result of the worst case was recorded in the report, if no other cases.
- 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
- 4. The test software is the Blue Test3 which can set the EUT into the individual test modes.
- 5. During the test, the battery was fully charged.

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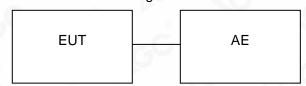


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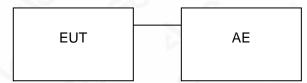
# 5. SYSTEM TEST CONFIGURATION

# **5.1. CONFIGURATION OF TESTED SYSTEM**

Radiated Emission Configure:



Conducted Emission Configure:



# **5.2. EQUIPMENT USED IN TESTED SYSTEM**

Item	Equipment	Model No.	ID or Specification	Remark EUT	
1	HOVER-1 - MAX - SELF-BALANCING HOVERBOARD	H1-MAX-NVY-20G	2AANZMAX2		
2	Adapter	TY0500100E1MN	N/A	AE	
3	Charger line	G258	N/A	AE	
4	control board	EPS-35-3.3	DC 3.3V	AE	

# **5.3. SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	5.247 (b)(3) Peak Output Power	
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	7 (d) Conducted Spurious Emission	
15.247 (e)	47 (e) Maximum Conducted Output Power Density	
15.209 Radiated Emission		Compliant
15.207	Conducted Emission	Not applicable

Note: The EUT is powered by battery. The EUT can not use the BT function with charging

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# 6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd			
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China			
Designation Number	CN1259			
FCC Test Firm Registration Number	975832			
A2LA Cert. No.	5054.02			
Description	Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA			

#### TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 15, 2020	May 14, 2022
LISN	R&S	ESH2-Z5	100086	Aug. 26, 2019	Aug. 25, 2020
Test software	R&S	ES-K1(Ver.V1.71)	N/A	N/A	N/A

# **TEST EQUIPMENT OF RADIATED EMISSION TEST**

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Aug. 26, 2019	Aug. 25, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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#### 7. PEAK OUTPUT POWER

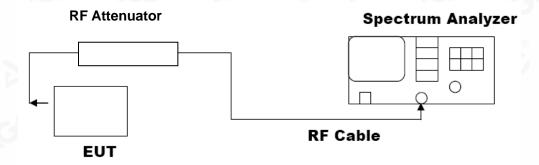
#### 7.1. MEASUREMENT PROCEDURE

For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. RBW≥DTS bandwidth
- 3. VBW≥3\*RBW.
- 4. SPAN≥VBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

# 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) PEAK POWER TEST SETUP



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The test results he test report.

# 7.3. LIMITS AND MEASUREMENT RESULT

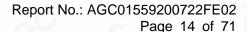
#### **GFSK 1Mbps**

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	1.862	30	Pass
2.440	1.738	30	Pass
2.480	1.068	30	Pass

CH<sub>0</sub>



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**CH19** 







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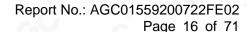
# **GFSK 2Mbps**

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION				
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail	
2.402	1.766	30	Pass	
2.440	1.604	30	Pass	
2.480	1.144	30	Pass	

CH<sub>0</sub>



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#### **CH39**



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#### 8. 6 DB BANDWIDTH

#### **8.1. MEASUREMENT PROCEDURE**

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW ≥ 3×RBW.
- 4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

#### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

#### **8.3. LIMITS AND MEASUREMENT RESULTS**

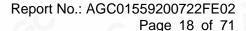
# **GFSK 1Mbps**

LIMITS AND MEASUREMENT RESULT				
Ampliaghla Limita		Applicable Limits		
Applicable Limits	Test Data (kHz)		Criteria	
>500KHZ	Low Channel	777.3	PASS	
	Middle Channel	844.9	PASS	
	High Channel	858.7	PASS	

#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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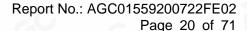
# **GFSK 2Mbps**

LIMITS AND MEASUREMENT RESULT				
Applicable Limits				
Applicable Limits	Test Data (kHz) Criteria			
100 cC	Low Channel	1061	PASS	
>500KHZ	Middle Channel	1055	PASS	
	High Channel	1061	PASS	

# TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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# 9. CONDUCTED SPURIOUS EMISSION

#### 9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

# 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

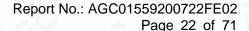
#### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT			
A collection to the section	Measurement Result		
Applicable Limits	Test Data	Criteria	
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS	

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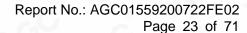


# GFSK 1Mbps TEST RESULT FOR ENTIRE FREQUENCY RANGE

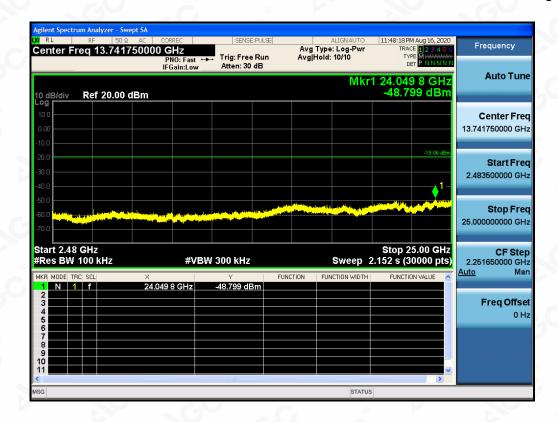
GFSK MODULATION IN LOW CHANNEL



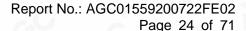
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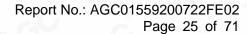




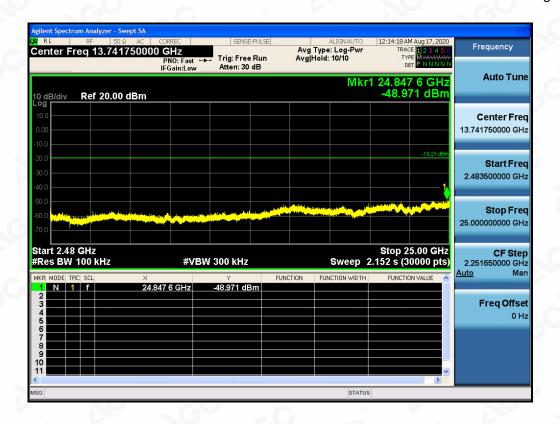
# GFSK MODULATION IN MIDDLE CHANNEL



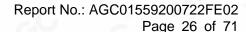
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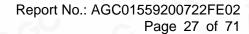




# GFSK MODULATION IN HIGH CHANNEL



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Note: The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.

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# **TEST RESULT FOR BAND EDGE**

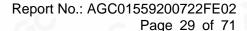
# GFSK MODULATION IN LOW CHANNEL



#### GFSK MODULATION IN HIGH CHANNEL



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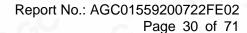




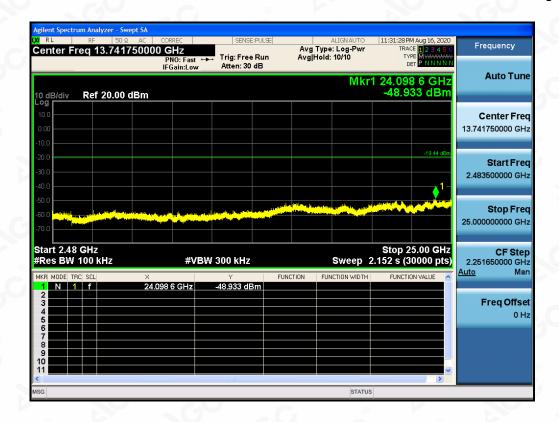
GFSK 2Mbps
TEST RESULT FOR ENTIRE FREQUENCY RANGE



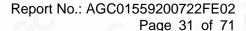
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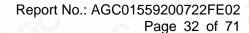




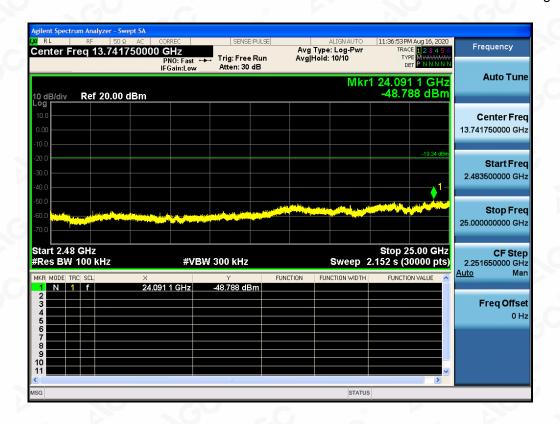
# GFSK MODULATION IN MIDDLE CHANNEL



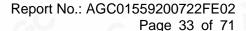
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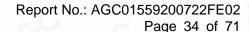




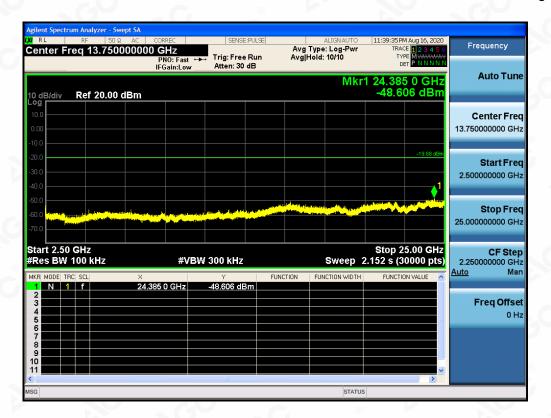
# GFSK MODULATION IN HIGH CHANNEL



Compliance the Manager of the took results t Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the Dedicated Post not/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results to the test deemed any objections to report issued by AGC should be submitted to AGC within 15day after the issuence of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc@agc-cert.com.







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# **TEST RESULT FOR BAND EDGE**

# GFSK MODULATION IN LOW CHANNEL



#### GFSK MODULATION IN HIGH CHANNEL



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# 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

#### 10.1. MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set the SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the KDB 558074 item 10.2 was used in this testing.

# 10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 7.2.

#### 10.3. MEASUREMENT EQUIPMENT USED

Refer to Section 6.

#### 10.4. LIMITS AND MEASUREMENT RESULT

**GFSK 1Mbps** 

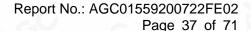
Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-5.296	8	Pass
Middle Channel	-5.277	8	Pass
High Channel	-6.112	8	Pass

# TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



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Attestation of Global Compliance(Shenzhen)Co., Ltd Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd Tel: +86-755 2523 4088 E-mail: agc@agc-cert.com Web: http://cn.agc-cert.com/





TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



# TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



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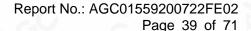
# **GFSK 2Mbps**

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-9.042	8	Pass
Middle Channel	-9.151	8	Pass
High Channel	-9.628	8	Pass

# TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



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TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



#### TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



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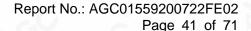
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#### 11. RADIATED EMISSION

#### 11.1. MEASUREMENT PROCEDURE

- 1. The EUT was placed on the top of the turntable 0.8 or 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 emission, 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.
- 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 RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 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 values.
- 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.

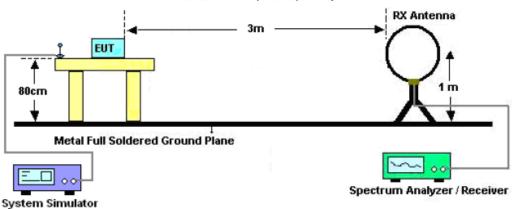
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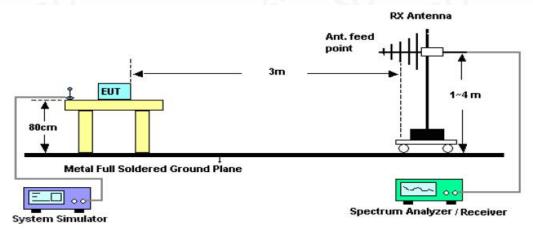


# 11.2. TEST SETUP

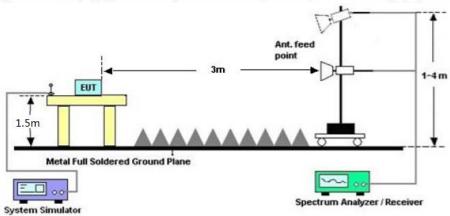
# Radiated Emission Test-Setup Frequency Below 30MHz



# RADIATED EMISSION TEST SETUP 30MHz-1000MHz



# RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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# 11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

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	

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

#### 11.4. TEST RESULT

#### **RADIATED EMISSION BELOW 30MHz**

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

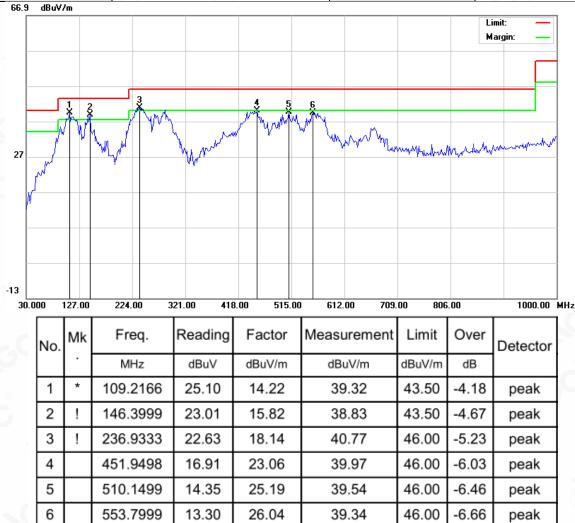
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# **RADIATED EMISSION BELOW 1GHZ**

EUT	HOVER-1 - MAX - SELF-BALANCING HOVERBOARD	Model Name	H1-MAX-NVY-20G
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



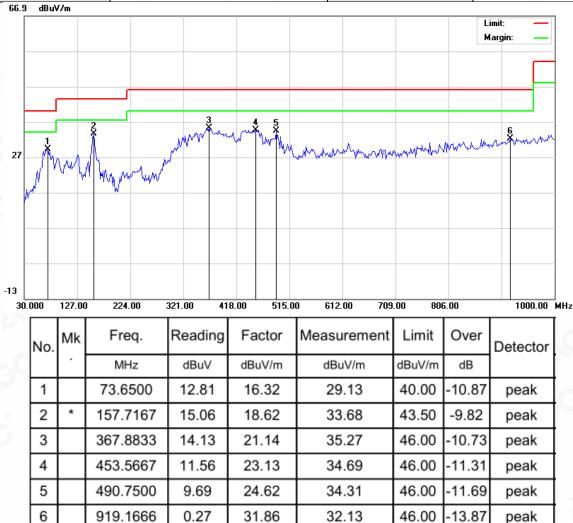
**RESULT: PASS** 

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EUT	HOVER-1 - MAX - SELF-BALANCING HOVERBOARD	Model Name	H1-MAX-NVY-20G
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



# RESULT: PASS Note:

- 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
- 2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.

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