

RADIO TEST REPORT

The device described below is tested by Dongguan Nore Testing Center Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results, data evaluation, test procedures, and equipment of configurations shown in this report were made in accordance with the procedures in ANSI C63.10(2013).

Applicant / Manufacturer : Shenzhen Star-Navi Technology Co., Ltd.

Address : Room 2203, Building B, Block three, Cloud Park Phase 1, Bantian Street, Longgang District, Shenzhen City, China

Factory : Dongguan Winlex Electronics Co., Ltd.

Address : Huatai Technology Park, Xiegang Town, Dongguan City, Guangdong Province, China.

E.U.T. : HeroGoGo Smart Driving Assistant System

Brand Name : HeroGoGo

Model No. : HeroGoGo Pro1, HeroGoGo Pro1C
(For model difference refer to section 1)

FCC ID : 2APORHEROGOGO-1

Measurement Standard : FCC PART 15.247

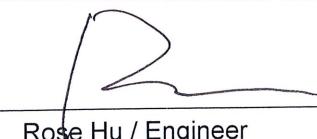
Date of Receiver : January 05, 2021

Date of Test : January 05, 2021 to April 16, 2021

Date of Report : April 16, 2021

This Test Report is Issued Under the Authority of :

Prepared by



Rose Hu / Engineer

Approved & Authorized Signer



Iori Fan / Authorized Signatory

This test report is for the customer shown above and their specific product only. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Nore Testing Center Co., Ltd.

Table of Contents

1. GENERAL INFORMATION	5
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST	5
1.2 RELATED SUBMITTAL(S) / GRANT (S)	8
1.3 TEST METHODOLOGY	8
1.4 EQUIPMENT MODIFICATIONS	8
1.5 SUPPORT DEVICE	8
1.6 TEST FACILITY AND LOCATION	9
1.7 SUMMARY OF TEST RESULTS	10
2. SYSTEM TEST CONFIGURATION	11
2.1 EUT CONFIGURATION	11
2.2 SPECIAL ACCESSORIES	11
2.3 DESCRIPTION OF TEST MODES	11
2.4 EUT EXERCISE	11
3. CONDUCTED EMISSIONS TEST	12
3.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	12
3.2 TEST CONDITION	12
3.3 MEASUREMENT RESULTS	12
4. MAX. CONDUCTED OUTPUT POWER	13
4.1 MEASUREMENT PROCEDURE	13
4.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	13
4.3 MEASUREMENT RESULTS	13
5. 6DB BANDWIDTH	14
5.1 MEASUREMENT PROCEDURE	14
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	14
5.3 MEASUREMENT RESULTS	14
6. POWER SPECTRAL DENSITY	17
6.1 MEASUREMENT PROCEDURE	17
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	17
6.3 MEASUREMENT RESULTS	17
7. BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS	20
7.1 REQUIREMENT AND MEASUREMENT PROCEDURE	20
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	20
7.3 MEASUREMENT RESULTS	20

8. RADIATED SPURIOUS EMISSIONS AND RESTRICTED BANDS.....	25
8.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	25
8.2 MEASUREMENT PROCEDURE	26
8.3 LIMIT	27
8.4 MEASUREMENT RESULTS	27
9. ANTENNA APPLICATION	32
9.1 ANTENNA REQUIREMENT.....	32
9.2 MEASUREMENT RESULTS	32
10. TEST EQUIPMENT LIST.....	33

Revision History of This Test Report

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

Product Name	: HeroGoGo Smart Driving Assistant System
Main model number	: HeroGoGo Pro1
Additional Model number	: HeroGoGo Pro1C
Brand Name	: HeroGoGo
Power Supply	: DC 12V, DC 24V come from Car charger, DC 3.6V li-ion battery
Car charger	: Model: VS2018-5 Input: DC 12-24V Output: USB1: DC 5.0V 2.1A Max USB2: DC 5.0V 1A
Test voltage	: DC 12V, DC 24V, DC 3.6V Only the worst case was recorded in the test report.
Model difference	: Both of models have the same circuitry, electrical mechanical, PCB Layout and physical construction. The differences in model number and color due to marketing purpose
Hardware version	: V1.0
Software version	: V1.0
Serial number	: N/A

Technical parameters

BT Version	: V4.2 (BLE)
Frequency	: 2402-2480MHz
Modulation	: GFSK
Number of Channel	: 40
Channel space	: 2MHz
Antenna Type	: FPC antenna
Antenna Gain	: 0.26 dBi

V4.2 (BLE) Channel List

Channel	Frequency MHz						
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Note: According to section 15.31(m), regards to the operating frequency range over 10MHz, the Lowest, Middle, and the Highest frequency of channel were selected to perform the test. The selected frequency see below:

Channel	Frequency MHz
0	2402
19	2440
39	2480

Test SW version	EMI_Test_Tool_v1.3
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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2APORHEROGOGO-1 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rule.

1.3 Test Methodology

The radiated emission measurement was performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters. All other measurements were made in accordance with the procedures in 47 CFR part 2.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

N/A

1.6 Test Facility and Location

Listed by CNAS, August 14, 2018

The certificate is valid until August 13, 2024

The Laboratory has been assessed and proved to be in compliance with
CNAS/CL01

The Certificate Registration Number is L5795.

Listed by A2LA, November 01, 2017

The certificate is valid until December 31, 2021

The Laboratory has been assessed and proved to be in compliance with ISO17025

The Certificate Registration Number is 4429.01

Listed by FCC, November 06, 2017

The Designation Number is CN1214

Test Firm Registration Number: 907417

Listed by Industry Canada, June 08, 2017

The Certificate Registration Number. Is 46405-9743

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1.7 Summary of Test Results

FCC Rules	Description Of Test	Uncertainty	Result
§15.207 (a)	AC Power Conducted Emission	±1.06dB	N/A
§15.247(b)(3)	Max. Conducted Output Power	±1.06dB	Compliance
§15.247(a)(2)	6dB Bandwidth	±1.42 x10 ⁻⁴ %	Compliance
§15.247(e)	Power Spectral Density	±1.06dB	Compliance
§15.247(d)	Band Edge and Conducted Spurious Emissions	±1.70dB & ±2.51dB	Compliance
§15.247(d),§15.209, §15.205	Radiated Spurious Emissions and Restricted Bands	±3.70dB	Compliance
§15.203	Antenna Requirement	-----	Compliance

Note:

1. The EUT powered by DC 12V, DC 24V come from vehicle power source, therefore the AC Power Conducted Emission is not applicable.
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X- plane results were found as the worst case and were shown in this report.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 Special Accessories

Not available for this EUT intended for grant.

2.3 Description of test modes

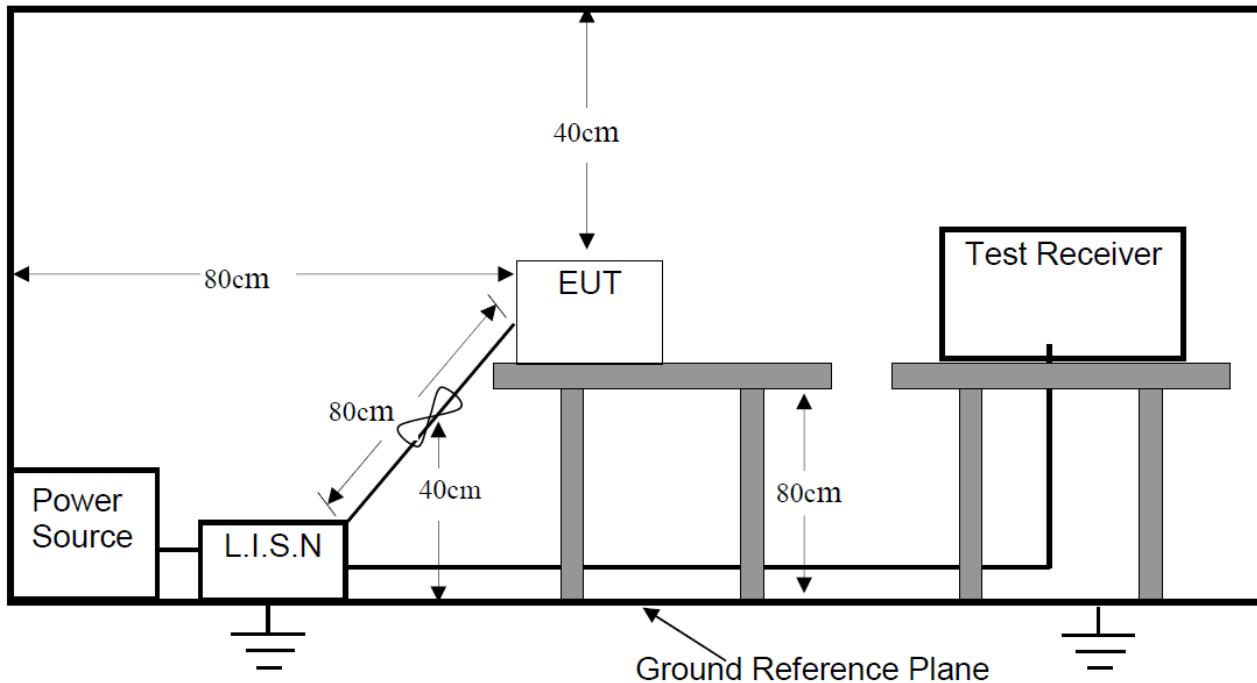
The EUT has been tested under continuous operating condition (The duty cycle \geq 98%, duty cycle factor is not required). Test program used to control the EUT staying in continuous transmitting mode. The Lowest, Middle and highest channel were chosen for testing, and modulation type GFSK was tested, but only the worst case data is shown in this report.

2.4 EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

3. Conducted Emissions Test

3.1 Test SET-UP (Block Diagram of Configuration)



3.2 Test Condition

Test Requirement: FCC Part 15.207

Frequency Range: 150KHz ~ 30MHz

Detector: RBW 9KHz, VBW 30KHz

Operation Mode: TX

3.3 Measurement Results

Not Applicable.

4. Max. Conducted Output Power

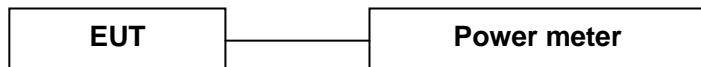
4.1 Measurement Procedure

Maximum Conducted Output power at Antenna Terminals, FCC Rules 15.247(b)(3):

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Results

Please refer to following table.

Modulation:	GFSK	Temperature :	24 °C	Humidity :	50 %
Test By:	Sance			Test Date :	April 12, 2021
Test Result:	PASS				

Frequency MHz	Data Rate Mbps	Peak Output Power dBm	Limit dBm
Low Channel: 2402	1	6.74	≤30
Middle Channel: 2440	1	7.21	≤30
High Channel: 2480	1	7.55	≤30

5. 6dB Bandwidth

5.1 Measurement Procedure

The minimum 6dB bandwidth shall be at least 500 kHz

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to DTS KDB 558074 D01 15.247 Measurement Guidance v05r02:

Set the RBW = 100KHz.

Set the VBW $\geq 3 \times$ RBW

Set the Detector = peak.

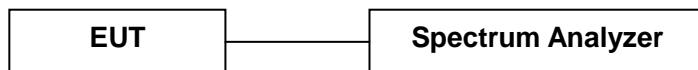
Set the Sweep time = auto couple.

Set the Trace mode = max hold.

Allow trace to fully stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.2 Test SET-UP (Block Diagram of Configuration)



5.3 Measurement Results

Please refer to following table and plots.

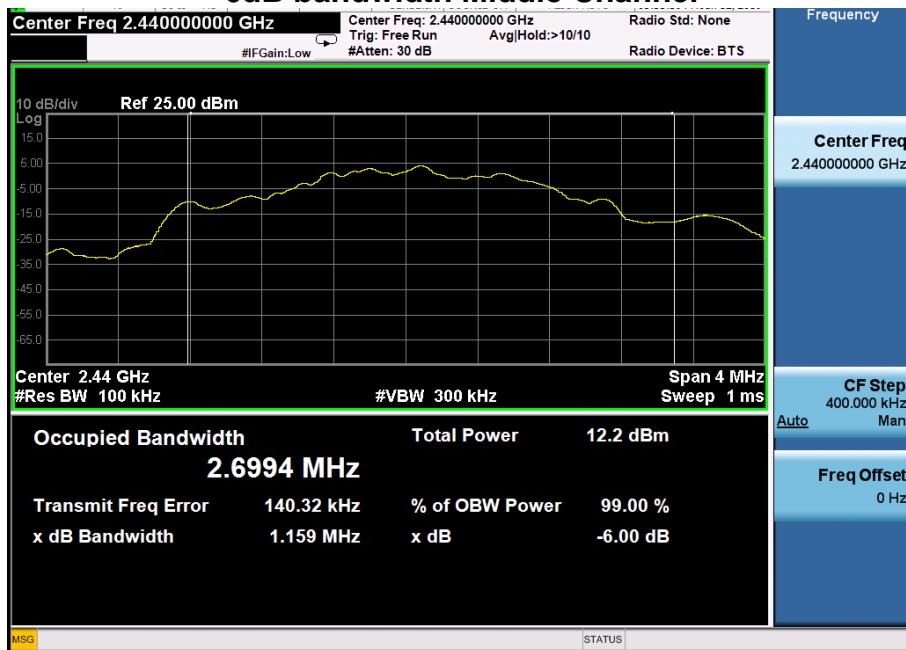
Modulation:	GFSK		
Temperature :	24 °C	Humidity :	50 %
Test By:	Sance	Test Date :	April 12, 2021
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	6dB Bandwidth KHz	Limit
Low Channel: 2402	1	1121	>500KHz
Middle Channel: 2440	1	1159	>500KHz
High Channel: 2480	1	1163	>500KHz

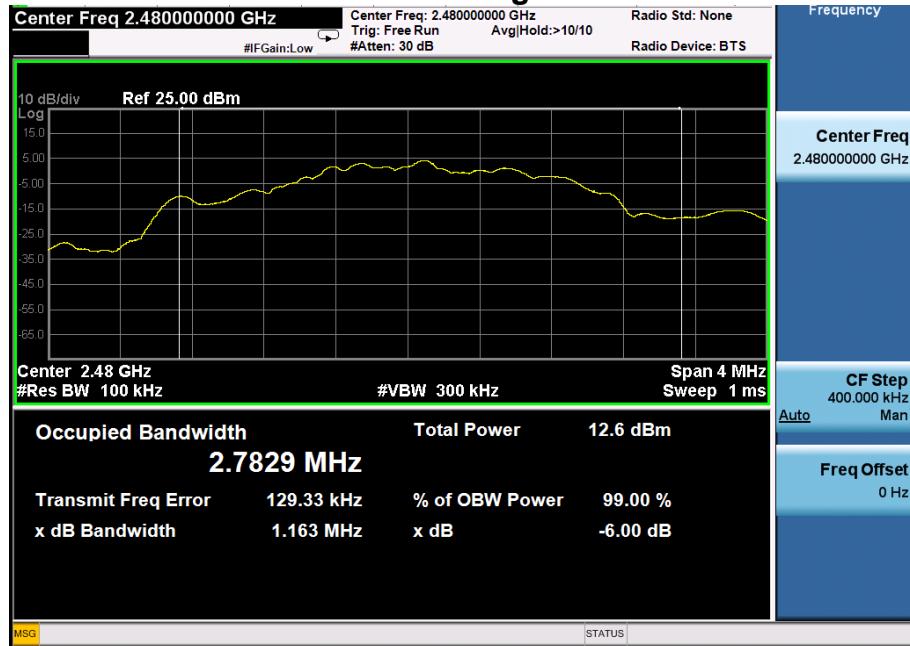
6dB bandwidth Low Channel



6dB bandwidth Middle Channel



6dB bandwidth High Channel



6. Power Spectral Density

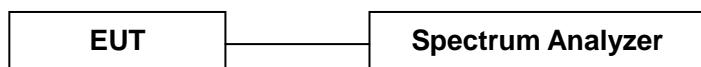
6.1 Measurement Procedure

Power Spectral Density, FCC Rule 15.247(e):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074 (v05):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.2 Test SET-UP (Block Diagram of Configuration)



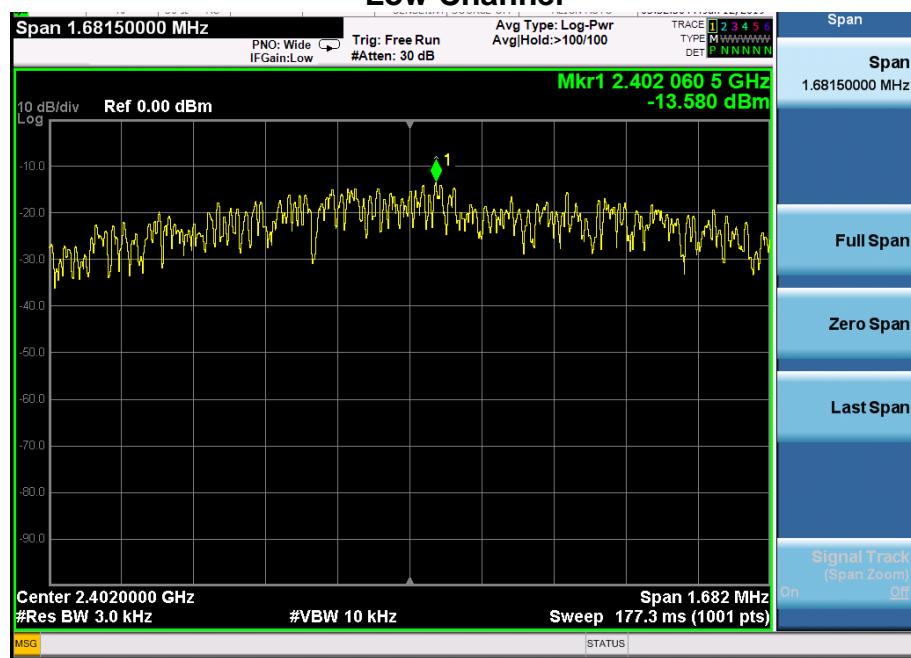
6.3 Measurement Results

Please refer to following table and plots.

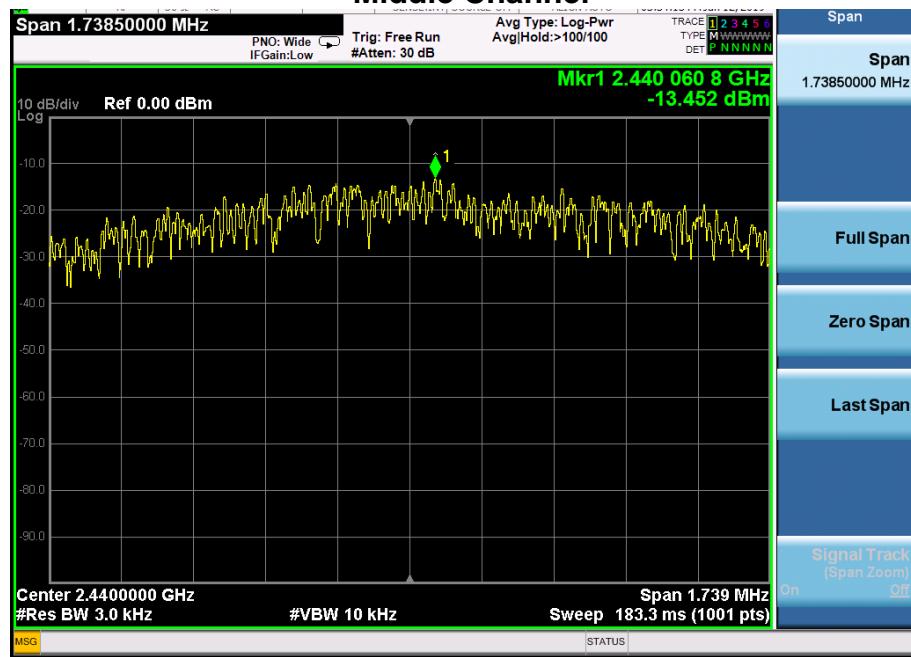
Modulation:	GFSK		
Temperature :	24 °C	Humidity :	50 %
Test By:	Sance	Test Date :	April 12, 2021
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	PSD dBm/3kHz	Limit dBm/3kHz
Low Channel: 2402	1	-13.58	8
Middle Channel: 2440	1	-13.45	8
High Channel: 2480	1	-12.85	8

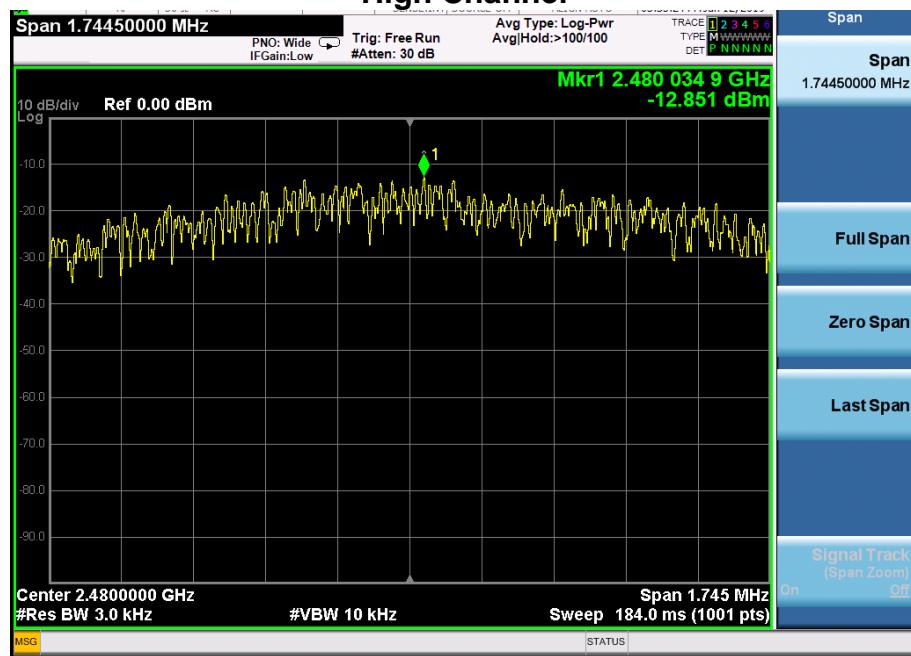
Low Channel



Middle Channel



High Channel



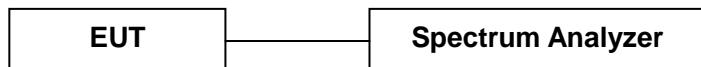
7. Band Edge and Conducted Spurious Emissions

7.1 Requirement and Measurement Procedure

In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Results

The test plots and table showed all spurious emission and up to the tenth harmonic was measured and they were found to be at least 20dB below the highest level of the desired power in the passband. Please refer to below plots.

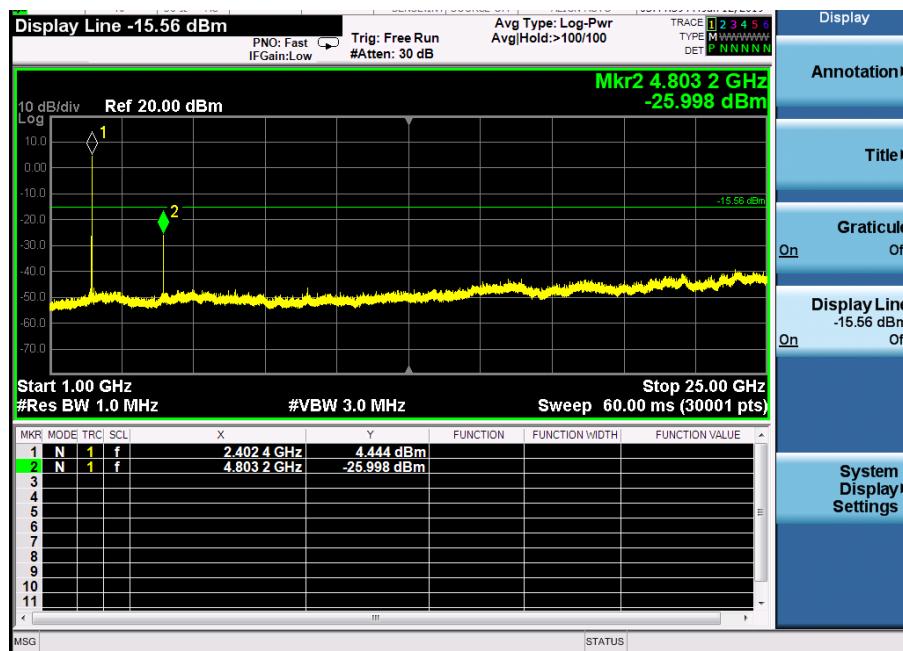
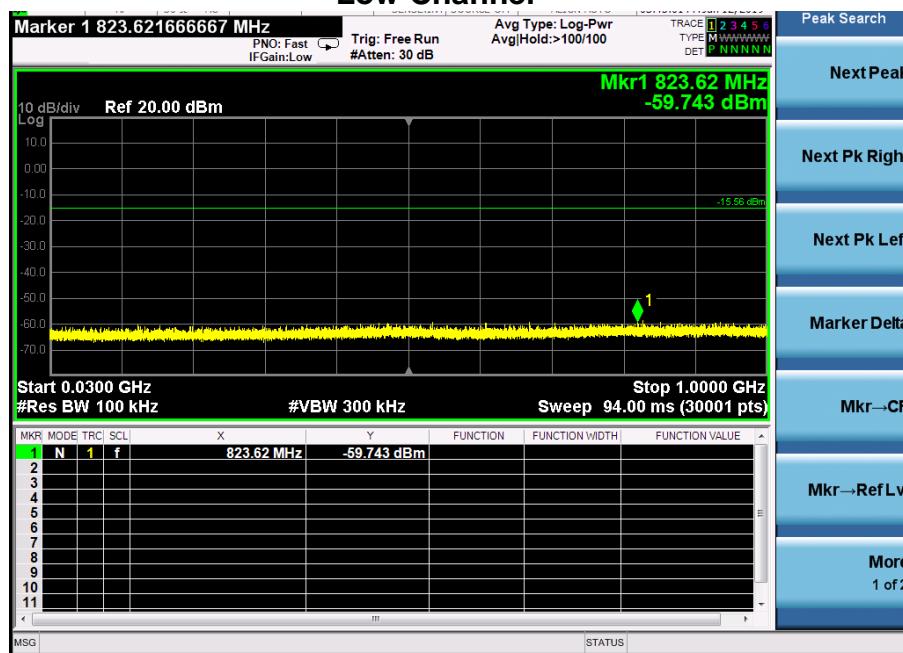
Band Edge Low Channel



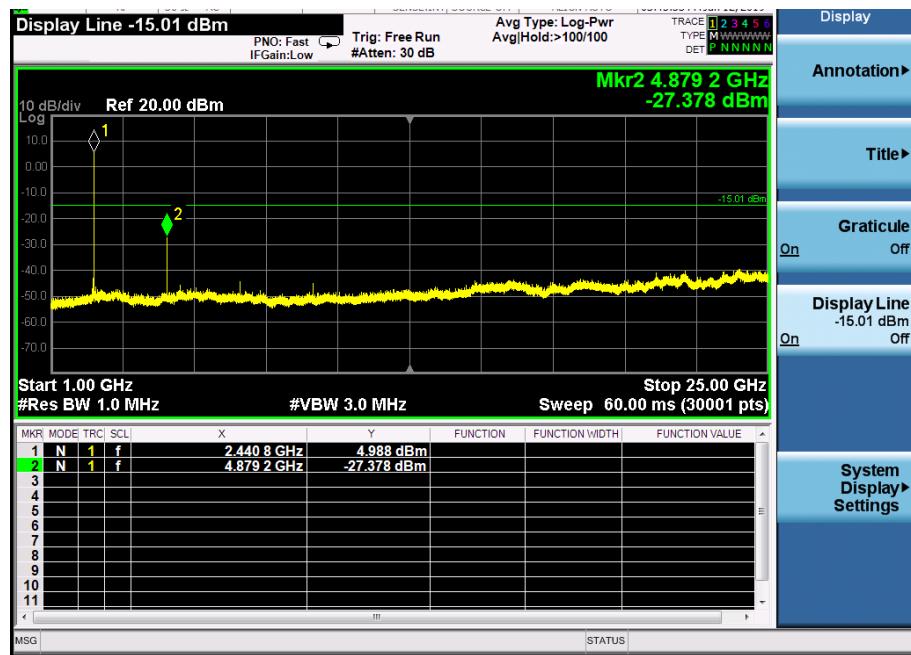
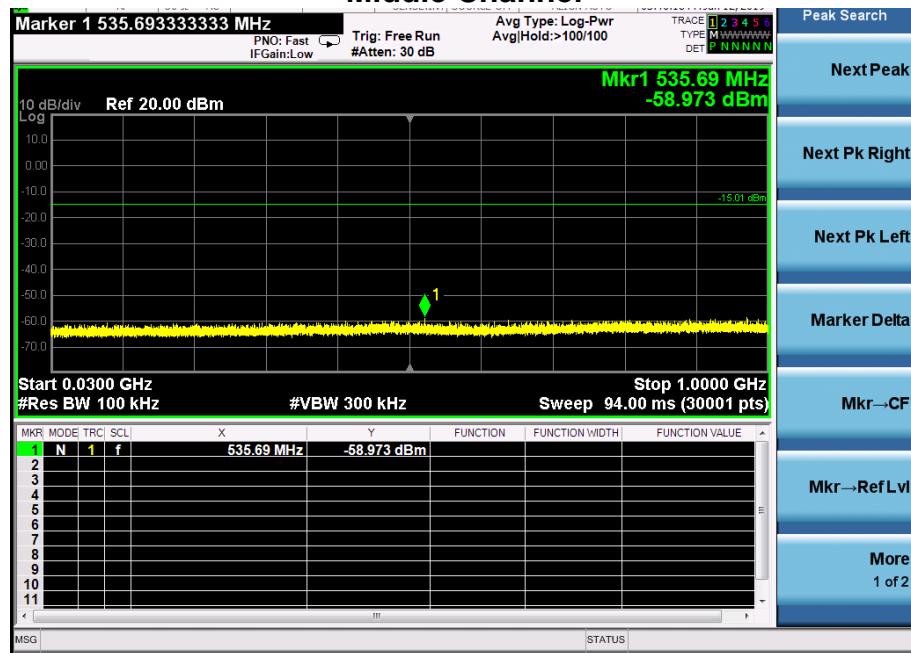
High Channel



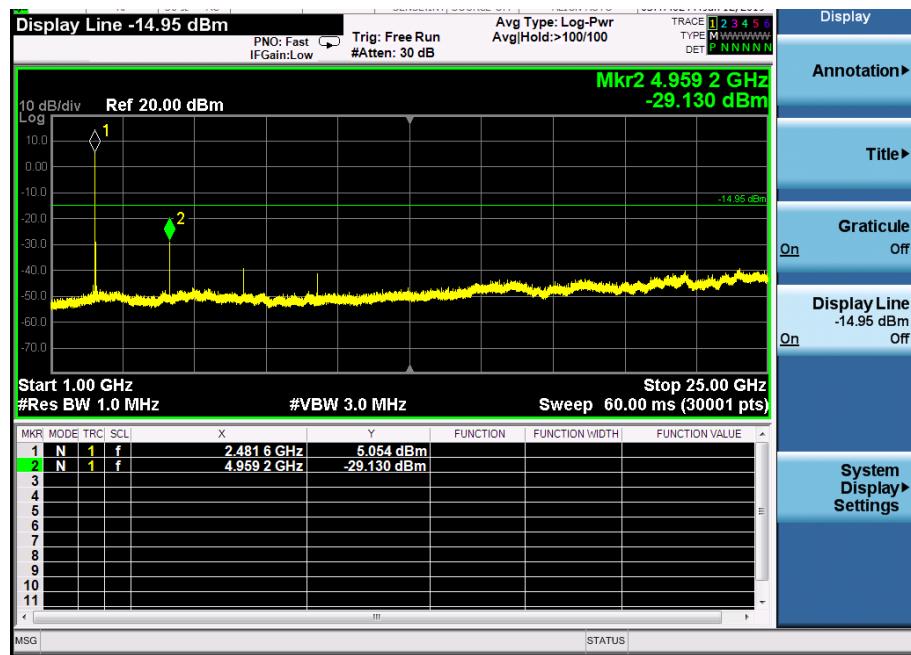
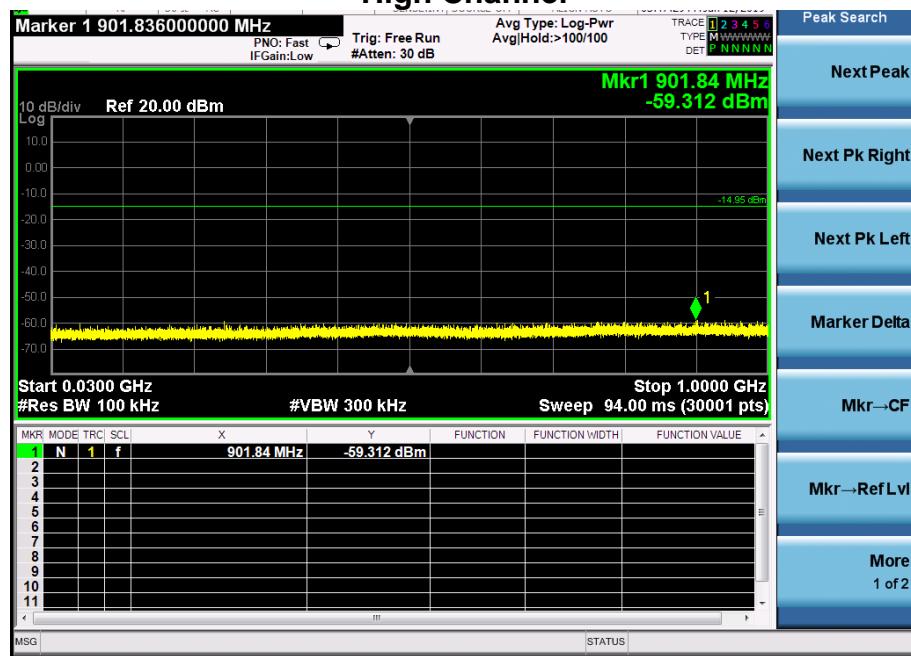
Conducted Spurious Emissions Low Channel



Middle Channel



High Channel

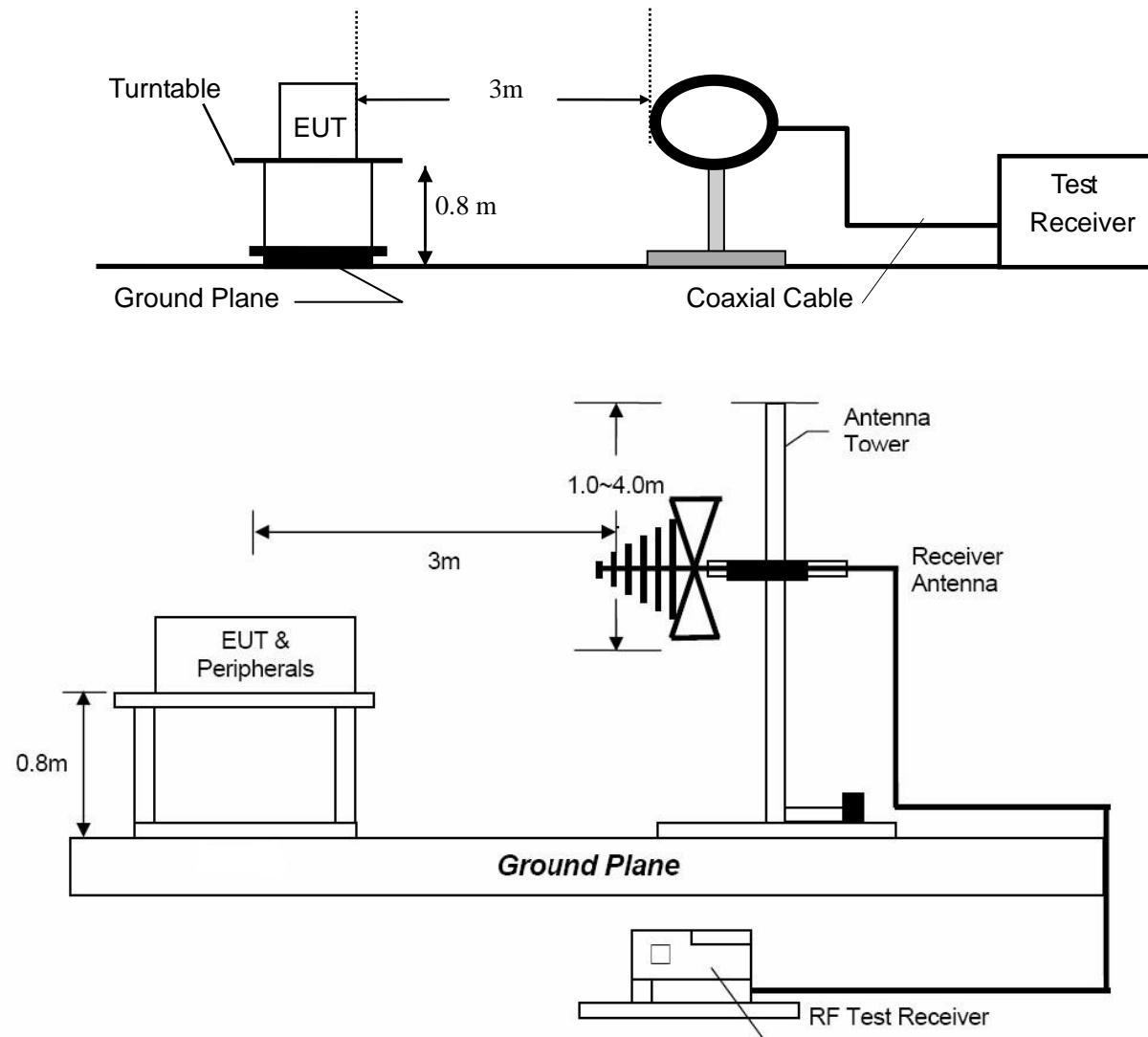


Note: Sweep points=30001pts

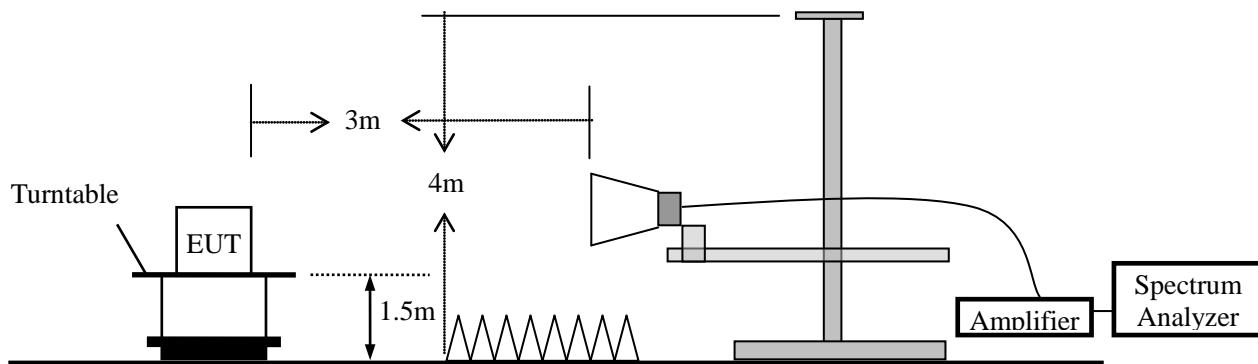
8. Radiated Spurious Emissions and Restricted Bands

8.1 Test SET-UP (Block Diagram of Configuration)

8.1.1 Radiated Emission Test Set-Up, Frequency Below 30MHz



8.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz



8.2 Measurement Procedure

- a. Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room.
- b. For the radiated emission test above 1GHz:
The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. 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.
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
- f. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

8.3 Limit

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209)
		µV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark:

- (1) Emission level (dB) μ V = 20 log Emission level μ V/m
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) As shown in 15.35(b), for frequencies above 1000MHz, 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 20dB under any condition of modulation.
- (4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.
- (5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

8.4 Measurement Results

Please refer to following plots of the worst case: Low channel.



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Radiated Emission Measurement

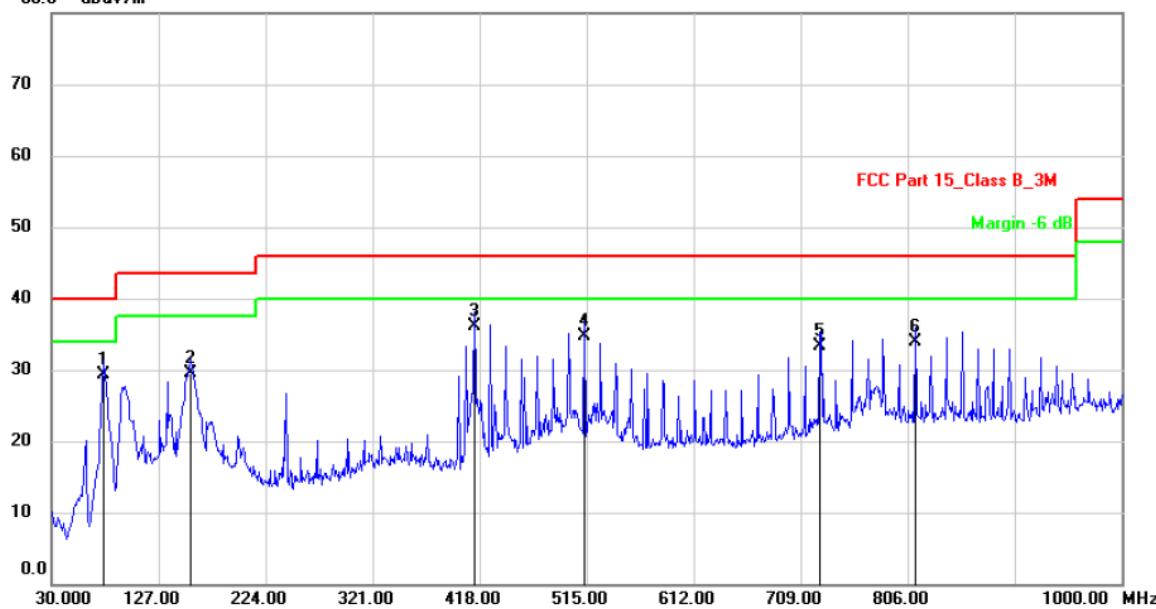
File :HeroGoGo Pro1

Data :#6

Date: 2021/4/13

Time: 16:15:35

80.0 dBuV/m



Site: 3m Chamber

Polarization: **Horizontal**

Temperature: 26

Limit: FCC Part 15_Class B_3M

Power: DC12V

Humidity: 47 %

EUT:

Distance: 3m

M/N: HeroGoGo Pro1

Mode: TX

Note: Eut:HeroGoGo Smart Driving Assistant System

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table		
			Level	Factor	ment						
			MHz	dBuV	dB/m	dBuV/m	dB	Detector	cm	degree	Comment
1		76.5600	48.89	-19.49	29.40	40.00	-10.60	QP			
2		156.1000	44.92	-15.32	29.60	43.50	-13.90	QP			
3	*	413.1500	45.00	-8.80	36.20	46.00	-9.80	QP			
4		513.0600	41.44	-6.74	34.70	46.00	-11.30	QP			
5		726.4600	36.45	-3.15	33.30	46.00	-12.70	QP			
6		812.7900	35.62	-1.72	33.90	46.00	-12.10	QP			

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.



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Radiated Emission Measurement

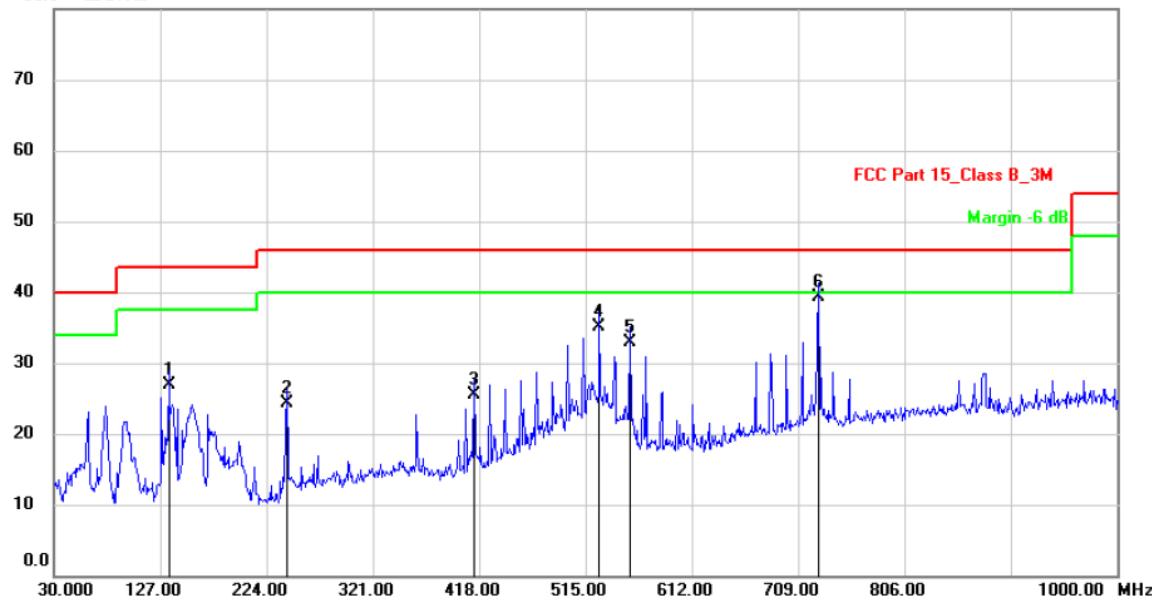
File :HeroGoGo Pro1

Data #:5

Date: 2021/4/13

Time: 16:07:55

80.0 dBuV/m



Site: 3m Chamber

Polarization: **Vertical**

Temperature: 26

Limit: FCC Part 15_Class B_3M

Power: DC12V

Humidity: 47 %

EUT:

Distance: 3m

M/N: HeroGoGo Pro1

Mode: TX

Note: Eut:HeroGoGo Smart Driving Assistant System

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm		Table Degree
								Detector	degree	
1		134.7600	45.36	-18.36	27.00	43.50	-16.50	QP		
2		242.4300	39.11	-14.71	24.40	46.00	-21.60	QP		
3		413.1500	37.06	-11.46	25.60	46.00	-20.40	QP		
4		527.6100	43.79	-8.69	35.10	46.00	-10.90	QP		
5		555.7400	41.37	-8.37	33.00	46.00	-13.00	QP		
6	*	727.4300	42.42	-3.12	39.30	46.00	-6.70	QP		

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

Modulation: GFSK
 Frequency Range: 1-25GHz
 Test Result: PASS
 Measured Distance: 3m
 Test By: Sance

Test Date : April 13, 2021
 Temperature : 22 °C
 Humidity : 54 %

Freq. (MHz)	Ant.Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode: TX Mode (Low)										
4804	V	55.87	42.79	6.30	62.17	49.09	74.00	54.00	-11.83	-4.91
7206	V	49.15	32.91	10.44	59.59	43.35	74.00	54.00	-14.41	-10.65

4804	H	50.61	34.67	6.30	56.91	40.97	74.00	54.00	-17.09	-13.03
7206	H	48.65	33.18	10.44	59.09	43.62	74.00	54.00	-14.91	-10.38

Operation Mode: TX Mode (Mid)										
4880	V	50.71	34.69	6.60	57.31	41.29	74.00	54.00	-16.69	-12.71
7320	V	47.73	31.51	10.55	58.28	42.06	74.00	54.00	-15.72	-11.94

4880	H	50.34	33.82	6.60	56.94	40.42	74.00	54.00	-17.06	-13.58
7320	H	48.22	31.55	10.55	58.77	42.10	74.00	54.00	-15.23	-11.90

Operation Mode: TX Mode (High)										
4960	V	50.68	34.24	6.89	57.57	41.13	74.00	54.00	-16.43	-12.87
7440	V	47.42	31.59	10.60	58.02	42.19	74.00	54.00	-15.98	-11.81

4960	H	51.54	35.83	6.89	58.43	42.72	74.00	54.00	-15.57	-11.28
7440	H	47.66	31.54	10.60	58.26	42.14	74.00	54.00	-15.74	-11.86

For others emissions are attenuated 20dB below the limits, so it does not record in report.

Note:

- (1) All Readings are Peak Value and AV.
- (2) Emission Level= Reading Level + Factor
- (3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
- (4) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
- (5) Measurement uncertainty : $\pm 3.7\text{dB}$.
- (6) Horn antenna used for the emission over 1000MHz.

Freq. (MHz)	Ant.Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
2390.000	H	49.69	33.89	0.09	49.78	33.98	74.00	54.00	-24.22	-20.02
2390.000	V	49.97	36.36	0.09	50.06	36.45	74.00	54.00	-23.94	-17.55
2483.500	H	51.07	35.64	0.35	51.42	35.99	74.00	54.00	-22.58	-18.01
2483.500	V	50.19	33.71	0.35	50.54	34.06	74.00	54.00	-23.46	-19.94

Note: (1) All Readings are Peak Value and AV
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : $\pm 3.7\text{dB}$
(4) For others emissions are attenuated 20dB below the limits, so it does not record in report.

9. Antenna Application

9.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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, 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.

Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

9.2 Measurement Results

The antenna is FPC antenna and no consideration of replacement, and the best case gain of the antenna is 0.26 dBi. So, the antenna is consider meet the requirement.

10. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	Mar. 13, 2021	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	Mar. 23, 2021	1 Year
3.	Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	Mar. 13, 2021	1 Year
4.	Spectrum Analyzer	Keysight	N9020A	MY54200831	Mar. 13, 2021	1 Year
5.	Spectrum Analyzer	Rohde & Schwarz	FSV40	101094	Mar. 13, 2021	1 Year
6.	Horn Antenna	Schwarzbeck	BBHA9170	9170-172	Mar. 22, 2021	2 Year
7.	Power Sensor	DARE	RPR3006W	15I00041SNO 64	Mar. 13, 2021	1 Year
8.	Horn Antenna	COM-Power	AH-118	071078	Mar. 23, 2021	1 Year
9.	Pre-Amplifier	HP	HP 8449B	3008A00964	Mar. 13, 2021	1 Year
10.	Pre-Amplifier	HP	HP 8447D	1145A00203	Mar. 13, 2021	1 Year
11.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	Mar. 23, 2021	1 Year
12.	Test Receiver	Rohde & Schwarz	ESCI	101152	Mar. 14, 2021	1 Year
13.	L.I.S.N	Rohde & Schwarz	ENV 216	101317	Mar. 13, 2021	1 Year
14.	RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	Mar.13, 2021	1 Year
15.	Temporary antenna connector	TESCOM	SS402	N/A	N/A	N/A
16.	Chamber	SAEMC	9*7*7m	N/A	Jun. 20, 2019	2 Year
17.	Test Software	EZ	EZ_EMCA	N/A	N/A	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

---End---