TEST REPORT

Product	:	Marine Entertainment System
Trade mark	:	B&G, Simrad, Lowrance, JL Audio
Model/Type reference	:	SonicHub 2, MM80-HR
Serial Number	:	N/A
Report Number	:	EED32J00067902
FCC ID	:	RAYSHGEN2
Date of Issue	:	Jul. 10, 2017
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

Navico Auckland Limited
44 Arrenway Drive, Rosedale, Auckland, New Zealand

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
Shenzhen, Guangdong, China
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Compiled by: Kevin Tang Reviewed by: Kevin Lan

Approved by: Sheek Luo Date: Jul. 10, 2017

Sheek Luo
Lab supervisor

Check No.: 2496542141

2 Version

Version No.	Date	Description
00	Jul. 10, 2017	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.
Model No.: SonicHub 2, MM80-HR
This test report (Ref. No.: EED32J00067902) is only valid with the test report (Ref. No.: EED32H000844-2). According to the declaration from the applicant, two models were same RF module. Their electriacl circuit design, layout, components used and internal wiring are idetical. Apart from the removal of the VIDEO OUT terminal (which is not used in the MM80-HR) and associated update to the software.

Therefore in this report only Radiated Spurious emissions below 1GHz was fully retested on model MM80-HR and shown the data in this report, other tests please refer to original report EED32H000844-2.

4 Content

5 Test Requirement

5.1 Test setup

5.1.1 For Radiated Emissions test setup

Radiated Emissions setup:

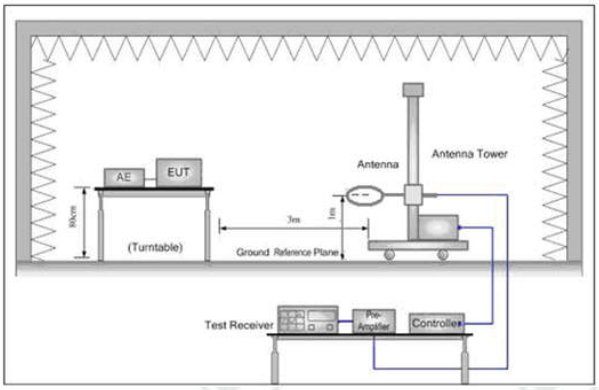


Figure 1. Below 30MHz

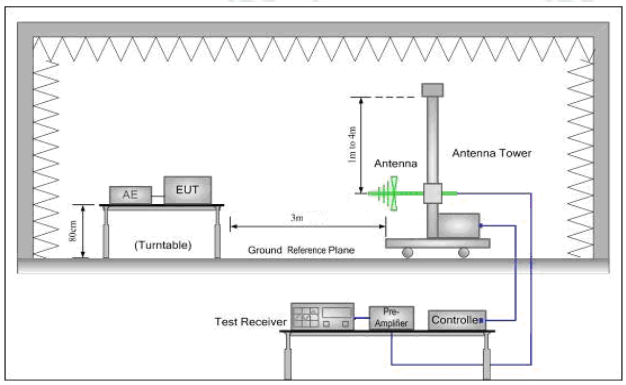


Figure 2. 30MHz to 1GHz

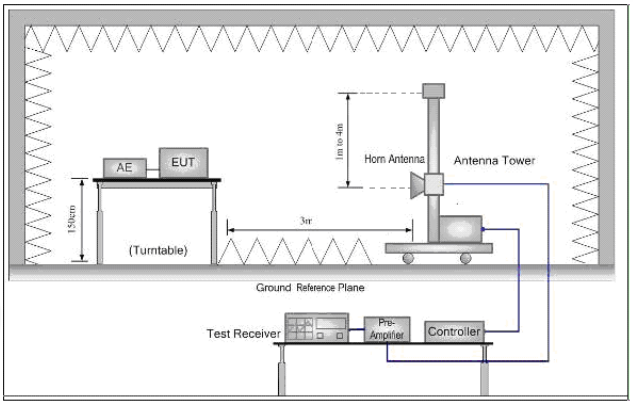


Figure 3. Above 1GHz

5.2 Test Environment

Operating Environment:	
Temperature:	25°C
Humidity:	52% RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK	2402MHz ~2480 MHz	Channel 1	Channel 20	Channel 40
		2402MHz	2440MHz	2480MHz
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.			

6 General Information

6.1 Client Information

Applicant:	Navico Auckland Limited
Address of Applicant:	44 Arrenway Drive, Rosedale, Auckland, New Zealand
Manufacturer:	SKYPINE ELECTRONICS (SHENZHEN) CO., LTD
Address of Manufacturer:	A1, A5 Building, No.6, Xinxing Industrial Park, Xinhe Village, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China
Factory:	SKYPINE ELECTRONICS (SHENZHEN) CO., LTD
Address of Factory:	A1, A5 Building, No.6, Xinxing Industrial Park, Xinhe Village, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China

6.2 General Description of EUT

Product Name:	Marine Entertainment System
Model No.:	SonicHub 2, MM80-HR
Trade Mark:	B&G, Simrad, Lowrance, JL Audio
EUT Supports Radios application:	BT4.0 Dual mode
Power Supply:	DC 12V
Sample Received Date:	May 15, 2017
Sample tested Date:	May 15, 2017 to Jul. 07, 2017

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.0
Modulation Type:	GFSK
Number of Channel:	40
EUT Function:	DVD PLAYER
Test power grade:	0(manufacturer declare)
Test software of EUT:	CSR BlueTest3(manufacturer declare)
Antenna Type:	Integral
Antenna Gain:	0dBi
Test Voltage:	DC 12V

Operation Frequency each of channel

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

9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

6.4 Description of Support Units

The EUT has been tested independently.

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

6.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.31dB (30MHz-1GHz)
		0.57dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-12.75GHz)
4	Conduction emission	3.6dB (9kHz to 150kHz)
		3.2dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	2.8%
7	DC power voltages	0.025%

7 Equipment List

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-05-2016	06-05-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	06-09-2017	06-08-2018
Microwave Preamplifier	Agilent	8449B	3008A02425	02-16-2017	02-15-2018
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015	07-18-2018
Loop Antenna	ETS	6502	00071730	07-30-2015	07-28-2017
Microwave Preamplifier	A.H.SYSTEMS	PAP-1840-60	6041.6042	06-30-2015	06-28-2018
Horn Antenna	A.H.SYSTEMS	SAS-574 374	---	06-30-2015	06-28-2018
Spectrum Analyzer	R&S	FSP40	100416	06-13-2017	06-12-2018
Receiver	R&S	ESCI	100435	06-14-2017	06-13-2018
Multi device Controller	maturo	NCD/070/10711112	---	01-11-2017	01-10-2018
LISN	schwarzbeck	NNBM8125	81251547	06-13-2017	06-12-2018
LISN	schwarzbeck	NNBM8125	81251548	06-13-2017	06-12-2018
Signal Generator	Agilent	E4438C	MY45095744	03-14-2017	03-13-2018
Signal Generator	Keysight	E8257D	MY53401106	03-14-2017	03-13-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018
Cable line	Fulai(7M)	SF106	5219/6A	01-11-2017	01-10-2018
Cable line	Fulai(6M)	SF106	5220/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5216/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5217/6A	01-11-2017	01-10-2018
High-pass filter	Sinoscite	FL3CX03WG18NM12-0398-002	---	01-11-2017	01-10-2018
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA09CL12-0395-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA08CL12-0393-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA04CL12-0396-002	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA03CL12-0394-001	---	01-11-2017	01-10-2018

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix A)

Appendix A): Radiated Spurious Emissions

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. 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, whichwas mounted on the top of a variable-height antenna tower.
c. The antenna height 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

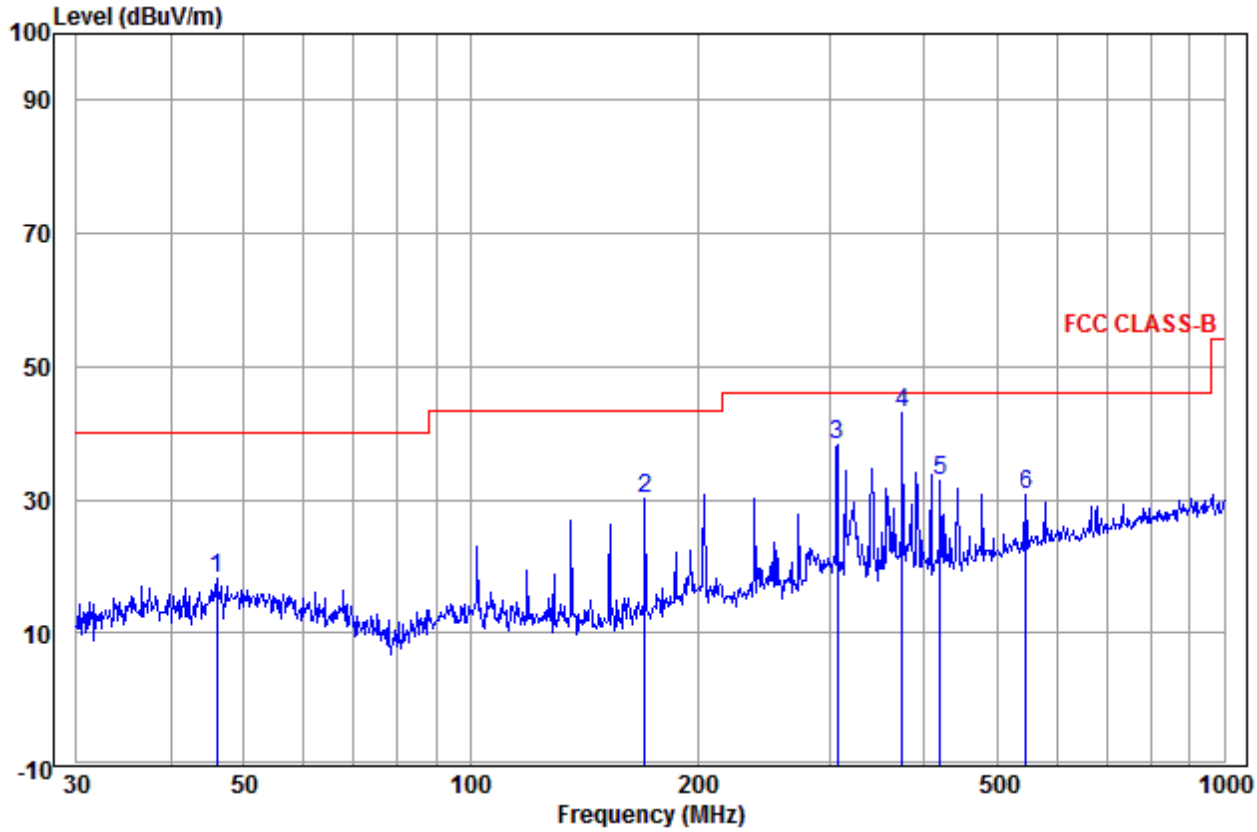
Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Radiated Spurious Emissions test Data:

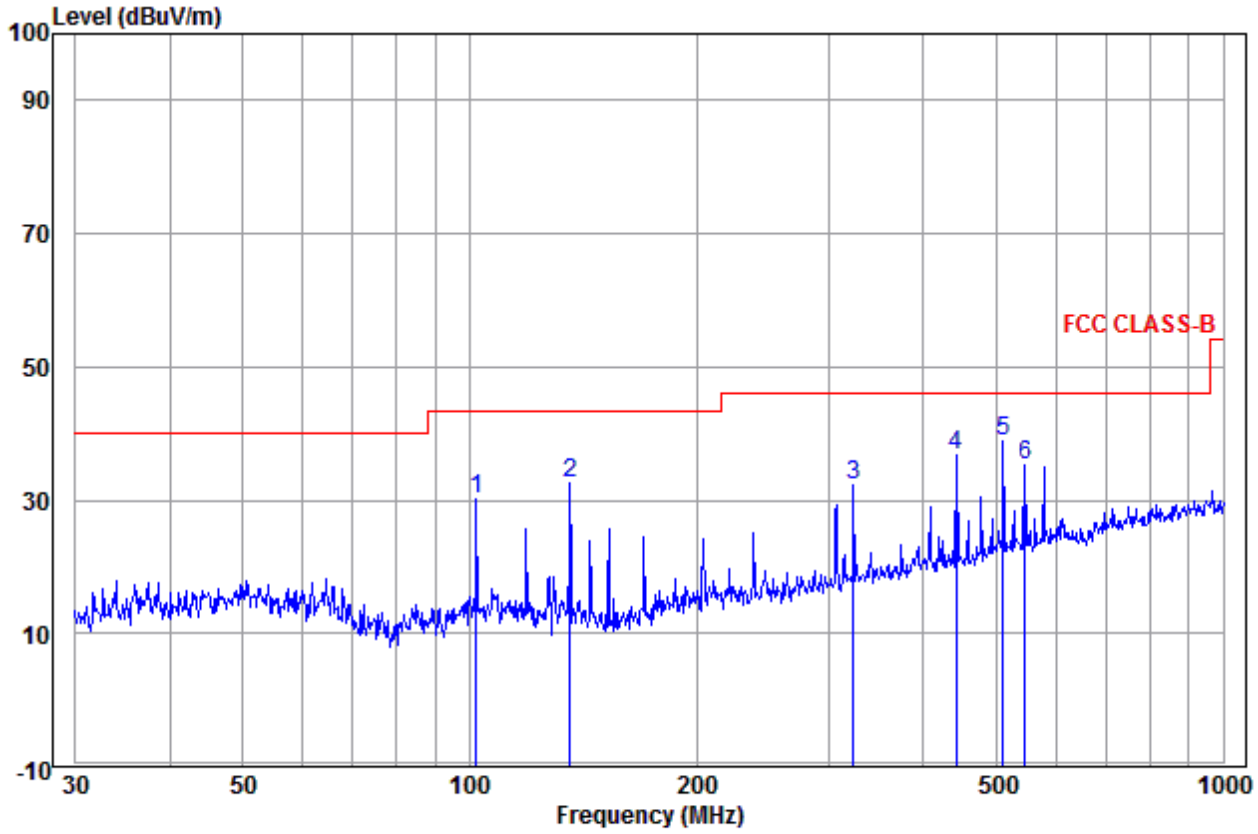
Radiated Emission below 1GHz

30MHz~1GHz (QP)		
Test mode:	Transmitting	Horizontal



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	46.016	12.97	0.09	5.23	18.29	40.00	-21.71	Horizontal	
2	170.195	9.20	0.83	20.17	30.20	43.50	-13.30	Horizontal	
3	306.754	13.64	1.11	23.46	38.21	46.00	-7.79	Horizontal	
4 pp	374.623	15.01	1.32	26.69	43.02	46.00	-2.98	Horizontal	
5	420.580	15.84	1.38	15.66	32.88	46.00	-13.12	Horizontal	
6	545.183	17.93	1.54	11.32	30.79	46.00	-15.21	Horizontal	

Test mode:	Transmitting	Vertical



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	102.001	10.94	0.59	18.55	30.08	43.50	-13.42	Vertical	
2	135.982	8.60	0.61	23.47	32.68	43.50	-10.82	Vertical	
3	323.320	13.99	1.19	16.96	32.14	46.00	-13.86	Vertical	
4	441.743	16.17	1.45	19.28	36.90	46.00	-9.10	Vertical	
5 pp	510.044	17.37	1.52	20.06	38.95	46.00	-7.05	Vertical	
6	545.183	17.93	1.54	15.69	35.16	46.00	-10.84	Vertical	

Note:

1) Through Pre-scan transmitting mode with all kind of modulation and all kind of data type, find the worse case is GFSK modulation type

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

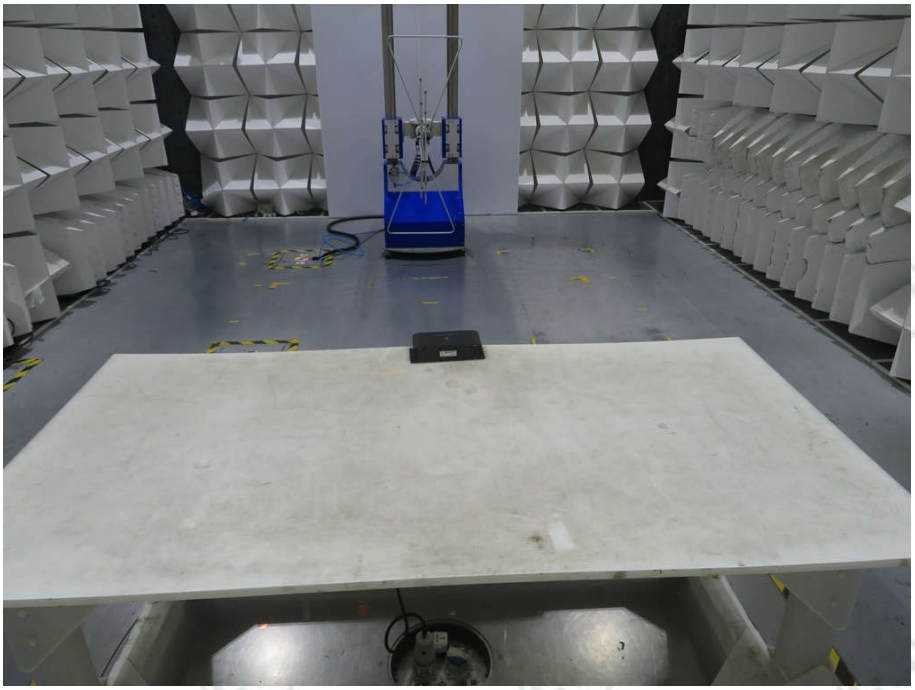
3)This test report (Ref. No.: EED32J00067902) is only valid with the test report (Ref. No.: EED32H000844-2). According to the declaration from the applicant, two models were same RF module. Their electriacl circuit design, layout, components used and internal wiring are idetical. Apart from the removal of the VIDEO OUT terminal (which is not used in the MM80-HR) and associated update to the software.Therefore in this report only

Radiated Spurious emissions below 1GHz was retested on model MM80-HR and shown the data in this report, other tests please refer to original report EED32H000844-2

4) Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

PHOTOGRAPHS OF TEST SETUP

Test model No.: MM80-HR



Radiated spurious emission Test Setup-1(Below 1GHz)

PHOTOGRAPHS OF EUT Constructional Details

Refer to Report No.EED32J00067901 for EUT external and internal photos.

*** End of Report ***