



FCC 47 CFR PART 15 SUBPART B TEST REPORT FOR

Innovative Input Device

Model : Orbital2

Issued to

BRAIN MAGIC Inc.

**3F TBS Akebonobashi Building, 15-53 Funamachi, Shinjuku-ku, Tokyo,
160-0006, Japan**

Issued by

WH Technology Corp.



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REVISION HISTORY

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	Aug. 09, 2021	Initial Issue	ALL	Maggie



1. GENERAL INFORMATION

Applicant : BRAIN MAGIC Inc.
Address : 3F TBS Akebonobashi Building, 15-53 Funamachi,
Shinjuku-ku, Tokyo, 160-0006, Japan
Manufacturer : BRAIN MAGIC Inc.
Address : 3F TBS Akebonobashi Building, 15-53 Funamachi,
Shinjuku-ku, Tokyo, 160-0006, Japan
EUT : Innovative Input Device
Model Name : Orbital2
FCC ID : 2AYTE-O2
Model difference : N/A
Receipt Date : July. 16, 2021
Final Test Date : Aug. 09, 2021

Is herewith confirmed to comply with the requirements set out in the FCC Rules and Regulations described below and the measurement procedures were according to ANSI C63.4-2014. The said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.


FCC 47 CFR Part 15 Subpart B

Class B

Tested By:

Reviewed by:

Aug. 09, 2021
(Date)


Bing/Project Engineer

Aug. 09, 2021
(Date)


Bell/Manager

FCC Designation Number: TW1083



1.1 DESCRIPTION OF THE TESTED SAMPLES

EUT Name : Innovative Input Device

Model Number : Orbital2

Receipt Date : 07/16/2021

EUT Power Rating : ☐ AC
☐ DC 12V
☒ DC 5V from PC
☐ from Adaptor

EUT highest operating frequency : 48 MHz

EUT Covered : N/A

I/O Port of EUT : Micro USB Port*1

**1.2 SUMMARY OF TEST RESULT****Test Result measurement is not including uncertainty.**

Emission				
Test Standard	Test Item	Limit	Test Result	Remark
FCC 47 CFR Part 15 Subpart B:2018	Conducted emission	Class B	PASS	NOTE (3)
	Radiated emission Below 1 GHz	Class B	PASS	
	Radiated emission Above 1 GHz	Class B	N/A	NOTE (2)

NOTE:

- 1) "N/A" denotes test is not applicable in this Test Report.
- 2) If the EUT's highest operating frequency does not exceed 108 MHz, the test will not be performed.
- 3) The conducted emission measurement was carried out at the AC port of the host PC since the EUT is supplied the DC power from the USB port of the host PC.



1.3 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

- ☐ **C01:** 7F., No.262, Sec. 3, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan, (R.O.C.)
- ☒ **C02:** No. 67-22, Baoxin St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Conducted emission at telecommunication ports Test:

- ☐ **C01:** 7F., No.262, Sec. 3, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan, (R.O.C.)
- ☐ **C02:** No. 67-22, Baoxin St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Below 1 GHz):

- ☐ **OS01:** No.120, Ln. 5, Hudong St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
- ☒ **CB02:** No. 67-22, Baoxin St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

- ☐ **OS01:** No.120, Ln. 5, Hudong St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
- ☐ **CB02:** No. 67-22, Baoxin St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

The immunity test:

No. 67-22, Baoxin St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)



1.4 TEST METHODOLOGY

EUT SYSTEM OPERATION

1. EUT is fully system and power on.
2. Exercise software is EMCTEST and run Scrolling H Pattern.
3. Perform the EMC testing procedures, and measure the maximum emission noise.

DESCRIPITON OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1(worst)	Full System

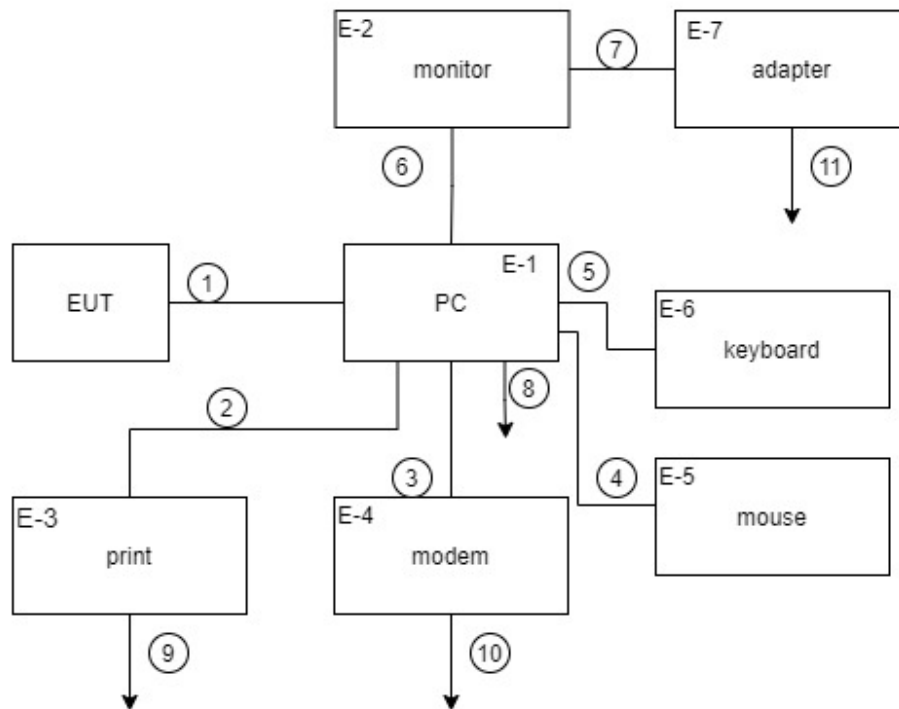
Conducted emission test	
Final Test Mode	Description
Mode 1(worst)	Full System

Radiated emission test	
Final Test Mode	Description
Mode 1(worst)	Full System



1.5 DESCRIPTION OF THE SUPPORT EQUIPMENTS
Setup Diagram

Mode 1



**Support Equipment**

OUTSIDE SUPPORT EQUIPMENT					
No.	Equipment	Model	Serial No.	FCC ID/BSMI ID	Trade name
E-1	PC	S340MC	NA	DOC/ BSMI:R31018	ASUS
E-2	Monitor	288E2	NA	DOC/ BSMI:R33037	PHILIP
E-3	Printer	SNPRH-1504-0 1	CN86A471WN	DOC/ BSMI:R3A304	HP
E-4	Modem	2FXS/2FXO	F09NH5910	DOC	ADi
E-5	Mouse	MS116p	CN-04DWDN-73826-5 CM-0120	DOC/ BSMI:R41108	DELL
E-6	Keyboard	KB216p	CN-005TW2-71581-5 AF-01I3-A01	DOC/ BSMI:D41108	DELL
E-7	Adapter	ADPC2065	NA	DOC/ BSMI:R33037	PHILIP

List of Used Cables under Test

Item	Type	Length (m)	Shielding (Yes/No)	Cores (Qty)	Remark
①	Micro USB Cable	1.0	Yes	0	Accessory of EUT.
②	USB Cable	1.8	Yes	0	Provided by Lab.
③	RS232 Cable	1.8	Yes	0	Provided by Lab.
④	USB Cable	1.8	Yes	0	Provided by Lab.
⑤	USB Cable	1.8	Yes	0	Provided by Lab.
⑥	HDMI Cable	1.8	Yes	0	Provided by Lab.
⑦	DC Cable	0.5	No	0	Provided by Lab.
⑧	PC AC Cable	1.8	No	0	Provided by Lab.
⑨	Printer AC Cable	1.8	No	0	Provided by Lab.
⑩	Modem AC Cable	1.8	No	1	Provided by Lab.
⑪	Monitor Adapter AC Cable	1.8	No	0	Provided by Lab.

Note:

- (1) The support equipment was authorized by Declaration of conformity (DOC).
- (2) All the above equipment/cable were placed in worse case position to maximize emission signals during emission test.
- (3) Grounding was established in accordance with the manufacturer's requirement and conditions for the intended use.

**1.6 FEATURES OF EUT:**

Please refer to user manual or product specification.

2. INSTRUMENT AND CALIBRATION**2.1 MEASURING INSTRUMENT CALIBRATION**

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

2.2 TEST AND MEASUREMENT EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR16-1-1:2010-11, ANSI C63.2 and. Other required standards. Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

TABLELIST OF TEST AND MEASUREMENT EQUIPMENT

Conducted emission					
Instrument	Manufacturer	Model No.	Serial No.	Cali Date	Cali Due Date
EMI Test Receiver	R&S	ESHS30	838550/003	2020/09/02	2021/09/01
Spectrum Analyzer	R&S	FSP7	830180/009	2020/09/01	2021/08/31
LISN	Schwarzbeck	NNLK 8121	8121#734	2021/07/24	2022/07/23
LISN	R&S	NNB-2/16z	98062	2020/08/16	2021/08/15
Test Cable	EMCI	EMCCFD300-B M-BM-3000	180618	2020/09/04	2021/09/03
Measurement Software	AUDIX	e3	V9.160707	N/A	N/A
Radiated emission Below 1GHz					
Instrument	Manufacturer	Model No.	Serial No.	Cali Date	Cali Due Date
Bilog antenna	SUNOL SCIENCES	JB1	1546A013004-1	2021/08/06	2022/08/05
Pre-amplifier	Anritsu	MH648A	M15180	2020/09/24	2021/09/23
Cable	EMCI	EMCCFD400-N M-NM-7000	180617	2020/09/24	2021/09/23
Cable	Marvelous Microwave	260260.F141	120A	2020/09/24	2021/09/23
Receiver	R&S	ESCI3	101131	2020/09/23	2021/09/22
Measurement Software	AUDIX	e3	V9.160707	N/A	N/A



Remark: "N/A" denotes No Model Name, No Serial No. or No Calibration specified.

2.3 TEST PERFORMED

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a receiver which resolution bandwidth is set at 9 kHz.

Radiated emissions were investigated over the frequency range from 30 MHz to 1000 MHz using a receiver which resolution bandwidth is set at 120 kHz. Radiated measurement was performed at distance that from an antenna to EUT is 3 meters.

2.4 APPENDIX

Appendix A: Measurement Procedure for Main Power Port Conducted Emissions

The measurements are performed in a WH lab test room; The EUT was placed on non-conductive 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50 ohm/50 uH) vs. Frequency Characteristic in accordance with the standard. Powers to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

If the EUT is supplied with a flexible power cord, the power cord length in excess of the distance separating the EUT from the LISN shall be folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall not be longer than 1 meter. The excess power cord shall be bundled as described above. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, hot and neutral, was measured.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

Appendix B: Test Procedure for Radiated Emissions

Preliminary Measurements in 743 Semi Anechoic Chamber

The radiated emissions are initially measured in the anechoic chamber at a measurement distance of 3 meters. Desktop EUT are placed on a wooden stand 0.8 meter in height. The measurement antenna is 3 meters from the EUT. The test setup in anechoic chamber is the same as open site. The turntable rotated 360°C. The antenna height is 1m. The primary



objective of the radiated measurements in the anechoic chamber is to identify the frequency spectrum in the absence of the electromagnetic environment existing on the open test site. The frequencies can then be pre-selected on the open test site to obtain the corresponding amplitude. The initial scan is made with the spectrum analyzer in automatic sweep mode. The spectrum peaks are then measured manually to determine the exact frequencies.

Measurements on the Open Site or 1166 Semi Anechoic Chamber

The radiated emissions test will then be repeated on the open site or chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipments are set up on the turntable. Desktop EUT are set up on a wooden stand 0.8 meter above the ground.

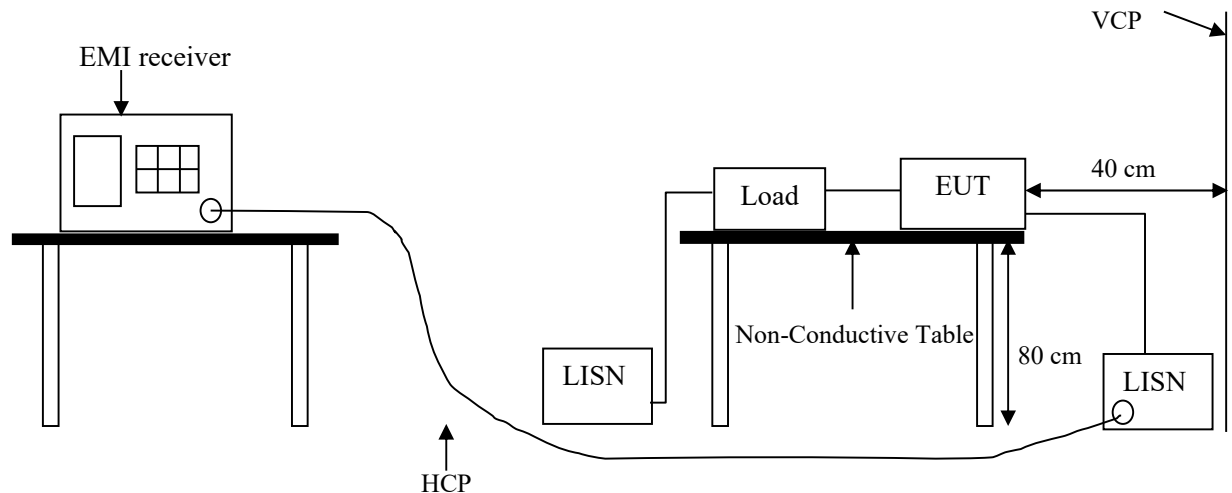
For the initial measurements, the receiving antenna is varied from 1-4-meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. Both reading is recorded with the quasi-peak detector with 120 kHz bandwidth. For frequency between 30 MHz and 1000 MHz, the reading is recorded with peak detector or quasi-peak detector.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.



3. CONDUCTED EMISSION MEASUREMENT

3.1 TEST SET-UP



3.2 LIMIT

Frequency range (MHz)	CLASS A		CLASS B	
	QP (dBμV)	Average (dBμV)	QP (dBμV)	Average (dBμV)
0.15 – 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 – 30	73	60	60	50

NOTE:

- 1) In the above table, the tighter limit applies at the band edges.
- 2) The test result calculated as following:
Level Value = Reading Level + Factor
Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
Over Limit Value = Level Value – Limit Value



3.3 TEST PROCEDURE

Please refer to

Appendix A: Measurement Procedure for Main Power Port Conducted Emissions
Note:

1. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
2. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn't perform.

3.4 TEST SPECIFICATION

According to ANSI C63.4-2014 Section 5.2, 7.1, 7.2 and FCC Part 15 Subpart B Class B.

(Please refer to Page 4 for dated references which are related to the standard as mentioned above)

3.5 RESULT: PASSED

Model Name	Orbital2
Test Voltage	AC 120V/60Hz
Temperature:	25 °C
Humidity:	50 % RH

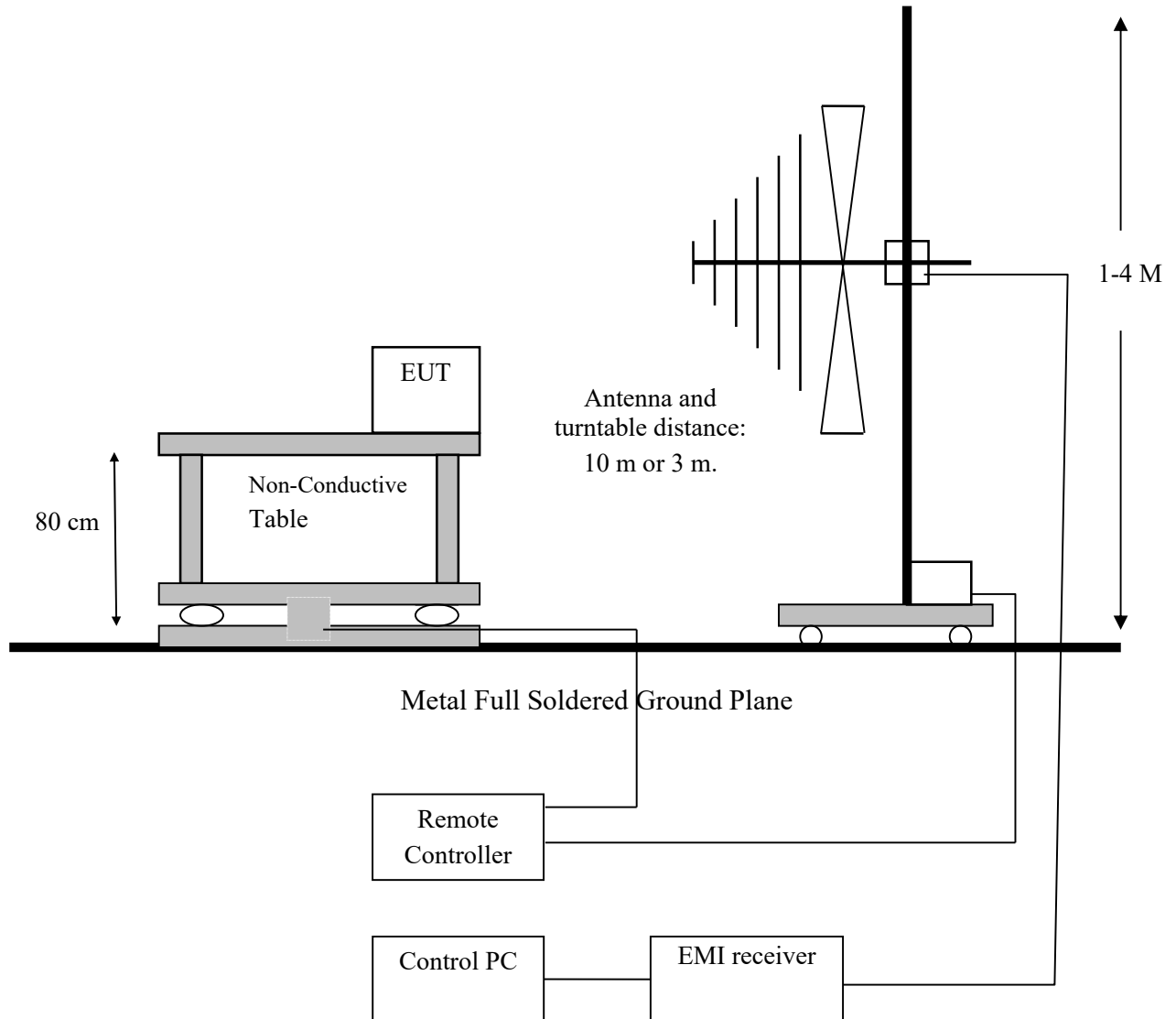
3.6 TEST DATA:

Please refer to APPENDIX 1.



4. RADIATED EMISSION MEASUREMENT

4.1 TEST SETUP





4.2 LIMIT

Frequency	Class A at 10m		Class B at 3m	
MHz	Field Strength ($\mu\text{V/m}$)	Quasi-peak (dB $\mu\text{V/m}$)	Field Strength ($\mu\text{V/m}$)	Quasi-peak (dB $\mu\text{V/m}$)
30 ~ 88	90	39.08	100	40
88 ~ 216	150	43.52	150	43.52
216 ~ 960	210	46.44	200	46.02
960 above	300	49.54	500	53.98

Frequency	Class A at 10m	Class B at 10m
MHz	Quasi-peak (dB $\mu\text{V/m}$)	Quasi-peak (dB $\mu\text{V/m}$)
30 ~ 230	40	30
230 ~ 1000	47	37

NOTE:

- 1) According to FCC 47 CFR Part 15 § 15.109(g) as refer to CISPR 22 Limits and method of measurement.

Frequency range (GHz)	Class A at 3m		Class B at 3m	
	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)
1 ~ 6	60	80	54	74

NOTE:

- 1) In the above table, the tighter limit applies at the band edges.
- 2) The test result calculated as following:
Level Value = Reading Level + Factor
Factor = Antenna Factor + Cable Loss – Amplifier Gain (if use)
Over Limit Value = Level Value – Limit Value

4.3 TEST PROCEDURE

Please refer to

Appendix B: Test Procedure for Radiated Emissions

Note:

(Below 1 GHz)

1. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz.



2. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

(Above 1 GHz)

1. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW=1 MHz, VBW= 1MHz.

Reading in which marked as AV means measurements by using are Average Mode with instruments setting in RBW=1 MHz, VBW= 10Hz.

2. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform.

4.4 TEST SPECIFICATION

According to ANSI C63.4-2014 Section 5.2, 7.1, 7.2 and FCC Part 15 Subpart B Class B.

(Please refer to Page 4 for dated references which are related to the standard as mentioned above)

4.5 RESULT: PASSED

Model Name	Orbital2
Test Voltage	AC 120V/60Hz
Temperature:	20 °C
Humidity:	50 % RH

4.6 TEST DATA:

Please refer to APPENDIX 1.



5. MEASUREMENT UNCERTAINTY

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2: 2011-06. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of **$k=2$**

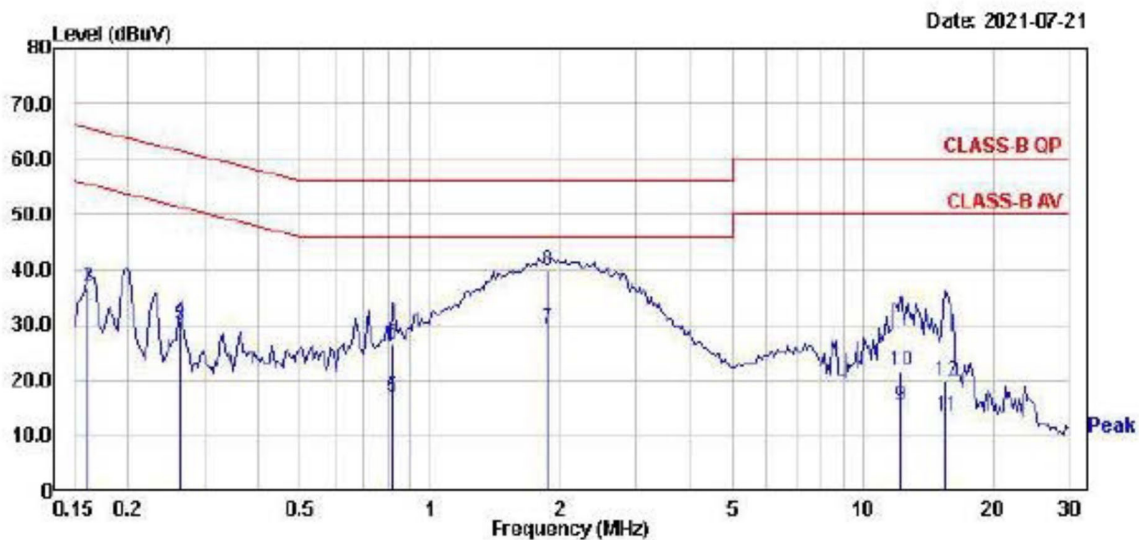
The uncertainties value is not used in determining the PASS/FAIL results.

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30 MHz	LINE/NEUTRAL	3.54 dB
Radiated Emission	Below 1GHz	Horizontal	2.81 dB
		Vertical	4.01 dB
	Above 1GHz	Horizontal	4.64 dB
		Vertical	5.16 dB



APPENDIX 1
TEST DATA
Test Data – Conducted Emission

Phase: L

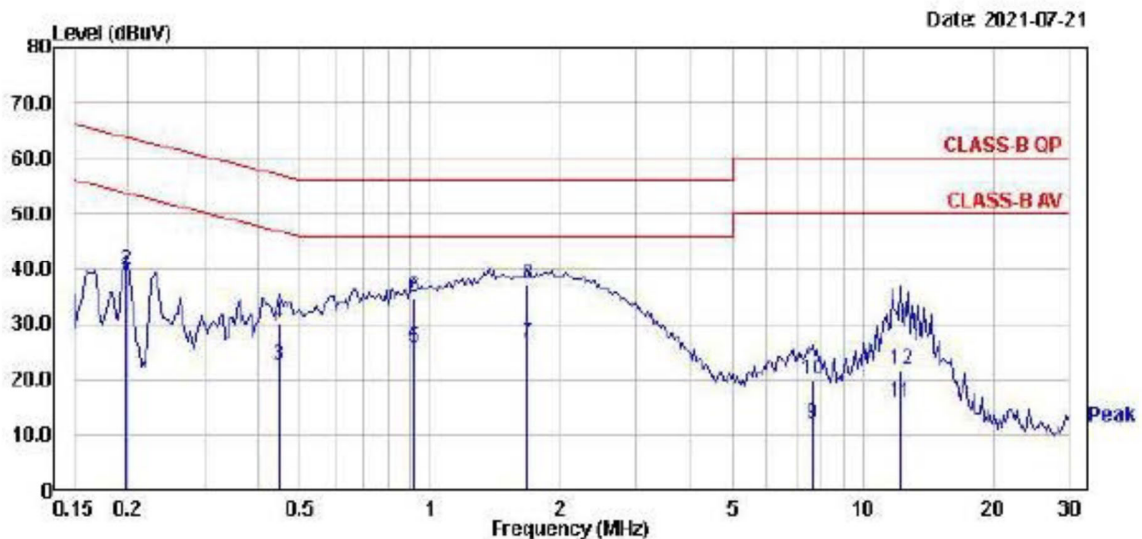


Site : C02
Condition : CLASS-B QP CON-NNLK8121-L1-109 Line
: DET:Peak
EUT : Orbital2
Power : 120VAC 60Hz
Mode : FULL SYSTEM
Temperature: 25
Humidity : 50

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.162	32.77	0.02	32.79	55.38	-22.59	Average
2	0.162	36.76	0.02	36.78	65.38	-28.60	QP
3	0.263	29.99	0.02	30.01	51.34	-21.33	Average
4	0.263	30.86	0.02	30.88	61.34	-30.46	QP
5	0.817	16.79	0.05	16.84	46.00	-29.15	Average
6	0.817	26.65	0.05	26.70	56.00	-29.30	QP
7	1.868	29.23	0.09	29.32	46.00	-16.68	Average
8	1.868	39.61	0.09	39.70	56.00	-16.30	QP
9	12.188	15.05	0.34	15.39	50.00	-34.61	Average
10	12.188	21.27	0.34	21.61	60.00	-38.39	QP
11	15.552	13.15	0.40	13.55	50.00	-36.45	Average
12	15.552	19.52	0.40	19.92	60.00	-40.08	QP



Phase: N



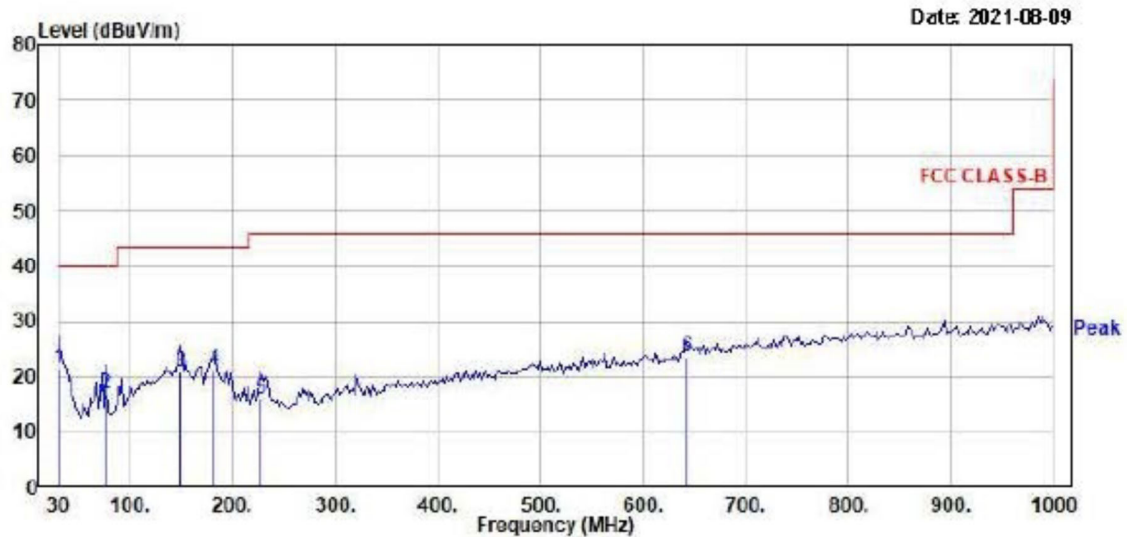
Site : C02
Condition : CLASS-B QP CON-NNLK8121-N-109 Neutral
DET:Peak
EUT : Orbital2
Power : 120VAC 60Hz
Mode : FULL SYSTEM
Temperature: 25
Humidity : 50

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV		dB	dBuV	dB	
1	0.198	38.47	0.04	38.51	53.71	-15.20	Average
2	0.198	39.86	0.04	39.90	63.71	-23.81	QP
3	0.447	22.58	0.05	22.63	46.93	-24.30	Average
4	0.447	30.22	0.05	30.27	56.93	-26.66	QP
5	0.918	25.53	0.07	25.60	46.00	-20.40	Average
6	0.918	34.70	0.07	34.77	56.00	-21.23	QP
7	1.680	26.48	0.10	26.58	46.00	-19.42	Average
8	1.680	36.90	0.10	37.00	56.00	-19.00	QP
9	7.646	11.70	0.26	11.96	50.00	-38.04	Average
10	7.646	19.78	0.26	20.04	60.00	-39.96	QP
11	12.188	15.77	0.35	16.12	50.00	-33.88	Average
12	12.188	21.33	0.35	21.68	60.00	-38.32	QP



Test Data – Radiated Emission-Below 1GHz

Polarization: Horizontal

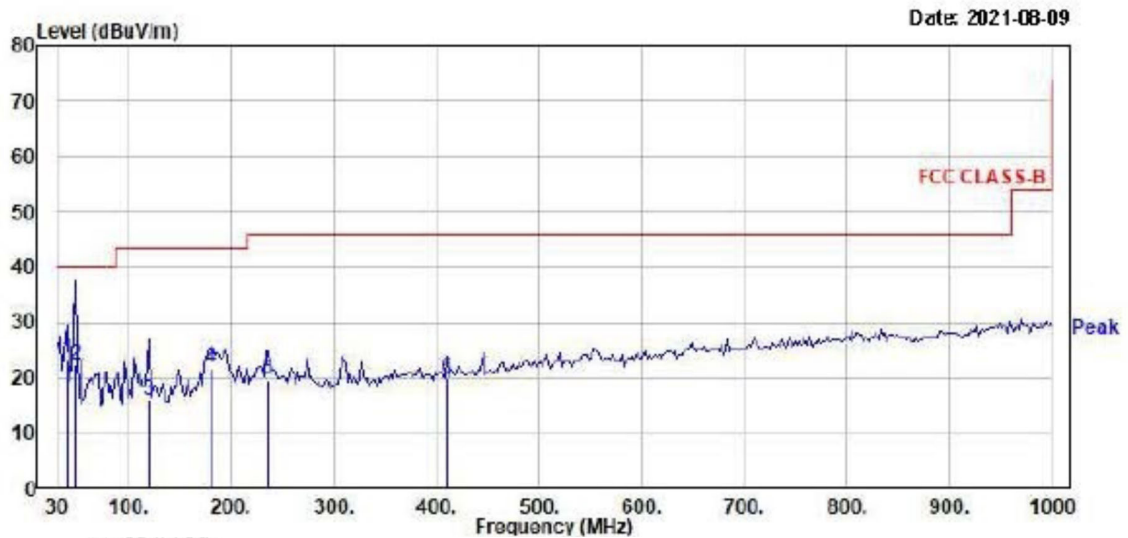


Site : CB02(1166)
Condition : horizontal
: DET:Peak
EUT : Orbital2
Power : 120VAC/60Hz
Mode : Full System
Temperature: 20
Humidity : 50

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	APos	TPos	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	30.176	23.58	-2.28	21.30	40.00	-18.70	100	118	QP
2	76.335	32.85	-15.93	16.92	40.00	-23.08	200	80	QP
3	149.017	31.66	-10.93	20.73	43.50	-22.77	200	0	QP
4	181.662	32.99	-12.00	20.99	43.50	-22.51	200	264	QP
5	228.014	27.68	-11.70	15.98	46.00	-30.02	200	108	QP
6	643.285	25.81	-2.39	23.42	46.00	-22.58	100	217	QP



Polarization: Vertical



Site : CB02(1166)
Condition : vertical
: DET:Peak
EUT : Orbital2
Power : 120VAC/60Hz
Mode : Full System
Temperature: 20
Humidity : 50

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	APos	TPos	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	40.214	32.95	-9.67	23.28	40.00	-16.72	100	324	QE
2	47.681	37.24	-14.91	22.33	40.00	-17.67	100	89	QE
3	120.058	25.82	-9.74	16.08	43.50	-27.42	200	93	QE
4	180.073	33.76	-12.00	21.76	43.50	-21.74	100	360	QE
5	236.027	31.08	-11.37	19.71	46.00	-26.29	100	10	QE
6	410.298	26.79	-6.86	19.93	46.00	-26.07	100	352	QE