

TEST REPORT

Reference No..... : WTX22X02015947W-3
FCC ID : 2AZQL-RANGEXTENDER
Applicant : Hydro Flow Products, LLC
Address : 1330 Ensell Rd., Lake Zurich, IL 60047
Manufacturer : The same as Applicant
Address : The same as Applicant
Product Name : Range Extender
Model No..... : RE001
Standards : **FCC PART15 SUBPART B**
Date of Receipt sample : 2022-05-28
Date of Test..... : 2022-05-28 to 2022-05-30
Date of Issue : 2022-05-30
Test Report Form No. : WTX_FCC PART15B_001
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

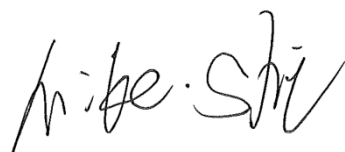
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Tested by:

Approved by:



Mike Shi



Silin Chen

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Report version

Version No.	Date of issue	Description
Rev.00	2022-05-30	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Range Extender
Trade Name:	/
Model No.:	RE001
Adding Model(s):	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Rated Voltage:	Battery:DC3.7V Wireless charging:DC5V
Rated Current:	/
Rated Power:	/
Power Adapter Model:	/
Lowest Internal Frequency:	32.768kHz
Highest Internal Frequency:	2480MHz
Classification of ITE:	Class B

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15 Subpart B:Unintentional Radiators.

ANSI C63.4-2014:American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List			
Test Mode	Description	Remark	Power Supply Mode
TM1	Wireless charging	Wireless charging mode	Battery:DC3.7V Wireless charging:DC5V
TM2	Normal working	Powered by battery	Battery:DC3.7V

EUT Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	With / Without Chip
/	/	/	/	/

Special Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	With / Without Chip
USB cable	1.0	Shielded	Without Ferrite	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Adapter	/	XY18W-1375-QC3.0	/
Wireless charger	/	WPC10-1MCNA	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Radiated Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
☒ Chamber A: Below 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2022-03-22	2023-03-21
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2022-03-22	2023-03-21
Amplifier	Agilent	8447F	3113A06717	2022-01-07	2023-01-06
Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2023-03-19
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-20	2023-03-19
☐ Chamber A: Above 1GHz					
Amplifier	C&D	PAP-1G18	2002	2022-03-22	2023-03-21
Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
☐ Chamber B: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2022-03-22	2023-03-21
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-04-09	2023-04-08
Amplifier	Agilent	8447D	2944A10179	2022-03-22	2023-03-21
☐ Chamber C: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2022-01-07	2023-01-06
Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2021-05-28	2023-05-27
Amplifier	HP	8447F	2944A03869	2022-03-22	2023-03-21
☒ Conducted Room 1#					
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2022-03-25	2023-03-24
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2022-03-22	2023-03-21
AC LISN	Schwarz beck	NSLK8126	8126-224	2022-03-22	2023-03-21
☐ Conducted Room 2#					
EMI Test Receiver	Rohde & Schwarz	ESPI	10129	2022-03-22	2023-03-21
LISN	Rohde & Schwarz	ENV 216	100097	2022-03-22	2023-03-21

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.107(a) Conducted Emission	Compliant
§15.109(a) Radiated Emission	Compliant

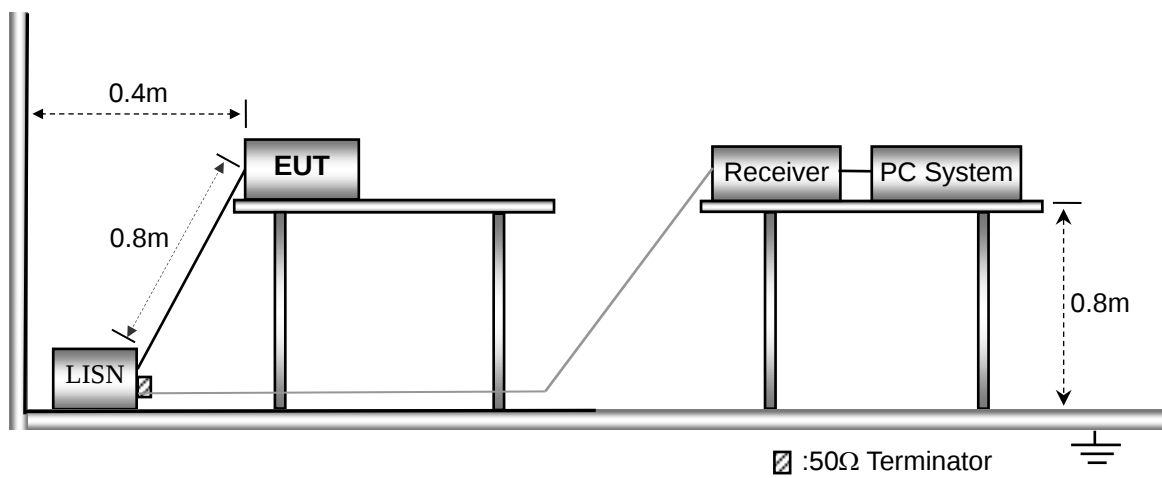
N/A: not applicable

3. Conducted Emissions

3.1 Test Procedure

The test is conducted under the description of ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

3.2 Basic Test Setup Block Diagram



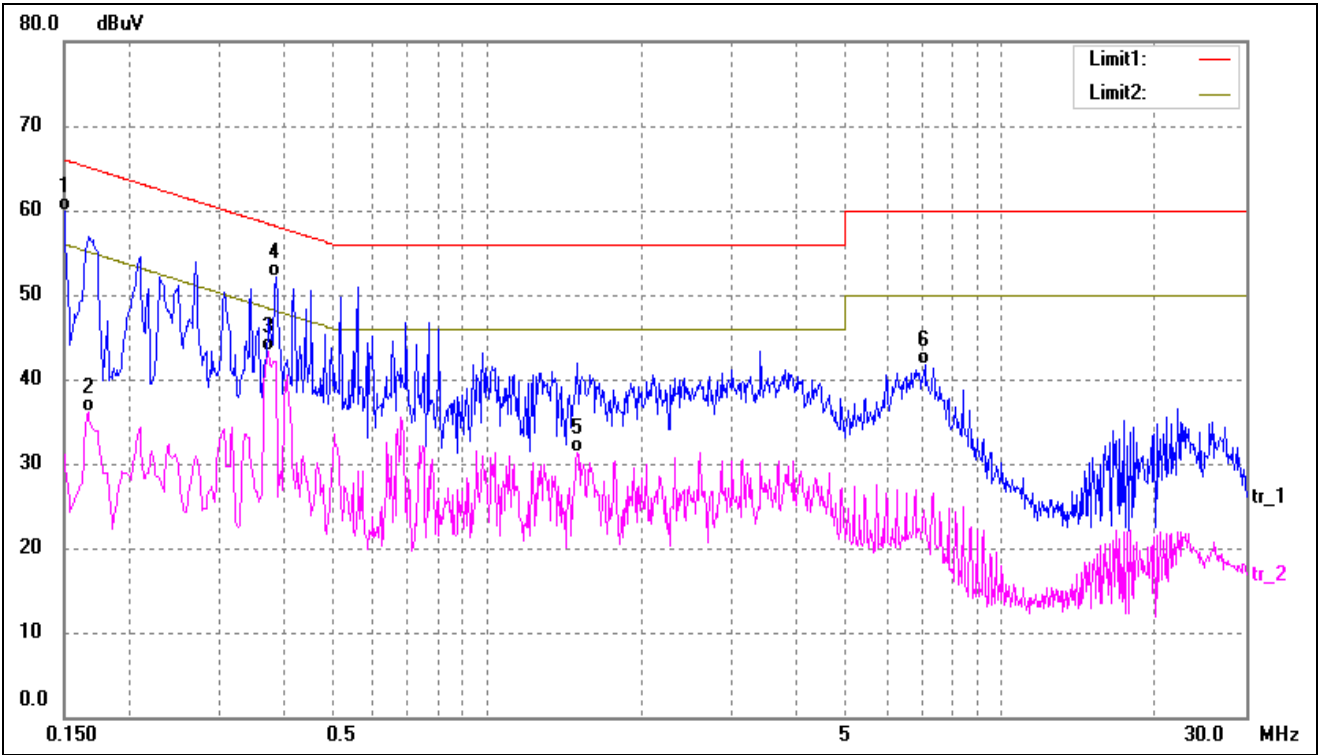
3.3 Environmental Conditions

Temperature:	23.5 °C
Relative Humidity:	54 %
ATM Pressure:	1014 mbar

3.4 Summary of Test Results

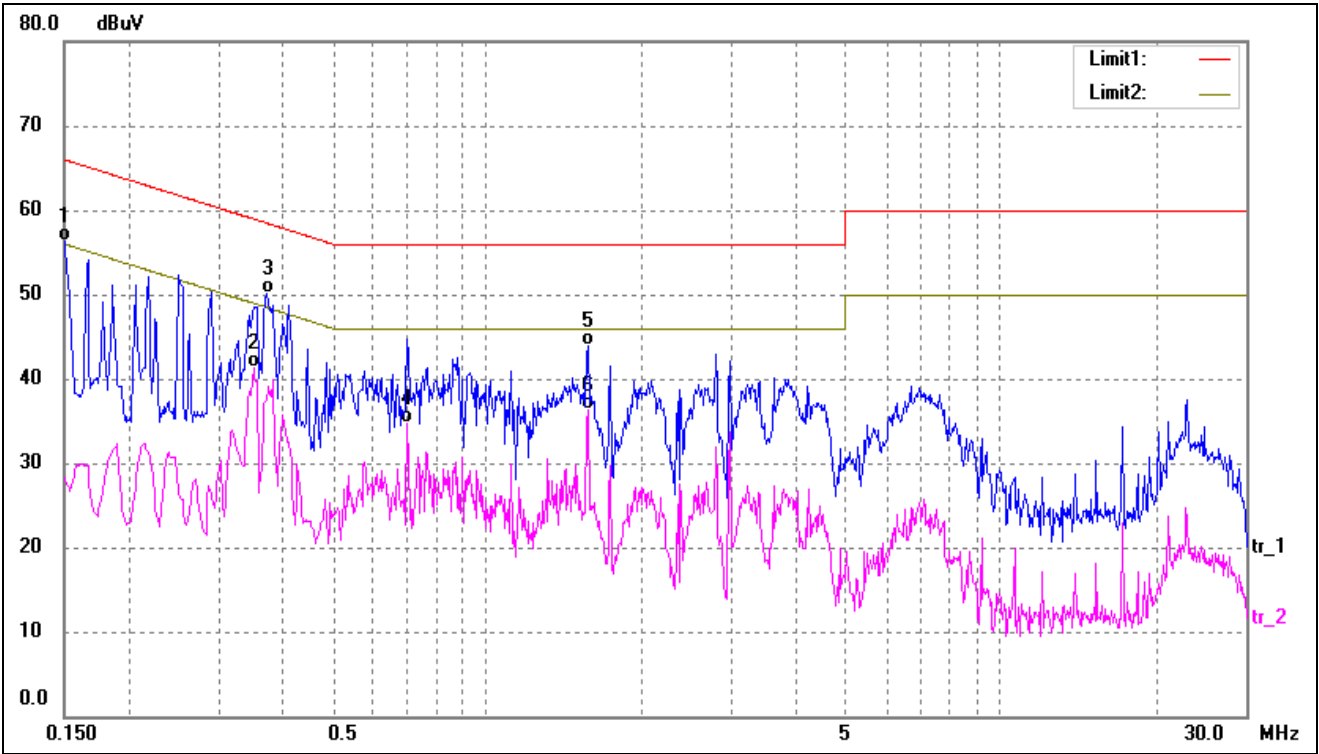
Please find the results below:

Test mode:	TM1	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	49.47	10.38	59.85	66.00	-6.15	QP
2	0.1660	25.74	10.37	36.11	55.16	-19.05	AVG
3*	0.3740	32.92	10.30	43.22	48.41	-5.19	AVG
4	0.3860	41.78	10.30	52.08	58.15	-6.07	QP
5	1.4980	21.01	10.35	31.36	46.00	-14.64	AVG
6	7.1020	31.68	9.95	41.63	60.00	-18.37	QP

Test mode:	TM1	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	45.91	10.38	56.29	66.00	-9.71	QP
2*	0.3500	30.95	10.32	41.27	48.96	-7.69	AVG
3	0.3700	39.79	10.30	50.09	58.50	-8.41	QP
4	0.6980	24.35	10.38	34.73	46.00	-11.27	AVG
5	1.5700	33.60	10.31	43.91	56.00	-12.09	QP
6	1.5700	25.92	10.31	36.23	46.00	-9.77	AVG

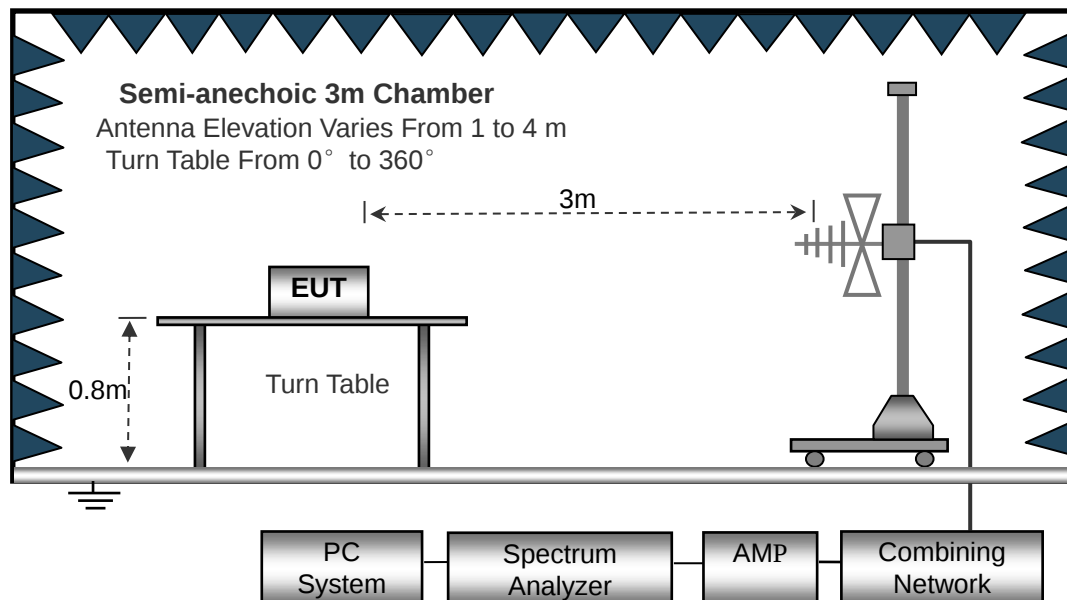
4. RADIATED EMISSION

4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.109 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

4.2 Block Diagram of Test Setup



4.3 Test Receiver Setup

Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\begin{aligned}\text{Corr. Ampl.} &= \text{Indicated Reading} + \text{Correct} \\ \text{Correct} &= \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}\end{aligned}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for a Class B device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.109(a) Limit}$$

4.5 Environmental Conditions

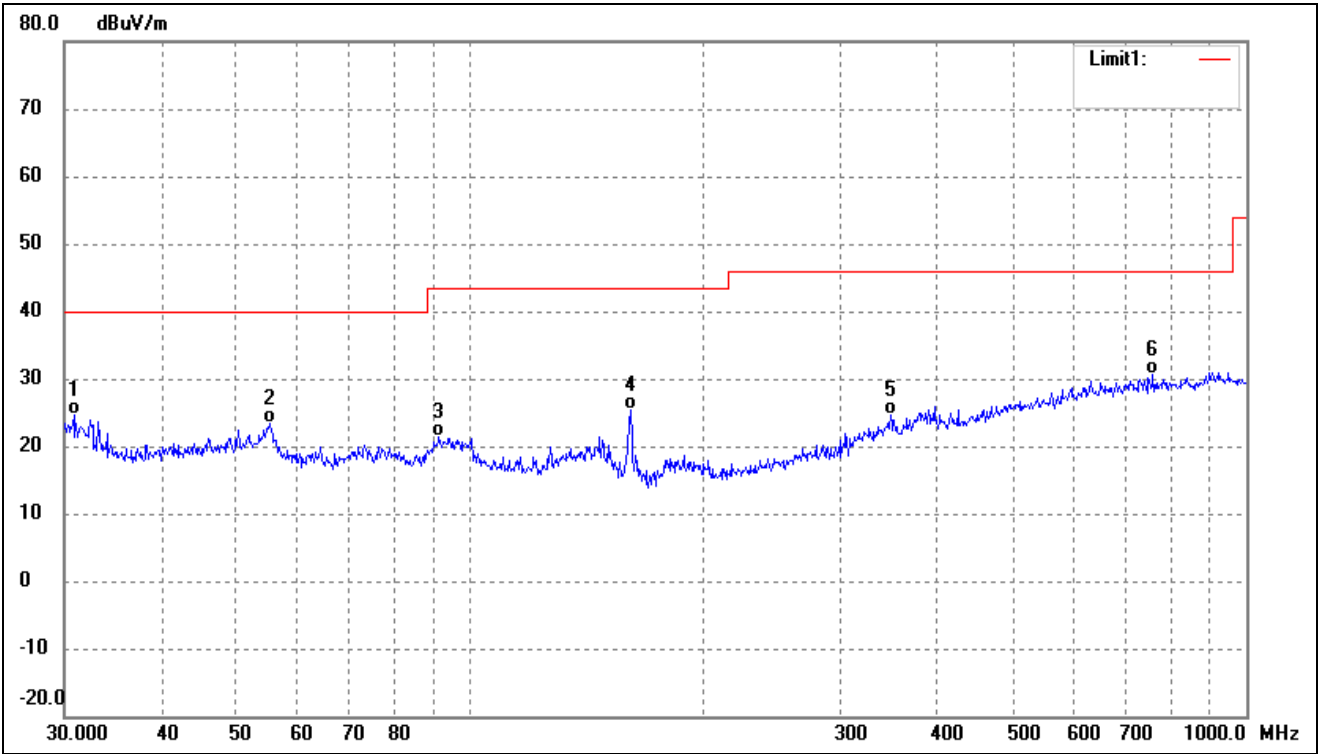
Temperature:	23.5°C
Relative Humidity:	54 %
ATM Pressure:	1011 mbar

4.6 Summary of Test Results

Please find the results below:

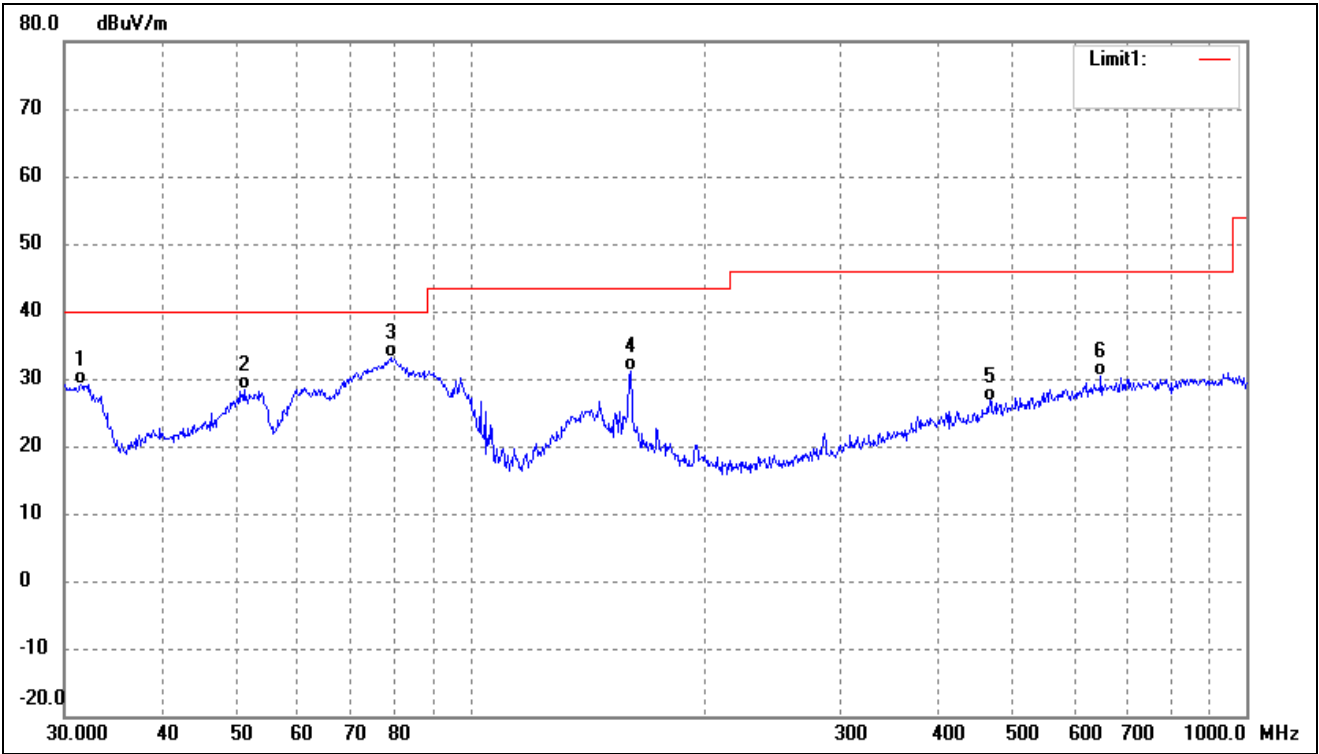
Below 1GHz

Test mode:	TM1	Polarity:	Horizontal
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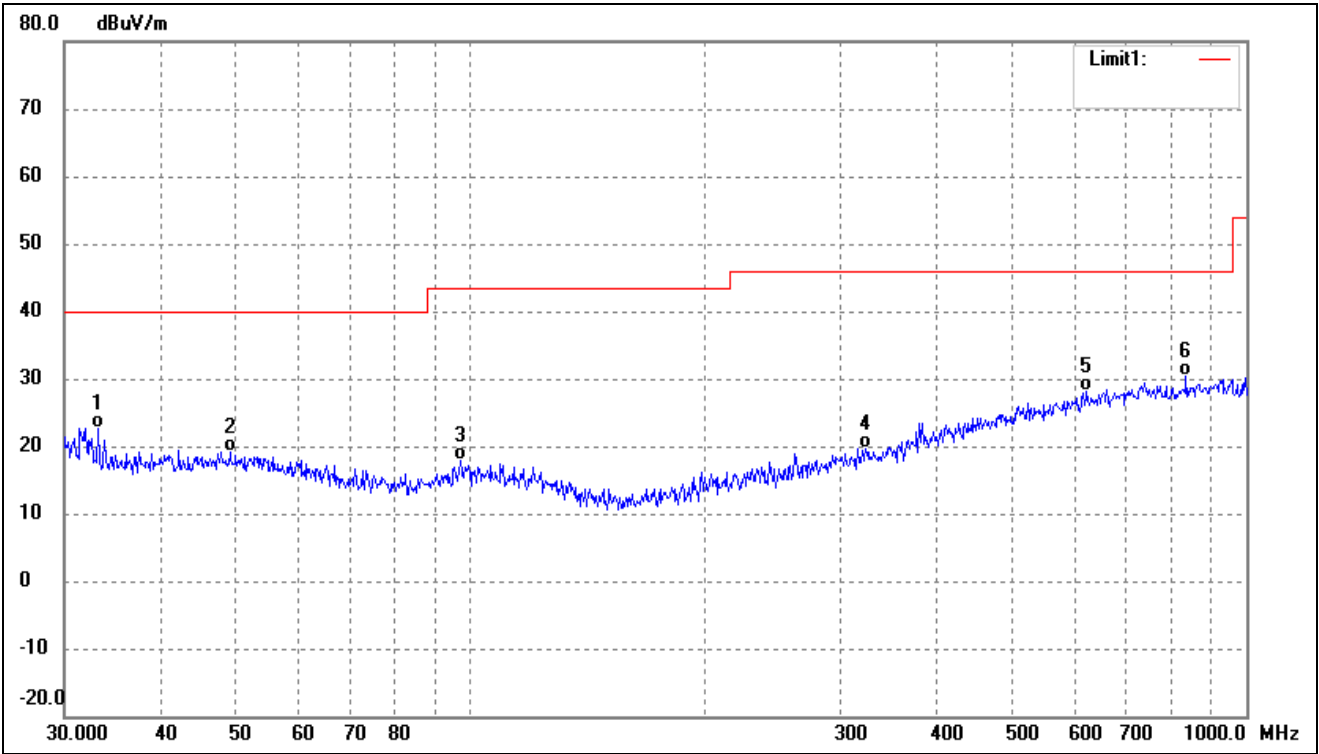
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	30.8535	33.77	-9.24	24.53	40.00	-15.47	-	-	QP
2	55.2207	31.09	-7.73	23.36	40.00	-16.64	-	-	QP
3	91.1746	31.64	-10.36	21.28	43.50	-22.22	-	-	QP
4	160.9089	37.55	-12.12	25.43	43.50	-18.07	-	-	QP
5	348.0274	30.08	-5.46	24.62	46.00	-21.38	-	-	QP
6	758.0408	28.87	1.82	30.69	46.00	-15.31	-	-	QP

Test mode:	TM1	Polarity:	Vertical
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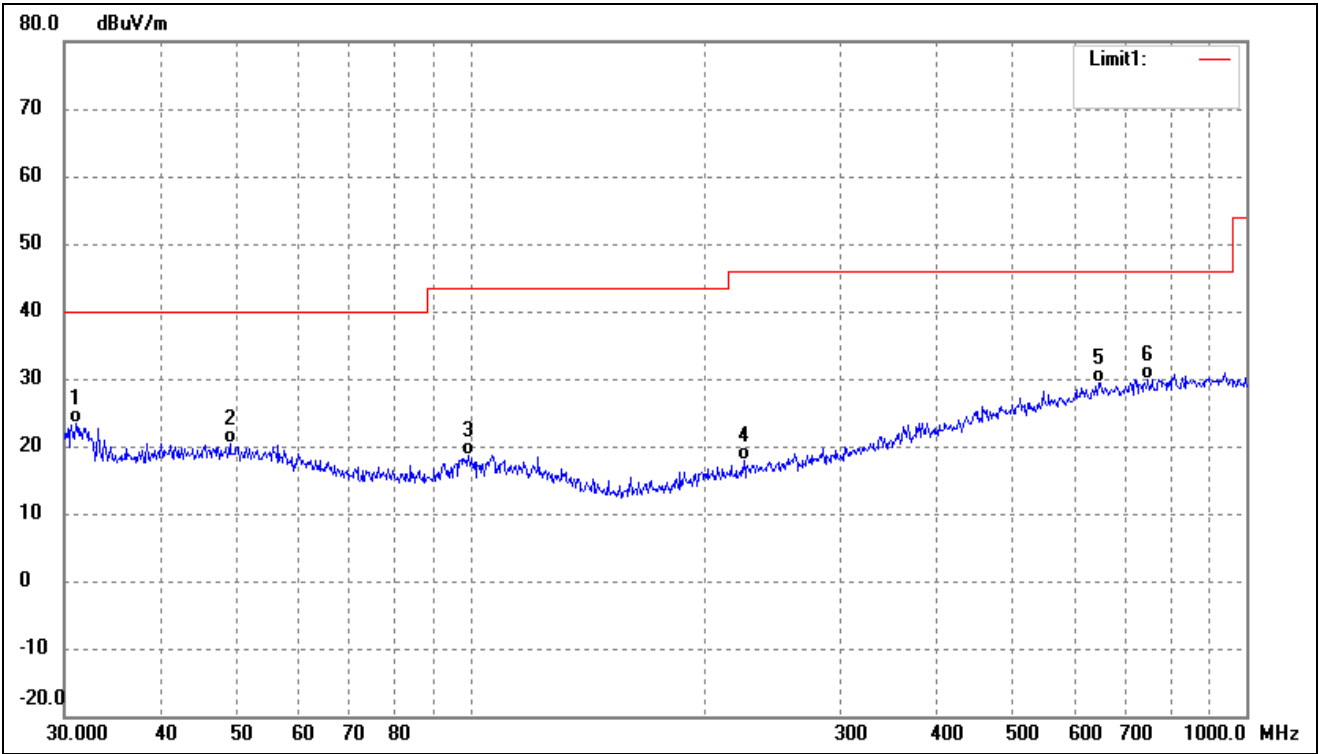
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	31.5095	38.19	-9.08	29.11	40.00	-10.89	-	-	QP
2	51.1209	35.45	-7.12	28.33	40.00	-11.67	-	-	QP
3	79.2426	43.74	-10.69	33.05	40.00	-6.95	-	-	QP
4	160.9089	43.19	-12.12	31.07	43.50	-12.43	-	-	QP
5	467.2349	28.88	-2.13	26.75	46.00	-19.25	-	-	QP
6	649.6597	29.40	0.92	30.32	46.00	-15.68	-	-	QP

Test mode:	TM2	Polarity:	Horizontal
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No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	33.2112	31.28	-8.67	22.61	40.00	-17.39	-	-	QP
2	49.0145	26.01	-6.96	19.05	40.00	-20.95	-	-	QP
3	97.1148	27.09	-9.26	17.83	43.50	-25.67	-	-	QP
4	323.3204	25.82	-6.23	19.59	46.00	-26.41	-	-	QP
5	622.8900	27.45	0.62	28.07	46.00	-17.93	-	-	QP
6	836.2443	28.16	2.30	30.46	46.00	-15.54	-	-	QP

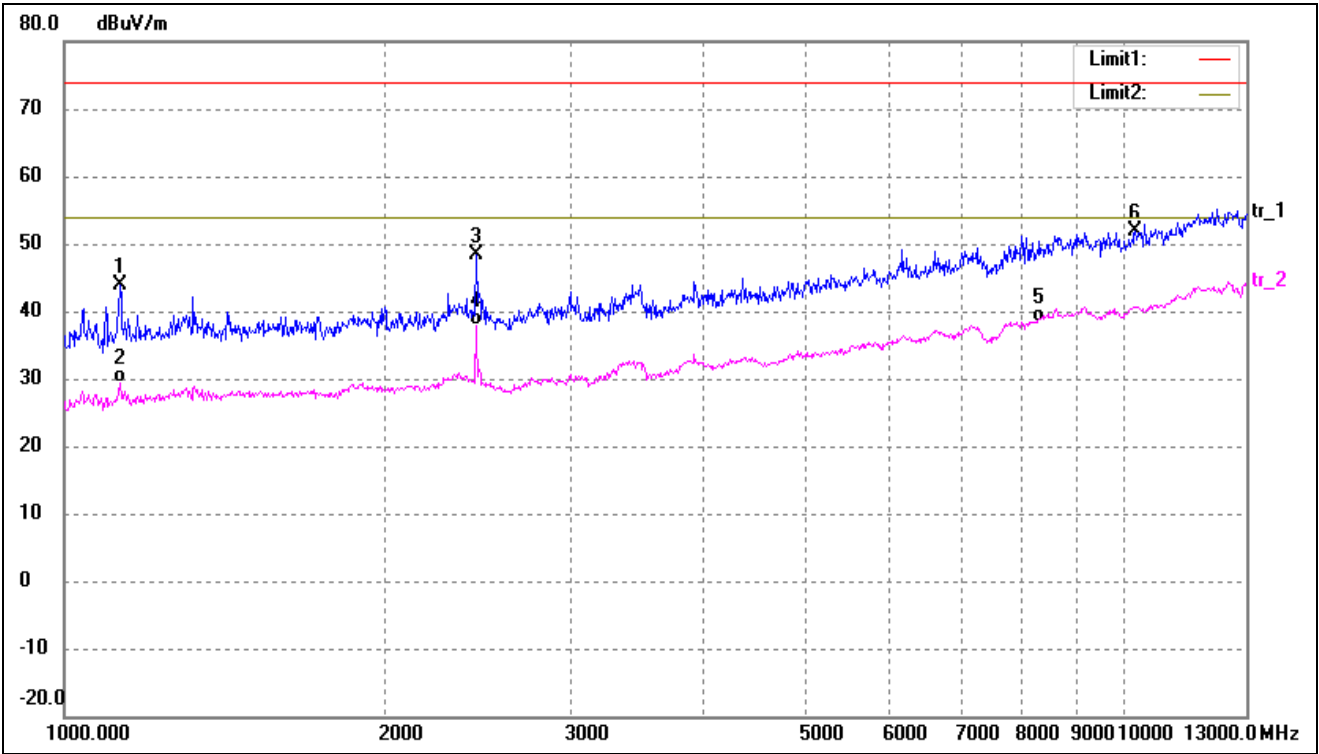
Test mode:	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	31.0706	32.62	-9.19	23.43	40.00	-16.57	-	-	QP
2	49.0145	27.34	-6.96	20.38	40.00	-19.62	-	-	QP
3	99.5281	27.51	-8.81	18.70	43.50	-24.80	-	-	QP
4	225.3080	26.77	-9.00	17.77	46.00	-28.23	-	-	QP
5	645.1195	28.58	0.87	29.45	46.00	-16.55	-	-	QP
6	747.4826	28.13	1.74	29.87	46.00	-16.13	-	-	QP

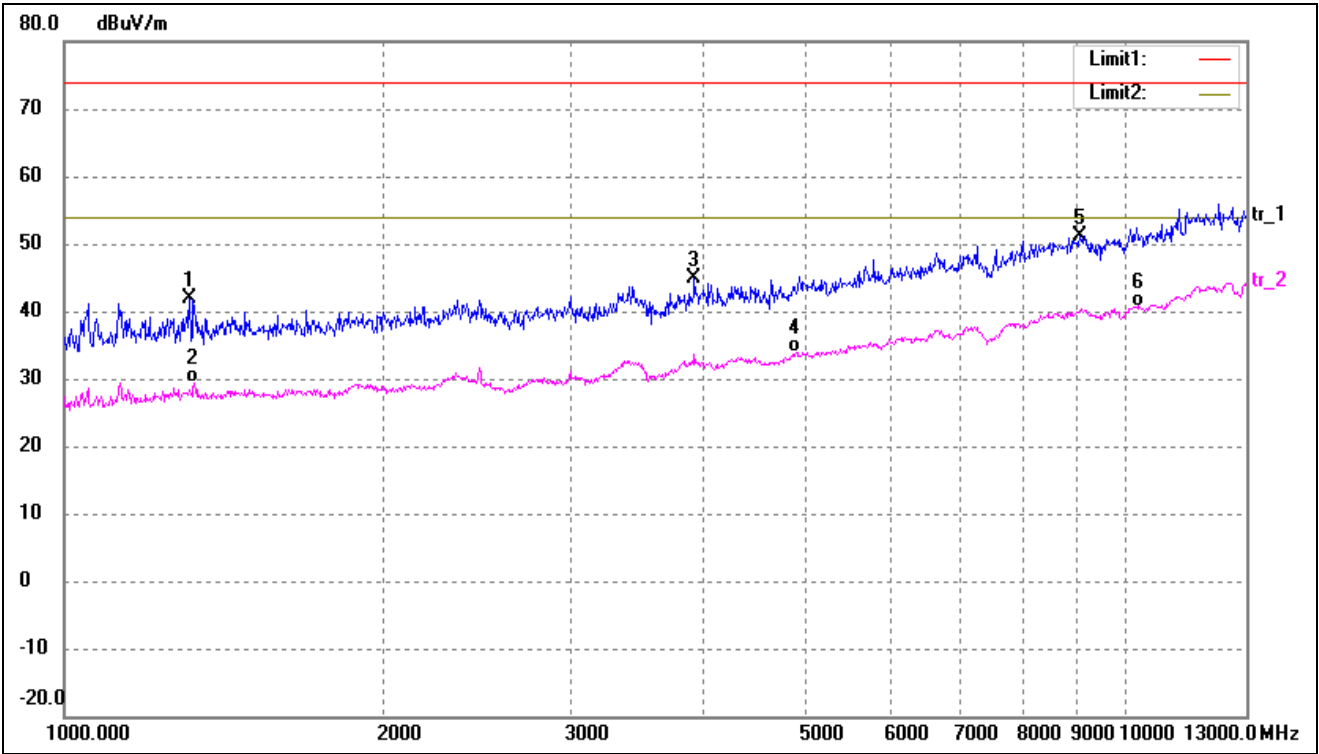
Above 1GHz

Test mode:	TM1 (worst case)	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	1128.120	58.54	-14.54	44.00	74.00	-30.00	-	-	peak
2	1128.120	43.94	-14.54	29.40	54.00	-24.60	-	-	AVG
3	2441.475	59.11	-10.63	48.48	74.00	-25.52	-	-	peak
4	2441.475	48.62	-10.63	37.99	54.00	-16.01	-	-	AVG
5	8234.959	38.36	0.13	38.49	54.00	-15.51	-	-	AVG
6	10214.866	49.51	2.30	51.81	74.00	-22.19	-	-	peak

Test mode:	TM1 (worst case)	Polarity:	Vertical
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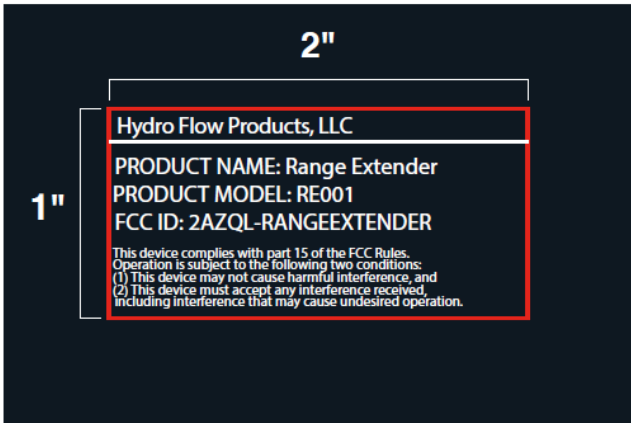
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	1312.436	55.52	-13.61	41.91	74.00	-32.09	-	-	peak
2	1325.970	42.96	-13.54	29.42	54.00	-24.58	-	-	AVG
3	3924.025	52.61	-7.85	44.76	74.00	-29.24	-	-	peak
4	4892.501	39.90	-5.90	34.00	54.00	-20.00	-	-	AVG
5	9054.768	49.61	1.52	51.13	74.00	-22.87	-	-	peak
6	10214.866	38.36	2.30	40.66	54.00	-13.34	-	-	AVG

Remark 1: ‘-’Means’ the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

Remark 2: Testing is carried out with frequency rang 9kHz to the fifth harmonics, other than listed in the above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

EXHIBIT 1 - PRODUCT LABELING

Proposed FCC ID Label Format



Specifications: The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device’s expected lifetime.

Proposed Label Location on EUT

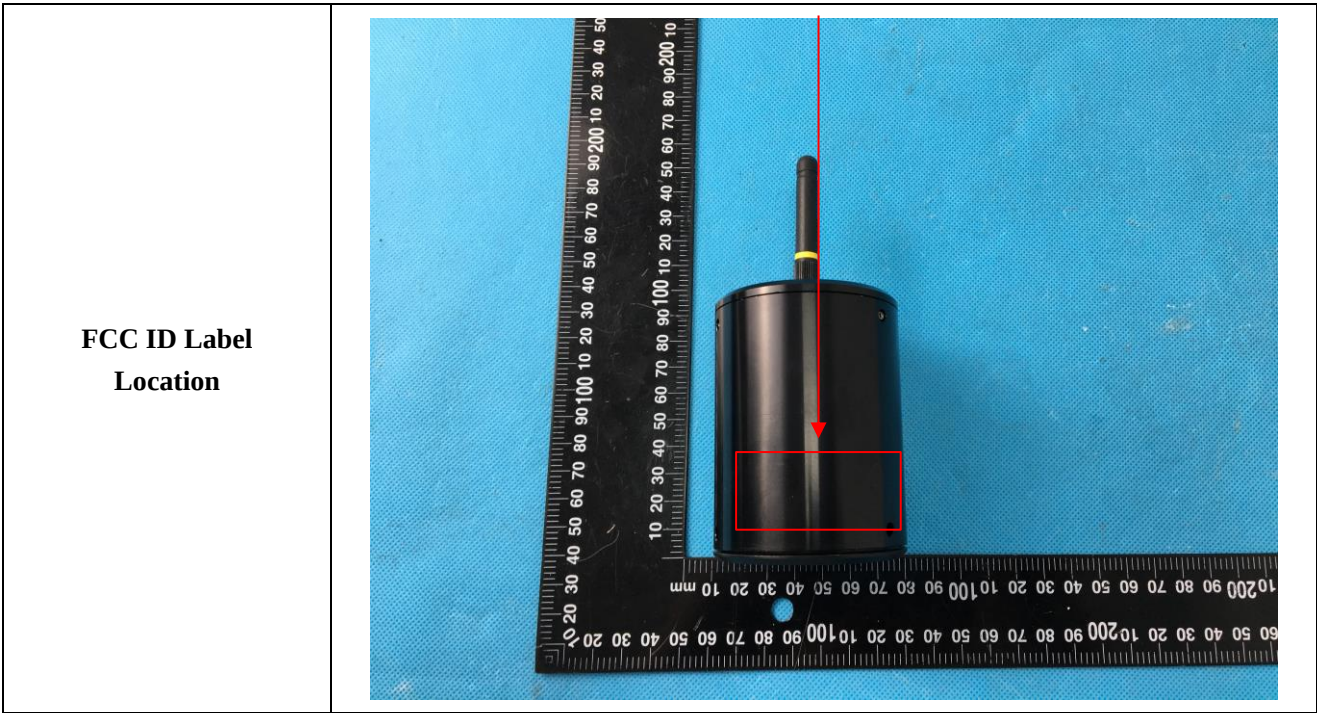


EXHIBIT 2 - EUT PHOTOGRAPHS

EUT View 1	
EUT View 2	

EUT View 3	
EUT View 4	

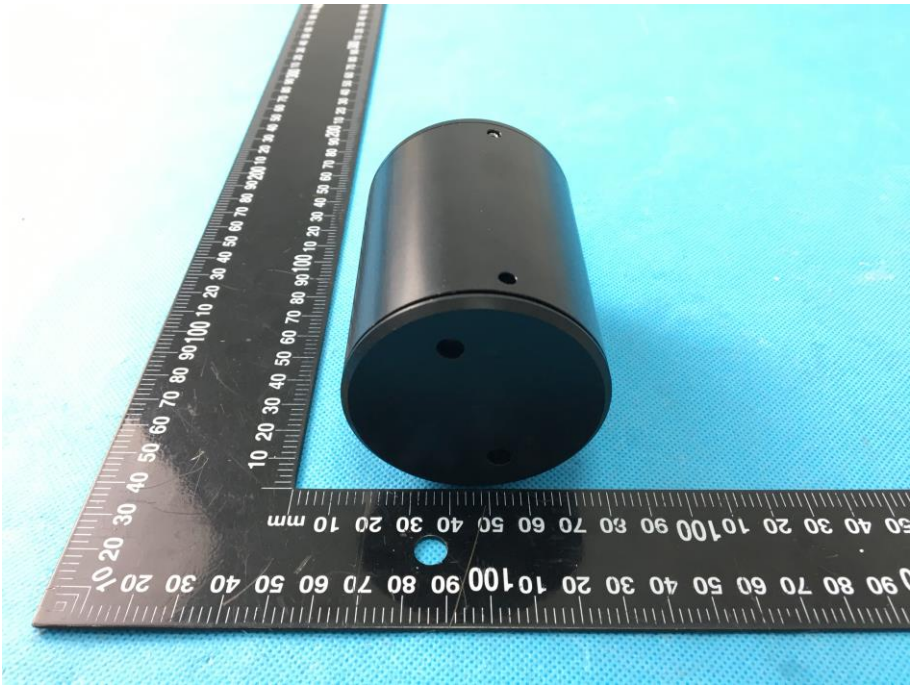
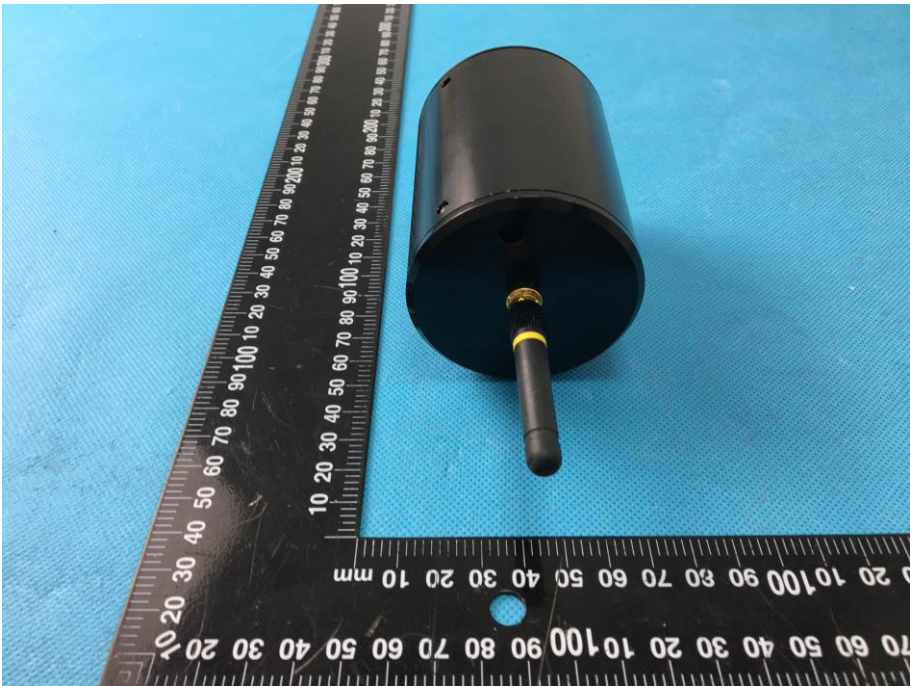
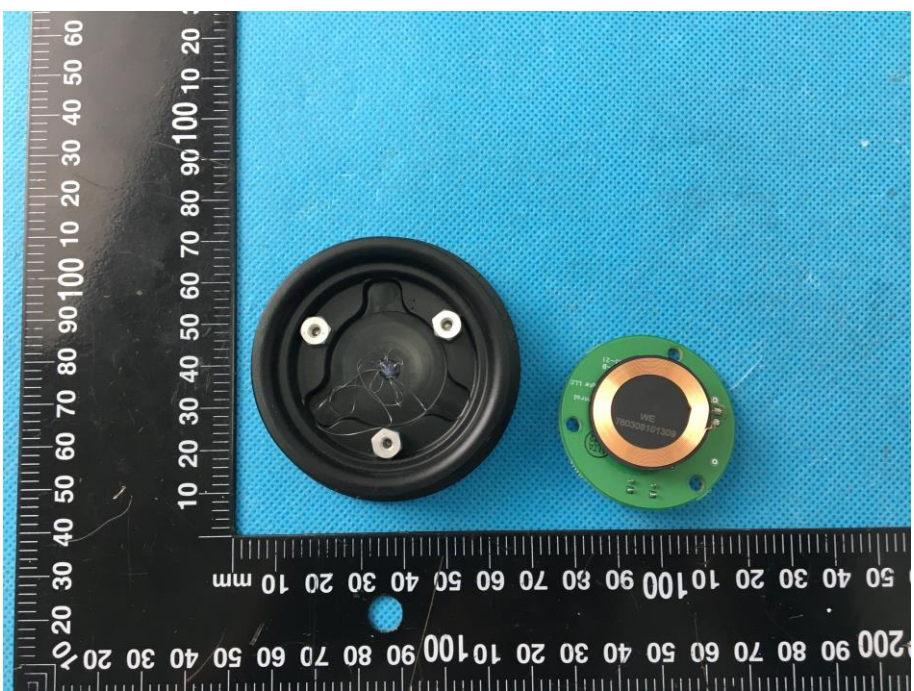
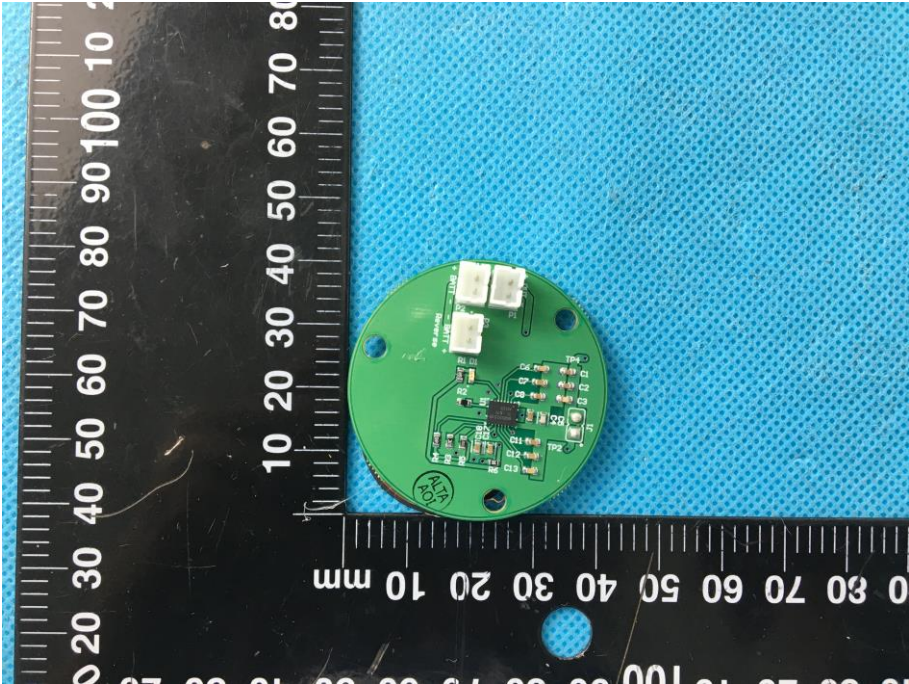
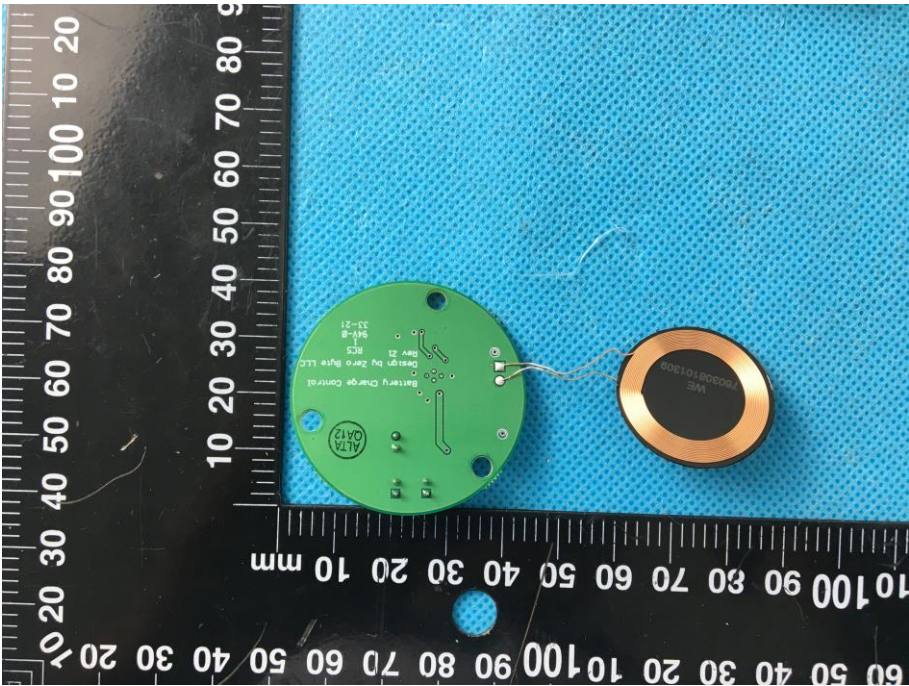
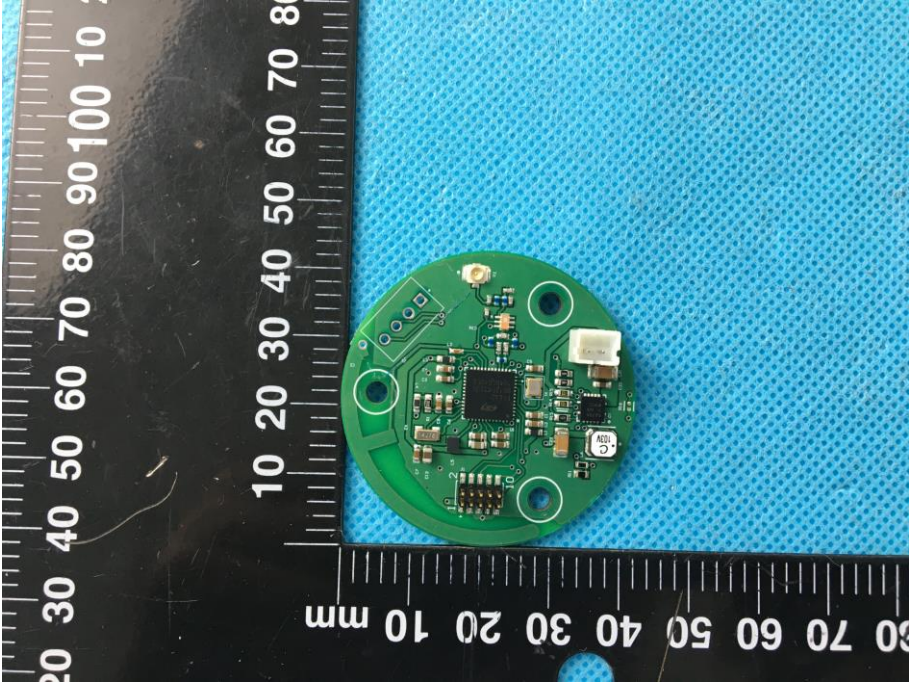
EUT View 5	 A black cylindrical component is shown lying horizontally on a blue textured surface. To its left is a black ruler with white markings in millimeters and centimeters. The component has three small, evenly spaced holes along its side. The ruler indicates the component is approximately 100 mm long.
EUT View 6	 A black cylindrical component is shown lying horizontally on a blue textured surface. A black probe with a yellow band is inserted into the top of the component. To the left of the component is a black ruler with white markings in millimeters and centimeters. The ruler indicates the component is approximately 100 mm long.

EXHIBIT 3 - EUT INTERNAL PHOTOGRAPHS

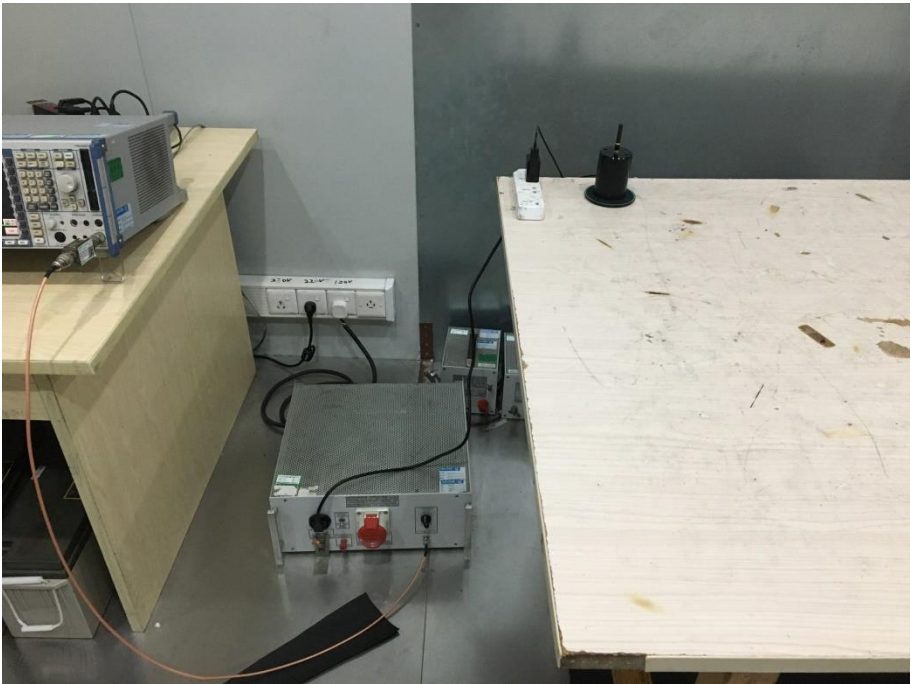
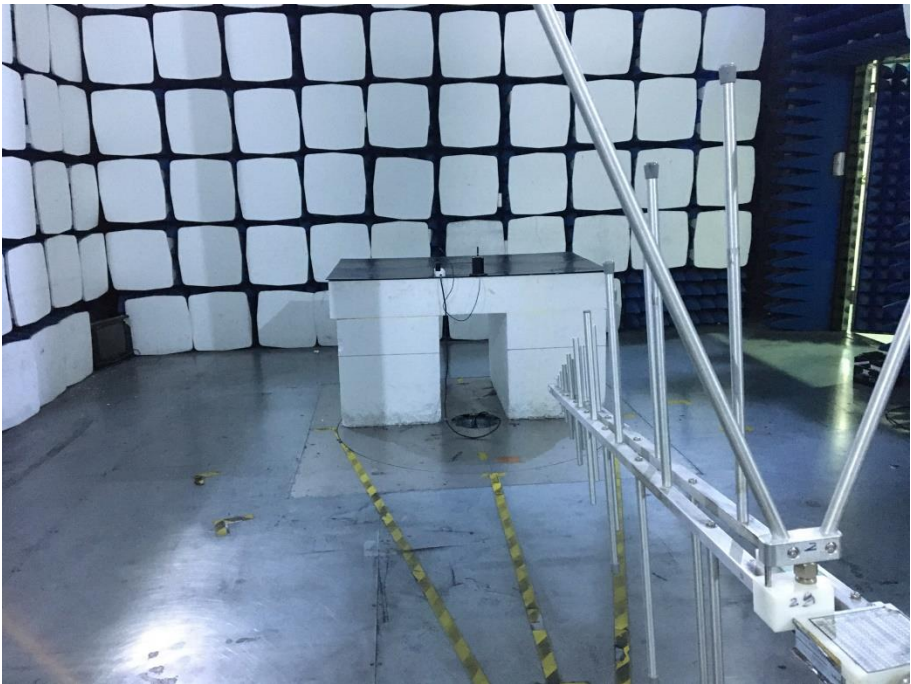
EUT Housing and Board View 1	 A photograph showing the EUT housing and board from a top-down perspective. The black cylindrical housing is open, revealing the green printed circuit board (PCB) inside. The PCB is populated with various electronic components, including a microcontroller, resistors, and a small antenna. A black ruler is placed vertically to the left of the housing for scale, with markings in millimeters and centimeters.
EUT Housing and Board View 2	 A photograph showing the EUT housing and board from a bottom-up perspective. The black cylindrical housing is open, revealing the green printed circuit board (PCB) inside. The PCB is populated with various electronic components, including a microcontroller, resistors, and a small antenna. A black ruler is placed vertically to the left of the housing for scale, with markings in millimeters and centimeters.

EUT Housing and Board View 3	 A photograph showing the EUT housing and board assembly. The assembly consists of a black cylindrical housing, a brown printed circuit board (PCB) with various electronic components, and a black antenna. The assembly is placed on a blue textured surface next to a black ruler with white markings. The ruler shows measurements in millimeters and centimeters.
Solder Board-Component View 1	 A photograph showing the solder board component. It is a green circular PCB with various electronic components, including resistors, capacitors, and integrated circuits. The board is placed on a blue textured surface next to a black ruler with white markings. The ruler shows measurements in millimeters and centimeters.

Solder Board-Component View 2	 A photograph showing a green circular printed circuit board (PCB) and a small, round, gold-colored component, likely a battery, resting on a blue textured surface. A black ruler with white markings is placed horizontally below the components, showing measurements in millimeters. The PCB has several small components and text printed on it, including "ALTA", "DATA", "Battery Charge Control", "Design by Zero Byte LLC", "Rev. 2.1", "RCS", and "33-21". The gold-colored component has "MS" and "9009101309" printed on it.
Solder Board-Component View 3	 A photograph showing the same green circular PCB from a different angle, resting on the same blue textured surface. A black ruler with white markings is placed horizontally below the component, showing measurements in millimeters. The PCB features a central black square component, several smaller electronic components, and a white rectangular component on the right side. The text "ALTA" and "DATA" are visible on the left side of the board.

Solder Board-Component View 4	
Solder Board-Component View 5	

EXHIBIT 4 - TEST SETUP PHOTOGRAPHS

Conducted Emission Test Setup	 A photograph showing a conducted emission test setup. On the left, a piece of electronic equipment, likely a spectrum analyzer or a power supply, sits on a wooden workbench. A red cable is connected to it. In the center, a power supply unit is on the floor, with a red and black cable connected to it. To the right, another wooden workbench is visible, with a small black device and a white power strip on top. The background is a plain wall with a power outlet.
Radiation Emission Test View (30MHz to 1GHz)	 A photograph showing a radiation emission test setup. The room is lined with white, square-shaped electromagnetic interference (EMI) shields. In the center, a white, box-like structure is placed on the floor. To the right, a metal frame structure is visible, likely used for mounting antennas or sensors. The floor is marked with yellow and black diagonal stripes.

**Radiation Emission Test
View (Above 1GHz)**

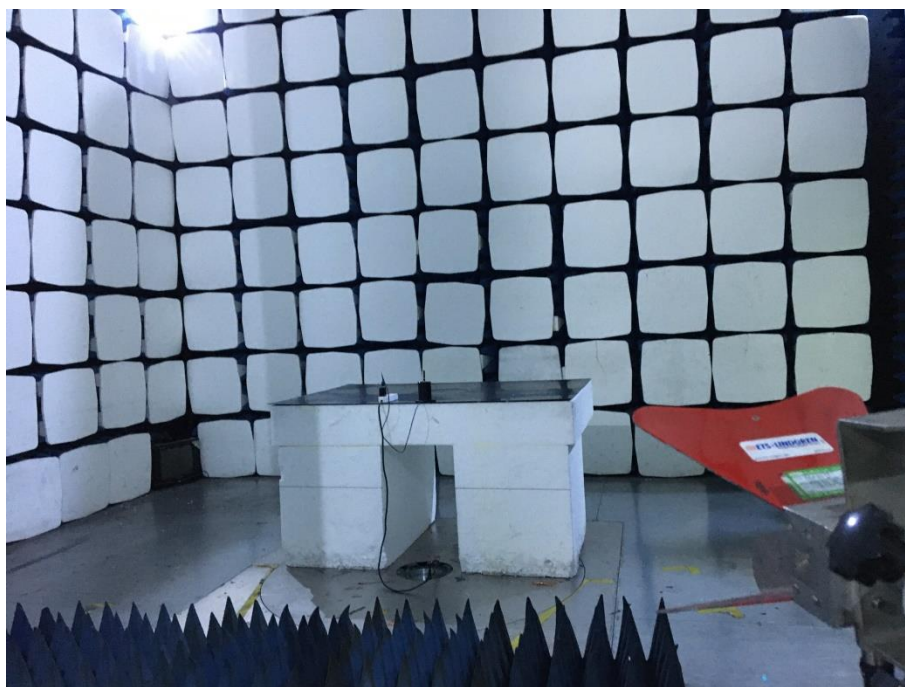


EXHIBIT 4 - USERS MANUAL

Information to Users

According to the FCC Part 15.19, 15.21, and 15.105 rules, for this EUT, the instructions or operation manual furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

***** END OF REPORT *****