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HCT

TEST REPORT

EMI Test for FCC SDoC / ISED of PWFSA2 Model

APPLICANT

LG Electronics, Inc.

REPORT NO.

HCT-EM-1908-FI007

DATE OF ISSUE

August 13, 2019

HCT Co., Ltd.

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HCT-EM-1908-FI007

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FCC ID. / IC
BEJ-PWFSA2 / 2703N-PWFSA2

Applicant **LG Electronics, Inc.**
170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do,
51533, Republic of Korea

Product Name Voice Recognition Module
Model Name PWFSA2

Date of Test August 08, 2019 to August 12, 2019

Test Standard Used FCC CFR 47 PART 15 Subpart B Class B / ICES-003 Issue 6 Class B
ANSI C63.4-2014

Test Results Refer to the present document

Manufacturer LG Electronics Inc.

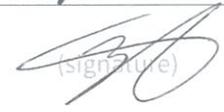
The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

Tested by
Wook Yi



(signature)

Technical Manager
Jeong-Hyun Choi



(signature)

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 13, 2019	Initial Release

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

CONTENTS

1. GENERAL INFORMATION	5
1.1 Description of EUT	5
1.2 Tested System Details	5
1.3 Cable Description	6
1.4 Noise Suppression Parts on Cable. (I/O Cable)	6
1.5 Test Facility	6
1.6 Calibration of Measuring Instrument	7
1.7 Measurement Uncertainty	7
2. DESCRIPTION OF TEST	8
2.1 Measurement of Conducted Emission	8
2.2 Measurement of Radiated Emission	9
2.3 Configuration of Tested System	10
3. PRELIMINARY TEST	11
3.1 Conducted Emission	11
3.2 Radiated Emission	11
4. EMISSION TEST SUMMARY	12
4.1 Conducted Emission	12
4.2 Radiated Emission Below 1 GHz	25
4.3 Radiated Emission Above 1 GHz	27
5. CONCLUSION	31
6. APPENDIX A. TEST SETUP PHOTOGRAPHS	32

1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is Voice Recognition Module.

FCC ID	BEJ-PWFSA2
IC	2703N-PWFSA2
Model Name	PWFSA2
Product Name	Voice Recognition Module
Frequency	2 412 MHz to 2 462 MHz (WiFi 2.4 GHz)
Operating Voltage	Min 4.5 V, Rated 5 / 12 V, Max 17 V
Manufacturer	LG Electronics Inc.

1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Serial Number	Manufacturer
EUT	PWFSA2	-	LG Electronics
Test JIG	-	-	-
AC adaptor	PA-1041-81		LITE ON Technology

1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	6 PIN	N	N	(P,D) 0.3
Test JIG	DC IN	N	N/A	(P) 1.8

NOTE. The marked "(D)" means the data cable and "(P)" means the power cable.

1.4 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	6 PIN	N	N/A	N	N/A
Test JIG	DC IN	Y	Test JIG End	Y	Test JIG End

1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Designation No.
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	
Filing the EMI Measurement Facility (3 m Semi Anechoic Chamber and Shielded Room)	IC 5944A-4
Filing the EMI Measurement Facility (10 m Semi-Anechoic Chamber)	IC 5944A-2

1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5:2017

1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	1.8 dB
Radiated Emissions (30 MHz to 1 GHz)	4.9 dB
Radiated Emissions (1 GHz to 18 GHz)	4.8 dB
Radiated Emissions (18 GHz to 40 GHz)	5.0 dB

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dB μ V)	Average (dB μ V)	Quasi-Peak (dB μ V)	Average (dB μ V)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m 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 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. 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. (1 GHz to 40 GHz)

Radiated Emission Limits

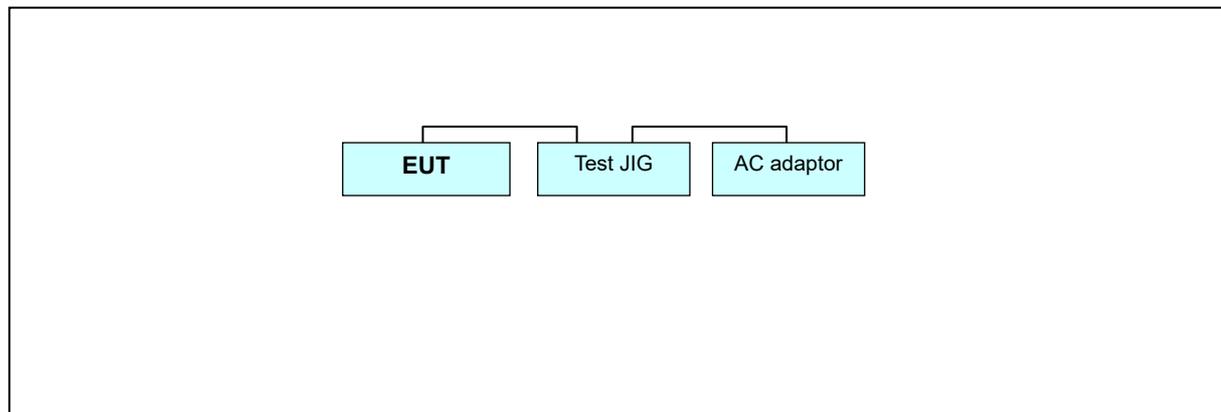
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}\mu\text{V/m}$)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)	Peak ($\text{dB}\mu\text{V/m}$)	Average ($\text{dB}\mu\text{V/m}$)	
Above 1 000	3	80	60	74	54	

2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



Non-Conductive Table

Power Line: 120 VAC, 60 Hz

3. PRELIMINARY TEST

3.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: WiFi 2.4 GHz Idle mode (5 V/ 12 V)

3.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: WiFi 2.4 GHz Idle mode (5 V/ 12 V)

4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission

4.1.1 Measuring instruments

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-

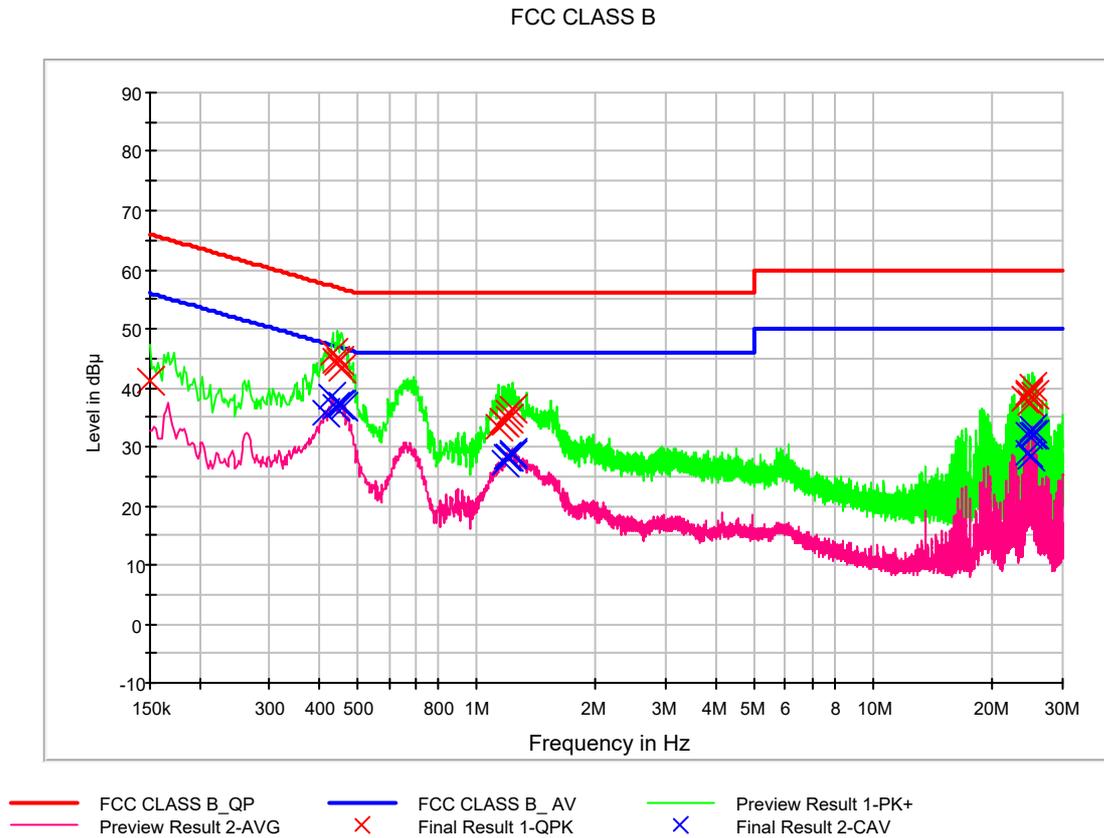
4.1.2 Operating Condition

The test results of conducted emission at mains ports provide the following information:

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operating Mode	WiFi 2.4 GHz Idle mode (5 V/ 12 V)
Kind of Test Site	EMI Shielded Room
Temperature	23.2 °C
Relative Humidity	41.1 %
Test Date	August 08, 2019

4.1.3 Measuring Data

Figure 1: Conducted Emission, WiFi 2.4 GHz Idle mode (5 V), Line (L1)



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dB V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.150000	41.2	9.000	L1	9.7	24.8	66.0
0.434000	46.0	9.000	L1	9.7	11.2	57.2
0.438000	44.6	9.000	L1	9.7	12.5	57.1
0.446000	44.2	9.000	L1	9.7	12.8	56.9
0.450000	44.5	9.000	L1	9.7	12.4	56.9
0.458000	43.3	9.000	L1	9.7	13.4	56.7
1.136000	33.5	9.000	L1	9.8	22.5	56.0
1.166000	34.5	9.000	L1	9.8	21.5	56.0
1.174000	34.0	9.000	L1	9.8	22.0	56.0
1.198000	34.9	9.000	L1	9.8	21.1	56.0
1.204000	35.8	9.000	L1	9.8	20.2	56.0
1.230000	36.3	9.000	L1	9.8	19.7	56.0
24.152000	38.1	9.000	L1	10.3	21.9	60.0
24.528000	38.7	9.000	L1	10.3	21.3	60.0
24.684000	39.1	9.000	L1	10.3	20.9	60.0
24.906000	37.6	9.000	L1	10.3	22.4	60.0
25.064000	40.1	9.000	L1	10.3	19.9	60.0
25.444000	38.7	9.000	L1	10.3	21.3	60.0

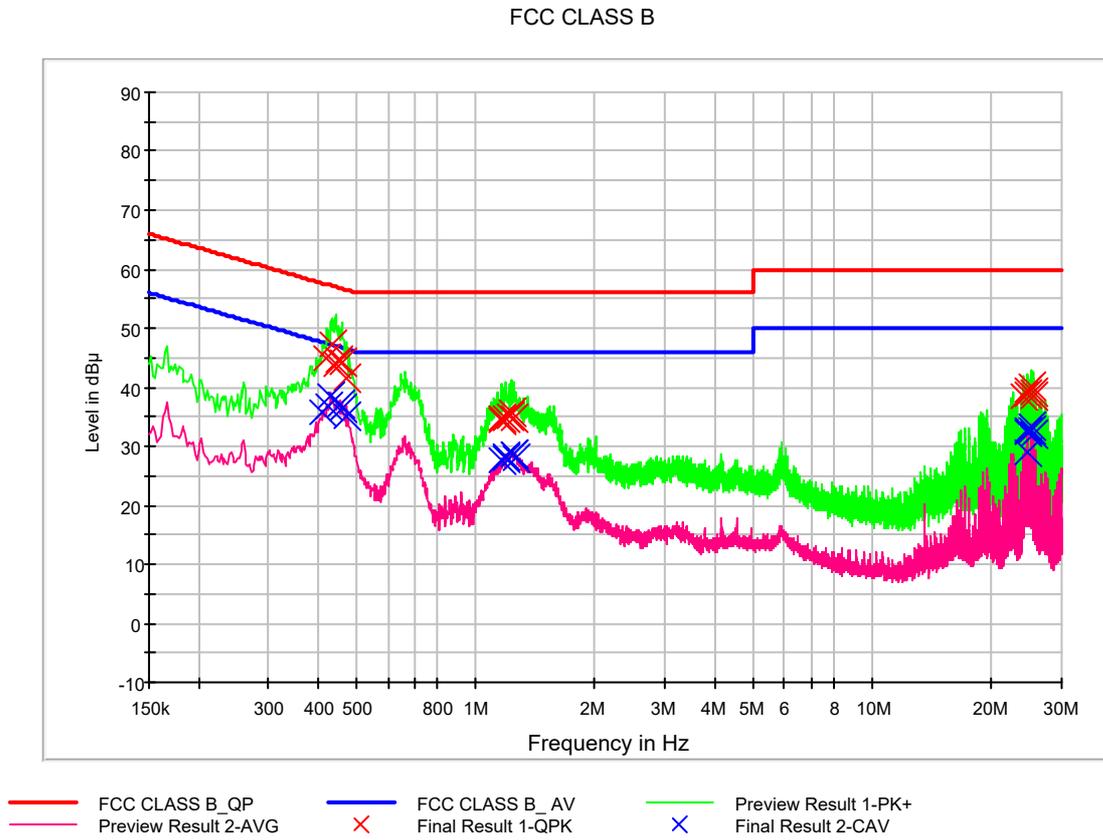
Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.414000	35.8	9.000	L1	9.7	11.8	47.6
0.432000	38.5	9.000	L1	9.7	8.8	47.2
0.442000	36.8	9.000	L1	9.7	10.3	47.0
0.450000	37.1	9.000	L1	9.7	9.8	46.9
0.454000	37.3	9.000	L1	9.7	9.5	46.8
0.460000	36.9	9.000	L1	9.7	9.8	46.7
1.176000	27.4	9.000	L1	9.8	18.6	46.0
1.194000	28.4	9.000	L1	9.8	17.6	46.0
1.198000	28.2	9.000	L1	9.8	17.8	46.0
1.204000	28.4	9.000	L1	9.8	17.6	46.0
1.230000	28.8	9.000	L1	9.8	17.2	46.0
1.238000	28.9	9.000	L1	9.8	17.1	46.0
24.528000	29.0	9.000	L1	10.3	21.0	50.0
24.684000	32.2	9.000	L1	10.3	17.8	50.0
24.906000	28.2	9.000	L1	10.3	21.8	50.0
25.058000	32.0	9.000	L1	10.3	18.0	50.0
25.064000	33.1	9.000	L1	10.3	16.9	50.0
25.442000	31.9	9.000	L1	10.3	18.1	50.0

Figure 2: Conducted Emission, WiFi 2.4 GHz Idle mode (5 V), Line (N)



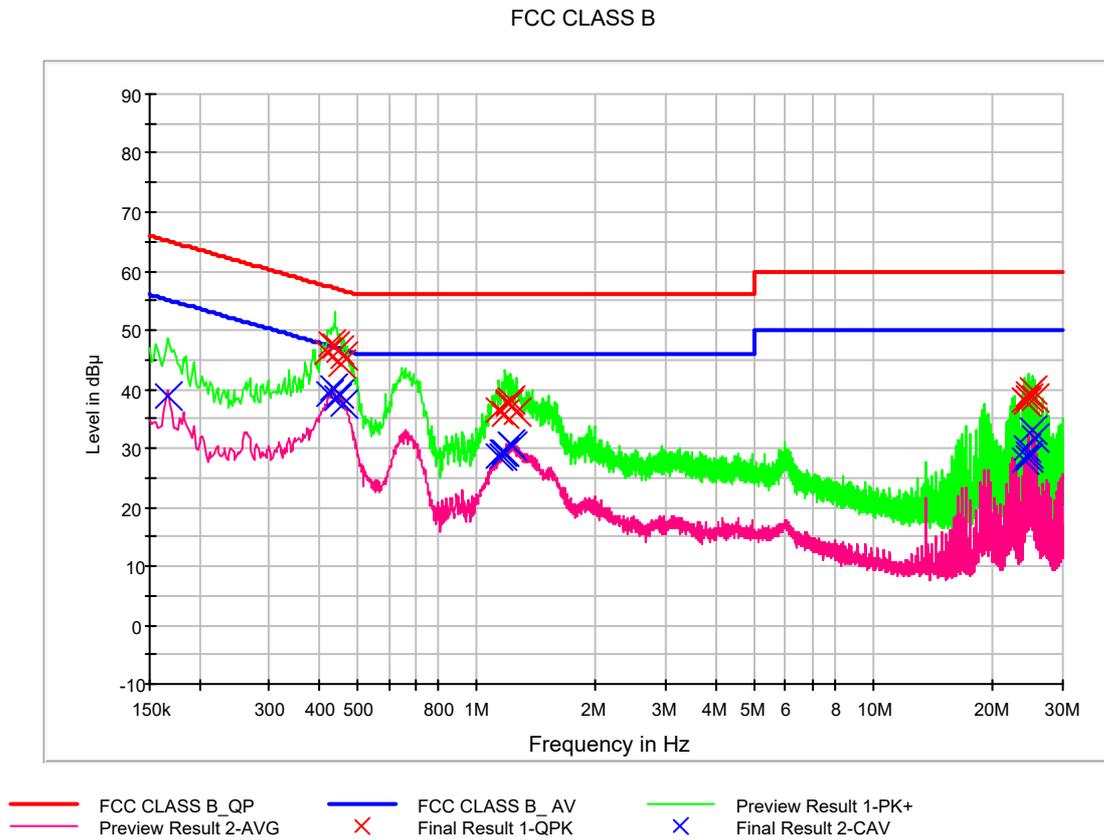
QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dB V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.422000	44.9	9.000	N	9.7	12.5	57.4
0.434000	47.4	9.000	N	9.7	9.8	57.2
0.444000	43.8	9.000	N	9.7	13.2	57.0
0.450000	44.6	9.000	N	9.7	12.3	56.9
0.460000	44.1	9.000	N	9.7	12.6	56.7
0.472000	41.5	9.000	N	9.7	14.9	56.5
1.162000	34.6	9.000	N	9.7	21.4	56.0
1.166000	34.4	9.000	N	9.7	21.6	56.0
1.186000	34.7	9.000	N	9.7	21.3	56.0
1.218000	35.1	9.000	N	9.7	20.9	56.0
1.232000	35.9	9.000	N	9.7	20.1	56.0
1.248000	34.6	9.000	N	9.7	21.4	56.0
24.152000	38.3	9.000	N	10.3	21.7	60.0
24.530000	38.8	9.000	N	10.3	21.2	60.0
24.682000	39.4	9.000	N	10.3	20.6	60.0
25.064000	40.3	9.000	N	10.3	19.7	60.0
25.442000	39.1	9.000	N	10.3	20.9	60.0
25.446000	38.6	9.000	N	10.3	21.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.412000	35.7	9.000	N	9.7	12.0	47.6
0.424000	36.9	9.000	N	9.7	10.5	47.4
0.432000	38.4	9.000	N	9.7	8.8	47.2
0.454000	37.3	9.000	N	9.7	9.5	46.8
0.460000	36.3	9.000	N	9.7	10.4	46.7
0.472000	35.1	9.000	N	9.7	11.4	46.5
1.162000	27.7	9.000	N	9.7	18.3	46.0
1.186000	28.0	9.000	N	9.7	18.0	46.0
1.190000	28.2	9.000	N	9.7	17.8	46.0
1.240000	28.5	9.000	N	9.7	17.5	46.0
1.248000	28.6	9.000	N	9.7	17.4	46.0
1.264000	27.9	9.000	N	9.8	18.1	46.0
24.530000	29.1	9.000	N	10.3	20.9	50.0
24.682000	32.6	9.000	N	10.3	17.4	50.0
24.688000	32.4	9.000	N	10.3	17.6	50.0
25.064000	33.2	9.000	N	10.3	16.8	50.0
25.068000	32.6	9.000	N	10.3	17.4	50.0
25.442000	32.2	9.000	N	10.3	17.8	50.0

Figure 3: Conducted Emission, WiFi 2.4 GHz Idle mode (12 V), Line (L1)



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dB V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.422000	46.2	9.000	L1	9.7	11.2	57.4
0.432000	47.7	9.000	L1	9.7	9.5	57.2
0.440000	47.2	9.000	L1	9.7	9.9	57.1
0.450000	46.7	9.000	L1	9.7	10.1	56.9
0.456000	44.2	9.000	L1	9.7	12.6	56.8
0.462000	45.7	9.000	L1	9.7	11.0	56.7
1.140000	36.3	9.000	L1	9.8	19.7	56.0
1.182000	35.9	9.000	L1	9.8	20.1	56.0
1.204000	37.6	9.000	L1	9.8	18.4	56.0
1.210000	37.7	9.000	L1	9.8	18.3	56.0
1.214000	38.3	9.000	L1	9.8	17.7	56.0
1.262000	36.0	9.000	L1	9.8	20.0	56.0
24.150000	38.1	9.000	L1	10.3	21.9	60.0
24.304000	37.7	9.000	L1	10.3	22.3	60.0
24.528000	38.6	9.000	L1	10.3	21.4	60.0
24.684000	39.1	9.000	L1	10.3	20.9	60.0
25.062000	39.8	9.000	L1	10.3	20.2	60.0
25.444000	38.6	9.000	L1	10.3	21.4	60.0

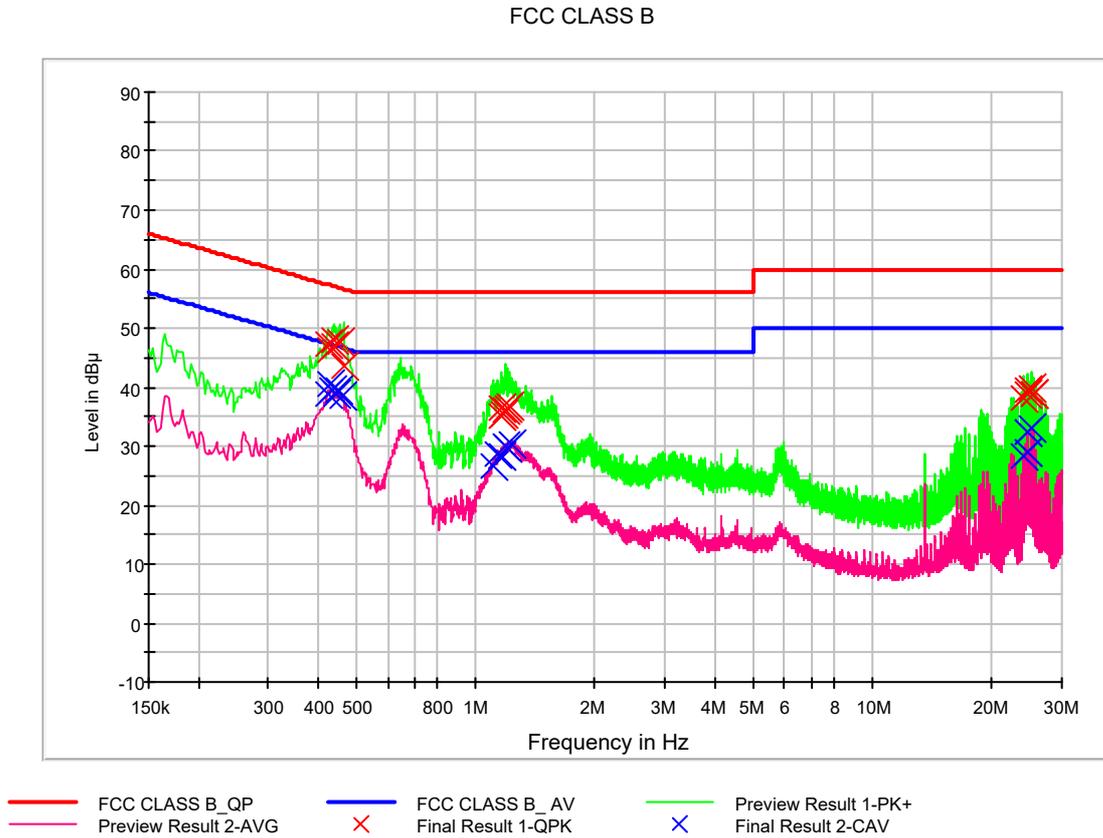
Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.166000	39.0	9.000	L1	9.7	16.2	55.2
0.426000	39.0	9.000	L1	9.7	8.3	47.3
0.434000	40.1	9.000	L1	9.7	7.1	47.2
0.444000	38.6	9.000	L1	9.7	8.4	47.0
0.450000	39.0	9.000	L1	9.7	7.9	46.9
0.462000	37.6	9.000	L1	9.7	9.0	46.7
1.140000	28.6	9.000	L1	9.8	17.4	46.0
1.156000	28.7	9.000	L1	9.8	17.3	46.0
1.160000	29.2	9.000	L1	9.8	16.8	46.0
1.180000	29.3	9.000	L1	9.8	16.7	46.0
1.214000	30.6	9.000	L1	9.8	15.4	46.0
1.230000	30.2	9.000	L1	9.8	15.8	46.0
24.148000	28.0	9.000	L1	10.3	22.0	50.0
24.304000	30.1	9.000	L1	10.3	19.9	50.0
24.524000	28.5	9.000	L1	10.3	21.5	50.0
24.530000	28.9	9.000	L1	10.3	21.1	50.0
25.064000	33.0	9.000	L1	10.3	17.0	50.0
25.442000	31.8	9.000	L1	10.3	18.2	50.0

Figure 4: Conducted Emission, WiFi 2.4 GHz Idle mode (12 V), Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dB V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.424000	47.4	9.000	N	9.7	10.0	57.4
0.430000	46.2	9.000	N	9.7	11.0	57.3
0.438000	46.8	9.000	N	9.7	10.3	57.1
0.442000	48.0	9.000	N	9.7	9.0	57.0
0.454000	47.5	9.000	N	9.7	9.3	56.8
0.464000	43.6	9.000	N	9.7	13.1	56.6
1.156000	35.2	9.000	N	9.7	20.8	56.0
1.164000	36.3	9.000	N	9.7	19.7	56.0
1.172000	35.4	9.000	N	9.7	20.6	56.0
1.186000	36.1	9.000	N	9.7	19.9	56.0
1.196000	36.3	9.000	N	9.7	19.7	56.0
1.222000	36.7	9.000	N	9.7	19.3	56.0
24.152000	38.3	9.000	N	10.3	21.7	60.0
24.528000	38.9	9.000	N	10.3	21.1	60.0
24.684000	39.4	9.000	N	10.3	20.6	60.0
25.062000	39.9	9.000	N	10.3	20.1	60.0
25.440000	38.9	9.000	N	10.3	21.1	60.0
25.444000	38.9	9.000	N	10.3	21.1	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB V)
0.426000	38.7	9.000	N	9.7	8.6	47.3
0.432000	40.5	9.000	N	9.7	6.8	47.2
0.436000	39.5	9.000	N	9.7	7.6	47.1
0.444000	38.7	9.000	N	9.7	8.3	47.0
0.452000	39.5	9.000	N	9.7	7.3	46.8
0.460000	38.3	9.000	N	9.7	8.4	46.7
1.102000	26.7	9.000	N	9.7	19.3	46.0
1.140000	28.5	9.000	N	9.7	17.5	46.0
1.156000	28.5	9.000	N	9.7	17.5	46.0
1.186000	29.9	9.000	N	9.7	16.1	46.0
1.200000	29.8	9.000	N	9.7	16.2	46.0
1.228000	30.4	9.000	N	9.7	15.6	46.0
24.152000	28.3	9.000	N	10.3	21.7	50.0
24.526000	29.1	9.000	N	10.3	20.9	50.0
24.530000	29.0	9.000	N	10.3	21.0	50.0
24.682000	32.4	9.000	N	10.3	17.6	50.0
24.686000	32.3	9.000	N	10.3	17.7	50.0
25.064000	33.2	9.000	N	10.3	16.8	50.0

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/>	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/>	Trilog antenna	Schwarzbeck	VULB 9168	760	2 year	03.22.2019
<input checked="" type="checkbox"/>	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/>	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/>	Turn Table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/>	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/>	Software	Rohde & Schwarz	EMC32	-	-	-

4.2.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operating Mode	WiFi 2.4 GHz Idle mode (5 V/ 12 V)
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.3 °C
Relative Humidity	42.9 %
Test Date	August 12, 2019

4.2.3 Measuring Data

WiFi 2.4 GHz Idle mode (5 V)

Frequency (MHz)	Quasi Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
31.172160	21.1	174.9	V	343.0	18.8	18.9	40.0
58.659200	17.5	174.8	V	177.0	19.8	22.5	40.0
123.091200	28.6	100.0	V	281.0	17.9	14.9	43.5
159.977600	24.4	100.0	V	0.0	20.0	19.1	43.5
204.581600	18.5	117.7	V	334.0	17.7	25.0	43.5
905.309600	32.0	274.8	V	283.0	32.1	14.0	46.0

WiFi 2.4 GHz Idle mode (12 V)

Frequency (MHz)	Quasi Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
31.056365	21.4	174.8	V	298.0	18.8	18.6	40.0
57.896800	17.4	174.8	H	89.0	19.9	22.6	40.0
126.368000	25.6	100.0	V	268.0	18.2	17.9	43.5
156.293600	20.4	100.0	V	296.0	19.9	23.1	43.5
694.166400	28.8	225.0	V	121.0	28.9	17.2	46.0
842.320000	31.1	325.1	V	261.0	31.3	14.9	46.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/>	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/>	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/>	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/>	Turn table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/>	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/>	Horn antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.19.2019
<input checked="" type="checkbox"/>	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
<input type="checkbox"/>	Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	12.17.2018
<input type="checkbox"/>	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA 9170 #786	2 year	12.05.2017
<input checked="" type="checkbox"/>	Software	Rohde & Schwarz	EMC32	-	-	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	2 462 MHz
Tested Frequency Range	1 GHz to 18 GHz
Operation Mode	WiFi 2.4 GHz Idle mode (5 V/ 12 V)
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.3 °C
Relative Humidity	42.9 %
Test Date	August 12, 2019

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage

4.3.3 Measuring Data

WiFi 2.4 GHz Idle mode (5 V)

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1506.535000	32.2	139.8	V	128.0	-25.6	41.8	74.0
3520.270000	35.1	125.6	V	182.0	-20.5	38.9	74.0
5531.000000	39.4	139.5	H	50.0	-15.2	34.6	74.0
7436.290000	44.5	100.0	H	0.0	-9.4	29.5	74.0
9588.300000	49.0	150.0	H	52.0	-5.1	25.0	74.0
10873.200000	48.4	124.6	H	290.0	-2.7	25.6	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1506.535000	19.3	139.8	V	128.0	-25.6	34.7	54.0
3520.270000	22.3	125.6	V	182.0	-20.5	31.7	54.0
5531.000000	26.5	139.5	H	50.0	-15.2	27.5	54.0
7436.290000	31.9	100.0	H	0.0	-9.4	22.1	54.0
9588.300000	35.7	150.0	H	52.0	-5.1	18.3	54.0
10873.200000	35.9	124.6	H	290.0	-2.7	18.1	54.0

WiFi 2.4 GHz Idle mode (12 V)

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
3046.770000	34.7	100.0	H	50.0	-21.0	39.3	74.0
5651.000000	39.1	150.0	V	174.0	-15.0	34.9	74.0
7250.495000	43.3	150.0	H	139.0	-10.0	30.7	74.0
7742.925000	45.3	100.0	H	4.0	-9.1	28.7	74.0
9893.095000	48.6	150.0	H	348.0	-5.1	25.4	74.0
10885.835000	48.2	100.0	H	37.0	-2.6	25.8	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
3046.770000	22.2	100.0	H	50.0	-21.0	31.8	54.0
5651.000000	26.4	150.0	V	174.0	-15.0	27.6	54.0
7250.495000	30.6	150.0	H	139.0	-10.0	23.4	54.0
7742.925000	32.1	100.0	H	4.0	-9.1	21.9	54.0
9893.095000	35.2	150.0	H	348.0	-5.1	18.8	54.0
10885.835000	35.8	100.0	H	37.0	-2.6	18.2	54.0

5. CONCLUSION

The data collected shows that the **Product Name: Voice Recognition Module, Model Name: PWFSA2** complies with § 15.107 and § 15.109 of the FCC rules and ICES-003 Issue 6 of the IC rules.

6. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-1908-FI007-P	August 13, 2019	Initial Release

End of report