On your side

TEST REPORT

EMI Test for FCC Certification / ISED of PWLGWB100 Model

APPLICANT

LG Electronics Inc.

REPORT NO.

HCT-EM-1911-FI003

DATE OF ISSUE

December 02, 2019

HCT Co., Ltd.

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FCC ID / IC
BEJ-PWLGWB100 / 2703N-PWLGWB100

Applicant	**LG Electronics Inc.** 170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, 51533, Korea
Product Name Model Name	Zigbee Dongle PWLGWB100
Date of Test	November 25, 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	Ohsung Electronics Co., Ltd.

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

Tested by
Kyoung-Hee Yoon (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	December 02, 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 denial the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

This Test Report is not related to the accredited test result by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation), which signed the ILAC-MRA.

CONTENTS

1. GENERAL INFORMATION

1.1 Description of EUT

FCC ID	BEJ-PWLGWB100
IC	2703N-PWLGWB100
Model Name	PWLGWB100
Product Name	Zigbee Dongle
Power Rating	12 V
Frequency	2 405 MHz to 2 480 MHz
Manufacturer	Ohsung Electronics Co., Ltd. 335-4, Sanho-daero, Gumi-si, Gyeongsangbuk-do, Korea

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	PWLGWB100	-	Ohsung Electronics
JIG Board	-	-	-
AC Adaptor	MLF-A001210 1000U0075	-	OURC
Notebook PC	HP ProBook 6560B	5CB2053MXF	HP
Notebook PC adaptor	PPP009L-E	WCNXA0C4L6SJIP	LITE-ON Technology
Gateway	DIR-806M	-	D-LINK
AC/DC Adaptor	AMS1-0501200FK	-	D-LINK
Mouse	AA-SM7PCP	CN57BA5903634 BDV8JK7B5029	Acrox Technologies
RJ45 cable	-	-	-

1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB	N/A	N/A	(D) 0.5
	DC IN	N	N/A	(P) 1.8
JIG Board	USB	N/A	Y	(D) 1.2
	6 PIN	N/A	N	(D) 0.5
Notebook PC	RJ 45	N/A	N	(D) 1.6
	USB	N/A	Y	(D) 1.2
	DC IN	N	N/A	(P) 1.8
Gateway	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	USB	N/A	N/A	Y	Both End
	DC IN	Y	AC adaptor End	Y	Both End
JIG Board	USB	Y	JIG Board End	Y	Both End
	6 PIN	N/A	N/A	Y	Both End
Notebook PC	USB	N/A	N/A	Y	Both End
	RJ 45	N/A	N/A	Y	Both End
	DC IN	N/A	N/A	Y	Both End
Gateway	DC IN	Y	Notebook PC End	Y	Both 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.Espectially, 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)	4.8 dB
Radiated Emissions (1 GHz to 18 GHz)	5.4 dB
Radiated Emissions (18 GHz to 40 GHz)	5.7 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 (dBµV)	Average (dBµV)	Quasi-Peak (dBµV)	Average (dBµV)
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 (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/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

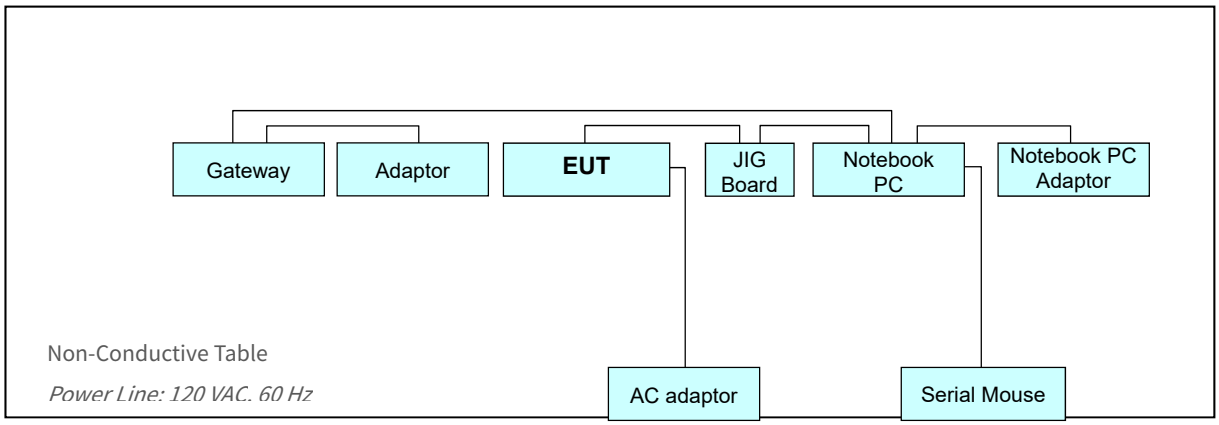
Frequency (MHz)	Antenna Distance (m)	Class A		Class B	
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
Above 1 000	3	80	60	74	54

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 ㎓, whichever is lower

2.3 Configuration of Tested System



3. PRELIMINARY TEST

3.1 Conducted Emission

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

Operating Mode: Idle mode

3.2 Radiated Emission

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

Operating Mode: Idle mode

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
☒	EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
☒	LISN	Rohde & Schwarz	ENV216	102245	1 year	09.11.2019
☒	LISN	Rohde & Schwarz	ENV216	100073	1 year	04.30.2019
☒	Software	Rohde & Schwarz	EMC32	-	-	-

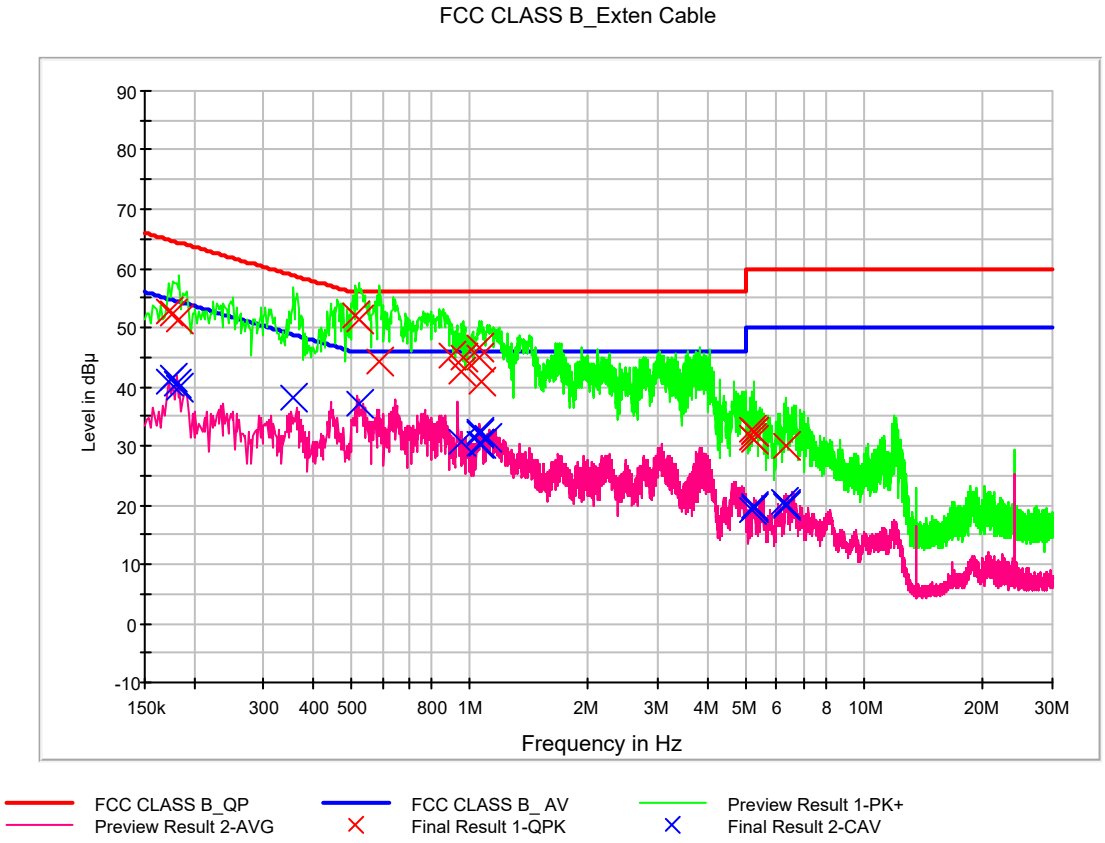
4.1.2 Operating Condition

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	Idle mode
Kind of Test Site	Shielded Room
Temperature	22.1 °C
Relative Humidity	43.8 %
Test Date	November 25, 2019

4.1.3 Measuring Data

Figure 1: Conducted Emission, AC Main Port, Line (L1)



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172000	52.7	9.000	L1	9.8	12.2	64.9
0.176000	52.4	9.000	L1	9.8	12.2	64.7
0.184000	51.5	9.000	L1	9.8	12.8	64.3
0.514000	52.0	9.000	L1	9.8	4.0	56.0
0.524000	51.3	9.000	L1	9.8	4.7	56.0
0.592000	44.1	9.000	L1	9.8	11.9	56.0
0.902000	45.4	9.000	L1	9.9	10.6	56.0
0.956000	42.5	9.000	L1	9.9	13.5	56.0
0.960000	44.8	9.000	L1	9.9	11.2	56.0
1.054000	45.1	9.000	L1	9.9	10.9	56.0
1.060000	46.6	9.000	L1	9.9	9.4	56.0
1.068000	40.8	9.000	L1	9.9	15.2	56.0
5.190000	31.4	9.000	L1	10.1	28.6	60.0
5.212000	32.7	9.000	L1	10.1	27.3	60.0
5.224000	32.4	9.000	L1	10.1	27.6	60.0
5.230000	32.3	9.000	L1	10.1	27.7	60.0
5.242000	30.9	9.000	L1	10.1	29.1	60.0
6.296000	29.9	9.000	L1	10.1	30.1	60.0

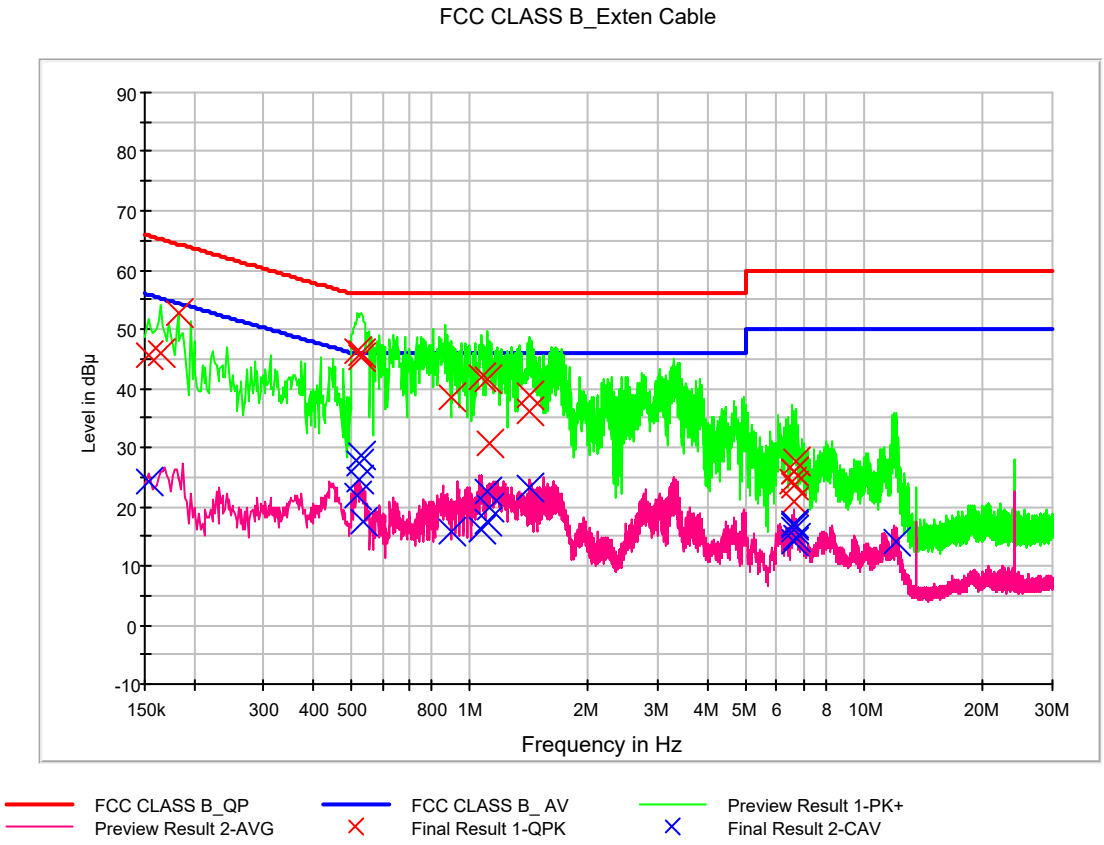
Calculation Formula:

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 (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172000	40.7	9.000	L1	9.8	14.1	54.9
0.176000	41.7	9.000	L1	9.8	13.0	54.7
0.180000	40.4	9.000	L1	9.8	14.1	54.5
0.184000	40.0	9.000	L1	9.8	14.3	54.3
0.358000	38.3	9.000	L1	9.8	10.5	48.8
0.524000	37.2	9.000	L1	9.8	8.8	46.0
0.956000	30.7	9.000	L1	9.9	15.3	46.0
1.054000	32.1	9.000	L1	9.9	13.9	46.0
1.058000	30.3	9.000	L1	9.9	15.7	46.0
1.062000	32.2	9.000	L1	9.9	13.8	46.0
1.066000	30.4	9.000	L1	9.9	15.6	46.0
1.114000	31.4	9.000	L1	9.9	14.6	46.0
5.212000	19.0	9.000	L1	10.1	31.0	50.0
5.224000	19.6	9.000	L1	10.1	30.4	50.0
5.230000	19.9	9.000	L1	10.1	30.1	50.0
6.282000	20.4	9.000	L1	10.1	29.6	50.0
6.296000	19.8	9.000	L1	10.1	30.2	50.0
6.338000	20.0	9.000	L1	10.1	30.0	50.0

Figure 2: Conducted Emission, AC Main Port, Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	45.5	9.000	N	9.8	20.3	65.8
0.164000	45.8	9.000	N	9.8	19.5	65.3
0.182000	52.7	9.000	N	9.8	11.7	64.4
0.520000	46.2	9.000	N	9.8	9.8	56.0
0.528000	45.3	9.000	N	9.8	10.7	56.0
0.532000	46.0	9.000	N	9.8	10.0	56.0
0.900000	38.5	9.000	N	9.9	17.5	56.0
1.068000	41.8	9.000	N	9.9	14.2	56.0
1.112000	41.4	9.000	N	9.9	14.6	56.0
1.124000	30.7	9.000	N	9.9	25.3	56.0
1.420000	38.9	9.000	N	9.9	17.1	56.0
1.424000	36.1	9.000	N	9.9	19.9	56.0
6.592000	24.3	9.000	N	10.2	35.8	60.0
6.636000	26.0	9.000	N	10.2	34.0	60.0
6.644000	25.9	9.000	N	10.2	34.1	60.0
6.654000	23.5	9.000	N	10.2	36.5	60.0
6.658000	21.0	9.000	N	10.2	39.0	60.0
6.694000	27.6	9.000	N	10.2	32.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	24.2	9.000	N	9.8	31.6	55.8
0.516000	21.9	9.000	N	9.8	24.1	46.0
0.522000	27.4	9.000	N	9.8	18.6	46.0
0.526000	24.7	9.000	N	9.8	21.3	46.0
0.530000	28.5	9.000	N	9.8	17.5	46.0
0.534000	17.5	9.000	N	9.8	28.5	46.0
0.900000	15.9	9.000	N	9.9	30.1	46.0
1.068000	16.0	9.000	N	9.9	30.0	46.0
1.102000	17.5	9.000	N	9.9	28.5	46.0
1.112000	22.6	9.000	N	9.9	23.4	46.0
1.124000	19.8	9.000	N	9.9	26.2	46.0
1.420000	23.3	9.000	N	9.9	22.7	46.0
6.636000	16.1	9.000	N	10.2	33.9	50.0
6.644000	13.9	9.000	N	10.2	36.1	50.0
6.654000	17.3	9.000	N	10.2	32.7	50.0
6.658000	16.9	9.000	N	10.2	33.1	50.0
6.694000	14.7	9.000	N	10.2	35.3	50.0
12.018000	13.9	9.000	N	10.4	36.1	50.0

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

Type		Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060-2M	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	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	Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.3 °C
Relative Humidity	42.5 %
Test Date	November 25, 2019

4.2.3 Measuring Data

Frequency (MHz)	Quasi Peak (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.984400	28.5	99.7	V	61.0	18.5	11.5	40.0
58.731000	23.5	99.8	V	315.0	19.4	16.5	40.0
74.930400	27.0	99.7	V	352.0	17.0	13.0	40.0
99.646000	31.0	99.8	V	222.0	15.2	12.5	43.5
132.812600	29.4	225.2	H	260.0	18.5	14.1	43.5
266.513400	34.9	125.1	H	170.0	19.3	11.1	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
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☒	Horn antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.19.2019
☐	Power Amplifier	TESTEK	TK-PA1840H	170030-L	1 year	12.17.2018
☐	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170 #786	2 year	12.05.2017
☒	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	2 480 MHz
Tested Frequency Range	1 GHz to 13 GHz
Operation Mode	Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.3 °C
Relative Humidity	42.5 %
Test Date	November 25, 2019

4.3.3 Measuring Data

Frequency (MHz)	Peak (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1498.580000	44.9	299.4	V	0.0	-25.6	29.1	74.0
2014.800000	51.7	113.4	V	52.0	-25.2	22.3	74.0
2660.725000	51.5	349.8	V	52.0	-22.6	22.5	74.0
4481.765000	45.7	203.4	V	4.0	-17.5	28.3	74.0
5978.590000	44.7	188.6	V	109.0	-14.7	29.3	74.0
9798.985000	48.7	276.4	V	71.0	-5.1	25.3	74.0

Frequency (MHz)	CAverage (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1498.580000	36.7	299.4	V	0.0	-25.6	17.3	54.0
2014.800000	36.2	113.4	V	52.0	-25.2	17.8	54.0
2660.725000	30.2	349.8	V	52.0	-22.6	23.8	54.0
4481.765000	28.5	203.4	V	4.0	-17.5	25.5	54.0
5978.590000	28.8	188.6	V	109.0	-14.7	25.2	54.0
9798.985000	35.2	276.4	V	71.0	-5.1	18.8	54.0

- 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

5. CONCLUSION

The data collected shows that the **Product Name: Zigbee Dongle, Model: PWLGWB100** 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-1911-FI003-P	December 02, 2019	Initial Release

End of report