FCC Part 15 Subpart B&C §15.247

Test Report

Equipment Under Test	**Wireless Weight Measurement**
Model Name	**P20-W-01**
Variant Model Name	**-**
FCC ID	**2AVR7-P20-W-01**
IC Number	**-**
Applicant	**AHQLab Inc.**
Manufacturer	**AHQLab Inc.**
Date of Test(s)	**2020. 12. 02 ~ 2020. 12. 07**
Date of Issue	**2020. 12. 07**

In the configuration tested, the EUT complied with the standards specified above.

Issue to	Issue by
AHQLab Inc. 402 Solian Officetel, 53 Daehak-ro, Yuseong-gu, Daejeon, South Korea Tel.: +82-42-826-3596 Fax: +82-42-367-3596	**MOVON Test Lab Co., Ltd** 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17030 Tel.: +82-31-338-8837 Fax: +82-31-338-8847

Revision history

Revision	Date of issue	Description	Revised by
--	2020.12.07	Initial	-

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1. Applicant Information

1.1. Details of applicant

Applicant	:	AHQLab Inc.
Address	:	402 Solian Offcetel, 53 Daehak-ro, Yuseong-gu, Daejeon, South Korea
Contact Person	:	Taeyeon Kim
Telephone	:	+82-42-826-3596
Fax	:	+82-42-367-3596

1.2. Manufacturer Information

Manufacturer	:	AHQLab Inc.
Address	:	402 Solian Offcetel, 53 Daehak-ro, Yuseong-gu, Daejeon, South Korea

2. Laboratory Information

Company name	:	MOVON Test Lab Co., Ltd
Test site number	:	FCC (KR0151)
Address	:	498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, South Korea
Web site	:	http://www.movonlab.co.kr
Telephone	:	+82-31-338-8837
Facsimile		+82-31-338-8847

3. Summary of test results

The EUT has been tested according to the following specifications:

FCC Rule FCC part 15	Description	Result
15.203 15.247(b)(4)	Antenna requirement	C
15.247(a)(1)	20 dB bandwidth & 99 % bandwidth	N/A Note1
15.247(b)(1)	Peak output power	N/A Note1
15.247(a)(1)	Carrier frequency separation	N/A Note1
15.247(a)(1)(iii)	Number of hopping frequency	N/A Note1
15.247(a)(1)(iii)	Time of occupancy (Dwell time)	N/A Note1
15.205(a) 15.209(a) 15.247(d)	Transmitter radiated spurious emissions, Conducted spurious emission	C
15.207(a)	AC Conducted power line test	N/A Note2

※ Abbreviation

C Complied
N/A Not applicable
F Fail

※ Note

Note 1 : This test is not applicable because the EUT uses certified module
Note 2 : This test is not applicable because the EUT uses battery and it's not to be connected to the Public utility(AC) power line

The sample was tested according to the following specification:
FCC Parts 15.247; ANSI C63.4:2014, ANSI C63.10:2013, FCC Public Notice DA 00-705

Approval Signatories

Test and Report Completed by :	Report Approval by :
손흠민	진해삽
Kin Son Test Engineer MOVON Test Lab Co., Ltd	Issac Jin Technical Manager MOVON Test Lab Co., Ltd

4. EUT Description

Kind of product	Wireless Weight Measurement
Model Name	P20-W-01
Variant Model Name	-
FCC ID	2AVR7-P20-W-01
IC Number	-
Power supply	DC 6.00 V (1.5 V AA Battery * 4)
Frequency range	2 402 MHz ~ 2 480 MHz
Modulation technique	GFSK, Pi/4DQPSK, 8DPSK
Number of channels	79 ch
Antenna gain / Type	3.2 ㏈i / PCB Antenna
Test Site Registration Number	FCC (KR0151)
H/W version / S/W version	1.0 / 1.0
Test S/W version	2.3(espRFTool)

4.1. Table for Test Modes and Frequency (Bluetooth)

Preliminary tests were performed in different data rate to find the worst radiated emission.
The data rate shown in the table below is the worst-case rate with respect to the specific test item.
Investigation has been done on all the possible configurations for searching the worst cases.
The following table is a list of the test modes shown in this test report.

Mode	Data rate (Worst case)	Frequency (Freq. MHz)
BDR	DH5	**Lowest** (2 402) / **Middle** (2 441) / **Highest** (2 480)
EDR	3-DH5	**Lowest** (2 402) / **Middle** (2 441) / **Highest** (2 480)

4.2. Information about the FHSS characteristics

4.2.1. Pseudorandom frequency hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s.

4.2.2. Medium access protocol

The manufacturer declares that the device uses Bluetooth protocol.
It confirmed that Medium access protocol is implemented.

5. Measurement equipment

Equipment	Manufacturer	Model	Serial number	Calibration Interval	Calibration date	Calibration due.
Test Receiver	R&S	ESVS30	829673/015	1 year	2020-11-23	2021-11-23
Signal Generator	R&S	SMB100A	178128	1 year	2020-06-26	2021-06-26
Spectrum Analyzer	R&S	FSV-40	100832	1 year	2020-05-27	2021-05-27
DC Power Supply	Agilent	U8002A	MY56110033	1 year	2020-06-26	2021-06-26
Power Meter	Agilent	E4416A	GB41290645	1 year	2020-05-26	2021-05-26
Power Sensor	Agilent	9327A	US40441490	1 year	2020-05-26	2021-05-26
Horn Antenna	R&S	HF906	100236	2 year	2019-04-09	2021-04-09
Horn Antenna	AH Systems	SAS-572	269	1 year	2020-05-29	2021-05-29
Horn Antenna	AH Systems	SAS-573	164	1 year	2020-04-27	2021-04-27
Bi-Log Ant.	S/B	VULB 9161SE	4159	2 year	2020-03-30	2022-03-30
Loop Antenna	ETS LINDGREN	6502	00118166	2 year	2020-06-30	2022-06-30
Power Amplifier	TESTEK	TK-PA18H	170013-L	1 year	2021-05-26	2022-05-26
Power Amplifier	MITEQ	AFS43-01002600	2048519	1 year	2020-06-29	2021-06-29
Power Amplifier	MITEQ	AMF-6F-26004000-33-8P-HS	1511665	1 year	2020-06-26	2021-06-26
Step Attenuator	Agilent	8494B	US37181955	1 year	2020-05-27	2021-05-27
Controller	INNCO	CO2000	CO2000/064/6961003/L	N/A	N/A	N/A
Antenna Master	INNCO	MA4000	MA4000/038/6961003/L	N/A	N/A	N/A
Controller	INNCO	CO3000	CO3000/812/34240914/L	N/A	N/A	N/A
Antenna Master	INNCO	MA4640-XP-ET	None	N/A	N/A	N/A
RF Cable	SUHNER	SUCOFLEX100	84047746	3 month	2020-12-04	2021-03-04
RF Cable	SUHNER	SUCOFLEX102	801270/2	3 month	2020-12-04	2021-03-04
RF Cable	SUHNER	SUCOFLEX102	801532/2	3 month	2020-12-04	2021-03-04
Test Receiver	R&S	ESR3	101873	1 year	2020-05-26	2021-05-26

※Remark
Support equipment

Description	Manufacturer	Model	Serial number
Notebook computer	DELL	Lattitude D510	-

6. Antenna requirement

6.1. Standard applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section §15.247 (c) if transmitting antennas of directional gain greater than 6dBi are used.

6.2. Antenna connected construction

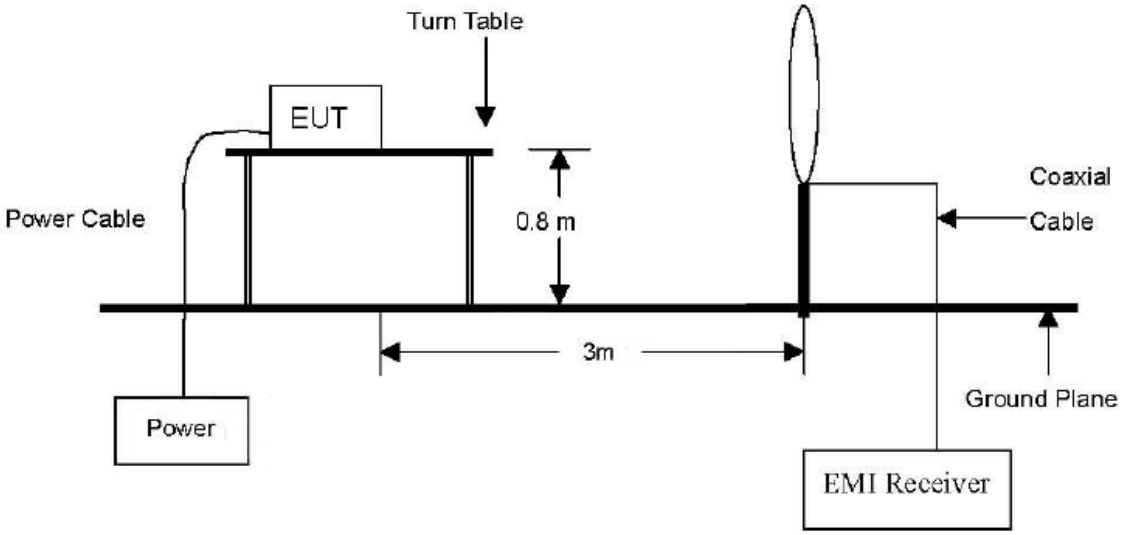
Antenna used in this product is PCB antenna,
Antenna gain is 3.2 dBi.

7. Transmitter radiated spurious emissions

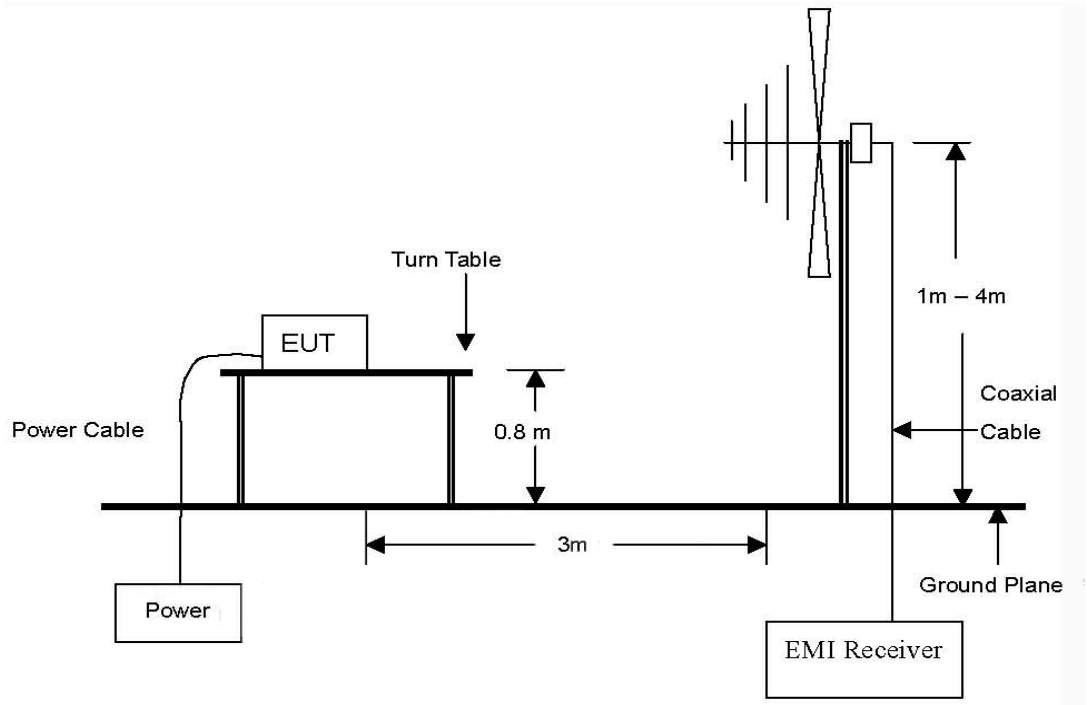
7.1. Test setup

7.1.1. Transmitter radiated spurious emissions

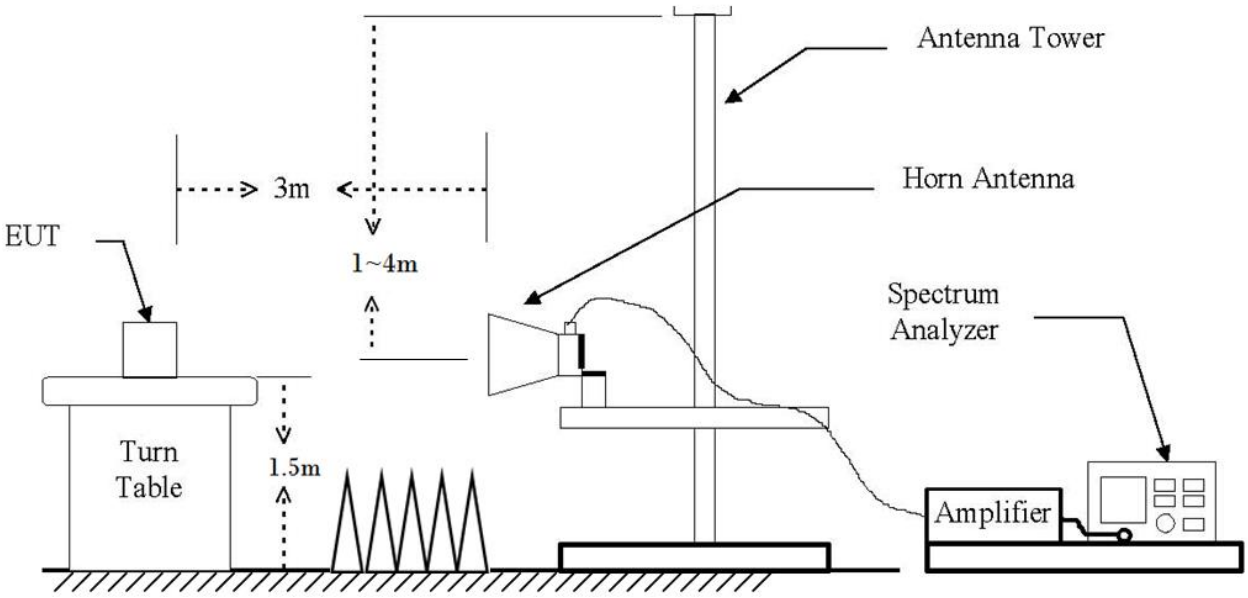
The diagram below shows the test setup that is utilized to make the measurements for emission from 9kHz to 30MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 40 ㎓ emissions.



12.2. Limit

According to §15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))
According to § 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated at 3M (㏈㎶/m)	Radiated (㎶/m)
0.009–0.490	300	See the remark	2400/F(㎑)
0.490–1.705	30		24000/F(㎑)
1.705–30.0	30		30
30 - 88	3	40.0	100
88 – 216	3	43.52	150
216 – 960	3	46.02	200
Above 960	3	53.97	500

※Remark

1. Emission level in ㏈uV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =20log(Specific distance/ test distance)(㏈)
   Limit line=Specific limits(㏈uV) + distance extrapolation factor.

7.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013
In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

7.3.1. Test procedures for radiated spurious emissions

1. The EUT is placed on a turntable, which is 0.8 m (Below 1 ㎓.)/ 1.5 m (Above 1 ㎓) above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

※Remark

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 ㎑ for Peak detection (PK) at frequency below 30 ㎒
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 ㎓.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 ㎒ for Peak detection and frequency above 1 ㎓.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒z and the video bandwidth is 10 ㎐ for Average detection (AV) at frequency above 1 ㎓.

7.4. Test results

7.4.1. Radiated spurious emissions (9 kHz to 30 MHz)

The frequency spectrum from 9㎑ to 30㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : EDR_2 402 MHz (Worst case)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
No other emissions were detected at a level greater than 20dB below limit.					

※Remark

1. Actual = Reading + Ant. factor - Amp + CL (Cable loss)
2. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

7.4.2. Radiated spurious emissions (30 MHz to 1 000 MHz)

The frequency spectrum from 30 ㎒ to 1 000 ㎒ was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : EDR_2 402 MHz (Worst case)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
35.90	QP	V	30.3	40.00	9.7
199.97	QP	V	23.5	40.00	16.5
Above 200 MHz Not detected					

※Remark

1. Actual = Reading + Ant. factor - Amp + CL (Cable loss)
2. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

7.4.3. Radiated spurious emissions & Bandedge (Above 1 000 MHz)

The frequency spectrum above 1 000 ㎒was investigated. Emission levels are not reported much lower than the limits by over 20 ㏈.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : BDR

A. Lowest Ch. (2 402 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 358.12	Peak	H	39.05	74.00	34.95
Above 5 000 MHz Not detected					

B. Middle Ch. (2 441 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*4 881.92	Peak	V	46.71	74.00	27.29
Above 5 000 MHz Not detected					

C. Highest Ch. (2 480 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 497.15	Peak	H	34.73	74.00	39.27
Above 3 000 MHz Not detected					

※Remark

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit

Test mode : EDR

A. Lowest Ch. (2 402 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 334.11	Peak	V	36.51	74.00	37.49
Above 3 000 MHz Not detected					

B. Middle Ch. (2 441 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*4 882.10	Peak	V	46.77	74.00	27.23
Above 3 000 MHz Not detected					

C. Highest Ch. (2 480 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 497.43	Peak	V	36.28	74.00	37.72
Above 3 000 MHz Not detected					

※Remark

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit