

EMF TEST REPORT

Report number		RAPA22-O-056
Applicant	Name	Innonet Co., Ltd.
	Logo	N/A
	Address	Building C, Office 417, Munjeong Hyundai Knowledge Industry Center, 7, Beobwon-ro 11-gil, Songpa-gu, Seoul 05836
Manufacturer	Name	Innonet Co., Ltd.
	Address	Building C, Office 417, Munjeong Hyundai Knowledge Industry Center, 7, Beobwon-ro 11-gil, Songpa-gu, Seoul 05836
Type of equipment		Fixed TVWS Gateway
Basic model name		BUHST10
Multi model name		N/A
Serial number		N/A
FCC ID		2A9R3-BUHST10
Test duration		December 1, 2022 to December 26, 2022
Date of issue		December 27, 2022
Total page		7 Pages (including this page)

SUMMARY

The equipment complies with the regulation; FCC Part 15 Subpart H

This test report only contains the result of a single test of the sample supplied for the examination.
It is not a general valid assessment of the features of the respective products of the mass-production.

December 27, 2022

December 27, 2022

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류우열

Tested by MinGu Ji
Tester

Reviewed by Wooyeol- Ryu
Executive Manager

Test Report Version History

Version	Date	Reason for revision
1.0	December 27, 2022	Original Document

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1. Description of EUT

1.1 Applicant

- Company name : Innonet Co., Ltd.
- Address : Building C, Office 417, Munjeong Hyundai Knowledge Industry Center, 7, Beobwon-ro 11-gil, Songpa-gu, Seoul 05836
- Contact person : Tae Hyun Kim / Researcher / thkim@innonet.net
- Phone/Fax : +82-2-406-8849 / +82-2-3012-8101

1.2 Manufacturer

- Company name : Innonet Co., Ltd.
- Address : Building C, Office 417, Munjeong Hyundai Knowledge Industry Center, 7, Beobwon-ro 11-gil, Songpa-gu, Seoul 05836
- Phone/Fax : +82-2-406-8849 / +82-2-3012-8101

1.3 Basic description

- Product name : Fixed TVWS Gateway
- Basic model name : BUHST10
- Alternative model name : N/A

1.4 General description

- EQUIPMENT CLASS : WGF – White Space Device with Geo-location - Fixed
- Frequency Range : 470 MHz ~ 698 MHz
- Output Power : 23.33 dBm
- Modulation Type : QPSK
- Antenna Type : Patch Antenna
- Antenna Gain : 8.28 dBi
- Power Supply : DC 24.0 V

Start of Frequency range, MHz	End of Frequency range, MHz	Frequency range Bandwidth, MHz	Channel size, MHz	Low channel	Mid channel	High channel
470	698	228	6	473	587	695
			12	476	584	692

1.5 Alternative type(s)/model(s)

There is no alternative type(s) and/or model(s).

2. General information of test

2.1 Test standards and results

Applied Standards : FCC Part 15 Subpart C		
Section	Description of Test	Result
ANSI 63.10 6.9.3	99 % Occupied Bandwidth	Pass
15.709 (b) (ii)	OUTPUT POWER AND POWER SPECTRAL DENSITY	Pass
15.709 (d)	BAND-EDGE and ADJACENT CHANNEL EMISSIONS	Pass
15.709 (d)	Radiated Emission which fall in the Restricted Band	Pass
15.207	Conducted Limits	Pass
15.209	Radiated Emission Limits	Pass
15.203	Antenna Requirement	Pass

2.2 Description of EUT during the test

During the test, keep the EUT in continuously transmitting mode.

There was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

The EUT was moved throughout the X, Y, and Z axis and worst case data was recorded in this report.

The BT module((2AUUG-BOT-CLE310) used a certified module.

2.3 Test configuration

• Type of peripheral equipment used

Model	Manufacturer	Description	Connected to
TVWS-GW-PSU	Innonet Co., Ltd.	AC/DC Adapter	EUT
EliteBook 8570p	HP	Notebook	EUT
PA-1900-32HT	LITE-ON TECHNOLOGY(CHANGZHOU_Co., Ltd.	Power Adapter	Notebook

2.4 Test Facility

- FCC Registration No: 931589
- IC Company address code: 9355B
- RRA Designation Number: KR0027

• Place of Test

Anyang Test Site(RF Test Room)

#101 & B104 Anyang Megavalley, 268, Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14056, Korea

3. MAXIMUM PERMISSIBLE EXPOSURE

3.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are $f/1500$ mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G)} / d, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric field strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 0.01 * d (m)

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

3.2 EUT Description

Kind of EUT	Fixed TVWS Gateway
Operating Frequency Band	<input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz <input type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz <input type="checkbox"/> WLAN: 5 180 MHz ~ 5 240 MHz <input type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz <input type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> Bluetooth BLE: 2 402 MHz ~ 2 480 MHz <input checked="" type="checkbox"/> Other : 473 MHz ~ 695 MHz
MAX. RF OUTPUT POWER	23.33 dBm
Antenna Gain	8.28 dBi
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR Exclusion <input type="checkbox"/> N/A

3.3 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Power Density (mW/cm ²) @ 30 cm Separation	Limit (mW/cm ²)
		(dBm)	(dBm)	(mW)	Log	Linear		
473	TVWS	23.33 ± 0.5	23.83	241.55	8.28	6.730	0.143 7	0.32
589	TVWS	22.24 ± 0.5	22.74	187.93	8.28	6.730	0.111 8	0.39
695	TVWS	22.56 ± 0.5	23.06	202.30	8.28	6.730	0.120 4	0.46

3.4 Data for Intermoduration Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Power Density (mW/cm ²) @ 30 cm Separation	Sum Power Density (mW/cm ²) @ 30 cm Separation	Limit
2 412 ~ 2 462	802.11n(HT20)	0.294 136	0.437 836	1.00
473	TVWS	0.143 7		

2.93
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