

EMF TEST REPORT

Test Report No. : OT-213-RWD-001
Reception No. : 2008003253
Applicant : PS TEC Co., Ltd.
Address : 80, HWANGGEUM 3-RO 7BEON-GIL, YANGCHON-EUP, GIMPO-SI,
GYEONGGI-DO, KOREA
Manufacturer : PS TEC Co., Ltd.
Address : 80, HWANGGEUM 3-RO 7BEON-GIL, YANGCHON-EUP, GIMPO-SI,
GYEONGGI-DO, KOREA
Type of Equipment : Autonomous Terminal
FCC ID. : 2AVSN-PSM-NGT-G01
Model Name : PSM-NGT-G01
Serial number : N/A
Total page of Report : 10 pages (including this page)
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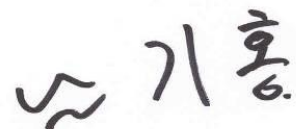
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.





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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-213-RWD-001	March 02, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : PS TEC Co., Ltd.

Address : 80, HWANGGEUM 3-RO 7BEON-GIL, YANGCHON-EUP, GIMPO-SI, GYEONGGI-DO, KOREA

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FCC ID : 2AVSN-PSM-NGT-G01

Model Name : PSM-NGT-G01

Brand Name : N/A

Serial Number : N/A

Date : March 02, 2021

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Autonomous Terminal
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The PS TEC Co., Ltd., Model PSM-NGT-G01 (referred to as the EUT in this report) is a Autonomous Terminal. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	Autonomous Terminal	
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz Band	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
		2 422 MHz ~ 2 452 MHz (802.11n(HT40))
RF Output Power	Bluetooth LE	-2.04 dBm
	WLAN 2.4 GHz Band	802.11b (8.23 dBm) 802.11g (3.10 dBm) 802.11n(HT20) (3.11 dBm) 802.11n(HT40) (0.70 dBm)
Number of Channel	Bluetooth LE	40 Channels
	WLAN 2.4 GHz Band	11 Channels
Modulation Type	Bluetooth LE	DSSS Modulation(GFSK)
	WLAN 2.4 GHz Band	DSSS Modulation(DBPSK/DQPSK/CCK) OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
Antenna Type	Bluetooth LE (Model Name: MDBT50Q-U)	Dipole Antenna
	WLAN 2.4 GHz Band	
Antenna Gain	Bluetooth LE (Model Name: MDBT50Q-U)	5.33 dBi
	WLAN 2.4 GHz Band	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz, 32 MHz	
Rated Supply Voltage	DC 5.0 V	

Note 1: The Product has total of 3 Modules including certified Bluetooth LE Module (Model Name: RN4870), Bluetooth LE Module (MDBT50Q-U) and WLAN module. For details of Certified Module, Please refer to the report. (Report No.: 10053523 001 / Model name: RN4870 / FCC ID: A8TBM70ABCDEFGH)

Note 2: Bluetooth LE (MDBT50Q-U), Certified Bluetooth LE(RN4870) and WLAN operate simultaneously.

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 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 $P \text{ (mW)} = P \text{ (W)} / 1\,000$, $d \text{ (cm)} = 0.01 * d \text{ (m)}$

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

Where

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

4.2 EUT Description

Kind of EUT	Autonomous Terminal
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input checked="" type="checkbox"/> Mobile (> 20 cm separation) <input type="checkbox"/> Others
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A

4.3 Calculated MPE Safe Distance for WLAN

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11b	8.23 ± 1.0	9.23	8.38	5.33	3.41	1.51	0.005 7	1
	802.11g	3.10 ± 1.0	4.10	2.57			0.84	0.001 7	1
	802.11n_HT20	3.11 ± 1.0	4.11	2.58			0.84	0.001 8	1
	802.11n_HT40	0.70 ± 1.0	1.70	1.48			0.63	0.001 0	1

According to above table, for 2 400 ~ 2483.5 MHz Band(802.11 b), safe distance,

$$D = 0.282 * \sqrt{(8.38 * 3.41)/1.00} = 1.51 \text{ cm.}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 8.38 * 3.41 / (4 * \pi * 20^2) = 0.005 7$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

4.4 Calculated MPE Safe Distance for Bluetooth

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	Bluetooth LE	-2.04 ± 1.0	-1.04	0.79	5.33	3.41	0.46	0.000 5	1.00

According to above table, for 2 402 ~ 2480 MHz Band(1 Mbps), safe distance,

$$D = 0.282 * \sqrt{(0.79 * 3.41)/1.00} = 0.46 \text{ cm.}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 0.79 * 3.41 / (4 * \pi * 20^2) = 0.000 5$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

4.6 DATA for Intermodulation Transmit

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Power Density (mW/cm ²) @ 20 cm Separation	Sum Power Density (mW/cm ²) @ 20 cm Separation	Limit (mW/cm ²)
			(dBm)	(mW)			
Bluetooth (MDBT50Q) + Bluetooth (RN4870) + WLAN 2 G	Bluetooth (1 Mbps, MDBT50Q)	-2.04 ± 1.0	-1.04	0.79	0.000 5	0.006 7	1.00
	Bluetooth (1 Mbps, RN4870)	1.36 ± 1.0	2.36	1.72	0.000 5		
	WLAN 2 G (802.11 b)	8.23 ± 1.0	9.23	8.38	0.005 7		