RADIO PERFORMANCE TEST REPORT (CLASS I Permissive Change)

Test Report No. : **OT-24N-RWD-057**

Reception No. : **2411004143**

Applicant : **SJIT Co., Ltd.**

Address : **54-11, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea**

Manufacturer : **SJIT Co., Ltd.**

Address : **54-11, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea**

Type of Equipment : **Asset Tracker**

FCC ID. : **2AS8LIET10MO**

Model Name : **IET10MO**

Multiple Model Name : **N/A**

Serial number : **N/A**

Total page of Report : **10 pages (including this page)**

Date of Incoming : **May 20, 2020**

Date of issue : **November 29, 2024**

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.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.

Reviewed by
Tae-Ho, Kim / Chief Engineer
ONETECH Corp.

Approved by
Jae-Ho, Lee / Chief Engineer
ONETECH Corp.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-206-RWD-007	June 03, 2020	Initial Release	All
1	OT-227-RWD-024	July 08, 2022	Changed company name. (Class I Permissive Change)	All
2	OT-24N-RWD-057	November 29, 2024	Changed company name and address. (Class I Permissive Change)	All

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1. VERIFICATION OF COMPLIANCE

Applicant : SJIT Co., Ltd.
Address : 54-11, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea
Manufacturer : SJIT Co., Ltd.
Address : 54-11, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea
Contact Person : Sangyoung, Lee / Senior researcher
Telephone No. : +82-70-7837-2853
FCC ID : 2AS8LIET10MO
Model Name : IET10MO
Brand Name : -
Serial Number : N/A
Date : November 29, 2024

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM DSS – PART 15 SPREAD SPECTRUM TRANSMITTER
E.U.T. DESCRIPTION	Asset Tracker
THIS REPORT CONCERNS	Class I Permissive Change
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 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.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

2. GENERAL INFORMATION

2.1 Product Description

The SJIT Co., Ltd., Model IET10MO (referred to as the EUT in this report) is a Asset Tracker. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Asset Tracker		
Temperature Range	-30 °C ~ 60 °C		
OPERATING FREQUENCY	Sig Fox	902.137 5 MHz ~ 904.662 5 MHz (RC2) 920.737 5 MHz ~ 923.262 5 MHz (RC4)	
	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
MODULATION TYPE	Sig Fox	DBPSK	
	Bluetooth LE	GFSK	
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
RF OUTPUT POWER	Sig Fox	25.364 dBm	
	Bluetooth LE	Peak	3.68 dBm
		Average	3.60 dBm
	WLAN 2.4 GHz	Peak	17.38 dBm(802.11b) 20.05 dBm(802.11g) 19.91 dBm(802.11n_HT20)
		Average	11.55 dBm(802.11b) 12.17 dBm(802.11g) 12.09 dBm(802.11n_HT20)
ANTENNA TYPE		Sig Fox : Metal Antenna Bluetooth LE / WLAN 2.4 GHz : Chip Antenna GPS : Ceramic Patch Antenna	
ANTENNA GAIN		Sig Fox: 2.50 dBi Bluetooth LE: 2.50 dBi WLAN 2.4 GHz: 2.50 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		32.768 kHz, 26 MHz, 32 MHz	

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

-. None

2.3 Related Submittal(s) / Grant(s)

-. CLASS I Permissive Change:

The EUT was granted on June 03, 2020 but only following modifications and/or changed items are implemented into the device.

Changed item	Changed company name and address.

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:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

Where

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

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

Combing 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

Kind of EUT	Asset Tracker
Device Category	☐ Portable (< 20 cm separation) ☐ Mobile (> 20 cm separation) ■ Others
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A

Tested by: Hyung-Kwon, Oh / Assistant Manager

4.2 Test Result for Bluetooth LE

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance [Average]	Max tune up power [Average]		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	Bluetooth LE	3.0 ± 2.0	5.00	3.16	2.50	1.78	0.67	0.001 1	1.00

According to above table, for 2 402 MHz ~ 2 480 MHz Band, safe distance,

$D = 0.282 * \sqrt{(3.16 * 1.78)} / 1.00 = 0.67$ cm

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

$S = P * G / (4\pi * R^2) = 3.16 * 1.78 / (4 * 3.14 * 20^2) = 0.001\ 1$

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

4.3 Test Result for WLAN 2.4 GHz

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance [Average]	Max tune up power [Average]		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11 b	12.0 ± 2.0	14.00	25.12	2.50	1.78	1.88	0.008 9	1.00

Note. The worse MPE data for each Mode(802.11 b / g / n20) is determined for IEEE 802.11b.

So, MPE data is Calculated only mode for 802.11 b.

According to above table, for 2 400 ~ 2 483.5 MHz Band(802.11b), safe distance,

$D = 0.282 * \sqrt{(25.12 * 1.78)/1.00} = 1.88$ cm

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

$S = P * G / (4\pi * R^2) = 25.12 * 1.78 / (4 * 3.14 * 20\text{^}2) = 0.008\ 9$

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

Tested by: Hyung-Kwon, Oh / Assistant Manager

4.4 Test Result for Sig Fox

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		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(dBm)	(mW)	Log	Linear			
902.00 ~ 928.00	RC4	23.5 ± 2.0	25.50	354.81	2.50	1.78	7.08	0.125 6	1.00

Note. The worse MPE data for each Mode(RC2 / RC4) is determined for RC2.

So, MPE data is Calculated only mode for RC2.

According to above table, for 902.00 ~ 928.00 MHz Band, safe distance,

$D = 0.282 * \sqrt{(354.81 * 1.78)/1.00} = 7.08$ cm

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

$S = P * G / (4\pi * R^2) = 354.81 * 1.78 / (4 * 3.14 * 20^2) = 0.125\ 6$

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

4.5 Test Result for Intermodulation Mode

According to above equation, the following result was obtained.

- ➔ WLAN 2.4 GHz(0.008 9/1.0) + Bluetooth LE(0.001 1/1.0) = 0.010 0 < 1.00
- ➔ Sig Fox(0.125 6/1.0) + Bluetooth LE(0.001 1/1.0) = 0.126 7 < 1.00

Tested by: Hyung-Kwon, Oh / Assistant Manager