

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-218-RWD-032

Reception No. : 2104003237

Applicant : Suntech International Ltd.

Address : A-1705, A-1706, Greatvally, 32, Digital-ro 9-gil, Geumcheon-Gu, Seoul, Korea

Manufacturer : Suntech International Ltd.

Address : A-1705, A-1706, Greatvally, 32, Digital-ro 9-gil, Geumcheon-Gu, Seoul, Korea

Type of Equipment : Tracking Device

FCC ID. : WA2ST4250

Model Name : ST4250

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 9 pages (including this page)

Date of Incoming : July 28, 2021

Date of issue : August 12, 2021

SUMMARY

The equipment complies with the regulation; *FCC 47 CFR Part 1, 1.1310*

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

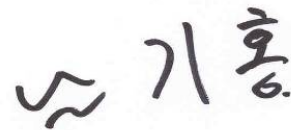
It is not a generally valid assessment of the features of the respective products of the mass-production.



Tested by
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CONTENTS**PAGE**

1. VERIFICATION OF COMPLIANCE	4
2. GENERAL INFORMATION	5
2.1 PRODUCT DESCRIPTION.....	5
2.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	6
3. EUT MODIFICATIONS.....	6
4. MAXIMUM PERMISSIBLE EXPOSURE.....	7
4.1 RF EXPOSURE CALCULATION	7
4.2 EUT DESCRIPTION.....	7
4.3 CALCULATED MPE SAFE DISTANCE (LTE CAT.M1)	8
4.4 CALCULATED MPE SAFE DISTANCE (BLE)	9
4.5 DATA FOR INTERMODULATION TRANSMIT	9

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-218-RWD-032	August 12, 2021	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Suntech International Ltd.
 Address : A-1705, A-1706, Greatvally, 32, Digital-ro 9-gil, Geumcheon-Gu, Seoul, Korea
 Contact Person : Sang-Kyu, Lee / General Manager
 Telephone No. : +82-2-6327-5662
 FCC ID : WA2ST4250
 Model Name : ST4250
 Brand Name : Suntech International
 Serial Number : N/A
 Date : August 12, 2021

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Tracking Device
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
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 Suntech International Ltd., Model ST4250 (referred to as the EUT in this report) is a Tracking Device. The product specification described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Tracking Device		
Operating Frequency	LTE Band 2	TX	1 850 MHz ~ 1 910 MHz
		RX	1 930 MHz ~ 1 990 MHz
	LTE Band 4	TX	1 710 MHz ~ 1 755 MHz
		RX	2 110 MHz ~ 2 155 MHz
	LTE Band 5	TX	824 MHz ~ 849 MHz
		RX	869 MHz ~ 894 MHz
	LTE Band 12	TX	699 MHz ~ 716 MHz
		RX	729 MHz ~ 746 MHz
	LTE Band 13	TX	777 MHz ~ 787 MHz
		RX	746 MHz ~ 756 MHz
Bluetooth LE	2 402 MHz ~ 2 480 MHz		
Modulation Type	LTE	QPSK, 16QAM	
	Bluetooth LE	GFSK	
Maximum Output Power	LTE Band 2	20.92 dBm	
	LTE Band 4	20.83 dBm	
	LTE Band 5	20.87 dBm	
	LTE Band 12	20.46 dBm	
	LTE Band 13	20.31 dBm	
	Bluetooth LE	6.49 dBm	

Rated Power	LTE Band 2	20.00 dBm
	LTE Band 4	20.00 dBm
	LTE Band 5	20.00 dBm
	LTE Band 12	20.00 dBm
	LTE Band 13	20.00 dBm
Antenna Type	LTE Cat.M1	Metal Antenna
	Bluetooth LE	PCB Antenna
Antenna Gain	LTE Band 2	1.31 dBi
	LTE Band 4	1.30 dBi
	LTE Band 5	1.64 dBi
	LTE Band 12	1.26 dBi
	LTE Band 13	1.26 dBi
	Bluetooth LE	-0.06 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 MHz	

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 (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

4.2 EUT Description

Kind of EUT	Tracking Device
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" 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 (LTE Cat.M1)

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	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			
LTE Band 2	1 850.70	20.00 ± 2.0	22.0	158.49	1.31	1.35	4.13	0.042 6	1
LTE Band 4	1 710.70	20.00 ± 2.0	22.0	158.49	1.30	1.35	4.12	0.042 5	1
LTE Band 5	824.70	20.00 ± 2.0	22.0	158.49	1.64	1.46	4.29	0.046 0	0.549 8
LTE Band 12	715.30	20.00 ± 2.0	22.0	158.49	1.26	1.34	4.10	0.042 1	0.476 9
LTE Band 13	782.00	20.00 ± 2.0	22.0	158.49	1.26	1.34	4.10	0.042 1	0.521 3

According to above table, for LTE Band 2, safe distance,

$$D = 0.282 * \sqrt{(158.49 * 1.31)/1.00} = 4.06 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 158.49 * 1.31 / (4 * \pi * 20^2) = 0.041 3$$

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

According to above table, for the frequency range between 300 MHz and 1 500 MHz, each limit,

$$\text{LTE Band 5 limit} = 824.70/1500 = 0.549 8 \text{ mW/cm}^2$$

$$\text{LTE Band 12 limit} = 715.30/1500 = 0.476 9 \text{ mW/cm}^2$$

$$\text{LTE Band 13 limit} = 782.00/1500 = 0.521 3 \text{ mW/cm}^2$$

4.4 Calculated MPE Safe Distance (BLE)

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	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			
Bluetooth LE	2 402.00	6.49 ± 2.0	8.49	7.06	-0.06	0.99	0.75	0.001 4	1

According to above table, safe distance,

$$D = 0.282 * \sqrt{(7.06 * 0.99)/1.00} = 0.75 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 7.06 * 0.99 / (4 * \pi * 20^2) = 0.001 4$$

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 DATA for Intermodulation Transmit

According to above equation, the following result was obtained.

Operating Mode	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
			(dBm)	(mW)			
Bluetooth LE + LTE	Bluetooth LE	6.49 ± 2.0	8.49	7.06	0.001 4	0.095 4	< 1
	LTE Band 5	20.00 ± 2.0	22.0	158.49	0.094 0		

$$\text{SumPower Density} = (\text{Power Density}_1/\text{Limit}_1 + \text{Power Density}_2/\text{Limit}_2 + \dots)$$

$$= (0.001 4/1 + 0.046 0/0.549 8)$$