ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No.	: OT-199-RWD-029
AGR No.	: A199A-034
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	: Telematics Device
FCC ID.	: WA2ST410
Model Name	: ST410
Multiple Model Name	: ST410GC
Serial number	: N/A
Total page of Report	: 10 pages (including this page)
Date of Incoming	: September 04, 2019
Date of issue	: September 18, 2019

SUMMARY

The equipment complies with the regulation; *FCC PART* **Part 2, Part 22 Subpart H, Part 24 Subpart E**

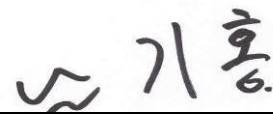This test report only contains the result of a single test of the sample supplied for the examination.

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

Reviewed by: _____

Tae-Ho, Kim / Senior Manager
ONETECH Corp.

Approved by: _____

Ki-Hong, Nam / Chief Engineer
ONETECH Corp.

CONTENTS

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-199-RWD-029	September 18, 2019	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   : Yohan Kim / Manager

Telephone No.   : 82-2-6327-5661

FCC ID   : WA2ST410

Model Name   : ST410

Serial Number   : N/A

Date   : September 18, 2019

EQUIPMENT CLASS	PCB-PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	Telematics Device
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.26:2015, KDB Publication 971168 D01
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC Part 2, Part 22 Subpart H, Part 24 Subpart E
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.

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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 Suntech International Ltd., Model ST410 (referred to as the EUT in this report) is a Telematics Device. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Telematics Device		
OPERATING FREQUENCY	GSM850	TX	824.2 MHz ~ 848.8 MHz
		RX	869.2 MHz ~ 893.8 MHz
	PCS1900	TX	1 850.2 MHz ~ 1 909.8 MHz
		RX	1 930.2 MHz ~ 1 989.8 MHz
Modulation Type	GMSK		
Maximum ERP Power	GSM850	ST410	24.32 dBm
		ST410GC	24.19 dBm
Maximum EIRP Power	PCS1900	ST410	22.06 dBm
		ST410GC	22.06 dBm
ANTENNA TYPE	PCB Pattern Antenna		
ANTENNA GAIN	GSM850	-0.98 dBi	
	PCS1900	1.73 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	26 MHz		

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

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
ST410	This model uses a paper enclosure.	☑
ST410GC	This model uses a plastic enclosure.	☑

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

3. EUT MODIFICATIONS

-. None

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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

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 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

IMPORTANT NOTE:

To comply with the FCC RF exposure compliance requirements, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with ant other antenna or transmitter. No change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device. There is no simultaneous operation within the bands used in this EUT

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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

4.2 EUT Description

Kind of EUT	Telematics Device			
OPERATING FREQUENCY	GSM850		TX	824.2 MHz ~ 848.8 MHz
			RX	869.2 MHz ~ 893.8 MHz
	PCS1900		TX	1 850.2 MHz ~ 1 909.8 MHz
			RX	1 930.2 MHz ~ 1 989.8 MHz
MAX. RF OUTPUT POWER	GSM850	ST410	32.24 dBm	
		ST410GC	32.23 dBm	
	PCS1900	ST410	29.12 dBm	
		ST410GC	29.08 dBm	
ANTENNA GAIN	GSM850		-0.98 dBi	
	PCS1900		1.73 dBi	
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A			

5 Evaluation Results

5.1 Assessment result of RF Power and Antenna gain

5.1.1 Basic Model: ST410

Operating Mode	Operating Frequency (MHz)	Avg. Power Level	
		(dBm)	(W)
GSM850	848.8	32.24	1.675
PCS1900	1 850.2	29.12	0.817

5.1.2 Multiple Model: ST410GC

Operating Mode	Operating Frequency (MHz)	Avg. Power Level	
		(dBm)	(W)
GSM850	836.6	32.23	1.671
PCS1900	1 850.2	29.08	0.809

Tested by: Ju Yun Park / Assistant Manager

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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

5.1.3 Basic Model: ST410 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	Conducted Average Power		Antenna Gain (dBi)		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(mW)	Log	Linear			
PCS1900	1 850.2	29.12	816.58	1.73	1.489	9.83	0.242	1.00

Operating Mode	Operating Frequency (MHz)	Conducted Average Power		Antenna Gain (dBi)		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(mW)	Log	Linear			
GSM850	848.8	32.24	1 674.94	-0.98	0.798	10.31	0.266	0.565

limit = $848.8/1500 = 0.565$ mW/cm²

PCS1900 Power Density = Conducted Average Power * Antenna Gain(dBi) / $(4\pi R^2)$

$$= (816.58*1.489)/(4*\pi*20^2) = 0.242 \text{ mW/cm}^2$$

GSM850 Power Density = Conducted Average Power * Antenna Gain(dBi) / $(4\pi R^2)$

$$= (1\,674.94*0.798)/(4*\pi*20^2) = 0.266 \text{ mW/cm}^2$$

Tested by: Ju Yun Park / Assistant Manager

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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

5.1.4 Multiple Model: ST410GC Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	Conducted Average Power		Antenna Gain (dBi)		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(mW)	Log	Linear			
PCS1900	1 850.2	29.08	809.10	1.73	1.489	9.79	0.239	1.00

Operating Mode	Operating Frequency (MHz)	Conducted Average Power		Antenna Gain (dBi)		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(mW)	Log	Linear			
GSM850	836.6	32.23	1 671.09	-0.98	0.798	10.30	0.265	0.557

limit = 836.6/1500 = 0.557 mW/cm²

PCS1900 Power Density = Conducted Average Power * Antenna Gain(dBi) / $(4\pi R^2)$

$$= (809.10*1.489)/(4*\pi*20^2) = 0.239 \text{ mW/cm}^2$$

GSM850 Power Density = Conducted Average Power * Antenna Gain(dBi) / $(4\pi R^2)$

$$= (1\ 671.09*0.798)/(4*\pi*20^2) = 0.265 \text{ mW/cm}^2$$

Tested by: Ju Yun Park / Assistant Manager

It should not be reproduced except in full, without the written approval of ONETECH Corp.   EMC-003 (Rev.2)

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