

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No. : OT-190-RWD-035
AGR No. : A198A-018
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. : WA2ST4330
Model Name : ST4330
Serial number : N/A
Total page of Report : 10 pages (including this page)
Date of Incoming : September 23, 2019
Date of issue : October 14, 2019

SUMMARY

The equipment complies with the regulation; **FCC PART Part 2, Part 22 Subpart H, Part 24 Subpart E, Part 27 Subpart C**

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

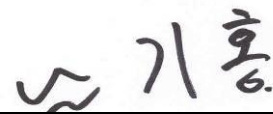
It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Tae-Ho, Kim / Senior Manager
ONETECH Corp.

Approved by:



Ki-Hong, Nam / Chief Engineer
ONETECH Corp.

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Revision History

| Rev. No. | Issue Report No. | Issued Date | Revisions | Section Affected |
|----------|------------------|------------------|-----------------|------------------|
| 0 | OT-19O-RWD-035 | October 14, 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 : WA2ST4330
 Model Name : ST4330
 Serial Number : N/A
 Date : October 14, 2019

| | |
|--|--|
| EQUIPMENT CLASS | PCB-PCS Licensed Transmitter |
| EQUIPMENT DESCRIPTION | Tracking 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 Part 2, Part 22 Subpart H, Part 24 Subpart E, Part 27 Subpart C |
| 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 ST4330 (referred to as the EUT in this report) is a Tracking Device. Product specification information described herein was obtained from product data sheet or user’s manual.

| | | | | |
|---|-----------------------|-------------|-----------------------|--|
| DEVICE TYPE | Tracking Device | | | |
| OPERATING FREQUENCY | LTE Band 2 | TX | 1 855 MHz ~ 1 905 MHz | |
| | | RX | 1 935 MHz ~ 1 985 MHz | |
| | LTE Band 4 | TX | 1 715 MHz ~ 1 750 MHz | |
| | | RX | 2 115 MHz ~ 2 150 MHz | |
| | LTE Band 5 | TX | 829 MHz ~ 844 MHz | |
| | | RX | 874 MHz ~ 889 MHz | |
| | LTE Band 12 | TX | 704 MHz ~ 711 MHz | |
| | | RX | 734 MHz ~ 741 MHz | |
| | LTE Band 13 | TX | 782 MHz | |
| | | RX | 751 MHz | |
| | LTE Channel Bandwidth | 10 MHz | | |
| | Modulation Type | QPSK, 16QAM | | |
| Maximum EIRP Power | LTE Band 2 | 21.95 dBm | | |
| | LTE Band 4 | 21.46 dBm | | |
| Maximum ERP Power | LTE Band 5 | 21.98 dBm | | |
| | LTE Band 12 | 21.23 dBm | | |
| | LTE Band 13 | 21.29 dBm | | |
| ANTENNA TYPE | PIFA Antenna | | | |
| ANTENNA GAIN | LTE Band 2 | 1.50 dBi | | |
| | LTE Band 4 | 1.47 dBi | | |
| | LTE Band 5 | 1.01 dBi | | |
| | LTE Band 12 | -0.84 dBi | | |
| | LTE Band 13 | 0.52 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.

-. 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 $f/1500 \text{ mW/cm}^2$ for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm^2 for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm^2 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/cm^2 , Z = Impedance of free space, 377Ω

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/cm^2

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 any 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

4.2 EUT Description

| Kind of EUT | Tracking Device | | |
|-----------------------------|---|-----------|-----------------------|
| Operating Frequency Band | LTE Band 2 | TX | 1 855 MHz ~ 1 905 MHz |
| | | RX | 1 935 MHz ~ 1 985 MHz |
| | LTE Band 4 | TX | 1 715 MHz ~ 1 750 MHz |
| | | RX | 2 115 MHz ~ 2 150 MHz |
| | LTE Band 5 | TX | 829 MHz ~ 844 MHz |
| | | RX | 874 MHz ~ 889 MHz |
| | LTE Band 12 | TX | 704 MHz ~ 711 MHz |
| | | RX | 734 MHz ~ 741 MHz |
| | LTE Band 13 | TX | 782 MHz |
| | | RX | 751 MHz |
| MAX. RF OUTPUT POWER | LTE Band 2 | 23.19 dBm | |
| | LTE Band 4 | 23.37 dBm | |
| | LTE Band 5 | 23.42 dBm | |
| | LTE Band 12 | 23.22 dBm | |
| | LTE Band 13 | 23.35 dBm | |
| Antenna Gain | LTE Band 2 | 1.50 dBi | |
| | LTE Band 4 | 1.47 dBi | |
| | LTE Band 5 | 1.01 dBi | |
| | LTE Band 12 | -0.84 dBi | |
| | LTE Band 13 | 0.52 dBi | |
| Exposure Evaluation Applied | <input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A | | |

5 Evaluation Results

5.1 Assessment result of RF Power and Antenna gain

5.1.1 LTE Band 2

| Operating Mode | Operating Frequency (MHz) | Avg. Power Level | |
|----------------|---------------------------|------------------|-------|
| | | (dBm) | (W) |
| LTE Band 2 | 1 905 | 23.19 | 0.208 |

5.1.2 LTE Band 4

| Operating Mode | Operating Frequency (MHz) | Avg. Power Level | |
|----------------|---------------------------|------------------|-------|
| | | (dBm) | (W) |
| LTE Band 4 | 1 732.5 | 23.37 | 0.217 |

5.1.3 LTE Band 5

| Operating Mode | Operating Frequency (MHz) | Avg. Power Level | |
|----------------|---------------------------|------------------|-------|
| | | (dBm) | (W) |
| LTE Band 5 | 836.5 | 23.42 | 0.220 |

5.1.4 LTE Band 12

| Operating Mode | Operating Frequency (MHz) | Avg. Power Level | |
|----------------|---------------------------|------------------|-------|
| | | (dBm) | (W) |
| LTE Band 12 | 707.5 | 23.22 | 0.210 |

5.1.5 LTE Band 13

| Operating Mode | Operating Frequency (MHz) | Avg. Power Level | |
|----------------|---------------------------|------------------|-------|
| | | (dBm) | (W) |
| LTE Band 13 | 782 | 23.35 | 0.216 |



Tested by: Ju Yun Park / Assistant Manager

5.1.3 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/cm ²) @ 20 cm Separation | Limit (mW/cm ²) |
|----------------|---------------------------|-------------------------|--------|--------------------|--------|--------------------|--|-----------------------------|
| | | (dBm) | (mW) | Log | Linear | | | |
| LTE Band 2 | 1 905 | 23.19 | 208.45 | 1.50 | 1.413 | 4.84 | 0.058 6 | 1.00 |
| LTE Band 4 | 1 732.5 | 23.37 | 217.27 | 1.47 | 1.403 | 4.92 | 0.060 7 | 1.00 |

| Operating Mode | Operating Frequency (MHz) | Conducted Average Power | | Antenna Gain (dBd) | | Safe Distance (cm) | Power Density (mW/cm ²) @ 20 cm Separation | Limit (mW/cm ²) |
|----------------|---------------------------|-------------------------|--------|--------------------|--------|--------------------|--|-----------------------------|
| | | (dBm) | (mW) | Log | Linear | | | |
| LTE Band 5 | 836.5 | 23.42 | 219.79 | 1.01 | 1.262 | 4.70 | 0.055 2 | 0.55 |
| LTE Band 12 | 707.5 | 23.22 | 209.89 | -0.84 | 0.824 | 3.71 | 0.034 4 | 0.47 |
| LTE Band 13 | 782 | 23.35 | 216.27 | 0.52 | 1.127 | 4.40 | 0.048 5 | 0.52 |

$$\text{limit} = 836.5/1500 = 0.55 \text{ mW/cm}^2$$

$$\text{limit} = 707.5/1500 = 0.47 \text{ mW/cm}^2$$

$$\text{limit} = 782/1500 = 0.52 \text{ mW/cm}^2$$

$$\begin{aligned} \text{LTE Band 2 Power Density} &= \text{Conducted Average Power} * \text{Antenna Gain(dBi)} / (4\pi R^2) \\ &= (208.45 * 1.413) / (4 * \pi * 20^2) = 0.058 6 \text{ mW/cm}^2 \end{aligned}$$

$$\begin{aligned} \text{LTE Band 4 Power Density} &= \text{Conducted Average Power} * \text{Antenna Gain(dBi)} / (4\pi R^2) \\ &= (217.27 * 1.403) / (4 * \pi * 20^2) = 0.060 7 \text{ mW/cm}^2 \end{aligned}$$

$$\begin{aligned} \text{LTE Band 5 Power Density} &= \text{Conducted Average Power} * \text{Antenna Gain(dBd)} / (4\pi R^2) \\ &= (219.79 * 1.262) / (4 * \pi * 20^2) = 0.055 2 \text{ mW/cm}^2 \end{aligned}$$

$$\begin{aligned} \text{LTE Band 12 Power Density} &= \text{Conducted Average Power} * \text{Antenna Gain(dBd)} / (4\pi R^2) \\ &= (209.89 * 0.824) / (4 * \pi * 20^2) = 0.034 4 \text{ mW/cm}^2 \end{aligned}$$

$$\begin{aligned} \text{LTE Band 13 Power Density} &= \text{Conducted Average Power} * \text{Antenna Gain(dBd)} / (4\pi R^2) \\ &= (216.27 * 1.127) / (4 * \pi * 20^2) = 0.048 5 \text{ mW/cm}^2 \end{aligned}$$



Tested by: **Ju Yun Park** / Assistant Manager