


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

**Test Report No.** : W154R-D001  
**AGR No.** : A149A-082  
**Applicant** : Remote Solution Co., Ltd.  
**Address** : 92,Chogokri, Nammyun, Kimchon city, Korea, 740-871  
**Manufacturer** : Remote Solution Co., Ltd.  
**Address** : 92, Chogokri, Nammyun, Kimchon city, Korea, 740-871  
**Type of Equipment** : Smart Home Sensor  
**FCC ID.** : TX4SA01E  
**Model Name** : SA01E  
**Multiple Model Name** : SB01E, SC01E  
**Serial number** : N/A  
**Total page of Report** : 8 pages (including this page)  
**Date of Incoming** : March 09, 2015  
**Date of issue** : April 03, 2015

## 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.

Reviewed by:   
 \_\_\_\_\_  
 Jae-Ho, Lee / Chief Engineer  
 ONETECH Corp.

Approved by:   
 \_\_\_\_\_  
 Sung-Ik, Han/ Managing Director  
 ONETECH Corp.

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### Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W154R-D001	April 03, 2015	Initial Issue	All

## 1. VERIFICATION OF COMPLIANCE

Applicant : Remote Solution Co., Ltd.  
 Address : 92,Chogokri, Nammyun, Kimchon city, Korea, 740-871  
 Contact Person : Kim Hyeon Soo / Assistant Research Engineer  
 Telephone No. : +82-54-420-4500  
 FCC ID : TX4SA01E  
 Model Name : SA01E  
 Serial Number : N/A  
 Date : April 03, 2015

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Smart Home Sensor
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2009 and FCC KDB 558074 D01 DTS Meas Guidance v03r02
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
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 Remote Solution Co., Ltd., Model SA01E (referred to as the EUT in this report) is a Smart Home Sensor. Product specification information described herein was obtained from product data sheet or user’s manual.

DEVICE TYPE	Portable Device
FREQUENCY RANGE	2 405 MHz ~ 2 480 MHz
Channel Number	16
MAX. RF OUTPUT POWER:	18.49 dBm
NUMBER OF LAYER	4 Layers
ANTENNA TYPE	F-Antenna
ANTENNA GAIN	0.27 dBi
MODULATION METHOD	O-QPSK
USED RF CHIP	Marker: radio pulse Model Name: MG2460
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32 MHz
POWER REQUIREMENT	DC 3.0 V
EXTERNAL CONNECTOR	-

### 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
SA01E	Basic Model	<input checked="" type="checkbox"/>
SB01E	This models are Temperature Sensor there is no difference on RF.	<input type="checkbox"/>
SC01E	This models are Humidity Sensor there is no difference on RF.	<input type="checkbox"/>

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

## 4. MAXIMUM PERMISSIBLE EXPOSURE

### 4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, and IC rule RSS-102 Section 2.4.1, the limit for the maximum permissible RF exposure for an uncontrolled environment are  $f/1500$  mW/cm<sup>2</sup> for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm<sup>2</sup> for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm<sup>2</sup> 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<sup>2</sup>, 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/cm<sup>2</sup>

#### 4.2 EUT Description

Kind of EUT	Smart Home Sensor
Operating Frequency Band	<input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz <input type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz <input type="checkbox"/> WLAN: 5 180 MHz ~ 5 320 MHz / 5 500 MHz ~ 5 700 MHz <input type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz <input type="checkbox"/> Bluetooth: 2 402 MHz ~ 2 480 MHz <input type="checkbox"/> GFSK Modulation: <input checked="" type="checkbox"/> O-QPSK Modulation: 2405 MHz , 2440 MHz , 2480 MHz
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" type="checkbox"/> Others
Max. Output Power	18.49 dBm
Used Antenna Gain	0.27 dBi
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A

## 5. Calculated MPE Safe Distance

### 5.1 Test data

According to above equation, the following result was obtained.

Operating Freq. Band (MHz) Frequency	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation	Limit (mW/ cm <sup>2</sup> )
	(dBm)	(dBm)	(mW)	Log	Linear			
2 405 ~ 2 480	18.4 ± 0.5	18.9	77.63	0.27	1.06	2.56	0.016 4	1.00

According to above table, for 2 405 ~ 2 480 MHz Band, safe distance,

$$D = 0.282 * \sqrt{(77.63 * 1.06)/1.00} = 2.56 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 77.63 * 1.06 / (4 * 3.14 * 20^2) = 0.016 4$$

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