

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

Test Report No. : W156R-D021
AGR No. : A155A-147
Applicant : Remote Solution Co., Ltd.
Address : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk, Korea, 740-871
Manufacturer : Remote Solution Co., Ltd.
Address : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk, Korea, 740-871
Type of Equipment : Smart Home Sensor
FCC ID. : TX4SH05A
Model Name : SH05A
Multiple Model Name : SH05B, SH05C, SH05D, SH05E, SH05F, SH05G, SH05H, SH05I, SH05J, SH05K,
SH05L, SH05M, SH05N, SH05O, SH05P, SH05Q, SH05R, SH05S, SH05T, SH05U,
SH05V, SH05W, SH05X, SH05Y, SH05Z
Serial number : N/A
Total page of Report : 6 pages (including this page)
Date of Incoming : June 05, 2015
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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: 

 Ki-Hong, Nam / Asst, 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
W156R-D021	June 17, 2015	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : Remote Solution Co., Ltd.
 Address : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk, Korea, 740-871
 Contact Person : Byung-Cheol, Kim / Manager
 Telephone No. : +82-54-420-4517
 FCC ID : TX4SH05A
 Model Name : SH05A
 Serial Number : N/A
 Date : June 17, 2015

EQUIPMENT CLASS	<i>DTS – DIGITAL TRNSMISSION SYSTEM</i>
E.U.T. DESCRIPTION	Smart Home Sensor
THIS REPORT CONCERNS	Original Grant
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
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 SH05A (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 ~ 2 475 MHz
Channel Number	15
MAX. RF OUTPUT POWER	19.40 dBm
NUMBER OF LAYER	4 Layers
ANTENNA TYPE	PCB Antenna
ANTENNA GAIN	0.28 dBi
MODULATION METHOD	GFSK
USED RF CHIP	Marker: GreenPeak Technologies Model Name: GP490
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	16 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
SH05A	Basic Model	<input checked="" type="checkbox"/>
SH05B, SH05C, SH05D, SH05E, SH05F, SH05G, SH05H, SH05I, SH05J, SH05K, SH05L, SH05M, SH05N, SH05O, SH05P, SH05Q, SH05R, SH05S, SH05T, SH05U, SH05V, SH05W, SH05X, SH05Y, SH05Z	The model is identical to basic model except for the model name only.	<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. RADIO FREQUENCY 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

4.2 Calculated MPE Safe Distance

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^2) @ 20 cm Separation	Limit (mW/cm^2)
	(dBm)	(dBm)	(mW)	Log	Linear			
2 405 ~ 2 475	19.0 ± 0.5	19.5	89.13	0.27	1.06	2.74	0.018 8	1.00

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

$$D = 0.282 * \sqrt{(89.13 * 1.06) / 1.00} = 2.74 \text{ cm.}$$

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

$$S = P * G / (4\pi * R^2) = 89.13 * 1.06 / (4 * 3.14 * 20^2) = 0.0188$$

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