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

Test Report No.	**: W17NR-D061**
AGR No.	**: A177A-358**
Applicant	**: Umain Inc.**
Address	**: 9th fl. Nano Fab Centre(KAIST), Daehak-ro 291, Yuseong-gu, Daejeon, 34141 South Korea**
Manufacturer	**: Umain Inc.**
Address	**: 9th fl. Nano Fab Centre(KAIST), Daehak-ro 291, Yuseong-gu, Daejeon, 34141 South Korea**
Type of Equipment	**: UWB Radar Sensor**
FCC ID.	**: 2AN8QUMI-HST-S1M-CT**
Model Name	**: HST-S1M-CT**
Serial number	**: N/A**
Total page of Report	**: 8 pages (including this page)**
Date of Incoming	**: October 11, 2017**
Date of issue	**: November 16, 2017**

SUMMARY

The equipment complies with the regulation; ***FCC PART 15 SUBPART F Section 15.521***

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: Keun-Young, Choi / Vice President, ONETECH Corp.

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

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
W17NR-D061	November 16, 2017	Initial Issue	All

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1. VERIFICATION OF COMPLIANCE

Applicant	: Umain Inc.
Address	: 9th fl. Nano Fab Centre(KAIST), Daehak-ro 291, Yuseong-gu, Daejeon, 34141 South Korea
Contact Person	: Youngwhan Kim / CEO
Telephone No.	: +82-42-825-9973
FCC ID	: 2AN8QUMI-HST-S1M-CT
Model Name	: HST-S1M-CT
Serial Number	: N/A
Date	: November 16, 2017

EQUIPMENT CLASS	***UWB – ULTRA WIDEBAND TRANSMITTER***
E.U.T. DESCRIPTION	UWB Radar 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 F Section 15.521
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.

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2. GENERAL INFORMATION

2.1 Product Description

The Umain Inc., Model HST-S1M-CT (referred to as the EUT in this report) is an UWB Radar Sensor. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	UWB Radar Sensor
OPERATING FREQUENCY	4 000 MHz
RF OUTPUT POWER	52.08 dBμV/m
MODULATION TYPE	MB-OFDM
ANTENNA TYPE	Monopole Antenna
ANTENNA GAIN	6.11 dBi
LIST OF EACH OSC. OR CRYSTAL. FREQ.(FREQ.>=1 MHz)	32.768 kHz, 16 MHz
RATED SUPPLY VOLTAGE	DC 5.0 V

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

-. None

3. EUT MODIFICATIONS

-. None

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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:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

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

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4.2 EUT Description

Kind of EUT	UWB Radar Sensor
Operating Frequency Band	☐ Wireless Microphone: 494.000 MHz ~ 501.000 MHz and 498.200 MHz ~ 505.200 MHz ☐ WLAN: 2 412 MHz ~ 2 462 MHz ☐ WLAN: 5 180 MHz ~ 5 240 MHz ☐ WLAN: 5 745 MHz ~ 5 825 MHz ☐ Bluetooth: 2 402 MHz ~ 2 480 MHz ☐ Bluetooth BLE: 2 402 MHz ~ 2 480 MHz ■ UWB: 3 100 MHz ~ 4 800 MHz
MAX. RF OUTPUT POWER	52.38 dBuV/m (-52.32 dBm @ 1 m)
Antenna Gain	6.11 dBi
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A

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4.3 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(dBm)	(mW)	Log	Linear		
3 100 ~ 4 800	UWB (MB-OFDM)	-52.82 ± 0.5	-52.32	0.69	6.11	4.083	0.000 000 005	1.00

-

Tested by: Ha-Ram, Lee / Assistant Manager

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