



SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China
Telephone: +86 (0) 21 6191 5666
Fax: +86 (0) 21 6191 5678
ee.shanghai@sgs.com

Report No.: SHEM161100736102
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1 Cover Page

RF Exposure Evaluation Report

Application No.:	SHEM1611007361CR
Applicant:	Hansong (Nanjing) Technology Ltd.
FCC ID:	XCO-M1DIGITAL
IC :	7756A-M1DIGITAL
Equipment Under Test (EUT): NOTE: The following sample(s) submitted was/were identified on behalf of the client as	
Product Name:	AM/FM/DAB Radio with WiFi, Bluetooth, and Speaker
Model No.:	Model One Digital
Standards:	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06 RSS-102 Issue 5 (March 2015)
Date of Receipt:	2016-11-17
Date of Test:	2016-11-23 to 2016-11-24
Date of Issue:	2017-03-08
Test Result:	Pass*

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.



The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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3 General Information

3.1 Client Information

Applicant:	Hansong (Nanjing) Technology Ltd.
Address of Applicant:	8th Kangping Road, Jiangning Economy and Technology Development Zone, Nanjing, 211106, China
Manufacturer:	Tivoli Audio, Inc.
Address of Manufacturer:	745 Atlantic Avenue, 4th Floor, Boston, MA, 02111, USA.
Factory:	Hansong (Nanjing) Technology Ltd.
Address of Factory:	8th Kangping Road, Jiangning Economy and Technology Development Zone, Nanjing, 211106, China

3.2 General Description of E.U.T.

Product Description:	Fixed product with 2.4GHz band WiFi and BT function		
Brand Name:	Tivoli Audio		
Adapter 1:	Manufacturer:	SHENZHEN FUJIA APPLIANCE CO.,LTD	
	Model No.	FJ-SW1501500N	
	Rated Input:	AC 100-240V,50/60Hz 0.6A Max	
	Rated Output:	DC 15.0V, 1.5A	
	Cable length:	AC port:	0cm (2wires)
		DC port:	180 cm
Adapter 2:	Manufacturer:	Dongguan Dongsong Electronic Co.,Ltd	
	Model No.	DYS624-150150W-K	
	Rated Input:	AC 100-240V,50/60Hz 0.8A Max	
	Rated Output:	DC 15.0V, 1.5A	
	Cable length:	AC port:	0 cm (2wires)
		DC port:	180 cm

3.3 Details of E.U.T.

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	3.0+HS
Modulation Technique:	FHSS(GFSK, π /4DQPSK, 8DPSK)
Number of Channel:	79
Antenna Type	PCB Antenna
Antenna Gain	3dBi

3.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China.

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

3.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868, C-4336, T-2221, G-830 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to §1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm ²)	Averaging time(minutes)
300MHz~1.5GHz	$f/1500$	30
1.5GHz~100GHz	1.0	30

4.2 IC Radiofrequency radiation exposure limits

According to RSS-102 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

For 2.4G device, the limit of worse case is 2.68 W

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHEM161100736101

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
GFSK	2402	0.65	1.16
	2441	0.70	1.17
	2480	0.45	1.11
$\pi/4$ DQPSK	2402	1.99	1.58
	2441	1.79	1.51
	2480	1.70	1.48
8DPSK	2402	2.07	1.61
	2441	2.21	1.66
	2480	2.12	1.63

The Max Conducted Peak Output Power of BT module is 1.66mW; The best case gain of the antenna is 3dBi. 3dB logarithmic terms convert to numeric result is nearly 1.995

The WiFi module which has been applied full module approved with FCC ID: XCO-LS6 and IC: 7756A-LS6. The Max Conducted Peak Output Power is 590mW in 2.4G band; The best case gain of the antenna is 3dBi. 3dB logarithmic terms convert to numeric result is nearly 1.995.

5.2 MPE Calculation

For FCC:

According to the formula $S = \frac{PG}{4R^2\pi}$, we can calculate S which is MPE.

Note:

- 1) P (Watts)
- 2) G (Antenna gain in numeric)
- 3) R = distance to the center of radiation of antenna (in meter) = 20cm
- 4) MPE limit = 1mW/cm²

$$S_{BT} = \frac{PG}{4R^2\pi} = \frac{1.66 \times 1.995}{4 \times 400 \times 3.14} = 0.00066 \text{ mW/cm}^2$$

$$S_{WiFi} = \frac{PG}{4R^2\pi} = \frac{590 \times 1.995}{4 \times 400 \times 3.14} = 0.23429 \text{ mW/cm}^2$$

The BT and the DTS modules can simultaneous transmitting at frequency 2.4GHz band. But the maximum rate of MPE is $\frac{0.00066}{1.0} + \frac{0.23429}{1.0} = 0.23495 < 1.0$. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

For IC:

$$E.I.R.P._{BT} = P \times G = 3.31 \text{ mW} < 2.68 \text{ W}$$

$$E.I.R.P._{WiFi} = P \times G = 1.177 \text{ W} < 2.68 \text{ W}$$

So the device is exclusion from SAR test.

6 EUT Constructional Details

Refer to the < Model One Digital _External Photos > & < Model One Digital _Internal Photos >.

--End of the Report--