RF Exposure Evaluation Report

Application No.:	SZCR2305001504AT
Applicant:	DT Research, Inc.
Address of Applicant:	3RD FL NO 36 WUQUAN 7TH RD WUGU DISTRICT, NEW TAIPEI, Taiwan
Manufacturer:	DT Research, Inc.
Address of Manufacturer:	2000 Concourse Drive, San Jose, CA 95131, USA
Factory:	DT Research, Inc. Taiwan Branch
Address of Factory:	6F., No.36 Wuquan 7 th Rd., Wugu Dist. New Taipei City 248 Taiwan

Equipment Under Test (EUT):

EUT Name:	Bluetooth Module
Model No.:	FSC-BT909C
Trade Mark:	DT Research
FCC ID:	YE3FSC-BT909C
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 47 CFR Part 2.1091
Date of Receipt:	2023-05-18
Date of Test:	2023-05-20 to 2023-06-01
Date of Issue:	2023-06-03
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2023-06-03*		*Original*

Authorized for issue by:				
		Edison Li **Edison Li/Project Engineer**		
		Eric Fu **Eric Fu/Reviewer**		

3 Contents

4 General Information

4.1 General Description of EUT

Power supply:	DC 3.3V powered by Test Motherboard.
Bluetooth Version:	V4.2
For Bluetooth Classic	
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna(Antenna1), 2.4G Terminal Antenna(Antenna2)
Antenna Gain:	PCB Antenna:2.0dBi 2.4G Terminal Antenna:10dBi Note: MIMO for Antenna PCB Antenna and 2.4G Terminal Antenna.
For Bluetooth LE	
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Data rate:	1Mbps
Antenna Type:	PCB Antenna(Antenna1), 2.4G Terminal Antenna(Antenna2)
Antenna Gain:	PCB Antenna:2.0dBi 2.4G Terminal Antenna:10dBi Note: MIMO for Antenna PCB Antenna and 2.4G Terminal Antenna.

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.3 Test Facility

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

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4* Pi * R^2)

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, f/1500 or 1 mW/cm^2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure Evaluation

For Bluetooth Classic:

PCB Antenna(Antenna1, Ant1):2.0dBi(Numeric:1.58)

2.4G Terminal Antenna(Antenna2, Ant2):10dBi(Numeric:10)

Directional Gain = 10*log((10^G1/20+10^G2/20)^2/N_{ANT}) =9.90dBi.

Output Power Into Antenna & RF Exposure Evaluation Distance:

ANT	Channel	Frequency (MHz)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
ANT1	Highest	2480	19.97	99.31	0.0313	1.0	PASS
ANT2	Highest	2480	19.97	99.31	0.1976	1.0	PASS
MIMO	Highest	2480	19.97	99.31	0.1931	1.0	PASS

Note: Refer to report No. SZCR230500150402 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement;

For Bluetooth LE:

PCB Antenna(Antenna1, Ant1):2.0dBi(Numeric:1.58)

2.4G Terminal Antenna(Antenna2, Ant2):10dBi(Numeric:10)

Directional Gain = 10*log((10^$G1/20$+10^$G2/20$)^2/N_{ANT}) =9.90dBi.

Output Power Into Antenna & RF Exposure Evaluation Distance:

ANT	Channel	Frequency (MHz)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
ANT1	Highest	2480	11.99	15.81	0.0050	1.0	PASS
ANT2	Highest	2480	11.99	15.81	0.0315	1.0	PASS
MIMO	Highest	2480	11.99	15.81	0.0307	1.0	PASS

Note: Refer to report No. SZCR230500150402 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement;

- End of the Report -

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