

RF Exposure Evaluation Report

Product : JSOM CONNECT MODULE
Trade mark : JABIL
Model/Type reference : CONNECT
Serial Number : JSZKSCNJV0012111000032
Report Number : EED32N801371
FCC ID : 2AXNJ-JSOM-CN
Date of Issue : Jun. 02, 2021
: 47 CFR Part 1.1307
: 47 CFR Part 1.1310
Test Standards : KDB447498D01 General RF
: Exposure Guidance v06
Test result : PASS

Prepared for:

Jabil

10560 Dr M.L.K. Jr St N, St. Petersburg, Florida, United States

Prepared by:

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2 Version

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4 General Information

4.1 Client Information

Applicant:	Jabil
Address of Applicant:	10560 Dr M.L.K. Jr St N, St. Petersburg, Florida, United States
Manufacturer:	Jabil
Address of Manufacturer:	10560 Dr M.L.K. Jr St N, St. Petersburg, Florida, United States
Factory:	Jabil Precision Industry (Guangzhou) CO., LTD.
Address of Factory:	5th floor, Building C, No. 1199, Hulin Road, Huangpu District, Guangzhou, Guangdong (510700), China

4.2 General Description of EUT

Product Name:	JSOM CONNECT MODULE
Mode No.:	CONNECT
Trade Mark:	JABIL
EUT Supports Radios application:	Bluetooth 5.0 single mode: 2402-2480MHz 2.4GHz: Wi-Fi: 802.11b/g/n(HT20): 2412MHz~2472MHz; 802.11n(HT40): 2422MHz~2462MHz
Sample Received Date:	Apr. 19, 2021
Sample tested Date:	Apr. 19, 2021 to May 22, 2021
Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.	

4.3 General Description of BLE

Bluetooth Version:	V5.0			
Operation Frequency:	2402MHz~2480MHz			
Modulation Type:	GFSK			
Transfer Rate:	☒ 1Mbps ☒ 2Mbps			
Number of Channel:	40			
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location			
Antenna Type:	PCB antenna	PCB	Flex	FPC Self-adhesive
Antenna Gain:	4.97dBi	3.45dBi	4.03dBi	2.17dBi
Power Supply:	DC 3.135V~3.465V			
Test Voltage:	DC 3.3V			

Note: Only the maximum antenna gain was tested.

4.4 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2472MHz IEEE 802.11n(HT40): 2422MHz to 2462MHz			
Modulation Type:	IEEE for 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE for 802.11g :OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20 and HT40) : OFDM (64QAM, 16QAM, QPSK, BPSK)			
Number of Channel:	IEEE 802.11b/g, IEEE 802.11n HT20: 13 Channels IEEE 802.11n HT40: 9 Channels			
Channel Separation:	5MHz			
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location			
Antenna Type:	PCB antenna	146187	146153	206994
Antenna Gain:	4.97dBi	3.45dBi	4.03dBi	2.17dBi
Power Supply:	DC 3.135V~3.465V			
Test Voltage:	DC 3.3V			

4.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

5 SAR 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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE, 1 mW/cm². 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.

5.1.3 EUT RF Exposure

1) For BLE

Antenna Gain: 4.97dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.14 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode(1Mbps)				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.86	2.0±1	3.0	1.995
Middle(2440MHz)	2.47	1.5±1	2.5	1.778
Highest(2480MHz)	2.87	2.0±1	3.0	1.995
GFSK mode(2Mbps)				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.89	2.0±1	3.0	1.995
Middle(2440MHz)	2.53	2.0±1	3.0	1.995
Highest(2480MHz)	2.87	2.0±1	3.0	1.995

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
1.995	4.97	0.0011	1.0	PASS

Note: 1) Refer to report No. EED32N80136901 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (1.995 * 3.14) / (4 * 3.1416 * 20^2) = 0.0011$

2) For 2.4G WIFI

Antenna Gain: 4.97dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.14 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

IEEE for 802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	19.27	18.5±1	19.5	89.125
Middle(2442MHz)	18.56	18.0±1	19.0	79.433
Highest(2472MHz)	13.45	13.0±1	14.0	25.119
IEEE for 802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	21.58	21.0±1	22.0	158.489
Middle(2442MHz)	23.25	22.5±1	23.5	223.872
Highest(2472MHz)	13.72	13.0±1	14.0	25.119
IEEE for 802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	20.86	20.0±1	21.0	125.893
Middle(2442MHz)	22.31	21.5±1	22.5	178.649
Highest(2472MHz)	13.66	13.0±1	14.0	25.119
IEEE for 802.11n(HT40) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	21.73	21.0±1	22.0	158.489
Middle(2442MHz)	23.13	22.5±1	23.5	223.872
Highest(2462MHz)	18.48	18.0±1	19.0	79.433

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
223.872	4.97	0.14	1.0	PASS

Note: 1) Refer to report No. EED32N80136902 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (223.872 * 3.14) / (4 * 3.1416 * 20^2) = 0.14$

PHOTOGRAPHS OF EUT Constructional Details

Refer to Report No. EED32N80136901 for EUT external and internal photos.

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*** End of Report ***