
MPE REPORT

Report No.: SRTC2020-9004(F)-20052103(D)

Product Name: Smart IO

Product Model: IO-10MIXR-NWE

Applicant: Honeywell (Beijing) Technology Solutions Lab Co., Ltd.

Manufacturer: Honeywell (Beijing) Technology Solutions Lab Co., Ltd.

Specification: FCC Part §2.1091, §2.1093, §1.1307(b), §1.1310 (2019)

FCC ID: 2ARTN-00003

The State Radio_monitoring_center Testing Center (SRTC)

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1 GENERAL INFORMATION

1.1 Notes of the test report

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1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
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1.3 Applicant's details

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1.4 Manufacturer's details

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2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Bluetooth

Frequency Range	2.402GHz~2.480GHz
Number of Channel	79
Modulation Type	GFSK, $\pi/4$ DQPSK, 8DPSK
Duplex Mode	TDD
Channel Spacing	1MHz
Data Rate	1Mbps, 2 Mbps, 3 Mbps
Power Supply	Charger or DC Power Supply
Hardware Version	100
Software Version	1.0.0.0
Original Sample	Sample 8#
Variant Sample	IO Sample 2#
Antenna type	Refer to Note1
Antenna connector	Refer to Note1

Note1: The antenna provides to the EUT, please refer to the following table:

SN	Model	Antenna gain(dBi)	Frequency band (GHz)	Antenna type	Connecter Type
Ant1	N/A	2.90	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant2	N/A	2.57	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.31	2.4GHz~2.4835GHz	Fixed External Antenna	N/A

Bluetooth BLE

Frequency Range	2.402GHz~2.480GHz
Number of Channel	40
Modulation Type	GFSK
Equipment Class	DTS
Channel Spacing	2MHz
Data Rate	1Mbps
Power Supply	Charger or DC Power Supply
Hardware Version	100
Software Version	1.0.0.0
Original Sample	Sample 8#
Variant Sample	IO Sample 2#
Antenna type	Refer to Note2
Antenna connector	Refer to Note2

Note2: The antenna provides to the EUT, please refer to the following table:

SN	Model	Antenna gain(dBi)	Frequency band (GHz)	Antenna type	Connector Type
Ant1	N/A	2.90	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant2	N/A	2.57	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.31	2.4GHz~2.4835GHz	Fixed External Antenna	N/A

WLAN 2.4GHz

Frequency Range	2.412GHz~2.462GHz
Number of Channel For 20MHz	11
Number of Channel For 40MHz	7
Modulation Type	DBPSK/DQPSK/CCK/BPSK/QPSK/16QAM/64QAM
Duplex Mode	TDD
Channel Spacing	5MHz
Data Rate	802.11b:1Mbps-11Mbps 802.11g:6Mbps-54Mbps 802.11n HT20:MCS0-MCS7 802.11n HT40:MCS0-MCS7
Power Supply	Charger or DC Power Supply
Hardware Version	100
Software Version	1.0.0.0
Original Sample	Sample 8#
Variant Sample	IO Sample 2#
Antenna type	Refer to Note3
Antenna connector	Refer to Note3

Note: The antenna provides to the EUT, please refer to the following table:

SN	Model	Antenna gain(dBi)	Frequency band (GHz)	Antenna type	Connector Type
Ant1	N/A	2.90	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant2	N/A	2.57	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.31	2.4GHz~2.4835GHz	Fixed External Antenna	N/A

WLAN 5GHz

Frequency Band(s)	U-NII-1:5150MHz-5250MHz U-NII-2A:5250MHz-5350MHz U-NII-2C:5470MHz-5725MHz U-NII-3:5725MHz-5850MHz
DFS	Client Without Radar Detection
Modulation Type	802.11a 802.11n (HT20/HT40) 802.11ac (VHT20/VHT40/VHT80)
Power Supply	Charger or DC Power Supply
Hardware Version	100
Software Version	1.0.0.0
Original Sample	Sample 8#
Variant Sample	IO Sample 2#
Antenna type	Refer to Note4
Antenna connector	Refer to Note4

Note4: The antenna provides to the EUT, please refer to the following table:

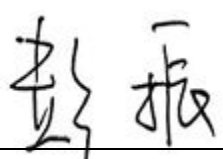
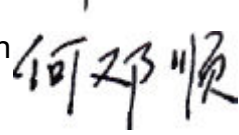
SN	Model	Antenna gain(dBi)	Frequency range (GHz)	Antenna type	Connector Type
Ant1	N/A	4.40	5.150GHz~5.250GHz	Fixed External Antenna	N/A
Ant1	N/A	6.00	5.250GHz~5.350GHz	Fixed External Antenna	N/A
Ant1	N/A	5.50	5.470GHz~5.725GHz	Fixed External Antenna	N/A
Ant1	N/A	3.60	5.725GHz~5.850GHz	Fixed External Antenna	N/A
Ant2	N/A	0.85	5.150GHz~5.250GHz	Fixed External Antenna	N/A
Ant2	N/A	1.38	5.250GHz~5.350GHz	Fixed External Antenna	N/A
Ant2	N/A	0.59	5.470GHz~5.725GHz	Fixed External Antenna	N/A
Ant2	N/A	1.19	5.725GHz~5.850GHz	Fixed External Antenna	N/A
Ant3	N/A	1.17	5.150GHz~5.250GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.04	5.250GHz~5.350GHz	Fixed External Antenna	N/A
Ant3	N/A	-1.11	5.470GHz~5.725GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.97	5.725GHz~5.850GHz	Fixed External Antenna	N/A

3 REFERENCE SPECIFICATION

Specification	Version	Title
2.1091	2019	Radio frequency radiation exposure evaluation: mobile devices.
2.1093	2019	Radio frequency radiation exposure evaluation: portable devices.
1.1307(b)	2019	Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
1.1310	2019	Radio frequency radiation exposure limits.
KDB447498	October 23, 2015	RF exposure procedures and equipment authorization policies for mobile and portable devices

4 RESULT SUMMARY

No.	Test case	FCC reference
1	MPE Calculation	FCC Part §2.1091, FCC Part §2.1093, FCC Part §1.1307(b) FCC Part §1.1310 KDB 447498

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Mr. Li Bin 
Tested by: Mr. He Dengshun 	Issued date: 20201027

5 TEST RESULTS

5.1 Average Power Output Test Result

BT output power

Modulation type	Average power output (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	2.38	3.17	3.20
$\pi/4$ DQPSK	-1.96	-1.61	-1.92
8DPSK	-1.98	-1.60	-1.92

BT BLE output power

Modulation type	Average power output (dBm)		
	2402MHz (Ch0)	2440MHz (Ch19)	2480MHz (Ch39)
GFSK (LE)	-4.28	-3.89	-5.20

WLAN 2.4GHz

Modulation type	Average power output (dBm)		
	2412MHz	2437MHz	2462MHz
11b	16.41	16.37	16.38
11g	15.02	14.98	15.24
11n HT20	14.48	14.46	14.85
Modulation type	Average power output (dBm)		
	2422MHz	2437MHz	2452MHz
11n HT40	15.37	15.42	15.52

WLAN 5GHz

U-NII-1

Test Mode	Average Power(dBm)		
	5180 MHz	5200 MHz	5240MHz
802.11a	13.89	14.48	15.27
802.11n(HT20)	13.44	14.04	14.86
802.11ac(VHT20)	11.83	12.25	13.19

Test Mode	Average Power(dBm)	
	5190 MHz	5230 MHz
802.11n(HT40)	13.58	14.65
802.11ac(VHT40)	12.06	13.01

Test Mode	Average Power(dBm)	
	5210 MHz	
802.11ac(VHT80)	12.20	

U-NII-2A

Test Mode	Average Power(dBm)		
	5260 MHz	5300 MHz	5320MHz
802.11a	14.82	15.29	15.76
802.11n(HT20)	14.50	14.80	15.38
802.11ac(VHT20)	12.66	13.07	13.60

Test Mode	Average Power(dBm)	
	5270 MHz	5310 MHz
802.11n(HT40)	14.36	14.98
802.11ac(VHT40)	12.71	13.28

Test Mode	Average Power(dBm)	
	5290 MHz	
802.11ac(VHT80)	12.69	

U-NII-2C

Test Mode	Average Power(dBm)		
	5500 MHz	5560 MHz	5700MHz
802.11a	15.75	15.83	15.48
802.11n(HT20)	15.37	15.50	14.78
802.11ac(VHT20)	13.63	13.73	13.02

Test Mode	Average Power(dBm)	
	5510 MHz	5670 MHz
802.11n(HT40)	15.61	15.59
802.11ac(VHT40)	13.74	13.67

Test Mode	Average Power(dBm)	
	5530 MHz	
802.11ac(VHT80)	12.95	

U-NII-3

Test Mode	Average Power(dBm)		
	5745MHz	5785MHz	5825MHz
802.11a	15.74	15.16	15.49
802.11n(HT20)	15.11	14.80	14.99
802.11ac(VHT20)	13.67	13.04	13.50

Test Mode	Average Power(dBm)	
	5755 MHz	5795 MHz
802.11n(HT40)	15.24	14.91
802.11ac(VHT40)	13.46	13.12

Test Mode	Average Power(dBm)	
	5775 MHz	
802.11ac(VHT80)	13.09	

5.2 Calculation result

FCC LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure ☐

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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 ☒

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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 *Plane-wave equivalent power density

Calculation procedure:

According to §2.1091, §2.1093, §1.1307(b) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

$$\text{The } S = PG / (4\pi R^2)$$

Where S = power density in mW/cm²

P = transmit power in mW

G = numeric gain of transmit antenna

R = distance (cm)

The calculations in the table below use the highest gain of antenna for client EUT. These calculations represent worst case in terms of the exposure levels.

Mode/Band	Freq (MHz)	Power		Antenna Gain		R (cm)	S (mW/cm ²)	Limits (mW/cm ²)
		(dBm)	(mW)	(dBi)	(Numeric)			
Bluetooth	2480	3.20	2.089	2.9	1.950	20	0.001	1.00
Bluetooth LE	2440	-3.89	0.408	2.9	1.950	20	0.001	1.00
WLAN2.4GHz	2412	16.41	43.752	2.9	1.950	20	0.017	1.00
WLAN5.2GHz	5240	15.27	33.651	4.4	2.818	20	0.019	1.00
WLAN5.3GHz	5320	15.76	37.670	6.0	3.981	20	0.030	1.00
WLAN5.6GHz	5560	15.83	38.282	5.5	3.548	20	0.027	1.00
WLAN5.8GHz	5745	15.74	37.497	3.6	2.291	20	0.017	1.00

Note: 1mW/cm² from §1.1310 Table 1.

Worst Simultaneous Transmission Result

Band/Mode	SUM(Ratio)	Limits
BT+ WIFI 5G	0.031	1.00

Note: Simultaneous Transmission Limit=Power Density_1/ limit_1 + Power Density_2/ limit_2<1

According to the KDB447498 D01 section 7.1 determine the device is exclusion from SAR test.

---End of Test Report---