

Maximum Permissible Exposure Evaluation

FCC ID: 2BBQL-DH100

1. Client Information

Applicant	:	Devicebook Inc.
Address	:	11811 NE 1st St, #A203, Bellevue, WA 98005
Manufacturer	:	Devicebook Inc.
Address	:	11811 NE 1st St, #A203, Bellevue, WA 98005

2. General Description of EUT

EUT Name	:	Devicebook Hub
Models No.	:	DH100
Model Difference	:	----
Sample ID	:	TBBJ-20210818-13-1#&TBBJ-20210818-13-2#
Product Description	:	Operation Frequency: Z-Wave: 916MHz ZigBee: 2405MHz~2480MHz Bluetooth 5.1(BLE): 2402MHz~2480MHz 2.4G WIFI: 2412MHz~2462MHz
Power Rating	:	AC Adapter (DSA-60PFE-12 1 120500) INPUT: 100-240V~50/60Hz 2.0A OUTPUT: 12V/5A
Software Version	:	1.0.0 Build 495
Hardware Version	:	V3
Connecting I/O Port(S)	:	Please refer to the User's Manual
Remark	:	The MPE report used the EUT-2(TBBJ-20210818-13-2#).

Method of Measurement for FCC

1. Antenna Gain:

Antenna	Type	Antenna Gain (dBi)
Z-Wave	Dipole	1.38
ZigBee	Dipole	5.27
Bluetooth LE	Dipole	5.27
2.4G WIFI	Dipole	5.27

2. EUT Operation Condition:

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

3. Exposure Evaluation:

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=(PG)/4\pi R^2$$

Where

S: power density

P: power input to the antenna

G: power gain of the antenna in the direction of interest relative to an isotropic radiator.

R: distance to the center of radiation of the antenna

4. Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$

5. Standalone MPE Evaluation:

916MHz Worst Data								
Mode	Max. Output Power (dBuV/m)	Max. Output Power (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]	Limit
916MHz	66.85	-33.11	-33 ± 1	-32	1.38	20	0	0.61

Note:
N_{TX}= Number of Transmit Antennas
 For conducted measurements below 1000 MHz, the field strength shall be computed as specified in item d), and then an additional 4.7 dB shall be added as an upper bound on the field strength that would be observed on a test range with a ground plane for frequencies between 30 MHz and 1000 MHz, or an additional 6 dB shall be added for frequencies below 30MHz.
 $E = \text{EIRP} - 20 \log d + 104.8$
 where
 E is the electric field strength in dBuV/m
 EIRP is the equivalent isotropically radiated power in dBm
 d is the specified measurement distance in m
 So: $\text{EIRP} = E + 20 \log 3 - 104.8 - (4.7 \text{ or } 6)$

ZigBee Worst Maximum MPE Result								
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
ZigBee	1	2405	7.17	7 ± 1	8	5.27	20	0.0042
		2445	7.76	7 ± 1	8	5.27	20	0.0042
		2480	7.32	7 ± 1	8	5.27	20	0.0042

Note:
N_{TX}= Number of Transmit Antennas
 RF Output power specifies that Maximum Conducted Peak Output Power.

Bluetooth LE Worst Maximum MPE Result								
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
GFSK (1Mbps)	1	2402	3.63	3 ± 1	4	5.27	20	0.0017
		2440	2.51	2 ± 1	3	5.27	20	0.0013
		2480	2.07	2 ± 1	3	5.27	20	0.0013

Note:
N_{TX}= Number of Transmit Antennas
 RF Output power specifies that Maximum Conducted Peak Output Power.

2.4G WiFi Worst Maximum MPE Result---Ant.1

Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11b	1	2412	13.93	13±1	14	5.27	20	0.0168
		2437	14.01	14±1	15	5.27	20	0.0212
		2462	14.06	14±1	15	5.27	20	0.0212
802.11g	1	2412	14.71	14±1	15	5.27	20	0.0212
		2437	14.80	14±1	15	5.27	20	0.0212
		2462	14.97	14±1	15	5.27	20	0.0212
802.11n (HT20)	1	2412	14.68	14±1	15	5.27	20	0.0212
		2437	14.67	14±1	15	5.27	20	0.0212
		2462	14.88	14±1	15	5.27	20	0.0212
802.11n (HT40)	1	2422	15.08	15±1	16	5.27	20	0.0267
		2437	15.02	15±1	16	5.27	20	0.0267
		2452	14.15	14±1	15	5.27	20	0.0212
802.11ax (HE20)	1	2412	14.13	14±1	15	5.27	20	0.0212
		2437	14.45	14±1	15	5.27	20	0.0212
		2462	14.62	14±1	15	5.27	20	0.0212
802.11ax (HE40)	1	2422	13.82	13±1	14	5.27	20	0.0168
		2437	13.69	13±1	14	5.27	20	0.0168
		2452	13.73	13±1	14	5.27	20	0.0168

Note:

 N_{TX}= Number of Transmit Antennas

RF Output power specifies that Maximum Conducted Peak Output Power.

2.4G WiFi Worst Maximum MPE Result---Ant.2

Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11b	1	2412	14.02	14±1	15	5.27	20	0.0212
		2437	13.89	13±1	14	5.27	20	0.0168
		2462	13.98	13±1	14	5.27	20	0.0168
802.11g	1	2412	14.91	14±1	15	5.27	20	0.0212
		2437	15.11	15±1	16	5.27	20	0.0267
		2462	15.13	15±1	16	5.27	20	0.0267
802.11n (HT20)	1	2412	14.86	14±1	15	5.27	20	0.0212
		2437	15.03	15±1	16	5.27	20	0.0267
		2462	15.20	15±1	16	5.27	20	0.0267
802.11n (HT40)	1	2422	15.37	15±1	16	5.27	20	0.0267
		2437	15.34	15±1	16	5.27	20	0.0267
		2452	14.65	14±1	15	5.27	20	0.0212
802.11ax (HE20)	1	2412	14.27	14±1	15	5.27	20	0.0212
		2437	14.82	14±1	15	5.27	20	0.0212
		2462	15.00	15±1	16	5.27	20	0.0267
802.11ax (HE40)	1	2422	14.00	14±1	15	5.27	20	0.0212
		2437	14.18	14±1	15	5.27	20	0.0212
		2452	14.27	14±1	15	5.27	20	0.0212

Note:

 N_{TX}= Number of Transmit Antennas

RF Output power specifies that Maximum Conducted Peak Output Power.

6. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm ²)
300-1,500	F/1500
1,500-100,000	1.0

7. Summary simultaneous transmission information

The sample supports five antennas for Z-Wave Antenna & ZigBee Antenna & Bluetooth Antenna & WIFI Antenna1 & WIFI Antenna2 can transmit simultaneous.

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

\sum of MPE ratios ≤ 1.0

8. Summary simultaneous transmission results

Z-Wave Antenna & ZigBee Antenna & Bluetooth Antenna & WIFI Antenna1 & WIFI Antenna2 *Maximum Simultaneous transmission MPE Ratios is*

$0+0.0042+0.0017+0.0267+0.0267=0.0593 \leq 1.0$.

9. Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

Note

For a more detailed features description, please refer to the RF Test Report.

-----END OF THE REPORT-----