

Maximum Permissible Exposure

Equipment : 802.11abgn Bluetooth Mini PCIe module
Brand Name : Fukuda Denshi
Model No. : WPEA-251N(BT)
FCC ID : RFH-DS101WIFI
Standard : FCC Part 2.1091
Applicant : IEI Integration Corp.
No. 29, Chung-Hsing Rd., Sijhih City,
New Taipei City 221, Taiwan (R.O.C.)
Manufacturer : SparkLAN Communications, Inc.
8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei 11493, Taiwan

The product sample received on Jan. 06, 2017 and completely tested on Jan. 21, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in FCC Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:


Jordan Hsiao / Manager





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Revision History

[illegible]

1 Human Exposure Assessment

1.1 Product Details

The difference between the report no. : N/A	
The Difference	N/A

Evaluated Test Items	N/A
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1.2 Maximum Permissible Exposure

1.2.1 Limit of Maximum Permissible Exposure

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
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
Note 1: f = frequency in MHz ; *Plane-wave equivalent power density				
Note 2: For the applicable limit, see FCC 1.1310				

1.2.2 MPE Calculation Method

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

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 (appropriate units, e.g., cm)

1.2.3 Result of Maximum Permissible Exposure (2.4G)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N _{TX})	RF Output Power (dBm)
2400-2483.5	b	2412-2462	1-11 [11]	2	19.21
2400-2483.5	g	2412-2462	1-11 [11]	2	23.25
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	22.56
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	14.85
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.					

Worst Maximum RF Output Power Result					
Exposure Environment		General Population / Uncontrolled Exposure			
Separation Distance (cm)		20			
Condition		RF Output Power (dBm)			
Modulation Mode	N _{TX}	RF Output Power	DG (dBi)	EIRP Power	PD (S) (mW/cm ²)
g	2	23.25	2.00	25.25	0.06664
Maximum Permissible Exposure Limit (mW/cm ²)					1
Note 1: N _{TX} = Number of Transmit Chains					

1.2.4 Result of Maximum Permissible Exposure (Bluetooth)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N _{TX})	RF Output Power (dBm)
2400-2483.5	BR/EDR	2402-2480	0-78 [79]	1	2.73
2400-2483.5	LE	2402-2480	0-39 [40]	1	2.16
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.					

Worst Maximum RF Output Power Result				
Exposure Environment	General Population / Uncontrolled Exposure			
Separation Distance (cm)	20			
Condition	RF Output Power (dBm)			
Modulation Mode	RF Output Power	Antenna Gain (dBi)	EIRP Power	PD (S) (mW/cm ²)
BR/EDR	2.73	2.00	4.73	0.00059
LE	2.16	2.00	4.16	0.00052
Maximum Permissible Exposure Limit (mW/cm ²)				1

1.2.5 Result of Maximum Permissible Exposure (5.2G)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N _{TX})	RF Output Power (dBm)
5150-5250	a	5180-5240	36-48 [4]	2	23.11
5150-5250	n (HT20)	5180-5240	36-48 [4]	2	22.66
5150-5250	n (HT40)	5190-5230	38-46 [2]	2	21.07
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.					

Worst Maximum RF Output Power Result					
Exposure Environment		General Population / Uncontrolled Exposure			
Separation Distance (cm)		20			
Condition		RF Output Power (dBm)			
Modulation Mode	N _{TX}	RF Output Power	DG (dBi)	EIRP Power	PD (S) (mW/cm ²)
a	2	23.11	2.00	25.11	0.06453
Maximum Permissible Exposure Limit (mW/cm ²)					1
Note 1: N _{TX} = Number of Transmit Chains					

1.2.6 Result of Maximum Permissible Exposure (5.8G)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	Number of Transmit Chains (N _{TX})	RF Output Power (dBm) Co-location
5725-5850	a	5745-5825	149-165 [5]	2	22.05
5725-5850	n (HT20)	5745-5825	149-165 [5]	2	22.43
5725-5850	n (HT40)	5755-5795	151-159 [2]	2	22.40
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.					

Worst Maximum RF Output Power Result					
Exposure Environment		General Population / Uncontrolled Exposure			
Separation Distance (cm)		20			
Condition		RF Output Power (dBm)			
Modulation Mode	N _{TX}	RF Output Power	DG (dBi)	EIRP Power	PD (S) (mW/cm ²)
n (HT20)	2	22.43	2.00	24.43	0.05517
Maximum Permissible Exposure Limit (mW/cm ²)					1
Note 1: N _{TX} = Number of Transmit Chains					

1.2.7 Result of Maximum Permissible Exposure (Co-location)

Worst Maximum RF Output Power Result							
Exposure Environment		General Population / Uncontrolled Exposure					
Separation Distance (cm)		20					
Condition		RF Output Power (dBm)					
Modulation Mode	N _{TX}	RF Output Power (dBm)	DG (dBi)	EIRP Power	PD (S) (mW/cm ²)	Limit (mW/cm ²)	Ratio
g (2.4GHz)	2	23.25	2.00	25.25	0.06664	1	0.06664
BR/EDR (Bluetooth)	1	2.73	2.00	4.73	0.00059	1	0.00059
Co-location Total							0.06723
Maximum Permissible Exposure Limit							1
Note 1: NTX = Number of Transmit Chains. Note.2: Both of the WLAN 2.4GHz and WLAN 5GHz and Bluetooth BR/EDR can transmit simultaneously, the formula of calculated the MPE is: $CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1$ CPD = Calculation power density LPD = Limit of power density Note 3: Refer to KDB 865664 D02 RF Exposure Reporting v01r02 for MPE Calculation Colocation.							