



MPE Calculation

Applicant:	JETBLACK PRODUCTS Pty Ltd
Address:	31 WALKER STREET, SYDNEY, NSW, 2756, Australia
FCC ID:	2BRHF-JBVICTORY
Contain FCC ID:	2AC7Z-ESPC3MINI1
Product:	SMART TRAINER
Model No.:	JETBLACK VICTORY
Reference RF report #	709502408421-00B, 709502408421-00C, R2103A0270-R1V2

According to subpart 15.247(i) and subpart §1.1307(b)(1), 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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (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
300–1,500	/	/	f/1500	30
1,500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data for BLE

Maximum peak output power at antenna input terminal (dBm):	-7.66
Maximum peak output power at antenna input terminal (mW):	0.17
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	-0.81
Maximum Antenna Gain (numeric):	0.8299
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.00003
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.0

The max power density 0.00003 (mW/cm²) < 1 (mW/cm²)

Result: Compliant

Calculated Data for Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	18.52
Maximum peak output power at antenna input terminal (mW):	71.12
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	3.96
Maximum Antenna Gain (numeric):	2.4889
The worst case is power density at predication frequency at 20 cm (mW/cm ²):	0.03522
MPE limit for general population exposure at prediction frequency (mW/cm ²):	1.0

The max power density 0.03522 (mW/cm²) < 1 (mW/cm²)

Result: Compliant

Calculation method for ANT+ (2457MHz)

$$\text{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t	is the transmitter output power in watts
g_t	is the numeric gain of the transmitting antenna (dimensionless)
E	is the electric field strength in V/m
d	is the measurement distance in meters (m)

For 2457MHz.

Field Strength (E _{Meas}):	72.40(dBuV/m)=0.0042V/m (f=2457 MHz)
Measurement Distance(d _{Meas}):	3 (m)
Equivalent Isotropically Radiated Power(EIRP):	0.000005W=0.005mW



According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4 \pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

PG =0.005mW (in appropriate units, e.g., mW);

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

The max power density $0.005mW/4 \pi R^2 = 9.9472 \cdot 10^{-7} (mW/cm^2) < 1 (mW/cm^2)$

Result: Compliant

Simultaneous transmission of MPE test exclusion for worst case configuration

(1) BLE: the ratio is 0.00003 /1=0.00003

Wi-Fi: the ratio is 0.03522 /1=0.03522

2457MHz:the ratio is $9.9472 \cdot 10^{-7} / 11 = 9.9472 \cdot 10^{-7}$

The sum of the MPE ratios for all simultaneous transmitting antennas

(Wi-Fi + 2.4G BLE): $0.03522 + 0.00003 = 0.03525$

(Wi-Fi + ANT+): $0.03522 + 9.9472 \cdot 10^{-7} = 0.03522$

2.4G BLE and ANT+ can't transmit simultaneously.

As the sum of MPE ratios for all simultaneous transmitting antennas is ≤ 1.0 , simultaneous transmission MPE test exclusion will be applied.

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