FCC 47 CFR MPE REPORT

HANSHOW PTE. LTD.

Electronic Shelf Label

Model Number: Nebular Ultra-160WQ-N

FCC ID: 2BPF3-NU1-160W

Applicant:	HANSHOW PTE. LTD.
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Maximum Permissible Exposure

1. Applicable Standards

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 & KDB 447498 D04 V01 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

1.1. 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 Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-10000			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 Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-10000			1.o	30

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

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: Pd (W/m^2) = $\frac{E^2}{377}$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

2. Conducted Power Result

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
BLE 1M	2402	3.62	2.301
	2440	3.55	2.265
	2480	3.68	2.333
BLE 2M	2402	3.81	2.404
	2440	3.61	2.296
	2480	3.75	2.371

3. Calculated Result and Limit

Mode	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW /cm^2)	Limited of Power Density (S) (mW /cm^2)	Test Result
				(dBi)	(Linear)			
2.4G Band								
BLE 1M	3.68	3±1	4	-1.1	0.776	0.00039	1	Complies
BLE 2M	3.81	3±1	4	-1.1	0.776	0.00039	1	Complies

For 2.4G SRD

Field strength =79.5dBuV/m@3m

P={10 [$^{(79.5/20)}$ /10^6 *3]^2/30 }*1000mW = 0.026738mW

Pd=5.4x10^(-6)mW/cm2<1mW/cm2

For NFC 13.56MHz

Limit=180/13.56=13.27 mW/cm2

Field strength = 46.51dBuV/m@3m

P={ [10$^{(46.51 /20)}$ /10^6 *3]^2/30 }*1000mW =0.0000144mW

Pd=2.7x10^(-9)mW/cm2<13.27mW/cm2

End of Test Report