RF Exposure Evaluation

PRODUCT DESCRIPTIION

Transmit Frequency Band:	156.05MHz – 157.425MHz
Maximum Output Power:	25W(43.98dBm)
Maximum Antenna Gain:	3dBi
Device Category:	☐ Portable (< 20cm separation) ☒ Fixed (> 20cm separation) ☐ Others:
Exposure Environment:	☐ Occupational / Controlled exposure ☒ General Population / Uncontrolled exposure
Evaluation Applied:	☒ MPE Evaluation ☐ SAR Evaluation

APPLICABLE STANDARD

FCC part 2.1091; KDB447498 v05r02; RSS-102

LIMIT

FCC Part 1.1310(e):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
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
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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

RSS-102 Section 4:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	**Electric Field (V/m rms)**	**Magnetic Field (A/m rms)**	**Power Density (W/m^2)**	**Reference Period (minutes)**
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10^{-4} $f^{0.5}$	6.67 x 10^{-5} f	616000/$f^{1.2}$

Note: f is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

MPE CALCULATION

The minimum separation distance is calculated as follows:

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

Where: S=power density

P=power input to 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

FCC: The limit for general uncontrolled exposure environment 30-300MHz is 0.2mW/cm^2.

IC: The limit for general uncontrolled exposure environment 48-300MHz is 1.291W/m^2.

Typical use qualifies for a maximum duty cycle factor of 50%.

FCC: P=25*1*(15/30)=12500mW, G=10^(3/10)=1.995dB, S=0.2mW/cm^2

Safely distance R=(12500*1.995/4*π*0.2)^(0.5)=99.61cm

IC: P=25*1*(3/6)=12500mW, G=10^(3/10)=1.995dB, S=0.1291mW/cm2

Safely distance R=(12500*1.995/4*π*0.1291)^(0.5)=123.98cm

Simultaneous Transmission analysis

Simultaneous Transmission Configurations: VHF radio + 2.4G ISM

FCC: P=25*1*(15/30)+0.0089=12508.9W, G=10^(3/10)=1.995dB, S=0.2mW/cm2

Safely distance R=(12508.9*1.995/4*π*0.2)^(0.5)=**99.65cm**

IC: P=25*1*(3/6)+0.0089=12508.9W, G=10^(3/10)=1.995dB, S=0.1291mW/cm2

Safely distance R=(12508.9*1.995/4*π*0.1291)^(0.5)=**124.03cm**

CONCLUSION

If the gain of the antenna is 3dBi, the separation distance is at least 1.24m from body and the antenna, so meet RF Exposure requirement.