

FCC RF Exposure Requirements

General information:

FCCID: MMASD225U1

Device category: Mobile per Part 2.1091

Environment: Controlled Exposure

Mobile devices that operate under Part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more. However, compliance with the power density limits of 1.1310 is not required.

Antenna:

This device has provisions for operation in a vehicle, or a fixed location.

Although the manufacturer does not specify an antenna. A typical vehicle antenna usually has a gain of less than 6 dBi, a gain of 6 dBi was used in this application.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Passenger car	Any	omni	6

Operating configuration and exposure conditions:

The conducted output power is 5 Watts. Typical use qualifies for a maximum duty cycle factor of 25%. This value is an intrinsic characteristic of this transceiver as the power amplifier can not handle a higher duty cycle without permanent damage to the power amplifier semiconductor. The manufacturer also markets this device only for occupational use.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).

- Vehicle Operation: A typical vehicle installation consists of an antenna system with a coaxial cable of the type RG 58 which has a loss of 1dB for a length of 15 feet.

MPE Calculation:

The minimum separation distance is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for general /uncontrolled exposure environment above 300 MHz is f/1500 mW/cm².

Channel frequency: 406.1-440 MHz
 The conducted power output is 5 watt.
 The coax loss was taken as 1 dB.
 Antenna gain was taken as 6 dBi
 25% talk time in 30 minutes

Power in Watts	Duty Factor in decimal % (1=100%)	
W := 5	D := 1	for an FM device D=1
Exposure time in minutes	U := 30	(use 6 for controlled and 30 for uncontrolled)
E := 7.5		
$W_{exp} := W \cdot D \cdot \left(\frac{E}{U}\right)$	$PC := \frac{E}{U}$	percent on time
Time compensated power output	PC = 0.25	
W _{exp} = 1.25 Watts		
W _{1exp} := W _{exp} · 1000		
W _{1exp} = 1.25 × 10 ³ mWatts		

Antenna gain	Coax Loss	For all UHF frequencies
dBd := 3.85	CL := 1 dB	
G := dBd + 2.15 - CL		f := 406.1
G = 5 Net gain in dBi		
$G_n := 10^{\frac{G}{10}}$	$S := \frac{f}{1500} \frac{mW}{cm^2}$	from OET 65
G _n = 3.162 Gain Numeric		
$R := \sqrt{\frac{(W_{1exp} \cdot G_n)}{(4 \cdot \pi \cdot S)}}$	Rinches := $\frac{R}{2.54}$	
R = 34.086 distance in centimeters required for compliance	Rinches = 13.42	

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 34.1 cm between the antenna, including any radiating structure, and any persons when normally operated .

Proposed RF exposure safety information to include in User's Manual:

“FCC RF Exposure Requirements:

CAUTION:

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device is approved with emissions having a source-based time-averaging duty factor not exceeding 25%.

Vehicle – Antenna Installation:

- Antennas used for this transmitter must not exceed an antenna gain of 6 dBi with a minimum cable loss of 1dB.
- For rear deck trunk and roof top installations, the antenna must be located at least 34.1 cm away from rear-seat passengers and bystanders in order to comply with the FCC RF exposure requirements.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.