

FCC ID:	QWY-ATM-R-522
CERTIFICATION NUMBER:	6588A-ATMR522
PMN: (Product Marketing Name)	ATM roof version
HMN: (Host Marketing Name)	-/-
HVIN: (Hardware Version Identification Number)	ATM-01 R1-US-4GW
FVIN: (Firmware Version Identification Number)	-/-

Prediction of MPE limit at given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

where: S = Power density
P = Power input to the antenna
G = Antenna gain
R = Distance to the center of radiation of the antenna

Technologies:

Technologies:	Max. Power: (AVG)	Max. Gain:	Min. Pathloss:
2G GSM850	31 dBm	-3.4 dBi	2.8 dB
2G PCS1900	28 dBm	-2.4 dBi	5.0 dB
3G Band V	25 dBm	-3.4 dBi	2.8 dB
3G Band II	25 dBm	-2.4 dBi	5.0 dB
LTE 17, 5	25 dBm	-3.4 dBi	2.4 dB
LTE 2, 4	25 dBm	-2.4 dBi	4.9 dB
WLAN	-1.8 dBm	5.0 dBi	2.0 dB

MPE results for FCC:

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

Frequency Range (MHz)	Power Density (mW/cm ²)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

		< 1500 MHz	> 1500 MHz	
		WWAN	WWAN	WLAN
P	Max power input to the antenna	28.2 dBm	23.0 dBm	-3.8 dBm
R	Distance	20 cm	20 cm	20 cm
G	Antenna gain	-3.4 dBi	-2.4 dBi	5 dBi
S	MPE limit for uncontrolled exposure	0.47 mW/cm ² (worst case)	1 mW/cm ²	1 mW/cm ²
	Calculated Power density:	0.06 mW/cm²	0.02 mW/cm²	0.0003 mW/cm²
	Colocation WWAN + WLAN	12.8 %	4.3 %	0.03 %

This prediction demonstrates the following:

The power density levels at a distance of 20 cm are below the maximum levels allowed by regulations.

MPE results for IC according RSS-102 Issue 5

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f0.5W$ (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- **at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834} W$ (adjusted for tune-up tolerance), where f is in MHz;**
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Prediction: worst case

		GSM850	PCS1900	LTE Band 4	LTE Band 17	WLAN
		WWAN	WWAN	WWAN	WWAN	WLAN
P	Max power input to the antenna	28.2 dBm	23.0 dBm	23.6 dBm	20.1 dBm	-3.8 dBm
G	Antenna gain	-3.4 dBi	-2.4 dBi	-2.4 dBi	-3.4 dBi	5.0 dBi
S	MPE limit for uncontrolled exposure	1289 mW	2239 mW	2141 mW	1164 mW	2707 mW
	Calculated output power:	302 mW	115 mW	132 mW	47 mW	1.3 mW

Conclusion: for applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.

Stefan Bös
Cetecom ICT Services GmbH