

Maximum Permissible Exposure (MPE)

Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section Part 22, subpart H and Part 24, subpart E of the FCC CFR 47 Rules. For 47 CFR 1.1310 Radio frequency Radiation Exposure requirement.

Special Accessories

Not available for this EUT intended for grant.

Equipment Modifications

Not available for this EUT intended for grant.

Limitation

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

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Maximum Permissible Exposure (MPE) Evaluation

In this application we seek approval to the AT5. Based on the FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091, we have concluded that the SIM340 module will comply with the FCC rules on RF exposure for mobile devices in cellular band and PCS band. The following analysis will demonstrate such compliance. The analysis will be done in two US bands.

Operation in cellular band (824 – 849 MHz)

The ERP of AT5 in cellular band is 30.86dBm max at GSM/GPRS mode. The resulted power density at a distance of 20 cm can be deducted as follows:

EUT Mode	Frequency (MHz)	CH	EUT Pol.	Antenna Pol.	SPA Reading (dBuV)	S.G. Output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	ERP (dBm)	Limit (dBm)
GSM 850	824.20	128	E2	V	125.02	38.63	-7.87	3.62	27.13	38.45
				H	125.62	39.35	-7.87	3.62	27.85	38.45
	836.60	190	E2	V	124.35	38.10	-7.88	3.65	26.57	38.45
				H	122.76	36.53	-7.88	3.65	25.00	38.45
	848.80	251	E2	V	125.80	39.68	-7.88	3.68	28.12	38.45
				H	128.61	42.42	-7.88	3.68	30.86	38.45

$$\text{ERP} = 30.86 \text{ dBm}$$

$$\text{EIRP} = 30.86 + 2.14 = 33\text{dBm} = 2000 \text{ mW}$$

$$\begin{aligned} \text{Power Density} &= \text{ERP} * \text{Duty Cycle} / (4 \pi R^2) \\ &= 2000 * 0.25 / (4 * \pi * 20^2) = 0.09929 \text{ mW/cm}^2 \end{aligned}$$

where Duty Cycle is 0.25 for GSM/GPRS operation (class 10) and R is 20 cm.

The MPE limit for General Population/Uncontrolled Exposure is shown in the FCC OET Bulletin 65 Supplement C and can be calculated as follows:

$$\text{MPE limit} = 824/1500 = 0.55 \text{ mW/cm}^2$$

As we can see the resulted power density is below the MPE limit, therefore AT5 in cellular band is compliant with the FCC rules on RF exposure.

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Operation in PCS band (1850 – 1910 MHz)

The EIRP of AT5 in PCS band is 25.35 dBm. max. The resulted EIRP can be expressed as follows:

EUT Mode	Frequency (MHz)	CH	EUT Pol.	Antenna Pol.	SPA Reading (dBuV)	S.G. Output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)
PCS 1900	1850.20	512	E2	V	116.48	12.09	9.90	5.56	16.43	33.00
				H	125.47	21.29	9.90	5.84	25.35	33.00
	1880.00	661	E2	V	113.44	9.08	9.99	5.61	13.46	33.00
				H	124.77	20.63	9.99	5.61	25.00	33.00
	1909.80	810	E2	V	114.04	9.71	10.08	5.66	14.13	33.00
				H	124.22	20.11	10.08	5.66	24.53	33.00

$$\text{EIRP} = 25.35 \text{ dBm} = 342.7 \text{ mW}$$

$$\begin{aligned} \text{Power Density} &= \text{EIRP} * \text{Duty Cycle} / (4 \pi R^2) \\ &= 342.7 * 0.25 / (4 * \pi * 20^2) = 0.01706 \text{ mW/cm}^2 \end{aligned}$$

where Duty Cycle is 0.25 for GSM/GPRS operation (class 10) and R is 20 cm.

The MPE limit for General Population/Uncontrolled Exposure is shown in the FCC OET Bulletin 65 Supplement C and can be calculated as follows:

$$\text{MPE limit} = 1.0 \text{ mW/cm}^2$$

As we can see the resulted power density is below the MPE limit, therefore AT5 in PCS band is compliant with the FCC rules on RF exposure.

End of Report ~

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