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. And RSS-102 issue 4 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

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Averaging Time (minutes)
0.003-1	280	2.19	-	6
1-10	$280/f$	$2.19/f$	-	6
10-30	28	$2.19/f$	-	6
30-300	28	0.073	2^*	6
300-1500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	$f/150$	6
1500-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

* Power density limit is applicable at frequencies greater than 100 MHz.

Maximum Permissible Exposure (MPE) Evaluation

In this application we seek approval to the V120. Based on the FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091, we have concluded that the MC55i 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 V120 in cellular band is 23.04dBm max at GPRS mode. The resulted power density at a distance of 20 cm can be deducted as follows:

EUT				**Measurement**					
Operation Band	**Pol.**	**Fundamental Frequency MHz**	**CH**	**Antenna Pol. V/H**	**S.G. Output dBm**	**Antenna Gain dBd**	**Cable Loss dB**	**ERP dBm**	**Limit dBm**
GPRS 850	E2	824.20	128	V	13.22	3.96	-4.22	12.96	38.40
				H	23.30	3.96	-4.22	**23.04**	38.40
		836.60	190	V	13.54	4.00	-4.24	13.30	38.40
				H	22.98	4.00	-4.24	22.74	38.40
		848.80	251	V	12.87	4.03	-4.33	12.57	38.40
				H	22.56	4.03	-4.33	22.26	38.40

ERP = 23.04 dBm = 201.37 mW

Power Density = ERP*Duty Cycle/($4\pi R^2$)

= 201.37*0.25/($4*\pi*20^2$) = 0.010015 mW/cm^2

where Duty Cycle is 0.25 for 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:

MPE limit = 824/1500 = 0.55 mW/cm^2

As we can see the resulted power density is below the MPE limit, therefore V120 in cellular band is compliant with the FCC rules on RF exposure.

Operation in PCS band (1850 – 1910 MHz)

The EIRP of V120 in PCS band is 18.71 dBm. max. The resulted EIRP can be expressed as follows:

EUT				Measurement					
Operation Band	**Pol.**	**Fundamental Frequency MHz**	**CH**	**Antenna Pol. V/H**	**S.G. Output dBm**	**Antenna Gain dBi**	**Cable Loss dB**	**EIRP dBm**	**Limit dBm**
GPRS 1900	E2	1850.20	512	V	16.38	4.17	-5.49	15.07	33.00
				H	10.89	4.51	-5.49	9.92	33.00
		1880.00	661	V	18.04	4.13	-5.56	16.61	33.00
				H	10.75	4.44	-5.56	9.62	33.00
		1909.80	810	V	20.17	4.09	-5.56	**18.71**	33.00
				H	12.92	4.36	-5.56	11.73	33.00

EIRP = 18.71 dBm = 74.30 mW

Power Density = EIRP*Duty Cycle/($4\pi R^2$)

= $74.30*0.25/(4*\pi*20^2) = 0.003695$ mW/cm^2

where Duty Cycle is 0.25 for 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:

MPE limit = 1.0 mW/cm^2

As we can see the resulted power density is below the MPE limit, therefore V120 in PCS band is compliant with the FCC rules on RF exposure.