

Maximum Permissible Exposure (MPE)

Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with § 2.1091 radiofrequency radiation exposure evaluation: mobile devices of the FCC CFR 47 Rules, CFR 1.1310 (b) 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 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}

Note: f is frequency in MHz.

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Maximum Permissible Exposure (MPE) Evaluation

The evaluation and calculation as deduces below presents only worst-case that produces highest value of the result:

Operation Configuration of the Worst-Case picked up to evaluate:

BAND 4

Transmission Band Width: 5M, Modulation: 16QAM, RB allocation: 1 offset: 24

BAND 13

Transmission Band Width: 10M , Modulation: 16QAM, RB allocation: 1 offset: 0

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SGS Taiwan Ltd.

No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號

台灣檢驗科技股份有限公司

t (886-2) 2299-3279

f (886-2) 2298-0488

www.tw.sgs.com

Member of SGS Group

Operation in LTE band (1712.5 – 1752.5 MHz)

The EIRP of VZ20M in LTE band 4 5MHz /16QAM/RB 1 offset: 24 is 29.80dBm. max. The resulted power density at a distance of 20 cm can be deducted as follows:

BAND 4 / BW: 5M / 16QAM / RB: 1 offset: 24									
EUT				Measurement					
Operation Band	Pol.	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
		MHz		V/H	dBm	dBi	dB	dBm	dBm
LTE Band 4	E2	1712.5	19975	V	28.92	5.24	-4.36	29.80	30.00
				H	24.59	5.24	-4.36	25.47	30.00
		1732.5	20175	V	25.00	5.22	-4.40	25.82	30.00
				H	23.40	5.22	-4.40	24.22	30.00
		1752.5	20375	V	26.18	5.20	-4.44	26.94	30.00
				H	23.59	5.20	-4.44	24.35	30.00

$$\text{EIRP} = 29.80 \text{ dBm} = 954.993 \text{ mW}$$

$$\begin{aligned} \text{Power Density} &= \text{EIRP} \cdot \text{Duty Cycle} / (4 \pi R^2) \\ &= 954.993 \cdot 1 / (4 \cdot \pi \cdot 20^2) = 0.18999 \text{ mW/cm}^2 \end{aligned}$$

where Duty Cycle is 1 for LTE band 4 5MHz /16QAM/RB 1 offset: 24 operation and R is 20 cm.

The MPE limit for General Population/Uncontrolled Exposure is referred to in section 14.4, and it is,

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

The resulted power density is below the limit of MPE, and therefore VZ20M in LTE band 4 is compliant with the FCC rules on RF exposure.

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Operation in LTE band (782.0 MHz)

The ERP of VZ20M in LTE band 13 10MHz /16QAM/RB 1 offset: 0 is 32.60dBm max at LTE mode. The resulted power density at a distance of 20 cm can be deducted as follows:

BAND 13 / BW: 10M / 16QAM / RB: 1 offset: 0									
EUT				Measurement					
Operation Band	Pol.	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
		MHz		V/H	dBm	dBi	dB	dBm	dBm
LTE Band 13	E2	782.0	23230	V	30.19	6.24	-3.89	32.60	34.77
				H	24.87	6.24	-3.89	27.28	34.77

$$\text{ERP} = 32.60\text{dBm} = 1819.701\text{mW}$$

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

$$= 1819.701 * 1 / (4 * \pi * 20^2) = 0.36202 \text{ mW/cm}^2$$

where Duty Cycle is 1 for LTE band 17 10MHz /16QAM/RB 1 offset: 0 operation 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:

$$\text{MPE limit} = 782/1500 = 0.521 \text{ mW/cm}^2$$

As we can see the resulted power density is below the MPE limit, therefore VZ20M in LTE band is compliant with the FCC rules on RF exposure.

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