

FCC §1.1307 (b) – RF EXPOSURE

Applicable Standard

According to FCC §1.1307(b), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.4 –MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

f = frequency in MHz;

R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Test result

For worst case:

Mode	Frequency Range (MHz)	Tune-up Output Power		Antenna Gain		ERP		Evaluation Distance (cm)	MPE-Based Exemption Threshold (mW)
		(dBm)	(mW)	(dBi)	(dBd)	(dBm)	(mW)		
GSM850	824-849	26.5	446.68	-0.04	-2.19	24.31	269.77	20	422
PCS1900	1850-1910	23.5	223.87	0.59	-1.56	21.94	156.31	20	768
WCDMA B2	1850-1910	23.0	199.53	0.59	-1.56	21.44	139.32	20	768
WCDMA B5	824-849	22.5	177.83	-0.04	-2.19	20.31	107.40	20	422
LTE B2	1850-1910	23.5	223.87	0.59	-1.56	21.94	156.31	20	768
LTE B4	1710-1755	23.0	199.53	-0.84	-2.99	20.01	100.23	20	768
LTE B5	824-849	23.5	223.87	-0.04	-2.19	21.31	135.21	20	422
LTE B7	2500-2570	23.5	223.87	0.62	-1.53	21.97	157.40	20	768
LTE B40	2305-2315	22.5	177.83	0.62	-1.53	20.97	125.03	20	768
	2350-2360	22.5	177.83	0.62	-1.53	20.97	125.03	20	768

Note 1: The tune-up power was declared by the applicant.

Note 2: 0dBd=2.15dBi.

Note 3: For GSM/GPRS/EDGE, the time base average power as below:

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB

GSM850:

Mode	Frequency (MHz)	Conducted Output Power (dBm)				Time based average power (dBm)			
		1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots
GSM	824.2	32.48	/	/	/	23.48	/	/	/
	836.6	32.44	/	/	/	23.44	/	/	/
	848.8	32.41	/	/	/	23.41	/	/	/
GPRS	824.2	32.51	31.44	30.00	28.84	23.51	25.44	25.75	25.84
	836.6	32.44	31.13	30.12	29.00	23.44	25.13	25.87	26.00
	848.8	32.37	31.11	30.15	29.08	23.37	25.11	25.90	26.08
EDGE	824.2	26.52	25.43	23.99	23.11	17.52	19.43	19.74	20.11
	836.6	26.38	25.39	23.93	23.03	17.38	19.39	19.68	20.03
	848.8	26.34	25.12	24.27	23.10	17.34	19.12	20.02	20.10

PCS1900:

Mode	Frequency (MHz)	Conducted Output Power (dBm)				Time based average power (dBm)			
		1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots
GSM	1850.2	29.58	/	/	/	20.58	/	/	/
	1880.0	29.36	/	/	/	20.36	/	/	/
	1909.8	29.25	/	/	/	20.25	/	/	/
GPRS	1850.2	29.38	28.23	27.22	26.15	20.38	22.23	22.97	23.15
	1880.0	29.19	28.09	27.18	26.17	20.19	22.09	22.93	23.17
	1909.8	29.08	28.19	26.76	25.74	20.08	22.19	22.51	22.74
EDGE	1850.2	25.52	24.49	23.21	22.21	16.52	18.49	18.96	19.21
	1880.0	25.37	24.03	22.73	21.59	16.37	18.03	18.48	18.59
	1909.8	25.32	23.98	22.72	21.82	16.32	17.98	18.47	18.82

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.