

RF Exposure / RF Technical Brief

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ATTN: Reviewing Engineer

RF exposure information for the equipment GG864-2.4 (FCC ID: RI7GG864, IC: 5131A-GG864)

The device **GG864-2.4** (FCC ID: RI7GG864, IC: 5131A-GG864) is designed to be used only for fixed and mobile applications.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

The table below is excerpted from RSS-102, Issue 4, 4.2, titled "RF Limits for Devices used by the General Public":

Frequency Range (MHz)	Power density (W/m ²)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz)/150	f (MHz) /1500	6
1500 – 15000	10	1.0	6

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 (MHz) /1500	30
1500 – 100.000	1.0	30

Based on the above tables the limits are:

For 850 MHz frequency band device: 0.55 mW/cm²
 For 1900 MHz frequency band device: 1 mW/cm²
 For 2.4 GHz frequency band device: 1 mW/cm²

Using the equation:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm²)
 P = power input to the antenna (in appropriate units, e.g., mW)
 G = power gain of the antenna in the direction of interest relative to an isotropic radiator
 R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Compliance with MPE limits can be guaranteed as the calculation below shows:

850 MHz frequency band

Maximum output power: 33.25 dBm (2113.49 mW)
Maximum antenna gain: 7 dBi (5.01 numerical gain)
Maximum eirp: 40.25 dBm (10.59 W < FCC/IC EIRP power limit (11.5 W))
Maximum exposure: 0,5268 mW/cm² < RF Limits for Devices used by the General Public (0.55 mW/cm²)

1900 MHz frequency band

Maximum output power: 29,10 dBm (812,83 mW)

Maximum antenna gain: 3,90 dBi (2,45 numerical gain)

Maximum eirp: 33 dBm (1.99 W < FCC/IC EIRP power limit (2 W))

Maximum exposure: 0,0992 mW/cm² < RF Limits for Devices used by the General Public (1mW/cm²)

2.4 GHz frequency band

Maximum output power: 12.92 dBm (19.59 mW)

Maximum antenna gain: 2.2 dBi (1,66 numerical gain)

Maximum eirp: 15.12 dBm (0.033 W < FCC/IC EIRP power limit (4 W))

Maximum exposure: 0,0065 mW/cm² < RF Limits for Devices used by the General Public (1mW/cm²)

Co-transmission

Frequency Band	Mode	Frequency Range (MHz)	S (mW/cm ²)	MPE limit (mW/cm ²)	S/MPE limit
GSM 850	GSM/GPRS	824,2 - 848,8	0,1744	0,5500	0,3172
PCS 1900	GSM/GPRS	1850,2 - 1909,8	0,0992	1,0000	0,0992
2,4 GHz	802.15.4	2400-2483,5	0,0065	1,0000	0,0065

Co-transmission SCENARIO	Equipment		S/MPE limit	S/MPE limit primary + S/MPE limit secondary	Compliance
Scenario 1	GSM 850	GSM/GPRS	0,3172	0,3236	COMPLIANT
	2,4 GHz ZigBee	802.15.4	0,0065		
Scenario 2	PCS 1900	GSM/GPRS	0,0992	0,1057	COMPLIANT
	2,4 GHz ZigBee	0	0,0065		