

## RF Exposure

# FCC ID: 2A5ZP-AIR

### Applied procedures / limit

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

According to KDB 447498 D01 General RF Exposure Guidance v06, Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

Limits for Maximum Permissible Exposure (MPE)

### Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

Note: *f* is frequency in MHz

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

### Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: *f* = frequency in MHz

\* = Plane-wave equivalent power density



**MPE PREDICTION**

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

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, R=0.2m

**TEST RESULTS**

Operation Mode	Tune up Produce power	Maximum peak output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm2)	Limit (mW / cm2 )	Result
2.4G WIFI	12±1	13	19.95	2.19(3.4dBi)	0.00869	1	Pass
BLE	0±1	1	1.26	2.19(3.4dBi)	0.00055	1	Pass

For the max result :  $0.00869 \leq 1.0$ , compliance with FCC's RF Exposure



**§ 2.1091 Radiofrequency radiation exposure evaluation**

**According to § 15.247(i), § 1.1307(b)(3)(i)(A) and KDB447498, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the commission's guidance.**

**Blanket 1 mW Blanket Exemption**

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

**1-mW Test Exemption**

Per §1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Antenna Gain (dBi): 0

RFID 125KHz:

$EIRP = E + 20\log(d) - 104.7 = 84.21 + 9.54 - 104.7 = -10.95\text{dBm}$ , For  $d=3\text{m}$

Transmit Power Max(dBm)	Power (mW )	Limits (mW )
-10.95	0.080	1

Antenna Gain (dBi): 0

RFID 13.56MHz:

$EIRP = E + 20\log(d) - 104.7 = 52.45 + 9.54 - 104.7 = -42.71\text{dBm}$ , For  $d=3\text{m}$

Transmit Power Max(dBm)	Power (mW )	Limits (mW )
-42.71	0.000054	1

**For the Max simultaneous transmission:**

**$0.080/1 + 0.000054/1 = 0.080054\text{mW}$**

**Conclusion:**

The maximum power is less than 1 mW, which meets the standard exemption requirements.

For the Max simultaneous transmission:

$BLE + 2.4G\text{ WIFI} + RFID(125K) + RFID(13.56MHz) = 0.00055/1 + 0.00869/1 + 0.080/1 + 0.000054/1 = 0.089294$

For the max result :  $0.089294 \leq 1.0$ , compliance with FCC's RF Exposure