

RF Exposure

1.0 SAR EXEMPTION PER KDB 447498 D01 V05R02

Only one 900 MHz channel transmits at a time. Either the 2.4 GHz or the 5 GHz WiFi may transmit at the same time as the 900 MHz channel. The WiFi Module is optional. Since separation distance between radiator/antenna and end-user can be less than or equal to 20 cm, they are portable devices.

1.1 Calculations for Stand alone

In accordance with FCC KDB Publication 447498 D01 V05R02 Clause 4.3.1,
The 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz are determined by:

For transmitters from 100-1500 MHz and distances > 50mm: **4.3.1 b) 1)**

$[(\text{max. power allowed at numeric threshold for 50mm in 4.3.1a, mW})] + [(\text{min. separation distance} - 50, \text{ mm}) * (\text{Freq}(\text{MHz}) / 150)]$

For transmitters from 1500-6000 MHz and distances > 50mm: **4.3.1 b) 2)**

$[(\text{max. power allowed at numeric threshold for 50mm in 4.3.1a, mW})] + [(\text{min. separation distance} - 50, \text{ mm}) * (10)]$

This table is for devices with a separation greater than 50 mm

MHz	Max Power dBm	Duty Cycle %	EIRP mW	Min Sep mm	SAR Exc Threshold at 50mm 4.3.1 a) in mW	SAR Exclusion threshold per 4.3.1 b)1) in mW	Result	Notes	
902.75	29.9	7.4	72.4	53	157.9	175.9	Exempt		
915	29.9	7.4	72.4	53	156.8	175.1	Exempt		
927.25	29.6	7.4	67.6	53	155.8	174.3	Exempt		

The EUT may have an optional WiFi module installed in the product. The module used will be FCC ID: Z64-WL18DBMOD.

Result: Transmitters meet the SAR exemption of section 4.3.1

1.2 Calculations for Simultaneous Transmission.

In accordance with FCC KDB Publication 447498 D01 V05R02 Clause 7.2 (a)

From Clause 4.3.2 (b) 2) For distances > 50mm, 0.4 W/kg limit is used for 1-g SAR limit

Freq. (MHz)	Max Power (dBm)	Duty Cycle %	Average Power per channel (mW)	Min Sep (mm)	SAR Calculation as per 4.3.2 b) 2) (W/kg)	SAR Exc Threshold as per 7.2 1 g limit (W/kg)	Result	Notes
902.75	29.9	7.41	72.4	53	0.40	1.6	Exempt	
915	29.9	7.41	72.4	53	0.40	1.6	Exempt	
927.25	29.6	7.41	67.6	53	0.40	1.6	Exempt	

MPE Calculation from OET 65 Edition 97-01

Band	Freq. (MHz)	Max Power (dBm)	Max Power (mW)	Max Ant Gain (dBi)	Max Ant Gain above Isotropic (numeric)	Duty Cycle %	Max EIRP (mW)	Power Density at 20 cm (mW/cm ²)	(S) GP Limit (mW/cm ²)	MPE Ratio
2G Wifi	2412	17.5	56.23	3.2	2.09	100.0	117.49	0.0234	1.000	0.0234
5G Wifi	5180	19.5	89.13	4.5	2.82	100.0	251.19	0.0500	1.000	0.0500

Notes on the above table:

The max power of 19 dBm between the two Wi-Fi modules of the 2.4 GHz was applied.

In accordance with OET 65, 97-01, Power Density is calculated by

$$S = P \cdot G / (4 \cdot \pi \cdot R^2)$$

Where

S = power density (mW/cm²)

P = power input to the antenna (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 (cm)

MPE Ratio = Product Power Density / power Density limit

The 2.4 GHz Wifi module is a Variscite brand module, FCC ID number Z64-WL18DBMOD.

1.2.1 Final Calculation

From FCC KDB Publication 447498 D01 V05R02 Clause 7.2 (a)

The $[\sum \text{of (the highest measured SAR for each standalone antenna configuration)} / 1.6 \text{ W/kg}] + [\sum \text{of MPE ratios}]$ shall be ≤ 1.0 .

The sum of the highest measured SAR for each standalone antenna configuration / 1.6 = $0.4 / 1.6 = 0.25$

Where 0.4 = total W/kg for 900 MHz

The sum of MPE ratios of the WiFi = 0.050

Only the highest value (0.05) is used since the 2.4 GHz and the 5 GHz WiFi will not transmit simultaneously.

The sum of the two values = $0.25 + 0.050 = 0.30$

Since the final sum is less than 1.0, SAR is not required.

2.0 DUTY CYCLE CALCULATIONS

Each transmission is followed by a pause of 12.5 times the transmit time so that the resulting duty cycle is $1 \div 13.5 = 0.0741 = 7.41\%$. We also note that there is a pause of 2 or more milliseconds between cycles which are added to the programmed pause which lowers the average power slightly so that the duty cycle falls slightly below 7.41% at all times.

For transmissions of 46ms duration, the pause is 575ms for normal operation. From time to time, particularly if more than one RFID tag is in the field, the transmission time may be longer, but the pause will then be longer by the same ratio of 12.5.

3.0 ANTENNA LOCATIONS

For a patient on a mattress that has compressed to the minimum depth possible for a foam mattress, the distance from the 900 MHz antenna and the patient is at least 53 mm. This is with an antenna directly beneath the patient.

The WiFi module is in the housing of the main processor which installed on the bottom of the bed frame. The housing is at least 20 cm from all personnel.