

MAXIMUM PERMISSIBLE EXPOSURE

KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.

According to FCC 1.1310: 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)

EUT Specification

FCC ID	2BBSU-DDL250
EUT	Smart deadbolt
Frequency band (Operating)	<input checked="" type="checkbox"/> BT: 2.402GHz ~ 2.480GH <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> RLAN: 5.180GHz ~ 5.240GHz <input type="checkbox"/> RLAN: 5.260GHz ~ 5.320GHz <input type="checkbox"/> RLAN: 5.500GHz ~ 5.700GHz <input type="checkbox"/> RLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others:433.92MHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others _____
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure <input checked="" type="checkbox"/> General Population/Uncontrolled exposure
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Antenna gain (Max)	BT Ant: 3.43dBi WIFI Ant: 6.09dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation



Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	30
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

Operating Mode	Maximum output power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
BT	2.42	2.42 ±1	3.42	3.43	0.0010	1
WIFI	19.60	19.60 ±1	20.60	6.09	0.0929	1
433.92	-12.718	-12.718 ±1	-11.718	0	0.000013	1

Operating Mode	E-Field strength (dBμV/m)	Max Output power (dBm)
433.92MHz	82.54	-12.718
Max Output power = E-Field strength - 95.2 = 82.54 - 95.2 = -12.718 dBm		
Note: EIRP (dBm) = E (dBμV/m) - 95.2		



The Maximum simultaneous transmission for BT+WIFI+433.92MHz:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$= SWLAN/S_{limit-2.4} + S_{BT}/S_{limit-2.4} + S_{433.92MHz}/S_{limit-433.92MHz}$$

$$= 0.0929/1 + 0.0010/1 + 0.000013/1$$

$$= 0.093913$$

$$< 1.0$$

Result: No Standalone SAR test is required.

