



# CTC Laboratories, Inc.

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## Maximum Permissible Exposure Evaluation

FCC ID: 2APN5NSPANELPRO

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

Product Name:	SONOFF NSPanel Pro Smart Home Control Panel
Trade Mark:	Sonoff
Model/Type reference:	NSPanel86PB
Listed Model(s):	NSPanel86PW, NSPanel86PG
Frequency band (Operating)	BT: 2.402GHz ~ 2.480GHz 2.4G WIFI: 2.412GHz ~ 2.462GHz Zigbee: 2.405GHz ~ 2.480GHz
Device category	<input type="checkbox"/> Portable (<5mm separation) <input type="checkbox"/> Mobile (>20cm separation) <input checked="" type="checkbox"/> Fixed (>20cm separation) <input type="checkbox"/> Others _____
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S=5mW/cm2) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antenna <input type="checkbox"/> TX diversity <input type="checkbox"/> RX diversity <input type="checkbox"/> TX/RX diversity
Antenna gain (Max)	BT/2.4G WIFI Antenna: 2.0dBi Zigbee Antenna: 2.0dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

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**Limits for Maximum Permissible Exposure (MPE)**

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm <sup>2</sup> )	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	6
1500-100000	--	--	1	30

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

Where

$P_d$  = Power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

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

$P_d$  the limit of MPE 1mW/cm<sup>2</sup>. 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**

BLE - Worst case						
Type	Frequency (MHz)	Max. Measured Power (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limit (mW/cm <sup>2</sup> )
GFSK	2480	6.47	7.00	2.0	0.00158	1

BR/EDR - Worst case						
Type	Frequency (MHz)	Max. Measured Power (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limit (mW/cm <sup>2</sup> )
8-DPSK	2441	8.39	9.00	2.0	0.00250	1

2.4G WIFI - Worst case						
Type	Frequency (MHz)	Max. Measured Power (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limit (mW/cm <sup>2</sup> )
802.11 G	2462	22.56	23.00	2.0	0.06291	1



Zigbee - Worst case						
Type	Frequency (MHz)	Max. Measured Power (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limit (mW/cm <sup>2</sup> )
OQPSK	2405	11.45	12.00	2.0	0.00500	1

The BT, WIFI and Zigbee can transmit simultaneously.

Type	Frequency (MHz)	Antenna Gain (dBi)	Power density at 20cm (mW/cm <sup>2</sup> )	Total Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limit (mW/cm <sup>2</sup> )
8-DPSK	2441	2.0	0.00250	0.07041	1
802.11 G	2462	2.0	0.06291		
OQPSK	2405	2.0	0.00500		

Note:

1. Calculate by Worst-case mode.
2. Max. Tune Up Power by Manufacturer's Declaration, and Max. Tune Up Power is used to calculate.
3. For a more detailed features description, please refer to the RF Test Report.

\*\*\*\*\*THE END\*\*\*\*\*