

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: SAMADHI WINDOW COVERING MANUFACTURING PTE.LTD.
Address of applicant: 9005 TAMPINES STREET 93 #02-230 TAMPINES INDUSTRIAL PARK A,
528839, Singapore

Manufacturer: SAMADHI WINDOW COVERING MANUFACTURING PTE.LTD.
Address of manufacturer: 9005 TAMPINES STREET 93 #02-230 TAMPINES INDUSTRIAL PARK A,
528839, Singapore

General Description of EUT:

Product Name: PRO HUB
Trade Name: /
Model No.: DD7006
Adding Model(s): /
Rated Voltage: DC 5V
Power Adaptor : /
FCC ID: 2BPBBDD7006A00
Equipment Type: Mobile device

Technical Characteristics of EUT:

Frequency Range: 433.92 MHz
Max. Field Strength: 433.92MHz: 78.17dBuV/m(3m)
Data Rate: /
Modulation: FSK
Antenna Type: PCB Antenna
Antenna Gain: 0dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} (\text{mW}) = \begin{cases} ERP_{20\text{ cm}}(d/20\text{ cm})^x & d \leq 20\text{ cm} \\ ERP_{20\text{ cm}} & 20\text{ cm} < d \leq 40\text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20\text{ cm}}\sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\text{ cm}} (\text{mW}) = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

1.3 Calculated Result

Radio Access Technology	Prediction Frequency	Output Power	Antenna Gain	Duty Cycle	Tune-Up Time-Averaged Power	ERP
	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)
SRD	433.92	-17.09	0	100	-17.00	-19.15
Wi-Fi	2412	18.01	3.70	100	19.00	20.55
Bluetooth	2402	4.58	3.70	100	5.00	6.55

Frequency (MHz)	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
433.92	C	20.00	-19.15	0.01	222.17	0.01	Pass
2412	C	20.00	20.55	113.50	768.00	0.15	Pass
2402	C	20.00	6.55	4.52	768.00	0.01	Pass

Note: 1. Time-Averaged Power=Output Power * Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-2.15dB

2. Option A, B and C refers as clause 1.2.
3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;
4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).
5. Ratio= Tune-Up ERP (mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Simultaneous Ratio	Limit	Result
					Pass/Fail
Wi-Fi + SRD	0.15	0.01	0.16	1	Pass

Note:

- 1) For RF Module (FCC ID: 2AC7Z-ESPWROOM32D; the issue date: 12/21/2017)
Bluetooth Maximum peak output power (dBm):4.58; Antenna Gain (dBi):3.70
Wi-Fi (2.4G) Maximum peak output power (dBm):18.01; Antenna Gain (dBi):3.70
- 2) BT and Wi-Fi can't transmit at the same time.

Result: Pass