

1. RF Exposure Requirements

1.1 General Information

Client Information	
Applicant:	EcoFlow Inc.
Address of applicant:	RM 401, Plant #1, Runheng Industrial Zone, Fuhai Street, Bao'an District, Shenzhen, 518000 China
Manufacturer:	The same as Applicant
Address of manufacturer:	The same as Applicant
General Description of EUT:	
Product Name:	EcoFlow 4G Dongle SEP
Trade Name:	ECOFLOW, EF ECOFLOW
Model No.:	EF-WM-001
Adding Model(s):	/
Rated Voltage:	DC5V/1A
Battery:	/
Adapter Model:	/
IMEI:	/
Device Category:	Portable Device
FCC ID:	2A2P9-REEFWM36
Equipment Type:	Mobile device
Technical Characteristics of EUT:	
4G	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 2, 4, 5, 12, 13, 66
Uplink Frequency:	FDD-LTE Band 2: Tx: 1850-1910MHz, FDD-LTE Band 4: Tx: 1710-1755MHz, FDD-LTE Band 5: Tx: 824-849MHz, FDD-LTE Band 12: Tx: 699-716MHz, FDD-LTE Band 13: Tx: 777-787MHz, FDD-LTE Band 66: Tx: 1710-1780MHz
Downlink Frequency:	FDD-LTE Band 2: Rx: 1930-1990MHz, FDD-LTE Band 4: Rx: 2110-2155MHz, FDD-LTE Band 5: Rx: 869-894MHz, FDD-LTE Band 12: Rx: 729-746MHz, FDD-LTE Band 13: Rx: 746-756MHz, FDD-LTE Band 66: Rx: 2110-2200MHz
RF Output Power:	FDD-LTE Band 2: 23.41dBm, FDD-LTE Band 4: 24.53dBm,

	FDD-LTE Band 5: 24.20dBm, FDD-LTE Band 12: 24.05dBm, FDD-LTE Band 13: 23.89dBm, FDD-LTE Band 66: 23.98dBm
Type of Emission:	FDD-LTE Band 2: 18M1G7D, 4M51W7D FDD-LTE Band 4: 18M2G7D, 4M51W7D FDD-LTE Band 5: 9M02G7D, 4M51W7D FDD-LTE Band 12: 9M05G7D, 4M51W7D FDD-LTE Band 13: 8M95G7D, 4M51W7D FDD-LTE Band 66: 18M0G7D, 4M51W7D
Type of Modulation:	QPSK, 16QAM
Antenna Type:	RE305: PCB Antenna RE306-4G:FPC Antenna
Antenna Gain:	RE305: FDD-LTE Band 2: 4.24dBi, FDD-LTE Band 4: 5.53dBi, FDD-LTE Band 5: 0.99dBi, FDD-LTE Band 12: 2.62dBi, FDD-LTE Band 13: 1.59dBi, FDD-LTE Band 66: 5.67dBi
	RE306-4G: FDD-LTE Band 2: 4.24dBi, FDD-LTE Band 4: 2.7dBi, FDD-LTE Band 5: 0.73dBi, FDD-LTE Band 12: 0.68dBi, FDD-LTE Band 13: 1.10dBi, FDD-LTE Band 66: 4.24dBi

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 Factor	Max. Tune-up Time-Averaged Power	ERP
	(MHz)	(dBm)	(dBi)	(dB)	(dBm)	(dBm)
LTE Band 2-RE305	1850	23.41	4.24	0	24.00	26.09
LTE Band 4-RE305	1710	24.53	5.53	0	25.00	28.38
LTE Band 5-RE305	824	24.20	0.99	0	25.00	23.84
LTE Band 12-RE305	699	24.05	2.62	0	25.00	25.47
LTE Band 13-RE305	777	23.89	1.59	0	24.00	23.44
LTE Band 66-RE305	1710	23.98	5.67	0	24.00	27.52
LTE Band 2 -RE306-4G	1850	23.41	4.24	0	24.00	26.09
LTE Band 4 -RE306-4G	1710	24.53	2.7	0	25.00	25.55
LTE Band 5 -RE306-4G	824	24.20	0.73	0	25.00	23.58
LTE Band 12 -RE306-4G	699	24.05	0.68	0	25.00	23.53
LTE Band 13 -RE306-4G	777	23.89	1.10	0	24.00	22.95
LTE Band 66 -RE306-4G	1710	23.98	4.24	0	24.00	26.09

Radio Access Technology	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
LTE Band 2-RE305	C	20.00	26.09	406.44	768.00	0.53	Pass
LTE Band 4-RE305	C	20.00	28.38	688.65	768.00	0.90	Pass
LTE Band 5-RE305	C	20.00	23.84	242.10	421.89	0.57	Pass
LTE Band 12-RE305	C	20.00	25.47	352.37	357.89	0.98	Pass
LTE Band 13-RE305	C	20.00	23.44	220.80	397.82	0.56	Pass
LTE Band 66-RE305	C	20.00	27.52	564.94	768.00	0.74	Pass
LTE Band 2 -RE306-4G	C	20.00	26.09	406.44	768.00	0.53	Pass
LTE Band 4 -RE306-4G	C	20.00	25.55	358.92	768.00	0.47	Pass
LTE Band 5 -RE306-4G	C	20.00	23.58	228.03	421.89	0.54	Pass
LTE Band 12 -RE306-4G	C	20.00	23.53	225.42	357.89	0.63	Pass
LTE Band 13 -RE306-4G	C	20.00	22.95	197.24	397.82	0.50	Pass
LTE Band 66	C	20.00	26.09	406.44	768.00	0.53	Pass

-RE306-4G							
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Note: 1. For GSM, Duty cycle factor = 9 dB for 1 Tx slot, 6 dB for 2 Tx slots, 4.25 dB for 3 Tx slots, 3 dB for 4 Tx slots;

2. Tune-up time-average power = Tune-up Power - Duty cycle factor in dB

2. Output Power=EIRP- Antenna Gain; ERP=EIRP-2.15dB

3. Option A, B and C refers as clause 1.2.

4. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

5. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

6. 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
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Result: Pass