RF Exposure Evaluation Declaration

FCC ID:	2BH7FBE65OD
Applicant:	TP-Link Systems Inc.
Product:	BE11000 Outdoor/Indoor Mesh Wi-Fi 7 Unit
Model No.:	Deco BE65-Outdoor
FCC Rule Part(s):	FCC Part 2.1091
Result:	Complies
Evaluation Date:	2025-03-13

Reviewed By: Kevin Guo

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
R25S1008026-U401	V01	Initial Report	2025-03-21	Valid

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1. General Information

1.1. Applicant

TP-Link Systems Inc.

10 Mauchly, Irvine, CA 92618

1.2. Manufacturer

TP-Link Systems Inc.

10 Mauchly, Irvine, CA 92618

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong)				
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China				
	Laboratory Location (Suzhou - SIP)				
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐ R-20025	☐ G-20034	☐ C-20020	☐ T-20020
		☐ R-20141	☐ G-20134	☐ C-20103	☐ T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen)				
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan)				
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: 3261				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	BE11000 Outdoor/Indoor Mesh Wi-Fi 7 Unit
Model No.	Deco BE65-Outdoor
Wi-Fi Specification	802.11a/b/g/n/ac/ax/be
Bluetooth Specification	V5.1 Single Mode
Antenna Information	Refer to section 1.5
Working Voltage	AC power or PoE Input
Operating Environment	Outdoor Use
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Antenna Details

Antenna Type	Frequency Band (MHz)	T_X Paths	Antenna Gain (dBi)		Antenna Gain (Elevation angle > 30°) (dBi)		Beamforming Directional Gain (dBi)	Beamforming Directional Gain (Elevation angle > 30°) (dBi)	CDD Directional Gain (dBi)	
			Ant 0	Ant 1	Ant 0	Ant 1			For Power	For PSD
Wi-Fi 2.4G-Horizontal Antenna										
Alford	2400 ~ 2483.5	2	2.40	1.41	--	--	4.28	--	2.40	4.28
Wi-Fi 2.4G-Vertical Antenna										
Dipole	2412 ~ 2462	2	2.33	2.87	--	--	5.07	--	2.87	5.07
Wi-Fi 5G Antenna										
Dipole	5150 ~ 5250	2	3.14	2.76	-5.03	-5.00	5.03	-1.99	3.14	5.03
	5250 ~ 5350	2	3.52	3.58	--	--	5.14	--	3.58	5.14
	5470 ~ 5725	2	3.01	3.42	--	--	4.65	--	3.42	4.65
	5725 ~ 5850	2	3.15	2.99	--	--	5.06	--	3.15	5.06
Wi-Fi 6G Antenna										
Dipole	5925 ~ 6425	2	4.11	5.41	-5.03	-5.00	8.42	-1.99	5.41	8.42
	6525 ~ 6875	2	5.19	4.52	-5.03	-5.02	8.20	-2.01	5.19	8.20
Bluetooth Antenna										
IFA	2400 ~ 2483.5	1	0.93		--	--	--	--	--	--

Remark:

1. The device supports CDD Mode and Beamforming mode, details refer to the table as below.
2. CDD signals are correlated, the directional gain as follows,

   for power measurements: Array Gain = 0 dB for $N_{ANT} \leq 4$, the directional gain = max antenna gain + array gain

   For power spectral density (PSD) measurements: the max directional gain (each angle) = 10 log[($10^{G1/20}$ + $10^{G2/20}$

+ … + $10^{GN/20})^2$ /N_{ANT}]

3. Beamforming signals are correlated, the directional gain as follows,
   the max directional gain (each angle) = 10 log[($10^{G1/20}$ + $10^{G2/20}$ + … + $10^{GN/20})^2$ /N_{ANT}]
4. The information as above is from the antenna report.

Test Mode	T_X Paths	CDD Mode	Beamforming Mode
802.11b/g/n (DTS)	3	√	X
802.11ax/be (DTS)	3	√	√
802.11a/n (NII)	2	√	X
802.11ac/ax/be (NII)	2	√	√
802.11ax/be (6SD)	2	√	√

1.6. Device Classification

According to the user manual, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

1.7. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01

2. RF Exposure Evaluation

2.1. Limits

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)

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 (Minutes)
(A) Limits for Occupational/ Control Exposures				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500	--	--	f/300	<6
1,500-100,000	--	--	5	<6
(B) Limits for General Population/ Uncontrolled Exposures				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*($180/f^2$)	<30
30-300	27.5	0.073	0.2	<30
300-1,500	--	--	f/1500	<30
1,500-100,000	--	--	1.0	<30

f= frequency in MHz. * = Plane-wave equivalent power density.

2.2. MPE Exemptions

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

(Option A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.
Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

(Option B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$\mathrm{P\,th\,(mW)} = \{\mathrm{ERP_{20cm}(d\,/\,20cm)^{x}}$ d ≤ 20cm

$\mathrm{P\,th\,(mW)} = \{\mathrm{ERP_{20cm}}$ 20cm < d ≤ 40cm

Where

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

and

$\mathrm{ERP_{20cm}(mW)} = \{2040\mathrm{f}$ 0.3GHz ≤ f < 1.5GHz

$\mathrm{ERP_{20cm}(mW)} = \{3060$ 1.5GHz ≤ f ≤ 6GHz

(Option C) Or using Table 1 and 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. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1920R^2$
1.34-30	$3450R^2/f^2$
30-300	$3.83R^2$
300-1,500	$0.0128R^2f$
1,500-100,000	$19.2R^2$

For multiple RF sources: Multiple RF sources are exempt if:

(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). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(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.

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

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source *i*.

ERP_j = the ERP of fixed, mobile, or portable RF source *j*.

ERP$_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source *j*, at a distance of at least λ/2π according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

Evaluated$_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit$_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k*, as applicable from §1.1310 of this chapter.

2.3. Calculated Result

Product	BE11000 Outdoor/Indoor Mesh Wi-Fi 7 Unit
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Tune-up ERP (dBm)	Tune-up ERP (mW)
BLE	2402 ~ 2480	3.60	4.10	0.93	2.88	1.90
802.11b/g/n/ax/be	2412 ~ 2462	26.30	26.80	2.87	27.52	564.94
802.11a/n/ac/ax/be	5180 ~ 5825	26.92	26.42	3.58	27.85	609.54
802.11ax/be	6115 ~ 6415 6535 ~ 6855	25.97	26.47	5.41	29.73	939.72

Notes:

1. Maximum Conducted Power is from report “R25S1008026-U201”, “R25S1008026-U202”, “R25S1008026-U203” and “R25S1008026-U205” separately.
2. Tune-up ERP = Tune up Conducted Power + Antenna Gain - 2.15.

For single RF source, Option B

Test Mode	Frequency Band (MHz)	λ / 2 π (m)	R (m)	Tune-up ERP (mW)	Thresholds ERP (mW)
BLE	2402 ~ 2480	0.0199	0.20	1.90	3060
802.11b/g/n/ax/be	2412 ~ 2462	0.0198	0.20	564.94	3060
802.11a/n/ac/ax/be	5180 ~ 5825	0.0092	0.20	609.54	3060
802.11ax/be	5955 ~ 7095	0.0080	0.20	939.72	3060

Note: R is from user manual.

For multiple RF sources

For 2.4G Wi-Fi, two types of antennas are supported, but they will not be used simultaneously.

The EUT supports BLE + Wi-Fi 2.4GHz + Wi-Fi 5GHz + Wi-Fi 6GHz simultaneous transmissions separate transmission.

So the Max Simultaneous Transmission = 1.90/3030 (DTS-BLE) + 564.94/3060 (DTS-Wi-Fi) + 609.54/3060 (NII) + 939.72/3060(6SD) = 0.6915 < 1

Therefore, the device qualifies for RF exposure test exemption.

The End