

RF Exposure Report

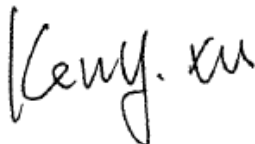
Application No.: SZCR2401000078AT
Applicant: ENERGYBOX LIMITED
Address of Applicant: Unit A1, 22/F, MG Tower, 133 Hoi Bun Road, Kwun Tong, Hong Kong
Manufacturer: EDA Technology Shanghai Co., Ltd
Address of Manufacturer: Building 29, Shengchuang Enterprise Park, No.1661 Jialuo Road, Jiading District, Shanghai, PRC
Factory: EDA Technology Shanghai Co., Ltd
Address of Factory: Building 29, Shengchuang Enterprise Park, No.1661 Jialuo Road, Jiading District, Shanghai, PRC

Equipment Under Test (EUT):
EUT Name: SuperHub
Model No.: EB/SHUB-00/01
Trade Mark: 

FCC ID: 2AP8YEBSHUB
Standard(s) : FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2024-01-05
Date of Test: 2024-01-10 to 2024-02-02
Date of Issue: 2024-02-04

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
EMC Laboratory Manager



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2024-02-04		Original

Authorized for issue by:			
		 <hr/> Leo Li/Project Engineer	
		 <hr/> Eric Fu/Reviewer	



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1 Contents

	Page
1 CONTENTS	3
2 GENERAL INFORMATION	4
2.1 GENERAL DESCRIPTION OF E.U.T.....	4
2.2 DETAILS OF E.U.T.....	4
2.3 TEST LOCATION	5
2.4 TEST FACILITY	5
3 FCC RADIOFREQUENCY RADIATION EXPOSURE LIMITS.....	6
3.1 BLANKET 1 MW BLANKET EXEMPTION.....	6
3.2 MPE-BASED EXEMPTION.....	6
3.3 SAR-BASED EXEMPTION	7
4 MEASUREMENT AND CALCULATION.....	10
4.1 MAXIMUM TRANSMIT POWER	10
4.2 RF EXPOSURE CALCULATION	13



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2 General Information

2.1 General Description of E.U.T.

Product Type:	<input type="checkbox"/> Portable device
	<input checked="" type="checkbox"/> Mobile device
	<input type="checkbox"/> Fixed device

2.2 Details of E.U.T.

Power supply:	DC 12V from adapter input AC 120V/60Hz Adapter Model: KSASB0241200200D5 Input: 100-240V~, 50/60Hz 0.6A Output: 12V=2.0A 24.0W
Cable(s):	DC cable: 140cm unshielded
Operation Frequency:	902.2-927.8MHz
Modulation Type:	GFSK
Number of Channels:	129
Channel Spacing:	0.2MHz
Antenna Type:	Rod Antenna
Antenna Gain:	3.01dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Separation Distance

Minimum test separation distance:	20cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	



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2.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

2.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd.

Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.



3 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

3.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

3.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R ²
1.34	–	30	35.6 m	–	1.6 m	3,450 R ² /f ²
30	–	300	1.6 m	–	159 mm	3.83 R ²
300	–	1,500	159 mm	–	31.8 mm	0.0128 R ² f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R ²

Subscripts L and H are low and high; λ is wavelength.
From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are



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based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B. 1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation			
Frequency range	Frequency(MHz)	$R(\lambda/2\pi)$ (m)	Threshold ERP(W)
300~1500MHz	915	0.0522	0.032
1500~100000MHz	2480	0.0193	0.007

3.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.



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The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad (\text{B.2})$$

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).



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Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance(mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
0.3~1.5	0.915	1.474	0.5	8.133
1.5~6	2.48	1.905	0.5	2.717



4 Measurement and Calculation

4.1 Maximum transmit power

For 902 MHz to 928MHz:

Mode	Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
902 MHz to 928MHz	902.2	12.30	16.98	3.01	0.86	13.16	20.70	1840.5	0.0112
902 MHz to 928MHz	915	12.26	16.83	3.01	0.86	13.12	20.51	1866.6	0.0110
902 MHz to 928MHz	927.8	12.30	16.98	3.01	0.86	13.16	20.70	1892.7	0.0109

The Power Data is based on the RF Test report SZCR24010007802



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For LTE:

Mode	Frequency (MHz)	Maximum Conducted power (dBm)	Antenna Gain(dBi)	EIRP [[dBm]	EIRP (mW)	Limit (mW)	MPE ratio
LTE band 2	1850.7	25	4.82	29.82	959.40	3060	0.3135
LTE band 4	1710.7	25	5.04	30.04	1009.25	3060	0.3298
LTE band 66	1710.7	25	5.04	30.04	1009.25	3060	0.3298

Mode	Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	Antenna Gain (dBd)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
LTE band 5	824.7	25	316.23	0.78	-1.37	23.63	230.67	1682.4	0.1880
LTE band 12	699.7	25	316.23	0.76	-1.39	23.61	229.61	1427.4	0.2215
LTE band 13	779.5	25	316.23	0.57	-1.58	23.42	219.79	1590.2	0.1989
LTE band 14	790.5	25	316.23	0.57	-1.58	23.42	219.79	1612.6	0.1961
LTE band 71	665.5	25	316.23	0.76	-1.39	23.61	229.61	1357.6	0.2329

Note 1: The power Data for LTE are based on the module MPE report: R1907A0408-M1V1.

Note 2: dBi=dBd+2.15



For BT classic:

Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
2441	6.5	4.47	3.7	10.2	10.47	3060	0.0034

The power Data are based on the module FCC authorization report: UL-RPT-RPI13337971-1061A.

For BLE:

Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
2440	4.7	2.95	3.7	8.4	6.92	3060	0.0023

The power Data are based on the module FCC authorization report: UL-RPT-RPI13337971-1216A.

For WiFi 2.4GHz:

Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
2437	15.4	34.67	3.7	19.1	81.28	3060	0.0266

The power Data are based on the module FCC authorization report: UL-RPT-RPI13337971-1416A.

For WiFi 5GHz:

Frequency (MHz)	Maximum Conducted power (dBm)	Maximum Conducted power (mW)	Antenna Gain (dBi)	ERP [[dBm]	ERP (mW)	Limit (mW)	MPE ratio
5670	18.2	66.07	3.4	21.6	144.54	3060	0.0472

The power Data are based on the module FCC authorization report: UL-RPT-RPI13337971-1616A.



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4.2 RF Exposure Calculation

Remark: we used the EIRP for LTE band 2, band 4, band 66; the conducted power for LTE band 5, band 12, band 13, band 14, band 71 and ERP for 902MHz-928MHz between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

	Evaluation method	Exempt Limit(mW)	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	1mW	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	7mW(ERP)	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	See above table	Yes

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

For simultaneous transmission status:

The applicant declared that 915MHz, LTE, BT, WiFi 2.4GHz, WiFi 5GHz have simultaneous transmission status for this device.

The simultaneous transmission result between of LTE and 915MHz:

The SAR Exclusion Threshold Level:

$$=CPD1 / LPD1 + CPD2 / LPD2 + CPD3 / LPD3 + CPD4 / LPD4 + CPD5 / LPD5$$

(CPD = Calculation power density, LPD = Limit of power density)

$$= (1009.25/3060) + (20.70/1840.5) + (10.47/3060) + (81.28/3060) + (144.54/3060)$$

$$=0.3298+0.0112+0.0034+0.0266+0.0472= 0.4182 < 1$$

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

--End of the Report--



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