

Report No.: KSCR241100241502 Page: 1 of 10

1 Cover Page

RF Exposure Evaluation Report

Application No.:	KSCR2411002415AT
FCC ID:	WBKR232UB
Applicant:	BTI Wireless
Address of Applicant:	11205 Knott Avenue-Suite A, Cypress, CA 90630, United States
Manufacturer:	BTI Wireless
Address of Manufacturer:	11205 Knott Avenue-Suite A, Cypress, CA 90630, United States
Equipment Under Test (EUT):	
EUT Name:	Remote Unit
Model No.:	PS-R232
Trade Mark:	(BTI WIRELESS
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt:	2024-12-09
Date of Test:	2025-02-05 to 2025-02-09
Date of Issue:	2025-02-17
Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards specified above.

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Compliance Certification Services (Kunshan) Inc.	No.10 Weiye Road, Development Zone, Kunshan, Jiangsu, China	t (86-512)57355888	www.sgsgroup.com.cn
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Report No.: KSCR241100241502 Page: 2 of 10

	Revision Record						
Version	Description	Date	Remark				
00	Original	2025-02-17	/				

Authorized for issue by:	
Tested By	Kass Gao
	Kass_Gao /Project Engineer
Approved By	Terry Hon
	Terry Hou /Reviewer



Report No.: KSCR241100241502 Page: 3 of 10

2 Contents

		F	'age
1	Cov	er Page	1
2	Con	itents	3
3	Gen	eral Information	4
	3.1	General Description of E.U.T.	4
	3.2	Details of E.U.T.	4
	3.3	Test Location	5
	3.4	Test Facility	5
4	RFI	Exposure Test Exemptions	6
	4.1	RF Exposure Test Exemptions for single RF sources	6
	4.2	RF Exposure Test Exemptions for Simultaneous Transmission	8
5	Tes	t Standards and Limits	9
	5.1	FCC Radiofrequency radiation exposure limits:	9
6	Меа	surement and Calculation	. 10
	6.1	Maximum transmit power	. 10
	6.2	MPE Calculation	. 10



Report No.: KSCR241100241502 Page: 4 of 10

3 General Information

3.1 General Description of E.U.T.

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3.2 Details of E.U.T.

Frequency Band:	452MHz to 512MHz
Antenna Type:	External
Antenna Gain:	0 dBi for 452MHz to 512MHz (Provided by manufacturer)
Modulation Type:	CQPSK/12.5kHz FM/TETRA
Antenna Delivery:	SISO
Nominal Output Power:	37±1dBm
Nominal gain:	47dB

Note:

The antenna gain value is provided by the customer. The test lab will not be responsible for wrong test result due to incorrect information about antenna gain values.



Report No.: KSCR241100241502 Page: 5 of 10

3.3 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China. Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1.SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc.) is provided by the applicant. (if applicable).

2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

3. Sample source: sent by customer.

3.4 Test Facility

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

• A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

• VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.



Report No.: KSCR241100241502

Page: 6 of 10

4 **RF Exposure Test Exemptions**

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

4.1 RF Exposure Test Exemptions for single RF sources

4.1.1 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.

Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

4.1.2 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. 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** $\lambda/2\pi$, 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 $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).



Report No.: KSCR241100241502

Page: 7 of 10

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

RF Sou	urce Fre	equency	Minim	Minimum Distance Th		Threshold ERP
<i>f</i> ∟ MHz		<i>f</i> ⊢ MHz	λ_ / 2π		λ _Η / 2π	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 R²/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
Outparinte Land LLang law and kinks Vie wavelen atte						

Subscripts L and H are low and high; λ is wavelength. R:Separation distance between the antenna to person

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 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.

Limit calculation							
Frequency range	Frequency(MHz)	λ/2π(m)	R(m)	Threshold ERP(W)			
300~1500MHz	824	0.0580	0.2000	0.422			
1500~100000MHz	1850	0.0258	0.2000	0.768			
1500~100000MHz	1710	0.0279	0.2000	0.768			
1500~100000MHz	2500	0.0191	0.2000	0.768			

4.1.3 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.

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 **0.5cm to 40cm** and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

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

where

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

and *f* is in GHz, d is the separation distance (cm), and *ERP*_{20cm} is per Formula (B.1).



Report No.: KSCR241100241502

Page: 8 of 10

Limit calculation						
Frequency range(GHz)	Frequency(GHz)	Х	d(cm)	Pth (mW)		
0.3~1.5	0.824	1.419	20	1680.960		
1.5~6	1.850	3.341	20	3060.000		
1.5~6	1.710	3.324	20	3060.000		
1.5~6	2.500	3.407	20	3060.000		

4.2 RF Exposure Test Exemptions for Simultaneous Transmission

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 (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluatedk term) shall be used to determine exemption for simultaneous transmission. 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.

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

Where:

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

 \mathbf{b} = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (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.

Pi = 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).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

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

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

Evaluatedk = 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 Limitk = 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.



Report No.: KSCR241100241502 Page: 9 of 10

5 Test Standards and Limits

5.1 FCC Radiofrequency radiation exposure limits:

According to§1.1310, the limit for general population/uncontrolled exposures

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
Limits for General I	Population/Uncontrolled I	Exposure		
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30



Report No.: KSCR241100241502 Page: 10 of 10

6 Measurement and Calculation

6.1 Maximum transmit power

The Power Data is based on the RF Test Report KSCR241100241501

6.2 MPE Calculation

	Evaluation method	Separation distance between the antenna to person (R)
	Blanket 1 mW Blanket Exemption	Regardless of separation distance
\boxtimes	MPE-based Exemption(ERP)	R≥(λ/2π)
	SAR-based Exemption(Pth)	0.5cm <r<40cm< th=""></r<40cm<>

According to the formula S=P/4 π R², we can calculate S which is MPE.

- Note:
- 1) P (mW)
- 2) R = distance to the center of radiation of antenna (in centimeter)
- 3) MPE limit = 1mW/cm²

Frequency Band (MHz)	Max Tune up power (dBm)	Ant Gain (dBi)	EIRP (dBm)	EIRP (mW)	Power Density (mW/cm2)	Limit of Power Density S(mW/cm2)	Distance R (cm)
452~512	38.00	0	38.00	6309.57	0.166	0.30	55

So the device is exclusion from SAR test.

--End of the Report--