

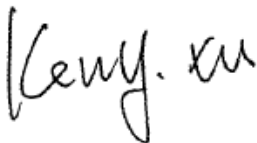
RF EXPOSURE EVALUATION REPORT

Application No.: SZCR2307002269AT
Applicant: UAB Teltonika Networks
Address of Applicant: K. Barsausko st. 66, Kaunas, LT-51436, Lithuania
Manufacturer: UAB Teltonika Networks
Address of Manufacturer: K. Barsausko st. 66, Kaunas, LT-51436, Lithuania
Factory: TELTONIKA EMS UAB
Address of Factory: Ditvos g. 6, LT-02121, Vilnius, Lithuania
Equipment Under Test (EUT):
EUT Name: 5G Router
Model No.: RUTM50
Trade Mark: TELTONIKA
FCC ID: 2AET4RUTM50
Standard(s) : FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2023-07-14
Date of Evaluation: 2023-07-23 to 2023-08-06
Date of Issue: 2023-08-10

Evaluation Result:

Pass*

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



Keny Xu

EMC Laboratory Manager



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

SZEMC-TRF-01 Rev. A/0 Aug01,2022

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-08-10		Original

Authorized for issue by:			
		<i>Vincent Chen</i>	
		Vincent Chen/Project Engineer	
		<i>Eric Fu</i>	
		Eric Fu/Reviewer	



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3 General Information

3.1 General Description of E.U.T.

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

3.2 Details of E.U.T.

Power supply:	Power by switching adapter Adapter Model No.: ASSA113A-120150 Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 12V, 1.5 A, 18.0W, 4-pin plug
For 2.4G WIFI:	
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11; 802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	Antenna 1: 2.52dBi and Antenna 2: 2.52dBi(Refer to Remark)
Remark:	Two antennas can simultaneous transmission
Antenna Number:	2
For 5G WIFI:	
Operation Frequency/Number of channels (20MHz):	U-NII-1:5180-5240MHz (4 Channels) U-NII-2A: 5260-5320MHz (4 Channels) U-NII-2C: 5500-5700MHz (11 Channels) U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	U-NII-1:5190-5230MHz (2 Channels) U-NII-2A: 5270-5310MHz (2 Channels) U-NII-2C: 5510-5670MHz (5 Channels) U-NII-3: 5755-5795MHz (2 Channels)
Operation Frequency/Number of channels (80MHz):	U-NII-1:5210MHz (1 Channel) U-NII-2A: 5290MHz (1 Channels) U-NII-2C: 5530-5610MHz (2 Channels) U-NII-3: 5775MHz (1 Channel)



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Modulation Type:	OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing:	802.11a/n/ac 20: 20MHz; 802.11n/ac 40: 40MHz; 802.11ac 80: 80MHz
DFS Function:	Master
TPC Function:	Support TPC function
Antenna Type:	Dipole Antenna
Antenna Gain:	Antenna 1: 3.59dBi and Antenna 2: 3.59dBi(Refer to Remark)
Remark:	Two antennas can simultaneous transmission
For 4G:	(Contained FCC ID: XMR2023RG520NNA)
LTE Operation Frequency Band:	LTE Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 48, 66, 71
Support Bandwidth:	B2, B4, B25, B66: 1.4, 3, 5, 10, 15, 20MHz; B7, B38, B41, B48, B71: 5, 10, 15, 20MHz B5, B26: 1.4, 3, 5, 10, 15MHz; B12: 1.4, 3, 5, 10MHz; B13, B14, B17, B30: 5, 10MHz
Modulation Type:	UL up to 256QAM, DL up to 256QAM
LTE Power Class:	Level 3
Antenna Type:	Dipole Antenna
Antenna Gain:	Antenna 1/2/3/4: 4.5dBi
For 5G:	(Contained FCC ID: XMR2023RG520NNA)
NR Operation Frequency Band:	n2, n5, n7, n12, n13, n14, n25, n26, n30, n38, n41, n48, n66, n71, n77, n78
Modulation Type:	DFT-s-OFDM: PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-OFDM: QPSK, 16QAM, 64QAM, 256QAM
Support Bandwidth:	n2, n5, n26, n71: 5, 10, 15, 20MHz n7, n25: 5, 10, 15, 20, 25, 30, 40MHz n66: 5, 10, 15, 20, 30, 40MHz n12: 5, 10, 15MHz n13, n14: 5, 10MHz n38: 10, 15, 20, 30, 40MHz n48: 10, 20, 30, 40MHz n41: 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100MHz n77, n78: 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100MHz
NR Power Class:	Level 3
SCS:	FDD Band: 15kHz; TDD Band: 30kHz
Antenna Type:	Dipole Antenna
Antenna Gain:	Antenna 1/2/3/4: 4.5dBi
SIM Card:	This device has dual SIM Card sockets. Both the SIM sockets have been tested. SIM1 was worst case, only record SIM1.



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Shenzhen Branch Testing & Calibration Laboratory

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3.3 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.	



3.4 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.

3.5 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.

3.6 Deviation from Standards

None

3.7 Abnormalities from Standard Conditions

None



4 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.

4.1 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.

4.2 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

4.3 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.



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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 0.5 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).

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



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5 Measurement and Calculation

5.1 Maximum transmit power

For 2.4G WIFI:

The Power Data is based on the manual.

Antenna Gain: Antenna 1: 2.52dBi and Antenna 2:2.52dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
2462	20	100

For 5G WIFI:

The Power Data is based on the manual.

Antenna Gain: Antenna 1: 3.59dBi and Antenna 2:3.59dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
5320	23	200

Note: Refer to the manual for EUT test Max Power Value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For LTE/NR:

Antenna Gain: Antenna 1/2/3/4: 4.5dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Mode	Max Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP (dBm)	Max EIRP (mW)
LTE / NR Band 2	25.00	4.5	29.5	891.25
LTE Band 4	25.00	4.5	29.5	891.25
LTE / NR Band 5	25.00	4.5	29.5	891.25



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LTE / NR Band 7	25.00	4.5	29.5	891.25
LTE / NR Band 12	25.00	4.5	29.5	891.25
LTE / NR Band 13	25.00	4.5	29.5	891.25
LTE / NR Band 14	25.00	4.5	29.5	891.25
LTE Band 17	25.00	4.5	29.5	891.25
LTE / NR Band 25	25.00	4.5	29.5	891.25
LTE / NR Band 26	25.00	4.5	29.5	891.25
LTE / NR Band 30	25.00	4.5	29.5	891.25
LTE / NR Band 38	28.00	4.5	32.5	1778.28
LTE Band 41	28.00	4.5	32.5	1778.28
NR Band 41	28.00	4.5	32.5	1778.28
LTE Band 48	25.00	4.5	29.5	891.25
LTE / NR Band 66	25.00	4.5	29.5	891.25
LTE / NR Band 71	25.00	4.5	29.5	891.25
n77	28.00	4.5	32.5	1778.28
n78	28.00	4.5	32.5	1778.28

Note: Refer to FCC ID: XMR2023RG520NNA for Max Power Value.



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5.2 RF Exposure Calculation

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

For 2.4G WIFI:

The Max EIRP is 100mW. The best case gain of the Antenna 1: 2.52dBi and Antenna 2: 2.52dBi

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	100	3060	0.0327	Pass

For 5G WIFI:

The Max EIRP is 200mW. The best case gain of the Antenna 1: 3.59dBi and Antenna 2: 3.59dBi

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	200	3060	0.0654	Pass

For LTE/NR:

The best case gain is 4.5dBi

	Evaluation method	Operating Band	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 2	891.25	3060	0.2913	Pass



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<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE Band 4	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 5	891.25	1680.96	0.5302	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 7	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 12	891.25	1425.96	0.6250	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 13	891.25	1585.08	0.5623	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 14	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE Band 17	891.25	1436.16	0.6206	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 25	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 26	891.25	1660.56	0.5367	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 30	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 38	1778.28	3060	0.5811	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE Band 41	1778.28	3060	0.5811	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	n41	1778.28	3060	0.5811	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 48	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 66	891.25	3060	0.2913	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE / NR Band 71	891.25	1352.52	0.6590	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	n77	1778.28	3060	0.5811	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	n78	1778.28	3060	0.5811	Pass



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For simultaneously transmitter:

Operating Mode	MPE ratio	MPE limit	Verdict
2.4GWIFI+ LTE / NR Band 71	0.6917	1	Pass
5GWIFI+ LTE / NR Band 71	0.7244	1	Pass

Remark: KDB 447498 D04 is not accredited by A2LA.

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

6 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for SZCR2307002269AT.

--End of the Report--



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