



# RF Exposure Evaluation Declaration

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**FCC ID:** VW3F5688A  
**Applicant:** SAGEMCOM BROADBAND SAS  
**Product:** 5G NR CPE Router  
**Model No.:** BGW530-900  
**Brand Name:** SAGEMCOM  
**FCC Classification:** Digital Transmission System (DTS)  
Unlicensed National Information Infrastructure (NII)  
PCS Licensed Transmitter (PCB)  
**FCC Rule Part(s):** FCC Part 2.1091  
**Evaluated Date:** 2023-09-05  
**Result:** Complies

**Reviewed By:**

\_\_\_\_\_  
Sunny Sun

**Approved By:**

\_\_\_\_\_  
Robin Wu



The test results relate only to the samples tested.  
The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.  
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

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### Revision History

Report No.	Version	Description	Issue Date	Note
2309RSU009-U6	V01	Initial Report	2023-10-25	Valid

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## CONTENTS

Description	Page
<b>1. General Information .....</b>	<b>4</b>
1.1. Applicant.....	4
1.2. Manufacturer .....	4
1.3. Testing Facility.....	4
1.4. Product Information .....	5
1.5. Antenna Details.....	6
1.6. Device Classification .....	6
1.7. Applied Standards .....	6
<b>2. RF Exposure Evaluation.....</b>	<b>7</b>
2.1. Test Limits .....	7
2.2. MPE Exemptions.....	8
2.3. Calculated Result .....	11



#### 1.4. Product Information

Product Name	5GNR CPE Router
Model No.	BGW530-900
Brand Name	SAGEMCOM
EUT Identification No.	20230905Sample#12
Wi-Fi Specification	802.11a/b/g/n/ac/ax
3GPP Specification	LTE Band 2/5/12/14/17/30/66 NR SA/NSA Band n2/5/12/30/66/77
Power Type	By AC/DC adapter
Integrated Modular Information	
Modular Name	5G Sub-6 GHz LGA Module
Mode No.	RG520N-AT
FCC ID	XMR2023RG520NAT
Manufacturer	QUECTEL
Accessories	
AC/DC adapter #01	Model No.: ADS-42DG-1212042EPCU-L Input: 100-127V~50/60Hz Max 1.2A Output: 12.0V=3.5A
AC/DC adapter #02	Model No.: G30-V3500R120-042E0-US Input: 100-127V~50/60Hz 1.2A Max Output: 12.0V=3.5A
AC/DC adapter #03	Model No.: NBS42F120350VU Input: 100-127V~50/60Hz 1.0A Output: 12.0V=3.5A
Remark:	
1. 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 (GHz)	Antenna Gain (dBi)				Directional Gain (dBi)	
		Ant 0	Ant 1	Ant 2	Ant 3	For Power	For PSD
Wi-Fi Internal Antenna (2.4GHz & 5GHz 4*4 MIMO)							
PCB Antenna	2400 ~ 2483.5	3.26	4.83	6.72	3.7	6.72	7.15
	5150 ~ 5250	3.9	3.1	3.57	5.41	5.41	5.94
	5250 ~ 5350	3.77	3.58	4.43	5.53	5.53	5.67
	5470 ~ 5725	4.2	4.62	3.84	3.86	4.62	6.09
	5725 ~ 5850	3.34	5.33	3.67	4.75	5.33	5.88

Note 1: The antenna gain and directional gain refer to manufacturer's antenna specification.

Note 2: The EUT supports Cyclic Delay Diversity (CDD) mode for 802.11a/b/g/n/ac/ax.

Note 3: Software automatically backs power down based on CDD power for beamforming operation.

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
LTE/NR band 2	1850 ~ 1910	PCB Antenna	4.69
LTE/NR band 5	824 ~ 849		2.32
LTE/NR band 12/17	699 ~ 716		2.57
n30	2305 ~ 2315		3.28
LTE/NR band 66	1710 ~ 1780		5.73
n77_SA	3450 ~ 3550		3.04
n77_SA	3700 ~ 3980		4.01
n77_MIMO	3450 ~ 3550		3.03
n77_MIMO	3700 ~ 3980		3.91

### 1.6. Device Classification

According to the user manual, the antenna of this device is at least 51cm away from the body of the user, 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. Test 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 <sup>2</sup> )	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 <sup>2</sup> )	<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 <sup>2</sup> )	<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:

$$P_{th}(mW) = \{ERP_{20cm} (d / 20cm)^x \quad d \leq 20cm$$

$$P_{th}(mW) = \{ERP_{20cm} \quad 20cm < d \leq 40cm$$

Where

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

and

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

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

**(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  $\lambda/2\pi$ , where  $\lambda$  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).



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 <sup>2</sup>
1.34-30	3450R <sup>2</sup> /f <sup>2</sup>
30-300	3.83R <sup>2</sup>
300-1,500	0.0128R <sup>2</sup> f
1,500-100,000	19.2R <sup>2</sup>

**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 in 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  $\lambda/2\pi$  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	5GNR CPE Router
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Max Conducted Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
802.11b/g/n/ax	2412 ~ 2462	28.58	6.72	33.15
802.11a/n/ac/ax	5150 ~ 5850	29.88	5.33	33.06
Test Mode	Frequency Band (MHz)	Max Tune-up Power (dBm)	Antenna Gain (dBi)	ERP (dBm)
LTE/NR Band 2	1850 ~ 1910	25	4.69	27.54
LTE/NR Band 5	824 ~ 849	25	2.32	25.17
LTE/NR Band 12	699 ~ 716	25	2.57	25.42
LTE Band 14	788 ~ 798	25	1.71	24.56
LTE Band 17	704 ~ 716	25	2.57	25.42
LTE/NR Band 30	2305 ~ 2315	20.5	3.28	21.63
LTE/NR Band 66	1710 ~ 1780	25	5.73	28.58
5G NR n77	3450 ~ 3550	26	4.01	27.86
	3700 ~ 3980			

Note: Tune-up power was declared by manufacturer.

#### For single RF source, Option B

Test Mode	$\lambda / 2 \pi$ (m)	R (m)	Tune-up ERP (W)	Threshold ERP (W)
802.11b/g/n/ax	0.0199	0.51	2.0654	4.9939
802.11a/n/ac/ax	0.0083	0.51	2.0230	4.9939
LTE/NR Band 2	0.0258	0.51	0.5675	4.9939
LTE/NR Band 5	0.0579	0.51	0.3289	2.7433
LTE/NR Band 12	0.0683	0.51	0.3483	2.3272
LTE Band 14	0.0606	0.51	0.2858	2.6235
LTE Band 17	0.0678	0.51	0.3483	2.3438
LTE/NR Band 30	0.0207	0.51	0.1297	4.9939
LTE/NR Band 66	0.0279	0.51	0.7211	4.9939
5G NR n77	0.0129	0.51	0.4853	4.9939

Note: R is from user manual.

**For multiple RF sources**

The EUT supports Wi-Fi 2.4G & 5GHz and LTE or NR transmit simultaneously.

The Max Simultaneous Transmission =  $2.0654/4.9939$  (2.4G) +  $2.0230/4.9939$  (5G) +  $0.3483/2.3272$   
(LTE/NR)=  $0.9684 < 1$

Therefore, the device qualifies for RF exposure test exemption.

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The End

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