

MAXIMUM PERMISSIBLE EXPOSURE EVALUATION REPORT

Applicant: XIAMEN BIVOCOM TECHNOLOGIES CO., LTD.

Address: 27-28th Floor, F14 Building, Software Park #3, Xiamen, China

Product Name: Industrial Gigabit Cellular Gateway

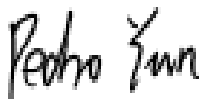
FCC ID: 2BOM5TG465

Standard(s): 47 CFR §1.1310, 47 CFR §2.1091,
47 CFR §15.247(i), 47 CFR §15.407(f)

Report Number: 2502S51299E-RF-00D

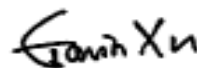
Report Date: 2025/7/29

The above device has been tested and found compliant with the requirement of the relative standards by Bay Area Compliance Laboratories Corp. (Dongguan).



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CONTENTS

DOCUMENT REVISION HISTORY	3
1. GENERAL INFORMATION	4
1.1 GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST.....	4
2.RF EXPOSURE EVALUATION (MPE).....	6
2.1. RF EXPOSURE EVALUATION.....	6
2.1.1 Applicable Standard.....	6
2.1.2 Calculation formula	6
2.1.3 Calculated Data:.....	7
EXHIBIT A - EUT PHOTOGRAPHS.....	9

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	2502S51299E-RF-00D	Original Report	2025/7/29

1. GENERAL INFORMATION

1.1 General Description Of Equipment under Test

EUT Name:	Industrial Gigabit Cellular Gateway
EUT Model:	TG465-NR
Multiple Model:	TG465-LF
Rated Input Voltage:	DC 5-60V
EUT Received Date:	2025/4/11
EUT Received Status:	Good
Note: The multiple models are electrically identical with the test model. Please refer to the declaration letter for more detail, which was provided by manufacturer.	

Output Power And Antenna Gain Information: For TG465-NR:

Operation Modes	Frequency (MHz)	Antenna Gain [▲] (dBi)	Max. Conducted output power [▲] (dBm)	EIRP/ERP (dBm)	Limit (dBm)
WCDMA B2	1850-1910	4.85	25	29.85	33
WCDMA B4	1710-1755	3.17	25	28.17	30
WCDMA B5	824-849	1.39	25	24.24	38.45
LTE B2 /CA 2C/n2	1850-1910	4.85	25	29.85	33
LTE B4	1710-1755	3.17	25	28.17	30
LTE B5 /CA 5B/n5	824-849	1.39	25	24.24	38.45
LTE B7 /CA 7C/n7	2500-2570	4.62	25	29.62	33
LTE B12/n12	699-716	-0.64	25	22.21	44.77
LTE B13/n13	777-787	0.48	25	23.33	44.77
LTE B14/n14	788-798	0.80	25	23.65	44.77
LTE B17	704-716	-1.54	25	21.31	44.77
LTE B25/n25	1850-1915	4.85	25	29.85	33
LTE B26/n26	814-824	0.95	25	23.8	50
LTE B26/n26	824-849	1.39	25	24.24	38.45
LTE B30/n30	2305-2315	-1.54	25	23.46	23.98
LTE B38/n38/CA 38C	2570-2620	4.77	28	32.77	33
LTE B41/CA 41C/n41	2496-2690	4.87	28	32.87	33
LTE B42/42C	3450-3550	1.89	28	29.89	30
LTE B43	3700-3800	1.74	28	29.74	30
LTE B66/n66	1710-1780	3.17	25	28.17	30
NR Band n70	1695-1710	4.03	25	29.03	30
LTE B71/n71	663-698	0.36	25	23.21	44.77
NR Band n77	3450-3550	1.89	28	29.89	30
	3700-3980				
NR Band n78	3450-3550	1.89	28	29.89	30
	3700-3800				

Note:

1.ERP is for operation below 1 GHz and EIRP for above 1 GHz.

2.The Antenna Gain and Conducted output power including Tune-up Tolerance provided by manufacturer.

For TG465-LF:

Operation Modes	Frequency (MHz)	Antenna Gain (dBi)	Conducted output power including Tune-up Tolerance (dBm)	EIRP/ERP (dBm)	Limit (dBm)
WCDMA B2	1850-1910	4.85	25	29.85	33
WCDMA B4	1710-1755	3.17	25	28.17	30
WCDMA B5	824-849	1.39	25	24.24	38.45
LTE B2	1850-1910	4.85	25	29.85	33
LTE B4	1710-1755	3.17	25	28.17	30
LTE B5	824-849	1.39	25	24.24	38.45
LTE B12	699-716	-0.64	25	22.21	44.77
LTE B13	777-787	0.48	25	23.33	44.77
LTE B14	788-798	0.80	25	23.65	44.77
LTE B66	1710-1780	3.17	25	28.17	30
LTE B71	663-698	0.36	25	23.21	44.77

Note:

1. ERP is for operation below 1 GHz and EIRP for above 1 GHz.
2. The Antenna Gain and Conducted output power including Tune-up Tolerance provided by manufacturer.

2.RF EXPOSURE EVALUATION (MPE)

2.1. RF Exposure Evaluation

2.1.1 Applicable Standard

According to subpart 15.247(i), 15.407(f) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

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

According to §1.1310 and §2.1091 RF exposure is calculated.

2.1.2 Calculation formula

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**2.1.3 Calculated Data:
For TG465-NR:**

Operation Modes	Frequency (MHz)	Antenna Gain [▲]		Conducted output power including Tune-up Tolerance [▲]		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G Wifi	2412-2462	4.17	2.61	27.5	562.34	25.00	0.187	1.0
5G Wifi	5150-5250	5.32	3.40	15.5	35.48	25.00	0.015	1.0
	5725-5850	6.68	4.66	17.5	56.23	25.00	0.033	1.0
WCDMA B2	1850-1910	4.85	3.05	25	316.23	25.00	0.123	1.0
WCDMA B4	1710-1755	3.17	2.07	25	316.23	25.00	0.084	1.0
WCDMA B5	824-849	1.39	1.38	25	316.23	25.00	0.055	0.6
LTE B2 /CA 2C/n2	1850-1910	4.85	3.05	25	316.23	25.00	0.123	1.0
LTE B4	1710-1755	3.17	2.07	25	316.23	25.00	0.084	1.0
LTE B5 /CA 5B/n5	824-849	1.39	1.38	25	316.23	25.00	0.055	0.6
LTE B7 /CA 7C/n7	2500-2570	4.62	2.90	25	316.23	25.00	0.117	1.0
LTE B12/n12	699-716	-0.64	0.86	25	316.23	25.00	0.035	0.5
LTE B13/n13	777-787	0.48	1.12	25	316.23	25.00	0.045	0.5
LTE B14/n14	788-798	0.80	1.20	25	316.23	25.00	0.048	0.5
LTE B17	704-716	-1.54	0.70	25	316.23	25.00	0.028	0.5
LTE B25/n25	1850-1915	4.85	3.05	25	316.23	25.00	0.123	1.0
LTE B26/n26	814-824	0.95	1.24	25	316.23	25.00	0.050	0.5
LTE B26/n26	824-849	1.39	1.38	25	316.23	25.00	0.055	0.6
LTE B30/n30	2305-2315	-1.54	0.70	25	316.23	25.00	0.028	1.0
LTE B38 /n38/CA 38C	2570-2620	4.77	3.00	28	630.96	25.00	0.241	1.0
LTE B41 /CA 41C/n41	2496-2690	4.87	3.07	28	630.96	25.00	0.247	1.0
LTE B42/42C	3450-3550	1.89	1.55	28	630.96	25.00	0.124	1.0
LTE B43	3700-3800	1.74	1.49	28	630.96	25.00	0.120	1.0
LTE B66/n66	1710-1780	3.17	2.07	25	316.23	25.00	0.084	1.0
NR Band n70	1695-1710	4.03	2.53	25	316.23	25.00	0.102	1.0
LTE B71/n71	663-698	0.36	1.09	25	316.23	25.00	0.044	0.5
NR Band n77	3450-3550	1.89	1.55	28	630.96	25.00	0.124	1.0
	3700-3980							
NR Band n78	3450-3550	1.89	1.55	28	630.96	25.00	0.124	1.0
	3700-3800							

Note: The device Contain a certified Cellular Module, FCC ID: XMR2022RM520NGL, certified on 8/1/2022.

Note:

The Antenna Gain and Conducted output power including Tune-up Tolerance provided by manufacturer.

2.4G Wifi and 5G Wifi can't transmit simultaneously, but 2.4G Wifi or 5G Wifi can transmit simultaneously with Cellular Module, Cellular Module supports simultaneous transmission of any two antennas:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

$$= S_{2.4G\ Wifi} / S_{limit-2.4G\ Wifi} + (S_{WWAN} / S_{limit- WWAN}) * 2$$

$$= 0.187 / 1.0 + (0.247 / 1.0) * 2$$

$$= 0.681$$

$$< 1$$

For TG465-LF:

Operation Modes	Frequency (MHz)	Antenna Gain [▲]		Conducted output power including Tune-up Tolerance [▲]		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G Wifi	2412-2462	4.17	2.61	27.5	562.34	25.00	0.187	1.0
5G Wifi	5150-5250	5.32	3.40	15.5	35.48	25.00	0.015	1.0
	5725-5850	6.68	4.66	17.5	56.23	25.00	0.033	1.0
WCDMA B2	1850-1910	4.85	3.05	25.00	316.23	25.00	0.123	1.0
WCDMA B4	1710-1755	3.17	2.07	25.00	316.23	25.00	0.084	1.0
WCDMA B5	824-849	1.39	1.38	25.00	316.23	25.00	0.055	0.6
LTE B2	1850-1910	4.85	3.05	25.00	316.23	25.00	0.123	1.0
LTE B4	1710-1755	3.17	2.07	25.00	316.23	25.00	0.084	1.0
LTE B5	824-849	1.39	1.38	25.00	316.23	25.00	0.055	0.6
LTE B12	699-716	-0.64	0.86	25.00	316.23	25.00	0.035	0.5
LTE B13	777-787	0.48	1.12	25.00	316.23	25.00	0.045	0.5
LTE B14	788-798	0.80	1.20	25.00	316.23	25.00	0.048	0.5
LTE B66	1710-1780	3.17	2.07	25.00	316.23	25.00	0.084	1.0
LTE B71	663-698	0.36	1.09	25.00	316.23	25.00	0.044	0.5

Note: The device Contains a certified WWAN Module(3G/4G), FCC ID: XMR202008EC25AFXD, certified on 08/06/2020.

Note:

The Antenna Gain and Conducted output power including Tune-up Tolerance provided by manufacturer.

2.4G Wifi and 5G Wifi can't transmit simultaneously, but 2.4G Wifi or 5G Wifi can transmit simultaneously with WWAN Module, WWAN Module supports simultaneous transmission of two antennas:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

$$= S_{2.4G\ Wifi} / S_{limit-2.4G\ Wifi} + (S_{WWAN} / S_{limit- WWAN}) * 2$$

$$= 0.187 / 1.0 + (0.123 / 1.0) * 2$$

$$= 0.433$$

$$< 1$$

Result: The device meets FCC MPE at 25 cm distance

EXHIBIT A - EUT PHOTOGRAPHS

Please refer to the attachment 2502S51299E-RF-EXP EUT EXTERNAL PHOTOGRAPHS and 2502S51299E-RF-INP EUT INTERNAL PHOTOGRAPHS.

******* END OF REPORT *******