

RF EXPOSURE REPORT



Applicant: Taijet Bointec Co. LTD.
4F,#114,Zhouzi St., Neihu-Taipei 11493,Taiwan
Product Name: DGF109A (a.k.a. DGF104A)
Brand Name: Bointec
Model No.: DGF109A, DGF104A
Model Difference: Marketing Different
Report Number: ER/2021/90007
FCC ID 2AMAF-DGF109A104A
IC: 23942-DGF109A104A
Issue Date: November 30, 2021
Date of EUT Received: September 8, 2021

Approved By

John Yeh

We hereby certify that:

The above equipment was evaluate by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC Rule Part §2.1091 and RSS-102.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By
ER/2021/90007	00	Original.	November 30, 2021	Yuri Tsai

Note:

- 1、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received and are assessed as identical in hardware and firmware to each other.

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 Product Description

Product Name:	DGF109A (a.k.a. DGF104A)
Brand Name:	Bointec
Model No.:	DGF109A, DGF104A
Model Difference:	Marketing Different
Hardware Version:	v01
Firmware Version:	v01
EUT Series No.:	Conducted: 20A7870094E6 Radiated: 20A7870094E6
Power Supply:	3.3V

1.2 Antenna Information:

1.2.1 BT

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Dipole	INVAX /Cortec	NB1363-B310BX	2402 – 2480MHz	3.62

Note: Antenna information is provided by the applicant.

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1.2.2 WLAN 2.4GHz

Antenna Type	Brand	Model No.	Freq.(MHz)	Peak Gain (dBi)	Direction Gain(dBi)
WiFi Antenna	INVAX/Cortec	NB1363-B310BX	2412-2462	3.62	6.63
WiFi Antenna	Bointec	TWRN-9161201-102	2412-2462	2.9	
WiFi Antenna	Bointec	TWRN-9161202-101	2412-2462	1.73	
WiFi Antenna	Cortec	AN2450-5706RS	2412-2462	2.11	
WiFi Antenna	Maglayer	EDA-8709-25GR2-A20-TN	2412-2462	2.03	
WiFi Antenna	Bointec	TWRN-9161201-191	2412-2462	2.21	
WiFi Antenna	Bointec	TWRN-9161202-171	2412-2462	2.43	
WiFi Antenna	Bointec	TWRN-9113203-151	2412-2462	2.6	
WiFi Antenna	Bointec	TWRN-91G3203-151	2412-2462	2.6	
WiFi Antenna	Bointec	TWRN-9113204-151	2412-2462	0.9	
WiFi Antenna	Bointec	TWRN-91G3204-151	2412-2462	0.9	
WiFi Antenna	Bointec	TWRN-91G3203-351	2412-2462	2.6	
WiFi Antenna	Molex	479504012	2412-2462	2.13	
WiFi Antenna	Bointec	TWRN-91G3206-351	2412-2462	2.99	

Note: Antenna information is provided by the applicant.

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1.2.3 WLAN 5GHz

Ant. Type	Brand	Part No.	Freq.(MHz)	Peak Gain (dBi)	Directional Gain (dBi)
WiFi Antenna	Bointec	TWRN-9161202-171	5150~5250	4.99	8.00
		TWRN-9161202-171	5250~5350	4.99	8.00
		TWRN-9161202-171	5470~5725	4.99	8.00
		TWRN-9161202-171	5725~5850	3.99	
WiFi Antenna	Bointec	TWRN-9161201-191	5150~5250	4.61	
		TWRN-9161201-191	5250~5350	4.61	
		TWRN-9161201-191	5470~5725	4.97	
		TWRN-9161201-191	5725~5850	4.88	7.98
WiFi Antenna	Bointec	TWRN-9161201-102	5150~5250	2.40	
		TWRN-9161201-102	5250~5350	2.40	
		TWRN-9161201-102	5470~5725	2.40	
		TWRN-9161201-102	5725~5850	2.40	
WiFi Antenna	Bointec	TWRN-9161202-101	5150~5250	1.79	
		TWRN-9161202-101	5250~5350	1.79	
		TWRN-9161202-101	5470~5725	1.79	
		TWRN-9161202-101	5725~5850	1.79	
WiFi Antenna	INVAX	AN2450-5706RS	5150~5251	4.08	
		AN2450-5706RS	5250~5351	4.35	
		AN2450-5706RS	5470~5726	4.26	
		AN2450-5706RS	5725~5851	4.61	
WiFi Antenna	Maglayer	EDA-8709-25GR2-A20-TN	5150~5252	2.29	
		EDA-8709-25GR2-A20-TN	5250~5352	2.29	
		EDA-8709-25GR2-A20-TN	5470~5727	2.29	
		EDA-8709-25GR2-A20-TN	5725~5852	2.29	
WiFi Antenna	Bointec	TWRN-9113203-151	5150~5253	3.30	
		TWRN-9113203-151	5250~5353	3.30	
		TWRN-9113203-151	5470~5728	3.30	
		TWRN-9113203-151	5725~5853	3.30	
WiFi Antenna	Bointec	TWRN-91G3203-151	5150~5254	3.30	
		TWRN-91G3203-151	5250~5354	3.30	
		TWRN-91G3203-151	5470~5729	3.30	
		TWRN-91G3203-151	5725~5854	3.30	
WiFi Antenna	Bointec	TWRN-9113204-151	5150~5255	3.80	
		TWRN-9113204-151	5250~5355	3.80	
		TWRN-9113204-151	5470~5730	3.80	
		TWRN-9113204-151	5725~5855	3.80	

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WiFi Antenna	Bointec	TWRN-91G3204-151	5150~5256	3.80	
		TWRN-91G3204-151	5250~5356	3.80	
		TWRN-91G3204-151	5470~5731	3.80	
		TWRN-91G3204-151	5725~5856	3.80	
WiFi Antenna	Bointec	TWRN-91G3203-351	5150~5257	3.30	
		TWRN-91G3203-351	5250~5357	3.30	
		TWRN-91G3203-351	5470~5732	3.30	
		TWRN-91G3203-351	5725~5857	3.30	
WiFi Antenna	Molex	479504012	5150~5258	2.81	
		479504012	5250~5358	2.81	
		479504012	5470~5733	2.81	
		479504012	5725~5858	2.81	
WiFi Antenna	Bointec	TWRN-91G3206-351	5150~5259	2.60	
		TWRN-91G3206-351	5250~5359	2.60	
		TWRN-91G3206-351	5470~5734	2.60	
		TWRN-91G3206-351	5725~5859	2.60	
WiFi Antenna	INVAX/Cortec	NB1363-B310BX	5150~5260	2.71	
		NB1363-B310BX	5250~5360	2.71	
		NB1363-B310BX	5470~5735	2.71	
		NB1363-B310BX	5725~5860	2.71	

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2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

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

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
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
1500-100000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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2.2 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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2.3 Power Density Calculation (Worst Case)

FCC Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (mW)	Power Density (PD) (mW/cm ²)	Limit (mW/cm ²)	Pass / Fail	Power Density / Limit
BT	2402.00	20	6.98	3.62	11.48	0.0023	1.000	Pass	0.002
WLAN 2.4G	2437.00	20	23.02	6.63	922.57	0.184	1.000	Pass	0.184
WLAN 5G	5745.00	20	23.6	7.98	1438.80	0.286	1.000	Pass	0.286

ISED Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Pass / Fail	Power Density / Limit
BT	2402.00	20	6.98	3.62	11.48	0.023	5.351	Pass	0.004
WLAN 2.4G	2437.00	20	23.02	6.63	922.57	1.836	5.404	Pass	0.340
WLAN 5G	5745.00	20	23.6	7.98	1438.80	2.864	9.710	Pass	0.295

2.4 Collocated Power Density Calculation

FCC Collocated MPE

Operation Mode	Power Density / Limit	Σ (Power Density / Limit)
BT	0.002	0.472
WLAN 2.4G	0.184	
WLAN 5G	0.286	

ISED Collocated MPE

Operation Mode	Power Density / Limit	Σ (Power Density / Limit)
BT	0.004	0.639
WLAN 2.4G	0.340	
WLAN 5G	0.295	

Note:

1. Σ (Power Density / Limit): This is a summation of [(Power Density for each transmitter/antenna included in the simultaneous transmission) / (corresponding MPE limit)].

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2. Considering the collocated transmitters, the aggregated (Power Density /limit) is smaller than 1, and MPE of collocated transmitters is compliant

~ End of Report ~

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