

RF Exposure Report

Report No.: SA141008E07D

FCC ID: PY3DC112A

Test Model: DC112A

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Applicant: NETGEAR, Inc.

Address: 350 East Plumeria Drive San Jose, CA 95134

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.



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Release Control Record

Issue No.	Description	Date Issued
SA141008E07D	Original release.	Dec. 02, 2016

2 RF Exposure

2.1 Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

$$Pd = (Pout * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as Mobile Device.

This product could be applied with 2G USB cellular device, and the safe distance is 48cm for collocated radio.

2.4 Antenna Gain

Antenna NO.	PCB Chain NO.	Brand	Model No.	Ant. Gain(dBi) <Excluding cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connector Type	Cable Loss(dB)		
1	Chain 0	Master Wave	98619PRSX006	2.48	2400~2500	Dipole	R-SMA	1		
				2.96	5150~5850			1.9		
2	Chain 1	Master Wave	98619PRSX006	2.48	2400~2500			PCB	i-pex	0.7
				2.96	5150~5850					1.5
3	WWAN_chain 0	Master Wav	9 8P2RZIPF000	2.5	703~960	PCB	i-pex	NA		
				4.4	1700~ 2170					
				4.5	2300~ 2700					
4	WWAN_chain 1	Master Wav	9 8P2RZIPF000	2.5	703~960	PCB	i-pex	NA		
				4.4	1700~ 2170					
				4.5	2300~ 2700					

2.5 Calculation Result

For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	996.75	4.64	20	0.57719	1
5180-5240	498.389	4.27	20	0.26503	1
5745-5825	791.595	4.27	20	0.42095	1

NOTE:

2.4GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.64\text{dBi}$

5.0GHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.27\text{dBi}$

For WLAN / 2G device coexistence mode:

Condition	Coexistence		
1	WLAN (2.4GHz)	WLAN (5GHz)	-
2	WLAN (2.4GHz)	WLAN (5GHz)	2G (USB cellular device)

Condition 1

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	996.75	4.64	20	0.57719	1
5745-5825	791.595	4.27	20	0.42095	1

Condition 2

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	996.75	4.64	48	0.10021	1
5745-5825	791.595	4.27	48	0.07308	1
824-849	11480*	-	48	0.39650	0.5495

* This product can operate with plug-in USB cellular device which has maximum of 7W(ERP) output power.

ERP is then converted to EIRP as follows:

Formula : $EIRP(W) = 1.64 \times ERP(W)$

$$EIRP = 1.64 \times 7 \text{ W} = 11.48 \text{ W} = 11480\text{mW}$$

Conclusion:

The formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Condition 1:

Therefore, the worst-case situation is $0.57719 / 1 + 0.42095 / 1 = 0.99814$,
which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

Condition 2:

Therefore, the worst-case situation is $0.10021 / 1 + 0.07308 / 1 + 0.39650 / 0.5495 = 0.89491$,
which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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