



RF EXPOSURE REPORT

REPORT NO.: SA110421E04

MODEL NO.: NBG5715, HGW-501HN-M

FCC ID: I88NBG5715

APPLICANT: ZyXEL Communications Corporation

ADDRESS: No. 6, Innovation Road II, Science-Park, Hsin-Chu,
300, Taiwan.

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

LAB ADDRESS: No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA110421E04	Original release	Aug. 03, 2011

1. CERTIFICATION

PRODUCT: Simultaneous Dual-Band Wireless N Media Router

MODEL: NBG5715, HGW-501HN-M

BRAND: ZyXEL, MitraStar

APPLICANT: ZyXEL Communications Corporation

TEST SAMPLE: MASS-PRODUCTION

STANDARDS: FCC Part 2 (Section 2.1091)

FCC OET Bulletin 65, Supplement C (01-01)

IEEE C95.1

The above equipment (Model: NBG5715) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Phoenix Huang , **DATE:** Aug. 03, 2011
(Phoenix Huang, Specialist)

APPROVED BY : May Chen , **DATE:** Aug. 03, 2011
(May Chen, Deputy Manager)

2. RF EXPOSURE LIMIT

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

3. MPE CALCULATION FORMULA

$$P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

4. 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**.

5. ANTENNA GAIN

There are three antennas provided to this EUT, please refer to the following table:

Transmitter Circuit	Manufacturer	Model name	Peak Gain (Included Cable loss)	Antenna Type	Connector Type
Chain (0)	ARISTOTLE	RFA-25-C2M2-M10-1	2.4G & 5G: 2dBi	Dipole	R-SMA
Chain (1)			2.4G & 5G: 2dBi	Dipole	R-SMA
Chain (2)			2.4G & 5G: 2dBi	Dipole	R-SMA

The EUT incorporates CDD function with 802.11a, 802.11b, 802.11g and MIMO function with 802.11n.

6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

For 15.247(2.4GHz):

802.11b:

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
2412-2462	53.7	2	20	0.017	1.00

802.11g:

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
2412-2462	501.9	6.8	20	0.478	1.00

Directional gain = gain of antenna element + 10 log (3)

Effective Legacy Gain (dBi)=6.8

802.11n(20MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
2412-2462	483.6	2	20	0.152	1.00

802.11n(40MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
2422-2452	501.9	2	20	0.158	1.00

For 15.247(5GHz):
802.11a:

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5745 ~ 5825	275.7	6.8	20	0.263	1.00

Directional gain = gain of antenna element + 10 log (3)

Effective Legacy Gain (dBi)=6.8

802.11n(20MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5745 ~ 5825	276.2	2	20	0.087	1.00

802.11n(40MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5755 ~ 5795	280.2	2	20	0.088	1.00

For 15.407(5GHz):

802.11a:

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5180 ~ 5240	22.9	6.8	20	0.022	1.00

Directional gain = gain of antenna element + 10 log (3)

Effective Legacy Gain (dBi)=6.8

802.11n(20MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5180 ~ 5240	29.6	2	20	0.009	1.00

802.11n(40MHz):

FREQUENCY BAND (MHz)	MAX POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm ²)	LIMIT (mW/cm ²)
5190 ~ 5230	46.8	2	20	0.015	1.00

CONCLUSION:

Both of the 2.4GHz and 5GHz can transmit simultaneously, the formula of calculated the MPE is:

$$CPD_1 / LPD_1 + CPD_2 / LPD_2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.478 / 1 + 0.263 / 1 = 0.741$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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