



Excellence in Compliance Testing

Certification Exhibit

**FCC ID: KBCIX-WS53HN1
IC: 1943A-WS53HN1**

**FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210**

ACS Project Number: 12-2029

**Manufacturer: General Dynamics Itronix Corporation
Model: 46-0503-002R**

**RF Exposure
Vehicle Dock Mobile**

General Information:

Applicant: General Dynamics Itronix Corporation
ACS Project: 12-2029
Device Category: Mobile
Environment: General Population/Uncontrolled Exposure

Technical Information**Standalone Configuration**

In the standalone configuration, the WLAN 802.11b/g/n module is connected to two internal Planar Inverted-F Antennas (PIFA) with gains corresponding to -0.93 dBi and -0.29 dBi, for the main and auxiliary chains, respectively. The auxiliary antenna chain is only operating when the radio is in the 802.11n mode. The highest EIRP is achieved when both antenna chains are transmitting simultaneously.

Antenna Chain 1

Antenna Type: Planar Inverted-F Antenna (PIFA)
Antenna Gain: -0.93 dBi
Maximum Transmitter Conducted Power: 25.82 dBm
EIRP: 24.89 dBm, 308.32 mW
Exposure Conditions: Greater than 20 centimeters

Antenna Chain 2

Antenna Type: Planar Inverted-F Antenna (PIFA)
Antenna Gain: -0.29 dBi
Maximum Transmitter Conducted Power: 26.57 dBm
EIRP: 26.28 dBm, 424.62 mW
Exposure Conditions: Greater than 20 centimeters

Maximum System EIRP: 28.6507 dBm, 732.94 mW

Vehicle Dock Configuration:

For the vehicle dock configuration, the external antenna is connected to the main RF chain of the WLAN 802.11b/g/n module only. The other RF chain remains connected to an internal -0.29 dBi planar inverted-F antenna (PIFA). The auxiliary antenna chain is only operating when the radio is in the 802.11n mode. The highest EIRP is achieved when both antenna chains are transmitting simultaneously.

Antenna Chain 1

Antenna Type: Whip Antenna
Antenna Gain: 5 dBi
Maximum Transmitter Conducted Power: 25.82 dBm
EIRP: 30.82 dBm, 1207.81 mW
Exposure Conditions: Greater than 20 centimeters

Antenna Chain 2

Antenna Type: Planar Inverted-F Antenna (PIFA)
Antenna Gain: -0.29 dBi
Maximum Transmitter Conducted Power: 26.57 dBm
EIRP: 26.28 dBm, 424.62 mW
Exposure Conditions: Greater than 20 centimeters

Maximum System EIRP: 32.1283 dBm, 1632.4 mW

The MPE calculations are performed for the vehicle dock configuration only, which leads to the highest EIRP.

MPE Calculation

The Power Density (mW/cm²) is calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = 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

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

Table 1: MPE Calculations – Vehicle Dock Configuration

MPE Calculator for Mobile Equipment Limits for General Population/Uncontrolled Exposure*								
Mode of Operation	Transmit Frequency (MHz)	Radio Power (dBm)	Power Density Limit (mW/Cm2)	Radio Power (mW)	Antenna Gain (dBi)	Antenna Gain (mW eq.)	Distance (cm)	Power Density (mW/cm^2)
802.11b	2412	22.86	1.00	193.20	5	3.162	20	0.122
802.11g	2412	26.91	1.00	490.91	5	3.162	20	0.309
802.11n HT20 CH0	2412	25.82	1.00	381.94	5	3.162	20	0.240
802.112 HT20 CH1	2412	26.57	1.00	453.94	-0.29	0.935	20	0.084
802.11n HT40 CH0	2437	24.99	1.00	315.50	5	3.162	20	0.198
802.112 HT40 CH1	2437	24.87	1.00	306.90	-0.29	0.935	20	0.057

Summation of Power Densities – Simultaneous Transmissions

This GD8200 notebook PC contains multiple transmitters, the 46-0503-002R WLAN 802.11b/g/n radio module which is collocated with the Bluetooth Radio module IX-WT11. These radios can operate simultaneously and therefore the maximum RF exposure is determined by the summation of power densities. The limit utilized is the lower limit specified for all simultaneous transmitters. The limit used to show compliance to the 20cm separation distance is 1.0 mW/cm².

The Bluetooth radio uses a -2.86 dBi internal antenna. The MPE calculation is provided below.

Table 2: MPE Calculations – Bluetooth Radio

MPE Calculator for Mobile Equipment Limits for General Population/Uncontrolled Exposure*								
Mode of Operation	Transmit Frequency (MHz)	Radio Power (dBm)	Power Density Limit (mW/Cm2)	Radio Power (mW)	Antenna Gain (dBi)	Antenna Gain (mW eq.)	Distance (cm)	Power Density (mW/cm^2)
Bluetooth	2402	13.375	1.00	21.75	-2.86	0.518	20	0.002

The maximum power density as calculated by a summation of power densities for each simultaneous transmission combination as follows:

2.4 GHz 802.11b/g/n and Bluetooth Modules operating simultaneously:

2.4 GHz (WLAN 802.11n HT20 CH0):	0.24 (mW/cm ²)
2.4 GHz (WLAN 802.11n HT20 CH1):	0.084 (mW/cm ²)
2.4 GHz (Bluetooth):	0.002 (mW/cm ²)
<u>TOTAL:</u>	<u>0.326 (mW/cm²)</u>

Installation Guidelines

The installation manual should contain text similar to the following advising how to install the equipment to maintain compliance with the FCC RF exposure requirements:

RF Exposure

In accordance with FCC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of 20 centimeters will be maintained.

Conclusion

This device complies with the MPE requirements by providing adequate separation between the device, any radiating structure and the general population.