



**SK TECH CO., LTD.**

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Certificate of Compliance

| | | | |
|---|--|--|-----------------|
| Test Report No.: | SKTTRT-040825-004 | | |
| NVLAP CODE: | 200220-0 | | |
| Applicant: | DIGIANA CO., LTD. | | |
| Applicant Address: | 1414 Hyundai Venture Ville, 713, Suseo-Dong, Kangnam-Ku, Seoul, 135-884 Korea | | |
| Device Under Test: | Wireless FM Linker | | |
| FCC ID: | QDNDGT-201 | Model No.: | DGT-201 |
| Receipt No.: | SKTEU04-0546 | Date of receipt: | August 17, 2004 |
| Date of Issue: | August 25, 2004 | | |
| Location of Testing: | SK TECH CO., LTD. 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea | | |
| Test Procedure: | ANSI C63.4 / 2001 | | |
| Test Specification: | FCC Title 47, Part 15 Subpart C (April 23, 2004) | | |
| Equipment Class: | Part 15 Low Power Communication Device Transmitter | | |
| Test Result: | The above-mentioned device has been tested and passed. | | |
| Tested & Reported by: Jong-Soo, Yoon | | Approved by: Jae-Kyung, Bae | |
|  08/25/2004 Signature Date | |  08/25/2004 Signature Date | |
| Other Aspects: | | | |
| Abbreviations: | · OK, Pass = passed · Fail = failed · N/A = not applicable | | |

- This test report is not permitted to copy partly without our permission.
- This test result is dependent on only equipment to be used.
- This test result is based on a single evaluation of one sample of the above mentioned.
- This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S Government.
- We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.



NVLAP Lab. Code: 200220-0



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1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2001 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.239 for Low Power Communication Device Transmitter. The EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards.

We attest to the accuracy of data. All measurements reported herein were performed by SK Tech Co., Ltd. and were made under Chief Engineer's supervision.

We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. TEST SITE

SK TECH Co., Ltd.

2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

This laboratory is accredited by NVLAP for NVLAP Lab. Code: 200220-0 and DATech for DAR-Registration No.: TTI-P-G155/97-10

**2.2 List of Test and Measurement Instruments**

| Equipment Type | Manufacturer | Model No. | Serial No. | Cal. Due Date |
|--------------------------------|---------------------|------------------|-------------------|----------------------|
| EMI Test Receiver | Rohde&Schwarz | ESVS 10 | 825120/013 | 10, 2004 |
| EMI Test Receiver | Rohde&Schwarz | ESVS 10 | 834468/008 | 10, 2004 |
| Spectrum Analyzer | Advantest | R3361A | 11730187 | 10, 2004 |
| Vector Signal Generator | Agilent | E4438C | MY42080359 | 08, 2005 |
| EMC Spectrum Analyzer | Agilent | E7405A | US40240203 | 01, 2005 |
| Amplifier | H.P | 8447F | 3113A05153 | 08, 2005 |
| Log Periodic Antenna | Schwarzbeck | UHALP9107 | 1819 | 10, 2004 |
| Biconical Antenna | Schwarzbeck | BBA9106 | 91031626 | 10, 2004 |
| Antenna Mast | TOKIN | 5907 | N/A | N/A |
| Antenna & Turntable controller | TOKIN | 5906 | N/A | N/A |
| 50Ω Switcher | Anritsu | MP59B | 6100214538 | N/A |

2.3 Test Date

Date of Application : August 17, 2004

Date of Test : August 19, 2004 ~ August 25, 2004

2.4 Test Environment

See each test item's description.



3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is a wireless audio portable FM transmitter to transmit audio signals from any music source, i.e. tape, MP3, or CD player, to a FM broadcast receiver. The product specification described herein was obtained from product data sheet or user's manual.

3.1 Rating and Physical Characteristics

| | |
|---------------------------|--|
| Type (Model No.) | DGT-201 |
| Power source | 1.5V AAA battery (x1) or 12V battery on vehicles |
| Local Oscillator or X-Tal | X-Tal: 7.6 MHz, 32.768 kHz |
| Transmit Frequency | 88.1 MHz to 107.9 MHz |
| Antenna Type | Integral (fixed Stereo Cable, 3.5Φ 1.5m) |
| Type of Modulation | FM |
| RF Output power | 1mW under |
| Interface Ports | Earphone Jack used to accept audio signals |

3.2 Equipment Modifications

None.

3.3 Submitted Documents

Block diagram

Schematic diagram

Part List

User manual



4. MEASUREMENT CONDITIONS

4.1 Description of test configuration

The EUT was configured for testing in a typical fashion (as a user would normally use it).

During the exploratory tests, the EUT was set to transmit the audio signals from a MP3 player to conduct Subpart C tests. The final radiated data were taken in the worst operating condition.

| Operating Mode |
|---|
| Transmitting audio signals from the MP3 player at the operating frequencies; low (88.1 MHz), middle (97.7 MHz), and high (107.9 MHz). |

4.2 List of Peripherals

| Equipment Type | FCC ID | Manufacture | Model | Serial Number |
|----------------|----------|---------------|--------|---------------|
| MP3 Player | PCMAR200 | Hyun Won Inc. | DAH200 | - |

4.3 Type of Used Cables

| Description | Length | Type of shield | Manufacturer | Remark |
|-------------|--------|----------------|--------------|--------|
|-------------|--------|----------------|--------------|--------|

None

4.4 Uncertainty

Radiated disturbance

Uc (Combined standard Uncertainty) = ± 2.37 dB

Expanded uncertainty U = KUc = ± 4.74 dB (K = 2)



5. TEST AND MEASUREMENTS

Summary of Test Results

| Requirement | CFR Section | Report Section | Test Result |
|------------------------------|-------------------|----------------|-------------|
| Antenna Requirement | 15.203 | 5.1 | PASS |
| Conducted Emissions | 15.207 | * | * |
| Occupied bandwidth | 15.239(a) | 5.3 | PASS |
| Field Strength (Fundamental) | 15.239(b) | 5.4 | PASS |
| Radiated Spurious Emissions | 15.239(c), 15.209 | 5.4 | PASS |

** Not required, the EUT is battery powered.*

5.1 ANTENNA REQUIREMENT

5.1.1 Regulation

FCC section 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.1.2 Result: **PASS**

The transmitter has a permanently attached antenna and meets the requirements of this section.



5.2 OCCUPIED BANDWIDTH

5.2.1 Regulation

According to §15.239(a), Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

5.2.2 Test Procedure

ANSI C63.4-2001 Section 13.1.7, Occupied Bandwidth Measurements. The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worst-case (i.e., the widest) bandwidth.

The measurements were performed at three channels, low (88.1 MHz), middle (97.7 MHz) and high (107.9 MHz). The spectrum trace data around fundamental frequency of the EUT was obtained with the spectrum analyzer in "Max Hold" mode. The bandwidth value was determined between the two points of 26dB down from the reference level.

5.3.3 Test Results:

PASS

Table 2: Measured values of the Occupied bandwidth

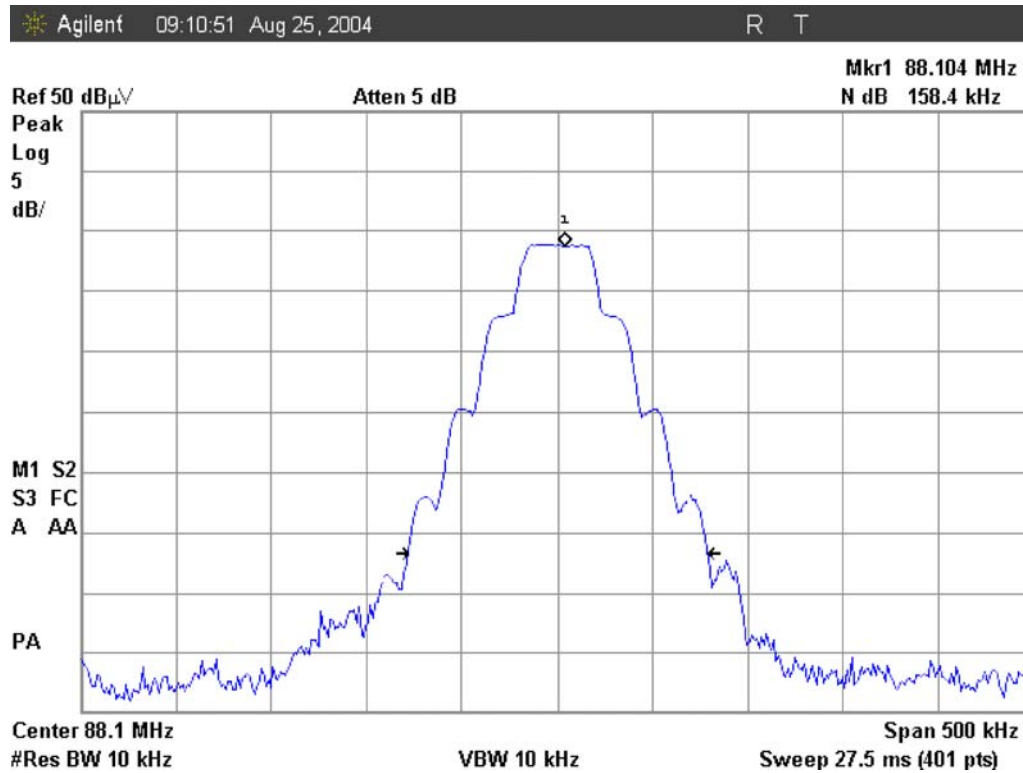
| Center frequency (MHz) | Limit (kHz) | Measured occupied bandwidth (kHz) |
|------------------------|-------------|-----------------------------------|
| 88.1 | 200.0 | 158.4 |
| 97.7 | 200.0 | 189.5 |
| 107.9 | 200.0 | 194.5 |

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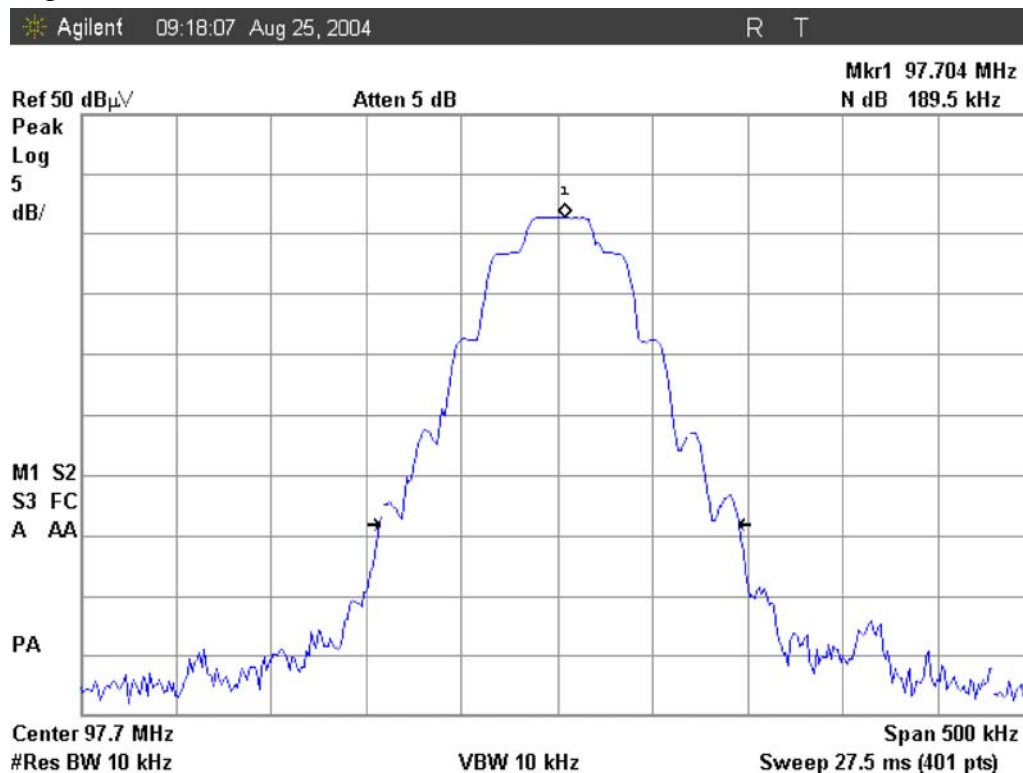
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Figure 1: Plot of the Occupied bandwidth

Operating at 88.1 MHz



Operating at 97.7 MHz

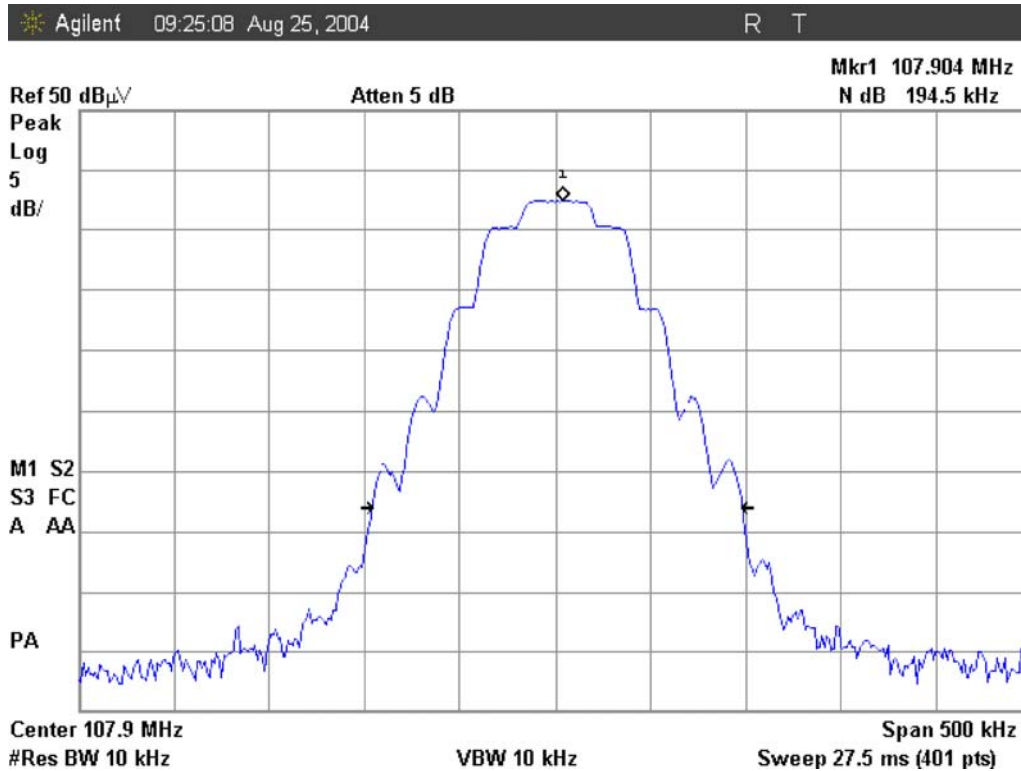


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Figure 1: Plot of the Occupied bandwidth (Continued)

Operating at 107.9 MHz





5.3 RADIATED EMISSIONS

5.3.1 Regulation

According to §15.239(b), The field strength of any emissions within the permitted 200kHz band shall not exceed the 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

| Fundamental frequency (MHz) | Field strength of fundamental (uV/m @ 3m) | Field strength of fundamental (dBuV/m @ 3m) |
|--------------------------------|---|---|
| 88-108 | 250 | 48.0 |

According to §15.239(c), the field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

| Frequency (MHz) | Field strength (uV/m @ 3m) | Field strength (dBuV/m @ 3m) |
|-----------------|--------------------------------|----------------------------------|
| 30–88 | 100 | 40.0 |
| 88–216 | 150 | 43.5 |
| 216–960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

5.4.2 Test Procedure

Preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters. The EUT was placed on the top of the 0.8 meter high, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 300 MHz using the biconical antenna and from 300 to 1000 MHz using the log-periodic antenna.

To obtain the final test data, the EUT was arranged on a turntable situated on a 4x4 meter at the Open Area Test Site. The EUT was tested at a 3-meter test distance. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was

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detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

The EUT was operated in transmitting mode. The measurements were performed at three modulated carrier frequencies: 88.1 MHz, 97.7 MHz and 107.9 MHz.

5.4.3 Test Results:**PASS**

POWER SOURCE: Full charged 1.5V battery

Table 3: Measured values of the Field strength

| Frequency [MHz] | Receiver Bandwidth [kHz] | Pol. (V/H) | Antenna Height [m] | Table Angle [°] | Reading [dB(μV)] | Amp Gain [dB] | AF / CL [dB(1/m)] | Actual [dB(μV/m)] | Limit [dB(μV/m)] | Margin [dB] |
|---|--------------------------------|---------------|--------------------------|-----------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------|
| Emissions AVERAGE DATA 15.239(b) Bands | | | | | | | | | | |
| 88.10 | 120 | H | 2.1 | 270 | 51.8 | 27.9 | 7.9/1.2 | 33.0 | 48.0 | 15.0 |
| 97.70 | 120 | H | 1.9 | 248 | 51.9 | 27.9 | 9.9/1.4 | 35.3 | 48.0 | 12.7 |
| 107.90 | 120 | H | 1.9 | 177 | 57.5 | 27.8 | 11.4/1.5 | 42.6 | 48.0 | 5.4 |
| Emissions PEAK DATA 15.239(b) Bands | | | | | | | | | | |
| 88.10 | 120 | H | 2.1 | 270 | 57.4 | 27.9 | 7.9/1.2 | 38.6 | 68.0 | 29.4 |
| 97.70 | 120 | H | 1.9 | 248 | 54.4 | 27.9 | 9.9/1.4 | 37.8 | 68.0 | 30.2 |
| 107.90 | 120 | H | 1.9 | 177 | 63.6 | 27.8 | 11.4/1.5 | 48.7 | 68.0 | 19.3 |
| Emissions Quasi-peak DATA 15.209; general radiated emissions | | | | | | | | | | |
| 264.26 | 120 | H | 1.3 | 249 | 37.8 | 27.0 | 17.8/2.8 | 31.4 | 46.0 | 14.6 |
| 293.14 | 120 | H | 1.1 | 29 | 36.6 | 27.2 | 19.0/2.9 | 31.3 | 46.0 | 14.7 |
| 323.73 | 120 | H | 1.0 | 169 | 36.5 | 27.2 | 16.7/3.2 | 29.2 | 46.0 | 16.8 |
| 431.65 | 120 | H | 2.1 | 192 | 36.9 | 27.9 | 17.6/4.1 | 30.7 | 46.0 | 15.3 |

1. H = Horizontal, V = Vertical Polarization

2. AF/CL = Antenna Factor and Cable Loss

3. The frequency range was scanned from 30 MHz to 1 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + AF + CL]

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5.4.3 Test Results (Continued)POWER SOURCE: 13.2 V_{DC} Powered**Table 3: Measured values of the Field strength**

| Frequency [MHz] | Receiver Bandwidth [kHz] | Pol. (V/H) | Antenna Height [m] | Table Angle [°] | Reading [dB(μV)] | Amp Gain [dB] | AF / CL [dB(1/m)] | Actual [dB(μV/m)] | Limit [dB(μV/m)] | Margin [dB] |
|---|--------------------------------|---------------|--------------------------|-----------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------|
| Emissions AVERAGE DATA 15.239(b) Bands | | | | | | | | | | |
| 88.10 | 120 | H | 2.1 | 151 | 63.0 | 27.9 | 7.9/1.2 | 44.2 | 48.0 | 3.8 |
| 97.70 | 120 | H | 3.2 | 170 | 61.8 | 27.9 | 9.9/1.4 | 45.2 | 48.0 | 1.8 |
| 107.90 | 120 | H | 1.6 | 177 | 61.1 | 27.8 | 11.4/1.5 | 46.2 | 48.0 | 1.8 |
| Emissions PEAK DATA 15.239(b) Bands | | | | | | | | | | |
| 88.10 | 120 | H | 2.1 | 151 | 65.5 | 27.9 | 7.9/1.2 | 46.7 | 68.0 | 21.3 |
| 97.70 | 120 | H | 3.2 | 170 | 63.1 | 27.9 | 9.9/1.4 | 46.5 | 68.0 | 21.5 |
| 107.90 | 120 | H | 1.6 | 177 | 65.9 | 27.8 | 11.4/1.5 | 51.0 | 68.0 | 17.0 |
| Emissions Quasi-peak DATA 15.209; general radiated emissions | | | | | | | | | | |
| 264.32 | 120 | H | 1.3 | 286 | 46.6 | 27.0 | 17.8/2.8 | 40.2 | 46.0 | 5.8 |
| 390.86 | 120 | H | 1.0 | 89 | 40.0 | 27.7 | 18.1/3.8 | 34.2 | 46.0 | 11.8 |
| 586.10 | 120 | H | 1.6 | 128 | 42.3 | 28.3 | 20.8/5.3 | 40.1 | 46.0 | 5.9 |
| 293.14 | 120 | H | 1.1 | 120 | 47.7 | 27.2 | 19.0/2.9 | 40.3 | 46.0 | 5.7 |
| 352.44 | 120 | H | 1.4 | 73 | 32.8 | 27.4 | 17.0/3.5 | 25.9 | 46.0 | 20.1 |
| 440.55 | 120 | H | 1.8 | 137 | 36.8 | 28.0 | 17.8/4.3 | 30.9 | 46.0 | 15.1 |
| 528.66 | 120 | H | 1.7 | 100 | 40.1 | 28.5 | 19.5/4.7 | 35.8 | 46.0 | 10.2 |
| 323.74 | 120 | H | 1.0 | 211 | 37.3 | 27.2 | 16.7/3.2 | 30.0 | 46.0 | 16.0 |
| 431.65 | 120 | H | 2.1 | 123 | 43.2 | 27.9 | 17.6/4.1 | 37.0 | 46.0 | 9.0 |
| 539.42 | 120 | H | 1.7 | 100 | 45.5 | 28.5 | 19.7/4.9 | 41.6 | 46.0 | 4.4 |
| 647.49 | 120 | H | 1.4 | 138 | 34.6 | 28.5 | 21.9/5.5 | 33.5 | 46.0 | 12.5 |

1. H = Horizontal, V = Vertical Polarization

2. AF/CL = Antenna Factor and Cable Loss

3. The frequency range was scanned from 30 MHz to 1 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

Margin (dB) = Limit – Actual**[Actual = Reading – Amp Gain + AF + CL]**