

**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
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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

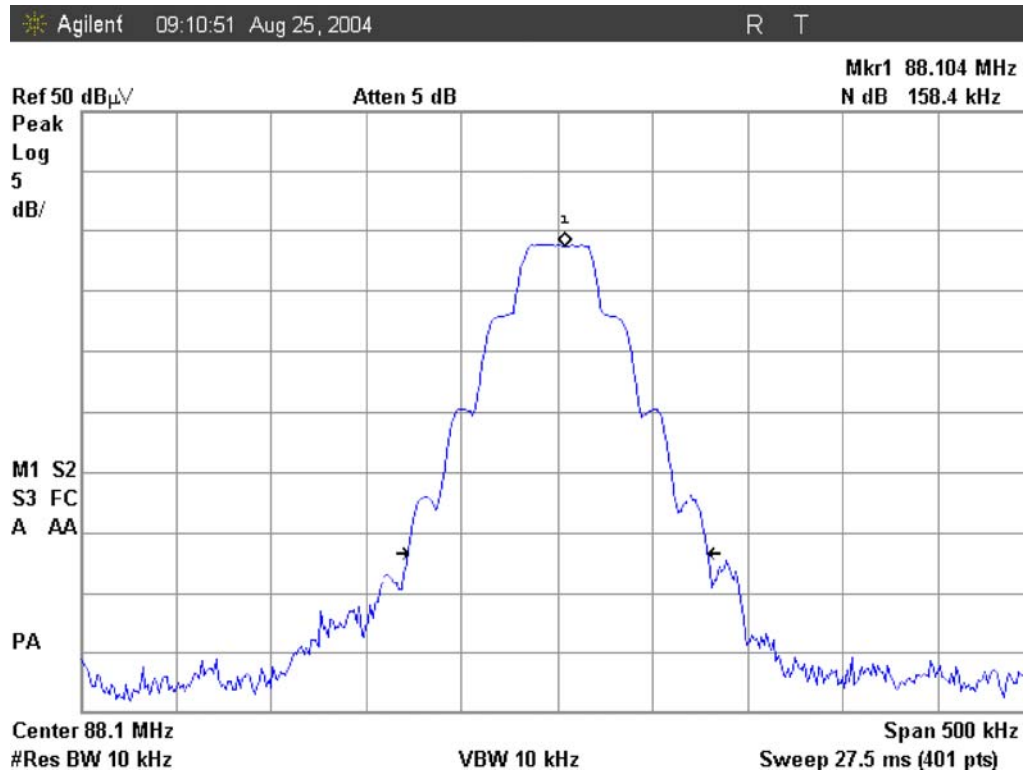
Center frequency (MHz)	Limit (kHz)	Measured occupied bandwidth (kHz)
88.1	200.0	158.4
97.7	200.0	189.5
107.9	200.0	194.5

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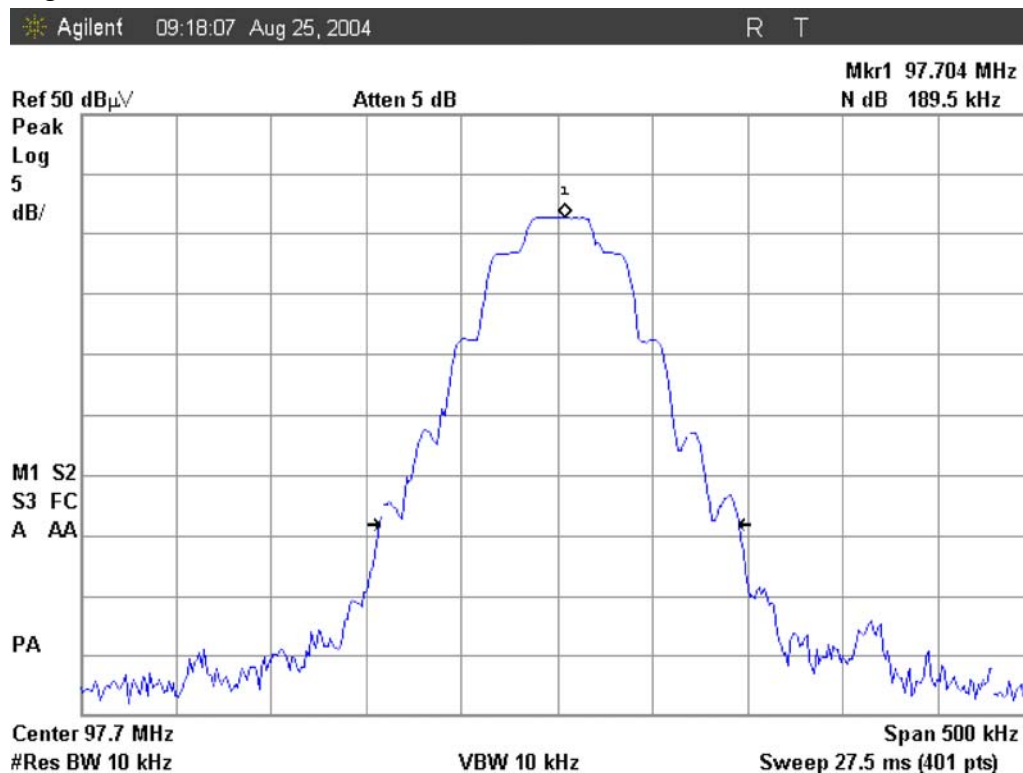
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Figure 1: Plot of the Occupied bandwidth

Operating at 88.1 MHz



Operating at 97.7 MHz

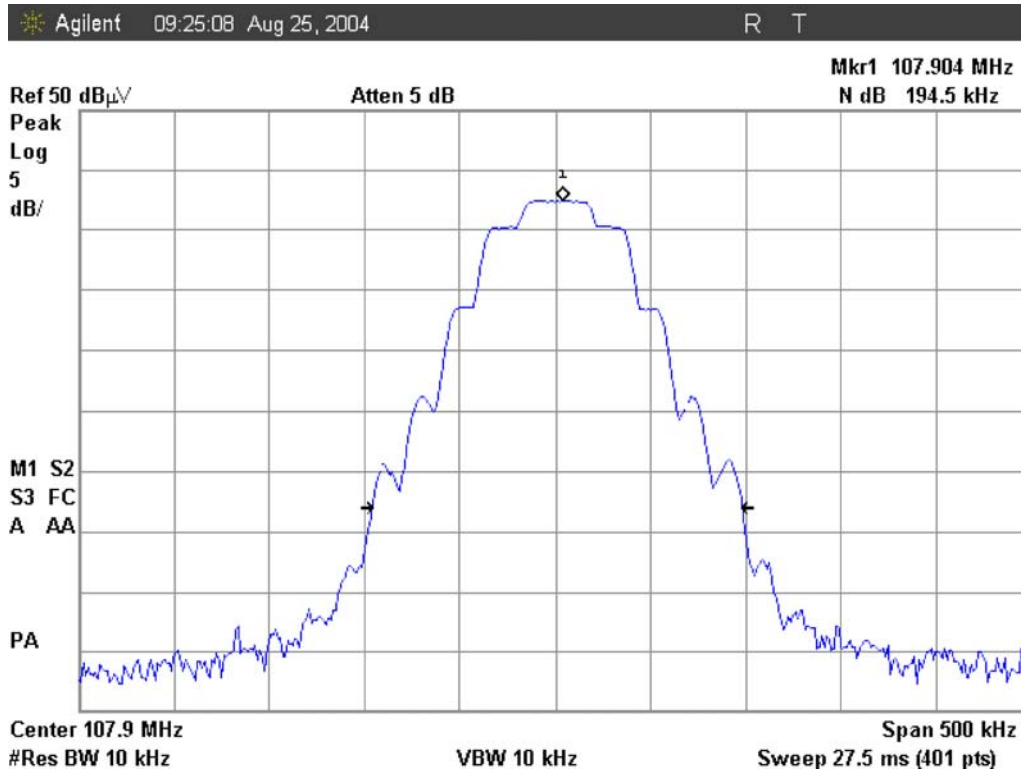


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Figure 1: Plot of the Occupied bandwidth (Continued)

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]**