



SK TECH CO., LTD.

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Certificate of Compliance

Test Report No.:	SKTTRT-070108-001		
KOLAS NO.:	KT191		
Applicant:	DIGIANA CO., LTD.		
Applicant Address:	1414 Hyundai Venture Ville, 713, Suseo-Dong, Kangnam-Ku, Seoul, 135-884 Korea		
Manufacturer:	DIGIANA CO., LTD.		
Manufacturer Address:	1414 Hyundai Venture Ville, 713, Suseo-Dong, Kangnam-Ku, Seoul, 135-884 Korea		
Device Under Test:	FM Transmitter		
FCC ID:	QDNDGT301	Model No.:	DGT-301
Receipt No.:	SKTEU06-0761	Date of receipt:	December 07, 2006
Date of Issue:	January 08, 2007		
Location of Testing:	SK TECH CO., LTD. 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
Test Procedure:	ANSI C63.4 / 2003		
Test Specification:	47CFR, Part 15 Subpart C		
Equipment Class:	DXX - Part 15 Low Power Communication Device Transmitter		
Test Result:	The above-mentioned device has been tested and passed.		
Tested & Reported by: Seong-Baek, Ko	Approved by: Jong-Soo, Yoon		
			
Signature	Date	Signature	Date
2007. 01. 08			2007. 01. 08
Other Aspects:			
Abbreviations:	· OK, Pass = passed · Fail = failed · N/A = not applicable		

☞

- The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.
- 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.
- We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.

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1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 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 recognized as a Conformity Assessment Body(CAB) for CAB's Designation Number: **KR0007** by FCC, is accredited by NVLAP for NVLAP Lab. Code: **200220-0**, DATech for DAR-Registration No.: **DAT-P-076/97-01** and KOLAS for Accreditation No. : **KT191**.



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2.2 List of Test and Measurement Instruments

Description	Manufacturer	Model #	Serial #	
Spectrum Analyzer	Agilent	E4405B	US40520856	
EMC Spectrum Analyzer	Agilent	E7405A	US40240203	<input checked="" type="checkbox"/>
EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	<input checked="" type="checkbox"/>
Pre-amplifier	HP	8447F	3113A05153	<input checked="" type="checkbox"/>
Pre-amplifier	MITEQ	AFS44	1116321	
Pre-amplifier	MITEQ	AFS44	1116322	
Power Meter	Agilent	E4418B	US39402179	
Power Meter	Agilent	E4417A	MY45100426	
Power Sensor	Agilent	E9327A	MY44420696	
Power Sensor	HP	8485A	3318A13916	
Oscilloscope	Agilent	54820A	US40240160	
Diode detector	Agilent	8473C	1882A03173	
VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	
UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	
Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	
TRILOG Broadband Antenna	Schwarzbeck	VULB9160	3141	<input checked="" type="checkbox"/>
TRILOG Broadband Antenna	Schwarzbeck	VULB9168	9168-230	<input checked="" type="checkbox"/>
Biconical Antenna	Schwarzbeck	VHA9103	2265	
Log-Periodic Antenna	Schwarzbeck	UHALP9107	1819	
Horn Antenna	AH Systems	SAS-200/571	304	
Horn Antenna	EMCO	3115	00040723	
Horn Antenna	EMCO	3115	00056768	
Vector Signal Generator	Agilent	E4438C	MY42080359	
PSG analog signal generator	Agilent	E8257D-520	MY45141255	
DC Power Supply	HP	6634A	2926A-01078	
DC Power Supply	HP	6268B	2542A-07856	
DC Power Supply	Goldstar	GP-4303D	-	<input checked="" type="checkbox"/>
Digital Multimeter	HP	HP3458A	2328A14389	<input checked="" type="checkbox"/>
PCS Interface	HP	83236B	3711J00881	
CDMA Mobile Test Set	HP	8924C	US35360253	
Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	<input checked="" type="checkbox"/>
Temperature/Humidity Chamber	All Three	ATH-50M	20030425	

2.3 Test Date

Date of Application: December 07, 2006

Date of Test: December 21, 2006 ~ January 06, 2007

2.4 Test Environment

See each test item's description.



3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is a 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.)	FM Transmitter (DGT-301)
Power source	12 V lead-acid battery on vehicles or 1.5 V Alkaline battery
Local Oscillator or X-Tal	X-Tal: 7.6 MHz
Transmit Frequency *	88.1 MHz to 107.9 MHz(Channel Spacing: 100 kHz)
Antenna Type	Integral (fixed Stereo audio Cable, 1.5 m, 3.5 φ)
Emission designation	170KF3E (B _n = 2M + 2DK(D = 70000 Hz, M = 1500))
Interface Ports	Earphone Jack used to accept audio signals

* The maximum turning range was verified with manually adjusting the operating frequency.

3.2 Equipment Modifications

None.

3.3 Submitted Documents

Block diagram

Schematic diagram

Part List

User manual

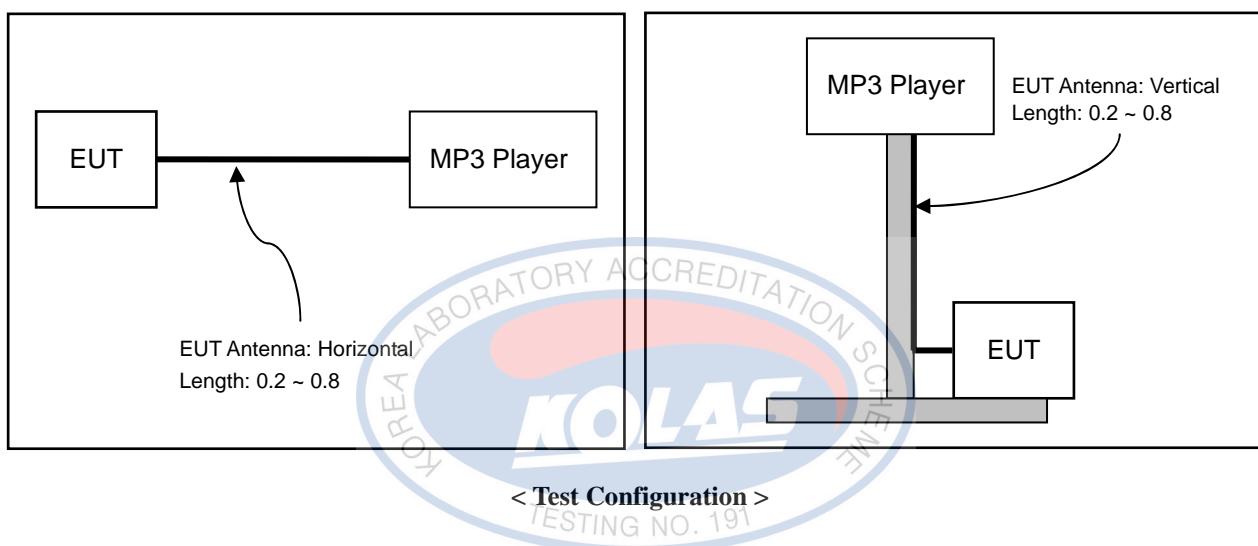


4. MEASUREMENT CONDITIONS

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. To find the worst radiated emissions, the length of the EUT antenna was varied with the polarization. The final radiated data were taken in the worst operating condition.



4.2 List of Peripherals

Equipment Type	Manufacture/Model	Serial No.
MP3 Player	Apple Computer Inc./iPod(A1136)	4J544JRSTXL

4.3 Uncertainty

Measurement Item	Combined Standard Uncertainty U_c	Expanded Uncertainty $U = KU_c (K = 2)$
Radiated disturbance	± 2.30 dB	± 4.60 dB



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)	5.2	PASS
Field Strength (Fundamental)	15.239(b)	5.3	PASS
Radiated Spurious Emissions	15.239(c), 15.209	5.4	PASS

* Not required, the EUT is only 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 C63.4-2003 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 occupied bandwidth measurements were made using a typical audio file from the typical MP3 player with the maximum volume setting.

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 26 dB down from the reference level.

5.2.3 Test Results:

PASS

Table 1: Measured values of the Occupied bandwidth

Power Source	Center frequency (MHz)	Limit (kHz)	Measured occupied bandwidth (kHz)
DC 13.2 V	88.1	200.0	129.3
	97.9	200.0	172.4
	107.9	200.0	165.2
Battery 1.5 V	88.1	200.0	130.2
	97.9	200.0	171.5
	107.9	200.0	160.8

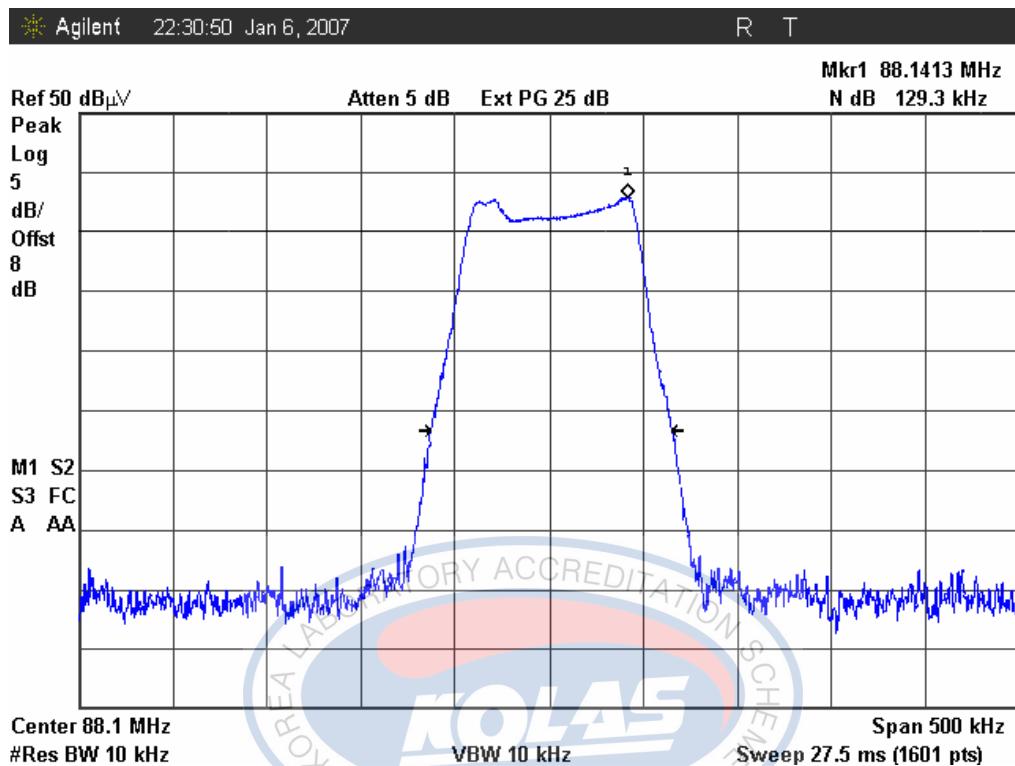


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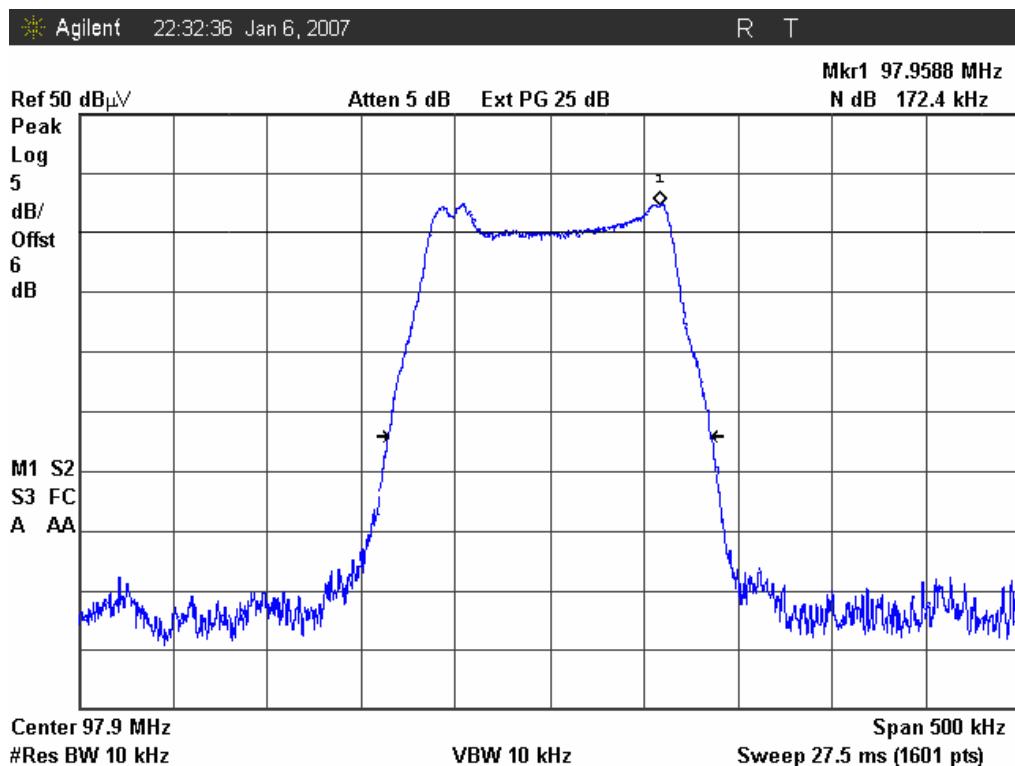
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Figure 1: Plot of the Occupied bandwidth

Operating at 88.1 MHz(DC 13.2 V)



Operating at 97.9 MHz(DC 13.2 V)



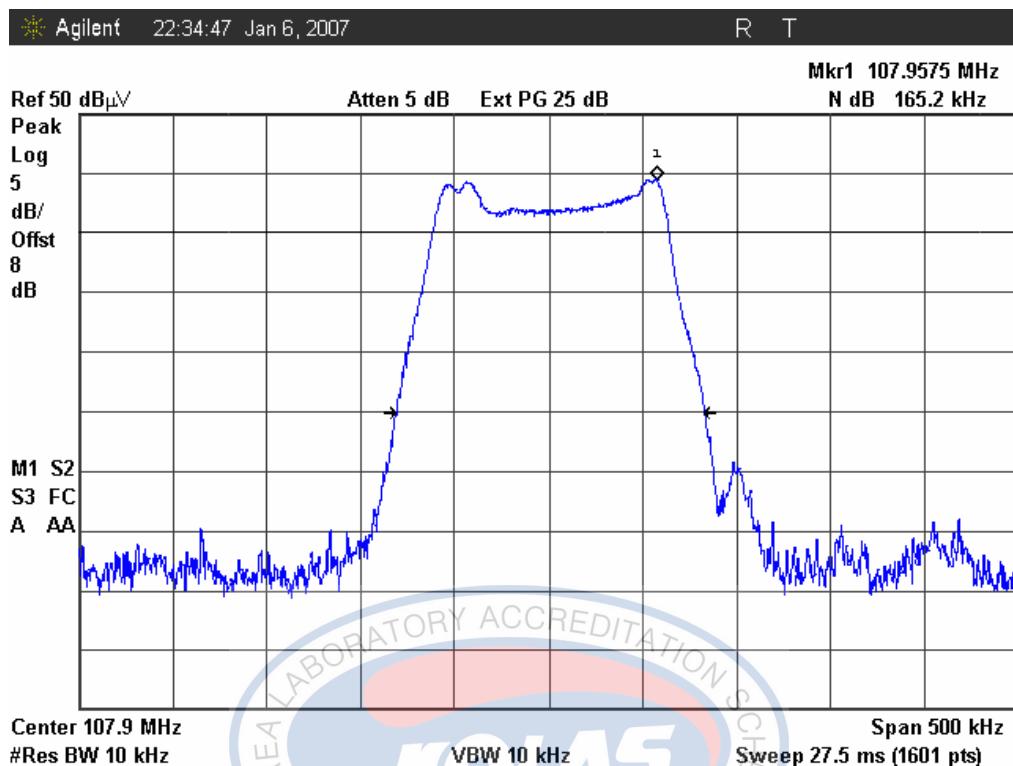


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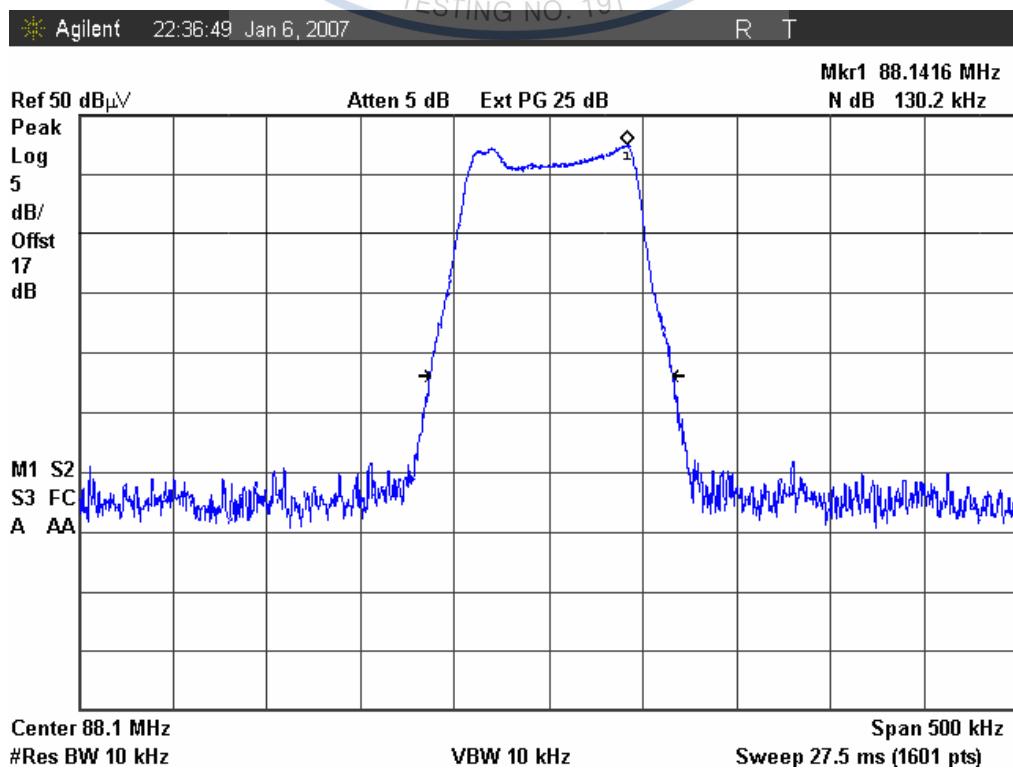
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Figure 1: Plot of the Occupied bandwidth(continued)

Operating at 107.9 MHz(DC 13.2 V)



Operating at 88.1 MHz(Battery 1.5 V)



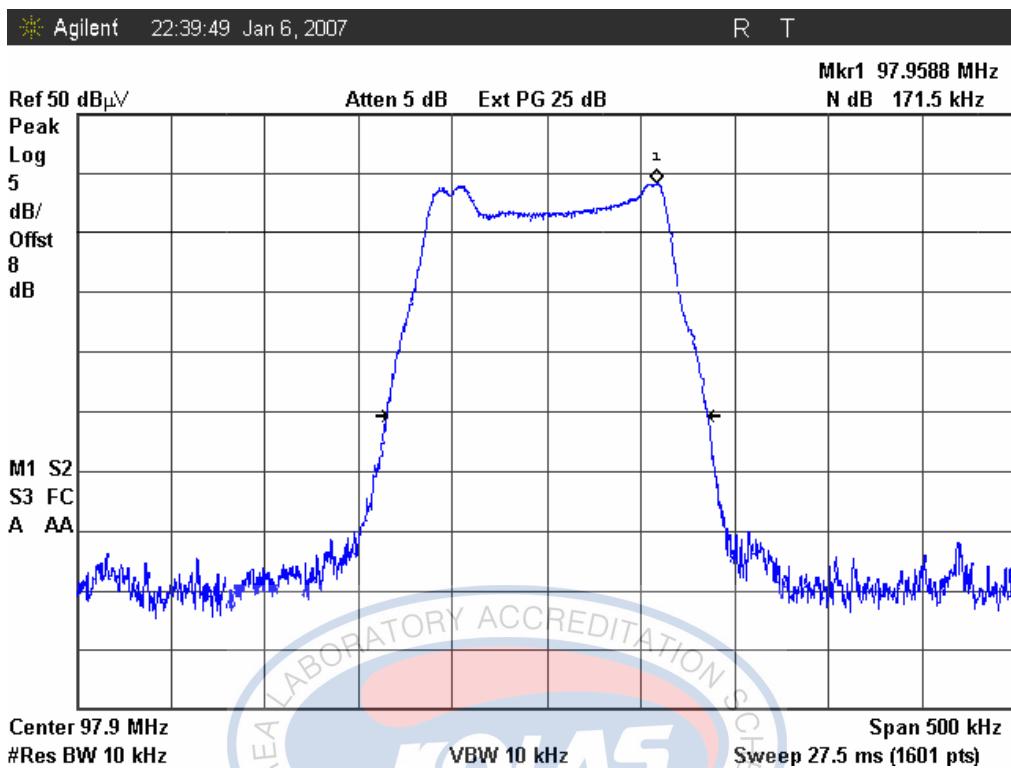


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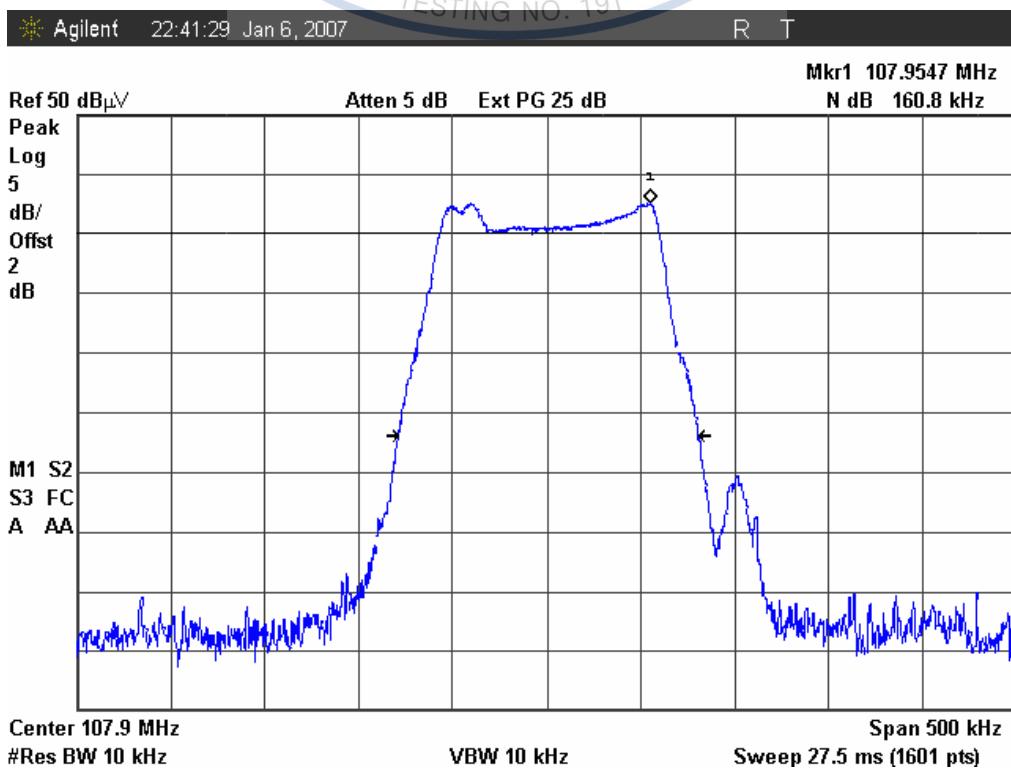
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Figure 1: Plot of the Occupied bandwidth(continued)

Operating at 97.9 MHz(Battery 1.5 V)



Operating at 107.9 MHz(Battery 1.5 V)





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5.3 RADIATED EMISSIONS

5.3.1 Regulation

According to §15.239(b), The field strength of any emissions within the permitted 200 kHz 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 @ 3 m)	Field strength of fundamental (dBuV/m @ 3 m)
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 @ 3 m)	Field strength (dBuV/m @ 3 m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

Frequency range	Detector
$f > 1000$ MHz	Average and Peak
$f < 1000$ MHz	Quasi-Peak



5.3.2 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 1000 MHz using the TRILOG Broadband Antenna.

To obtain the final test data, the EUT was arranged on a turntable situated on a 4 x 4 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 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 length of the EUT antenna was varied from 0.2 m to 0.8 m(max.) with the polarization of the EUT antenna, Vertical/Horizontal.

The EUT was operated in transmitting mode. The field strength of the carrier frequencies were measured with the EUT un-modulated, the MP3 player paused, and spurious emissions were measured with the EUT modulated with a typical audio file.

Table 2: Worst Radiated Emissions

Power Source	Operating Frequency(MHz)	EUT antenna polarization	EUT antenna length extended(m)	Peak reading
Power Supply 13.2 V	88.1	V	0.8	43.4
		H	0.6	41.5
	97.9	V	0.8	43.2
		H	0.6	40.1
	107.9	V	0.4	44.6
		H	0.2	42.6
New Battery 1.5 V	88.1	V	0.8	47.0
		H	0.6	46.2
	97.9	V	0.6	44.8
		H	0.4	42.5
	107.9	V	0.4	42.5
		H	0.4	38.3



5.3.3 Test Results:

PASS

POWER SOURCE: Power Supply Used (removed battery)

EUT ANTENNA Polarization: Vertical

Table 3: Measured values of the Field strength

Frequency [MHz]	RBW [kHz]	POL [V/H]	ANT [m]	Reading [dBuV]	Amp Gain [dB]	AF [dB/m]	CL [dB]	Actual [dBuV/m]	Limit [dBuV/m]	Margin [dB]
Length of the EUT Antenna extended: 0.8 m										
88.10	120	V	1.0	62.1 Pk	28.0	8.7	0.7	43.4 Pk	68.0 Pk	24.6
88.10	120	V	1.0	61.3 Av	28.0	8.7	0.7	42.6 Av	48.0 Av	5.4
Length of the EUT Antenna extended: 0.8 m										
264.32	120	H	1.0	47.6 Qp	26.9	11.3	1.4	33.4 Qp	46.0 Qp	12.6
352.40	120	H	1.0	46.4 Qp	27.3	14.1	1.6	34.8 Qp	46.0 Qp	11.2
440.51	120	H	1.0	45.7 Qp	27.8	15.2	1.8	34.9 Qp	46.0 Qp	11.1
704.86	120	H	1.0	34.5 Qp	28.5	20.5	2.4	29.0 Qp	46.0 Qp	17.1
792.92	120	H	1.0	36.1 Qp	28.1	21.9	2.5	32.5 Qp	46.0 Qp	13.5
Length of the EUT Antenna extended: 0.8 m										
97.90	120	V	1.0	62.6 Pk	28.0	7.9	0.7	43.2 Pk	68.0 Pk	24.8
97.90	120	V	1.0	61.9 Av	28.0	7.9	0.7	42.5 Av	48.0 Av	5.5
Length of the EUT Antenna extended: 0.4 m										
195.80	120	V	1.1	44.2 Qp	27.4	11.0	1.3	29.1 Qp	43.5 Qp	14.4
293.72	120	H	1.2	45.6 Qp	26.9	11.3	1.5	31.5 Qp	46.0 Qp	14.5
391.60	120	H	1.0	43.3 Qp	27.8	14.1	1.7	31.2 Qp	46.0 Qp	14.8
587.46	120	V	1.0	32.0 Qp	28.3	18.3	2.1	24.1 Qp	46.0 Qp	21.9
Length of the EUT Antenna extended: 0.4 m										
107.90	120	V	1.0	62.8 PK	27.9	8.9	0.8	44.6 PK	68.0 PK	23.4
107.90	120	V	1.0	62.0 AV	27.9	8.9	0.8	43.8 AV	48.0 AV	4.2
Length of the EUT Antenna extended: 0.4 m										
215.81	120	H	1.0	41.6 Qp	27.2	9.3	1.4	25.1 Qp	43.5 Qp	18.5
323.72	120	H	1.0	35.9 Qp	27.1	12.9	1.5	23.2 Qp	46.0 Qp	22.8
431.60	120	H	1.6	36.0 Qp	27.9	15.2	1.8	25.1 Qp	46.0 Qp	20.9

1. H = Horizontal, V = Vertical Polarization

2. AF = Antenna Factor, CL = Cable Loss

3. Pk=Peak, Av= Average, Qp=Quasi-peak detector

4. 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.

$$\text{Margin (dB)} = \text{Limit} - \text{Actual}$$

$$[\text{Actual} = \text{Reading} - \text{Amp Gain} + \text{AF} + \text{CL}]$$



5.3.3 Test Results(continued)

POWER SOURCE: Full charged 1.5V battery

EUT ANTENNA POLE: Vertical

Table 3: Measured values of the Field strength

Frequency [MHz]	RBW [kHz]	POL [V/H]	ANT [m]	Reading [dBuV]	Amp Gain [dB]	AF [dB/m]	CL [dB]	Actual [dBuV/m]	Limit [dBuV/m]	Margin [dB]
Length of the EUT Antenna extended: 0.8 m										
88.10	120	V	1.0	65.6 Pk	28.0	8.7	0.7	47.0 Pk	68.0 Pk	21.0
88.10	120	V	1.0	64.7 Av	28.0	8.7	0.7	46.1 Av	48.0 Av	1.9
Length of the EUT Antenna extended: 0.6 m										
97.90	120	V	1.0	64.1 Pk	28.0	7.9	0.7	44.8 Pk	68.0 Pk	23.2
97.90	120	V	1.0	63.6 Av	28.0	7.9	0.7	44.3 Av	48.0 Av	3.7
195.81	120	V	2.0	43.4 Qp	27.4	11.0	1.3	28.4 Qp	43.5 Qp	15.1
293.73	120	V	3.0	35.5 Qp	26.9	11.3	1.5	21.4 Qp	46.0 Qp	24.6
391.60	120	V	4.0	38.5 Qp	27.8	14.1	1.7	26.5 Qp	46.0 Qp	19.5
Length of the EUT Antenna extended: 0.4 m										
107.90	120	V	1.0	60.7 Pk	27.9	8.9	0.8	42.5 Pk	68.0 Pk	25.5
107.90	120	V	1.0	60.1 Av	27.9	8.9	0.8	41.9 Av	48.0 Av	6.1
323.71	120	V	2.0	31.9 Qp	27.1	12.9	1.5	19.2 Qp	46.0 Qp	26.8
431.61	120	V	3.0	43.9 Qp	27.9	15.2	1.8	33.0 Qp	46.0 Qp	13.0

1. H = Horizontal, V = Vertical Polarization

2. AF = Antenna Factor, CL = Cable Loss

3. Pk=Peak, Av= Average, Qp=Quasi-peak detector

4. 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.

$$\text{Margin (dB)} = \text{Limit} - \text{Actual}$$

$$[\text{Actual} = \text{Reading} - \text{Amp Gain} + \text{AF} + \text{CL}]$$



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5.4 Maximum Tuning Range

The maximum tuning range was verified with manually adjusting the operating frequency.

- Minimum(88.1 MHz)



- Step(100 kHz)



- Maximum(107.9 MHz)

