

FCC TEST REPORT

Test report No.: EMC- FCC- 0456

Type of equipment: NAVIGATION SYSTEM

Model Name: BD-100

Variant Model: COOLNAVI430

FCC ID : U07BD-100

Applicant: 3SOFT, INC

Test standards: FCC part 15 subpart B (Class B)
FCC part 15 subpart C

Test Standard : FCC Part 15, Subpart B
FCC Part 15, Subpart C

Test Procedure : ANSI C63.4:2003

Test result : Complied

The above equipment was tested at EMC compliance Testing Laboratory in compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system tested only. Other similar equipments will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: 2006. 11. 09 ~ 10

Issued date: 2006 . 11. 13

Tested by: 

PARK, SEUNG-SOO

Approved by: 

CHUNG, MIN-SEOK

EMC Compliance Ltd.

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* The tuning controls were manually adjusted to verify maximum tuning range on 4.1 and 6.2 section.

1. Client information

Applicant : 3SOFT, INC
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Contact Person: Je Hwan Lee

2. Laboratory information

Address

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Telephone Number : 82 31 336 9919

Facsimile Number : 82 31 336 4767

FCC Registration No. : 793334

VCCI Registration No. : C-1713, R-1606,T-258

KOLAS NO.:231

CBTL Testing Laboratory

SITE MAP



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3. Test system configuration

3.1 Operation Environment

	Temperature	Humidity	Pressure
OATS :	15 °C	48 %	1007 hPa
Shielded room :	20 °C	50 %	1006 hPa

Test site

These tests were performed at following locations;

Shielded Room : N/A

3m Semi-anechoic chamber & OATS :

- Radiated Emission
- Occupied bandwidth

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are test receiver, Cable Loss, antenna factor calibration, Antenna directivity, antenna factor Variation with height, antenna phase center variation, antenna Frequency interpolation, measurement distance variation, Site imperfection, mismatching, and system repeatability.

Based on NIS 80, 81, the measurement uncertainty level with a 95% confidence level was applied.

3.3 Sample calculation

Radiated emission

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

$$FS = MR + AF + CL + AT - AG$$

MR = Meter Reading / AF = Antenna Factor / CL = Cable Loss

AP = Antenna Pad / AG=Amplifier Gain /

If MR is 30dB, AF 12dB, CL 5dB, AP 10dB, AG 35dB

The result (MR) is

$$30 + 12 + 5 + 10 - 35 = 22\text{dBuV/m}$$

Conducted emission

The field strength is calculated by adding the LISN factor, cable loss to the measured reading.

The sample calculation is as follow :

$$FS = MR + LF + CL$$

MR = Meter Reading

LF = LISN Factor

CL = Cable Loss

If MR is 30dB, LISN Factor 1dB, CL 1dB

The result (FS) is

$$30 + 1 + 1 = 32\text{dBuV}$$

4. Description of EUT

4.1 Product description

This BD-100 is a Multifunction device with FM transmitter.

The device has following functions.

- MP3, Navigation, FM transmitter

USB port is connected to PC for file up and down mode.

Power requirement	DC 12V
Tx Frequency range	88.1MHz ~ 107.9MHz (100KHz step)
Type of Chassis	Metal
ANT type	Pattern of PCB
External Connector	DC In,AV output, AV input,USB,GPS

The tuning controls were manually adjusted to verify maximum tuning range.

4.2 Peripherals

Description	Model / Part #	Serial number	Manufacturer
PC	DIMENSION3000	B2ZRD1S	DELL
MONITOR	52S-S	N379HVEY216486E	SAMSUNG
PRINTER	EPSON STYLUS C60	DR5K015097	EPSON
PS/2 KEYBOARD	7801	N36004569	SAMSUNG
USB MOUSE	M056UOA	F0M01Y0Q	DELL

4.3 Mode of Operation

During FCC Part 15 Subpart B

Conducted emission was not performed because of 12V dc.

Radiated emission was tested with following testing mode.

- Mode
1. MP3 File up and download
 2. MP3 play
 3. Navigation

During FCC Part 15 Subpart C (15.239)

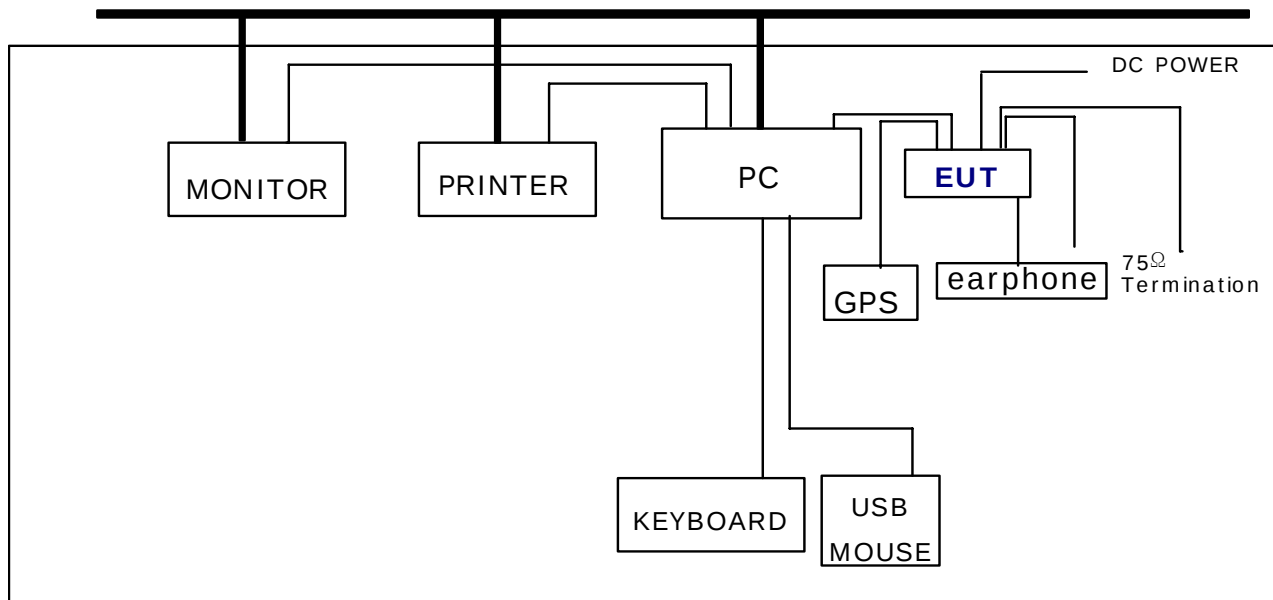
- Mode
1. Normal mp3 music file transmitting mode

4.4 Used cables

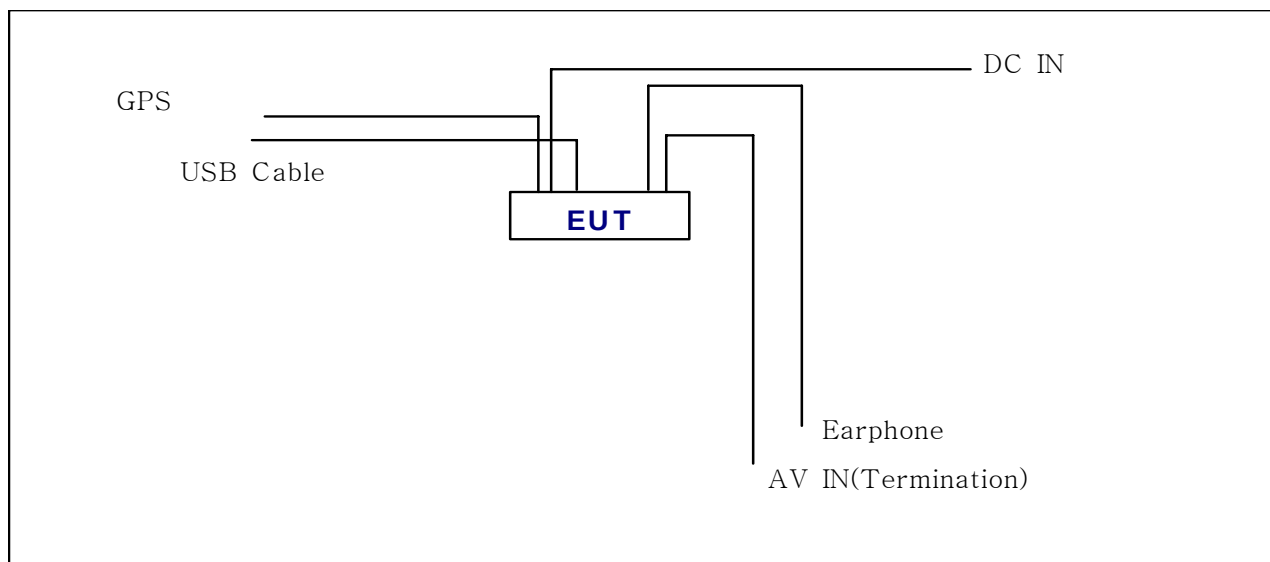
Start		END		Cable Spec.	
Name	I / O Port	Name	I / O Port	Length	Shield
EUT	COM1 cable	-	-	1.3	Unshielded
	USB cable	PC	USB	1.2	Shielded
	GPS cable	GPS	GPS cable	0.5	Unshielded
	AV IN cable	75ΩTermination	-	1.2	Shielded
	Earphone	-	-	1.2	Unshielded
	DC Power	-	-	1.3	Unshielded

4.5 E.U.T. test configuration

Mode ; MP3 File up and down



Mode ; MP3 Play, Navigation. FM transmitter



5. Summary of test results

5.1 Modification to the E.U.T.

- None

5.2 Standards & results

FCC part 15 subpart B (Class B)		
Description of test	Result	Margin
Conducted Emission	N/A	DC 12V
Radiated Emission	Complied	2.92dB

FCC part 15 subpart C (15.239)		
Description of test	Result	Margin
Conducted Emission	N/A	DC 12V
Radiated Emission	Complied	2.42dB
Occupied bandwidth	Complied	N/A
Antenna requirement	Complied	N/A

6. Test results

6.1 Conducted Emission test

6.1.1 Limit

Frequency	Limit (dB μ V)	
	Quasi-peak	Average
150KHz ~ 500KHz	66 ~ 56 *	66 ~ 56 *
500KHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

- Decreasing linearly with logarithm of the frequency
- The lower limit shall apply at the transition frequency

6.1.2 Measurement procedure

Mains

The measurements were performed in a shielded room.

EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.

The rear of table was located 0.4 m to the vertical conducted plane.

Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source.

Both lines of power cord, hot and neutral, were measured.

6.1.3 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test receiver	ESHS10	843276/003	R&S	07.05.09	☐
L.I.S.N.	ESH3-Z5	100267	R&S	07.06.17	☐
	L2-16A	0000J10705	PMM	06.11.30	☐
Test site	Shield room	-	-	-	☐

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6.1.4 Measurement uncertainty

Conducted emission measurement : (k=2, 95%)

9kHz-150 kHz : ± 3.47 [dB]

150kHz-30 MHz : ± 3.01 [dB]

6.1.5 Test data

N/A

6.1.6 Result

Not required.

Power of EUT is being supplied by a car battery.

6.2 Radiated emission

6.2.1 Limit

FREQUENCY (MHz)	Class A (at 10m) *	Class B (at 10m) *
	dBuV / m	dBuV / m
30-230	40	30
230-1000	47	37

* Detector Function : Quasi - Peak

Deviation from the Standards

This British Standard is of English language version of EN55022 : 1998.

It was derived by CENELEC from CISPR 22 : 1997.

The section 15.107 and 15.109 of FCC Part 15. As an alternative to the FCC Rules are acceptable for the CISPR 22 (EN55022).

FCC part 15 subpart C (15.239)

Frequency band (MHz)	Fundamental limits 3m measurement distance (dBuV / m)	
	Peak	AV
88 ~ 108	68	48

The field strength of any emissions which appear outside of this band shall not exceed the radiated emissions (15.209(a)).

Frequency(MHz)	Distance (meters)	Limits(dBuV / m)
30 ~ 88	3	40
88 ~ 216	3	43.5
216 ~ 960	3	46
above 960	3	54

*The tuning controls were manually adjusted to verify maximum tuning range.

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6.2.2 Measurement procedure

FCC part 15, subpart B

A pretest was performed at 3m distance in a semi-anechoic chamber for searching correct frequency. The final test was done at a 10m open area test site with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane. Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

FCC part 15 subpart C (15.239)

The radiation tests were performed at 3-meter open area test site, using the setup accordance with ANSI C63.4-2003.

The EUT was placed on the center of the test table. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

The turntable was rotated to find maximum value.(360 degrees).

6.2.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal. date	Used
Test receiver	ESVD	841729/010	R&S	07.06.02	☒
TRILOG SUPER Broadband ANT	VULB 9160	3138	SCHWAREBECK	07.10.31	☒
Antenna Mast	A109	N/A	DEAIL	-	☒
Turn Table	TS14	N/A	DEAIL	-	☒
3m OATS	-	-	EMC Compliance	-	☒

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6.2.4 Measurement uncertainty

Radiated Emission measurement : (k=2, 95%)

30-300 MHz ; 3 m: ± 3.69 [dB], 10 m: ± 3.67 [dB]

300-1000 MHz ; 3 m: ± 4.07 [dB], 10 m: ± 3.41 [dB]

6.2.5 Test data

FCC part 15 subpart B (Class B)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	angle	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
					Antenna	Cable			
MP3 file Up/Down mode									
39.70	12.3	V	1.0	214	11.58	1.77	30.0	25.65	4.35
88.00	14.7	V	1.0	230	7.86	2.39	30.0	24.96	5.04
107.60	14.3	V	1.0	360	9.99	2.60	30.0	26.89	3.11
199.80	12.1	H	4.0	25	9.24	3.47	30.0	24.81	5.19
209.50	14.0	H	4.0	246	9.52	3.56	30.0	27.08	2.92
MP3 Play mode									
108.02	24.2	V	1.3	157	10.07	1.80	43.5	36.11	7.39
209.49	23.1	H	4.0	94	9.52	2.60	43.5	35.22	8.28
345.22	18.7	H	3.4	310	13.86	3.30	46.0	35.86	10.14
699.31	12.4	V	1.0	247	20.65	5.40	46.0	38.45	7.55
Navigation mode									
108.03	27.1	H	4.0	215	10.07	1.80	43.5	38.97	4.53
269.94	23.2	H	3.8	6	11.88	3.00	46.0	38.08	7.92
294.30	22.4	H	4.0	354	12.69	3.20	46.0	38.29	7.71
437.31	14.7	H	3.8	28	16.18	3.90	46.0	34.78	11.22

* Receiving Antenna Mode : *Horizontal, Vertical*

* 10 m OATS (MP3 file Up/Down mode)

* 3 m OATS (MP3 Play mode, Navigation mode)

* Note : Reading = Test Receiver meter,

$P = \text{Polarization} \rightarrow \text{POL H} = \text{Horizontal}, \text{POL V} = \text{Vertical}$

* Result = Field Strength (Antenna factor + Cable factor + Reading)

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FCC part 15 subpart C (15.239)

Detection mode ; Peak

Frequency	Reading	Pol.	Height	angle	Correction Factor		Limits	Result	Margin
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
88.10	37.2	H	3.5	261	7.88	1.60	68.0	46.68	21.32
98.00	35.6	H	3.1	265	9.07	1.80	68.0	46.47	21.53
107.90	34.5	H	1.4	104	10.04	1.80	68.0	46.34	21.66

Detection mode ; AV

Frequency	Reading	Pol.	Height	angle	Correction Factor		Limits	Result	Margin
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
88.10	36.1	H	3.5	261	7.88	1.60	48.0	45.58	2.42
98.00	34.5	H	3.1	265	9.07	1.80	48.0	45.37	2.63
107.90	33.7	H	1.4	104	10.04	1.80	48.0	45.54	2.46

Detection mode ; Quasi-Peak

Frequency	Reading	Pol.	Height	angle	Correction Factor		Limits	Result	Margin
[MHz]	[dBuV/m]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
88.1MHz									
113.12	11.7	V	1.0	320	10.62	1.80	43.5	24.12	19.38
175.50	19.2	H	1.3	122	11.58	2.40	43.5	33.18	10.33
176.20	24.3	H	1.6	336	11.48	2.40	43.5	38.18	5.32
190.10	16.8	H	1.5	156	10.06	2.40	43.5	29.26	14.25
849.20	9.3	H	1.7	241	22.91	5.90	46.0	38.11	7.89
98.0MHz									
190.10	17.2	H	1.2	63	10.06	2.40	43.5	29.66	13.85
196.00	13.1	H	1.7	11	9.43	2.40	43.5	24.93	18.57
500.50	12.5	H	1.5	127	17.21	4.40	46.0	34.11	11.89
599.30	17.1	H	3.2	122	19.53	4.80	46.0	41.43	4.57
699.30	12.7	H	1.5	159	20.68	5.40	46.0	38.78	7.22

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107.9MHz									
140.65	14.1	H	2.2	97	12.85	2.10	43.5	29.05	14.45
190.10	17.9	H	2.2	54	10.06	2.40	43.5	30.36	13.15
215.80	15.2	H	1.6	183	9.71	2.60	43.5	27.51	15.99
699.30	12.8	H	1.5	147	20.68	5.40	46.0	38.88	7.12
745.90	11.8	H	2.5	166	21.85	5.50	46.0	39.15	6.85

* Receiving Antenna Mode : P= Polarization → POL H = Horizontal, POL V =Vertical

* 3m OATS

* IF Bandwidth : 120kHz

* Note : Reading = Test Receiver meter,

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.2.6 Result

Complied

6.3 Occupied Bandwidth

6.3.1 Limit

Emissions from the intentional radiator shall be confined within a band of 200kHz Wide centered on the operating frequency.

6.3.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal. date	Used
EMC Analyzer	E7401A	US38460066	Agilent	07.04.07	☒

6.3.3 Measurement procedure

The EUT was placed on a turn table which is 0.8m above ground plane.

Set the spectrum analyzer as follow.

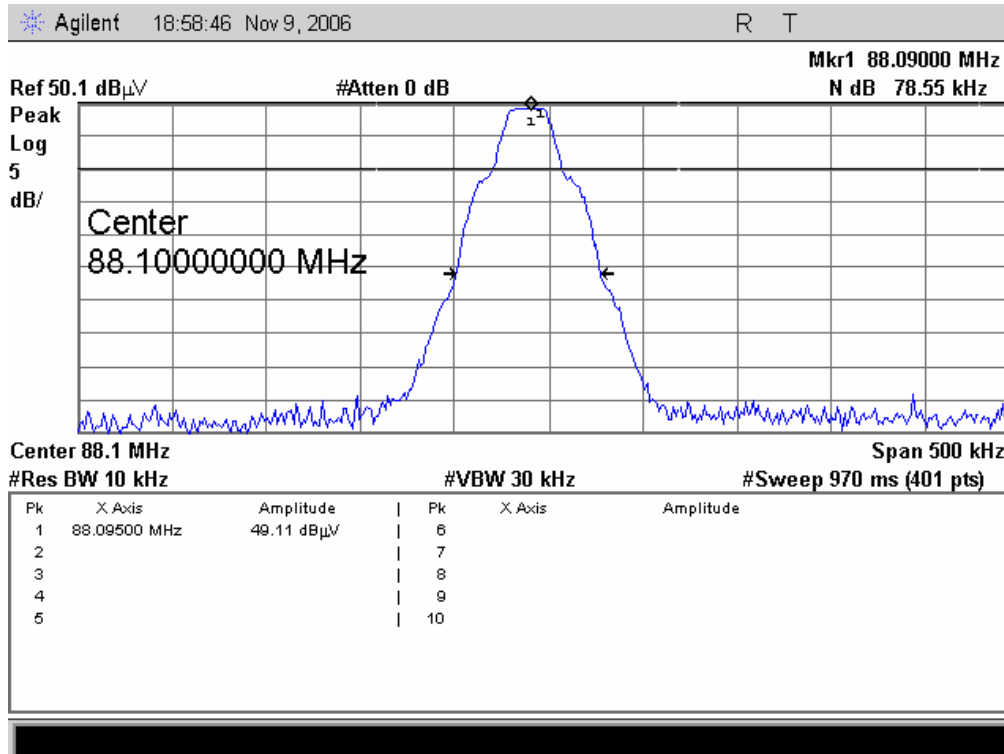
R.B.W : 10 kHz

V.B.W : 30 kHz

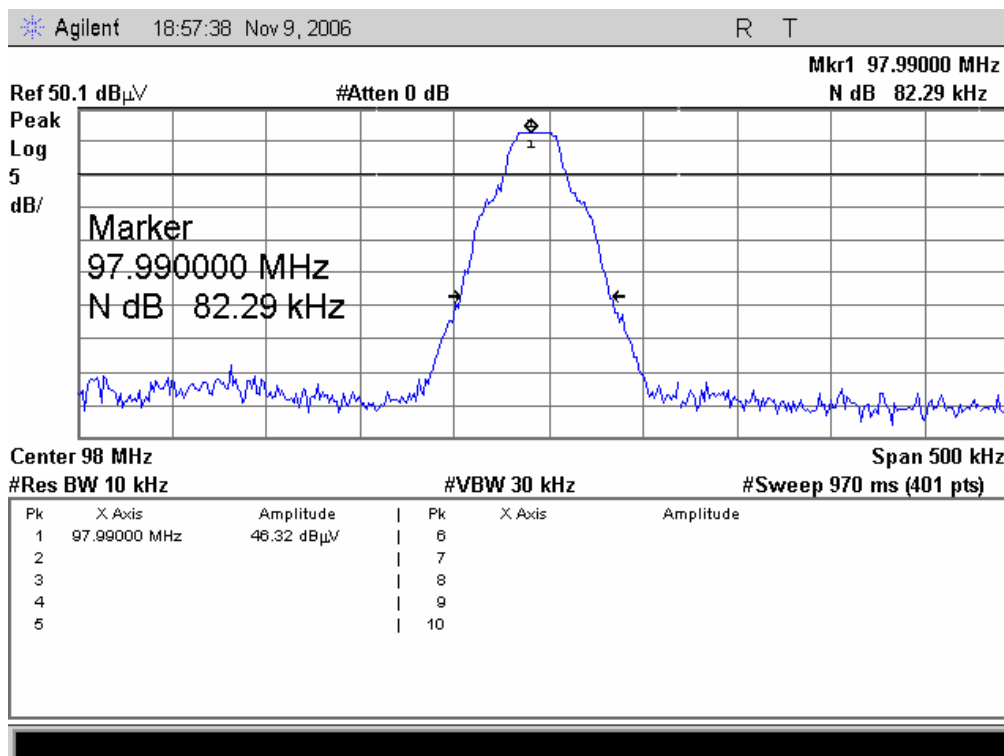
Measured the spectrum width with Maximum power.

6.3.4 Test data

88.1MHz



98.0MHz

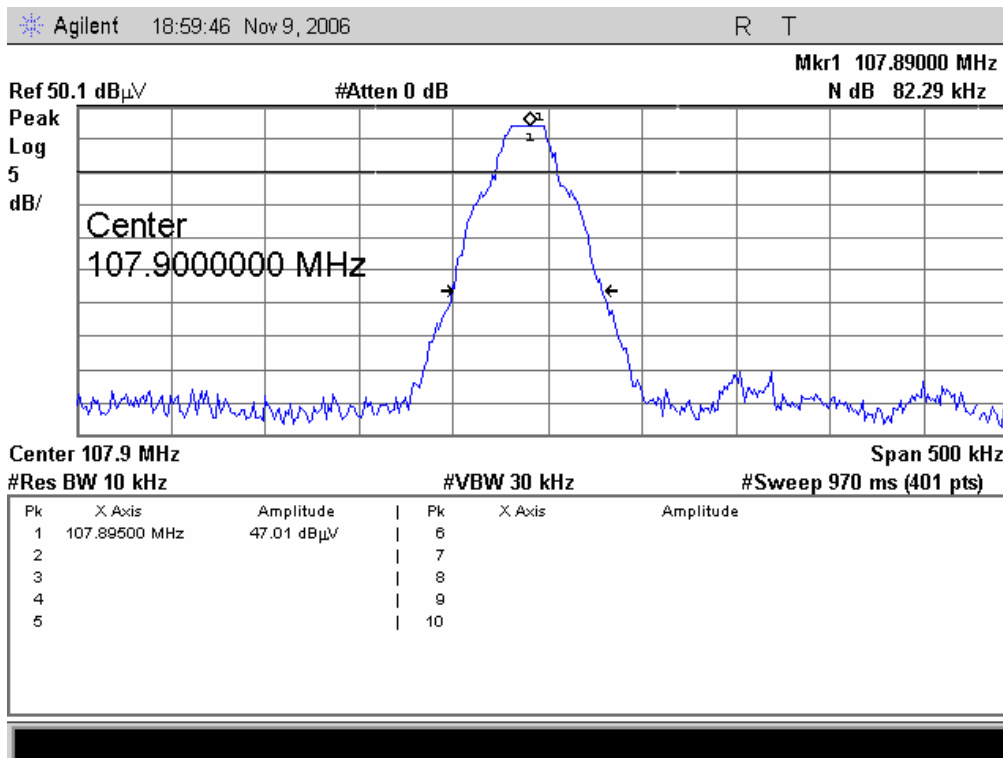


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107.9MHz



6.3.5 Result

Complied

*Measurements have been done with typical audio file.
(Normal mp3 music file)

*Measurements have been done with maximum output level on the
audio device.

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6.4 Antenna requirement

6.4.1 Requirement

According to section 15.203, an international radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna construction ; Complied

Antenna of the EUT is not replaceable by the user. Antenna is pattern of the printed circuit board.

6.5 Tuning controls

*MIN(88.1MHz)



*STEP(100KHz)



*MAX(107.9MHz)



* The tuning range is 88.1 ~ 107.9MHz, (100KHz step)
setting as program firmware
the frequency can be controlled manually.
the frequency range is 88.1~107.9

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