

Test Report

Electromagnetic Compatibility



DAT- P-121 / 02-00

Test report file no: E-0017-1436-09 JP
Applicant: SEIKAKU TECHNICAL GROUP LIMITED
Unit 1107 BLK.A2, Yau Tong Industrial City
.No.17, Ko Fai Road, Kowloon
HONG KONG

Model: DMT-300LV
Kind of Product: Wireless Microphone
Manufacturer: Same as applicant

Test result Emission tests: Compliance with FCC Part 74 Subpart H

Date of issue: 2004-December-08

The testresult only responds to the tested sample.
It is not allowed to copy this report partly without the allowance of the test laboratory.

DIRECTORY

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IDENTIFICATION OF THE TEST LABORATORY

Company name: *emitel* AG

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FCC Registration number: 765810

DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT):

Date of receipt of test sample: according to the storage records of emitel AG

Testing Start Date: 2004-10-06

Testing End Date: 2004-11-14

Number of received/tested samples: 4 samples DMT-300LV

Serial Number: none

FCC-ID: H38DMT-300LV

Voltage consumption: 3V DC Battery supplied

Product status:

- Development Sample
- Preproduction Sample
- Production Sample

Dimensions: L x W x H 65mm x 25mm x 110mm

Following system devices and were connected during the measurement:

Following cables were connected with the EUT during the measurement:

Microphone cable, Type LM-10, Length: 1m, Part of EUT

OPERATION MODES

OPERATION MODES:

TX-mode, lowest channel 175.00MHz
center channel 192.82MHz
highest channel 214.82MHz

EUT MONITORING

Receiver connection display observed

ENVIRONMENTAL CONDITIONS

Temperature 20 °C
Humidity 50 %
Atmospheric pressure: 860-1060 mbar

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report according to NIS 81 /5.1994 „The Treatment of Uncertainty in EMC Measurements“ and is documented in the emitel quality system according to EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

TEST SPECIFICATION

The tests were performed according to the following specifications:

- FCC Part 74 Subpart H Code of Regulations Part 74 – Experimental radio, auxiliary, special broadcast and other program distributional services
Subpart H- Low power auxiliary Stations
- ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz - 40 GHz 2001

FCC Part 74 Subpart H

Specification	Result	Remarks
§74.861 §2.1055(a)(1) §2.1055(d)(2) Frequency stability	limit kept	
§74.861(e)(1)(i) Output power	limit kept	
§2.1047(a) Modulation characteristics	limit kept	
§74.861(e)(5) §2.1049(c)(1) Channel Bandwidth	limit kept	
§74.861(e)(6) Fieldstrength of emission	limit kept	
§15.207 Conducted emission	N/A	EUT is battery supplied

SUMMARY:

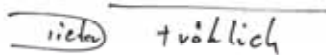
FINAL JUDGEMENT

The tested sample meets the requirements according to the technical regulations of

**Code of Regulations Part 74 Subpart H(Low Power Auxiliary Stations)
of the Federal Communication Commission (FCC)**

Straubing, 2004-December-08

emitel AG



Dieter Fröhlich
Dipl. Ing. (FH)
Director

Test engineer:



Jürgen Pessinger

FREQUENCY STABILITY

According to §74.861, §2.1055(a)(1), §2.1055(d)(2)

MEASUREMENT PROCEDURE

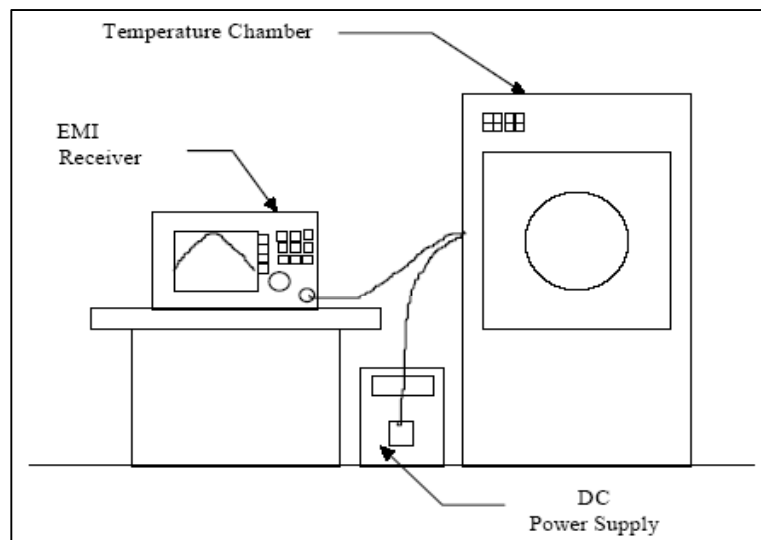
A) Frequency stability versus environmental temperature

1. Testsetup according to figure below. Set the environmental chamber to 20°C. After a temperature stabilization period of approximately 30 min turn on the device and take the reference frequency.
2. Set the chamber to 50°C. After a temperature stabilization period of approximately 30 min turn on the device again and record the operating frequency.
3. Repeat step 2 with a 10°C decreased temperature per stage until a temperature of -30°C is reached.

B) Frequency stability versus input voltage

1. Testsetup according to figure below. Set the environmental chamber to 20°C.
2. For only battery operated device, supply the EUT primary voltage at the battery operating end point which is specified by the manufacturer and record the operating frequency.

TESTSETUP



Reference number(s) of test equipment used (for reference see test equipment list):

1023, 1048, 1060, 1067

A) Frequency stability versus environmental temperature

lowest channel

reference frequency [MHz]: 175,0095

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	3	175,0057	-0,0022%	0,0050%
40	3	175,0077	-0,0010%	0,0050%
30	3	175,0082	-0,0007%	0,0050%
20	3	175,0091	-0,0002%	0,0050%
10	3	175,0102	0,0004%	0,0050%
0	3	175,0127	0,0018%	0,0050%
-10	3	175,0164	0,0039%	0,0050%
-20	3	175,0178	0,0047%	0,0050%
-30	3	175,0178	0,0048%	0,0050%

center channel

reference frequency [MHz]: 199,8160

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	3	199,8163	0,0002%	0,0050%
40	3	199,8177	0,0009%	0,0050%
30	3	199,8167	0,0004%	0,0050%
20	3	199,8166	0,0003%	0,0050%
10	3	199,8183	0,0012%	0,0050%
0	3	199,8224	0,0032%	0,0050%
-10	3	199,8237	0,0039%	0,0050%
-20	3	199,8243	0,0042%	0,0050%
-30	3	199,8258	0,0049%	0,0050%

highest channel

reference frequency [MHz]: 214,8229

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	3	214,8188	-0,0019%	0,0050%
40	3	214,8205	-0,0011%	0,0050%
30	3	214,8227	-0,0001%	0,0050%
20	3	214,8149	-0,0037%	0,0050%
10	3	214,8259	0,0014%	0,0050%
0	3	214,8283	0,0025%	0,0050%
-10	3	214,8304	0,0035%	0,0050%
-20	3	214,8329	0,0047%	0,0050%
-30	3	214,8336	0,0050%	0,0050%

B) Frequency stability versus input voltage

Battery operating end point specified by manufacturer [Vdc]: not specified

lowest channel reference frequency [MHz]: 175,0095

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	2,25	175,0066	-0,0016%	0,0050%
20	1,5	175,0064	-0,0018%	0,0050%

center channel reference frequency [MHz]: 199,8160

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	2,25	199,8142	-0,0009%	0,0050%
20	1,5	199,8131	-0,0015%	0,0050%

highest channel reference frequency [MHz]: 214,8229

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	2,25	214,8176	-0,0025%	0,0050%
20	1,5	214,8186	-0,0020%	0,0050%

TEST RESULT:

The requirements are: **MET**

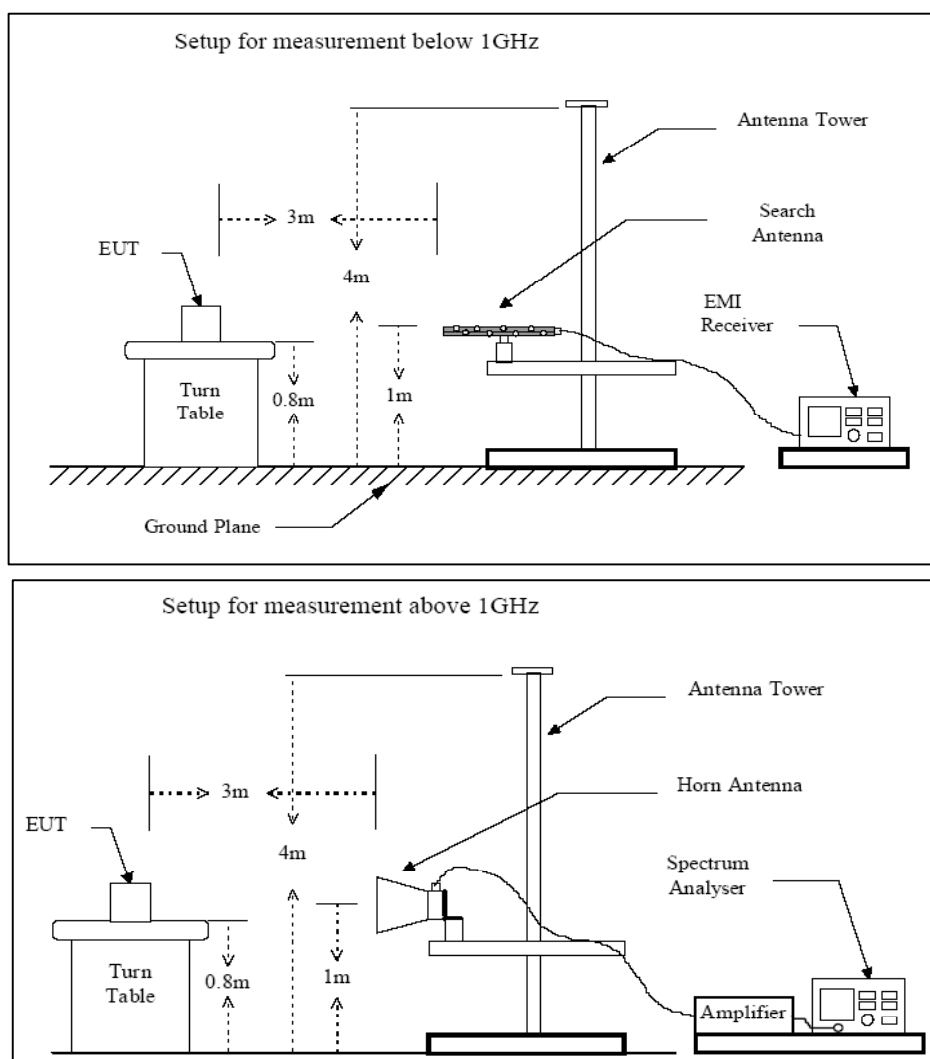
REMARKS:

OUTPUT POWER

According to §74.861(e)(1)(i)

Measurement Procedure:

1. Testsetup to the figures below. The EMI receiver is set to 120kHz resolution bandwidth and CISPR quasi peak function for measurement below 1GHz. For measurement above 1GHz the spectrum analyser is set to 100kHz resolution bandwidth and to average detector.
2. The EMI receiver/spectrum analyser is adjusted to the transmitting frequency. The Antenna is set to horizontal polarization.
3. During the test the EUT is rotated from 0° to 360° and the measurement antenna is raised and lowered from 1m to 4m to find the maximum output power.
4. Set the antenna to vertical polarization and repeat step 3.
5. The highest level shall be recorded.



Reference number(s) of test equipment used (for reference see test equipment list):
1002, 1005, 1012, 1013, 1020, 1021, 1032, 1043, 1044

Rated maximum radiated power:

10 mW

lowest CH

frequency [MHz]	polarization	output power [mW]	limit [mW]	outputpower [dB]	limit [dB]
175,00	vertical	0,22	50	-6,6	16,99

center CH

frequency [MHz]	polarization	output power [mW]	limit [mW]	outputpower [dB]	limit [dB]
199,82	vertical	0,20	50	-6,9	16,99

highest CH

frequency [MHz]	polarization	output power [mW]	limit [mW]	outputpower [dB]	limit [dB]
214,82	vertical	0,21	50	-6,7	16,99

TEST RESULT:

The requirements are:

MET

REMARKS:

Transmitter operated unmodulated.

MODULATION CHARACTERISTICS

According to §2.1047(a)

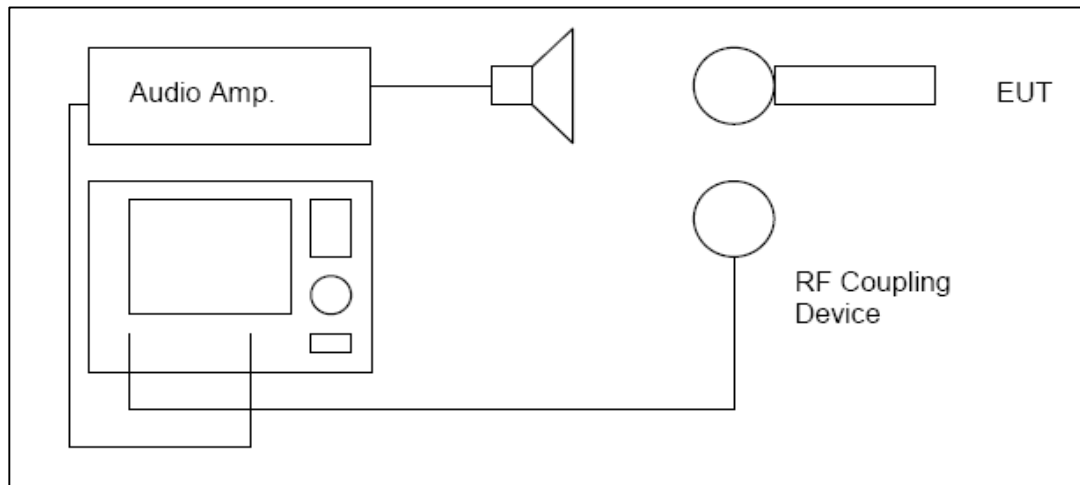
Measurement Procedure:

A) Audio Frequency Response

1. The audio signal was coupled to the microphone via a calibrated loudspeaker.
2. The level of the 1kHz audio signal was adjusted to create 20% of the nominal modulation.
3. The audio signal was varied from 100Hz to 30kHz, while the level was held constant.
4. The response was measured and recorded
5. The measurement was performed for positive and negative deviation.

B) Modulation Limiting

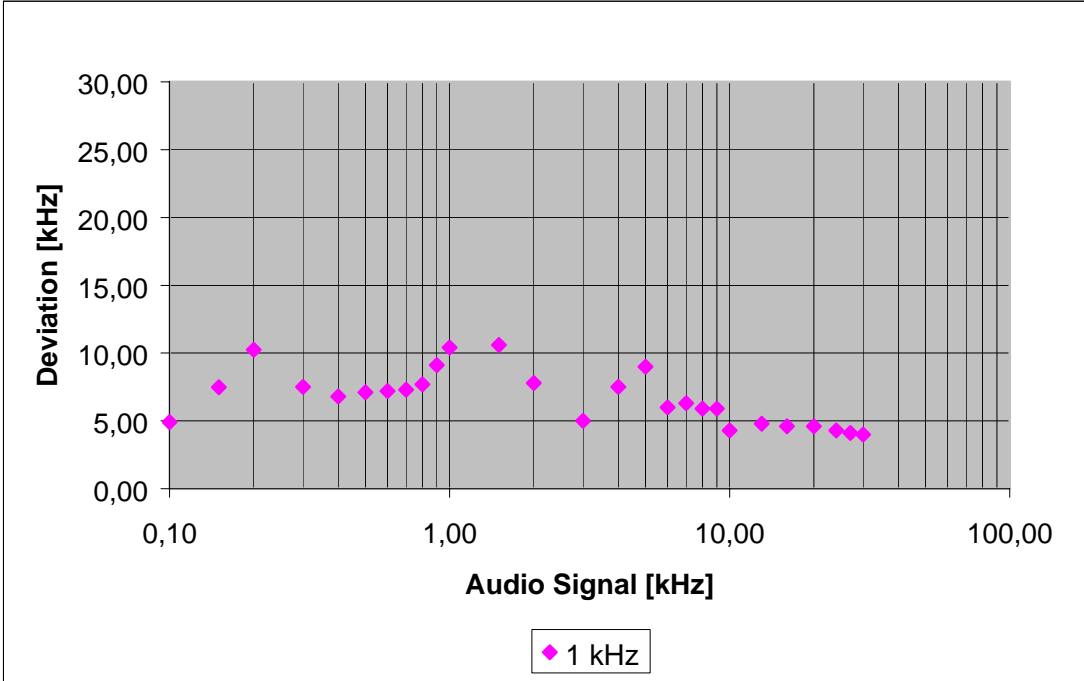
1. The audio signal was coupled to the microphone via a calibrated loudspeaker.
2. The modulation response was measured from 100Hz to 15kHz including the frequency with maximum response found during "Audio Frequency Response Test".
3. The input level was varied from the level which creates 30% of the nominal modulation to 20dB higher than the saturation point. The resulting deviation was recorded.
4. The measurement was performed for positive and negative deviation.



Reference number(s) of test equipment used (for reference see test equipment list):

1001, 1015, 1023, 1045, 1049, 1059

A) Audio Frequency Response

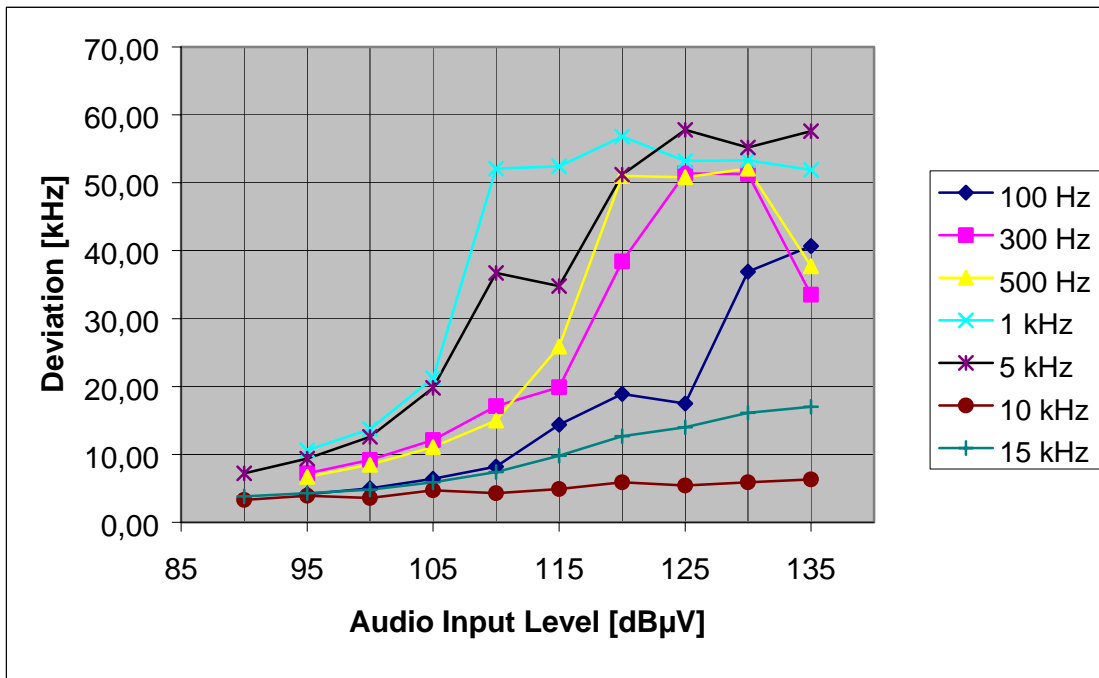


TEST RESULT:

The requirements are: **MET**

REMARKS:

B) Modulation Limiting



TEST RESULT:

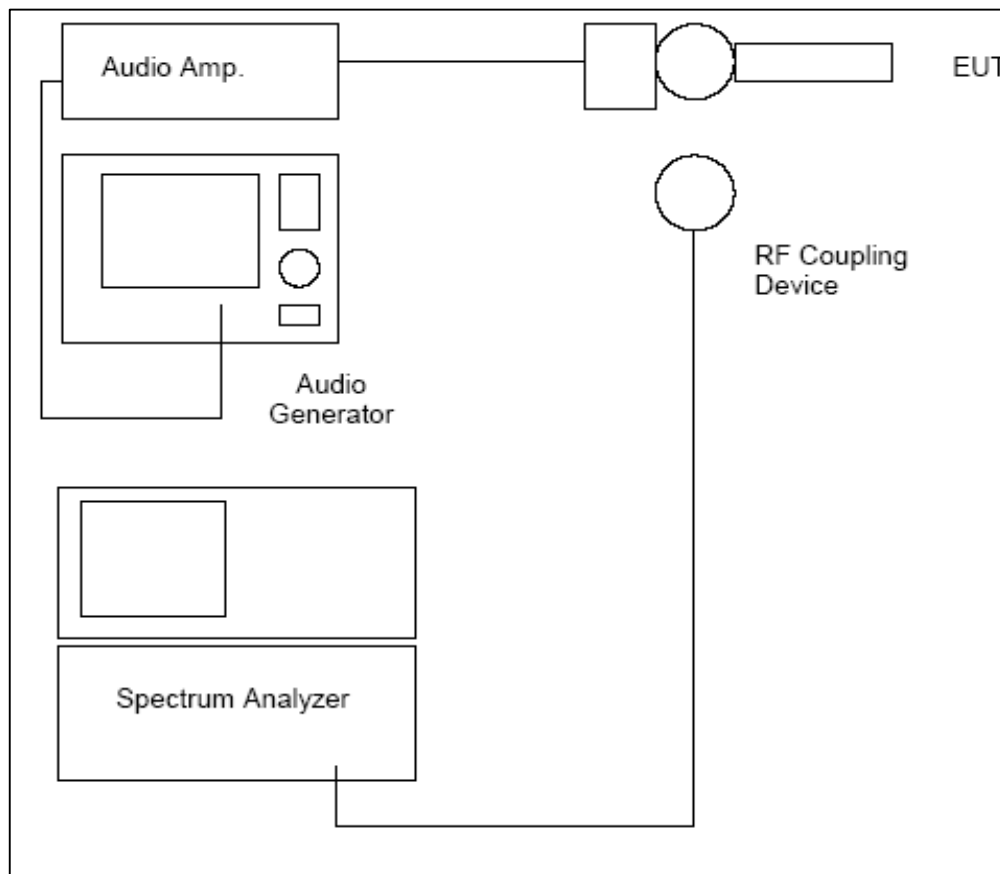
The requirements are: **MET**

REMARKS:

CHANNEL BANDWIDTH

According to §74.861(e)(5), §2.1049(c)(1)

1. EUT and testequipment were set up as shown below.
2. Turn on the EUT measure the highest peak value and set the reference level of the spectrum analyser to a level which is equal to the highest peak value.
3. Apply a 2.5kHz signal to the EUT. The level of the modulation signal shall be 16dB above the level which creates 50% of nominal modulation. Record the occupied channel bandwidth.



Reference number(s) of test equipment used (for reference see test equipment list):
1015, 1020, 1023, 1046, 1048, 1059

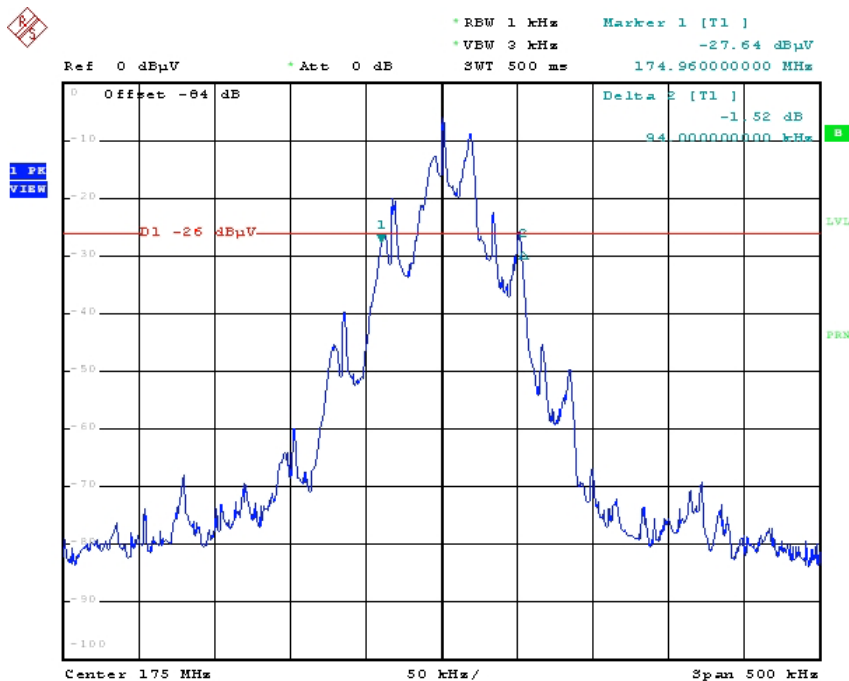
TESTRESULTS:

Channel	bandwidth [kHz]	Limit [kHz]	requirements are
lowest CH	94	200	MET
center CH	30	200	MET
highest CH	30	200	MET

REMARKS:

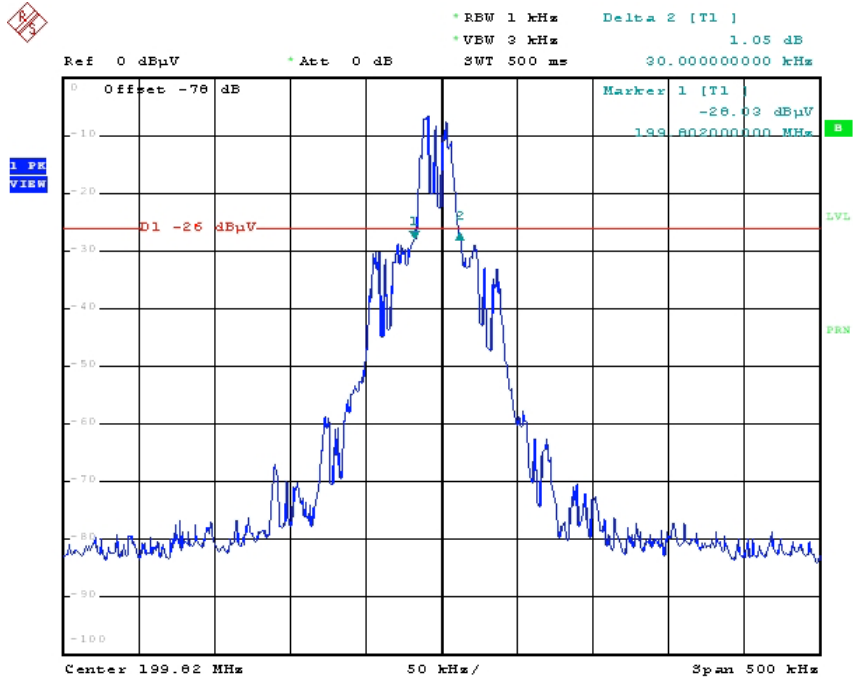
For detailed results pay attention to attached charts.

chart for lowest CH



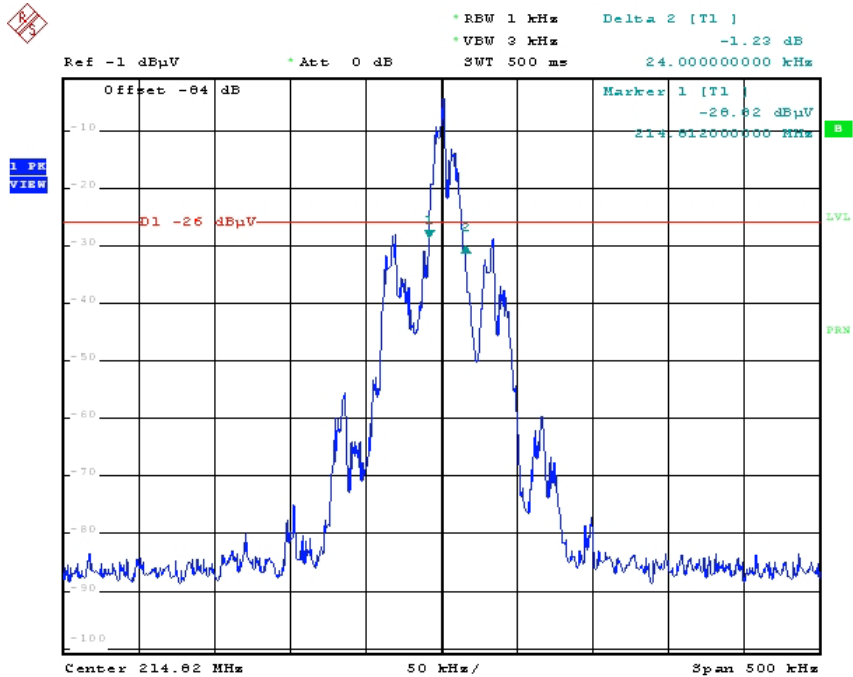
Date: 5.NOV.2004 14:26:22

chart for center CH



Date: 5.NOV.2004 14:21:44

chart for highest CH



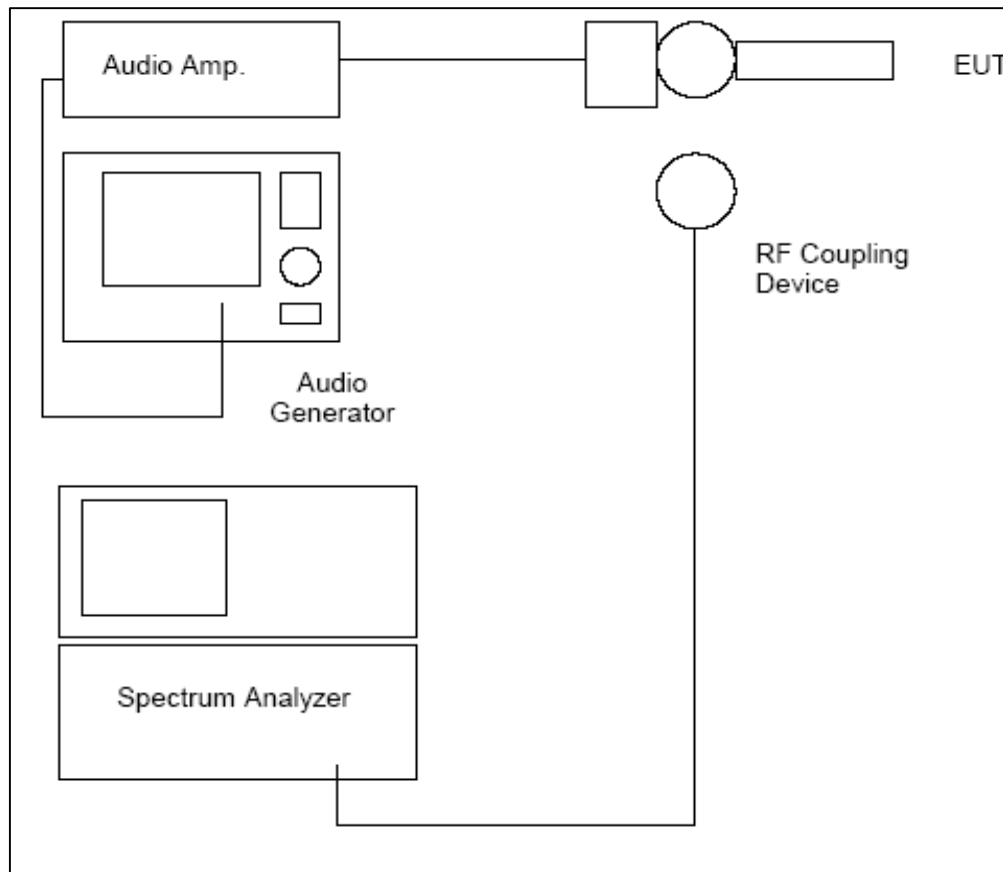
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FIELDSTRENGTH OF EMISSION

EMISSION NEAR THE CARRIER

According to §74.861(e)(6)(i),(ii),(iii)

1. EUT and testequipment were set up as shown below.
2. Turn on the EUT measure the highest peak value and set the reference level of the spectrum analyser to a level which is equal to the highest peak value.
3. Apply a 2.5kHz signal to the EUT. The level of the modulation signal shall be 16dB above the level which creates 50% of nominal modulation. Record the founded emissions.



Reference number(s) of test equipment used (for reference see test equipment list):

1015, 1020, 1023, 1046, 1048, 1059

LIMITS

Frequency range	Limit (below max mean power)
fnom +/- 100kHz to +/- 200kHz	25 dB
fnom +/- 200kHz to +/- 500kHz	35 dB
fnom +/- more than 500kHz	6,4 dB

calculation for fnom +/- more than 500kHz:

$$43+10\log_{10}(\text{mean outputpower in watts}) \text{ dB}$$

insert maximum mean output power

$$43+10\log_{10}(0,22 \text{ mW}) \text{ dB} = 6,4 \text{ dB}$$

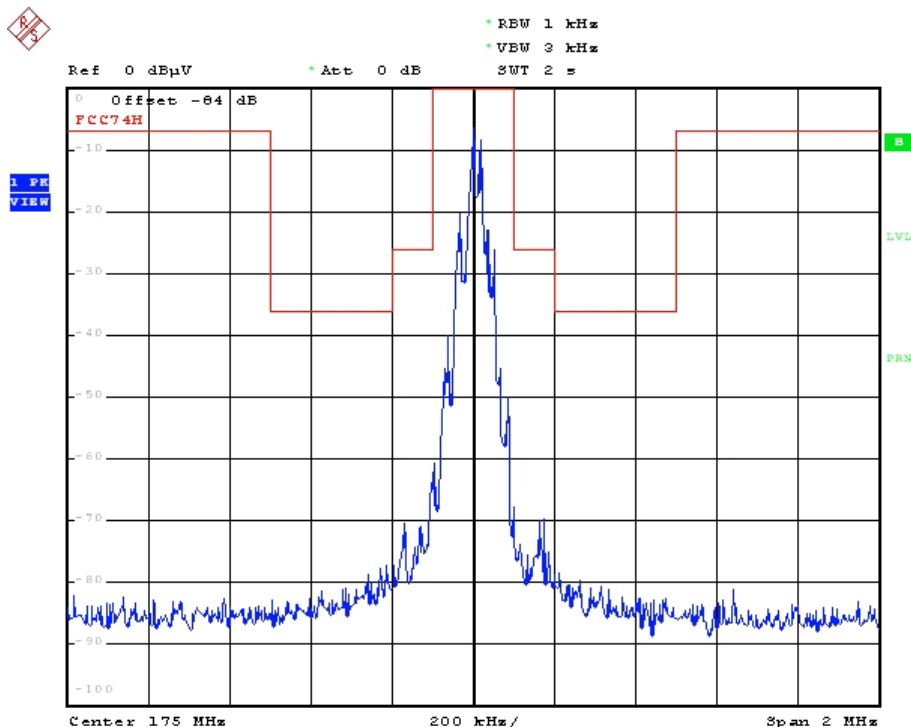
TESTRESULTS:

The requirements are: **MET**

REMARKS:

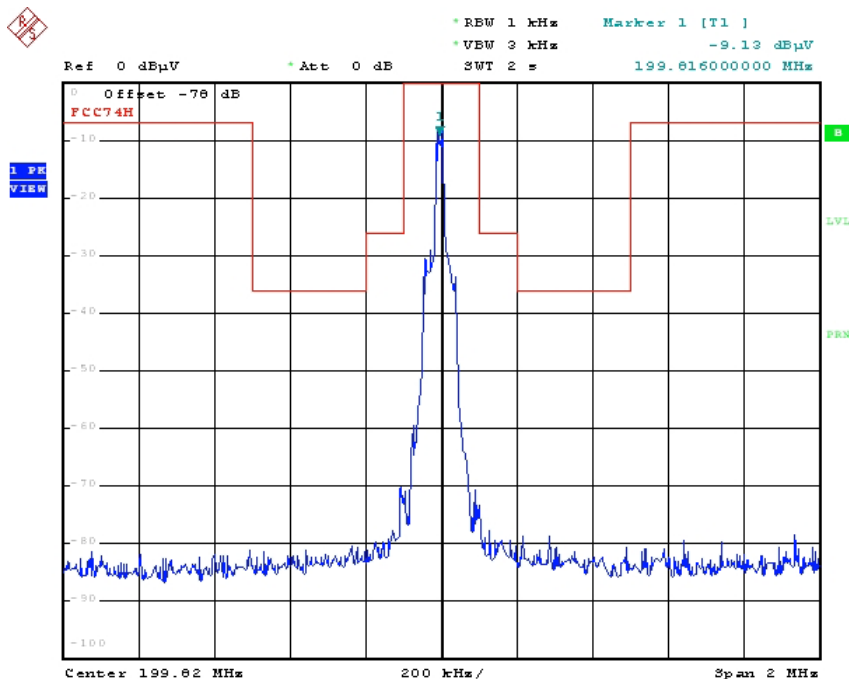
For detailed results pay attention to attached charts.

chart for lowest CH



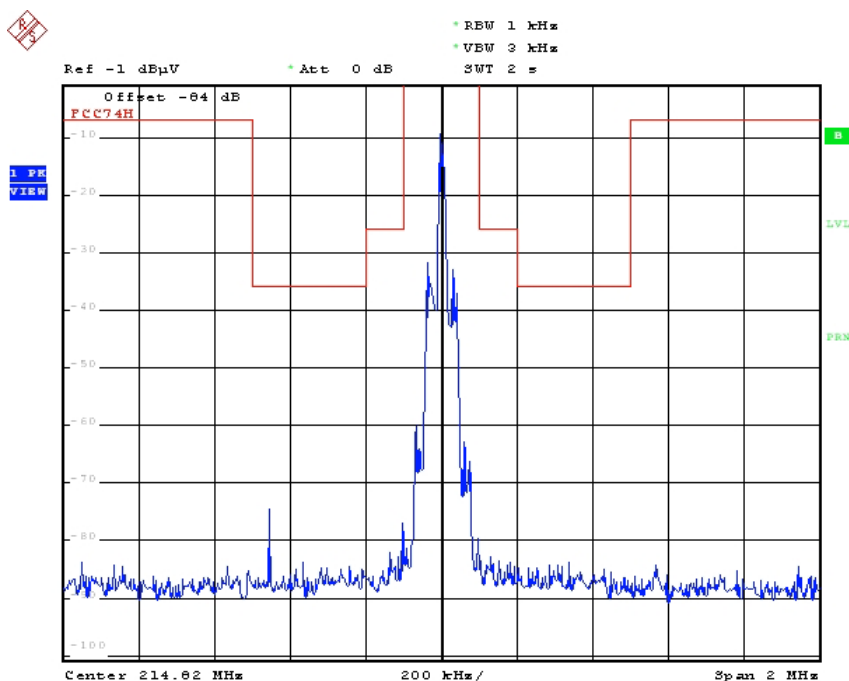
Date: 5.NOV.2004 14:27:41

chart for center CH



Date: 5.NOV.2004 14:19:41

chart for highest CH



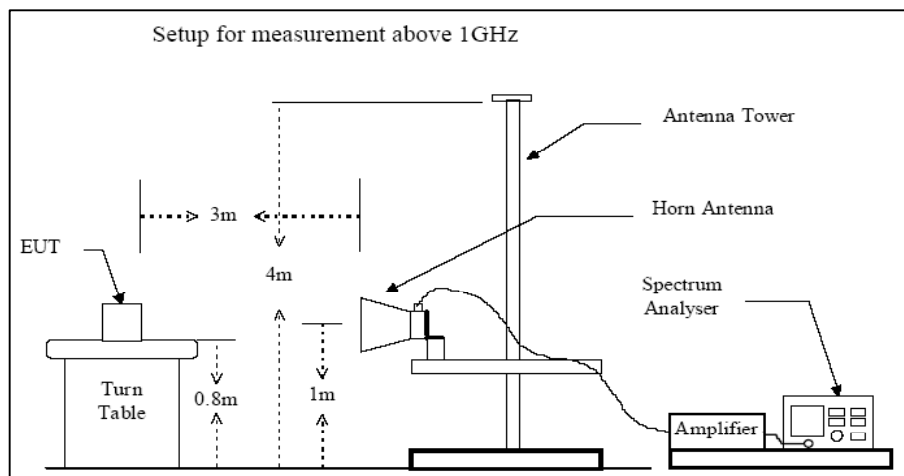
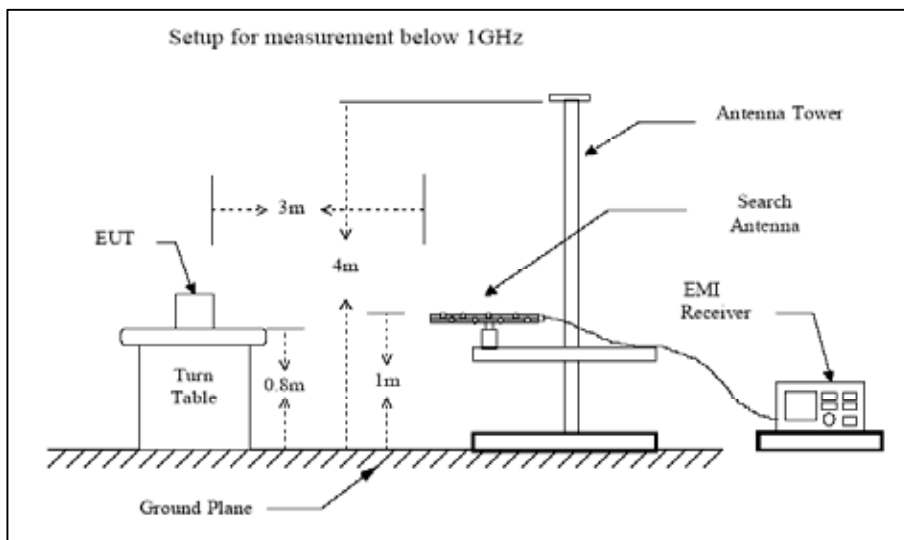
Date: 5.NOV.2004 14:15:26

GENERAL EMISSIONS

According to §74.861(e)(6)(iii)

Measurement Procedure:

1. Testsetup to the figures below. The EMI receiver is set to 120kHz resolution bandwidth and CISPER quasi peak function for measurement below 1GHz. For measurement above 1GHz the spectrum analyser is set to 100kHz resolution bandwidth and to average detector.
2. The EMI receiver/spectrum analyser is adjusted to the transmitting frequency. The Antenna is set to horizontal polarization.
3. During the test the EUT is rotated from 0° to 360° and the measurement antenna is raised and lowered from 1m to 4m to find the maximum output power.
4. Set the antenna to vertical polarization and repeat step 3.
5. The highest level shall be recorded.



Reference number(s) of test equipment used (for reference see test equipment list):

1002, 1005, 1012, 1013, 1020, 1021, 1032, 1043, 1044

Limit calculation:

max unmodulated carrier power (in dBm) - $[43+10\log_{10}(\text{max unmodulated carrierpower (in Watts)})]$ dB

Radiated emissions 30MHz - 2.5GHz

Results lowest channel

Frequency [MHz]	Reading [dBμV]	Correction [dB]	Value [dBm]	Limit [dBm]
218,76	13,7	-78,3010	-64,6	-13,0
350,01	15,5	-72,8663	-57,4	-13,0

Results center channel

Frequency [MHz]	Reading [dBμV]	Correction [dB]	Value [dBm]	Limit [dBm]
216,47	4,5	-75,6010	-71,1	-13,0
249,77	7,2	-76,0600	-68,9	-13,0
399,63	2,9	-74,8000	-71,9	-13,0

Results highest channel

Frequency [MHz]	Reading [dBµV]	Correction [dB]	Value [dBm]	Limit [dBm]
232,73	15,8	-77,3206	-61,5	-13,0
268,53	6,3	-75,5892	-69,3	-13,0

Example for calculation of the values:

$$\text{Value [dBm]} = \text{Reading [dBµV]} + \text{Correction [dB]}$$

TEST RESULT:

The requirements are: **MET**

REMARKS:

PHOTO TESTSETUP RADIATED EMISSION



PHOTOGRAPHS OF THE EQUIPMENT UNDER TEST

Photo No. 1

TOP VIEW OF EUT



Photo No. 2

BOTTOM VIEW OF EUT



Photo No. 3

BOTTOM VIEW OF EUT REMOVED BATTERYCOVER



Photo No. 4

DISASSEMBLED EUT



Photo No. 5
TOP VIEW OF PCB

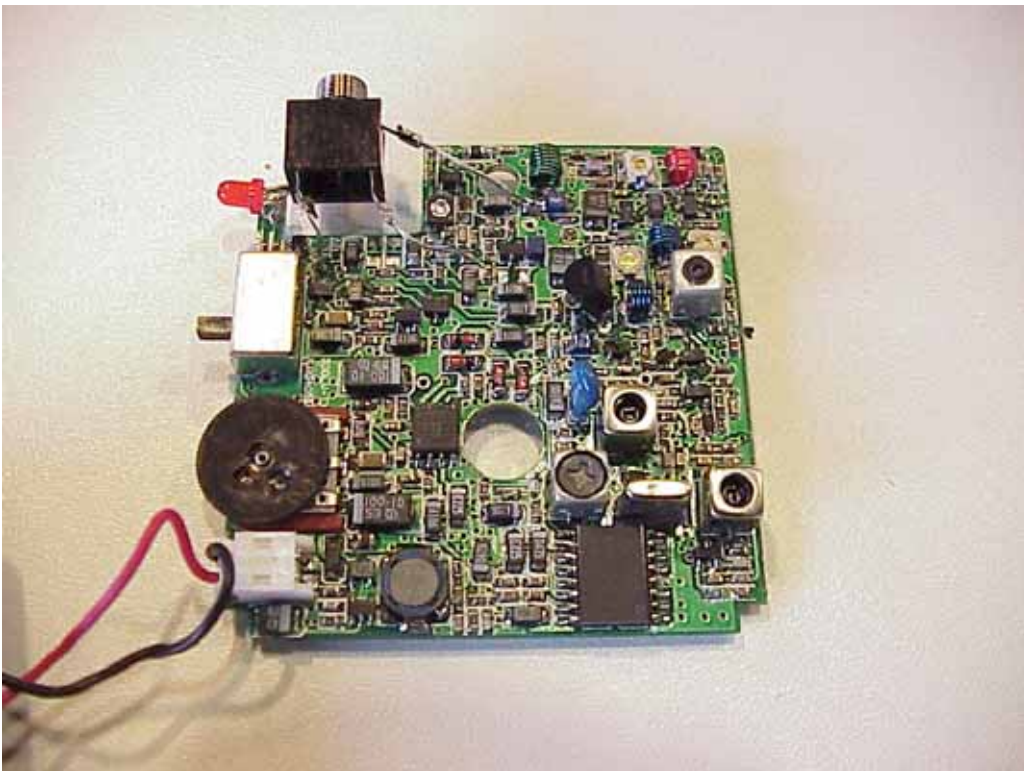


Photo No. 6

BOTTOM VIEW OF PCB

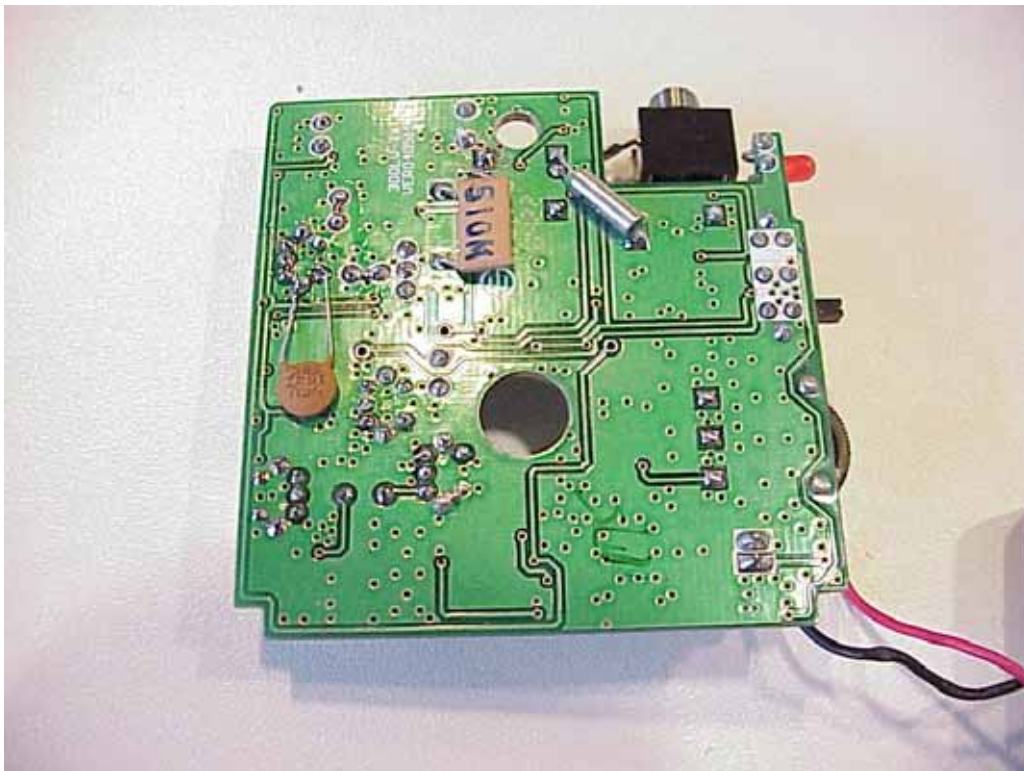


Photo No. 7

Microphone cable LM-10

