

Test Report

Electromagnetic Compatibility



DAT- P-121 / 02-00

Test report file no:
Applicant:

E-0017-1590-08 JP
Sam Ash Music Corporation
262 Duffy Avenue Hicksville
NY 11801
United States

Model:

CT7

Kind of Product:

Wireless Microphone Transmitter (worn on body)

Manufacturer:

Same as applicant

Test result Emission tests:

Compliance with FCC Part 74 Subpart H

Date of issue:

2005-June-16

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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eMail: germany@emitel.de
Homepage: www.emitel.de

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: 2005-04-14

Testing End Date: 2005-04-26

Number of received/tested samples: 1

Serial Number: none

FCC-ID: CCRCT7

Voltage consumption: 9V DC battery supplied

Product status:

- ☐ Development Sample
- ☒ Preproduction Sample
- ☐ Production Sample

Dimensions(without antenna): L x W x H 70mm x 35mm x 105mm

Following system devices and were connected during the measurement:

none

Following cables were connected with the EUT during the measurement:

Microphone cable, length: 1m, Part of EUT

OPERATION MODES

OPERATION MODES:

TX mode : lowest channel U1 at 801.375MHz
 center channel U3 at 803.125MHz
 highest channel U6 at 804.750MHz

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 2003

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:

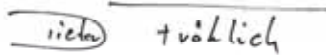
FINAL JUDGEMENT

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, 2005-June-16

emitel AG



Dieter Fröhlich
Dipl. Ing. (FH)
Director

Test engineer:


Jürgen Pessinger

FREQUENCY STABILITY

According to §74.861(e)(4), §2.1055(a)(1), §2.1055(d)(2)

MEASUREMENT PROCEDURE

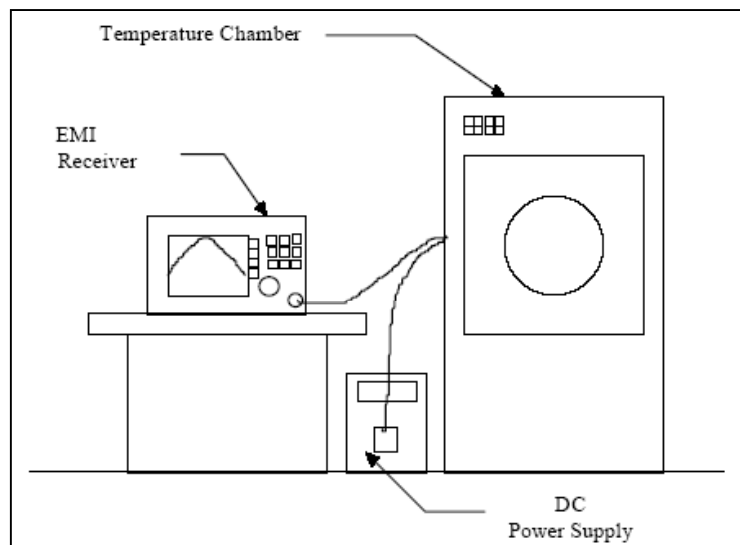
A) Frequency stability versus environmental temperature

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

U1 lowest CH reference frequency [MHz]: 801,3750

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	9	801,3428	-0,0040%	0,0050%
40	9	801,3424	-0,0041%	0,0050%
30	9	801,3429	-0,0040%	0,0050%
20	9	801,3443	-0,0038%	0,0050%
10	9	801,3456	-0,0037%	0,0050%
0	9	801,3461	-0,0036%	0,0050%
-10	9	801,3468	-0,0035%	0,0050%
-20	9	801,3458	-0,0036%	0,0050%
-30	9	801,3416	-0,0042%	0,0050%

U3 center CH reference frequency [MHz]: 803,1250

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	9	803,0925	-0,0040%	0,0050%
40	9	803,0923	-0,0041%	0,0050%
30	9	803,0938	-0,0039%	0,0050%
20	9	803,0946	-0,0038%	0,0050%
10	9	803,0957	-0,0036%	0,0050%
0	9	803,0964	-0,0036%	0,0050%
-10	9	803,0964	-0,0036%	0,0050%
-20	9	803,0945	-0,0038%	0,0050%
-30	9	803,0916	-0,0042%	0,0050%

U6 highest CH reference frequency [MHz]: 804,7500

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
50	9	804,7176	-0,0040%	0,0050%
40	9	804,7173	-0,0041%	0,0050%
30	9	804,7176	-0,0040%	0,0050%
20	9	804,7192	-0,0038%	0,0050%
10	9	804,7208	-0,0036%	0,0050%
0	9	804,7215	-0,0035%	0,0050%
-10	9	804,7217	-0,0035%	0,0050%
-20	9	804,7207	-0,0036%	0,0050%
-30	9	804,7719	0,0027%	0,0050%

B) Frequency stability versus input voltage

Battery operating end point specified by manufacturer [Vdc]:

4,1

U1 lowest CH

reference frequency [MHz]: 801,3750

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	6,75	801,3446	-0,0038%	0,0050%
20	5,85	801,3447	-0,0038%	0,0050%
20	4,1	801,3451	-0,0037%	0,0050%

U3 center CH

reference frequency [MHz]: 803,1250

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	6,75	803,0944	-0,0038%	0,0050%
20	5,85	803,0946	-0,0038%	0,0050%
20	4,1	803,0951	-0,0037%	0,0050%

U6 highest CH

reference frequency [MHz]: 804,7500

temperature [°C]	power supply [Vdc]	measured frequency [MHz]	frequency tolerance	limit
20	6,75	804,7194	-0,0038%	0,0050%
20	5,85	804,7195	-0,0038%	0,0050%
20	4,1	804,7200	-0,0037%	0,0050%

TEST RESULT:

The requirements are: **MET**

REMARKS:

OUTPUT POWER

According to §74.861(e)(1)(i)

Measurement Procedure:

1. The measurement is performed at an OATS which is in accordance with ANSI C63.4 2003.
2. For final measurement a frequency dependent correction factor is calculated based on substitution method. Instead of the EUT an Antenna is placed which is connected to a signal generator. A specified power level is given to the antenna.

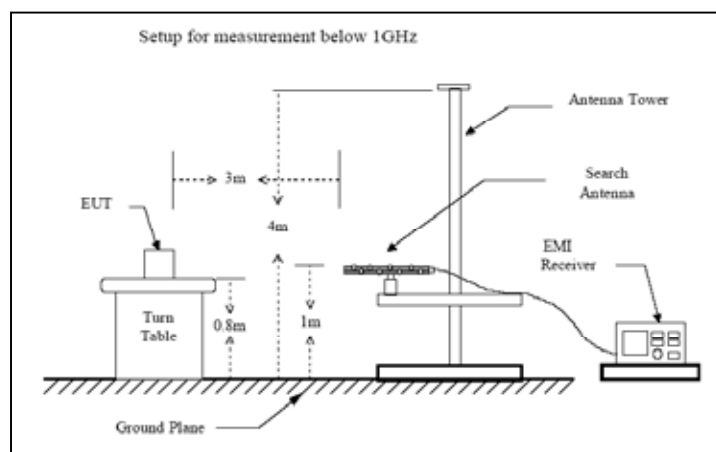
$$\text{power level at antenna [dBm]} = \text{signal generator level [dBm]} + \text{antenna gain [dB]} - \text{cable loss [dB]}$$

The antenna is raised and lowered until the maximum reading value is obtained. With this reading and the known power level at the antenna the correction factor is calculated.

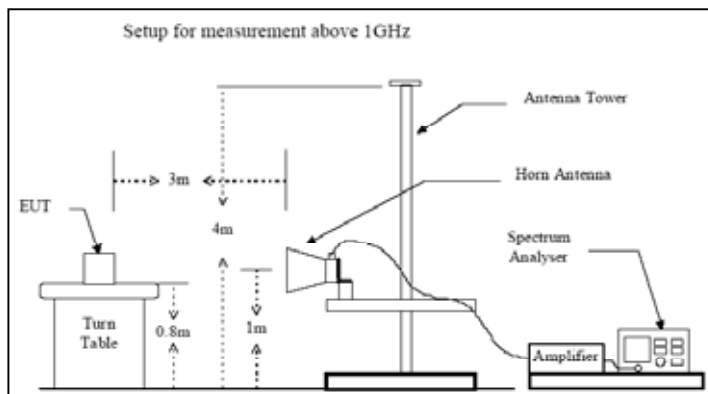
$$\text{correction factor [dB]} = \text{power level at antenna [dBm]} - \text{reading of receiver [dB}\mu\text{V]}$$

This procedure is performed for the frequencies specified by ANSI C63.4 2003. The correction factor for the frequencies between the specified frequencies is interpolated.

3. Test setup 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 1 MHz resolution bandwidth and to average detector.
4. The EMI receiver/spectrum analyser is adjusted to the transmitting frequency. The antenna is set to horizontal polarization.
5. 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 emission.
6. Set the antenna to vertical polarization and repeat step 3.
7. The highest level shall be recorded.
8. The reading value in dBμV is corrected by an correction factor which is based on the substitution method.



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:

not specified

U1 lowest CH

frequency [MHz]	polarization	reading [dBμV]	Correction [dB]	output power [dBm]	limit [dBm]	output power [mW]	limit [mW]
801,375	vertical	76,3	-65,0	11,3	24,0	13,5	250

U3 center CH

frequency [MHz]	polarization	reading [dBμV]	Correction [dB]	output power [dBm]	limit [dBm]	output power [mW]	limit [mW]
803,125	vertical	75,7	-65,0	10,7	24,0	11,7	250

U6 highest CH

frequency [MHz]	polarization	reading [dBμV]	Correction [dB]	output power [dBm]	limit [dBm]	output power [mW]	limit [mW]
804,750	vertical	73,3	-65,0	8,3	24,0	6,8	250

TEST RESULT:

The requirements are:

MET

REMARKS:

Transmitter operated unmodulated.

MODULATION CHARACTERISTICS

According to §2.1047(a)

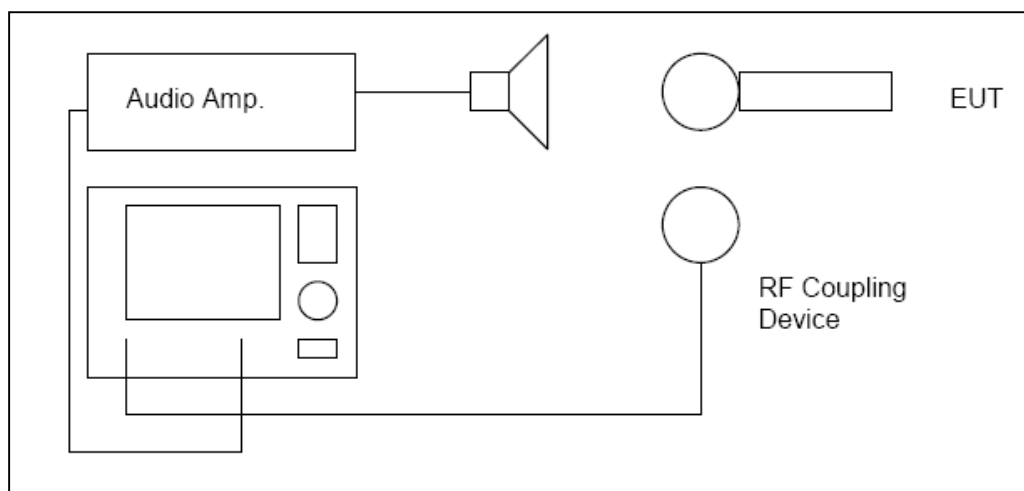
Measurement Procedure:

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.

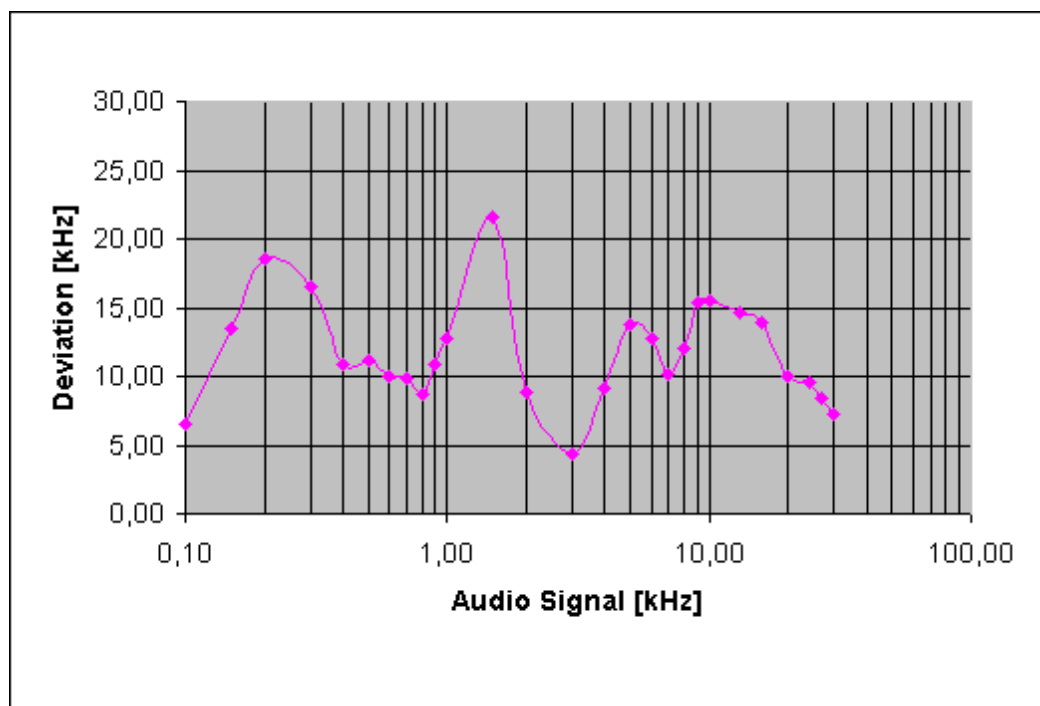
B) Modulation Limiting

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

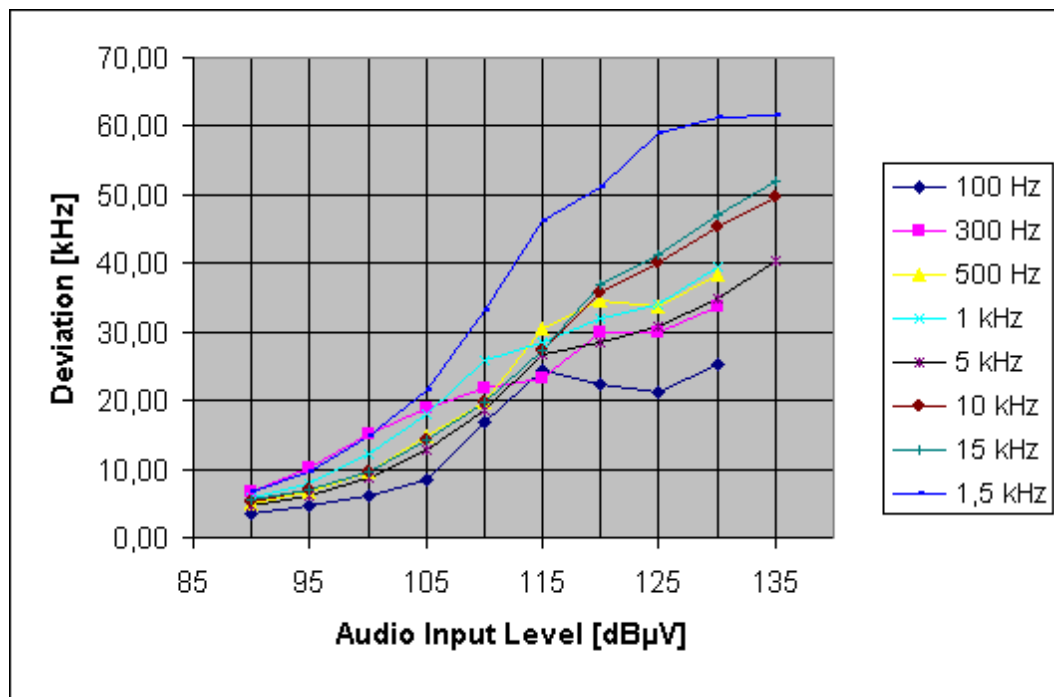


TEST RESULT:

The requirements are: **MET**

REMARKS:

B) Modulation Limiting



TEST RESULT:

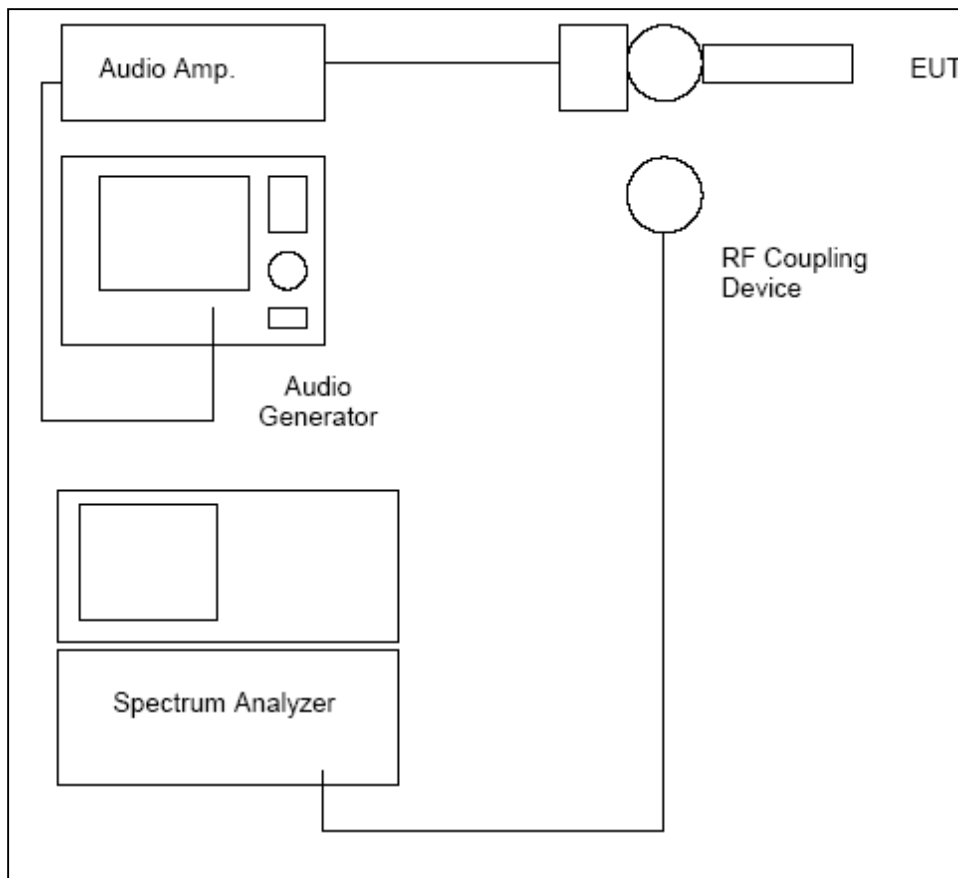
The requirements are: **MET**

REMARKS:

CHANNEL BANDWIDTH

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

1. EUT and test equipment were set up as shown below.
2. Turn on the EUT to measure the highest peak value and set the reference level of the spectrum analyzer 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):
1001, 1015, 1020, 1023, 1046, 1048, 1059

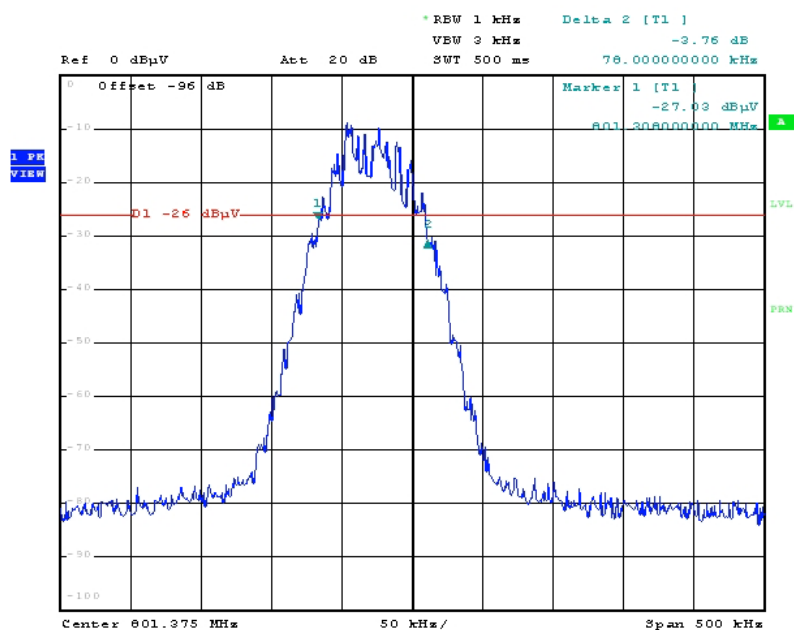
TESTRESULTS:

Channel	bandwidth [kHz]	Limit [kHz]	requirements are
U1 lowest CH	78	200	MET
U3 center CH	73	200	MET
U6 highest CH	73	200	MET

REMARKS:

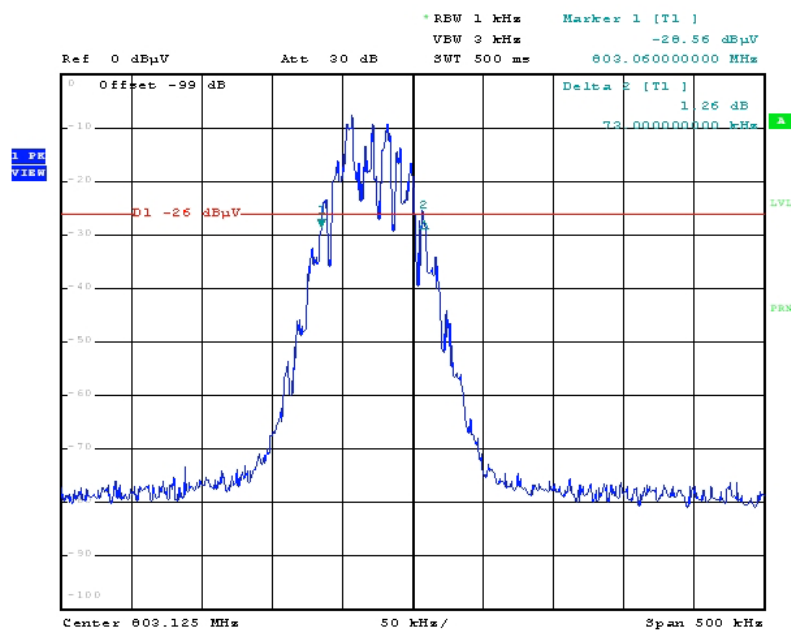
For detailed results pay attention to attached charts.

chart for U1 lowest CH



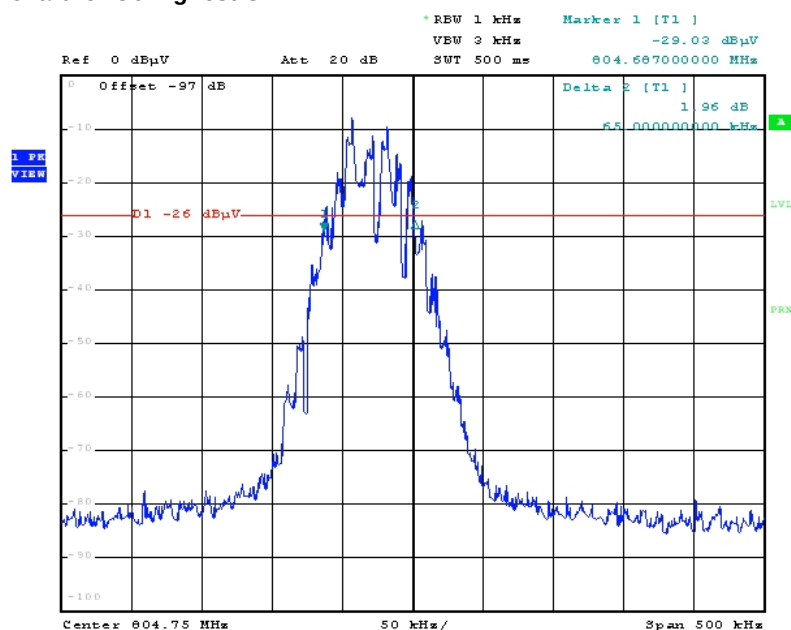
Date: 25. APR. 2005 16:05:43

chart for U3 center
CH



Date: 25.APR.2005 16:16:45

chart for U6 highest CH



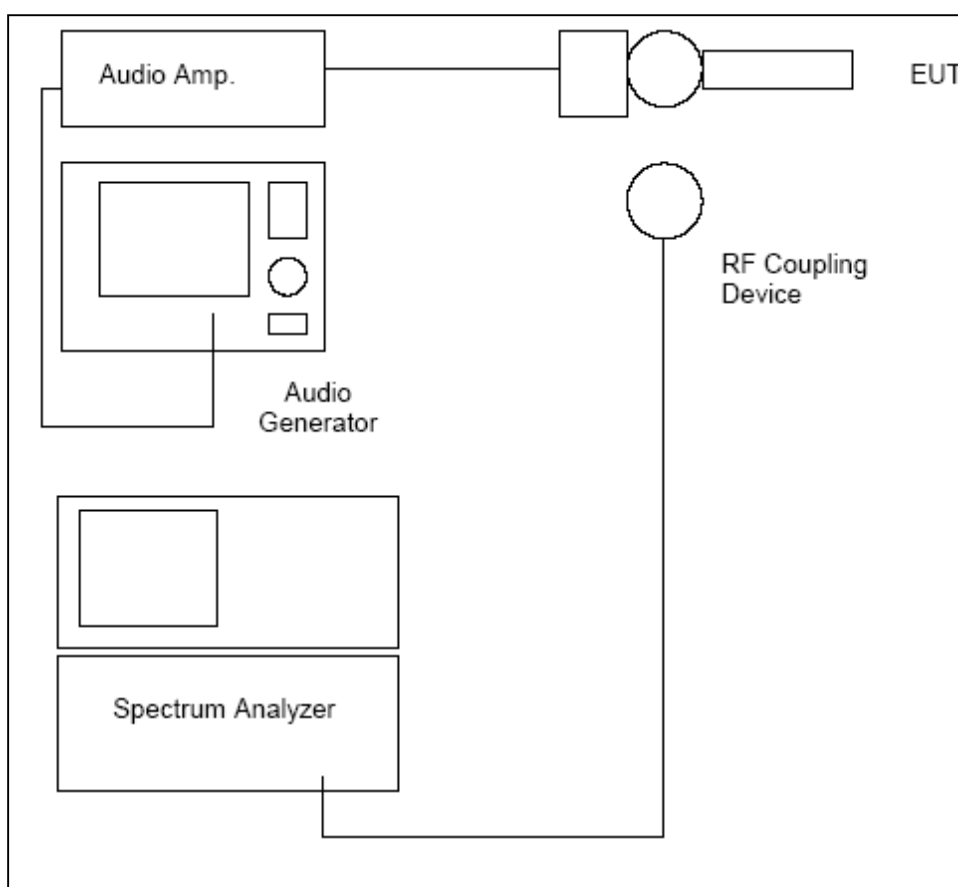
Date: 25.APR.2005 16:23:43

FIELDSTRENGTH OF EMISSION

EMISSION NEAR THE CARRIER

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

1. EUT and test equipment were set up as shown below.
2. Turn on the EUT measure the highest peak value and set the reference level of the spectrum analyzer 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	24,3 dB

calculation for fnom +/- more than 500kHz:

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

insert maximum mean output power

$$43 + 10 \log_{10}(13,49 \text{ mW}) \text{ dB} = 24,3 \text{ dB}$$

TESTRESULTS:

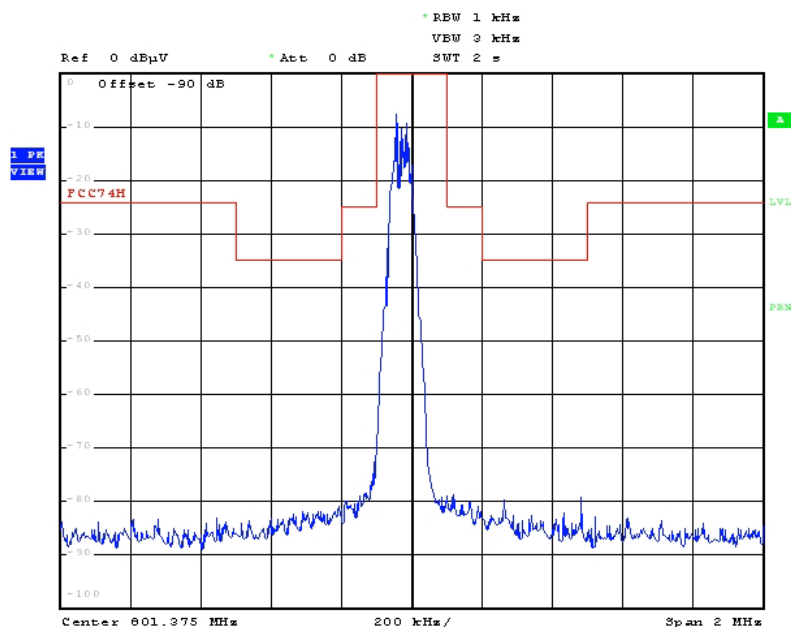
The requirements are:

MET

REMARKS:

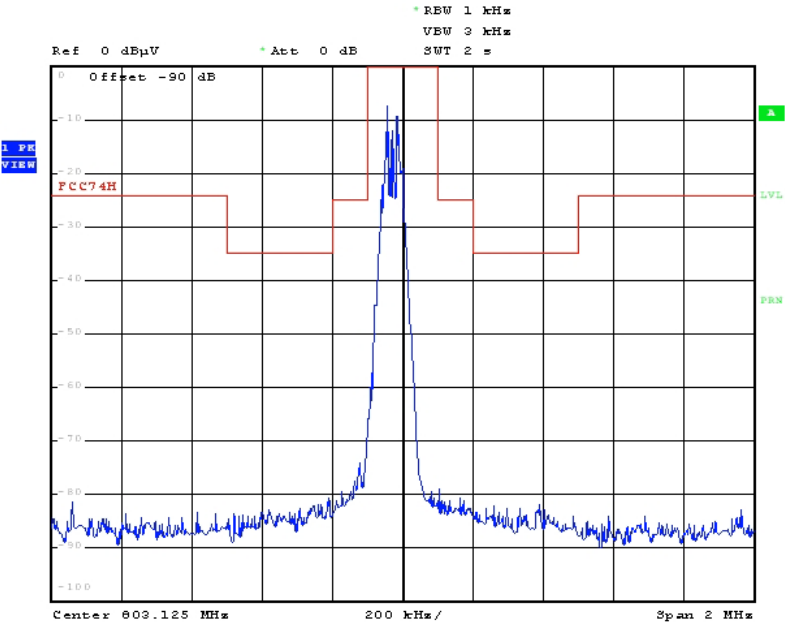
For detailed results pay attention to attached charts.

chart for U1 lowest CH



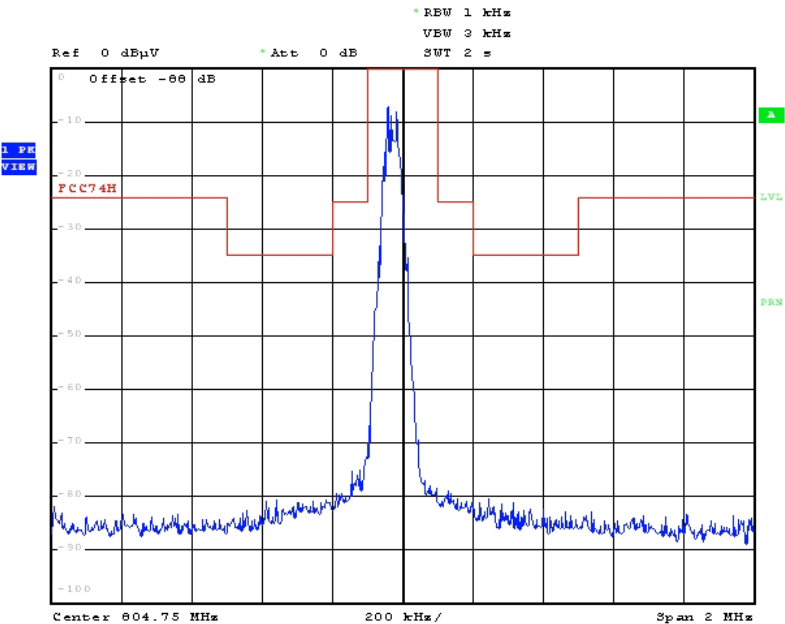
Date: 26. APR. 2005 12:52:35

chart for U3 center CH



Date: 26.APR.2005 12:54:58

chart for U6 highest CH



Date: 26.APR.2005 12:09:45

GENERAL EMISSIONS

According to §74.861(e)(6)(iii)

Measurement Procedure:

1. The measurement is performed at an OATS which is in accordance with ANSI C63.4 2003.
2. For final measurement a frequency dependent correction factor is calculated based on substitution method. Instead of the EUT an Antenna is placed which is connected to a signal generator. A specified power level is given to the antenna.

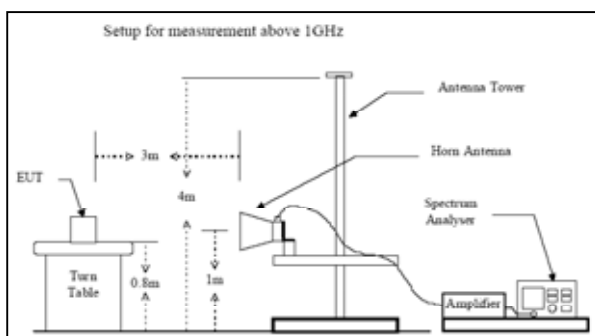
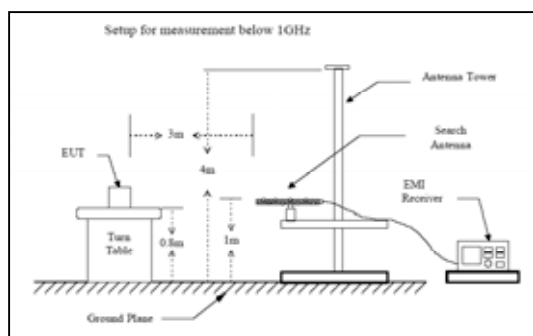
$$\text{power level at antenna [dBm]} = \text{signal generator level [dBm]} + \text{antenna gain [dB]} - \text{cable loss [dB]}$$

The antenna is raised and lowered until the maximum reading value is obtained. With this reading and the known power level at the antenna the correction factor is calculated.

$$\text{correction factor [dB]} = \text{power level at antenna [dBm]} - \text{reading of receiver [dB}\mu\text{V]}$$

This procedure is performed for the frequencies specified by ANSI C63.4 2003. The correction factor for the frequencies between the specified frequencies is interpolated.

3. Test setup 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 1 MHz resolution bandwidth and to average detector.
4. The EMI receiver/spectrum analyser is adjusted to the transmitting frequency. The Antenna is set to horizontal polarization.
5. 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 emission.
6. Set the antenna to vertical polarization and repeat step 3.
7. The highest level shall be recorded.
8. The reading value in dB μ V is corrected by an correction factor which is based on the substitution method.



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

Radiated emissions 25 MHz - 10 GHz

Results U1 lowest CH

Frequency [MHz]	Reading [dBμV]	Correction [dB]	Value [dBm]	Limit [dBm]
(*)				

Results U3 center CH

Frequency [MHz]	Reading [dBμV]	Correction [dB]	Value [dBm]	Limit [dBm]
(*)				

Results U6 highest CH

Frequency [MHz]	Reading [dBμV]	Correction [dB]	Value [dBm]	Limit [dBm]
(*)				

(*) Frequencies which are not listed have a margin more than 12dB to the limit.

TEST RESULT:

The requirements are: **MET**

REMARKS:

PHOTO TESTSETUP RADIATED EMISSION



TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Instrument/Ancillary	Type	Inventory No.	Manufacturer
1001	Shielded room	No. 1	01-05/04-01-021	emitel AG
1002	Full-compact chamber	No. 2	01-05/04-01-022	emitel AG
1003	Shielded room	No. 3	01-05/04-01-023	emitel AG
1004	Shielded room	No. 4	01-05/04-01-024	emitel AG
1005	Open area test site	OATS 01	01-05/04-01-020	emitel AG
1006				
1007				
1008				
1009				
1010	Antenna	FMZB 1516	01-01/01-01-050	Schwarzbeck
1011	Antenna LOGPER	3142B	01-01/01-01-067	ETS EMC Systems LP
1012	Antenna Trilog	VULP 9163	01-01/01-01-059	Schwarzbeck
1013	Antenna Horn 1-18 GHz	3115	01-01/01-01-062	ETS EMC Systems LP
1014	Antenna Horn 18-26,5 GHz	3160-09	01-02/01-01-002	ETS EMC Systems LP
1015	Field Probes	7405	01-05/02-01-022	ETS EMC Systems LP
1016				
1017				
1018				
1019				
1020	Spectrum analyzer	FSP 30	01-01/01-01-063	Rohde & Schwarz
1021	Test receiver	ESVP	01-01/01-01-035	Rohde & Schwarz
1022	Test receiver	ESH3	01-01/01-01-065	Rohde & Schwarz
1023	Radio Communication Analyzer	CMTA	01-02/01-01-001	Rohde & Schwarz
1024	Oszilloscope 300 MHz	LeCroy 9361	01-05/02-01-027	LeCroy
1025	Multimeter	2700	01-05/02-01-009	Keithley Instruments GmbH
1026	Power Meter	NRVD	01-01/01-01-043	Rohde & Schwarz
1027	Test receiver	ESPI 3	01-01/01-03-085	Rohde & Schwarz
1028	Audio analyzer	UPA	01-01/01-03-086	Rohde & Schwarz
1029				
1030	Pulse Limiter	ESH3 Z2	01-01/01-02-075	Rohde & Schwarz
1031	Preamplifier 0,1-1000 MHz	TVV-695 SN10	01-05/02-01-016	MTS Mikoretechnik
1032	Preamplifier 0,5-18 GHz	AMF-40-005-180-24-10P	01-02/01-02-005	MITEQ Inc.
1033				
1034	Mechanic coupling device	MKE-2008/02	02-05/50-05-01	SBF electronic GbR
1035	Key Operation Unit	TBS-2008-SME	02-05-50-05-02	SBF electronic GbR
1036				
1037				
1038				
1039				
1040				

No.	Instrument/Ancillary	Type	Inventory No.	Manufacturer
1041	Cable Full Compact chamber	RG 214	01-05/02-01-038	emitel AG
1042	Cable Full Compact chamber	RG 214	01-05/02-01-043	Huber & Suhner
1043	Cable OATS	RG 214	01-05/02-01-050	emitel AG
1044	HF - Cable	FA210A0050M	01-05/02-01-034	Anritsu GmbH
1045	HF - Cable	RG 223	01-05/02-02-102	emitel AG
1046	HF - Cable	RG 223	01-05/02-02-103	emitel AG
1047	HF - Cable	RG 223	01-05/02-02-104	emitel AG
1048	HF - Cable	RG 223	01-05/02-02-105	emitel AG
1049	HF - Cable	RG 223	01-05/02-02-106	emitel AG
1050	HF - Cable	RG 223	01-05/02-02-107	emitel AG
1051	HF - Cable	RG 223	01-05/02-02-108	emitel AG
1052	HF - Cable	RG 214	01-05/02-02-109	emitel AG
1053	HF - Cable	RG 214	01-05/02-02-110	emitel AG
1054				
1055				
1056				
1057				
1058	RF Step Attenuator	DPSP	01-05/02-03-140	Rohde & Schwarz
1059	Audio Amplifier	UPA-F07	01-05/04-04-038	Denon
1060	Climatic Chamber	305SB	01-05/04-02-026	Weiss Technik GmbH
1061	TEM Cell	TEM 01	01-02/01-01-003	emitel AG
1062	Antenna Controller	HCC	01-05/04-01-005	Rohde & Schwarz
1063	Turntable	RST 70	01-05/04-02-027	Schäfer
1064	Mast	HCM	01-05/04-01-012	Rohde & Schwarz
1065	Signal Generator	SMT 03	01-01/01-01-044	Rohde & Schwarz
1066	Regulating Transformer	2422 529	01-05/04-01-008	Philips Fluke GmbH
1067	Power Supply DC	PS 302	01-05/04-01-003	Conrad Elektronik GmbH
1068	Acoustical Calibrator	4231	01-05/02-02-101	Brüel & Kjaer GmbH
1070	Splitter	ZFRSC-42	01-05/02-02-091	Mini Circuits
1071	Richtkoppler	DC 6180	01-05/02-01-017	Amplifier Research
1072	Power Divider	Power Divider	01-05/02-02-088	Fielder Messtechnik
1073	Noise sources	04 012	01-05/02-02-120	robotron Messelektronik
1074	Filter	BS.559-2	01-05/02-03-126	emitel
1075	Combining network	ZFSC-3-4	01-05/02-04-146	Mini Circuits
1076	Attenuator 30 dB 11W	PRO-012-E30	01-05/02-01-018	BIRD Electronic Corporation
1077	Attenuator 6 dB 75W	75-A-MFN-06	01-05/02-01-019	BIRD Electronic Corporation
1078	Attenuator 6 dB 10W	50FH-006-10	01-05/02-01-020	BIRD Electronic Corporation
1079	Messfernsprecher	MS100	01-04/01-01-003	BOSSE Meßtechnik
1080	Signal Generator	SMG	01-01/01-01-053	Rohde & Schwarz
1081	Combining network	ZFSC-2-2500	01-05/02-04-145	Mini Circuits

PHOTOGRAPHS OF THE EQUIPMENT UNDER TEST

Photo No. 1

TOP VIEW OF EUT



Photo No. 2

BOTTOM VIEW OF EUT



Photo No. 3

EUT WITHOUT BATTERYCOVER



Photo No. 4

DISASSEMBLED EUT



Photo No. 5

TOP VIEW OF PCB1

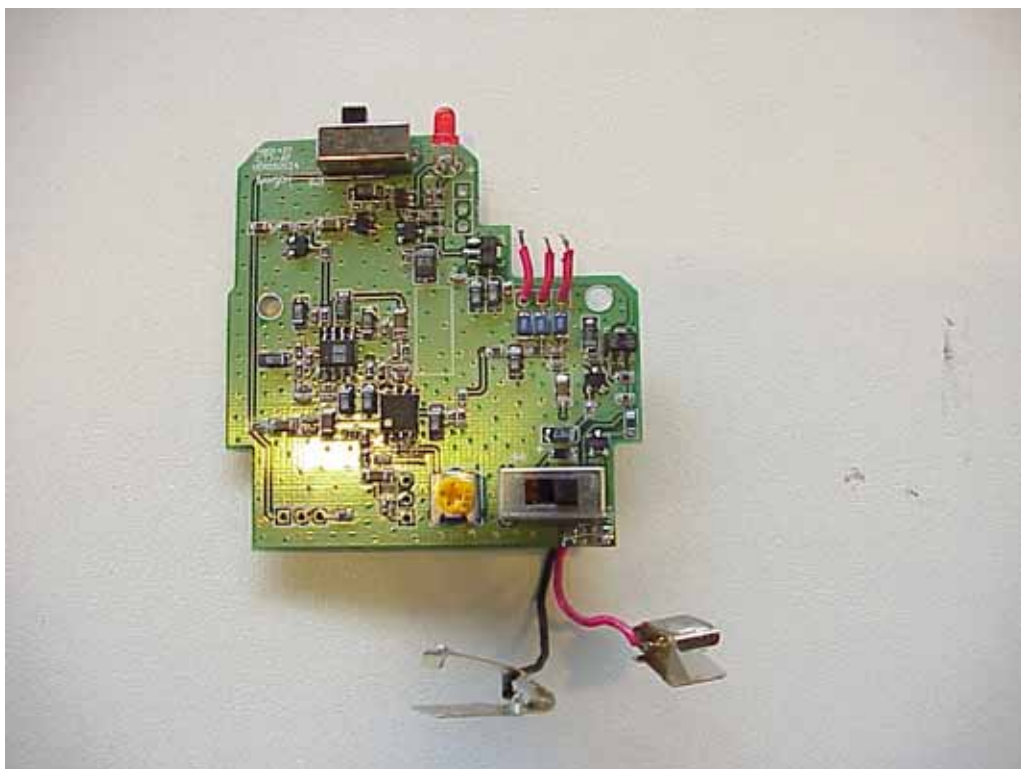


Photo No. 6

BOTTOM VIEW OF PCB1

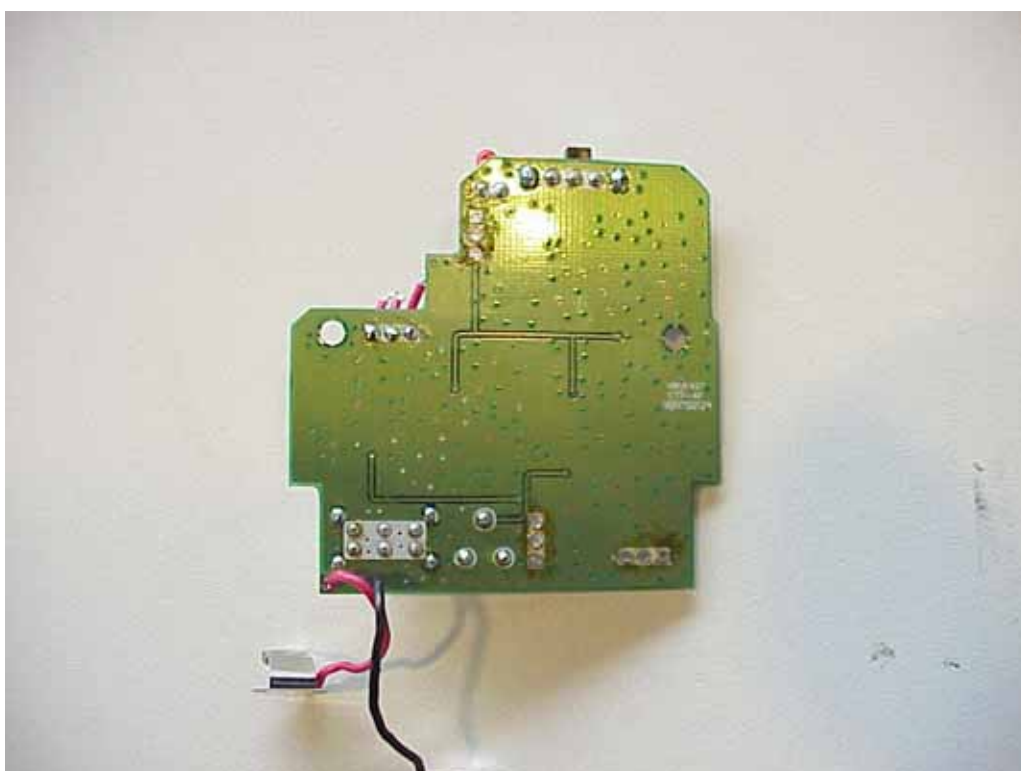


Photo No. 7

TOP VIEW OF PCB2



Photo No. 8

BOTTOM VIEW OF PCB2

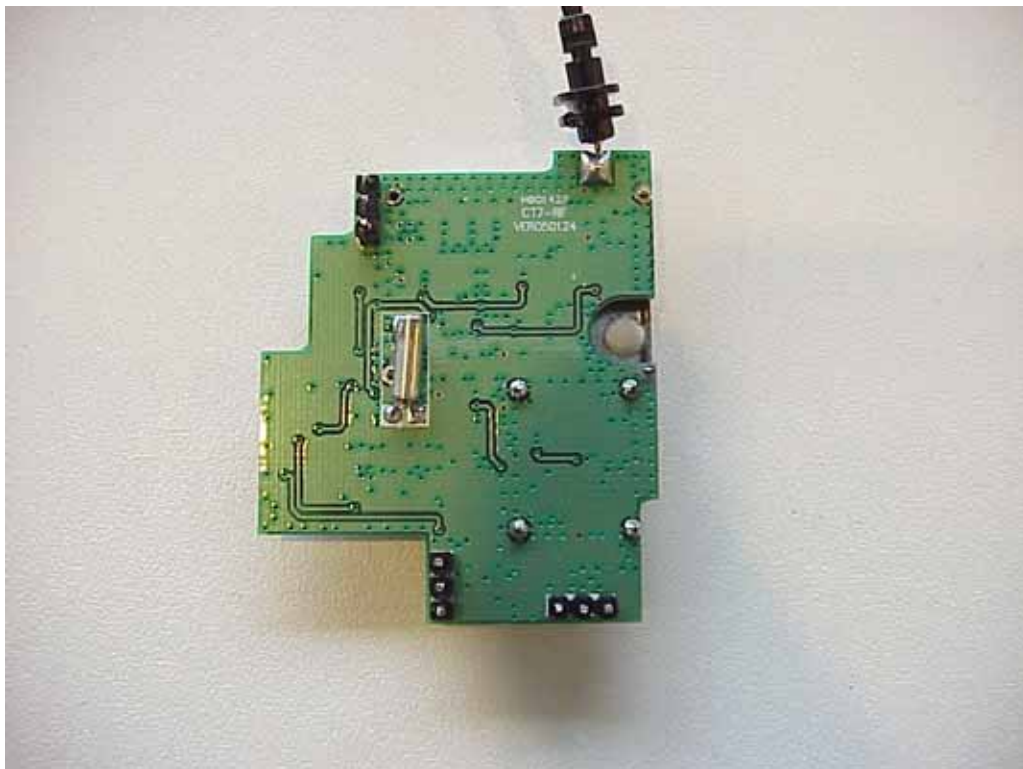


Photo No. 9

TOP VIEW OF PCB2 WITHOUT RF SHIELD

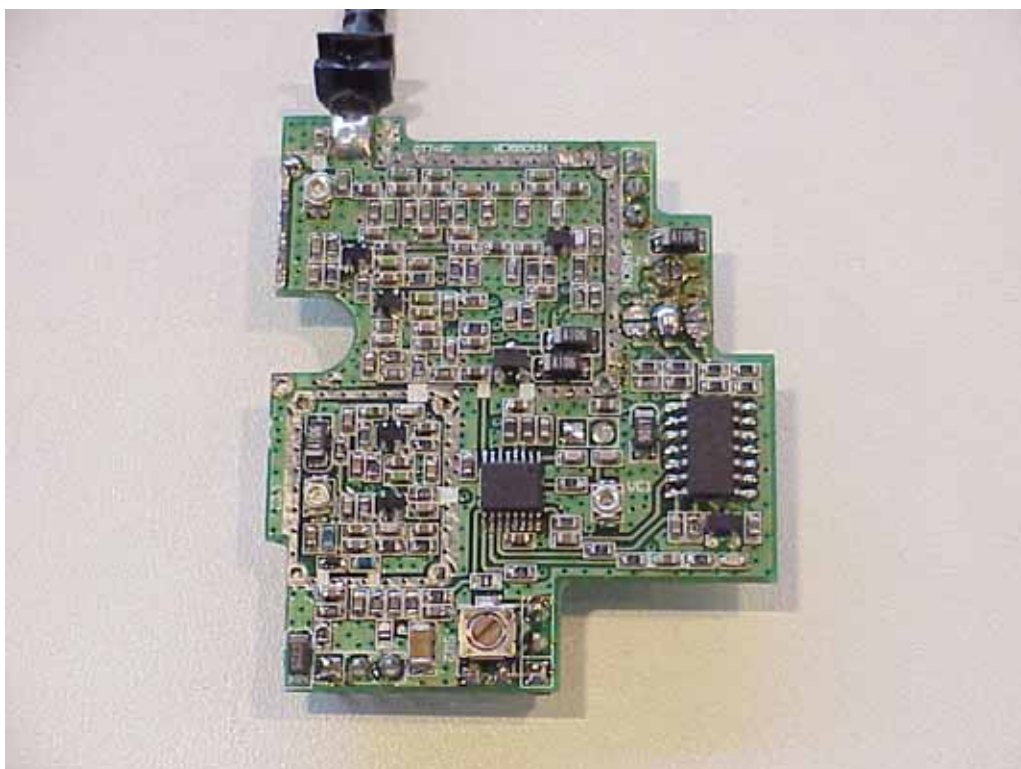


Photo No. 10

Microphone cable

