





Korea Technology Institute Co., Ltd.

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Test Report

Test Report No.:	KTIO3EF11002		
Registration No.:	99058		
Applicant:	G,G-KAISER.COM., Ltd.		
Applicant Address:	36Dong 301Ho #1367, Jung Wang Dong, Siheung-City, Kyungki-Do, Korea		
Product:	MP3 Player		
FCC ID:	RKQKOMACHO-VT	Model No.	KOMACHO-VT
Receipt No.:	03-1006	Date of receipt:	October 4, 2003
Date of Issue:	November 24, 2003		
Testing location	Korea Technology Institute Co., Ltd. 51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeongki-Do, Korea		
Test Standards:	FCC/ANSI. C63.4: 2001		
Rule Parts: FCC	Part 15, Subpart C		
Equipment Class:	Lower power communication device transmitter		
Test Result:	The above-mentioned product has been tested with compliance.		
Tested by: E.S. Park / Engineer  _____ Signature Date		Approved by: G. C. Min /President  _____ Signature Date	
Other Aspects:			
Abbreviations:	* OK, Pass=passed * Fail=failed * N/A=not applicable		
 <ul style="list-style-type: none"> - 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 by the client to claim product endorsement by NVLAP or any agency of the U.S Government. - We certify 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

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. Korea Technology Institute Co., Ltd. performed all measurements reported herein. And were made under Chief Engineer's supervisor.

We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. Test Site

Korea Technology Institute Co., Ltd.

2.1 Location

51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeongki-Do, Korea

The Test Site is in compliance with ANSI C63.4/2001 for measurement of radio Interference.



2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

- Conducted Emissions

Kind of Equipment	Type	S/N	Calibrated until
Spectrum Analyzer	R3261C	61720417	11.2004
Field Strength Meter	ESPC	832827/011	9.2004
LISN	KNW407	8-1157-2	10.2004
LISN	EM-7823	115019	1.2004
Conducted Cable	N/A	N/A	11.2004

- Radiated Emissions

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESIB 40	100093 1088.7490K40	1.2004
Spectrum Analyzer	R3261C	61720417	11.2004
Pre Amplifier	8447D	2944A06874	11.2004
BiconiLog Antenna	3142B	1705	12.2003
Bilog Antenna	CBL6140A	1217	5.2004
Open Site Cable	N/A	N/A	11.2004
Antenna Mast	DETT-03	N/A	N/A
Antenna & Turntable controller	DETT-04	91X519	N/A

2.3 Test Date

Date of Application: October 4, 2003

Date of Test: October 20, 2003

2.4 Test Environment

See each test item's description.



3. Description of the tested samples

The EUT is MP3 Player which is sending and receiving audio file with radio frequency by using the bandwidth of 88MHz to 92.5MHz. User can enjoy the audio file with car audio, home audio and FM radio by receiving the frequency set by RF. The EUT is compliance with Subpart B is authorized under a certificate procedure.

3.1. Rating and Physical Characteristics

- Working Frequency: 88-92.5MHz
- MP3 Decoding
Supports MPEG 1/2 Layer 3 Including variable Bit rate)
- MPEG 1 Layer3 : 16KHz/22.05KHz/24KHz
8,16,24,32,40,48,56,64,80,96,112,128,144,160 Kbps
MONO/STEREO MODE(Variable Bit rate)
- WMA Decoding
Supports High Bit Rate version. Middle Bit Rate version
Bit rate: 32Kbps to 192Kbps
- MP3 Encoding
MPEG 1/2 Layer 3 Supports Including variable Bit rate (up to 256Kbps)
Sampling Frequency: 48KHz, 44.1KHz, 32KHz, 22.05KHz, 16KHz, 8KHz
MP3 Encoding: 8Kbps to 256 Kbps
Earphone Output: 103dB
Signal to Noise Ratio: Over 80dB (without filter)
Playback Time: Over 14hours FM: Over 20hours
Recording Time: Over 16hours (Based on 128MB memory at 16Kbps encoding)
Line-In Recording Time: Over 2hours (Based on 128MB memory at 128Kbps encoding)
- PC Interface: USB
- Power: AAx2: 3V
- Dimensions: 51mm x 103mm x 12mm(WxH)
- Weight: 53g (without the battery)

3.2. Submitted Documents

- User's Guide
- Block Diagram



4. Measurement Conditions

Testing Input Voltage: DC 3V battery

4.1 Modes of Operation

The EUT was in the following operation mode during all testing;

- 1) Normal operating(Play) mode.

4.2 Additional Equipment

DEVICE TYPE	Manufacturer	M/N	S/N	FCC ID
Ear phone	G,G-KAISER.COM., Ltd.	-	-	-

4.3 Uncertainty

- 1) Radiated disturbance

U_c (Combined standard Uncertainty) = $\pm 1.8\text{dB}$

Expanded uncertainty $U=KU_c$

$K = 2$

$\therefore U = \pm 3.6\text{dB}$

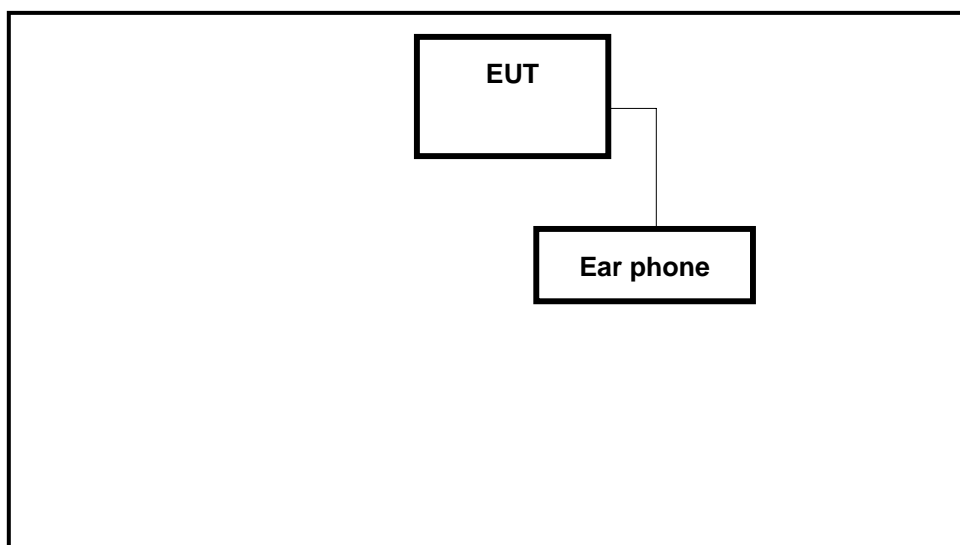
- 2) Conducted disturbance

$U_c = \pm 0.88\text{dB}$

$U = KU_c=2 \times U_c = \pm 1.8\text{dB}$



4.4 Test Setup



——— **Signal Line**



5. Definition and Limits

5.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

5.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.25
0.495 – 0.505 **	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 21.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
5.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3360 - 4400	Abobe 38.6
13.36 – 13.41			

Remark “***” : Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz

5.3 Limitation

(1) Conducted Emission Limits :

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency(MHz)	Emission(dBuV)
0.15 – 0.5	66dBuV – 56dBuV
0.5 – 5.0	56 dBuV
5.0 – 30.0	60 dBuV



(2) Radiated Emission Limits :

According to 15.239 the field strength of emissions from intentional radiators operated under these frequency bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental	
	uV/meter	dBuV/meter
88-108	250	48

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209, as following table:

Other Frequencies (MHz)	Field Strength of Fundamental	
	uV/meter	dBuV/meter
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

(3) Emission Band Limits :

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200KHz wide centered on the operating frequency. The 200 KHz band shall lie wholly within the frequency range of 88 – 108 MHz.

5.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

5.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



6. Radiated Emission Measurement

6.1 Applicable Standard

1. The field strength of any emission within this band shall not exceed 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.
2. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

6.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Test setup was configured as clause 4.4 this report. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1GHz, a pre-scan is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions and then each selected frequency is precisely measured. As the same purpose, for emission measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the antenna when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies that need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.



Table 1: Test Data, Radiated Emissions

A. Channel Low(88.2MHz)

Frequency (MHz)	Height [m]	Angle [°]	(1) Reading Peak (dB μ V)		(2) AFCL (dB/m)	(3) Actual (dB μ V/m)		(4) Limit (dB μ V/m)	(5)Margin (dB)	
			H	V		H	V		H	V
88.20	2.18	5	23.7	26.8	16.15	39.85	42.95	48.0	8.15	5.05
176.40	-	-	-	-	-	-	-	43.5	-	-
264.60	-	-	-	-	-	-	-	46.0	-	-
352.80	-	-	-	-	-	-	-	46.0	-	-
441.00	-	-	-	-	-	-	-	46.0	-	-
529.20	-	-	-	-	-	-	-	46.0	-	-
617.40	-	-	-	-	-	-	-	46.0	-	-
705.60	-	-	-	-	-	-	-	46.0	-	-
793.80	-	-	-	-	-	-	-	46.0	-	-
882.00	-	-	-	-	-	-	-	46.0	-	-

***Remark:** “-” means that the emission level is too low to be measured.

$f < 1\text{GHz}$ – RBW/VBW : 100KHz, $f > 1\text{GHz}$ – RBW/VBW : 1MHz

PK: Peak reading, QP: Quasi Peak reading, AV: Average reading

H: Horizontal, V: Vertical

Note :

- Limit on the field strength of fundamental
 $250 \mu\text{V/m} = 20\log(250) \approx 48.0\text{dB } \mu\text{V/m}$
- Limit on the field strength of spurious less than limit value 20dB.
- If the measured frequencies fall in the restricted frequency band, the limit employed is §15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

♠ **Margin Calculation**

(5) Margin = (4) Limit – (3) Actual

[(3) Actual = (1) Reading + (2) AFCL]



B. Channel Middle(90.0MHz)

Frequency (MHz)	Height [m]	Angle [°]	(1) Reading (dB μ V)		(2) AFCL (dB/m)	(3) Actual (dB μ V/m)		(4) Limit (dB μ V/m)	(5)Margin (dB)	
			H	V		H	V		H	V
90.0	2.13	3	23.4	26.6	16.15	39.55	42.75	48.0	8.45	5.25
180.0	-	-	-	-	-	-	-	43.5	-	-
270.0	-	-	-	-	-	-	-	46.0	-	-
360.0	-	-	-	-	-	-	-	46.0	-	-
450.0	-	-	-	-	-	-	-	46.0	-	-
540.0	-	-	-	-	-	-	-	46.0	-	-
630.0	-	-	-	-	-	-	-	46.0	-	-
720.0	-	-	-	-	-	-	-	46.0	-	-
810.0	-	-	-	-	-	-	-	46.0	-	-
900.0	-	-	-	-	-	-	-	46.0	-	-

***Remark:** “-“ means that the emission level is too low to be measured.

$f < 1\text{GHz}$ – RBW/VBW : 100KHz, $f > 1\text{GHz}$ – RBW/VBW : 1MHz

PK: Peak reading, QP: Quasi Peak reading, AV: Average reading

H: Horizontal, V: Vertical

Note :

1. Limit on the field strength of fundamental
 $250 \mu\text{V/m} = 20\log(250) \approx 48.0\text{dB } \mu\text{V/m}$
2. Limit on the field strength of spurious less than limit value 20dB.
3. If the measured frequencies fall in the restricted frequency band, the limit employed is §15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

♣ **Margin Calculation**

(5) Margin = (4) Limit – (3) Actual

[(3) Actual = (1) Reading + (2) AFCL]



C. Channel High(92.2MHz)

Frequency (MHz)	Height [m]	Angle [°]	(1) Reading (dB μ V)		(2) AFCL (dB/m)	(3) Actual (dB μ V/m)		(4) Limit (dB μ V/m)	(5)Margin (dB)	
			H	V		H	V		H	V
92.2	2.15	3	21.0	26.6	16.15	37.15	42.75	48.0	10.85	5.25
184.4	-	-	-	-	-	-	-	43.5	-	-
276.6	-	-	-	-	-	-	-	46.0	-	-
368.8	-	-	-	-	-	-	-	46.0	-	-
461.0	-	-	-	-	-	-	-	46.0	-	-
553.2	-	-	-	-	-	-	-	46.0	-	-
645.4	-	-	-	-	-	-	-	46.0	-	-
737.6	-	-	-	-	-	-	-	46.0	-	-
829.8	-	-	-	-	-	-	-	46.0	-	-
922.0	-	-	-	-	-	-	-	46.0	-	-

***Remark:** “-“ means that the emission level is too low to be measured.

$f < 1\text{GHz}$ – RBW/VBW : 100KHz, $f > 1\text{GHz}$ – RBW/VBW : 1MHz

PK: Peak reading, QP: Quasi Peak reading, AV: Average reading

H: Horizontal, V: Vertical

Note :

1. Limit on the field strength of fundamental
 $250 \mu\text{V/m} = 20\log(250) \doteq 48.0\text{dB } \mu\text{V/m}$
2. Limit on the field strength of spurious less than limit value 20dB.
3. If the measured frequencies fall in the restricted frequency band, the limit employed is §15.209 general requirement when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function, no duty factor applied.

♣ **Margin Calculation**

(5) Margin = (4) Limit – (3) Actual

[(3) Actual = (1) Reading + (2) AFCL]



7. Conducted Emissions (Not Applicable)

This EUT is excused from investigation of conducted emission, for it is powered by DC Battery only. According to §15.207(d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.



8. Antenna Requirement

8.1 Standard Applicable

According to §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.

8.2 Antenna Construction

The antenna is permanently mounted on PCB, no consideration of replacement.



9. Emission Band Measurement

9.1 Standard Applicable

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200KHz wide centered on the operating frequency. The 200KHz band shall lie wholly within the frequency range of 88 – 108MHz.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 1 and measurement the turn on the EUT. Then set it to any one measured frequency within its operation range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 10 KHz and 100 KHz respectively with a convenient frequency span including 200 KHz bandwidth of the emission.
4. Mark the bandwidth of 200 KHz points and plot the graph on spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Data

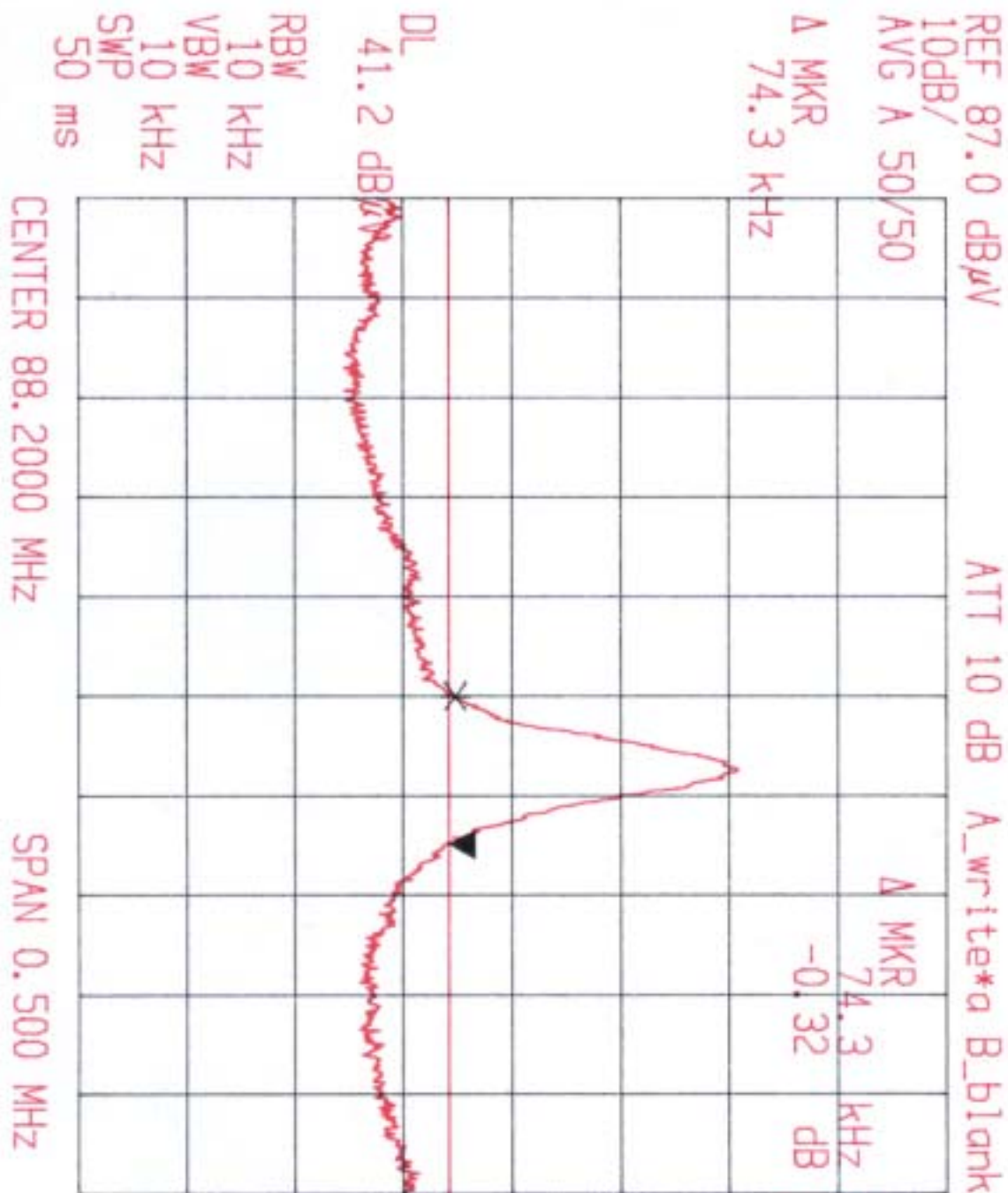
1. Test result:

- A. The 26dB bandwidth of 88.2 MHz = 74.3 KHz < 200 KHz
- B. The 26dB bandwidth of 90.0 MHz = 62.8 KHz < 200 KHz
- C. The 26dB bandwidth of 92.2 MHz = 62.1 KHz < 200 KHz
- D. The 200 KHz band lie within the frequency range 88-92.5 MHz.

Note : Please see appendix 1 for Plotted Data

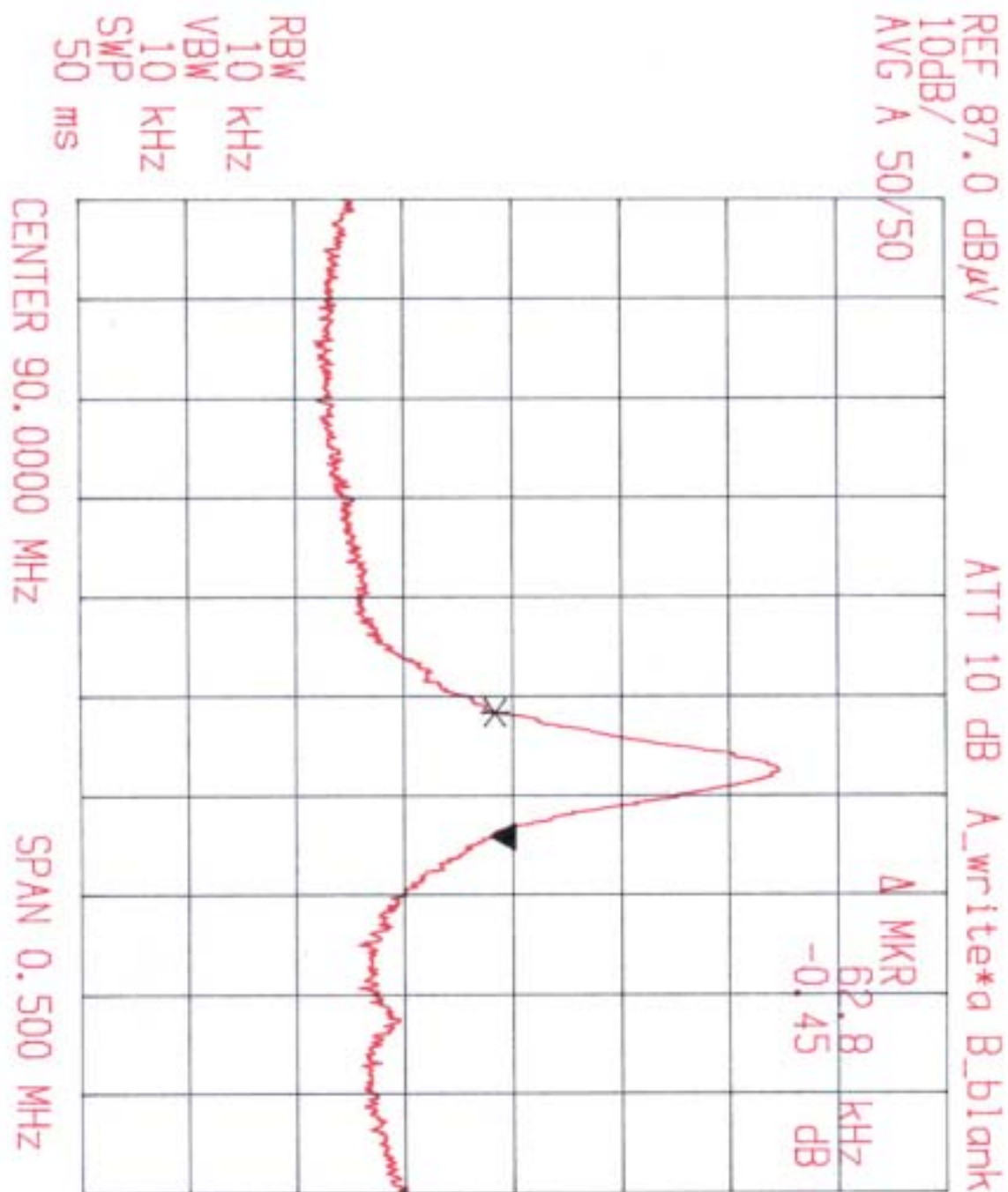


Channel Low(88.2MHZ)





Channel Middle(90.0MHZ)





Channel High(92.2MHZ)

