FCC Part 15 Subpart C
EMI TEST REPORT

of

E.U.T. : RF HANDERSFREE

FCC ID. : QF48860222030301

MODEL : SJ-005

Working Frequency : 88-108 MHz

for

APPLICANT : Sheng Chiang Auto Technology Co., Ltd.

ADDRESS : No. 10, lane 30, Da An Road, Hsin Chunang City, Taipei Hsien, Taiwan, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 34, LIN 5, DING FU TSUN, LINKOU HSIANG,
TAIPEI HSIEN, TAIWAN, R.O.C.

Tel:(02)26023052, 26023054
Fax:(02)26010910
Report Number : ET91R-06-031-01

TEST REPORT CERTIFICATION

Applicant : Sheng Chiang Auto Technology Co., Ltd.
2nd Fl., No. 111-32, Sec. 4, San Ho Rd., Sanchung City, Taipei Hsien, Taiwan, R.O.C.

Manufacturer : Sheng Chiang Auto Technology Co., Ltd.
2nd Fl., No. 111-32, Sec. 4, San Ho Rd., Sanchung City, Taipei Hsien, Taiwan, R.O.C.

Description of EUT :

a) Type of EUT	: RF HANDERSFREE
b) Trade Name	: ----
c) Model No.	: SJ-005
d) Working Frequency	: 88-108 MHz
e) Power Supply	: DC 12V Battery

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2001)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : Jun. 15, 2002

Test Engineer : Tien Lu Liau
(Tien Lu Liau)

Approve & Authorized Signer : Will Yauo
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : RF HANDERSFREE
b) Trade Name : ----
c) Model No. : SJ-005
d) Working Frequency : 88-108 MHz
e) Power Supply : DC 12V Battery

1.2 Characteristics of Device:

1. Low consumption, Low radiation R.F hand free kits.
2. Low noise voice/signal transmission.
3. Rechargeable lithium battery
4. Automatic turn off when power is low.
5. Battery is easily changed with the backup recharge set.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in chapter 13 of ANSI C63.4.

The RF HANDERSFREE under test was operated in its normal operating mode for the purpose of the measurements.

The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the RF HANDERSFREE under test.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No. 34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Tapei Hsien, Taiwan 244, R.O.C..

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

2. DEFINITION AND LIMITS

2.1 Definition

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

2.2 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 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	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	Above 38.6
13.36-13.41			

Remark "**" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 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 (μV)	Emission (dBμV)
0.45 - 30.0	250	48.0

(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 μV/meter	dBμV/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 μV/meter	dBμV/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) Antenna Requirement :

For intentional device, 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.

(4) Emissions 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.

2.4 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.

2.5 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.

3. RADIATED EMISSION MEASUREMENT

3.1 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.

3.2 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. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies 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 highness 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 need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

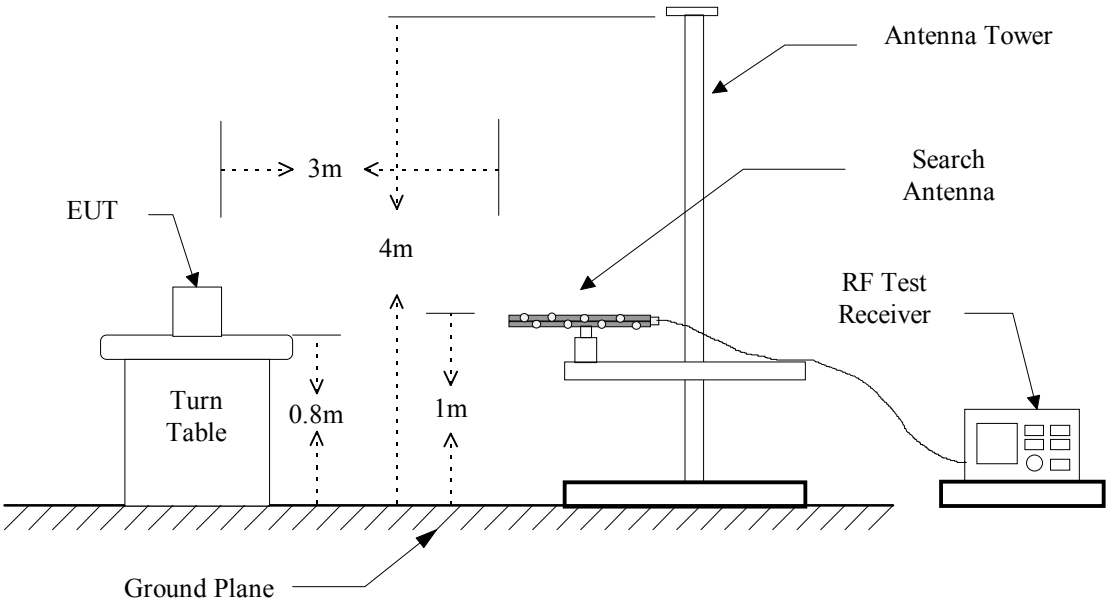
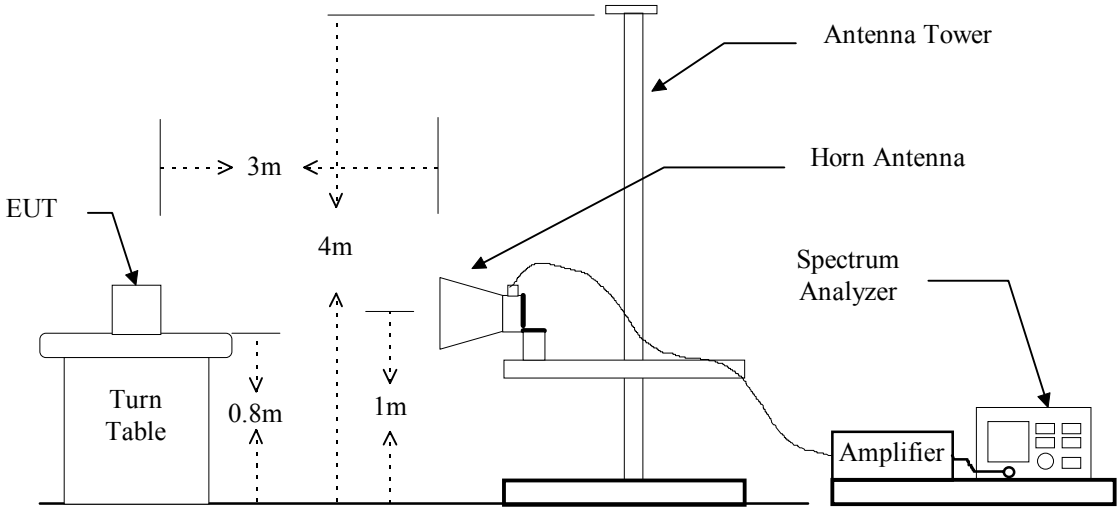


Figure 2 : Frequencies measured above 1 GHz configuration



3.3 Test Data

A. 88.5MHz

Operation Mode : TX
Temperature : 23 ℃
Humidity : 68 %
Test Date : May 29, 2002

Frequency (MHz)	Meter Reading (dBuV) H	V	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
88.500	45.8	41.4	-14.2	31.6	48.0	-16.4	0	4.00
177.000	---	---	-9.1	---	43.5	---	---	---
265.500	---	---	-3.7	---	46.0	---	---	---
354.000	---	---	-9.8	---	46.0	---	---	---
442.500	---	---	-5.6	---	46.0	---	---	---
531.000	---	---	-5.0	---	46.0	---	---	---
619.500	---	---	-3.6	---	46.0	---	---	---
708.000	---	---	-0.9	---	46.0	---	---	---
796.500	---	---	0.6	---	46.0	---	---	---
885.000	---	---	2.3	---	46.0	---	---	---

Note :

1. *Remark "---" means that the emission level is too low to be measured.*
2. *Remark "*" means that the emission frequency is produced from local oscillator.*

B. 98.0 MHz

Operation Mode : TX
Temperature : 23 ℃
Humidity : 68 %
Test Date : May 29, 2002

Frequency (MHz)	Meter Reading (dBuV) H	V	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
98.000	44.1	43.5	-13.9	30.2	48.0	-17.8	0	4.00
196.000	---	---	-7.6	---	43.5	---	---	---
294.000	---	---	-1.5	---	46.0	---	---	---
392.000	---	---	-6.2	---	46.0	---	---	---
490.000	---	---	-4.4	---	46.0	---	---	---
588.000	---	---	-4.9	---	46.0	---	---	---
686.000	---	---	-1.0	---	46.0	---	---	---
784.000	---	---	0.1	---	46.0	---	---	---
882.000	---	---	2.3	---	46.0	---	---	---
980.000	---	---	3.4	---	54.0	---	---	---

Note :

1. *Remark "---" means that the emission level is too low to be measured.*
2. *Remark "*" means that the emission frequency is produced from local oscillator.*

C. 107.8MHz

Operation Mode : TX
Temperature : 23 ℃
Humidity : 68 %
Test Date : May 29, 2002

Frequency (MHz)	Meter Reading (dBuV) H	V	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
107.800	47.6	41.4	-12.2	35.4	-12.6	0	4.00	1.20
215.600	---	---	-6.1	---	---	---	---	---
323.400	---	---	-6.7	---	---	---	---	---
431.200	---	---	-5.5	---	---	---	---	---
539.000	---	---	-5.1	---	---	---	---	---
646.800	---	---	-3.0	---	---	---	---	---
754.600	---	---	-0.3	---	---	---	---	---
862.400	---	---	2.3	---	---	---	---	---
970.200	---	---	3.3	---	---	---	---	---
1078.000	---	---	-9.4	---	---	---	---	---

Note :

1. *Remark "---" means that the emission level is too low to be measured.*
2. *Remark "*" means that the emission frequency is produced from local oscillator.*

3.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

3.5 Radiated Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Hewlett-Packard	8568B	01/10/2003
Pre-selector	Hewlett-Packard	85685A	01/10/2003
Quasi Peak Detector	Hewlett-Packard	85650A	01/10/2003
RF Test Receiver	Rohde & Schwarz	ESVS 30	08/06/2002
Log periodic Antenna	EMCO	3146	11/02/2002
Biconical Antenna	EMCO	3110B	11/02/2002
Biconical Antenna	EMCO	3104	08/23/2002
Preamplifier	Hewlett-Packard	8447D	10/14/2002
Spectrum Analyzer	Hewlett-Packard	8564E	04/16/2003

3.6 Measuring Instrument Setup

Explanation of measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz

3.7 Radiated Measurement Photos

Please see Setup Photos in Exhibit F.

4 CONDUCTED EMISSION MEASUREMENT

4.1 Description

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.

5 ANTENNA REQUIREMENT

5.1 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.

5.2 Antenna Construction

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

6 EMISSION BAND MEASUREMENT

6.1 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 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

6.2 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 operating 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 100kHz respectively with a convenient frequency span including 200kHz bandwidth of the emission.
4. Mark the bandwidth of 200kHz points and plot the graph on spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

6.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESBI	05/15/2003
Plotter	Hewlett-Packard	7440A	N/A

6.4 Measurement Data

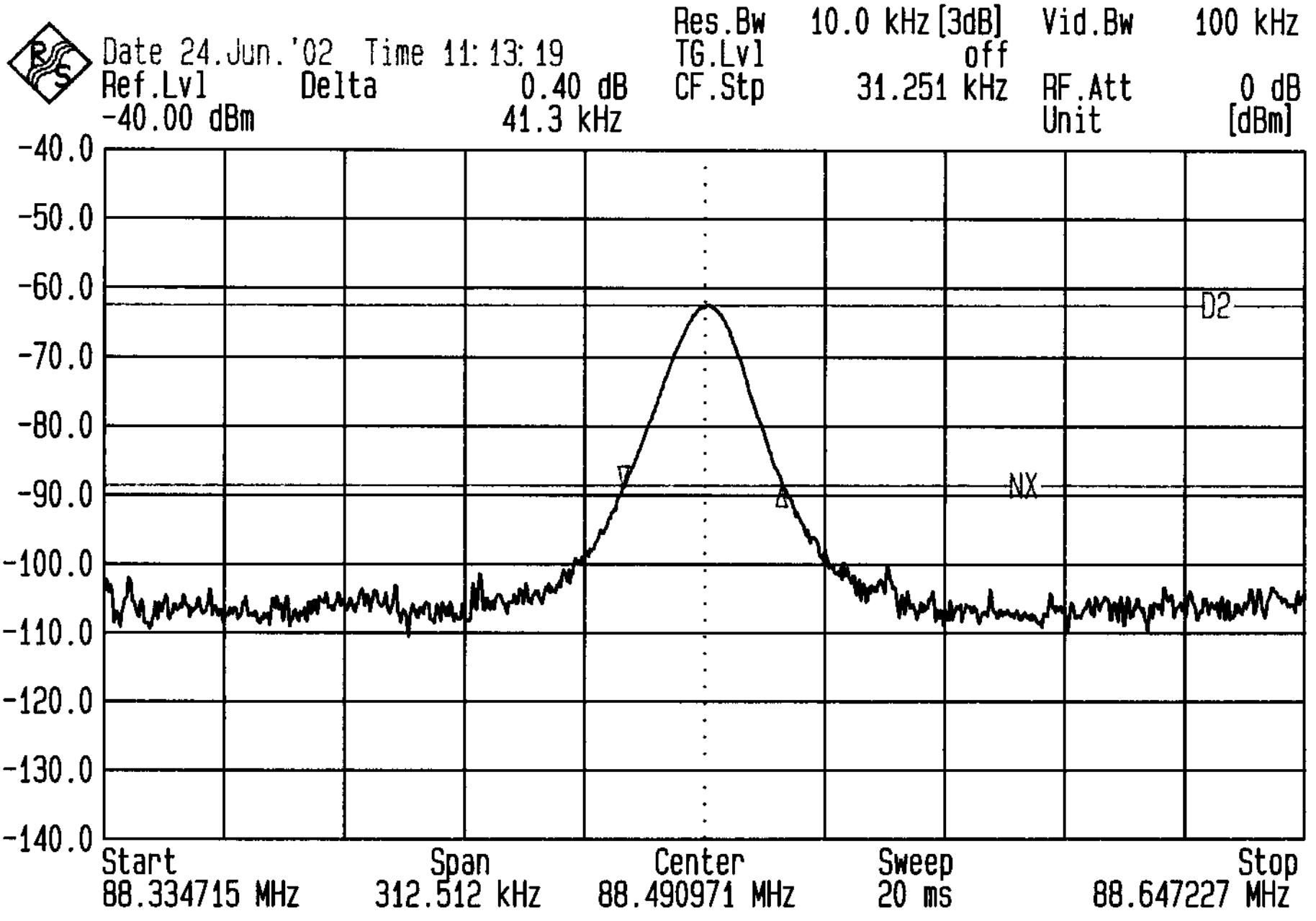
Test Date : Jun. 24, 2002 Temperature : 25 ℃ Humidity: 60%

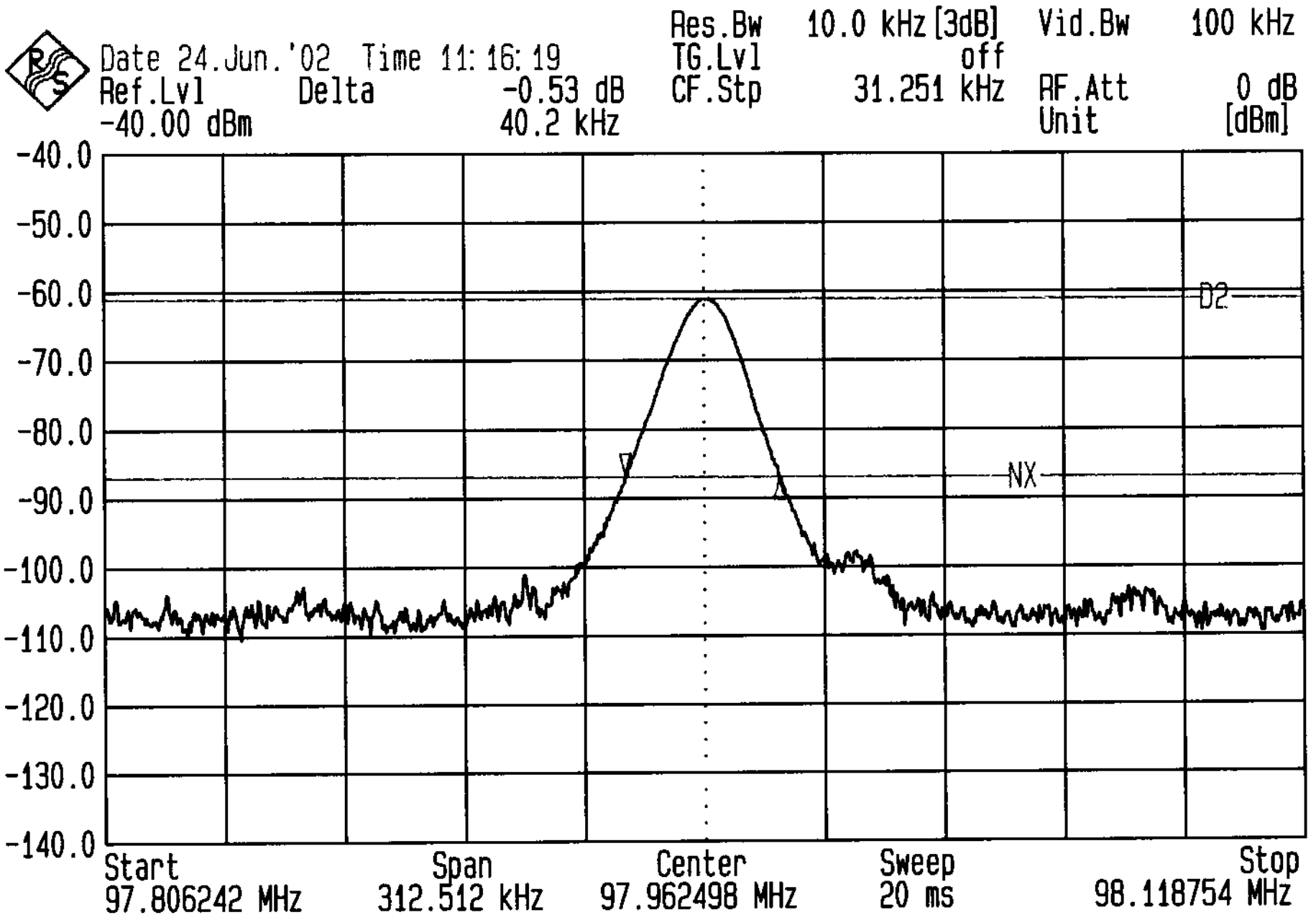
Test result:

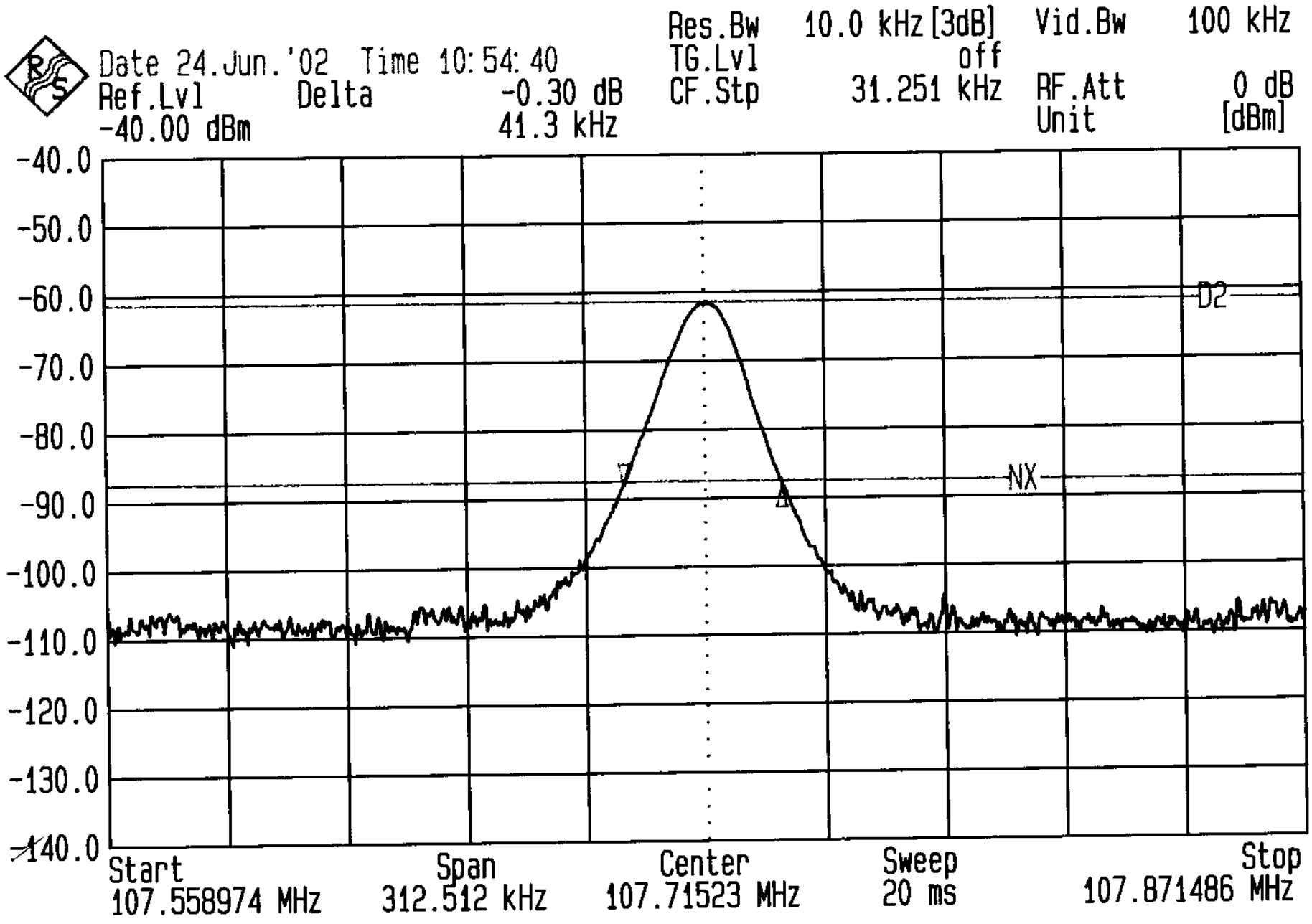
A. The 26 dB bandwidth of 88.5 MHz = 41.3 KHz < 200 KHz.
B. The 26 dB bandwidth of 98 MHz = 40.2 KHz < 200 KHz.
C. The 26 dB bandwidth of 107.8 MHz = 41.3 KHz < 200 KHz.
D. The 200 Khz band lie wholly within the frequency range of 88-108 MHz.

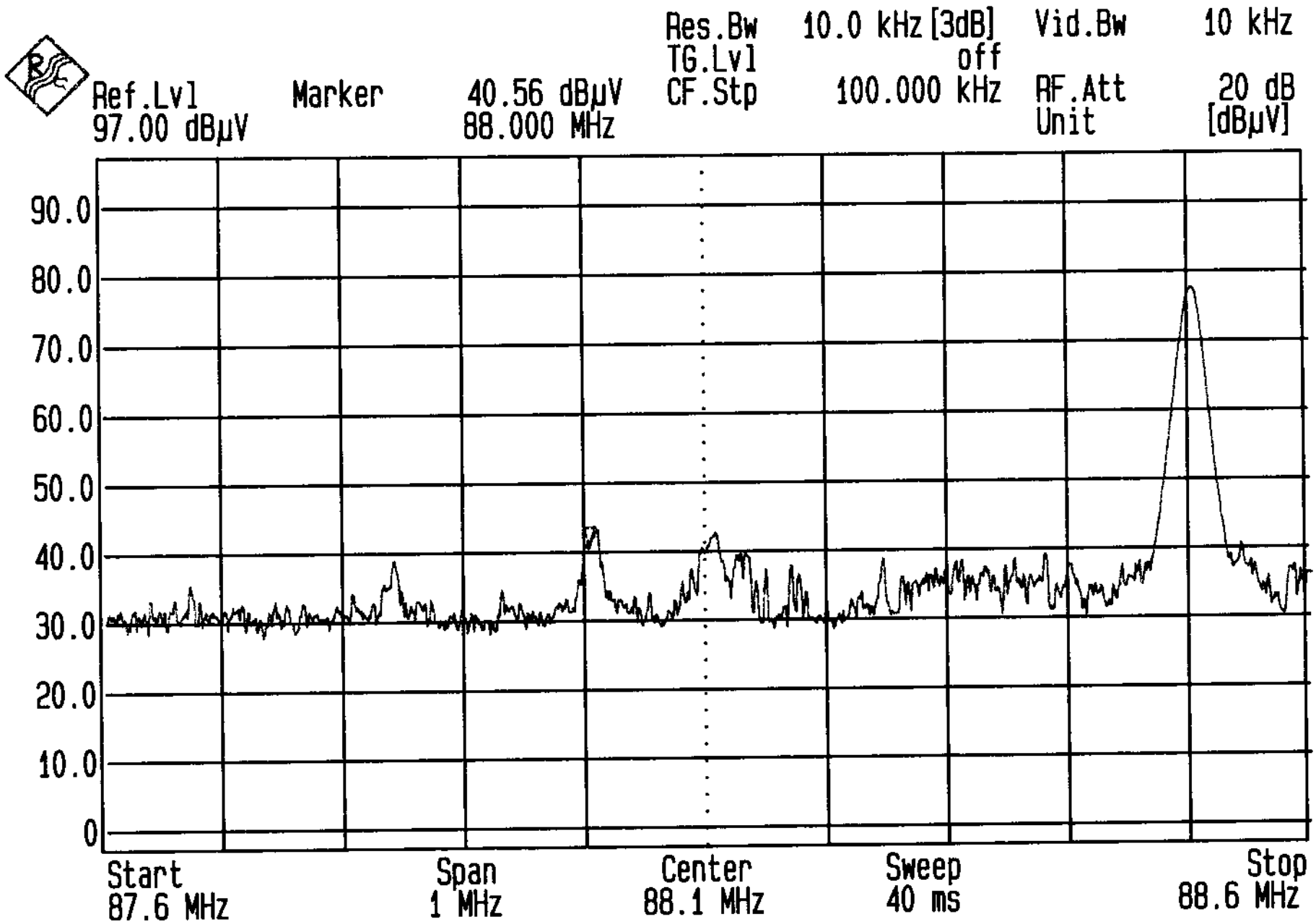
Note : Please see appendix 1 for Plotted Data

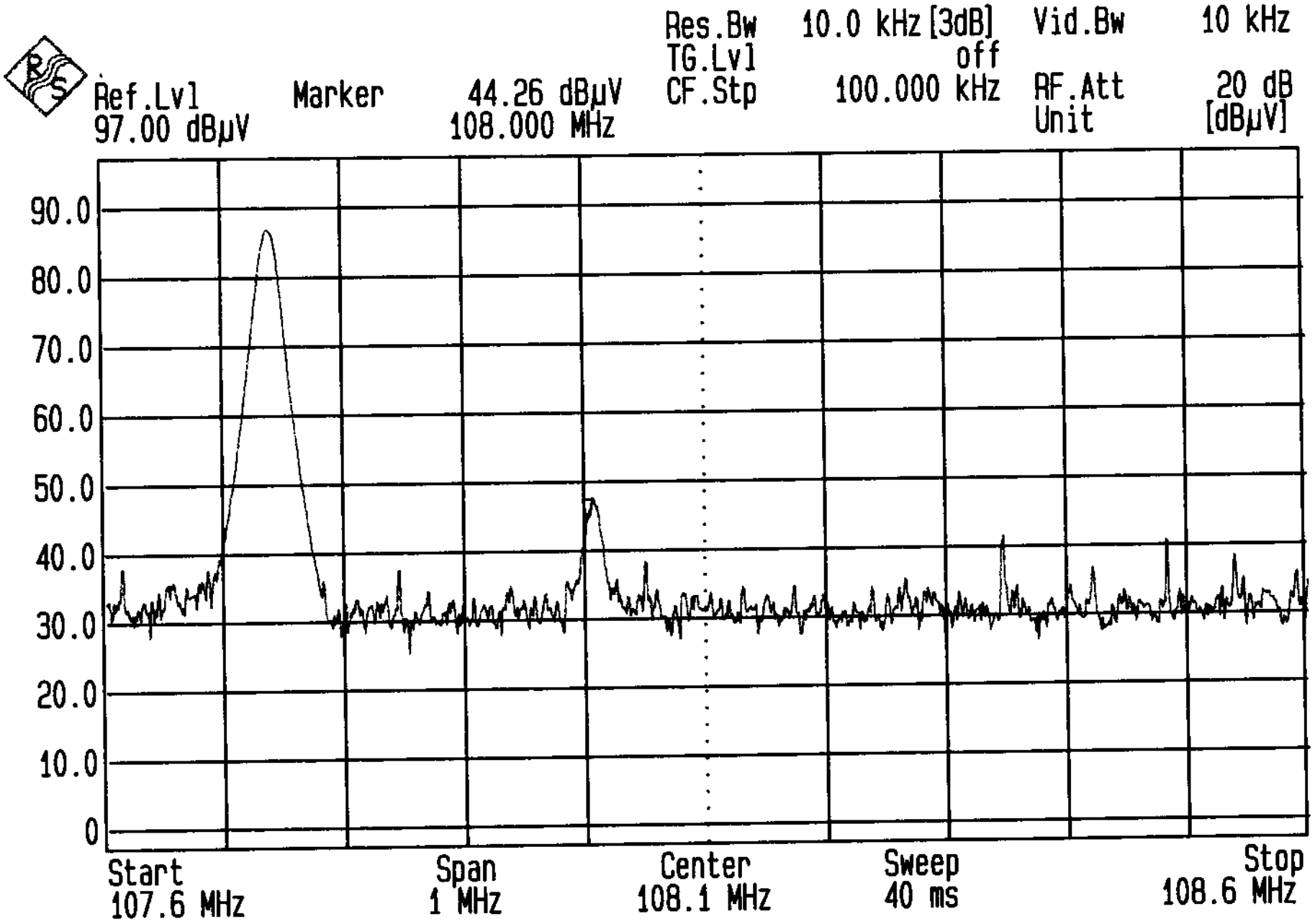
Appendix 1 : Plotted Data For Emission Band Measurement


Date 24.Jun.'02 Time 11:13:19
Ref.Lvl -40.00 dBm
Delta 0.40 dB 41.3 kHz
Res.Bw 10.0 kHz [3dB]
TG.Lvl off
CF.Stp 31.251 kHz
Vid.Bw 100 kHz
RF.Att 0 dB
Unit [dBm]
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
-130.0
-140.0
D2
NX
Start 88.334715 MHz
Span 312.512 kHz
Center 88.490971 MHz
Sweep 20 ms
Stop 88.647227 MHz


Date 24.Jun.'02 Time 11:16:19
Ref.Lvl
-40.00 dBm
Delta
-0.53 dB
40.2 kHz
Res.Bw 10.0 kHz [3dB]
TG.Lvl off
CF.Stp 31.251 kHz
Vid.Bw 100 kHz
RF.Att 0 dB
Unit [dBm]
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
-130.0
-140.0
D2
NX
Start
97.806242 MHz
Span
312.512 kHz
Center
97.962498 MHz
Sweep
20 ms
Stop
98.118754 MHz


Date 24.Jun.'02 Time 10:54:40
Ref.Lvl
-40.00 dBm
Delta
-0.30 dB
41.3 kHz
Res.Bw 10.0 kHz [3dB]
TG.Lvl off
CF.Stp 31.251 kHz
Vid.Bw 100 kHz
RF.Att 0 dB
Unit [dBm]
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
-130.0
-140.0
D2
NX
Start
107.558974 MHz
Span
312.512 kHz
Center
107.71523 MHz
Sweep
20 ms
Stop
107.871486 MHz


Ref.Lvl
97.00 dBµV
Marker
40.56 dBµV
88.000 MHz
Res.Bw
TG.Lvl
CF.Stp
10.0 kHz [3dB]
off
100.000 kHz
Vid.Bw
RF.Att
Unit
10 kHz
20 dB
[dBµV]
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
Start
87.6 MHz
Span
1 MHz
Center
88.1 MHz
Sweep
40 ms
Stop
88.6 MHz


Ref.Lvl
97.00 dBµV
Marker
44.26 dBµV
108.000 MHz
Res.Bw
TG.Lvl
CF.Stp
10.0 kHz [3dB]
off
100.000 kHz
Vid.Bw
10 kHz
RF.Att
20 dB
Unit
[dBµV]
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
Start
107.6 MHz
Span
1 MHz
Center
108.1 MHz
Sweep
40 ms
Stop
108.6 MHz