CHAPMAN
TECHNOLOGIES, INC.

FCC Type Acceptance Application

EXHIBIT 4

TEST REPORT

"Personal Safeguard Companion"

FCC ID – N6TSCACEJ

SUMMARY OF TEST REPORT

The Chapman Personal Safeguard Companion was tested to all the relevant FCC requirements.

The Radiated Emission Testing was carried out at the EMI Research and Development Laboratory of Florida Atlantic University. Their Report, "Technical Report 99-004" is appended to this Exhibit.

The Frequency Stability Testing was carried out using the Temperature Test Chamber at Amitek Corporation, in Boca Raton, Florida.

All other testing was carried out in the laboratory at Chapman Technologies, Fort Lauderdale, Florida.

The Test Results demonstrate that the Chapman Personal Safeguard Companion satisfies the relevant FCC requirements.

Report Complied by: ..... Date: 2/3/99.....
G K Smith

TABLE OF CONTENTS

TABLE OF CONTENTS

1 General Information

1.1 PURPOSE

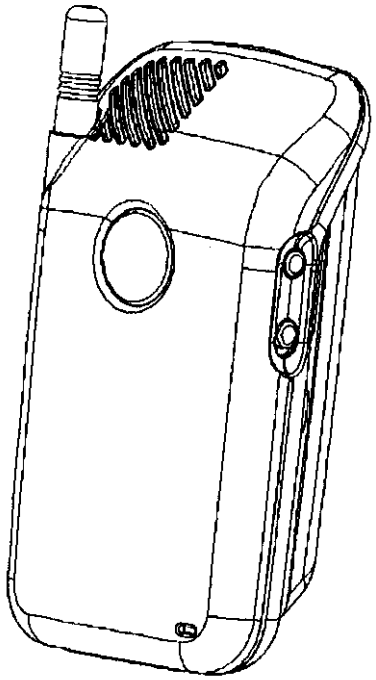
The purpose of this document is to provide the Test Results on the Safeguard Companion product for submission to the FCC for Type Acceptance as requested in "EXHIBIT 4 – TEST REPORT".

1.2 GLOSSARY OF TERMS

Acronym	Description
FCC	Federal Communications Commission
§	Code of Federal Regulations Part.
AMPS	Advanced Mobile Phone System
GPS	Global Positioning System
LED	Light Emitting Diode

2 Safeguard Companion

The Safeguard Personal Companion is designed for use as a personal security device. It consists of a fully functional AMPS cellular phone (IS-19 and IS 91) and a 12-channel GPS receiver packaged in a hand-held plastic case as shown below.



The AMPS cellular phone is based on a reference design using the ACE Chipset manufactured by Mitel (formally GEC-Plessey). This chipset is used in several cellphones on the market including ones manufactured by Ericsson and Uniden.
The device uses the analog AMPS cellular network for all communications between the user and the Central Control Station. The AMPS network is used for both data and voice communications. An internal loudspeaker and a microphone are used for "handsfree" voice communications.

The device uses the 12-channel GPS receiver for determining its location. The GPS Receiver is based on a reference design using the Zodiac Chipset manufactured by Rockwell Semiconductors.

3 Test Specifications

3.1 FCC REGULATIONS

3.1.1 General

The specific tests required for FCC Type Acceptance are contained within "FCC Code of Federal Regulations, Title 47".

§2.985 to §2.997 specify the required data, in general, and §2.999 adds the specific data for the particular type of equipment.

The Safeguard Companion consists of two main boards: the AMPS Cellular Controller and the GPS Receiver. The two functions performed by these boards are those of public cellular radio communications and GPS reception.

3.1.2 Relevant FCC Parts

3.1.2.1 AMPS Board

The AMPS Cellular board conforms to Part 22 Subpart K – Domestic Public Cellular Radio Telecommunication Service, §22.900.

3.1.2.2 GPS Board

The GPS receiver conforms to Part 15 Subpart B "Unintentional Radiator", §15.101. The GPS Receiver operating at 1575MHz, as per §15.101 (b), is exempt from complying with the technical provisions of §15. ET Docket No.97-94, on April 1998, eliminated the Notification requirement of §15.101 and the GPS receiver requires only Declaration of Conformity.

As the GPS receiver forms an integral part of the device, it was switched on during the testing of Radiation Emission Limits, and hence the GPS receiver, as well as the complete device, was tested to §15.109. The results of this testing is given in this report.

3.2 RELEVANT SPECIFICATIONS

3.2.1 FCC and EIA/IS-19-B

A list of the tests required by FCC is given in the following Table. Where applicable, EIA Interim Standard "Recommended Minimum Standards for 800-MHZ Cellular Subscriber Units", EIA/IS-19-B, is used as the reference for the measurements and results.

TEST	FCC Part	IS-19-B Clause	Specification
Radiated Emission Limits	§15.109(a)		§15.109(a)
RF Power Output		3.2.1	-2dBW, +2dB –4dB
Modulation Characteristics Modulation Deviation Limiting	§2.987(a)	3.3.2.3	Modulation Response NGT 12kHz peak deviation.
Occupied Bandwidth Spectrum Noise Suppression		3.4.1	Voice + SAT 20-45kHz <-26dBc >45kHz <-(63+10logP)dBc SAT + ST 20-45kHz <-26dBc 45-60kHz <-45dBc 60-90kHz <-60dBc >90kHz <-(63+10logP)dBc Wideband Data 20-45kHz <-26dBc 45-60kHz <-45dBc 60-90kHz <-60dBc >90kHz <-(63+10logP)dBc All Modulation 869-894MHz <-80dBm
Spurious Emissions at antenna terminal Harmonic and Spurious Emissions (Conducted) - Discrete		3.4.2.	Voice + SAT >-(43+10logP)dBc Wideband Data >-(43+10logP)dBc
Field Strength of Spurious Radiation	§2.993		
Frequency Stability	§2.995		–30 to +50°C +/- 2.5ppm

3.3 METHOD OF MEASUREMENT

The Method of Measurement, where appropriate, is as given in the following document:

EIA INTERIM STANDARD

"Recommended Minimum Standards for 800-MHZ Cellular Subscriber Units"

EIA/IS-19-B

3.4 STANDARD TEST CONDITIONS

The Standard Test Conditions are as given in Section 6 of the following document:

EIA INTERIM STANDARD

"Recommended Minimum Standards for 800-MHZ Cellular Subscriber Units"

EIA/IS-19-B

3.5 TEST EQUIPMENT

For the Tests carried out at Chapman Technologies, the following Test Equipment was used:

3.5.1 AMPS Test Set

MARCONI INSTRUMENTS Radio Communications Test Set 2955B, S/N 132423/078
with adapter AMPS Radio Test System 2957B, S/N 132451/064

3.5.2 Modulation Analyzer

HEWLETT PACKARD 8901A. S/N 2324A02790

3.5.3 Spectrum Analyzer

HEWLETT PACKARD 8590B, 9kHz to 1.8GHz. S/N 2932A00221

3.5.4 Multimeter

HEWLETT PACKARD 3468A. S/N 2137A13790

3.5.5 Plotter

HEWLETT PACKARD HP7470A Plotter. S/N 2210A10932 FCC ID BSD8537470A

3.5.6 10dB Fixed Attenuator

PASTERNACK PE1070-10.

3.5.7 Dummy Load

WEINSCHEL ENGINEERING M1413 S/N 3443, 10W AVG, 1KW Peak.

For the Frequency Stability Test, carried out at Amitek, Corporation, the following test equipment was also used:

3.5.8 Temperature Test Chamber

RANSCO 16000 Series Model 16219 S/N 235-009130

4 TESTING

4.1 RADIATED EMISSION LIMITS

This test was carried out at EMI Research and Development Laboratory at Florida Atlantic University.

In order to preserve battery life, the cellular board of the Safeguard Companion was set to receive mode and the GPS Receiver board was switched on with a duty cycle of 1 second ON, 2 seconds OFF.

Details of the measurements are given in Florida Atlantic University Technical report No. 99.004, Page 3, which is appended to this Exhibit.

4.2 RF POWER OUTPUT

4.2.1 Specification

FCC regulations and OST Bulletin No. 53 control the effective Radiated power (ERP).
The ERP of the Safeguard Companion is as defined in EIA/IS-19-B para. 3.2.1. and Table 4.
The antenna fitted to the Safeguard Companion device has a nominal gain of 0dBd. The Safeguard Companion is a Class III subscriber device with a maximum nominal power level of 0.6W ERP, +2dB, -4dB.

4.2.2 Measurement

The output from the antenna terminal was connected to the input of the AMPS Test Set (para. 3.5.1). The unit under test was set to transmit at Power Level 0, the maximum output. The Transmit Power is measured at Channels #991, #331, #799 corresponding to the lowest, center and highest frequencies.

4.2.3 Results

Measurement	Standard	Result	Remarks
Channel #991	27.8dBm +2 –4 dB	25.5 dBm	OK
Channel #331	27.8dBm +2 –4 dB	25.8 dBm	OK
Channel #799	27.8dBm +2 –4 dB	24.5 dBm	OK

Date Tested: 12-10-98

Test Engineer: Steven D. Raglin (Signature)

STEVEN D. RAGLIN (Printed)

4.2 MODULATION CHARACTERISTICS

4.2.1 Audio Frequency Response

The Audio Frequency Responses are controlled by the ACE9040 Audio Processor IC. The typical audio responses are given in the ACE9040 specification. These are reproduced below.

ACE9040

TYPICAL FREQUENCY RESPONSES

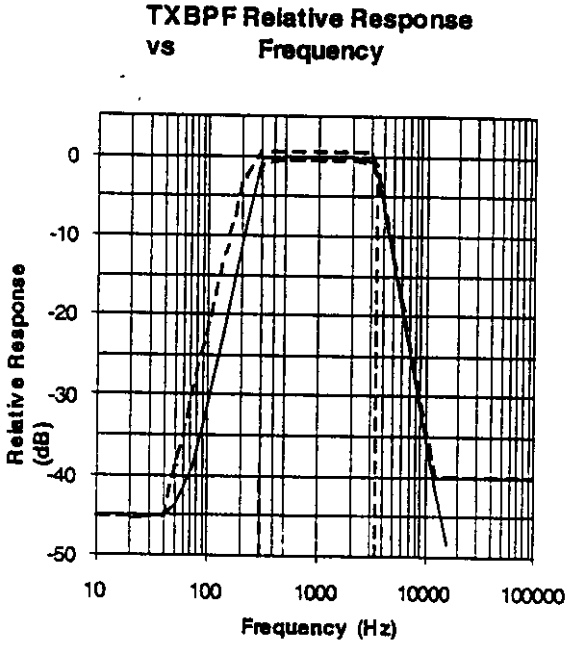


Figure 4

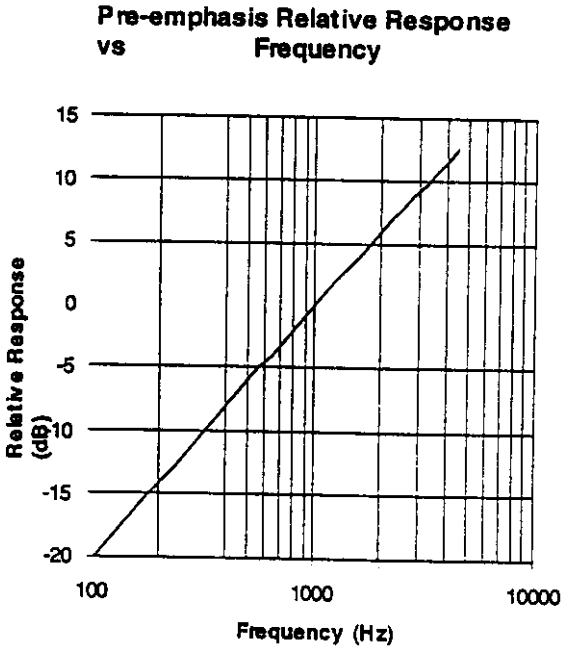


Figure 5

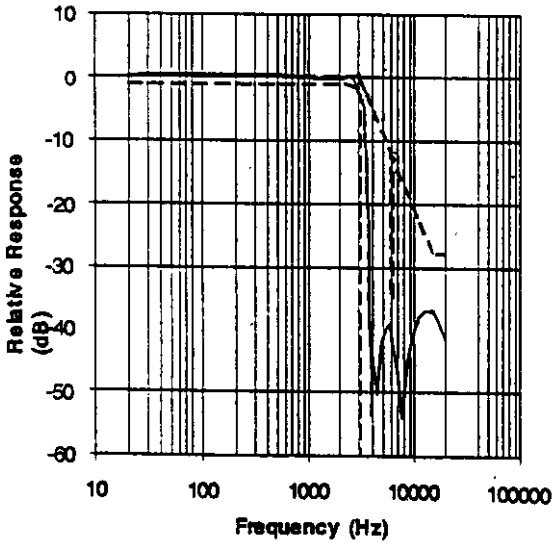


Figure 6

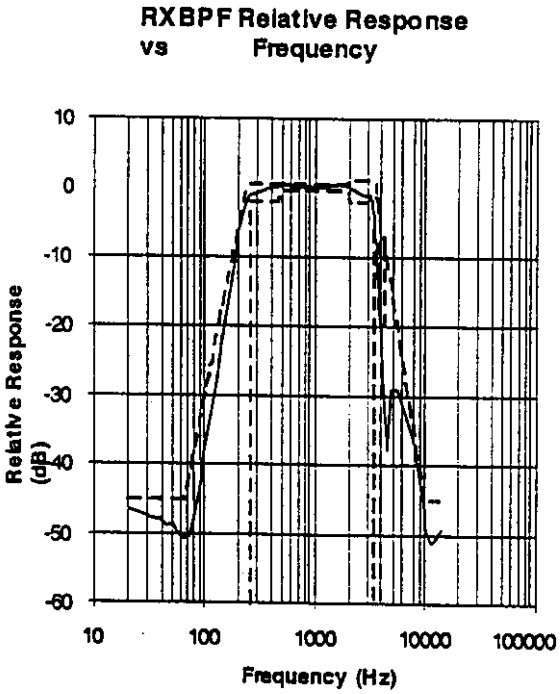


Figure 7

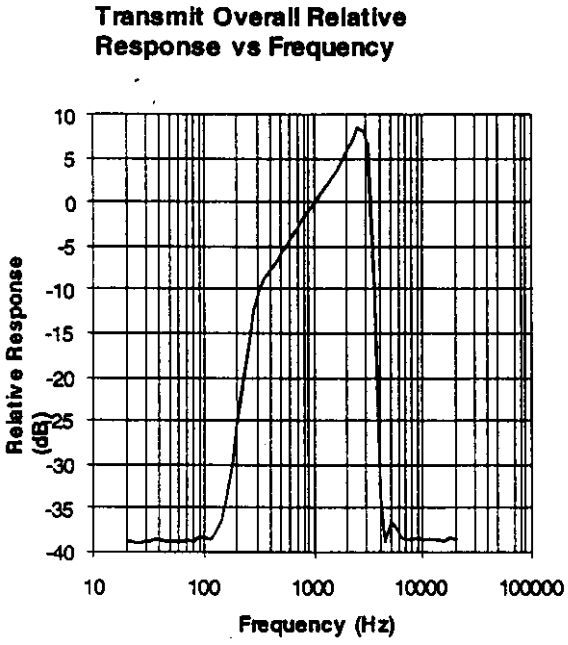


Figure 8

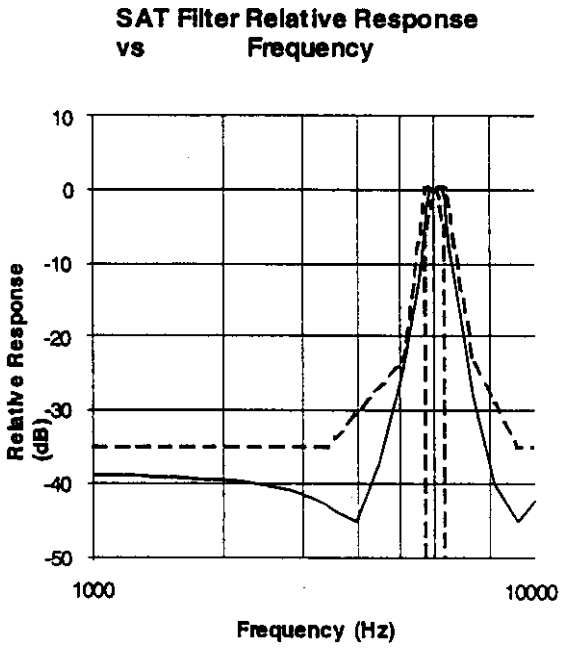


Figure 9

4.3.2 Modulation Deviation Limiting

Modulation limiting refers to the ability of the transmitter circuits to prevent the transmitter from producing deviation in excess of rated system deviation.
The output from the antenna terminal is connected to the input of the Modulation Analyzer (para. 3.5.2). The Deviation Limiting is tested in accordance with Clause 3.3.2.3. of IS-19-B.

4.3.2.1 Specification

The instantaneous peak and steady state deviation shall not exceed ±12kHz at any audio frequency.

4.3.2.2 Measurement

Set transmitter to channel #991 (lowest frequency). With compressor enabled and the SAT disabled, adjust the audio input for ±8kHz peak deviation at 1000Hz. Increase the audio input level by 20dB. Vary the frequency and observe the deviation for all frequencies between 300 and 3000Hz. Record the highest deviation and corresponding frequency. Repeat for channels #331 (center frequency) and #799 (highest frequency).

4.3.3 RESULTS

Measurement	Standard	Result	Remarks
		Max. Deviation	
Channel #991	NMT ±12kHz 300 to 3000Hz	11.86	2.5 KHz
Channel #331	NMT ±12kHz 300 to 3000Hz	11.86	2.5 KHz
Channel #799	NMT ±12kHz 300 to 3000Hz	11.75	2.5 KHz

Date Tested: 12-10-98

Test Engineer: Steven D. Raglin (Signature)

STEVEN D. RAGLIN (Printed)

4.4 OCCUPIED BANDWIDTH

The Occupied Bandwidth was tested in accordance with Clause 3.4.1. of IS-19-B.

The output from the antenna terminal is connected to the input of the Spectrum Analyzer, (para. 3.5.3) via a 10dB fixed attenuator (para. 3.5.6). The Spectrum Analyzer display is plotted on a Hewlett Packard 7470A Plotter. (para. 3.5.5).

4.4.1 Specification

The mean power of emissions from the transmitter with modulated carrier shall be attenuated below the mean power of the unmodulated carrier in accordance with the following:

Modulation	Frequency removed from carrier	Attenuation
All modulation	20kHz up to 45kHz	At least 26dBc
Voice and SAT	>45kHz	At least (63 + 10 log P) dBc
Signaling Tone plus SAT	>45kHz to 60kHz >60kHz to 90kHz >90kHz	At least 45dBc At least 60dBc At least (63 + 10 log P) dBc
Wideband Data	>45kHz to 60kHz >60kHz to 90kHz >90kHz	At least 45dBc At least 60dBc At least (63 + 10 log P) dBc

NOTE: P is mean output power in watts.

In the band 869MHz to 894MHz, the mean power of emissions from the transmitter with modulated carrier shall not exceed –80dBm.

4.4.2 Measurement

Set the transmitter to channel #1 (to avoid interference).

For combined audio and SAT measurements, disable compressor and modulate transmitter with 1000Hz tone at a level to produce ±8kHz peak deviation. Increase audio level by 13.5dB and change audio frequency to 2500kHz. Switch on SAT tone of 6000Hz with ±2kHz peak deviation. Adjust Spectrum Analyzer and record display accordingly.

For combined SAT and Signaling Tone (ST) measurements, the transmitter is modulated with a 10kHz ST frequency with ±8kHz peak deviation in addition to the SAT tone of 6000Hz with ±2kHz peak deviation.

For Wideband data measurements, the transmitter is modulated with a quasi-random 10kilobit/second data pattern at ±8kHz peak deviation.

4.4.3 RESULTS:

The results of the measurements are given in Spectrum Analyzer plots #

4.4.3.1 Voice (2500Hz limiting), and SAT 6000H)

CONDITION	PLOT	SPEC	RESULTS	REMARKS
20kHz to 45kHz	#1	<-26dBc	-35dBc	PASS
>45kHz, up to 1st Harmonic	#1 & #2	<-59dBc	-69dBc	PASS

NOTE: Assuming Mean output power of unmodulated carrier = –4dBW

4.4.3.2 Signaling Tone (10kHz), and SAT 6000Hz

CONDITION	PLOT	SPEC	RESULTS	REMARKS
20kHz to 45kHz	#3	<-26dBc	-39dBc	PASS
45kHz to 60 kHz	#4	<-45dBc	-65.5dBc	PASS
60kHz to 90 kHz	#4	<-65dBc	-69dBc	PASS
>90kHz, up to 1st Harmonic	#4 & #5	<-59dBc	<-70dBc	PASS

NOTE: Assuming Mean output power of unmodulated carrier = –4dBW

4.4.3.3 Wide Band Data

CONDITION	PLOT	SPEC	RESULTS	REMARKS
20kHz to 45kHz	#6	<-26dBc	-32dBc	PASS
45kHz to 60 kHz	#7	<-45dBc	-70dBc	PASS
60kHz to 90 kHz	#7	<-65dBc	-70dBc	PASS
>90kHz, up to 1st Harmonic	#7 & #8	<-59dBc	-70dBc	PASS

NOTE: Assuming Mean output power of unmodulated carrier = –4dBW

In all Plots, the unmodulated carrier is shown at level 16dBm. A 10dB fixed attenuator was used on the input of the Spectrum Analyzer, hence, level of unmodulated carrier assumed to be 26dBm or –4dBW.

4.4.3.4 All Modulation

CONDITION	PLOT	SPEC	RESULTS	REMARKS
869MHz to 894MHz	#9	-80dBm	<-85dBm	PASS

NOTES:

1) Resolution bandwidth 10kHz in order to reduce noise floor of Spectrum Analyzer below –95dBm

2) 10dB fixed attenuator on input of Spectrum Analyzer, hence 10dB added to reading.

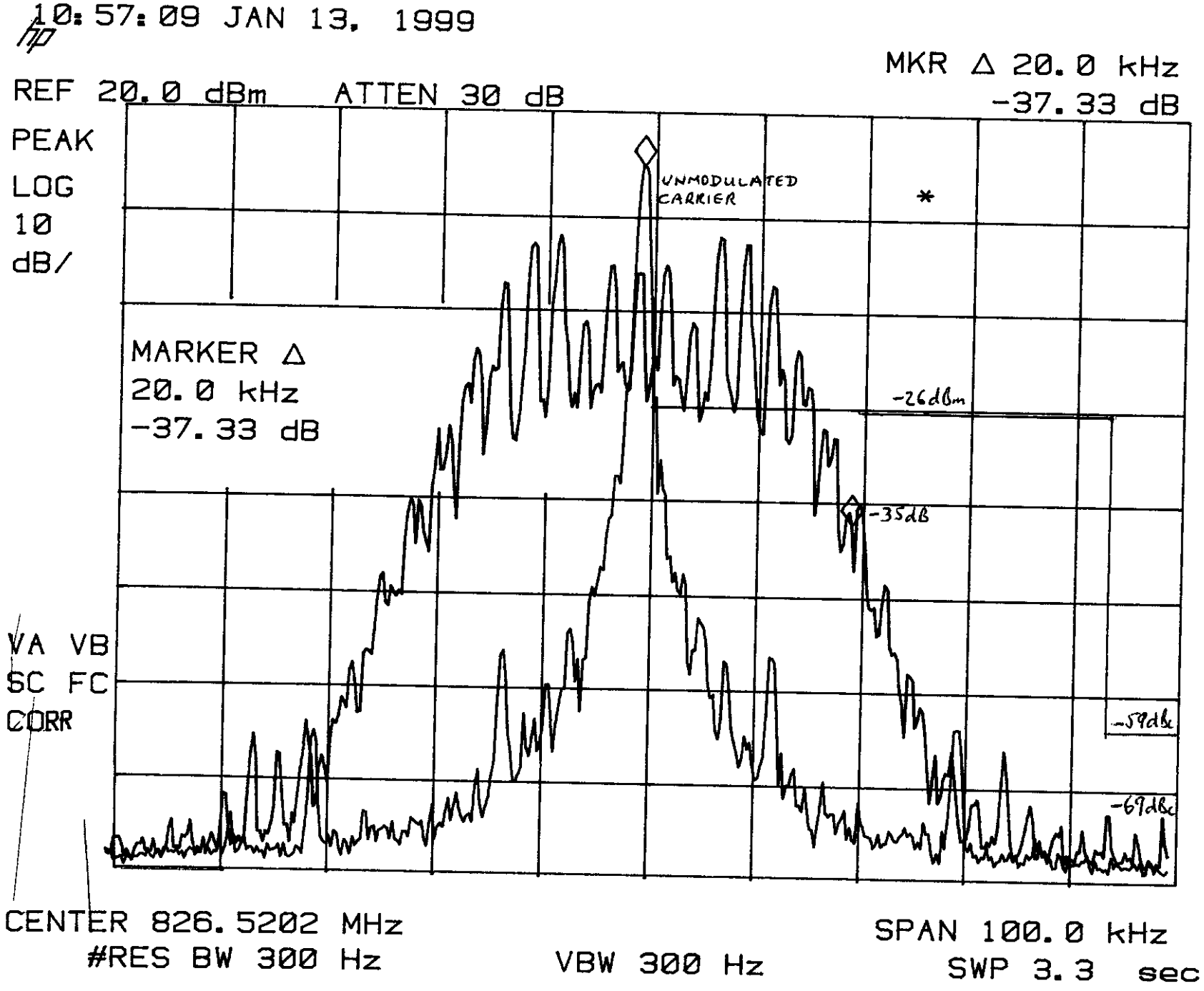
3) All forms of modulation were applied to unit, in all cases no discrete signals were observed above the Spectrum Analyzer noise, hence just one plot given.

Date Tested: 1/13/99

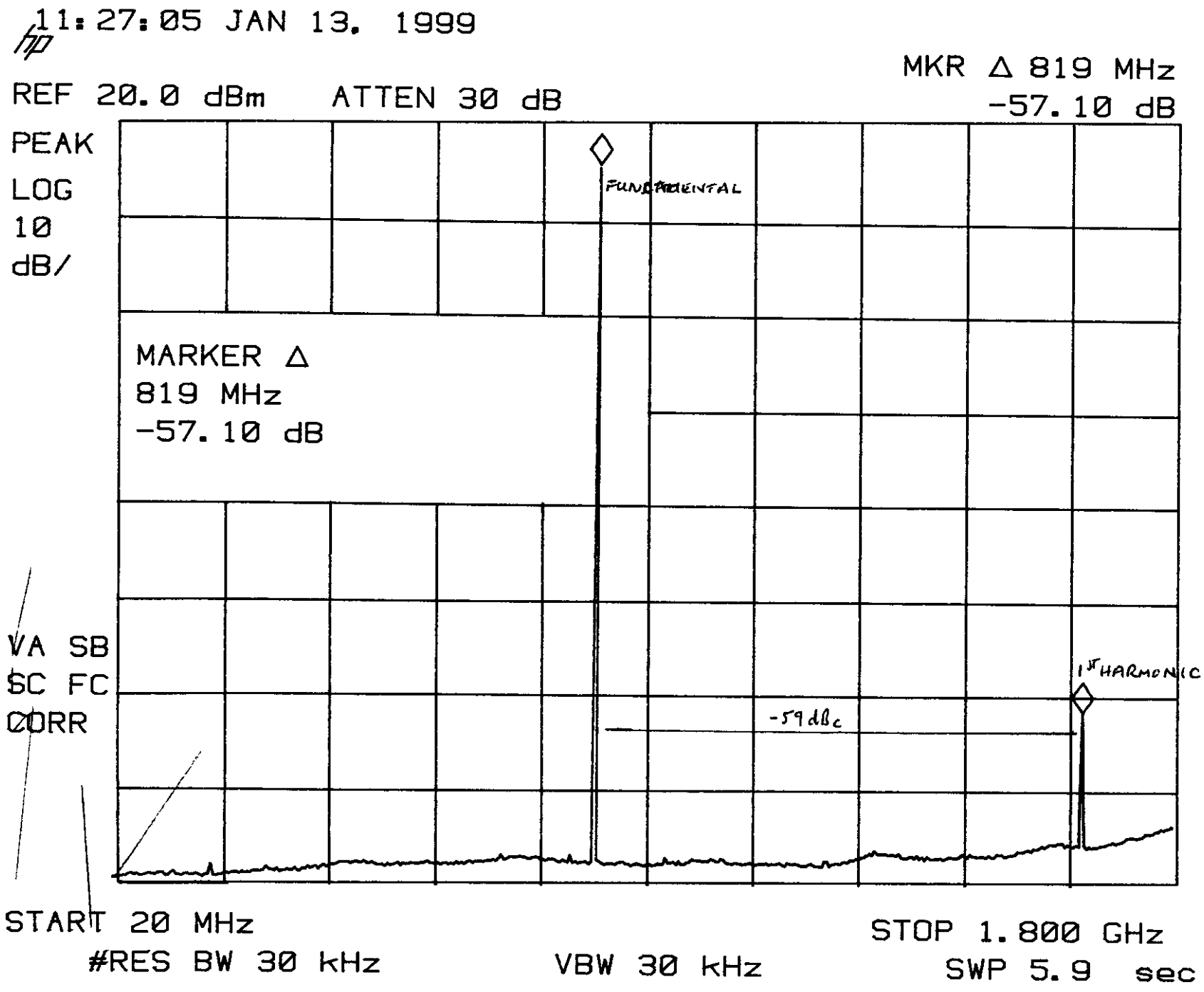
Test Engineer: ..... (Signature)

G. K. SMITH (Printed)

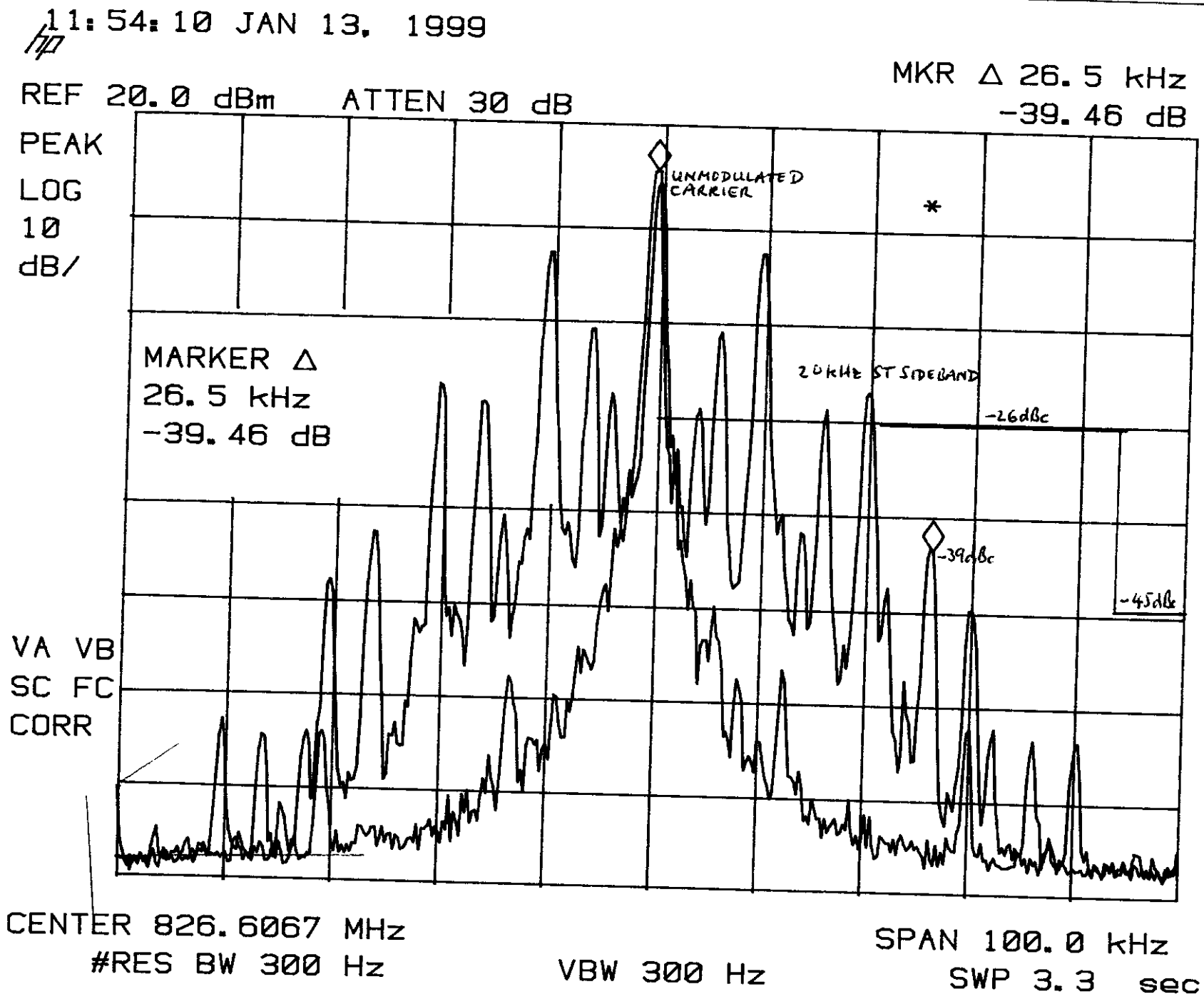
PLOT #1 – VOICE and SAT **FCC ID – N6TSCACEJ**



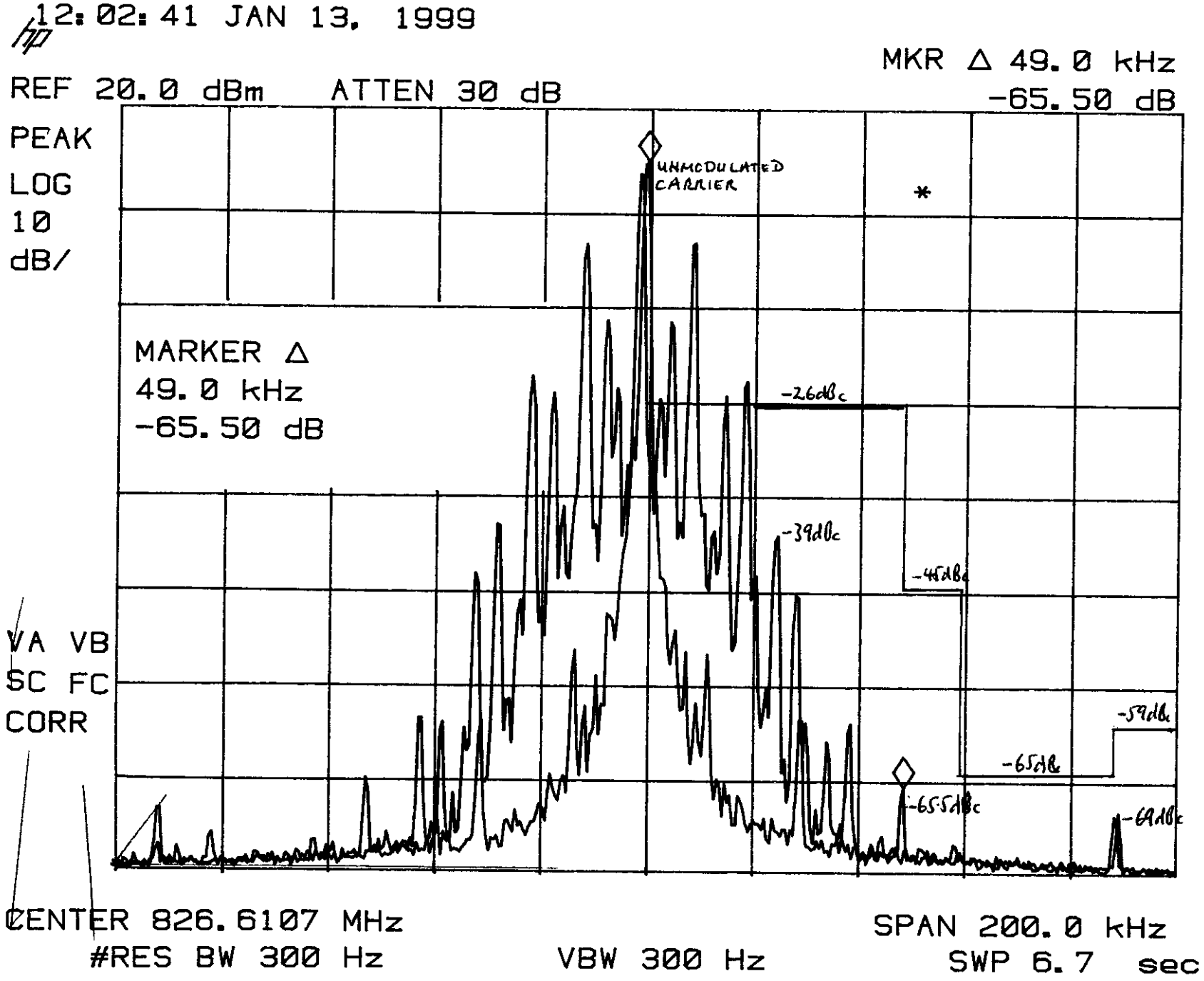
PLOT #2 – VOICE and SAT **FCC ID – N6TSCACEJ**



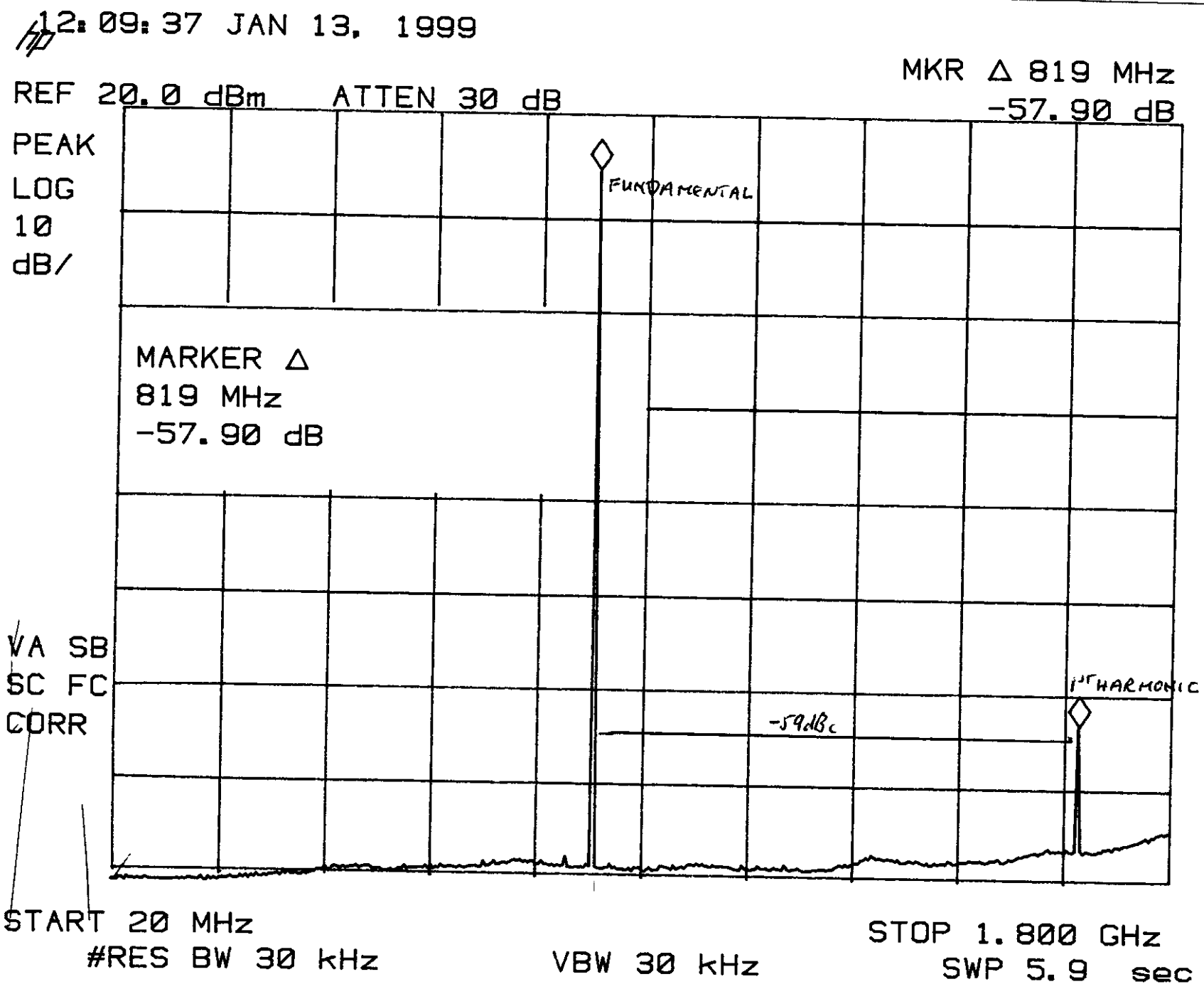
PLOT #3 – SAT and SIGNALING TONE **FCC ID – N6TSCACEJ**



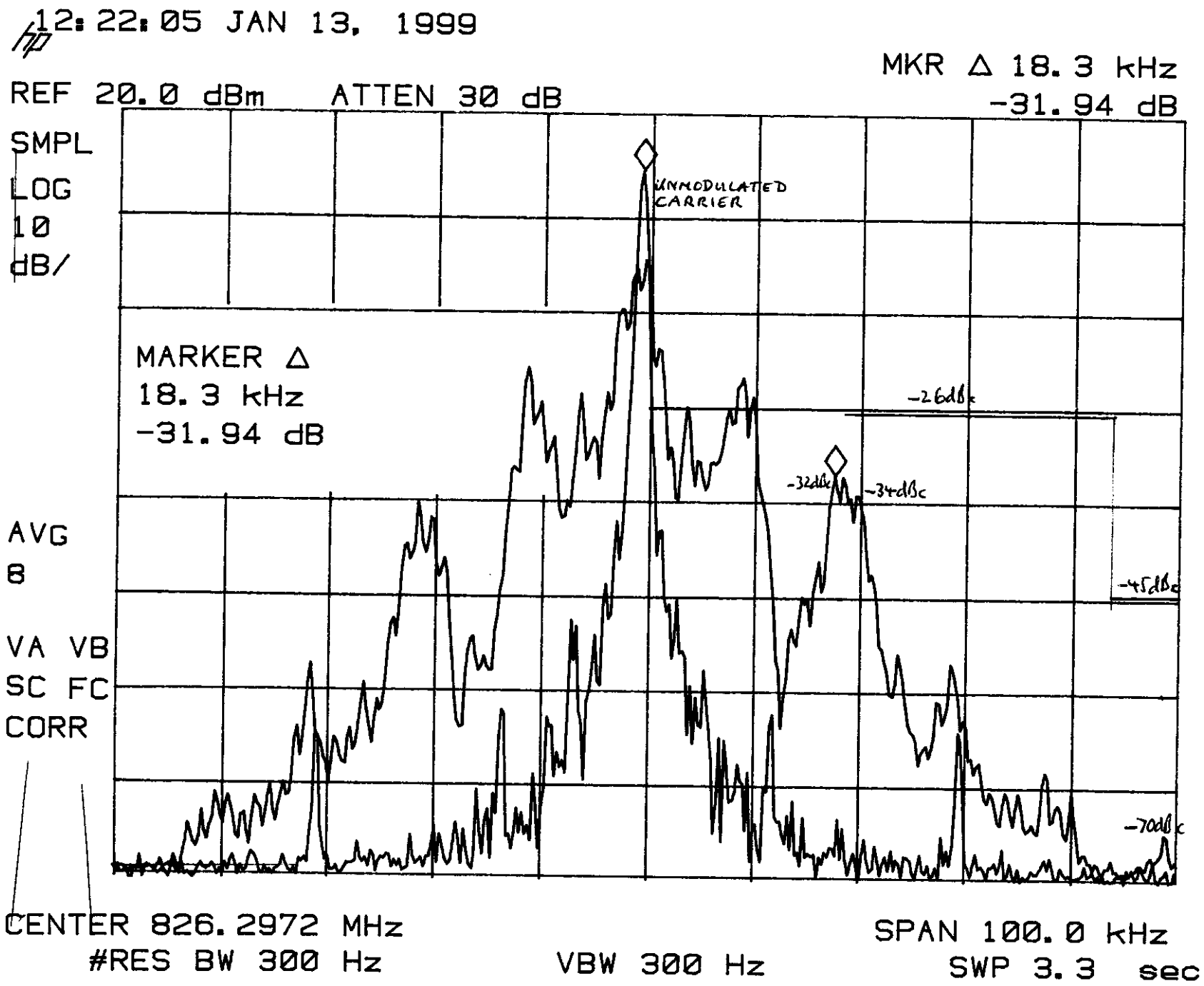
PLOT #4 – SAT and SIGNALING TONE **FCC ID – N6TSCACEJ**



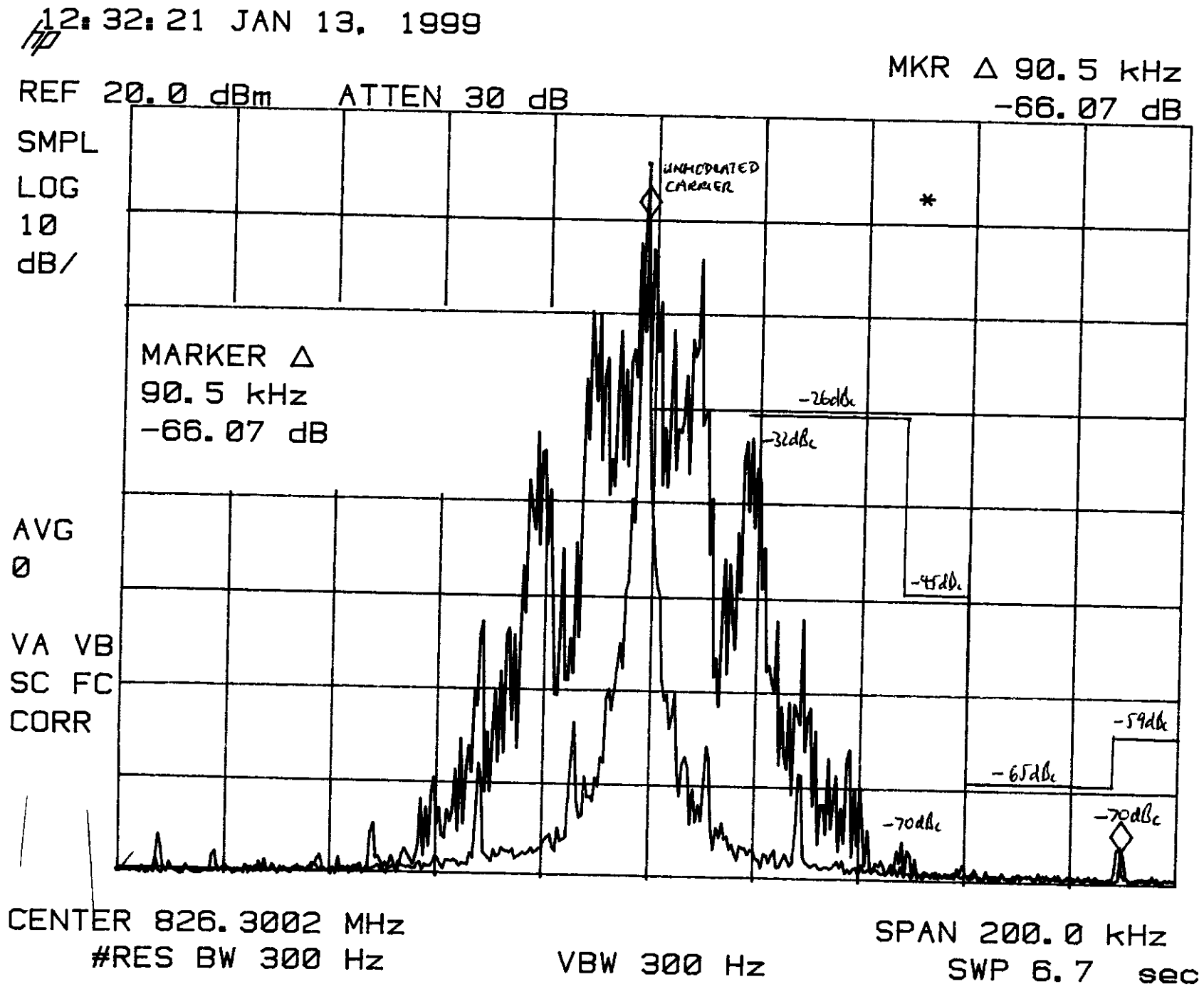
PLOT #5 – SAT and SIGNALING TONE **FCC ID – N6TSCACEJ**



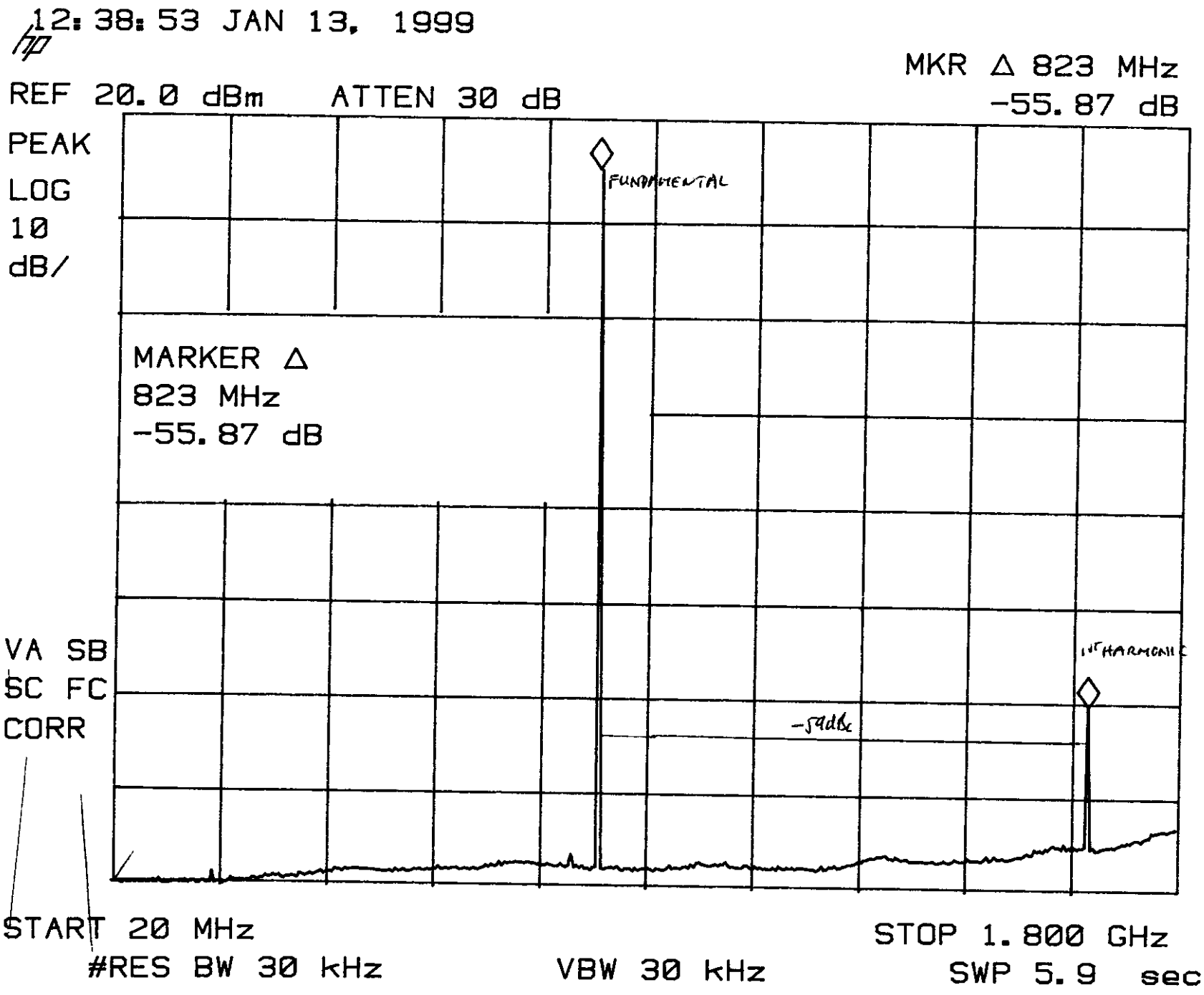
PLOT #6 – WIDEBAND DATA **FCC ID – N6TSCACEJ**



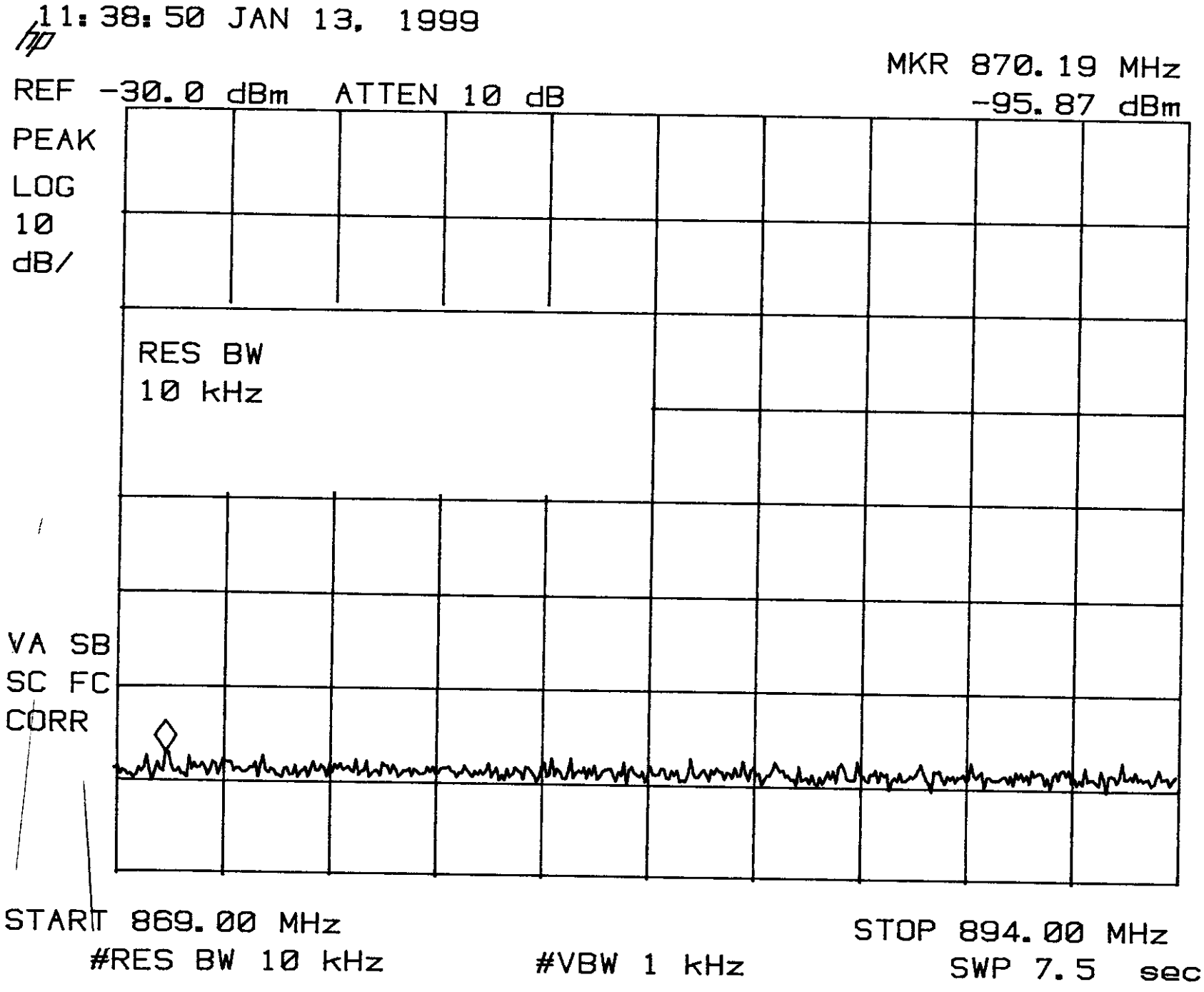
PLOT #7 – WIDEBAND DATA **FCC ID – N6TSCACEJ**



PLOT #8 – WIDEBAND DATA **FCC ID – N6TSCACEJ**



PLOT #9 – ANY MODULATION **FCC ID – N6TSCACEJ**



4.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

This test was carried out at EMI Research and Development Laboratory at Florida Atlantic University. The Details given in Technical report No. 99-004.

The Spurious Emissions at Antenna Terminals is tested in accordance with Clause 3.4.2. of IS-19-B.3., "Harmonic and Spurious Emissions (Conducted) – Discrete".

4.5.1 Specification

The transmitter shall be alternately modulated with combined voice and SAT and with wideband data. The conducted spurious emissions shall be attenuated below the level of emissions of the carrier frequency by at least 43 + 10 [log10 (mean output power in Watts)] dB.

4.5.2 Measurement

Set the transmitter to channel #331 (center), full power.
For combined audio and SAT measurements, disable compressor and modulate transmitter with 1000Hz tone at a level to produce ±8kHz peak deviation. Increase audio level by 13.5dB and change audio frequency to 2500kHz. Switch on SAT tone of 6000Hz with ±2kHz peak deviation. Adjust Spectrum Analyzer and set display accordingly..
For Wideband data measurements, the transmitter is modulated with a quasi-random 10kilobit/second data pattern at ±8kHz peak deviation.
Record up to the tenth harmonic.

4.5.3 RESULTS

The measured results are contained in Florida Atlantic University Technical Report No. 99-004, Page 13, which is appended to this Exhibit.

4.6 FIELD STRENGTH OF SPURIOUS RADIATION

This test was carried out at EMI Research and Development Laboratory at Florida Atlantic University.

In order to preserve battery life, the Safeguard Companion was set for a transmit duty cycle of 1 second ON, 2 seconds OFF. The antenna output was loaded by the Dummy Load (para. 3.5.7).

Details of the measurements are given in Florida Atlantic University Technical report No. 99.004, Page 16, which is appended to this Exhibit.

4.7 FREQUENCY STABILITY

This Test is carried out at AMITEK Corporation, Clint Moore Road, Boca Raton, Florida.
The output from the antenna terminal is connected to the input of the AMPS Test Set (para. 3.5.1).
The unit was placed into the Temperature Test Chamber (para 3.5.8).

4.7.1 Specification

The Carrier Frequency shall be maintained within ±2.5ppm of any assigned channel frequency.

4.7.2 Measurement

The Frequency Stability is tested in accordance with the following:

Paragraph	Description
§2.995 (a) (1)	-30° to +50° centigrade
§2.995 (b)	10° steps
§2.995 (d) (2)	Supply voltage set to battery operating end point.

Battery used in unit is two ICP-340948 Lithium Ion Cells, manufactured by PolyStor Corporation, Dublin, CA. The operating voltage range is specified as 2.5 to 4.2V per cell. The supply voltage, in accordance with §2.995 (d) (2) is therefore set to 5V, measured at the supply input to the device, using the Multimeter (para 3.5.4).

The unit was placed in the Environmental Chamber. The unit was set to channel #991, receive mode. An input signal, for channel #991, at –80dBm was applied to the antenna. The temperature of the Environmental Chamber was then set to –30°C and increased, in 10-degree steps over the range, allowing time for the temperature to be stable at each step. At each step, the unit was set to channels #991, #331 and #799 in turn, the transmitter was switched on and the frequency recorded.

4.7.3 RESULTS

Comment on Test Results: The Automatic Frequency Control system worked throughout the temperature range. Hence at each temperature reading, the frequency error was noted to vary over a small range of –110 to +60Hz, less than 0.2ppm max error. The recorded frequency was that of the first reading shown on the Marconi Test Set.

Supply Voltage ..5.094 V

TEMP Degrees C	Channel #991 824.04000MHz		Channel #991 834.93000MHz		Channel #991 848.97000MHz	
	Frequency	Error ppm	Frequency	Error ppm	Frequency	Error ppm
-30	824.04002	0.02	834.93006	0.07	848.96992	0.09
-20	824.04007	0.08	834.93005	0.06	848.96999	0.01
-10	824.03998	0.02	834.93006	0.07	848.97004	0.05
0	824.03996	0.05	834.93002	0.02	848.97003	0.04
10	824.03999	0.01	834.92998	0.02	848.97000	0.00
20	824.03996	0.05	834.92994	0.07	848.96995	0.06
30	824.03995	0.06	834.92991	0.11	848.96997	0.04
40	824.03990	0.12	834.92993	0.08	848.96990	0.12
50	824.03994	0.07	834.92992	0.10	848.96995	0.06
60	824.03995	0.06	834.92990	0.12	848.96992	0.09

Maximum error recorded ..-110, +60 Hz < 0.2 ppm

Date Tested:... 1/28/99

Test Engineer:.....(Signature)

GRAHAM K SMITH(Printed)

EMI Research and Development Laboratory
Department of Electrical Engineering
Florida Atlantic University
Boca Raton, Florida 33431
(561) 338-1650

Technical Report No. 99-004

**"Evaluation of the Chapman Technologies, Inc.
'Personal Safeguard Companion'
FCC ID: N6TSCACEJ
to FCC Radiated Emission Requirements."**

Performed: 12 January 1999

Customer: Chapman Technologies, Inc.
800 W. Cypress Creek Rd. #240
Fort Lauderdale, FL 33309

Company Official responsible
for product(s) tested: _____
Graham K. Smith, Director of Systems Development
tel (954) 958-9000, fax (954) 958-9009.

Test Performed &
Reported by: _____
J.R. Nicholson
FAU EMI R & D Laboratory

Approved by: _____
Vichate Ungvichian, Ph.D., P.E.
Director, FAU EMI R & D Laboratory

1. INTRODUCTION

The Chapman Technologies, Inc. 'Personal Safeguard Companion' FCC ID: ND6TSCACEJ was evaluated for compliance to FCC emission requirements and the results reported in this 16 page document apply only to the specific items of equipment, configurations (including software/unit operation), and procedures supplied to the Florida Atlantic University EMI Research Lab by Chapman Technologies, Inc as reported in this document.

2. OBJECTIVE

This evaluation was performed to verify conformance of the Chapman Technologies, Inc. 'Personal Safeguard Companion' to the Radiated Emission limits of FCC CFR 47, Part 15, paragraph 15.109(a) over the frequency range defined in 15.33(b)(1). Further evaluations were performed to the requirements of EIA/IS-19-B "Recommended Minimum Standards for 800 MHz Cellular Subscriber Units" as identified in the Tests Results section.

3. CONCLUSION

The Chapman Technologies, Inc. 'Personal Safeguard Companion' FCC ID: N6TSCACEJ met the FCC unintentional radiator emission requirements and the EIA/IS-19-B requirements as described in the following pages.

4. TEST PROCEDURES AND RESULTS

4.1 TEST PROCEDURES

The measurement techniques identified in measurement procedure ANSI C63.4-1992 *"American National Standard of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"* and EIA/IS-19-B *"Recommended Minimum Standards for 800-MHz Cellular Subscriber Units"* were followed as close as practical during this evaluation. Complete details and specific procedures used are discussed in the respective Tests Results sections.

4.2 RECEIVER TESTS:

RADIATED EMISSIONS TEST RESULTS - FCC 15.109(a).

The 'Personal Safeguard Companion' FCC ID: N6TSCACEJ unit was set up on a wooden turntable 80 centimeters above the ground plane floor of the FCC listed Semi-Anechoic test site. Radiated emission measurements were performed with the unit in three orientations, on it's 'foot', 'side', and 'back' as compared to FCC 15.109(a) Unintentional Radiator emission limits. Photograph 1 shows the device installed on the turntable and Photograph 2 shows the dummy load connection to the device.

An EMCO 3104 Broadband Biconical antenna was installed on an EMCO pneumatically controlled Antenna Mast at a distance of 3 meters from the unit. The 30 to 200 MHz frequency range was observed for maximum radiated emission levels on an HP 8566B Spectrum Analyzer, the turntable was rotated through 360 degrees, and the antenna was scanned in height from 1 to 4 meters in both the horizontal and vertical polarizations. No emissions were detected within -25 dB of the FCC limit of 150 uV/m or 43.5 dBuV/m.

An EMCO 3146 Log Periodic antenna was then used and the above procedure was repeated for the 200 to 1000 MHz range. Figure 1 shows maximum emission profile observed. It should be noted that with exception of the receiver local oscillator frequency of 957.273 Mhz, all emissions are from the GPS portion of the device and are all at least -6 dB below the FCC limit. This was demonstrated by disabling the GPS and observing the receiver only. At 957.273 MHz, the limit is 200 uV/m or 46.0 dBuV/m plus 26.3 dB Amplifier Gain minus 21.87 dB Antenna Factor minus 4.68 dB Cable Loss or 45.75 dBuV. The emission level is indicated to be 44.3 dBuV which is -1.45dB below the limit.

For frequencies above 1GHz, an EMCO 3115 Horn antenna was used and the following maximum level emissions (independent of unit orientation) were observed in reference to the FCC limit of 54 dBuV/m:

1.914 GHz	=	51.3 dBuV/m
2.871 GHz	=	39.0 dBuV/m
3.829 GHz	=	29.4 dBuV/m
4.786 GHz	=	37.3 dBuV/m

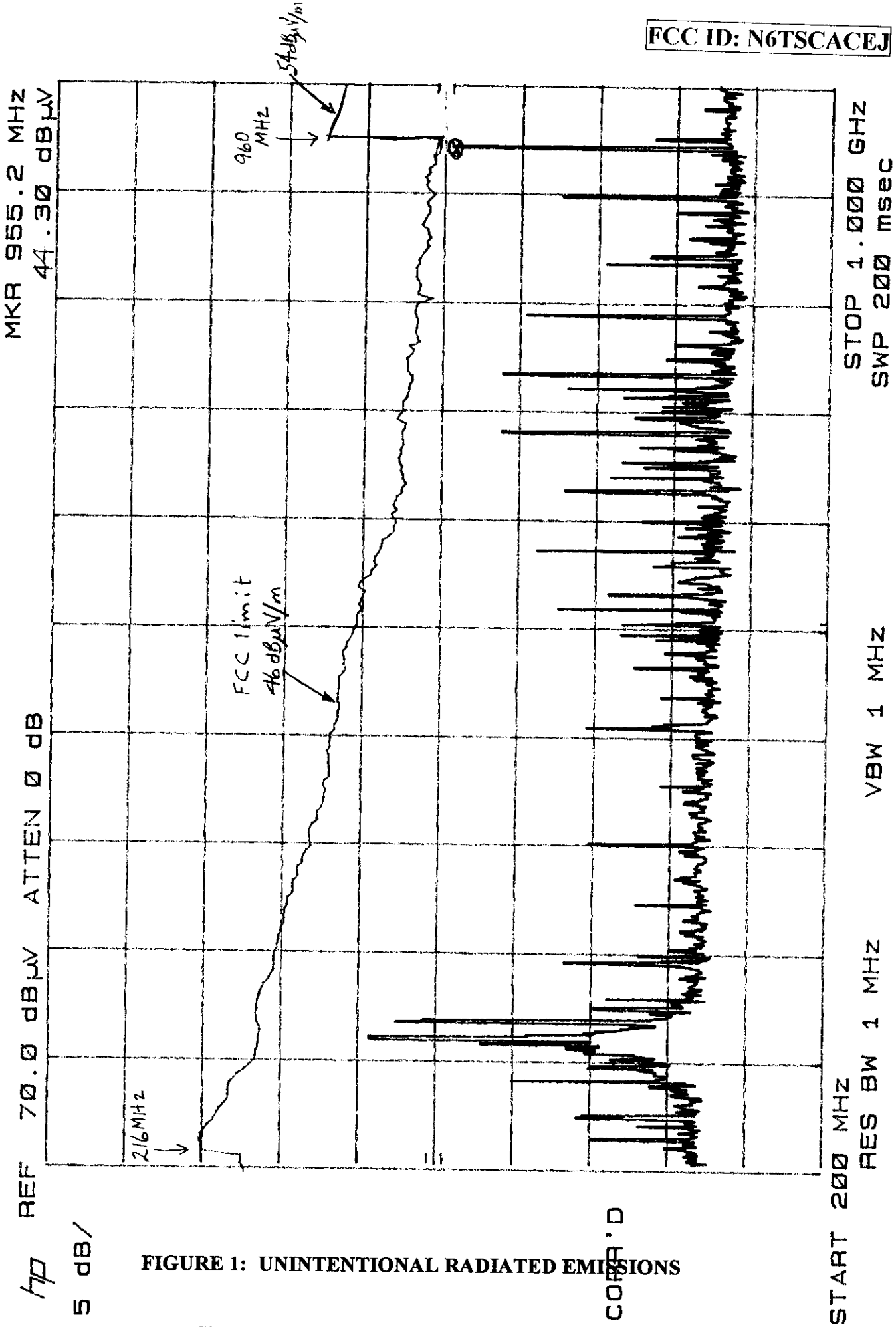


FIGURE 1: UNINTENTIONAL RADIATED EMISSIONS

CONDUCTED SPURIOUS EMISSIONS - PARA 2.4 EIA/IS-19-B.

Conducted spurious-output signals are those generated or amplified in a receiver and appearing at the receiver antenna terminals.

The conducted spurious emissions were observed on the HP-8556B Spectrum Analyzer with a coax cable attached to the "Personal Safeguard Companion" test connector.

Figures 2 - 7 show the results observed from 1MHz to 3 GHz summarized below showing the maximum signal observed as compared to the limits of paragraph 2.4.3:

Figure	Frequency range	Spec limit	Max signal observed
2	1 - 76 MHz	-47dBm	-82.40 dBm
3	75 - 824 MHz	-47 dBm	-79.35 dBm
4	824 - 850 MHz	-60 dBm	-83.40 dBm
5	850 - 894 MHz	-80 dBm	-83.20 dBm
6	894 - 2500 MHz	-47 dBm	-55.05 dBm
7	2.0 - 3.0 GHz	-47 dBm	-72.40 dBm

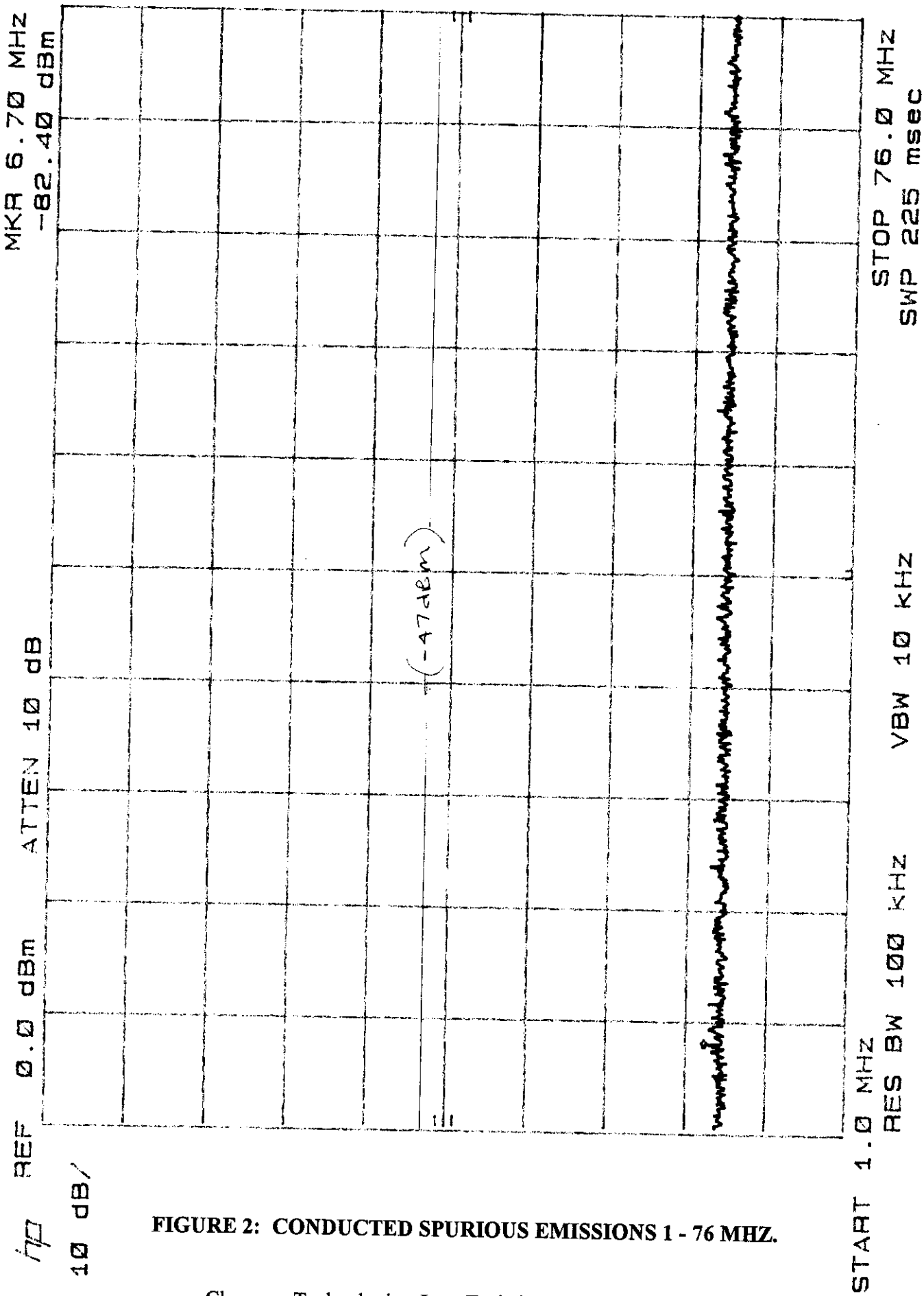


FIGURE 2: CONDUCTED SPURIOUS EMISSIONS 1 - 76 MHZ.

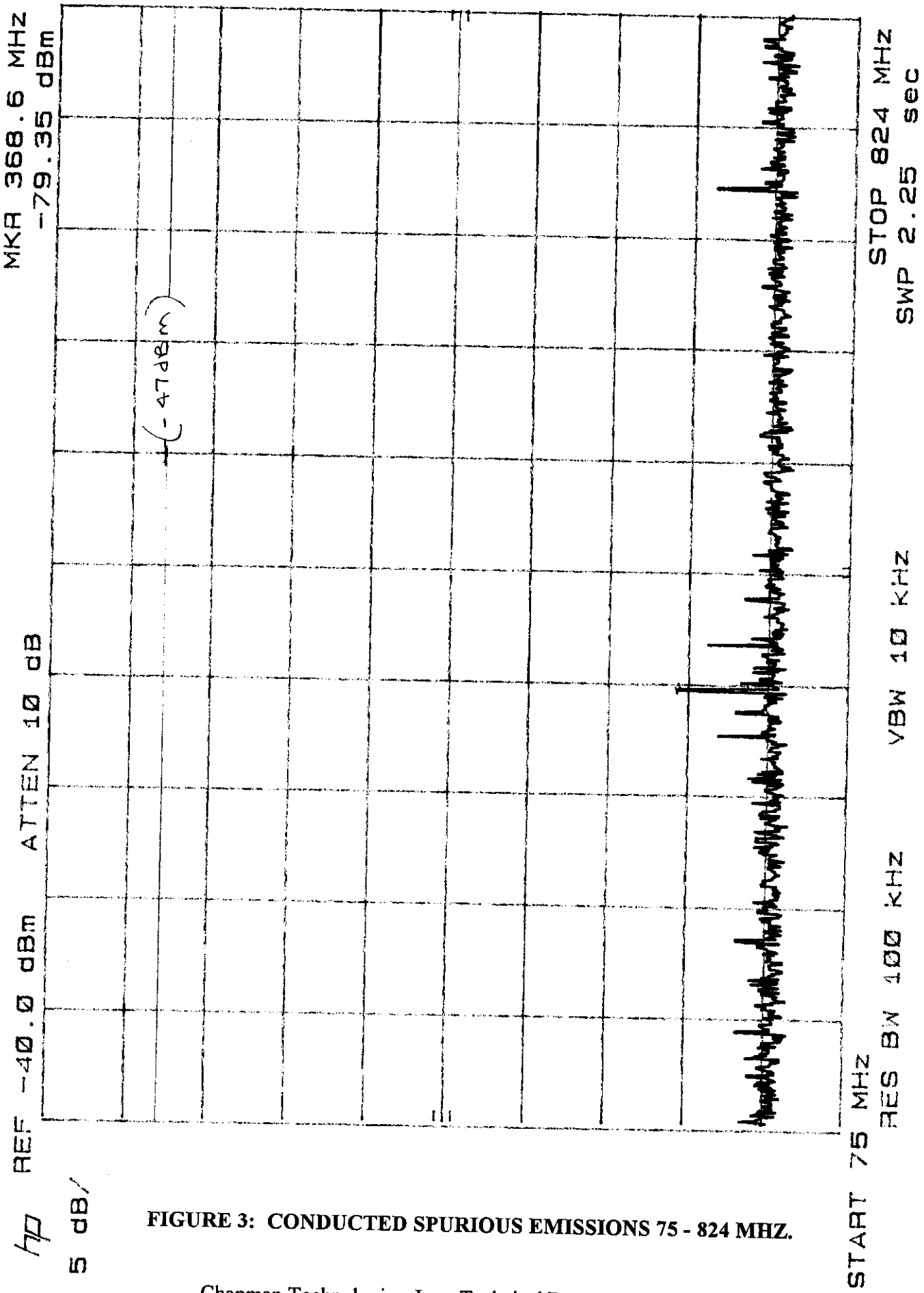


FIGURE 3: CONDUCTED SPURIOUS EMISSIONS 75 - 824 MHZ.

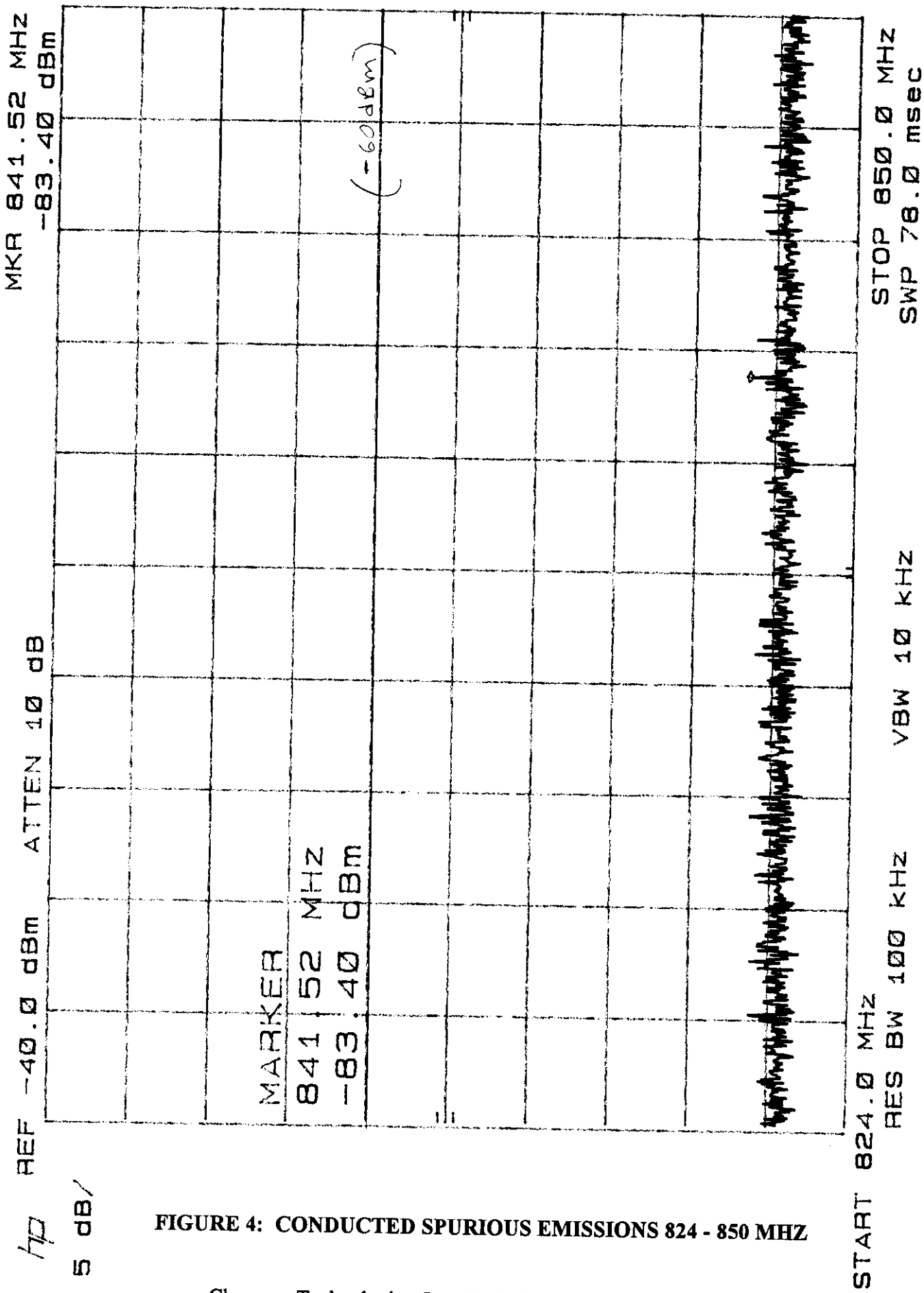


FIGURE 4: CONDUCTED SPURIOUS EMISSIONS 824 - 850 MHZ

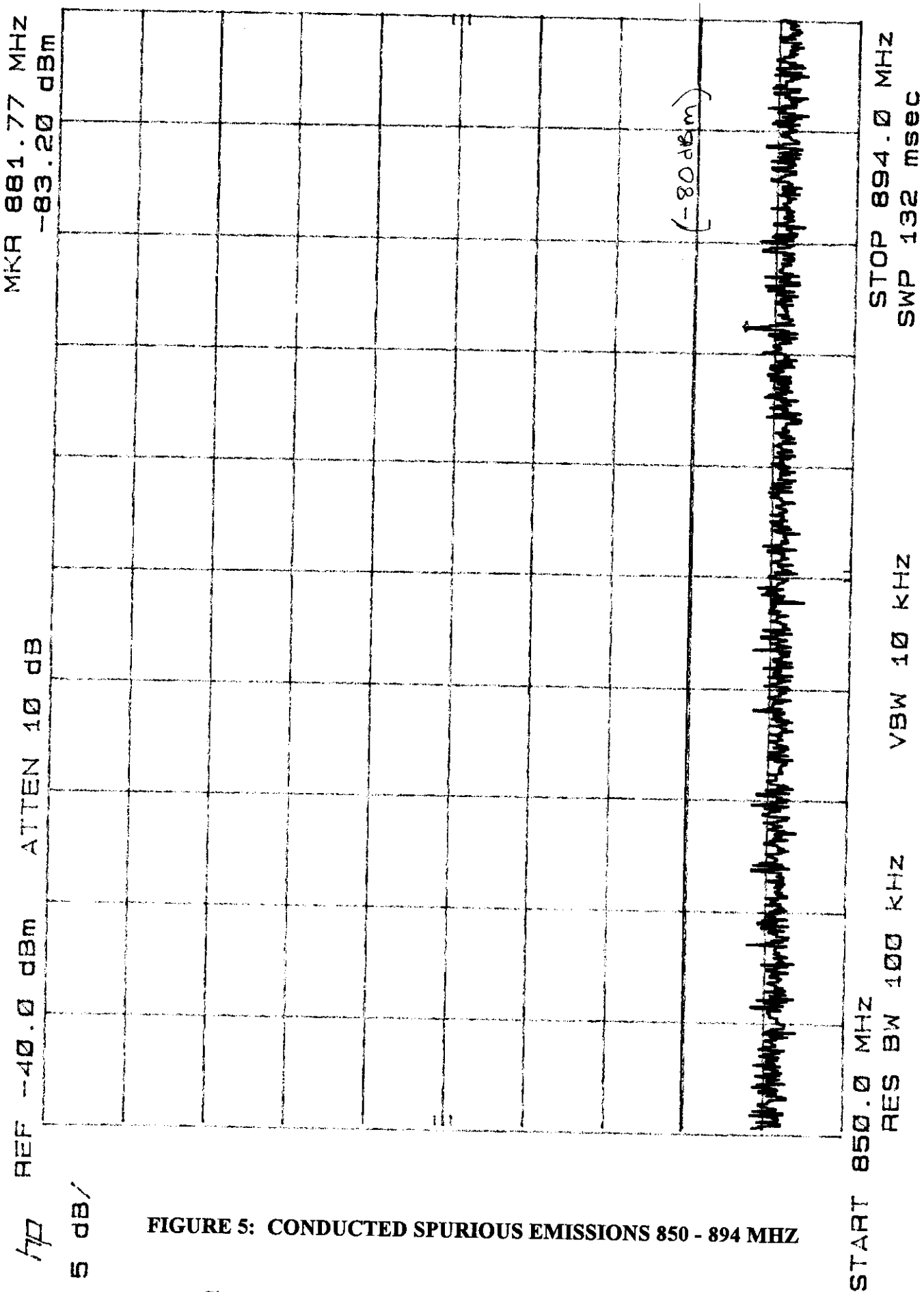


FIGURE 5: CONDUCTED SPURIOUS EMISSIONS 850 - 894 MHZ

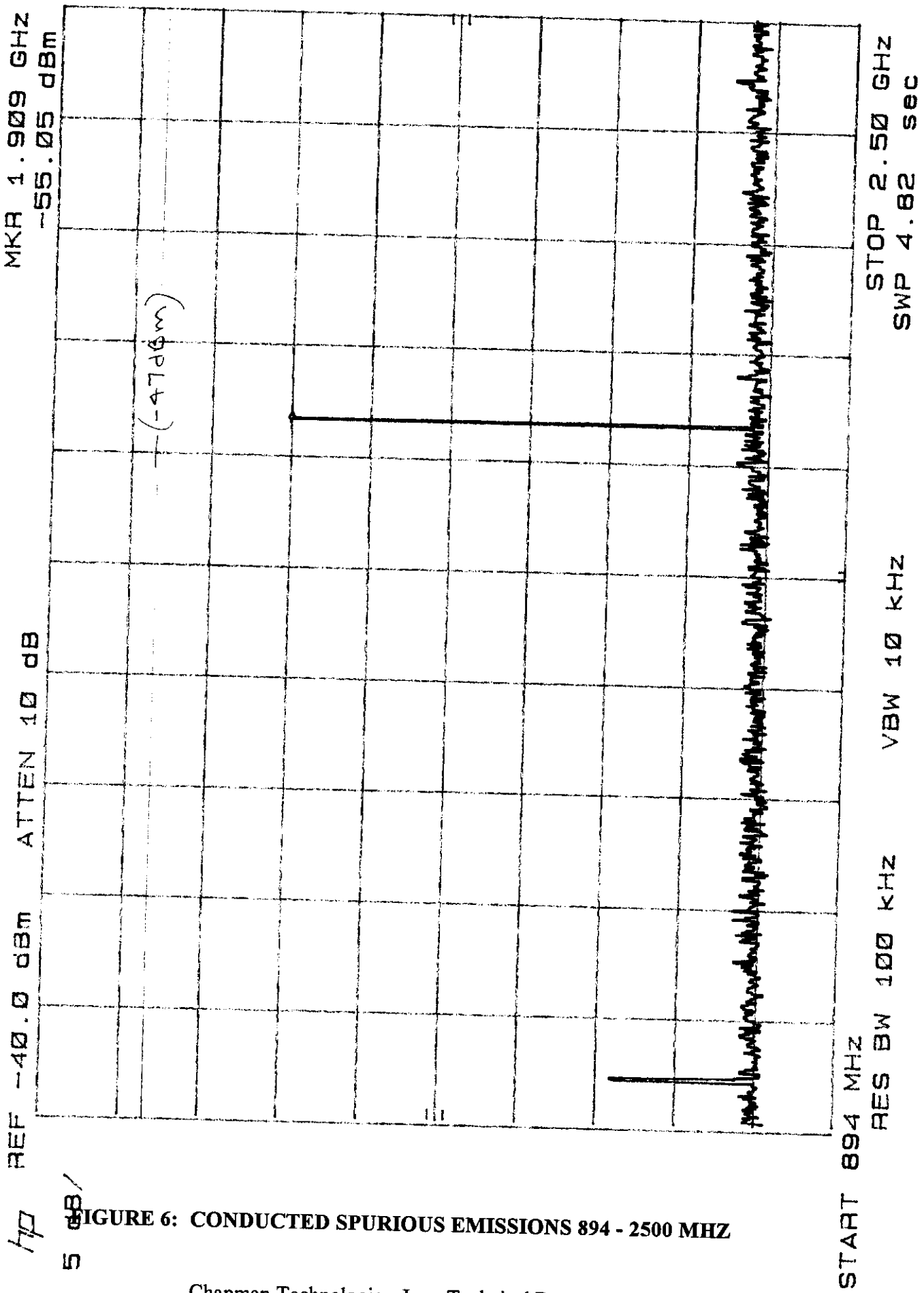


FIGURE 6: CONDUCTED SPURIOUS EMISSIONS 894 - 2500 MHZ

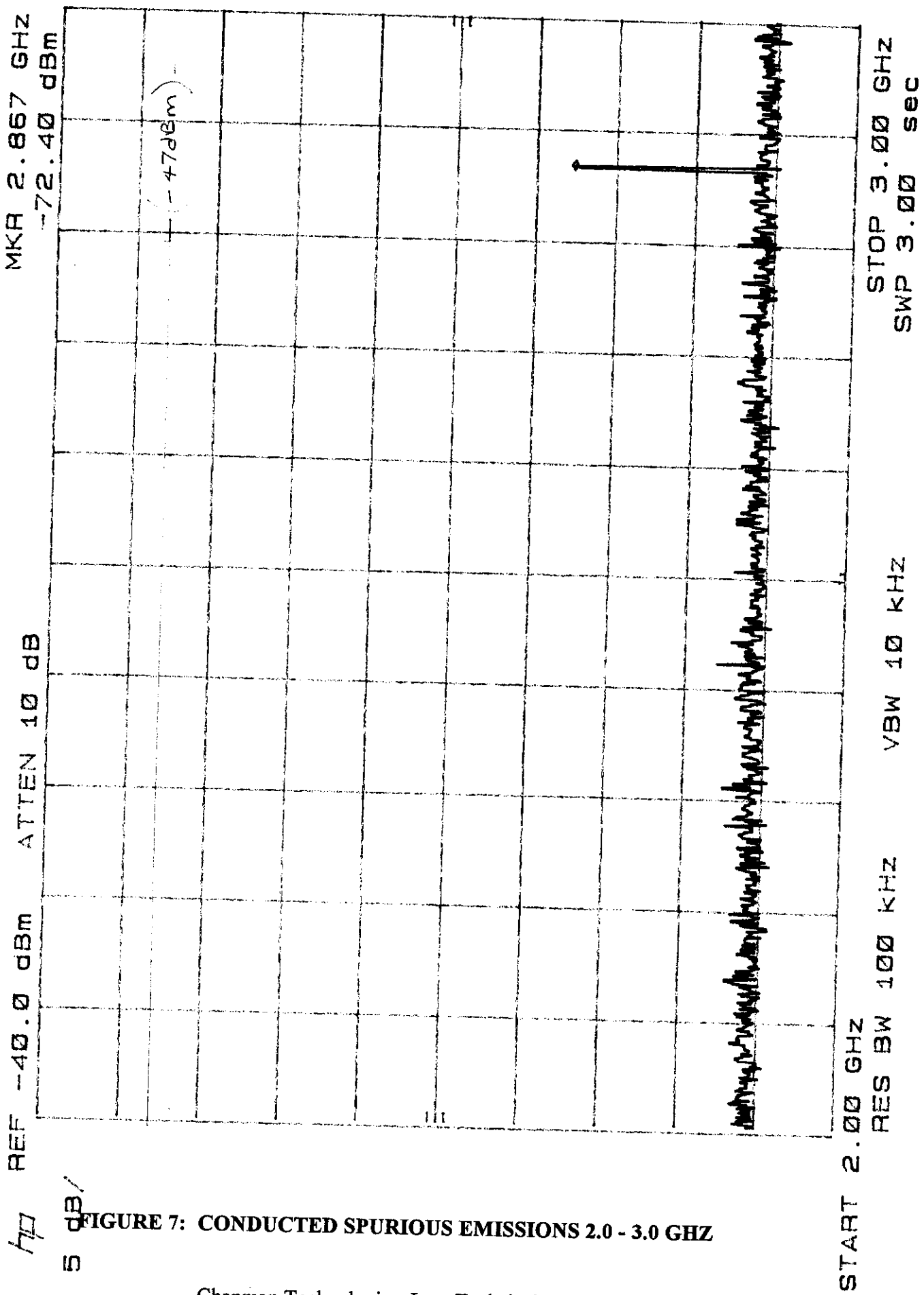


FIGURE 7: CONDUCTED SPURIOUS EMISSIONS 2.0 - 3.0 GHZ

4.3 TRANSMITTER TESTS:

The following transmitter tests were performed to the referenced paragraphs of EIA/IS-19-B:

Harmonic and Spurious Emissions (Conducted) - Discrete, para 3.4.2

Conducted harmonic and spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside the authorized bandwidth of the transmitter.

A Marconi 2955B Radio Communication Test Set was used to program the device for the modes identified in 3.4.2.2, 1) combined voice and Supervisory Audio Tone (SAT) and 2) wideband data.

The transmitter output at 834.989 MHz was connected to a Pasternack 10w10dB attenuator through a HP8494A 10 dB Attenuator to the HP 8556B Spectrum Analyzer. Figures 8 and 9 show the corresponding emission levels detected from 800MHz to 5.5 Ghz.

The following list shows the fundamental through 10th harmonic of the transmitter in the two modes and the resultant levels detected as compared to the maximum allowable level of paragraph 3.4.2.3 (-39dB below fundamental).

Frequency	Wideband	Voice & SAT	Max. level
834.982 MHz	+3.20 dBm	+3.10 dBm	--
1.669 GHz	-54.3 dBm	-55.3 dBm	-35.9 dBm
2.504 GHz	-58.5 dBm	-57.9 dBm	-35.9 dBm
3.339 GHz	-56.5 dBm	-56.7 dBm	-35.9 dBm
4.174 GHz	-76.0 dBm	-77.4 dBm	-35.9 dBm
5.009 GHz	-65.3 dBm	-65.6 dBm	-35.9 dBm
5.844 GHz	-70.3 dBm	-69.9 dBm	-35.9 dBm
6.679 GHz	-71.0 dBm	-72.2 dBm	-35.9 dBm
7.515 GHz	-71.8 dBm	-71.3 dBm	-35.9 dBm
8.349 GHz	-71.1 dBm	-71.6 dBm	-35.9 dBm

As can be seen from the figures and above data, all harmonics are attenuated more than the specified amount.

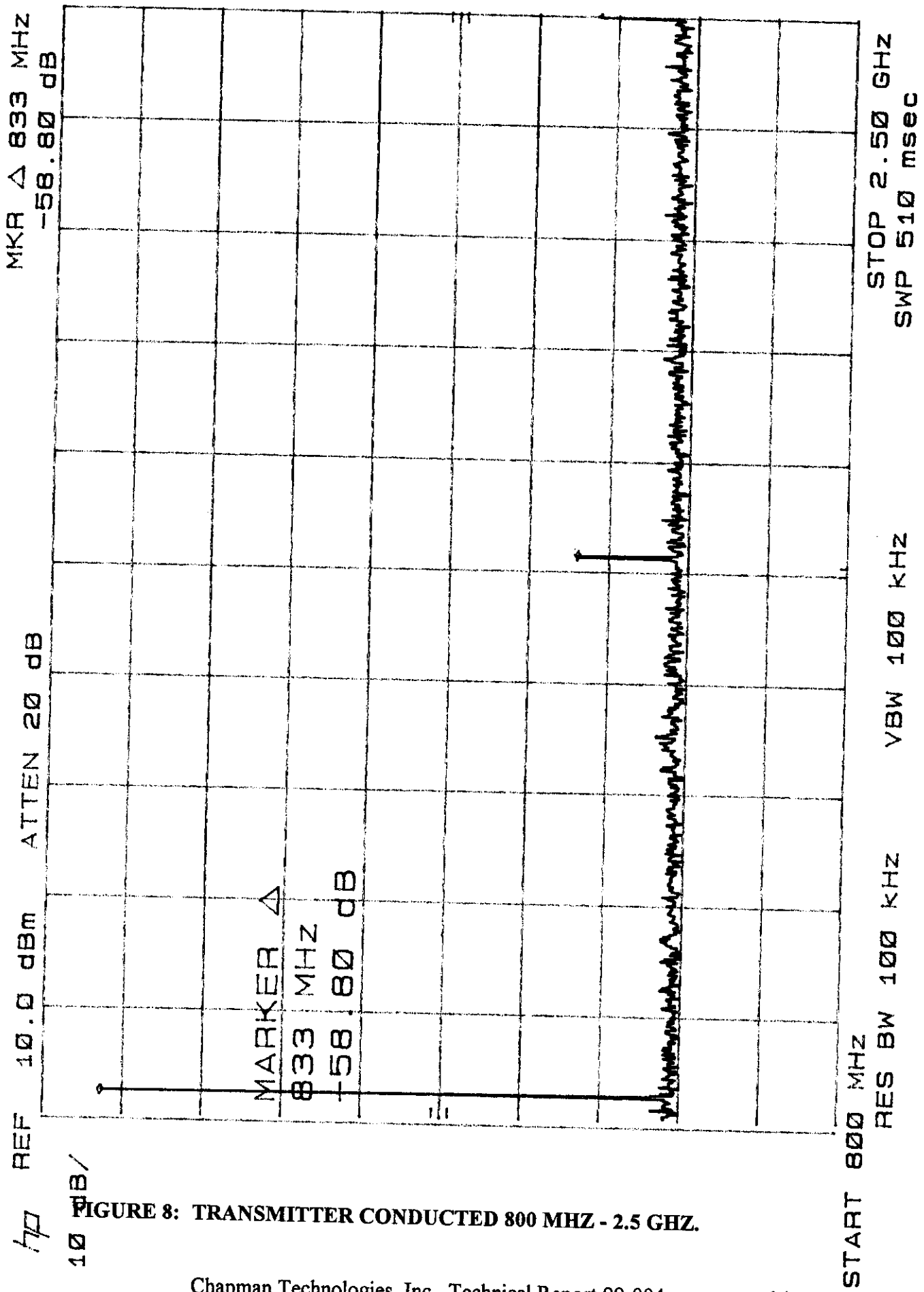


FIGURE 8: TRANSMITTER CONDUCTED 800 MHZ - 2.5 GHZ.

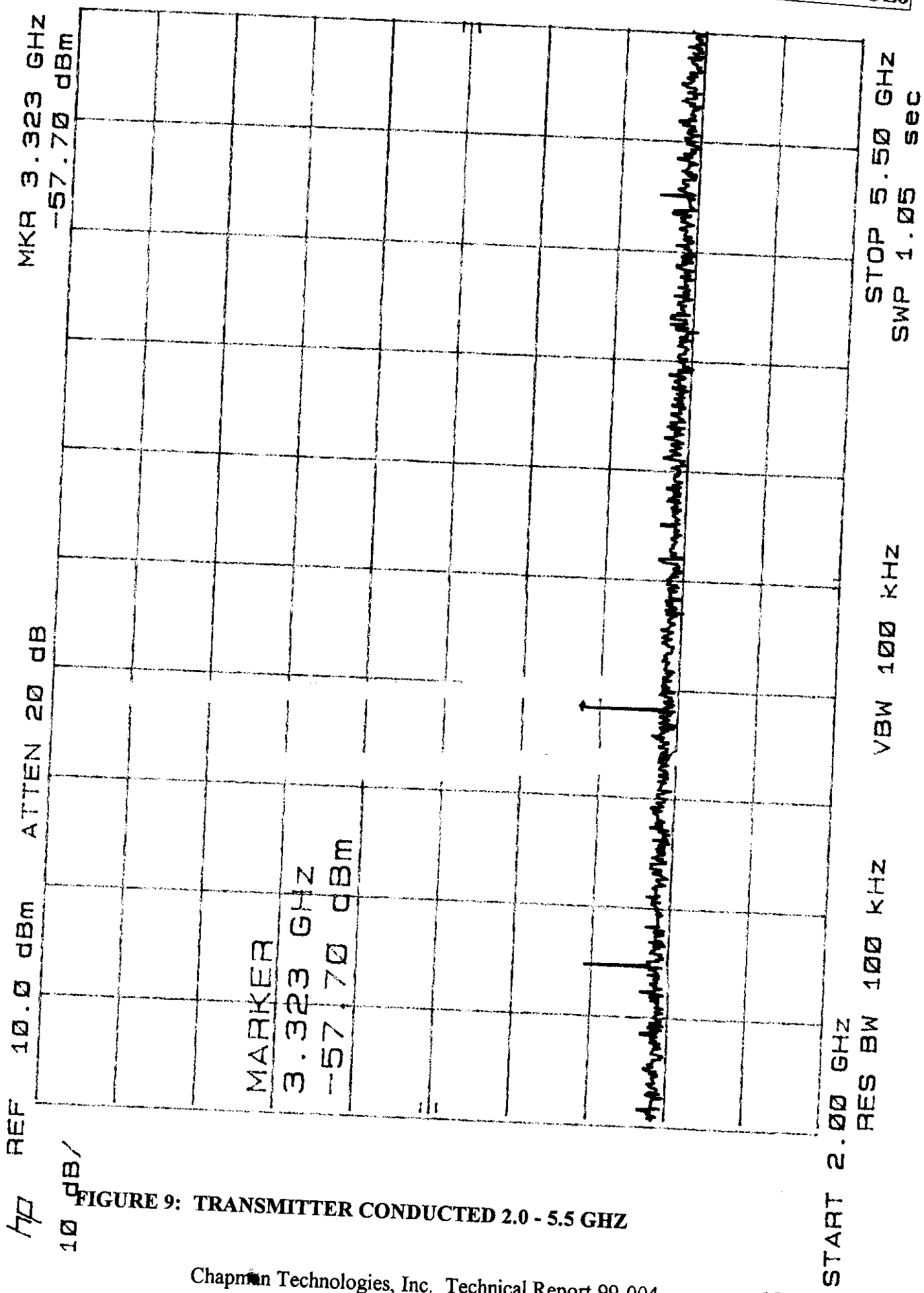


FIGURE 9: TRANSMITTER CONDUCTED 2.0 - 5.5 GHZ

Harmonic and Spurious Emissions (Radiated) - Discrete, para 3.4.3

Radiated spurious emissions are emissions from the subscriber unit when loaded into a non-radiating load on a frequency or frequencies that are outside an occupied band. These radiated emissions shall be attenuated below the maximum level of emission of the carrier frequency by at least -39dB.

Photographs 1 and 2 show the device with a 50 ohm dummy load attached. The unit was positioned in three orientations (foot, side and back) and the harmonic emissions up through the 10th harmonic were observed with a EMCO 3115 Horn antenna positioned 3 meters distance in both the horizontal and vertical polarizations. The device was rotated on the turntable and the antenna height varied for maximum emission levels detected on the HP 8566B Spectrum Analyzer.

The following list shows the results as compared to the equivalent signal substitution level comparable to the -39 dB below the fundamental per para 3.4.3.3

FREQ - GHZ	Level equal to -39dB	Foot		Side		Back	
		Hor	Vert	Hor	Vert	Hor	Vert
1.669	-20.0	-46.1	-40.9	-47.7	-44.4	-46.5	-45.4
2.505	-28.0	-47.2	-54.9	-52.5	-54.4	-53.2	-54.9
3.339	-30.0	-47.1	-55.3	-51.5	-49.7	-48.3	-52.8
4.175	-39.0	-48.0	-49.9	-46.0	-52.1	-49.4	-47.4
5.009	-37.0	-44.8	-52.5	-48.7	-47.1	-47.9	-46.8
5.845	-44.0	-61.1	-61.6	-64.3	-62.5	-61.5	-59.7
6.679	-47.0	-63.1	-70.7	-69.9	-66.9	-71.1	-64.5
7.515	-53.0	-74.5	-79.0	-76.9	-74.8	-77.6	-75.5
8.349	-54.0	-67.9	-72.8	-69.3	-69.4	-73.0	-66.6

All levels above are in -dBm units and as can be seen are all well below the specified level.