

RUBICOM SYSTEMS, INC.



**FCC INTENTIONAL RADIATOR
TEST REPORT
FOR THE
COLLINS AVIONICS
VHF-900B
COMMUNICATIONS TRANSCEIVER**



JUNE 1997

Rubicom Systems, Inc.
284 West Drive, Suite B
Melbourne, FL 32904

FCC TEST REPORT
(INTENTIONAL RADIATOR)
FOR THE
COLLINS AVIONICS
MODEL VHF-900B
COMMUNICATIONS TRANSCEIVER
S/N: 576

Prepared by: Joseph G. Barbee 7/2/97
Joseph G. Barbee

Tested by: Joseph G. Barbee 7/2/97
Joseph G. Barbee

Performed by:
RUBICOM SYSTEMS, INC.
284 West Drive, Suite B
Melbourne, Florida 32904

Performed for:
COLLINS COMMERCIAL AVIONICS
1100 Hibiscus Blvd.
Melbourne, Florida 32901

Completed: June 19, 1997

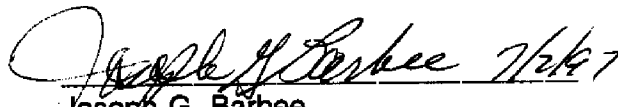
TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	CERTIFICATION	1
	ABSTRACT.	2
1.0	INTRODUCTION	3
1.1	Purpose	3
1.2	Requirements	3
1.3	Unit Under Test Description	4
1.4	Summary of Results.	4
2.0	APPLICABLE DOCUMENTS	5
3.0	TEST SITE DESCRIPTION	6
3.1	Environmental Conditions.	6
4.0	TEST INSTRUMENTATION	7
5.0	TEST SAMPLE SETUP AND CONFIGURATION	8
6.0	PROCEDURES AND RESULTS	10
6.1	Radiated Emissions (Receive Mode)	10
6.2	Radiated Spurious Emissions (TX Mode)	10
	FIGURES 6.1-1 - 6.1-20.	11 - 30
APPENDIX A	COMPLIANCE LETTER	34

CERTIFICATION

Rubicom Systems, Inc. certifies the information obtained in this report was performed consistent with the requirements of ANSI C63.4-1992. The Collins Avionics Model VHF-900B Transceiver complies with the requirements of CFR 47 Part 15, Subpart C for intentional radiators.

This data was obtained while testing a Model VHF-900B Transceiver, S/N 576 furnished by Collins Avionics and described in Paragraph 1.3 of this document. Any modifications to the unit as tested may invalidate the data and void this certification.


Joseph G. Barbee
President

ABSTRACT

This report presents test results of the emanations found emitting from the Collins Avionics, VHF-900B and the comparison of these emissions to the requirements of the FCC, Title 47, Part 15, Subpart C for Spurious Radiated emission. This testing was

This testing was performed on a 3-meter open area test site at Rubicom Systems, Inc. (RSI). The testing was performed for Collins Avionics under purchase order 7-612439 and is filed under JA-1465 at RSI. The results of this test effort demonstrate compliance of the Collins Avionics VHF-900B to the FCC, Title 47, Part 15, Subpart C, intentional radiators.

The unit under test was Collins Avionics S/N: 576.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to show compliance of the Collins Avionics Model VHF-900B to the requirements of Part 15 of the FCC Rules and Regulations (47CFR, Part 15, Subpart C) for intentional radiators. The tests were performed on a three meter site.

1.2 Requirements

The test requirements are as follows:

RADIATED RX MODE (15.209A)

<u>Freq. (MHz)</u>	3 Meter Field Strength <u>μV/M</u>	3 Meter <u>dBμV/M</u>
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
960 - Above	500	54 Avg 74 Peak

RADIATED TX MODE (CFR 87.139)

Harmonics of transmitter attenuated by at least 43dB.

1.3 Unit Under Test Description

The VHF-900B Transceiver is a solid state, 2280 channel AM transceiver designed to provide air-to-air or air to ground voice or data communications in the 118.000 to 136.975MHz VHF band. It operates in communication systems having 25KHz or 8.33KHz channel spacing.

The unit operates on 27.5VDC and is packaged in an ARINC 600 standard MCU configuration. Power output is 25 watt carrier power. A low pass filter at the output attenuates transmitter harmonics of at least 60dB below the carrier level.

1.4 Summary of Results

Results are presented in Paragraph 6.0.

2.0

APPLICABLE DOCUMENTS

The following documents form a part of this report to the extent expressed herein:

FCC Code of Federal Regulations Title 47, Part 15,

FCC Procedure for Measuring RF Emissions from Computing Devices FCC/OET MP-4, July 1987

ANSI C63.4-1992

FCC Characteristics of Open Field Test Sites Bulletin OET 55, October 1989

3.0 TEST SITE DESCRIPTION

This testing was performed at Rubicom Systems, Inc. 3-meter open area test site. The description of the measurement facility was found to be compliant with the requirements of Section 2.948 of the FCC Rules. A copy of the compliance letter is attached to this report as Appendix A.

3.1 Environmental Conditions

Environmental conditions during testing of the EUT were as follows:

Date: **June 19, 1997**

Temperature: **86°**

Barometer: **29.30 inches**

Humidity: **80%**

4.0 TEST INSTRUMENTATION

The following test equipment was used to perform this testing.

<u>Qty.</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>Last Cal.</u>	<u>Cal Cycle</u>
1	Spectrum Analyzer	Advantest	R3261A	04/08/97	1 yr
1	Log Periodic Antenna	A.H. Systems	SAS-200/ 512	(See Note 1)	
1	Biconical Antenna	A.H. Systems	SAS-200/ 540	(See Note 1)	
1	Ridge Guide Horn	Electro Metrics	RGA-180 24-BNC	(See Note 1)	
1	Plotter	Hewlett Packard	7440A	NCR	

NOTE 1: The Biconical and Log Periodic antennas are calibrated by the manufacturer at the time of purchase. Gain curves and antenna factors are provided with these antennas per serial number. Antennas are calibrated per SAE ARP 958 methodology.

5.0 TEST SAMPLE SETUP AND CONFIGURATIONS

The Collins Avionics VHF-900B was placed on the nonconductive 80cm high manual turntable. The unit was configured with a DC power supply and VHF antenna on the turntable. The system cable was coiled on the table with the EUT and antenna. The DC power supply was located below the EUT.

Test setup is shown in Photo 1.

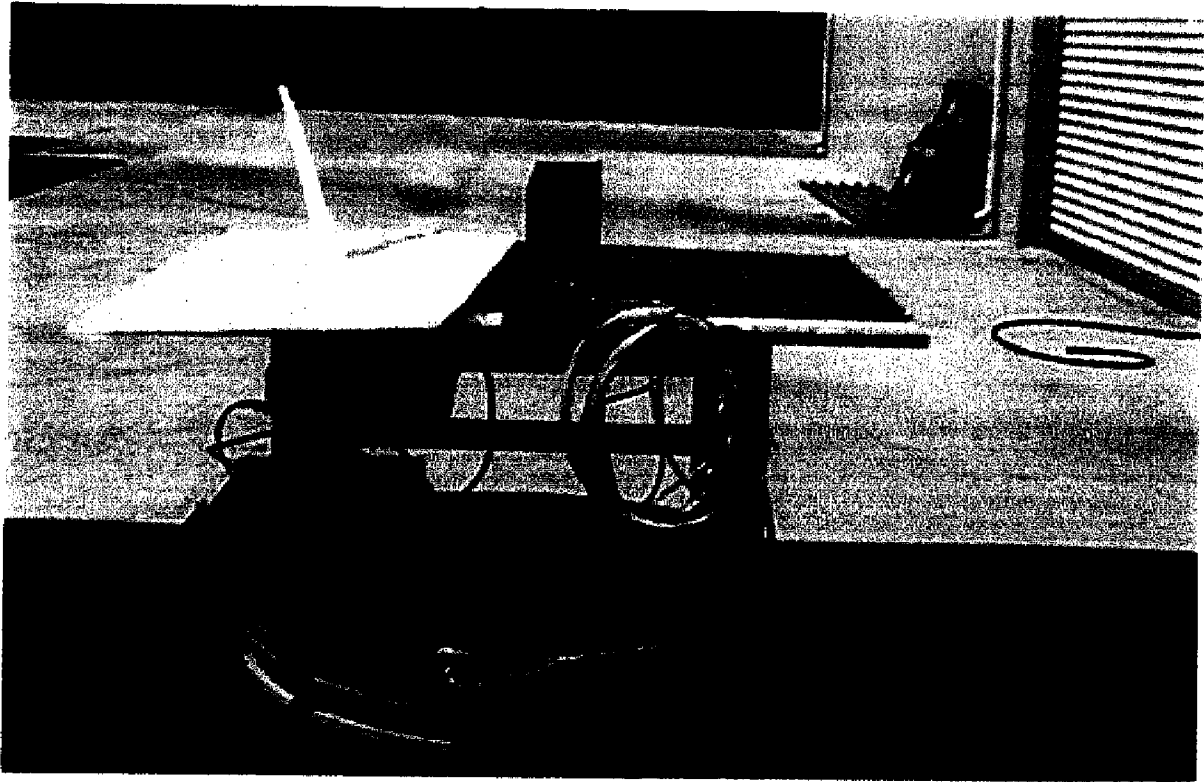


PHOTO 1

6.0 PROCEDURES AND RESULTS

6.1 Radiated Emissions (Receive Mode)

Figures 6.1-1 through 1.1-10 present the scans during Electric Field testing on the open air test site. There were no signals detected from the transceiver in the receive mode, therefore no tabulated data is listed in this section. Figures 6.1-11 through 6.1-20 present the ambient scans.

6.2 Radiated Spurious Emissions (TX Mode)

Spurious radiation results are presented in data sheets 6.1-1 through 6.1-3. The results are for three transmit channels (low, mid and high). The antenna factors and cable loss numbers are stored in a memory card and automatically included in the spectrum analyzer display. The reference level was established at a maximized antenna height and azimuth using the VHF antenna.

An example of calculations are as follows:

Meter Reading	20 dB μ V
Antenna Factor	+16 Conversion Factor
Cable Loss	± 2 Correction Factor
Result	+38 dB μ V/m



TEST: FCC RADIATED		EUT: COLLINS VHF 900B (RECEIVE)		S/N: 576	
FREQ: 30M-100MHz	SPEC: FCC UNIT: RAD.	ANT. HT / POL: 2.25mH 2.2			
DETECTOR: QUASI PEAK	LINE UNDER TEST: N/A	EUT POSITION:			
DATE: 14 JUNE 97	TEST SITE: 3 METER	TESTER: [Signature]			

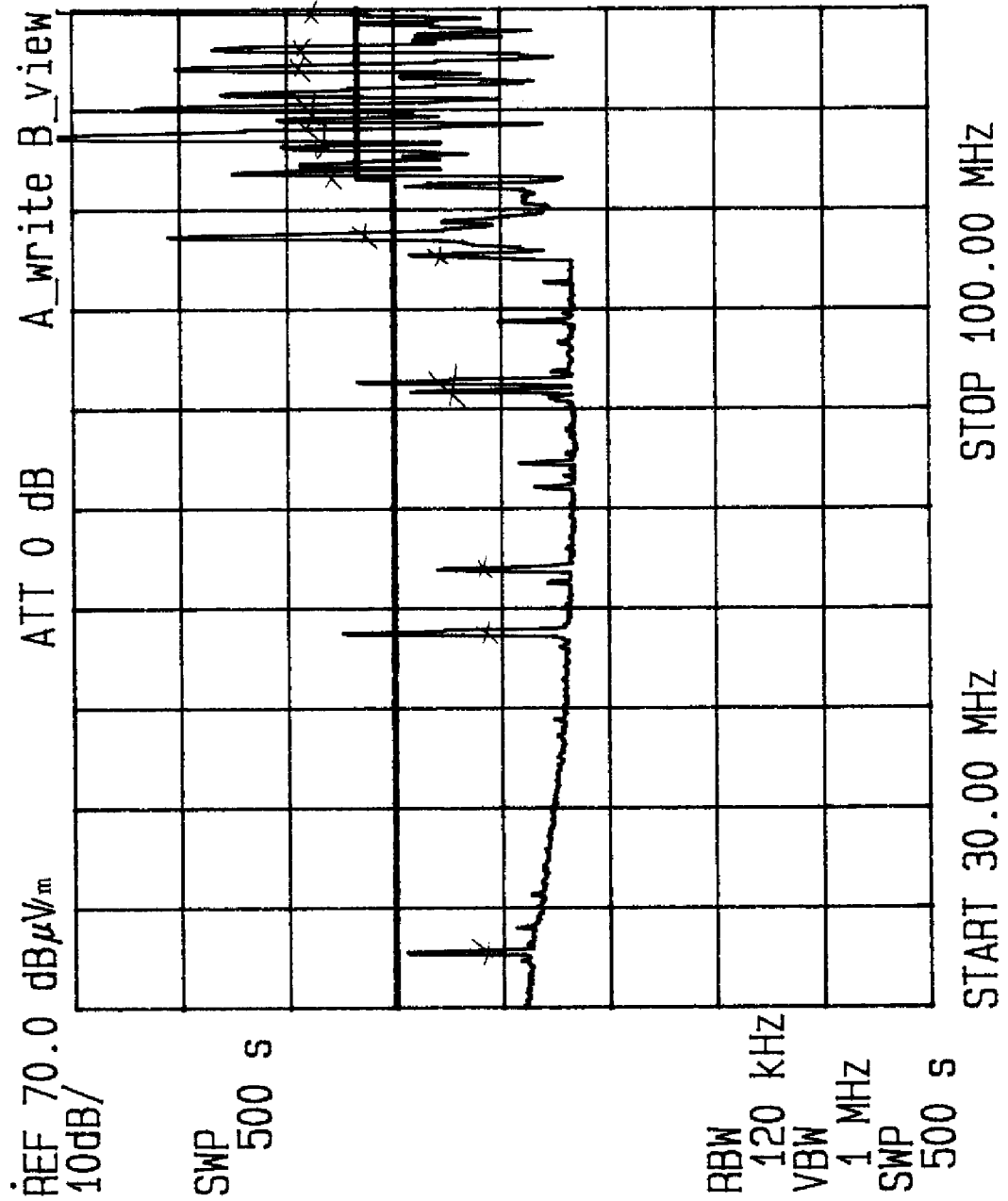


FIGURE 6.1-1



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 30M-100MHZ SPEC: FCC UNIT. RAD. ANT. HT/POL: 225 V 2.2
DETECTOR: QUASI PEAK LINE UNDER TEST: N/A EUT POSITION:
DATE: 19 June 97 TEST SITE: 3 METER TESTER: *[Signature]*

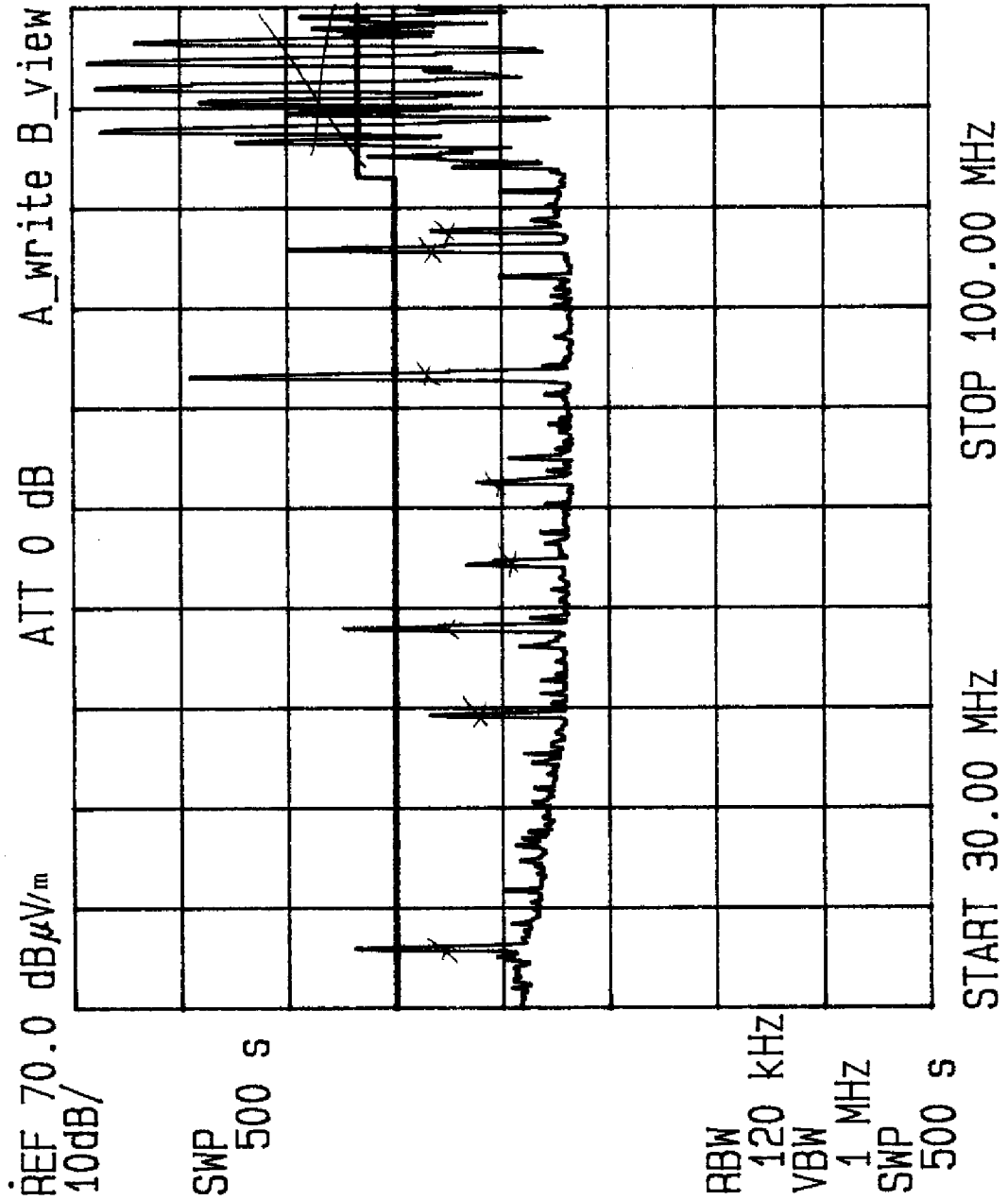


FIGURE 6.1-2



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 100M-200MHZ SPEC: FCC UNIT. RAD. ANT. HT/POL: 225 H 2.2
DETECTOR: QUASI PEAK LINE UNDER TEST: N/A EUT POSITION:
DATE: 19 June 97 TEST SITE: 3 METER TESTER: *[Signature]*

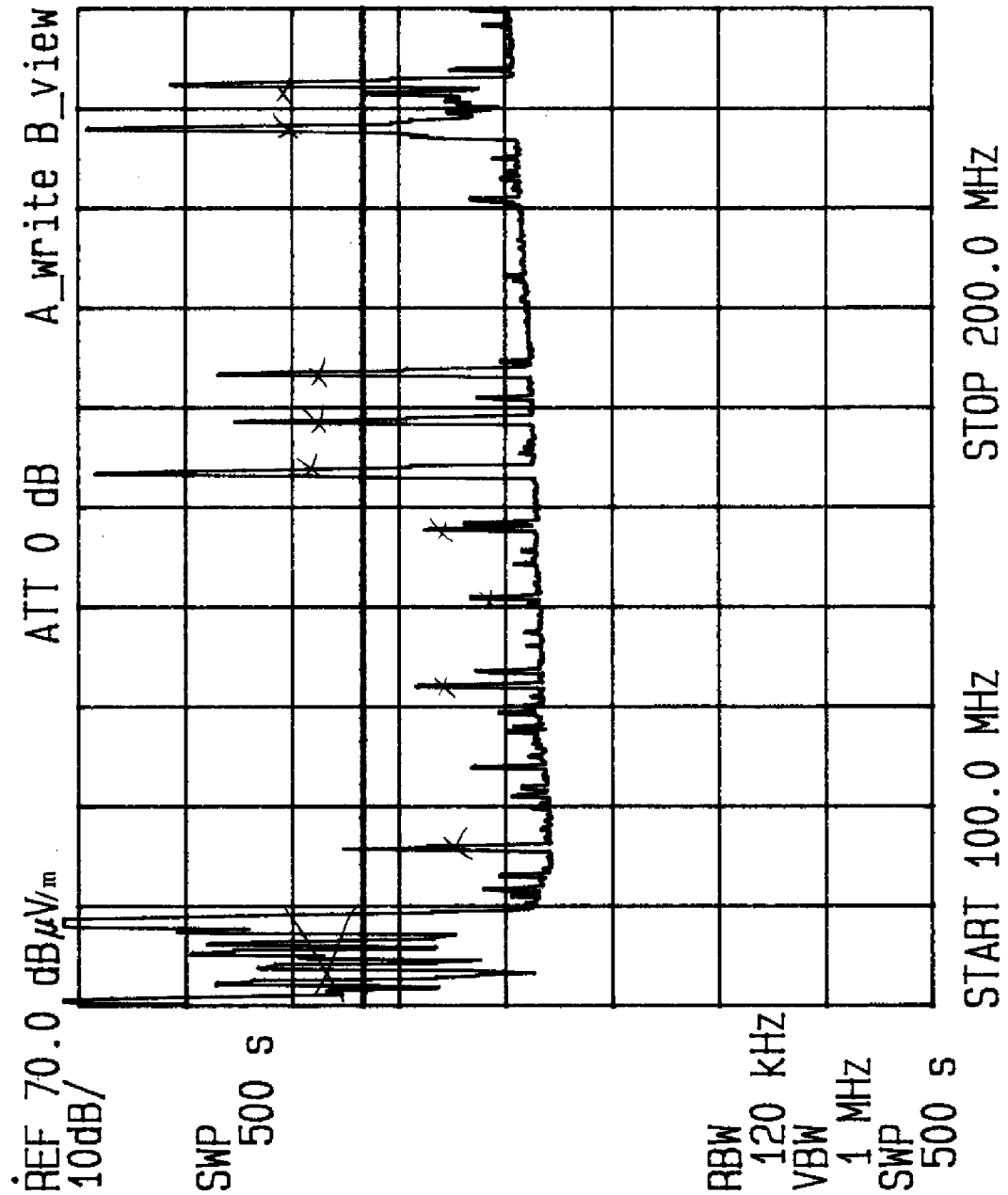


FIGURE 6.1-3



TEST: FCC RADIATED	EUT: COLLINS VHF 900B (RECEIVE)	S/N: 576
FREQ: 100M-200MHz	SPEC: FCC UNIT. RAD.	ANT.HT/POL: <i>22 V</i>
DETECTOR: QUASI PEAK	LINE UNDER TEST: N/A	EUT POSITION: <i>22.0</i>
DATE: <i>19 June</i>	TEST SITE: 3 METER	TESTER: <i>z</i>

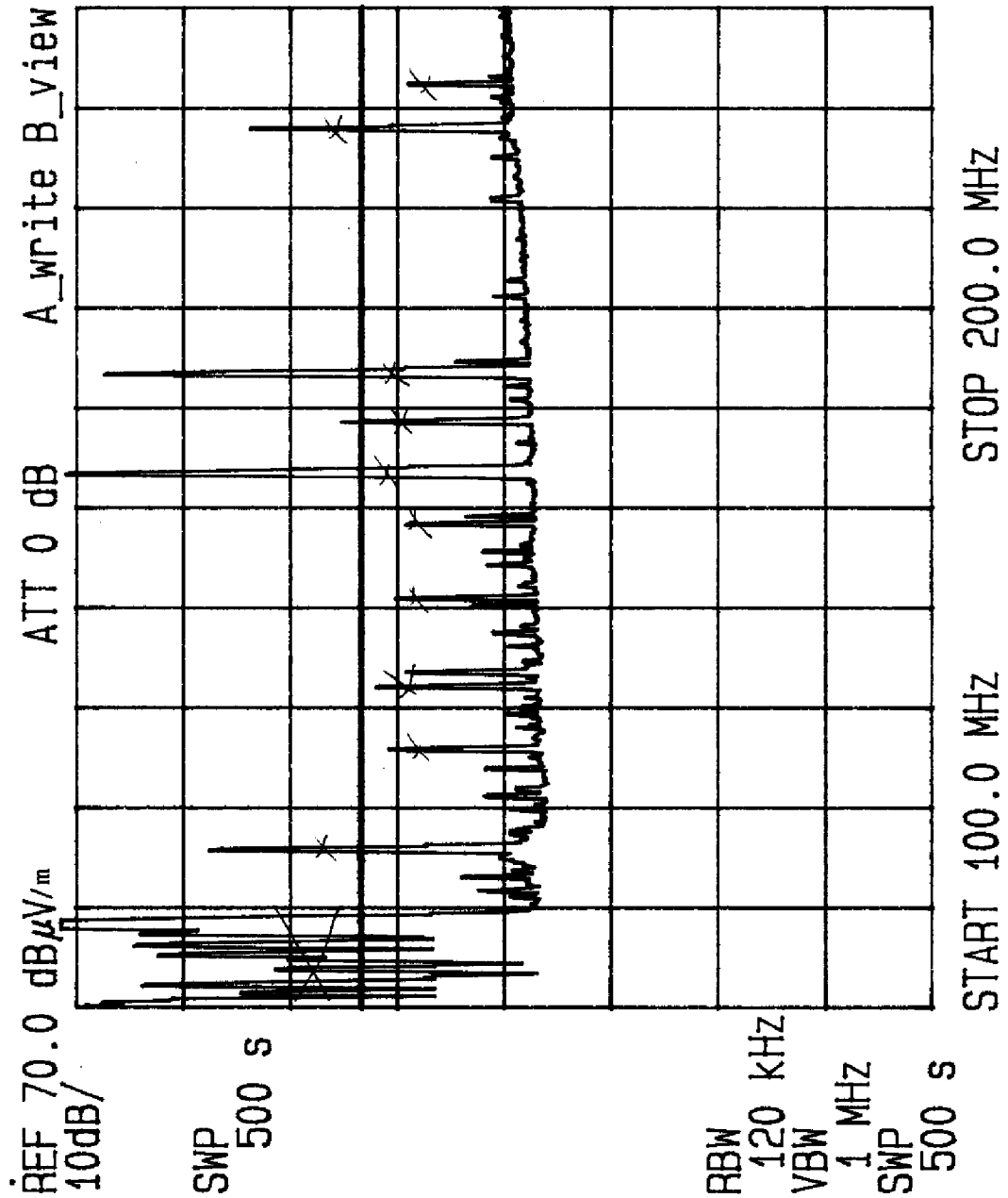


FIGURE 6.1-4



TEST: FCC RADIATED	EUT: COLLINS VHF 900B (RECEIVE)	S/N: 576
FREQ: 200M-1GHz	SPEC: FCC UNIT. RAD.	ANT. HT/POL: 22 H
DETECTOR: QUASI PEAK	LINE UNDER TEST: N/A	EUT POSITION: 22
DATE: 19 June 1997	TEST SITE: 3 METER	TESTER: J

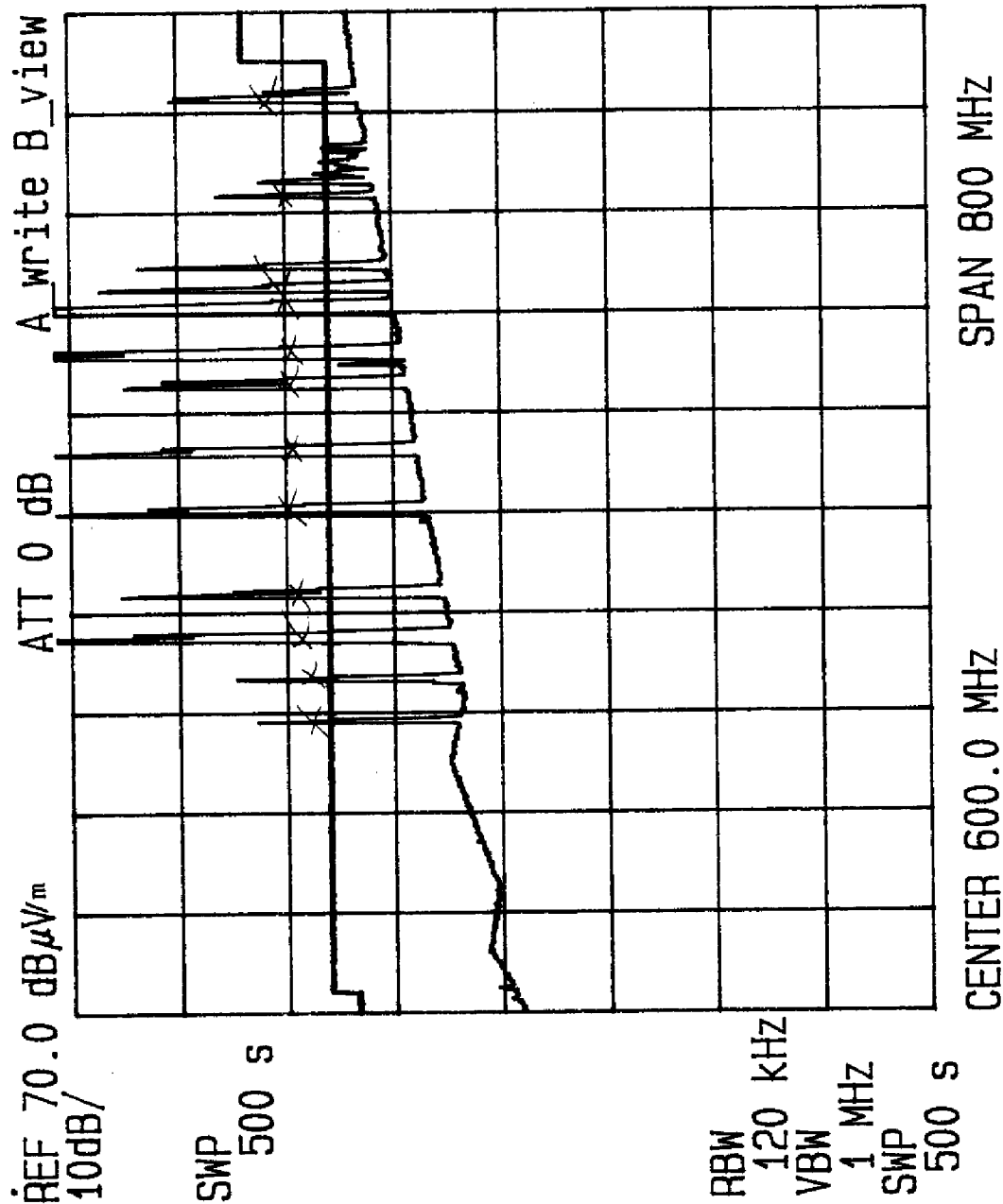


FIGURE 6.1-5



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 200M-1GHZ SPEC: FCC UNIT. RAD. ANT. HT/POL: 22 V
 DETECTOR: QUASI PEAK LINE UNDER TEST: N/A EUT POSITION: 225
 DATE: 10/22/97 TEST SITE: 3 METER TESTER: C

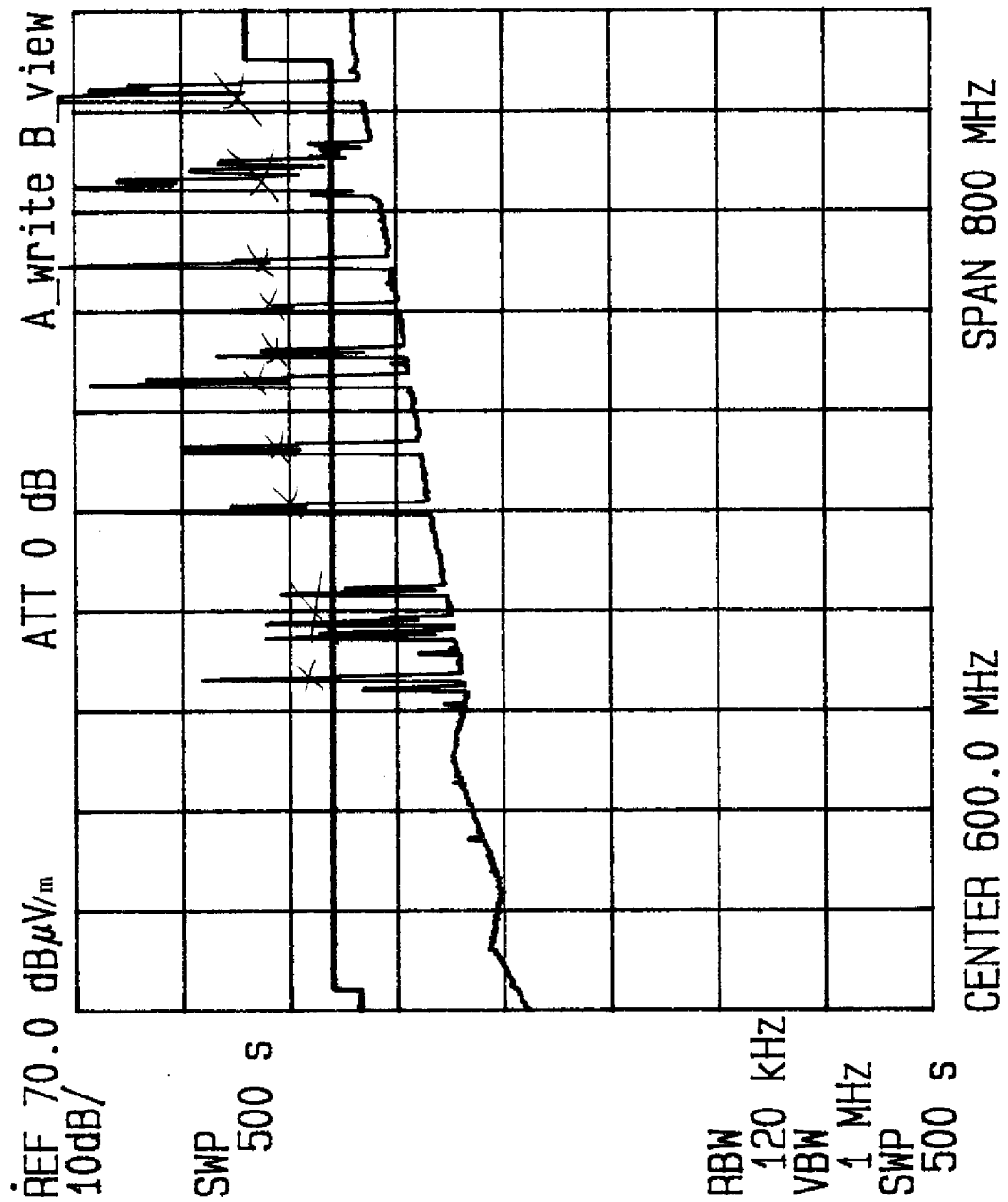


FIGURE 6.1-6



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: H 22
DETECTOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: 225°
DATE: 8 June 97 TEST SITE: 1 METER TESTER: [Signature]

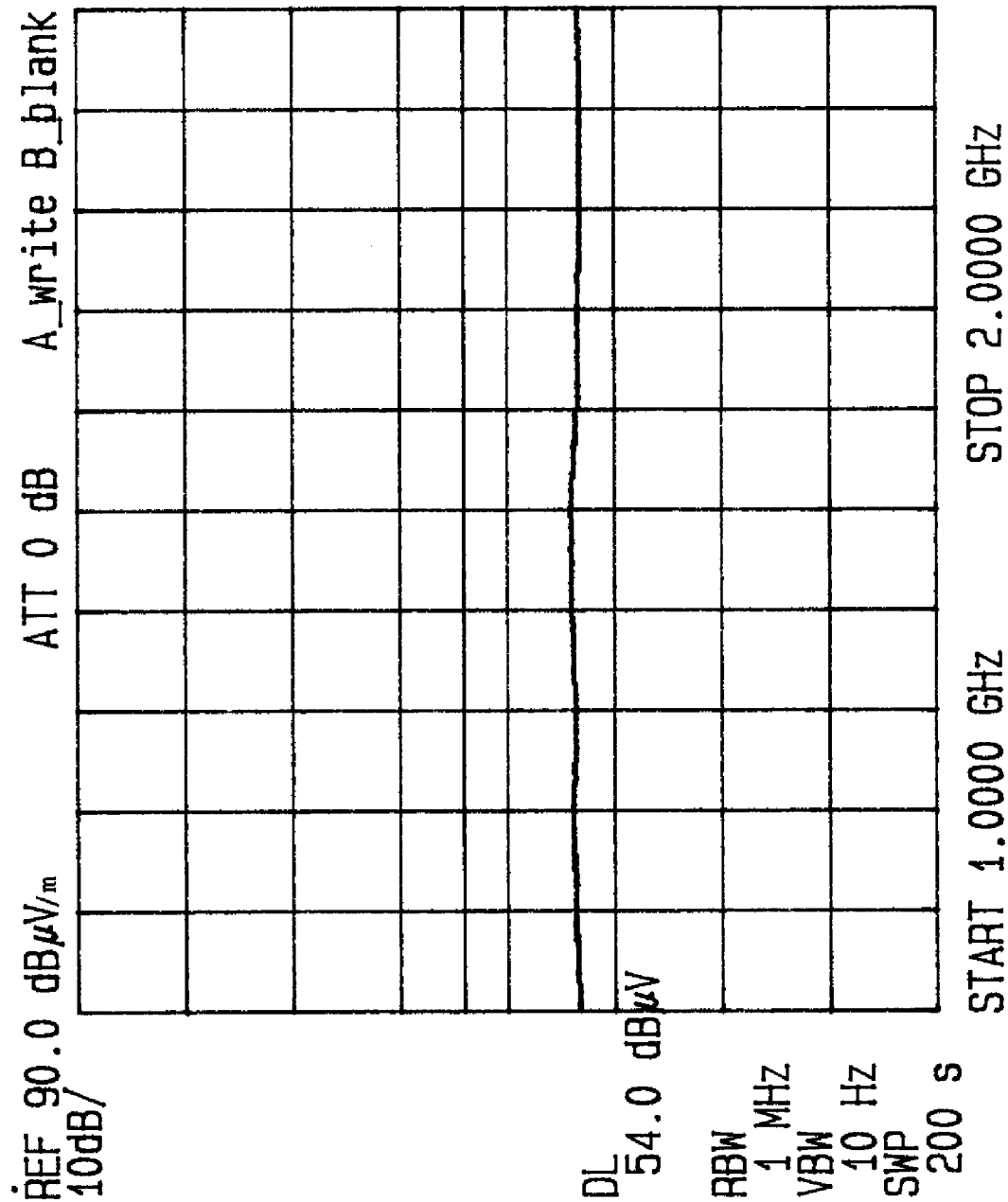


FIGURE 6.1-7



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: V *22.3*
 DETECTOR: AVERAGE LINE UNDER TEST: N/A EUT POSITION: *2250*
 DATE: *19 June 97* TEST SITE: 1 METER TESTER: *[Signature]*

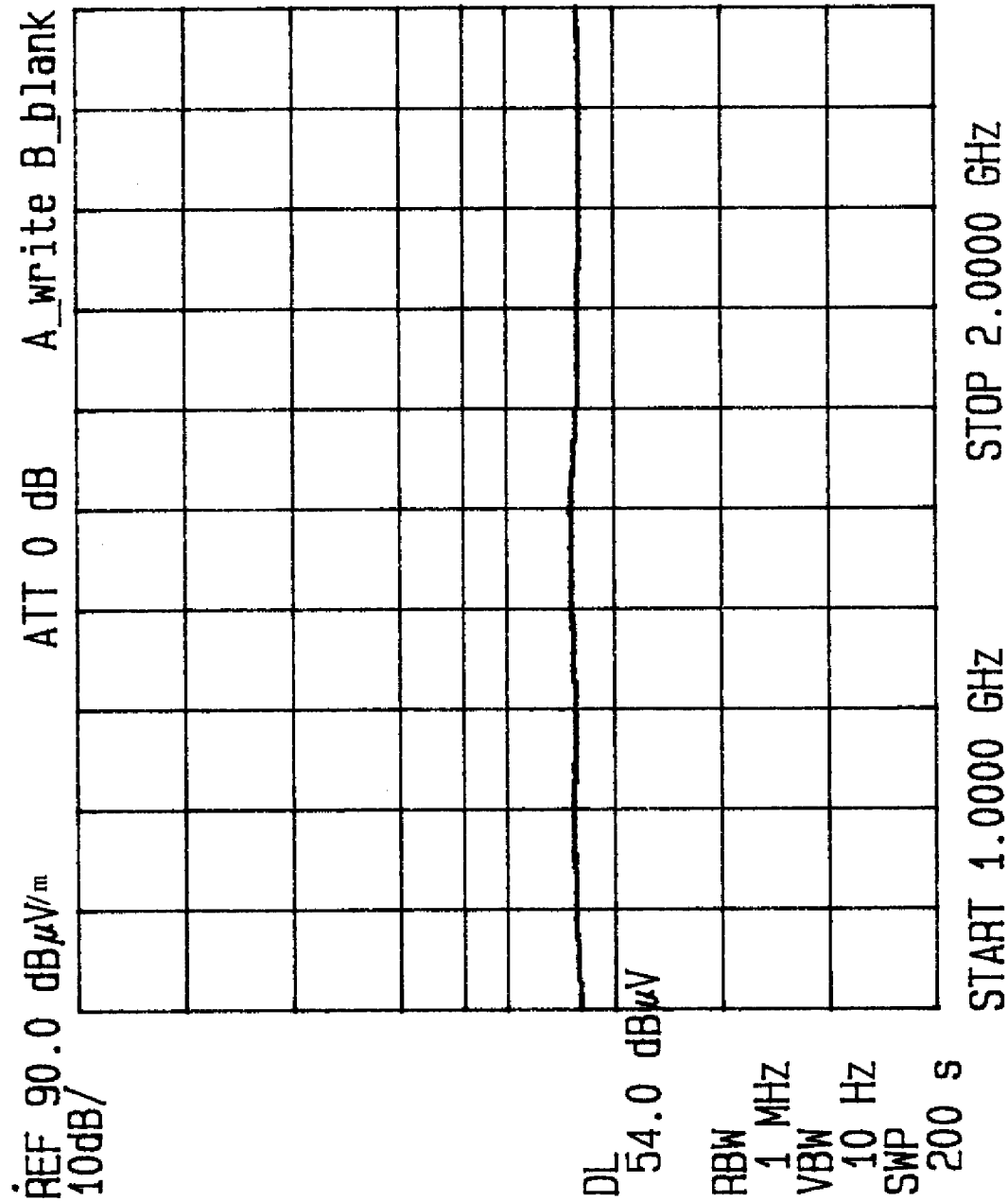


FIGURE 6.1-8



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT.HT/POL: H 2.2 M,
 DETECTOR: PEAK LINE UNDER TEST: N/A EUT POSITION: 22S
 DATE: 19 June 97 TEST SITE: 1 METER TESTER: *[Signature]*

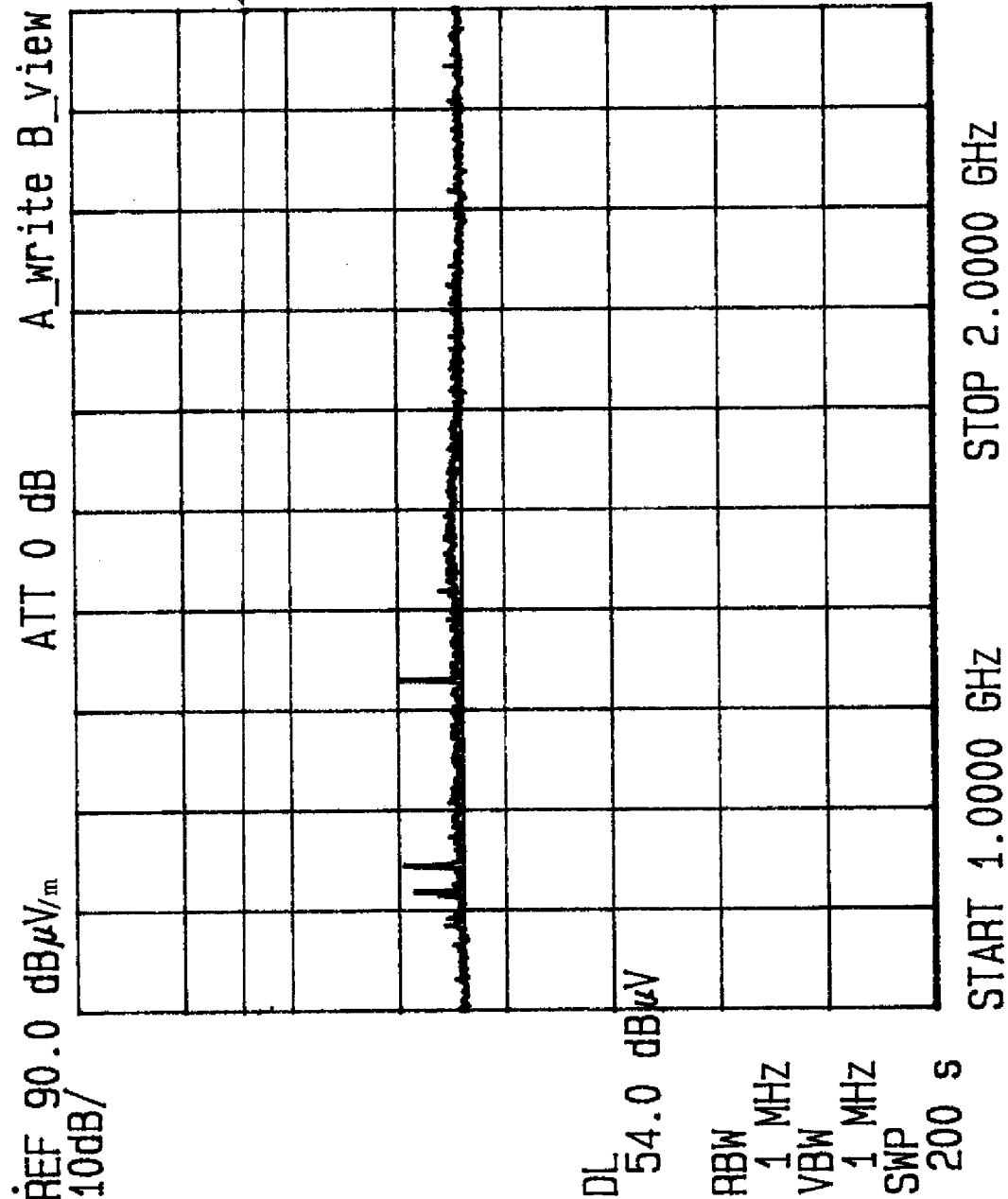


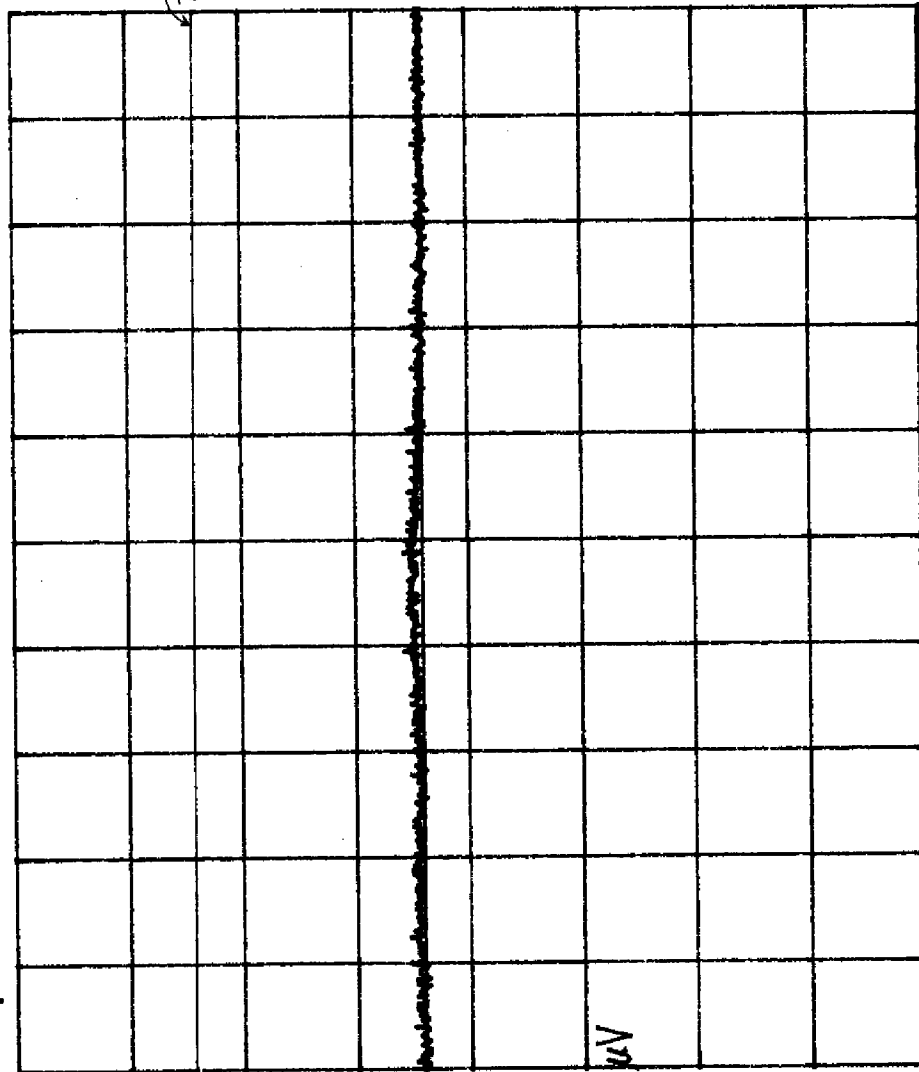
FIGURE 6.1-9



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: V 2.2 M
DETECTOR: PEAK LINE UNDER TEST: N/A EUT POSITION: 2250
DATE: *June 97* TEST SITE: 1 METER TESTER: *[Signature]*

REF 90.0 dB μ V_m ATT 0 dB A_write B_view
10dB/

PKL



DL 54.0 dB μ V

RBW 1 MHz
VBW 1 MHz
SWP 200 s

START 1.0000 GHz STOP 2.0000 GHz

FIGURE 6.1-10



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 30M-100MHz SPEC: FCC UNIT. RAD. ANT. HT/POL: 225 H 2.2
 DETECTOR: Q PEAK AMB. LINE UNDER TEST: N/A EUT POSITION:
 DATE: 19 June 97 TEST SITE: 3 METER TESTER: *[Signature]*

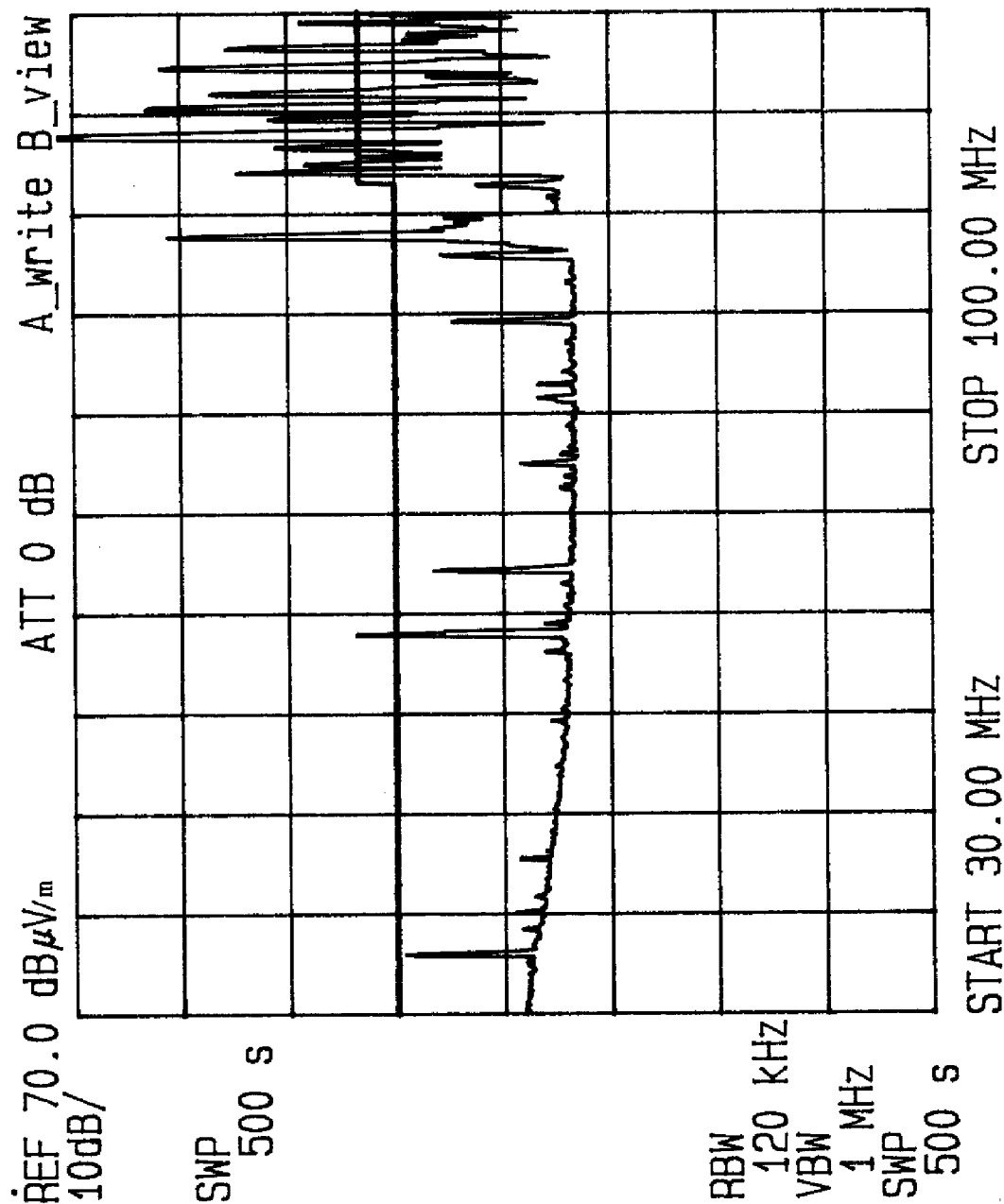


FIGURE 6.1-11



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 30M-100MHz SPEC: FCC UNIT. RAD. ANT. HT/POL: 225 V 2.2
DETECTOR: 0 PEAK AMB. LINE UNDER TEST: N/A EUT POSITION:
DATE: 19 June 97 TEST SITE: 3 METER TESTER: *[Signature]*

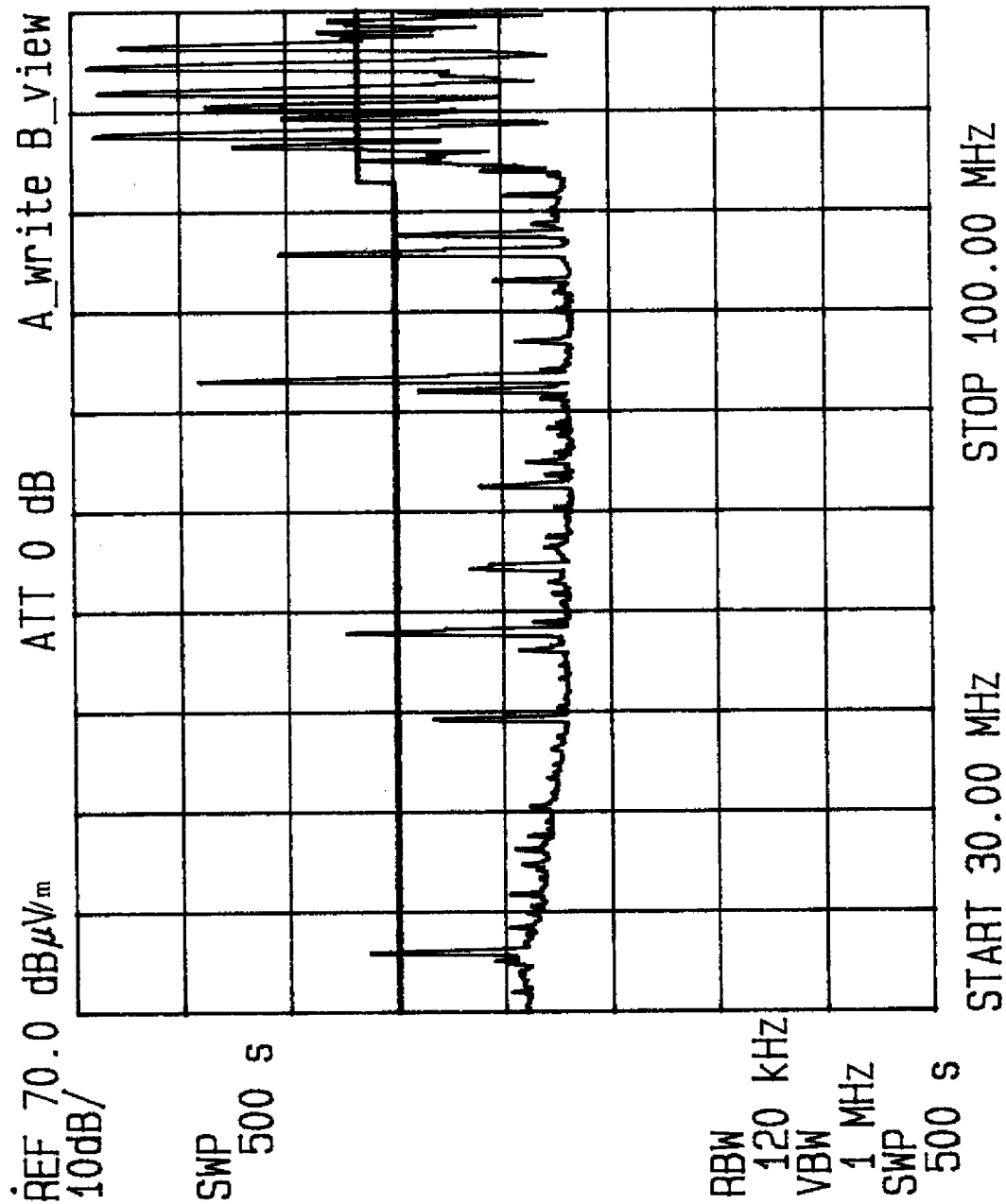


FIGURE 6.1-12



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 100M-200MHZ SPEC: FCC UNIT. RAD. ANT. HT/POL: 225 H 2.2
 DETECTOR: 0 PEAK AMB. LINE UNDER TEST: N/A EUT POSITION:
 DATE: June 99 TEST SITE: 3 METER TESTER: *[Signature]*

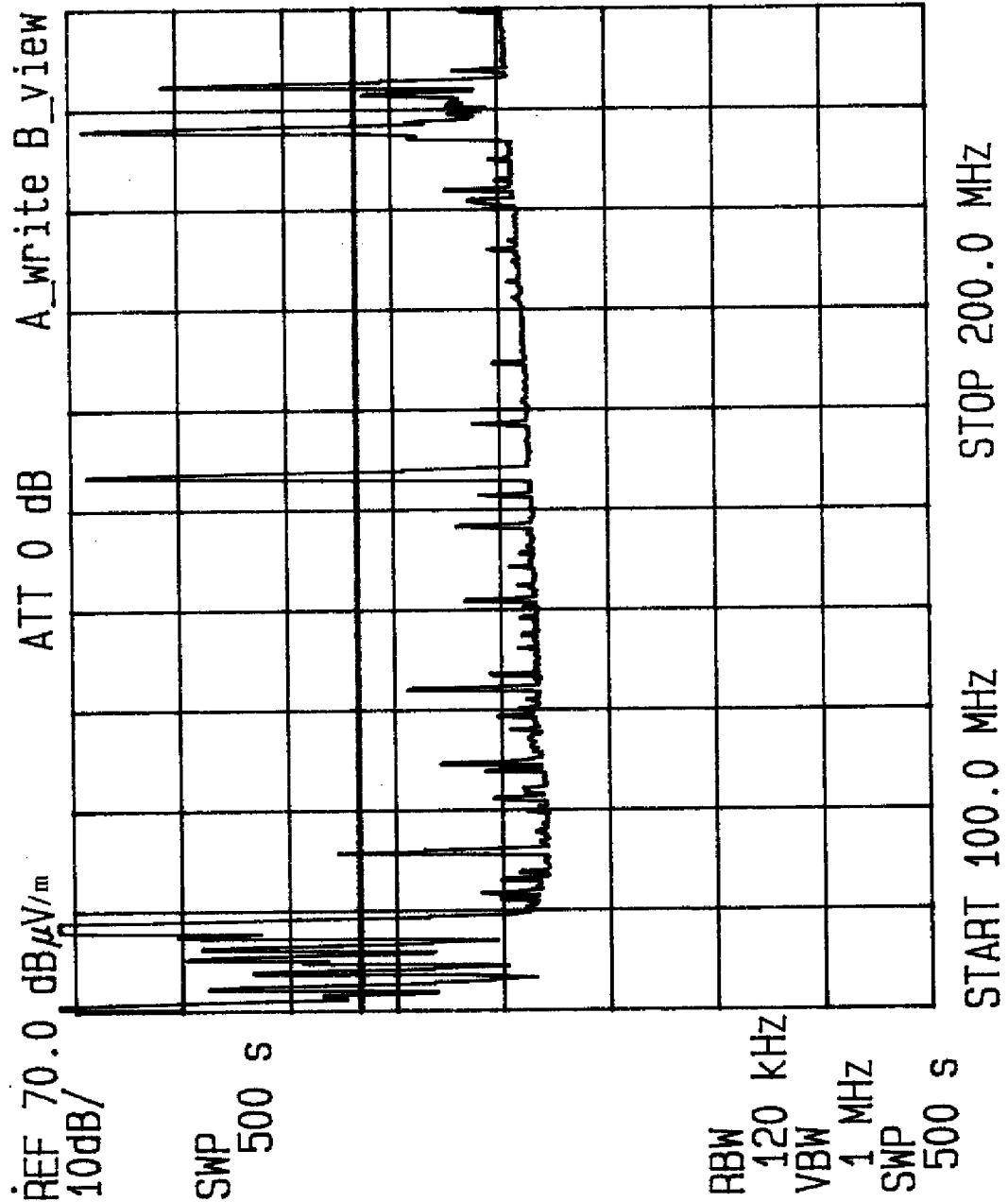


FIGURE 6.1-13



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 100M-200MHz SPEC: FCC UNIT. RAD. ANT. HT/POL: 212 V
DETECTOR: 0 PEAK AMB. LINE UNDER TEST: N/A EUT POSITION: 225
DATE: 19 June 1997 TEST SITE: 3 METER TESTER: JY

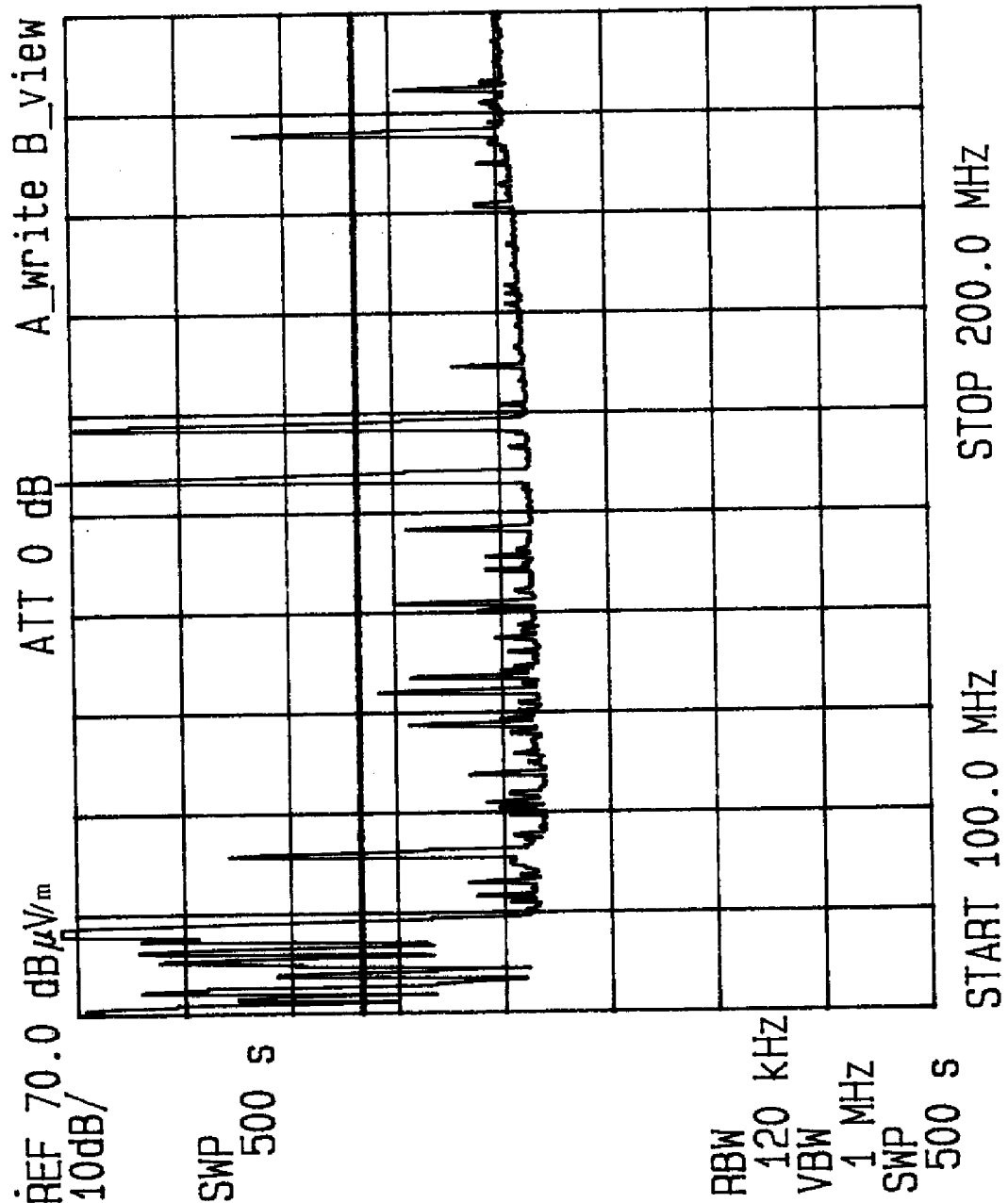


FIGURE 6.1-14



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 200M-1GHZ SPEC: FCC UNIT. RAD. ANT. HT/POL: 22 H
 DETECTOR: Q PEAK AMB. LINE UNDER TEST: N/A EUT POSITION: 223
 DATE: 6/19/97 TEST SITE: 3 METER TESTER: *[Signature]*

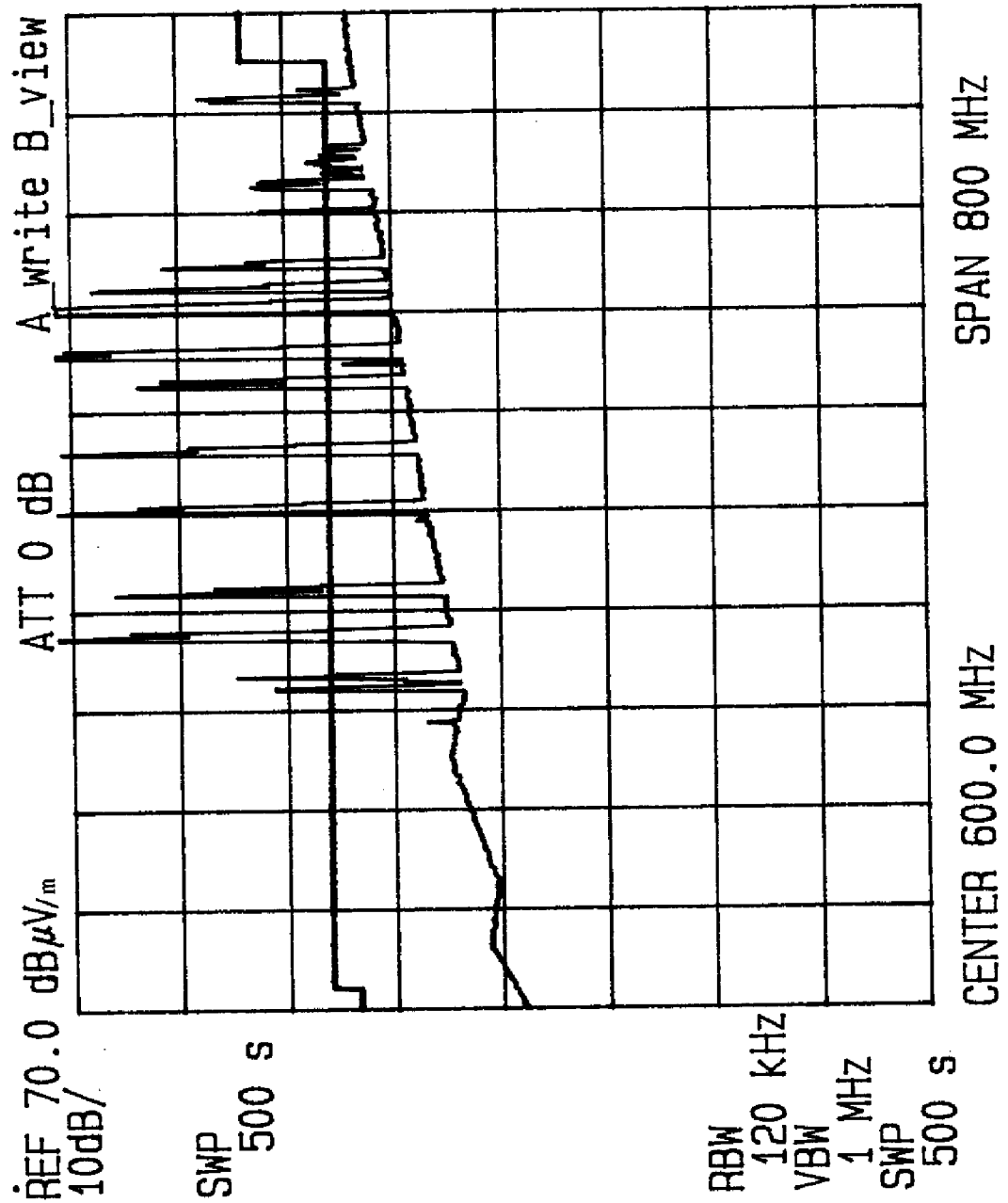


FIGURE 6.1-15



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 200M-1GHZ SPEC: FCC UNIT. RAD. ANT.HT/POL: 2.2 V
DETECTOR: 0 PEAK AMB. LINE UNDER TEST: N/A EUT POSITION: 225
DATE: 18 June 1997 TEST SITE: 3 METER TESTER: J

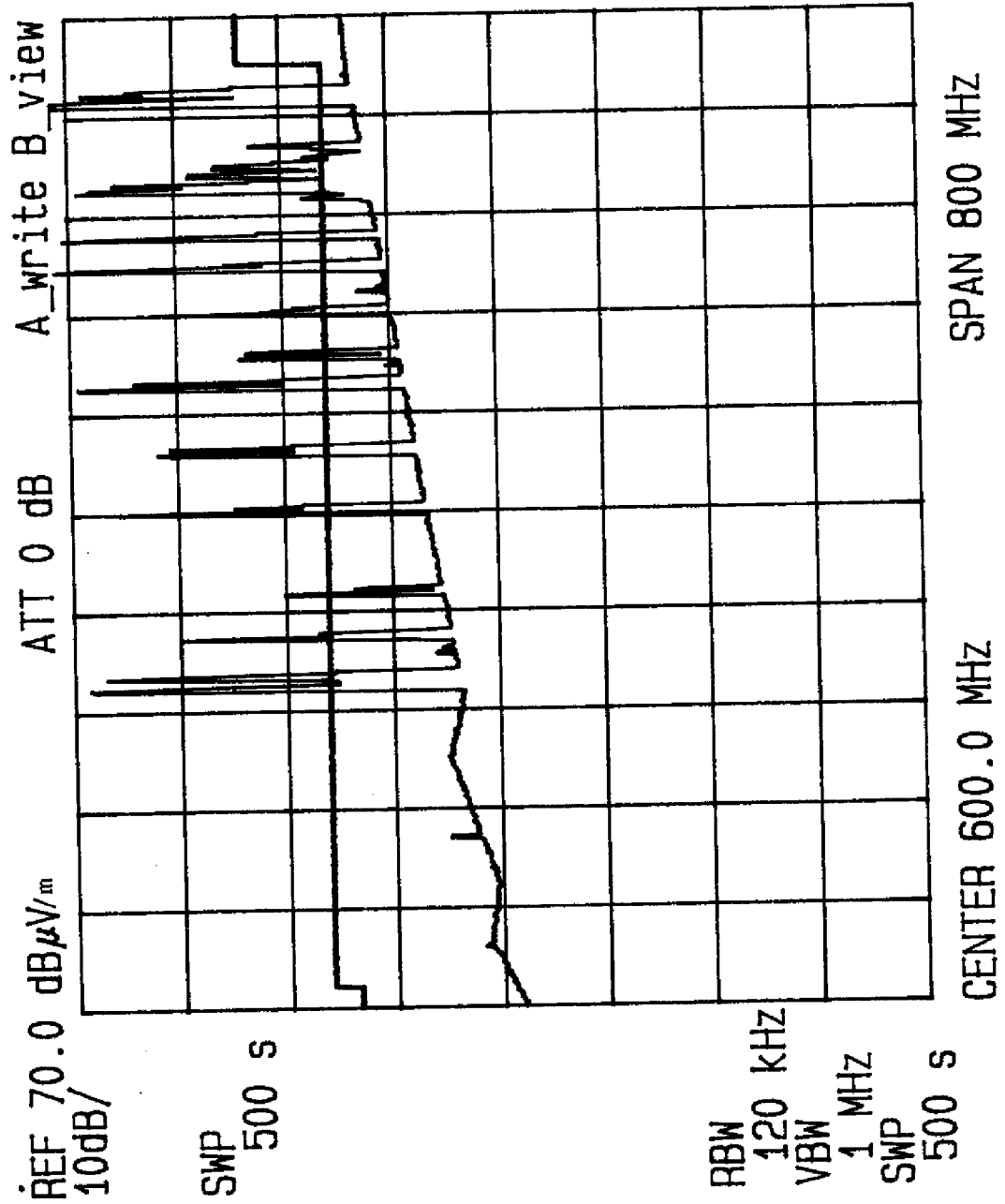


FIGURE 6.1-16



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: H 2.2
DETECTOR: AVG. AMB. LINE UNDER TEST: N/A EUT POSITION: 225
DATE: 18 June 97 TEST SITE: 1 METER TESTER: *[Signature]*

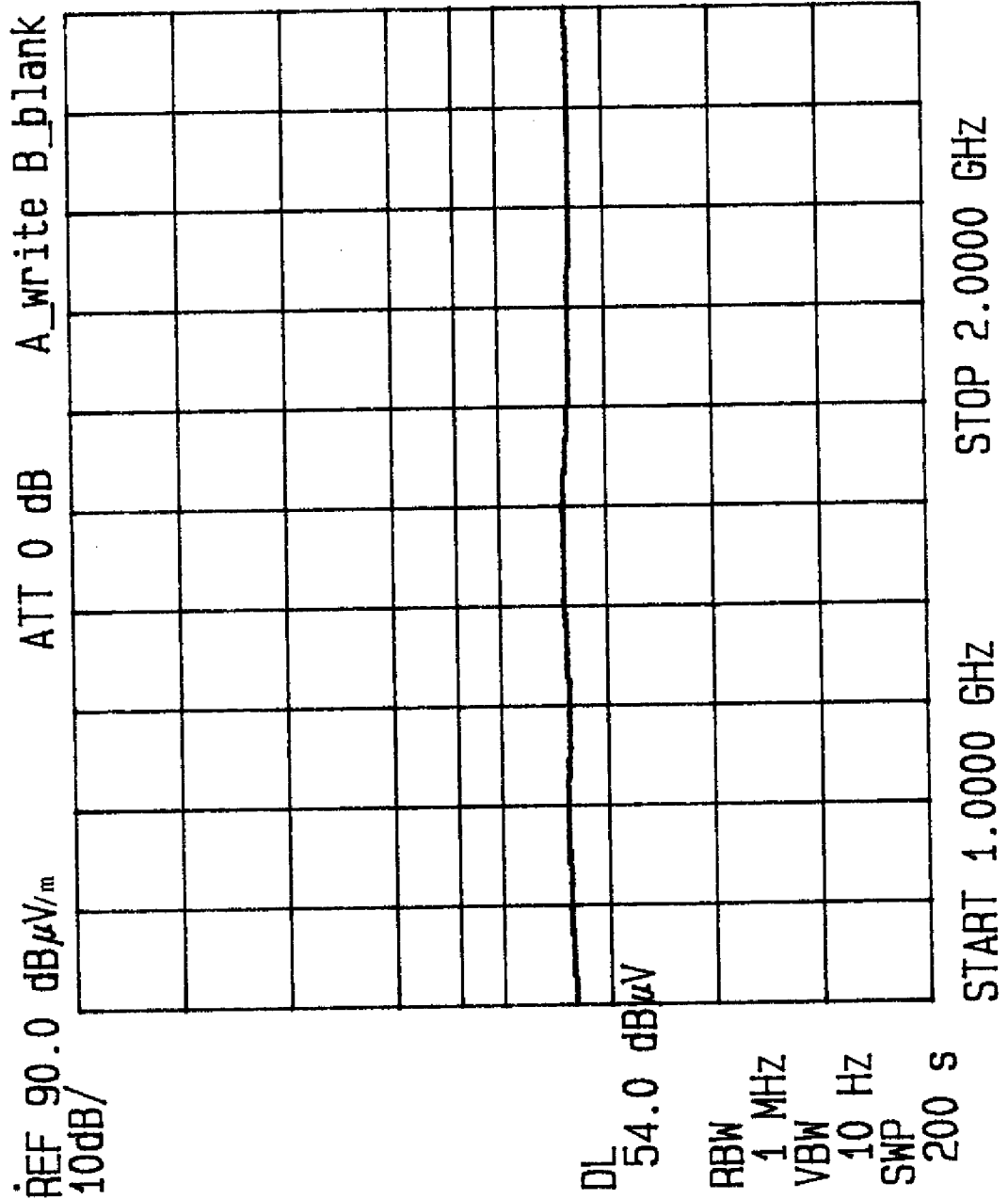


FIGURE 6.1-17



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
 FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: V 2.2 M
 DETECTOR: AVG. AMB. LINE UNDER TEST: N/A EUT POSITION: 225
 DATE: 19 Jan 97 TEST SITE: 1 METER TESTER:

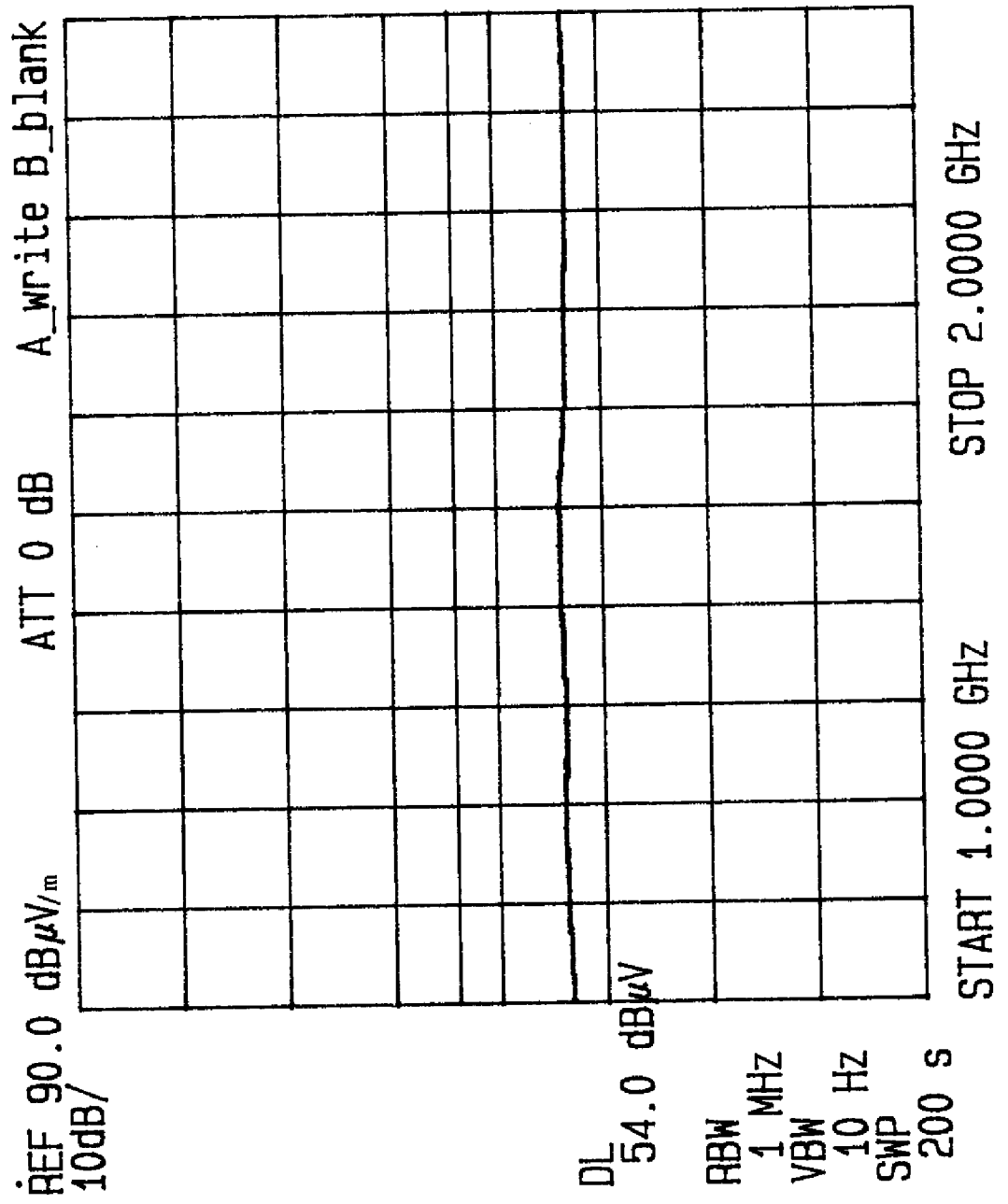


FIGURE 6.1-18



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: H 2.2 M
DETECTOR: PEAK AMB. LINE UNDER TEST: N/A EUT POSITION: 225°
DATE: 8/2/97 TEST SITE: 1 METER TESTER: [Signature]

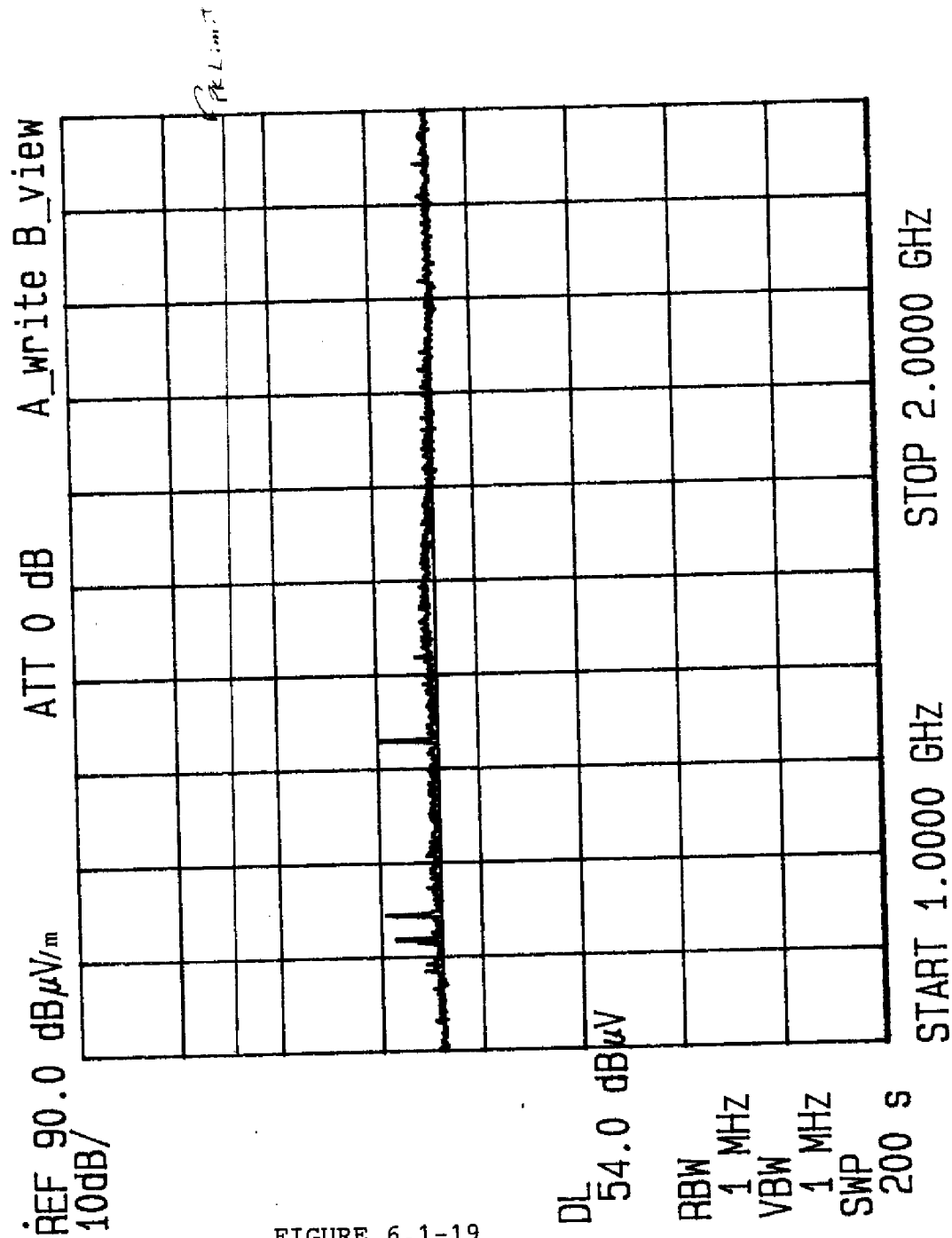


FIGURE 6.1-19



TEST: FCC RADIATED EUT: COLLINS VHF 900B (RECEIVE) S/N: 576
FREQ: 1GHz-2.0 GHz SPEC: FCC UNIT. RAD. ANT. HT/POL: V 2.2 m
DETECTOR: PEAK AMB. LINE UNDER TEST: N/A EUT POSITION: 225
DATE: 19 June 97 TEST SITE: 1 METER TESTER: *[Signature]*

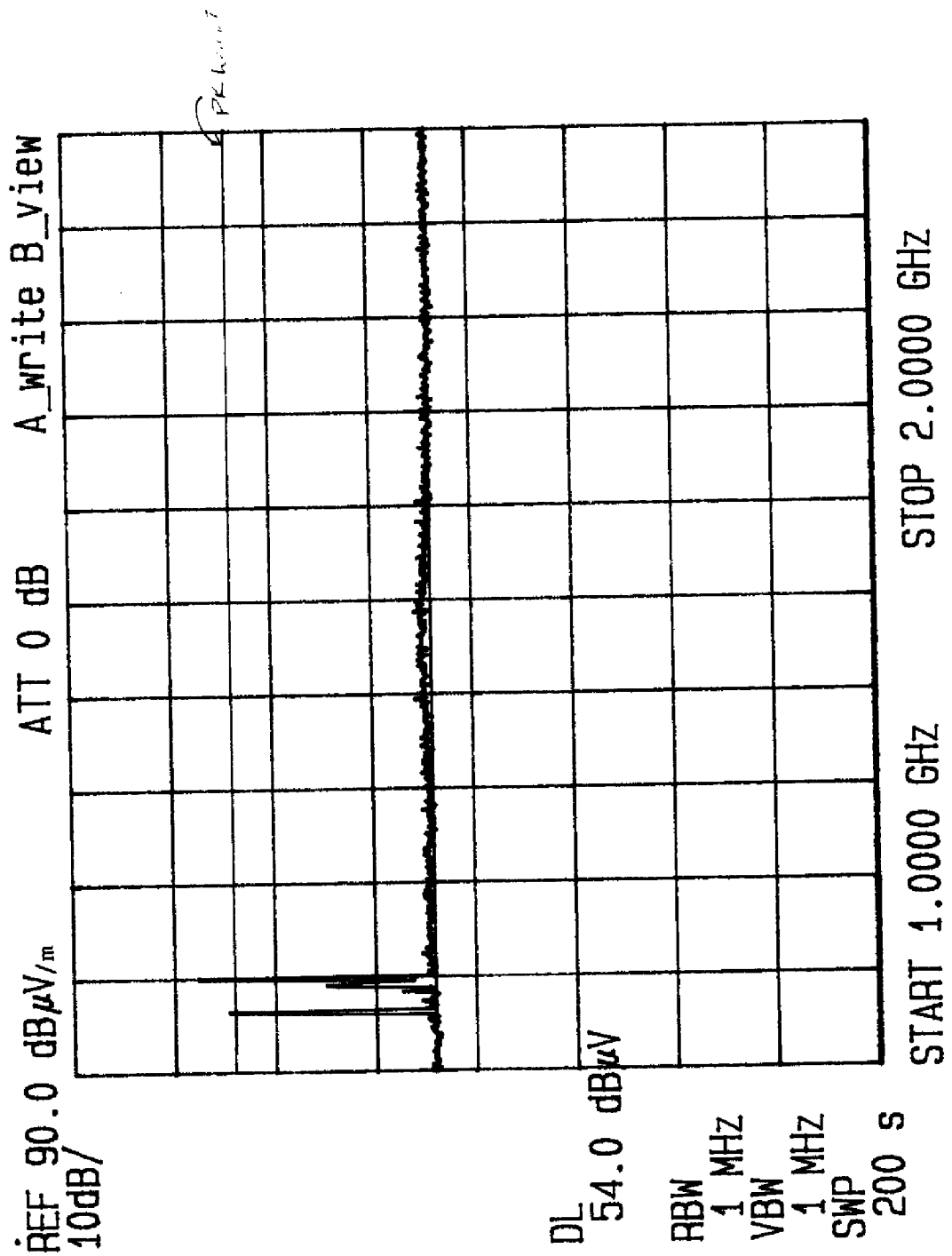


FIGURE 6.1-20

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems Inc.

Operating Frequency: _____ MHz Polarization: Horizontal

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
118	129.8			225°	2.2
236	"	36	93.8	"	"
354	"	38	91.8	"	"
472	"	40	89.9	"	"
590	"	43	86.8	"	"
708	"	45	84.8	"	"
826	"	46	83.8	"	"
944	"	NF 48	82.8	"	"
1062	"	NF 48	81.8	"	"
1180	129.8	NF 48	81.8	225°	2.2

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems, Inc.

Operating Frequency: _____ MHz Polarization: Vertical

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
118	134.6			225°	2.2
236	"	38	96.6	"	"
354	"	39	95.6	"	"
472	"	40	94.6	"	"
590	"	41	93.6	"	"
708	"	45	89.6	"	"
826	"	47	87.6	"	"
944	"	NF 48	87.6	"	"
1062	"	NF 48	86.6	"	"
1180	134.6	NF 48	86.6	225°	2.2

DATA SHEET 6.2-1

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems Inc.

Operating Frequency: _____ MHz Polarization: Horizontal

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
127	129.8			225°	2.2
254	"	38	93.8	"	"
381	"	40	89.8	"	"
508	"	43	86.8	"	"
635	"	43	86.8	"	"
762	"	50	79.8	"	"
889	"	47	82	"	"
1016	"	NF 48	81.8	"	"
1143	"	NF 48	81.8	"	"
1270	129.8	NF 48	81.8	225°	2.2

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems, Inc.

Operating Frequency: _____ MHz Polarization: Vertical

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
127	134.6			225°	2.2
254	"	37	100.6	"	"
381	"	40	94.6	"	"
508	"	40	94.6	"	"
635	"	43	91.6	"	"
762	"	46	88.6	"	"
889	"	47	87.6	"	"
1016	"	NF 48	86.6	"	"
1143	"	NF 48	86.6	"	"
1270	134.6	NF 48	86.6	225°	2.2

DATA SHEET 6.2-2

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems Inc.

Operating Frequency: _____ MHz Polarization: Horizontal

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
136	129.8			225°	2.1
272	"	35	94.8	"	"
408	"	40	89.8	"	"
544	"	40	89.9	"	"
680	"	45	84.8	"	"
816	"	46	83.8	"	"
952	"	48	81.8	"	"
1088	"	NF 48	81.8	"	"
1224	"	NF 48	81.8	"	"
1360	129.8	NF 48	81.8	225°	2.1

Data Sheet - Field Strength of Spurious Radiation

Type Number: 900B Serial Number: 576

Dated Tested: 6/19/97 Tested By: Rubicom Systems, Inc.

Operating Frequency: _____ MHz Polarization: Vertical

Spurious Output Frequency (MHz)	Test Antenna Level (dB μ V/m)	Spurious Level (dB μ V/m)	Margin (dB)	Azimuth	Antenna Height
136	134.6			225°	2.5
272	"	34	100.6	"	"
408	"	40	94.6	"	"
544	"	40	94.6	"	"
680	"	44	90.6	"	"
816	"	46	88.6	"	"
952	"	48	86.6	"	"
1088	"	NF 48	86.6	"	"
1224	"	NF 48	86.6	"	"
1360	134.6	NF 48	86.6	225°	2.5

DATA SHEET 6.2-3

APPENDIX A
COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-725-1585 (ext-218)
Facsimile: 301-344-2050

December 5, 1996

IN REPLY REFER TO
31040/SIT
1300F2

Rubicom Systems, Inc.
284 West Drive, Suite B
Melbourne, FL 32904

Attention: Joseph G. Barbee

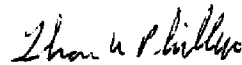
Re: Measurement facility located at above address
(3 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is published periodically and is also available on the Laboratory's Public Access Link as described in the enclosed Public Notice.

Sincerely,



Thomas W. Phillips
Electronics Engineer
Customer Service Branch

Enclosure:
PAL PN

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