USA Type Approval Test Report

For

MainStreet Broadband Wireless

Basestation (BTS) 28GHz

(LMDS)

With Telaxis Communications Corp. (Millitech) Radios

Test Dated: Sept. 15,1999

Test Performed:

FCC Part 101 and 2

NOTICE

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ABSTRACT

This document provides the test procedure and test report used to fulfill the requirements of the Approvals Group personnel and the Wireless product designers to evaluate the MainStreet Broadband Wireless System during radio type approval testing.

The test data contained in this report is evidence of compliance to specified radio standards for the units described herein.

GLOSSARY

ARIC	*ATM Radio Interface Card*
ATM	*Asynchronous Transfer Mode*
BER	*Bit Error Rate.* The ratio of incorrect bits to total number of bits transmitted.
BTS	*Base Transceiver System*
CISPR	*International Special Committee on Radio Interference*
CPE	*Customer Premises Equipment*
CW	*Continuous Wave*
EMC	*Electro Magnetic Compatibility*
EUT	*Equipment Under Test*
FCC	*Federal Communications Commission*
ITE	*Information Technology Equipment*
MIB	*Management Information Base.* A collection of objects that can be accessed via a network management protocol.
NIU	*Network Interface Unit*
ORU	*Outdoor Receiver Unit*
OTRU	*Outdoor Transmitter Receiver Unit*
OTU	*Outdoor Transmitter Unit*
RF	*Radio Frequency*
TBD	*To Be Determined*

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1 INTRODUCTION

1.1 Purpose

This document provides a test plan and report for Radio Type Approval testing of the "MainStreet Broadband Wireless System" according to applicable FCC standards. This test report is to show compliance according to the FCC Part 101 requirements and FCC Part 2 methods for the MainStreet Broadband Wireless System – **Basestation from 27.5GHz to 28.35GHz** using ***Telaxis Communications Corp. (Millitech) Radios*** to achieve certification in the United States.

1.2 Scope

This document shall be used to evaluate "MainStreet Broadband Wireless - Basestation 28GHz" conformance to the test requirements contained in applicable FCC standards. The test results are documented according to the test methods as mentioned in the FCC standards, and are to be submitted with the FCC Form 731 "Application for Equipment Authorization. This report is to show compliance for the 27.5GHz to 28.35GHz band only.

2 EQUIPMENT UNDER TEST (EUT)

2.1 Equipment Description

The Broadband Wireless System is a network of Network Interface Units connected to Base Stations via wireless links and the Base Stations are, in turn, connected to the ATM Backbone Network via wired or point to point wireless links. A Network Manager augments the network. The system consists of a TDM QPSK downstream and two TDMA upstream Differential Coded QPSK burst mode per ARIC card.

The ATM Radio Interface Cards (ARIC) connects to external transmitters and receivers via coax cable. Typically there is one BTS per cell and is connected to the Backbone Network usually via OC-3. The BTS is the hub that delivers and collects all the wireless traffic from and to the subscribers in the BTS coverage area. The BTS is also the linking point between the subscribers and the Backbone Network.

The 36170 card cages/shelves are housed in Newbridge 19” equipment racks.

The external transmitters and receivers is typically mast mounted or mounted on a flat surface of the building.

Indoor BTS Equipment

Figure 1 shows the components that are required for the BTS. The number of ARICs required depends on the number of users supported. Today’s system configuration can handle up to 6 ARIC cards, operating with one OTU.

The minimum set of components required to support the first user is:

- 1 36170 Peripheral Shelf
- 1 Control Card Interconnect Panel
- 1 System Synchronization Unit
- 1 or 2 Switching Hub Cards (for redundancy)
- 1 or 2 Control Cards (for redundancy)
- 1 ATM Radio Interface Card
- 1 OC-3/STM1 Card (assuming the BTS is connected to an ATM backbone)
- 1-Combiner/splitter unit
- 1 Transmitter (OTU)
- 1 Receiver (ORU)
- External -48 v power supply for the transmitter, receiver and BTS shelf
- 2 90° sectored antenna (one for transmit, one for receive)

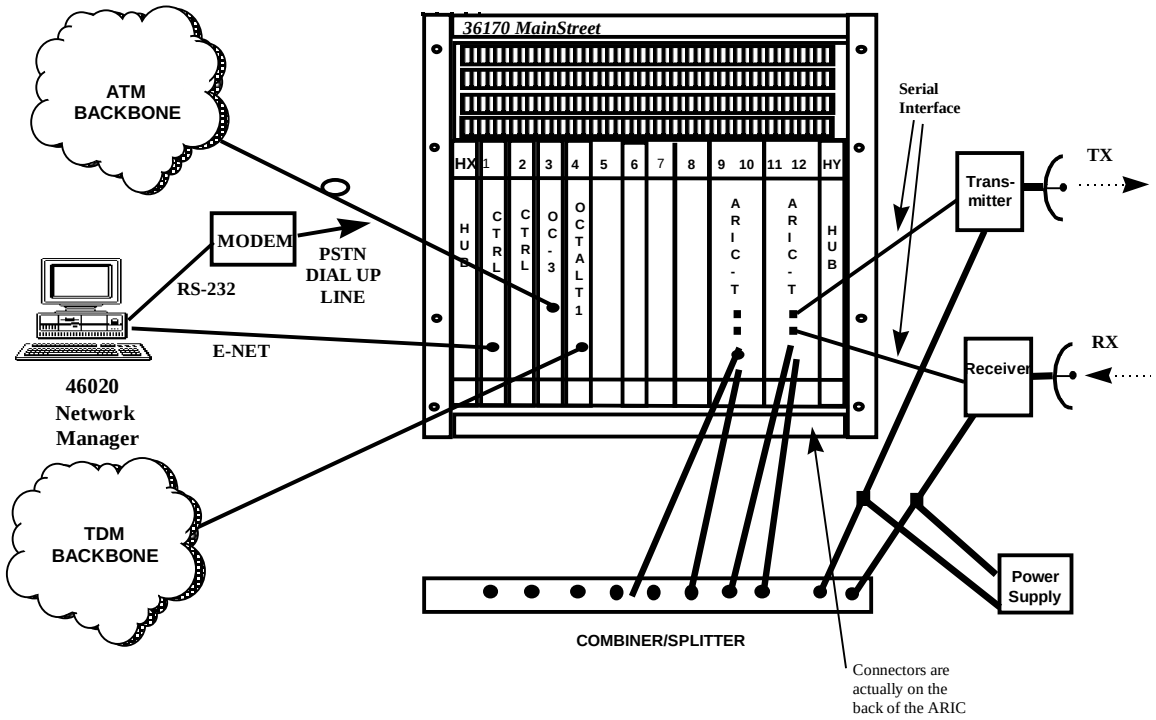


Figure 1: Base Transceiver Station

External RF Equipment

The ARICs are connected to a Combiner/Splitter complex, which is used to interface to the mast-mounted transmitter(s) and receiver(s). This equipment is developed/provided by an OEM supplier. The OEM supplier for the ORU and OTU that has been tested and mentioned within this report is:

Telaxis Communications Corporation (name changed from Millitech)
20 Industrial Drive east
P.O Box 109
South Deerfield Massachusetts 01373-0109, USA

The base station radio equipment is located on pole mounts such that each sector has dedicated transmitters and receivers. The transmitters and receivers are mounted directly onto their respective sector antennas as shown in Figure 2 below.

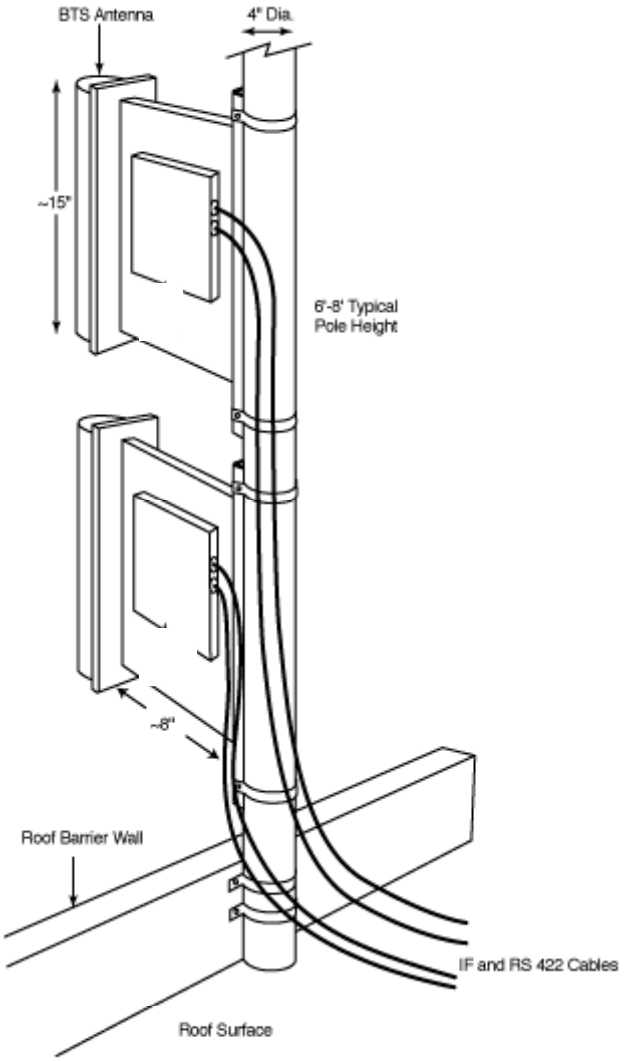


Figure 2 Typical Multi transmitter or receiver installation (vertical stacking)

2.2 EUT Configuration

Model Number	**Name and Description**	**S/N**
90-4907-01	36170 High Power Peripheral Shelf	18990124306
90-2507-11	Standalone Hub Card	033980104629
90-2507-11	Standalone Hub Card	489601009740
90-3346-01	Control Card 2	09990110620

90-3347-01	SSU 3 Module	10980110769
90-4905-03	OC3 –2 MMF	11990115109
90-6474-01	MAU	04990110991
90-6206-01	ARIC card	Sample #7
90-6206-01	ARIC card	Prototype #8
90-6206-01	ARIC card	Sample # none (K1MMM0 , tuner)
90-6206-01	ARIC card	Sample #6
90-2190-01	36170 Peripheral Shelf	02960113098
90-6085-01	Standalone Hub Card	35980110108
90-3346-01	Control Card 2	34980100354
90-6206-01	ARIC card	Sample #17
90-6206-01	ARIC card	Sample #18
PS6-A19 (9832)	Pulsar Microwave Combiner/Splitter	None
PS6-A19 (9832)	Pulsar Microwave Combiner/Splitter	None
9031237801	OTU (TX) Basestation Telaxis (Millitech)	82710586
9031238101	ORU (RX) Basestation Telaxis (Millitech)	82710588
90-6516-01	Bias-Tee	none
90-6210-01	NIU (CPE) 28110	23990108967
90-6626-01	OTRU (CPE) Transceiver / Antenna Unit	991633649

2.3 EUT Cables

Part Number	**Cable Type**	**Length (m)**	**Shield**	**Connector Hoods**
90-2296-04	ISL Cable Optical	10.0	none	none

N/A	RJ45 shielded cable	5.0	Foil	metalized
N/A	coaxial cable	2.0	braid	SMA

2.4 System Test Configuration

2.4.1 Justification

The system was configured with 6 ARIC cards with each carrier having a bandwidth (BW) of 36MHz, which is the maximum the OTU (TX) Basestation radio can handle. The TX IF modulated carriers are combined together and fed to the OTU to achieve a maximum RF level of $\geq$ +19dBm per carrier for a total output power of +27dBm. Only one carrier was used to operate with the OTRU (CPE) and NIU to achieve traffic. Operating with the maximum carriers and widest bandwidth will provide the worst condition based on intermodulation, spurious and spectral re-growth.

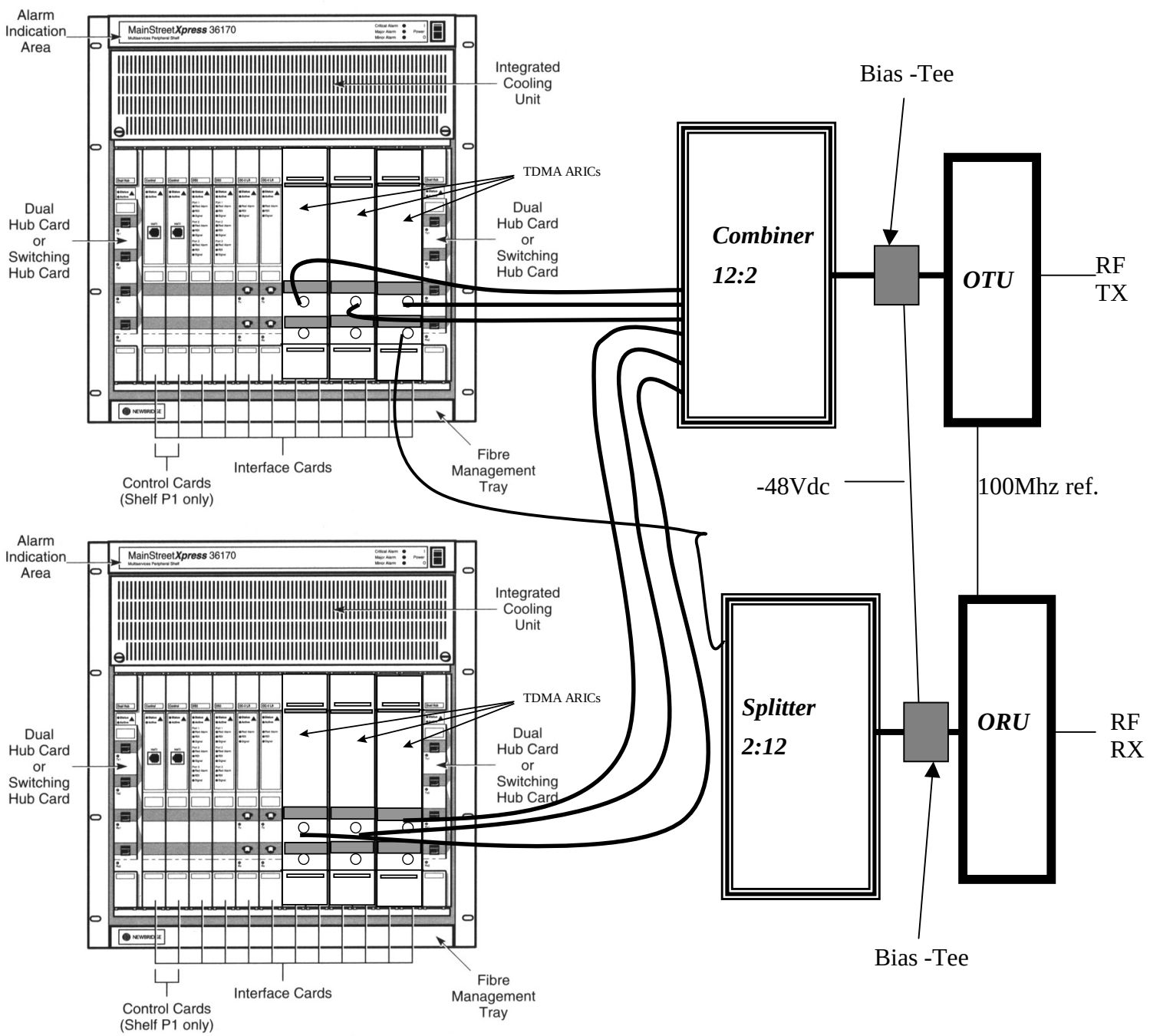
For the frequency stability measurements, an external source was used to provide an IF CW to the radio units. Only the OTU and ORU were placed in the temperature chamber during this specific test due to the 36170 shelf will usually be in a temperature-controlled environment, but meets all internal performance requirements between the temperatures of -5^{o}C to $+55^{o}$C.

For all tests, the EUT was configured to simulate a typical application. The testing was conducted using only cables recommended for use with the EUT by Newbridge. Attention was made to follow any recommended chassis grounding, cable routing, etc. in the Newbridge Technical Practices.

The EUT was placed according to the required set ups detailed in the test specifications and methods within this document for each type of radio type approval test (FCC Part 101 and 2).

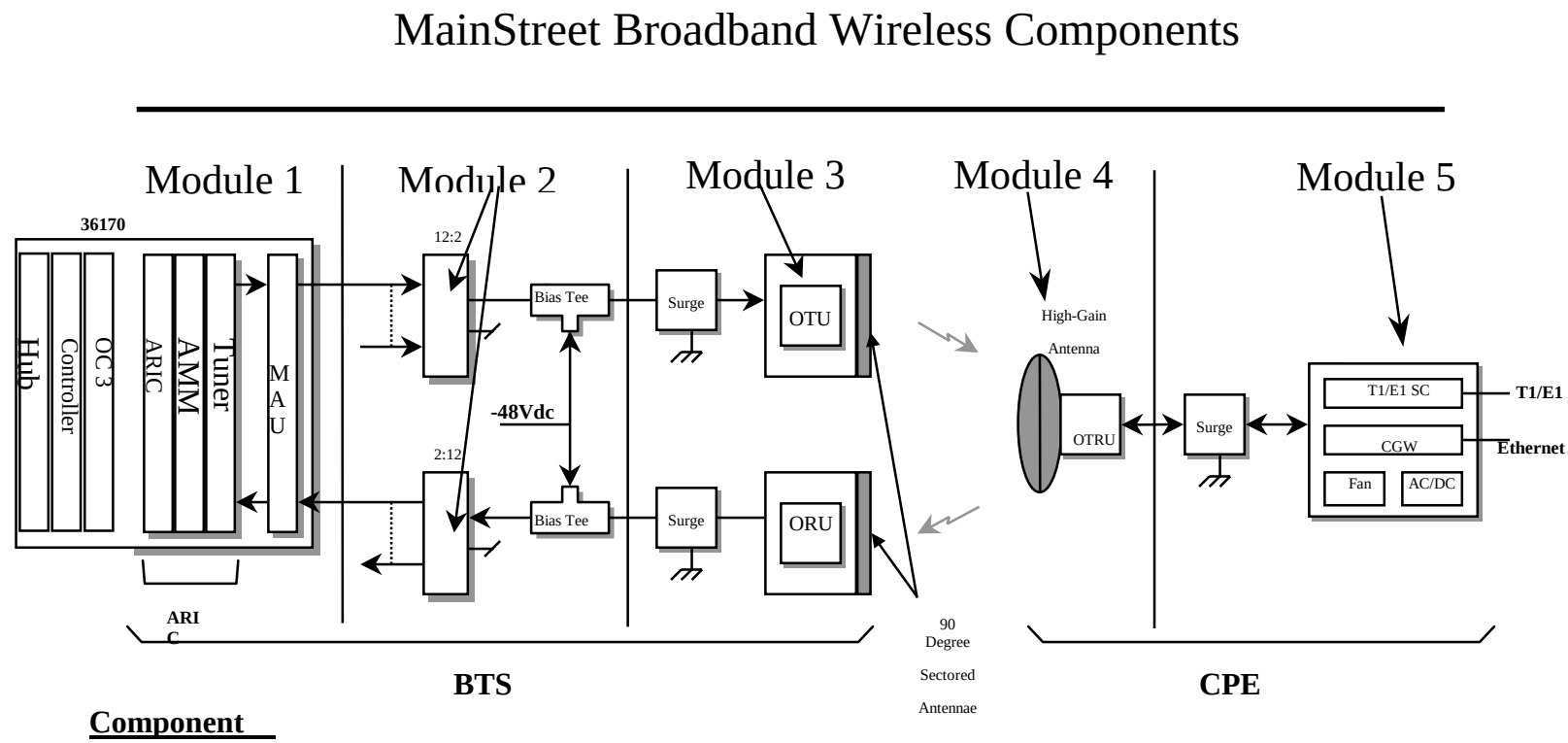
The test result for conducted and radiated spurious were performed by an external lab (KTL Ottawa) and complied together in this test report. The measurements were taken according to the instructions mentioned in the FCC Part 2 and Part 101.

Figure 3 Diagram of System Configuration



2.4.2 Functional Interconnect

Figure 4 Block Diagram of Functional Interconnect



Component

BTS	**CPE**
ARIC, Tuner, AMM, MAU Combiner, Splitter, Bias-Tee	T1/E1 Services Card Commercial GateWay (CGW)
Surge Arrestor	Surge Arrestor
OTU, ORU	OTRU
90 Degree Sectored Antennae	12” Antenna

3 Regulatory COMPLIANCE Summary

This report has been read and approved by the appropriate departments responsible for its implementation. All changes found necessary for compliance will be incorporated into production.
The EUT as configured in this report meets the requirements indicated below. The results of these tests apply only to items tested and provide an indication of hardware quality during operation and maintenance in their intended environment.

Declaration of Compliance

" This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. . Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by Newbridge Networks Corporation, 600 March Road, Kanata, Ontario, K2K2E6. and KTL, 3325 River Road RR#5, Ottawa, Ontario, K1V 1H2 "

Standard	Measurement Type	Method/ Limit	Pass/Fail Criteria
FCC Part 101 & FCC Part 2 (10-1-98 edition)	Output Power	Section 2.1046 / Section 101.113	Pass
	Spectrum Mask (Occupied Bandwidth)	Section 2.1049 / Section 101.111(a)(2)(ii)	Pass
	Radiated Spurious	Section 2.1053 & 2.1057 / Section 101.111(a)(2)(ii)	Pass
	Conducted Spurious	Section 2.1051 & 2.1057 / Section 101.111(a)(2)(ii)	Pass
	Frequency Stability	Section 2.1055 / Section 101.107	Pass

Regulatory Compliance Requirements

Vito Scaringi
Wireless Approvals Specialist

Date Oct.25/ 1999 _____

4 TEST RESULTS

4.1 RF Output Power

4.1.1 Test Specification

Standard	FCC Part 101 section 101.113 (edition 10-1-98)
Method	FCC Part2 section 2.1046 (edition 10-1-98)
Limits	Maximum EIRP of +55dBW

4.1.2 Test Location

Test Laboratory	Newbridge Networks Corporation, Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Vito Scaringi, Wireless Approvals Specialist

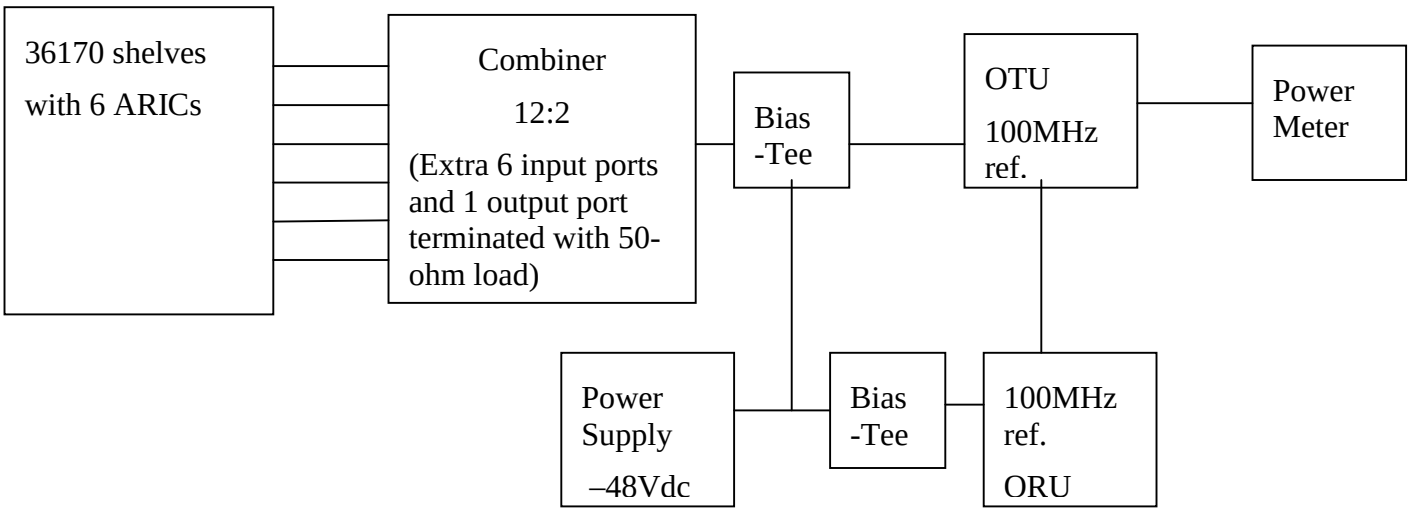
4.1.3 Tested by

Test Engineer	Vito Scaringi, Wireless Approvals Specialist
Company	Newbridge Networks Corporation

4.1.4 Test Procedure

The output power was adjusted to have each carrier set at approximately $\geq$+19dBm, giving a total output power at the antenna port of +27dBm maximum. The transmitter can support a maximum of 6 carriers or less, each with a BW of 36MHz or smaller.

Therefore, the worst condition was tested, using 6 carriers each set at a BW of 36MHz which is the maximum configuration this power amplifier will be operating. All power measurements were taken in normal operation (modulated).



RF Power Output Test Setup

(1) Calibrate power meter to the proper frequency of transmission.

(2) Enable OTU and add the appropriate attenuation at the antenna port to avoid damage to the power meter.

(3) Measure output power at the low and high end of the band of operation of the OTU. Measure the attenuator and compensate with an offset.

4.1.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Power Meter	Hewlett Packard/ Model EPM-441A Tool # 8067	N/A	Last: 98/11/13 Due: 99/11/13
Power Sensor	Hewlett Packard/ Model 8487A Tool # 10419	-30dBm to +20dBm	Last: 99/08/23 Due: 00/08/23

4.1.6 Results - Test Data

Unit under Test	Frequency Band (MHz)	Maximum EIRP Level
OTU Telaxis (Millitech) Basestation Transmitter	27650 to 28350	+18dBW maximum (6 carriers) +10dBW maximum per carrier

Antenna Gain of 90 degree sector antenna: 21dBi

Each carrier set at +19dBm (-11dBW), with a total of +27dBm (-3dBW) at the antenna port

Conversion from dBm to dBW: +19dBm - 30dB= -11dBW

4.2 Spectrum Mask

4.2.1 Test Specification

Standard FCC Part 101 section 101.111(a)(2)(ii) (edition 10-1-98)

Method FCC Part 2 section 2.1049 (edition 10-1-98)

Limits A= 11+0.4(P-50) =10logB (B= 850MHz)

4.2.2 Test Location

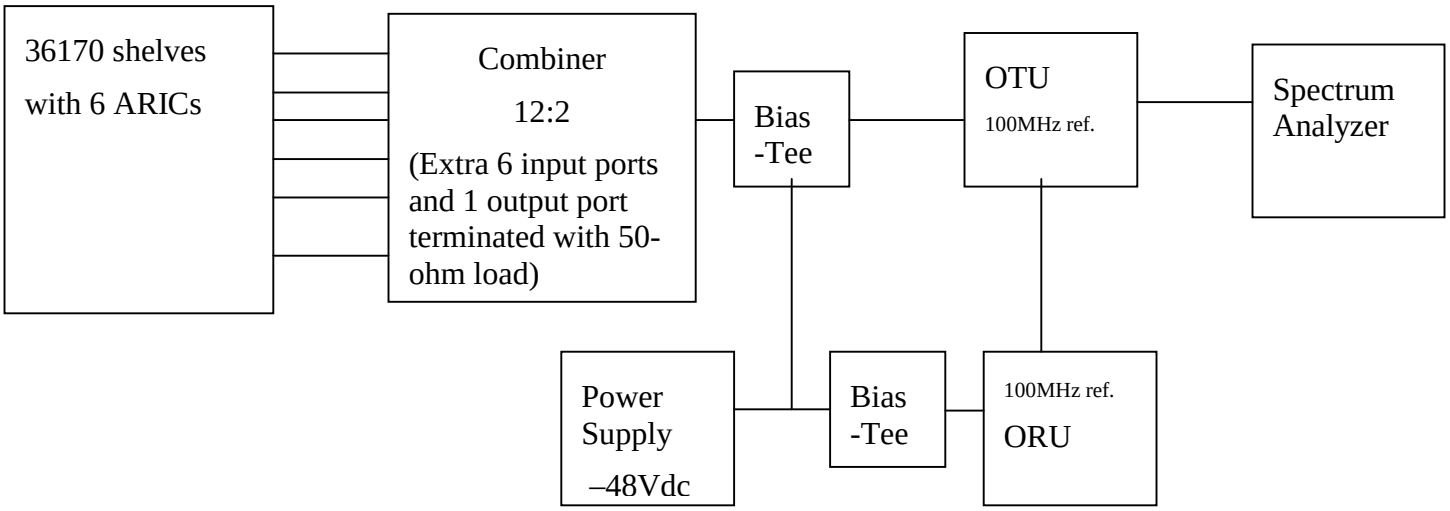
Test Laboratory	Newbridge Networks Corporation, Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Vito Scaringi, Wireless Approvals Specialist

4.2.3 Tested by

Test Engineer	Vito Scaringi, Wireless Approvals Specialist
Company	Newbridge Networks Corporation

4.2.4 Test Procedure

The measurements were done with 6 ARIC cards inserted in the 36170 shelf and the 12:2 combiner. Each carrier was adjusted at the RF output to approximately +19dBm, which gave a measured total power at the antenna port of +27dBm.



Spectrum Mask measurement setup

(1) Set the settings of a spectrum analyzer as follows:

Center frequency	Last carrier set at 28,332MHz (each carrier is 36MHz)
Sweeping time	Automatic
Resolution bandwidth	1 MHz
Video bandwidth	$\geq$ 300 kHz (video averaging of display is allowed)
Y scale	10 dB/Div

(2) Connect spectrum analyzer at the antenna port and record the spectrum shape. Perform measurements at the edge of the frequency block with all 6 carriers grouped side by side near the higher end of the assigned band. Repeat measurements at the lower end of the assigned band or to the lowest frequency the transmitter can operate at.

(3) Overlay the FCC mask and verify that it does not exceed the limits.

4.2.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	Hewlett Packard/ Model 8564/ Tool # 738	9kHz to 40GHz	Last: 98/11/13 Due: 99/11/13

4.2.6 Results - Test Data

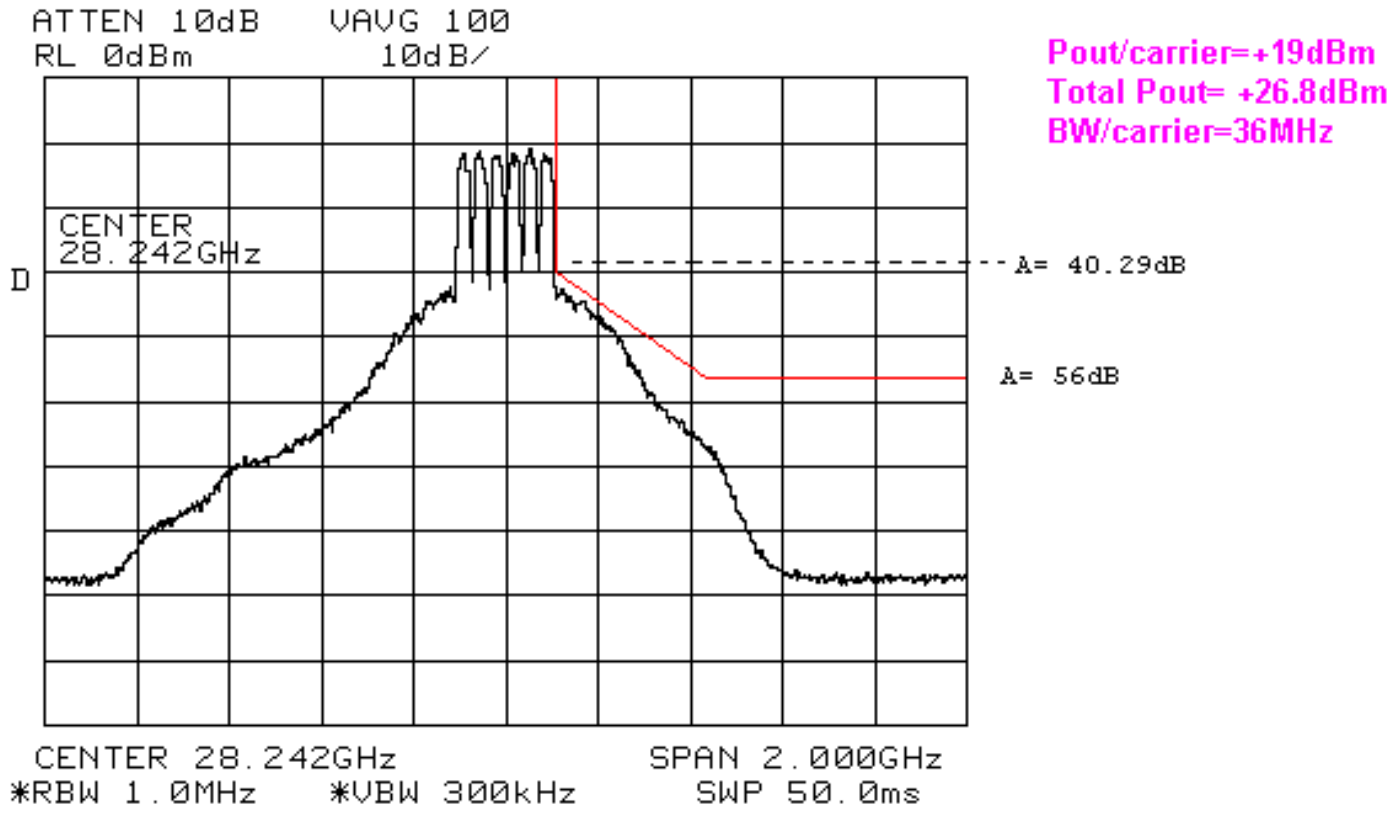
Downlink frequency range: 27,650 to 28, 350MHz

The highest frequency the last carrier will operate is at 28,332MHz with 36MHz carriers.

The lowest frequency the first carrier will operate at is 27,668MHz with 36MHz carriers

Note: The OTU will not operate below 27,650MHz, therefore the spectrum mask is offset by 150MHz from the edge of the first carrier.

Each carrier BW= 36MHz


ATTEN 10dB
VAVG 100
RL 0dBm
10dB/
Pout/carrier=+19dBm
Total Pout= +26.8dBm
BW/carrier=36MHz
CENTER
28.242GHz
D
A= 40.29dB
A= 56dB
CENTER 28.242GHz
SPAN 2.000GHz
*RBW 1.0MHz
*VBW 300kHz
SWP 50.0ms

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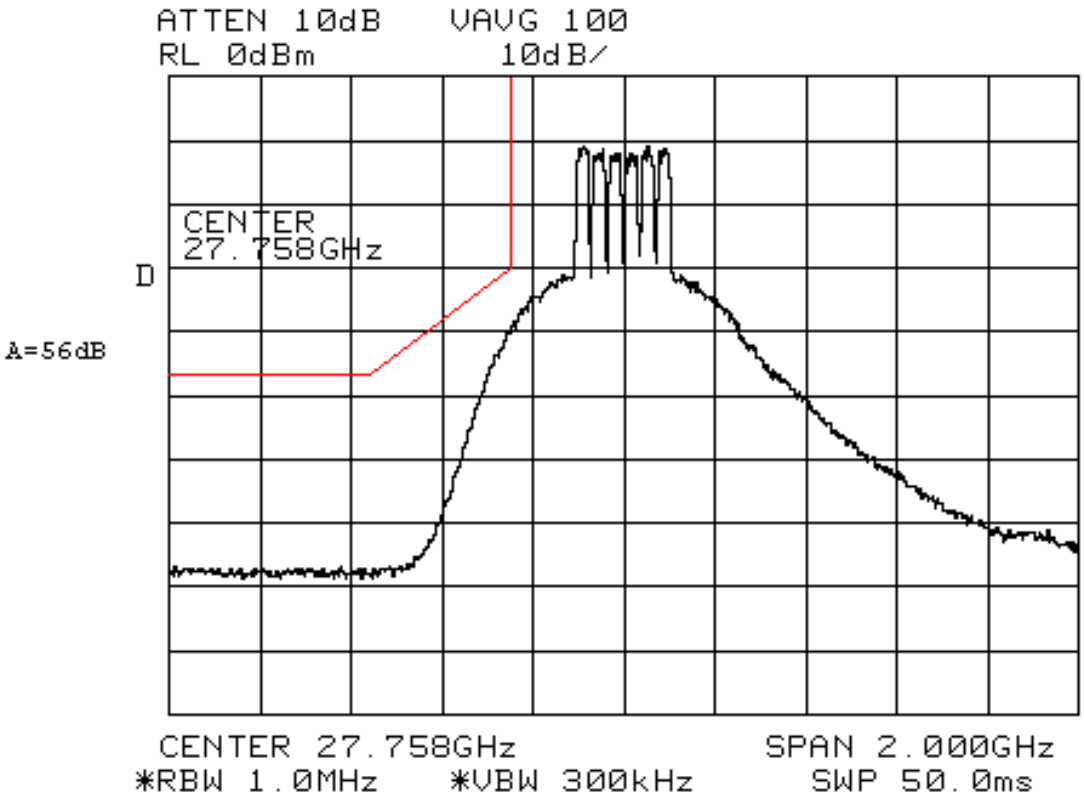


Pout/carrier=+19dBm
Total Pout= +27.0dBm
BW/carrier=36MHz

4.3 Radiated Spurious

4.3.1 Test Specification

Standard	FCC Part 101 section 101.111(a)(2)(iii) (edition 10-1-98)
Limit	43 +10log Pmean

4.3.2 Test Location

Test Laboratory	KTL Ottawa Inc.
Address	3325 River Road R.R.5 Ottawa, Ontario K1V 1H2
Prime Contact	Ted Grant, Manager Electromagnetic Services

4.3.3 Tested by

Test Engineer Wayne Clarke

Company KTL Ottawa Inc.

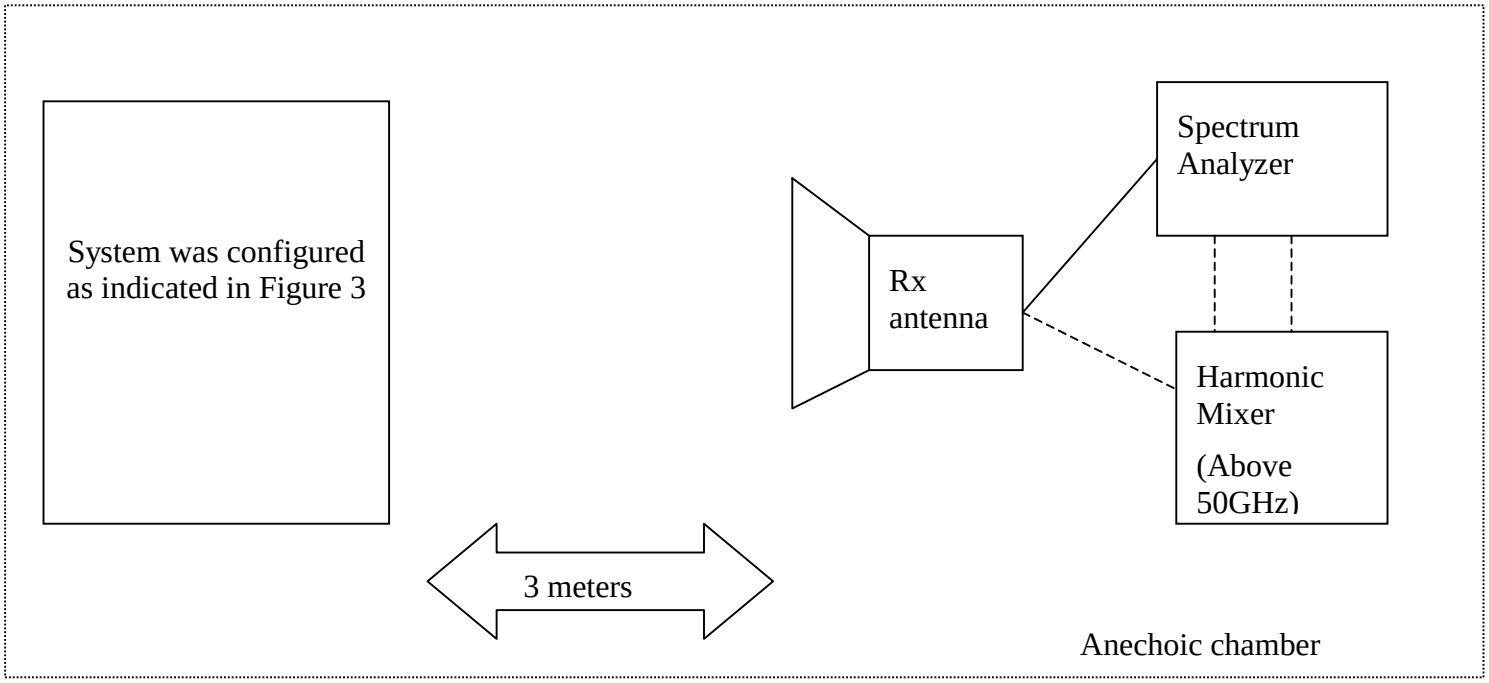
4.3.4 Test Procedure

The measurements were done with 6 ARIC cards inserted in the 36170 shelf and the 12:2 combiner. Each carrier was adjusted at the RF output to approximately ≥+19dBm, which gave a measured total power at the antenna port of +27dBm.

The reference level was measured with the vertical polarized 90-degree sector antenna that had a gain of 21dBi. Once the reference level was defined, the final measurements were taken with the OTU port terminated with a 50Ω load.

All radiated spurious measurements were taken in semi-anechoic room at a distance of 3 meters in the vertical and horizontal polarization.

The system was setup in maximum configuration as indicated in figure 3 (section 2.4.1).



Radiated Spurious measurement setup

Radiated Spurious Setup in a Semi- Anechoic Chamber at KTL Ottawa Laboratories

4.3.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	HP 8565E SN #FA000981	9kHz to 50GHz	Last: 99/06/16 Due: 00/06/16
Biconical Antenna	EMCO/ 3109 SN #9204-2708	20 MHz to 300Mhz	Last: 98/09/24 Due: 99/09/24
Log Periodic Antenna	EMCO/ LPA-25 SN #1141	200MHz to 1GHz	Last: 98/07/27 Due: 99/09/24
Horn Antenna	EMCO/ 3115 SN #4336	1GHz to 18GHz	Last: 98/10/30 Due: 99/10/30
Horn Antenna	Electro-Metrics/ SH-50/60-1 SN # FA000479	18GHz to 26.5GHz	Last: 97/07/29 Due: 00/07/29
Horn Antenna	Electro-Metrics/ SH-50/60-2 SN # FA000485	26.5GHz to 40GHz	Last: 97/07/29 Due: 00/07/29
Horn Antenna	Millitech/ SGH-19-RP000 SN #021	40GHz to 60GHz	Last: 97/04/25 Due: 00/04/25
Horn Antenna	Millitech/ SGH-12-RP000 SN #031	60GHz to 90GHz	Last: 97/04/25 Due: 00/04/25
Horn Antenna	Millitech/ SGH-08-RP000 SN #FA001296	90GHz to 140GHz	Last: 98/10/13 Due: 01/10/13
Harmonic Mixer	HP 11970V SN #2521A01150	50GHz to 75GHz	Last: 97/02/25 Due: 00/02/25
Harmonic Mixer	HP 11970W SN #2521A01465	75GHz to 110GHz	Last: 98/10/13 Due: 01/10/13

4.3.6 Results - Test Data

<u>Note 1</u>: Ignore the limit lines on the plots specified in Appendix A, for the calculations during the measurements were wrong. The new levels are calculated and specified in the Table below for a spurious measured or mid-band of each graph that does not display a spurious.

The spurious were verified from 30MHz to 100GHz and were below the limits.
See Appendix A for plots.
Antenna Gain = 21dBi
Total Output Power = +27dBm (-3dBW) or 0.5W
A= 43+10log(Pmean in watts) ; therefore, A= 40dB

The total power measured at a distance of 3 meters was 94dBuV over a 216MHz bandwidth (6 carriers x 36MHzBW) using a 21dBi, 90 degree sector antenna in the vertical polarization.
Total output power at the antenna port = +27dBm (0.5watts)

NOTE 2:

When a RBW of 10kHz was used, a correction factor of -4 dB was subtracted to the limit line (10log 4/10 =- 4dB).

When a RBW of 3kHz was used, a correction factor of 1.25 dB was subtracted from the limit level. (10 log 4/3 = 1.25dB).

Cables losses were not taken into consideration for the calculations, but would be used if spurious were within 5 dBs of the limits. (Above 50GHz a correction factor was added into the HP spectrum analyzer according to the harmonic mixer specifications).

Calculations

Absolute Level = (measured level) + (Propagation loss) – (Receiver Antenna Gain) – (RBW correction factor)

Limit Level = Absolute Level – A;

where A= 43+10log (Pmean in watts) therefore, A= 43 + 10 log 0.5= 40dB

Propagation Loss = 32 dB + 20 log f(MHz) + 20 log d (km)

(All measurements were taken at 3 meters distance)

i.e.: Reference level at 27.75GHz

Absolute Reference Level = 94dBuV + (32 + 88.87 - 50.46) – 15.28dB = 149.13dBuV

Limit Level = 149.13- 40 = 109.13dBuV

Radiated Spurious Measurements (Vertical Polarization)

Absolute Level = (measured level) + (Propagation loss) – (Receiver Antenna Gain) – (RBW correction factor)

Reference level at 27.75GHz

Absolute Reference Level = 94dBuV + (32 + 88.87 - 50.46) – 15.28dB = 149.13dBuV

Limit Level = 149.13- 40 = **109.13dBuV**

Frequency (MHz)	Measured Level (dBuV)	Polarization (V/H)	Propagation Losses (dB)	RX Antenna Gain (dBi)	RBW correction Factor (dB)	Attenuation below Pmean (dB)	Spurious Measured (dBuV)	Limit Level (dBuV)
38.6	35	V	13.2741712	-10	1.25	40	**17.02417**	**109.13**
151	35	V	25.121964	1.2	1.25	40	**17.67196**	**109.13**
250	30	V	29.5012253	1.3	1.25	40	**16.95123**	**109.13**
525	37	V	35.9456112	6.8	1.25	40	**24.89561**	**109.13**
725	34	V	38.7491852	5.9	1.25	40	**25.59919**	**109.13**
1260	24.17	V	43.549836	5.6	1.25	40	**20.86984**	**109.13**
2500	20	V	49.5012253	8.2	1.25	40	**20.05123**	**109.13**
3500	18	V	52.423786	8.1	-4	40	**26.32379**	**109.13**
7000	22	V	58.4443859	9.6	-4	40	**34.84439**	**109.13**
14000	25	V	64.4649858	12	-4	40	**41.46499**	**109.13**
20000	25	V	67.563025	15.73	-4	40	**40.83303**	**109.13**
23000	27	V	68.7769818	16.79	-4	40	**42.98698**	**109.13**
25250	22	V	69.5876527	17.58	1.25	40	**32.75765**	**109.13**
31000	17	V	71.369659	16	1.25	40	**31.11966**	**109.13**
33500	22	V	72.0433212	16.56	1.25	40	**36.23332**	**109.13**
37500	27	V	73.0230504	17.44	1.25	40	**41.33305**	**109.13**
41250	26	V	73.8509042	22.75	1.25	40	**35.8509**	**109.13**
43750	25	V	74.3619862	23	1.25	40	**35.11199**	**109.13**
46250	27	V	74.8446598	23.2	1.25	40	**37.39466**	**109.13**
48750	26	V	75.3019175	23.35	1.25	40	**36.70192**	**109.13**
55000	28	V	76.3496789	23.6	-4	40	**44.74968**	**109.13**

67500	28	V	78.1285006	23	-4	40	**47.1285**	**109.13**
77500	32	V	79.3284591	23.45	-4	40	**51.87846**	**109.13**
82500	30	V	79.8715041	23.6	-4	40	**50.2715**	**109.13**
87500	30	V	80.3825862	23.65	-4	40	**50.73259**	**109.13**
92500	32	V	80.8652597	22.55	-4	40	**54.31526**	**109.13**
97500	32	V	81.3225174	22.8	-4	40	**54.52252**	**109.13**

Radiated Spurious Measurements (Horizontal Polarization)

Absolute Level = (measured level) + (Propagation loss) – (Receiver Antenna Gain) – (RBW correction factor)

Reference level at 27.75GHz

Absolute Reference Level = 94dBuV + (32 + 88.87 - 50.46) – 15.28dB = 149.13dBuV

Limit Level = 149.13- 40 = **109.13dBuV**

Frequency (MHz)	Measured Level (dBuV)	Polarization (V/H)	Propagation Losses (dB)	RX Antenna Gain (dBi)	RBW correction Factor (dB)	Attenuation below Pmean (dB)	Spurious Measured (dBuV)	Limit Level (dBuV)
84	32	H	20.02801	0.8	1.25	40	**9.978011**	**109.13**
122	35	H	23.26962	0.2	1.25	40	**16.81962**	**109.13**
250	34	H	29.50123	1.3	1.25	40	**20.95123**	**109.13**
525	39	H	35.94561	6.8	1.25	40	**26.89561**	**109.13**
1250	17	H	43.48063	5.5	1.25	40	**13.73063**	**109.13**
2500	12	H	49.50123	8.2	1.25	40	**12.05123**	**109.13**
3500	12	H	52.42379	8.1	1.25	40	**15.07379**	**109.13**
4500	12	H	54.60668	9	1.25	40	**16.35668**	**109.13**
5500	12	H	56.34968	8.9	1.25	40	**18.19968**	**109.13**
6500	15	H	57.80069	9.9	1.25	40	**21.65069**	**109.13**
7500	17	H	59.04365	9.4	1.25	40	**25.39365**	**109.13**
8500	15	H	60.1308	10	1.25	40	**23.8808**	**109.13**
9500	15	H	61.0969	10.1	1.25	40	**24.7469**	**109.13**
10500	15	H	61.96621	10.6	1.25	40	**25.11621**	**109.13**

11500	14	H	62.75638	11.6	1.25	40	**23.90638**	**109.13**
12500	15	H	63.48063	11.2	1.25	40	**26.03063**	**109.13**
14000	17	H	64.46499	12	1.25	40	**28.21499**	**109.13**
15500	18	H	65.34906	14.4	1.25	40	**27.69906**	**109.13**
16500	17	H	65.8921	14.1	1.25	40	**27.5421**	**109.13**
17500	17	H	66.40319	10.9	1.25	40	**31.25319**	**109.13**
19000	17	H	67.1175	15.38	1.25	40	**27.4875**	**109.13**
21500	20	H	68.19119	16.26	1.25	40	**30.68119**	**109.13**
24175	25	H	69.20975	17.23	1.25	40	**35.72975**	**109.13**
28250	23	H	70.56279	15.39	-4	40	**42.17279**	**109.13**
30500	23	H	71.22842	15.89	-4	40	**42.33842**	**109.13**
31500	30	H	71.50864	16.11	-4	40	**49.39864**	**109.13**
33500	32	H	72.04332	16.56	-4	40	**51.48332**	**109.13**
35250	22	H	72.48561	16.94	1.25	40	**36.29561**	**109.13**
36000	32	H	72.66848	17.11	1.25	40	**46.30848**	**109.13**
37000	28	H	72.90646	17.33	1.25	40	**42.32646**	**109.13**
38000	30	H	73.1381	17.56	1.25	40	**44.3281**	**109.13**
39250	30	H	73.41922	17.83	1.25	40	**44.33922**	**109.13**
41250	25	H	73.8509	22.75	1.25	40	**34.8509**	**109.13**
43750	25	H	74.36199	23	1.25	40	**35.11199**	**109.13**
46138	28.67	H	74.8236	23.2	1.25	40	**39.0436**	**109.13**
48750	27	H	75.30192	23.4	1.25	40	**37.65192**	**109.13**
55000	27	H	76.34968	23.6	-4	40	**43.74968**	**109.13**
67500	27	H	78.1285	23	-4	40	**46.1285**	**109.13**
77500	32	H	79.32846	23.45	-4	40	**51.87846**	**109.13**
82500	32	H	79.8715	23.55	-4	40	**52.3215**	**109.13**
87500	32	H	80.38259	23.6	-4	40	**52.78259**	**109.13**
92500	32	H	80.86526	22.5	-4	40	**54.36526**	**109.13**
97500	32	H	81.32252	22.8	-4	40	**54.52252**	**109.13**

Type Examination

The same setup and equipment was also tested according to the FCC Part 15 Subpart B and Bellcore GR-1089 standards and met Class A for radiated emission measurements.

4.4 Conducted Spurious

4.4.1 Test Specification

Standard	FCC Part 101 section 101.111(a)(2)(iii) (edition 10-1-98)
Limit	+10log Pmean

4.4.2 Test Location

Test Laboratory	KTL Ottawa Inc.
Address	3325 River Road R.R.5 Ottawa, Ontario K1V 1H2
Prime Contact	Ted Grant, Manager Electromagnetic Services

4.4.3 Tested by

Test Engineer	Vito Scaringi, Wireless Approvals Specialist
Company	Newbridge Networks Corporation

4.4.4 Test Procedure

The conducted spurious are measured at the antenna port of the OTU in normal operation.

The measurements were done with 6 ARIC cards inserted in the 36170 shelf and the 12:2 combiner. Each carrier was adjusted at the RF output to approximately $\geq$ +19dBm, which gave a measured total power at the antenna port of +27dBm.

Measured emissions at the frequencies, which are outside the occupied bandwidth up to 100GHz.

Conducted Spurious measurement setup

Conducted Spurious Setup at KTL Ottawa Laboratories

4.4.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Harmonic Mixer	HP 11970V SN #2521A01150	50GHz to 75GHz	Last: 97/02/25 Due: 00/02/25
Harmonic Mixer	HP 11970W SN #2521A01465	75GHz to 110GHz	Last: 98/10/13 Due: 01/10/13
Spectrum Analyzer	HP 8565E SN #FA000981	9kHz to 50GHz	Last: 99/06/16 Due: 00/06/16

4.4.6 Results - Test Data

The spurious were verified from 30MHz to 100GHz and were below the limits.

See Appendix B for plots and calculations of limit lines.

Total Output Power = +27dBm (-3dBW) or 0.5W

A= 43+10log(Pmean in watts)

Therefore, A= 40dB

Note: A correction factor of 4dB for the different resolution bandwidth used from RBW= 10kHz to 4kHz; (10log 10/4 = 4dB) was ignored and taken as worst conditions. Cables losses were not taken into consideration for the calculations, but would be used if spurious were within 5 dBs of the limits. (Above 50GHz a correction factor was added into the HP spectrum analyzer according to the harmonic mixer specifications).

The reference output power measured was 0.6dBm over a 216MHz bandwidth after the attenuators and cable losses. Total output power at the antenna port = +27dBm (0.5watts)

Limit = (measured level) – A; where A= 43+10log (Pmean in watts)

A= 43 + 10 log 0.5= 40dB

i.e.: 0.6dBm – 40 = 39.4dBm (reference level)

4.5 Frequency Stability

4.5.1 Test Specification

Standard	FCC Part 101 section 101.107
Limit	+/- 10ppm

4.5.2 Test Location

Test Laboratory	Newbridge Networks Corporation, Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Vito Scaringi, Wireless Approvals Specialist

4.5.3 Tested by

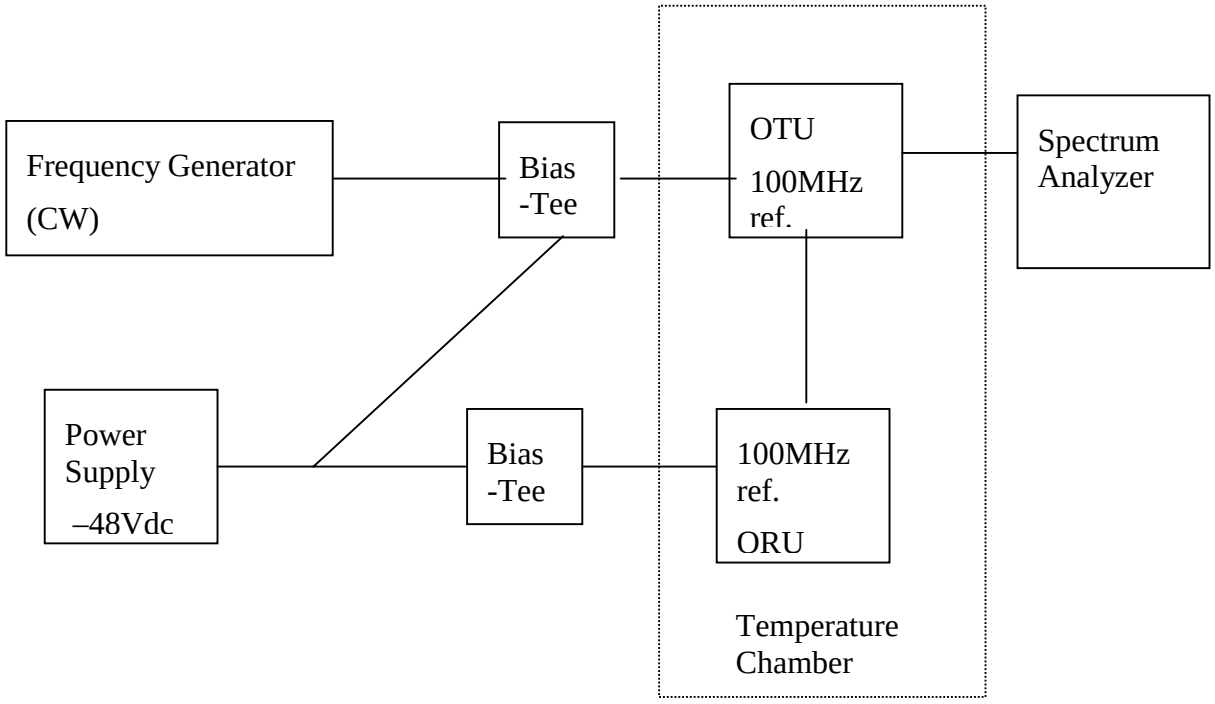
Test Engineer	Vito Scaringi, Wireless Approvals Specialist
Company	Newbridge Networks Corporation

4.5.4 Test Procedure

For the frequency stability measurements, an external source was used to provide an IF CW to the radio units. Only the OTU and ORU were placed in the temperature chamber during this specific test due to the 36170 shelf will be in a temperature-controlled environment, and can operate within a range of –10C to +55C.

All measurements were taken according to the method mentioned in the FCC Part 2, where a reading was taken at every 10^{o} C intervals and the supply voltage was varied to the range of -38Vdc to –56Vdc.

<u>Note:</u> The BTS operates only on DC, therefore the DC supply was varied to show that the frequency is not affected by voltage fluctuation.



Frequency Stability measurement setup

4.5.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	Hewlett Packard/ Model 8564/ Tool # 738	9kHz to 40GHz	Last: 98/11/13 Due: 99/11/13
Frequency Generator	Hewlett Packard/ Model 8648C/ Tool # 8323	9kHz to 3.2GHz	Last: 98/04/06 Due: 00/04/06

4.5.6 Results - Test Data

Nominal DC Supply Voltage to Radio is –48Vdc

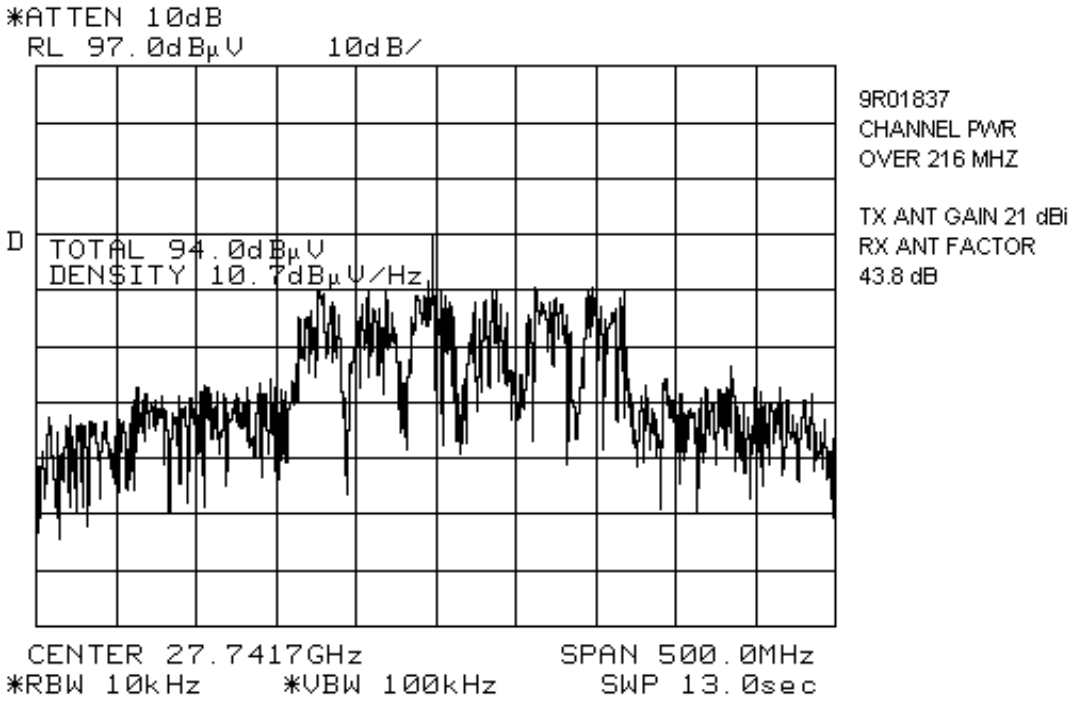
Note: An external supply was used to vary the DC source from –38V to –56V.

Temperature (^{o}C)	Frequency (kHz)	Measured Frequency (kHz)		Tolerance
		Supply voltage		Limit (+/-10ppm)
		-38Vdc	-56Vdc	
-30	27 650 000	27 649 996. 2	27 649 996.2	<1ppm
-20	27 650 000	27 649 996. 2	27 649 996.2	<1ppm
-10	27 650 000	27 649 996. 2	27 649 996.2	<1ppm
0	27 650 000	27 649 996. 3	27 649 996.3	<1ppm
10	27 650 000	27 649 996. 5	27 649 996.5	<1ppm
20	27 650 000	27 649 996. 7	27 649 996.7	<1ppm
30	27 650 000	27 649 997. 0	27 649 997.0	<1ppm
40	27 650 000	27 649 997. 0	27 649 997.0	<1ppm
50	27 650 000	27 649 997. 2	27 649 997.2	<1ppm

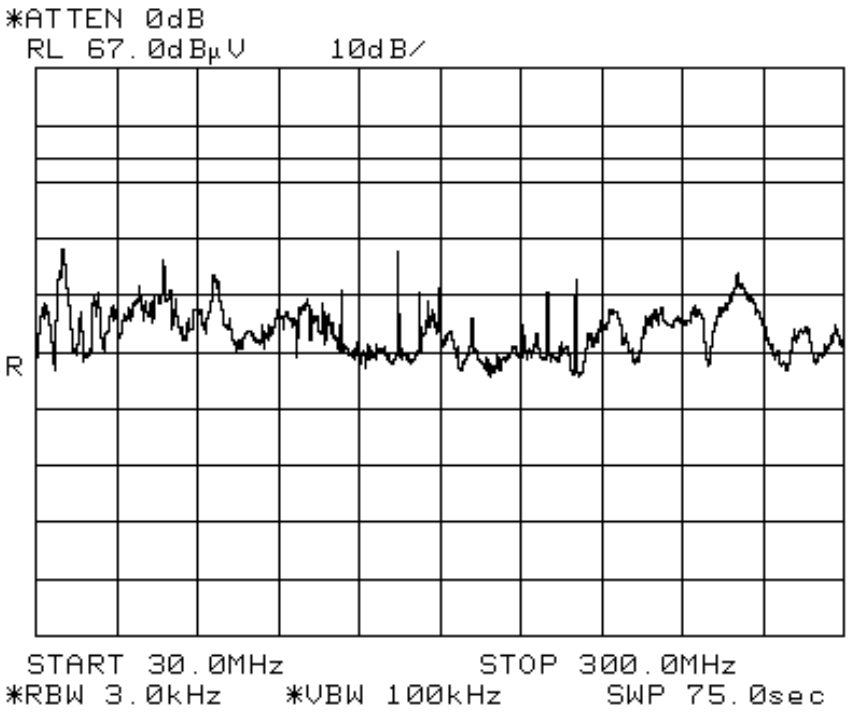
APPENDIX A: RADIATED SPURIOUS PLOTS - VERTICAL

(Vertical Polarization)

REFERENCE LEVEL

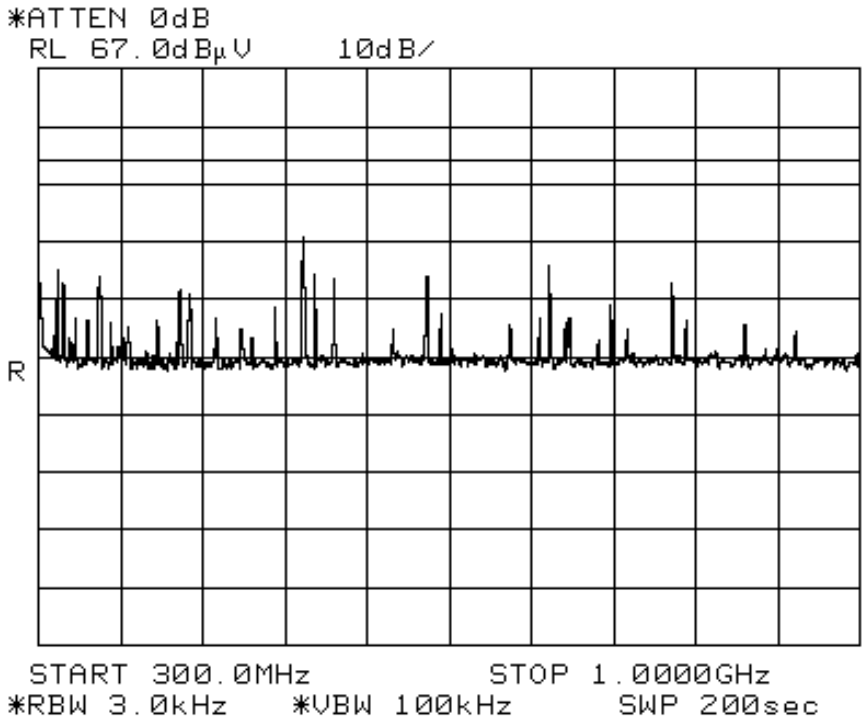


The total power measured at a distance of 3 meters was 94dBuV over a 216MHz bandwidth (6 carriers x 36MHzBW) using a 21dBi, 90 degree sector antenna in the vertical polarization. Total output power at the antenna port = +27dBm (0.5watts)



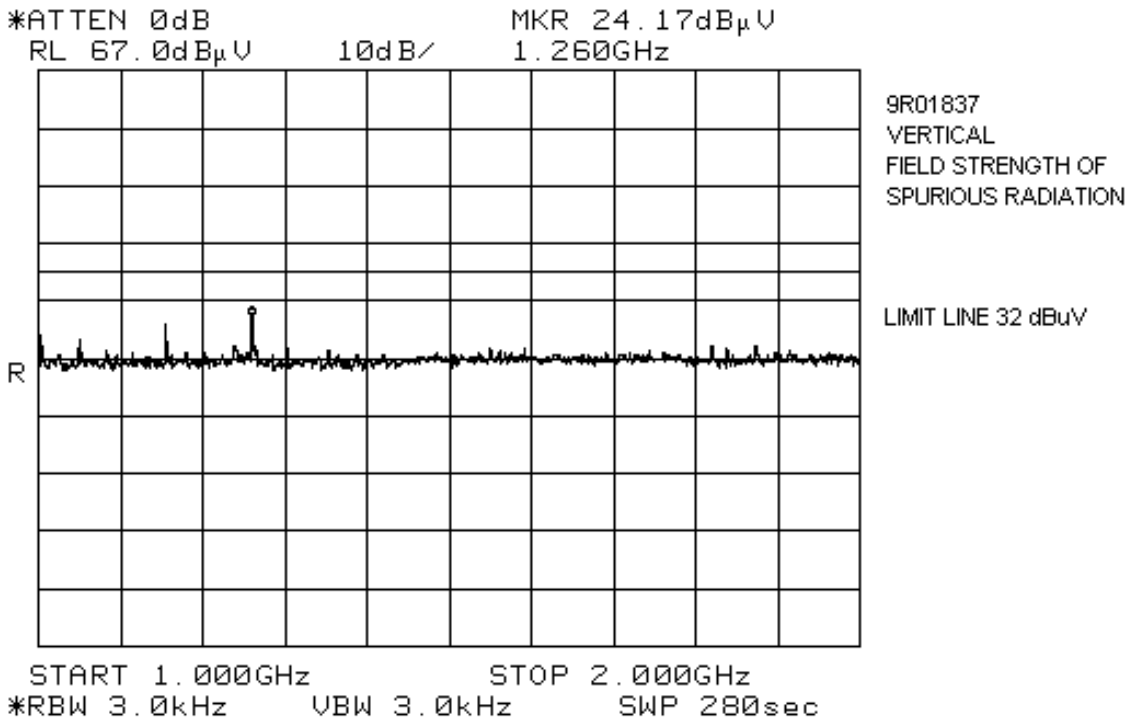
9R01837
VERTICAL BICON 1
FIELD STRENGTH OF
SPURIOUS RADIATION

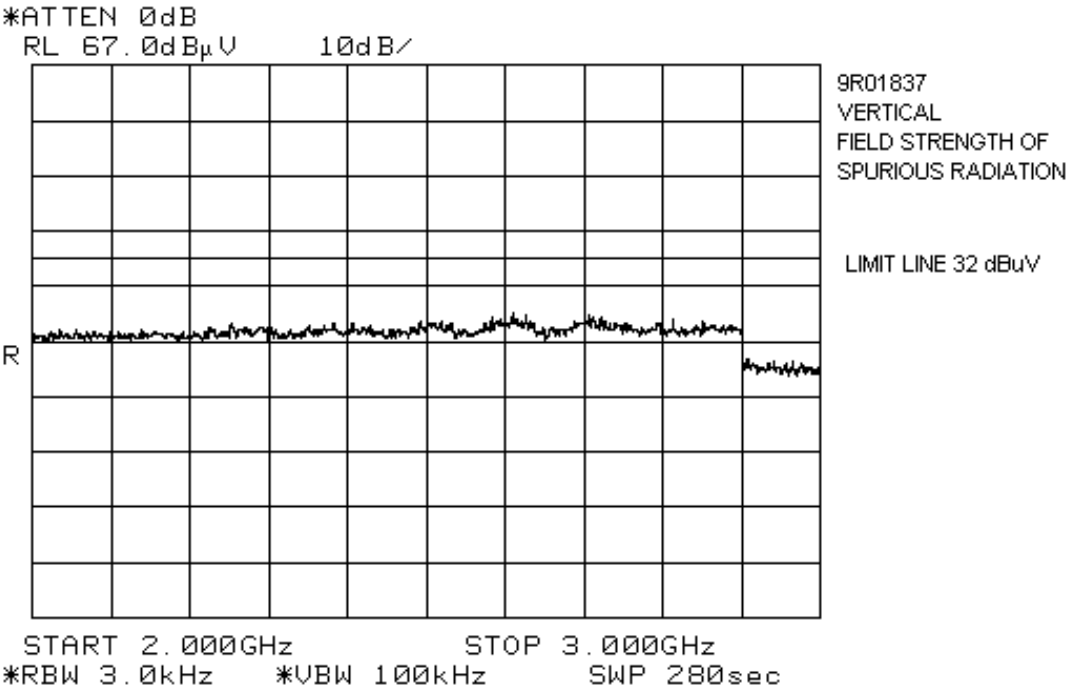
LIMIT LINE 51 dBuV

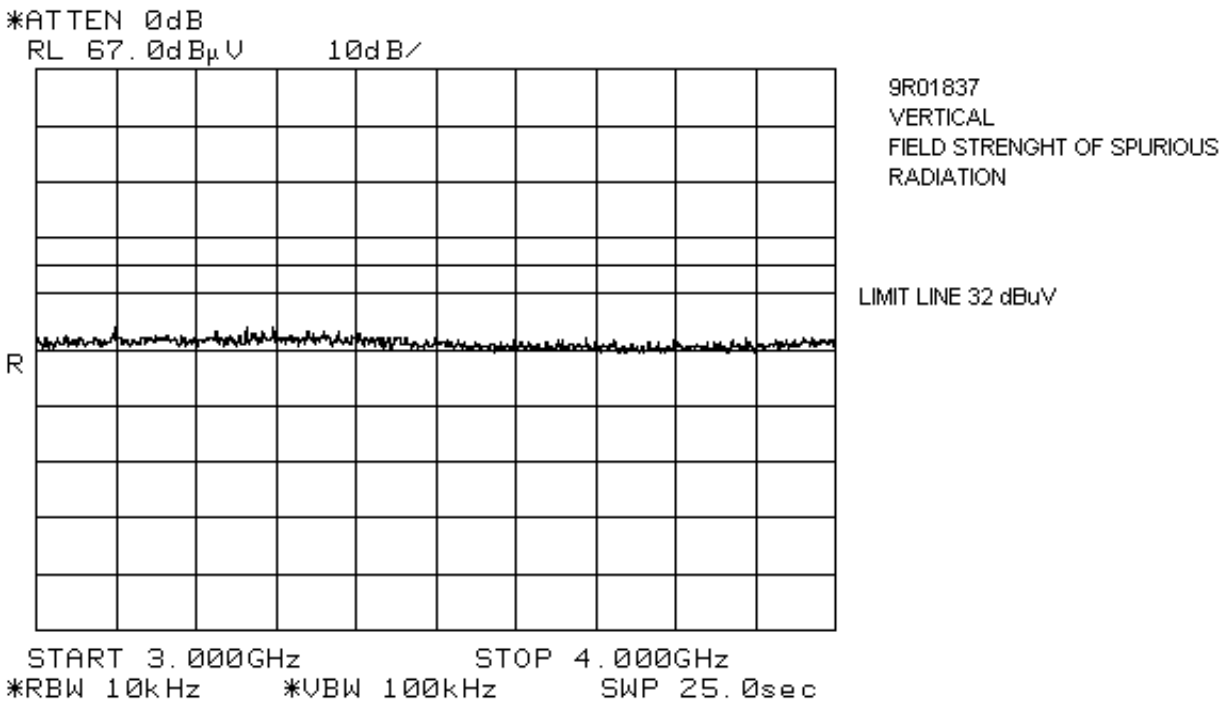


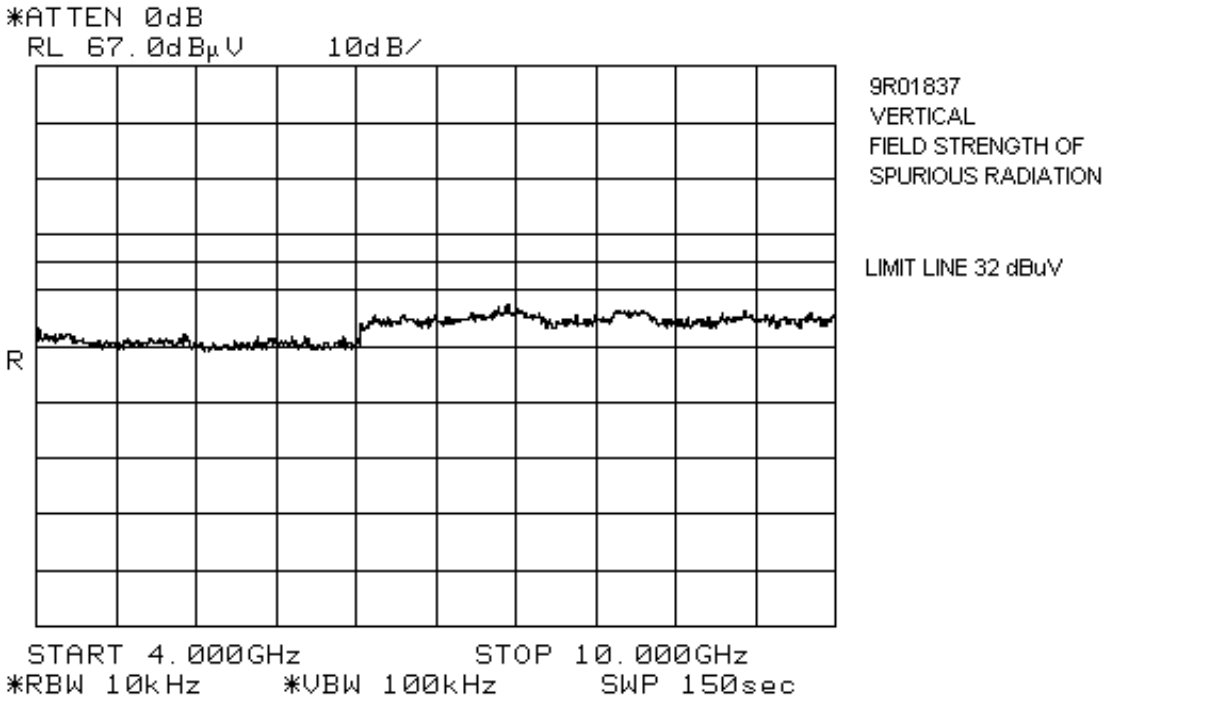
9R01837
VERTICAL LOG PERIODIC
FIELD STRENGTH O
SPURIOUS RADIATION

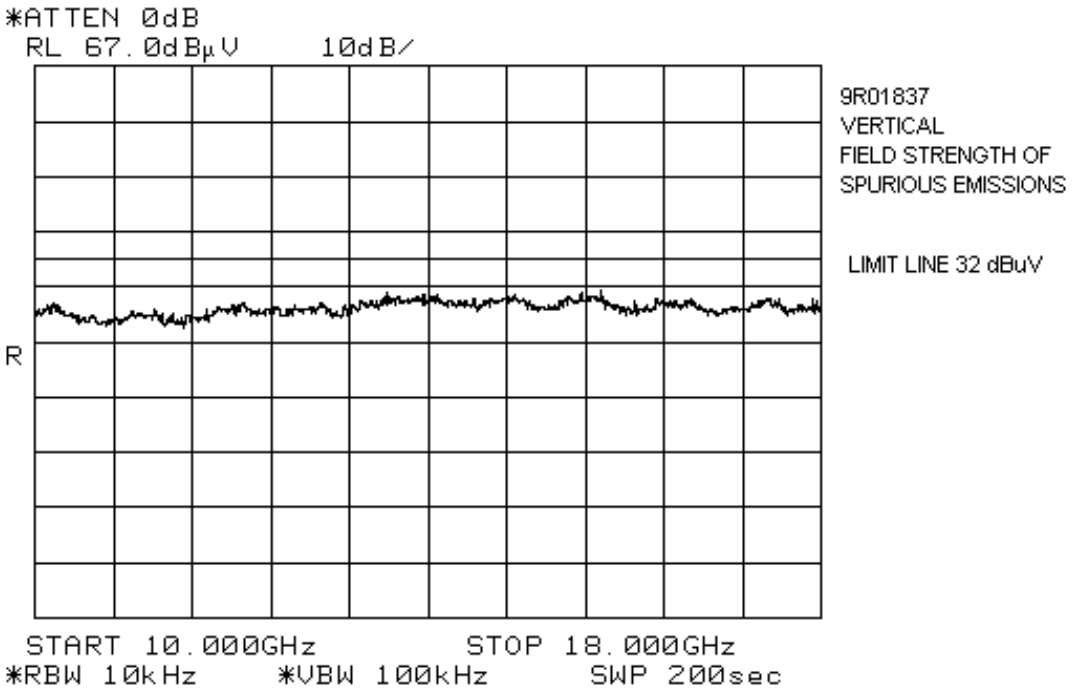
LIMIT LINE 51 dBuV

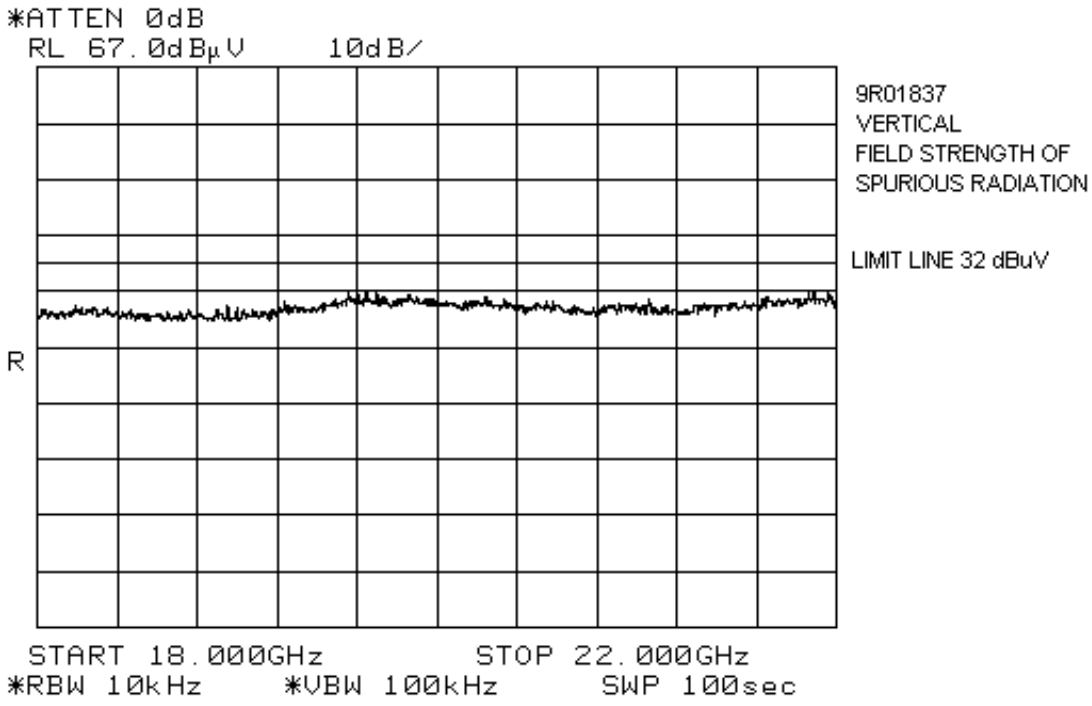

*ATTEN 0dB
MKR 24.17dBµV
RL 67.0dBµV
10dB/
1.260GHz
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 1.000GHz
STOP 2.000GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 280sec

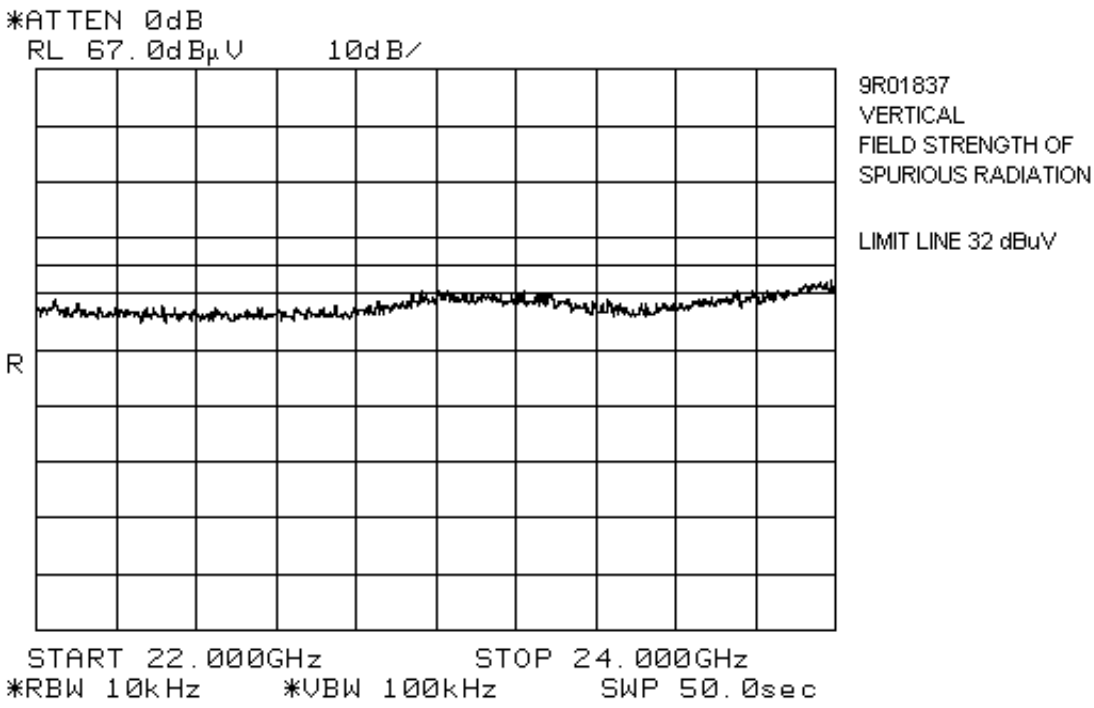

*ATTEN 0dB
RL 67.0dBµV
10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 2.000GHz
STOP 3.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

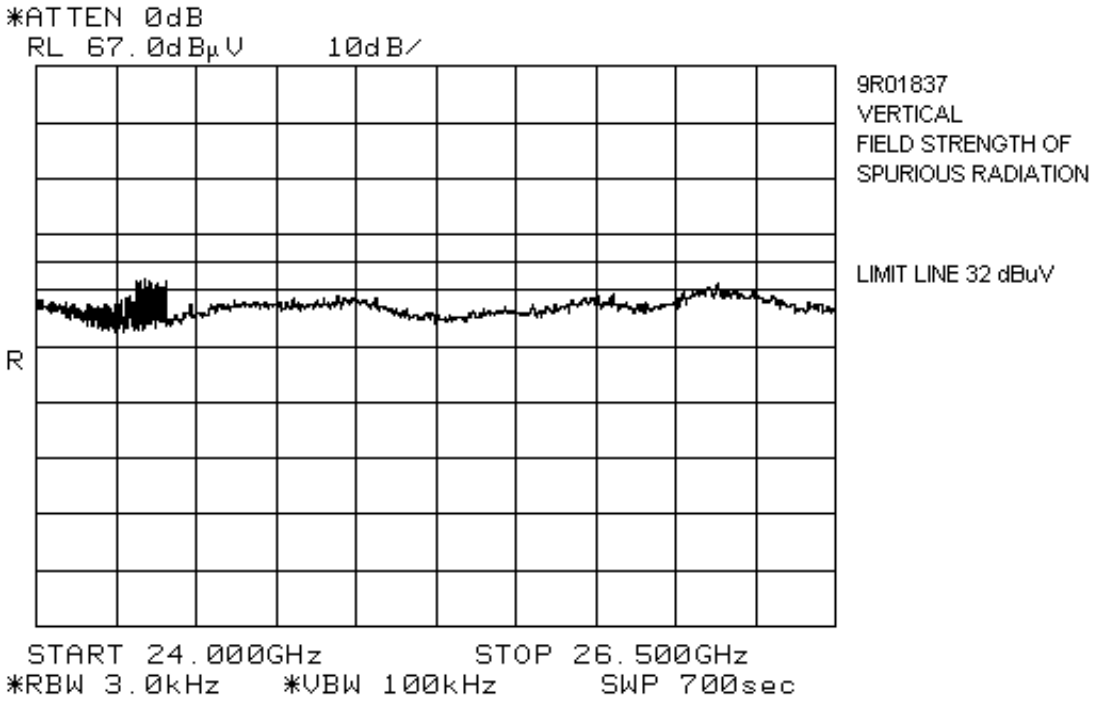

*ATTEN 0dB
RL 67.0dBµV
10dB/
R
START 3.000GHz
STOP 4.000GHz
*RBW 10kHz
*VBW 100kHz
SWP 25.0sec
9R01837
VERTICAL
FIELD STRENGHT OF SPURIOUS RADIATION
LIMIT LINE 32 dBuV

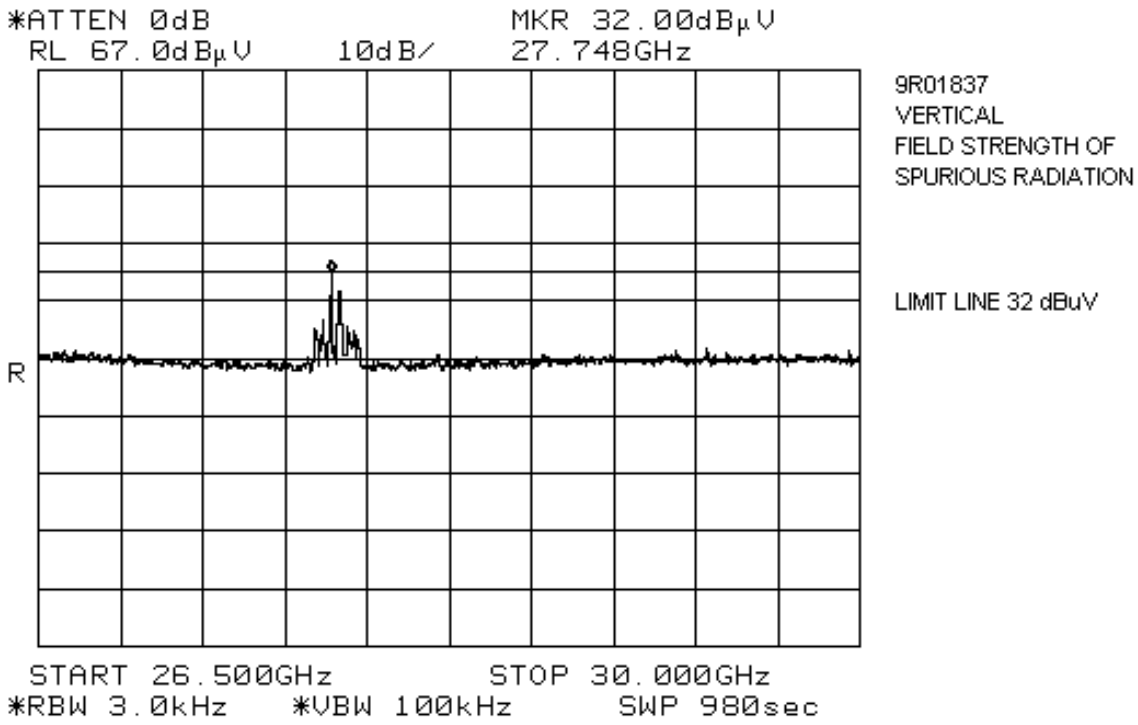

*ATTEN 0dB
RL 67.0dBµV
10dB/
R
START 4.000GHz
STOP 10.000GHz
*RBW 10kHz
*VBW 100kHz
SWP 150sec
9R01837
VERTICAL
FIELD STRENGTH OF SPURIOUS RADIATION
LIMIT LINE 32 dBuV


*ATTEN 0dB
RL 67.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS EMISSIONS
LIMIT LINE 32 dBuV
R
START 10.000GHz STOP 18.000GHz
*RBW 10kHz *VBW 100kHz SWP 200sec

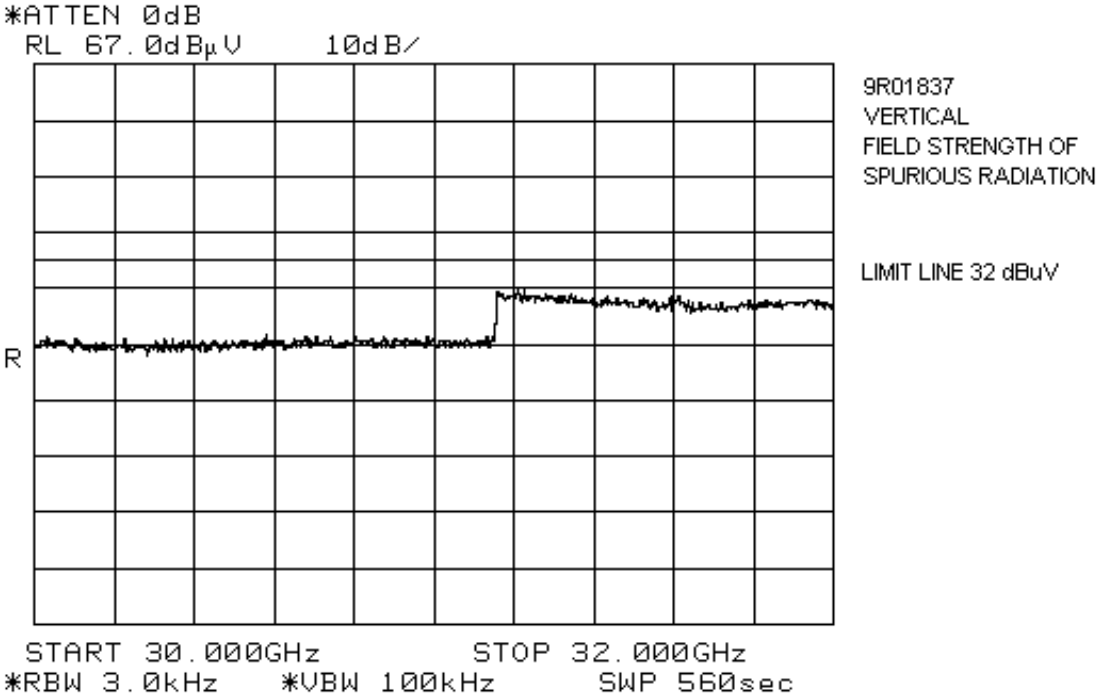

*ATTEN 0dB
RL 67.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 18.000GHz STOP 22.000GHz
*RBW 10kHz *VBW 100kHz SWP 100sec

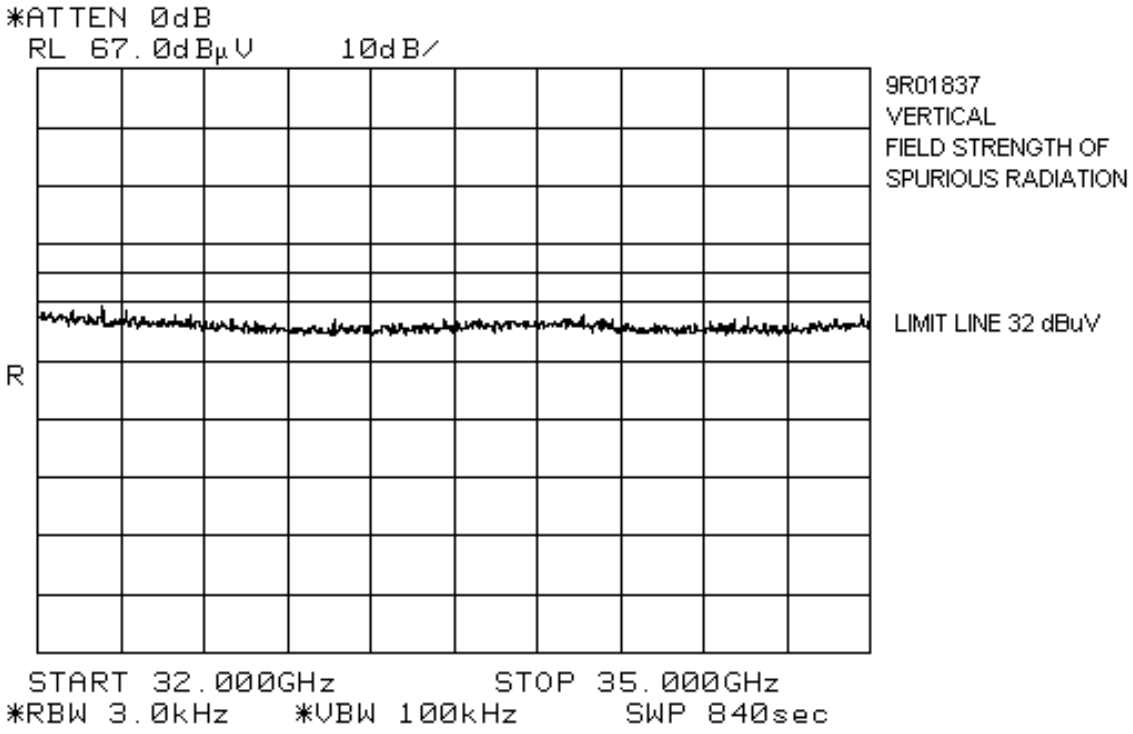


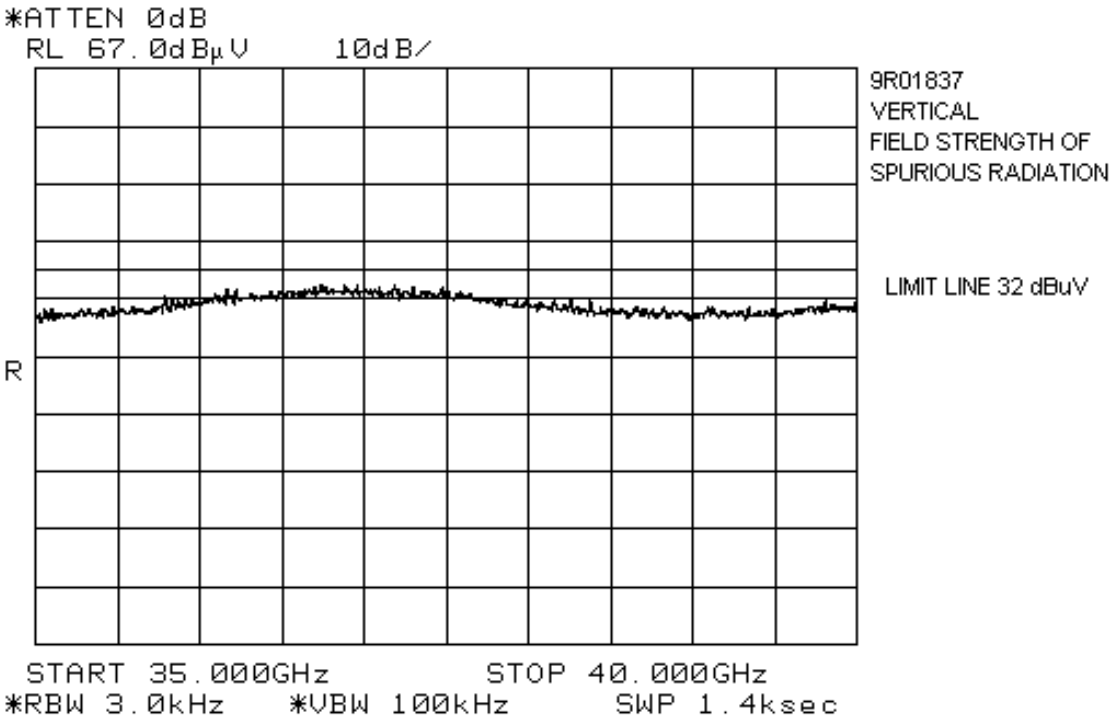


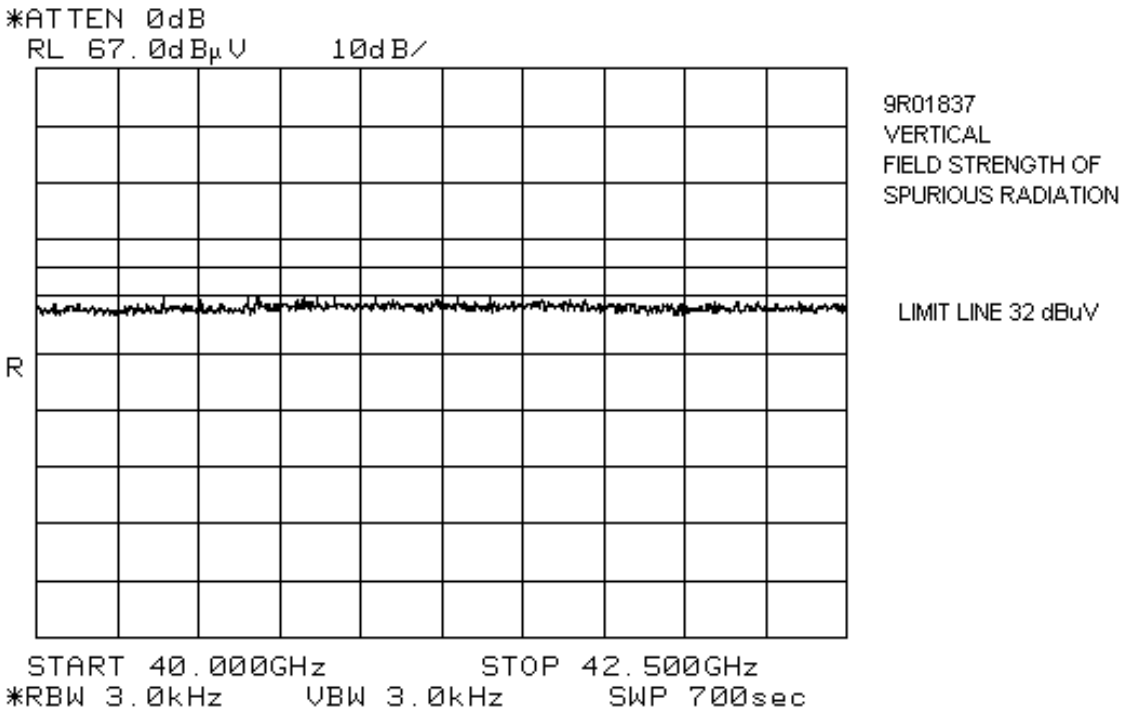


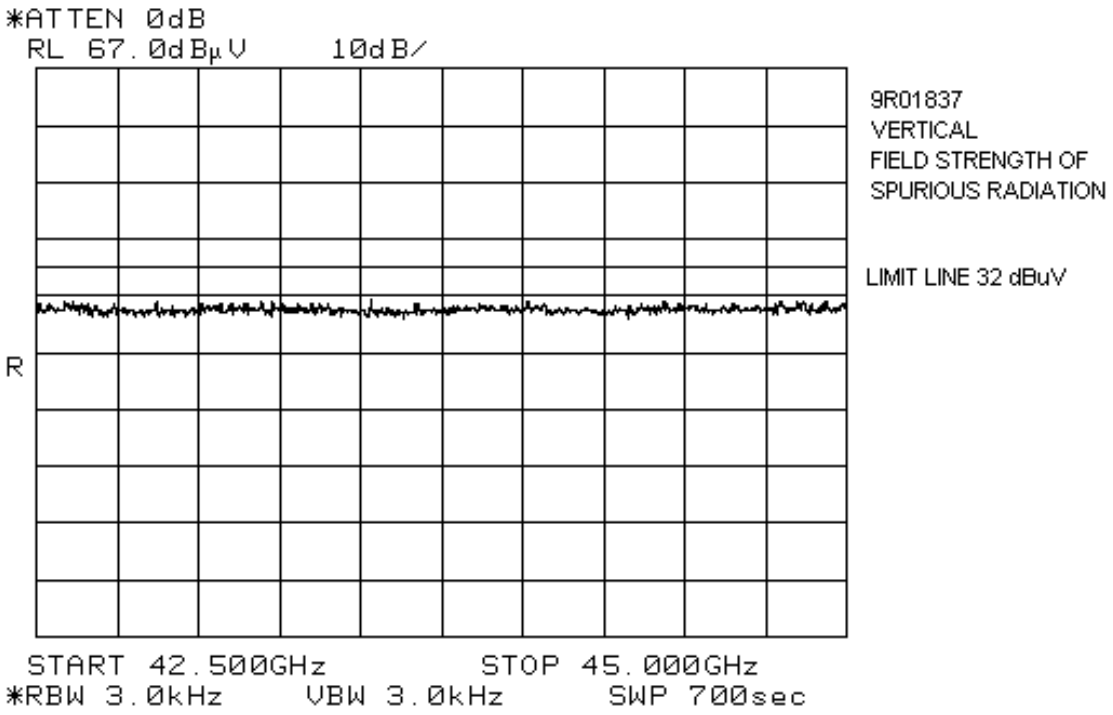
The spurious that are seen here are the actual 6 carriers within the 850MHz occupied bandwidth with the antenna port terminated with a 50-ohm load.

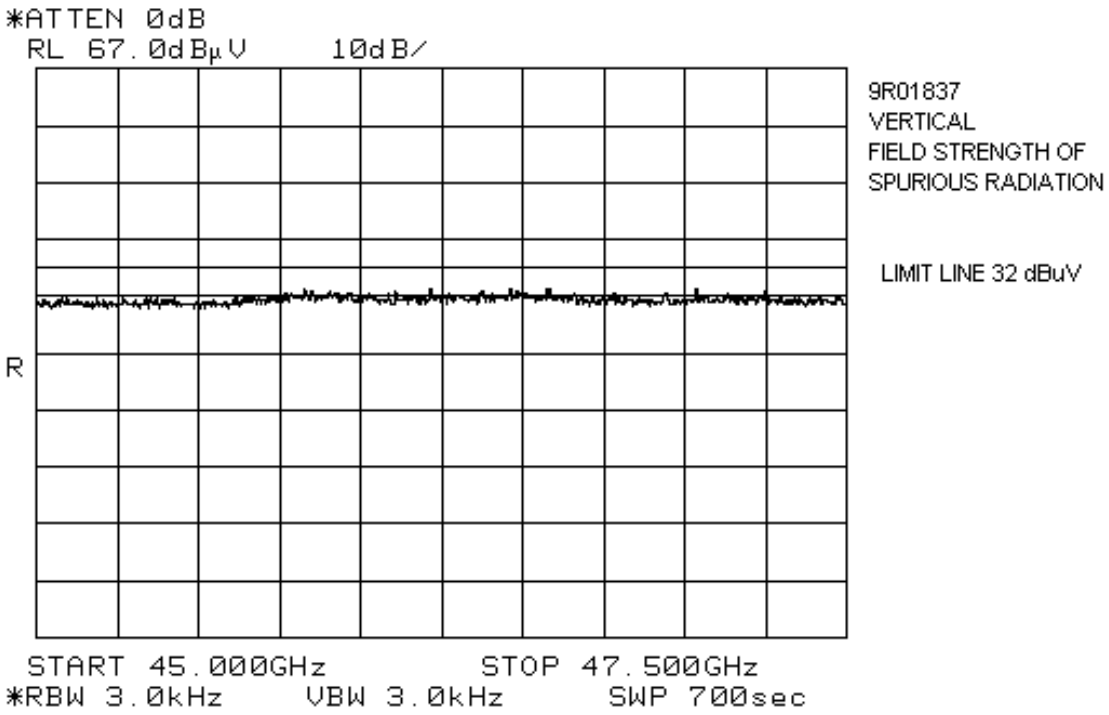


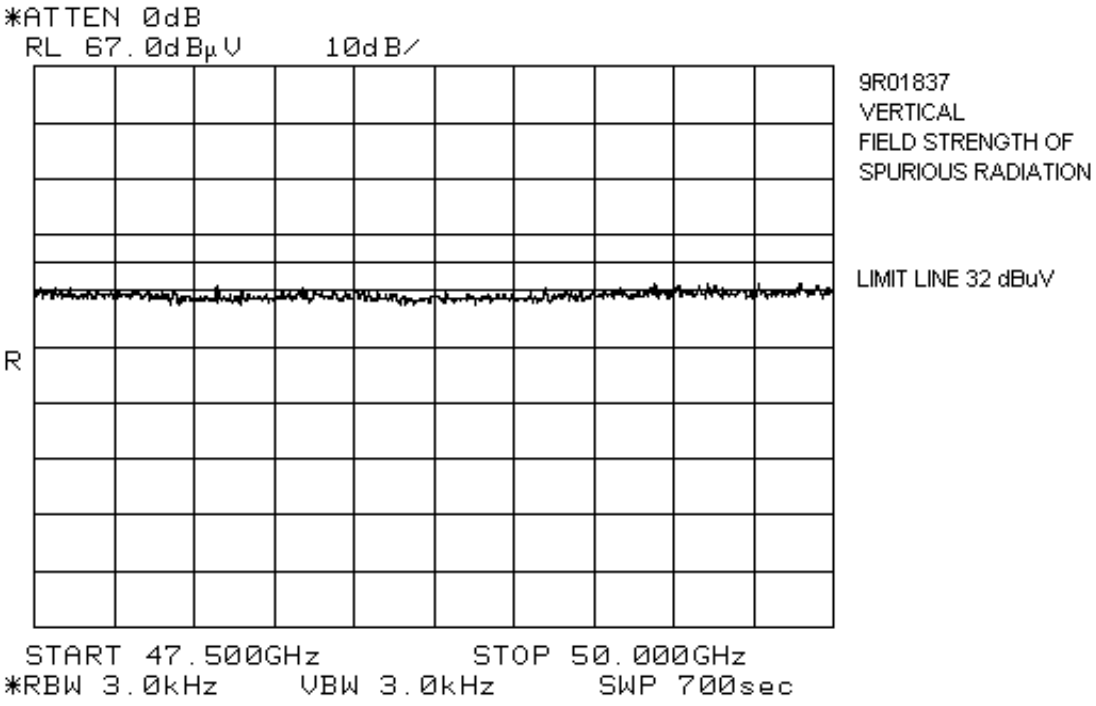

*ATTEN 0dB
RL 67.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 32.000GHz STOP 35.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 840sec

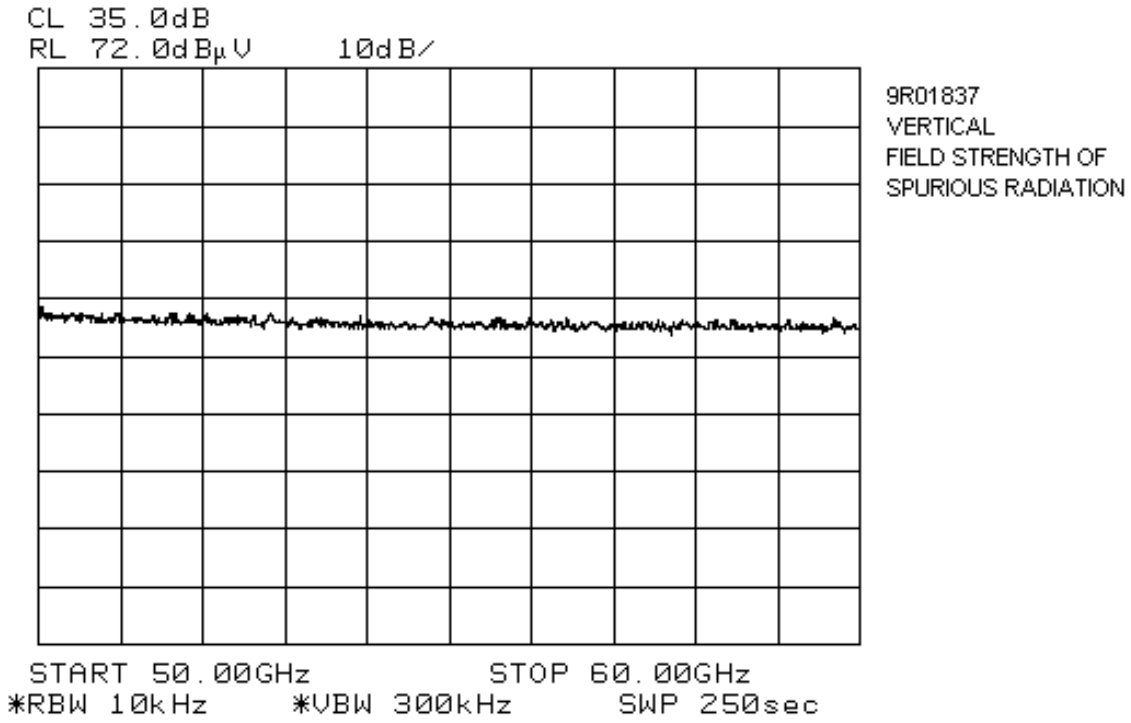

*ATTEN 0dB
RL 67.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 35.000GHz STOP 40.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 1.4ksec

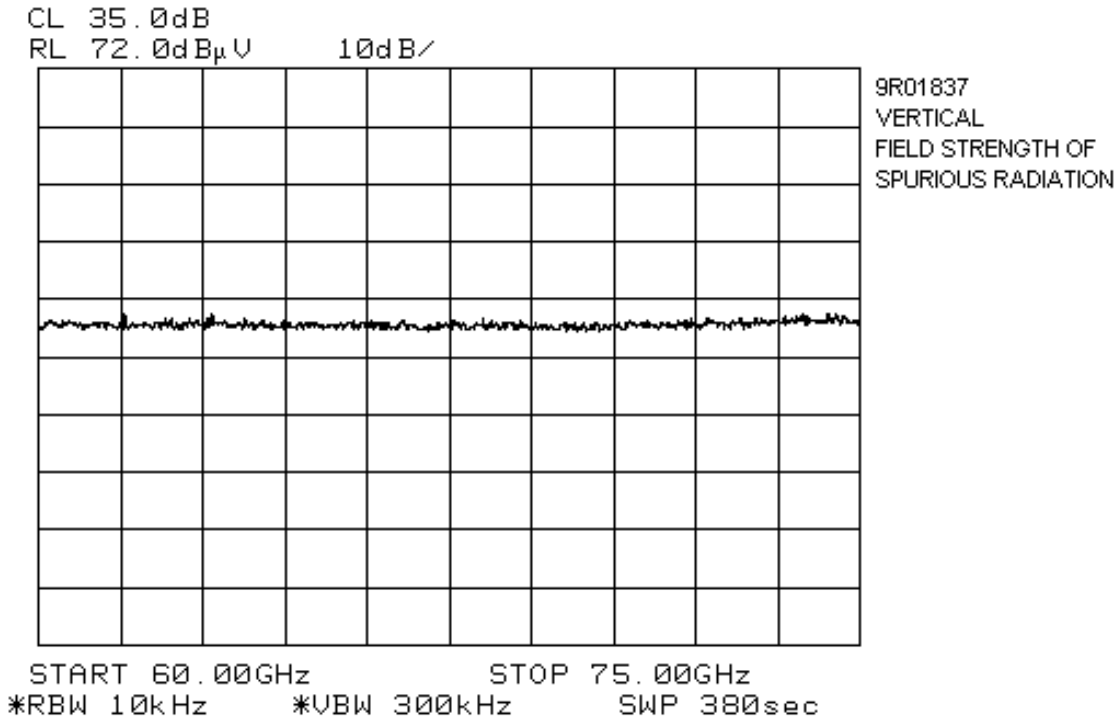

*ATTEN 0dB
RL 67.0dBµV
10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 40.000GHz
STOP 42.500GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec

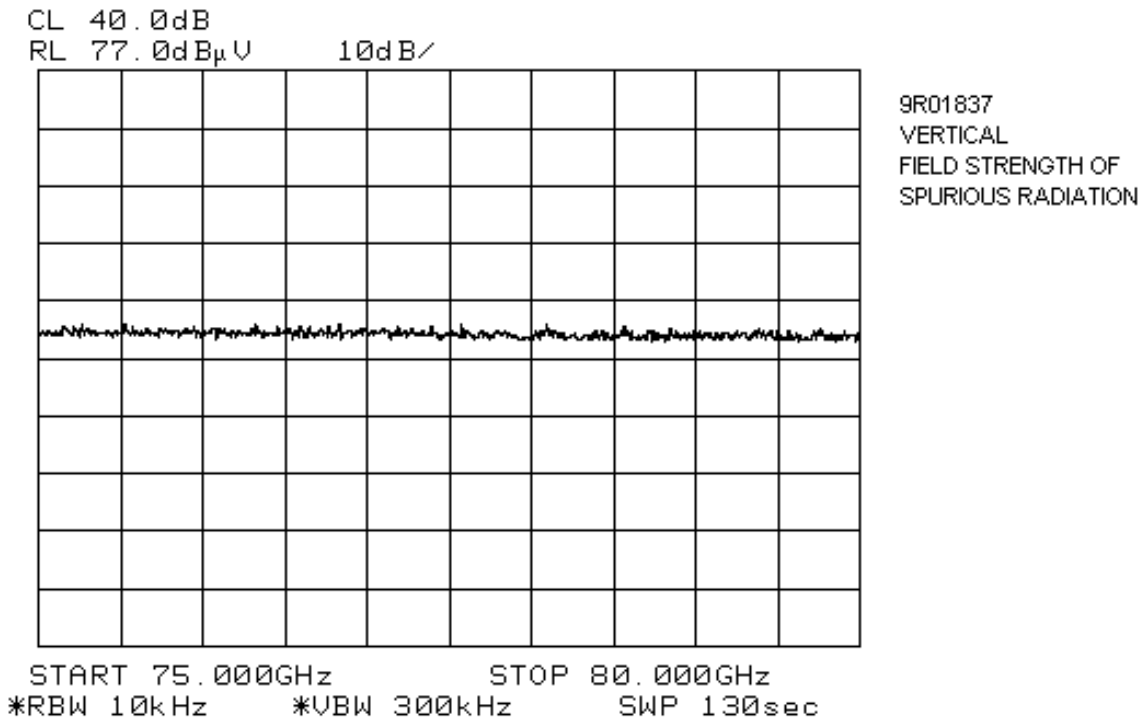

*ATTEN 0dB
RL 67.0dBµV
10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 42.500GHz
STOP 45.000GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec

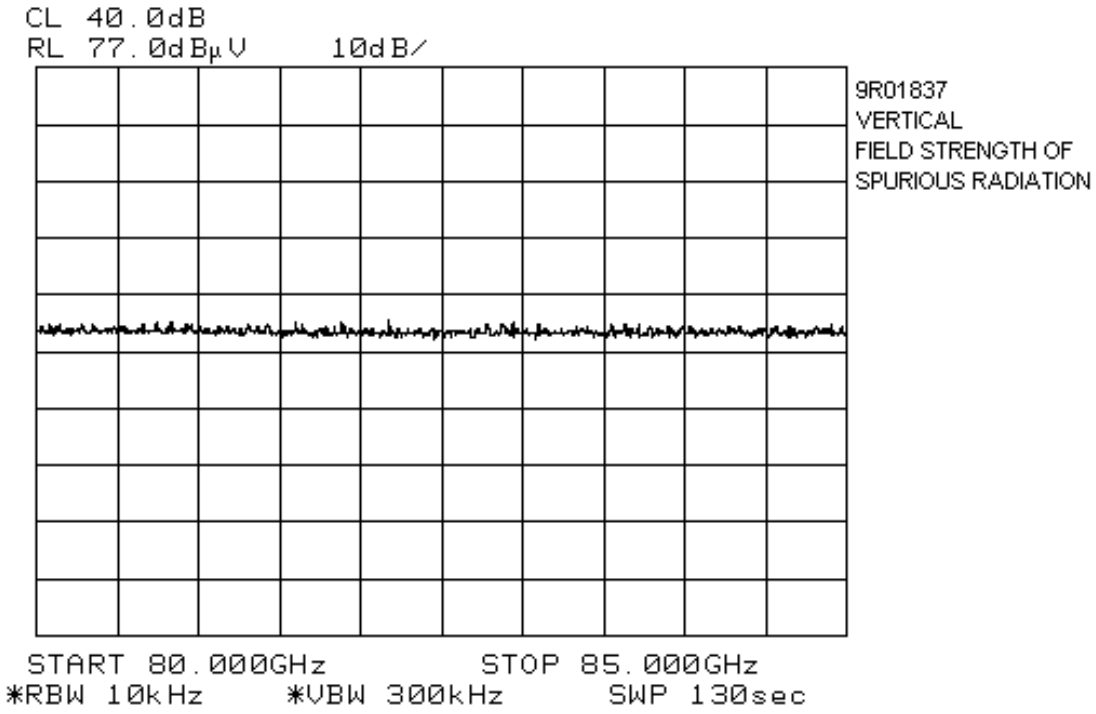


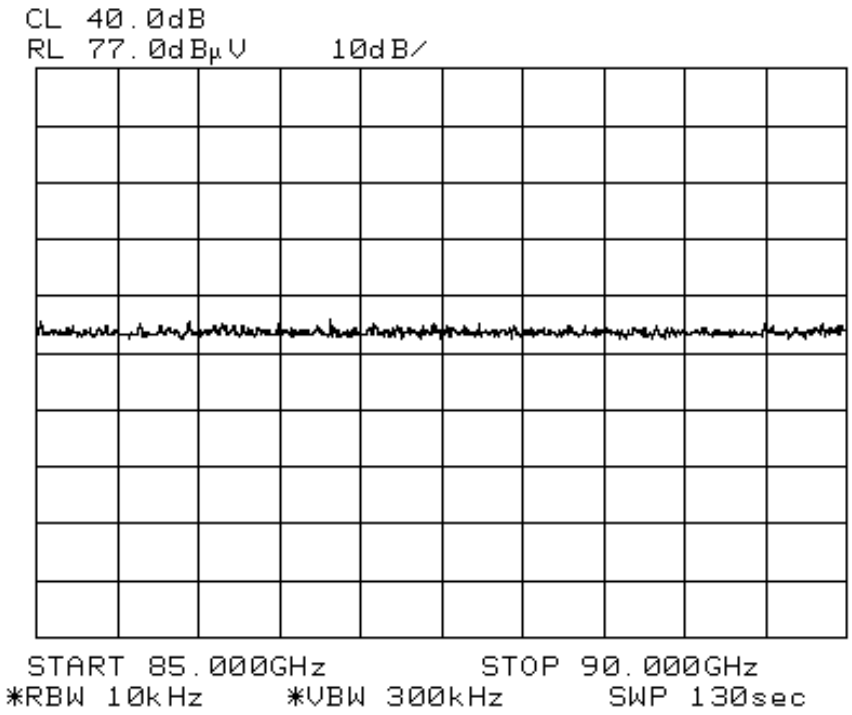



CL 35.0dB
RL 72.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 50.00GHz STOP 60.00GHz
*RBW 10kHz *VBW 300kHz SWP 250sec

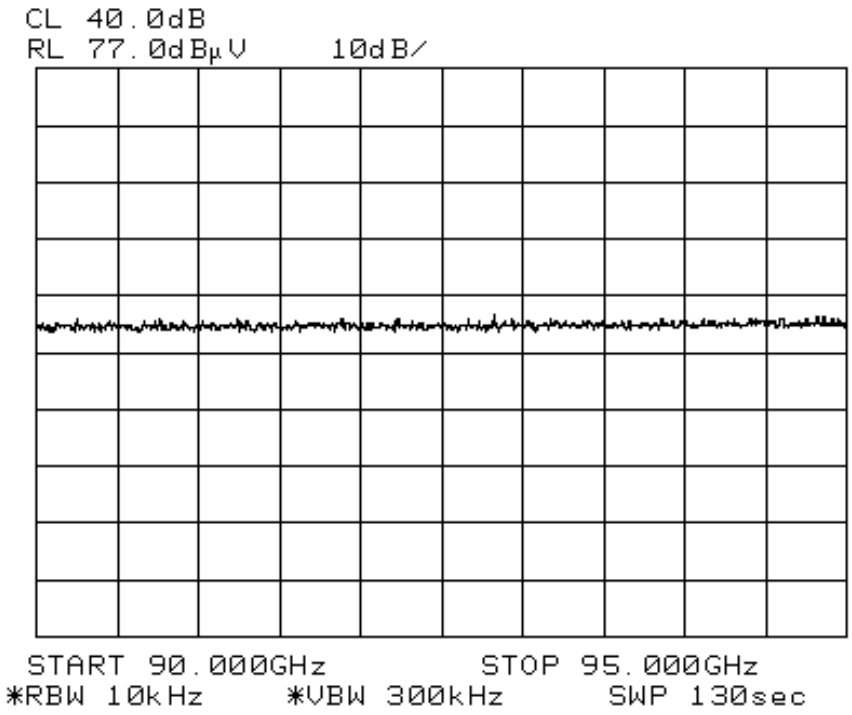

CL 35.0dB
RL 72.0dBµV 10dB/
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 60.00GHz STOP 75.00GHz
*RBW 10kHz *VBW 300kHz SWP 380sec


CL 40.0dB
RL 77.0dBµV 10dB/
START 75.000GHz STOP 80.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION

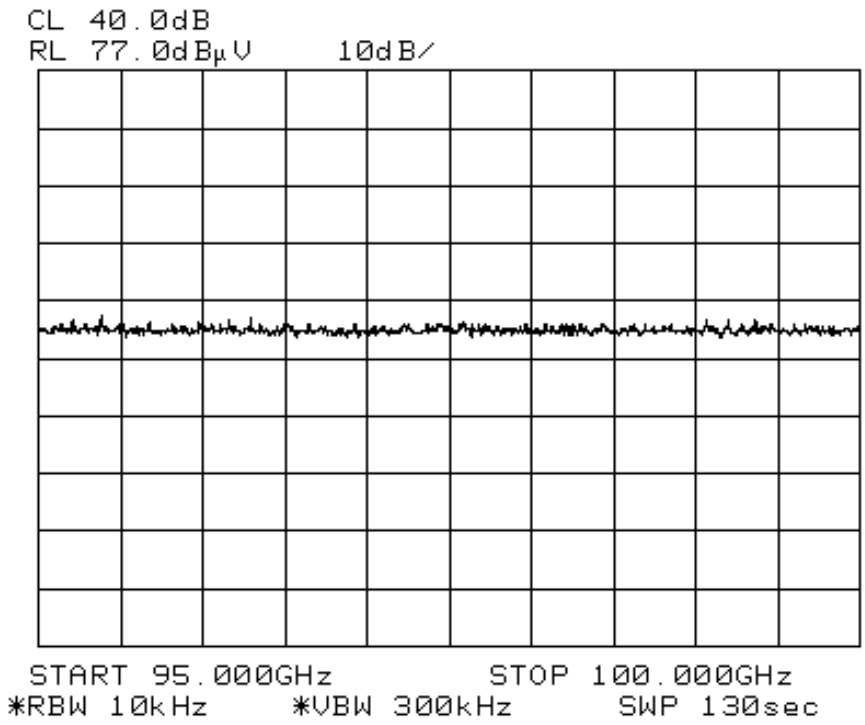

CL 40.0dB
RL 77.0dBµV 10dB/
START 80.000GHz STOP 85.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION



9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION



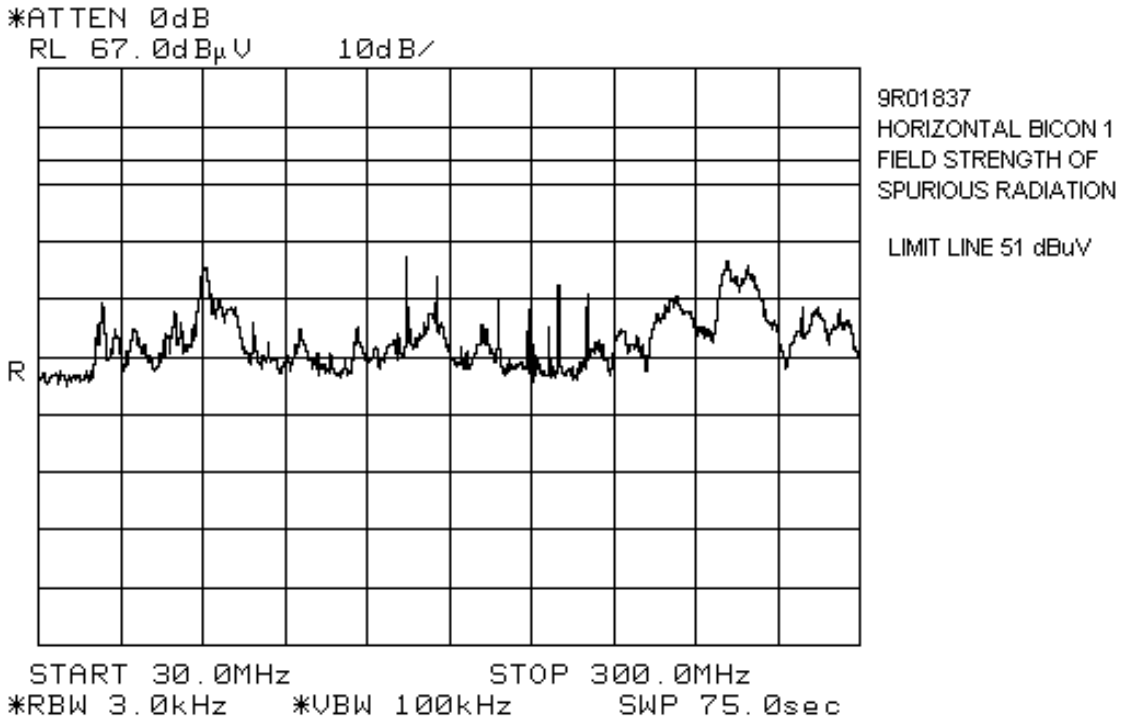
9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION

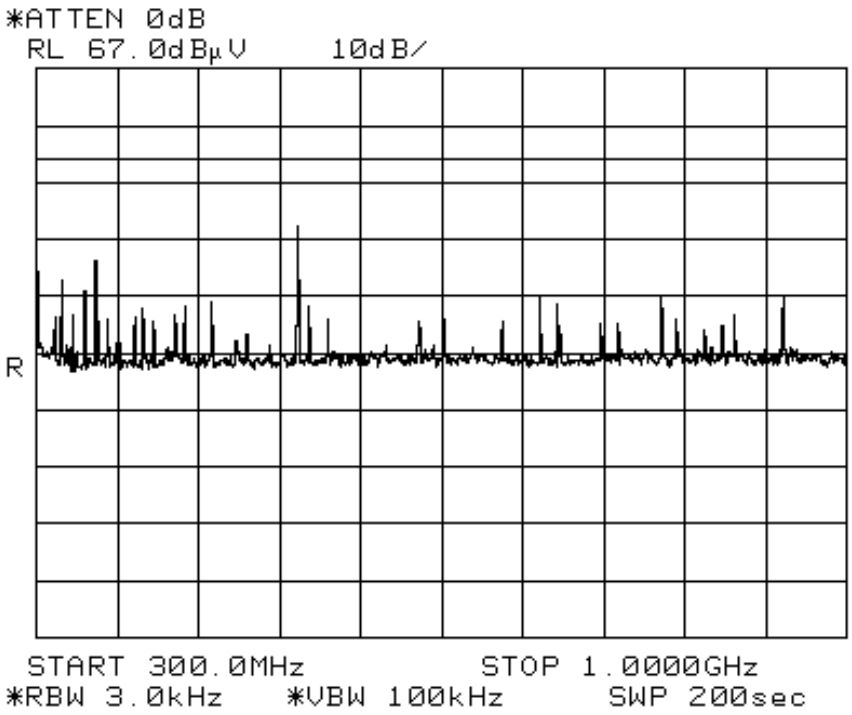


9R01837
VERTICAL
FIELD STRENGTH OF
SPURIOUS RADIATION

Radiated Spurious Plots - Horizontal

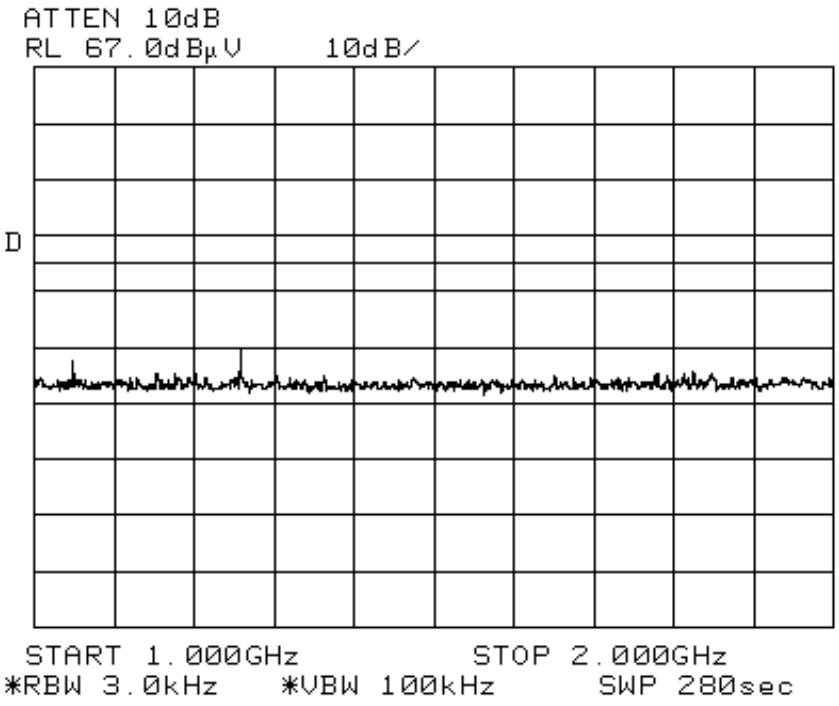
(Horizontal Polarization)





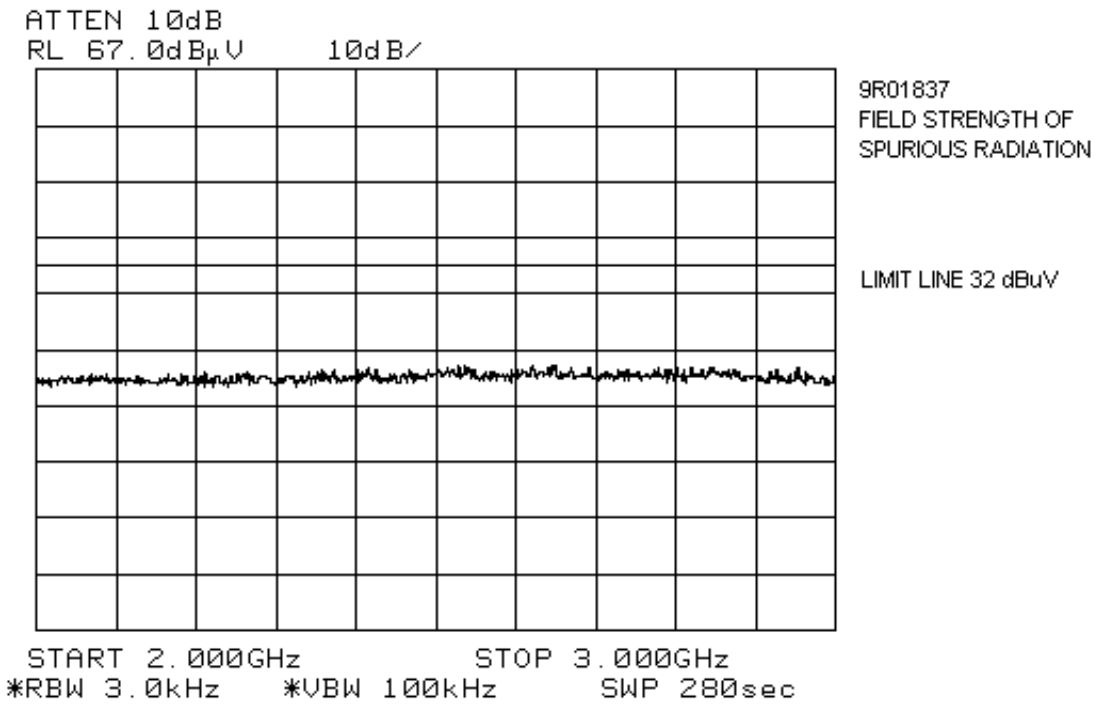
9R01837
HORIZONTAL LOG PERIODIC
FILED STRENGTH OF
SPURIOUS RADIATION

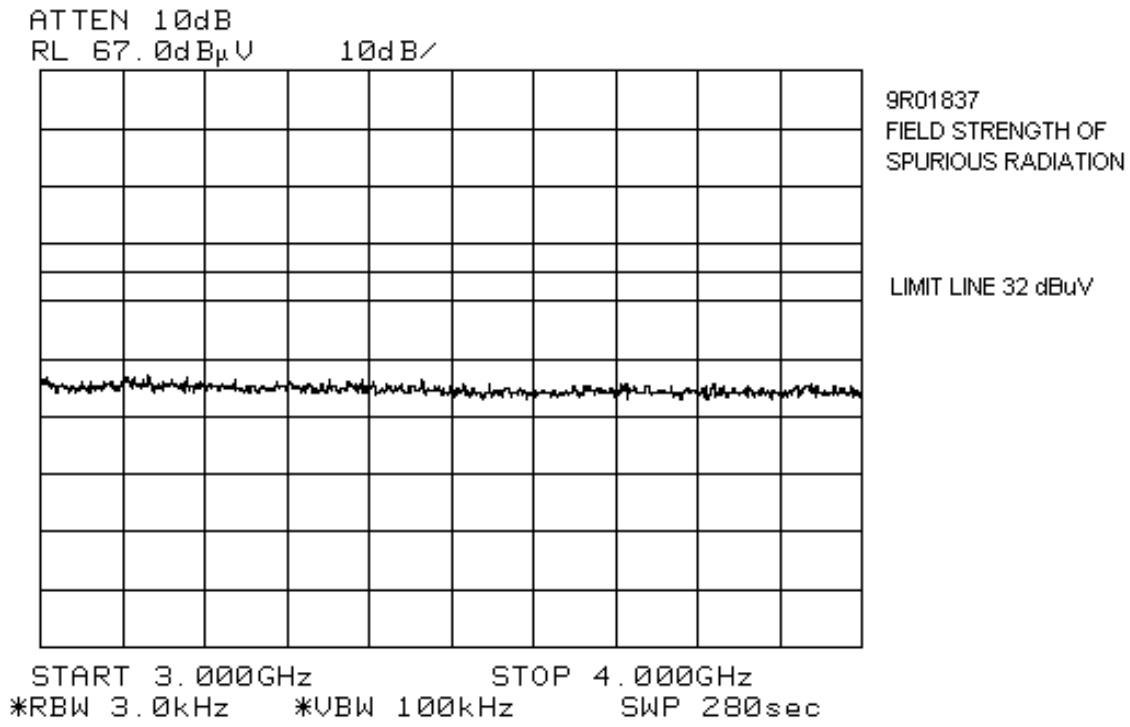
LIMIT LINE 51 dBuV

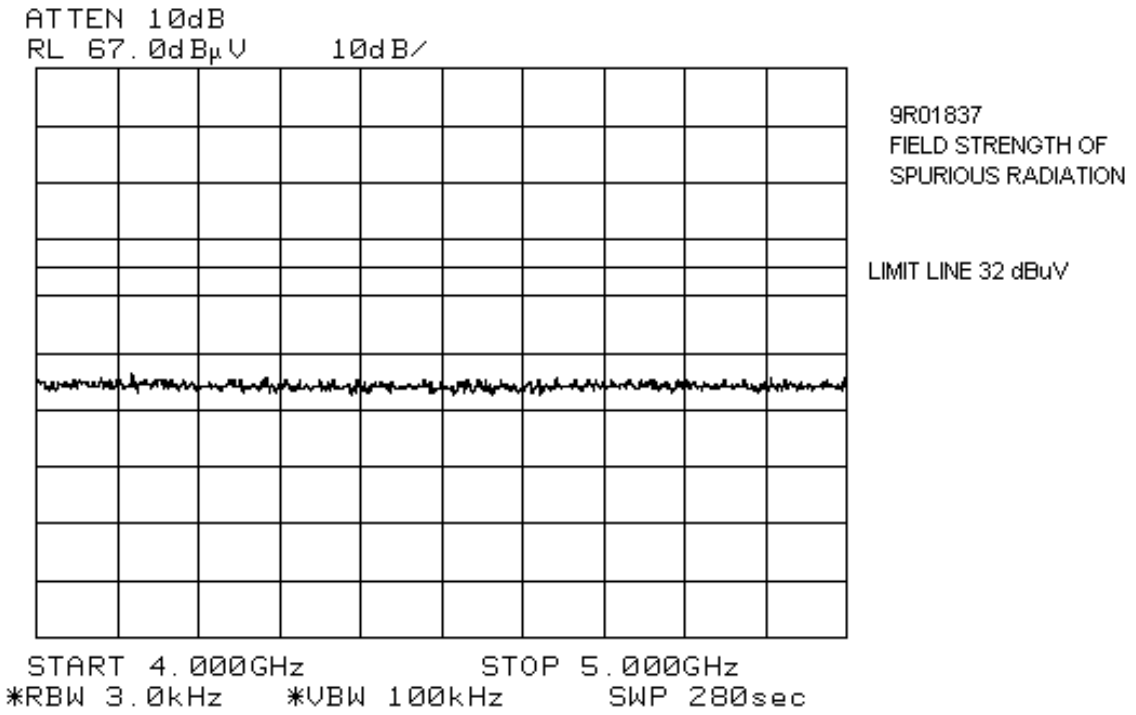


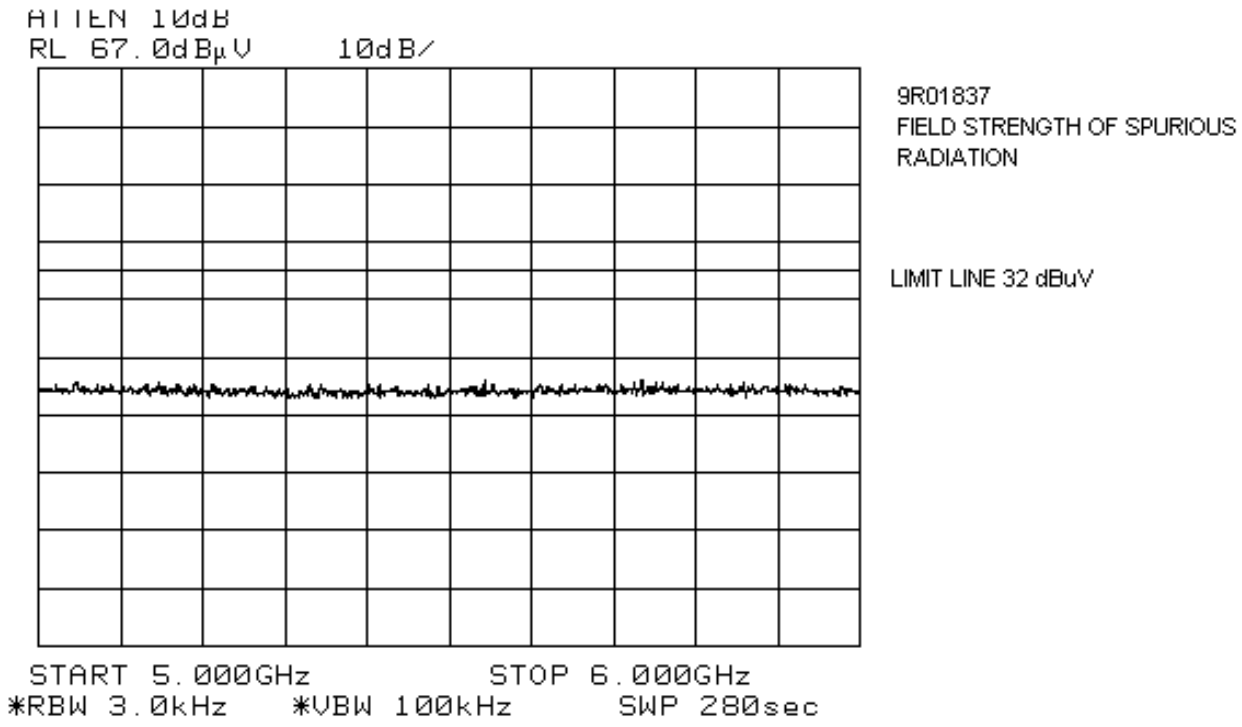
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION

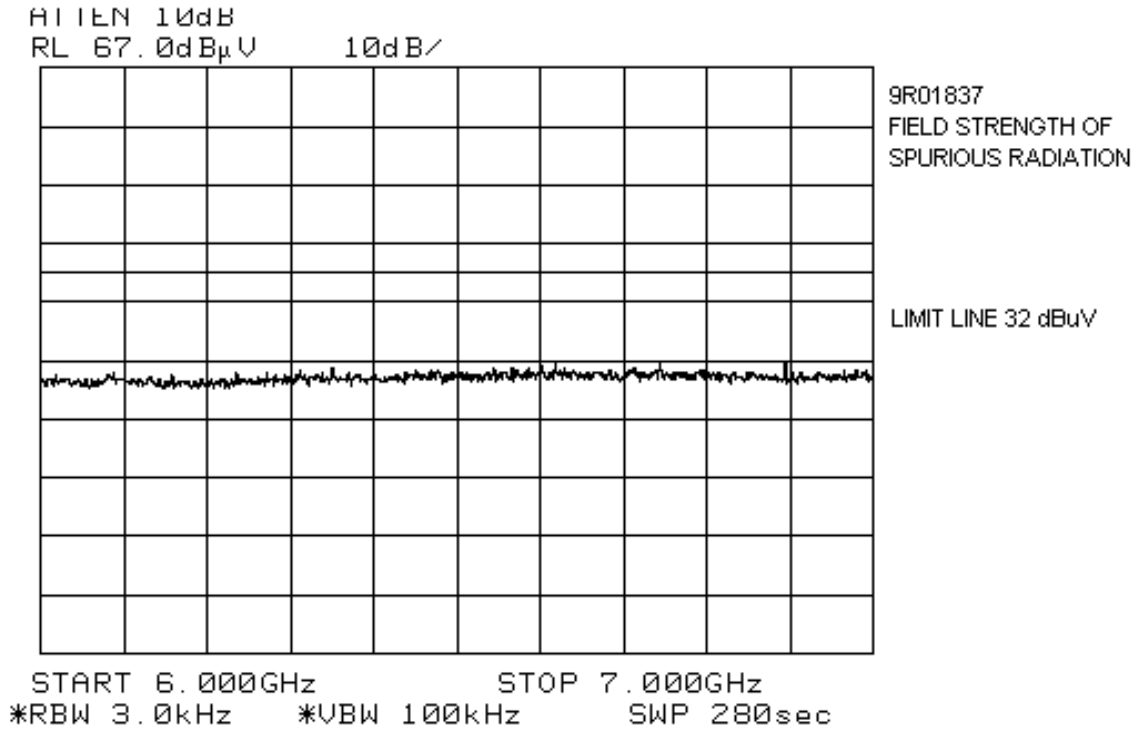
LIMIT LINE 32 dBuV

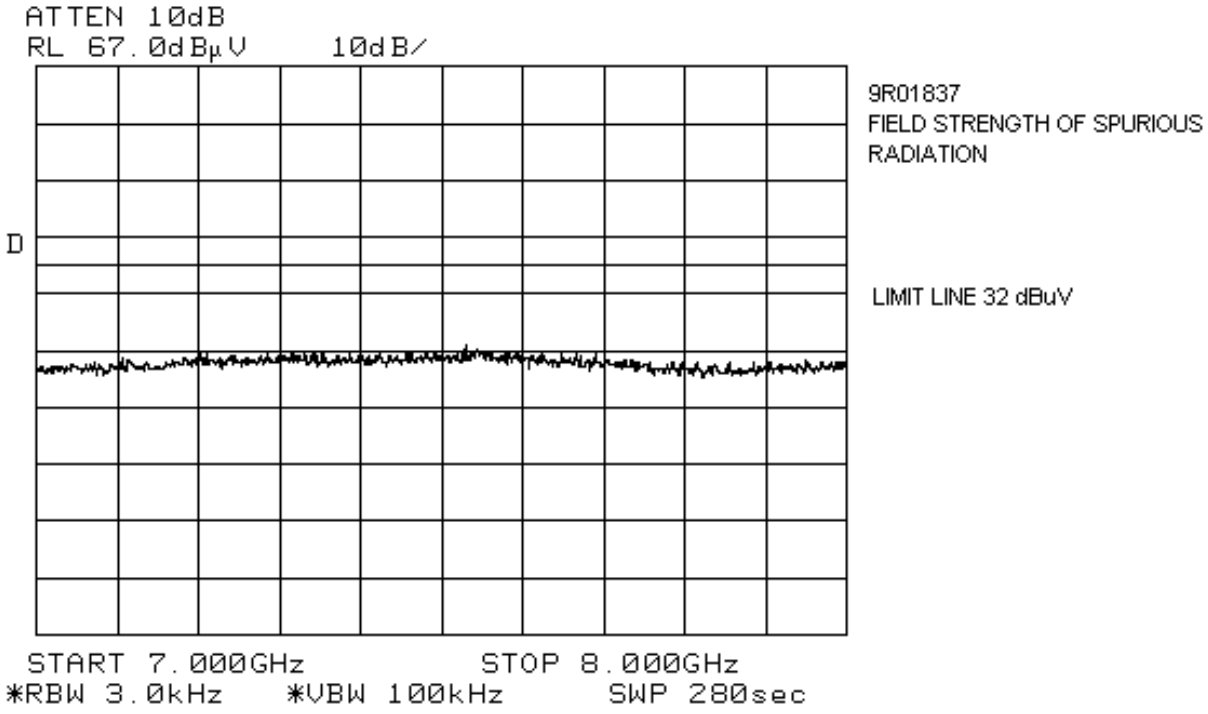

ATTEN 10dB
RL 67.0dBµV 10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 2.000GHz STOP 3.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 280sec

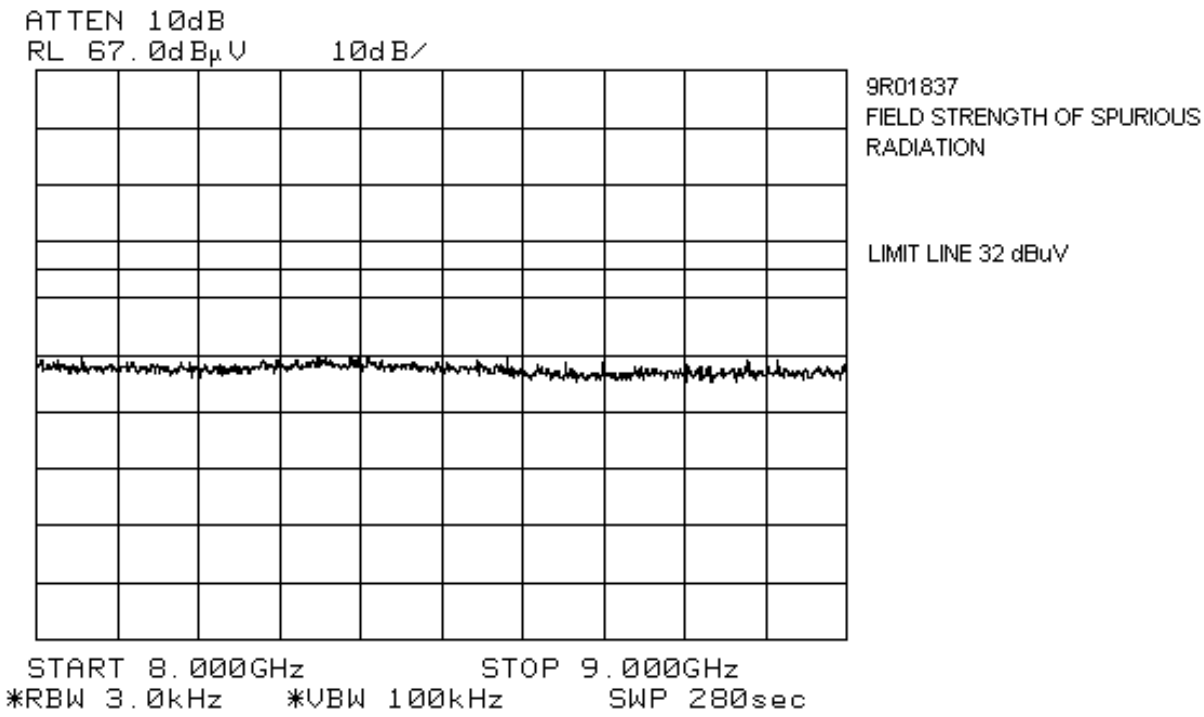

ATTEN 10dB
RL 67.0dBµV 10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 3.000GHz STOP 4.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 280sec

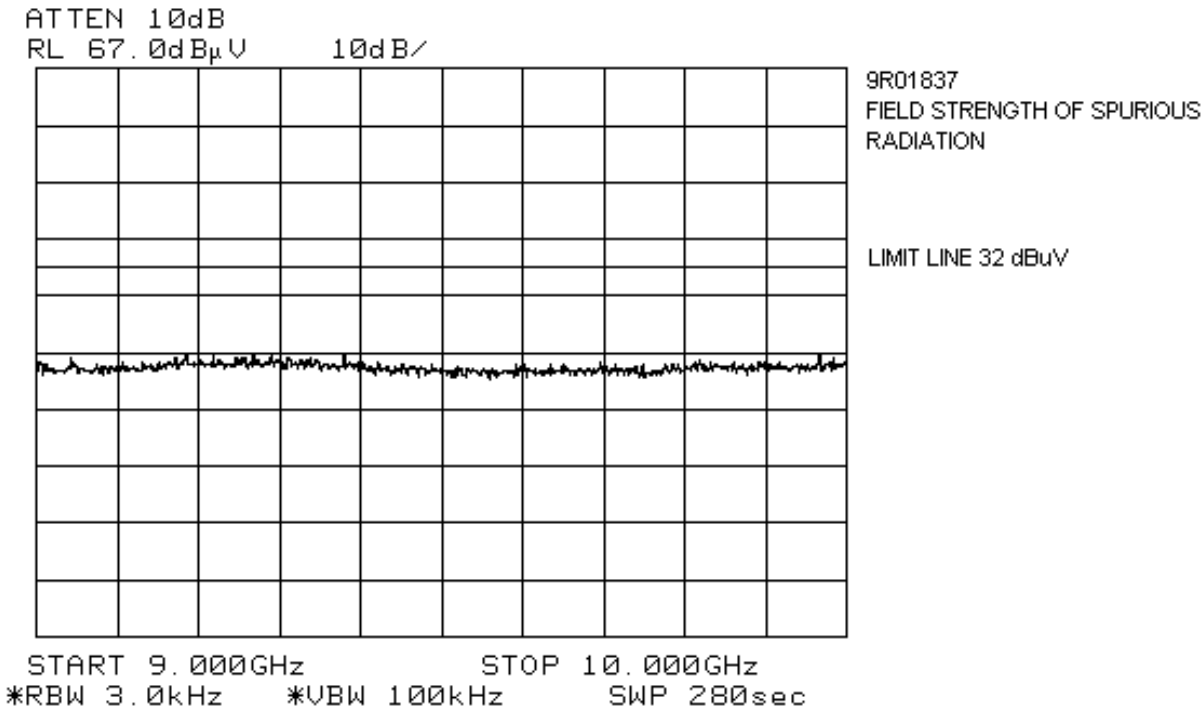

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 4.000GHz
STOP 5.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

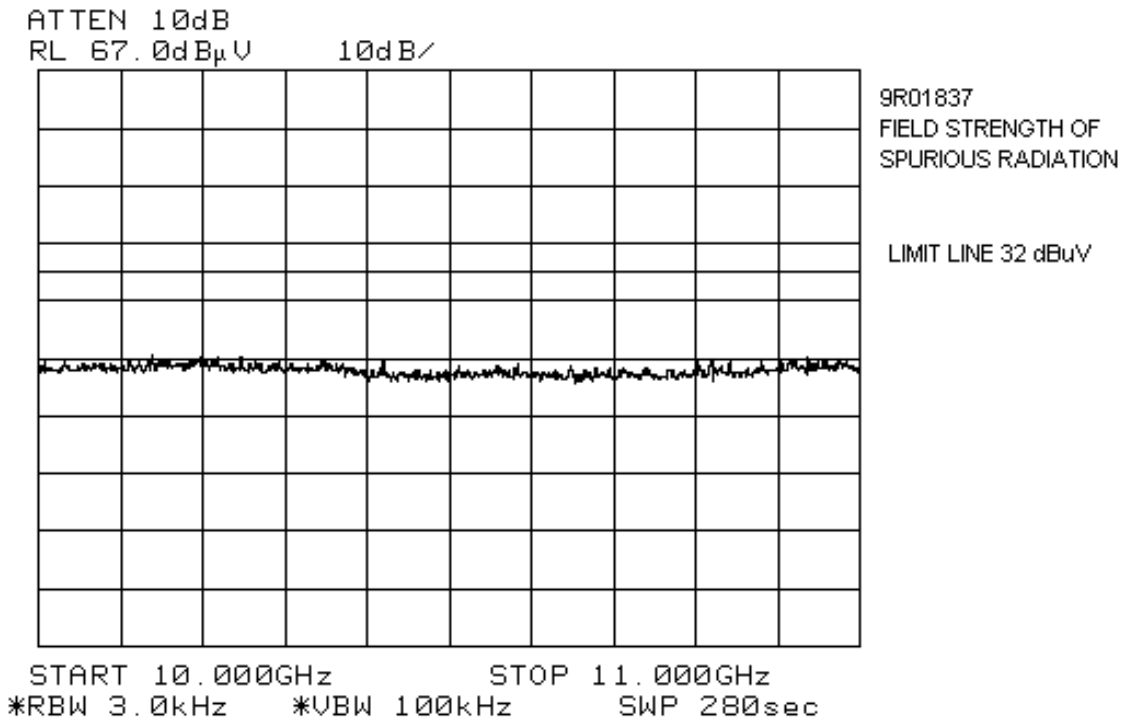

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION
LIMIT LINE 32 dBuV
START 5.000GHz
STOP 6.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

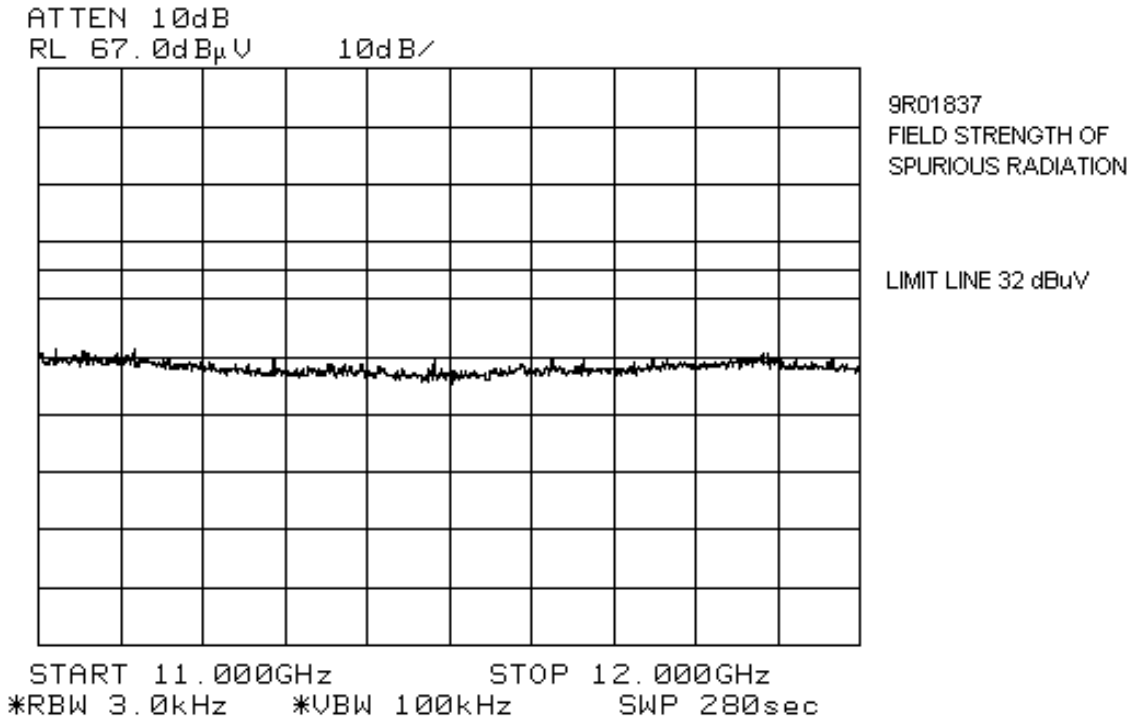

ATTEN 10dB
RL 67.0dBµV 10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 6.000GHz STOP 7.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 280sec

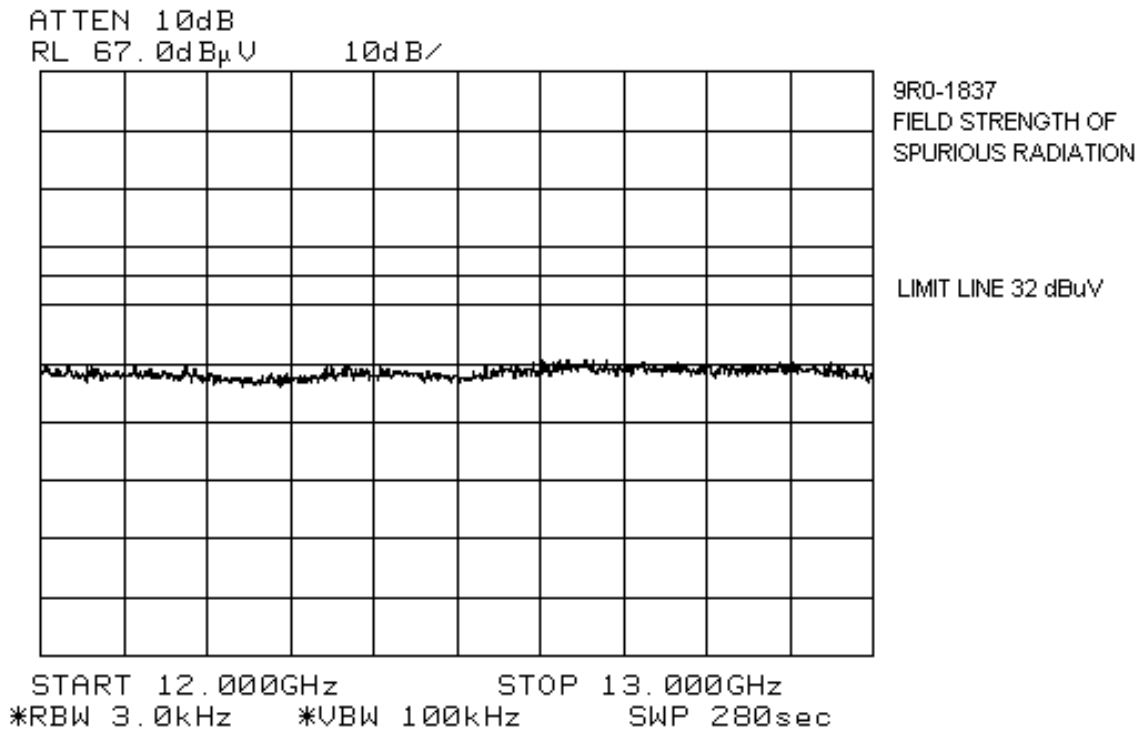

ATTEN 10dB
RL 67.0dBµV 10dB/
D
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION
LIMIT LINE 32 dBuV
START 7.000GHz STOP 8.000GHz
*RBW 3.0kHz *VBW 100kHz SWP 280sec

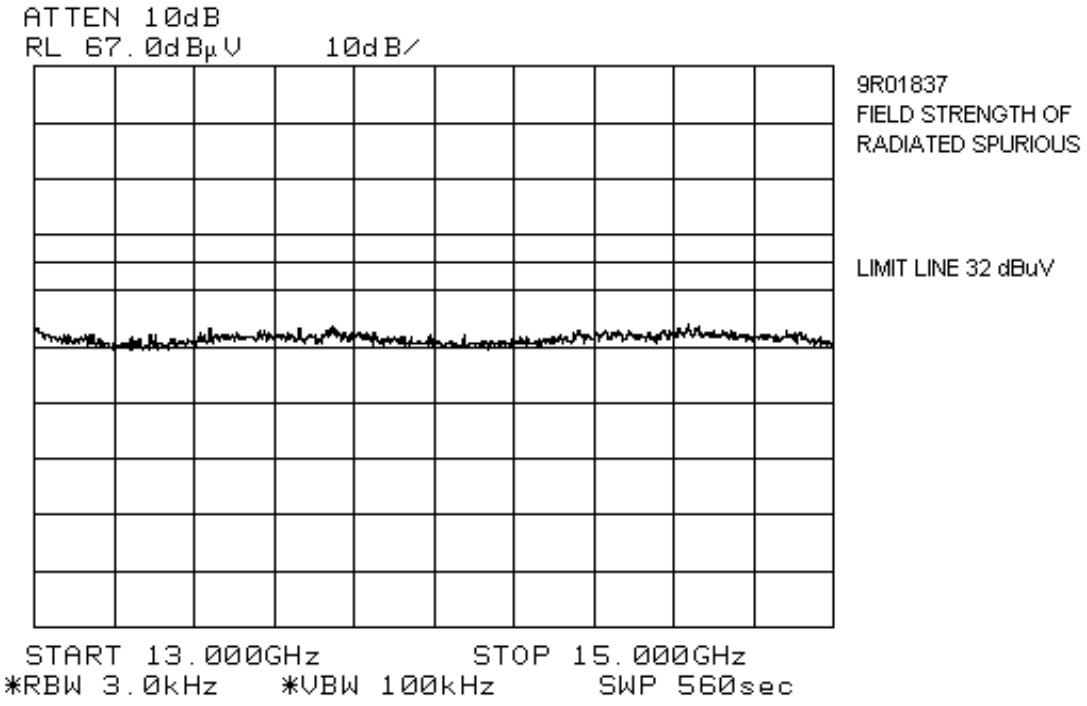


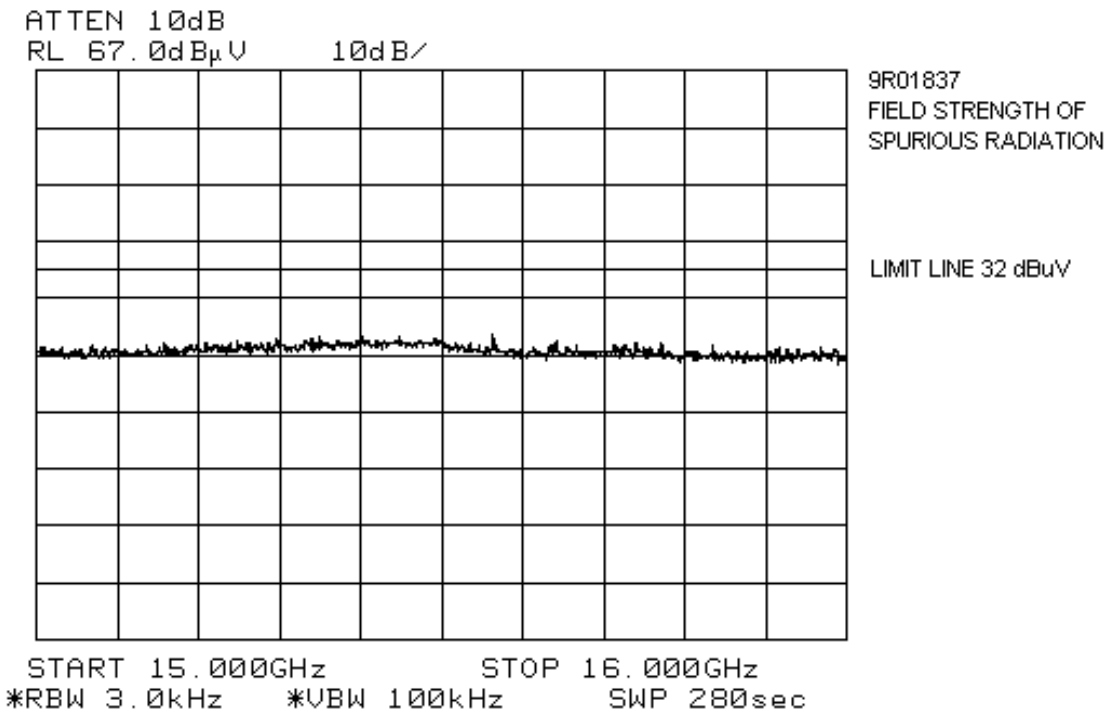


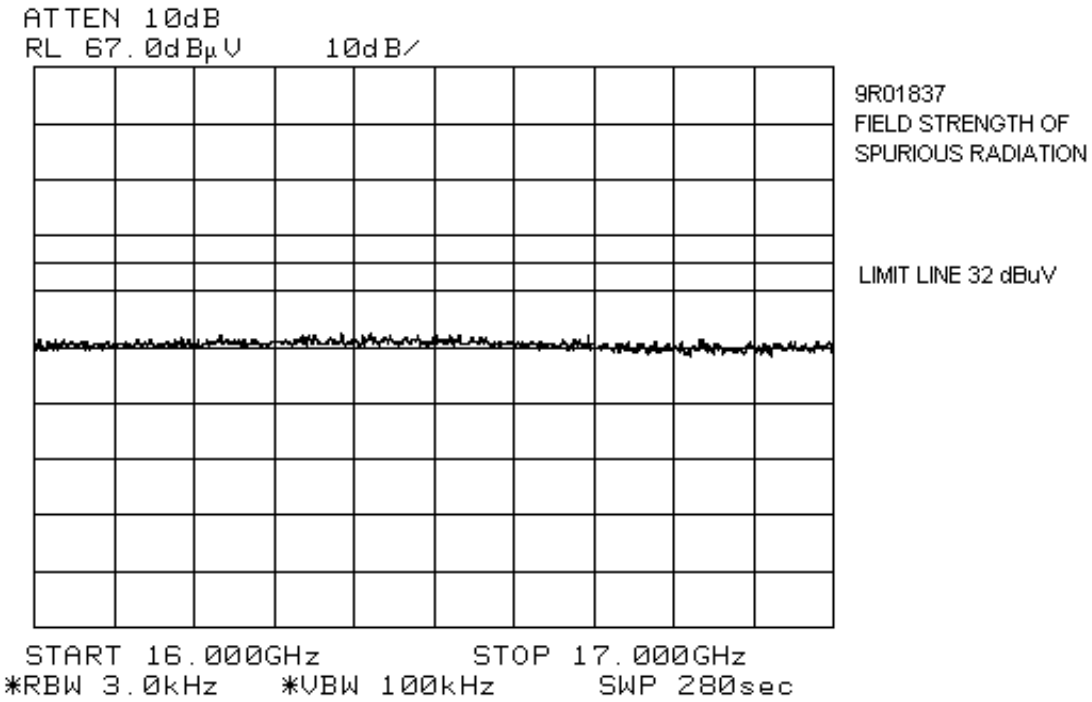

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 10.000GHz
STOP 11.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

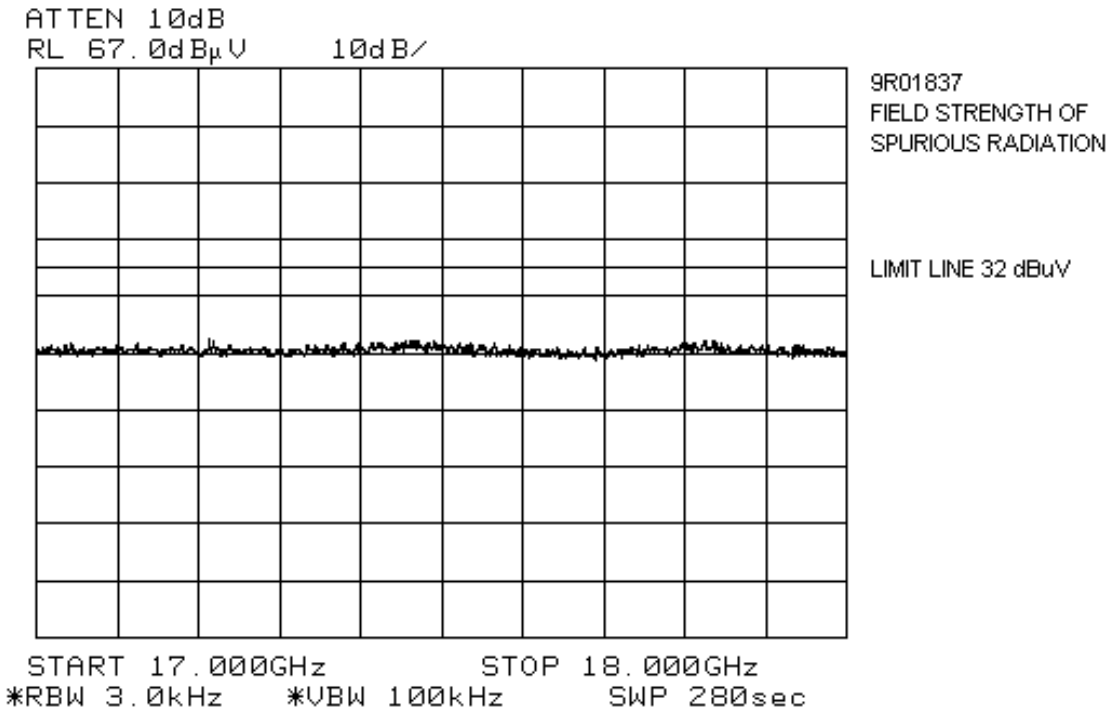

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 11.000GHz
STOP 12.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

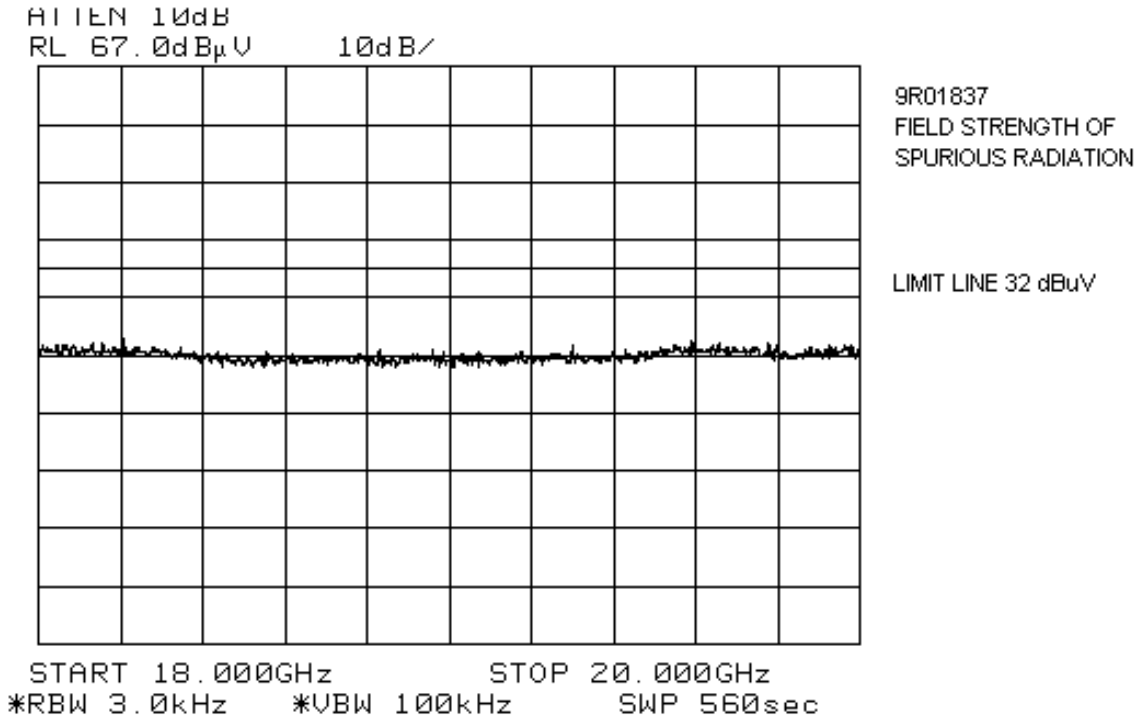

ATTEN 10dB
RL 67.0dBµV
10dB/
9R0-1837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 12.000GHz
STOP 13.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

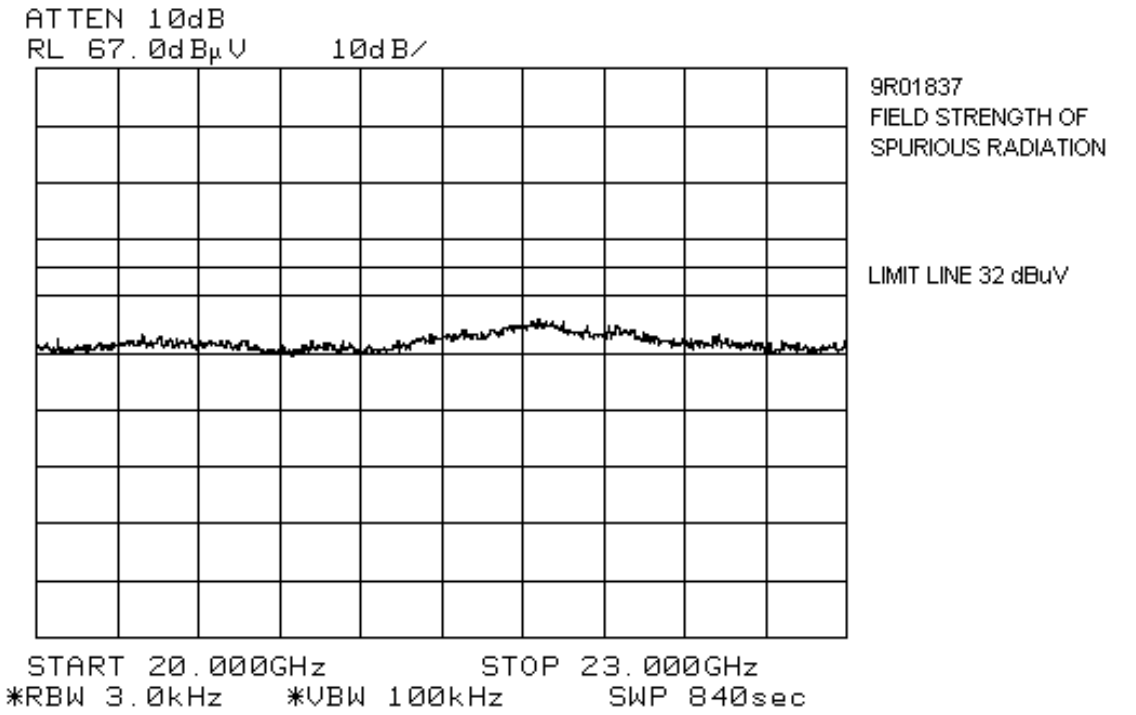

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
RADIATED SPURIOUS
LIMIT LINE 32 dBuV
START 13.000GHz
STOP 15.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 560sec

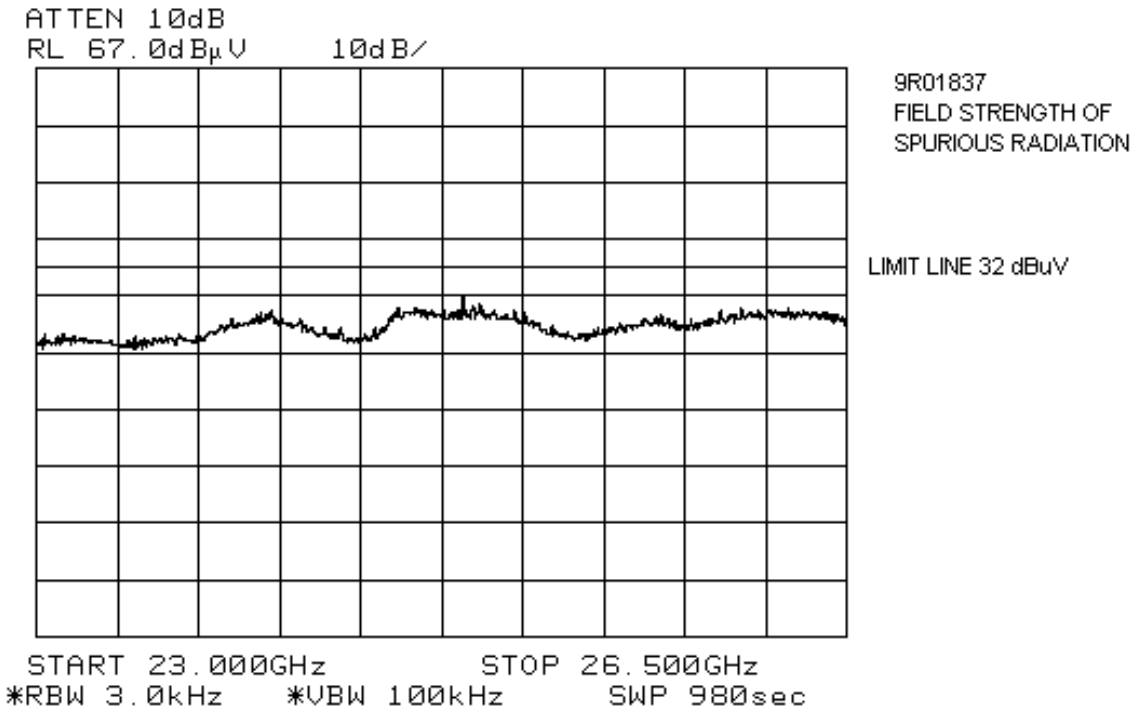

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 15.000GHz
STOP 16.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

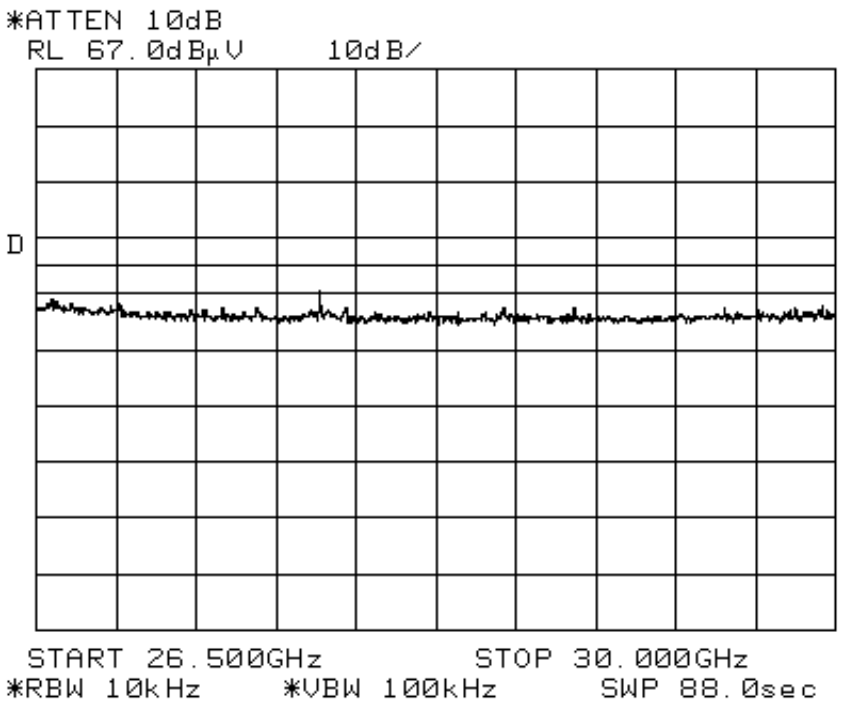

ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 16.000GHz
STOP 17.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec


ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 17.000GHz
STOP 18.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec


ATTEN 10dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 18.000GHz
STOP 20.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 560sec

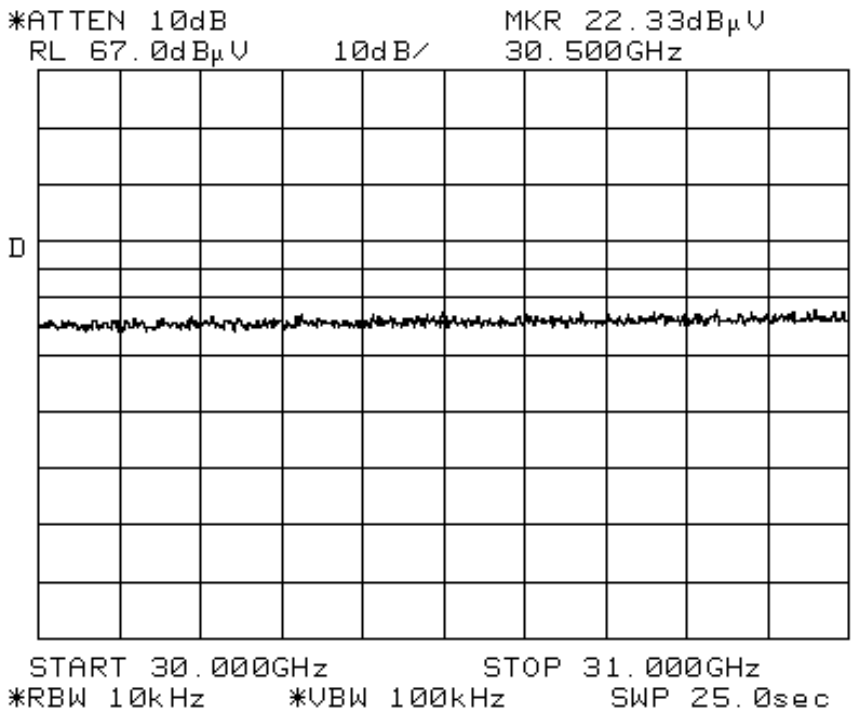






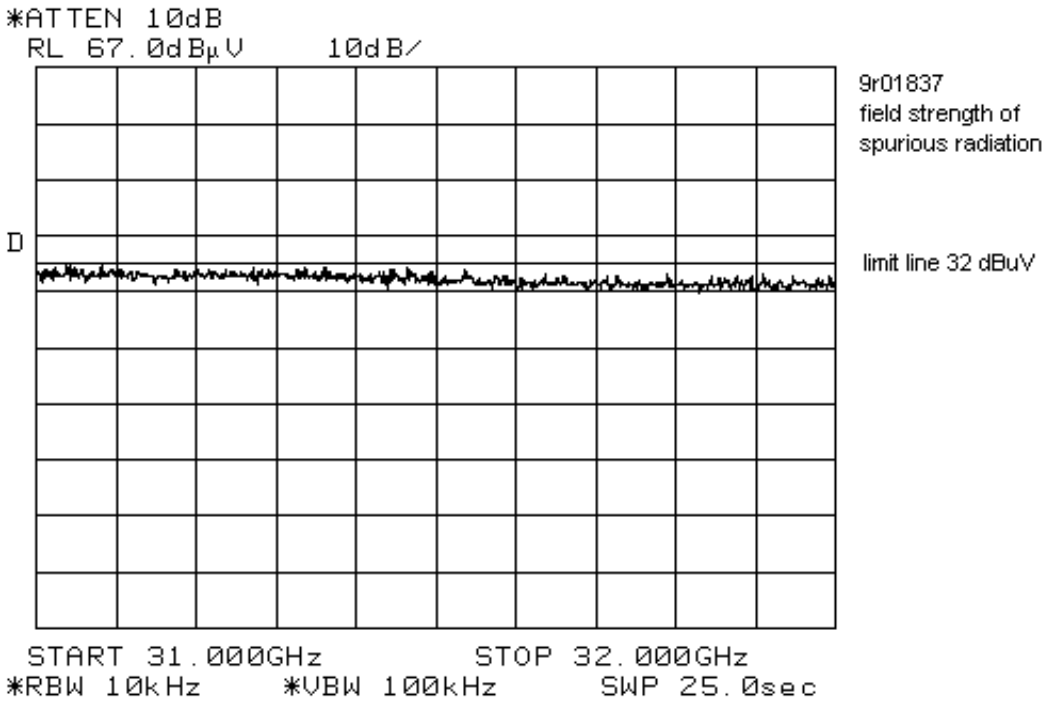
9r01837
Field strength of spurious radiation

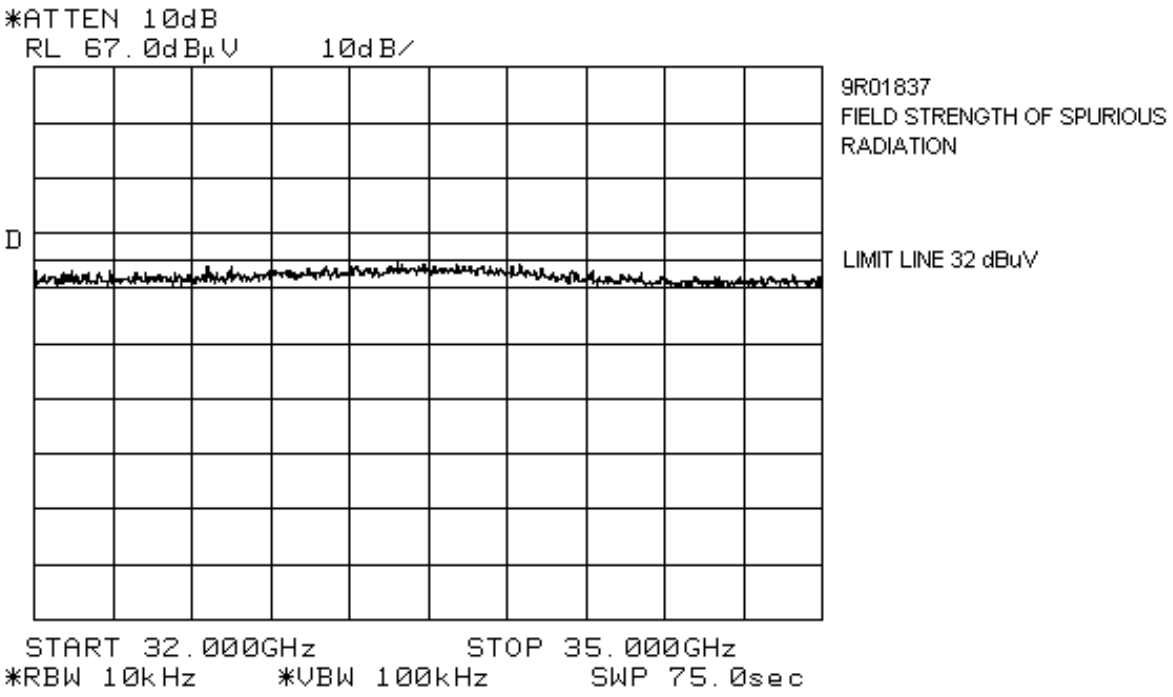
display line 32 dBuv

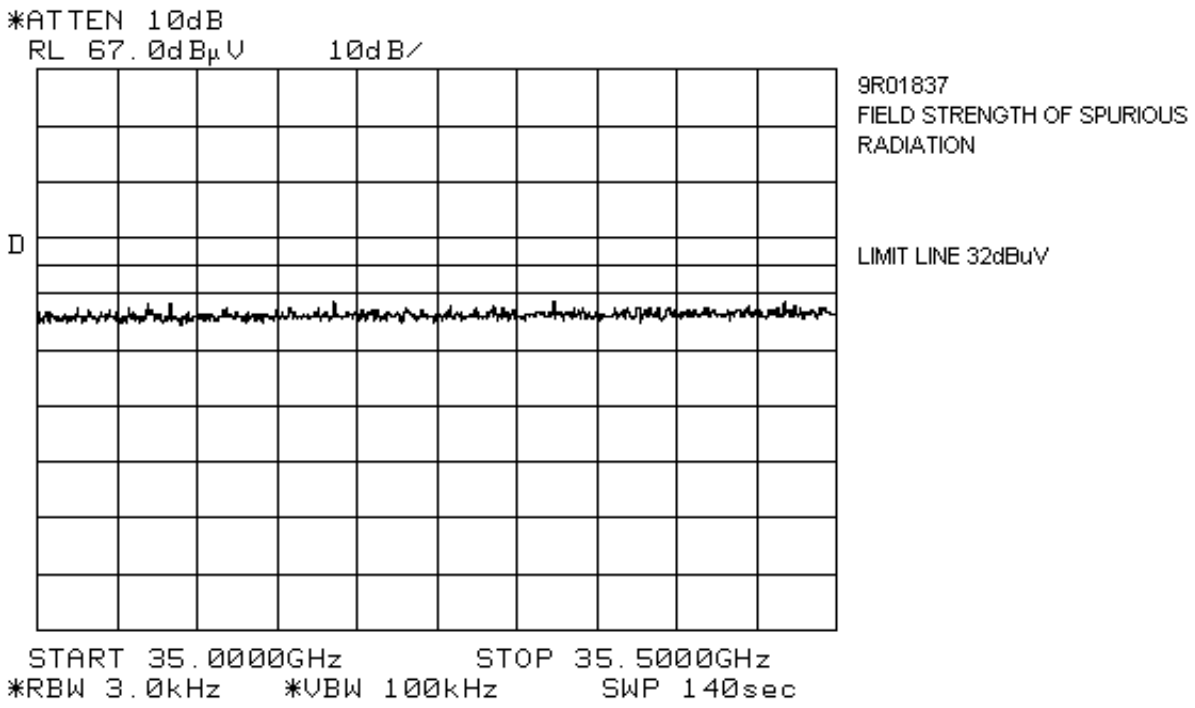


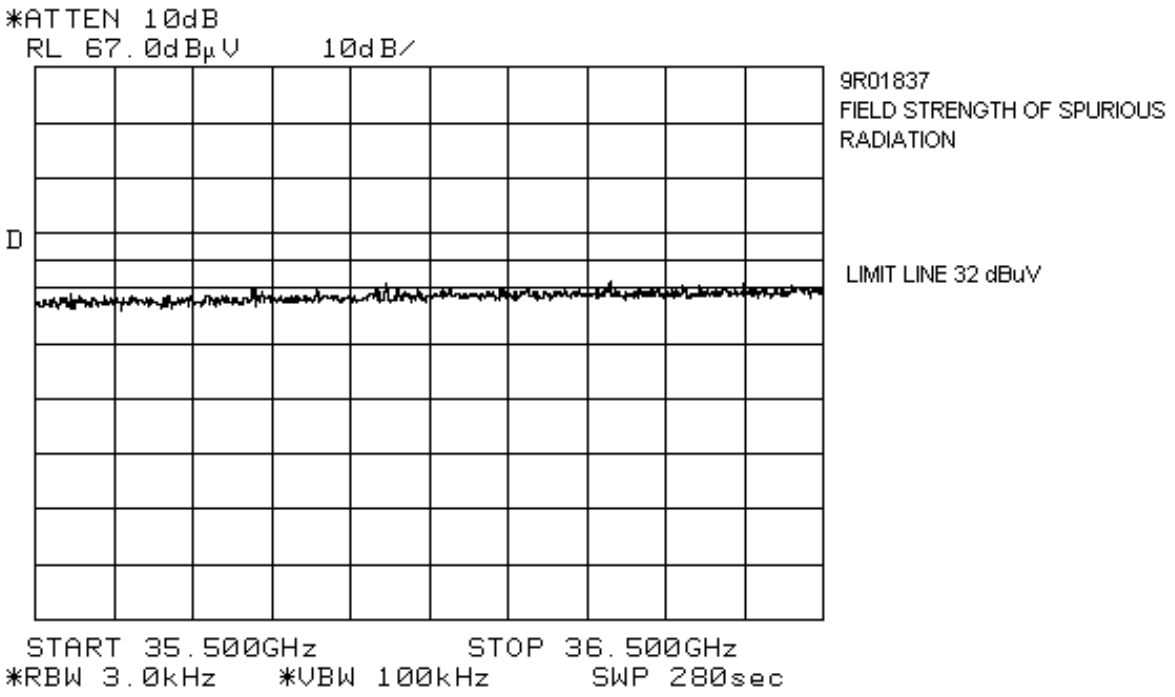
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION

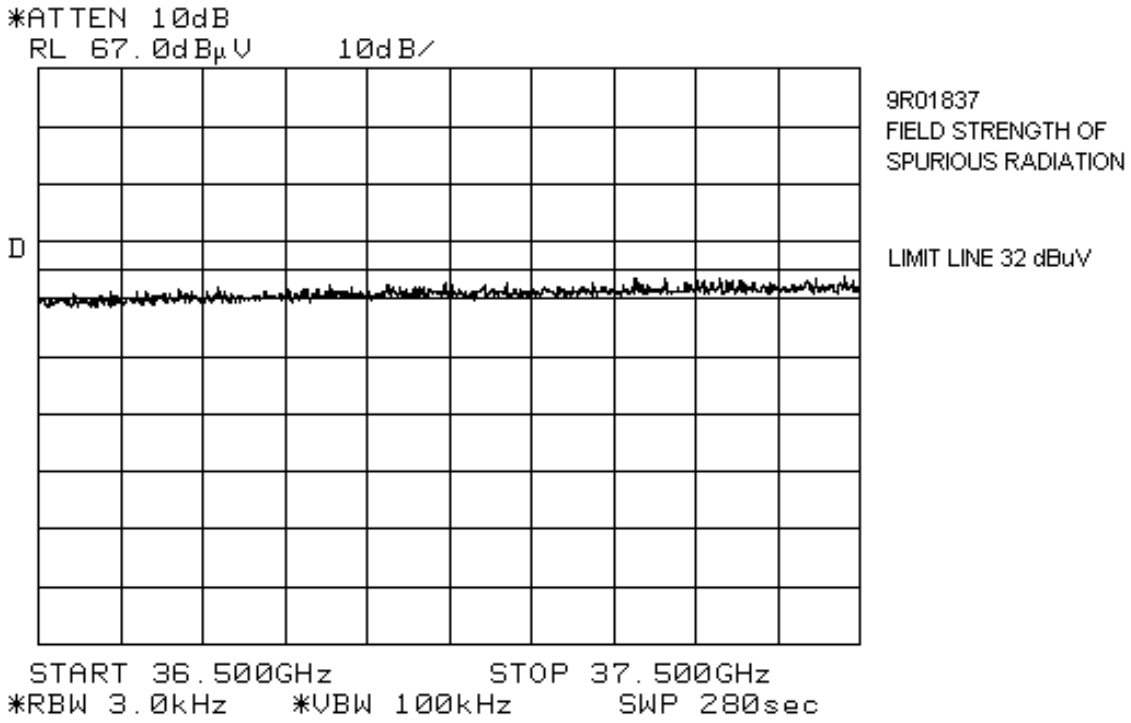
DISPLAY LINE 32 dBuV

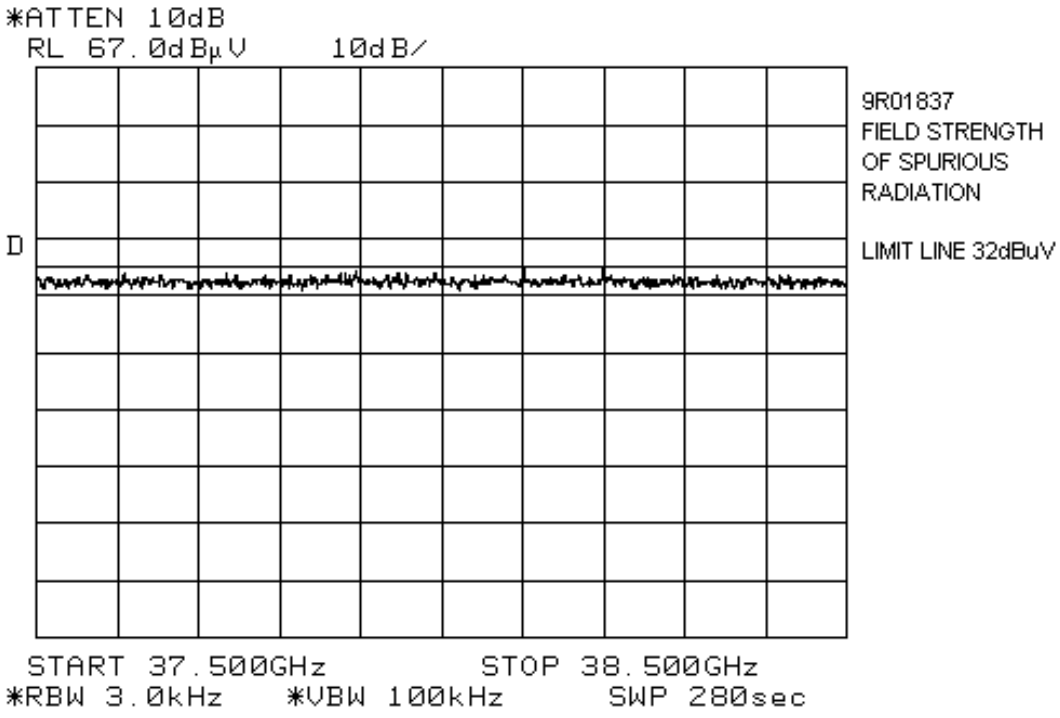

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
START 31.000GHz
STOP 32.000GHz
*RBW 10kHz
*VBW 100kHz
SWP 25.0sec
9r01837
field strength of
spurious radiation
limit line 32 dBuV

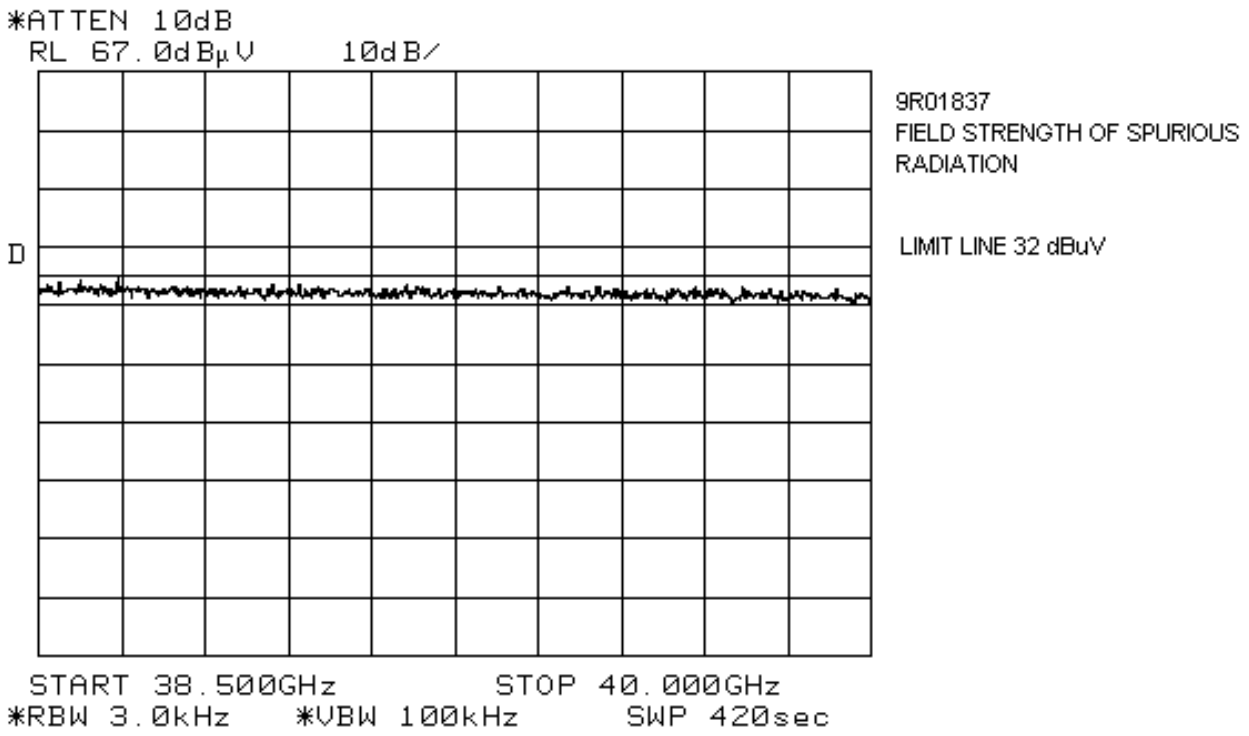

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
START 32.000GHz
STOP 35.000GHz
*RBW 10kHz
*VBW 100kHz
SWP 75.0sec
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION
LIMIT LINE 32 dBuV

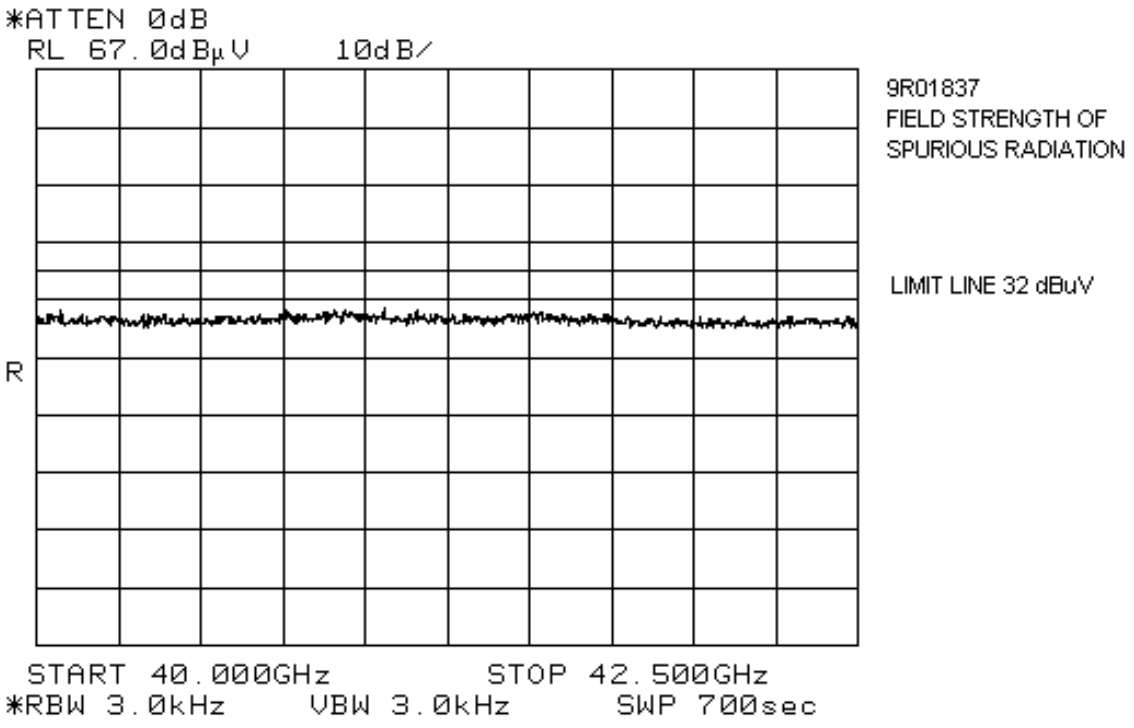

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION
LIMIT LINE 32dBuV
START 35.0000GHz
STOP 35.5000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 140sec

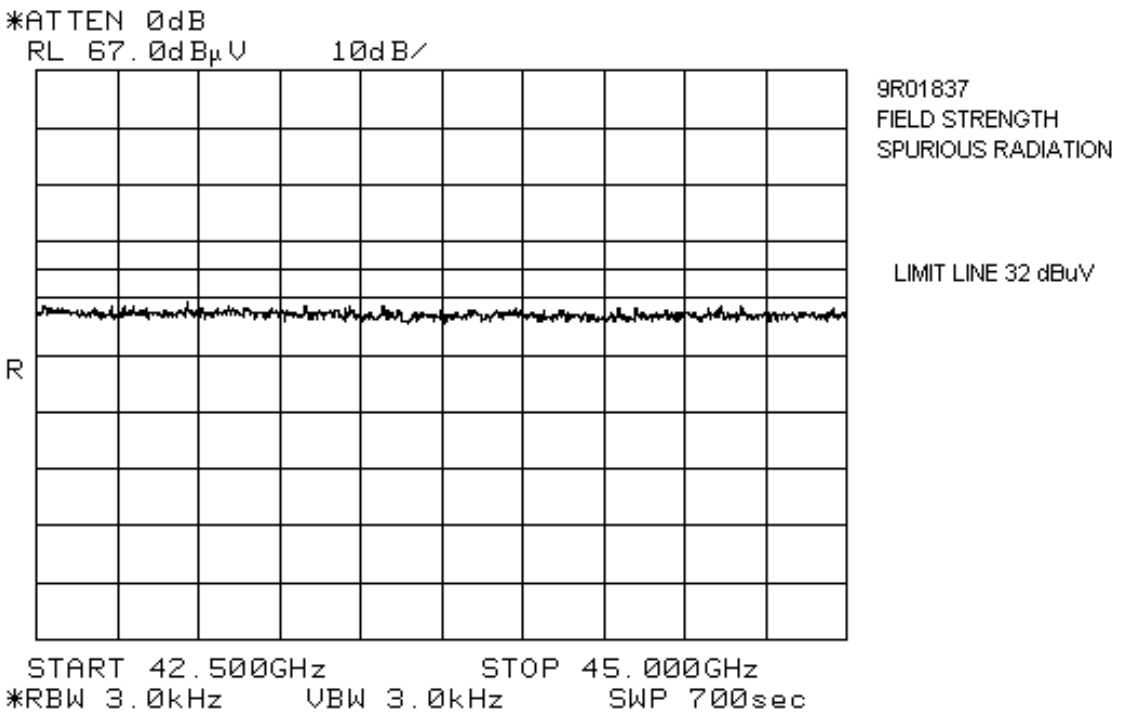

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
9R01837
FIELD STRENGTH OF SPURIOUS
RADIATION
LIMIT LINE 32 dBuV
START 35.500GHz
STOP 36.500GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

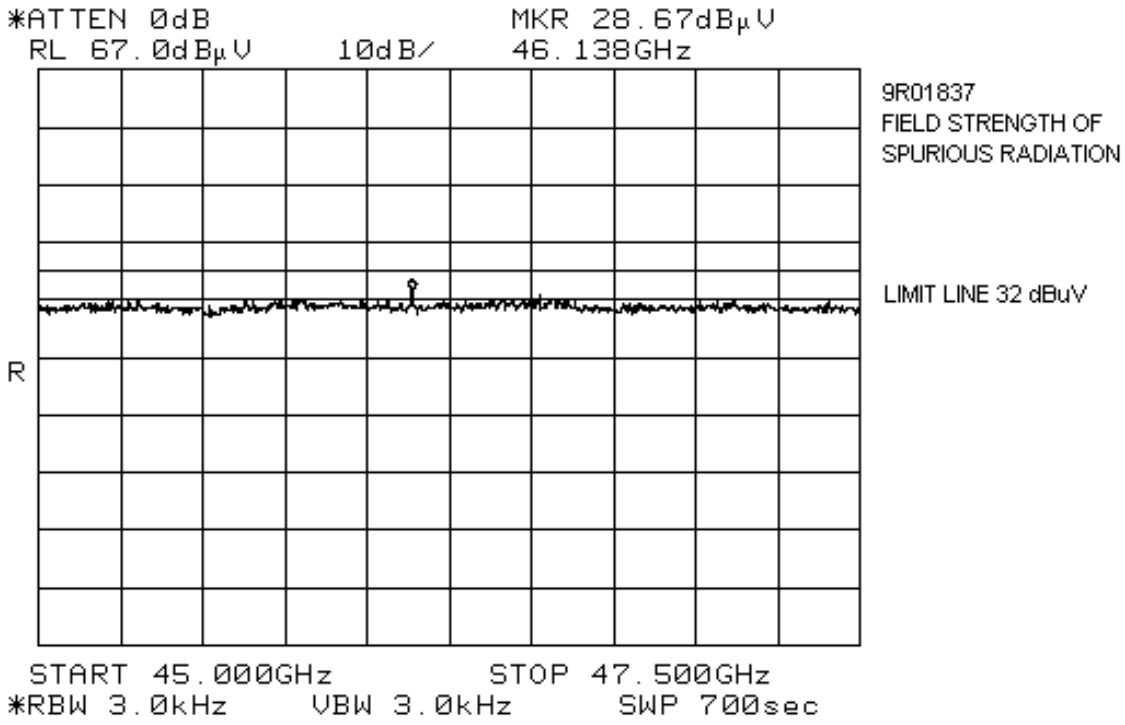

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 36.500GHz
STOP 37.500GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

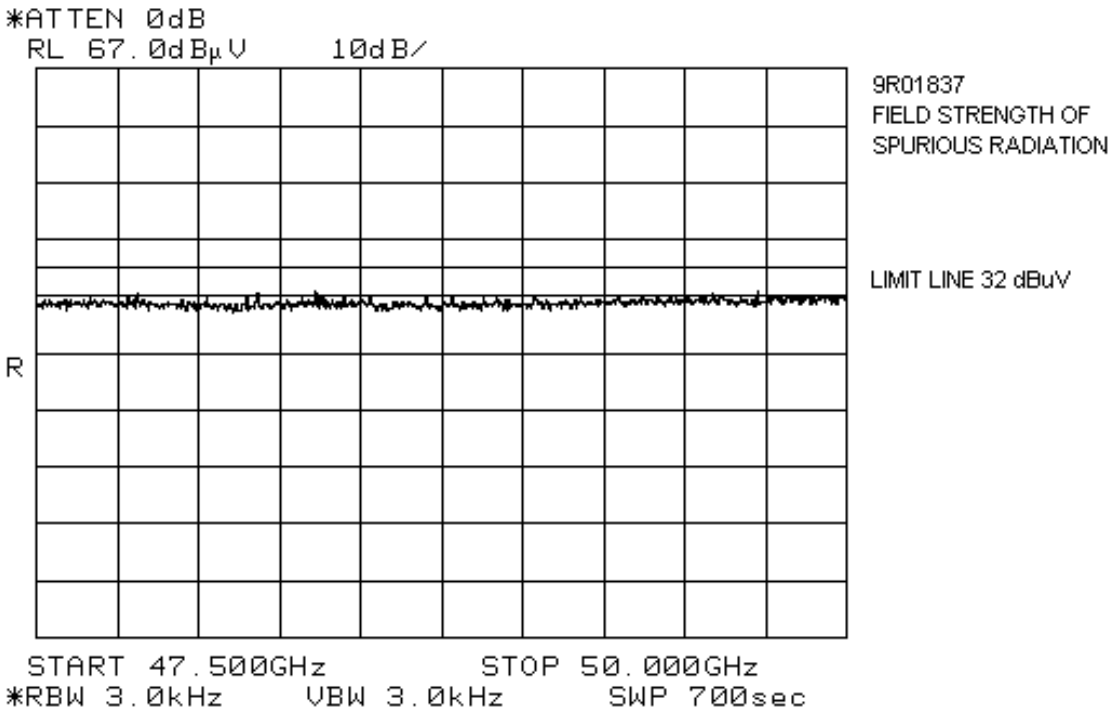

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
9R01837
FIELD STRENGTH
OF SPURIOUS
RADIATION
LIMIT LINE 32dBuV
START 37.500GHz
STOP 38.500GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 280sec

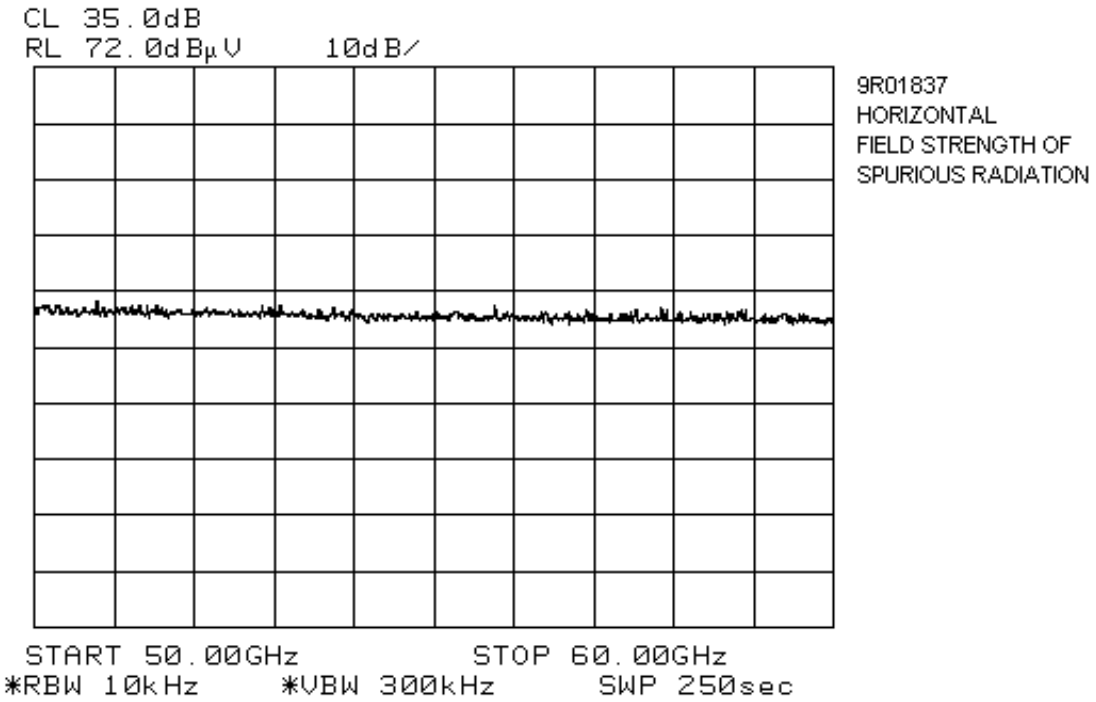

*ATTEN 10dB
RL 67.0dBµV
10dB/
D
9R01837
FIELD STRENGTH OF SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 38.500GHz
STOP 40.000GHz
*RBW 3.0kHz
*VBW 100kHz
SWP 420sec

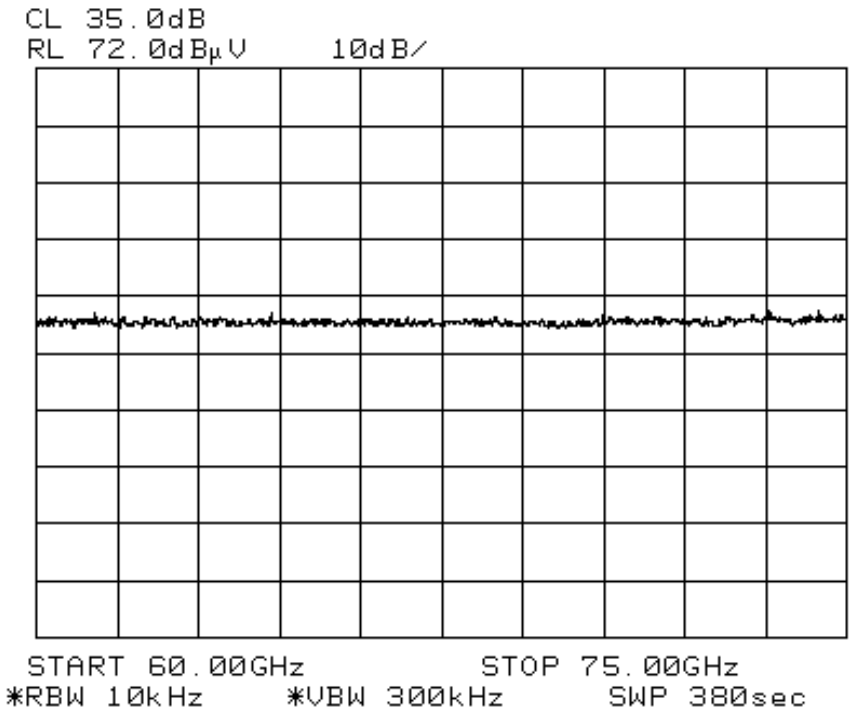

*ATTEN 0dB
RL 67.0dBµV
10dB/
R
9R01837
FIELD STRENGTH OF SPURIOUS RADIATION
LIMIT LINE 32 dBuV
START 40.000GHz
STOP 42.500GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec


*ATTEN 0dB
RL 67.0dBµV
10dB/
R
START 42.500GHz
STOP 45.000GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec
9R01837
FIELD STRENGTH
SPURIOUS RADIATION
LIMIT LINE 32 dBuV

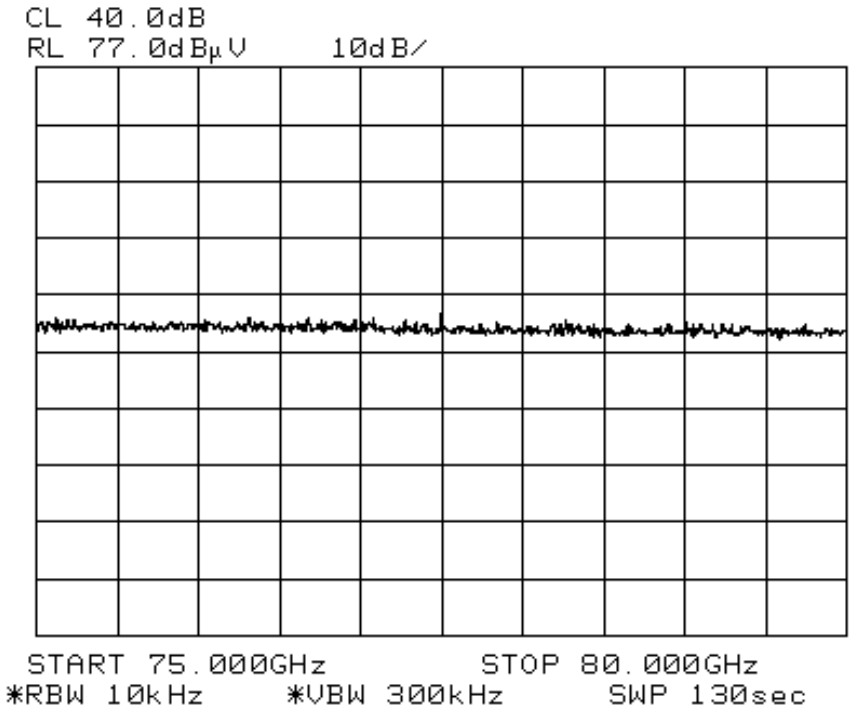

*ATTEN 0dB
MKR 28.67dBµV
RL 67.0dBµV
10dB/
46.138GHz
R
START 45.000GHz
STOP 47.500GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV


*ATTEN 0dB
RL 67.0dBµV
10dB/
9R01837
FIELD STRENGTH OF
SPURIOUS RADIATION
LIMIT LINE 32 dBuV
R
START 47.500GHz
STOP 50.000GHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 700sec

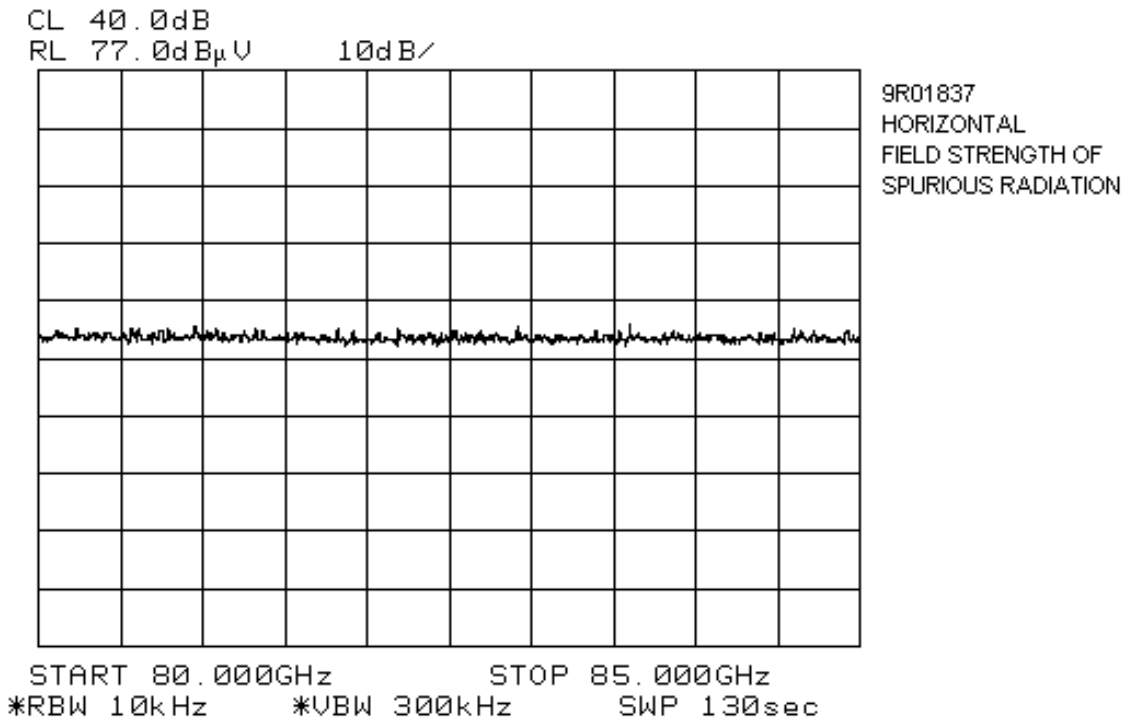

CL 35.0dB
RL 72.0dBµV
10dB/
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 50.00GHz
STOP 60.00GHz
*RBW 10kHz
*VBW 300kHz
SWP 250sec

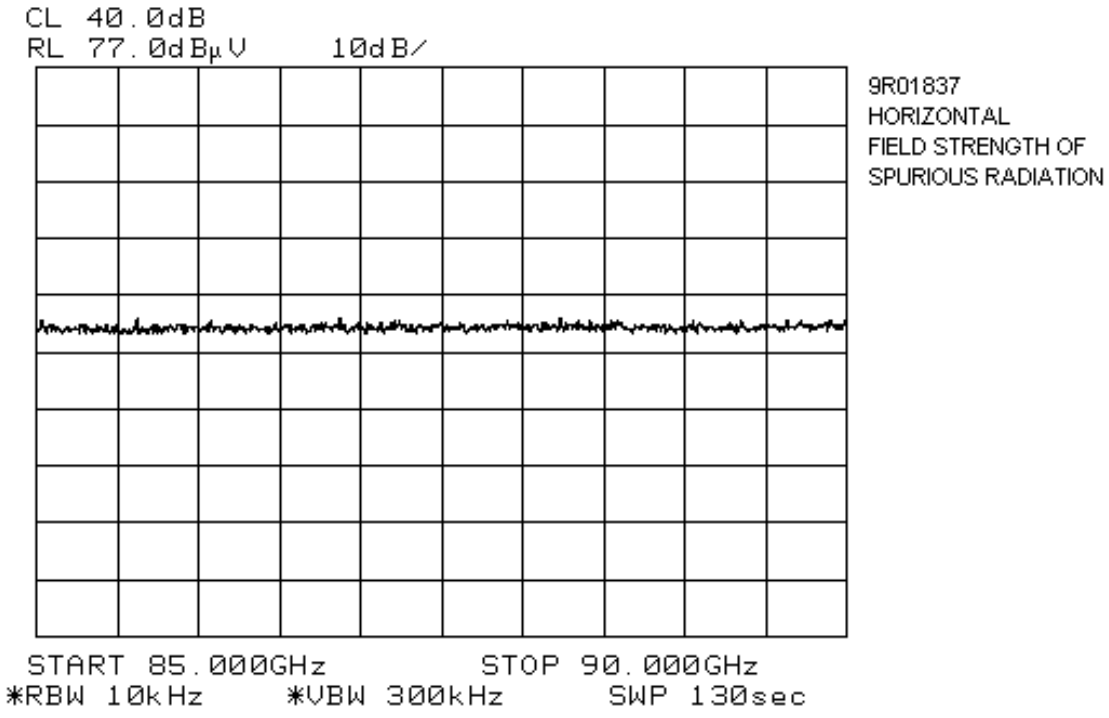


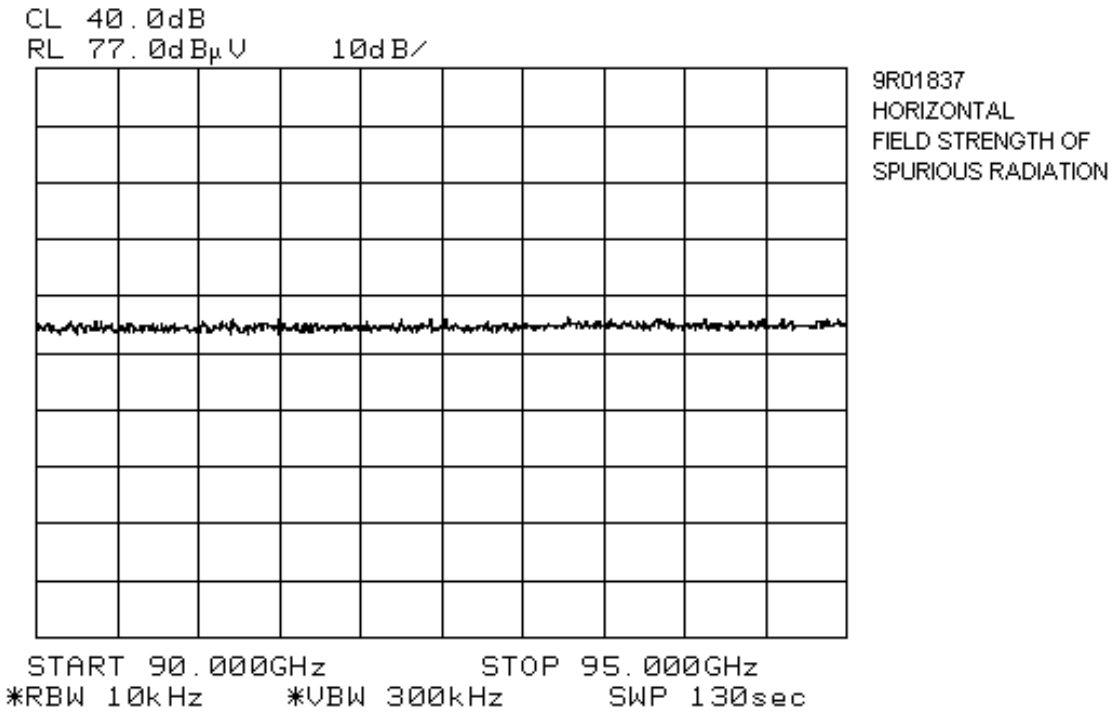
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION

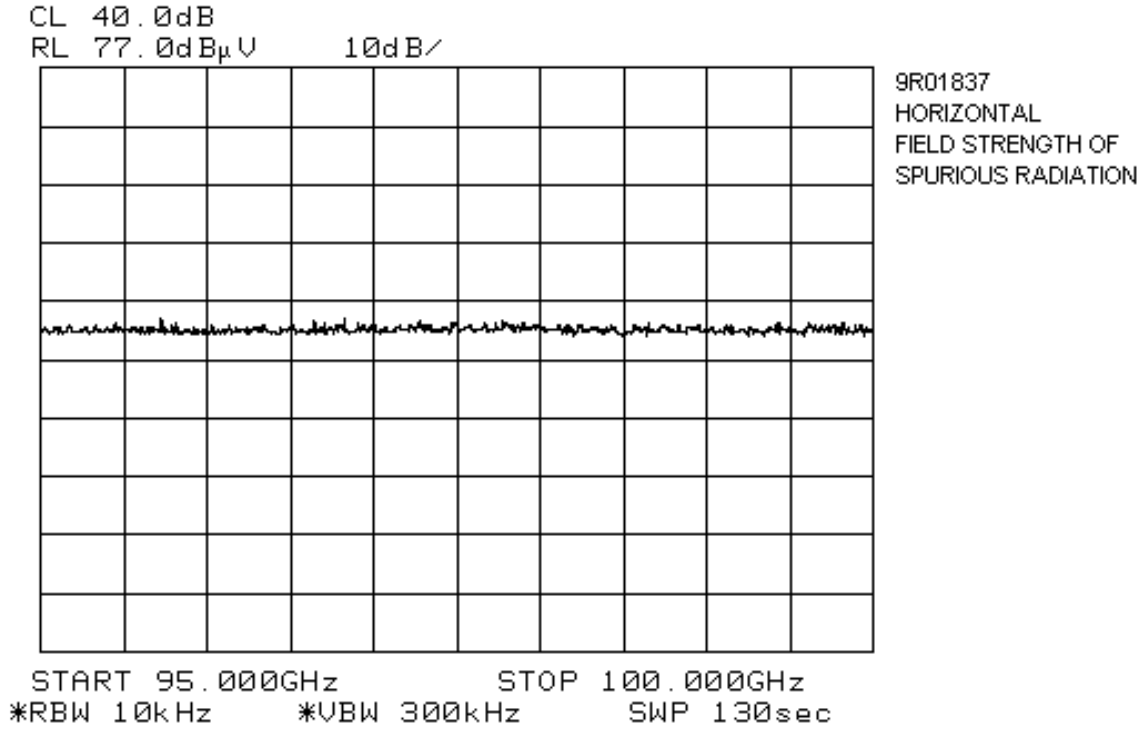


9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION


CL 40.0dB
RL 77.0dBµV 10dB/
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 80.000GHz STOP 85.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec

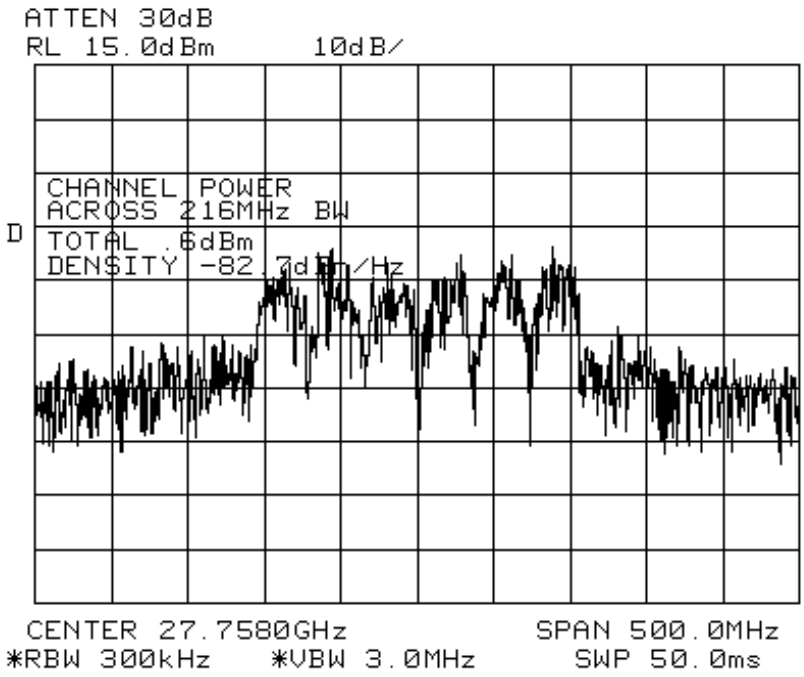

CL 40.0dB
RL 77.0dBµV 10dB/
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 85.000GHz STOP 90.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec


CL 40.0dB
RL 77.0dBµV 10dB/
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 90.000GHz STOP 95.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec


CL 40.0dB
RL 77.0dBµV 10dB/
9R01837
HORIZONTAL
FIELD STRENGTH OF
SPURIOUS RADIATION
START 95.000GHz STOP 100.000GHz
*RBW 10kHz *VBW 300kHz SWP 130sec

APPENDIX B: CONDUCTED SPURIOUS PLOTS

REFERENCE LEVEL



9R01837
Conducted Spurious at Antenna Port

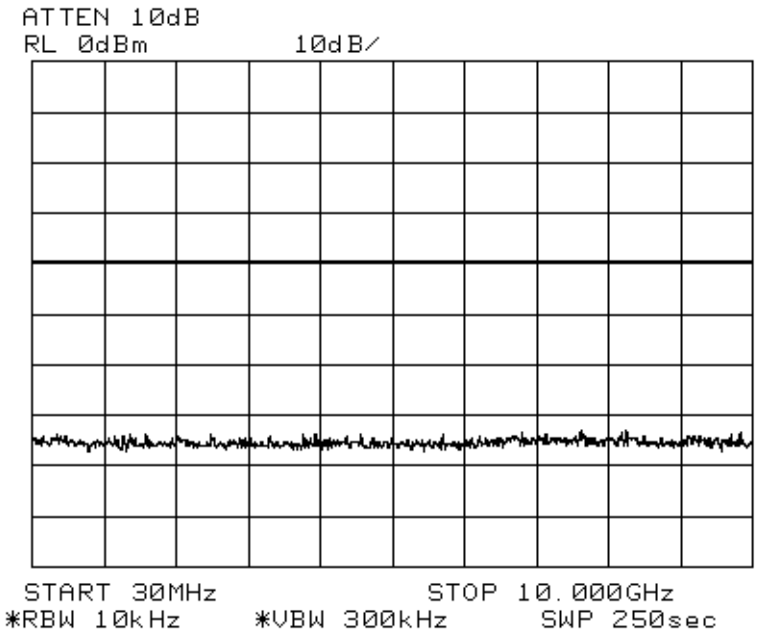
The reference output power measured was 0.6dBm over a 216MHz bandwidth after the attenuators and cable losses. Total output power at the antenna port = +27dBm (0.5watts)

Limit = (measured level) – A; where A= 43+10log (Pmean in watts)

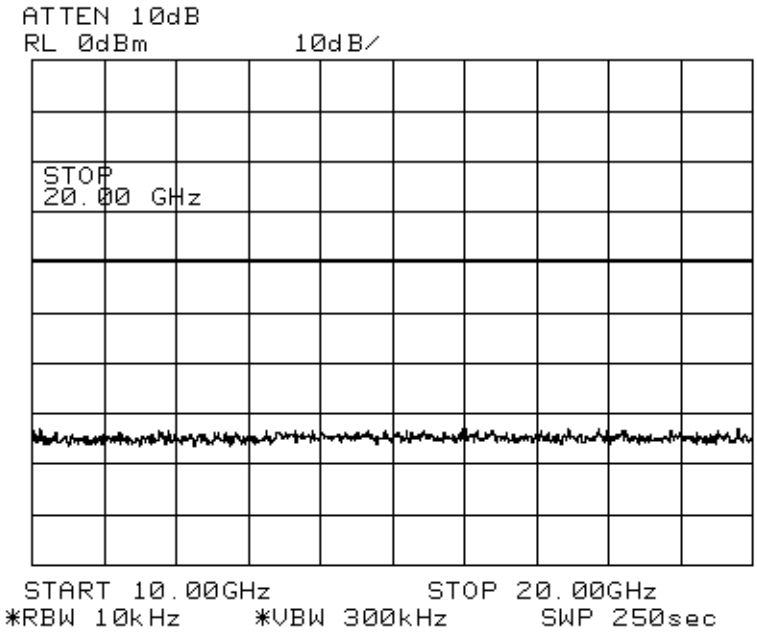
A correction factor of 4dB for the different resolution bandwidth used from RBW= 10kHz to 4kHz; (10log 10/4 = 4dB) was ignored and taken as worst conditions.

A= 43 + 10 log 0.5= 40dB

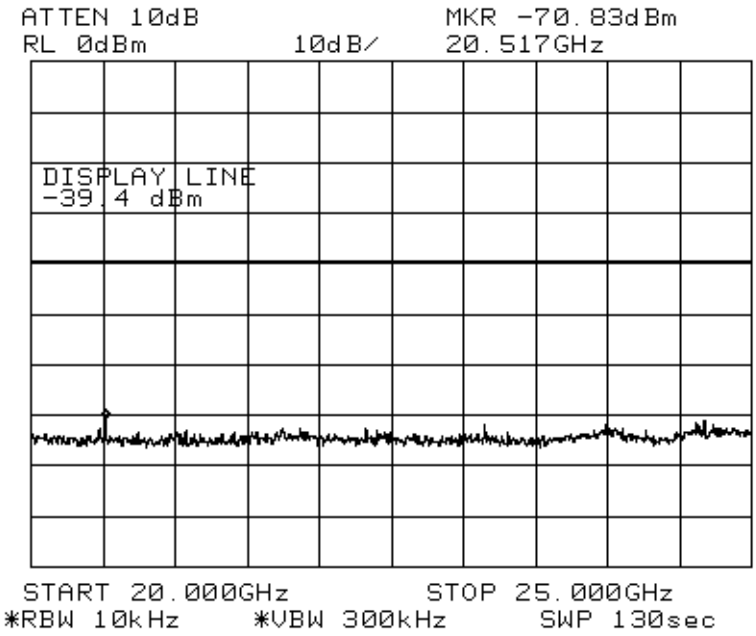
i.e.: 0.6dBm – 40 = 39.4dBm (reference level)



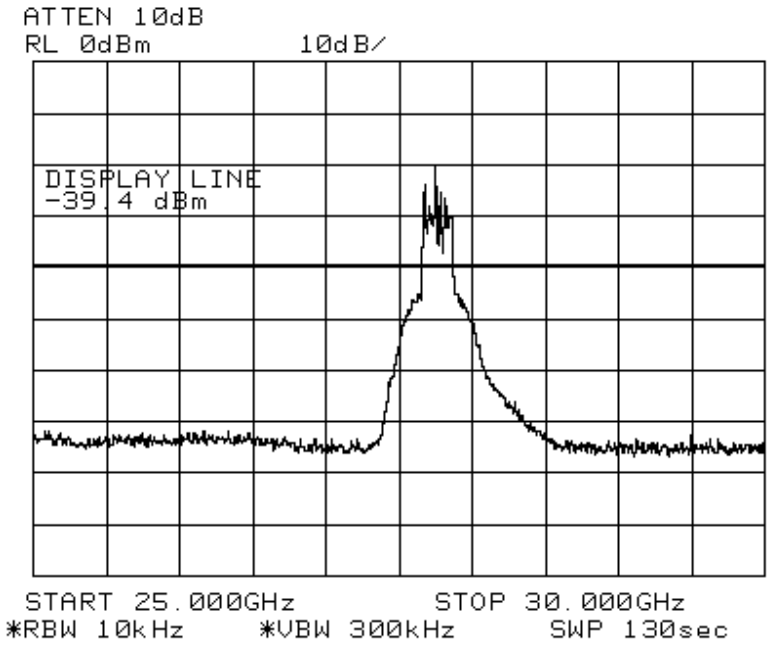
9R01837
Conducted Spurious at Antenna Port



9R01837
Conducted Spurious at Antenna Port

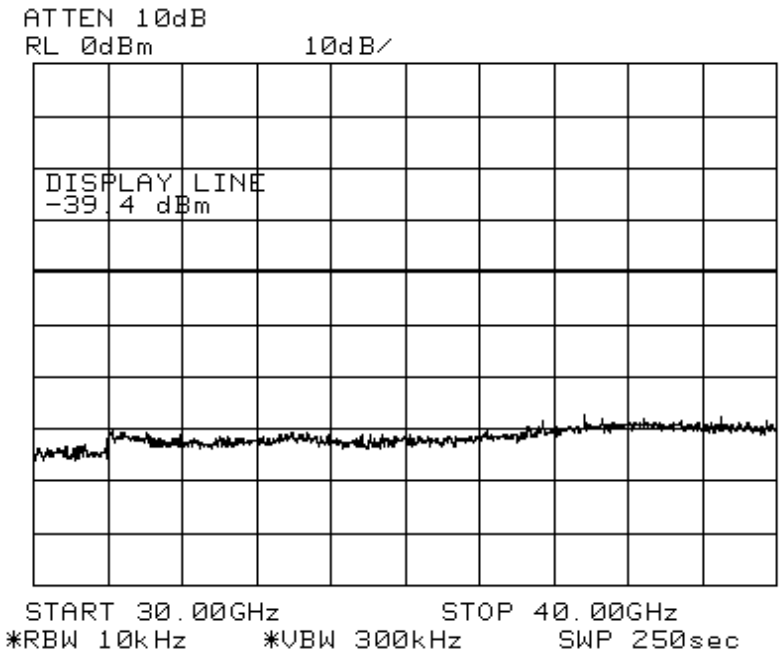


9R01837
Conducted Spurious at Antenna Port

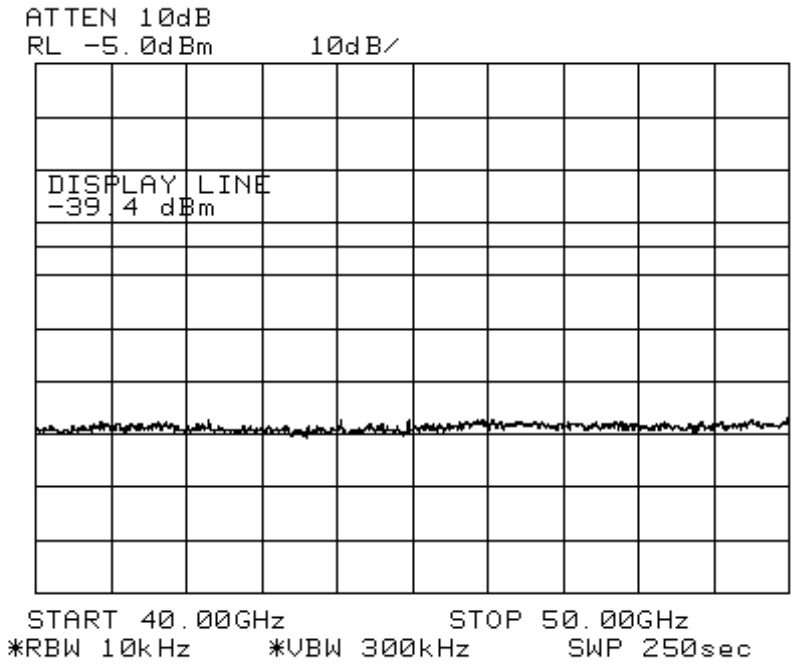


9R01837
Conducted Spurious at Antenna Port

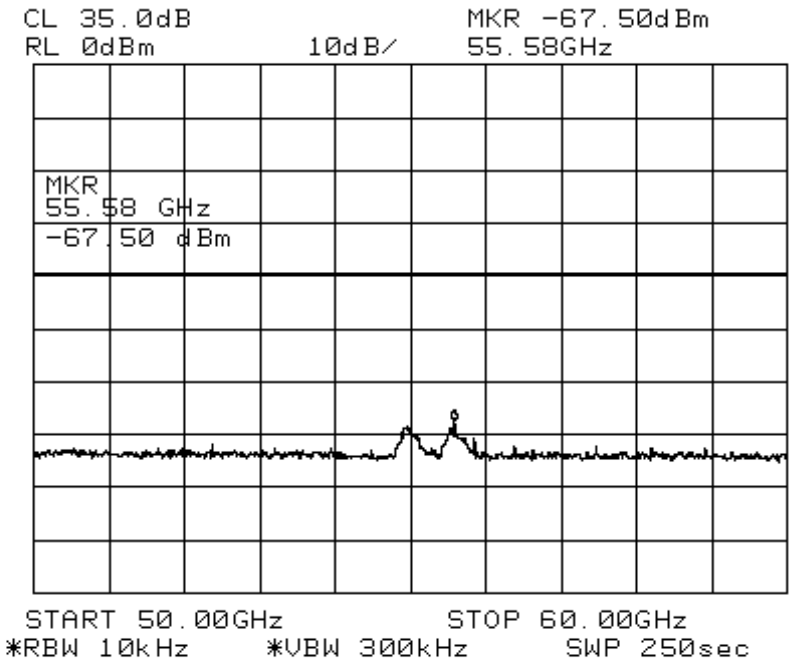
The spurious that are seen here are the actual 6 carriers within the 850MHz occupied bandwidth.



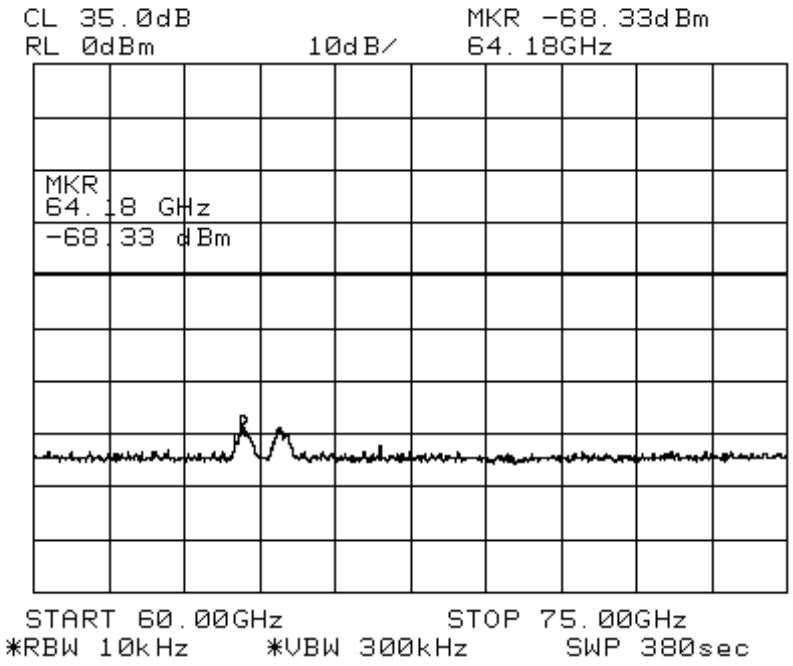
9R01837
Conducted Spurious at Antenna Port



9R01837
Conducted Spurious at Antenna Port



9R01837
Conducted Spurious at Antenna Port



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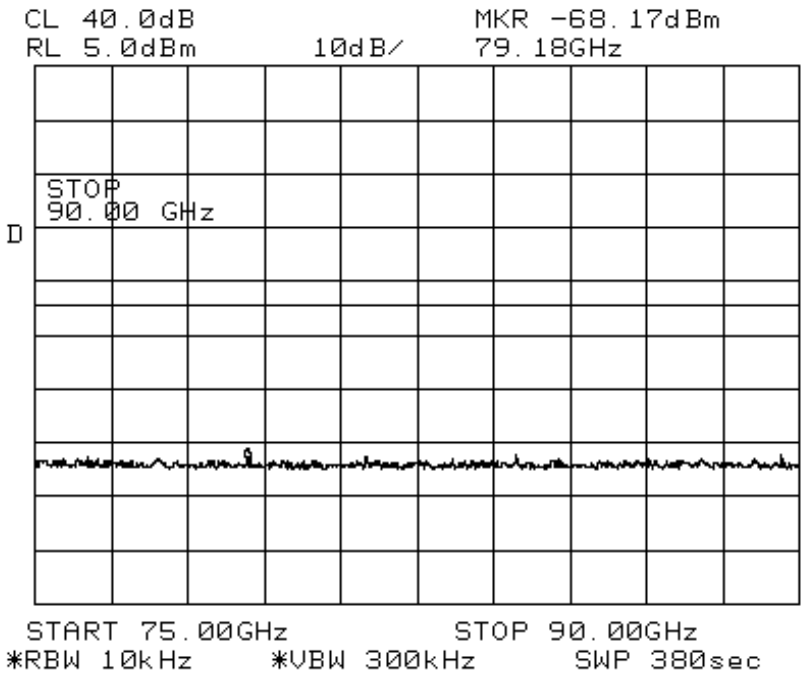
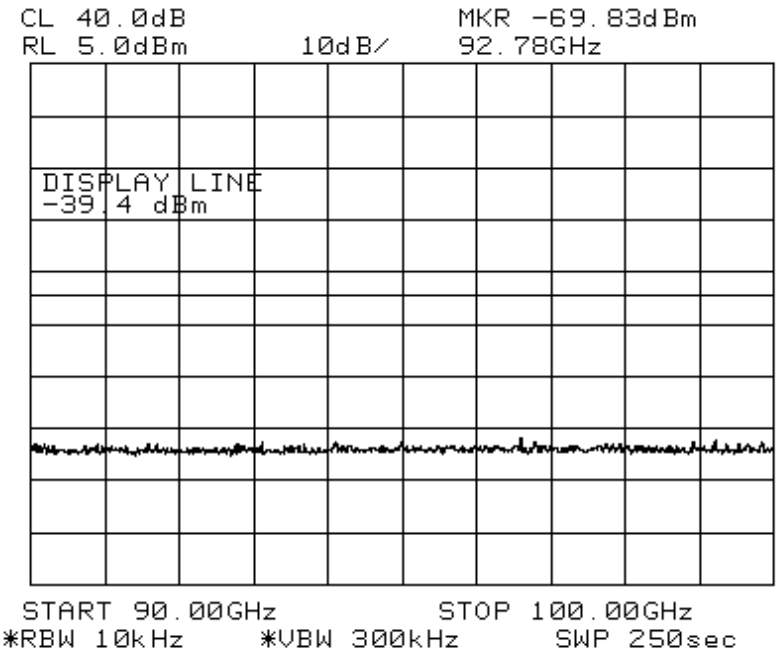
Conducted Spurious at Antenna Port



9R01837
Conducted Spurious at Antenna Port



9R01837
Conducted Spurious at Antenna Port

APPENDIX C: ANTENNA SPEC SHEETS

ETS

Gain and Antenna Factors for Biconical Antenna
Manufactured by EMC Test Systems
Model Number: 3109 Serial Number: 2708
3.0 Meter Calibration Polarization: Horizontal

Frequency (MHz)	Antenna Factor (dB)	Gain Numeric	Gain dBi
20	16.7	0.01	-20.6
30	13.6	0.04	-13.9
40	12.0	0.11	-9.7
50	10.3	0.24	-6.2
60	8.5	0.54	-2.7
70	9.1	0.64	-1.9
80	7.5	1.20	0.8
90	8.5	1.19	0.8
100	9.7	1.12	0.5
110	10.6	1.05	0.2
120	11.6	1.05	0.2
130	12.0	1.12	0.5
140	12.5	1.16	0.7
150	12.5	1.31	1.2
160	12.3	1.57	2.0
170	12.4	1.75	2.4
180	12.2	2.06	3.1
190	12.5	2.08	3.2
200	13.6	1.84	2.6
210	14.3	1.71	2.3
220	15.3	1.51	1.8
230	15.9	1.44	1.6
240	16.4	1.37	1.4
250	16.9	1.35	1.3
260	17.0	1.42	1.5
270	17.2	1.47	1.7
280	17.5	1.45	1.6
290	18.2	1.33	1.2
300	19.1	1.17	0.7

Specification compliance testing factor (3.0 meter spacing) to be added to receiver meter reading in dBV to convert to field intensity in dBV/meter. Calibrated 03 Aug 99 (DD/MM/YYYY). Calibration per ANSI C63.5.

ETS

Gain and Antenna Factors for Log Periodic Antenna
Manufactured by Electro - Metrics
Model Number: LPA-25 Serial Number: 1141
3.0 Meter Calibration Polarization: Horizontal

Frequency (MHz)	Antenna Factor (dB)	Gain Numeric	Gain dBi
200	11.6	2.88	4.6
225	11.1	4.08	6.1
250	12.2	3.96	6.0
275	13.3	3.75	5.7
300	14.8	3.13	5.0
325	14.8	3.68	5.7
350	15.0	4.02	6.0
375	15.3	4.39	6.4
400	15.9	4.29	6.3
425	16.1	4.65	6.7
450	16.6	4.64	6.7
475	17.1	4.60	6.6
500	17.8	4.33	6.4
525	17.8	4.81	6.8
550	18.3	4.73	6.7
575	18.6	4.76	6.8
600	18.8	4.84	6.9
625	19.1	5.02	7.0
650	19.6	4.84	6.9
675	21.1	3.73	5.7
700	21.4	3.75	5.7
725	21.5	3.91	5.9
750	21.4	4.26	6.3
775	21.4	4.54	6.6
800	21.5	4.72	6.7
825	22.0	4.49	6.5
850	22.3	4.44	6.5
875	22.7	4.36	6.4
900	22.8	4.41	6.4
925	23.1	4.41	6.4
950	23.6	4.17	6.2
975	24.2	3.77	5.8
1000	24.6	3.66	5.6

Specification compliance testing factor (3.0 meter spacing) to be added to receiver meter reading in dBV to convert to field intensity in dBV/meter. Calibrated 04 Aug 99 (DD/MM/YYYY) Calibration per ANSI C63.5.

EMC TEST SYSTEMS LP
A Subsidiary of ESCO Electronics Corporation

Gain and Antenna Factors for Double Ridged Guide Antenna
Manufactured by EMC Test Systems
Model Number: 3115 Serial Number: 4336
3.0 Meter Calibration

Frequency (MHz)	Antenna Factor (dB)	Gain Numeric	Gain dBi
1000	25.7	2.80	4.5
1500	27.0	4.76	6.8
2000	29.0	5.24	7.2
2500	29.9	6.65	8.2
3000	31.6	6.47	8.1
3500	32.9	6.53	8.1
4000	33.8	6.98	8.4
4500	34.3	7.90	9.0
5000	35.4	7.51	8.8
5500	36.1	7.83	8.9
6000	36.4	8.58	9.3
6500	36.5	9.84	9.9
7000	37.5	9.22	9.6
7500	38.3	8.75	9.4
8000	38.4	9.61	9.8
8500	38.8	10.03	10.0
9000	38.5	9.50	9.8
9500	38.7	10.15	10.1
10000	40.0	10.50	10.2
10500	40.1	11.37	10.6
11000	40.2	12.05	10.8
11500	39.9	14.37	11.6
12000	39.5	15.98	12.0
12500	40.9	13.21	11.2
13000	41.4	12.89	11.1
13500	41.6	13.25	11.2
14000	41.1	15.87	12.0
14500	41.6	15.42	11.9
15000	41.9	15.29	11.8
15500	39.6	27.70	14.4
16000	39.4	30.96	14.9
16500	40.5	25.42	14.1
17000	42.6	16.58	12.2
17500	44.2	12.30	10.9
18000	44.9	11.10	10.5

Specification compliance testing factor (3.0 meter spacing) to be added to receiver meter reading in dBµV to convert to field intensity in dBµV/meter. Calibrated 30 Oct 97 (DD/MM/YYYY). Calibration per ANSI C63.5.

10/08/87 09:54 MULTILEK INC OTTAWA 002
10-07 07 15:44 2733 8826 P02

ELECTRO-METRICS
STANDARD
GAIN AND ANTENNA FACTORS
MODEL BH-50-1
HORN ANTENNA

FREQUENCY (MHz)	ANTENNA FACTOR (dB)	GAIN (dB)
18.00	40.28	15.02
18.25	40.31	15.11
18.50	40.34	15.20
18.75	40.37	15.29
19.00	40.40	15.38
19.25	40.42	15.46
19.50	40.45	15.55
19.75	40.47	15.64
20.00	40.49	15.73
20.25	40.51	15.82
20.50	40.53	15.91
20.75	40.55	15.99
21.00	40.56	16.08
21.25	40.58	16.17
21.50	40.59	16.26
21.75	40.60	16.35
22.00	40.61	16.44
22.25	40.62	16.52
22.50	40.63	16.61
22.75	40.64	16.70
23.00	40.65	16.79
23.25	40.65	16.88
23.50	40.66	16.96
23.75	40.66	17.05
24.00	40.66	17.14
24.25	40.66	17.23
24.50	40.67	17.32
24.75	40.67	17.41
25.00	40.66	17.49
25.25	40.66	17.58
25.50	40.66	17.67
25.75	40.66	17.76
26.00	40.65	17.85
26.25	40.65	17.94
26.50	40.64	18.02

10/08/87 09:59 MULTILEK INC OTTAWA 003
10-07-87 15:45 ? 2753 #825 P03

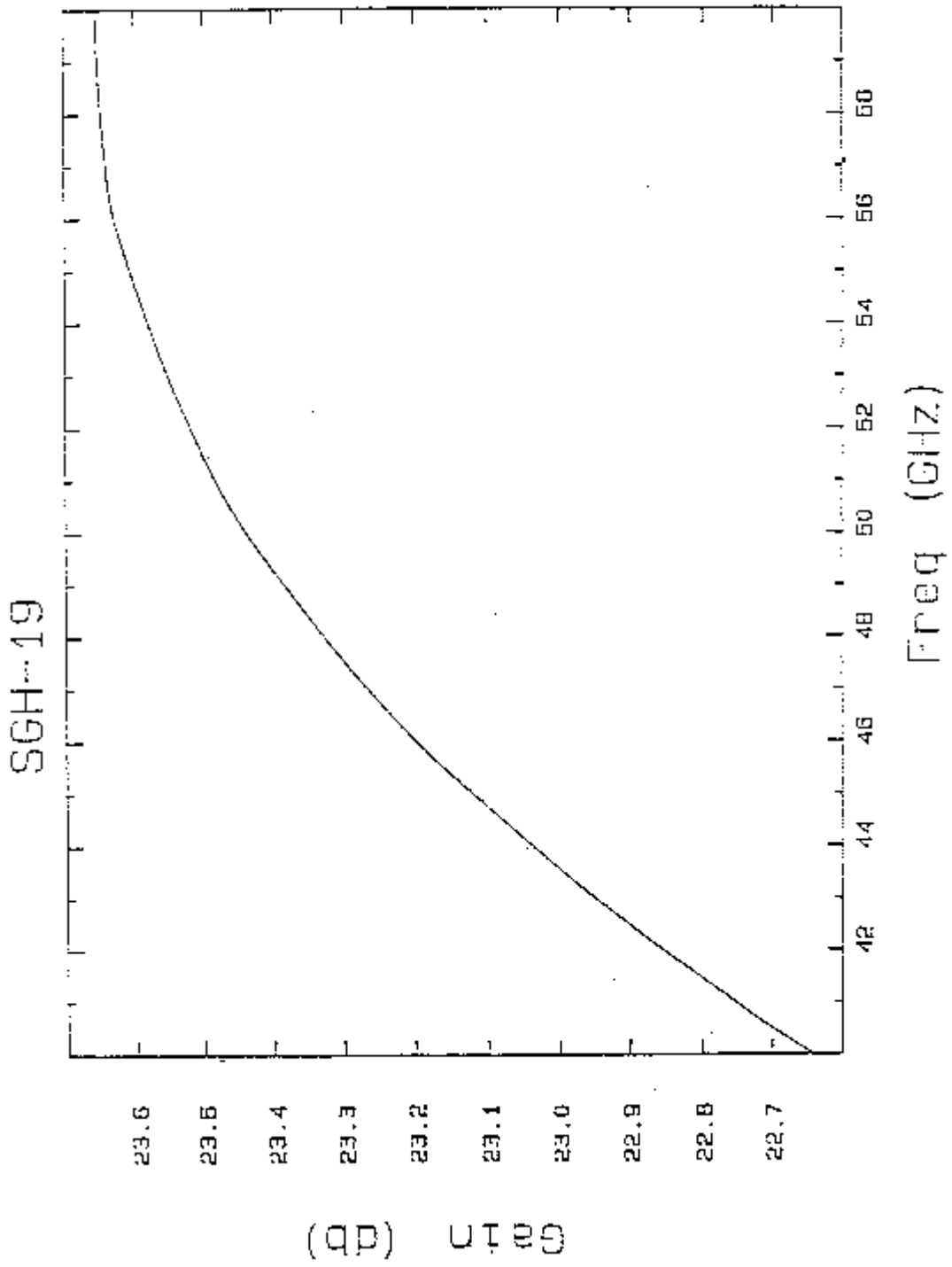
ELECTRO-METRICS
STANDARD
GAIN AND ANTENNA FACTORS
MODEL SH-50-2
HORN ANTENNA

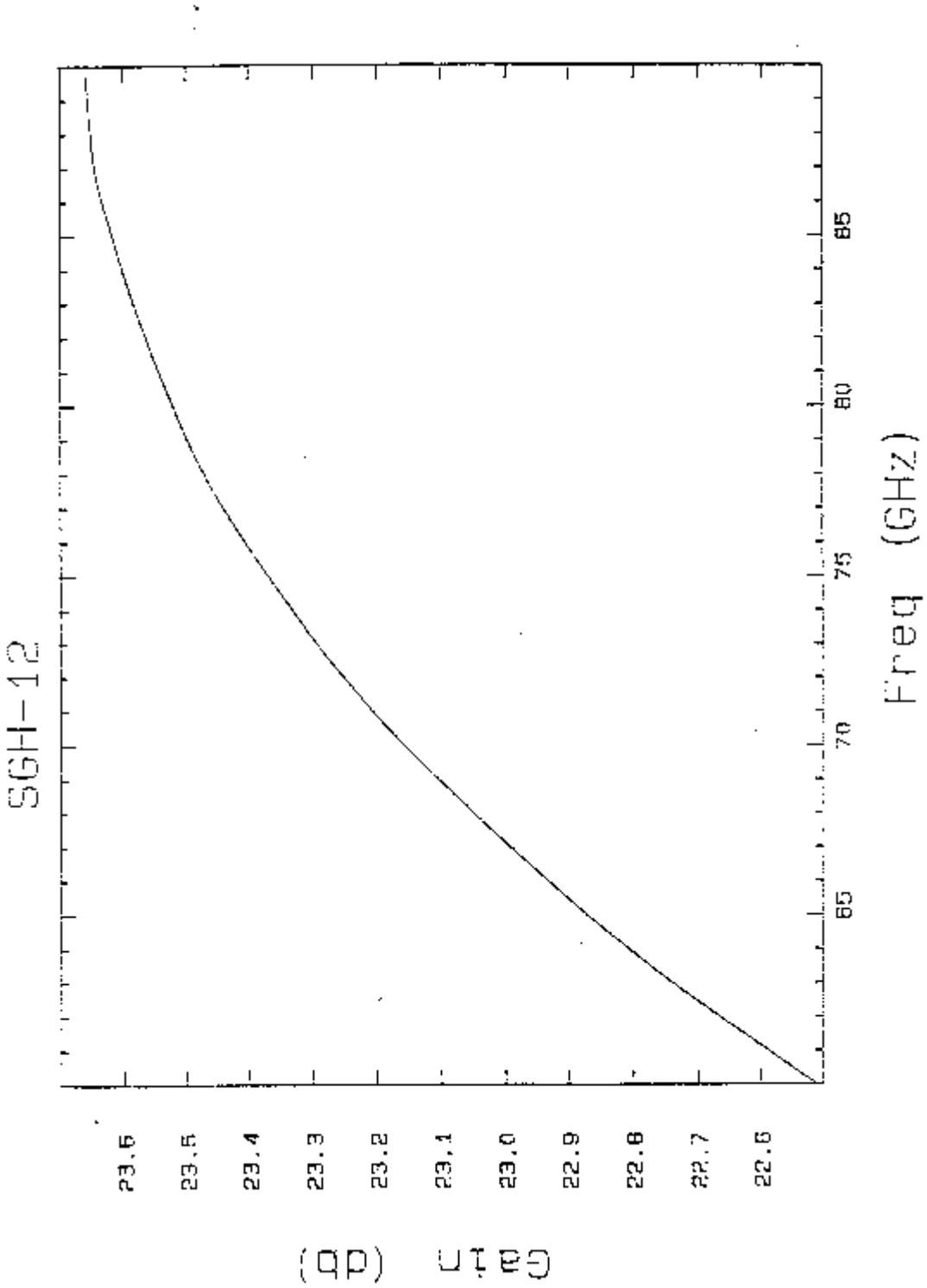
FREQUENCY (MHz)	ANTENNA FACTOR (dB)	GAIN (dB)
26.50	43.66	15.00
26.75	43.69	15.06
27.00	43.72	15.11
27.25	43.74	15.17
27.50	43.76	15.22
27.75	43.79	15.28
28.00	43.81	15.33
28.25	43.83	15.39
28.50	43.85	15.44
28.75	43.87	15.50
29.00	43.89	15.56
29.25	43.91	15.61
29.50	43.93	15.67
29.75	43.95	15.72
30.00	43.96	15.78
30.25	43.98	15.83
30.50	44.00	15.89
30.75	44.01	15.94
31.00	44.03	16.00
31.25	44.04	16.06
31.50	44.06	16.11
31.75	44.07	16.17
32.00	44.08	16.22
32.25	44.09	16.28
32.50	44.10	16.33
32.75	44.12	16.39
33.00	44.13	16.44
33.25	44.14	16.50
33.50	44.15	16.56
33.75	44.15	16.61
34.00	44.16	16.67
34.25	44.17	16.72
34.50	44.18	16.78
34.75	44.19	16.83
35.00	44.19	16.89
35.25	44.20	16.94
35.50	44.20	17.00
35.75	44.21	17.06
36.00	44.21	17.11
36.25	44.22	17.17
36.50	44.22	17.22
36.75	44.23	17.28
37.00	44.23	17.33
37.25	44.23	17.39

16-07-97 15:46 T- 2753 8826 P04

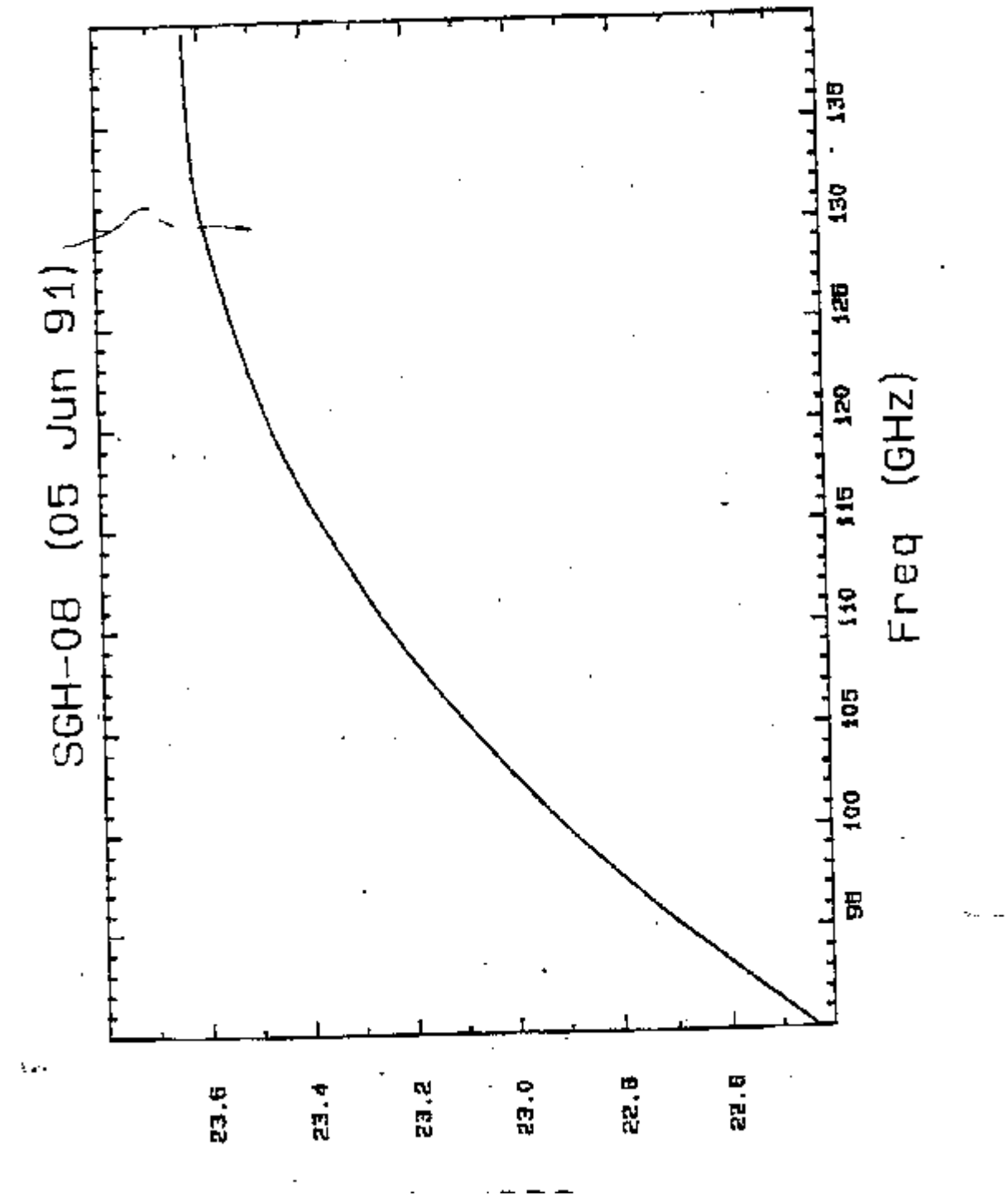
ELECTRO-METRICS
STANDARD
GAIN AND ANTENNA FACTORS
MODEL EH-50-2
HORN ANTENNA
(CONT'D)

FREQUENCY (MHz)	ANTENNA FACTOR (dB)	GAIN (dB)
37.50	44.24	17.44
37.75	44.24	17.50
38.00	44.24	17.56
38.25	44.24	17.61
38.50	44.24	17.67
38.75	44.24	17.72
39.00	44.24	17.78
39.25	44.24	17.83
39.50	44.24	17.89
39.75	44.24	17.94
40.00	44.24	18.00


SGH-19
Gain (dB)
23.6
23.5
23.4
23.3
23.2
23.1
23.0
22.9
22.8
22.7
Freq (GHz)
42
44
46
48
50
52
54
56
58
60


SGH-12
Gain (dB)
23.6
23.5
23.4
23.3
23.2
23.1
23.0
22.9
22.8
22.7
22.6
65
70
75
80
85
Freq (GHz)

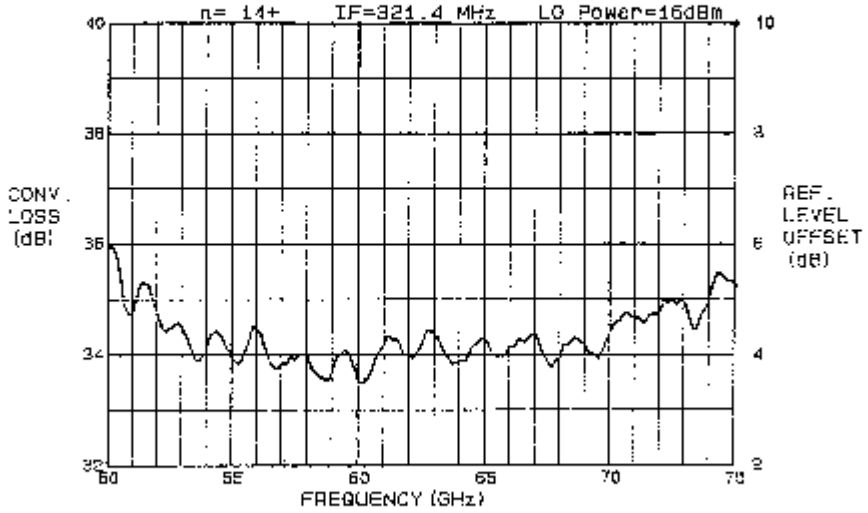
SEP-24-1999 08:32 KIL UTTAWA 15137379691 P.02/02



HEWLETT PACKARD

11970V CALIBRATION

SER NO. : 2521A01150 FEB. 25, 1997 (See cal. sticker)



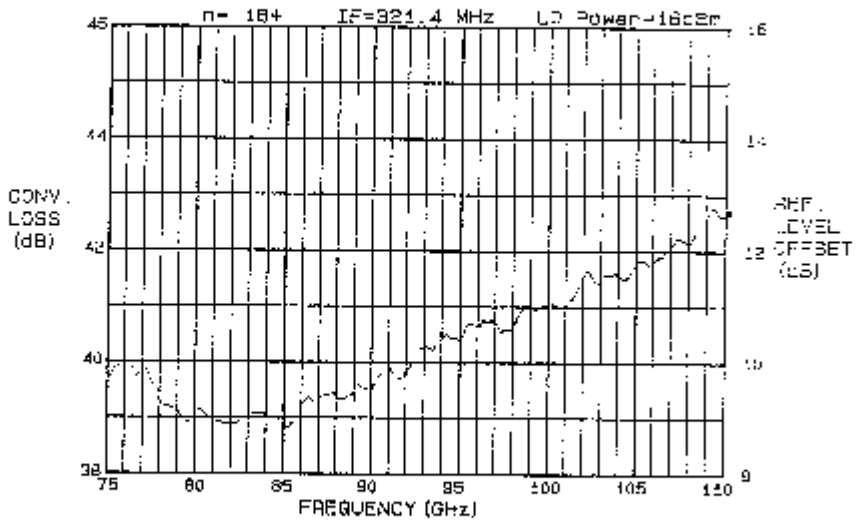
FREQ.	CONV. LOSS	REF. LVL OFS	FREQ.	CONV. LOSS	REF. LVL OFS
60.00	35.9	5.9	63.00	34.4	4.4
60.50	35.4	5.4	63.50	34.0	4.0
61.00	34.8	4.8	64.00	33.9	3.9
61.50	35.3	5.3	64.50	34.2	4.2
62.00	34.8	4.8	65.00	34.3	4.3
62.50	34.5	4.5	65.50	34.0	4.0
63.00	34.5	4.5	66.00	34.2	4.2
63.50	34.0	4.0	66.50	34.3	4.3
64.00	34.2	4.2	67.00	34.4	4.4
64.50	34.4	4.4	67.50	33.9	3.9
65.00	34.0	4.0	68.00	34.0	4.0
65.50	34.0	4.0	68.50	34.3	4.3
66.00	34.5	4.5	69.00	34.2	4.2
66.50	33.9	3.9	69.50	34.0	4.0
67.00	33.9	3.9	70.00	34.5	4.5
67.50	33.9	3.9	70.50	34.7	4.7
68.00	34.0	4.0	71.00	34.7	4.7
68.50	33.6	3.6	71.50	34.7	4.7
69.00	33.7	3.7	72.00	34.8	4.8
69.50	34.1	4.1	72.50	35.0	5.0
70.00	33.5	3.5	73.00	34.9	4.9
70.50	33.7	3.7	73.50	34.5	4.5
71.00	34.2	4.2	74.00	35.1	5.1
71.50	34.3	4.3	74.50	35.5	5.5
72.00	34.0	4.0	75.00	35.3	5.3
72.50	34.2	4.2			

RECOMMENDED CALIBRATION CYCLE: THREE YEARS

HEWLETT PACKARD

11970W CALIBRATION

SER NO. : 2521A01469 OCT. 13. 1988



FREQ.	CONV. LOSS	REF. LVL OFS	FREQ.	CONV. LOSS	REF. LVL OFS
75.00	39.7	9.7	93.00	40.3	10.3
76.00	40.0	10.0	94.00	40.5	10.5
77.00	39.9	9.9	95.00	40.4	10.4
78.00	39.2	9.2	96.00	40.6	10.6
79.00	39.1	9.1	97.00	40.7	10.7
80.00	39.1	9.1	98.00	40.7	10.7
81.00	38.9	8.9	99.00	40.9	10.9
82.00	38.9	8.9	100.00	41.1	11.1
83.00	39.1	9.1	101.00	41.1	11.1
84.00	39.0	9.0	102.00	41.6	11.6
85.00	38.8	8.8	103.00	41.5	11.5
86.00	39.3	9.3	104.00	41.5	11.5
87.00	39.4	9.4	105.00	41.8	11.8
88.00	39.3	9.3	106.00	41.8	11.8
89.00	39.6	9.6	107.00	42.1	12.1
90.00	39.6	9.6	108.00	42.1	12.1
91.00	39.9	9.9	109.00	42.7	12.7
92.00	39.9	9.9	110.00	42.7	12.7

RECOMMENDED CALIBRATION CYCLE: THREE YEARS

REFERENCES

[1] FCC, 47 CFR Part101 Fixed Microwave Services, edition 10-1-98

[2] FCC, 47 CFR Part 2 Frequency Allocation and Radio Treaty Matters: General Rules and Regulations, edition 10-1-98

[3] ANSI, C63.4, Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz, 1992.

[4] Bellcore**,** GR-1089-CORE Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 1, November 1994.

[5] Bellcore**,** GR-1089-ILR Revised and Additional Criteria for GR-1089-CORE, Issue 1A, JULY 1996.

[6] Bellcore, TR-NWT-001089 Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 1, October, 1991.

[7] FCC, 47 CFR Part 15 Radio Frequency Devices, 1995

[8] Industry Canada, ICES-003 Interference-Causing Equipment Standard DIGITAL APPARATUS, Issue 2, Revision 1, 1995.

[9] ISO, GUIDE 25 General requirements for the competence of calibration and testing laboratories, Third Edition, 1990.

HISTORY

This document was created from the document template GQP0001, version 8.2.

Version	Date	Person	Reason
1.0	99.10.25	V.Scaringi	Issued