MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Computational Systems, Incorporated**

MODEL: **RF Smart Sensor, 4100, 001 Eng. Proto**

FCC ID: **NL54100**

DATE: **January 15, 1998**

This report concerns (check one): Original grant_X_
Class II change_____

Equipment Type: **_DSS- Spread Spectrum Transceiver_____**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No_X_

If yes, defer until:_____
date

__N.A.__ agrees to notify the Commission by__N.A.____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

United States Technologies, Inc.
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
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GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT) is the Computational Systems, Incorporated Spread Spectrum Transceiver, Model RF Smart Sensor, 4100, 001 Eng. Proto.

1.2 Related Submittal(s)/Grant(s)

The EUT will be used with part of a system to send/receive data. The transceiver presented in this report will be used with another transceiver which has been submitted and approved under FCC ID: NL52400.

The EUT is subject to the following authorizations:

a) Certification as a transceiver
b) Verification as a receiver and digital device

The information contained in this report is presented for the certification & verification authorization(s) for the EUT.

TEST AND MEASUREMENTS

2.1 Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

The sample used for testing was received by U.S. Technologies on December 17, 1998 in good condition.

Due to complexities involved with dismantling the unit to program channel selection, CSI provided separate preprogrammed units, four were for different transmit channels and one for receive mode of operation.

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

2.3 Test Equipment

Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

No modifications were made by US Tech, to bring the EUT into compliance with FCC Part 15, Class B Limits for the transmitter portion of the EUT or the Class A Digital Device Requirements.

FIGURE 1

TEST CONFIGURATION

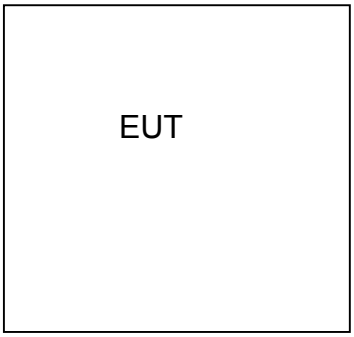

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FIGURE 2a

Photograph(s) for Spurious Emissions (Front)

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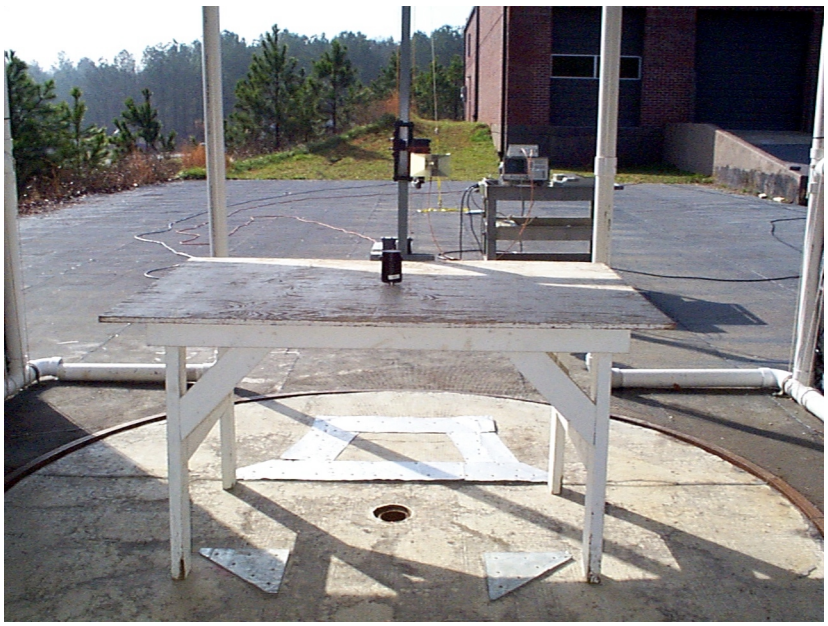
FIGURE 2b

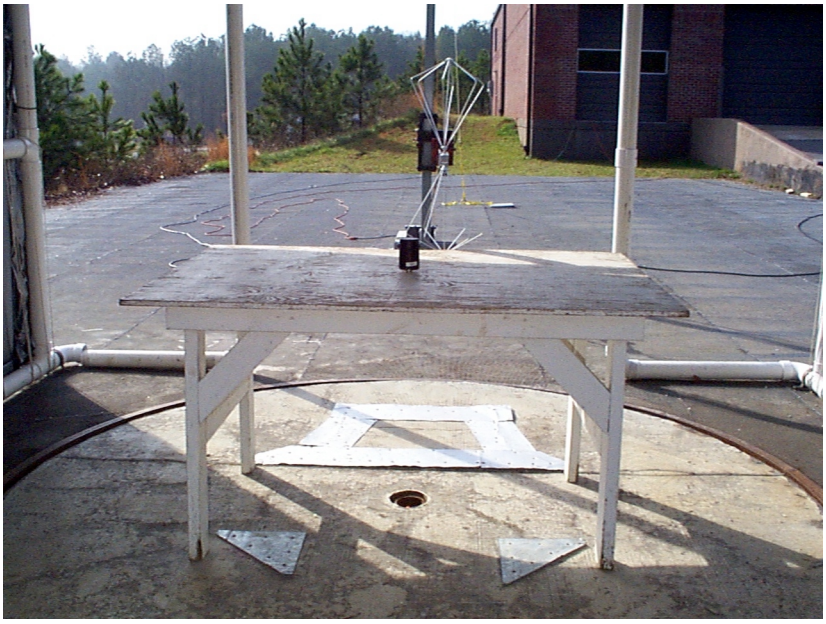
Photograph(s) for Spurious Emissions (Back)



Test Date: January 15, 1998
UST Project: 98-672
Customer: Computational Systems, Incorporated
Model: RF Smart Sensor, 4100, 001 Eng. Proto

FIGURE 2c

Photograph(s) for Digital Device Emissions (Front)



Test Date: January 15, 1998
UST Project: 98-672
Customer: Computational Systems, Incorporated
Model: RF Smart Sensor, 4100, 001 Eng. Proto

FIGURE 2d

Photograph(s) for Digital Device Emissions (Back)

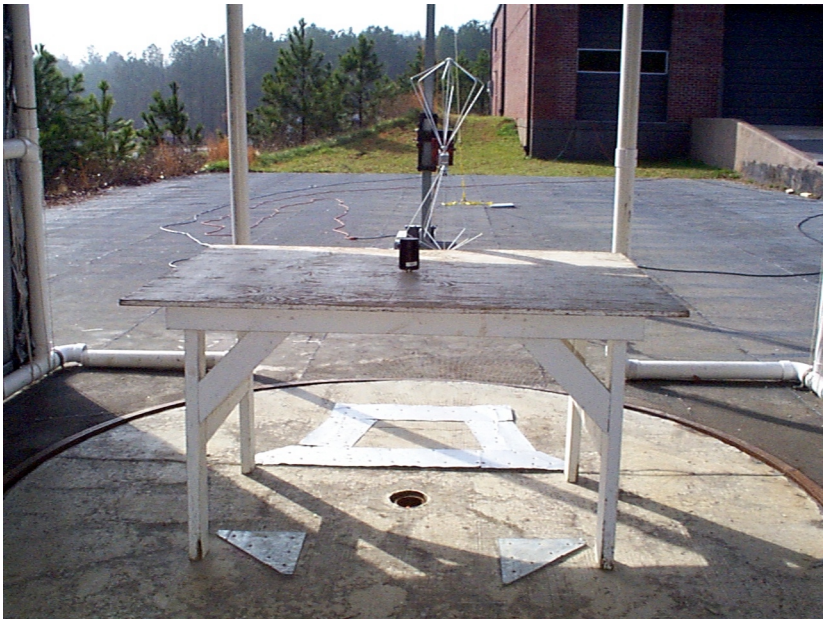


TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Transmitter Computational Systems, Incorporated (EUT)	4100	14427, 14424, 14399, 14411, & 14396	NL54100 (Pending)	None

TABLE 2
TEST INSTRUMENTS

TYPE	MANUFACTURER	MODEL	SN.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
BILOG	CHASE	CBL6112A	2238
LISN	SOLAR ELE.	8012	865577
LISN	SOLAR ELE.	8028	910494
LISN	SOLAR ELE.	8028	910495
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
FUNCTION GENERATOR	TEKTRONIX	CFG250	CFG250TW15059
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394

2.6 Antenna Description (Paragraph 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The Model Computational Systems, Incorporated RF Smart Sensor, 4100, 001 Eng. Proto incorporates an internal antenna only.

Manufacturer:	Cushcraft Corporation 48 Perimeter Road P.O. Box 4680 Manchester, NH 03108
Type:	Offset Patch
Model Number:	Custom Made
Gain:	0 dBd
Connector:	Hirose H.FL-R

2.7 Peak power within the band 2400-2483.5 MHz per FCC Section 15.247(b)

Peak power within the band 2400 – 2483.5 MHz has been measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. The results of the measurements are given in Table 3 and Figure 3a through Figure 3c. The spectrum analyzer did not have a RBW greater than the 6 dB bandwidth for the largest Fundamental Bandwidth, therefore this data was taken using the channel power function of the spectrum analyzer.

The EUT did not incorporate any antennas of directional gain greater than 6 dBi, therefore the output power has not been reduced as required by 15.247(b)(3).

TABLE 3
PEAK POWER OUTPUT

Test Date: **January 15, 1998**
UST Project: **98-672**
Customer: **Computational Systems, Incorporated**
Model: **RF Smart Sensor, 4100, 001 Eng. Proto**

Frequency of Fundamental (MHz)	Measurement (dBm)*	Measurement (Watt)*	FCC Limit (Watt)
2.42250	18.17	0.0656	1.0
2.43250	17.14	0.0518	1.0
2.45250	17.07	0.0590	1.0

*** Measurement includes 1.25 cable loss**

Tester
Signature: _____ Name: Tim R. Johnson

Figure 3a.
Peak Power per FCC Section 15.247(b) (Low)

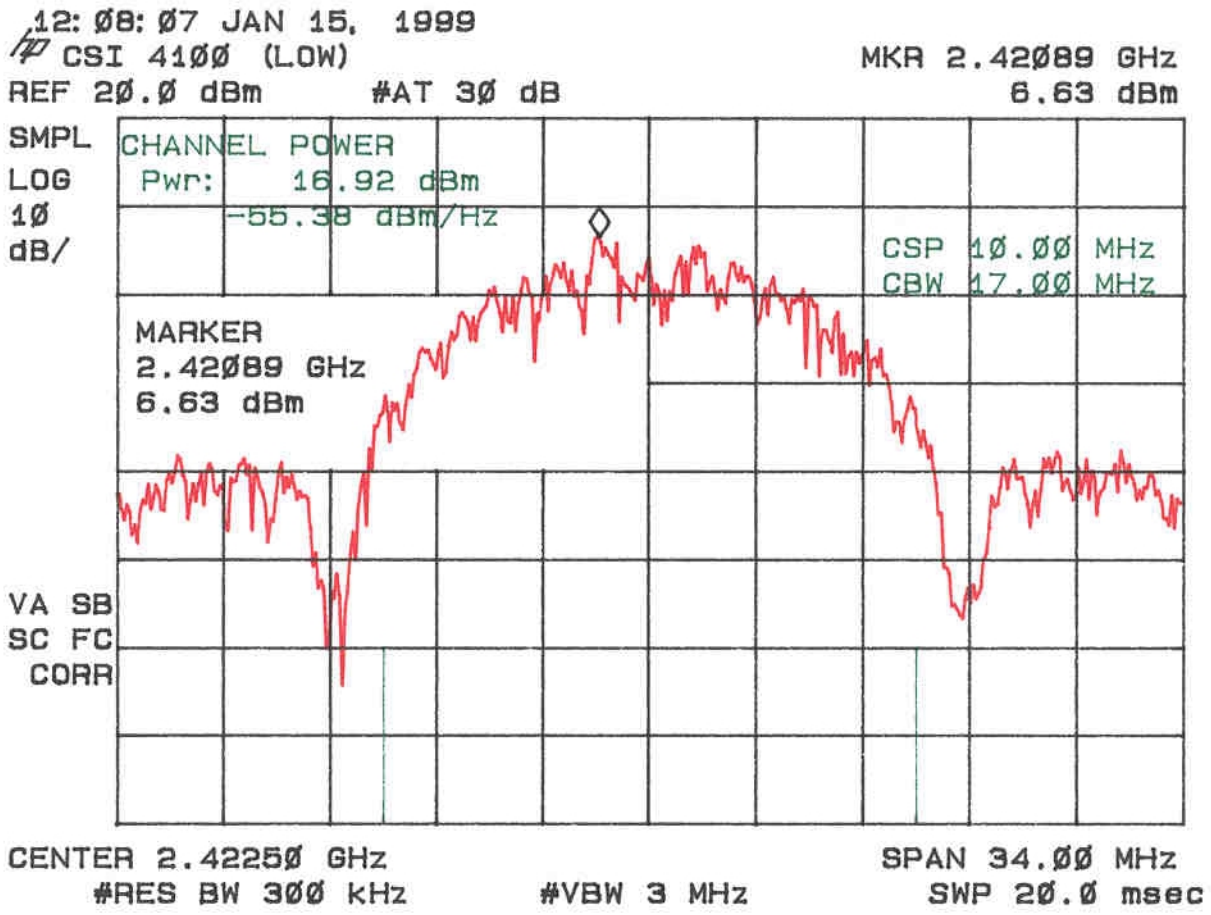


Figure 3b.
Peak Power per FCC Section 15.247(b) (Mid)

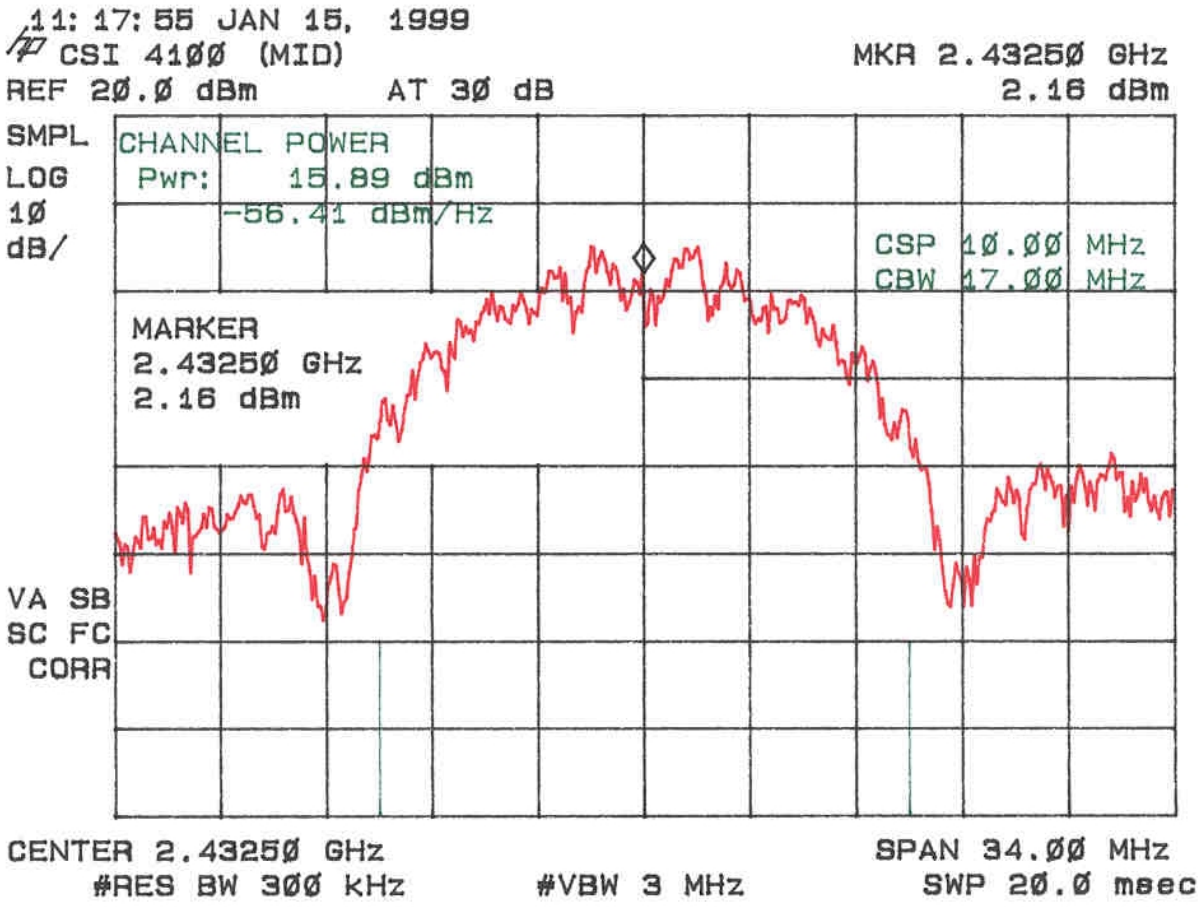
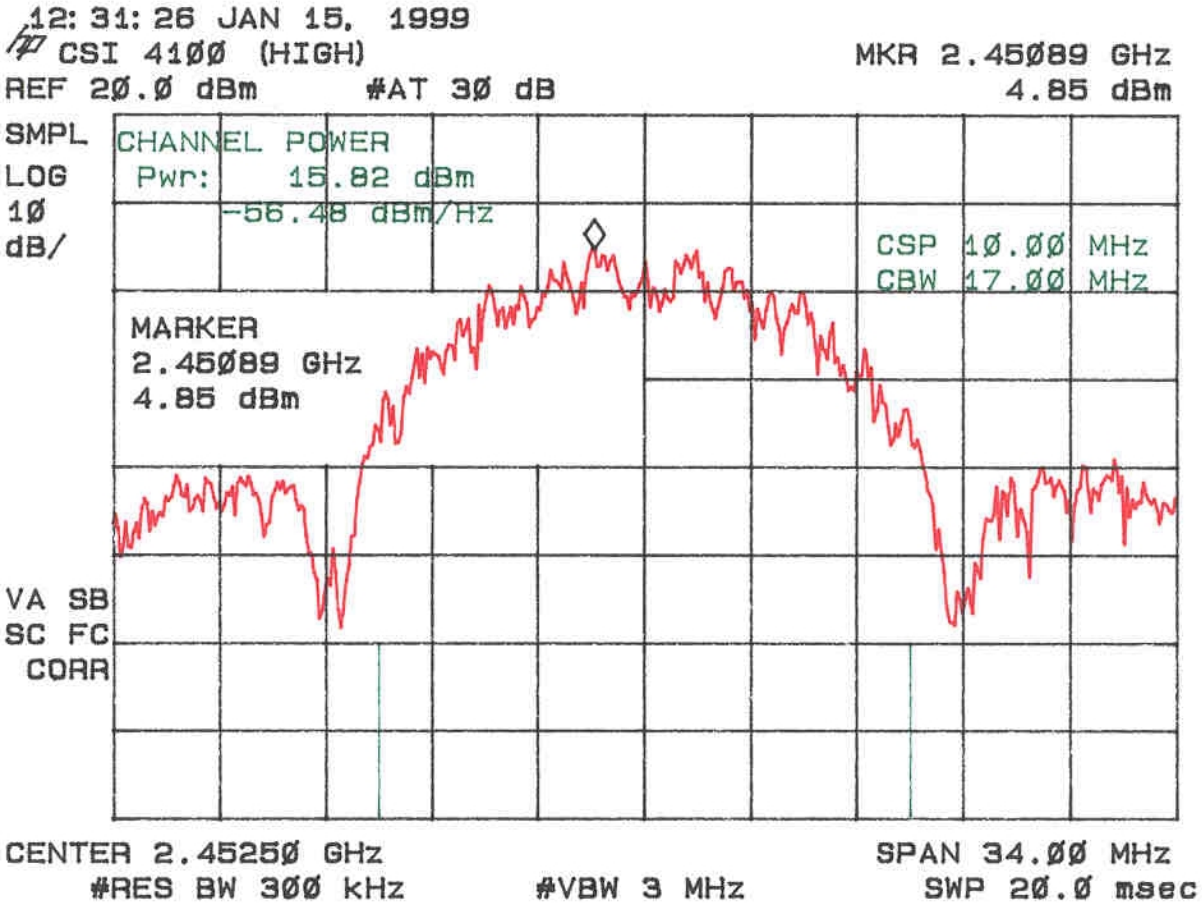


Figure 3c.
Peak Power per FCC Section 15.247(b) (High)



2.8 Antenna Conducted Spurious Emission in the Frequency Range 30 - 25000 MHz (FCC Section 15.247(c))

Spurious emissions in the frequency range 30 - 25000 have been measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. The spectrum analyzer was set for a 50 Ω impedance with the RBW = 100 kHz & VBW > RBW. All spurious emissions were measured to be greater than 20 dB down from the fundamental. The results of conducted spurious emissions are given in Figure 4a through Figure 4l.

Figure 4a
Conducted Spurious Emission 15.247(c) Low

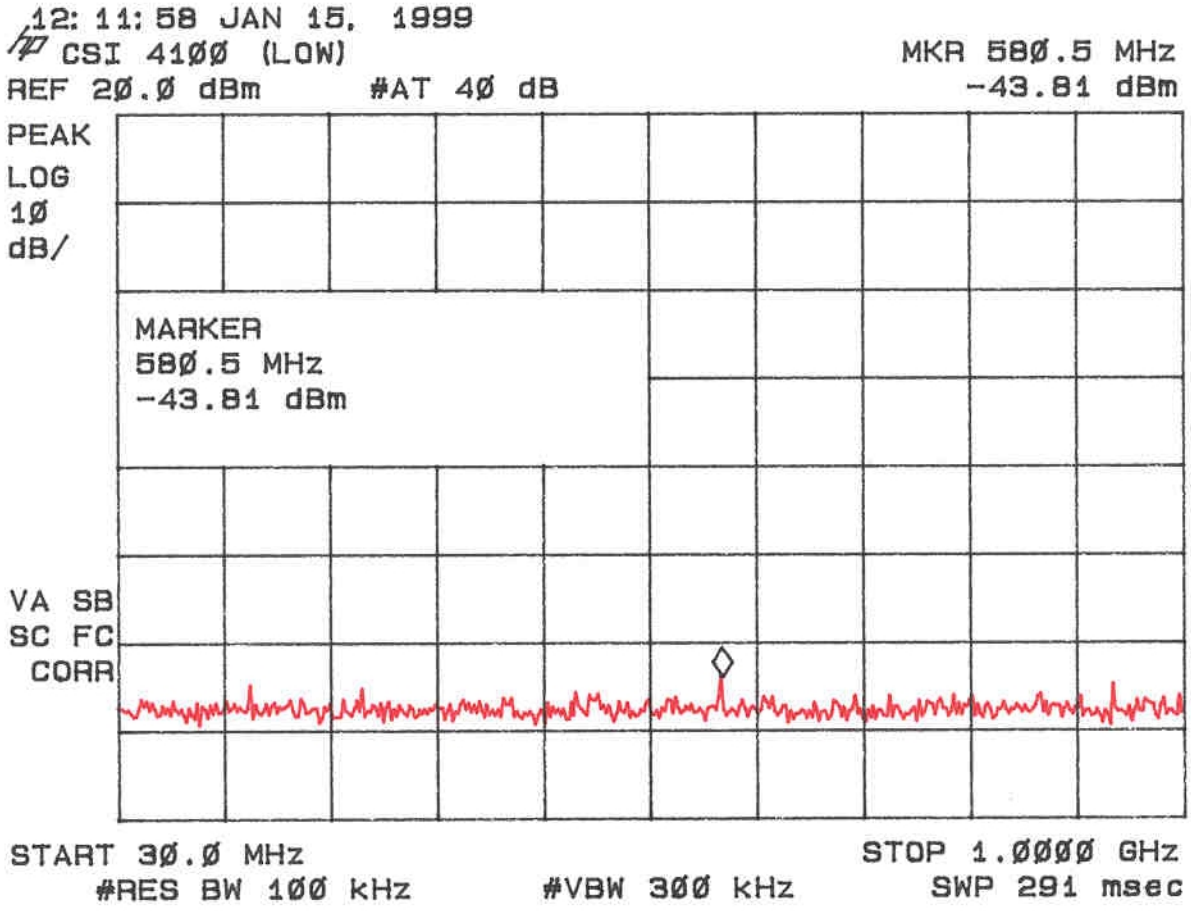


Figure 4b
Conducted Spurious Emission 15.247(c) Low

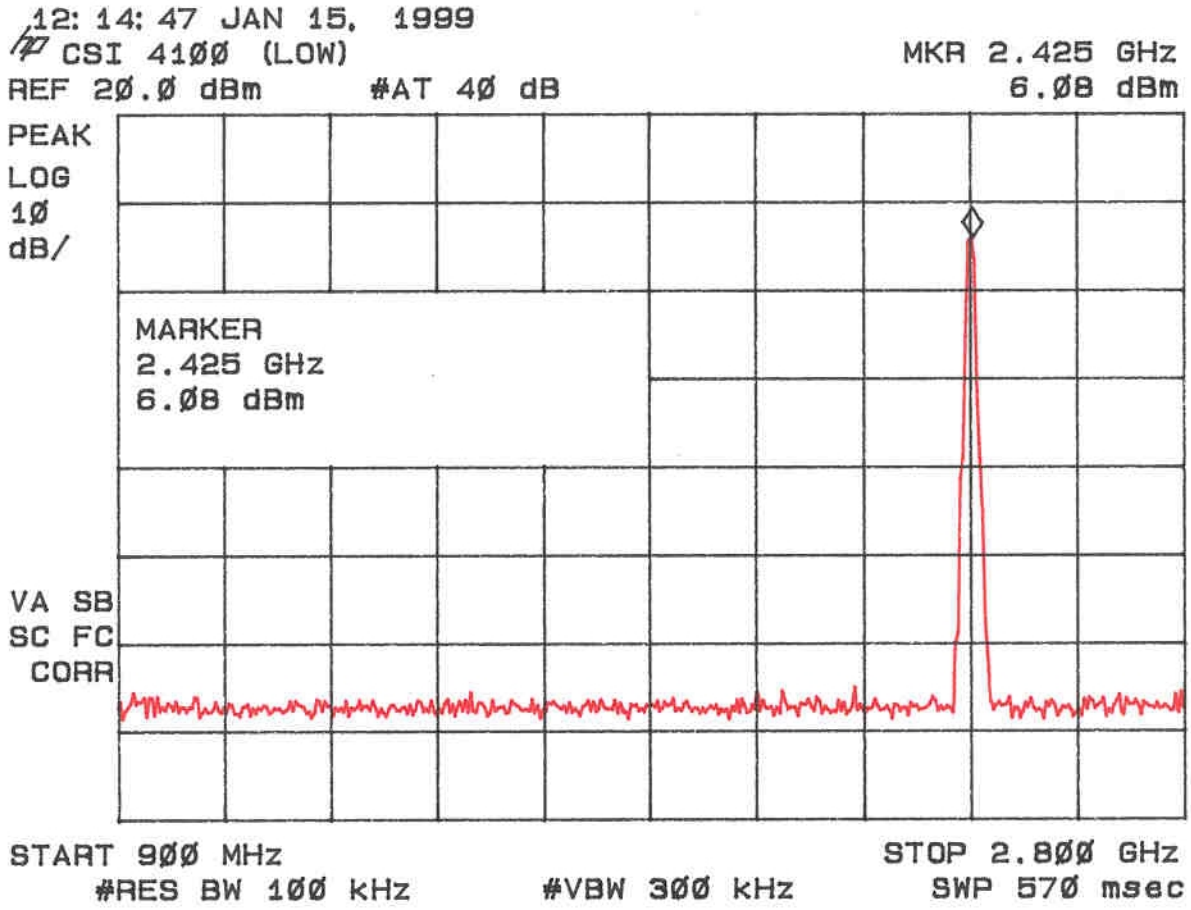


Figure 4c
Conducted Spurious Emission 15.247(c) Low

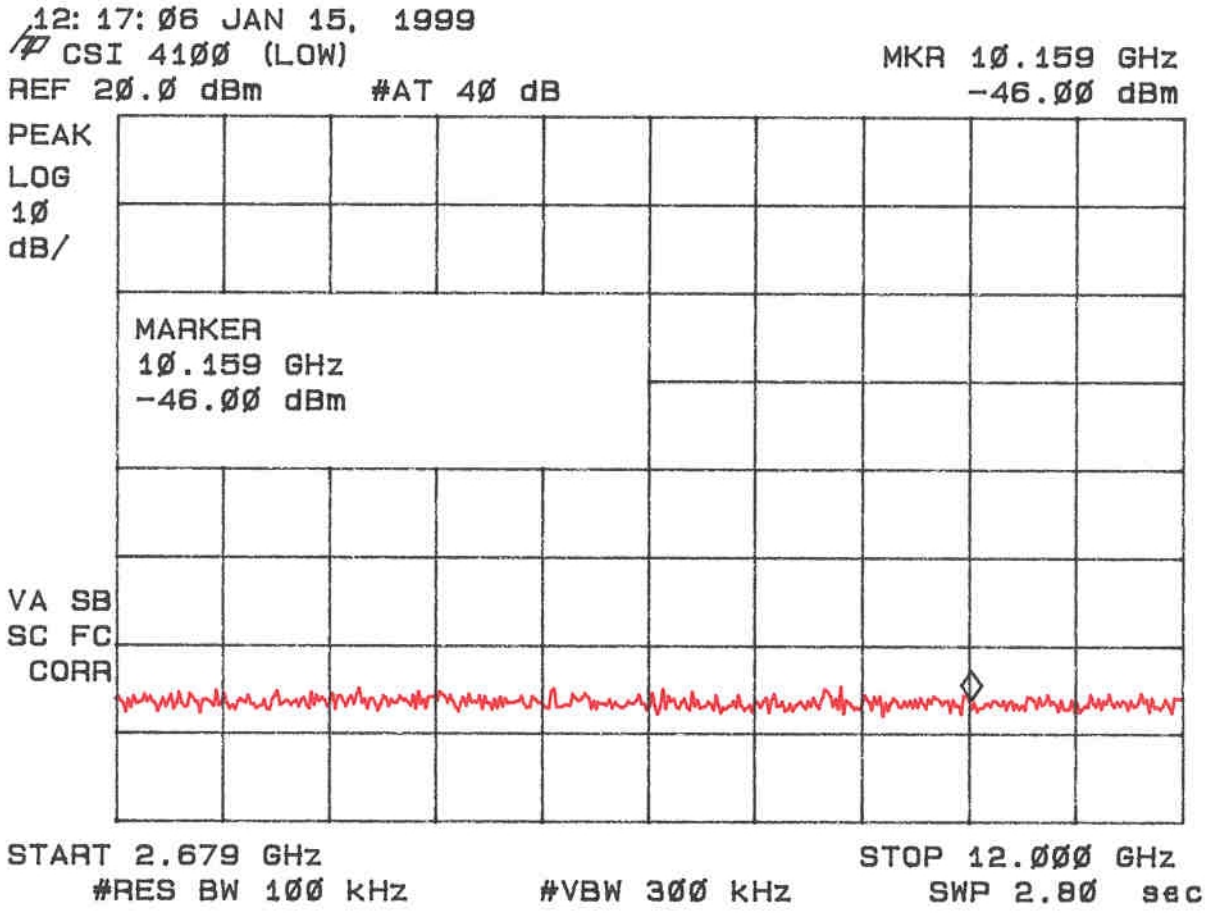


Figure 4d
Conducted Spurious Emission 15.247(c) Low

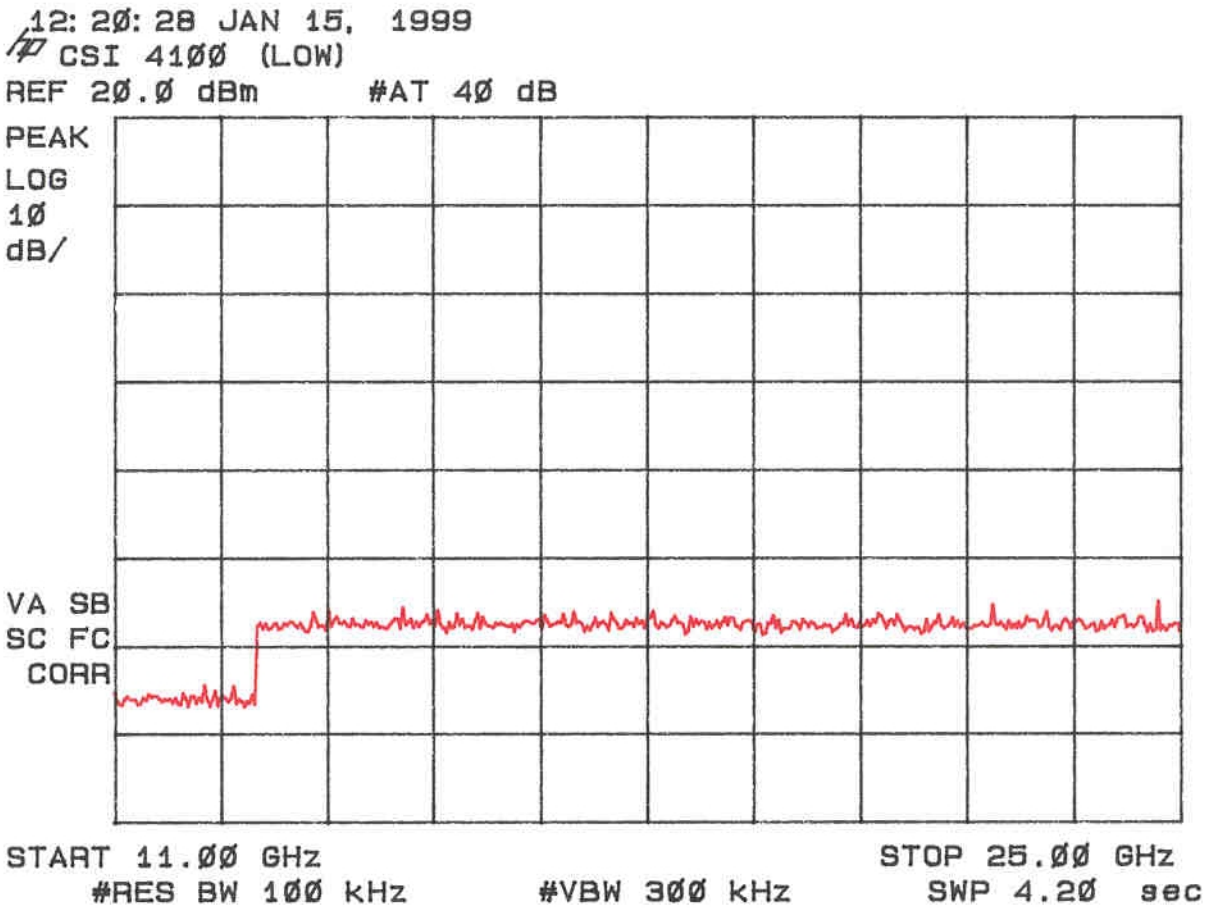


Figure 4e
Conducted Spurious Emission 15.247(c) Mid

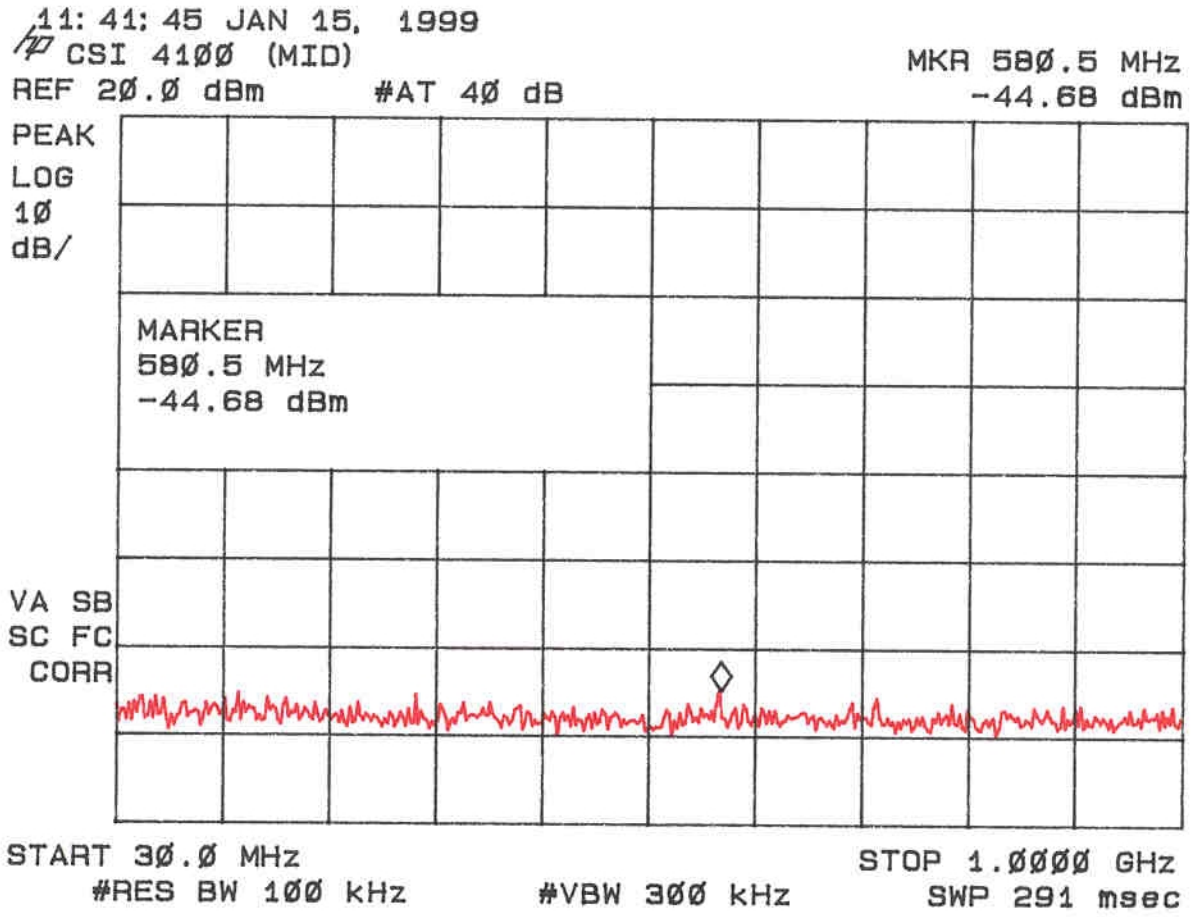


Figure 4f
Conducted Spurious Emission 15.247(c) Mid

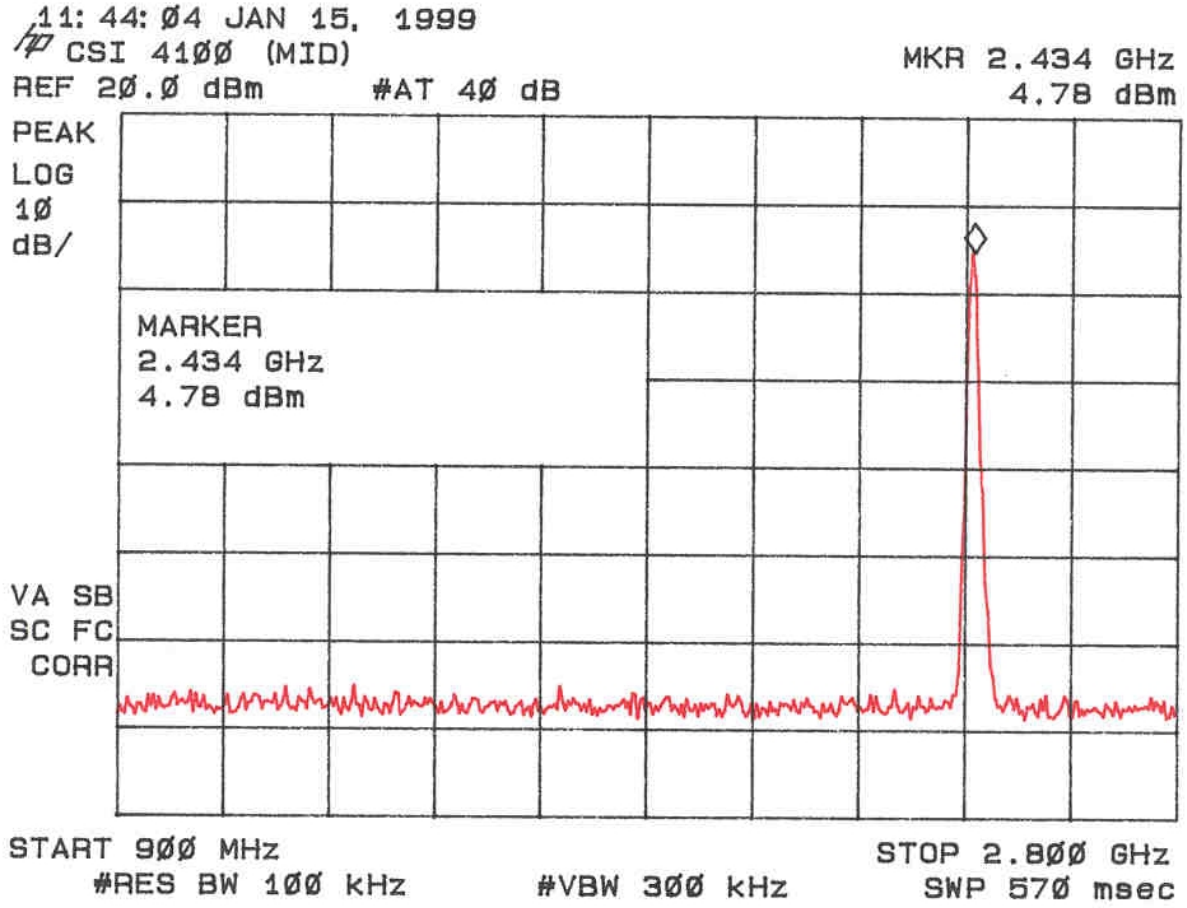


Figure 4g
Conducted Spurious Emission 15.247(c) Mid

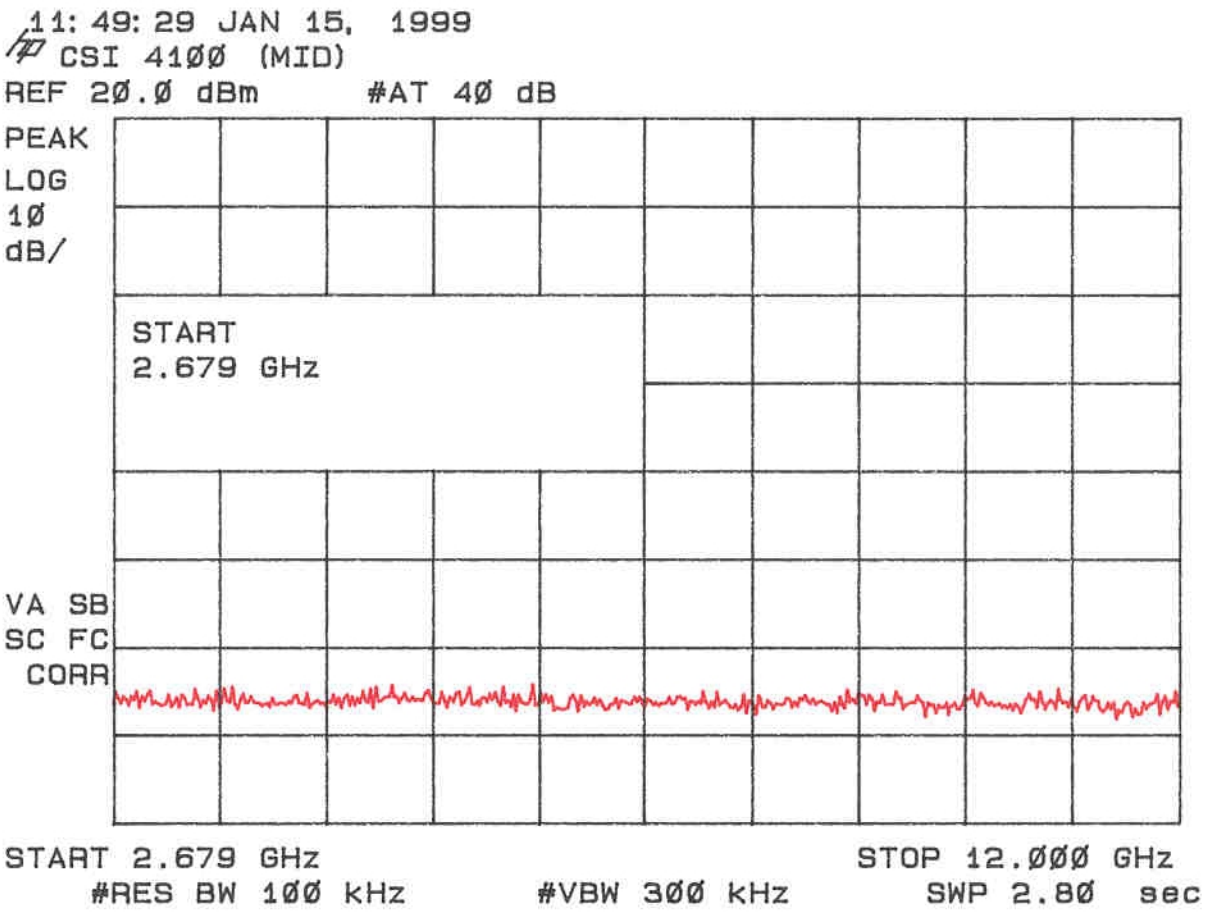


Figure 4h
Conducted Spurious Emission 15.247(c) Mid

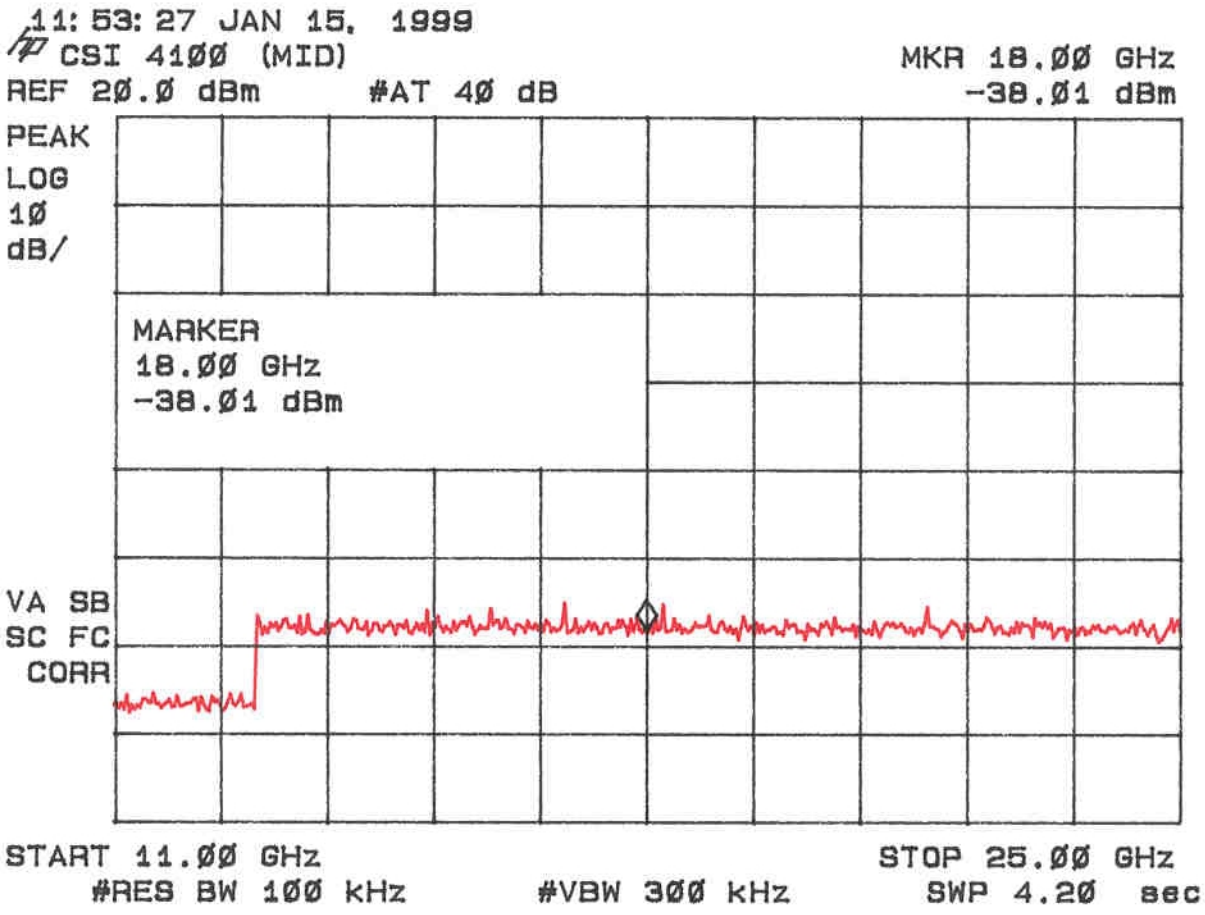


Figure 4i
Conducted Spurious Emission 15.247(c) High

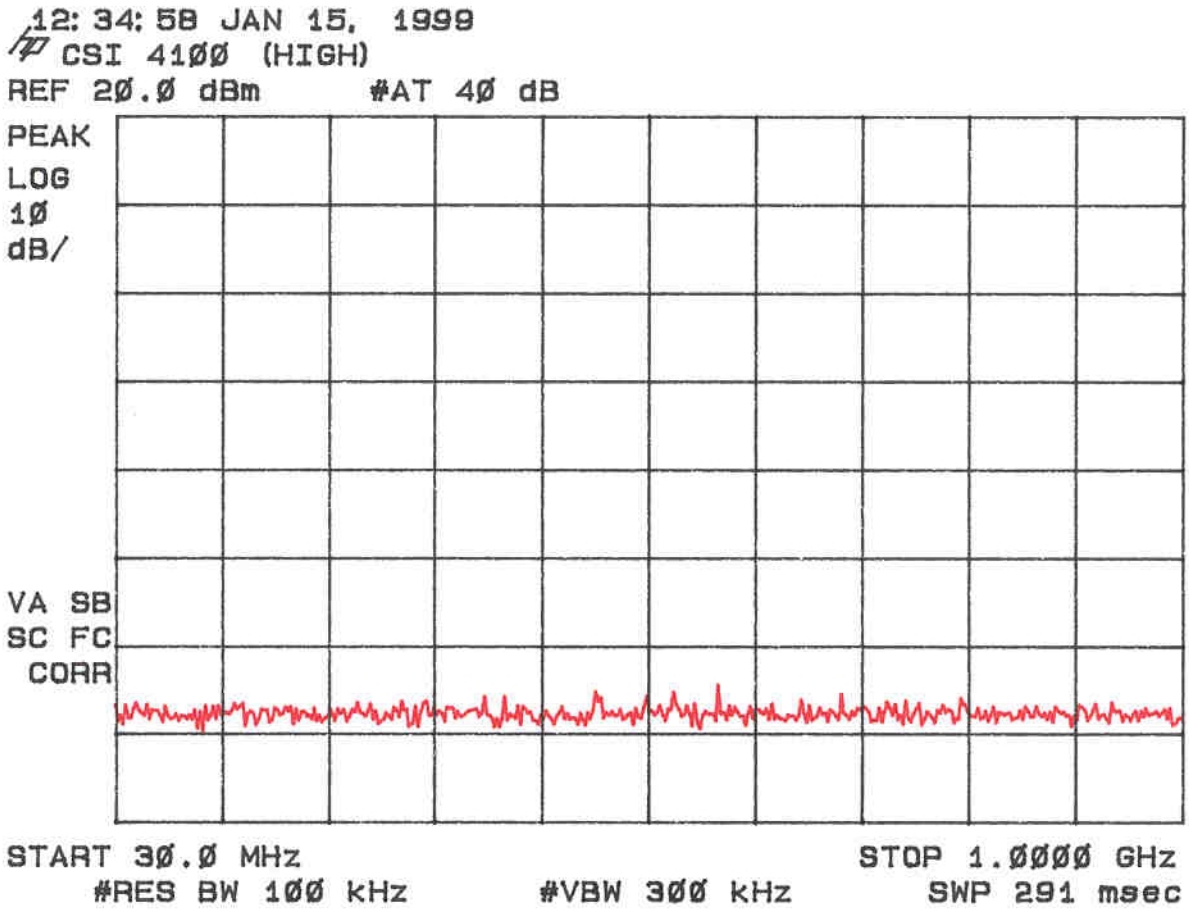


Figure 4j
Conducted Spurious Emission 15.247(c) High

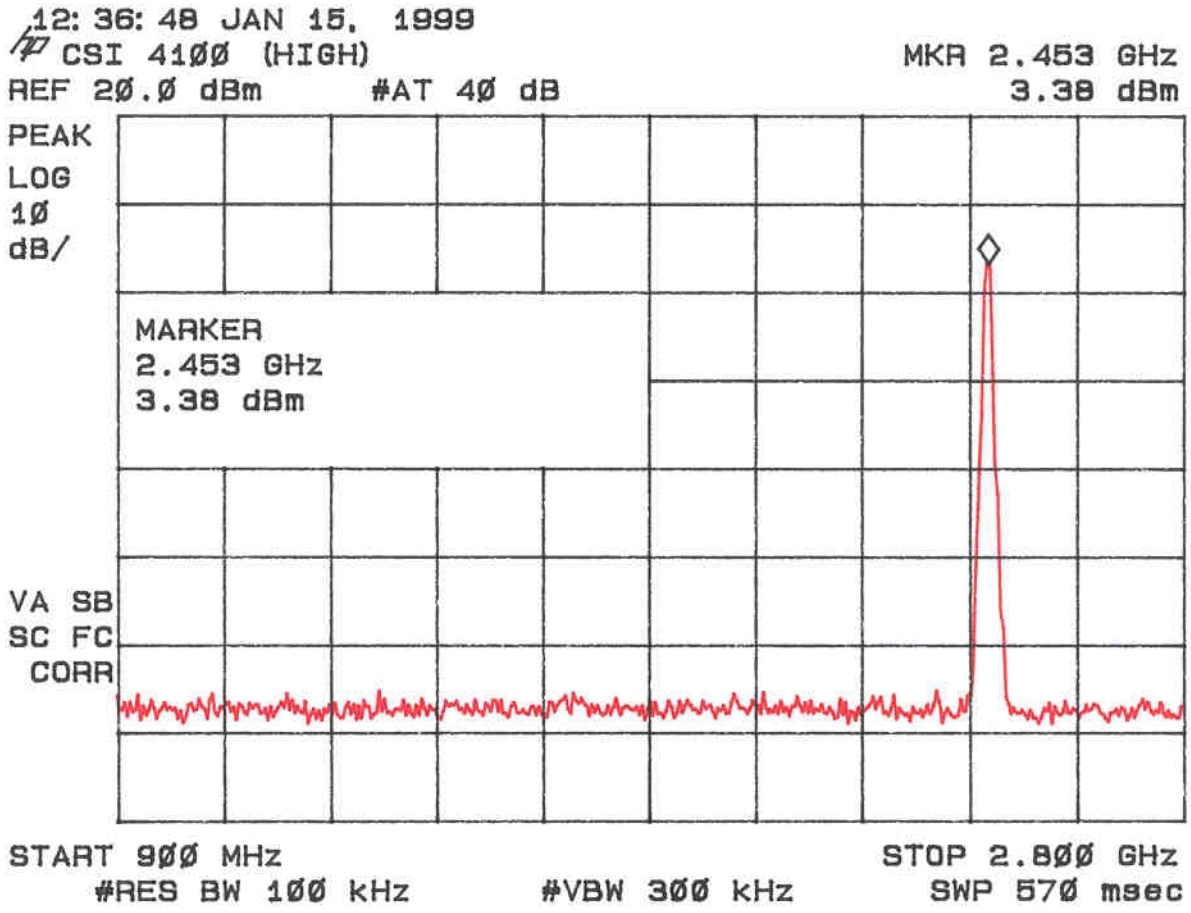


Figure 4k
Conducted Spurious Emission 15.247(c) High

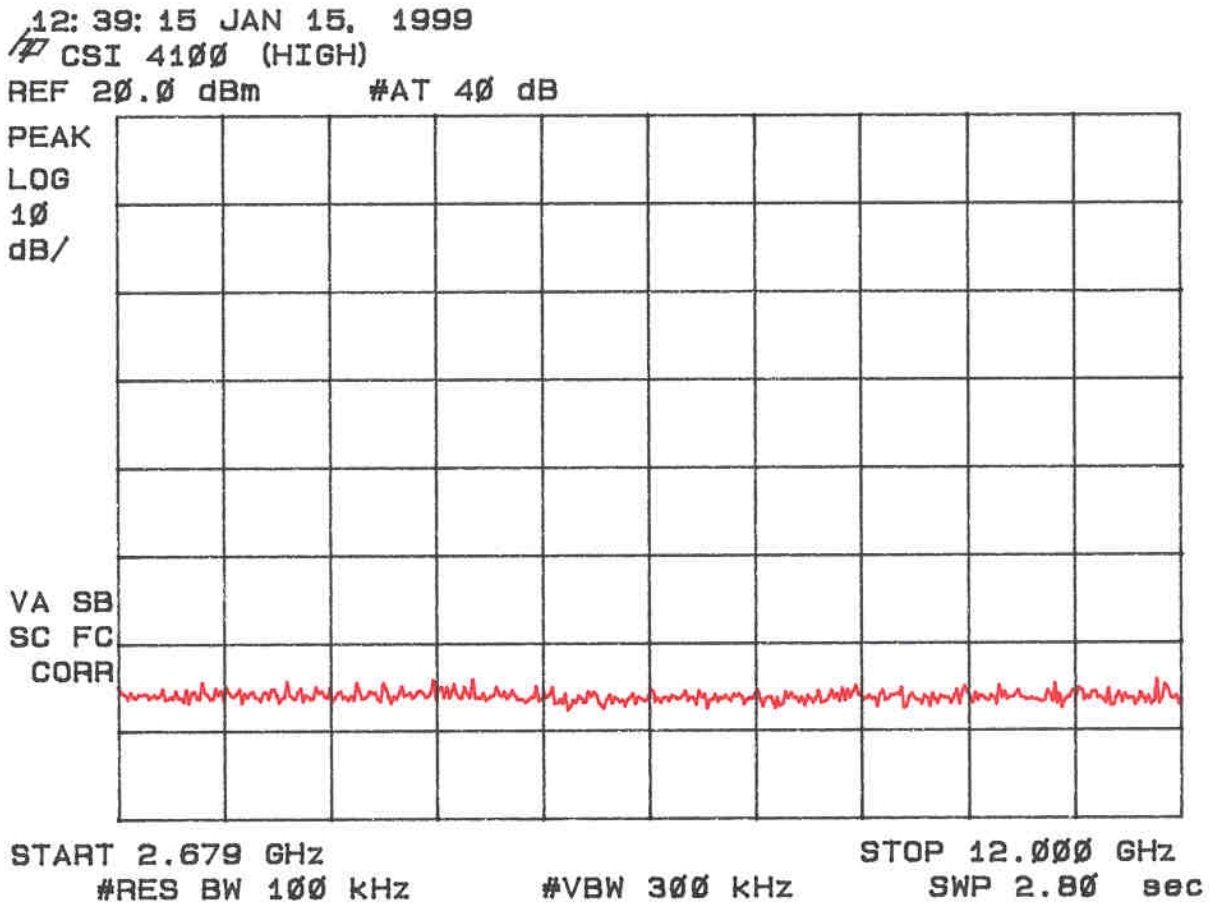


Figure 4l
Conducted Spurious Emission 15.247(c) High