U.S. TECH
A TRADITION IN TESTING SERVICES

Nivis, LLC.
FCC Part 15
Permissive Change Application

Model Amplified Radio Modem RF-P9-05-01-03
UST Project: 05-0007
March 3, 2005

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Nivis, LLC.**

MODEL: **Amplified Radio Modem RF-P9-05-01-03**

FCC ID: **SQB-NIVISP9050103**

DATE: **March 3, 2005**

This report concerns (check one): Original grant____
Class II change__X__

Equipment type: Spread-Spectrum Frequency Hopping RF Modem

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
Fax Number: (770) 740-1508

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

FIGURES

TABLES

SECTION 1

GENERAL INFORMATION

GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT) is the Nivis Amplified Radio Modem RF-P9-05-01-03. The EUT is a Spread-Spectrum Frequency Hopping RF Modem operating in the 902-928 MHz ISM band. The radio modem is designed for remote data acquisition systems.

1.2 Related Submittal(s)/Grant(s)

The EUT has been previously approved under FCC ID: SQB-NIVISP9050103 on 3/16/2005 under Part 15C.

The EUT will be co-located with another transceiver (already submitted and approved under FCC ID: SQB-NIVISSGM48 granted on 3/2/2005 under Part 24.

A separate Class II Permissive Change application for SQB-NIVISSGM48 will be submitted under U.S. Technologies Project Number: 05-0008. This permissive change will include Intermodulation Test results as presented in this report for use with the Nivis RF-P9-05-01-03 module, and use of a minimum 1.5dB attenuator at the output of the SGM48 RF connection to provide a Net Gain of –1.5 dBi , to correspond with the original Grant antenna Requirements.

1.3 Descriptions of Changes in Certified Equipment

There are no changes to the original equipment. Co-location requires a steel barrier to be located between the RF-P9 Module and the SGM 48 Module and 2 steel barriers (one on each side of the modules) between each module and their respective antennas, with a minimum antenna separation of 23cm.

Refer to sample photo for details.

A 1.5 dB attenuator was placed in series with the Nivis SGM48 Module and the Unity gain antenna to produce a net gain of –1.5 dBi to meet the original Grant Requirements of the Nivis SGM48 Module.

1.4 Copy of Previous and Associated Grant

TCB

GRANT OF EQUIPMENT AUTHORIZATION

Certification

Issued Under the Authority of the

Federal Communications Commission

By:

TCB

American TCB, Inc.
6731 Whittier Avenue Suite C110
McLean, VA 22101
United States

Date of Grant: 03/23/2005

Application Dated: 03/23/2005

Nivis, LLC
900 Circle 75 Parkway
Suite 1700
Atlanta, GA 30339
United States

Attention: L. Bay , Project Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SQB-NIVISP9050103
Name of Grantee: Nivis, LLC
Equipment Class: Part 15 Spread Spectrum Transmitter
Notes: Amplified Radio Modem

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	910.5 - 927.499962	0.13		

Power Output listed is Conducted. This transmitter is authorized only for use in devices where the antenna may be installed such that no less than 20 cm will be maintained between the antenna and users, as specified in this filing. The antenna used for this device must be installed to provide a separation distance of at least 20cm from all persons, and must not be co-located or operating in conjunction with any other antenna or transmitter other than those contained within this device. Integrators must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF Exposure compliance.

1.4 Copy of Previous and Associated Grant

TCB **TCB**

GRANT OF EQUIPMENT AUTHORIZATION
Certification
Issued Under the Authority of the
Federal Communications Commission
By:

American TCB, Inc.
6731 Whittier Avenue Suite C110
McLean, VA 22101
United States

Date of Grant: 03/02/2005
Application Dated: 03/02/2005

Nivis, LLC
900 Circle 75 Parkway
Suite 1700
Atlanta, GA 30339
United States

Attention: L. Bay , Project Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SQB-NIVISSGM48
Name of Grantee: Nivis, LLC
Equipment Class: PCS Licensed Transmitter
Notes: Transmitter Module for Mobile Applications

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	22H	824.2 - 848.8	1.11	1.0 PM	300KGXW
	24E	1850.2 - 1908.75	1.4	1.0 PM	300KGXW

Power is conducted. This device is to be used ONLY for mobile and fixed applications. Antenna gain is not to exceed -1.5 dBi. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance. This device is GSM (PCS) and GSM 850 both of which can operate within the US.

SECTION 2

TESTS AND MEASUREMENTS

TEST AND MEASUREMENTS

2.1 Configuration of Tested EUT

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), and TIA603 (for substitution method). 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. Bock diagrams of the tested systems are shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2a.

The sample used for testing was received by U.S. Technologies on March 1, 2005 in good condition.Both bands of the GSM Module were tested for intermodulation data.

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. The test facility also consists of a Lindgren Modular Shielded Room lined with both ferrite tile and Absorbers. Power input to the room is run through steel conduit beneath the ground plane and is filtered by screen room filters located at the shielded enclosure power.

2.3 Test Equipment

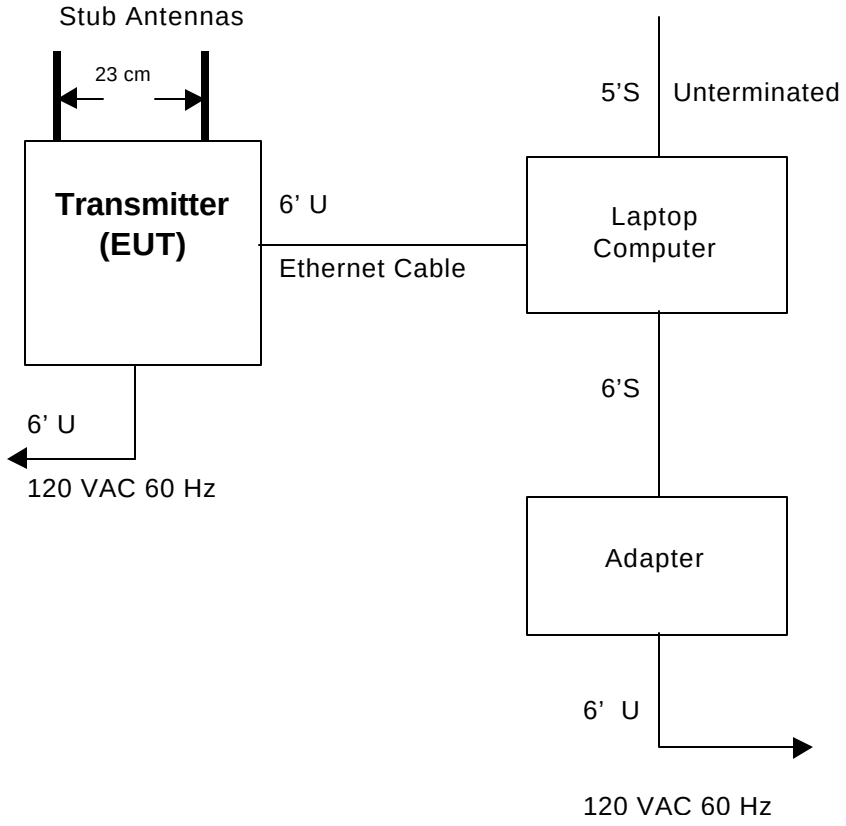
Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

No modifications were made by US Tech, to bring the EUT into compliance with FCC Part 15, Intermodulation limits for the transmitter portion of the EUT.

FIGURE 1

TEST CONFIGURATION



S = Shielded
U = Unshielded

TABLE 1

EUT and Peripherals

PERIPHERAL MANU.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Radio Modem (Located in AI Node Unit) (EUT) Nivis, LLC	RF-P9-05-01-03	None	SQB-NIVISP9050103	6' U 120 VAC/ 60 Hz Power Cord 6' U Ethernet Cable
GSM Modem (Located in AI Node Unit) Nivis, LLC	GSM 48	None	SQB-NIVISSGM48	None
2@ Antenna Stub	None		None	None
Laptop Computer Compaq	EVO N160	5Y22KHYZJ1NB	None	6' S 5' S Unterminated
Adapter Compag	PA-1000-02	198714-001	None	6' U 120 VAC/ 60 Hz Power Cord

TABLE 2
TEST INSTRUMENTS

EQUIPMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8558B	HEWLETT-PACKARD	2332A10055	2/19/05
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	11/29/04
SIGNAL GENERATOR	8648B	HEWLETT-PACKARD	3642U01679	9/9/04
RF PREAMP	8447D	HEWLETT-PACKARD	2944A06291	4/29/04
BICONICAL ANTENNA	3110B	EMCO	9307-1431	5/18/04
LOG PERIODIC	3146	EMCO	3110-3236	6/30/04
LISN (x 2) 8028-50-TS24-BNC	8028	SOLAR ELE.	910494 & 910495	1/20/04
HORN ANTENNA	SAS-571	A. H. SYSTEMS	605	04/26/04
PREAMP	8449B	HEWLETT PACKARD	3008A00480	06/23/04
CALCULATION PROGRAM	N/A	N/A	Ver. 6.0	N/A

Note: The calibration interval of the above test instruments is 12 months and all calibrations are traceable to NIST/USA.

2.5 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 Nivis modem uses both a permanently attached antenna for the Fractal Antenna and a reverse SMA connector for the Dual Band Antenna.

For purposes of co-location, only the dual band antenna approval is sought.

Comtelco Dual Band Mobile Antenna

Type of antenna: Dual band cellular PCS mobile antenna, ultra-wide band performance covering 806 – 928 and 1710-1970 Mhz.

Model number: A113182B
Part number: 438155
Manufacturer: Comtelco Industries
Antenna gain: Unity gain.
Type of connector: SMA connector

2.6 Substitution Method Results, Inter-modulated Frequencies

The Test Jig was placed in the anechoic chamber. The EUT (RF-P9 Modem) was activated to transmit in hopping mode. All spurious emissions (sub harmonics and harmonics) frequencies were recorded.

The procedure was repeated with only the GSM Module in transmit mode (actively hopping)at both low and high bands. All spurious emissions (sub harmonics and harmonics) frequencies were recorded for both bands.

The procedure was repeated once more with both modules transmitting in hopping mode. Any additional sub harmonics and harmonics, as well as established harmonics from previous procedures with higher levels were recorded (intermodulation frequencies). The results presented occurred during operation of the GSM Module in the 1850.2-1908.75 frequency band.

The unit was then transferred to the U.S. Technologies OATS Site, where Substitution Method Testing was conducted on all intermodulation frequencies. The results of the measurements are given in Table 3 and Figures 3a through Figure 3e.

TABLE 3

Substitution Method Results, Inter-modulated Frequencies

AI Node

EUT Frequency (MHz)	**P**EUT (dBm)	**P**subst TX (dBm)	Psubs (dBm)	**Antenna Gain (dBi)**	**L** cable	**Output power (dBm)**	**Margin (dB)**
725.20	-64.2	-29.0	-64.2	-1.1	0.7	-30.8	17.8 under limits
1034.05	-60.9	-33.3	-60.9	5.2	0.9	-29.0	16.0 under limits
1635.68	-52.9	-58.9	-52.9	8.1	1.1	-51.9	38.9 under limits
1759.3	-50.3	-55.9	-50.3	8.1	1.1	-48.9	35.9 under limits
2777.68	-37.4	-33.9	-37.4	9.9	1.4	-25.4	12.4 under limits

Output Power (dBm) = Psubst TX + Antenna Gain (dBi) – L cable

Limit = -13 dBm

Test Date: February 14, 2005

Figure 3a

Substitution Method Results, Inter-modulated Frequencies

AI Node Test Jig

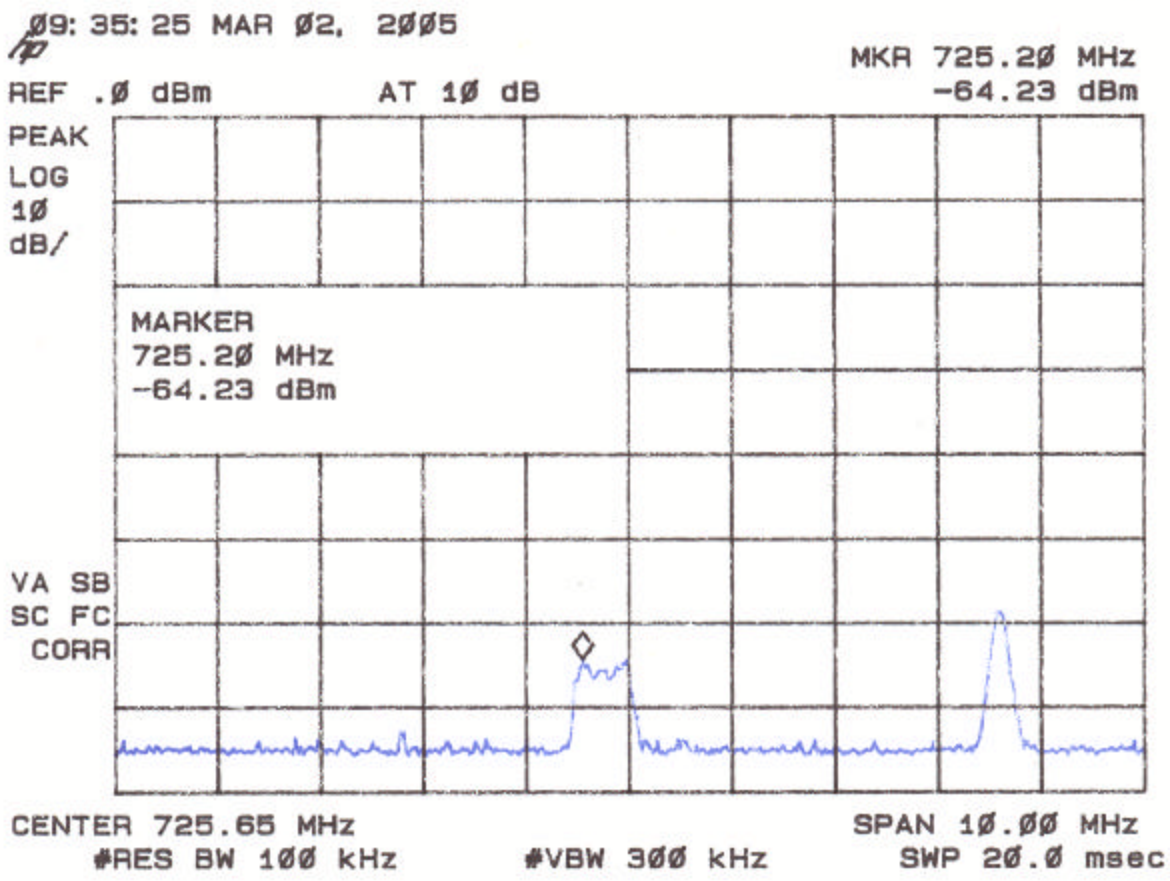


Figure 3b

Substitution Method Results, Inter-modulated Frequencies

AI Node Test Jig

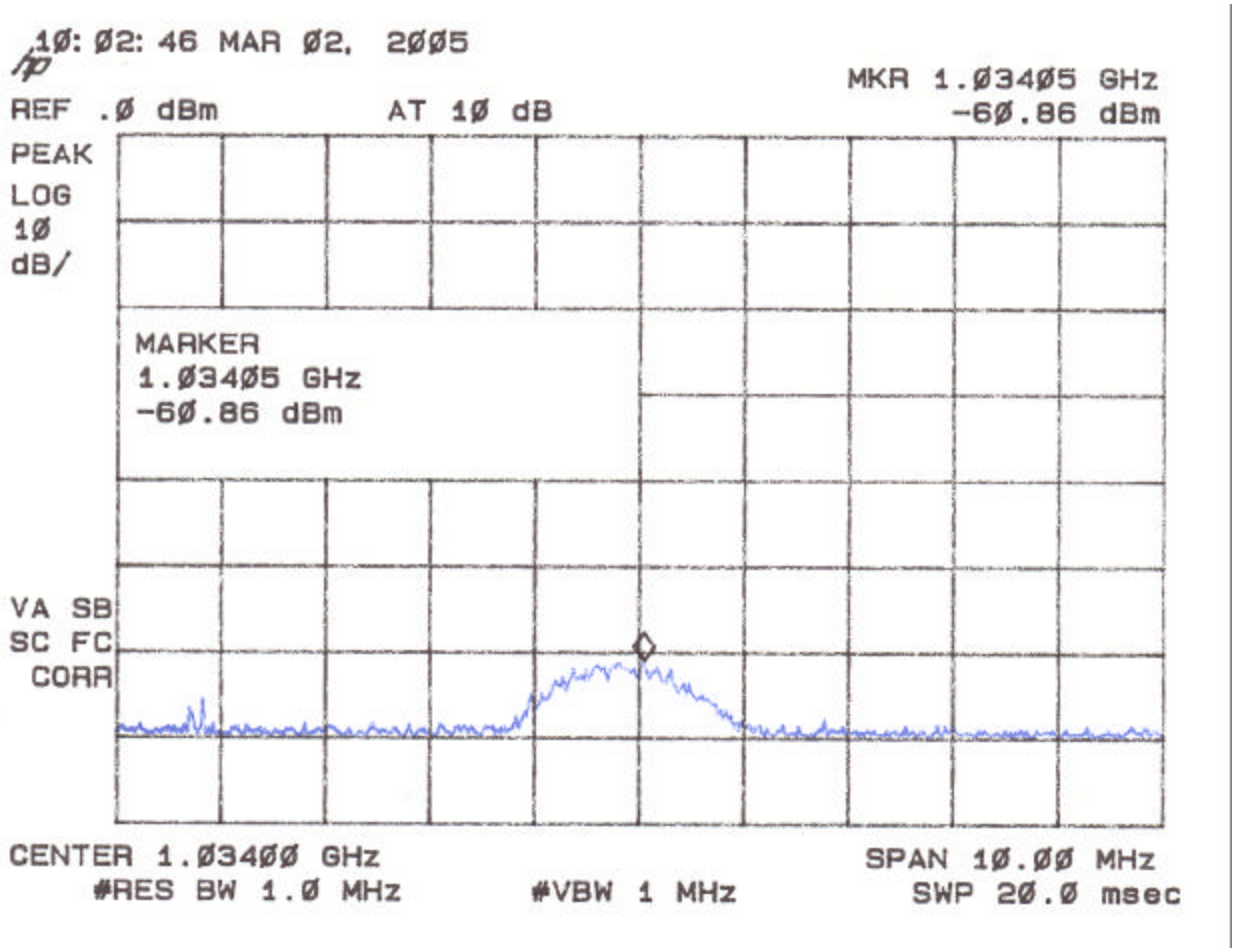


Figure 3c

Substitution Method Results, Inter-modulated Frequencies

AI Node Test Jig

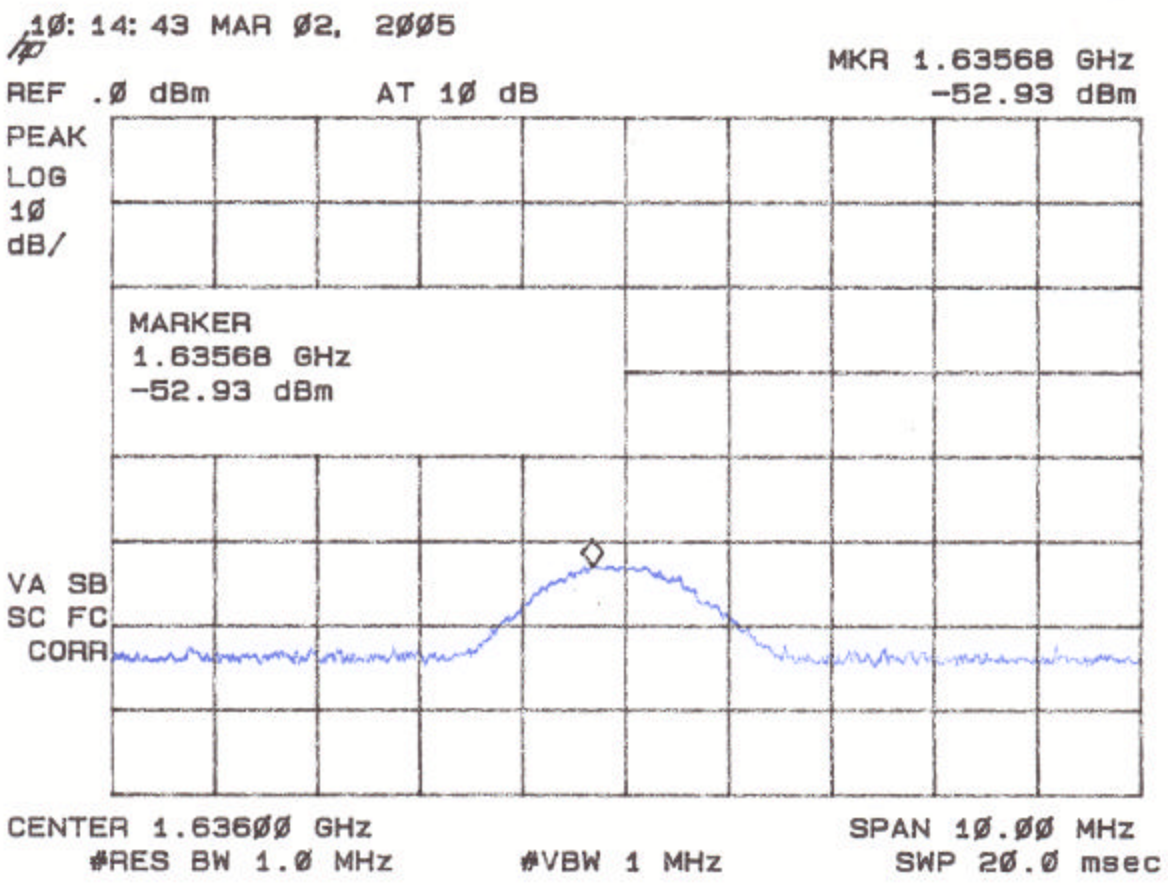


Figure 3d

Substitution Method Results, Inter-modulated Frequencies

AI Node Test Jig

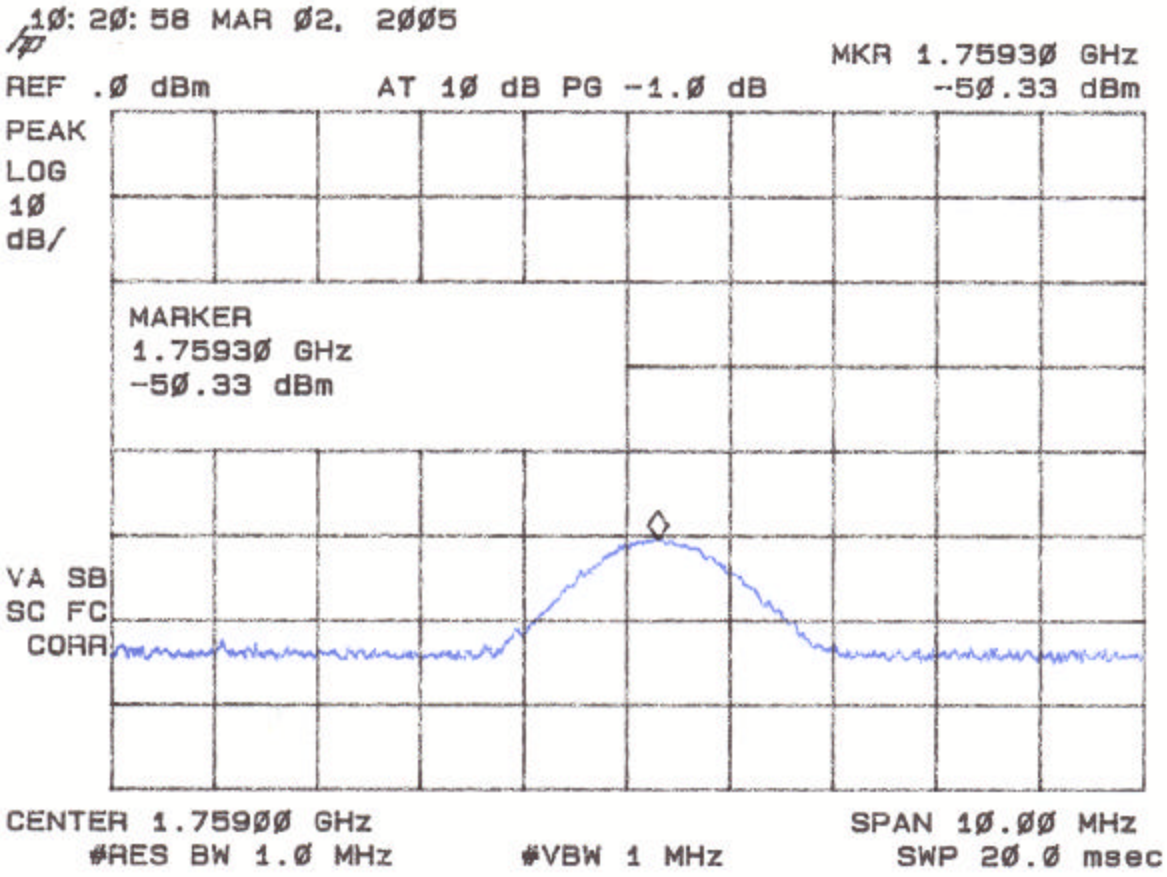


Figure 3e

Substitution Method Results, Inter-modulated Frequencies

AI Node Test Jig