

**EMC EVALUATION OF THE
PLANAR DOME
INVITUM
IN ACCORDANCE WITH THE
FCC PART 15.247**

Prepared For:

**PLANAR DOME
400 FIFTH AVENUE
WALTHAM, MASSACHUSETTS 02154
ATTENTION: MEHER NERKIZIAN**

Prepared By:

**ROBERT FOSTER
CHOMERICS TEST SERVICES
77 DRAGON COURT
WOBURN, MASSACHUSETTS 01888**

Date:

JUNE 4, 2003

Test Report Number:

TR3602A.03

Test Technician or Engineer: _____

CTS Approved Signatory: _____

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TABLE OF CONTENTS

1.0 General

1.1 Introduction

- 1.1.1 Purpose
- 1.1.2 Requirements

1.2 Test Summary

- 1.2.1 Summary of Recommendations

1.3 Administrative Data

- 1.3.1 Test Facility
- 1.3.2 Equipment Calibration
- 1.3.3 Test Personnel

1.4 Test Set-up

- 1.4.1 Test Site Matrix
- 1.4.2 Test Site Descriptions
- 1.4.3 Equipment Under Test

2.0 Tests Performed

2.1 Part 15 Subpart C 15.247 Bandwidth

- 2.1.1 Equipment Used
- 2.1.2 Test Conditions
- 2.1.3 Test Method
- 2.1.4 Results
- 2.1.5 Test Data
- 2.1.6 Photographic Documentation

2.2 Part 15 Subpart C 15.247 Power Output

- 2.2.1 Equipment Used
- 2.2.2 Test Conditions
- 2.2.3 Test Method
- 2.2.4 Results
- 2.2.5 Test Data
- 2.2.6 Photographic Documentation

2.3 Part 15 Subpart C 15.247 Field Strength of Fundamental

- 2.3.1 Equipment Used
- 2.3.2 Test Conditions
- 2.3.3 Test Method
- 2.3.4 Result
- 2.3.5 Test Data
- 2.3.6 Photographic Documentation

- 2.4 Part 15 Subpart C 15.247 Spurious Emissions**
 - 2.4.1 Equipment Used
 - 2.4.2 Test Conditions
 - 2.4.3 Test Method
 - 2.4.4 Results
 - 2.4.5 Test Data
 - 2.4.6 Photographic Documentation
- 2.5 Part 15 Subpart C 15.247 Band Edge**
 - 2.5.1 Equipment Used
 - 2.5.2 Test Conditions
 - 2.5.3 Test Method
 - 2.5.4 Results
 - 2.5.5 Test Data
 - 2.5.6 Photographic Documentation
- 2.6 Part 15 Subpart C 15.247 Power Spectral Density**
 - 2.6.1 Equipment Used
 - 2.6.2 Test Conditions
 - 2.6.3 Test Method
 - 2.6.4 Results
 - 2.6.5 Test Data
 - 2.6.6 Photographic Documentation
- 2.7 Part 15 Subpart C 15.247 Field Strength Harmonics**
 - 2.7.1 Equipment Used
 - 2.7.2 Test Conditions
 - 2.7.3 Test Method
 - 2.7.4 Results
 - 2.7.5 Test Data
 - 2.7.6 Photographic Documentation

Appendix A: Test Log

Appendix B: Photographs of Antenna

LIST OF DEFINITIONS/ABBREVIATIONS

AC	Alternating Current
BB	Broadband
BW	Bandwidth
cm	Centimeter
C.P.U.	Calibrate Prior to Use
dB	Decibel
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ER	Electric Radiation
EUT	Equipment Under Test
GHz	GigaHertz
Hz	Hertz
I-face	Interface
kHz	KiloHertz
m	Meter
MHz	MegaHertz
mm	Millimeter
mS	Millisecond
mV	MilliVolt
MR	Magnetic Radiation
NB	Narrowband
N.C.R.	No Calibration Required
PLC	Power Line Conduction
PPS	Pulses Per Second
uF	MicroFarad
uH	MicroHenry
uS	Microsecond
uV	MicroVolt
U.W.C.	Use With Calibrated Equipment

1.0 GENERAL

1.1 Introduction

1.1.1 Purpose

The purpose of this report is to document the performance of the Planar Dome Invitium during a variety of radio-performance tests and record the test requirements and procedures used. At the request of Planar Dome, the tests were performed by Chomerics Test Service (CTS) of Woburn, Massachusetts. The assessment will determine the compliance or non-compliance to the requirements set by FCC Part 15 Subpart B and C.

Testing was performed during the period of May 22 through May 28, 2003 under Chomerics order number 896015.

1.1.2 Requirements

The requirements for the sequence of tests performed on the Planar Dome Invitium are as follows:

FCC Part 15 Subpart C 15.247 Bandwidth

For Direct Sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

FCC Part 15 Subpart C 15.247 Output Power

For Direct Sequence systems, the maximum output power is 1 Watt.

FCC Part 15 Subpart C 15.247 Spurious

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

FCC Part 15 Subpart C 15.247 Power Spectral Density

For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any interval of continuous transmission.

FCC Part 15 Subpart C 15.249 Field strength of the Fundamental and Harmonics

Field Strength of Fundamental and Harmonics		
Frequency (MHz)	Fundamental (mV/meter)	Harmonics (uV/meter)
2400-2483.5	50	500

FCC Part 15 Subpart C Band-Edge

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power, based on either an RF conducted or a radiated measurement.

1.2 Summary

The terms "Passed" or "Failed" in this section are intended to guide the reader as to whether or not the EUT met the minimum Performance Criteria that can be interpreted from the FCC Parts 2, 15. The "Results" paragraph in each test section to follow, and the test data sheets, will outline specifically how the EUT performed during each test.

Bandwidth	Passed
Power Output	Passed
Field Strength Fundamental	Passed
Spurious Emission	Passed
Band Edge	Passed
Power Spectral Density	Passed
Field Strength Harmonics & Spurious	Passed

1.2.1 Summary of Recommendations

The Planar Dome Invitium will not require modifications in order to insure compliance with CFR 47 FCC Part 15.247.

1.3 Administrative Data

1.3.1 Test Facility

Chomerics Test Services in Woburn, Massachusetts is an American Association for Laboratory Accreditation (A2LA) accredited facility as defined on Certification Number 1980-01. For Emissions and Immunity testing, the Scope of Accreditation is limited to the following tests: CFR 47, FCC Part 15 Subpart B, CISPR 11, EN 55011, CISPR 13, EN55013, CISPR 14, EN55014-1, CISPR 22, EN55022, AS/NZS 3548, CNS 13438, CNS 13783-1, VCCI, EN 61000-3-2, EN 61000-3-3, EN 50081-1, EN55081-2, EN61000-6-3, EN 61000-6-4, EN 61000-4-2, EN 61000-4-3, EN61000-4-4, EN 61000-4-5, EN 61000-4-6, EN61000-4-8, EN 61000-4-11, EN 50082-1, EN 50082-2, EN 61000-6-1, EN 61000-6-2, IEC/EN 60601-1-2, EN 300 386, EN 61362-1, CISPR 24, EN55024, CISPR 14, EN 55014-2, EN 50083-2, EN 55103-1, and EN 55103-2. Any tests in this report that are not listed above are not covered by the A2LA Accreditation.

Chomerics' Open Area Test Sites A and B are listed by the Federal Communications Corporation (FCC) for Radiated and Conducted Emissions testing under FCC Registration numbers 90498 and 90499 respectively.

Chomerics' Open Area Test Sites A and B are accredited for Radiated and Conducted Emissions through Industry Canada under file numbers IC2959A and IC2959B respectively.

Chomerics' Open Area Test Site B is accredited to the Voluntary Control Council for Interference (VCCI) for Radiated and Conducted Emissions testing under file R-1508 and C-1589 respectively.

Chomerics test facility operates under the current revision of Chomerics Quality Assurance (QA) Manual Document Number QA002.

The QA Manual has been constructed to reflect a quality program in accordance with the requirements of the National Institute of Standards and Technology (NIST), ISO 9002, ISO Guide 25, NIST Handbook 150, EN 45001, MIL-I-45208A, MIL-STD-461D, 462D and Chomerics Quality Assurance Program (QAP).

The QA Manual outlines and describes the procedures for establishing and maintaining the quality of analysis, research, inspection, and testing within Chomerics Test Service (CTS).

This test report does not represent an endorsement by the U.S. Government.

The results and/or conclusions within this test report refer and/or apply only to the unit(s) tested as defined by this report.

Measurements performed for this test are traceable to the National Institute of Standards and Technology (NIST) based on the fact that all test equipment used for the measurements were previously calibrated using standards traceable to NIST.

No deviations, additions to, or exclusions from the test specification(s) were made.

The system amplitude accuracy for the measurements made during the radiated emission tests was $\pm 3\text{dB}$. Chomerics Test Services measurement uncertainty calculations are available for review upon request.

1.3.2 Equipment Calibration

The calibration of Chomerics test facility equipment is controlled under the current edition of Chomerics Laboratory Test Equipment Calibration Manual Document Number QA001.

The test equipment used throughout this test sequence conforms to laboratory calibration standards, MIL-STD-45662, traceable to the National Institute of Standards and Technology. The date of the next due scheduled calibration is listed in each test section for the applicable equipment.

All test equipment is calibrated in one year intervals

1.3.3 Personnel

The test personnel performing or supervising the tests are accredited by the National Association of Radio and Telecommunications Engineers, Inc. (NARTE) as Certified Electromagnetic Compatibility Engineers (N.C.E.) and Technicians (N.C.T.).

1.4 Test Set-up

1.4.1 Test Site Matrix

The test locations used for the emissions and immunity tests are as follows: (Refer to Section 1.4.2 for test site descriptions).

Test Performed

Bandwidth 15.247
Power Output 15.247
Field Strength Fundamental
Spurious Emission 15.247
Band Edge
Power Spectral Density
Strength Harmonics

Test Site

Open Area Test Site A
Open Area Test Site A
Open Area Test Site A
Open Area Test Site A
Open Area Test Site A
Open Area Test Site A
Open Area Test Site A

1.4.2 Test Site Descriptions

The following is a list of the test sites and descriptions of each. Refer to Section 1.4.1 for specific test sites used for testing.

Open Area Test Site A: Chomerics Open Area Test Site "A" if used for this test program is located in the lower parking lot attached to the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 1). Parking is permitted on one side of test site "A" at a discrete distance from the imaginary ellipse.

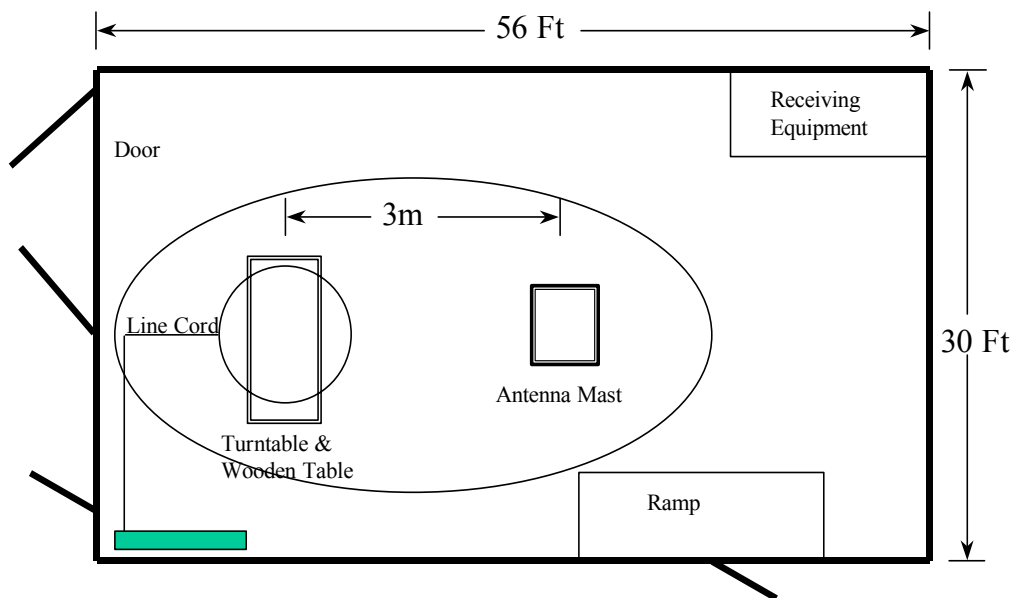
The Open Area Test Site A enclosure is a wooden structure measuring 56 x 30 x 25 feet in size with galvanized steel sheet metal used as the ground plane. The structure is sized to allow 3 meter measurements and is heated and/or air conditioned.

The structure used to support equipment under test is an EMCO 4 foot diameter motorized turntable. For tabletop equipment, a wooden table measuring 1.5 x 1 meter in size is positioned at the center of the turntable, at the proper height above the ground plane.

The area at the end of the Open Area Test Site "A" is the location for the test personnel and equipment to ensure they are outside the imaginary ellipse.

The available AC power within Open Area Test Site "A" is 120V 60Hz Single Phase 60Amps; 208V 60Hz Three Phase 60Amps; 208V 60Hz Single Phase 60Amps; 230V 50Hz Single Phase 50Amps.

This Site is listed with the Federal Communications Commissions (FCC).

OPEN AREA TEST SITE A**Figure 1**

Key:  = Power board

1.4.3 Equipment Under Test

The equipment is the Planar Dome Invitium System with touch screen PC and Cisco Aironet 350 Series Wireless LAN Adaptor. The Planar Dome Invitium is a diagnostic station used in the medical market.

The Invitium System uses a CISCO PCMCIA card for its wireless LAN applications. The CISCO Series 350 has been certified by the FCC the FCC ID number is LDK102040. Planar Dome is connecting a custom antenna to its Series 350 Card. See appendix B for details.

2.0 TESTS PERFORMED**2.1 FCC Part 15 Subpart C 15.247 Bandwidth****2.1.1 Equipment Used**

Test Equipment	Asset #	Serial #	Cal Date
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04

2.1.2 Test Conditions

Bandwidth measurement testing was performed with the Invitium set up on a wooden table above the turntable with the output connected to the spectrum analyzer with the output connected to the spectrum analyzer. The Invitium was configured to operate in the continuous full power mode of operation. The test was performed at the low, mid, and high frequency.

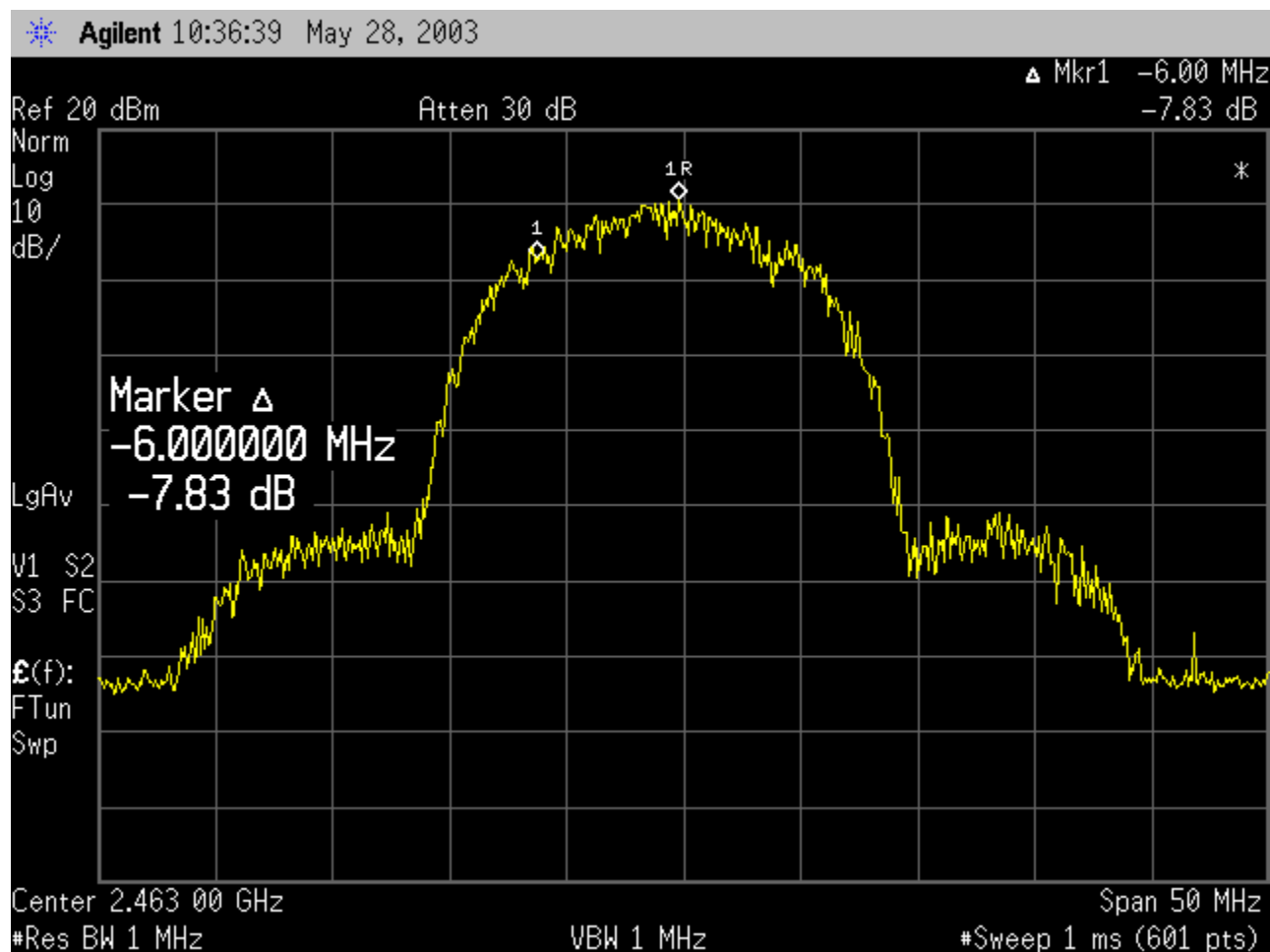
2.1.3 Test Method

The test method of “Guidance on Measurements for Direct Sequence Spread Spectrum Systems” Appendix C of Docket No. 96-8 FCC 97-114 was followed.

The bandwidth of the Invitium was measured with the output of the transceiver directly connected to the input of the Spectrum Analyzer.

2.1.4 Results

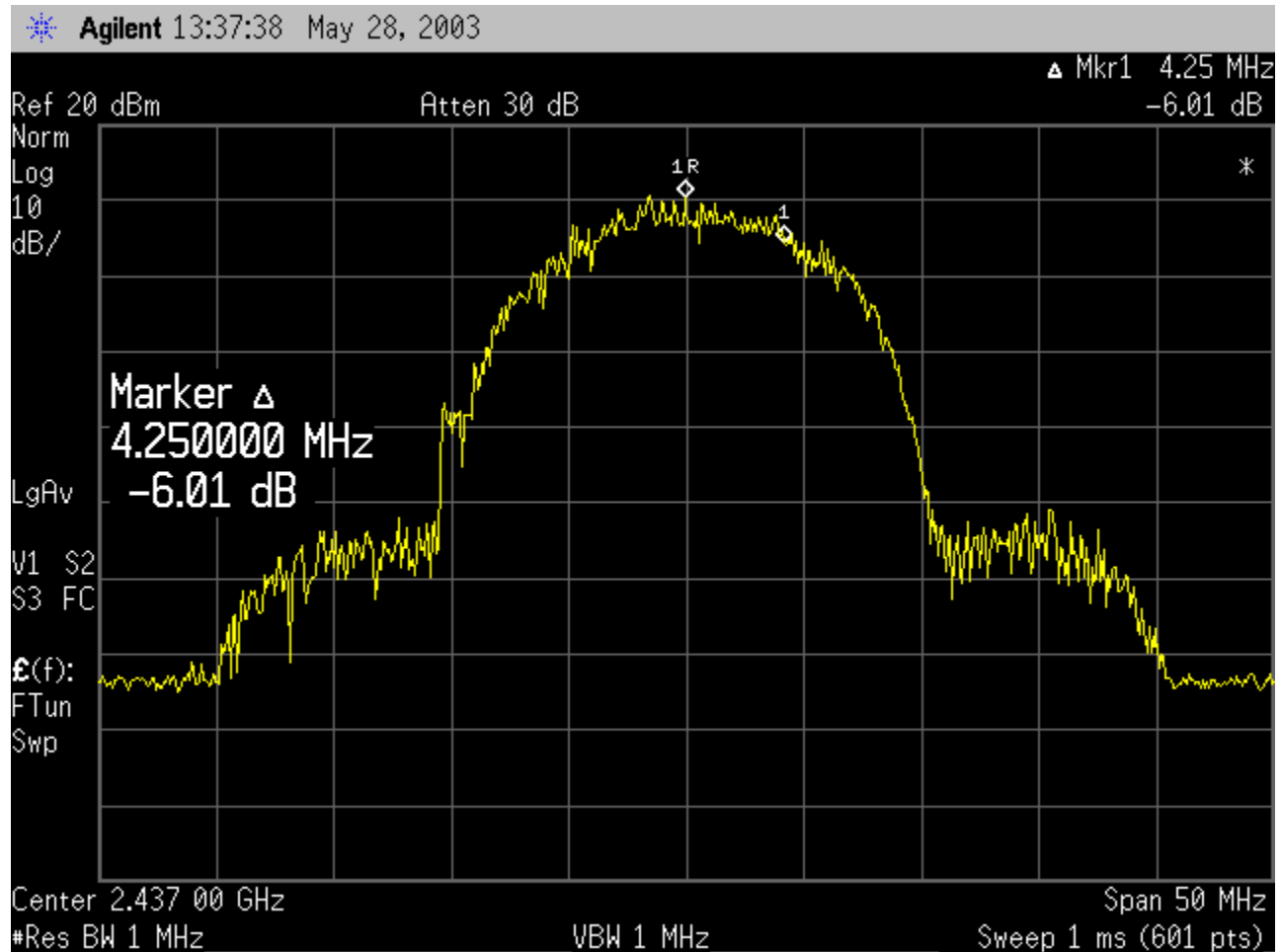
The Planar Dome Invitium meets the bandwidth requirements of FCC Part 15 Subpart C 15.247 bandwidth requirements.

2.1.5 Test Data**BANDWIDTH MEASUREMENTS****CUSTOMER: PLANAR DOME****EQUIPMENT: INVITUM****TESTED BY: ROBERT FOSTER****OPERATING MODE: CONTINUOUS TRANSMISSION****DATE: MAY 28, 2003****TEST NUMBER: 1****PROCEDURE: 97-114****High Frequency**

BANDWIDTH MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: CONTINUOUS TRANSMISSION

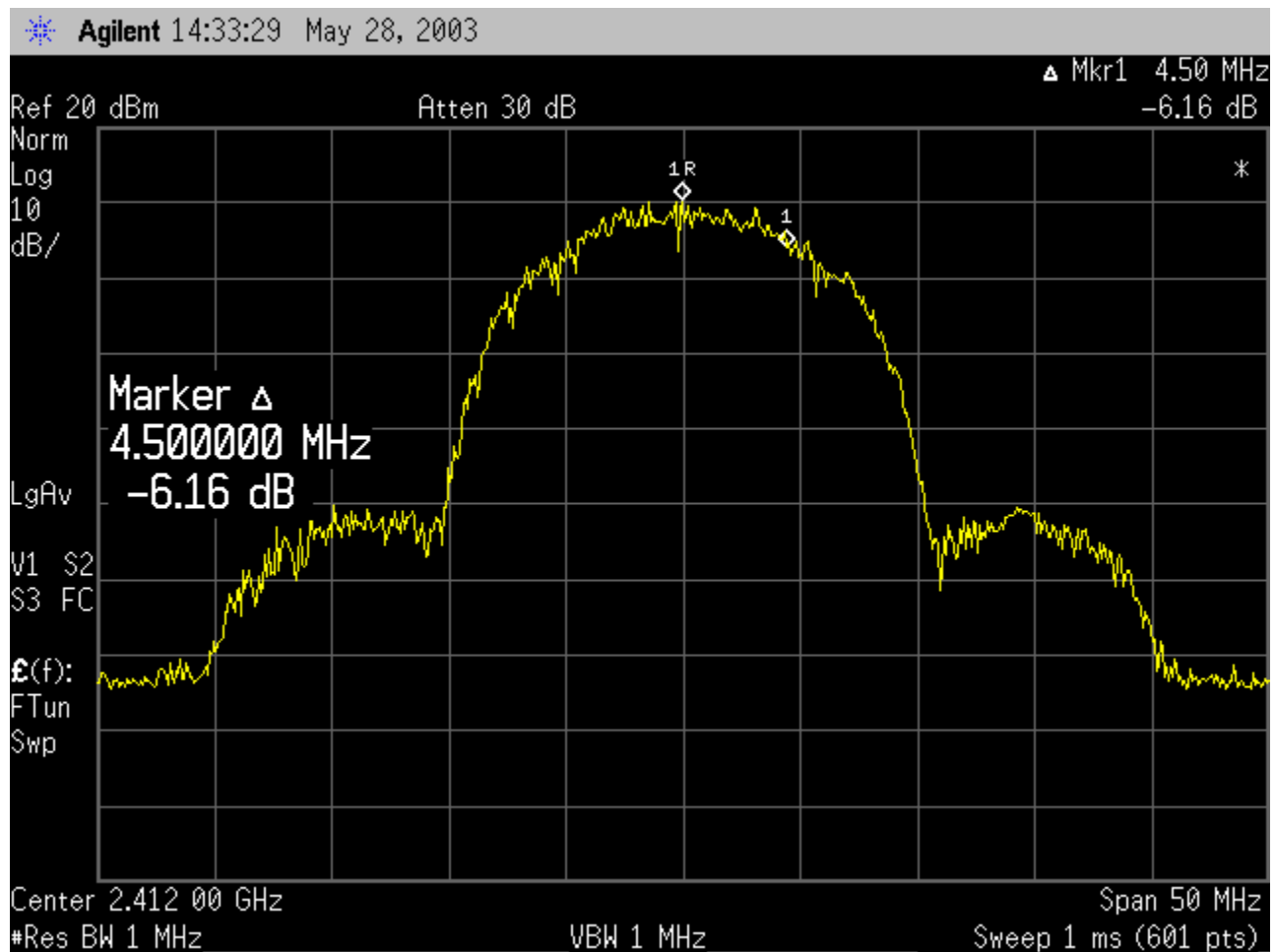
DATE: MAY 28, 2003
TEST NUMBER: 1
PROCEDURE: 97-114
Mid. Frequency



BANDWIDTH MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: CONTINUOUS TRANSMISSION

DATE: MAY 28, 2003
TEST NUMBER: 1
PROCEDURE: 97-114
Low Frequency



2.1.6 Photographic Documentation

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: CONTINUOUS TRANSMISSION

DATE: MAY 28, 2003
TEST NUMBER: 1
COUPLING DEVICE:
TEST SPEC:



Photograph Description:

FORM CTS-PHOTO

Planar Dome Invitum
Document #: TR3602A.03
Date: June 4, 2003

2.2 FCC Part 15 Subpart C Output Power**2.2.1 Equipment Used**

Test Equipment	Asset #	Serial #	Cal Date
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04
Hewlett Packard 435B Power Meter	209	2005A01666	2/04
Hewlett Packard 487A Thermister Mount	210	84576	2/04

2.2.2 Test Conditions

Output Power tests were performed on the Planar Dome Invitium. The Output Power measurement tests were performed with the Invitium placed in the open area test site with the output connected to the power meter. The Invitium was configured to operate in the continuous full power mode of operation. The test was performed at the low, mid, and high frequencies.

2.2.3 Test Method

The test method of “Guidance on Measurements for Direct Sequence Spread Spectrum Systems” Appendix C of Docket No. 96-8 FCC 97-114 was followed.

The Output Power of the Invitium was measured with the output of the transceiver directly connected to the input of the power meter.

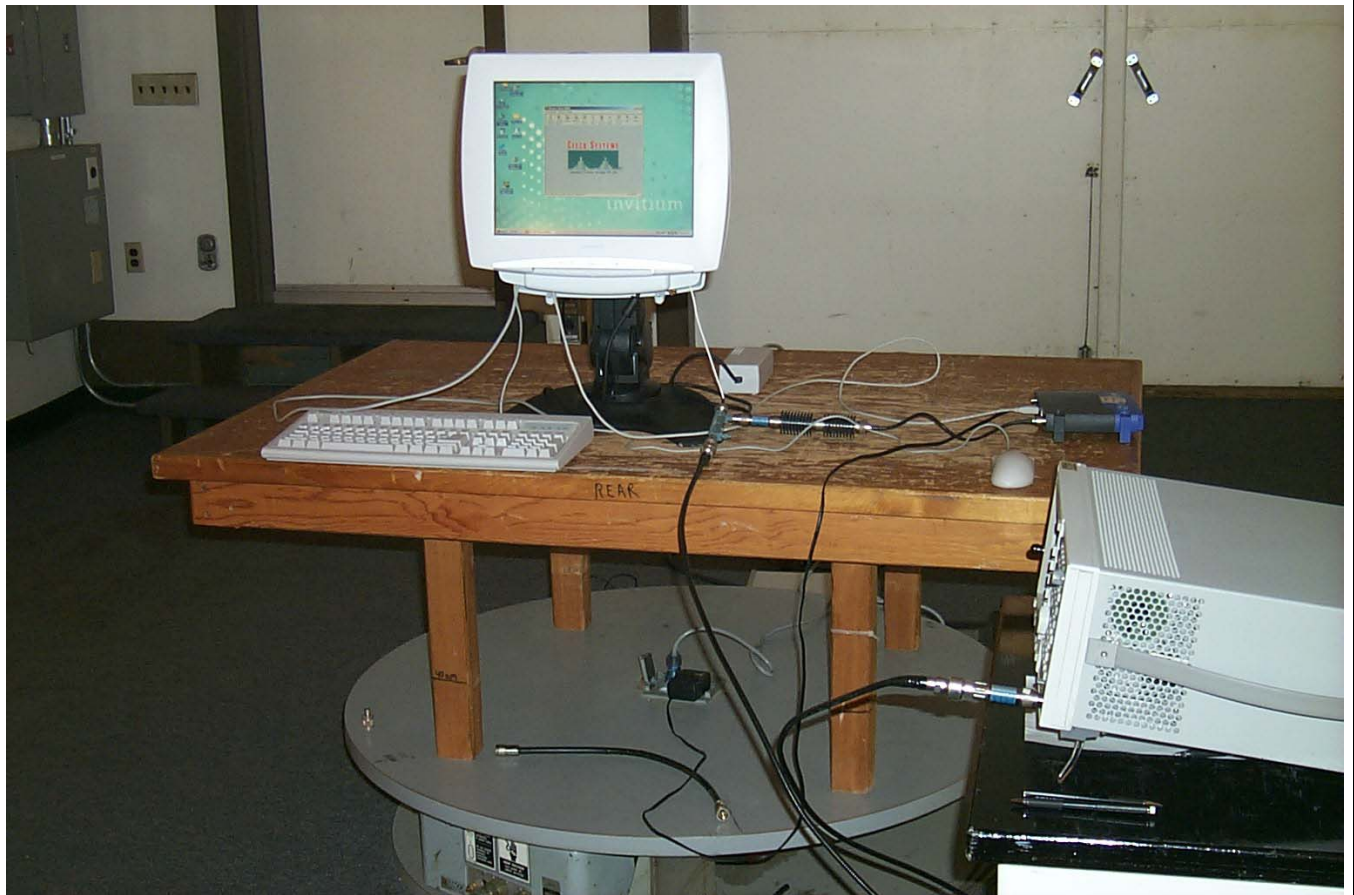
2.2.4 Results

The Planar Dome Invitium meets the Output Power requirements of FCC Part 15 Subpart C 15.247.

2.2.5 Test Data**OUTPUT POWER MEASUREMENTS****CUSTOMER: PLANAR DOME****DATE: MAY 28, 2003****EQUIPMENT: INVITUM****TEST NUMBER: 2****TESTED BY: ROBERT FOSTER****TEST SPEC: FCC PART 15 SUBPART C****OPERATING MODE: CONTINUOUS TRANSMIT****TEST PROCEDURE: FCC 97-114**

FREQUENCY MHZ	PEAK MEASURED LEVEL dBm	CABLE LOSS dB	OUTPUT POWER dBm	OUTPUT POWER W	LIMIT W
2412	19.6	0.3	19.9	0.100	1
2.437	19.6	0.3	19.9	0.100	1
2.462	19.7	0.3	20	0.100	1

NOTES: * Measurement made with Power Meter
FORM CTS-DS-001R

2.2.6 Photographic Documentation**CUSTOMER: PLANAR DOME****EQUIPMENT: INVITIUM****TESTED BY: ROBERT FOSTER****OPERATING MODE: CONTINUOUS TRANSMISSION****DATE: MAY 28, 2003****TEST NUMBER: 2****COUPLING DEVICE:****TEST SPEC:**

Photograph Description:

FORM CTS-PHOTO

Planar Dome Invitium
Document #: TR3602A.03
Date: June 4, 2003

2.3 FCC Part 15 Subpart C Field Strength of Fundamental**2.3.1 Equipment Used**

Equipment Used	Asset #	Serial #	Cal Date
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03
EMCO 3115 Microwave Horn Antenna	376	2796	1/04

2.3.2 Test Conditions

The field strength of the fundamental was measured by placing the Invitium set up on a wooden table above the turntable at a distance of 3 meters from a tuned dipole antenna within Open Area Test Site A.

The Invitium was configured to operate in the continuous mode of operation to maximize the emissions.

The Invitium has two antennas connected to the output of the PCMCIA card. Only one antenna will be connected to it at a time. The following antennas were tested:

Antenna A

Antenna B

2.3.3 Test Method

The test method of ANSI C63.4 was followed, for the field strength of the fundamental emission measurements. A manual scan was performed. During this scan, the antenna, turntable and the EUT' were manipulated to maximize the emission level.

2.3.4 Results

The Planar Dome Invitium meets the FCC Part 15 Subpart C field strength fundamental.

2.3.5 Test Data

FIELD STRENGTH OF THE FUNDAMENTAL

CUSTOMER: PLANAR DOME
EQUIPMENT: TRANSCEIVER TOWER
TESTED BY: ROBERT FOSTER
OPERATING MODE: FULL POWER
ANTENNA DISTANCE: 3 METERS

DATE: MAY 28, 2003
TEST NUMBER: 3
PROCEDURE: ANSI C63.4 & FCC 97-114
TEST SPEC: FCC PART 15 SUBPART C

Antenna A

FREQUENCY MHz	PEAK MEASURED LEVEL -dBm	ANTENNA HEIGHT (METERS)	TURNTABLE AZIMUTH (DEGREES)	ANTENNA H/V	ANTENNA FAC/CABLE LOSS dB	FIELD LEVEL dBm	FIELD LEVEL mW
2412	32	1.0	0	V	27.9	-4.1	38.9
2437	46	1.0	0	V	27.9	-18.1	1.5
2462	31	1.0	0	V	27.9	-3.1	48.9

FORM CTS-DS-001R

Antenna B

FREQUENCY MHz	PEAK MEASURED LEVEL -dBm	ANTENNA HEIGHT (METERS)	TURNTABLE AZIMUTH (DEGREES)	ANTENNA H/V	ANTENNA FAC/CABLE LOSS dB	FIELD LEVEL dBuV/m	FIELD LEVEL mW
2412	30	1.0	0	V	27.9	-2.1	61.8
2437	32	1.0	0	V	27.9	-4.1	38.9
2462	28	1.0	0	V	27.9	-0.1	97.7

FORM CTS-DS-001R

2.3.6 Photographic Documentation

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: CONTINUOUS TRANSMISSION

DATE: MAY 28, 2003
TEST NUMBER: 3
COUPLING DEVICE:
TEST SPEC:



Photograph Description:

FORM CTS-PHOTO

Planar Dome Invitum
Document #: TR3602A.03
Date: June 4, 2003

2.4 FCC Part 15 Subpart C 15.247 Conducted Spurious Emissions**2.4.1 Equipment Used**

Test Equipment	Asset #	Serial #	Cal Date
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03
EMCO 3115 Microwave Horn Antenna	376	2796	1/04

2.4.2 Test Conditions

Spurious Emissions measurement test was performed with the Invitium placed on top of a wooden turntable with its output connected to a spectrum analyzer. The Invitium was configured to operate in the continuous full power mode of operation. The test was performed at the low, mid, and high frequencies.

2.4.3 Test Method

The test method of “Guidance on Measurements for Direct Sequence Spread Spectrum Systems” Appendix C of Docket No. 96-8 FCC 97-114 was followed.

The Spurious emissions of the Invitium were measured with the output of the transceiver directly connected to the input of the Spectrum Analyzer.

2.4.4 Results

The Planar Dome Invitium meets the spurious requirements of FCC Part 15 Subpart C 15.247.

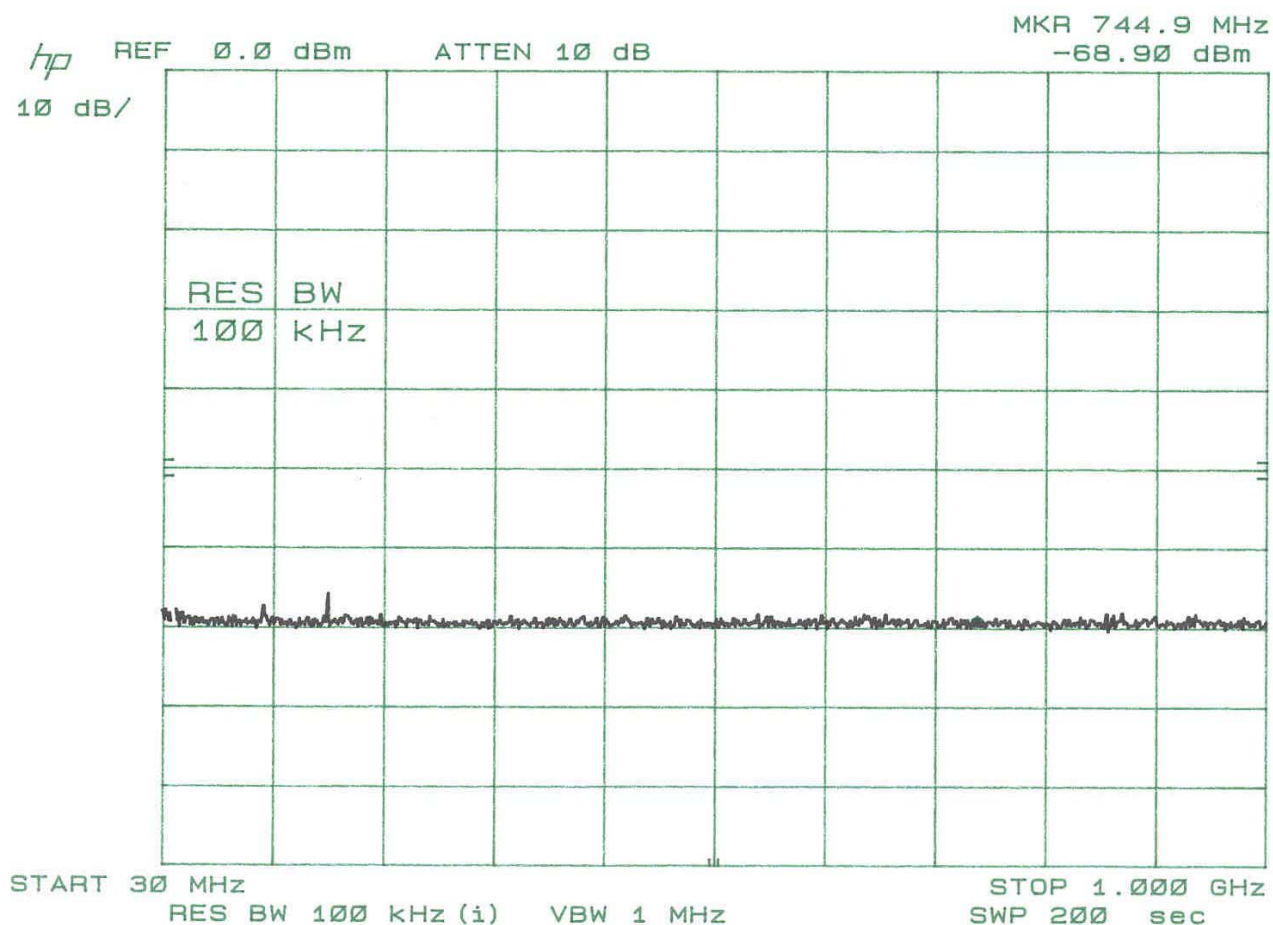
2.4.5 Test Data

CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
Low Frequency

A

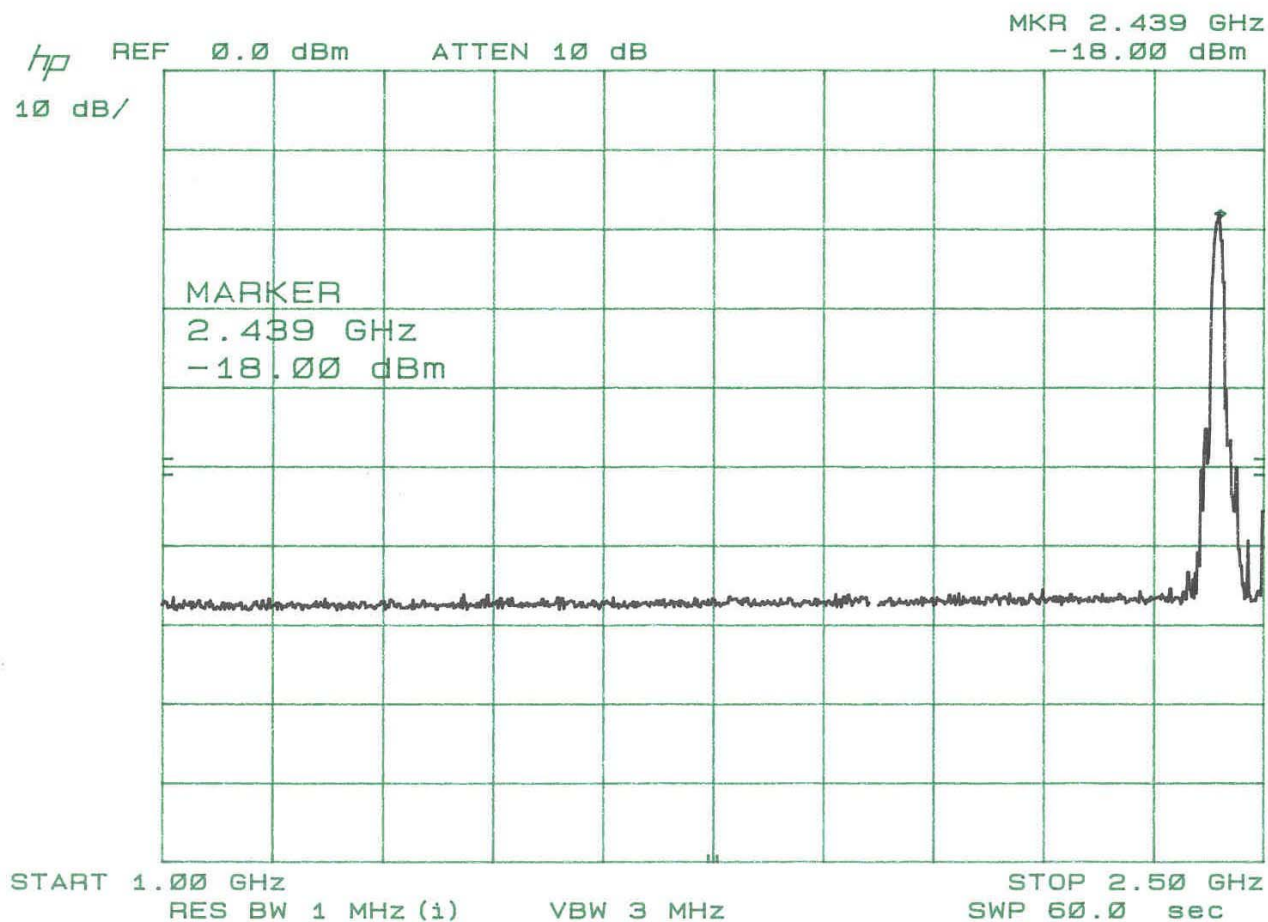


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
Low Frequency

ft

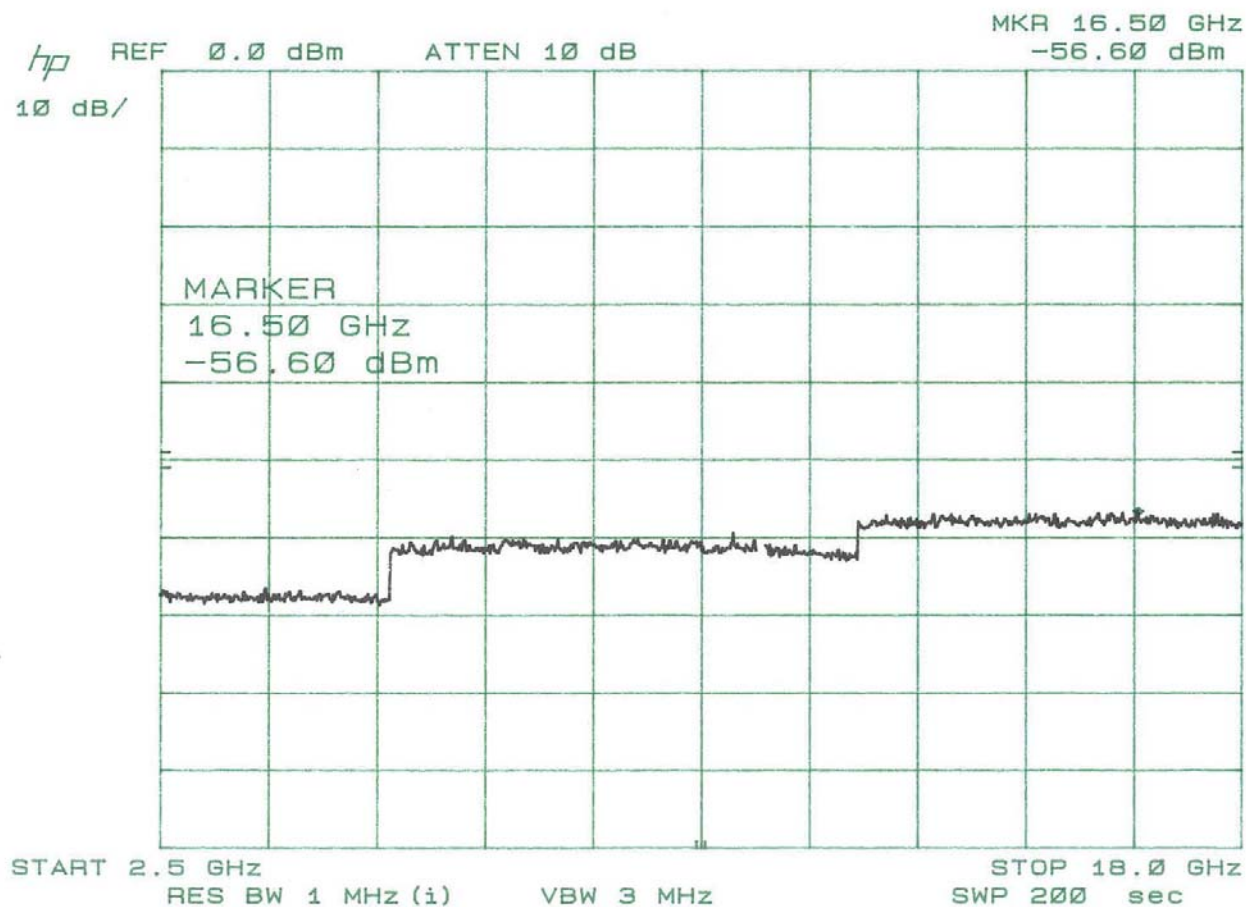


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
Low Frequency

A

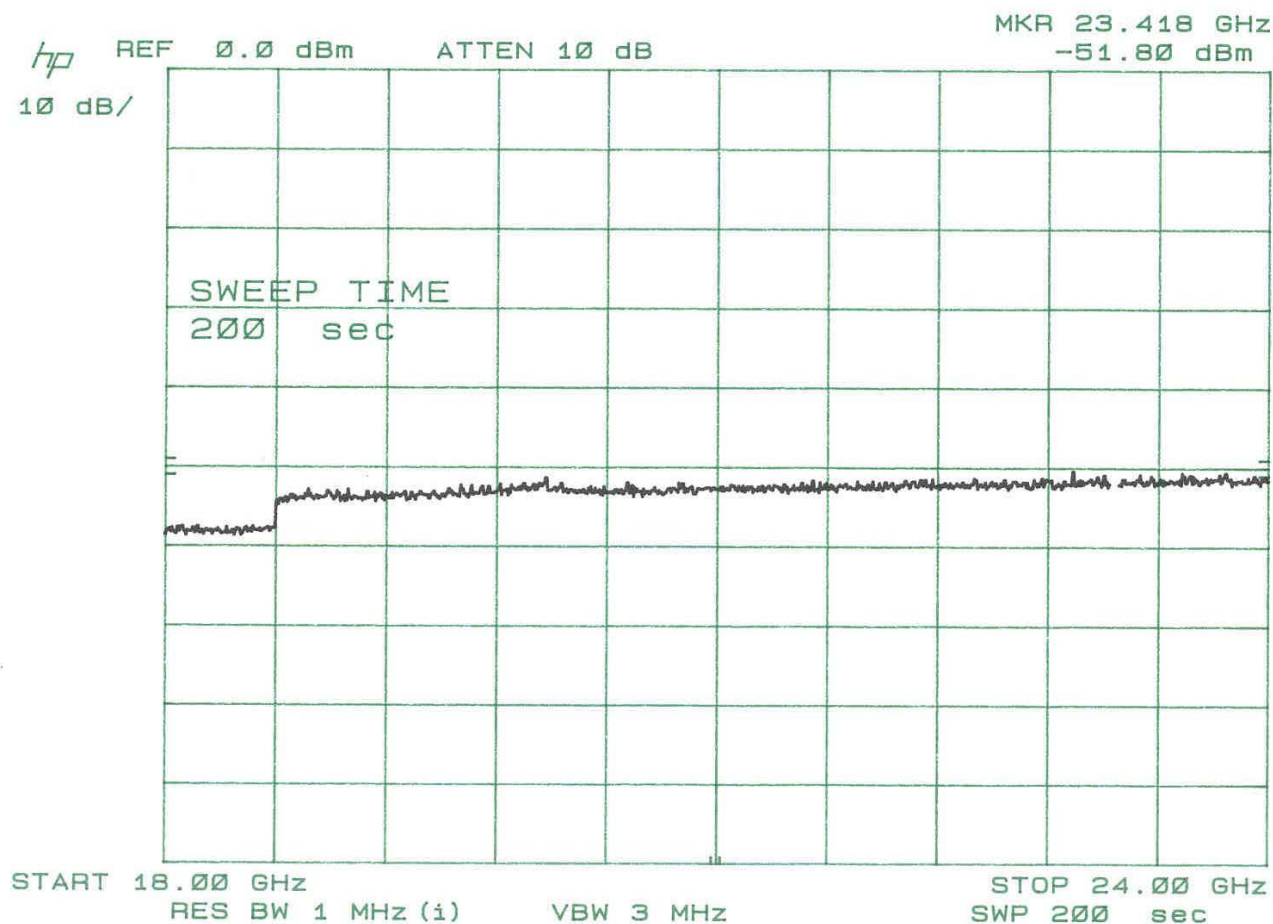


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
Low Frequency

A

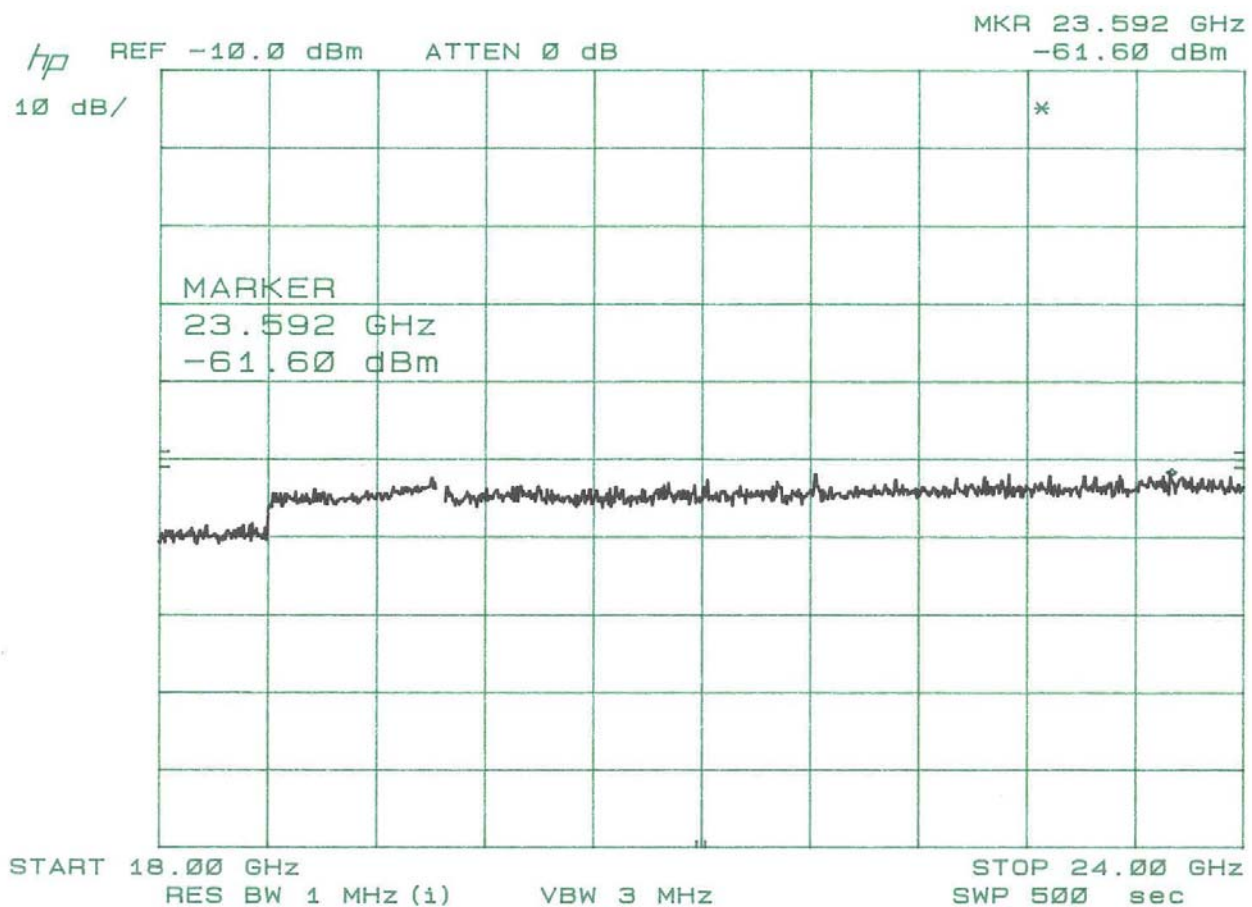


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
High Frequency

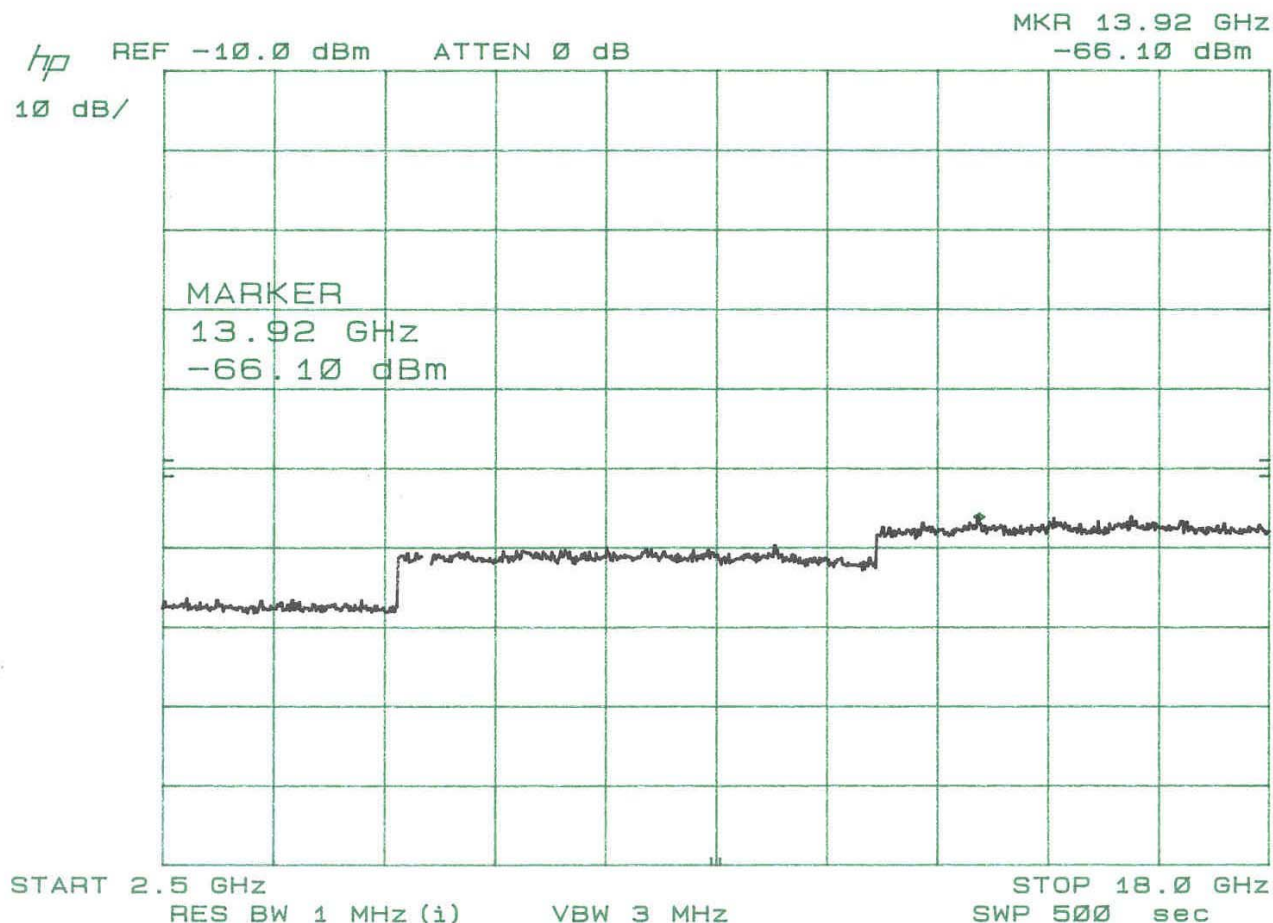
B



CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
High Frequency

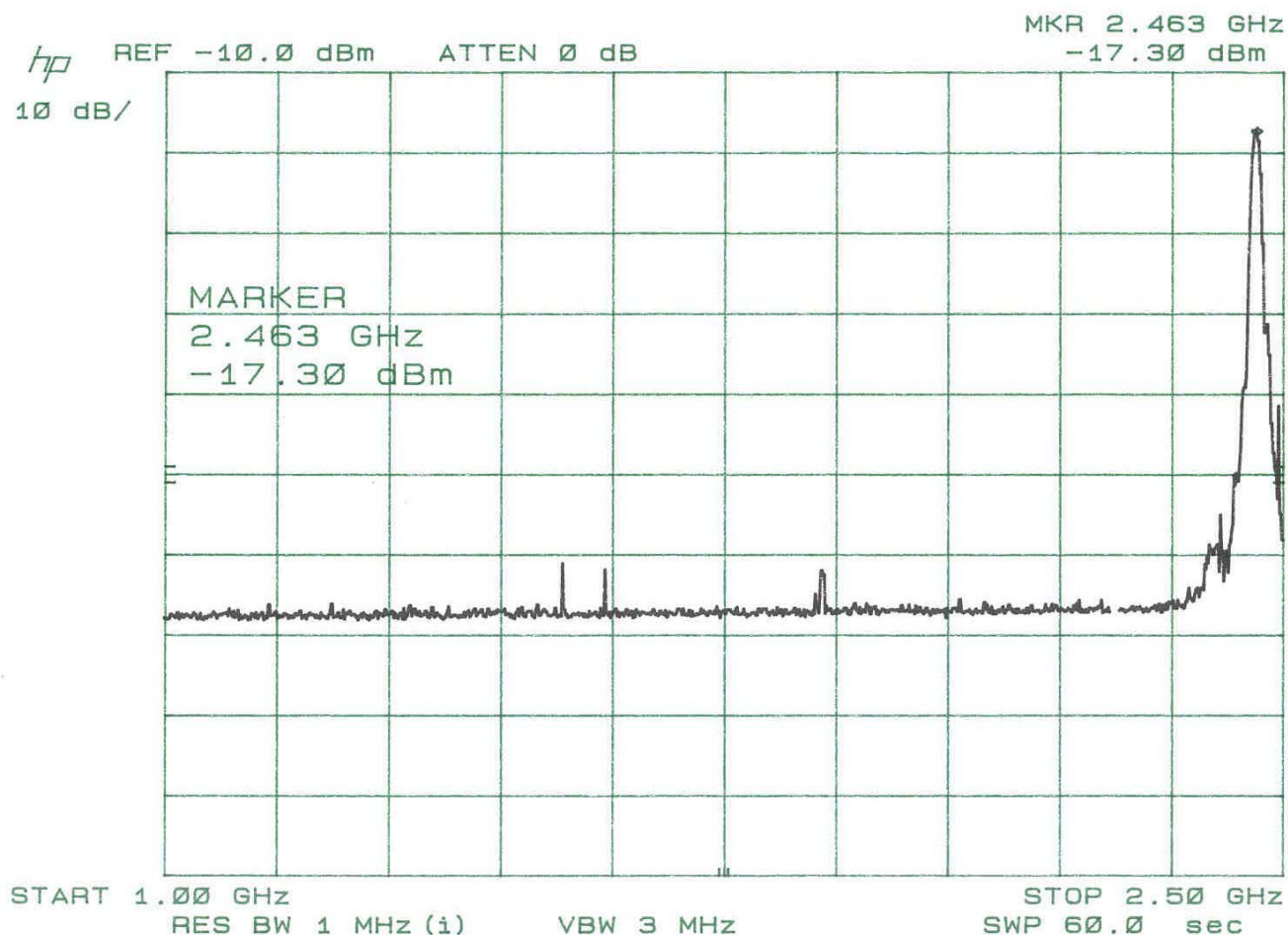


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
High Frequency

8

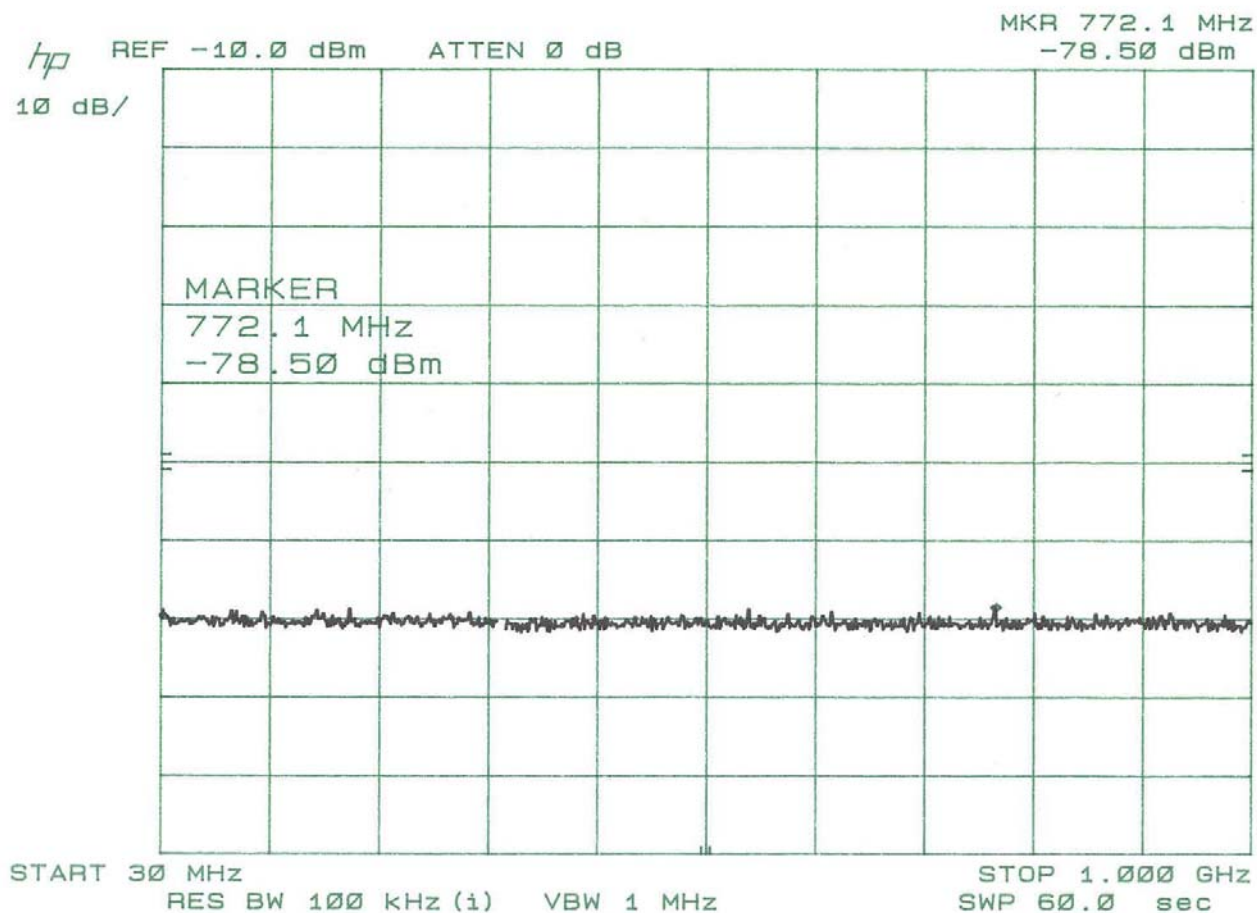


CONDUCTED SPURIOUS MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITIUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 22, 2003
TEST NUMBER: 4
PROCEDURE: 97-114
High Frequency

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2.4.6 Photographic Documentation

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: CONTINUOUS TRANSMISSION

DATE: MAY 22, 2003
TEST NUMBER: 4
COUPLING DEVICE:
TEST SPEC:



Photograph Description:

FORM CTS-PHOTO

Planar Dome Invitum
Document #: TR3602A.03
Date: June 4, 2003

2.5 FCC Part 15 Subpart C 15.247 Band Edge**2.5.1 Equipment Used**

Test Equipment	Asset #	Serial #	Cal Date
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03
EMCO 3115 Microwave Horn Antenna	376	2796	1/04

2.5.2 Test Conditions

Band Edge measurements were performed with the Invitium placed on top of a wooden turntable with its output connected to a spectrum analyzer. The Invitium was configured to operate in the continuous full power mode of operation.

2.5.3 Test Method

The test method of “Guidance on Measurements for Direct Sequence Spread Spectrum Systems” Appendix C of Docket No. 96-8 FCC 97-114 was followed.

2.5.4 Results

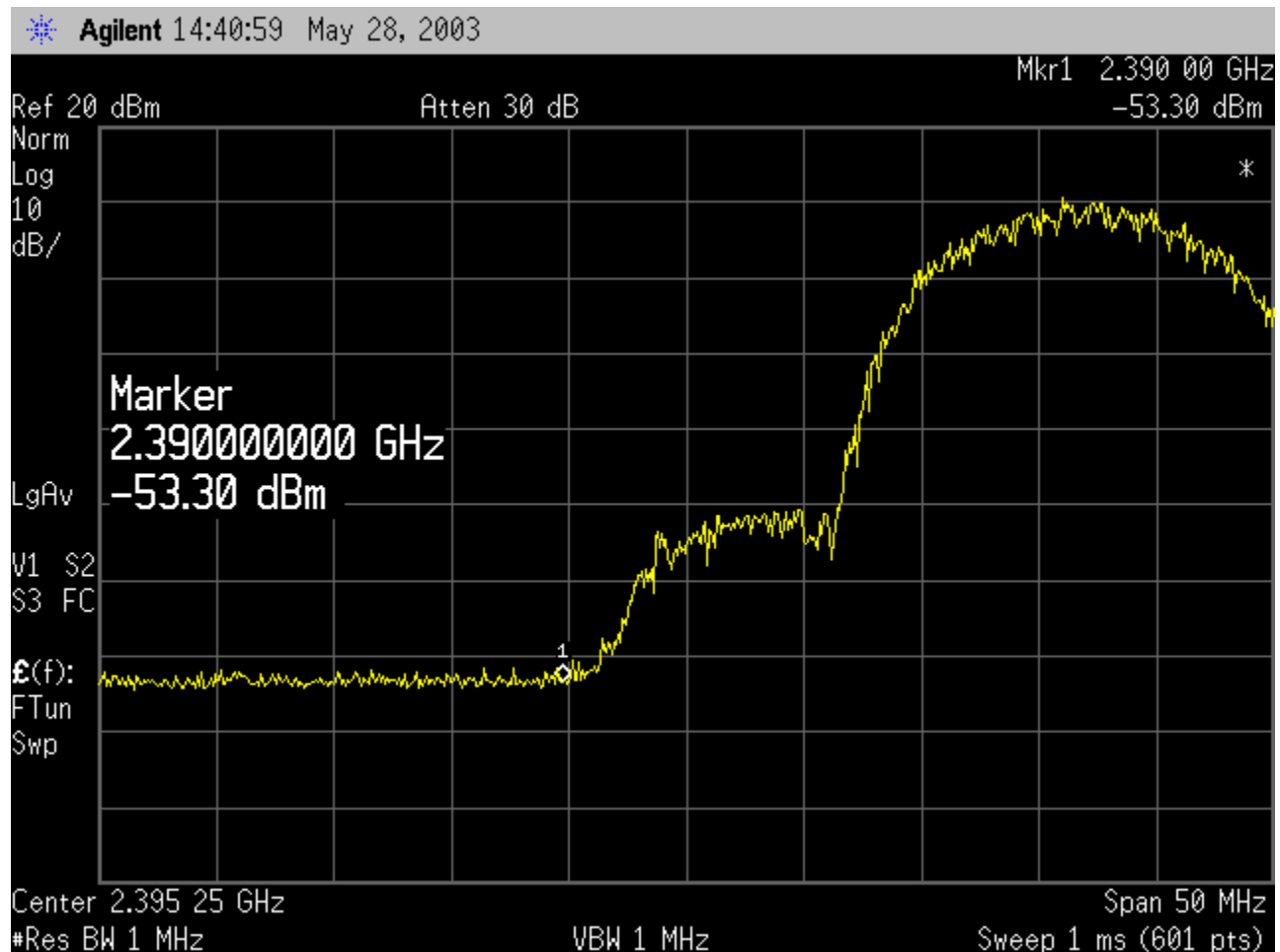
The Planar Dome Invitium meets the Band Edge requirements of FCC Part 15 Subpart C 15.247.

2.5.5 Test Data

BAND EDGE MEASUREMENTS CONDUCTED

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

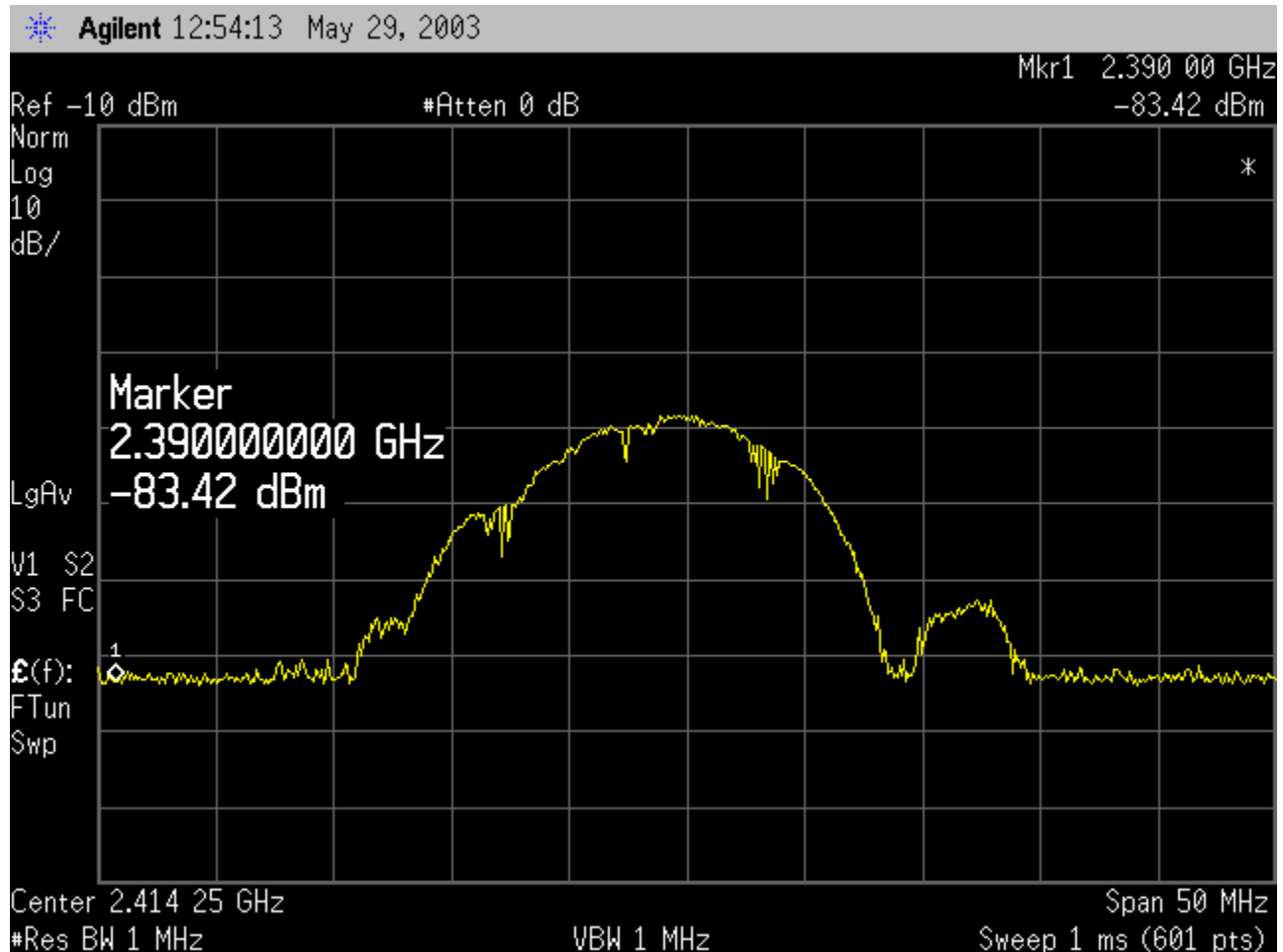
DATE: MAY 28, 2003
TEST NUMBER: 5
PROCEDURE: 97-114
Low Band



BAND EDGE MEASUREMENTS RADIATED

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

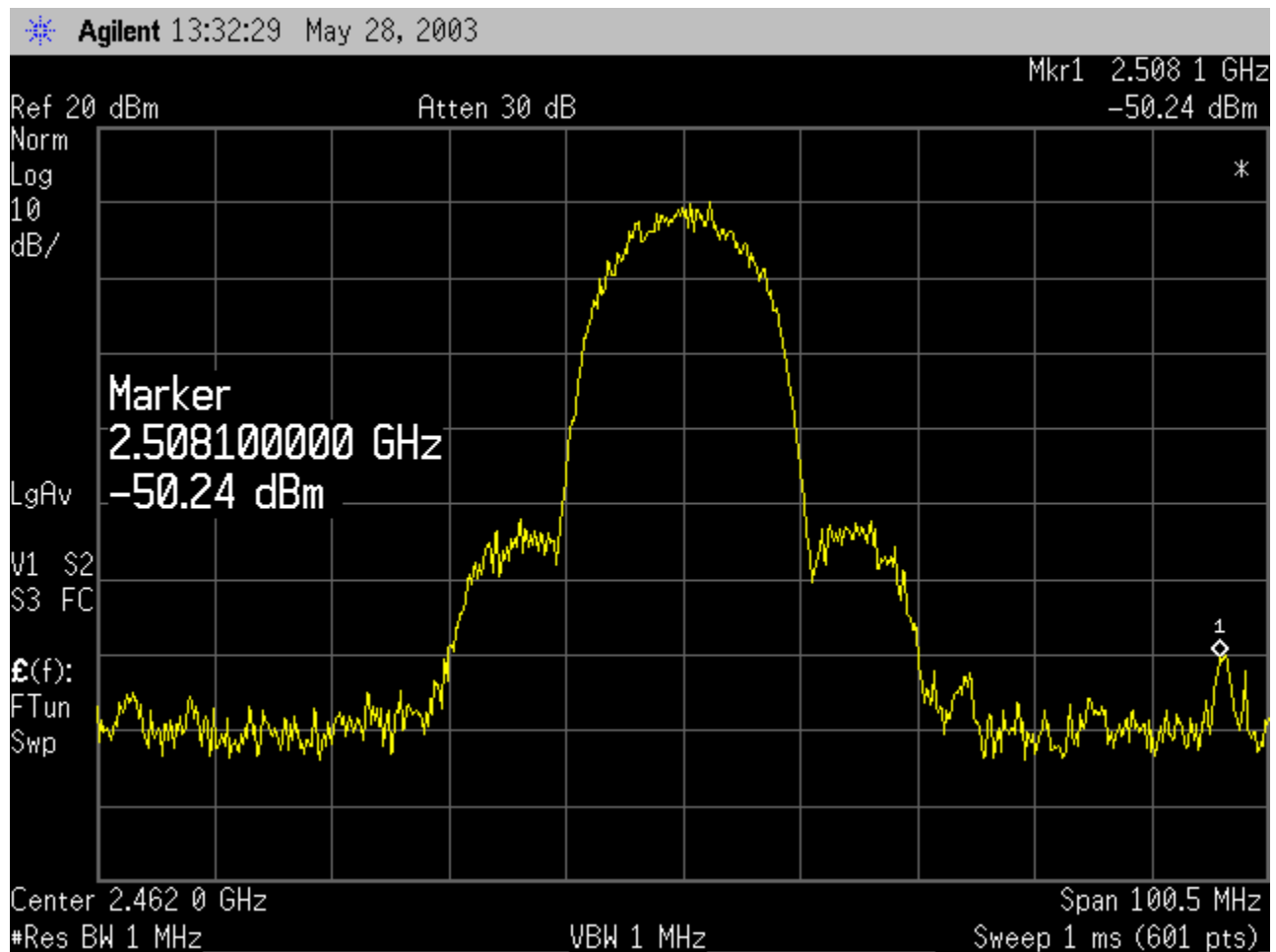
DATE: MAY 28, 2003
TEST NUMBER: 5
PROCEDURE: 97-114
Low Band



BAND EDGE MEASUREMENTS CONDUCTED

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

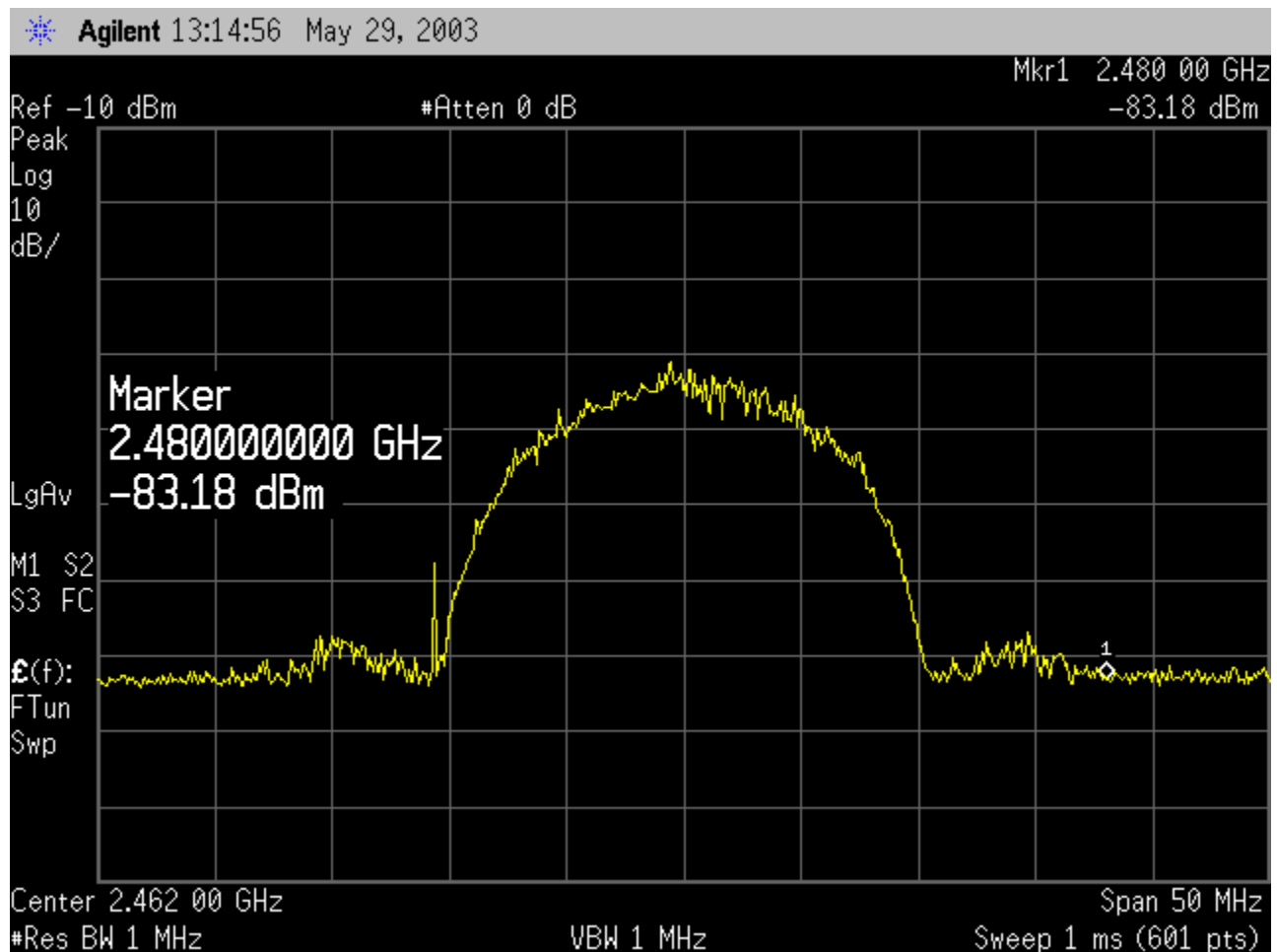
DATE: MAY 28, 2003
TEST NUMBER: 5
PROCEDURE: 97-114
High Band

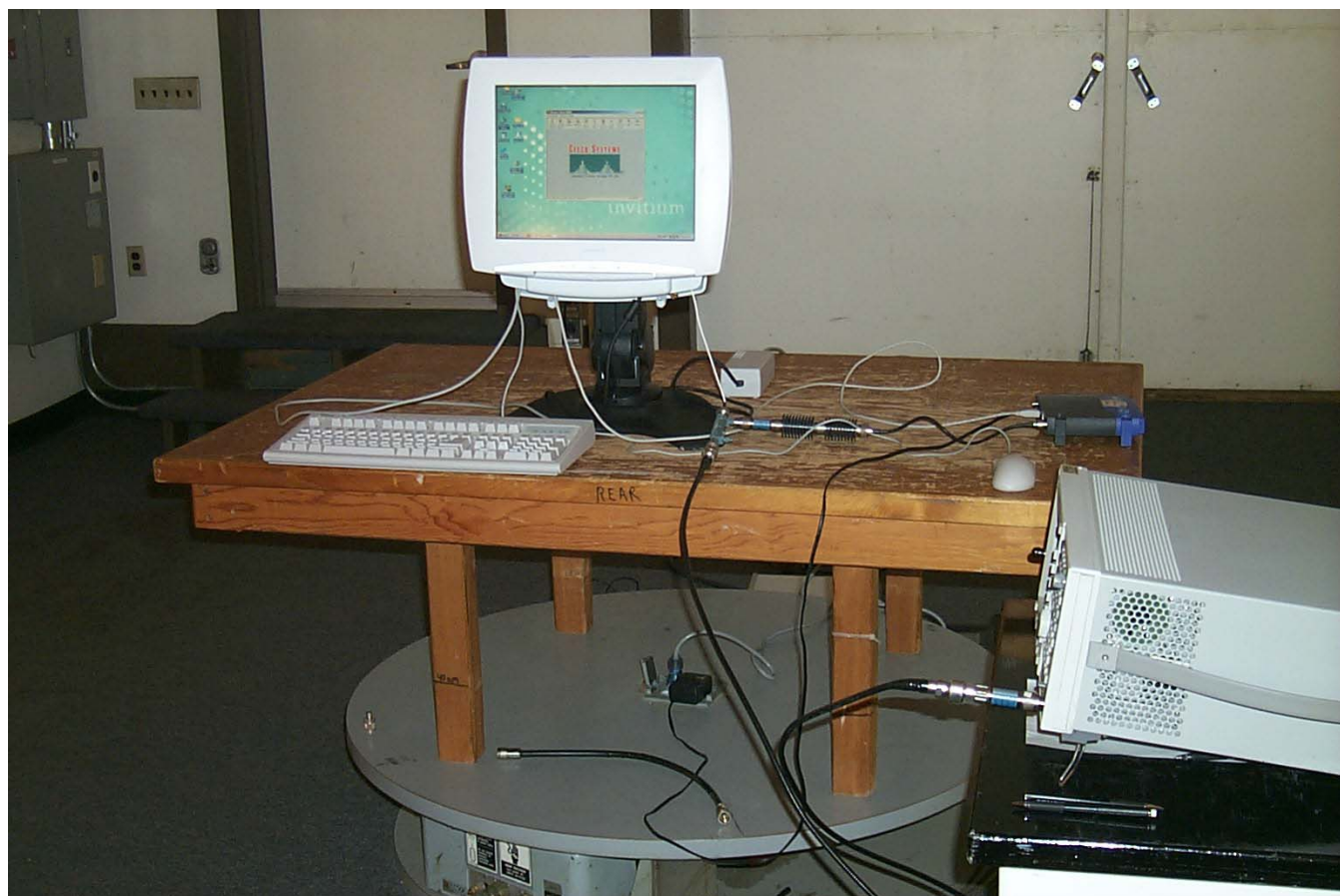


BAND EDGE MEASUREMENTS RADIATED

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 28, 2003
TEST NUMBER: 5
PROCEDURE: 97-114
High Band



2.5.6 Photographic Documentation**CUSTOMER: PLANAR DOME****EQUIPMENT: INVITIUM****TESTED BY: ROBERT FOSTER****OPERATING MODE: CONTINUOUS TRANSMISSION****DATE: MAY 28, 2003****TEST NUMBER: 5****COUPLING DEVICE:****TEST SPEC:**

Photograph Description:

FORM CTS-PHOTO

Planar Dome Invitium
Document #: TR3602A.03
Date: June 4, 2003

2.6 FCC Part 15 Subpart C 15.247 Power Spectral Density**2.6.1 Equipment Used**

Test Equipment	Asset #	Serial #	Cal Date
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03

2.6.2 Test Conditions

Power Spectral Density tests were performed on the Planar Dome Invitium.

Power Spectral Density measurement test was performed with the Invitium placed on a wooden turntable with the output connected to the spectrum analyzer. The Invitium was configured to operate in the continuous full power mode of operation.

2.6.3 Test Method

The test method of “Guidance on Measurements for Direct Sequence Spread Spectrum Systems” Appendix C of Docket No. 96-8 FCC 97-114 was followed.

The Spurious of the Transceiver Tower was measured with the output of the transceiver directly connected to the in put of the Spectrum Analyzer.

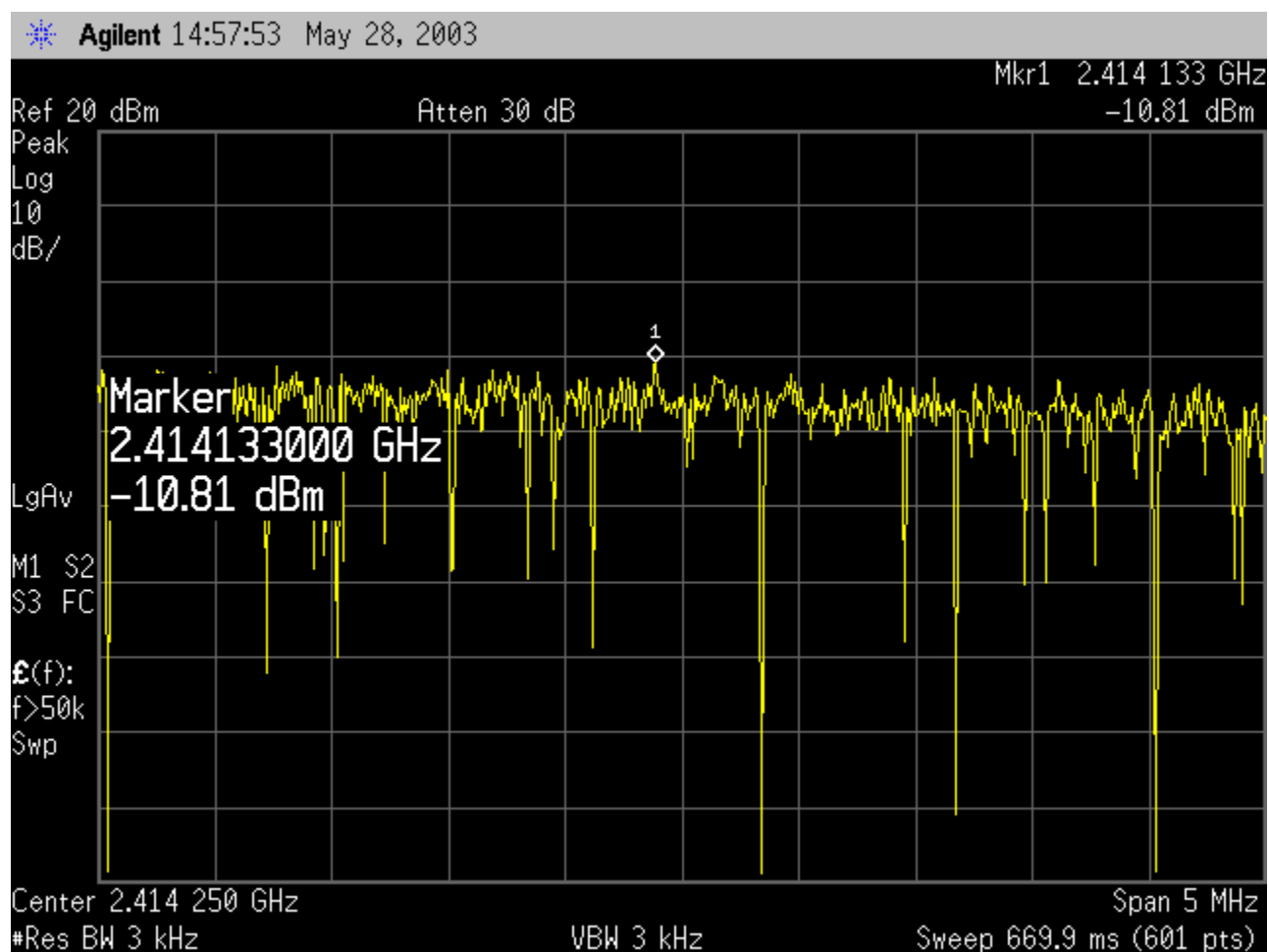
2.6.4 Results

The Planar Dome Invitium meets the spurious requirements of FCC Part 15 Subpart C 15.247.

2.6.5 Test Data**POWER SPECTRAL DENSITY MEASUREMENTS**

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

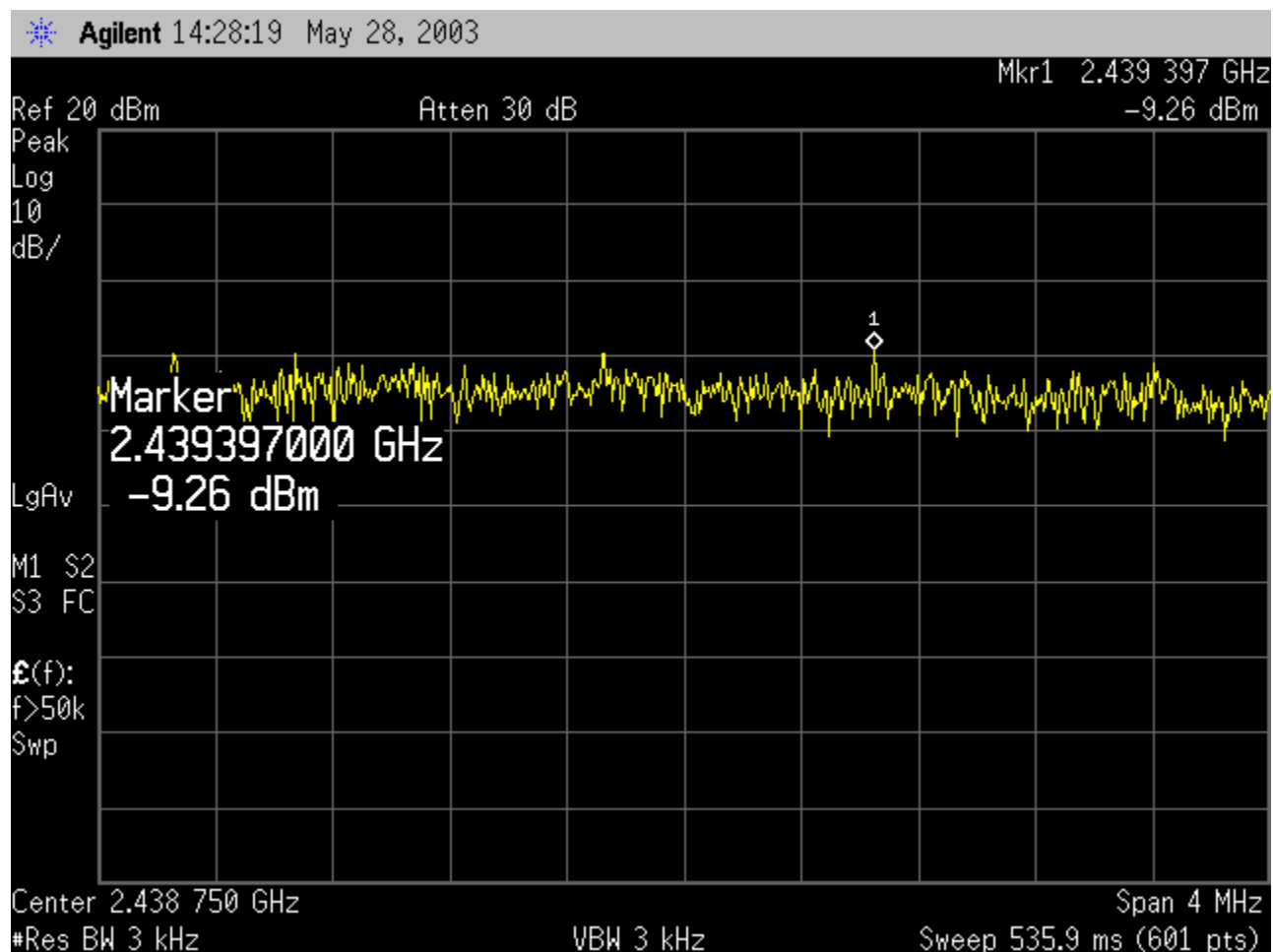
DATE: MAY 28, 2003
TEST NUMBER: 6
PROCEDURE: 97-114
Low Frequency



POWER SPECTRAL DENSITY MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: SPURIOUS

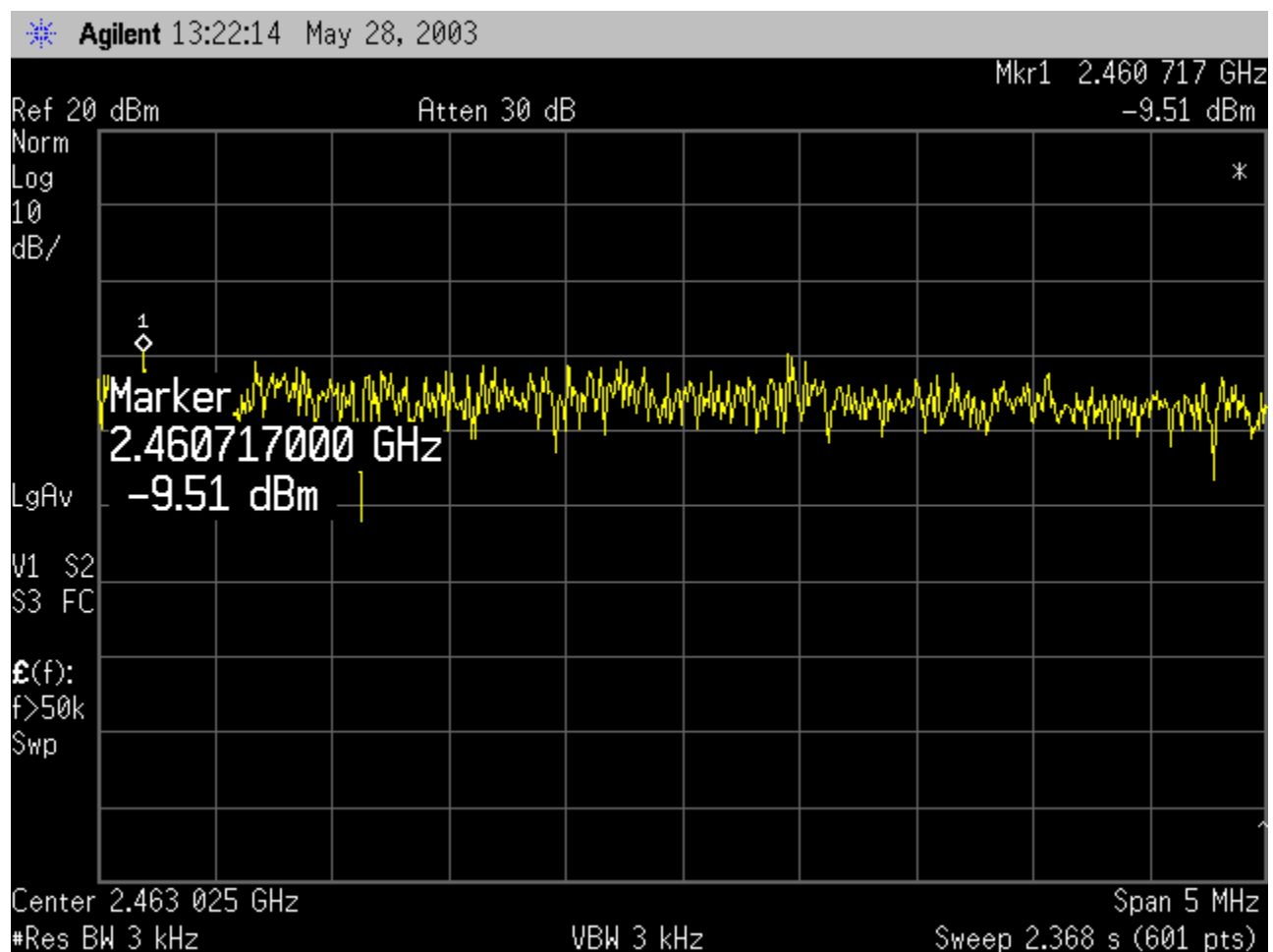
DATE: MAY 28, 2003
TEST NUMBER: 6
PROCEDURE: 97-114
Mid. Frequency

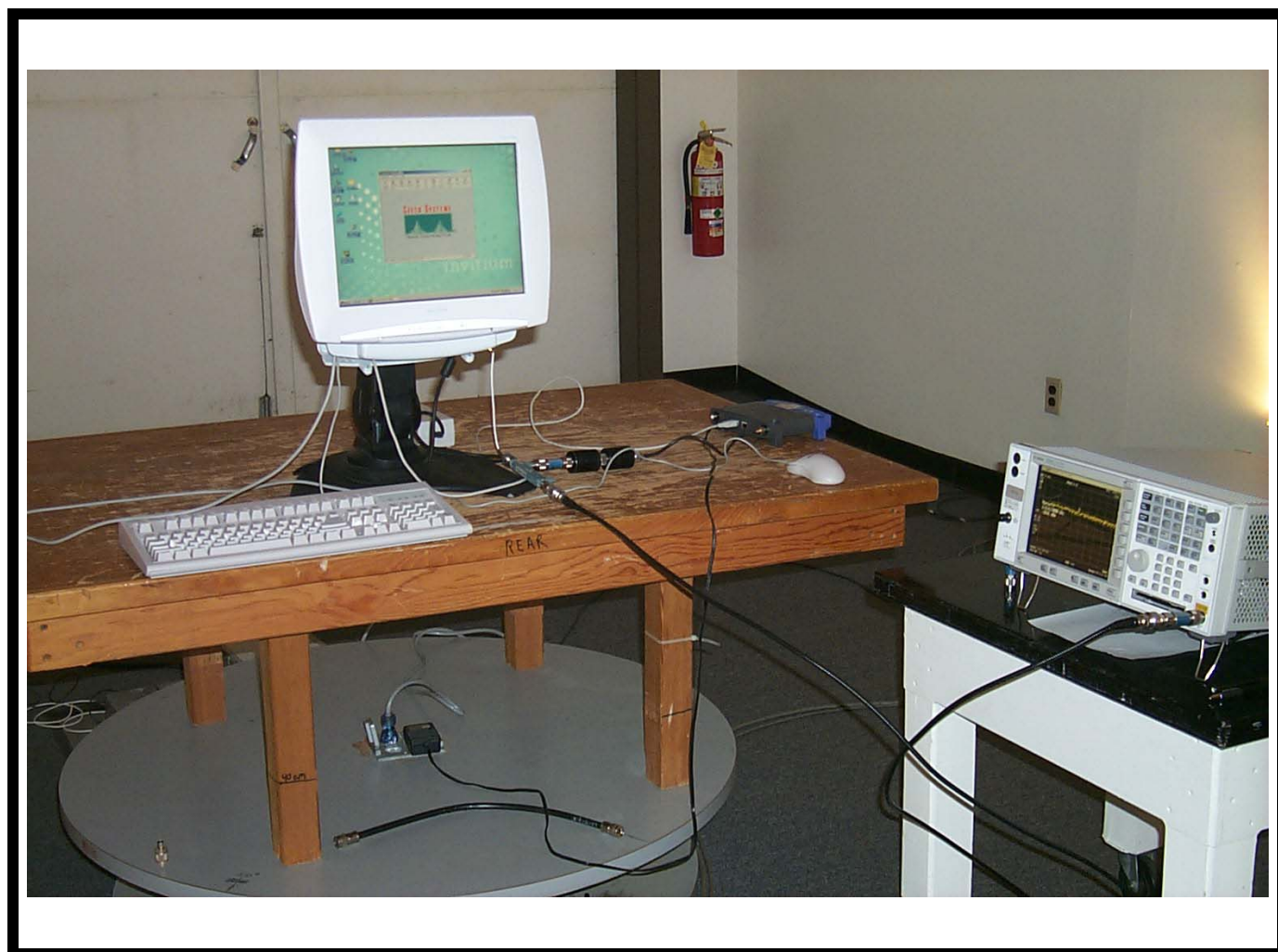


POWER SPECTRAL DENSITY MEASUREMENTS

CUSTOMER: PLANAR DOME
EQUIPMENT: INVITUM
TESTED BY: ROBERT FOSTER
OPERATING MODE: NORMAL

DATE: MAY 28, 2003
TEST NUMBER: 6
PROCEDURE: 97-114
High Frequency



2.6.6 Photographic Documentation**CUSTOMER: PLANAR DOME****EQUIPMENT: INVITIUM****TESTED BY: ROBERT FOSTER****OPERATING MODE: CONTINUOUS TRANSMISSION****DATE: MAY 28, 2003****TEST NUMBER: 6****COUPLING DEVICE:****TEST SPEC:**

Photograph Description:

FORM CTS-PHOTO

2.7 FCC Part 15 Subpart C Field Strength Harmonics and Spurious**2.7.1 Equipment Used**

Equipment Used	Asset #	Serial #	Cal Date
Agilent E4440A Spectrum Analyzer	704	US41421236	1/04
Tektronix 496 Spectrum Analyzer	56	B010206	4/04
Hewlett Packard 8566B Spectrum Analyzer	47	2637A04064	7/03
Hewlett Packard 8566 Display Analyzer Main	46	2648A14289	7/03
Hewlett Packard 85685A RF Preselector	48	2648A00483	7/03
Eaton 94626-1 Horn Antenna	334	145	1/04
EMCO 3115 Microwave Horn Antenna	376	2796	1/04

2.7.2 Test Conditions

Field Strength of harmonics emissions testing were performed with the Invitium set up on a wooden table above the turntable at a distance of 3 meters from a tuned dipole antenna within Open Area Test Site A. The Invitium was configured to operate in the continuous mode of operation to maximize the emissions. The worst case signals detected were recorded.

2.7.3 Test Method

The test method of ANSI C63.4 was followed. A manual scan was performed from 30MHz to 25GHz. During this scan, the antenna, turntable and the EUT's cable positions were manipulated to maximize the emission levels in a given frequency band displayed on the spectrum analyzer.

2.7.4 Results

The Planar Dome Invitium meets the FCC Part 15 Subpart C Harmonics Field Strength requirements.

2.7.5 Test Data

RADIATED E FIELD EMISSION MEASUREMENTS

CUSTOMER: PLANAR DOME

DATE: MAY 22, 2003

EQUIPMENT: INVITUM

TEST NUMBER: 7

TESTED BY: ROBERT FOSTER

TEST PROCEDURE: ANSI C63.4 & FCC 97-114

OPERATING MODE: CONTINUOUS TRANSMIT

TEST SPEC: FCC PART 15 SUBPART C

FREQUENCY RANGE: 30MHZ – 25 GHz

FREQUENCY MHz	PEAK MEASURED LEVEL -dBm	QUASI- PEAK MEASURED LEVEL dBuV	ANTENNA HEIGHT (METERS)	TURNTABLE AZIMUTH (DEGREES)	ANTENNA H/V	ANTENNA FAC/CABLE LOSS dB	FIELD LEVEL dBuV/m ✧	LIMIT dBuV/m (QP)
No harmonic or spurious detected emissions were detected								

✧ All signals greater than 3dB from the limit are calculate to the nearest whole number.

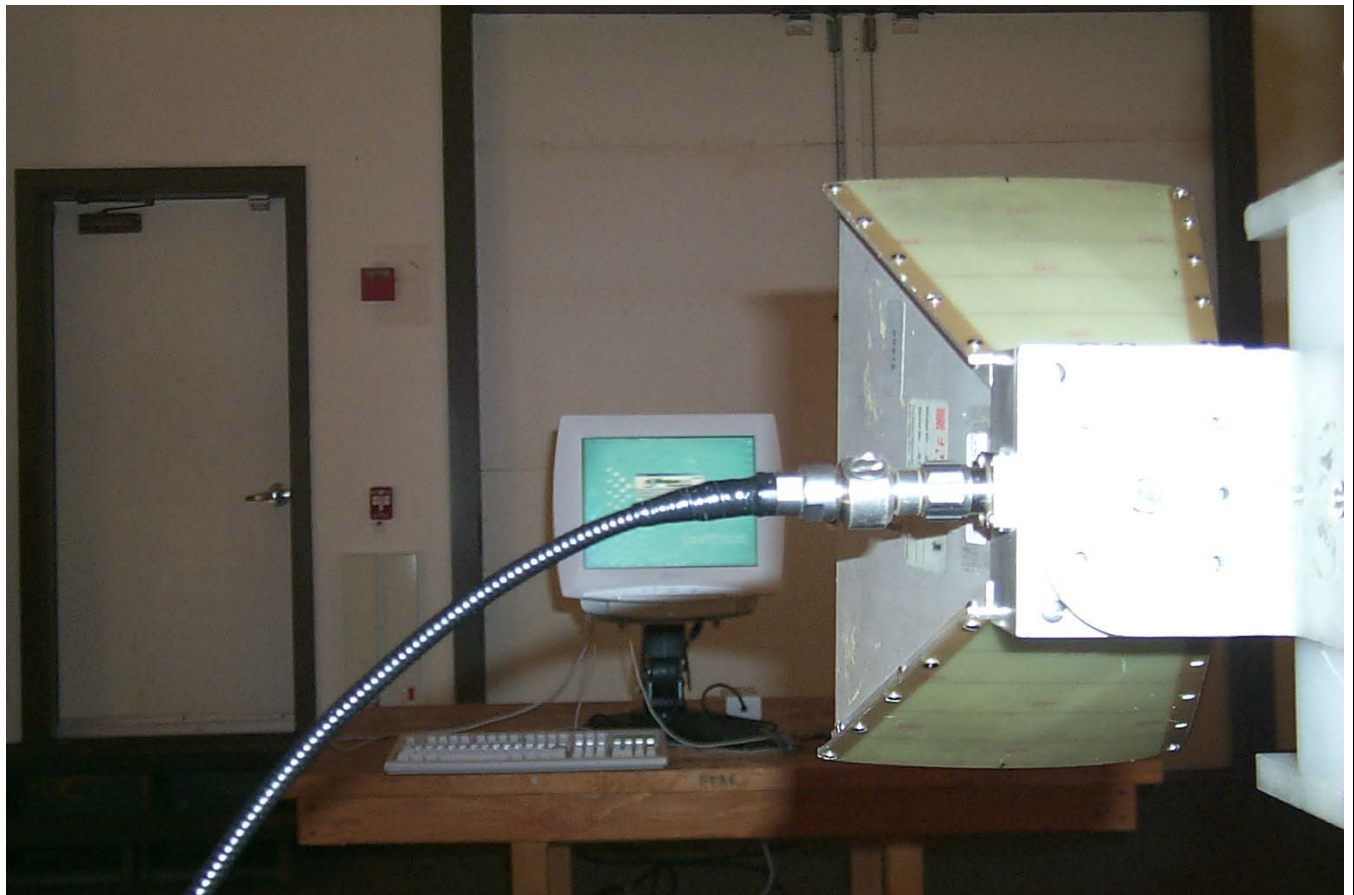
✧ Field Level (dBuV/m) = [107 – Measured level (dBm)] + Antenna Factor/Cable Loss (dB)

Ambient Temperature: 68°F

Humidity: 25 %

Atmospheric Pressure: 29.8 "

FORM CTS-DS-001R

2.7.6 Photographic Documentation**CUSTOMER: PLANAR DOME****EQUIPMENT: INVITUM****TESTED BY: ROBERT FOSTER****OPERATING MODE: CONTINUOUS TRANSMISSION****DATE: MAY 22, 2003****TEST NUMBER: 7****COUPLING DEVICE:****TEST SPEC:**

Photograph Description:

FORM CTS-PHOTO

**APPENDIX A
TEST LOG**

TEST SERVICES

TEST LOG

CUSTOMER: PLANAR DOME

PROGRAM: FCC CERTIFICATION

EQUIPMENT: INVITIUM

TESTED BY: ROBERT FOSTER

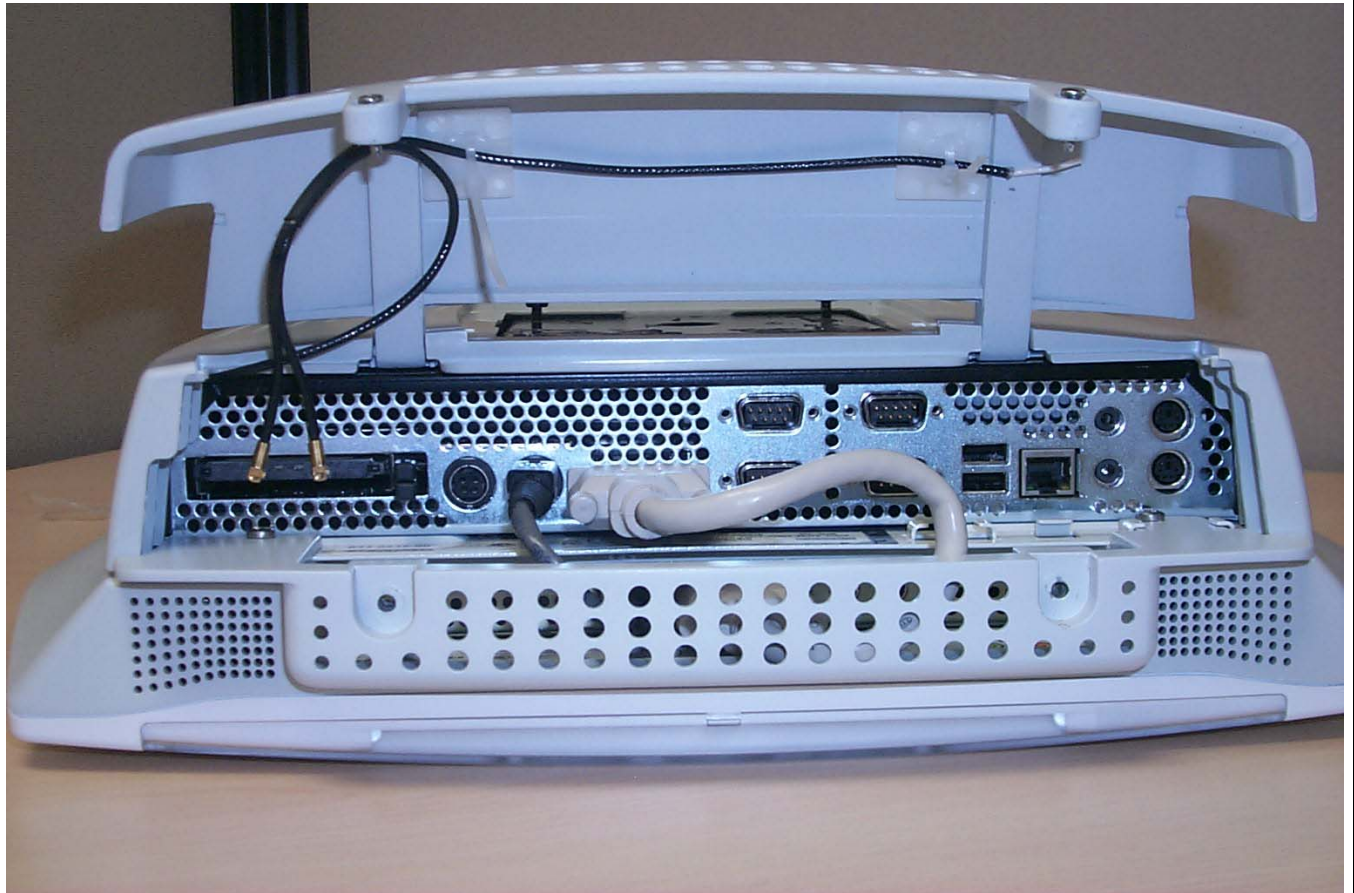
Pre-Test Checklist	Date	Comments					
	May 22, 2003	Test Plan/Procedure: ANSI C63.4 & FCC 97-114 Test Specification: FCC Part 15 Subpart B & C Chomerics Procedure: CHO TPEC T1, T2 EUT Power Requirement Verified: Invitium: 120V/60Hz Single phase EUT Functional Operational Check: [X] Pass [] Fail Environmental: Bonding/Grounding: N/A Safety Issues: N/A					
In-Process Test Checklist	Date	Test #	Test Type	Test Equipment Calibrated	Test Performed Properly – Data Accepted	EUT Set-up Check/ Operational Check	EUT Pass/ Fail
	May 28 2003	1	Bandwidth Subpart C	Yes	Yes	Yes	Pass
	May 28 2003	2	Power Output Subpart C	Yes	Yes	Yes	Pass
	May 28 2003	3	Field Strength of Fundamental Subpart C	Yes	Yes	Yes	Pass
	May 22 2003	4	Spurious Subpart C	Yes	Yes	Yes	Pass
	May 28 2003	5	Band Edge Subpart C	Yes	Yes	Yes	Pass
	May 28 2003	6	Power Spectral Density Subpart C	Yes	Yes	Yes	Pass
	May 22 2003	7	Field Strength of Harmonic Subpart C	Yes	Yes	Yes	Pass
Post Test Checklist	Date: May 28, 2003	EUT Functional Operation Check: [X] Pass [] Fail		Test Engineer/Tech Approved Signatory			

FORM CTS-010

Planar Dome Invitium
Document #: TR3602A.03
Date: June 4, 2003

**APPENDIX B
PHOTOGRAPHS OF ANTENNA**

Internal Clamshell Antenna "Antenna A"



Internal Side Antenna “ Antenna B”

