TEST REPORT

Limited FCC CFR 47: Part 15 Testing in support of an Application for
Grant of Equipment Authorisation of a Symbol 21-64436
Main Terminal Module (MTM) with embedded Radio
FCC ID: H9P2164436

Report Number: OR611514/02 Issue 2 November 2003

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REPORT ON	Limited FCC CFR 47: Part 15 Testing in support of an Application for Grant of Equipment Authorisation of a Symbol 21-64436 Main Terminal Module (MTM) with embedded Radio FCC ID: H9P2164436 Report No OR611514/02 Issue 2 November 2003
EQUIPMENT:	21-64436 Main Terminal Module with embedded Radio
FCC ID:	H9P2164436
SPECIFICATION:	FCC CFR 47: Part 15, August 2002
PREPARED FOR:	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
MANUFACTURERS REPRESENTATIVE:	Mr Marco Belli
APPROVED BY:	**C H GOULD** **EMC Signatory**
	M JENKINS **Radio Signatory**
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ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

A Guy

B Airs

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STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Main Terminal Module (MTM) with embedded Radio
APPLICANT	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
MANUFACTURERS TYPE NUMBER	21-64436
MANUFACTURERS PART NUMBER	21-64436-01
SERIAL NUMBER	00A0F85DBE93
HARDWARE REVISION	Rev 2
TEST SPECIFICATION NUMBER	FCC CFR 47: Part 15 Subparts B and C, August 2002
REGISTRATION NUMBER	OR611514
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR611514 13th October 2003
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	15th October 2003 3rd November 2003
TEST ENGINEERS	A Guy B Airs
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. FCC Public Notice document (DA 00-705 released 30 March 2000)

TEST RATIONALE

The information contained within this report is intended to show verification of compliance of the Symbol Technologies Inc 21-64436 MTM with embedded radio to the requirements of FCC Specification Part 15 - Modular Approval.

FCC ID H9P2164436

The unit supplied for testing was a 21-64436 Main Terminal Module with embedded Radio, which offers 2.4GHz 802.11b Wireless LAN connectivity.

The Symbol 21-64436 MTM (EUT) was configured for all tests powered via Symbol supplied "Test Jig" (p/n 3735-1000-0-000), 120V 60Hz ac Power Supply Unit (p/n 50-14001-008) and was connected to the "Host" Laptop Computer via a Cardbus Adaptor (p/n 3735-2000-3-001), PC Extender Card (p/n 140A-12773) and Cable Assembly (p/n 3188B). The EUT was supplied with two Antennas as shown in Photograph 5. Maximum Peak Output Power was performed as both EIRP and Conducted measurements.

This report details testing carried out in accordance with:

- FCC: Part 15.109, Spurious Radiated Emissions
- FCC: Part 15.205, 15.209, Measurement at Band Edge (Marker Delta Method)
- FCC: Part 15.207, Conducted Emissions (on Power Lines)
- FCC: Part 15.247(a)(2), 6dB Bandwidth
- FCC: Part 15.247(b)(3), Maximum Peak Output Power
- FCC: Part 15.247(c), Spurious Conducted Emissions (on Antenna Port)
- FCC: Part 15.247(c), Spurious Radiated Emissions
- FCC: Part 15.247(d), Peak Power Spectral Density

Location Of Testing

BABT Engineers, A Guy and B Airs, conducted all testing at the premises BABT, Segensworth Road, Fareham, Hampshire, PO15 5RH. Spurious Radiated Emissions measurements (30 MHz to 1GHz & 1GHz - 25GHz) were performed in a 3 metre Anechoic Chamber. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

SYSTEM CONFIGURATION DURING EMC TESTING

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site detailed in Annex A, and tested in accordance with the specification.

The Symbol 21-64436 MTM (EUT) was configured for all tests powered via Symbol supplied "Test Jig" (p/n 3735-1000-0-000), 120V 60Hz ac Power Supply Unit (p/n 50-14001-008) and was connected to the "Host" Laptop Computer via a Cardbus Adaptor (p/n 3735-2000-3-001), PC Extender Card (p/n 140A-12773) and Cable Assembly (p/n 3188B).

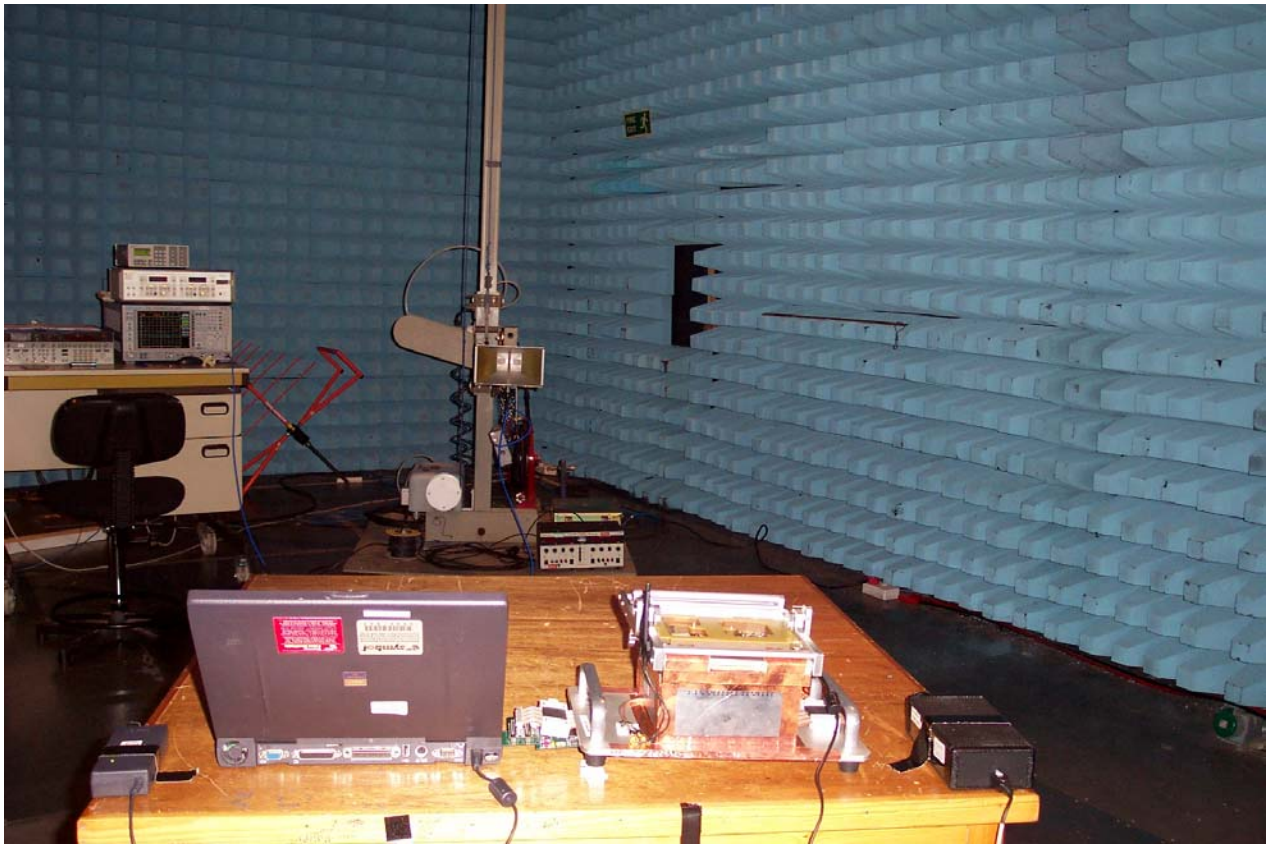
2.4GHz RLAN functionality

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

The Output Power level (controlled by application software) was set to its maximum rated output power.

TEST SET UP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing.



Photograph 1

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment: 21-64436 Main Terminal Module with embedded Radio

Manufacturer: Symbol Technologies Inc

Type No: 21-64436

Part No. 21-64436-01

Serial No: 00A0F85DBE93

Drawing Revision: Rev 2

Test Equipment and Ancillaries Used For Test

Instrument	Manufacturer	Type No.	Calibration Dates
Room 5	Siemens and Matsushita	EAC54300	TU
Turntable & Controller	HD	HD 050	TU
Antenna Mast	EMCO	2070	TU
Antenna Mast Controller	EMCO	2090	TU
Test Receiver	Rohde & Schwarz	ESIB 26	05/08/04
Signal Generator	Hewlett Packard	8673B	05/06/04
High Pass Filter	RLC Electronics	F-100-4000-5-R	TU
Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	TU
Horn (1-18GHz)	EMCO	3115	04/07/04
Horn (1-18GHz)	EMCO	3115	04/07/04
18-40GHz Horn	Advanced Microtek	AM180-HA-K-TU2	15/08/04
8-18GHz Low Noise Amplifier	Avantek	AWT-18036	26/06/04
18-26GHz Low Noise Amplifier	Avantek	AMT-26177-33	26/06/04
Spectrum Monitor	Rohde & Schwarz	EMZ	TU
Barometer	diplex	-	TU
Thermo hydrograph	Rotronic	A1	28/11/03

Table of Instrumentation Used for Testing

Test Equipment and Ancillaries Used For Test-continued

Instrument	Manufacturer	Type No.	Calibration Dates
Power Supply	Thurlby	PL330QMD	TU
Digital Voltmeter	Fluke	8050A	29/04/04
Thermo hygrometer	Rotronic	I-1000	08/10/04
Attenuator 10dB	Texscan	HFP-50N	28/07/04
Crystal Detector	Hewlett Packard	8470B	TU
Digital Storage Scope	LeCroy	LC534L	18/12/03
Signal Generator	Hewlett Packard	8673B	16/06/04
Power Analyser	Hewlett Packard	8990A	14/08/04
Power Analyser Probe	Hewlett Packard	84812A	14/08/04
Attenuator 20dB	Weinschel	46-20-34	08/10/04
Spectrum Analyser	Rohde & Schwarz	FSEM	16/12/03
Signal Generator	Marconi	2031	20/08/04

Table of Instrumentation Used for Testing

Instrumentation Used For Exercising The EUT

Instrument	Manufacturer	Type No	Serial No
Notebook PC	Dell	PPX	#2
AC Adapter	Dell	AA20031	09364U-12761-04T-3516
Notebook PC	Toshiba	Tecra 8100 PT810U	Y0081530U
AC Adapter	Toshiba	PA2450U	9709

Table of Instrumentation Used for Exercising the EUT

Note(s)

1) All items are calibrated annually, except where labelled TU (Traceability Unscheduled). These items are calibrated within the test configurations using calibrated equipment.

Test Case	:	Spurious Radiated Emissions
Test Date	:	16th October 2003
Rule Parts	:	15.109

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart B, Section 15.109, for Spurious Radiated Emissions was carried out on the Measurement Test Facility detailed in Annex A.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance unless otherwise stated. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 25GHz. The list of worst-case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

30MHz – 1GHz emission levels were then formally measured using a CISPR Quasi-Peak detector.
1GHz – 25GHz emission levels were then formally measured using a Peak detector.

The EUT was connected to a 120V 60Hz supply.

Measurements were made with the EUT receiving on the following channels.

2412MHz
2437MHz
2462MHz

Spurious Radiated Emissions from 30MHz to 1GHz were made using a HP 8542E Test Receiver.

Spurious Radiated Emissions from 1GHz to 25GHz were made using a Rhode and Schwarz ESIB 40 Test Receiver.

The measurements were performed at a 3m distance unless otherwise stated.

Test Case : Spurious Radiated Emissions - continued

Test Date : 16th October 2003

Rule Parts : 15.109

Test Results

30MHz - 1GHz Frequency Range

Equipment Designation: Unintentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15, Subpart B, Section 15.109 for Spurious Radiated Emissions (30MHz – 1GHz).

EUT Rx on Bottom Channel (2412MHz)

30MHz – 1GHz Open Area Test Site Results: The levels of the emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
88.5	V	106	180	26.0	20.0	43.5	150.0
132.5	V	100	25	24.3	16.4	43.5	150.0
132.9	H	180	275	34.2	51.3	43.5	150.0
176.0	V	100	140	24.1	16.0	43.5	150.0
200.1	H	180	275	34.2	51.3	43.5	150.0
200.1	V	110	10	31.7	38.5	43.5	150.0
263.1	H	100	0	37.6	75.9	46.0	200.0
460.0	H	100	0	37.1	71.6	46.0	200.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 16th October 2003

Rule Parts : 15.109

Test Results - continued

30MHz - 1GHz Frequency Range

EUT Rx on Middle Channel (2437MHz)

30MHz – 1GHz Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
88.0	V	100	175	26.4	20.1	40.0	100.0
132.8	V	100	16	23.8	15.5	43.5	150.0
133.1	H	184	0	25.5	18.8	43.5	150.0
176.0	V	100	134	22.3	13.0	43.5	150.0
199.7	H	182	280	33.7	48.4	43.5	150.0
199.7	V	107	10	32.4	41.7	43.5	150.0
263.1	H	100	0	38.5	84.1	46.0	200.0
460.4	H	100	0	36.7	68.4	46.0	200.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 16th October 2003

Rule Parts : 15.109

Test Results - continued

30MHz - 1GHz Frequency Range

EUT Rx on Top Channel (2462MHz)

30MHz – 1GHz Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
88.2	V	100	180	25.7	19.3	40.0	100.0
132.4	V	100	36	26.5	21.1	43.5	100.0
133.0	H	197	5	29.7	30.5	43.5	150.0
176.0	V	120	300	25.0	17.8	43.5	150.0
198.9	H	185	240	30.1	32.0	43.5	150.0
199.7	V	103	0	32.3	41.2	43.5	150.0
261.0	H	100	0	40.1	101.2	46.0	200.0
461.1	H	100	0	39.4	93.3	46.0	200.0
466.2	V	100	343	37.4	74.1	46.0	200.0

ABBREVIATIONS FOR ABOVE TABLES

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Test Case : Spurious Radiated Emissions - continued

Test Date : 18th October 2003

Rule Parts : 15.109

Test Results - continued

1GHz – 25GHz Frequency Range

Equipment Designation: Unintentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15, Subpart B, Section 15.109 for Spurious Radiated Emissions (1GHz – 25GHz).

EUT Rx on Bottom Channel (2412MHz)

1GHz – 25GHz Open Area Test Site Results: The levels of the emissions measured in accordance with the specification are presented below: -

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Polarisation	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	100	102	52.3	74.0	33.0	54.0
1.643	V	100	86	51.2	74.0	33.7	54.0
4.076	V	110	320	43.4	74.0	36.1	54.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 18th October 2003

Rule Parts : 15.109

Test Results - continued

1GHz – 25GHz Frequency Range

EUT Rx on Middle Channel (2437MHz)

1GHz – 25GHz Open Area Test Site Results: The levels of the emissions measured in accordance with the specification are presented below: -

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Polarisation	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	100	95	53.4	74.0	33.2	54.0
1.643	V	105	87	50.9	74.0	33.8	54.0
4.126	V	115	327	43.6	74.0	35.5	54.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 18th October 2003

Rule Parts : 15.109

Test Results - continued

1GHz – 25GHz Frequency Range

EUT Rx on Top Channel (2462MHz)

1GHz – 25GHz Open Area Test Site Results: The levels of the emissions measured in accordance with the specification are presented below: -

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Polarisation	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	100	97	53.7	74.0	33.1	54.0
1.643	V	100	77	51.2	74.0	33.6	54.0
4.176	V	110	331	46.2	74.0	37.1	54.0

ABBREVIATIONS FOR ABOVE TABLES

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Test Case : Band Edge Measurements (Marker Delta Method)

Test Date : 15th October 2003

Rule Parts : 15.205

Measurement Method

The following Test Results were obtained using the FCC Public Notice document (DA 00-705 released 30 March 2000) for making measurements at the Band Edge, incorporating the 'Marker Delta Method'.

Test Results

The EUT met the requirements of FCC CFR 47: Part 15, Subpart C, Section 15.205 for Band Edge Measurements.

Step 1

Bottom Channel Fundamental Field Strength Measurement.

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak Field Strength	Average Field Strength
GHz	H/V	cm	deg	dBµV/m	dBµV/m
2.412	V	110	176	109.6	101.8

Step 2

Determine Marker delta amplitude between 2.412GHz fundamental and 2.390GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.412GHz Peak using above instrument settings = 74.6 dBµV (uncorrected)
2.390GHz Peak using above instrument settings = 15.6 dBµV (uncorrected)

Therefore Marker Delta Amplitude (74.6 – 15.6) = 59.0dB

Step 3

By subtracting the Marker Delta obtained from Step 2 from the 2412MHz Field Strength measurement from Step 1, gives following Result

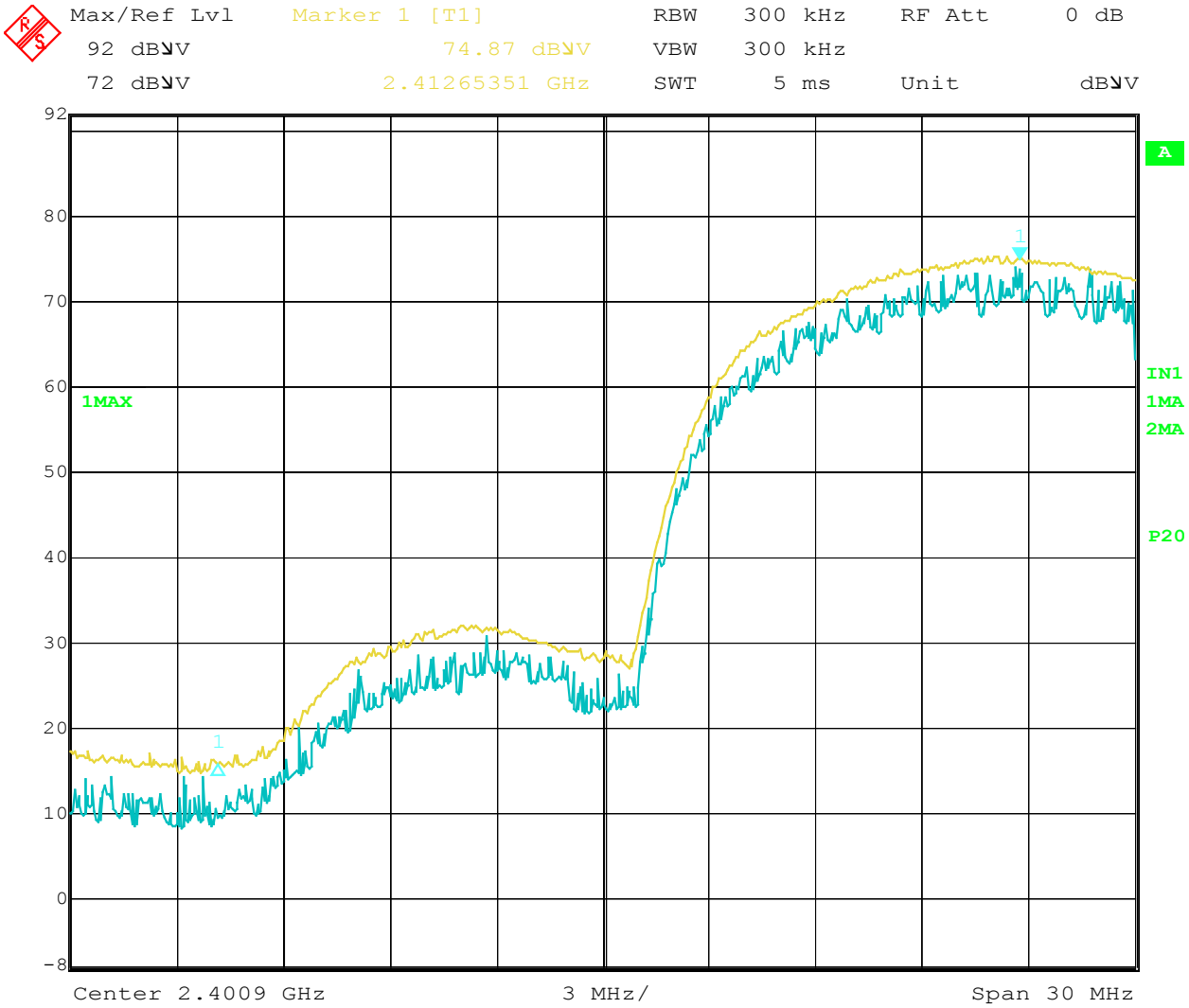
Peak of 109.6dBµV/m – 59.0dB (Delta) = **50.6dBµV/m** (Limit is 74.0dBµV/m = Pass)

Average of 101.8dBµV/m – 59.0dB (Delta) = **42.8dBµV/m** (Limit is 54.0dBµV/m = Pass)

Test Case	:	Band Edge Measurements - continued
Test Date	:	15th October 2003
Rule Parts	:	15.205

Test Results - continued

Plot for Tx on Bottom Channel (2412MHz)



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Test Case : Band Edge Measurements - continued

Test Date : 15th October 2003

Rule Parts : 15.205

Test Results - continued

Step 1

Top Channel Fundamental Field Strength Measurement.

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Freq	Ant Pol	Hgt	Azi	Peak FS	Average FS
GHz	H/V	cm	deg	dBµV/m	dBµV/m
2.462	V	131	173	111.15	104.0

Step 2

Determine Marker delta amplitude between 2.462GHz fundamental and 2.4835GHz the Band Edge under investigation.

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

2.462GHz Peak using above instrument settings = 77.0dBµV (uncorrected)
2.4835GHz Peak using above instrument settings = 15.3dBµV (uncorrected)

Therefore Marker Delta Amplitude (77.0 – 15.0) = 60.0dB

Step 3

By subtracting the Marker Delta obtained from Step 2 from the 2412MHz Field Strength measurement from Step 1, gives following Result

Result Peak of 111.15dBµV/m – 60.0dB (Delta) = **51.15dBµV/m** (Limit is 74.0dBµV/m = Pass)

Result Average of 104.0dBµV/m – 60.0dB (Delta) = **44.0dBµV/m** (Limit is 54.0dBµV/m = Pass)

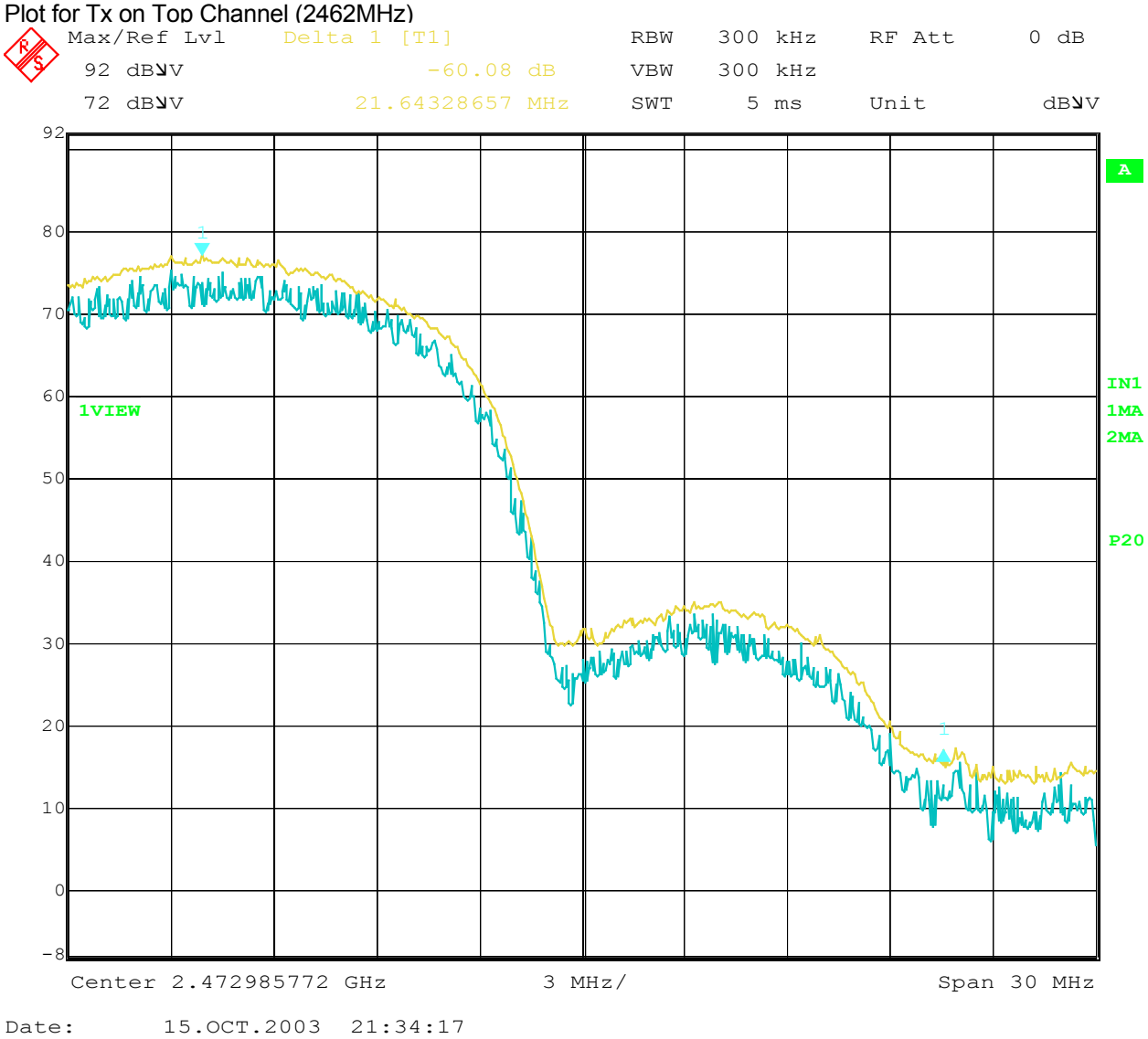
Procedure: Test Performed in accordance with FCC Public Notice document (DA 00-705 released 30 March 2000)

Performed by: A Guy, EMC Engineer.

Test Case	:	Band Edge Measurements - continued
Test Date	:	15th October 2003
Rule Parts	:	15.205

Test Results - continued

Plot for Tx on Top Channel (2462MHz)



Test Case	:	Conducted Emissions on Power Lines
Test Date	:	19th October 2003
Rule Parts	:	15.207

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.207, for Conducted Emissions was carried out on the Measurement Test Facility detailed in Annex A.

Conducted Emission Measurements were undertaken within the semi-anechoic chamber. Emissions were measured on the Live and Neutral Lines.

Emissions were formally measured using a Quasi-Peak Detector, which meets the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in Tables below respectively.

The EUT was connected to a 120V 60Hz supply.

The Conducted Emission measurements were made using a Hewlett Packard 8542E EMI Receiver.

Test Case : Conducted Emissions on Power Lines - continued

Test Date : 19th October 2003

Rule Parts : 15.207

Test Results

The EUT met the Class B requirements of FCC CFR 47: Part 15 Subpart C, Section 15.207 for Conducted Emissions on the Live and Neutral Lines.

EUT Tx on Bottom Channel (2412MHz)

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.161	47.2	65.4	40.2	55.4
0.179	41.3	64.5	23.0	54.5
0.201	38.4	63.6	14.6	53.6
0.250	33.8	61.8	13.5	51.8
0.319	23.5	59.7	7.6	49.7
10.645	22.3	60.0	16.7	50.0

The margin between the specification requirements and all other emissions were 37.2dB or more below the specified Quasi-Peak limit and 42.2dB or more below the Average limit.

Conducted Emissions Neutral Line:

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.173	42.5	64.8	22.0	54.8
0.183	40.9	64.3	21.4	54.3
0.207	39.0	63.3	15.8	53.3
0.240	35.4	62.1	14.4	52.1
0.250	33.5	59.7	13.5	49.7
10.645	22.6	60.0	16.4	50.0

The margin between the specification requirements and all other emissions were 32.1dB or more below the specified Quasi-peak limit and 45.9dB or more below the specified Average limit.

Test Case : Conducted Emissions on Power Lines - continued

Test Date : 19th October 2003

Rule Parts : 15.207

Test Results - continued

EUT Tx on Middle Channel (2437MHz)

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.159	47.4	65.5	40.2	55.5
0.160	47.5	65.5	40.2	55.5
0.207	38.7	63.3	15.3	53.3
0.223	38.2	62.7	27.9	52.7
0.224	37.7	62.7	27.7	52.7
10.771	28.8	60.0	21.3	50.0

The margin between the specification requirements and all other emissions were 31.4dB or more below the specified Quasi-Peak limit and 45.4dB or more below the Average limit.

Conducted Emissions Neutral Line :

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.159	47.1	65.5	37.7	55.5
0.211	39.4	63.2	15.3	53.2
0.306	24.9	60.1	2.4	50.1
0.860	24.6	55.0	25.1	45.0
10.520	22.3	60.0	15.7	50.0
14.318	31.6	60.0	30.7	50.0

The margin between the specification requirements and all other emissions were 25.3dB or more below the specified Quasi-peak limit and 18.7dB or more below the specified Average limit

Test Case : Conducted Emissions on Power Lines - continued

Test Date : 19th October 2003

Rule Parts : 15.207

Test Results - continued

EUT Tx on Top Channel (2462MHz)

Conducted Emissions - Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.160	47.4	65.5	40.2	55.5
0.201	38.4	63.6	14.6	53.6
0.207	38.7	63.3	15.8	53.3
0.223	37.7	62.7	29.6	52.7
0.287	27.4	60.6	20.3	50.6
10.835	22.6	60.0	16.9	50.0

The margin between the specification requirements and all other emissions were 37.5dB or more below the specified Quasi-Peak limit and 39.0dB or more below the Average limit.

Conducted Emissions Neutral Line :

Emission Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.1593	47.1	65.5	37.9	55.5
0.1821	40.9	64.4	22.0	54.4
0.2228	37.7	62.7	30.1	52.7
0.2230	38.1	62.7	30.0	52.7
0.2532	33.6	61.7	14.4	51.7
10.6447	24.7	60.0	18.6	50.0

The margin between the specification requirements and all other emissions were 23.3dB or more below the specified Quasi-peak limit and 36.8dB or more below the specified Average limit.

Procedure: Test performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Test Case : 6dB Bandwidth

Test Date : 30th October 2003

Rule Parts : 15.247(a)(2)

Measurement Method

The EUT was transmitting at maximum power at all data rates via a 20dB Attenuator to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the –6dBc points of the displayed spectrum.

The measurement plots can be seen on the following pages.

Test Results

The EUT met the Class B requirements of FCC CFR 47: Part 15, Subpart C, Section 15.247(a)(2) for 6dB Bandwidth.

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (MHz)
2412	1	11.060
2437	1	10.130
2462	1	11.060

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (MHz)
2412	2	9.810
2437	2	9.690
2462	2	9.880

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (MHz)
2412	5.5	10.500
2437	5.5	11.000
2462	5.5	10.500

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (MHz)
2412	11	11.130
2437	11	10.810
2462	11	10.690

Limit	≥500kHz

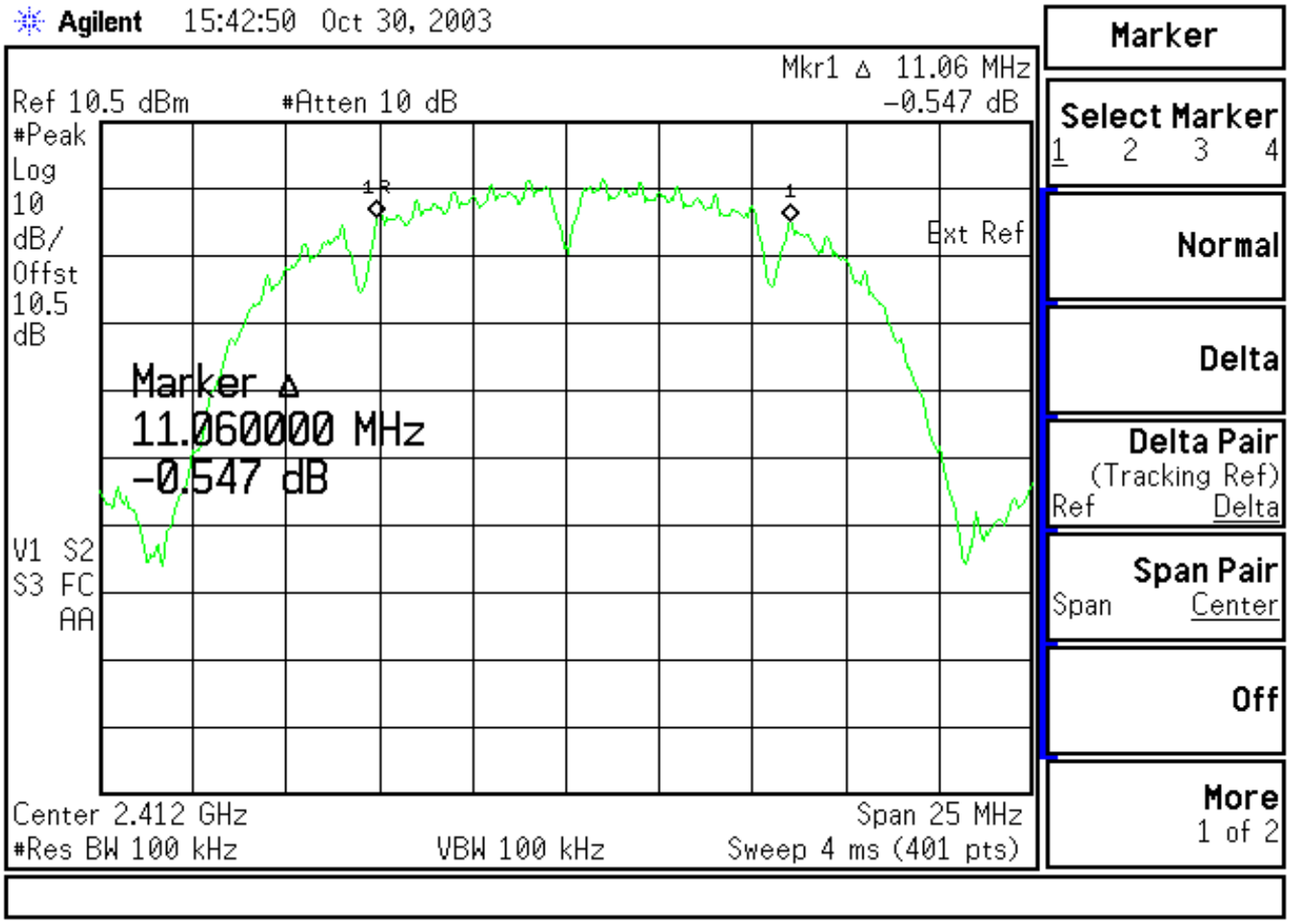
Procedure: Test Performed in accordance with FCC CFR 47: Part 15, Subpart C, Section 15.247(a)(2)

Performed by: B Airs, Radio Engineer.

Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

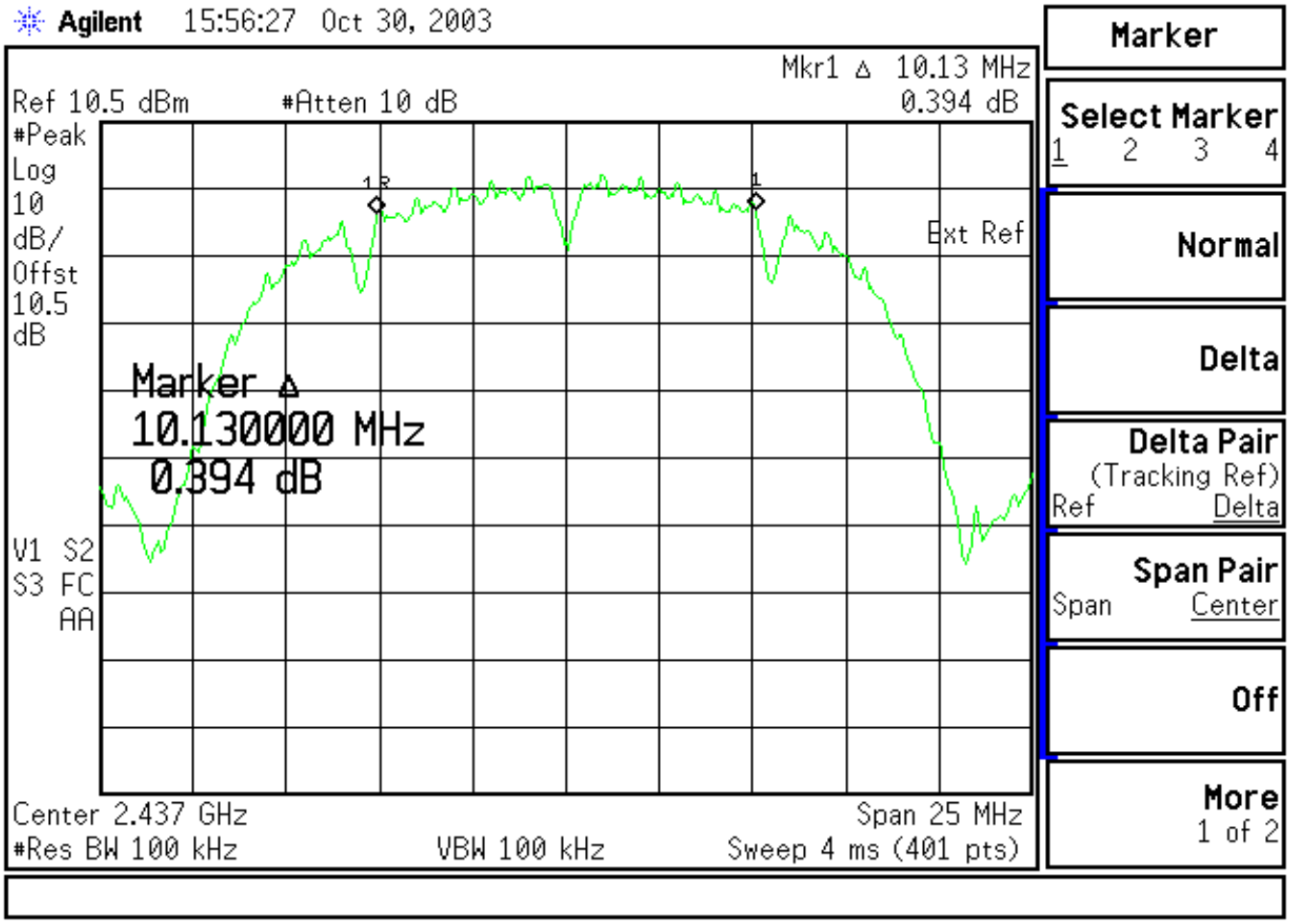
EUT Tx on Bottom Channel (2412MHz) – Maximum Power 1Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

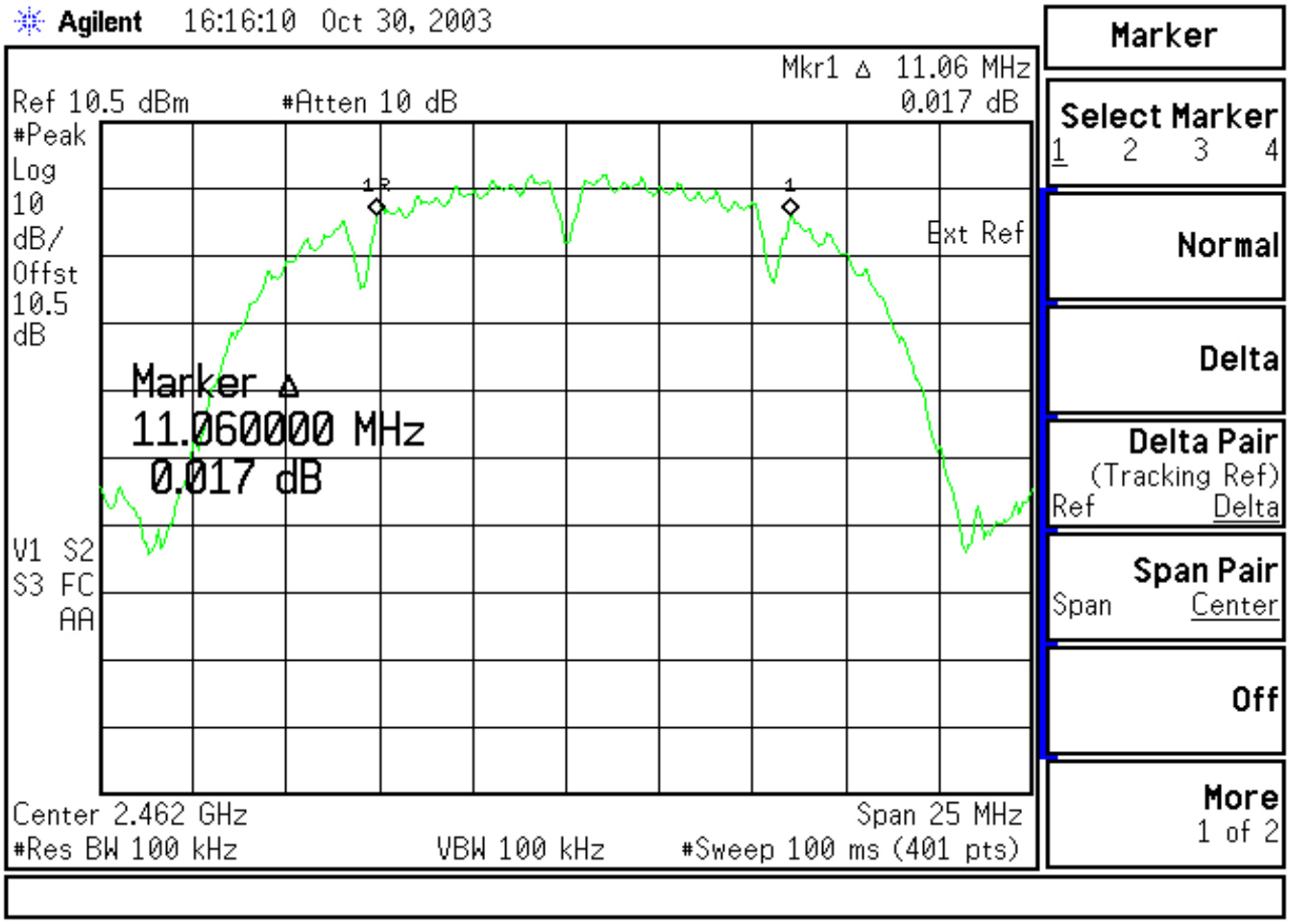
EUT Tx on Middle Channel (2437MHz) – Maximum Power 1Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

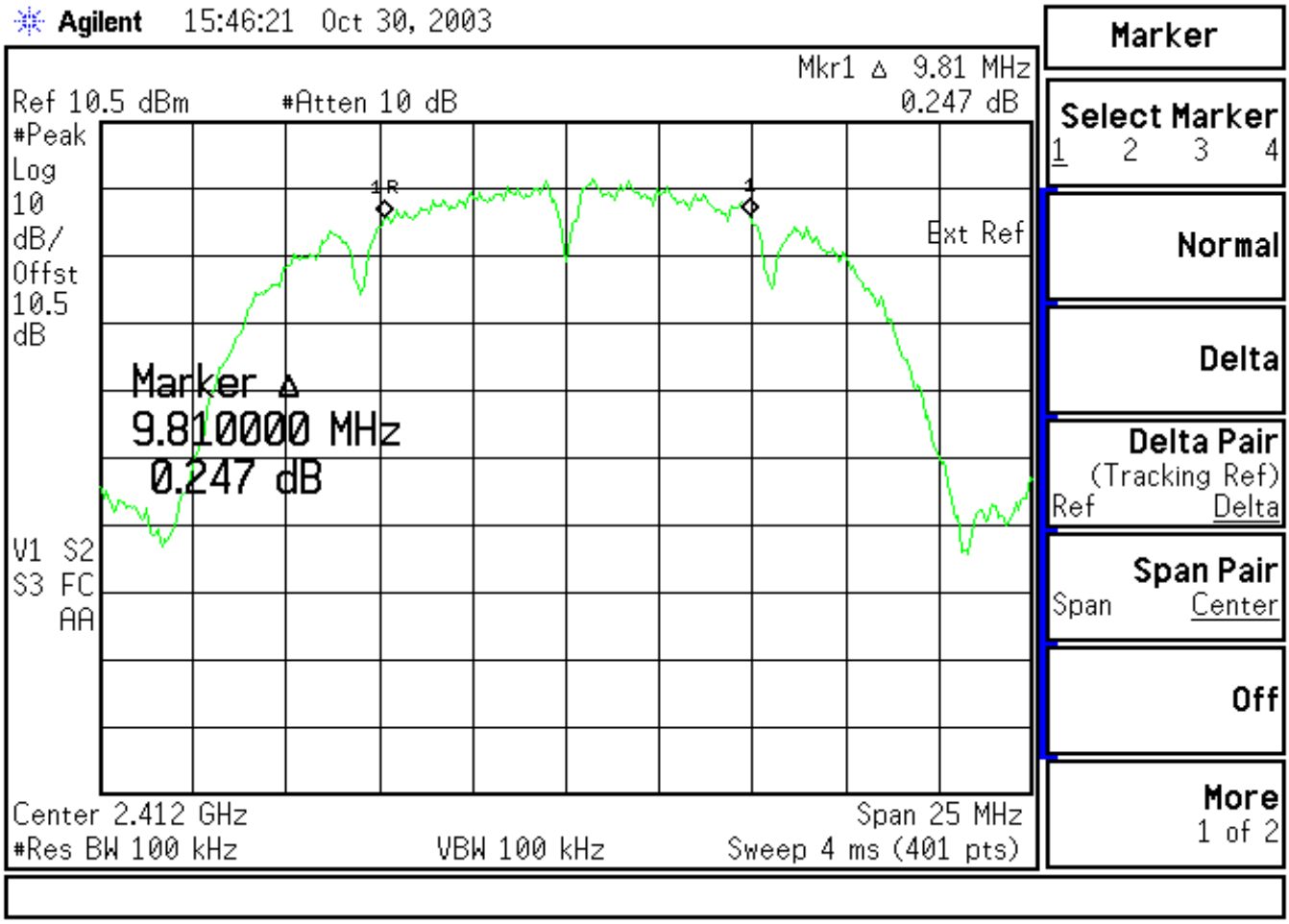
EUT Tx on Top Channel (2462MHz) – Maximum Power 1Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

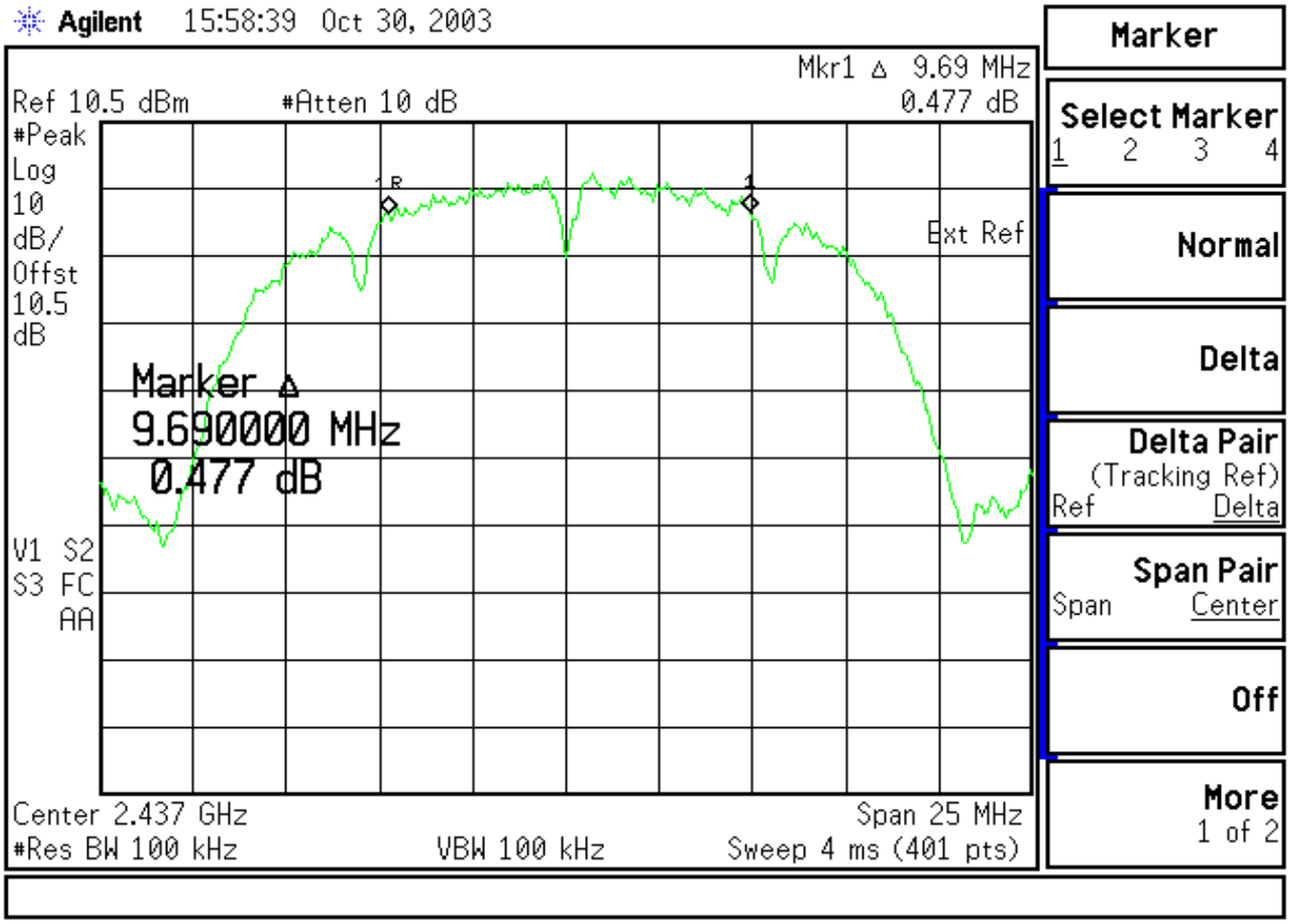
EUT Tx on Bottom Channel (2412MHz) – Maximum Power 2Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

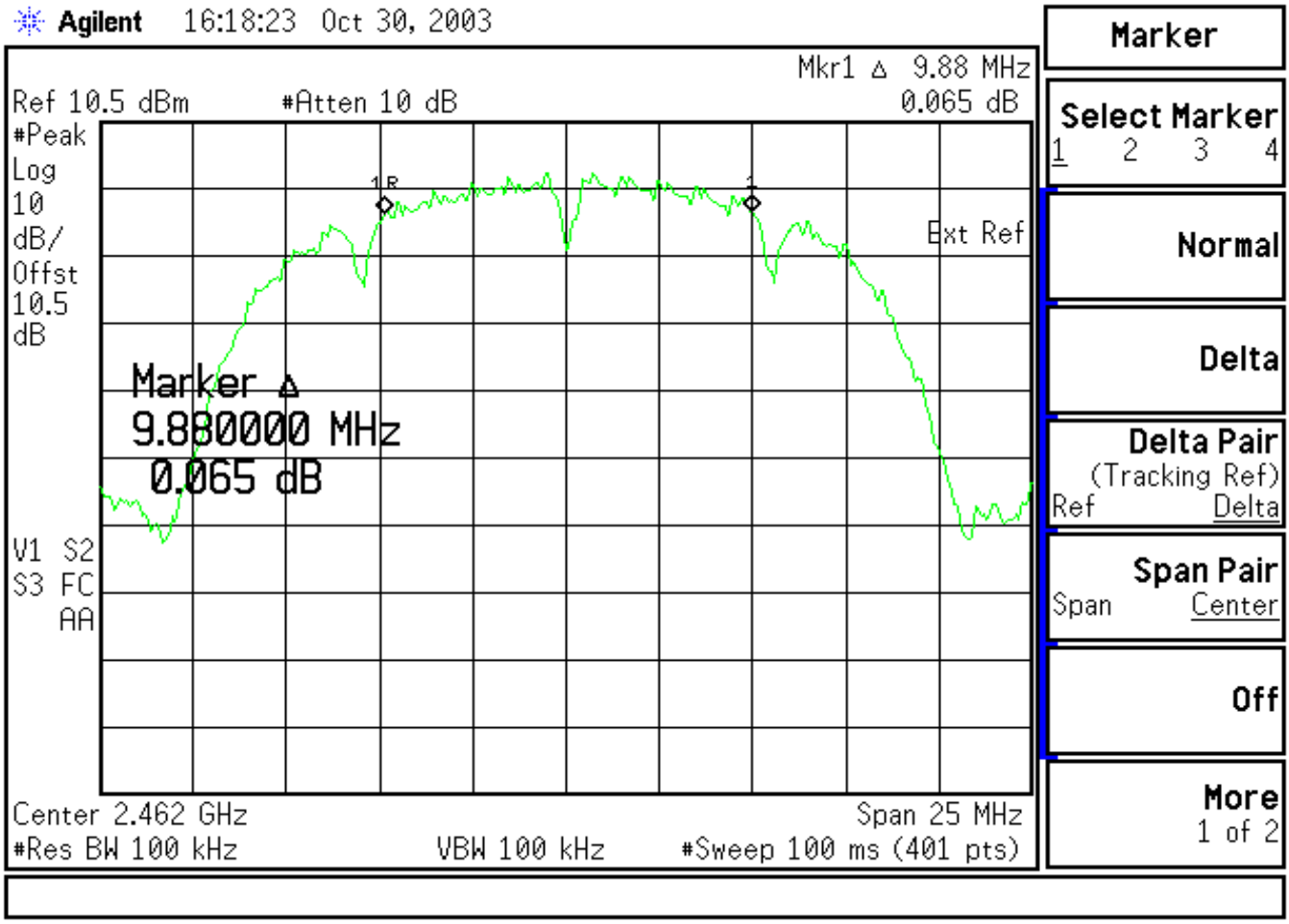
EUT Tx on Middle Channel (2437MHz) – Maximum Power 2Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

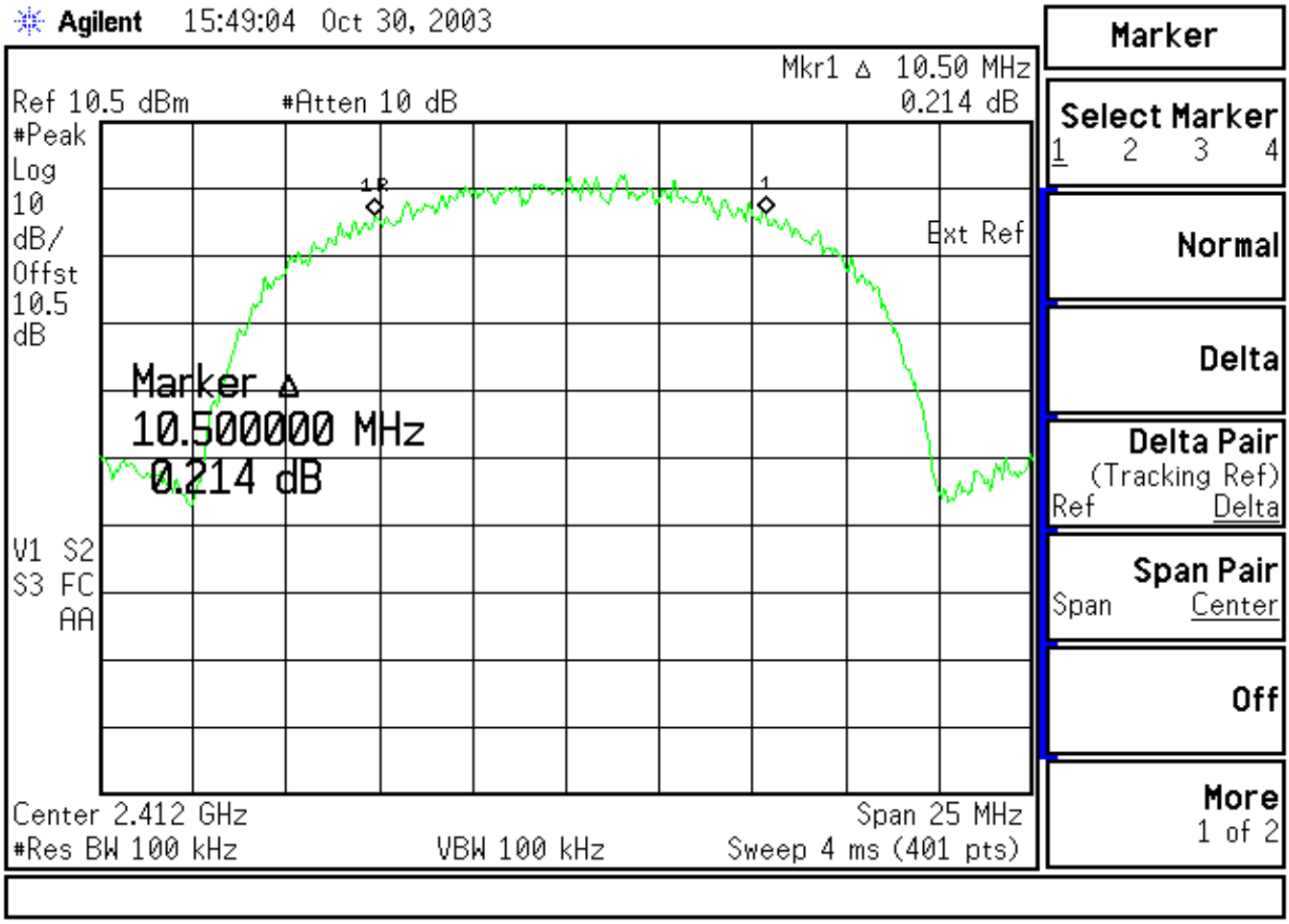
EUT Tx on Top Channel (2462MHz) – Maximum Power 2Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

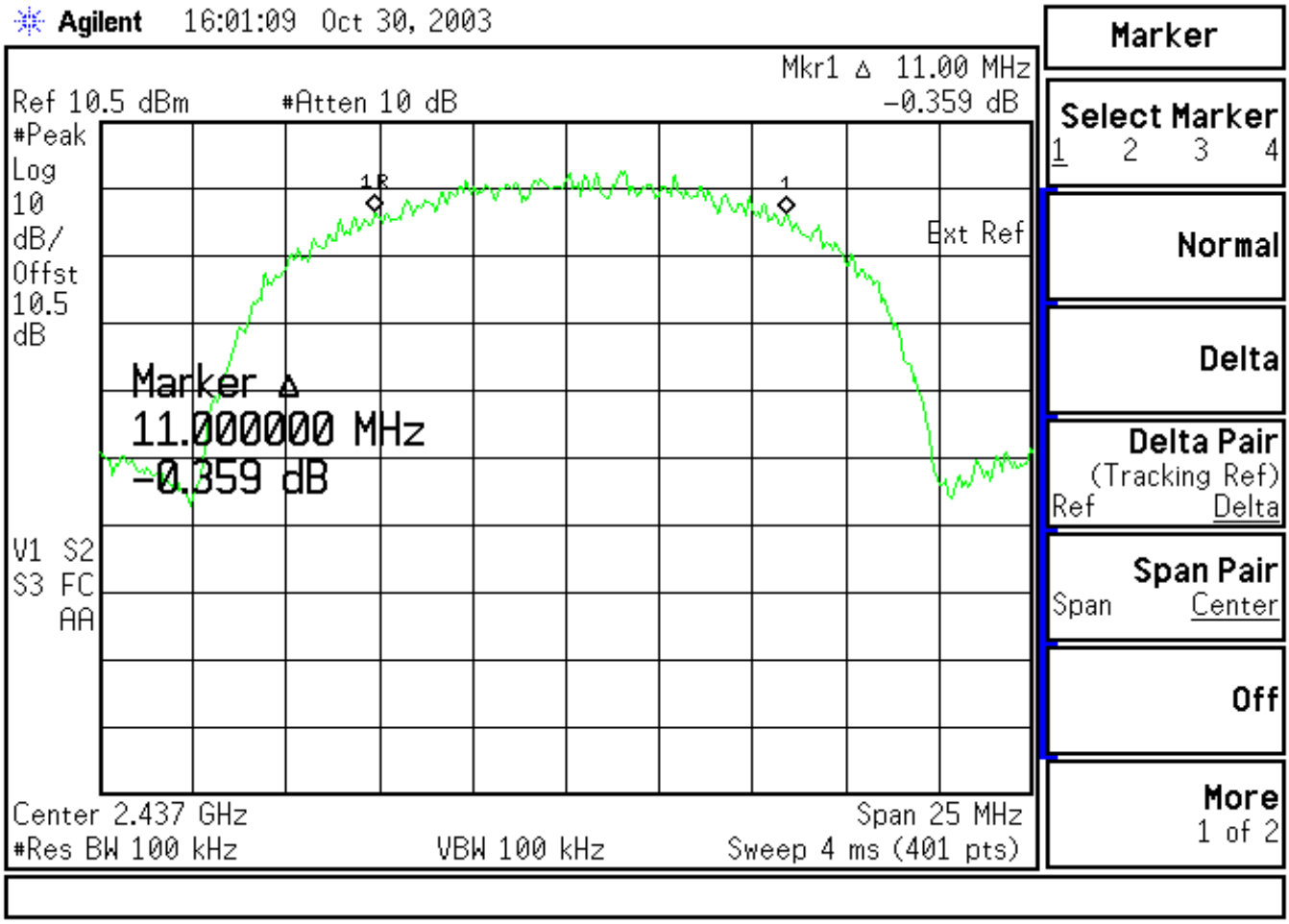
EUT Tx on Bottom Channel (2412MHz) – Maximum Power 5.5Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

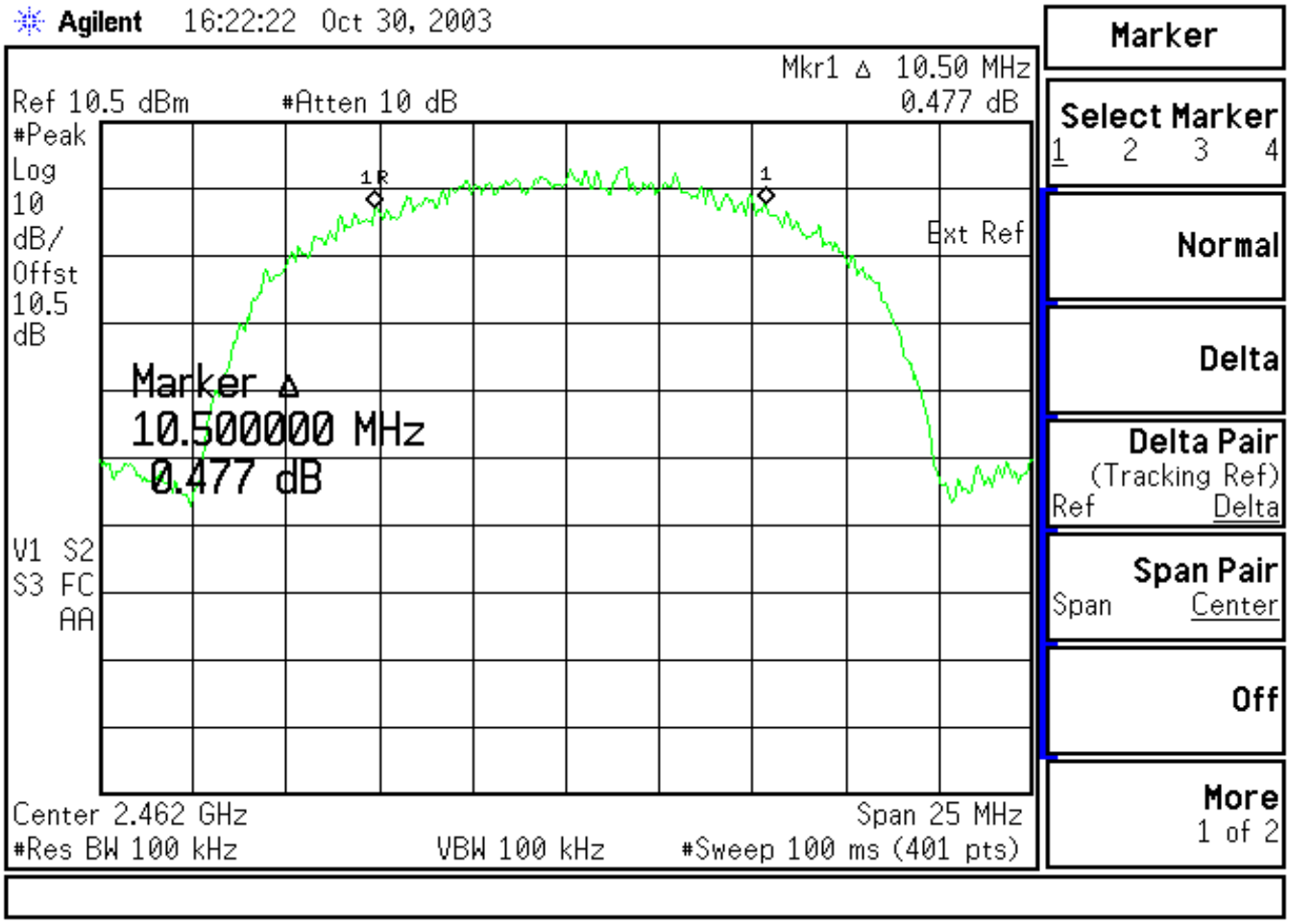
EUT Tx on Middle Channel (2437MHz) – Maximum Power 5.5Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

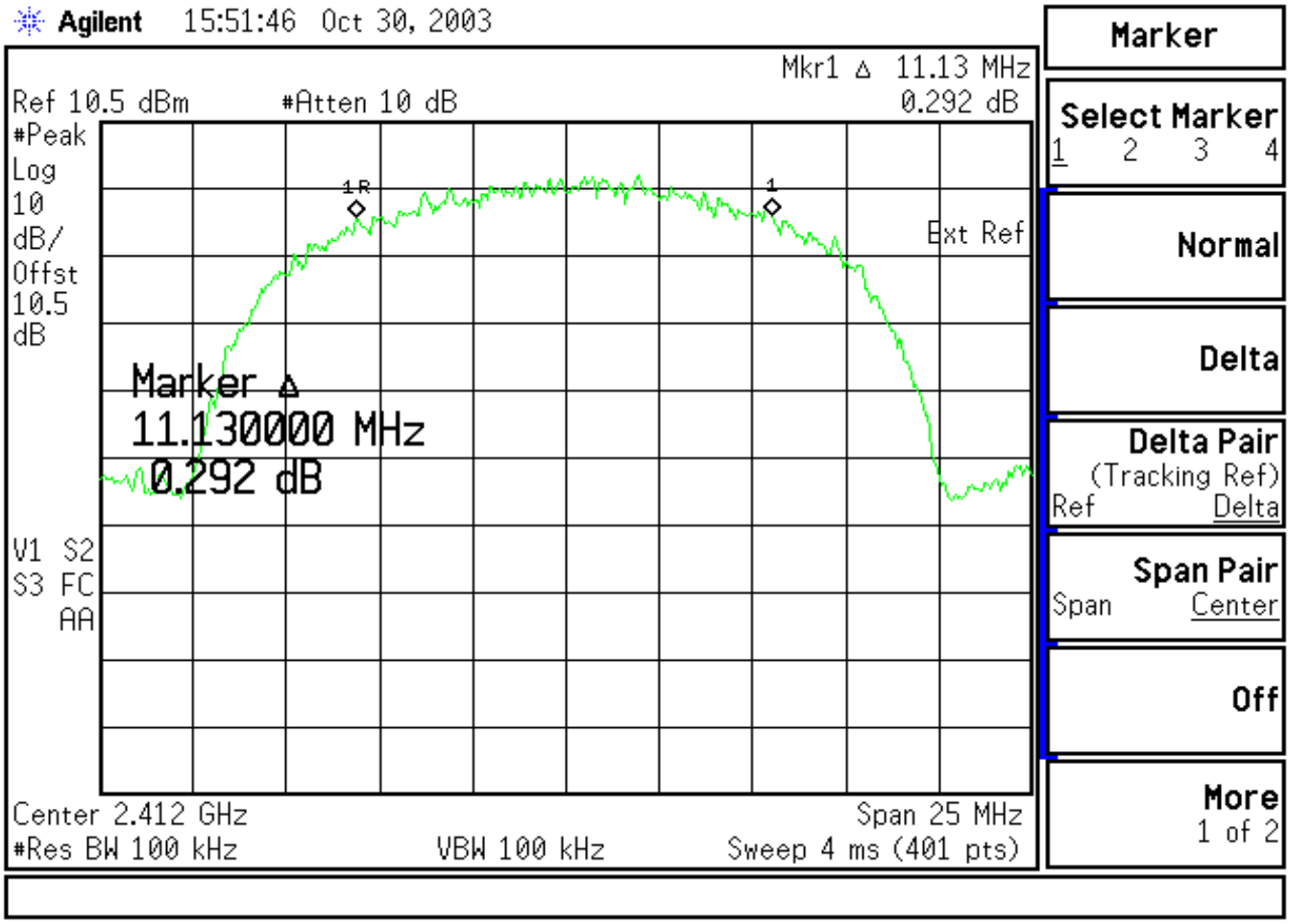
EUT Tx on Top Channel (2462MHz) – Maximum Power 5.5Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

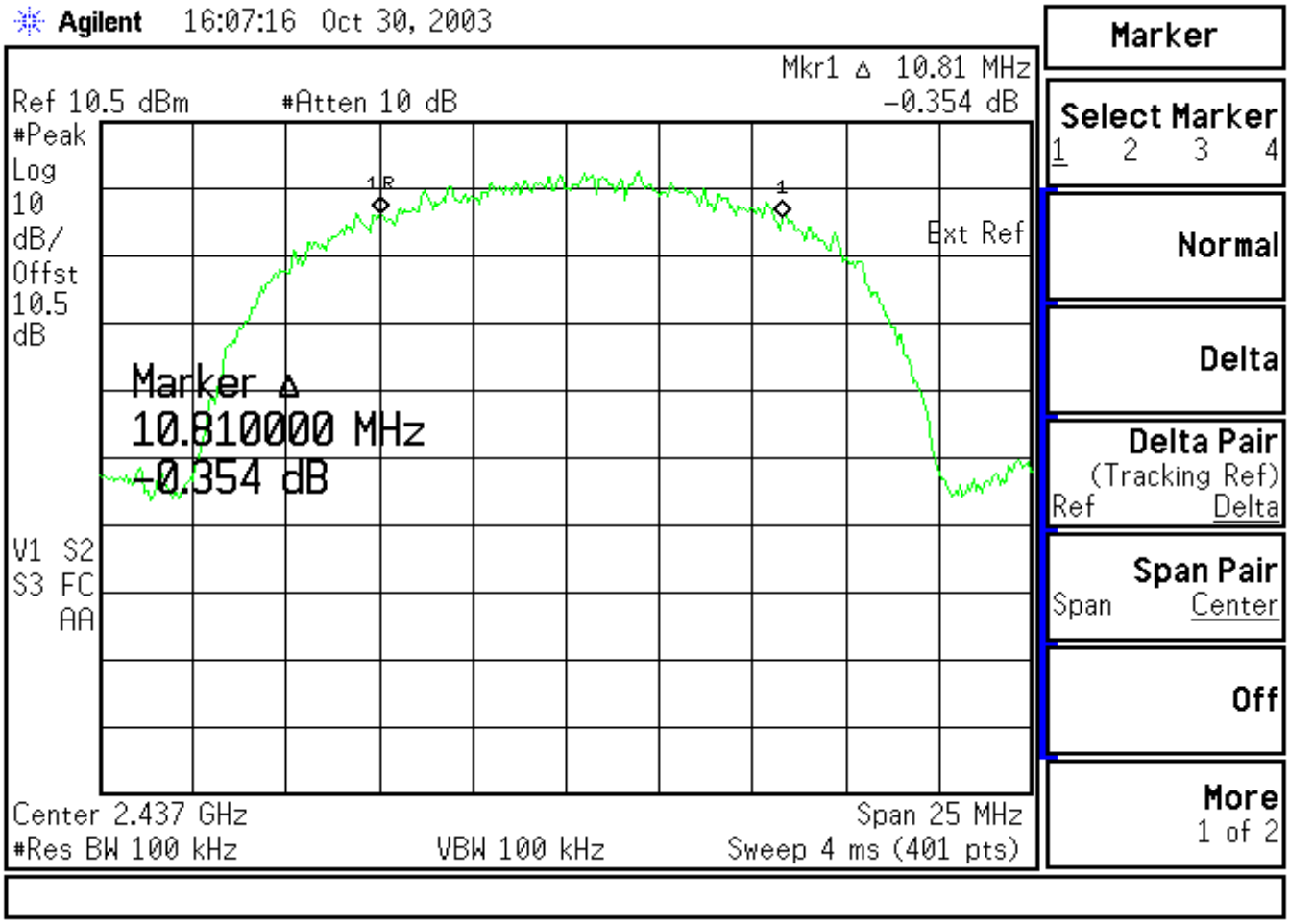
EUT Tx on Bottom Channel (2412MHz) – Maximum Power 11Mbps



Test Case	:	6dB Bandwidth - continued
Test Date	:	30th October 2003
Rule Parts	:	15.247(a)(2)

Test Results - continued

EUT Tx on Middle Channel (2437MHz) – Maximum Power 11Mbps



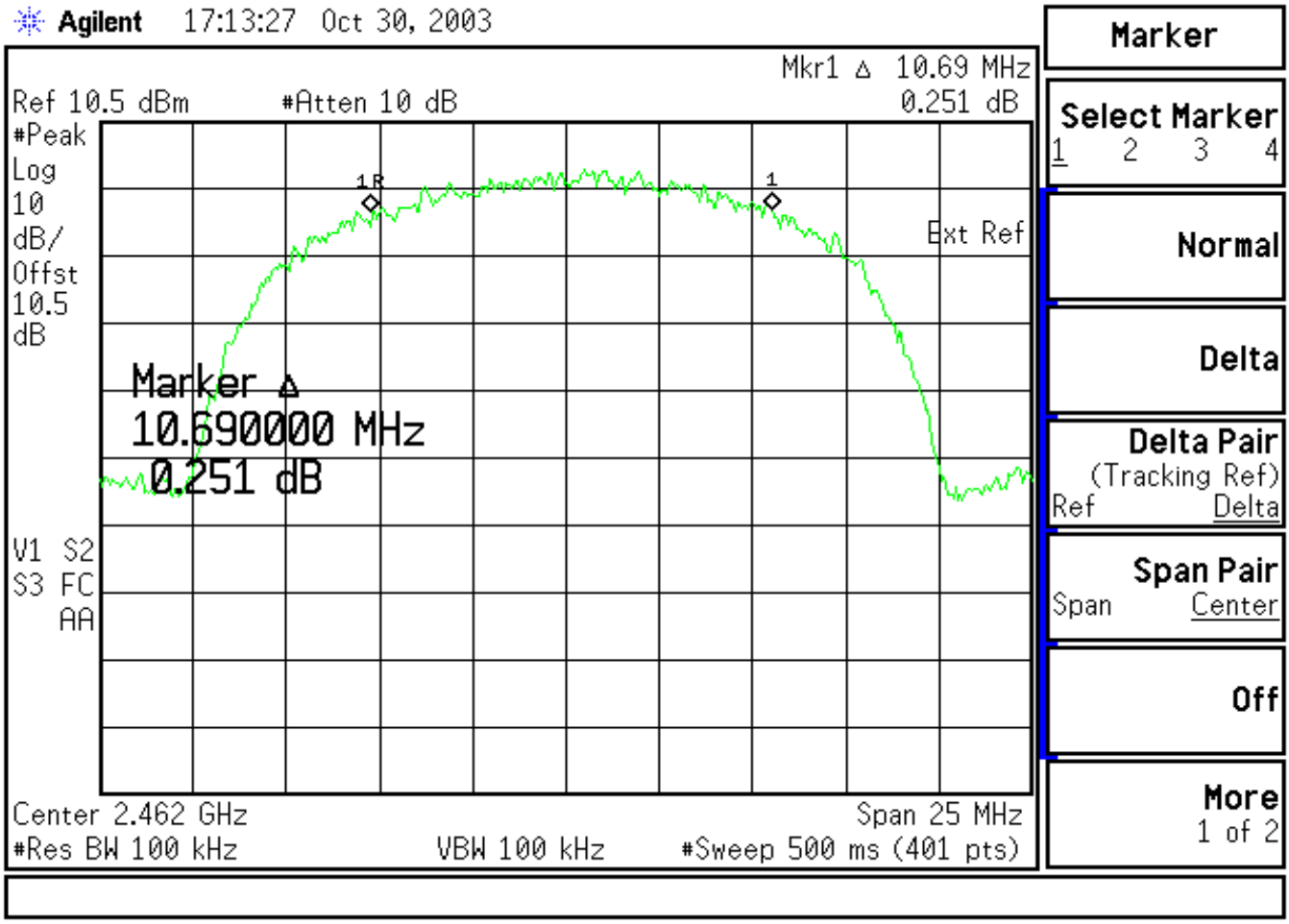
Test Case : 6dB Bandwidth - continued

Test Date : 30th October 2003

Rule Parts : 15.247(a)(2)

Test Results - continued

EUT Tx on Top Channel (2462MHz) – Maximum Power 11Mbps



Test Case : Maximum Peak Output Power

Test Date : 30th October 2003

Rule Parts : 15.247(b)(3)

Measurement Method

The EUT was connected to a Digital Storage Oscilloscope via an attenuator and Crystal Detector. The DC output from the Crystal Detector was measured on the Oscilloscope. The EUT was then substituted for a Signal Generator. The generators frequency was adjusted to that of the EUT and the amplitude increased to give the same DC level as measured from the EUT. The level was read from the Signal Generator and gave the maximum output power.

Test Results

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(3) for Maximum Peak Output Power.

1Mbps

Frequency (MHz)	Output Power (dBm)	Result (mW)
2412.0	+14.35	27.23
2437.0	+15.15	32.73
2462.0	+15.85	38.46

2Mbps

Frequency (MHz)	Output Power (dBm)	Result (mW)
2412.0	+13.85	24.27
2437.0	+15.10	32.36
2462.0	+15.45	35.08

5.5Mbps

Frequency (MHz)	Output Power (dBm)	Result (mW)
2412.0	+13.60	22.91
2437.0	+14.75	29.85
2462.0	+15.20	33.11

Test Case : Maximum Peak Output Power -continued

Test Date : 30th October 2003

Rule Parts : 15.247(b)(3)

Test Results - continued

11Mbps

Frequency (MHz)	Output Power (dBm)	Result (mW)
2412.0	+13.85	24.27
2437.0	+14.75	29.85
2462.0	+15.25	33.50

Limit	<1W or <+30dBm

Procedure: Test Performed in accordance with FCC CFR 47: Part 15.247(b)(3) for Maximum Peak Output Power.

Performed by: B Airs, Radio Engineer.

Test Case	:	Spurious Conducted Emissions on Antenna Port
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Measurement Method

In accordance with FCC CFR 47: Part 15 Subpart C, Section 15.247(c), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 25 GHz. The EUT was set to transmit on full power at all data rates. The EUT was tested on Bottom, Middle and Top channels. The resolution and video bandwidths were set to 100kHz in accordance with Part 15.247. The spectrum analyser detector was set to Max Hold.

For measuring the range 9kHz to 4GHz, and 4kHz to 18GHz a 10dB attenuator was used. From 4 to 18GHz, a 10dB attenuator. From 18 to 25GHz a piece of waveguide was used as a high pass filter.

With the EUT transmitting at maximum power, the Spectrum Analyser was set to Max Hold and the fundamental peak measured in a RBW and VBW of 100kHz. This level was used to determine the limit line as displayed on the plots of -20dBc.

The maximum path loss across each measurement band was used as the reference level offset to ensure worst case

Test Results

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c) for Spurious Conducted Emissions on the Antenna Port.

The plots on the following pages show the frequency spectrum from 9kHz to 25GHz of the EUT.

Procedure: Test Performed in accordance with FCC CFR 47: Part 15 Subpart C, Section 15.247(c).

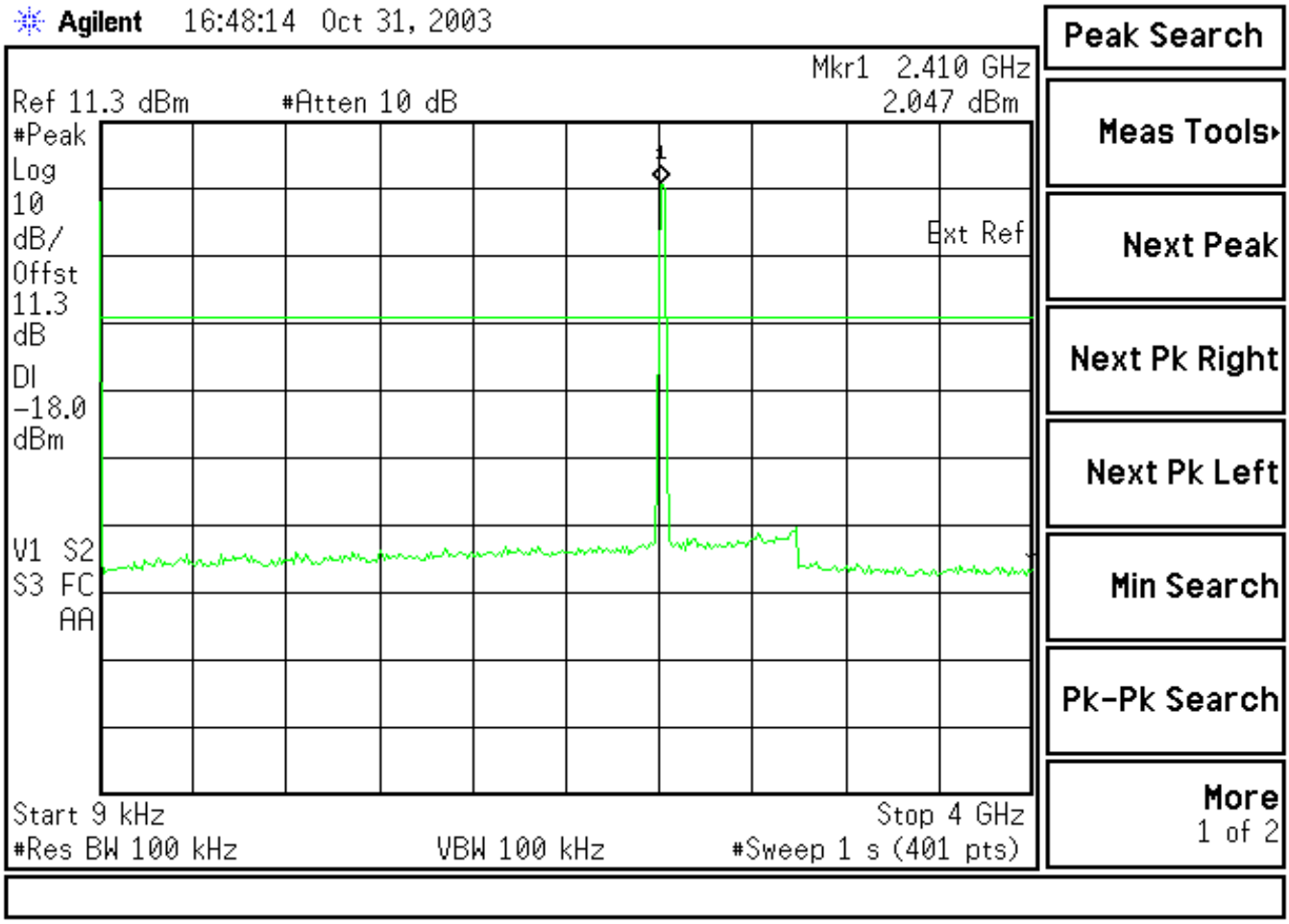
Performed by: B Airs, Radio Engineer.

Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 1Mbps

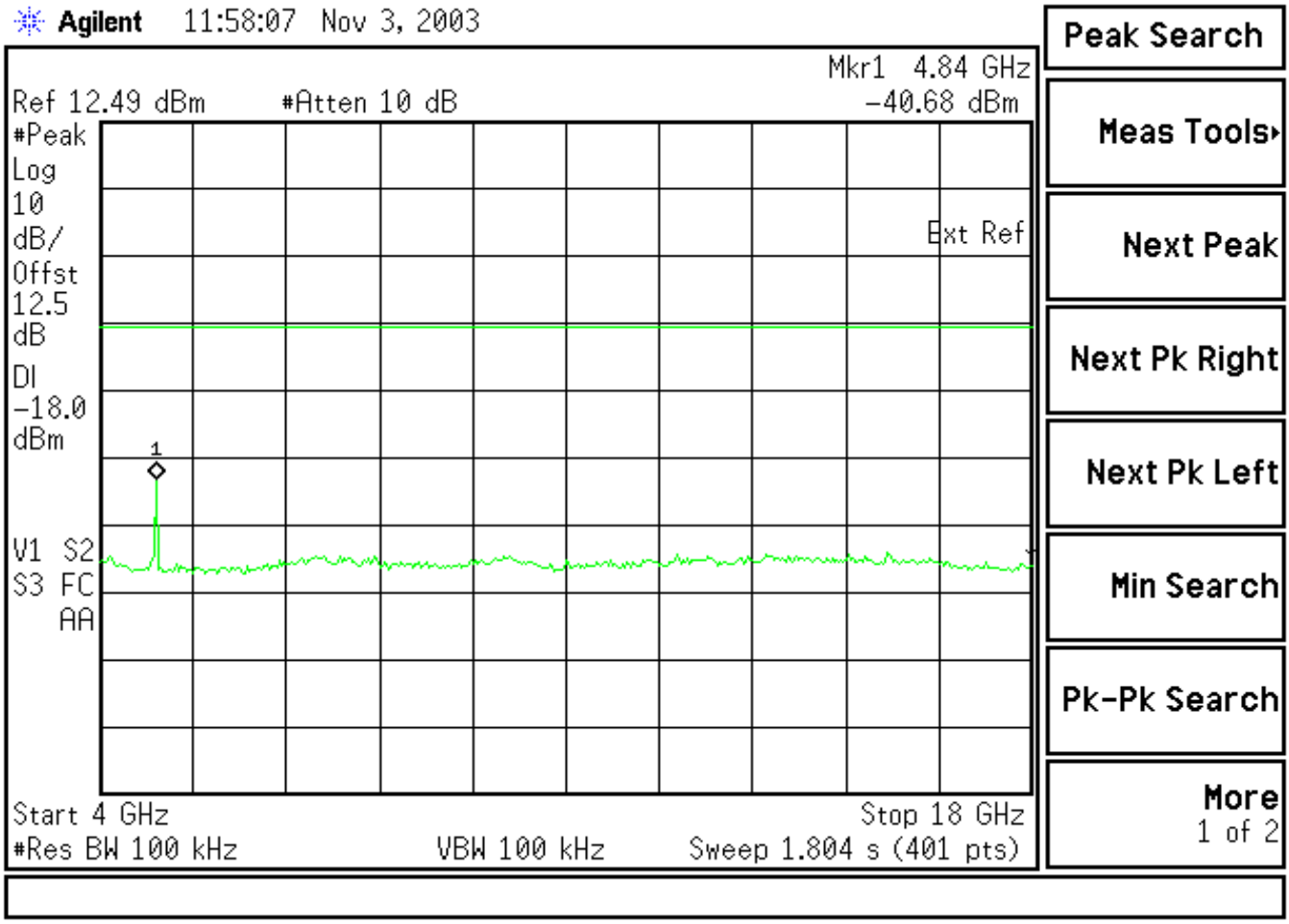


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power1Mbps

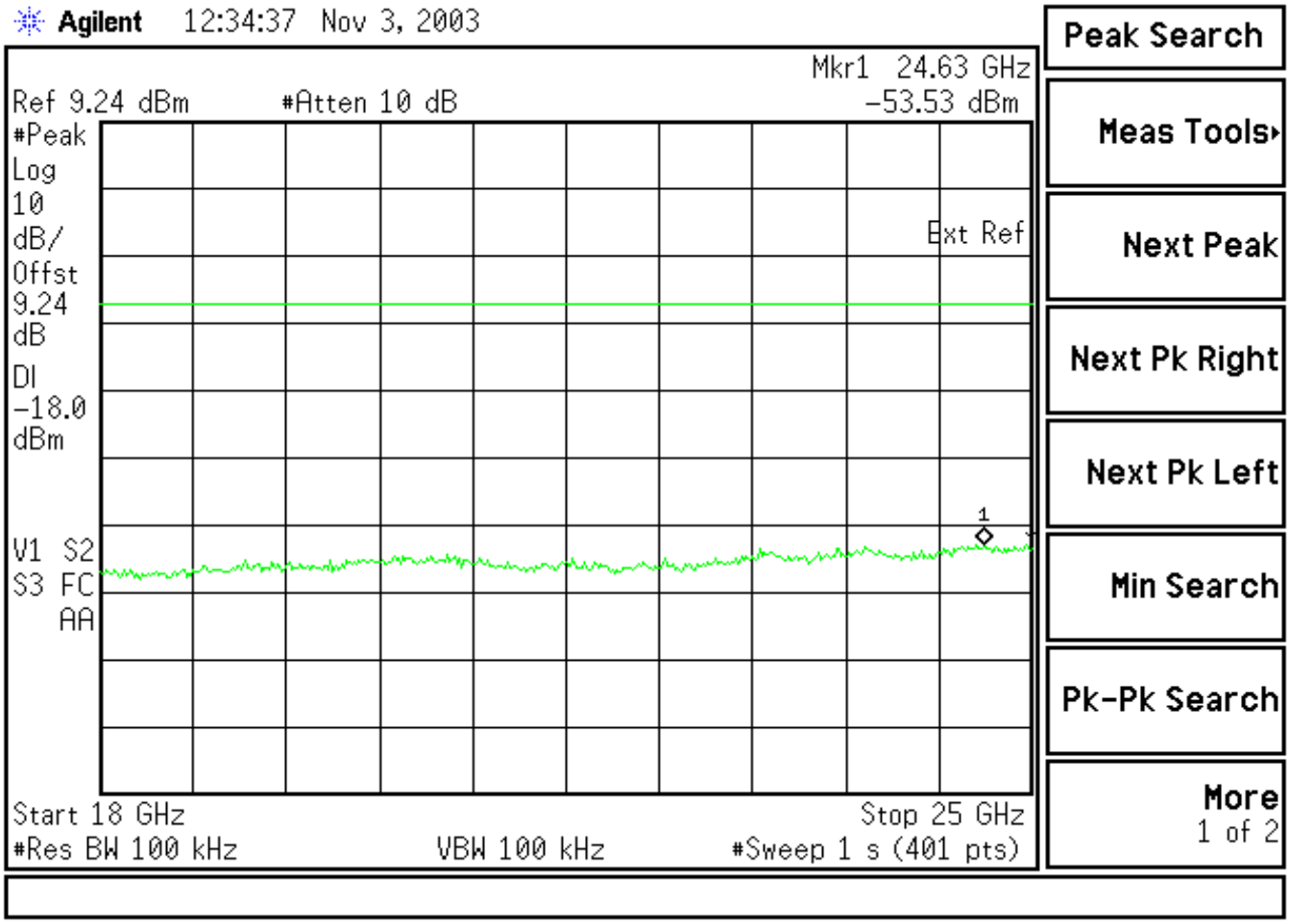


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power1Mbps

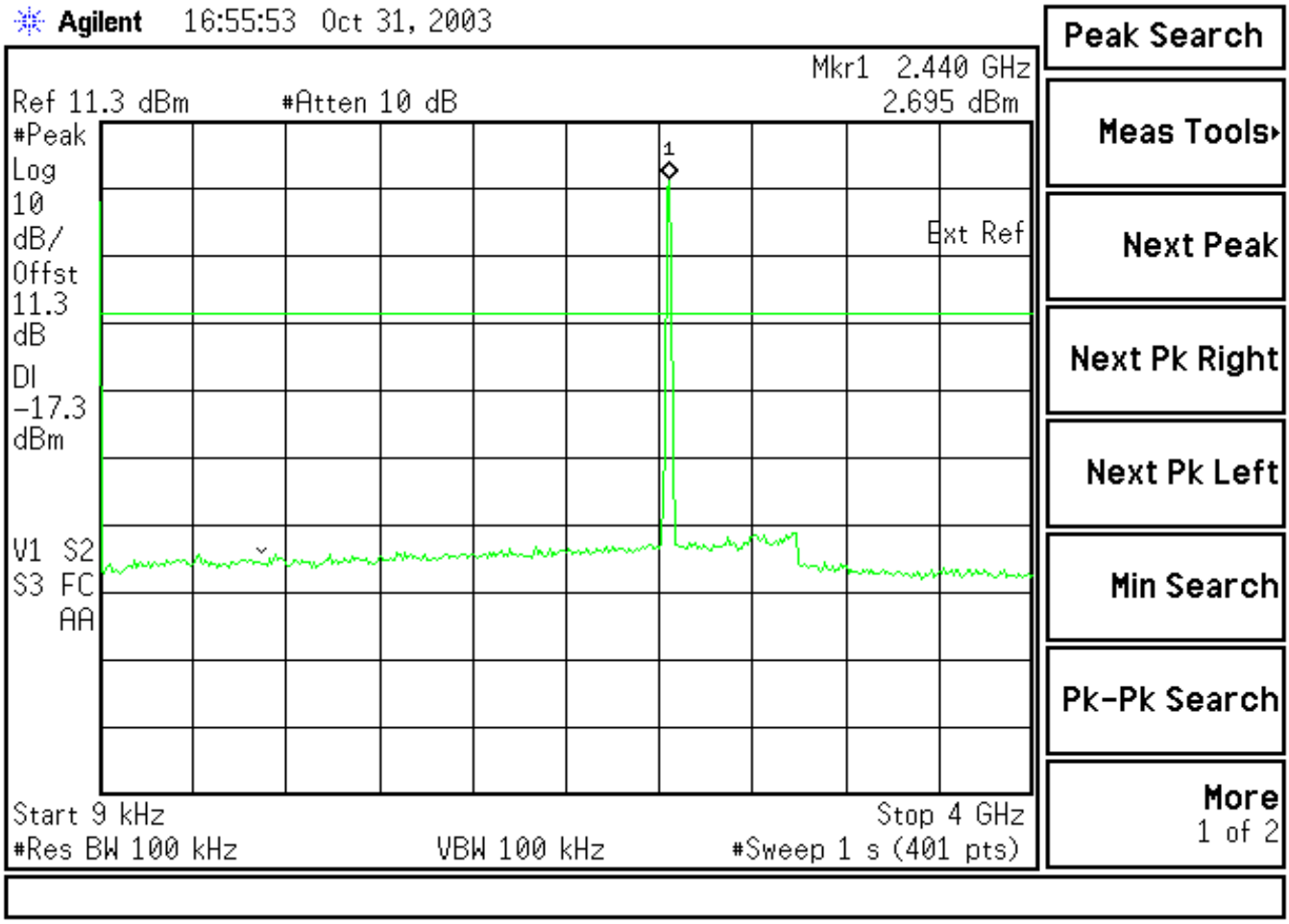


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 1Mbps

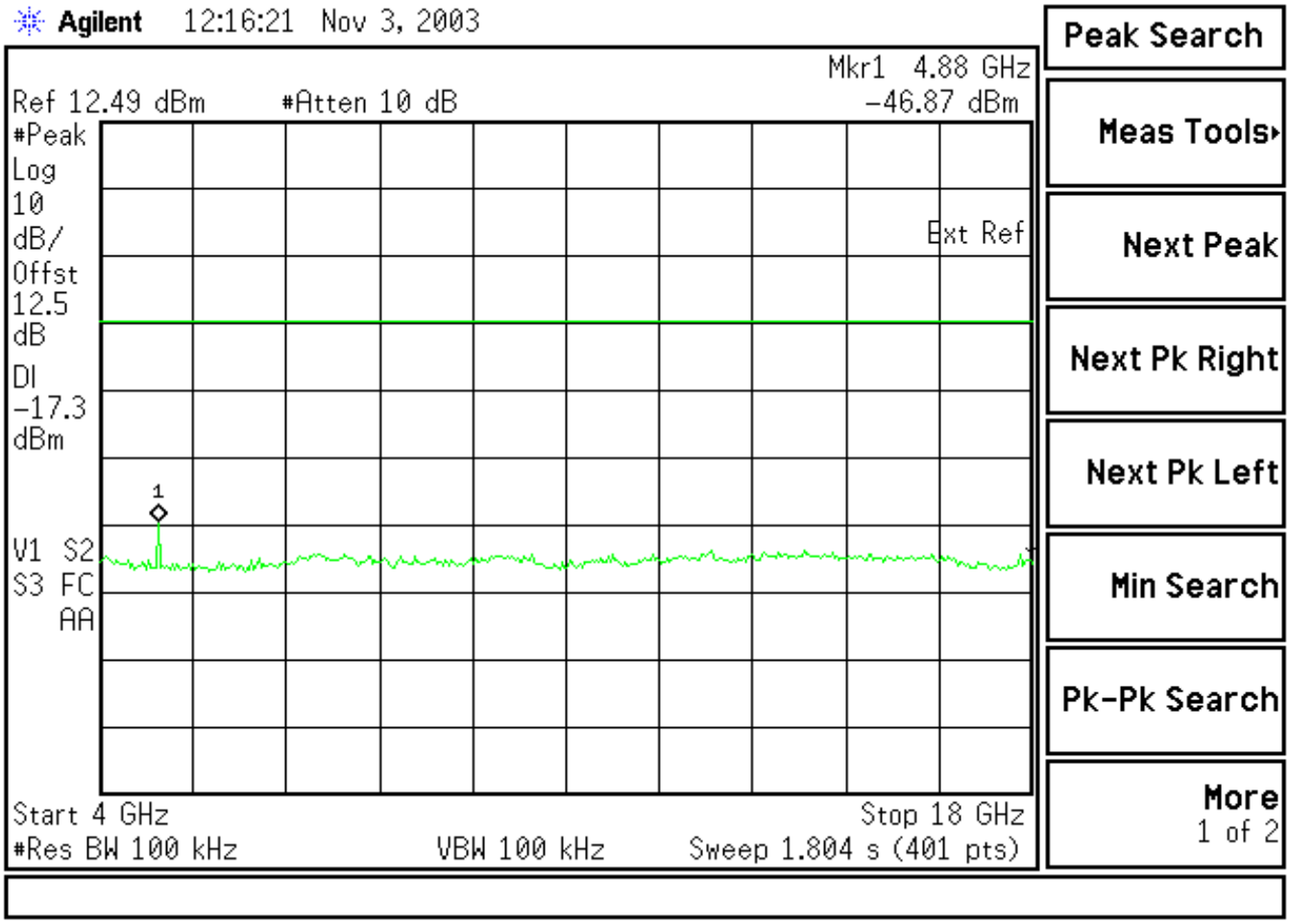


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 1Mbps

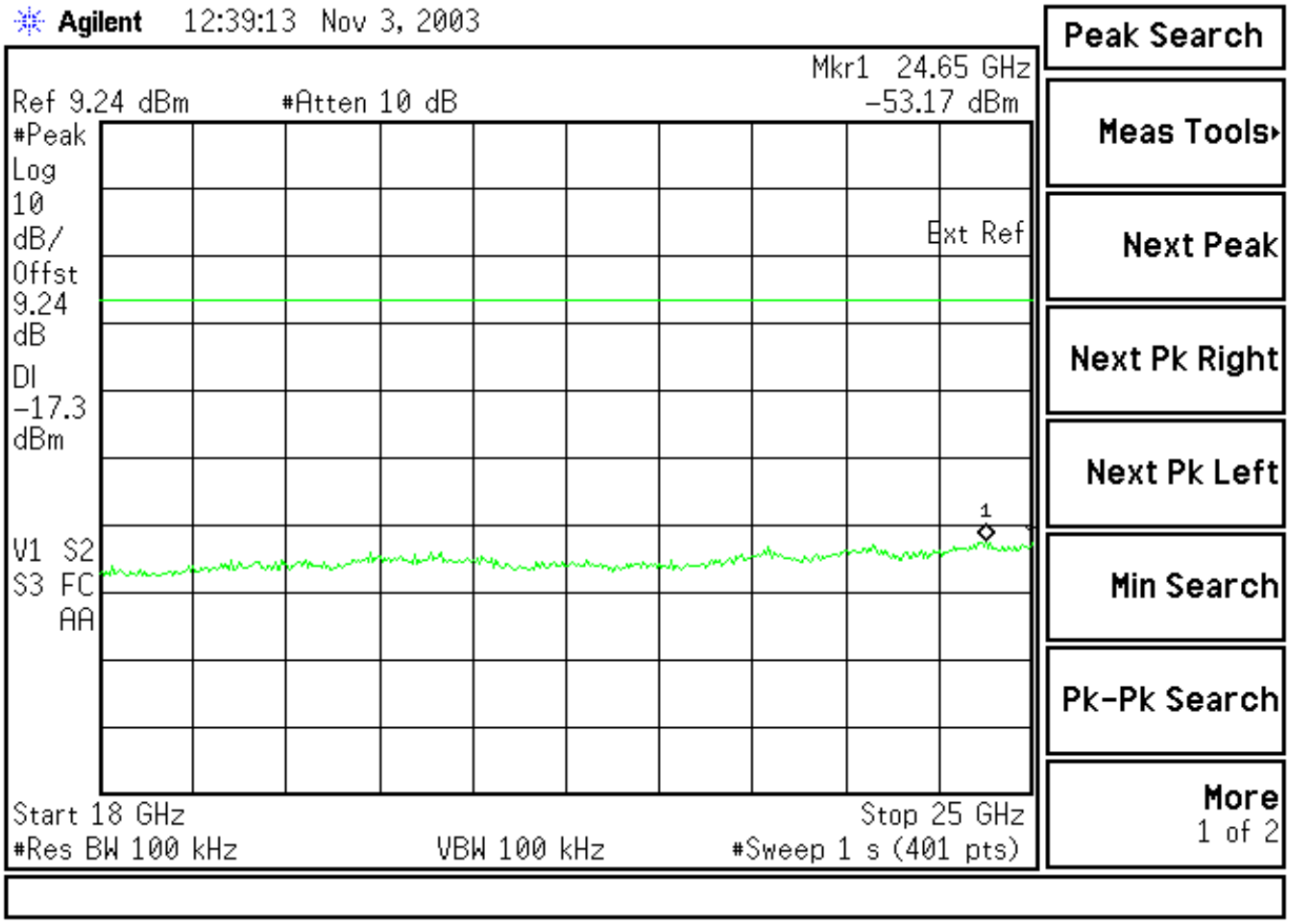


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 1Mbps

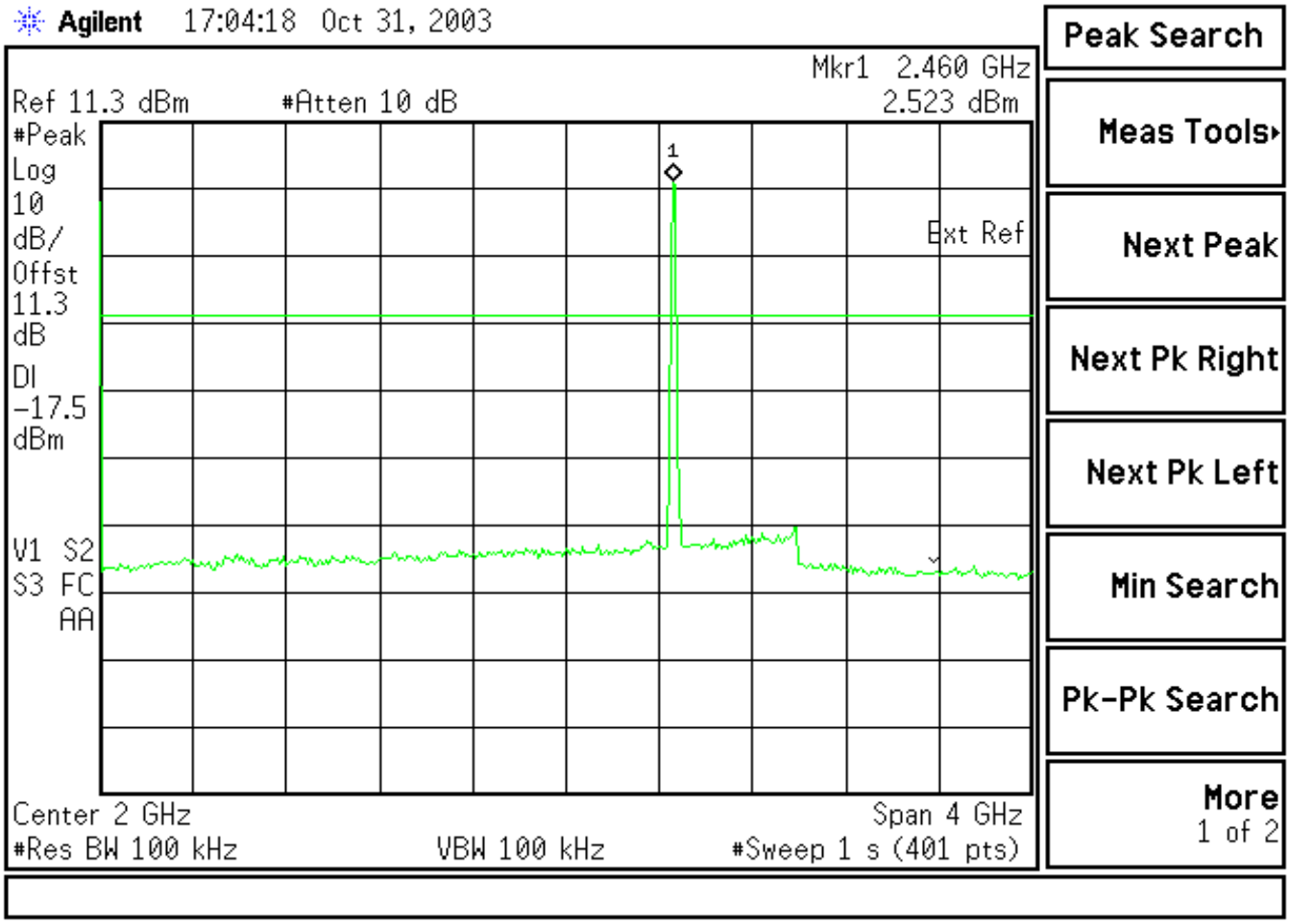


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 1Mbps

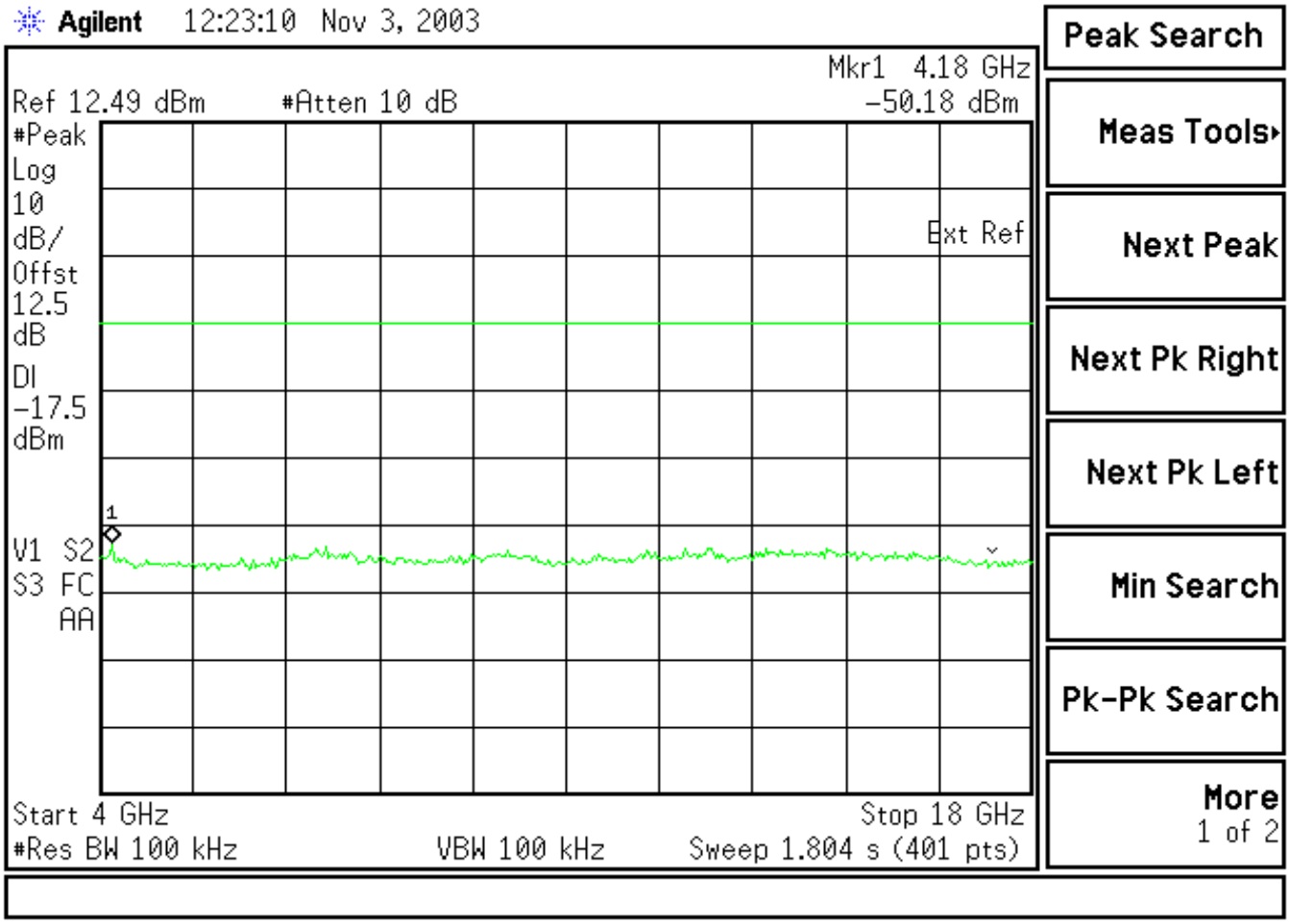


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 1Mbps

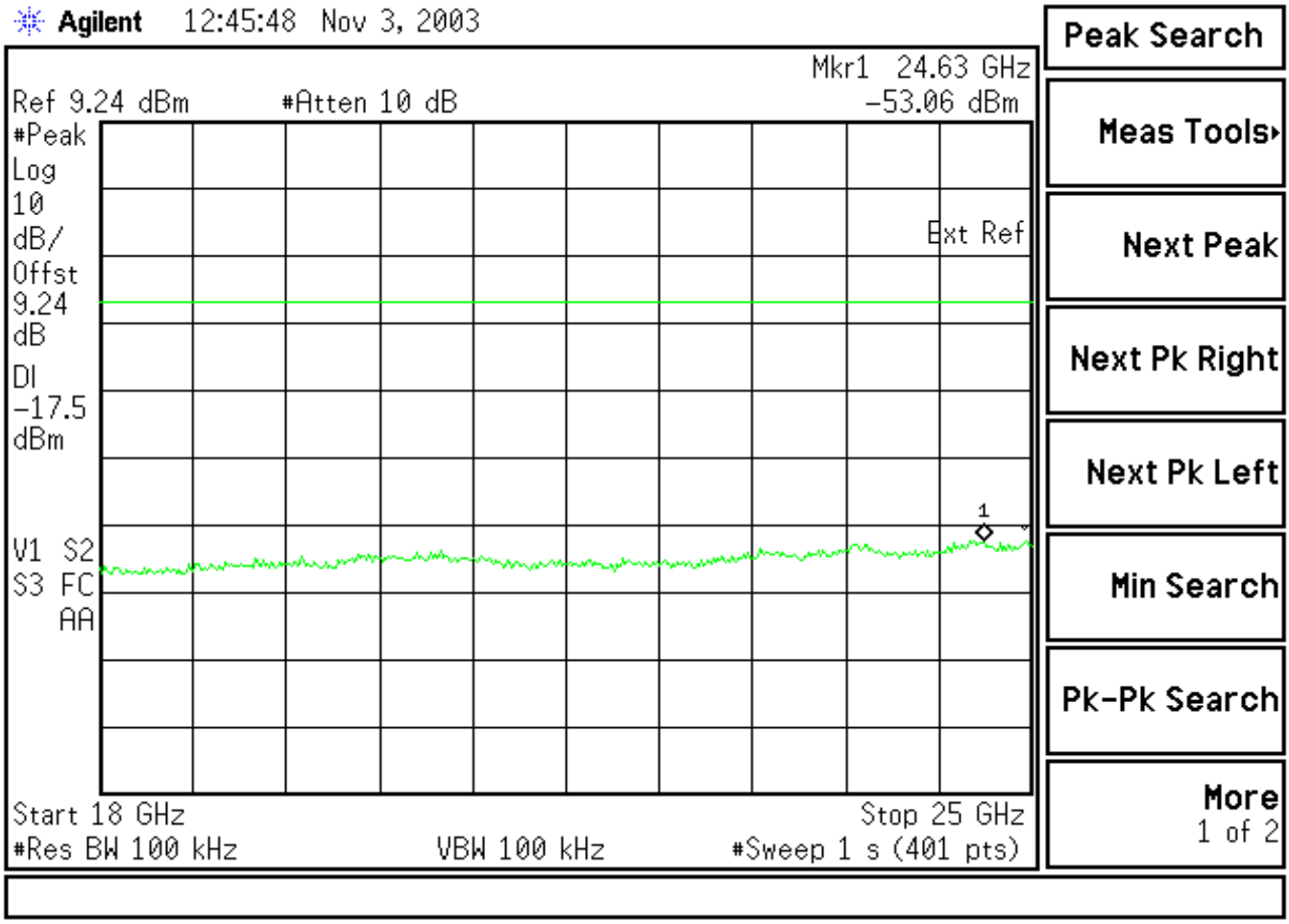


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 1Mbps

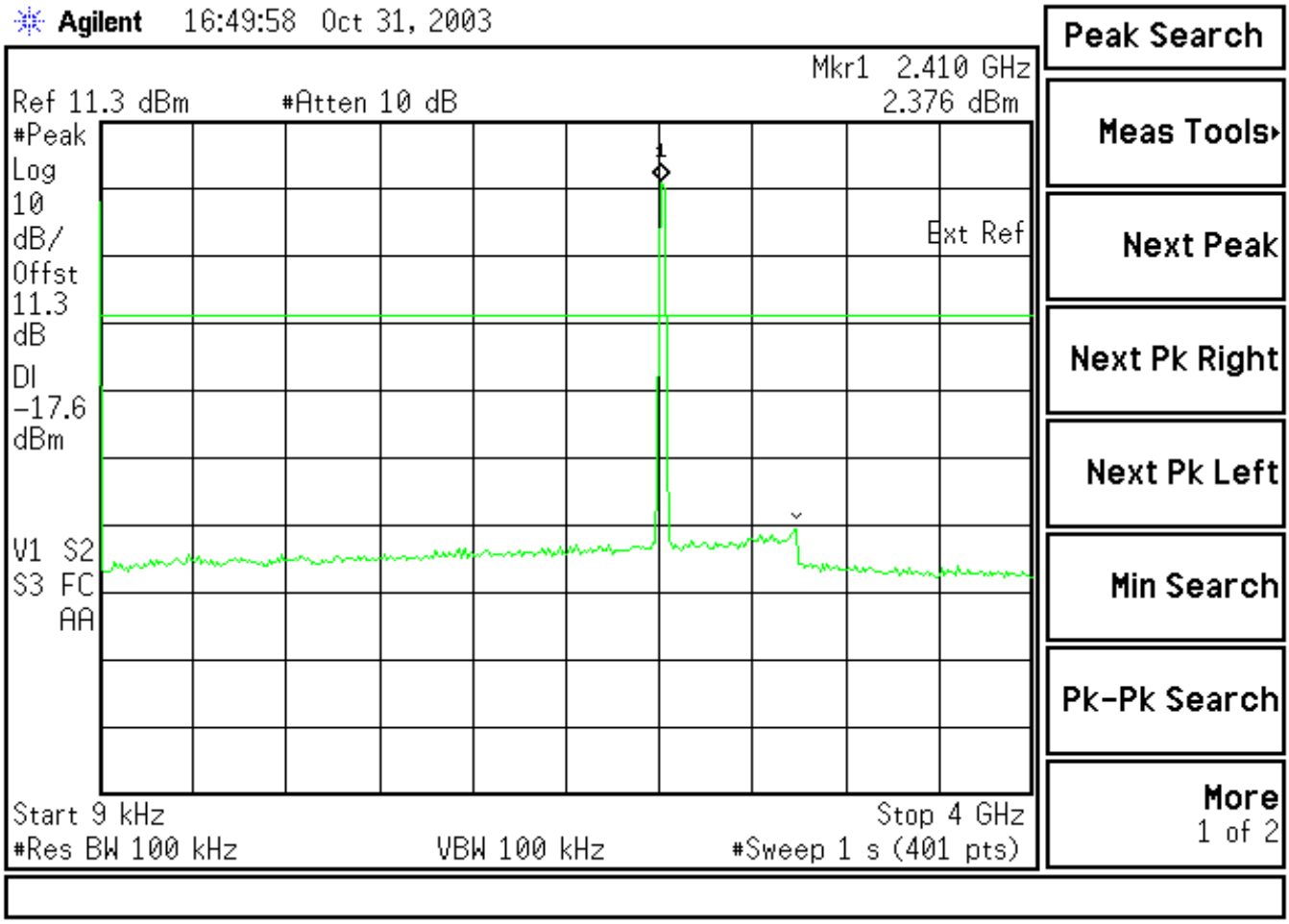


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power2Mbps

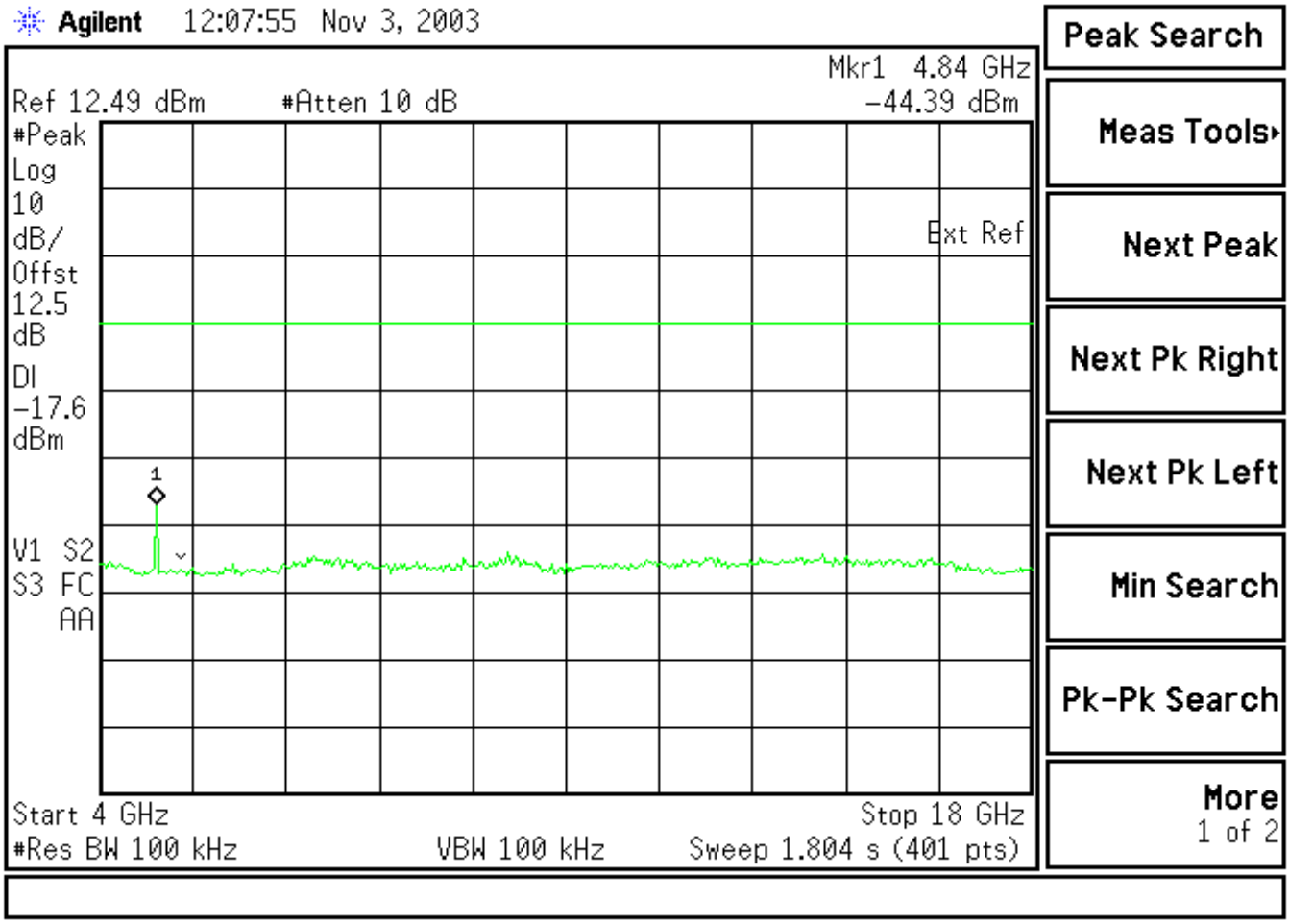


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Top Channel (2412MHz) – Maximum Power 2Mbps

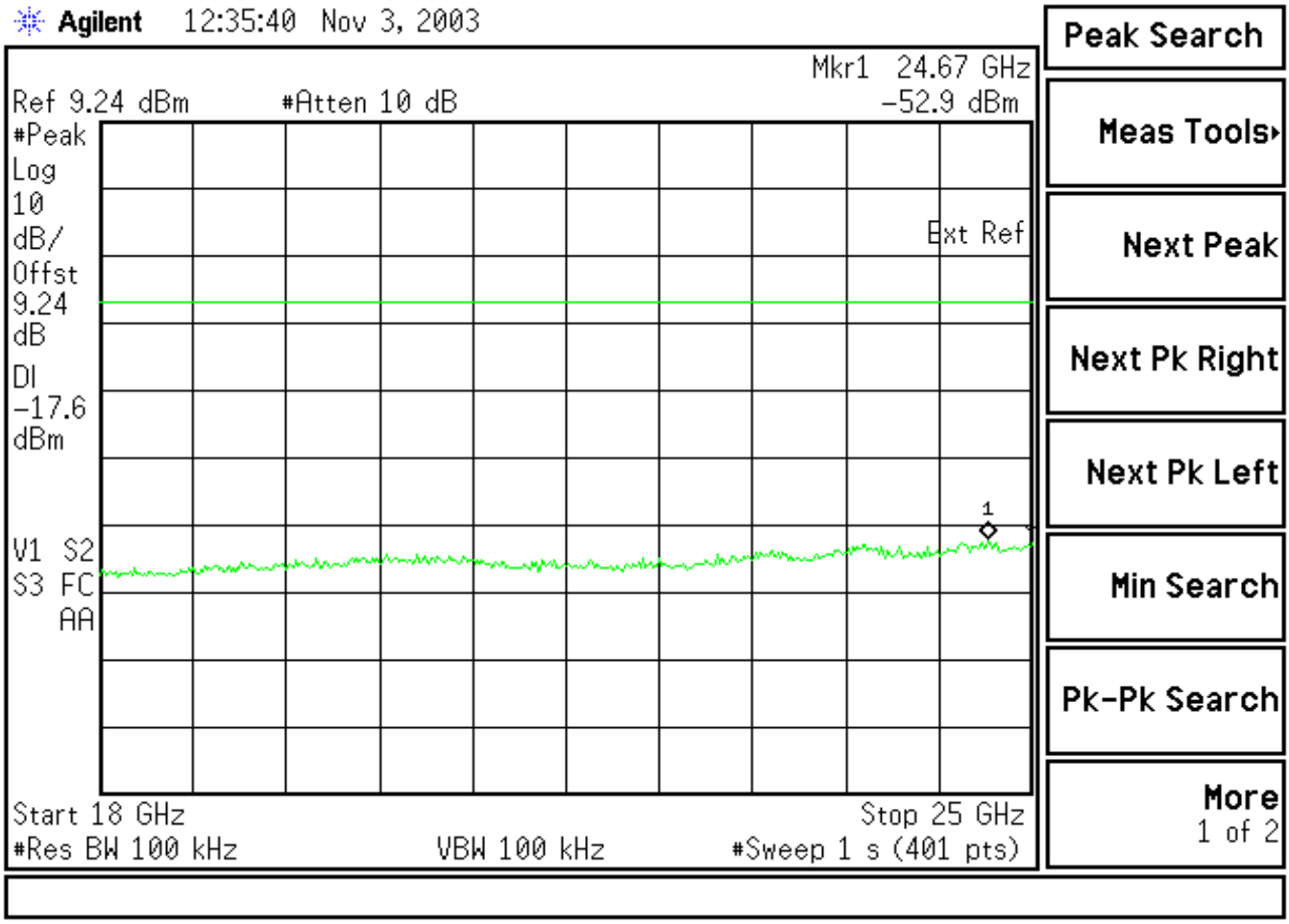


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2412MHz) – Maximum Power 2Mbps

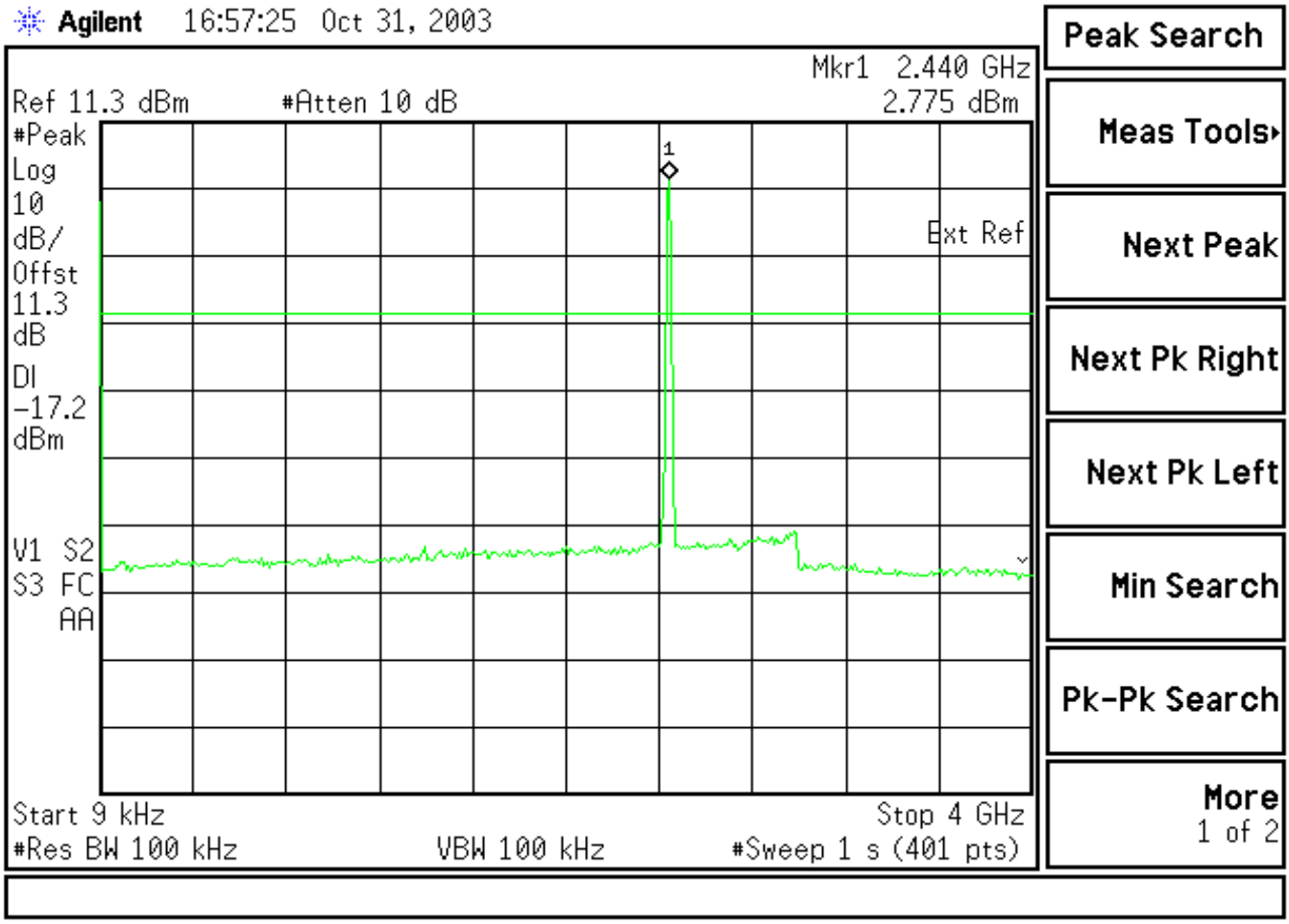


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 2Mbps

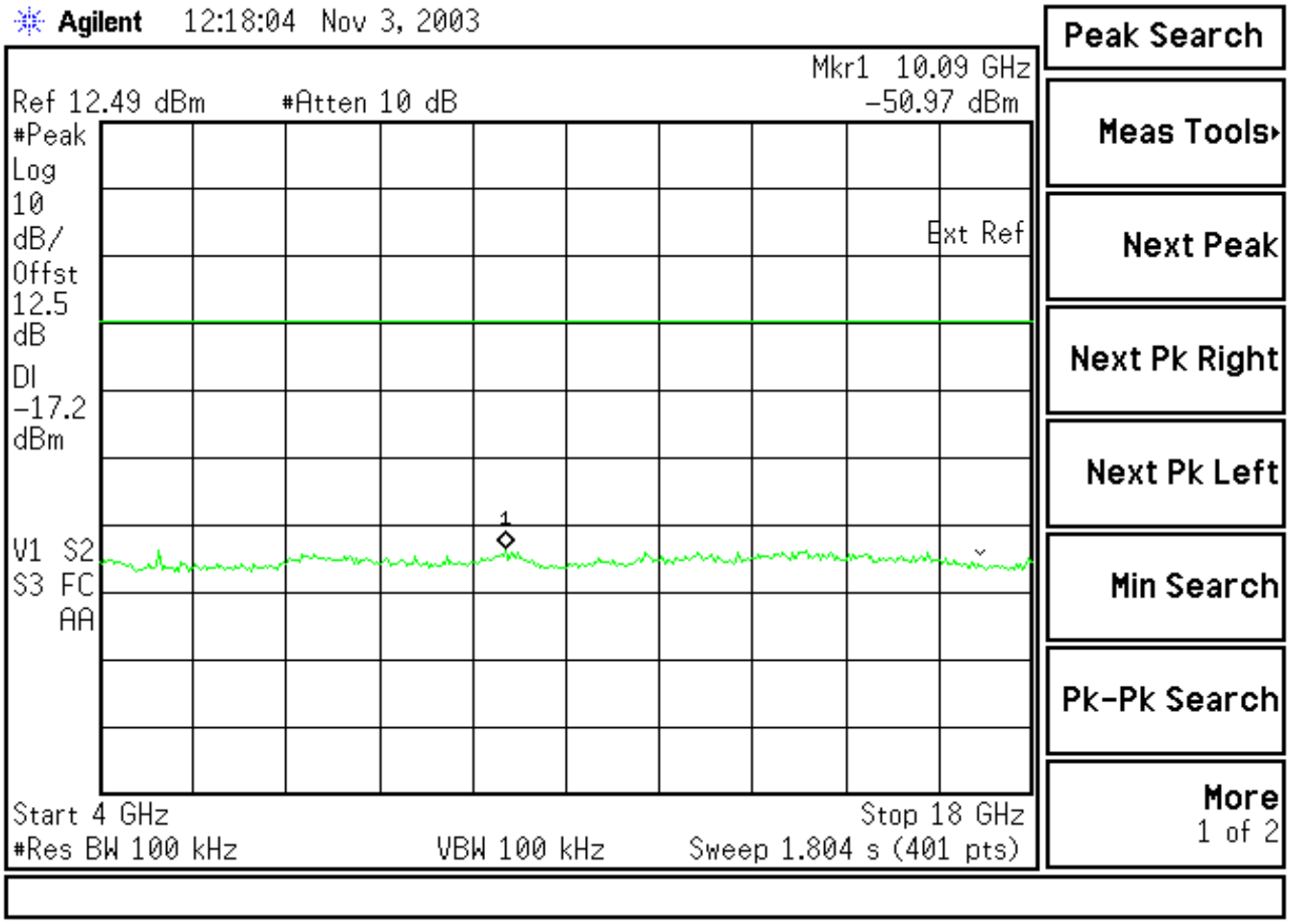


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 2Mbps

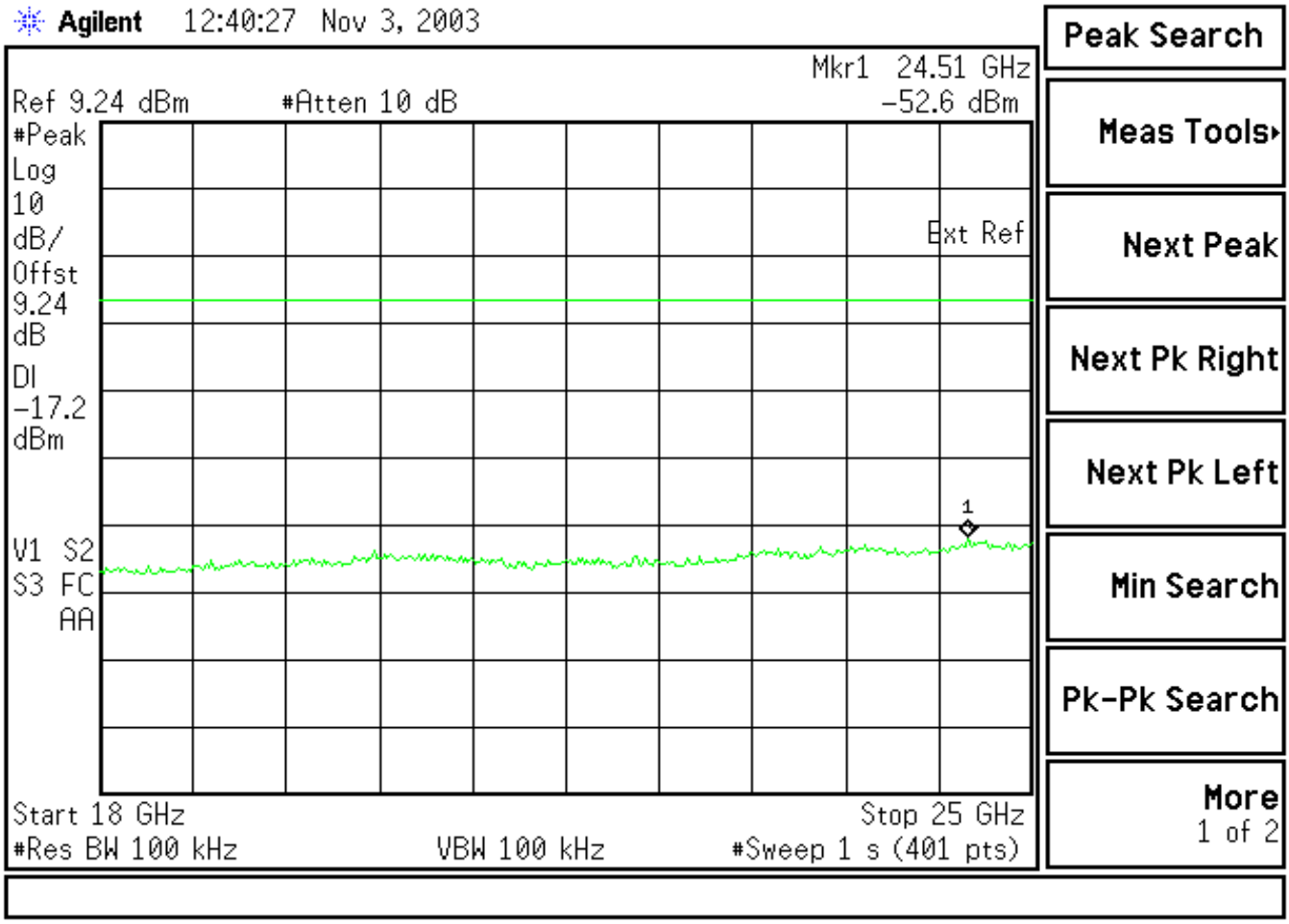


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 2Mbps

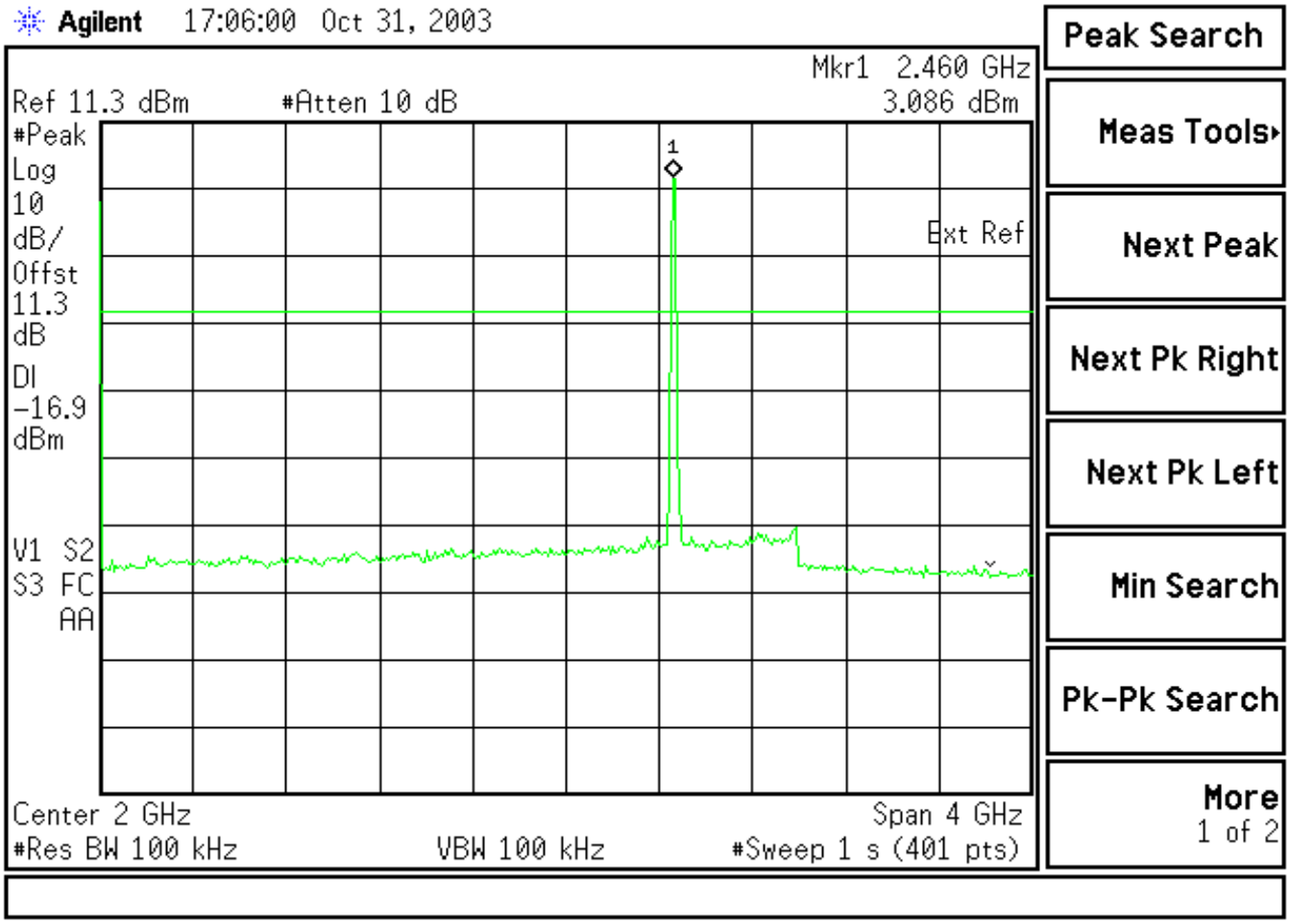


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 2Mbps

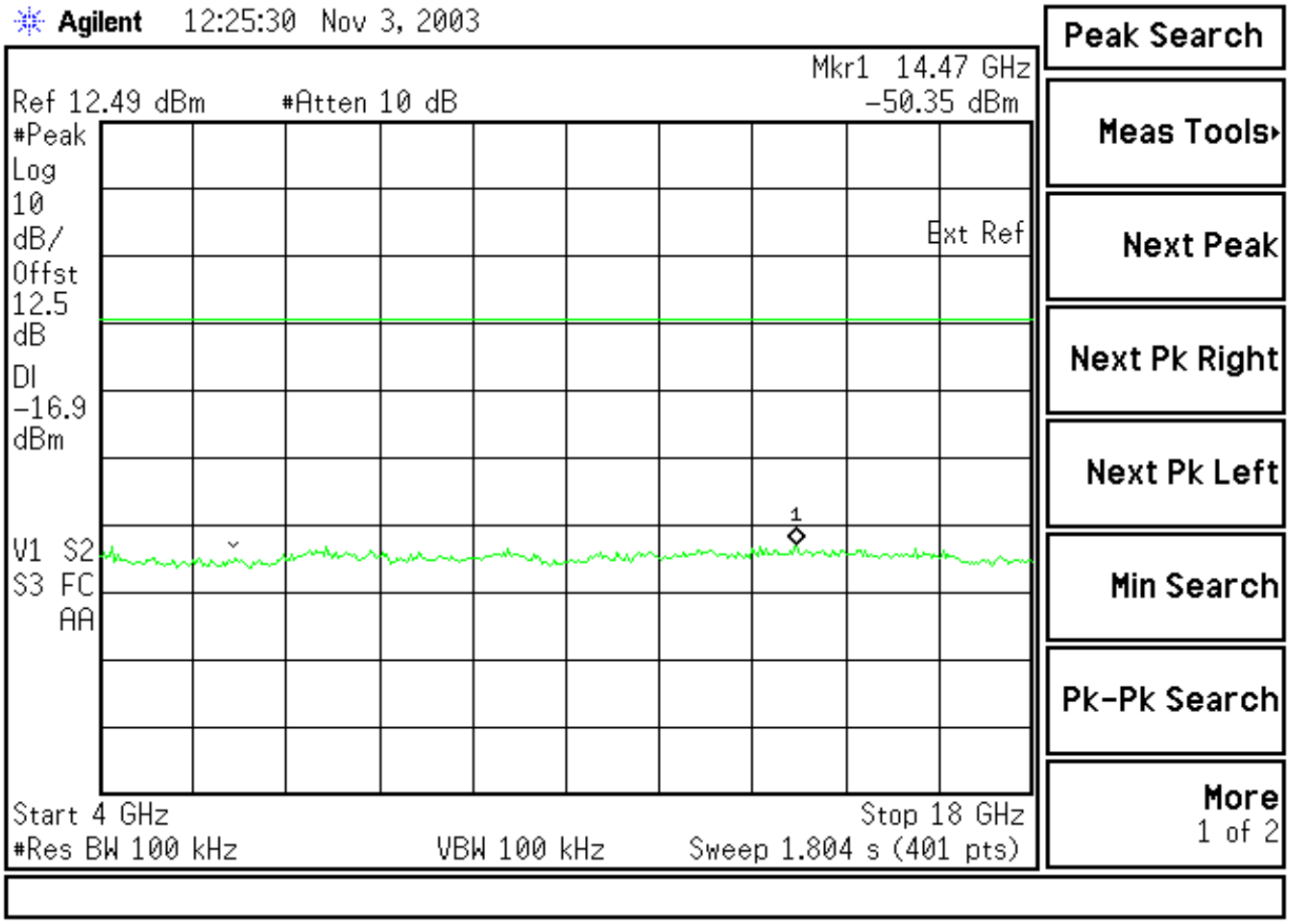


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 2Mbps

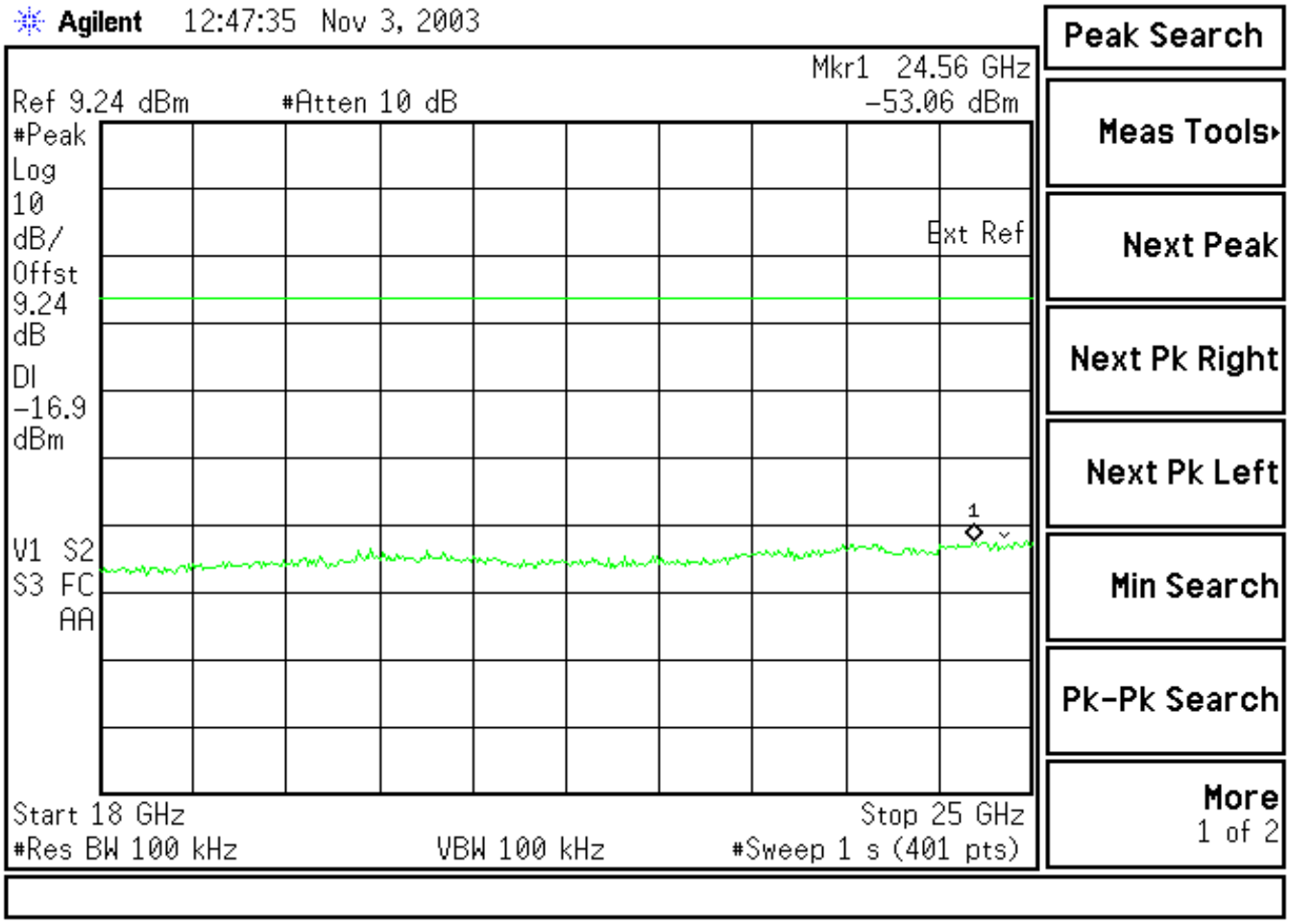


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 2Mbps

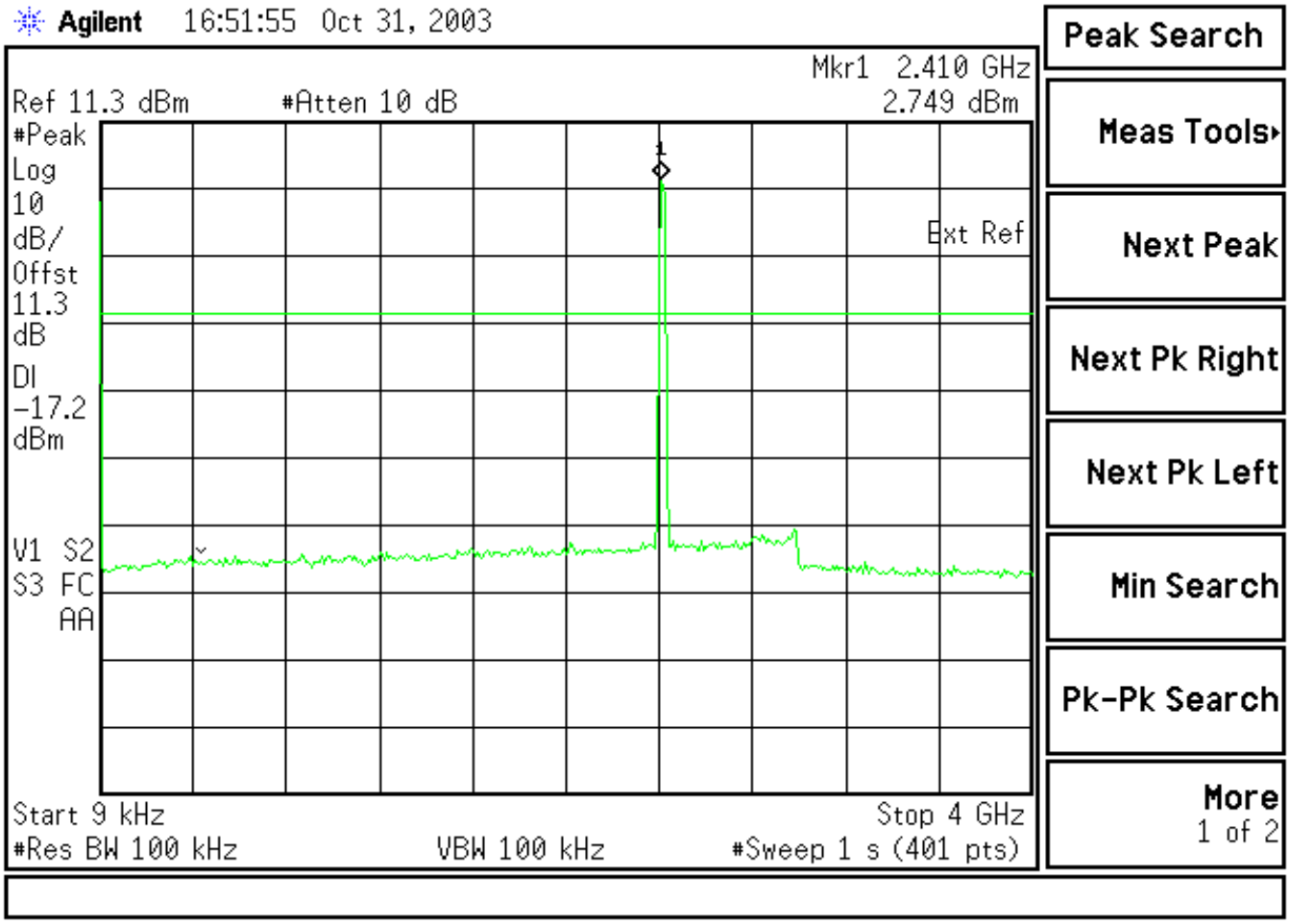


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 5.5Mbps

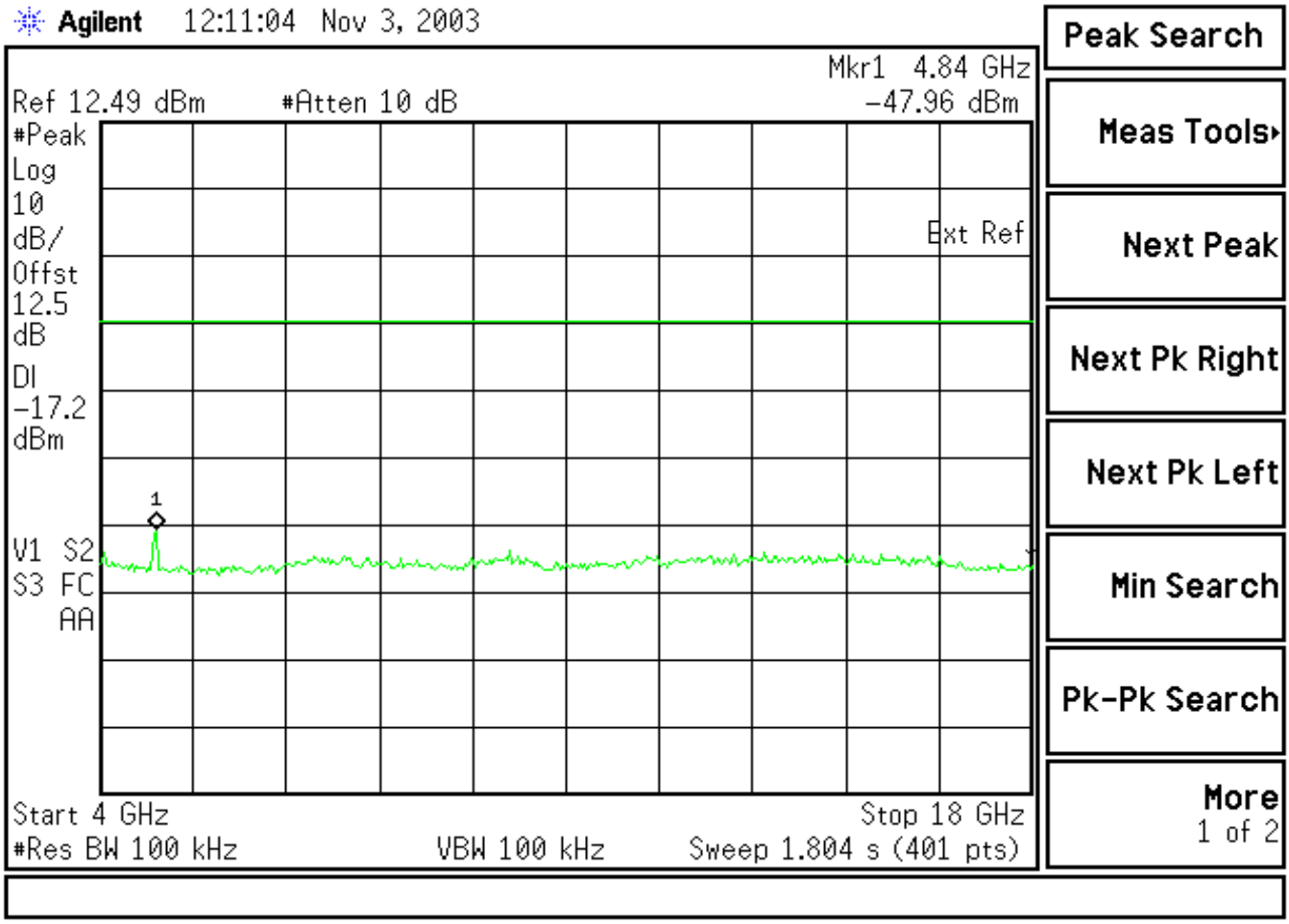


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 5.5Mbps

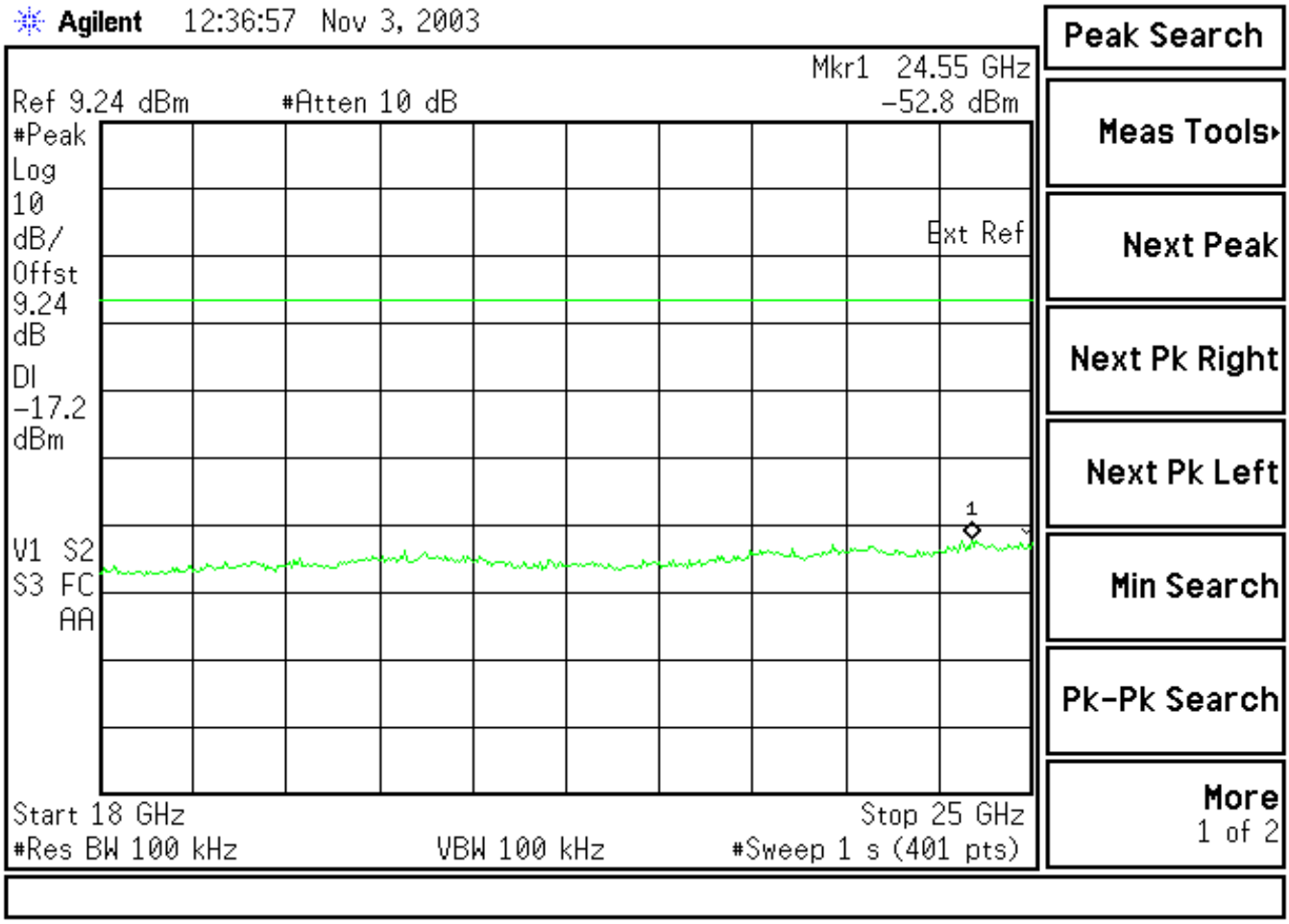


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 5.5Mbps

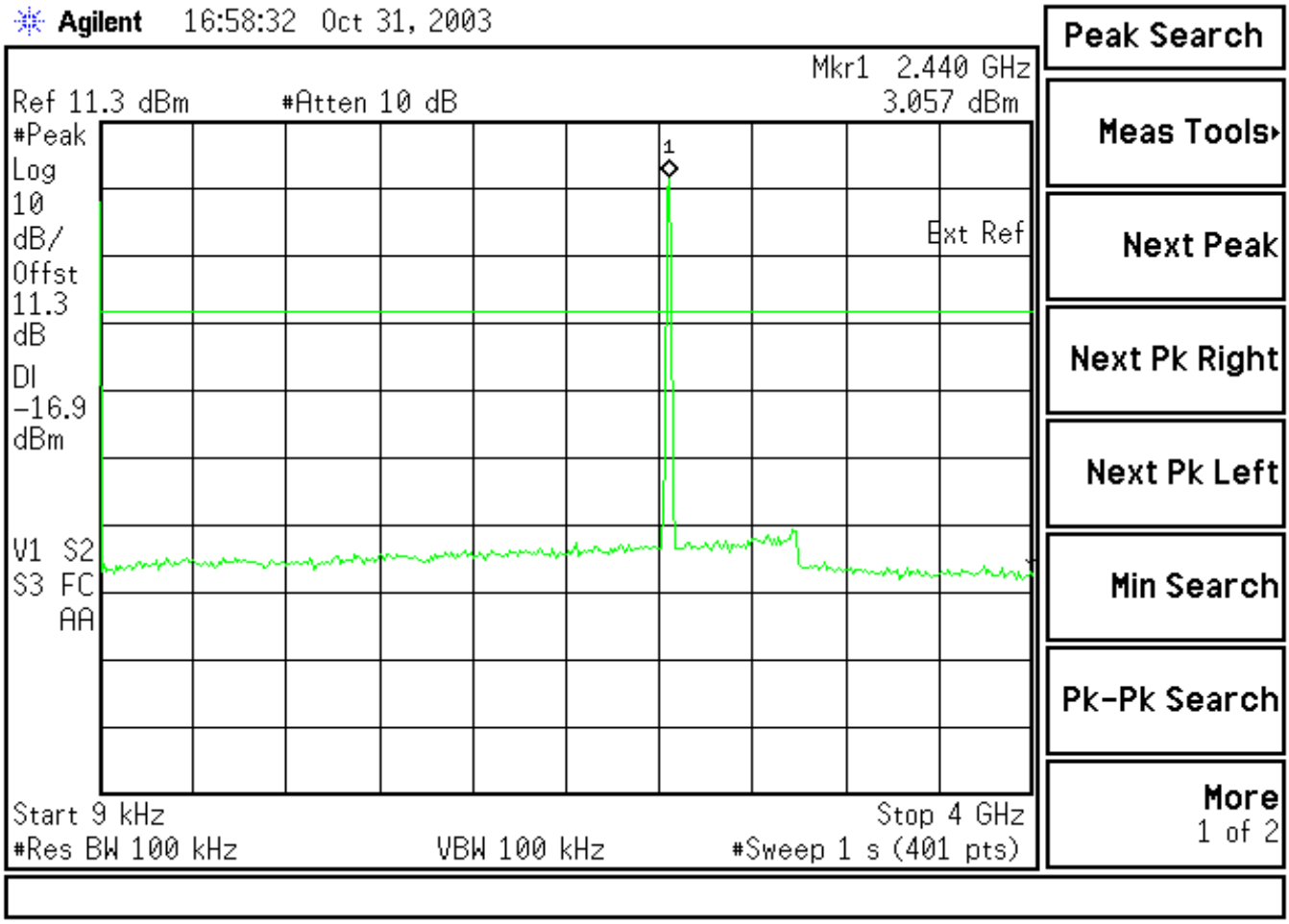


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 5.5Mbps

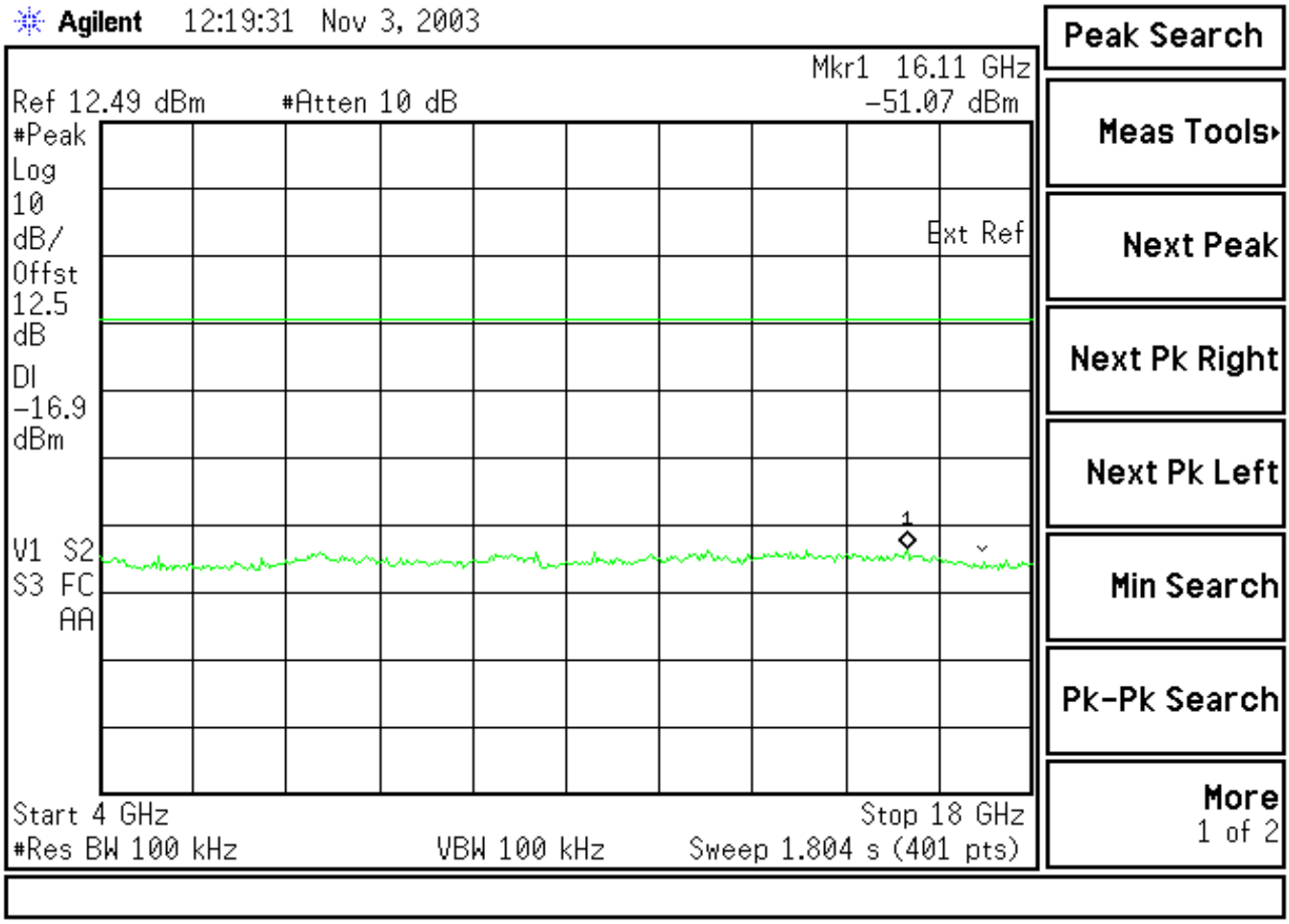


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 5.5Mbps

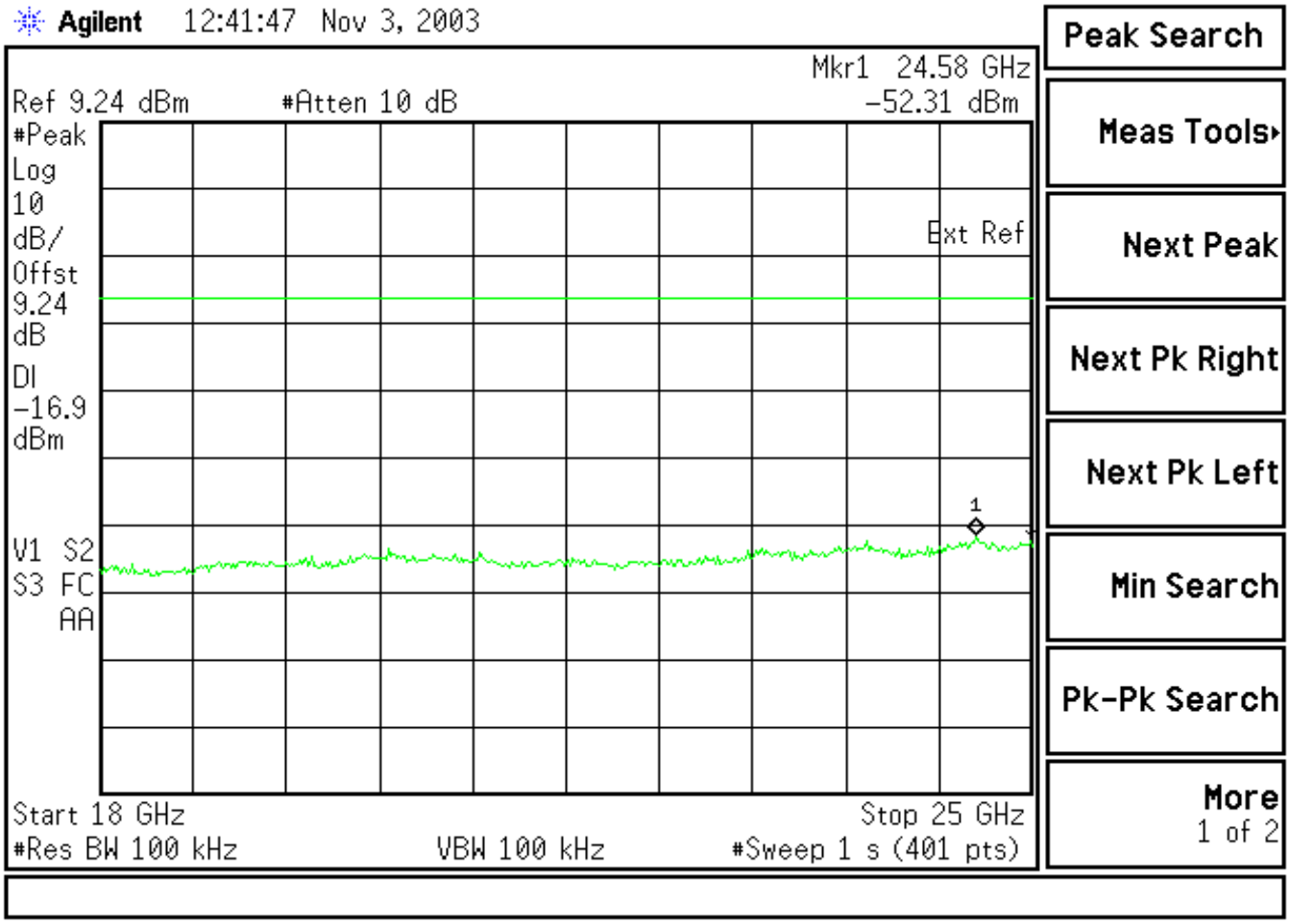


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 5.5Mbps

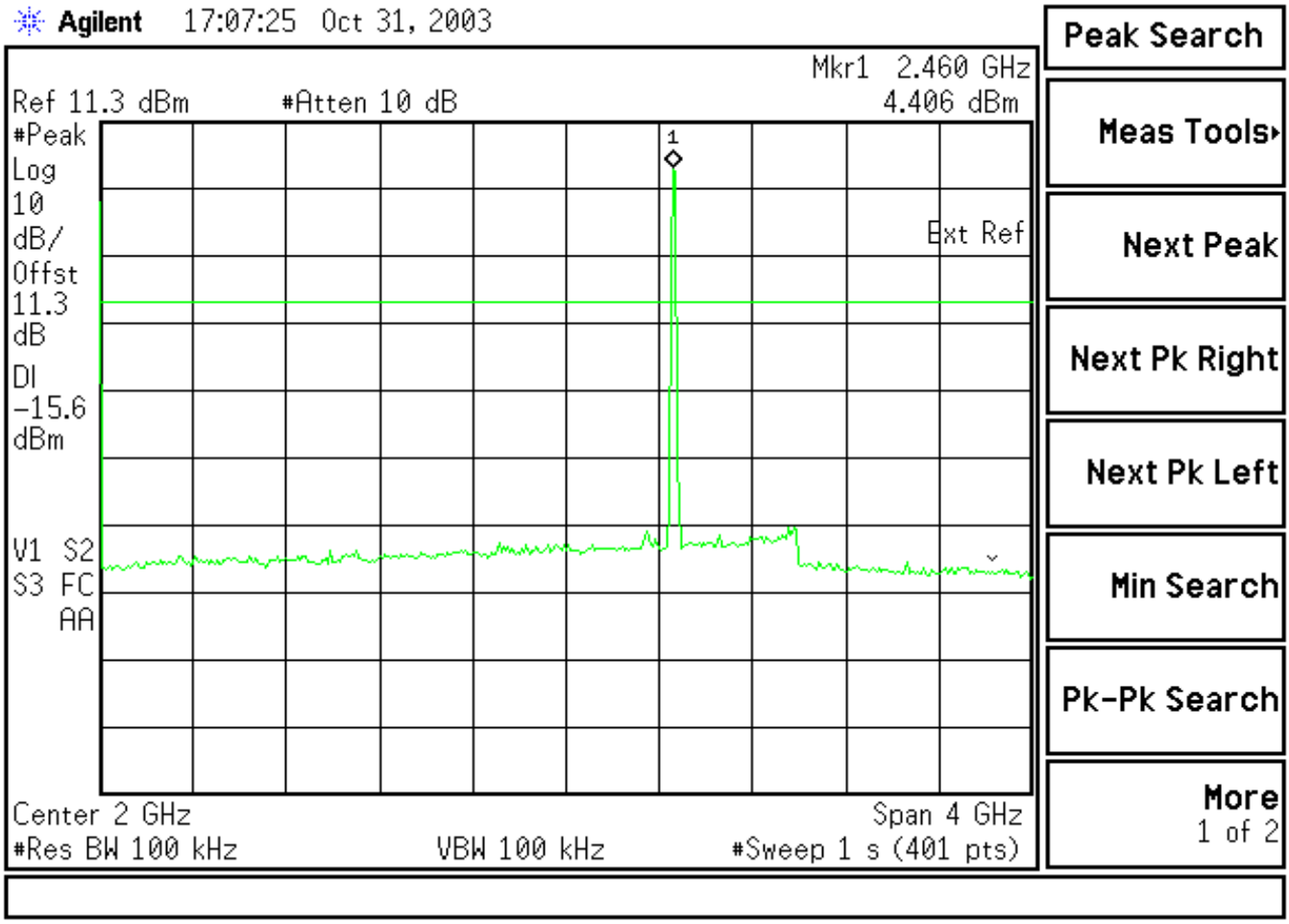


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 5.5Mbps

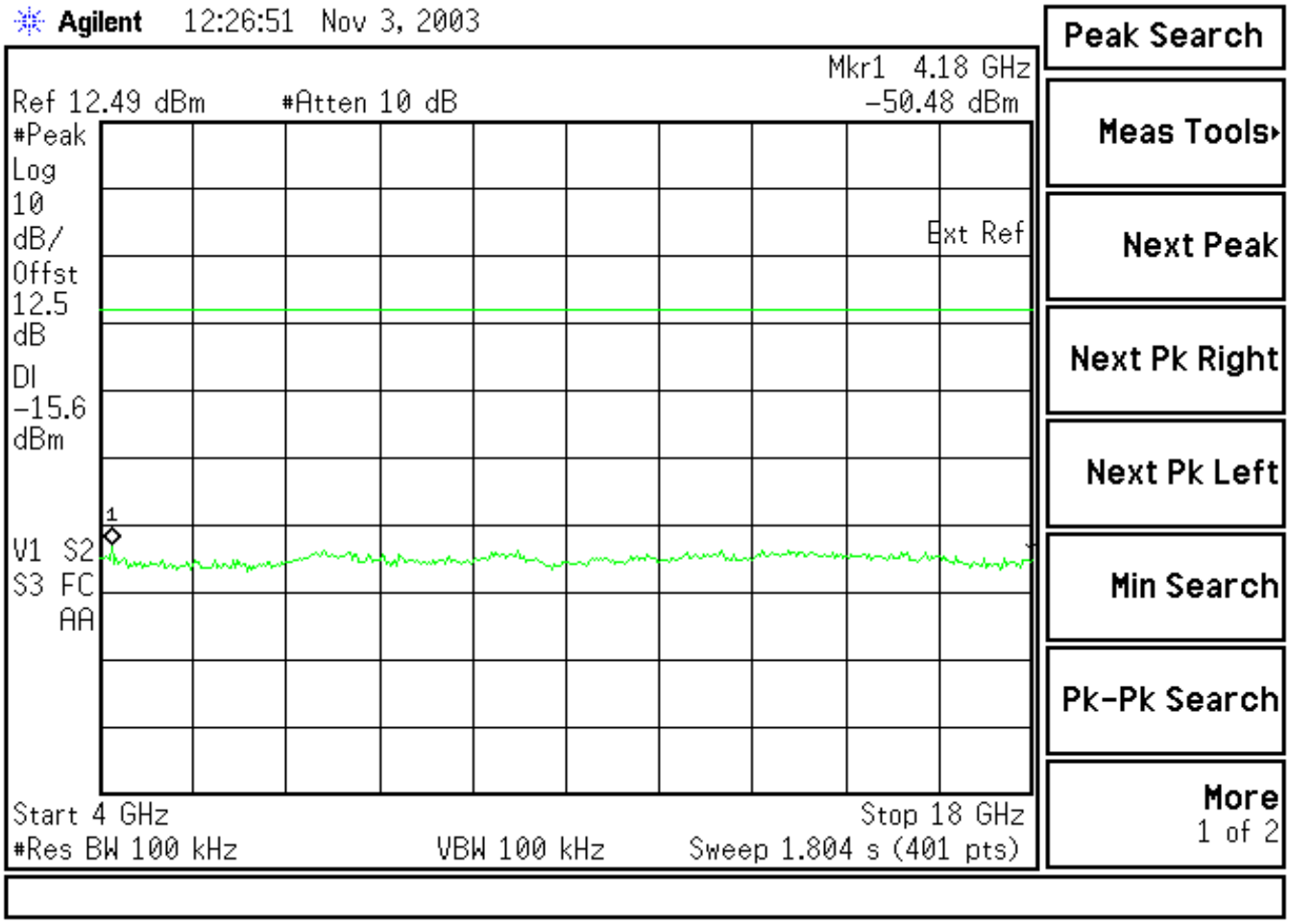


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 5.5Mbps

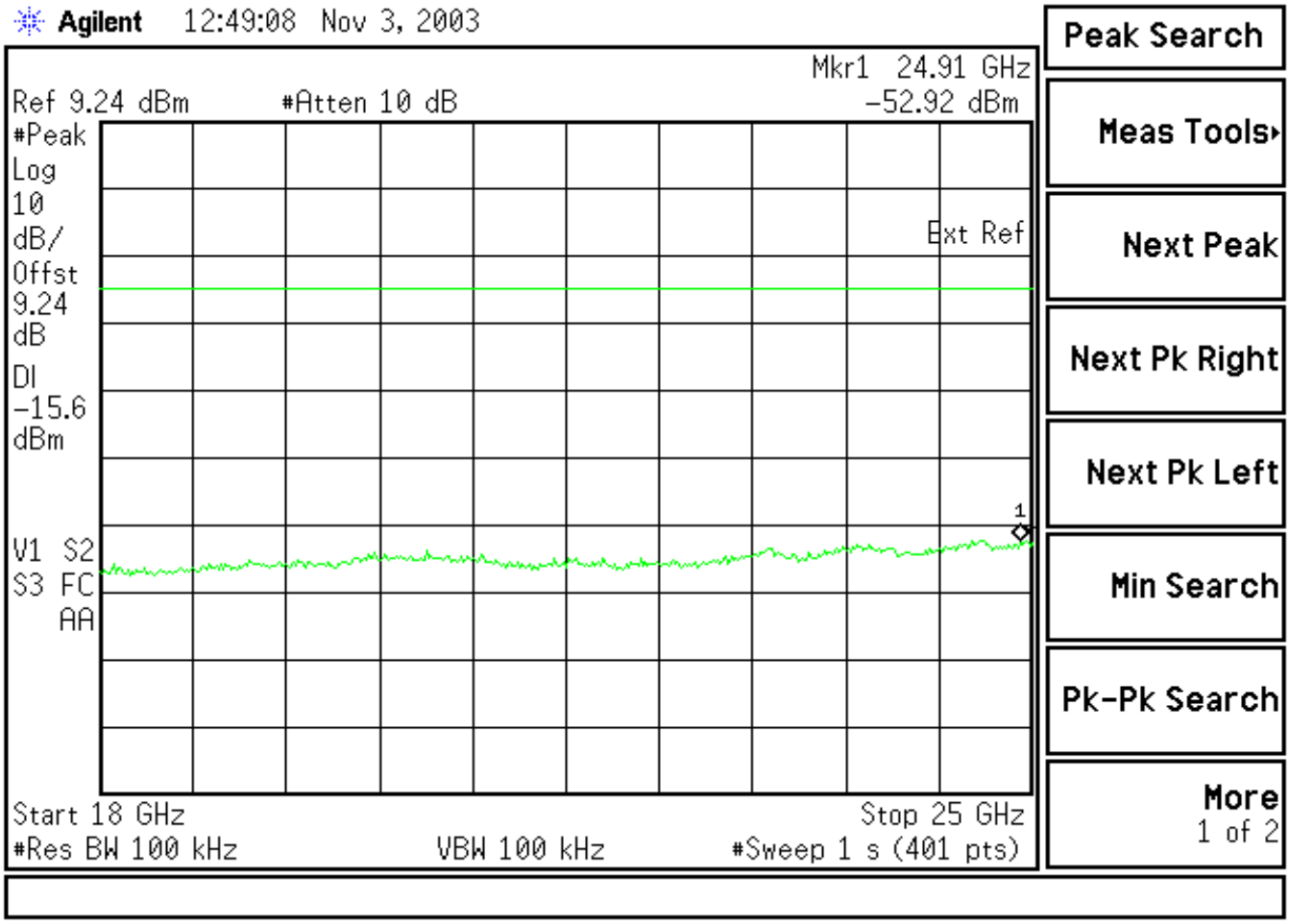


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 5.5Mbps

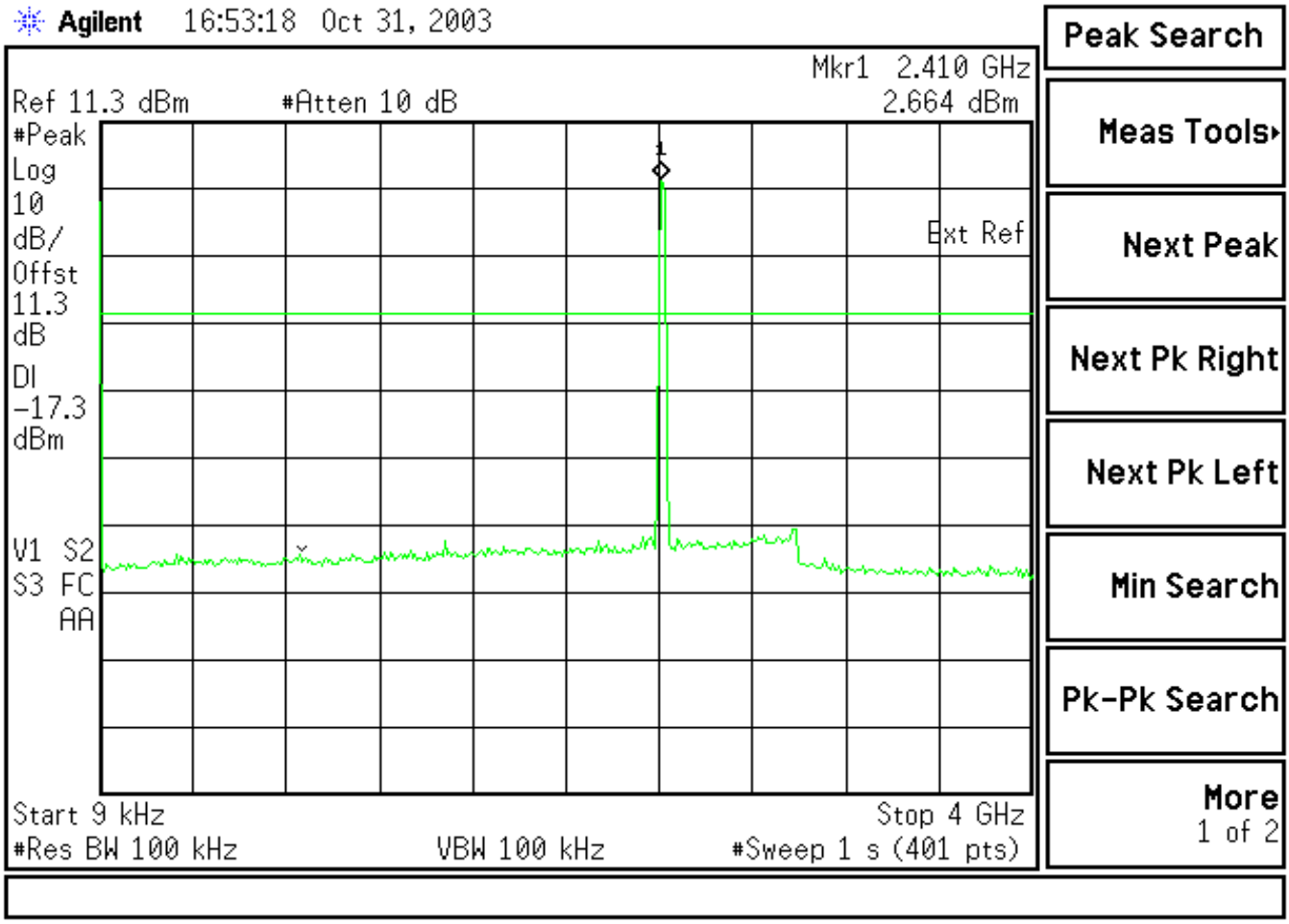


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 11Mbps

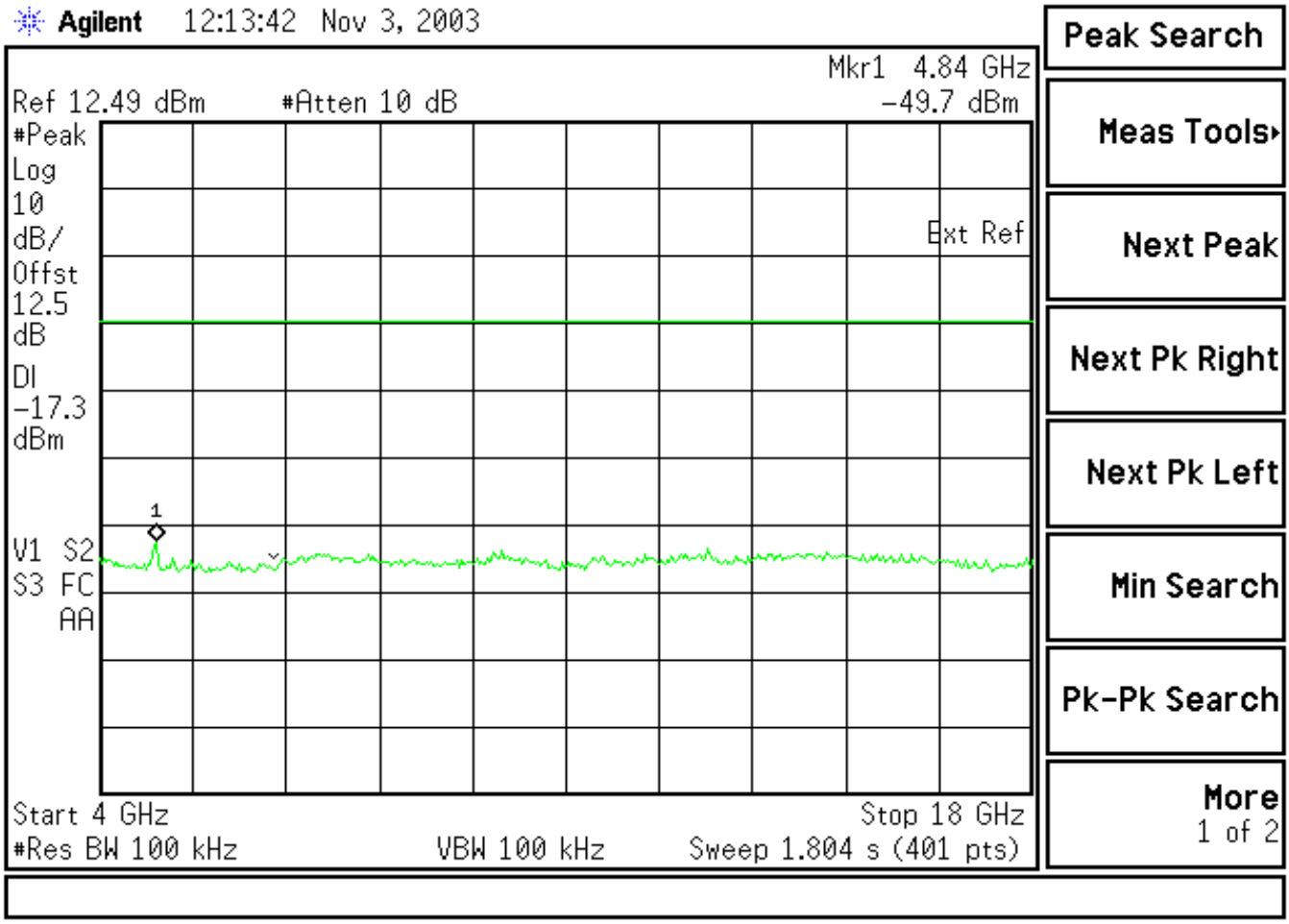


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Bottom Channel (2412MHz) – Maximum Power 11Mbps

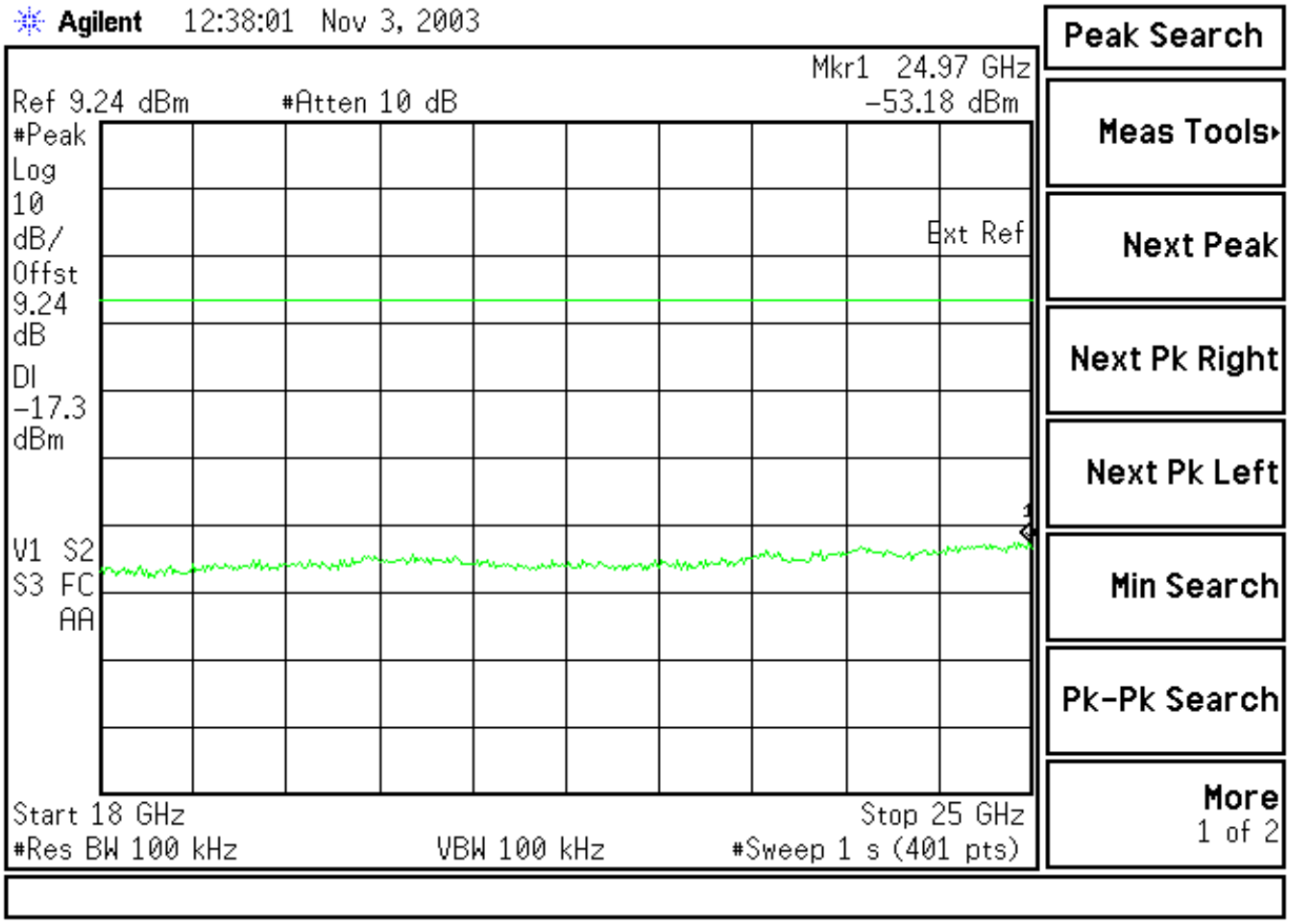


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2412MHz) – Maximum Power 11Mbps

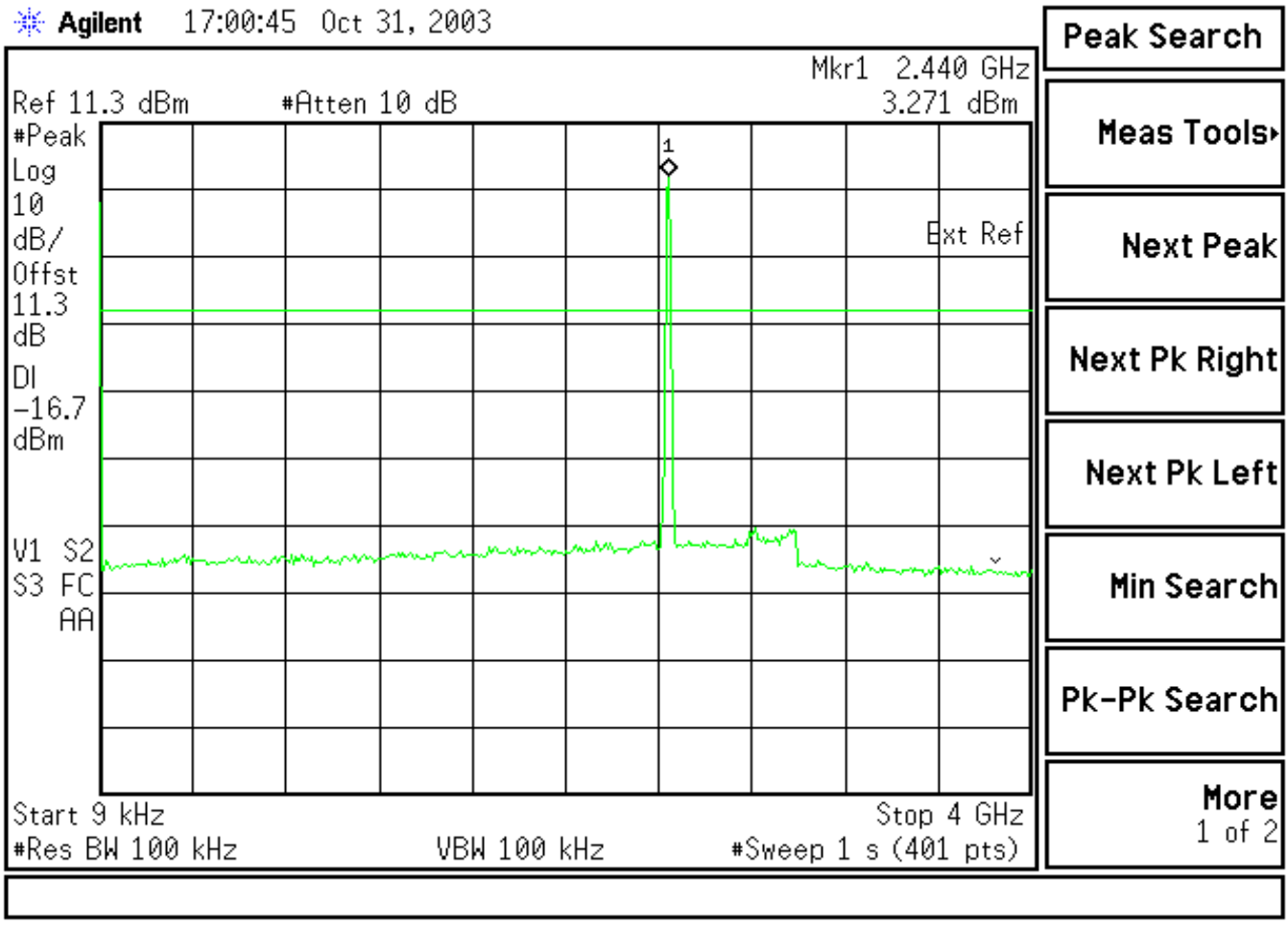


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 11Mbps

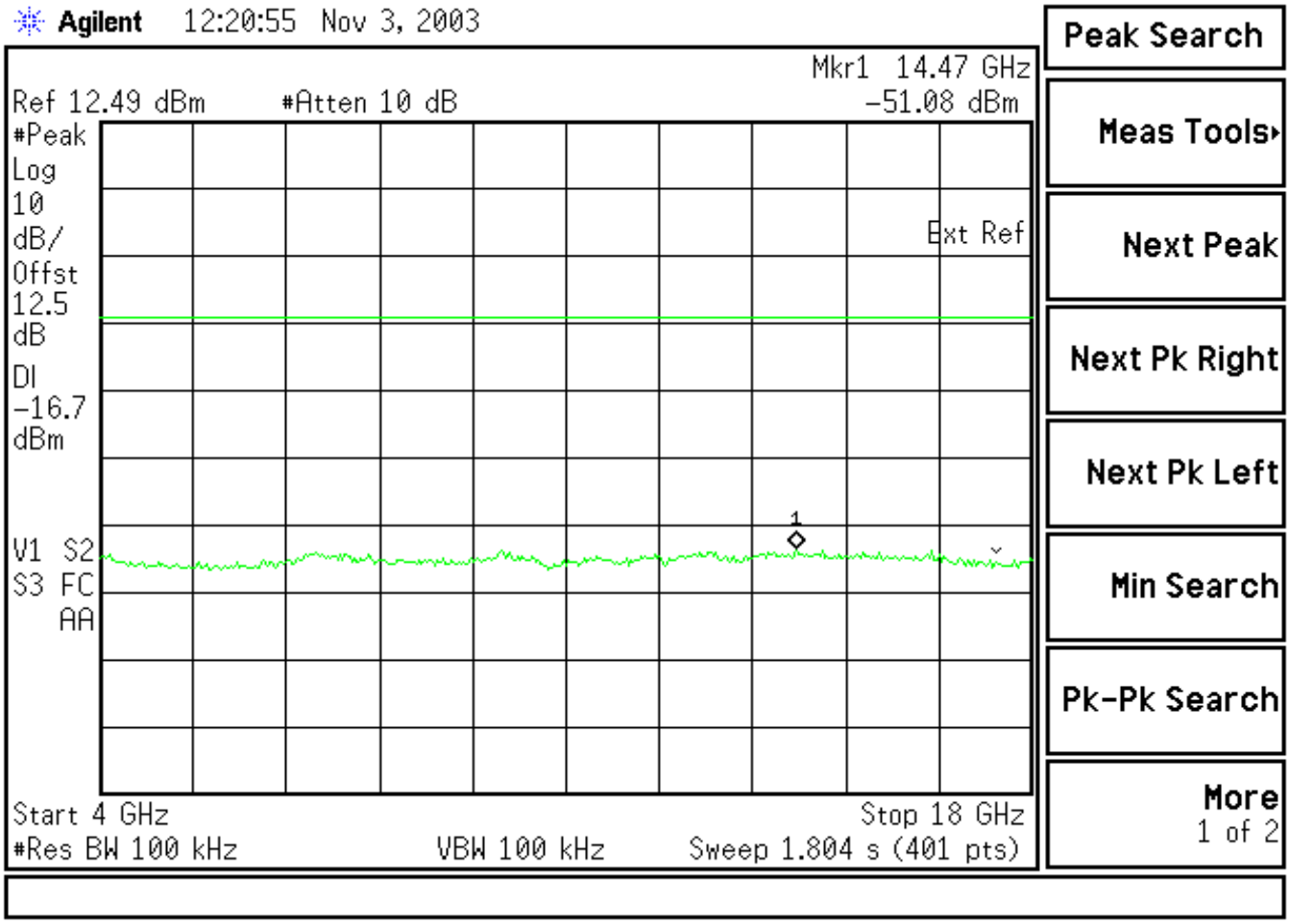


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 11Mbps

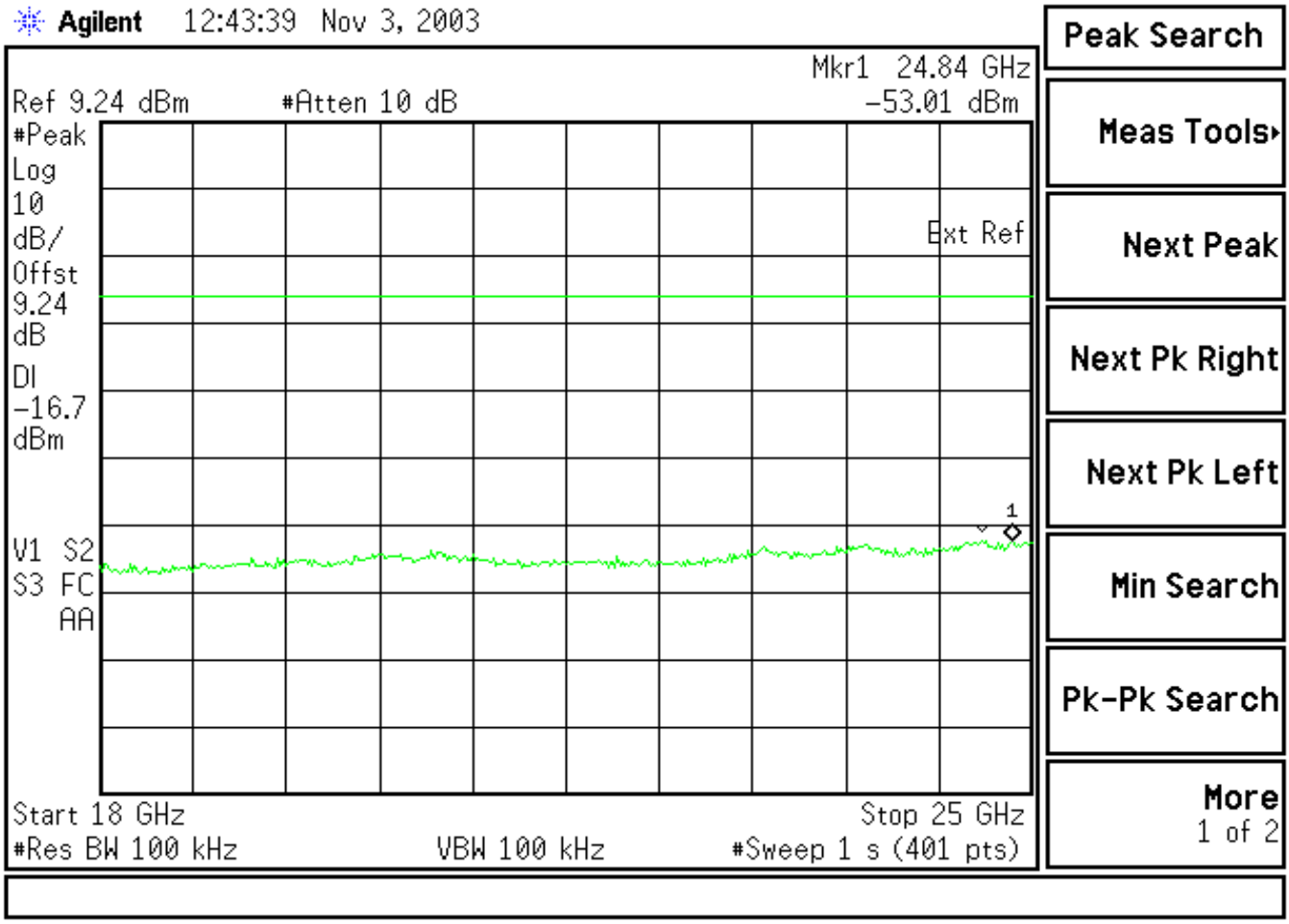


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Middle Channel (2437MHz) – Maximum Power 11Mbps

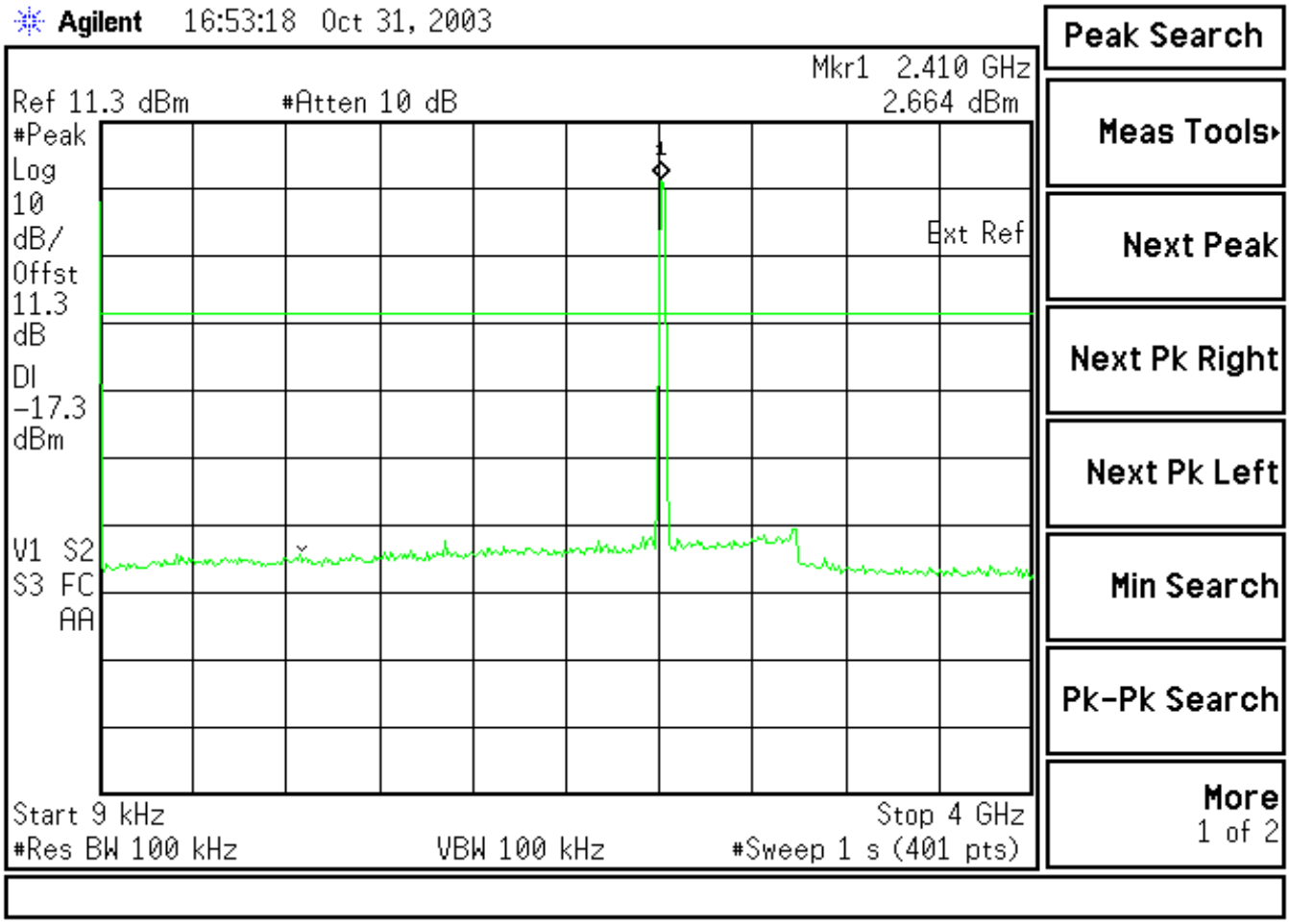


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	31st October 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (9kHz – 4GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 11Mbps

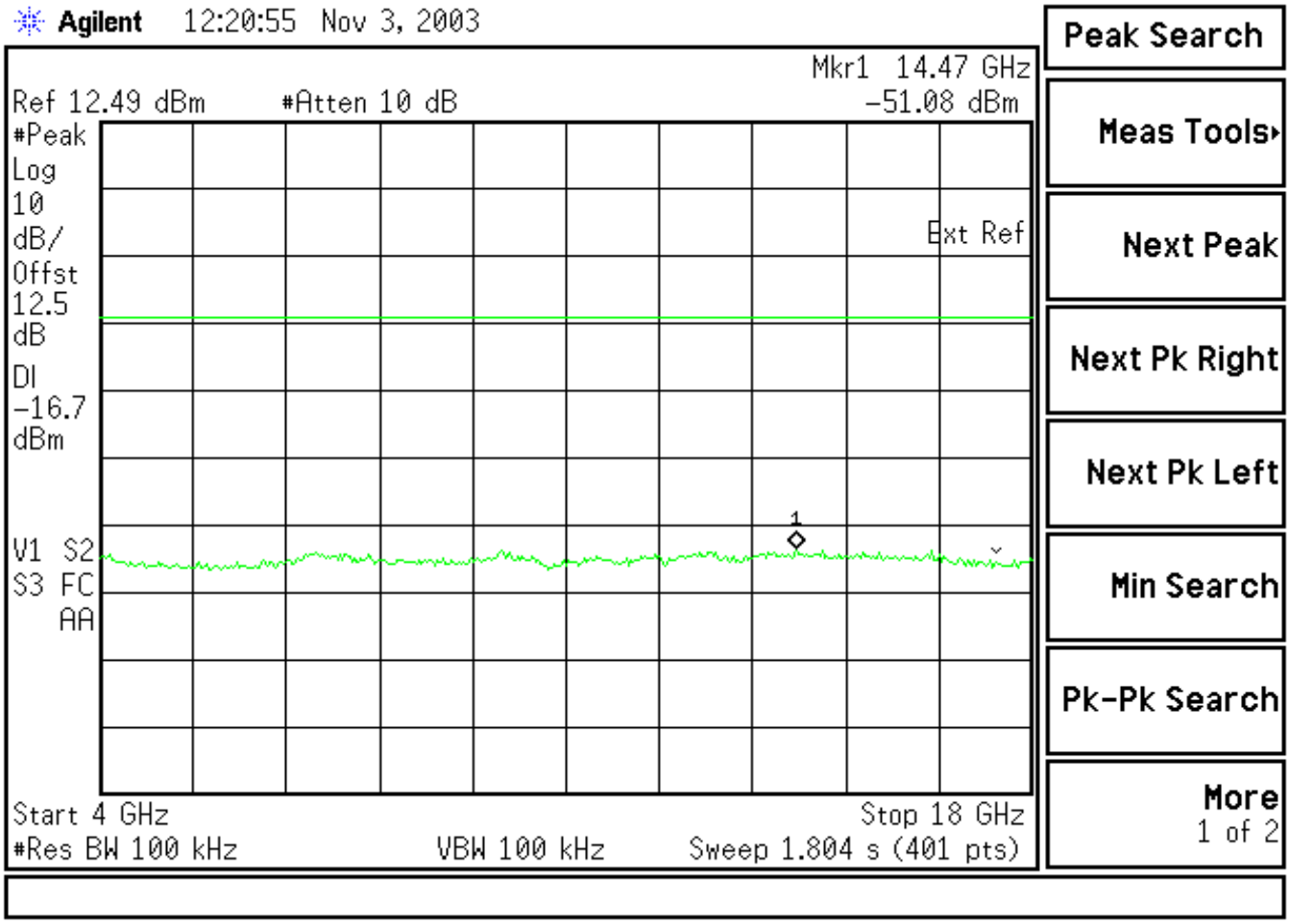


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (4GHz – 18GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 11Mbps

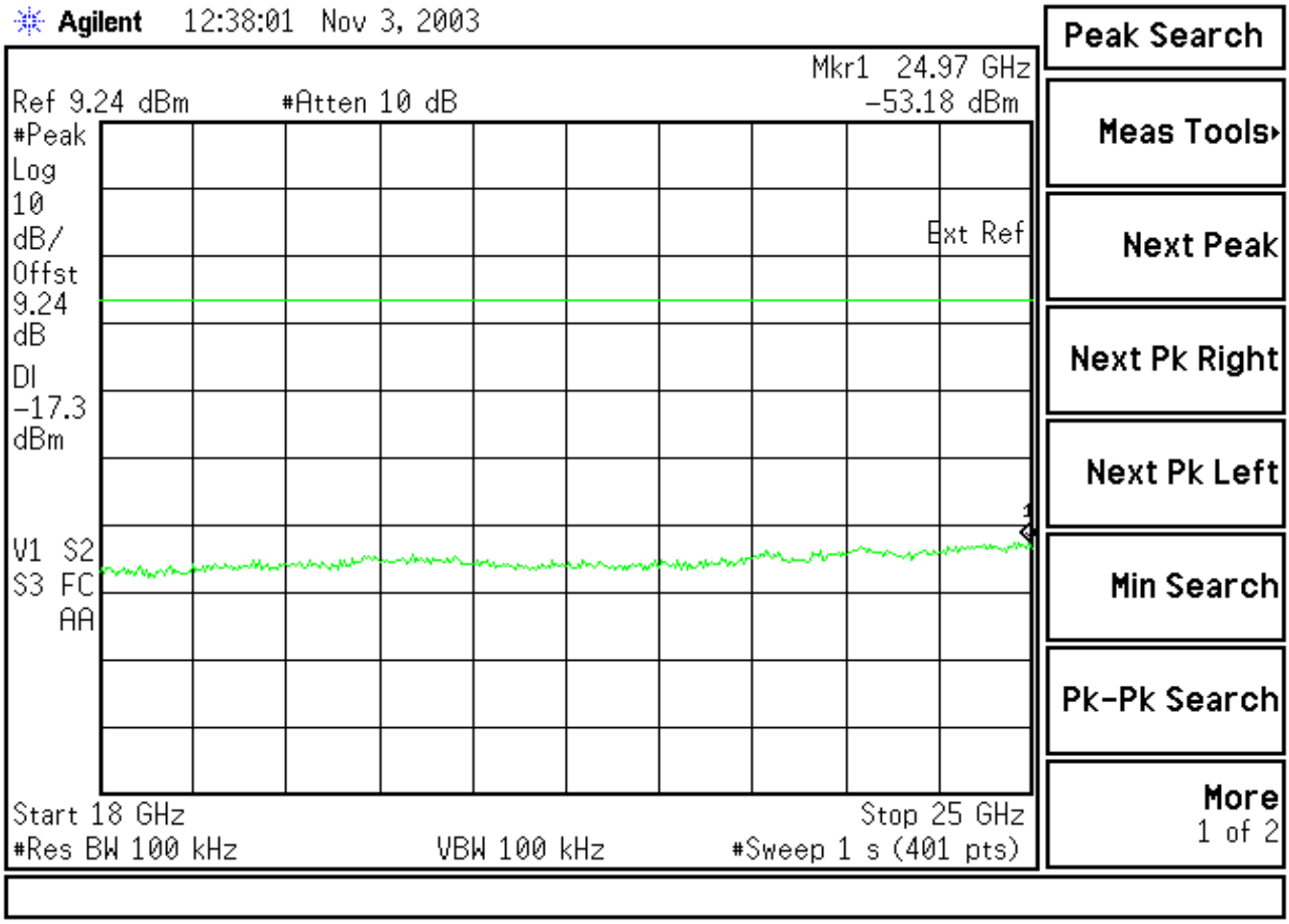


Test Case	:	Spurious Conducted Emissions on Antenna Port - continued
Test Date	:	3rd November 2003
Rule Parts	:	15.247(c)

Test Results - continued

Spurious Conducted Emissions (18GHz – 25GHz)

EUT Tx on Top Channel (2462MHz) – Maximum Power 11Mbps



Test Case	:	Spurious Radiated Emissions
Test Date	:	15th October 2003
Rule Parts	:	15.247(c)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), for Radiated Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.247(c) also requires Sections 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance unless otherwise stated. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 25GHz. The list of worst-case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

30MHz – 1GHz emissions levels were then formally measured using a CISPR Quasi-Peak detector.
1GHz – 25GHz emissions levels were then formally measured using Peak and Average detectors.

(Note: Peak measurements performed using a Resolution and Video Bandwidth of 1MHz, Average measurements performed using a Resolution Bandwidth of 1MHz and a Video Bandwidth of 10Hz)

The EUT was operating via the internal power supply of the Host.

Measurements were made with the EUT transmitting with the Data Rate set to 11Mbits/sec (worst case) on the following channels.

2412MHz
2437MHz
2462MHz

Spurious Radiated Emissions from 30MHz to 1GHz were made using a Rohde and Schwarz ESVP Receiver.

Spurious Radiated Emissions from 1GHz to 25GHz were made using a Rhode and Schwarz ESIB 26 Test Receiver.

The measurements were performed at a 3m distance unless otherwise stated.

Test Case : Spurious Radiated Emissions - continued

Test Date : 15th October 2003

Rule Parts : 15.247(c)

Test Results

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), 15.205 and 15.209 for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (2412MHz)

30MHz –1GHz: Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
201.0	V	100	0	35.1	56.9	43.5	150.0
263.5	H	100	300	39.4	93.3	46.0	200.0
320.8	H	118	180	35.8	61.7	46.0	200.0
466.5	V	100	352	37.3	73.3	46.0	200.0
460.1	H	120	200	36.8	69.2	46.0	200.0
526.3	V	123	180	40.0	100	46.0	200.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 18th October 2003

Rule Parts : 15.247(c)

Test Results - continued

30MHz - 1GHz Frequency Range

EUT Tx on Middle Channel (2437MHz)

30MHz –1GHz: Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
132.0	V	100	32	28.6	26.9	43.5	150.0
200.9	V	100	0	36.1	63.8	43.5	150.0
263.6	H	107	290	38.5	84.1	46.0	200.0
460.0	H	121	180	35.7	61.0	46.0	200.0
463.2	V	100	357	37.1	71.6	46.0	200.0
523.6	V	100	176	39.9	98.9	46.0	200.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 18th October 2003

Rule Parts : 15.247(c)

Test Results - continued

30MHz - 1GHz Frequency Range

EUT Tx on Top Channel (2462MHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBµV/m	µV/m	dBµV/m	µV/m
200.6	V	100	7	34.3	51.9	43.5	150.0
263.7	H	100	299	38.6	85.1	46.0	200.0
460.0	H	113	188	35.8	61.7	46.0	200.0
463.1	V	100	25	36.7	68.4	46.0	200.0
523.1	V	100	154	40.1	101.2	46.0	200.0

ABBREVIATIONS FOR ABOVE TABLES

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer.

Test Case : Spurious Radiated Emissions - continued

Test Date : 15th October 2003

Rule Parts : 15.247(c)

Test Results - continued

1GHz –25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Spurious Radiated Emissions (1GHz – 25GHz).

EUT Tx on Bottom Channel (2412MHz)

1GHz – 25GHz Alternative Open Area Test Site Results: The levels of the highest emissions measured in accordance with the specification are presented below: -

Note: measurement of the carrier frequency (2412MHz) produced a Field Strength of 103.3dBµV/m. Therefore the specification limit for any spurious emissions found outside of the Restricted Band table (Section 15.205) is 83.3dBµV/m (carrier level minus 20dB)

Emission Frequency	Pol	Hgt	Azm	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	113	91	51.6	74.0	32.5	54.0
4.076	V	147	56	51.8	74.0	48.4	54.0
4.824	H	203	266	61.5	74.0	42.0	54.0
7.236	V	157	107	55.7	83.3	-	-
8.152	V	164	208	56.2	74.0	48.2	54.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 15th October 2003

Rule Parts : 15.247(c)

Test Results - continued

1GHz –25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15.247(c), 15.205 and 15.209 for Spurious Radiated Emissions (1GHz – 25GHz).

EUT Tx on Middle Channel (2437MHz)

1GHz – 25GHz Alternative Open Area Test Site Results: The levels of the highest emissions measured in accordance with the specification are presented below: -

Note: measurement of the carrier frequency (2437MHz) produced a Field Strength of 104.0dBµV/m. Therefore the specification limit for any spurious emissions found outside of the Restricted Band table (Section 15.205) is 84.0dBµV/m (carrier level minus 20dB)

Emission Frequency	Pol	Hgt	Azm	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	104	88	52.1	74.0	32.5	54.0
1.643	V	103	84	51.4	84.0	-	-
4.126	V	102	237	51.6	74.0	48.5	54.0
4.874	V	108	325	61.2	74.0	49.3	54.0
7.315	V	143	105	54.8	74.0	42.5	54.0
8.252	V	100	52	53.9	74.0	46.3	54.0

Test Case : Spurious Radiated Emissions - continued

Test Date : 15th October 2003

Rule Parts : 15.247(c)

Test Results - continued

1GHz –25GHz Frequency Range

EUT Tx on Top Channel (2462MHz)

1GHz – 25GHz Alternative Open Area Test Site Results: The levels of the highest emissions measured in accordance with the specification are presented below: -

Note: measurement of the carrier frequency (2462MHz) produced a Field Strength of 105.4dBµV/m. Therefore the specification limit for any spurious emissions found outside of the Restricted Band table (Section 15.205) is 85.4dBµV/m (carrier level minus 20dB)

Emission Frequency	Pol	Hgt	Azm	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
1.598	V	109	98	51.8	74.0	32.5	54.0
1.643	V	106	100	49.7	74.0	33.3	54.0
4.176	V	122	257	50.1	74.0	45.3	54.0
4.924	V	127	175	57.6	74.0	46.8	54.0
7.386	V	144	108	56.8	74.0	46.6	54.0
8.352	V	144	272	56.6	74.0	45.8	54.0

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: A Guy, EMC Engineer's.

Test Case : Peak Power Spectral Density

Test Date : 31st October 2003

Rule Parts : 15.247(d)

Measurement Method

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(d), for Peak Power Spectral Density was carried out as a conducted bench test.

The EUT was connected to the Spectrum Analyser via a 10dB Attenuator. The EUT was set to transmit at maximum power on all three channels and at all data rates.

With the EUT transmitting, the trace was adjusted to display the whole of the fundamental. The RBW and VBW were initially set to 100kHz. Using the Max Hold function on the Spectrum Analyser, the peak response of the fundamental was established. This point was then centred on the display screen and the span adjusted to 600kHz and the RBW and VBW changed to 3kHz. The sweep time was set at 200 seconds, (600×10^3 / 3×10^3), and Max Hold selected. The peak response was then measured and recorded.

Test Results

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(d) for Peak Power Spectral Density.

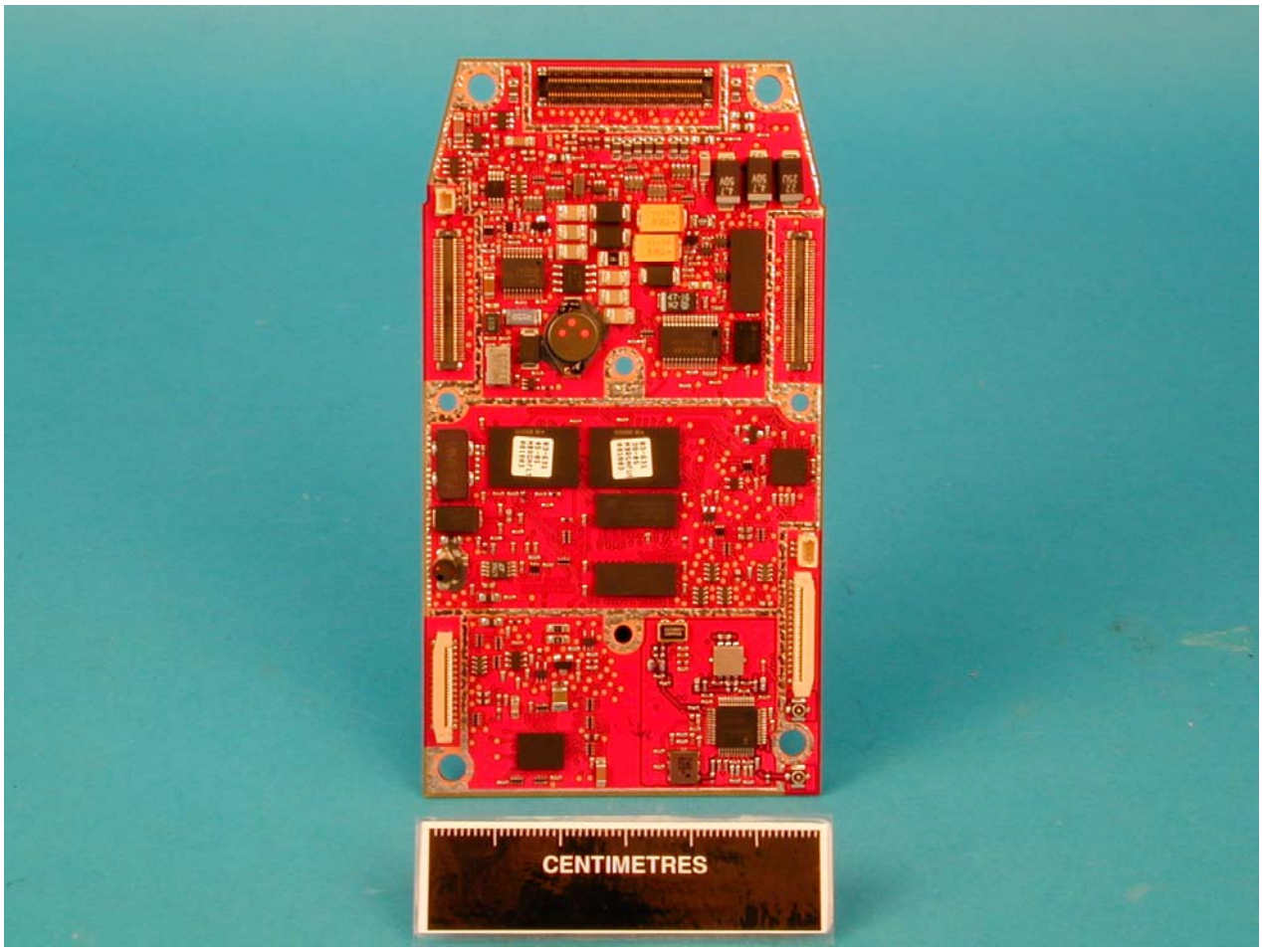
Frequency (MHz)	Data Rate (Mbps)	Measurement Bandwidth (kHz)	Result (dBm)
2412	1	3	-15.59
2437	1	3	-14.93
2462	1	3	-13.81
2412	2	3	-9.62
2437	2	3	-8.83
2462	2	3	-8.28
2412	5.5	3	-12.80
2437	5.5	3	-11.96
2462	5.5	3	-11.32
2412	11	3	-12.94
2437	11	3	-12.35
2462	11	3	-11.60

Limit	≤ +8dBm/3kHz

Procedure: Test Performed in accordance with ANSI C63.4.

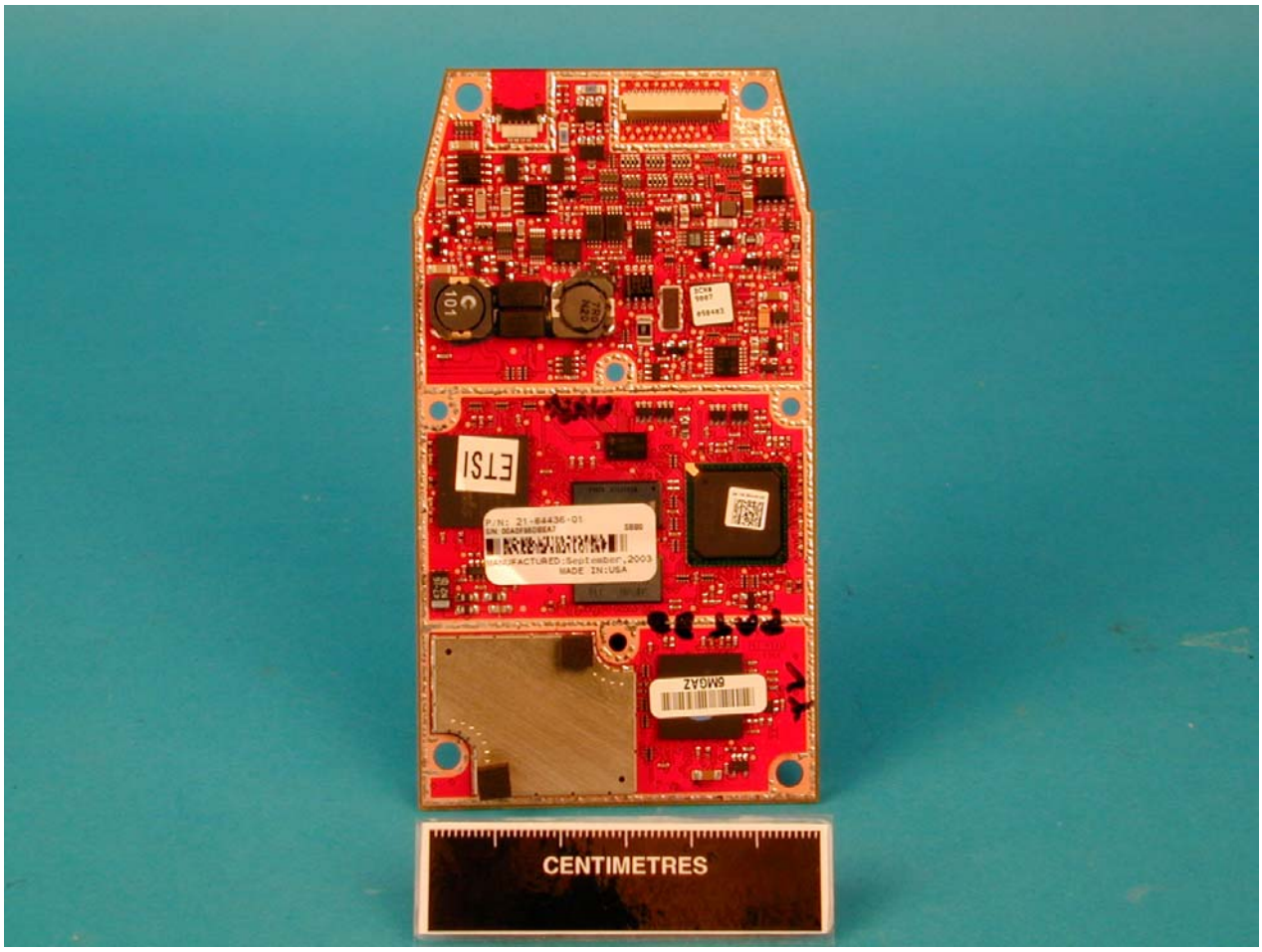
Performed by: B Airs, Radio Engineer.

PHOTOGRAPHS OF EQUIPMENT



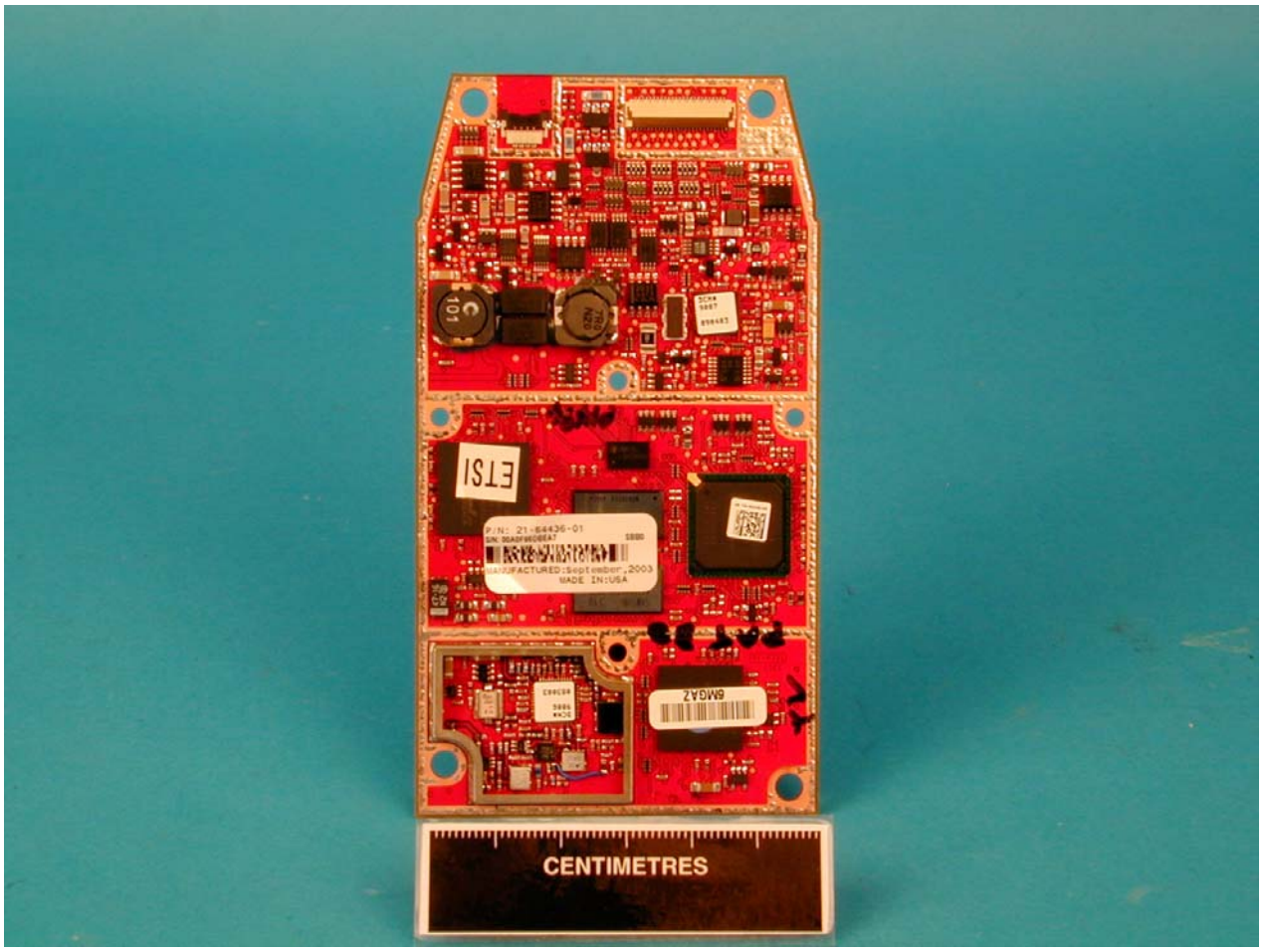
Photograph 2
Front View

PHOTOGRAPHS OF EQUIPMENT



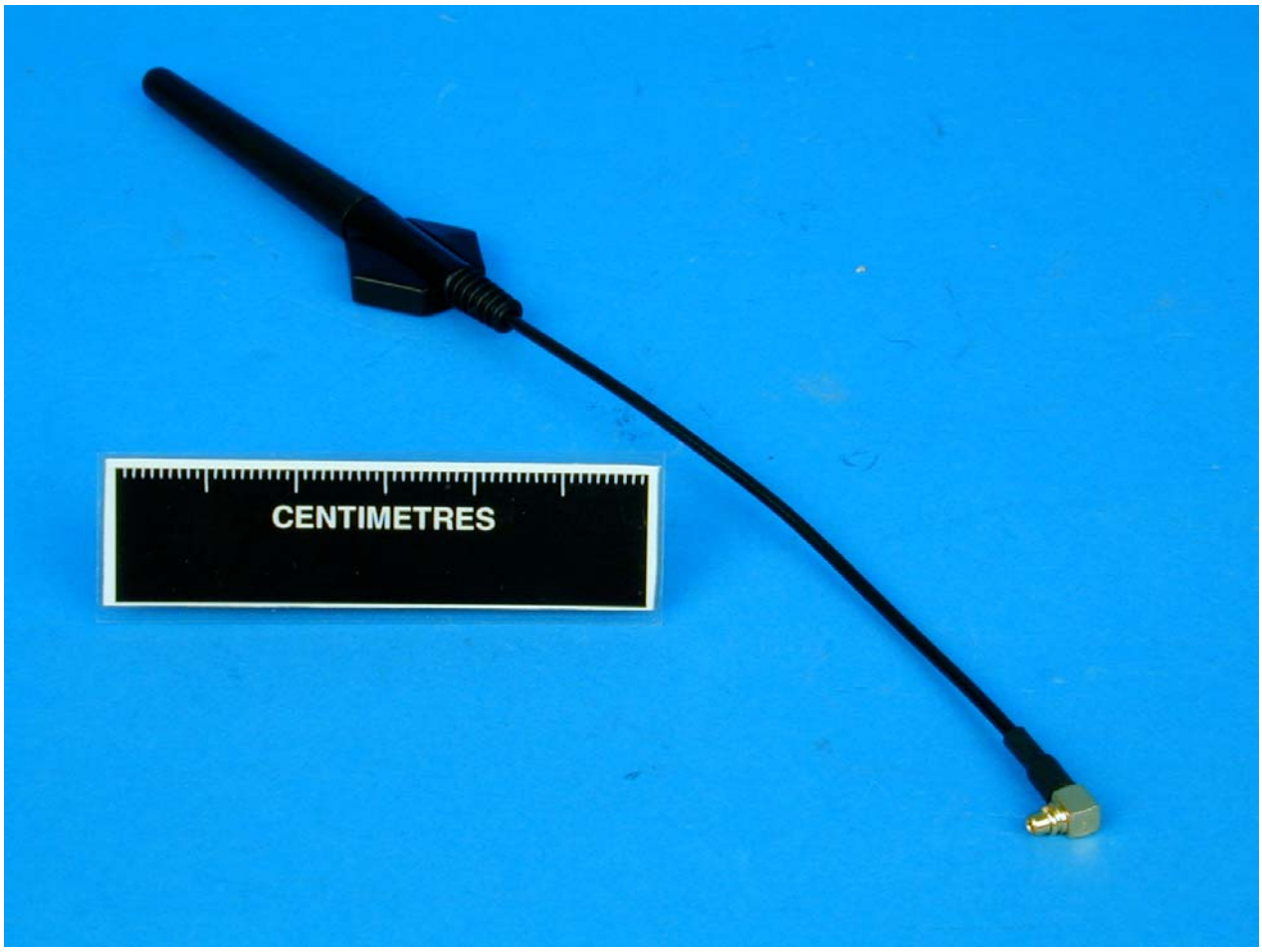
Photograph 3
Rear View

PHOTOGRAPHS OF EQUIPMENT



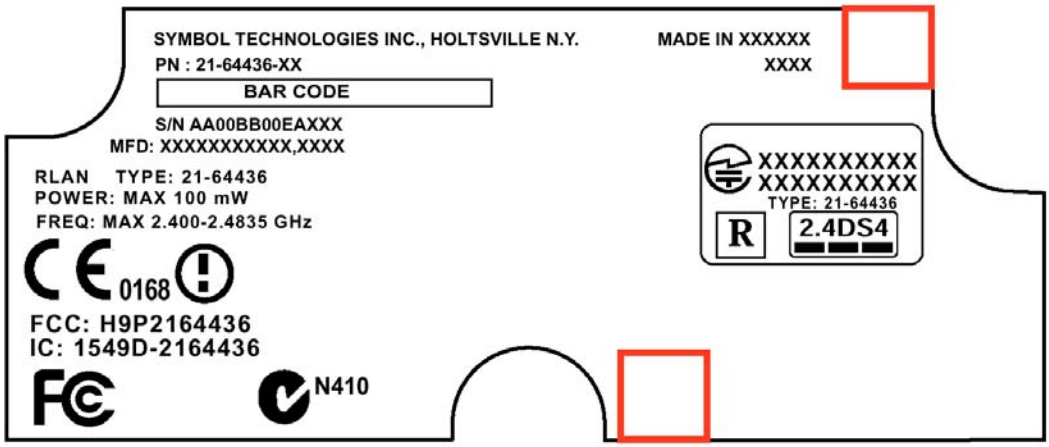
Photograph 4
Internal View

PHOTOGRAPHS OF EQUIPMENT



Photograph 5
Antenna Front View

MANUFACTURER'S LABEL DRAWING



Not to scale

MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are: -

In the frequency range 30MHz to 1000MHz

For 6dB Bandwidth

Frequency	±210.894kHz
Amplitude	±0.5dB

For Maximum Output Power

Amplitude	±0.5dB

For Spurious Conducted Emissions

Amplitude	±3.0dB

For Radiated Emissions, Quasi-Peak Measurements using the ESVP Test Receiver and Bilog Antenna: -

Frequency	±5ppm + 500Hz
Amplitude	±4.1dB

In the frequency range 1GHz to 25GHz

For Spurious Radiated Emissions measurements: -

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	±3.4dB

For Peak Power Spectral Density

Amplitude	±1.8dB

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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ANNEX A
FCC SITE COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

October 18, 2002

Registration Number: 90987

TUV Product Service Ltd
Segensworth Road
Titchfield
Fareham, Hampshire, PO15 5RH
United Kingdom
Attention: Kevan Adsetts

Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W. Phillips

Thomas W Phillips
Electronics Engineer