



AIR-RM1252G-A-K9

2.4GHz 802.11b/g MIMO Radio Module

FCC ID: LDK102062

Against the following Specifications:

CFR47 Part 15.247(a)

CFR47 Part 15.247(a)(2)

CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210)

Cisco Systems

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San Jose, CA 95134

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Approved By:

Title:



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Section 1: Overview

1.1 Test Summary

Samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

Emission	Immunity
CFR47 Part 15.247(a) CFR47 Part 15.247(a)(2) CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210) CFR47 Part 15: 2005 CFR47 Part 15: 2005 (CAN/CSA-CISPR 22-02)	N/A

The specifications listed above represent actual tests performed to demonstrate compliance against the specifications and basic standards listed on the front cover of this report. This list is not a one to one match to the front cover for one or more of the following reasons.

1. Basic standards call up many different test phenomena specifications such as the 61000-4-X series. The basic standards define which elements and levels shall be applied from these specifications and as such it is not appropriate to list the individual specifications on the front cover.
2. A Standard listed on the front cover may be required in a particular country but is not appropriate for the particular technologies included in the equipment under test. E.g. You cannot test a DC product to the mains Harmonics requirements in EN61000-3-2. See section 3.2.
3. Test results against a particular standard or specification may be included in a different test report. See section 3.2 for an EDCS reference of this data.
4. Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
5. Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.
6. Testing may have been performed to an equivalent test that satisfies the requirements of the standards and specifications listed on the front cover of the report. See section 3.2.
7. Where radiated emissions testing has been performed to EN55022/CISPR22 the additional requirements of VCCI: V- 3/2006.04, EN55022: 1994 +A1/2 and CAN/CSA- CISPR 22-02 have also been evaluated unless otherwise stated.
8. Testing to the requirements of CFR47 Part 15 was performed against the CISPR22 limits. The results are therefore deemed satisfactory evidence of compliance with Industry Canada Interference Causing Equipment Standard ICES-003.
9. Where assessment has been performed to CISPR24, all the applicable test requirements may have not been covered. Refer to the results section for the tests performed.

Notes:

- 1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
- 2) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
- 3) Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.



Section 2: Assessment Information

2.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc:

With regard to this assessment, the following points should be noted:

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.
- e) All AC testing was performed at one or more of the following supply voltages:

110V 60 Hz (+/-20%)
220V 50 Hz (+/-20%)

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2.2 Date of start of testing

11-Dec-2006

2.3 Report Issue Date

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,	Cisco Systems, Inc.
4125 Highlander Parkway	170 West Tasman Drive
Richfield, OH 44286	San Jose, CA 95134
USA	USA

Test Engineers

James Nicholson

2.5 Equipment Assessed (EUT)

AIR-RM1252G-A-K9 2.4GHz 802.11b/g MIMO Radio Module.

2.6 EUT Description

The AIR-RM1252G-A-K9 2.4GHz 802.11b/g MIMO radio module operates in the AIR-AP1250 series access point, and may operate simultaneously with the AIR-RM1252A-A-K9 5 GHz 802.11a MIMO radio module. The following modes of operation are supported. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst case data for all modes.

Legacy CCK, Single Antenna, 1 to 11 Mbps
Legacy OFDM, Single Antenna, 6 to 54 Mbps
Legacy OFDM, Dual Antennas, 6 to 54 Mbps
Legacy OFDM, Dual Antennas with Beam Forming, 6 to 54 Mbps
HT- 20 MHz, Dual Antennas, MCS0 to MCS15
Duplicate 2x20 MHz, Dual Antennas, 6 Mbps
HT- 40 MHz, Dual Antennas, MCS0 to MCS15

The following antennas are supported by this product. The antennas in bold were tested as representative samples of all.

AIR-ANT5959	2 dBi Diversity Omni-Directional Antenna with RP-TNC Connectors
AIR-ANT2422DG-R	2.2 dBi Grey Non-Articulating Dipole Antenna with RP-TNC Connectors
AIR-ANT4941	2.2 dBi Black Articulating Dipole Antenna with RP-TNC Connectors
AIR-ANT2430V-R	3 dBi Omni-Directional Antenna with RP-TNC Connectors
AIR-ANT1728	5.2 dBi Ceiling Mount Omni-Directional Antenna with RP-TNC Connectors
AIR-ANT2506	5.2 dBi Mast Mount Omni-Directional Antenna with RP-TNC Connectors
AIR-ANT3213	5.2 dBi Diversity Mount Omni-Directional Antenna with RP-TNC Connectors
AIR-ANT2460P-R	6 dBi Patch Antenna with RP-TNC Connectors
AIR-ANT2465P-R	6.5 dBi Diversity Patch Antenna with RP-TNC Connectors
AIR-ANT2485P-R	8.5 Patch Antenna with RP-TNC Connectors
AIR-ANT2410Y-R	10 dBi Yagi Antenna with RP-TNC Connectors



2.8 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, these are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in dBuV and current in dBuA.

As an example, the basic calculation for all measurements is as follows:

$$\text{Emission level [dBuV]} = \text{Indicated voltage level [dBuV]} + \text{Cable Loss [dB]} + \text{Other correction factors [dB]}$$

The components of factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss, Current Probe Factors.

Note: to convert the results from dBuV/m to uV/m use the following formula:-

$$\text{Level in uV/m} = \text{Common Antilogarithm } [(X \text{ dBuV/m})/20] = Y \text{ uV/m}$$

2.9 Customer/Customer Report Template Revision No.

Revision: RFCR4.0

* Not intended to be used for WorldWide or GR1089 approvals.



Section 3: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. Please also refer to the "Justification for worst Case test Configuration" section of this report for further details on the selection of EUT samples.

3.1 Sample Details(Photographs of the test samples, where appropriate can be found in appendix H)

Sample No.	Equipment Details	Part Number	Manufacturer	Hardware Rev.	Firmware Rev.	Software Rev.	Serial Number
S01	AIR-RM1252G-A-K9	NA	Cisco Systems	NA	NA	NA	NA
S02	AIR-AP1250 Access Point	NA	Cisco Systems	NA	NA	NA	NA

3.2 System Details

System #	Description	Samples
1	EUT	S01 and S02

3.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous Transmit	Continuous Transmit Mode

**Appendix A: Emission Test Results****Testing Laboratory:** Cisco Systems, Inc., 4125 Highlander Parkway, Richfield, OH, USA**Average Output Power**

2.4 GHz Average Power with up to 10 dBi Antennas

Frequency	Mode	Data Rate	Target Power Level			Actual Power Level
			Tx A	Tx B	Total	Total
2412	Dual BF	54	17	17	20	20.0
2412	Duplicate	6	14	14	17	16.2
2437	Dual BF	54	20	20	23	23.0
2437	Duplicate	6	17	17	20	20.0
2462	Dual BF	54	17	17	20	20.7
2462	Duplicate	6	14	14	17	17.5



6dB Bandwidth

15.247: Systems using digital modulation techniques may operate in the 2400-2483.5MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.

Conducted emissions

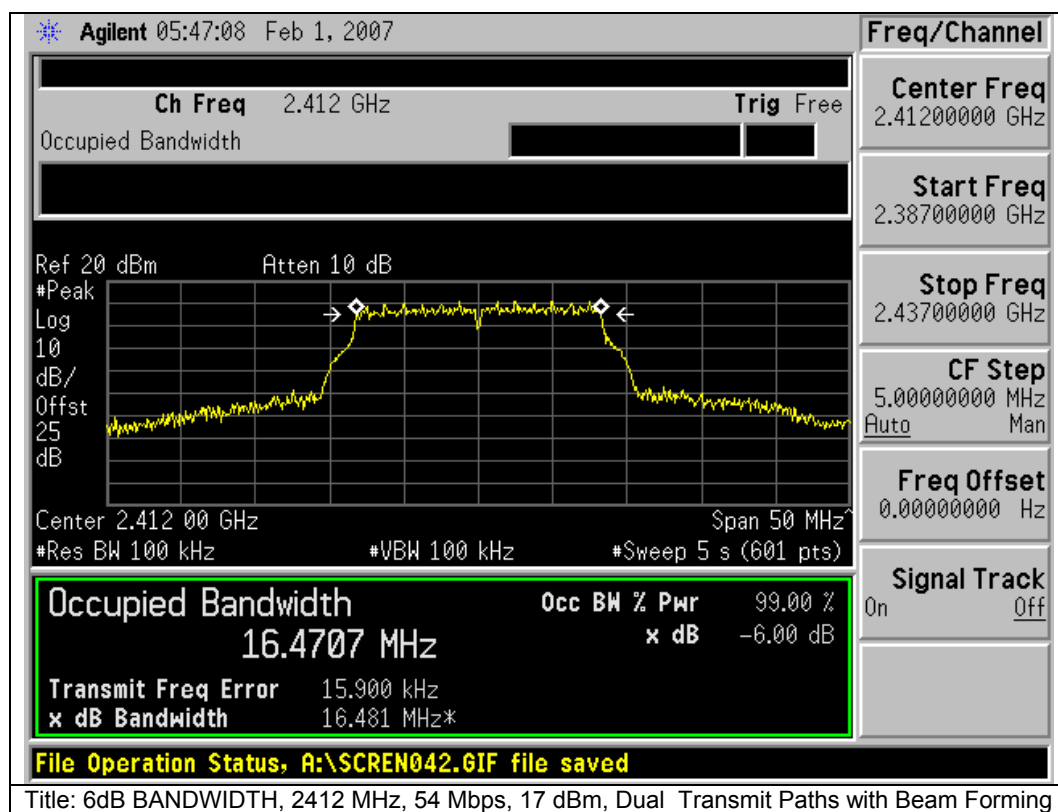
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15.247(a)(2)	RF Ports	N/A	2400MHz - 2483.5MHz	6dB Bandwidth, also complies with RSS 210, LP0002
Operating Mode	Mode : 1, Continuous Transmitting			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03 and S04	☒	☐

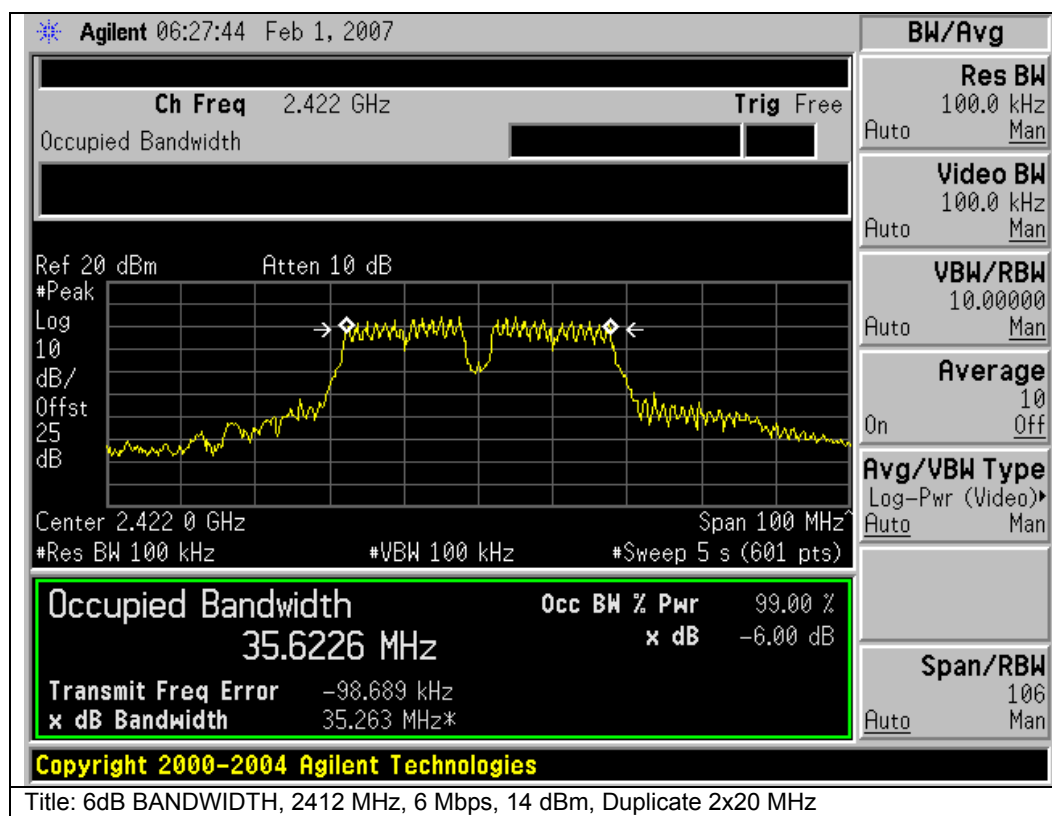
Frequency (MHz)	Mode	Data Rate (Mbps)	6dB BW (MHz)	Limit (kHz)	Margin (kHz)
2412	Dual BF	54	16.5	>500	16000
2412	Duplicate	6	35.3	>500	34800
2437	Dual BF	54	16.5	>500	16000
2437	Duplicate	6	35.7	>500	35200
2462	Dual BF	54	16.5	>500	16000
2462	Duplicate	6	35.5	>500	35000



Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

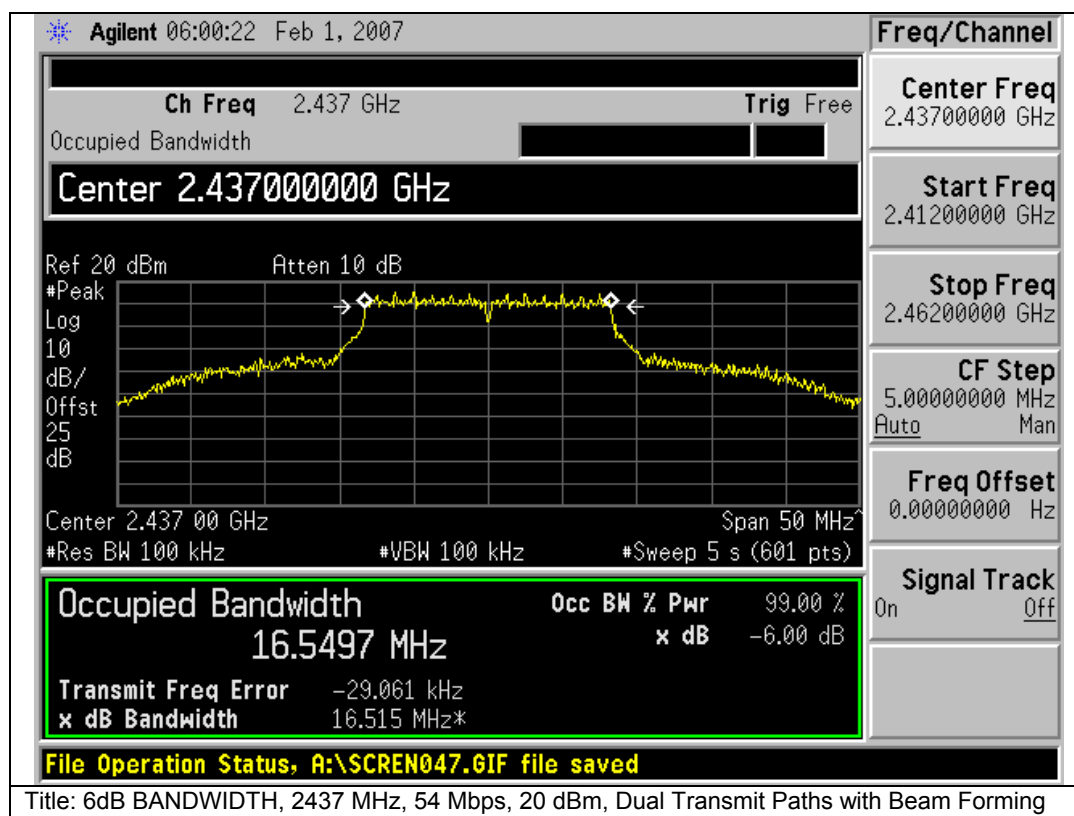


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

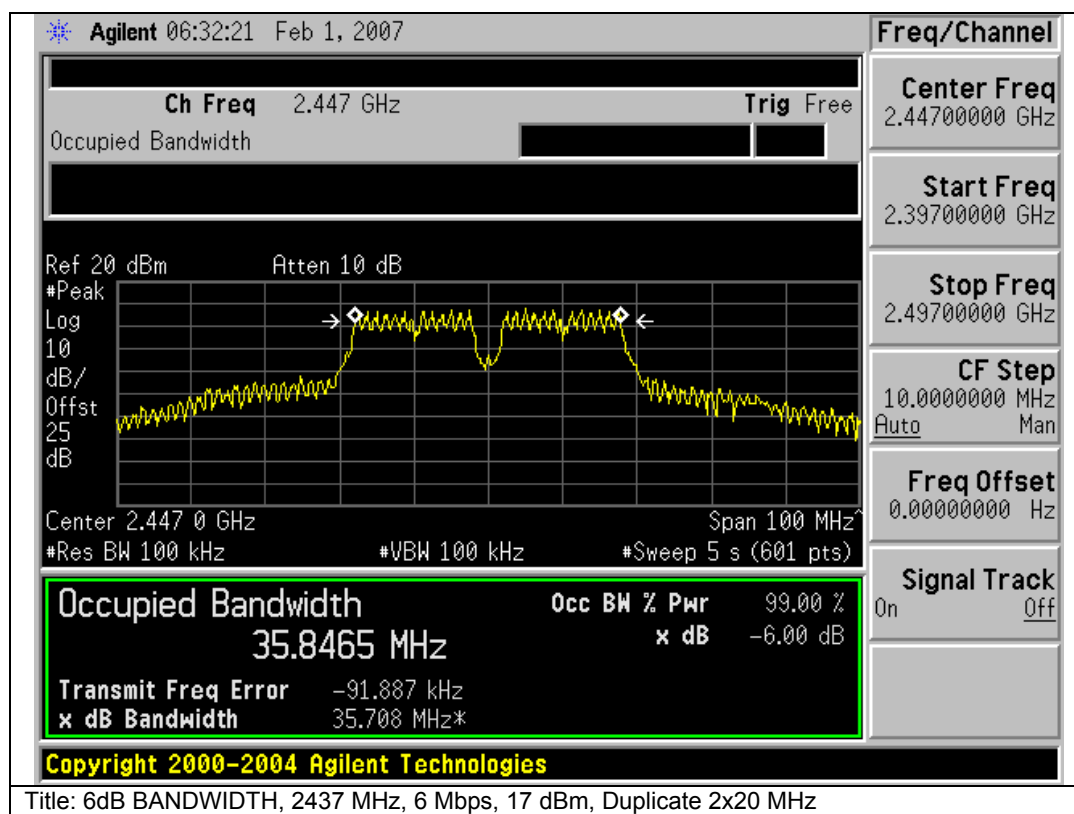




Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

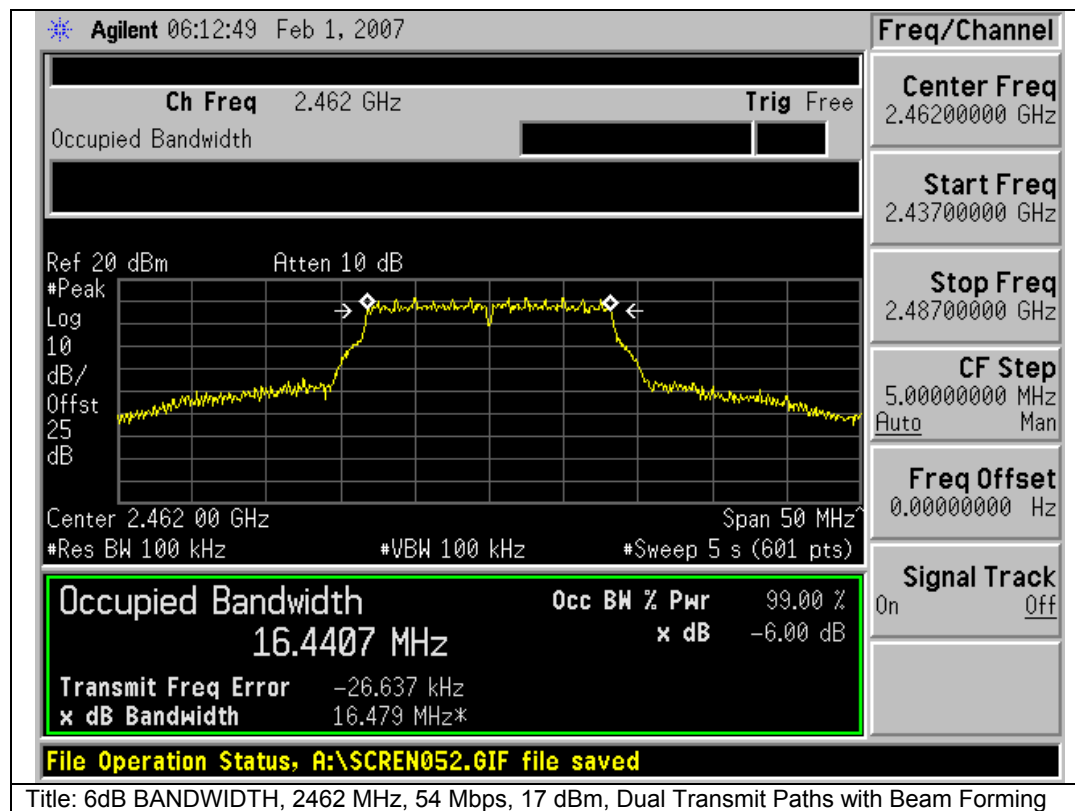


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



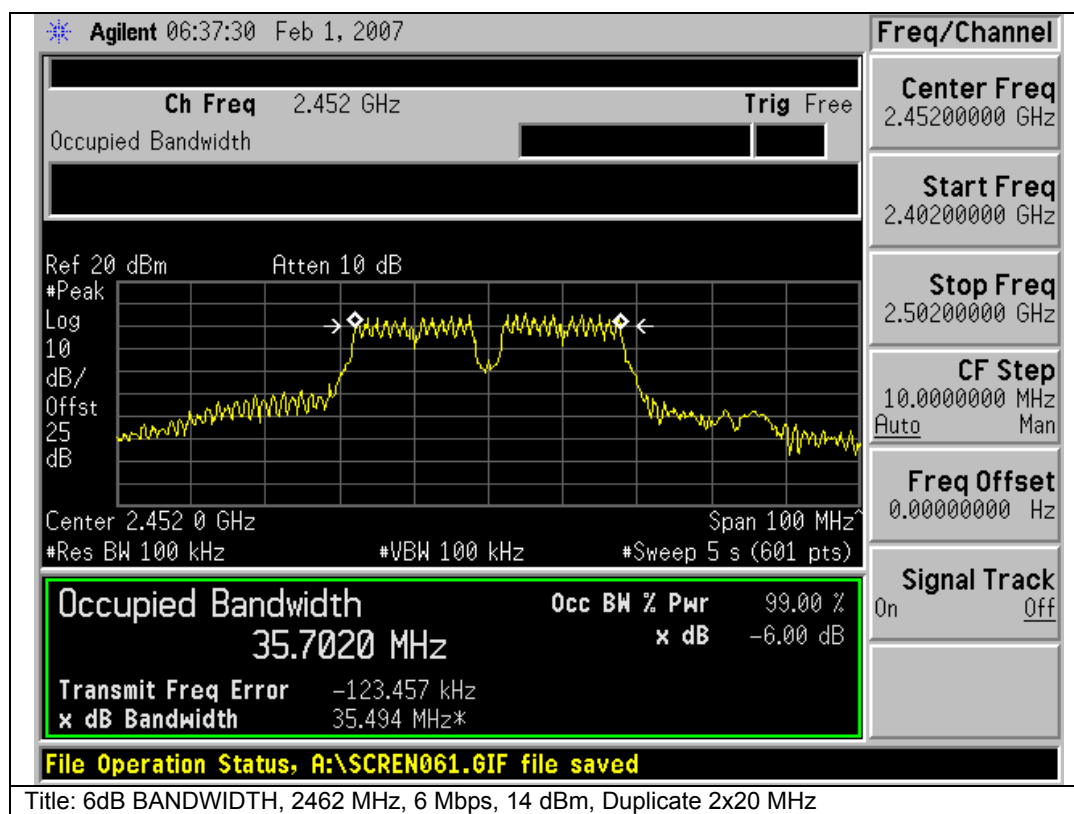


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





99% and 26dB Bandwidth

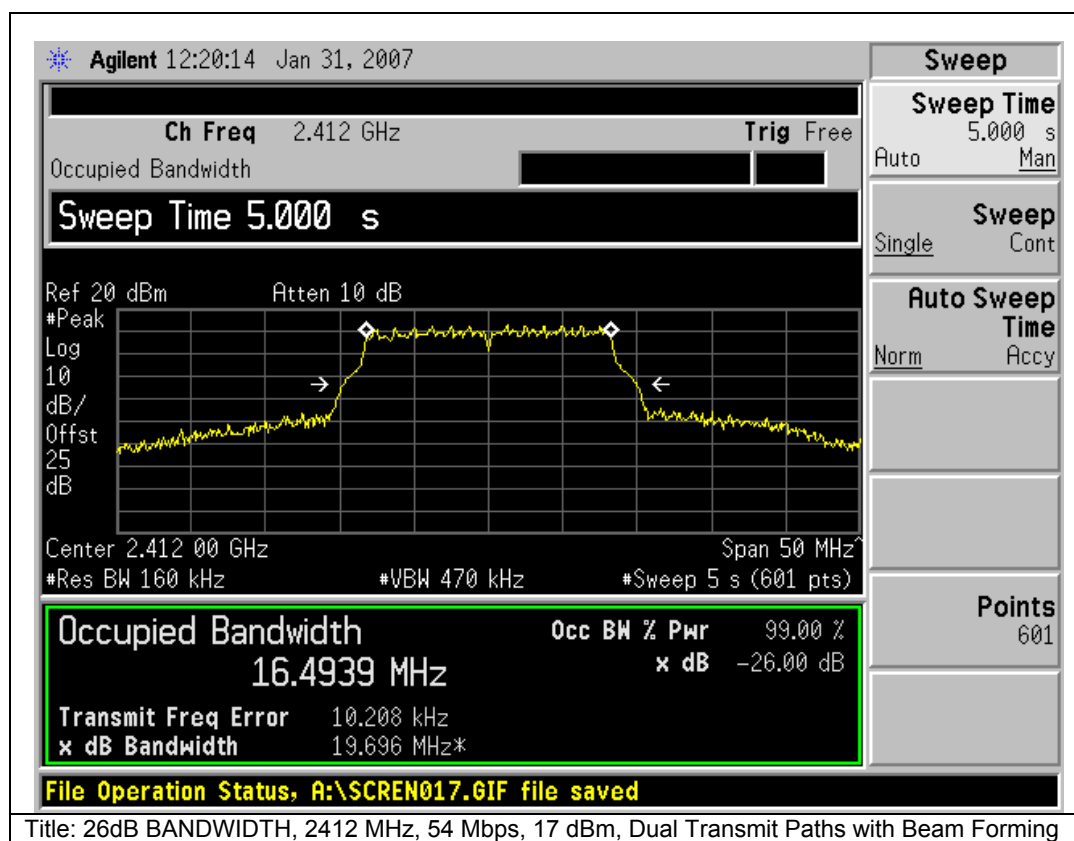
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15.247(a)	RF Ports	N/A	2400MHz - 5850MHz	26dB Bandwidth also complies with RSS 210, LP0002.
Operating Mode	Mode : 1, Continuous Transmitting			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03 and S04	☒	☐

Frequency (MHz)	Mode	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
2412	Dual BF	54	19.7	16.5
2412	Duplicate	6	40.7	36.1
2437	Dual BF	54	20.3	16.6
2437	Duplicate	6	45.1	36.5
2462	Dual BF	54	19.5	16.5
2462	Duplicate	6	40.7	36.2

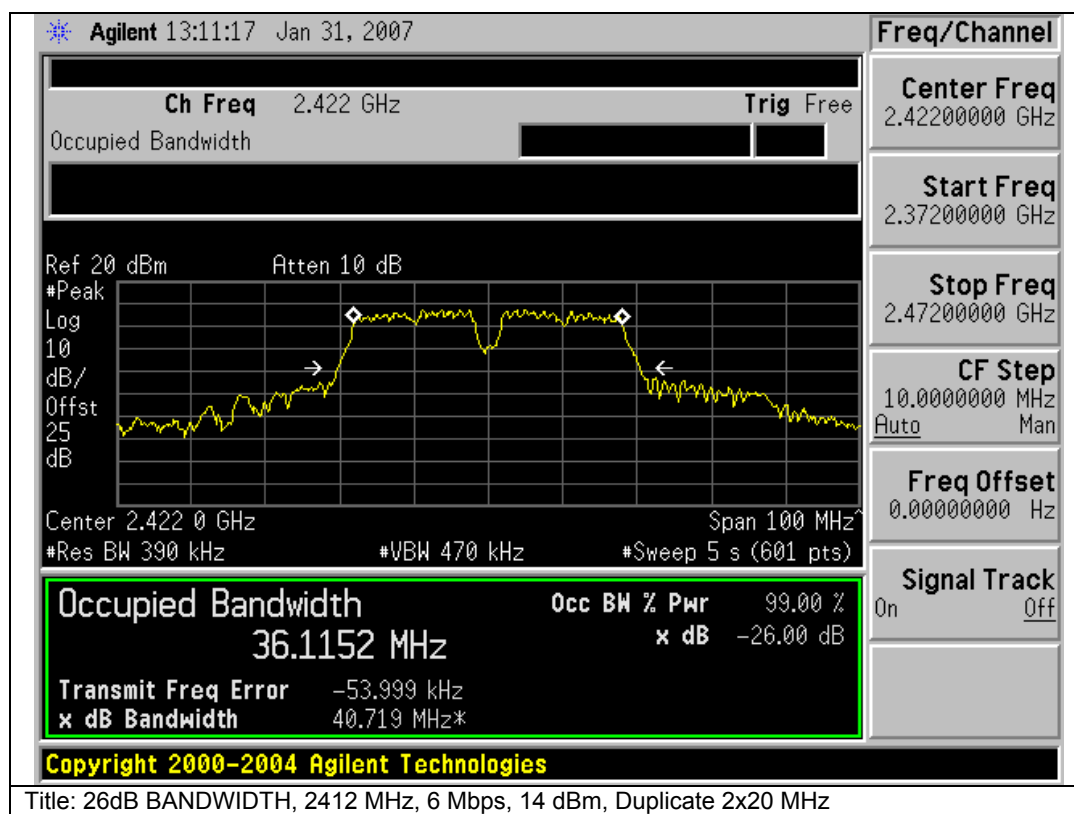


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	DIRECT
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



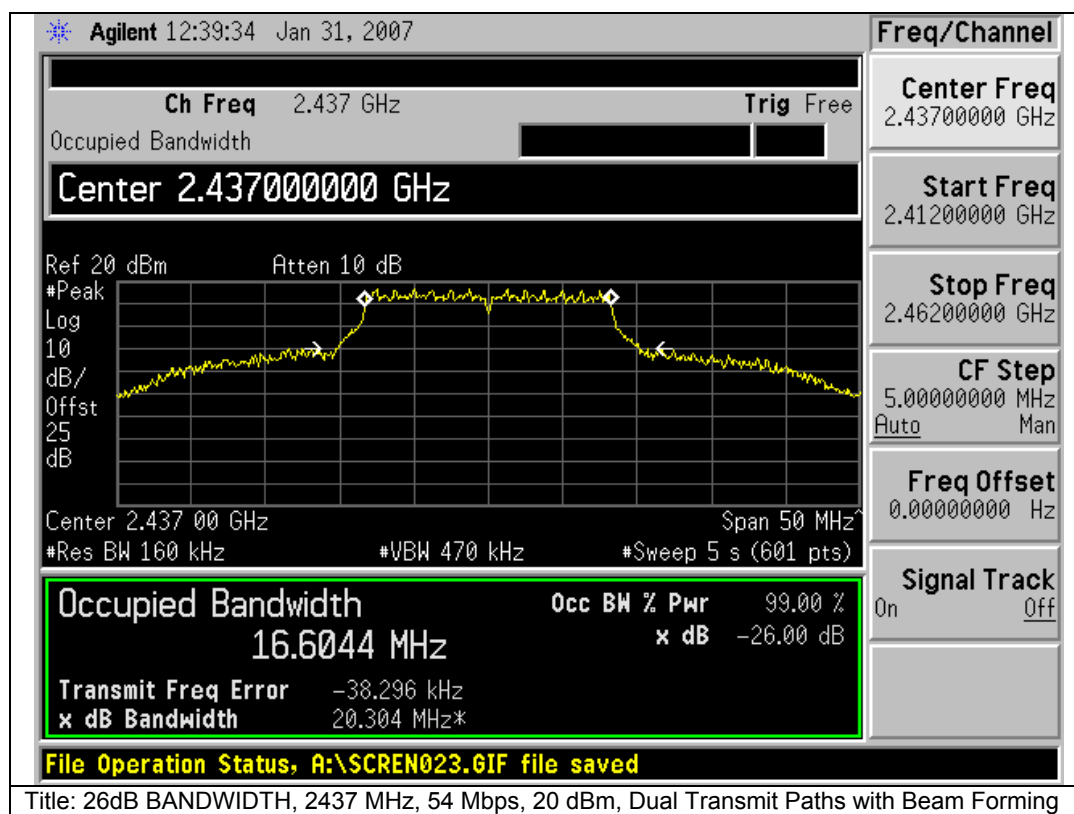


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	DIRECT
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



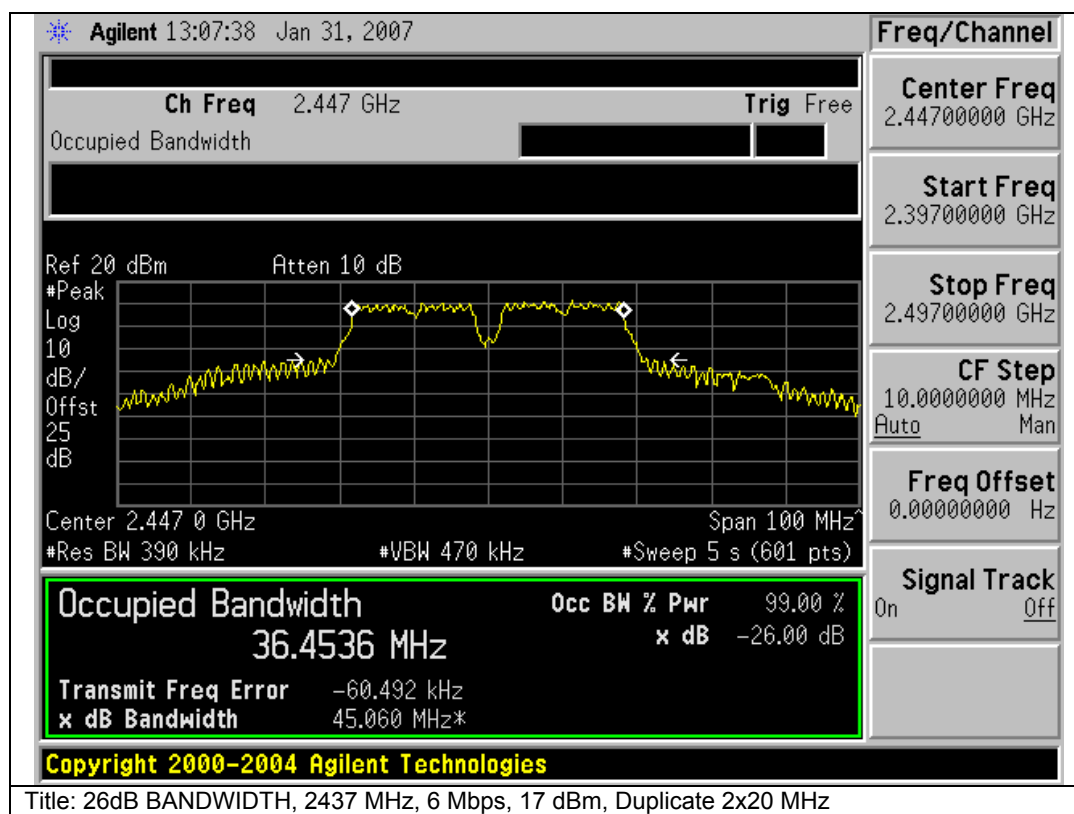


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	DIRECT
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



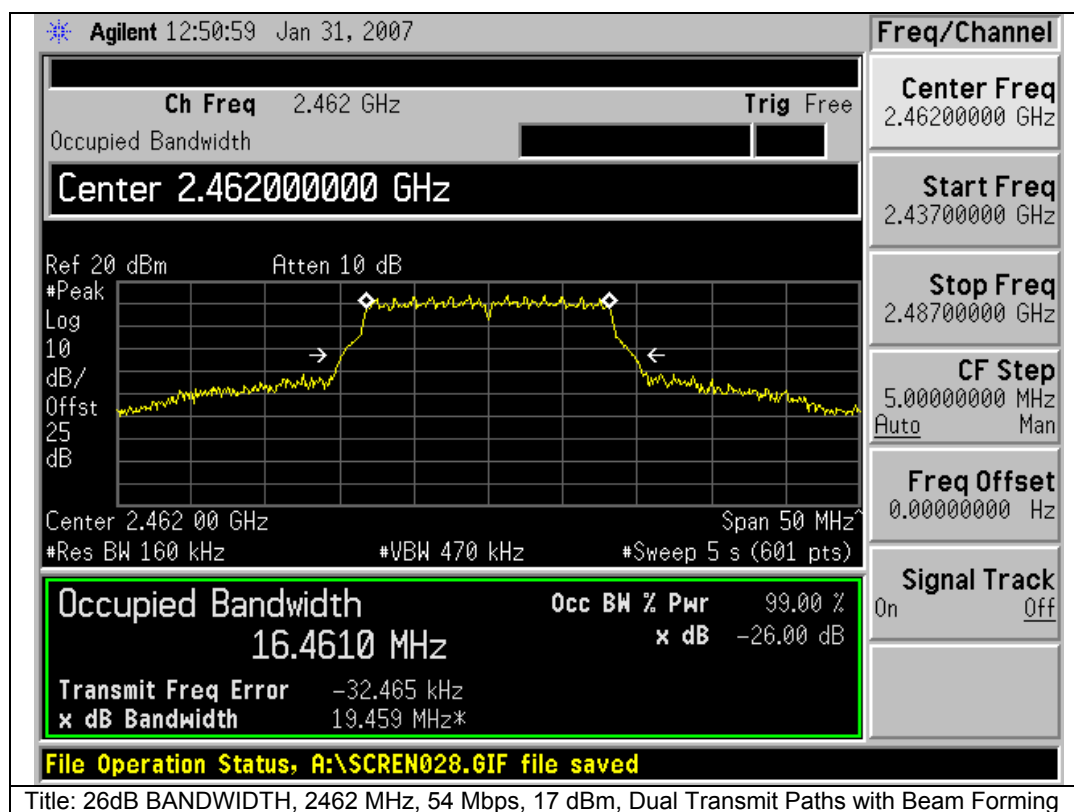


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	DIRECT
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

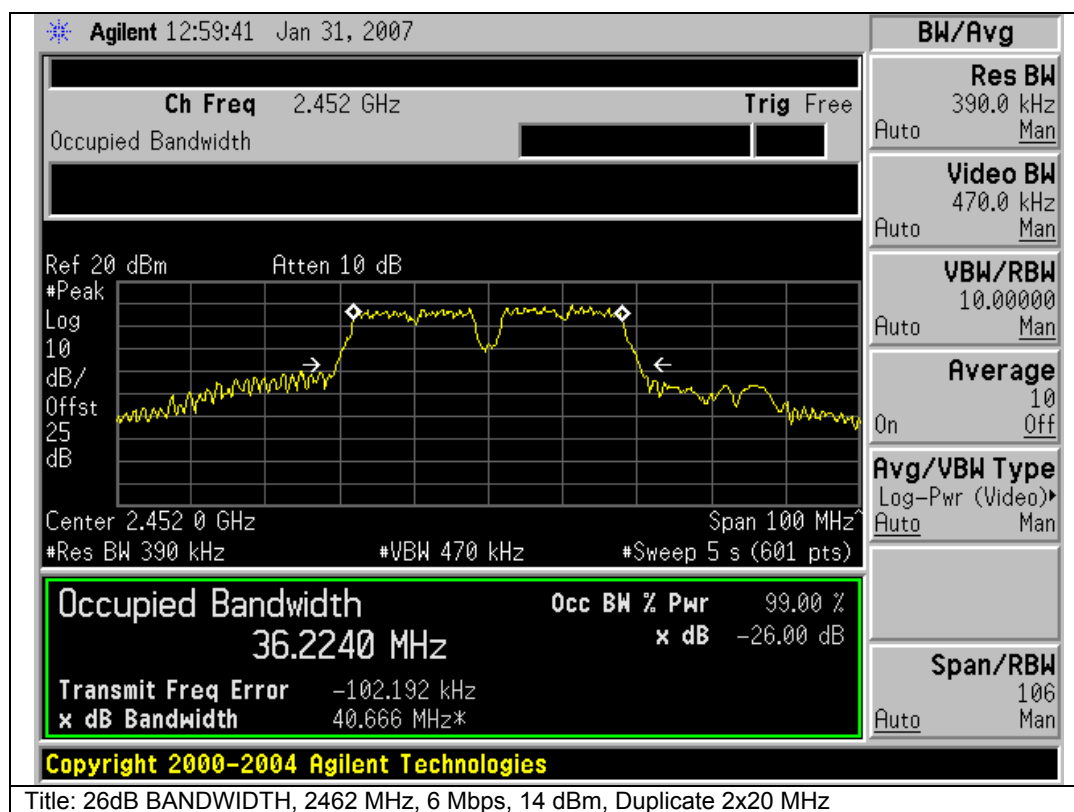




Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	DIRECT
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





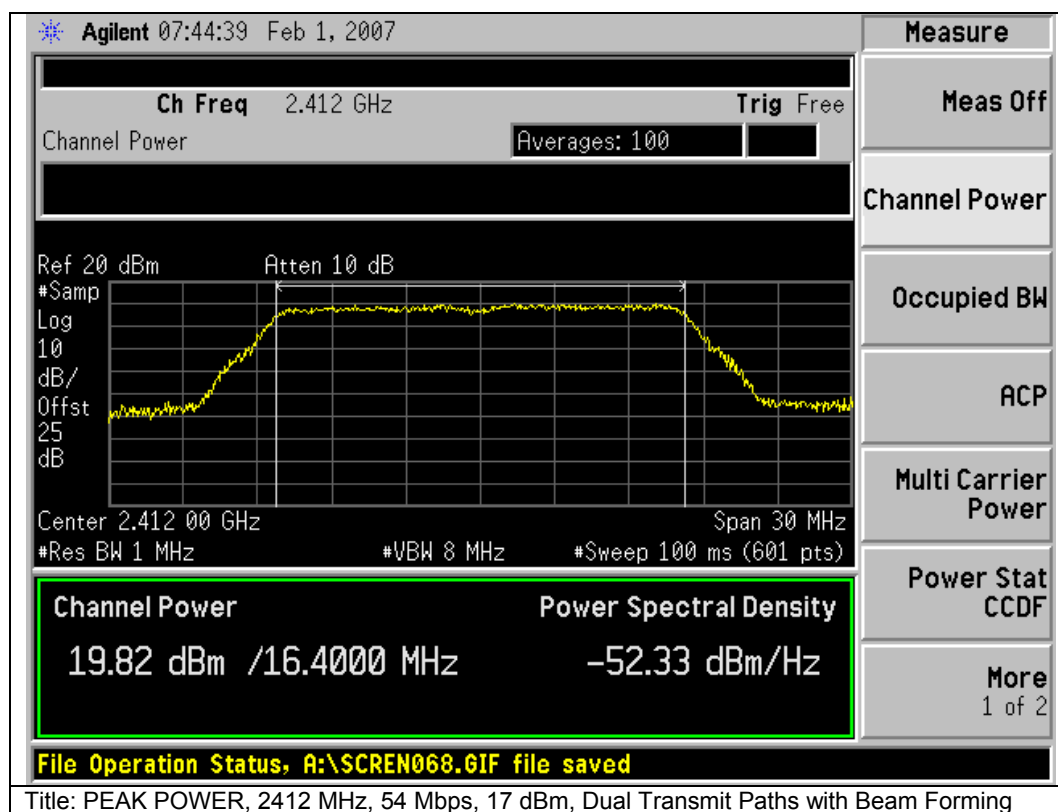
Peak Output Power

15.247: The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum supported antenna gain for all bands is 10dBi. In beamforming mode, the 10dBi behaves as $10\text{dBi} + 10\log(n)$ ($n=2$ radiating elements) = 13dBi. Therefore the maximum allowable output power for all bands in beamforming mode must be reduced by $13\text{dBi} - 6\text{dBi} = 7\text{dB}$.

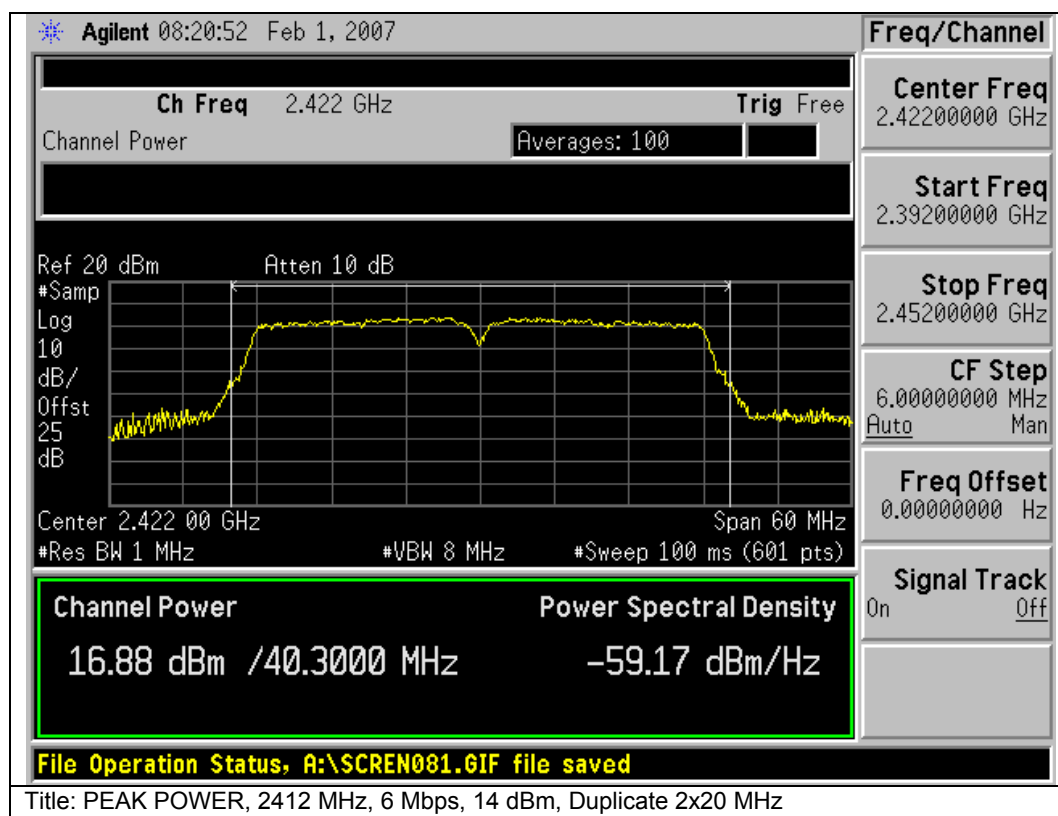
Frequency (MHz)	Mode	Data Rate (Mbps)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
2412	Dual BF	54	19.8	23	3.2
2412	Duplicate	6	16.3	23	6.7
2437	Dual BF	54	23.0	23	0
2437	Duplicate	6	20.0	23	3.0
2462	Duplicate	54	20.5	23	2.5
2462	Dual BF	6	17.5	23	5.5

Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



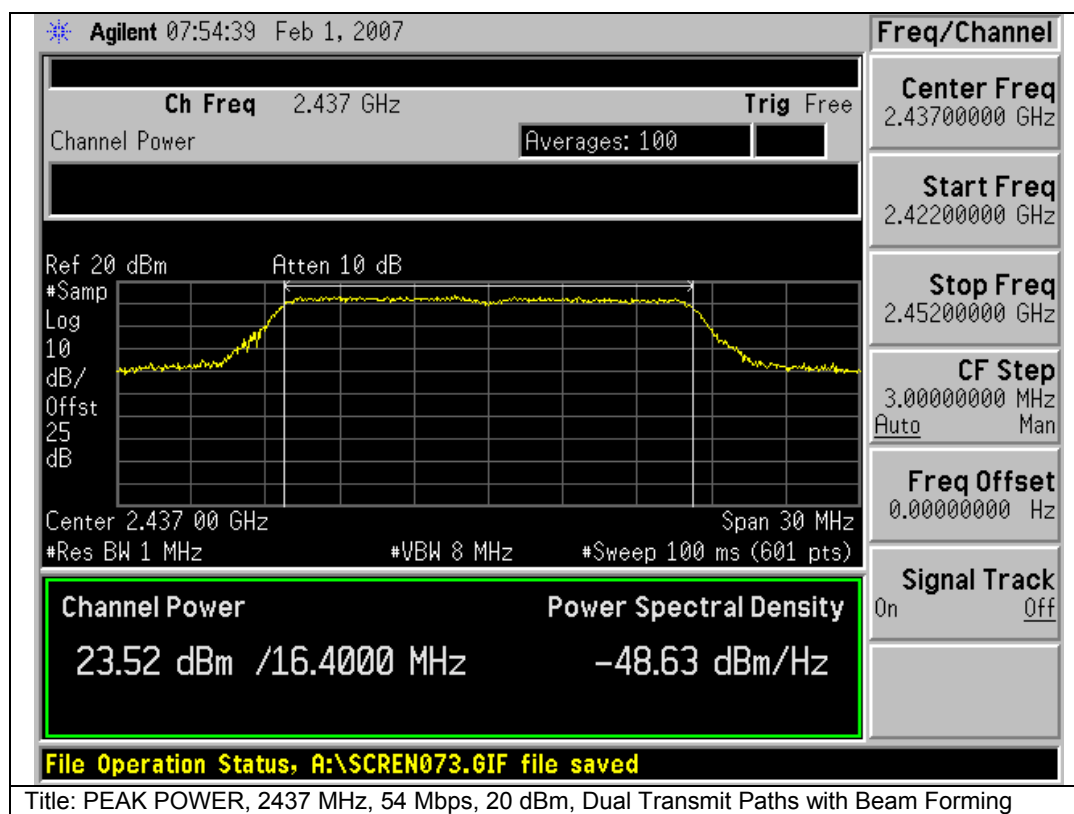


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



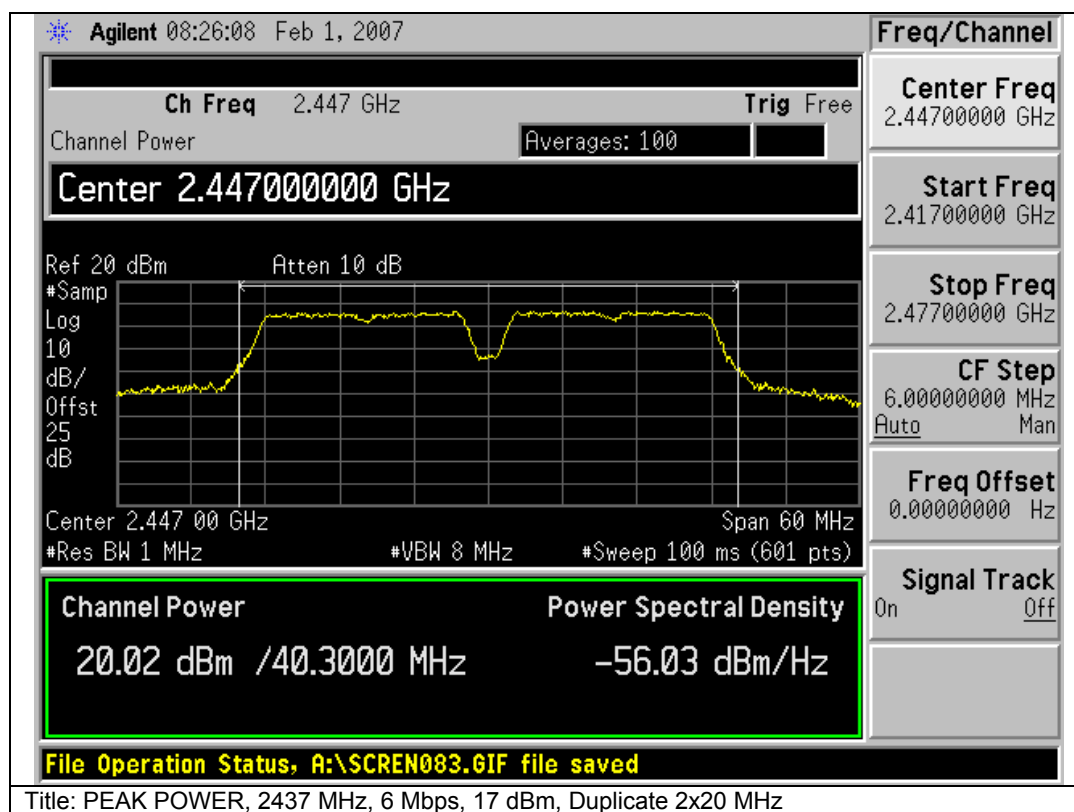


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



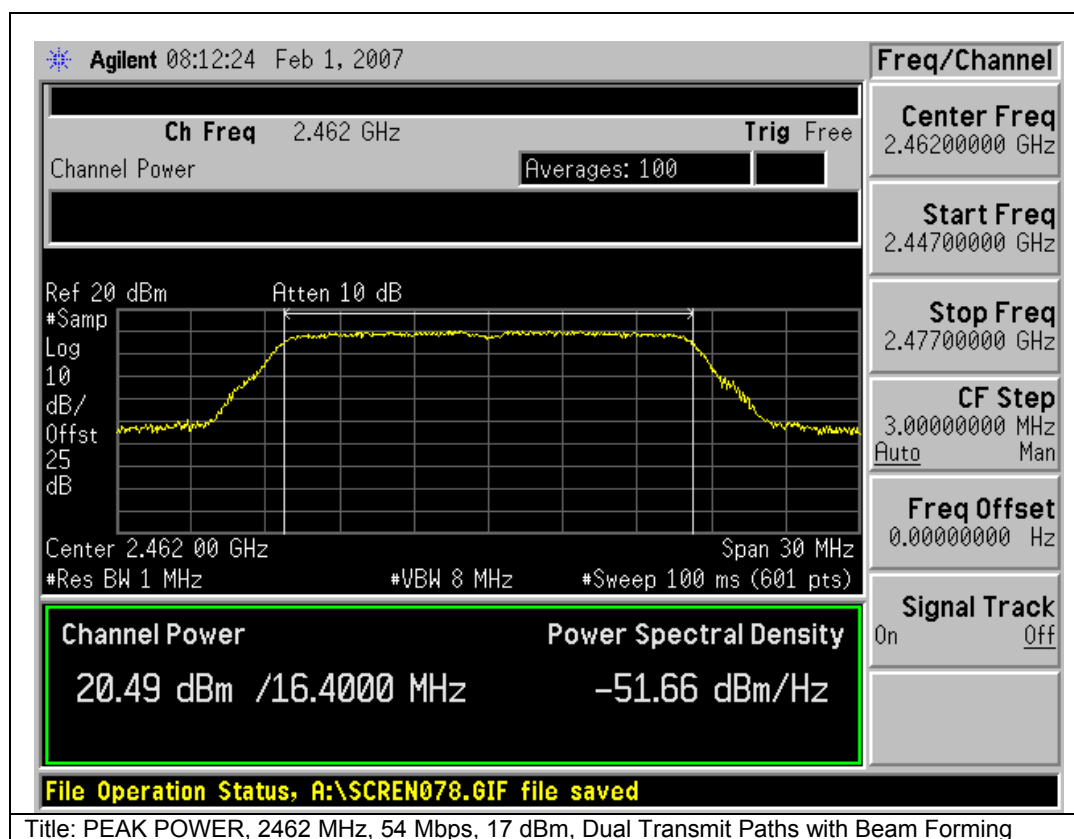


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



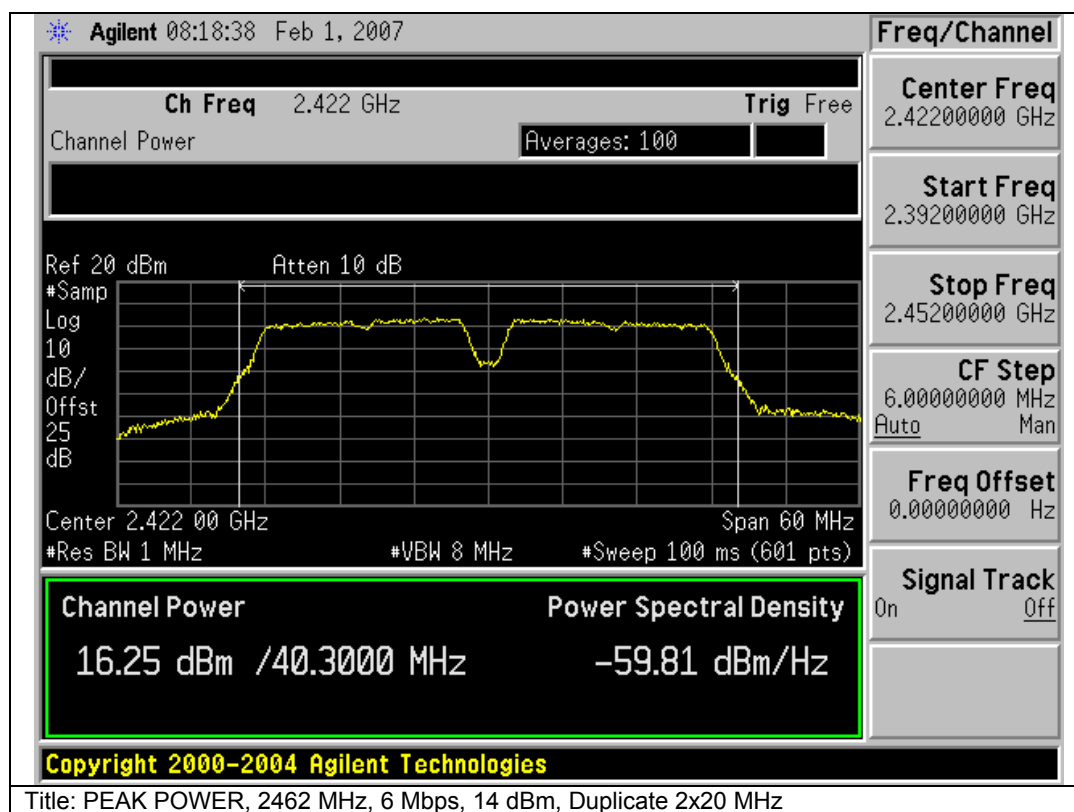


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Power Spectral Density

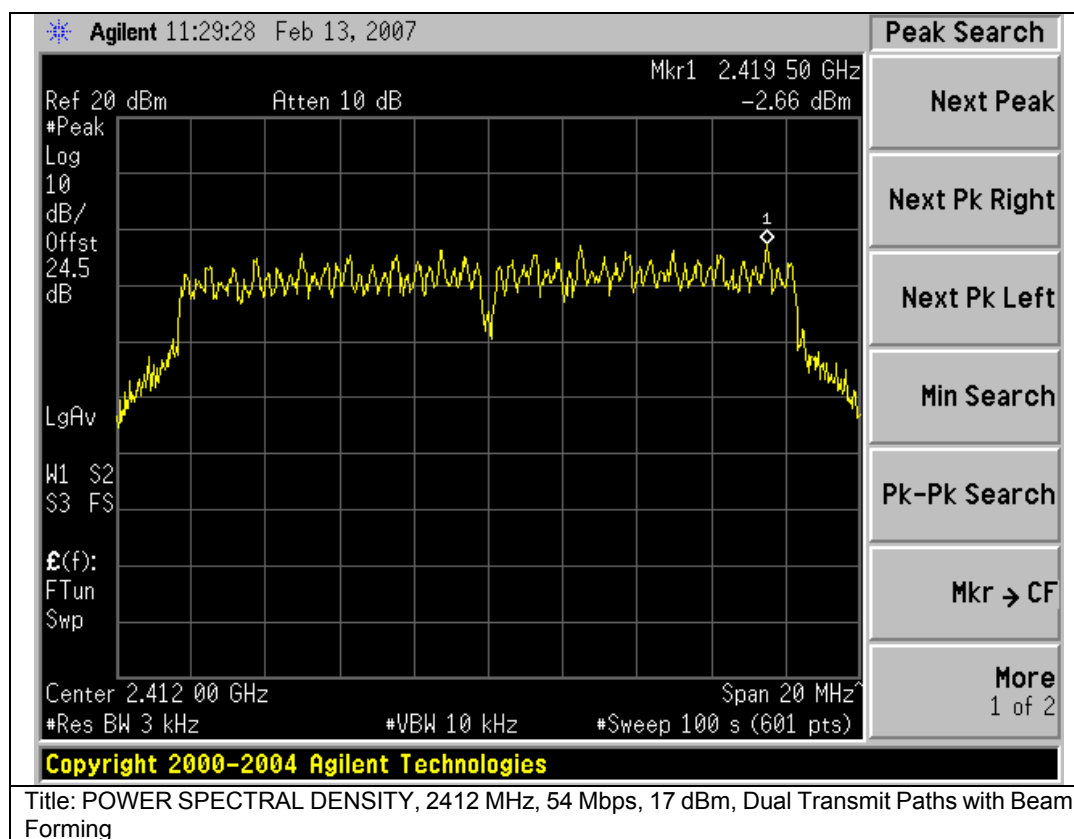
15.247: For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210)	RF Ports	N/A	2400MHz - 2483.5MHz	Power Spectral Density
Operating Mode	Mode : 1, Continuous Transmitting			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

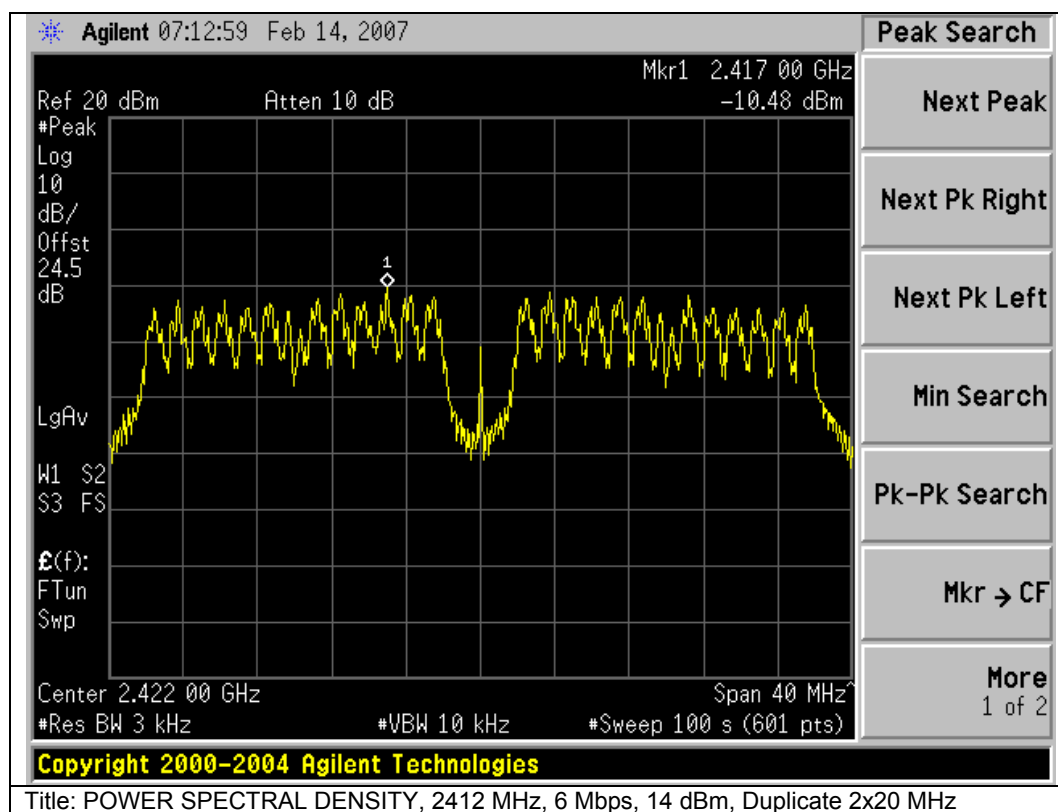
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03 and S04	☒	☐

Frequency (MHz)	Mode	Data Rate (Mbps)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
2412	Dual BF	54	-2.7	8	10.7
2412	Duplicate	6	-10.5	8	18.5
2437	Dual BF	54	0.3	8	7.7
2437	Duplicate	6	-7.5	8	15.5
2462	Dual BF	54	-2.5	8	10.5
2462	Duplicate	6	-9.5	8	17.5

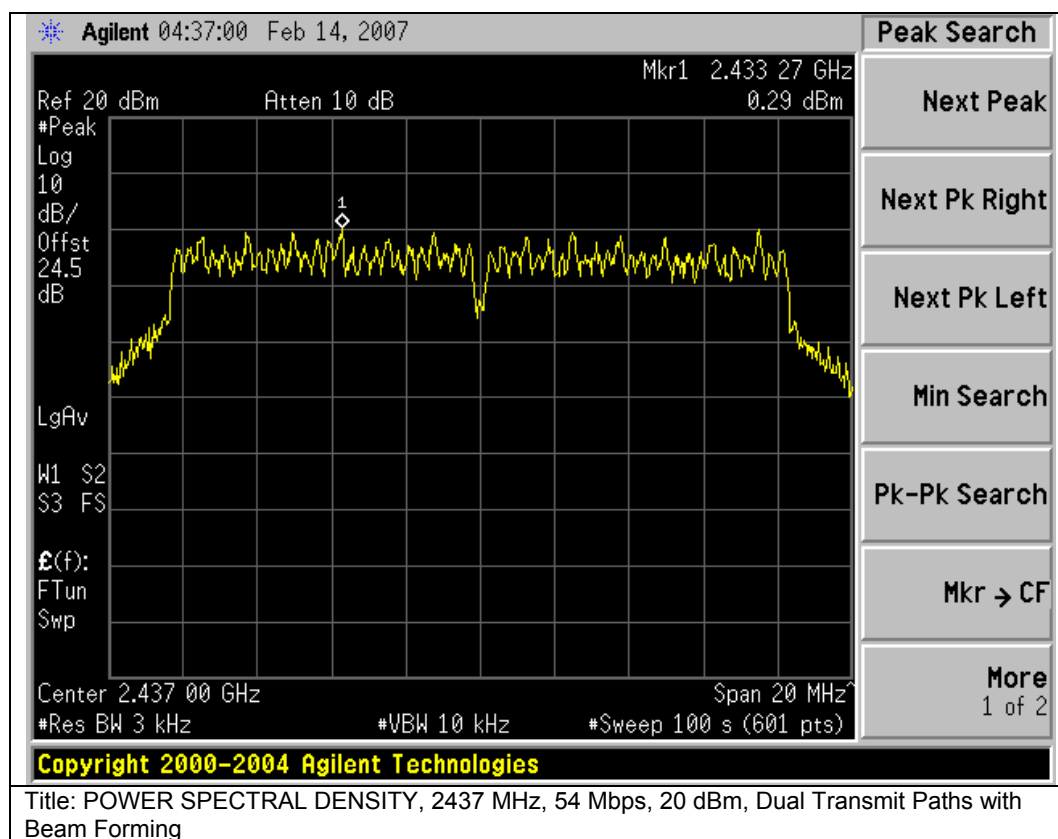
Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



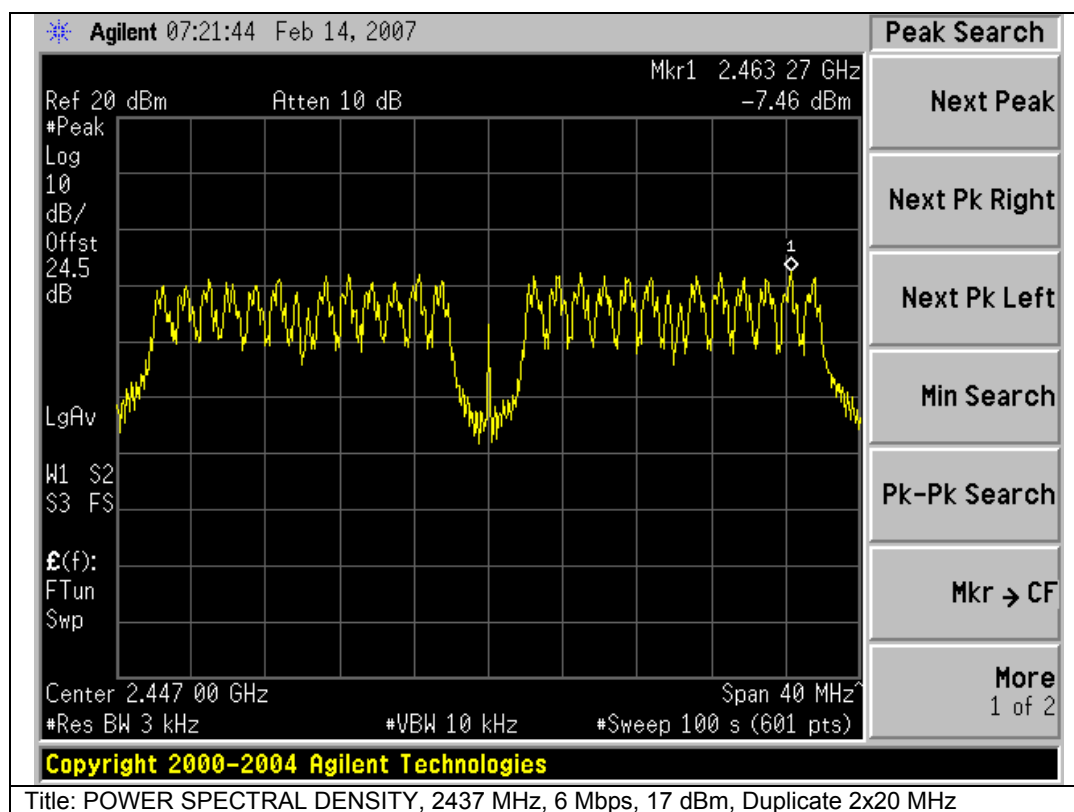
Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



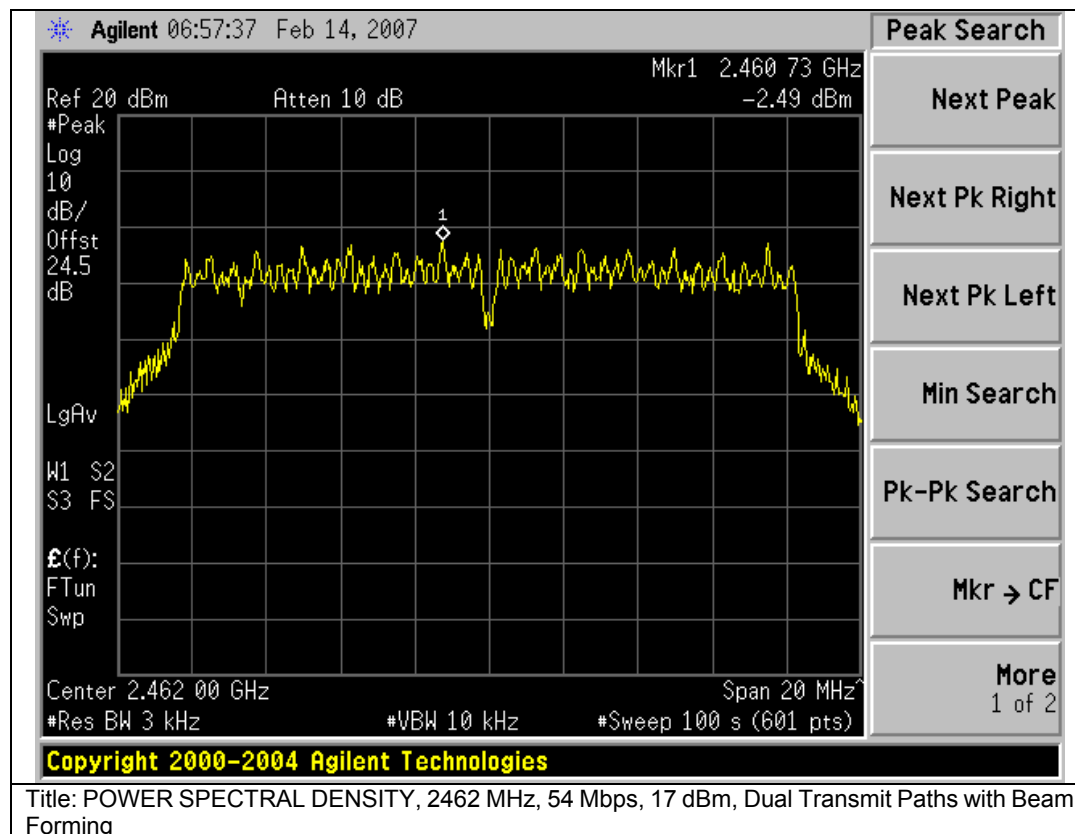
Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



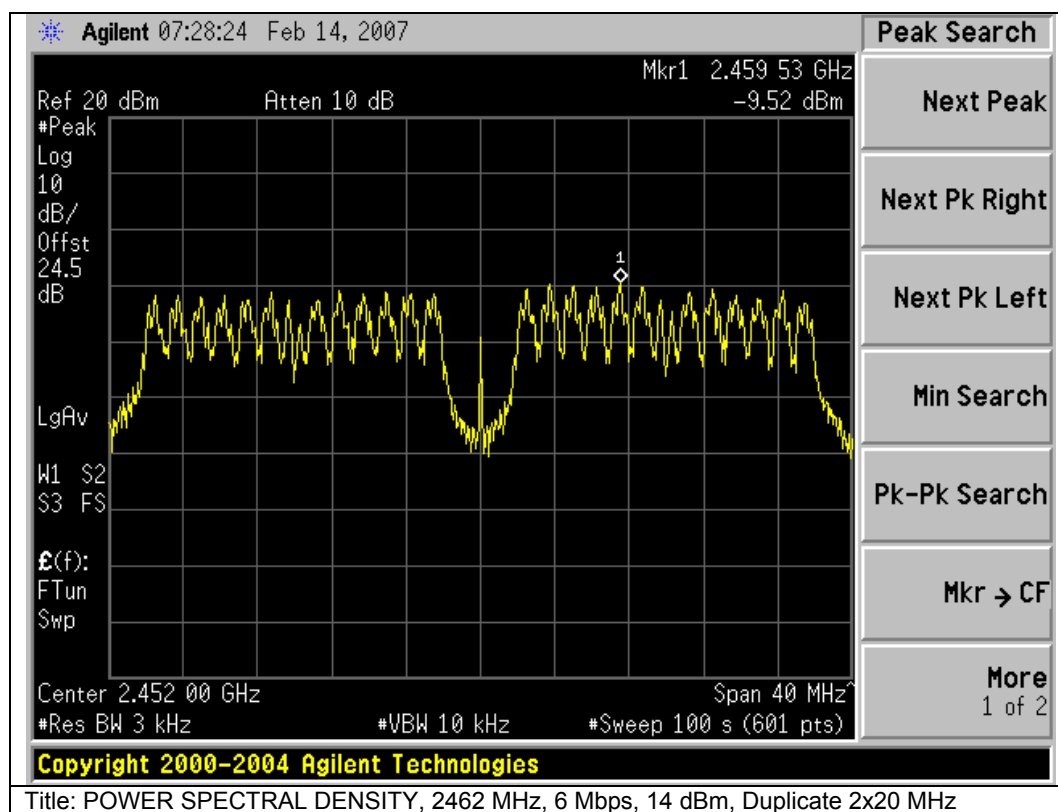
Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Conducted Spurious Emissions

15.247: In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

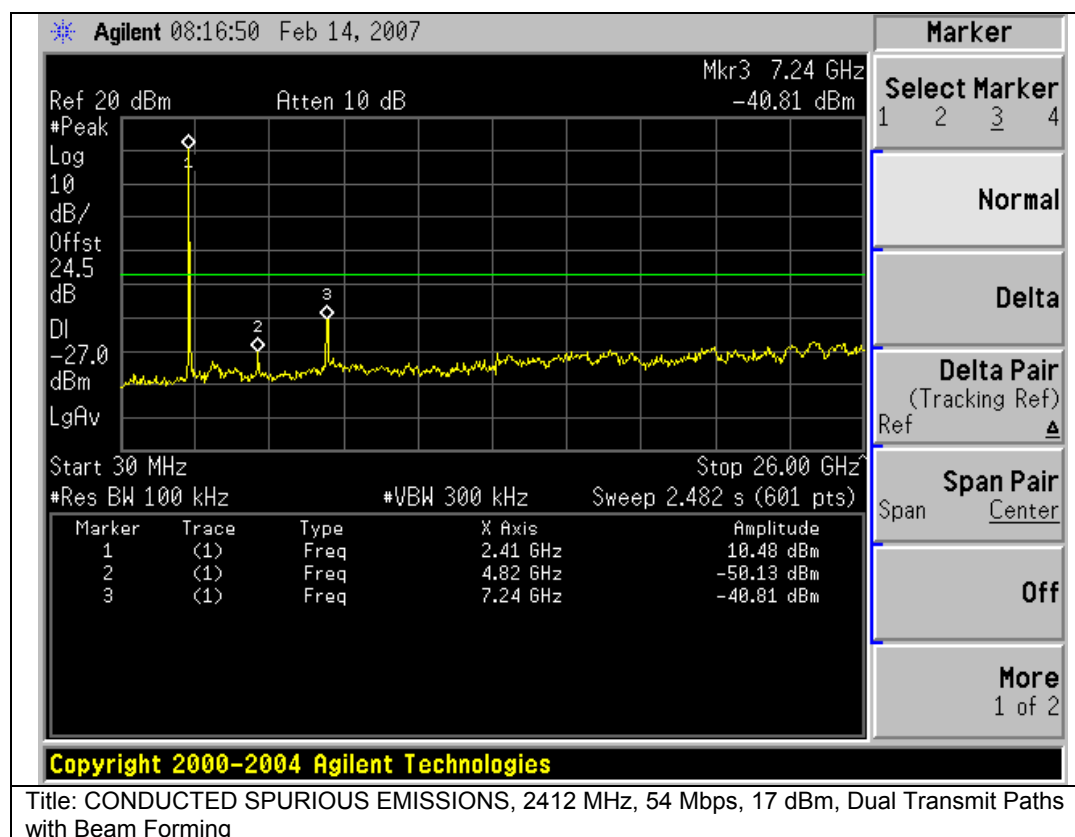
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
Conducted Spurious Emissions	RF Ports	N/A	30MHz - xGHz	Also complies with RSS 210, LP0002
Operating Mode	Mode : 1, Continuous Transmitting			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03 and S04	☒	☐

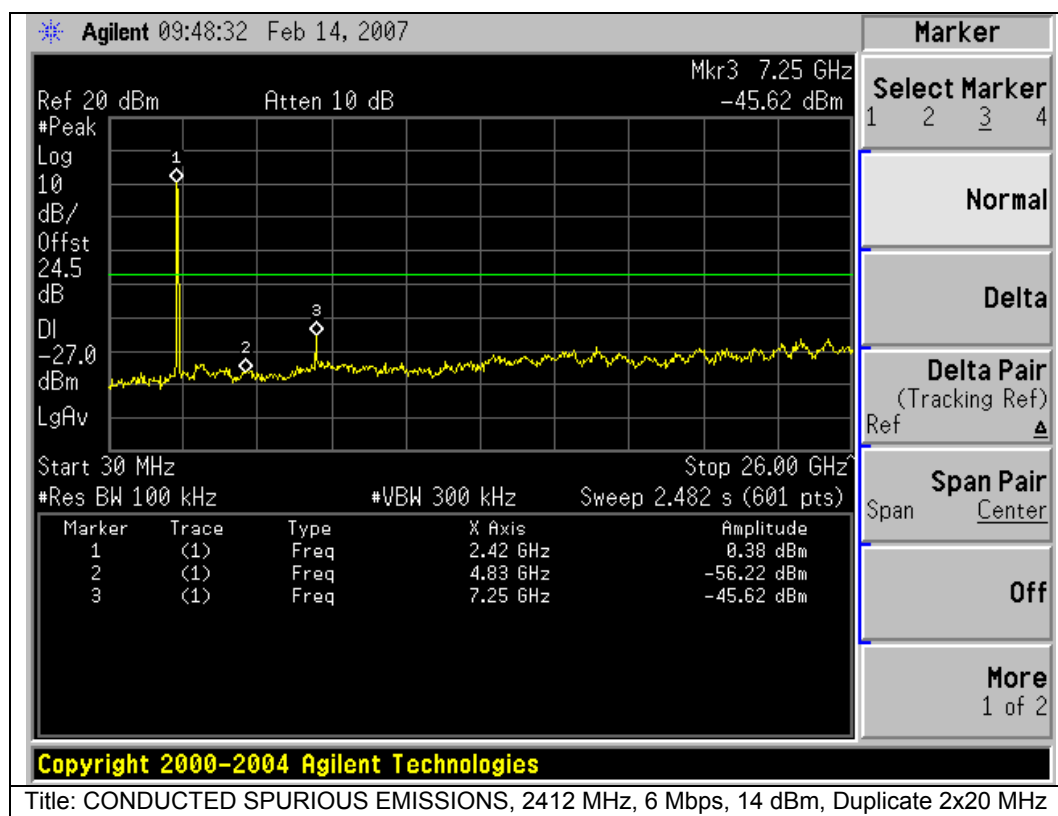
Frequency (MHz)	Mode	Data Rate (Mbps)	Conducted Spurs (dBm)	Limit (dBm)	Margin (dB)
2412	Dual BF	54	-40.8	-27	13.8
2412	Duplicate	6	-45.6	-27	18.6
2437	Dual BF	54	-33.4	-27	6.4
2437	Duplicate	6	-45.5	-27	18.5
2462	Dual BF	54	-42.2	-27	15.2
2462	Duplicate	6	-47.3	-27	20.3



Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

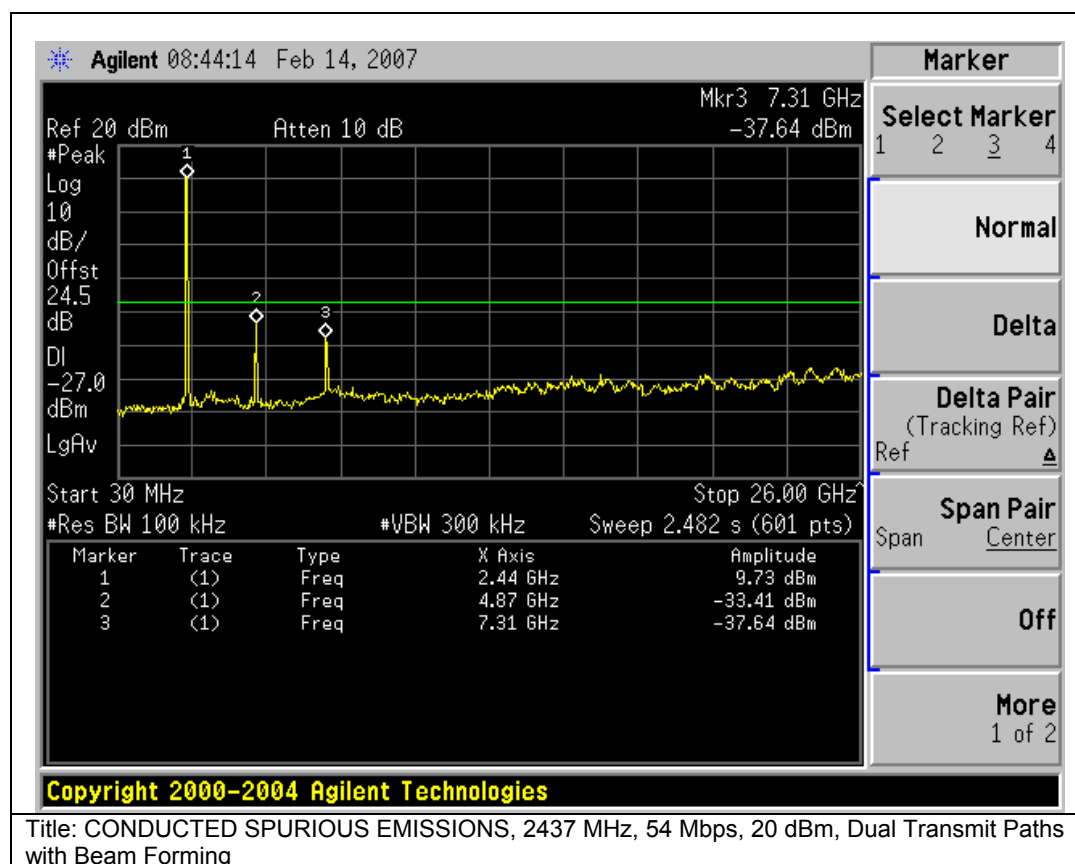


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

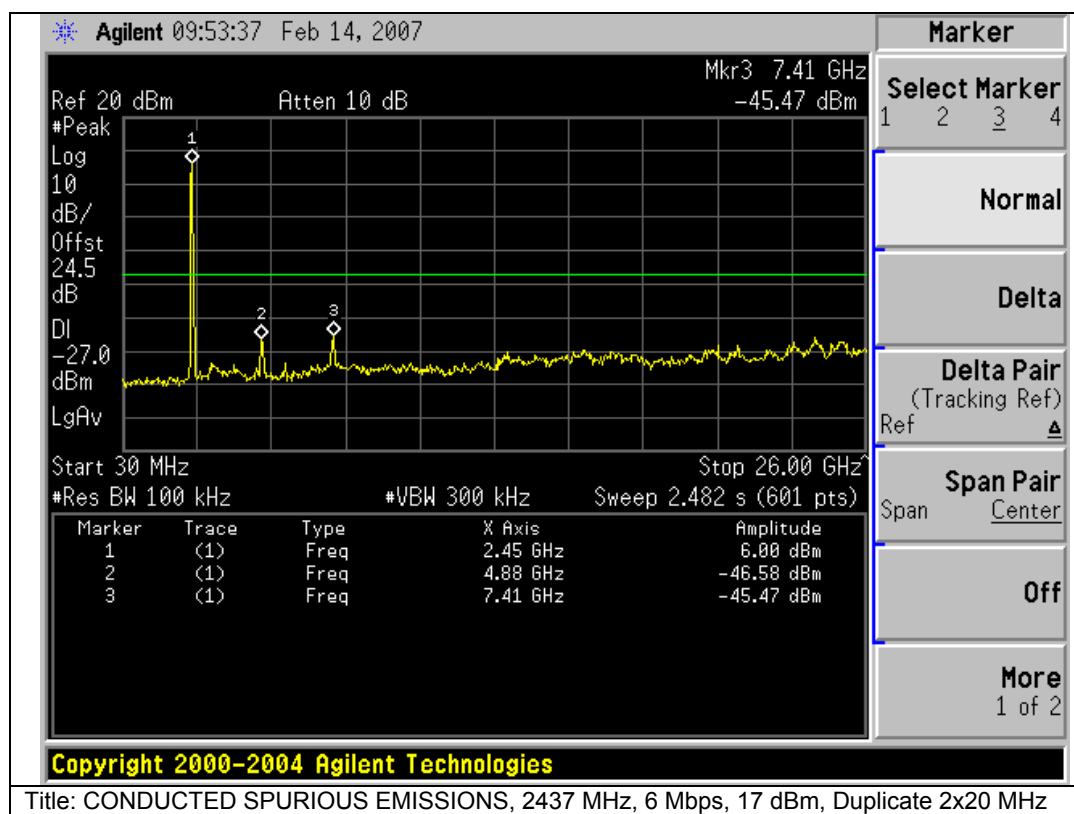




Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

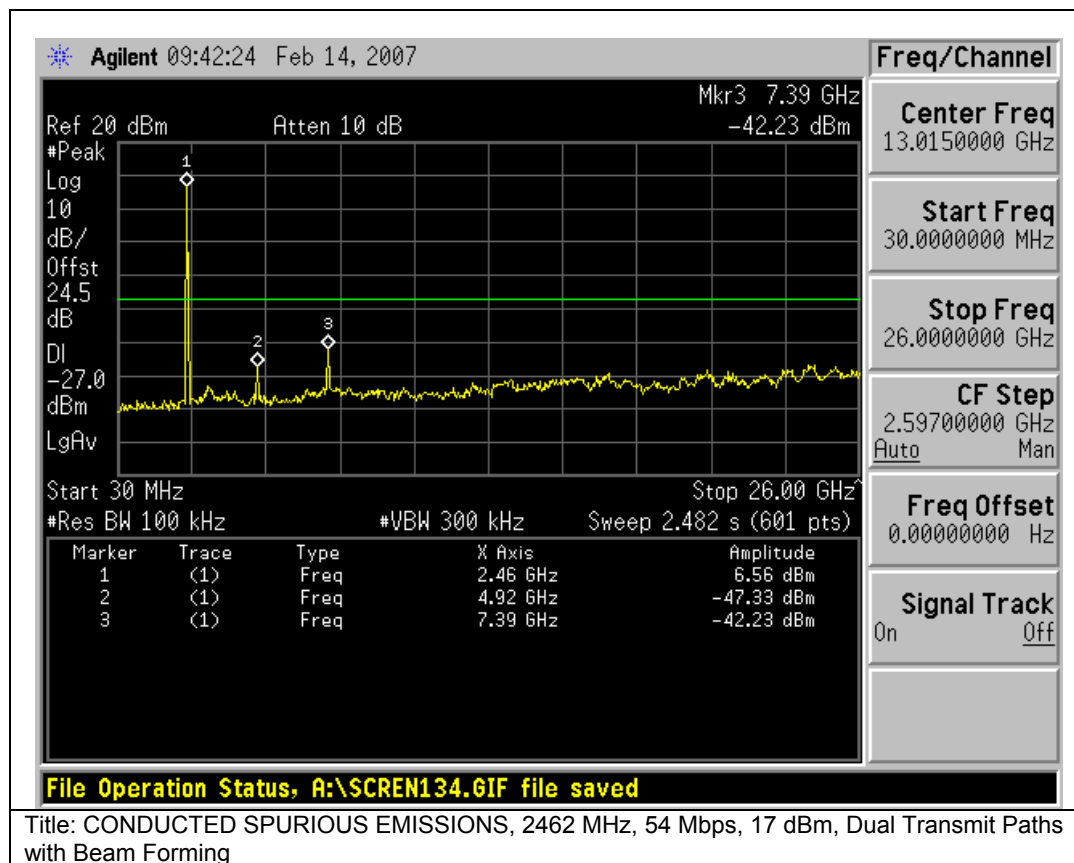


Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments



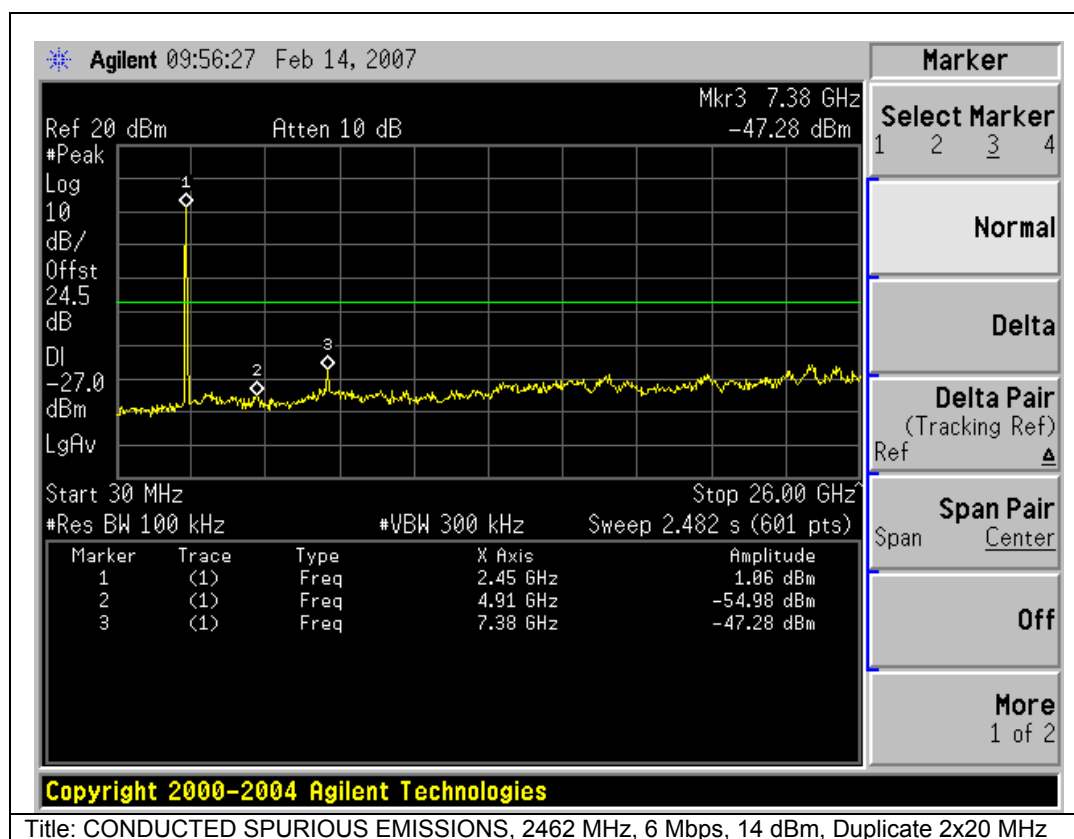


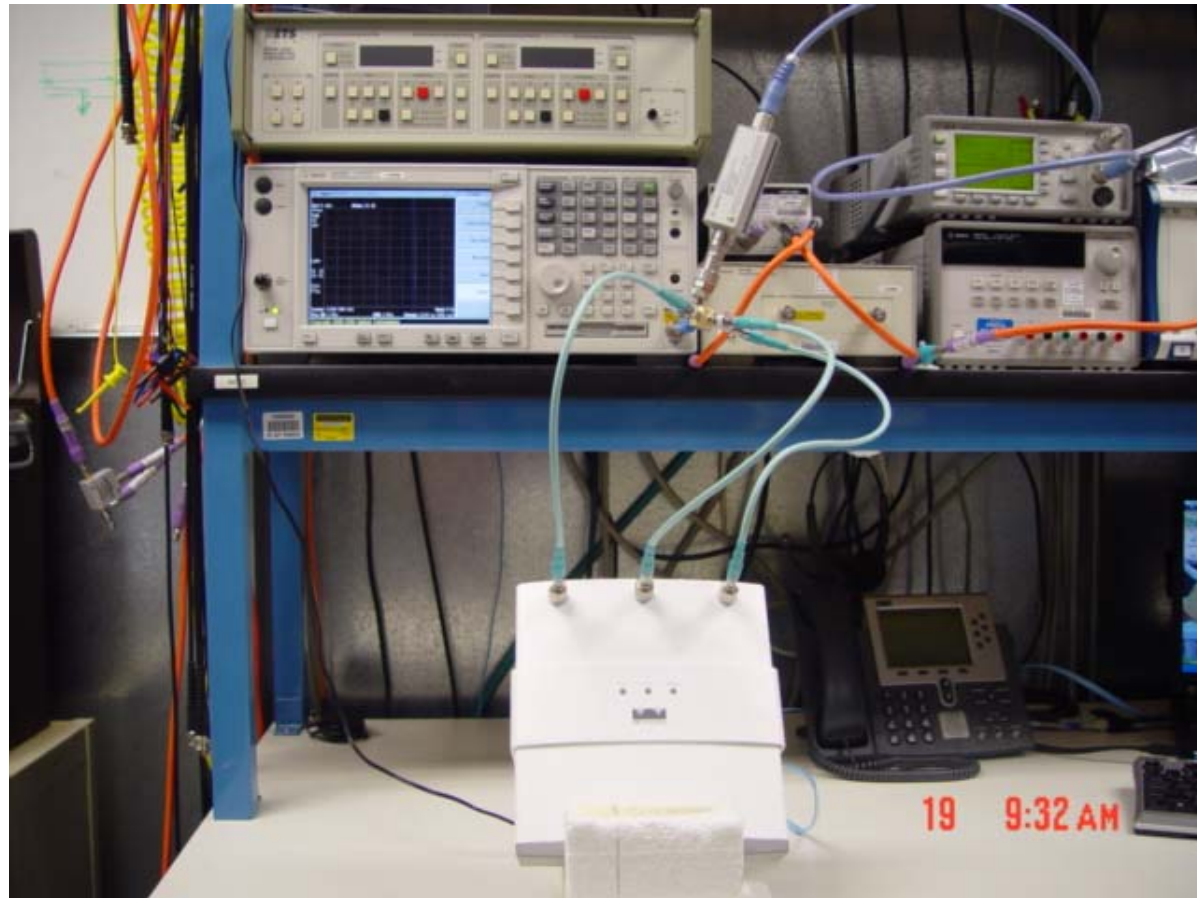
Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Engineer	James Nicholson
Lab Information	Richfield, EMC Labs
Subtest Results	
Line Under Test	RF Port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments





Title: Conducted Test Setup

**Appendix B: Emission Test Results**

Testing Laboratory: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134, USA

Radiated emissions

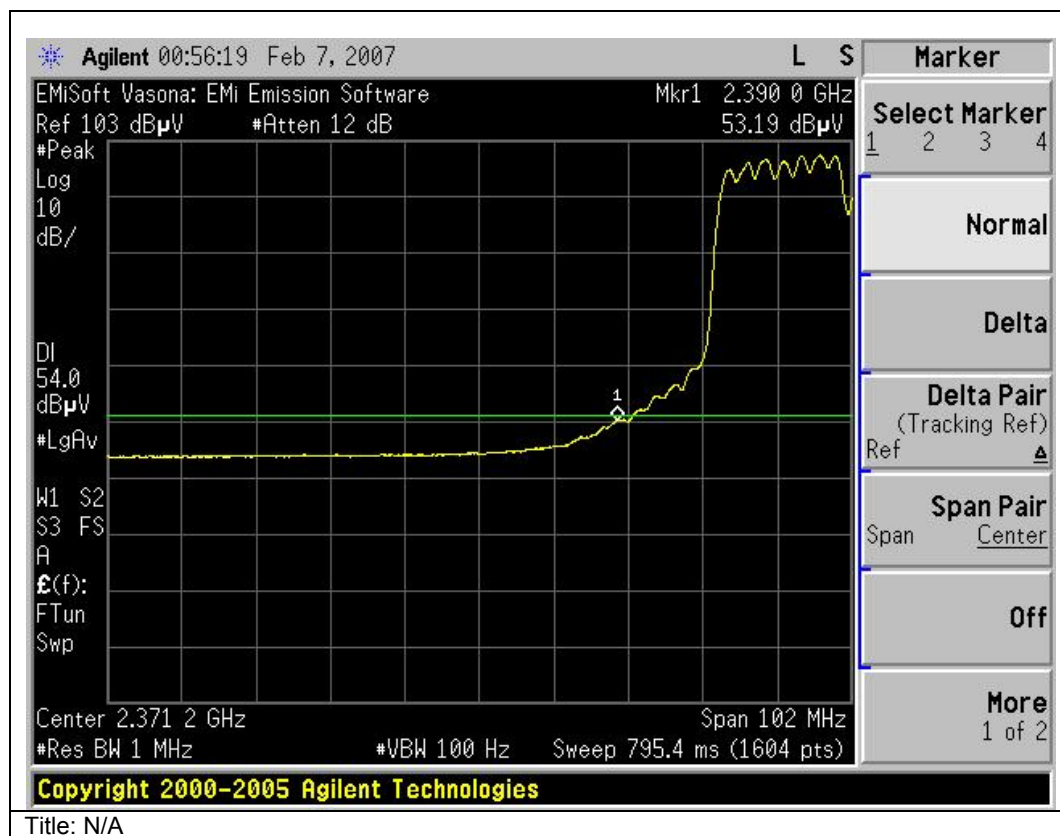
Test Number: 25506 Spec ID: 648				
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
Restricted Bandedge Measurements	Enclosure	B	2.4GHz - 5.825GHz	CFR47 Part 15.205, CFR47 Part 15.209, LP002, RSS210
Operating Mode	Mode : 1, Continuous Transmit			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01 and S02	☒	☐

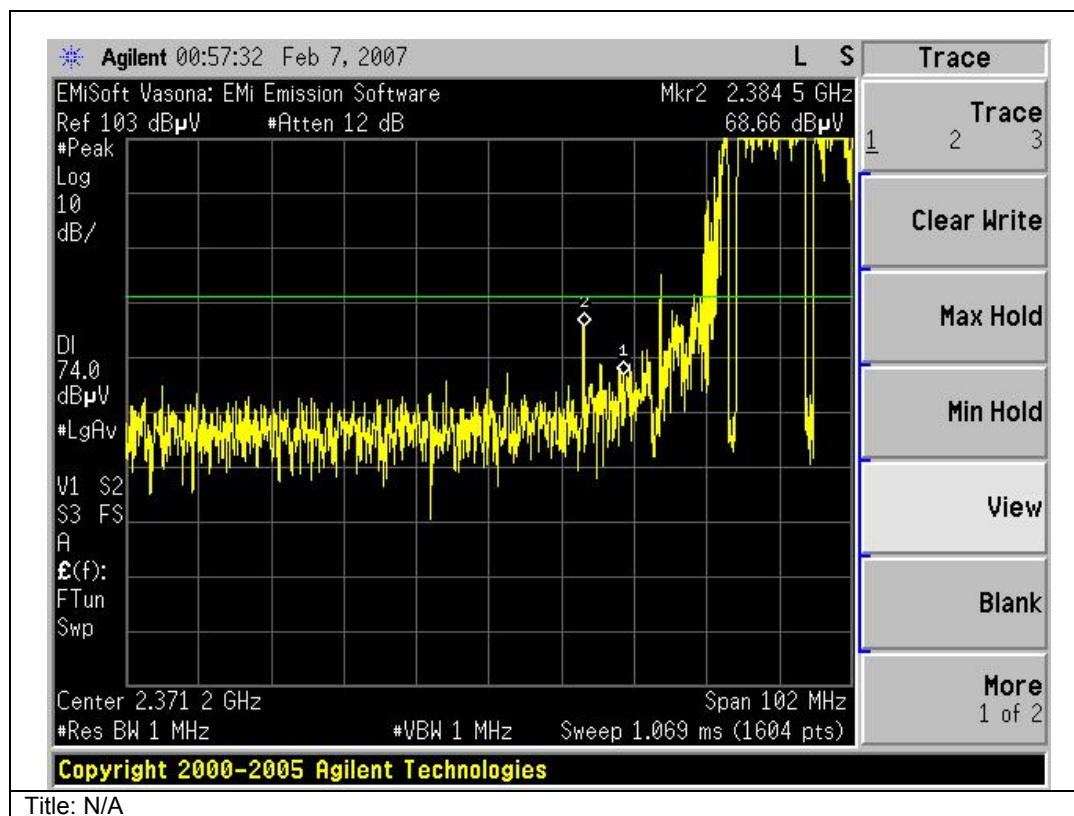
Frequency (MHz)	Mode	Data Rate (Mbps)	Radiated Band Edge Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2412	Dual BF	54	52.8	54	1.2
2412	Duplicate	6	53.2	54	0.8
2462	Dual BF	54	53.9	54	0.1
2462	Duplicate	6	52.4	54	1.6

Radiated emissions

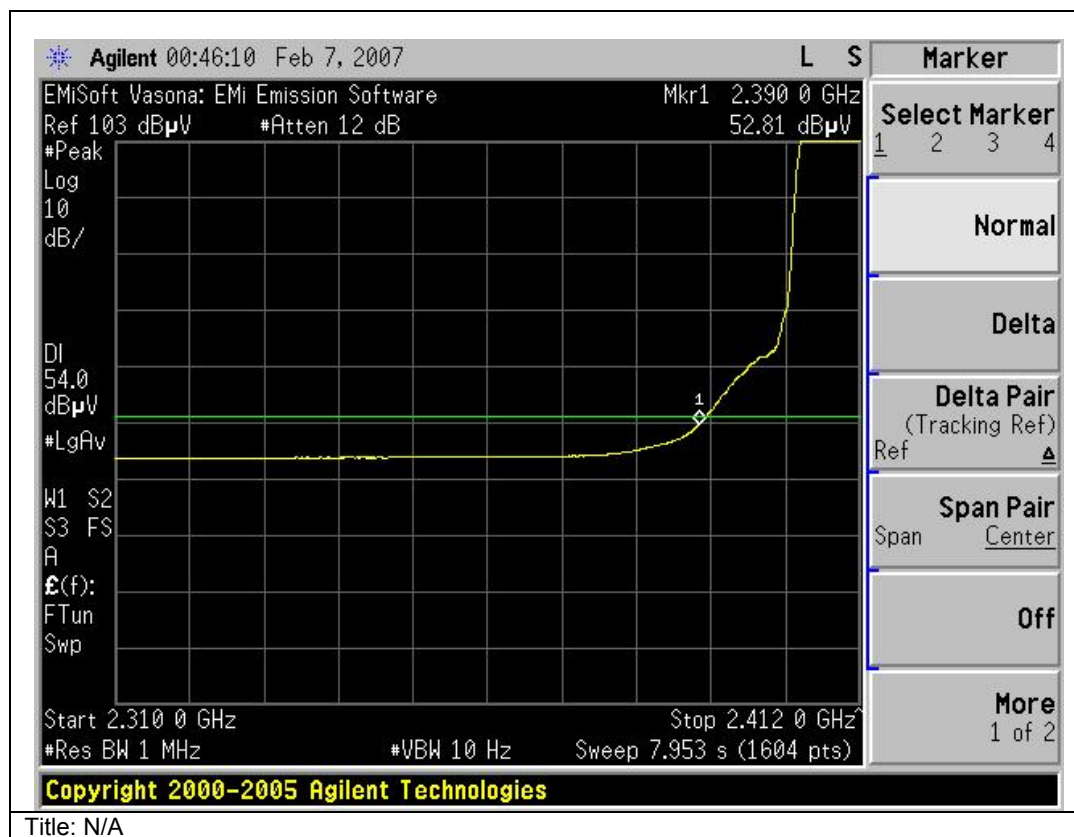
Subtest Number: 25506 - 1		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



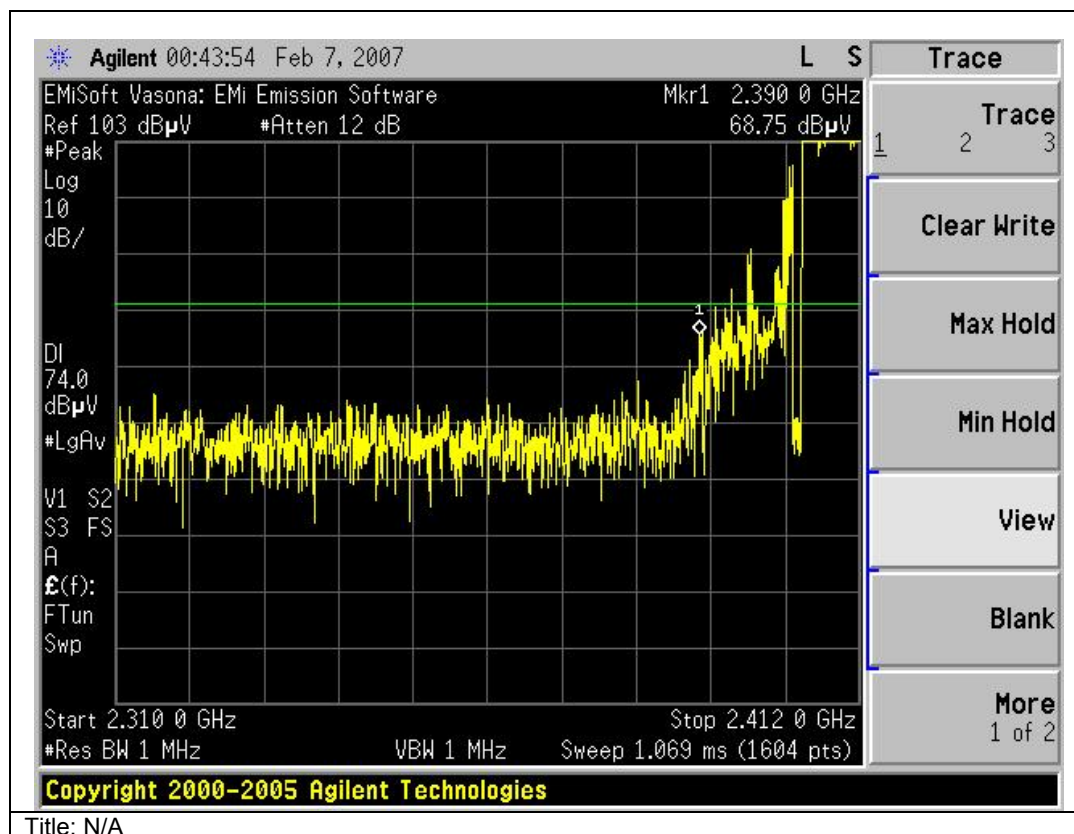
Subtest Number: 25506 - 2		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



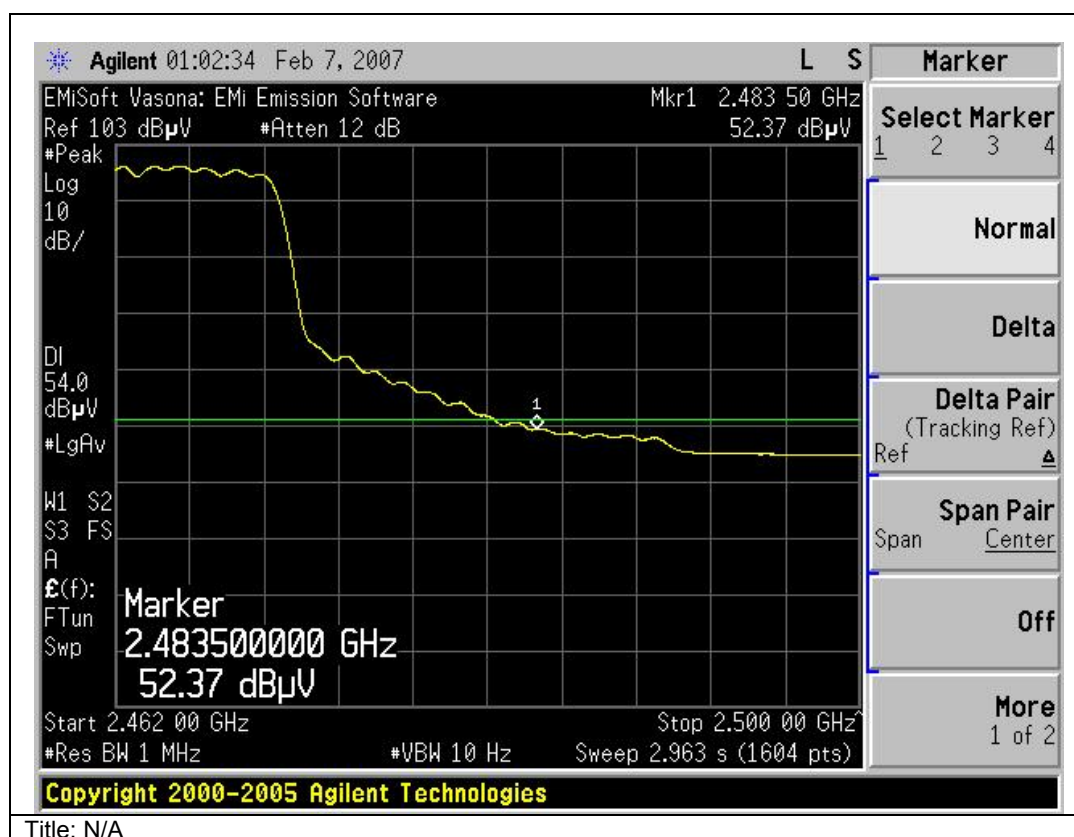
Subtest Number: 25506 - 3		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



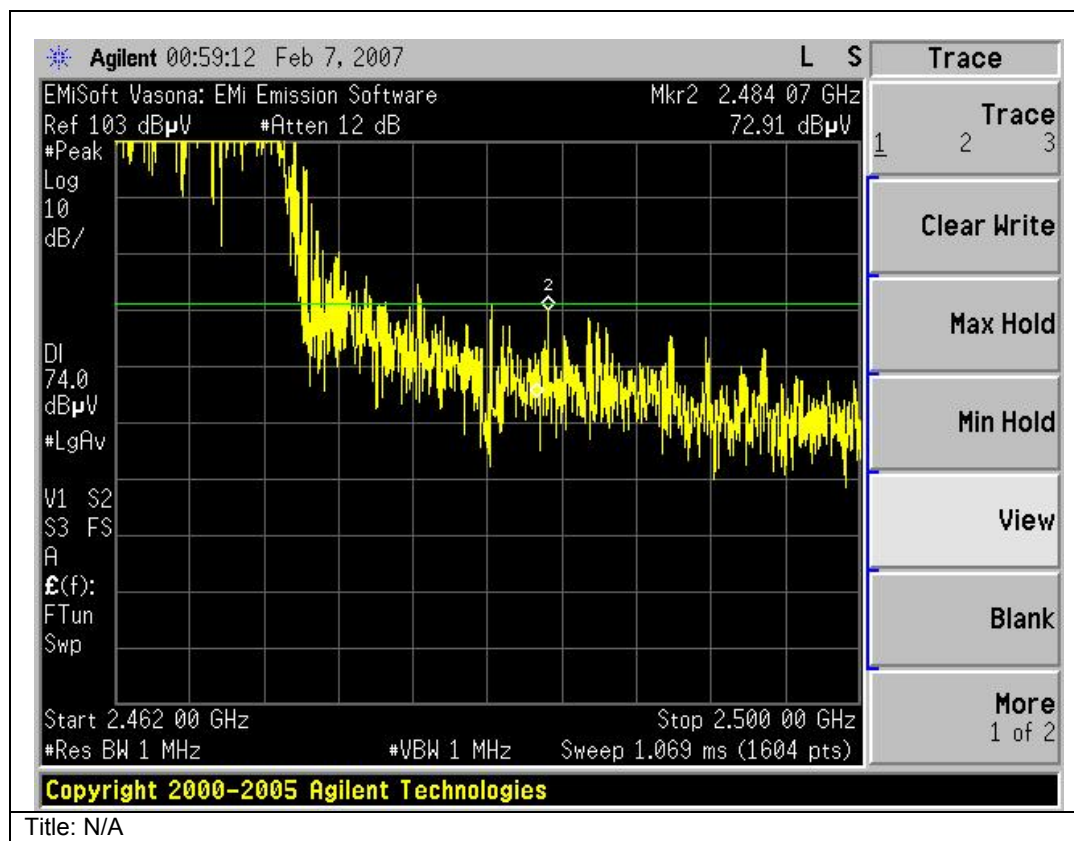
Subtest Number: 25506 - 4		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK	
Subtest Result	Pass	
Highest Frequency	N/A	
Lowest Frequency	N/A	
Comments on the above Test Results	No further comments	



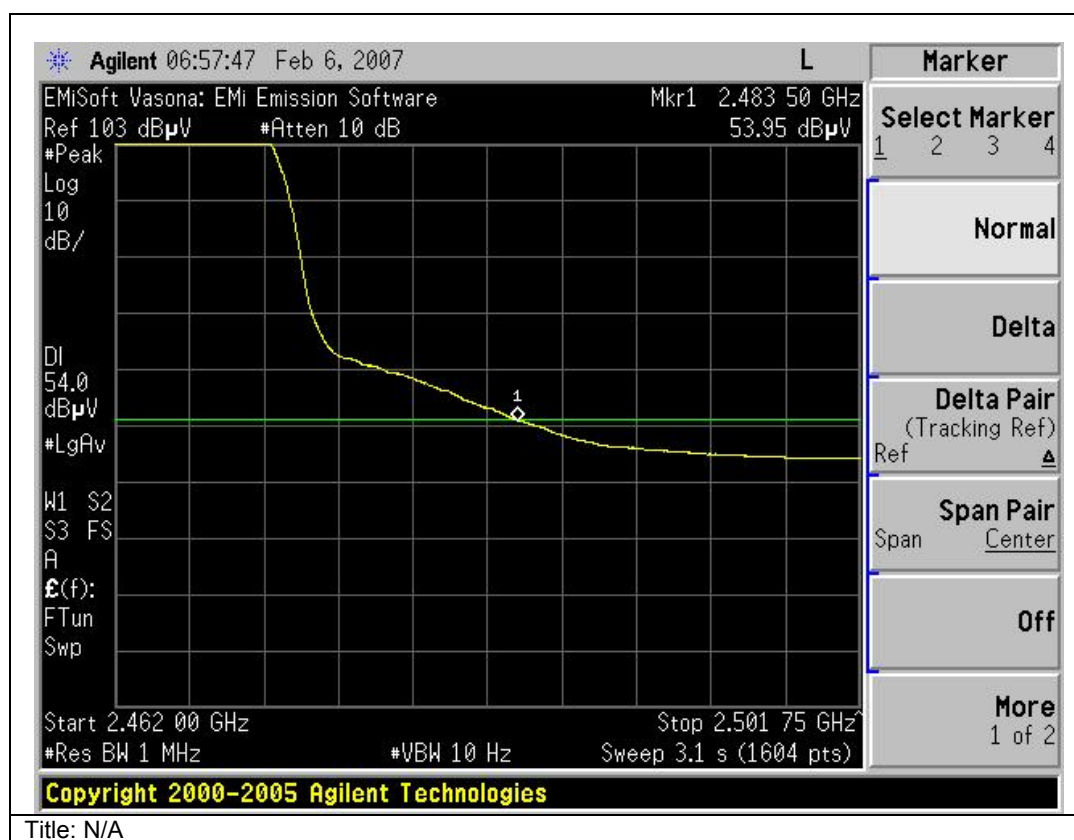
Subtest Number: 25506 - 5		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE	
Subtest Result	Pass	
Highest Frequency	N/A	
Lowest Frequency	N/A	
Comments on the above Test Results	No further comments	



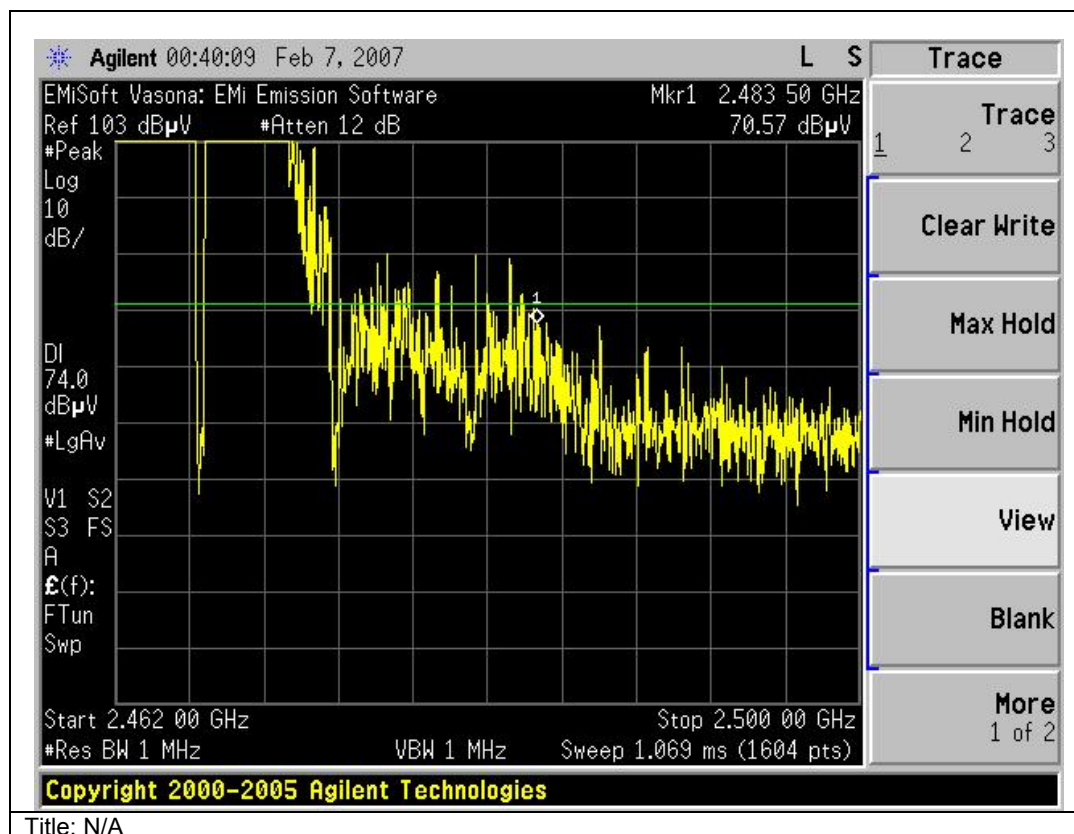
Subtest Number: 25506 - 6		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK	
Subtest Result	Pass	
Highest Frequency	N/A	
Lowest Frequency	N/A	
Comments on the above Test Results	No further comments	

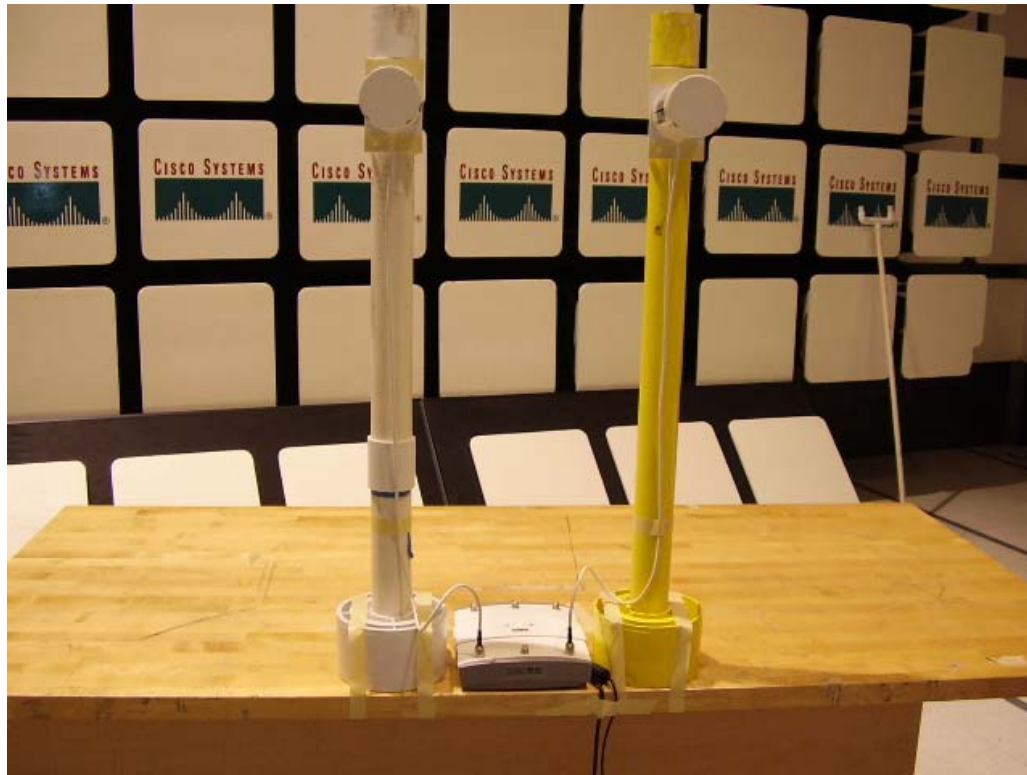


Subtest Number: 25506 - 7		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

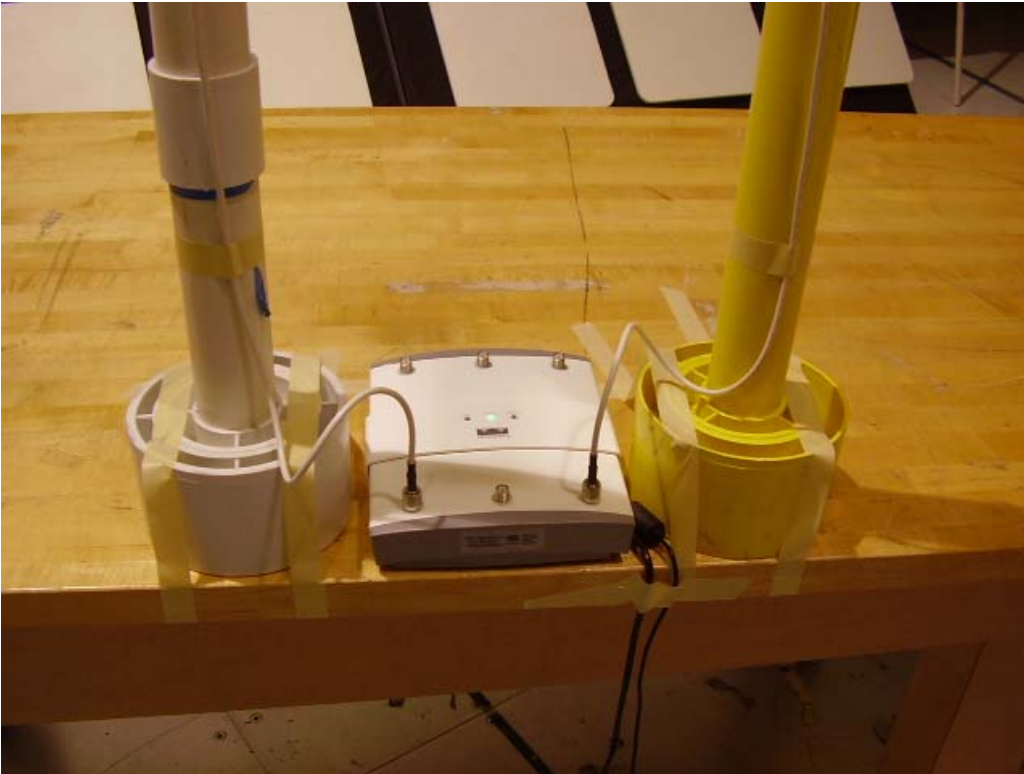


Subtest Number: 25506 - 8		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 10dBi Yagi, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

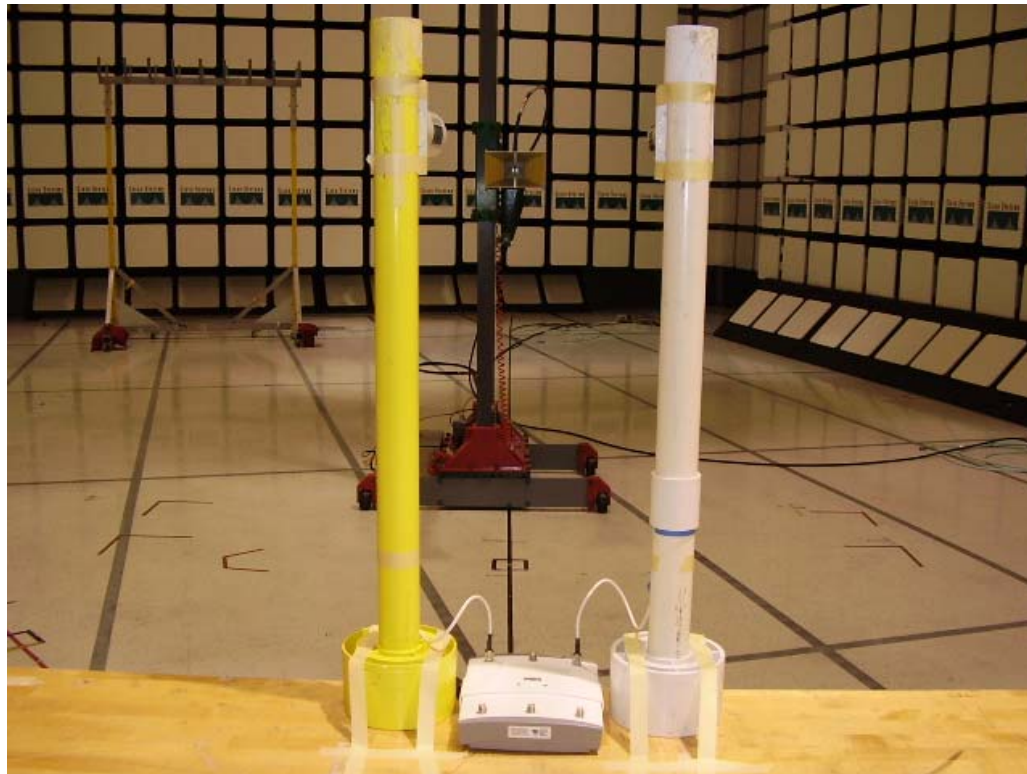




Title: 10dBi Yagi Antennas



Title: N/A



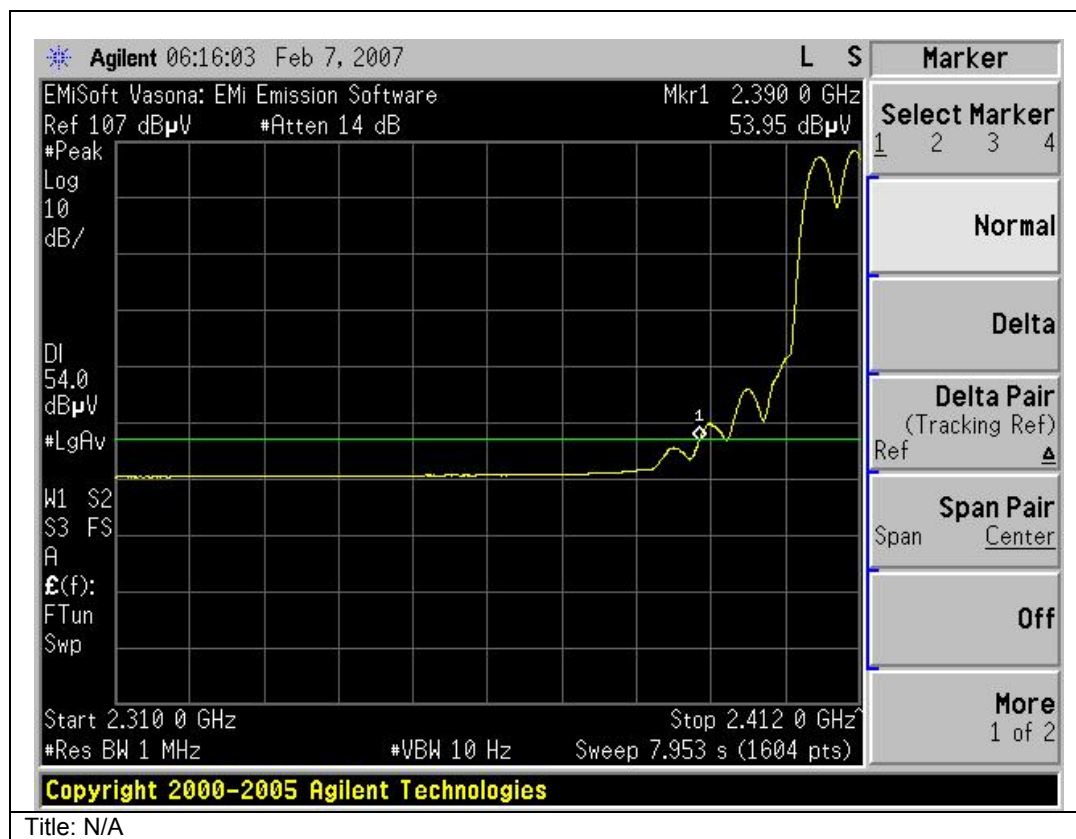
Title: 10dBi Yagi Antennas

**Radiated emissions**

Test Number: 25514 Spec ID: 648				
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
Restricted Bandedge Measurements	Enclosure	B	2.4GHz - 5.825GHz	CFR47 Part 15.205, CFR47 Part 15.209, LP002, RSS210
Operating Mode	Mode : 1, Continuous Transmit			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

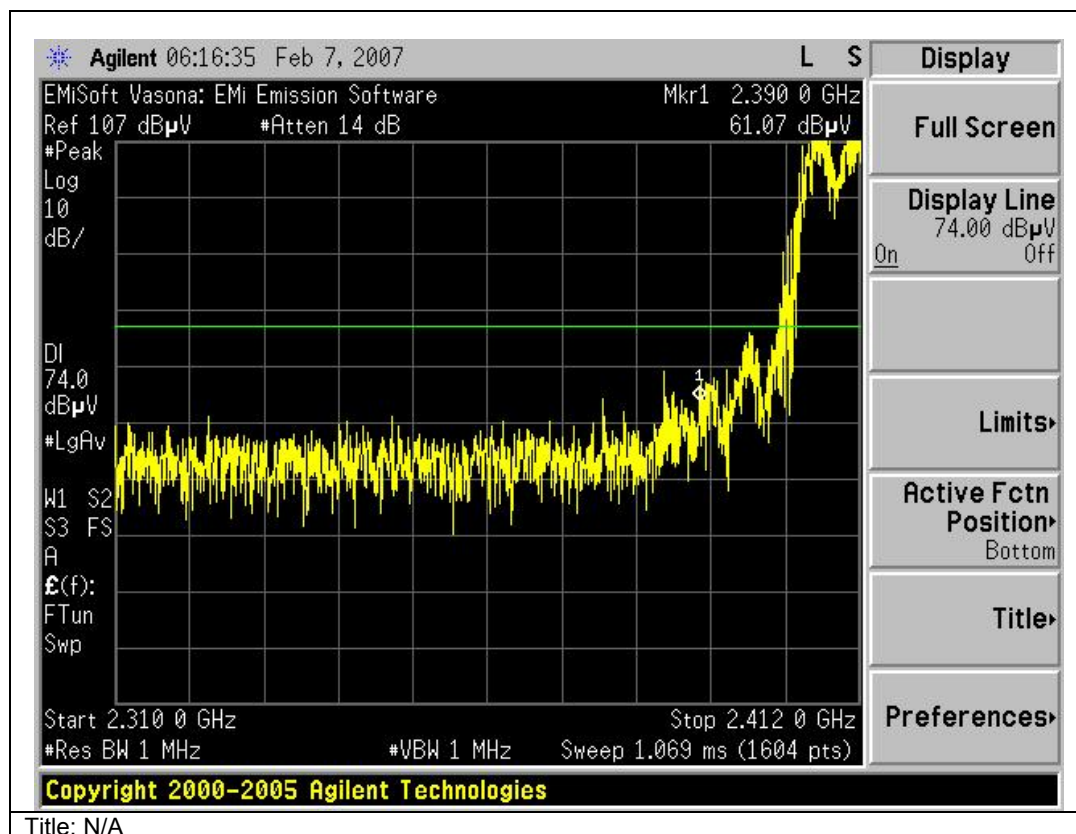
System Number	Description	Samples	System under test	Support equipment
1	EUT	S01 and S02	☒	☐

Subtest Number: 25514 - 1		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

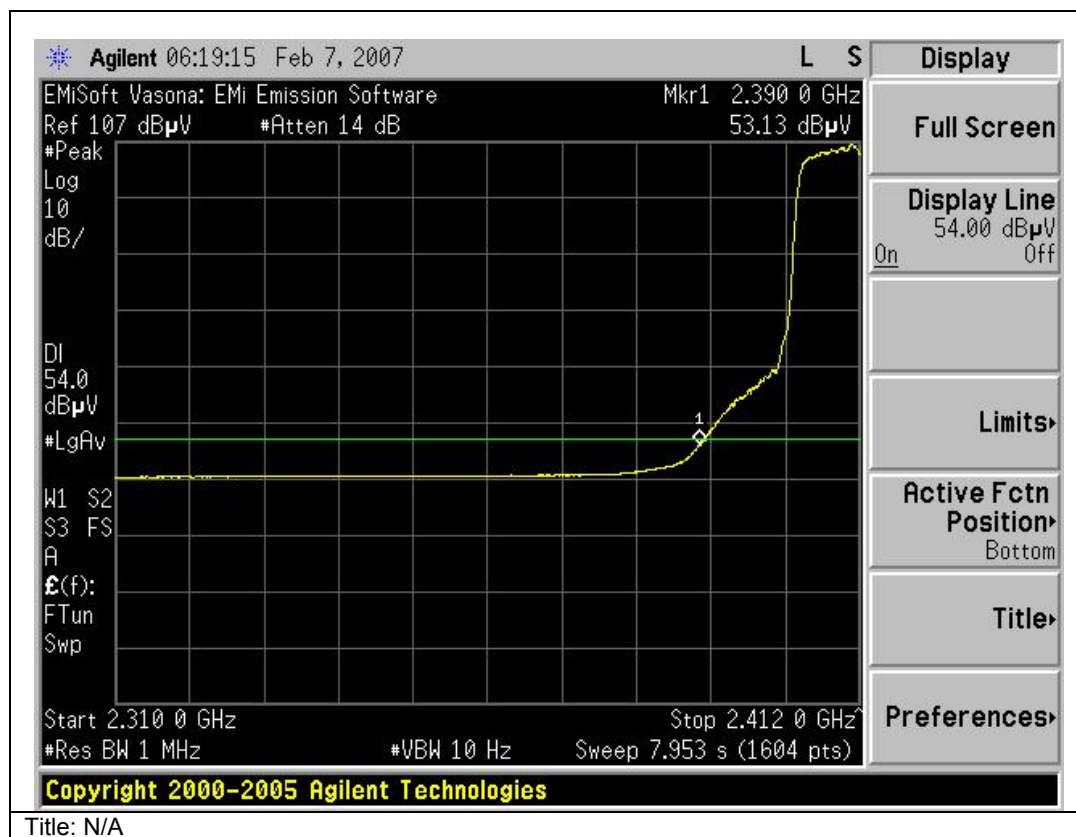




Subtest Number: 25514 - 2		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

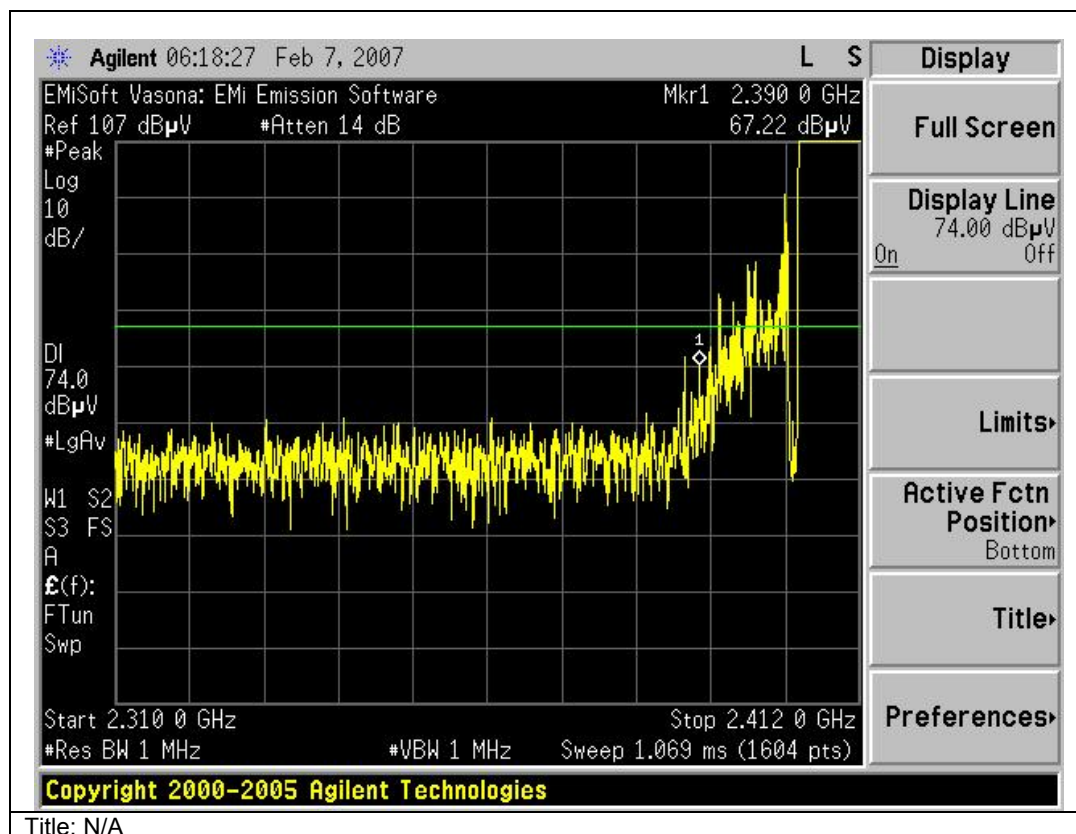


Subtest Number: 25514 - 3		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



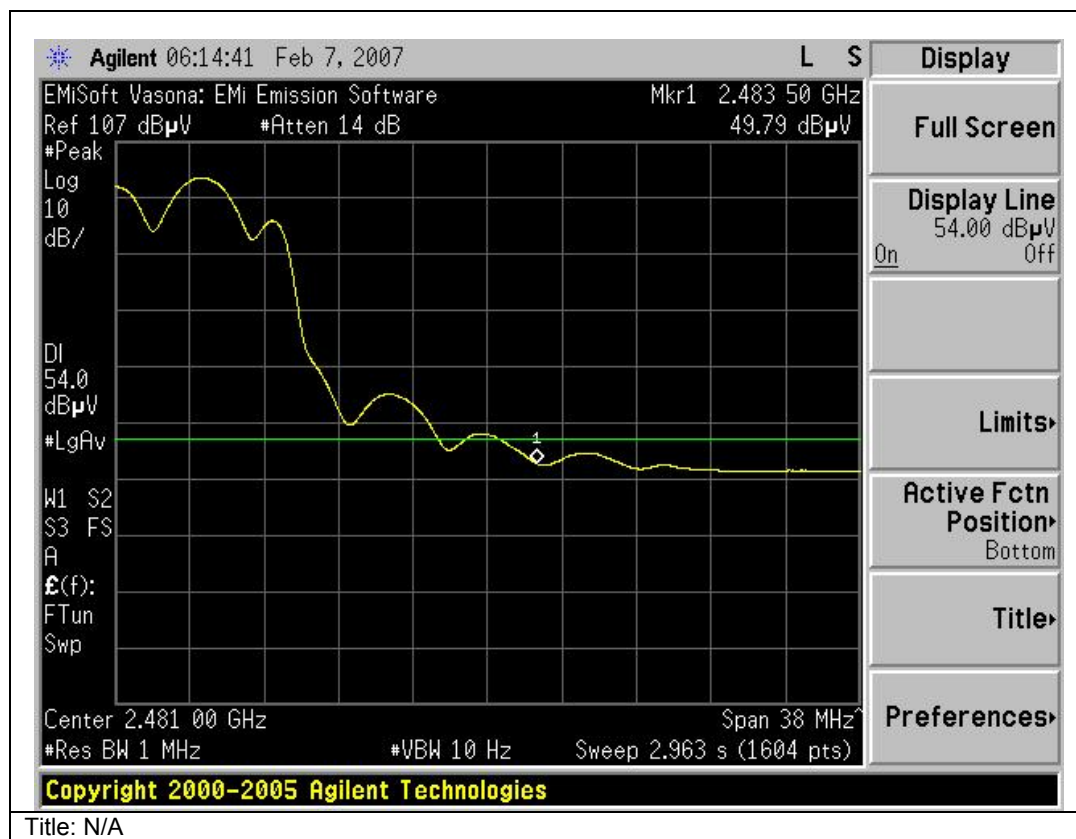


Subtest Number: 25514 - 4		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



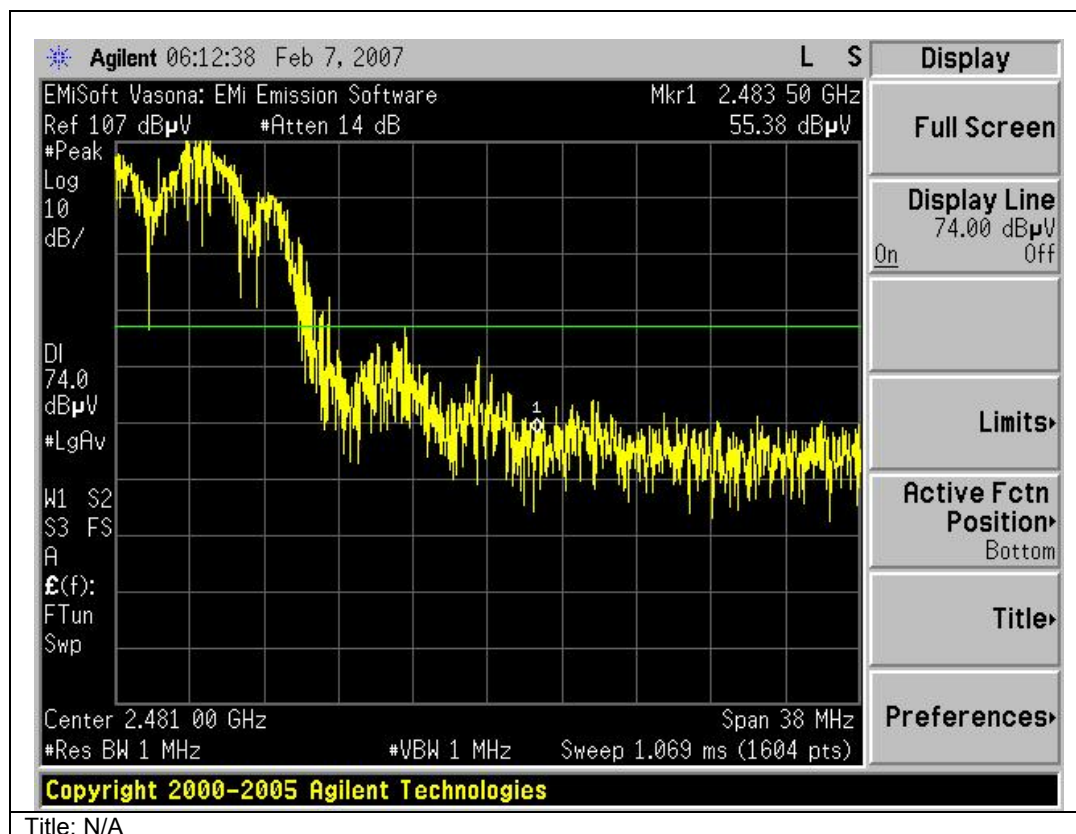


Subtest Number: 25514 - 5		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

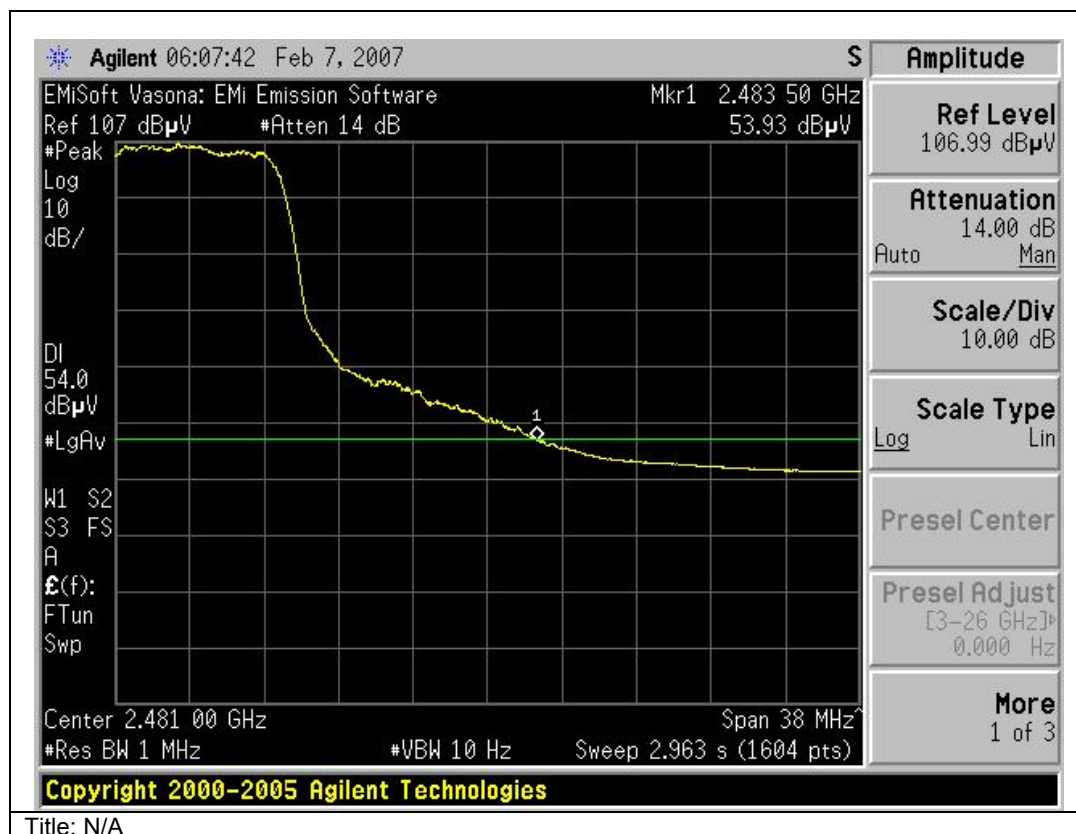




Subtest Number: 25514 - 6		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

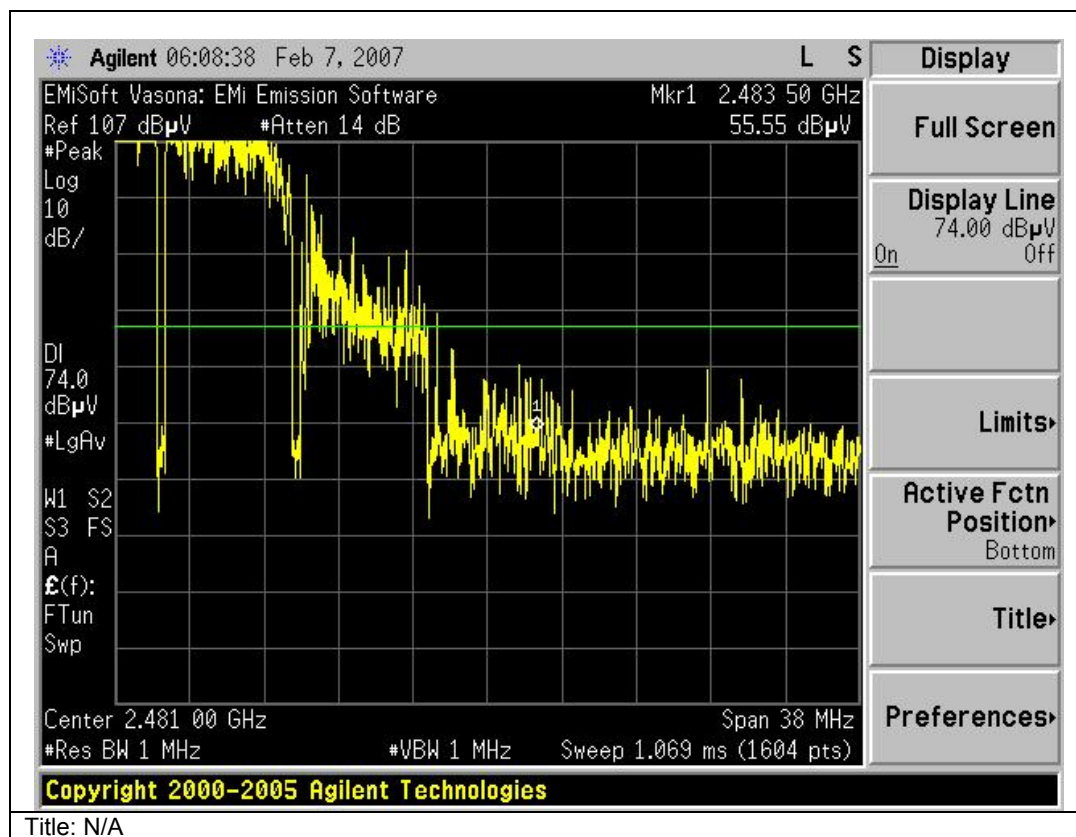


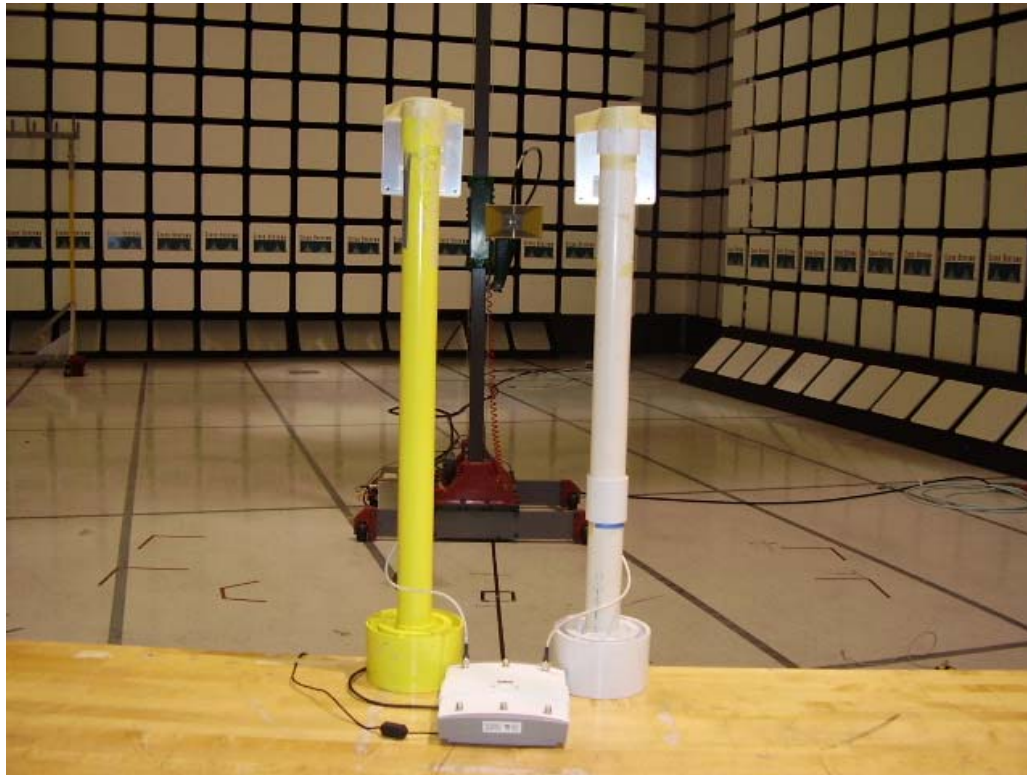
Subtest Number: 25514 - 7		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



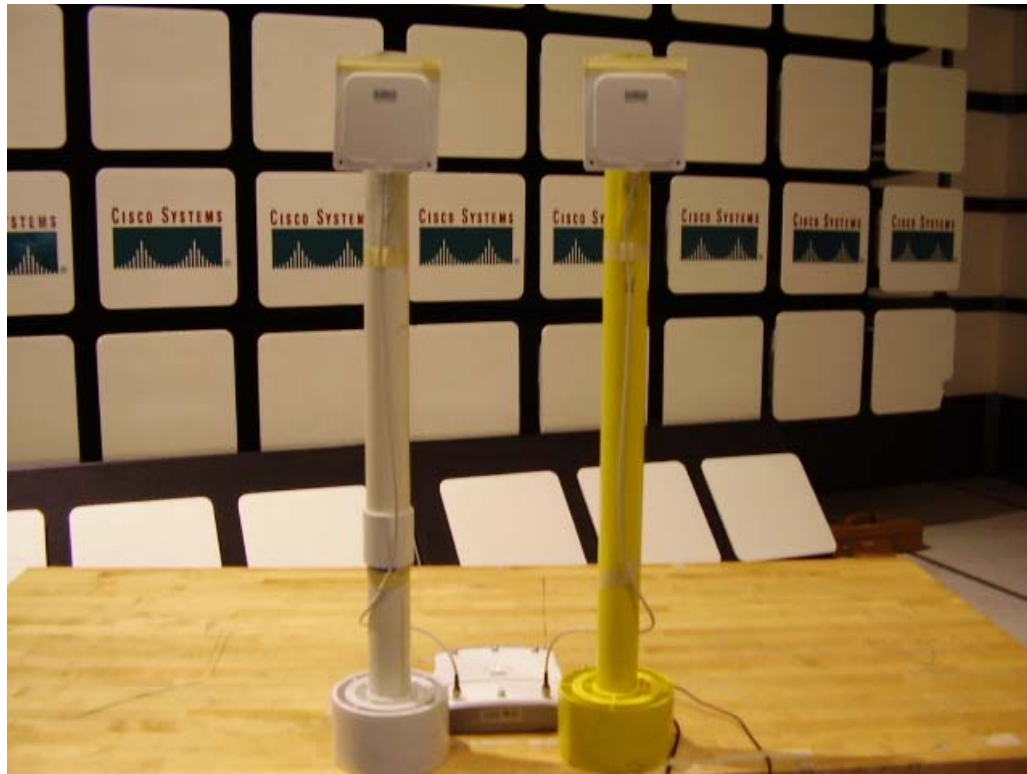


Subtest Number: 25514 - 8		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 8.5 dBi Patch, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		





Title: 8.5 dBi Patch Antennas



Title: 8.5dBi Patch Antennas

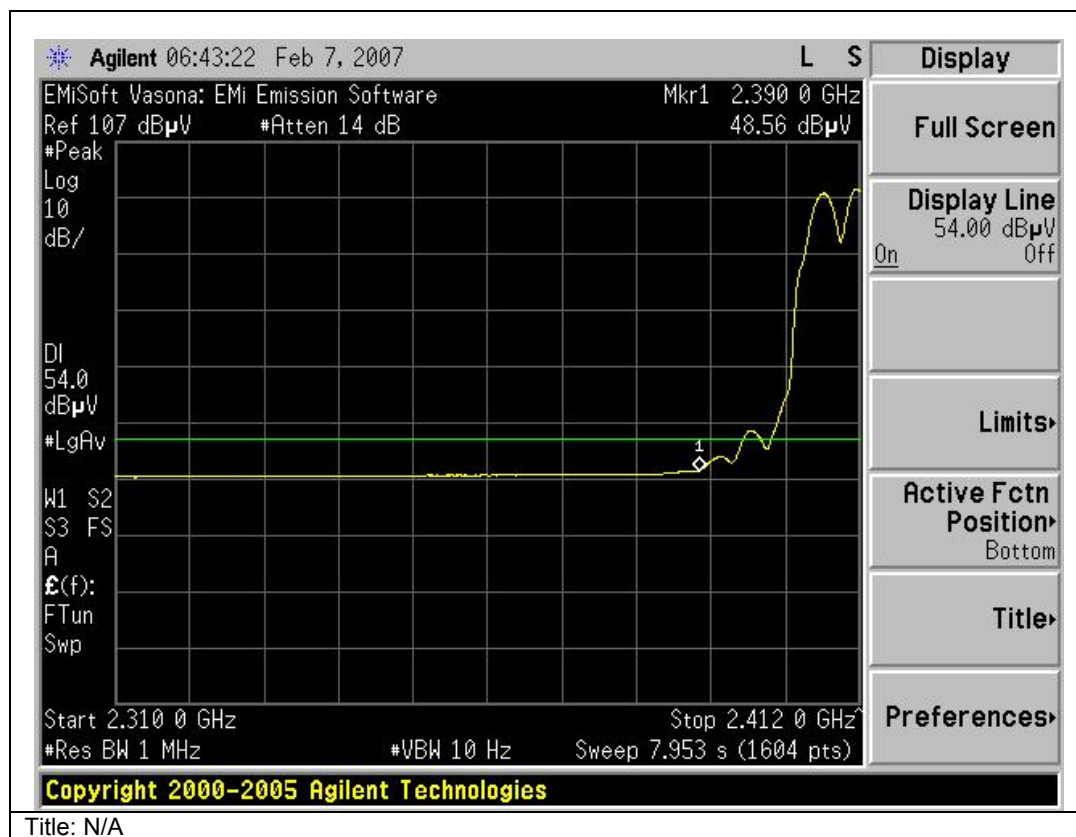
**Radiated emissions**

Test Number: 25515 Spec ID: 648				
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
Restricted Bandedge Measurements	Enclosure	B	2.4GHz - 5.825GHz	CFR47 Part 15.205, CFR47 Part 15.209, LP002, RSS210
Operating Mode	Mode : 1, Continuous Transmit			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01 and S02	☒	☐

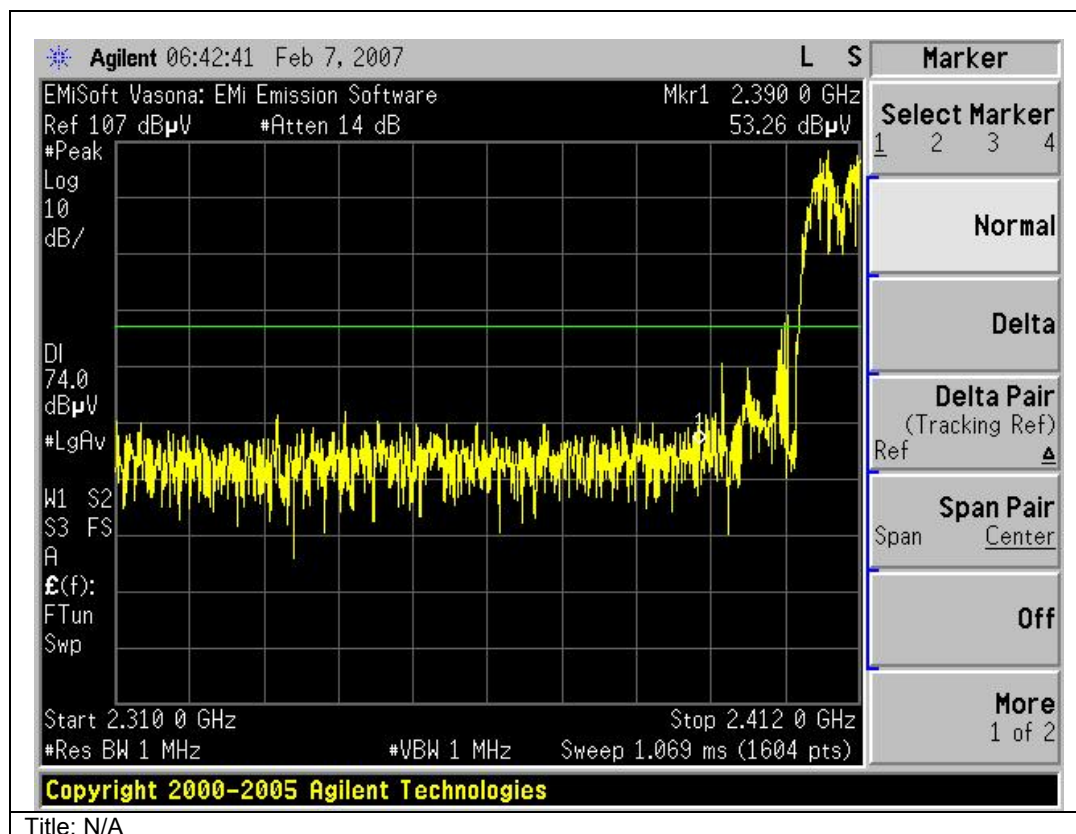


Subtest Number: 25515 - 1		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

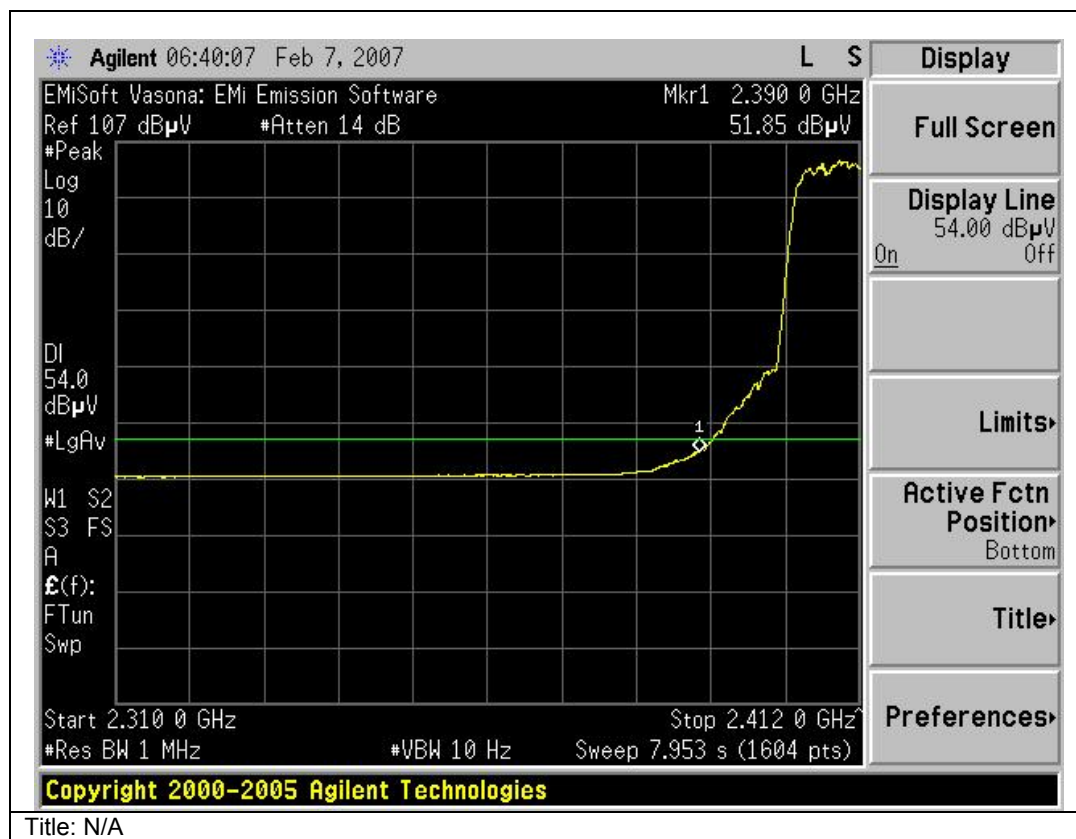




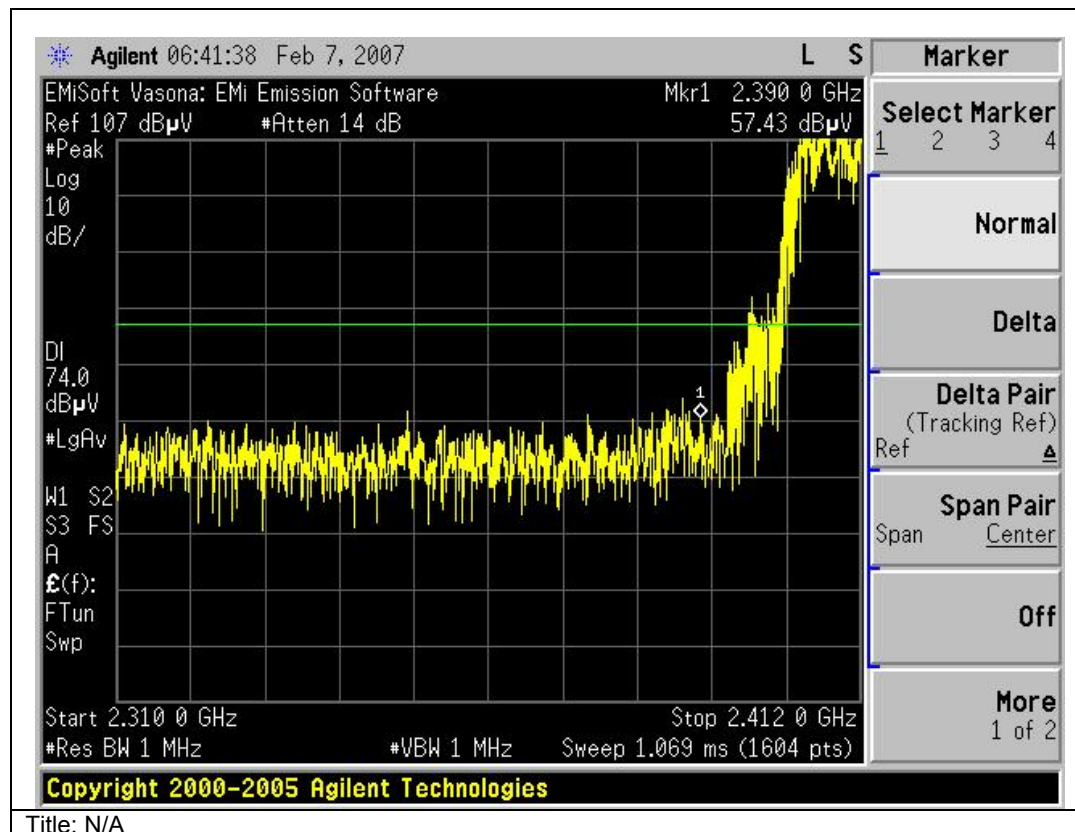
Subtest Number: 25515 - 2		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2412 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



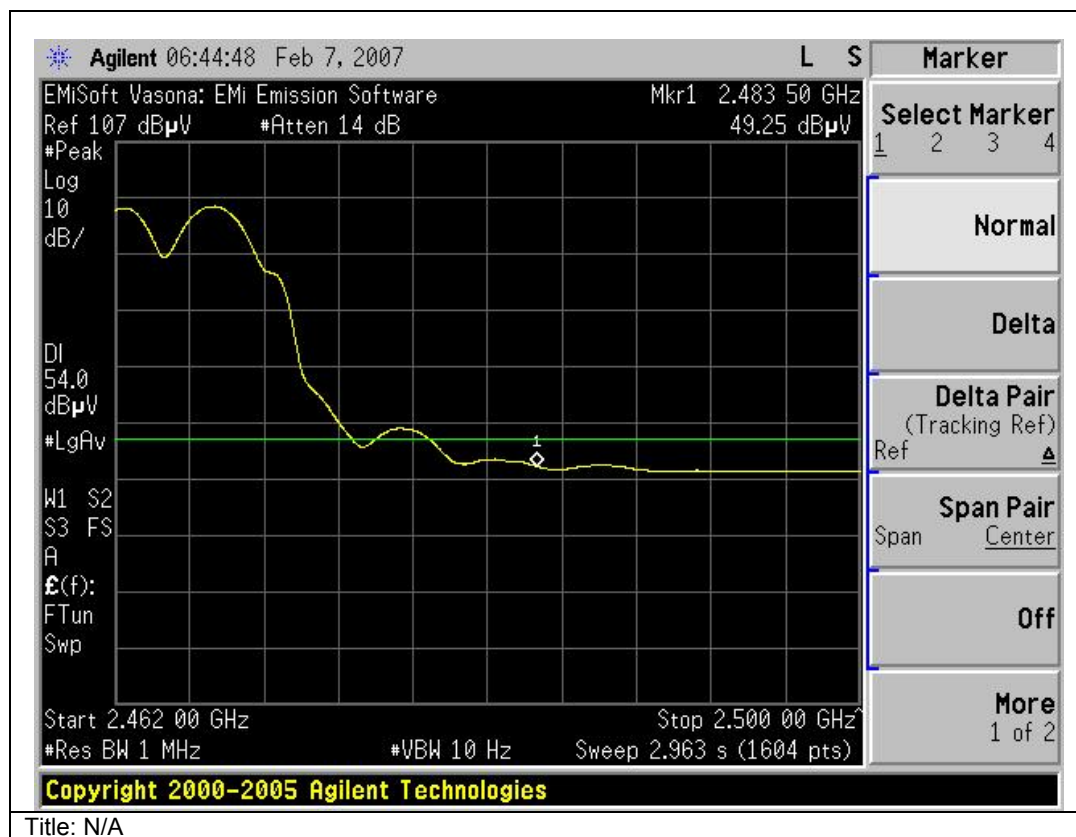
Subtest Number: 25515 - 3		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		



Subtest Number: 25515 - 4		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2412 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK.gif	
Subtest Result	Pass	
Highest Frequency	N/A	
Lowest Frequency	N/A	
Comments on the above Test Results	No further comments	

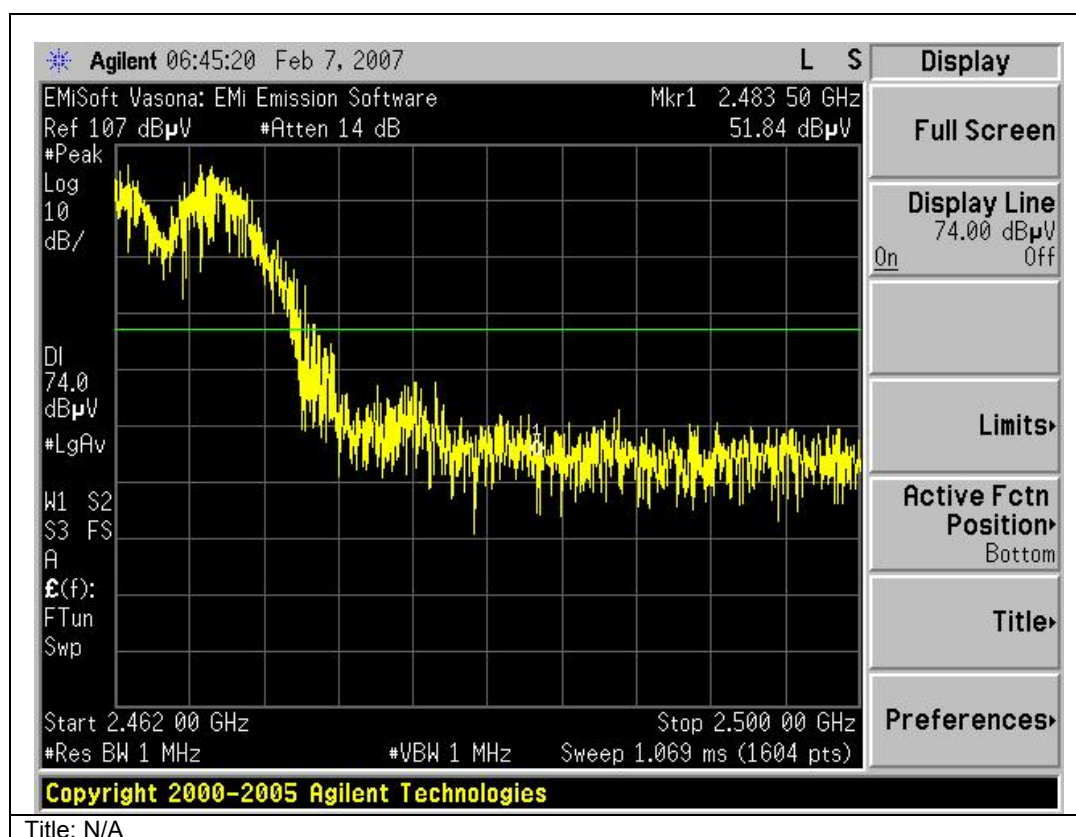


Subtest Number: 25515 - 5		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, AVERAGE		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

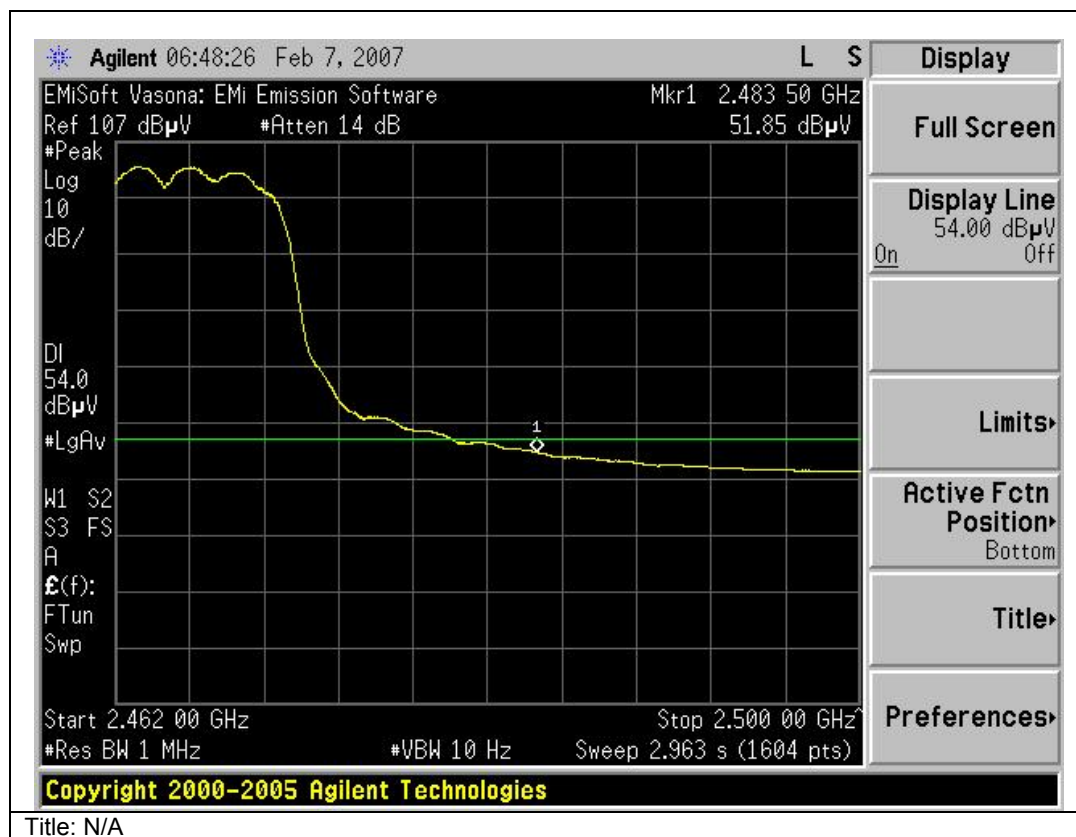




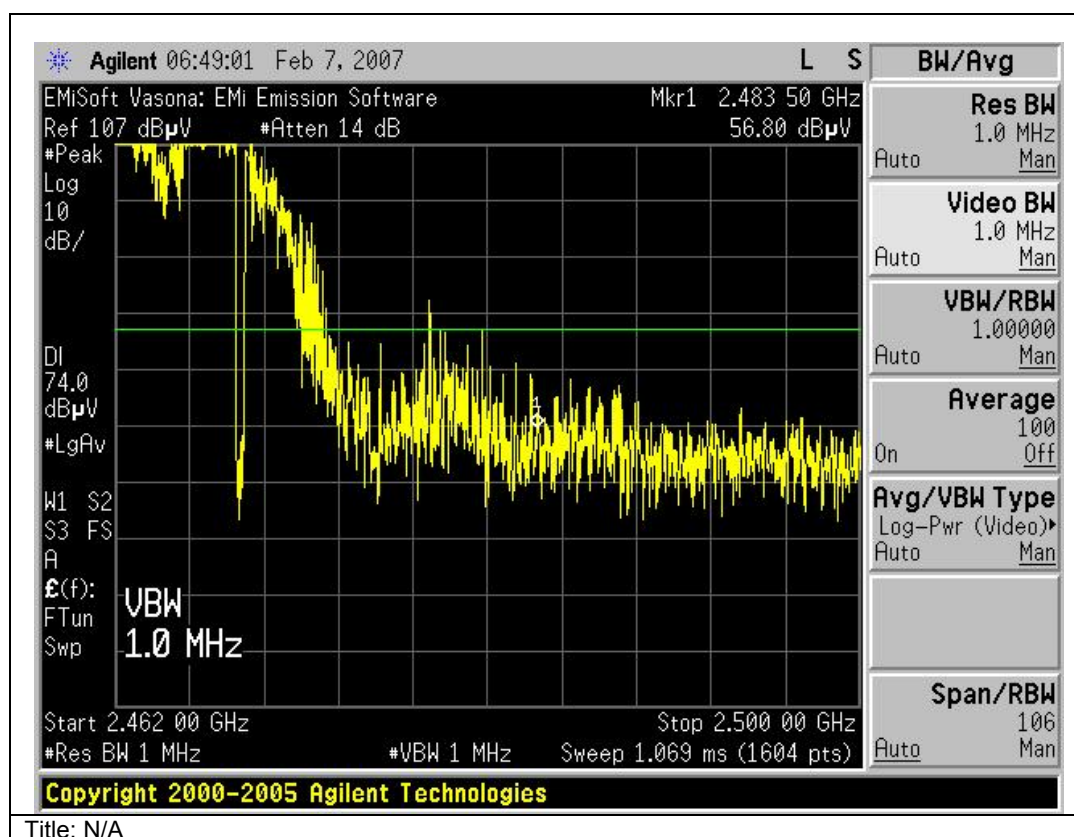
Subtest Number: 25515 - 6		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2462 MHz, 6 Mbps, 14 dBm, Duplicate 2x20 MHz, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		

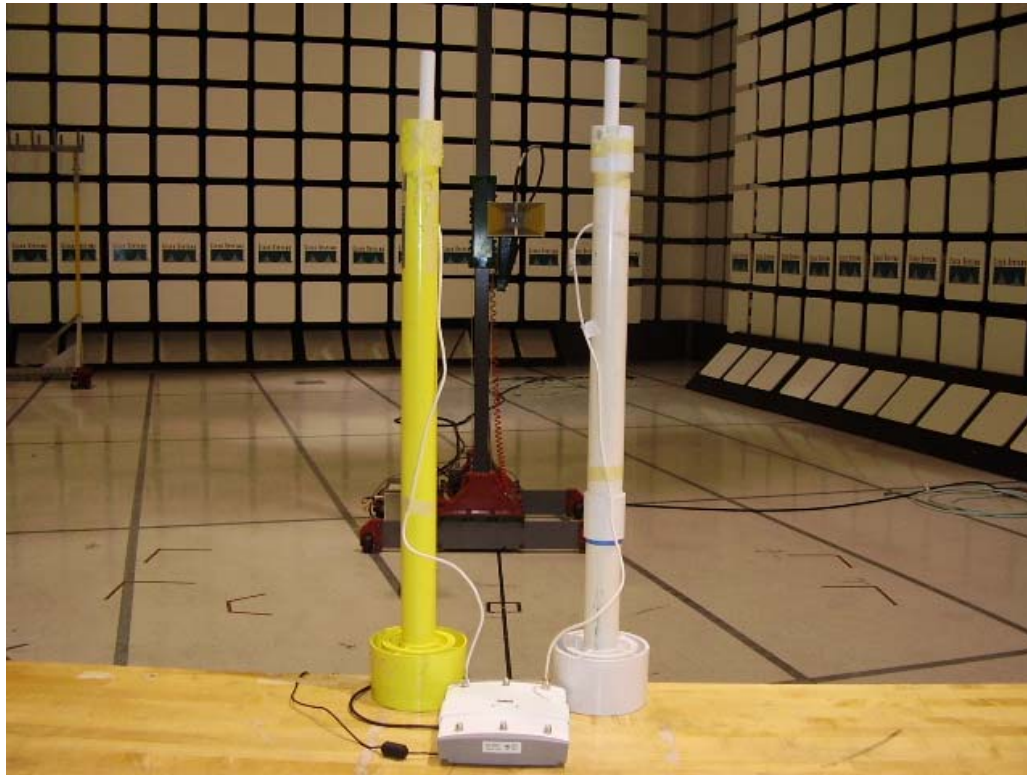


Subtest Number: 25515 - 7		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, AVERAGE	
Subtest Result	Pass	
Highest Frequency	N/A	
Lowest Frequency	N/A	
Comments on the above Test Results	No further comments	

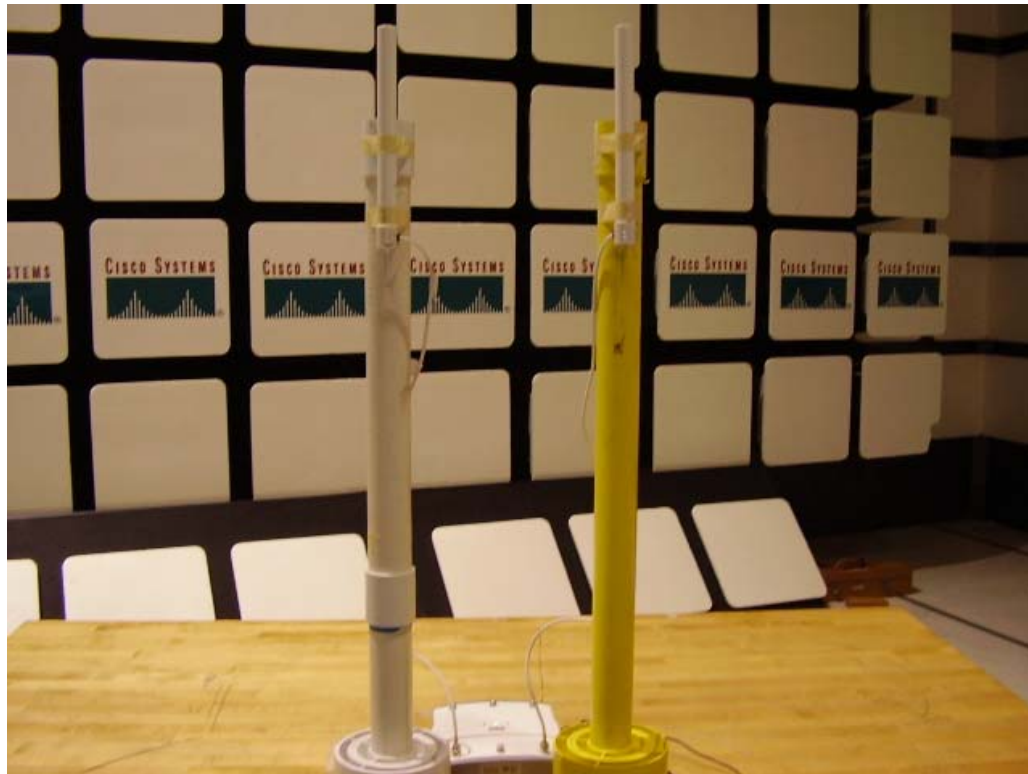


Subtest Number: 25515 - 8		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RESTRICTED BAND EDGE, 5.2 dBi Omni, 2462 MHz, 54 Mbps, 17 dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	N/A		
Lowest Frequency	N/A		
Comments on the above Test Results	No further comments		





Title: 5.2dBi Omnis



Title: 5.2dBi Omnis



Radiated emissions

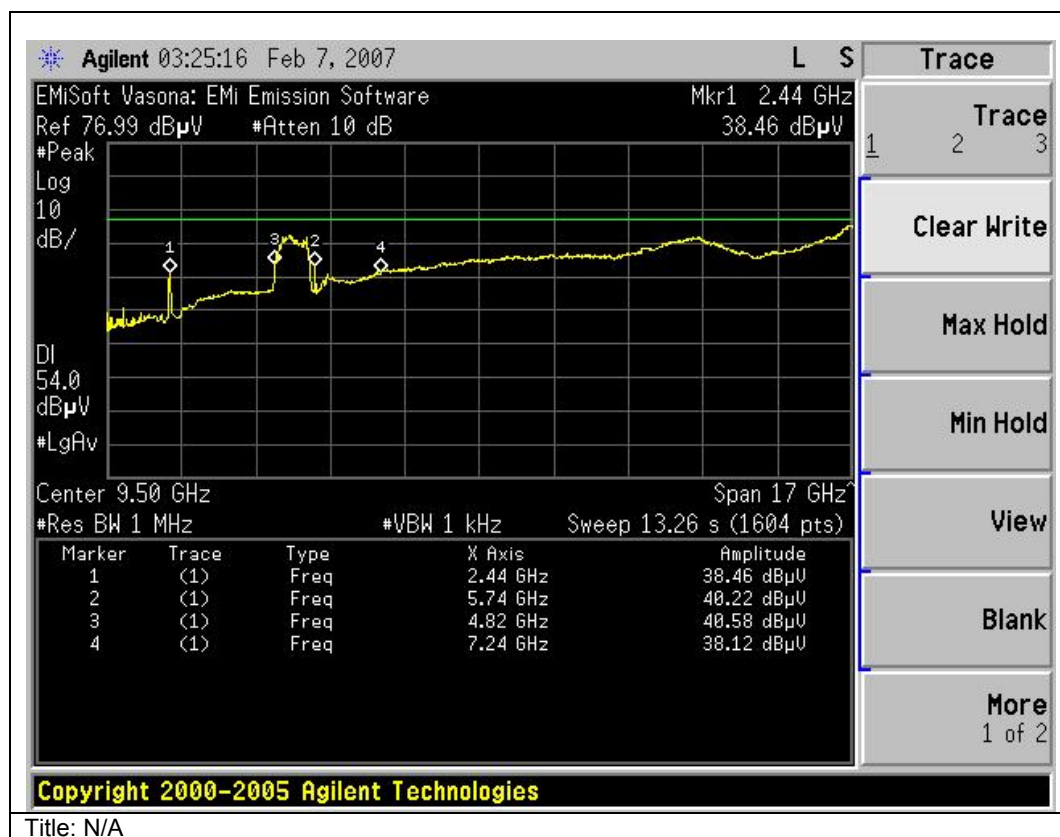
Radiated emissions

Test Number: 25509		Spec ID: 441		
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
Co-Located Transmitters	Enclosure	N/A	1GHz-1.0GHz	Compliance based upon meeting the emission levels for radiated spurious emissions as stated in RSS-210 and FCC part 15.209. CISPR limits are not applicable for this test
Operating Mode	Mode : 1, Continuous Transmit			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	There were no discernable emissions above 18GHz. Includes Co-location with 5GHz radio module AIR-RM1252A-A-K9.			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01 and S02	☒	☐

Frequency (MHz)	Mode	Data Rate (Mbps)	Radiated Spurious Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2412	Dual BF	54	40.6	54	13.4
2412	Duplicate	6	40.6	54	13.4
2437	Dual BF	54	53.1	54	0.9
2437	Duplicate	6	44.0	54	10.0
2462	Dual BF	54	47.5	54	6.5
2462	Duplicate	6	45.6	54	8.4

Subtest Number: 25509 - 1		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2412 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE	
Subtest Result	Pass	
Highest Frequency	12750.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	



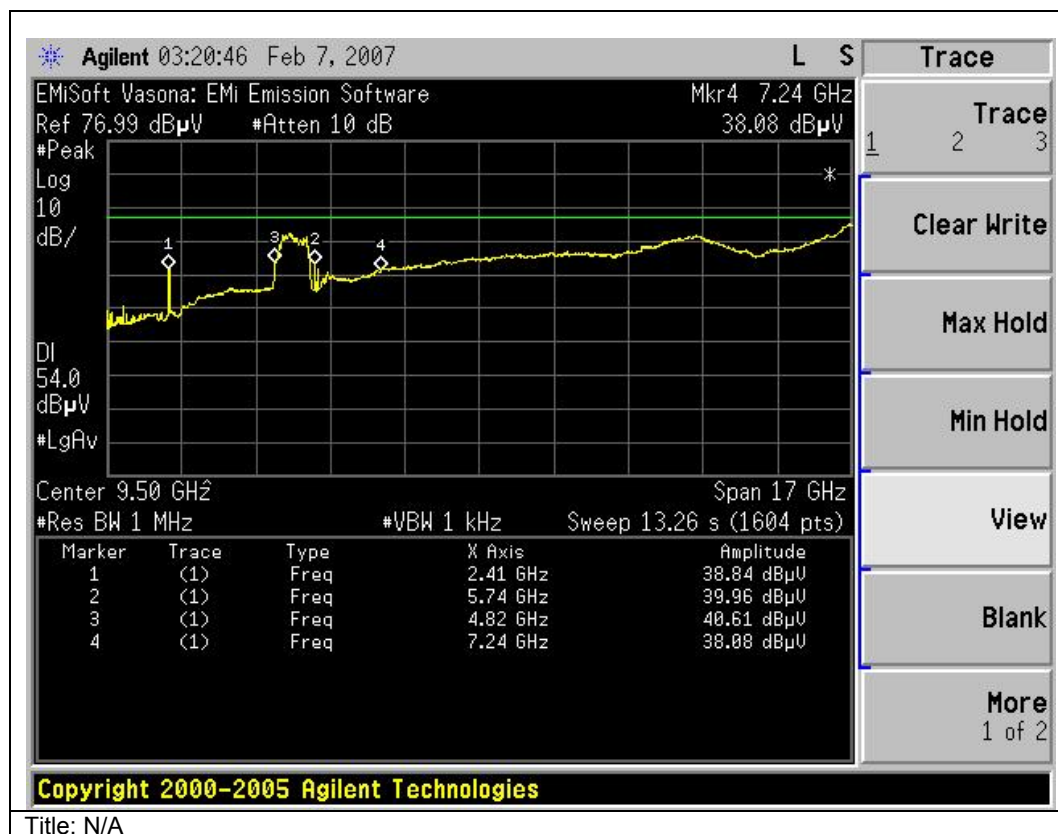


Subtest Number: 25509 - 2		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2412 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		





Subtest Number: 25509 - 3		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2412 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



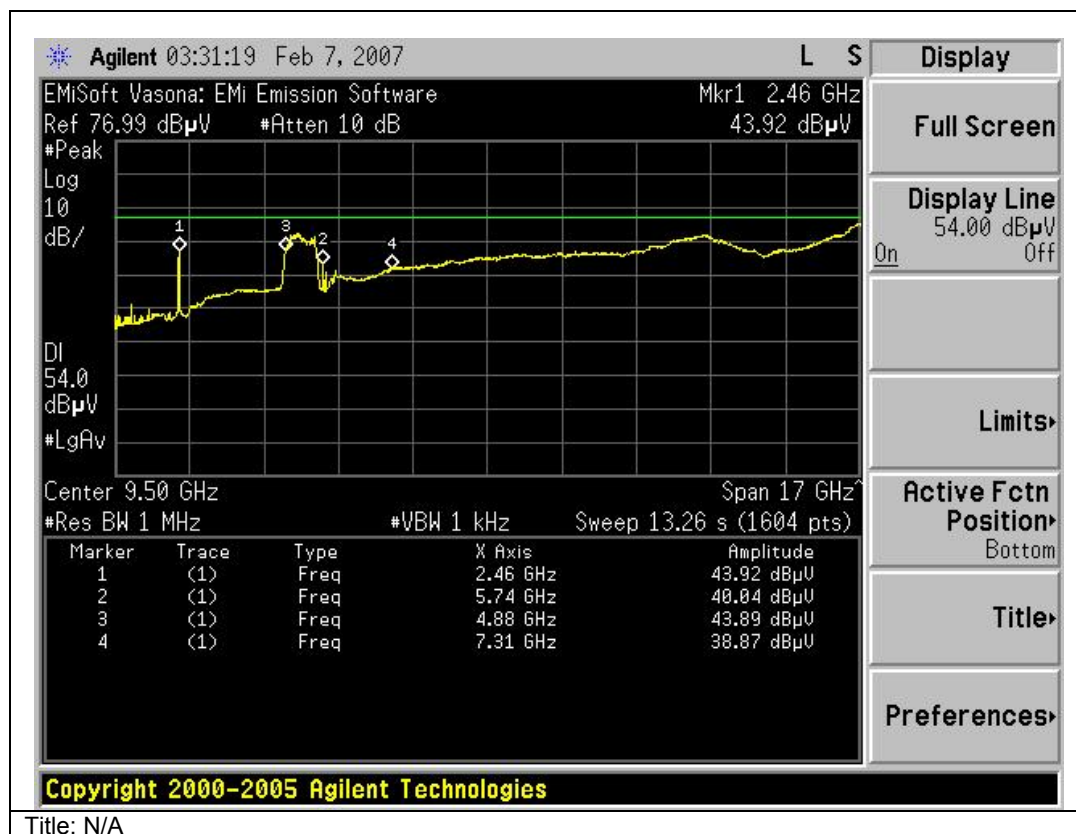


Subtest Number: 25509 - 4		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2412 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



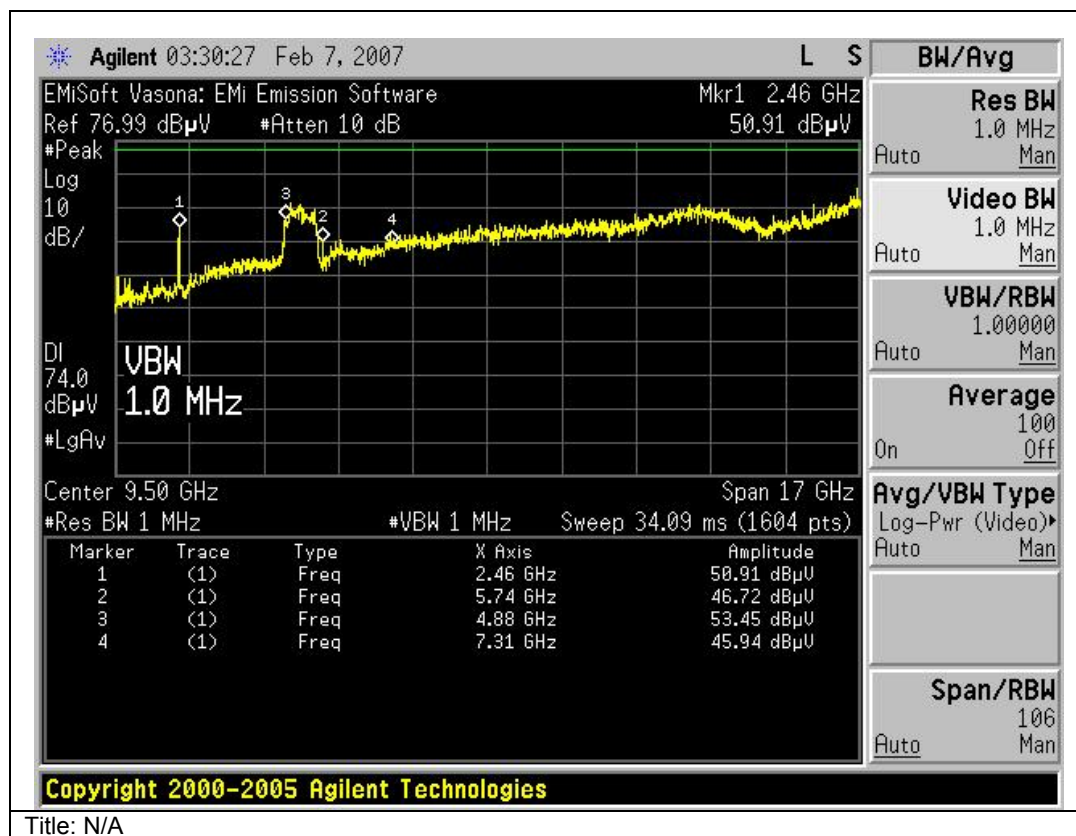


Subtest Number: 25509 - 5		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2437 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



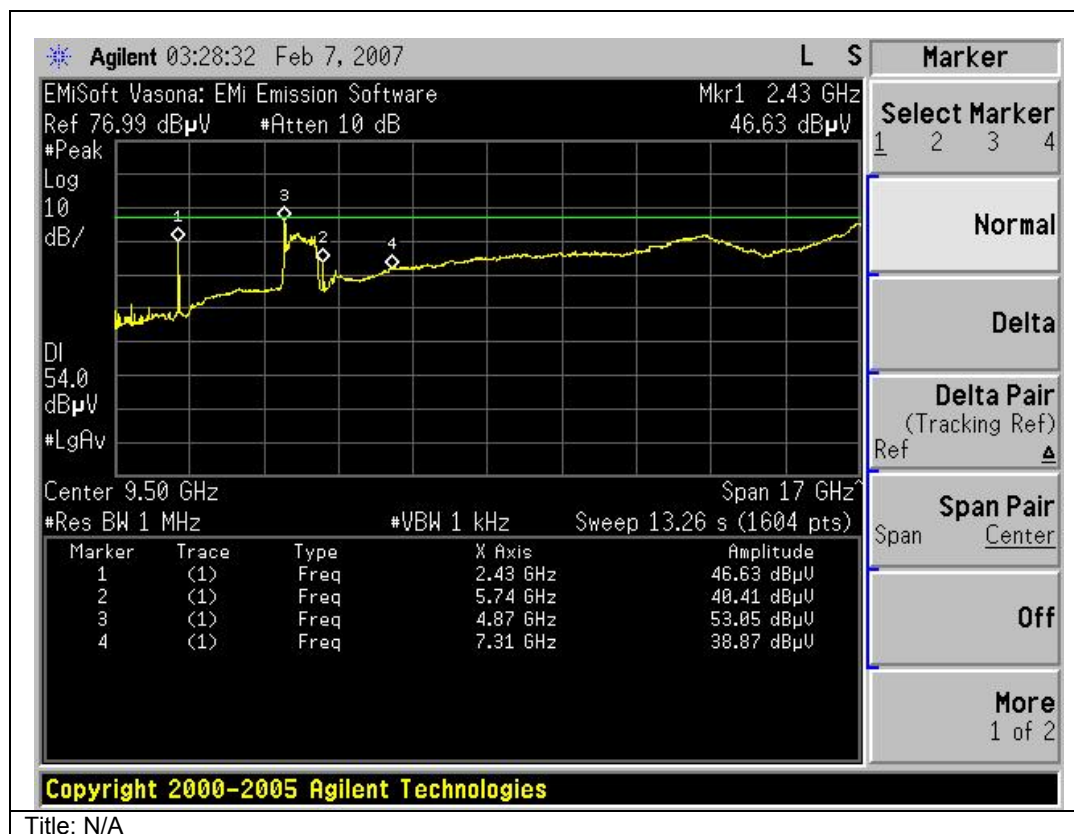


Subtest Number: 25509 - 6		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2437 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



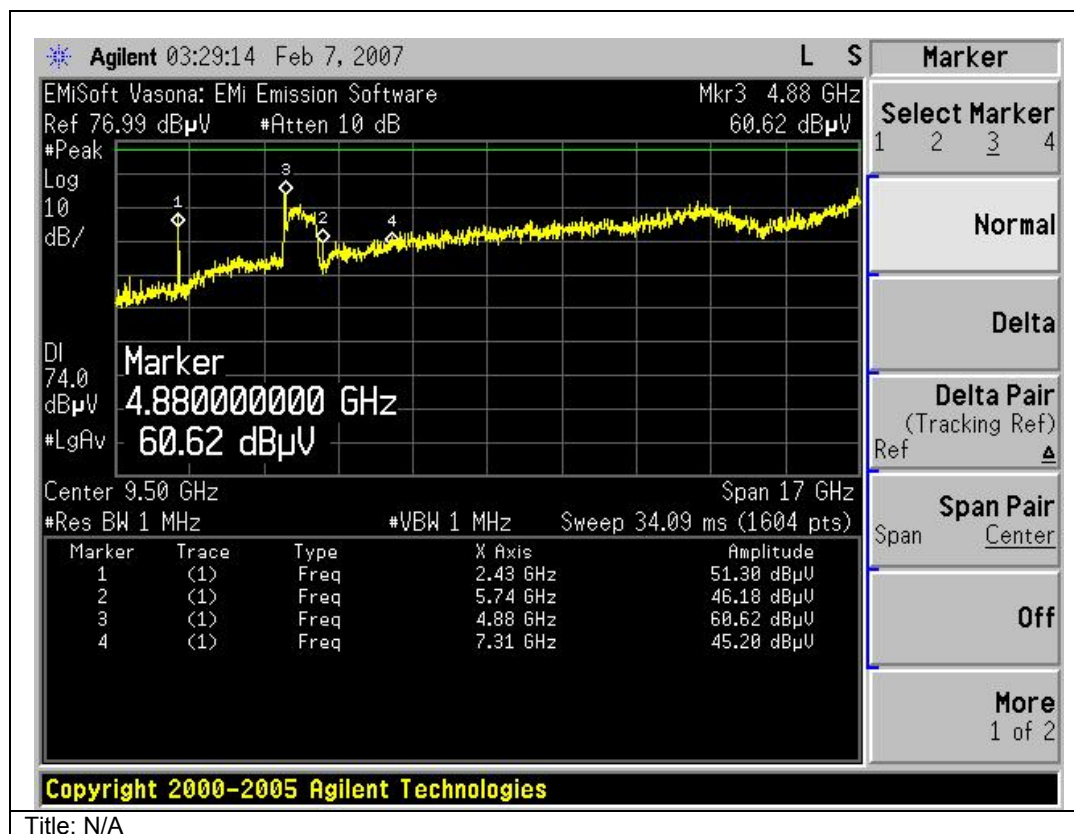


Subtest Number: 25509 - 7		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2437 MHz, 54 Mbps, 20 dBm, Dual Transmit Paths with Beam Forming, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



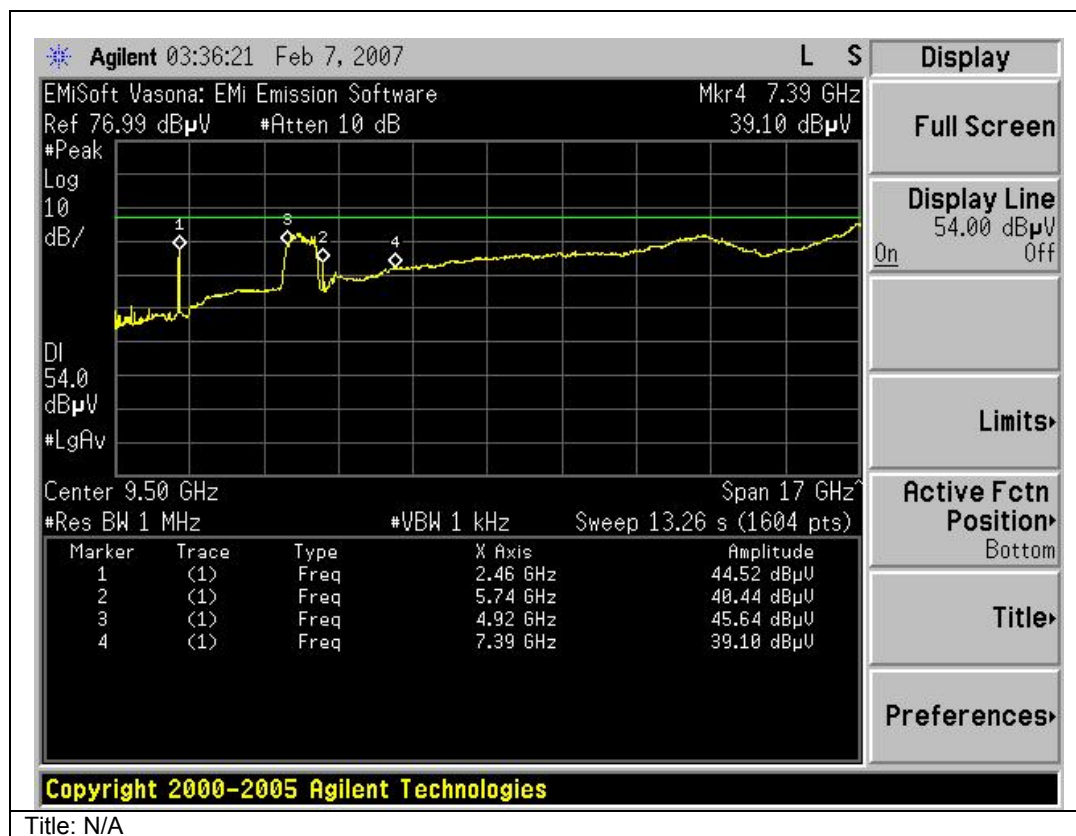


Subtest Number: 25509 - 8		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2437 MHz, 54 Mbps, 20 dBm, Dual Transmit Paths with Beam Forming, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, PEAK		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		

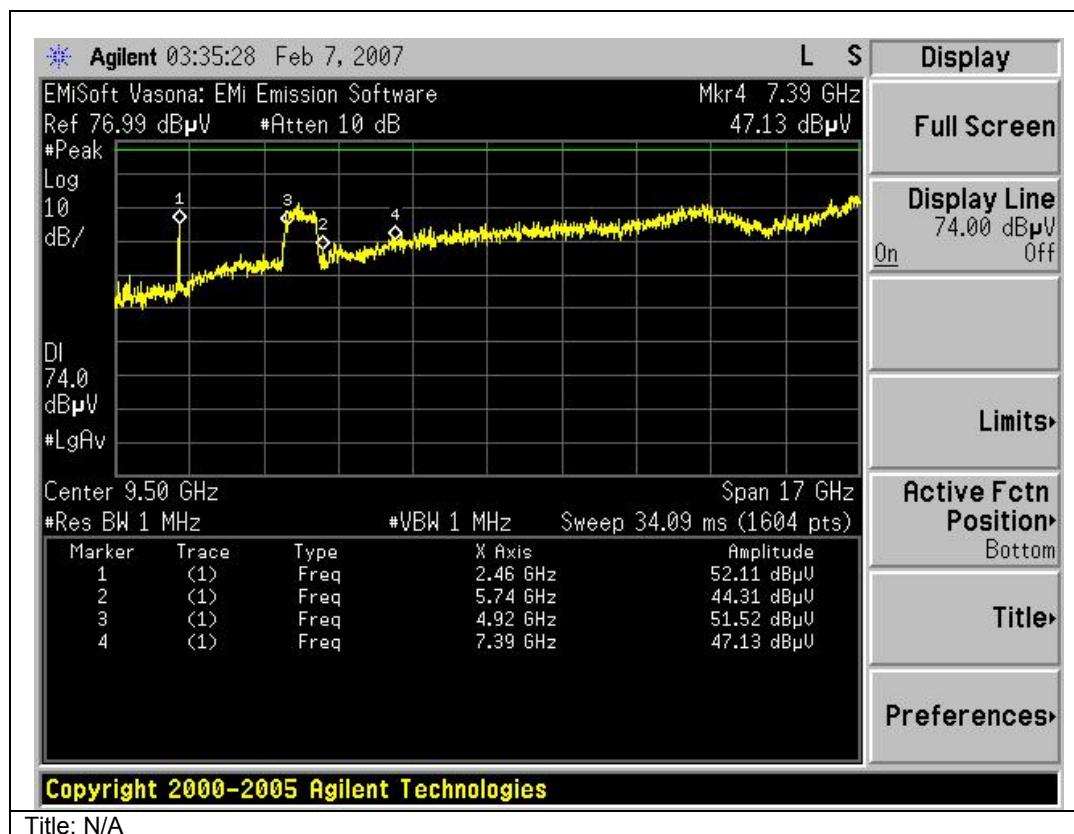




Subtest Number: 25509 - 9		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2462 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		

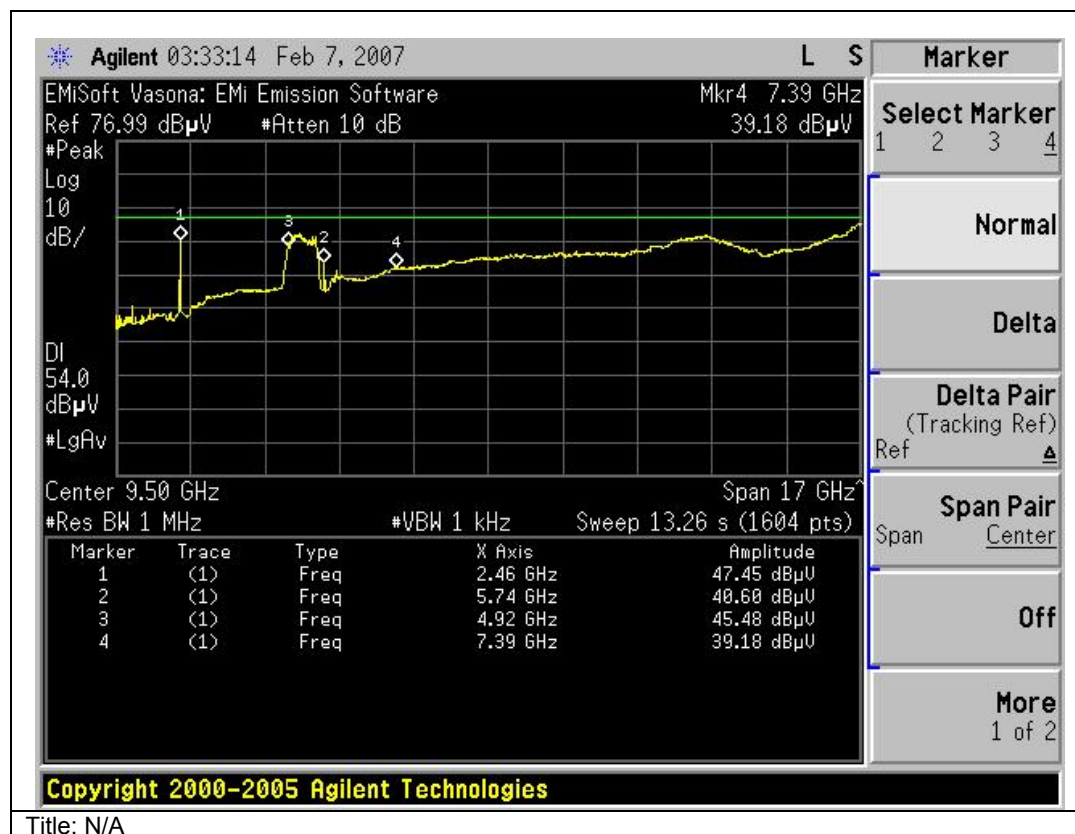


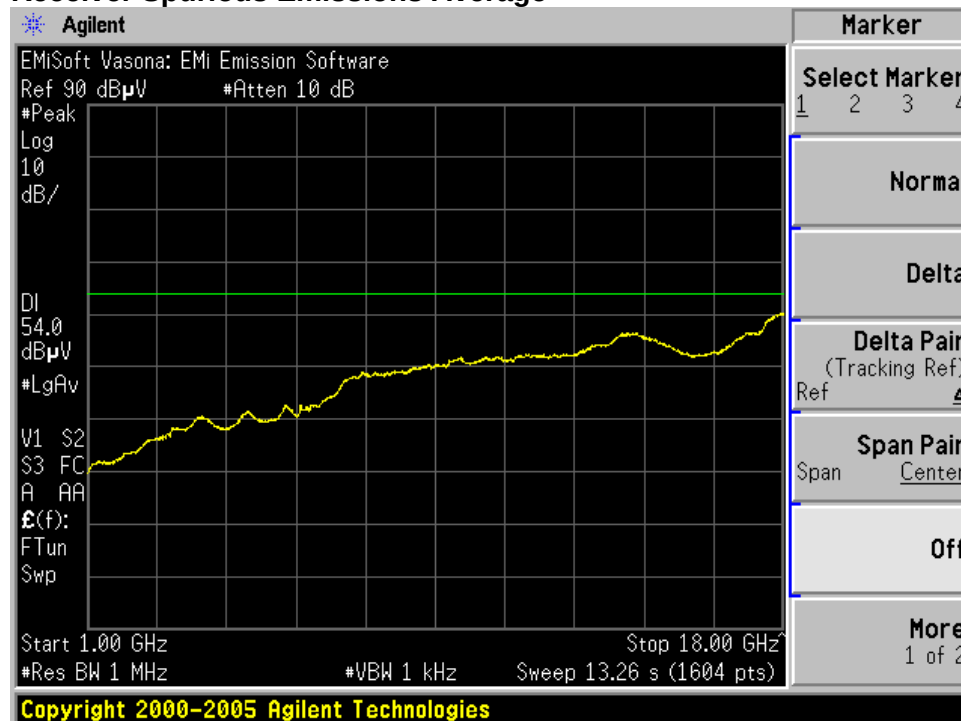
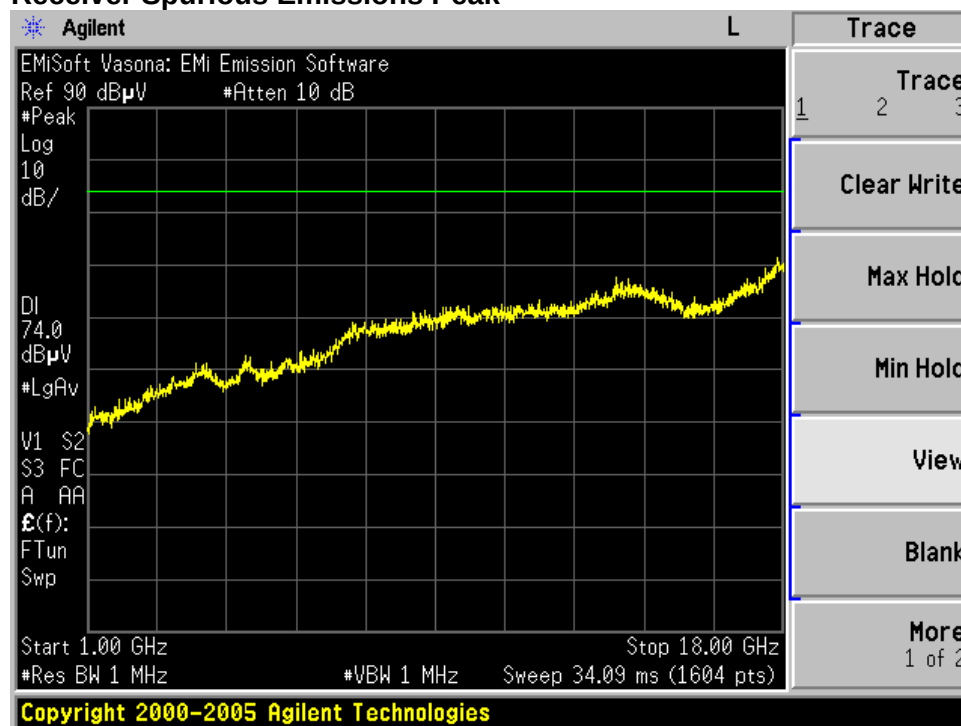
Subtest Number: 25509 - 10		Subtest Date: 06-Feb-2007
Engineer	James Nicholson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2462 MHz, 6 Mbps, 17dBm, Duplicate 2x20 MHz, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, PEAK	
Subtest Result	Pass	
Highest Frequency	12750.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	

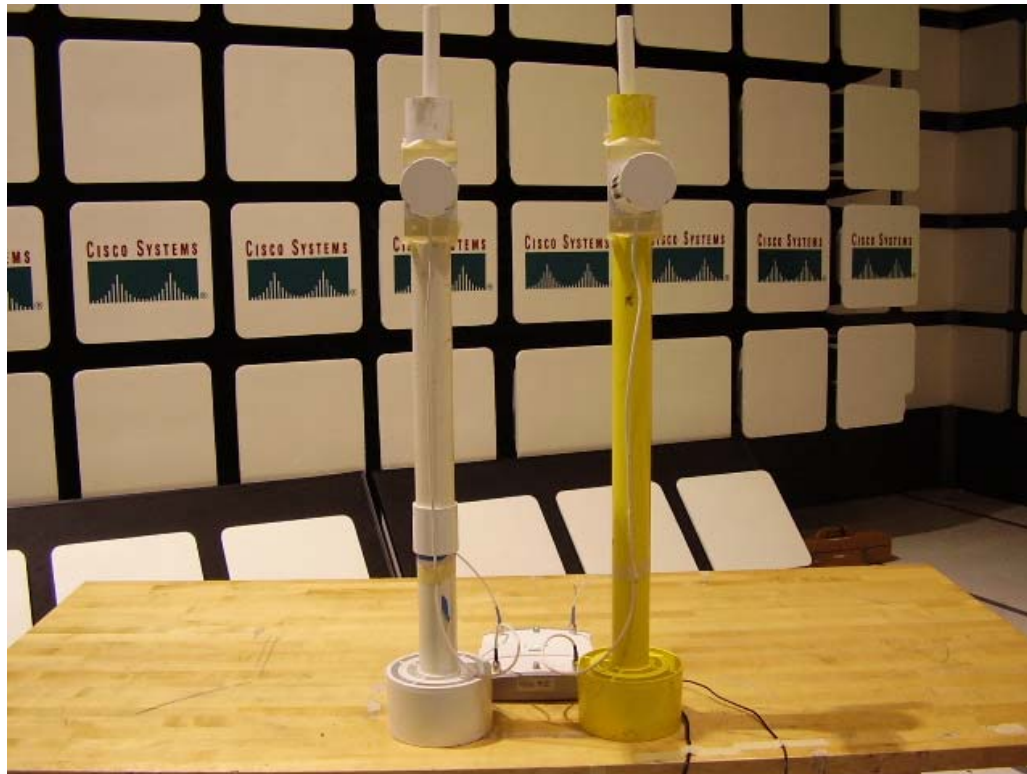




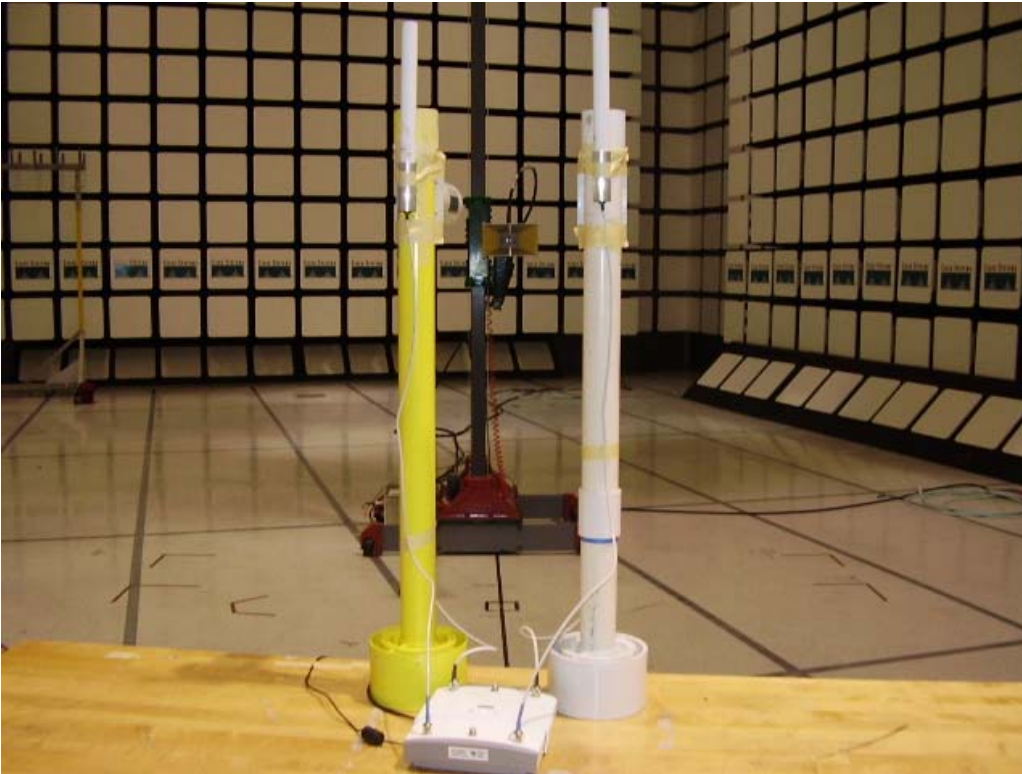
Subtest Number: 25509 - 11		Subtest Date: 06-Feb-2007	
Engineer	James Nicholson		
Lab Information	Building P, 10m Anechoic		
Subtest Results			
Subtest Title	RADIATED SPURIOUS EMISSIONS, 10dBi Yagi, 2462 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, Colocated with 6dBi Omni, 5745 MHz, 54 Mbps, 17dBm, Dual Transmit Paths with Beam Forming, AVERAGE		
Subtest Result	Pass		
Highest Frequency	12750.0		
Lowest Frequency	1000.0		
Comments on the above Test Results	No further comments		



Receiver Spurious Emissions Average**Receiver Spurious Emissions Peak**



Title: 2.4GHz with 10dBi Yagi Colocated with 5GHz and 6dBi Omni



Title: 2.4GHz with 10dBi Yagi Colocated with 5GHz and 6dBi Omni

**Conducted emissions**

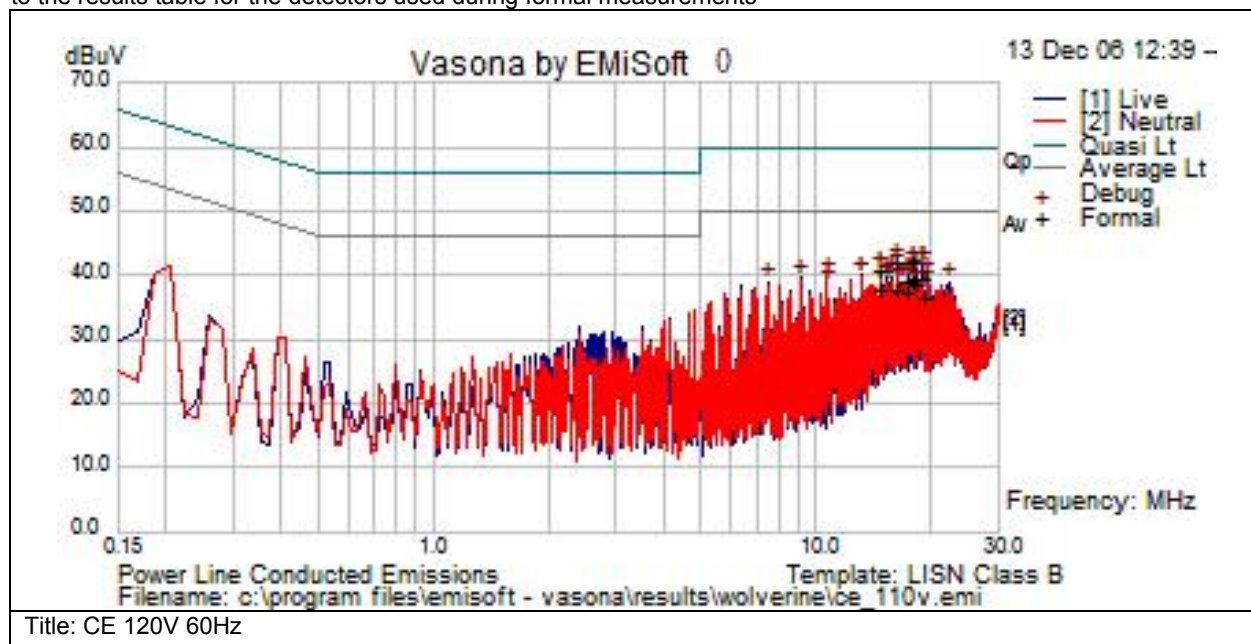
Test Number: 24621		Spec ID: 708		
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15: 2005 (CAN/CSA-CISPR 22-02)	AC Power Line	B	0.15- 30MHz	Test procedure must follow ANSI C63.4 and U.S line voltages must be used (e.g 110V 60Hz).
Operating Mode	Mode : 1, 2.4GHz & 5GHz			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03, S04, S05, S06, S07 and S08	☒	☐
2	Support equipment	S09, S10 and S11	☐	☒

Subtest Number: 24621 - 1		Subtest Date: 13-Dec-2006
Engineer	David Wilson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Line Under Test	AC/DC Power Brick	
Transducer	LISN	
Subtest Result	Pass	
Highest Frequency	30.0	
Lowest Frequency	0.15	
Comments on the above Test Results	EUT powered from 120V/60Hz AC source	

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measureme nt Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
17.935	15.9	20.5	0.3	36.8	Av	L	50	-13.2	Pass	
18.41	15.7	20.6	0.4	36.6	Av	N	50	-13.4	Pass	
16.328	15.1	20.5	0.2	35.8	Av	N	50	-14.2	Pass	
14.726	14.9	20.5	0.1	35.5	Av	L	50	-14.5	Pass	
17.452	14.4	20.5	0.3	35.2	Av	L	50	-14.8	Pass	
19.055	13.2	20.6	0.4	34.2	Av	L	50	-15.8	Pass	
16.328	19.4	20.5	0.2	40	Qp	N	60	-20	Pass	
17.935	18.9	20.5	0.3	39.8	Qp	L	60	-20.2	Pass	
14.726	18.1	20.5	0.1	38.7	Qp	L	60	-21.3	Pass	
18.41	16.5	20.6	0.4	37.4	Qp	N	60	-22.6	Pass	
19.055	16.2	20.6	0.4	37.2	Qp	L	60	-22.8	Pass	
17.452	16.2	20.5	0.3	37	Qp	L	60	-23	Pass	

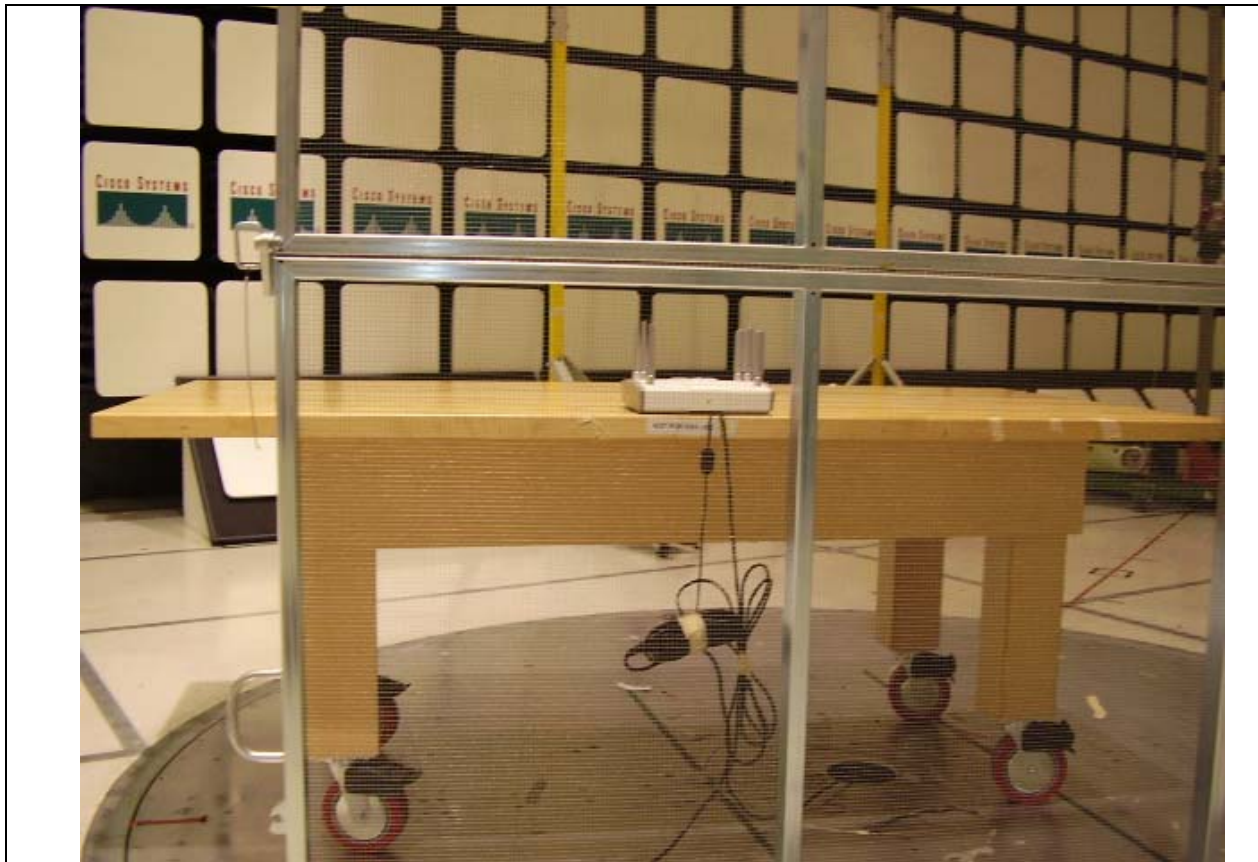
Physical Test arrangement Photograph:



Title: Conducted Power Line Emissions

Comments on the above Photograph:

Cable orientation



Title: Conducted Power Line Emissions

Comments on the above Photograph:

Showing VCP

**Radiated emissions**

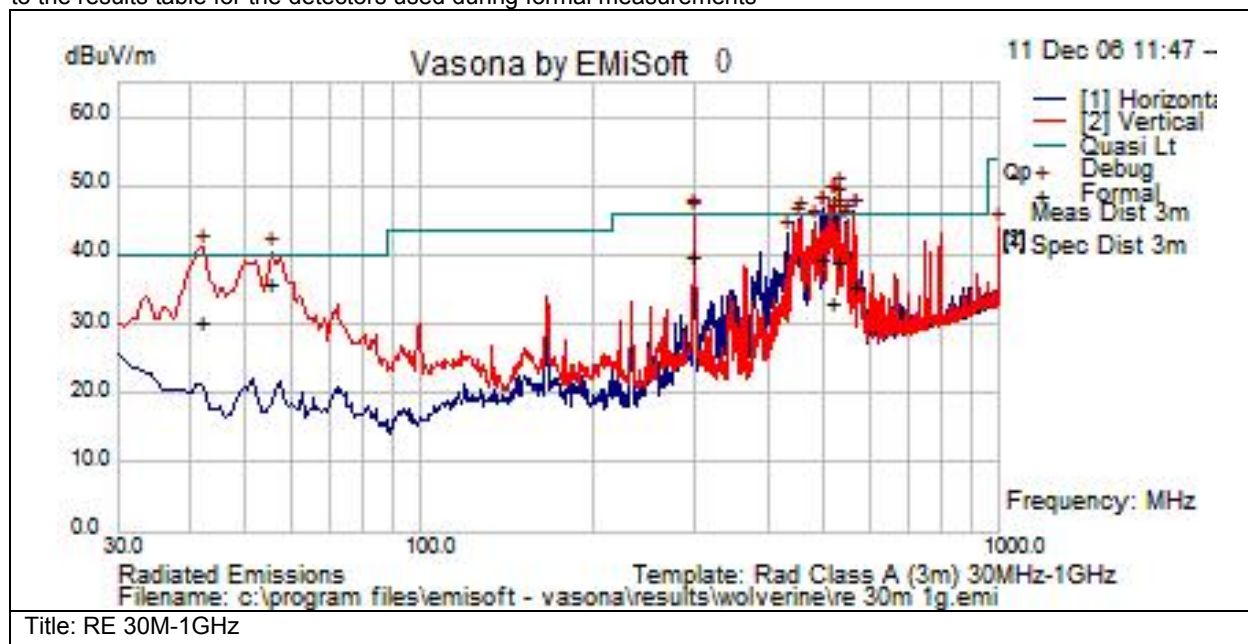
Test Number: 24538 Spec ID: 713				
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15: 2005	Enclosure	B	30MHz- 1GHz	N/A
Operating Mode	Mode : 1, 2.4GHz & 5GHz			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03, S04, S05, S06, S07 and S08	☒	☐
2	Support equipment	S09, S10 and S11	☐	☒

Subtest Number: 24538 - 1		Subtest Date: 11-Dec-2006
Engineer	David Wilson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	Radiated Emissions 30M-1GHz	
Subtest Result	Pass	
Highest Frequency	1000.0	
Lowest Frequency	30.0	
Comments on the above Test Results	No further comments	

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
55.592	27.8	0.8	5.3	33.9	Qp	V	106	68	40	-6.1	Pass	
298.539	23.4	1.9	12.7	38	Qp	V	106	182	46	-8	Pass	
498.066	17.7	2.5	17.5	37.7	Qp	H	180	172	46	-8.3	Pass	
531.182	17	2.4	17.8	37.2	Qp	V	185	267	46	-8.8	Pass	
41.902	17.1	0.7	10.3	28.2	Qp	V	140	177	40	-11.8	Pass	
563.862	12.8	2.5	18.4	33.7	Qp	H	143	148	46	-12.3	Pass	
518.555	11.3	2.4	17.6	31.3	Qp	H	348	11	46	-14.7	Pass	

Physical Test arrangement Photograph:



Title: Radiated Emissions 30M-1GHz

Comments on the above Photograph:

EUT



Comments on the above Photograph:

Set-upRadiated emissions



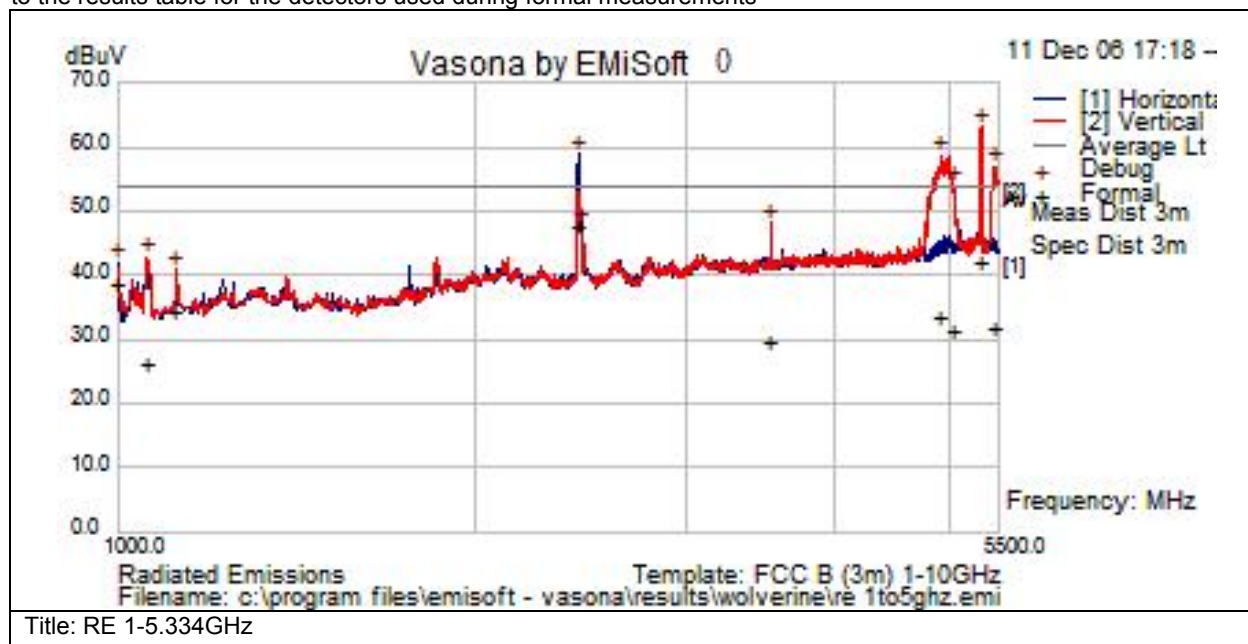
Test Number: 24558 Spec ID: 714				
Basic Standard	Applied to	Class	Freq Range	Test Details / Comments
CFR47 Part 15: 2005	Enclosure	B	1GHz-5.334GHz	N/A
Operating Mode	Mode : 1, 2.4GHz & 5GHz			
Power Input	110, 60Hz (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	Description	Samples	System under test	Support equipment
1	EUT	S01, S02, S03, S04, S05, S06, S07 and S08	☒	☐
2	Support equipment	S09, S10 and S11	☐	☒

Subtest Number: 24558 - 1		Subtest Date: 11-Dec-2006
Engineer	David Wilson	
Lab Information	Building P, 10m Anechoic	
Subtest Results		
Subtest Title	Radiated Emissions 1-5.334GHz	
Subtest Result	Pass	
Highest Frequency	5500.0	
Lowest Frequency	1000.0	
Comments on the above Test Results	No further comments	

Graphical Test Results

Note that the data displayed on the plots detailed in this appendix were measured using a 'Peak Detector'. Please refer to the results table for the detectors used during formal measurements



Test Results Table

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2443.417	47.1	8.1	-9.5	45.7	Av	H	400	139	54	-8.3	Pass	Carrier
5321.469	35.5	11.4	-6.8	40.1	Av	V	128	338	54	-13.9	Pass	Carrier
1000	47.4	4	-14.8	36.6	Av	H	228	143	54	-17.4	Pass	
1119.971	42	4.3	-14.1	32.2	Av	V	146	130	54	-21.8	Pass	
4920.173	29.7	9	-7.5	31.2	Av	V	261	338	54	-22.8	Pass	Carrier sideba
5478.853	25.7	10.2	-6.3	29.6	Av	V	118	286	54	-24.4	Pass	Carrier sideba
5053.246	25.3	11.2	-7.2	29.3	Av	V	98	167	54	-24.7	Pass	
3546.414	27.7	7.5	-7.8	27.3	Av	V	336	51	54	-26.7	Pass	
1058.874	34.3	4.2	-14.5	24	Av	V	190	153	54	-30	Pass	

Physical Test arrangement Photograph:



Title: Radiated Emissions 1-5.334GHz

Comments on the above Photograph:

No further comments



Appendix C: Abbreviation Key and Definitions

The following table defines abbreviations used within this test report.

Abbreviation	Description	Abbreviation	Description
EMC	Electro Magnetic Compatibility	°F	Degrees Fahrenheit
EMI	Electro Magnetic Interference	°C	Degrees Celsius
EUT	Equipment Under Test	Temp	Temperature
ITE	Information Technology Equipment	S/N	Serial Number
TAP	Test Assessment Schedule	Qty	Quantity
ESD	Electro Static Discharge	emf	Electromotive force
EFT	Electric Fast Transient	RMS	Root mean square
EDCS	Engineering Document Control System	Qp	Quasi Peak
Config	Configuration	Av	Average
CIS#	Cisco Number (unique identification number for Cisco test equipment)	Pk	Peak
Cal	Calibration	kHz	Kilohertz (1×10^3)
EN	European Norm	MHz	Megahertz (1×10^6)
IEC	International Electro technical Commission	GHz	Gigahertz (1×10^9)
CISPR	International Special Committee on Radio Interference	H	Horizontal
CDN	Coupling/Decoupling Network	V	Vertical
LISN	Line Impedance Stabilization Network	dB	decibel
PE	Protective Earth	V	Volt
GND	Ground	kV	Kilovolt (1×10^3)
L1	Line 1	μ V	Microvolt (1×10^{-6})
L2	Line2	A	Amp
L3	Line 3	μ A	Micro Amp (1×10^{-6})
DC	Direct Current	mS	Milli Second (1×10^{-3})
RAW	Uncorrected measurement value, as indicated by the measuring device	μ S	Micro Second (1×10^{-6})
RF	Radio Frequency	μ S	Micro Second (1×10^{-6})
SLCE	Signal Line Conducted Emissions	m	Meter
Meas dist	Measurement distance	Spec dist	Specification distance
N/A or NA	Not Applicable	SL	Signal Line (or Telecom Line)
P	Power Line	L	Live Line
N	Neutral Line	R	Return
S	Supply	AC	Alternating Current

**Appendix D: Test Equipment/Software Used to perform the test**

Equip#	Manufacturer/ Model	Description	Last Cal	Next Due	Test Number(s)
5568	HP/	PreAmplifier (1-26.5GHz)	8-Sep-06	8-Sep-07	[25010]
	8449B				
5691	Miteq/	Broadband Preamplifier (1-18GHz)	9-Oct-06	9-Oct-07	[25010]
	NSP1800-25-S1				
21117	Micro-Coax/	RF Coaxial Cable, to 18GHz, 248.4 in	19-Aug-06	19-Aug-07	[25010]
	UFB311A-0-2484-520520				
25657	Micro-Coax/	RF Coaxial Cable, to 18GHz, 84 in	19-Aug-06	19-Aug-07	[25010]
	UFB311A-1-0840-504504				
30495	Agilent/	SPDT RF Switch, to 18GHz	7-Apr-06	7-Apr-07	[25010]
	8761B				
30564	Micro-Coax/	RF Coaxial Cable, to 18GHz, 95 in	19-Aug-06	19-Aug-07	[25010]
	UFB311A-1-0950-504504				
32801	ETS-Lindgren/	Double Ridged Waveguide Horn Antenna	28-Jul-06	28-Jul-07	[25010]
	3117				
34974	Midwest Microwave/	Attenuator, 20dB, DC-40GHz	9-May-06	9-May-07	[24973], [25010]
	ATT-0640-20-29M-02				
35038	Micro-Tronics/	Notch Filter, SB:5.150-5.350GHz, to 11GHz	17-Jul-06	17-Jul-07	[25010]
	BRC50703-02				
35098	Micro-Coax/	RF Coaxial Cable, to 40 GHz, 18 in	26-Apr-06	26-Apr-07	[24973], [25010]
	UFA147A-0-0180-110200				
35285	ETS-Lindgren/	Double Ridged Waveguide Horn Antenna	25-May-06	25-May-07	[25010]
	3117				
35605	Micro-Tronics/	Notch Filter, SB:5.470-5.725GHz, to 12GHz	17-Jul-06	17-Jul-07	[25010]
	BRC50704-02				
37576	Micro-Coax/	RF Coaxial Cable, to 18GHz, 320 in	15-May-06	15-May-07	[25010]
	UFB293C-Q-3200-50U50U				
3325	HP/	EMI Receiver RF Section	30-Oct-06	30-Oct-07	[24538], [24621]
	85462A				
5558	Fischer Custom Communications/	Coupling/Decoupling Network	28-Mar-06	28-Mar-07	[24621]
	FCC-801-M2-32A				
5704	Fischer Custom Communications/	LISN	16-Mar-06	16-Mar-07	[24621]
	FCC-LISN-50-50				
6324	Lufft/	Thermo-Hydrometer	16-Oct-06	16-Oct-07	[24538], [24558], [24621]
	5063-33W				
7591	Agilent/	RF Filter Section	30-Oct-06	30-Oct-07	[24538], [24621]
	85460A				
8195	TTE/	Hi Pass Filter - 150KHz cutoff	4-Jan-06	4-Jan-07	[24621]



	H613-150K-50-21378				
8320	Times Microwave Systems/ RG-214	3 ft RG-214 Cable	16-Nov-06	16-Nov-07	[24538]
8366	Coleman/ RG-223	1.5 ft RG-223 Cable	7-Nov-06	7-Nov-07	[24621]
8375	Andrew/ F4A-PNMNM	49 ft Heliac Cable	16-Mar-06	16-Mar-07	[24621]
8588	Fischer Custom Communications/ FCC-RFM2F-520R	LISN AC Adaptor - Std 120V outlet	16-Mar-06	16-Mar-07	[24621]
18713	Fischer Custom Communications/ F-203I-DCN-32mm	Ferrite Decoupler	Cal Not Required	N/A	[24538], [24558]
18963	York/ CNE V	Comparison Noise Emitter, 30 - 1000MHz	22-May-06	22-May-07	[24621]
20767	Fischer Custom Communications/ FCC-450B-2.4-N	Instrumentation Limiter	10-Jul-06	10-Jul-07	[24621]
20975	Micro-Coax/ UFB311A-0-1344-520520	RF Coaxial Cable, to 18GHz, 134.4 in	16-Mar-06	16-Mar-07	[24538]
21116	Micro-Coax/ UFB311A-0-3540-520520	RF Coaxial Cable, to 18GHz, 354 in	16-Mar-06	16-Mar-07	[24538]
27233	York/ CNE V	Comparison Noise Emitter	22-May-06	22-May-07	[24538], [24558]
30442	Micro-Coax/ UFB311A-0-4800-520520	RF Coaxial Cable, to 18GHz, 480 in.	16-Mar-06	16-Mar-07	[24558]
30565	Micro-Coax/ UFB311A-1-3510-504504	Rf Coaxial Cable to 18GHz, 351 in	17-Mar-06	17-Mar-07	[24558]
30652	Sunol Sciences/ JB1	Combination Antenna, 30MHz-2GHz	6-Jul-06	6-Jul-07	[24538]
32455	Midwest Microwave/ CSY-MNMN-82-273001	RF Coaxial Cable to 18 GHz	11-Sep-06	11-Mar-07	[24621]
32544	ETS-Lindgren/ 3117	Double Ridged Waveguide Horn Antenna	5-Jul-06	5-Jul-07	[24558]
32671	Cisco/ TH0118	Mast Mount Preamplicifier Array, 1-18GHz	21-Jun-06	21-Jun-07	[24558]
32840	Fluke/ 112	Digital Multimeter	16-Jun-06	16-Jun-07	[24621]
34188	Micro-Tronics/ BRC50703-02	Notch Filter, SB:5.150-5.350GHz, to 11GHz	17-Jul-06	17-Jul-07	[24558]
34304	Micro-Tronics/ BRM50702-02	Notch Filter, SB:2.4-2.5GHz, to 18GHz	17-Jul-06	17-Jul-07	[24558]



35097	Micro-Coax/	RF Coaxial Cable, to 40 GHz, 18 in	6-Mar-06	6-Mar-07	[24558]
	UFA147A-0-0180-110200				
35248	Stanley/	Tape Measure	9-May-06	9-May-07	[24621]
	33-696				
37241	Micro-Coax/	RF Coaxial Cable, to 18 GHz, 320 in	11-Sep-06	11-Mar-07	[24538]
	UFB293C-Q-3200-50U50U				
37533	Agilent/	Precision Spectrum Analyzer	24-Feb-06	24-Feb-07	[24538], [24558], [24621]
	E4440A				
513	Gigatronics/	Universal Power Meter	20-Dec-06	20-Dec-07	[25232], [25234], [25251], [25253], [25260], [25267]
	8542C				
514	Gigatronics/	Power Sensor, 0.01-18GHz	19-Dec-06	19-Dec-07	[25232], [25234], [25251], [25253], [25260], [25267]
	80420A				
590	Agilent/	Spectrum Analyzer	2-Feb-05	2-Feb-07	[25232], [25234], [25251], [25253], [25260], [25267]
	E4448A				

Maximum Permissible Exposure (MPE) Calculations

15.247: Systems operating under the provisions of this section are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Given

$$E = \sqrt{(30 \cdot P \cdot G)/d} \quad \text{and} \quad S = E^2/3770$$

where

E=Field Strength in Volts/meter

P=Power in Watts

G=Numeric Antenna Gain

d=Distance in meters

S=Power Density in mW/cm²

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

$$d = \sqrt{((30 \cdot P \cdot G)/(3770 \cdot S))}$$

Changing to units of power in mW and distance in cm, using:

$$P(\text{mW}) = P(\text{W})/1000 \quad d(\text{cm}) = 100 \cdot d(\text{m})$$

yields

$$d = 100 \cdot \sqrt{((30 \cdot (P/1000) \cdot G)/(3770 \cdot S))}$$

$$d = 0.282 \cdot \sqrt{(P \cdot G/S)}$$

where

d=Distance in cm

P=Power in mW

G=Numerical Antenna Gain

S=Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P(\text{mW}) = 10^{(P(\text{dBm})/10)} \quad G(\text{numeric}) = 10^{(G(\text{dBi})/10)}$$

yields

$$d = 0.282 \cdot 10^{((P+G)/20)} / \sqrt{S} \quad \text{Equation (1)}$$

and

$$S = ((0.282 \cdot 10^{((P+G)/20)})/d)^2 \quad \text{Equation (2)}$$

where

d=MPE distance in cm

P=Power in dBm

G=Antenna Gain in dBi

S=Power Density in mW/cm²



Equation (1) and the measured peak power are used to calculate the MPE distance. Note that for mobile or fixed location transmitters such as an access point, the minimum separation distance is 20 cm even if the calculations indicate that the MPE distance may be less.

$S=1\text{mW/cm}^2$ maximum. The highest supported antenna gain is 6 dBi (9dBi with beamforming). Using the peak power levels recorded in the test report along with Equation 1 above, the MPE distances are calculated as follows.

Frequency (MHz)	Bit Rate (Mbps)	Power Density (mW/cm ²)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)	Limit (cm)	Margin (cm)
2412	54	1	19.8	13	12.31	20	7.69
2437	54	1	23	13	17.79	20	2.21
2462	54	1	20.5	13	13.34	20	6.66

MPE Calculations

To maintain compliance, installations will assure a separation distance of at least 20cm.

Using Equation 2, the MPE levels (s) at 20 cm are calculated as follows:

Frequency (MHz)	Bit Rate (Mbps)	MPE Distance (cm)	Peak Transmit Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Margin (mW/cm ²)
2412	54	20	19.8	13	0.38	1	0.62
2437	54	20	23	13	0.79	1	0.21
2462	54	20	20.5	13	0.45	1	0.55