FCC CFR47 PART 15 SUBPART E
CERTIFICATION TEST REPORT

FOR

802.11a POINT TO POINT TRANSCEIVER

MODEL NUMBERS: P5055M-INT-19, P5055M-INT-23, P5055M-EXT

FCC ID: NCYP5055M

REPORT NUMBER: 06U10393-1

ISSUE DATE: APRIL 27, 2007

Prepared for
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Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/27/07	Initial Issue	M. Heckrotte

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TRANGO SYSTEMS, INC.
15070 AVENUE OF SCIENCE, SUITE 200
SAN DIEGO, CA 92128
U.S.A.

EUT DESCRIPTION: 802.11a POINT TO POINT TRANSCEIVER

MODELS: P5055M-INT-19, P5055M-INT-23, P5055M-EXT

SERIAL NUMBER: 06380011

DATE TESTED: JULY 03, 2006 TO APRIL 15, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

MICHAEL HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

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EMC ENGINEER
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA and at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a Point to Point transceiver.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power, utilized with the lowest antenna gain, as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5265 - 5325	802.11a	9.64	9.20
5500 - 5700	802.11a	9.55	9.02

The power is adjustable for higher antenna gains and TPC purposes.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio can be configured with an 18 dBi patch antenna (Model P5055M-INT-19), a 22 dBi patch antenna (Model P5055M-INT-23), or dish antennas with gains in the range of 27 to 33dBi (Model P5055M- EXT). These antenna gain specifications are applicable to the 5.3 and 5.5 GHz bands.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was P5055.

The EUT driver software installed in the host support equipment during testing was Window XP, rev. 5.1.2600

The test utility software used during testing was Command Prompt.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
PoE	Trango	N/A	8/22/1904	N/A
Switching Adapter	Technics	TESA1-240075	1726	DoC
Laptop	SONY	PCG-R50SEL	1695	DoC
AC/DC Adapter	SONY	PCGA-AC19V1	044D0183529	N/A

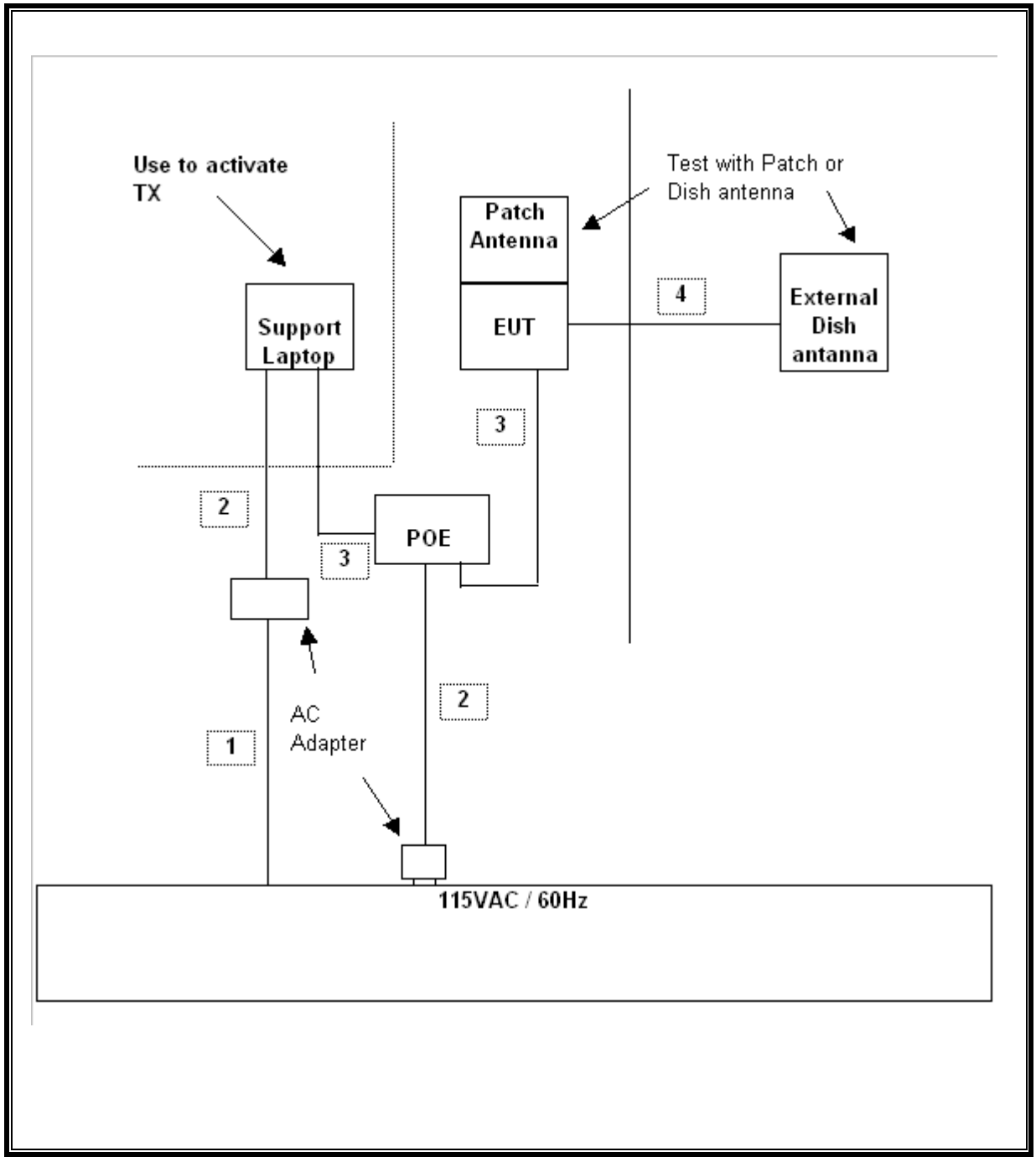
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	1m	No
2	DC	2	DC Plug	Un-shielded	1.5m	No
3	WLAN	3	RJ45	Un-shielded	1.5m	Yes
4	BNC	1	BNC	Shielded	1.5m	Yes

TEST SETUP

The EUT is connected to a host laptop computer via a PoE during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	04/22/07
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	04/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/03/07
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	08/18/07
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	09/12/07
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	04/13/07
EMI Test Receiver	R & S	ESHS 20	827129/006	06/03/07
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	08/30/07
Bilog Antenna 30 MHz ~ 2 GHz	Sunol Sciences	JB1	A121003	09/03/07
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	01/23/08
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	01/07/08
Quasi-Peak Adaptor	Agilent / HP	85650A	3145A01654	01/21/08
SA Display Section 2	Agilent / HP	85662A	2816A16696	04/07/08
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/02/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/02/07
Spectrum Analyzer	Agilent / HP	E4446A	MY43360112	05/03/07
7.6GHz HPF	MicroTronic	HPM13195	1	CNR

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 5250 TO 5350 MHz BAND

7.1.1. EMISSION BANDWIDTH

LIMIT

§15.403 (i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

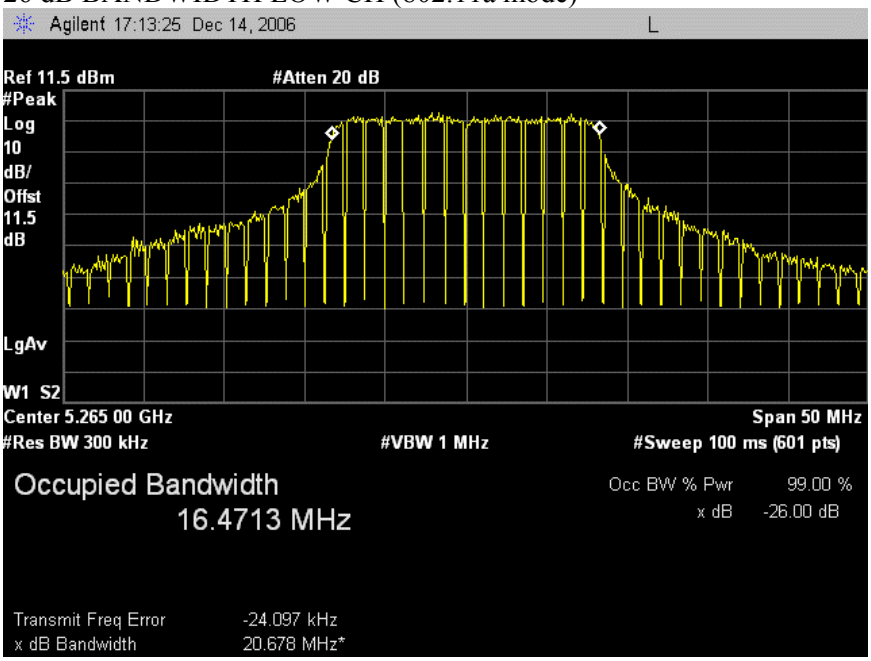
No non-compliance noted:

802.11a Mode (For 18 dBi Patch Antenna)

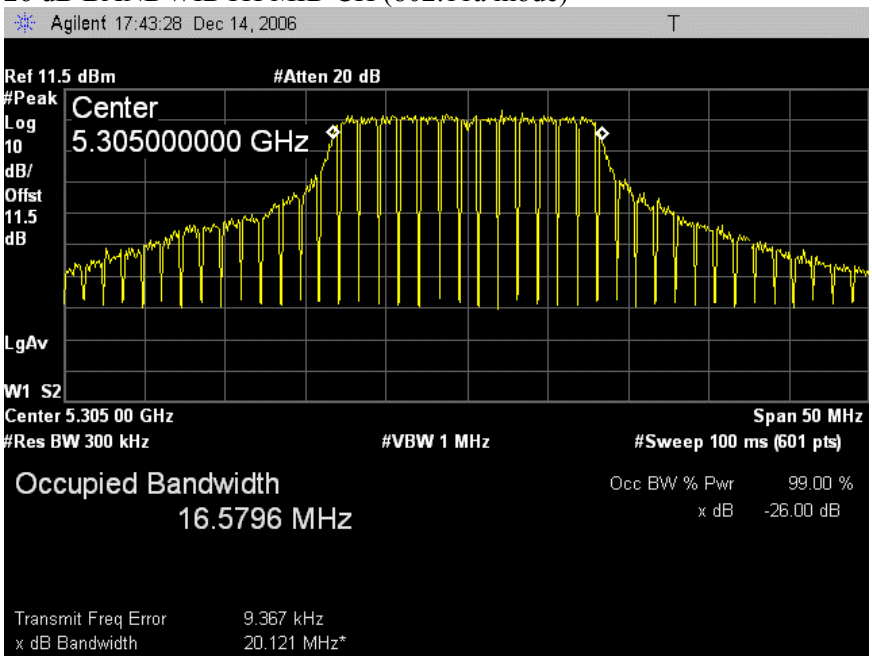
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5265	20.678	13.16
Middle	5305	20.121	13.04
High	5325	21.364	13.30

26 dB EMISSION BANDWIDTH (802.11a MODE) (For 18 dBi Patch Antenna)

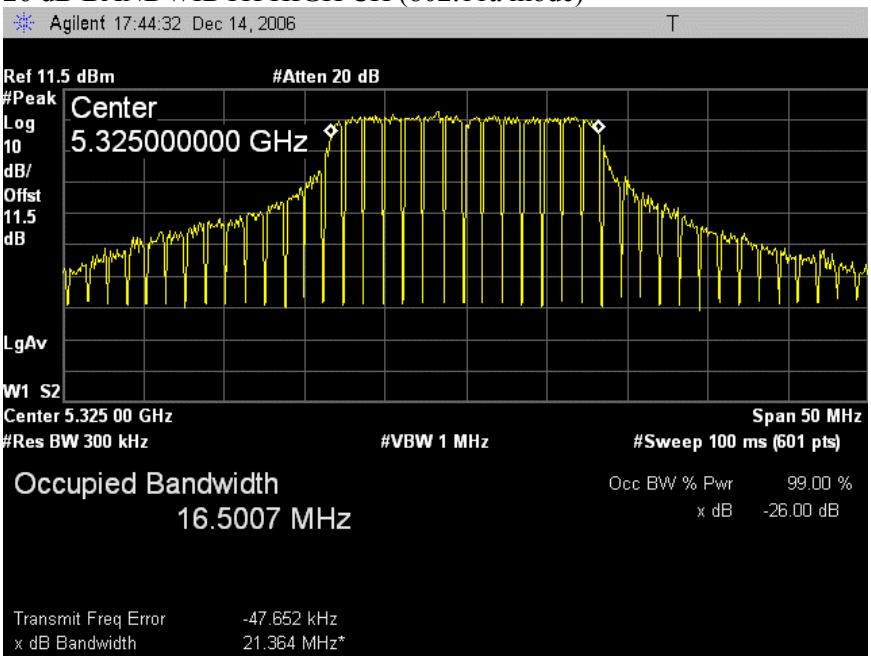
26 dB BANDWIDTH LOW CH (802.11a mode)



26 dB BANDWIDTH MID CH (802.11a mode)



26 dB BANDWIDTH HIGH CH (802.11a mode)



7.1.2. PEAK POWER

LIMIT

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS (For 18 dBi Patch Antenna)

No non-compliance noted:

Limit

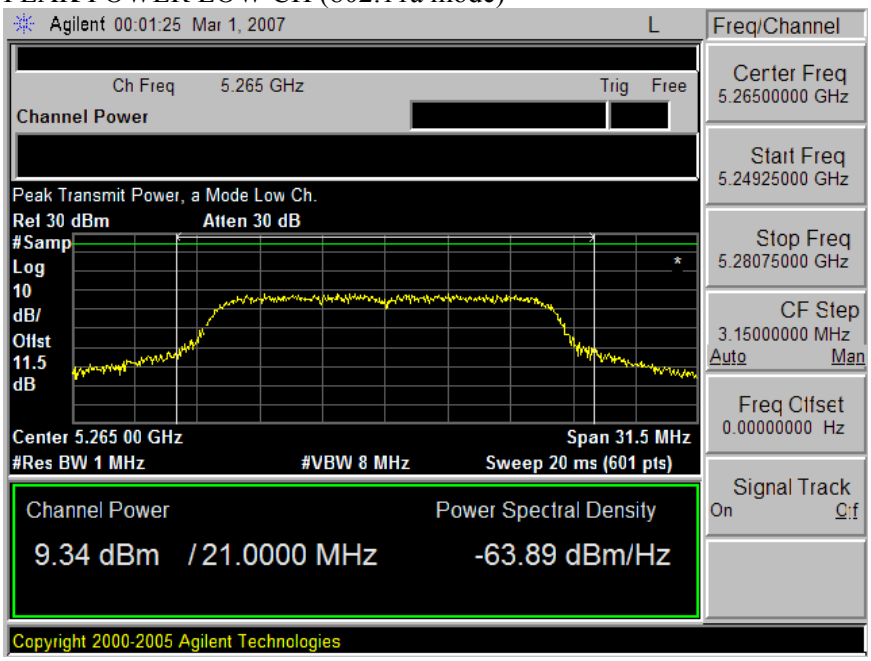
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5265	24	20.678	24.16	18.00	12.00
Mid	5305	24	20.121	24.04	18.00	12.00
High	5325	24	21.364	24.30	18.00	12.00

Results

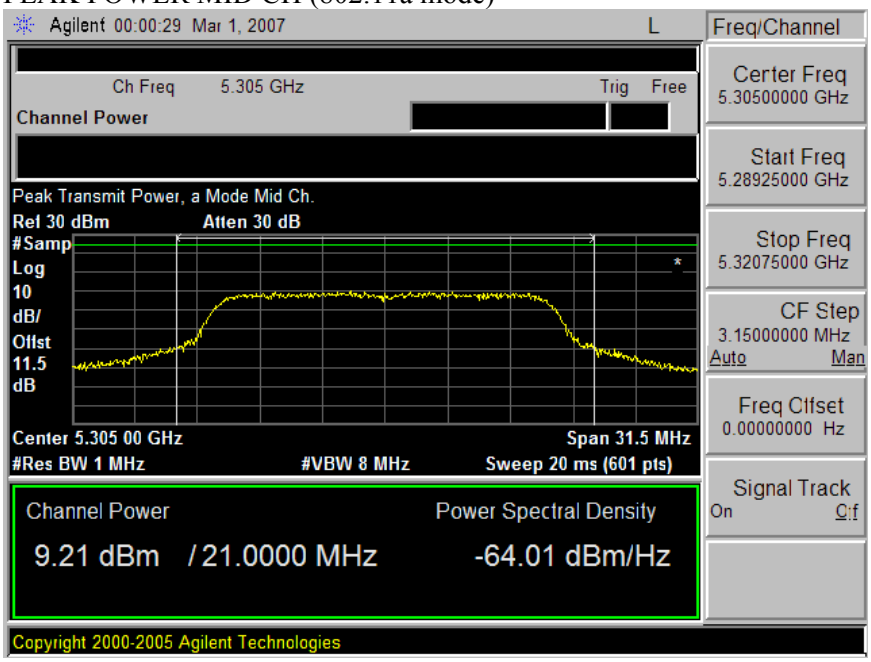
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5265	9.34	12.00	-2.66
Mid	5305	9.21	12.00	-2.79
High	5325	9.64	12.00	-2.36

PEAK POWER (802.11a MODE) (For 18 dBi Patch Antenna)

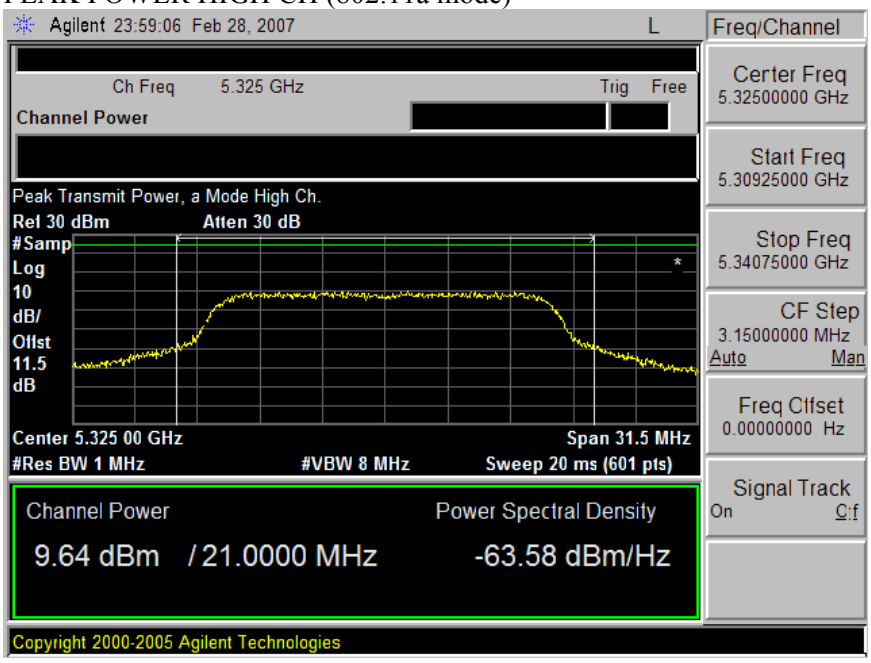
PEAK POWER LOW CH (802.11a mode)



PEAK POWER MID CH (802.11a mode)



PEAK POWER HIGH CH (802.11a mode)



7.1.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G) / d}$

and

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

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

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

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 \wedge ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 \wedge ((P + G) / 10) / (d\wedge 2)$

LIMITS

From §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11a	20.0	9.64	18.00	0.12

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.1.4. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.3dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode 18dBi Patch Antenna gain

Channel	Frequency (MHz)	Average Power (dBm)
Low	5265	9.11
Middle	5305	9.00
High	5325	9.40

7.1.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

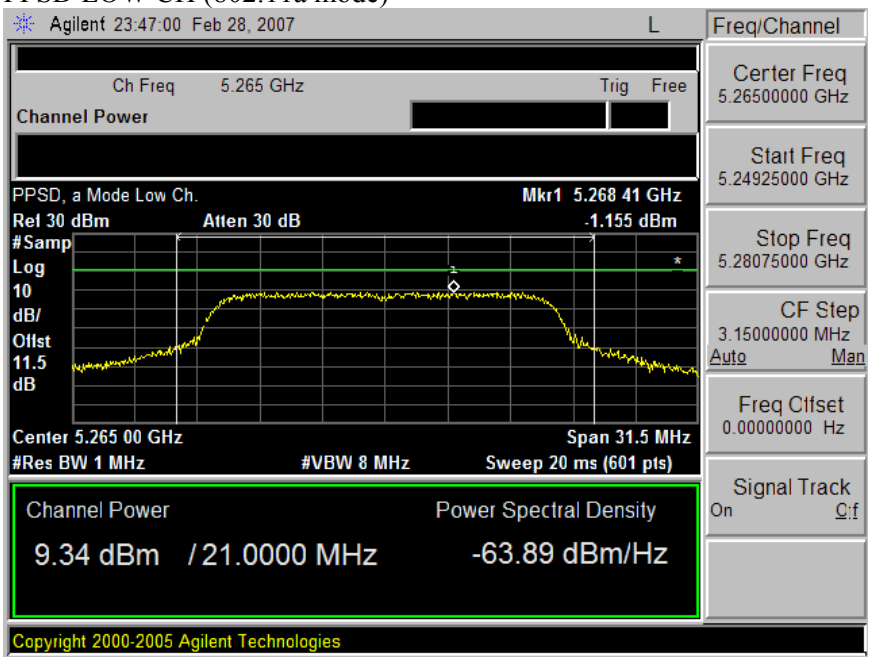
No non-compliance noted:

802.11a Mode (For 18 dBi Patch Antenna)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5265	-1.155	-1.00	-0.16
Mid	5305	-1.178	-1.00	-0.18
High	5325	-1.239	-1.00	-0.24

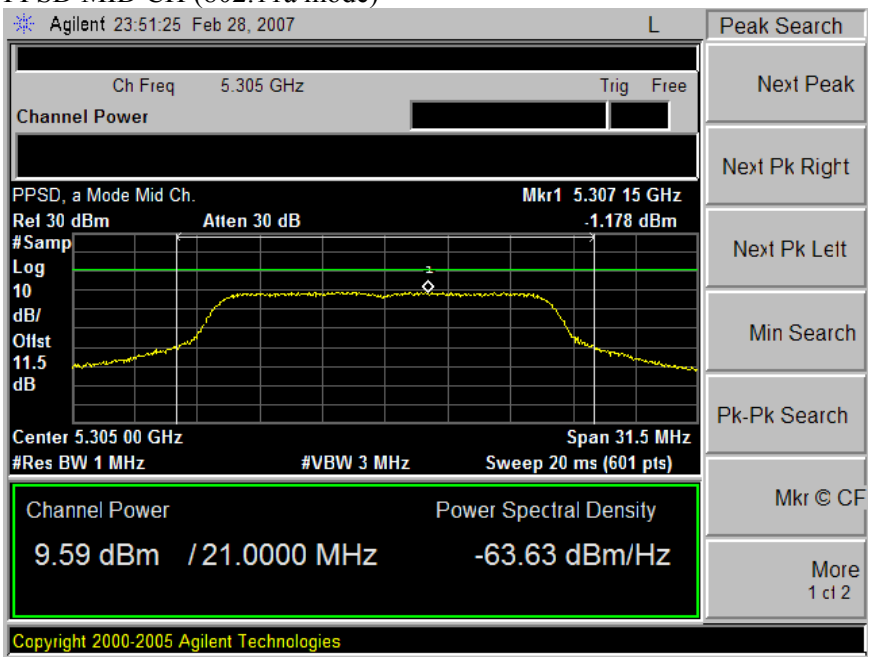
PEAK POWER SPECTRAL DENSITY (802.11a MODE) (For 18 dBi Patch Antenna)

PPSD LOW CH (802.11a mode)



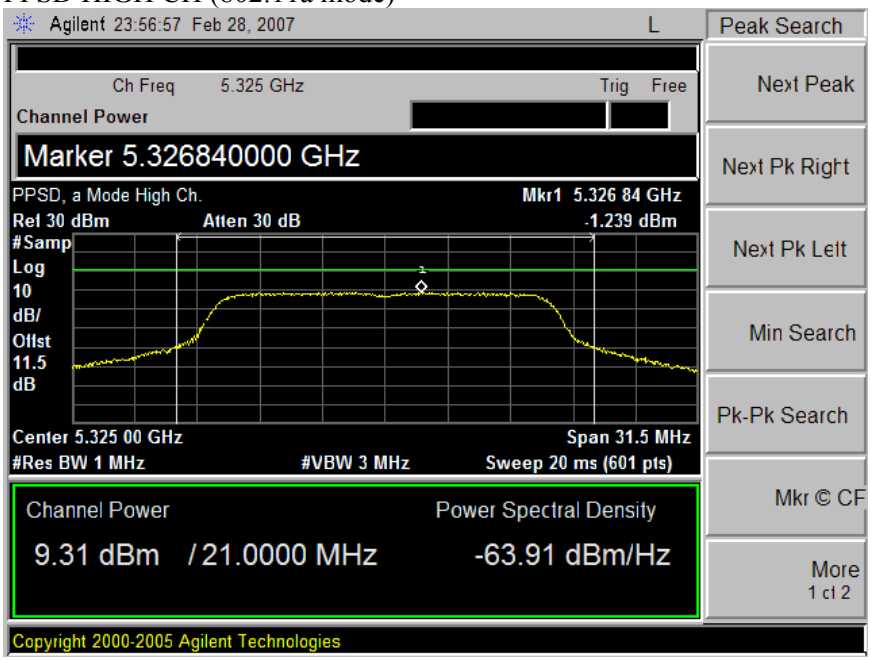
PEAK POWER SPECTRAL DENSITY (802.11a MODE)

PPSD MID CH (802.11a mode)



PEAK POWER SPECTRAL DENSITY (802.11a MODE)

PPSD HIGH CH (802.11a mode)



7.1.6. PEAK EXCURSION

LIMIT

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

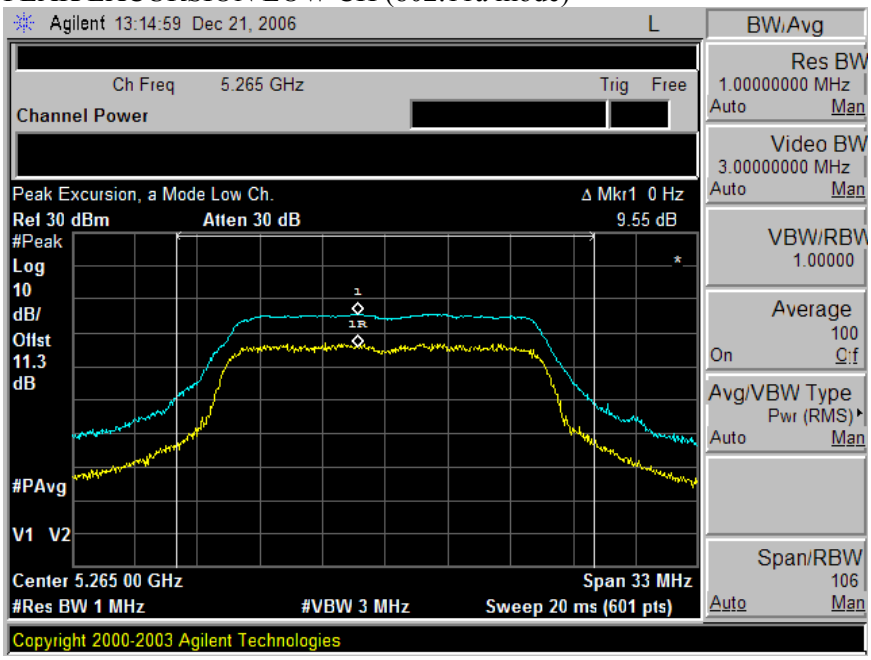
No non-compliance noted:

PEAK EXCURSION (802.11a MODE (18 dBi Patch Antenna)

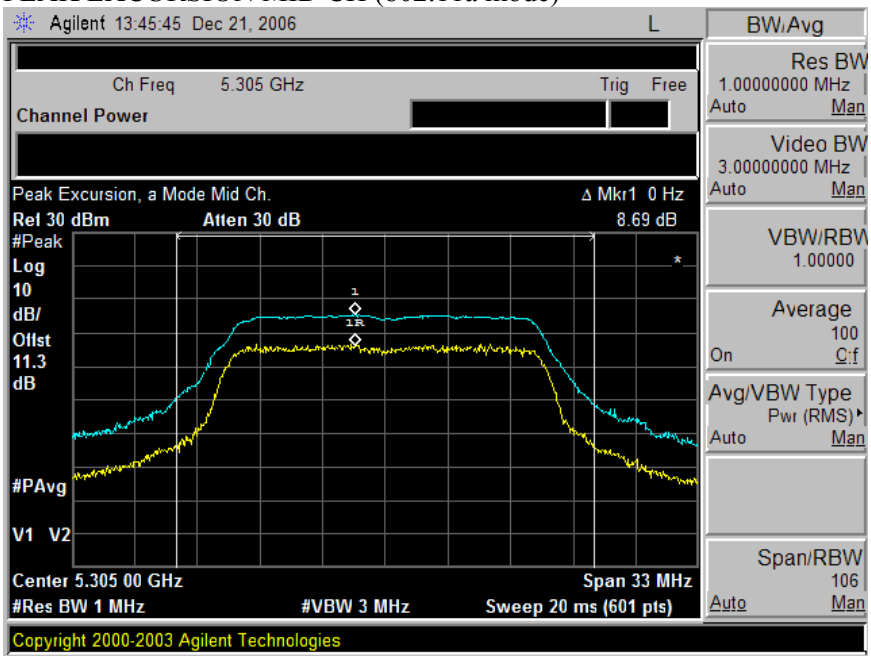
802.11a Mode (For 18 dBi Patch Antenna)

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5265	9.55	13	-3.45
Mid	5305	8.69	13	-4.31
High	5325	9.10	13	-3.90

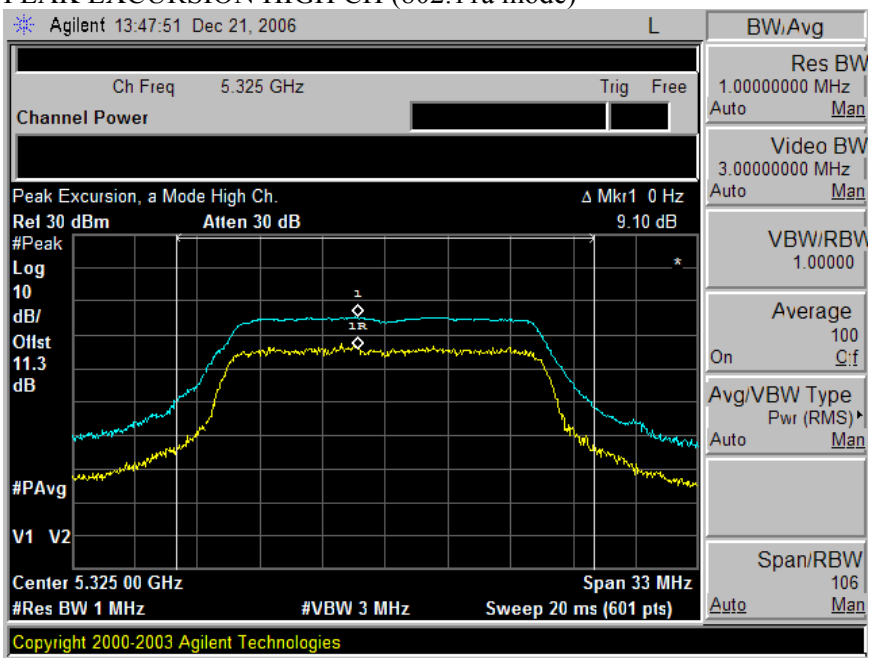
PEAK EXCURSION LOW CH (802.11a mode)



PEAK EXCURSION MID CH (802.11a mode)



PEAK EXCURSION HIGH CH (802.11a mode)



7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.25-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

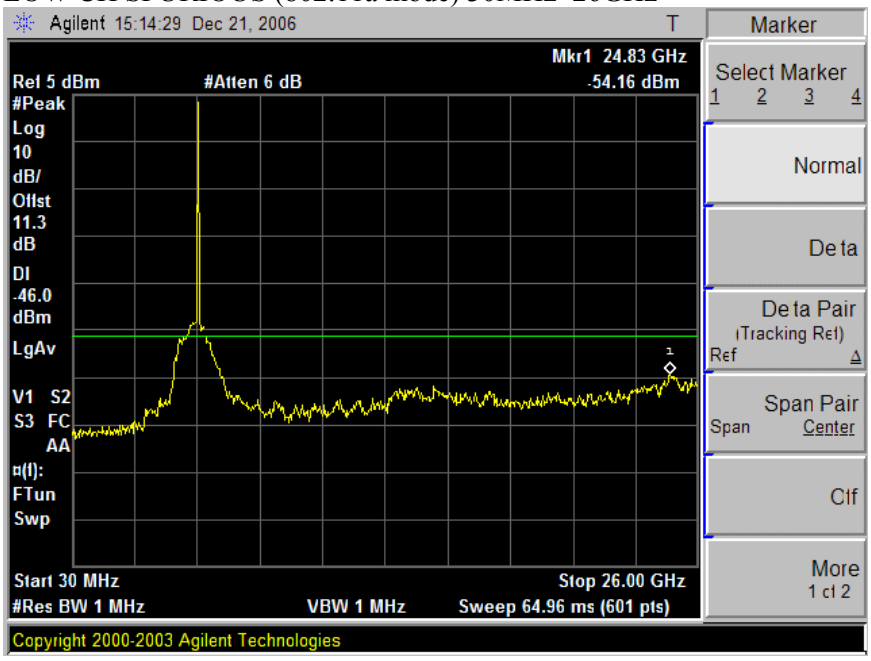
RESULTS

No non-compliance noted:

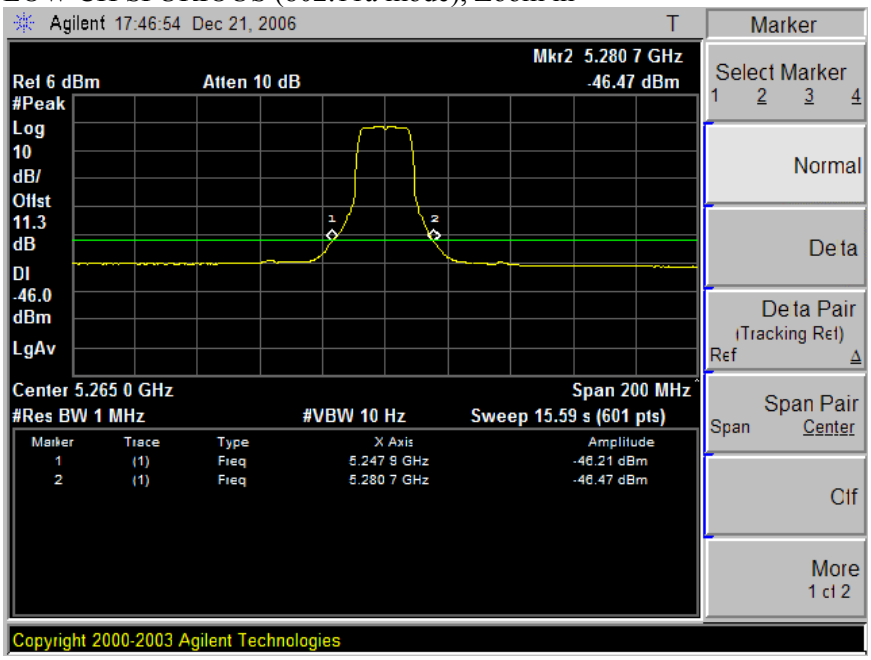
18 dBi Patch Antenna:

SPURIOUS EMISSIONS (802.11a MODE

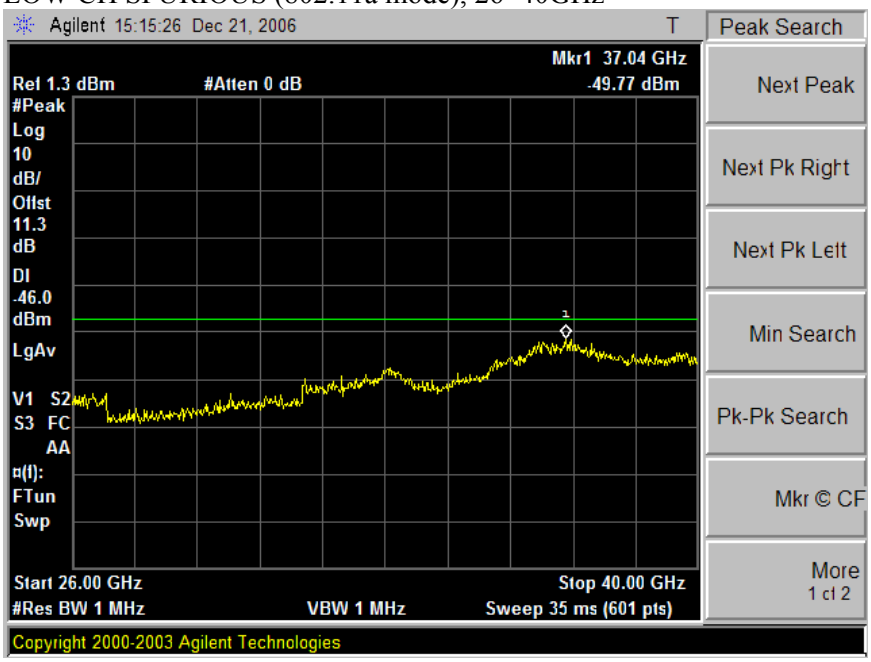
LOW CH SPURIOUS (802.11a mode) 30MHz~26GHz



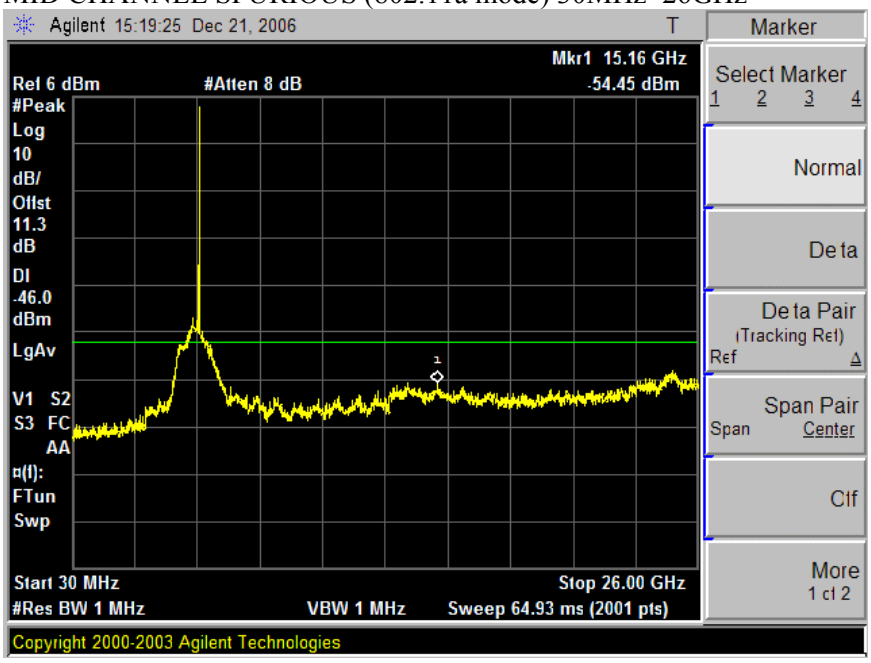
LOW CH SPURIOUS (802.11a mode), Zoom in



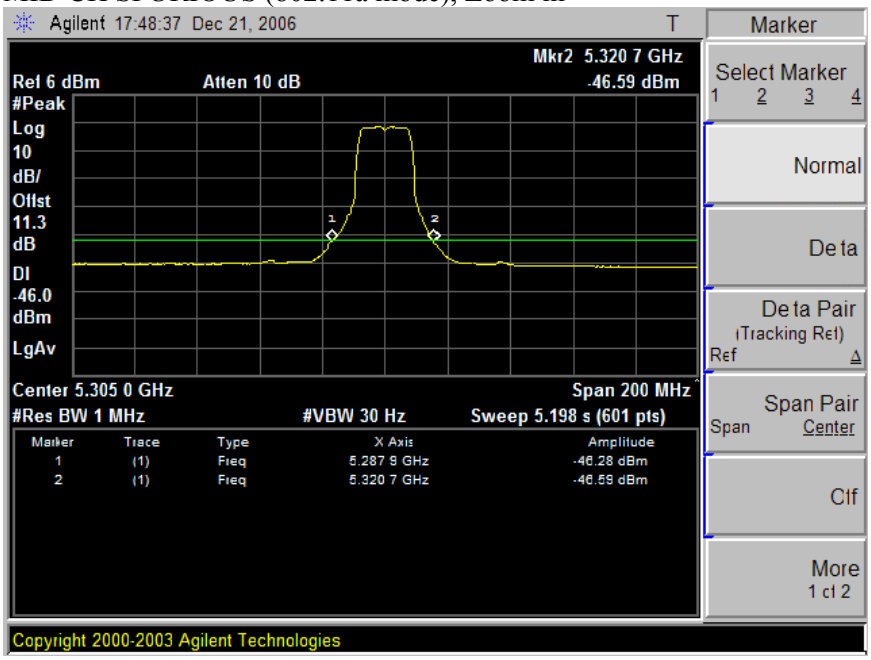
LOW CH SPURIOUS (802.11a mode), 26~40GHz



MID CHANNEL SPURIOUS (802.11a mode) 30MHz~26GHz



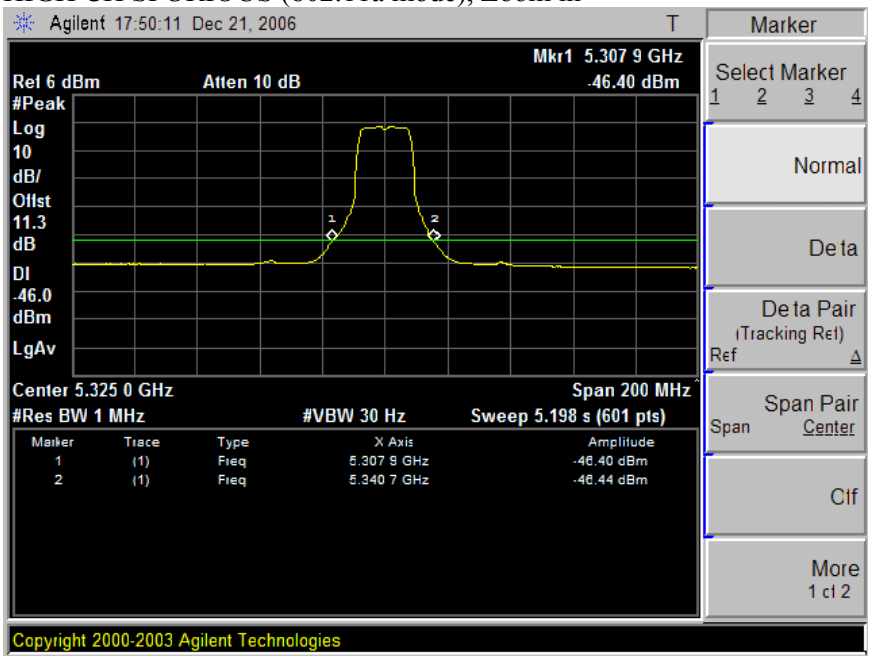
MID CH SPURIOUS (802.11a mode), Zoom in



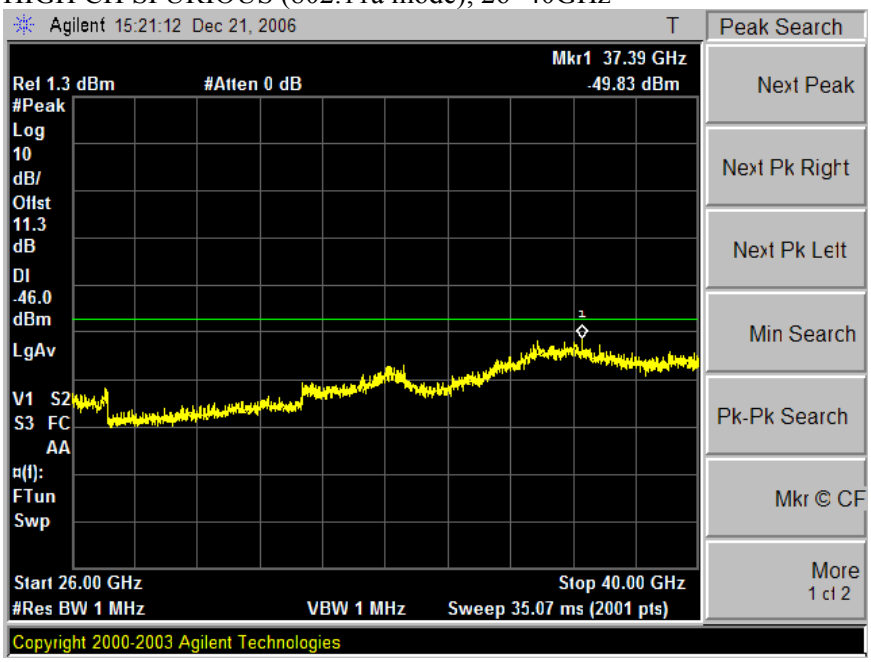
MID CH SPURIOUS (802.11a mode), 26~40GHz

HIGH CHANNEL SPURIOUS (802.11a mode) 30MHz~26GHz

HIGH CH SPURIOUS (802.11a mode), Zoom in



HIGH CH SPURIOUS (802.11a mode), 26~40GHz



7.2. CHANNEL TESTS FOR THE 5470 TO 5725 MHz BAND

7.2.1. EMISSION BANDWIDTH

LIMIT

§15.403 (i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

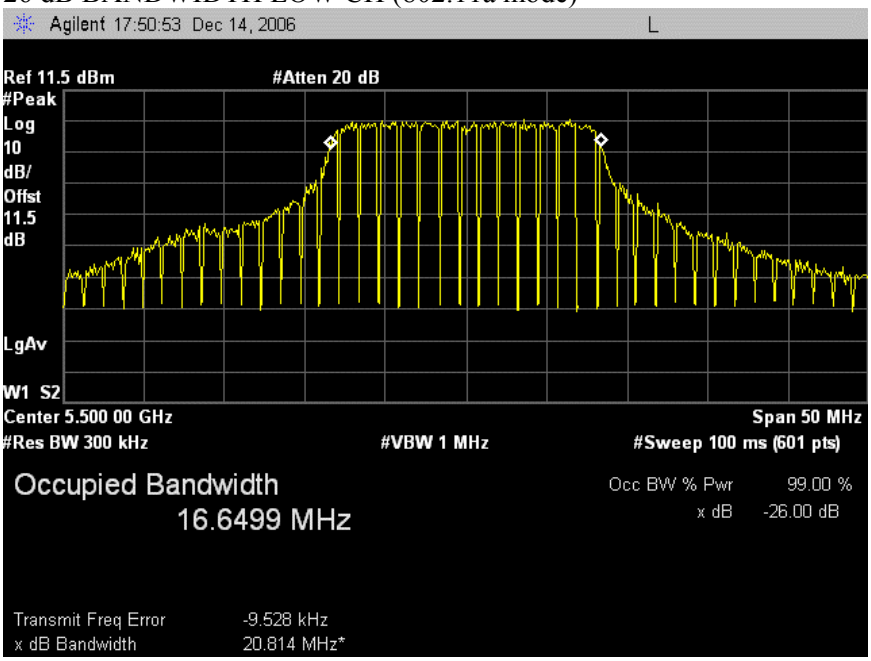
No non-compliance noted:

802.11a Mode (For 18 dBi Patch Antenna)

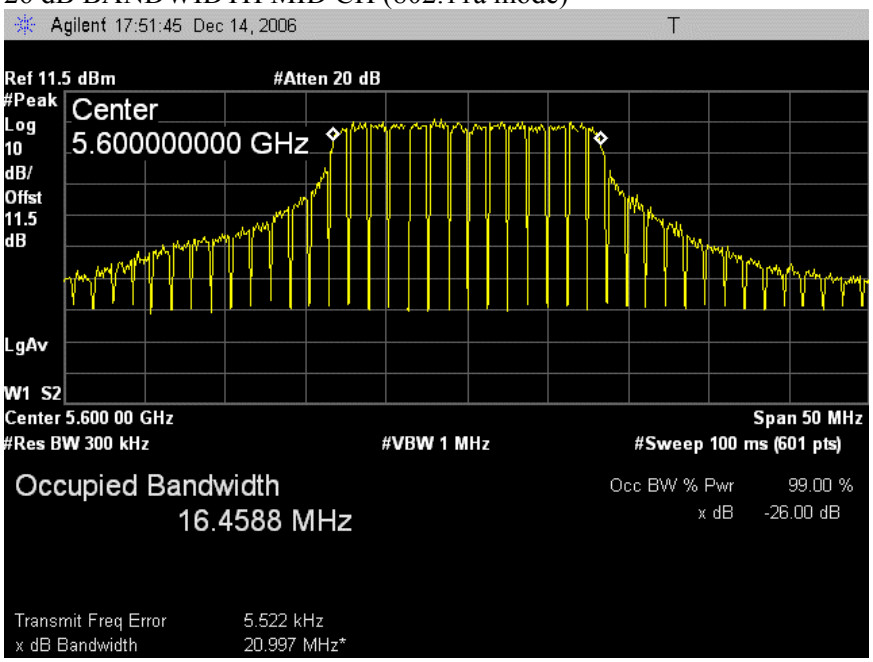
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5500	20.814	13.18
Mid	5600	20.997	13.22
High	5700	20.982	13.22

26 dB EMISSION BANDWIDTH (802.11a MODE) (For 18 dBi Patch Antenna)

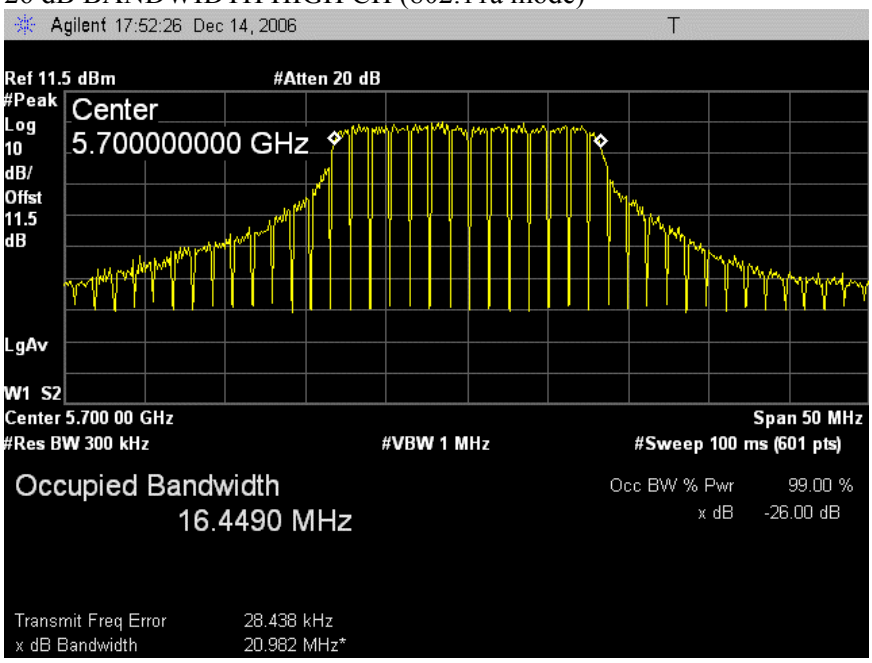
26 dB BANDWIDTH LOW CH (802.11a mode)



26 dB BANDWIDTH MID CH (802.11a mode)



26 dB BANDWIDTH HIGH CH (802.11a mode)



7.2.2. PEAK POWER

LIMIT

§15.407 (a) (2) For the 5.47–5.725 GHz band, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS (For 18 dBi Patch Antenna)

No non-compliance noted:

Limit

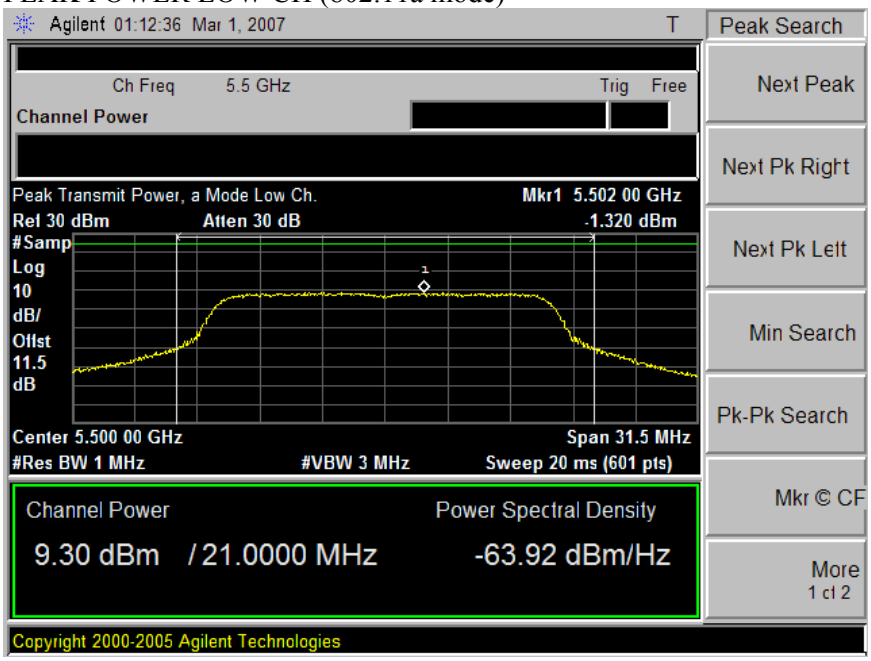
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	20.814	24.18	18.00	12.00
Mid	5600	24	20.997	24.22	18.00	12.00
High	5700	24	20.982	24.22	18.00	12.00

Results

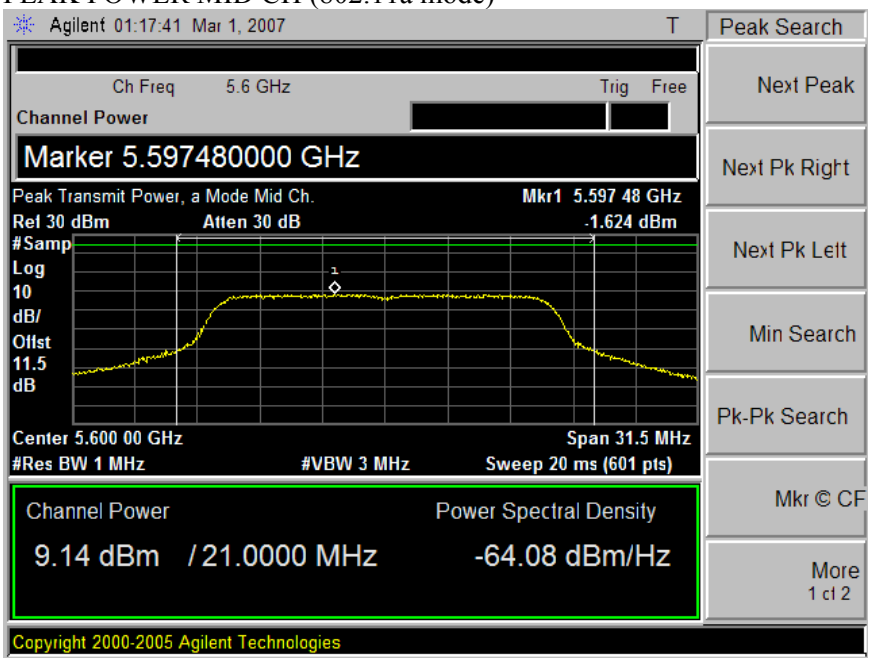
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	9.30	12.00	-2.70
Mid	5600	9.14	12.00	-2.86
High	5700	9.55	12.00	-2.45

PEAK POWER (802.11a MODE) (For 18 dBi Patch Antenna)

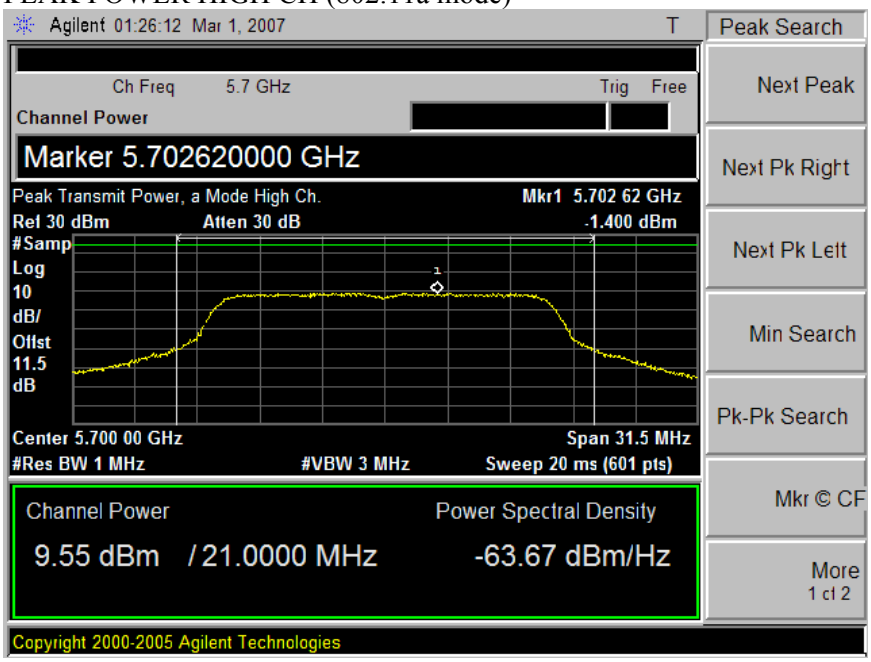
PEAK POWER LOW CH (802.11a mode)



PEAK POWER MID CH (802.11a mode)



PEAK POWER HIGH CH (802.11a mode)



7.2.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G) / d}$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

LIMITS

From §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11a	20.0	9.55	18.00	0.11

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2.4. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.4dB (including 10 dB pad and 1.4dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode, 18dBi Patch Antenna Gain

Channel	Frequency (MHz)	Average Power (dBm)
Low	5500	9.26
Mid	5600	9.05
High	5700	9.35

7.2.5. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (2) For the 5.47–5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

PEAK POWER SPECTRAL DENSITY (802.11a MODE) (For 18 dBi Patch Antenna)

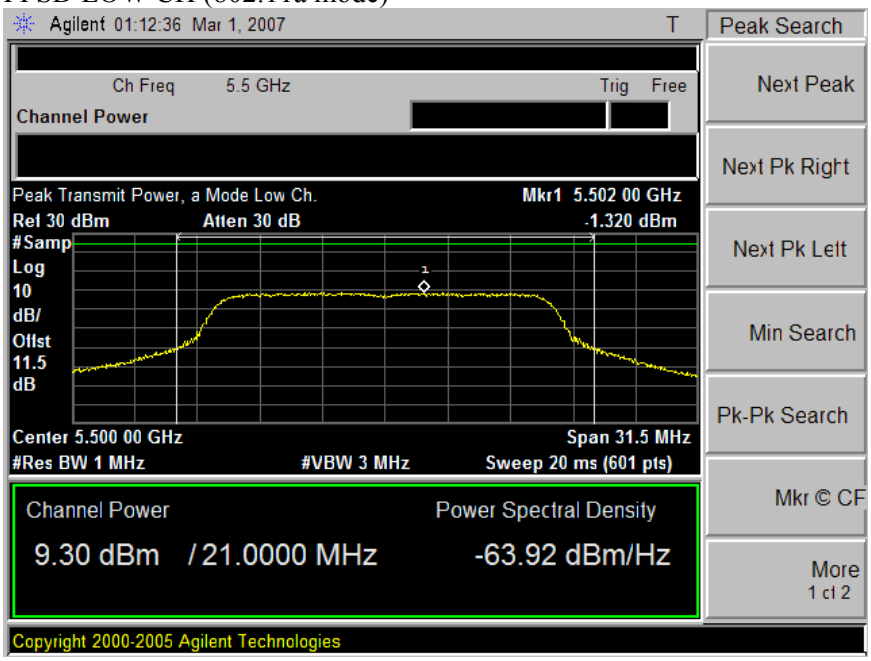
No non-compliance noted:

802.11a Mode (For 18 dBi Patch Antenna)

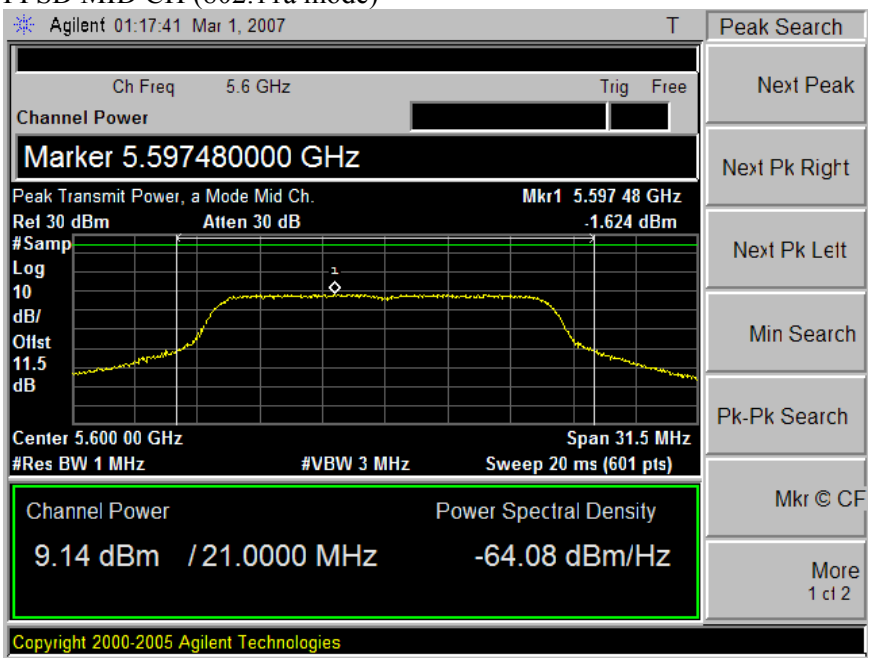
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	-1.32	-1.00	-0.32
Mid	5600	-1.62	-1.00	-0.62
High	5700	-1.40	-1.00	-0.40

PEAK POWER SPECTRAL DENSITY (802.11a MODE) (For 18 dBi Patch Antenna)

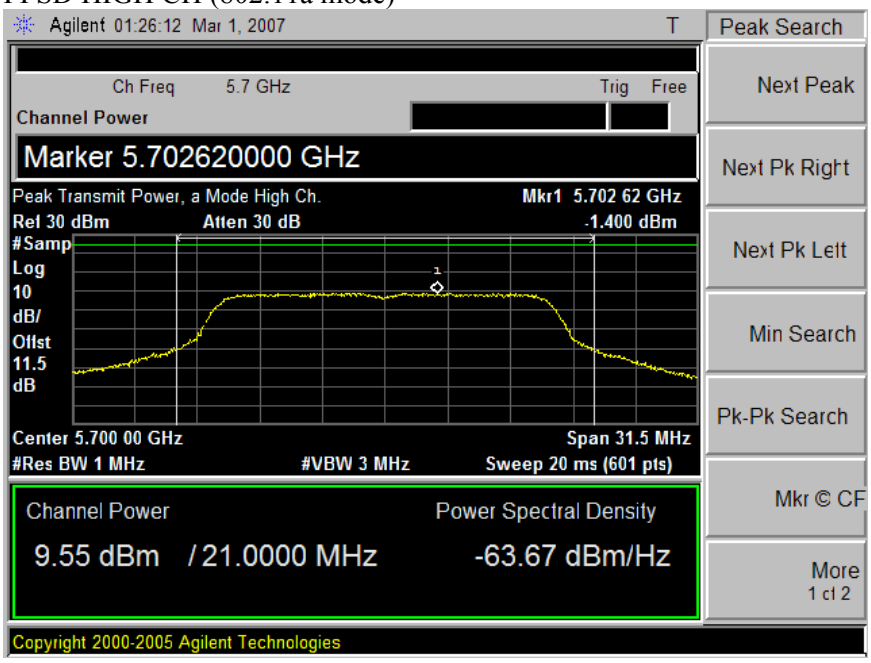
PPSD LOW CH (802.11a mode)



PPSD MID CH (802.11a mode)



PPSD HIGH CH (802.11a mode)



7.2.6. PEAK EXCURSION

LIMIT

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

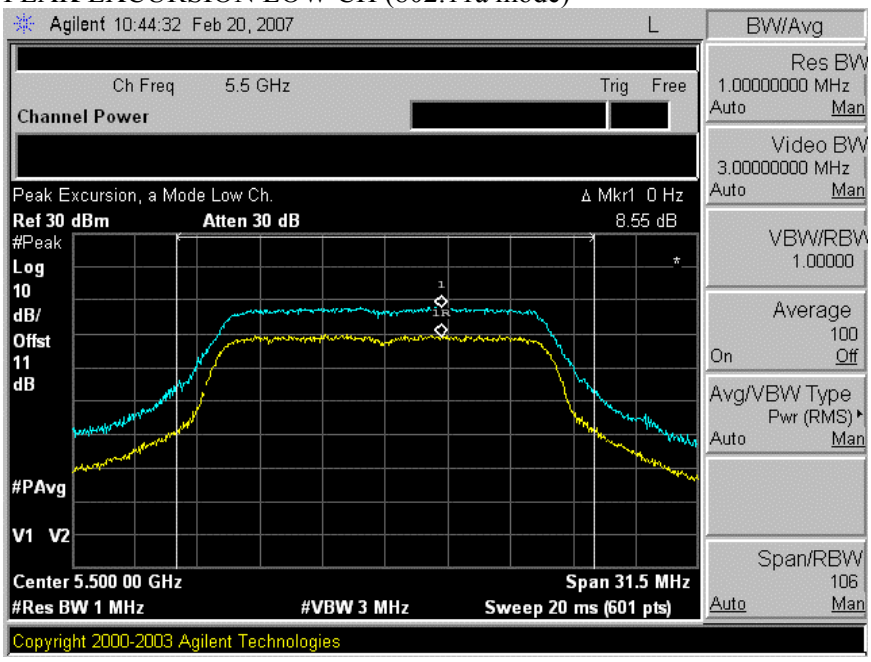
No non-compliance noted:

802.11a Mode (For 18 dBi Patch Antenna)

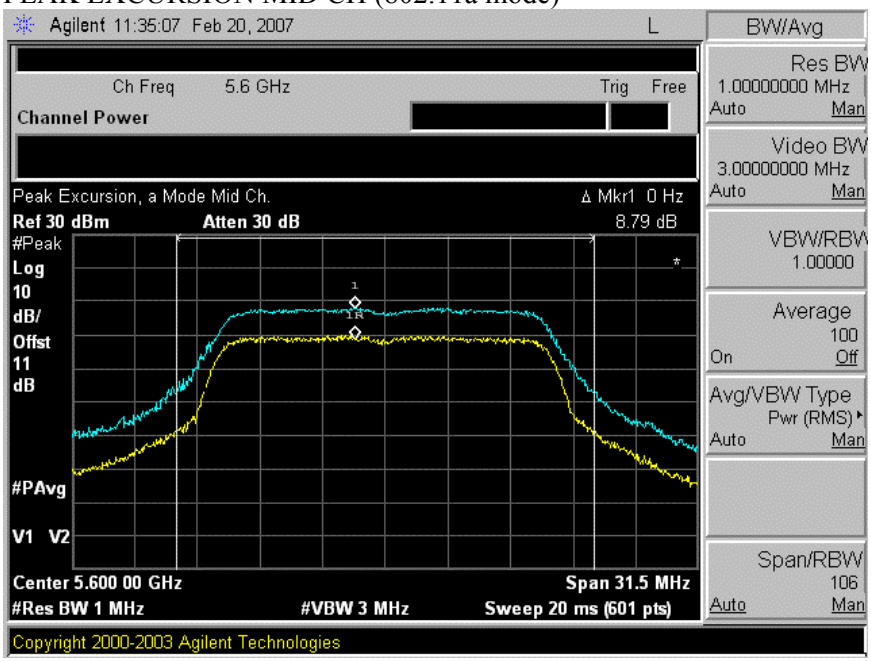
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	8.55	13	-4.45
Mid	5600	8.79	13	-4.21
High	5700	8.39	13	-4.61

PEAK EXCURSION (802.11a MODE (18 dBi Patch Antenna)

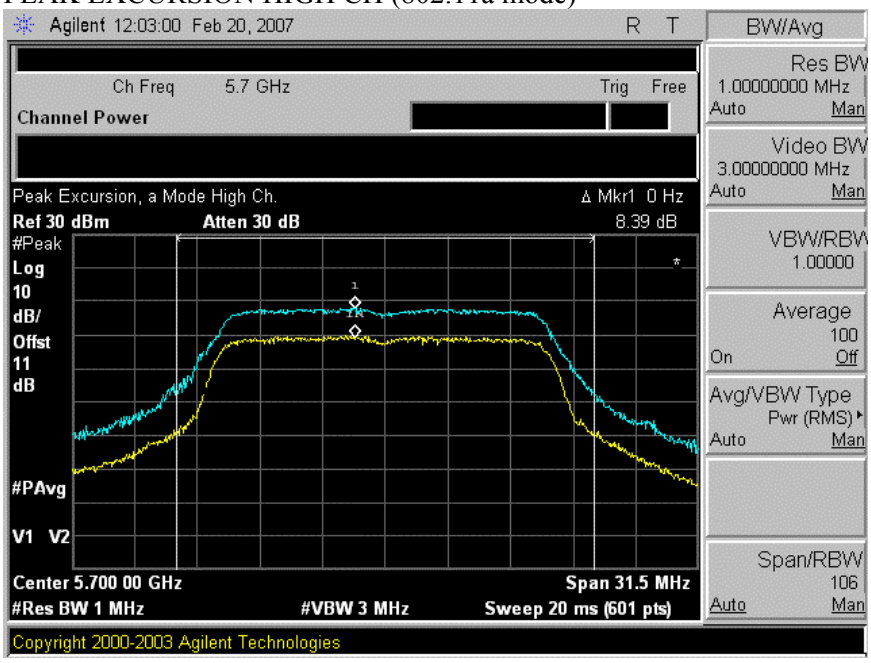
PEAK EXCURSION LOW CH (802.11a mode)



PEAK EXCURSION MID CH (802.11a mode)



PEAK EXCURSION HIGH CH (802.11a mode)



7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

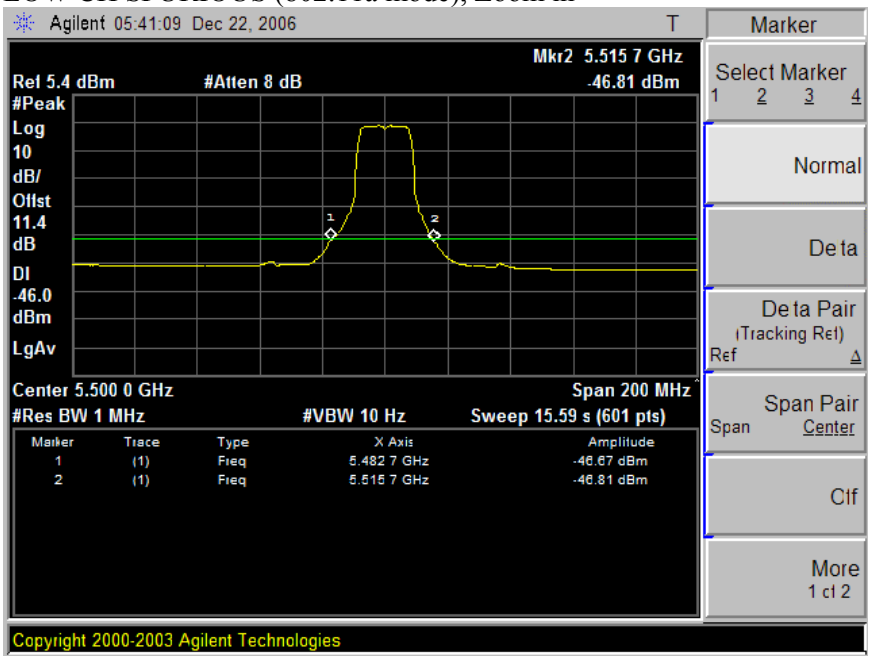
No non-compliance noted:

18 dBi Patch Antenna:

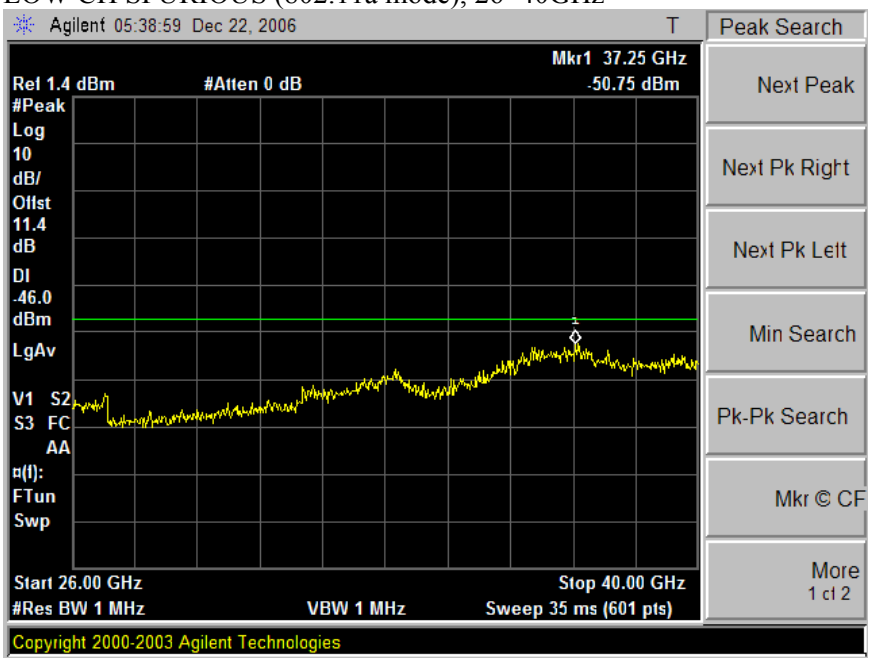
SPURIOUS EMISSIONS (802.11a MODE

LOW CH SPURIOUS (802.11a mode) 30MHz~26GHz

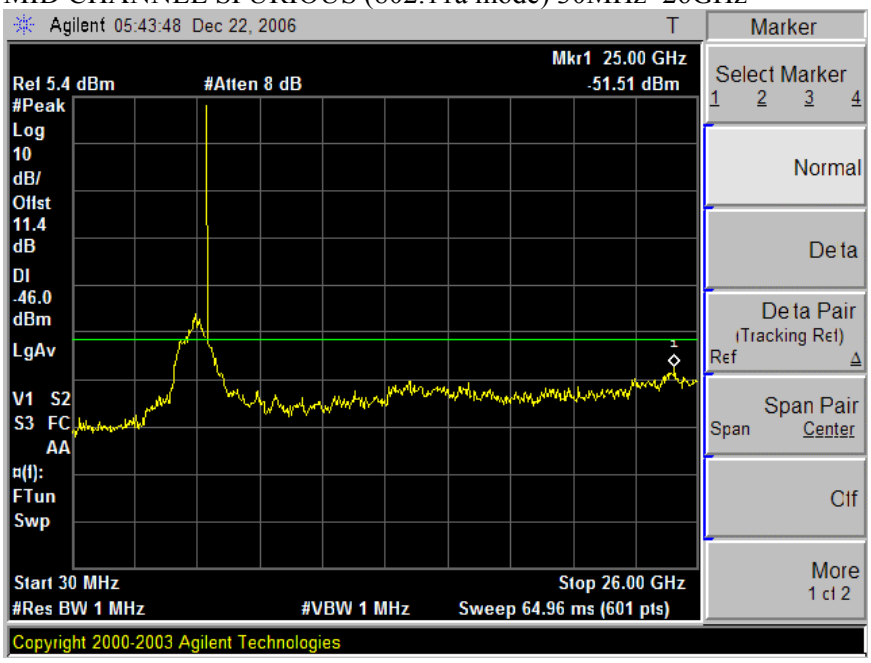
LOW CH SPURIOUS (802.11a mode), Zoom in



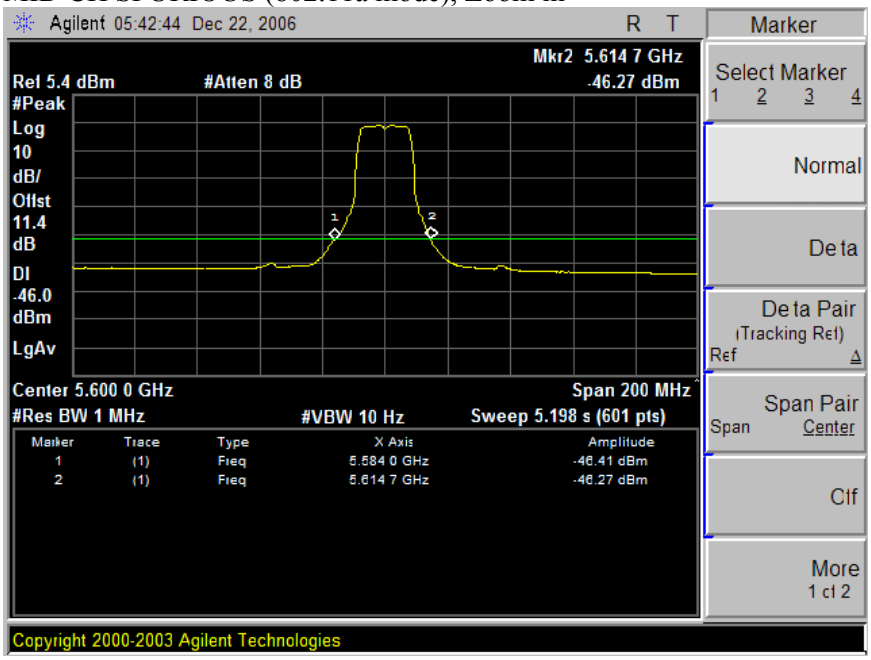
LOW CH SPURIOUS (802.11a mode), 26~40GHz



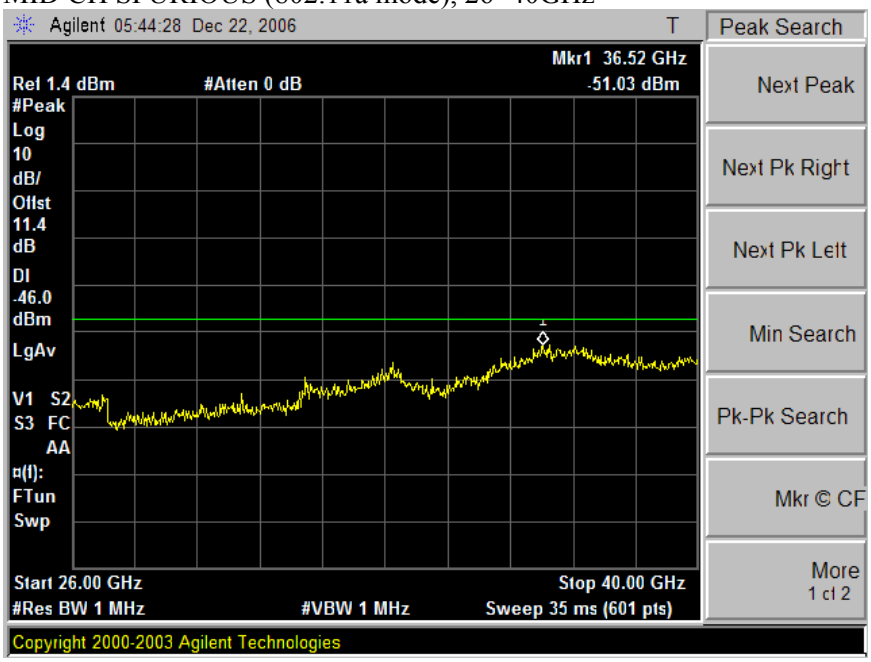
MID CHANNEL SPURIOUS (802.11a mode) 30MHz~26GHz



MID CH SPURIOUS (802.11a mode), Zoom in

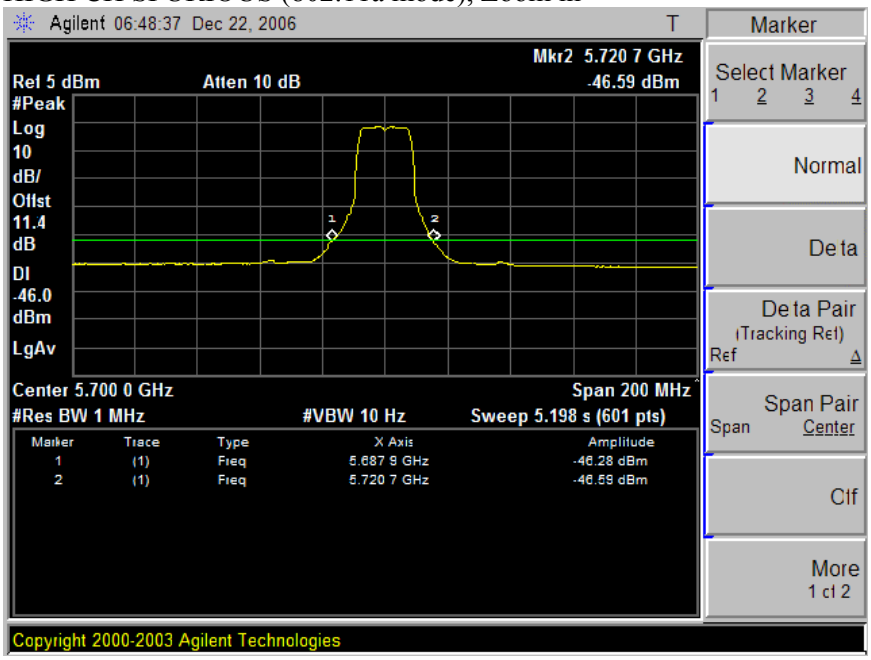


MID CH SPURIOUS (802.11a mode), 26~40GHz



HIGH CHANNEL SPURIOUS (802.11a mode) 30MHz~26GHz

HIGH CH SPURIOUS (802.11a mode), Zoom in



HIGH CH SPURIOUS (802.11a mode), 26~40GHz

7.2.8. FREQUENCY STABILITY

LIMIT

§15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

RSS-210 A9.5 (e) +/- 10 ppm

TEST PROCEDURE

Reference measurements of the carrier frequency are made at nominal conditions of +20°C and the rated supply voltage.

Additional measurements are made at temperatures of – 30°C and +50°C at the manufacturer's rated power supply voltage. Additional measurements are made at +/- 15 percent of the manufacturer's rated supply voltage temperature of +20°C.

The additional measurements are compared with the reference measurements to calculate the frequency stability.

RESULTS

No non-compliance noted:

Reference Frequency at 20 deg C and 115 VAC

Supply Voltage (VAC)	Temperature (deg C)	Frequency (MHz)	Delta (ppm)
115.00	20	5305.00079	Reference
115.00	-30	5304.99652	0.806
115.00	50	5305.01791	-3.227
97.75	20	5305.00792	-1.344
132.25	20	5305.00855	-1.463

7.3. RADIATED EMISSIONS

7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each band.

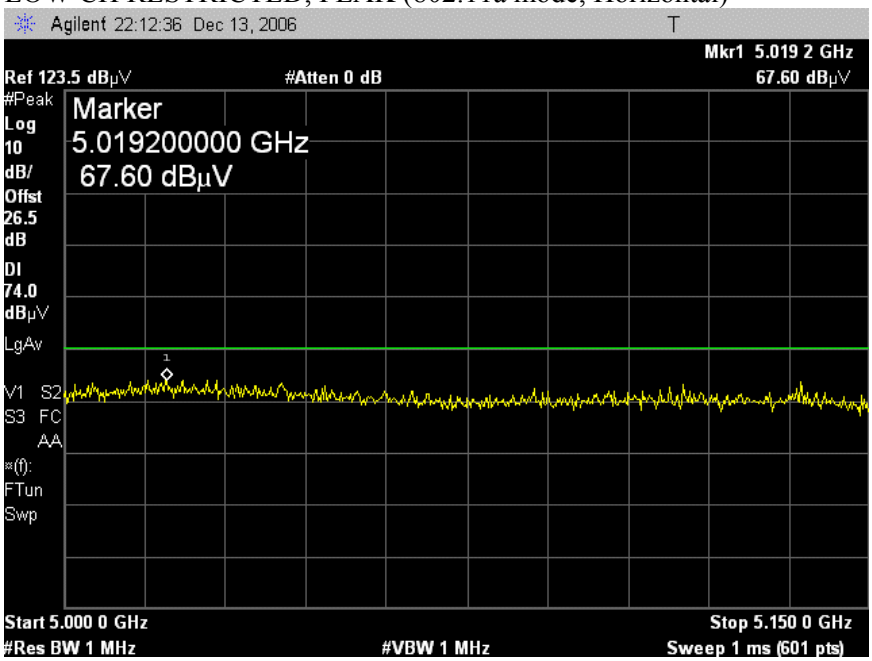
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

7.3.2. TRANSMITTER ABOVE 1 GHZ FOR 5250 TO 5350 MHz BAND

33dBi DISH ANTENNA HORIZONTAL POLARITY:

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

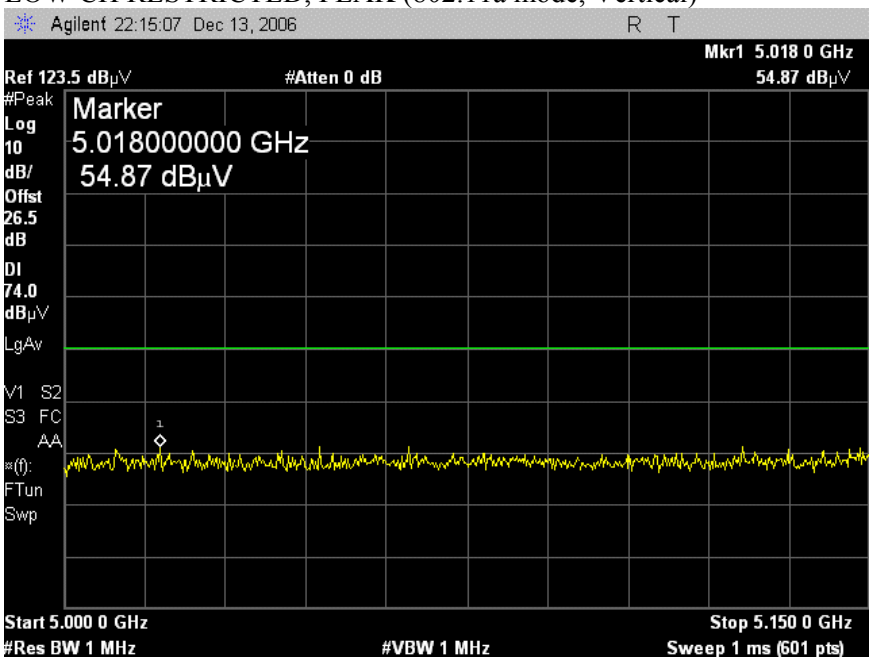
LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)



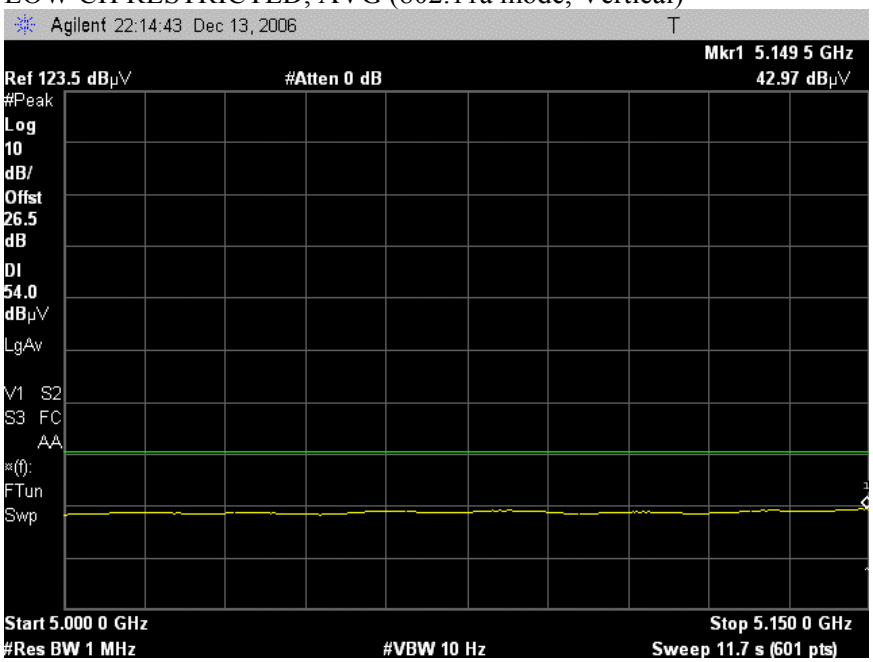
LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

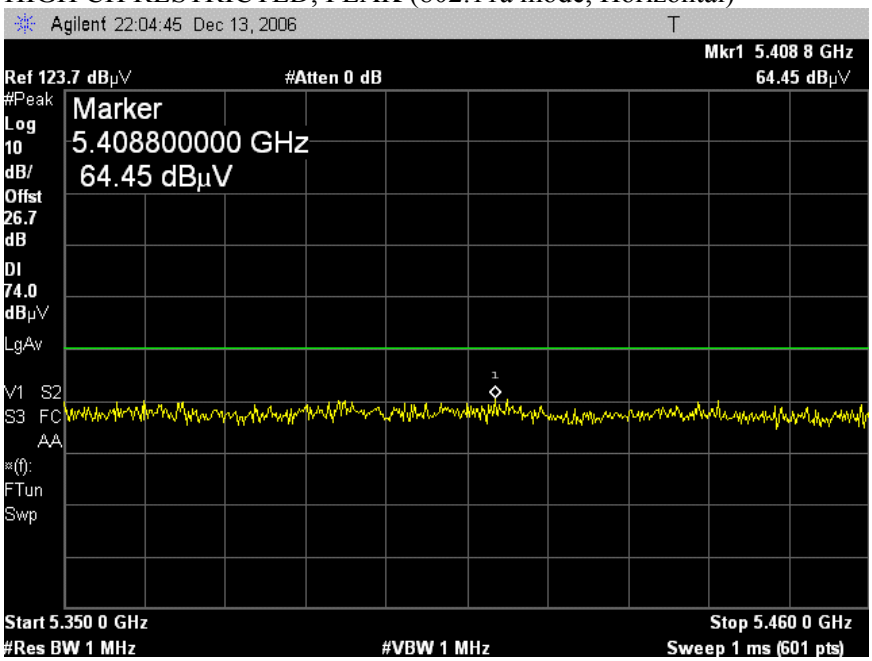


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

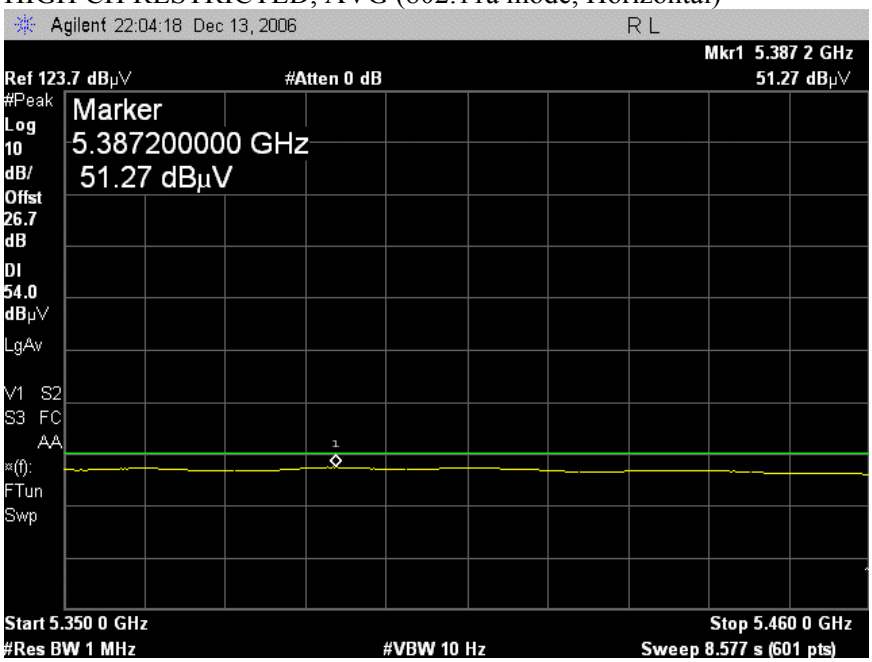


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

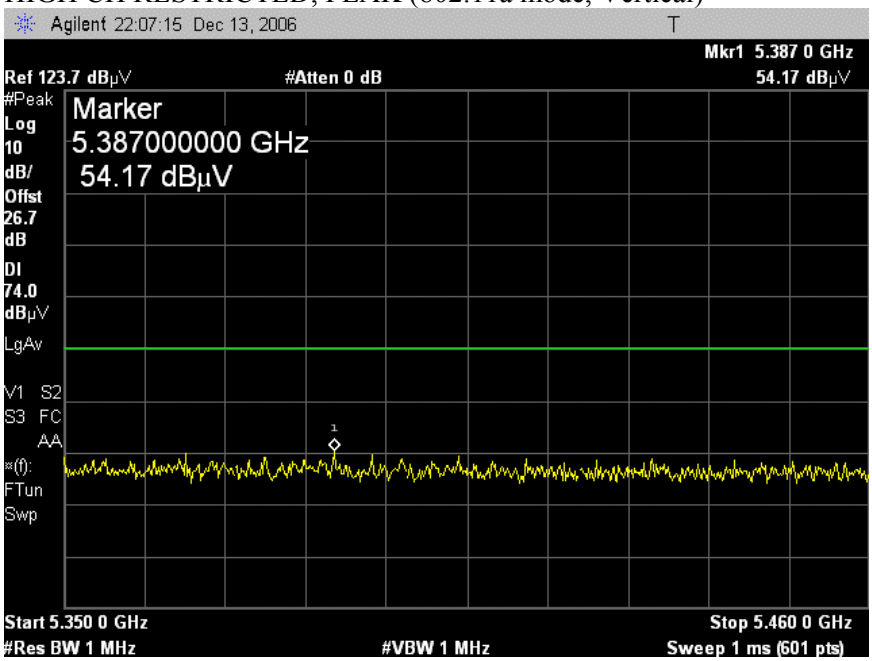


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)



RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)

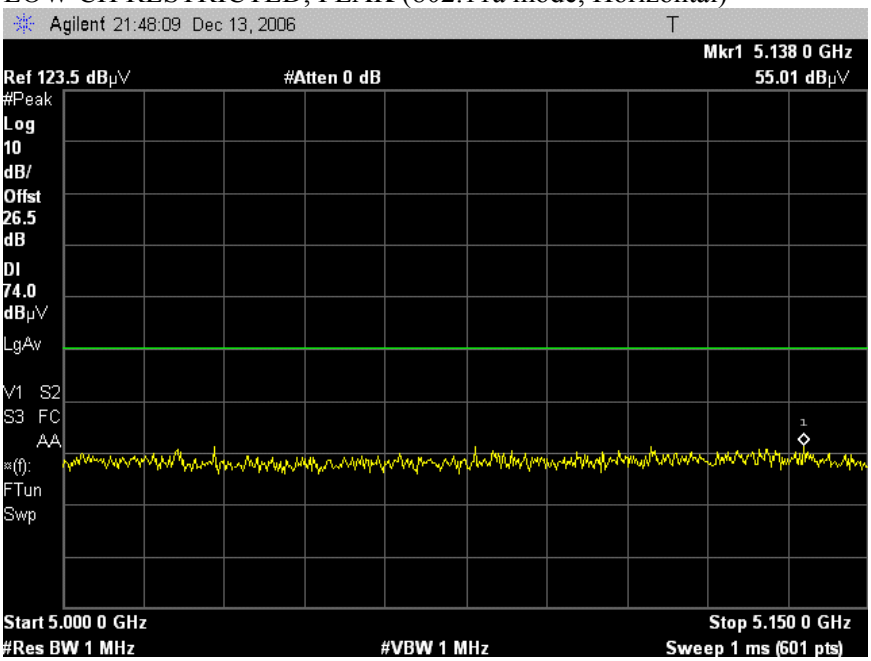


HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)

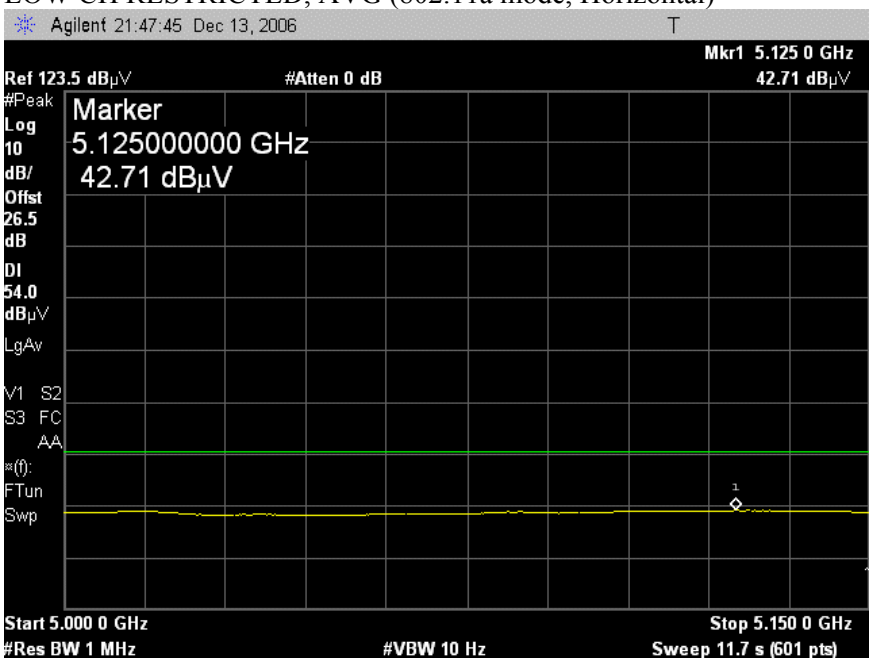
33dBi DISH ANTENNA VERTICAL POLARITY:

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

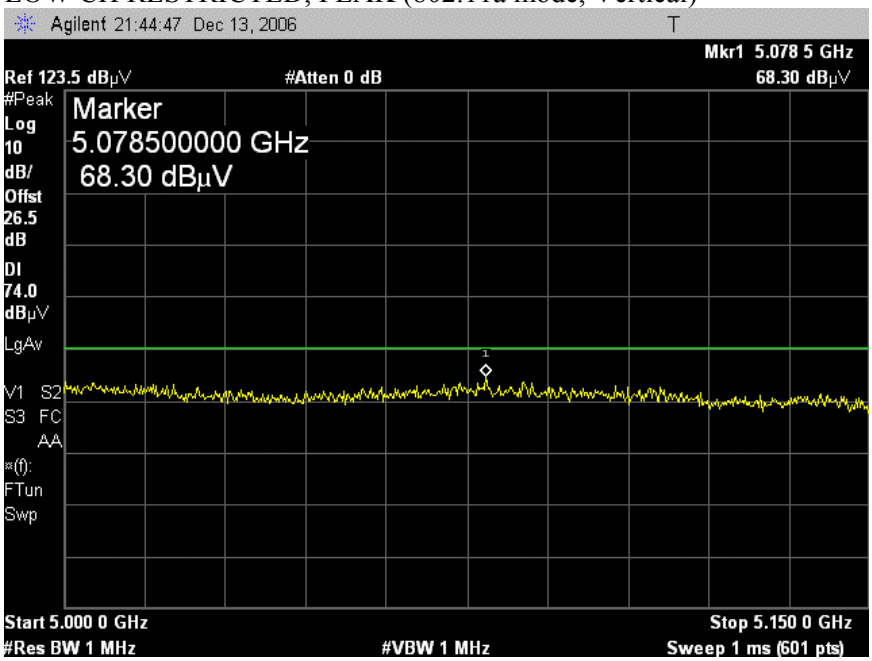


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

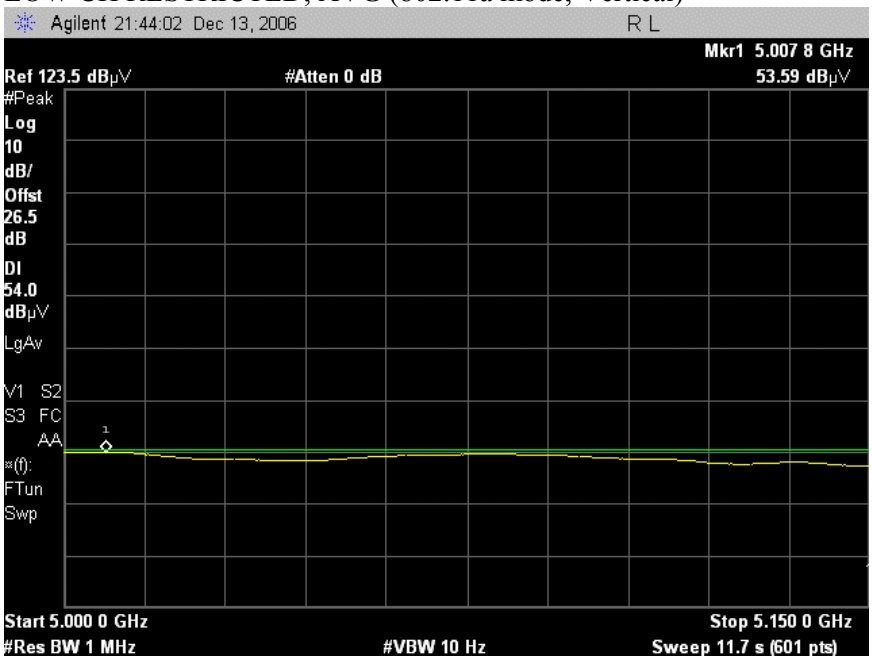


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

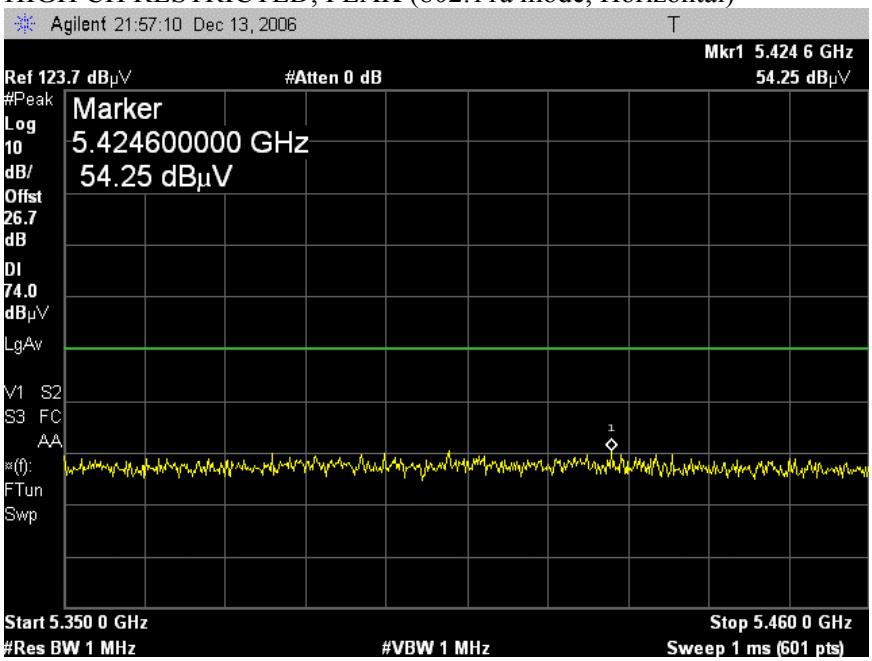


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

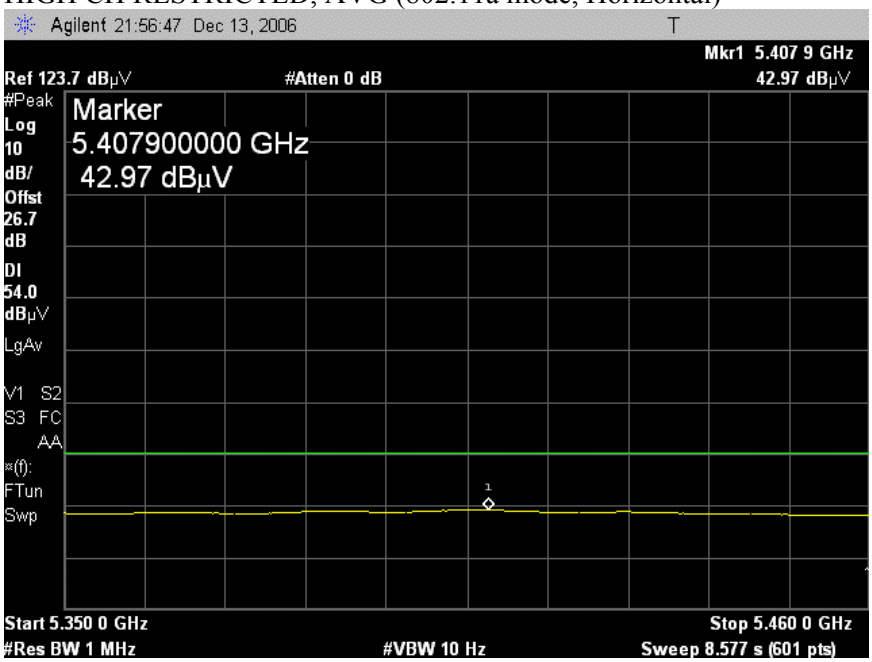


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

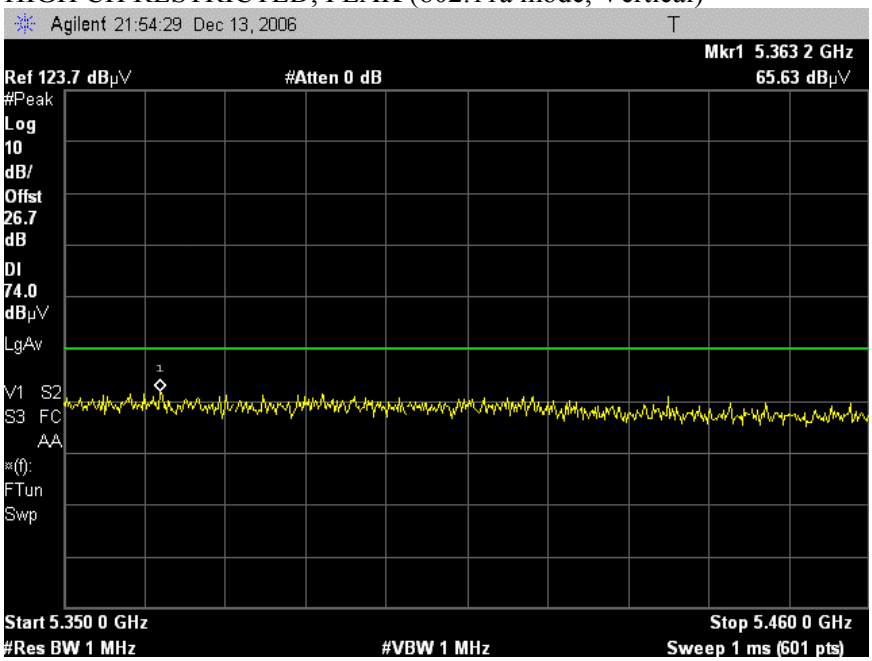


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

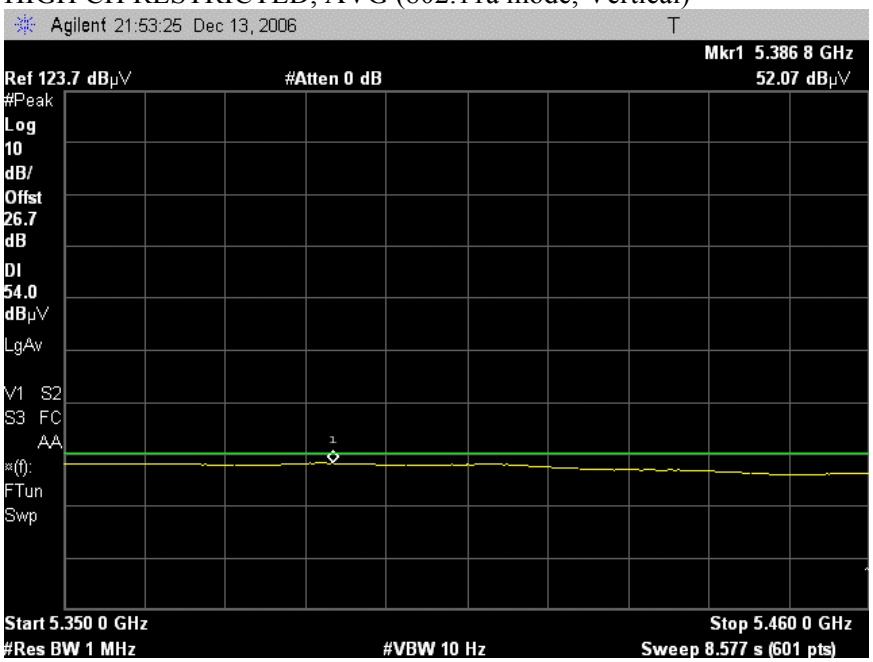


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worst Case)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company:Trango
Project #:06U10393
Date:12/13/06
Test Engineer:Thanh Nguyen
Configuration:EUT w/RadioWave Dish Antenna SPD4-5.2
Model: P5055M-EXT

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T119; S/N: 29301 @3m	T87 Miteq 924342		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

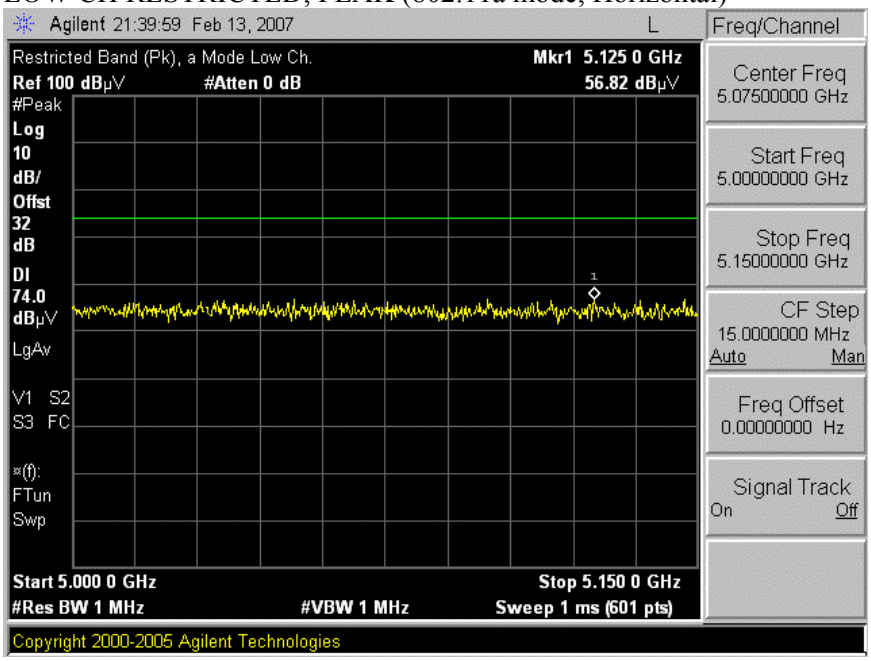
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5265 MHz															
10.530	3.0	51.20	36.24	36.8	3.9	-39.3	0.0	0.8	53.4	38.4	74	54	-20.6	-15.6	V
15.795	3.0	50.54	36.84	38.8	4.8	-41.2	0.0	0.7	53.6	39.9	74	54	-20.4	-14.1	Noise floor
10.530	3.0	50.22	36.44	36.8	3.9	-39.3	0.0	0.8	52.4	38.6	74	54	-21.6	-15.4	H
15.795	3.0	50.38	37.34	38.8	4.8	-41.2	0.0	0.7	53.5	40.4	74	54	-20.5	-13.6	Noise floor
Mid Ch. 5305 MHz															
10.610	3.0	55.64	40.12	36.8	4.0	-39.4	0.0	0.8	57.8	42.3	74	54	-16.2	-11.7	V
15.915	3.0	51.26	37.83	38.8	4.8	-41.2	0.0	0.7	54.5	41.0	74	54	-19.5	-13.0	Noise floor
10.610	3.0	50.18	35.65	36.8	4.0	-39.4	0.0	0.8	52.4	37.8	74	54	-21.6	-16.2	H
15.915	3.0	51.26	37.83	38.8	4.8	-41.2	0.0	0.7	54.5	41.0	74	54	-19.5	-13.0	Noise floor
High Ch. 5325 MHz															
10.650	3.0	56.44	40.83	36.8	4.0	-39.4	0.0	0.8	58.6	43.0	74	54	-15.4	-11.0	V
15.975	3.0	50.56	35.72	38.8	4.9	-41.1	0.0	0.7	53.8	39.0	74	54	-20.2	-15.0	Noise floor
10.650	3.0	51.25	39.67	36.8	4.0	-39.4	0.0	0.8	53.4	41.9	74	54	-20.6	-12.1	H
15.975	3.0	50.32	37.87	38.8	4.9	-41.1	0.0	0.7	53.6	41.1	74	54	-20.4	-12.9	Noise floor

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

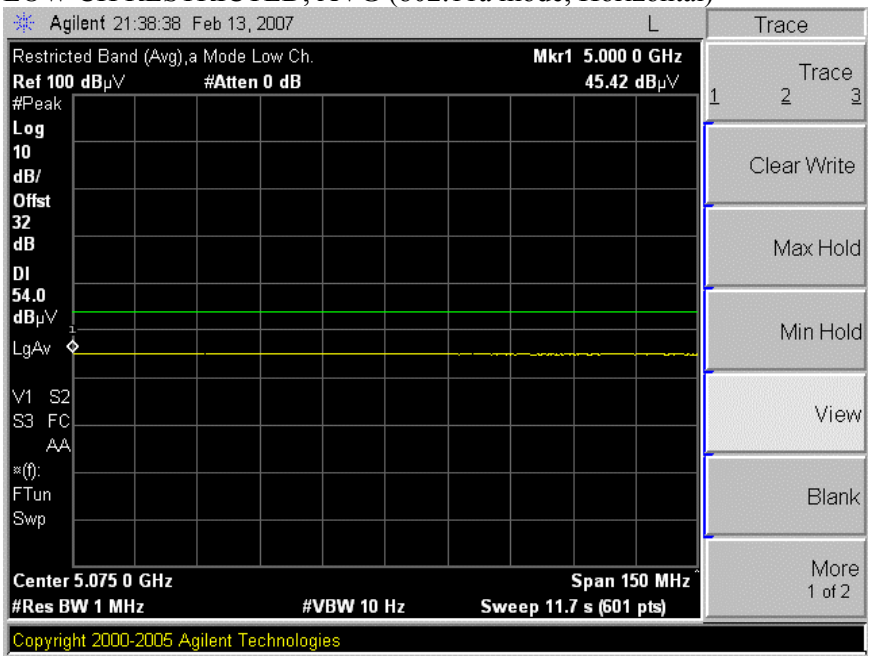
22dBi PATCH ANTENNA (HORIZONTALLY POLARIZED):

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

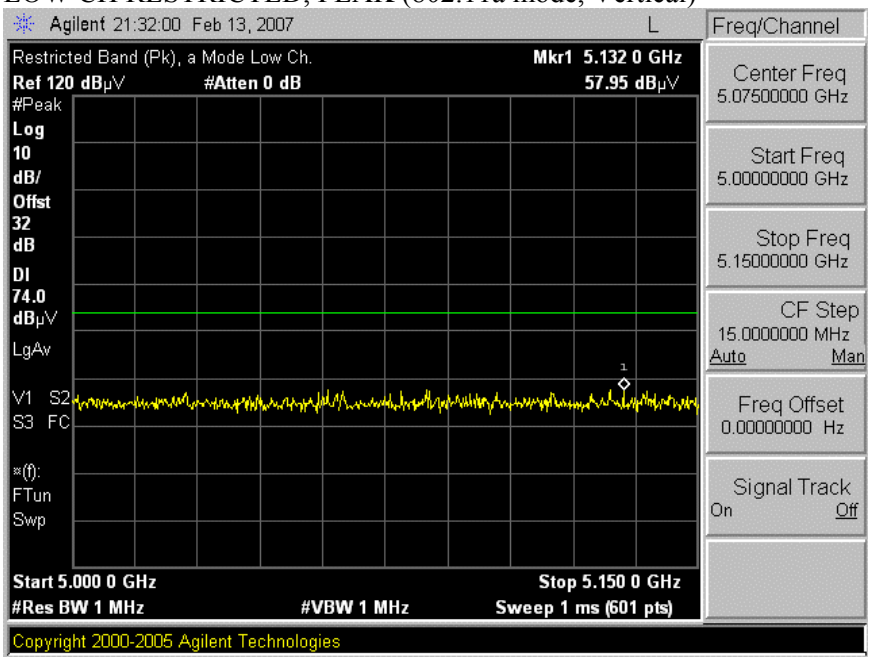


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

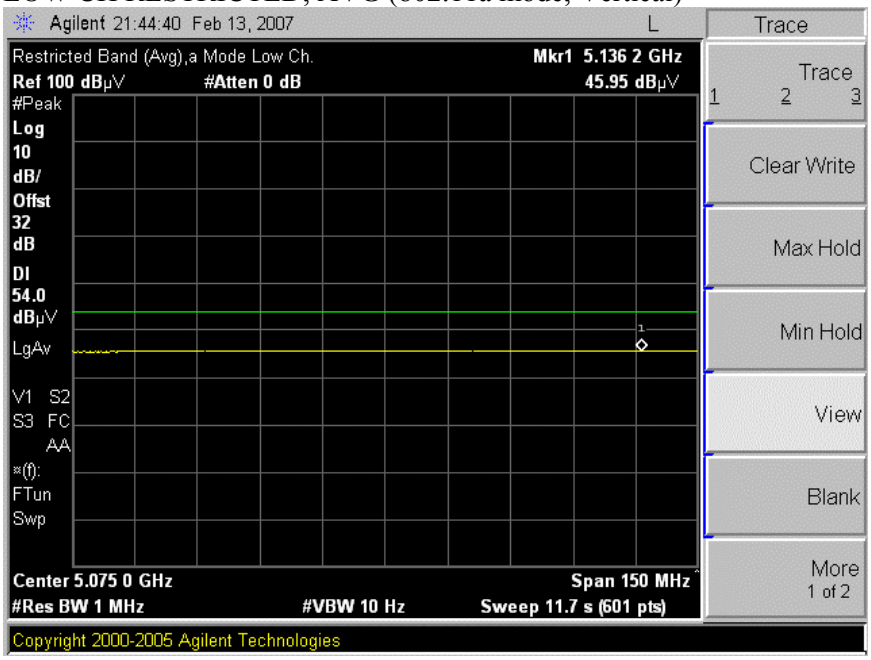


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

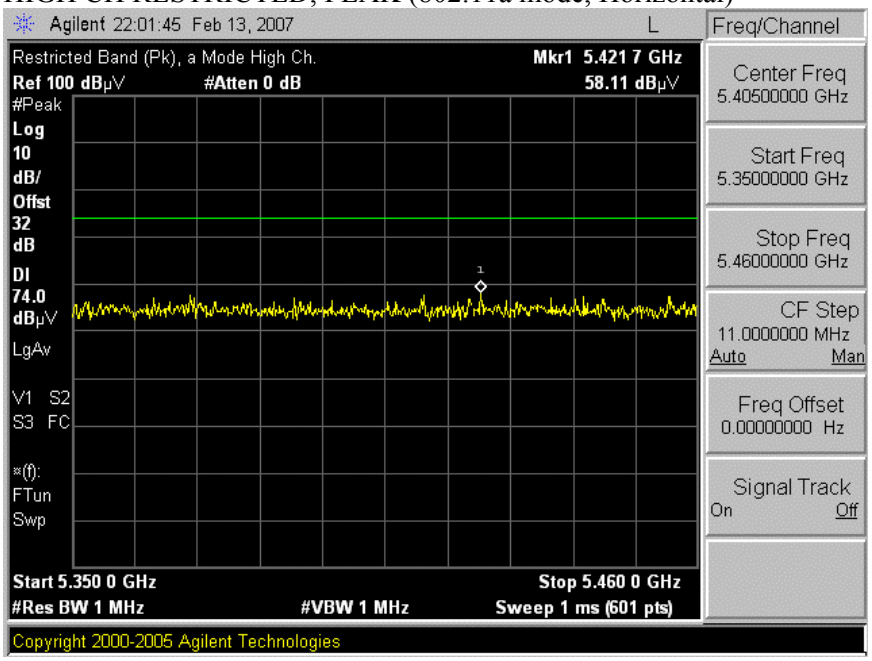


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

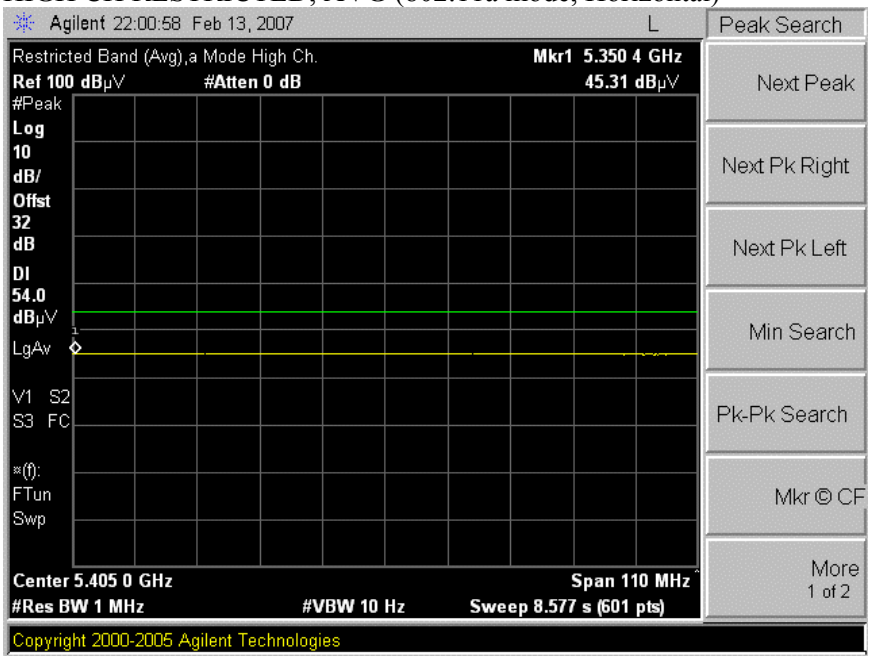


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

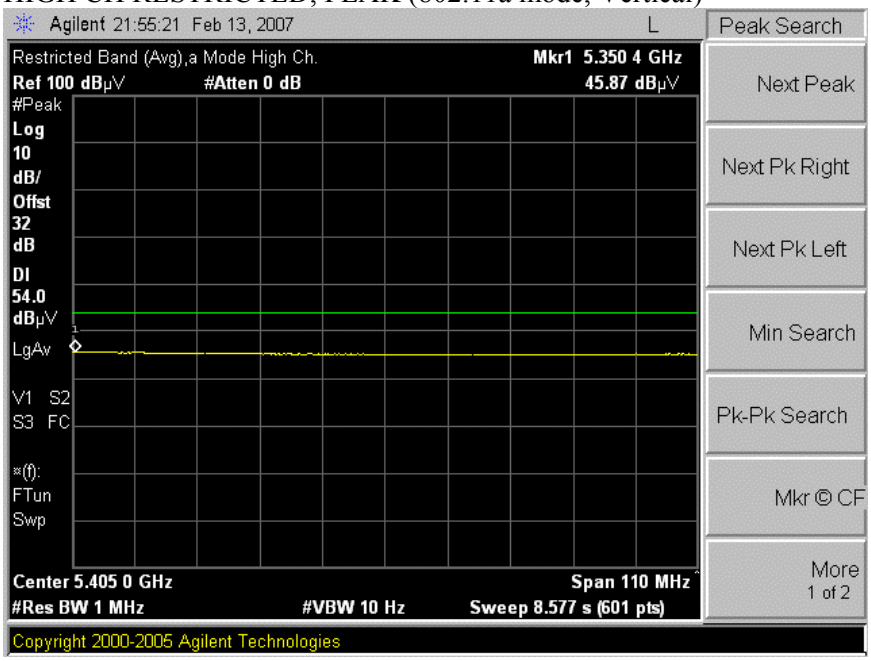


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

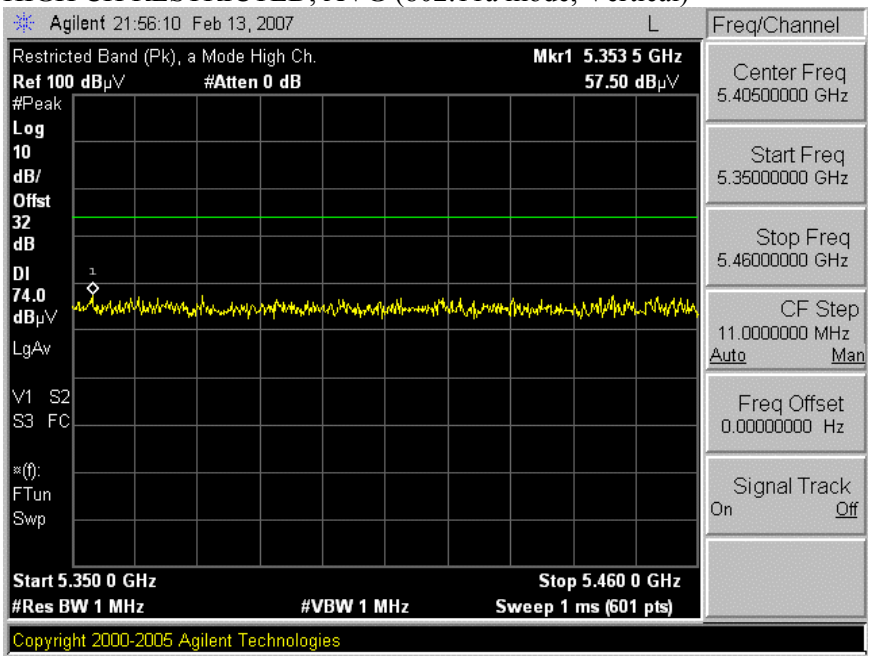


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



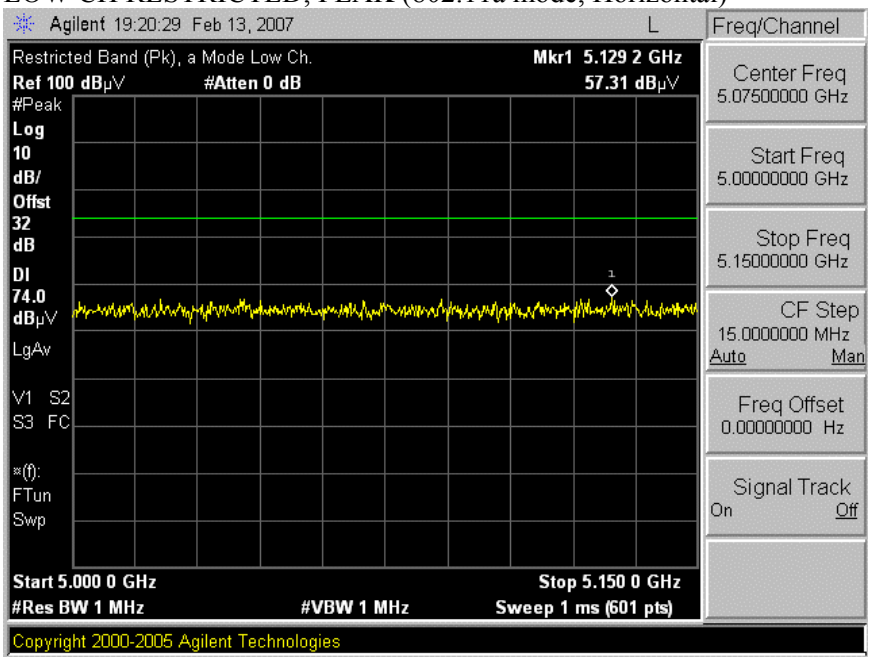
HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



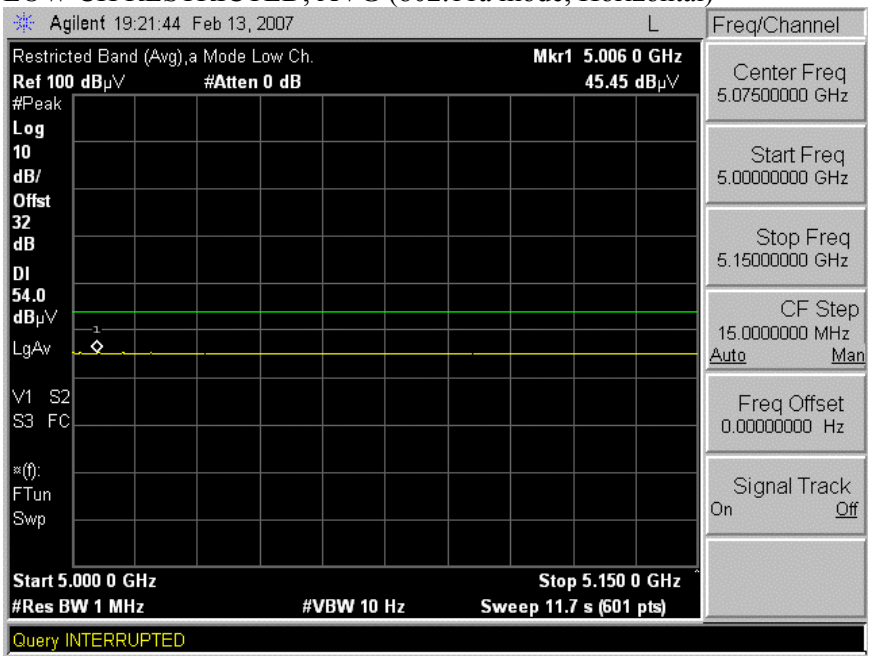
22dBi PATCH ANTENNA (VERTICALLY POLARIZED):

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

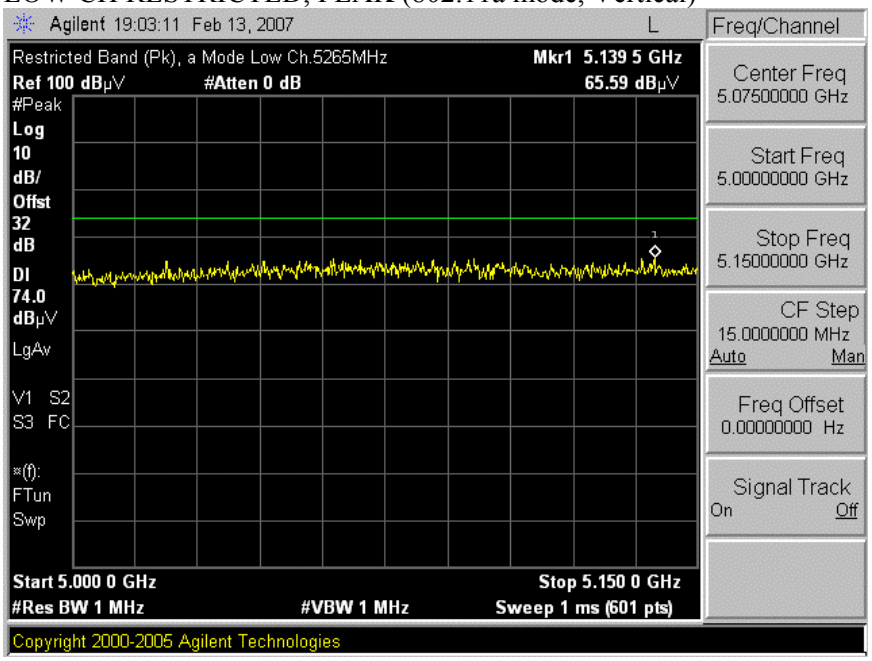


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

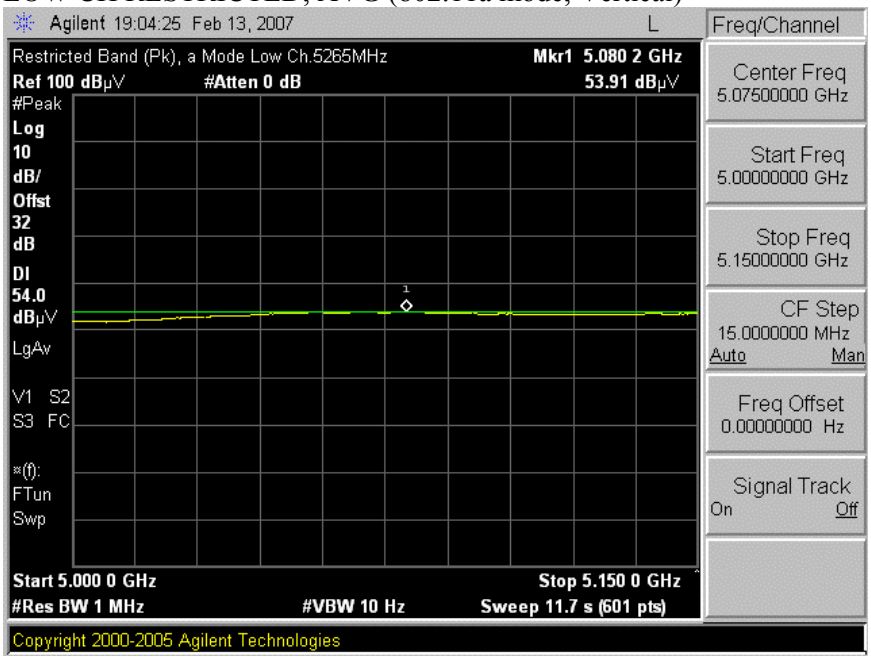


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

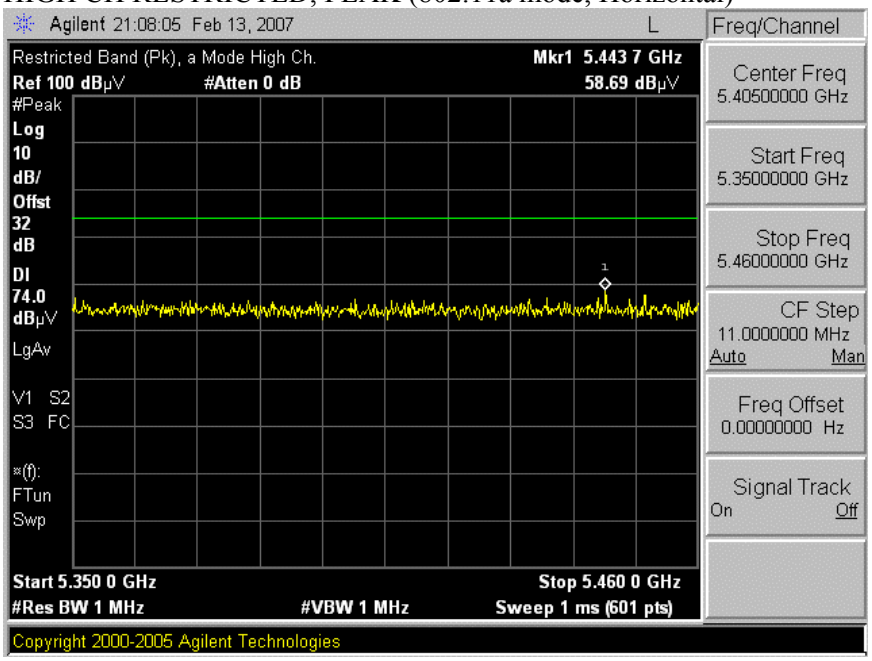


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

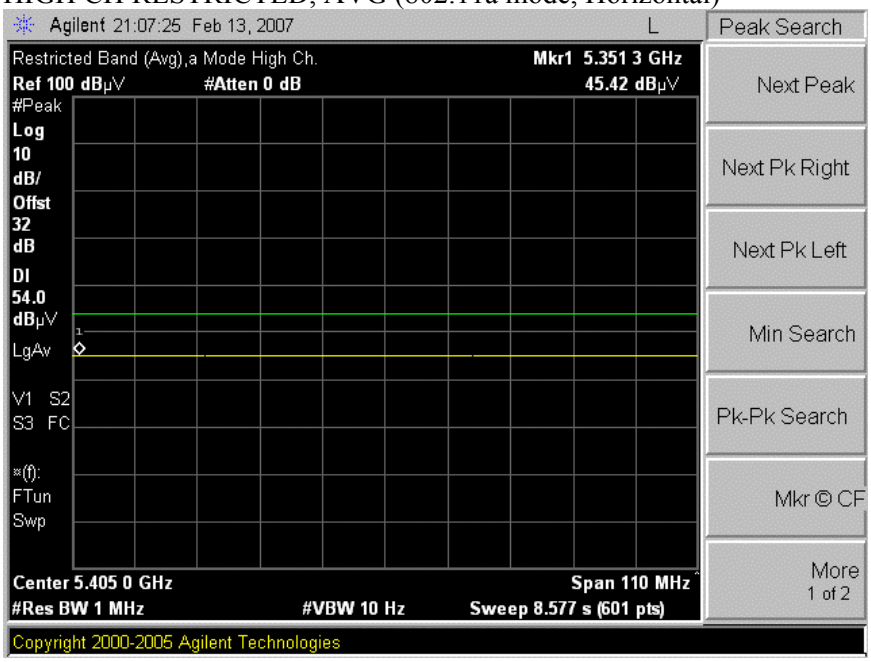


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

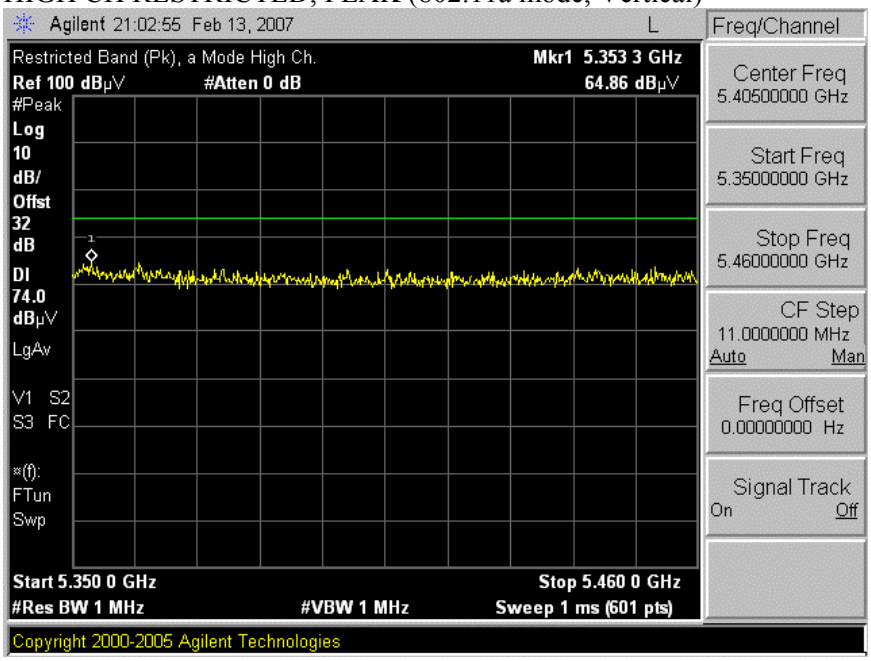


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

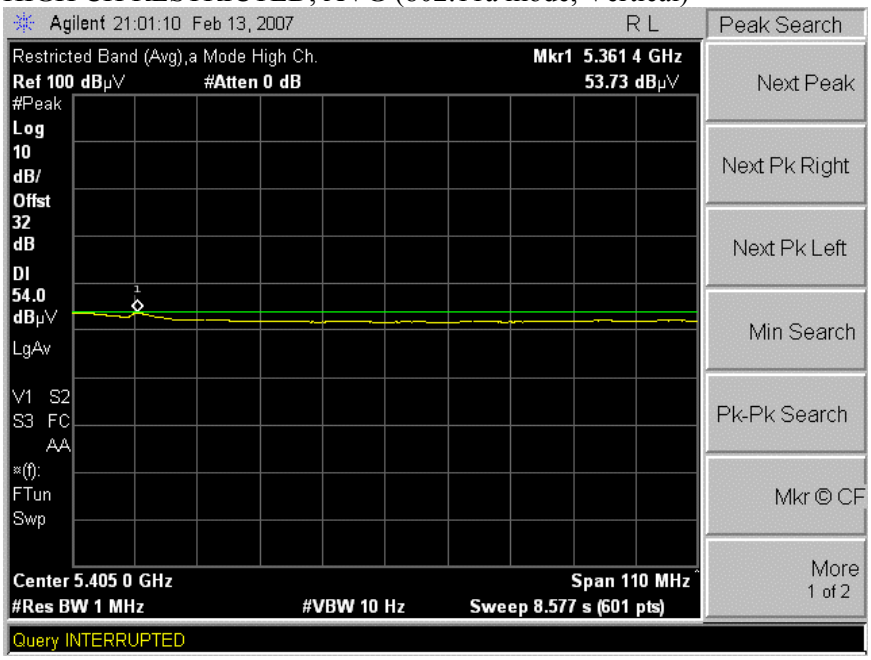


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worst Case)

02/13/07 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:William Zhuang
Project #:06U10393
Company:Trango Systems
EUT Descrip.:EUT with 23 dBi Patch Antenna
Mode Oper:Tx On, worst case: set V

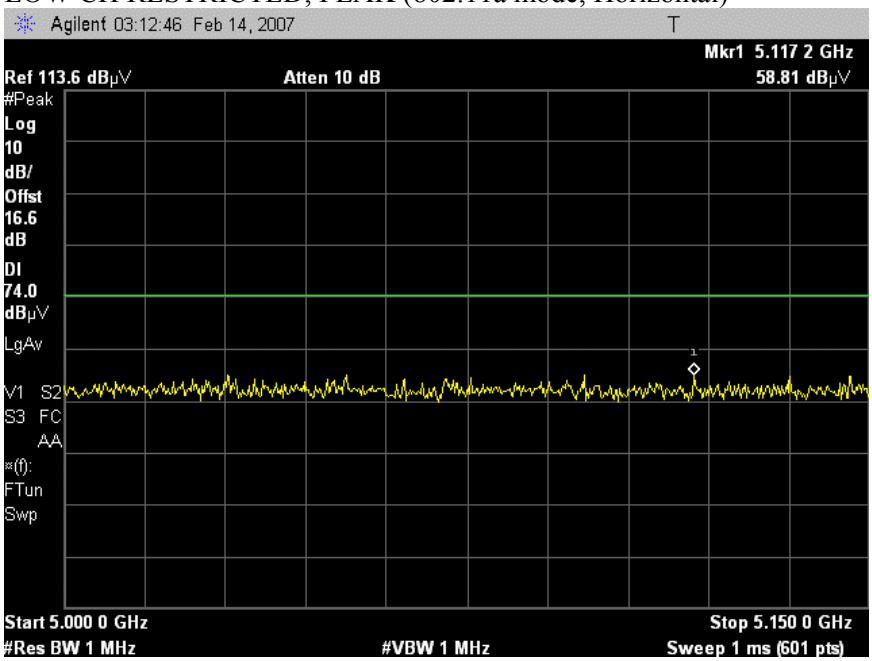
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch. 5265MHz															
10.530	3.0	39.7	28.1	37.1	11.9	-32.6	0.0	0.8	56.9	45.3	74.0	54.0	-17.1	-8.7	V
15.795	3.0	41.8	29.6	37.5	14.3	-32.2	0.0	0.7	62.2	50.0	74.0	54.0	-11.8	-4.0	V
10.530	3.0	39.5	27.7	37.1	11.9	-32.6	0.0	0.8	56.6	44.8	74.0	54.0	-17.4	-9.2	H
15.795	3.0	41.6	29.6	37.5	14.3	-32.2	0.0	0.7	61.9	49.9	74.0	54.0	-12.1	-4.1	H
Mid Ch. 5305MHz															
10.610	3.0	40.2	28.3	37.1	12.0	-32.6	0.0	0.8	57.5	45.6	74.0	54.0	-16.5	-8.4	V
15.915	3.0	41.9	29.7	37.2	14.4	-32.1	0.0	0.7	62.0	49.8	74.0	54.0	-12.0	-4.2	V
10.610	3.0	39.7	28.2	37.1	12.0	-32.6	0.0	0.8	57.0	45.4	74.0	54.0	-17.0	-8.6	H
15.915	3.0	41.2	29.7	37.2	14.4	-32.1	0.0	0.7	61.3	49.8	74.0	54.0	-12.7	-4.2	H
High Ch. 5325MHz															
10.650	3.0	40.6	28.9	37.1	12.1	-32.6	0.0	0.8	58.0	46.3	74.0	54.0	-16.0	-7.7	V
15.975	3.0	41.8	29.6	37.1	14.4	-32.1	0.0	0.7	61.8	49.7	74.0	54.0	-12.2	-4.3	V
10.650	3.0	39.9	28.6	37.1	12.1	-32.6	0.0	0.8	57.2	45.9	74.0	54.0	-16.8	-8.1	H
15.975	3.0	41.9	29.6	37.1	14.4	-32.1	0.0	0.7	61.9	49.6	74.0	54.0	-12.1	-4.4	H

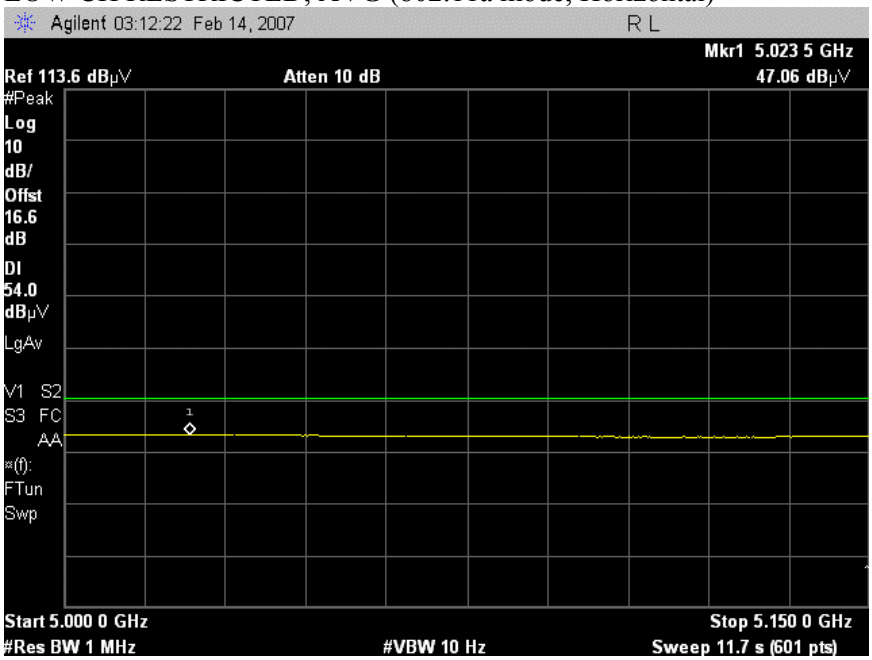
18dBi PATCH ANTENNA (HORIZONTALLY POLARIZED):

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

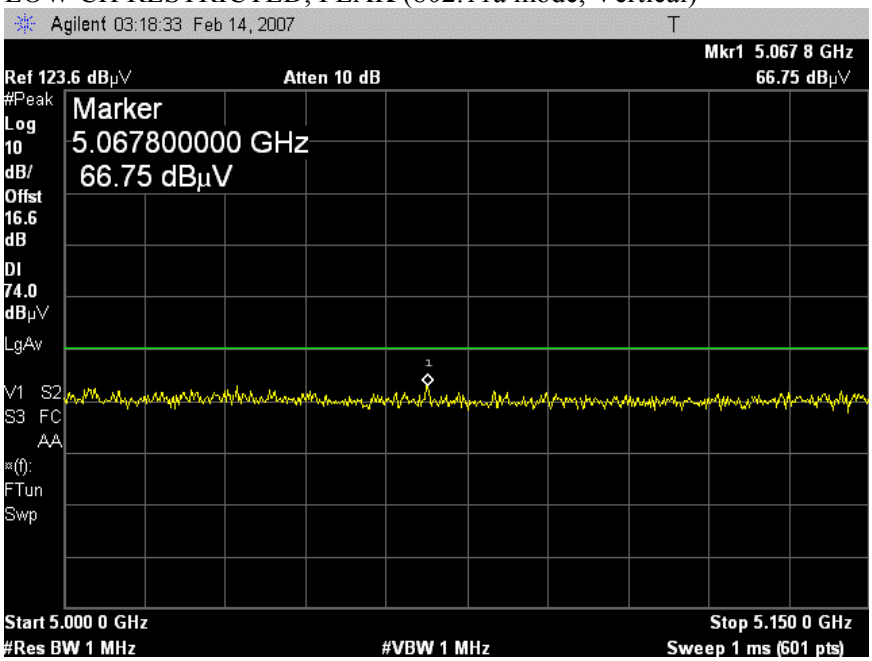


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

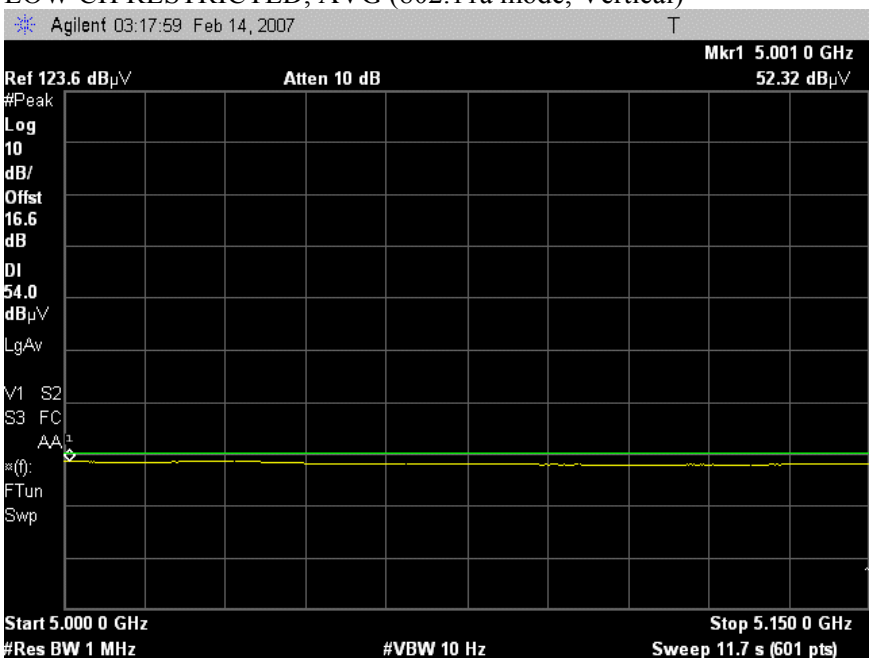


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

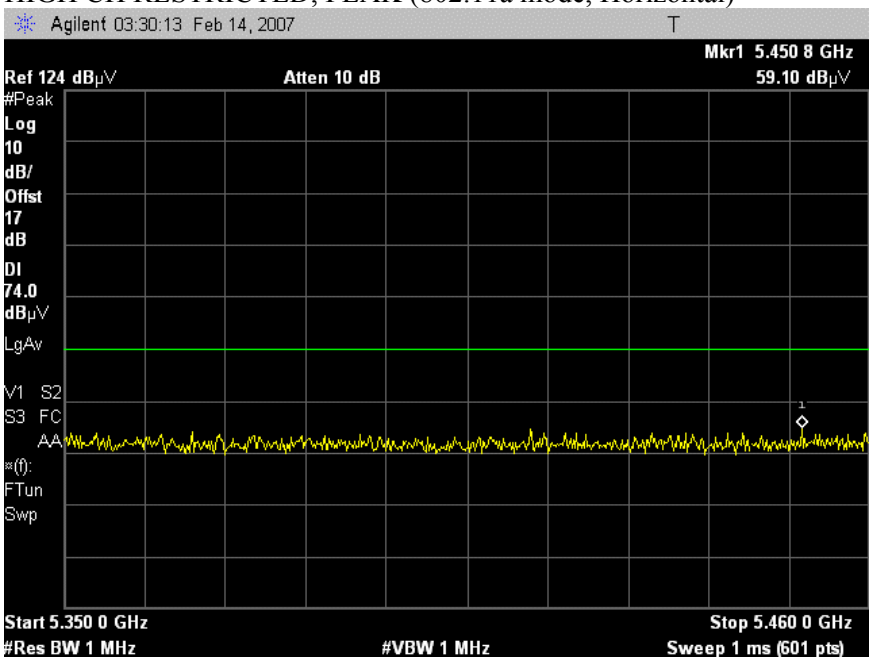


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

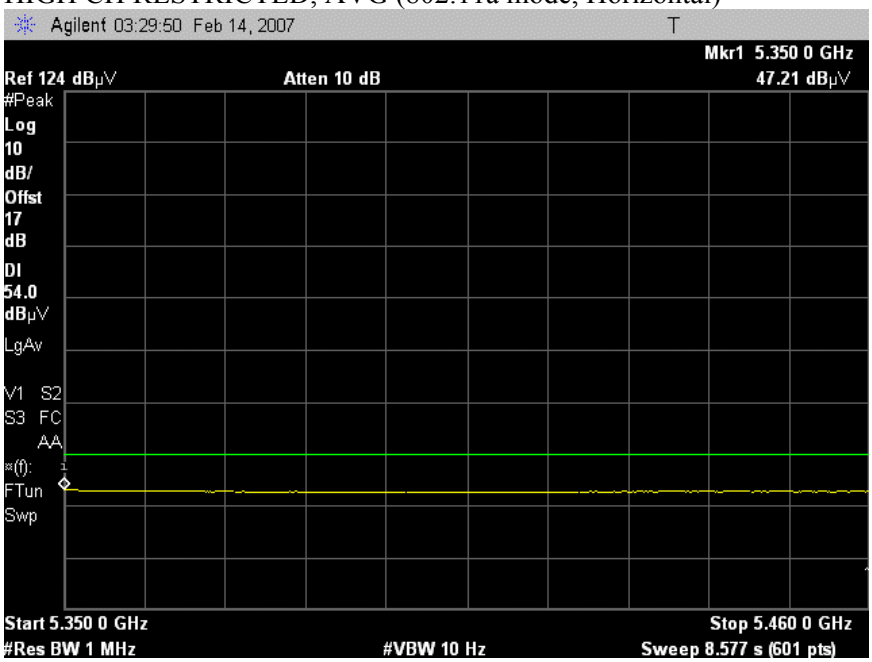


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

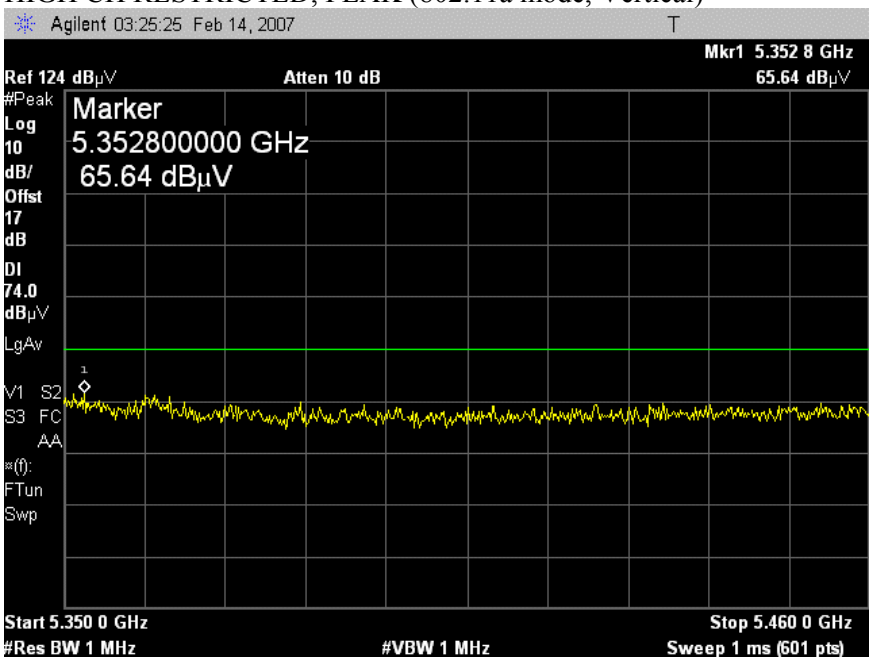


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)



RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)

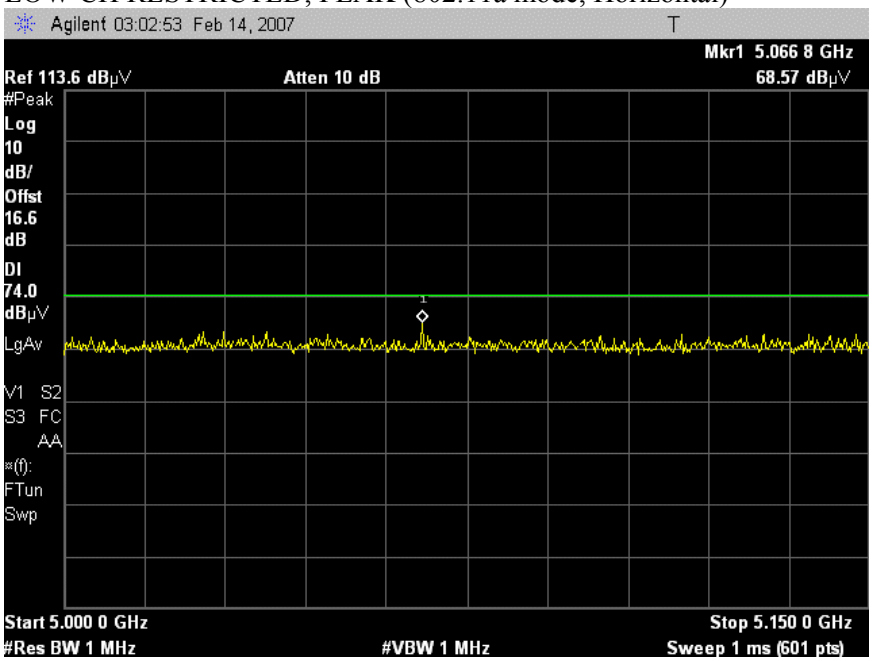


HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)

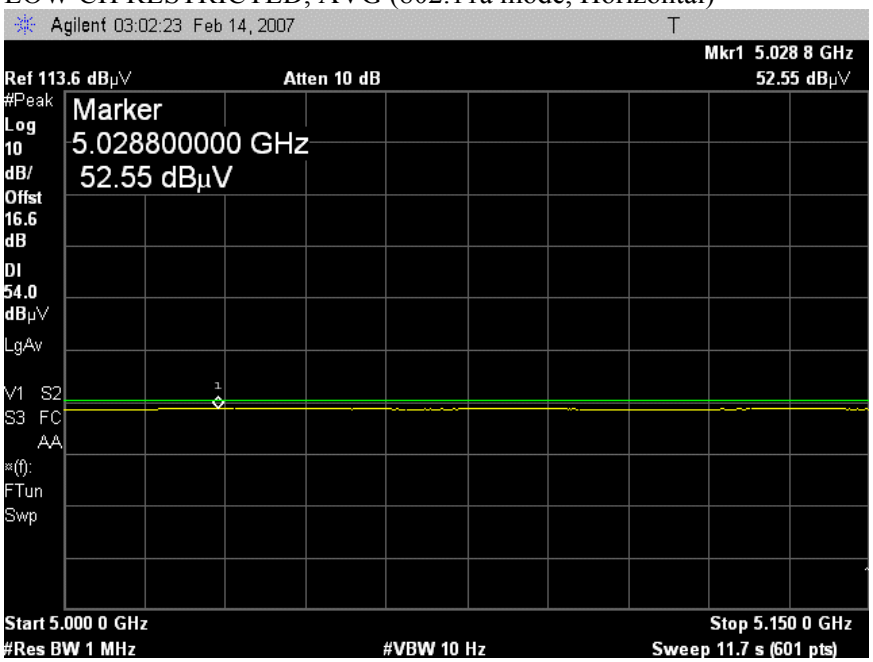
18dBi PATCH ANTENNA (VERTICALLY POLARIZED):

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

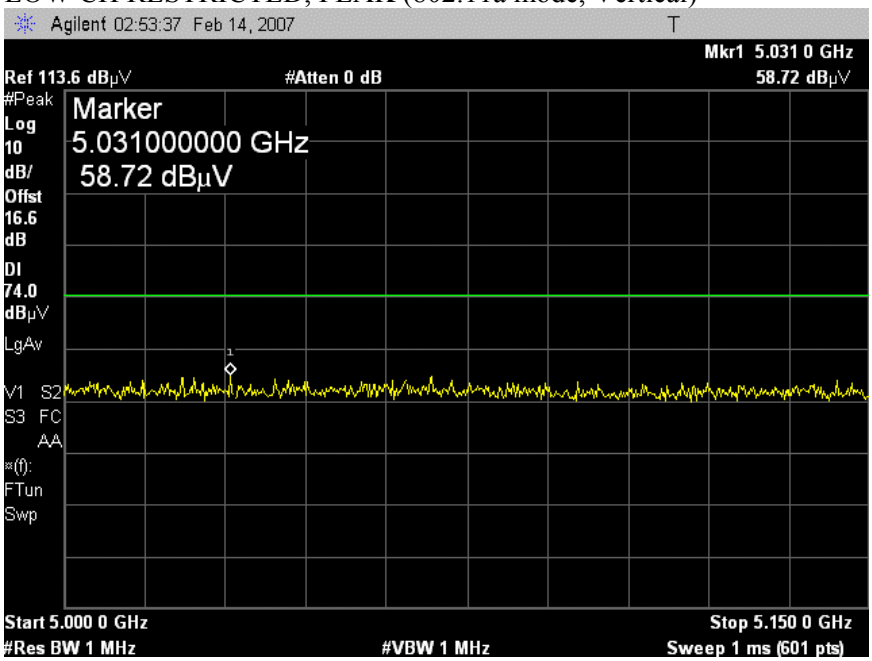


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

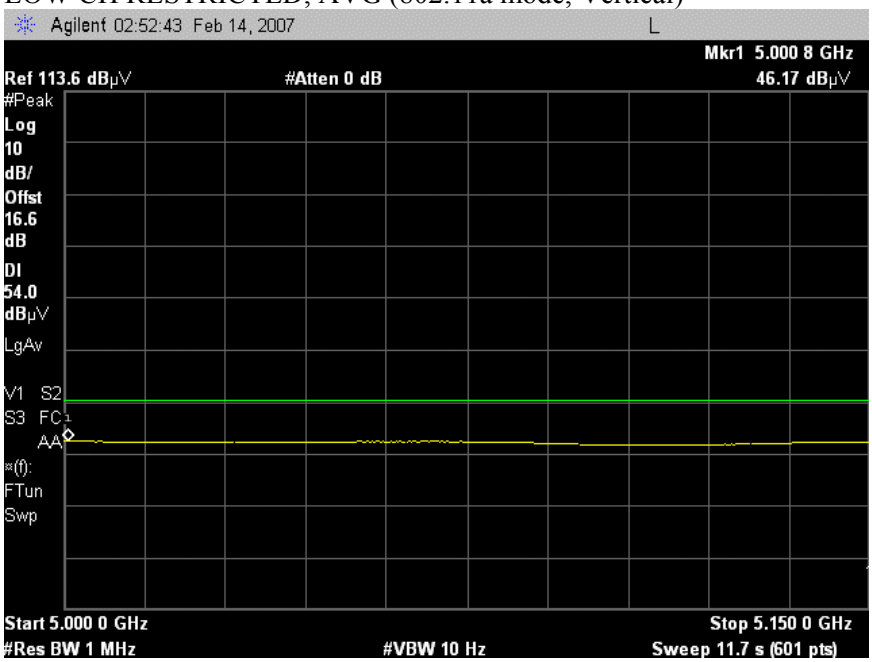


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

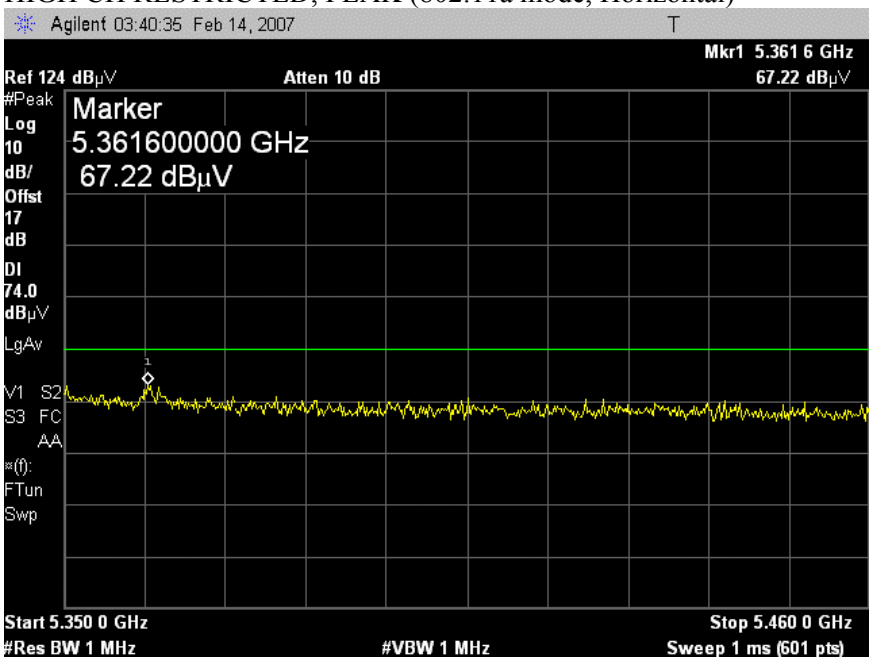


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

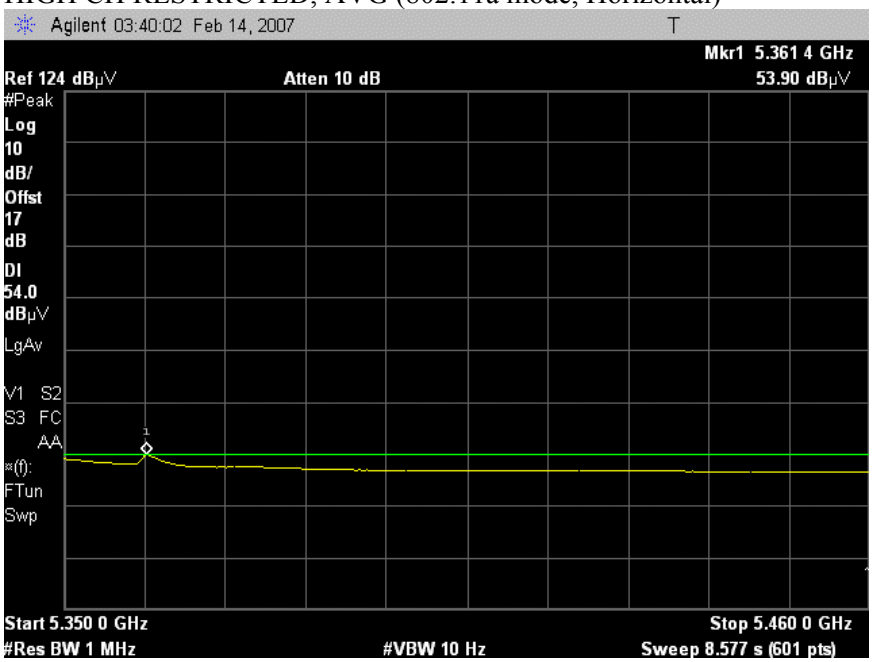


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

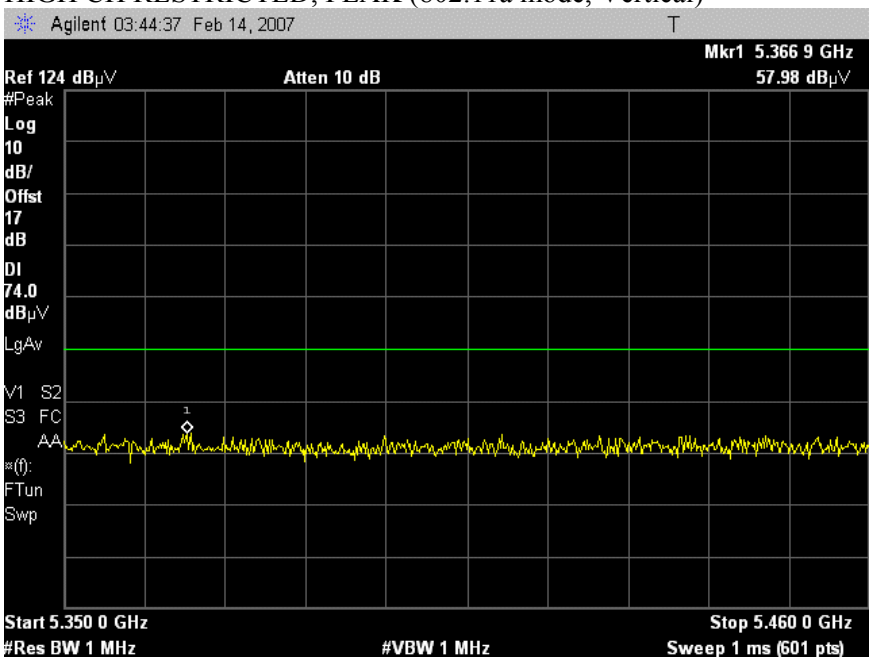


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

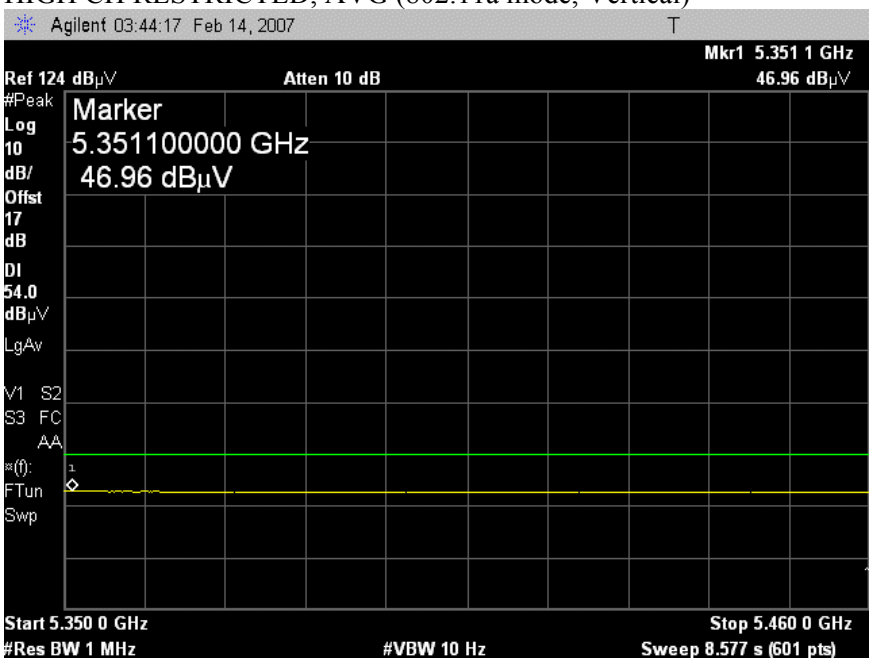


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worst Case)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Trango
Project #: 06U10393
Date: 02/13/07
Test Engineer: Frank Ibrahim
Configuration: EUT with 19 dBi Patch Antenna, EUT connected to Laptop PC, horizontally polarized
Mode: TX ON, 5.2 GHz band
S/N: 310-91512

Test Equipment:

Horn 1-18GHz: T60; S/N: 2238 @3m
Pre-amplifer 1-26GHz: T34 HP 8449B
Pre-amplifer 26-40GHz: T88 Miteq 26-40GHz
Horn > 18GHz: T89; ARA 18-26GHz; S/N:1049

Hi Frequency Cables
2 foot cable: Thanh 177079008
3 foot cable:
12 foot cable: Gordon 203134001
HPF:
Reject Filter: R_002

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (5265 MHz)															
1.056	3.0	61.2	49.6	25.6	3.4	-38.2	0.0	0.0	51.9	40.4	74	54	-22.1	-13.6	V, power setting = 11 dBm
1.194	3.0	59.7	35.7	25.9	3.6	-38.0	0.0	0.0	51.2	27.2	74	54	-22.8	-26.8	V, power setting = 11 dBm
15.795	3.0	44.5	31.7	37.9	13.5	-32.2	0.0	0.0	63.7	51.0	74	54	-10.3	-3.0	V, power setting = 11 dBm
1.056	3.0	58.5	47.5	25.6	3.4	-38.2	0.0	0.0	49.2	38.3	74	54	-24.8	-15.7	H, power setting = 11 dBm
15.795	3.0	43.6	30.5	37.9	13.5	-32.2	0.0	0.0	62.9	49.8	74	54	-11.1	-4.2	H, power setting = 11 dBm
Mid Channel (5305 MHz)															
10.610	3.0	44.0	31.6	37.4	11.4	-32.6	0.0	0.0	60.1	47.7	74	54	-13.9	-6.3	V, power setting = 11 dBm
15.915	3.0	45.0	31.7	37.9	13.6	-32.1	0.0	0.0	64.3	51.0	74	54	-9.7	-3.0	V, power setting = 11 dBm
10.610	3.0	43.8	31.4	37.4	11.4	-32.6	0.0	0.0	59.9	47.5	74	54	-14.1	-6.5	H, power setting = 11 dBm
15.915	3.0	44.6	31.3	37.9	13.6	-32.1	0.0	0.0	63.9	50.6	74	54	-10.1	-3.4	H, power setting = 11 dBm
High Channel (5325 MHz)															
10.650	3.0	43.5	31.7	37.3	11.4	-32.6	0.0	0.0	59.7	47.9	74	54	-14.3	-6.1	V, power setting = 10 dBm
15.975	3.0	44.7	31.4	37.8	13.6	-32.1	0.0	0.0	64.0	50.7	74	54	-10.0	-3.3	V, power setting = 10 dBm
10.650	3.0	43.3	31.5	37.3	11.4	-32.6	0.0	0.0	59.5	47.7	74	54	-14.5	-6.3	H, power setting = 10 dBm
15.975	3.0	44.5	31.3	37.8	13.6	-32.1	0.0	0.0	63.8	50.6	74	54	-10.2	-3.4	H, power setting = 10 dBm

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

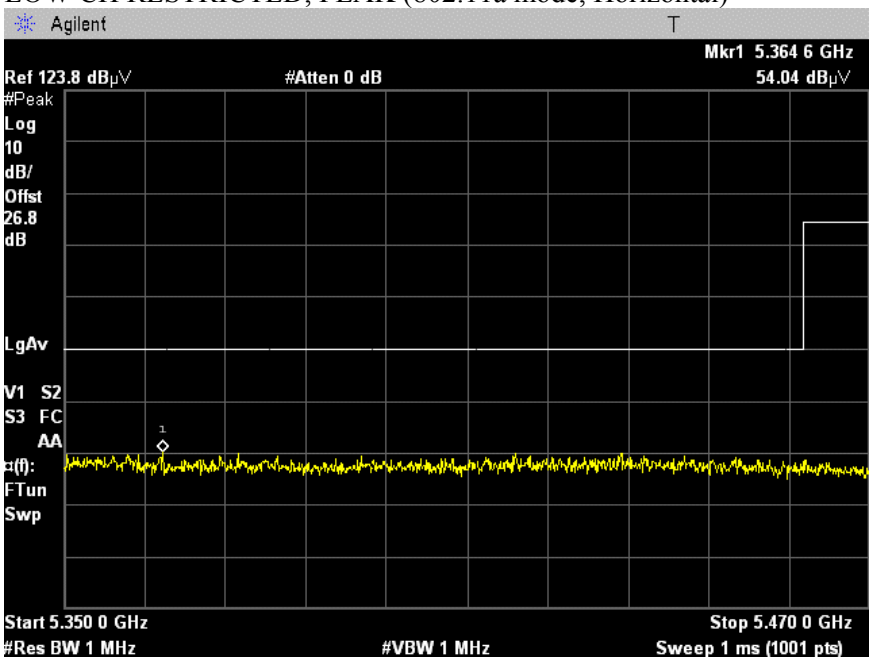
Note: EUT was scanned from 1 GHz to 18 GHz, no other emissions were detected above system noise floor.

7.3.3. TRANSMITTER ABOVE 1 GHZ FOR 5470 TO 5725 MHz BAND

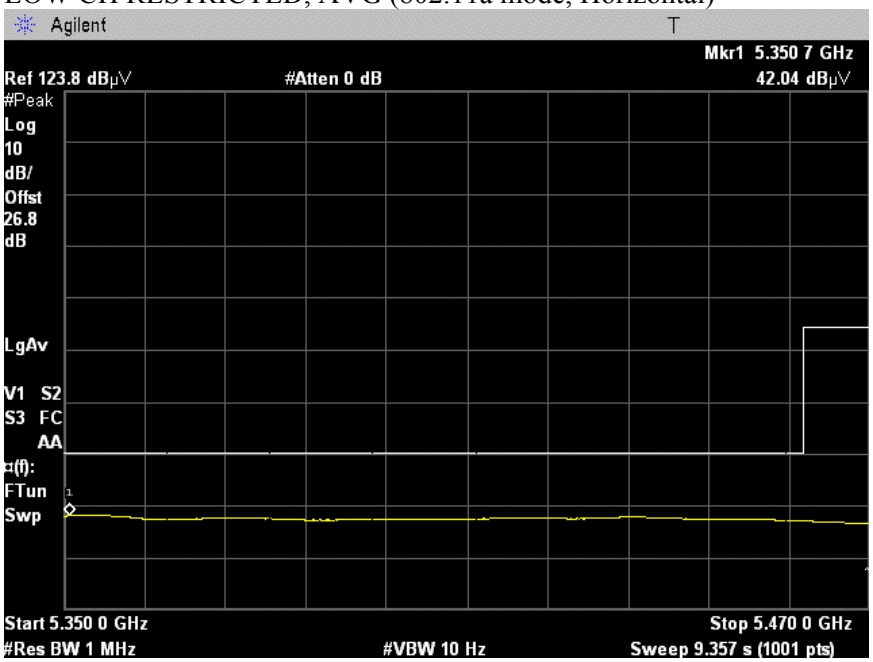
33dBi Dish Antenna at Vertical Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

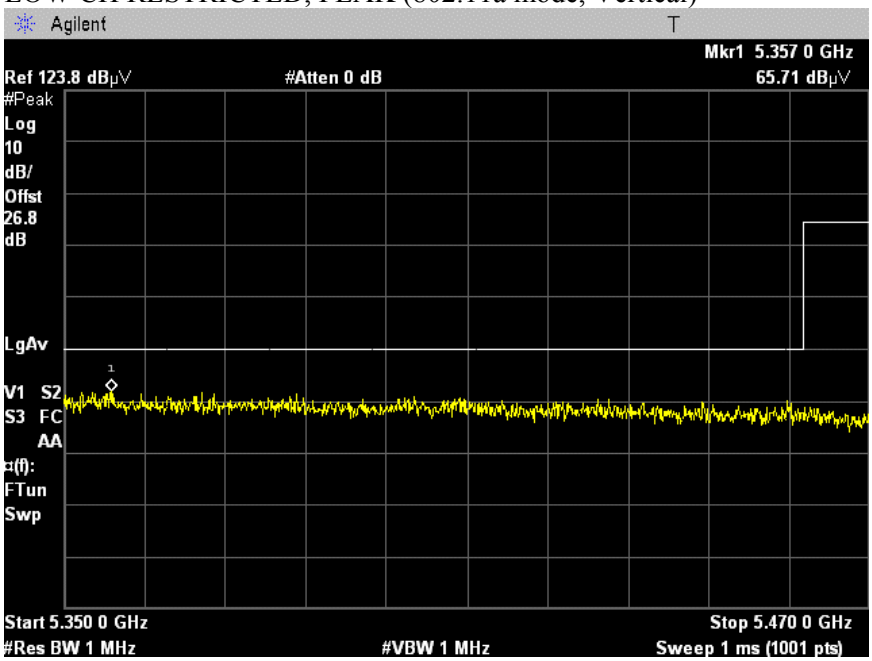


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

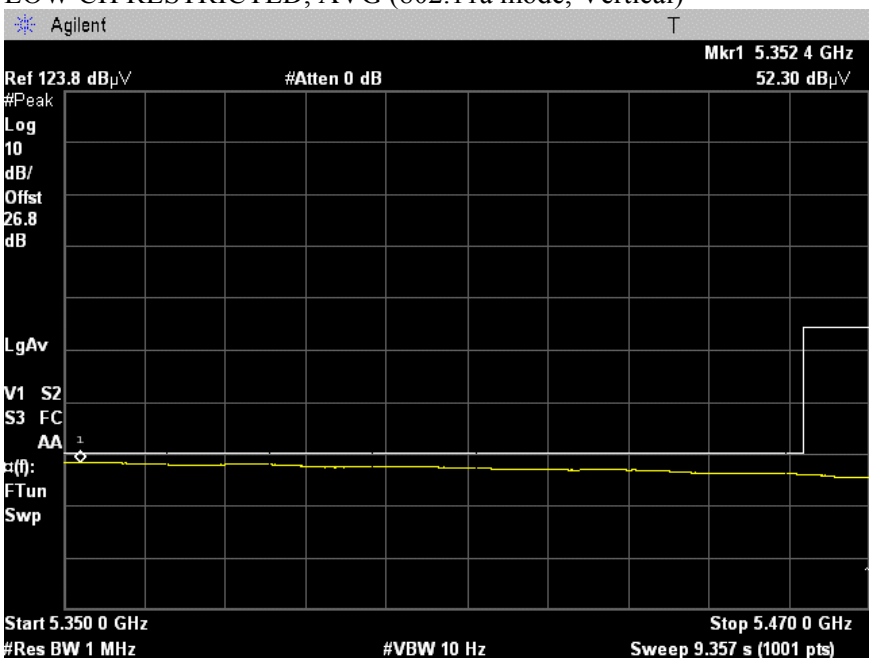


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

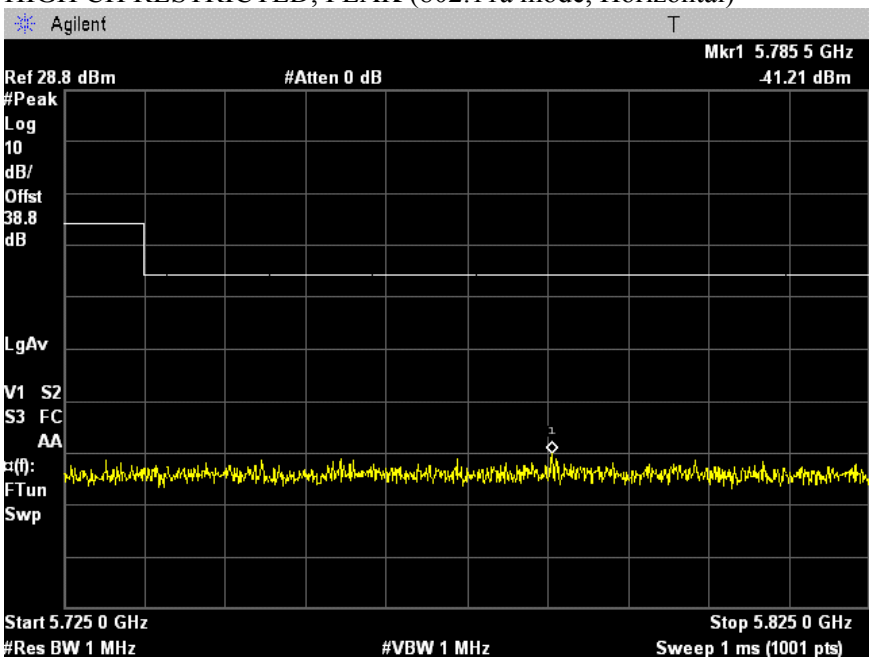


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

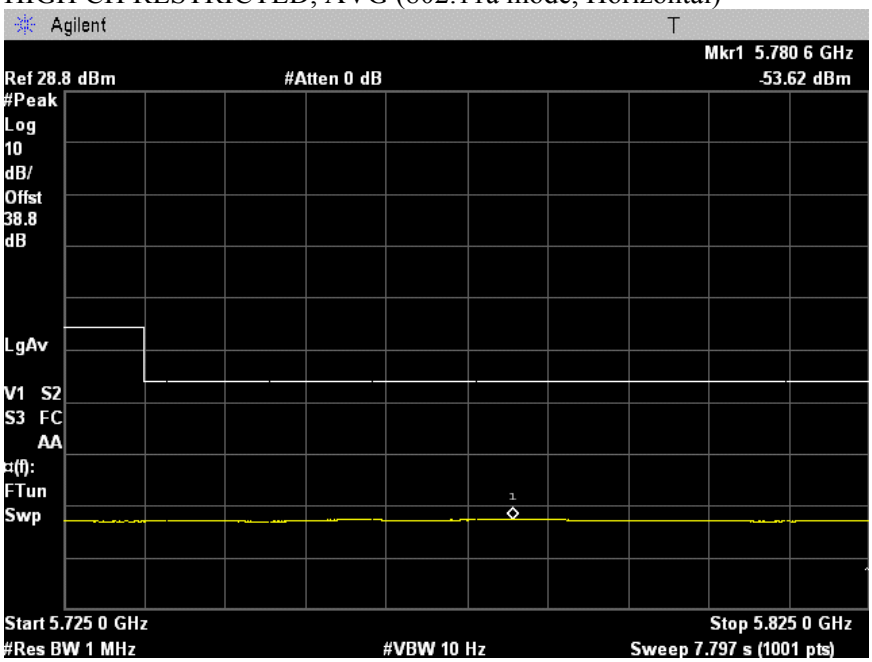


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

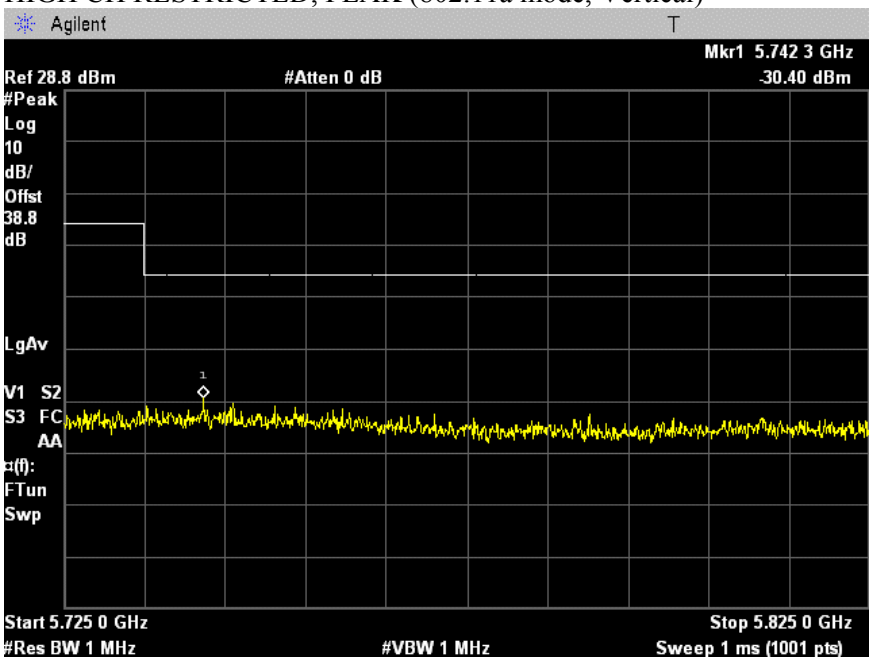


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

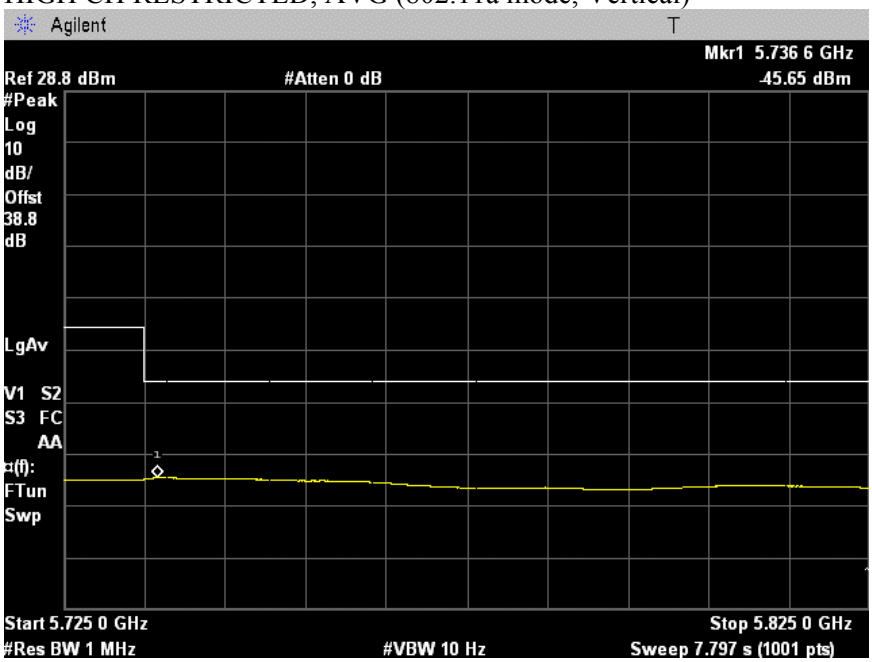


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



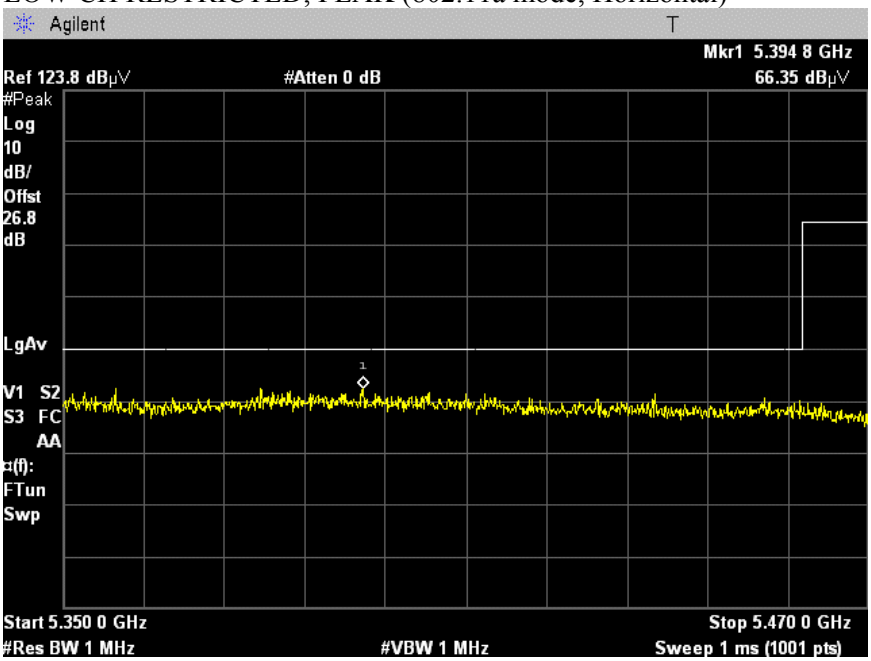
HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



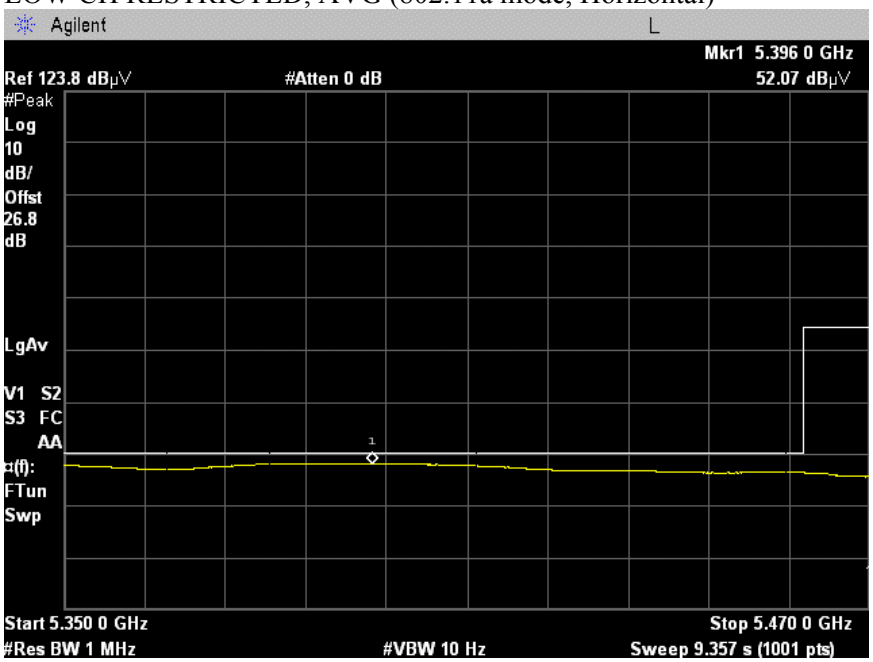
33dBi Dish Antenna at Horizontal Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

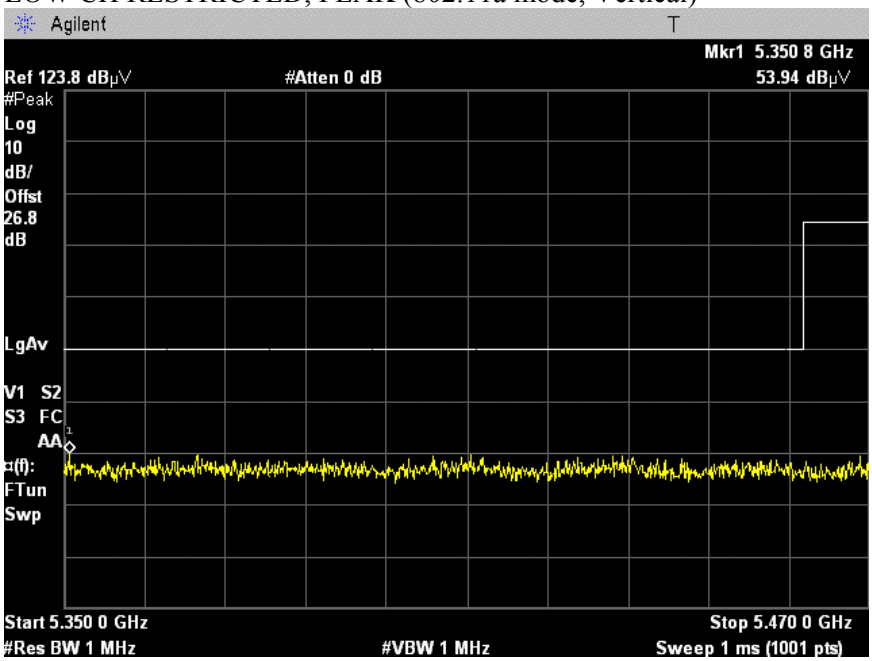


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

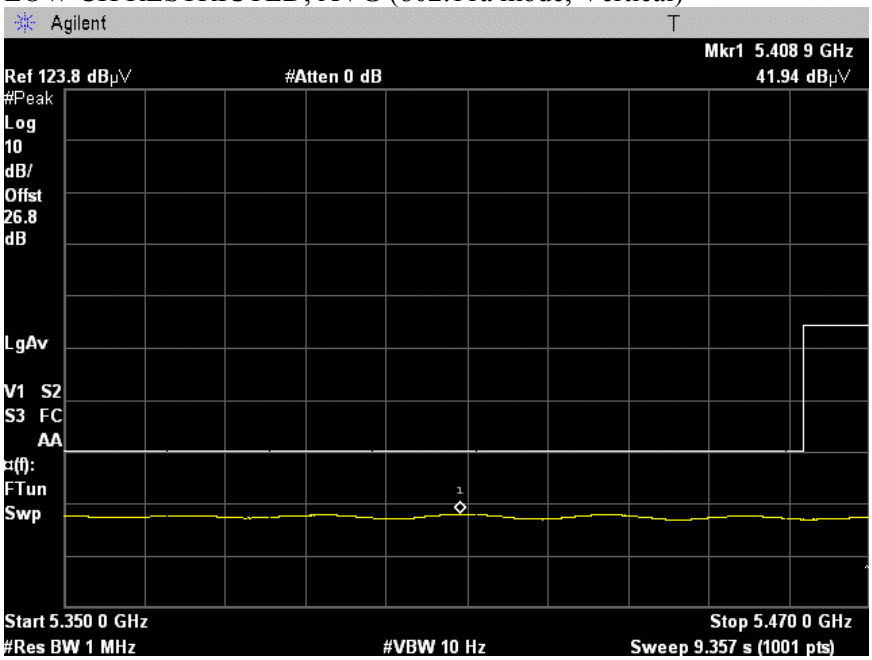


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

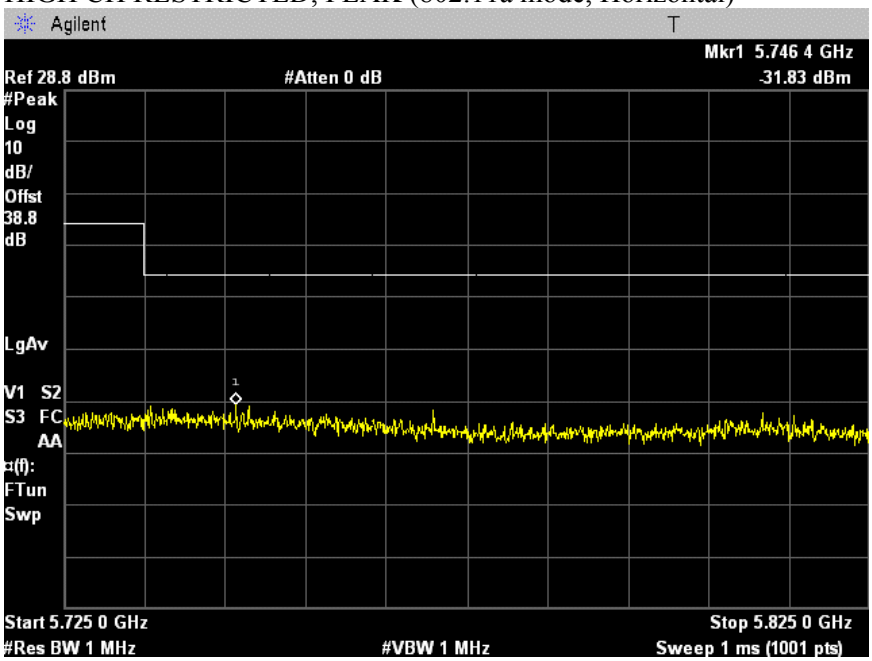


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

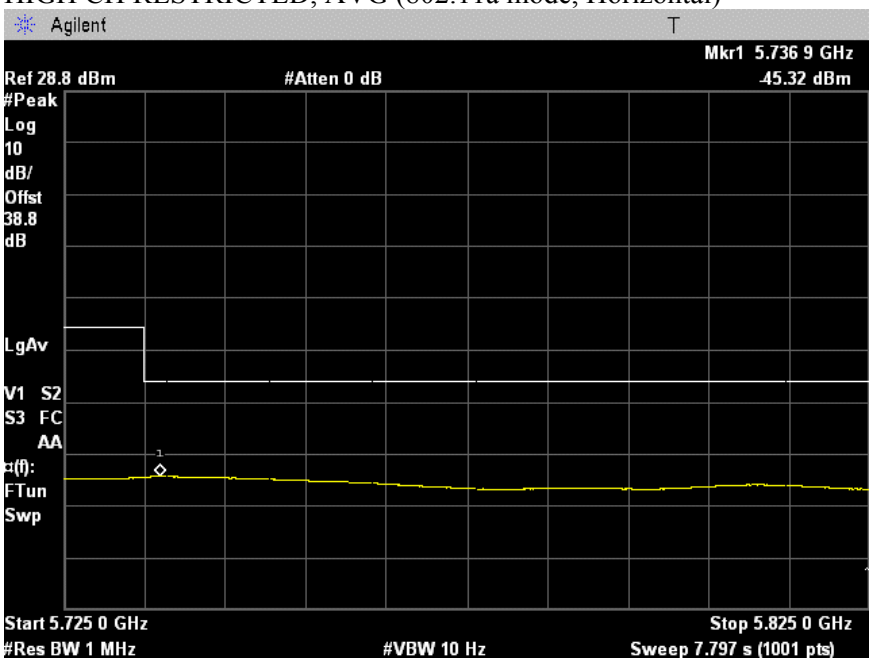


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

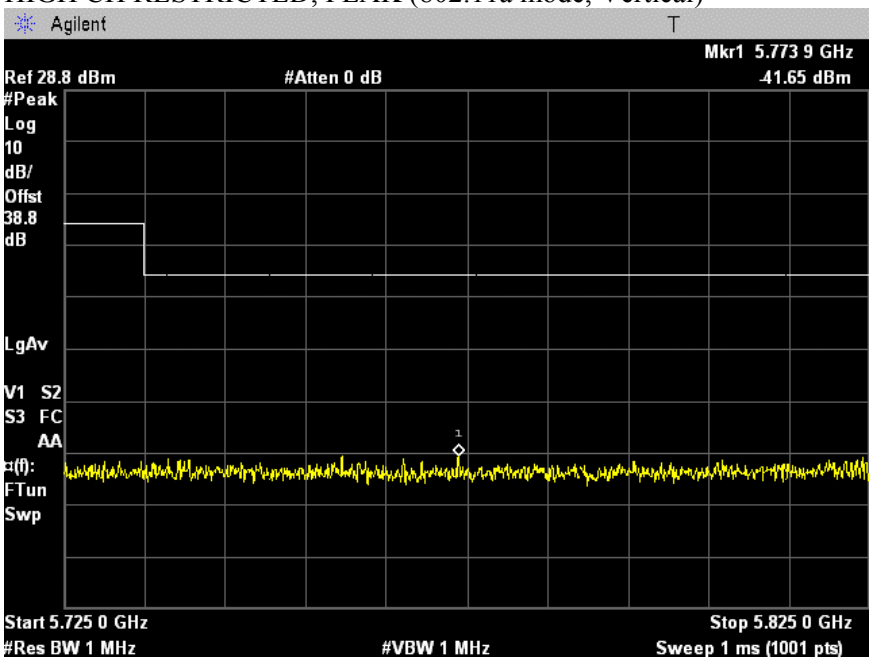


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

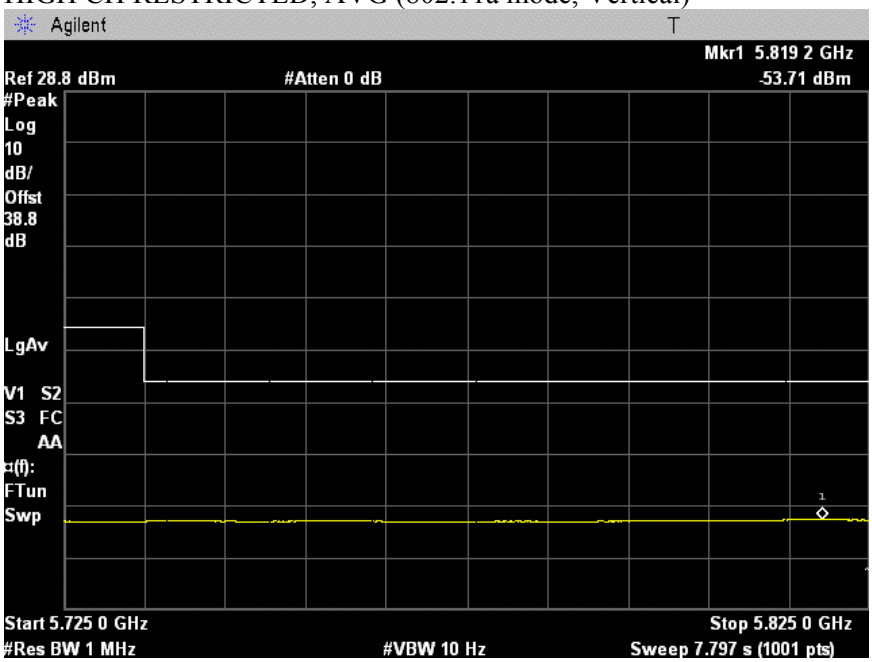


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worst Case)

High Frequency Measurement
Compliance Certification Services, Fremont Chamber B

Company:Trango
Project #:06U10393
Date:March 1, 2007
Test Engineer:Chin Pang
Configuration:EUT/33dBi Dish Antenna
Mode: Transmit at Dish Antenna Horizontal Position

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B	T88 Miteq 26-40GHz	T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Chin 197538001	Gordon 203134001	HPF_7.6GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch, 5500MHz															
11.000	3.0	43.7	30.6	37.2	11.9	-32.6	0.0	0.7	61.0	47.9	74	54	-13.0	-6.1	V
11.000	3.0	44.5	31.2	37.2	11.9	-32.6	0.0	0.7	61.8	48.5	74	54	-12.2	-5.5	H
Mid Ch, 5600Mhz															
11.200	3.0	43.3	29.8	37.3	12.1	-32.6	0.0	0.7	60.9	47.4	74	54	-13.1	-6.6	V
11.200	3.0	44.6	31.3	37.3	12.1	-32.6	0.0	0.7	62.2	48.9	74	54	-11.8	-5.1	H
High Ch, 5700MHz															
11.400	3.0	43.5	30.0	37.4	12.3	-32.5	0.0	0.7	61.4	47.9	74	54	-12.6	-6.1	V
11.400	3.0	44.3	31.0	37.4	12.3	-32.5	0.0	0.7	62.2	48.9	74	54	-11.8	-5.1	H

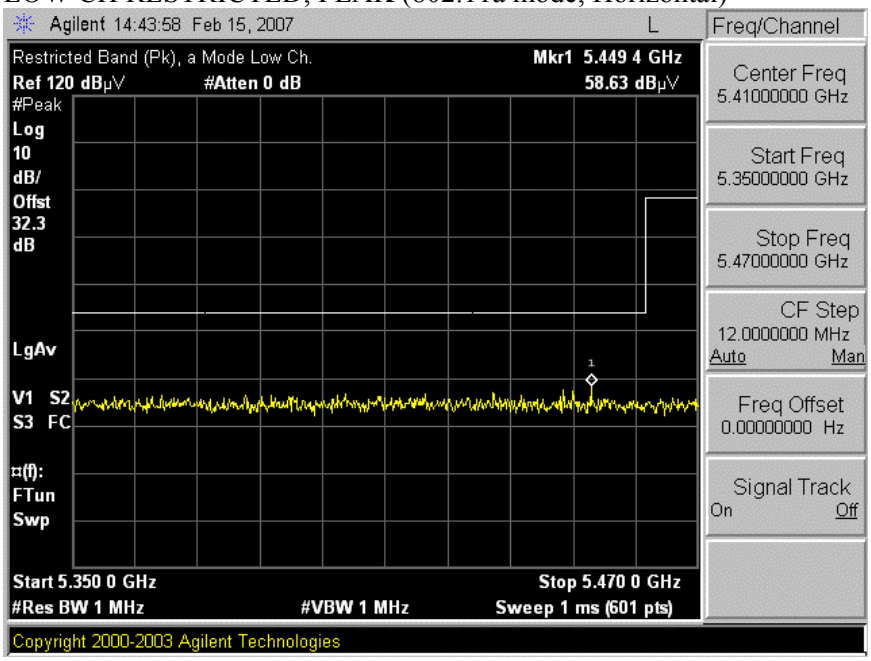
Note: No other emissions were detected above the system noise floor.
Rev. 5.1.6

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

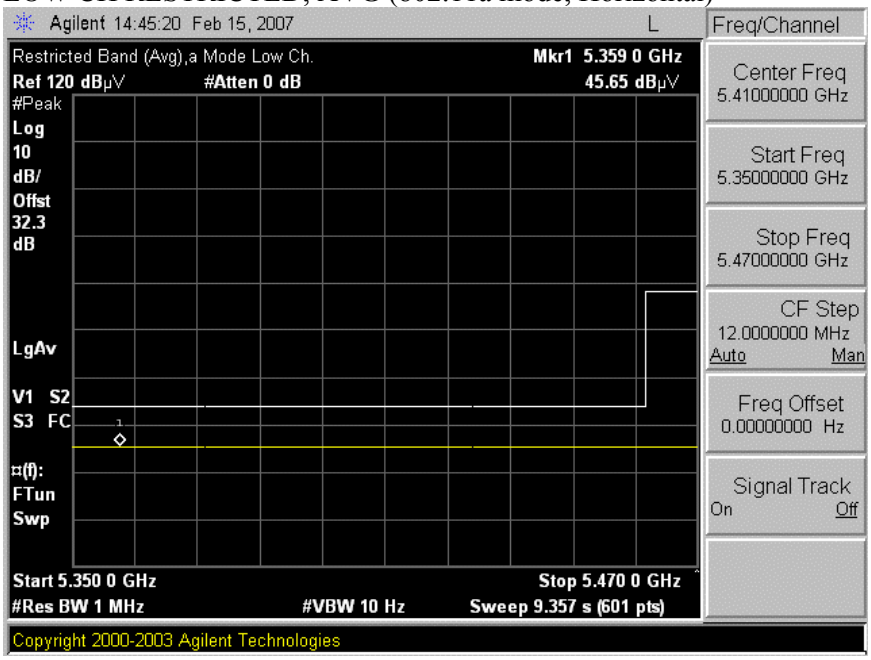
22dBi Dish Antenna at Vertical Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

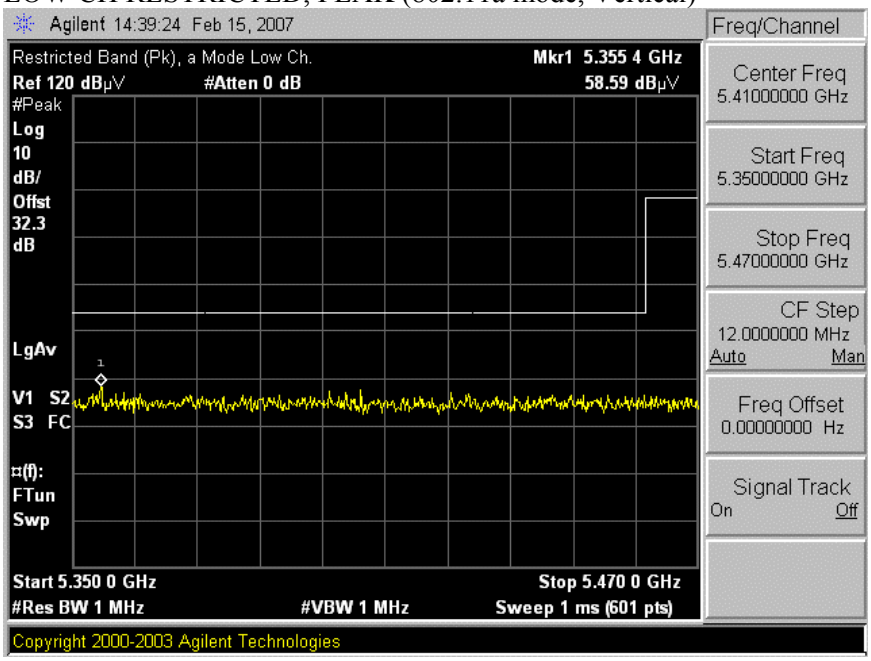


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

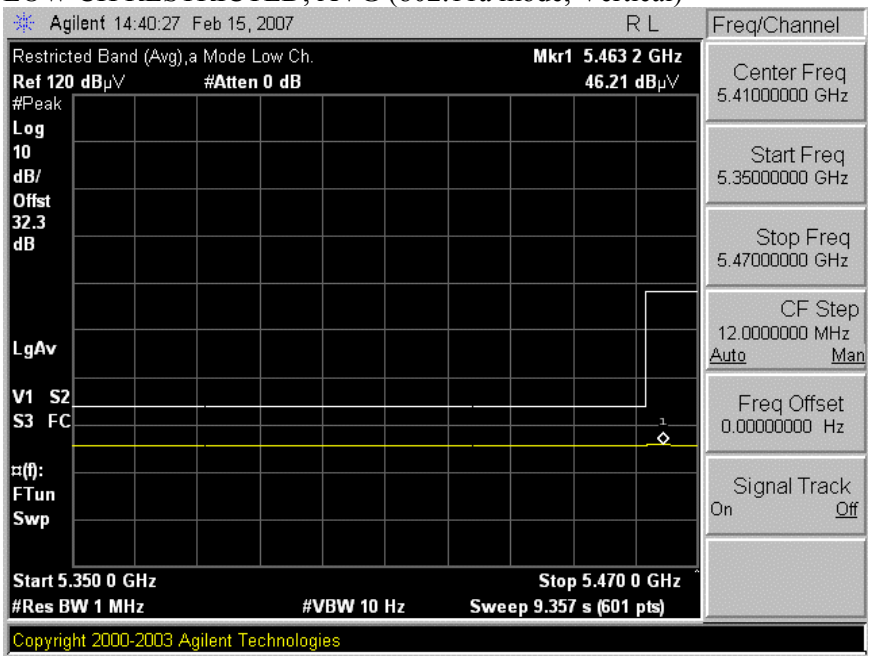


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

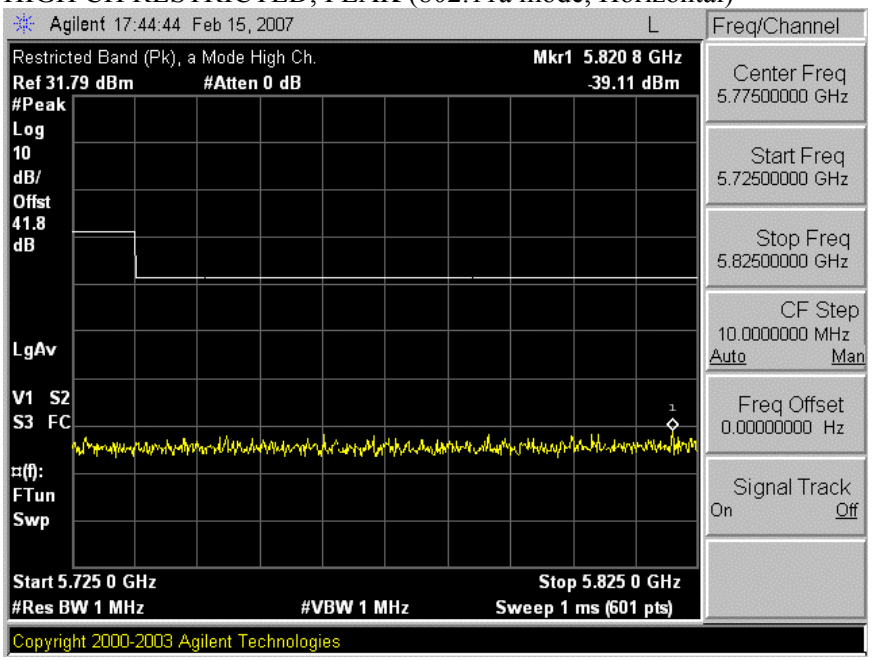


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

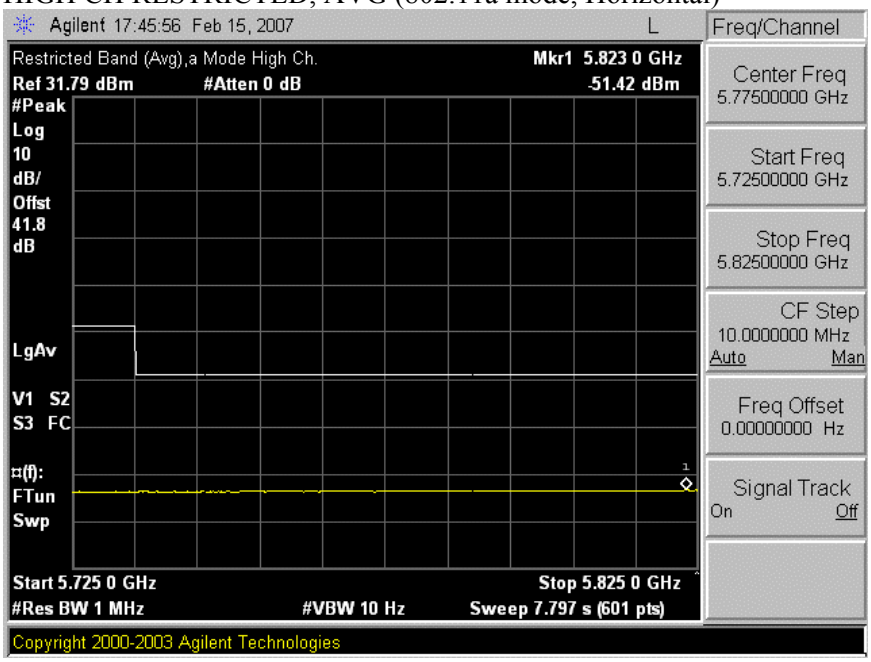


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

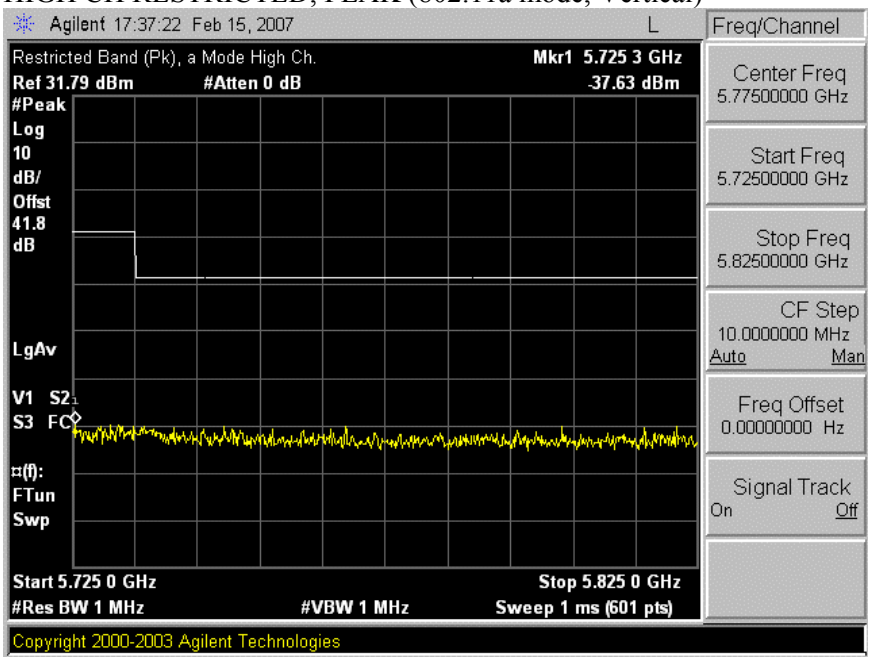


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

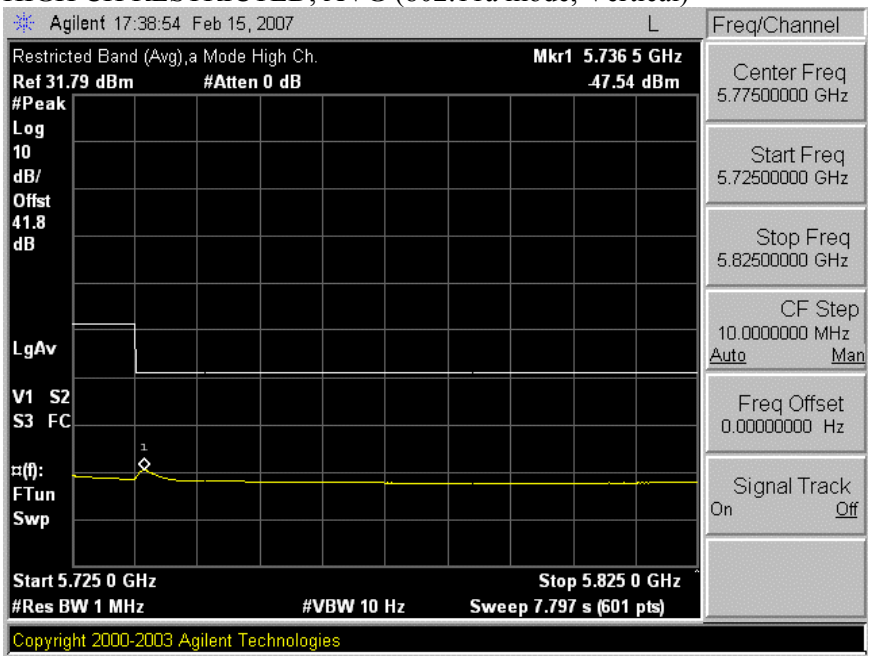


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



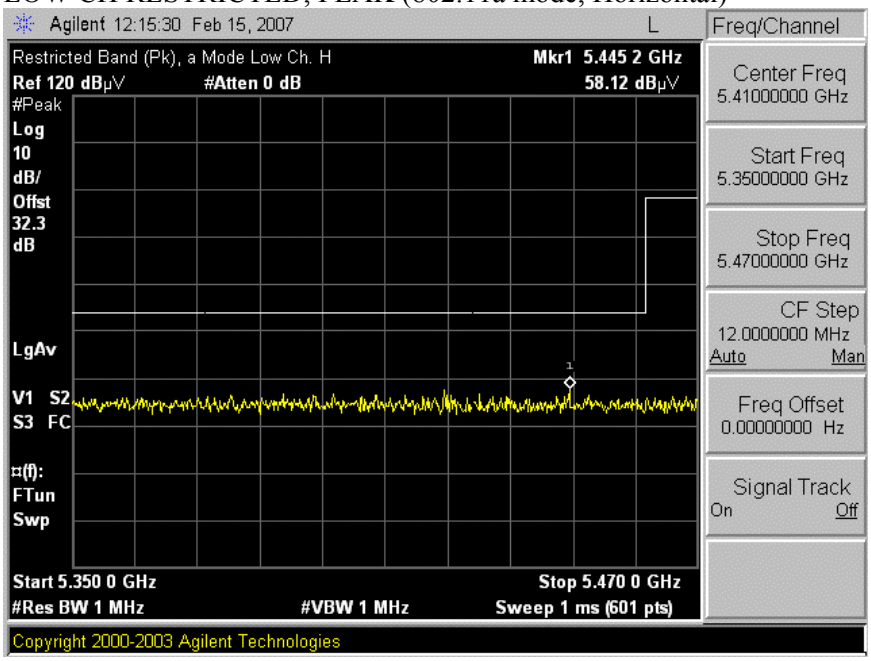
HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



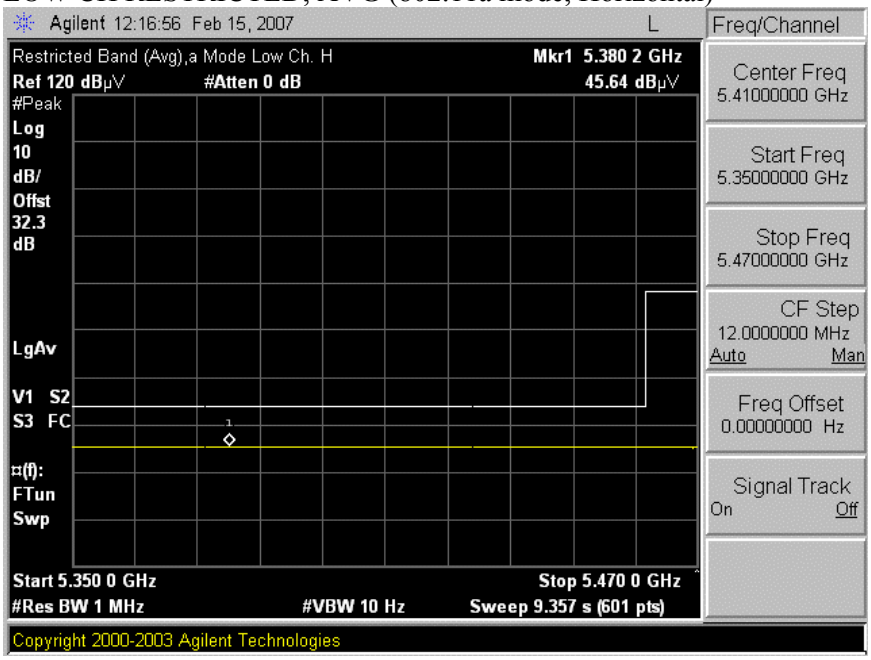
22dBi Dish Antenna at Horizontal Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

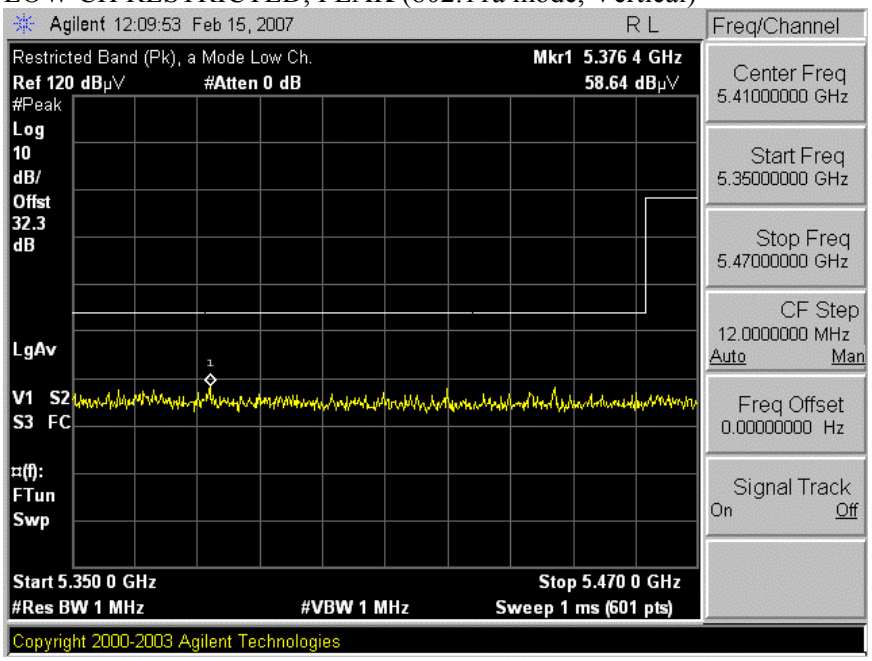


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

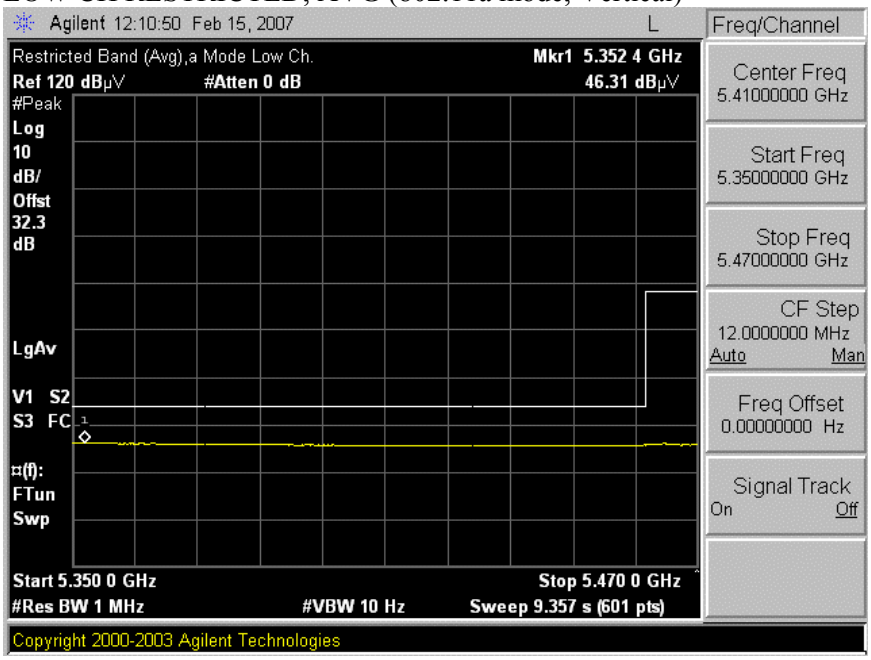


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

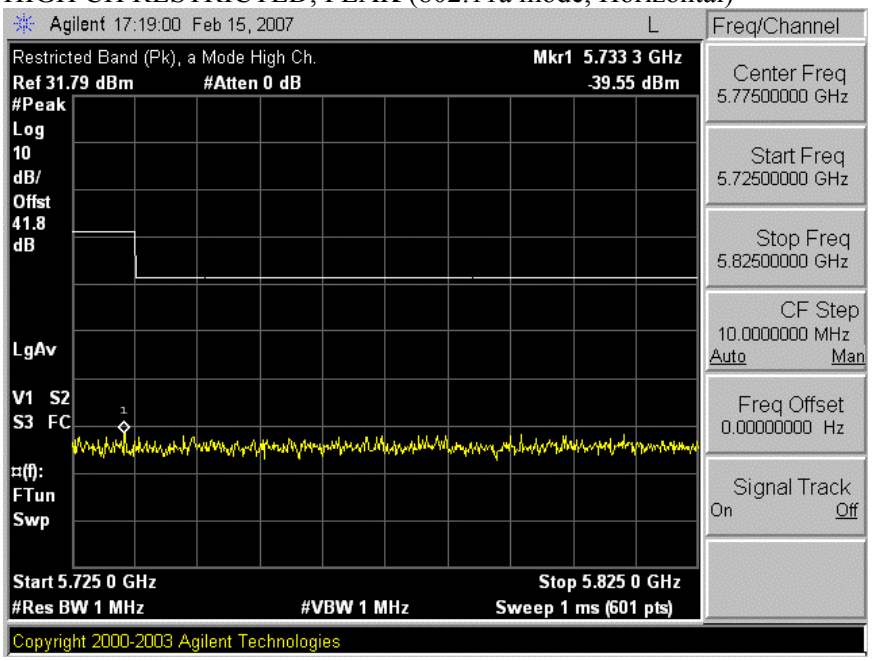


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

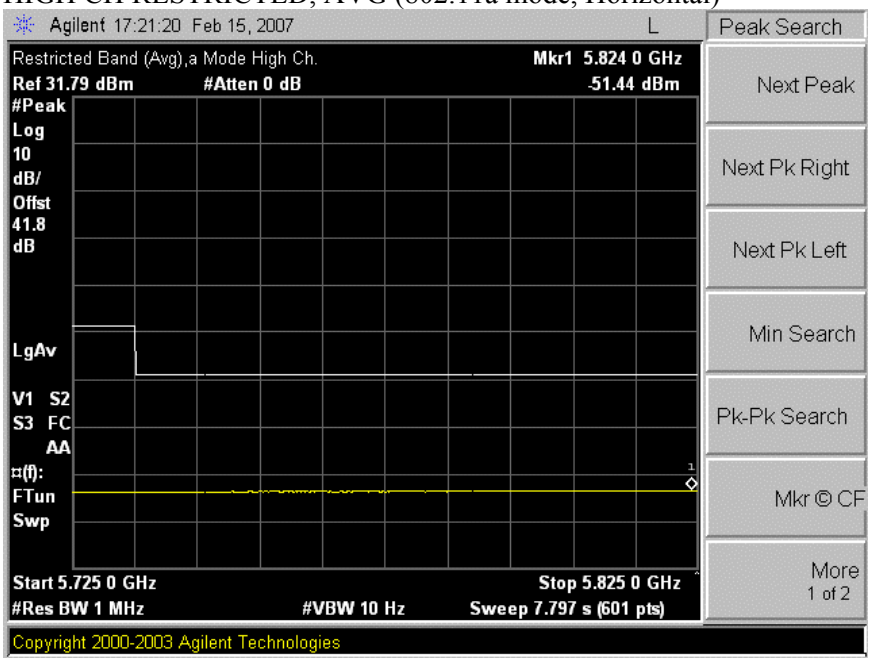


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

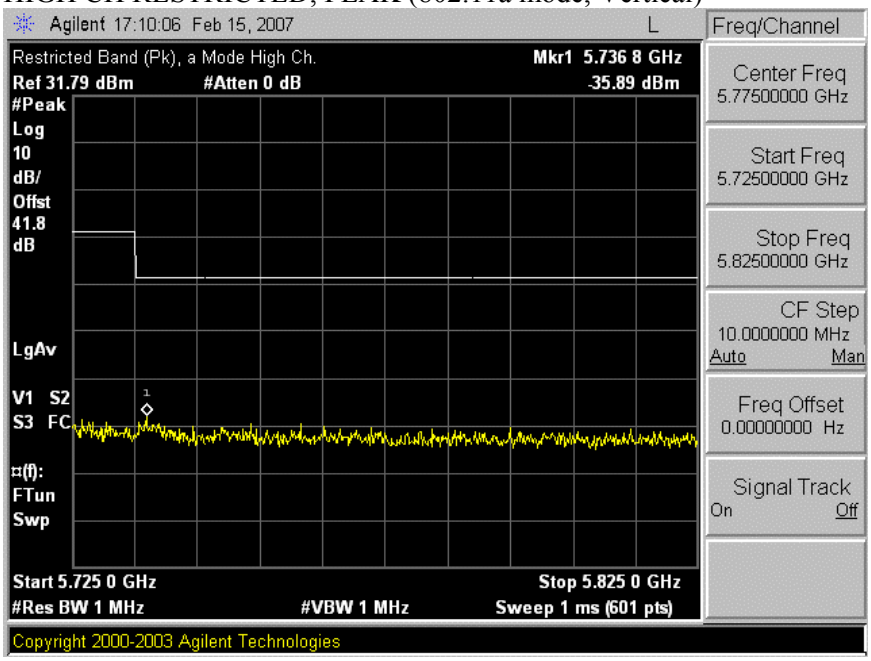


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

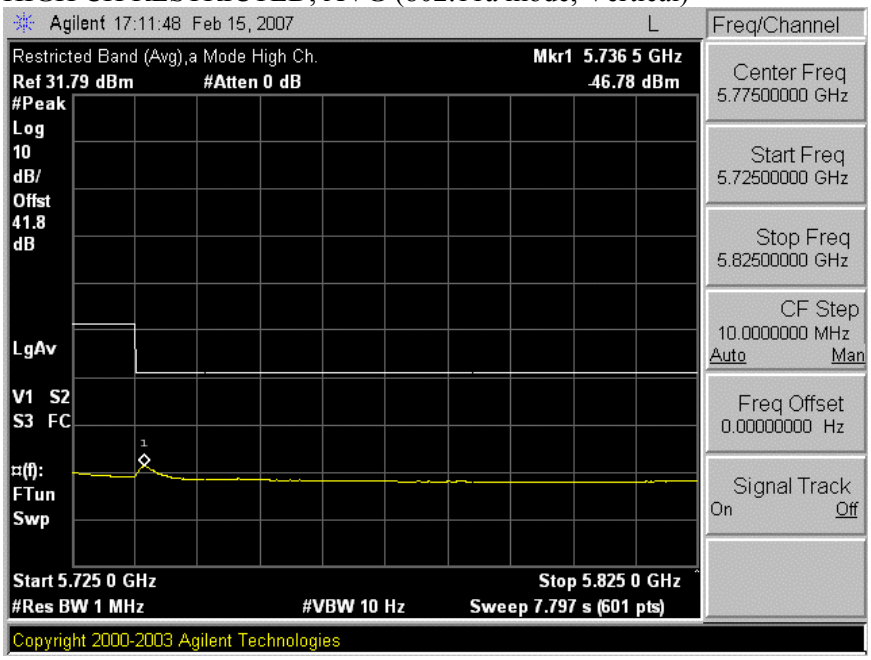


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worst Case)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company:.Trango Systems
Project #: 06U10393
Date: 02-16-2007
Test Operator: Thanh Nguyen
Configuration: EUT with 23dBi patch antenna
Mode: Transmit 5.4GHz-5.7GHz UNII Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T119; S/N: 29301 @3m	T144 Miteq 3008A00931		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Thanh 187215003	Gordon 203134001		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

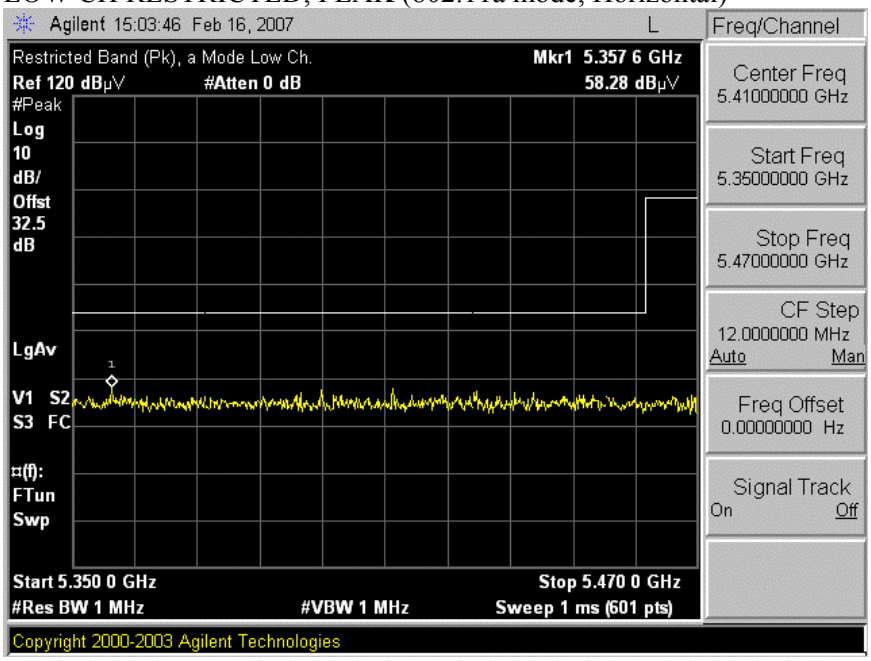
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Spurious Emissions															
1.055	1.0	68.4	57.3	27.9	3.0	-39.4	-9.5	0.0	50.3	39.2	74	54	-23.7	-14.8	V
1.056	1.0	70.4	59.6	27.9	3.0	-39.4	-9.5	0.0	52.3	41.4	74	54	-21.7	-12.6	H
Harmonics Emissions															
Low Channel 5500MHz															
11.000	1.0	45.2	31.7	37.0	11.0	-36.3	-9.5	0.0	47.3	33.8	74	54	-26.7	-20.2	V
16.500	1.0	44.6	32.4	39.5	14.1	-34.1	-9.5	0.0	54.6	42.4	74	54	-19.4	-11.6	Noise floor
11.000	1.0	46.3	33.0	37.0	11.0	-36.3	-9.5	0.0	48.4	35.2	74	54	-25.6	-18.8	H
16.500	1.0	44.7	32.5	39.5	14.1	-34.1	-9.5	0.0	54.6	42.5	74	54	-19.4	-11.5	Noise floor
Mid channel 5600MHz															
11.200	1.0	46.2	32.8	37.1	11.1	-36.1	-9.5	0.0	48.7	35.3	74	54	-25.3	-18.7	H
16.800	1.0	44.5	32.1	39.9	14.3	-33.8	-9.5	0.0	55.3	42.9	74	54	-18.7	-11.1	Noise floor
11.200	1.0	47.3	33.0	37.1	11.1	-36.1	-9.5	0.0	49.8	35.5	74	54	-24.2	-18.5	V
16.800	1.0	44.7	32.3	39.9	14.3	-33.8	-9.5	0.0	55.5	43.1	74	54	-18.5	-10.9	Noise floor
High Channel 5700MHz															
11.400	1.0	45.5	31.2	37.1	11.2	-35.9	-9.5	0.0	48.4	34.1	74	54	-25.6	-19.9	V
17.100	1.0	44.3	32.4	40.2	14.5	-33.7	-9.5	0.0	55.7	43.9	74	54	-18.3	-10.1	Noise floor
11.400	1.0	46.3	32.4	37.1	11.2	-35.9	-9.5	0.0	49.2	35.3	74	54	-24.8	-18.7	H
17.100	1.0	44.3	32.5	40.2	14.5	-33.7	-9.5	0.0	55.7	43.9	74	54	-18.3	-10.1	Noise floor

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

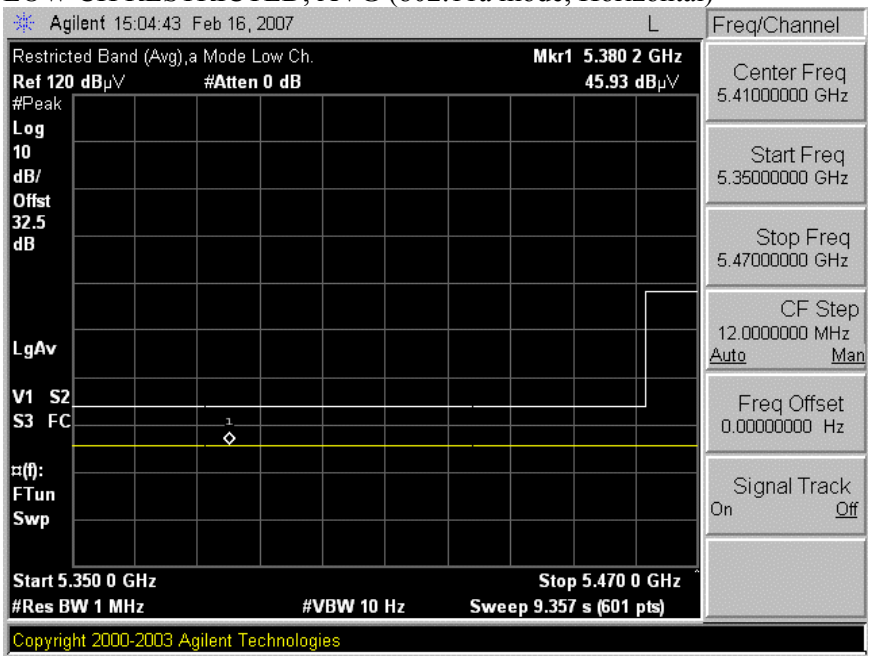
18dBi Dish Antenna at Vertical Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

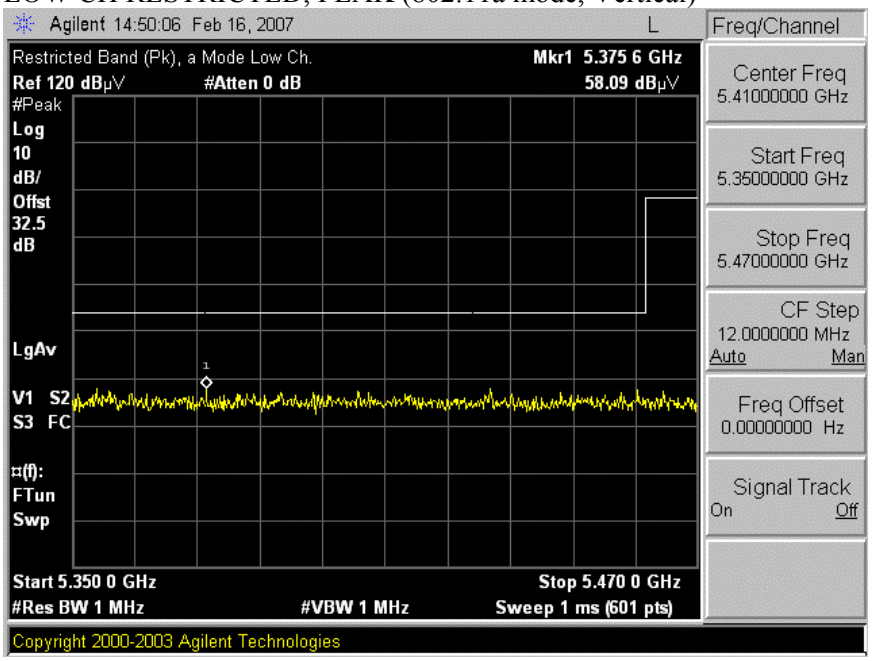


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

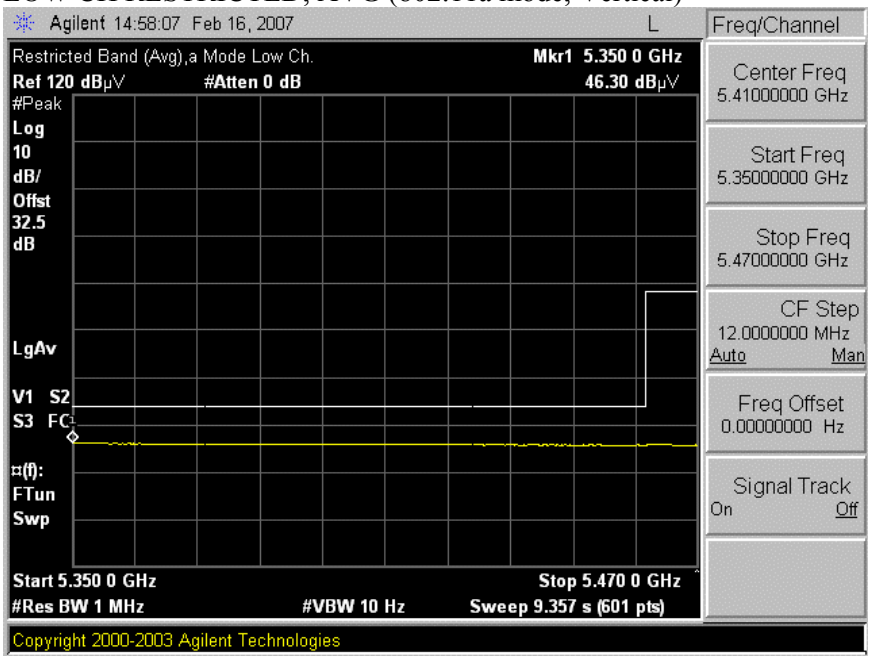


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

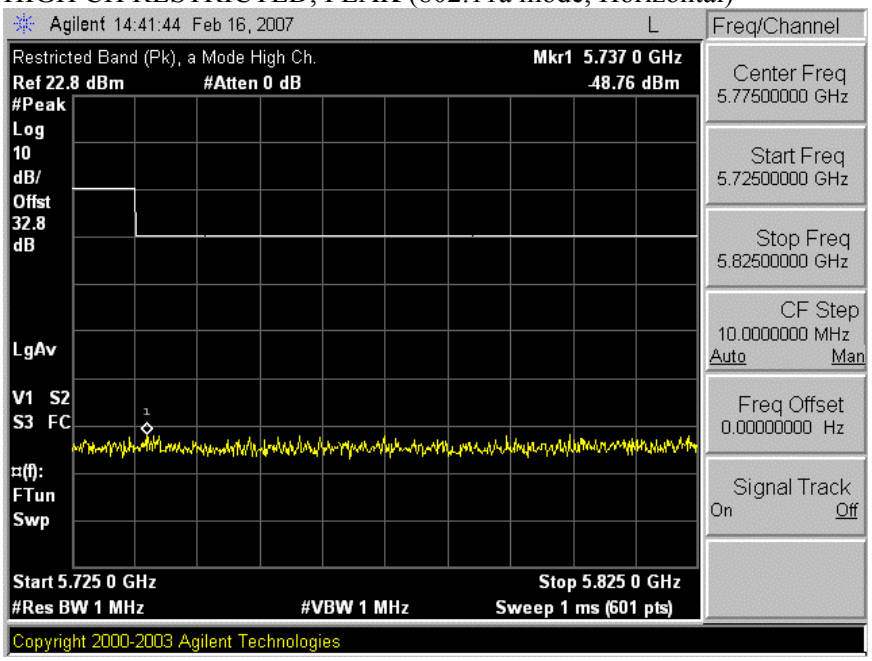


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

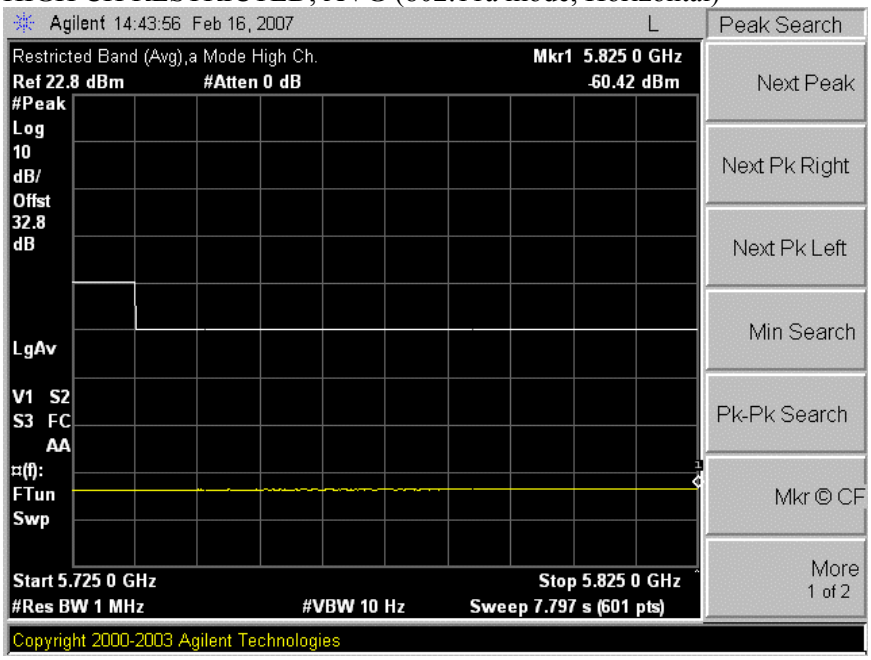


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

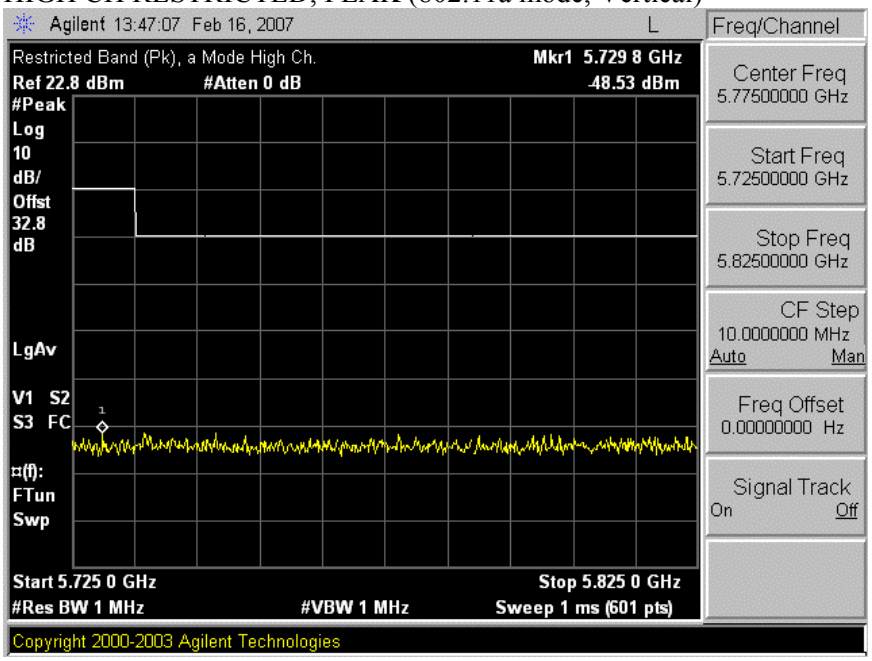


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

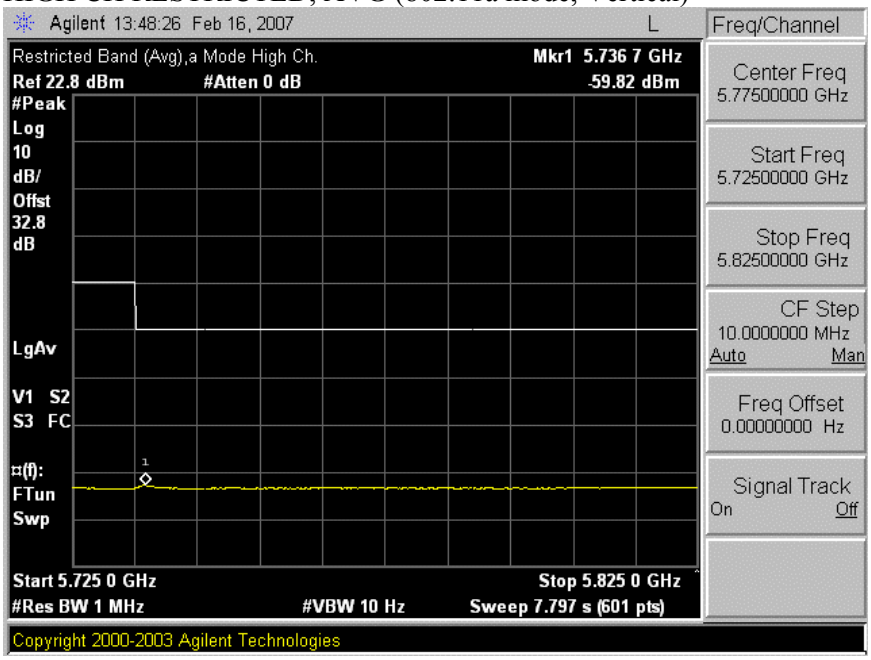


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



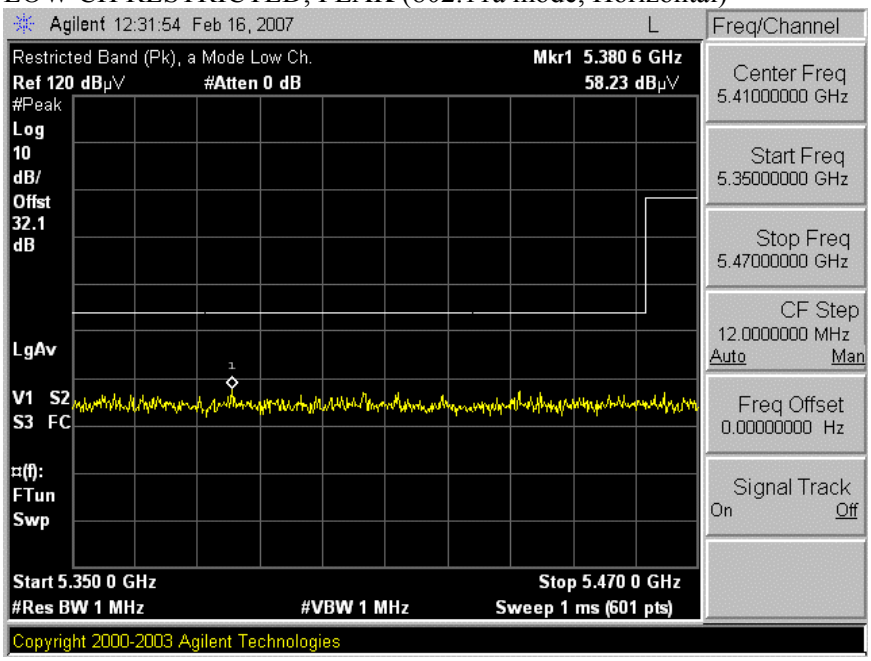
HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



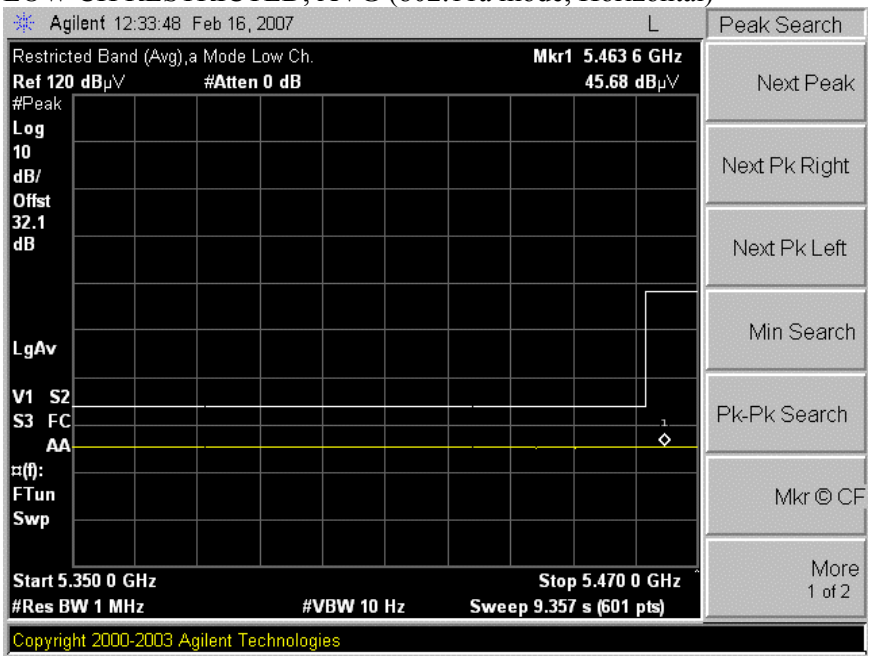
18dBi Dish Antenna at Horizontal Polarity

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

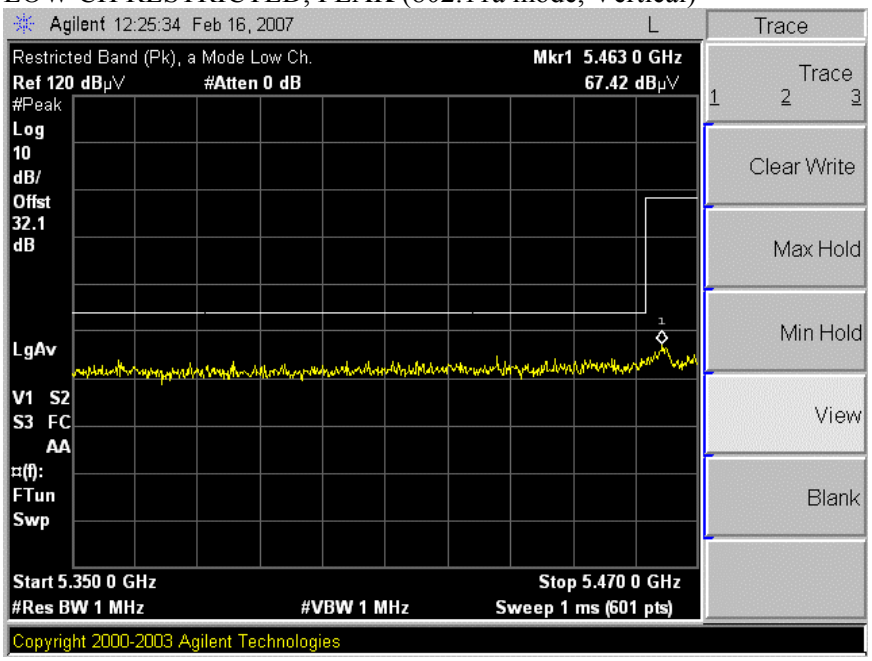


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

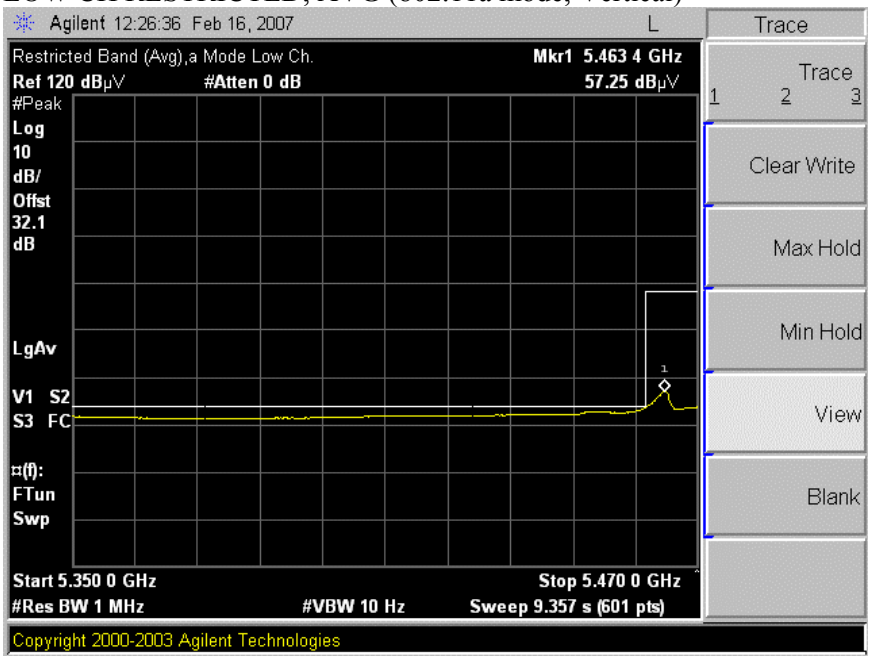


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

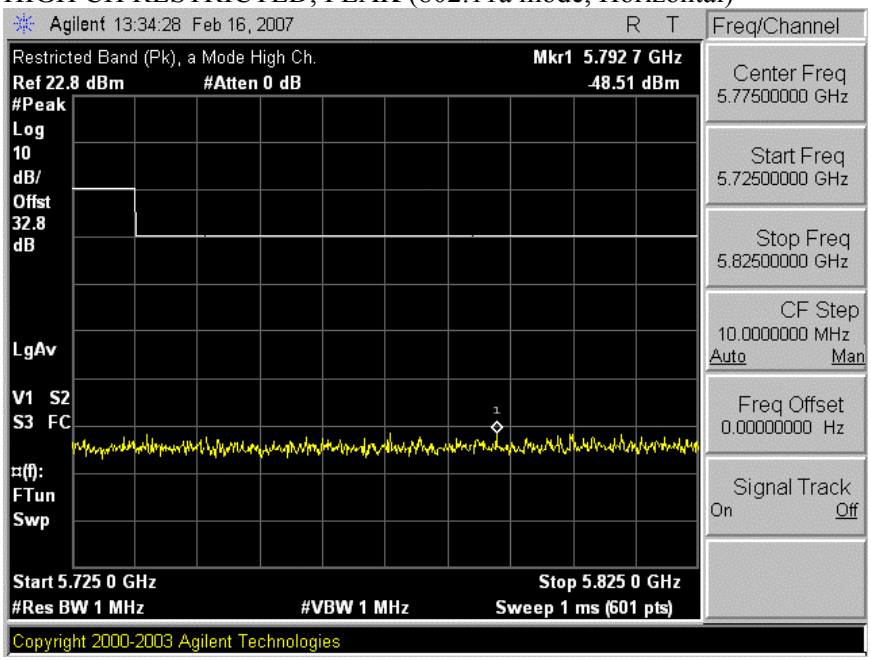


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

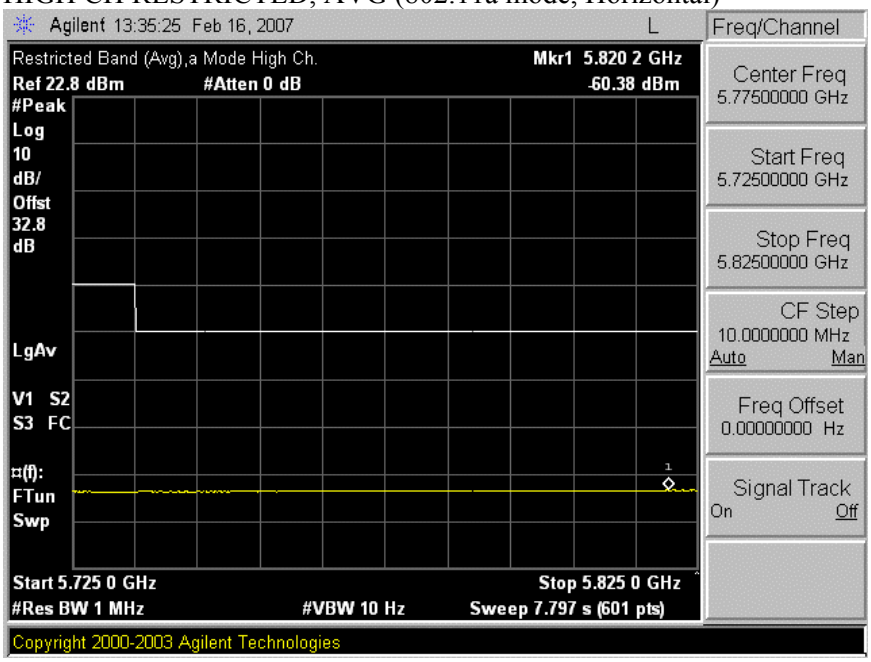


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

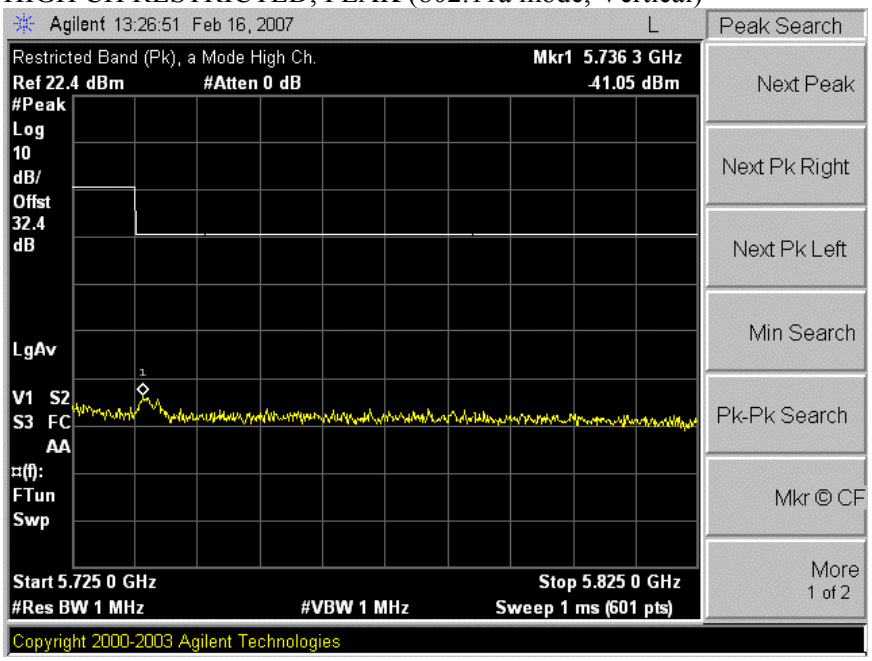


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

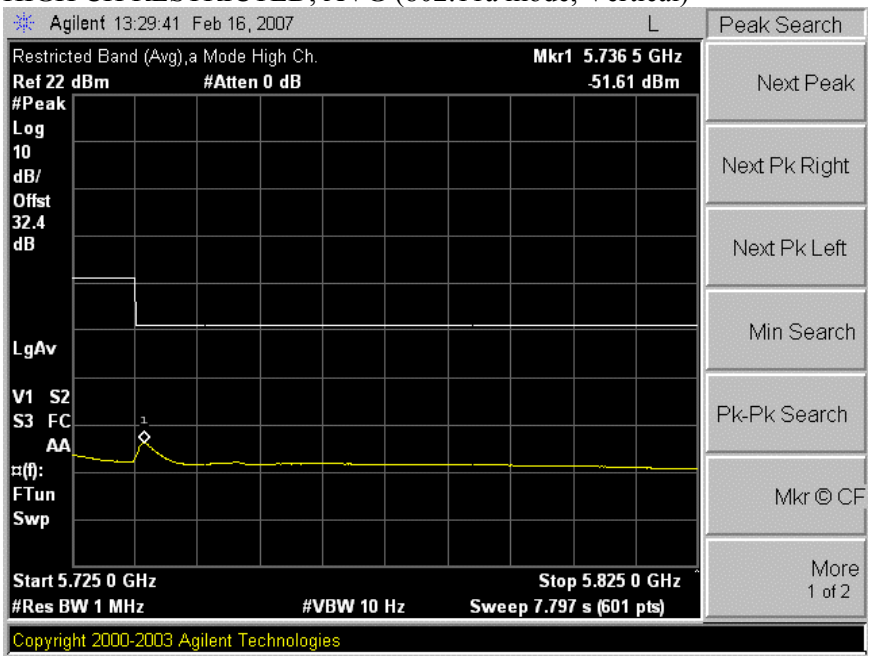


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)(Worse Case)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company:.Trango Systems
Project #: 06U10393
Date: 02-16-2007
Test Operator: Thanh Nguyen
Configuration: EUT with 19dBi patch antenna
Mode: Transmit 5.4GHz-5.7GHz UNII Band

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T119; S/N: 29301 @3m	T144 Miteq 3008A00931		

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
	Thanh 187215003	Gordon 203134001		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Spurious Emissions															
1.056	1.0	67.5	57.8	27.9	3.0	-39.4	-9.5	0.0	49.4	39.7	74	54	-24.6	-14.3	V
1.056	1.0	68.3	58.2	27.9	3.0	-39.4	-9.5	0.0	50.2	40.1	74	54	-23.8	-13.9	H
Harmonics Emissions															
Low Channel 5500MHz															
11.000	1.0	46.6	32.0	37.0	11.0	-36.3	-9.5	0.0	48.7	34.2	74	54	-25.3	-19.8	V
16.500	1.0	45.3	32.1	39.5	14.1	-34.1	-9.5	0.0	55.3	42.1	74	54	-18.7	-11.9	Noise floor
11.000	1.0	47.3	33.7	37.0	11.0	-36.3	-9.5	0.0	49.5	35.8	74	54	-24.5	-18.2	H
16.500	1.0	46.1	33.6	39.5	14.1	-34.1	-9.5	0.0	56.1	43.5	74	54	-17.9	-10.5	Noise floor
Mid channel 5600MHz															
11.200	1.0	48.8	32.5	37.1	11.1	-36.1	-9.5	0.0	51.3	35.1	74	54	-22.7	-18.9	H
16.800	1.0	45.2	33.2	39.9	14.3	-33.8	-9.5	0.0	56.0	44.1	74	54	-18.0	-9.9	Noise floor
11.200	1.0	49.3	33.2	37.1	11.1	-36.1	-9.5	0.0	51.8	35.7	74	54	-22.2	-18.3	V
16.800	1.0	46.9	33.3	39.9	14.3	-33.8	-9.5	0.0	57.7	44.1	74	54	-16.3	-9.9	Noise floor
High Channel 5700MHz															
11.400	1.0	46.7	32.4	37.1	11.2	-35.9	-9.5	0.0	49.5	35.3	74	54	-24.5	-18.7	V
17.100	1.0	45.6	32.8	40.2	14.5	-33.7	-9.5	0.0	57.0	44.2	74	54	-17.0	-9.8	Noise floor
11.400	1.0	46.6	32.7	37.1	11.2	-35.9	-9.5	0.0	49.4	35.6	74	54	-24.6	-18.4	H
17.100	1.0	44.5	32.9	40.2	14.5	-33.7	-9.5	0.0	56.0	44.3	74	54	-18.0	-9.7	Noise floor

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

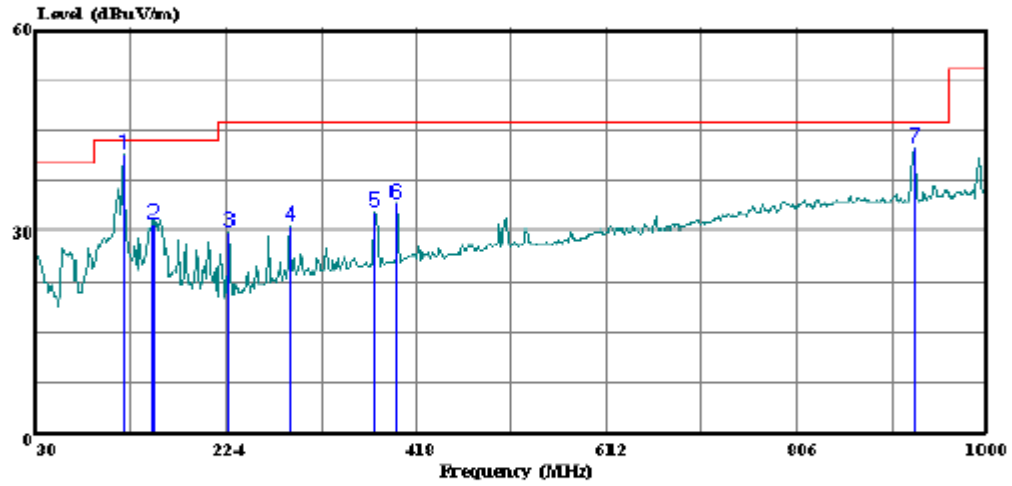
With 33 dBi Dish Antenna:

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: trango_06u10393.EMI
Date: 01-03-2007 Time: 10:38:08



(Audix A TC)

Trace: 1 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/33 dBi Dish Antenna
Mode of Operation:: TX (5GHz band, Mid Ch)
Target: : FCC Class B

HORIZONTAL DATA

Page: 1

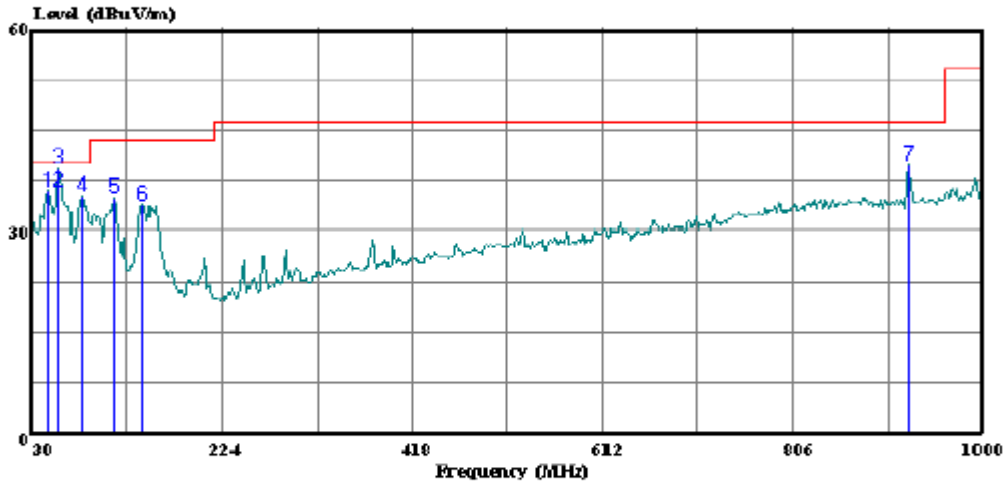
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	119.240	26.17	15.05	41.22	43.50	-2.28	Peak
2	149.310	16.60	14.26	30.86	43.50	-12.64	Peak
3	227.880	16.93	12.95	29.88	46.00	-16.12	Peak
4	288.990	15.50	15.26	30.76	46.00	-15.24	Peak
5	376.290	15.10	17.53	32.63	46.00	-13.37	Peak
6	397.630	16.00	17.99	33.99	46.00	-12.01	Peak
7	926.280	16.00	26.23	42.23	46.00	-3.77	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: trango_06u10393.EMI
Date: 01-03-2007 Time: 10:48:51



(Audix A TC)
Trace: 3 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/33 dBi Dish Antenna
Mode of Operation:: TX (5GHz band, Mid Ch)
Target: : FCC Class B

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	46.490	24.08	11.79	35.87	40.00	-4.13	Peak
2	58.130	27.15	8.61	35.76	40.00	-4.24	QP
3	58.130	30.71	8.61	39.32	40.00	-0.68	Peak
4	80.440	26.29	8.81	35.11	40.00	-4.90	Peak
5	114.390	20.38	14.46	34.84	43.50	-8.66	Peak
6	143.490	19.13	14.63	33.76	43.50	-9.75	Peak
7	924.340	13.60	26.20	39.80	46.00	-6.20	Peak

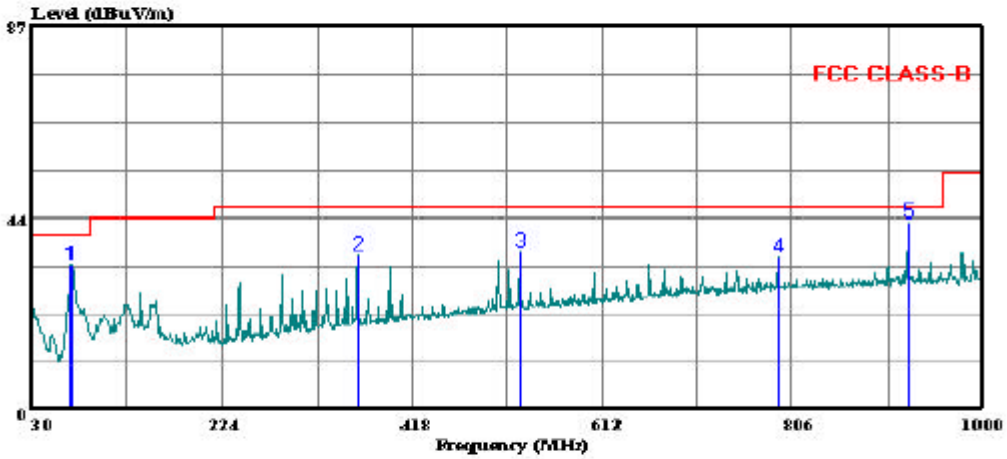
With 22 dBi Dish Antenna:

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 15 File#: trango_06u10393.EMI
Date: 02-16-2007 Time: 17:00:53



Trace: 14 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/ 23dBi Patch Antenna
Mode of Operation:: TX 5.5GHz band, Mid Ch.
Target: : FCC Class B

HORIZONTAL DATA

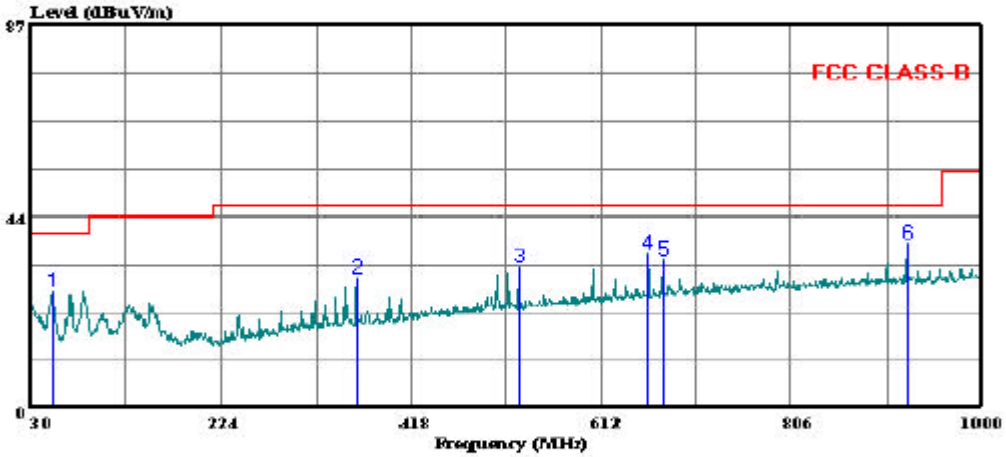
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	70.740	51.90	-18.80	33.10	40.00	-6.90	Peak
2	362.710	45.90	-10.43	35.47	46.00	-10.53	Peak
3	527.610	42.70	-6.65	36.05	46.00	-9.95	Peak
4	792.420	37.10	-1.98	35.12	46.00	-10.88	Peak
5	924.340	43.40	-0.69	42.71	46.00	-3.29	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 17 File#: trango_06u10393.EMI
Date: 02-16-2007 Time: 17:07:40



Trace: 16 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/ 23dBi Patch Antenna
Mode of Operation:: TX 5.5GHz band, Mid Ch.
Target: : FCC Class B

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	52.310	46.00	-19.26	26.74	40.00	-13.26	Peak
2	362.710	40.00	-10.43	29.57	46.00	-16.43	Peak
3	527.610	38.90	-6.65	32.25	46.00	-13.75	Peak
4	659.530	39.60	-4.16	35.44	46.00	-10.56	Peak
5	675.050	37.80	-3.80	34.00	46.00	-12.00	Peak
6	924.340	38.20	-0.69	37.51	46.00	-8.49	Peak

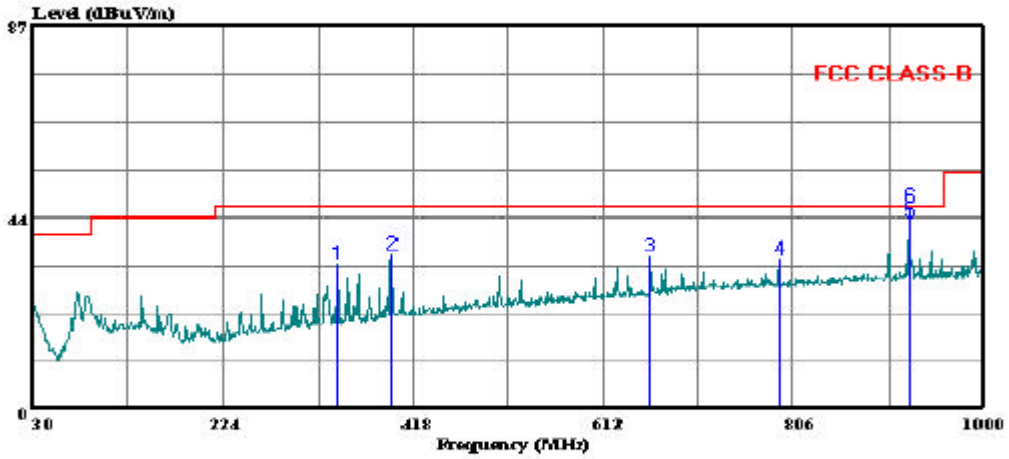
With 18 dBi Dish Antenna:

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 13 File#: trango_06u10393.EMI
Date: 02-16-2007 Time: 16:43:36



Trace: 10 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/ 19dBi Patch Antenna
Mode of Operation:: TX 5.5GHz band, Mid Ch.
Target: : FCC Class B

HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	340.400	44.00	-11.00	33.00	46.00	-13.00	Peak
2	395.690	45.10	-9.69	35.41	46.00	-10.59	Peak
3	659.530	39.30	-4.16	35.14	46.00	-10.86	Peak
4	792.420	36.20	-1.98	34.22	46.00	-11.78	Peak
5	924.340	43.25	-0.69	42.56	46.00	-3.44	QP
6	924.340	46.50	-0.69	45.81	46.00	-0.19	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

Compliance Certification Services
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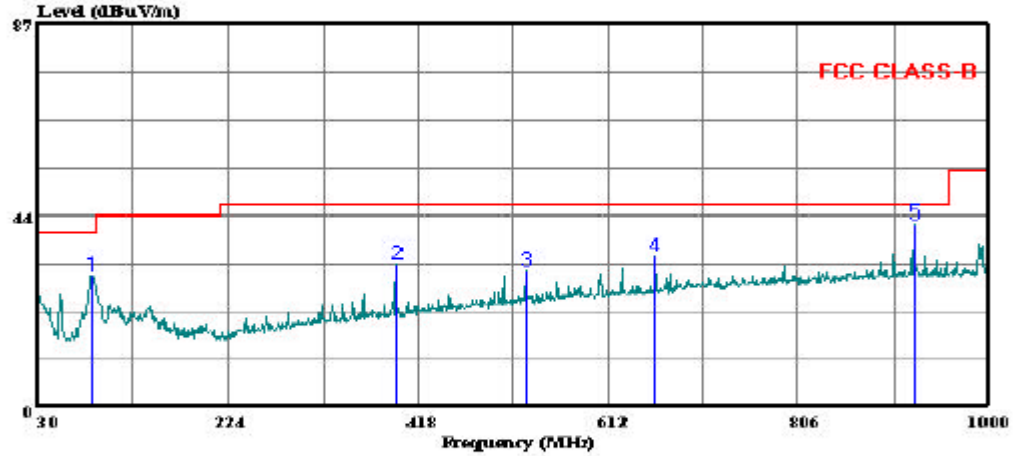
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 9 File#: trango_06u10393.EMI
Date: 02-16-2007 Time: 16:31:25



Trace: 8 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Company: : Trango
Project #: : 06U10393
Configuration: : EUT/ 19dBi Patch Antenna
Mode of Operation:: TX 5.5GHz band, Mid Ch.
Target: : FCC Class B

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	84.320	49.50	-19.54	29.96	40.00	-10.04	Peak
2	395.690	42.40	-9.69	32.71	46.00	-13.29	Peak
3	527.610	37.90	-6.65	31.25	46.00	-14.75	Peak
4	659.530	38.70	-4.16	34.54	46.00	-11.46	Peak
5	924.340	42.60	-0.69	41.91	46.00	-4.09	Peak

7.4. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

6 WORST EMISSIONS, POE:

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.20	52.03	--	40.53	0.00	63.53	53.53	-11.50	-13.00	L1
3.33	48.00	--	26.12	0.00	56.00	46.00	-8.00	-19.88	L1
5.51	45.74	--	22.51	0.00	60.00	50.00	-14.26	-27.49	L1
0.20	47.45	--	41.06	0.00	63.69	53.69	-16.24	-12.63	L2
3.51	47.64	--	26.76	0.00	56.00	46.00	-8.36	-19.24	L2
5.51	46.42	--	26.21	0.00	60.00	50.00	-13.58	-23.79	L2
6 Worst Data EUT with POE									

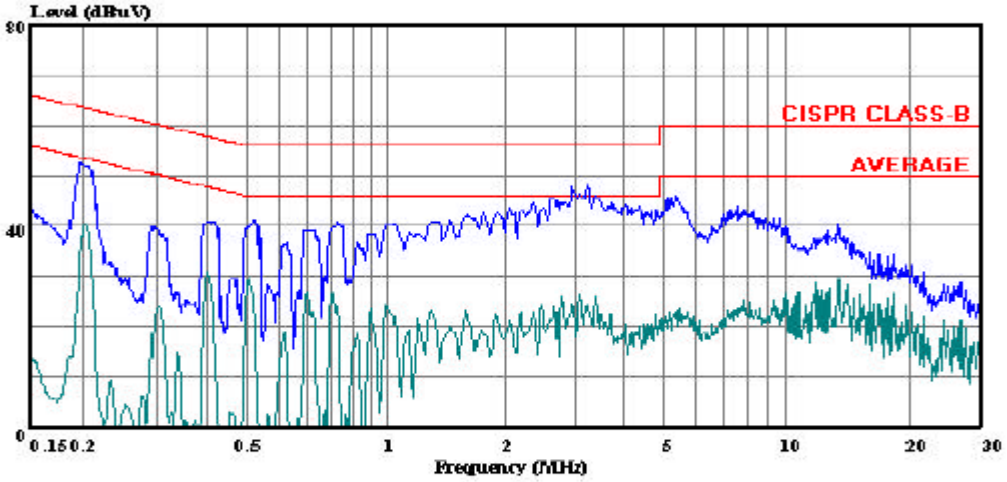
6 WORST EMISSIONS, Laptop:

CONDUCTED EMISSIONS DATA (230VAC 50Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.17	53.13	--	41.09	0.00	64.82	54.82	-11.69	-13.73	L1
0.29	42.10	--	27.12	0.00	60.55	50.55	-18.45	-23.43	L1
13.55	32.98	--	28.51	0.00	60.00	50.00	-27.02	-21.49	L1
0.17	52.33	--	40.90	0.00	64.77	54.77	-12.44	-13.87	L2
0.23	44.62	--	32.10	0.00	62.45	52.45	-17.83	-20.35	L2
3.82	32.01	--	27.87	0.00	56.00	46.00	-23.99	-18.13	L2
6 Worst Data EUT/ Lapotop AC Adapter									

LINE 1 RESULTS (POE)

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 7 File#: trango LC.EMI Date: 01-03-2007 Time: 11:41:45



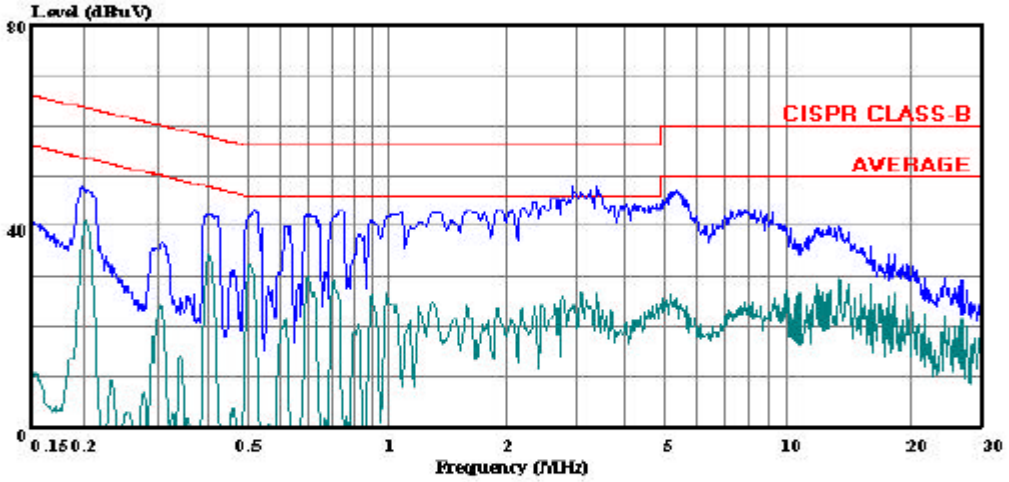
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06U10393
Company : Trango
EUT configuration: EUT/ 33 dBi Dish Antenna with POE
Mode of operation: TX, (5GHz Band mid Ch)
Power Source : 115V 60H
: L1: Peak (Blue), Averge (Green)

LINE 2 RESULTS (POE)

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 14 File#: trango LC.EMI Date: 01-03-2007 Time: 12:01:26



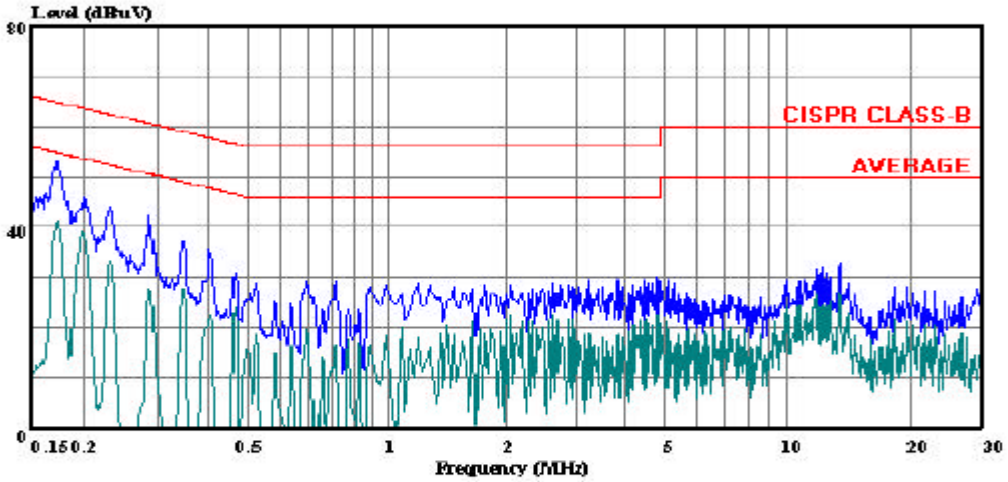
Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06U10393
Company : Trango
EUT configuration: EUT/ 33 dBi Dish Antenna with POE
Mode of operation: TX, (5GHz Band mid Ch)
Power Source : 115V 60H
: L2: Peak (Blue), Averge (Green)

LINE 1 RESULTS (LAPTOP)

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 21 File#: trango LC.EMI Date: 01-03-2007 Time: 12:25:48



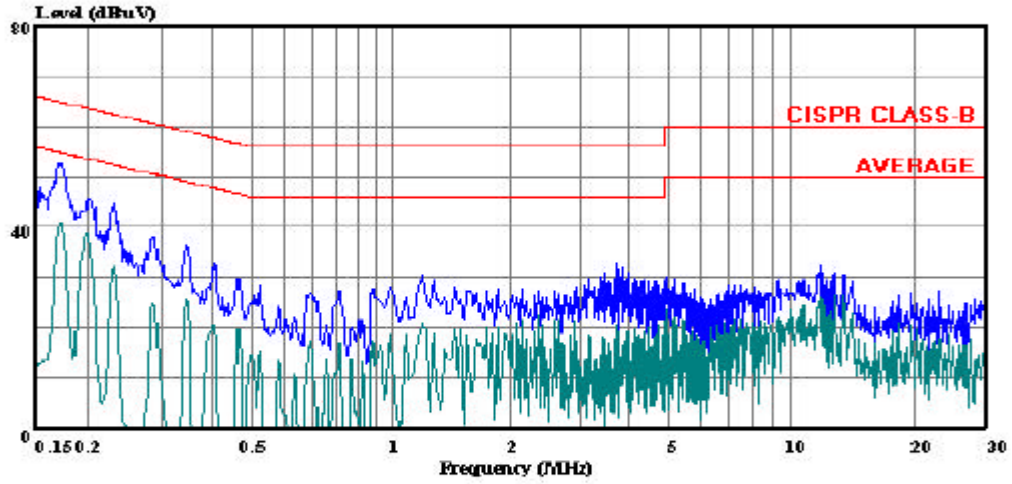
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06U10393
Company : Trango
EUT configuration: EUT/ 33 dBi Dish Antenna with Laptop
Mode of operation: TX, (5GHz Band mid Ch)
Power Source : 115V 60H
: L1: Peak (Blue), Averge (Green)

LINE 2 RESULTS (LAPTOP)

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 28 File#: trango LC.EMI Date: 01-03-2007 Time: 13:31:05



Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06U10393
Company : Trango
EUT configuration: EUT/ 33 dBi Dish Antenna with Laptop
Mode of operation: TX, (5GHz Band mid Ch)
Power Source : 115V 60H
: L2: Peak (Blue), Averge (Green)