

Vyyo Inc.

FCC ID: [PBJV3000-C](#)

FCC Rule Part: [27](#)

Section 27.5(c) Block C: 740–746 MHz

General Overview

A description of the theory of operation and product configuration is found in an attachment to this application and report.

SPECIFICATIONS

Transmitter

TX operating frequency:	741-745 MHz
TX output power:	64.1 watts Peak/ 17 watts Average
Digital Modulation:	64QAM in 1.75 MHz channel
Power requirements:	Modulation is internally generated and limited
Antenna connector:	120 VAC or 48 VDC
Frequency Tolerance	N- type
	Remain in band:
	-30 to +50 C
	85%-115% supply voltage at 20C

Block diagram and theory of operation is provided in a separate attachment.

Test Summary Results

Test Description	Plot or Table No.	Test Results
RF Power Output	Plots 1- 4	Pass
Occupied Bandwidth	Plots 5 - 7	Pass
Spurious and Harmonic Emissions at Antenna Terminals	Plots 8-10	Pass
Field Strength of Spurious and Harmonic Radiation	Table 1-3	Pass
Frequency Stability	Plots 11-17	Pass

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Parts 1 and 2.

1.1307(b) RF exposure information is provided in a separate attachment in the form of maximum permissible exposure (MPE) data.

2.1033(c)1 Applicant: Vyyo Inc.
4015 Miranda Avenue
Palo Alto, CA. 94304

2.1033(c)2 FCC ID: [PBJV3000-C](#)

2.1033(c)3 Installation instructions are found in separate document.

2.1033(c)4 Emission type: 64QAM

Emission designator: 1M52W1D

2.1033(c)5 Frequency range: 741-745 MHz

2.1033(c)6 Range of Operating Power

64.1 watts Peak/ 17 watts Average Maximum, variable in 1 dB steps

2.1033(c)7 Maximum Power Rating

64.1 watts Peak/ 17 watts Average

Maximum allowed per Section 27.50(c)1: 50 kW ERP

2.1033(c)8 Applied voltages and currents into the final transistor elements

Refer to schematics, separate submission accompanying this application

2.1033(c)9 Tune-up procedure

Refer to installation instructions.

2.1033(c)10 Circuit and Functional Block Diagram, Description of Circuitry

Product schematics are provided in separate attachments.

Circuit description and theory of operation are found in separate attachment.

2.1033(c)11 FCC ID Label

Refer to separate attachment.

2.1033(c)12 Product Photographs

Refer to separate attachment.

2.1033(c)13 Description of Modulation System

64QAM produced by internal DOCSIS cable modem

2.1033(c)14 Test Data per 2.1046 – 2.1057

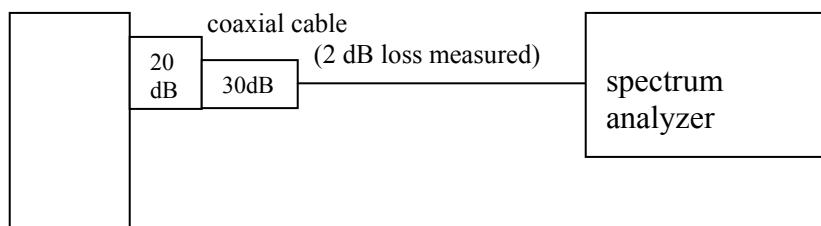
Test Equipment List

TEST EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/06
RF Filter Section	HP	85420E	3705A00256	3/29/06
Antenna, Bilog 30MHz ~ 2Ghz	Sunol Sciences	JB1	A121003	3/3/06
Signal Generator 2 ~40 GHz	R & S	SMP04	DE 34210	6/8/06
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/06
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/06
Antenna, Horn 1 ~ 18 GHz Peak Power Meter	ETS	3117	29310	4/22/06
Peak / Average Power Sensor	Agilent	E4416A	GB41291160	2/9/06
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E9327A	US40440755	2/10/06
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	29800	1/1/06
High Power Attenuator	BIRD ELECTRONIC CORP	8343-200	970	6/10/06 N/A

2.1046 RF Output Power Measurements

Test set-up:

Figure 1



Total offset: $20 \text{ dB} + 30 \text{ dB} + 2 \text{ dB} = 52 \text{ dB}$

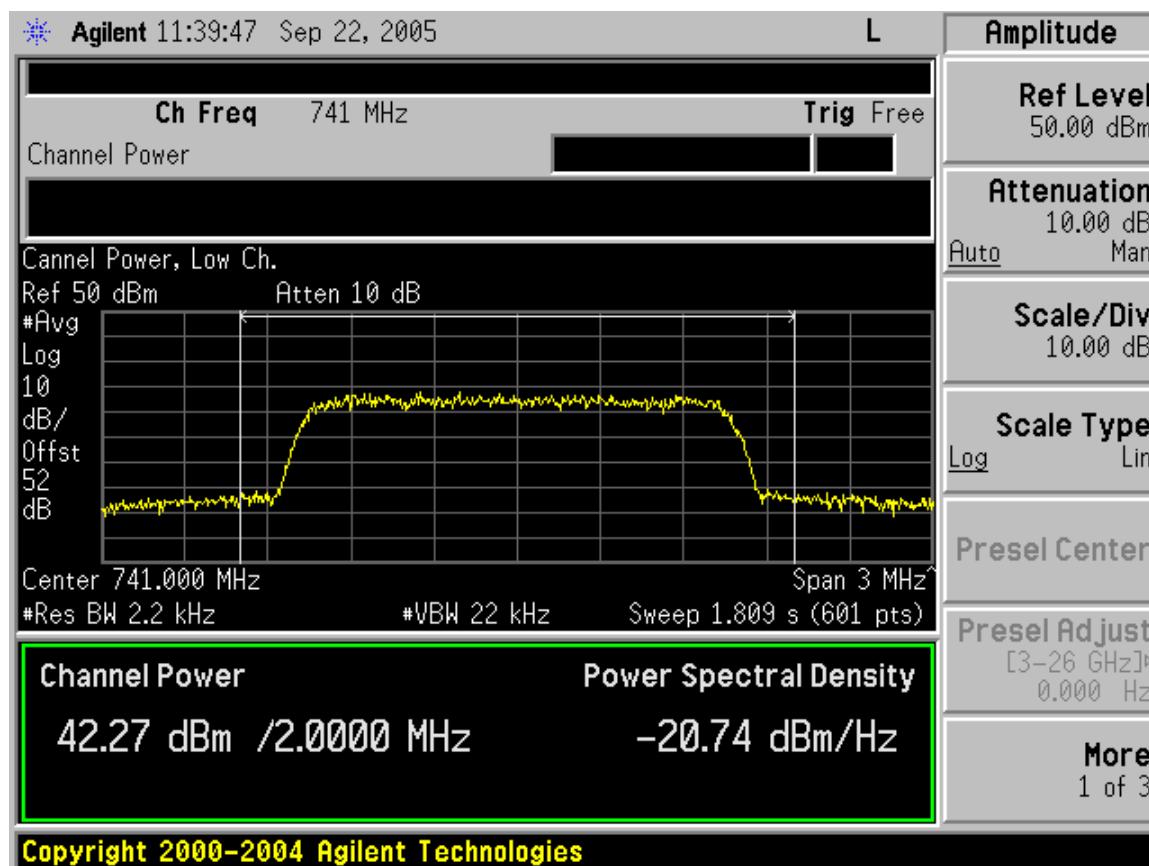
Test Procedures

The transmitter was set to produce the required 64QAM modulation. The spectrum analyzer was set to measure total channel power for LOW, MID, and HIGH channels.

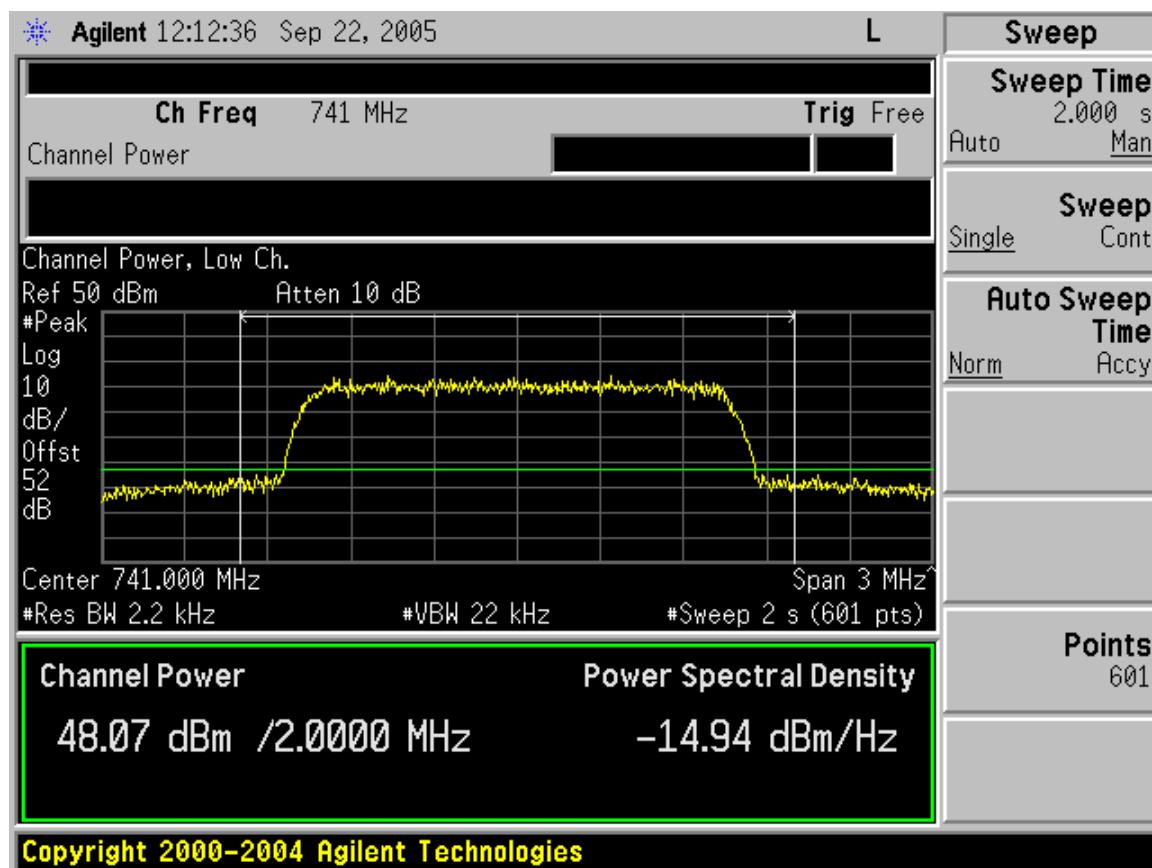
Test Results

Maximum results were 64 watts Peak, 17 watts Average.
Refer to spectrum analyzer plots below.

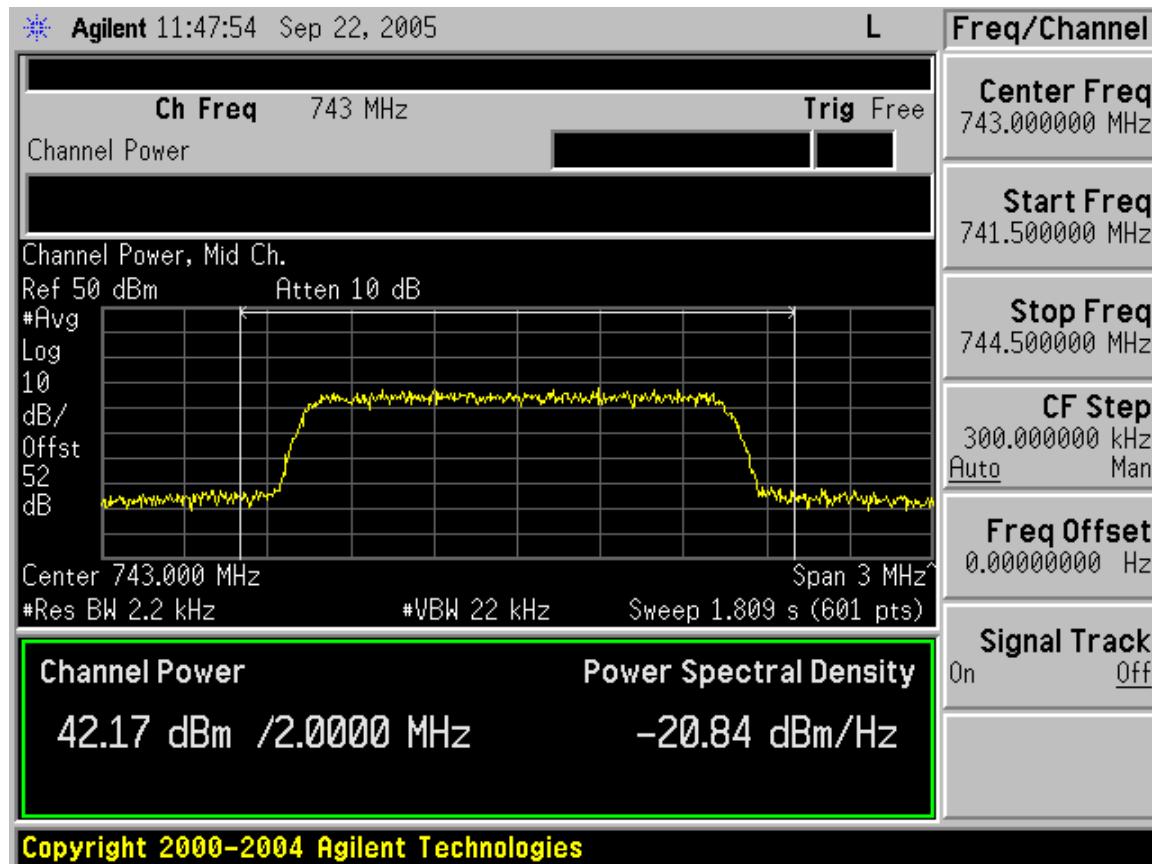
Plot#1 - Low Channel Output Power, AVERAGE

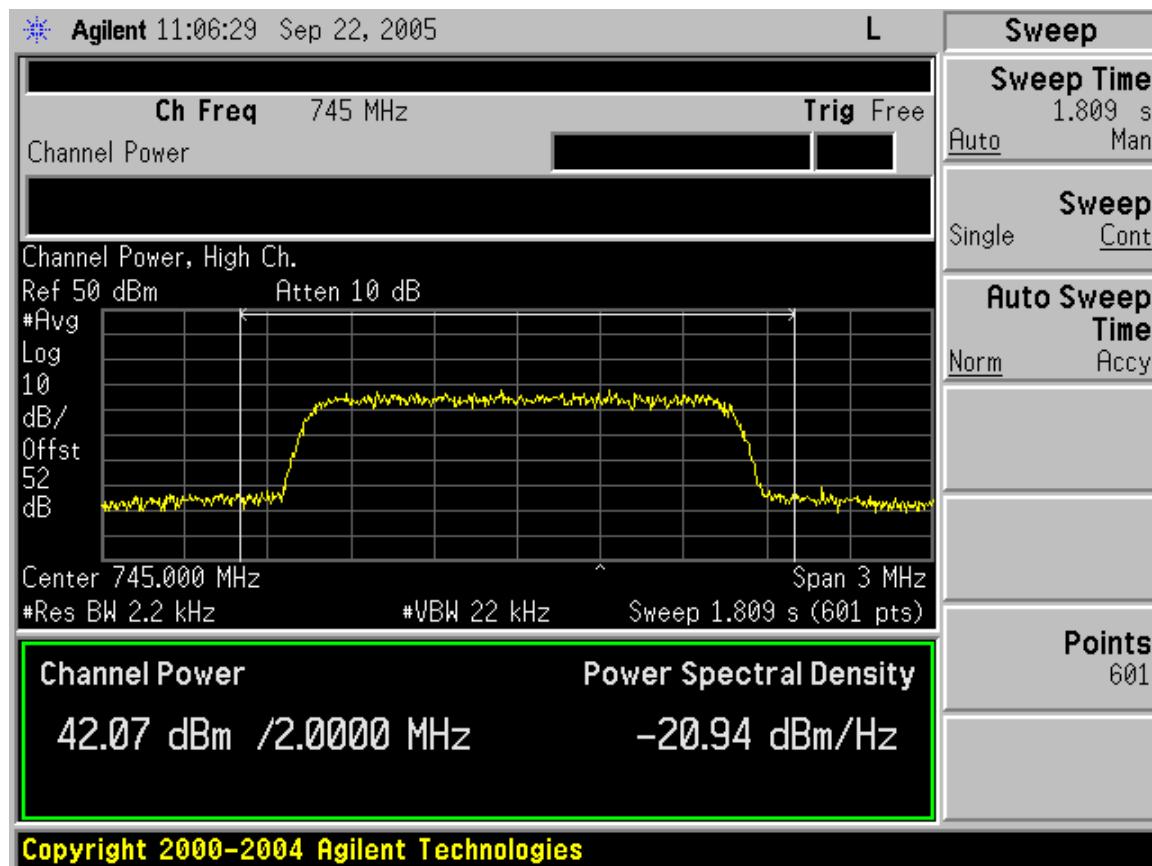


Plot#2 - Low Channel Output Power, PEAK



Plot#3 - Mid Channel Output Power



Plot#4 -High Channel Output Power

**Section 2.1049 Occupied Bandwidth
Requirement/Limit: 22.531**

Test set-up: Refer to Figure 1, above

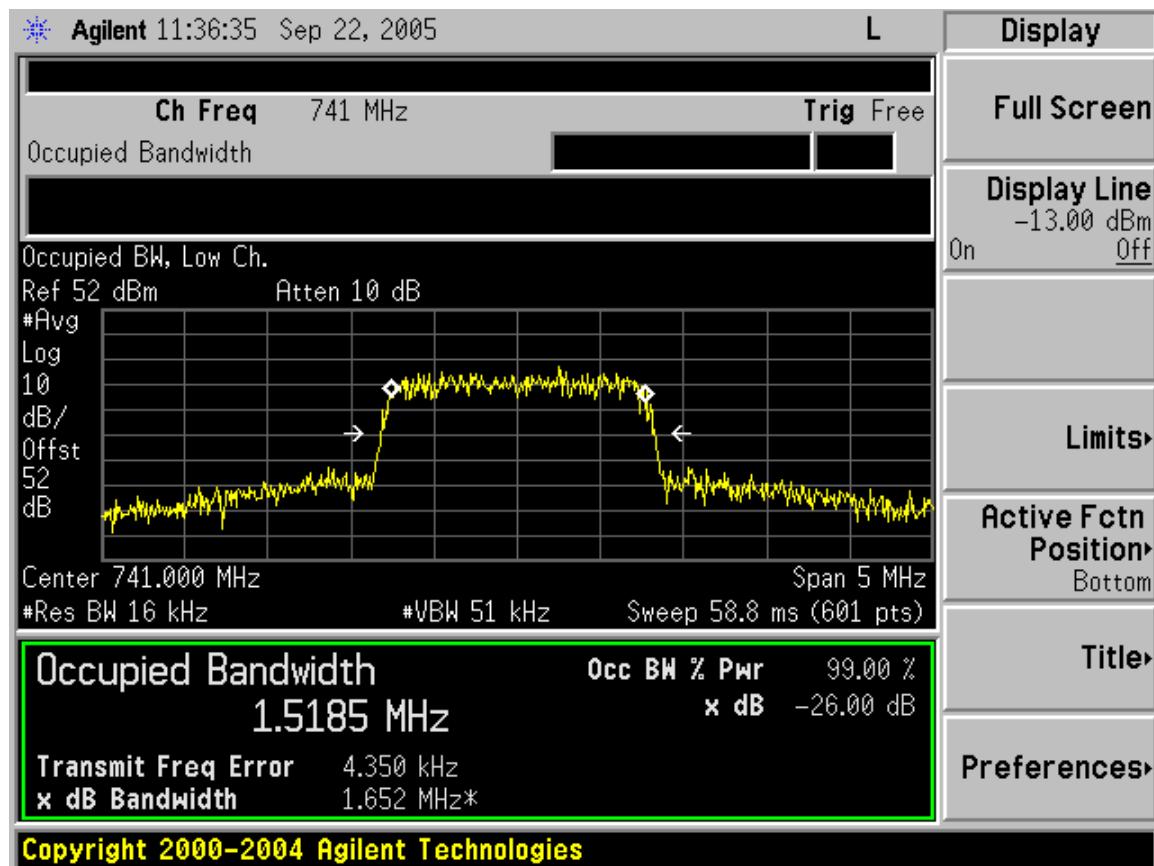
Test Procedures:

Using the spectrum analyzer Occupied Bandwidth measurement function, the 99% occupied bandwidth was measured for the EUT at LOW, MID, and HIGH channels with the EUT operating at full rated power.

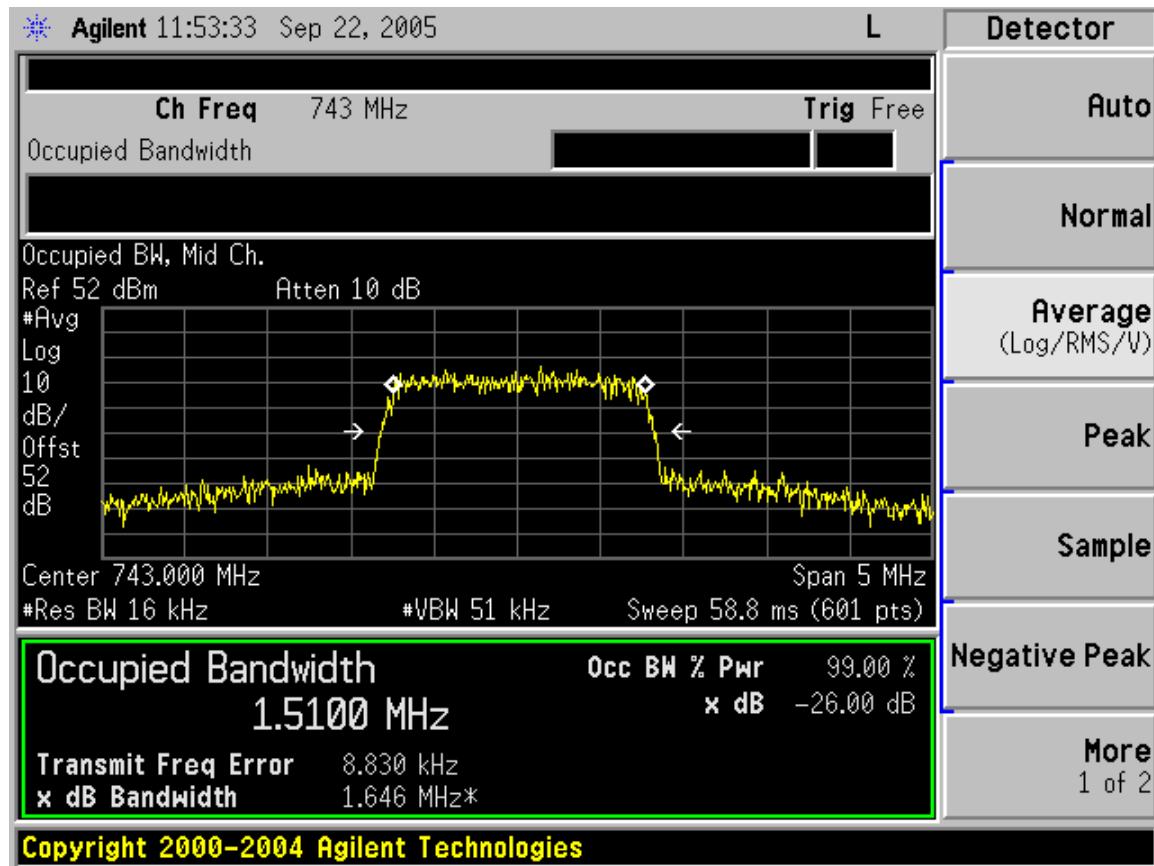
Test Results:

Refer to spectrum analyzer displays below.

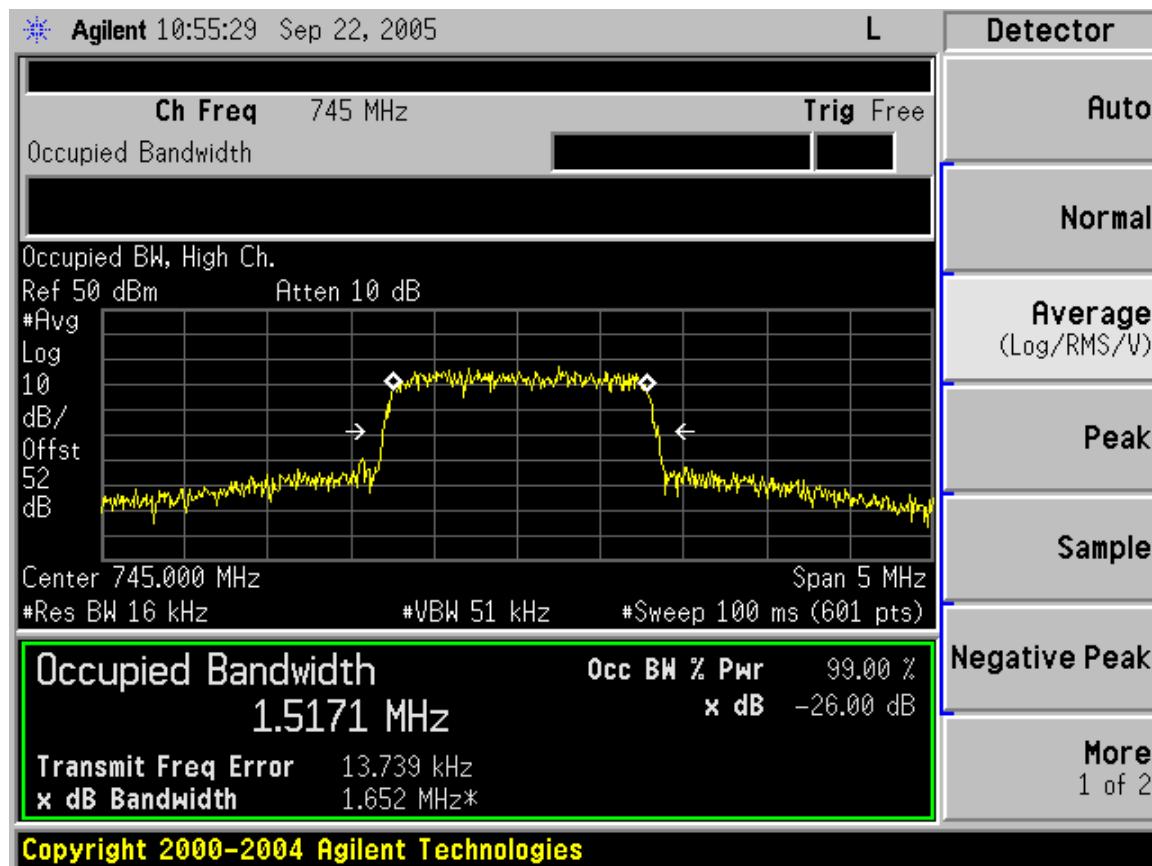
Plot#5 - LOW Channel Occupied Bandwidth



Plot#6 - MID Channel Occupied Bandwidth



Plot#7 - HIGH Channel Occupied Bandwidth



Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals**Requirement/Limit: 27.53(f)**

(f) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Test set-up: Refer to Figure 1, above

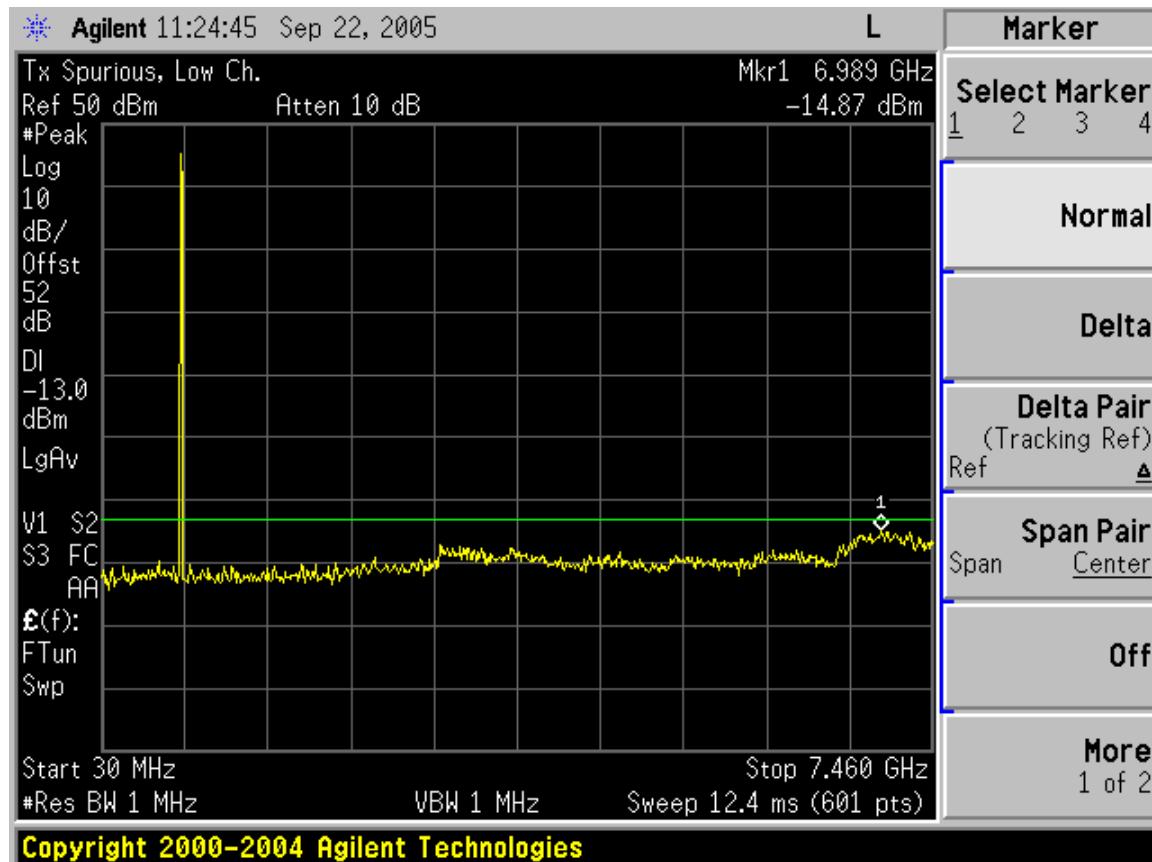
Test Procedures

1. Set the EUT to produce maximum power at LOW channel.
2. Set spectrum analyzer REF LEVEL OFFSET to total of cable loss and attenuator losses.
3. Set the spectrum analyzer to $RBW=VBW > 100$ kHz
4. Set display line to -13 dBm (30 dBm/W + $10 \log P$ watts – $(43+10\log P)$ watts)
5. Scan from lowest frequency generated by EUT to 10^{th} harmonic.

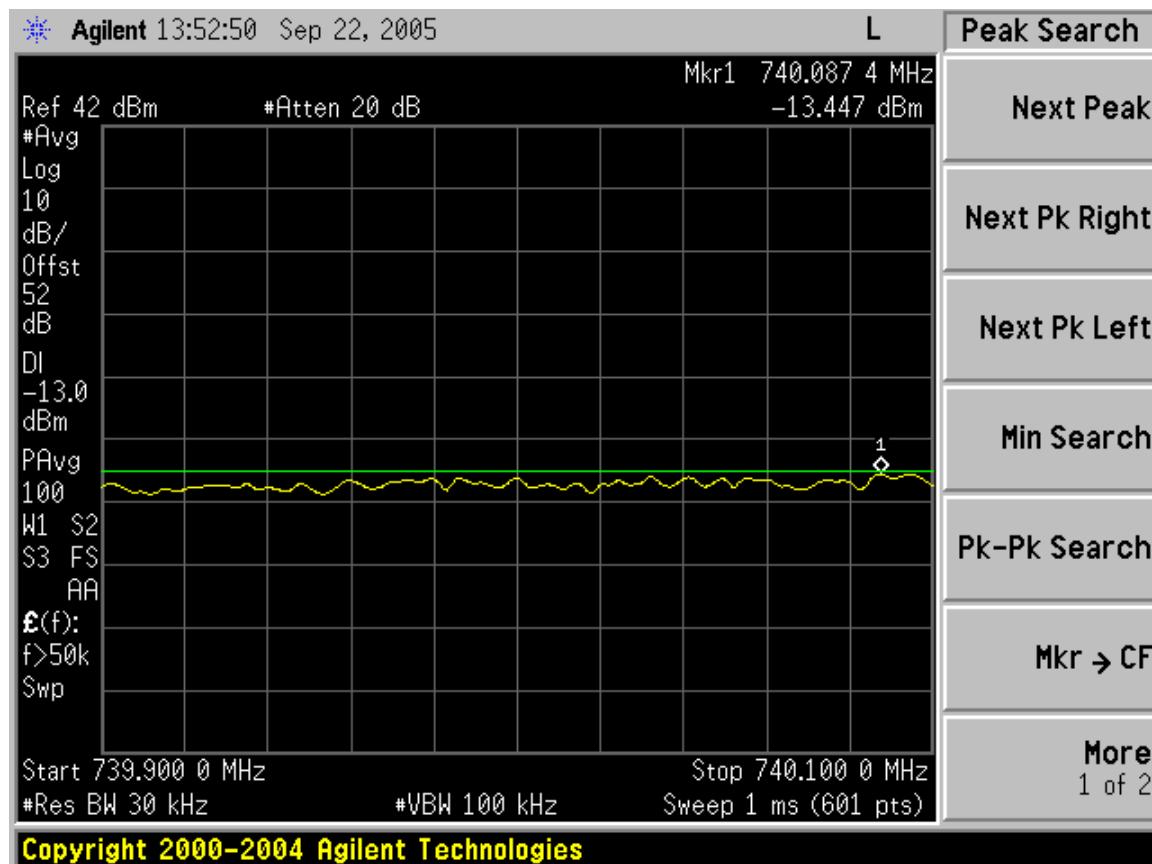
Test Results

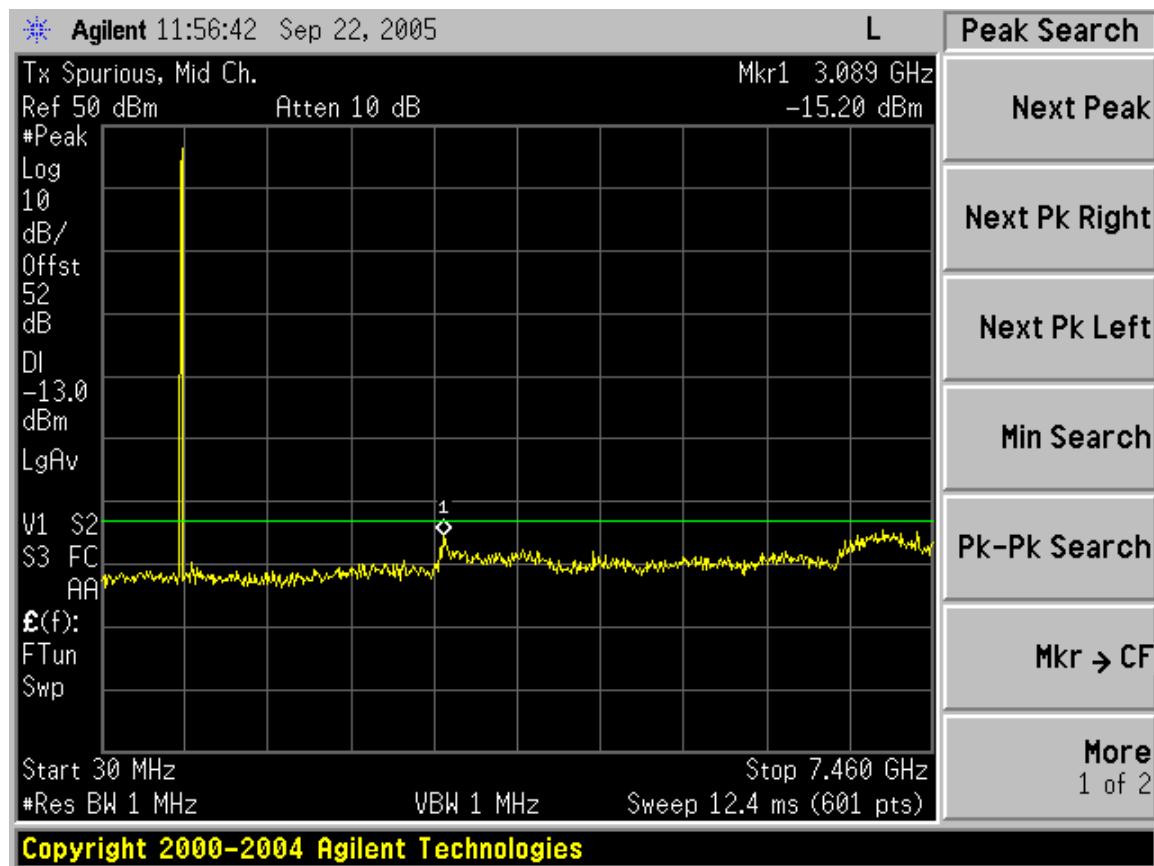
PASS. Refer to spectrum analyzer plots below.

Plot#8A - LOW Channel Spurious Emissions, Antenna Conducted Output

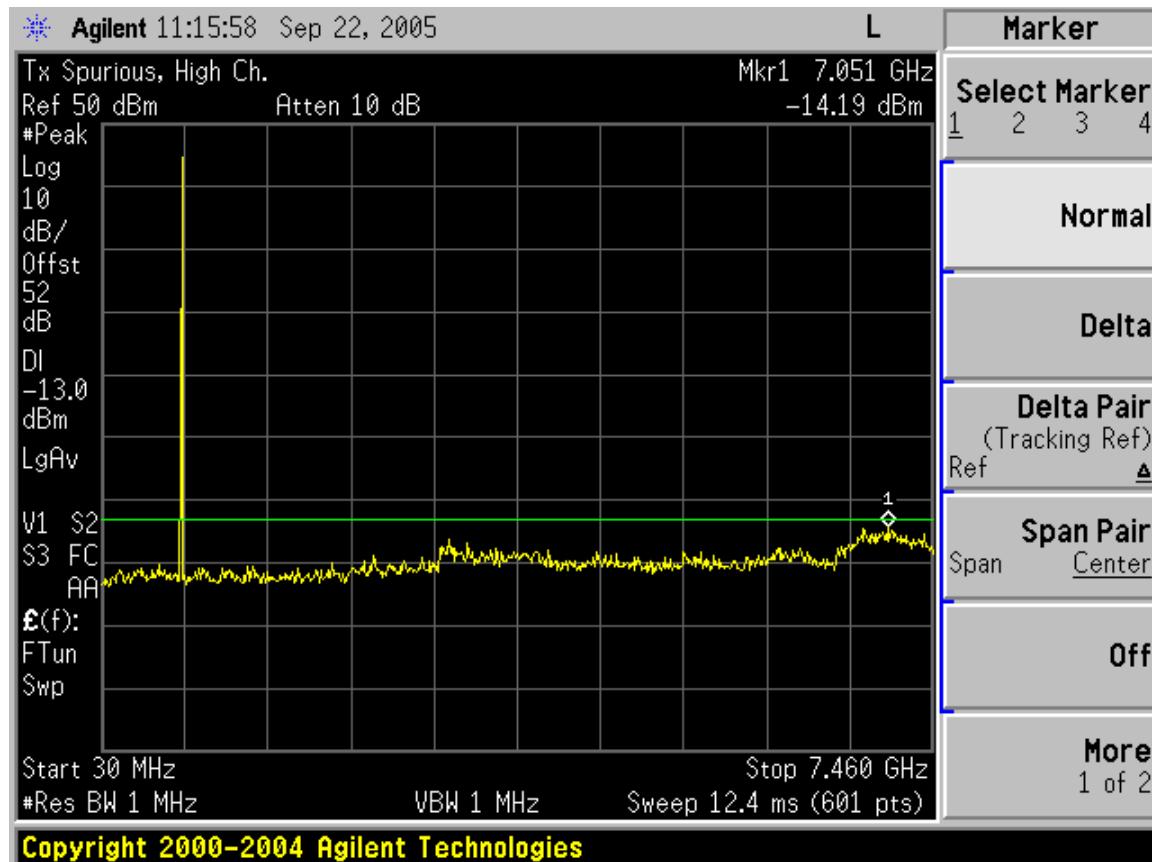


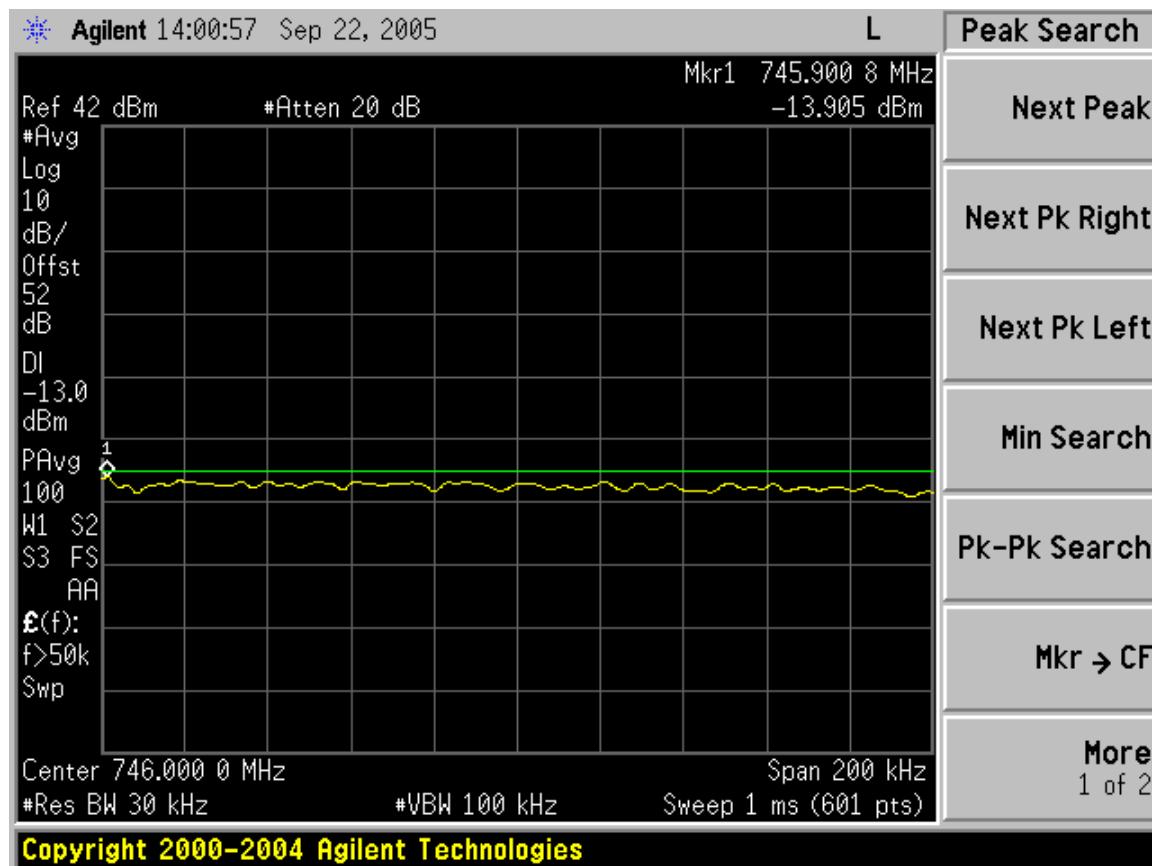
Plot#8B - LOW Channel Bandedge Emissions, Antenna Conducted Output



Plot#9 - MID Channel Spurious Emissions, Antenna Conducted Output

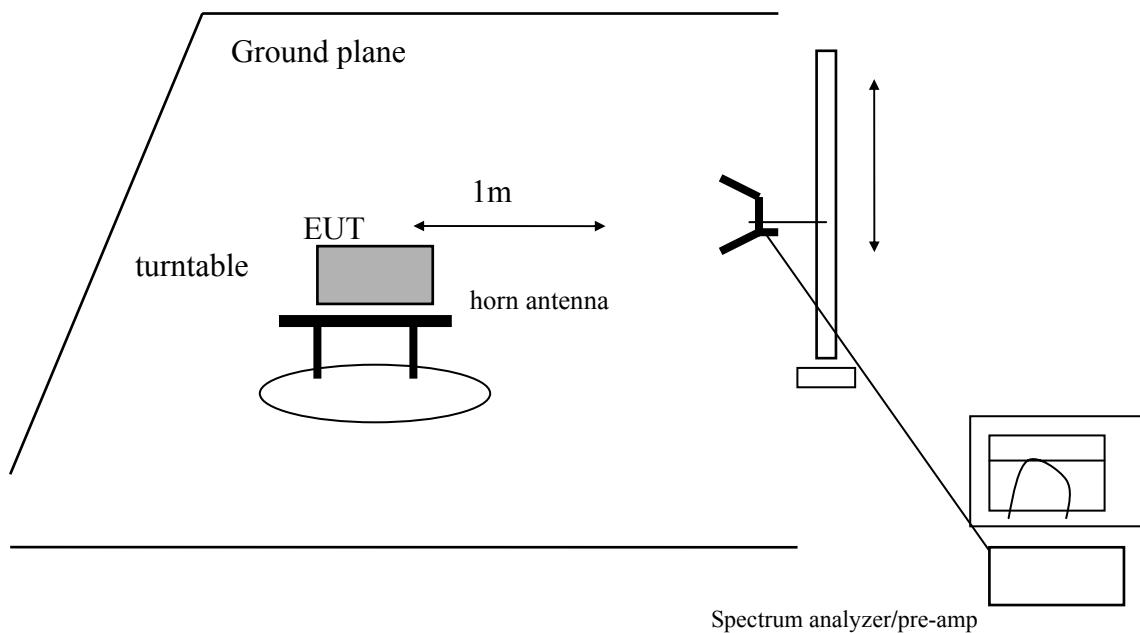
Plot#10A - HIGH Channel Spurious Emissions, Antenna Conducted Output



Plot#10B - HIGH Channel Bandedge Emissions, Antenna Conducted Output

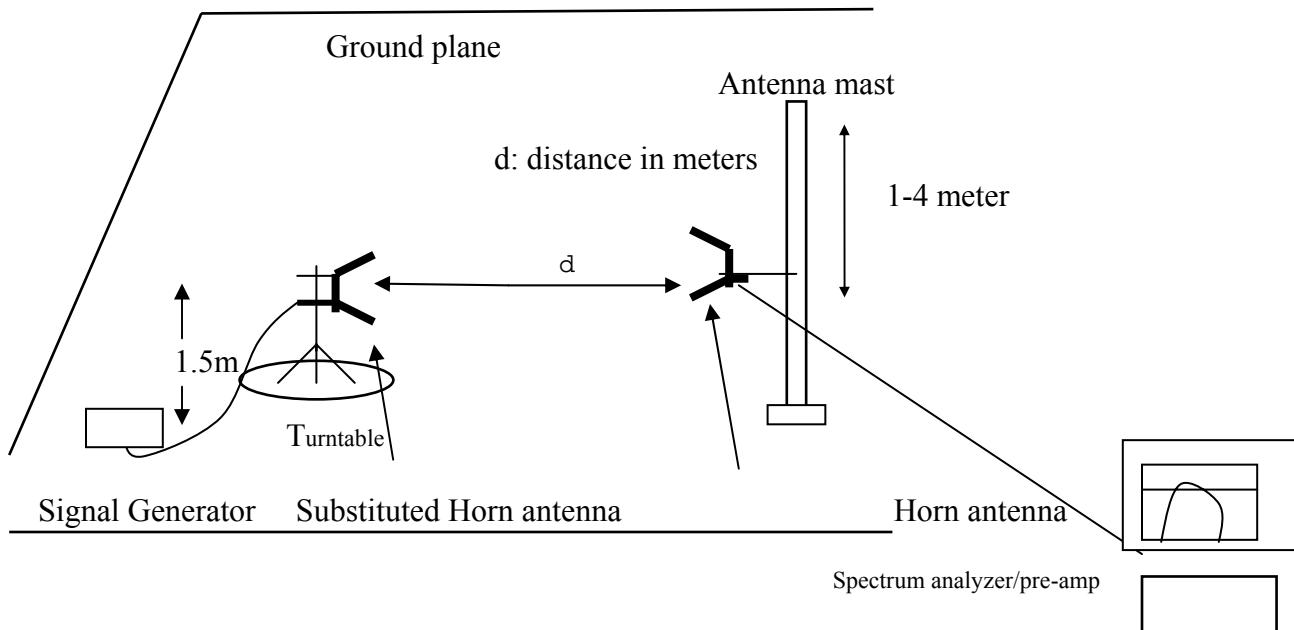
Section 2.1053 Field Strength of Spurious and Harmonic Radiation**Requirement: 27.53(f)**

(f) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Test Set-Up : Spurious and harmonic emissions measurements**Figure 2a**

Test Setup: Substitution antenna and signal generator

Figure 2b



Minimum Requirement

-13 dBm EIRP beyond 250% of authorized bandwidth

Test Method

The antenna output port of the EUT was terminated with a 50 ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

The EUT was removed and was replaced by a substitution antenna connected via coax to a signal generator. The generator output was set to each emission frequency detected, the search antenna was raised and lowered, the turntable was rotated, until the maximum emission level was obtained. The signal generator output level was adjusted to match the radiated emission level from the EUT. After correcting for substitution antenna factor and generator cable loss, output power level is compared to the limit.

Test Results

Pass. All emissions detected were below -13 dBm EIRP. Refer to test data below.

Table#1 - Radiated Emissions above 1 GHz – 741 MHz Operation

09/23/05 High Frequency Substitution Measurement Compliance Certification Services, Morgan Hill 5m Chamber Site									
Test Engr: William Zhuang Project #: 05U3662-1 Company: Tom Cokenias / Vyyo EUT Descrip.: Base Station, C band, 741MHz EUT M/N: V3000 Test Target: FCC Part 27 Mode Oper:									
Test Equipment: <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> EMCO Horn 1-18GHz <input type="text" value="T60; S/N: 2238 @3m"/> </div> <div style="text-align: center;"> Horn > 18GHz <input type="text"/> </div> <div style="text-align: center;"> Limit <input type="text" value="EIRP"/> </div> <div style="margin-top: 20px;"> Hi Frequency Cables <div style="display: flex; justify-content: space-around;"> <input type="checkbox" value="2 ft"/> <input type="checkbox" value="2 ~ 3 ft"/> <input type="checkbox" value="4 ~ 6 ft"/> <input checked="" type="checkbox" value="12 ft"/> </div> </div> <div style="margin-top: 20px;"> Pre-amplifier 1-26GHz <input type="text"/> </div> <div style="margin-top: 20px;"> Pre-amplifier 26-40GHz <input type="text"/> </div> </div>									
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Antenna port with dummy load									
1.482	38.5	V	-31.2	1.2	6.8	4.6	-25.6	-13.0	-12.6
2.223	23.3	V	-43.1	1.5	7.7	5.6	-36.8	-13.0	-23.8
2.964	21.8	V	-43.0	1.8	9.1	6.9	-35.7	-13.0	-22.7
1.287	24.0	V	-46.8	1.1	6.6	4.4	-41.3	-13.0	-28.3
1.657	45.6	V	-23.2	1.3	7.0	4.8	-17.5	-13.0	-4.5
1.800	26.6	V	-41.4	1.3	7.1	5.0	-35.6	-13.0	-22.6
1.976	30.0	V	-37.0	1.4	7.3	5.2	-31.1	-13.0	-18.1
1.983	27.3	V	-39.7	1.4	7.3	5.2	-33.8	-13.0	-20.8
2.745	22.1	V	-43.1	1.7	8.7	6.5	-36.1	-13.0	-23.1
3.314	32.7	V	-31.3	1.9	9.3	7.2	-23.9	-13.0	-10.9
3.660	38.0	V	-25.2	2.0	9.5	7.3	-17.7	-13.0	-4.7
4.575	25.9	V	-35.9	2.3	10.4	8.3	-27.8	-13.0	-14.8
4.971	37.3	V	-24.1	2.4	10.9	8.8	-15.6	-13.0	-2.6
5.100	36.8	V	-23.2	2.5	11.0	8.9	-14.7	-13.0	-1.7
5.490	38.2	V	-30.7	2.6	11.1	9.0	-22.2	-13.0	-9.2
6.628	29.0	V	-28.4	2.8	11.3	9.1	-19.9	-13.0	-6.9
1.482	34.2	H	-34.8	1.2	6.8	4.6	-29.2	-13.0	-16.2
2.223	21.3	H	-44.8	1.5	7.7	5.6	-38.6	-13.0	-25.6
2.964	23.2	H	-41.4	1.8	9.1	6.9	-34.1	-13.0	-21.1
1.287	20.2	H	-49.9	1.1	6.6	4.4	-44.4	-13.0	-31.4
1.657	42.8	H	-25.3	1.3	7.0	4.8	-19.6	-13.0	-6.6
1.800	20.3	H	-47.0	1.3	7.1	5.0	-41.2	-13.0	-28.2
1.976	22.5	H	-43.9	1.4	7.3	5.2	-37.9	-13.0	-24.9
1.983	18.8	H	-47.5	1.4	7.3	5.2	-41.6	-13.0	-28.6
2.745	20.1	H	-45.0	1.7	8.7	6.5	-38.0	-13.0	-25.0
3.314	27.0	H	-36.9	1.9	9.3	7.2	-29.5	-13.0	-16.5
3.660	26.2	H	-36.9	2.0	9.5	7.3	-29.4	-13.0	-16.4
4.575	22.5	H	-38.9	2.3	10.4	8.3	-30.8	-13.0	-17.8
4.971	31.3	H	-29.8	2.4	10.9	8.8	-21.3	-13.0	-8.3
5.100	26.9	H	-32.1	2.5	11.0	8.9	-23.6	-13.0	-10.6
5.490	23.3	H	-35.0	2.6	11.1	9.0	-26.5	-13.0	-13.5
6.628	26.8	H	-29.9	2.8	11.3	9.1	-21.4	-13.0	-8.4

No other emissions detected from EUT above 6.628 GHz

Table#2 - Radiated Emissions above 1 GHz – 743 MHz Operation

09/21/05 High Frequency Substitution Measurement Compliance Certification Services, Morgan Hill 5m Chamber Site									
Test Engr: William Zhuang Project #: 05U3662-1 Company: Tom Cokenias / Vyyo EUT Descrip.: Base Station, C band, 743MHz EUT M/N: V3000 Test Target: FCC Part 27 Mode Oper: <u>Test Equipment:</u>									
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> EMCO Horn 1-18GHz <input type="text" value="T60; S/N: 2238 @3m"/> </div> <div style="text-align: center;"> Horn > 18GHz <input type="text"/> </div> <div style="text-align: center;"> Limit <input type="text" value="EIRP"/> </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Hi Frequency Cables <input type="checkbox" value="2 ft"/> (2 ft) <input type="checkbox" value="2 ~ 3 ft"/> (2 ~ 3 ft) <input type="checkbox" value="4 ~ 6 ft"/> (4 ~ 6 ft) <input checked="" type="checkbox" value="12 ft"/> (12 ft) </div> <div style="text-align: center;"> Pre-amplifier 1-26GHz <input type="text"/> </div> <div style="text-align: center;"> Pre-amplifier 26-40GHz <input type="text"/> </div> </div>									
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Antenna port with dummy load									
1.486	39.1	V	-30.6	1.2	6.8	4.7	-25.0	-13.0	-12.0
1.486	40.1	H	-28.9	1.2	6.8	4.7	-23.3	-13.0	-10.3
1.657	46.8	V	-22.0	1.3	7.0	4.8	-16.3	-13.0	-3.3
1.657	41.6	H	-26.4	1.3	7.0	4.8	-20.7	-13.0	-7.7
1.976	31.4	V	-35.6	1.4	7.3	5.2	-29.7	-13.0	-16.7
1.976	25.8	H	-40.5	1.4	7.3	5.2	-34.6	-13.0	-21.6
1.983	30.4	V	-36.7	1.4	7.3	5.2	-30.8	-13.0	-17.8
1.983	24.7	H	-41.6	1.4	7.3	5.2	-35.7	-13.0	-22.7
2.229	23.5	V	-42.8	1.5	7.7	5.6	-36.5	-13.0	-23.5
2.229	27.7	H	-38.4	1.5	7.7	5.6	-32.2	-13.0	-19.2
2.972	26.0	V	-38.8	1.8	9.1	6.9	-31.4	-13.0	-18.4
2.972	21.5	H	-43.1	1.8	9.1	6.9	-35.8	-13.0	-22.8
3.660	40.7	V	-22.5	2.0	9.5	7.3	-15.0	-13.0	-2.0
3.660	28.1	H	-35.0	2.0	9.5	7.3	-27.6	-13.0	-14.6
4.458	22.1	V	-39.8	2.3	10.2	8.1	-31.8	-13.0	-18.8
4.458	25.5	H	-36.0	2.3	10.2	8.1	-28.1	-13.0	-15.1
4.971	36.4	V	-25.0	2.4	10.9	8.8	-16.5	-13.0	-3.5
4.971	36.5	H	-24.6	2.4	10.9	8.8	-16.1	-13.0	-3.1
5.106	35.2	V	-24.7	2.5	11.0	8.9	-16.2	-13.0	-3.2
5.106	25.1	H	-33.9	2.5	11.0	8.9	-25.3	-13.0	-12.3

No emissions detected from EUT above 5.106 GHz

Table#3 - Radiated Emissions above 1 GHz – 745 MHz Operation

09/23/05 High Frequency Substitution Measurement Compliance Certification Services, Morgan Hill 5m Chamber Site										
Test Engr: William Zhuang Project #: 05U3662-1 Company: Tom Cokenias / Vyyo EUT Descrip.: Base Station, C band, 745MHz EUT M/N: V3000 Test Target: FCC Part 27 Mode Oper:										
<u>Test Equipment:</u>										
EMCO Horn 1-18GHz			Horn > 18GHz				Limit			
T60; S/N: 2238 @3m							EIRP			
Hi Frequency Cables										
<input type="checkbox"/> (2 ft)			<input type="checkbox"/> (2 ~ 3 ft)			<input type="checkbox"/> (4 ~ 6 ft)			<input checked="" type="checkbox"/> (12 ft)	
Pre-amplifier 1-26GHz							Pre-amplifier 26-40GHz			
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	
Antenna port with dummy load										
1.490	40.9	V	-28.8	1.2	6.8	4.7	-23.2	-13.0	-10.2	
2.235	22.8	V	-43.5	1.5	7.8	5.6	-37.2	-13.0	-24.2	
1.287	25.0	V	-45.7	1.1	6.6	4.4	-40.3	-13.0	-27.3	
1.657	48.3	V	-20.4	1.3	7.0	4.8	-14.7	-13.0	-1.7	
1.800	26.4	V	-41.6	1.3	7.1	5.0	-35.8	-13.0	-22.8	
1.976	30.2	V	-36.8	1.4	7.3	5.2	-30.9	-13.0	-17.9	
1.983	27.3	V	-39.7	1.4	7.3	5.2	-33.8	-13.0	-20.8	
2.745	25.6	V	-39.7	1.7	8.7	6.5	-32.7	-13.0	-19.7	
2.974	26.2	V	-38.6	1.8	9.1	7.0	-31.2	-13.0	-18.2	
3.314	32.6	V	-31.5	1.9	9.3	7.2	-24.0	-13.0	-11.0	
3.660	39.8	V	-23.4	2.0	9.5	7.3	-16.0	-13.0	-3.0	
4.575	24.4	V	-37.4	2.3	10.4	8.3	-29.3	-13.0	-16.3	
4.971	35.4	V	-26.0	2.4	10.9	8.8	-17.5	-13.0	-4.5	
5.112	38.1	V	-21.8	2.5	11.0	8.9	-13.3	-13.0	-0.3	
5.490	37.4	V	-22.0	2.6	11.1	9.0	-13.5	-13.0	-0.5	
6.628	29.3	V	-28.1	2.8	11.3	9.1	-19.6	-13.0	-6.6	
1.490	36.8	H	-32.1	1.2	6.8	4.7	-26.5	-13.0	-13.5	
2.235	26.5	H	-39.6	1.5	7.8	5.6	-33.4	-13.0	-20.4	
1.287	19.5	H	-50.6	1.1	6.6	4.4	-45.1	-13.0	-32.1	
1.657	41.4	H	-26.6	1.3	7.0	4.8	-20.9	-13.0	-7.9	
1.800	20.2	H	-47.0	1.3	7.1	5.0	-41.3	-13.0	-28.3	
1.976	24.5	H	-41.9	1.4	7.3	5.2	-36.0	-13.0	-23.0	
1.983	24.4	H	-41.9	1.4	7.3	5.2	-36.0	-13.0	-23.0	
2.745	18.5	H	-46.6	1.7	8.7	6.5	-39.6	-13.0	-26.6	
2.974	22.6	H	-41.9	1.8	9.1	7.0	-34.6	-13.0	-21.6	
3.314	27.0	H	-36.9	1.9	9.3	7.2	-29.5	-13.0	-16.5	
3.660	27.2	H	-35.9	2.0	9.5	7.3	-28.4	-13.0	-15.4	
4.575	24.8	H	-36.7	2.3	10.4	8.3	-28.6	-13.0	-15.6	
4.971	32.1	H	-29.0	2.4	10.9	8.8	-20.5	-13.0	-7.5	
5.112	24.7	H	-34.3	2.5	11.0	8.9	-25.8	-13.0	-12.8	
5.490	21.4	H	-36.9	2.6	11.1	9.0	-28.4	-13.0	-15.4	
6.628	24.2	H	-32.5	2.8	11.3	9.1	-24.1	-13.0	-11.1	

No other emissions detected from EUT above 6.628 GHz

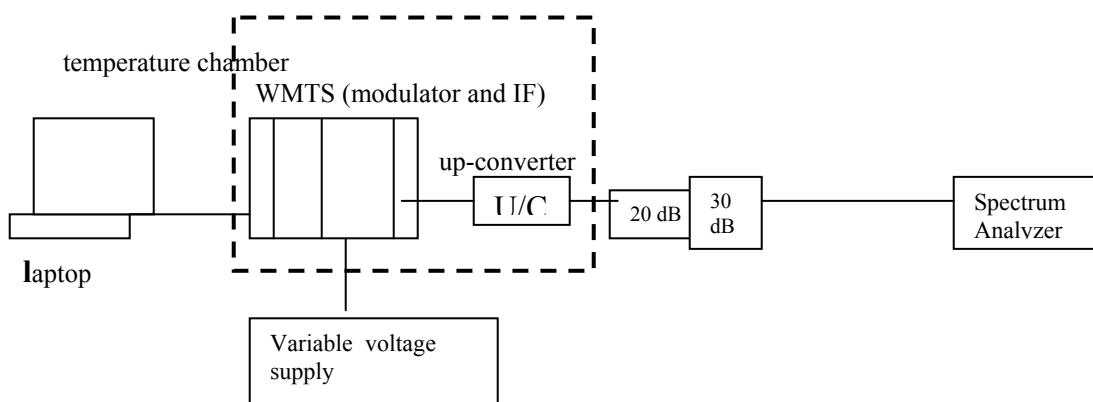
2.1055 Frequency Stability

Requirement/Limit: Section 27.54

27.54. The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Test Setup

Figure 3



Test Procedures

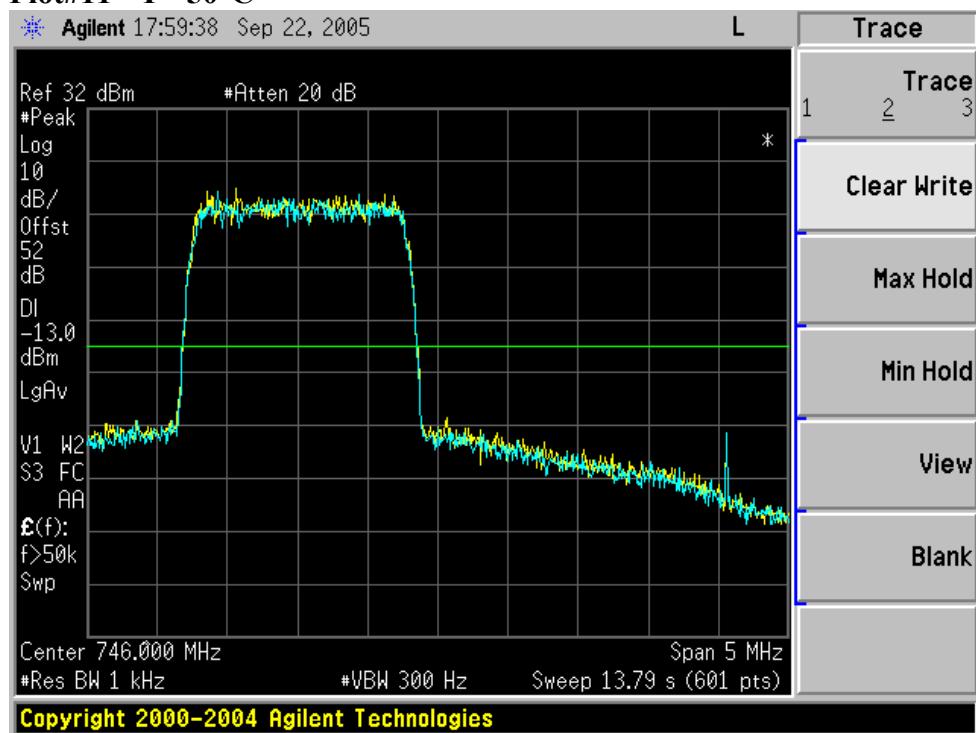
1. The WMTS modulator and the frequency up-converter portions of the transmitter were placed inside the temperature chamber. These are the two subassemblies that determine the operating frequency of the EUT.
2. The output of the U/C was connected to the spectrum analyzer through the same attenuators and coaxial cable used for the other antenna port conducted tests for a total attenuation of 52 dB.
3. The temperature was set to 25C and a plot of the transmitter output mask was recorded (yellow trace). The temperature was allowed to stabilize at every 10 degrees C from -30C to +50C. For each temperature tested a second output mask plot (blue trace) was superimposed on the yellow 25C plot.

Test Results

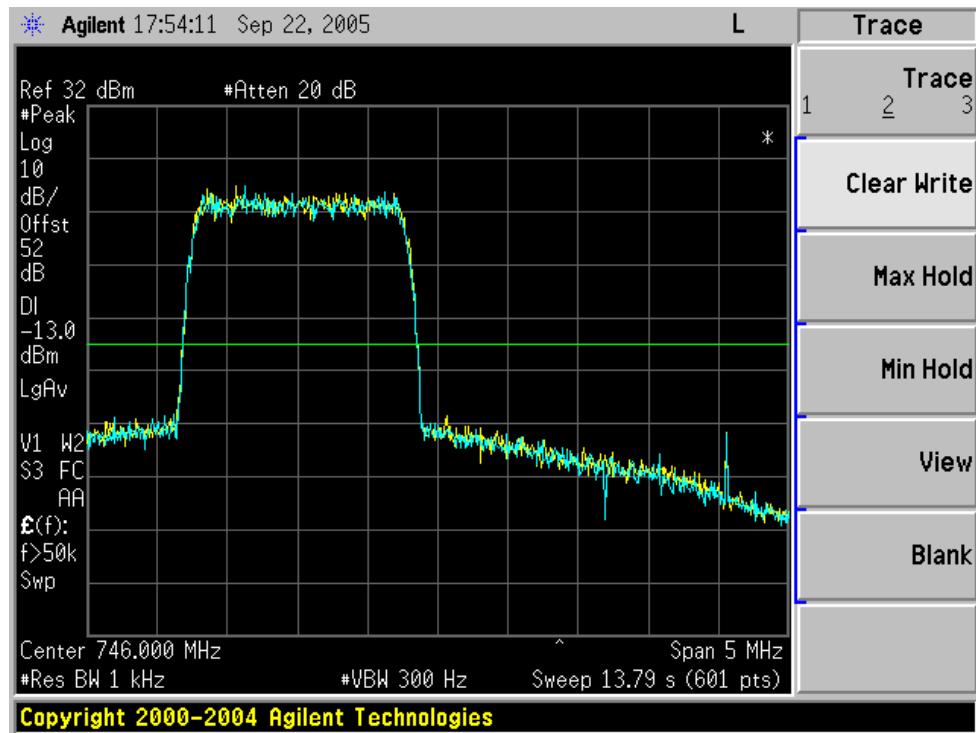
From +10C - +50C the EUT output mask did not vary noticeably from the 25C plot. The EUT is designed for indoor operation in a climate protected room. A temperature sensitive switch turns off the TX power when temperature goes below 10C and there is no TX output.

Refer to attached spectrum analyzer photos.

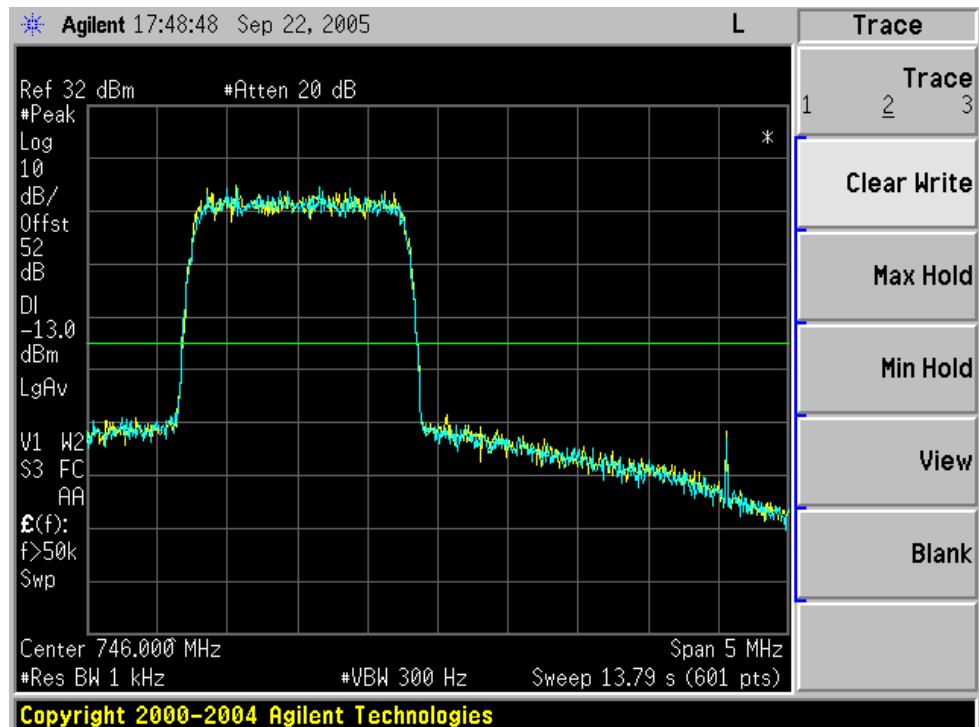
Plot#11 - T= 50°C



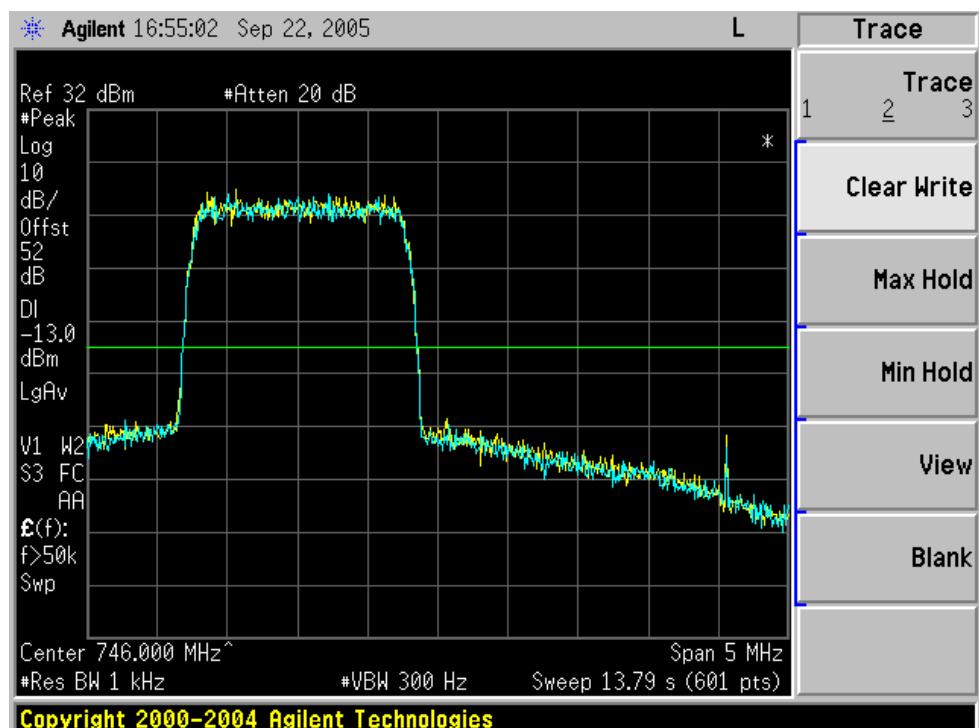
Plot#12 - T= 40°C



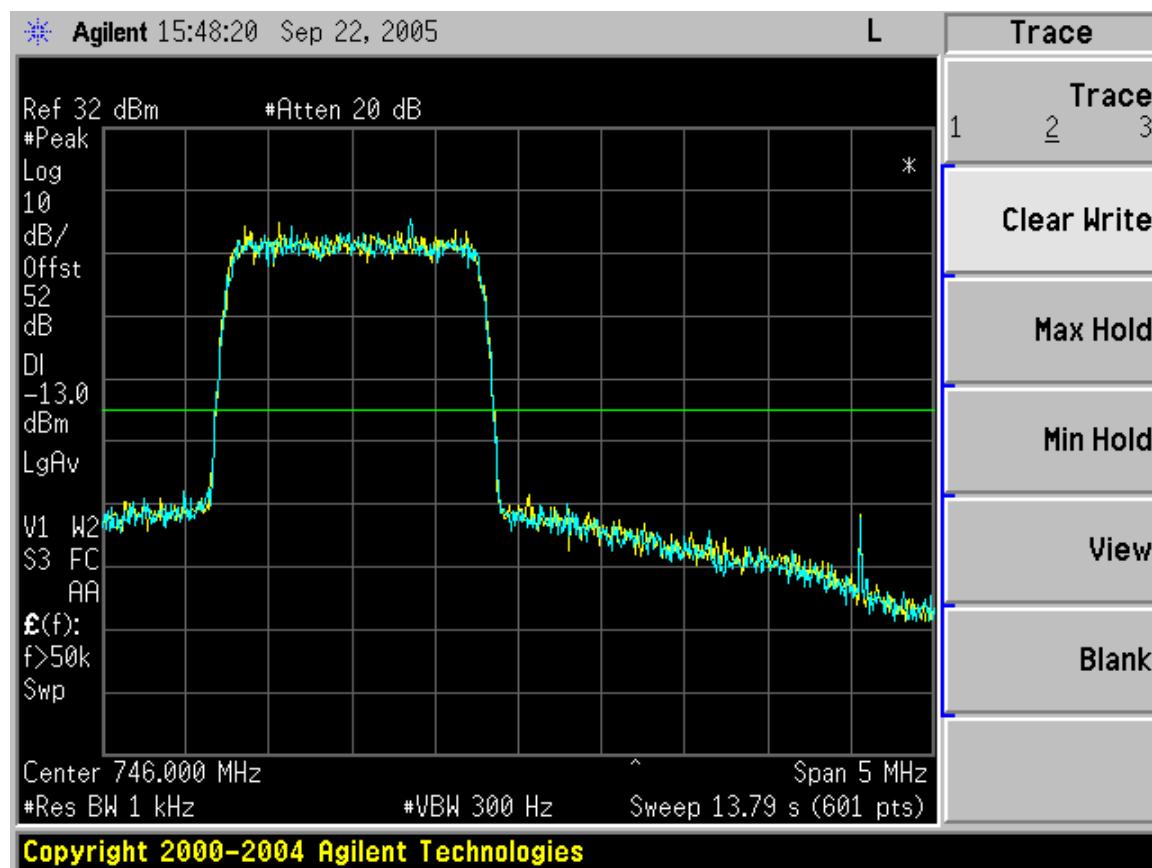
Plot#13 - T= 30°C



Plot#14 - T= 20°C



Plot#15 - T= 10°C



Operating Voltage v Frequency

Test Setup

Refer to Figure 3

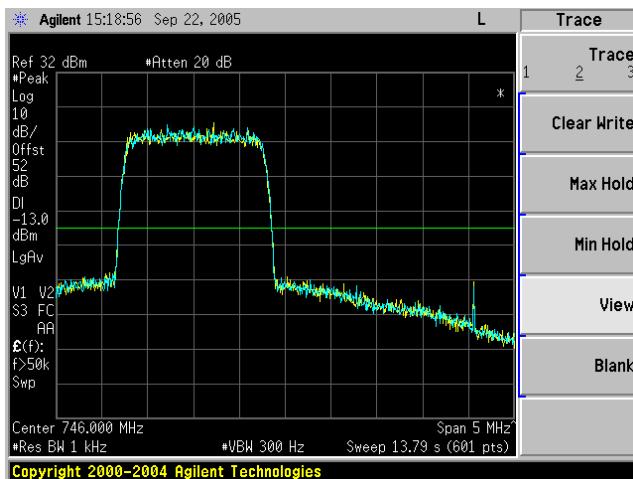
Test Procedures

At 25C the power supply voltage was varied between 85% and 115% nominal.

Test Results

No detectable variation over voltage excursion.

Plot#16 - T= 25°C, V = 102 VAC (85% nominal)



Plot#17 - T= 25°C, V = 102 VAC (115% nominal)



Test Site And Test Dates

Test Location: Compliance Certification Services
561 F Monterey Road
Morgan Hill CA 95037

Test Dates: 22 September – 4 October 2005

All testing was performed at Compliance Certification Services either by me or under my supervision. Conducted and radiated emissions were performed using test equipment with calibration traceable to NIST, and following test procedures accepted by the industry.

A handwritten signature in blue ink that reads "T.N. Cokenias". The signature is fluid and cursive, with "T.N." on top and "Cokenias" written below it in a slightly larger, more formal script.

THOMAS N. COKENIAS
Consultant, EMC&Radio Type Approvals
Agent for Vyyo Inc.