EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

I. GENERAL INFORMATION

Requirement: Federal Communications Commission
Test Requirements: 15.205, 15.207, 15.209, 15.247

Applicant: Sensus Metering Systems

FCC ID: **KCHMXU530T**
Model No.: 530-T

II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Sensus Model 530-T MXU (Meter Transceiver Unit) FCC ID: KCHMXU530T, IC: 2220AMXU530T is a Radio Frequency transceiver unit operating under CFR47 Part 15 of the FCC rules. The Model 530-T incorporates a part 15.247 Direct Sequence Spread Spectrum Transmitter operating in the 902 to 928 MHz ISM band, and a Part 15 AM Receiver operating in the 952 or 956 MHz MAS bands. The MXU uses spread spectrum techniques for remote electric meter reading.

Transmitter Specification

TX Power	23.58 dBm max.
Frequency of operation	904.6-925.4 MHz
Data Rate and Modulation	DSSS RF Data Rate 15.625 Kb/s RF Chip Rate 1 Mb/s (Spreading Sequence = 64 chips/bit) Typical application 50msec burst/week
6 dB bandwidth	1.16 MHz
Power source	3.6 V lithium thionyl chloride battery
Radio firmware	MXU4 GP-TC v0.0.4 (MXU 4.13.7)
Test software name	GetApp.exe Test Software (MXU5T100)

III. TEST DATES AND TEST LOCATION

Testing was performed 16-21 June 2006. All tests were performed at:

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037

IV. REVISION INFORMATION AND ATTESTATION OF RESULTS

Report No: 06PR042FCCREP

REV No.	Description	Revised By:	Date
1.0	Original	T. Cokenias	27 June 2006
1.1	Per TCB comments	T. Cokenias	24 July 2006

Test Requirement:	FCC Part 15
Manufacturer:	Sensus Metering Systems
FCC ID:	KCHMXU530T
Brand name:	Sensus Metering Systems
Model Nos.:	530T
IC:	2220A-MXU530T

FCC ID: KCHMXU530T meets all FCC requirements for a device of this type.

THOMAS N. COKENIAS 24 July 2006

EMC and Radio Regulatory Consultant
Agent for Sensus Metering Systems

15.203 Antenna connector requirement

The antenna is permanently attached to the product. For antenna conducted tests, a unit was modified by disconnecting the printed circuit antenna and replacing it with a 50 ohm coaxial cable connection terminated at one end with an SMA connector.

Antenna description

The meter transceiver uses a printed circuit folded dipole antenna:

Antenna description	Gain
printed ckt antenna	2.2 dBi

TEST PROCEDURES

All tests were performed in accordance with the applicable procedures called out in the following documents, unless otherwise noted:

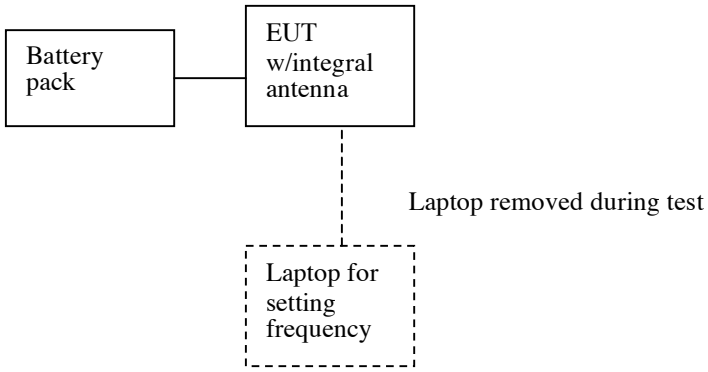
1) **ANSI C63.4 – 2003,** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
2) **FCC Public Notice 97-114,** Guidance on Measurements for Direct Sequence Spread Spectrum Systems

For each measurement reported below, EUT was set to produce maximum output power:

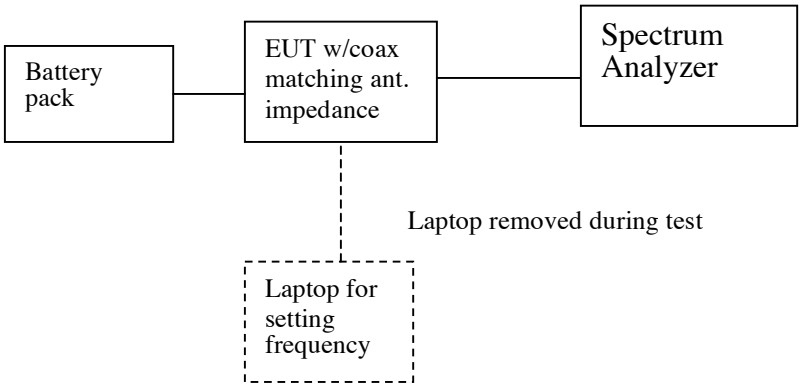
Channel	Frequency, MHz	Peak Output Power, dBm
LOW	904.6	23.58
MID	915.0	21.83
HIGH	925.4	21.94

TEST SET-UP

Radiated emissions



Antenna port conducted emissions



TEST RESULTS

Radiated Emissions
Test Requirement: 15.205, 15.247

Out of Band Measurements
Test Requirement: 15.247

Radiated Test Set-up, 1-26 GHz

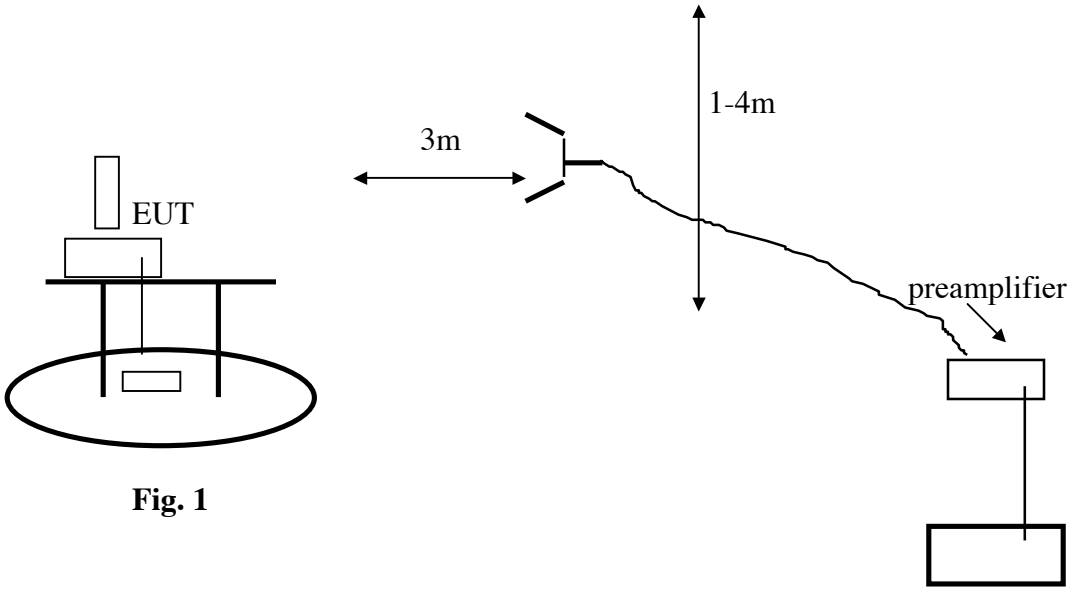


Fig. 1

Test Procedures

Radiated emissions generated by the transmitter portion of the EUT were measured.

1. The EUT was placed on a wooden table resting on a turntable on the test site. The search antenna was placed 3m from the EUT. The EUT antenna was positioned in the XY plane ("X-hat"), the first of three test positions.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

3. Radiated emissions were investigated for a LOW channel, a MID channel, and HIGH channel. Emissions were investigated to the 10^{th} harmonic.

4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

5. Steps 2 - 5 were repeated for YZ ("Y-hat") and XZ ("Z-hat") orientation of the EUT.

Test Results: Worst-case results are presented (Y-hat position). Refer to data sheets below. Restricted band emissions meet 54 dBuV/m. Other undesired emissions from the transmitter meet the -20 dBc requirement in 15.247(c), as follows:

Maximum output power in 100kHz BW = 18.77 dBm
(refer to spurious emission plots below)

Calculated fundamental frequency field strength at 3m:

95.24 + P dBm + G, dBi = 95.24dB + 18.77dBm + 2.2dBi = 116.2 dBuV/m

116.2 dBuV/m – 20 dB = 96.2 dBuV/m
limit for non-restricted band emissions outside 902-928 MHz operating frequency band.

Non-restricted band emissions measured at more than 20 dB below limit, refer to data sheets below.

FCC Radiated Emissions Limits

Section 15.205 Restricted bands of operation.
(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
0.495 - 0.505 (1)	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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(2)
13.36 - 13.41	322 - 335.4		

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

(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.
(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

Section 15.209 Radiated emission limits, general requirements.

(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)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
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.

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

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in Sections 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this Part.

YZ ("Y-hat") worst-case orientation

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

Company: Sensus
Project #: 06U1
Date: June 16, 2006
Test Engineer: Gordon Andrews
Configuration: EUT
Mode: Tx, Worsecase ETU orientation is Y hat
Average Power Meter: Low = 23.58 dBm, Mid = 21.83 dBm, High = 21.94 dBm
FCC ID: KCHMXU530T
Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T73; S/N: 6717 @3m	T87 Miteq 924342		

Hi Frequency Cables

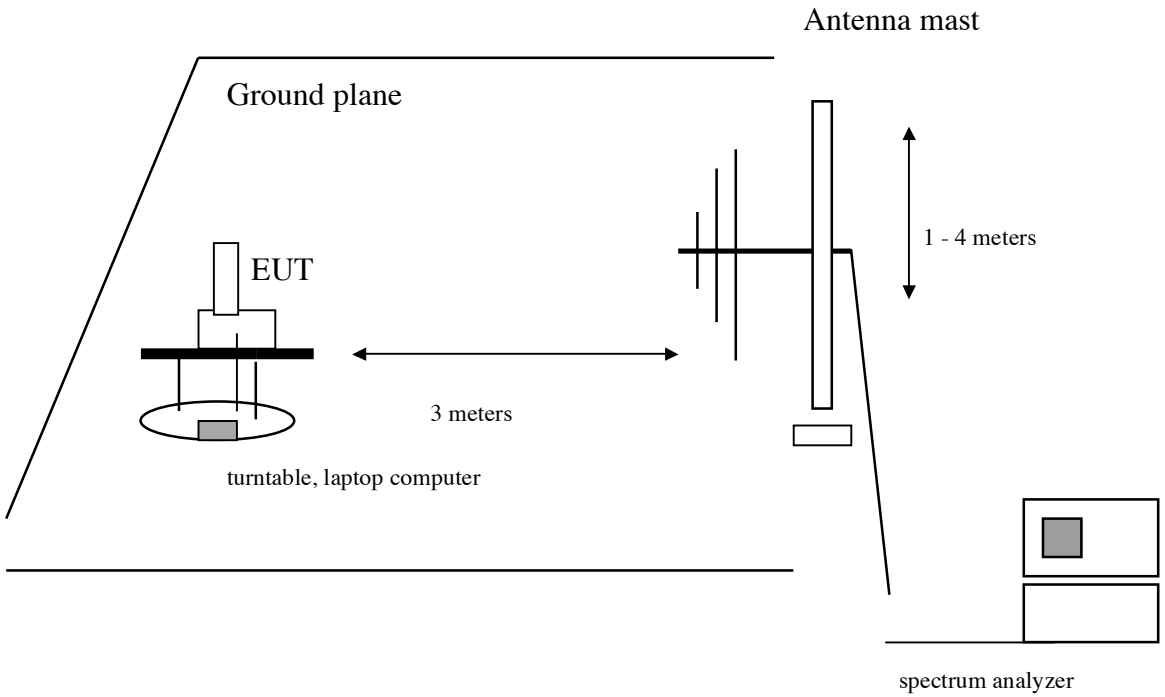
2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008			HPF_1.5GHz	

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 Chnanel Y EUT orientation			904.6												
1.809	3.0	79.4	78.1	26.7	0.4	-44.8	0.0	0.3	62.0	60.7	74	96.2	-12.0	-35.5	V
2.714	3.0	56.4	48.0	29.2	0.5	-44.5	0.0	0.6	42.2	33.8	74	54	-31.8	-20.2	V
3.620	3.0	54.0	46.4	31.6	0.5	-44.6	0.0	0.6	42.1	34.5	74	54	-31.9	-19.5	V
4.520	3.0	57.0	50.6	33.0	0.5	-45.1	0.0	0.6	46.0	39.6	74	54	-28.0	-14.4	V
5.430	3.0	54.4	45.0	33.8	0.6	-45.7	0.0	0.5	43.6	34.2	74	54	-30.4	-19.8	V
6.330	3.0	56.6	48.2	34.0	0.6	-44.8	0.0	0.5	46.8	38.4	74	54	-27.2	-15.6	V
7.240	3.0	54.4	47.0	34.9	0.6	-43.3	0.0	0.6	47.2	39.8	74	54	-26.8	-14.2	V
8.140	3.0	51.0	42.0	35.5	0.6	-42.0	0.0	0.7	45.8	36.8	74	54	-28.2	-17.2	V
9.050	3.0	51.0	41.0	36.5	0.6	-41.2	0.0	0.7	47.6	37.6	74	54	-26.4	-16.4	V
1.809	3.0	78.8	78.0	26.7	0.4	-44.8	0.0	0.3	61.4	60.6	74	96.2	-12.6	-35.6	H
2.714	3.0	57.3	49.8	29.2	0.5	-44.5	0.0	0.6	43.1	35.6	74	54.0	-30.9	-18.4	H
3.620	3.0	57.0	52.1	31.6	0.5	-44.6	0.0	0.6	45.1	40.2	74	54	-28.9	-13.8	H
4.520	3.0	59.0	53.2	33.0	0.5	-45.1	0.0	0.6	48.0	42.2	74	54	-26.0	-11.8	H
5.430	3.0	53.0	46.0	33.8	0.6	-45.7	0.0	0.5	42.2	35.2	74	54	-31.8	-18.8	H
6.330	3.0	57.7	49.9	34.0	0.6	-44.8	0.0	0.5	47.9	40.1	74	54	-26.1	-13.9	H
7.240	3.0	50.0	47.0	34.9	0.6	-43.3	0.0	0.6	42.8	39.8	74	54	-31.2	-14.2	H
8.140	3.0	50.0	47.0	35.5	0.6	-42.0	0.0	0.7	44.8	41.8	74	54	-29.2	-12.2	H
9.050	3.0	50.0	47.0	36.5	0.6	-41.2	0.0	0.7	46.6	43.6	74	54	-27.4	-10.4	H
Mid Chnanel Y hat		Worse Case EUT Orie			15 Fund										
1.830	3.0	75.4	74.8	26.8	0.4	-44.8	0.0	0.3	58.1	57.5	126.0	96.2	-67.9	-38.7	V
2.745	3.0	56.8	49.2	29.3	0.5	-44.4	0.0	0.6	42.7	35.1	74	54	-31.3	-18.9	V
3.660	3.0	55.9	48.7	31.7	0.5	-44.6	0.0	0.6	44.1	36.9	74	54	-29.9	-17.1	V, in 5m chamber
4.580	3.0	56.8	48.1	33.1	0.5	-45.2	0.0	0.6	45.8	37.1	74	54	-28.2	-16.9	V
5.500	3.0	53.0	46.0	33.9	0.6	-45.7	0.0	0.5	42.3	35.3	74	54	-31.7	-18.7	V
6.400	3.0	57.7	49.9	34.1	0.6	-44.7	0.0	0.5	48.1	40.3	74	54	-25.9	-13.7	V
7.320	3.0	50.0	47.0	35.0	0.6	-43.2	0.0	0.6	43.0	40.0	74	54	-31.0	-14.0	V
8.230	3.0	50.0	47.0	35.6	0.6	-41.9	0.0	0.7	45.0	42.0	74	54	-29.0	-12.0	V
9.150	3.0	50.0	47.0	36.5	0.6	-41.0	0.0	0.7	46.9	43.9	74	54	-27.1	-10.1	V
1.830	3.0	77.6	77.0	26.8	0.4	-44.8	0.0	0.3	60.3	59.7	126.0	96.2	-65.7	-36.5	H
2.745	3.0	58.2	49.9	29.3	0.5	-44.4	0.0	0.6	44.1	35.8	74	54.0	-29.9	-18.2	H, in 5m CHAMBER
3.660	3.0	56.8	52.1	31.7	0.5	-44.6	0.0	0.6	45.0	40.3	74	54	-29.0	-13.7	H
4.580	3.0	59.0	48.5	33.1	0.5	-45.2	0.0	0.6	48.0	37.5	74	54	-26.0	-16.5	H
5.500	3.0	57.1	51.8	33.9	0.6	-45.7	0.0	0.5	46.4	41.1	74	54	-27.6	-12.9	H
6.400	3.0	58.0	52.7	34.1	0.6	-44.7	0.0	0.5	48.4	43.1	74	54	-25.6	-10.9	H
7.320	3.0	51.0	48.0	35.0	0.6	-43.2	0.0	0.6	44.0	41.0	74	54	-30.0	-13.0	H
8.230	3.0	50.7	49.0	35.6	0.6	-41.9	0.0	0.7	45.7	44.0	74	54	-28.3	-10.0	H
9.150	3.0	49.9	47.0	36.5	0.6	-41.0	0.0	0.7	46.8	43.9	74	54	-27.2	-10.1	H
High Channel Y hat Worsecase EUT Orientation					925.4										
1.850	3.0	76.5	75.6	26.9	0.4	-44.8	0.0	0.3	59.3	58.4	126.0	96.2	-66.7	-37.8	V
2.770	3.0	53.7	49.8	29.3	0.5	-44.4	0.0	0.6	39.7	35.8	74	54	-34.3	-18.2	V
3.700	3.0	53.1	48.6	31.8	0.5	-44.7	0.0	0.6	41.3	36.8	74	54	-32.7	-17.2	V
4.630	3.0	55.2	47.8	33.1	0.5	-45.2	0.0	0.6	44.3	36.9	74	54	-29.7	-17.1	V
5.550	3.0	52.6	41.0	33.8	0.6	-45.6	0.0	0.5	41.9	30.3	74	54	-32.1	-23.7	V
6.478	3.0	52.6	41.0	34.2	0.6	-44.6	0.0	0.5	43.3	31.7	74	54	-30.7	-22.3	V
7.400	3.0	52.1	43.7	35.0	0.6	-43.1	0.0	0.6	45.3	36.9	74	54	-28.7	-17.1	V
8.320	3.0	52.6	42.5	35.7	0.6	-41.8	0.0	0.7	47.8	37.7	74	54	-26.2	-16.3	V
9.250	3.0	52.1	41.0	36.6	0.6	-40.8	0.0	0.7	49.3	38.2	74	54	-24.7	-15.8	V
1.850	3.0	68.4	67.3	26.9	0.4	-44.8	0.0	0.3	51.2	50.1	126.0	96.2	-74.8	-46.1	H
2.770	3.0	57.3	51.0	29.3	0.5	-44.4	0.0	0.6	43.3	37.0	74	54	-30.7	-17.0	H
3.700	3.0	60.1	55.3	31.8	0.5	-44.7	0.0	0.6	48.3	43.5	74	54	-25.7	-10.5	H
4.630	3.0	55.1	47.9	33.1	0.5	-45.2	0.0	0.6	44.2	37.0	74	54	-29.8	-17.0	H
5.550	3.0	60.1	55.3	33.8	0.6	-45.6	0.0	0.5	49.4	44.6	74	54	-24.6	-9.4	H
6.478	3.0	60.1	56.1	34.2	0.6	-44.6	0.0	0.5	50.8	46.8	74	54	-23.2	-7.2	H
7.400	3.0	60.1	48.0	35.0	0.6	-43.1	0.0	0.6	53.3	41.2	74	54	-20.7	-12.8	H
8.320	3.0	60.1	44.0	35.7	0.6	-41.8	0.0	0.7	55.3	39.2	74	54	-18.7	-14.8	H
9.250	3.0	60.1	41.0	36.6	0.6	-40.8	0.0	0.7	57.3	38.2	74	54	-16.7	-15.8	H

Radiated Emissions
Test Requirement: 15.109

Radiated Test Set-up, 30 - 1000 MHz



Test Procedures

1. The EUT was placed on a wooden table resting on a turntable on the open air test site. The search antenna was placed 3m from the EUT. The EUT antenna was mounted vertically as per normal installation. The EUT was set to transmit continuously on the MID channel.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

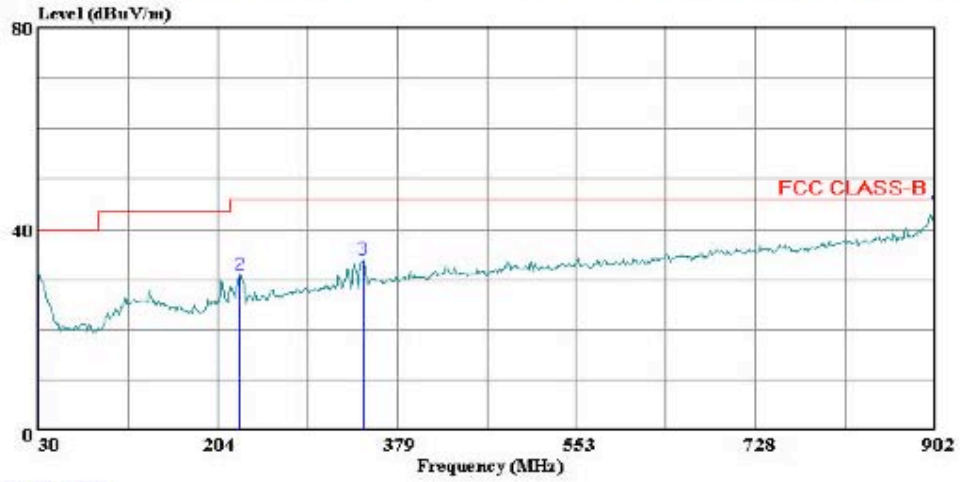
4. Steps 1-3 were repeated for HIGH and LOW channels

Test Results: EUT meets requirements. Worst case emissions were for HIGH channel, closest to 960-1240 MHz restricted band, data plots attached. All transmitter emissions in the 30-1000 MHz band are at least 20 below the carrier:

Radiated Emissions, Horizontal Search Antenna, 30-902 MHz

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

Data#: 47 File#: 30-1000 MHz.EMI Date: 06-21-2006 Time: 12:36:24



Trace: 46 Ref Trace:

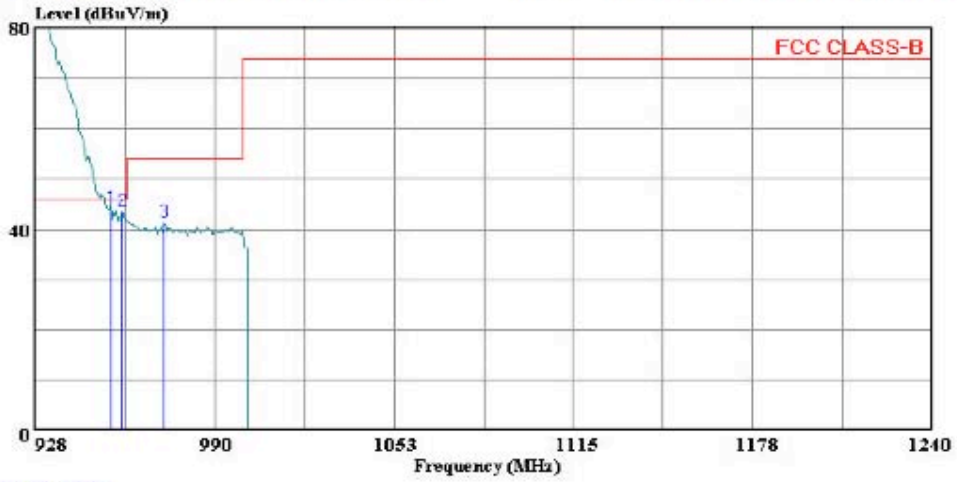
Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Gordon Andrews
Company: : Sensus
Project #: : 06U10351
Model: : KCHMXU530T
Configuration: : EUT with battery pack, Y axis
Mode of Operation: Transmit Mode High Channel

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	10.41	20.45	30.86	40.00	-9.14	Peak
2	226.200	17.90	12.91	30.81	46.00	-15.19	Peak
3	345.664	16.89	16.81	33.70	46.00	-12.30	Peak
4	902.000	18.33	25.93	44.26	46.00	-1.74	Peak

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

Data#: 43 File#: 30-1000 MHz.EMI Date: 06-21-2006 Time: 12:23:12



(Audix ATC)

Trace: 42 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Gordon Andrews
Company: : Sensus
Project #: : 06U10351
Model: : KCHMXU530T
Configuration: : EUT with battery pack, Y axis
Mode of Operation: Transmit Mode High Channel

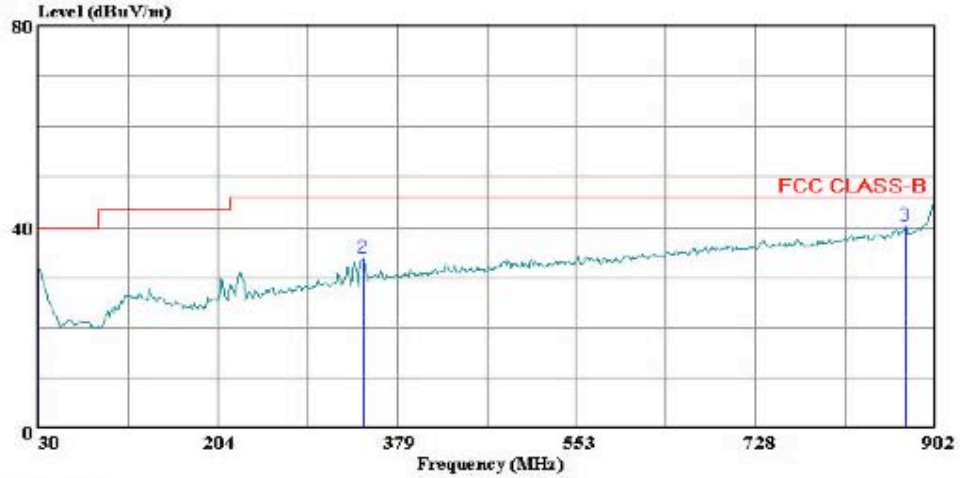
Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	954.520	17.64	26.49	44.13	46.00	-1.87	Peak
2	958.264	17.09	26.50	43.59	46.00	-2.41	Peak
3	972.928	14.69	26.69	41.37	54.00	-12.63	Peak

Radiated Emissions, Vertical Search Antenna, 928-1000 MHz

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

Data#: 49 File#: 30-1000 MHz.EMI Date: 06-21-2006 Time: 12:41:46



(Audix ATC)

Trace: 48 Ref Trace:

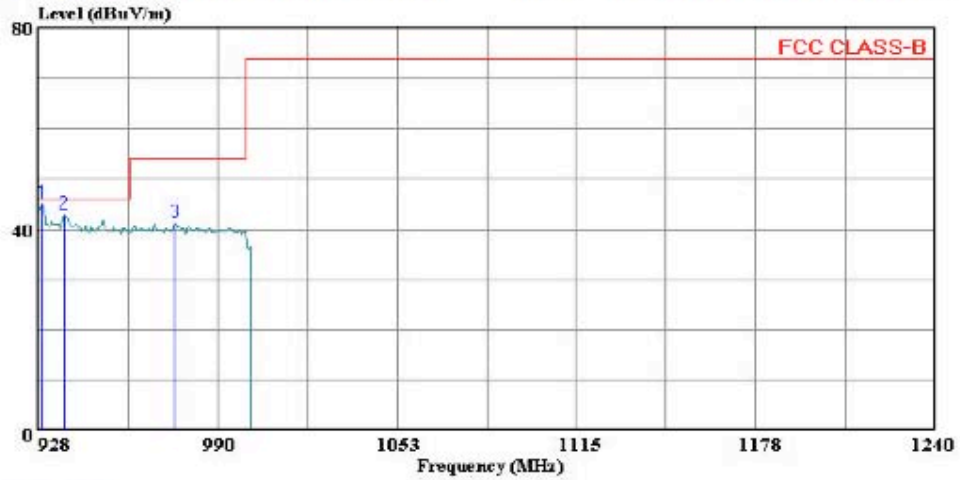
Condition: FCC CLASS-B VERTICAL
Test Operator: : Gordon Andrews
Company: : Sensus
Project #: : 06U10351
Model: : KCHMXU530T
Configuration: : EUT with battery pack, Y axis
Mode of Operation: Transmit Mode High Channel

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	11.34	20.45	31.79	40.00	-8.21	Peak
2	345.664	16.89	16.81	33.70	46.00	-12.30	Peak
3	873.224	14.44	25.61	40.05	46.00	-5.95	Peak

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

Data#: 39 File#: 30-1000 MHz.EMI Date: 06-21-2006 Time: 12:05:21



(Audix ATC)

Trace: 38 Ref Trace:

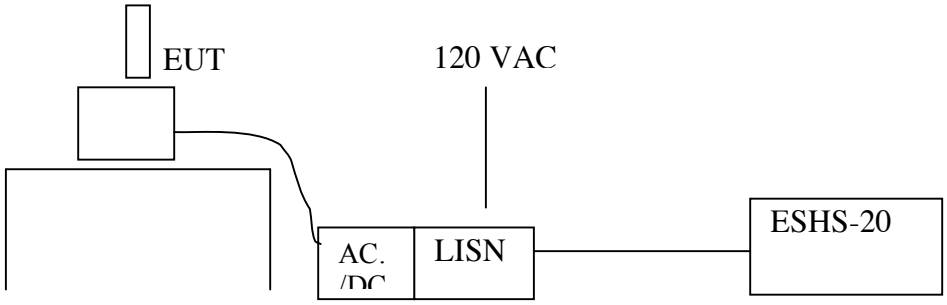
Condition: FCC CLASS-B VERTICAL
Test Operator: : Gordon Andrews
Company: : Sensus
Project #: : 06U10351
Model: : KCHMXU530T
Configuration: : EUT with battery pack, Y axis
Mode of Operation: Transmit Mode Low Channel

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	929.248	18.96	26.25	45.22	46.00	-0.78	Peak
2	937.048	16.42	26.36	42.79	46.00	-3.21	Peak
3	975.424	14.67	26.70	41.37	54.00	-12.63	Peak

AC Line Conducted Emissions
Test Requirement: 15.107, 15.207

AC Conducted Set-up



Test Procedure

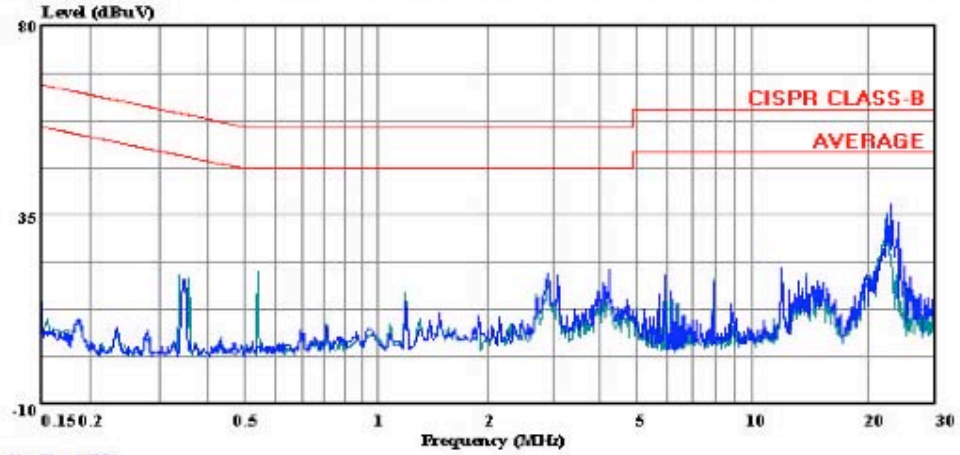
1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in normally.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

Test Results

Refer to data plots below.

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

Data#: 7 File#: MXU530T 115V.EMI Date: 06-21-2006 Time: 16:07:13

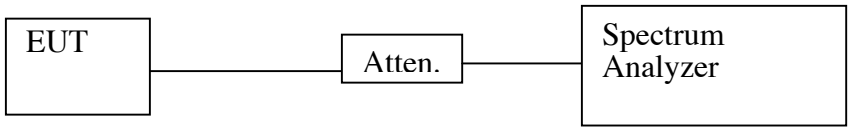


Trace: 3 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Gordon Andrews
Project # : 06U10351
Company : Sensus, Model MXU530T
EUT configuration: EUT with Agilent Lab Power Supply
EUT mode : Continous Tx worst case
Power Source : 115 VAC, 60 Hz
: Peak, L2:(Black), L3:(Green)

6dB Bandwidth for DTS
Test Requirement: 15.247

Test Set-up



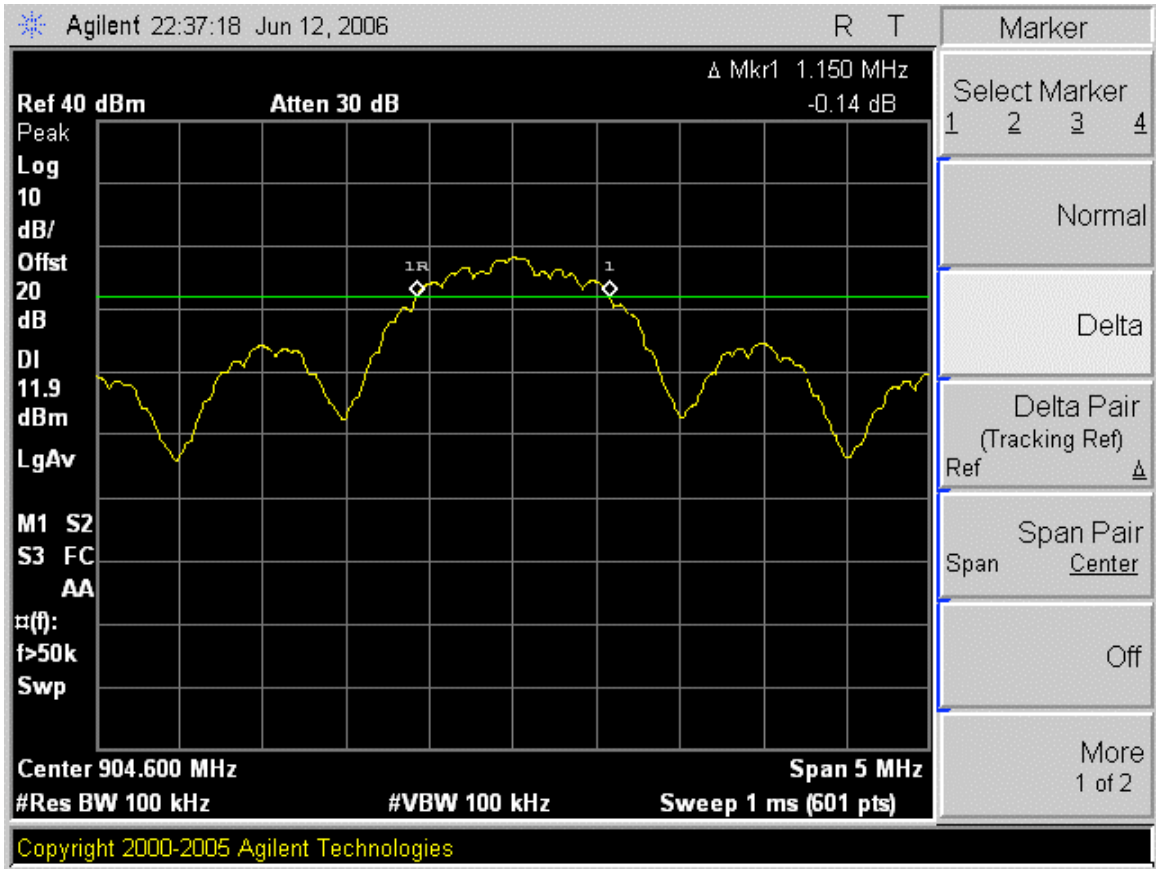
Test Procedures

A modified EUT with a coaxial cable attached to the radio antenna port was configured on a test bench. The cable's SMA connector was connected to the spectrum analyzer. The EUT transmission was continuous at 904.6 MHz (LOW channel). While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission occupied bandwidth.

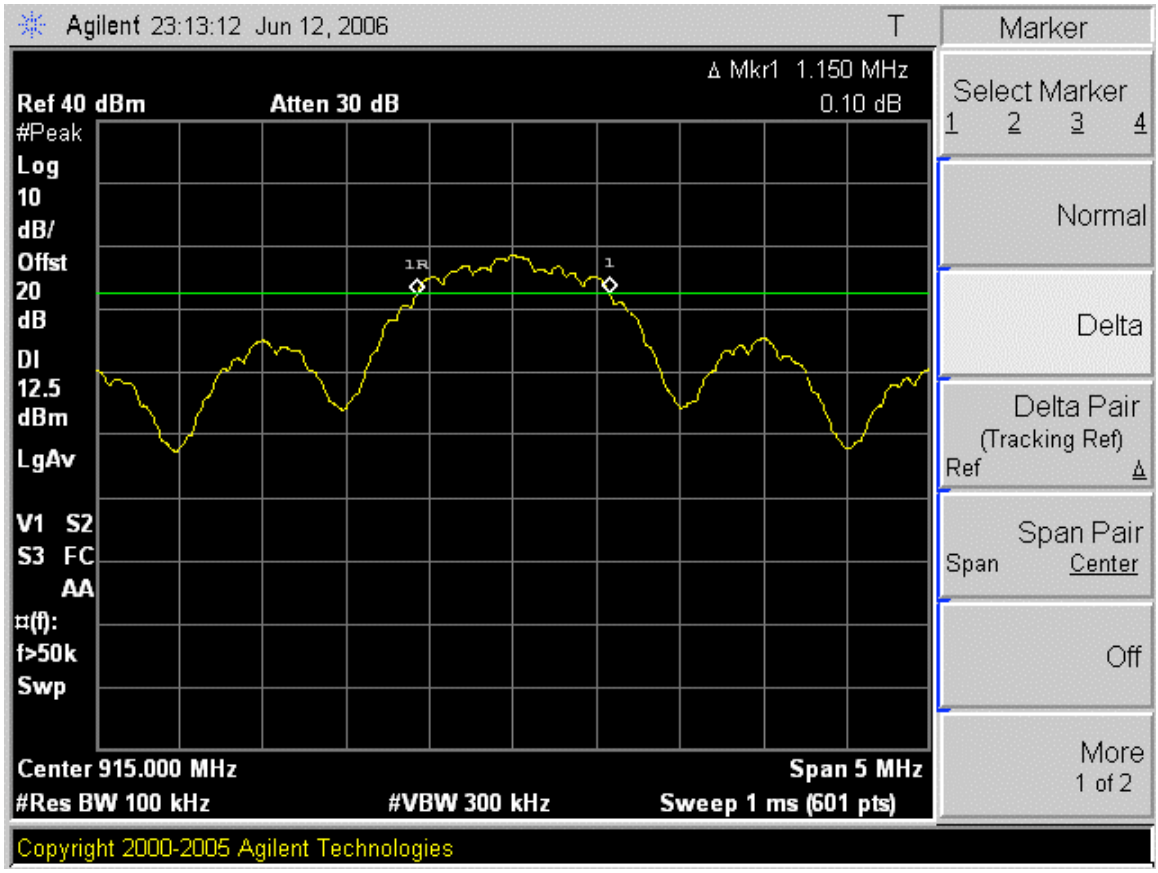
Test was repeated for MID and HIGH channels.

Test Results: Measured approximately 1.16 MHz 6 dB BW. Refer to data plots below.

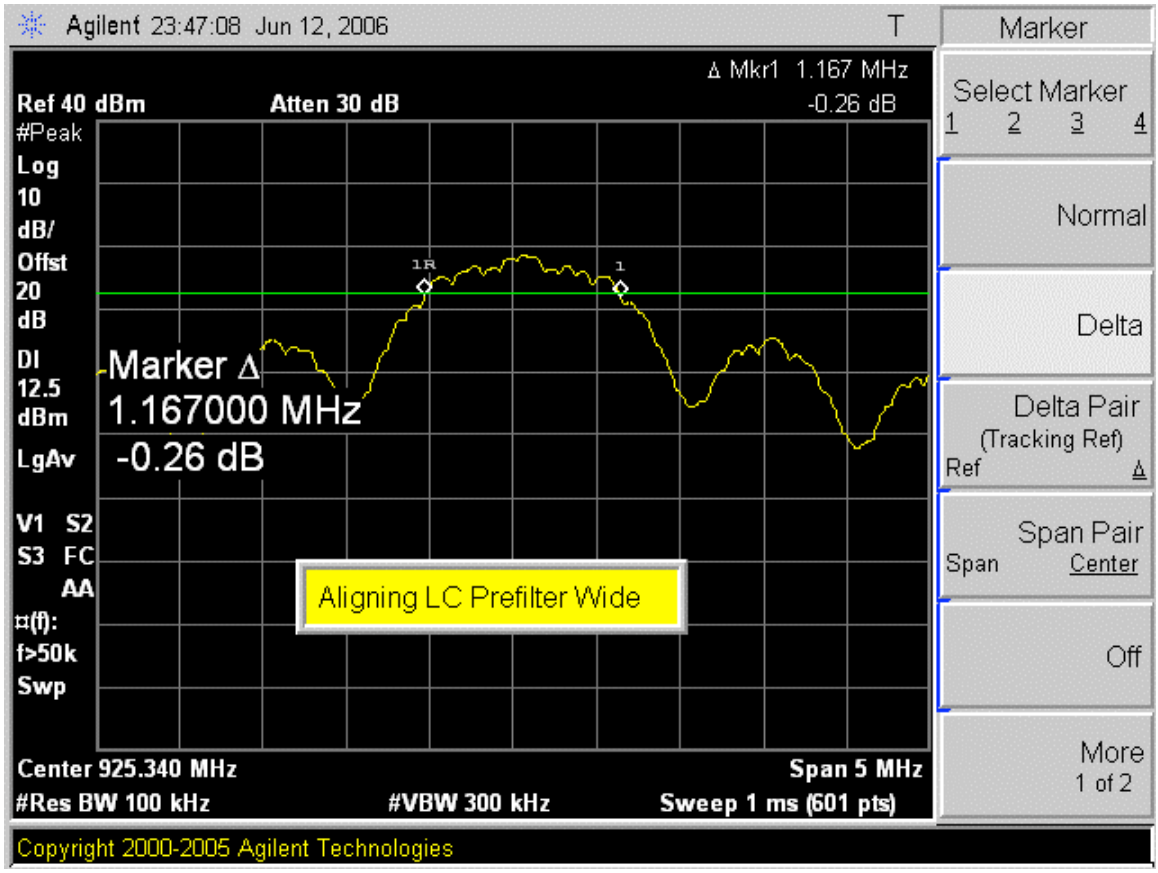
15.247 6dB Channel Bandwidth LOW channel



15.247 6 dB Channel Bandwidth MID channel

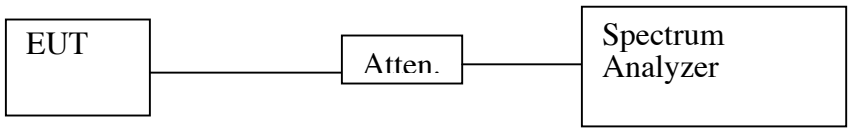


15.247 6 dB Channel Bandwidth HIGH channel



99% Bandwidth
Test Requirement: RSS-210 (Canada Only, FCC Information Only)

Test Setup



Limit

None: for reporting purposes only.

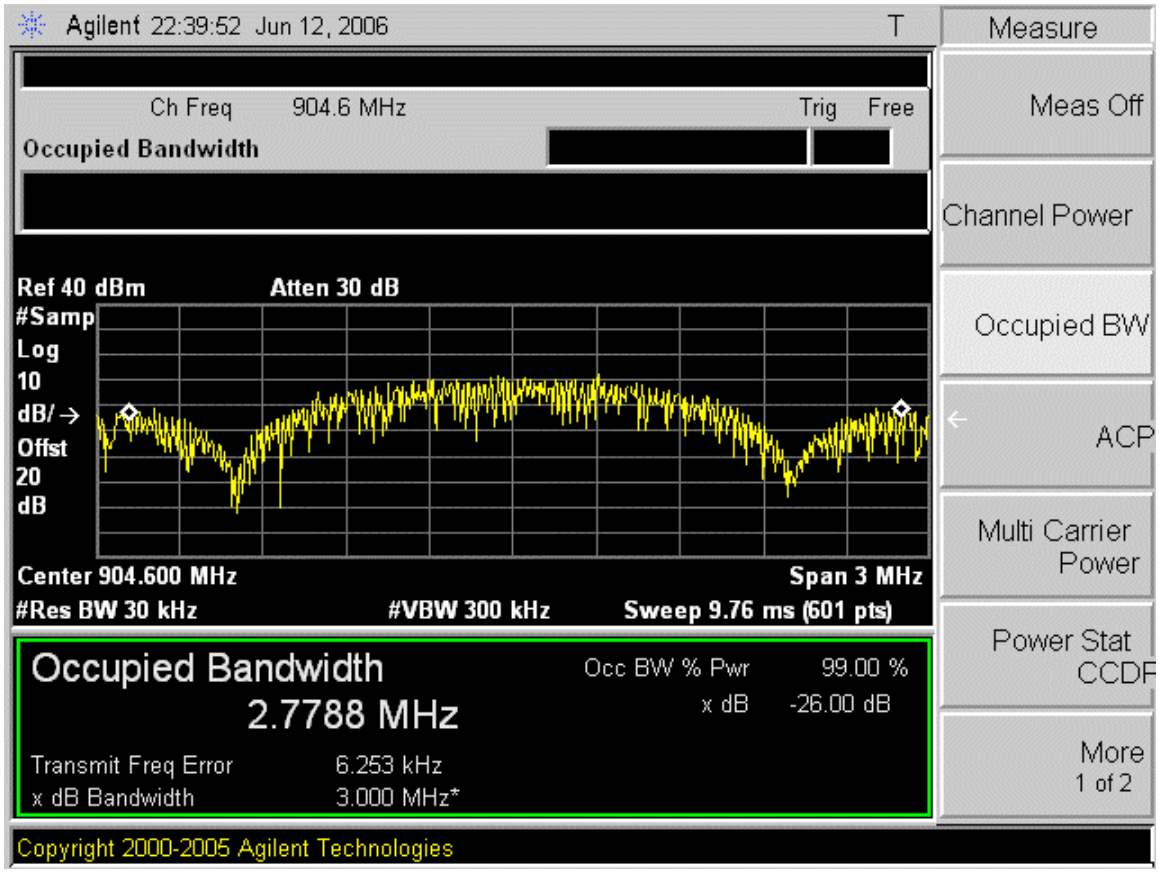
Test Procedure

For LOW channel, the transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to at least 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized. Testing was repeated for MID and HIGH channels.

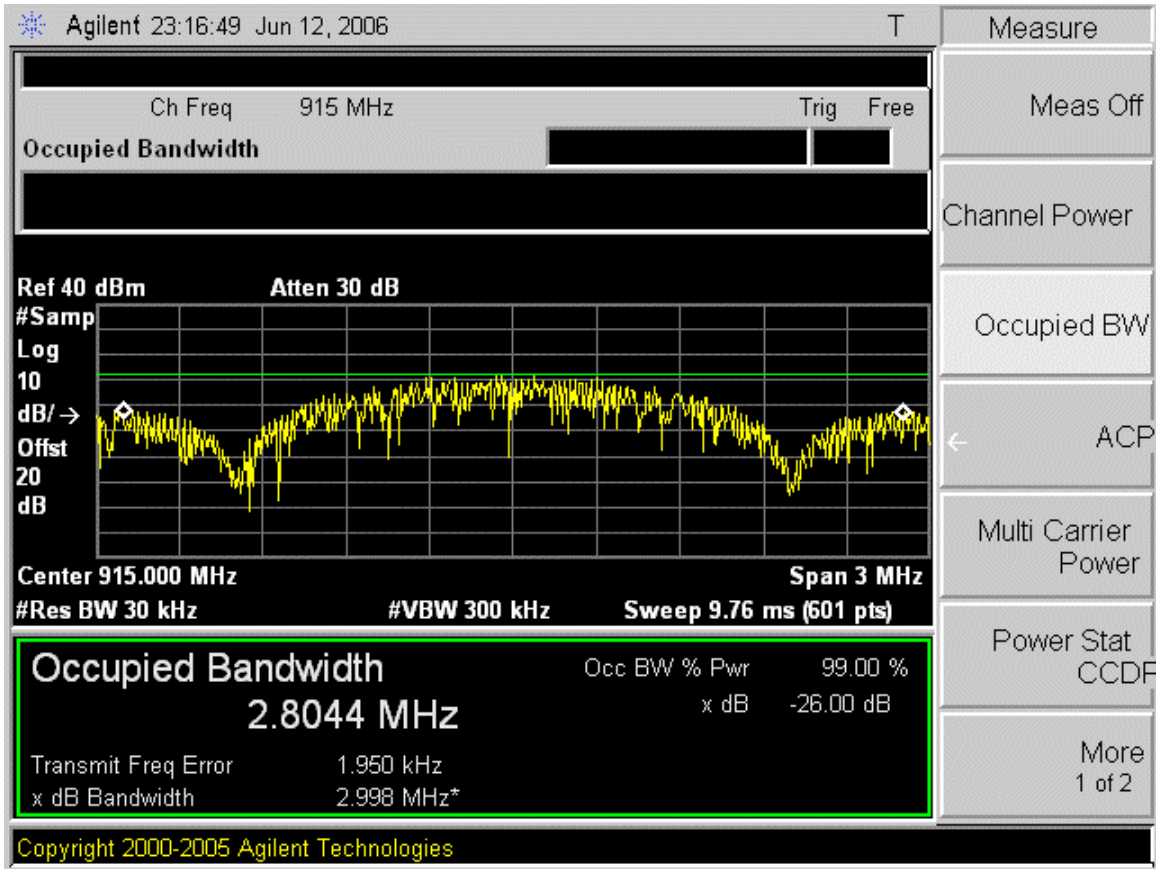
Test Results

Refer to spectrum analyzer charts below. 99% bandwidth is approximately 2.8 MHz.

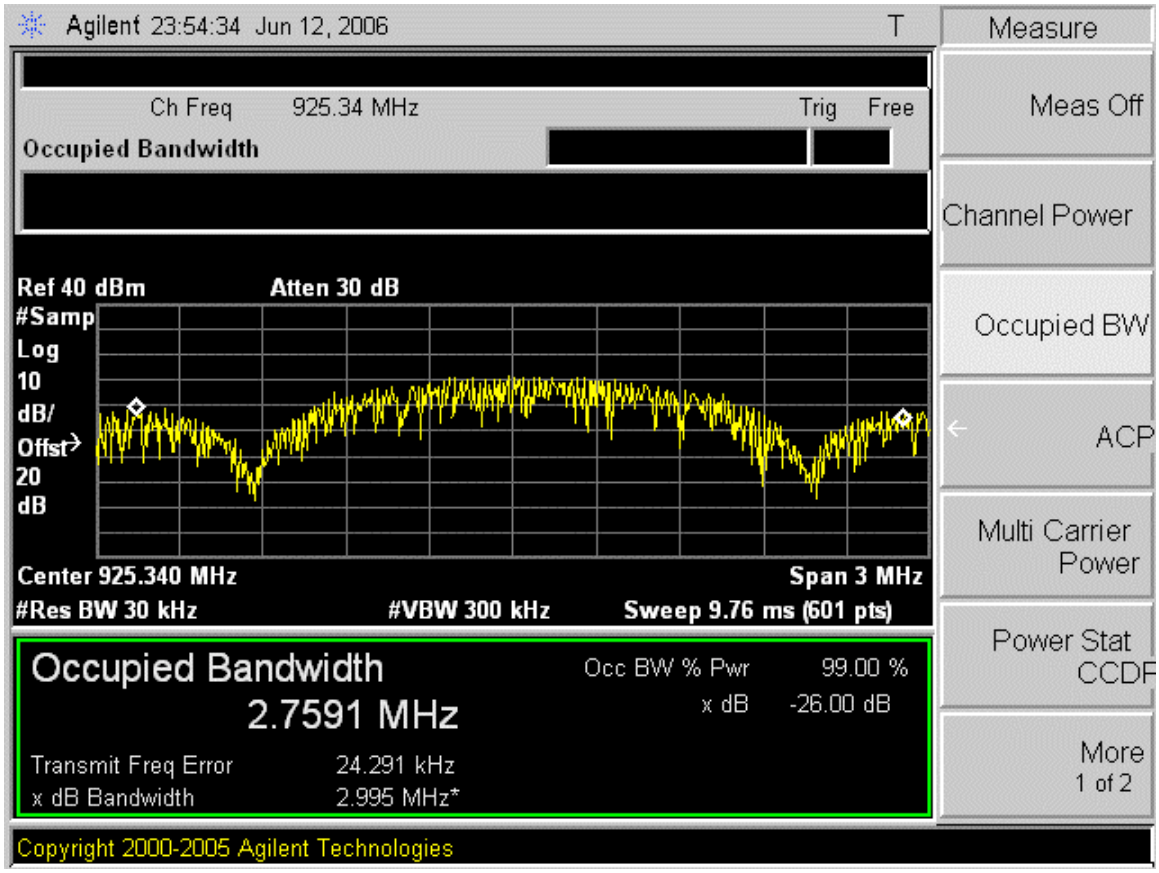
99% Bandwidth LOW Channel



99% Bandwidth MID Channel

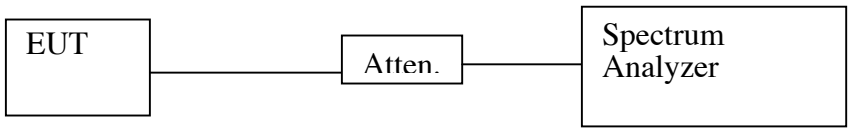


99% Bandwidth HIGH Channel



RF Power Output
Test Requirement: 15.247

Test Setup



Test Procedures

1.The EUT was configured on a test bench. The spectrum analyzer RBW and VBW were set to greater than emission bandwidth, to 3 and 4 MHz respectively.

2. The spectrum analyzer channel power was used to measure peak power.

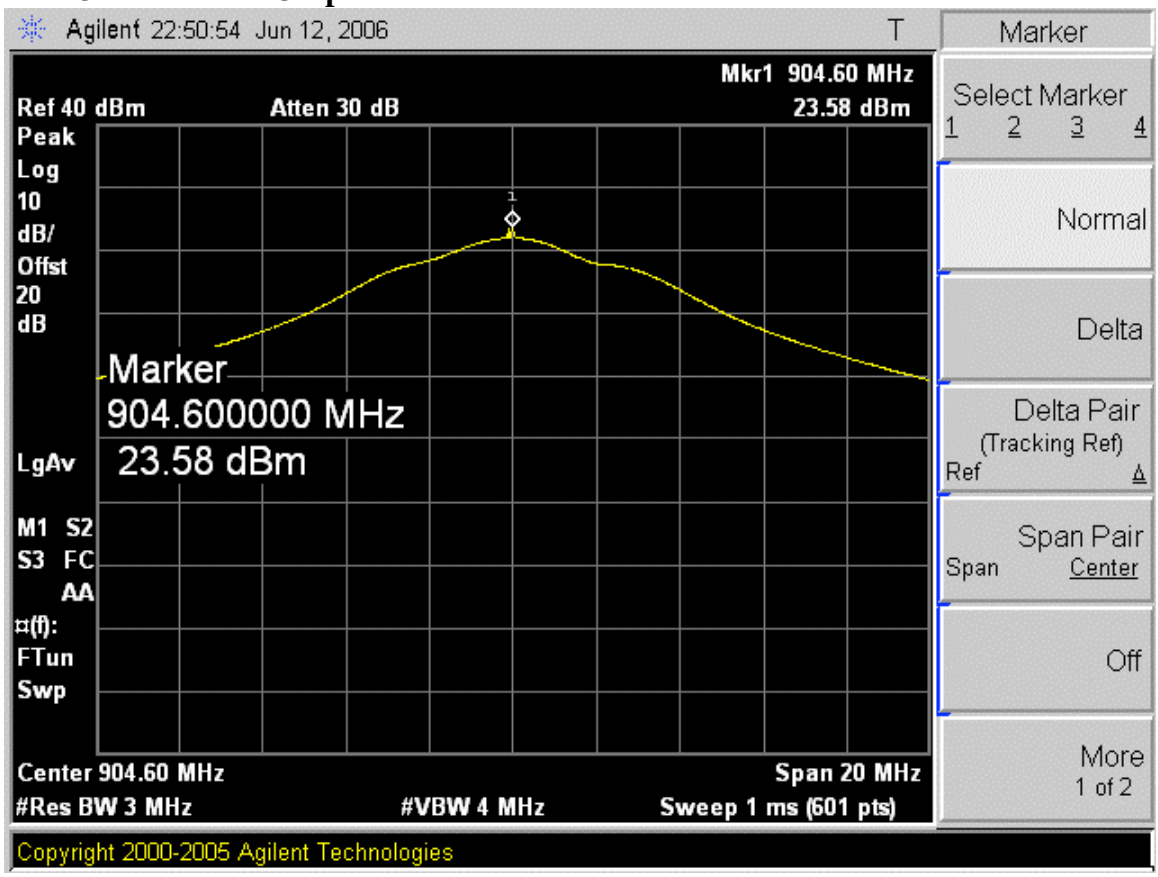
3. The process in (1) and (2) was repeated for MID channel and HIGH channel.

Test Results

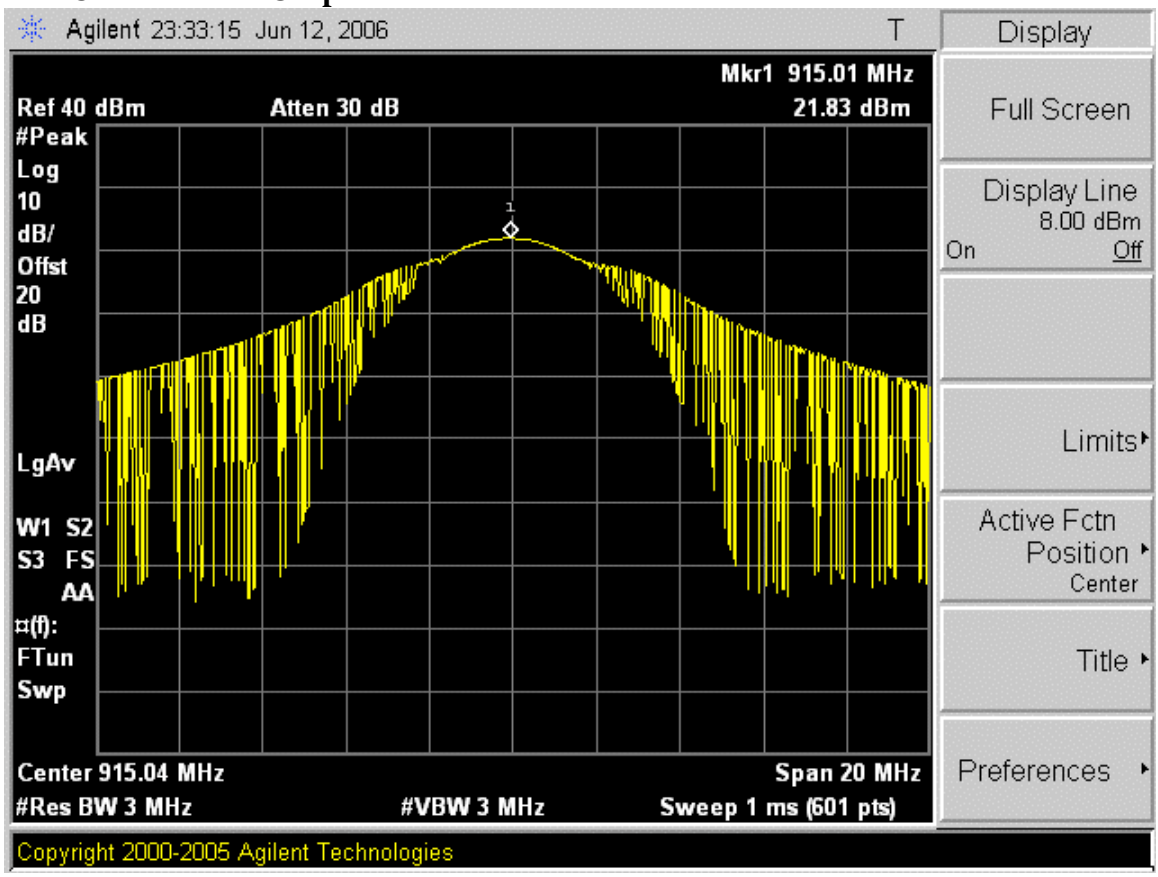
Power level readings converted to dBm are shown below. Refer also to spectrum analyzer graphs. Reference level offset corrects for external attenuation and cable loss.

Channel	Frequency, MHz	Output Power, dBm
LOW	904.6	23.58
MID	915.0	21.83
HIGH	925.4	21.94

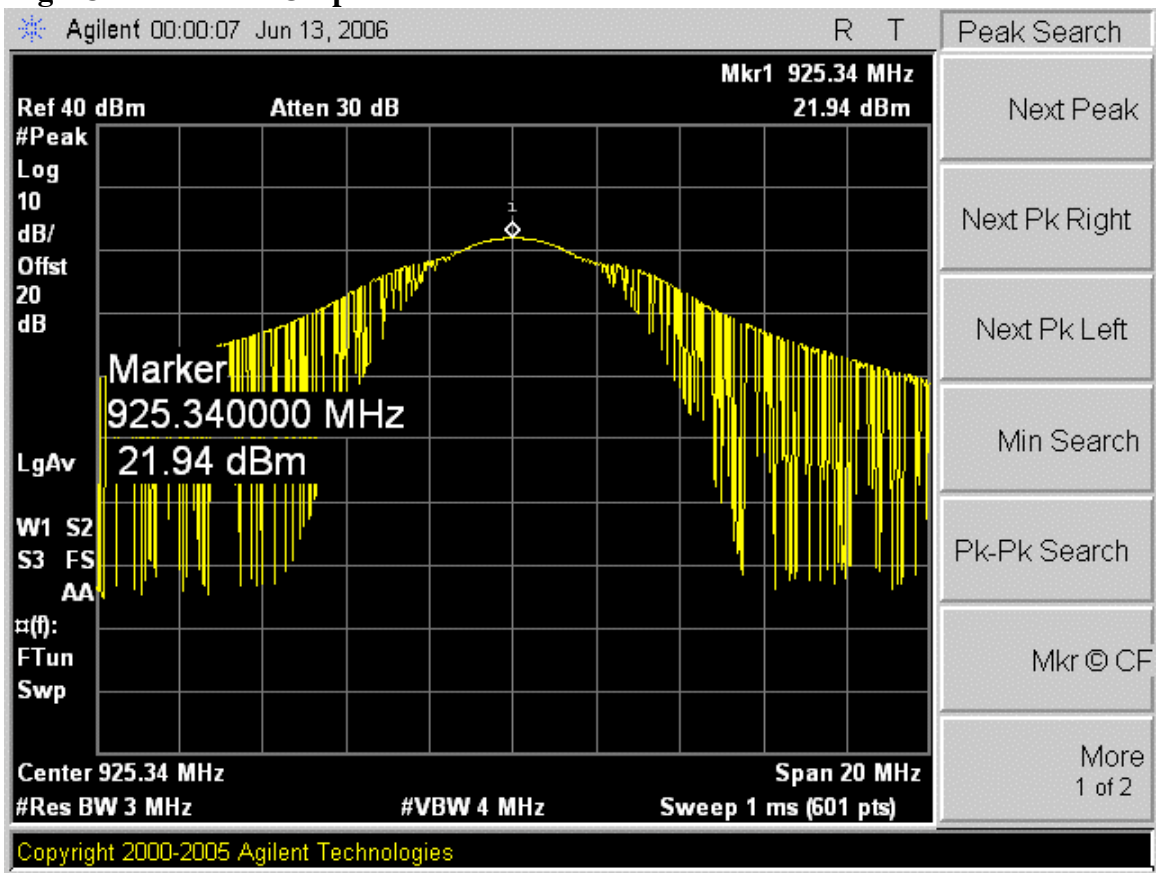
Low Channel Peak Output Power



Mid Channel Peak Output Power



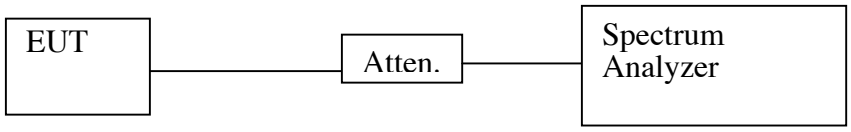
High Channel Peak Output Power



Spurious Emissions, Conducted
Test Requirement: 15.247(c)

Measurement Equipment Used:

Test Setup



Test Procedure

1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

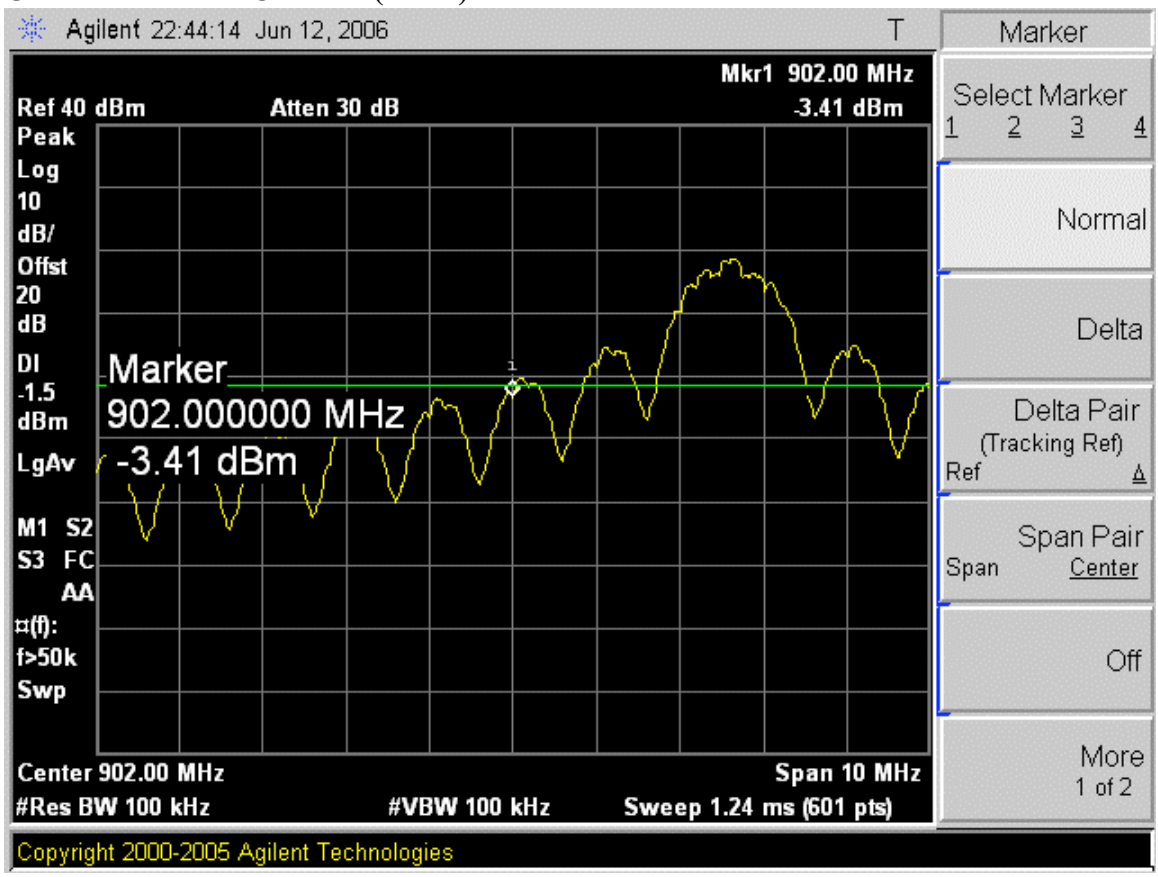
Readings were taken out to 10fo.

2. The process in (1) was repeated for MID channel and HIGH channel.

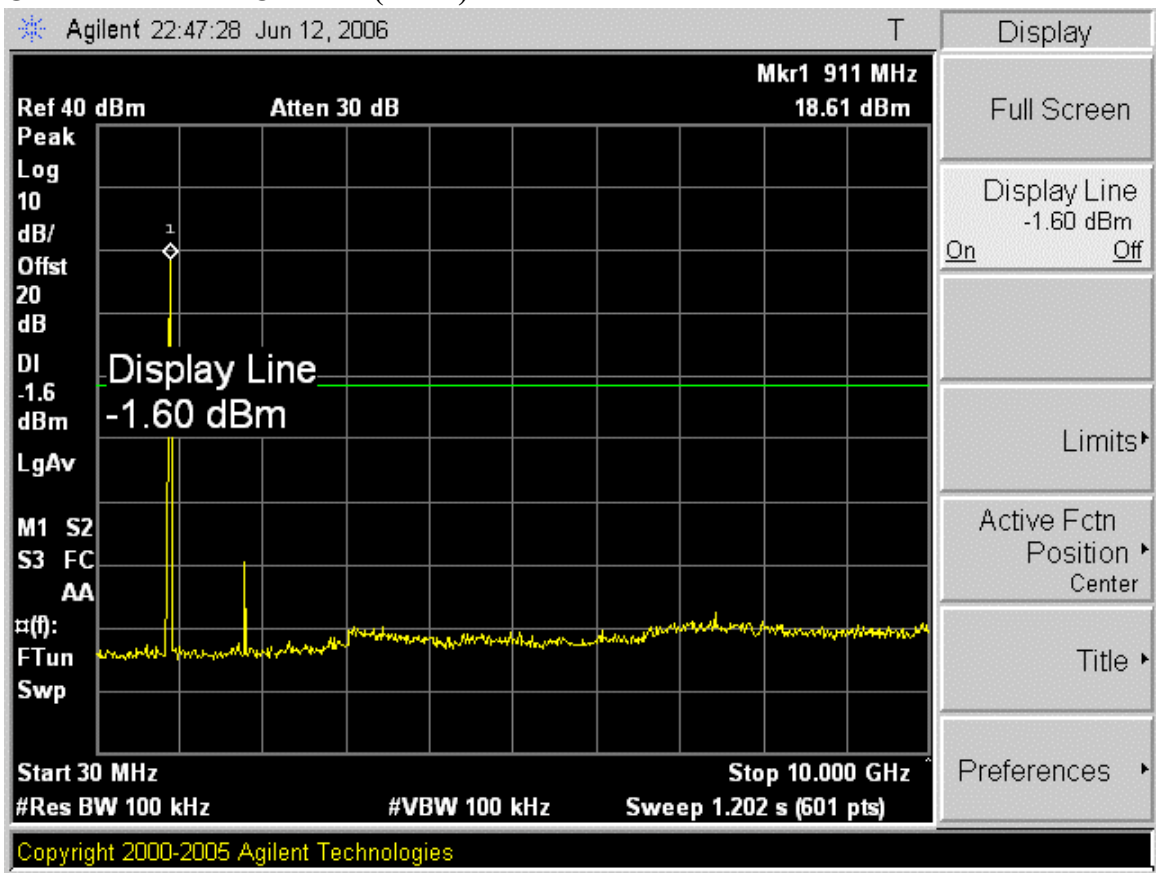
Test Results

Refer to attached data sheets. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

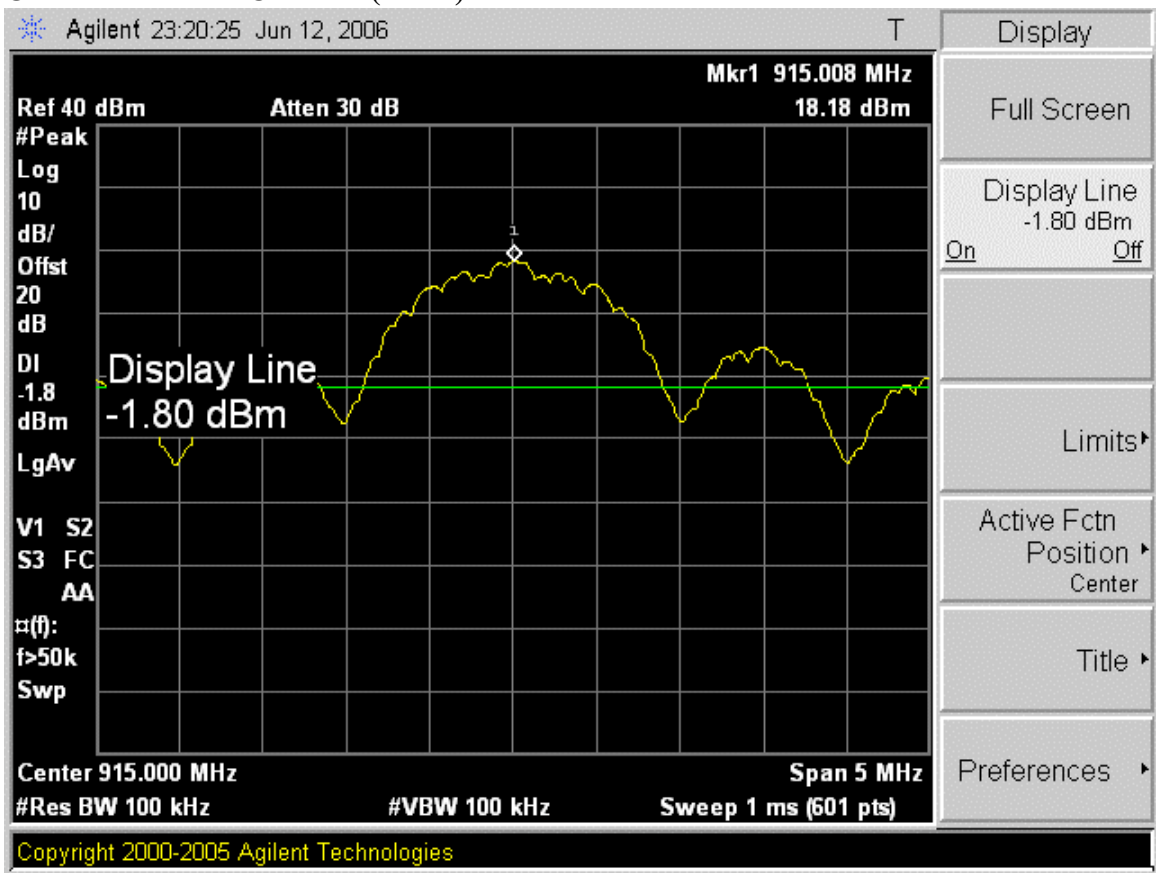
Out of Band Low Channel (1 of 2)



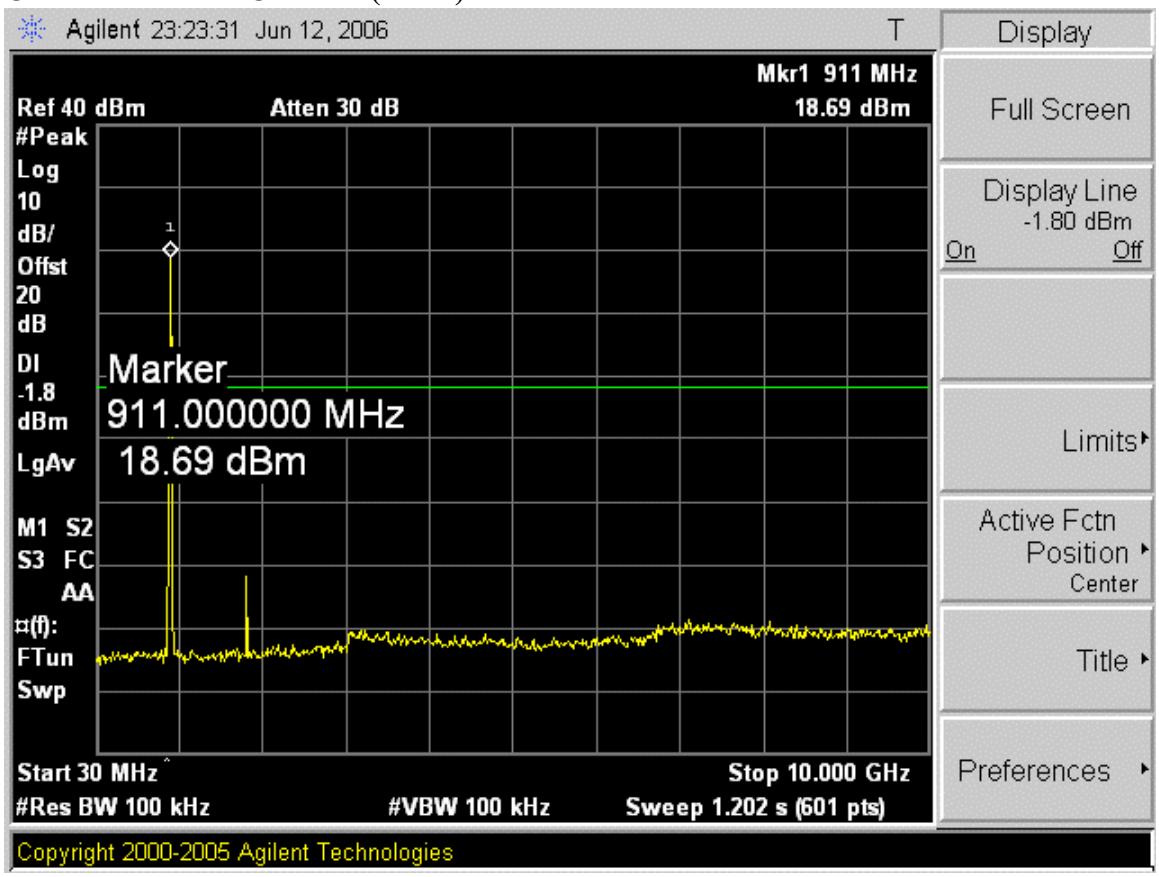
Out of Band Low Channel (2 of 2)



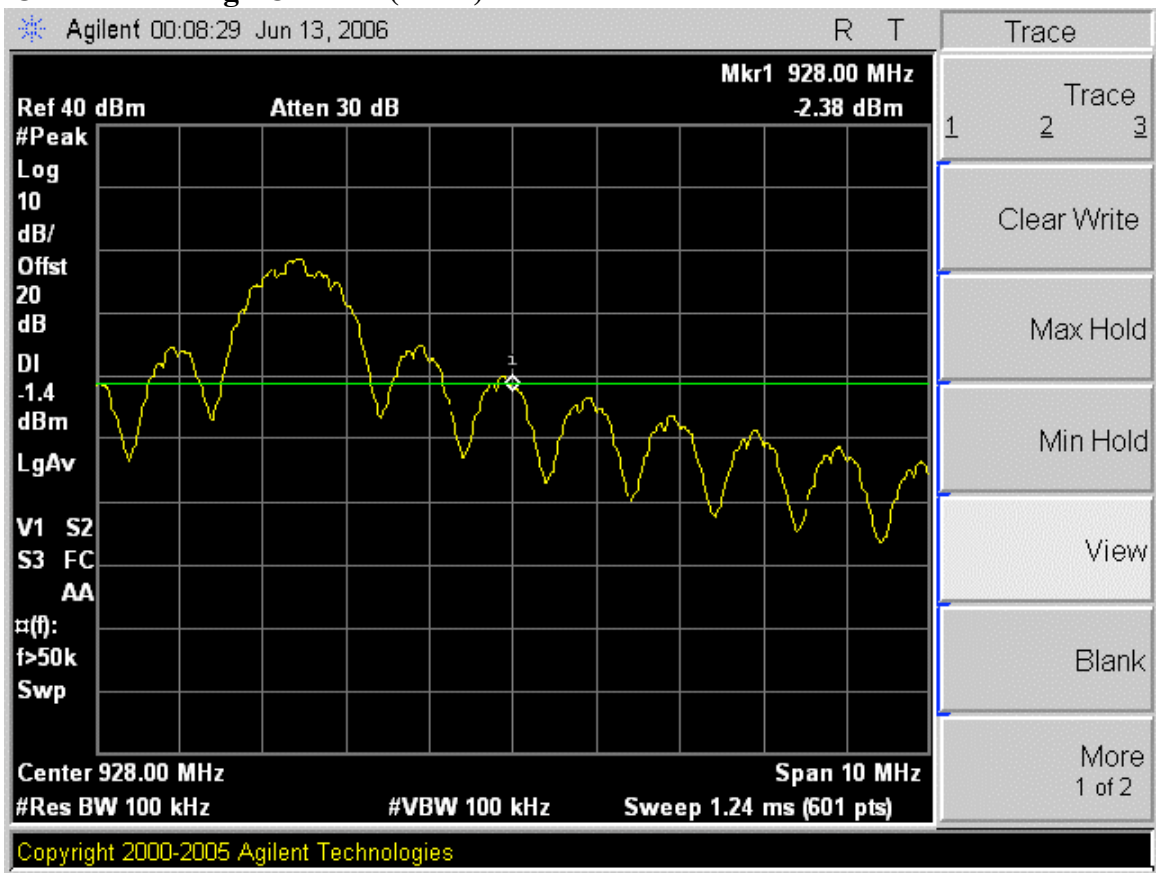
Out of Band Mid Channel (1 of 2)



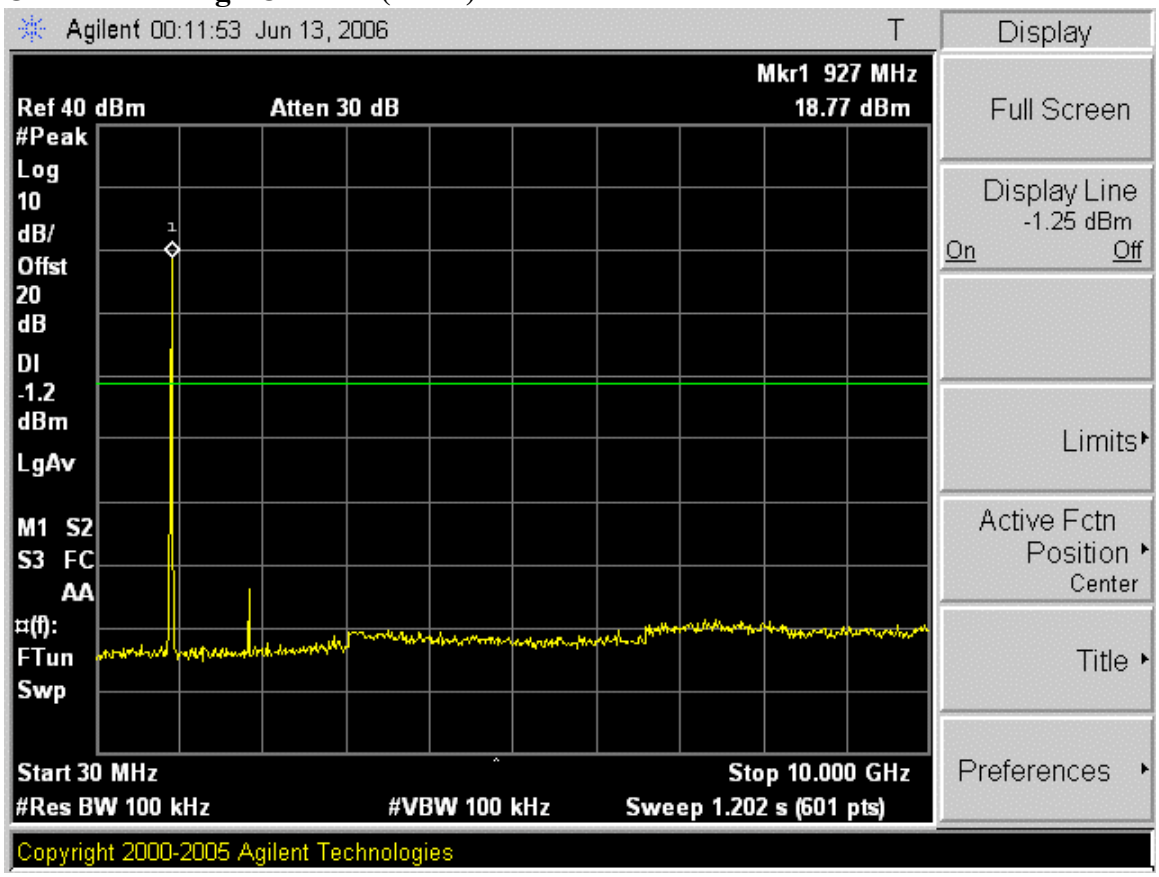
Out of Band Mid Channel (2 of 2)



Out of Band High Channel (1 of 2)

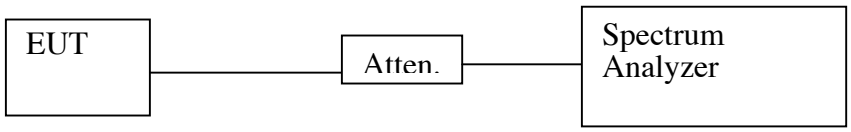


Out of Band High Channel (2 of 2)



Power Spectral Density
Test Requirement: 15.247(d)

Test Setup



Test Procedure

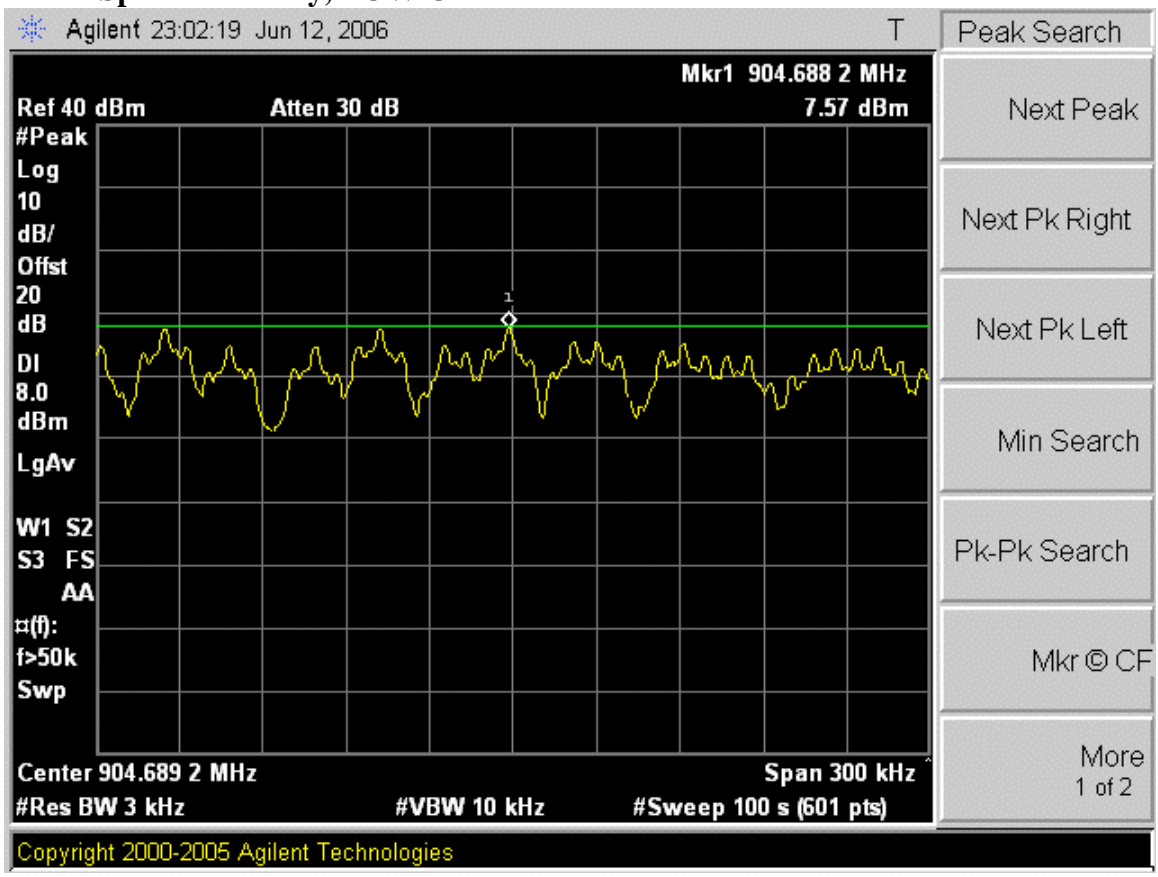
1. Using PEAK search and CF analyzer functions, set LOW channel peak emission to center of analyzer screen.
2. Gradually reduce SPAN to 300 kHz, while adjusting tuning frequency so that peak remains at center of screen.
3. Set RES BW =3 kHz, VID BW = 10 kHz, SWEEP = 100 sec.
4. Record highest reading and compare to 8 dBm limit.

The test was repeated for MID and HIGH channel.

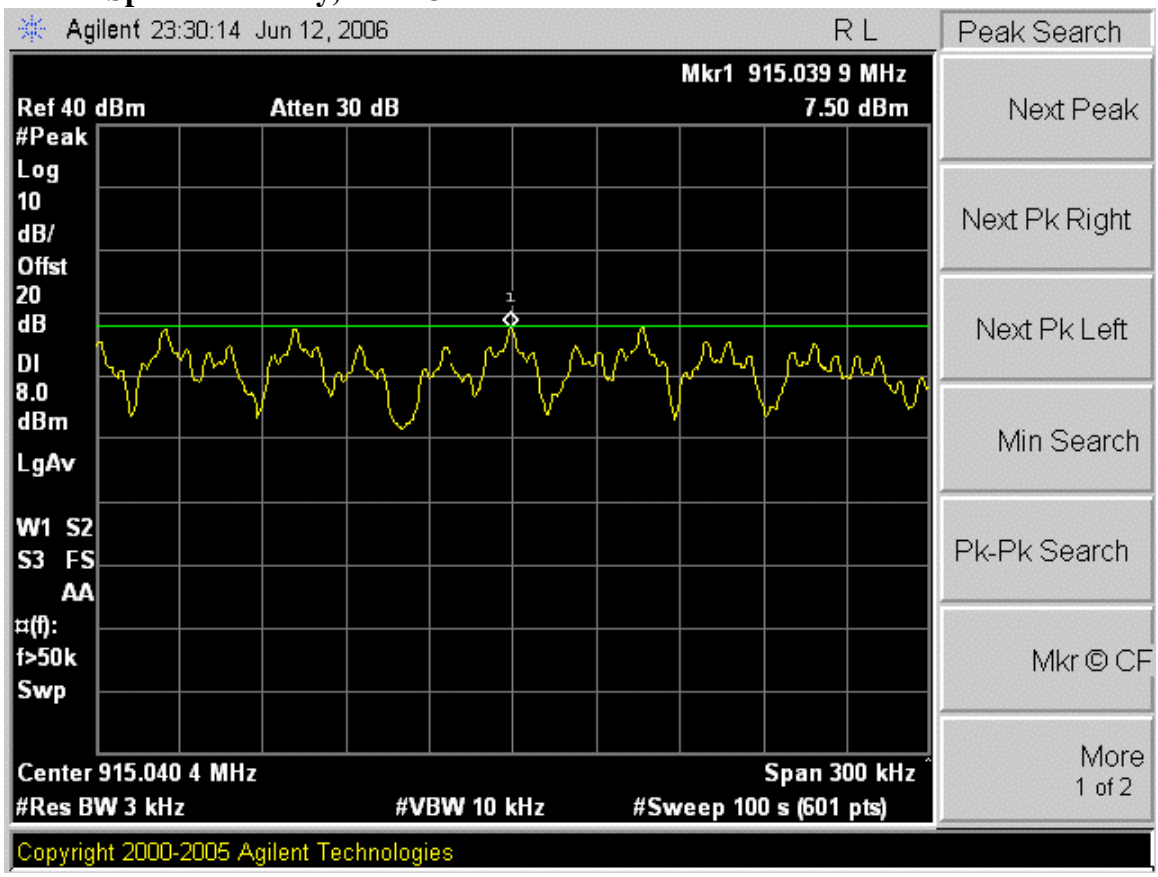
Test Results

Maximum PSD was 7.82 dBm. Refer to attached spectrum analyzer charts.

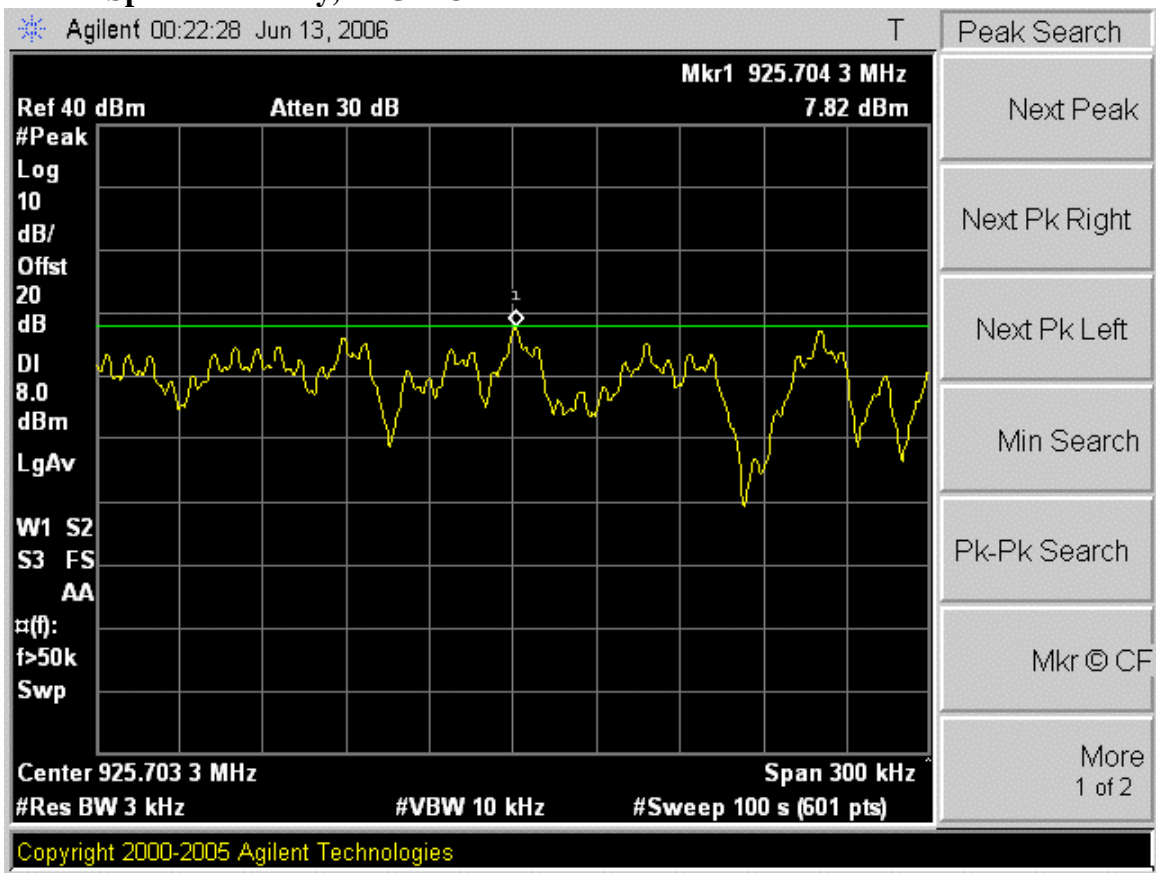
Power Spectral Density, LOW Channel



Power Spectral Density, MID Channel



Power Spectral Density, HIGH Channel



RF Exposure (MPE) Calculations

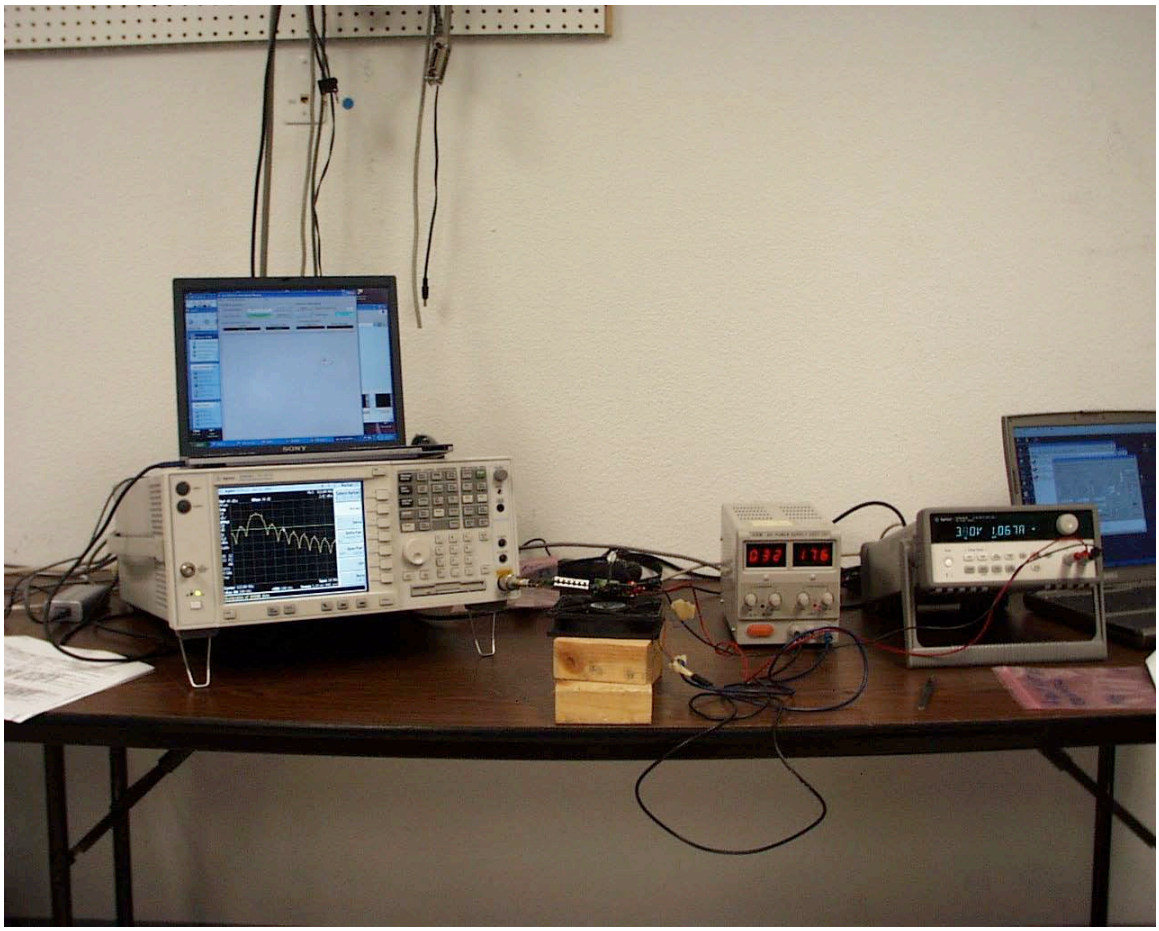
Sensus Metering Systems										
FCC ID: KCHMXU530T										
902-928 MHz DSSS Transmitter						**Calculate mW/cm2 here. Enter frequency in MHz:**				
RF Hazard Distance Calculation						Calculation of Limits from 1.1310 Table 1				
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 from Table1:		0.60				F(MHz)	**Actual F, MHz**		Occ, mW/c2	Gen, mW/cm2
						0.3-3	0.5		100.0	100.0
Max RF Power	TX Antenna	MPE distance	S, mW/cm@	Comment		*3.0 - 30.0*	*5*		*180.0*	*36.0*
P, dBm	G, dBi	cm	at 20 cm			**30.0-300**	**55**		**1.0**	**0.2**
						300-1500	*902*		*3.0*	*0.60*
23.58	**2.20**	**7.1**	**0.08**			1500-100000	5555		5.0	1.0
						Enter P(mW)	Equivalent dBm	**Enter dBm**	Equivalent Watts	
Basis of Calculations:						***895.4***	**29.52**	***29.52***	895.4	
E^2/3770 = S, mW/cm2										
E, V/m = (Pwatts*Ggain*30)^.5/d, meters										
d = ((Pwatts*G*30)/3770*S))^0.5			Pwatts*Ggain = 10^(PdBm-30+GdBi)/10)							
S@20cm = 20 log (MPE dist/20cm)										
NOTE: For mobile or fixed location transmitters, minimum separation distance is for FCC compliance is 20 cm,										
even if calculations indicate MPE distance is less										

Test Equipment List

TEST EQUIPMENT LIST				
Name of Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Due Date**
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/06
EMI Test Receiver	R & S	ESHS 20	827129/006	11/3/06
Antenna, Horn 1 ~ 18 GHz	ETS	3117	35234	4/22/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY45300064	12/19/06
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/07
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/06

Test Set-up Photographs

Antenna Port Conducted



Radiated Emissions

AC Line Conducted