



**Test Report:** 6W63835.2

**Applicant:** Barrett Communications Pty  
10 Port Kembla Drive,  
Bibra Lake, Perth,  
Western Australia, 6163

**Apparatus:** 2050 Transceiver

**FCC ID:** OW4-BARRETT2050HF

**In Accordance With:** FCC Part 90  
Private Land Mobile Radio Services

**Tested By:** Nemko Canada Inc.  
303 River Road  
Ottawa, Ontario  
K1V 1H2

**Authorized By:** *Roman Kuleba*  
Roman Kuleba, Wireless Specialist

**Date:** November 7, 2006

**Total Number of Pages:** 35

## Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

<b>Apparatus Assessed:</b>	2050 Transceiver
<b>Specification:</b>	FCC Part 90 Private Land Mobile Radio Services
<b>Compliance Status:</b>	Complies
<b>Exclusions:</b>	None
<b>Non-compliances:</b>	None
<b>Report Release History:</b>	Original Release

Author: Xu Jin, Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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## **Section 1: Equipment Under Test**

### **1.1 Product Identification**

The Equipment Under Test was identified as follows: 2050 Transceiver

### **1.2 Samples Submitted for Assessment**

The following samples of the apparatus have been submitted for type assessment:

<b>Sample No.</b>	<b>Description</b>	<b>Serial No.</b>
1	Barrett 2050 HF Transceiver	205002619

The first samples were received on: Mar 24, 2006

### **1.3 Technical Specifications of the EUT**

<b>Manufacturer:</b>	Barrett Communications Pty
<b>Operating Frequency:</b>	Tx: 2MHz to 29.9MHz Rx: 500KHz to 30MHz
<b>Modulation:</b>	SSB
<b>Emission Designator:</b>	J3E
<b>Rated Power:</b>	50dBm(100W, PEP), +/- 1dB.
<b>Power Source:</b>	13.8VDC

## Section 2: Test Conditions

### 2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures  
 FCC Part 90 Private Land Mobile Radio Services

### 2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

### 2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range : 15 – 30 °C  
 Humidity range : 20 - 75 %  
 Pressure range : 86 - 106 kPa  
 Power supply range : +/- 5% of rated voltages

### 2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 10/07
Signal Generator	HP	33120A	FA001082	Aug 14/07
Vector Signal Analyzer	HP	80410A	FA001571	Mar. 14/07
Frequency Counter	HP	5352B	FA001915	Oct 14, 06
Receiver	Rohde & Schwarz	ESVS-30	FA001445	July 14/07
Biconical (1) Antenna	EMCO	3109	FA000805	May 03/07
Active Loop Antenna	Rohde & Schwarz	HFH2-Z2	FA000631	June 12/07
Receiver	Rohde & Schwarz	ESHS 10	FA001918	Feb. 17/07
Climate Chamber	Thermotron	SM-16C	15649-S	COU

\* COU (Calibrate on Use)

## **Section 3: Observations**

### **3.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **3.2 Record Of Technical Judgements**

No technical judgements were made during the assessment.

### **3.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **3.4 Test Deleted**

No Tests were deleted from this assessment.

### **3.5 Additional Observations**

There were no additional observations made during this assessment.

## **Section 4: Results Summary**

This section contains the following:

FCC Part 90: Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No: not applicable / not relevant.
- Y Yes: Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.



**4.1 FCC Part 90: Test Results**

Clause	Test Method	Test Description	Required	Result
90.205	2.1046	Output power	Y	Complies
90.207	2.1047	Modulation Characteristics	Y	Complies
90.209	2.1049	Occupied bandwidth	Y	Complies
90.210	2.1051	Spurious Emissions at the antenna terminal	Y	Complies
90.210	2.1053	Field strength of spurious radiation	Y	Complies
90.213	2.1055	Frequency stability	Y	Complies

## Appendix A: Test Results

### Clause 90.205 Output Power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized for new stations authorized after August 16, 1995 is as follows in FCC Part 90.205(a) through (r).

#### Test Conditions:

<b>Sample Number:</b>	2	<b>Temperature:</b>	23°C
<b>Date:</b>	Sep.1, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Wireless Lab

**Test Results:** Complies.

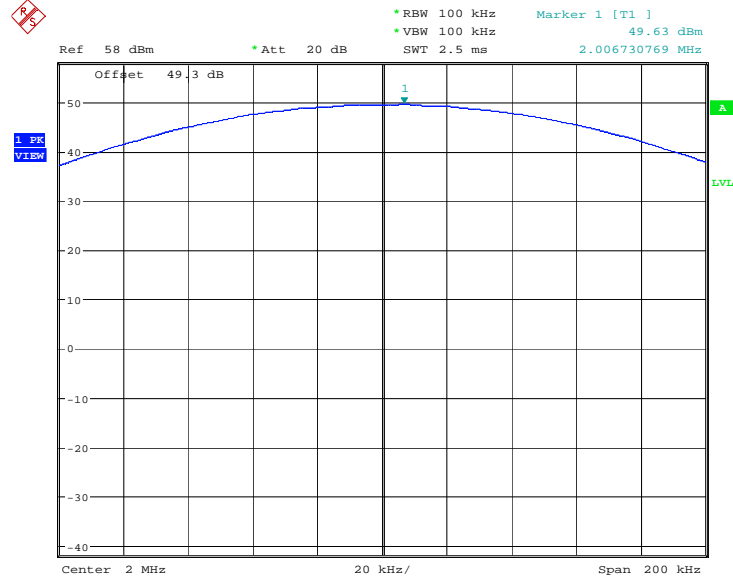
**Test Data:** See attached plots and table.

Two audio signal, 400Hz and 1.8KHz, have been added to the audio input of the EUT to achieve Peak Envelope Power.

Frequency (MHz)	Maximum PEP (dBm)
2	49.63
14.5	49.24
29.9	49.20

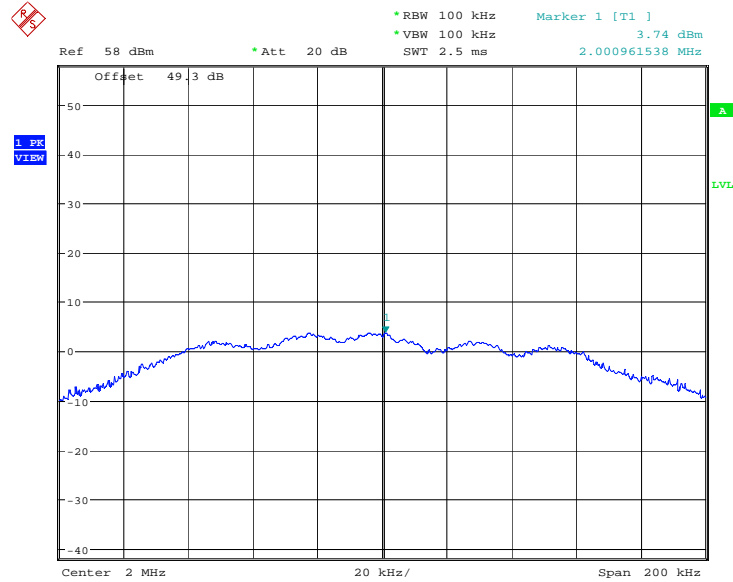
Operation frequency: 2MHz

Peak Envelope Power-- P<sub>pk</sub>



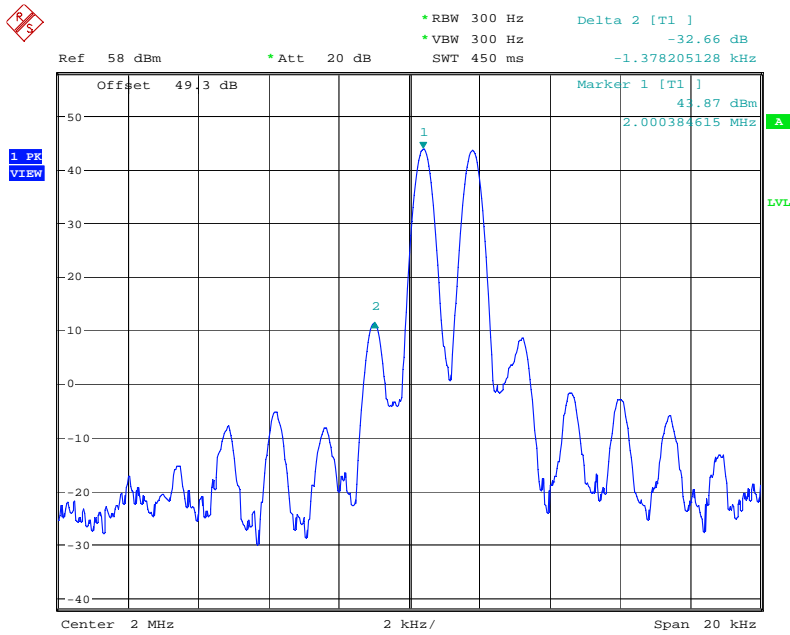
Date: 1.SEP.2006 14:28:45

Residual Carrier Power--P<sub>c</sub>



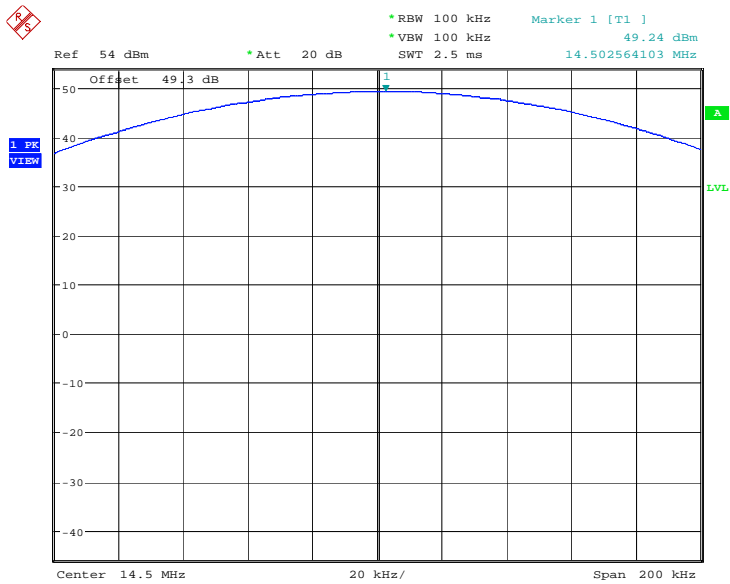
Date: 1.SEP.2006 14:29:28

$$P_{pk} - P_c = 49.63 \text{ dBm} - 3.74 \text{ dBm} = 45.89 \text{ dB}$$



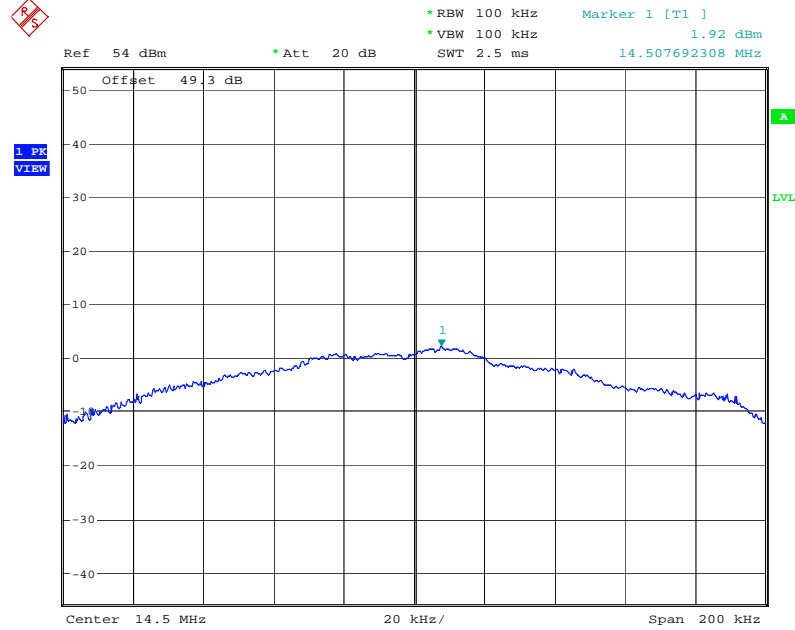
Date: 1.SEP.2006 14:26:15

Operation frequency: 14.5MHz  
Peak Envelope Power-- P<sub>pk</sub>



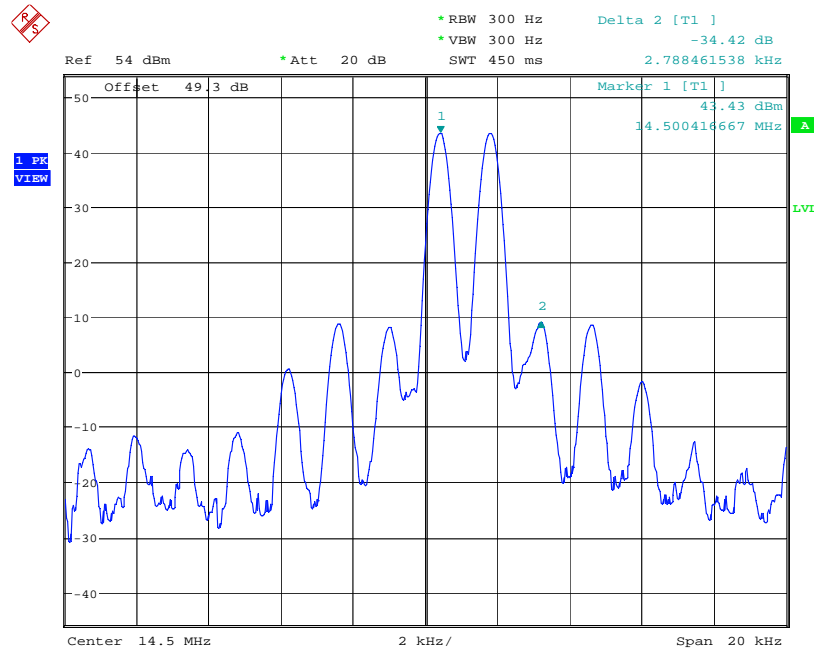
Date: 1.SEP.2006 15:01:02

Residual Carrier Power--P<sub>c</sub>



Date: 1.SEP.2006 15:12:44

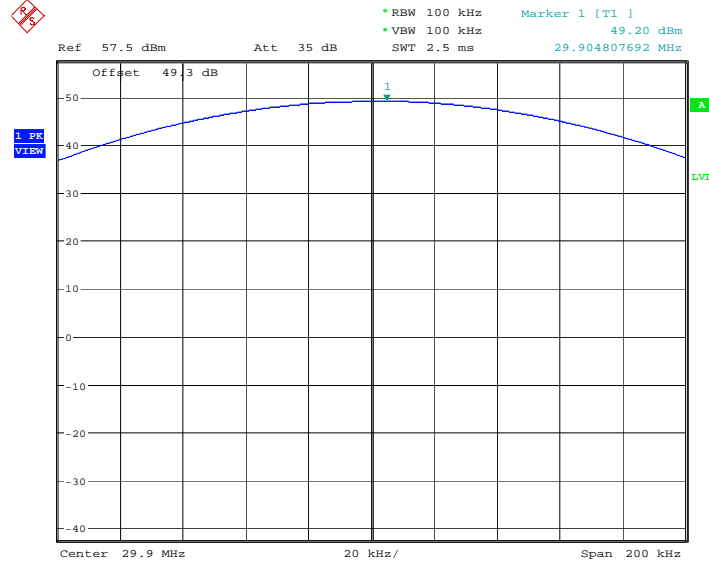
$$P_{pk} - P_c = 49.24 \text{ dBm} - 1.92 \text{ dBm} = 47.32 \text{ dB}$$



Date: 1.SEP.2006 14:59:11

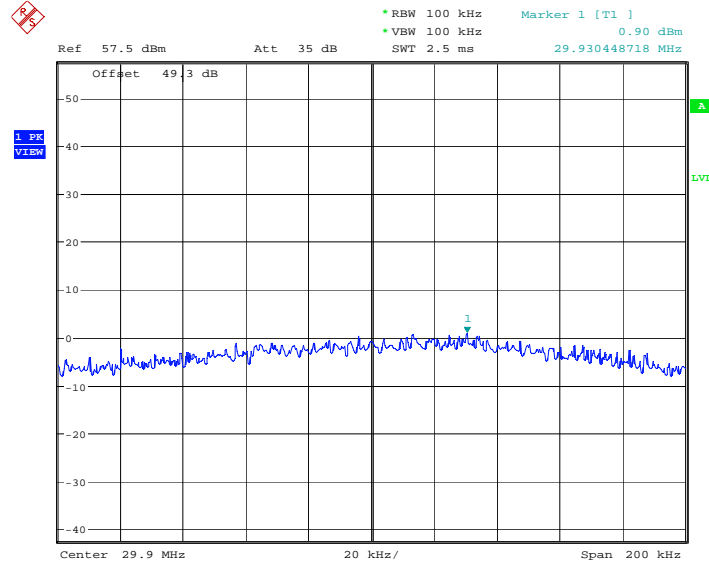
Operation frequency: 29.9MHz

Peak Envelope Power-- P<sub>pk</sub>



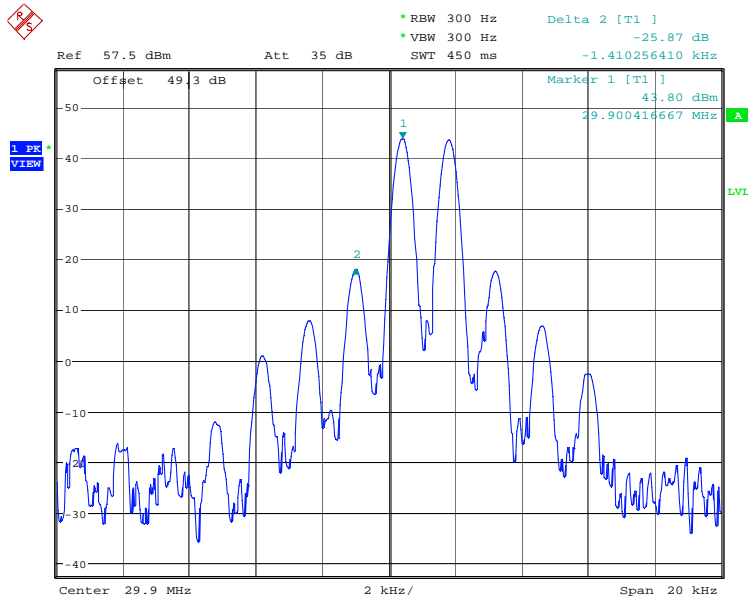
Date: 1.SEP.2006 13:15:54

Residual Carrier Power--P<sub>c</sub>



Date: 1.SEP.2006 13:16:37

$$P_{pk} - P_c = 49.20 \text{ dBm} - 0.9 \text{ dBm} = 48.3 \text{ dB}$$



Date: 1.SEP.2006 13:12:16

**Clause 90.209 Occupied Bandwidth**

(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following Table.

Standard Channel Spacing/Bandwidth

Frequency Band (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
Below 25	--	--
25-50	20	20
72-76	20	20
150-174	7.5	20/11.25/6
216-220	6.25	20/11.25/6
220-222	5	4
406-512	6.25	20/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902-928	--	--
929-930	25	20
1427-1432	12.5	12.5
2450-2483.5	--	--
Above 2500	--	--

**Test Conditions:**

<b>Sample Number:</b>	2	<b>Temperature:</b>	23°C
<b>Date:</b>	Sep.1, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Wireless Lab

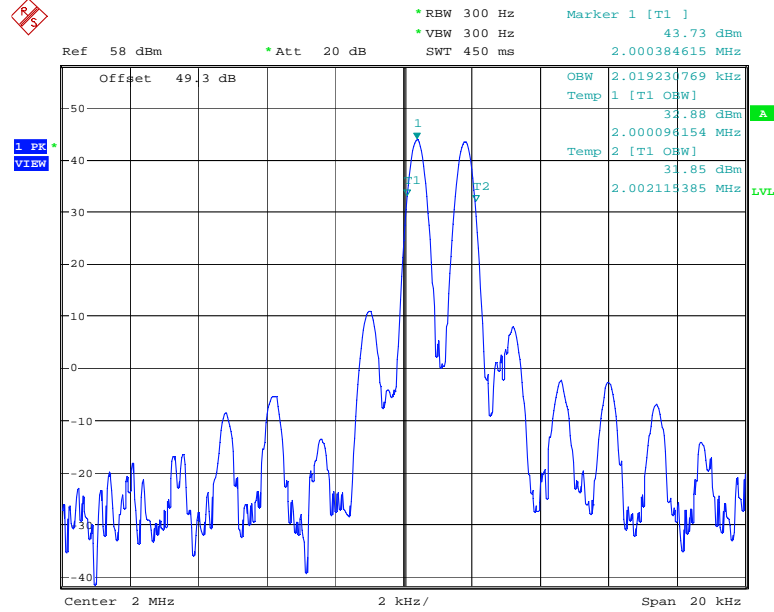
**Test Results:** Complies.

**Test Data:** See attached data and plots.

Operation Frequency (MHz)	Occupied Bandwidth (KHz)
2	2.019
14.5	2.019
29.9	2.083

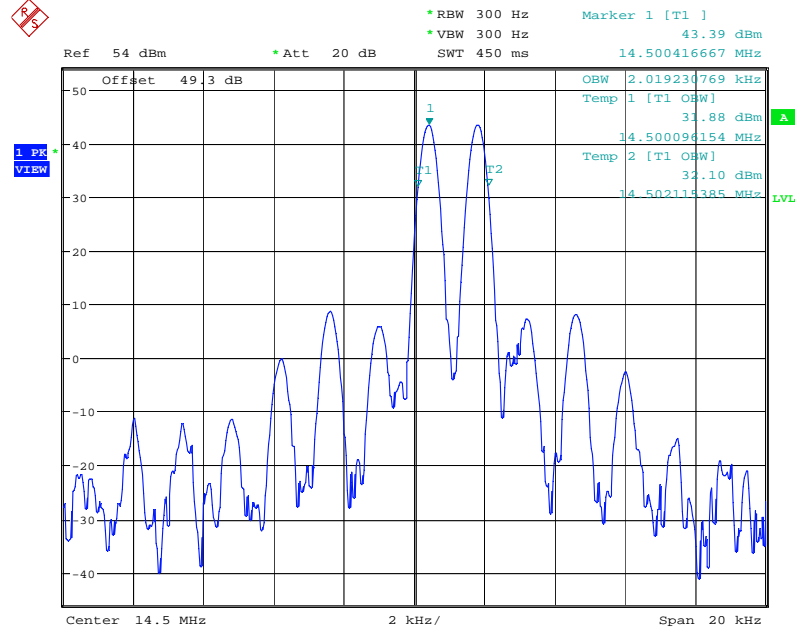


Operation frequency-2MHz



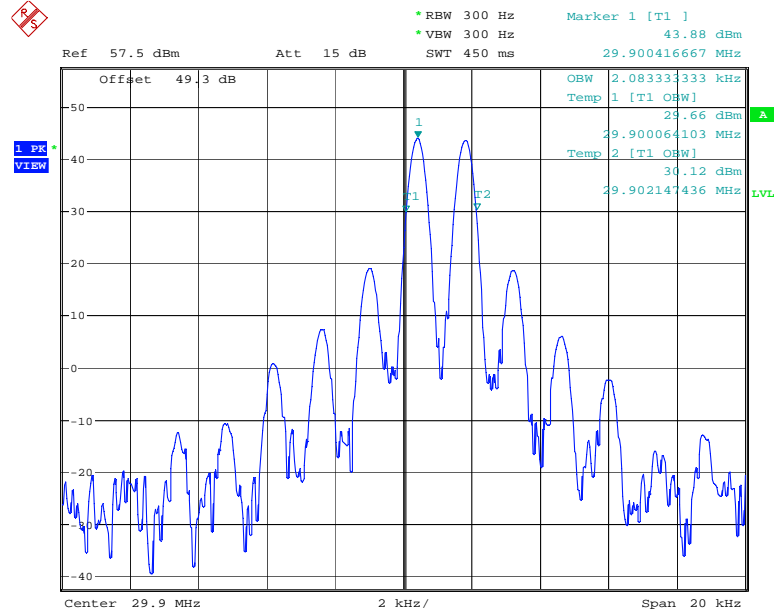
Date: 1.SEP.2006 14:27:17

Operation frequency-14.5MHz



Date: 1.SEP.2006 15:00:00

Operation frequency-29.9MHz



Date: 1.SEP.2006 13:14:18

**Clause 90.210 Spurious emissions at the antenna terminal**

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

(a) Emission Mask A. For transmitters utilizing J3E emission, the carrier must be at least 40 dB below the peak envelope power and the power of emissions must be reduced below the output power (P in watts) of the transmitter as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 150 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 150 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log P$  dB.

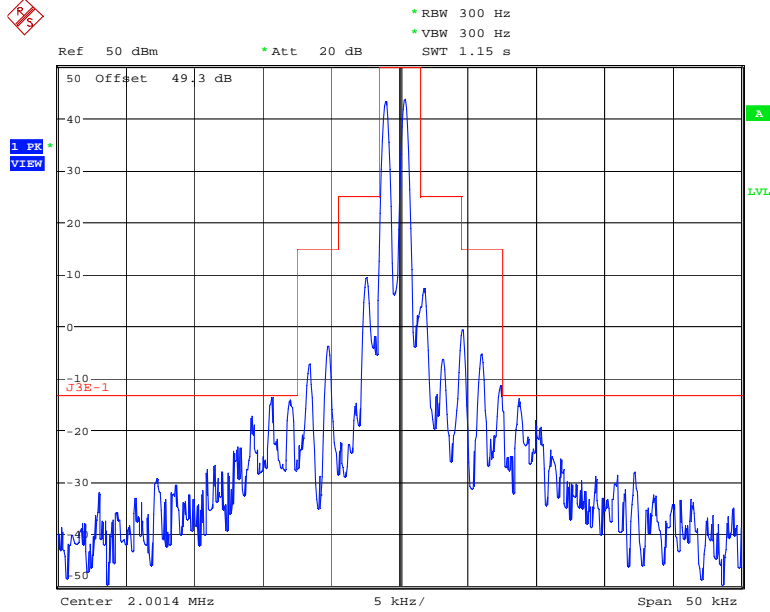
**Test Conditions:**

<b>Sample Number:</b>	2	<b>Temperature:</b>	23°C
<b>Date:</b>	Sep.1, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Wireless Lab

**Test Results:** Complies

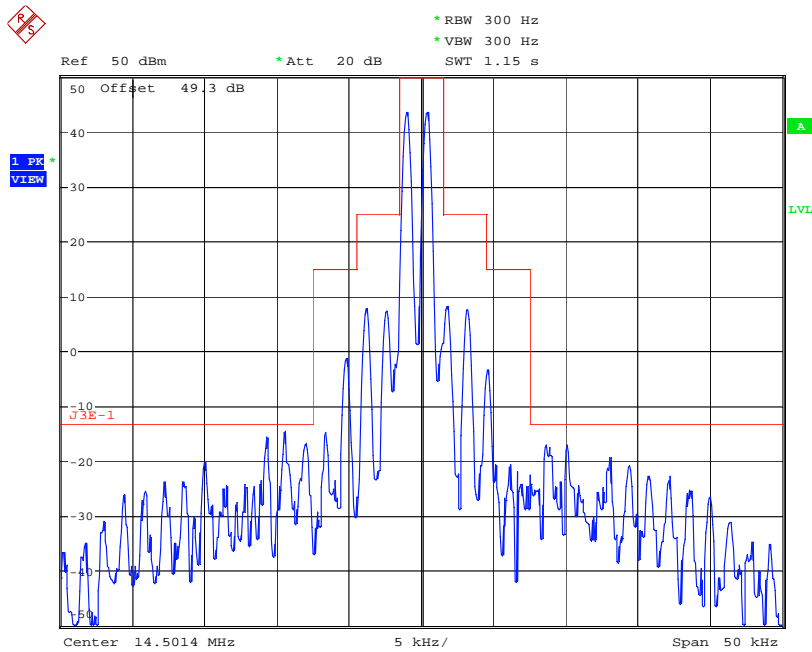
**Test Data:** See Attached Plots and tables.

Operation Frequency---2MHz



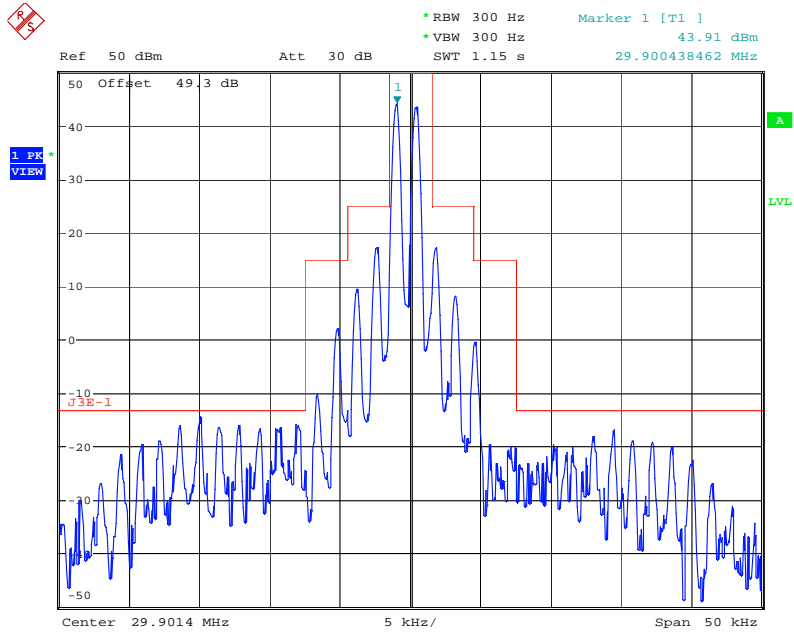
Date: 1.SEP.2006 14:34:00

Operation Frequency--14.5MHz



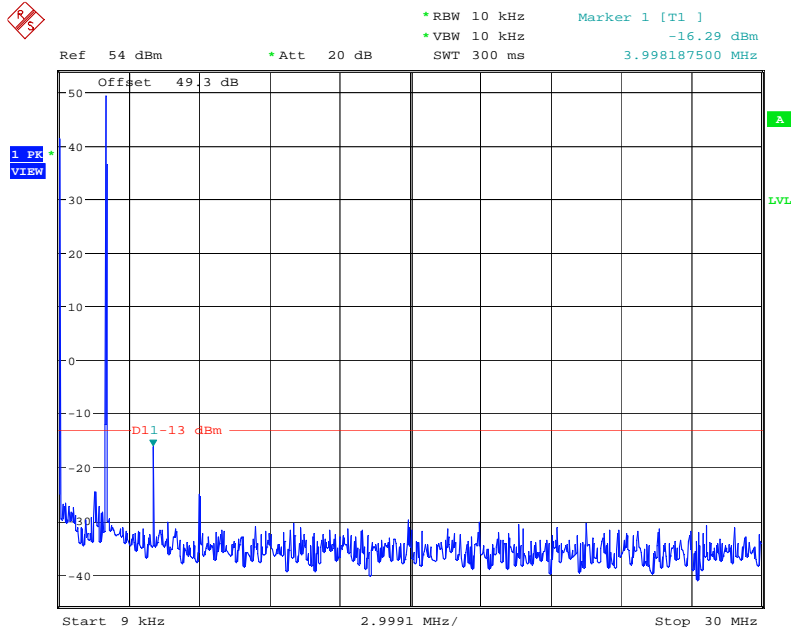
Date: 1.SEP.2006 15:15:41

Operation Frequency--29.9MHz

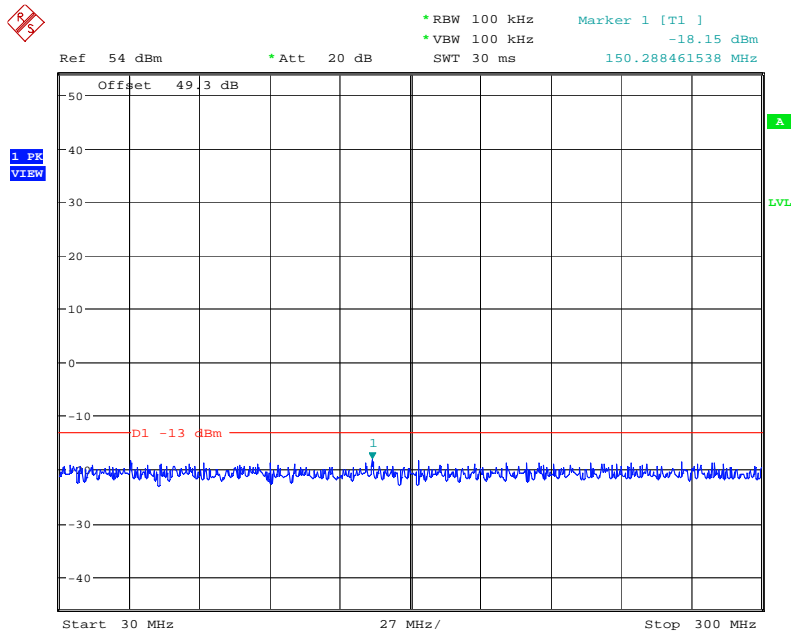


Date: 1.SEP.2006 13:27:54

Conducted Emissions-2MHz

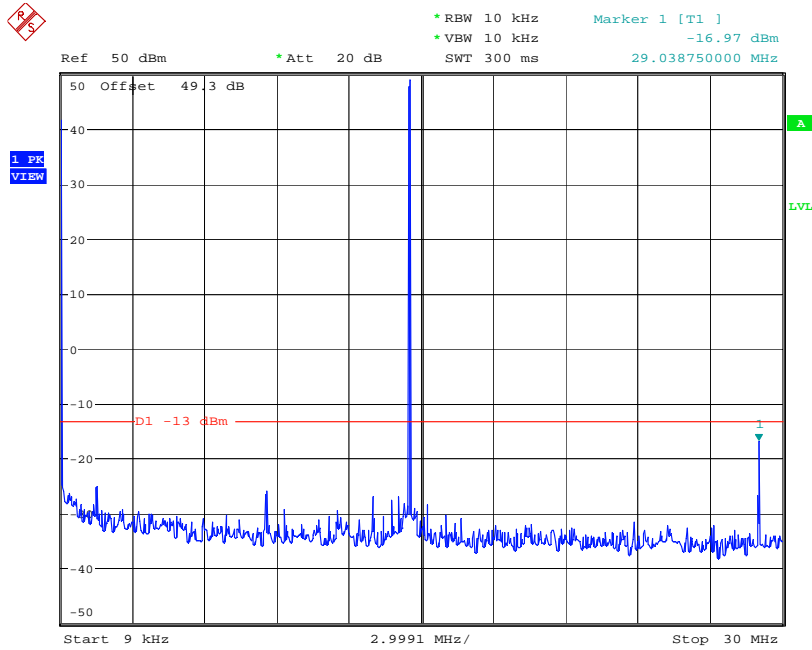


Date: 1.SEP.2006 14:45:08

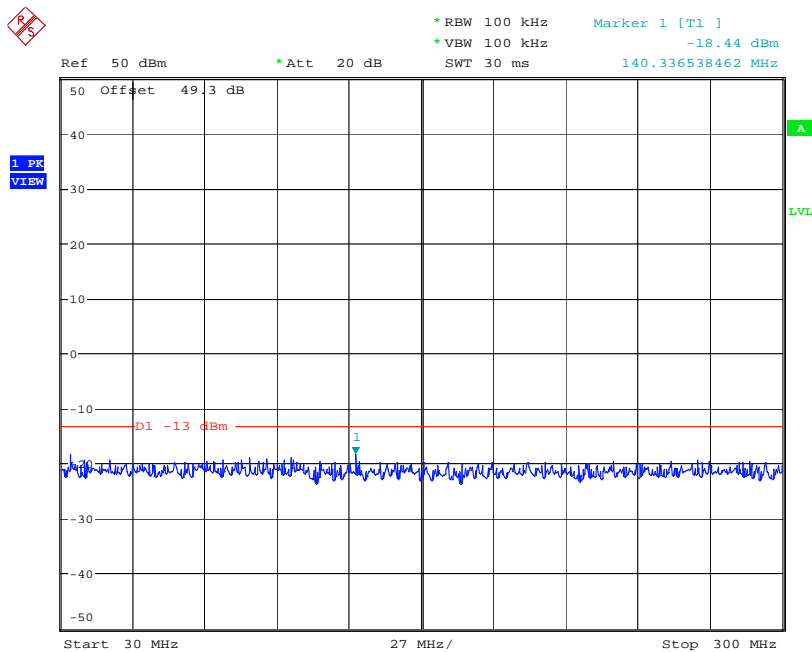


Date: 1.SEP.2006 14:45:55

Conducted Emissions-14.5MHz

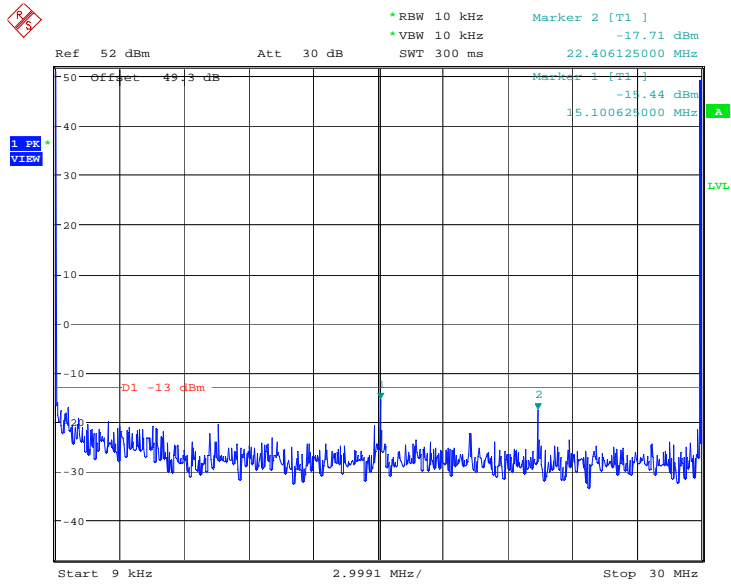


Date: 1.SEP.2006 15:16:45

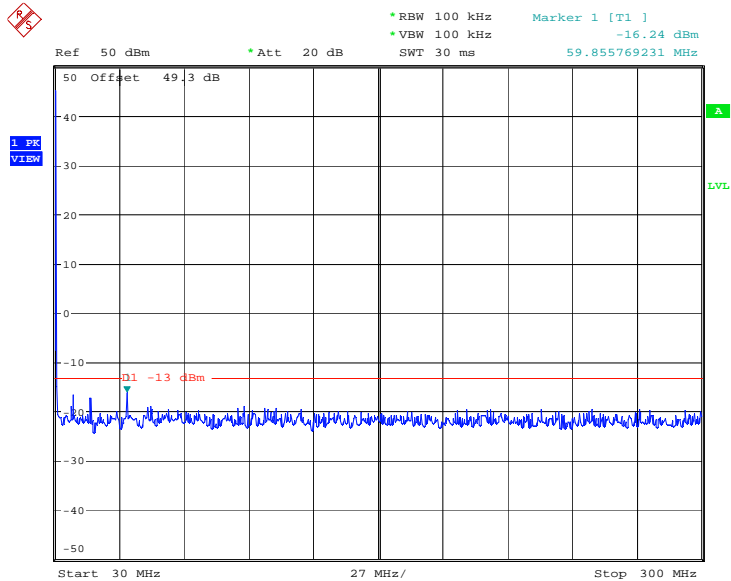


Date: 1.SEP.2006 15:19:38

Conducted Emissions-29.9MHz



Date: 1.SEP.2006 13:43:25



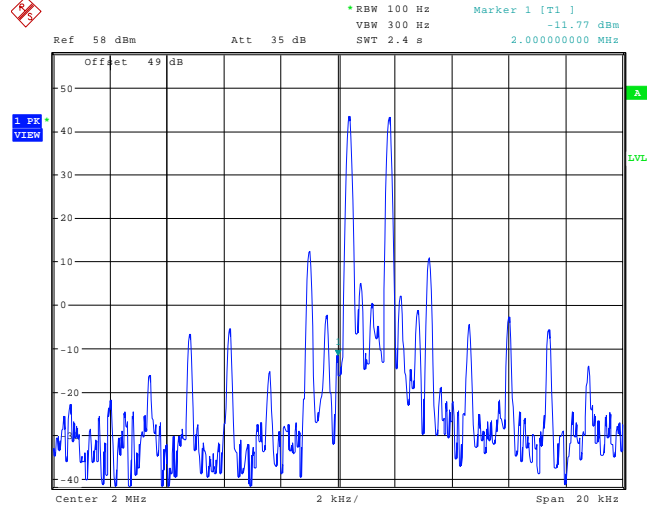
Date: 1.SEP.2006 13:47:26



Tx: 2MHz

Carrier Suppression= $49.63\text{dBm} - (-11.77\text{dBm}) = 61.4\text{dB}$

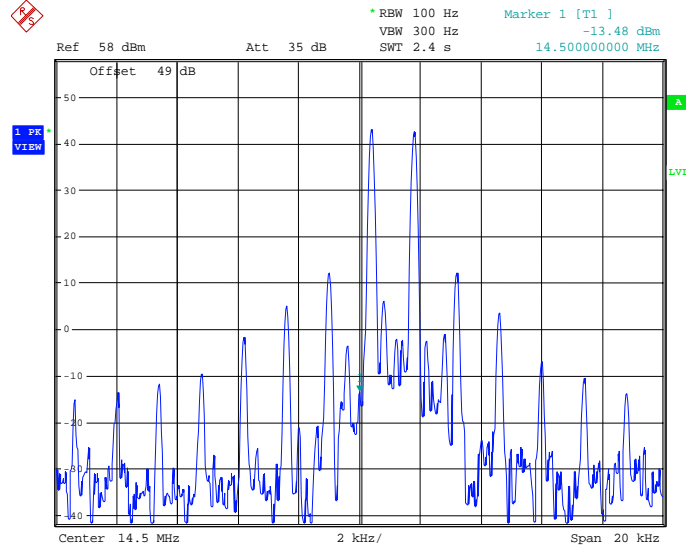
Limit: > 40dB



Tx: 14.5MHz

Carrier Suppression= $49.24\text{dBm} - (-13.48\text{dBm}) = 62.72\text{dB}$

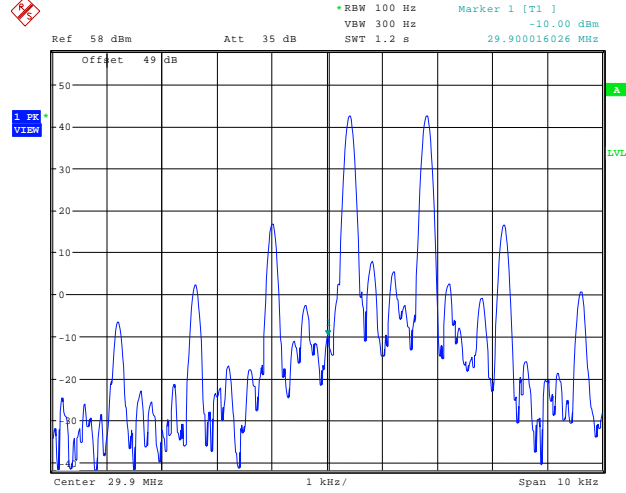
Limit: >40dB



Tx: 29.9MHz

Carrier Suppression= 49.20dBm-(-10dBm)=59.2dB

Limit: >40dB

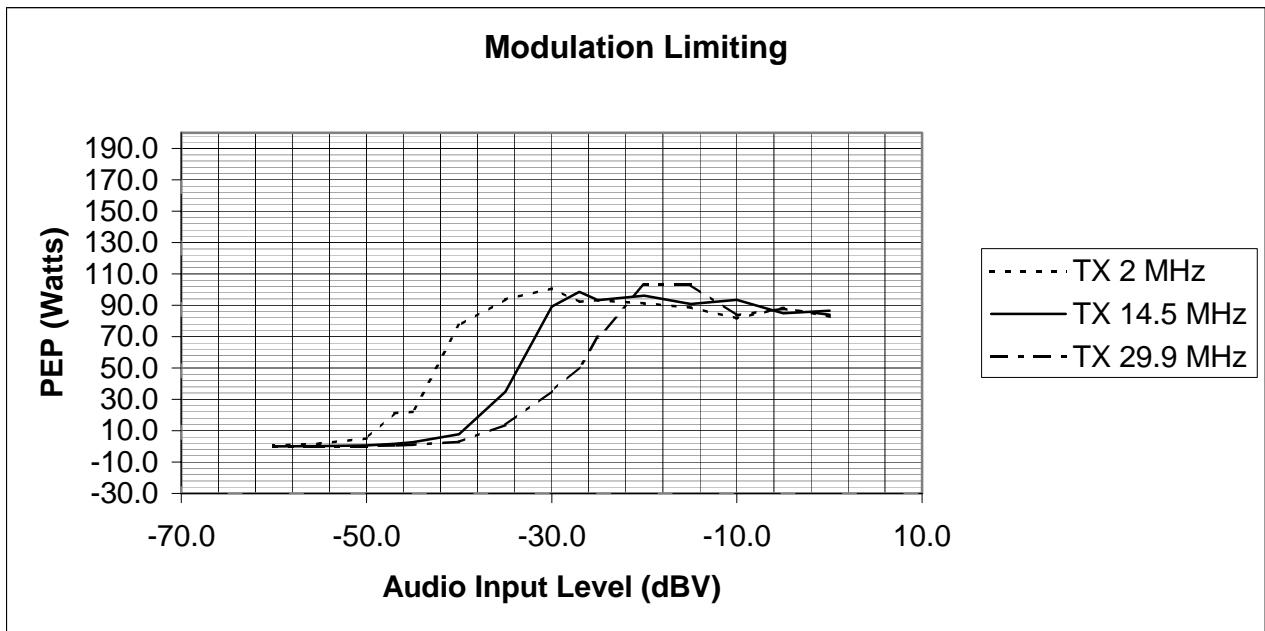
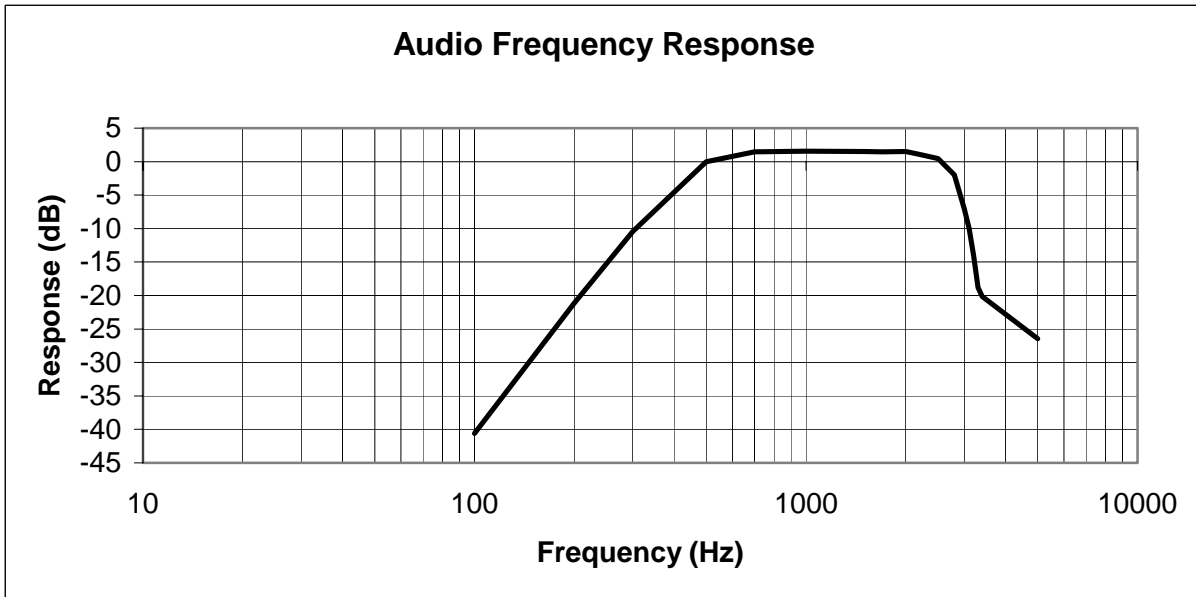


**Clause 90.207 Modulation Characteristics**

- (a) Voice modulated communication equipment: A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 cps shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
- (b) Equipment which employs modulation limiting: A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
- (c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power: A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
- (d) Other types of equipment: A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

**Test Conditions:**

<b>Sample Number:</b>	2	<b>Temperature:</b>	23°C
<b>Date:</b>	Sep. 1, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Wireless Lab



**Clause 90.210 Field Strength of Spurious Radiation**

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	10°C
<b>Date:</b>	April, 24, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	OATS

**Test Results:**

See Attached Table for Results

**Additional Observations:**

The Spectrum was searched from 9kHz to the 300MHz.

All measurements were performed using a peak detector. The RBW is set to 10kHz for emissions below 30MHz and 120kHz for emissions 30MHz to 300MHz, at a distance of 3 meters.

Only worse case emissions were reported.

Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dBμV)	Sig Sub. Factor (dB)	Signal Substitution Power (dBm)	Limit (dBm)	Margin (dB)	Detector
109.8000	BC1	V	13.1	-88.7	-75.6	-13	-62.6	Peak
109.8000	BC1	H	16.2	-89.8	-73.6	-13	-60.6	Peak
120.2000	BC1	V	19.6	-87.0	-67.4	-13	-54.4	Peak
120.2000	BC1	H	17.2	-89.6	-72.4	-13	-59.4	Peak
43.5000	BC1	H	24.3	-85.3	-61.0	-13	-48	Peak
43.5000	BC1	V	32.1	-88.7	-56.7	-13	-43.7	Peak
130.5000	BC1	H	35.3	-89.2	-53.9	-13	-40.9	Peak
130.5000	BC1	V	28.1	-86.2	-58.2	-13	-45.2	Peak
149.5000	BC1	H	46.4	-88.3	-41.8	-13	-28.8	Peak
149.5000	BC1	V	43.6	-86.5	-42.9	-13	-29.9	Peak
179.3000	BC1	H	32.6	-88.4	-55.8	-13	-42.8	Peak
179.3000	BC1	V	28.8	-84.4	-55.6	-13	-42.6	Peak
209.3000	BC1	H	39.3	-85.9	-46.7	-13	-33.7	Peak
209.3000	BC1	V	31.1	-82.7	-51.6	-13	-38.6	Peak

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

**Clause 90.213 Frequency Stability**

a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following Table.

Frequency range (MHz)	Fixed and base stations 2 watts output power	Mobile stations Over 2 watts or less output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5	---	50
150-174	50	5	50
216-220	1.0	---	1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
929-930	1.5	---	---
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450	---	---	---

**Test Conditions:**

<b>Sample Number:</b>	2	<b>Temperature:</b>	23°C
<b>Date:</b>	April. 17, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Wireless Lab

**Test Results:** See Attached Table.

**Test Conditions** Ambient Temperature: 23°C  
 Extreme Temperature: -30°C to +50°C  
 Extreme voltage conditions: +/- 15% of 13.8VDC

**Frequency Stability Test Data**

<b>Test Condition</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Drift (Hz)</b>	<b>Frequency Drift (ppm)</b>
+23°C, 13.8VDC	14.5017947	-----	-----
+23°C, 11.73VDC	14.5017942	0	-0.03
+23°C, 15.57VDC	14.507948	0	0.01
+50°C, 13.8VDC	14.5017958	1	0.08
+40°C, 13.8VDC	14.5017943	0	-0.03
+30°C, 13.8VDC	14.5017940	-1	-0.05
+20°C, 13.8VDC	14.5017936	-1	-0.08
+10°C, 13.8VDC	14.5017941	-1	-0.04
0°C, 13.8VDC	14.5017948	0	0.01
-10°C, 13.8VDC	14.5017938	-1	-0.06
-20°C, 13.8DC	14.5017926	-2	-0.14
-30°C, 13.8VDC	14.5017925	-2	-0.15



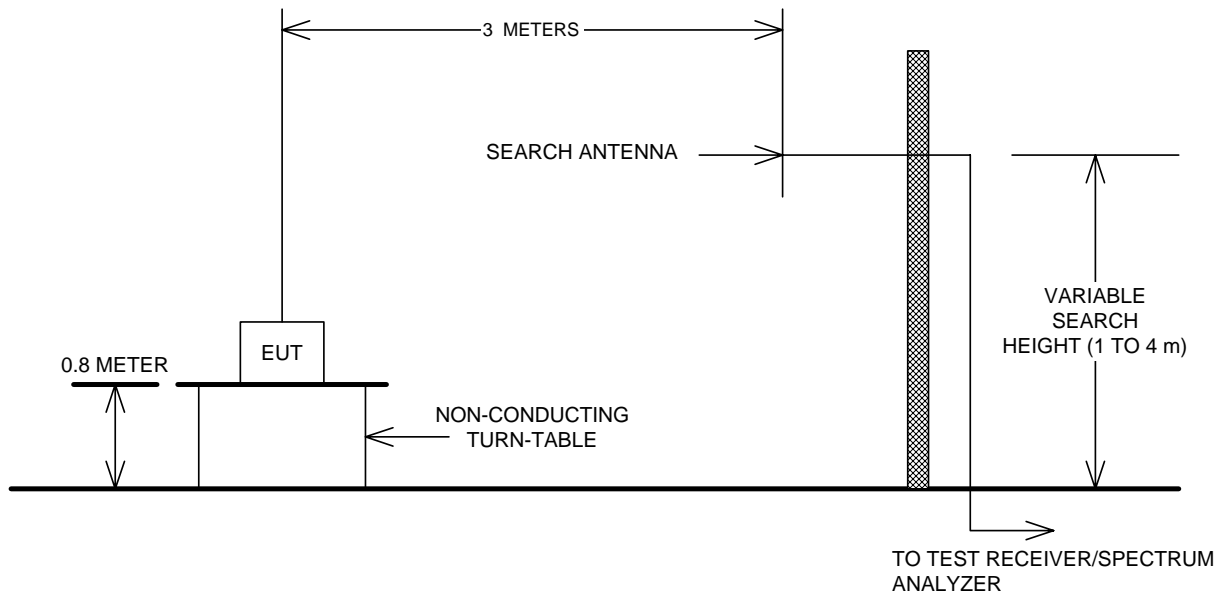
## **Appendix B : Setup Photographs**

### **Radiated Emissions Setup:**

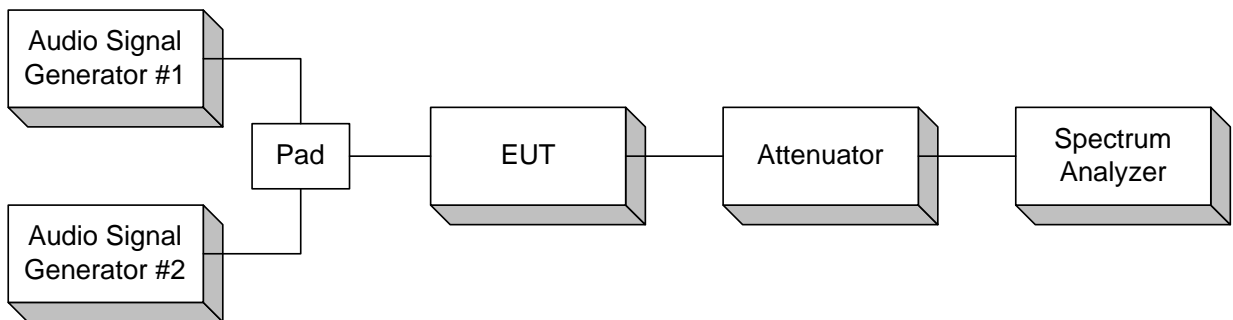


### Appendix C : Block Diagram of Test Setups

#### Test Site for Field Strength of Radiated Emissions



#### Conducted Measurement



**Frequency Stability**

