Standards Council of Canada
Accredited Laboratory
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Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:	5W50143.2 Issue 2
Applicant:	Codan Limited 81 Graves Street, Newton SA 5074, Australia
Apparatus:	2010 HF SSB Transceiver
FCC ID:	DYYNGT-3
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:	 Sim Jagpal, Resource Manager
Date:	January 31, 2006
Total Number of Pages:	33

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 is 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:

Apparatus Assessed:	2010 HF SSB Transceiver
Specification:	FCC Part 90 Private Land Mobile Radio Services
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Issue 2 – Addition of Carrier Suppression results

Author: Jason Nixon, Telecom 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.

TABLE OF CONTENTS

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

2010 (NGT ASR) SSB Transceiver
2010 (NGT SR) SSB Transceiver

1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
1	Transceiver Supply (M/N: TS3020)	1249
5	Codan Speaker (P/N: 15-00649)	———
6	NGT Test Jig	———
7	Interconnection Cable (P/N: 08-05610-001)	———
12	NGT ASR Handset (M/N: 2020)	5A35591B0004
17	NGT ASR RF-Unit (M/N: 2010)	5A35590F0004

The first samples were received on: December 15, 2005

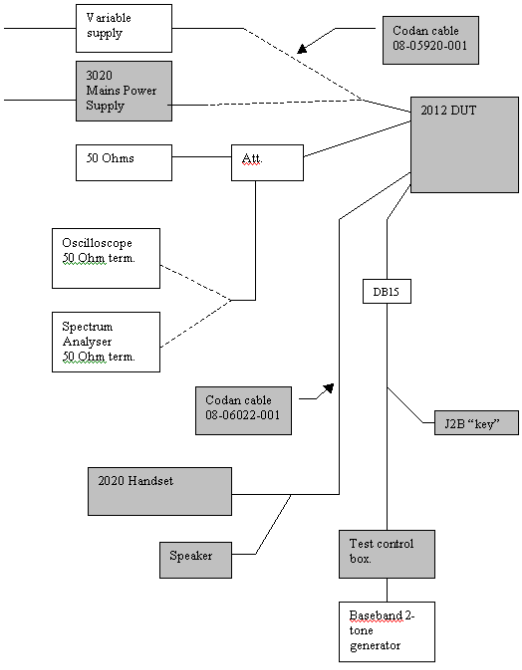
1.3 Theory of Operation

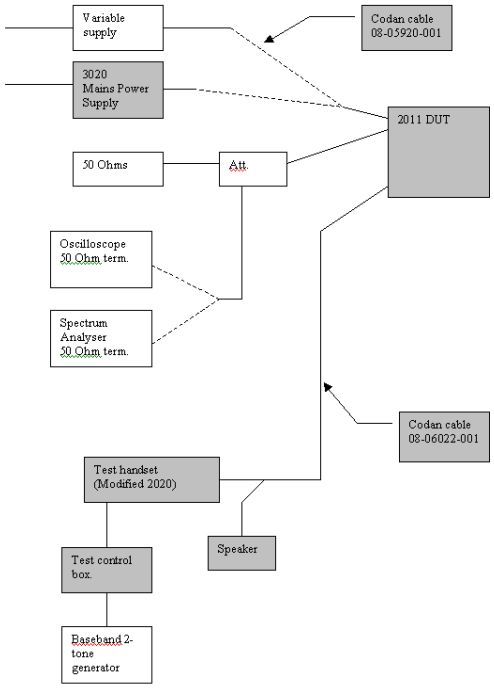
2010 HF SSB Transceiver is a Single Side Band (SSB) HF transceiver, 400 channels, 1.6-30MHz, 125W PEP, can be installed in a vehicle or as a base station. The system is comprised of a 2020 Handset, a 2030 Junction Box and the 2010 RF unit. The difference between the NGT ASR and the NGT SR is that the NGT SR has less advanced ALE functionality available.

1.4 Technical Specifications of the EUT

Manufacturer:	Codan Limited
Operating Frequency:	Tx: 1.6 – 30MHz Rx: 250kHz – 30MHz
Emission Designator:	J2B, J3E, H3E
Rated Power:	125W PEP
Modulation:	Upper Single Sideband Suppressed Carrier, Upper Single Sideband Full Carrier, Morse Code, AFSK
Antenna Connector:	PL259 connector
Power Source:	13.6VDC

1.5 Block Diagram of the EUT





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 ^{o}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.	Last Cal.	Next Cal.
Spectrum Analyzer	HP	8565E	FA000981	15 Sept 05	15 Sept 06
20dB Attenuator	Narda	769-20	FA001394	COU	COU
20dB Attenuator	Narda	776B-20	FA001153	COU	COU
10dB Attenuator	Narda	768-10	—	COU	COU
10dB Attenuator	Narda	768-10	—	COU	COU
Signal Generator	Tektronics	AWG2021	FA001529	NCR	NCR
Vector Signal Analyzer	HP	89410A	FA001571	11 Feb 05	11 Feb 06
Frequency Counter	HP	5352B	FA001915	14 Oct 05	14 Oct 06
Receiver	Rohde & Schwarz	ESVS-30	FA001437	July 27/05	July 27/06
Biconical (2) Antenna	EMCO	3109	FA000904	Aug. 26/05	Aug. 26/06
Active Loop Antenna	Rohde & Schwarz	HFH2-Z2	FA000631	May 20/05	May 20/06
Receiver	Rohde & Schwarz	ESHS 10	FA001918	Feb. 28/05	Feb. 28/06

COU- Cal on Use
NCR – No Cal Required

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

The following technical judgement was made during this assessment:

3.2.1 Technical Judgement 1

The difference between the 2010 NGT ASR and 2010 NGT SR is that the NGT SR has less advanced ALE functionality available. It was judged that the results for the 2010 NGT ASR would be representative of both units.

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	PASS
90.207	2.1047	Modulation Characteristics	Y	PASS
90.209	2.1049	Occupied bandwidth	Y	PASS
90.210	2.1051	Spurious Emissions at the antenna terminal	Y	PASS
90.210	2.1053	Field strength of spurious radiation	Y	PASS
90.213	2.1055	Frequency stability	Y	PASS
90.214	—	Transient Behavior	N	
90.219	—	Use of boosters	N	

Notes:

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:

Sample Number:	17	**Temperature:**	24
Date:	January 4, 2006	**Humidity:**	14
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

Frequency (MHz)	Maximum PEP (dBm)	Maximum PEP (Watts)	Maximum PEP Rated (Watts)
1.63 (J3E)	51.33	135.8	125
14.3 (J3E)	51.33	135.8	125
28.3 (J3E)	51.37	137.1	125
1.63 (H3E)	51.33	135.8	125
14.3 (H3E)	51.33	135.8	125
28.3 (H3E)	51.37	137.1	125

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.

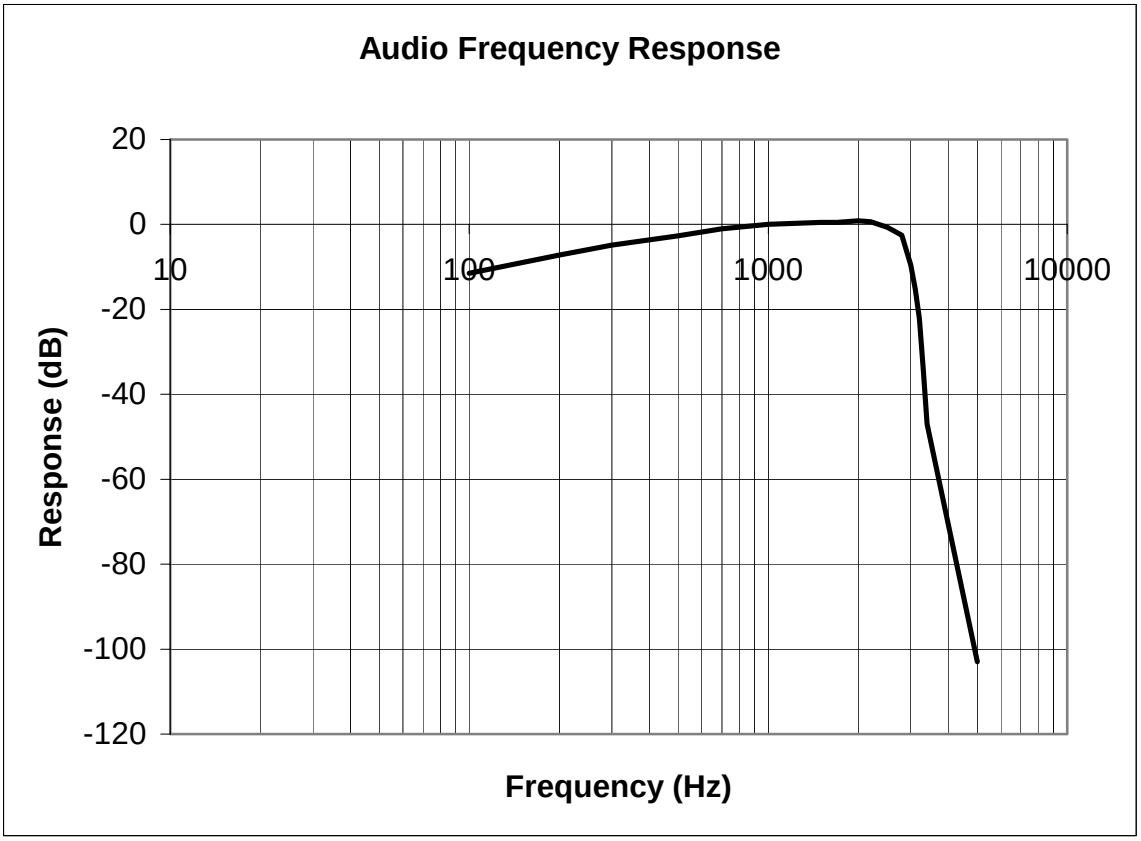
(d) Other types of equipment: A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

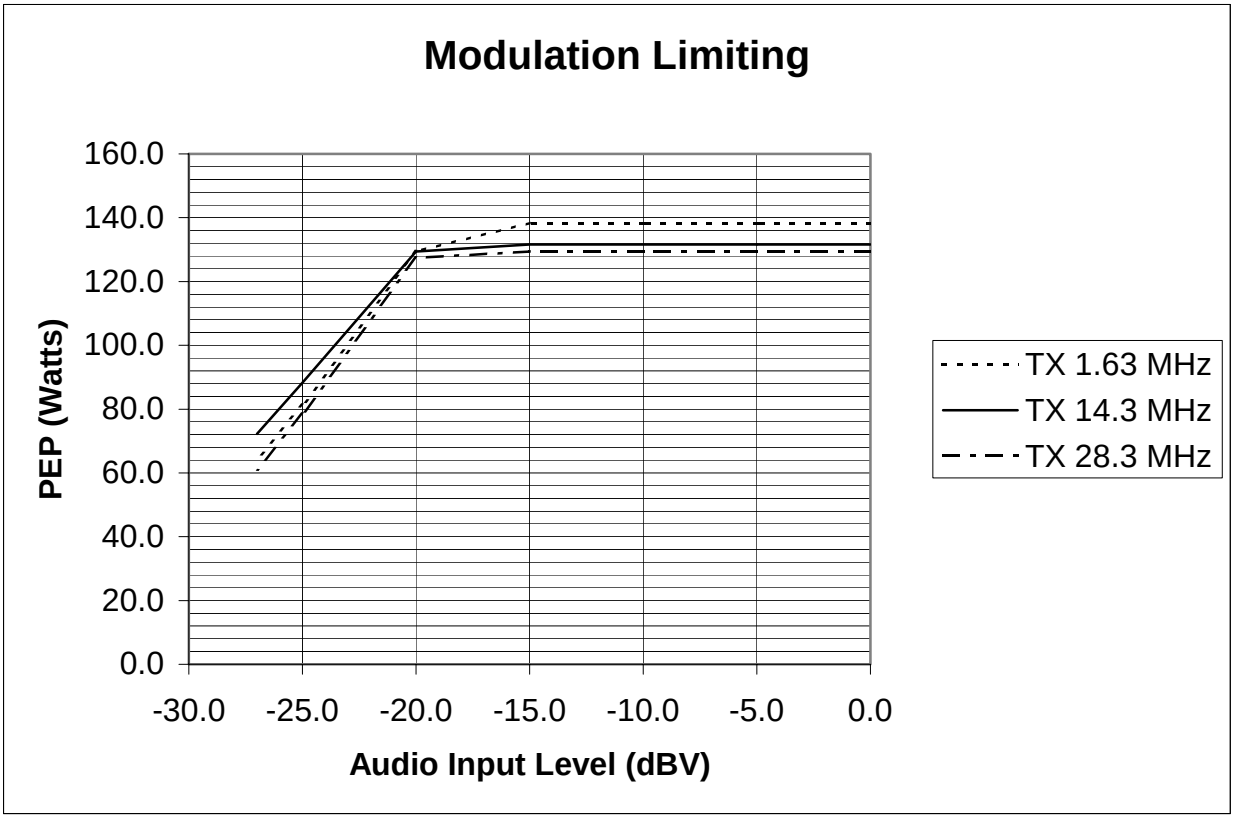
Test Conditions:

Sample Number:	17	**Temperature:**	24
Date:	January 4, 2006	**Humidity:**	14
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

See Attached Plots.


Audio Frequency Response
20
0
-20
-40
-60
-80
-100
-120
10
100
1000
10000
Response (dB)
Frequency (Hz)


Modulation Limiting
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PEP (Watts)
-30.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Audio Input Level (dBV)
TX 1.63 MHz
TX 14.3 MHz
TX 28.3 MHz

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:

Sample Number:	17	**Temperature:**	24
Date:	January 4, 2006	**Humidity:**	14
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

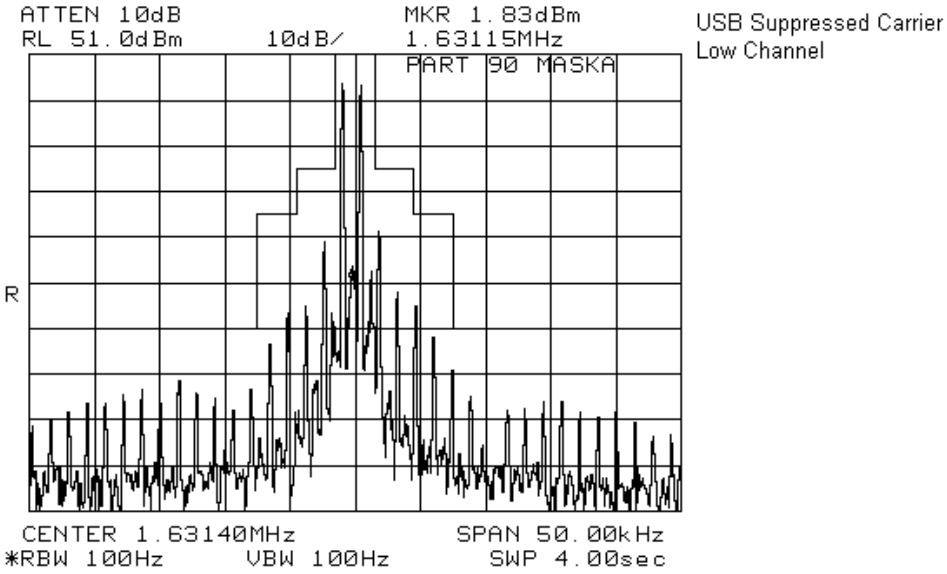
Test Results:

See Attached Plots.

Additional Observations:

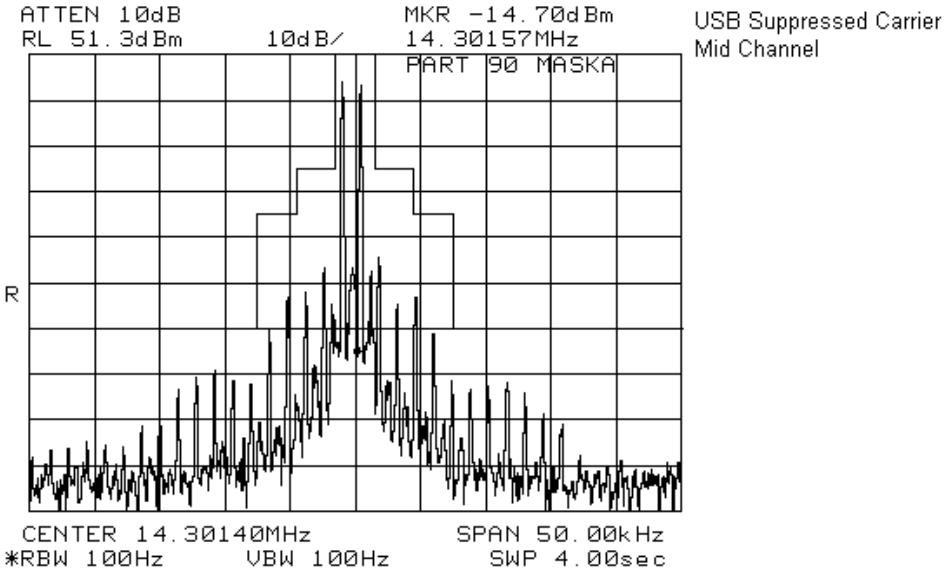
The level N (dB) of the carrier with respect to peak envelope power is –63.0dB. The requirement for Carrier Suppression is N > 40dB.

Emission Mask Low Channel – USB Suppressed Carrier (J3E)



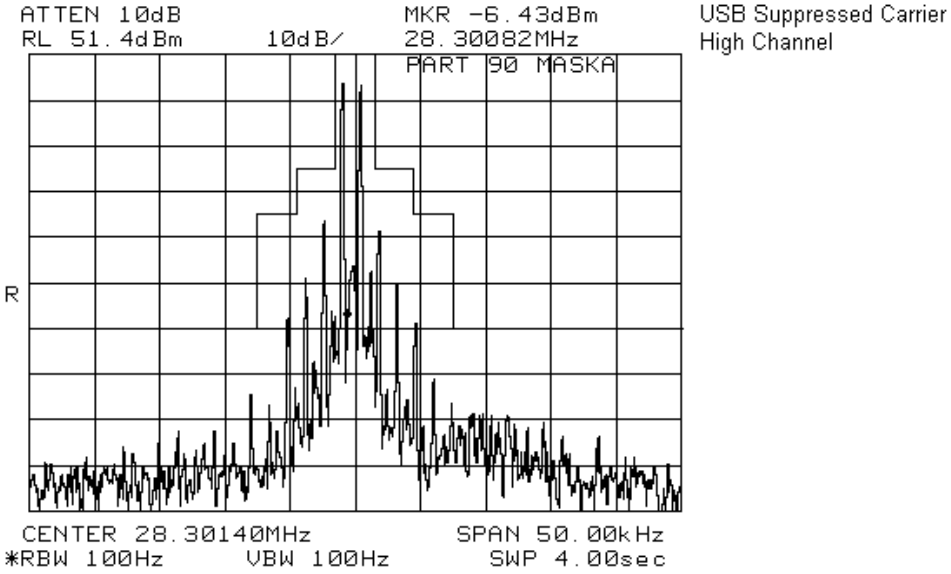
USB Suppressed Carrier
Low Channel

Emission Mask Mid Channel – USB Suppressed Carrier (J3E)



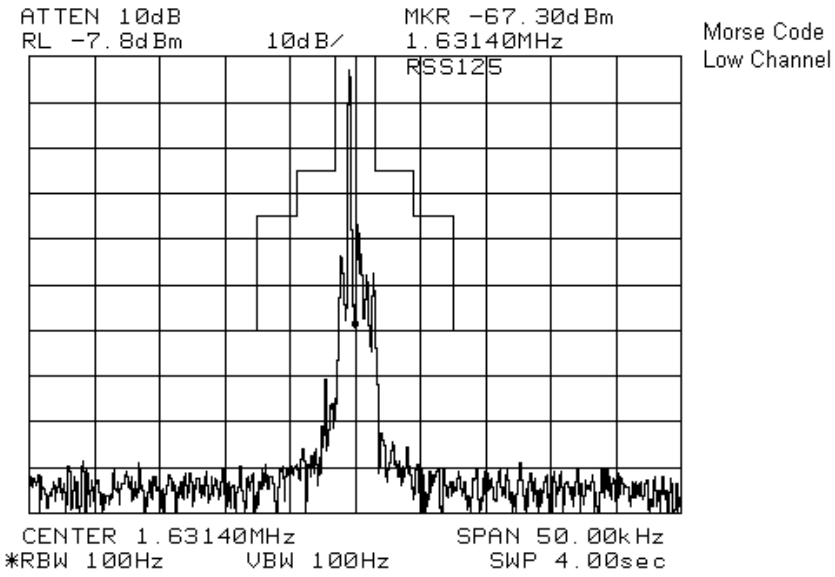
USB Suppressed Carrier
Mid Channel

Emission Mask High Channel – USB Suppressed Carrier (J3E)



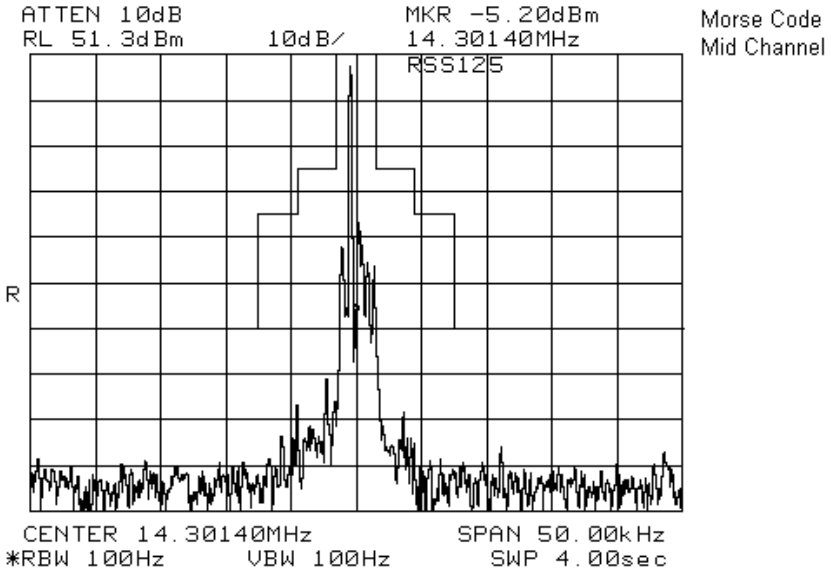
USB Suppressed Carrier
High Channel

Emission Mask Low Channel – Morse Code (J2B)

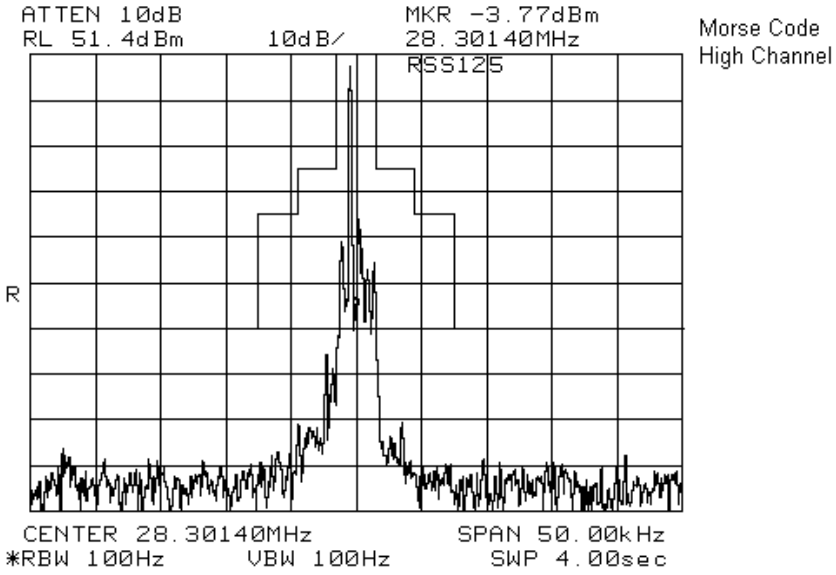


Morse Code
Low Channel

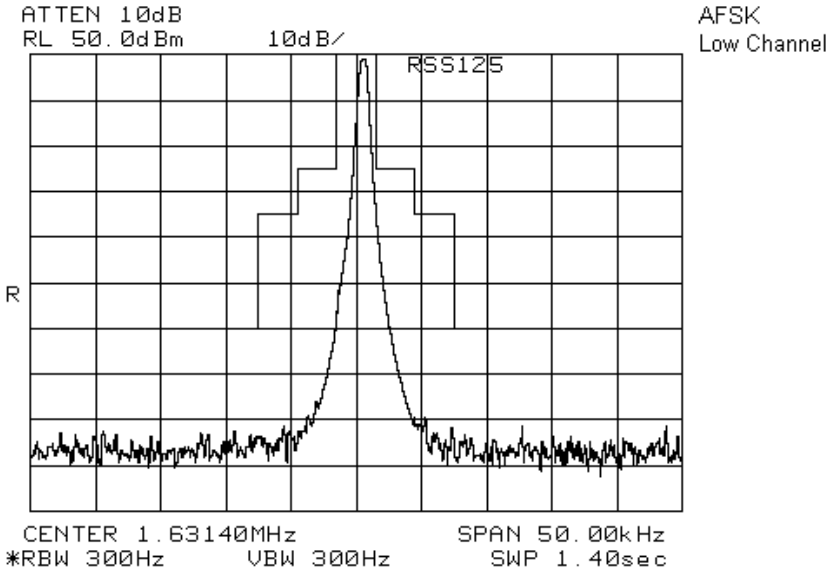
Emission Mask Mid Channel – Morse Code (J2B)

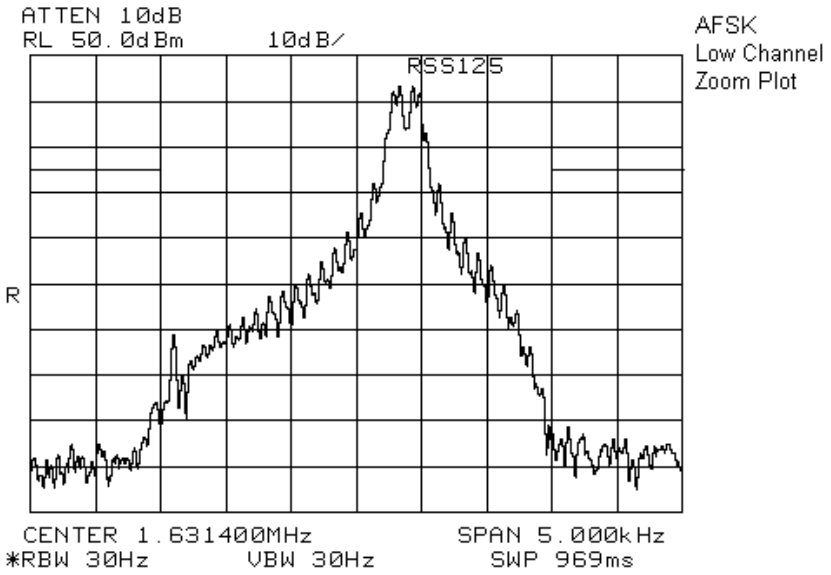


Emission Mask High Channel – Morse Code (J2B)

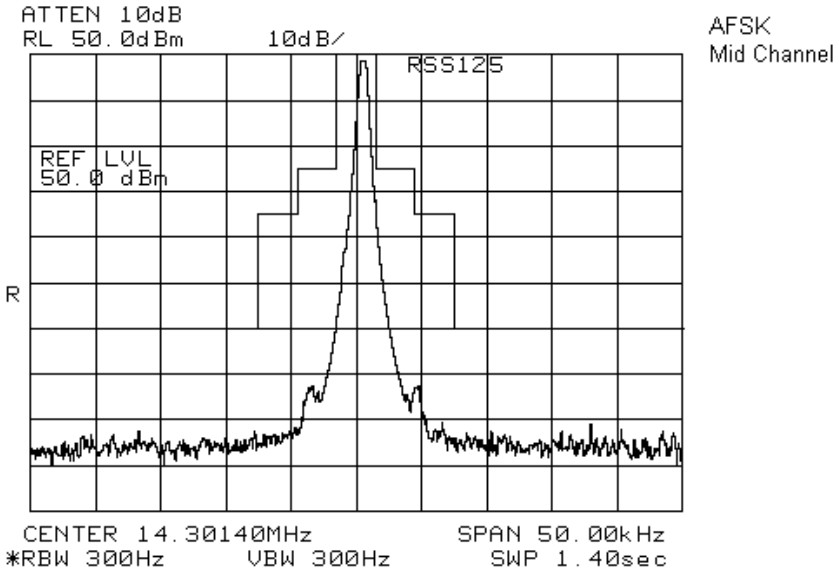


Emission Mask Low Channel – AFSK (J2B)

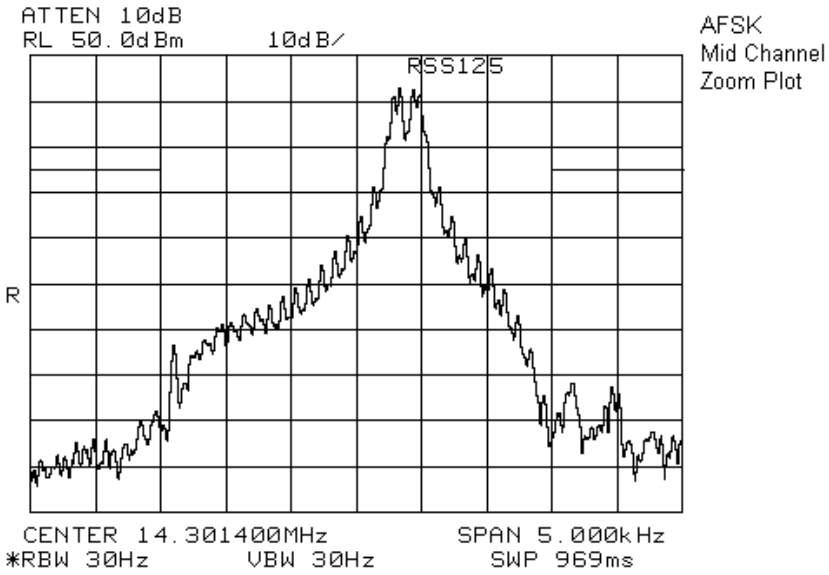




Emission Mask Mid Channel – AFSK (J2B)

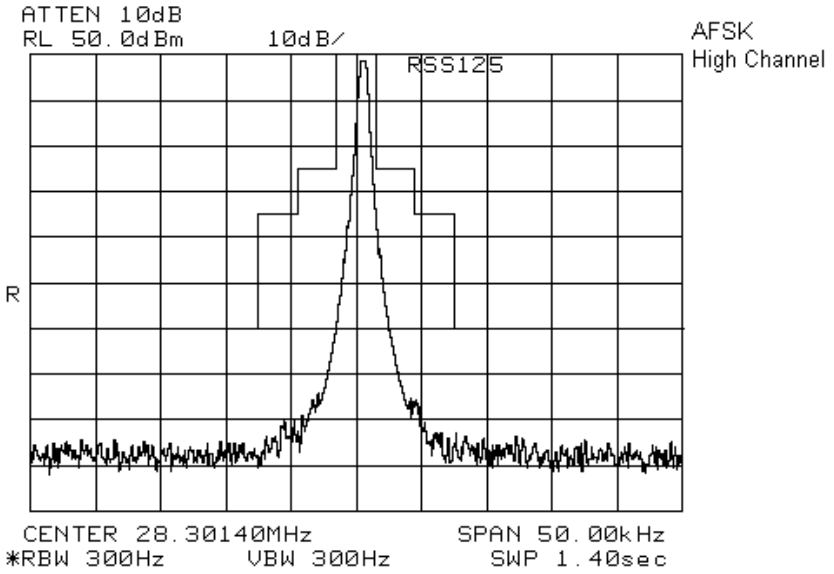


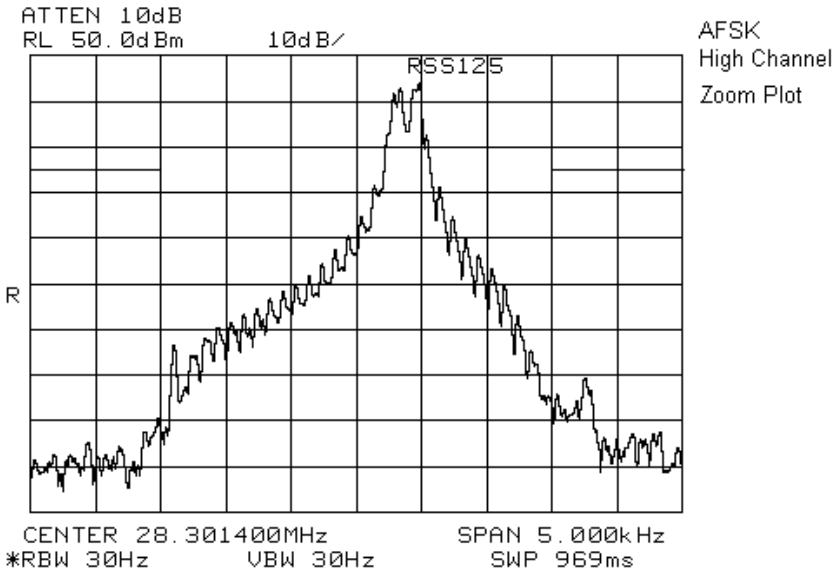
AFSK
Mid Channel



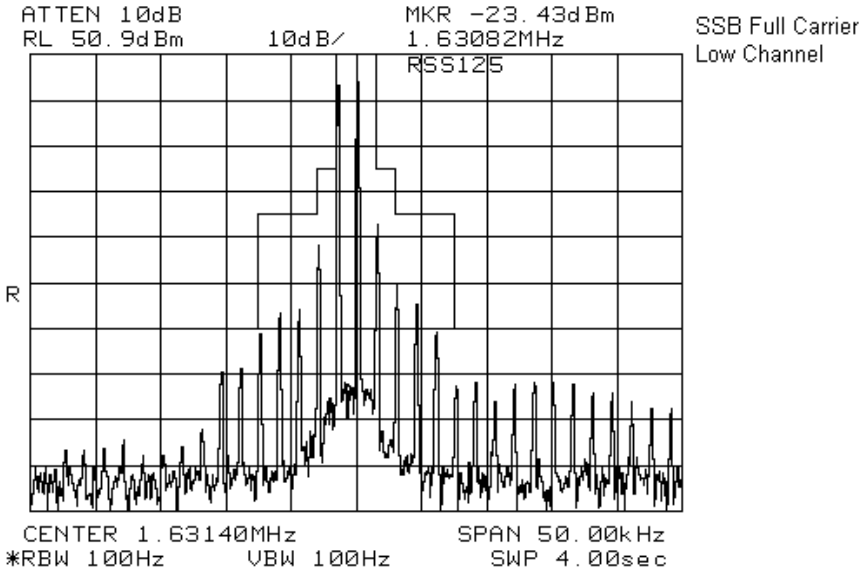
AFSK
Mid Channel
Zoom Plot

Emission Mask High Channel – AFSK (J2B)

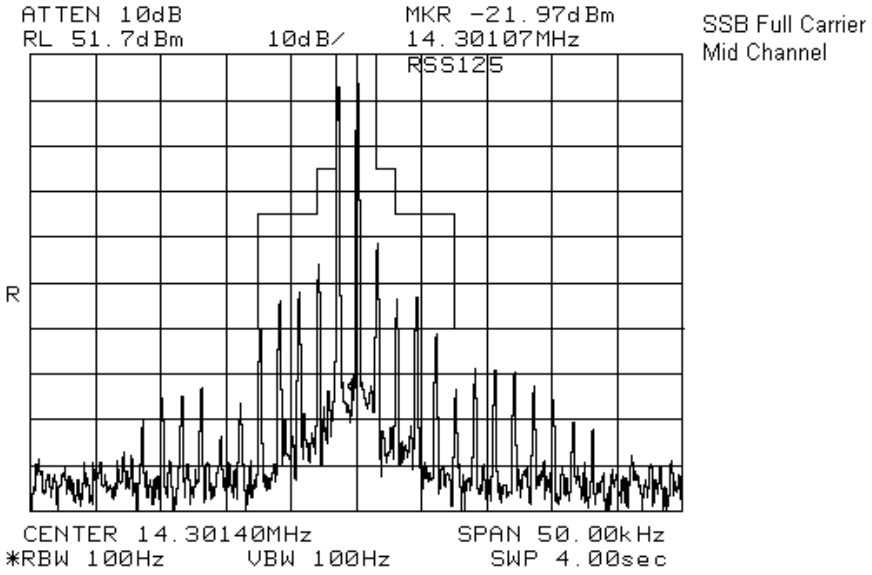




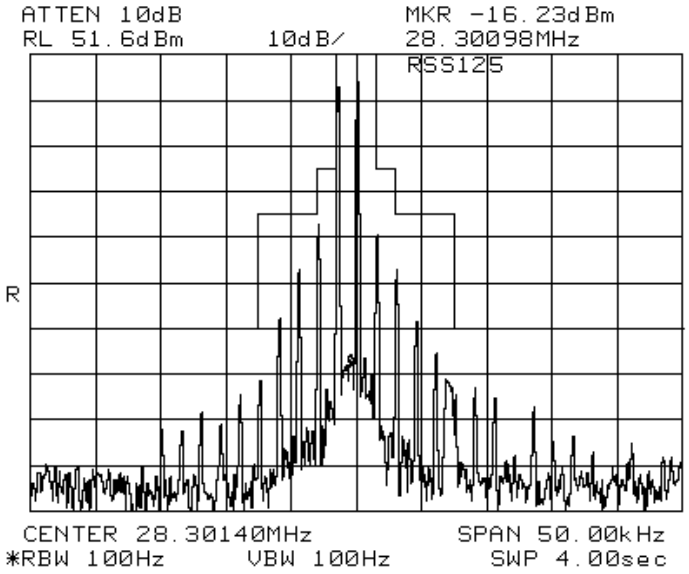
Emission Mask Low Channel – USB Full Carrier (H3E)



Emission Mask Mid Channel – USB Full Carrier (H3E)



Emission Mask High Channel – USB Full Carrier (H3E)



USB Full Carrier
High Channel

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.

Test Conditions:

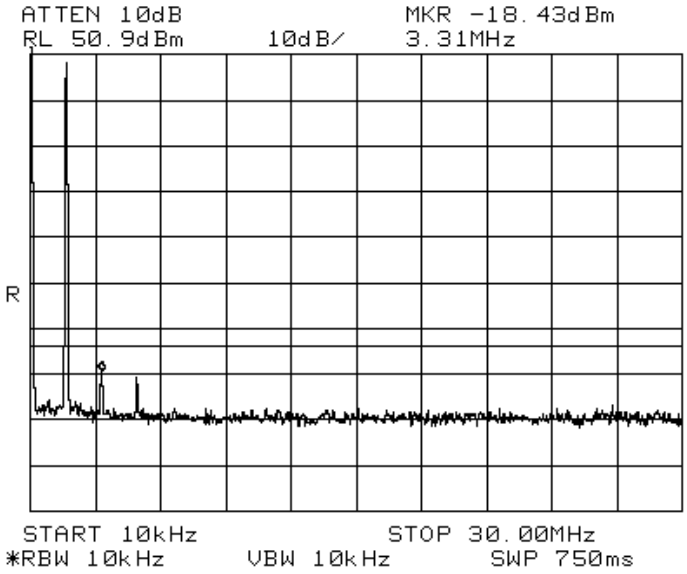
Sample Number:	17	**Temperature:**	24
Date:	January 4, 2006	**Humidity:**	14
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

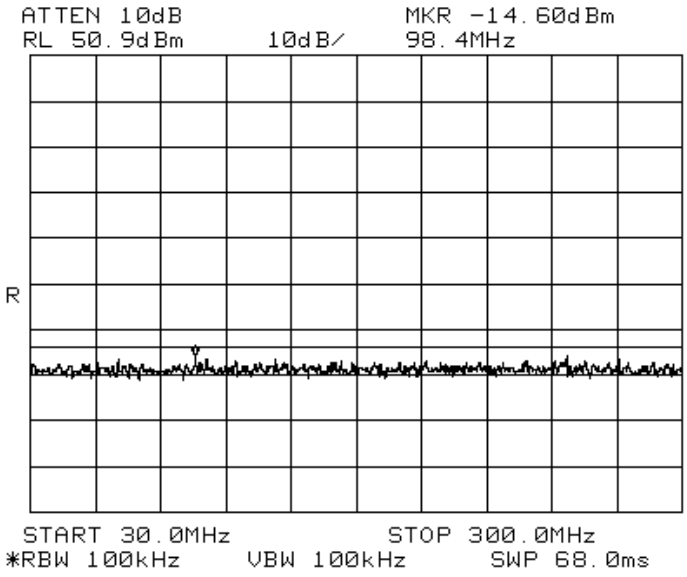
See Attached Plots.

Additional Observations:

Conducted Emissions Low Channel

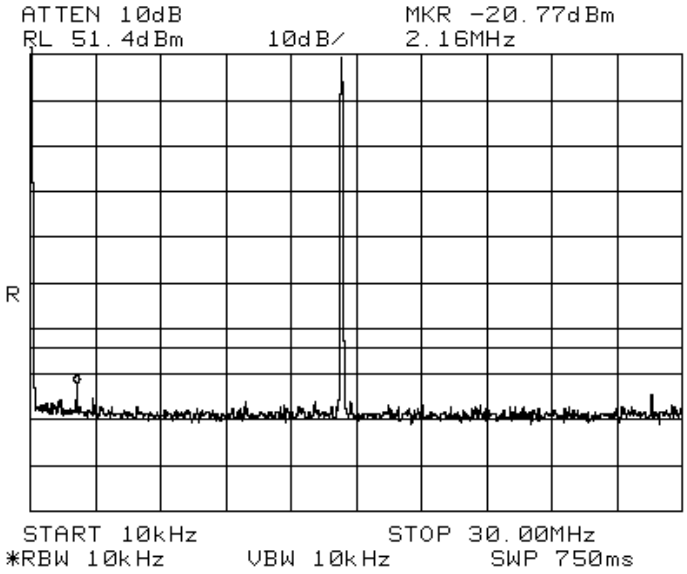


2010
Conducted Emissions
Low Channel

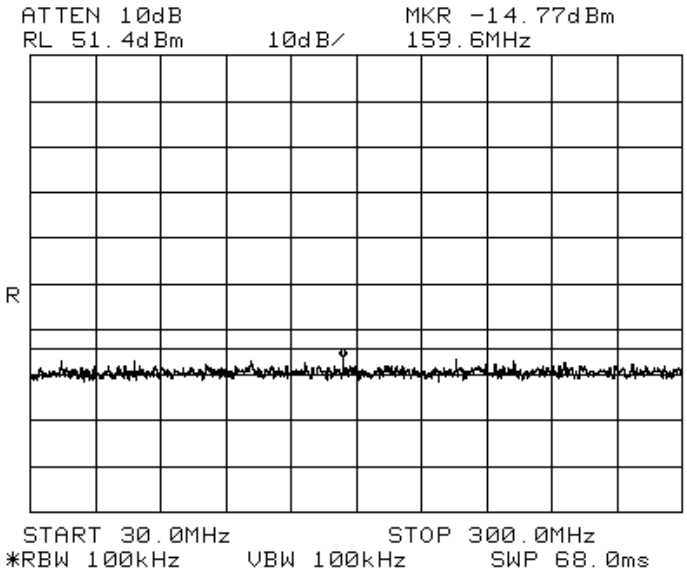


2010
Conducted Emissions
Low Channel

Conducted Emissions Mid Channel

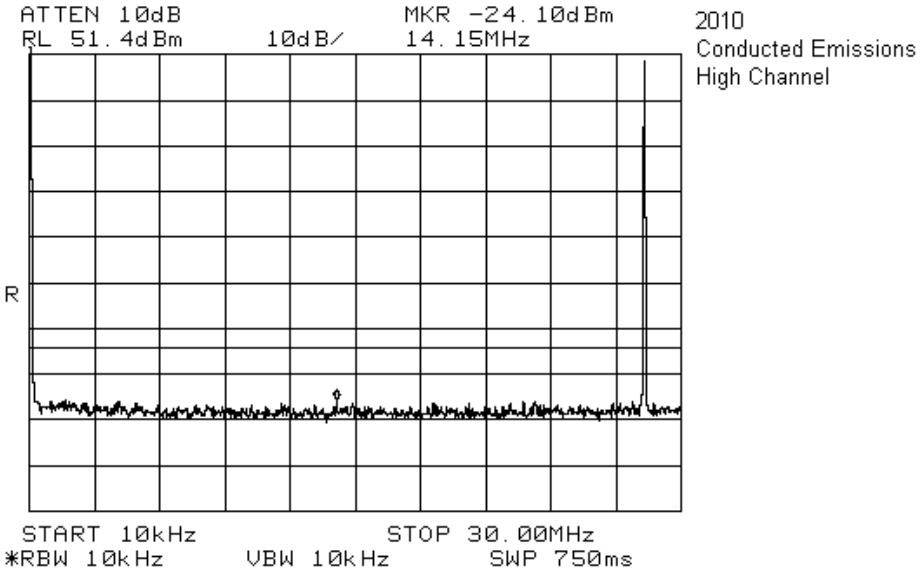


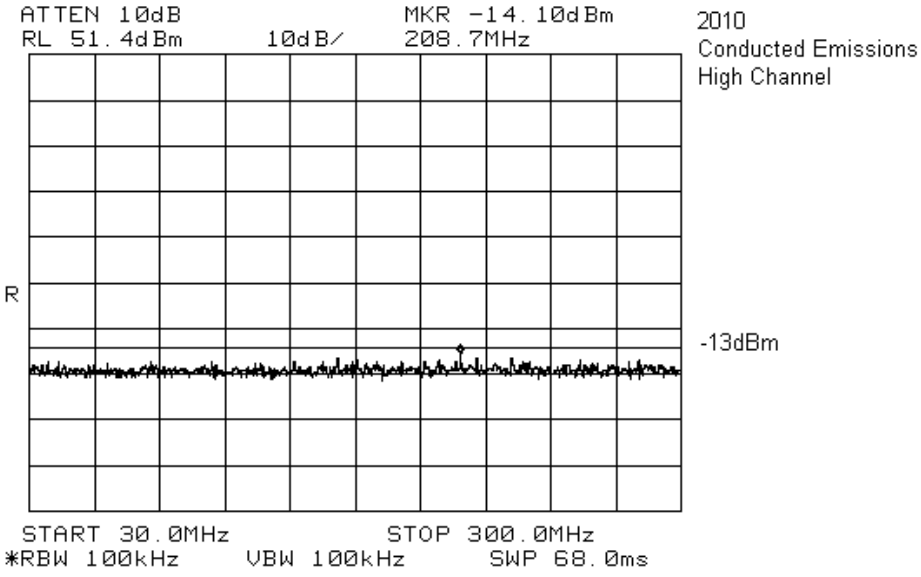
2010
Conducted Emissions
Mid Channel



2010
Conducted Emissions
Mid Channel

Conducted Emissions High Channel





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:

Sample Number:	17	**Temperature:**	10
Date:	January 11, 2006	**Humidity:**	80
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

See Attached Table for Results

Additional Observations:

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

All measurements were performed using a Peak Detector with 10kHz RBW below 30MHz and a 100kHz RBW above 30MHz at a distance of 3 meters.

Only measurements within 25dB below the limit have been reported.

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Sig. Sub. Factor	Level (dBm)	Limit (dBm)	Margin (dB)
Mid Channel							
100.1034	BC2	V	52.6	-90.2	-37.6	-13.0	24.6
100.1034	BC2	H	52.8	-88.2	-35.4	-13.0	22.4
High Channel							
113.2052	BC2	V	48.5	-86.6	-38.1	-13.0	25.1
113.2052	BC2	H	56.7	-88.3	-31.6	-13.0	18.6
141.5063	BC2	V	32.3	-81.3	-49.0	-13.0	36.0
141.5063	BC2	H	48.2	-85.7	-37.5	-13.0	24.5
226.4094	BC2	V	36.1	-78.9	-42.8	-13.0	29.8
226.4094	BC2	H	61.2	-82.9	-21.7	-13.0	8.7
283.0130	BC2	V	34.7	-73.5	-38.8	-13.0	25.8
283.0130	BC2	H	47.3	-75.9	-28.6	-13.0	15.6

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.
Minimum Frequency Stability
parts per million (ppm)

Frequency range (MHz)	Fixed and base stations 2 watts output power	Mobile stations Over power	2 watts or less output
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:

Sample Number:	17	**Temperature:**	22
Date:	January 10, 2006	**Humidity:**	22
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results: See Attached Table.

Test Condition	Frequency (Hz)	Frequency Drift (Hz)	Frequency drift (ppm)
+50°C	14301789	0	0.0
+40°C	14301789	0	0.0
+30°C	14301790	1	0.07
+20°C, +15%	14301789	0	0.0
+20°C, Nominal	**14301789**	—	—
+20°C, -15%	14301789	0	0.0
+10°C	14301791	2	0.14
0°C	14301791	2	0.14
-10°C	14301791	2	0.14
-20°C	14301792	3	0.21
-30°C	14301792	3	0.21

Test signal:

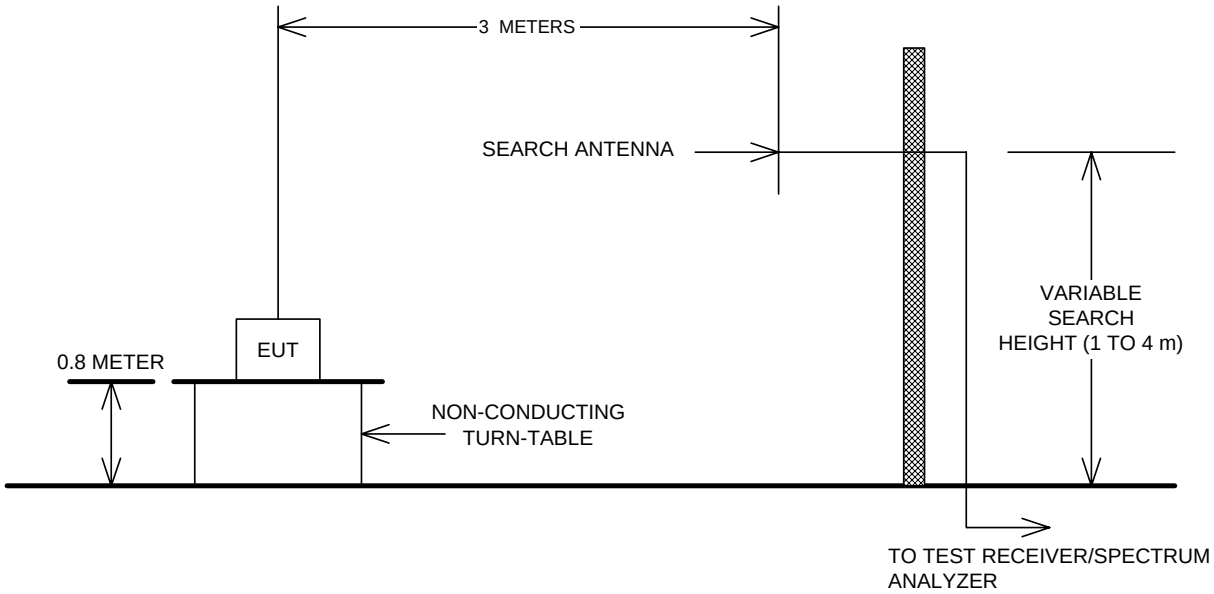
Transmit was set to 14.3MHz and modulated with a 1800Hz tone.

Appendix B : Setup Photographs

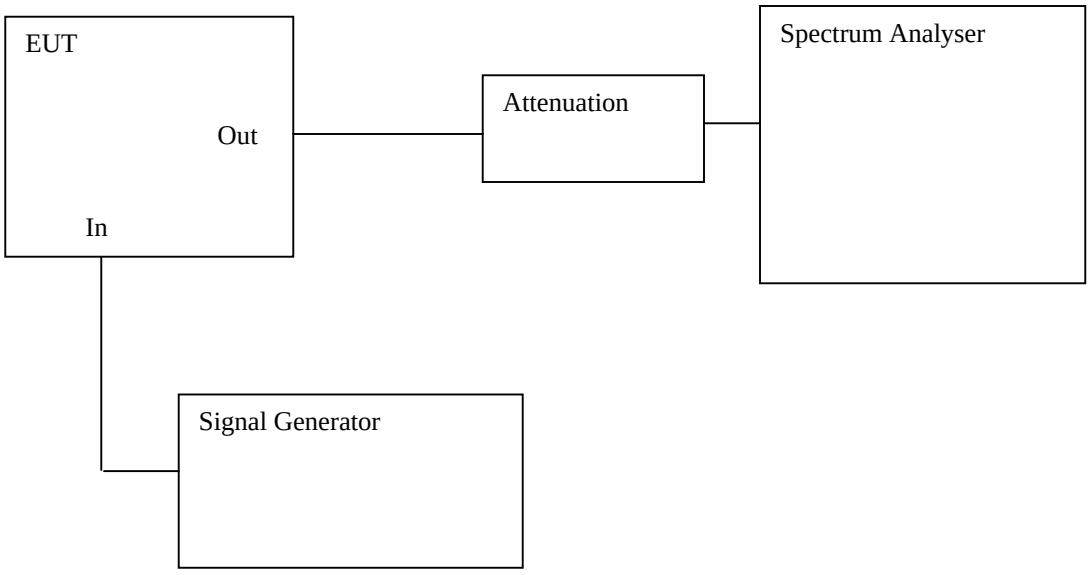
Radiated Spurious Emissions Setup:

Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth, Audio Frequency Response and Modulation Limiting



Frequency Stability

Environmental Test Chamber