

Nemko Test Report: 115868-1TRFWL

Applicant: Codan Limited
81 Graves Street,
Newton, SA
5074
Australia

Apparatus: 3160 Power Amplifier

FCC ID: DYY3160

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

Authorized By:

A blue ink signature of Andrey Adelberg, written in a cursive style.

Andrey Adelberg, EMC/Wireless Specialist

Date: January 22, 2009

Total Number of Pages: 19

TABLE OF CONTENTS

Section 1 : Report Summary	3
Section 2 : Equipment Under Test.....	4
2.1 Identification of Equipment Under Test (EUT).....	4
2.2 Accessories	4
2.3 EUT Description.....	4
2.4 Technical Specifications of the EUT	5
2.5 EUT Setup diagram	5
2.6 Operation of the EUT during testing	5
2.7 Modifications incorporated in the EUT	5
Section 3 : Test Conditions.....	6
3.1 Specifications	6
3.2 Deviations From Laboratory Test Procedures	6
3.3 Test Environment	6
3.4 Measurement Uncertainty.....	6
3.5 Test Equipment.....	7
Section 4 : Results Summary	8
4.1 FCC Part 90 : Test Results	8
Appendix A : Test Results.....	9
Clause 2.815 External radio frequency power amplifiers	9
Clause 90.205 Output Power	10
Clause 90.210 Conducted Spurious Emissions.....	11
Clause 90.210 Radiated Spurious Emissions.....	13
Clause 2-11-04/EAB/RF Occupied Bandwidth	15
Clause 2-11-04/EAB/RF Out of Band Rejection	17
Appendix B : Setup Photographs	18
Appendix C : Block Diagram of Test Setups.....	19

Section 1 : 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.

The assessment summary is as follows:

Apparatus Assessed:	3160 Power Amplifier
Specification:	FCC Part 90
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3m Semi-Anechoic Chamber)
Tests Performed By:	Jason Nixon, Wireless/Telecom Specialist
Test Dates:	November 26 and 27 and December 1, 2008

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. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	External Power Amplifier
Brand Name:	Codan
Model Name or Number:	3160
Serial Number:	8640213A0011
Nemko Sample Number:	4
FCC ID:	DYY3160
Date of Receipt:	November 10, 2008

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	SSB Transceiver
Brand Name:	Codan
Model Name or Number:	2110
Serial Number:	5636467B0137
Nemko Sample Number:	2

Description:	Transceiver Supply
Brand Name:	Codan
Model Name or Number:	3020
Serial Number:	2118
Nemko Sample Number:	1

2.3 EUT Description

The EUT is an external power amplifier designed to operate with the SSB radio to amplify the 25W PEP output of the SSB radio to 125W PEP for base station and fixed location installations. The external power amplifier is controlled by the SSB radio.

2.4 Technical Specifications of the EUT

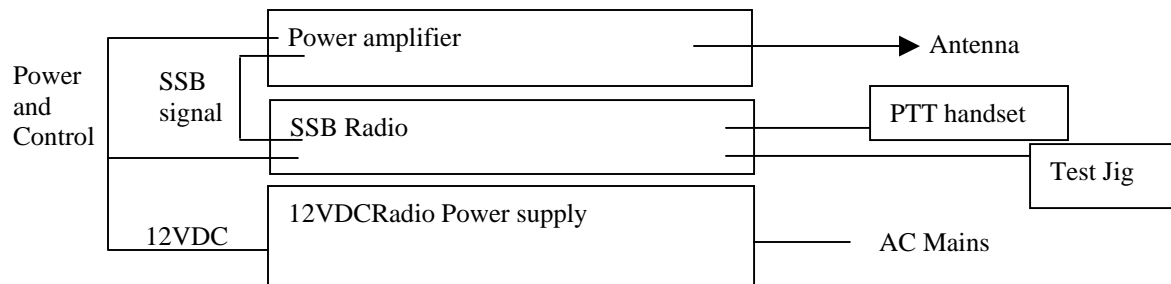
Operating Frequency: 1.6-30MHz

Modulation: SSB

Emission Designator: 2K80J3E, 2K80H3E, 2K80J2B

Power Supply Requirements: 12VDC

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

The EUT was stimulated with the SSB radio. The frequency and power level were selected on the SSB radio, which controls if the PA turns on.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 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
FCC 2-11-04/EAB/RF Amplifier, Booster, and Repeater Reminder Sheet

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 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

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95% and can be found in Nemko Canada document MU-003.



3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU46	FA001877	Aug 28/08	Aug 28/09
Attenuator	Narda	776B-20	FA001153	COU	COU
Attenuator	Narda	769-20	FA001394	COU	COU
Attenuator	Narda	768-10	9707	COU	COU
3m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/08	May 06/09
Bilog	Sunol	JB3	FA002108	Jan. 21/08	Jan. 21/09
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
LISN	Rohde & Schwarz	ENV216	FA002023	Sept. 02/08	Sept. 02/09
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 07/07	Dec. 07/08
50 Coax cable	HUBER + SUHNER	None	FA002015	Aug. 05/08	Aug. 05/09
International Power Supply	California Inst.	3001i	FA001021	Jan. 16/08	Jan. 16/09
Signal Generator	Rhode & Schwarz	SML-03	FA002046	Dec 04/07	Dec 04/08
Amplifier	AR	75A250A	FA001943	NCR	NCR

COU – Calibrate on Use

NCR – No Calibration Required

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 Report Summary)

4.1 FCC Part 90 : Test Results

Clause	Test Method	Test Description	Required	Result
—	2.815	External radio frequency power amplifiers	Y	PASS
90.205	2.1046	Output power	Y	PASS
90.210	2.1051	Conducted spurious emissions	Y	PASS
90.210	2.1053	Radiated spurious emissions	Y	PASS
90.213	2.1055	Frequency stability	N ¹	
90.214	—	Transient Behavior	N	
90.219	—	Use of boosters	N	
2-11-04/EAB/RF	2.1049	Occupied bandwidth	Y	PASS
2-11-04/EAB/RF	—	Out of band rejection	Y	PASS

Notes:

¹ The EUT is not a frequency translator and has no frequency determining circuitry.

Appendix A : Test Results

Clause 2.815 External radio frequency power amplifiers

(b) No person shall manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease) or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any external radio frequency power amplifier capable of operation on any frequency or frequencies below 144 MHz unless the amplifier has received a grant of certification in accordance with subpart J of this part and other relevant parts of this chapter. These amplifiers shall comply with the following:

- (1) The external radio frequency power amplifier shall not be capable of amplification in the frequency band 26–28 MHz.
- (2) The amplifier shall not be capable of easy modification to permit its use as an amplifier in the frequency band 26–28 MHz.
- (3) No more than 10 external radio frequency power amplifiers may be constructed for evaluation purposes in preparation for the submission of an application for a grant of certification.
- (4) If the external radio frequency power amplifier is intended for operation in the Amateur Radio Service under part 97 of this chapter, the requirements of §§97.315 and 97.317 of this chapter shall be met.

- 1) The external amplifier must be turned on via the SSB radio. The software in the radio will not allow the PA power setting be selected.
- 2) The power amplifier acts as a through path for the RF until it is activated by the SSB radio. This is done over a custom cable that interconnects the two devices. See Results below showing power levels during a CB band communication.
- 3) Only 1 power amplifier has been submitted for this assessment.
- 4) This device is not for use under part 97.

	Input	Output
CB Band (27.7MHz)	36.68dBm	36.38dBm

Output power was measured using a Peak detector with 20kHz RBW/ 50kHz VBW set to Max-Hold.



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 Results: Pass

	1.68MHz	14.8MHz	28.8MHz	Highest Power
Voice	51.43dBm	50.58dBm	50.00dBm	139.0W PEP
Data	51.36dBm	50.54dBm	49.74dBm	136.8W PEP
Morse Code	51.25dBm	50.38dBm	49.57dBm	133.4W PEP

Rated Output power = 125W PEP

Output power was measured using a Peak detector with 20kHz RBW/ 50kHz VBW set to Max-Hold.

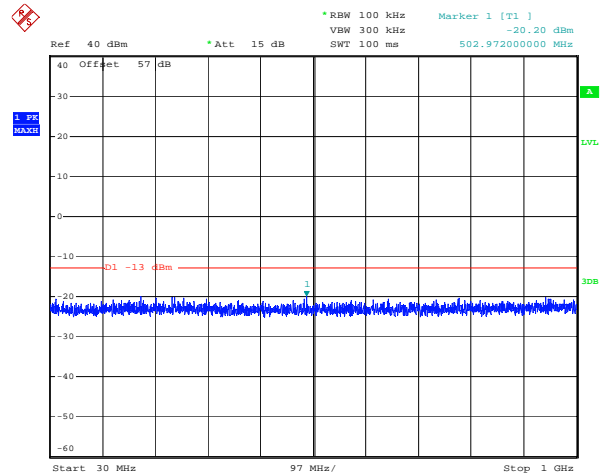
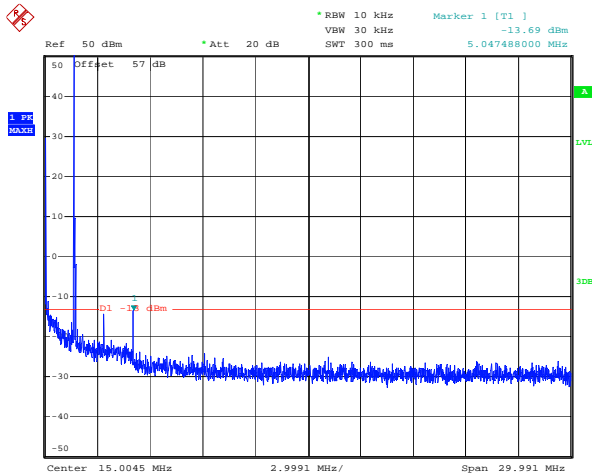
Clause 90.210 Conducted Spurious Emissions

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 Results: Pass

Conducted spurious emissions were tested using a CW signal set to 25W input power.

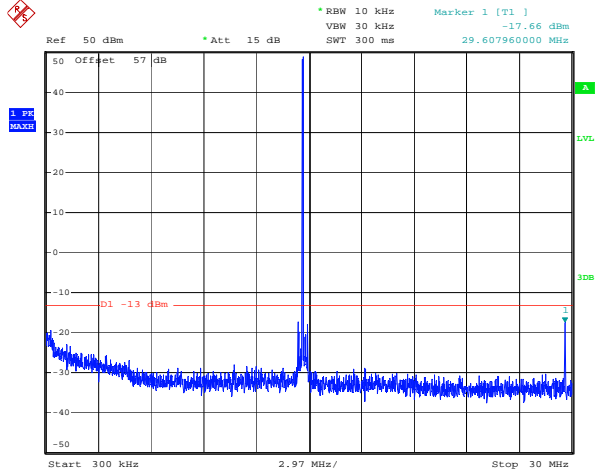
Low Channel



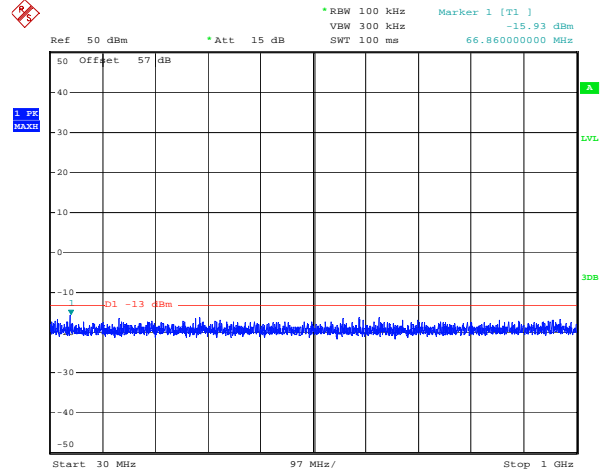
Date: 27.NOV.2008 10:28:44

Date: 27.NOV.2008 10:29:17

Mid Channel

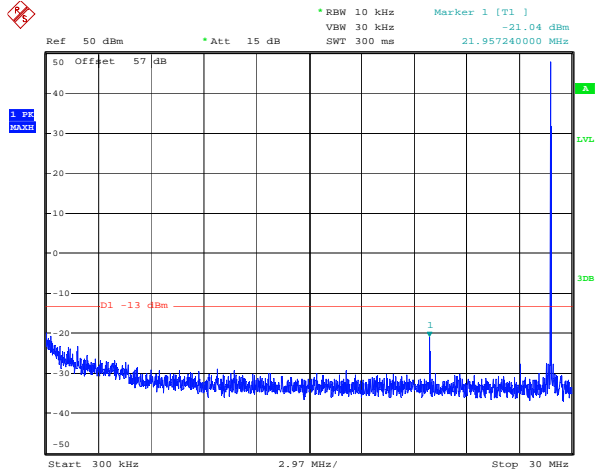


Date: 27.NOV.2008 11:07:30

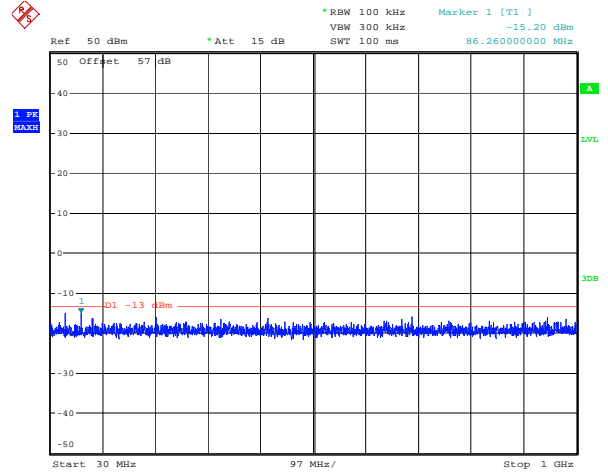


Date: 27.NOV.2008 11:07:51

High Channel



Date: 27.NOV.2008 11:11:47



Date: 27.NOV.2008 11:12:11



Nemko Canada Inc.

Clause 90.210 Radiated Spurious Emissions

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 Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to 1GHz.

All measurements were performed using a Peak Detector with 100kHz RBW/
300kHz VBW at a distance of 3 meters.



Frequency MHz	MaxPeak dBm	Antenna height cm	Polarity	Turntable position deg	Corr. dB	Limit dBm	Margin dB
57.60	-44.55	372.60	H	354.00	-93.23	-13.0	31.55
57.60	-45.98	100.00	V	0.00	-91.79	-13.0	32.98
86.40	-22.01	126.08	V	0.00	-92.01	-13.0	9.01
86.40	-23.31	217.95	H	0.00	-92.80	-13.0	10.31
115.20	-25.84	127.39	H	0.00	-87.24	-13.0	12.84
115.20	-30.31	101.26	V	0.00	-87.31	-13.0	17.31
144.00	-20.05	100.04	V	359.00	-87.98	-13.0	7.05
144.00	-15.05	204.08	H	0.00	-85.22	-13.0	2.05
172.80	-25.21	99.95	H	289.00	-85.78	-13.0	12.21
172.80	-24.90	100.04	V	0.00	-90.39	-13.0	11.90
201.60	-35.70	228.04	V	0.00	-90.86	-13.0	22.70
201.60	-23.14	100.00	H	0.00	-83.76	-13.0	10.14
230.40	-24.62	155.73	H	0.00	-82.95	-13.0	11.62
230.40	-42.58	100.04	V	0.00	-91.03	-13.0	29.58
259.20	-50.45	99.95	V	0.00	-88.44	-13.0	37.45
259.20	-33.10	114.65	H	0.00	-80.91	-13.0	20.10
288.00	-36.22	99.95	H	0.00	-82.26	-13.0	23.22
288.00	-52.39	193.17	V	0.00	-87.05	-13.0	39.39

MaxPeak results include Corr values

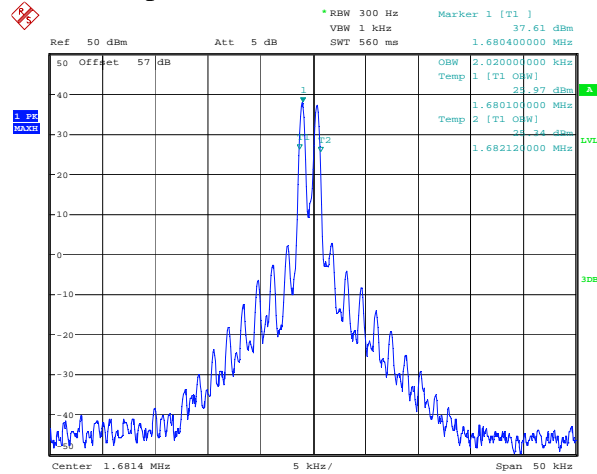
Corr = Reference signal level from signal generator
 -Reference signal level received from spectrum analyzer reading
 +Antenna gain
 -Cable loss

Clause 2-11-04/EAB/RF Occupied Bandwidth

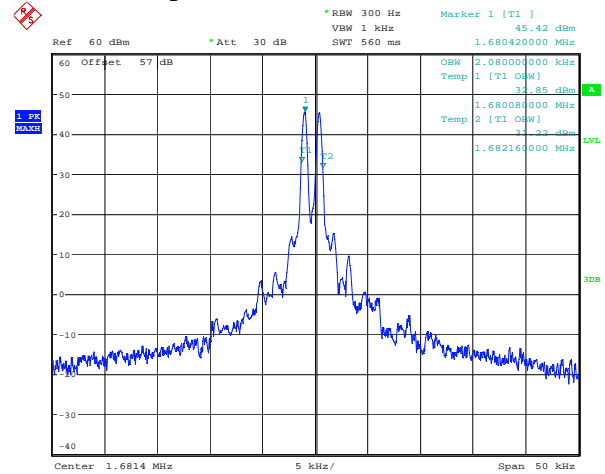
Using an RBW of 300Hz or 1% of the emission bandwidth, The spectral shape of the output should look similar to the input for all modulations.

Test Results: Pass

Voice – Input

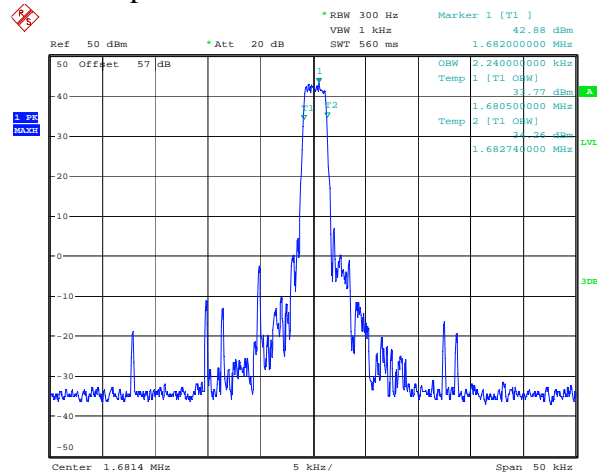


Voice – Output



Date: 26.NOV.2008 14:23:38

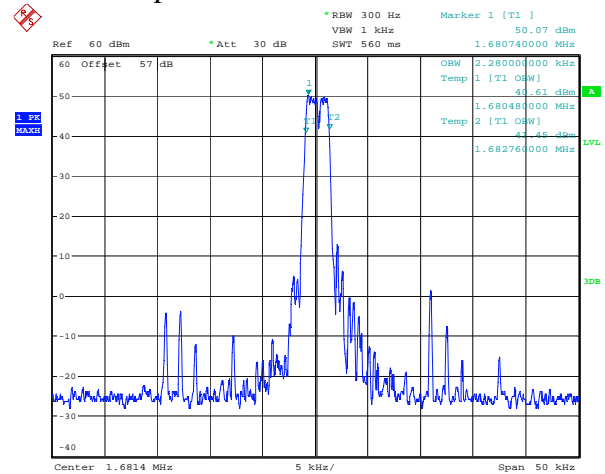
Data – Input



Date: 26.NOV.2008 14:31:28

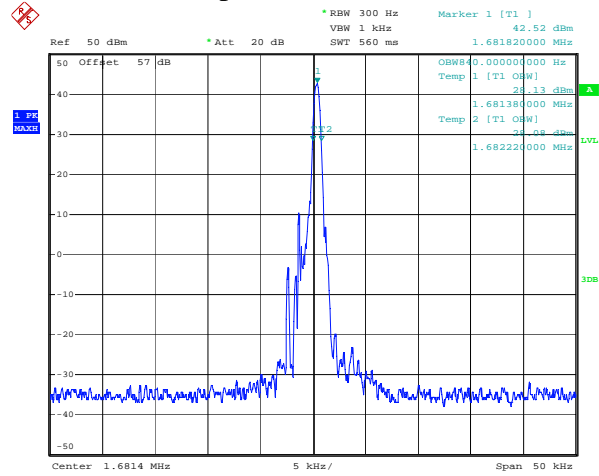
Date: 26.NOV.2008 14:51:44

Data – Output



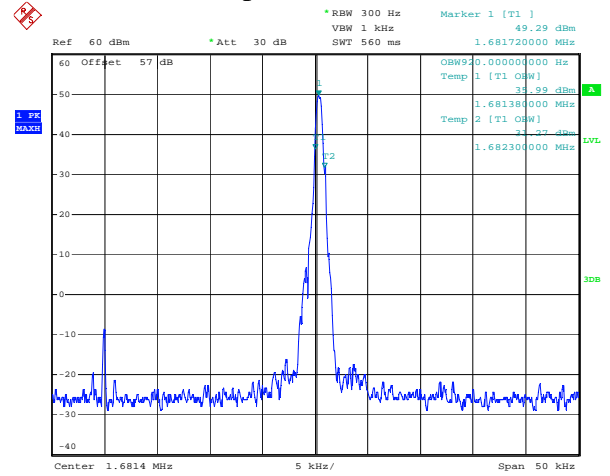
Date: 26.NOV.2008 14:53:00

Morse code – Input



Date: 26.NOV.2008 14:32:19

Morse code – Output

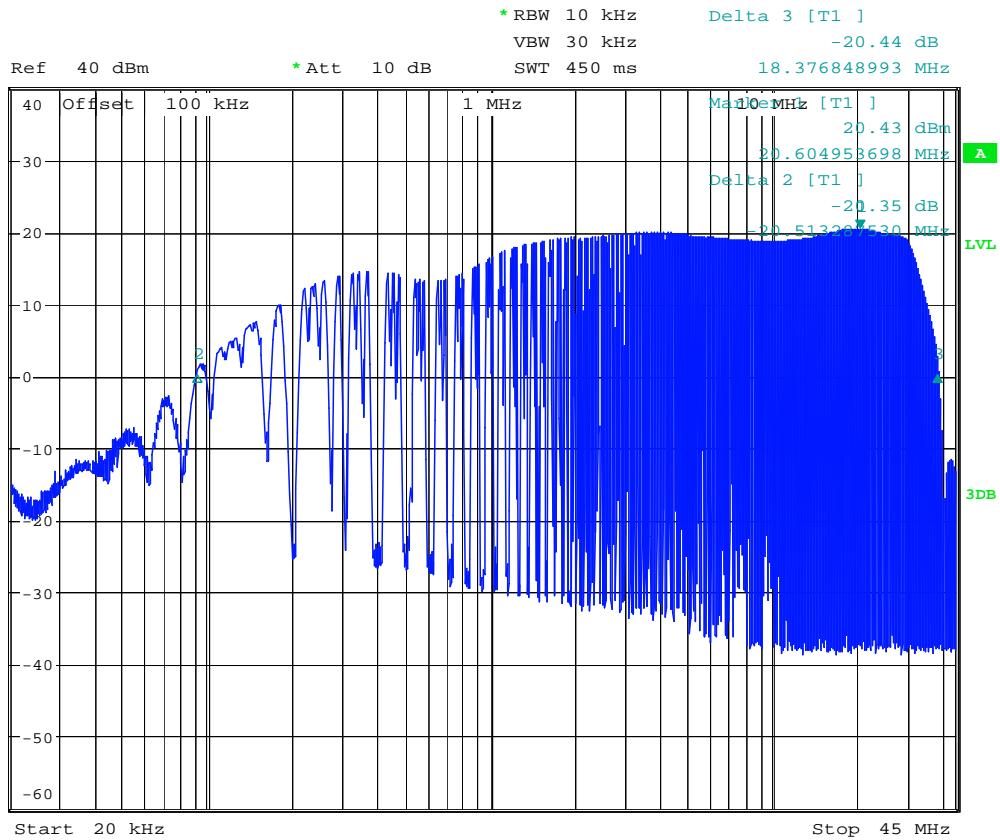


Date: 26.NOV.2008 14:52:15

Clause 2-11-04/EAB/RF Out of Band Rejection

Plots showing the filter frequency response.

Test Results: Pass



Date: 27.NOV.2008 10:03:51

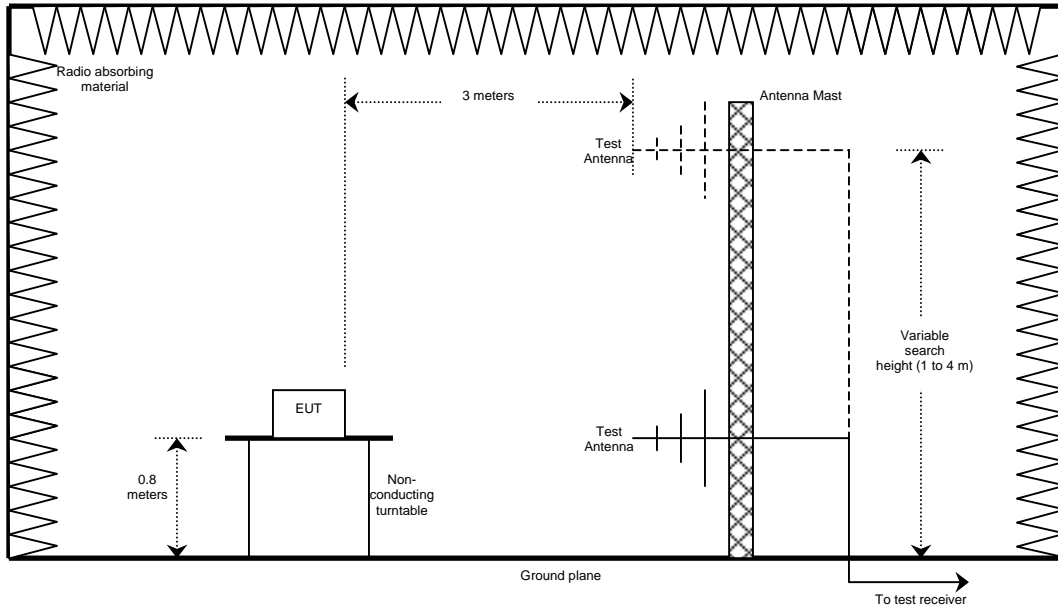
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30MHz Test Site



Conducted Emissions, Output power, Occupied Bandwidth and Out of Band Rejection

