Nemko USA, Inc.
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CERTIFICATION TEST REPORT
PART 15.247C
IC RSS-210

For The Keyfob
Model: 7652V, 7652P, 7652X

FCC ID: EZSDEI7652
IC: 1513A-7652

PREPARED FOR:

Directed Electronics, Inc
1 Viper Way
Vista, CA 92081

Prepared on: April 24, 2008

Report Number: 2008 0412226 FCC

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NEx Number: 104603

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DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	April 24, 2008	Prepared By: Alan Laudani
-	April 24, 2008	Initial Release: Alan Laudani

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on April 2, 2008.
- Testing was performed on the unit described in this report on April 2, 2008 to April 3, 2008
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), Industry Canada, NVLAP or any other government agency.

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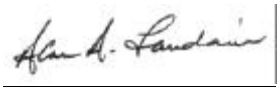
CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4–2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15). The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample.

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.



Alan Laudani
EMC Engineer

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT:	Directed Electronics, Inc 1 Viper Way Vista, CA 92081
CONTACT: E-Mail:	Minas Minassian minas.minassian@directed.com
DATE (S) OF TEST:	April 2, 2008 to April 3, 2008
EQUIPMENT UNDER TEST (EUT):	Keyfob
MODEL:	7652V, 7652P, 7652X
CONDITION UPON RECEIPT:	Suitable for Test
TEST SPECIFICATION:	FCC, Part 15.247, Subpart C Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz bands and RSS 210 (Issue 7, June 2007) Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

1.2. Test Summary

Specification	***Frequency Range***	***Compliance Status***
FCC, CFR 47, Section 15.207	0.15 MHz - 30.00 MHz	PASS
FCC, CFR 47, Section 15.209	30 MHz – 10th Harmonic	PASS
FCC CFR 47, §15.247 Plus Bandedge	909.44 to 918.5 MHz	PASS
RSS-210 - Low Power License Exempt Radio-communication Devices (All Frequency Bands)	909.4 4to 918.5 MHz	PASS

Testing was started at 30 MHz as there are no RF signals generated below this frequency.
Refer to the test results section for further details.

2. SYSTEM CONFIGURATION

2.1. Description and Method of Exercising the EUT

The 7652V, 7652P, 7652X is a Keyfob. The EUT is a hand held transmitter used as a remote control for vehicle security/convenience systems. It's comprised of a PCB which has an MCU, Battery, user interface (switches and LED display) and RF circuitry.

When a user activates a command with one of the EUT switches, the command is interpreted by the MCU which generates the data packets to be transmitted and controls the RFIC to generate the hopping sequence for as long as the user presses the button. When there are no buttons pressed, the EUT goes into sleep mode waiting for the next user switch press to wake-up and begin the code hopping transmission again.

The Transmission is achieved via a soldered on helical antenna on the PCB.
This design employs 25 channels which operate in the 902MHz to 928MHz band. Each channel has a 20dB BW greater than 250KHz but less than 500KHz.

2.2. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Keyfob	Directed Electronics, Inc Model: 7652V, 7652P, 7652X Serial #: NA	

2.3. Device Interconnection and I/O Cables

Connection	I/O Cable
No Connections	

2.4. Design Modifications for Compliance

The following design modifications were made to the EUT during testing.

No design modifications were made to the EUT during testing.

2.5. Technical Specifications of the EUT

Manufacturer: Directed Electronics, Inc

Operating Frequency: 909.44 to 918.5 MHz in the 902to 928MHz

Rated Power: 10 dBm

Modulation: FSK

Antenna Data: Integral antenna: helical wire soldered circuit board

Antenna Connector: None

Power Source: 3 V battery

3. DESCRIPTION OF TEST SITE AND ENVIRONMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-2001 documents. The OATS normalized site attenuation characteristics are verified for compliance every year, and registered with the Federal Communications Commission under Registration Number 90579 and Industry Canada under 2040B-1 and 2040B-2.

3.2. Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	17 – 22 ^{o}C
Humidity range	:	29 - 30%
Pressure range	:	87 - 105 kPa
Power supply range	:	120VAC 60Hz (±15%)

4. DESCRIPTION OF TESTING METHODS

4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document ANSI C63.4–2003, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

4.2. Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The EUT is powered via a Line Impedance Stabilization Network (LISN). The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 kHz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

4.3. Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Incoming power lines are filtered using a 120 dB, 30-ampere; 115/208-volt filter to assist in reducing ambient signals for tests of levels of conducted emissions. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency which is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed, the EUT's signal is centered on the analyzer, the scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

4.4. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4–2003 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/m
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dB/m

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dB/m (antenna factor @ frequency)
36.9 dBuV/m Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

5. Test Results

5.1. Bandwidth

RSS-210 Annex 8.1(4)

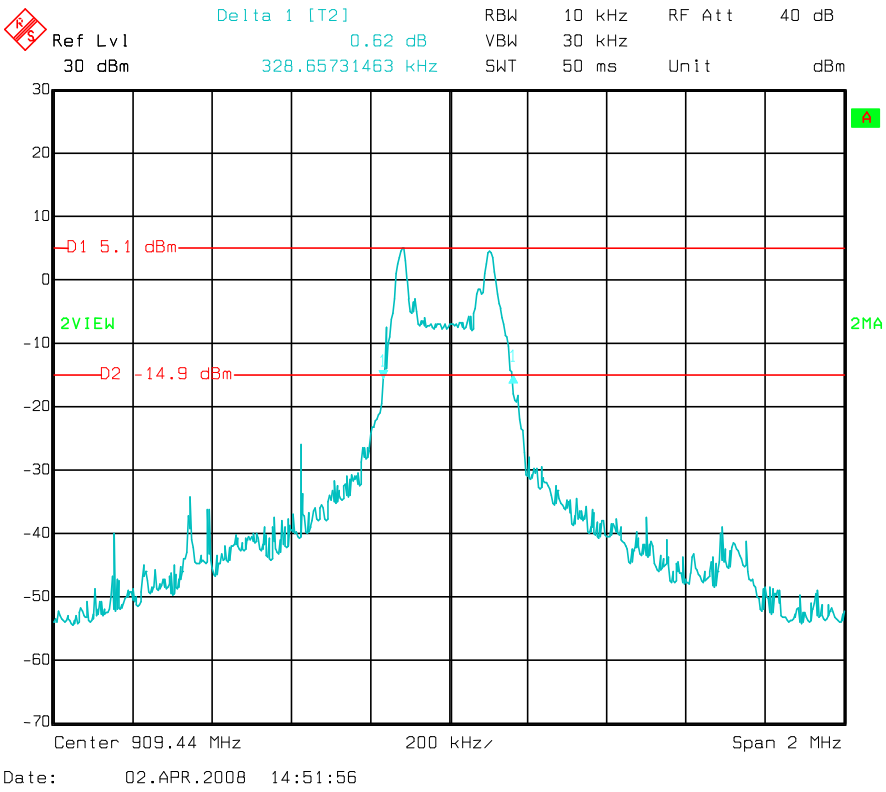
(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power now greater than 125mW.

15.247(a)(1)

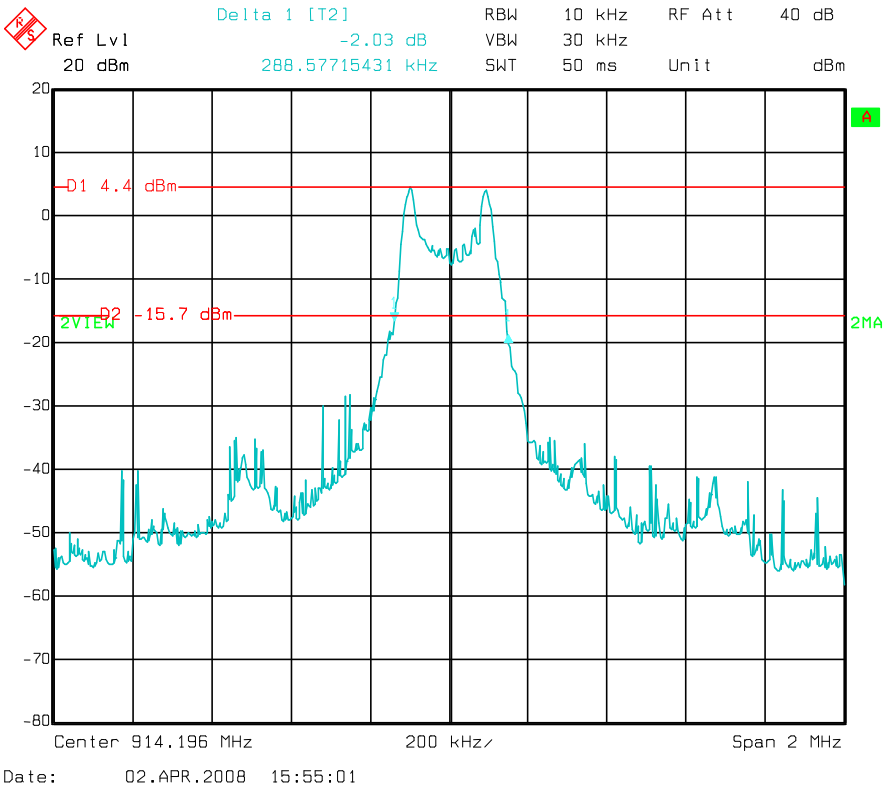
Test Results:

20 dB Bandwidth		
Low Channel	**Mid Channel**	**High Channel**
328.6 kHz	288.5 kHz	280.5 kHz

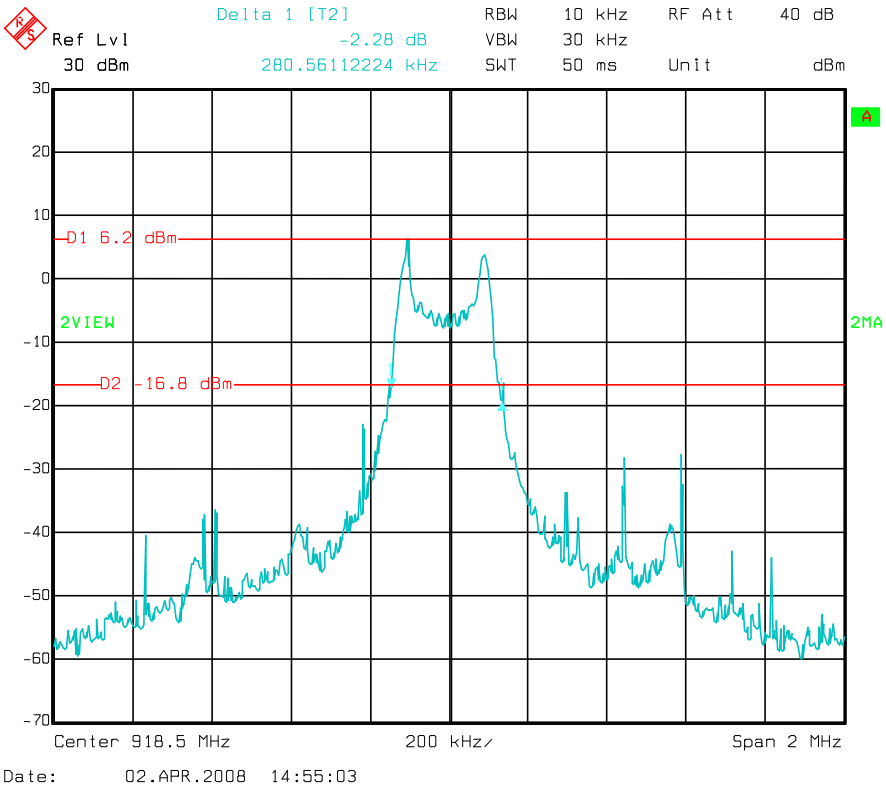
Low Channel


Delta 1 [T2]
RBW 10 kHz
RF Att 40 dB
Ref Lvl
0.62 dB
VBW 30 kHz
30 dBm
328.65731463 kHz
SWT 50 ms
Unit dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
A
D1 5.1 dBm
2VIEW
2MA
D2 -14.9 dBm
Center 909.44 MHz
200 kHz/
Span 2 MHz
Date: 02.APR.2008 14:51:56

Mid Channel


Delta 1 [T2]
-2.03 dB
288.57715431 kHz
RBW 10 kHz
VBW 30 kHz
SWT 50 ms
RF Att 40 dB
Unit dBm
Ref Lvl
20 dBm
D1 4.4 dBm
D2 -15.7 dBm
2VIEW
A
2MA
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 914.196 MHz
200 kHz/
Span 2 MHz
Date: 02.APR.2008 15:55:01

High Channel

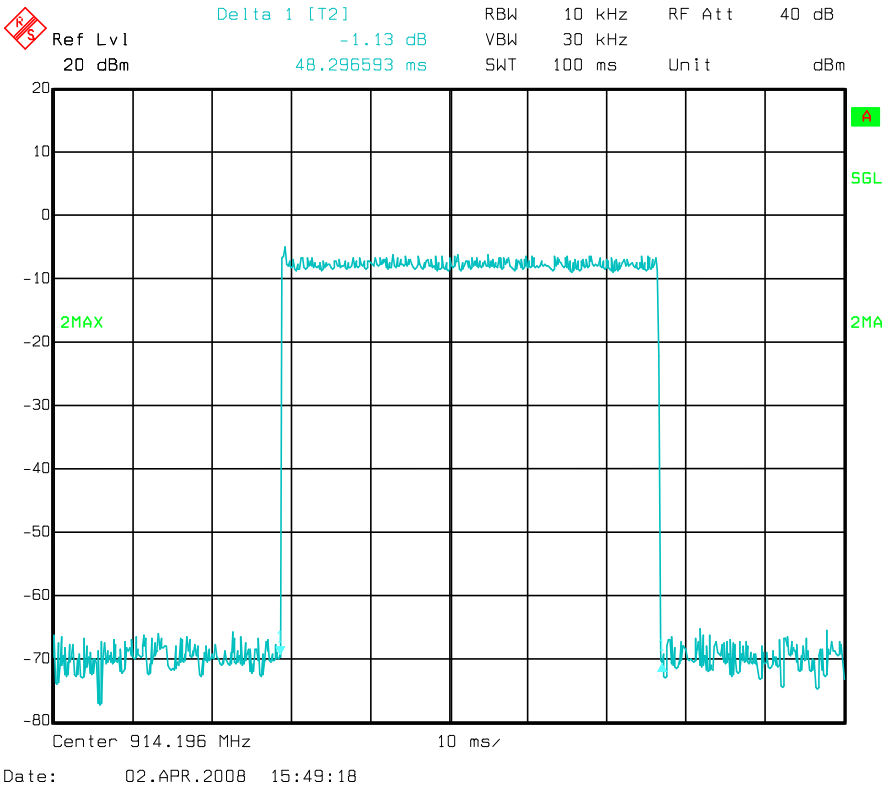


5.2. Duty Cycle Measurement

RSS-210 Annex 8.1(4)
Duty cycle = 48.3 microseconds in 100ms
Duty cycle = 0.483
Duty Cycle Factor = 20*log(.483) = -6.32dB

Test Conditions:

Sample Number:	NA	**Temperature:**	74°F
Date:	4/2/08	**Humidity:**	60%
Modification State:	Mid Channel	**Tester:**	**Alan Laudani**
		Laboratory:	Nemko



5.3. Time of Occupancy

Clause 15.247(a)(1)(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, **the system shall use at least 25 hopping frequencies** and **the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.** The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

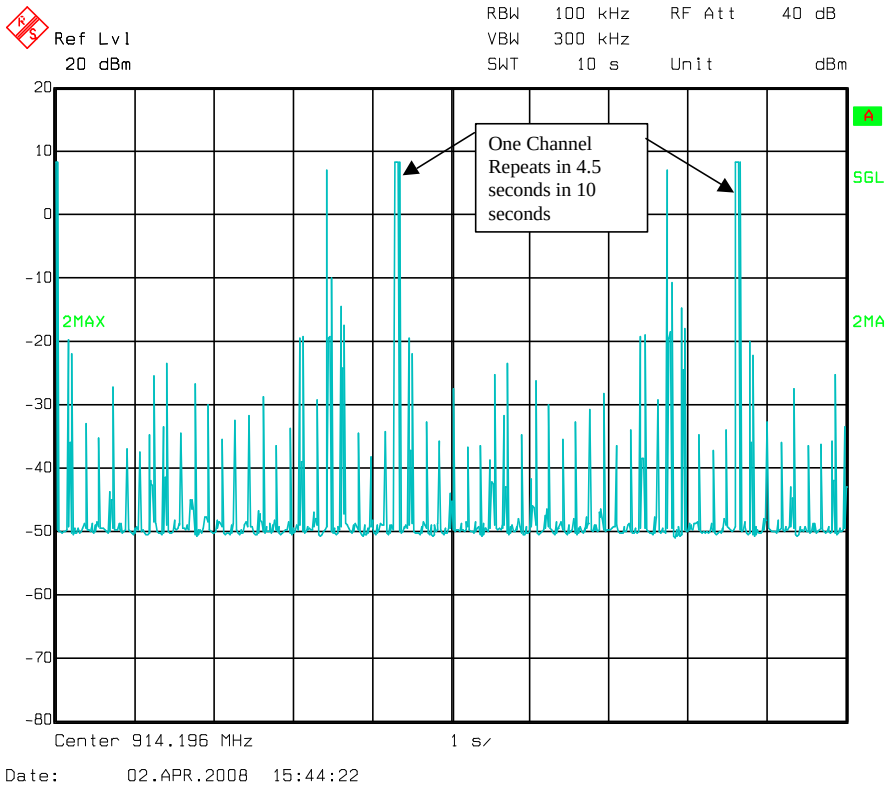
Test Conditions:

Sample Number:	NA	**Temperature:**	74°F
Date:	4/2/08	**Humidity:**	60%
Modification State:	Mid Channel	**Tester:**	**Alan Laudani**
		Laboratory:	Nemko

Test Results:

The EUT was placed 3m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 100 kHz. The test sample was set to hopping mode and the frequency span was set zero centered on a hopping channel. The sweep was set to 10 seconds.

2 occurrences in 10 seconds x 48.3 ms = 96 ms which is less than 400 ms
EUT complies.
Duty Cycle Factor Calculation
Since there is an emission for each channel 48.3ms in 200 ms and no repeat for 4.5 seconds, one could conclude that a duty cycle exists 48.3ms per 100 ms or 48.3%. Duty cycle factor is 20 x Log(duty cycle) = 20 x log (.488) = -6.32. Round to –6.3 as measurements are to nearest 0.1. Actual duty cycle would be less. Use of a Keyfob transmitter for remote control devices like garage door openers, automobile alarm systems, etc. imply intermittent use over time.


RBW 100 kHz
RF Att 40 dB
VBW 300 kHz
SWT 10 s
Unit dBm
Ref Lvl
20 dBm
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
2MAX
A
SGL
2MA
One Channel Repeats in 4.5 seconds in 10 seconds
Center 914.196 MHz
1 s/
Date: 02.APR.2008 15:44:22

5.4. Channel Separation

Clause 15.247(a)(1) **Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.** Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

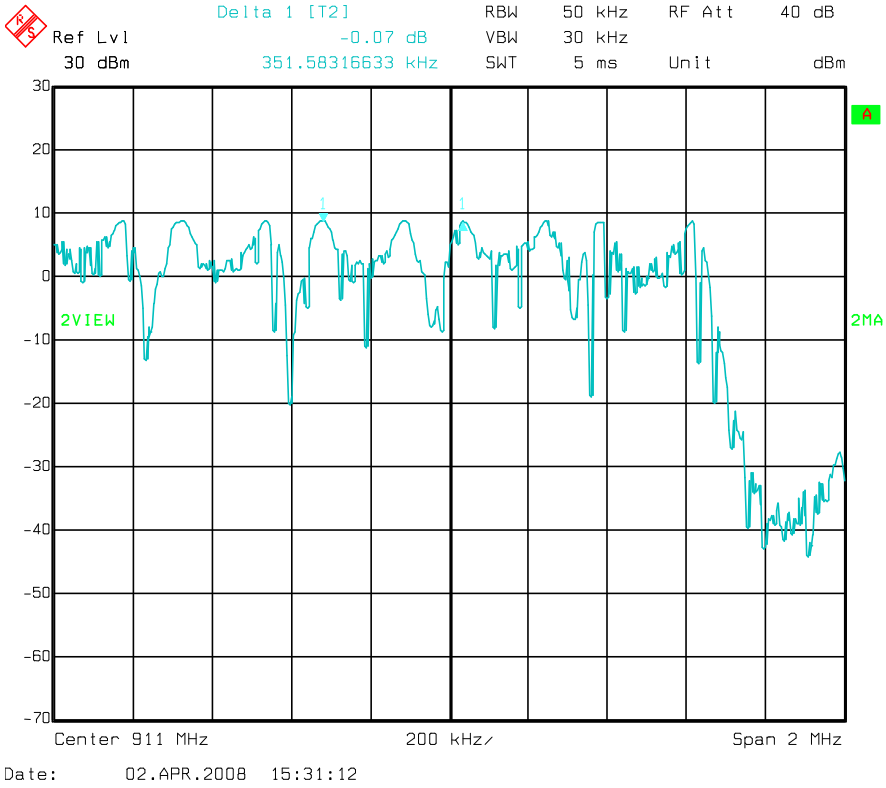
Test Conditions:

Sample Number:	NA	**Temperature:**	74°F
Date:	4/2/08	**Humidity:**	60%
Modification State:	Two or more Channels	**Tester:**	**Alan Laudani**
		Laboratory:	Nemko

Test Results:

The EUT was placed 3m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 10 kHz. The test sample was set to hopping mode and the frequency span was set to a value to capture two or more hopping channels. Marker delta shows frequency separation.

Channel Separation equal to the 20 dB bandwidth.
351.5kHz



5.5. Frequency Plan

Clause 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. **The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.**

Test Conditions:

Sample Number:		**Temperature:**	74°F
Date:	7-30-07	**Humidity:**	60%
Modification State:	Lo/Mid/High Channels	**Tester:**	**Alan Laudani**
		Laboratory:	Nemko

Test Results:

The Frequency Plan is discussed in the Technical Description exhibit and was reviewed by this test engineer and was found to comply.

5.6. Number of Hopping Channels

Clause 15.247(a)(1)(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, **the system shall use at least 25 hopping frequencies** and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

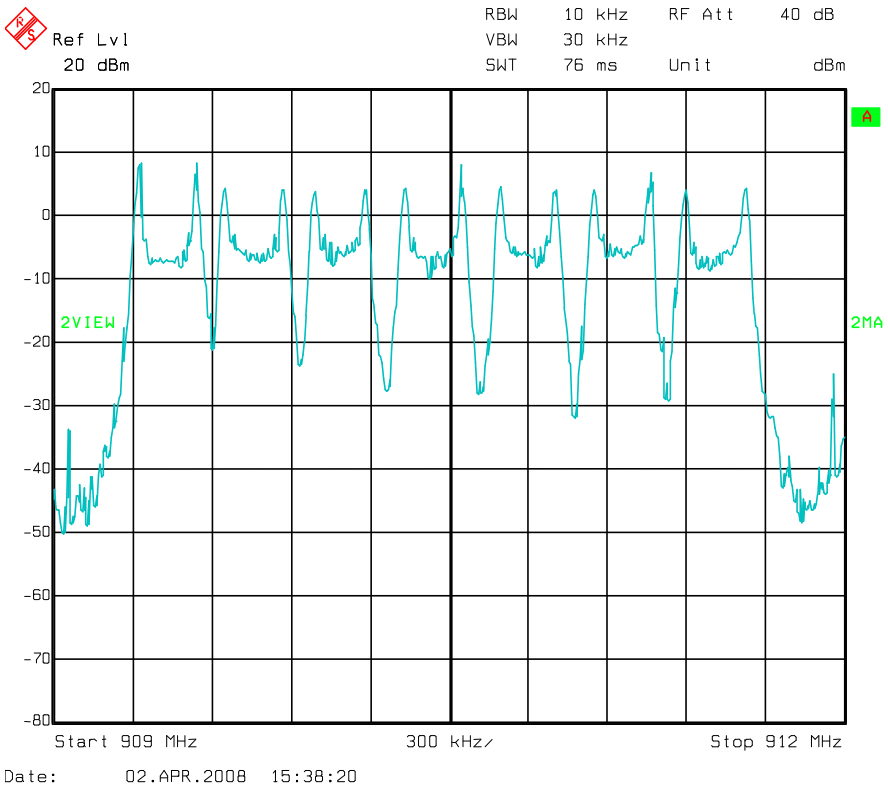
Test Conditions:

Sample Number:		**Temperature:**	74°F
Date:	7-30-07	**Humidity:**	60%
Modification State:	Lo/Mid/High Channels	**Tester:**	**Alan Laudani**
		Laboratory:	Nemko

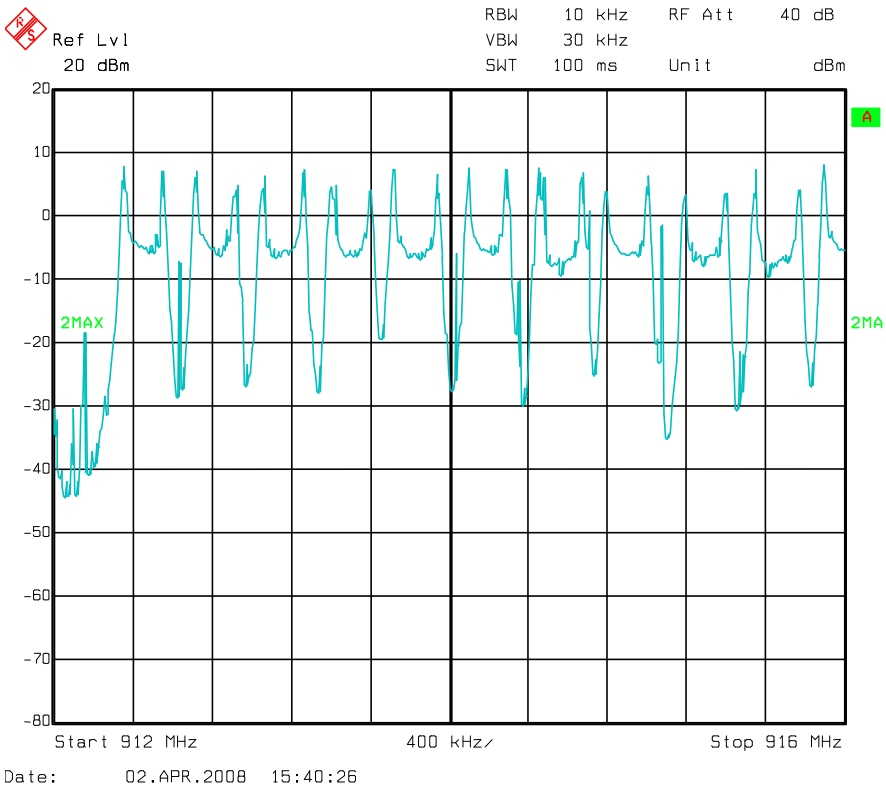
Test Results:

The EUT was placed 3m from the receiving antenna to allow a representative signal to fill the display > 30dB from the noise floor. The Spectrum Analyzer RES BW was set to 30 kHz to discriminate channels. The test sample was set to hopping mode and the frequency span was set to a value small enough to display the channels to allow counting. Three continuous scans show the complete band from 902 MHz to 928 MHz and 25 channels are evident.

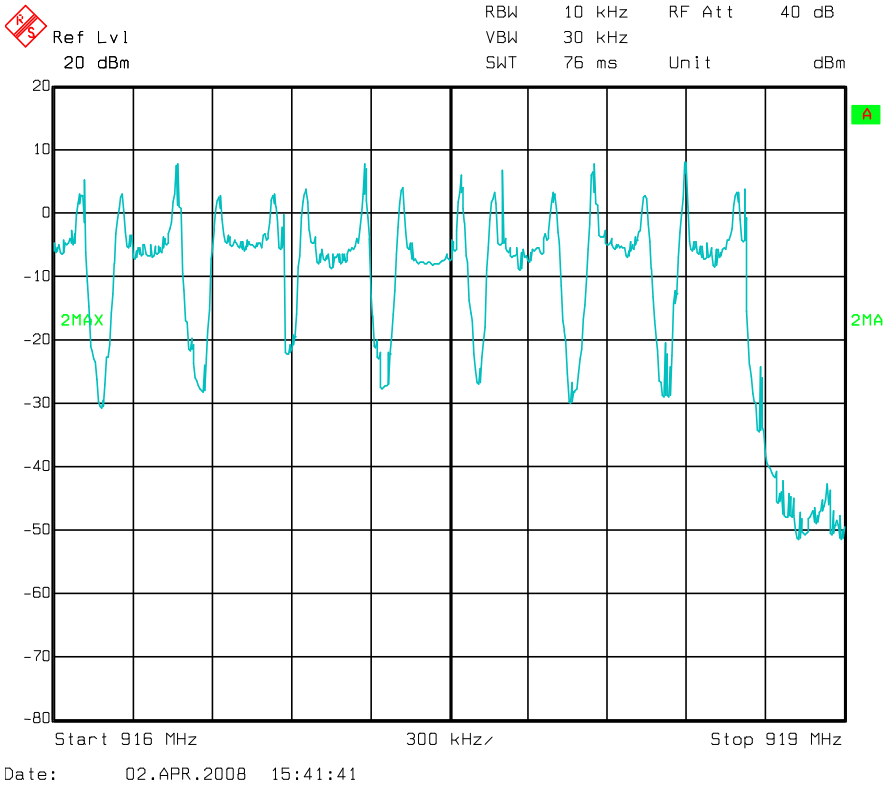
7 Hopping channels



10.5 Hopping Channels



7.5 Hopping Channels
7 + 10.5 + 7.5 = 25 Hopping Channels



5.7. Radiated Emissions Test Data

Clause 15.209(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 (uV/meter)	Measurement Distance (meter)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a) must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

Test Conditions:

Sample Number:		**Temperature:**	
Date:	4-3/-8	**Humidity:**	
Modification State:	Lo/Mid/High Channels	**Tester:**	A. Laudani
		Laboratory:	SOATS

Test Results: See Table Below

Additional Observations:

Emissions were searched over a range of 30 MHz to 10000 MHz
Three orthogonal axes were tried to maximize emissions. Worst case was used in measurements presented.
A new battery was installed initially and replaced every 20 minutes of test time.
There are no emissions found that apply to the restricted bands defined in FCC Part 15 Subpart C, 15.205.
Measurements below 1GHz were performed at 3m with a Quasi-Peak detector while Peak and Average detectors were used above 1GHz.
As the emission is pulsing, a duty cycle factor was introduced to spurious harmonics
OATS: IC Site #: 2040B-1; RN#: 90579

Example Frequency = 3674 MHz
52.4 dBµV (Peak spectrum analyzer reading)
-6.3 dB Duty Cycle Factor
+11.0 dB (cable loss @ frequency)
+31.9 dB/m (antenna factor @ frequency)
-36.4 dB (PreAmp Gain @ frequency)
52.6 dBµV/m Final adjusted value

7652VPX is prototype model number for the models 7652V, 7652P, 7652X

Radiated Emissions Data

Job # :	12226-1	Date :	4/2/08	Page	1 of 1
NEX #:	104604	Time :	1300 om		
		Staff :	aal		
Client Name :	Directed Electronics			EUT Voltage :	3 V
EUT Name :	Keyfob			EUT Frequency :	battery
EUT Model # :	7652VPX			Phase:	
EUT Serial # :	NA			NOATS	
EUT Config. :	Transmitting			SOATS	X
				Distance < 1000 MHz:	3 m
				Distance > 1000 MHz:	3 m
Specification :	CFR47 Part 15, Subpart C, 15.205				
Loop Ant. #:	NA				
Bicon Ant.#:	128	Temp. (°C) :	16		
Log Ant.#:	110	Humidity (%) :	46		
DRG Ant. #	529	Spec An.#:	911		
Cable LF#:	60ft	Spec An. Display #:	911		
Cable HF#:	60ft	QP #:	911		
Preamp LF#:	901	PreSelect#:	NA		
Preamp HF#	317	dcf	-6.30		

Quasi-Peak	RBW:	120 kHz	
	Video Bandwidth	300 kHz	
Peak	RBW:	1 MHz	
	Video Bandwidth	3 MHz	
Average	Peak + DCF		

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
902.0	29.3	31.3	Q	-	1.0	31.3	26.5	46.0	-19.5	Pass	
928.0	32.2	32.0	Q	-	2.0	32.2	28.9	46.0	-17.1	Pass	
				-							
909.4				-							
3637.8	50.8	49.1	P	-	1.0	50.8	57.3	74.0	-16.7	Pass	
3637.8	44.5	42.8	A	-	1.0	44.5	51.0	54.0	-3.0	Pass	
914.196											
3673.8	50.1	50.5	P	-	1.1	50.5	57.0	74.0	-17.0	Pass	
3673.8	43.8	44.2	A	-	1.1	44.2	50.7	54.0	-3.3	Pass	
918.5											
3674.0	52.4	50.2	P	-	1.0	52.4	58.9	74.0	-15.1	Pass	
3674.0	46.1	43.9	A	-	1.0	46.2	52.6	54.0	-1.3	Pass	

5.8. Conducted Output Power

RSS-210 Annex 8.4(2)
(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system-hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average of each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Conditions:

Sample Number:		**Temperature:**	72°F
Date:	4-3-8	**Humidity:**	60%
Modification State:	Lo/Mid/High Channels	**Tester:**	A. Laudani
		Laboratory:	SOATS

Test Results:

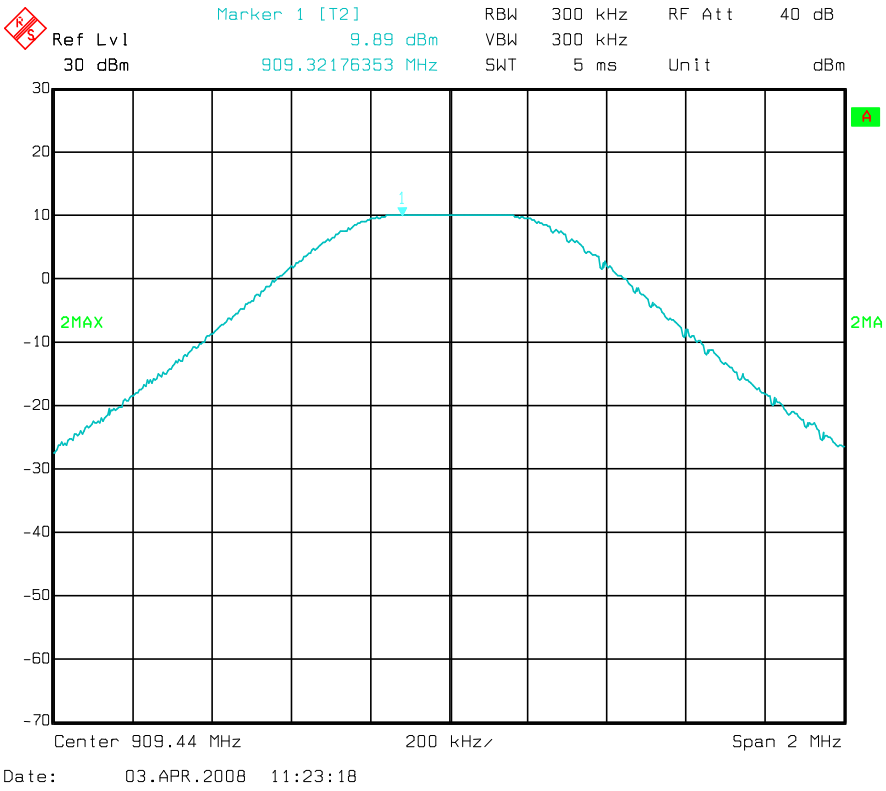
A cable was temporarily soldered across the input to the circuit comprising the antenna. Peak measurements were taken with a spectrum analyzer. Plots shown below.

Conducted Output Power dBm		
Low Channel	**Mid Channel**	**High Channel**
9.89	9.56	9.31

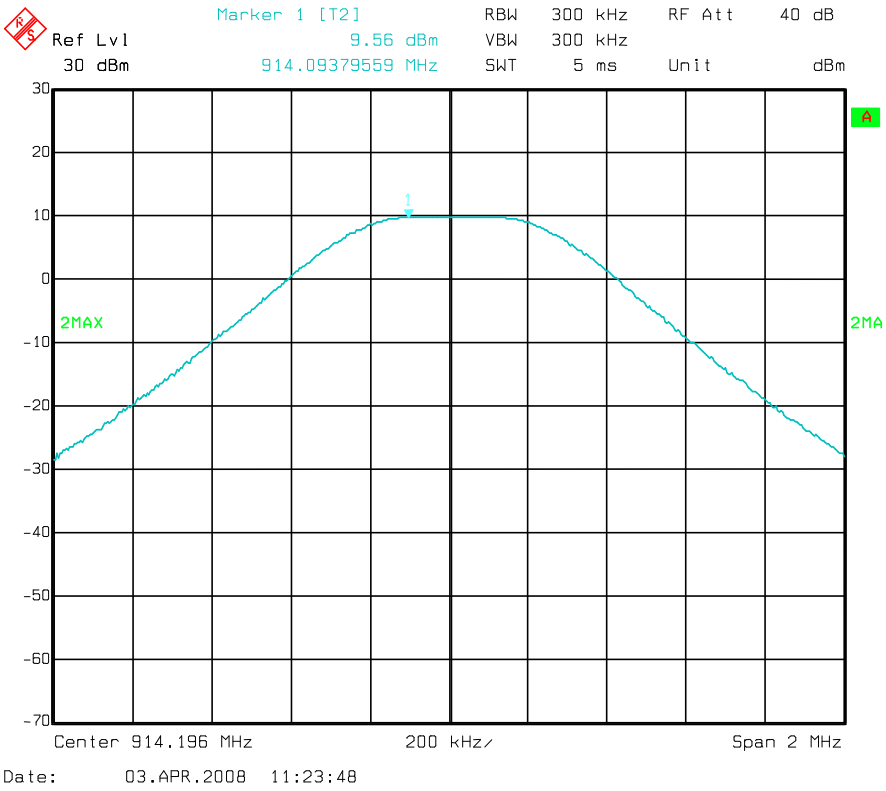
Based on Radiated Output Field Strength at 3m converted to Radiated Output Power, the antenna gains were calculated to be:

Radiated Output Power			
	Low Channel	Mid Channel	High Channel
dBuV/m(at 3m)	**104.1**	**103.3**	**102.8**
dBm	**8.84**	**8.0**	**7.5**
Antenna Gain (dB)	**-1.0**	**-1.6**	**-1.8**

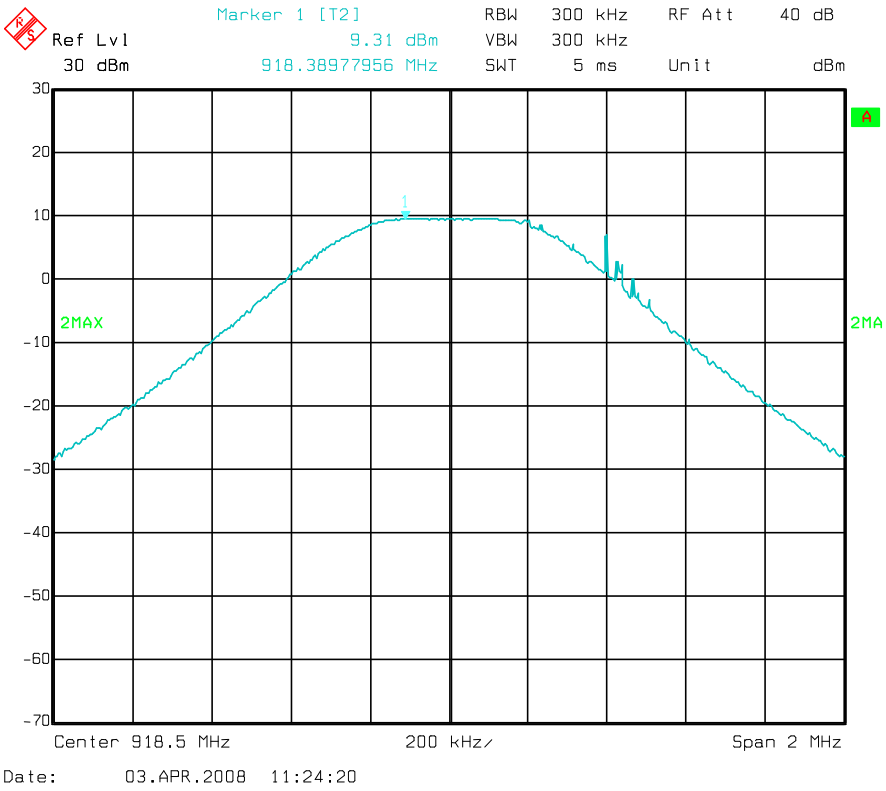
Low Channel.


Marker 1 [T2]
Ref Lvl
30 dBm
9.89 dBm
909.32176353 MHz
RBW 300 kHz
VBW 300 kHz
SWT 5 ms
RF Att 40 dB
Unit dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
2MAX
2MA
A
Center 909.44 MHz
200 kHz/
Span 2 MHz
Date: 03.APR.2008 11:23:18

Mid Channel.


Marker 1 [T2]
9.56 dBm
914.09379559 MHz
RBW 300 kHz
VBW 300 kHz
SWT 5 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
2MAX
2MA
A
Center 914.196 MHz
200 kHz/
Span 2 MHz
Date: 03.APR.2008 11:23:48

High Channel.



5.9. Conducted Spurious

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a) must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

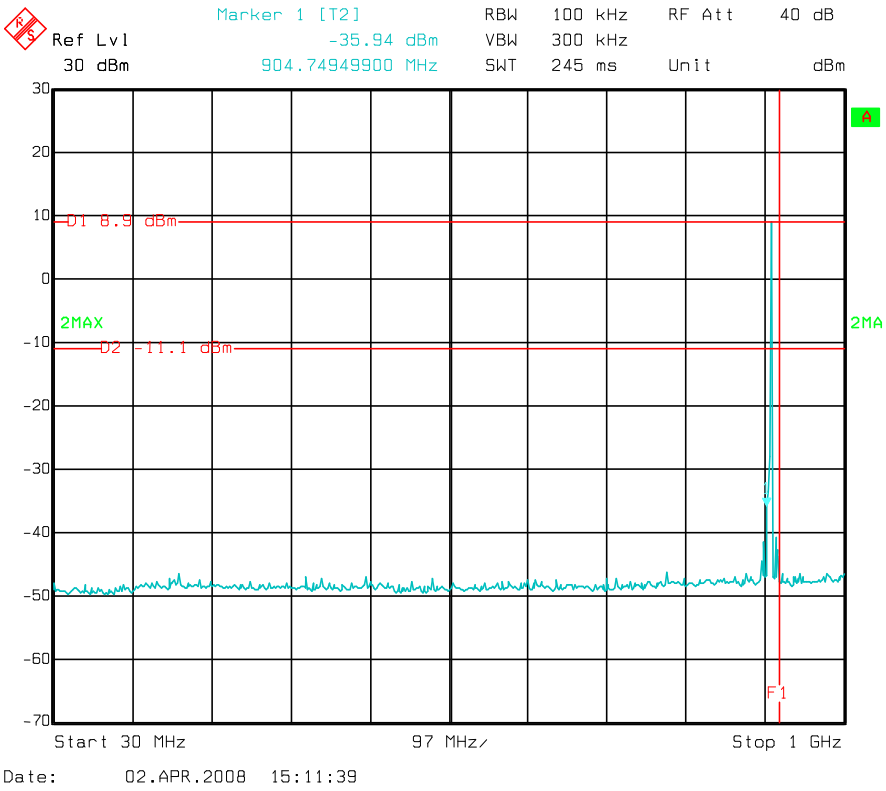
Test Conditions:

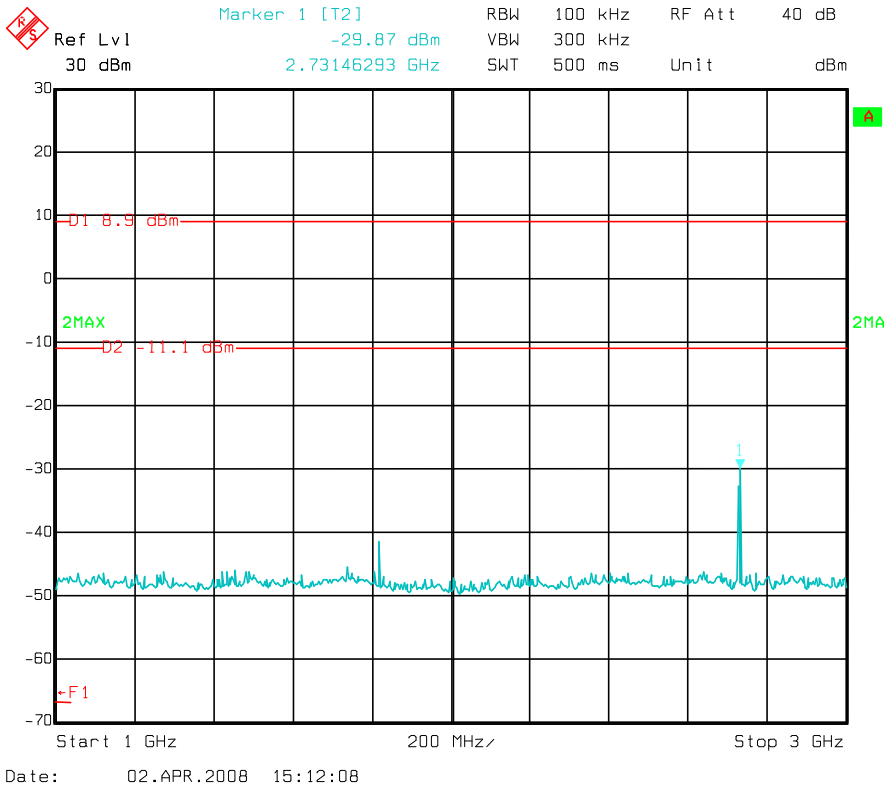
Sample Number:		**Temperature:**	72°F
Date:	4-3-8	**Humidity:**	60%
Modification State:	Lo/Mid/High Channels	**Tester:**	A. Laudani
		Laboratory:	SOATS

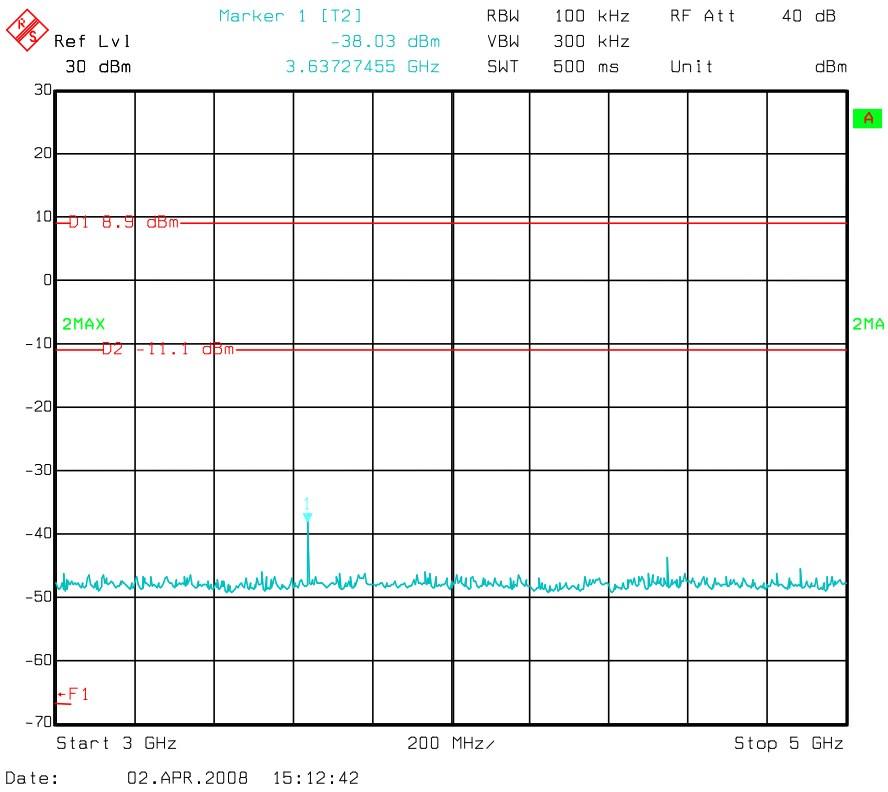
Test Results:

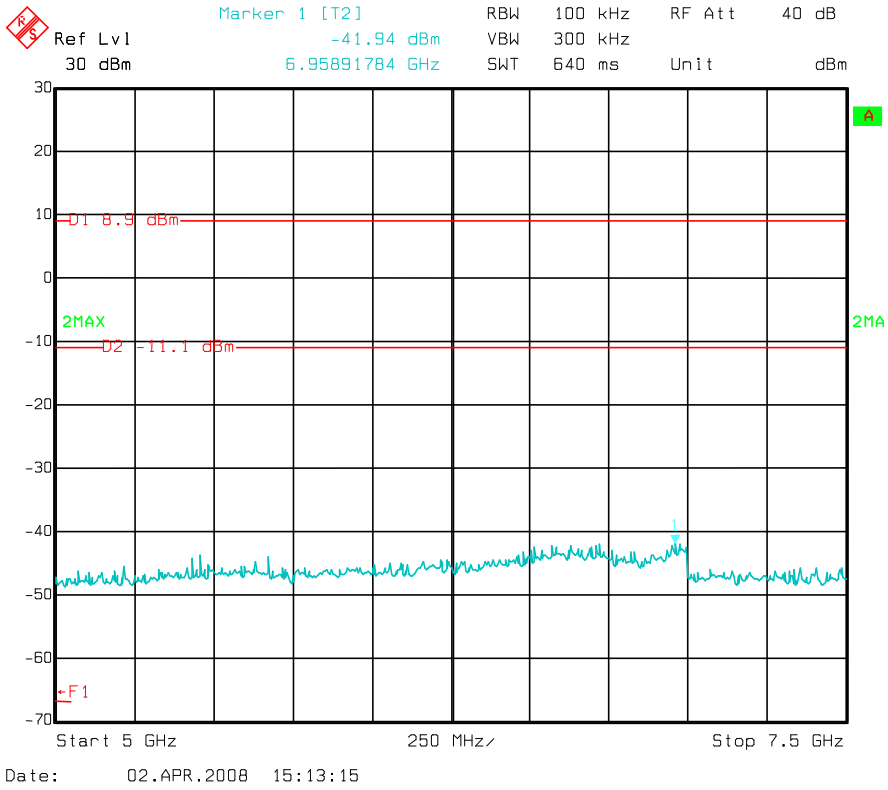
A cable was temporarily soldered across the input to the circuit comprising the antenna. Peak measurements were taken with a spectrum analyzer. Plots shown below. Limit line inserted at 20 dBc.

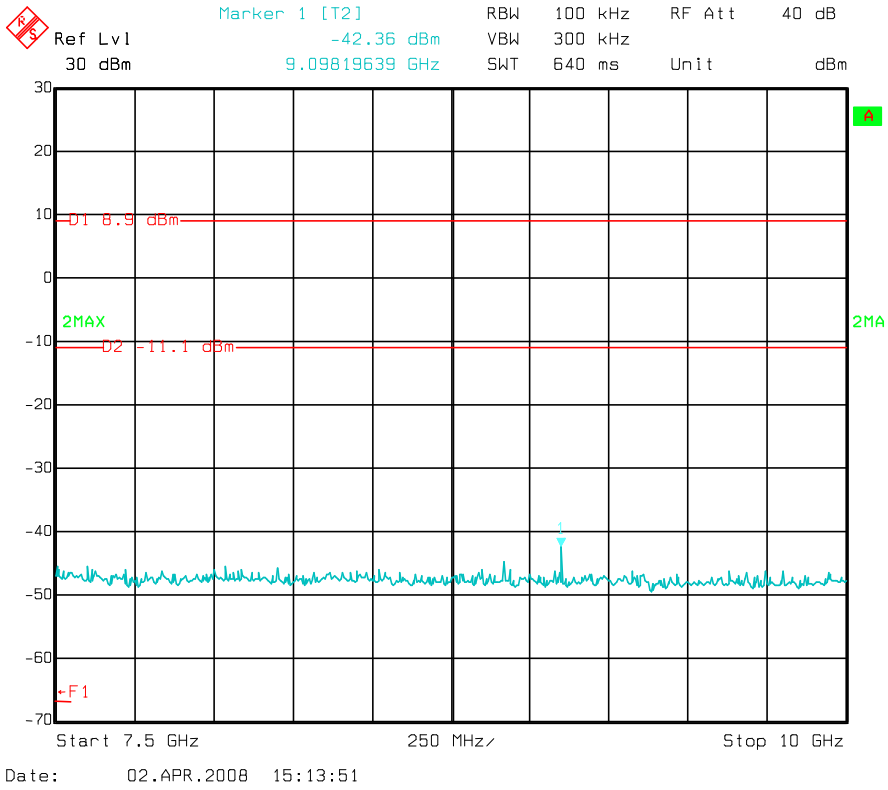
Low Channel.


Marker 1 [T2]
-35.94 dBm
904.74949900 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.9 dBm
2MAX
D2 -11.1 dBm
A
2MA
F1
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 02.APR.2008 15:11:39

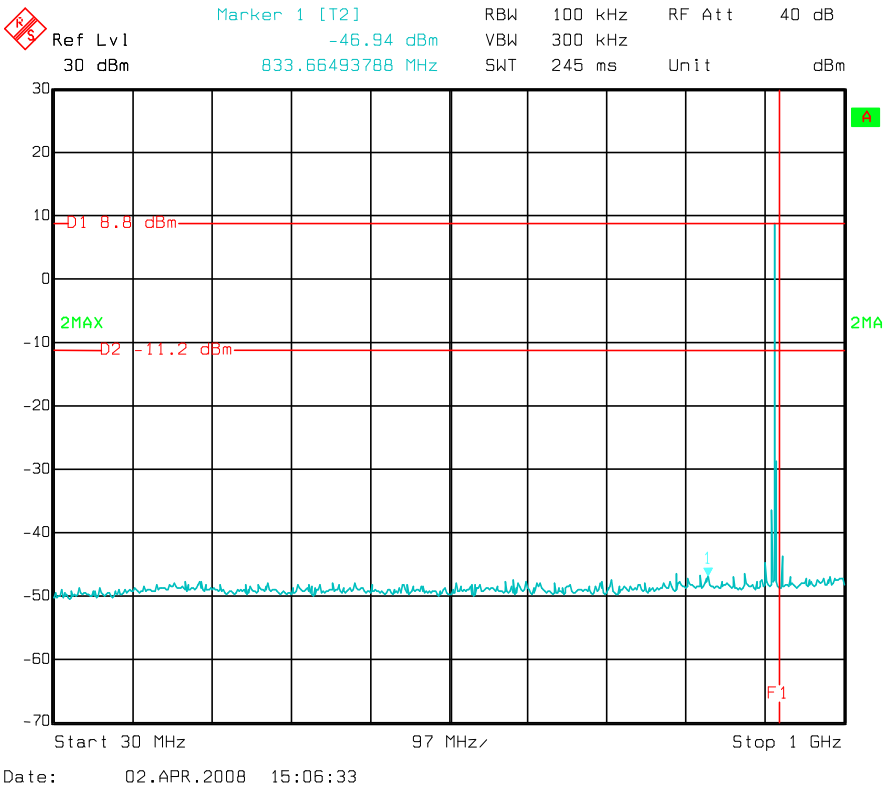

Marker 1 [T2]
Ref Lvl
30 dBm
-29.87 dBm
2.73146293 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
D1 8.9 dBm
2MAX
D2 -11.1 dBm
2MA
A
F1
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 02.APR.2008 15:12:08

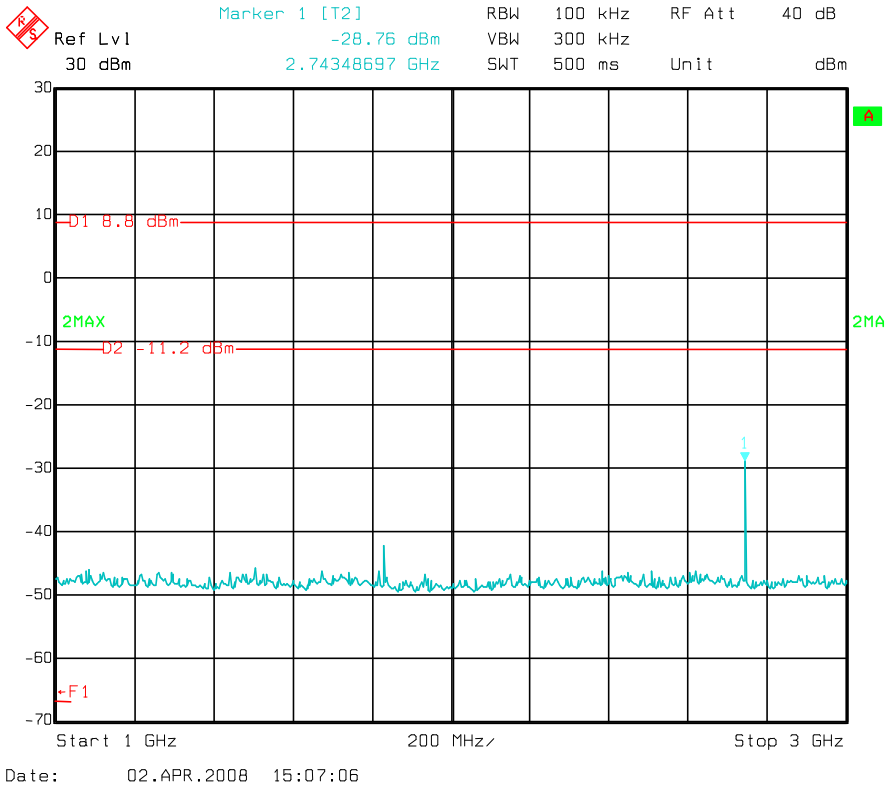

Marker 1 [T2]
-38.03 dBm
3.63727455 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.9 dBm
2MAX
D2 -11.1 dBm
2MA
A
1
F1
Start 3 GHz
200 MHz/
Stop 5 GHz
Date: 02.APR.2008 15:12:42

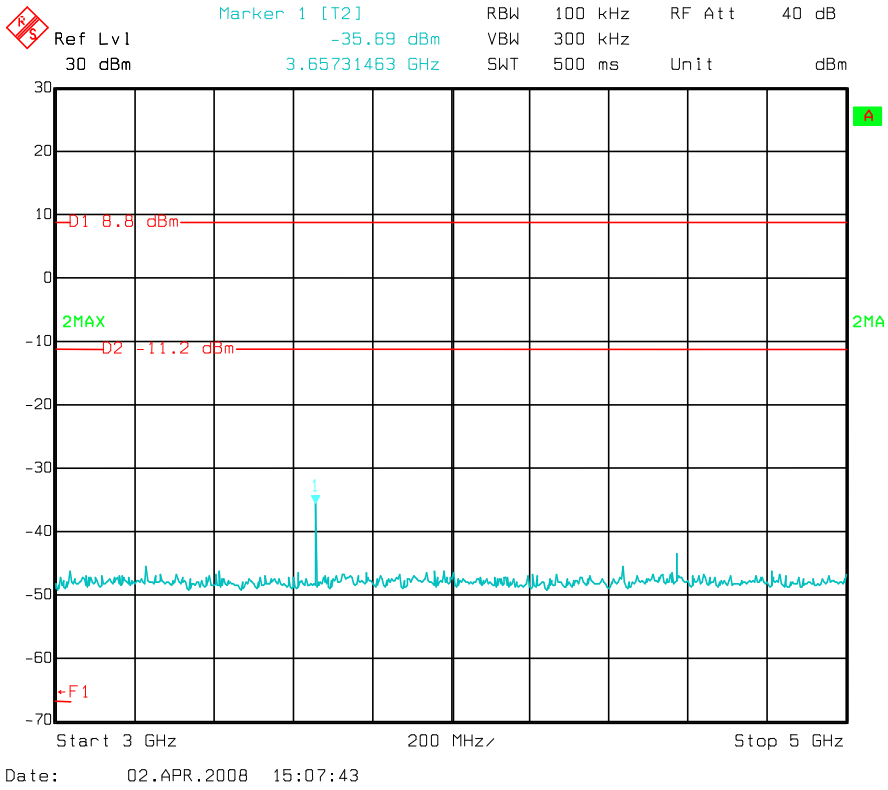

Marker 1 [T2]
-41.94 dBm
6.95891784 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.9 dBm
D2 -11.1 dBm
2MAX
2MA
A
F1
Start 5 GHz
250 MHz/
Stop 7.5 GHz
Date: 02.APR.2008 15:13:15

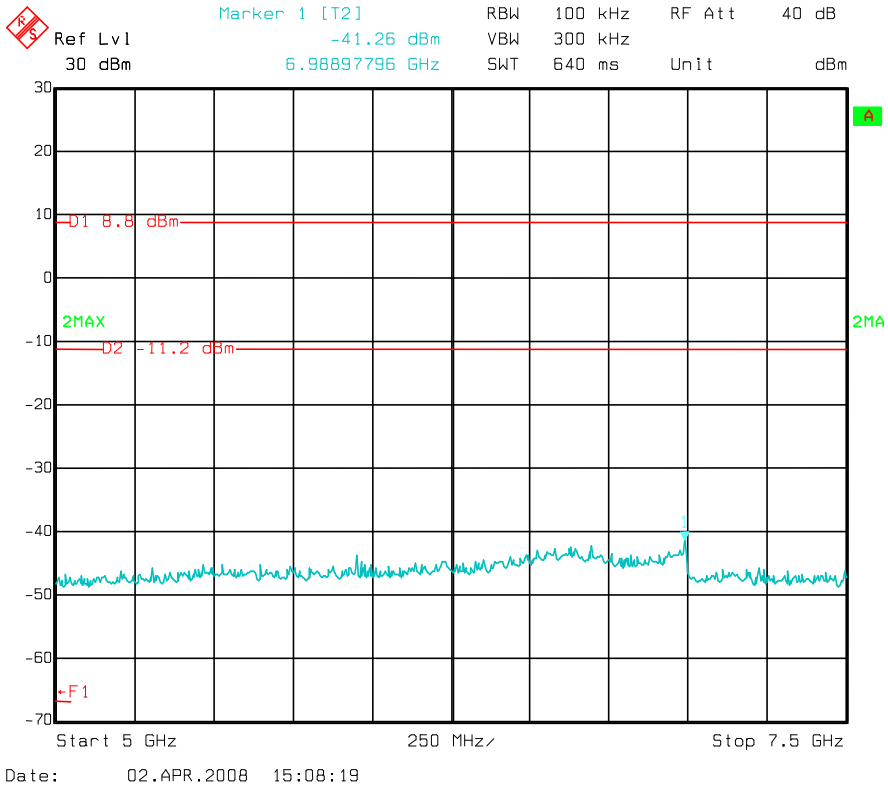

Marker 1 [T2]
-42.36 dBm
9.09819639 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.9 dBm
D2 -11.1 dBm
2MAX
A
2MA
F1
Start 7.5 GHz
250 MHz/
Stop 10 GHz
Date: 02.APR.2008 15:13:51

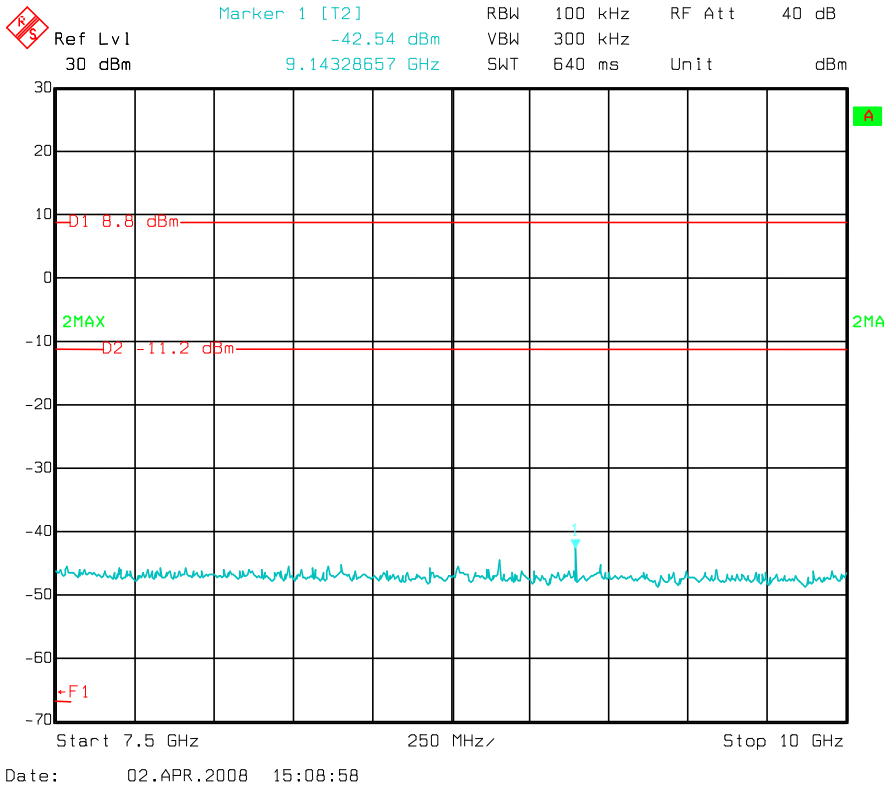
Mid Channel.


Marker 1 [T2]
-46.94 dBm
833.66493788 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.8 dBm
D2 -11.2 dBm
2MAX
2MA
A
F1
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 02.APR.2008 15:06:33

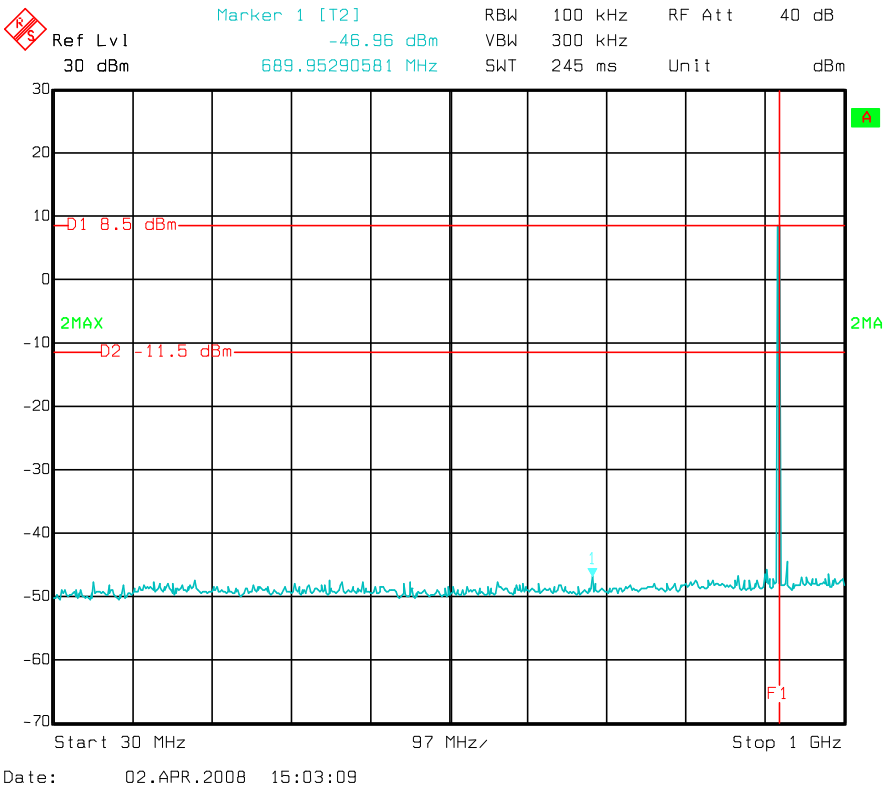

Marker 1 [T2]
-28.76 dBm
2.74348697 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.8 dBm
D2 -11.2 dBm
2MAX
2MA
A
F1
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 02.APR.2008 15:07:06

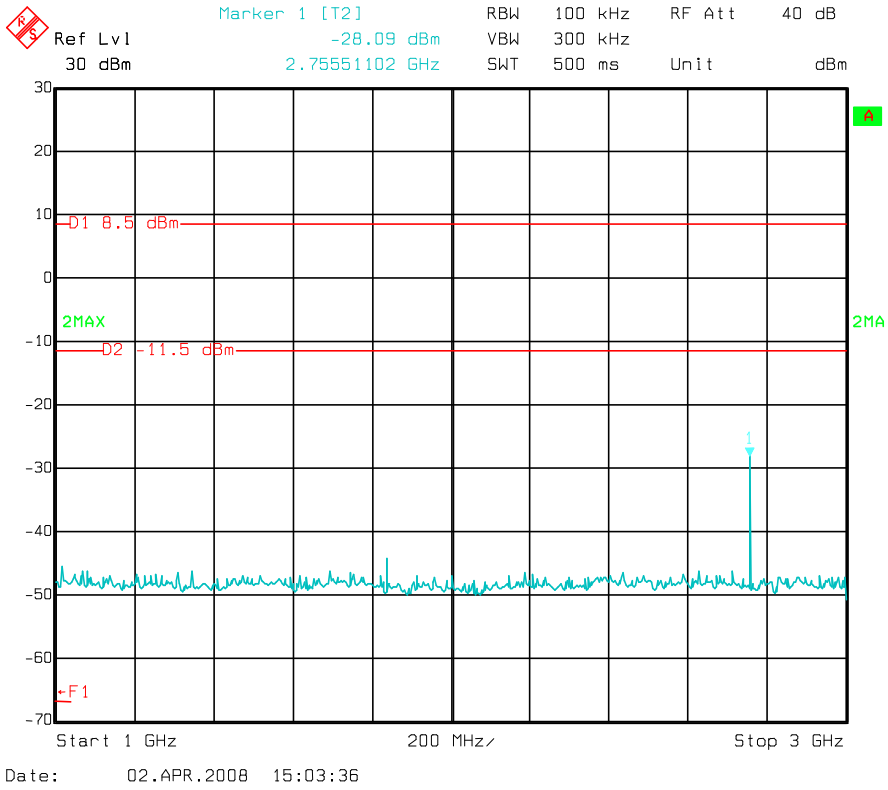

Marker 1 [T2]
-35.69 dBm
3.65731463 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.8 dBm
D2 -11.2 dBm
2MAX
2MA
A
F1
Start 3 GHz
200 MHz/
Stop 5 GHz
Date: 02.APR.2008 15:07:43

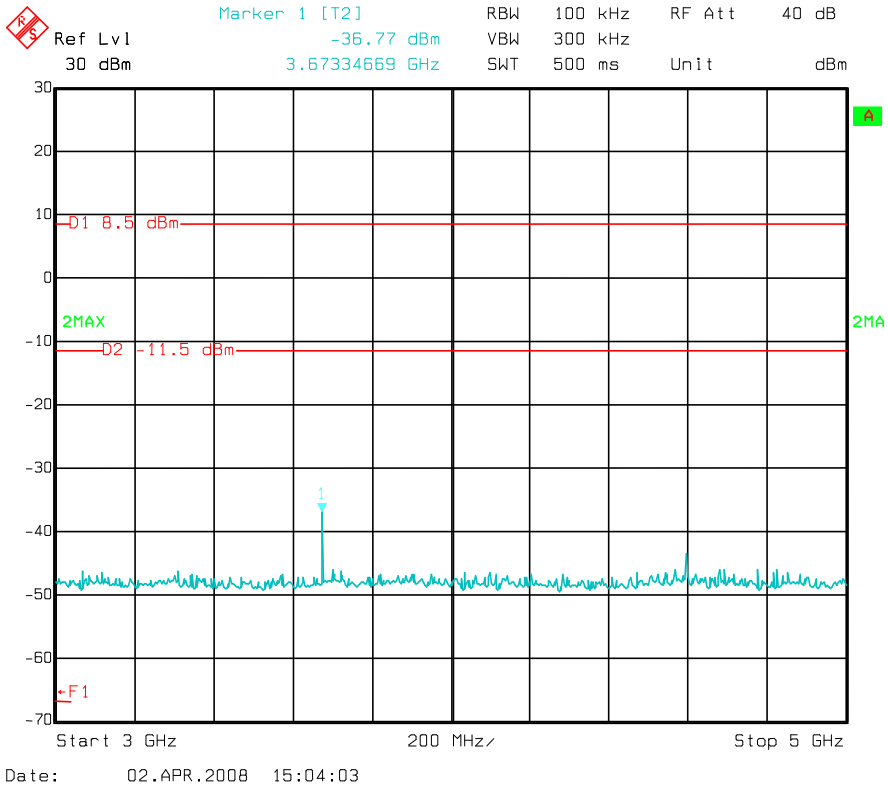

Marker 1 [T2]
-41.26 dBm
6.98897796 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.8 dBm
D2 -11.2 dBm
2MAX
2MA
A
F1
Start 5 GHz
250 MHz/
Stop 7.5 GHz
Date: 02.APR.2008 15:08:19

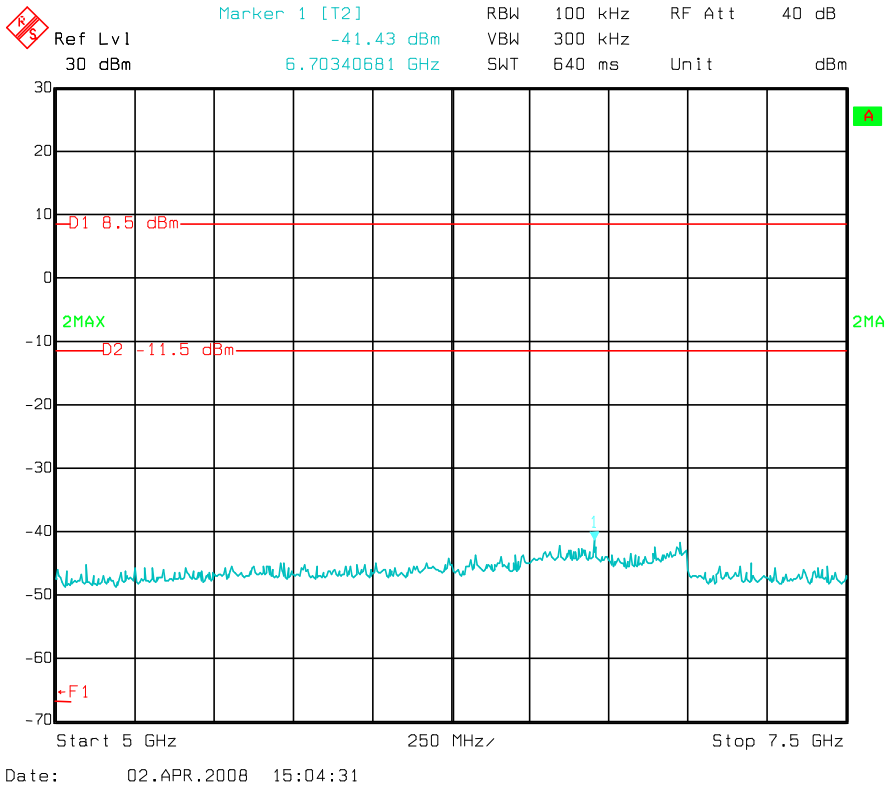

Marker 1 [T2]
-42.54 dBm
9.14328657 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.8 dBm
D2 -11.2 dBm
2MAX
2MA
A
F1
Start 7.5 GHz
250 MHz/
Stop 10 GHz
Date: 02.APR.2008 15:08:58

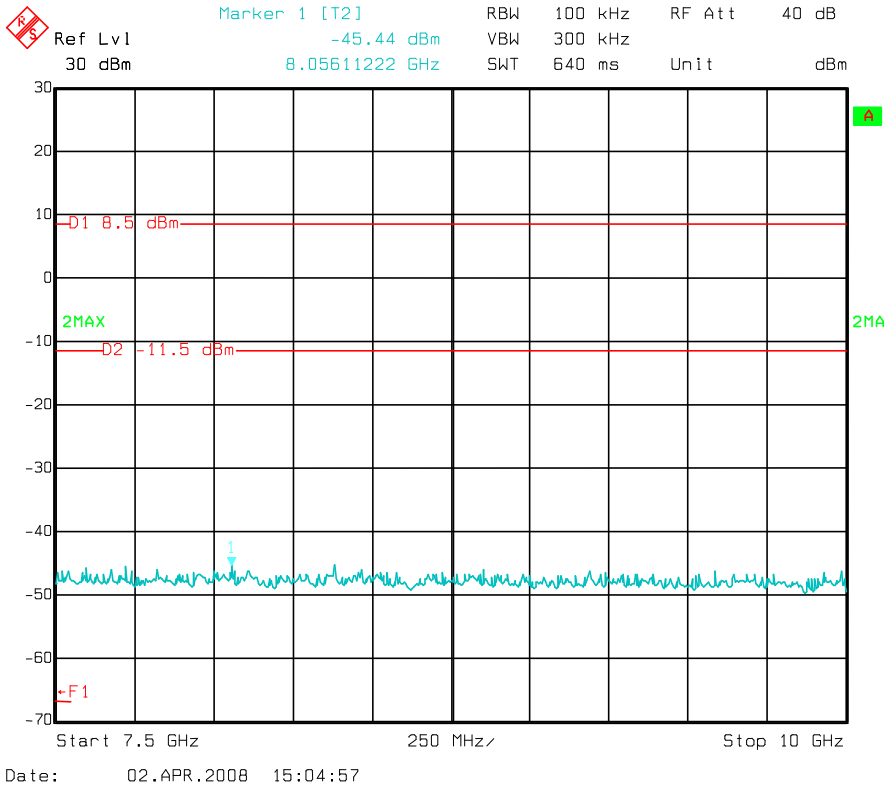
High Channel.

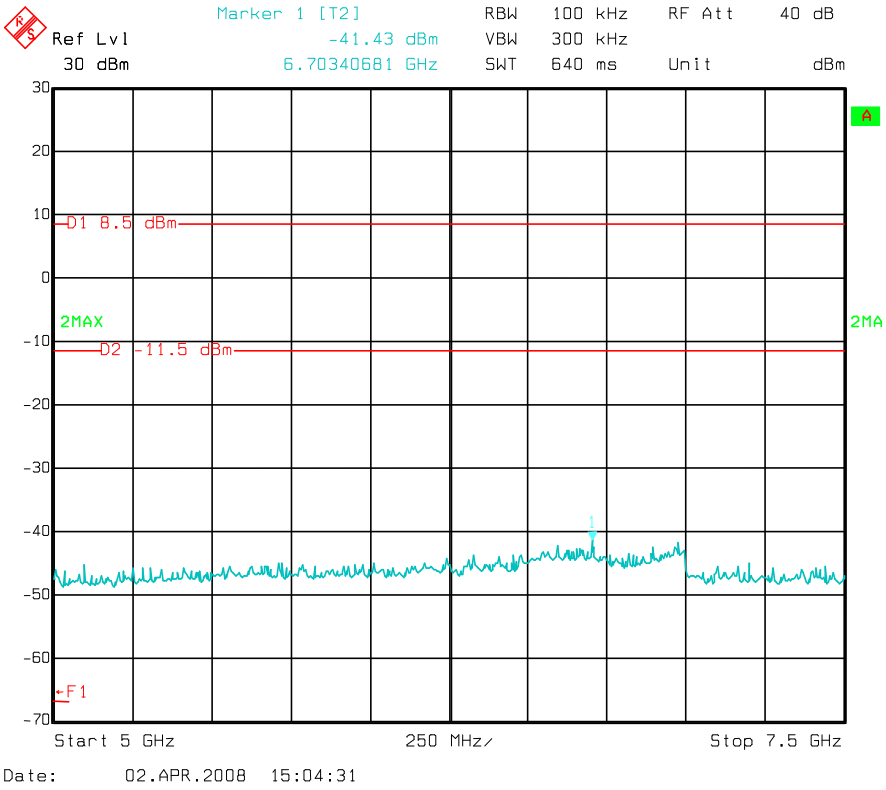



Marker 1 [T2]
Ref Lvl
30 dBm
-28.09 dBm
2.75551102 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.5 dBm
D2 -11.5 dBm
2MAX
2MA
A
1
F1
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 02.APR.2008 15:03:36


Marker 1 [T2]
-36.77 dBm
3.67334669 GHz
RBW 100 kHz
VBW 300 kHz
SWT 500 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
D1 8.5 dBm
D2 -11.5 dBm
2MAX
2MA
A
F1
Start 3 GHz
200 MHz/
Stop 5 GHz
Date: 02.APR.2008 15:04:03


Marker 1 [T2]
-41.43 dBm
6.70340681 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.5 dBm
D2 -11.5 dBm
2MAX
2MA
A
1
F1
Start 5 GHz
250 MHz/
Stop 7.5 GHz
Date: 02.APR.2008 15:04:31


Marker 1 [T2]
-45.44 dBm
8.05611222 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.5 dBm
D2 -11.5 dBm
2MAX
2MA
A
1
F1
Start 7.5 GHz
250 MHz/
Stop 10 GHz
Date: 02.APR.2008 15:04:57


Marker 1 [T2]
-41.43 dBm
6.70340681 GHz
RBW 100 kHz
VBW 300 kHz
SWT 640 ms
RF Att 40 dB
Unit dBm
Ref Lvl
30 dBm
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
D1 8.5 dBm
2MAX
D2 -11.5 dBm
A
2MA
1
F1
Start 5 GHz
250 MHz/
Stop 7.5 GHz
Date: 02.APR.2008 15:04:31

5.10. Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
128	Antenna, Bicon	EMCO	3104	2996	10-Jan-08	10-Jan-09
110	Antenna, LPA	EMCO	3146	1382	10-Jan-08	10-Jan-09
901	pre amp	Sonoma	310 N	130607	13-Mar-08	13-Mar-09
625	Antenna, Dbl Ridge Horn	EMCO	3116	2325	01-Apr-08	01-Apr-09
317	Preamp	HP	8449A	2749A00167	31-Mar-08	31-Mar-09
911	Spectrum Analyzer	Agilent	E4440A	US41421266	18-Mar-08	18-Mar-09
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	20-Jun-07	20-Jun-08
529	Antenna, DRWG	EMCO	3115	2505	27-Aug-07	27-Aug-08