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Test Report: 2007 031019 NX01 FCC

Project number: 26-1019-EXPR1

Applicant: Expertise Engineering
4186 Sorrento Valley Blvd. Suite J
San Diego, CA 92121

Equipment Under Test (EUT): GPRF Transceiver

Model: NX01

FCC ID: USI0000A

IC ID# 6835A-0000A

In Accordance With: FCC Part 15 Subpart C, 15.247
RSS-Gen, IC RSS 210 Issue 7 June 2007

Tested By: Nemko USA Inc.
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Authorized By: 
Michael T. Krumweide, EMC Supervisor

Date: JULY 23, 2007

Total Number of Pages: 46

2.2. Section 1. Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. 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.

This Radio Standards Specification (RSS) sets out the requirements for license exempt low-power intentional radiators. The applicable standard for low-power intentional radiators in Canada, corresponding to FCC Part 15 Subpart C, is RSS-210. The two are very closely harmonized in terms of permitted frequencies, types of operation, and other technical requirements. The test results reported in this report are deemed satisfactory evidence of compliance with Industry Canada Standard RSS-210.

The assessment summary is as follows:

Apparatus Assessed: GPRF Transceiver NX01

Specification: FCC Part 15 Subpart C, 15.247
IC RSS-Gen (Issue 2, June 2007)
IC RSS 210 (Issue 7, June 2007)

Compliance Status: Complies

Exclusions: None

Non-compliances: None

Report Release History:

REVISION	DATE	COMMENTS	
-	July 23, 2007	Prepared By:	Ferdinand S. Custodio
-	July 23, 2007	Initial Release:	Mike T. Krumweide

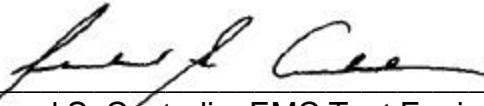
Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

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

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TESTED BY:


Ferdinand S. Custodio, EMC Test Engineer

Date: July 23, 2007

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

NX01 GPRF (General Purpose Radio Frequency) Device

Engineering sample, serial number not available during assessment

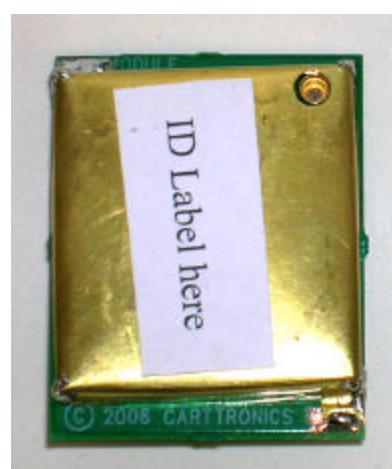
2.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
NX01 (20 dB)	NX01 Network PCBA (50445-001)	NA

2.3 Sample Description

NX01 (20 dB) - NX01 with part number 50445-001 is a 20 dB transceiver. All of the testing done on this report will be based on this unit. Final production of the EUT will have it's own shielding as shown (3rd photograph):



2.4 Theory of Operation

The NX01 is a GPRF Transceiver (General Purpose Radio Frequency) and a Zigbee RF radio device used in retail stores for shopping cart security. The EUT was exercised by fully powering on the unit and manually changing between the 16 (sixteen) available channels from 2.405GHz to 2.480GHz as test requires. There is only one default power setting.

2.5 Technical Specifications of the EUT

Manufacturer:	Expertise Engineering
Operating Frequency:	2405 to 2480 MHz in the 2400 - 2483.5 MHz Band
Emission Designator	3M42G1D
Rated Power:	0.108 watt
Modulation:	QPSK
Type of Receiver:	Heterodyne type with in-phase and quadrature components
Antenna Data:	Centurion WCP2400-MMCX8 (1.5 dBi Gain)
Antenna Connector:	MMCX
Power Source:	AC Adapter 9VDC GlobTek®, Inc. Model # GT-A81051-0509UW2 SN5105HB. This AC Adapter powers the Carttronics GPRF Board (50021-001 Rev. H) where the EUT is connected, the EUT with CC2420 chip has onboard power regulation for internal modulation and signal processing functions.

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
5725-5850 MHz and 24.0-24.25 GHz bands.

RSS-Gen General Requirements and Information for the Certification of Radio
Communication Equipment

RSS-210 Low-power License-exempt Radio Communication Devices (All
Frequency Bands): Category I Equipment

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	14 – 22 °C
Humidity range	:	26 - 32 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
674	Spectrum Analyzer	HP	2882	2007A00910	2/15/06	2/15/07
675	Spectrum Analyzer Display	HP	85662A	2005A01282	2/15/06	2/15/07
676	Quasi-Peak Adapter	HP	85650A	2430A00576	1/5/06	1/5/07
805	LISN	Solar	9348-50-R-24-BNC	992823	12/1/06	12/1/07
542	High Pass Filter	Solar	7801-5.0	838132	3/1/06	3/1/07
560	Transient Limiter	HP	11947A	2820A00502	1/18/06	1/18/07
833	Peak Power Meter	HP	HP8900D	2131A00861	3/31/06	3/31/07
117	Antenna	Electro-Metrics	BIA-25	2611	7/5/06	7/5/07
111	Antenna, LPA	EMCO	3146	1382	8/7/06	8/7/07
529	Antenna, DRWG	EMCO	3115	2505	8/31/2006	8/31/07
827	Preamplifier	Com-Power	PA-103	161032	1/11/06	1/11/07
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	6/20/06	6/20/07
842	Preamp	NA	Nemko	NA	verified	03/06/07
897	Spectrum Analyzer	Rohde & Schwarz	FSP7	837620/009	8/11/06	8/11/07
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	1/18/06	1/18/07
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	5/11/06	5/11/07
915	Spectrum Analyzer	Rohde & Schwarz	EMI Test Receiver ESI	837401/002	2/8/07	2/3/10
911	Spectrum Analyzer	Agilent	E4440A	US41421266	2/14/07	2/14/08
317	Preamplifier	HP	8449A	2749A00167	2/9/2007	02/09/08
839	Spectrum Analyzer Display	HP	85662A	3014A18995	2/27/2007	02/27/08
840	Spectrum Analyzer	HP	8566B	2416A00394	2/27/2007	02/27/08

Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

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

4.4 Test Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.

Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results and corresponding IC RSS-210 equivalent.

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 test.

N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

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

5.1 FCC Part 15 Subpart C and IC RSS-210 Equivalent: Test Results

Part 15	Test Description	Required	Result
15.247(b)(3) <i>IC RS-210 A8.4 (4)</i>	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y	Pass
15.209 (a) <i>IC RS-210 2.2/2.7</i>	Radiated Emissions within Restricted Bands	Y	Pass
15.215 (c) <i>IC RS-Gen 4.4.1</i>	Occupied Bandwidth	Y	Pass
15.247(a)(2) <i>IC RS-210 A8.2 (1)</i>	Minimum 6dB RF Bandwidth	Y	Pass
15.249 (d) <i>IC RS-210 A8.5</i>	Out-of-band Emissions	Y	Pass
15.247(e) <i>IC RS-210 A8.2 (2)</i>	Power Spectral Density for Digitally Modulated Devices	Y	Pass
2.1055 (a) <i>IC RS-210 2.1, IC RS-Gen 4.5</i>	Frequency Stability	Y	As Reported
15.207 <i>IC RS-Gen 7.2.2</i>	Transmitter and Receiver AC Power Lines Conducted Emission Limit	Y	Pass
<i>IC RS-Gen 4.8</i>	Receiver Spurious Emissions	Y	Pass

Appendix A: Test Results

Clause 15.209(a) Radiated Emissions within Restricted Bands

(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

Test Conditions:

Sample Number:	NX01	Temperature:	57.2°F
Date:	March 6, 2007	Humidity:	27 %
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
Laboratory:			OATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205. The EUT was measured on three orthogonal axis. Only worst case results reported.

Measurements below 1GHz were performed at 3m with a Quasi-Peak detector while Peak detector was used above 1GHz. Average measurements are computed using the formula $FS_{avg} = FS_{peak} \cdot 20 \log (duty\ cycle)$. Only the worst channel reported.

Radiated Emissions 30 MHz to 1000 MHz



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Radiated Emissions DataComplete X
Preliminary Job # : 26-1019-EXPR Test # : 1
Page 1 of 1Client Name : Expertise EngineeringEUT Name : GPRFEUT Model # : NX01 TransmitterEUT Part # : EUT Serial # : EUT Config. : Transmit Mode Low ChannelSpecification : CFR47 Part 15, Subpart B, Class BRod. Ant. #: NATemp. (deg. C) : 14

Reference :

Date : Dec. 19, 2006Bicon Ant. #: 117Humidity (%) : 27Time : 12:30PMLog Ant. #: 111EUT Voltage : 120Staff : FSCustodioDRG Ant. # NAEUT Frequency : 60Quasi-Peak RBW: 120 kHzDipole Ant. #: NAPhase: 1Video Bandwidth 120 kHzCable#: SOATSLocation: SOATSAverage RBW: 1 MHzPreamp#: 827Distance: 3 metersVideo Bandwidth 10 HzSpec An. #: 897Peak RBW: 1 MHzQP #: 897Video Bandwidth 1 MHzPreSelect#: NAMeasurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
127.99	V		39.7	11.8	1.8	32.6	20.7	43.5	-22.9	Pass	
240	H		47	11.1	2.6	32.7	28.0	46.0	-18.0	Pass	
248.1	H		49.4	11.1	2.6	32.7	30.4	46.0	-15.6	Pass	
262.92	H		47.8	12.2	2.6	32.7	29.9	46.0	-16.1	Pass	

Radiated Emissions: To 10th Harmonic

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Radiated Emissions DataComplete YES
PreliminaryJob #: 26-1019-EXPR1 Test #: 2
Page 1 of 1
 Client Name : Expertise Engineering
 EUT Name : GPRF
 EUT Model # : NX01 Transmitter
 EUT ANTENNA Part # :
 EUT Serial # :
 EUT Config. :

Transmit (Low, Mid and High Channels)

 Specification : FCC Part 15.209 (a) Part 15.247C and 15.205(a)
 Rod. Ant. #: NA Temp. (deg. C) : 19
 Bicon Ant. #: NA Humidity (%) : 27
 Log Ant. #: NA EUT Voltage : 120VAC
 DRG Ant. # 877 EUT Frequency : 60Hz
 Dipole Ant. #: NA Phase: 1
 Cable #: 40ft Location: SOATS
 Preamp #: 842 Distance: 3 m
 Spec An. #: 915 Duty Cycle Factor -20
 QP #: NA Duty Cycle (%) 0.10
Date : 3/6/2007Time : 8:00AMStaff : FSCustodio

Photo ID:

Peak Res Bandwidth: 1 MHzPeak Video Bandwidth: 1 MHzAVE Res Bandwidth: 1 MHzAVE Video Bandwidth: 10 Hz

Meas. Freq. (MHz)	Vertical (dBuV)		Horizontal (dBuV)		CF (db)	Max Level (dBuV/m)		Spec. Limit (dBuV/m)		Margin dB		EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
pk	av	pk	av	pk	av	pk	av	pk	av	pk	av				
4810.00	72.5	52.5	74.1	54.1	-4.7	69.4	49.4	74.0	54.0	-4.6	-4.6	250.0	1.1	Pass	
7215.00	61.5	41.5	57.5	37.5	3.5	65.1	45.1	74.0	54.0	-8.9	-8.9	270.0	1.3	Pass	
4880.00	75.9	55.9	76.2	56.2	-4.7	71.5	51.5	74.0	54.0	-2.5	-2.5	200.0	1.0	Pass	
7320.00	61.9	41.9	55.9	35.9	3.2	65.1	45.1	74.0	54.0	-8.9	-8.9	200.0	1.0	Pass	
4960.00	54.3	34.3	53.8	33.8	-4.8	49.6	29.6	74.0	54.0	-24.4	-24.4	190.0	1.3	Pass	

Note: Correction factor (CF) computations $= \text{Antenna Factor} + \text{Path Loss} - \text{RF Gain (Preamp)}$ $= 33.9 + 6.0 - 44.6$ $= -4.7$

IC RS-210 2.2/2.7 Radiated Emissions within Restricted Bands (30 MHz to 1000 MHz)

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Radiated Emissions DataComplete X
Preliminary _____Job # : 26-1019-EXPR Test # : 1
Page 1 of 1Client Name : Expertise EngineeringEUT Name : GPRFEUT Model # : NX01 Transmitter

EUT Part # :

EUT Serial # :

EUT Config. : Transmit Mode Low ChannelSpecification : RSS Gen Restricted Bands

Rod. Ant. #:	<u>NA</u>	Temp. (deg. C) :	<u>14</u>
Bicon Ant. #:	<u>117</u>	Humidity (%) :	<u>27</u>
Log Ant. #:	<u>111</u>	EUT Voltage :	<u>120</u>
DRG Ant. #:	<u>NA</u>	EUT Frequency :	<u>60</u>
Dipole Ant. #:	<u>NA</u>	Phase:	<u>1</u>
Cable #:	<u>SOATS</u>	Location:	<u>SOATS</u>
Preamp #:	<u>827</u>	Distance:	<u>3 meters</u>
Spec An. #:	<u>897</u>		
QP #:	<u>897</u>		
PreSelect #:	<u>NA</u>		

Reference :

Date : Dec. 19, 2006Time : 12:30PMStaff : FSCustodio

Quasi-Peak RBW: <u>120 kHz</u>
Video Bandwidth <u>120 kHz</u>
Average RBW: <u>1 MHz</u>
Video Bandwidth <u>10 Hz</u>
Peak RBW: <u>1 MHz</u>
Video Bandwidth <u>1 MHz</u>

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

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
127.99	V		39.7	11.8	1.8	32.6	20.7	43.5	-22.9	Pass	
240	H		47	11.1	2.6	32.7	28.0	46.0	-18.0	Pass	
248.1	H		49.4	11.1	2.6	32.7	30.4	46.0	-15.6	Pass	
262.92	H		47.8	12.2	2.6	32.7	29.9	46.0	-16.1	Pass	

IC RS-210 2.2/2.7 Radiated Emissions within Restricted Bands (To 10th Harmonic)

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Radiated Emissions DataComplete
PreliminaryYESJob # : 26-1019-EXPR1Test # : 2Page 1of 1

Client Name :

Expertise Engineering

EUT Name :

GPRF

EUT Model # :

NX01 Transmitter

EUT ANTENNA Part # :

EUT Serial # :

EUT Config. :

Transmit (Low, Mid and High Channels)

Specification :

RSS Gen Restricted Bands

Rod. Ant. #:

NA

Temp. (deg. C) :

19Date : 3/6/2007

Bicon Ant. #:

NA

Humidity (%) :

27Time : 8:00AM

Log Ant. #:

NA

EUT Voltage :

120VACStaff : FSCustodio

DRG Ant. #

877

EUT Frequency :

60HzPhoto ID:

Dipole Ant. #:

NA

Phase:

1Peak Res Bandwidth: 1 MHz

Cable#:

40ft

Location:

SOATSPeak Video Bandwidth: 1 MHz

Preamp#:

842

Distance:

3 mAVE Res Bandwidth: 1 MHz

Spec An. #:

915

Duty Cycle Factor

-20AVE Video Bandwidth: 10 Hz

QP #:

NA

Duty Cycle (%)

0.10

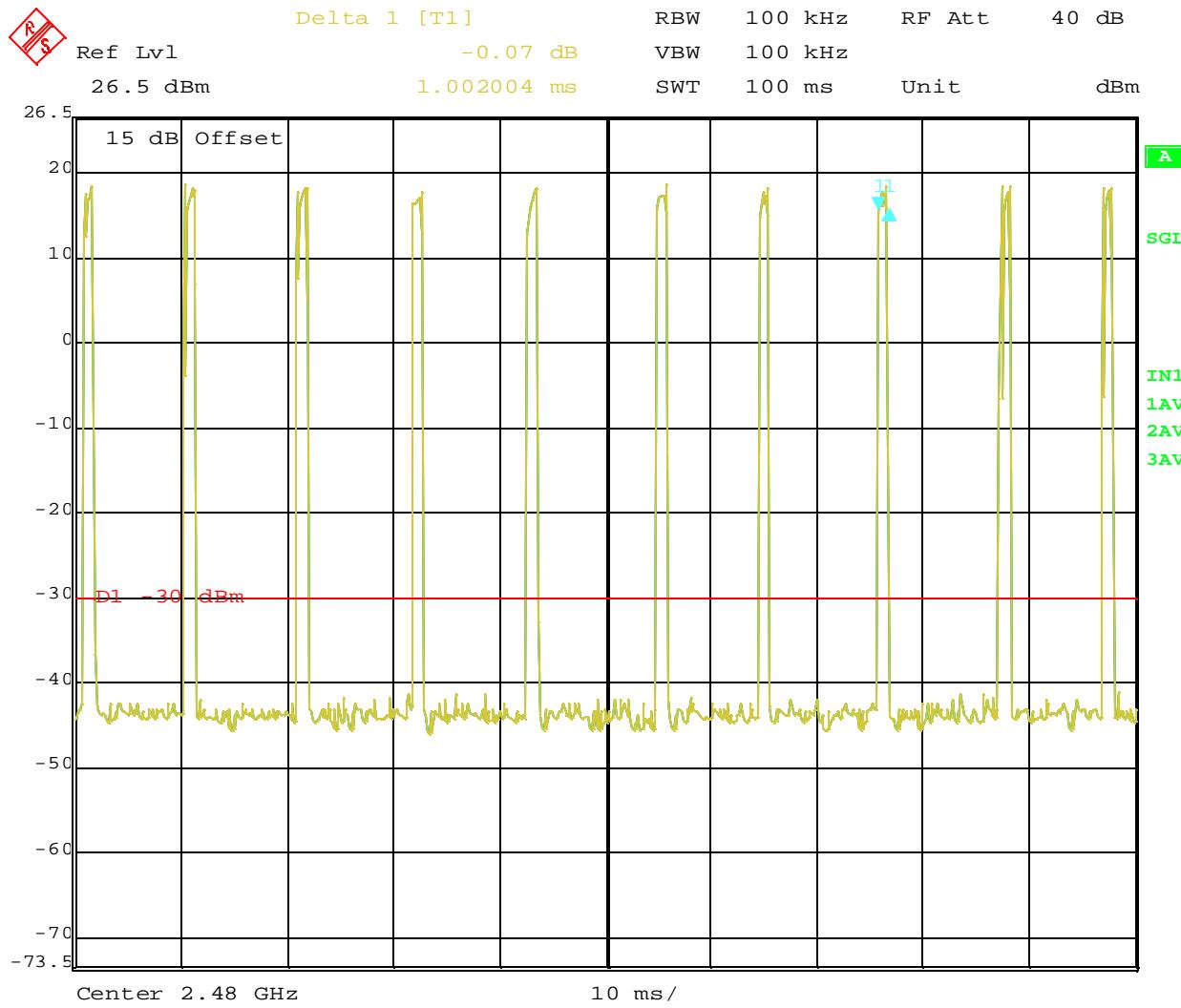
Meas. Freq. (MHz)	Vertical pk		Horizontal pk		CF (db)	Max Level (dBuV/m)		Spec. Limit (dBuV/m)		Margin dB		EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
	pk	av	pk	av		pk	av	pk	av	pk	av				
4810.00	72.5	52.5	74.1	54.1	-4.7	69.4	49.4	74.0	54.0	-4.6	-4.6	250.0	1.1	Pass	
7215.00	61.5	41.5	57.5	37.5	3.5	65.1	45.1	74.0	54.0	-8.9	-8.9	270.0	1.3	Pass	
4880.00	75.9	55.9	76.2	56.2	-4.7	71.5	51.5	74.0	54.0	-2.5	-2.5	200.0	1.0	Pass	
7320.00	61.9	41.9	55.9	35.9	3.2	65.1	45.1	74.0	54.0	-8.9	-8.9	200.0	1.0	Pass	
4960.00	54.3	34.3	53.8	33.8	-4.8	49.6	29.6	74.0	54.0	-24.4	-24.4	190.0	1.3	Pass	

Note: Correction factor (CF) computations

= Antenna Factor + Path Loss - RF Gain (Preamp)

= 33.9 + 6.0 - 44.6

= -4.7

Time domain plot and Duty Cycle calculations

Duty Cycle = 1.002004 ms (x 10)
= 10.02 ms/100 ms
= 0.1002 (reported)
= 10%

IC RSS-GEN 4.8 Receiver Spurious Emission

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions. Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements employing a CISPR quasi-peak detector shall be used. Above 1 GHz, measurements employing an average detector shall be used.

Test Conditions:

Sample Number:	NX01	Temperature:	57.2°F
Date:	December 19, 2006	Humidity:	27 %
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
		Laboratory:	Nemko OATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

The EUT was measured on three orthogonal axis. Only worst case results reported.

Measurements below 1GHz were performed at 3m with a Quasi-Peak detector while Average detector was used above 1GHz.

No receiver spurious emission detected above 1GHz.



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Radiated Emissions DataComplete X
Preliminary _____Job # : 26-1019-EXPR Test # : 1
Page 1 of 1Client Name : Expertise EngineeringEUT Name : GPRFEUT Model # : NX01 Transmitter

EUT Part # :

EUT Serial # :

EUT Config. : Receive ModeSpecification : CFR47 Part 15, Subpart B, Class B

Rod. Ant. #:	<u>NA</u>	Temp. (deg. C) :	<u>14</u>
Bicon Ant. #:	<u>117</u>	Humidity (%) :	<u>27</u>
Log Ant. #:	<u>111</u>	EUT Voltage :	<u>120</u>
DRG Ant. #	<u>NA</u>	EUT Frequency :	<u>60</u>
Dipole Ant. #:	<u>NA</u>	Phase:	<u>1</u>
Cable#:	<u>SOATS</u>	Location:	<u>SOATS</u>
Preamp#:	<u>827</u>	Distance:	<u>3 meters</u>
Spec An. #:	<u>897</u>		
QP #:	<u>897</u>		
PreSelect#:	<u>NA</u>		

Reference :

Date :	<u>Dec. 19, 2006</u>
Time :	<u>4:00PM</u>
Staff :	<u>FSCustodio</u>
Quasi-Peak RBW:	<u>120 kHz</u>
Video Bandwidth	<u>120 kHz</u>
Average RBW:	<u>1 MHz</u>
Video Bandwidth	<u>10 Hz</u>
Peak RBW:	<u>1 MHz</u>
Video Bandwidth	<u>1 MHz</u>

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

Measurements above 1 GHz are Average values, unless otherwise stated.

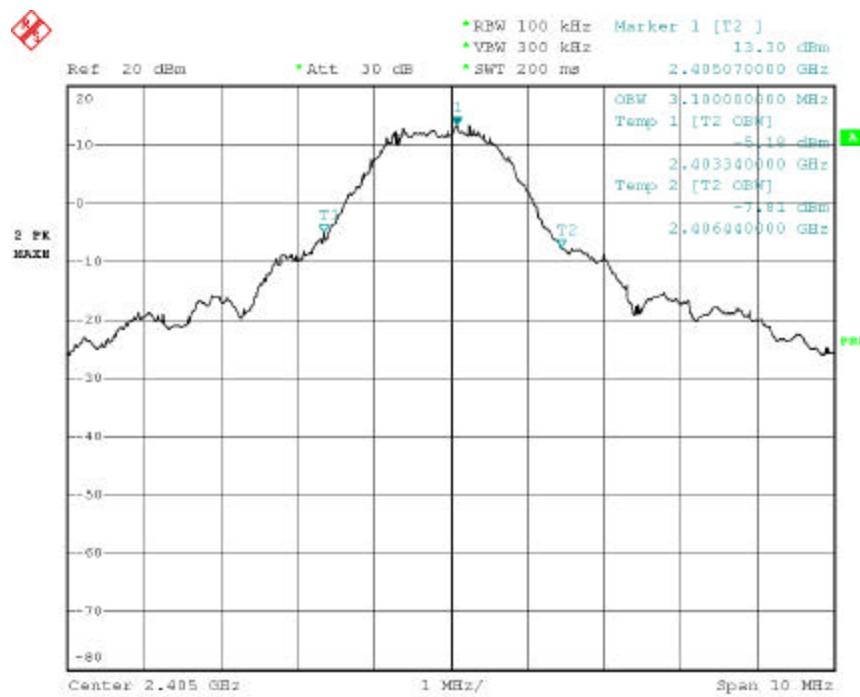
Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
48.02	V		43.3	11.2	1.2	32.6	23.1	40.0	-16.9	Pass	
86.722	V		41.4	8.2	1.5	32.4	18.7	40.0	-21.3	Pass	
127.99	V		38.2	11.8	1.8	32.6	19.2	43.5	-24.4	Pass	
240	H		46.6	11.1	2.6	32.7	27.6	46.0	-18.4	Pass	
248.1	H		49.1	11.1	2.6	32.7	30.1	46.0	-15.9	Pass	
262.92	H		46.3	12.2	2.6	32.7	28.4	46.0	-17.6	Pass	
304.16	H		45.2	14	2.9	32.8	29.3	46.0	-16.7	Pass	
581.54	H		34.32	17.5	4.5	32.6	23.7	46.0	-22.3	Pass	
768	H		35.33	20.2	5.3	32.5	28.3	46.0	-17.7	Pass	

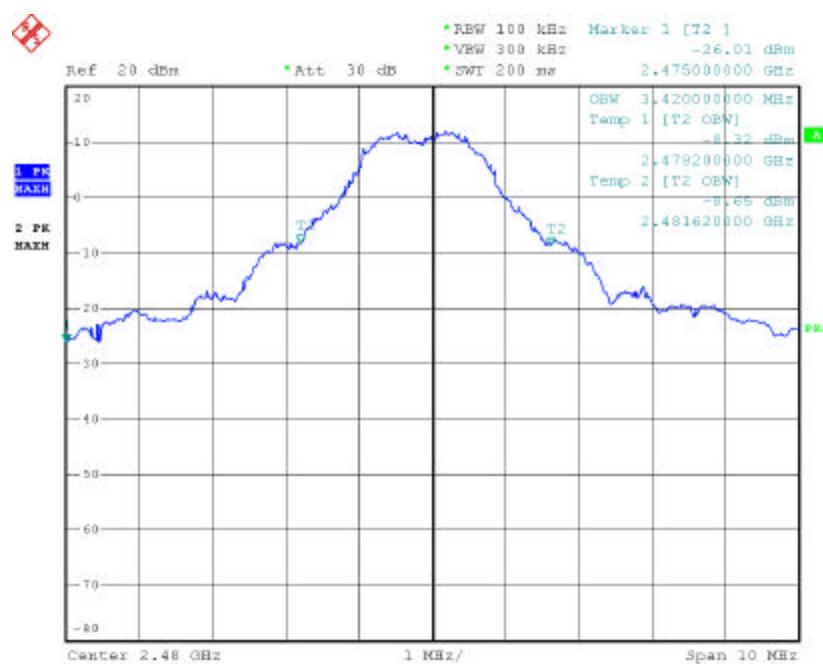
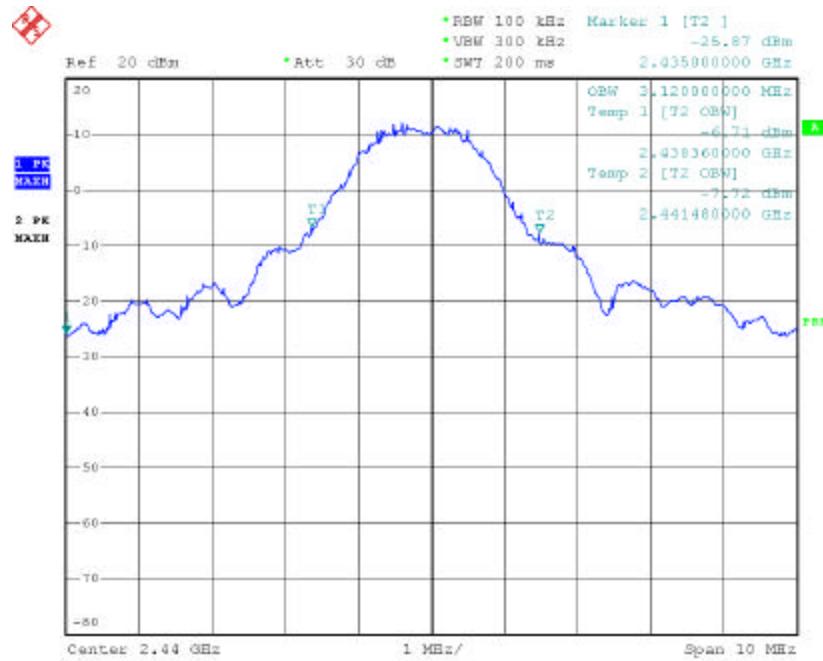
Clause 15.215(c) Occupied Bandwidth

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sec. Sec. 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Conditions:

Sample Number:	NX01	Temperature:	69°F
Date:	December 18, 2006	Humidity:	32%
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
		Laboratory:	Nemko

Test Results:**Low Channel = 3.1MHz**



Clause 15.247(a)(2) Minimum 6dB RF Bandwidth

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Conditions:

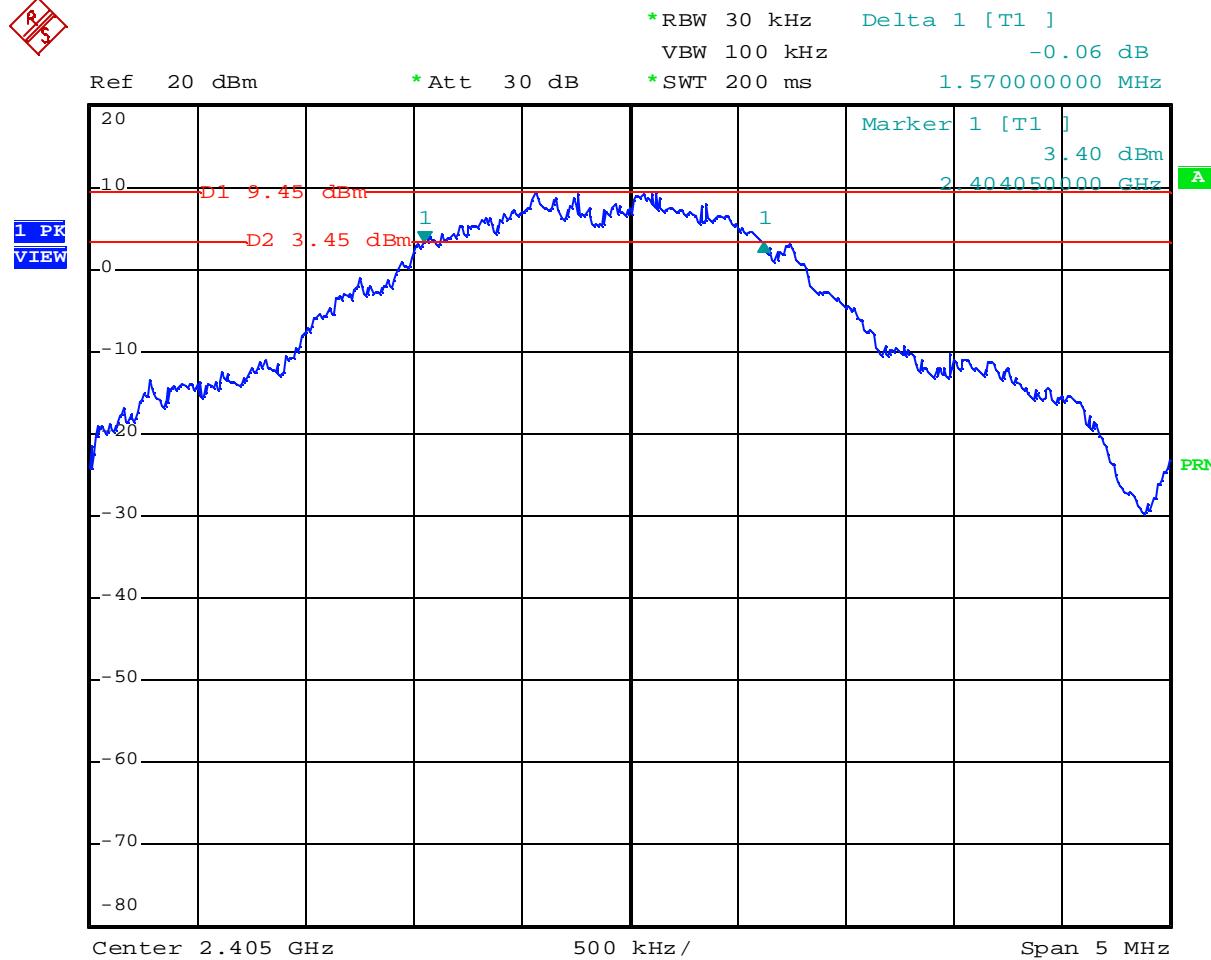
Sample Number:	NX01	Temperature:	69°F
Date:	January 11, 2007	Humidity:	32%
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
Laboratory:			Nemko

Test Results:**6dB Bandwidth:**

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 1.0% of the emission bandwidth. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Channel Range	Max. 6 dB Bandwidth (kHz)
Low (2.405GHz)	1,570
Mid (2.440 GHz)	1,540
High (2.480GHz)	1,540

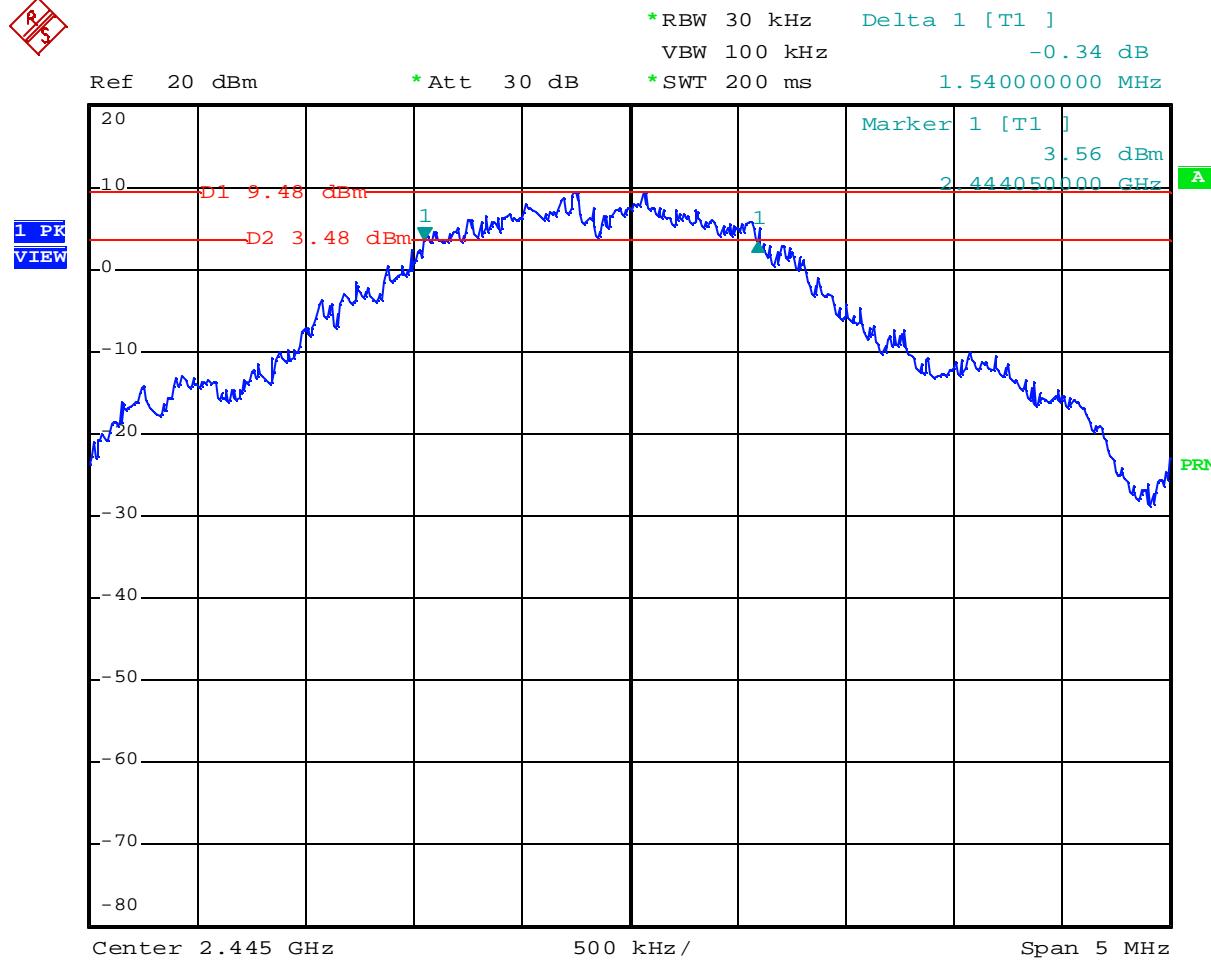
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Date: 11.JAN.2007 15:59:03

Low Channel 2.405GHz

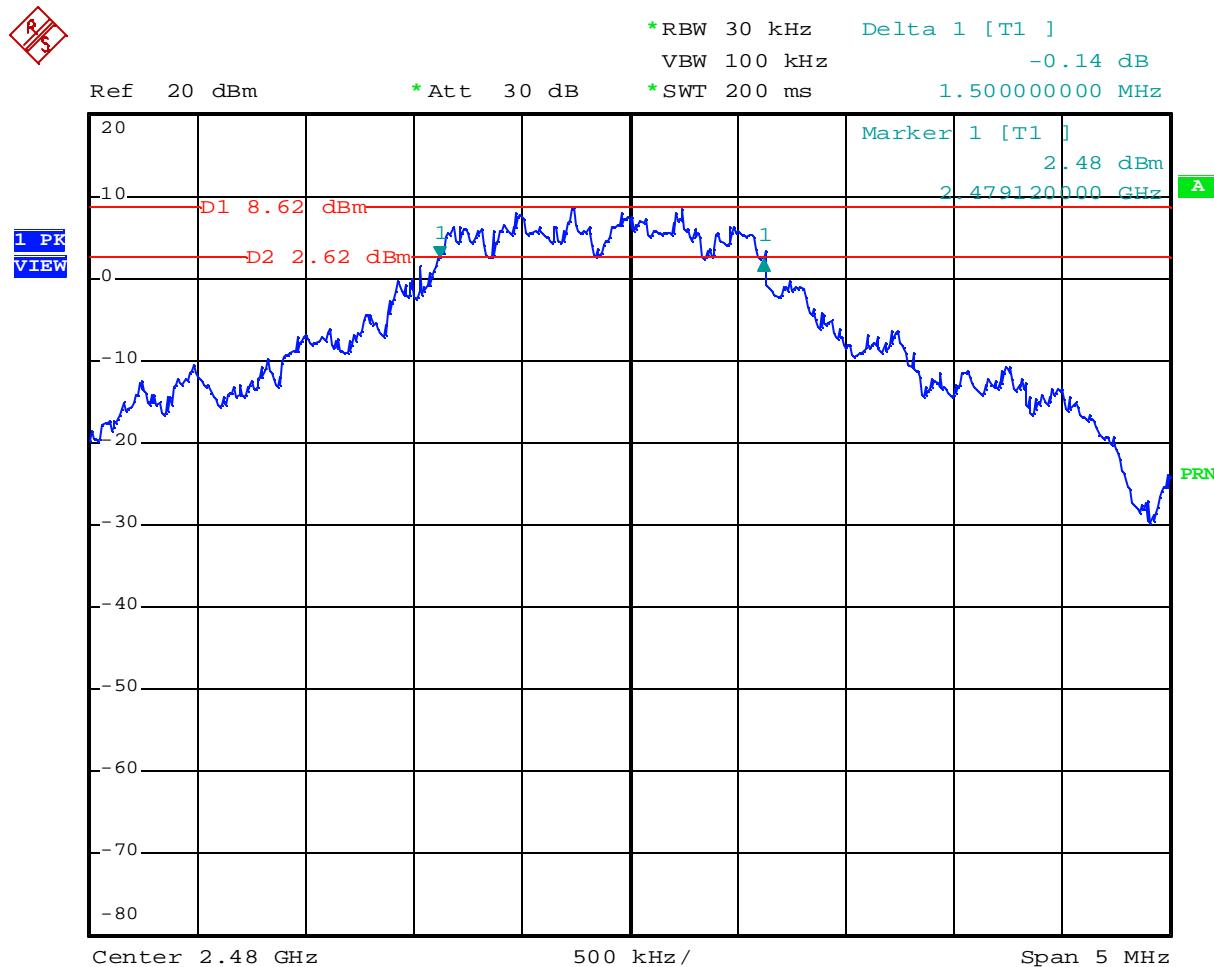
USI0000A



Date: 11.JAN.2007 16:01:41

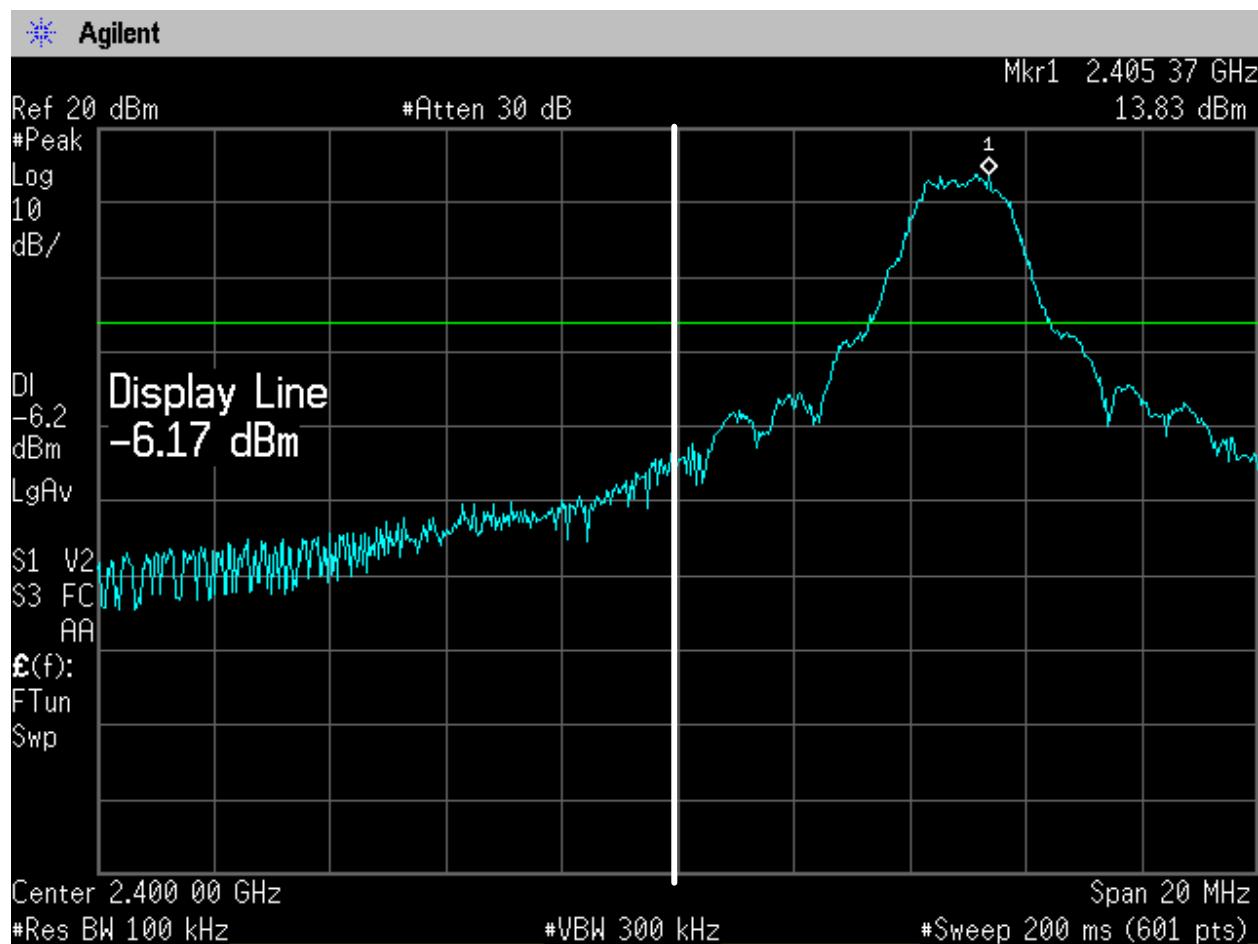
Mid Channel 2.44GHz

USI0000A

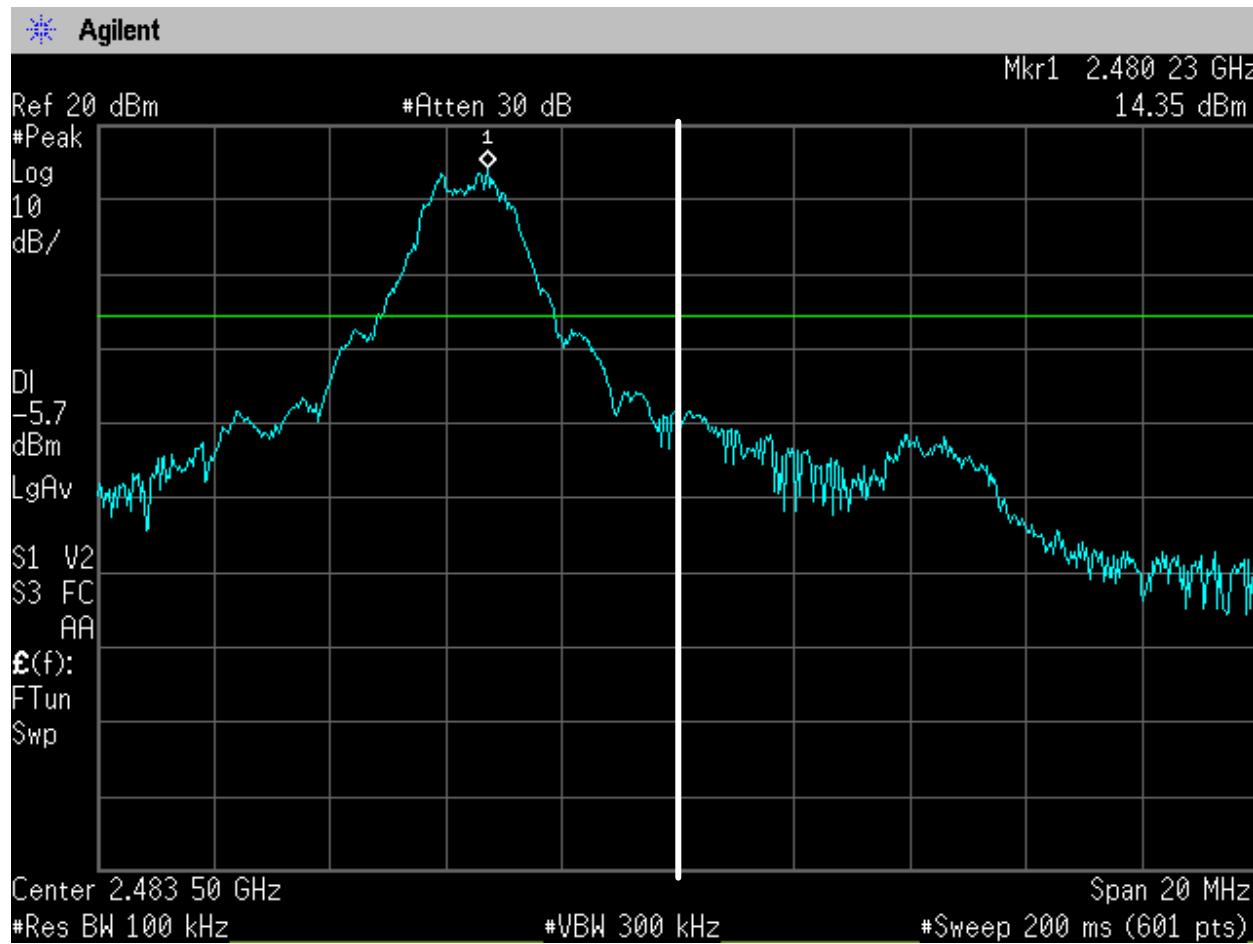


Date: 11.JAN.2007 15:56:26

High Channel 2.48GHz

Bandedge Measurements:

Low Channel 2405MHz
20 dBc from peak is -6.17 dBm
Center is 2400MHz



High Channel 2480MHz
20 dBc from peak is -5.65 dBm
Center is 2483.5MHz

Radiated bandedge measurements in the 2483.5 to 2500 MHz restricted band:**San Diego Headquarters:**

11696 Sorrento Valley Rd.

San Diego, CA 92121

Tel: (858) 755-5525

Fax: (858) 452-1810

Radiated Emissions Data

Job # :	<u>26-1019-EXPR</u>	Date :	<u>7/23/2007</u>	Page	<u>1</u>	of	<u>1</u>
NEX #:	<u> </u>	Time :	<u>3PM</u>				
Client Name :	<u>Expertise Engineering</u>			EUT Voltage :	<u>120</u>		
EUT Name :	<u>GPRF</u>			EUT Frequency :	<u>60</u>		
EUT Model # :	<u>NX01 Transmitter</u>			Phase:	<u>1</u>		
EUT Serial # :	<u> </u>			NOATS	<u> </u>		
EUT Config. :	<u>Transmit @ 2480 MHz (High Channel)</u>			SOATS	<u>X</u>		
Specification :	<u>CFR47 Part 15, Subpart B, Class B</u>			Distance:	<u>3m</u>		
Loop Ant. #:	<u>NA</u>	Temp. (°C) :	<u>24</u>	Quasi-Peak	<u>RBW: 120 kHz</u>		
Bicon Ant. #:	<u> </u>	Humidity (%) :	<u>58</u>	Peak	<u>Video Bandwidth 300 kHz</u>		
Log Ant. #:	<u> </u>	Spec An. #:	<u>840</u>	Average	<u>RBW: 1 MHz</u>		
DRG Ant. #	<u>529</u>	Spec An. Display #:	<u>839</u>		<u>Video Bandwidth 3 MHz</u>		
Dipole Ant. #:	<u> </u>	QP #:	<u> </u>		<u>RBW: 1 MHz</u>		
Cable LF#:	<u>NA</u>	PreSelect#:	<u> </u>		<u>Video Bandwidth 10 Hz</u>		
Cable HF#:	<u>60ft</u>			Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.			
Preamp LF#:	<u>NA</u>			Measurements above 1 GHz are Average values, unless otherwise stated.			
Preamp HF#:	<u>317</u>						

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2483.5	37.1	36.5	P	F/L/R/B	1.0	37.1	44.6	74.0	-29.4	Pass	
2483.5	25.1	25.2	A	F/L/R/B	1.0	25.2	32.7	54.0	-21.3	Pass	
2500	36.5	36.9	P	F/L/R/B	1.0	36.9	45.3	74.0	-28.7	Pass	
2500	24.8	24.6	A	F/L/R/B	1.0	24.8	33.2	54.0	-20.8	Pass	

Note: Correction factor (CF) computations $= \text{Antenna Factor} + \text{Path Loss} - \text{RF Gain (Preamp)}$ $= 28.1 + 7.5 - 28.1$ $= 7.5$ **Corrected reading computations** $= \text{Max. reading} + \text{Correction Factor}$ $= 37.1 + 7.5$ $= 44.6 \text{ dBuV/m}$

Clause 15.247(b)(3) Maximum peak output power

of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Conditions:

Sample Number:	NX01	Temperature:	69°F
Date:	December 15, 2006	Humidity:	32%
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
Laboratory:			Nemko

Test Results:**Conducted Output Power:**

The antenna port of the EUT was connected to the input of the peak power meter through a 10dB attenuator. Power was read directly, cable loss and attenuator correction was added to the reading to obtain power at the EUT antenna terminals. Input voltage to the EUT was varied from 7.65VDC, 9VDC (nominal) and 10.35VDC during these measurements, however no change in the output power was observed during voltage variations.

Channel Range	Measured Output Power (mW)
Low (2.405GHz)	108.0 mW
Mid (2.440 GHz)	92.9 mW
High (2.480GHz)	82.1 mW

Clause 15.247(d) Spurious Emissions (RF Antenna Conducted Test)

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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Conditions:

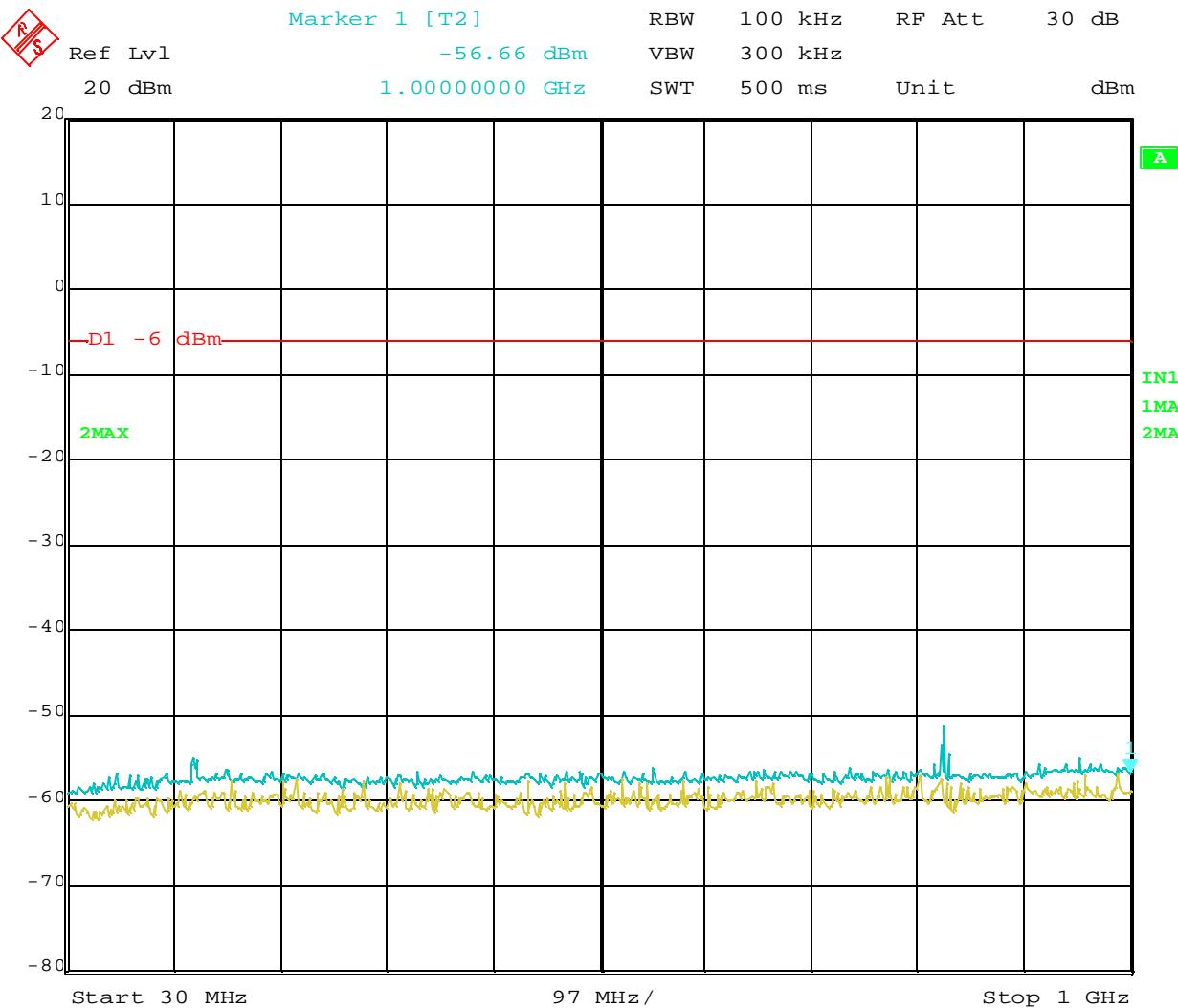
Sample Number:	NX01	Temperature:	71°F
Date:	March 7, 2007	Humidity:	30%
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
		Laboratory:	Nemko

Test Results:

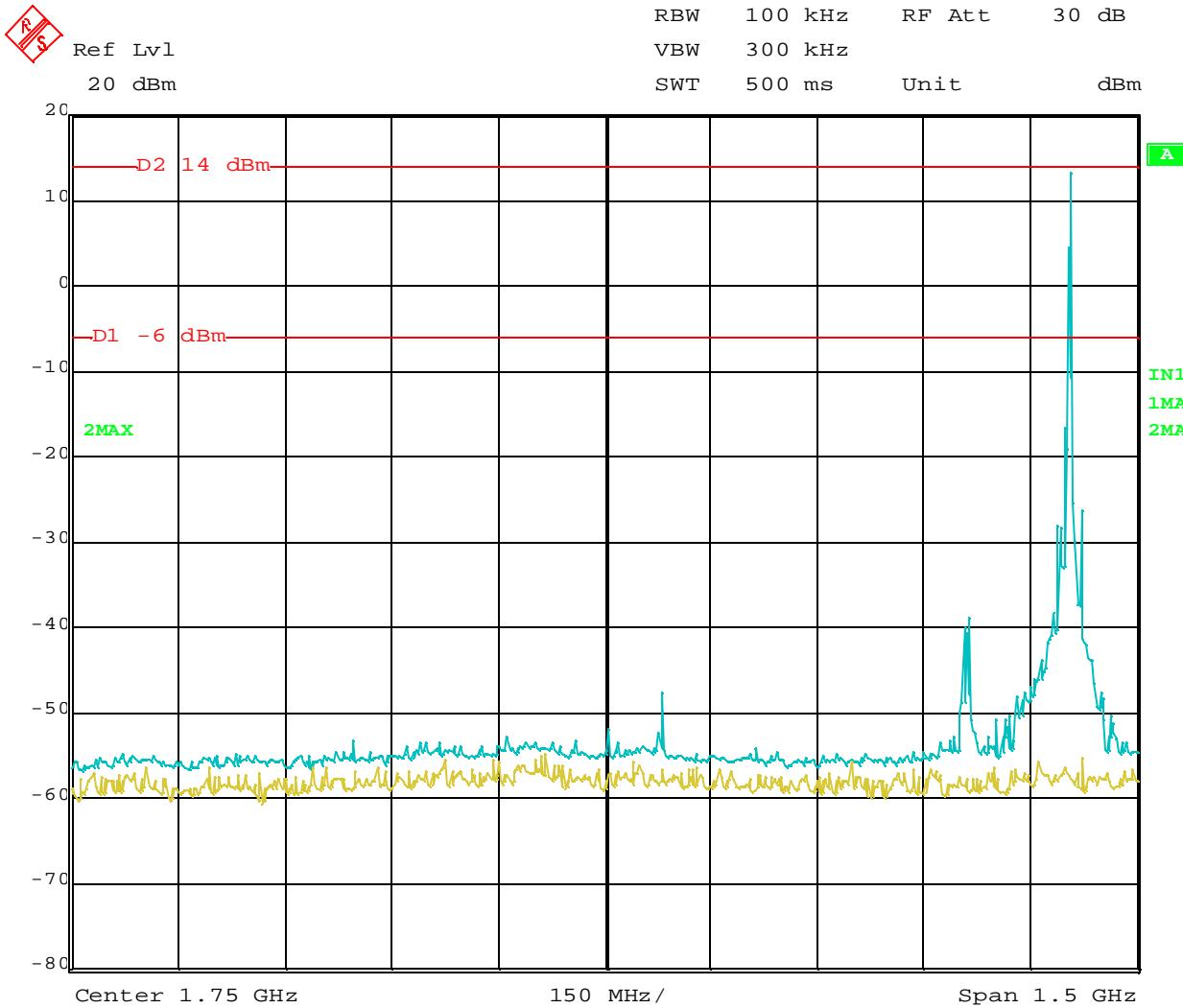
See Attached Plots.

The transmitter output was connected to the spectrum analyzer via a low loss cable. RBW was set to 100kHz and VBW to 300kHz with suitable frequency span and appropriate sweep time. The EUT was investigated for spurious emission on Low, Mid and High channels and worst-case (High channel) results are reported. The spectrum was scanned from 30 MHz to 25 GHz.

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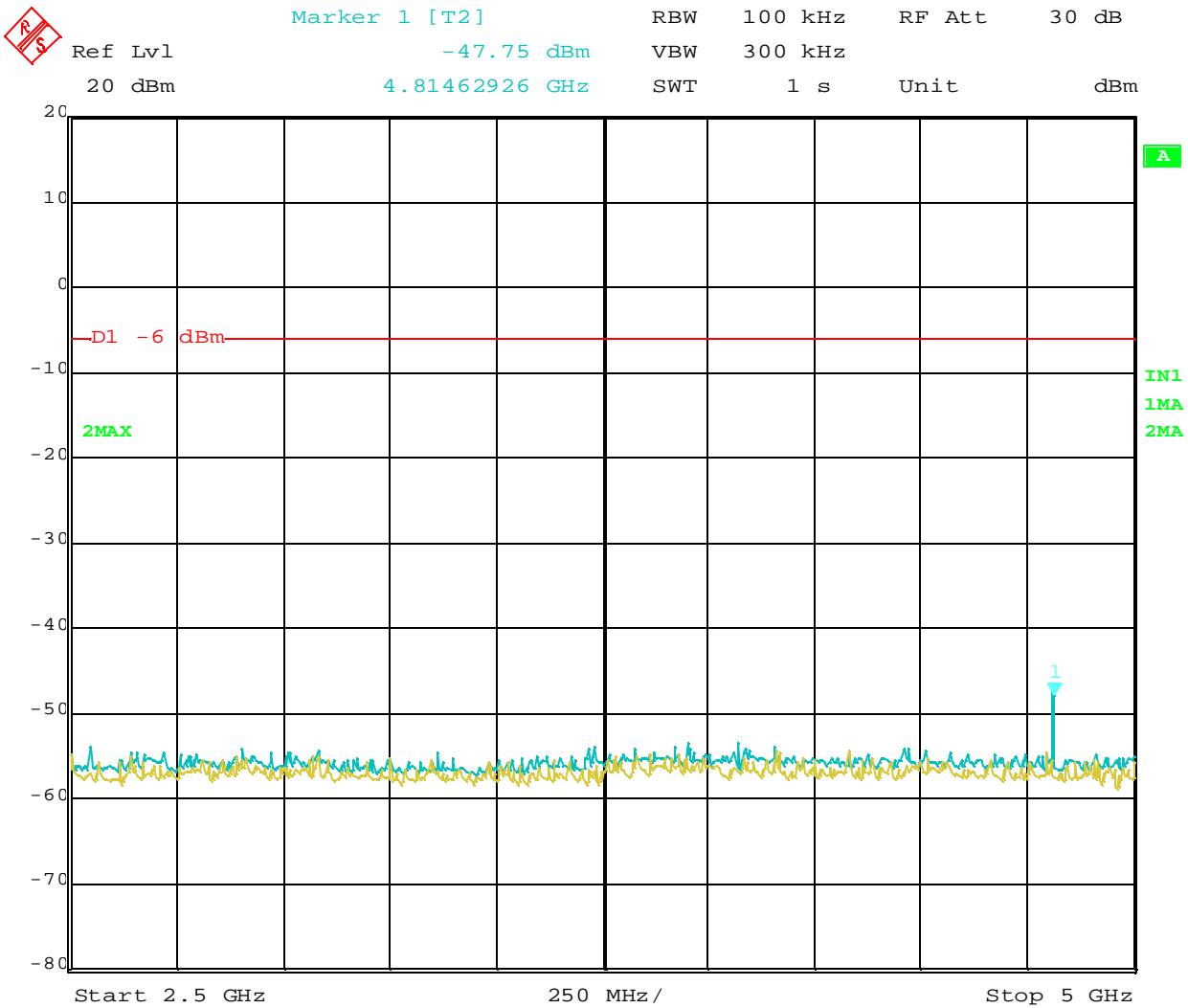


Date: 7.MAR.2007 10:12:10

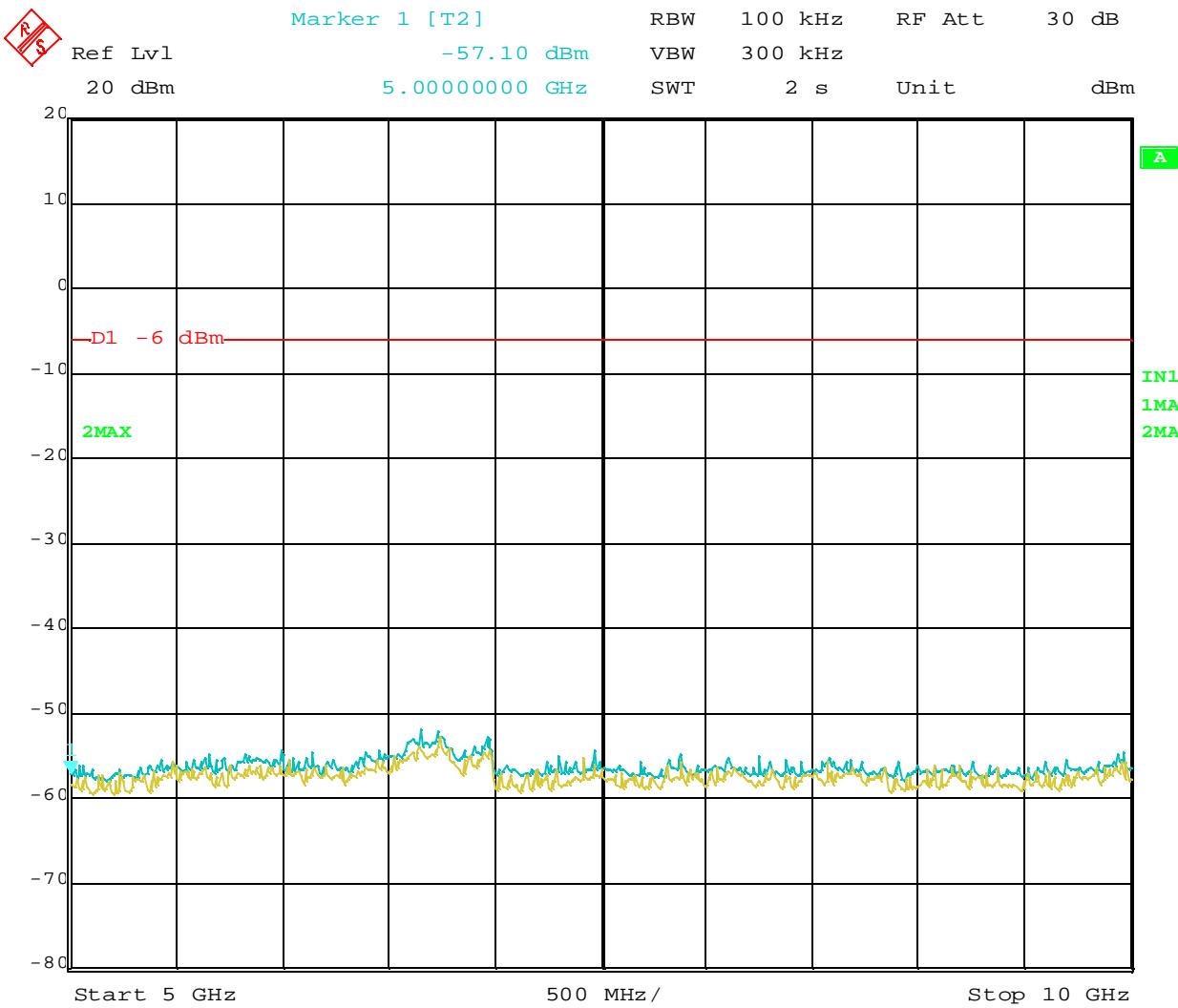


Date: 7.MAR.2007 10:16:33
Start 1.0 GHz /Stop 2.5 GHz

Note: At lower measurement span, fundamental was recorded at 14dBm.

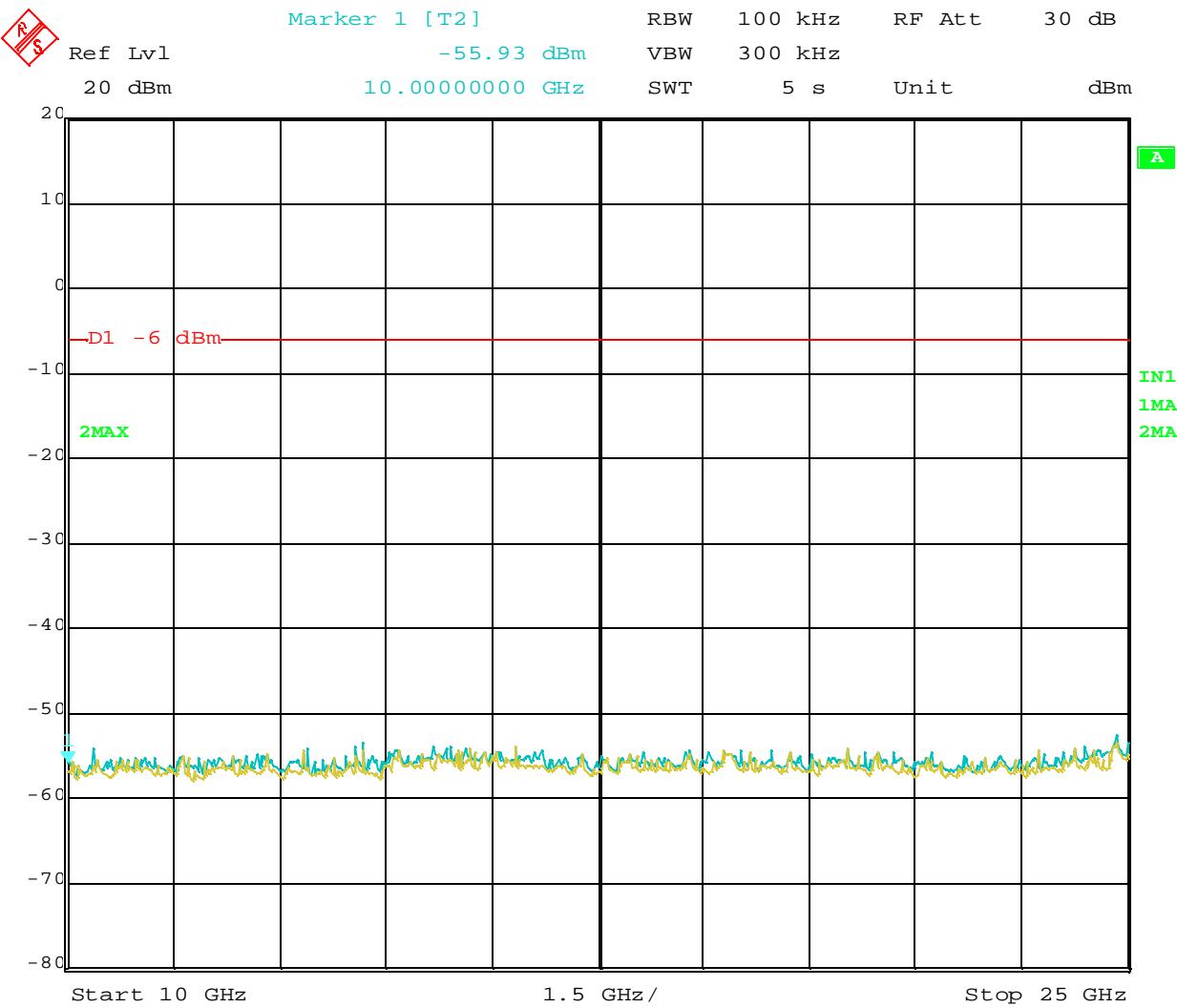


USI0000A



Date: 7.MAR.2007 10:22:39

USI0000A



Date: 7.MAR.2007 10:23:22

Clause 15.247(e) Power Spectral Density for Digitally Modulated Devices

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

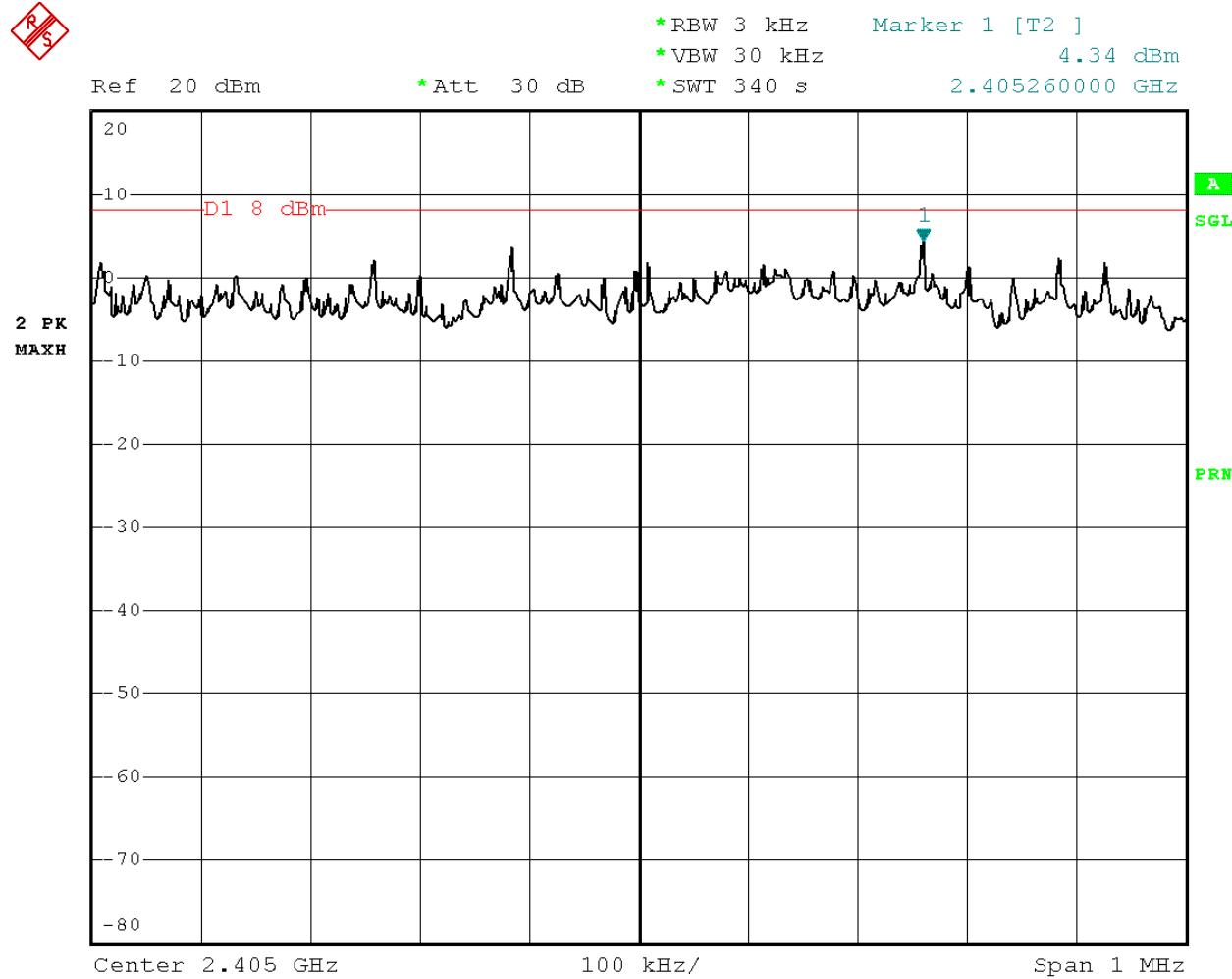
Test Conditions:

Sample Number:	NX01	Temperature:	69°F
Date:	December 18, 2006	Humidity:	32%
Modification State:	Lo/Mid/High Channels	Tester:	Ferdinand Custodio
Laboratory:			Nemko

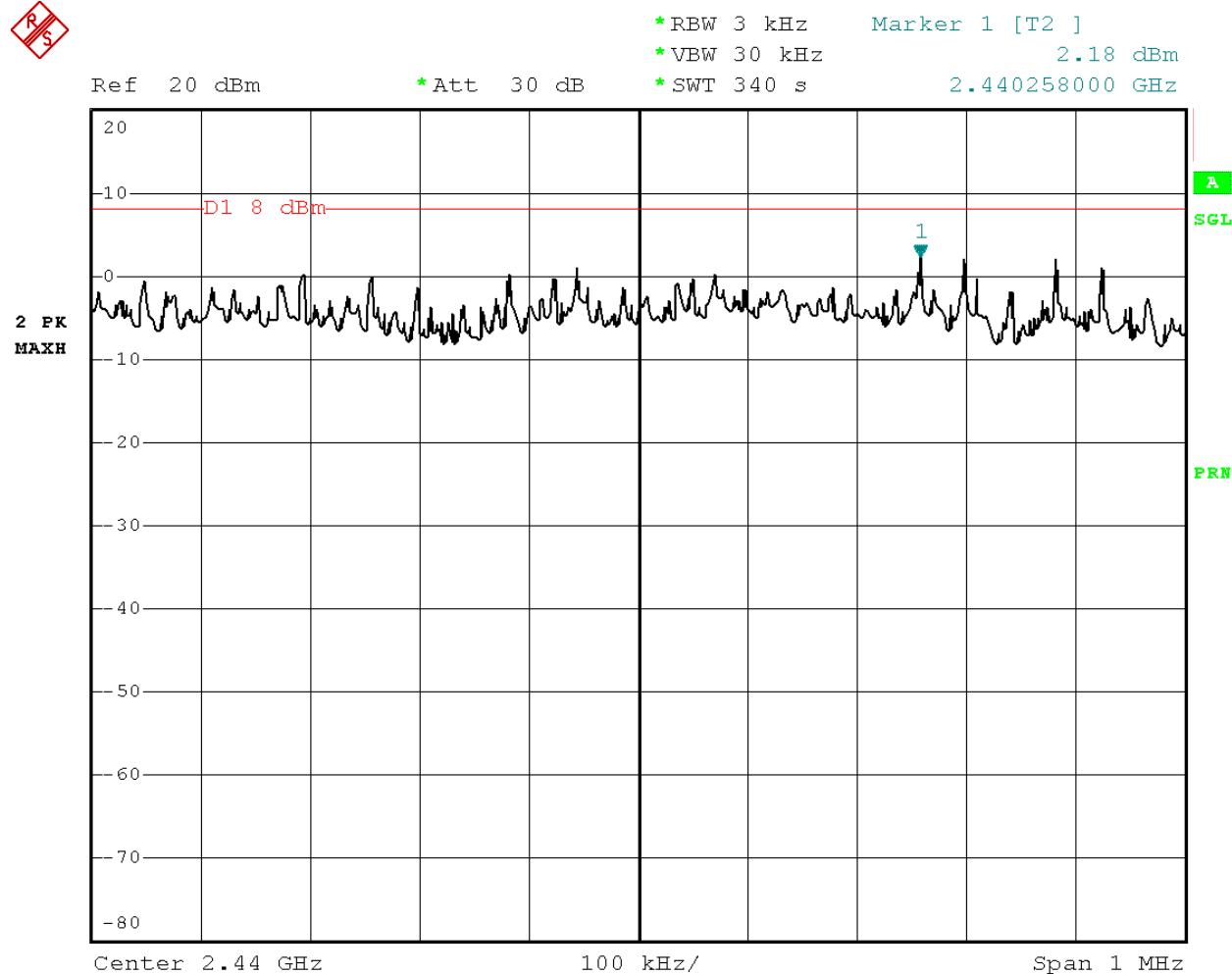
Test Results:

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time=span/3kHz for a full response of the mixer in the spectrum analyzer.

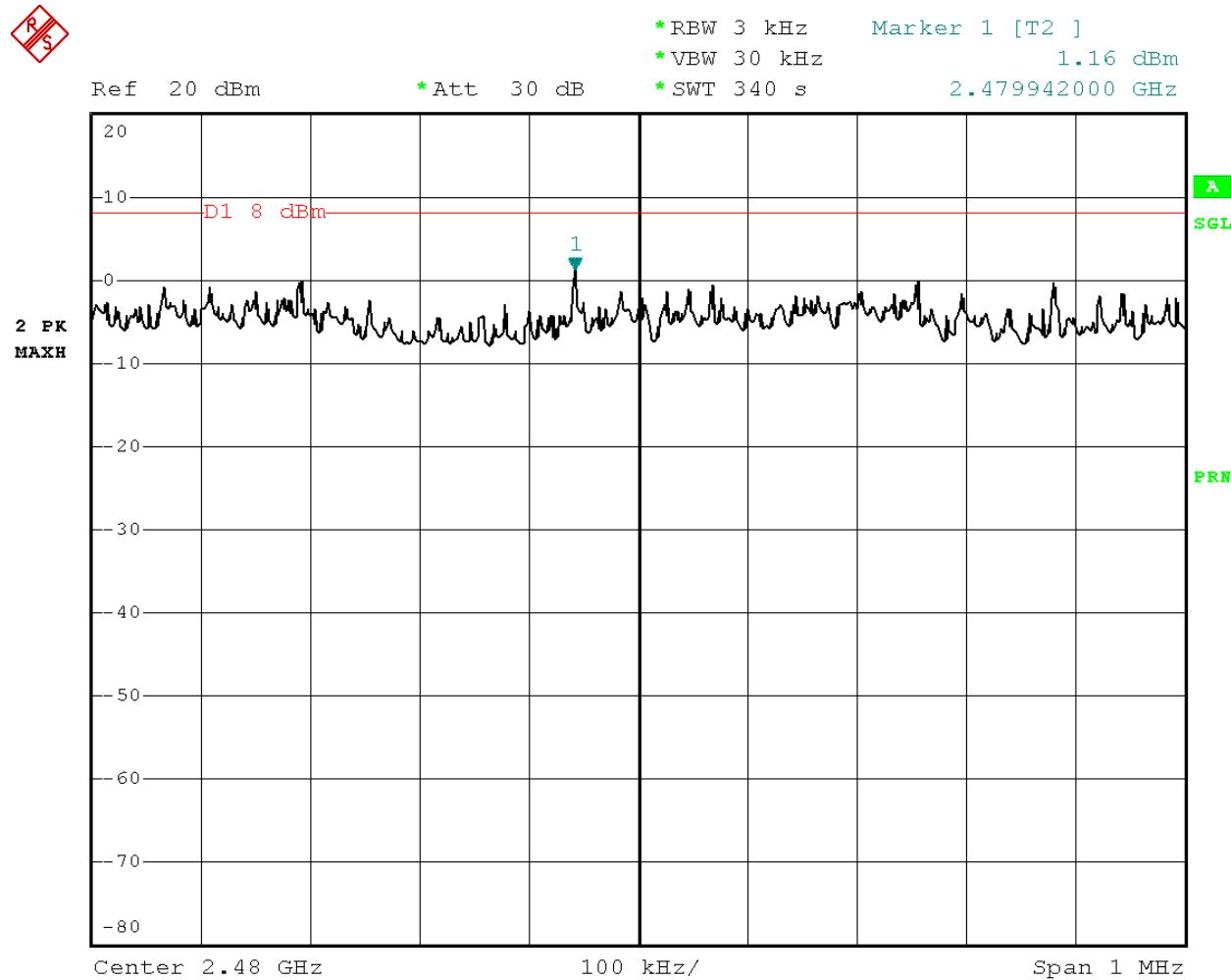
Channel	Channel Frequency (GHz)	RF Power Level in 3KHz BW	Maximum Limit (dBm)	PASS/FAIL
LO	2.405	4.34	8	Pass
MID	2.440	2.18	8	Pass
HIGH	2.480	1.16	8	Pass



Date: 18.DEC.2006 12:57:18



Date: 18.DEC.2006 11:59:22



Date: 18.DEC.2006 12:16:18

IC RSS-Gen 7.2.2 Transmitter and Receiver AC Power Lines Conducted Emissions Limits

The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

Except when the requirements applicable to a given device state otherwise, for any license-exempt radio-communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 micro-Henry line impedance stabilization network. A description of the method of measurement that is acceptable to Industry Canada is found in RSS-212.

AC Power Lines Conducted Emissions Limits

Frequency range (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with the logarithm of the frequency

Test Conditions:

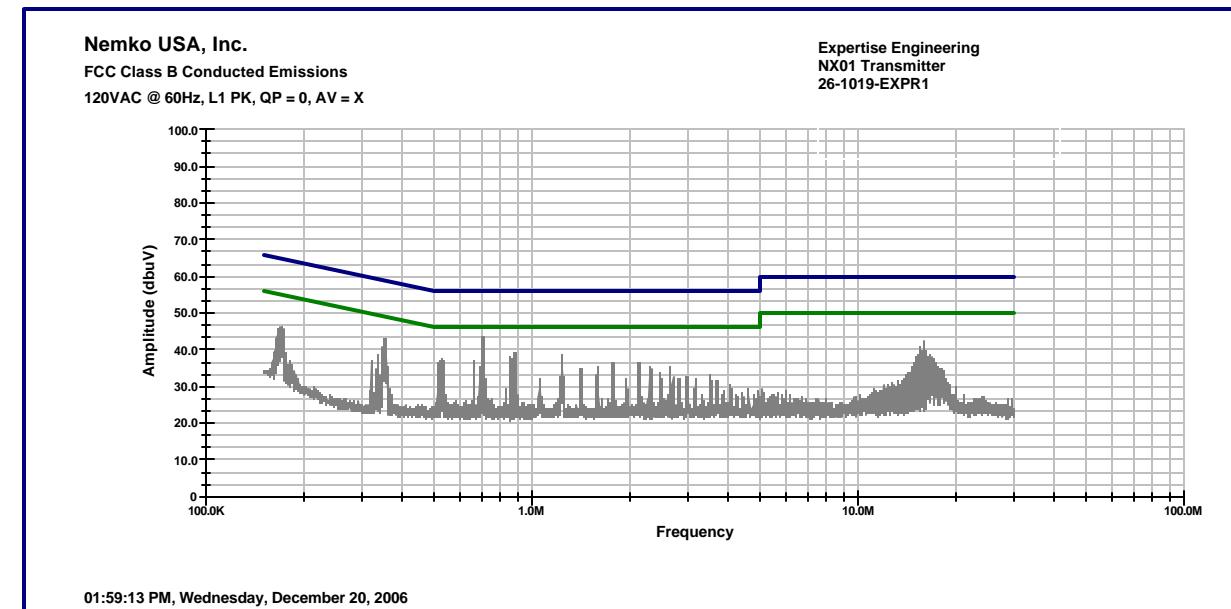
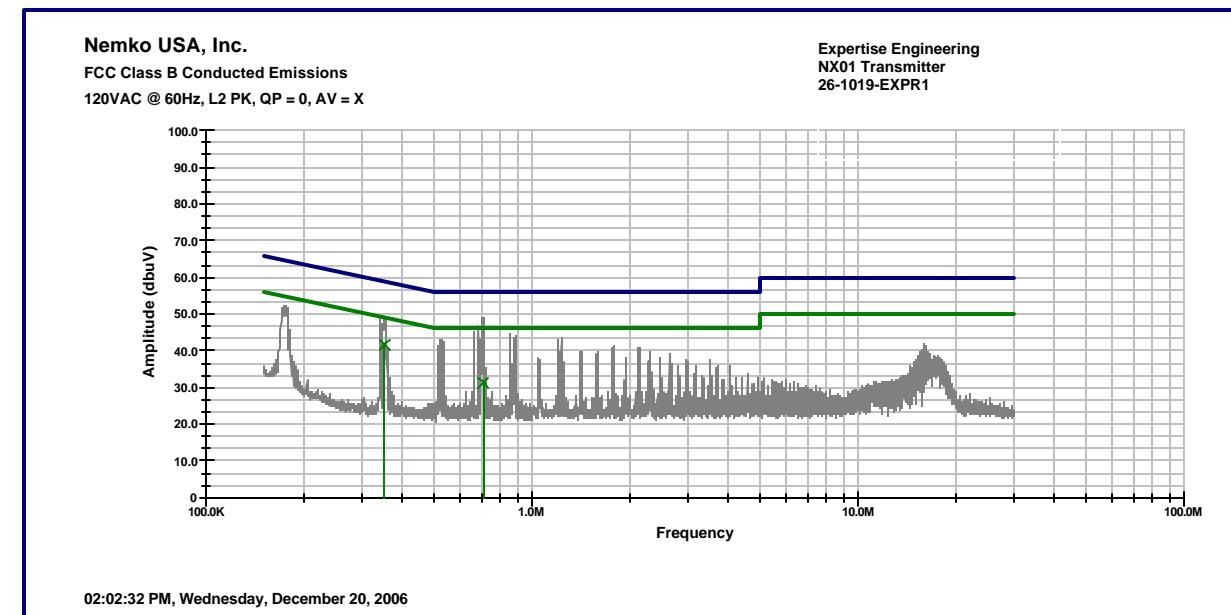
Sample Number:	NX01	Temperature:	69°F
Date:	December 20, 2006	Humidity:	26 %
Modification State:	Low Channel 2.405GHz	Tester:	Ferdinand Custodio
		Laboratory:	Nemko Shield Room 2

Test Results:

See Attached Plots.

Notes:

- Test was done using the supplied AC Adapter/Charger (GlobTek Inc. Model# GT- A81051-0509UW2, DC 9V). Instrumentation settings are 9kHz RBW/30kHz VBW for Average measurements and 100kHz RBW/100kHz VBW for Peak measurements. No Quasi Peak measurements were done since peak results are below the Quasi Peak limits.
- Data are peak. Green limit line is Average while Blue limit line is Quasi Peak.

**Line 1****Line 2****Legend:**

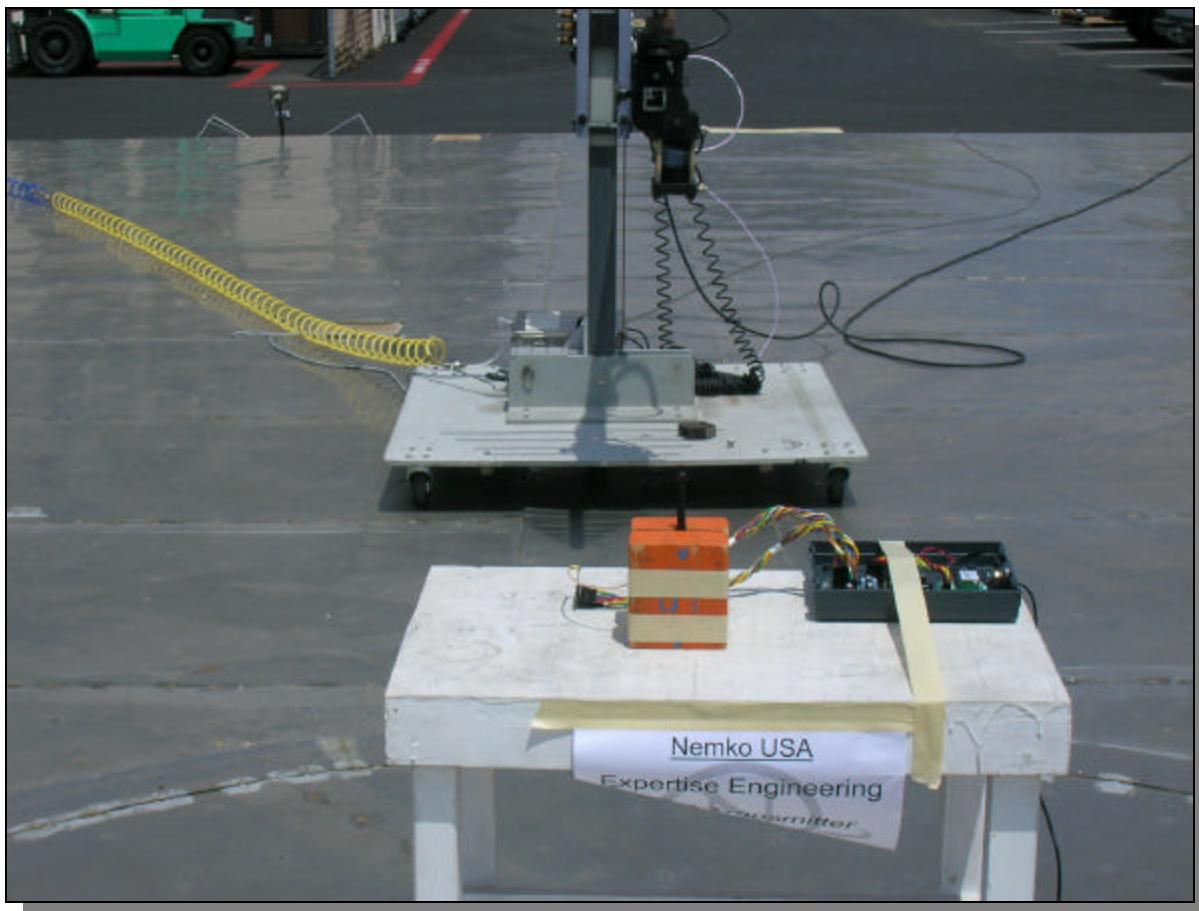
- Gray - Peak Data with Average measurements (green X marker)
- Green - Average limit
- Blue - Quasi Peak limit

Appendix B: Setup Photographs

Radiated Emissions Setup:



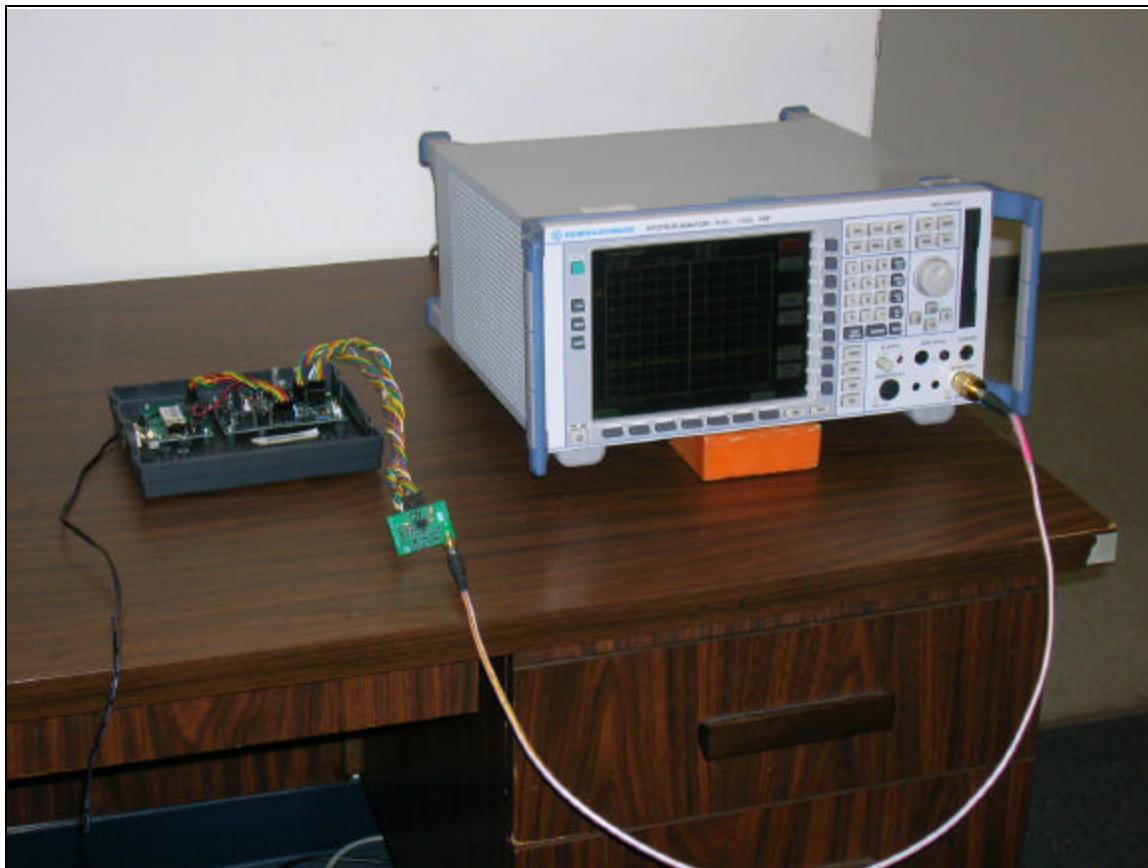
Spurious Emissions Setup:



Conducted Emissions Setup:

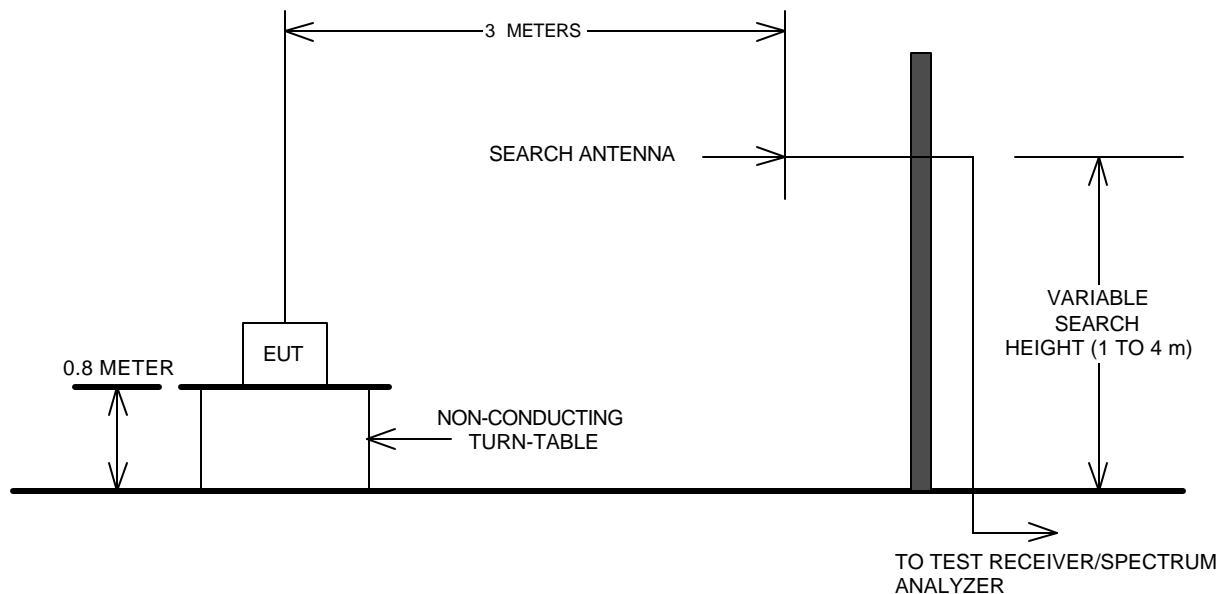


Conducted RF Emissions Setup:



Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions

