



Measurement of RF Emissions from a Model Xeta-9 Licensed Radio Transmitter

For	XetaWave, LLC 1668 Valtec Lane, Suite G Boulder, CO 80301
P.O. Number	FCCXETA9MAS&XETA4
Date Tested	June 14, 2013
Test Personnel	Richard King
Test Specification	FCC "Code of Federal Regulations" Title 47 Part 101, Subpart C

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THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE
WRITTEN APPROVAL OF ELITE ELECTRONIC ENGINEERING INCORPORATED.



REVISION HISTORY

Revision	Date	Description
—	28 June 2013	Initial release



Measurement of RF Emissions from a Model No. Xeta-9 Licensed Radio Transmitter

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of the RF emissions measurements performed on a Licensed Radio Transmitter, Model No. Xeta-9, serial number 4, (hereinafter referred to as the Equipment Under Test (EUT)). The EUT is designed to transmit in the frequency range 928MHz to 960MHz frequency range. The EUT uses an external antenna. The EUT was manufactured and submitted for testing by XetaWave, LLC located in Boulder, CO.

1.2. Purpose

The test series was performed to determine if the EUT continues to meet the FCC technical requirements for transmitters with the addition of a 12.5kHz channel spacing. The EUT shall comply with the technical requirements of FCC Part 101. The testing includes the occupied bandwidth test for transmitters. Testing was performed in accordance with TIA-603-C-2004.

1.3. Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4. EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by The American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786.01.

1.5. Laboratory Conditions

The temperature at the time of the test was 23.1°C and the relative humidity was 56%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 101, Subpart C, dated 1 October 2012
- TIA-603-C-2004, "Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards"

3. EUT SETUP AND OPERATION

3.1. General Description

The EUT is a XetaWave, LLC, Licensed Radio Transmitter, Model No. Xeta-9.

3.1.1. Power Input

The EUT is typically powered with batteries. For test purposes, a DC power supply provided 7.4VDC to the EUT.

3.1.2. Peripheral Equipment

The EUT was submitted for testing with the following peripheral equipment:

- Sony Viao Laptop Computer M/N: PCG-8N2L, P/N: 28398098, S/N: 3000596



3.1.3. Signal Input/Output Leads

The EUT was submitted for testing with a 10 wire, 50 cm long cable. Eight (8) of those wires went to the serial port of the Sony laptop computer. The other two (2) wires went to the output of the DC power supply and were used to provide 7.4VDC power to the EUT.

3.1.4. Grounding

The EUT was ungrounded during testing.

3.2. Software

XetaWave LLC Firmware Version 11779 was installed onto the EUT to provide correct load characteristics. The EUT uses Teraterm Software Version 4.7.3 to control the device during testing

3.3. Operational Mode

For all transmitter tests, the EUT was set to transmit separately at 928.025MHz, 942.1MHz, and 959.975MHz. The EUT was operated with 2FSK, 8QAM, 16QAM, 32QAM, BPSK and QPSK modulations.

3.4. EUT Modifications

No modifications were required for compliance.

4. TEST FACILITY AND TEST INSTRUMENTATION

4.1. Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2009 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

Conducted and radiated emission measurements were performed with a spectrum analyzer. This receiver allows measurements with the bandwidths and detector functions specified by the FCC.

4.3. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

4.4. Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system. The measurement uncertainty for these tests is presented below:

Conducted Emissions Measurements		
Combined Standard Uncertainty	1.07	-1.07
Expanded Uncertainty (95% confidence)	2.1	-2.1

Radiated Emissions Measurements		
Combined Standard Uncertainty	2.26	-2.18
Expanded Uncertainty (95% confidence)	4.5	-4.4

5. TEST PROCEDURES

5.1. Transmitter

5.1.1. Emission Mask

5.1.1.1. Requirements

Per 101.111(a)(5), When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a 12.5 KHz bandwidth, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 2.5 KHz up to and including 6.25 KHz: At least $53 \log_{10} (fd/2.5)$ decibels;
- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 6.25 KHz up to and including 9.5 KHz: At least $103 \log_{10} (fd/3.9)$ decibels;
- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) of more than 9.5 KHz up to and including 15 KHz: At least $157 \log_{10} (fd/5.3)$ decibels; and
- On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater than 15 KHz: At least 50 plus $10 \log_{10} (P)$ or 70 decibels, whichever is the lesser attenuation.

5.1.1.2. Procedures

The EUT was set to transmit at 928.025MHz.

- a) The antenna port of the EUT was connected to a spectrum analyzer through 39.5 dB of attenuation.
- b) The following spectrum analyzer settings were employed:
 - trace 1 = on
 - center frequency = transmit frequency of the EUT
 - resolution bandwidth = 300 Hz
 - video bandwidth > resolution bandwidth
 - frequency span = 150 kHz sweep = Auto
 - detector function = peak
 - trace = max hold
- c) Several sweeps were made with the settings listed above.
- d) This plot determined the reference level for the emission mask.
- e) This plot was recorded.
- f) The following spectrum analyzer settings were employed:
 - trace 1 = on
 - resolution bandwidth = 300 Hz
 - video bandwidth > resolution bandwidth
 - sweep = Auto
 - detector function = peak
 - trace = max hold
- g) Several sweeps were made with the settings listed above.
- h) Steps (d) through (f) were repeated with the EUT set to transmit at all modulations listed in paragraph 3.2.
- i) Steps (a) through (f) were repeated with the EUT set to transmit at the remaining frequencies listed in paragraph 3.2.



5.1.1.3. Results

The spectrum analyzer plots of the emissions of the EUT are shown on pages 10 through 27. The limits, shown on the plots, are referenced to the power measured with a modulation turned off. As can be seen from the data, the emissions are within the limit.

6. OTHER TEST CONDITIONS

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to XetaWave, LLC upon completion of the tests.

7. CONCLUSIONS

It was determined that the XetaWave, LLC, Model No. Xeta-9, Licensed Radio Transmitter did fully meet the emissions mask requirements of the FCC "Code of Federal Regulations" Title 47, Part 101, Subpart C, when tested per TIA-603-C-2004.

8. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.



9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
GSD0	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMB 100A	100395	9KHZ-6GHZ	8/13/2012	8/13/2013
MDA0	MULTIMETER (R. KING)	FLUKE CORPORATION	26	72120781	I;VDC;VAC;R	3/18/2013	3/18/2014
RBA0	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB26	100145	20HZ-26.5GHZ	3/12/2013	3/12/2014
SMAH	POWER SUPPLY	MASTECH	HY3020EX	1014	30 Volt, 20 Amp	NOTE 1	
T1E1	10DB 25W ATTENUATOR	WEINSCHEL	46-10-43	AU1883	DC-18GHZ	8/6/2012	8/6/2013
T2D2	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AV5815	DC-18GHZ	8/6/2012	8/6/2013
T2S3	20DB 25W ATTENUATOR	WEINSCHEL	46-20-34	BV3544	DC-18GHZ	1/2/2013	1/2/2014

I/O: Initial Only

N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

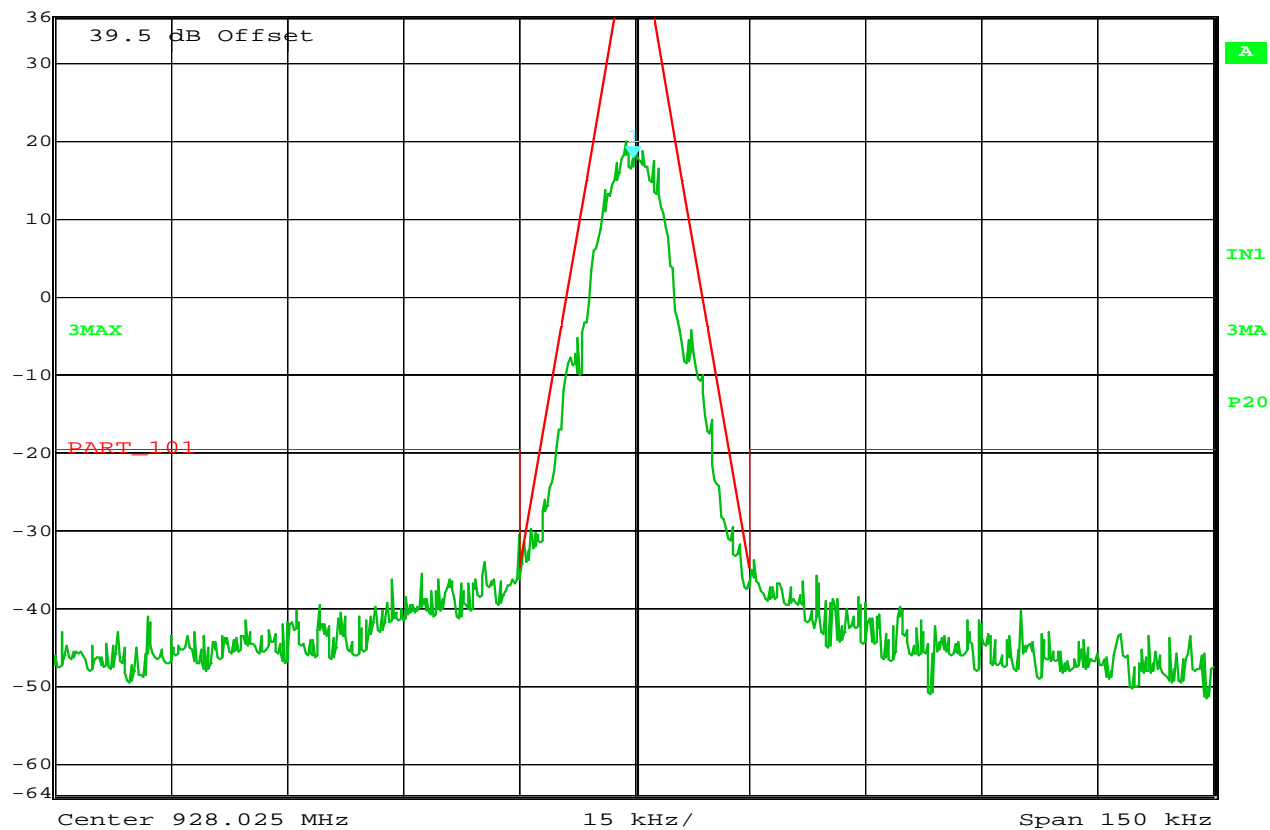
Figure 1



Test Setup for Occupied Bandwidth Emissions FCC Part 101 for the Xeta-9



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
17.87 dBm VBW 3 kHz
36 dBm 928.02489980 MHz SWT 8.4 s Unit dBm



Date: 14.JUN.2013 13:56:17

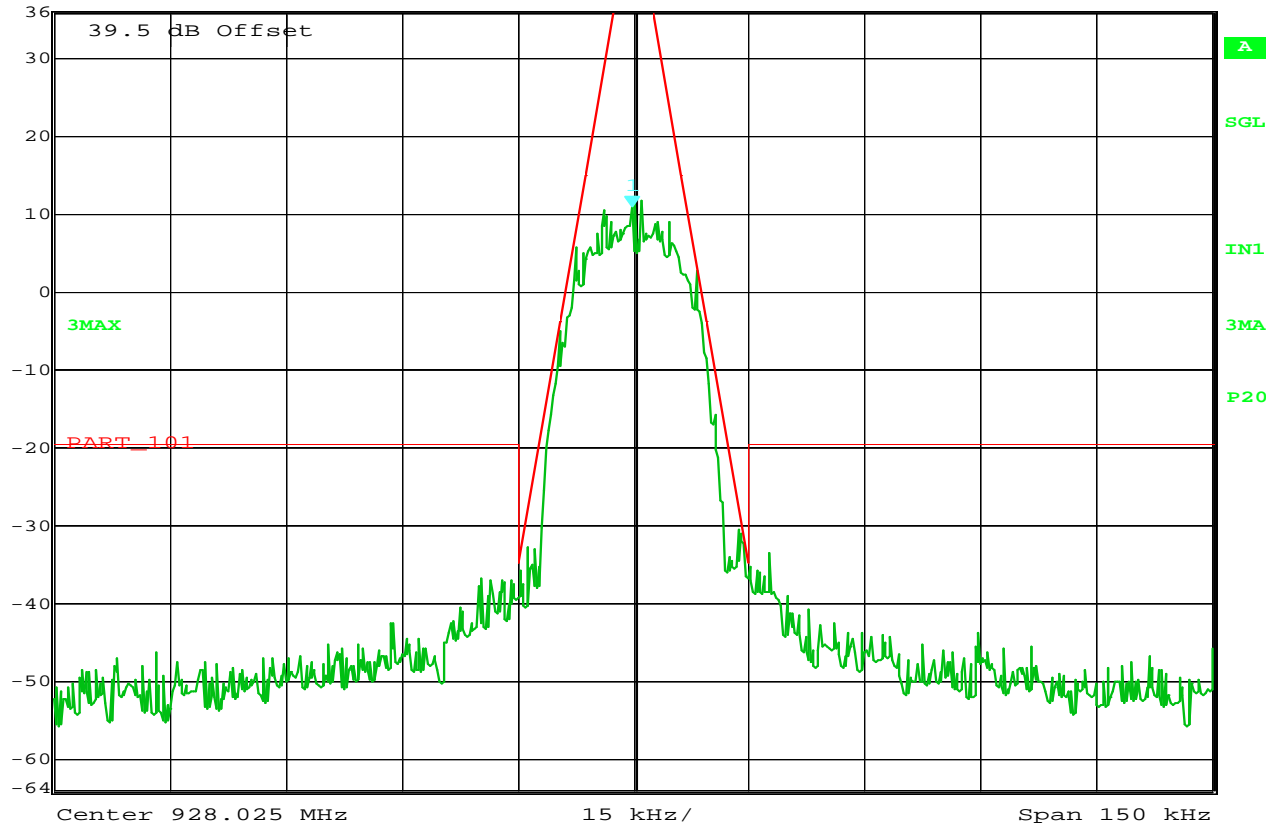
FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 2FSK modulation
: TXPWR = 2500

NOTES



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
Ref Lvl 10.86 dBm VBW 3 kHz
36 dBm 928.02484970 MHz SWT 8.4 s Unit dBm



Date: 14.JUN.2013 14:06:21

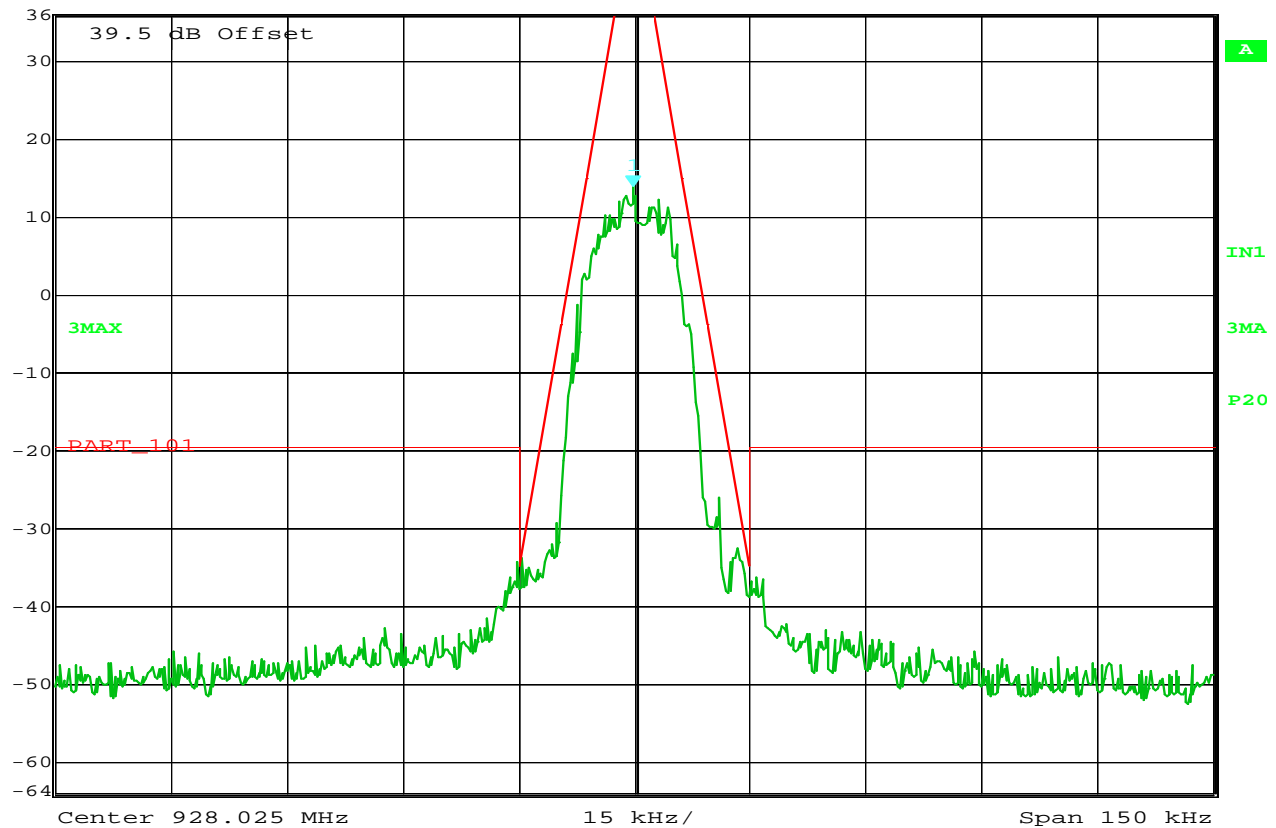
FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 8QAM modulation
: TXPWR = 3000

NOTES



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
Ref Lvl 13.78 dBm VBW 3 kHz
36 dBm 928.02484970 MHz SWT 8.4 s Unit dBm



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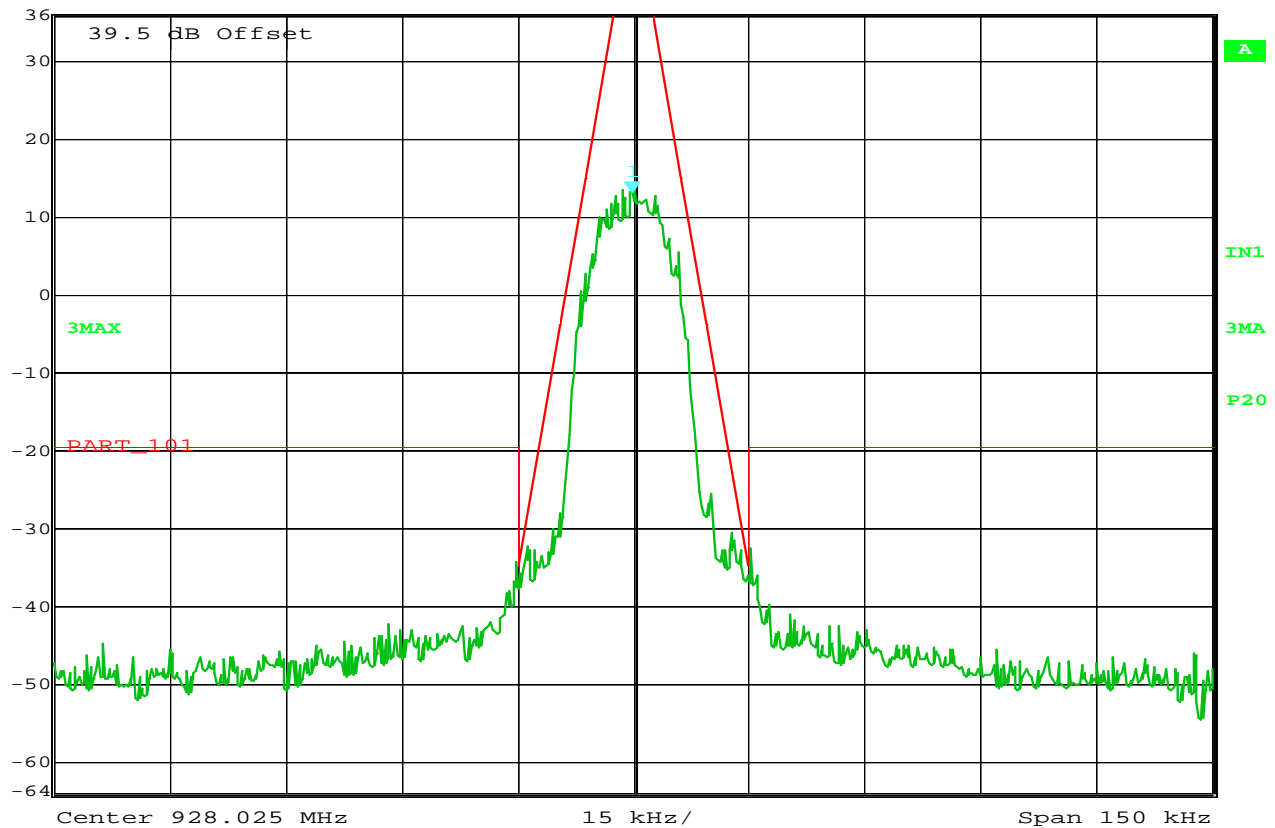
FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 16QAM modulation
: TXPWR = 2800

NOTES



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
Ref Lvl 13.23 dBm VBW 3 kHz
36 dBm 928.02484970 MHz SWT 8.4 s Unit dBm



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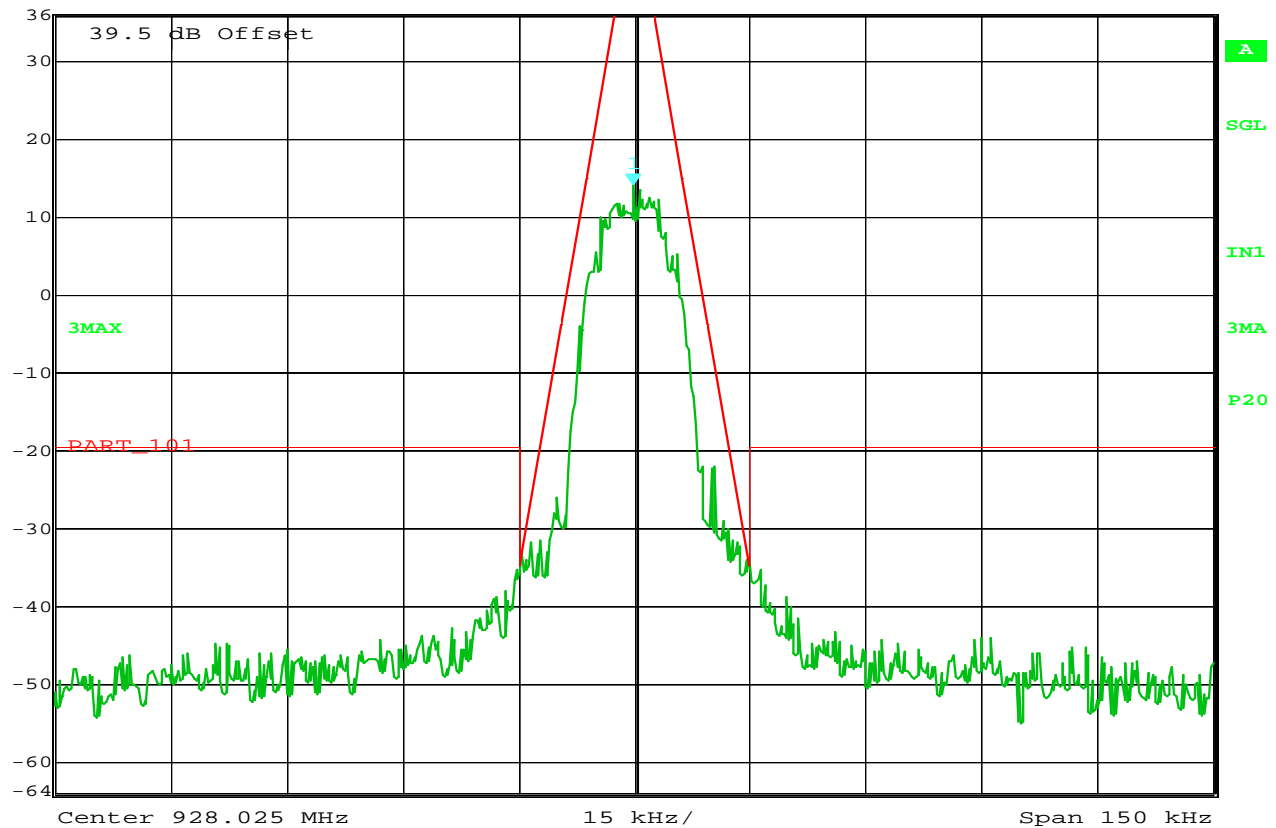
FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 32QAM modulation
: TXPWR = 2800

NOTES



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
14.17 dBm VBW 3 kHz
36 dBm 928.02484970 MHz SWT 8.4 s Unit dBm



Date: 14.JUN.2013 14:01:03

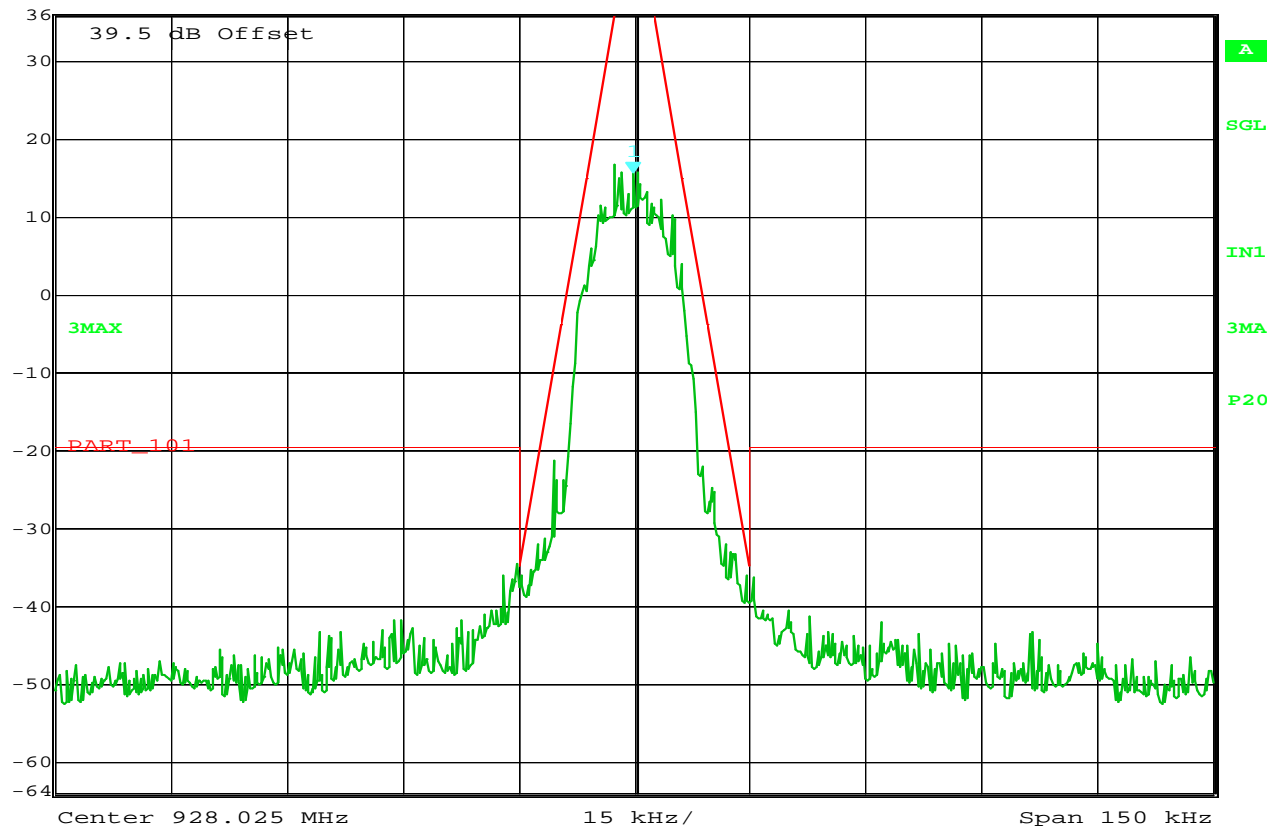
FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts BPSK modulation
: TXPWR = 3000

NOTES



Marker 1 [T3] RBW 300 Hz RF Att 40 dB
Ref Lvl 15.50 dBm VBW 3 kHz
36 dBm 928.02484970 MHz SWT 8.4 s Unit dBm

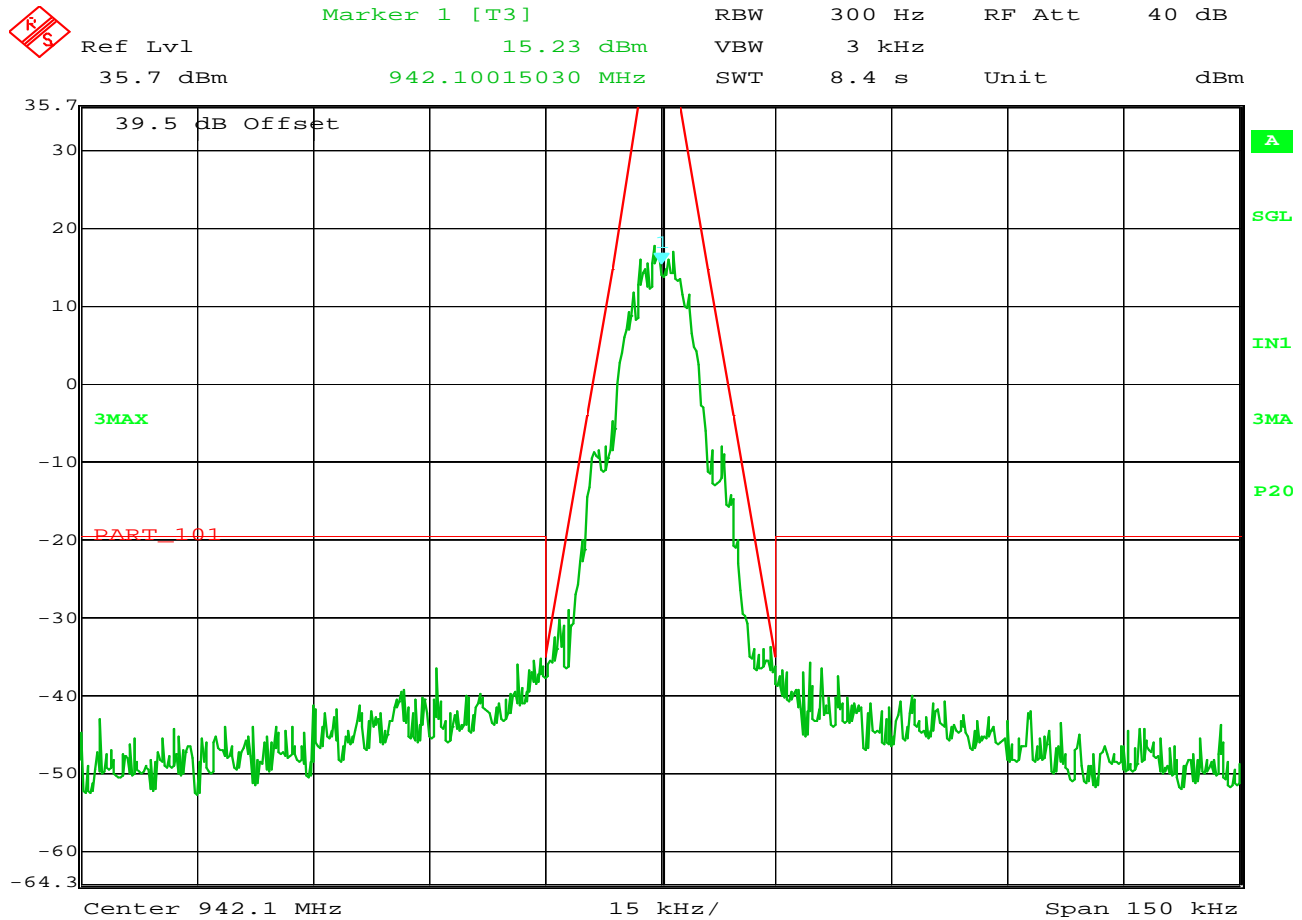


Date: 14.JUN.2013 14:04:23

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 928.025MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts QPSK modulation
: TXPWR = 3000

NOTES



Date: 14.JUN.2013 14:15:07

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 2FSK modulation
: TXPWR = 2250

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

11.50 dBm

VBW

3 kHz

35.7 dBm

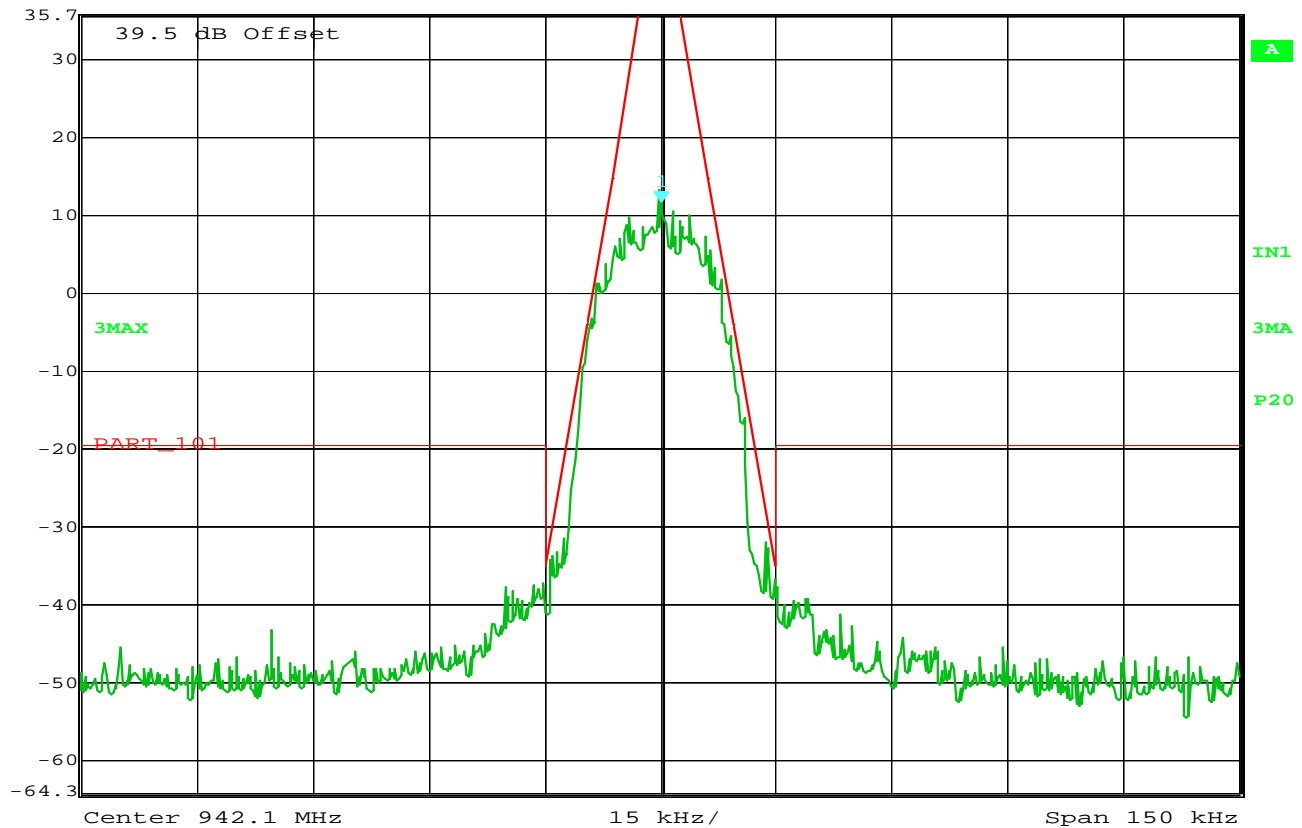
942.10015030 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:21:38

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 8QAM modulation
: TXPWR = 3250

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

15.46 dBm

VBW

3 kHz

35.7 dBm

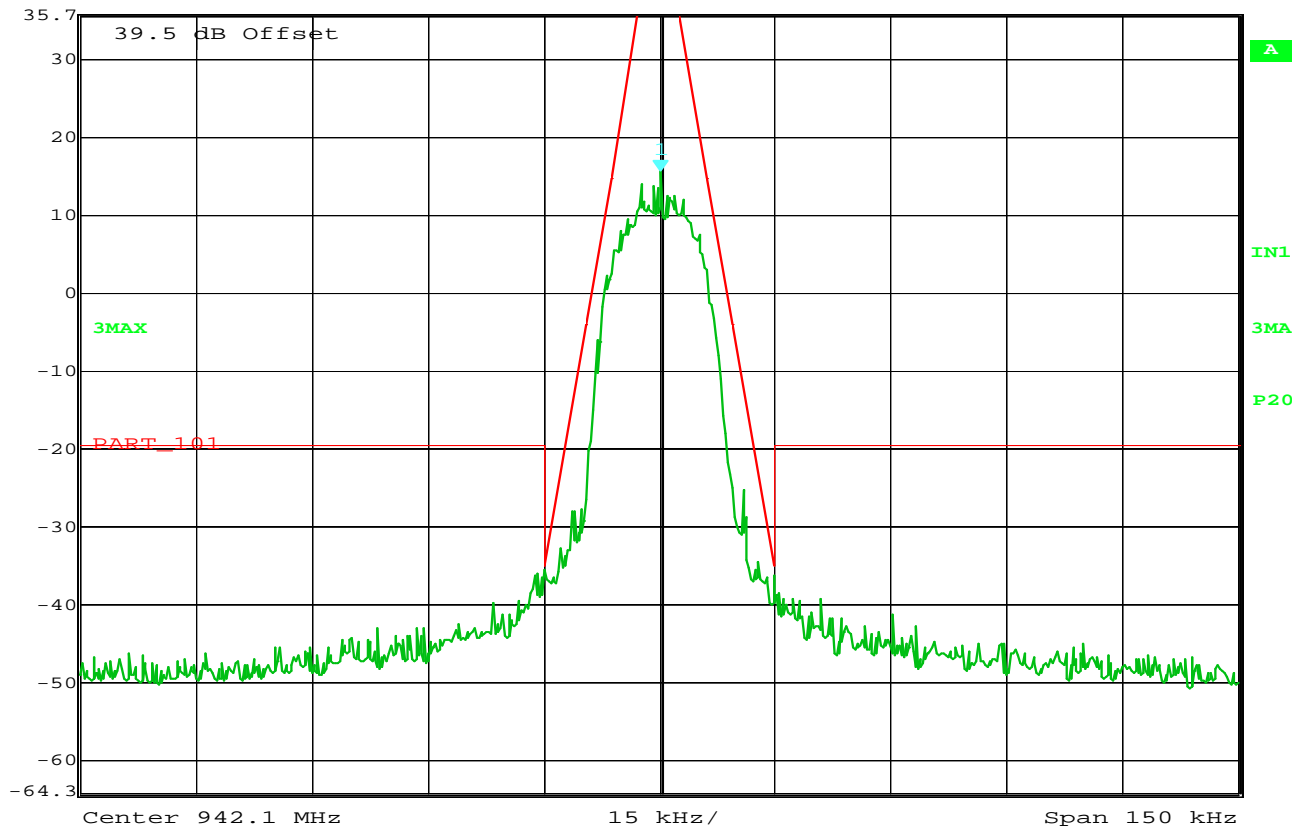
942.10015030 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:23:40

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 16QAM modulation
: TXPWR = 3250

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

13.30 dBm

VBW

3 kHz

35.7 dBm

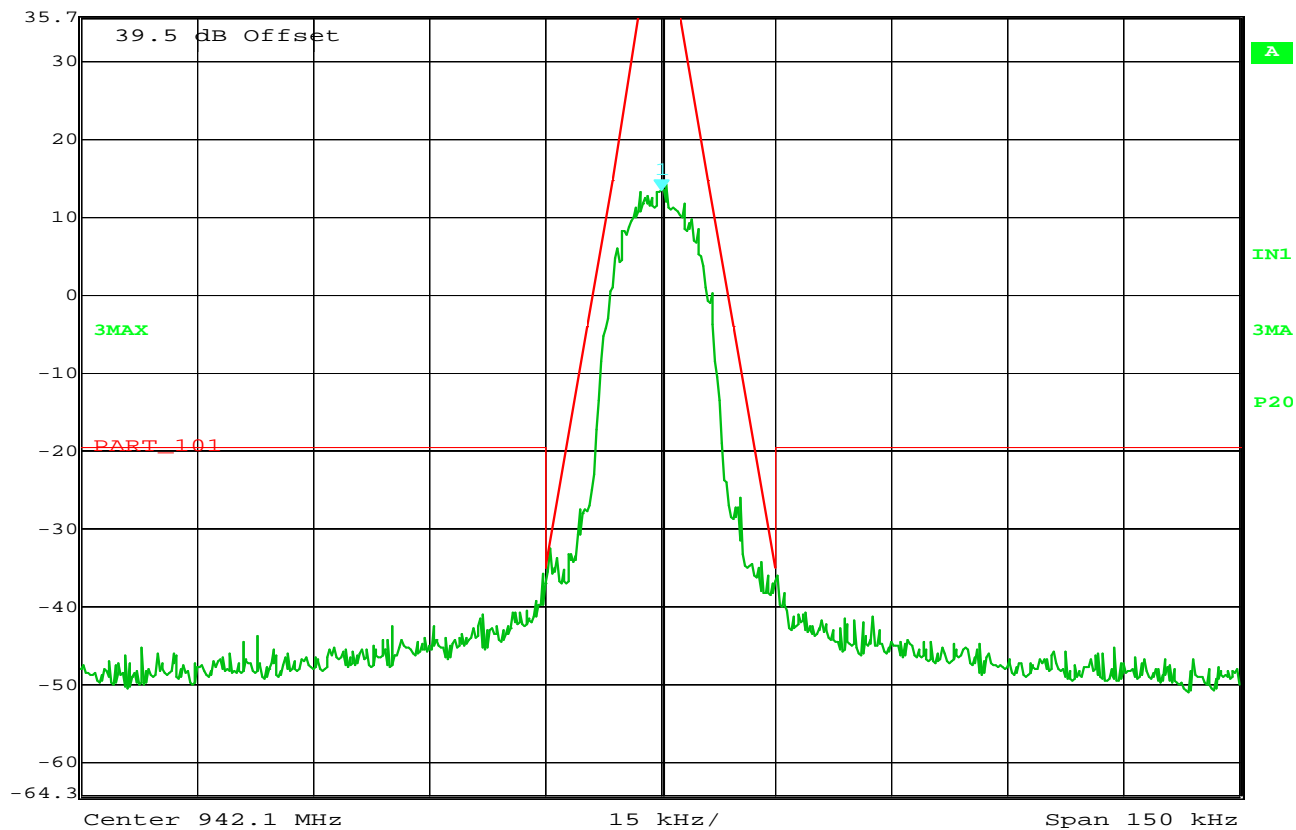
942.10015030 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:25:19

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 32QAM modulation
: TXPWR = 3250

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

12.08 dBm

VBW

3 kHz

35.7 dBm

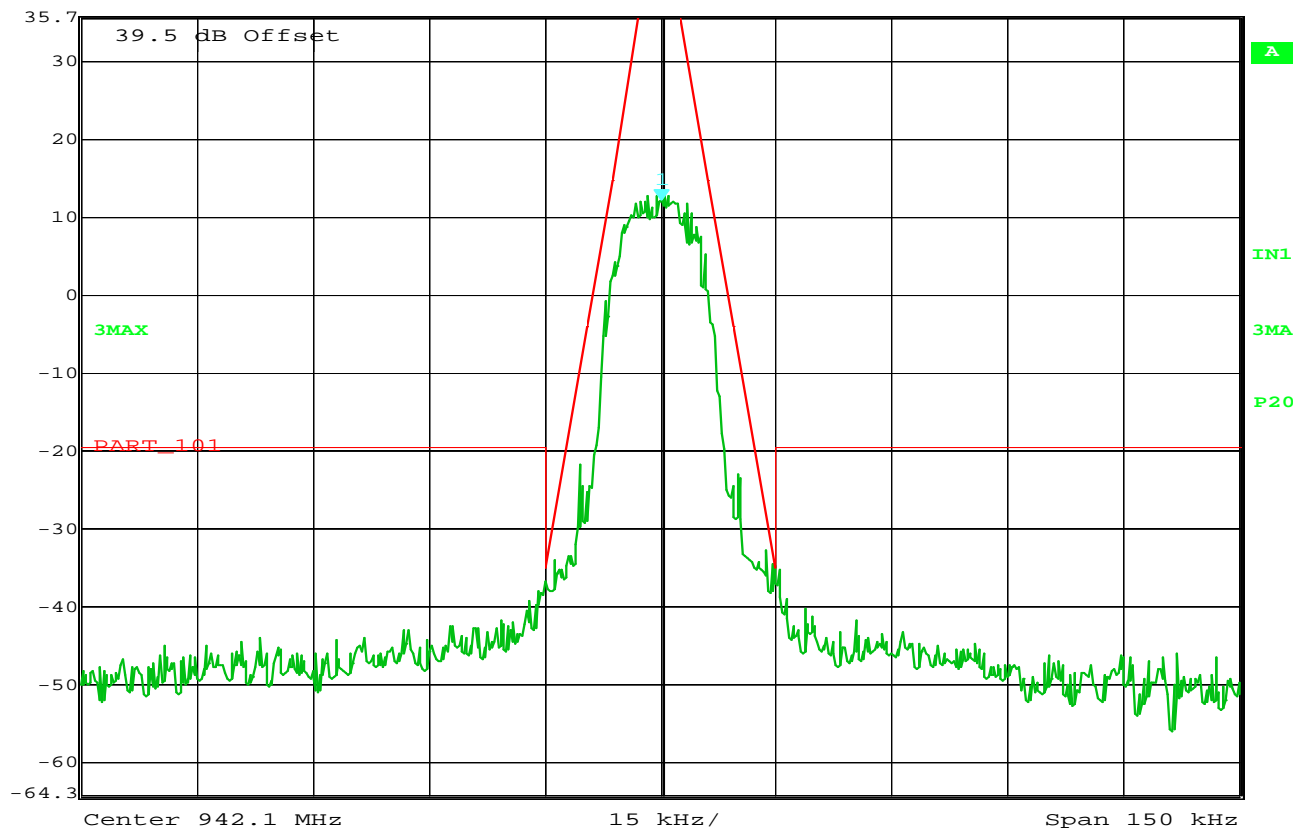
942.10015030 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:18:36

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts BPSK modulation
: TXPWR = 3000

NOTES



Marker 1 [T3]

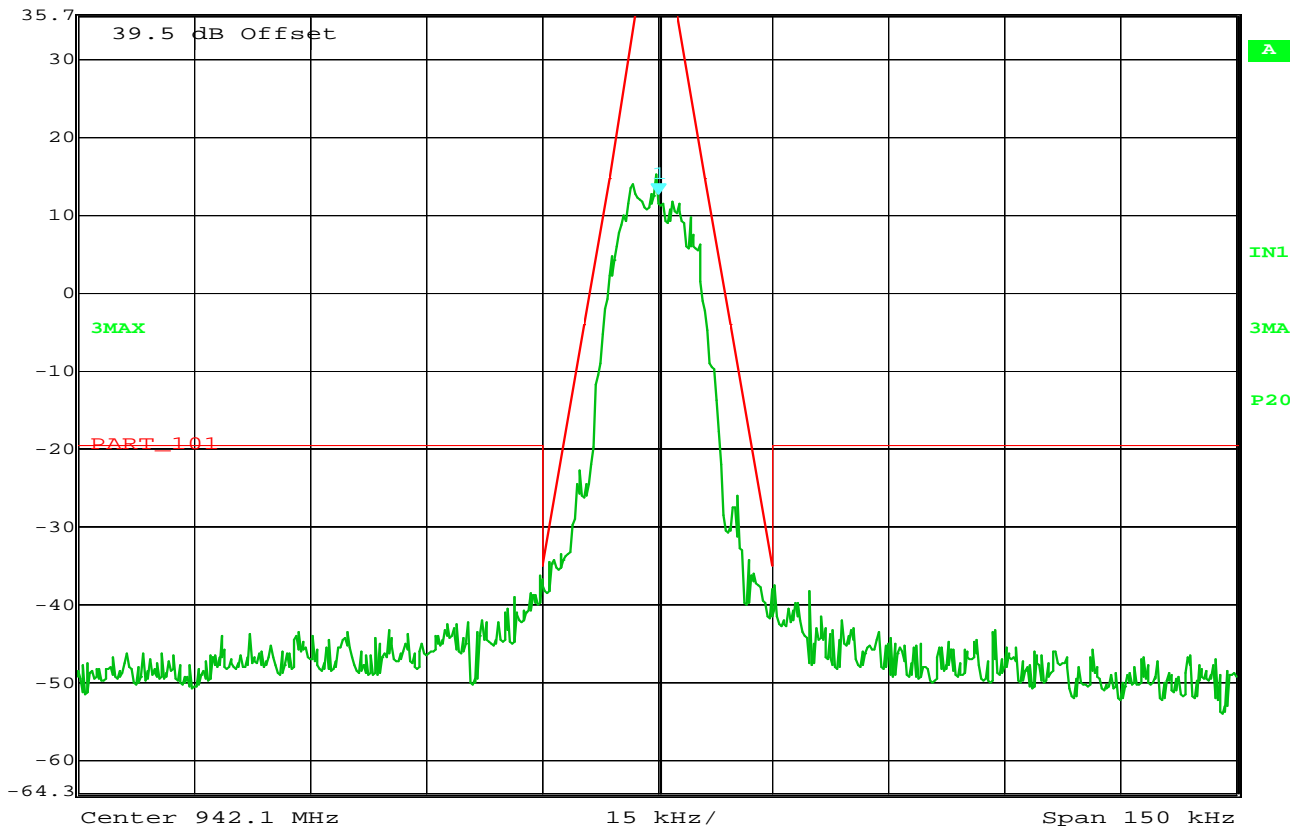
RBW 300 Hz RF Att 40 dB

Ref Lvl 12.59 dBm

VBW 3 kHz

35.7 dBm 942.10015030 MHz

SWT 8.4 s Unit dBm

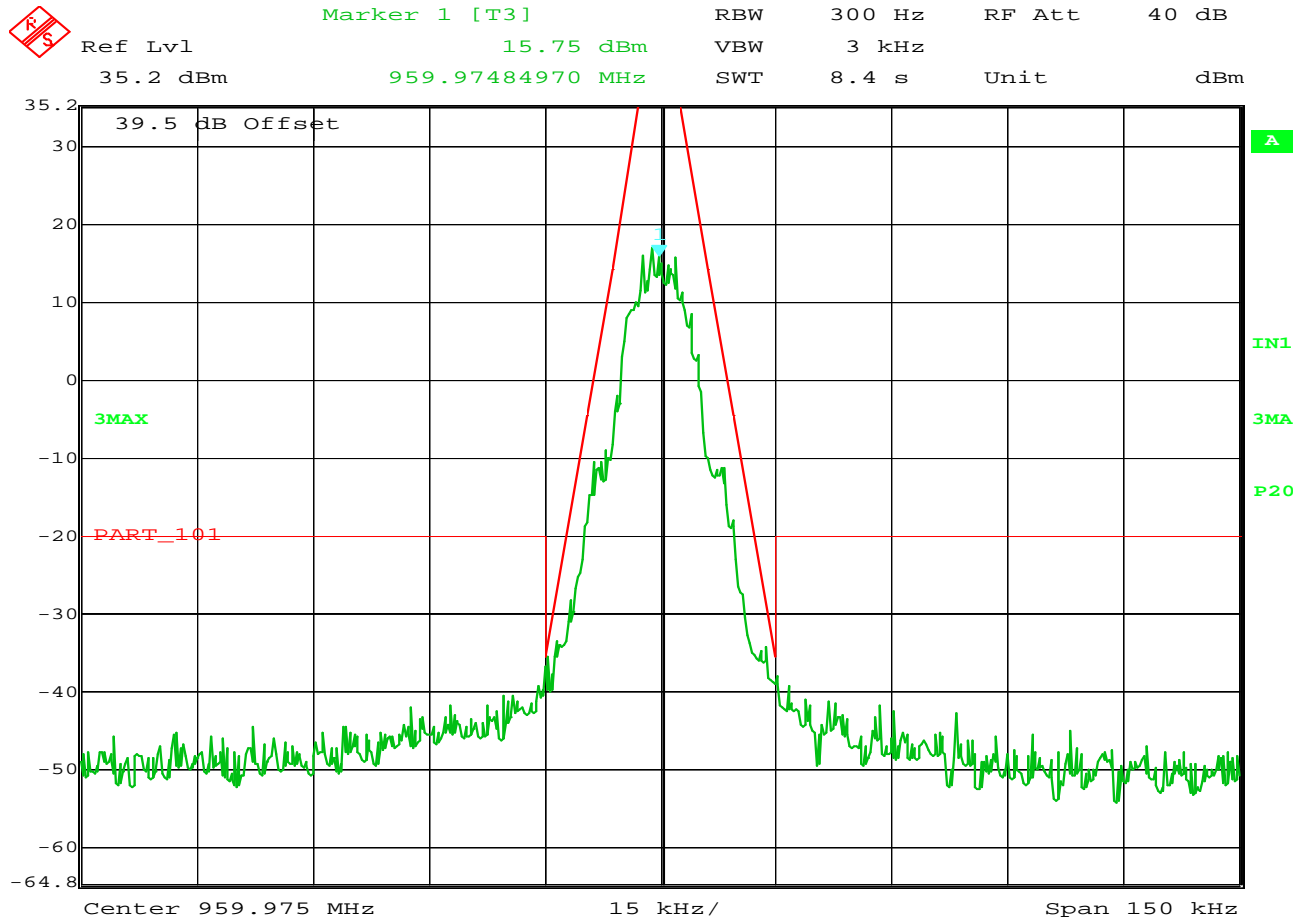


Date: 14.JUN.2013 14:20:33

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 942.1MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts QPSK modulation
: TXPWR = 3250

NOTES



Date: 14.JUN.2013 14:30:21

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 959.975MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 2FSK modulation
: TXPWR = 3500

NOTES



```
MANUFACTURER      : XetaWave LLC
MODEL NUMBER      : Xeta-9
TEST MODE         : Tx @ 959.975MHz
SERIAL NUMBER     : E50103C3
NOTES             : Tx 4Watts 8QAM modulation
                  : TXPWR = 5250
```

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Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

13.63 dBm

VBW

3 kHz

35.2 dBm

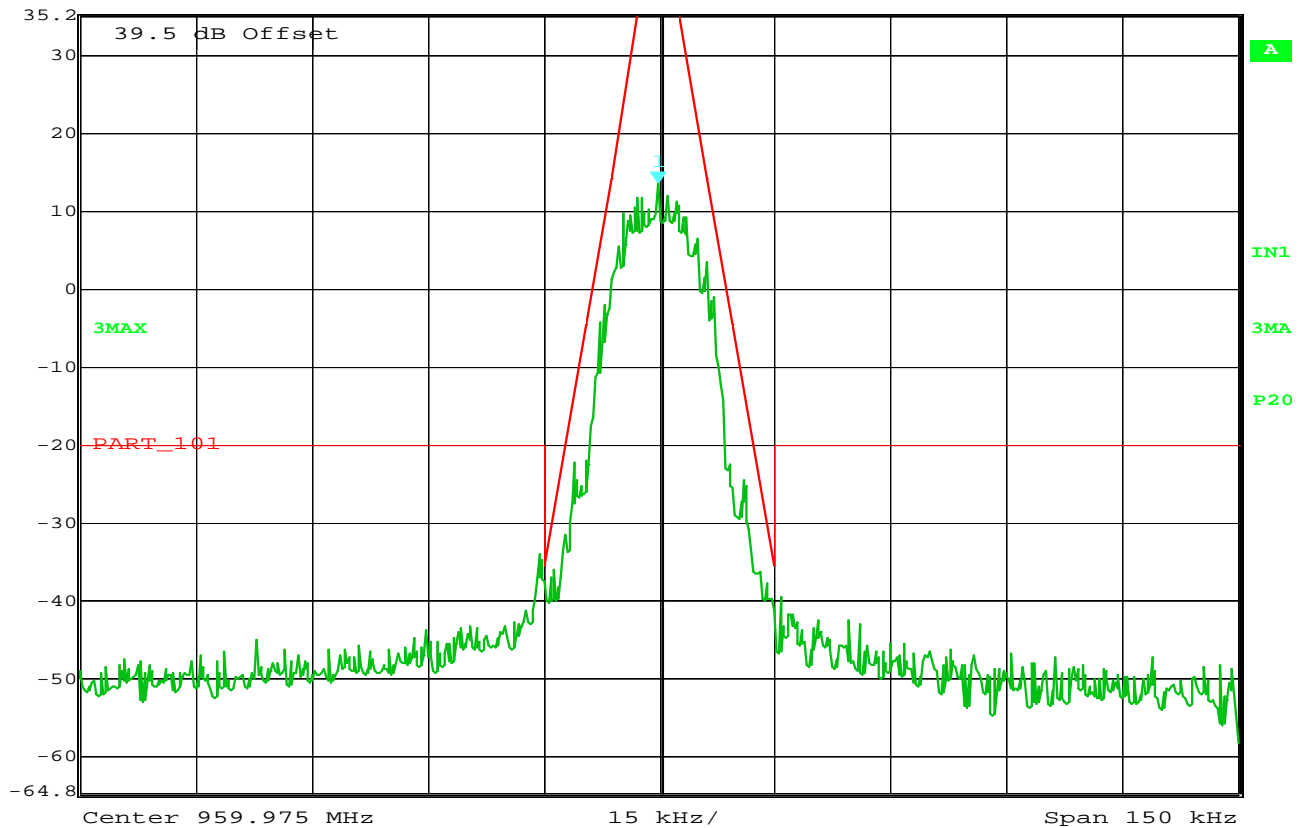
959.97484970 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:40:28

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 959.975MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 16QAM modulation
: TXPWR = 6250

NOTES



Marker 1 [T3]

RBW 300 Hz RF Att 40 dB

Ref Lvl 10.11 dBm

VBW 3 kHz

35.2 dBm

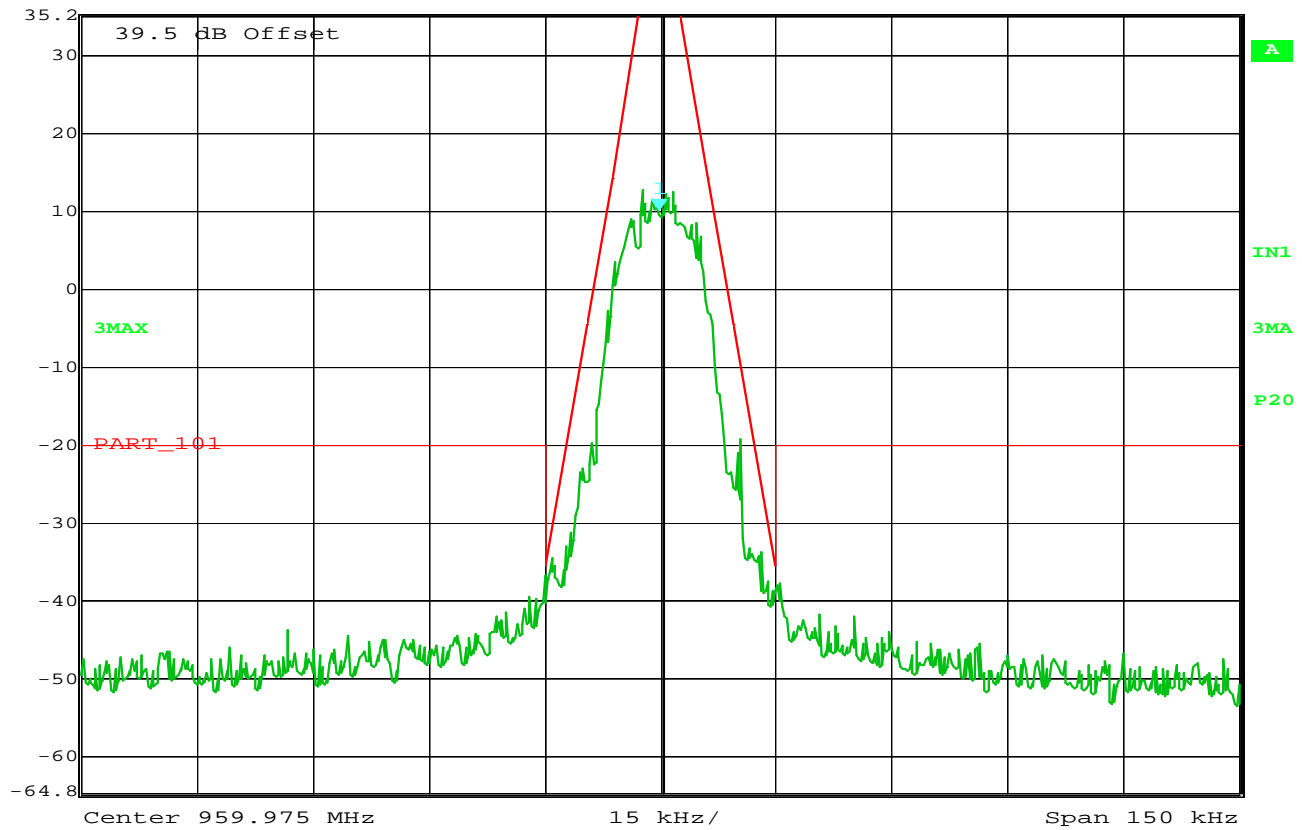
959.97484970 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:41:26

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 959.975MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts 32QAM modulation
: TXPWR = 6250

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

6.67 dBm

VBW

3 kHz

35.2 dBm

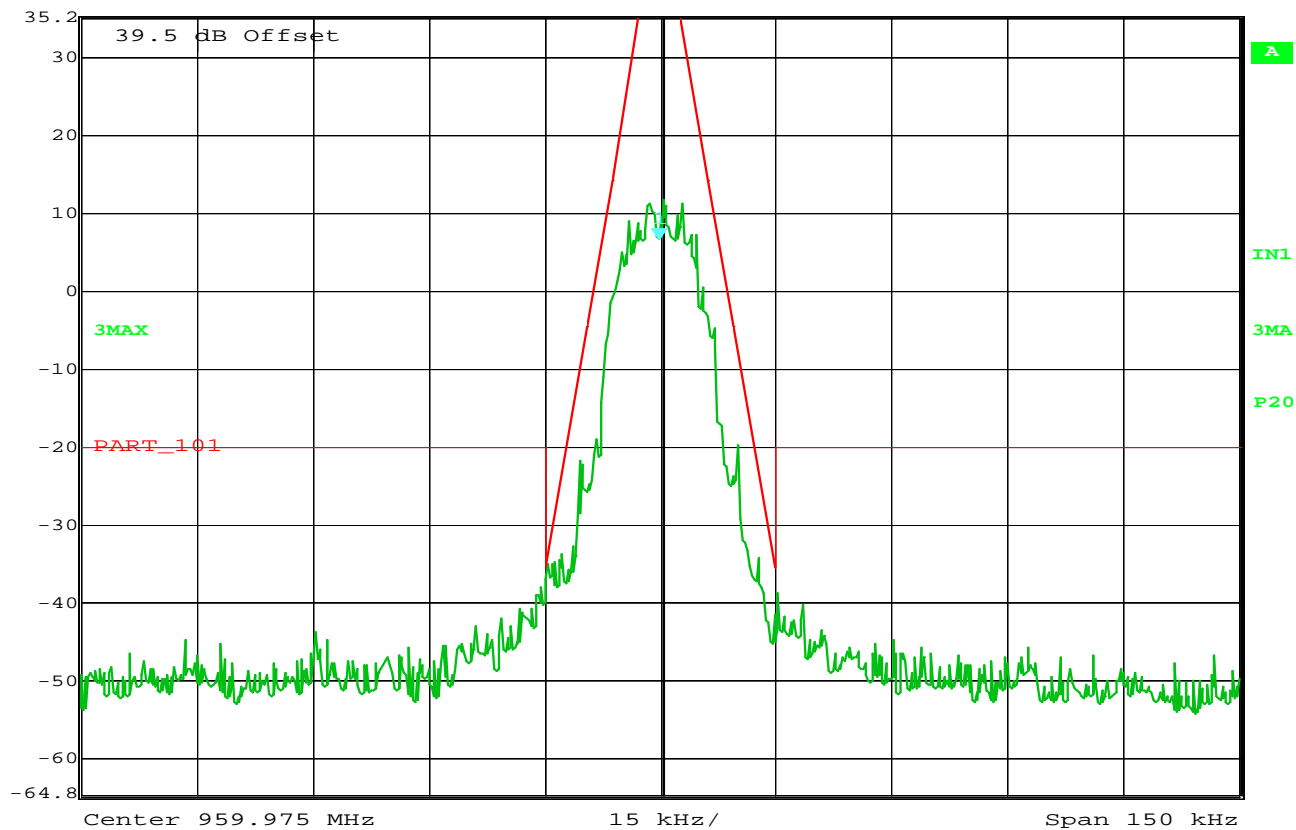
959.97484970 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:32:04

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 959.975MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts BPSK modulation
: TXPWR = 5000

NOTES



Marker 1 [T3]

RBW

300 Hz

RF Att

40 dB

Ref Lvl

12.39 dBm

VBW

3 kHz

35.2 dBm

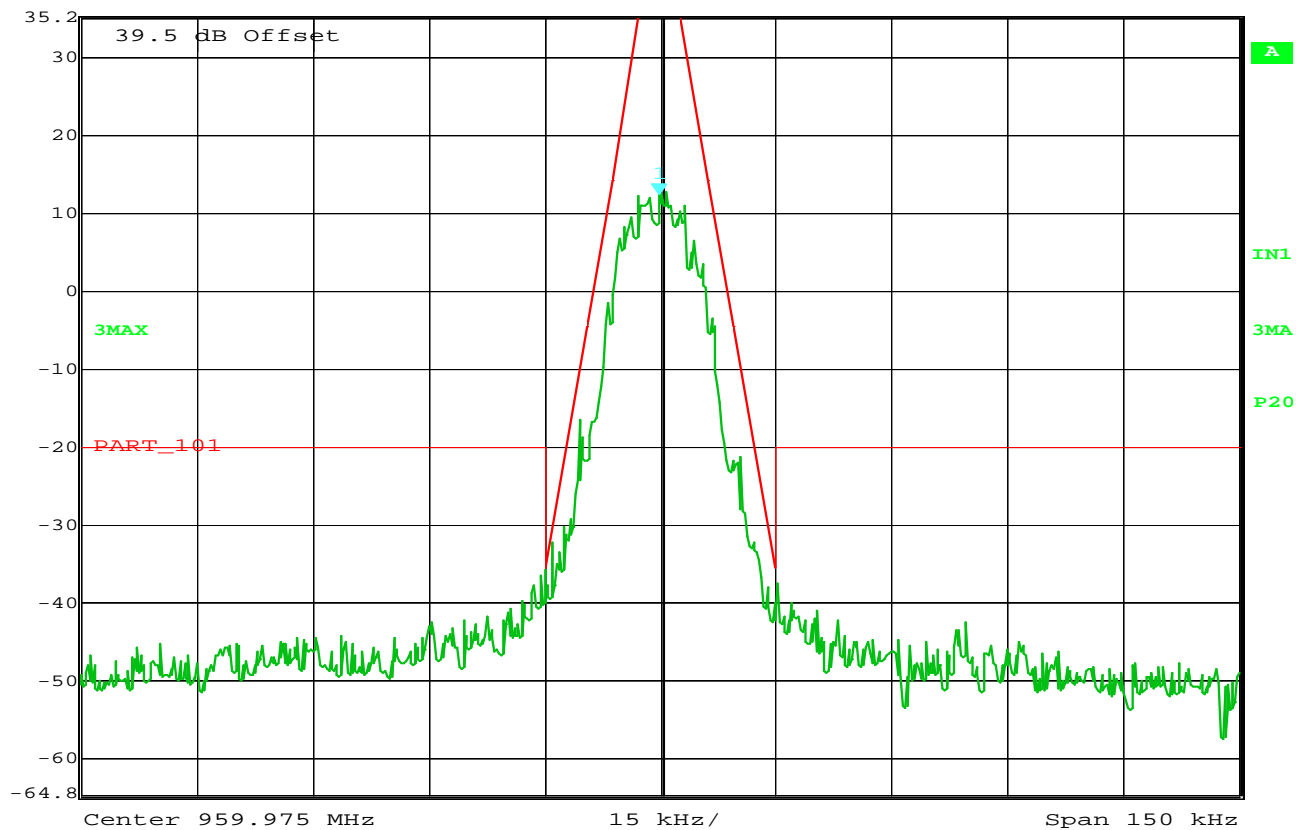
959.97484970 MHz

SWT

8.4 s

Unit

dBm



Date: 14.JUN.2013 14:33:59

FCC Part 101: Occupied Bandwidth

MANUFACTURER : XetaWave LLC
MODEL NUMBER : Xeta-9
TEST MODE : Tx @ 959.975MHz
SERIAL NUMBER : E50103C3
NOTES : Tx 4Watts QPSK modulation
: TXPWR = 6500

NOTES

Checked BY RICHARD E. King :Richard E. King