Radio Test Report

FCC Part 90
RSS-119

150 – 174 MHz

Model: XETA1-M2

FCC ID: PEJ-9382010
IC: 11169A-00001

COMPANY:	XetaWave LLC 258 S. Taylor Avenue Louisville, CO 80027
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	January 26, 2017
FINAL TEST DATES:	December 19, 20, 21 and 22, 2016
TOTAL NUMBER OF PAGES:	60

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REVISION HISTORY

Rev#	Date	Comments	Modified By
1	January 26, 2017	First release	

TABLE OF CONTENTS

SCOPE

Tests have been performed on the XetaWave LLC model XETA1-M2, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Innovation, Science and Economic Development Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 90 (Private Land Mobile Radio Service)
- RSS-119 Issue 12 – Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41 – 960 MHz
- RSS-Gen Issue 4 – General Requirements for Compliance of Radio Apparatus

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI TIA-603-D: 2010
ANSI C63.4: 2014
FCC KDB 971168 Licensed Digital Transmitters

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the XetaWave LLC model XETA1-M2 and therefore apply only to the tested sample. The sample was selected and prepared by Sandee Malang of XetaWave LLC.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA and Canada, the device requires certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of XetaWave LLC model XETA1-M2 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC	Canada	Description	Limit	Measured	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 90.35	SRSP-500 4.3	Frequency range(s)	150.0 – 174.0 MHz	150.0 – 174.0 MHz	Pass
§2.1033 (c) (6) §2.1033 (c) (7) § 2.1046 § 90.205	RSS-119 5.4	RF power output	FCC: 500 W ERP IC: 110 W conducted.	39.8 W ERP 5.13 W Conducted	Pass
§2.1033 (c) (4) § 2.1047 § 90.210	Emission types			F1D, G1D	
	RSS-119 5.5	Emission masks	Masks C, D and E	Emissions within the masks	Pass
§ 2.1049 § 90.209	RSS-119 5.5	Occupied Bandwidth	6 kHz, 11.25 kHz and 20 kHz	4.19 kHz, 11.1 kHz and 18.0 kHz	Pass
§ 90.214	RSS-119 5.9	Transient Frequency Behavior	t_1: ±6.25 kHz, 5 ms, t_2: ±3.125 kHz, 20 ms, t_3: ±6.25 kHz, 5 ms.	Within the limits	Pass
Transmitter spurious emissions					
§ 2.1051 § 2.1057	RSS-119 5.8	At the antenna terminals	-25 dBm (Mask E)	-25.8 dBm @ 190.974 MHz (-0.8 dB)	Pass
§ 2.1053 § 2.1057	RSS-119 5.8	Field strength	-25 dBm (Mask E)	-36.1 dBm @ 903.012 MHz (-11.1 dB)	Pass
Other details					
§ 2.1055 § 90.213	RSS-119 5.3	Frequency stability	Fixed and Base station: 1 ppm	0.5 ppm	Pass
§ 2.1093	RSS-102	RF Exposure		See separate exhibit	
§2.1033 (c) (8)	-	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range		See operational description exhibit	
-	-	Antenna Gain		11 dBi (Declared by manufacturer)	

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 85 to 115 percent of the nominal value.

The extremes of temperature were -30°C to +50°C as specified in FCC §2.1055(a)(1).

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The XetaWave LLC model XETA1-M2 is a radio module which is designed to be used for licensed radio operations for private data transmission networking or telemetry. Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the worst case user environment. The electrical rating of the EUT is 11 Volts DC, 3 Amps.

The sample was received on December 19, 2016 and tested on December 19, 20, 21 and 22, 2016. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID / IC
XetaWave	XETA1-M2	Radio Module	E501C237	PEJ-9382010 11169A-00001

OTHER EUT DETAILS

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. In some cases, the highest internal source determines the frequency range of test for radiated emissions. The highest internal source of the EUT was declared as: 284.1 MHz (1st LO).

ENCLOSURE

The EUT does not have an enclosure. The radio module dimensions are 50 mm x 50 mm x 12 mm.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at National Technical Systems - Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Xetawave	-	Test bed (Heat sink with fan)	-	-
HP	6024A	AC/DC power supply	Asset# 3004	-

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
HP	Pavilion dv7	Laptop	-	-

Note: The computer was used to configure the radio via serial port. It was not connected during the radiated emission tests.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC power	AC/DC power supply	DC power cable	Unshielded.	1

EUT OPERATION

During emissions testing the EUT was transmitting with the rated RF power in each required modulation types and data rates.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the National Technical Systems - Silicon Valley test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

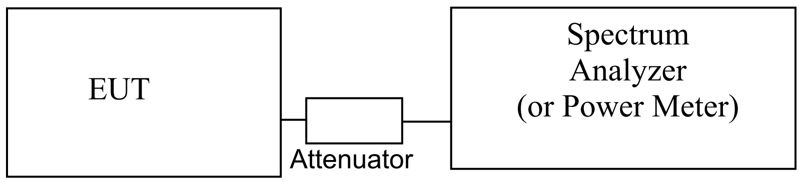
Radiated spurious emissions measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers listed below. The sites conform to the requirements of ANSI C63.4: 2014 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

Site	Designation / Registration Numbers		Location
	FCC	Canada	
Chamber 7	US0027	IC 2845B-7	41039 Boyce Road Fremont, CA 94538-2435

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement (refer to RADIATED EMISSIONS MEASUREMENTS). All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

OUTPUT POWER

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

BANDWIDTH MEASUREMENTS

The 99% bandwidth is measured using the methods detailed in ANSI C63.10 and RSS-GEN with RBW 1% to 5% of the OBW and VBW ≥ 3xRBW.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector (VBW ≥ 3xRBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). For transmitter measurements the appropriate detector (average, peak, normal, sample, quasi-peak) is used when making measurements for licensed devices.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

FREQUENCY STABILITY

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 6-digit display for the marker-frequency function. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower X dB points (where X is typically 6 dB or 10 dB) on the signal's skirts.

RADIATED EMISSIONS MEASUREMENTS

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20 dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in an anechoic chamber during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. Initial scans are made using a peak detector (VBW ≥ 3xRBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission.

For transmitter spurious emissions, the radiated power of all emissions within 20 dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm

S = Specification Limit in dBm

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is sued when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20*LOG_{10}(D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBμV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBμV/m

L_s = Specification Limit in dBμV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS –RADIATED POWER

The ERP/EIRP limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\,P\,G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBμV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20 dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at EIRP P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.1 dBi) from the EIRP value.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Antenna port measurements, 19-Dec-16					
NTS	NTS EMI Software (rev 2.10)	N/A	0		N/A
NTS	NTS Mask Software (rev 3.8)	N/A	0		N/A
NTS	NTS Capture Analyzer Software (rev 3.8)	N/A	0		N/A
Fluke	Multimeter, True RMS	111	1480	3/28/2016	3/28/2017
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	3/10/2016	3/10/2017
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	5/6/2016	5/6/2017
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	3268	4/22/2016	2/22/2017
Frequency Stability, 20-Dec-16					
Fluke	Multimeter, True RMS	111	1480	3/28/2016	3/28/2017
Watlow	Temp Chamber (w/ F4 Watlow Controller)	F4	2170	7/8/2016	7/8/2017
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	5/6/2016	5/6/2017
Transient Frequency Behavior, 20-Dec-16					
Werlatone	Directional Coupler, 80-1000 MHz, 40dB, 200W	C3910	917		N/A
Tektronix	1 GHz, 4 CH, 5GS/s Oscilloscope	TDS5104	1435	8/2/2016	8/2/2017
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	2/20/2016	2/20/2017
Rohde & Schwarz	signal generator 100KHz-12.75GHz	SMB 100A	3002		N/A
Radiated Emissions, 30 - 3,000 MHz, 21-Dec-16					
NTS	NTS EMI Software (rev 2.10)	N/A	0		N/A
Filtek	Filter, 1 GHz High Pass	HP12/1000-5BA	957	5/4/2016	5/4/2017
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	6/2/2015	6/2/2017
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	9/30/2016	9/30/2017
Hewlett Packard	Spectrum Analyzer (SA40) Purple 9 kHz - 40 GHz,	8564E (84125C)	2415	3/19/2016	3/19/2017
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	2/20/2016	2/20/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/31/2015	8/31/2017
Substitution Measurements, 22-Dec-16					
NTS	NTS EMI Software (rev 2.10)	N/A	0		N/A
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	6/2/2015	6/2/2017
Compliance Design	Tuned Dipole Antenna	Roberts (180-400MHz)	1894	1/19/2016	1/19/2018
Compliance Design	Tuned Dipole Antenna	Roberts (400-1000MHz)	1896	1/19/2016	1/19/2018
Rohde & Schwarz	Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms	NRV-Z1	2114	10/27/2016	10/27/2017
Agilent Technologies	MXG Analog Signal Generator 6 GHz	N5181A	2146	1/19/2016	1/19/2017

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	2/20/2016	2/20/2017
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	3268	4/22/2016	2/22/2017

Appendix B Test Data

T98773 Pages 20 – 59

Client:	XetaWave LLC	Job Number:	JD103500
Product	Xeta1-M2	T-Log Number:	T103571
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Emissions Standard(s):	FCC Part 90, RSS-119	Class:	A
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

XetaWave LLC

Product

Xeta1-M2

Date of Last Test: 12/22/2016

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

FCC Part 90 and RSS-119 Issue 12

Power, Occupied Bandwidth, Frequency Stability and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 20-22 °C

Rel. Humidity: 30-35 %

Summary of Results

Run #	Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
1	6.25 kHz, 12.5 kHz and 25 kHz	Output Power	FCC: 500 W ERP IC: 110 W Conducted	Pass	39.8 W ERP 5.13 W Conducted
2	6.25 kHz, 12.5 kHz and 25 kHz	Spectral Mask	Masks C, D and E	Pass	Emissions within the masks.
3	6.25 kHz, 12.5 kHz and 25 kHz	99% or Occupied Bandwidth	6 kHz, 11.25 kHz and 20 kHz	Pass	4.19 kHz, 11.1 kHz, and 18.0 kHz
4	-	Tx Spurious Emissions (conducted)	-25 dBm	Pass	-25.8 dBm @ 190.974 MHz (-0.8 dB)
5	-	Tx Spurious emissions (radiated)	-25 dBm	Pass	-36.1 dBm @ 903.012 MHz (-11.1 dB)
6	6.25 kHz, 12.5 kHz and 25 kHz	Transient Frequency Behavior	±6.25 kHz ±3.125 kHz	Pass	Within the limits.
7	6.25 kHz, 12.5 kHz and 25 kHz	Frequency Stability	1 ppm	Pass	0.5 ppm

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #1: Output Power

Date: 12/19/2016 Engineer: Kevin Location: FT Lab #4b

Cable/Splitter Loss: 3.3 dB Attenuator: 20.0 dB Total Loss: 23.3 dB
Cable/Splitter ID(s): 1455 Attenuator IDs: #1878

Run #1a: Output power at 150.5-164 MHz band

Power setting	Frequency (MHz)	Modulation	Channel plan	Output Power (dBm) [1]	Output Power W	Ant. Gain (dBi)	Result	ERP (dBm)[3]	ERP W
	150.50	MSK	6.25 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	150.50	MSK	12.5 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	150.50	8PSK	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	150.50	16QAM	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	150.50	64QAM	12.5 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	150.50	MSK	25.0 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	150.50	8PSK	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	150.50	16QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	150.50	64QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	MSK	6.25 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	MSK	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	8PSK	12.5 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	162.00	16QAM	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	64QAM	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	MSK	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	8PSK	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	16QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	162.00	64QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	MSK	6.25 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	MSK	12.5 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	173.40	8PSK	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	16QAM	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	64QAM	12.5 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	MSK	25.0 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	173.40	8PSK	25.0 kHz	37.0	5.01	11.0	Pass	45.9	38.905
	173.40	16QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811
	173.40	64QAM	25.0 kHz	37.1	5.13	11.0	Pass	46.0	39.811

Note 1:	Output power measured using a peak power meter
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Transmit power (erp) = Output Power (dBm) + Ant. Gain (dBi) - 2.1

NTS
WE ENGINEER SUCCESS

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #2: Spectral Mask, FCC Part 90 and RSS-119 Masks C, D and E

Date: 12/19/2016 Engineer: Kevin, Deniz

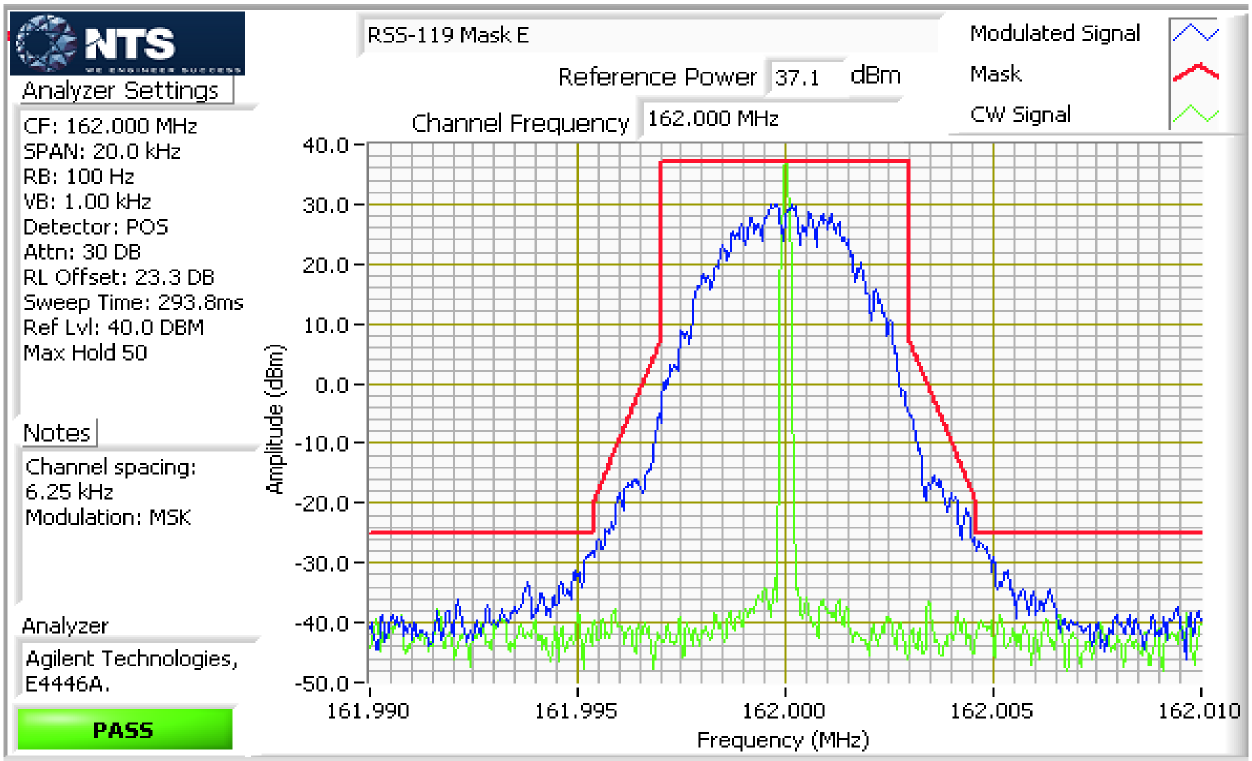
Power setting	Data rate	Channel plan	Modulation	Channel Frequency (MHz)	Result Pass/Fail
	4.8 kbps	6.25 kHz	MSK	162.000000	Pass
	10 kbps	12.5 kHz	MSK	162.000000	Pass
	27 kbps	12.5 kHz	8PSK	162.000000	Pass
	37 kbps	12.5 kHz	16QAM	162.000000	Pass
	54 kbps	12.5 kHz	64QAM	162.000000	Pass
	18 kbps	25.0 kHz	MSK	162.000000	Pass
	41 kbps	25.0 kHz	8PSK	162.000000	Pass
	56 kbps	25.0 kHz	16QAM	162.000000	Pass
	88 kbps	25.0 kHz	64QAM	162.000000	Pass

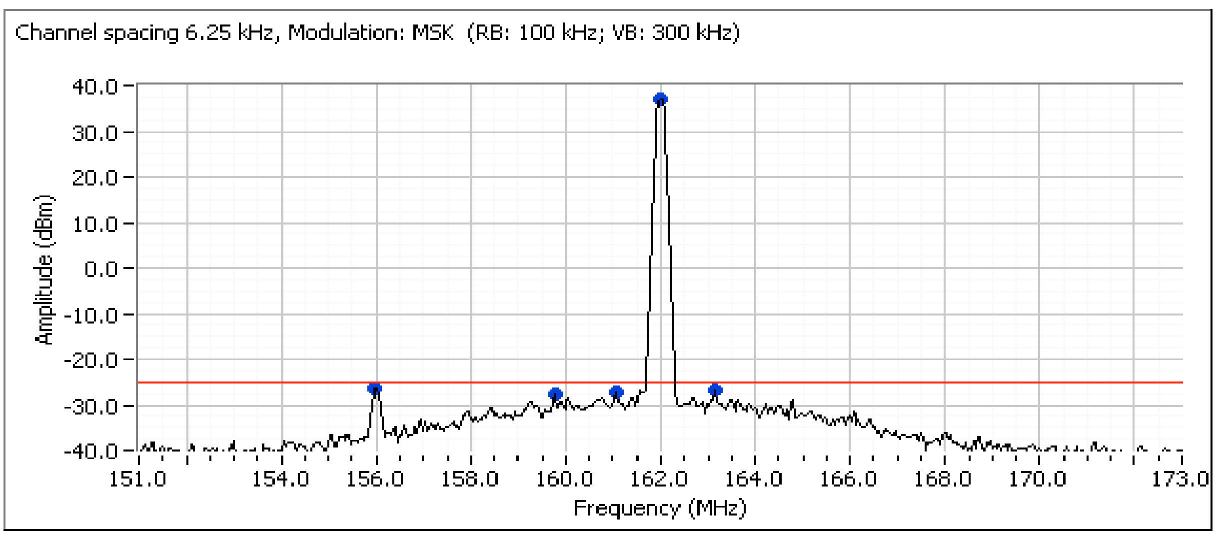
Note 1: The mask reference was established using the peak amplitude of the unmodulated transmitter output.

Spurious Emissions, >50 kHz and >250% of Authorized BW (RB: 100 kHz; VB: 300 kHz)

Frequency	Level	Port	FCC 90.210		Detector	Ch. Freq.	Comments	
MHz	dBm		Limit	Margin	Pk/QP/Avg	MHz		
155.987	-26.4	RF Port	-25.0	-1.4	PK	162.0000	6.25 kHz, MSK	
159.763	-27.8	RF Port	-25.0	-2.8	PK	162.0000	6.25 kHz, MSK	
161.047	-27.3	RF Port	-25.0	-2.3	PK	162.0000	6.25 kHz, MSK	
162.000	37.1	RF Port	-	-	PK	162.0000	6.25 kHz, MSK	Carrier
163.137	-26.8	RF Port	-25.0	-1.8	PK	162.0000	6.25 kHz, MSK	
155.987	-24.3	RF Port	-20.0	-4.3	PK	162.0000	12.5 kHz, MSK	
162.000	37.1	RF Port	-	-	PK	162.0000	12.5 kHz, MSK	Carrier
156.023	-23.9	RF Port	-20.0	-3.9	PK	162.0000	12.5 kHz, 8PSK	
162.000	37.3	RF Port	-	-	PK	162.0000	12.5 kHz, 8PSK	Carrier
155.987	-23.1	RF Port	-20.0	-3.1	PK	162.0000	12.5 kHz, 16QAM	
162.000	37.2	RF Port	-	-	PK	162.0000	12.5 kHz, 16QAM	Carrier
155.987	-22.9	RF Port	-20.0	-2.9	PK	162.0000	12.5 kHz, 64QAM	
162.000	37.2	RF Port	-	-	PK	162.0000	12.5 kHz, 64QAM	Carrier
156.023	-25.4	RF Port	-13.0	-12.4	PK	162.0000	25.0 kHz, MSK	
162.000	37.4	RF Port	-	-	PK	162.0000	25.0 kHz, MSK	Carrier
156.023	-23.9	RF Port	-13.0	-10.9	PK	162.0000	25.0 kHz, 8PSK	
162.000	37.3	RF Port	-	-	PK	162.0000	25.0 kHz, 8PSK	Carrier
155.987	-26.8	RF Port	-13.0	-13.8	PK	162.0000	25.0 kHz, 16QAM	
162.000	37.1	RF Port	-	-	PK	162.0000	25.0 kHz, 16QAM	Carrier
155.987	-23.8	RF Port	-13.0	-10.8	PK	162.0000	25.0 kHz, 64QAM	
162.000	37.2	RF Port	-	-	PK	162.0000	25.0 kHz, 64QAM	Carrier

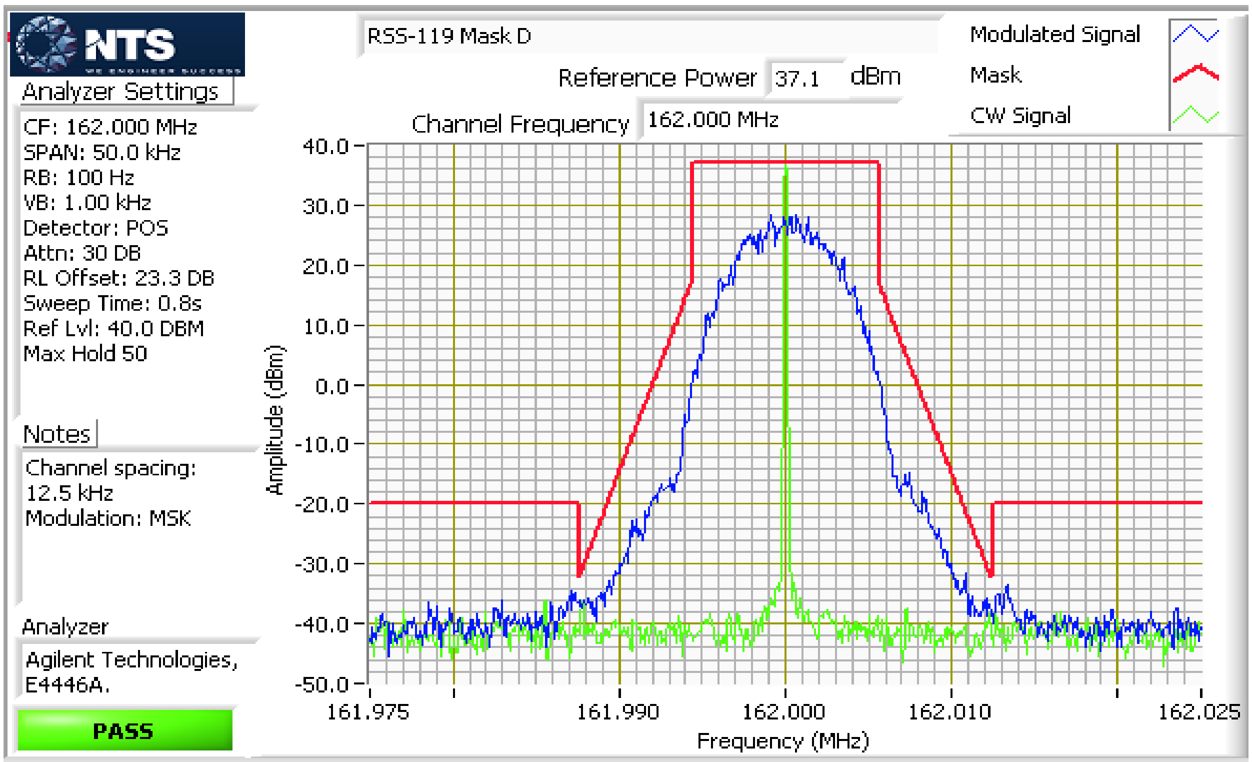
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

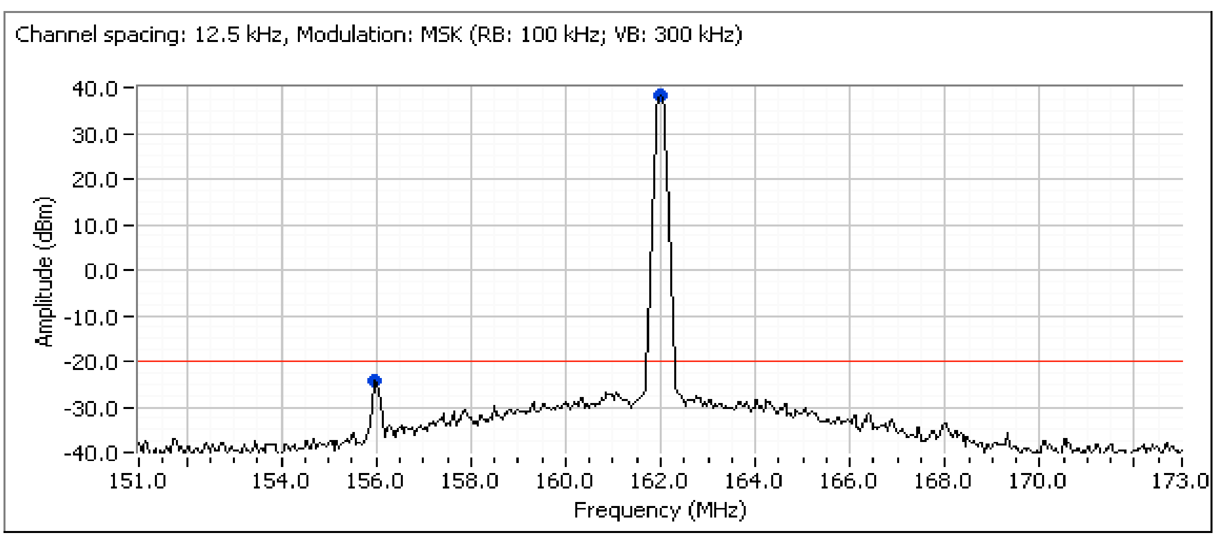




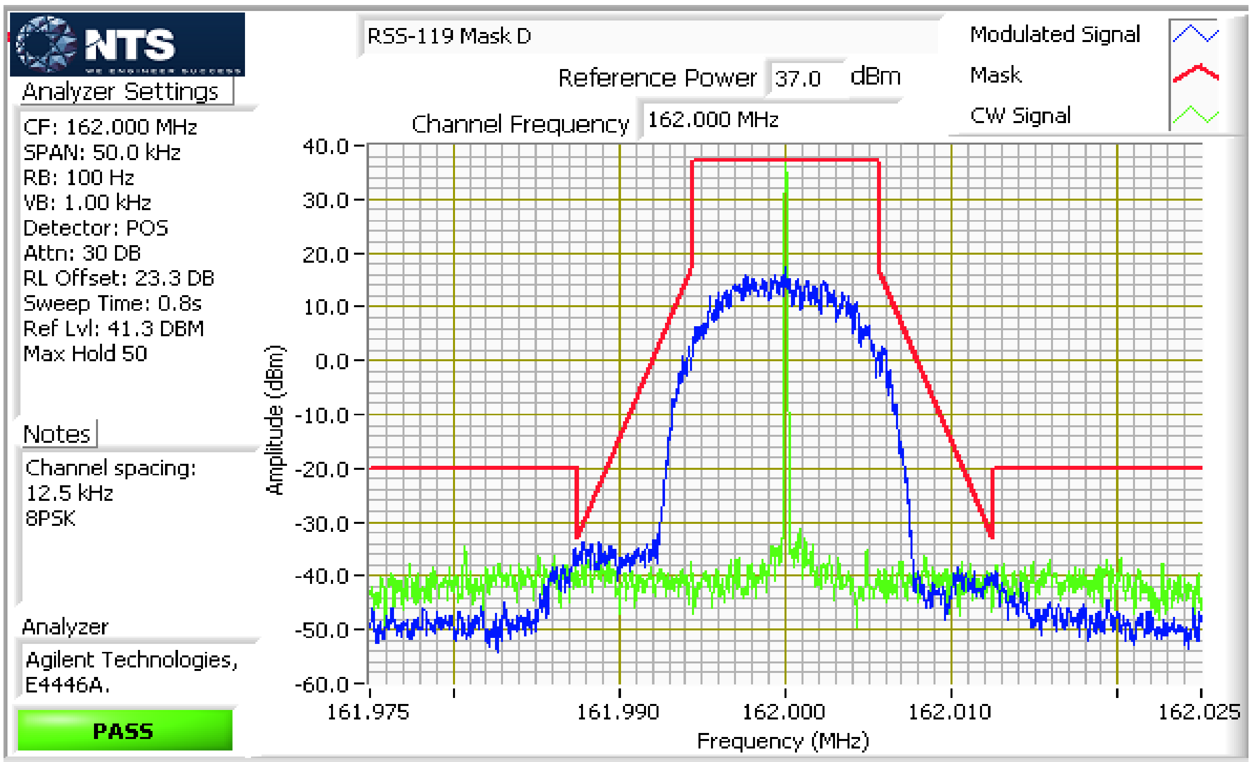
EMC Test Data

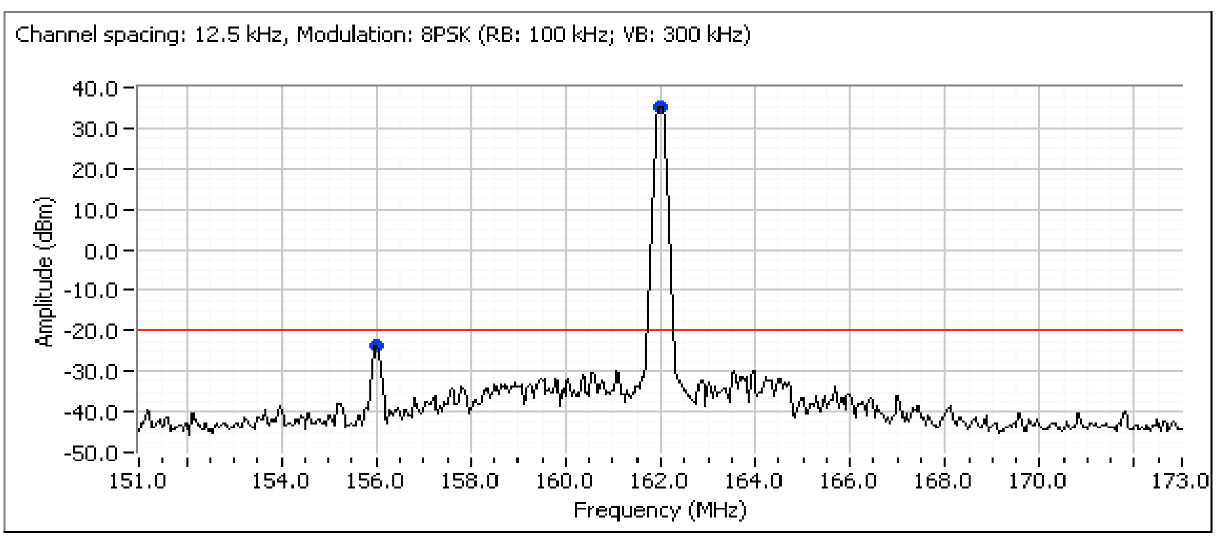
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





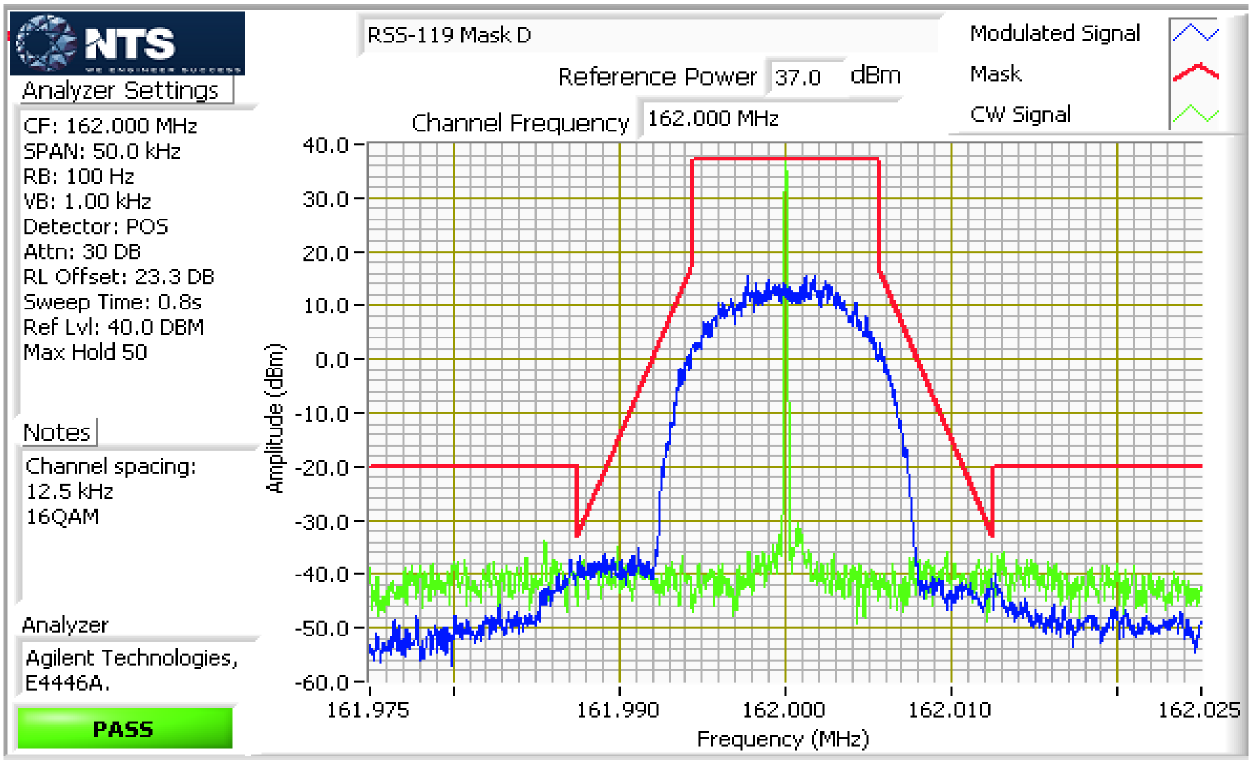
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

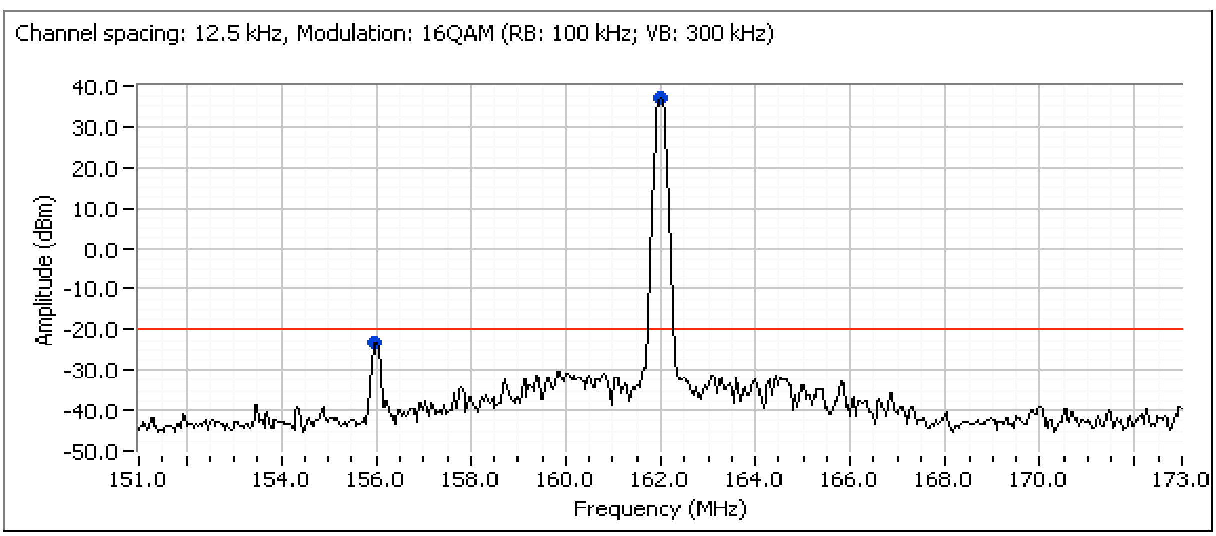




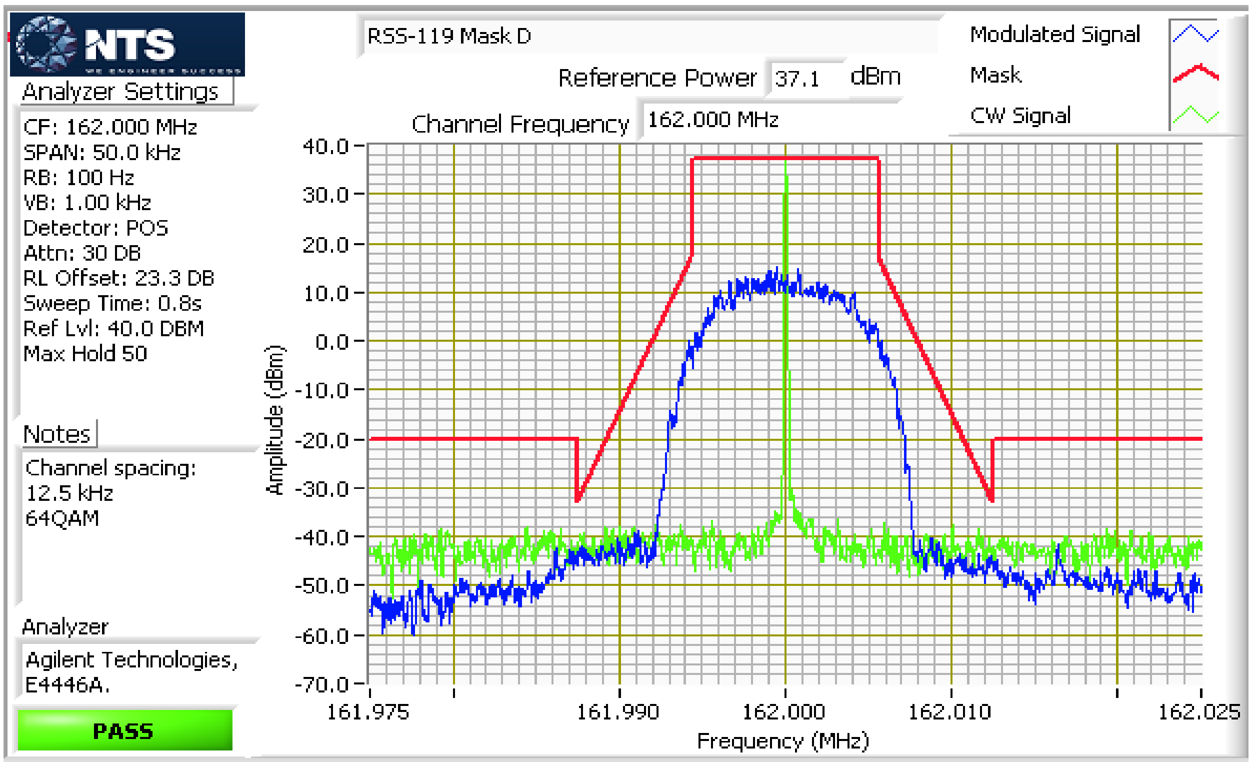
EMC Test Data

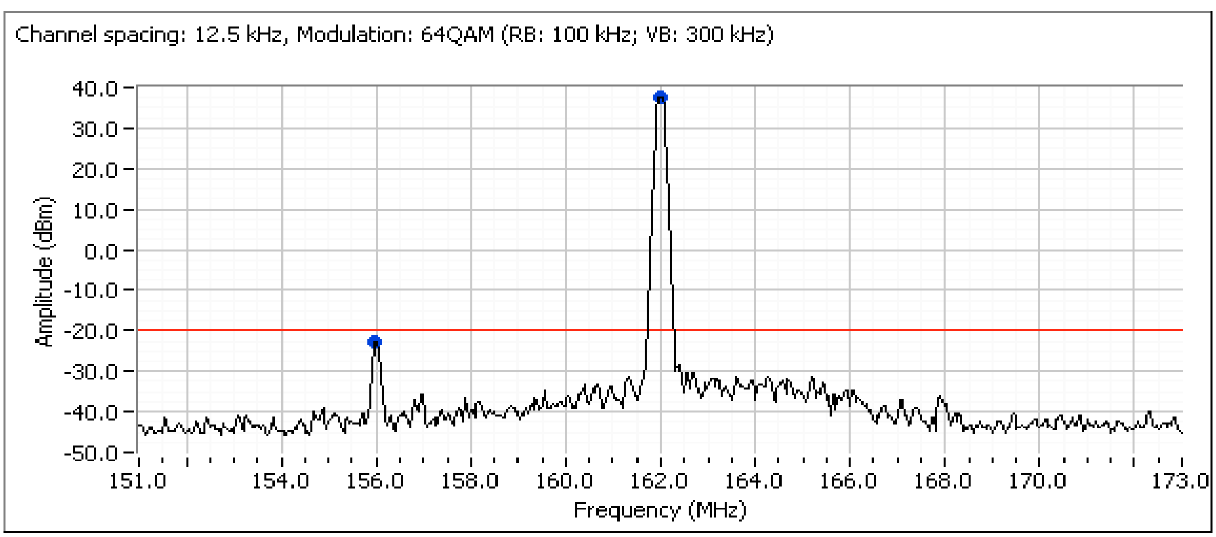
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





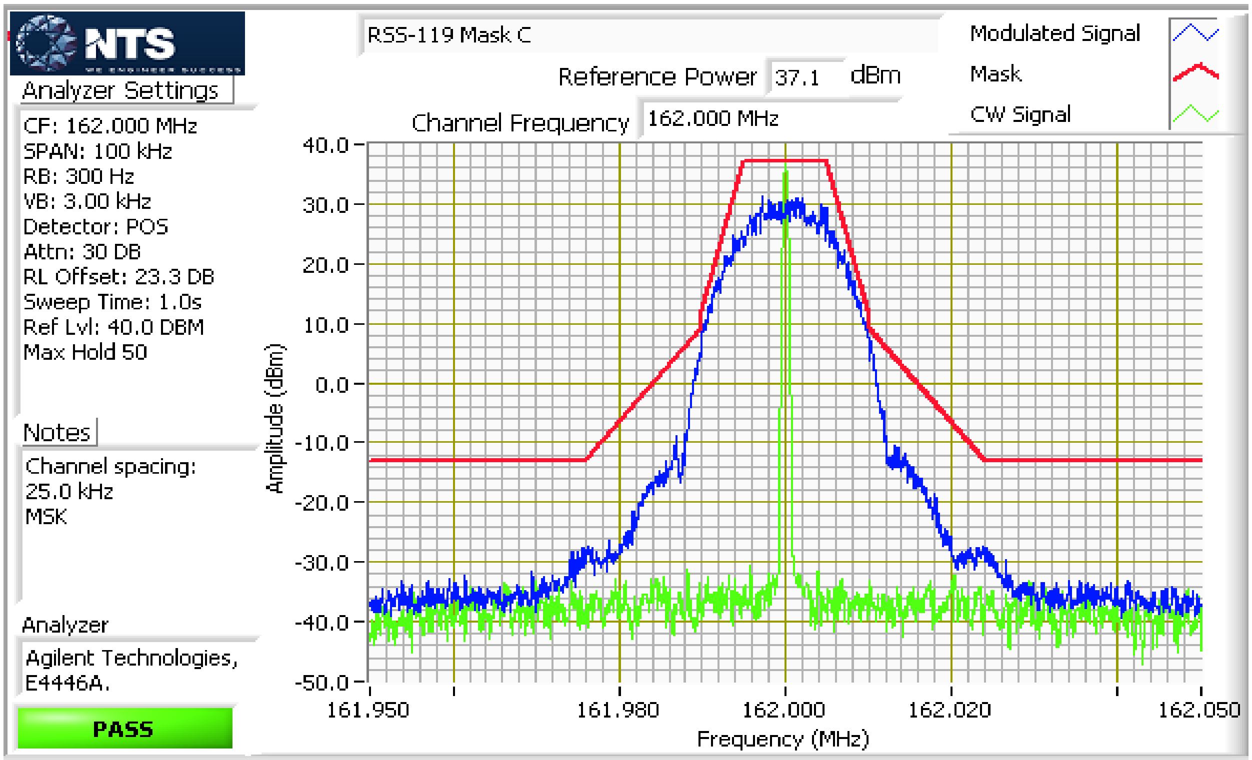
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

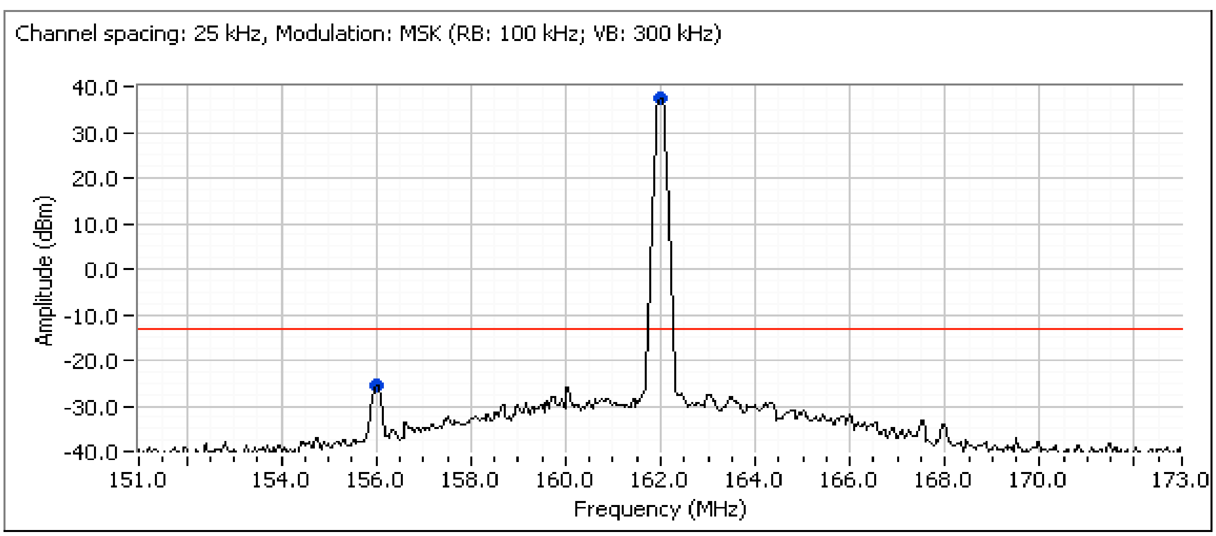




EMC Test Data

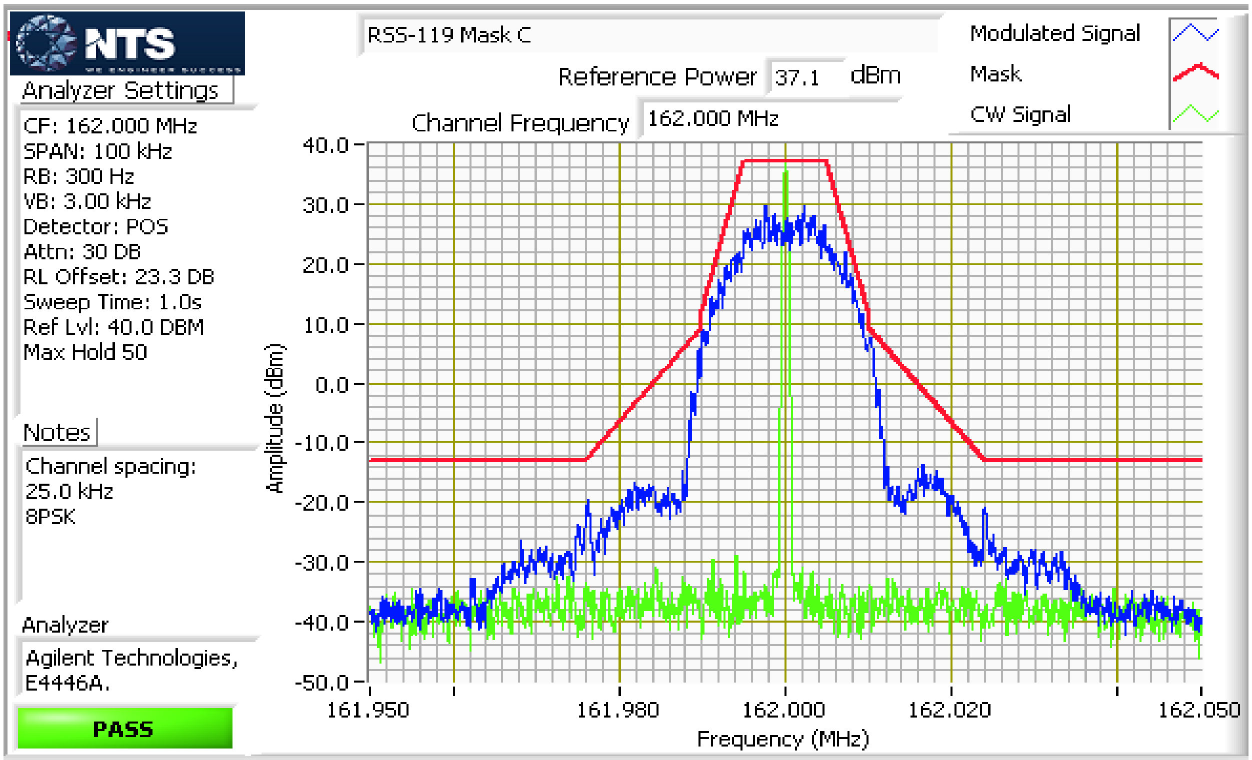
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

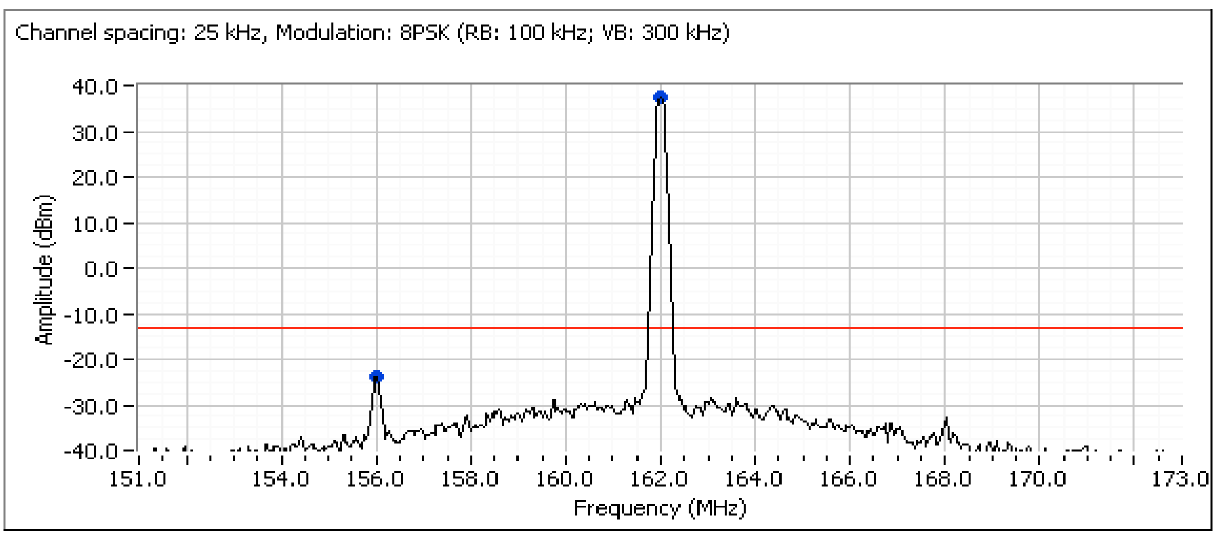




EMC Test Data

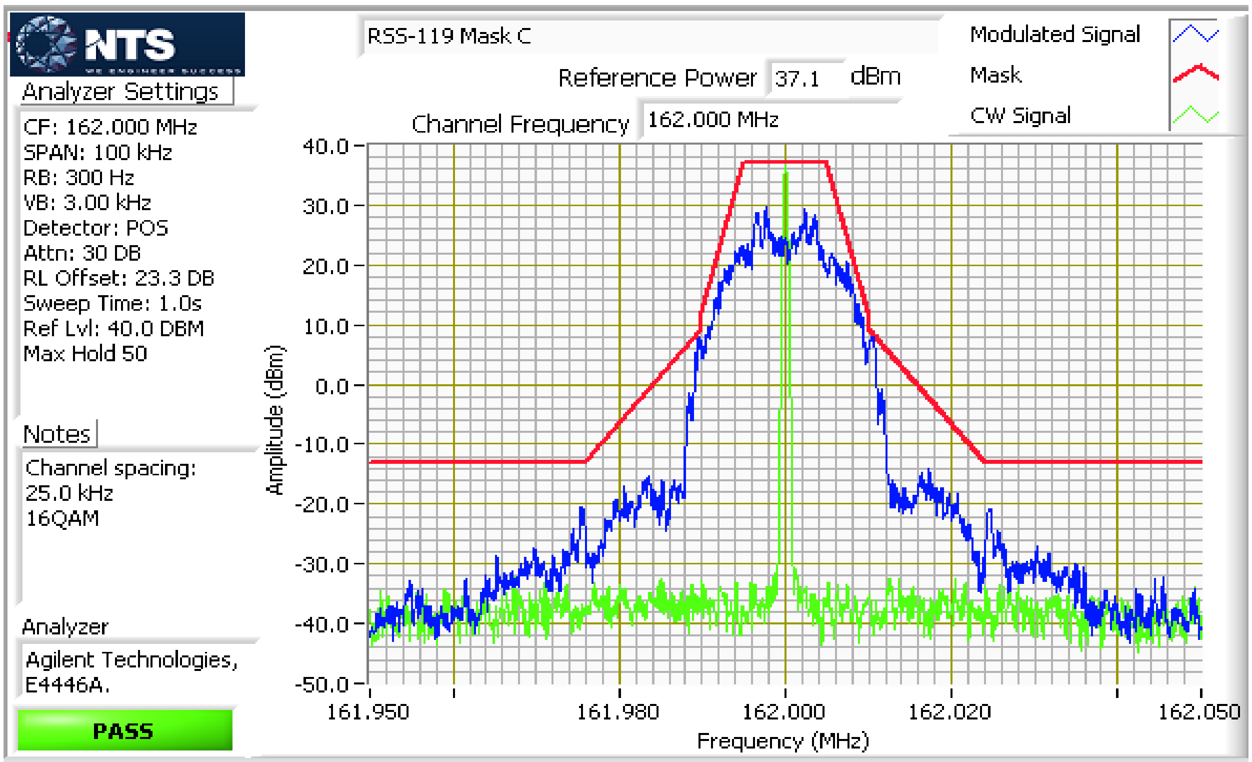
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

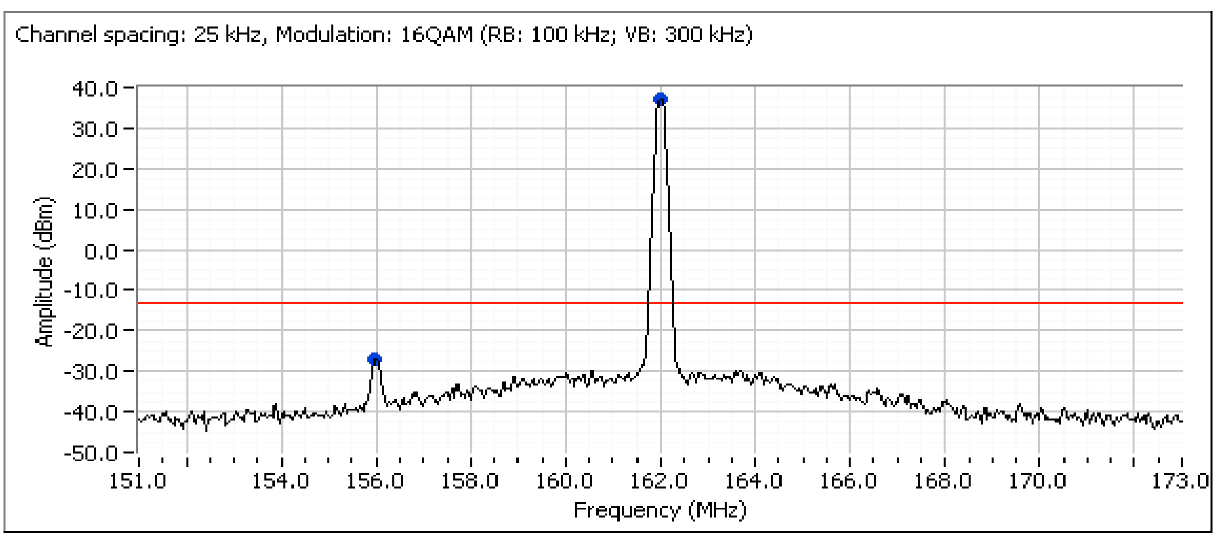




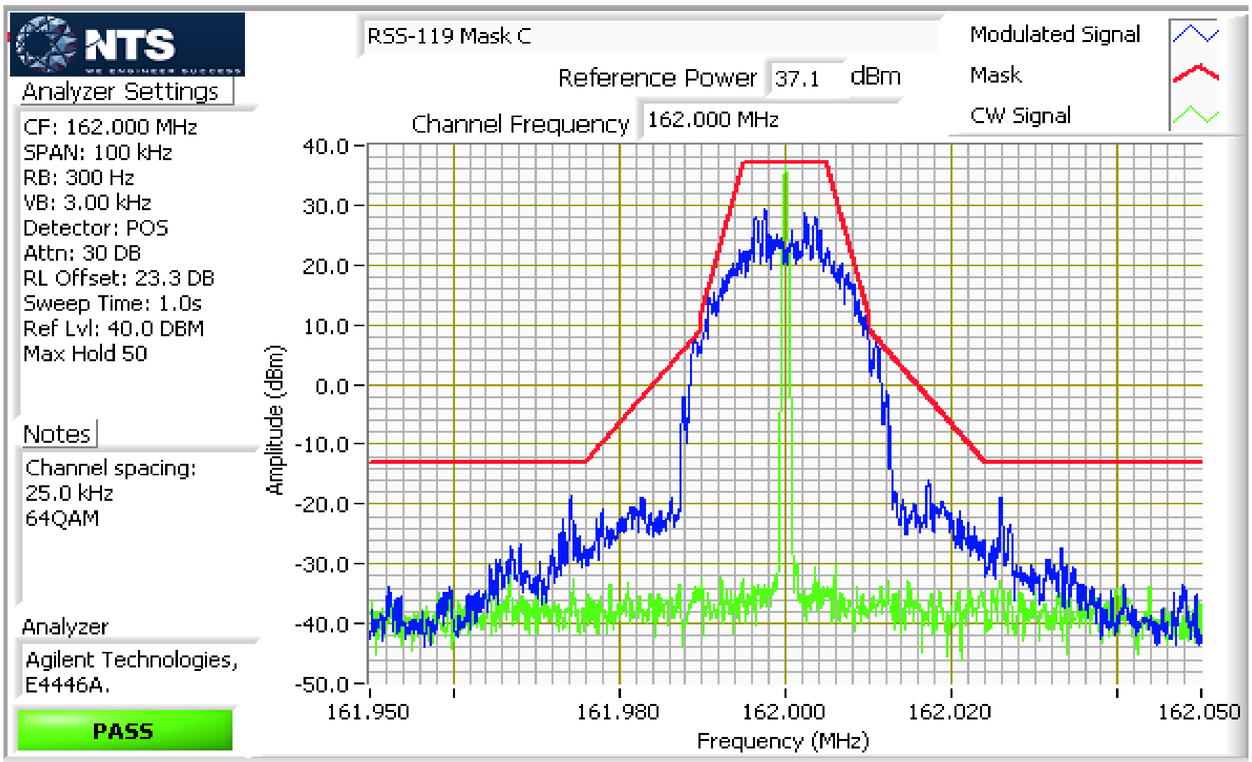
EMC Test Data

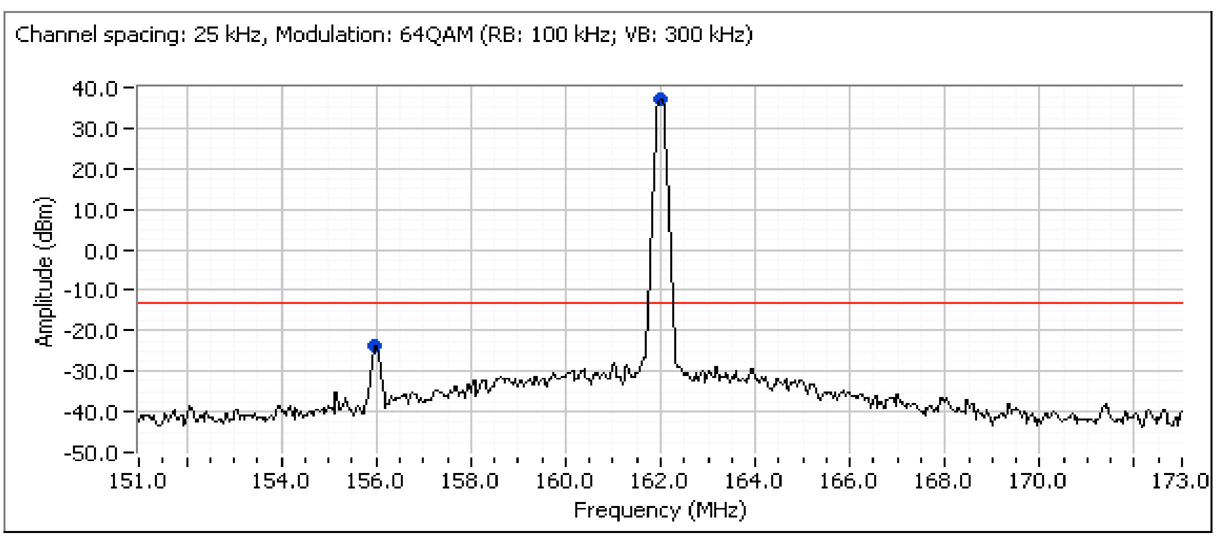
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





Run #3: Signal Bandwidth

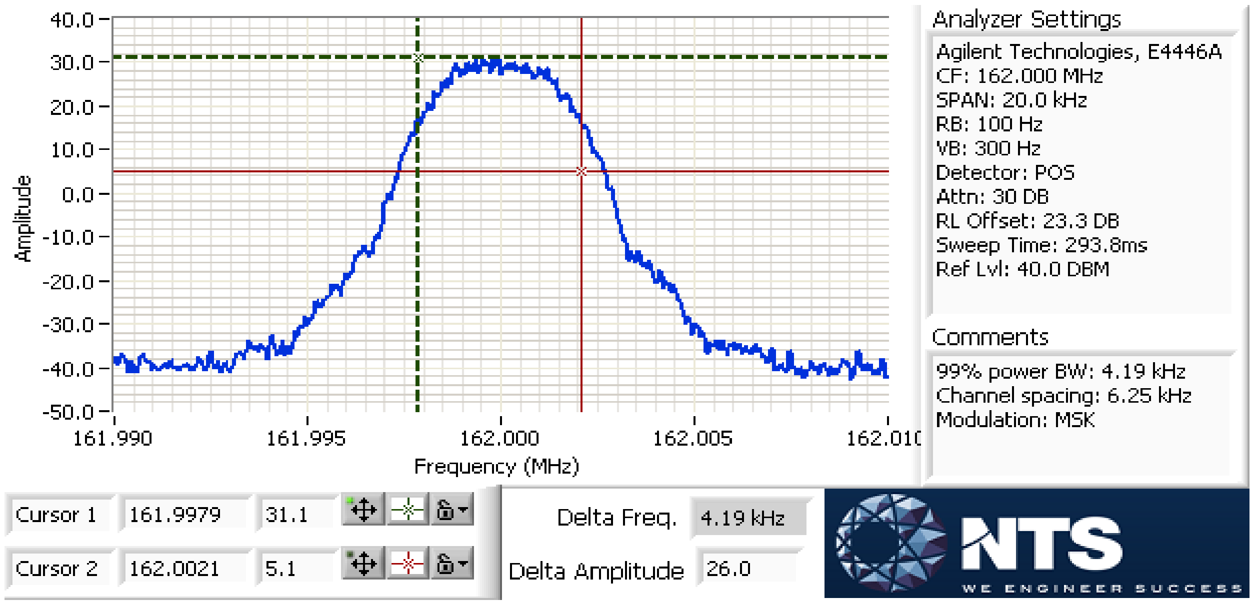
Date of Test: 12/19/2016, 12/20/2016
Test Engineer: Kevin, Deniz
Test Location: FT Lab #4b

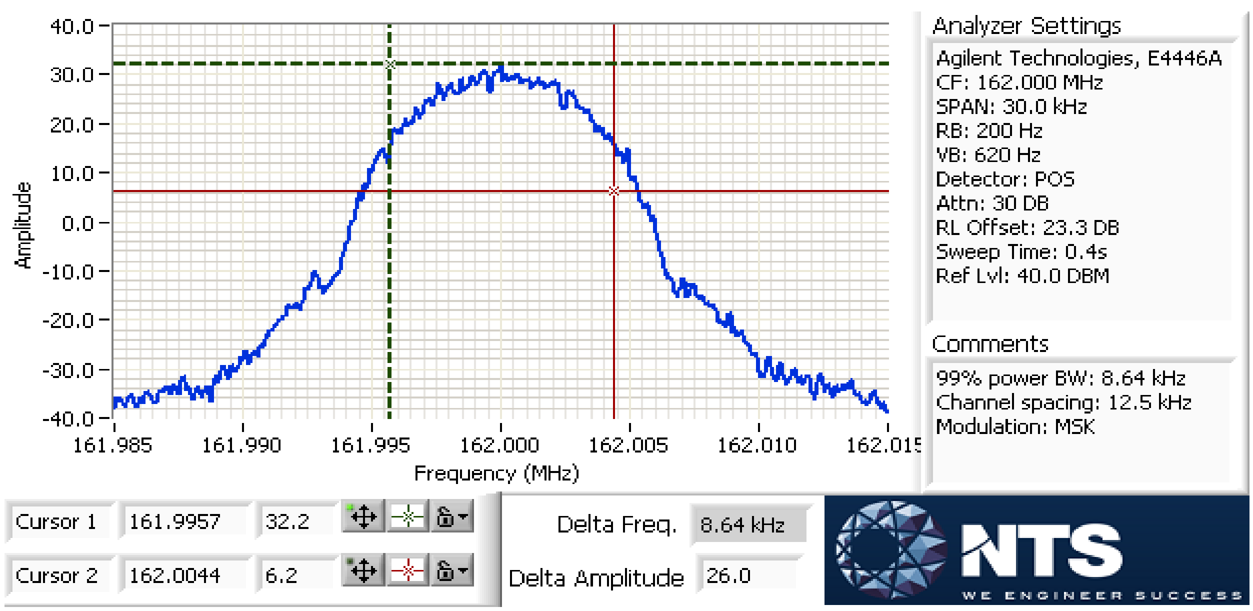
Config. Used: 1
Config Change: None
EUT Voltage: 11.0 Vdc

Power setting	Data rate	Channel plan	Modulation	Frequency MHz	RB (Hz)	Bandwidth (kHz) 26 dB	Bandwidth (kHz) 99%	Authorized bandwidth
	4.8 kbps	6.25 kHz	MSK	162.00	100		4.19	6 kHz
	10 kbps	12.5 kHz	MSK	162.00	200		8.64	11.25 kHz
	27 kbps	12.5 kHz	8PSK	162.00	200		10.70	11.25 kHz
	37 kbps	12.5 kHz	16QAM	162.00	200		11.10	11.25 kHz
	54 kbps	12.5 kHz	64QAM	162.00	200		10.90	11.25 kHz
	18 kbps	25.0 kHz	MSK	162.00	300		16.40	20 kHz
	41 kbps	25.0 kHz	8PSK	162.00	300		17.00	20 kHz
	56 kbps	25.0 kHz	16QAM	162.00	300		17.00	20 kHz
	88 kbps	25.0 kHz	64QAM	162.00	300		18.00	20 kHz

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

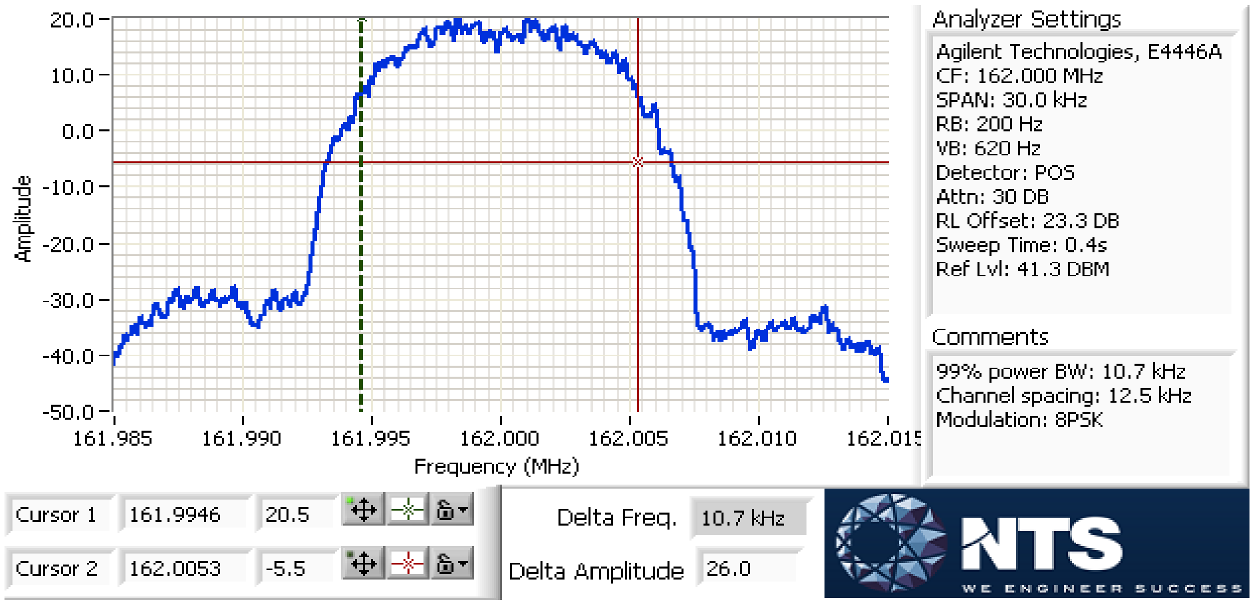


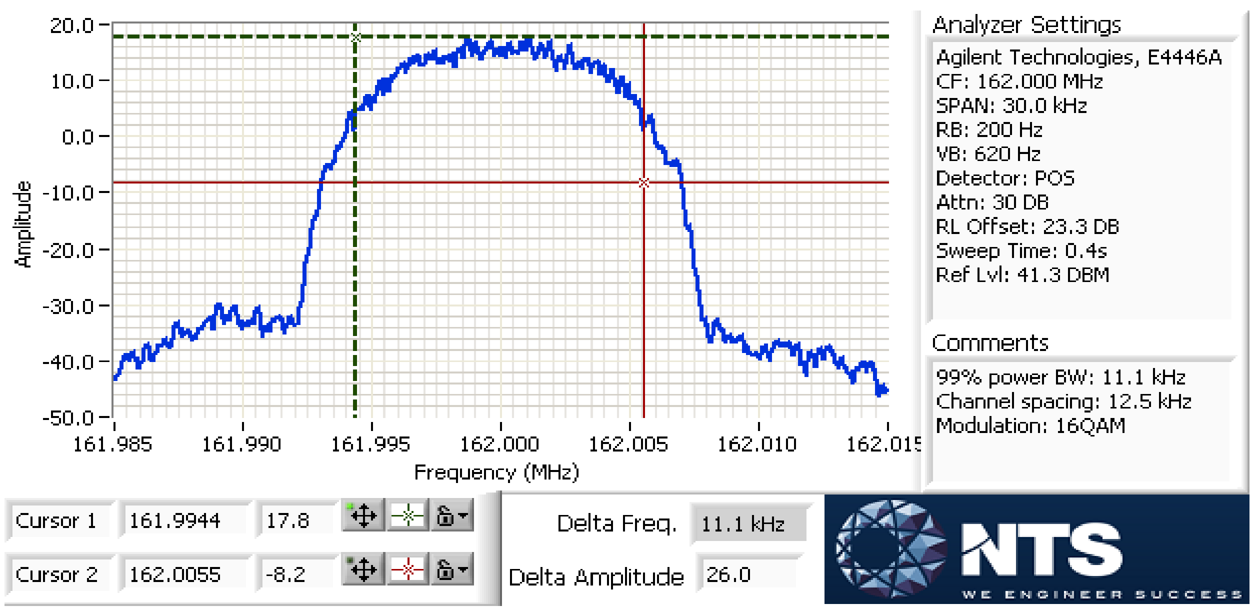


NTS WE ENGINEER SUCCESS

EMC Test Data

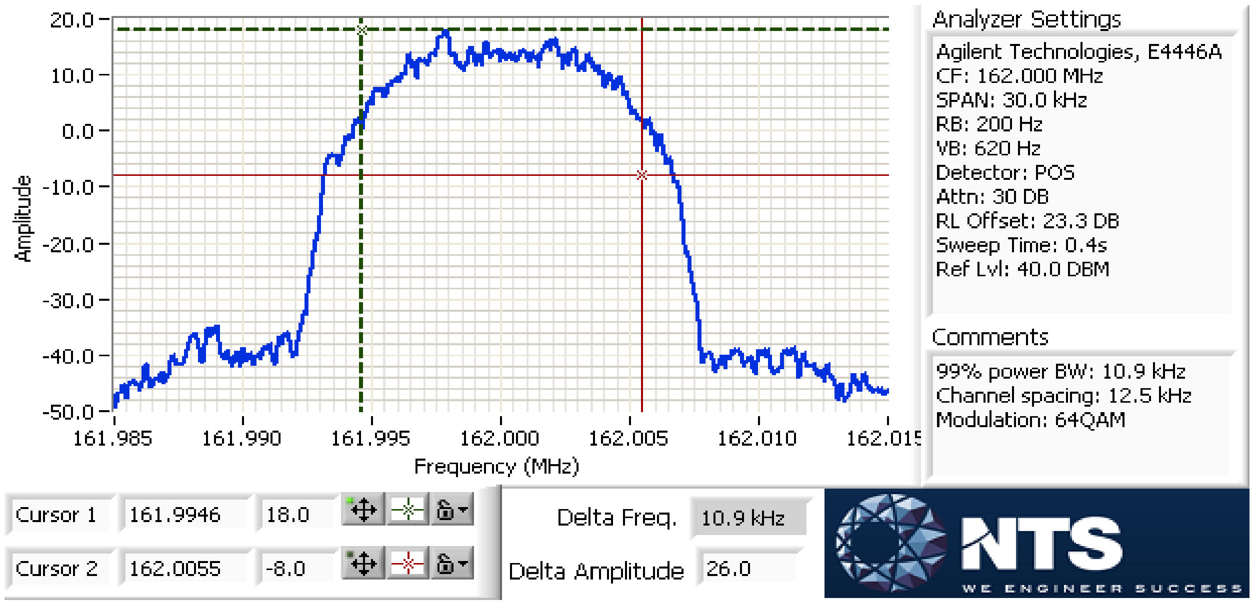
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

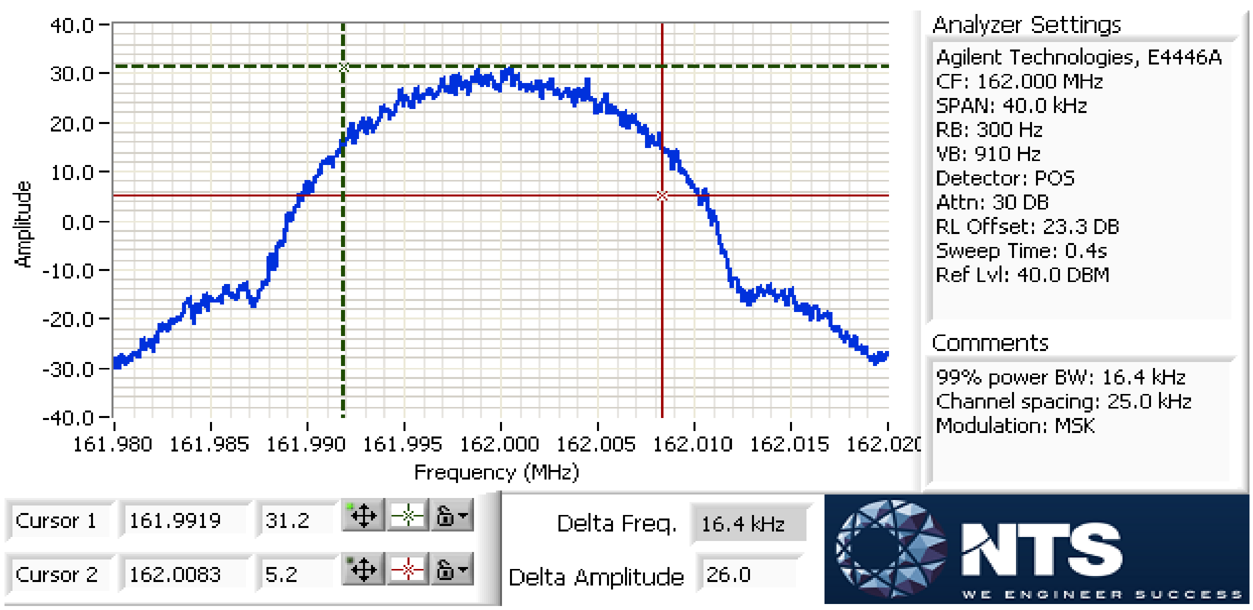




EMC Test Data

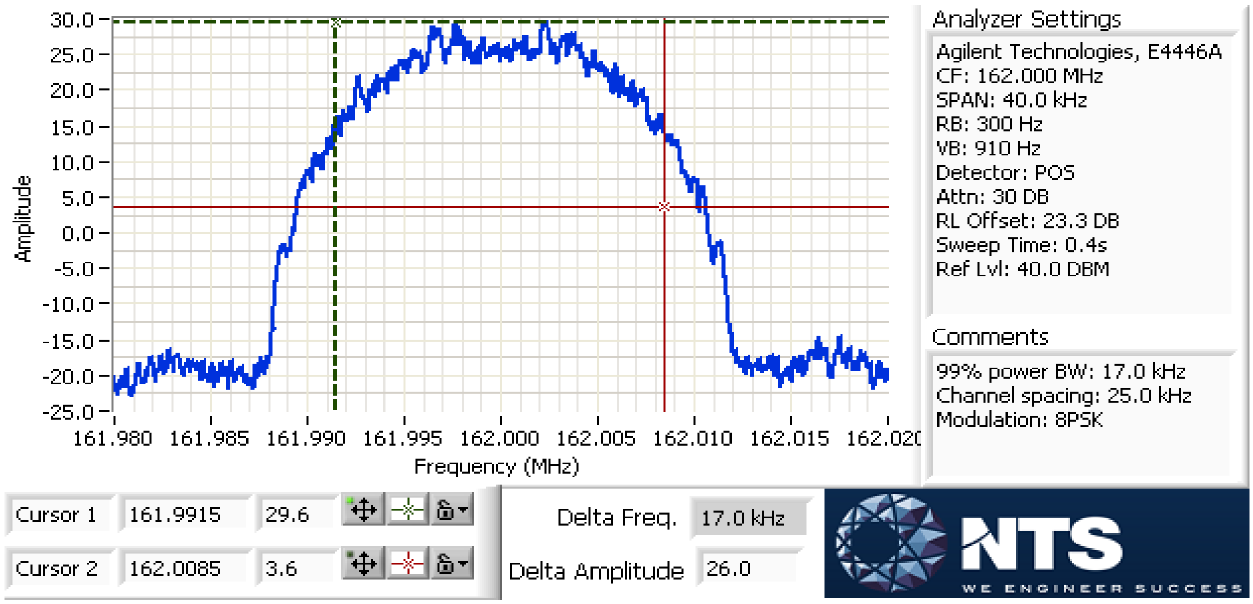
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

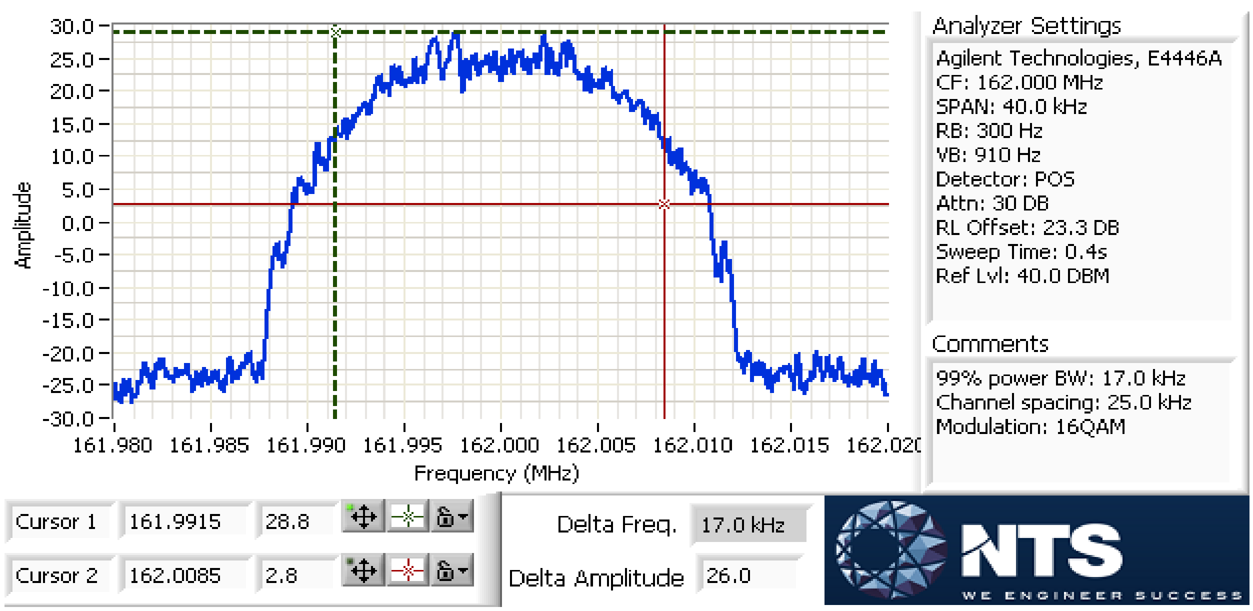




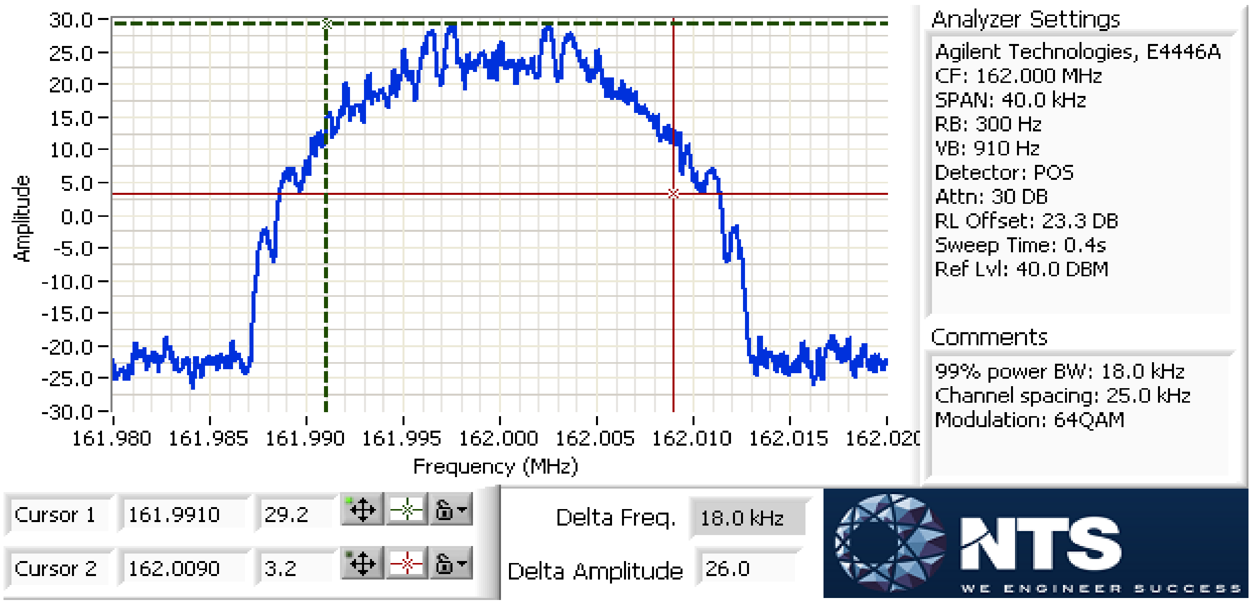
EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A



NTS WE ENGINEER SUCCESS

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #4: Out of Band Spurious Emissions, Conducted

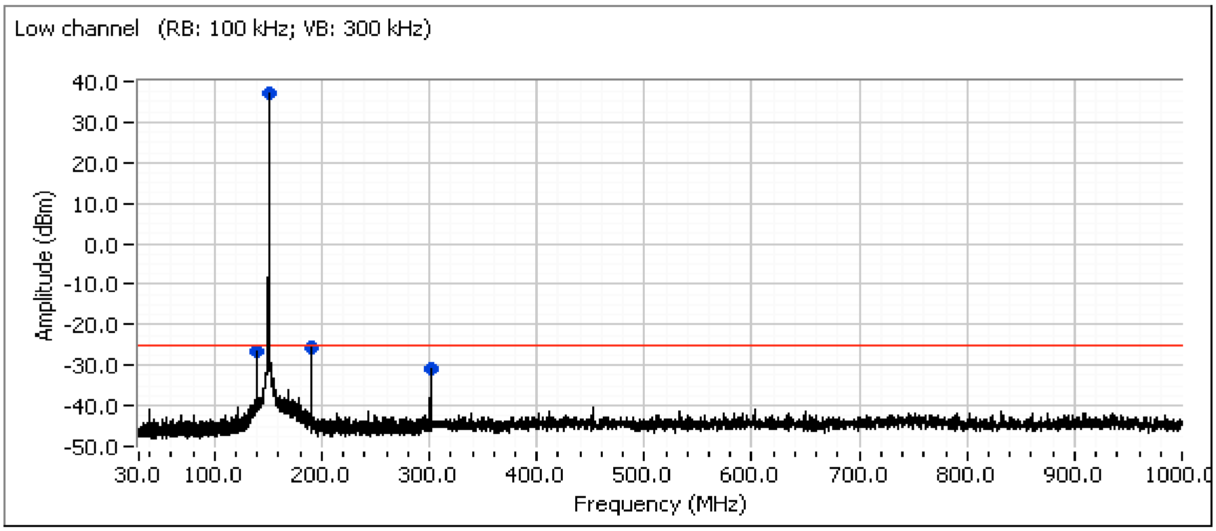
Date: 12/19/2016 Engineer: Kevin Location: FT Lab #4B

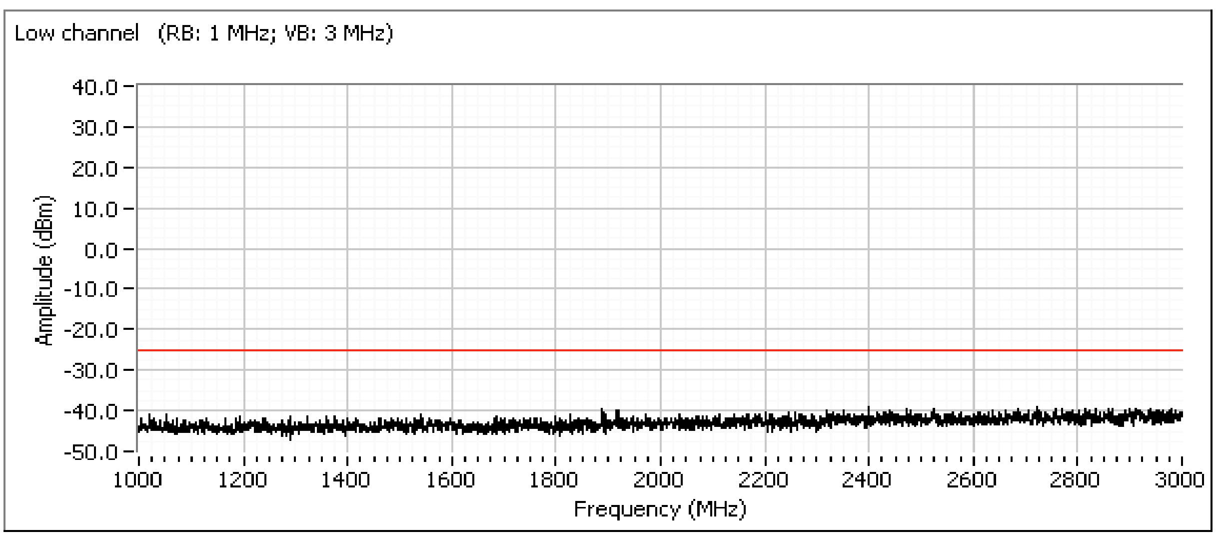
Frequency	Level	Port	FCC 90.210(e)		Detector	Ch. Freq.	Comments
MHz	dBm		Limit	Margin	Pk/QP/Avg	MHz	
190.974	-25.8	RF Port	-25.0	-0.8	PK	150.5000	
150.550	37.3	RF Port	-	-	PK	150.5000	Carrier
139.026	-26.7	RF Port	-25.0	-1.7	PK	150.5000	
300.934	-30.8	RF Port	-25.0	-5.8	PK	150.5000	
51.967	-39.8	RF Port	-25.0	-14.8	PK	162.0000	
110.037	-37.2	RF Port	-25.0	-12.2	PK	162.0000	
155.952	-27.6	RF Port	-25.0	-2.6	PK	162.0000	
161.994	37.1	RF Port	-	-	PK	162.0000	Carrier
173.958	-28.8	RF Port	-25.0	-3.8	PK	162.0000	
214.021	-39.7	RF Port	-25.0	-14.7	PK	162.0000	
324.041	-34.9	RF Port	-25.0	-9.9	PK	162.0000	
63.491	-38.4	RF Port	-25.0	-13.4	PK	173.4000	
110.037	-36.8	RF Port	-25.0	-11.8	PK	173.4000	
139.747	-28.1	RF Port	-25.0	-3.1	PK	173.4000	
143.618	-29.1	RF Port	-25.0	-4.1	PK	173.4000	
173.418	37.1	RF Port	-	-	PK	173.4000	Carrier
190.253	-29.7	RF Port	-25.0	-4.7	PK	173.4000	
220.053	-38.7	RF Port	-25.0	-13.7	PK	173.4000	
236.889	-39.4	RF Port	-25.0	-14.4	PK	173.4000	
346.682	-34.3	RF Port	-25.0	-9.3	PK	173.4000	

Note 1:	Carrier is unmodulated.
Note 2:	The limit is taken from FCC Part 90/RSS-119 Mask E.
Note 3:	Preliminary test results indicate that there are no measurable spurious emissions between 9 kHz and 30 MHz.

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

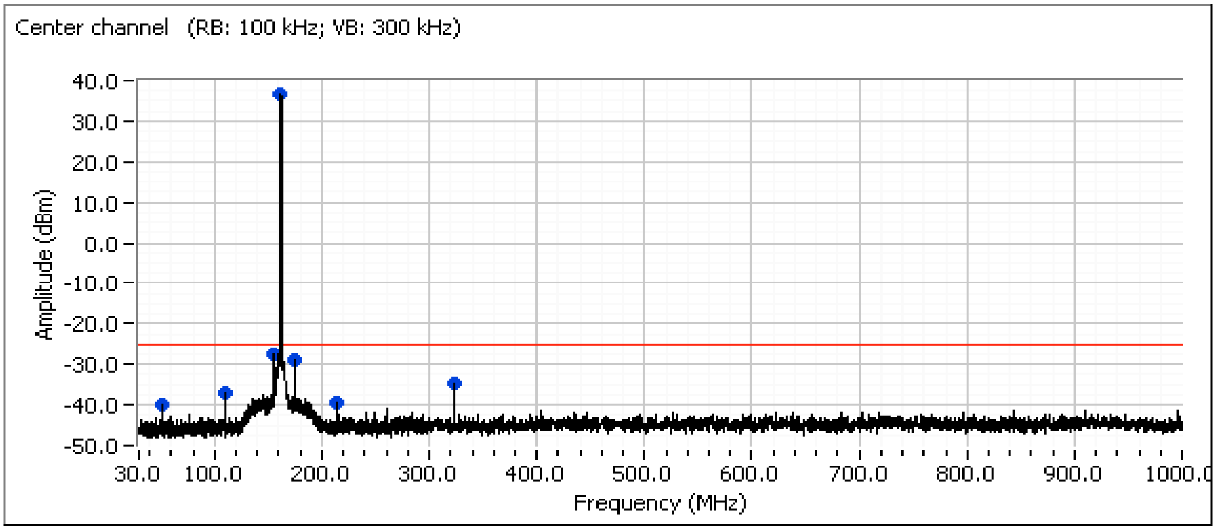
Plots for low channel, power setting = 37 dBm

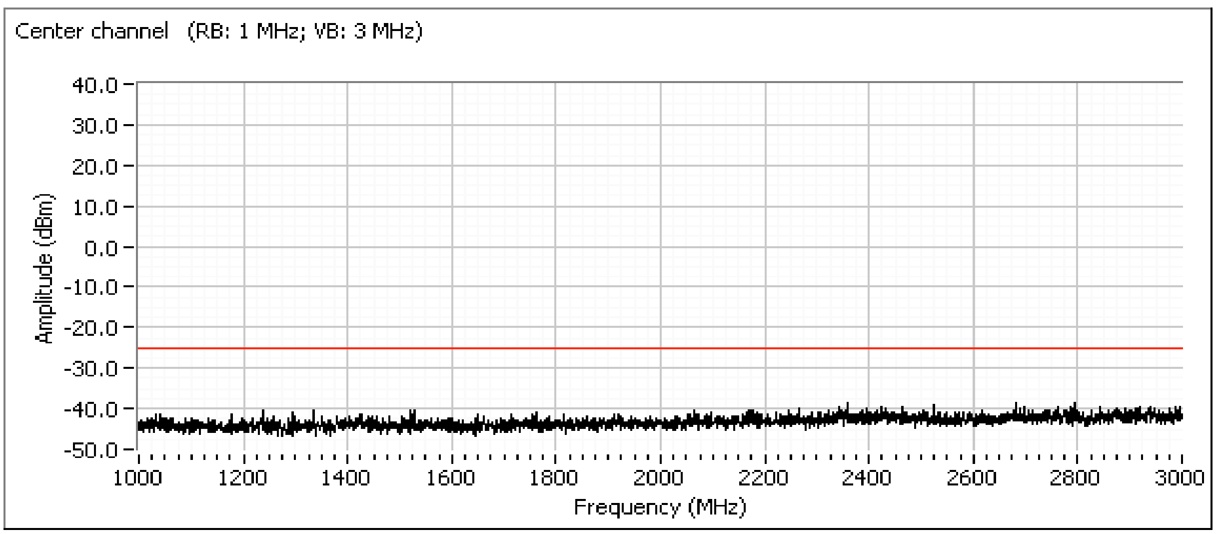




Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Plots for center channel, power setting: 37 dBm

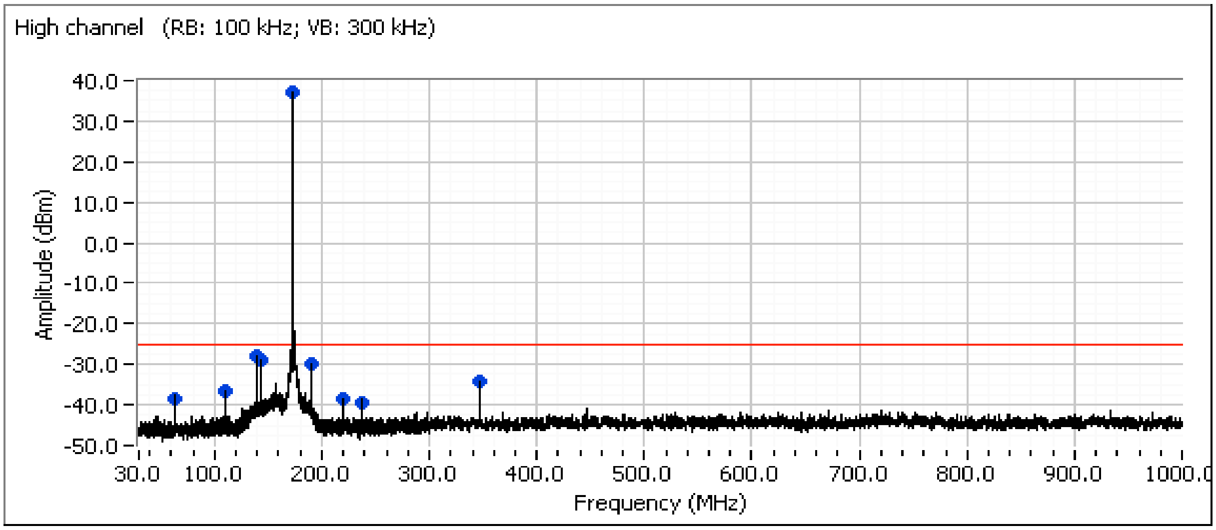


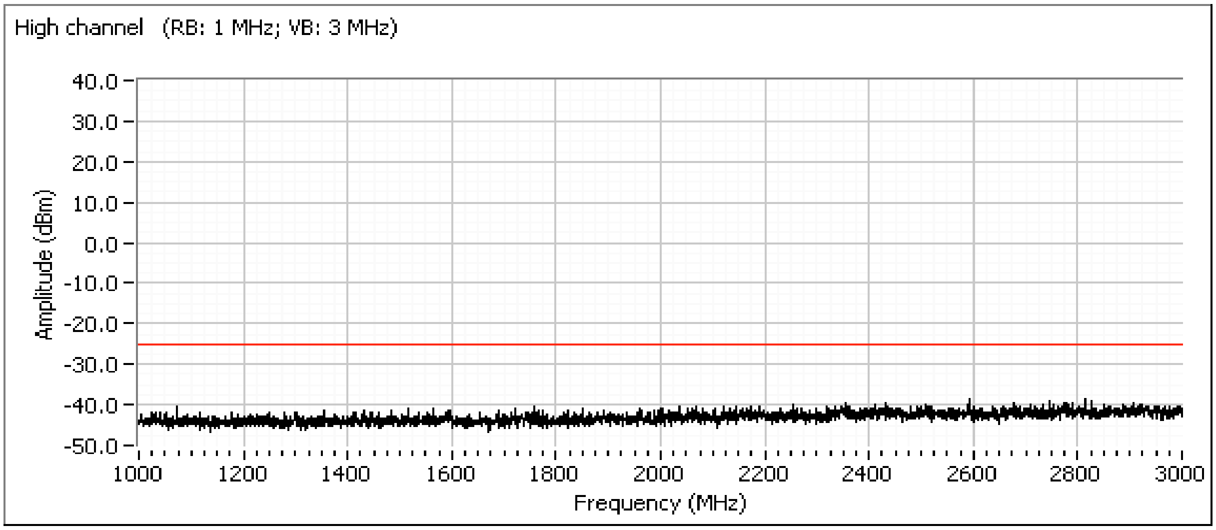


EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Plots for high channel, power setting: 37 dBm





Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #5: Out of Band Spurious Emissions, Radiated

Date of Test:	12/21/2016	Config. Used:	1
Test Engineer:	Kevin, Deniz	Config Change:	None
Test Location:	FT Ch #7	EUT Voltage:	11.0 Vdc

Conducted limit: -25 dBm
Approximate field strength limit @ 3m: 70.2 dBµV/m

Run #5a - Preliminary measurements

Frequency	Level	Pol	FCC 90.210(e)		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
150.501	*50.6*	*H*	*-*	*-*	*Peak*	*128*	*2.0*	*EUT flat - Carrier*	Low
402.405	*45.5*	*H*	*70.2*	*-24.7*	*Peak*	*255*	*1.0*	*EUT flat*	Low
451.503	*48.2*	*V*	*70.2*	*-22.0*	*Peak*	*291*	*1.0*	*EUT flat*	Low
601.603	*53.2*	*H*	*70.2*	*-17.0*	*Peak*	*236*	*1.5*	*EUT flat*	Low
753.106	*58.6*	*V*	*70.2*	*-11.6*	*Peak*	*145*	*1.5*	*EUT flat*	Low
903.206	*58.1*	*H*	*70.2*	*-12.1*	*Peak*	*276*	*1.5*	*EUT flat*	Low
920.040	*49.9*	*H*	*70.2*	*-20.3*	*Peak*	*294*	*1.5*	*EUT flat*	Low
150.561	*54.8*	*H*	*-*	*-*	*Peak*	*148*	*2.0*	*EUT Side - Carrier*	Low
451.503	*52.0*	*H*	*70.2*	*-18.2*	*Peak*	*149*	*2.0*	*EUT Side*	Low
601.603	*51.7*	*H*	*70.2*	*-18.5*	*Peak*	*162*	*1.5*	*EUT Side*	Low
753.106	*62.0*	*H*	*70.2*	*-8.2*	*Peak*	*338*	*1.0*	*EUT Side*	Low
903.206	*60.6*	*H*	*70.2*	*-9.6*	*Peak*	*100*	*1.5*	*EUT Side*	Low
150.561	*56.1*	*H*	*-*	*-*	*Peak*	*145*	*2.0*	*EUT Upright - Carrier*	Low
451.503	*48.8*	*H*	*70.2*	*-21.4*	*Peak*	*156*	*2.0*	*EUT Upright*	Low
601.603	*52.9*	*H*	*70.2*	*-17.3*	*Peak*	*306*	*1.5*	*EUT Upright*	Low
753.106	*61.4*	*H*	*70.2*	*-8.8*	*Peak*	*296*	*1.0*	*EUT Upright*	Low
903.206	*62.0*	*H*	*70.2*	*-8.2*	*Peak*	*308*	*1.5*	*EUT Upright*	Low
920.248	*52.9*	*V*	*70.2*	*-17.3*	*Peak*	*134*	*1.0*	*EUT Upright*	Low
162.024	*49.1*	*V*	*-*	*-*	*Peak*	*152*	*1.0*	*EUT flat - Carrier*	*Center*
323.848	*45.1*	*H*	*70.2*	*-25.1*	*Peak*	*162*	*1.0*	*EUT flat*	*Center*
402.405	*45.7*	*H*	*70.2*	*-24.5*	*Peak*	*278*	*1.0*	*EUT flat*	*Center*
485.170	*44.3*	*H*	*70.2*	*-25.9*	*Peak*	*162*	*2.0*	*EUT flat*	*Center*
647.896	*50.9*	*V*	*70.2*	*-19.3*	*Peak*	*268*	*1.0*	*EUT flat*	*Center*
810.621	*51.1*	*V*	*70.2*	*-19.1*	*Peak*	*141*	*1.5*	*EUT flat*	*Center*
973.347	*48.7*	*H*	*70.2*	*-21.5*	*Peak*	*266*	*3.0*	*EUT flat*	*Center*

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #5a - Preliminary measurements

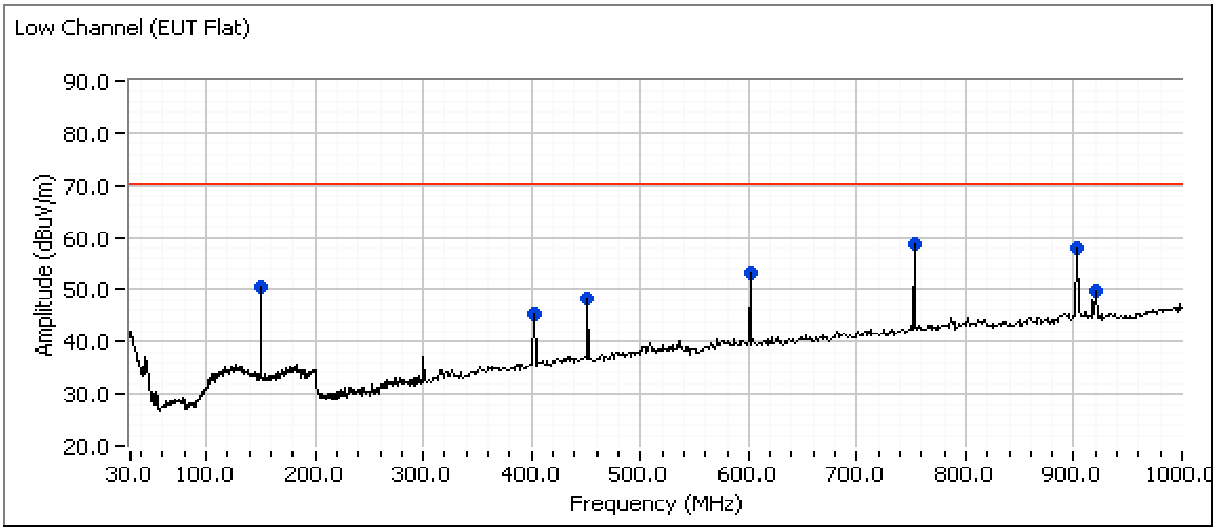
Frequency	Level	Pol	FCC 90.210(e)		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		Low
162.024	*50.8*	*H*	*-*	*-*	*Peak*	*168*	*1.5*	*EUT Side - Carrier*	*Center*
323.848	*49.0*	*H*	*70.2*	*-21.2*	*Peak*	*244*	*1.0*	*EUT Side*	*Center*
485.170	*42.9*	*V*	*70.2*	*-27.3*	*Peak*	*243*	*1.0*	*EUT Side*	*Center*
647.896	*53.6*	*H*	*70.2*	*-16.6*	*Peak*	*240*	*1.5*	*EUT Side*	*Center*
810.621	*54.5*	*H*	*70.2*	*-15.7*	*Peak*	*102*	*1.0*	*EUT Side*	*Center*
973.347	*49.2*	*H*	*70.2*	*-21.0*	*Peak*	*302*	*1.5*	*EUT Side*	*Center*
162.024	*50.8*	*H*	*-*	*-*	*Peak*	*185*	*2.5*	*EUT Upright - Carrier*	*Center*
323.848	*49.8*	*H*	*70.2*	*-20.4*	*Peak*	*248*	*1.0*	*EUT Upright*	*Center*
485.170	*45.8*	*V*	*70.2*	*-24.4*	*Peak*	*240*	*1.0*	*EUT Upright*	*Center*
647.896	*53.3*	*H*	*70.2*	*-16.9*	*Peak*	*245*	*1.5*	*EUT Upright*	*Center*
810.621	*55.3*	*H*	*70.2*	*-14.9*	*Peak*	*295*	*1.0*	*EUT Upright*	*Center*
973.347	*51.7*	*H*	*70.2*	*-18.5*	*Peak*	*294*	*1.5*	*EUT Upright*	*Center*
173.387	*48.8*	*V*	*-*	*-*	*Peak*	*192*	*1.0*	*EUT flat - Carrier*	*High*
346.293	*48.4*	*H*	*70.2*	*-21.8*	*Peak*	*101*	*1.0*	*EUT flat*	*High*
402.405	*43.1*	*V*	*70.2*	*-27.1*	*Peak*	*302*	*1.5*	*EUT flat*	*High*
520.240	*42.1*	*V*	*70.2*	*-28.1*	*Peak*	*94*	*1.0*	*EUT flat*	*High*
694.188	*54.1*	*V*	*70.2*	*-16.1*	*Peak*	*244*	*1.0*	*EUT flat*	*High*
868.136	*49.5*	*H*	*70.2*	*-20.7*	*Peak*	*270*	*1.5*	*EUT flat*	*High*
173.387	*49.1*	*H*	*-*	*-*	*Peak*	*164*	*1.5*	*EUT side - Carrier*	*High*
346.293	*42.7*	*H*	*70.2*	*-27.5*	*Peak*	*232*	*1.0*	*EUT side*	*High*
520.240	*41.8*	*H*	*70.2*	*-28.4*	*Peak*	*132*	*1.5*	*EUT side*	*High*
694.188	*54.9*	*H*	*70.2*	*-15.3*	*Peak*	*358*	*2.0*	*EUT side*	*High*
868.136	*52.6*	*H*	*70.2*	*-17.6*	*Peak*	*120*	*1.0*	*EUT side*	*High*
911.623	*52.4*	*V*	*70.2*	*-17.8*	*Peak*	*327*	*1.5*	*EUT side*	*High*
173.387	*50.9*	*V*	*-*	*-*	*Peak*	*303*	*1.0*	*EUT side - Carrier*	*High*
346.293	*44.4*	*H*	*70.2*	*-25.8*	*Peak*	*243*	*1.0*	*EUT side*	*High*
520.240	*44.2*	*V*	*70.2*	*-26.0*	*Peak*	*230*	*1.0*	*EUT side*	*High*
694.188	*55.5*	*H*	*70.2*	*-14.7*	*Peak*	*312*	*2.5*	*EUT side*	*High*
868.136	*54.8*	*H*	*70.2*	*-15.4*	*Peak*	*113*	*1.0*	*EUT side*	*High*
904.609	*50.1*	*H*	*70.2*	*-20.1*	*Peak*	*82*	*3.0*	*EUT side*	*High*

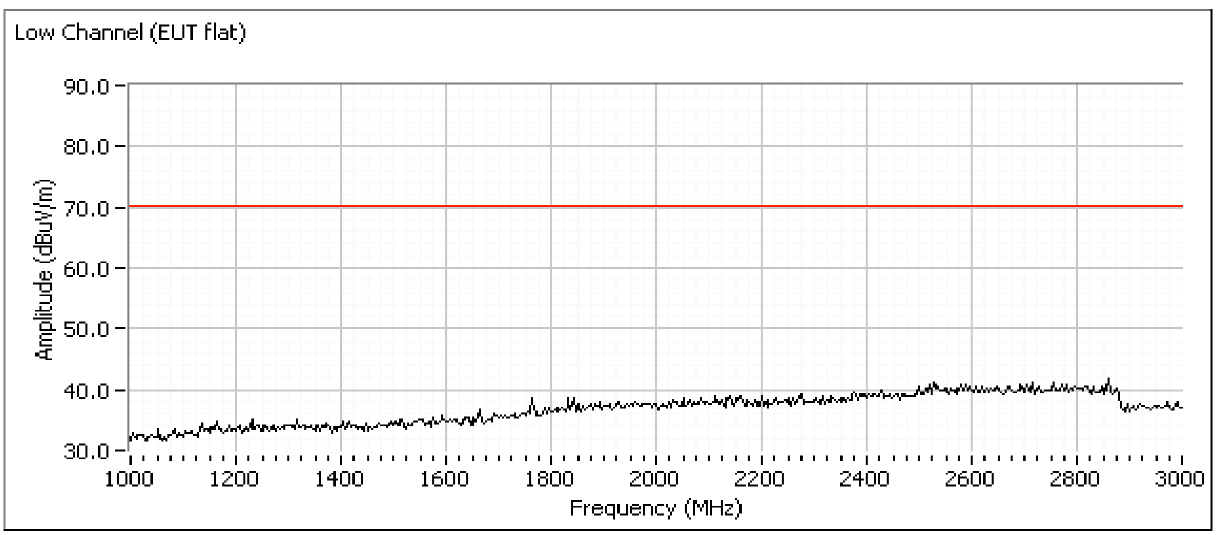
Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.1 dBi) has not been included. The erp or eirp for all signals with less than 20 dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.
Note 3:	The limit is taken from FCC Part 90/RSS-119 Mask E.
Note 4:	Preliminary test results indicate that there are no measurable spurious emissions between 9 kHz and 30 MHz.

EMC Test Data

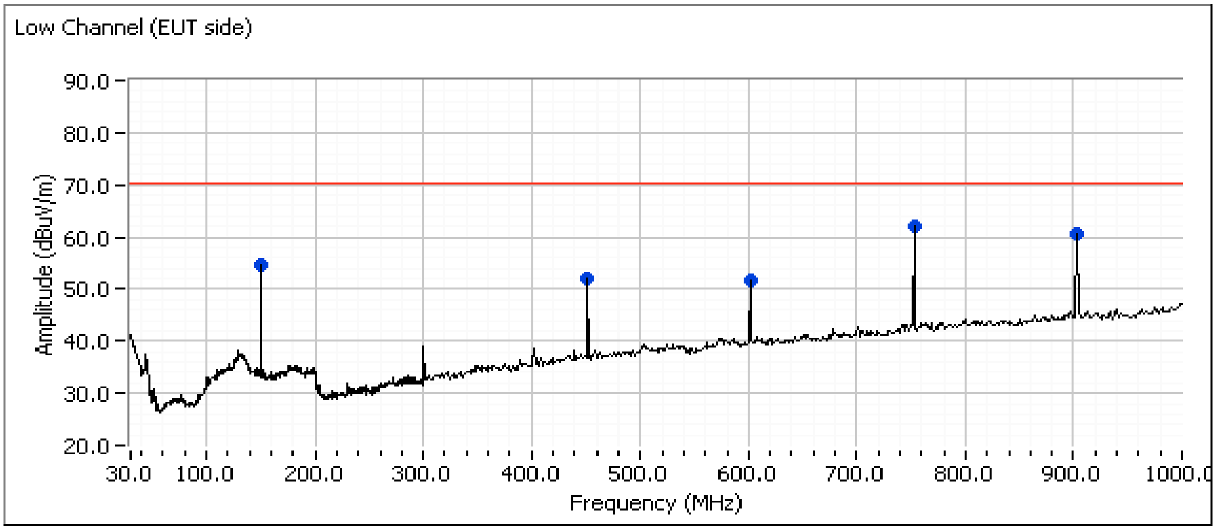
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

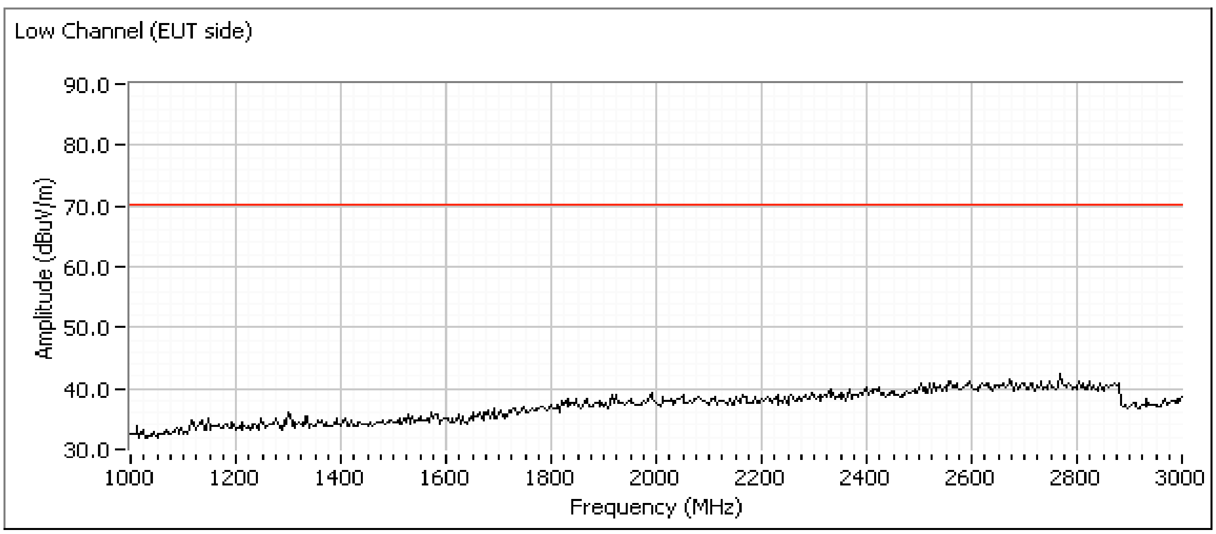
Plots for low channel, power setting = 37 dBm





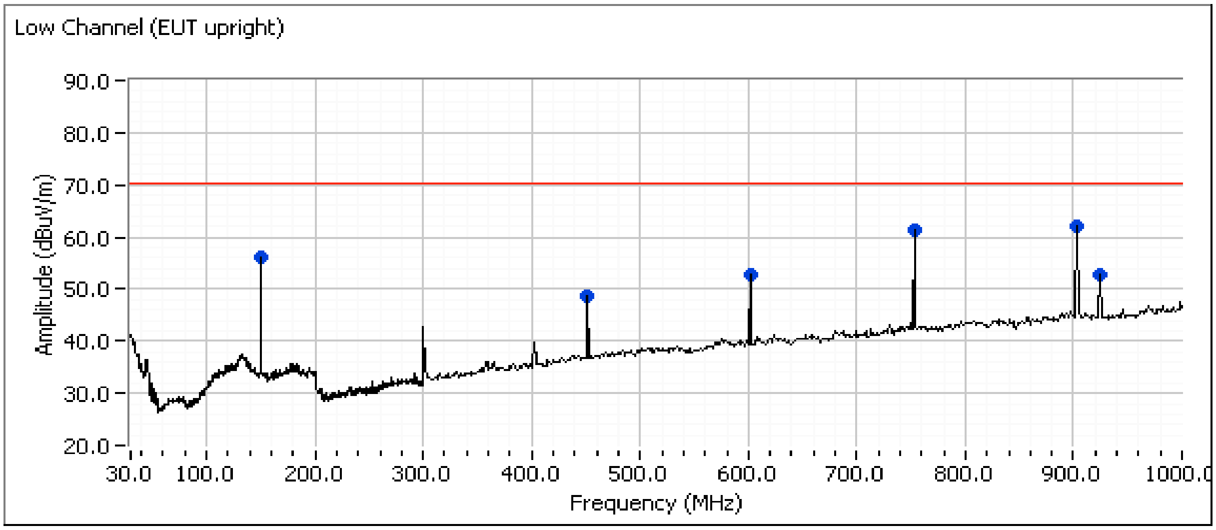
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

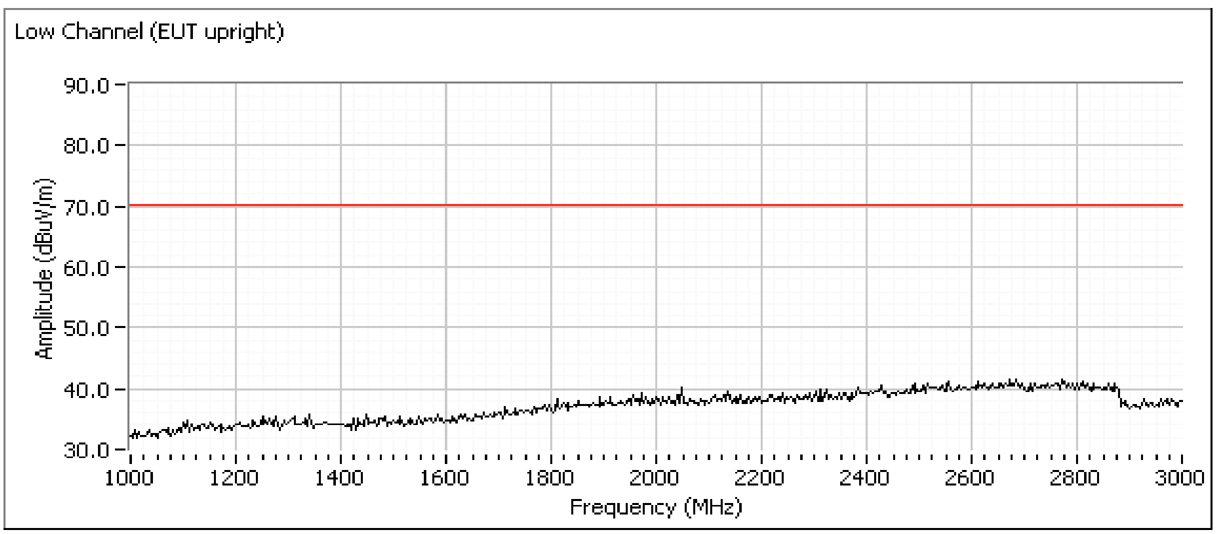




EMC Test Data

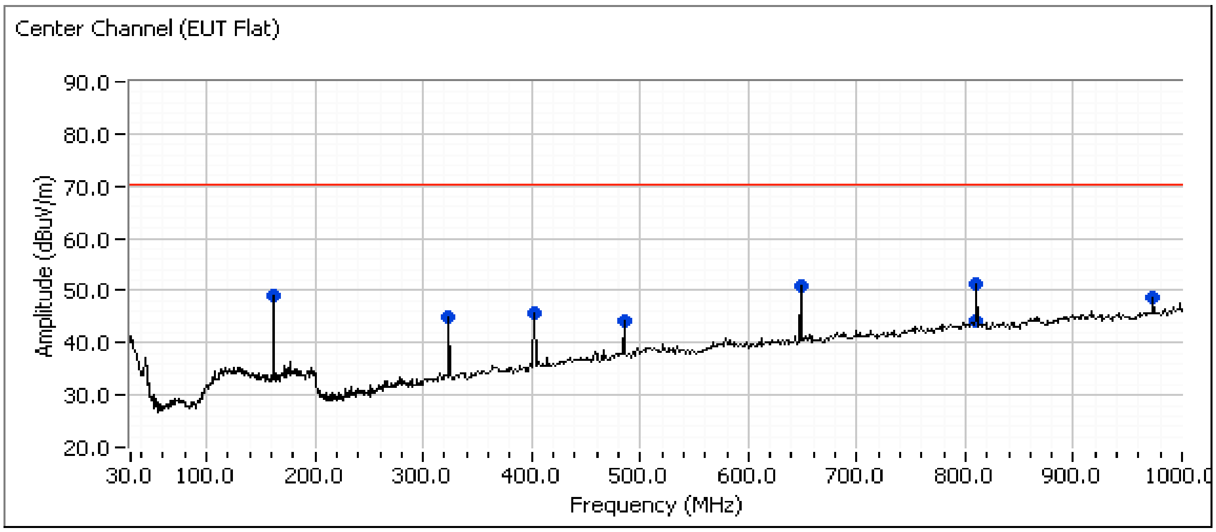
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

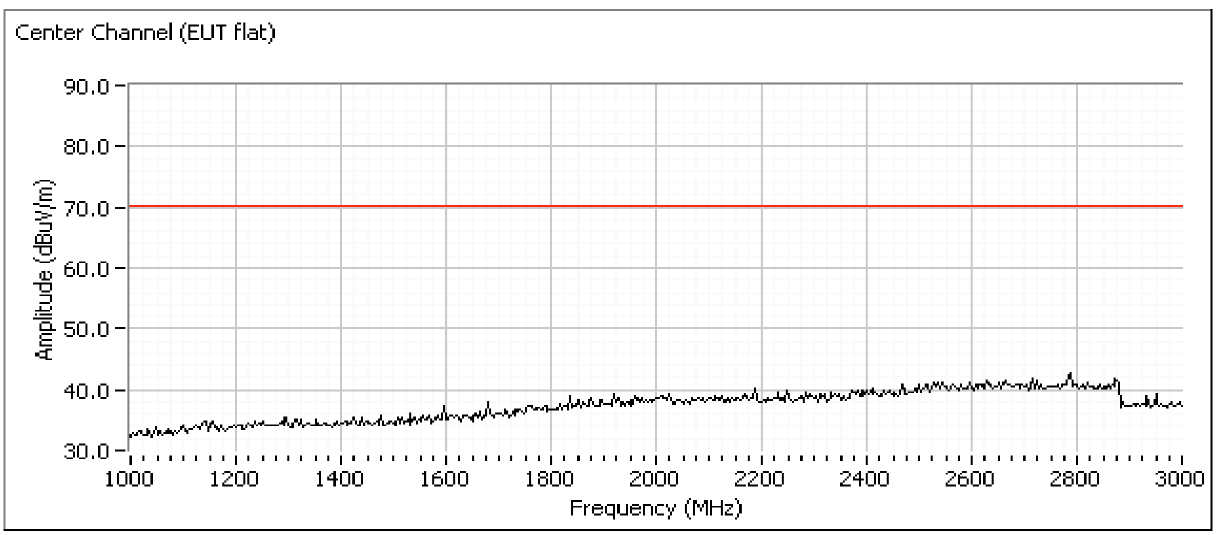




Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

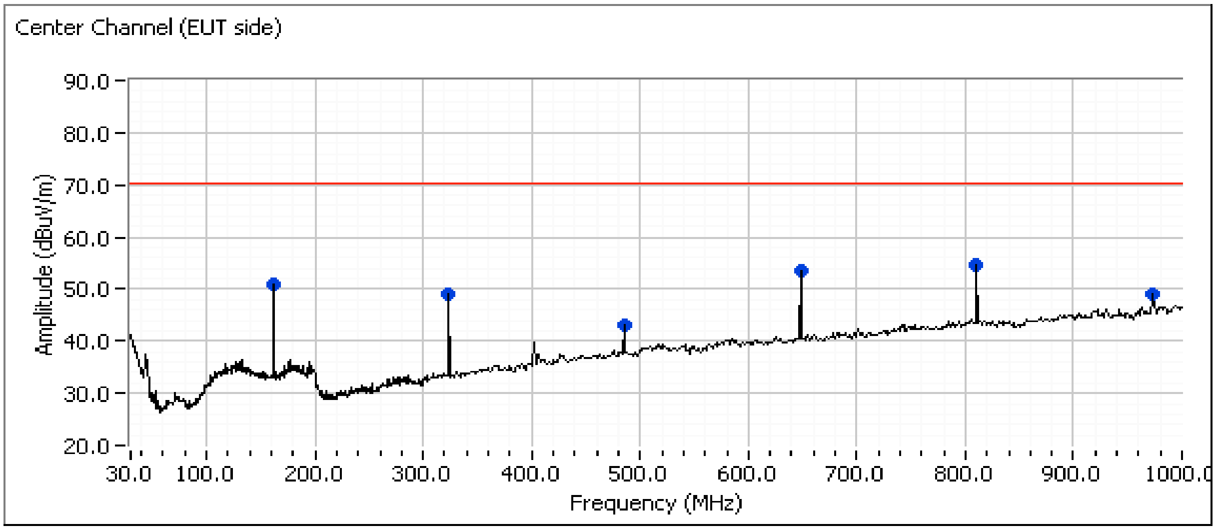
Plots for center channel, power setting = 37 dBm

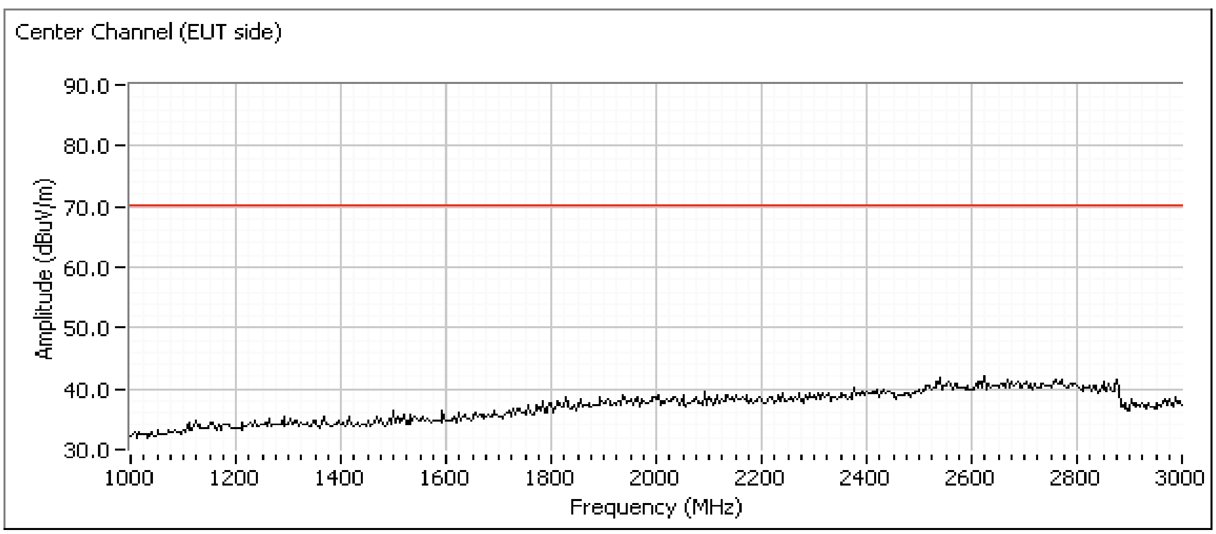




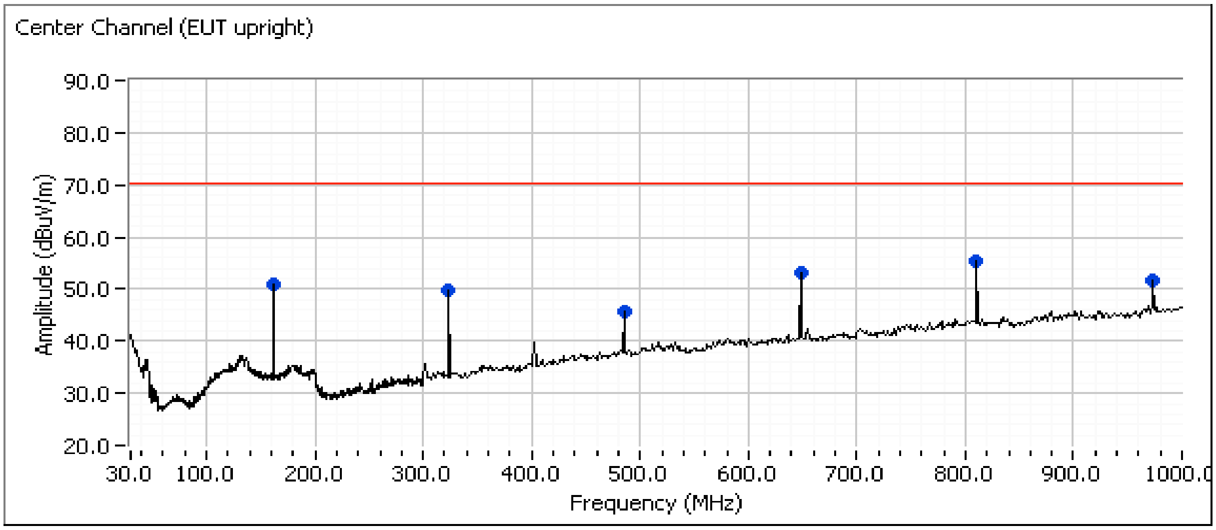
EMC Test Data

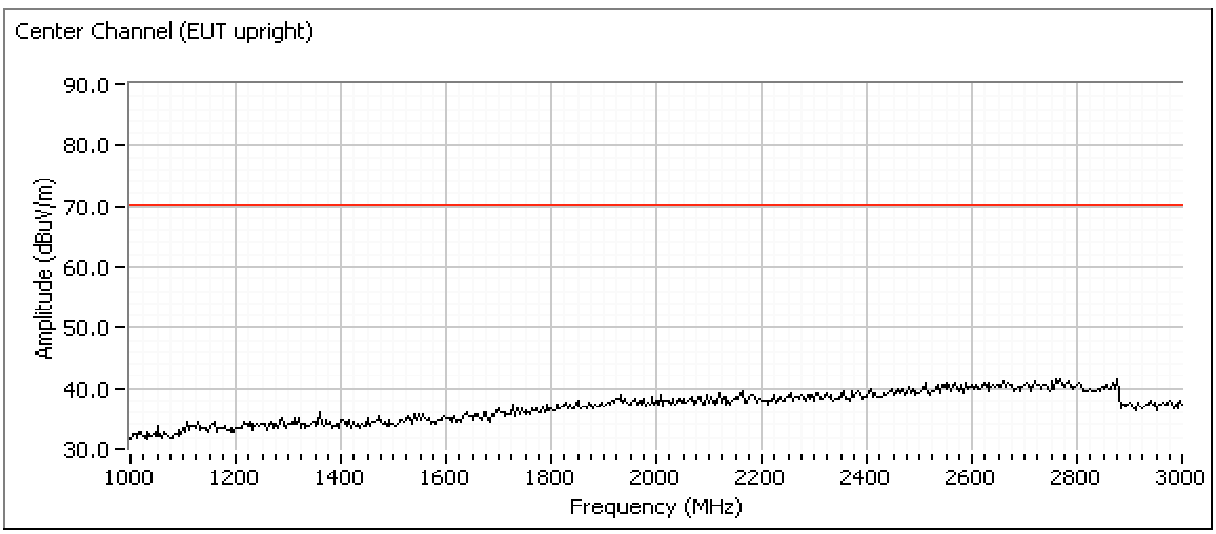
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





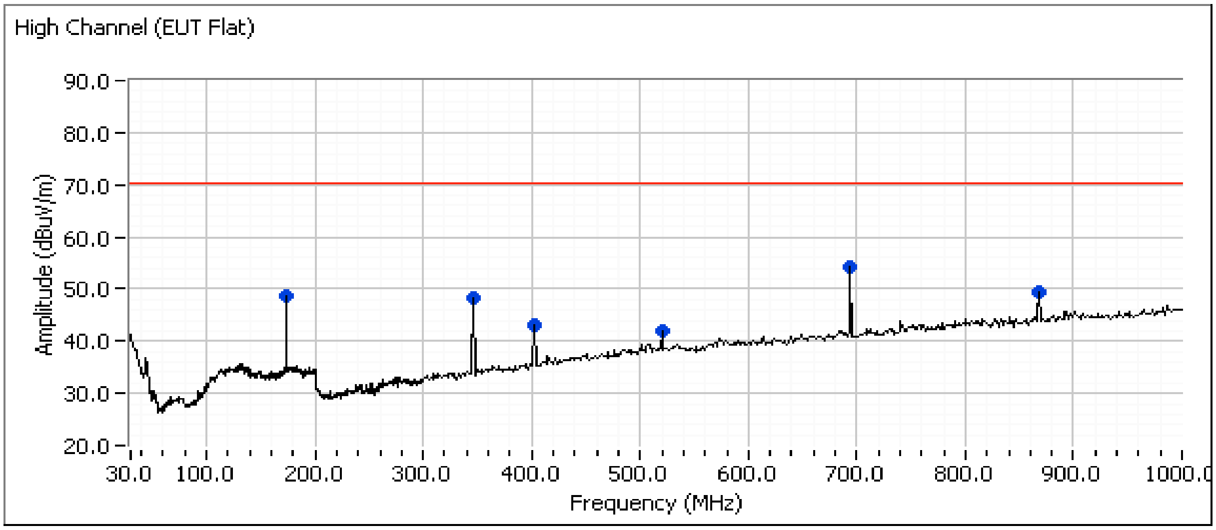
NTS WE ENGINEER SUCCESS			***EMC Test Data***
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

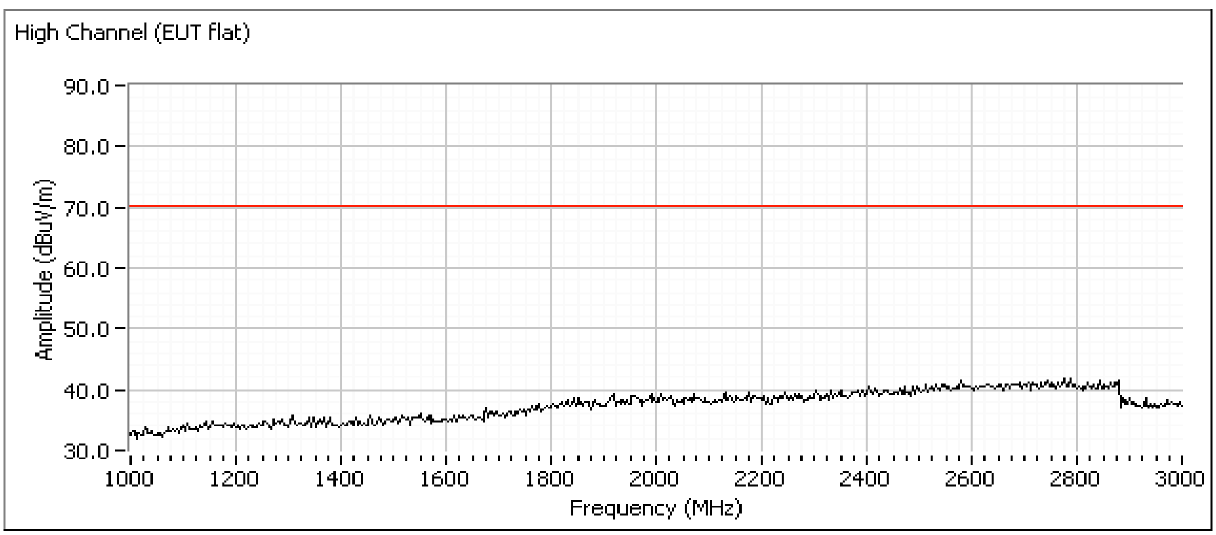


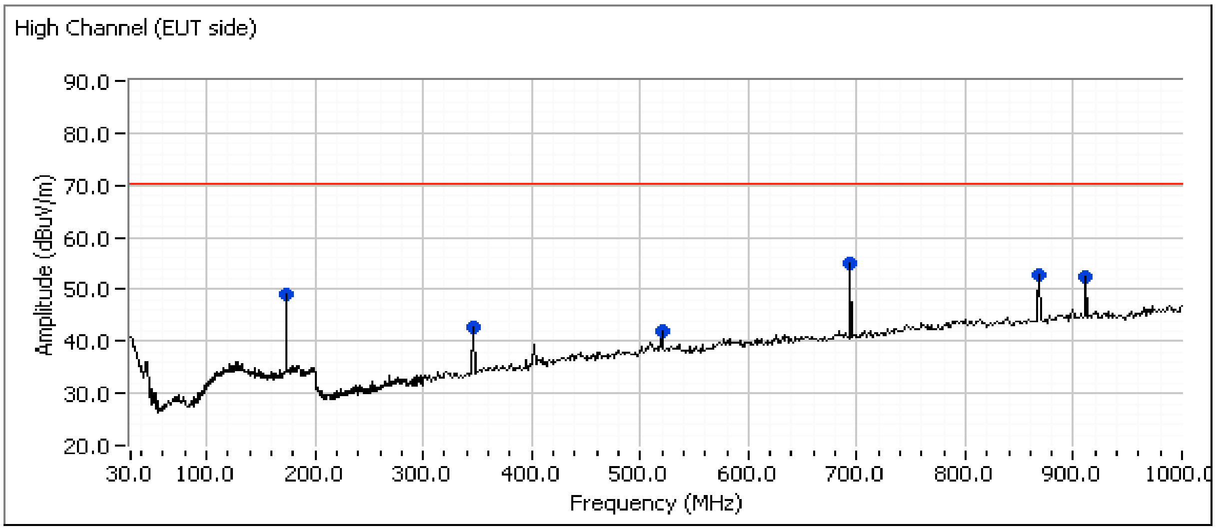


Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

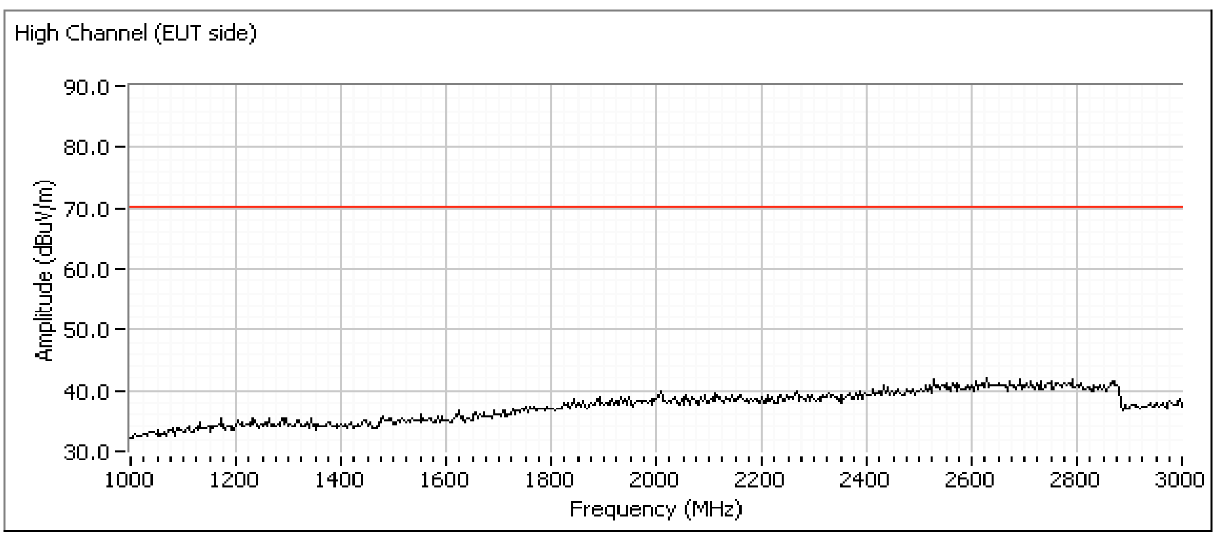
Plots for high channel, power setting = 37 dBm







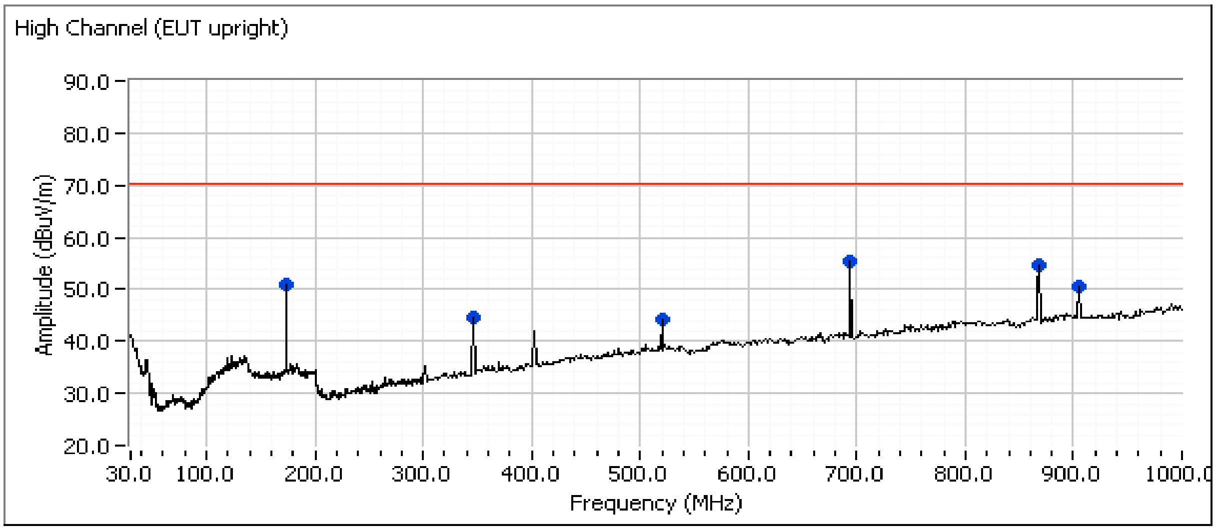
High Channel (EUT side)
Amplitude (dBuV/m)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
30.0 100.0 200.0 300.0 400.0 500.0 600.0 700.0 800.0 900.0 1000.0
Frequency (MHz)

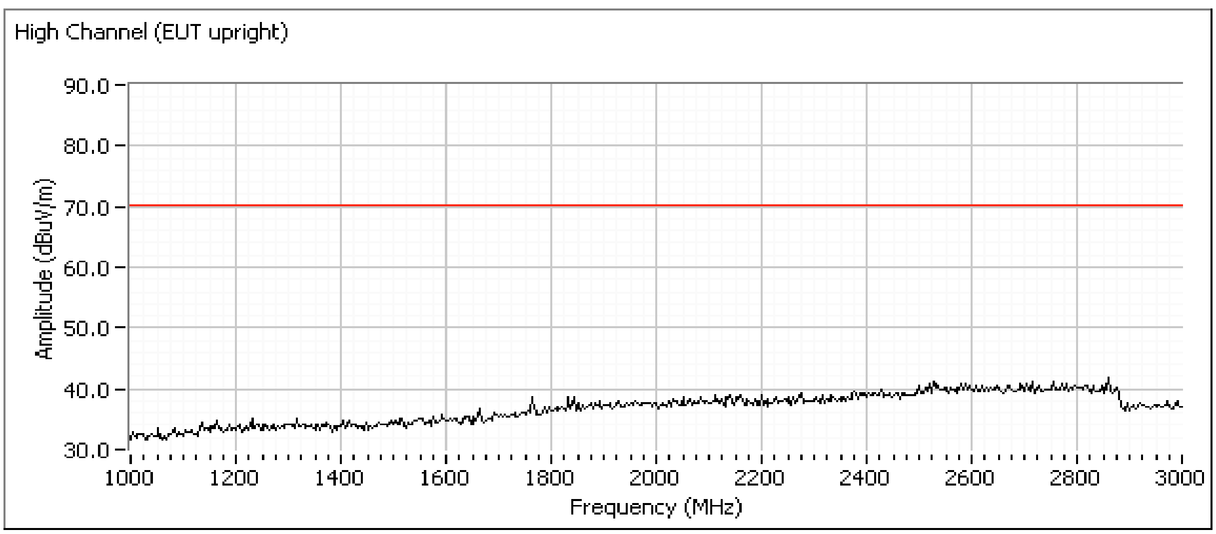


High Channel (EUT side)
Amplitude (dBuV/m)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000
Frequency (MHz)

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A





EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #5b: - Final Field Strength Measurements and Substitution Measurements

EUT Field Strength

Frequency	Level	Pol	FCC 90.210(e)		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
602.015	56.7	H	70.2	-13.5	PK	238	1.5	PK (0.10s) - EUT Flat	Low
752.514	61.7	V	70.2	-8.5	PK	145	1.5	PK (0.10s) - EUT Flat	Low
903.018	61.4	H	70.2	-8.8	PK	276	1.5	PK (0.10s) - EUT Flat	Low
752.508	64.1	H	70.2	-6.1	PK	338	1.0	PK (0.10s) - EUT Side	Low
903.012	63.2	H	70.2	-7.0	PK	100	1.5	PK (0.10s) - EUT Side	Low
752.508	63.6	H	70.2	-6.6	PK	296	1.0	PK (0.10s) - EUT Uprigh	Low
903.012	64.5	H	70.2	-5.7	PK	308	1.5	PK (0.10s) - EUT Uprigh	Low
920.355	53.6	V	70.2	-16.6	PK	134	1.0	PK (0.10s) - EUT Uprigh	Low
648.017	56.0	V	70.2	-14.2	PK	260	1.01	PK (0.10s) - EUT Flat	Center
810.012	56.6	V	70.2	-13.6	PK	142	1.46	PK (0.10s) - EUT Flat	Center
648.014	56.4	H	70.2	-13.8	PK	240	1.51	PK (0.10s) - EUT Side	Center
810.012	58.3	H	70.2	-11.9	PK	102	1.00	PK (0.10s) - EUT Side	Center
648.014	56.4	H	70.2	-13.8	PK	245	1.51	PK (0.10s) - EUT Uprigh	Center
810.009	58.8	H	70.2	-11.4	PK	295	1.00	PK (0.10s) - EUT Uprigh	Center
972.006	58.0	H	70.2	-12.2	PK	295	1.51	PK (0.10s) - EUT Uprigh	Center
346.812	51.4	H	70.2	-18.8	PK	100	1.00	PK (0.10s) - EUT Flat	High
693.613	57.4	V	70.2	-12.8	PK	240	1.00	PK (0.10s) - EUT Flat	High
867.005	56.3	H	70.2	-13.9	PK	278	1.53	PK (0.10s) - EUT Flat	High
693.613	58.1	H	70.2	-12.1	PK	356	2.42	PK (0.10s) - EUT Side	High
867.011	58.2	H	70.2	-12.0	PK	120	1.00	PK (0.10s) - EUT Side	High
913.222	53.8	V	70.2	-16.4	PK	327	1.51	PK (0.10s) - EUT Side	High
693.610	58.5	H	70.2	-11.7	PK	312	2.51	PK (0.10s) - EUT Uprigh	High
867.008	58.9	H	70.2	-11.3	PK	113	1.00	PK (0.10s) - EUT Uprigh	High

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.1 dBi) has not been included. The erp or eirp for all signals with less than 20 dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2:	Measurements are made with the antenna port terminated.

EMC Test Data

Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Substitution measurements

Date of Test: 12/22/2016
Test Engineer: Kevin
Test Location: FT Ch #7

Config. Used: -
Config Change: -
EUT Voltage: -

Horizontal

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
346.812	-30.0	1.75	69.7	98.0	51.4	-46.6	-48.8		-25.0	-23.8
602.015	-30.0	2.10	70.0	97.9	56.7	-41.2	-43.4		-25.0	-18.4
648.014	-30.0	2.00	70.1	98.1	56.4	-41.7	-43.9		-25.0	-18.9
693.610	-30.0	1.90	70.7	98.8	58.5	-40.3	-42.5		-25.0	-17.5
752.508	-30.0	1.60	70.2	98.6	63.6	-35.0	-37.2		-25.0	-12.2
810.009	-30.0	1.60	69.9	98.3	58.8	-39.5	-41.7		-25.0	-16.7
867.008	-30.0	1.65	70.2	98.6	58.9	-39.7	-41.9		-25.0	-16.9
903.012	-30.0	1.75	70.1	98.4	64.5	-33.9	**-36.1**		-25.0	**-11.1**
972.006	-30.0	1.85	69.9	98.1	58.0	-40.1	-42.3		-25.0	-17.3

Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
913.222	-30.0	1.75	69.8	98.1	53.8	-44.3	-46.5		-25.0	-21.5
920.355	-30.0	1.75	69.2	97.5	53.6	-43.9	-46.1		-25.0	-21.1

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBμV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

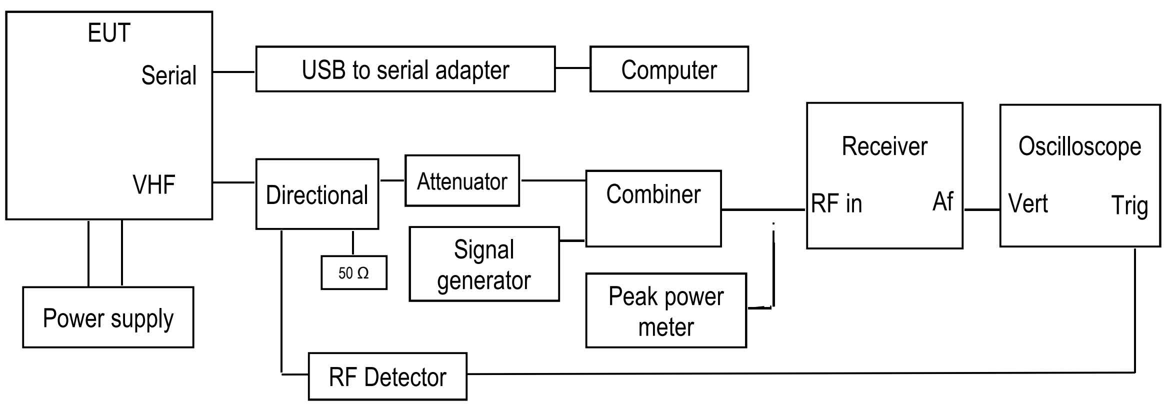
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #6: Transient Frequency Behavior

Date of Test:	12/20/2016	Config. Used:	1
Test Engineer:	Kevin, Deniz	Config Change:	None
Test Location:	FT Lab #4b	EUT Voltage:	11.0 Vdc

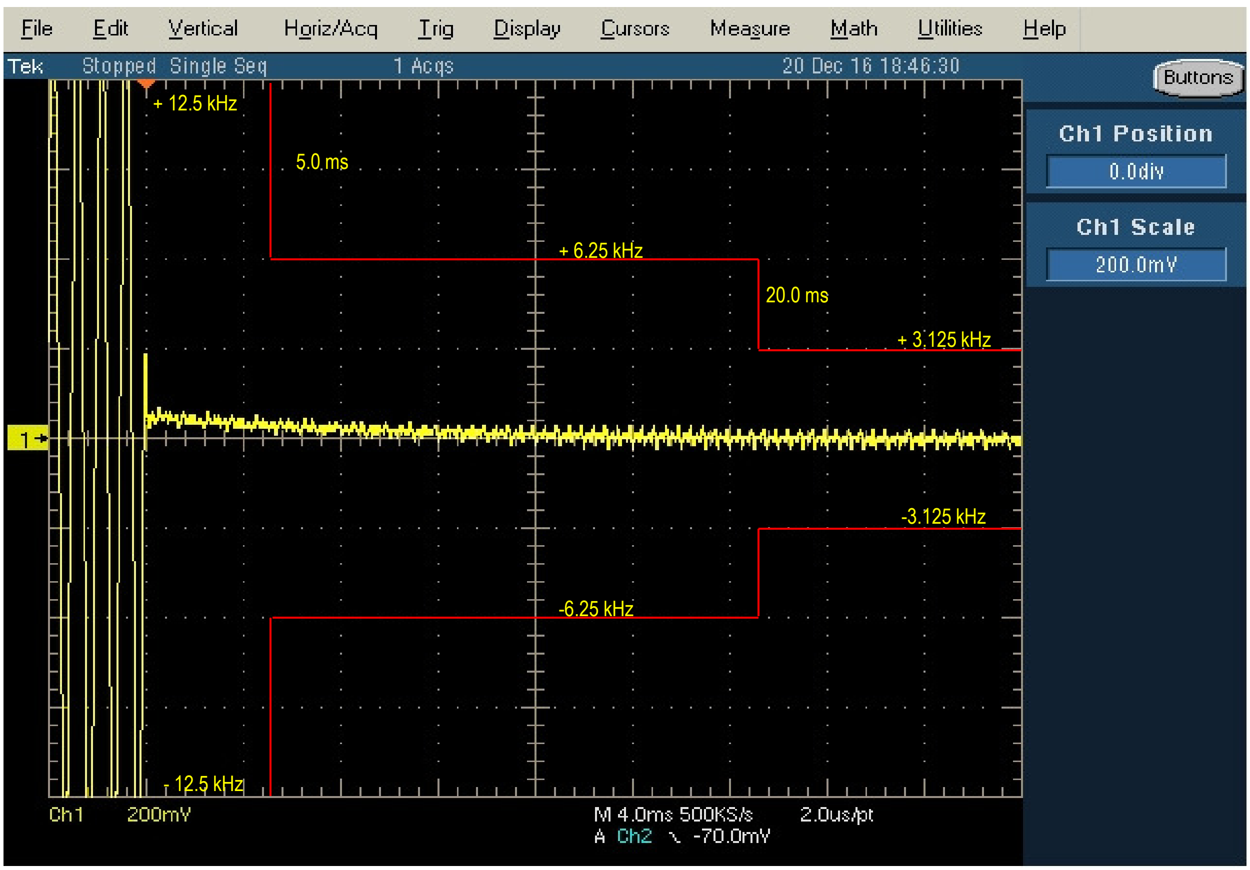
Transient frequency Behavior measurements setup

Note: The test has been performed with the method given in ANSI / TIA 603-D (2.2.19.3)



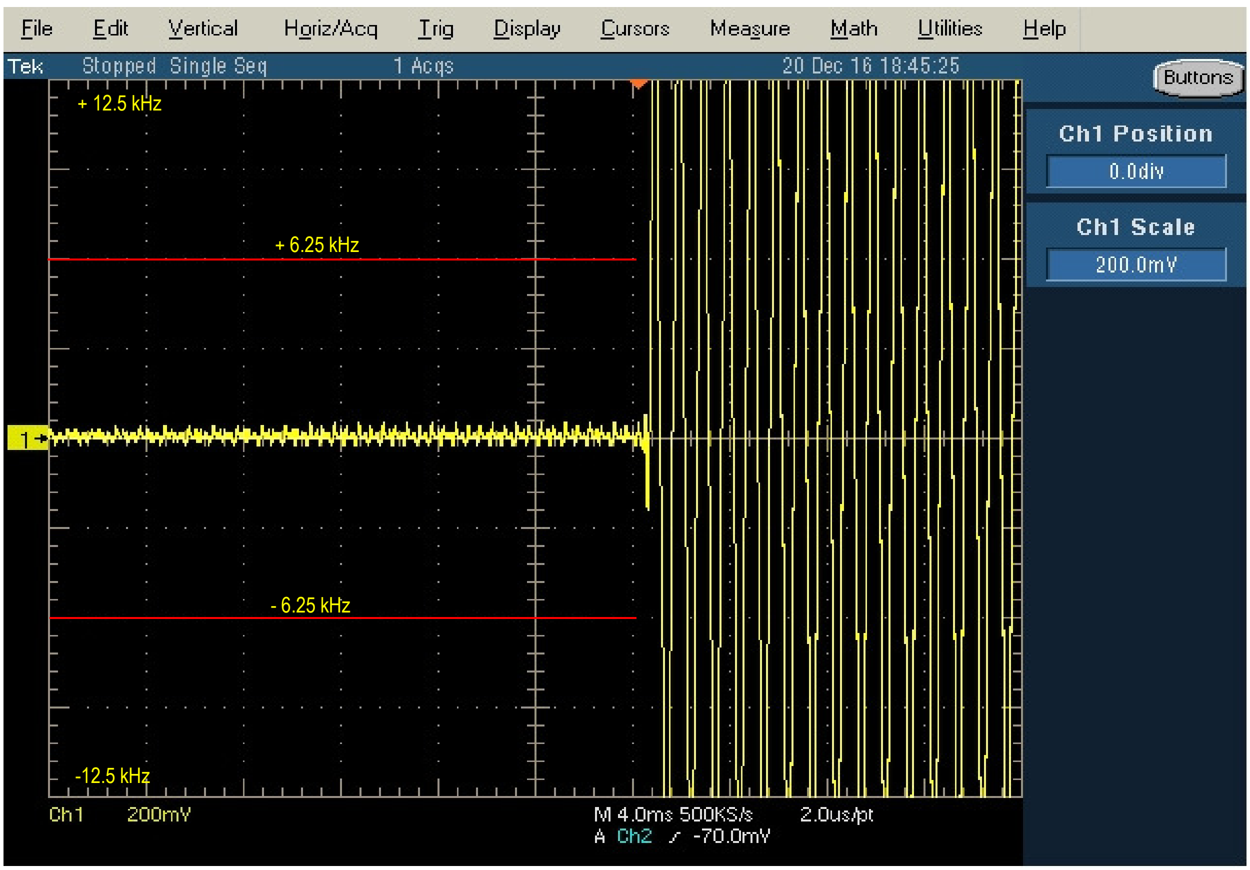
Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #6a
Carrier Frequency: 162.000000 MHz
Channel Spacing: 6.25 kHz (worst case)
Modulation: CW
Description: Switch on condition t_{on}, t_1, and t_2
Limit: t_1: ±6.25 kHz, 5 ms; t_2: ±3.125 kHz, 20 ms



Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #6b
Carrier Frequency: 162.000000 MHz
Channel Spacing: 6.25 kHz (worst case)
Modulation: CW
Description: Switch off condition t_3 and t_{off}
Limit: t_3: ±6.25 kHz, 5 ms



Client:	XetaWave LLC	Job Number:	JD103500
Model:	Xeta1-M2	T-Log Number:	T103571
		Project Manager:	Christine Krebill
Contact:	Sandee Malang	Project Coordinator:	-
Standard:	FCC Part 90, RSS-119	Class:	N/A

Run #7: Frequency Stability

Date of Test: 12/20/2016
Test Engineer: Kevin, Deniz
Test Location: FT Lab #4b

Config. Used: 1
Config Change: None
EUT Voltage: 11.0 Vdc

Nominal Frequency: 162.00000 MHz

Frequency Stability Over Temperature

The EUT was soaked at each temperature for a minimum of 30 minutes prior to making the measurements to ensure the EUT and chamber had stabilized at that temperature.

Temperature	Frequency Measured	Drift	
(Celsius)	(MHz)	(Hz)	(ppm)
-30	162.000012	12	0.1
-20	162.000089	89	0.5
-10	162.000056	56	0.3
0	162.000031	31	0.2
10	162.000018	18	0.1
20	162.000014	14	0.1
30	162.000000	0	0.0
40	161.999996	-4	0.0
50	161.999988	-12	-0.1
	Worst case:	89	0.5

Frequency Stability Over Input Voltage

Nominal Voltage is 11 Vdc. (9.35 - 12.65 Vdc)

Voltage	Frequency Measured	Drift	
(DC)	(MHz)	(Hz)	(ppm)
85%	162.000014	14	0.1
115%	162.000013	13	0.1
	Worst case:	14	0.1

Note 1:	Center frequency was measured with unmodulated carrier.
Note 2:	Maximum drift of fundamental frequency before it shut down at 2.8 Vdc is 10 Hz.

End of Report

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