


Radio Test Report**FCC Part 90
RSS-119****150 – 174 MHz****Model: XETA1-M2**FCC ID: PEJ-9382010
IC: 11169A-00001COMPANY: XetaWave LLC
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Louisville, CO 80027TEST SITE(S): National Technical Systems - Silicon Valley
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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) | dB μ V/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 | Description | Cable(s) | |
|----------|--------------------|----------------|------------------------|-----------|
| | | | 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.

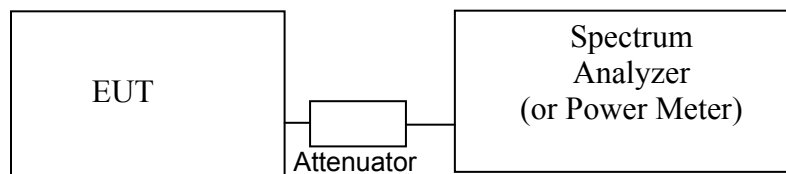
Radiated spurious emissions measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers listed below. The sites conform to the requirements of ANSI C63.4: 2014 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical 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 $VBW \geq 3 \times RBW$.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector ($VBW \geq 3 \times RBW$) 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 ($VBW \geq 3 \times RBW$) 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 angle 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 used when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20 \cdot \log_{10} (D_m/D_s)$$

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 dB μ V/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dB μ V/m

L_s = Specification Limit in dB μ V/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

| <u>Manufacturer</u> | <u>Description</u> | <u>Model</u> | <u>Asset #</u> | <u>Calibrated</u> | <u>Cal Due</u> |
|--|--|-----------------------|----------------|-------------------|----------------|
| 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 |



| <u>Manufacturer</u> | <u>Description</u> | <u>Model</u> | <u>Asset #</u> | <u>Calibrated</u> | <u>Cal Due</u> |
|---------------------|---------------------------------|--------------------------|----------------|-------------------|----------------|
| 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

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EMC Test Data

| | | | |
|------------------------|----------------------|----------------------|-------------------|
| 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

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



EMC Test Data

| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | 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 | | Ant. Gain (dBi) | Result | ERP | |
|---------------|-----------------|------------|--------------|--------------------|------|-----------------|--------|--------------------|--------|
| | | | | (dBm) ¹ | W | | | (dBm) ³ | 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



EMC Test Data

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

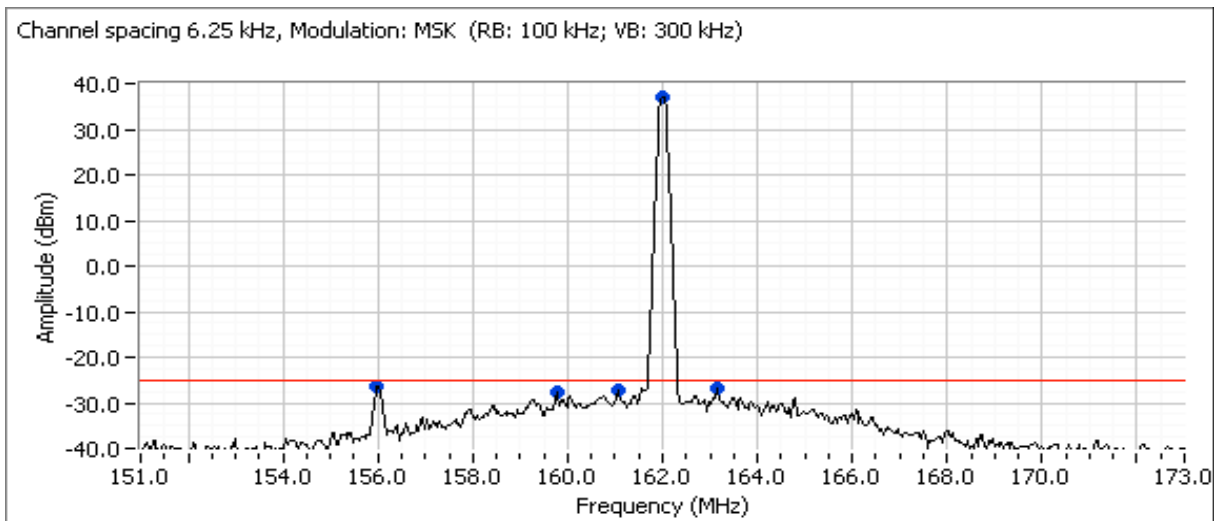
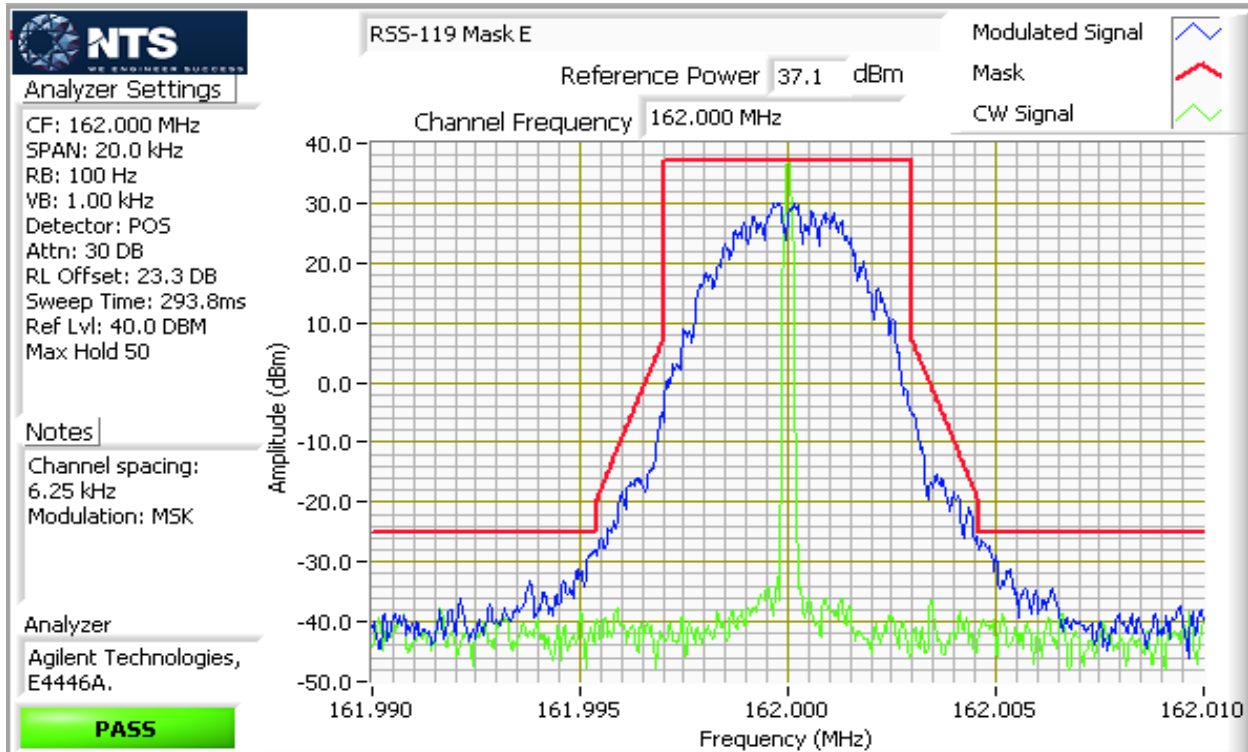
| Power setting | Data rate | Channel plan | Modulation | Channel Frequency (MHz) | Result Pass/Fail |
|---------------|-----------|--------------|------------|-------------------------|------------------|
| | 4.8 kbps | 6.25 kHz | MSK | 162.000000 | Pass |
| | 10 kbps | 12.5 kHz | MSK | 162.000000 | 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.

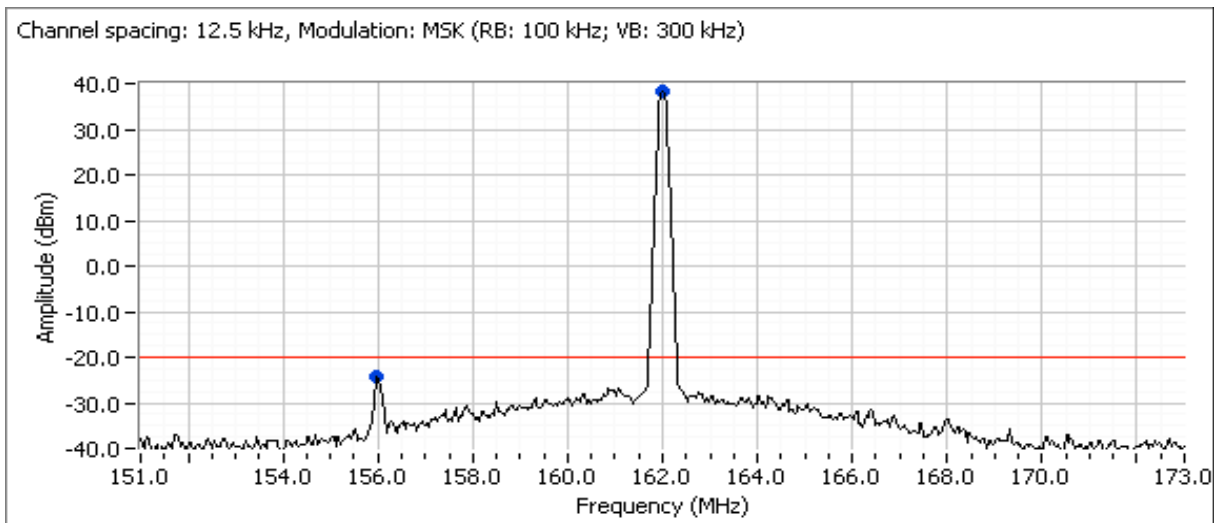
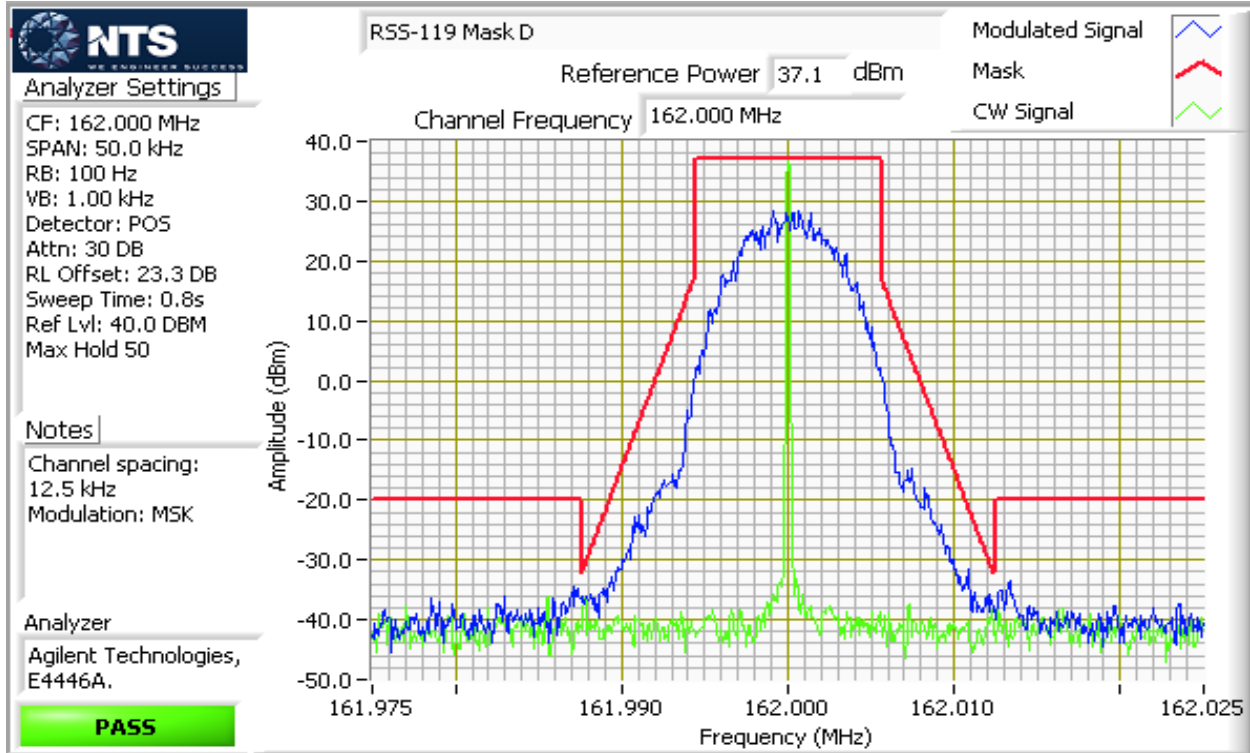
Spurious Emissions, >50 kHz and >250% of Authorized BW (RB: 100 kHz; VB: 300 kHz)

| 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 |

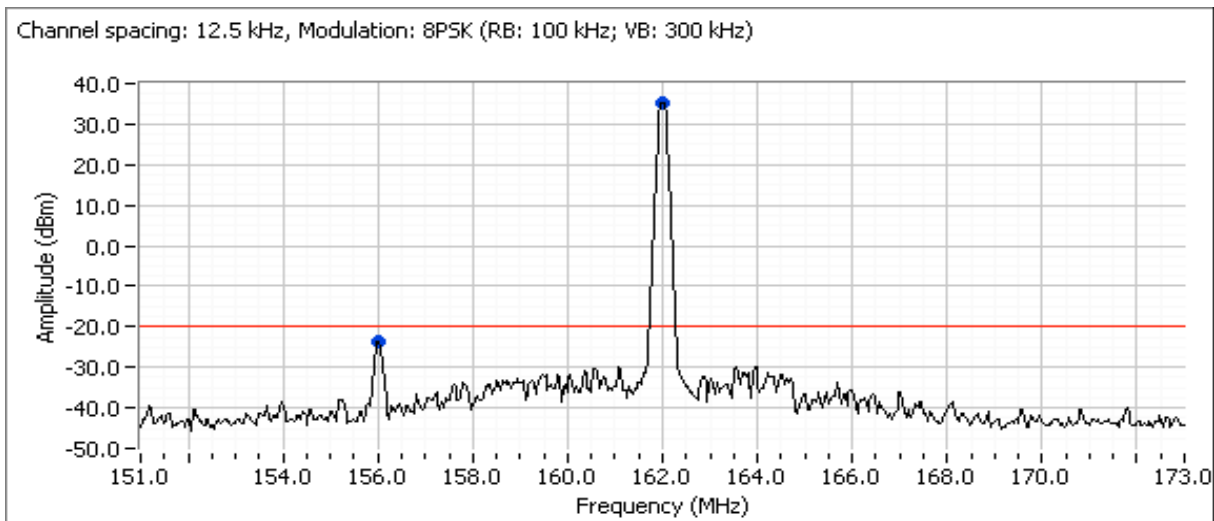
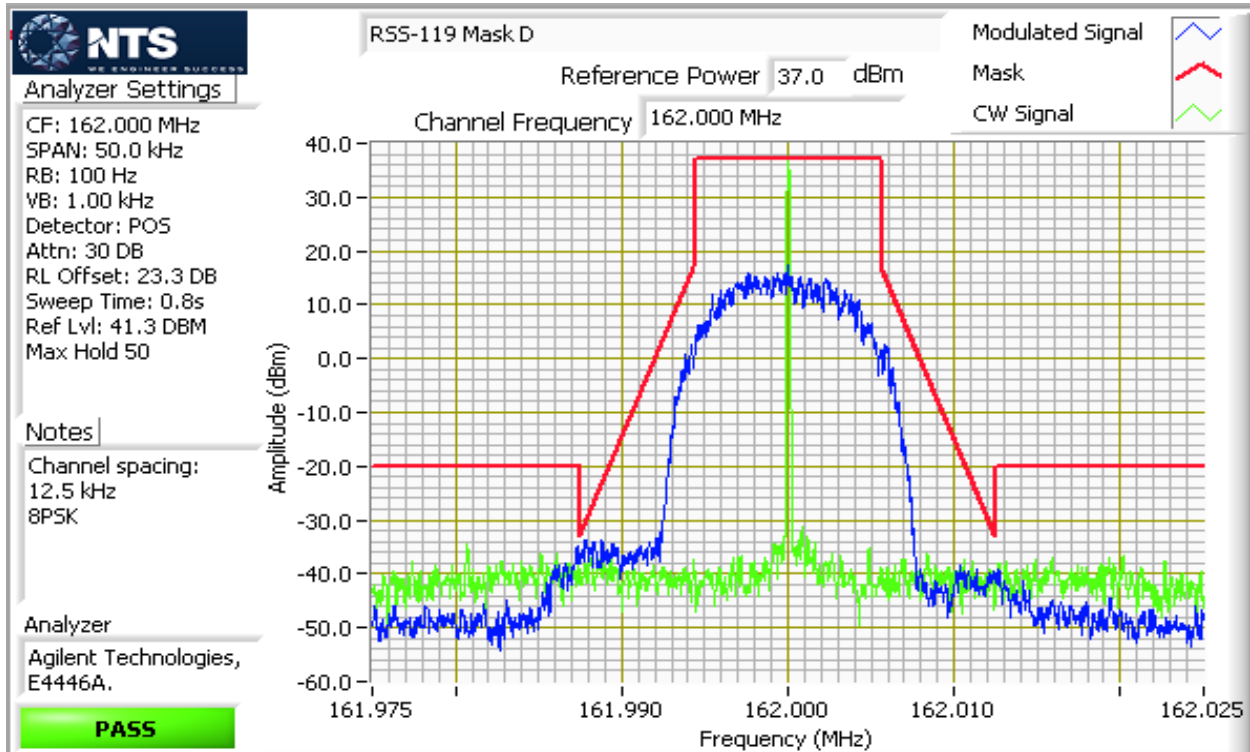
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



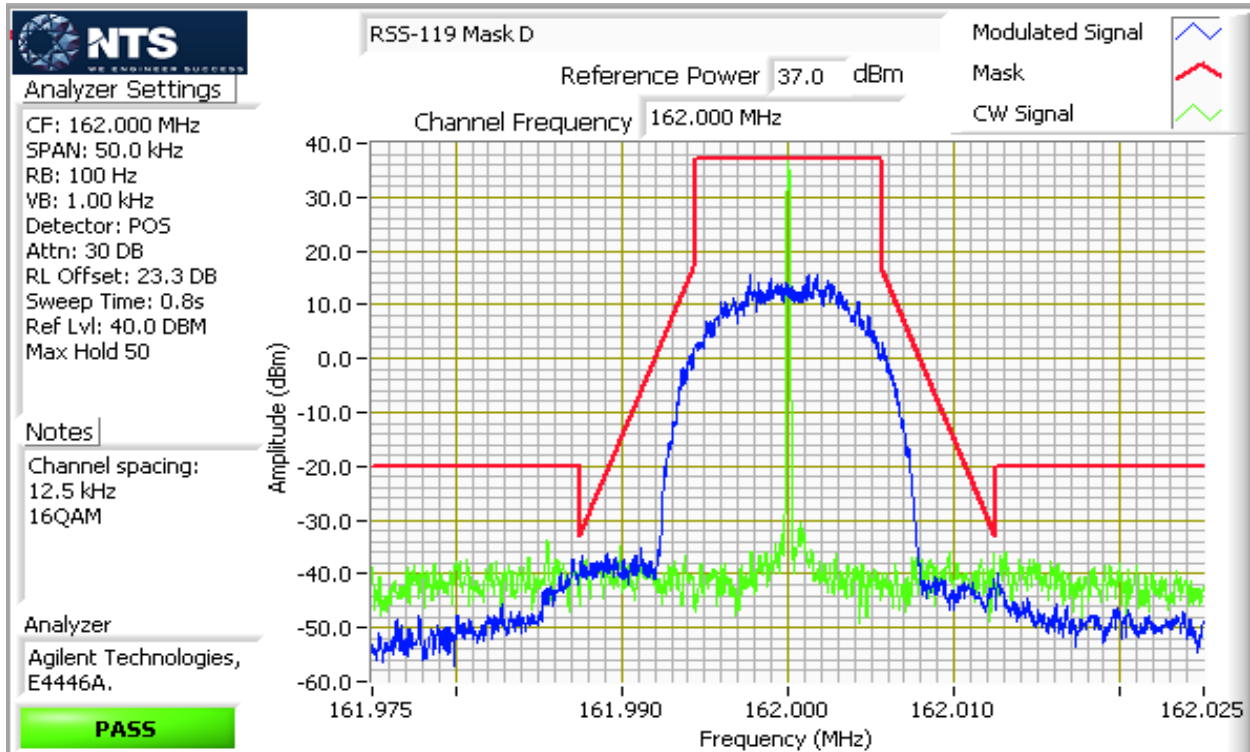
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



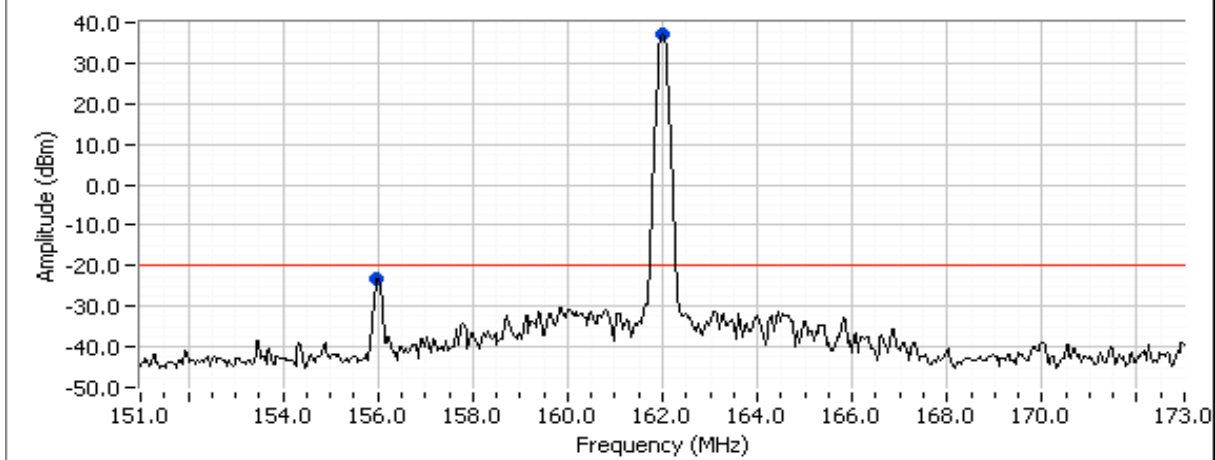
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



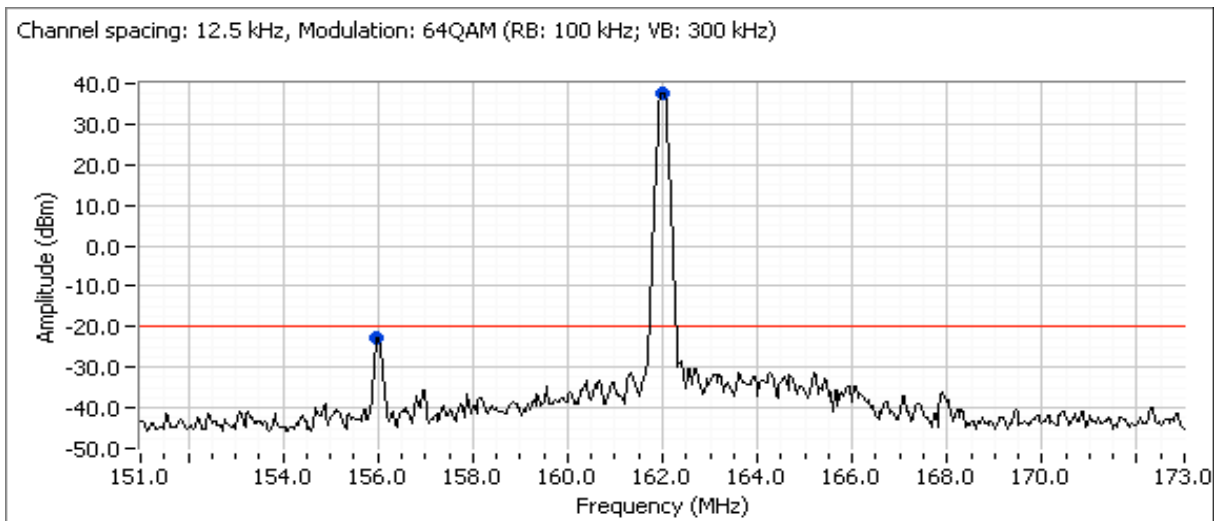
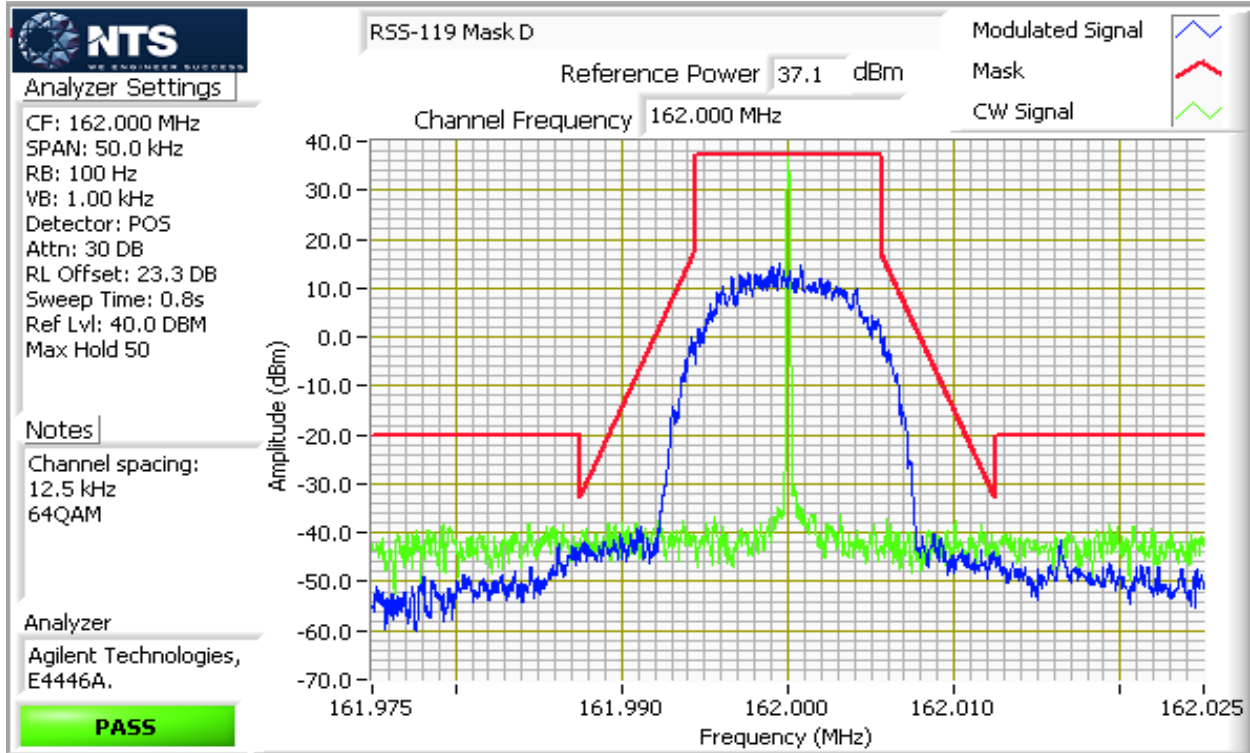
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|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part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



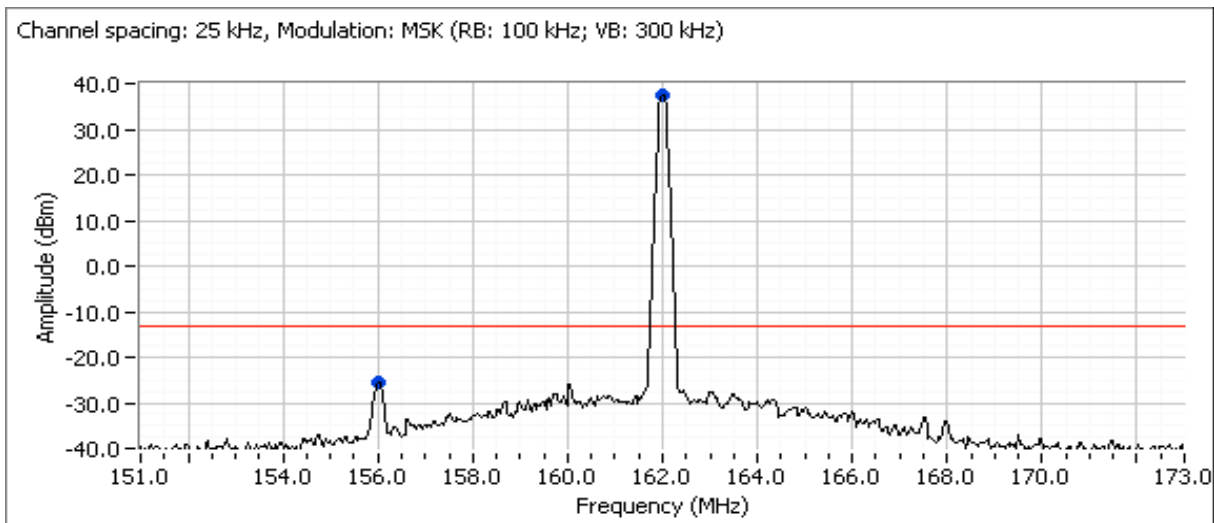
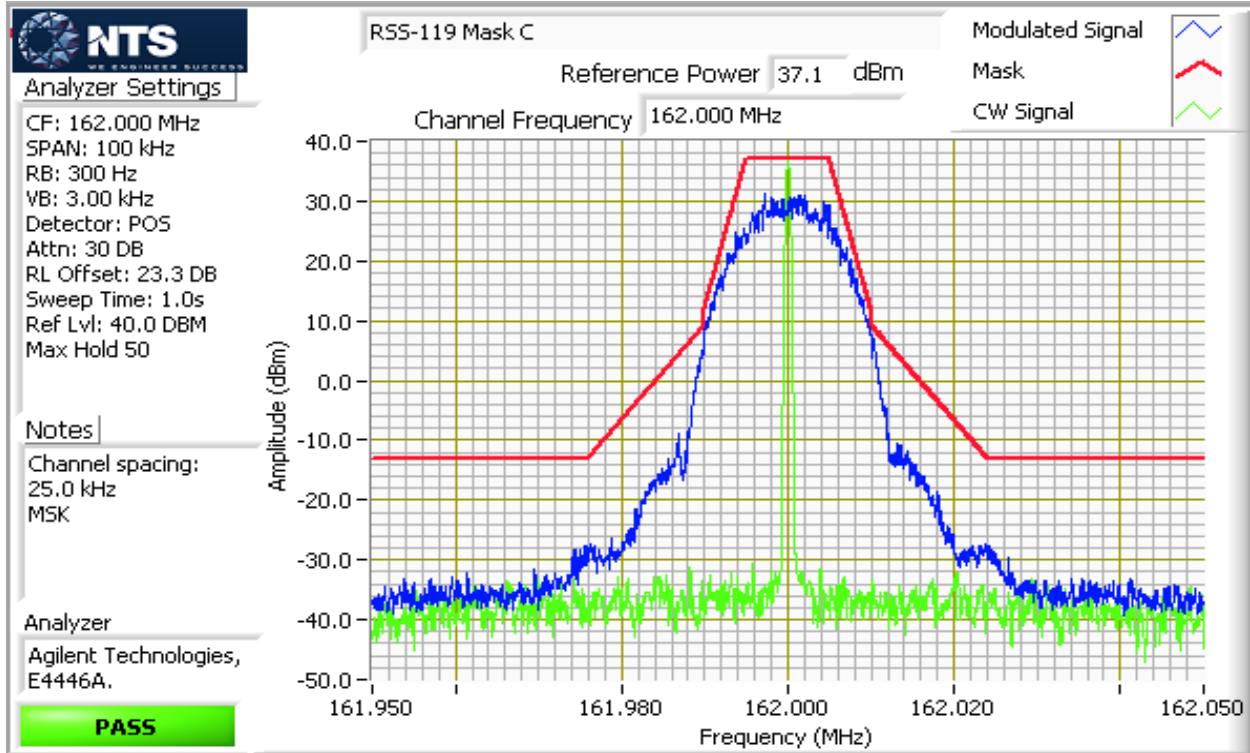
Channel spacing: 12.5 kHz, Modulation: 16QAM (RB: 100 kHz; VB: 300 kHz)



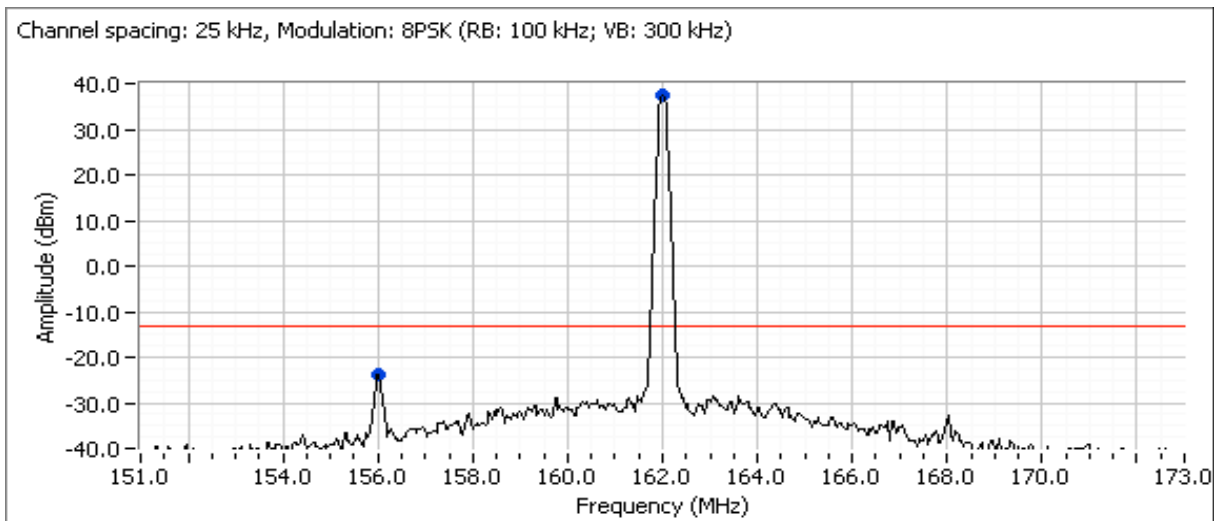
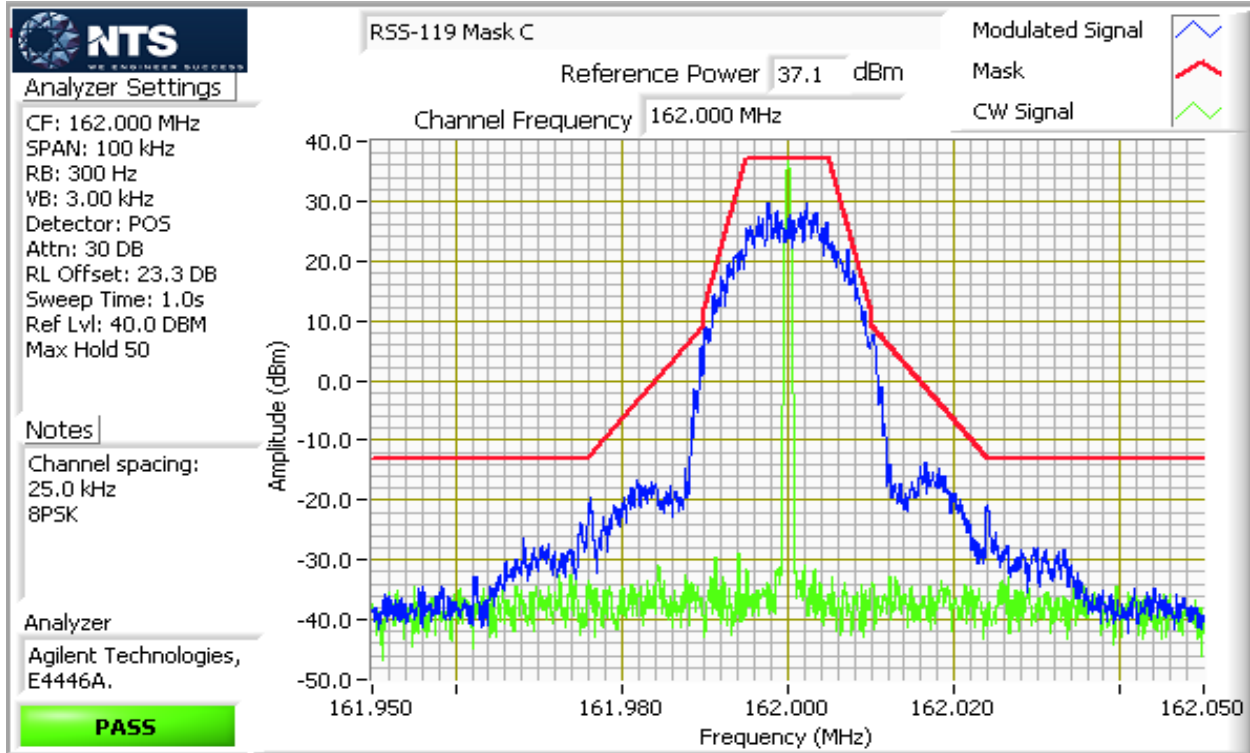
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



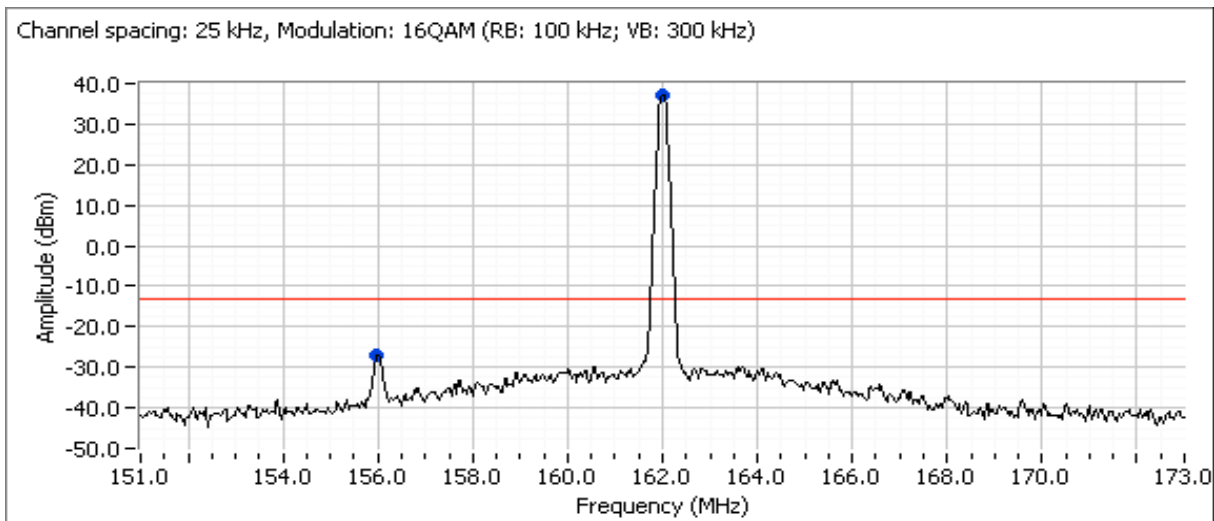
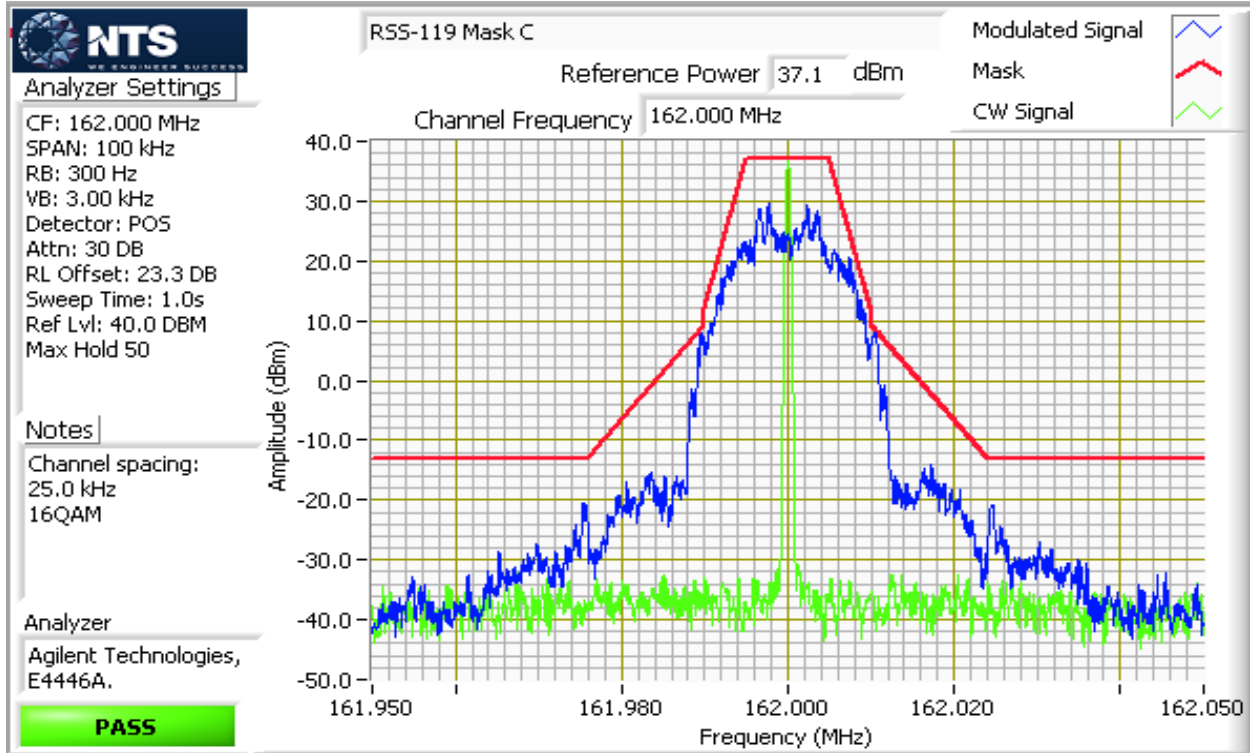
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



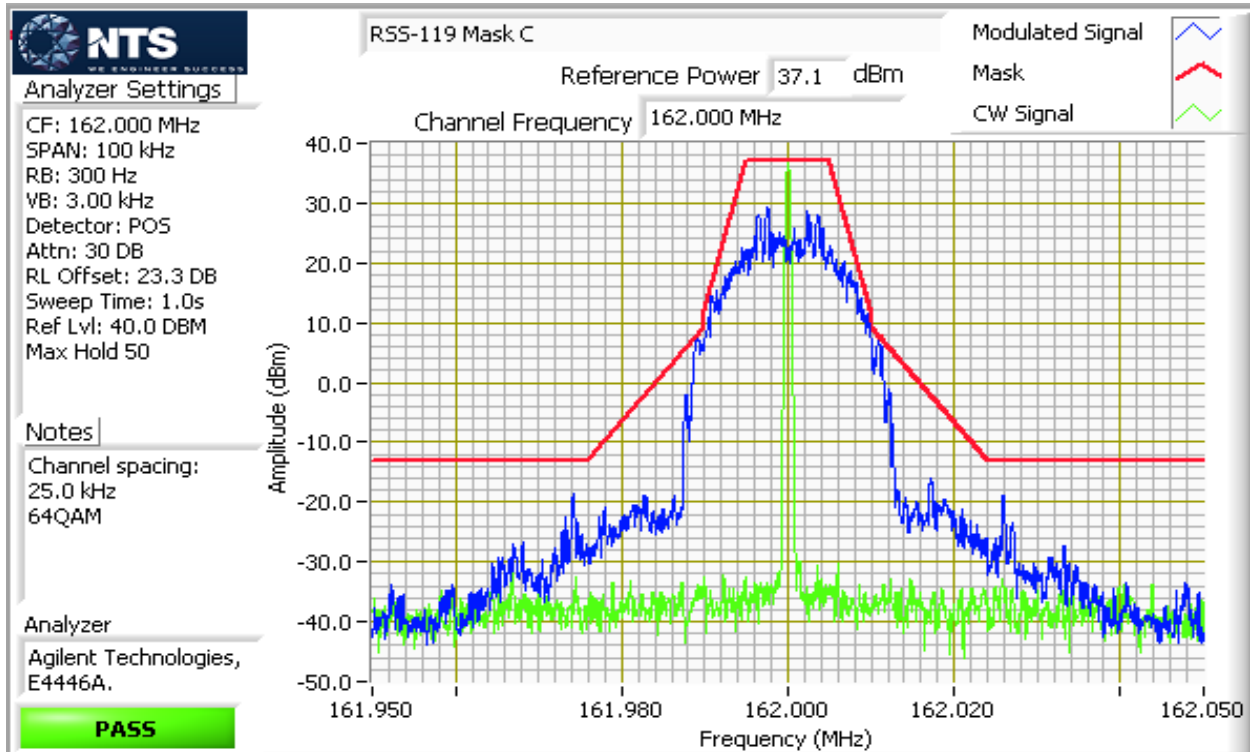
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



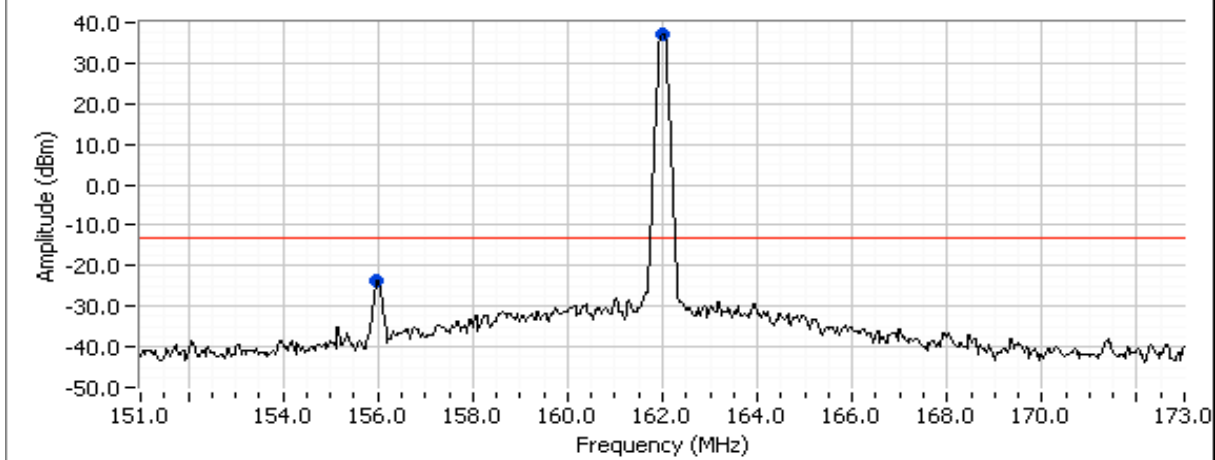
| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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



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



Channel spacing: 25 kHz, Modulation: 64QAM (RB: 100 kHz; VB: 300 kHz)



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

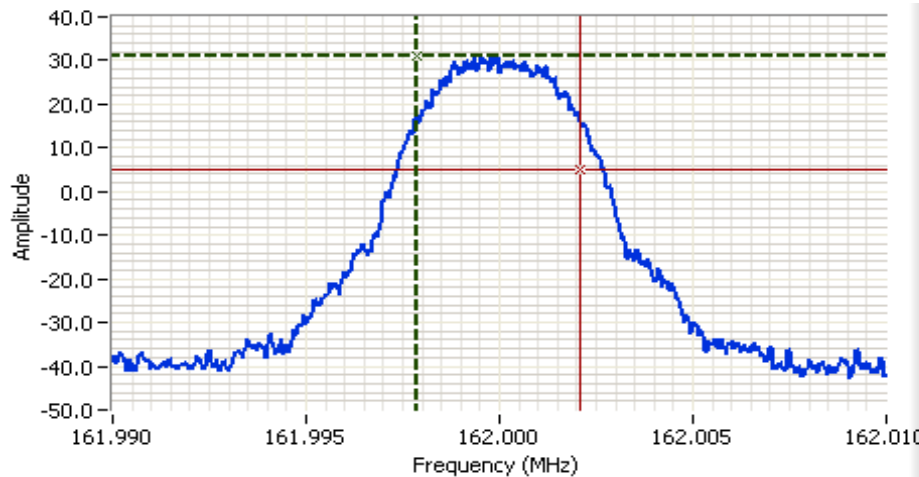
Run #3: Signal Bandwidth

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) | | Authorized bandwidth |
|---------------|-----------|--------------|------------|---------------|---------|-----------------|-------|----------------------|
| | | | | | | 26 dB | 99% | |
| | 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 |

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

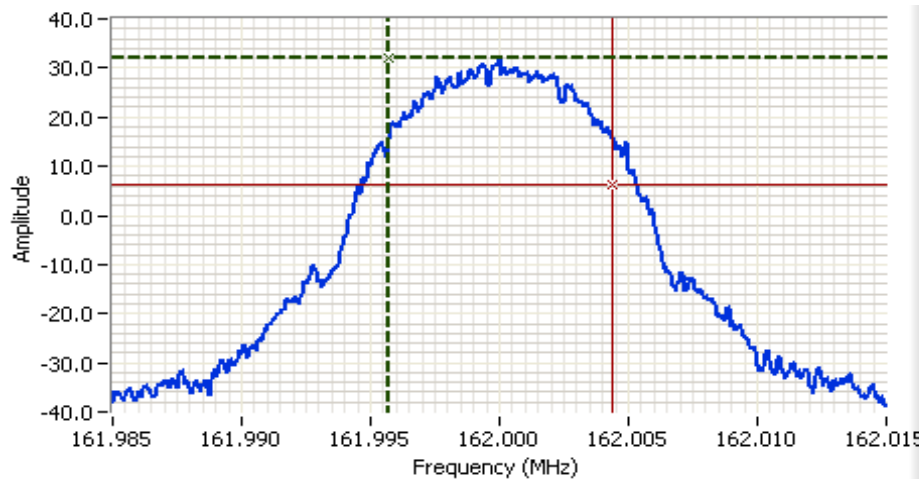


Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 20.0 kHz
 RB: 100 Hz
 VB: 300 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 293.8ms
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 4.19 kHz
 Channel spacing: 6.25 kHz
 Modulation: MSK



Analyzer Settings

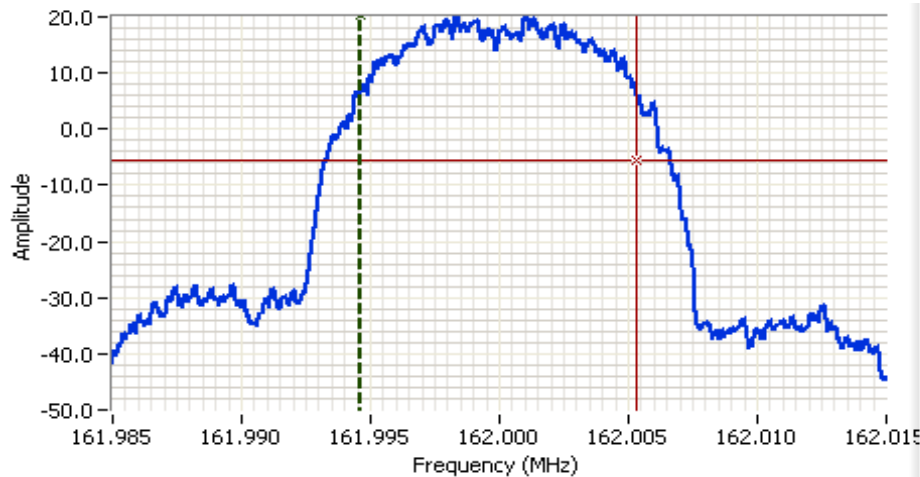
Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 30.0 kHz
 RB: 200 Hz
 VB: 620 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 8.64 kHz
 Channel spacing: 12.5 kHz
 Modulation: MSK



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



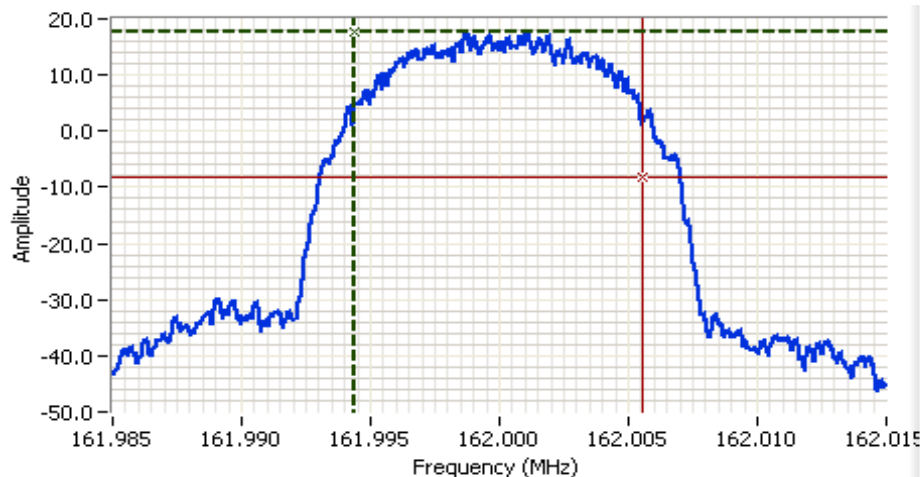
Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 30.0 kHz
 RB: 200 Hz
 VB: 620 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 41.3 DBM

Comments

99% power BW: 10.7 kHz
 Channel spacing: 12.5 kHz
 Modulation: 8PSK

| | | | | | |
|----------|----------|------|--|-----------------|----------|
| Cursor 1 | 161.9946 | 20.5 | | Delta Freq. | 10.7 kHz |
| Cursor 2 | 162.0053 | -5.5 | | Delta Amplitude | 26.0 |



Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 30.0 kHz
 RB: 200 Hz
 VB: 620 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 41.3 DBM

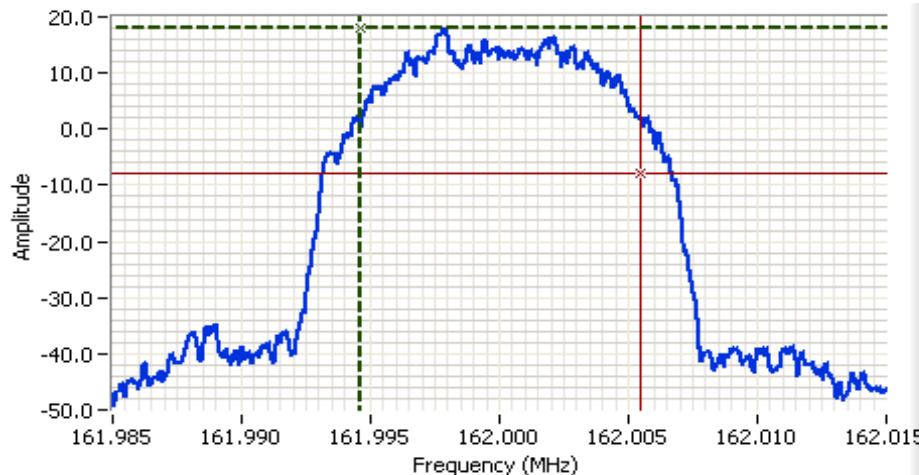
Comments

99% power BW: 11.1 kHz
 Channel spacing: 12.5 kHz
 Modulation: 16QAM

| | | | | | |
|----------|----------|------|--|-----------------|----------|
| Cursor 1 | 161.9944 | 17.8 | | Delta Freq. | 11.1 kHz |
| Cursor 2 | 162.0055 | -8.2 | | Delta Amplitude | 26.0 |



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



Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 30.0 kHz
 RB: 200 Hz
 VB: 620 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

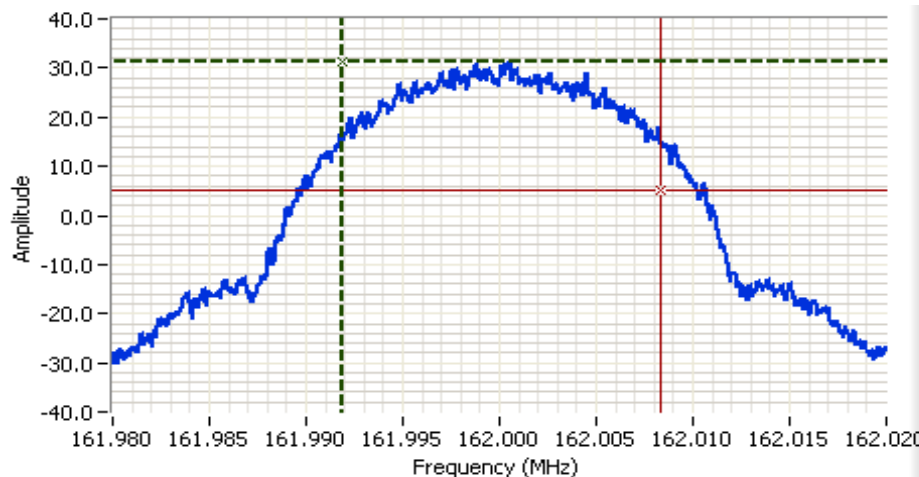
Comments

99% power BW: 10.9 kHz
 Channel spacing: 12.5 kHz
 Modulation: 64QAM

| | | | |
|----------|----------|------|--|
| Cursor 1 | 161.9946 | 18.0 | |
| Cursor 2 | 162.0055 | -8.0 | |

Delta Freq. 10.9 kHz

Delta Amplitude 26.0



Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 40.0 kHz
 RB: 300 Hz
 VB: 910 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 16.4 kHz
 Channel spacing: 25.0 kHz
 Modulation: MSK

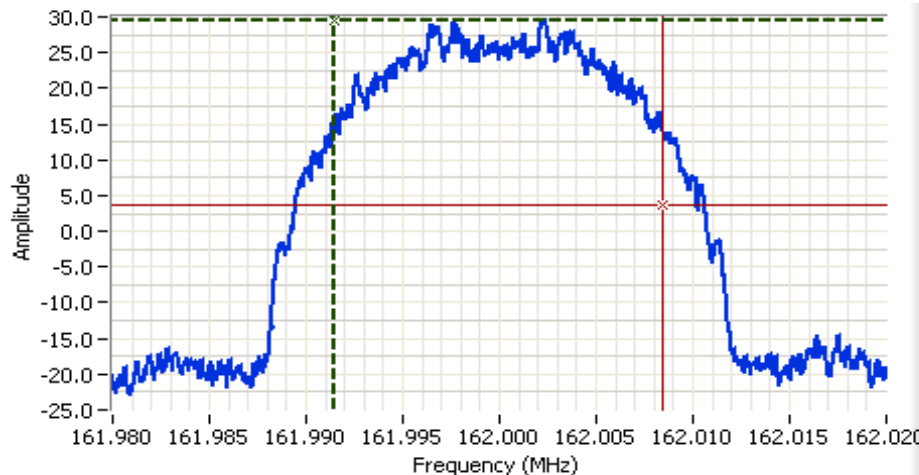
| | | | |
|----------|----------|------|--|
| Cursor 1 | 161.9919 | 31.2 | |
| Cursor 2 | 162.0083 | 5.2 | |

Delta Freq. 16.4 kHz

Delta Amplitude 26.0



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

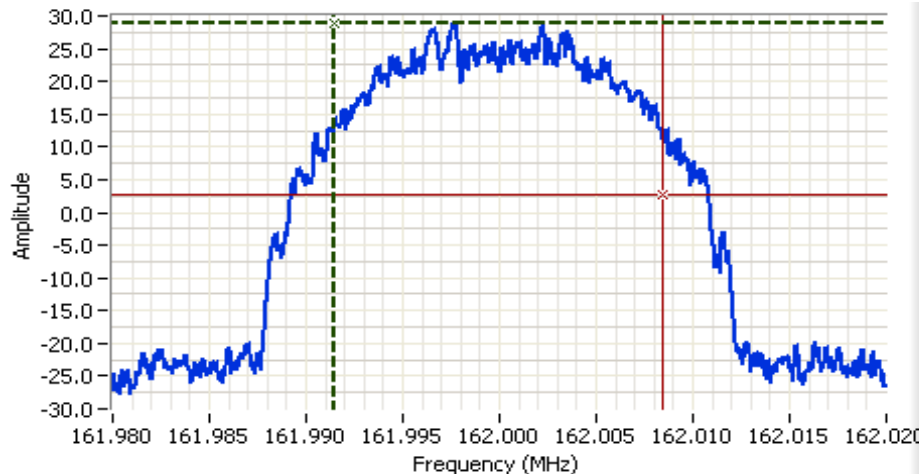


Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 40.0 kHz
 RB: 300 Hz
 VB: 910 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 17.0 kHz
 Channel spacing: 25.0 kHz
 Modulation: 8PSK



Analyzer Settings

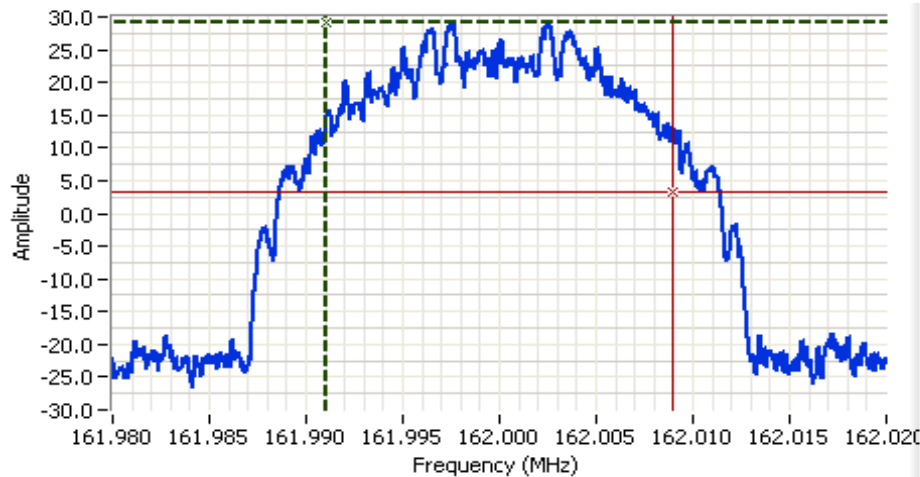
Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 40.0 kHz
 RB: 300 Hz
 VB: 910 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 17.0 kHz
 Channel spacing: 25.0 kHz
 Modulation: 16QAM



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









Analyzer Settings

Agilent Technologies, E4446A
 CF: 162.000 MHz
 SPAN: 40.0 kHz
 RB: 300 Hz
 VB: 910 Hz
 Detector: POS
 Attn: 30 DB
 RL Offset: 23.3 DB
 Sweep Time: 0.4s
 Ref Lvl: 40.0 DBM

Comments

99% power BW: 18.0 kHz
 Channel spacing: 25.0 kHz
 Modulation: 64QAM

| | | | | | |
|----------|----------|------|---|---|---|
| Cursor 1 | 161.9910 | 29.2 |  |  |  |
| Cursor 2 | 162.0090 | 3.2 |  |  |  |

Delta Freq. 18.0 kHz
 Delta Amplitude 26.0



EMC Test Data

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

Run #4: Out of Band Spurious Emissions, Conducted

Date: 12/19/2016

Engineer: Kevin

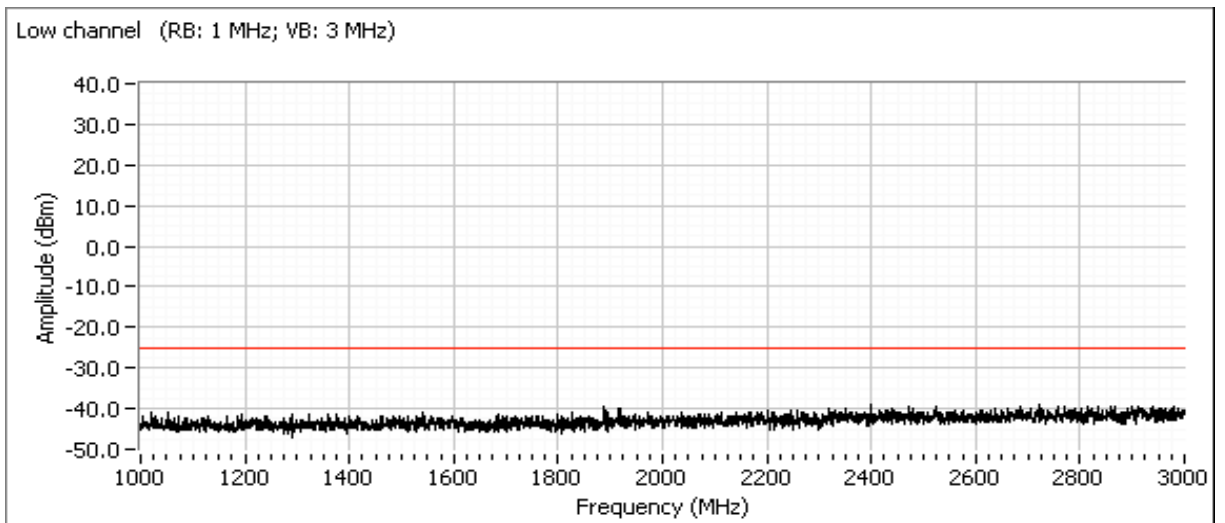
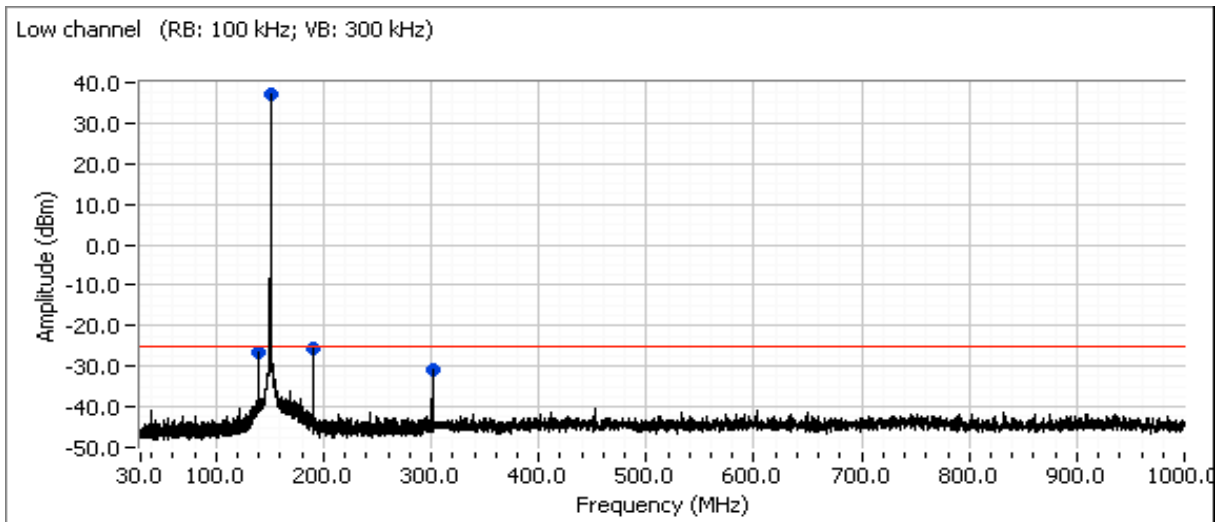
Location: FT Lab #4B

| 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. |

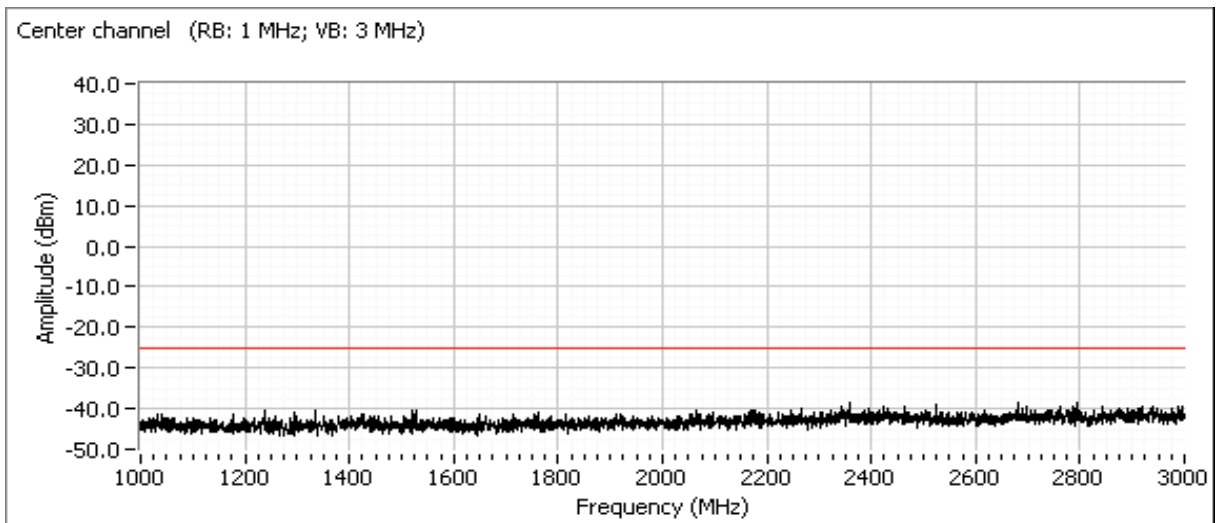
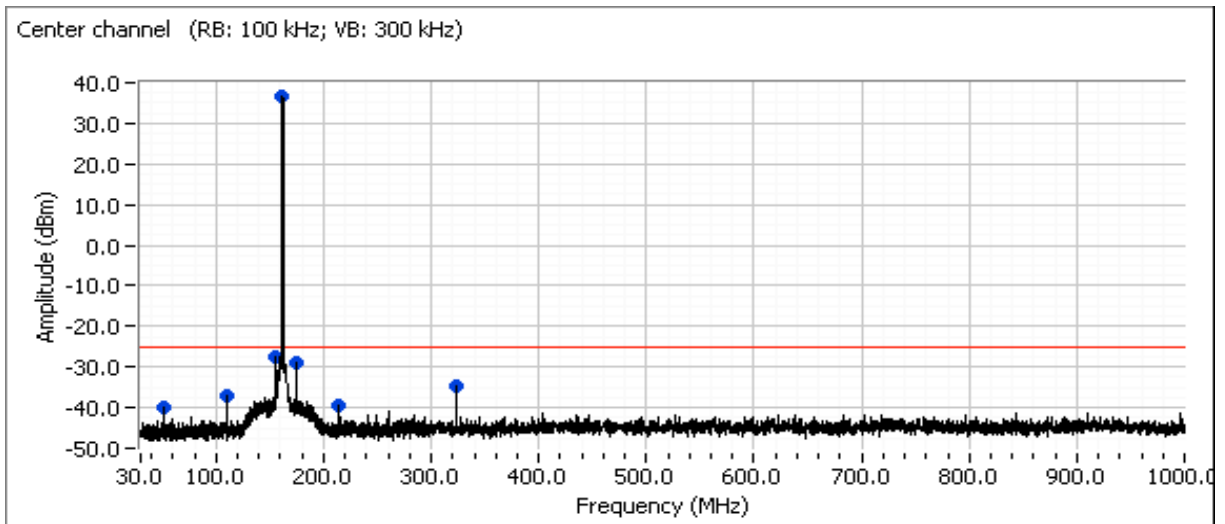
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|-----------|----------------------|----------------------|-------------------|
| Client: | XetaWave LLC | Job Number: | JD103500 |
| Model: | Xeta1-M2 | T-Log Number: | T103571 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |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

Plots for low channel, power setting = 37 dBm



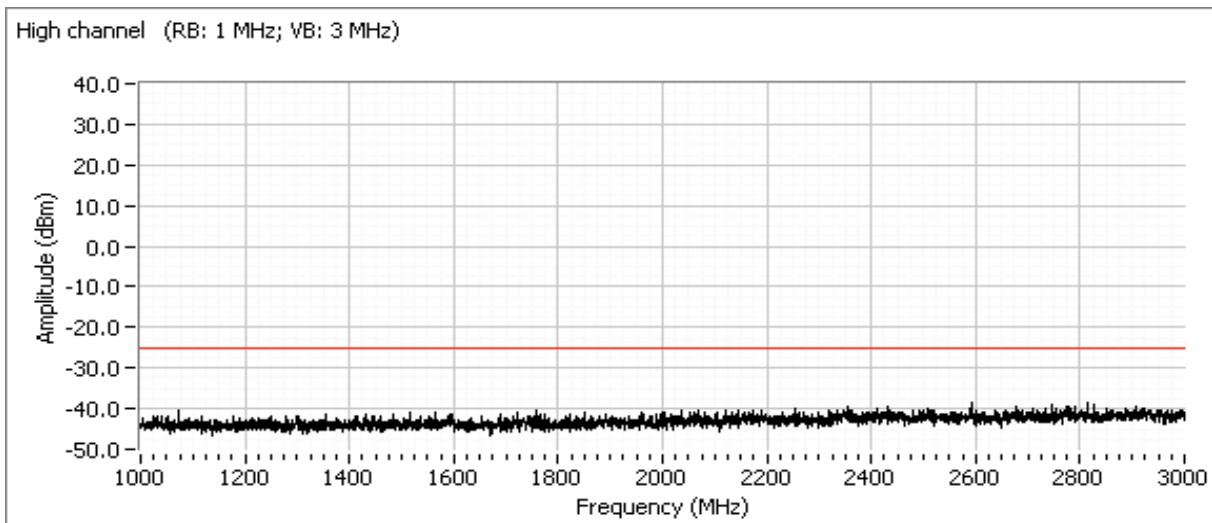
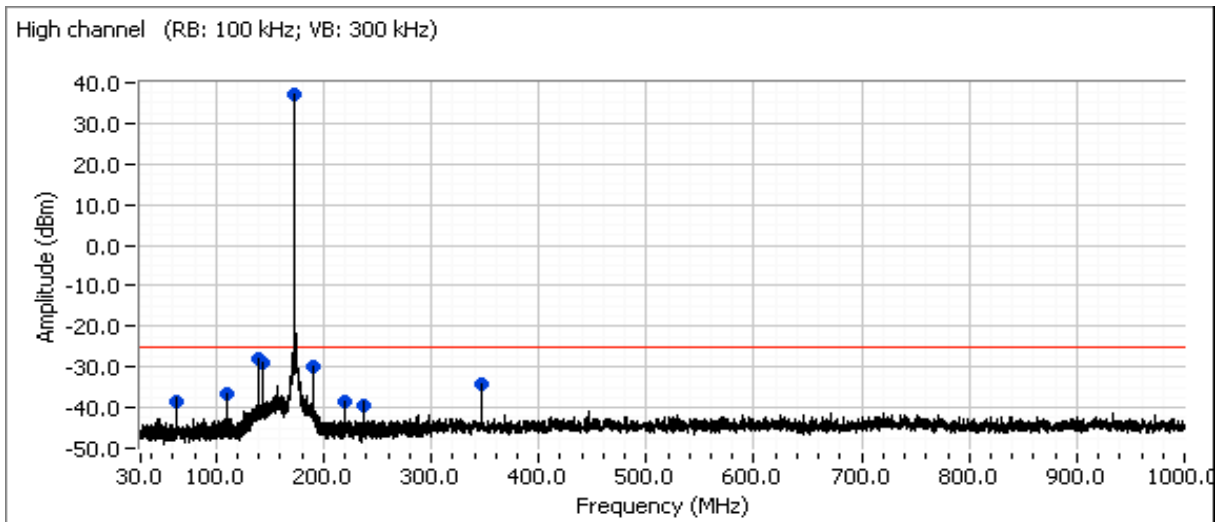
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|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part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

Plots for center channel, power setting: 37 dBm



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

Plots for high channel, power setting: 37 dBm





EMC Test Data

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

Run #5: Out of Band Spurious Emissions, Radiated

Date of Test: 12/21/2016
 Test Engineer: Kevin, Deniz
 Test Location: FT Ch #7

Config. Used: 1
 Config Change: None
 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 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | Class: | N/A |

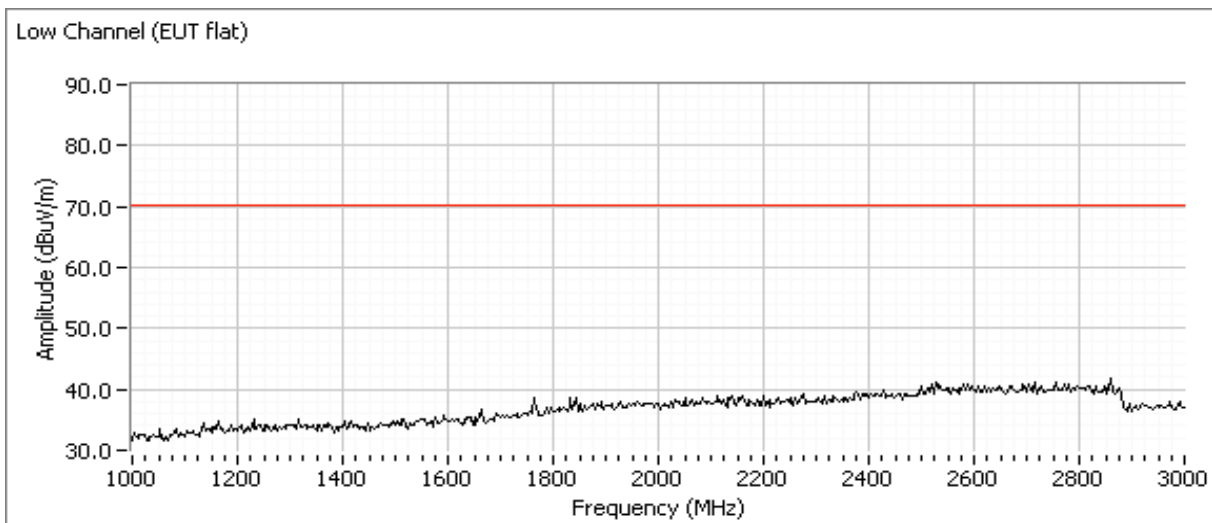
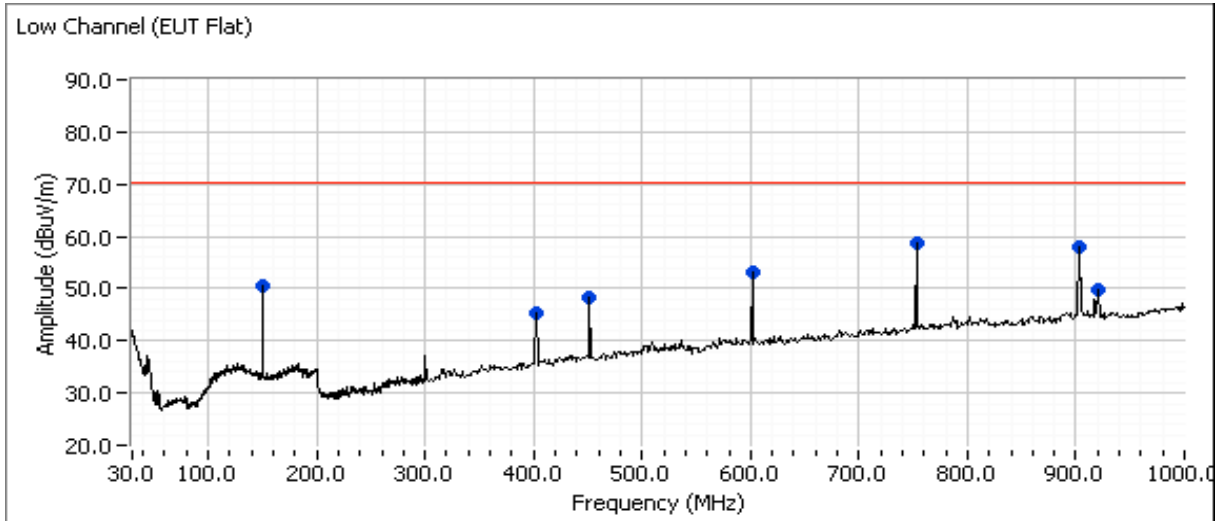
Run #5a - Preliminary measurements

| 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 | 50.6 | 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 | 50.6 | H | - | - | Peak | 185 | 2.5 | EUT Upright - Carrier | Center |
| 323.848 | 49.6 | H | 70.2 | -20.4 | Peak | 248 | 1.0 | EUT Upright | Center |
| 485.170 | 45.6 | 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 | 48.6 | 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 |

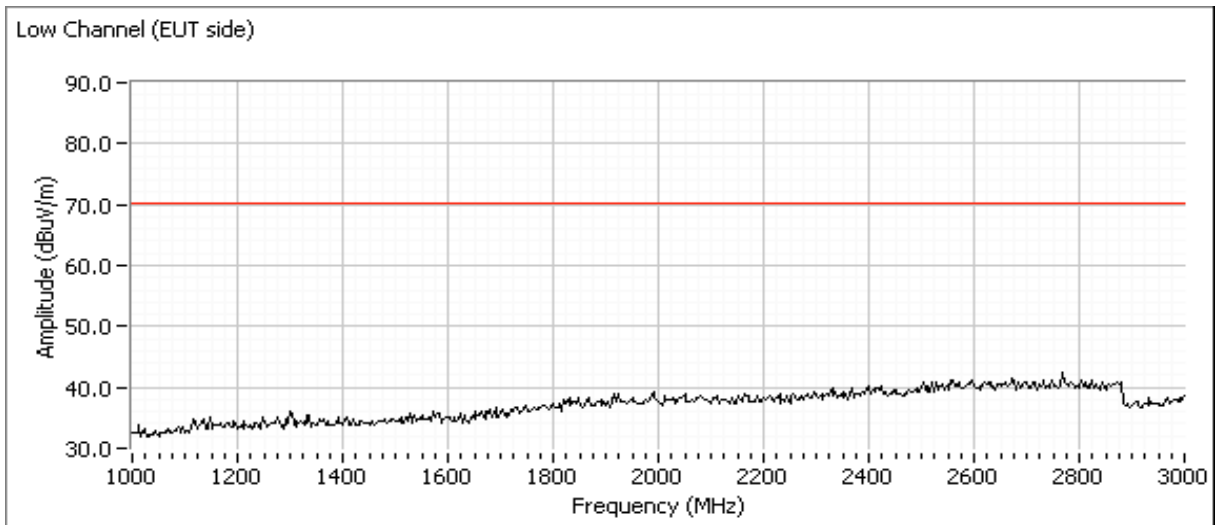
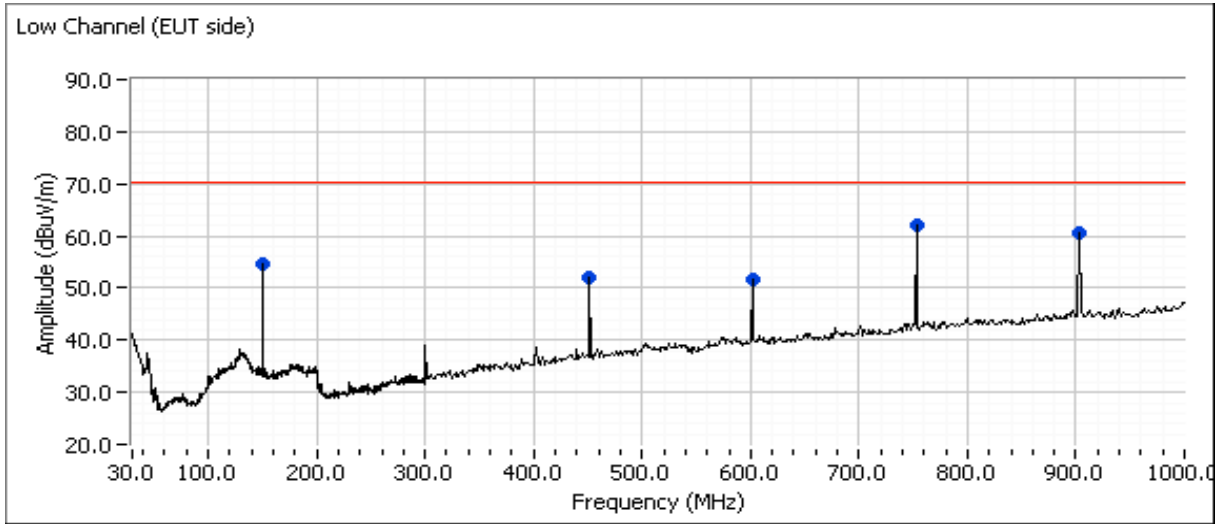
| | |
|---------|--|
| Note 1: | The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E = \sqrt{(30PG)/d}$. This limit is conservative - it does not consider the presence of the ground plane and, for erp 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. |

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

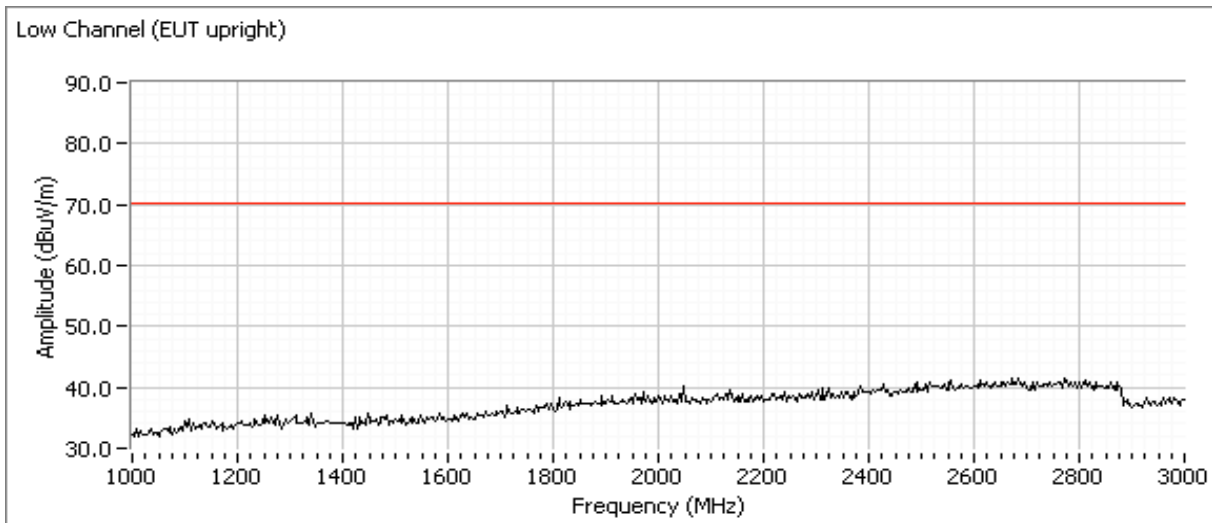
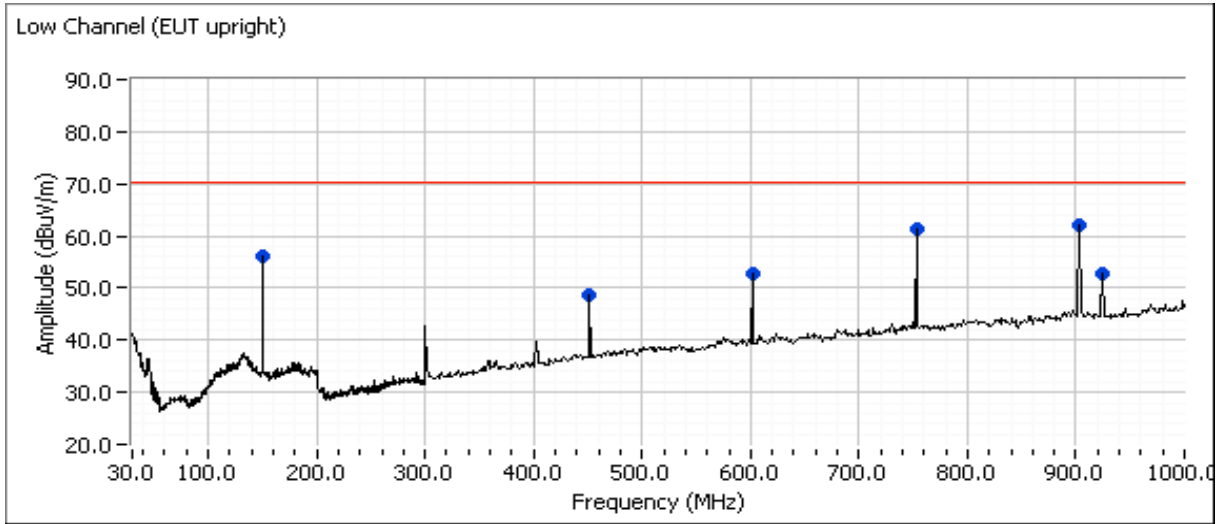
Plots for low channel, power setting = 37 dBm



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

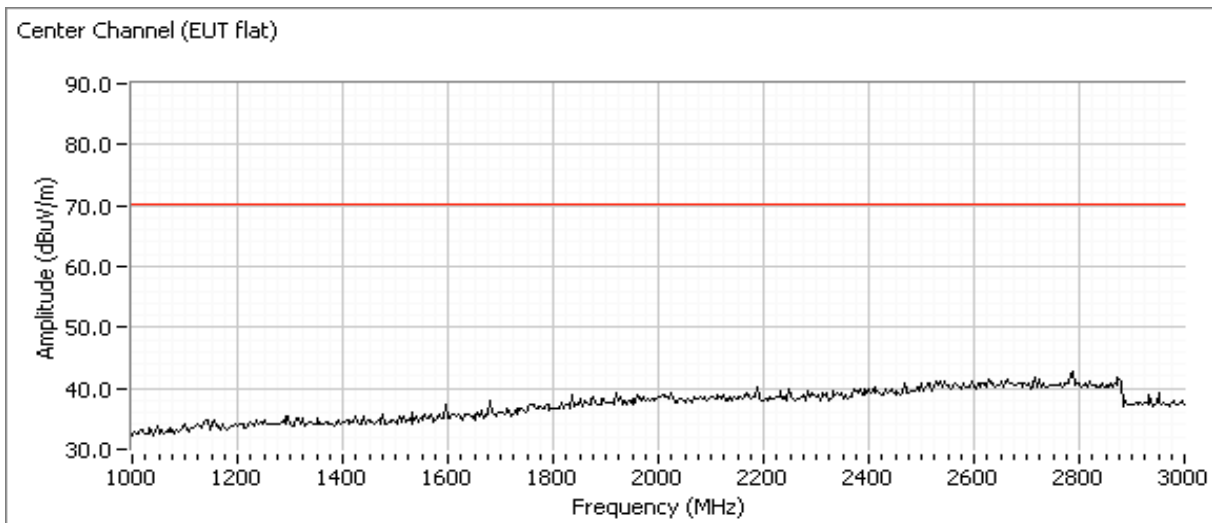
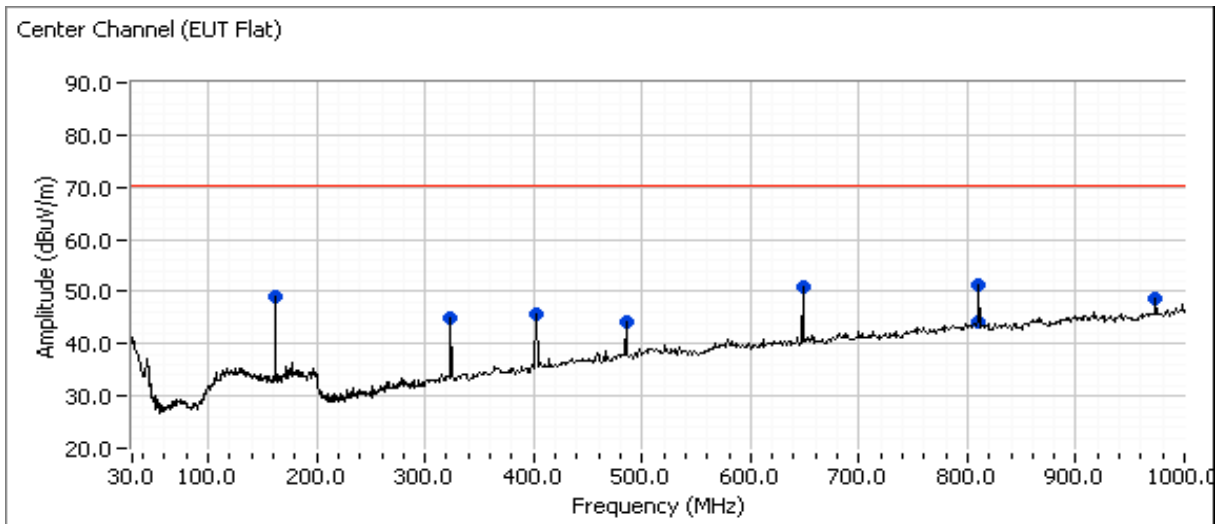


| | | | |
|-----------|----------------------|----------------------|-------------------|
| Client: | XetaWave LLC | Job Number: | JD103500 |
| Model: | Xeta1-M2 | T-Log Number: | T103571 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project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

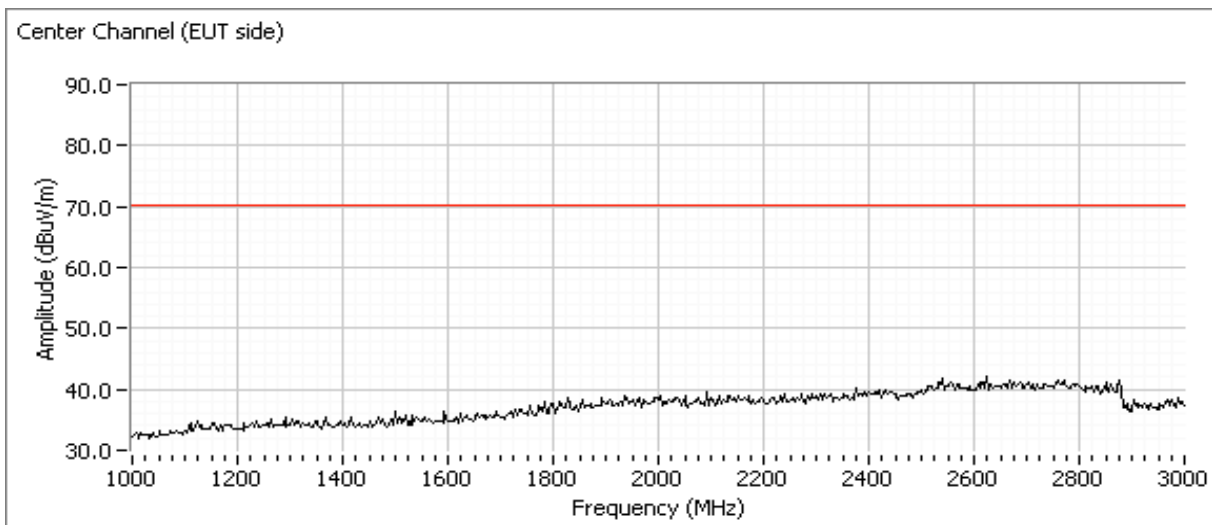
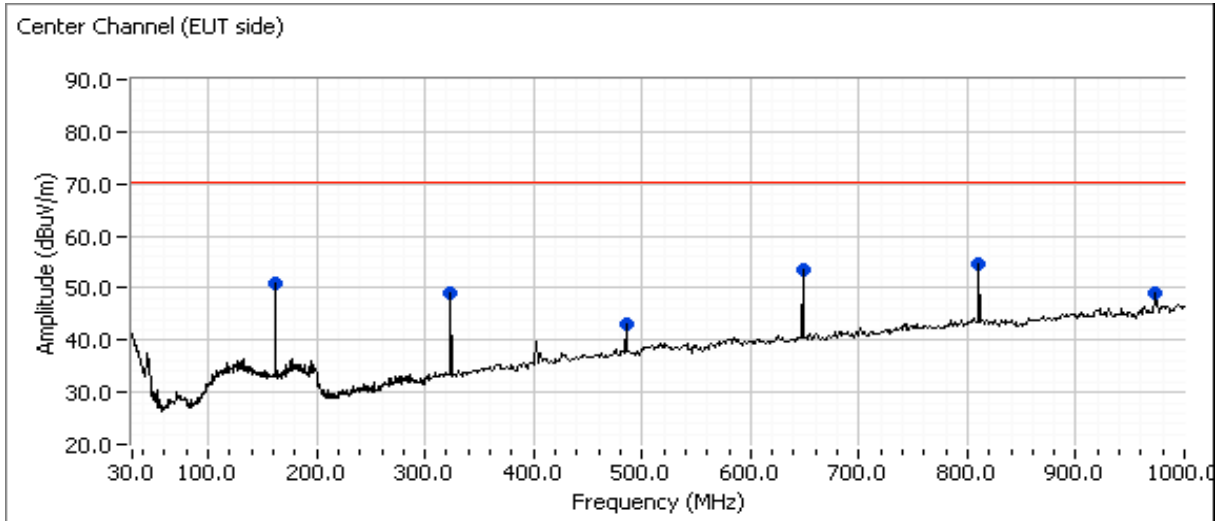


| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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

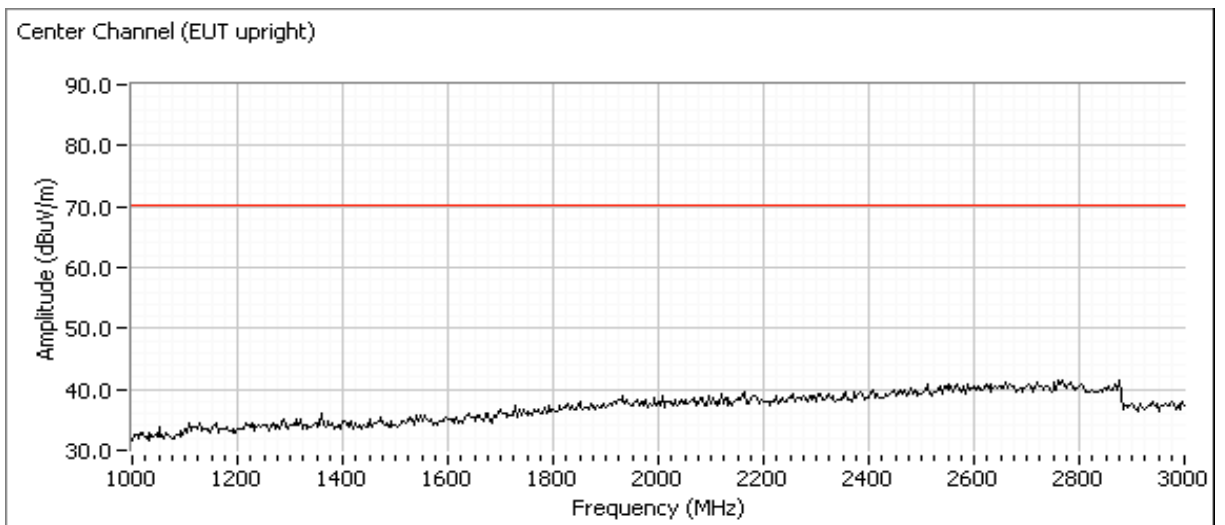
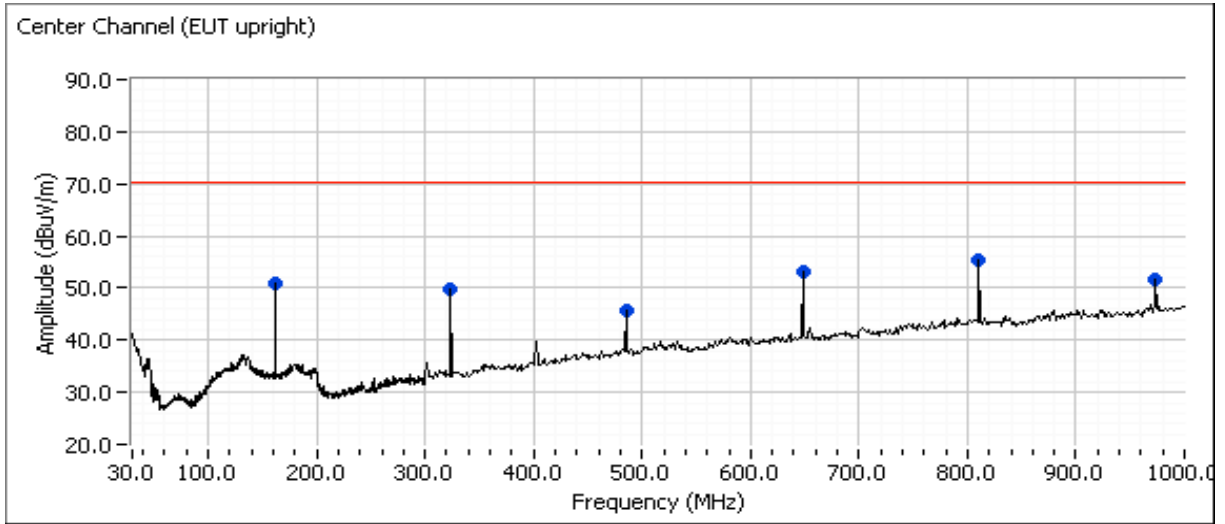
Plots for center channel, power setting = 37 dBm



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

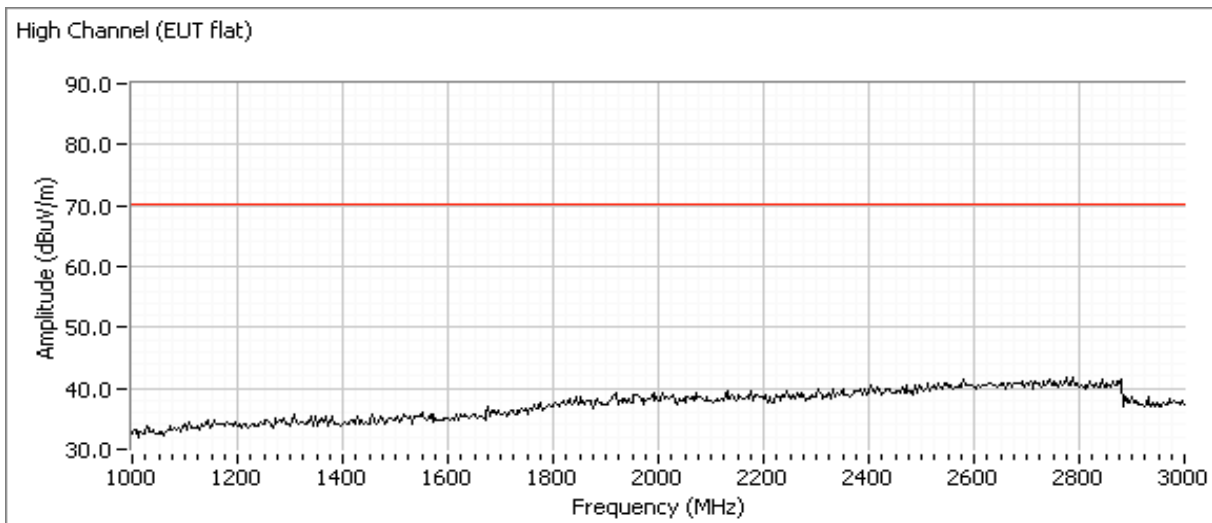
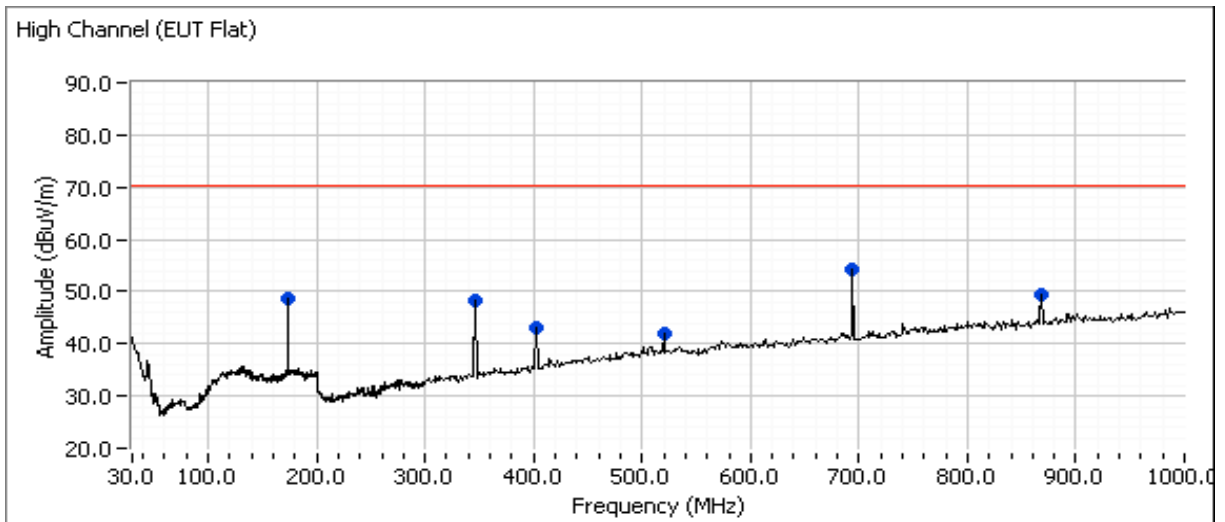


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|-----------|----------------------|----------------------|-------------------|
| Client: | XetaWave LLC | Job Number: | JD103500 |
| Model: | Xeta1-M2 | T-Log Number: | T103571 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |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

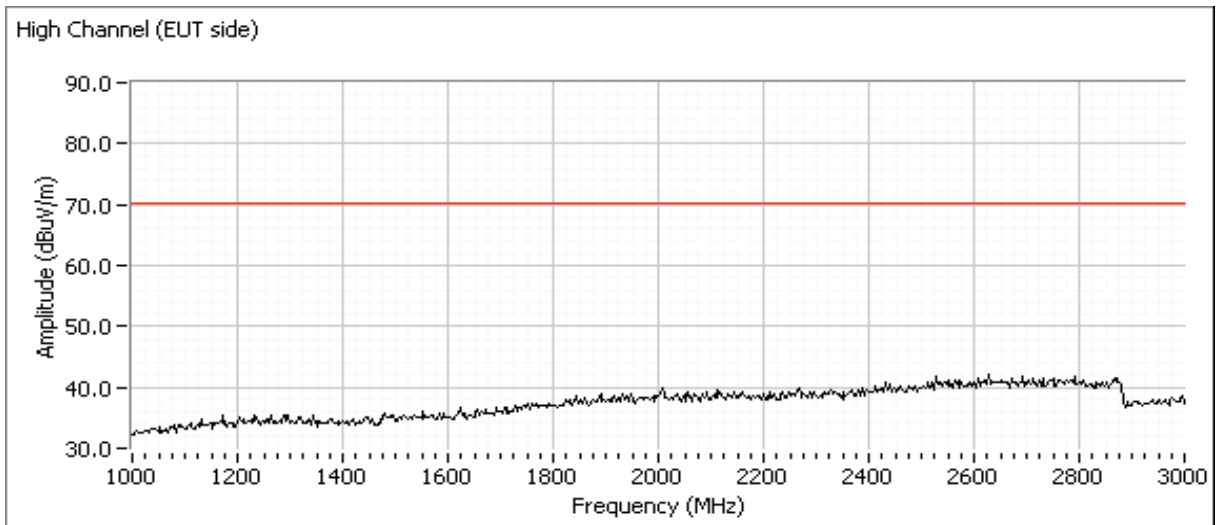
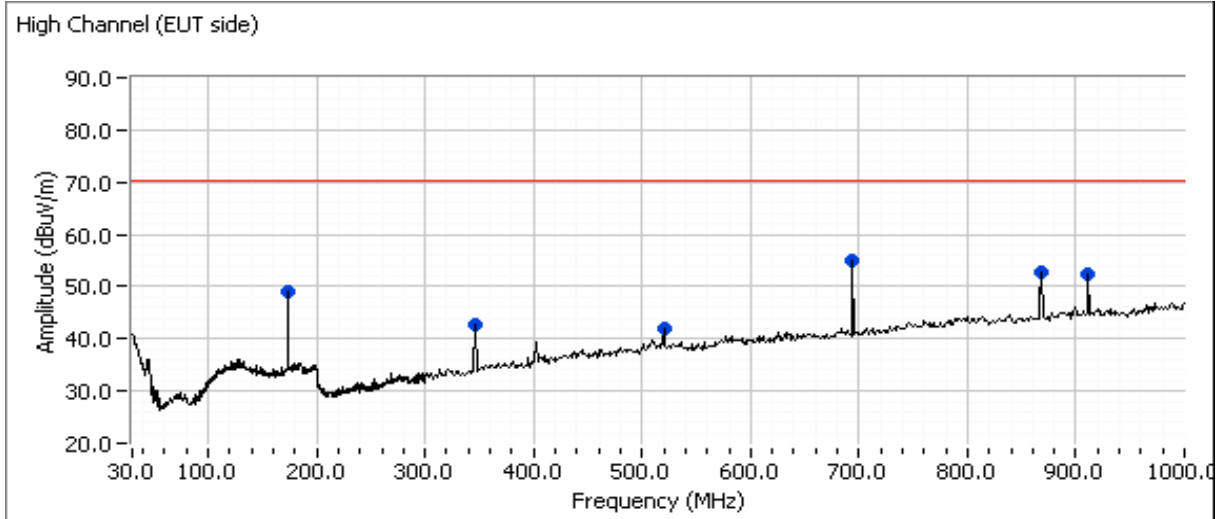


| | |
|--------------------------------|------------------------------------|
| Client: XetaWave LLC | Job Number: JD103500 |
| Model: Xeta1-M2 | T-Log Number: T103571 |
| Contact: Sandee Malang | Project Manager: Christine Krebill |
| Standard: FCC Part 90, RSS-119 | Project Coordinator: - |
| | Class: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

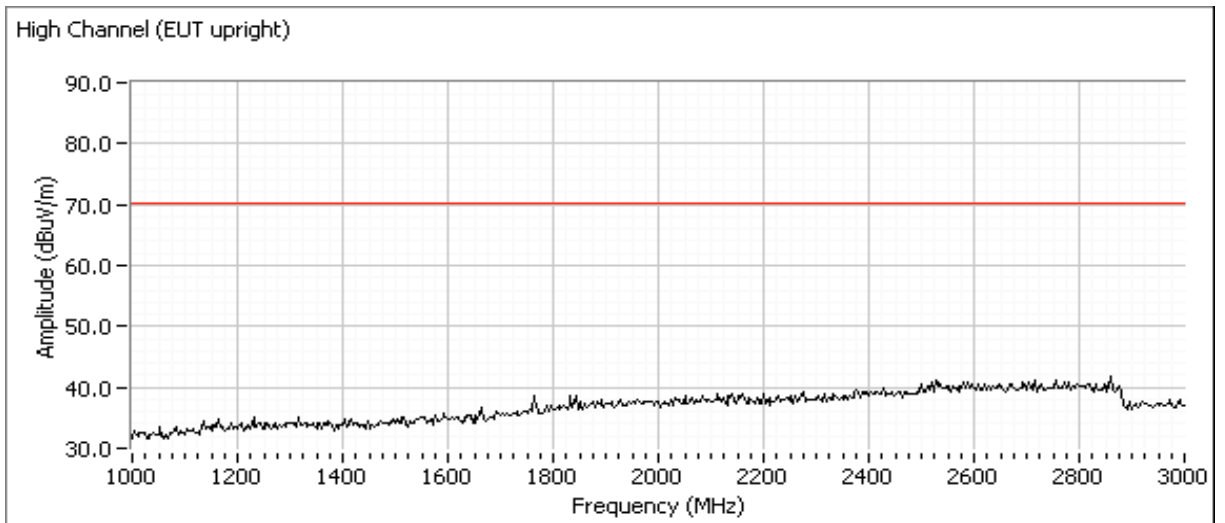
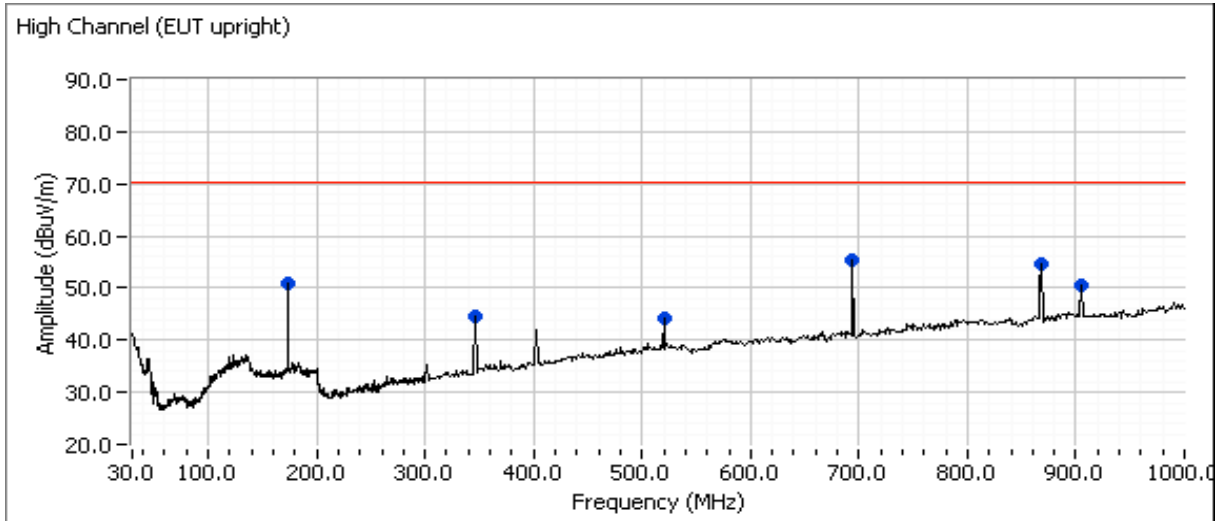
Plots for high channel, power setting = 37 dBm



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



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





EMC Test Data

| | | | |
|-----------|----------------------|----------------------|-------------------|
| Client: | XetaWave LLC | Job Number: | JD103500 |
| Model: | Xeta1-M2 | T-Log Number: | T103571 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | 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 Upright | Low |
| 903.012 | 64.5 | H | 70.2 | -5.7 | PK | 308 | 1.5 | PK (0.10s) - EUT Upright | Low |
| 920.355 | 53.6 | V | 70.2 | -16.6 | PK | 134 | 1.0 | PK (0.10s) - EUT Upright | 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 Upright | Center |
| 810.009 | 58.8 | H | 70.2 | -11.4 | PK | 295 | 1.00 | PK (0.10s) - EUT Upright | Center |
| 972.006 | 58.0 | H | 70.2 | -12.2 | PK | 295 | 1.51 | PK (0.10s) - EUT Upright | 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 Upright | High |
| 867.008 | 58.9 | H | 70.2 | -11.3 | PK | 113 | 1.00 | PK (0.10s) - EUT Upright | 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 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | 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 MHz | Substitution measurements | | | Site Factor ⁴ | EUT measurements | | | eirp Limit dBm | erp Limit dBm | Margin dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-----------|-------------------|------------------|--------------|
| | Pin ¹ | Gain ² | FS ³ | | FS ⁵ | eirp (dBm) | erp (dBm) | | | |
| 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 MHz | Substitution measurements | | | Site Factor ⁴ | EUT measurements | | | eirp Limit dBm | erp Limit dBm | Margin dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-----------|-------------------|------------------|--------------|
| | Pin ¹ | Gain ² | FS ³ | | FS ⁵ | eirp (dBm) | erp (dBm) | | | |
| 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 dBuV/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 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | Class: | N/A |

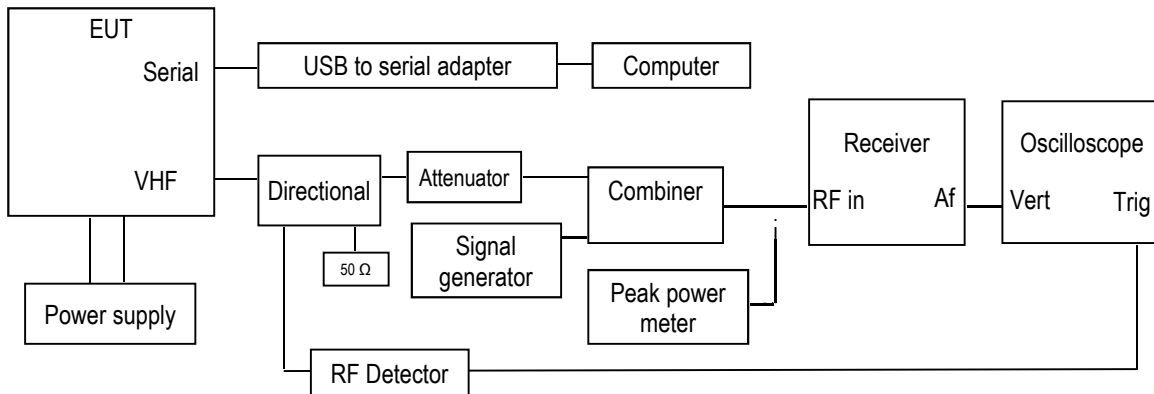
Run #6: Transient Frequency Behavior

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

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 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | Class: | N/A |

Run #6a

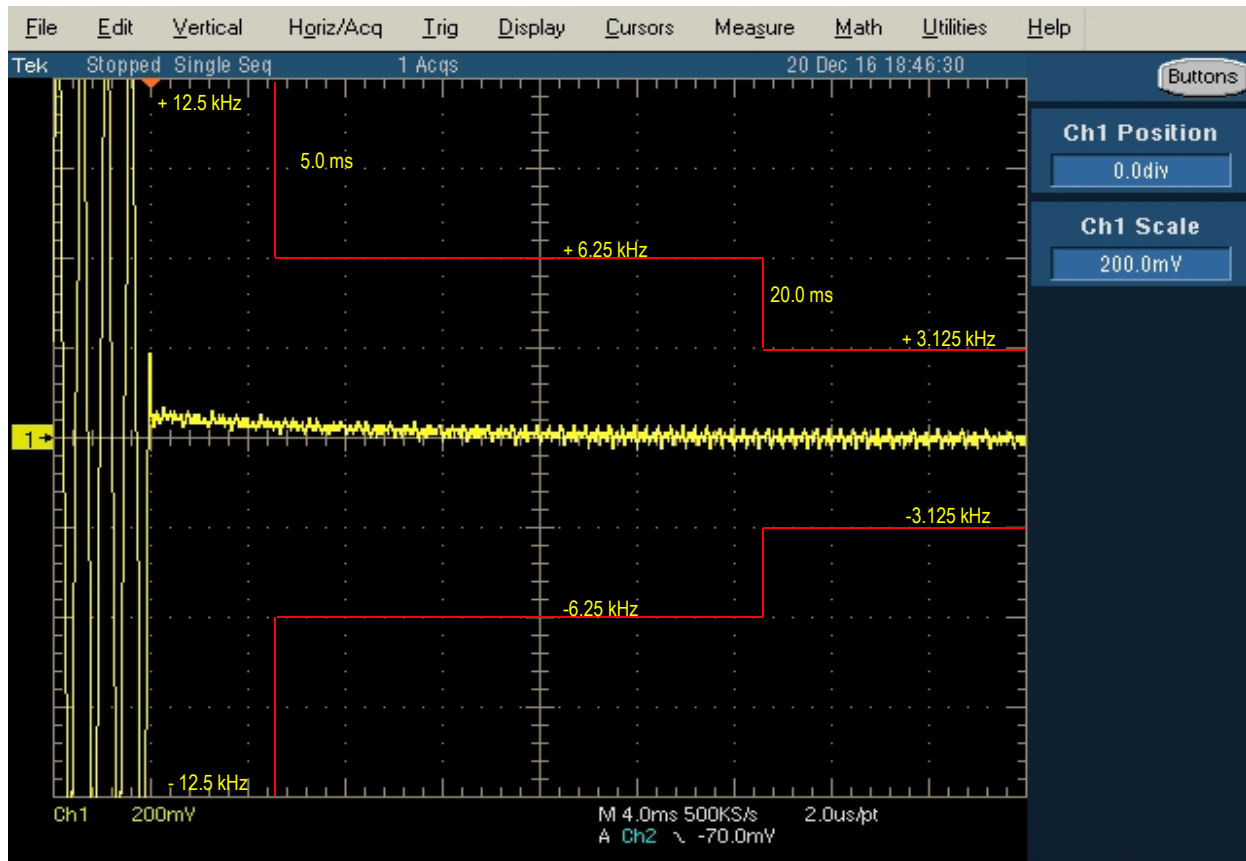
Carrier Frequency: 162.000000 MHz

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 |
| Contact: | Sandee Malang | Project Manager: | Christine Krebill |
| Standard: | FCC Part 90, RSS-119 | Project Coordinator: | - |
| | | Class: | N/A |

Run #6b

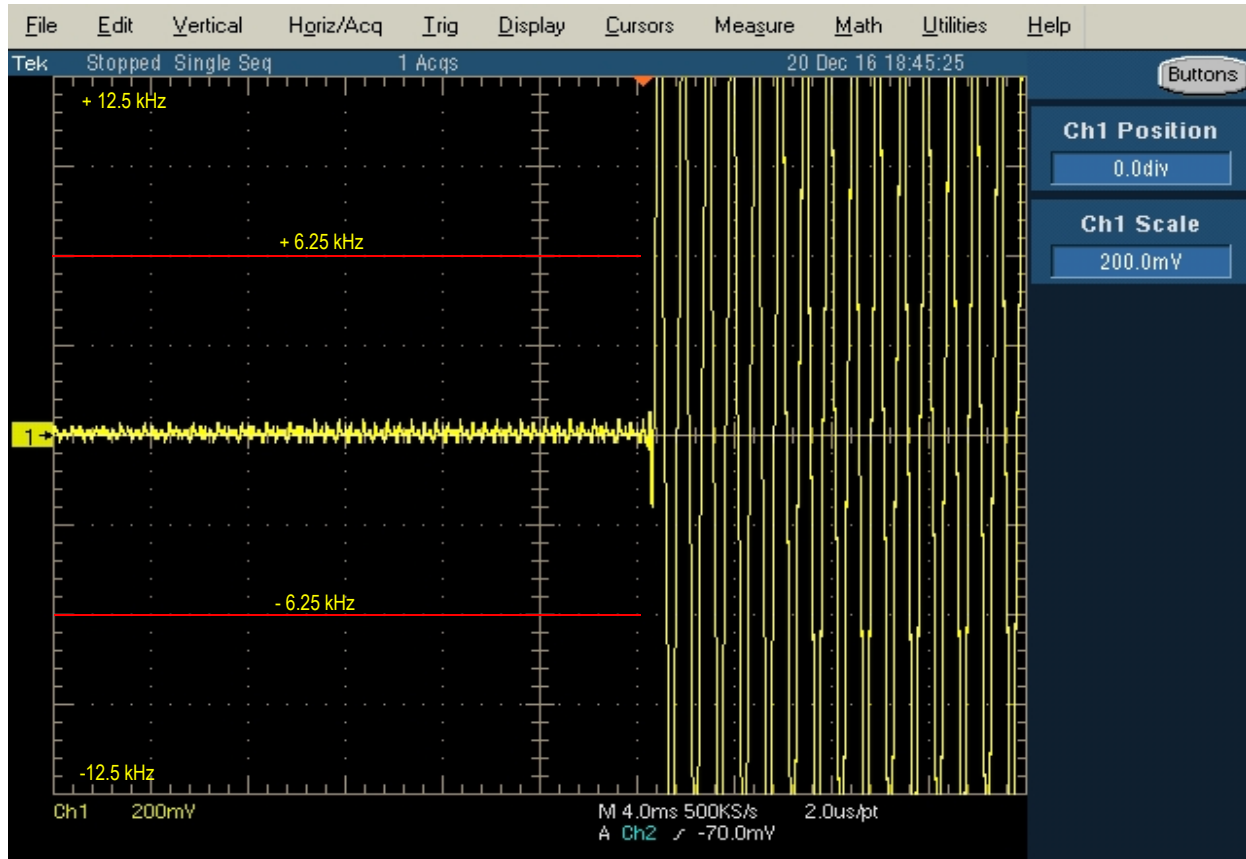
Carrier Frequency: 162.000000 MHz

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





EMC Test Data

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