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# *Radio Test Report*

## *FCC Part 27*
## *(757 MHz to 758 MHz and 787 to 788 MHz)*

## *Model: LN700 Module*

| | |
|---|---|
| FCC ID: | E5MDS-LN700 |
| COMPANY: | GE MDS LLC<br>175 Science Parkway<br>Rochester, NY 14620 |
| TEST SITE(S): | National Technical Systems - Silicon Valley<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| REPORT DATE: | July 26, 2016 |
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| FINAL TEST DATES: | May 23, July 18, 19 and 28, 2016 |
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A2LA ACCREDITED
Testing Cert #0214.26

## REVISION HISTORY

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| - | July 26, 2016 | First release | |
| 1 | July 27, 2016 | Added page showing preliminary test results for the different QAM level modulations | dwb |
| 2 | July 28, 2016 | Added low block edge data plots and corrected frequency bands listed on page 4 | dwb |

## TABLE OF CONTENTS

## SCOPE

Tests have been performed on the GE MDS LLC model LN700 Module, 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.

- CFR 47 Part 27 Subpart C (Operation in 757-758 MHz and 787–788 MHz Bands)

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

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Innovation Science and Economic Development Canada performance and procedural standards.

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 GE MDS LLC model LN700 Module and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of GE MDS LLC.

## OBJECTIVE

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

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require 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 GE MDS LLC model LN700 Module 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 | | Description | Measured | Limit | Result |
|---|---|---|---|---|---|
| **Transmitter Modulation, output power and other characteristics** | | | | | |
| §2.1033 (b) (5)<br>§27.5 (b) (1) | | Frequency range(s) | 757-758 MHz and<br>787-788 MHz | 757-758 MHz<br>787-788 MHz | Pass |
| §2.1033 (c) (4)<br>§2.1047 | | Modulation Type | 4, 16 and 64QAM | Any allowed | Pass |
| §2.1033 (c) (6)<br>§2.1033 (c) (7)<br>§2.1046<br>§27.50(b)(1) & (9) | | ERP | 55.1 dBm ERP<br>(757-758 MHz)<br>44.7 dBm ERP<br>(787-788 MHz) | 1000 Watt<br>(757-758 MHz)<br>30 Watt<br>(787-788 MHz) | Pass |
| §2.1049<br>§27.53 | | Occupied Bandwidth | 5.18 - 21.5 kHz | Remain in Block | Pass |
| **Transmitter spurious emissions**[3] | | | | | |
| §2.1051<br>§2.1053<br>§2.1057<br>§27.53(c) & (f) | | At the antenna terminals | All < -13 dBm | -13 dBm | Pass |
| | | Field strength | -48.7 dBm @<br>1575.0 MHz<br>(-8.7 dB) | -40 dBm/MHz<br>eirp | Pass |
| **Other details** | | | | | |
| §2.1055<br>§27.54 | | Frequency stability | 0.1 ppm | 2.5 ppm[1] | Pass |
| §2.1093 | | RF Exposure | Refer to separate MPE exhibit | 2.98 meters | Pass |
| §2.1033 (c) (8) | | Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range | Refer to operational description | - | - |
| - | - | Antenna Gain | Maximum<br>16.5 dBi | - | - |

**Notes**

Note 1 – The requirement for frequency stability is that the signal remains within the allocated band. A limit of 2.5ppm is being used to ensure the signal remains within the allocated band as defined by the spurious limits at the channel edges.

Note 2 – The measurement at the channel edge is made in a resolution bandwidth of at least 100 kHz. For measurements less than 100 kHz from the edge of the channel the measurement bandwidth is at least 30 kHz. For emissions above 1 GHz, the resolution bandwidth used is at least 1 MHz.

*EXTREME CONDITIONS*

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 10 to 60 VDC.

The extremes of temperature were -40°C to +70°C as this is the specified operating temperature range for this product.

*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 | $1.7 \times 10^{-7}$ |
| 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<br>1 to 40 GHz | ± 3.6 dB<br>± 6.0 dB |

## EQUIPMENT UNDER TEST (EUT) DETAILS

### GENERAL

The GE MDS LLC model LN700 Module is a licensed radio module that is designed to operate in the 757-758 MHz and 787-788 MHz bands utilizing QAM modulations. Since the EUT could be placed in any position during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 10-60 Volts DC, 2.5 Amps.

The sample was received on May 23, 2016 and tested on May 23, July 18, 19 and 28, 2016. The following samples were used for testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| GE MDS LLC | LN700 | Radio Module | 2733921 | E5MDS-LN700 |
| GE MDS LLC | LN700 | Radio Module | 2744878 | E5MDS-LN700 |

### OTHER EUT DETAILS

The following EUT details should be noted: The host product in which this product will be used "Orbit MCR" is rated from -40°C to +70°C, 10-60 VDC input. The output power is variable from 20 – 40 dBm with a tolerance of 1 dB.

### ENCLOSURE

The EUT does not have an enclosure as it is intended to be installed in a complete product. The PCB measures approximately 11 cm wide by 3.8 cm deep 0.6 cm high.

### MODIFICATIONS

The EUT required the following modifications in order to comply with the emission specifications.

| Mod. # | Test | Date | Modification |
|---|---|---|---|
| 1 | Radiated Spurious Emissions | 18-Jul | 1. C632 From 3.9pF to 3.3pF, 2. C633 From 3.9pF to 2.4pF, 3. C639 From 3.9pF to 3.3pF, 4. C635 From N/U to 0.5pF, 5. C640 From N/U to 0.5pF, 6. C700 From 0.5pF to 8.2pF, 7. L700 From 22nH to 3.3nH, 8. C615 From 100pF to N/U |

### SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Sorensen | | Power Supply | | - |
| HP | | Power Supply | | - |

No remote support equipment was used during testing.

*EUT INTERFACE PORTS*

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

EUT

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| RF out | Antenna or Load | Direct | - | - |

Additional on Support Equipment

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Serial | Unterminated | Cat 5 | Unshielded | 1.0 |

*EUT OPERATION*

During power, frequency stability and spurious emissions testing, the EUT was set to transmit an unmodulated signal at the desired frequency and power level. During bandwidth and block edge testing, the EUT was set to transmit a modulated signal at the desired frequency and power level.

## 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 and/or Open Area Test Site(s) 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 Innovation Science and Economic Development Canada.

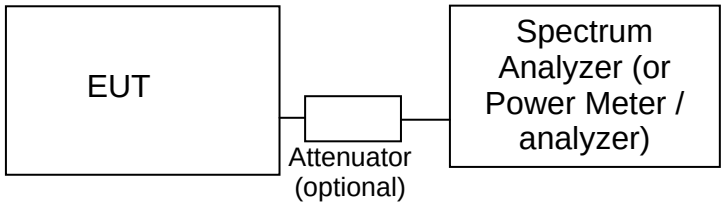
| Site | Designation / Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| Chamber 3 | US0027 | IC 2845B-3 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435 |
| Chamber 4 | US0027 | IC 2845B-4 | |
| Chamber 5 | US0027 | IC 2845B-5 | |
| Chamber 7 | US0027 | IC 2845B-7 | |

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

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.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

*BANDWIDTH MEASUREMENTS*

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS-GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

*CONDUCTED SPURIOUS EMISSIONS*

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tunes to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal ,sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

*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. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. 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 XdB points (where X is typically 6dB or 10dB) on the signal’s skirts.

*TRANSIENT FREQUENCY BEHAVIOR:*

The TIA/EIA 603 procedure is used to determine compliance with transient frequency timing requirements as the radio is keyed on and off.

The EUTs rf output is connected via a combiner/splitter to the test receiver/spectrum analyzer and to a diode detector. The test receiver or spectrum analyzer video output is connected to an oscilloscope, which is triggered by the output from the diode detector.

Plots showing Ton, T1, and T2 are made when turning on the transmitter and showing T3 when turning off the transmitter.

## RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

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 20dB 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 either an anechoic chamber or on an OATS 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 is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) 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 on an OATS or 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. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB 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

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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 dBuV/m

$F_d$ = Distance Factor in dB

$R_c$ = Corrected Reading in dBuV/m

$L_s$ = Specification Limit in dBuV/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 (dBuV/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 20dB 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 (2.2dBi) from the eirp value.

## RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS-210 Table 2, RSS-GEN Table 1 and RSS-310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

| Frequency Range (MHz) | Limit (uV/m @ 3m) | Limit (dBuV/m @ 3m) |
|---|---|---|
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

# Appendix A Test Equipment Calibration Data

| Manufacturer | Description | Model | Asset # | Calibrated | Cal Due |
|---|---|---|---|---|---|
| **Radio Antenna Port (Power and Spurious Emissions), 23-May-16** | | | | | |
| Agilent Technologies | PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX, | E4446A | 2139 | 6/22/2015 | 6/22/2016 |
| **Radiated Emissions, 30 - 8,000 MHz, 18-Jul-16** | | | | | |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 263 | 1/21/2016 | 1/21/2017 |
| Hewlett Packard | Spectrum Analyzer (Spare SA26) 9 KHz-26.5 GHz, Non-Program | 8563E | 284 | 3/23/2016 | 3/23/2017 |
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 487 | 7/29/2014 | 7/29/2016 |
| Hewlett Packard | High Pass filter, 1.5 GHz (Blu System) | P/N 84300-80037 (84125C) | 1389 | 5/4/2016 | 5/4/2017 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1538 | 12/19/2015 | 12/19/2016 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1548 | 9/17/2014 | 9/17/2016 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 1780 | 10/9/2015 | 10/9/2016 |
| Hewlett Packard | Spectrum Analyzer (SA40) Purple 9 kHz - 40 GHz, | 8564E (84125C) | 2415 | 3/19/2016 | 3/19/2017 |
| Com-Power | Preamplifier, 30-1000 MHz | PA-103 | 2465 | 9/1/2015 | 9/1/2016 |
| **Radiated Emissions, Substitutions, 18-Jul-16** | | | | | |
| EMCO | Antenna, Horn, 1-18GHz | 3115 | 868 | 6/30/2016 | 6/30/2018 |
| Rohde & Schwarz | Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms | NRV-Z1 | 2114 | 10/26/2015 | 10/26/2016 |
| Agilent Technologies | PSG, Vector Signal Generator, (250kHz - 20GHz) | E8267D | 3011 | 2/2/2016 | 2/2/2017 |
| Rohde & Schwarz | Power Meter, Dual Channel | NRVD | 3268 | 4/22/2016 | 2/22/2017 |
| **Power, Spurious Emissions and Frequency Stability, 18, 19-Jul-16** | | | | | |
| 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 |
| Fluke | Multimeter, True RMS | 111 | 1480 | 3/28/2016 | 3/28/2017 |
| **Spurious Emissions, 28-Jul-16** | | | | | |
| Agilent Technologies | 3Hz -44GHz PSA Spectrum Analyzer | E4446A | 2139 | 6/24/2016 | 6/24/2017 |

# Appendix B Test Data

T101702 Pages 21 – 71

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Product | LN700 | T-Log Number: | T101702 |
| System Configuration: | Module | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Emissions Standard(s): | FCC Parts 15 and 27 | Class: | A |
| Immunity Standard(s): | - | Environment: | Radio |

# EMC Test Data

For The

# GE MDS LLC

Product

LN700

Date of Last Test: 7/18/2016

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

# FCC Part 27

## 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: 21 °C
Rel. Humidity: 37 %

### Summary of Results

| Run # | | | Test Performed | Limit | Pass / Fail | Result / Margin |
|---|---|---|---|---|---|---|
| 1 | | | Output Power | 27.53 (b)(1) or (b)(9) 44.8 or 60 dBm ERP | Pass | 55.1 dBm ERP |
| 2 | | | Band Edge / Block Edge | 27.53 (c) | Pass | Within block |
| 3 | | | 99% or Occupied Bandwidth | 1 MHz | - | 5.18 - 21.5 kHz |
| 4 | | | Spurious Emissions (conducted) | -13 dBm | Pass | All < -13 dBm |
| 5 | | | Spurious emissions (radiated) | -13 or -40 dBm | Pass | -48.7 dBm @ 1575.0 MHz (-8.7 dB) |
| 6 | | | Modulation | - | - | 4, 16 and 64QAM |
| 7 | | | Frequency Stability | Sufficient to stay in authorized band | Pass | 0.1 ppm |

### Modifications Made During Testing

The following modifications were made to the EUT during testing in order to comply with the requirements of the standard:
1. C632 From 3.9pF to 3.3pF, 2. C633 From 3.9pF to 2.4pF, 3. C639 From 3.9pF to 3.3pF, 4. C635 From N/U to 0.5pF
5. C640 From N/U to 0.5pF, 6. C700 From 0.5pF to 8.2pF, 7. L700 From 22nH to 3.3nH, 8. C615 From 100pF to N/U

### Deviations From The Standard

No deviations were made from the requirements of the standard.

NTS WE ENGINEER SUCCESS

# EMC Test Data

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Run #1: Output Power

Date of Test: 7/18/2016
Test Engineer: David Bare
Test Location: Fremont EMC Lab #4B

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

Cable Loss: 0.5 dB
Cable ID(s): EL 621

Attenuator: 20.0 dB
Attenuator IDs: 1878

Total Loss: 20.5 dB

*Limt is 30W or 1000W ERP for antenna heights less than 305 m depending on frequency band*

| Power Setting[2] | Frequency (MHz) | Output Power (dBm) [1] | Output Power mW | Antenna Gain (dBd) | Result | ERP dBm | ERP W |
|---|---|---|---|---|---|---|---|
| 40 (FB 24) | 757.5 | 40.8 | 12022.6 | 14.3 | Pass | 55.1 | 323.594 |
| 40 (FB 24) | 787.5 | 40.1 | 10232.9 | 4.6 | Pass | 44.7 | 29.512 |
| 34 (FB 18) | 787.5 | 30.4 | 1096.5 | 14.3 | Pass | 44.7 | 29.512 |

| | |
|---|---|
| Note 1: | Output power measured using a spectrum analyzer with RBW=1 MHz, VB=1 MHz, Peak detector |
| Note 2: | Power setting - the software power setting used during testing, included for reference only. |
| Note 3: | Typical antennas are 12.2 dBd Yagi and 3 dBd Monopole. |

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| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Run #2: Band edge/Block edge, FCC part 27.53 (c1, 2, 3, 4, 5)

Date of Test: 5/23 & 7/28/2016 Config. Used: 1

Test Engineer: David Bare Config Change: None

Test Location: Fremont EMC Lab #4B EUT Voltage: 13.8 VDC

On any frequency outside the 746-758 MHz and 776-788 MHz bands, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB (-13 dBm) (FCC §27.53(c)(1) & (2))
Compliance with this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. (FCC §27.53(c)(5)).
On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations. (FCC §27.53(c)(3))
Compliance with this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

| | |
|---|---|
| Note 1: | Preliminary tests showed no difference in emissions between QAM4, QAM16 and QAM64 modulations. See Run #3 |
| Note 2: | For operation in 787-788 MHz band, first plot for the highest used channel shows complance within 100 kHz of block edge, second plot shows compliance in the 200 kHz band that starts 100 kHz from the block edge, third plot shows compliance in the 793-805 MHz band. |
| Note 3: | For operation in the 787-788 MHz band, first plot for the lowest used channel shows complance within 100 kHz of block edge, second plot shows compliance in the 200 kHz band that starts 100 kHz from the block edge, third plot shows compliance in the 763-775 MHz band. |
| Note 4: | For operation in 757-758 MHz band, first plot for the highest used channel shows complance within 100 kHz of block edge, second plot shows compliance in the 200 kHz band that starts 100 kHz from the block edge, third plot shows compliance in the 763-775 MHz band. |
| Note 5: | For operation in the 757-758 MHz band, plot for the lowest used channel shows complance within 100 kHz of block edge, second plot shows compliance in the 200 kHz band that starts 100 kHz from the block edge, third plot shows compliance in the 763-775 MHz band. |
| Note 6: | For operation in the 757-758 MHz band, highest channel frequency is 757.93125 MHz. For operation in the 787-788 MHz band, highest channel frequency is 787.93125 MHz. The frequency on some of the plots is truncated to 3 decimal places. |

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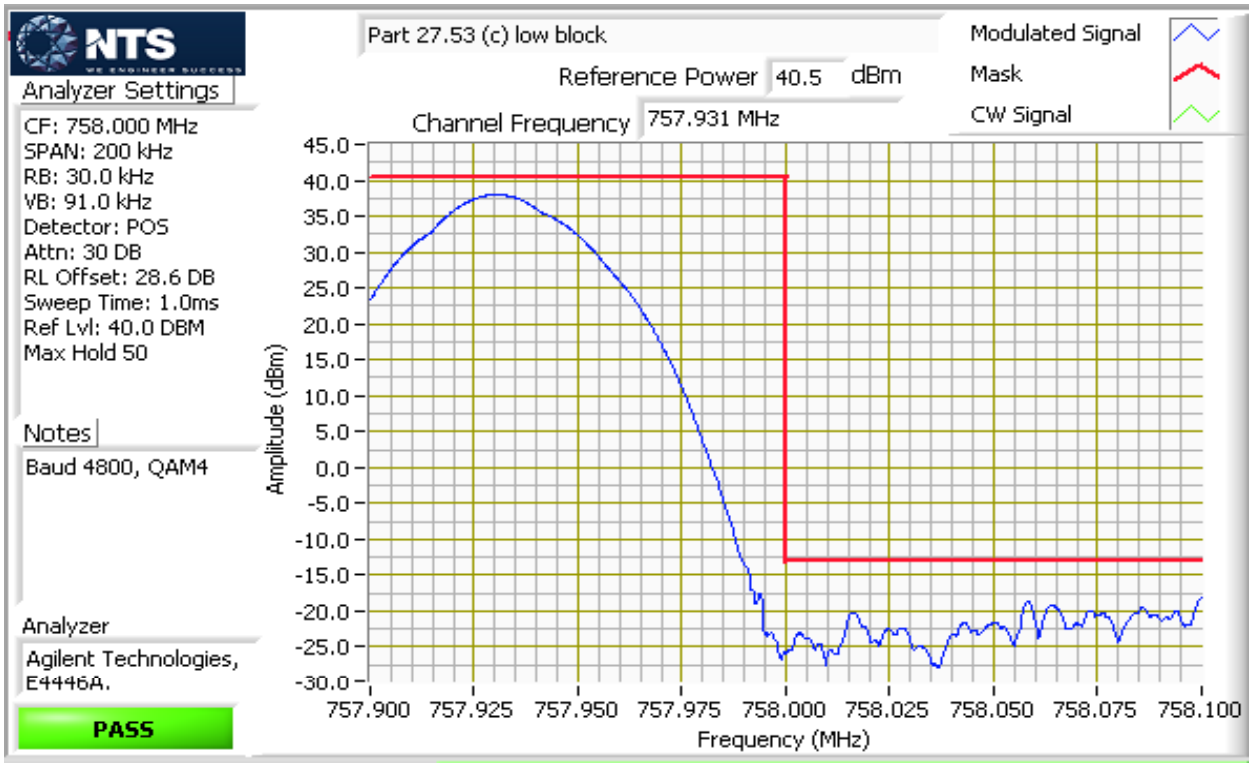
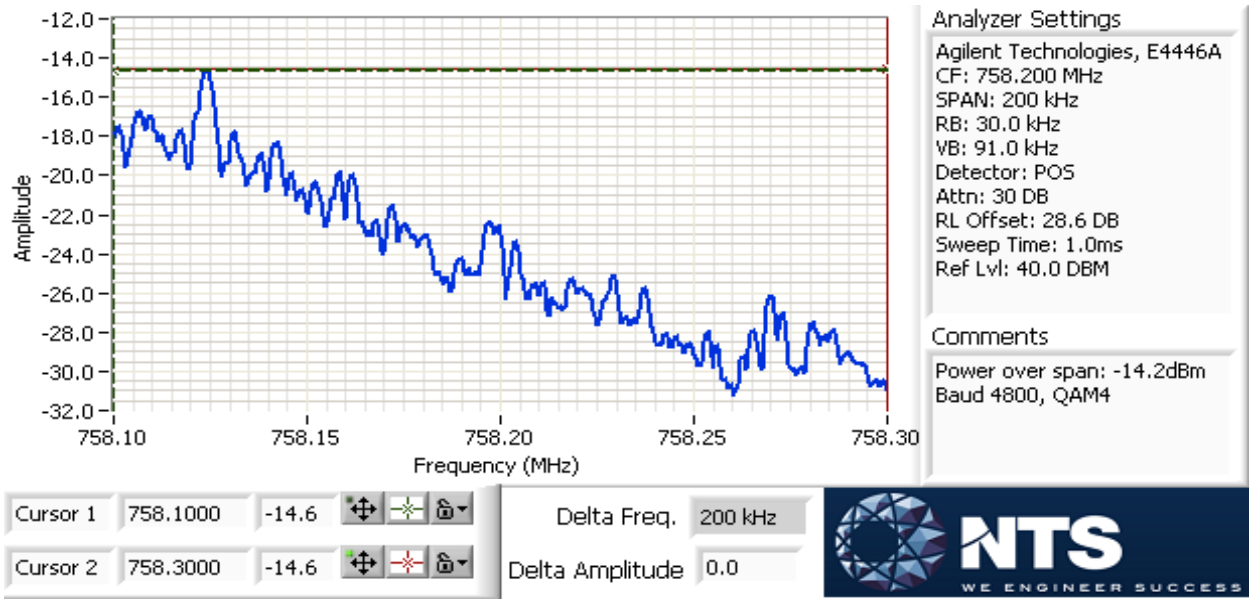
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



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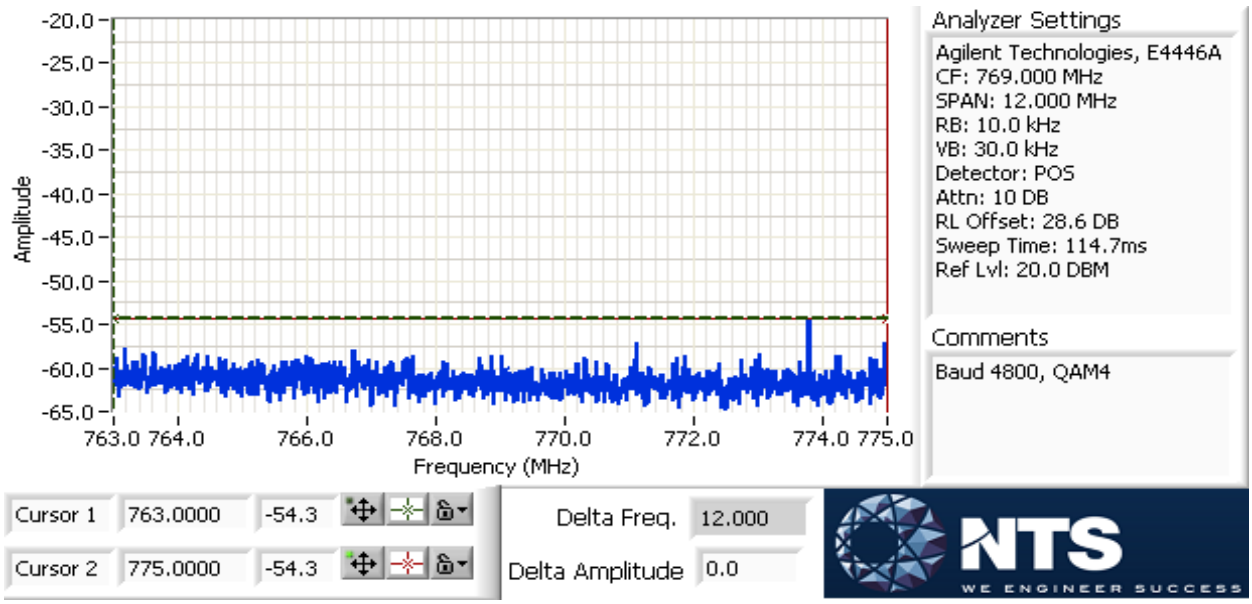


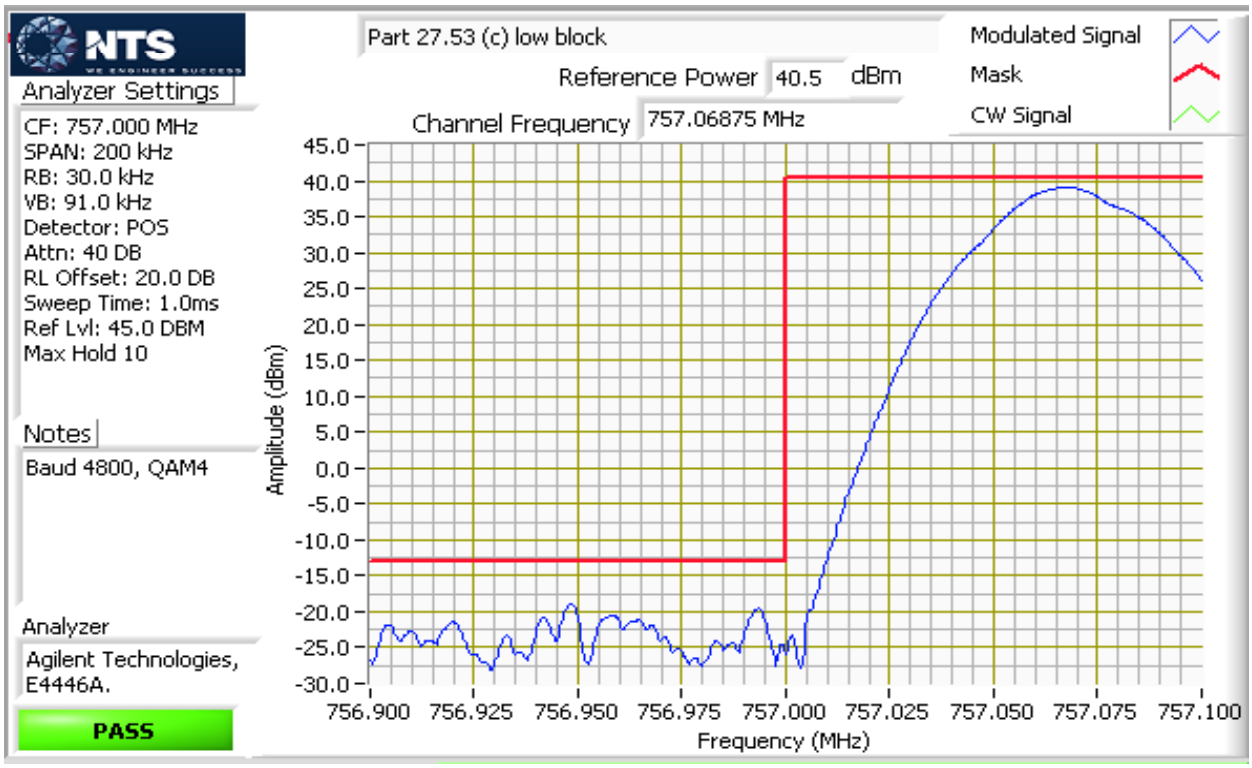

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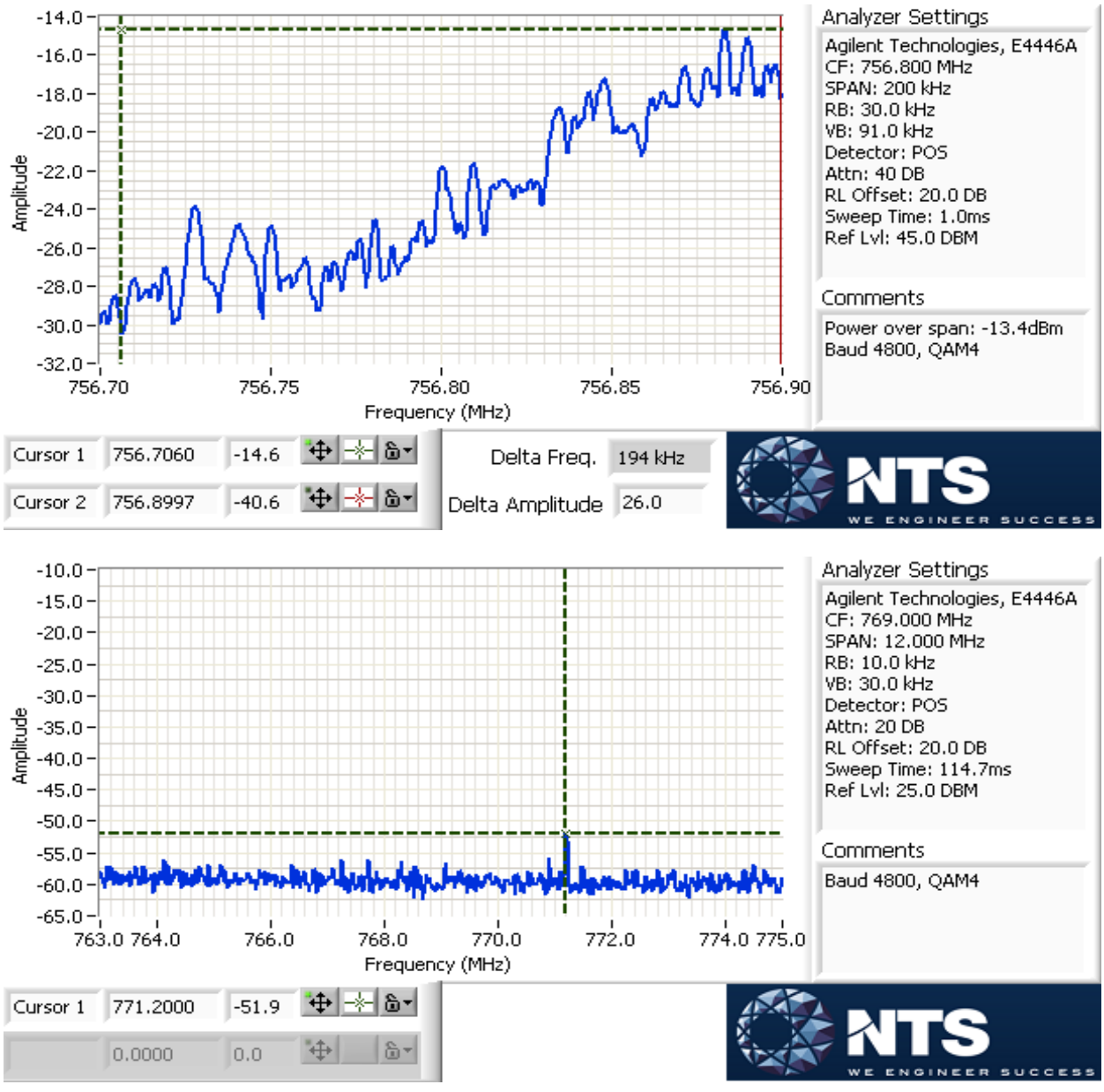

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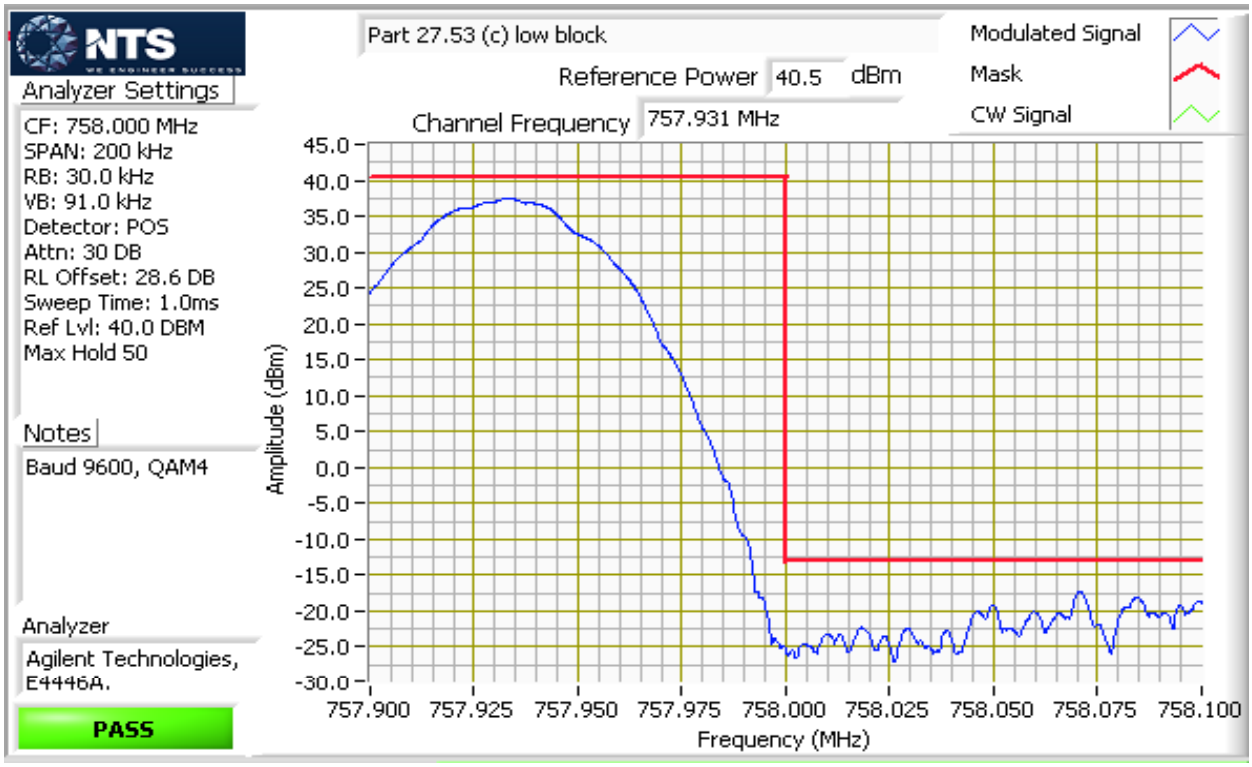


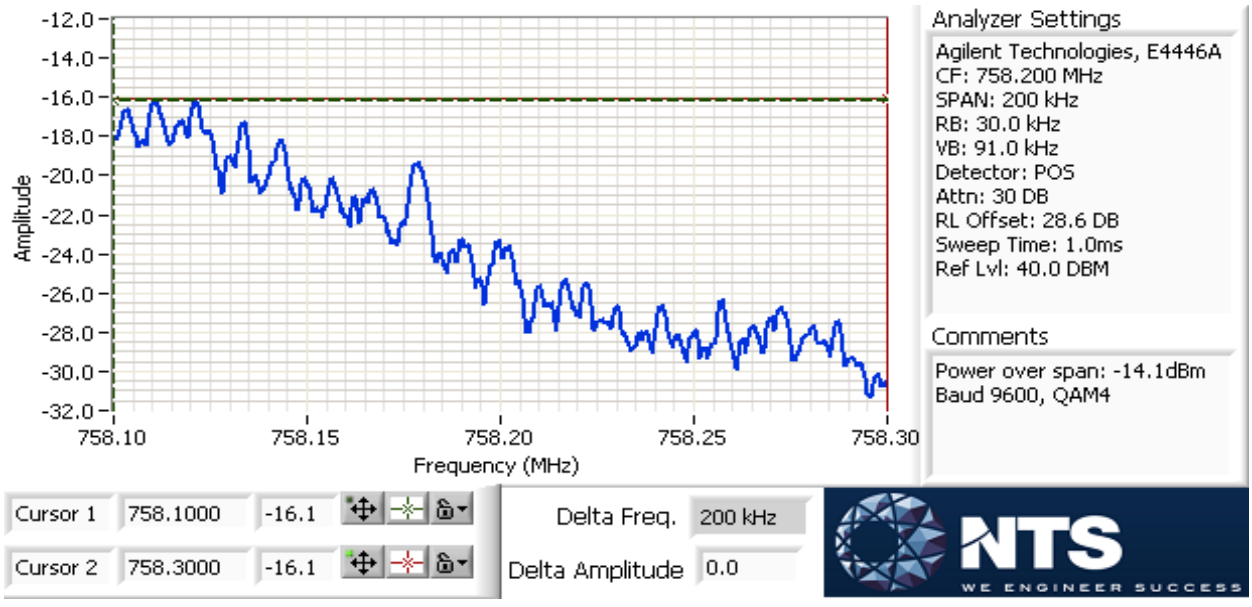

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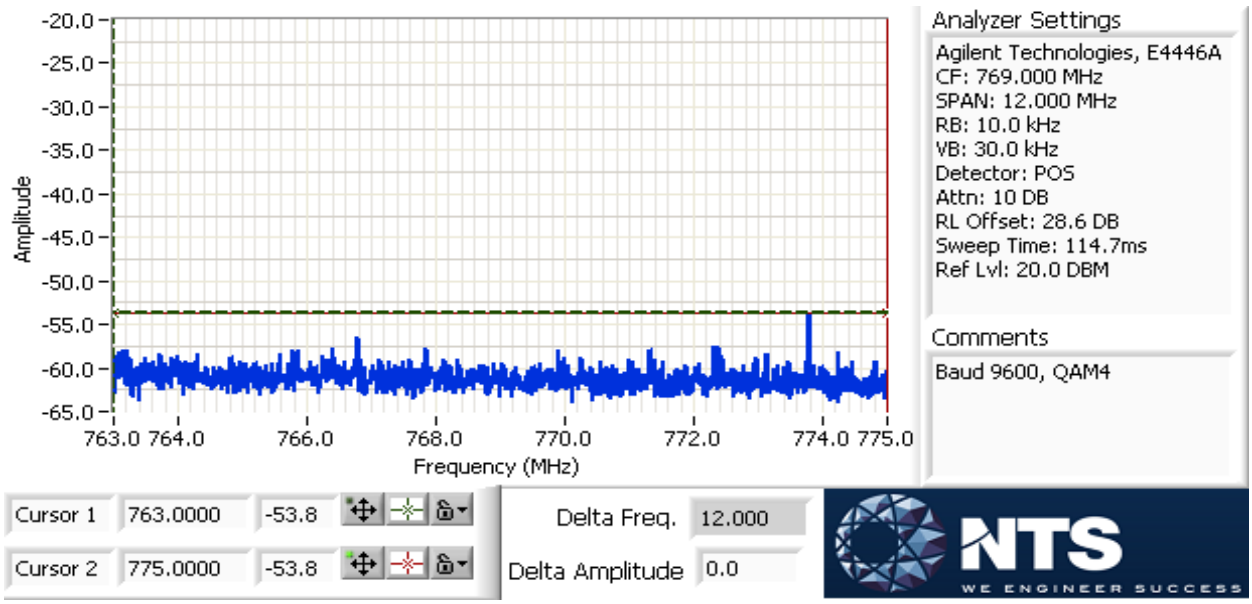


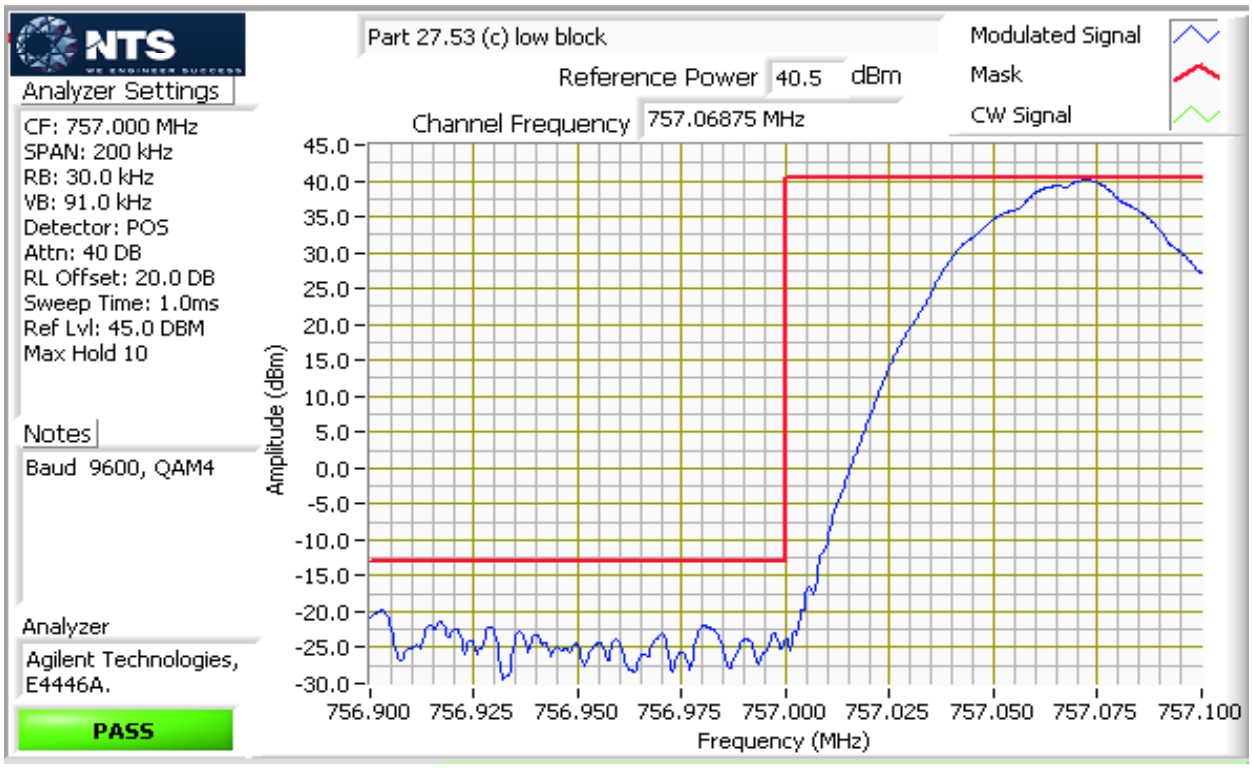

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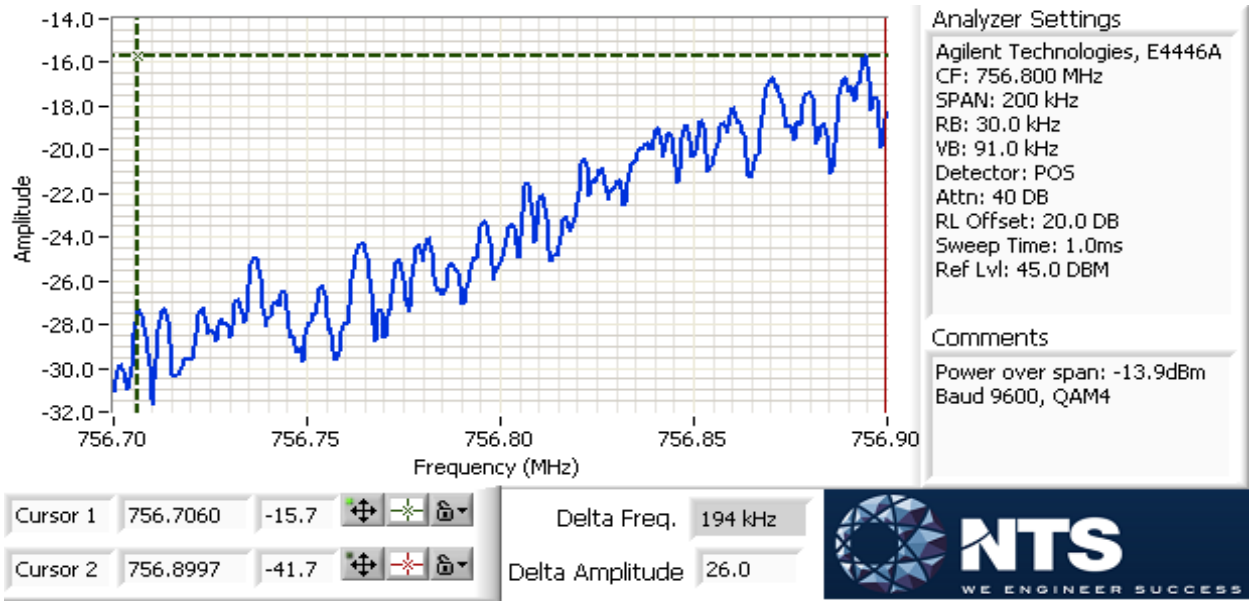


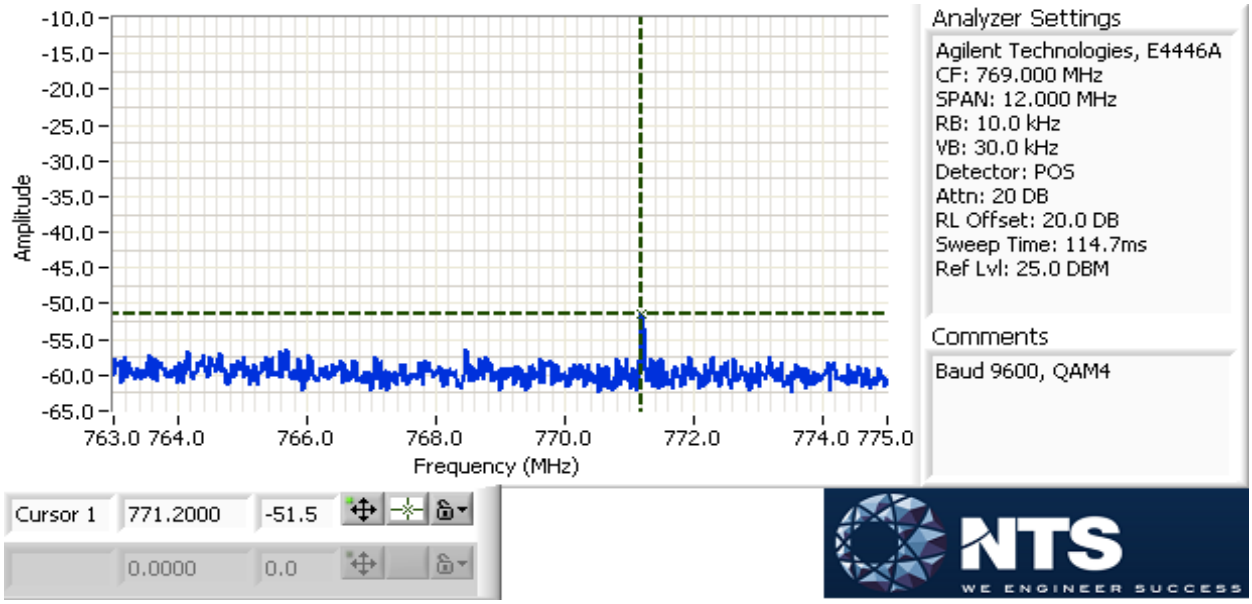

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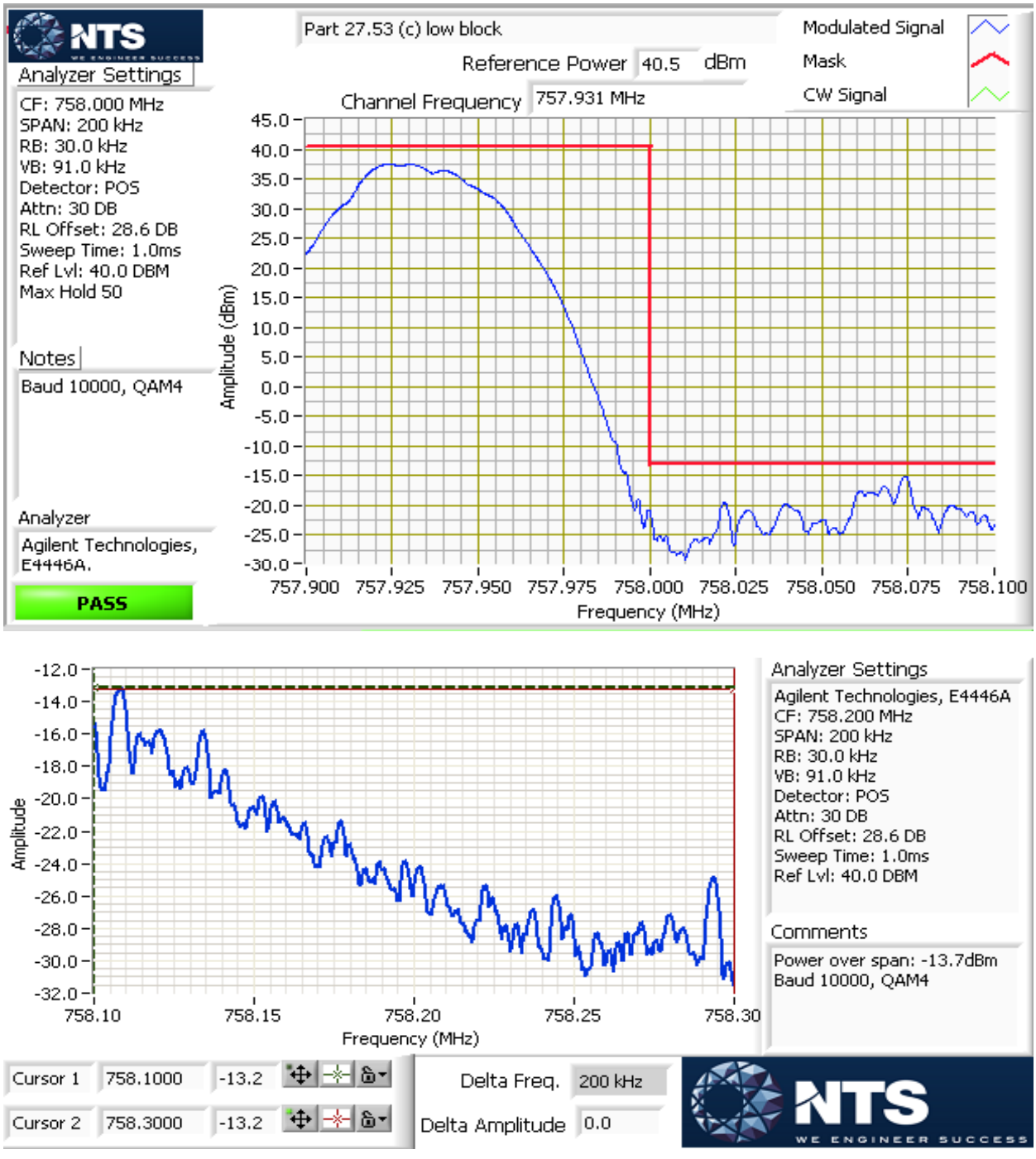

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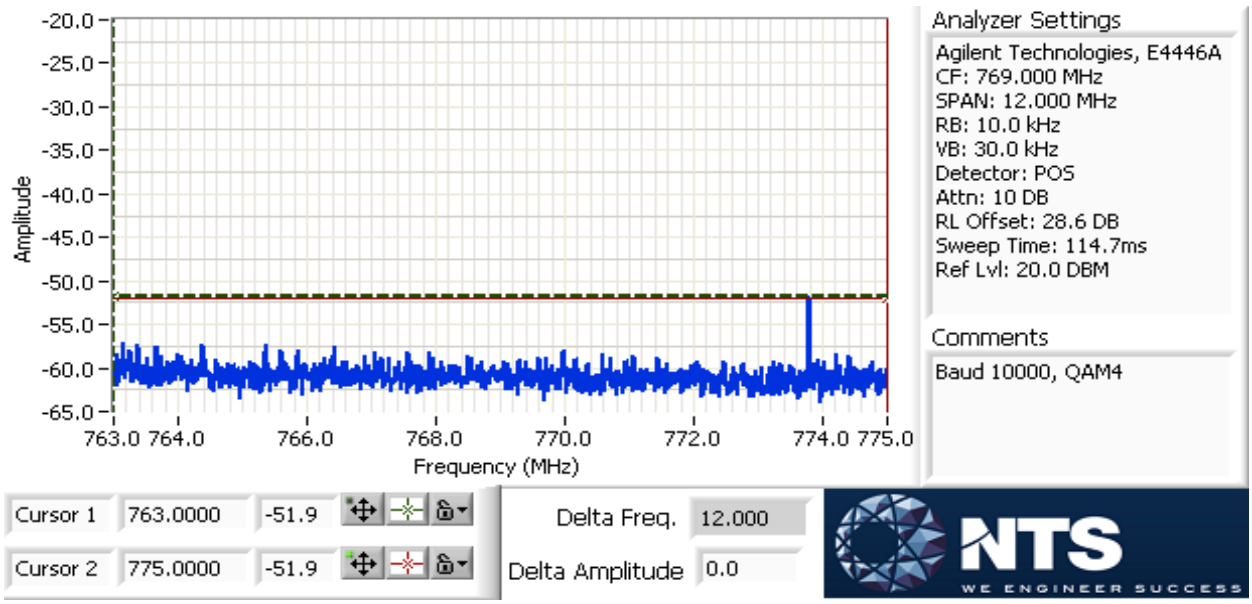


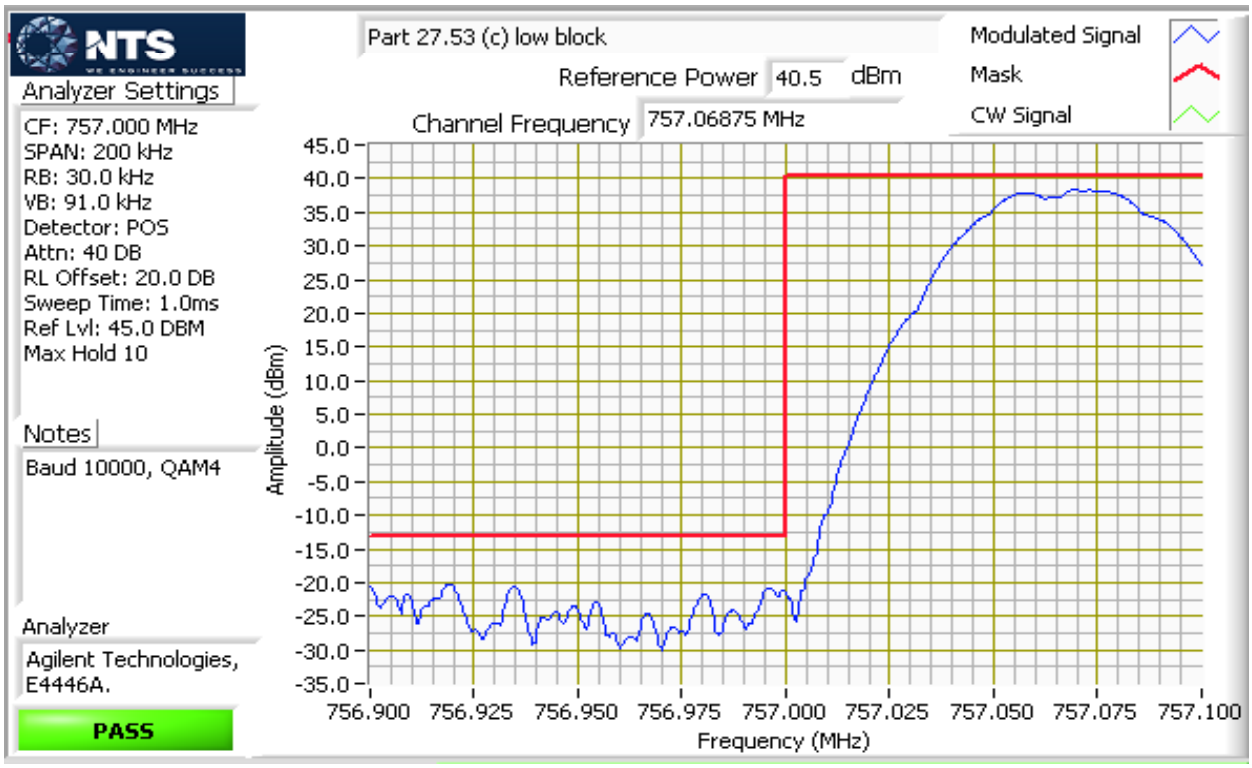

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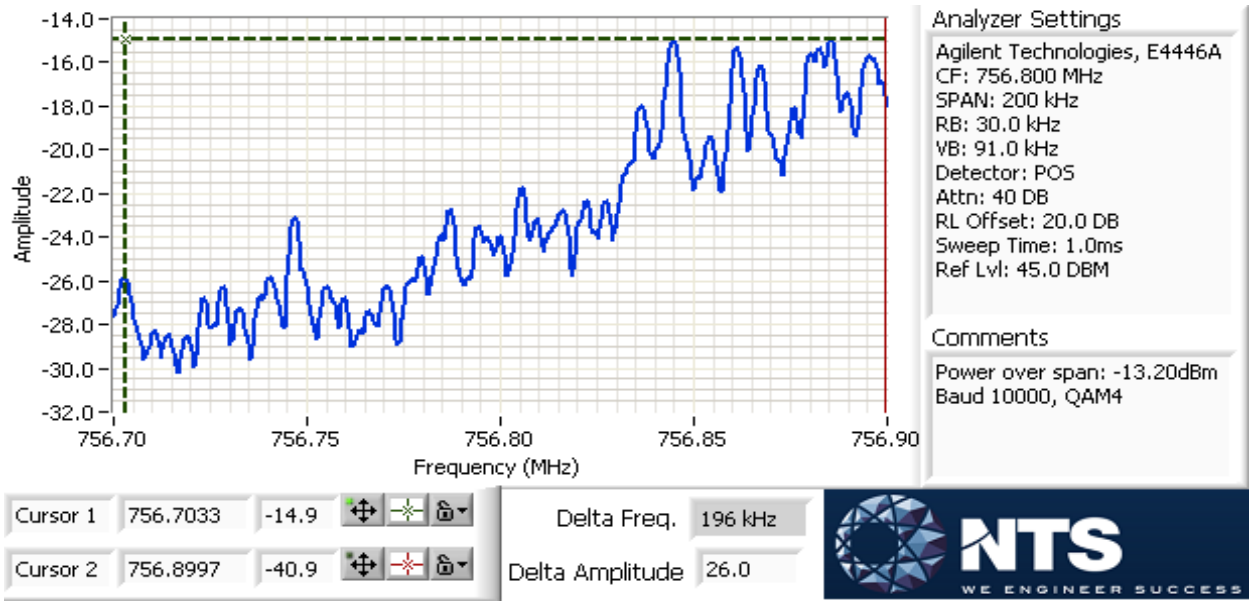


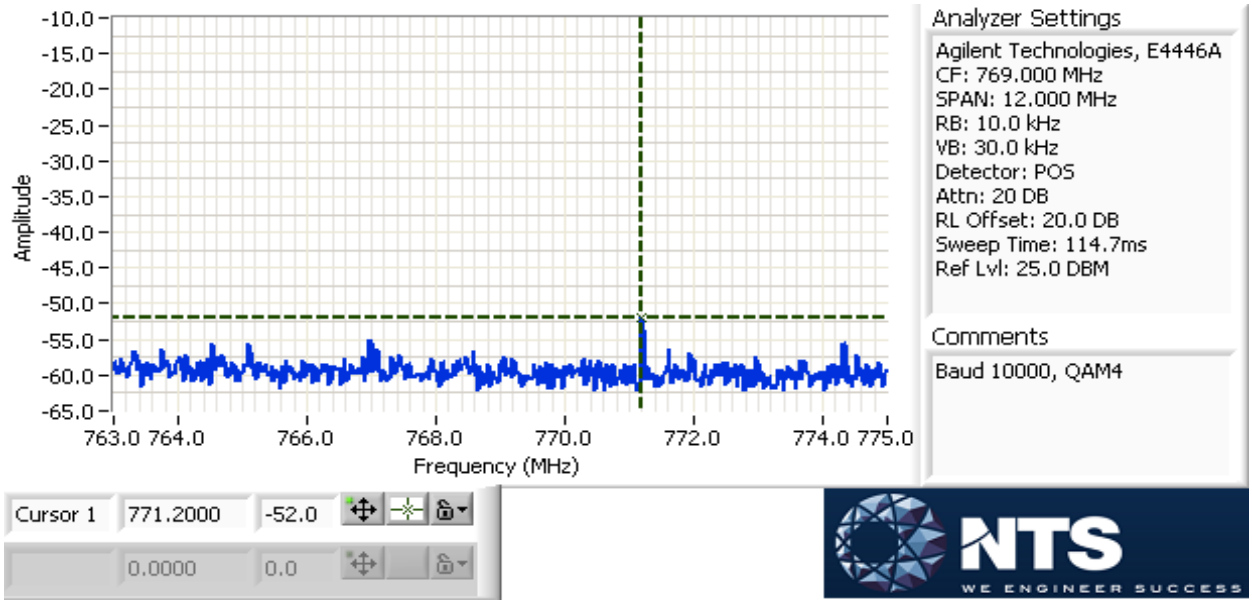

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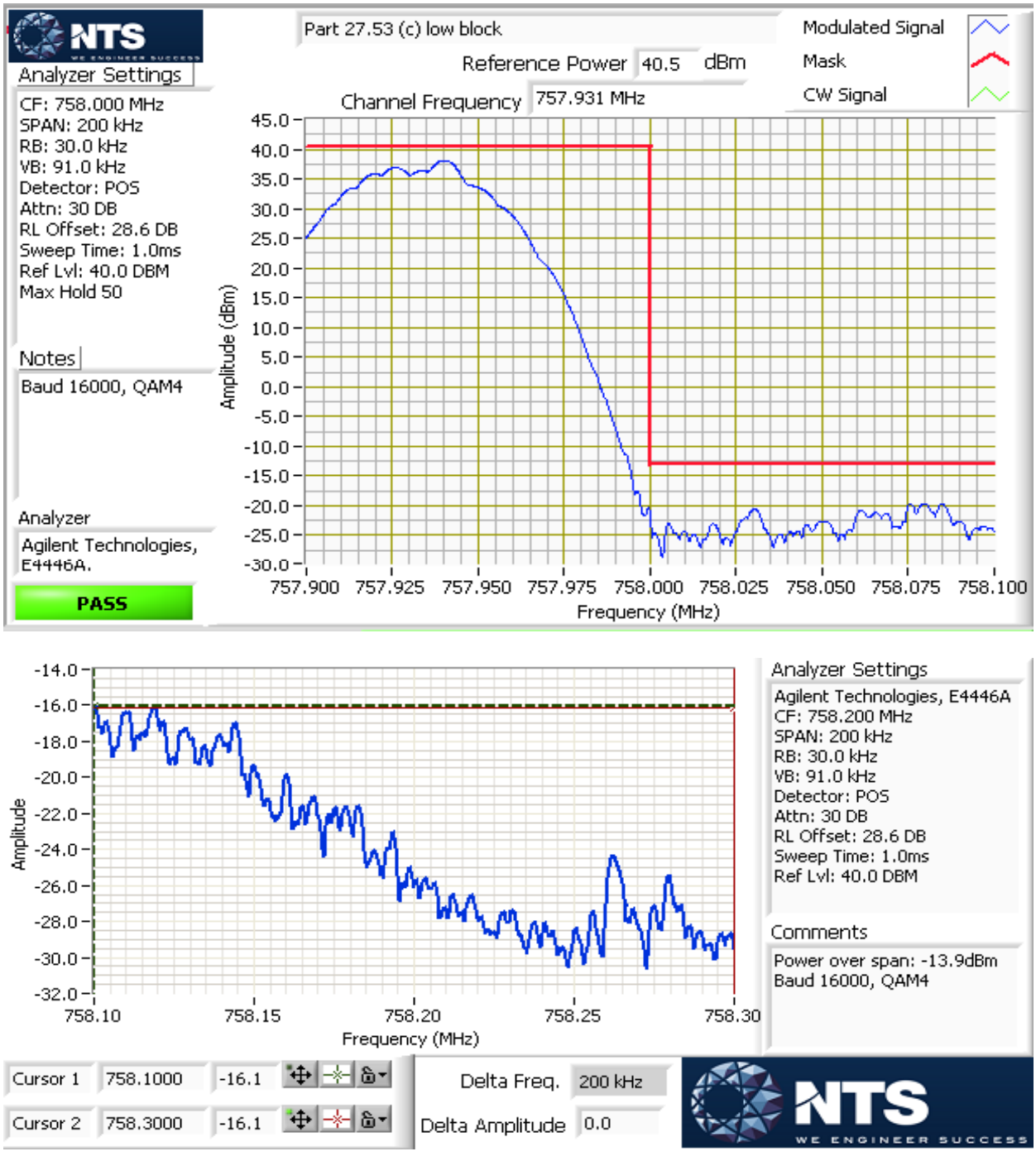

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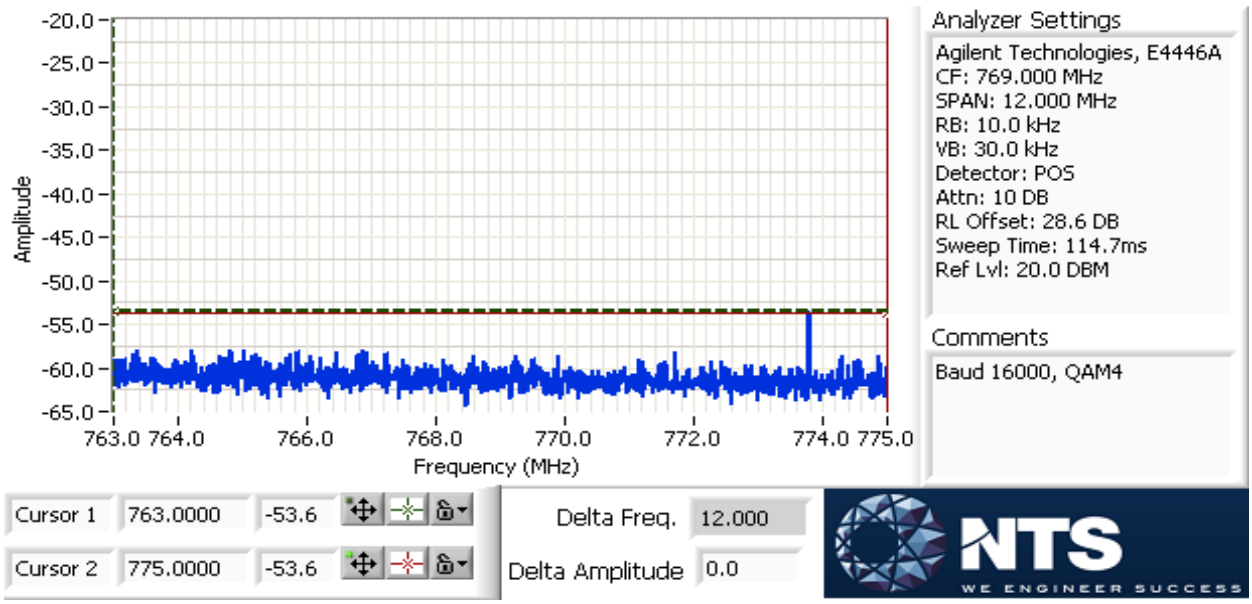


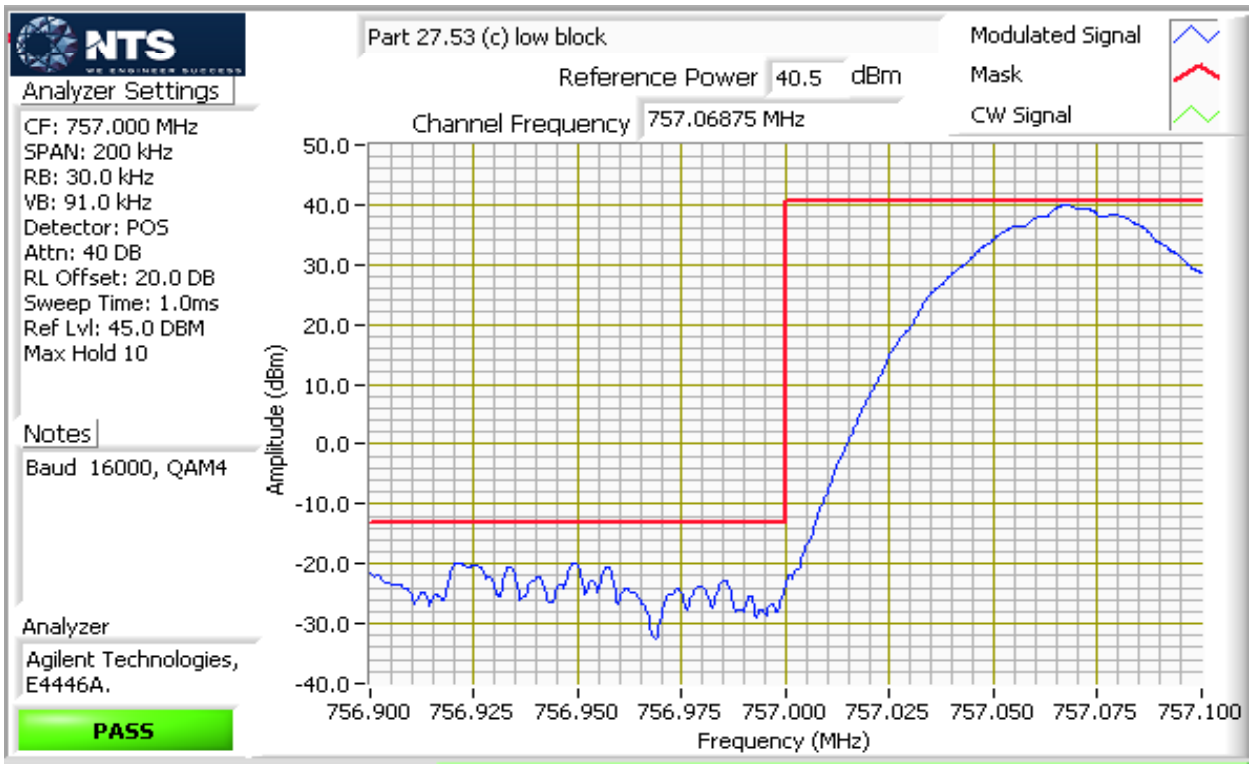

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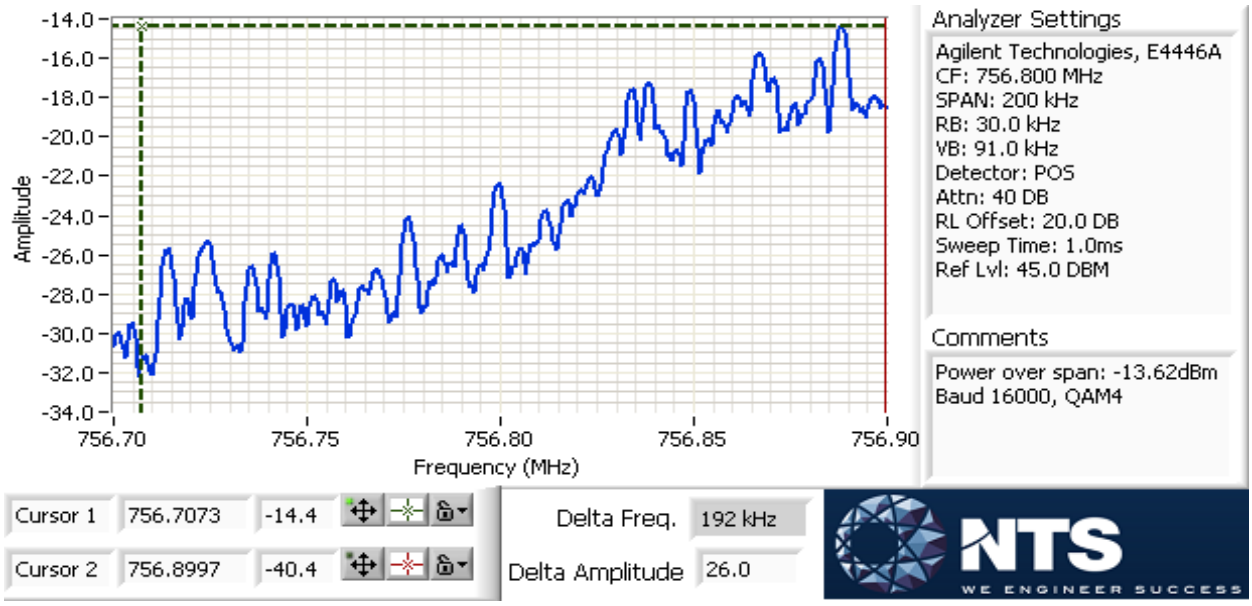


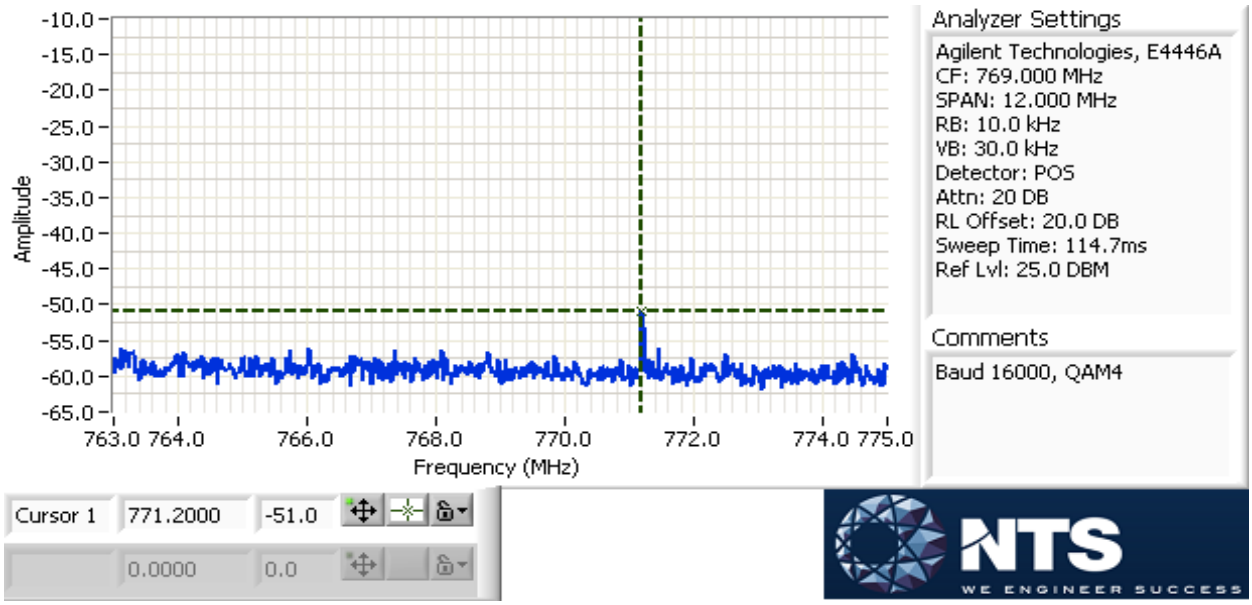

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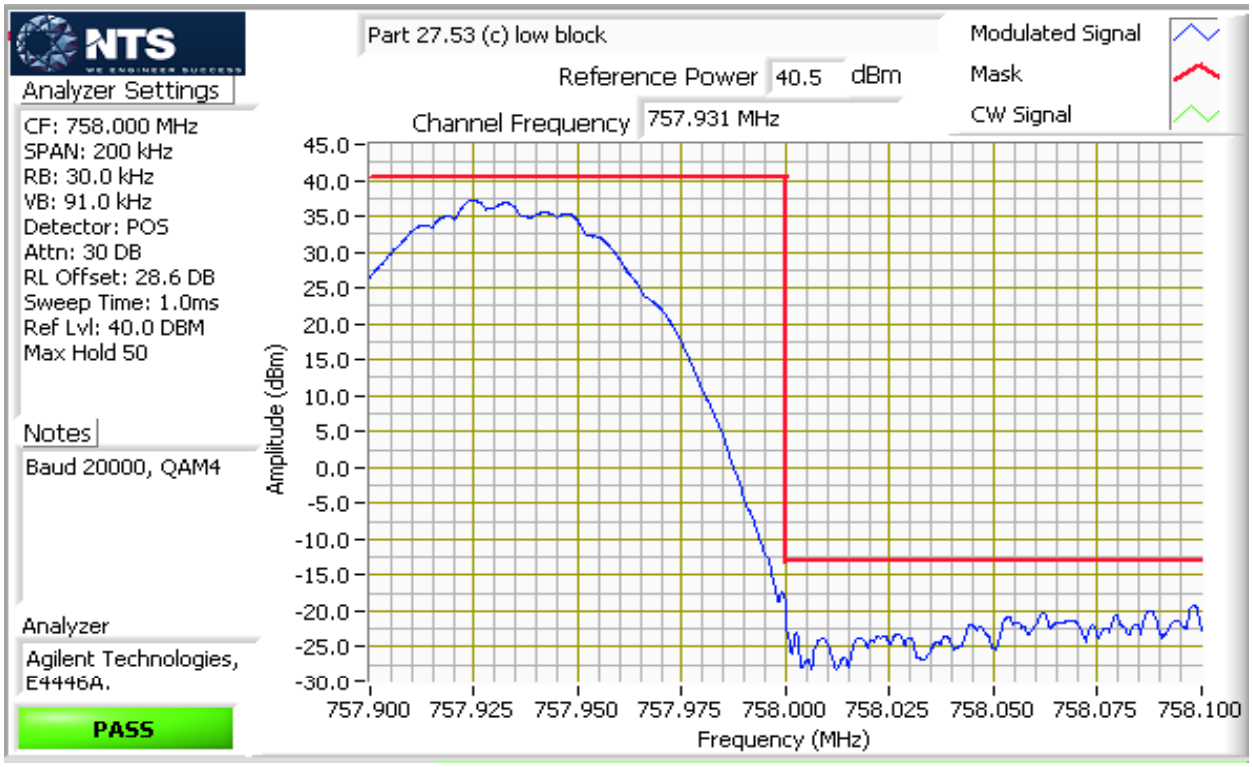


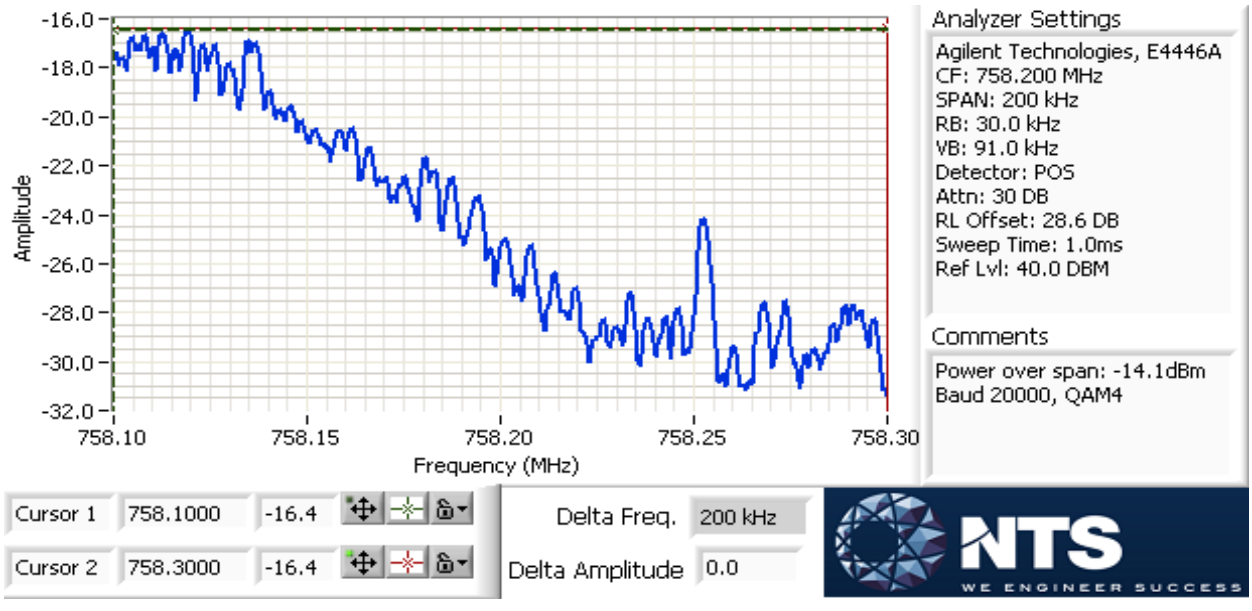

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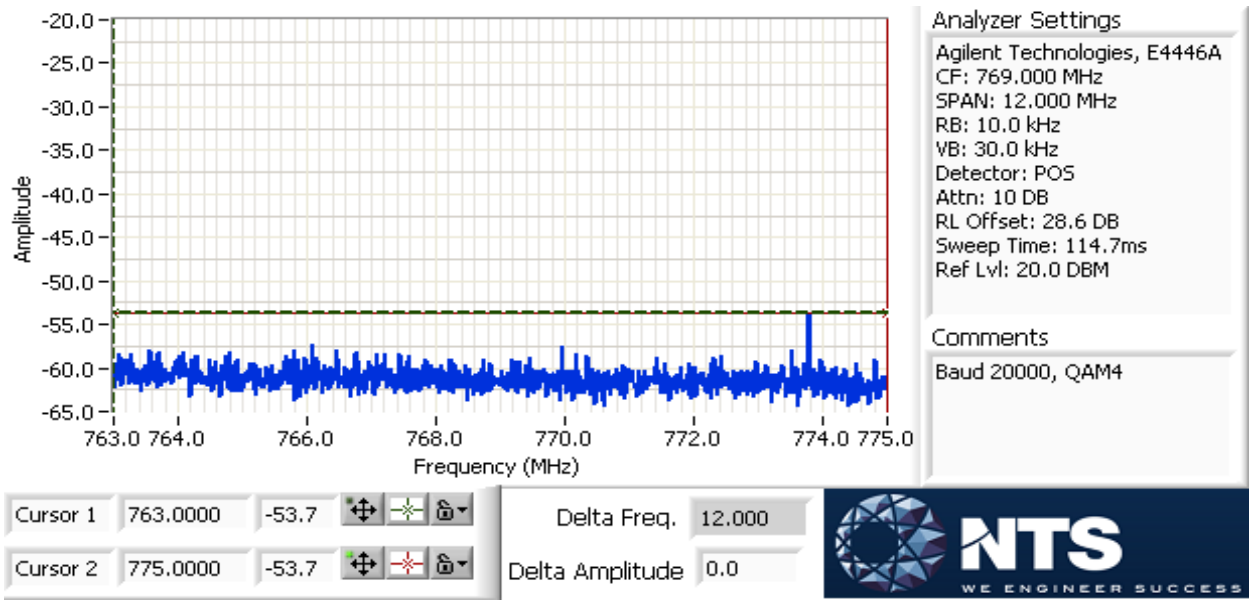


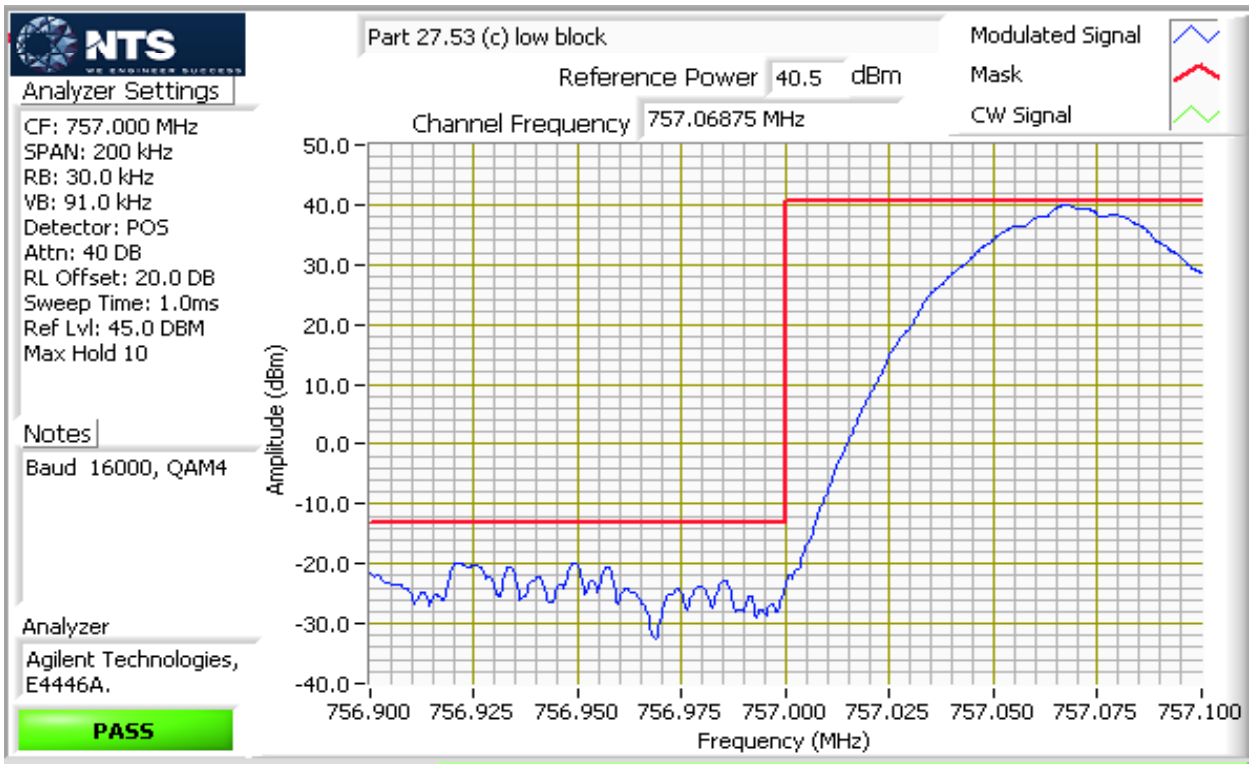

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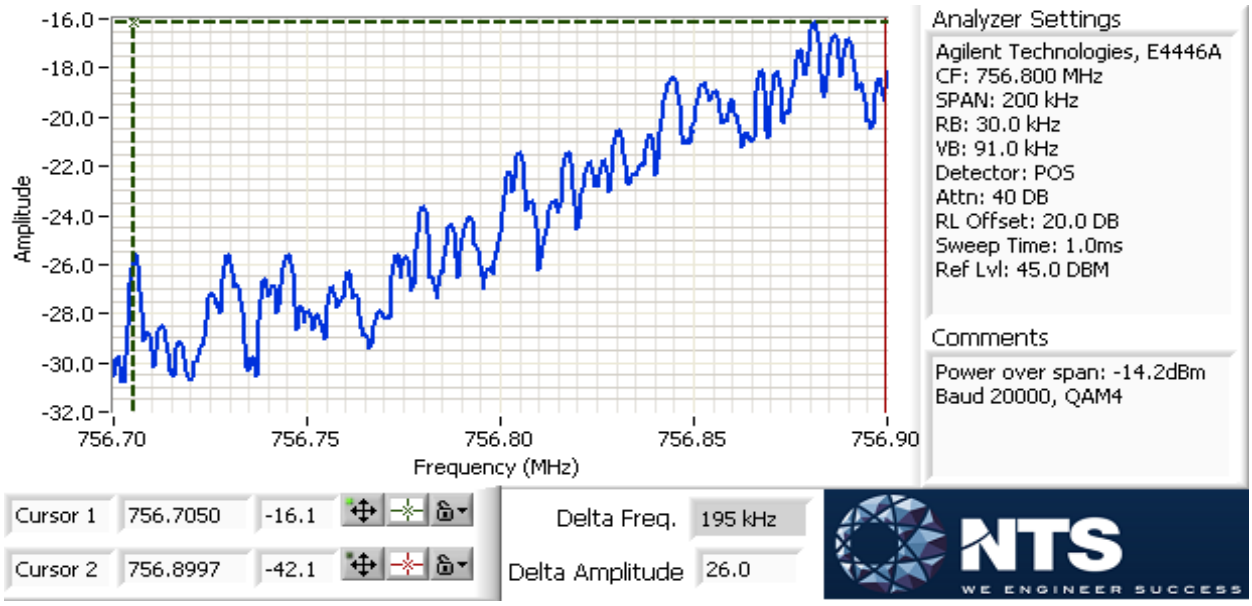


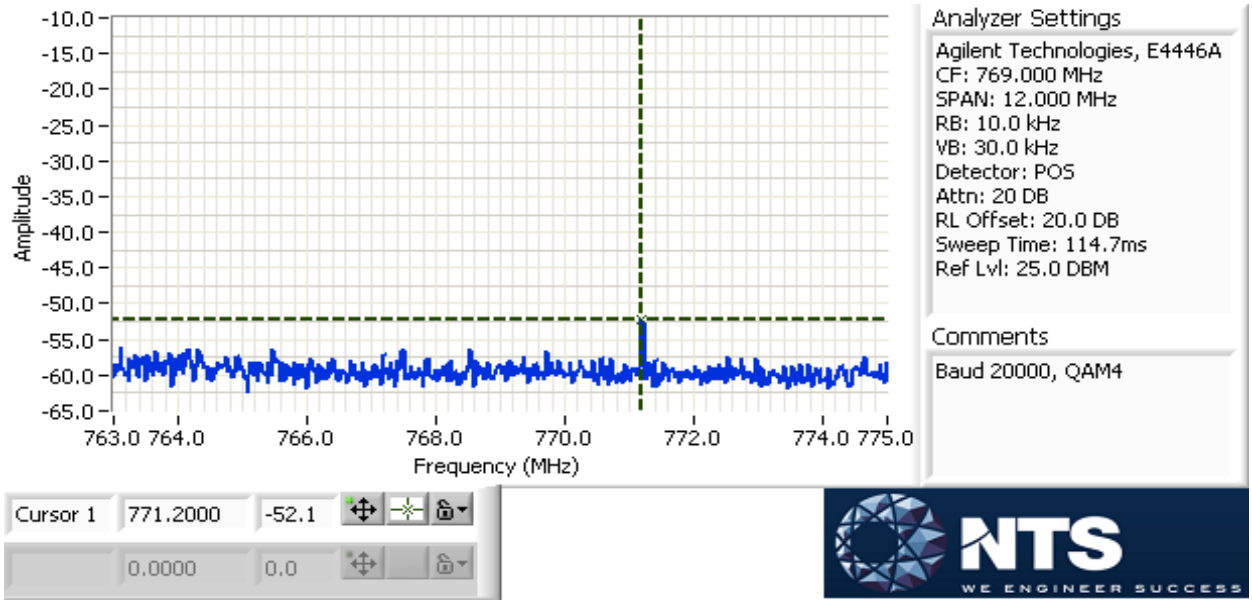

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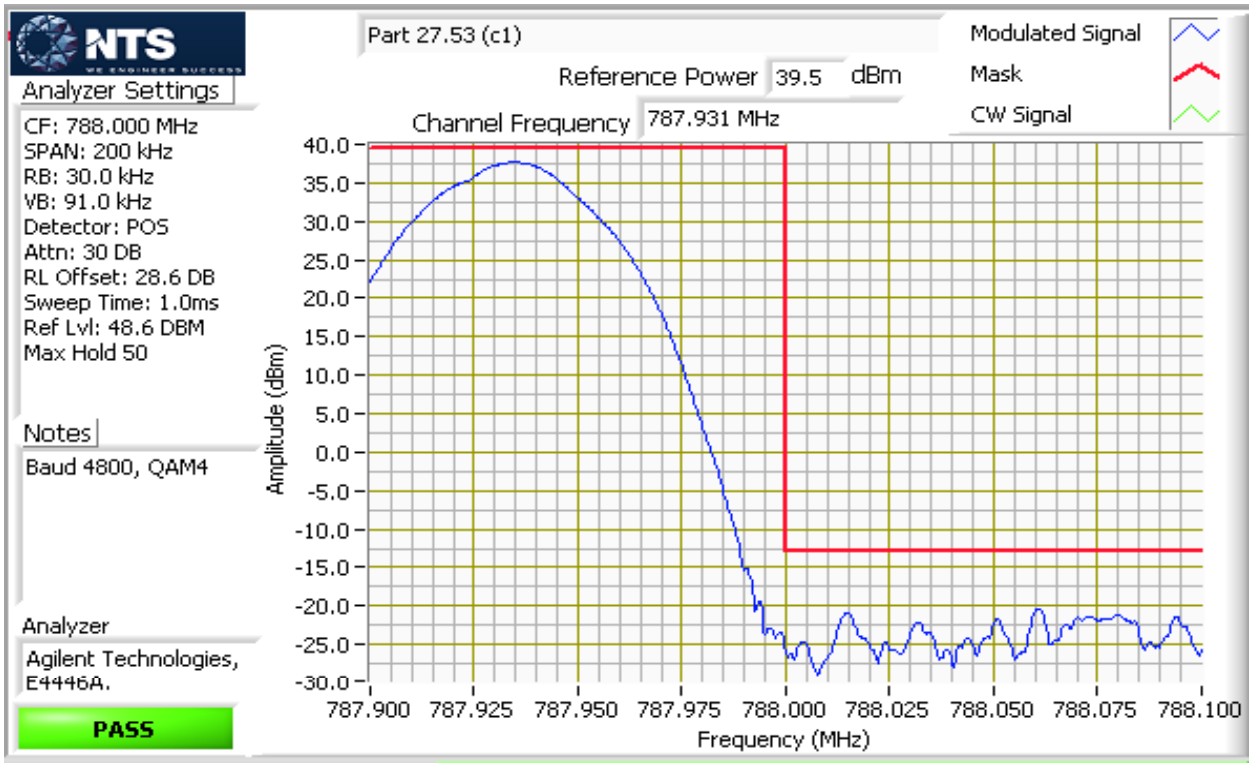


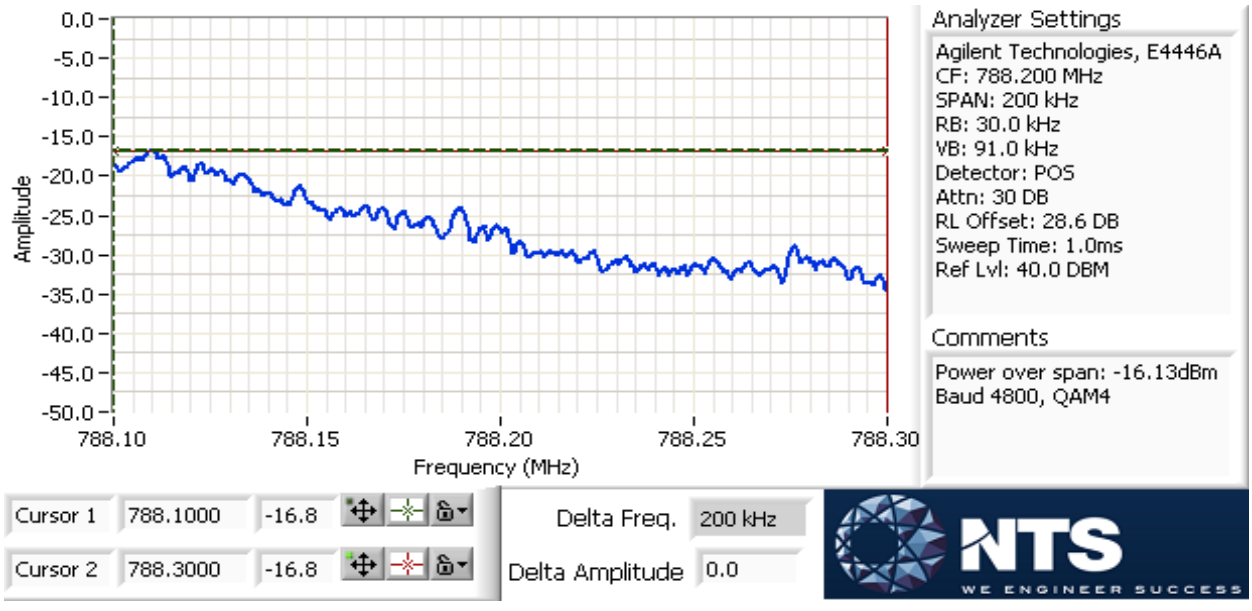

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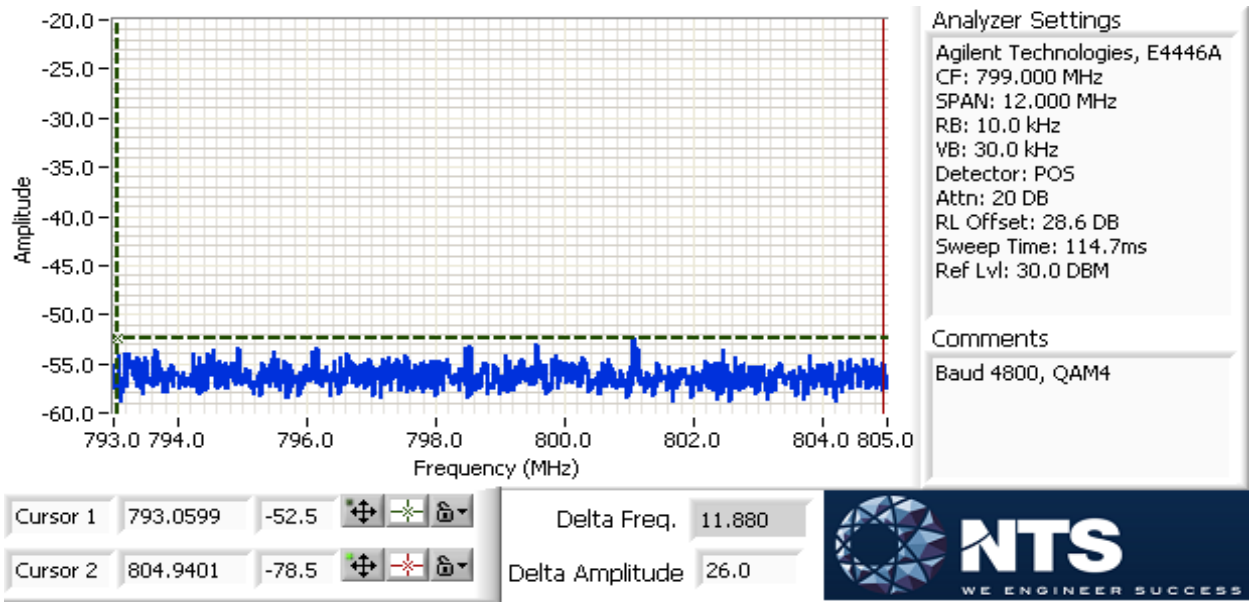


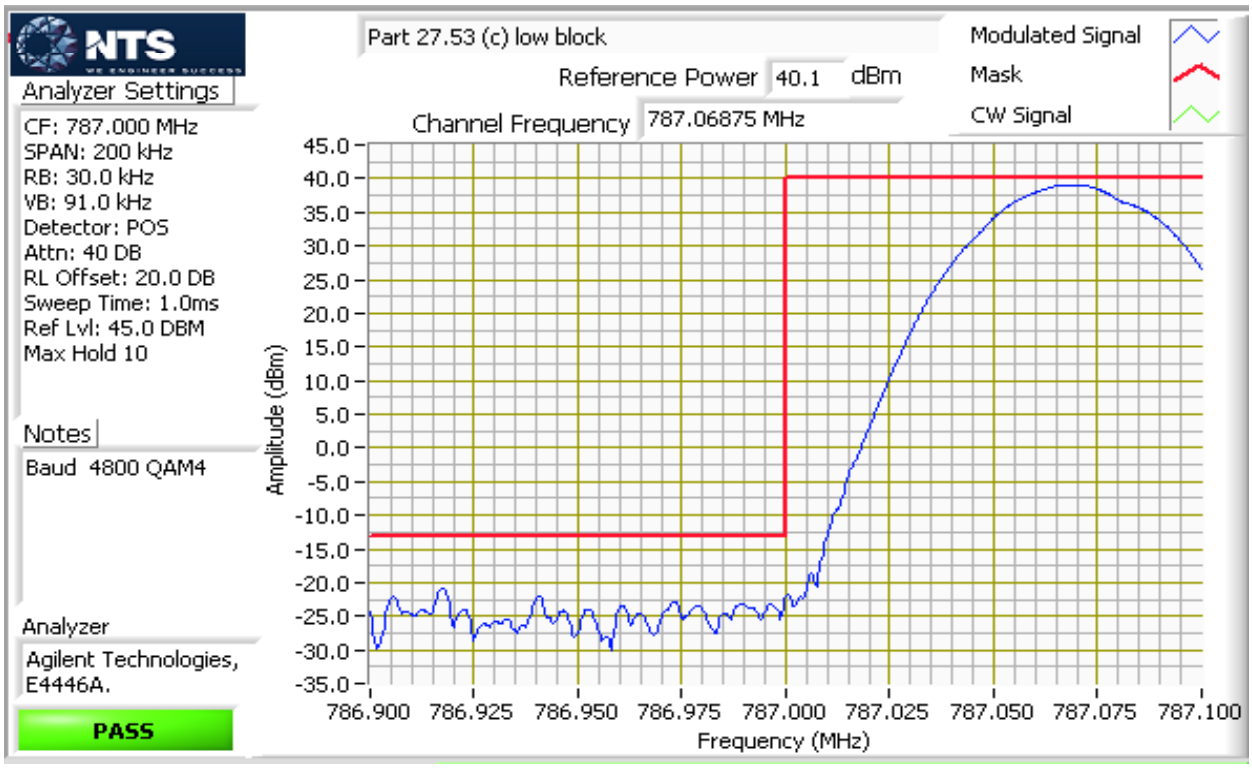

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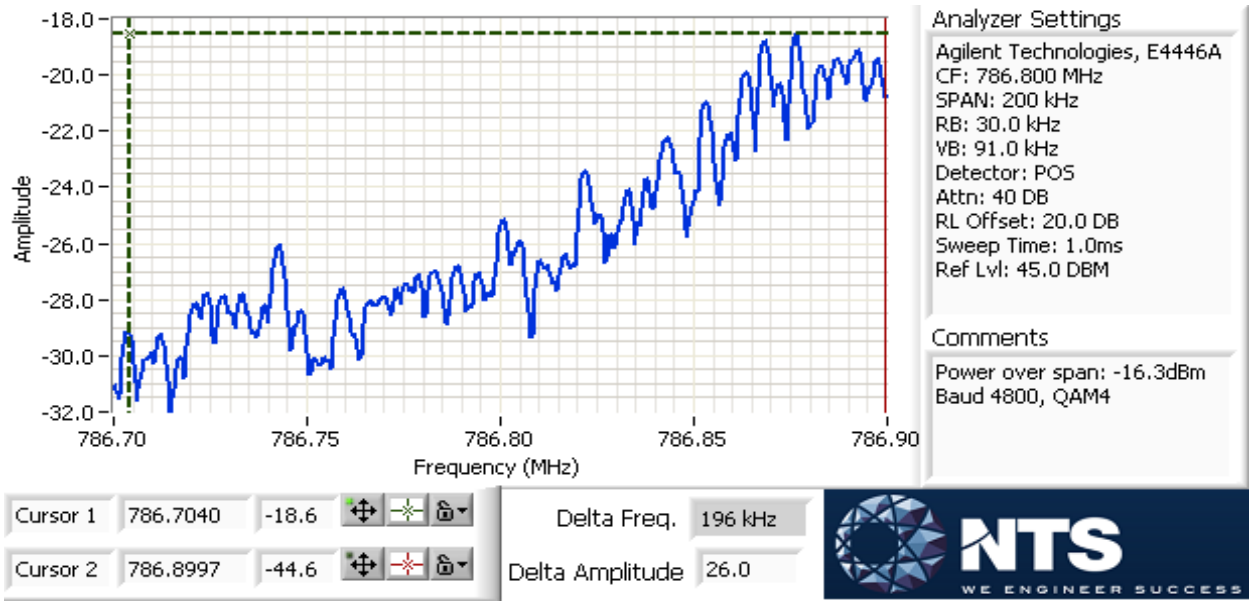


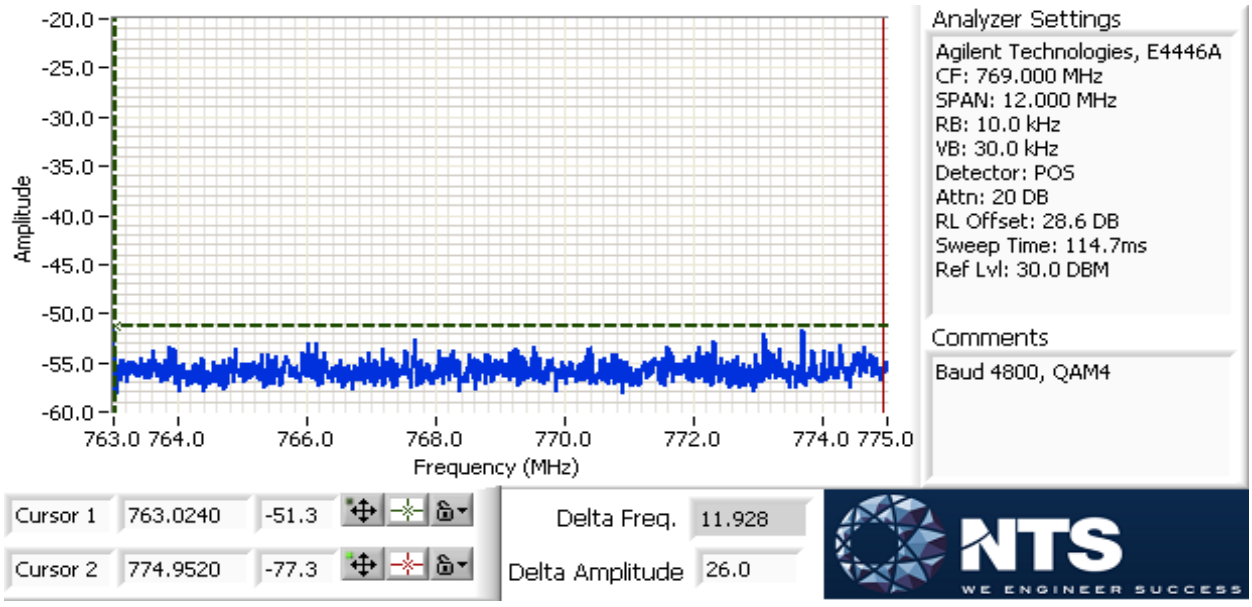

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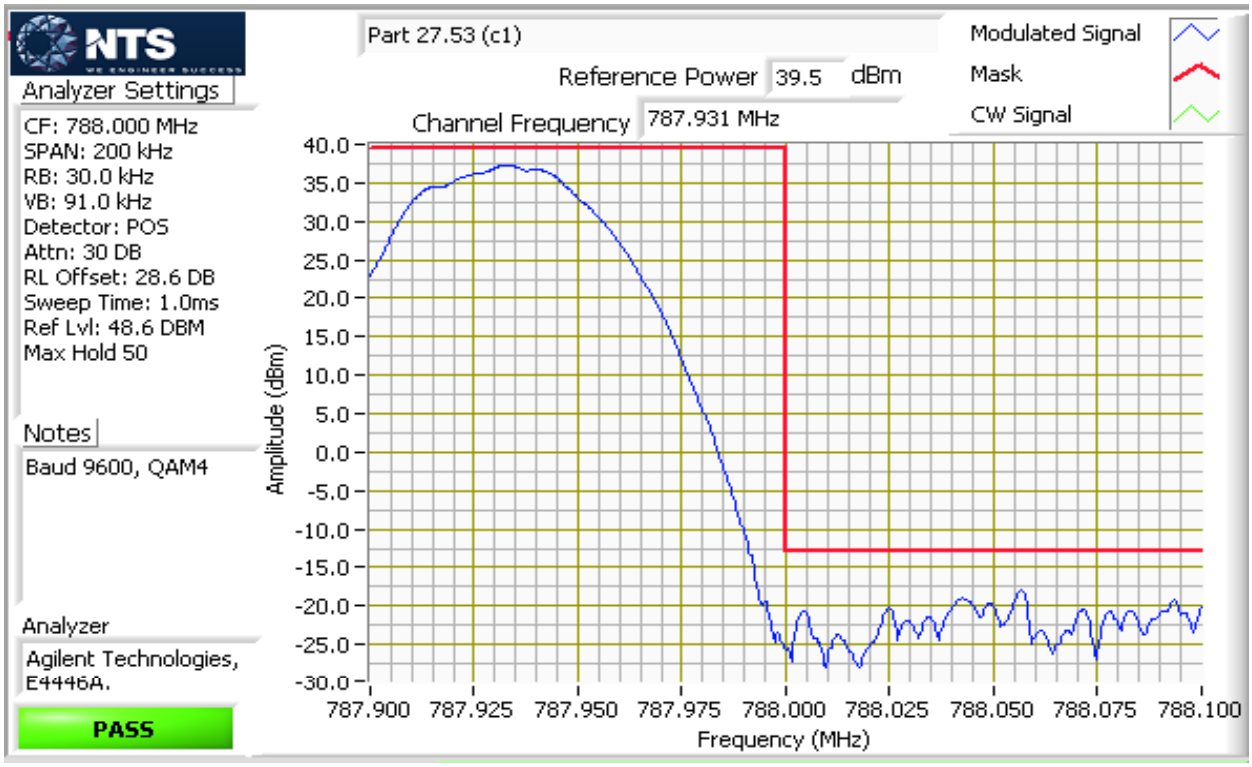


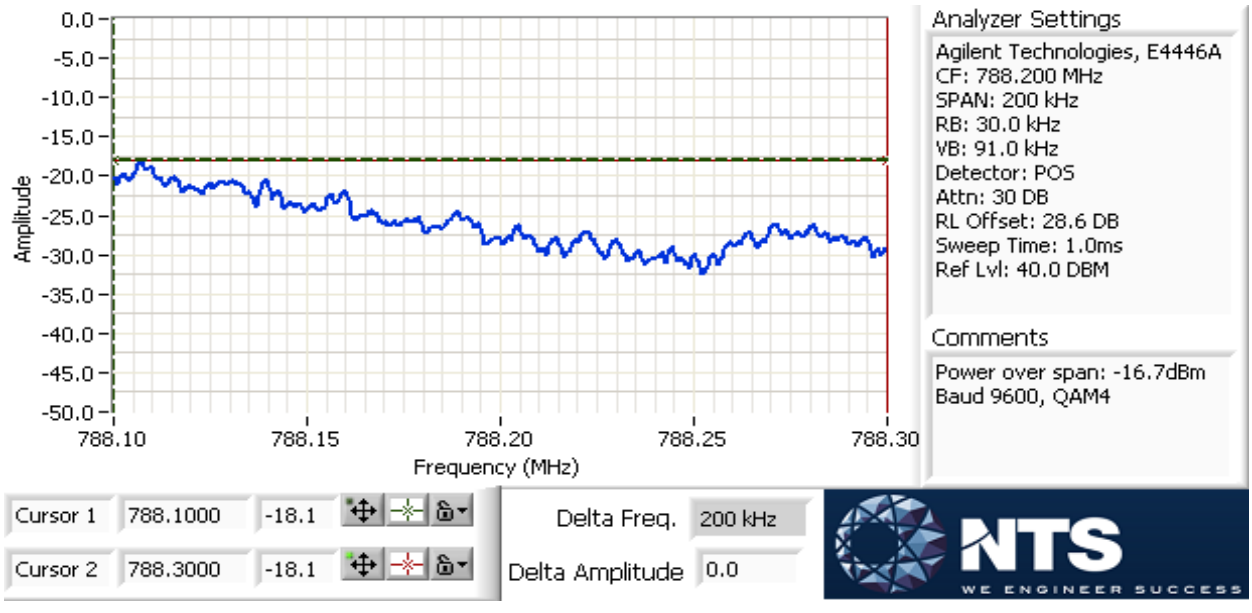

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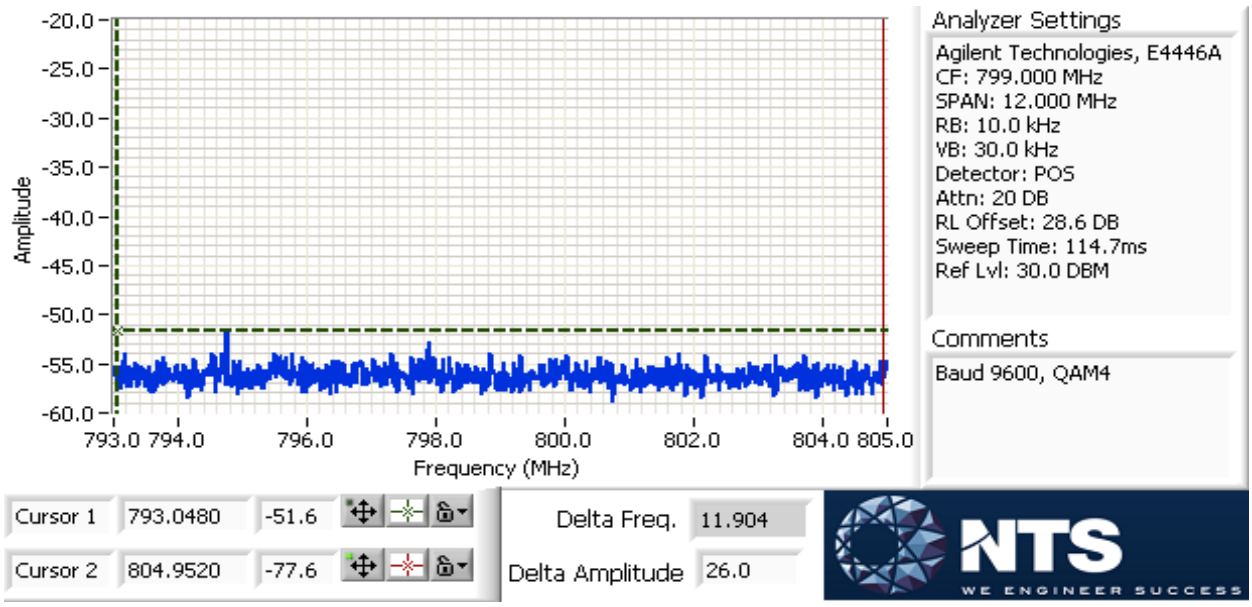
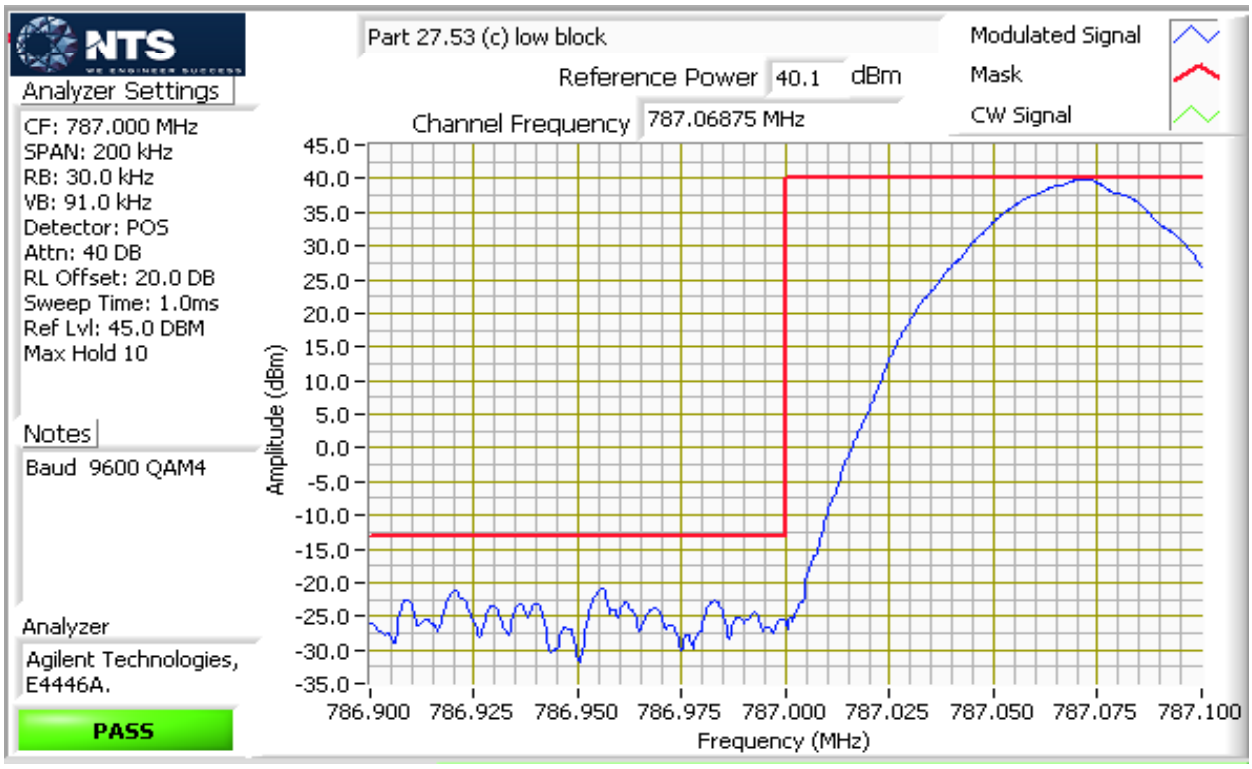
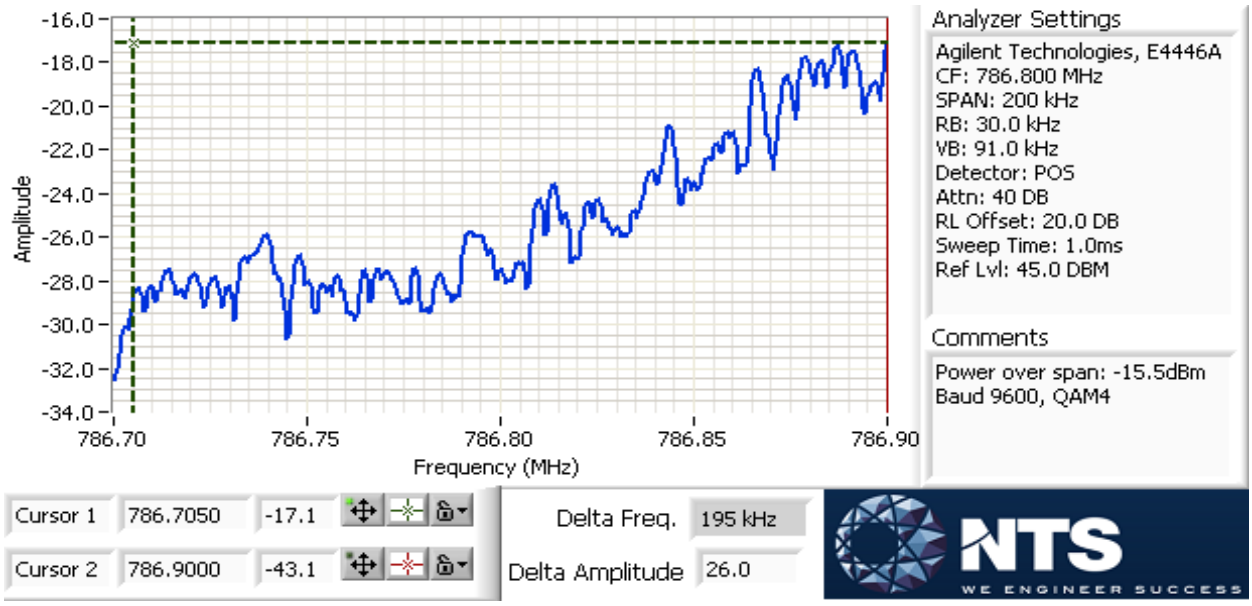
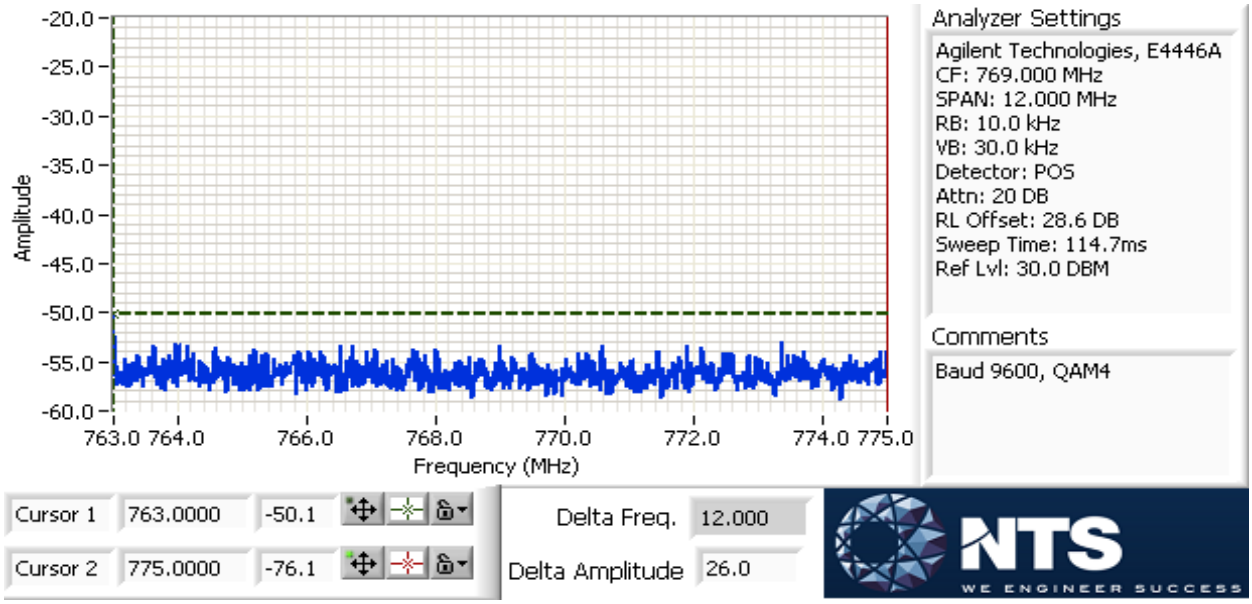
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



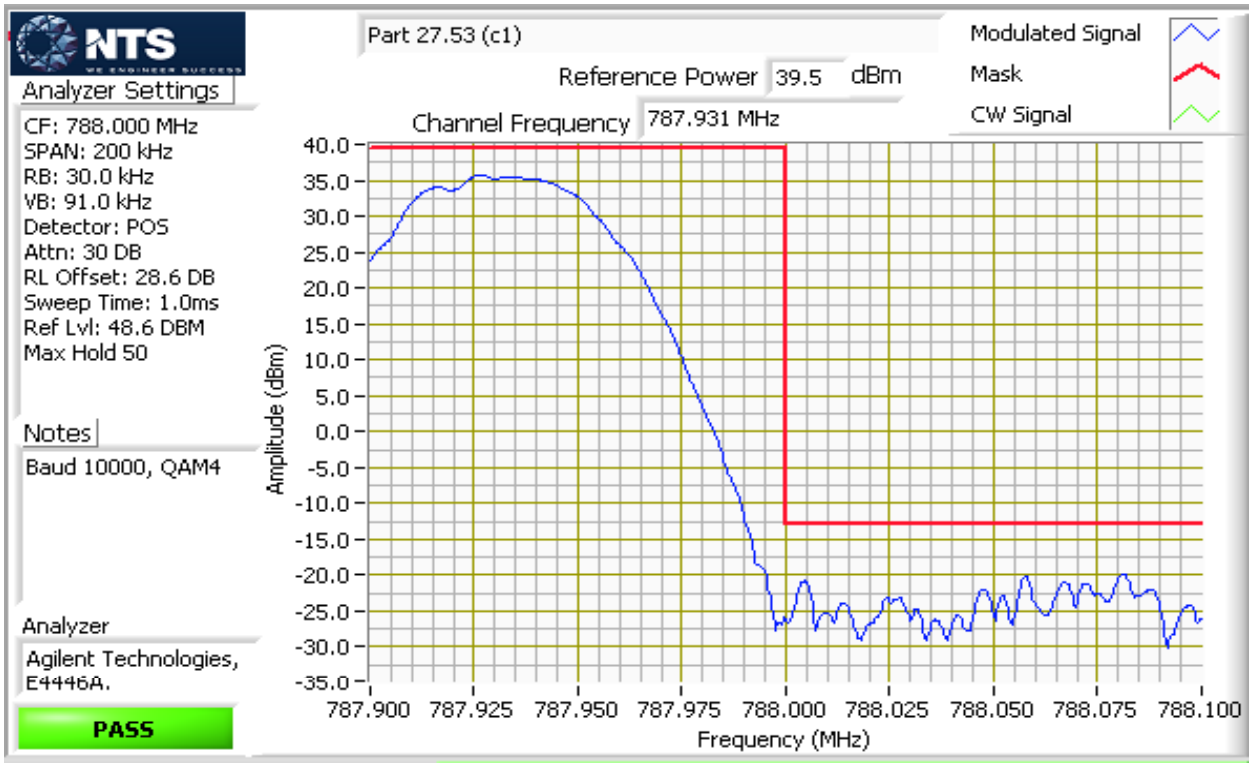



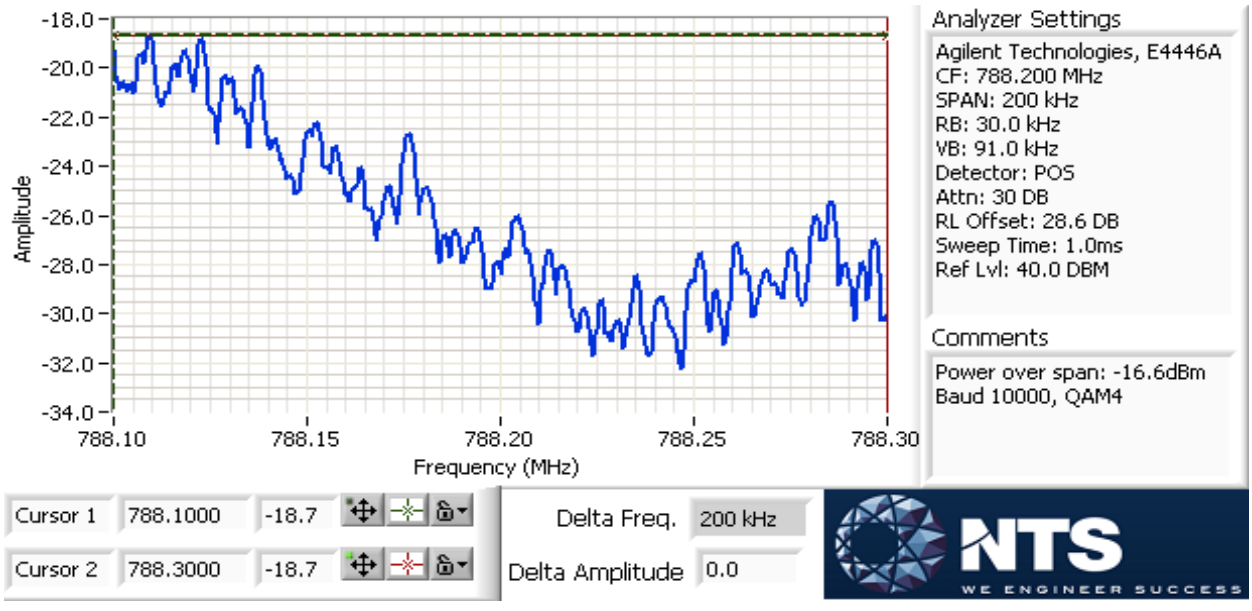
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



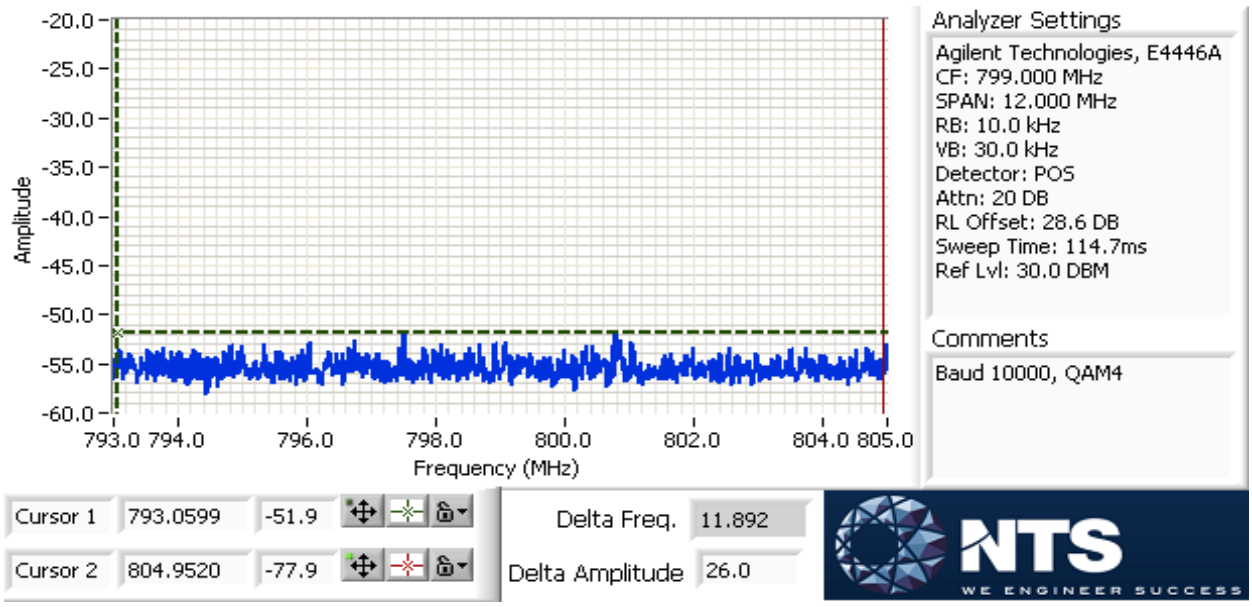



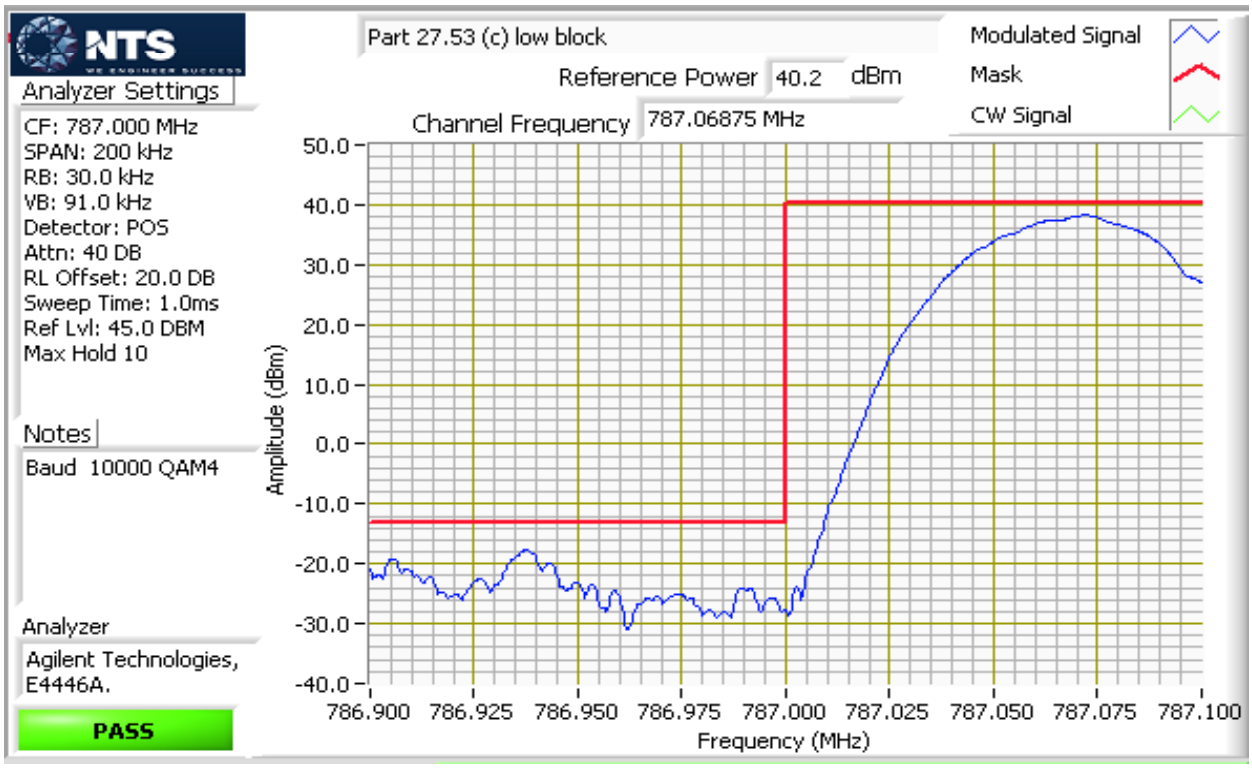
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



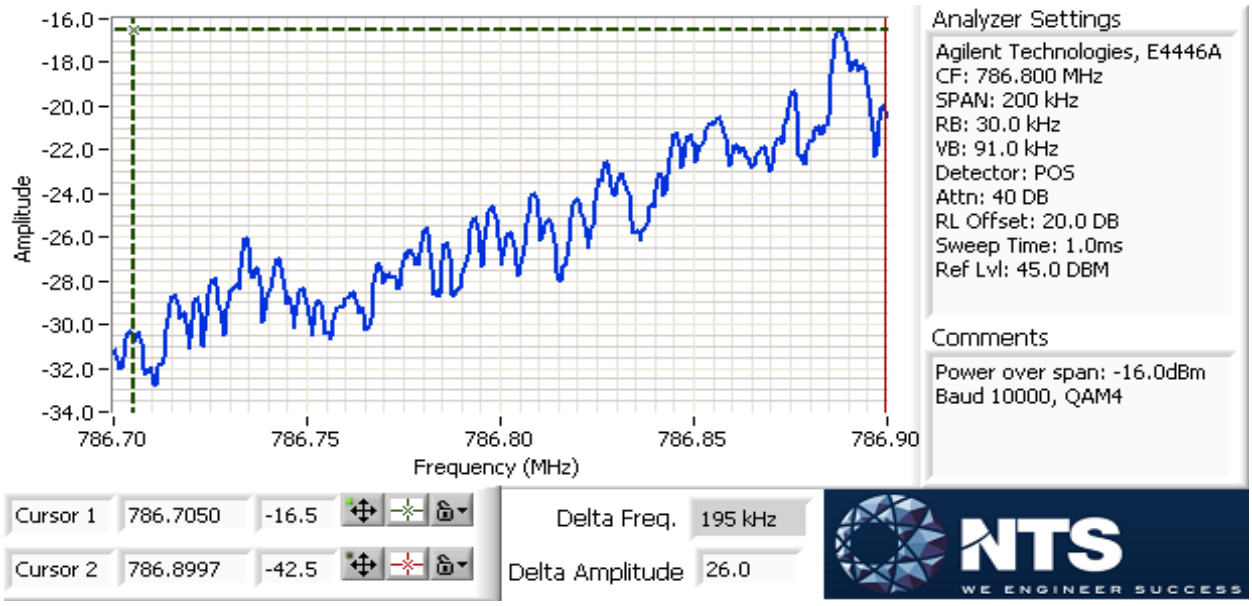



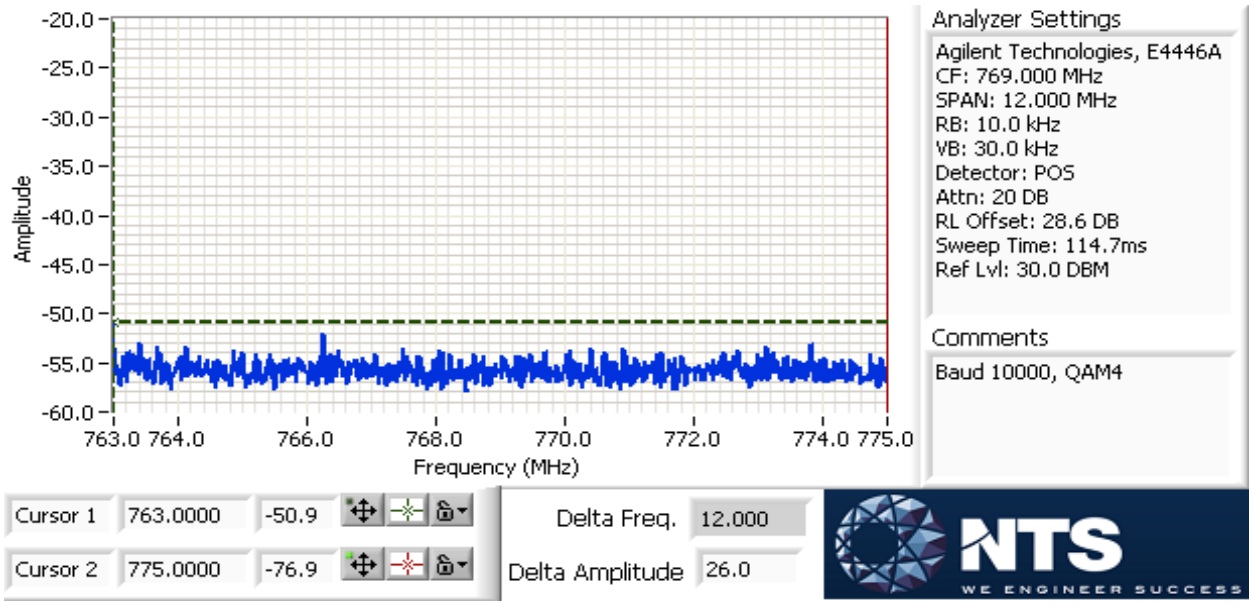
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



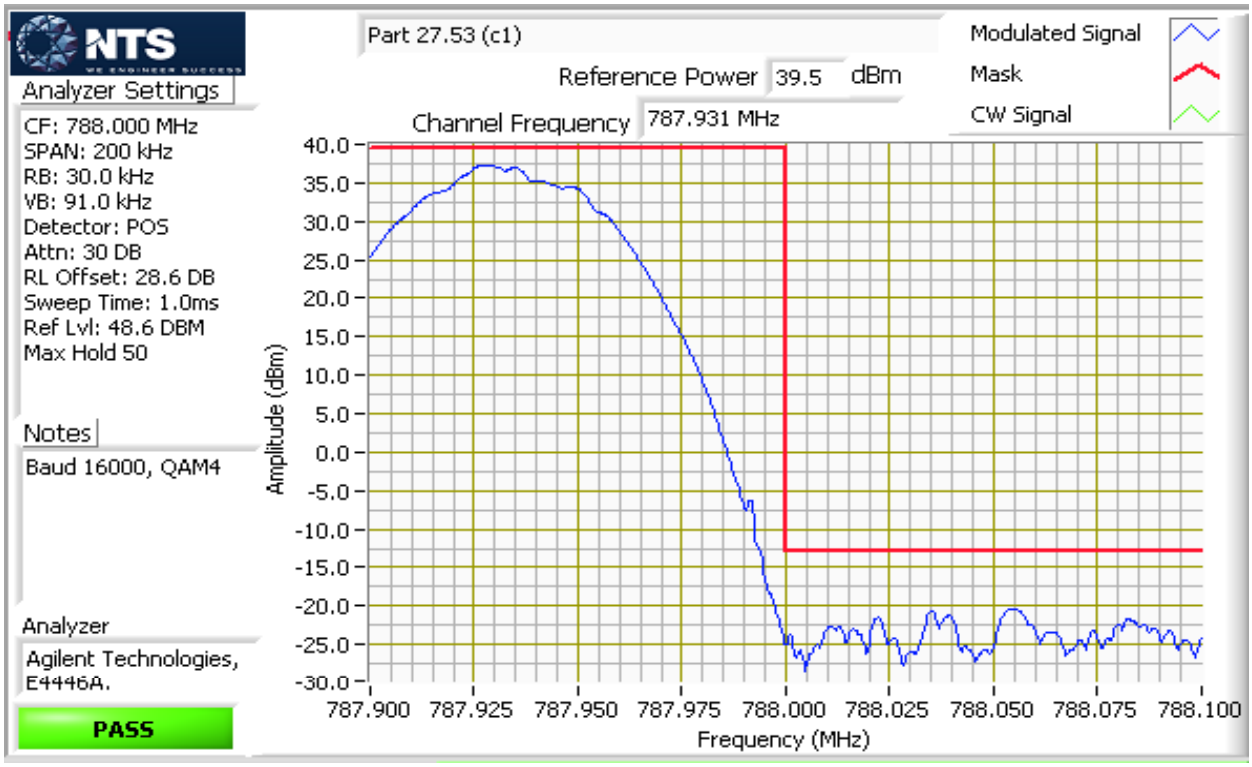



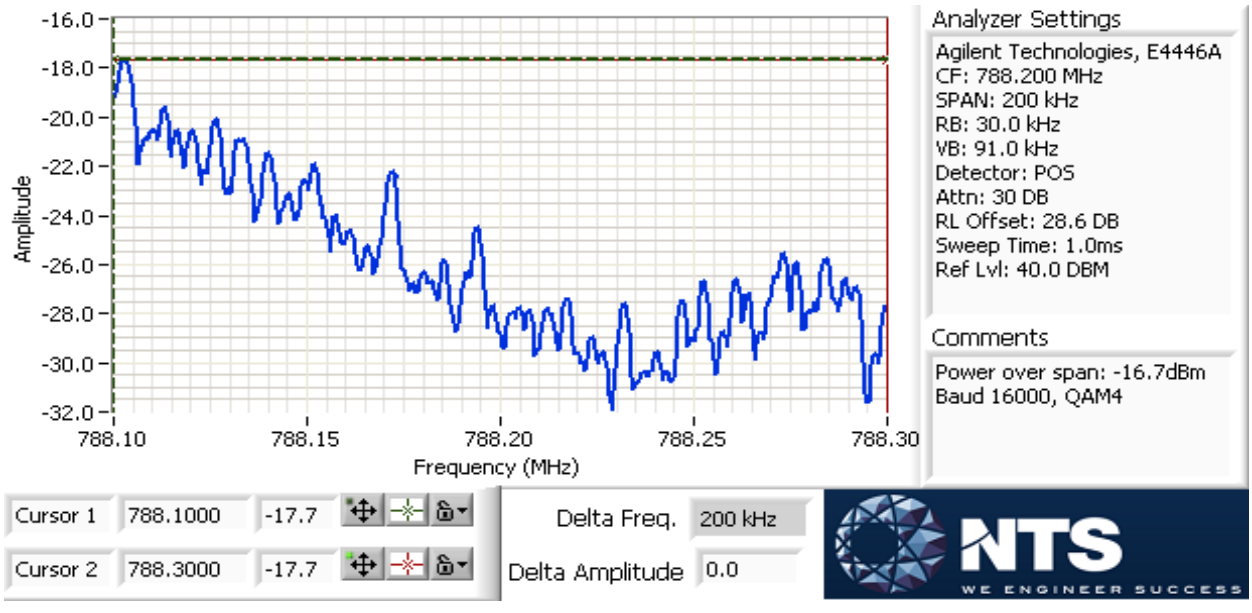
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



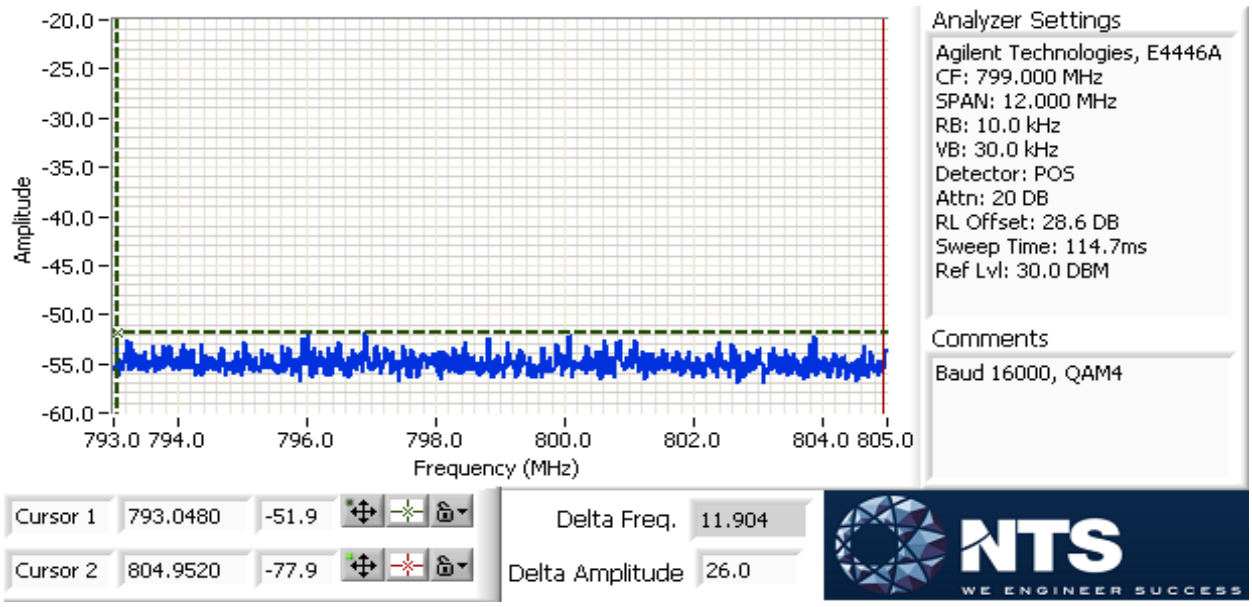



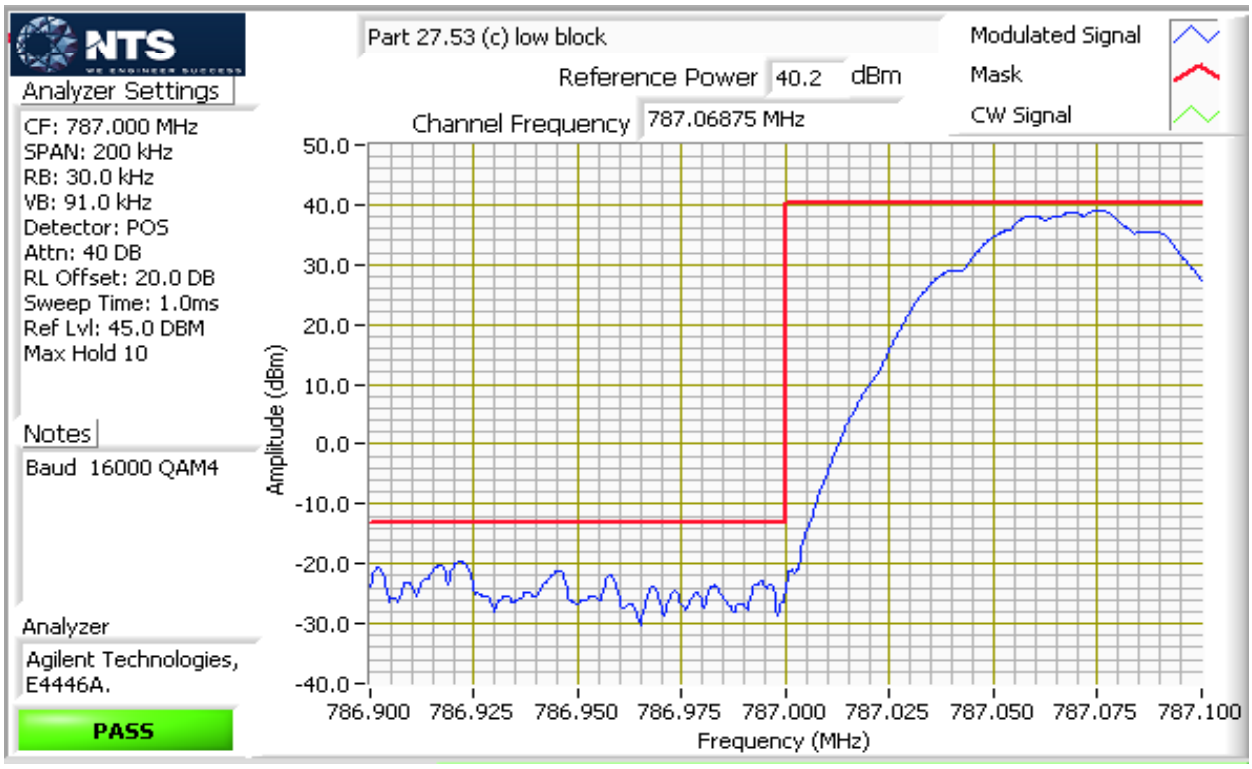
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



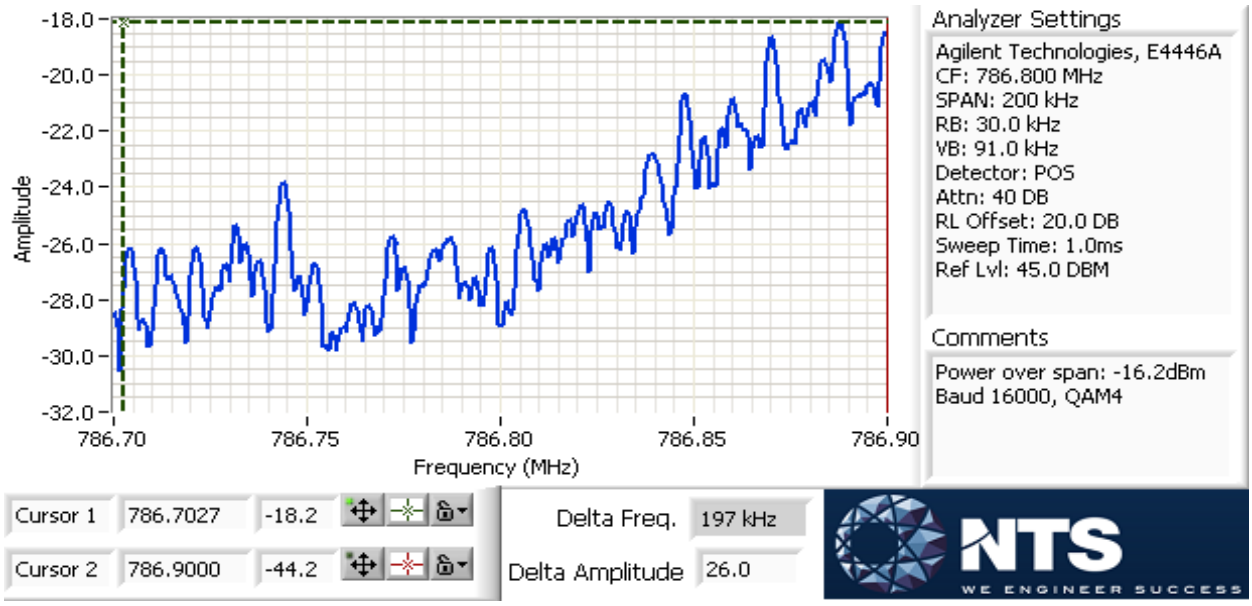



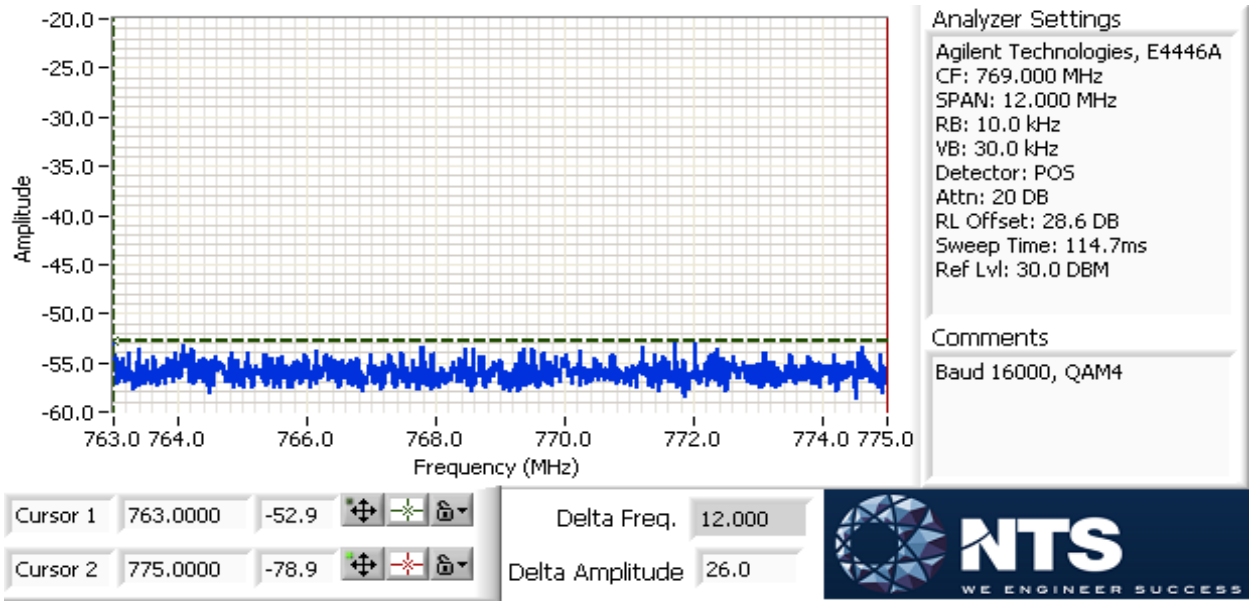
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



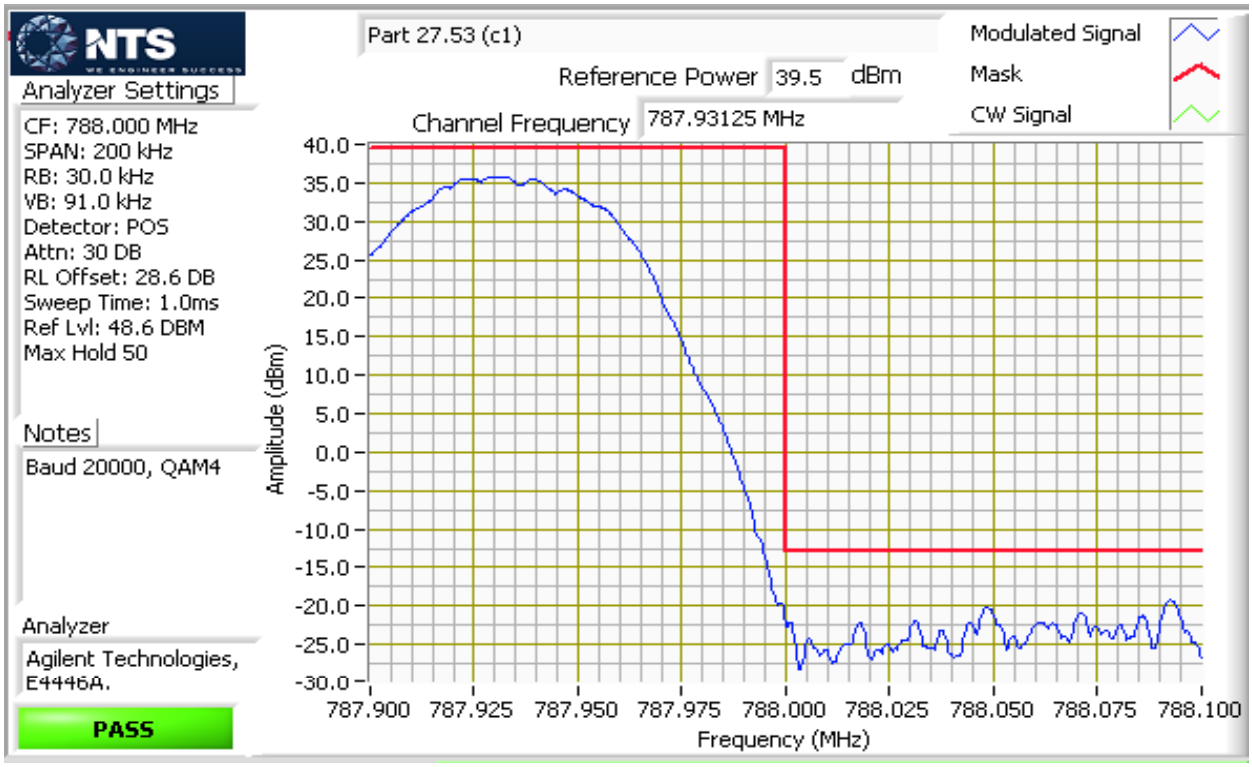



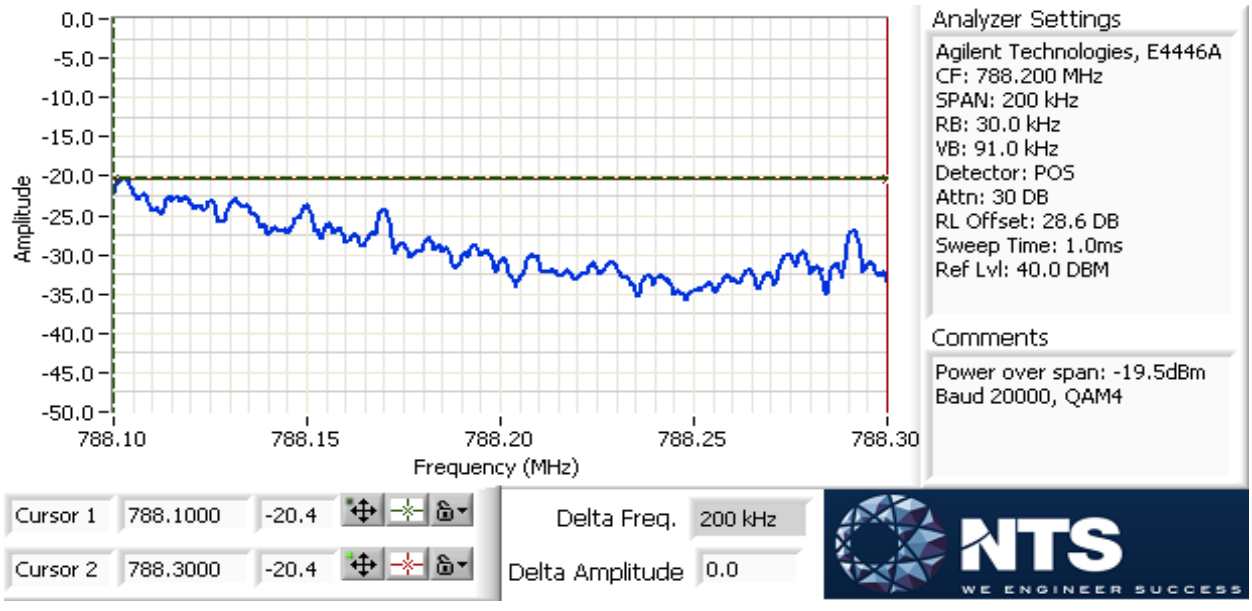
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



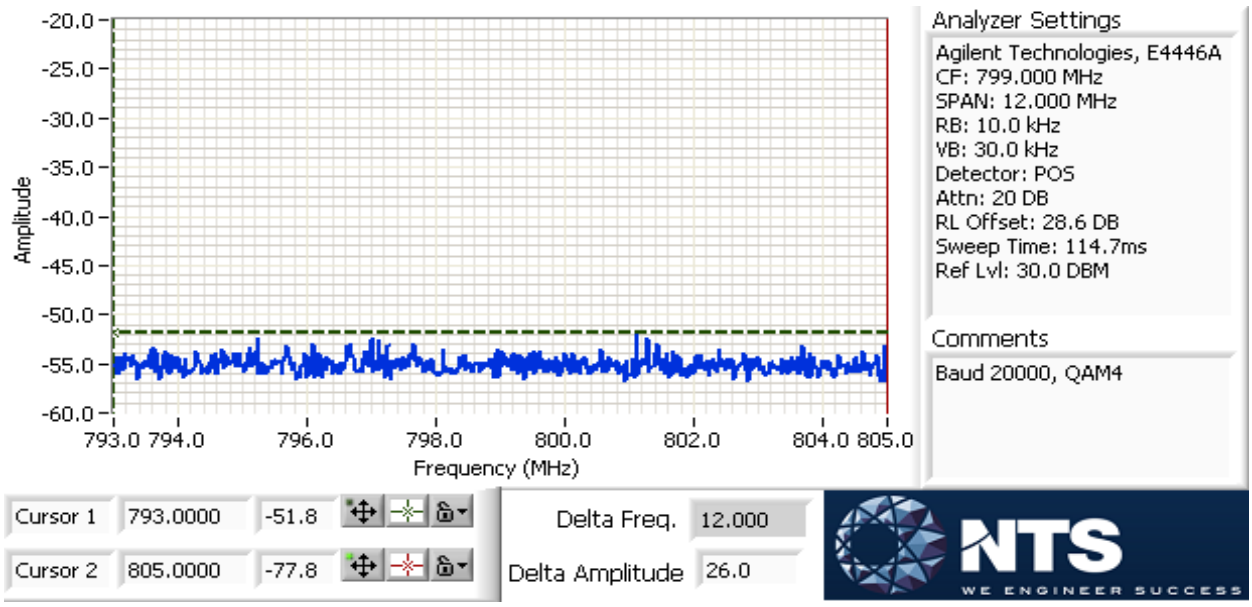



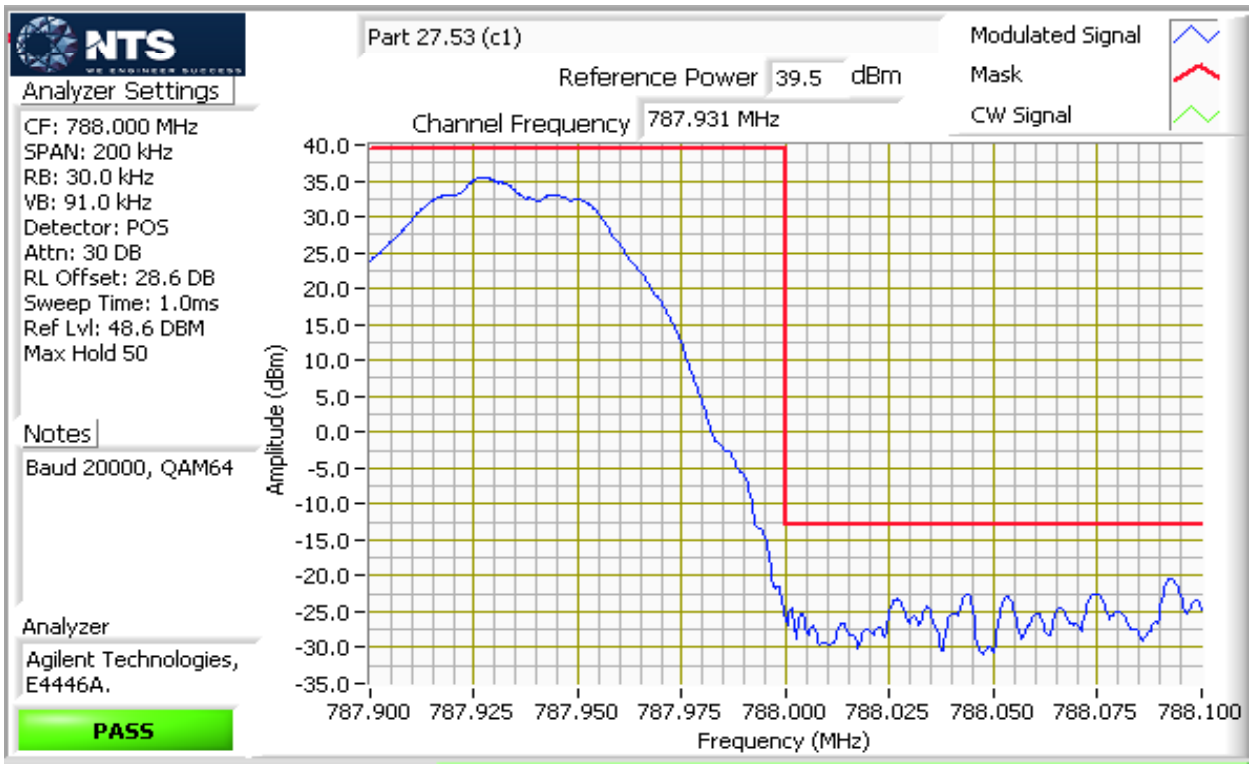
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



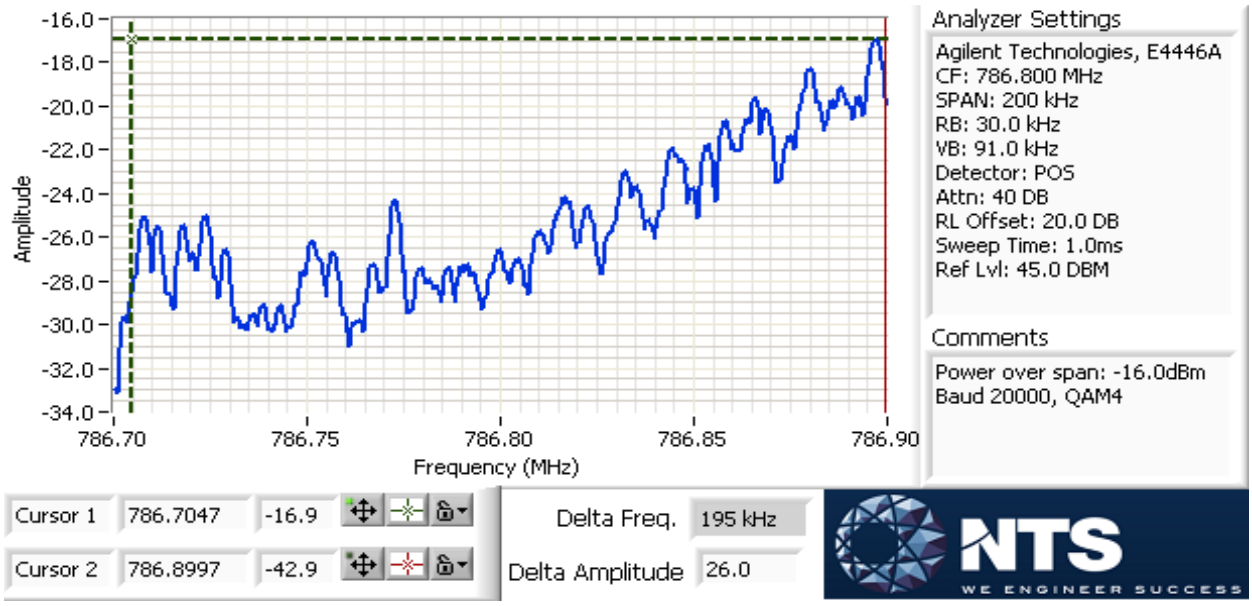



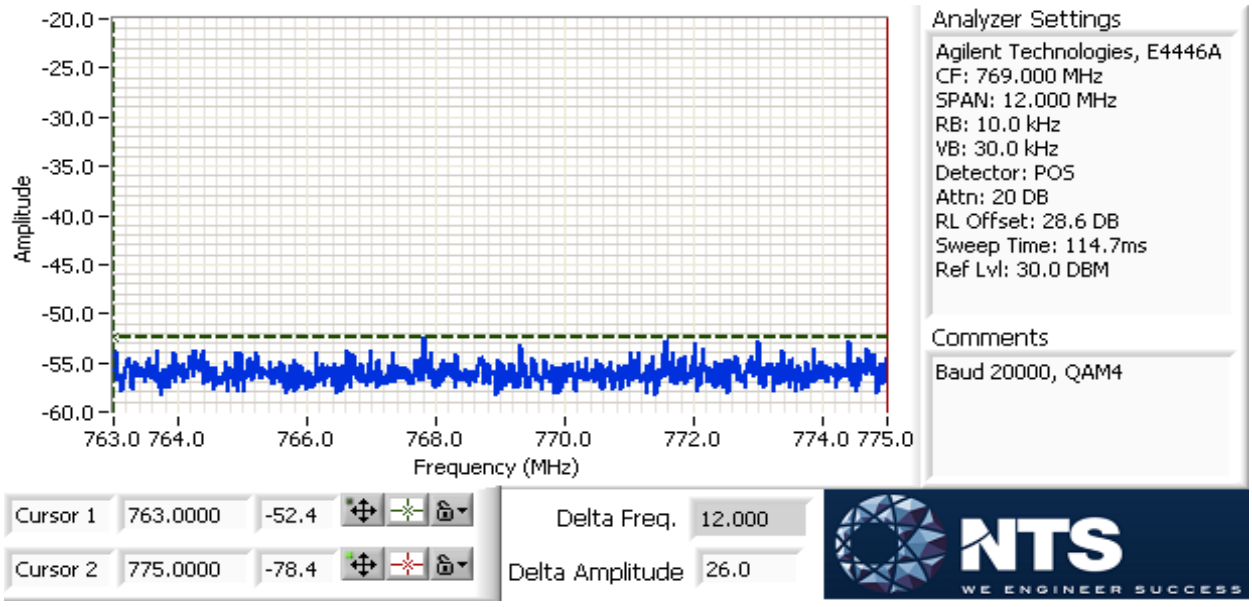
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

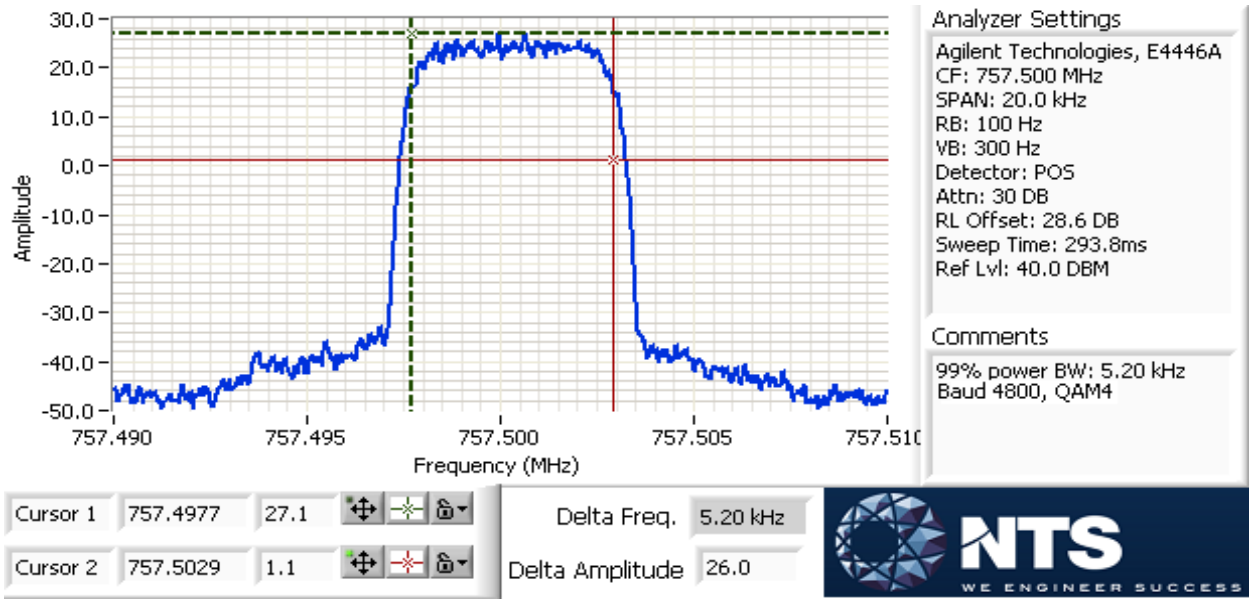
Run #3: Signal Bandwidth

Date of Test: 5/23/2016
Test Engineer: David Bare
Test Location: Fremont EMC Lab #4B

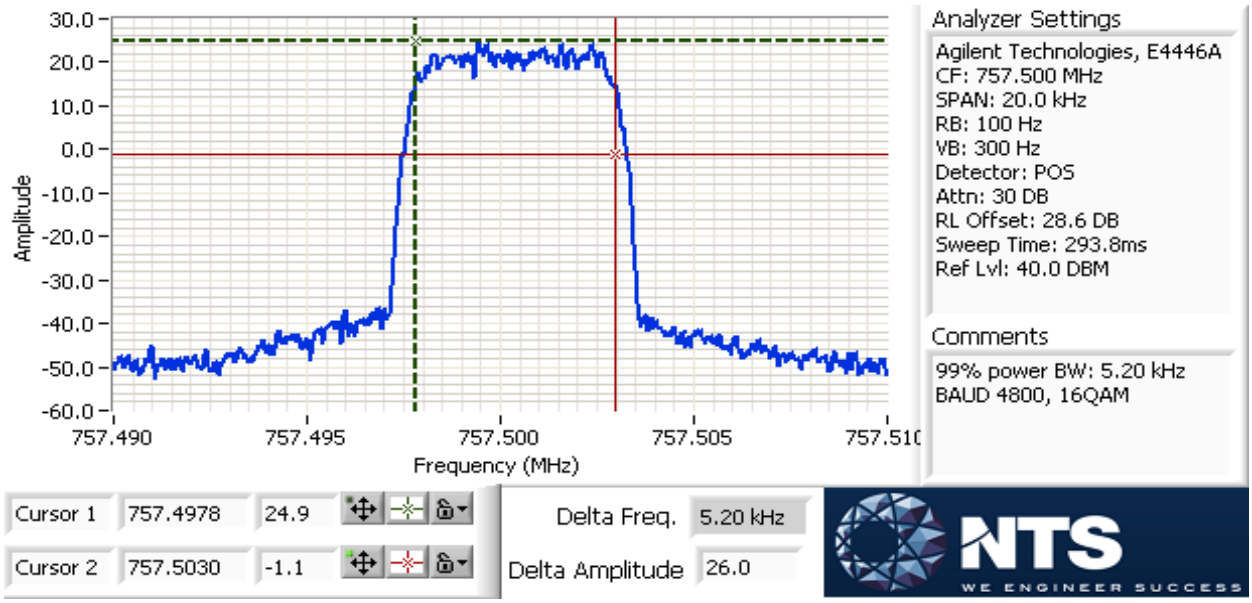
Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

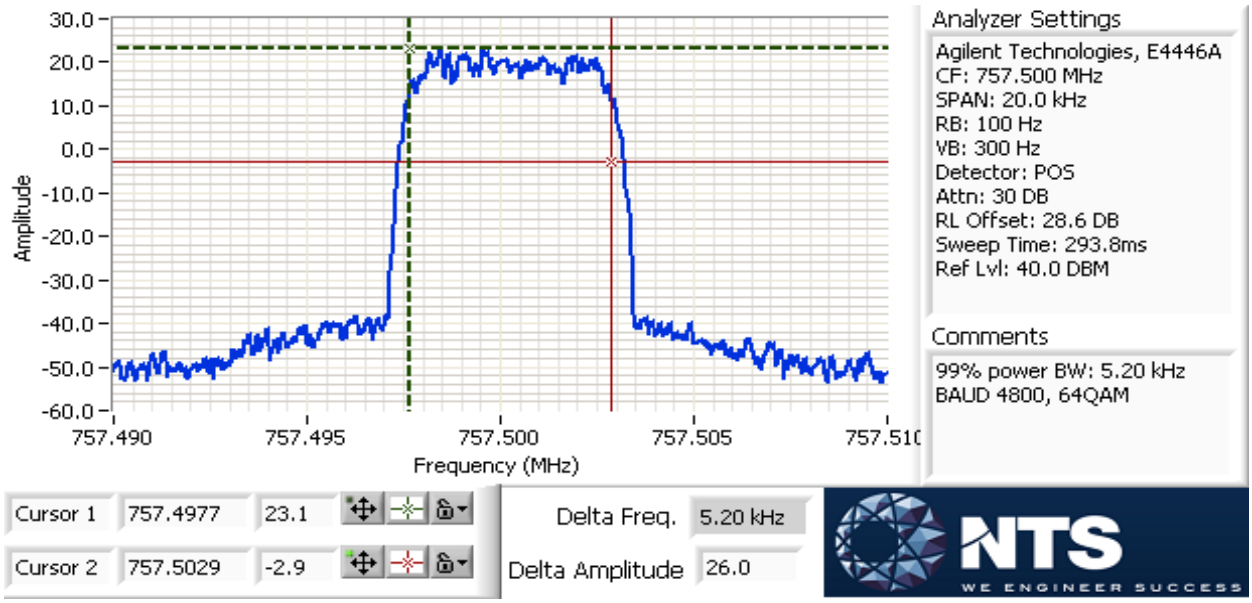
| Power Setting | Frequency (MHz) | Resolution Bandwidth | Bandwidth (kHz) | | Baud | Modem |
|---|---|---|---|---|---|---|
| | | | | 99% | | |
| 40 | 757.5 | 100 | | 5.20 | 4800 | 4QAM |
| 40 | 757.5 | 120 | | 10.3 | 9600 | 4QAM |
| 40 | 757.5 | 120 | | 10.8 | 10000 | 4QAM |
| 40 | 757.5 | 200 | | 17.1 | 16000 | 4QAM |
| 40 | 757.5 | 300 | | 21.5 | 20000 | 4QAM |
| 40 | 787.5 | 100 | | 5.18 | 4800 | 4QAM |
| 40 | 787.5 | 120 | | 10.4 | 9600 | 4QAM |
| 40 | 787.5 | 120 | | 10.7 | 10000 | 4QAM |
| 40 | 787.5 | 200 | | 17.1 | 16000 | 4QAM |
| 40 | 787.5 | 300 | | 21.5 | 20000 | 4QAM |

| | |
|---|---|
| Note 1: | 99% bandwidth measured in accordance with ANSI C63.10, with RB between 1% and 5% of the measured bandwidth and VB ≥ 3*RB and Span ≥ 1.5x and ≤ 5x of measured bandwidth. |
| Note 2: | Preliminary testing showed that the 99% BW is the same for 4QAM, 16QAM and 64QAM modulations. |

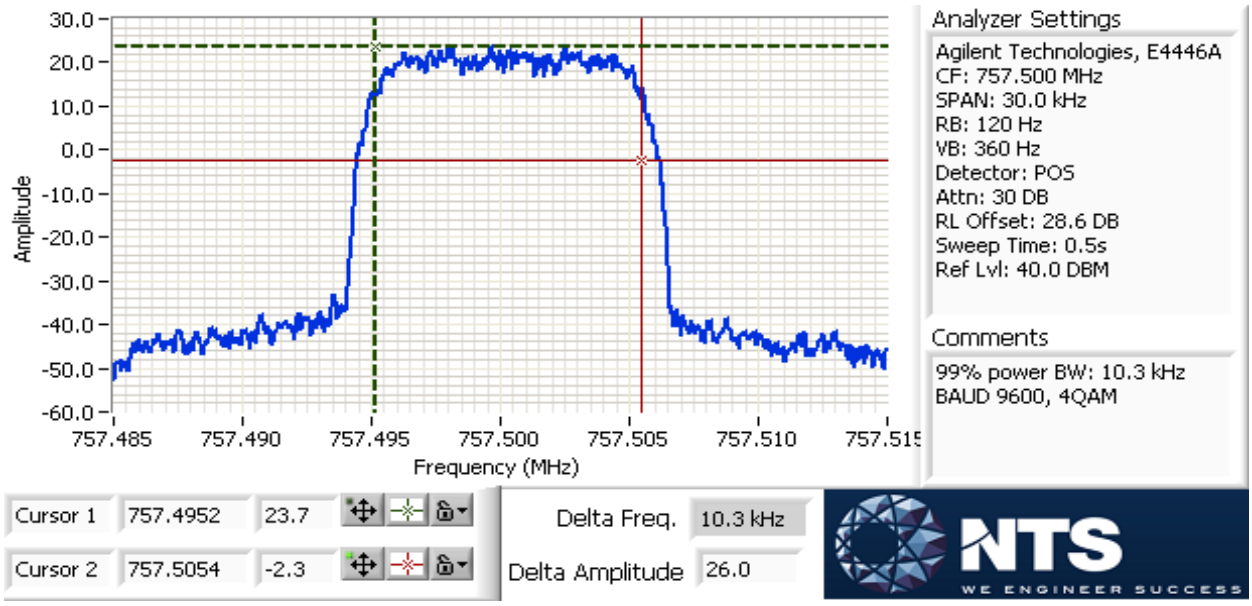


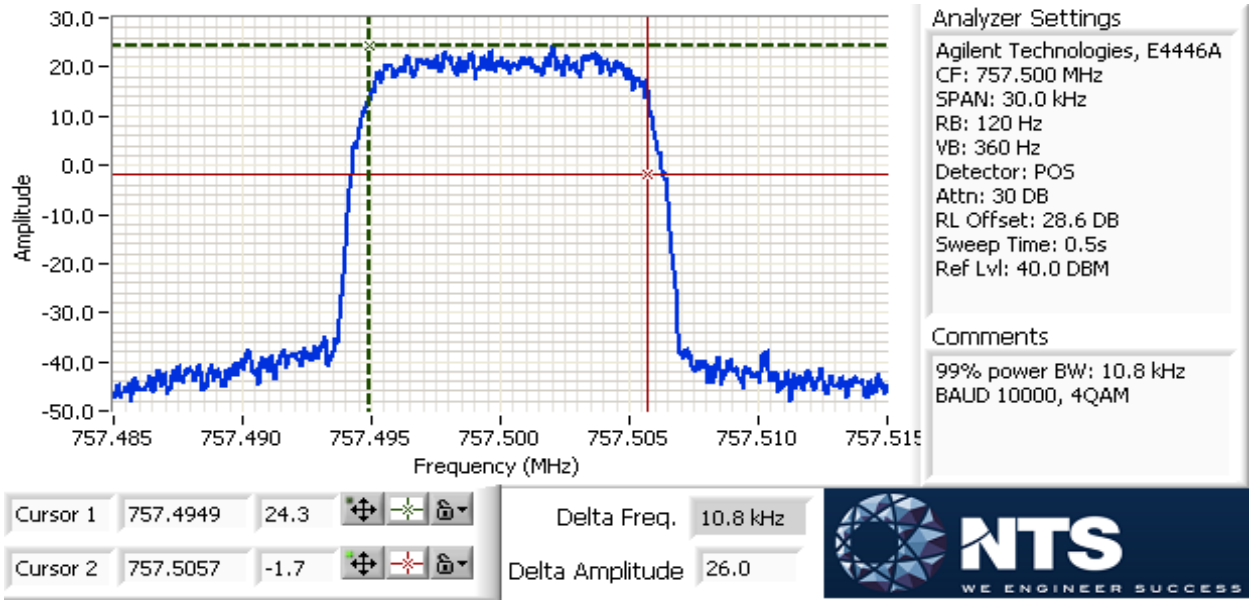
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



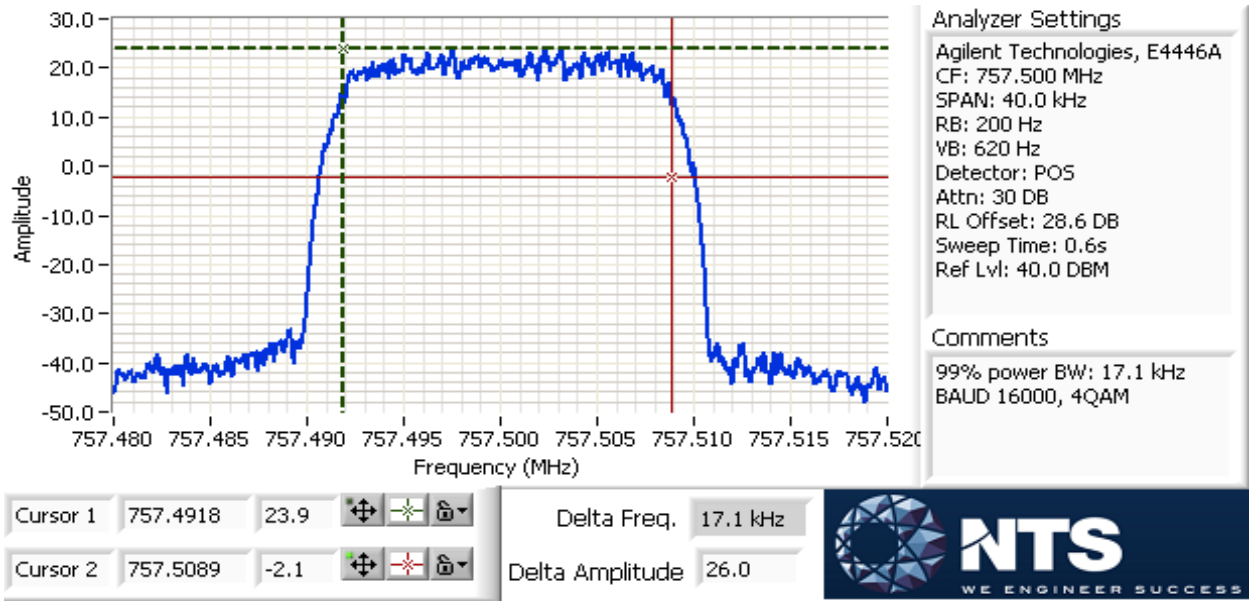



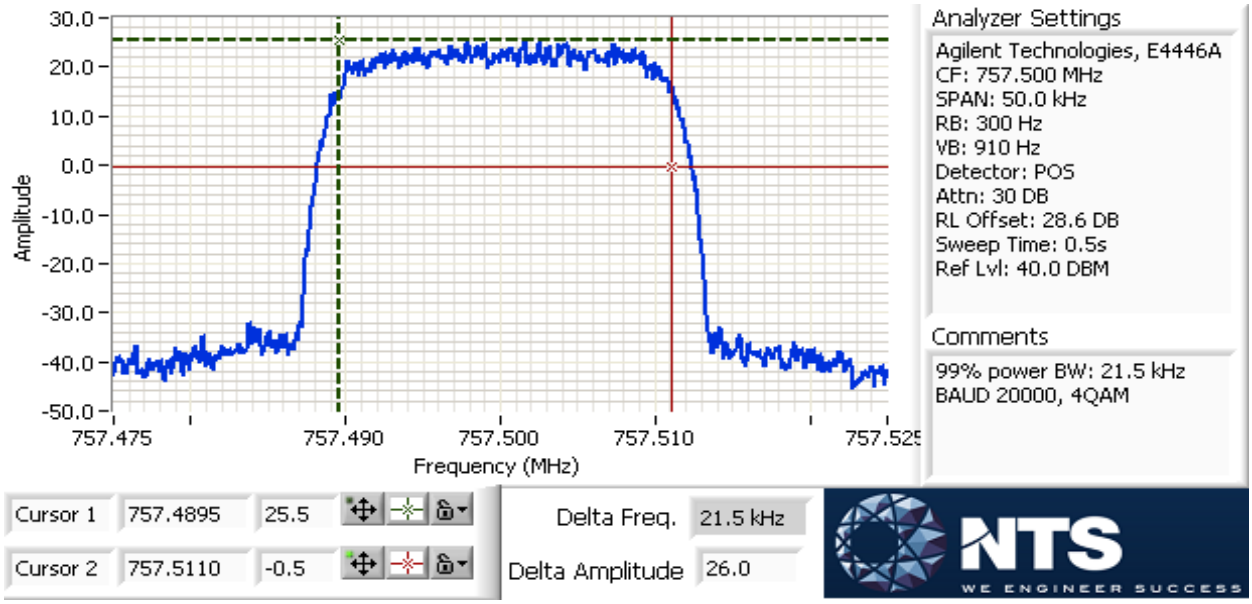
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



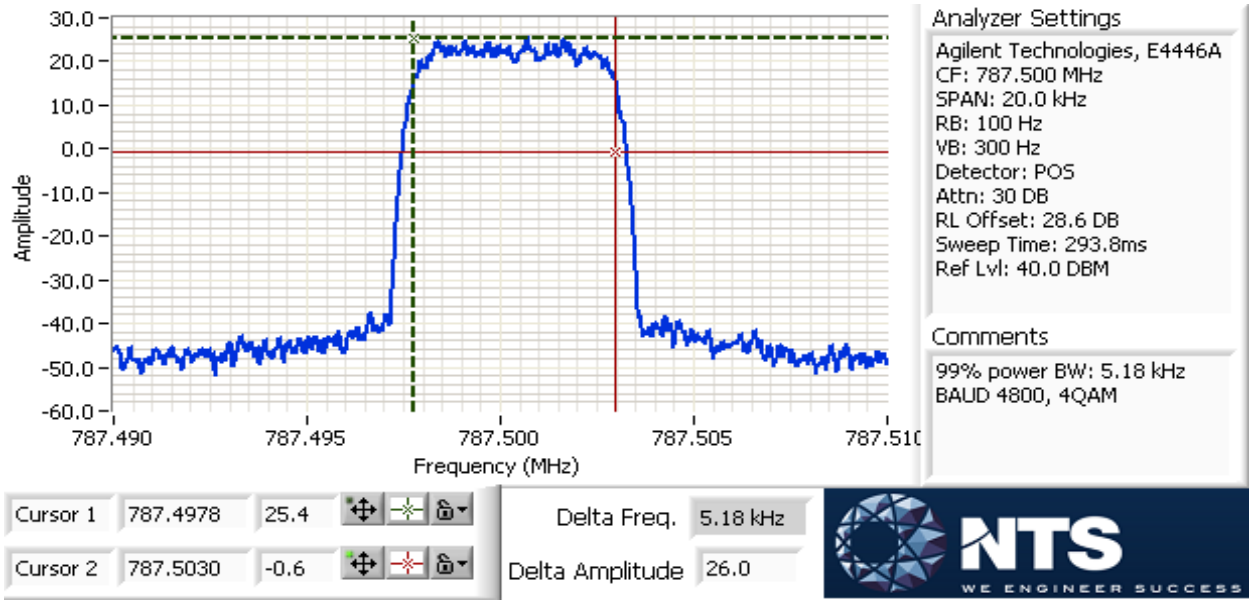



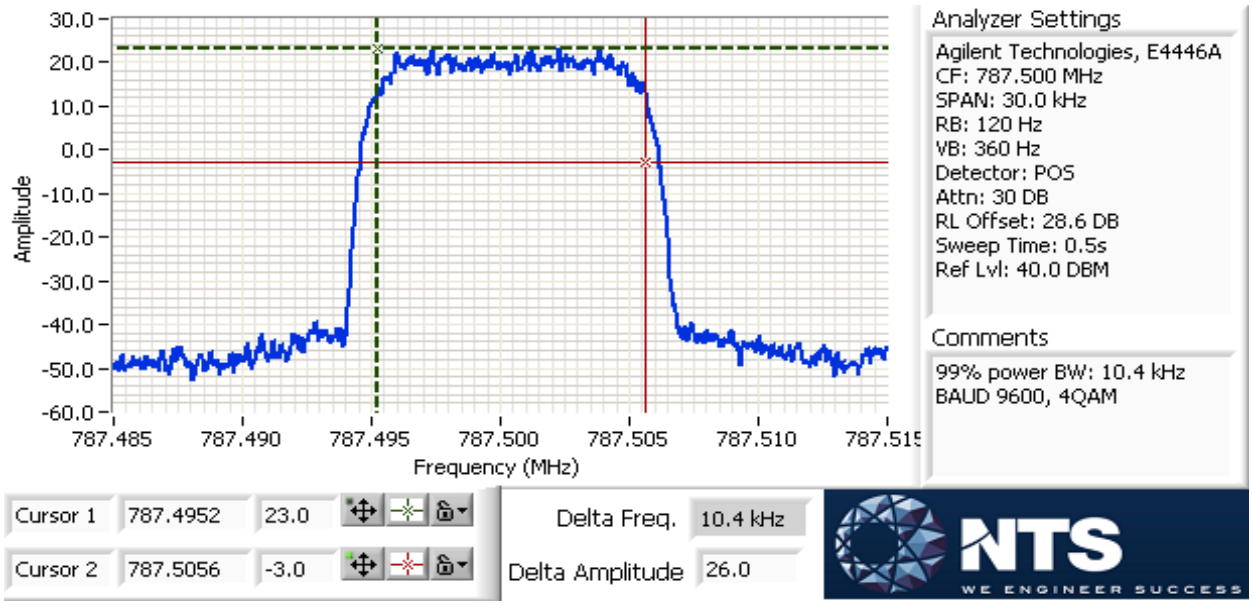
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



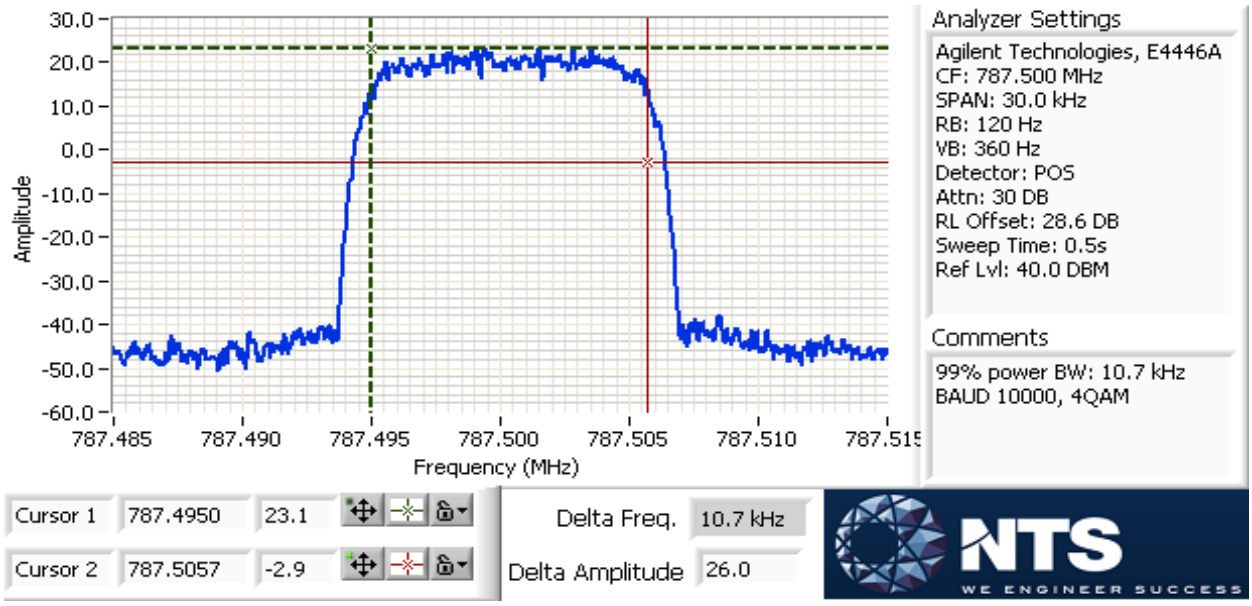



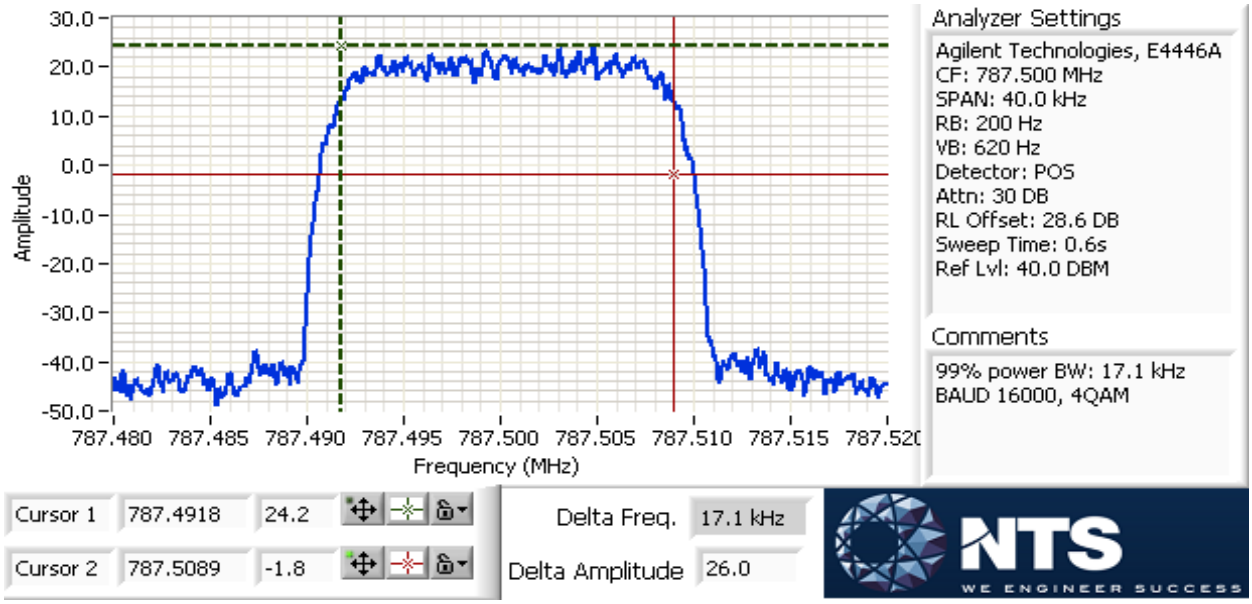
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



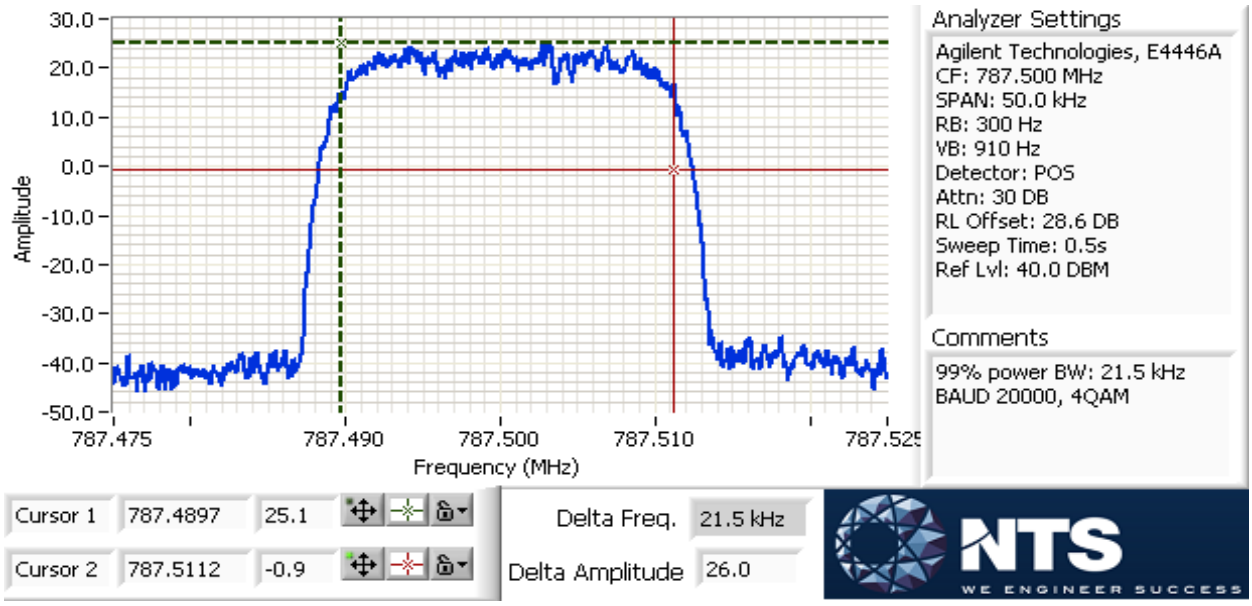



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Run #4: Out of Band Spurious Emissions, Conducted

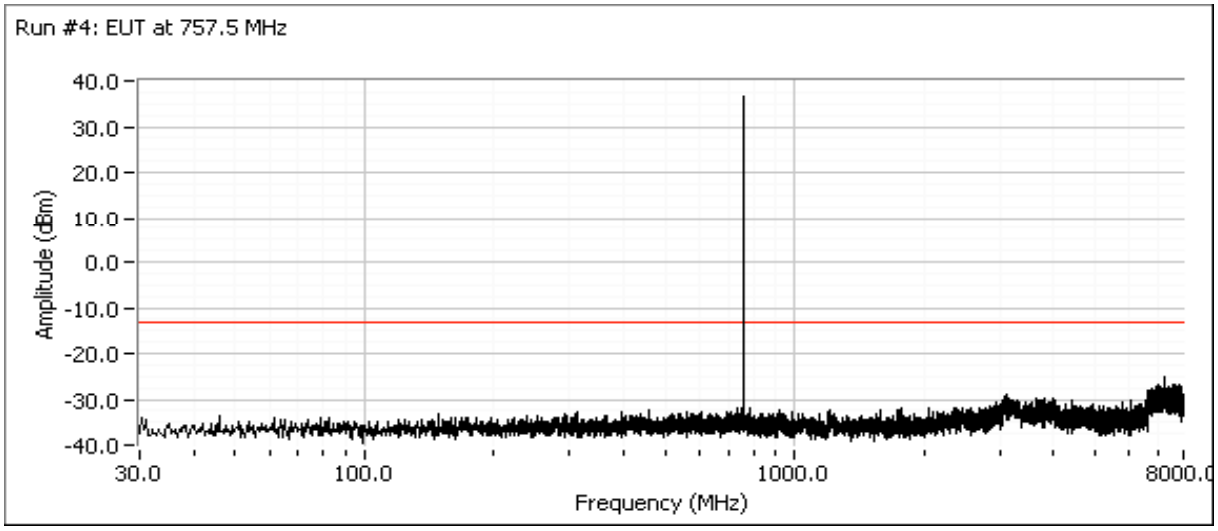
Date of Test: 7/18/2016
Test Engineer: David Bare
Test Location: Fremont EMC Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: 13.8 VDC

| Frequency (MHz) | Limit | Result |
|---|---|---|
| 757.5 | -13 dBm | Pass |
| 787.5 | -13 dBm | Pass |

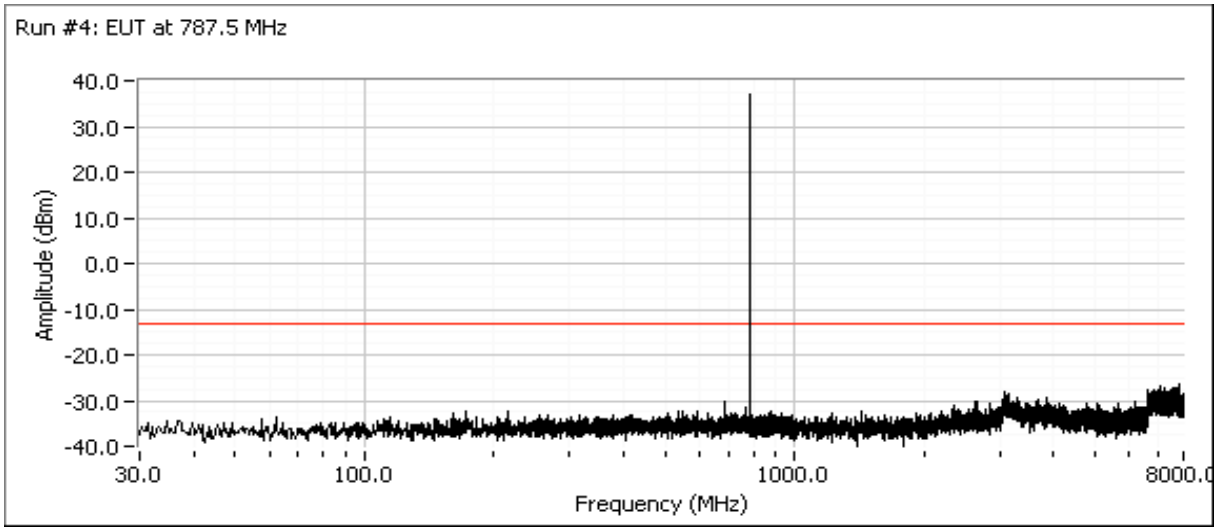
The limit is taken from FCC Part 27.53(c)(1)

Plots for low channel, power setting(s) = 40



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Plots for high channel, power setting(s) = 40



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Run #5: Out of Band Spurious Emissions, Radiated

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz (-40 dBm) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP (-50 dBm) for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.
For other spurious emisisons, the limit is taken from FCC Part 27.53(c)(1)

| | | | |
|---|---|---|---|
| limit (dBm): | -13 | -40 | -50 |
| Approximate field strength limit @ 3m: | 82.3 | 55.3 | 45.3 |

Run #5a - Preliminary measurements - chamber scans

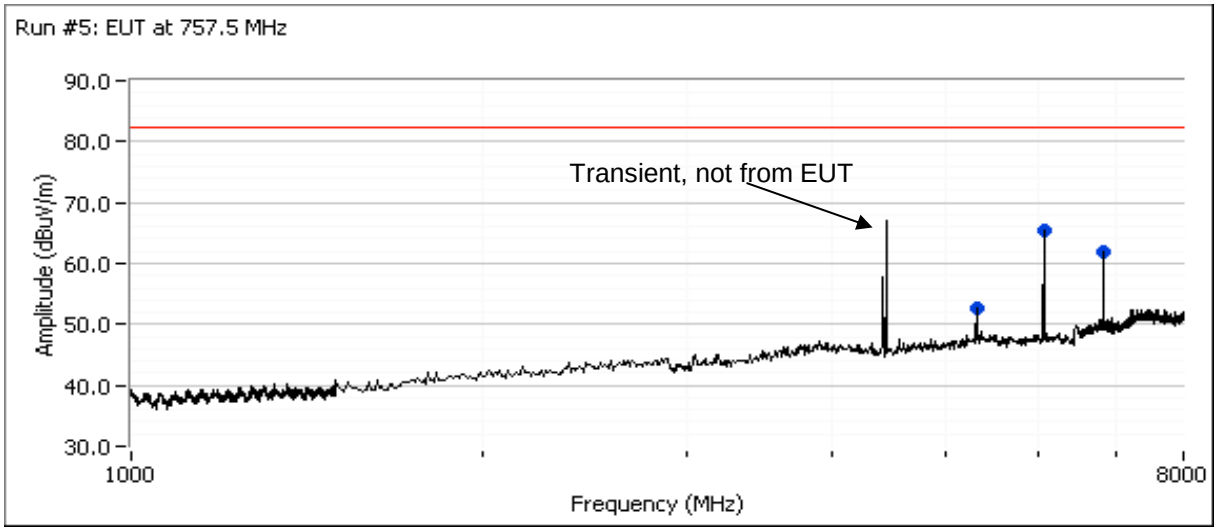
| | | | |
|---|---|---|---|
| Date of Test: | 7/18/2016 | Config. Used: | 1 |
| Test Engineer: | David Bare | Config Change: | None |
| Test Location: | Fremont Chamber #5 | EUT Voltage: | 5.25 VDC and 13.8 VDC |

| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 5302.500 | 52.6 | V | 82.2 | -29.6 | Peak | 195 | 2.0 | | 757.5 |
| 6060.000 | 65.4 | V | 82.2 | -16.8 | Peak | 190 | 2.0 | | 757.5 |
| 6817.500 | 62.0 | V | 82.2 | -20.2 | Peak | 193 | 2.5 | | 757.5 |
| 3937.500 | 52.7 | H | 82.2 | -29.5 | Peak | 207 | 1.5 | | 787.5 |
| 5512.500 | 56.7 | V | 82.2 | -25.5 | Peak | 135 | 2.0 | | 787.5 |
| 6300.000 | 63.0 | V | 82.2 | -19.2 | Peak | 30 | 2.5 | | 787.5 |
| 7087.500 | 62.8 | V | 82.2 | -19.4 | Peak | 27 | 2.5 | | 787.5 |
| 1559-1610 MHz band, 12.2 dBd Yagi Antenna | | | | | | | | | |
| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 1575.000 | 44.0 | H | 55.3 | -11.3 | PK | 155 | 2.2 | | 787.5 |
| 1559-1610 MHz band, 3 dBd Monopole Antenna | | | | | | | | | |
| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 1575.000 | 45.8 | H | 55.3 | -9.5 | Peak | 89 | 1.5 | | 787.5 |

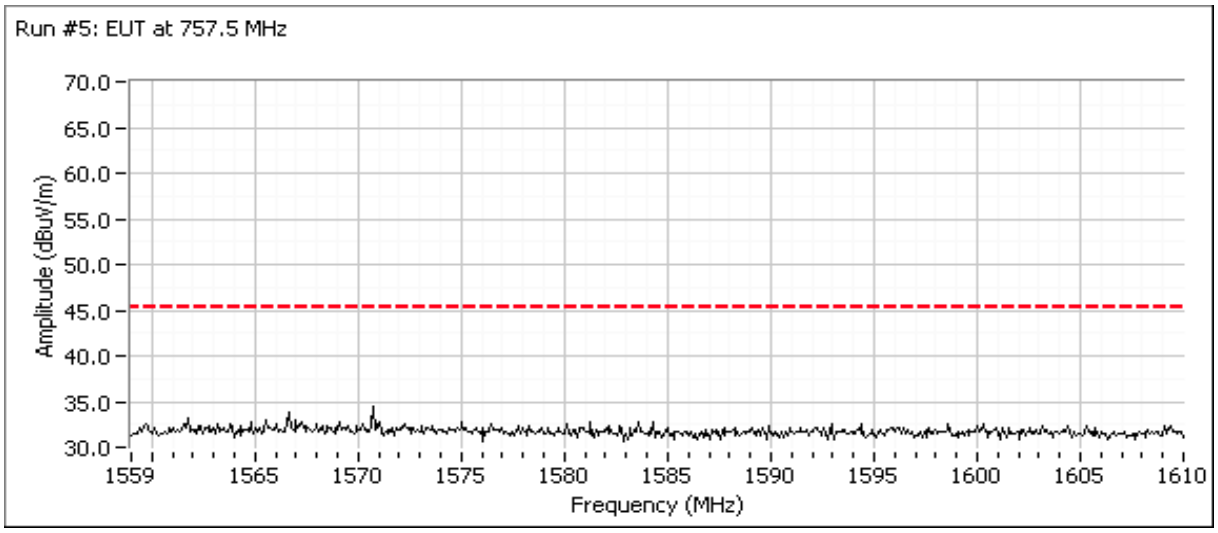
| | |
|---|---|
| Note 1: | The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2 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 except in the 1559 to 1610 MHz band. |
| Note 3: | Emission at 1575 MHz is more than 10 kHz wide |
| Note 4: | No emissions detected above the test system noise floor in the 1559 -1610 Mhz band with the EUT operating at 757.5 MHz. |

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

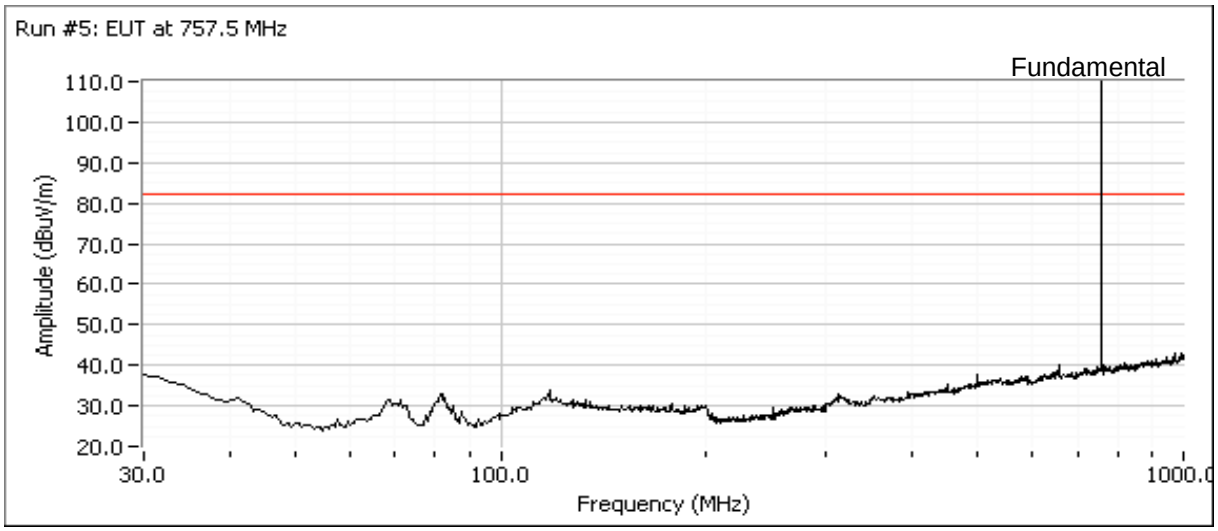
Plots for low channel, power setting(s) = 40



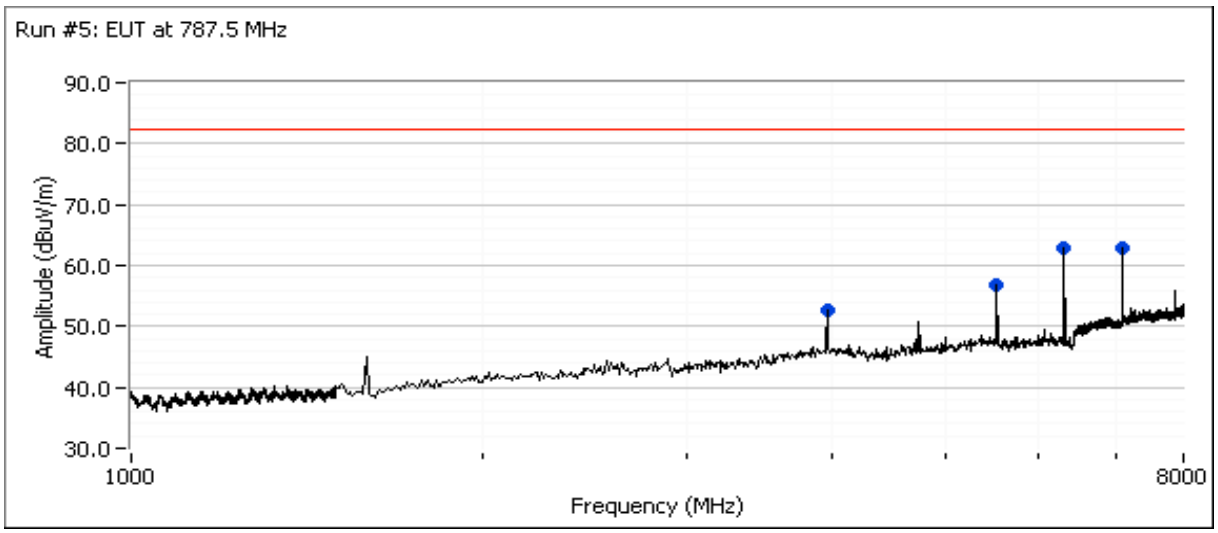

1559-1610 MHz band, Yagi Antenna



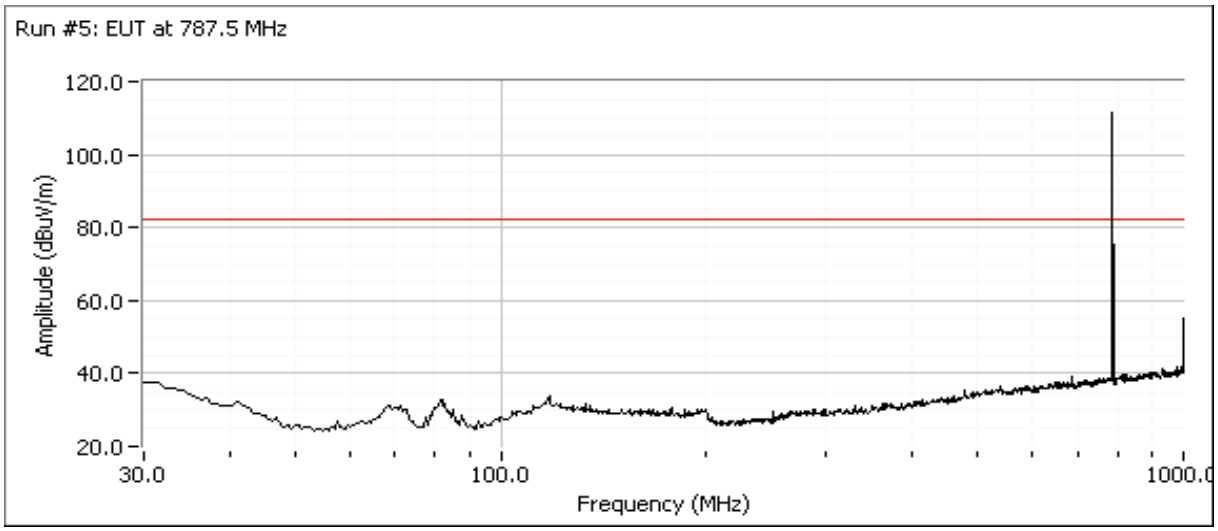
| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |




Plots for high channel, power setting(s) = 40

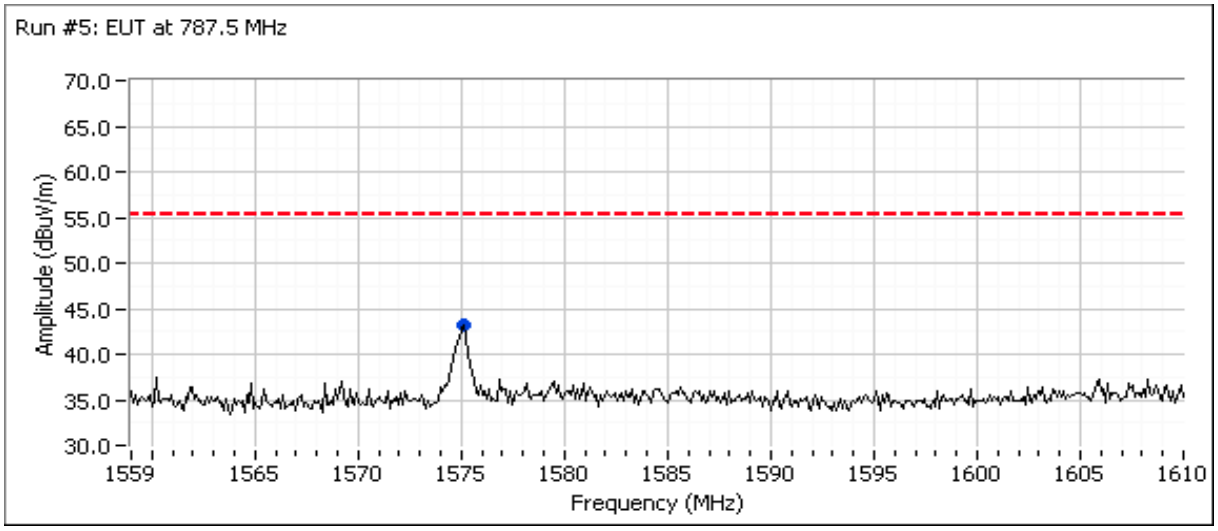


| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

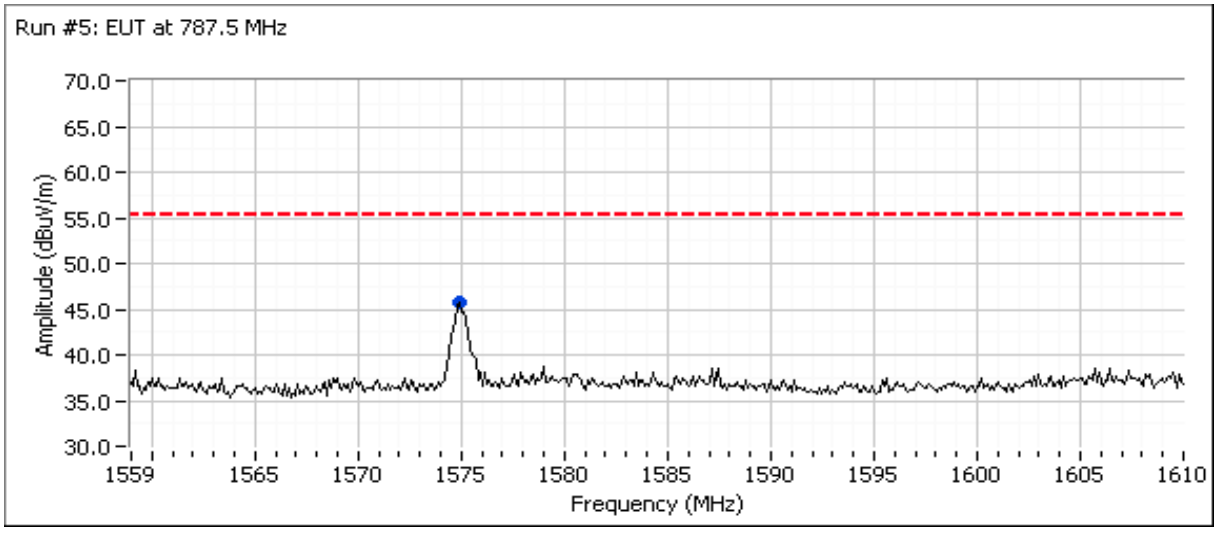


| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

1559-1610 MHz band, Yagi Antenna




1559-1610 MHz band, Monopole Antenna



| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

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

Date of Test: 7/18/2016 Config. Used: 1

Test Engineer: David Bare Config Change: None

Test Location: Fremont Chamber #5 EUT Voltage: 5.25 VDC and 13.8 VDC

EUT Field Strength

| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 6060.120 | 66.7 | V | 82.2 | -15.5 | PK | 150 | 2.1 | RB 1 MHz;VB 3 MHz;Pe | 757.5 |
| 6817.330 | 63.6 | V | 82.2 | -18.6 | PK | 187 | 2.2 | RB 1 MHz;VB 3 MHz;Pe | 757.5 |
| 6300.170 | 63.8 | V | 82.2 | -18.4 | PK | 40 | 2.5 | RB 1 MHz;VB 3 MHz;Pe | 787.5 |
| 7087.550 | 64.3 | V | 82.2 | -17.9 | PK | 20 | 2.5 | RB 1 MHz;VB 3 MHz;Pe | 787.5 |
| 1559-1610 MHz band, Yagi Antenna | | | | | | | | | |
| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 1575.020 | 46.2 | H | 55.3 | -9.1 | PK | 155 | 2.2 | RB 1 MHz;VB 3 MHz;Pe | 787.5 |
| 1559-1610 MHz band, Monopole Antenna | | | | | | | | | |
| Frequency | Level | Pol | FCC Part 27 | | Detector | Azimuth | Height | Comments | Channel |
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | | |
| 1575.030 | 48.5 | H | 55.3 | -6.8 | PK | 166 | 1.6 | RB 1 MHz;VB 3 MHz;Pe | 787.5 |

| | |
|---|---|
| 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=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 20dB of margin relative to this field strength limit is determined using substitution measurements. |
| Note 2: | Measurements are made with the antenna port terminated except in the 1559 to 1610 MHz band. |

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Substitution measurements

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 |
| 1575.030 | -41.5 | 8.4 | 61.9 | 95.0 | 48.5 | -46.5 | -48.7 | | -40.0 | -8.7 |

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 |
| 6060.120 | -41.7 | 11.0 | 63.7 | 94.4 | 66.7 | -27.7 | -29.9 | | -13.0 | -16.9 |
| 6817.330 | -41.8 | 11.3 | 63.5 | 94.0 | 63.6 | -30.4 | -32.6 | | -13.0 | -19.6 |
| 6300.170 | -41.7 | 11.1 | 63.3 | 93.9 | 63.8 | -30.1 | -32.3 | | -13.0 | -19.3 |
| 7087.550 | -41.9 | 11.6 | 63.4 | 93.7 | 64.3 | -29.4 | -31.6 | | -13.0 | -18.6 |

| | |
|---|---|
| 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. |

Run #6: Modulation Analysis

QAM4, QAM16, QAM64

| | | | |
|---|---|---|---|
| Client: | GE MDS LLC | Job Number: | JD101568 |
| Model: | LN700 | T-Log Number: | T101702 |
| | | Project Manager: | Christine Krebill |
| Contact: | Dennis McCarthy | Project Coordinator: | - |
| Standard: | FCC Parts 15 and 27 | Class: | N/A |

Run #7: Frequency Stability

Date of Test: 7/18-19/2016
Test Engineer: David Bare
Test Location: Fremont EMC Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: Various (see below)

Nominal Frequency: 757.5 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) |
| -40 | 757.499928 | -72 | -0.1 |
| -30 | 757.499998 | -2 | 0.0 |
| -20 | 757.500085 | 85 | 0.1 |
| -10 | 757.500032 | 32 | 0.0 |
| 0 | 757.499965 | -35 | 0.0 |
| 10 | 757.500095 | 95 | 0.1 |
| 20 | 757.500088 | 88 | 0.1 |
| 30 | 757.500068 | 68 | 0.1 |
| 40 | 757.500062 | 62 | 0.1 |
| 50 | 757.500015 | 15 | 0.0 |
| 60 | 757.500002 | 2 | 0.0 |
| 70 | 757.499922 | -78 | -0.1 |
| | Worst case: | 95 | 0.1 |

Frequency Stability Over Input Voltage

Nominal Voltage is from 10 to 60 Vdc.

| Voltage | Frequency Measured | Drift | |
|---|---|---|---|
| (DC) | (MHz) | (Hz) | (ppm) |
| 10 | 757.500088 | 88 | 0.1 |
| 60 | 757.500088 | 88 | 0.1 |
| | Worst case: | 88 | 0.1 |

| Voltage | Frequency Measured | Drift | |
|---|---|---|---|
| (DC) | (MHz) | (Hz) | (ppm) |
| 8.9 | 757.500082 | 82 | 0.1 |

Note 1: Maximum drift of fundamental frequency before it shut down at 8.4 Vdc.

*End of Report*

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marks the last page of this test report.