41039 Boyce Road
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Radio Test Report

FCC Parts 24 and 101 and RSS-119
(930-941 MHz, 935-940 MHz and 928-960 MHz)

Model: Orbit SDM9-1 Module

IC CERTIFICATION #:	101D-SDM91
FCC ID:	E5MDS-SDM9-1
COMPANY:	GE Digital Energy - MDS 175 Science Pkwy Rochester, NY 14620
TEST SITE(S):	NTS Labs LLC 41039 Boyce Road. Fremont, CA. 94538-2435
PROJECT NUMBER:	PR166351
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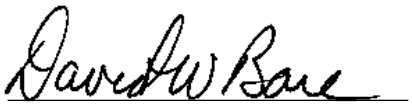
VALIDATING SIGNATORIES

PROGRAM MGR



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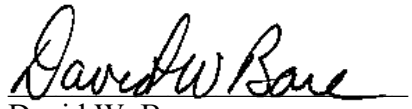

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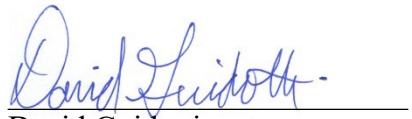

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	December 12, 2022	First release	
1	March 17, 2023	Updated ISED Certification Number, revised to remove FCC Part 90, add OOB plots, add missing ambient conditions	David Bare
2	March 20, 2023	Revised to remove FCC part 90 references	David Bare

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SCOPE

Tests have been performed on the GE Digital Energy - MDS model Orbit SDM9-1 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.

- Code of Federal Regulations (CFR) Title 47 Part 2
- RSS-Gen Issue 5, April 2018
- CFR 47 Part 24 Subpart E (Narrowband PCS)
- CFR 47 Part 101
- RSS-119, Issue 12, May 2015 (Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz)

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 NTS Labs LLC test procedures:

ANSI C63.26:2015
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.

NTS Labs LLC is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

The test results recorded herein are based on a single type test of the GE Digital Energy - MDS model Orbit SDM9-1 Module and therefore apply only to the tested sample. The sample was selected and prepared by Jonathan Vilagy of GE Digital Energy - MDS.

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 Digital Energy - MDS model Orbit SDM9-1 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

RSS-119

	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
	RSS-119	Frequency range(s)	930-941 MHz	930-941 MHz	Complied
	RSS-119	RF power output at the antenna terminals	30 dBm to 40.7 dBm	50 dBm	Complied
	RSS-119	Emission types	F1D, F2D, F3D	-	-
		Emission mask	Mask G	Within Mask	Complied
	RSS-GEN 6.7 RSS-119	Occupied Bandwidth	9.78 kHz, 15.2 kHz	13.6 kHz and 20 kHz	Complied
		Occupied Bandwidth	9.78 kHz, 15.2 kHz	11.25 kHz and 20.0 kHz	Complied
Transmitter spurious emissions					
	RSS-119	At the antenna terminals	-24.1 dBm	-20 dBm	Complied
	RSS-119	Field strength	-35.6 dBm ERP	-20 dBm	Complied
Other details					
	RSS-119	Frequency stability	0.5 ppm	Note 2	Complied
	RSS-102	RF Exposure	See separate MPE exhibit		Complied
		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	24Vdc, 2A		
-	-	Antenna Gain	Up to 9.15 dBi		

Note 1 Pass/Fail criteria defined by standards listed above.
Note 2 Refer to separate GE MDS LLC attestation concerning frequency stability for RSS-119 operation.
Note 3 The measurement at the channel edge is made in a reference bandwidth of at least 1% the emission bandwidth is used and the measured power is integrated over 100 kHz. For measurements more than 1MHz from the edge of the channel the measurement bandwidth is 100 kHz for emissions below 1 GHz and 1MHz for emissions above 1 GHz.

FCC Part 24D (Base Station))

FCC		Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) §24.129		Frequency Range	930-931 MHz 940-941 MHz	930-931 MHz 940-941 MHz	Complied
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 §24.132		RF power output at antenna terminals	30 dBm to 40.7 dBm	65.4 dBm ERP	Complied
§2.1033 (c) (4)		Emission types	F1D, F2D, F3D	-	-
§2.1047 §24.133(a)(1) and (a)(2)		Emissions Mask			Complied
§2.1049 §24.131		Occupied Bandwidth	5.76 kHz 7.13 kHz 15.2 kHz 26.8 kHz	10 kHz 10 kHz 20 kHz 45 kHz	Complied
Transmitter spurious emissions					
§2.1051 §2.1057 §24.133		At the antenna terminals	-24.1 dBm	-13 dBm	Complied
§2.1053 §2.1057 §24.133		Field strength	-35.6 dBm	-13 dBm	Complied
Other details					
§2.1055 §24.135		Frequency stability	0.5 ppm	1.0 ppm	Complied
§2.1093		RF Exposure	See separate MPE exhibit		Complied
§2.1033 (c) (8)		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	24Vdc, 2A		
-	-	Antenna Gain	Up to 9.15 dBi		
Note 1 Pass/Fail criteria defined by standards listed above.					

FCC Part 101 and RSS-119

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) §101.101	RSP-100, SRSP-504, -505, -506, -507	Frequency Range	928-960 MHz	928-960 MHz	Complied
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 §101.113	RSS-119 5.4 SRSP-504, -505, -506, -507	RF power output at antenna terminals	30 dBm to 40.7 dBm	47.0 dBm EIRP[1]	Complied
§2.1033 (c) (4) §2.1047 §101.111(a)(5) & (a)(6)	RSP-100 RSS-119 5.8 (masks D and G)	Emission Types	F1D, F2D, F3D	-	-
		Emission Mask	Within masks	Within masks	Complied
	RSS-GEN 6.7 RSS-119 5.5	Occupied Bandwidth	9.78 kHz 15.2 kHz 26.8 kHz	11.25 kHz 20 kHz 50 kHz[2]	Complied
§2.1049 §101.109		Occupied Bandwidth	5.76 kHz 7.13 kHz 15.2 kHz 26.8 kHz	200 kHz	Complied
Transmitter spurious emissions					
§2.1051 §2.1057 §101.111	RSS-119 5.8	At the antenna terminals	-24.1 dBm	-13 dBm	Complied
§2.1053 §2.1057 §101.111	RSS-119 5.8	Field strength	-35.5 dBm	-13 dBm eirp	Complied
Other details					
§2.1055 §101.107	RSS-119 5.3	Frequency stability	0.5 ppm	1.5 ppm	Complied
§2.1093	RSS-102	RF Exposure	See separate MPE exhibit		Complied
§2.1033 (c) (8)	RSP-100	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	24Vdc, 2A		
-	-	Antenna Gain	Up to 9.15 dBi		

Note 1 Power is adjusted to comply with 47 dBm EIRP limitation as needed depending on antenna gain
Note 2 Aggregate occupied bandwidth per RSS-119 clause 5.6
Note 3 Pass/Fail criteria defined by standards listed above.

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 +60°C as specified in FCC §2.1055(a)(1) increased to +60°C.

MEASUREMENT UNCERTAINTIES

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

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE Digital Energy - MDS model Orbit SDM9-1 Module is a radio module designed to be used in GE Digital Energy – MDS SD Master Station chassis. It operates in the 930-931 MHz and 940-941 MHz bands for FCC Part 24, 928-960 MHz band for FCC Part 101 and as allowed per RSS-119.

The sample was received on November 10, 2022 and tested on November 16 and 18, 2022. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID / ISED CN
GE Digital Energy - MDS	SDM9-1	Orbit Radio Module		E5MDS-SDM9-1 101D-SDM91

OTHER EUT DETAILS

The radio module can operate on 6.25, 12.5, 25 and 50 kHz channel spacings using F1D, F2D or F3D modulation depending on rule part and licensing.

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host SD Master Station.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Labs LLC.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
GE MDS LLC	-	Test Fixture	-	-
Hp	6024A	Power Supply	2430A-03013	-

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

Company	Model	Description	Serial Number	FCC ID
hp	HSN-124C-5	Laptop	5CG014D6TC	-

No support equipment was used during testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Card Edge Connector	Test Fixture	Direct connection	-	-

SUPPORT EQUIPMENT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Test Fixture Power	Power Supply	Two wire	Unshielded	1.8
Test Fixture Serial	Laptop	Multiwire	Shielded	1.5

The serial cable was removed during testing after configuration of the EUT.

EUT OPERATION

During emissions testing the EUT was configured to transmit on the selected channel at power setting of 40 (maximum) with or without modulation depending on the test.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the NTS Labs LLC test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

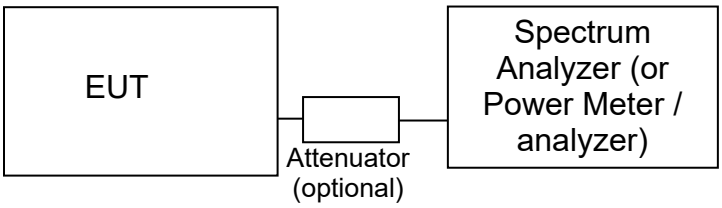
Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 6.2 of RSS-GEN, NTS Labs LLC has been recognized as an accredited test laboratory by the Commission and Innovation, Science and Economic Development Canada. A description of the facilities employed for testing is maintained by NTS Labs LLC.

Site	Company / Registration Numbers		Location
	FCC	Canada	
Chamber 3	US1031	2845B (Wireless test lab #US0027)	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4			
Chamber 5			
Chamber 7			

ANSI C63.26 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Results from testing performed in this chamber have been correlated with results from an open area test site. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.26.

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 C63.26. 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 (VBW = 3 x RBW) 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 tuned 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.

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.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.26 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 may then be 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 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 may be 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 30 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.

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.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Spurious Emissions (30-10000MHz), 14, 15, 16-Nov-22					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Hewlett Packard	Spectrum Analyzer (Red)	8564E (84125C)	WC055584	11/3/2021	12/3/2022
EMCO	Antenna, Horn, 1 - 18 GHz (SA40-Red)	3115	WC064463	7/9/2022	7/9/2024
Sunol Sciences	Biconilog, 30 - 3000 MHz	JB3	WC064536	1/29/2021	3/23/2023
Com-Power	Preamplifier, 1 - 1000 MHz	PAM-103	WC064733	6/2/2022	6/2/2023
Rohde & Schwarz	EMI Test Receiver, 20 Hz - 40 GHz	ESI	WC068000	7/21/2022	7/21/2023
MITEQ	Preamplifier, 1 - 18 GHz	AFS44	WC080962	7/18/2022	7/18/2023
Antenna port measurements, 18-Nov-22					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
National Technical Systems	NTS Mask Software (rev 3.9)	N/A	WC022701	N/A	
National Technical Systems	NTS Capture Analyzer Software (rev 4.0)	N/A	WC022706	N/A	
National Technical Systems	EMC Lab #4B	None	WC055575	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055670	10/24/2022	10/31/2023
Rohde & Schwarz	Power Meter, Single	NRVS	WC062570	2/11/2022	2/11/2023
Fluke	Fluke Multimeter, True RMS	175	WC064448	10/9/2022	10/31/2023
Hewlett Packard	High Pass filter, 1.5 GHz	84300-80037	WC064487	11/15/2022	11/15/2023
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts use with 20 dB attenuator sn:1031.6959.00 only	NRV-Z32	WC064862	11/18/2021	11/18/2022
Watlow	Environmental Chamber Controller	F4	WC066185	6/2/2022	6/2/2023
Unknown	20 dB Attenuator	18n50w-20fm	WC068107	N/A	
Watlow	Limit Controller	Limit 97	WC071533	N/A	
Envirotronics	EMC Chamber #10 (Lab #3)	SH16C	WC071534	N/A	
Hewlett Packard	DC Power Supply	6024A	WC071548	N/A	

Appendix B Test Data

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Client:	GE MDS LLC	PR Number:	PR166351
Product	Orbit SDM9 Module	T-Log Number:	TL166351-RA
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Emissions Standard(s):	FCC Parts 24 and 101, RSS-119	Class:	-
Immunity Standard(s):	-	Environment:	Industrial Radio

EMC Test Data

For The

GE MDS LLC

Product

Orbit SDM9 Module

Date of Last Test: 3/15/2023

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

RSS-119 and FCC Part 24D and Part 101C

Power, Occupied Bandwidth, Frequency Stability and Spurious Emissions

Test Specific Details

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

General Test Configuration

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

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

Ambient Conditions:

Temperature: 18-21 °C

Rel. Humidity: 31-43 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
1			Output Power	None	Pass	Max 40.7 dBm
2			Spectral Mask	Within mask	Pass	Refer to plots
3			99% or Occupied Bandwidth	Per rule part	Pass	Refer to table
4			Spurious Emissions (conducted)	-20 dBm or -13 dBm	Pass	
6			Frequency Stability	Per rule part	Pass	Refer to table

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

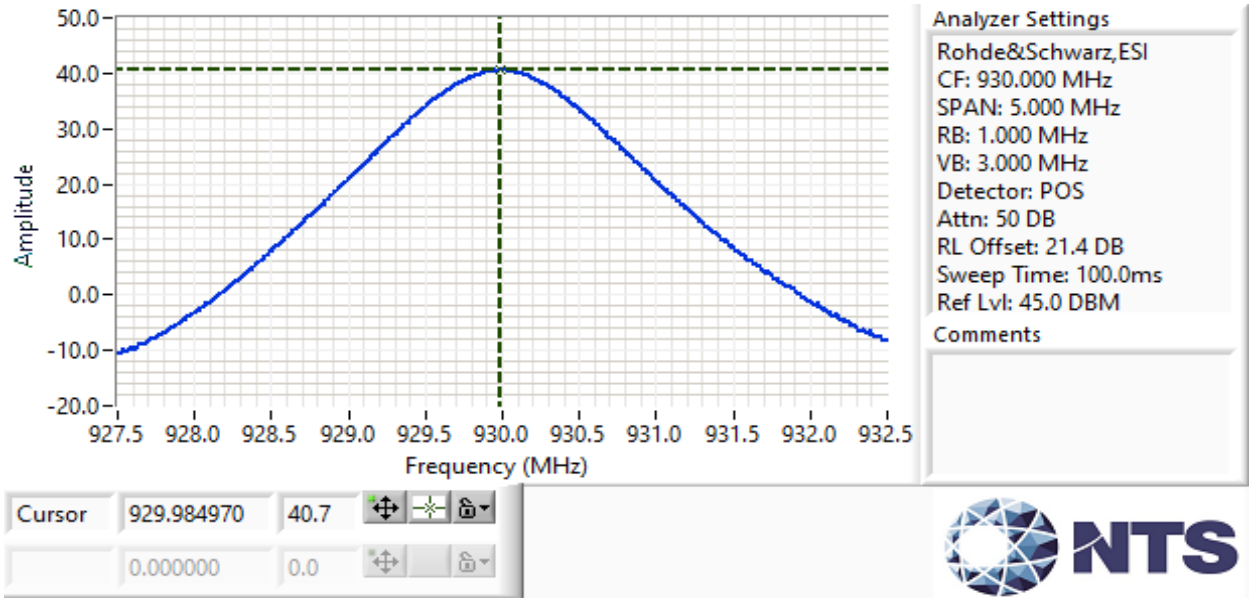
Run #1: Output Power

Date of Test: 11/14/2022 Config. Used: 1
Test Engineer: David Bare Config Change: None
Test Location: Fremont Chamber #7 EUT Voltage: 24 VDC

Cable Loss: 1.4 dB Attenuator: 20.0 dB Total Loss: 21.4 dB
Cable ID(s): WC064538 Attenuator IDs: WC068107

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W
40	928	40.2	10471.3	9.15	Pass	49.4	86.099
40	930	40.7	11749.0	9.15	Pass	49.9	96.605
40	935	40.6	11481.5	9.15	Pass	49.8	94.406
40	940	40.2	10471.3	9.15	Pass	49.4	86.099
40	941	40.2	10471.3	9.15	Pass	49.4	86.099
40	953	40.3	10715.2	9.15	Pass	49.5	88.105
40	960	40.2	10471.3	9.15	Pass	49.4	86.099

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VBW=3MHz, Peak detector
Note 2:	Power setting - the software power setting used during testing, included for reference only.

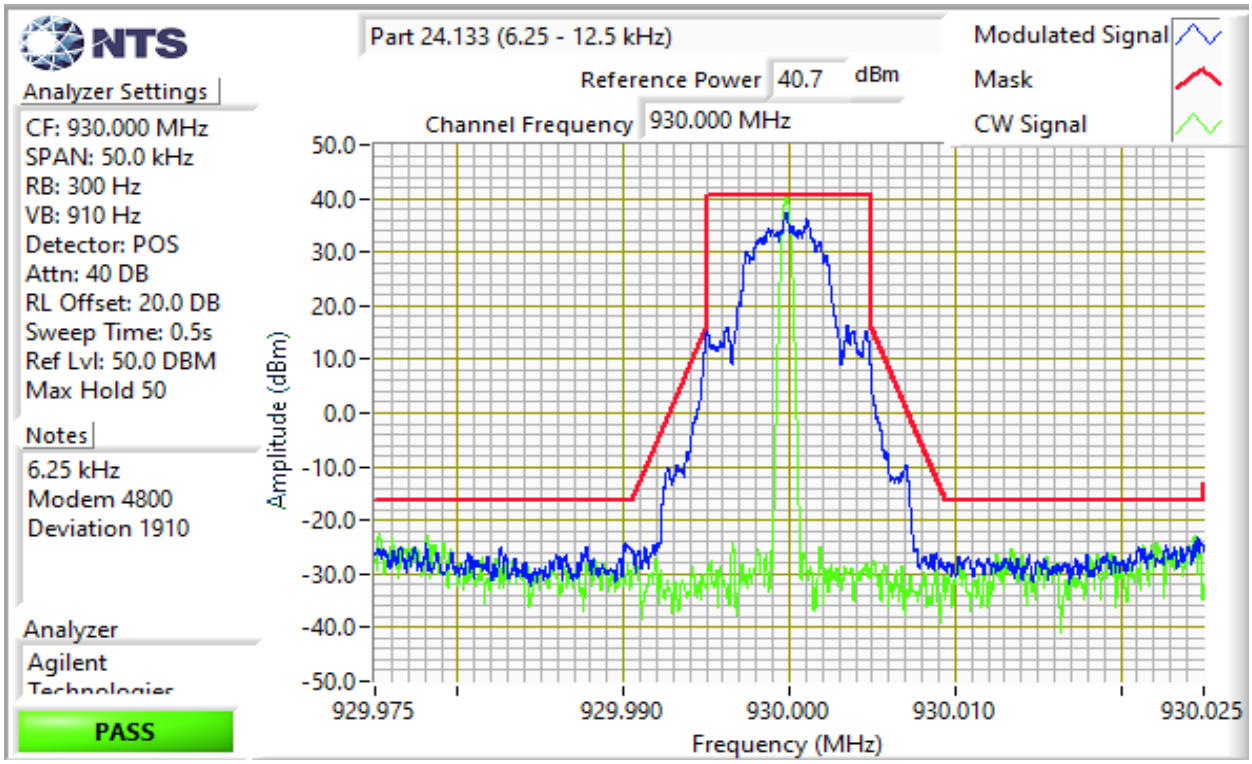


Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

Run #2: Spectral Mask

Date of Test: 11/17/2022 Config. Used: 1
Test Engineer: Deniz Demirci, Mehran Birgani Config Change: None
Test Location: FT Lab #4B EUT Voltage: 24 VDC

Note 1:	Unmodulated carrier power is measured for the reference for the top of the mask.



§ 24.131 Authorized bandwidth.

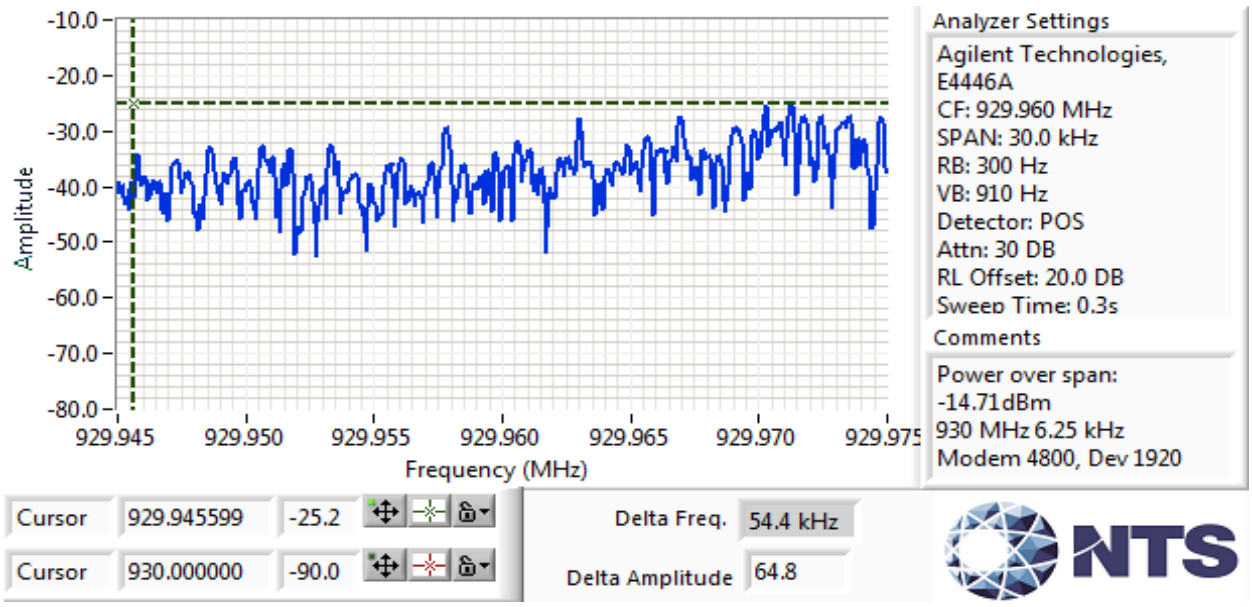
The authorized bandwidth of narrowband PCS channels will be 10 kHz for 12.5 kHz channels and 45 kHz for 50 kHz channels. For aggregated adjacent channels, a maximum authorized bandwidth of 5 kHz less than the total aggregated channel width is permitted.

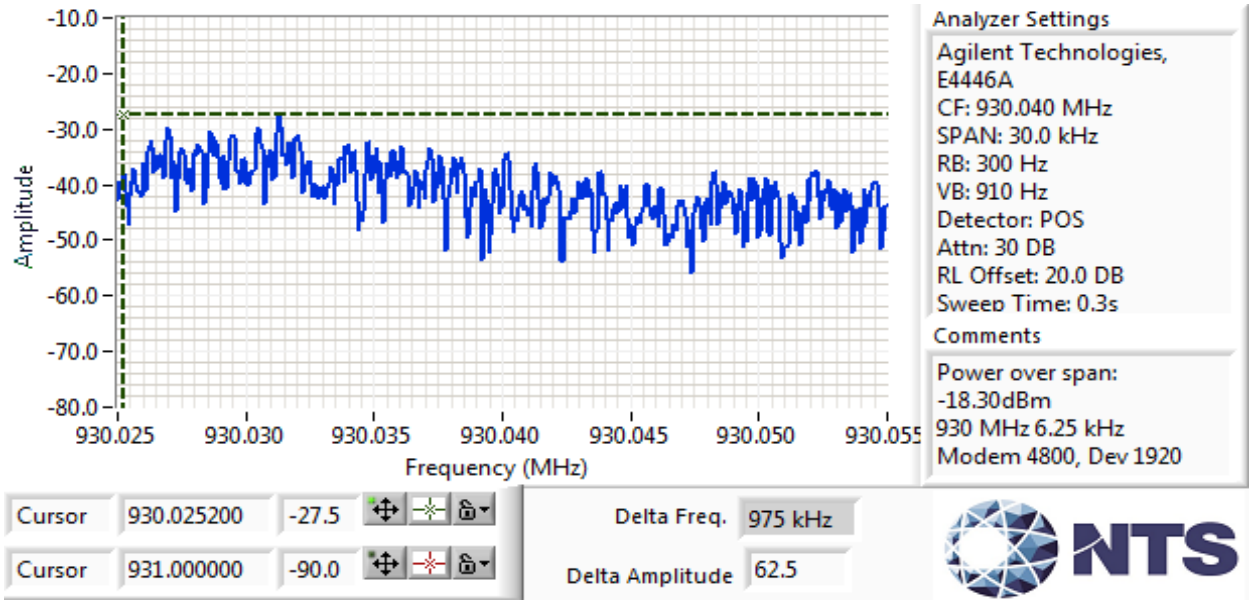
Freq MHz	Ch. Sp. kHz	Auth. BW kHz	20 kHz displacement from the Auth. BW	Lower BA ($f_d \leq 250\%$) MHz		Higher BA ($f_d > 250\%$) MHz	
930.0000	6.25	10.0	25.0	929.945	929.975	930.025	930.055

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

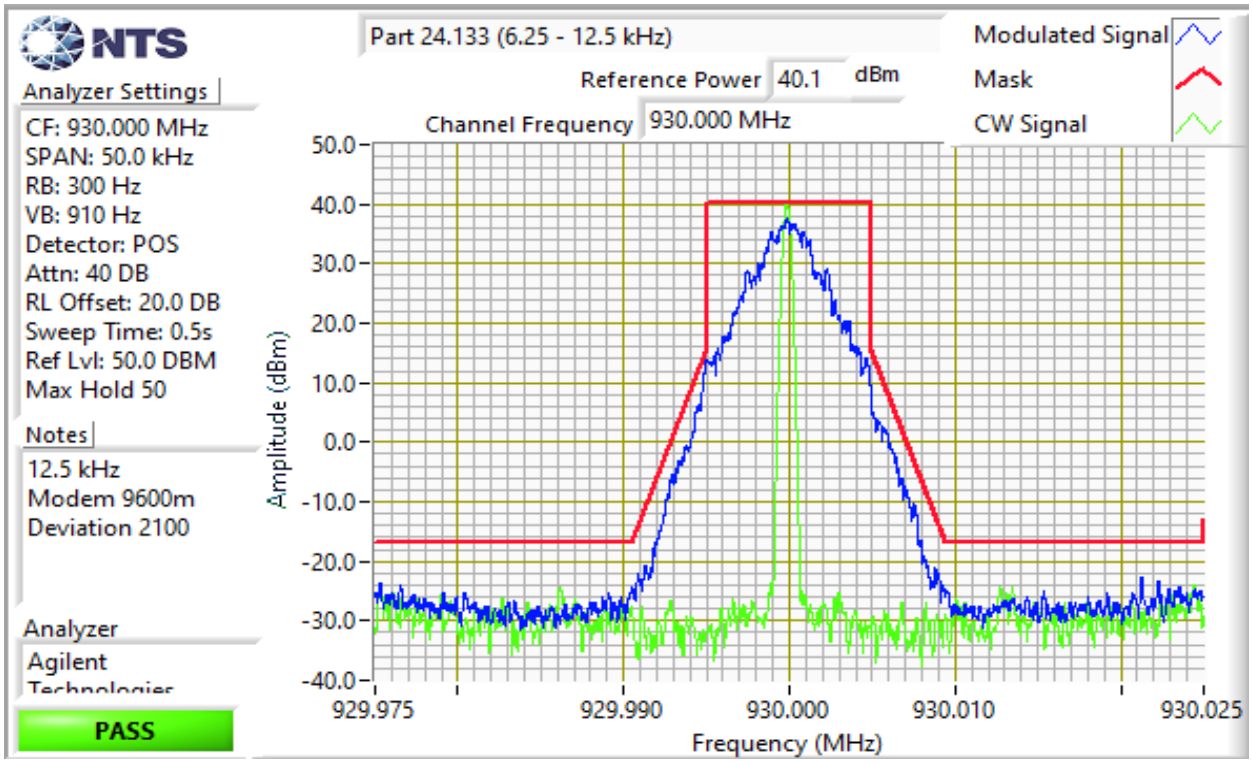
§ 24.133 (a)(1) Emission limits.

30 kHz integrated power





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



§ 24.131 Authorized bandwidth.

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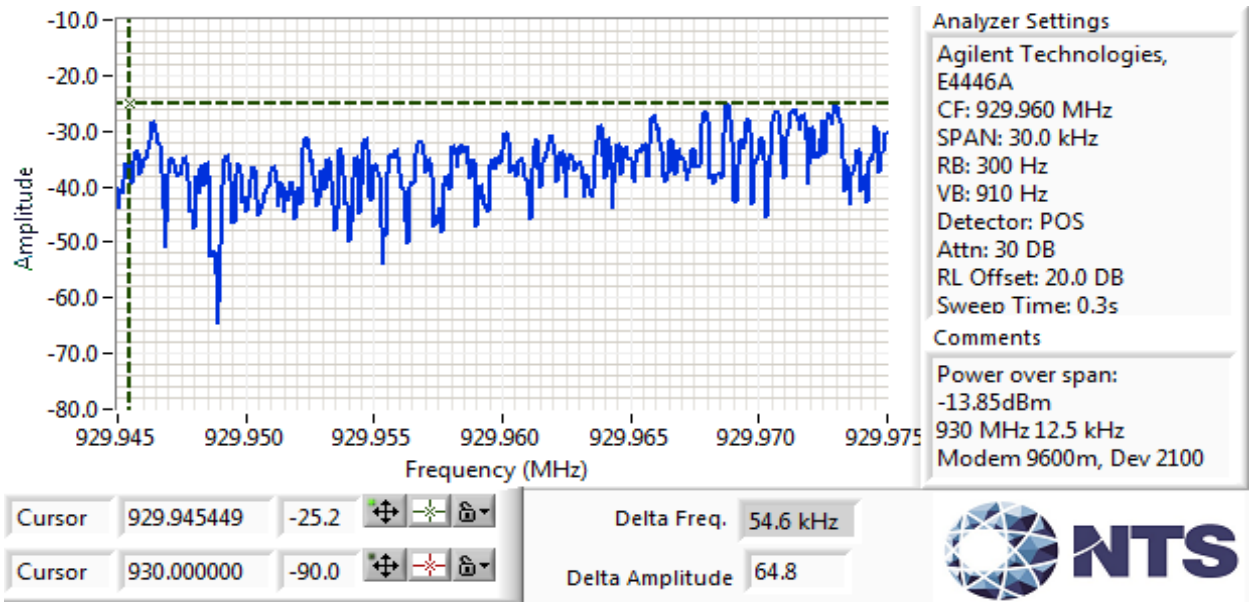
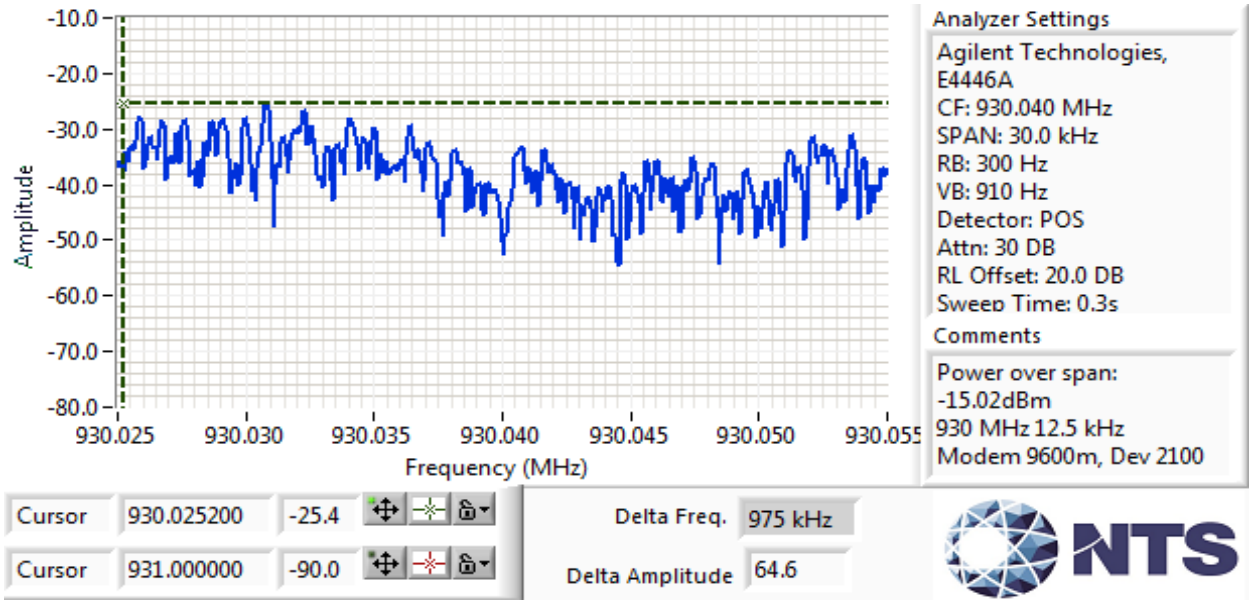
Freq MHz	Ch. Sp. kHz	Auth. BW kHz	20 kHz displacement from the Auth. BW	Lower BA ($f_d \leq 250\%$) MHz		Higher BA ($f_d > 250\%$) MHz	
930.0000	12.5	10.0	25.0	929.945	929.975	930.025	930.055

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

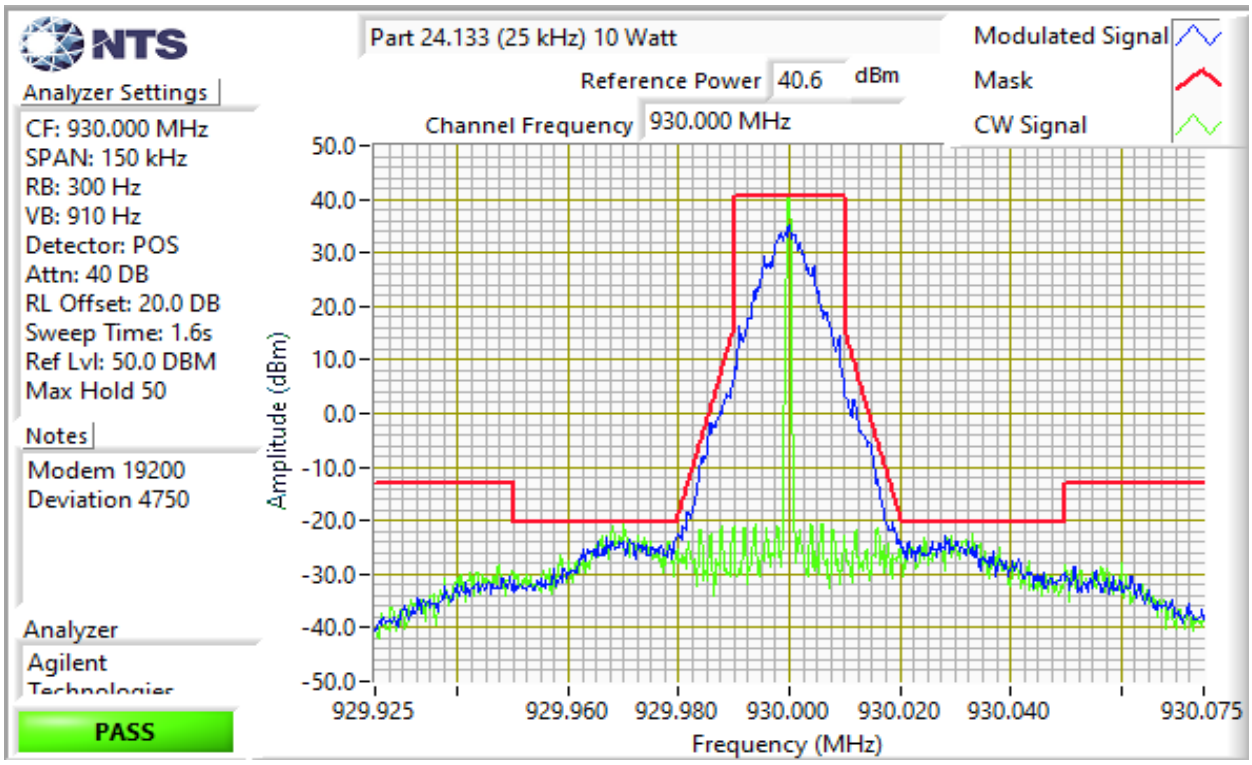
§ 24.133 (a)(1) Emission limits.

30 kHz integrated power





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



§ 24.131 Authorized bandwidth.

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Freq MHz	Ch. Sp. kHz	Auth. BW kHz	40 kHz displacement from the Auth. BW	Lower BA ($f_d \leq 250\%$) MHz		Higher BA ($f_d > 250\%$) MHz	
930.0000	25	20.0	50.0	929.920	929.950	930.050	930.080

Client:	GE MDS LLC	PR Number:	PR166351
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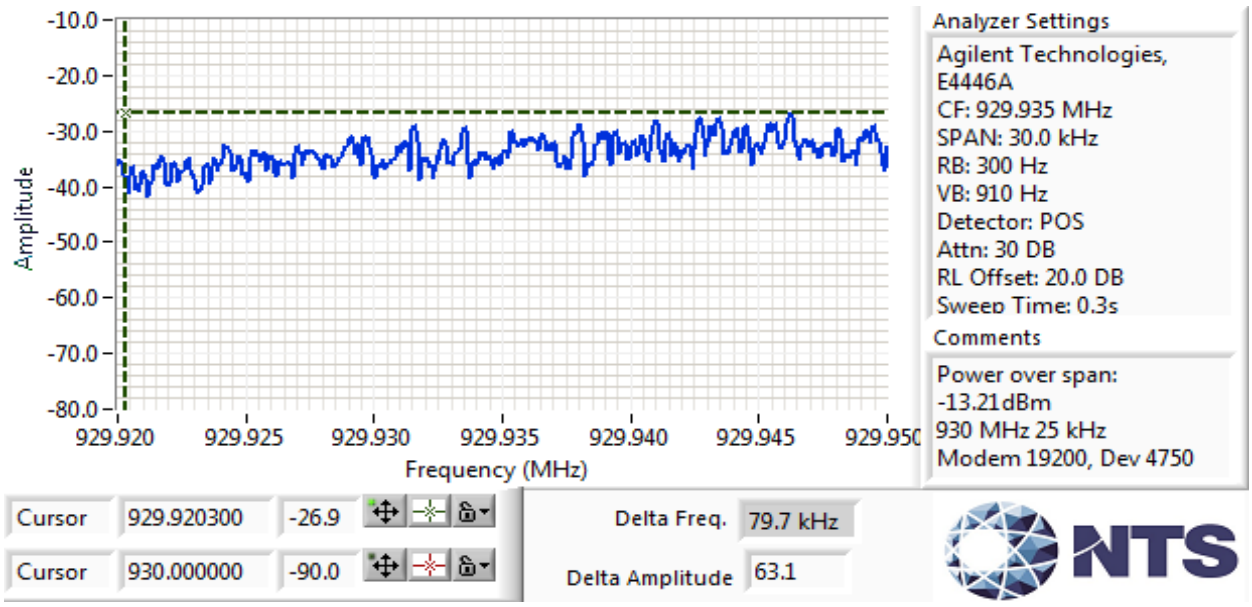
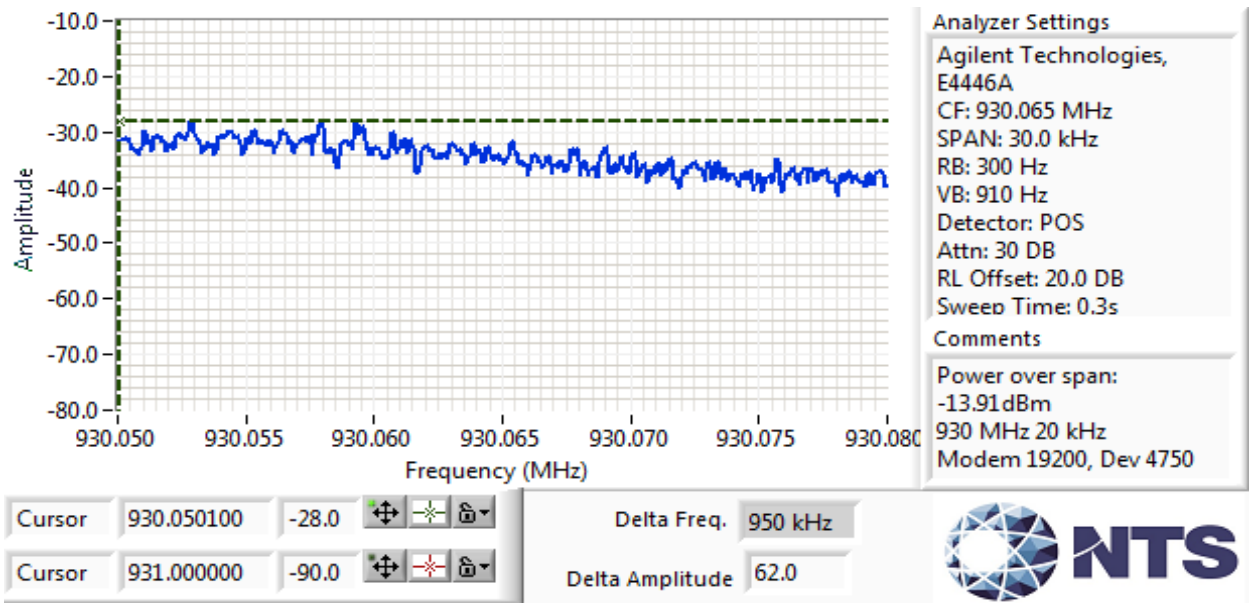
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

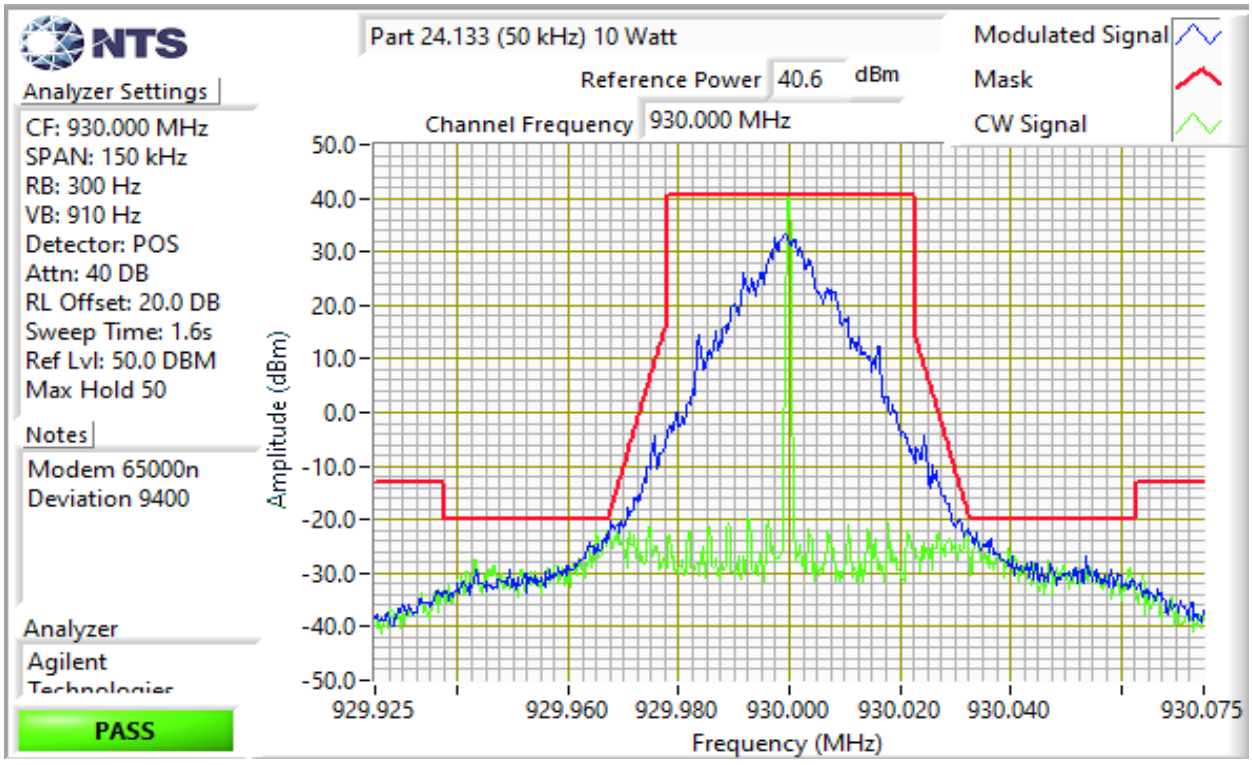
§ 24.133 (a)(1) Emission limits.

30 kHz integrated power





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



§ 24.131 Authorized bandwidth.

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Freq MHz	Ch. Sp. kHz	Auth. BW kHz	40 kHz displacement from the Auth. BW	Lower BA ($f_d \leq 250\%$) MHz		Higher BA ($f_d > 250\%$) MHz	
930.0000	50	45.0	62.5	929.908	929.938	930.063	930.093

Client:	GE MDS LLC	PR Number:	PR166351
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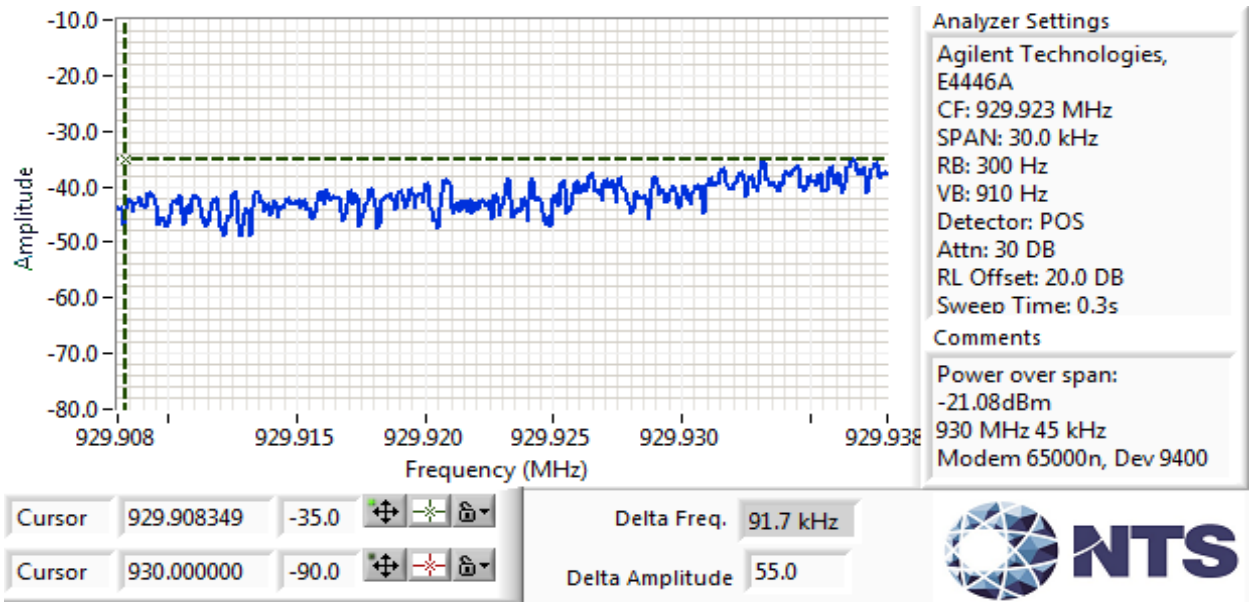
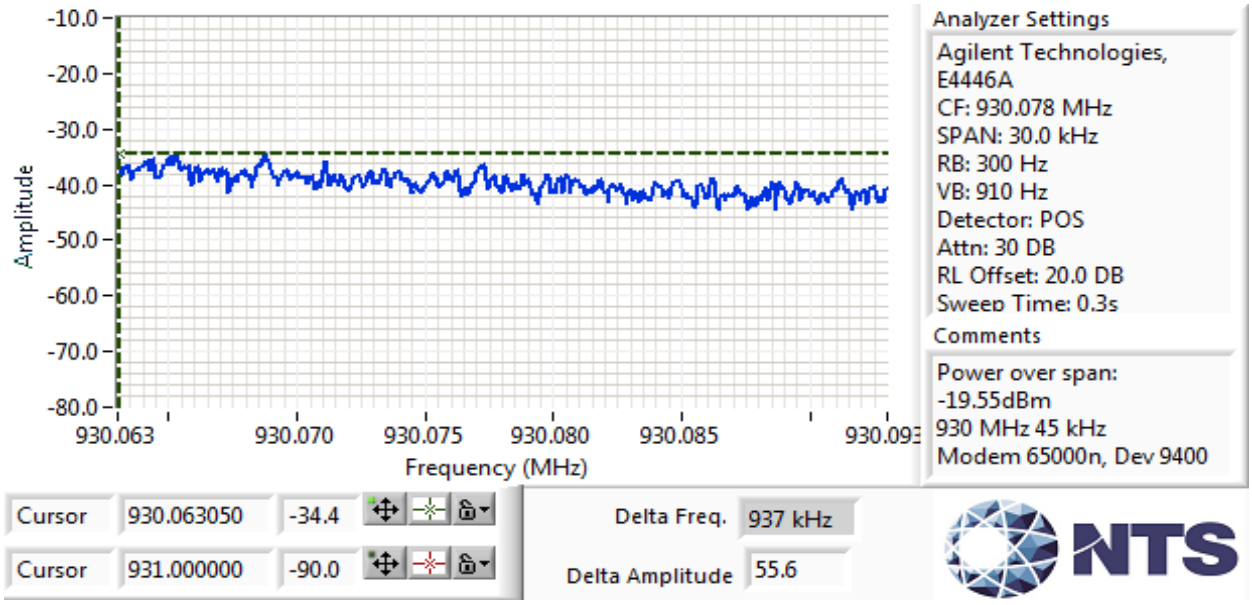
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

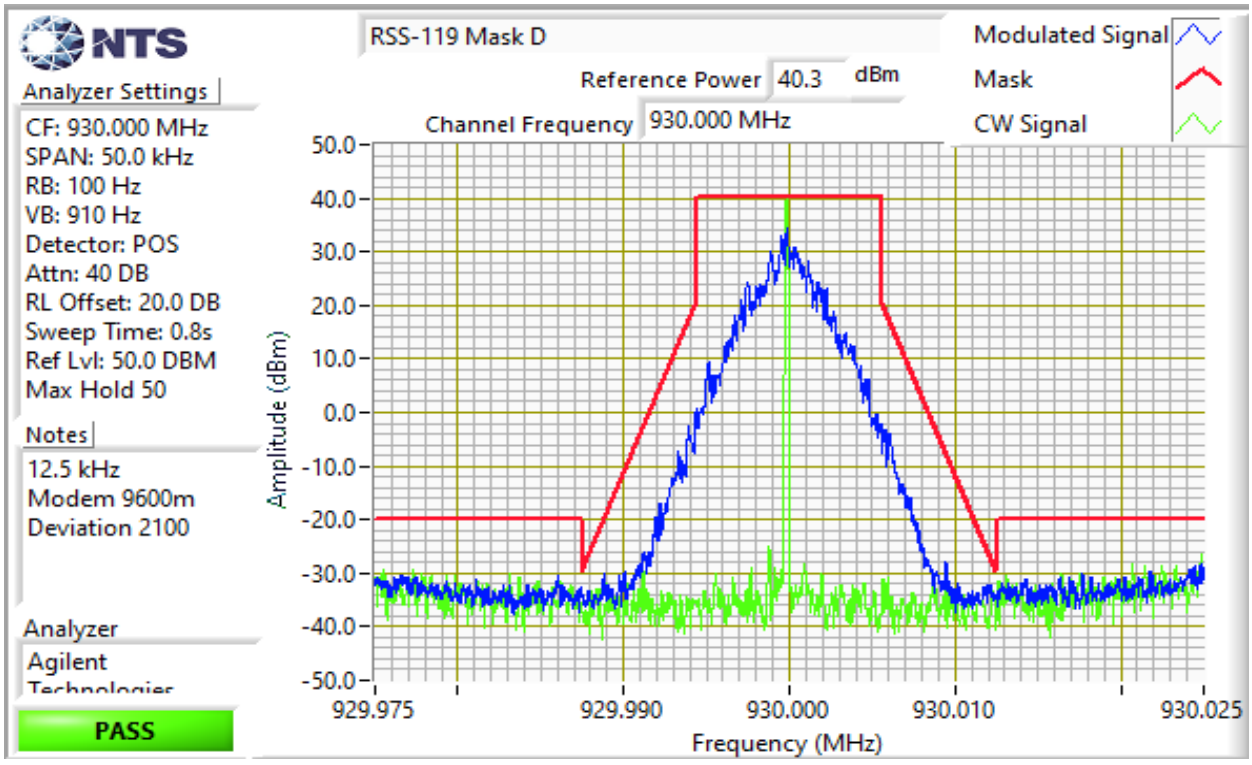
§ 24.133 (a)(1) Emission limits.

30 kHz integrated power





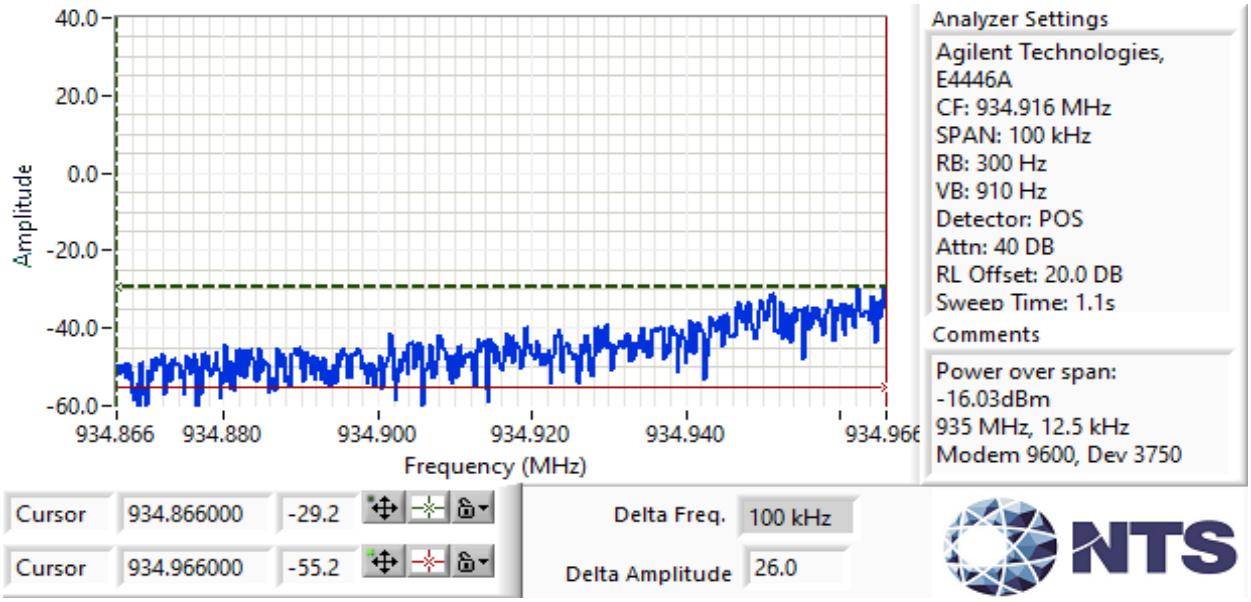
Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

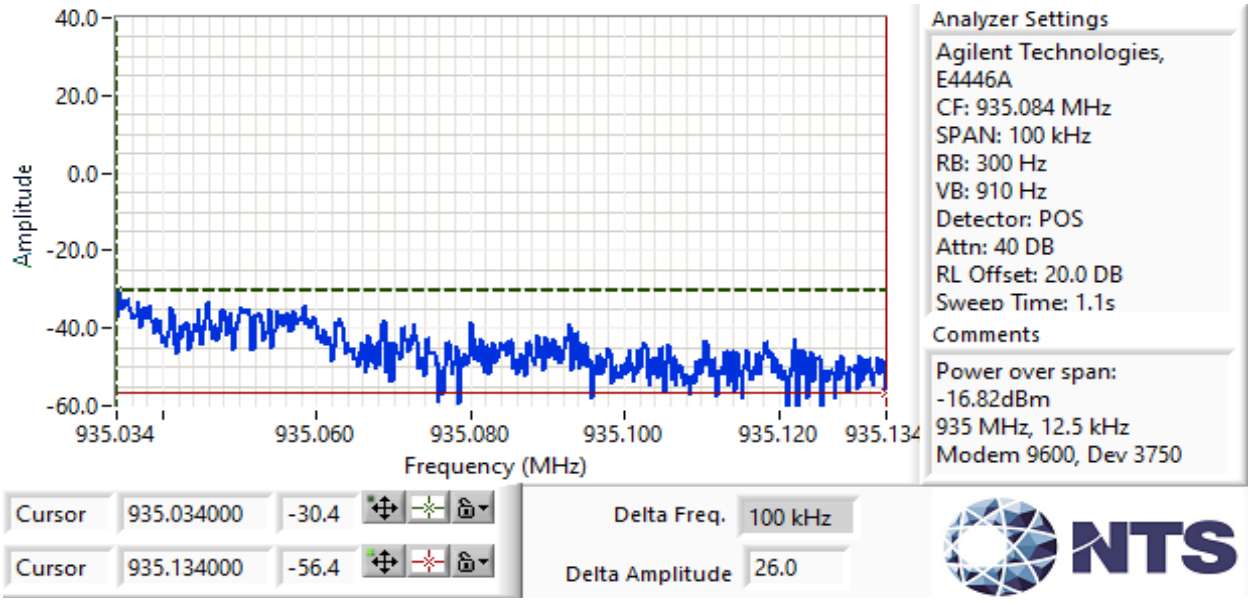


Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

RSS-119 Section 5.5, Table 3

Freq MHz	Ch. Sp. kHz	Auth. BW kHz	250% of the Auth. BW kHz	Lower BA ($f_d \leq 250\%$) MHz		Higher BA ($f_d > 250\%$) MHz	
935.0000	12.5	13.6	34.0	934.866	934.966	935.034	935.134





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

Run #3: Signal Bandwidth

Date of Test: 11/17/2022 Config. Used: 1
Test Engineer: Deniz Demirci, Mehran Birgani Config Change: None
Test Location: FT Lab #4B EUT Voltage: 24 VDC

6.25 kHz Modem 4800 Deviation 1910

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
40	930	240 Hz	5.76

12.5 kHz Modem 9600m Deviation 2100

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
40	930	240 Hz	7.13

12.5 kHz Modem 9600 Deviation 3750

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
40	935	240 Hz	9.78

25.0 kHz Modem 19200 Deviation 4750

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
40	930	620 Hz	15.20

50.0 kHz Modem 65000n Deviation 9400

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 99%
40	930	620 Hz	26.80

Note 1:	99% bandwidth measured in accordance with ANSI C63.26, with RB between 1% and 5% of the measured bandwidth and VB ≥ 3*RB and Span ≥ 1.5% and ≤ 5% of measured bandwidth.

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		Project Manager:	Christine Krebill
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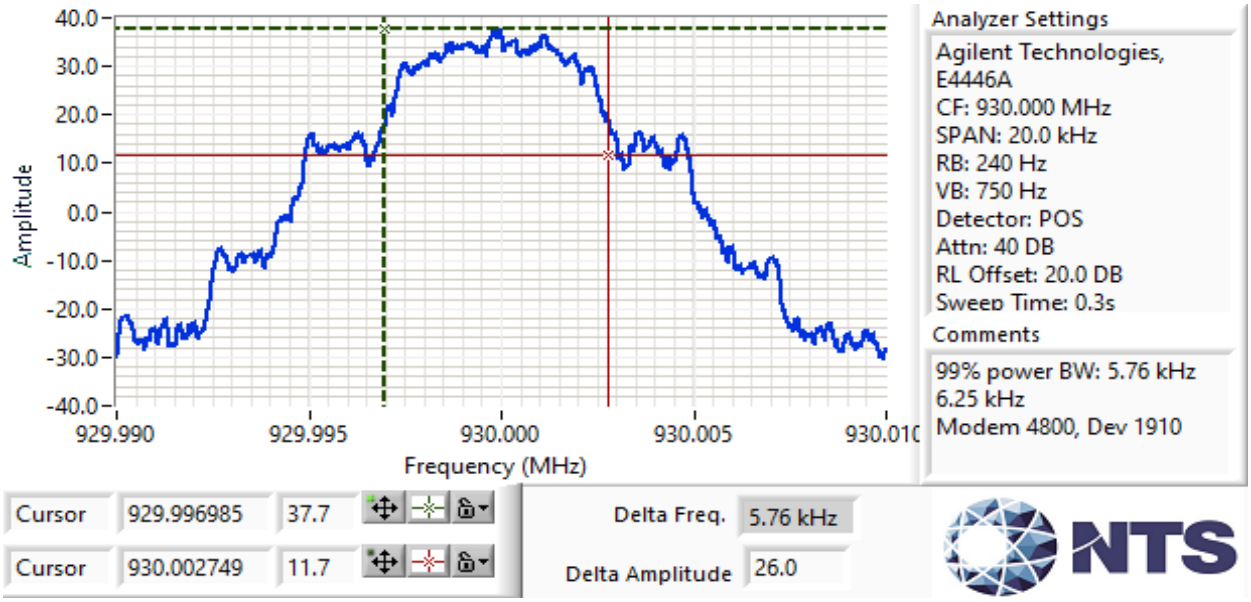
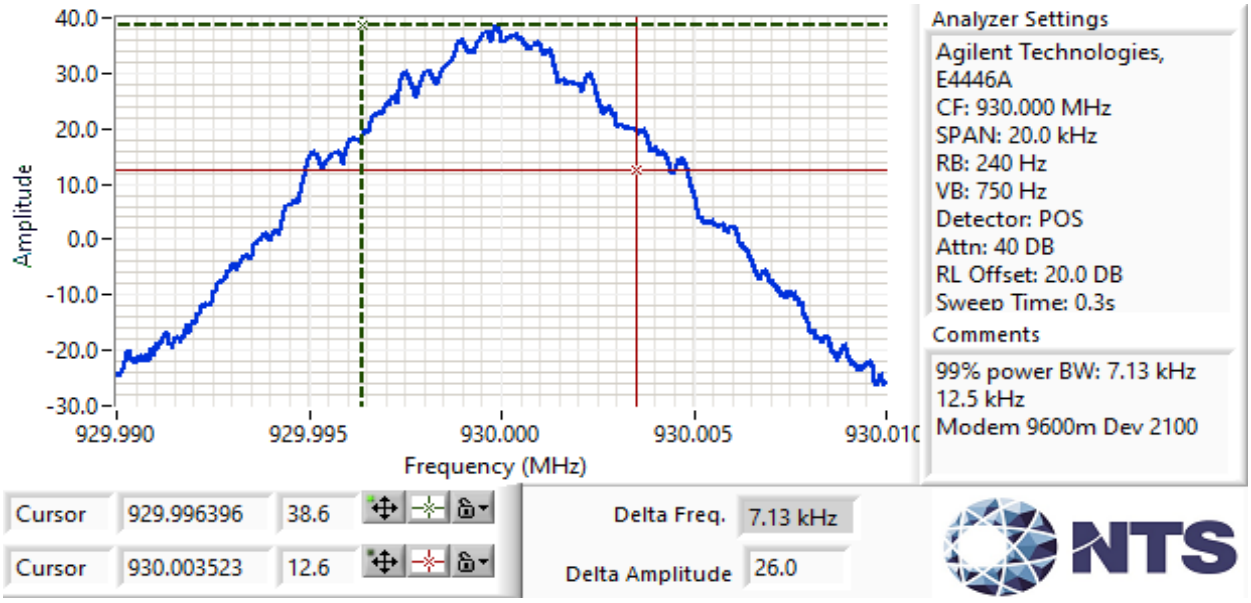
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





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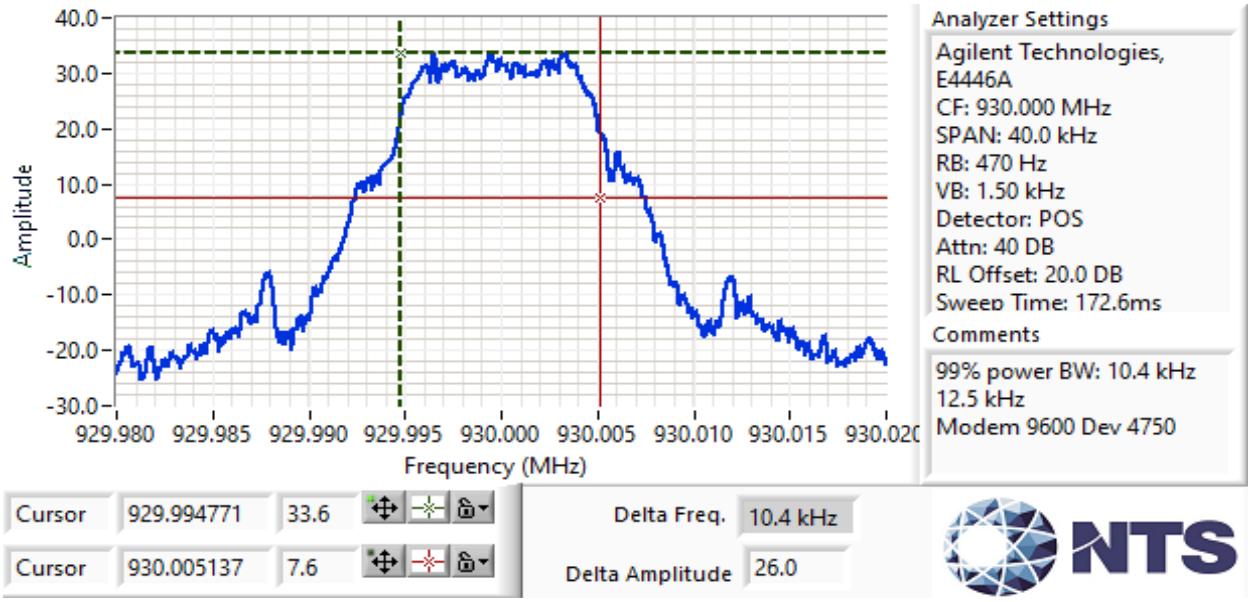
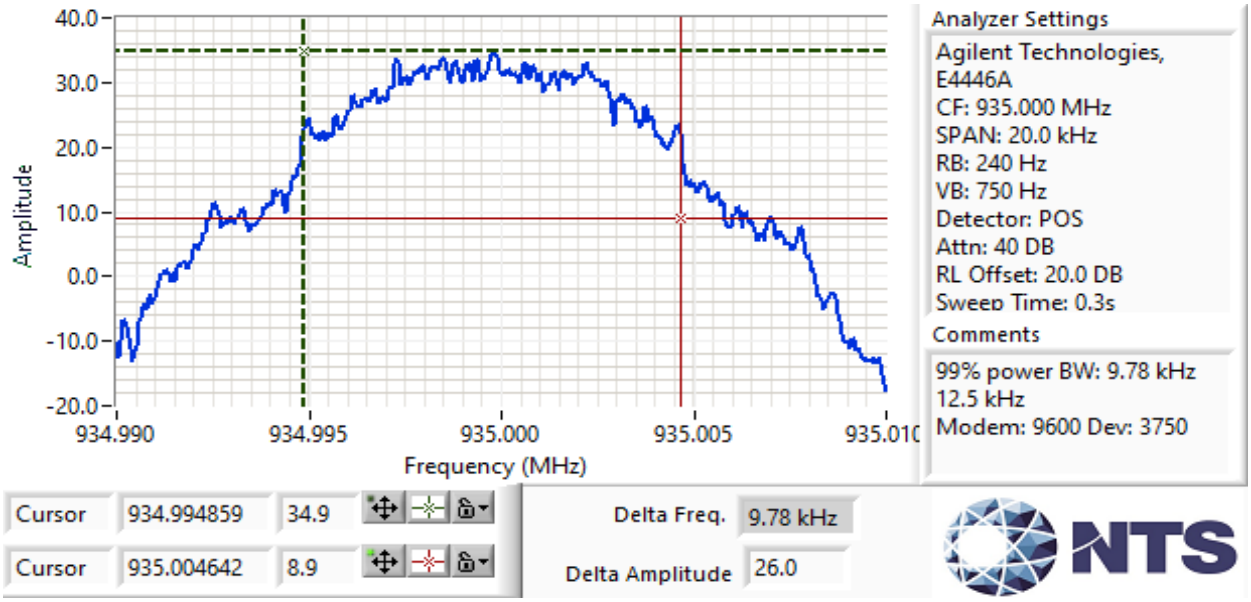
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





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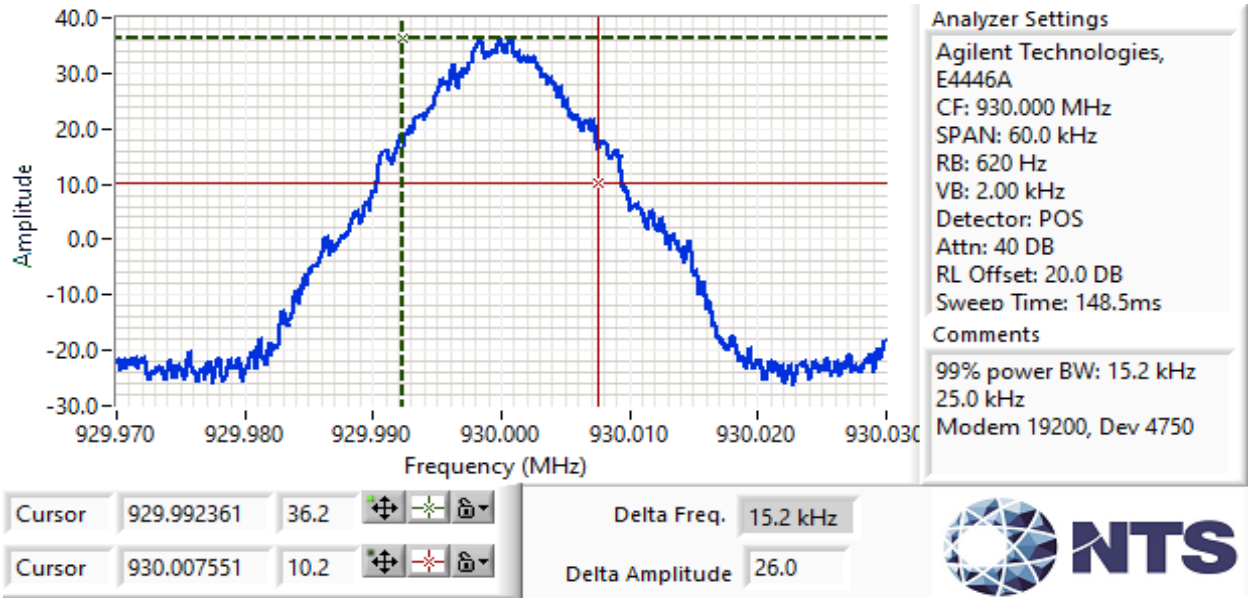
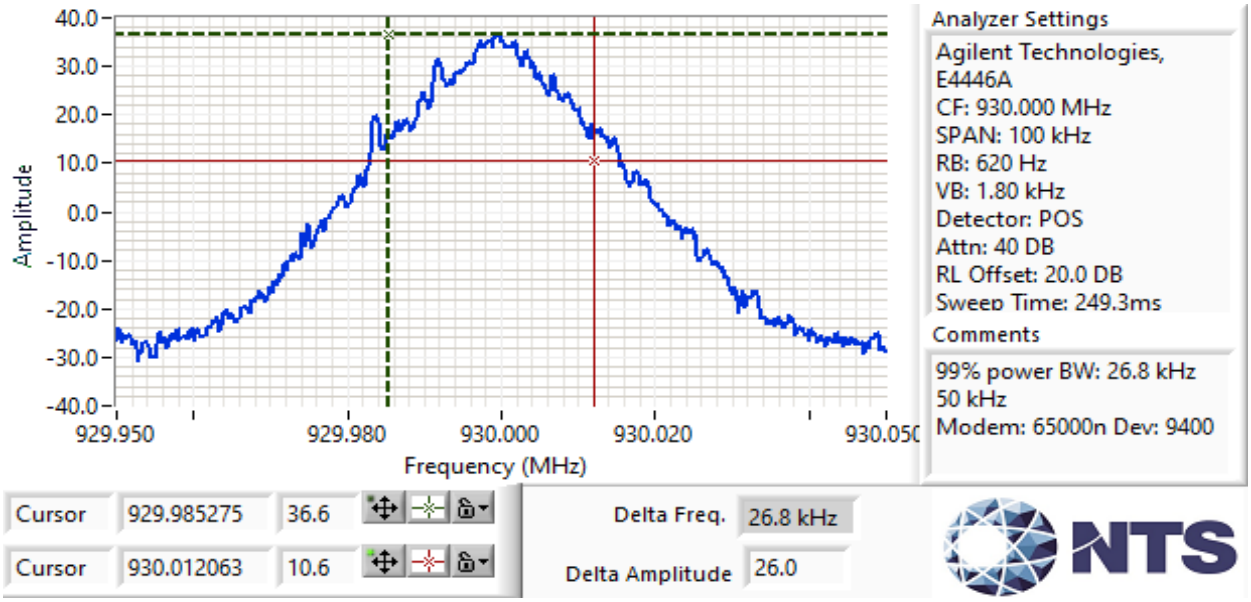
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

Run #4: Out of Band Spurious Emissions, Conducted

Date of Test: 11/17/2022 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Lab #4B EUT Voltage: 24 VDC

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments	Channel
MHz	dBm	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		frequency
217.885	-26.7	RF Port	-20.0	-6.7	PK	-	-	RB: 100 kHz, VB: 300 kH	928
927.998	40.3	RF Port	-	-	PK	-	-	Fundamental	928
945.990	-31.2	RF Port	-20.0	-11.2	PK	-	-	RB: 100 kHz, VB: 300 kH	928
1855.990	-24.1	RF Port	-20.0	-4.1	PK	-	-	RB: 1 MHz VB: 3 MHz	928
217.902	*-27.8*	*RF Port*	*-20.0*	-7.8	PK	-	-	RB: 100 kHz, VB: 300 kH	930
930.009	*40.0*	*RF Port*	-	-	PK	-	-	Fundamental	930
947.870	*-27.9*	*RF Port*	*-20.0*	-7.9	PK	-	-	RB: 100 kHz, VB: 300 kH	930
1860.009	*-24.3*	*RF Port*	*-20.0*	-4.3	PK	-	-	RB: 1 MHz VB: 3 MHz	930
217.902	*-27.8*	*RF Port*	*-13.0*	-14.8	PK	-	-	RB: 100 kHz, VB: 300 kH	935
934.995	*40.1*	*RF Port*	-	-	PK	-	-	Fundamental	935
952.912	*-30.2*	*RF Port*	*-13.0*	-17.2	PK	-	-	RB: 100 kHz, VB: 300 kH	935
1869.990	*-24.3*	*RF Port*	*-13.0*	-11.3	PK	-	-	RB: 1 MHz VB: 3 MHz	935
217.902	*-29.2*	*RF Port*	*-20.0*	-9.2	PK	-	-	RB: 100 kHz, VB: 300 kH	*940*
939.992	*40.5*	*RF Port*	-	-	PK	-	-	Fundamental	*940*
1879.998	*-26.1*	*RF Port*	*-20.0*	-6.1	PK	-	-	RB: 1 MHz VB: 3 MHz	*940*
217.962	*-27.6*	*RF Port*	*-20.0*	-7.6	PK	-	-	RB: 100 kHz, VB: 300 kH	941
940.997	*40.0*	*RF Port*	-	-	PK	-	-	Fundamental	941
1881.994	*-27.2*	*RF Port*	*-20.0*	-7.2	PK	-	-	RB: 1 MHz VB: 3 MHz	941
217.902	*-27.7*	*RF Port*	*-20.0*	-7.7	PK	-	-	RB: 100 kHz, VB: 300 kH	*953*
952.997	*40.8*	*RF Port*	-	-	PK	-	-	Fundamental	*953*
1905.987	*-32.9*	*RF Port*	*-20.0*	-12.9	PK	-	-	RB: 1 MHz VB: 3 MHz	*953*
218.022	*-27.5*	*RF Port*	*-20.0*	-7.5	PK	-	-	RB: 100 kHz, VB: 300 kH	*960*
960.005	*40.6*	*RF Port*	-	-	PK	-	-	Fundamental	*960*
1920.008	*-35.6*	*RF Port*	*-20.0*	-15.6	PK	-	-	RB: 1 MHz VB: 3 MHz	*960*

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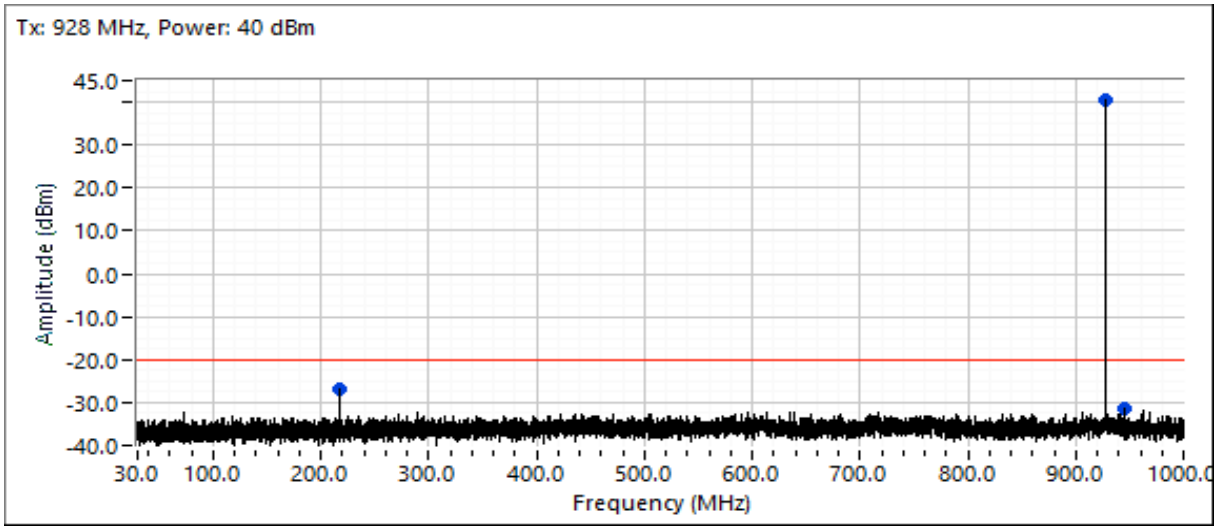
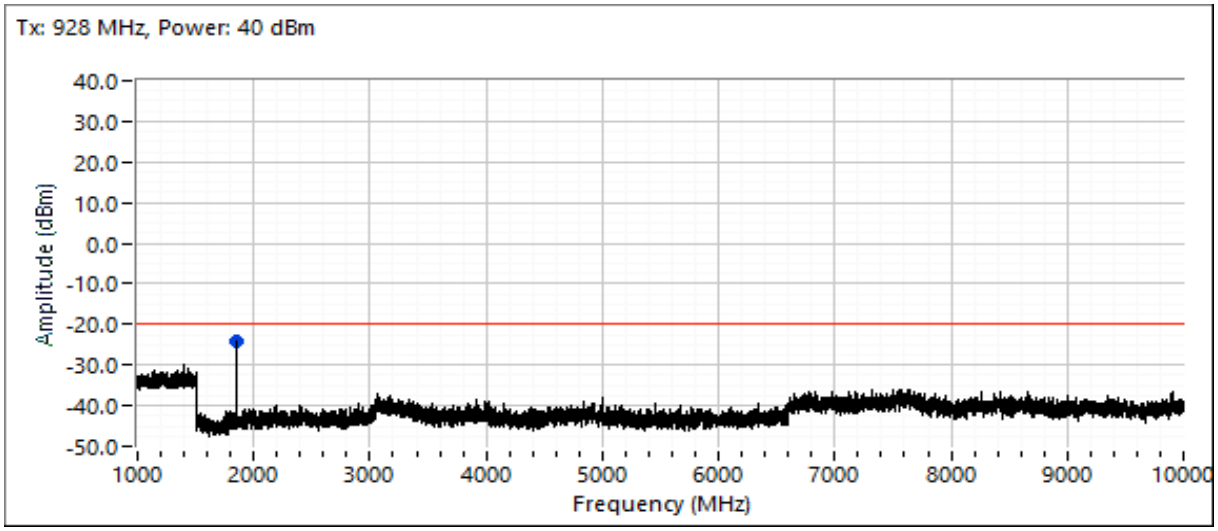
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





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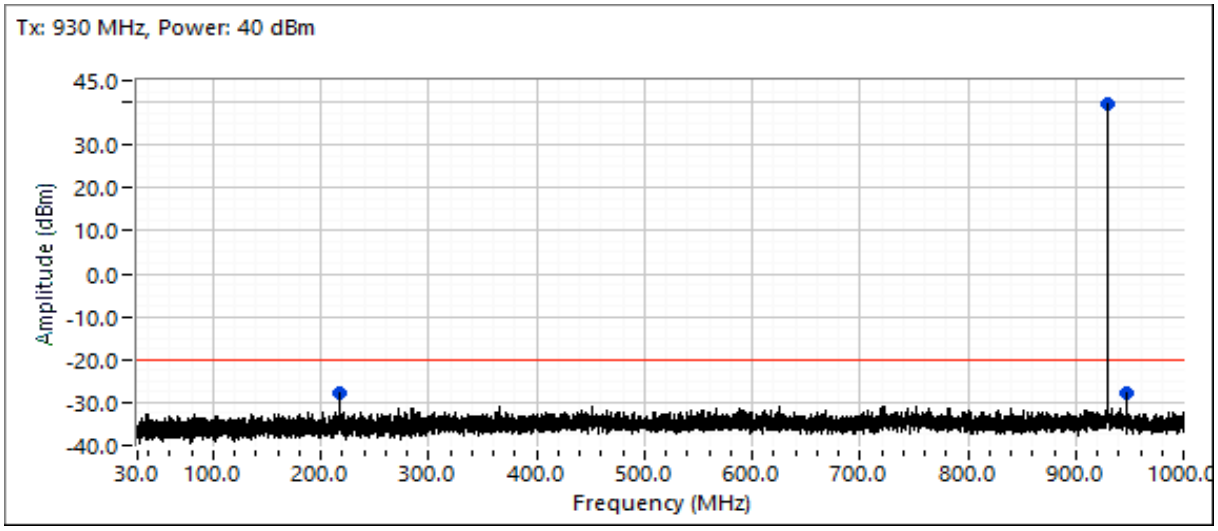
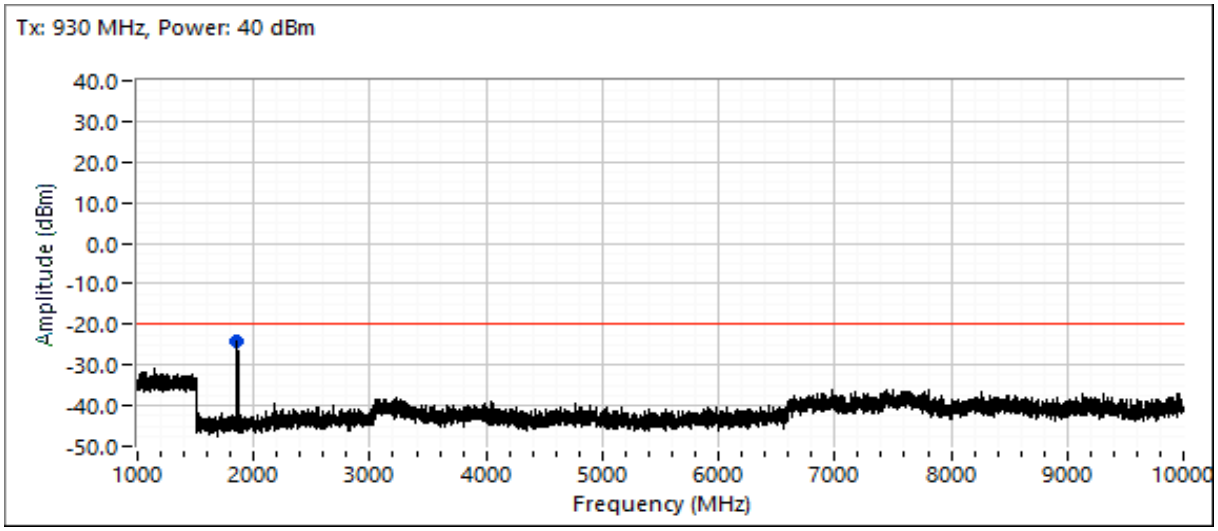
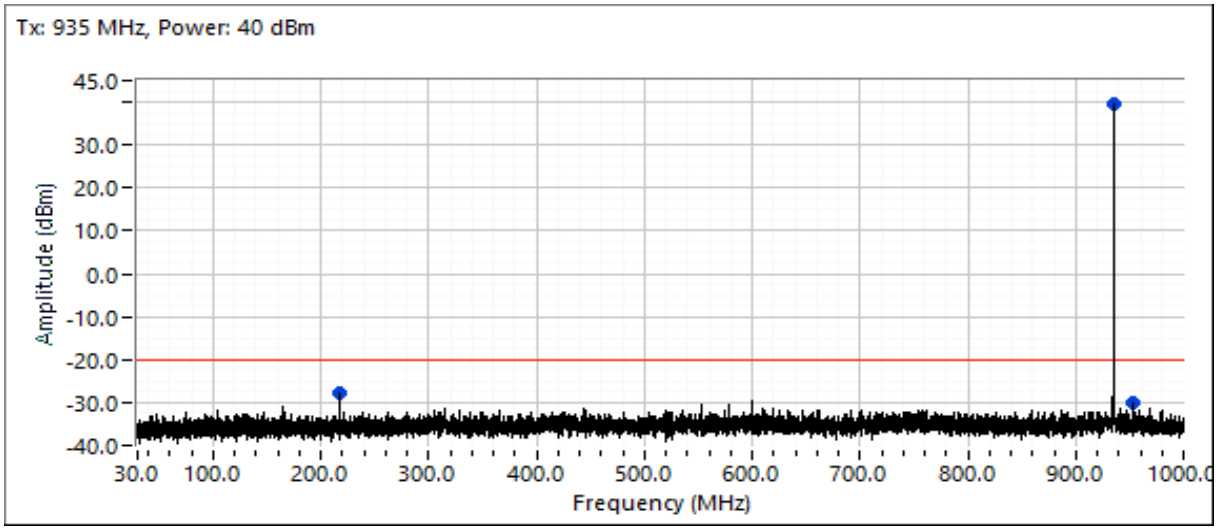
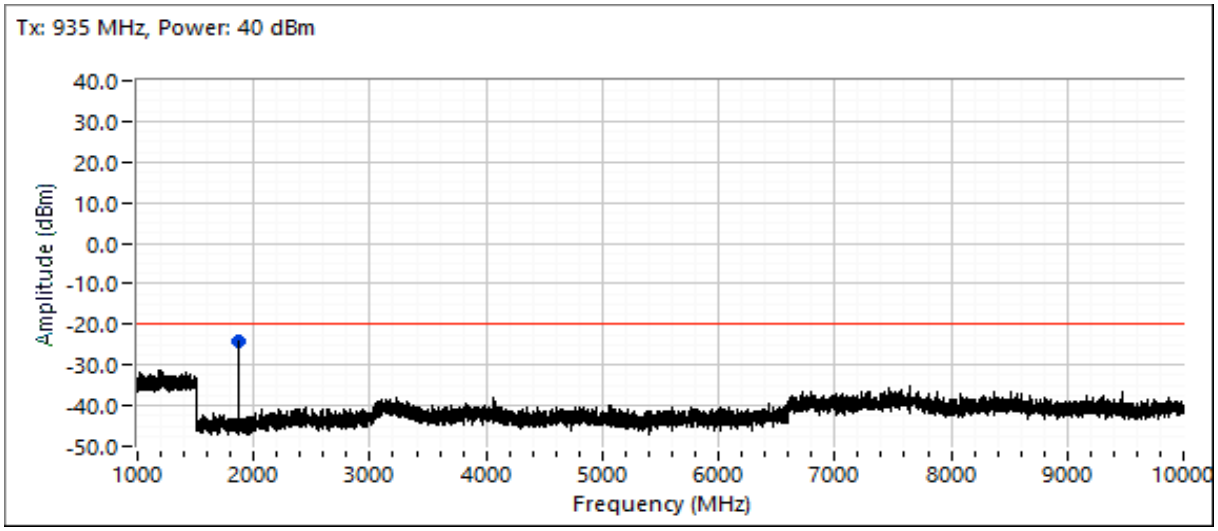
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



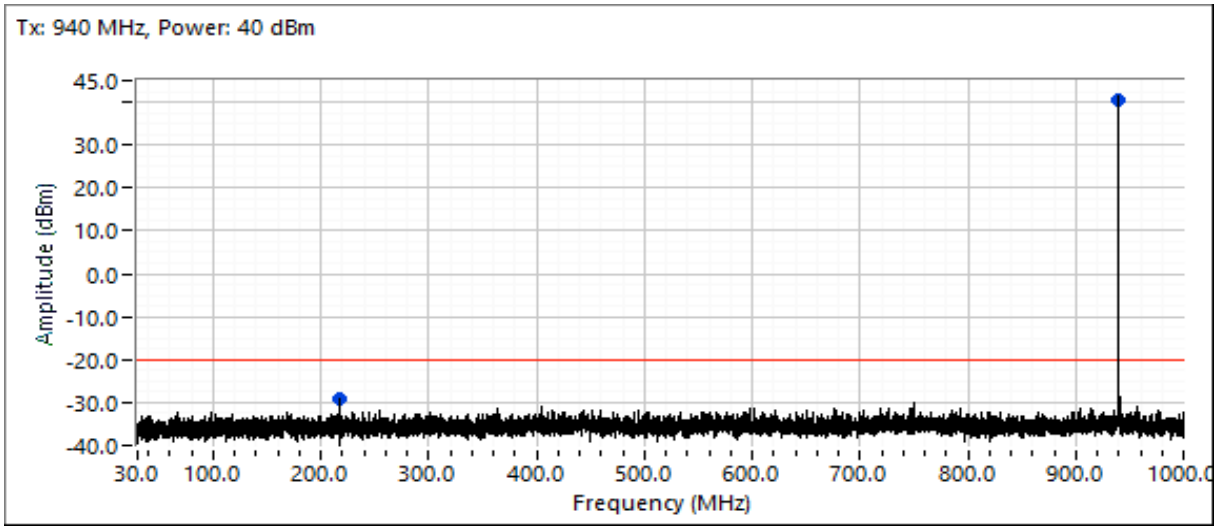


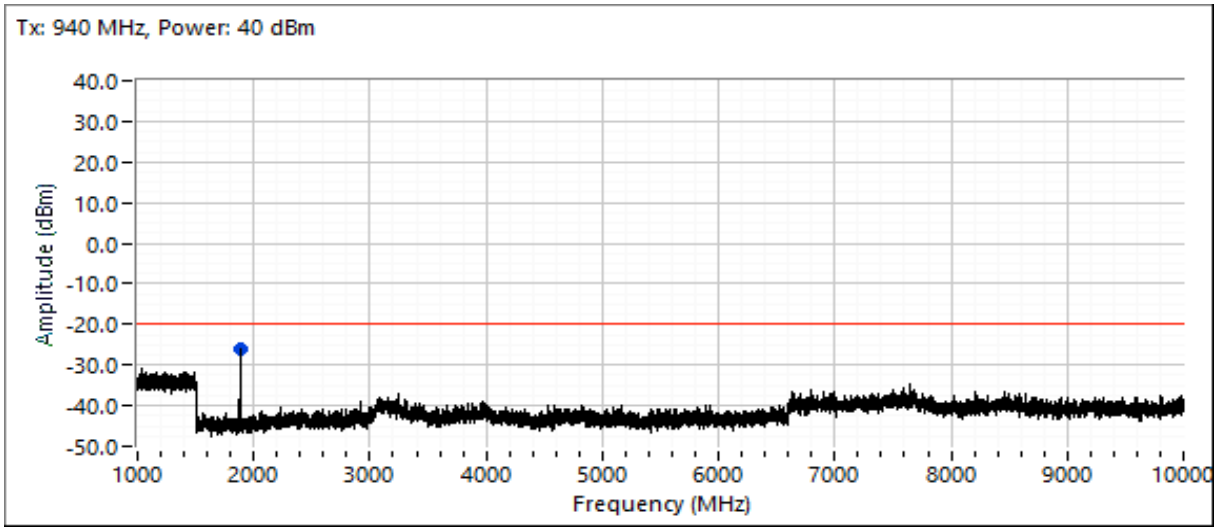
Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



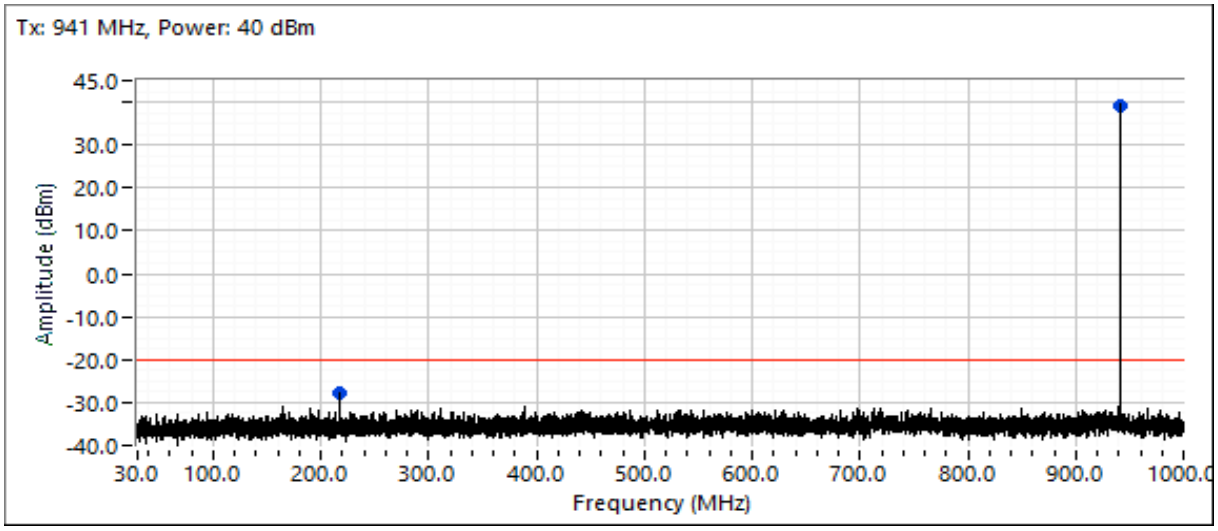


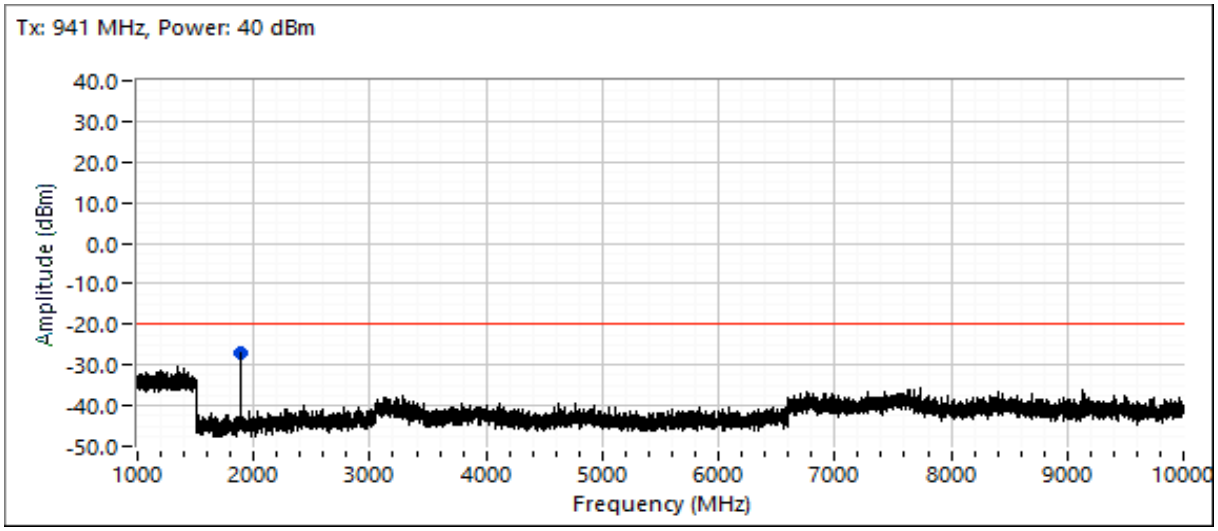
Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



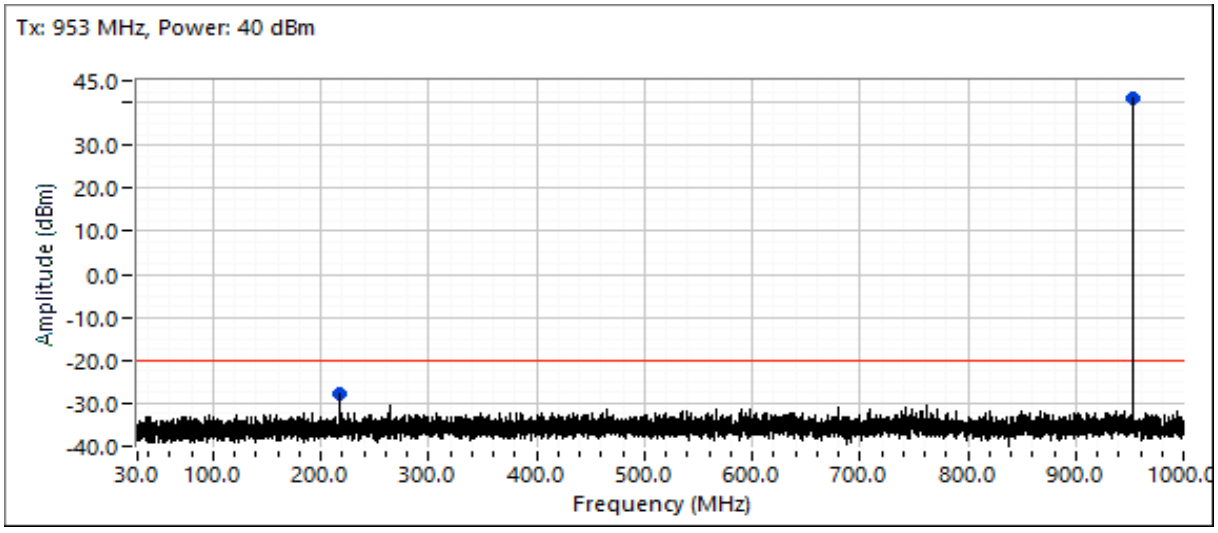


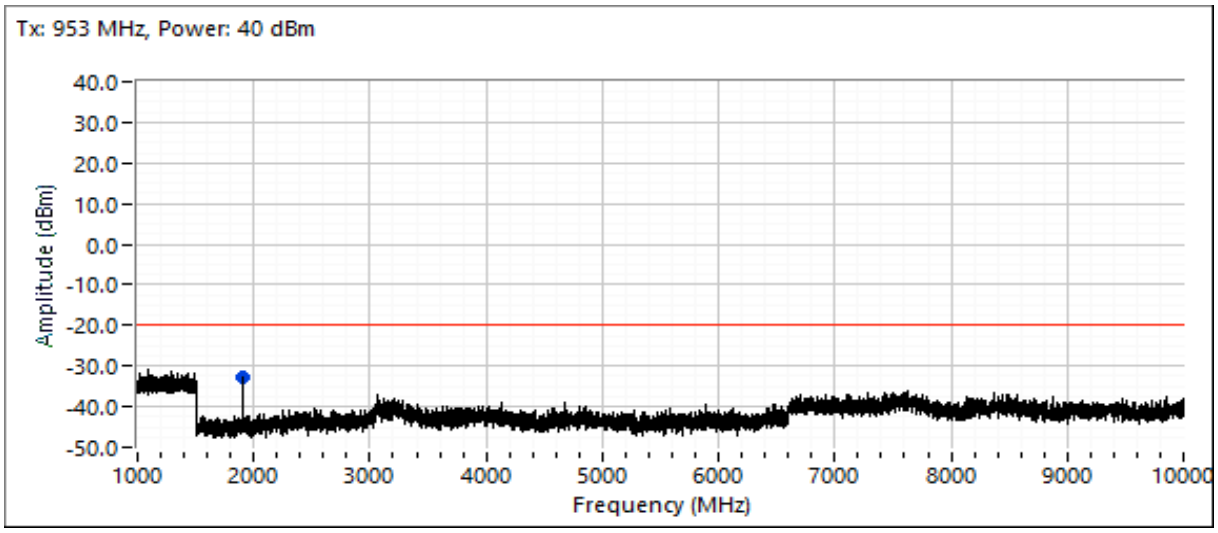
Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A



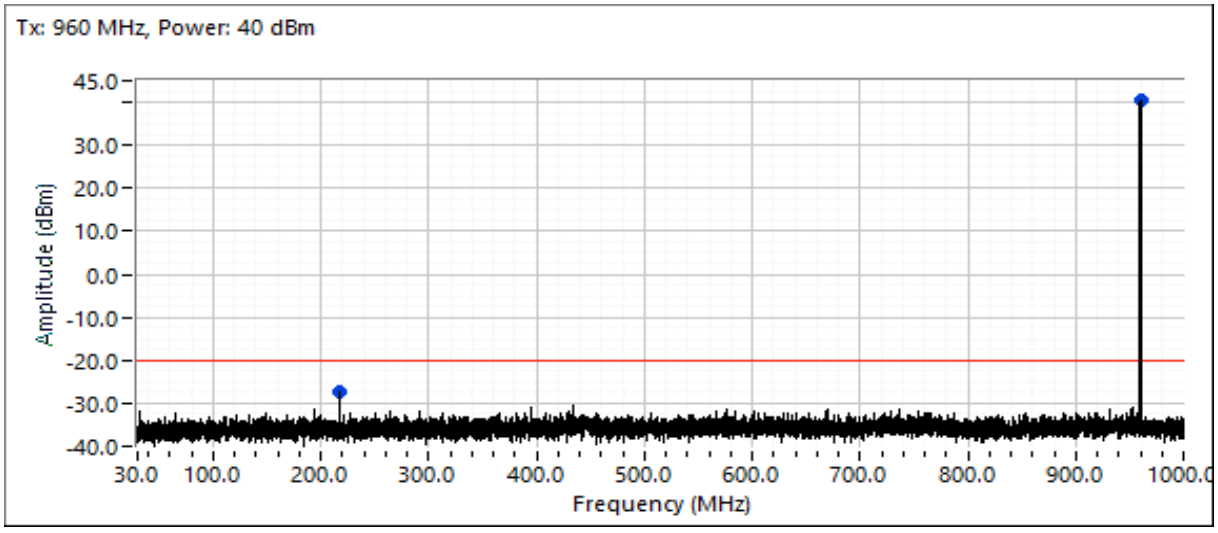


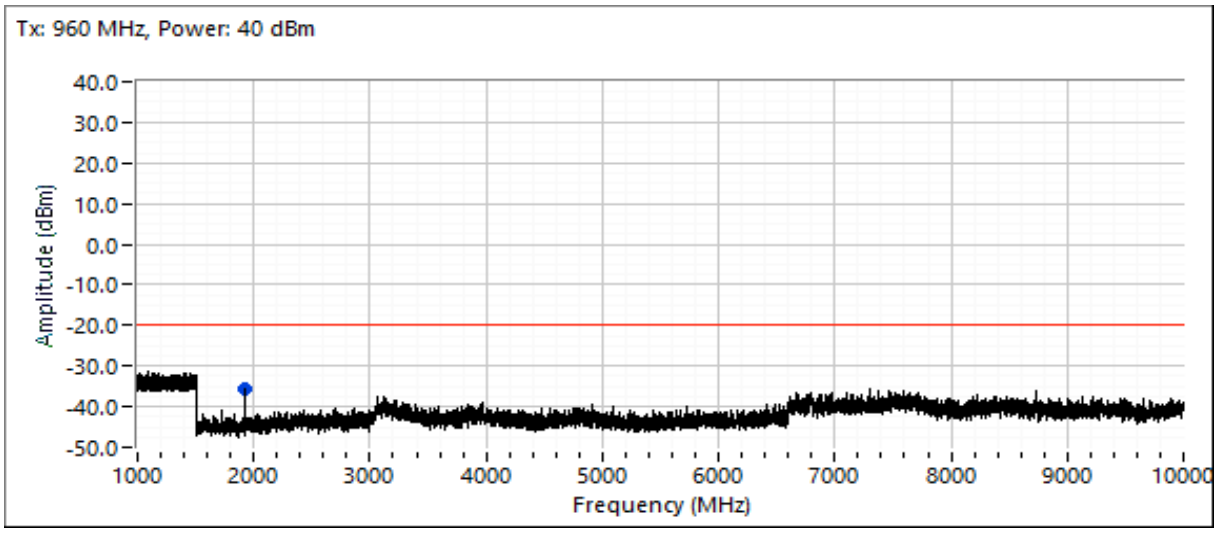
Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	N/A

Run #5: Frequency Stability

Date of Test: 11/18/2022 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: None
Test Location: FT Lab #4B EUT Voltage: 24 VDC

Nominal Frequency: 930.00000 MHz Test performed with an unmodulated carrier signal

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	929.999525	-475	-0.5
-20	929.999817	-183	-0.2
-10	929.999833	-167	-0.2
0	929.999925	-75	-0.1
10	929.999983	-17	0.0
20	929.999992	-8	0.0
30	930.000050	50	0.1
40	930.000083	83	0.1
50	930.000033	33	0.0
60	929.999833	-167	-0.2
	Worst case:	-475	-0.5

Frequency Stability Over Input Voltage

Nominal Voltage is 24.0 Vdc.

Voltage	Frequency Measured	Drift		
(DC)	(MHz)	(Hz)	(ppm)	
20.4	929.999825	-175	-0.2	85%
27.6	929.999708	-292	-0.3	115%
	Worst case:	-292	-0.5	

Note 1:	Maximum drift of fundamental frequency before it shut down at 20.3 Vdc was 0.2 ppm

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Radiated Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

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.

Date of Test: 11/14 & 11/15/2022
Test Engineer: D. Bare, M. Birgani
Test Location: Fremont Chamber #7
Config. Used: 1
Config Change: None
EUT Voltage: 24VDC

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment were routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.
Radiated emissions tests above 1 GHz to FCC Part 15 were performed with floor absorbers in place in accordance with the test methods of ANSI C63.4 and CISPR 16-1-4.
The test distance and extrapolation factor (if applicable) are detailed under each run description.
Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 46-50 %

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Summary of Results

Run #	Test Performed	Limit	Result	Margin (ERP calculated values)
1 (928 MHz)	Transmitter Radiated Spurious Emissions, 30 - 1,000 MHz	RSS-119 (-20 dBm)	Pass	-50.0 dBm @ 400.01 MHz (-30.0 dB)
2 (928 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-35.6 dBm @ 7765.1 MHz (-15.6 dB)
3 (940 MHz)	Transmitter Radiated Spurious Emissions, 30 - 1,000 MHz	RSS-119 (-20 dBm)	Pass	-50.1 dBm @ 400.02 MHz (-30.1 dB)
4 (960 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-36.3 dBm @ 7765.2 MHz (-16.3 dB)
5 (930 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-35.7 dB @ 7765.2 MHz (-15.7 dB)
6 (935 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	FCC part 24 (-13 dBm)	Pass	-35.7 dB @ 7765.2 MHz (-22.7 dB)
7 (940 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-35.6 dBm @ 7765.2 MHz (-15.6 dB)
8 (941 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-35.7 dBm @ 7765.2 MHz (-15.7 dB)
9 (953 MHz)	Transmitter Radiated Spurious Emissions, 1,000 - 10,000 MHz	RSS-119 (-20 dBm)	Pass	-35.5 dBm @ 7765.2 MHz (-15.5 dB)

The limit is taken from ISED RSS-119 Mask D

Conducted limit (dBm): -13

Approximate field strength limit @ 3m: 82.3

The limit is taken from FCC Part 24, 101 Mask (a)(1) and (a)(2)

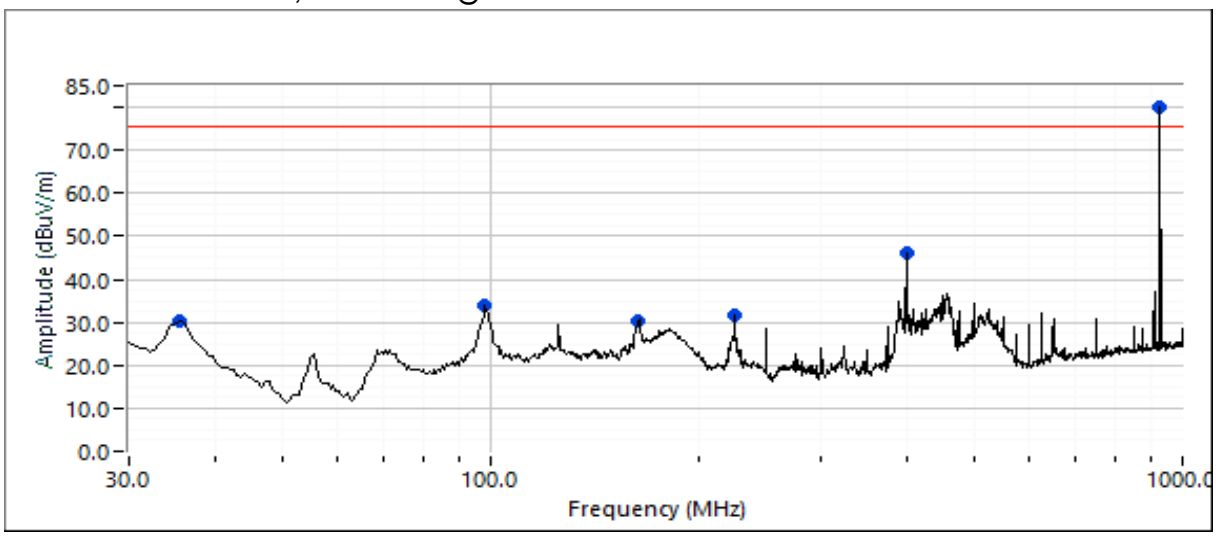
Conducted limit (dBm): -13

Approximate field strength limit @ 3m: 82.3

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 10,000	3	3	0.0

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #1: Radiated Emissions, 30 - 1000 MHz @ 928 MHz

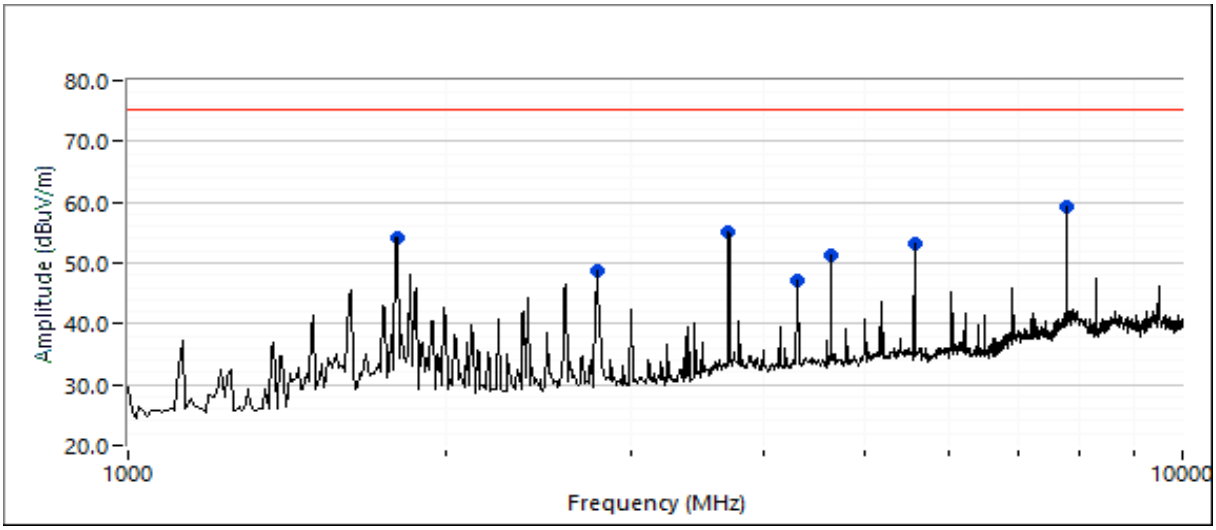


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
35.032	29.1	V	75.3	-46.2	PK	330	1.0	PK (0.10s)
98.200	34.8	V	75.3	-40.5	PK	52	1.0	PK (0.10s)
162.493	29.5	V	75.3	-45.8	PK	167	1.0	PK (0.10s)
224.996	34.8	V	75.3	-40.5	PK	184	2.0	PK (0.10s)
400.009	47.5	H	75.3	-27.8	PK	69	1.0	PK (0.10s)
928.000	80.2	H	N/A	N/A	PK	306	1.5	Fundamental

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #2: Radiated Emissions, 1,000 - 10,000 MHz @ 928 MHz

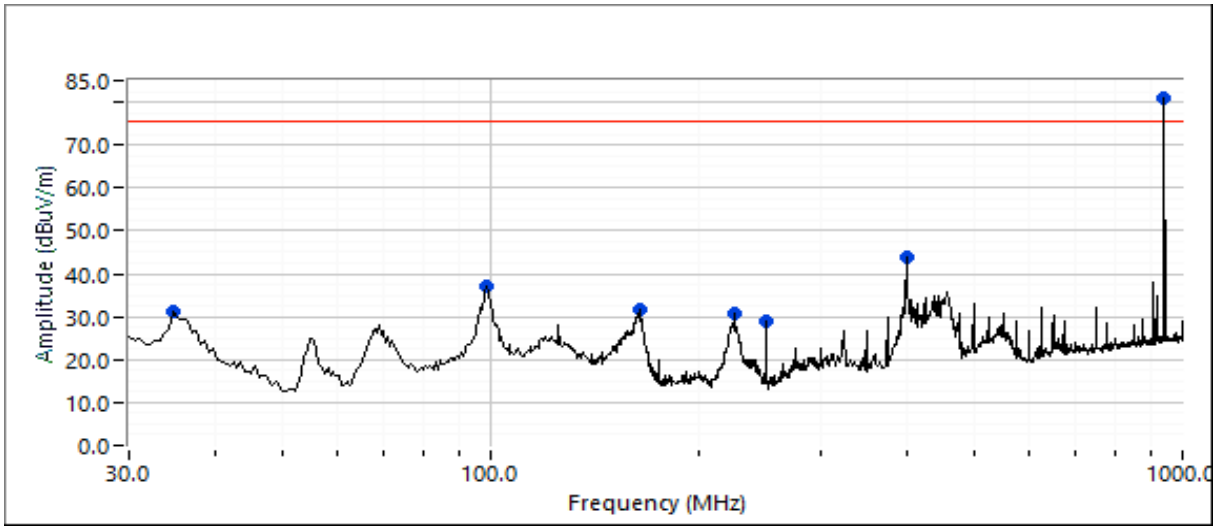


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.110	**61.9**	V	75.3	**-13.4**	PK	254	1.5	RB 1 MHz;VB 3 MHz;Peak
3712.050	56.2	V	75.3	-19.1	PK	328	1.9	RB 1 MHz;VB 3 MHz;Peak
1799.920	55.2	V	75.3	-20.1	PK	295	1.9	RB 1 MHz;VB 3 MHz;Peak
5568.190	54.4	V	75.3	-20.9	PK	319	2.4	RB 1 MHz;VB 3 MHz;Peak
2784.040	51.0	V	75.3	-24.3	PK	311	1.7	RB 1 MHz;VB 3 MHz;Peak
1856.150	50.8	V	75.3	-24.5	PK	326	1.5	RB 1 MHz;VB 3 MHz;Peak
4640.170	50.6	V	75.3	-24.7	PK	295	1.9	RB 1 MHz;VB 3 MHz;Peak
1856.140	49.1	H	75.3	-26.2	PK	334	1.5	RB 1 MHz;VB 3 MHz;Peak
4314.100	49.0	V	75.3	-26.3	PK	316	1.7	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #3: Radiated Emissions, 30 - 1000 MHz @ 940 MHz



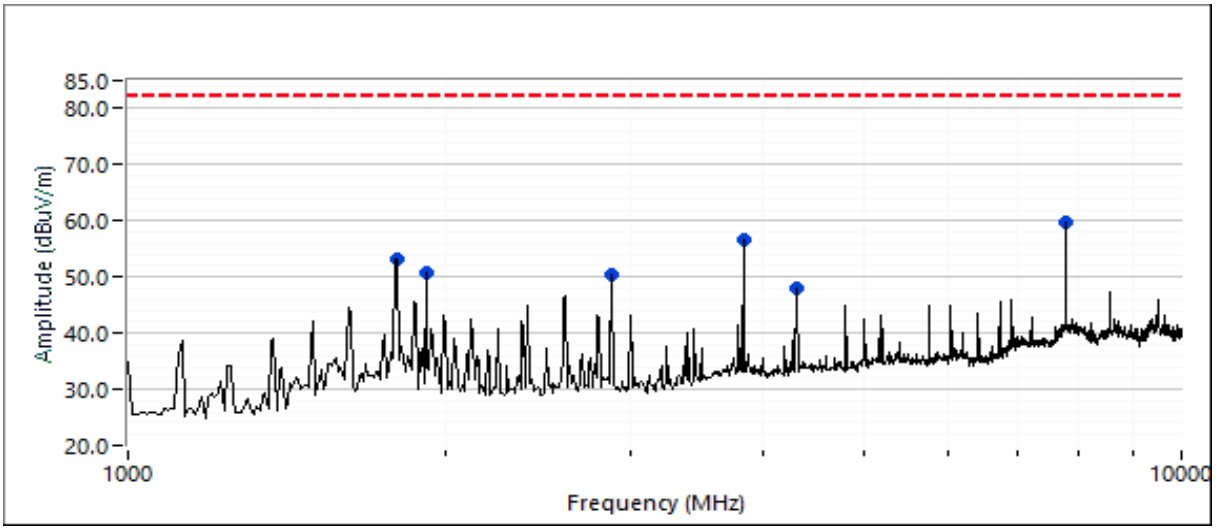
Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
35.032	29.0	V	75.3	-46.3	PK	350	1.0	PK (0.10s)
98.200	34.6	V	75.3	-40.7	PK	167	1.0	PK (0.10s)
162.493	29.3	V	75.3	-46.0	PK	282	1.0	PK (0.10s)
225.000	32.6	V	75.3	-42.7	PK	148	2.1	PK (0.10s)
250.000	33.6	H	75.3	-41.7	PK	146	1.0	PK (0.10s)
400.016	47.4	H	75.3	-27.9	PK	70	1.0	PK (0.10s)
940.000	81.1	H	N/A	N/A	PK	308	1.4	Fundamental

Note 1:	Additional tests from 30-1,000 MHz were considered unnecessary for operation at 930, 935, 941, 953 and 960 MHz as all of the emissions observed below 1 GHz except for the fundamental were the same frequencies and amplitudes for operation at 928 and 940 MHz.

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #4: Radiated Emissions, 1,000 - 10,000 MHz @ 960 MHz

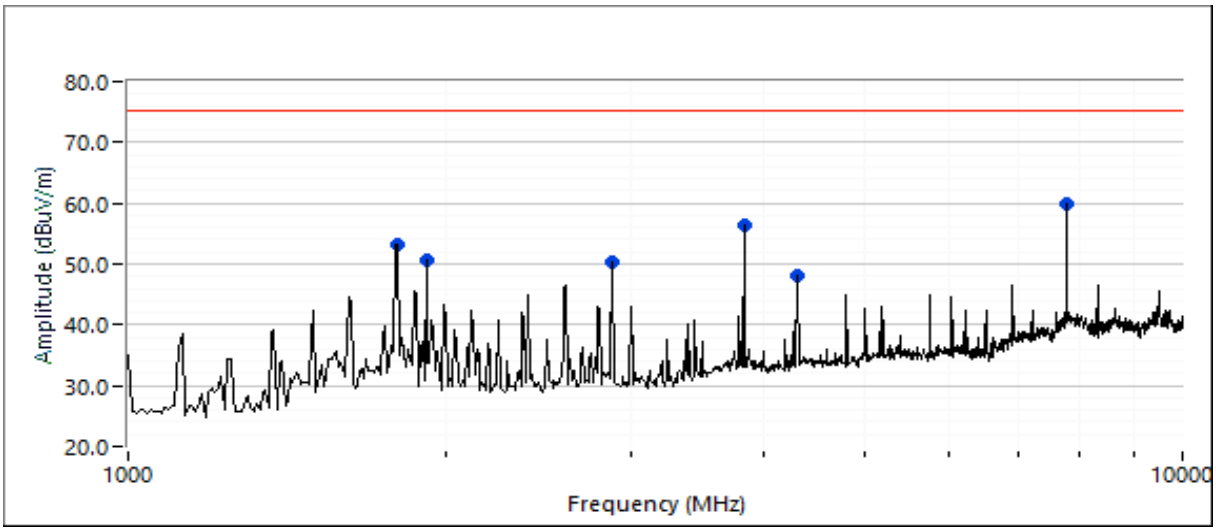


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.230	**61.2**	V	75.3	**-14.1**	PK	248	2.4	RB 1 MHz;VB 3 MHz;Peak
3840.130	61.0	V	75.3	-14.3	PK	290	2.5	RB 1 MHz;VB 3 MHz;Peak
1800.150	55.2	V	75.3	-20.1	PK	290	1.6	RB 1 MHz;VB 3 MHz;Peak
2880.100	54.4	V	75.3	-20.9	PK	318	1.5	RB 1 MHz;VB 3 MHz;Peak
1919.990	53.7	V	75.3	-21.6	PK	296	1.6	RB 1 MHz;VB 3 MHz;Peak
4313.950	50.8	V	75.3	-24.5	PK	325	1.3	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #5: Radiated Emissions, 1,000 - 10,000 MHz @ 930 MHz

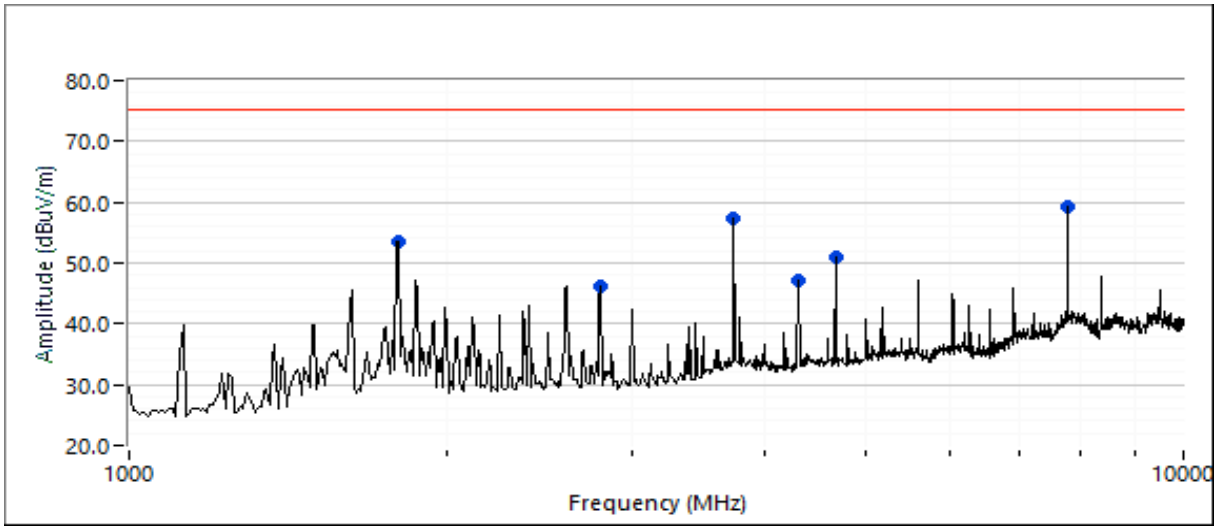


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.230	**61.8**	V	75.3	**-13.5**	PK	249	2.1	RB 1 MHz;VB 3 MHz;Peak
3720.150	57.6	V	75.3	-17.7	PK	330	2.3	RB 1 MHz;VB 3 MHz;Peak
1800.060	54.6	V	75.3	-20.7	PK	303	1.3	RB 1 MHz;VB 3 MHz;Peak
4650.010	54.3	V	75.3	-21.0	PK	288	2.2	RB 1 MHz;VB 3 MHz;Peak
5580.000	52.8	V	75.3	-22.5	PK	336	2.4	RB 1 MHz;VB 3 MHz;Peak
2799.770	46.2	V	75.3	-29.1	PK	303	2.3	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #6: Radiated Emissions, 1,000 - 10,000 MHz @ 935 MHz

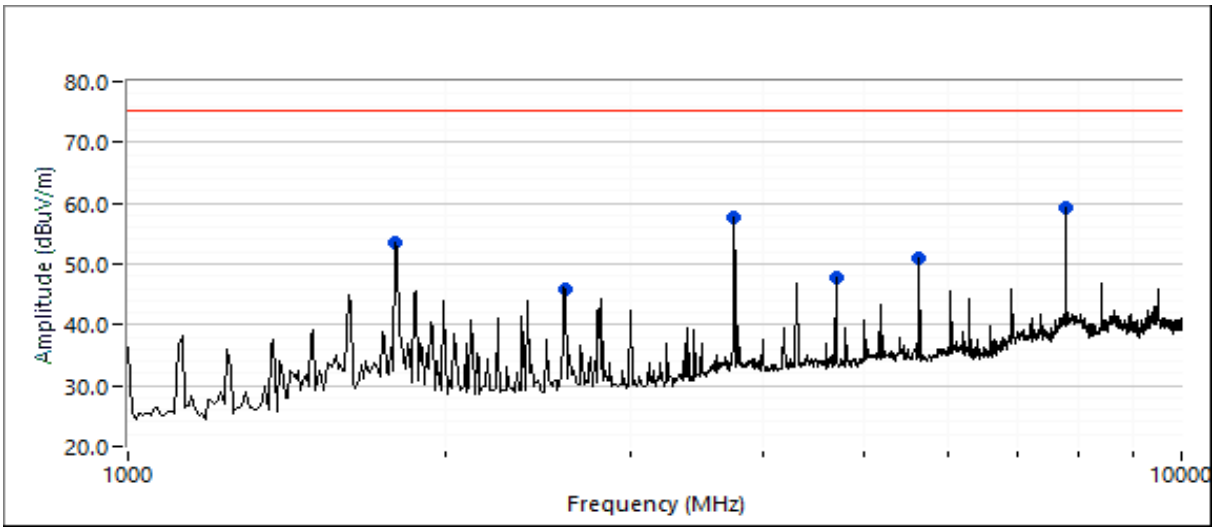


Maximized readings captured during pre-scan

Frequency	Level	Pol	FCC 24		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.230	**61.8**	V	82.3	**-20.5**	PK	253	1.6	RB 1 MHz;VB 3 MHz;Peak
3740.090	57.6	V	82.3	-24.7	PK	299	2.1	RB 1 MHz;VB 3 MHz;Peak
1800.010	55.4	V	82.3	-26.9	PK	304	1.8	RB 1 MHz;VB 3 MHz;Peak
4675.080	53.2	V	82.3	-29.1	PK	304	2.5	RB 1 MHz;VB 3 MHz;Peak
4314.140	50.4	V	82.3	-31.9	PK	324	1.4	RB 1 MHz;VB 3 MHz;Peak
2805.110	49.1	V	82.3	-33.2	PK	312	2.0	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #7: Radiated Emissions, 1,000 - 10,000 MHz @ 940 MHz

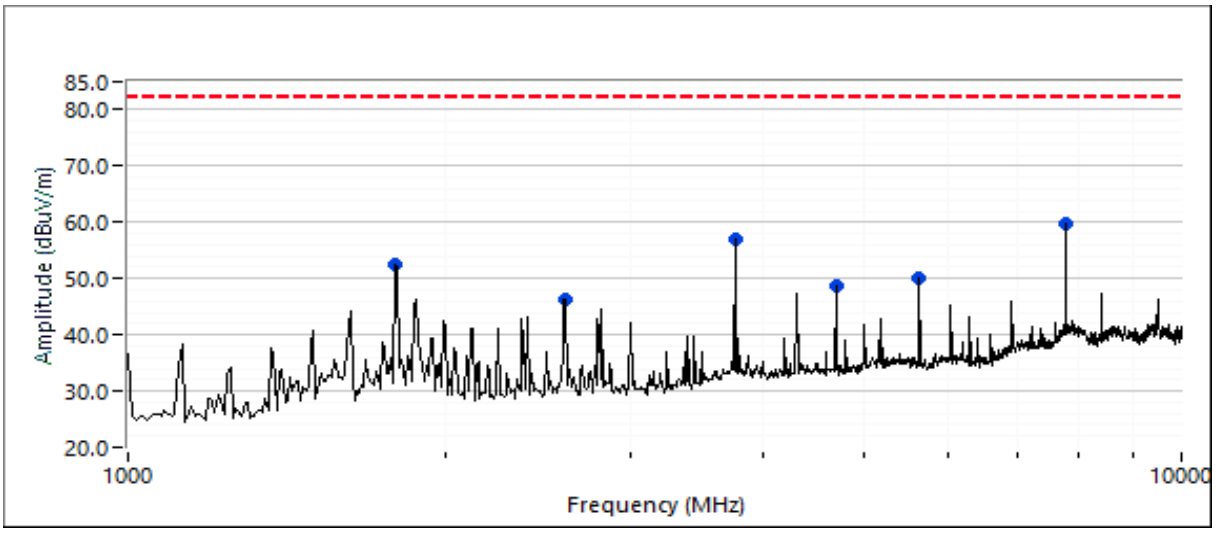


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.230	**61.9**	V	75.3	**-13.4**	PK	252	1.6	RB 1 MHz;VB 3 MHz;Peak
3760.120	60.3	V	75.3	-15.0	PK	31	1.2	RB 1 MHz;VB 3 MHz;Peak
1800.160	55.5	V	75.3	-19.8	PK	300	1.8	RB 1 MHz;VB 3 MHz;Peak
5640.050	53.3	V	75.3	-22.0	PK	323	2.2	RB 1 MHz;VB 3 MHz;Peak
4700.120	51.7	V	75.3	-23.6	PK	302	2.4	RB 1 MHz;VB 3 MHz;Peak
2600.190	49.5	V	75.3	-25.8	PK	330	2.2	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #8: Radiated Emissions, 1,000 - 10,000 MHz @ 941 MHz

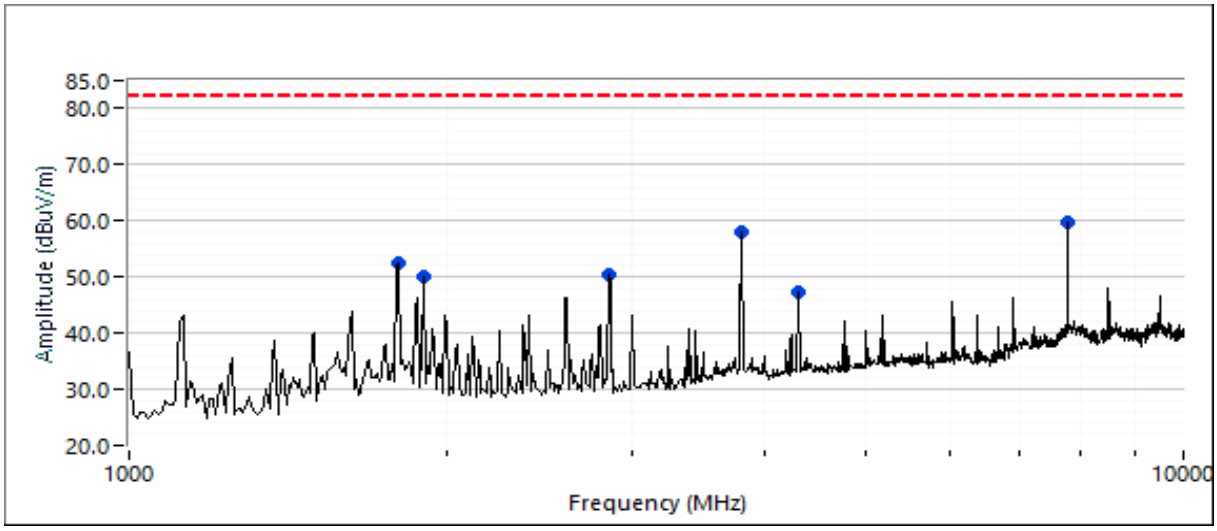


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.190	**61.8**	V	75.3	**-13.5**	PK	252	1.6	RB 1 MHz;VB 3 MHz;Peak
3764.070	59.1	V	75.3	-16.2	PK	30	1.5	RB 1 MHz;VB 3 MHz;Peak
1799.960	54.6	V	75.3	-20.7	PK	295	1.9	RB 1 MHz;VB 3 MHz;Peak
5646.070	52.9	V	75.3	-22.4	PK	318	2.3	RB 1 MHz;VB 3 MHz;Peak
4705.060	50.4	V	75.3	-24.9	PK	308	1.8	RB 1 MHz;VB 3 MHz;Peak
2600.080	49.5	V	75.3	-25.8	PK	335	2.0	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #9: Radiated Emissions, 1,000 - 10,000 MHz @ 953 MHz

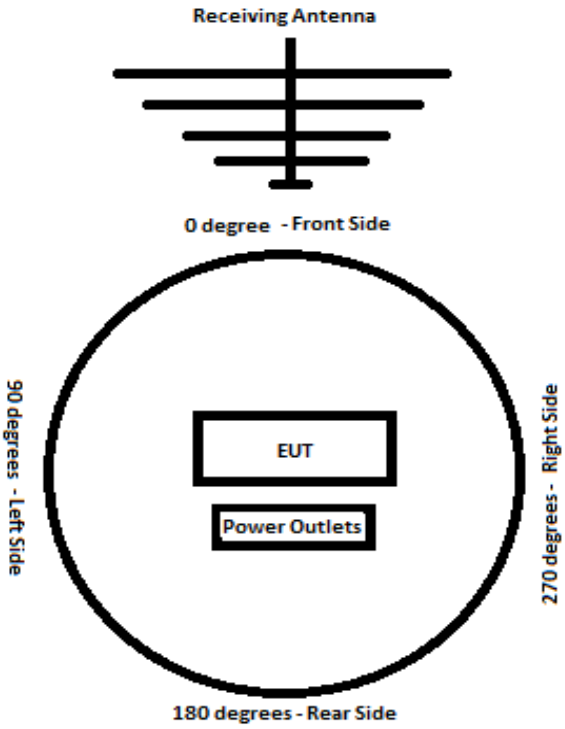


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.200	**62.0**	V	75.3	**-13.3**	PK	253	1.4	RB 1 MHz;VB 3 MHz;Peak
3812.120	58.2	V	75.3	-17.1	PK	28	1.0	RB 1 MHz;VB 3 MHz;Peak
1800.030	54.7	V	75.3	-20.6	PK	300	1.8	RB 1 MHz;VB 3 MHz;Peak
1905.990	51.7	V	75.3	-23.6	PK	292	1.5	RB 1 MHz;VB 3 MHz;Peak
2859.040	51.6	V	75.3	-23.7	PK	304	1.6	RB 1 MHz;VB 3 MHz;Peak
4313.980	50.3	V	75.3	-25.0	PK	325	1.4	RB 1 MHz;VB 3 MHz;Peak

Note 2:	Per ANSI C63.26-2015 section 5.5.1, since a validated test site was used in performing these spurious emissions tests, the conversion of the field strength measurement result to the ERP value is acceptable per section 5.5.4 and substitution measurements per section 5.5.3 are not required.

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-



Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Radiated Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

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.

Date of Test: 11/15/2022
Test Engineer: David Bare
Test Location: Fremont Chamber #7
Config. Used: 1
Config Change: -
EUT Voltage: 24VDC

General Test Configuration

The EUT was located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment were routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.
Radiated emissions tests above 1 GHz to FCC Part 15 were performed with floor absorbers in place in accordance with the test methods of ANSI C63.4 and CISPR 16-1-4.
The test distance and extrapolation factor (if applicable) are detailed under each run description.
Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19-21 °C
Rel. Humidity: 38-40 %

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1 (Upright) (940 MHz)	Transmitter Radiated Spurious Emissions, 30 - 1,000 MHz	RSS-119 (-20 dBm)	Pass	47.2 dBµV/m (229.1 µV/m) @ 250.00 MHz
2 (Flat) (940 MHz)	Transmitter Radiated Spurious Emissions, 30 - 1,000 MHz	RSS-119 (-20 dBm)	Pass	47.1 dBµV/m (226.5 µV/m) @ 250.00 MHz
3 (Upright) (940 MHz)	Transmitter Radiated Spurious Emissions, 1- 10 GHz	RSS-119 (-20 dBm)	Pass	61.8 dBµV/m (1230.3 µV/m) @ 7765.3 MHz
4 (Flat) (940 MHz)	Transmitter Radiated Spurious Emissions, 1- 10 GHz	RSS-119 (-20 dBm)	Pass	60.8 dBµV/m (1096.5 µV/m) @ 7765.3 MHz

The limit is taken from ISED RSS-119 Mask D

Conducted limit (dBm): -20 Low Channels = 928 and 935 MHz

Approximate field strength limit @ 3m: 75.3 High Channels = 930 and 940 MHz

The limit is taken from FCC Part 24, 101 Mask (a)(1) and (a)(2)

Conducted limit (dBm): -13

Approximate field strength limit @ 3m: 82.3

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 10,000	3	3	0.0

Client:	GE MDS LLC	PR Number:	PR166351
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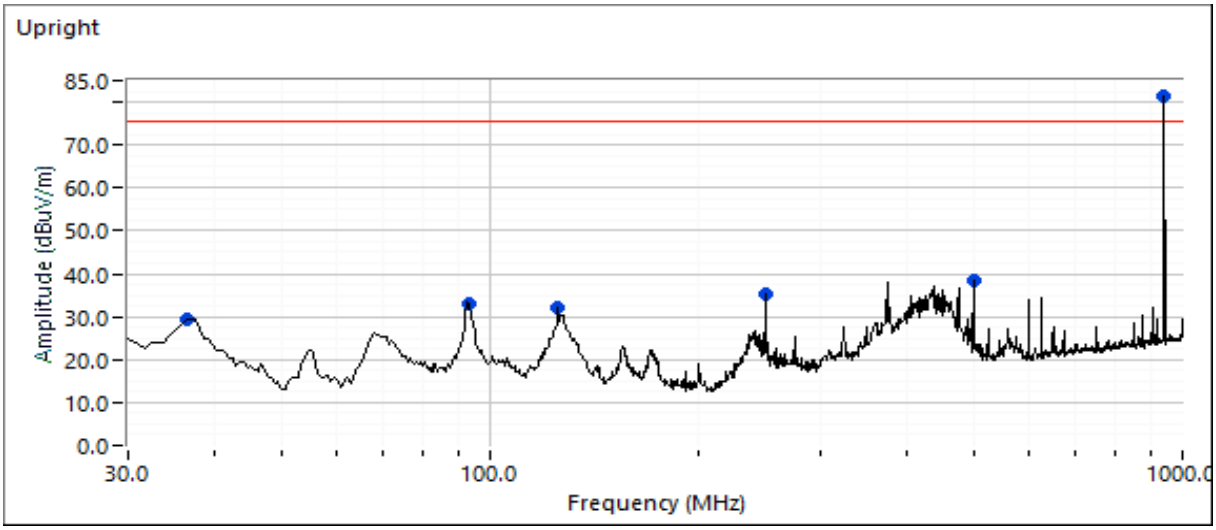
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #1: Radiated Emissions, 30 - 1000 MHz @ 940 MHz, Module Upright

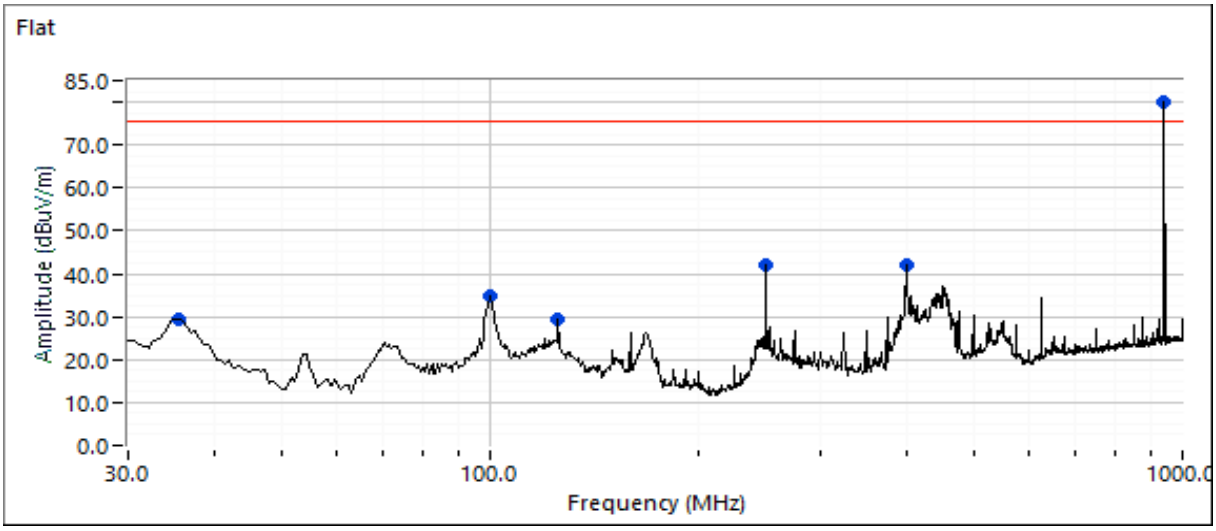


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
250.000	**47.2**	V	75.3	**-28.1**	PK	245	1.9	PK (0.10s)
500.000	42.9	V	75.3	-32.4	PK	72	1.0	PK (0.10s)
36.568	40.7	V	75.3	-34.6	PK	4	1.0	PK (0.10s)
125.000	36.8	H	75.3	-38.5	PK	279	2.4	PK (0.10s)
93.374	32.9	V	75.3	-42.4	PK	160	1.0	PK (0.10s)
940.000	82.6	H	N/A	N/A	PK	315	2.5	PK (0.10s)

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #2: Radiated Emissions, 30 - 1000 MHz @ 940 MHz, Module Flat

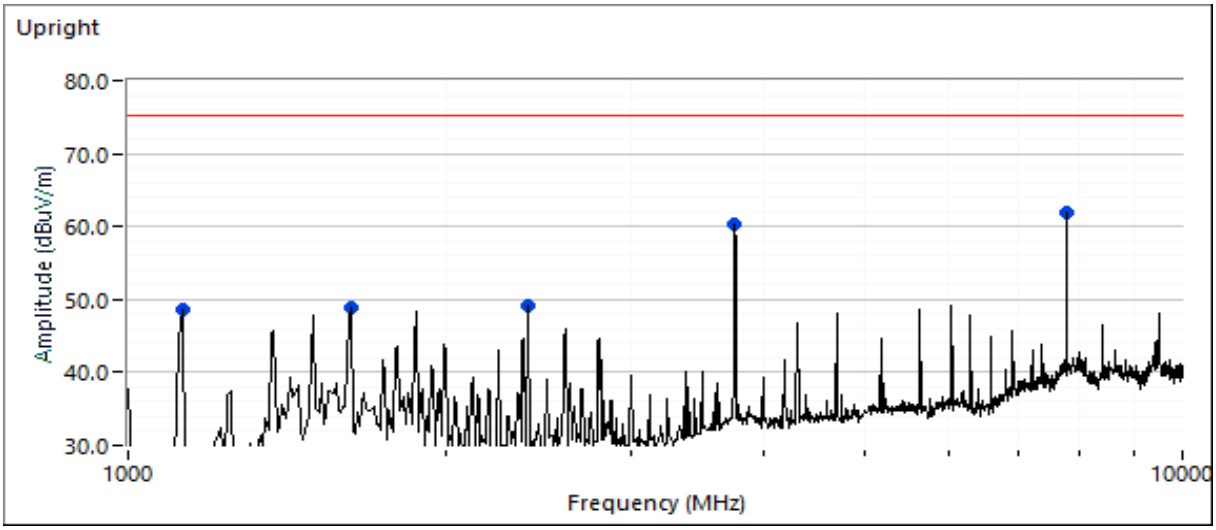


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
250.000	**47.1**	H	75.3	**-28.2**	PK	133	1.0	PK (0.10s)
400.000	45.0	H	75.3	-30.3	PK	316	2.3	PK (0.10s)
35.578	37.5	V	75.3	-37.8	PK	329	1.0	PK (0.10s)
125.000	31.2	H	75.3	-44.1	PK	282	3.5	PK (0.10s)
99.623	30.4	V	75.3	-44.9	PK	202	1.0	PK (0.10s)
940.000	80.6	H	N/A	N/A	PK	314	1.4	PK (0.10s)

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

Run #3: Radiated Emissions, 1,000 - 10,000 MHz @ 940 MHz, Module Upright

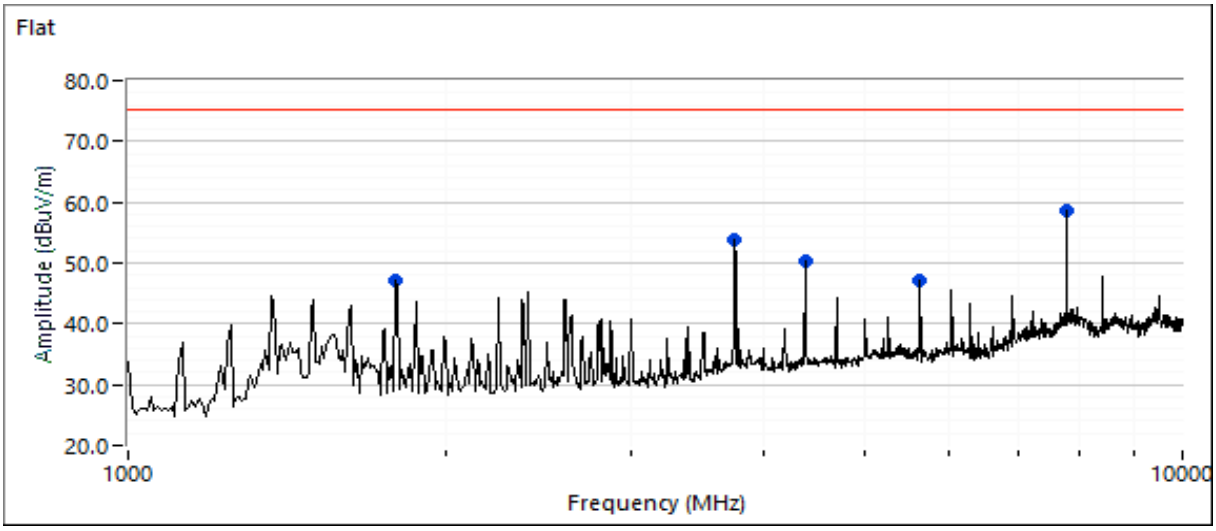


Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.250	**61.8**	H	75.3	**-13.5**	PK	296	1.2	RB 1 MHz;VB 3 MHz;Peak
3760.040	60.2	H	75.3	-15.1	PK	43	2.5	RB 1 MHz;VB 3 MHz;Peak
1625.160	52.2	H	75.3	-23.1	PK	360	1.7	RB 1 MHz;VB 3 MHz;Peak
2400.000	51.2	H	75.3	-24.1	PK	308	2.1	RB 1 MHz;VB 3 MHz;Peak
1124.990	42.9	V	75.3	-32.4	PK	186	1.8	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-

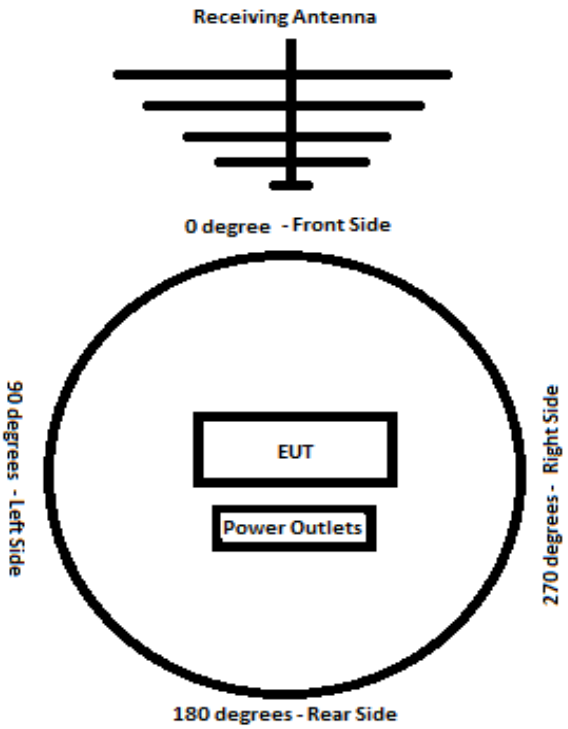
Run #4: Radiated Emissions, 1,000 - 10,000 MHz @ 940 MHz, Module Flat



Maximized readings captured during pre-scan

Frequency	Level	Pol	RSS-119		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7765.320	**60.8**	V	75.3	**-14.5**	PK	253	1.0	RB 1 MHz;VB 3 MHz;Peak
3759.970	57.0	H	75.3	-18.3	PK	40	2.0	RB 1 MHz;VB 3 MHz;Peak
1800.100	51.5	H	75.3	-23.8	PK	72	1.0	RB 1 MHz;VB 3 MHz;Peak
5640.080	50.3	V	75.3	-25.0	PK	53	1.2	RB 1 MHz;VB 3 MHz;Peak
4388.230	42.7	H	75.3	-32.6	PK	327	1.0	RB 1 MHz;VB 3 MHz;Peak

Client:	GE MDS LLC	PR Number:	PR166351
Model:	Orbit SDM9 Module	T-Log Number:	TL166351-RA
		Project Manager:	Christine Krebill
Contact:	Jonathan Vilagy	Project Engineer:	David Bare
Standard:	FCC Parts 24 and 101, RSS-119	Class:	-



End of Report

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