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EMC Test Report

Application for FCC Grant of Equipment Authorization
Canada Certification

Innovation, Science and Economic Development Canada
RSS-Gen Issue 5 / RSS-247 Issue 2
FCC Part 15 Subpart C

Model: NET9S

IC CERTIFICATION #:	E5MDS-NET9S
FCC ID:	101D-NET9S
APPLICANT:	GE Digital Energy - MDS 175 Science Pkwy Rochester, NY 14620
TEST SITE(S):	NTS Labs LLC 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-4
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A2LA ACCREDITED
Testing Cert #0214.26

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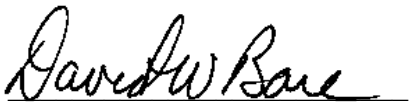
VALIDATING SIGNATORIES

PROGRAM MGR



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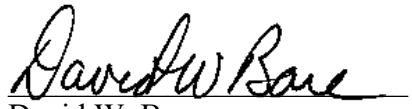

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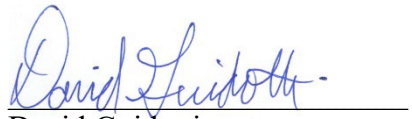

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	June 1, 2023	First release	
1	July 11, 2023	Added results for other hopping mode, added firmware and settings used during testing.	David Bare
2	July 13, 2023	Revised to correct the values of output power and antenna gain for Yagi antenna.	David Bare
3	July 14, 2023	Revised to update power plots for Yagi antenna	David Bare

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SCOPE

An electromagnetic emissions test has been performed on the GE Digital Energy - MDS model NET9S, pursuant to the following rules:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

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 C63.10-2013

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

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

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.

OBJECTIVE

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

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

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 NET9S complied with the requirements of the following regulations:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

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.

The test results recorded herein are based on a single type test of GE Digital Energy - MDS model NET9S and therefore apply only to the tested sample. The sample was selected and prepared by Jonathan Vilagy of GE Digital Energy - MDS.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (902 – 928 MHz, 50 channels or more)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1) (i)	RSS 247 5.1 (1) & (3)	20dB Bandwidth	128 kHz	<= 500 kHz	Complies
15.247 (a) (1)	RSS 247 5.1 (2)	Channel Separation	200 kHz	Channel spacing > 20dB bandwidth (minimum 25kHz)	Complies
15.247 (a) (1) (i)	RSS 247 5.1 (3)	Number of Channels	128	50 or more	Complies
15.247 (a) (1) (i)	RSS 247 5.1 (3)	Channel Dwell Time	77.0 mS in any 20 second period	<0.4 second within a 20 second period	Complies
15.247 (a) (1)	RSS 247 5.1 (1)	Channel Utilization	All channels are used equally - refer to the operational description for full explanation	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 247 5.4 (1)	Output Power (Both radios)	30 dBm (1.0 W) EIRP = 3.98 W Note 1	1Watt, EIRP <= 4 Watts	Complies
15.247 (d)	RSS 247 5.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz	-25.2 dBc (margin: 5.2 dB)	< -20dBc	Complies
15.247 (d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 30MHz – 9.28 GHz Omni	51.0 dBµV/m @ 2782.8 MHz (-3.0 dB)	Refer to the limits section (p19) for restricted bands, all others < -20dBc	Complies
		Radiated Spurious Emissions 30MHz – 9.28 GHz Yagi	47.3 dBµV/m @ 2704.16 MHz (-6.7 dB)		
15.247 (a) (1)	RSS 247 5.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1 EIRP calculated using antenna gain of 6 dBi for the highest EIRP system.
Note 2 Pass/Fail criteria defined by standards listed above.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Professional Install, Refer to User Manual	Unique or integral antenna required or Professional Installation	Complies
15.407 (b) (6)	RSS-Gen Table 4	AC Conducted Emissions	42.7 dBµV @ 2.224 MHz (-3.3 dB)	Refer to page 19	Complies
15.247 (i) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in separate exhibit, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSS-Gen 6.8	User Manual	Refer to User Manual statements	Statement for products with detachable antenna	Complies
-	RSS-Gen 8.4	User Manual	Refer to User Manual statements	Statement for all products	Complies
-	RSP-100 RSS-Gen 6.7	Occupied Bandwidth	121 kHz	Information only	N/A

Note 1 Pass/Fail criteria defined by standards listed above.

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 and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The GE Digital Energy - MDS model NET9S is an industrial frequency hopping radio that is designed to operate in the 902-928 MHz band. 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 6-36 Volts DC, 1.2 Amps max.

The sample was received on May 11, 2023 and tested on May 11 thru 22, 2023. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GE MDS	NET9S	Industrial Dual Transceiver	Pre-production	E5MDS-NET9S

ANTENNA SYSTEM

The antenna system consists of either a Hana Wireless HW-0D9-6D-NF multi-element omnidirectional 6 dBi with at least 3 dB of cable loss or PCTEL BMYD890K-DP Yagi 11 dBi with at least 8 dB cable loss antenna.

ENCLOSURE

The EUT enclosure is primarily constructed of metal. It measures approximately 13.5 cm wide by 9.6 cm deep by 3.8 cm high.

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 local support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
HP	6024A	Power Supply	2430A-03013	-

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

Company	Model	Description	Serial Number	FCC ID
D-Link	DES-1105	Ethernet Switch	DRL7271011218	-
hp	250 G8	Laptop	CND1454HKM	-

EUT INTERFACE PORTS

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

EUT

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Antenna	Antenna	Coax	Shielded	0.6
Ethernet	Remote switch	Cat 6	Shielded	7.6
COM	Termination	Cat 6	Unshielded	2
Chassis	Ground	Braid	Unshielded	2.5

Additional on Support Equipment

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Laptop USB	EUT (for configuration only, removed for testing)	Multiwire	Shielded	0.5
Laptop DC	AC Adapter	two wire	Unshielded	1.7
AC Adapter	Mains	three wire	Unshielded	1.5

EUT OPERATION

During emissions testing the EUT was configured using commands in a TeraTerm application on the laptop to transmit a 100% duty cycle modulated signal at the desired frequency and maximum power level from both radios or set to hop on all channels at the maximum power level on both radios depending on the test being performed. The EUT firmware 06-7272A01 is version 0.1.9. Single frequency operation was set using command “radio channel x” where x is the channel number. Radio output power was set using command “cfg set radio.power 30” and hopping mode was set using command “radio mode transnet”.

TEST SITE

GENERAL INFORMATION

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 4	US1031	2845B (Wireless Test Lab #US0027)	41039 Boyce Road Fremont, CA 94538-2435

ANSI C63.4 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 C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 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. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

Software is used to view and convert receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers. The software used for radiated and conducted emissions measurements is NTS Labs LLC EMI Test Software (rev 2.10)

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

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

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

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. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 centimeters for testing below 1 GHz and 1.5m for testing above 1 GHz. Floor mounted equipment shall be 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 as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

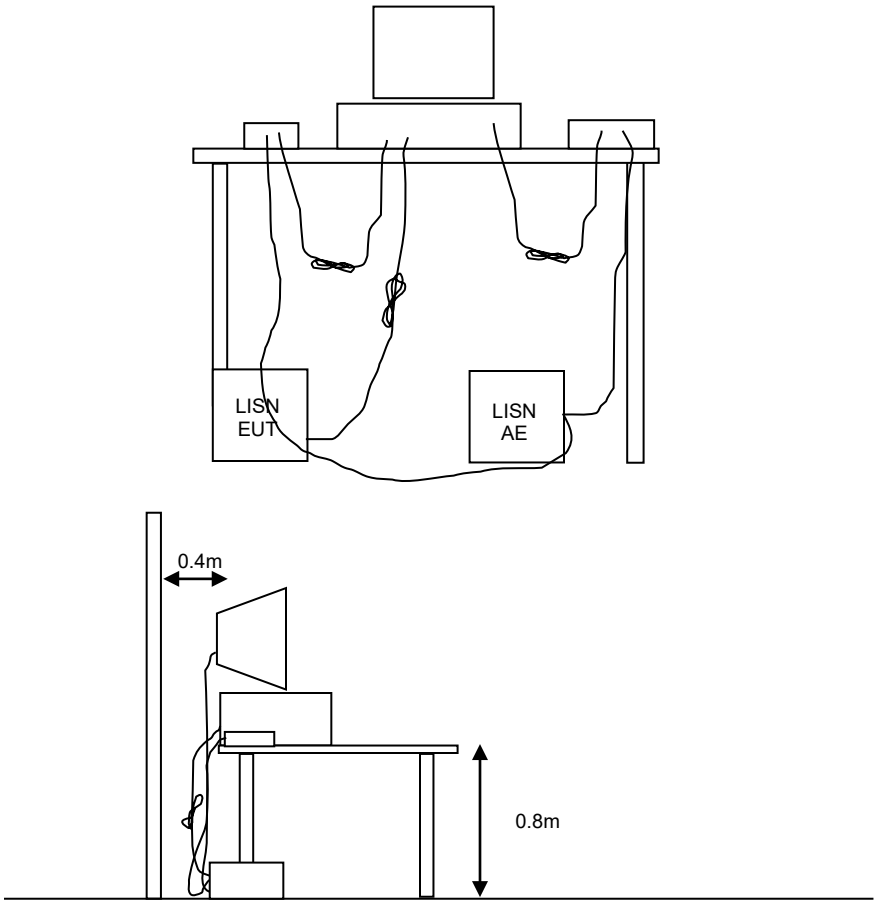


Figure 1 Typical Conducted Emissions Test Configuration

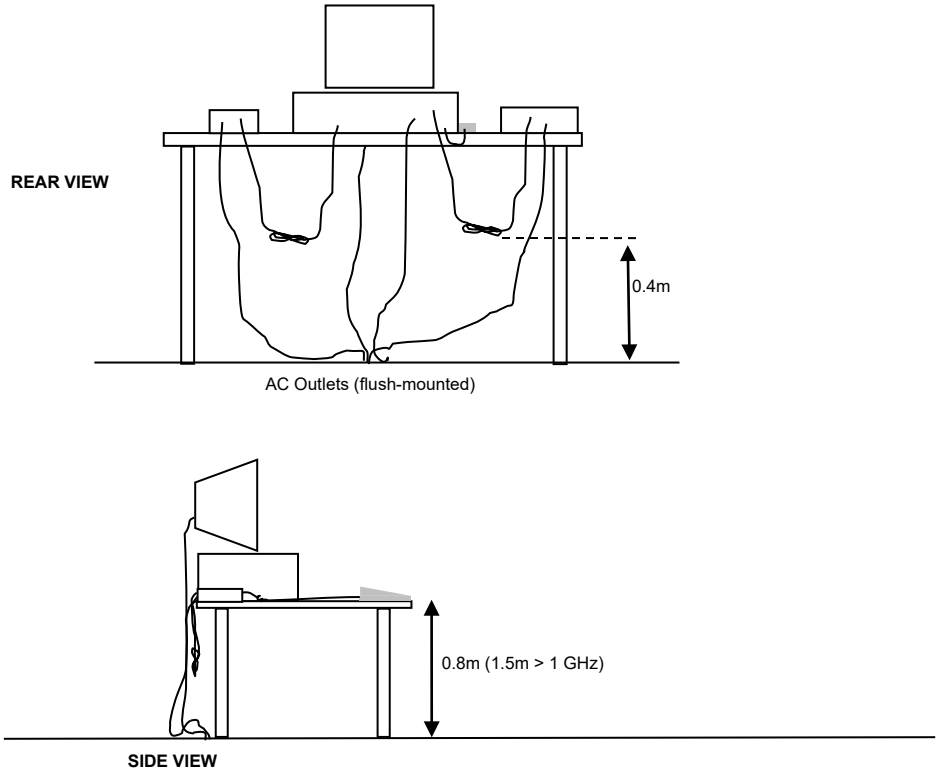
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

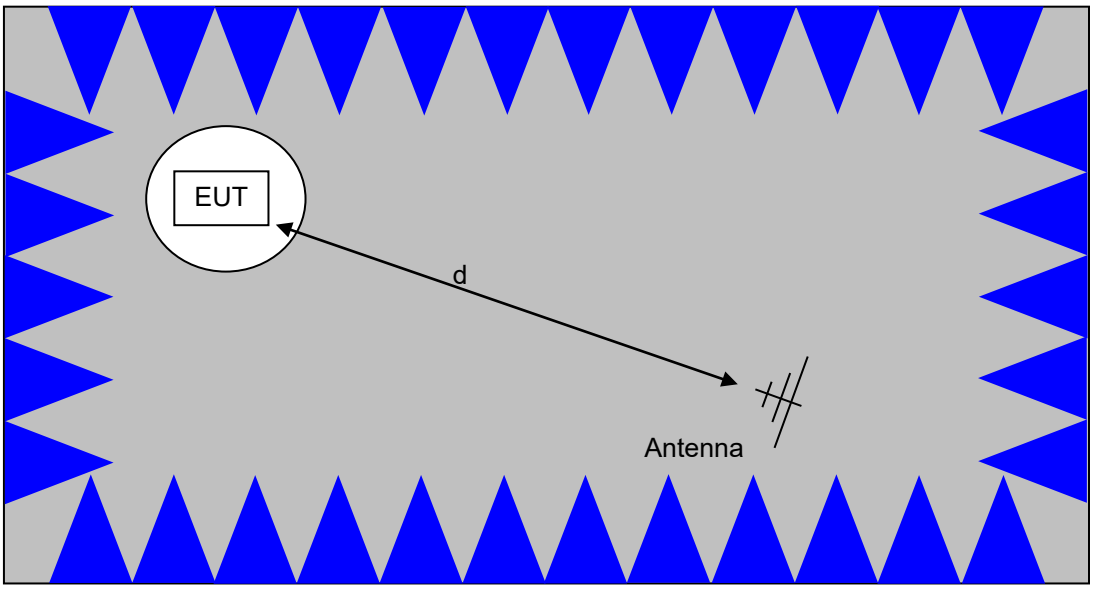
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

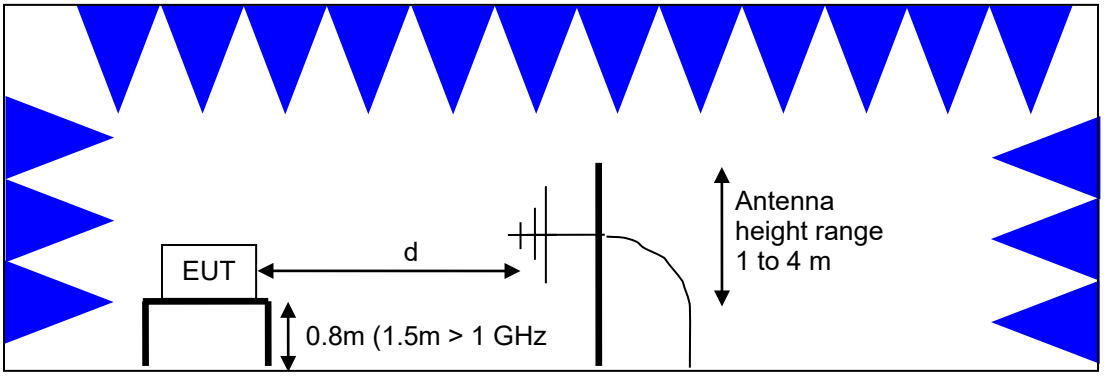


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

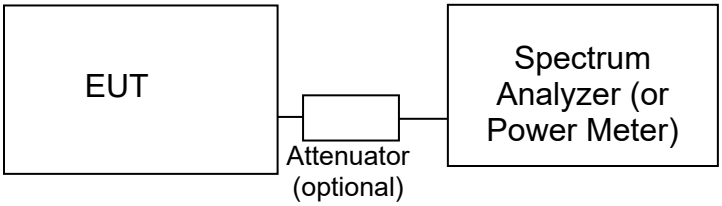
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Labs LLC's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1].

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

[1] The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 7

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS GEN. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:
R_r = Receiver Reading in dBuV
S = Specification Limit in dBuV
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally 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, when used for electric field measurements above 30MHz, is calculated 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:

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

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

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 - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 30 - 9,300 MHz, 11-17-May-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Hewlett Packard	Spectrum Analyzer (Blue)	8564E	WC055592	4/19/2023	4/19/2024
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blue)	3115	WC064442	11/18/2022	11/18/2024
Hewlett Packard	High Pass filter, 1.5 GHz	84300-80037	WC064494	11/15/2022	11/15/2023
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	WC064573	2/27/2022	8/1/2024
Agilent Technologies	Microwave Preamplifier, 1-26.5GHz	8449B	WC064574	2/28/2023	2/28/2024
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB 7	WC064989	1/4/2023	1/4/2024
Rohde & Schwarz	EMI Test Receiver, 9kHz-7GHz	ESR 7	WC078725	3/14/2023	3/14/2024
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	WC080961	5/20/2022	5/20/2023
Radio Antenna Port (Power and Spurious Emissions), 16-May-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
National Technical Systems	NTS Capture Analyzer Software (rev 4.0)	N/A	WC022706	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055650	8/30/2022	8/31/2023
Conducted Emissions - AC Power Ports, 22-May-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Fischer Custom Communications	LISN, 25A, 150kHz to 30MHz, 25 Amp	FCC-LISN-50-25-2-09	WC064532	9/8/2022	9/8/2023
Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	ESI	WC068000	7/21/2022	7/21/2023
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	WC072359	6/30/2022	6/30/2023
Channel Occupancy, 10-Jul-23					
National Technical Systems	NTS Capture Analyzer Software (rev 4.0)	N/A	WC022706	N/A	
Rohde & Schwarz	Spectrum Analyzer	FSQ26	WC055662	12/11/2022	12/31/2023

Appendix B Test Data

TL171060-RA NET9S Pages 25 – 71

Client:	GE MDS LLC	PR Number:	PR171060
Product	NET9S	T-Log Number:	TL171060-RA-NET9S
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Emissions Standard(s):	FCC §15.247, RSS-247	Class:	-
Immunity Standard(s):	-	Environment:	Industrial

EMC Test Data

For The

GE MDS LLC

Product

NET9S

Date of Last Test: 7/10/2023

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (FHSS) Measurements

Power, Bandwidth 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.

Test Location: Fremont Chambers #2 & #4 Config. Used: 1

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located outside the chamber with all I/O connections running under the floor.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.
When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.
Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 20-24 °C
Rel. Humidity: 35-48 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	25 - 9,300 MHz Transmitter Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	51.0 dBµV/m @ 2782.8 MHz (-3.0 dB)
4	Transmitter Conducted Spurious Emissions	FCC Part 15.247(c)	Pass	-25.2 dBc (margin: 5.2 dB)
5	Output Power	15.247(b)	Pass	30 dBm (1.0 W)
6	20dB Bandwidth	15.247(a)	Pass	128 kHz
6	Channel Occupancy	15.247(a)	Pass	18.29 mS or 77.0 mS in any 20 second period
6	Number of Channels	15.247(a)	Pass	64 or 128

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.

Test Notes

Based on prelimiary radiated emissions tests in 3 orthogonal orientations, the flat orientation was the worst case w.r.t. the limits and was therefore used for all radiated testing.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #1: Radiated Spurious Emissions, 25 - 9,300 MHz.

Date of Test: 5/15 & 5/17/2023 Test Engineer: David Bare / M. Birgani

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.358	128.3	V	-	-	PK	143	2.0	POS; RB 100 kHz; VB: 300 kHz
902.228	130.2	H	-	-	PK	188	1.7	POS; RB 100 kHz; VB: 300 kHz

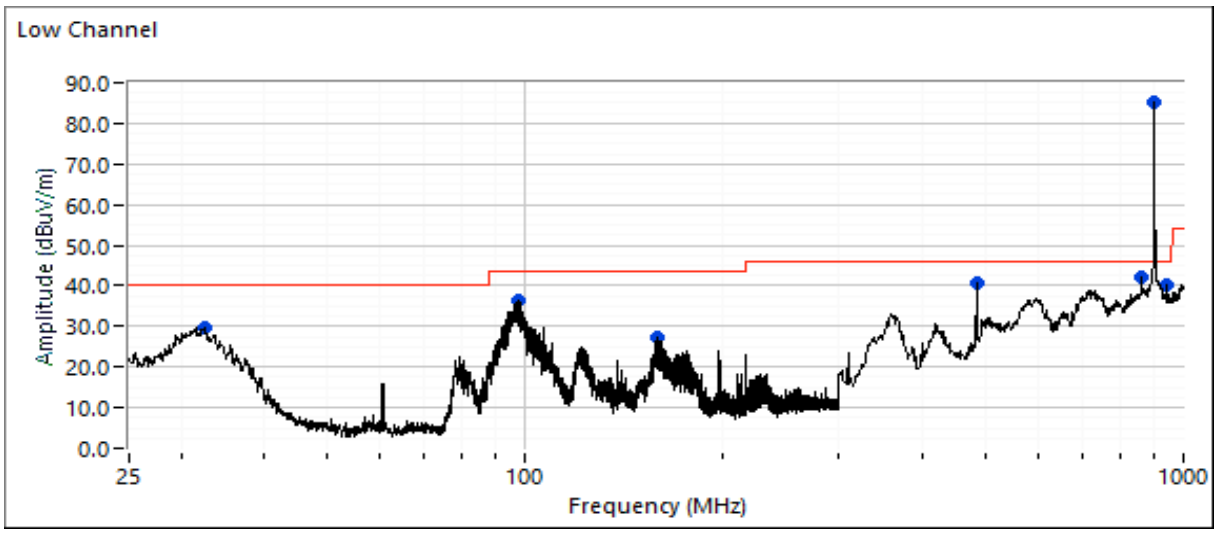
Maximun Fundamental emission level @ 3m in 100kHz RBW:	130.2 dBµV/m	
Limit for emissions outside of restricted bands:	110.2 dBµV/m	**Limit is -20dBc**

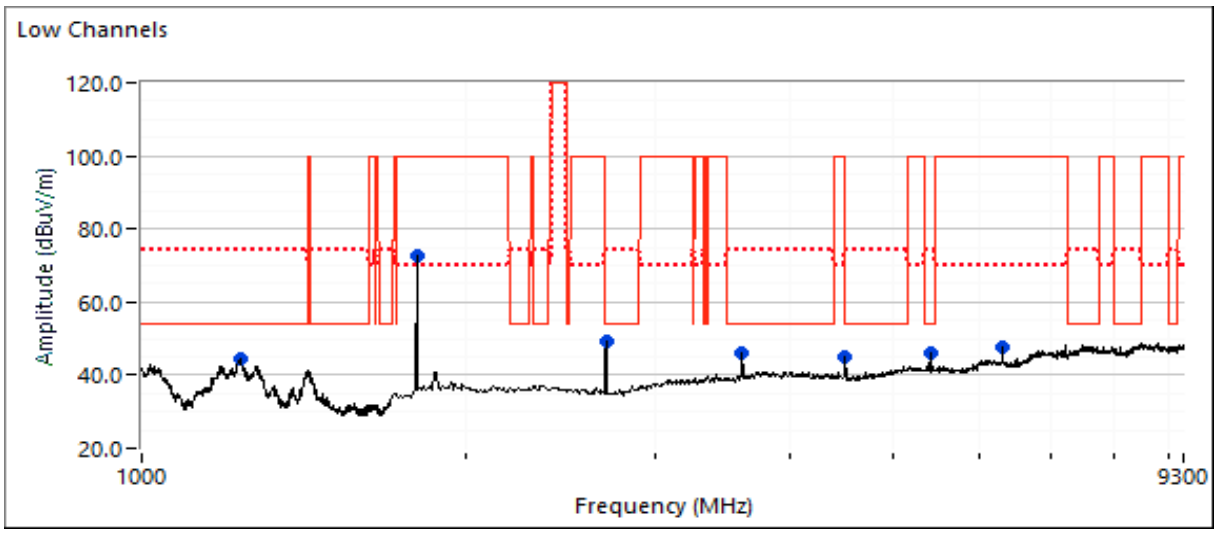
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
863.398	39.9	H	46.0	-6.1	QP	192	2.0	QP (1.00s), Note 3
941.366	39.8	H	46.0	-6.2	QP	225	1.0	QP (1.00s), Note 3
96.113	34.9	V	43.5	-8.6	QP	144	1.0	QP (1.00s), Note 3
2707.170	44.6	V	54.0	-9.4	AVG	182	1.5	RB 1 MHz;VB 10 Hz;Peak
5413.230	44.0	V	54.0	-10.0	AVG	197	1.8	RB 1 MHz;VB 10 Hz;Peak
3609.540	42.6	H	54.0	-11.4	AVG	209	1.5	RB 1 MHz;VB 10 Hz;Peak
6316.650	42.4	V	54.0	-11.6	AVG	134	1.7	RB 1 MHz;VB 10 Hz;Peak;Note 3
4510.920	41.1	V	54.0	-12.9	AVG	184	2.5	RB 1 MHz;VB 10 Hz;Peak
1233.710	39.5	V	54.0	-14.5	AVG	130	1.6	RB 1 MHz;VB 10 Hz;Peak
158.855	24.1	V	43.5	-19.4	QP	219	1.0	QP (1.00s), Note 3
27.500	19.9	V	40.0	-20.1	QP	309	1.0	QP (1.00s), Note 3
1234.200	52.6	V	74.0	-21.4	PK	130	1.6	RB 1 MHz;VB 3 MHz;Peak
5413.420	50.9	V	74.0	-23.1	PK	197	1.8	RB 1 MHz;VB 3 MHz;Peak
6316.540	49.9	V	74.0	-24.1	PK	134	1.7	RB 1 MHz;VB 3 MHz;Peak;Note 3
3609.490	49.3	H	74.0	-24.7	PK	209	1.5	RB 1 MHz;VB 3 MHz;Peak
488.613	20.6	H	46.0	-25.4	QP	3	1.5	QP (1.00s), Note 3
2707.310	48.3	V	74.0	-25.7	PK	182	1.5	RB 1 MHz;VB 3 MHz;Peak
4510.910	47.5	V	74.0	-26.5	PK	184	2.5	RB 1 MHz;VB 3 MHz;Peak
1804.870	71.5	H	110.2	-38.7	PK	202	1.0	RB 100 kHz;VB 300 kHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 25 - 9,300 MHz. Center Channels @ 914.8 & 915 MHz

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
914.962	129.8	H	-	-	PK	178	1.7	POS; RB 100 kHz; VB: 300 kHz
914.829	127.6	V	-	-	PK	144	1.9	POS; RB 100 kHz; VB: 300 kHz

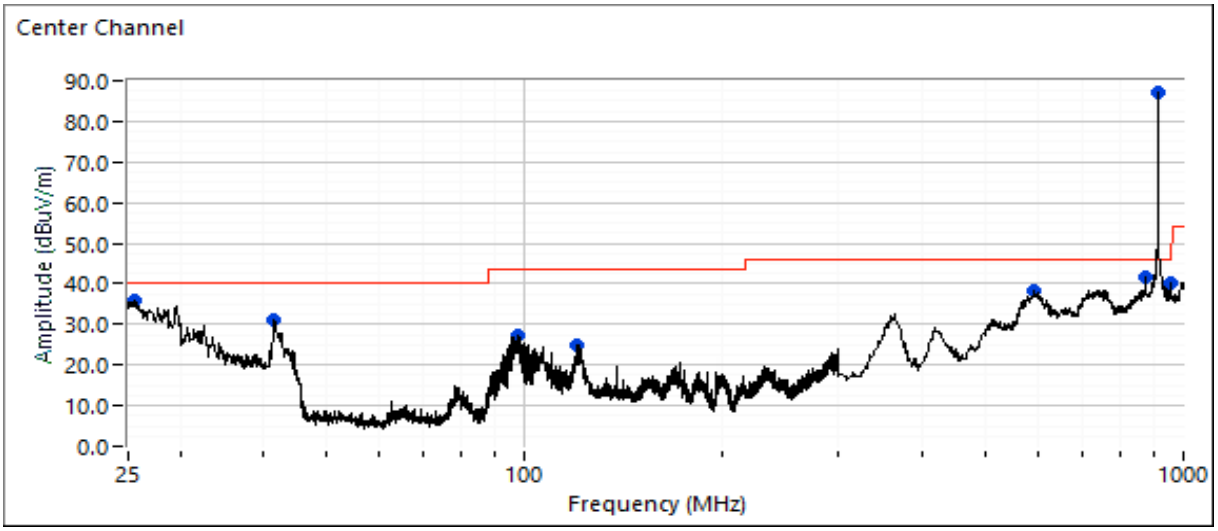
Maximun Fundamental emission level @ 3m in 100kHz RBW:	129.8 dBµV/m
Limit for emissions outside of restricted bands:	109.8 dBµV/m

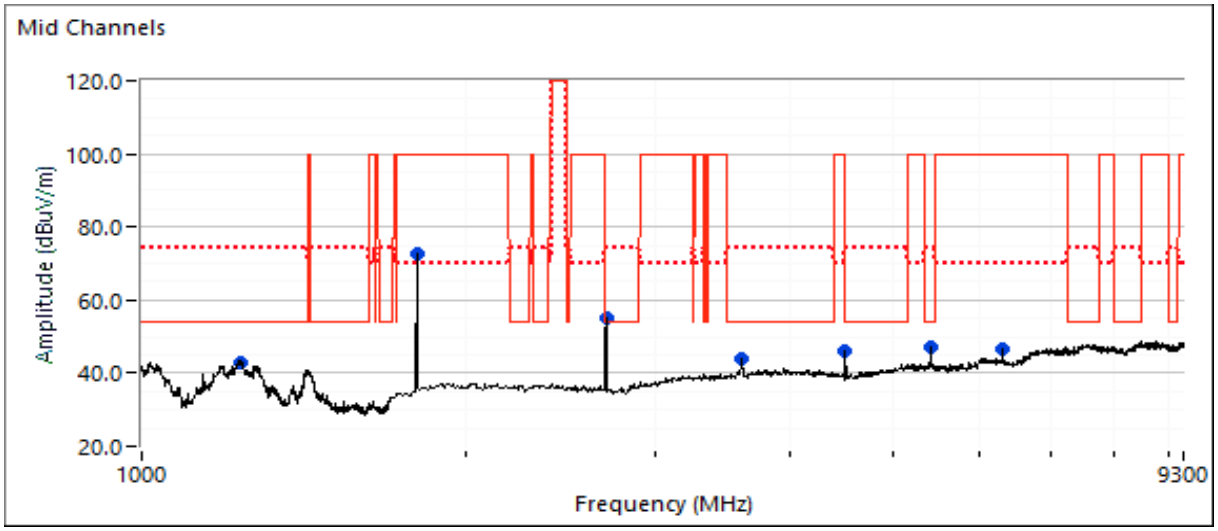
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2744.420	50.2	H	54.0	-3.8	AVG	196	2.5	RB 1 MHz;VB 10 Hz;Peak
953.772	41.1	H	46.0	-4.9	QP	232	1.1	QP (1.00s), Note 3
875.770	40.4	H	46.0	-5.6	QP	218	1.0	QP (1.00s), Note 3
6403.410	47.6	V	54.0	-6.4	AVG	132	1.4	RB 1 MHz;VB 10 Hz;Peak;Note 3
5489.920	46.2	V	54.0	-7.8	AVG	208	1.6	RB 1 MHz;VB 10 Hz;Peak;Note 3
594.345	34.2	V	46.0	-11.8	QP	221	2.0	QP (1.00s), Note 3
1232.080	39.7	V	54.0	-14.3	AVG	160	1.5	RB 1 MHz;VB 10 Hz;Peak
3659.190	39.1	H	54.0	-14.9	AVG	214	1.4	RB 1 MHz;VB 10 Hz;Peak
4574.960	38.8	H	54.0	-15.2	AVG	56	3.0	RB 1 MHz;VB 10 Hz;Peak
2744.610	55.8	H	74.0	-18.2	PK	196	2.5	RB 1 MHz;VB 3 MHz;Peak
95.116	23.7	V	43.5	-19.8	QP	88	1.0	QP (1.00s), Note 3
6403.900	52.7	V	74.0	-21.3	PK	132	1.4	RB 1 MHz;VB 3 MHz;Peak;Note 3
25.480	18.3	V	40.0	-21.7	QP	13	2.5	QP (1.00s)
1232.180	52.2	V	74.0	-21.8	PK	160	1.5	RB 1 MHz;VB 3 MHz;Peak
120.415	21.4	V	43.5	-22.1	QP	3	1.0	QP (1.00s)
5489.790	51.9	V	74.0	-22.1	PK	208	1.6	RB 1 MHz;VB 3 MHz;Peak;Note 3
3659.090	47.8	H	74.0	-26.2	PK	214	1.4	RB 1 MHz;VB 3 MHz;Peak
4575.010	46.9	H	74.0	-27.1	PK	56	3.0	RB 1 MHz;VB 3 MHz;Peak
39.000	10.1	H	40.0	-29.9	QP	180	3.5	QP (1.00s), Note 3
1829.550	69.3	H	109.8	-40.5	PK	205	1.0	RB 100 kHz;VB 300 kHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #1c: Radiated Spurious Emissions, 25 - 9,300 MHz. High Channels @ 927.4 & 927.6 MHz

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.428	126.6	V			PK	116	1.1	POS; RB 100 kHz; VB: 300 kHz
927.562	129.5	H			PK	181	1.7	POS; RB 100 kHz; VB: 300 kHz

Maximun Fundamental emission level @ 3m in 100kHz RBW:	129.5 dBµV/m	
Limit for emissions outside of restricted bands:	109.5 dBµV/m	**Limit is -20dBc**

Band Edge Signal Field Strength

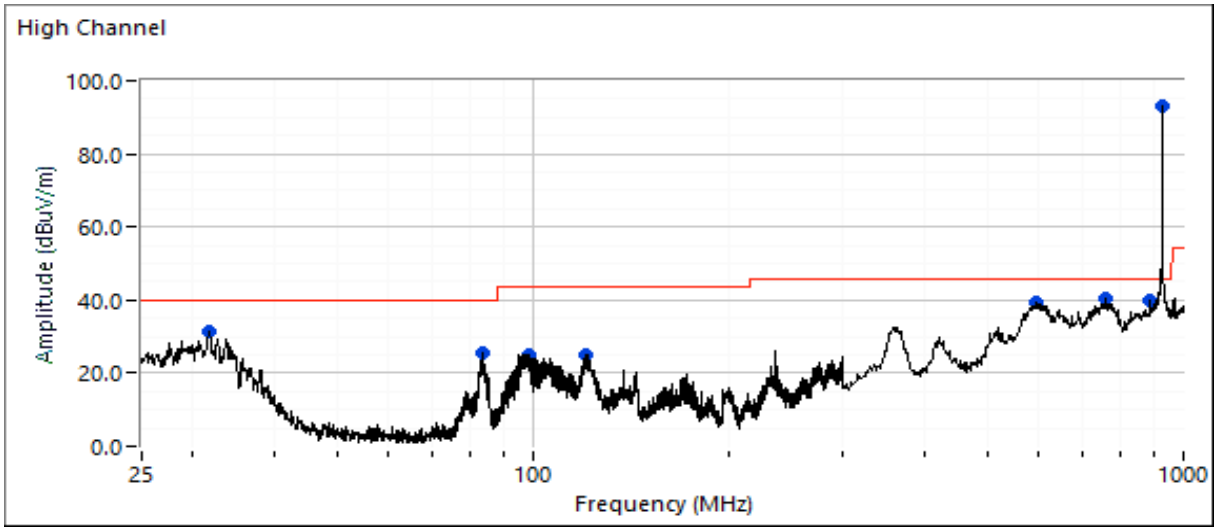
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
960.000	34.3	H	46.0	-11.7	QP	220	1.1	QP (1.00s)
960.000	29.6	V	46.0	-16.4	QP	126	1.1	QP (1.00s)

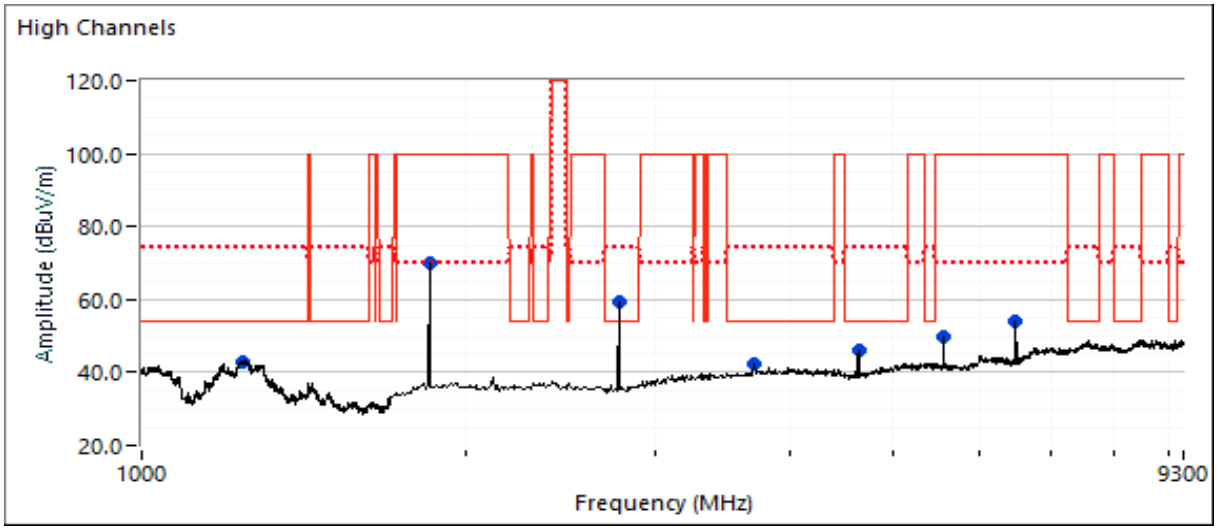
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2782.750	**51.0**	V	54.0	**-3.0**	AVG	141	2.1	RB 1 MHz;VB 10 Hz;Peak
888.362	42.7	H	46.0	-3.3	QP	215	1.2	QP (1.00s), Note 3
4637.940	45.8	V	54.0	-8.2	AVG	158	1.5	RB 1 MHz;VB 10 Hz;Peak
594.861	36.1	V	46.0	-9.9	QP	215	1.3	QP (1.00s), Note 3
755.106	35.4	H	46.0	-10.6	QP	168	1.5	QP (1.00s), Note 3
29.524	25.9	V	40.0	-14.1	QP	316	1.0	QP (1.00s), Note 3
3710.390	39.6	H	54.0	-14.4	AVG	166	1.5	RB 1 MHz;VB 10 Hz;Peak
1241.690	39.5	V	54.0	-14.5	AVG	120	1.7	RB 1 MHz;VB 10 Hz;Peak
2782.630	55.3	V	74.0	-18.7	PK	141	2.1	RB 1 MHz;VB 3 MHz;Peak
81.284	20.8	V	40.0	-19.2	QP	322	1.0	QP (1.00s), Note 3
97.732	22.6	V	43.5	-20.9	QP	102	1.0	QP (1.00s), Note 3
1242.700	52.7	V	74.0	-21.3	PK	120	1.7	RB 1 MHz;VB 3 MHz;Peak
120.565	21.8	V	43.5	-21.7	QP	45	1.0	QP (1.00s)
4637.750	51.5	V	74.0	-22.5	PK	158	1.5	RB 1 MHz;VB 3 MHz;Peak
3709.940	48.3	H	74.0	-25.7	PK	166	1.5	RB 1 MHz;VB 3 MHz;Peak
1855.140	71.4	V	109.5	-38.1	PK	271	2.4	RB 100 kHz;VB 300 kHz;Peak
6492.920	54.2	V	109.5	-55.3	PK	144	1.4	RB 100 kHz;VB 300 kHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #4: Antenna Conducted Tx Spurious Emissions

Date of Test: 5/16/2023 Test Engineer: David Bare

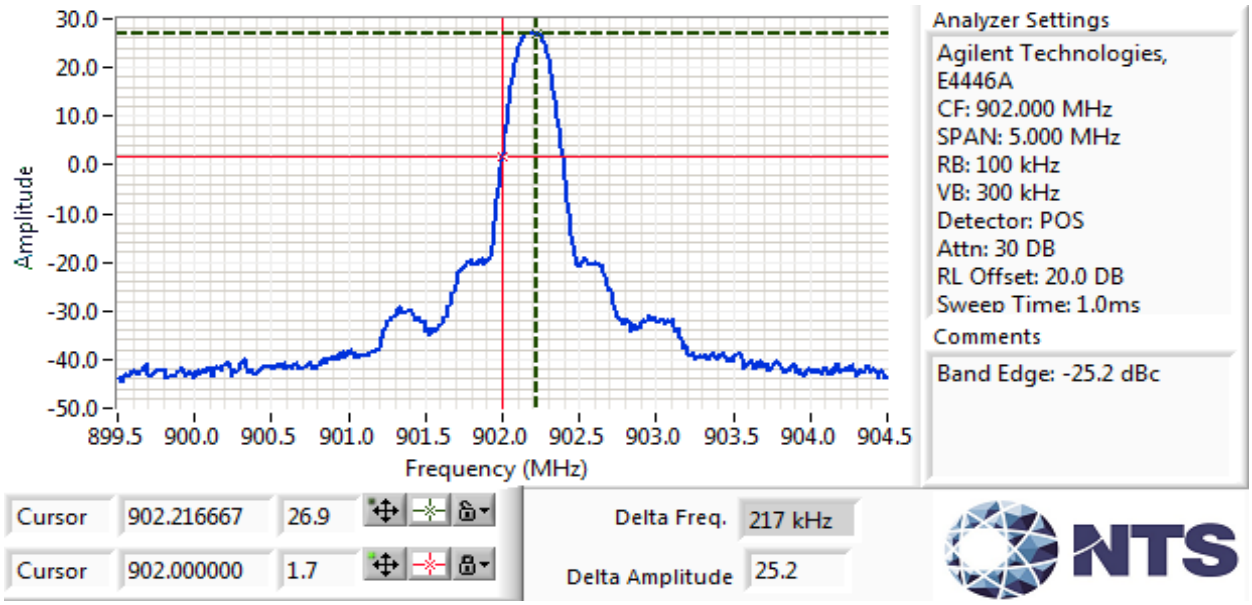
Test Location: Fremont Chamber #2

Refer to plots below. Scans made using RBW=100 kHz & VBW=300 KHz with the limit line set at 20dB below the highest in-band signal level with the **hopping feature disabled.**

Radiated measurements used to demonstrate compliance of Tx spurious emissions.

Low channel

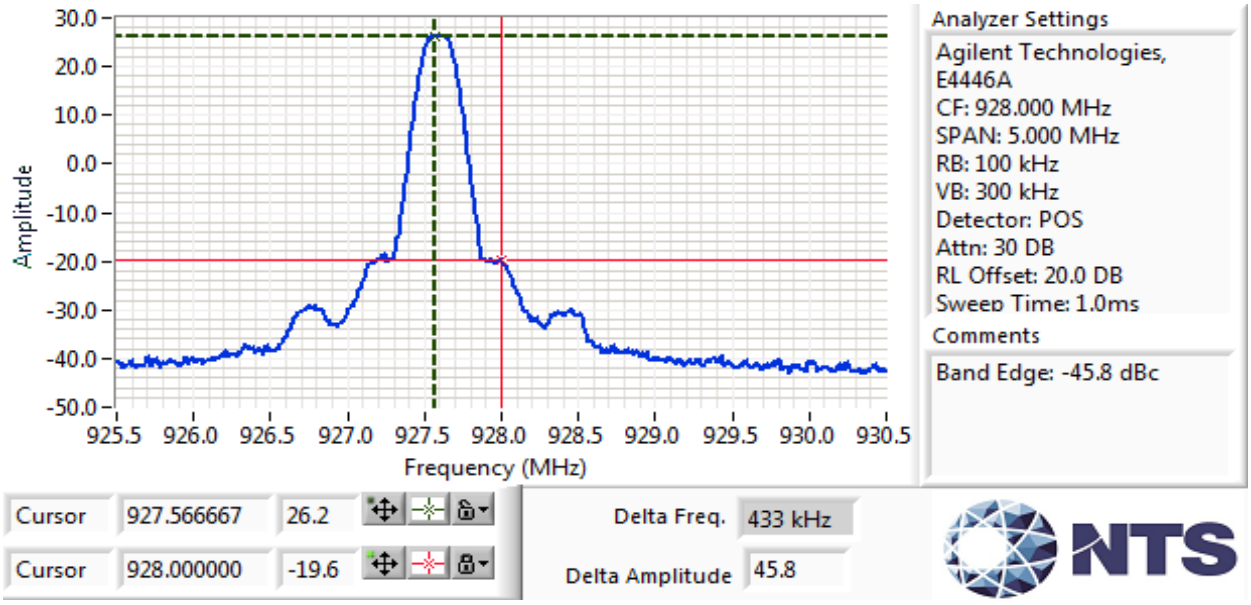
Plot showing > -20dBc at the lower band edge



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

High channel

Plot showing > -20dBc at the upper band edge

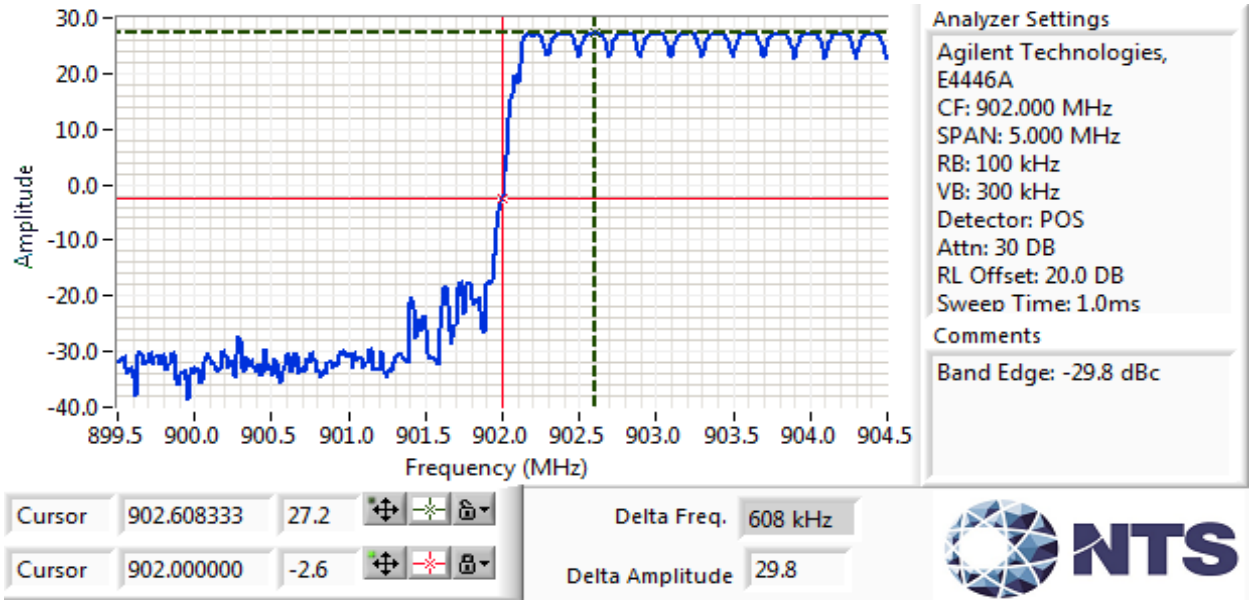


Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Refer to plots below. Scans made using RBW=100kHz & VBW=300 KHz with the limit line set at 20dB below the highest in-band signal level with the **hopping feature enabled** to show compliance with the -20dBc requirement at the allocated band edge. The spectrum analyzer is left in max hold mode until the trace stabilizes.

Low channel, hopping enabled

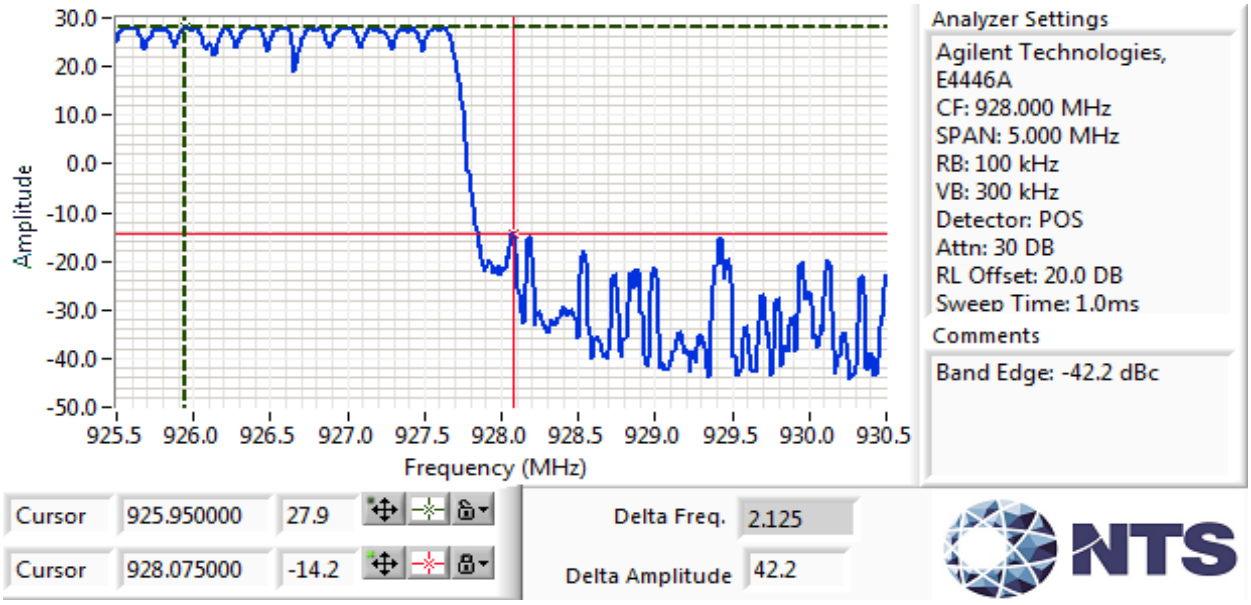
Plot showing > -20dBc at the lower band edge



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

High channel, hopping enabled

Plot showing > -20dBc at the upper band edge



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #5: Output Power (Peak Detector)

Date of Test: 5/15 & 5/16/2023
Test Engineer: David Bare
Test Location: Fremont Chamber #2

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Maximum antenna gain: 6 dBi

Radio 1 (measured at RF output with 3dB cable loss included)

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	27.0	0.500	1.991
Mid	915	1 MHz	27.0	0.500	1.991
High	927.6	1 MHz	26.6	0.457	1.820

Radio 2 (measured at RF output with 3 dB cable loss included)

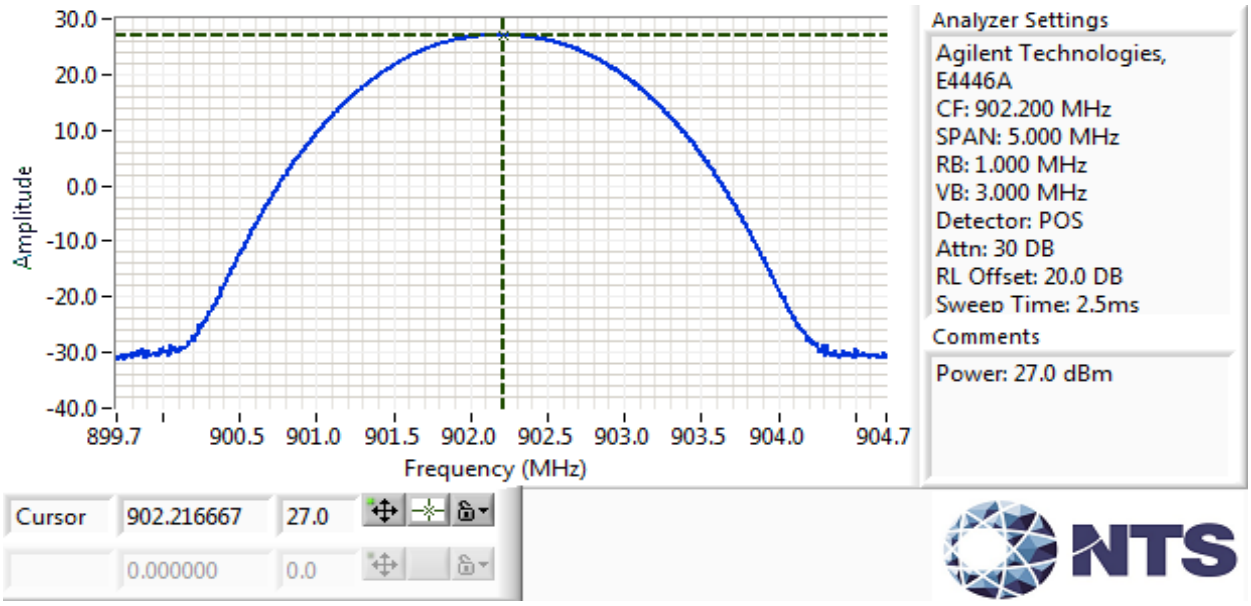
Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	27.0	0.500	1.991
Mid	915.0	1 MHz	26.9	0.490	1.950
High	927.6	1 MHz	26.2	0.417	1.660

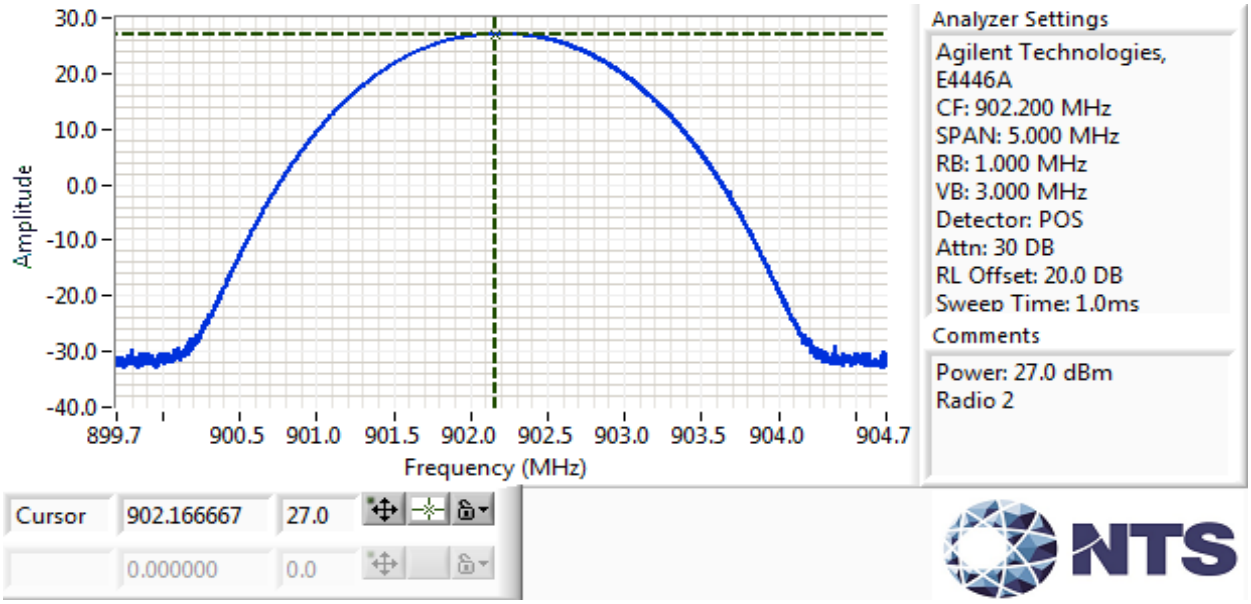
Combined (with 3dB cable loss included)

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	30.0	1.000	3.981
Mid	915	1 MHz	30.0	0.990	3.941
High	927.6	1 MHz	29.4	0.874	3.479

Note 1:	Output power measured at each of the antenna ports with a suitable attenuator and spectrum analyzer with RBW >> Occupied Bandwidth. Represenative plot below.
Note 2:	The two radios both use 128 pseudo-random hopping channels, however, they never use the same hopping channel at the same time.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #6: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Date of Test: 5/10 and 7/10/2023
Test Engineer: David Bare
Test Location: Fremont Chamber #2

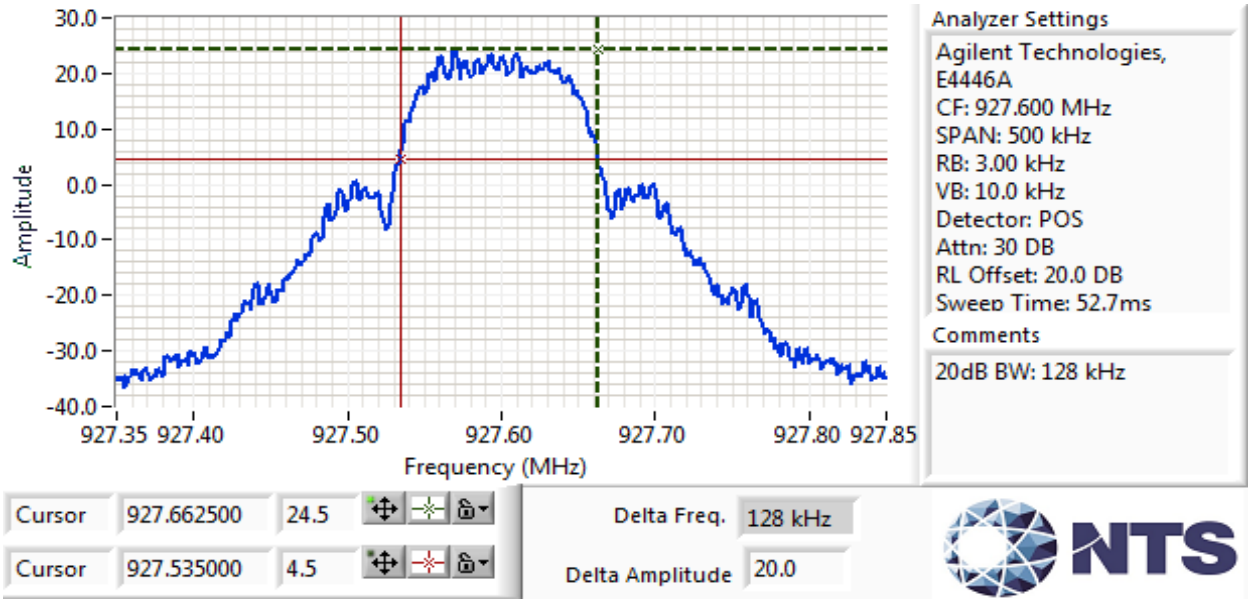
Radio 1

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.2	3 kHz	128	121
Mid	915	3 kHz	128	121
High	927.6	3 kHz	128	120

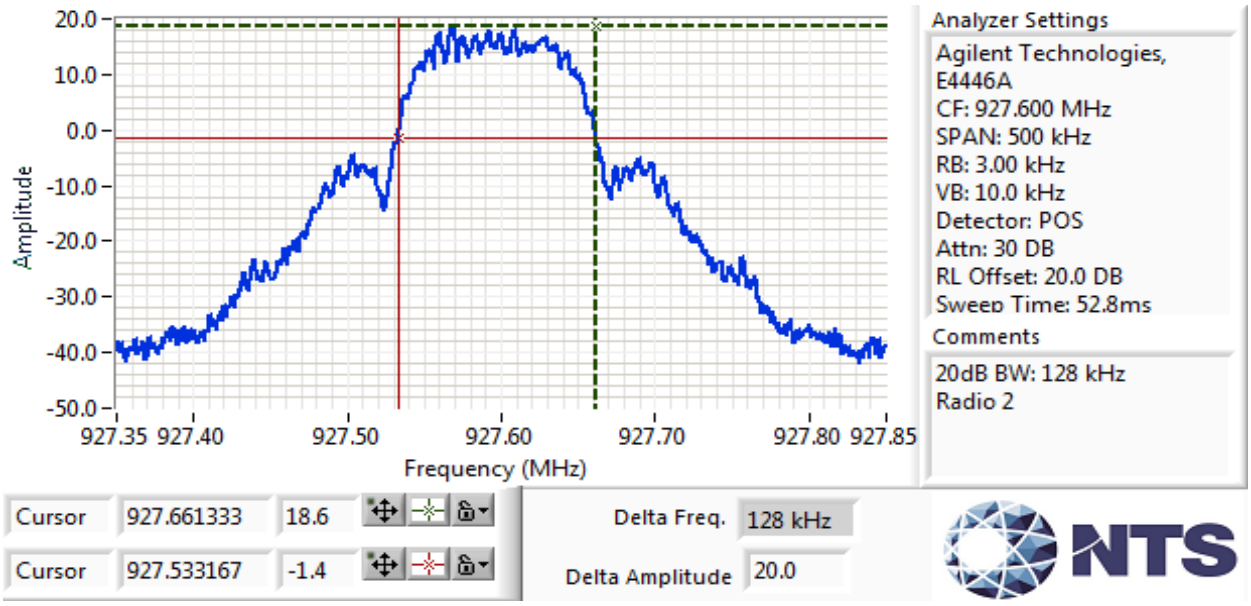
Radio 2

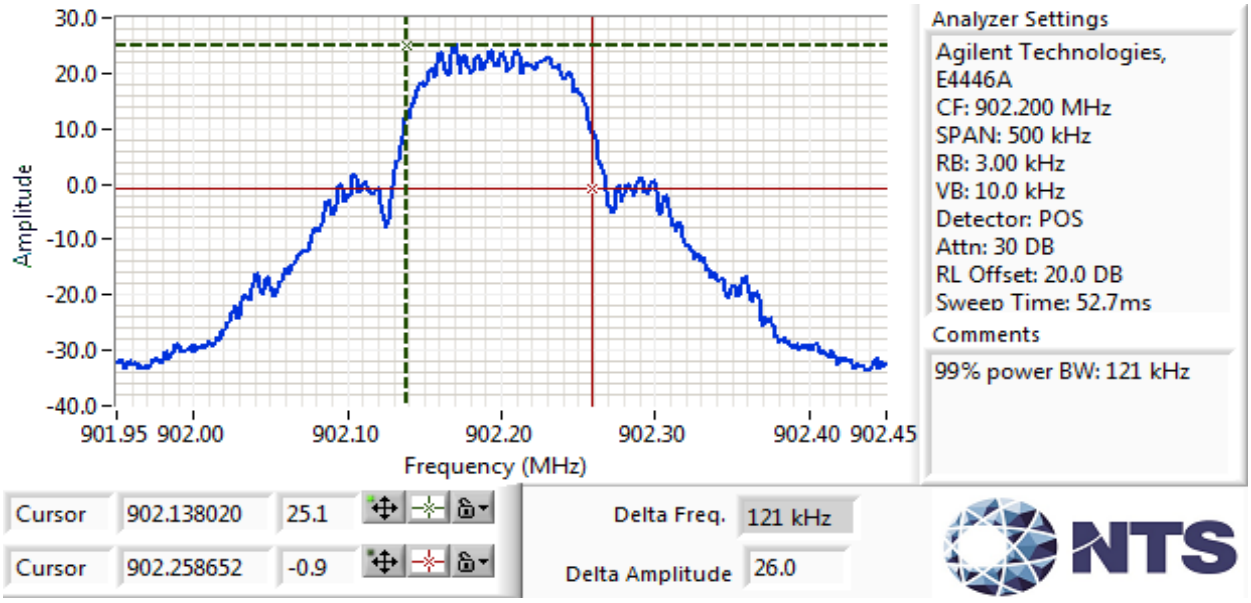
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	902.2	3 kHz	128	121
Mid	915	3 kHz	128	121
High	927.6	3 kHz	128	120

Note 1:	20dB bandwidth measured using RB = 3 kHz, VB = 10 kHz (VB > RB). Representative plot below.

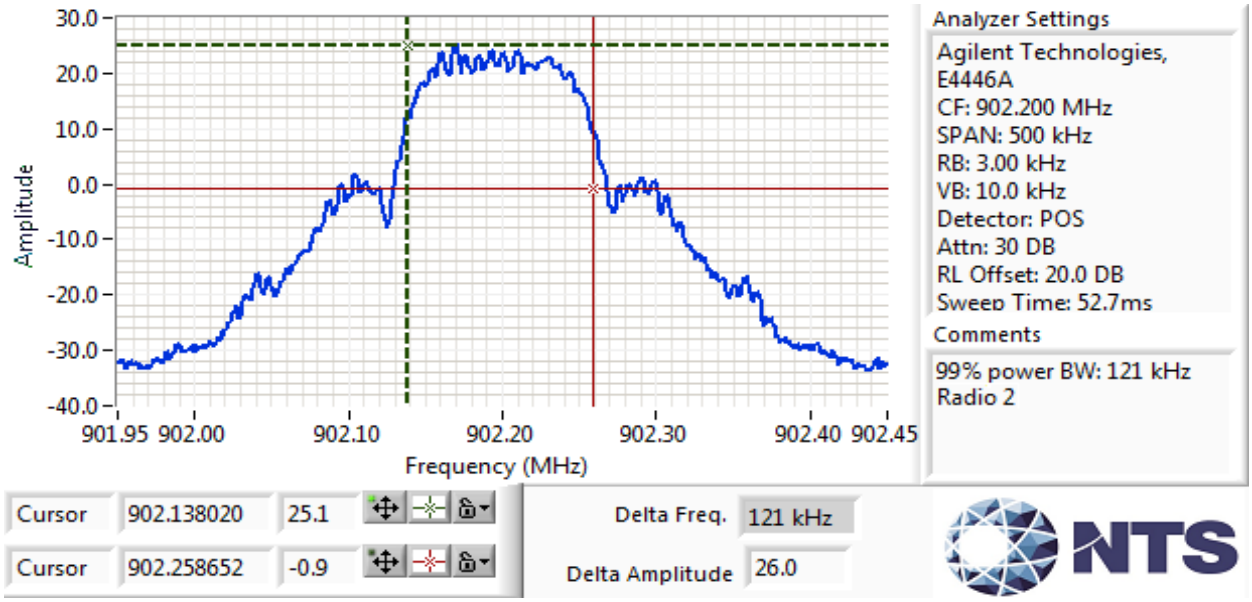


Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





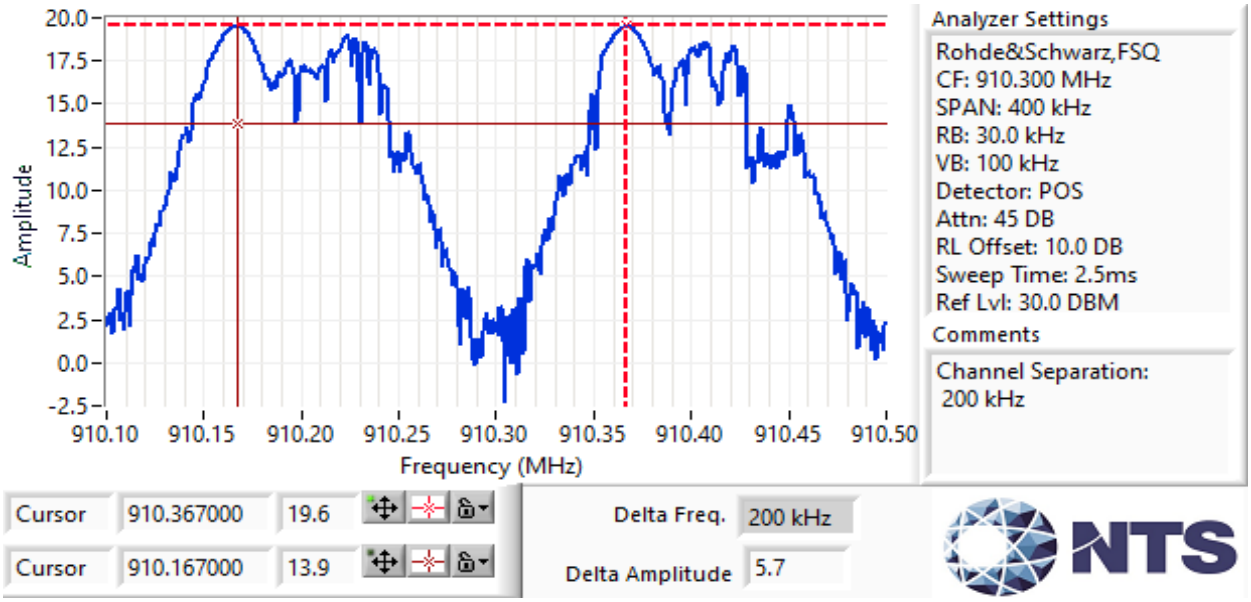
Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A



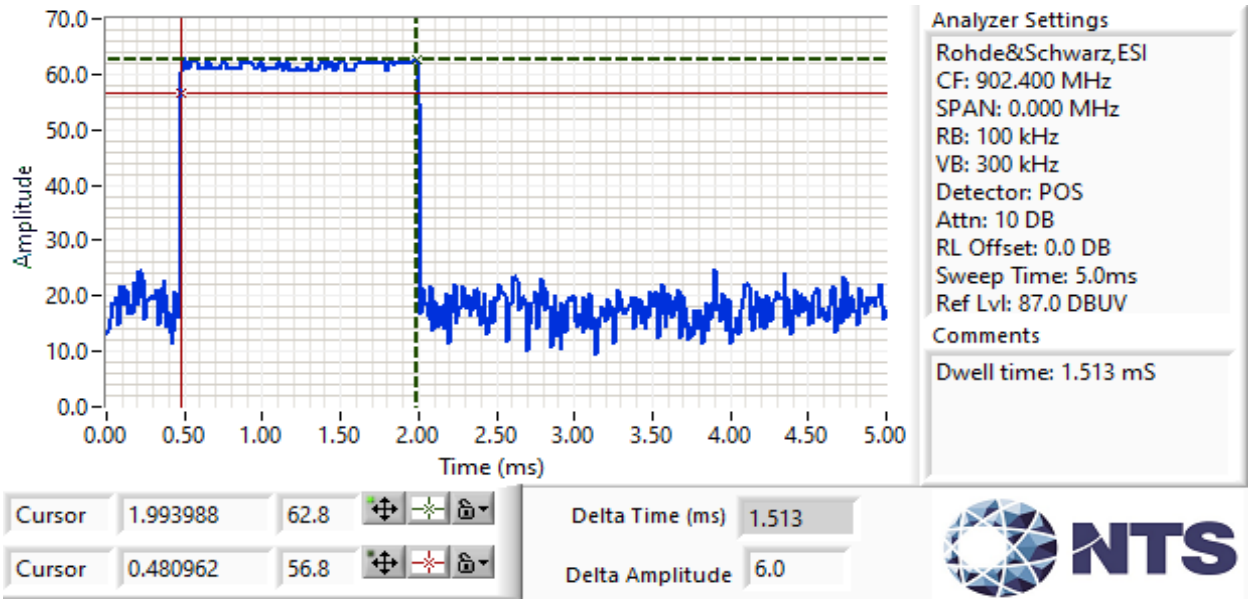
Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

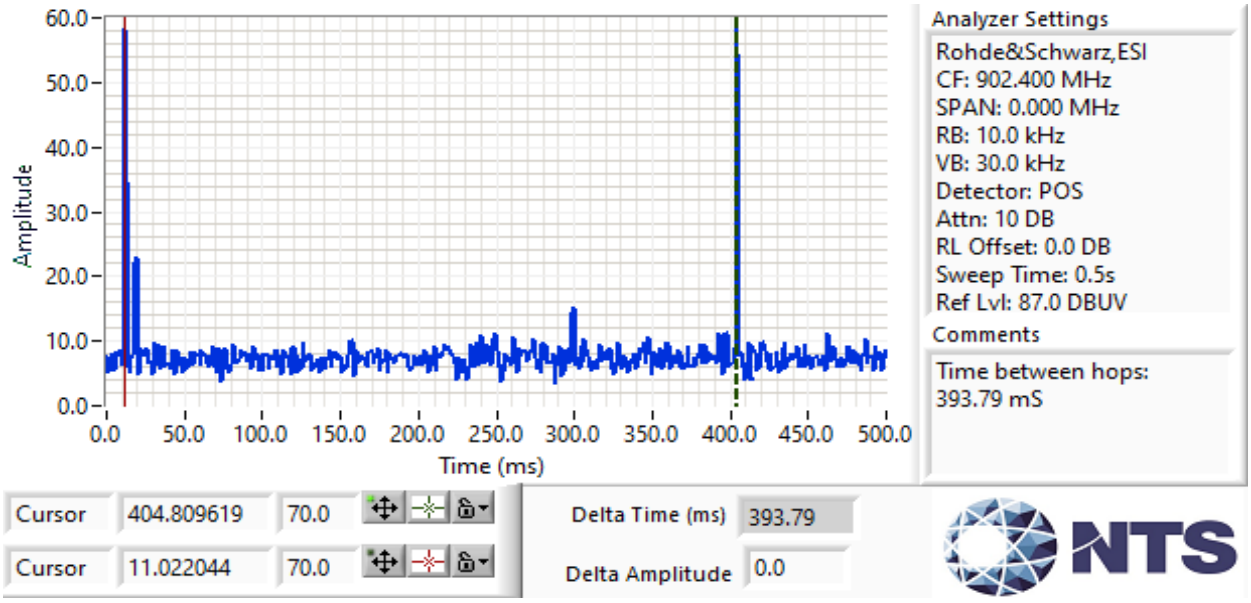
For frequency hopping systems operating in the **902-928 MHz** band:
If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.
The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in the 20 second period (i.e. 20s divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 20s in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	128	kHz	**Pass**
Channel spacing:	200	kHz	**Pass**
Transmission time per hop:	1.51	ms	
The time between successive hops on a channel:	393.8	ms	
Number of channels (N):	128		**Pass**
Channel dwell time in 20 seconds:	77.01	ms	**Pass**

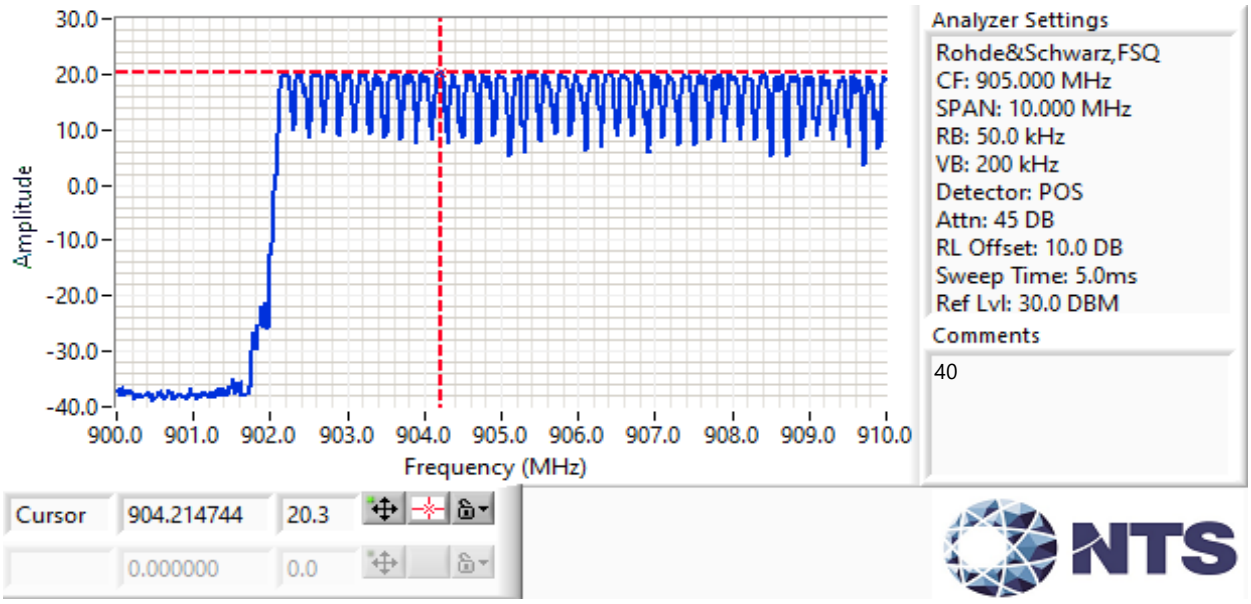


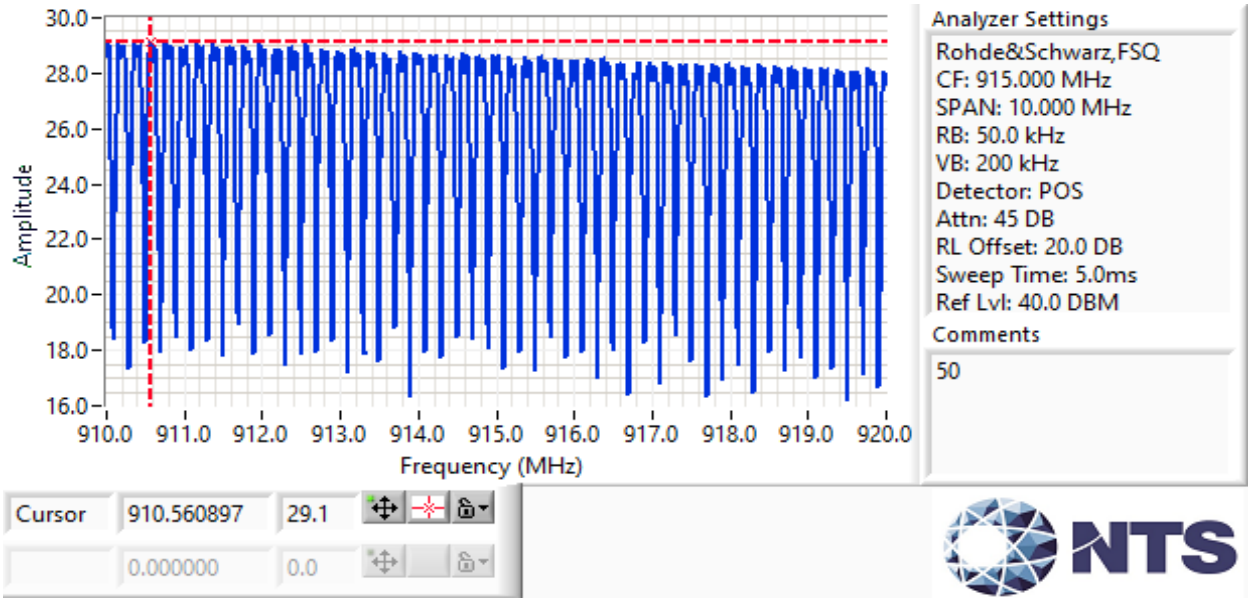
Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A



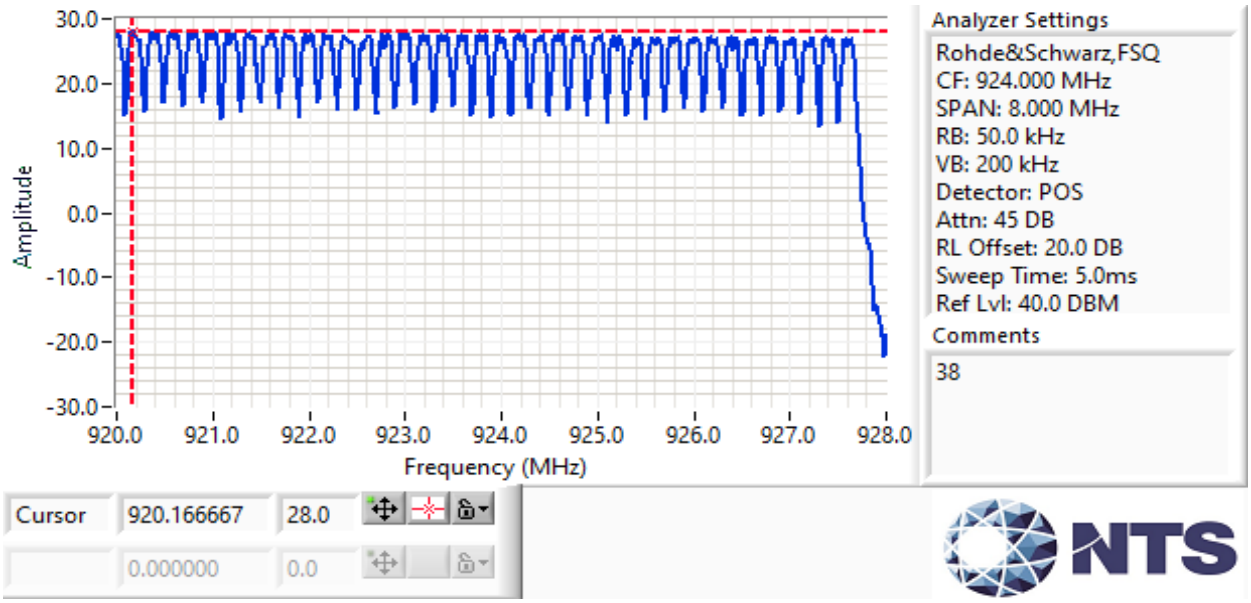


Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

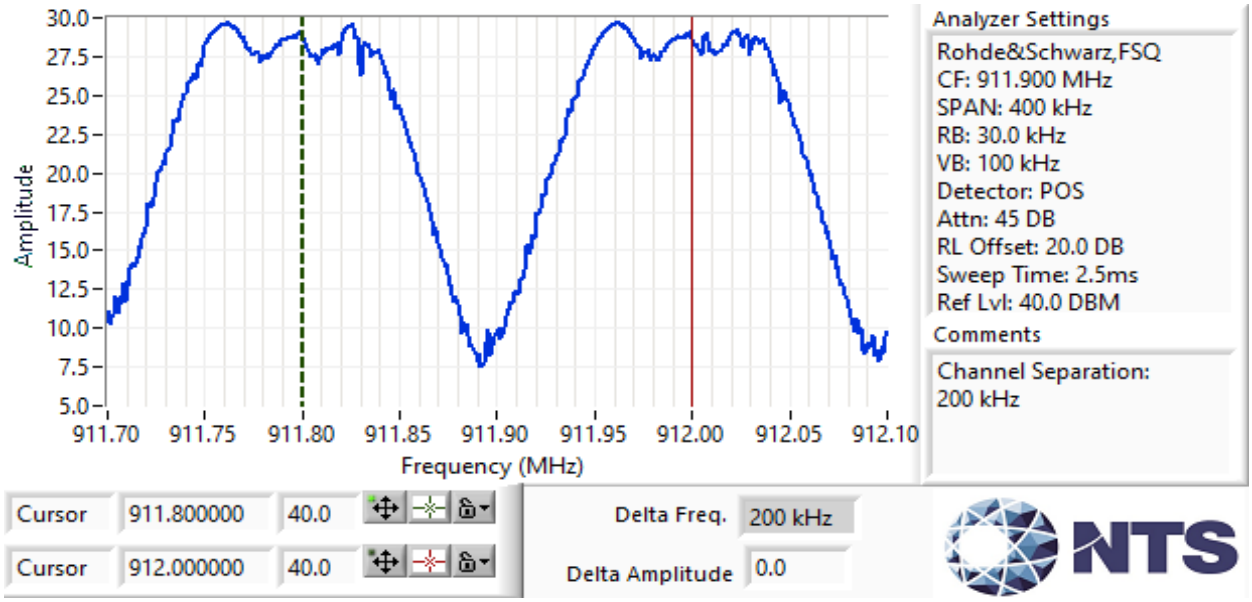
64 Channels, 28 ms dwell

For frequency hopping systems operating in the **902-928 MHz** band:

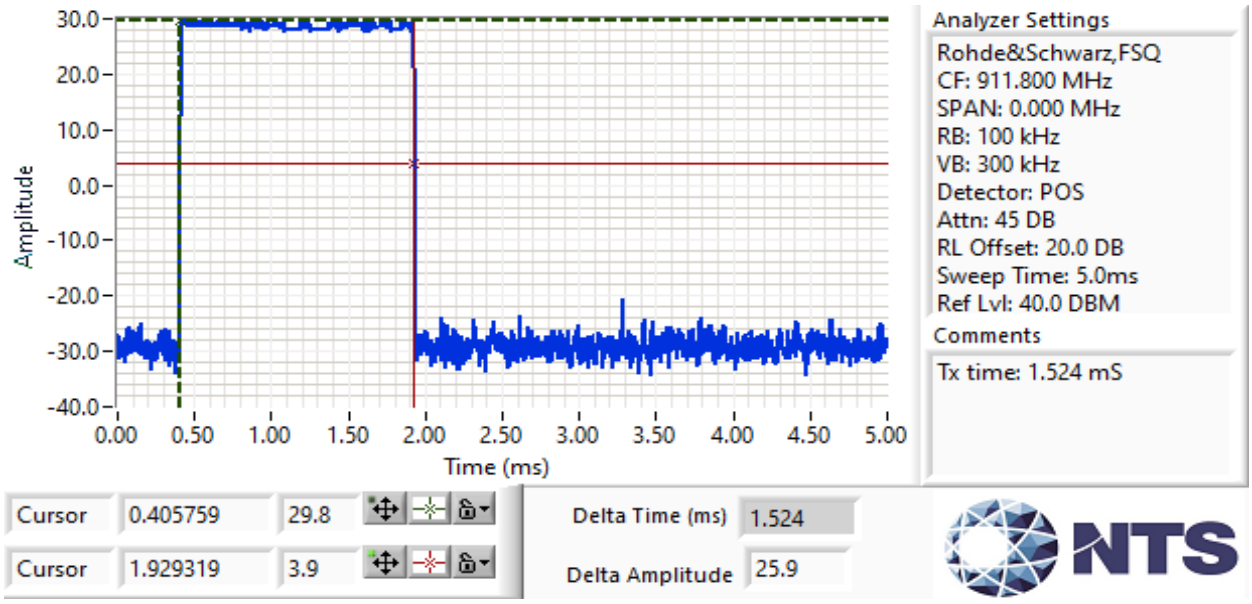
If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

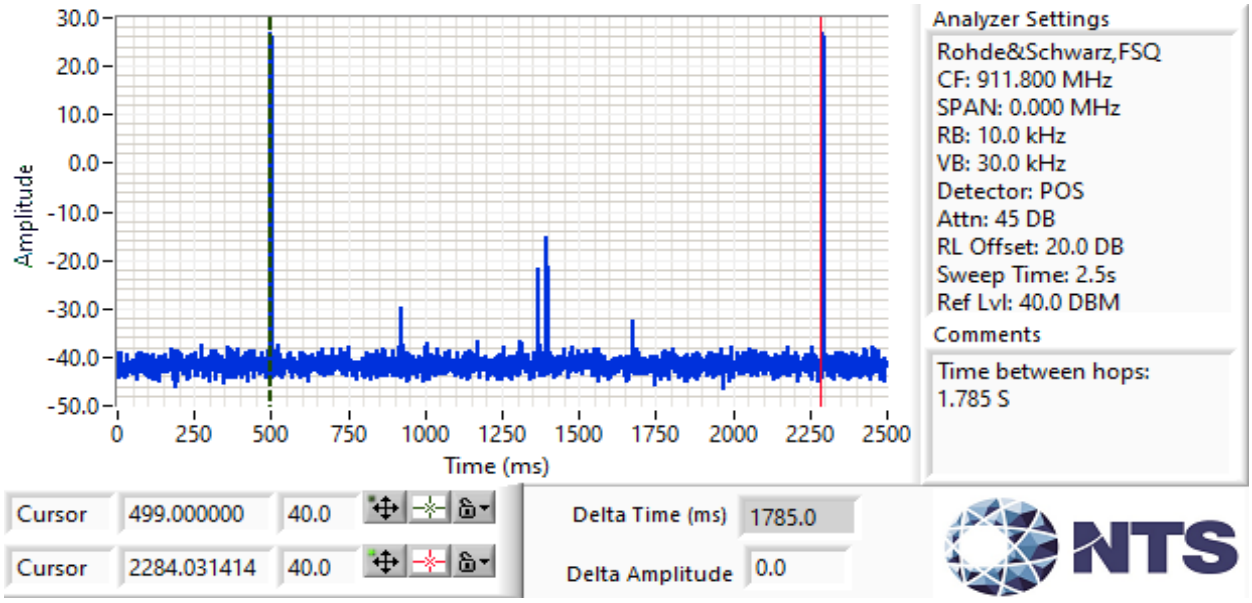
The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in the 20 second period (i.e. 20s divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 20s in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	128	kHz	**Pass**
Channel spacing:	200	kHz	**Pass**
Transmission time per hop:	1.524	ms	
The time between successive hops on a channel:	1785	ms	
Number of channels (N):	64		**Pass**
Channel dwell time in 20 seconds:	18.288	ms	**Pass**



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





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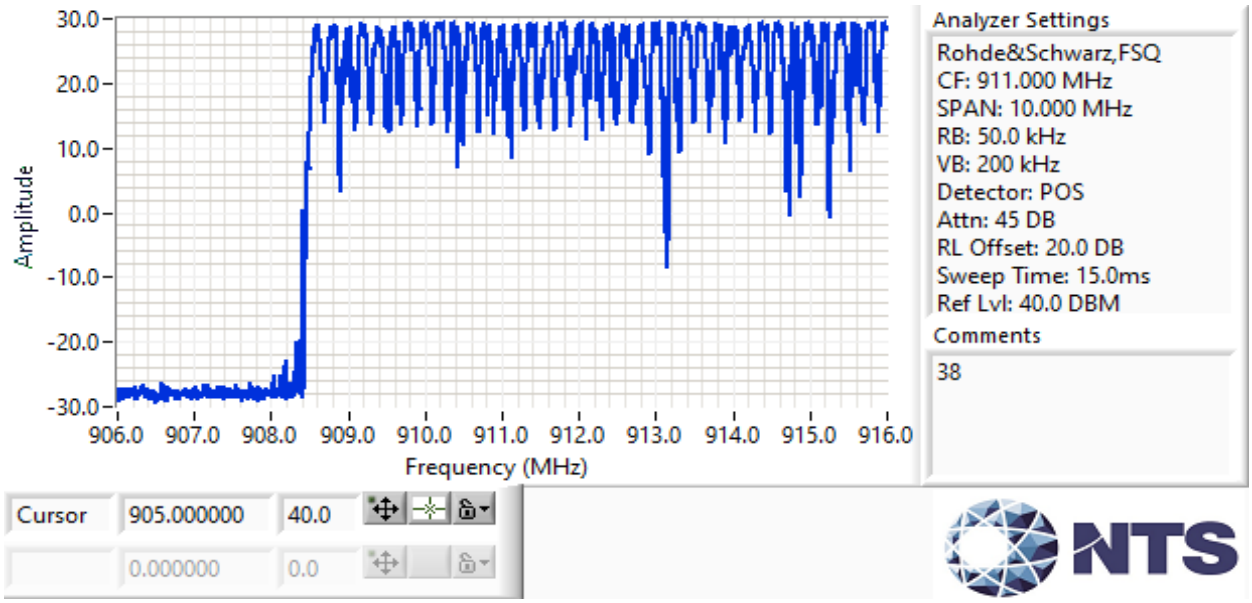
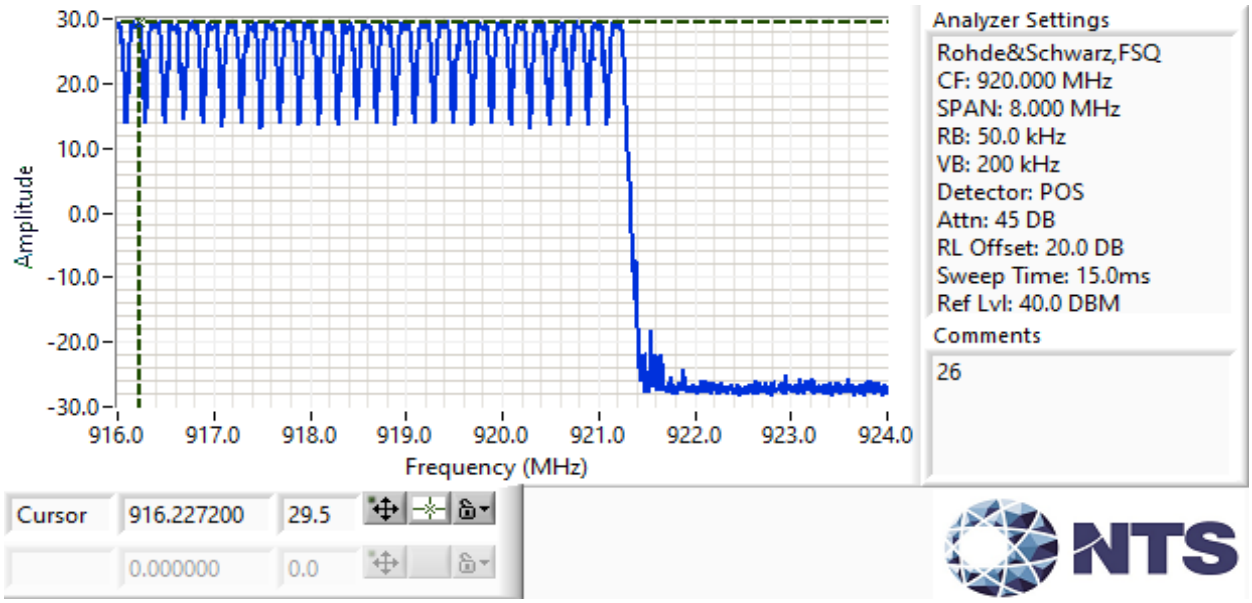
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (FHSS) Measurements

Power, Bandwidth 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.

Test Location: Fremont Chamber #4 Config. Used: 1

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located outside the chamber with all I/O connections running under the floor.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.
When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.
Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 20-24 °C
Rel. Humidity: 35-48 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	25 - 9,300 MHz - Transmitter Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	47.3 dBµV/m @ 2704.16 MHz (-6.7 dB)
2	Output Power	15.247(b)	Pass	30 dBm (1.0 W)

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.

Test Notes

Based on prelimiary radiated emissions tests in 3 orthogonal orientations, the flat orientation was the worst case w.r.t. the limits and was therefore used for all radiated testing.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Note: From 25 MHz to 1.6GHz for transmit mode a narrow band tunable notch filter was used to reduce the fundamental level of transmit frequency during the spurious emission testing and from 1.6 to 9.3GHz a 1.5GHz high pass filter was used.

Run #1: Radiated Spurious Emissions, 25 - 9,300 MHz

Date of Test: 5/12 & 5/17/2023 Test Engineer: David Bare

Run #1a: Radiated Spurious Emissions, 30 - 9,300 MHz. Low Channels @ 902.2 & 902.4 MHz

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.231	131.7	V	-	-	PK	5	1.0	POS; RB 100 kHz; VB: 300 kHz
902.361	131.6	H	-	-	PK	360	1.4	POS; RB 100 kHz; VB: 300 kHz

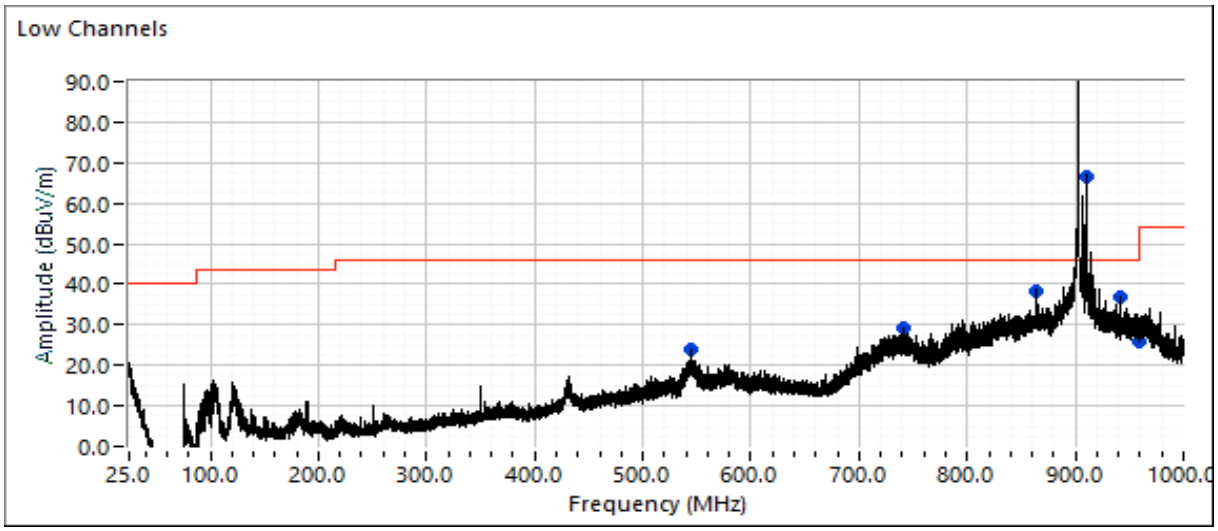
Maximun Fundamental emission level @ 3m in 100kHz RBW:	131.7 dBµV/m	
Limit for emissions outside of restricted bands:	111.7 dBµV/m	**Limit is -20dBc**

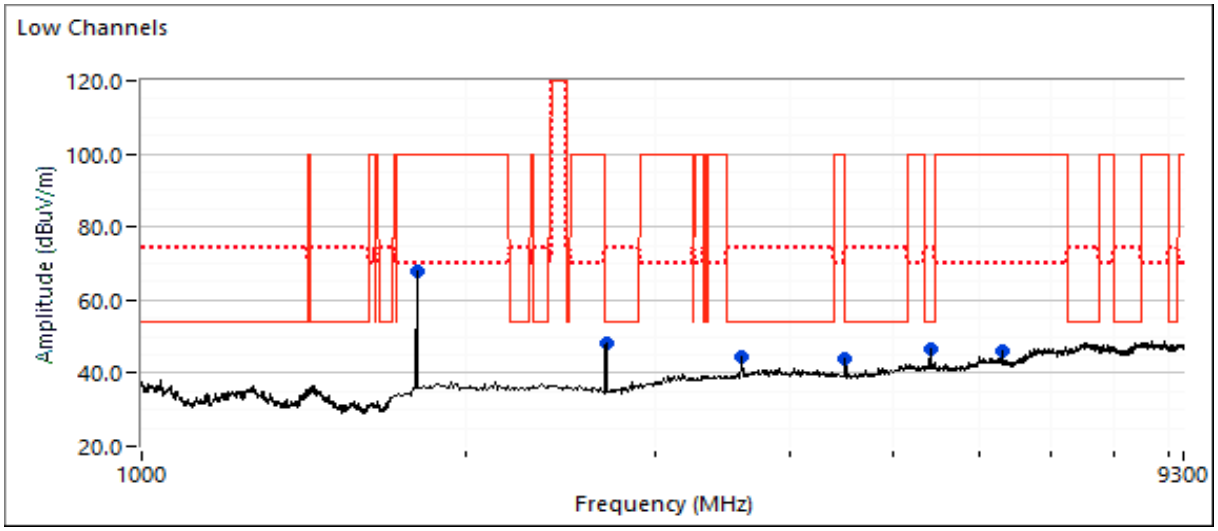
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
543.732	19.5	H	46.0	-26.5	QP	328	1.5	QP (1.00s), Note 3
741.444	25.2	H	46.0	-20.8	QP	360	1.0	QP (1.00s), Note 3
863.432	37.4	H	46.0	-8.6	QP	360	1.0	QP (1.00s), Note 3
941.256	36.1	V	46.0	-9.9	QP	360	1.0	QP (1.00s), Note 3
960.000	29.2	V	46.0	-16.8	QP	360	1.0	QP (1.00s)
1804.470	68.9	V	111.7	-42.8	PK	287	1.5	RB 100 kHz;VB 300 kHz;Peak
2707.160	47.3	V	54.0	-6.7	AVG	178	1.8	RB 1 MHz;VB 10 Hz;Peak
2707.130	50.5	V	74.0	-23.5	PK	178	1.8	RB 1 MHz;VB 3 MHz;Peak
3609.530	42.2	V	54.0	-11.8	AVG	173	1.8	RB 1 MHz;VB 10 Hz;Peak
3609.540	48.5	V	74.0	-25.5	PK	173	1.8	RB 1 MHz;VB 3 MHz;Peak
4510.970	42.6	V	54.0	-11.4	AVG	197	1.6	RB 1 MHz;VB 10 Hz;Peak
4511.160	49.0	V	74.0	-25.0	PK	197	1.6	RB 1 MHz;VB 3 MHz;Peak
5413.070	46.4	V	54.0	-7.6	AVG	193	1.8	RB 1 MHz;VB 10 Hz;Peak
5413.400	52.0	V	74.0	-22.0	PK	193	1.8	RB 1 MHz;VB 3 MHz;Peak
6316.540	40.0	V	111.7	-71.7	PK	360	1.5	RB 100 kHz;VB 300 kHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.
Note 4:	Emission adjacent to fundamental is in band and was a transient.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 25 - 9,300 MHz. Center Channels @ 914.8 & 915 MHz

Date of Test: 5/12 & 5/17/2023 Test Engineer: David Bare

Fundamental Signal Field Strength

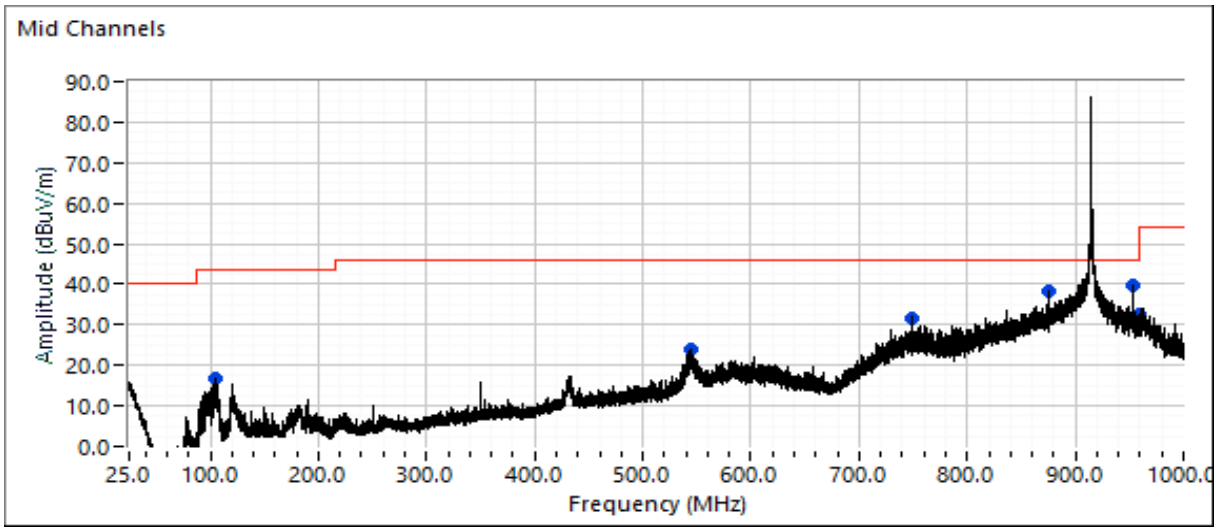
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
914.960	131.3	V	-	-	PK	360	1.0	POS; RB 100 kHz; VB: 300 kHz
914.828	131.2	H	-	-	PK	360	1.4	POS; RB 100 kHz; VB: 300 kHz

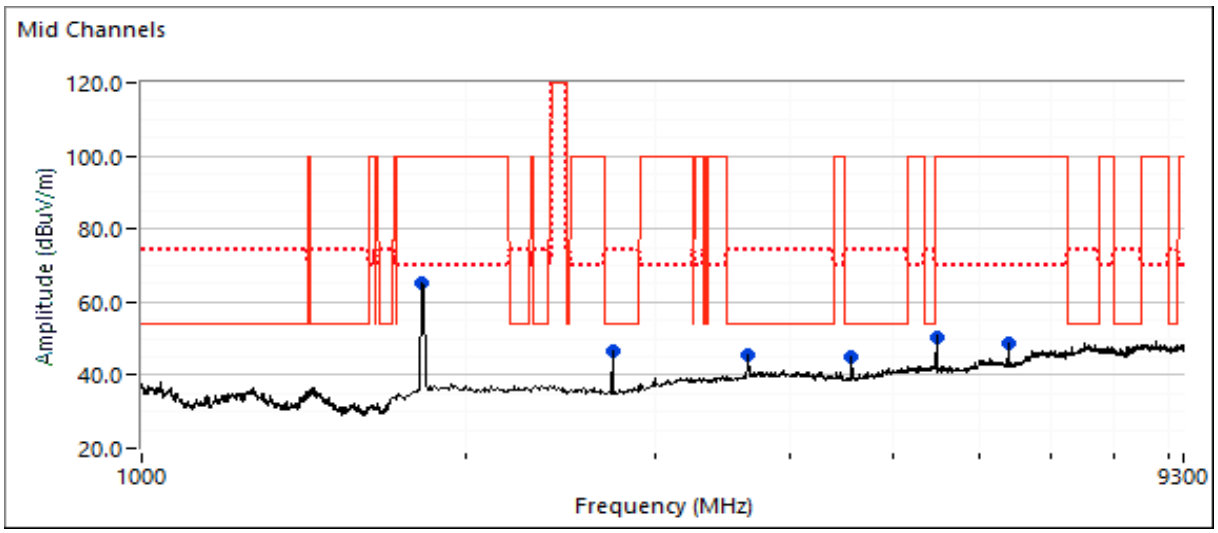
Maximun Fundamental emission level @ 3m in 100kHz RBW:	131.3 dBµV/m
Limit for emissions outside of restricted bands:	111.3 dBµV/m

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
544.092	21.8	H	46.0	-24.2	QP	235	1.8	QP (1.00s), Note 3
748.945	26.4	H	46.0	-19.6	QP	360	1.0	QP (1.00s), Note 3
875.792	37.9	H	46.0	-8.1	QP	360	1.0	QP (1.00s), Note 3
954.037	37.2	V	46.0	-8.8	QP	356	1.0	QP (1.00s), Note 3
960.000	30.0	V	46.0	-16.0	QP	0	1.0	QP (1.00s)
1829.950	66.1	V	111.3	-45.2	PK	89	1.7	RB 100 kHz;VB 300 kHz;Peak
2744.380	44.6	V	54.0	-9.4	AVG	178	2.0	RB 1 MHz;VB 10 Hz;Peak
2744.660	48.3	V	74.0	-25.7	PK	178	2.0	RB 1 MHz;VB 3 MHz;Peak
3659.980	39.9	V	54.0	-14.1	AVG	132	1.6	RB 1 MHz;VB 10 Hz;Peak
3659.480	48.6	V	74.0	-25.4	PK	132	1.6	RB 1 MHz;VB 3 MHz;Peak
4574.880	44.3	V	54.0	-9.7	AVG	156	1.4	RB 1 MHz;VB 10 Hz;Peak
4575.280	50.1	V	74.0	-23.9	PK	156	1.4	RB 1 MHz;VB 3 MHz;Peak
5489.770	50.9	V	111.3	-60.4	PK	200	1.8	RB 100 kHz;VB 300 kHz;Peak
6403.810	48.9	H	111.3	-62.4	PK	159	1.4	RB 100 kHz;VB 300 kHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #1c: Radiated Spurious Emissions, 25 - 9,300 MHz. High Channels @ 927.4 and 927.6 MHz

Date of Test: 5/11 & 5/17/2023 Test Engineer: David Bare

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.560	130.8	V	-	-	PK	0	1.0	POS; RB 100 kHz; VB: 300 kHz
927.427	130.6	H	-	-	PK	360	1.3	POS; RB 100 kHz; VB: 100 kHz

Maximun Fundamental emission level @ 3m in 100kHz RBW:	130.8 dBµV/m	
Limit for emissions outside of restricted bands:	110.8 dBµV/m	**Limit is -20dBc**

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
960.000	29.0	V	46.0	-17.0	QP	354	1.0	QP (1.00s)
960.000	30.0	H	46.0	-16.0	QP	6	1.2	QP (1.00s)

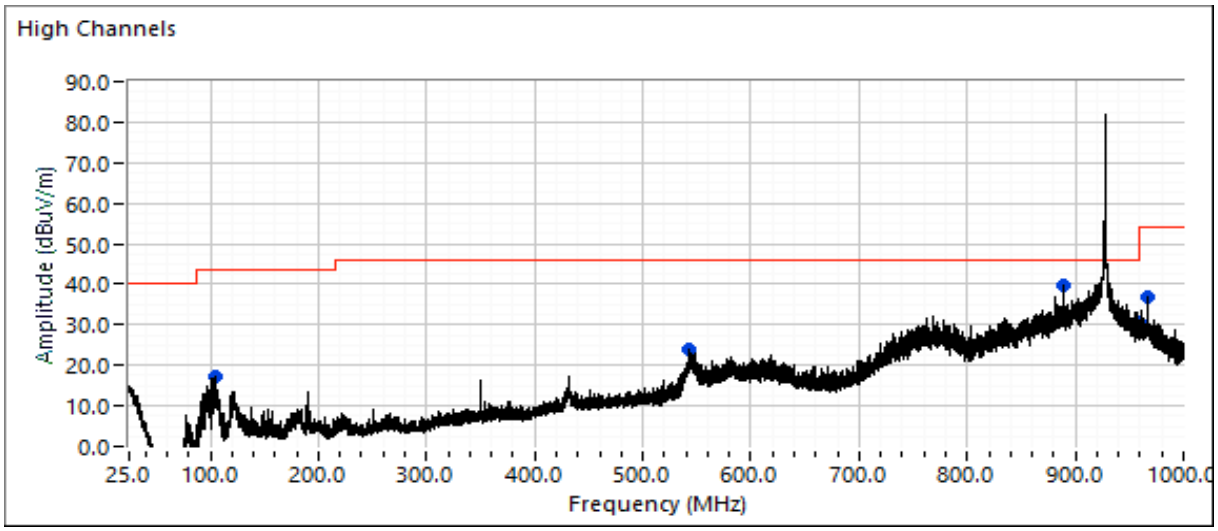
Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.

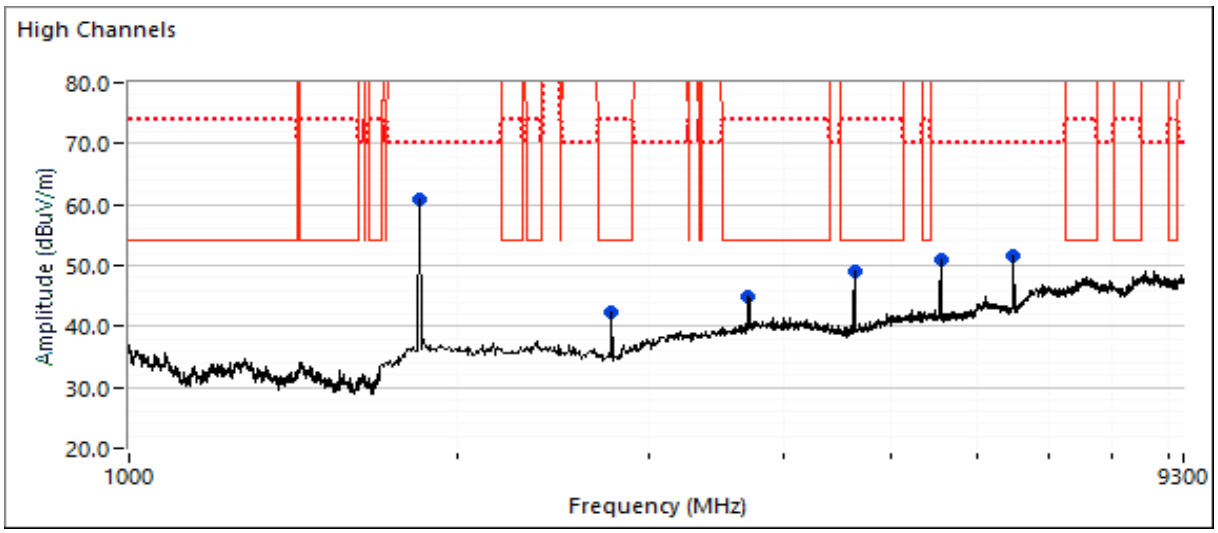
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
105.285	12.2	V	43.5	-31.3	QP	196	1.0	QP (1.00s), Note 3
543.300	20.7	H	46.0	-25.3	QP	224	2.0	QP (1.00s), Note 3
888.453	38.6	H	46.0	-7.4	QP	360	1.5	QP (1.00s), Note 3
966.698	30.8	V	54.0	-23.2	QP	1	1.0	QP (1.00s)
1855.130	61.5	V	110.8	-49.3	PK	287	1.5	RB 100 kHz;VB 300 kHz;Peak
4637.940	45.8	V	54.0	-8.2	AVG	219	2.0	RB 1 MHz;VB 10 Hz;Peak
4637.920	50.4	V	74.0	-23.6	PK	219	2.0	RB 1 MHz;VB 3 MHz;Peak
5565.750	50.0	V	110.8	-60.8	PK	206	2.0	RB 100 kHz;VB 300 kHz;Peak
6491.550	51.5	V	110.8	-59.3	PK	153	1.5	RB 100 kHz;VB 300 kHz;Peak
3709.500	44.4	H	54.0	-9.6	AVG	140	1.0	RB 1 MHz;VB 10 Hz;Peak
3709.720	50.1	H	74.0	-23.9	PK	140	1.0	RB 1 MHz;VB 3 MHz;Peak
2782.220	41.9	H	54.0	-12.1	AVG	127	1.0	RB 1 MHz;VB 10 Hz;Peak
2782.430	46.9	H	74.0	-27.1	PK	127	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	1.5 GHz low pass filter used for 1.7 - 9.3 GHz scans, 900 MHz notch filer used for 25-1700 MHz scans.
Note 3:	Although this frequency is not in a restricted bands, the limit of 15.209 was used.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A

Run #2: Output Power (Peak Detector)

Date of Test: 5/15 & 5/16/2023 Test Engineer: David Bare

Test Location: Fremont Chamber #2

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Maximum antenna gain: 11 dBi

Radio 1 (measured at RF output and the 8 dB cable loss included)

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	22.0	0.158	1.995
Mid	915	1 MHz	22.0	0.158	1.995
High	927.6	1 MHz	21.6	0.145	1.820

Radio 2 (measured at RF output and the 8 dB cable loss included)

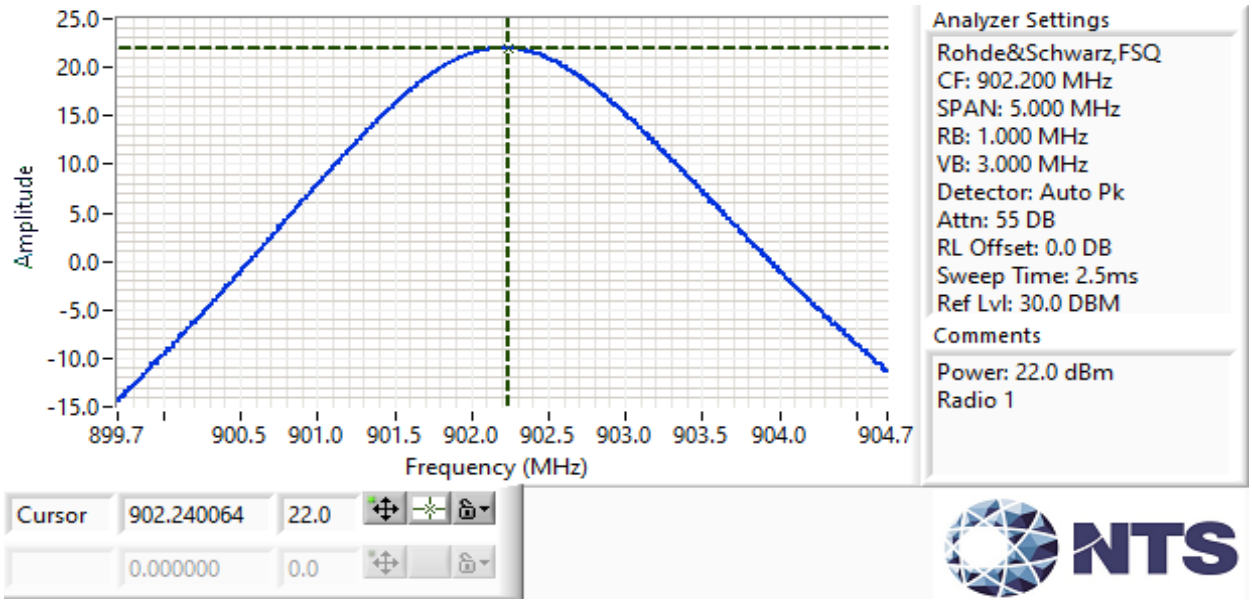
Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	22.0	0.158	1.995
Mid	915.0	1 MHz	21.9	0.155	1.950
High	927.6	1 MHz	21.2	0.132	1.660

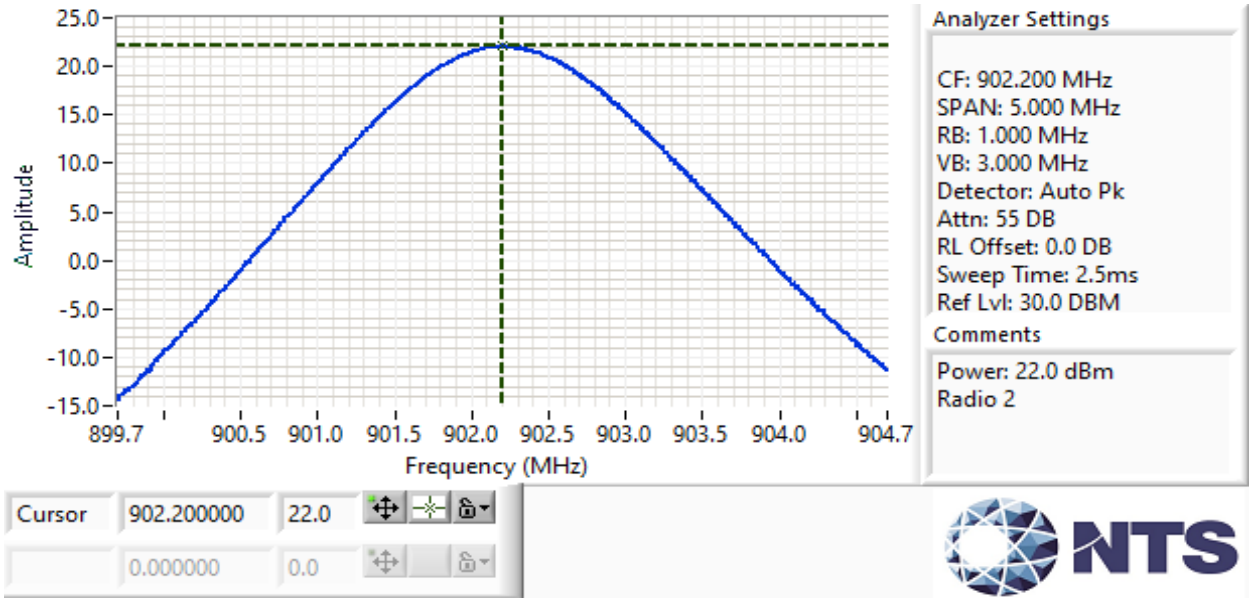
Combined (with and the 8 dB cable loss included)

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	902.2	1 MHz	25.0	0.317	3.991
Mid	915	1 MHz	25.0	0.313	3.945
High	927.6	1 MHz	24.4	0.276	3.479

Note 1:	Output power measured at each of the antenna ports with a suitable attenuator and spectrum analyzer with RBW >> Occupied Bandwidth. Represenative plot below.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	N/A





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Conducted 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:	5/22/2023	Config. Used:	1
Test Engineer:	David Bare	Config Change:	None
Test Location:	Fremont Chamber #7	Host Unit Voltage	120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a foam table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Ambient Conditions:

Temperature:	24 °C
Rel. Humidity:	42 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	FCC §15.207(a)	Pass	42.7 dBµV @ 2.224 MHz (-3.3 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

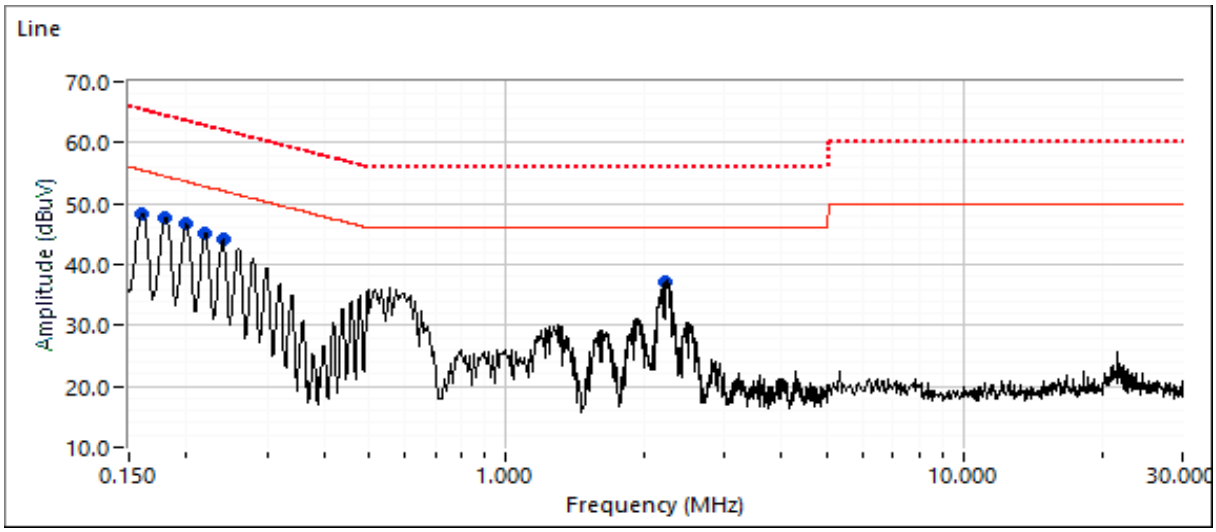
No deviations were made from the requirements of the standard.

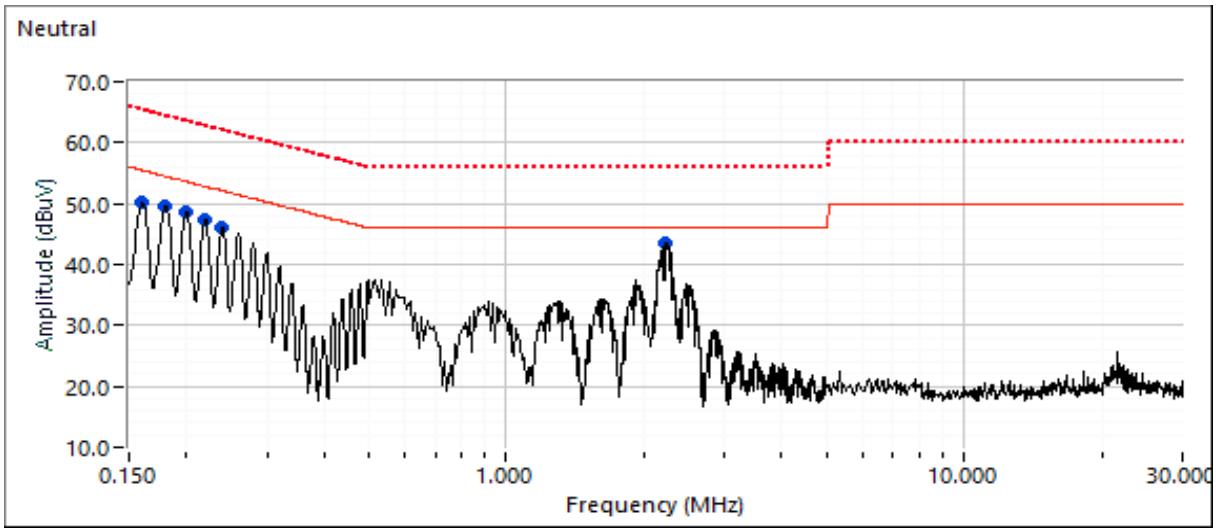
Test Notes

EUT configured to transmit on mid channels during tests.

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency	Level	AC	FCC §15.207(a)		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.159	48.4	Line 1	55.4	-7.0	Peak	
0.179	47.6	Line 1	54.5	-6.9	Peak	
0.199	46.6	Line 1	53.6	-7.0	Peak	
0.219	45.0	Line 1	52.8	-7.8	Peak	
0.239	44.0	Line 1	52.1	-8.1	Peak	
2.224	37.2	Line 1	46.0	-8.8	Peak	
0.159	50.1	Neutral	55.4	-5.3	Peak	
0.179	49.5	Neutral	54.5	-5.0	Peak	
0.198	48.5	Neutral	53.6	-5.1	Peak	
0.219	47.3	Neutral	52.8	-5.5	Peak	
0.238	46.2	Neutral	52.1	-5.9	Peak	
2.224	43.4	Neutral	46.0	-2.6	Peak	

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Final quasi-peak and average readings

Frequency	Level	AC	FCC §15.207(a)		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.159	48.1	Line 1	55.5	-7.4	AVG	AVG (0.10s)
0.159	48.1	Line 1	65.5	-17.4	QP	QP (1.00s)
0.179	47.4	Line 1	54.5	-7.1	AVG	AVG (0.10s)
0.179	47.5	Line 1	64.5	-17.0	QP	QP (1.00s)
0.199	46.1	Line 1	53.6	-7.5	AVG	AVG (0.10s)
0.199	46.2	Line 1	63.6	-17.4	QP	QP (1.00s)
0.219	44.7	Line 1	52.9	-8.2	AVG	AVG (0.10s)
0.219	44.8	Line 1	62.9	-18.1	QP	QP (1.00s)
0.239	43.3	Line 1	52.1	-8.8	AVG	AVG (0.10s)
0.239	43.5	Line 1	62.1	-18.6	QP	QP (1.00s)
2.224	35.8	Line 1	46.0	-10.2	AVG	AVG (0.10s)
2.224	36.3	Line 1	56.0	-19.7	QP	QP (1.00s)
0.159	49.9	Neutral	55.5	-5.6	AVG	AVG (0.10s)
0.159	50.0	Neutral	65.5	-15.5	QP	QP (1.00s)
0.179	49.3	Neutral	54.5	-5.2	AVG	AVG (0.10s)
0.179	49.4	Neutral	64.5	-15.1	QP	QP (1.00s)
0.198	48.4	Neutral	53.7	-5.3	AVG	AVG (0.10s)
0.198	48.5	Neutral	63.7	-15.2	QP	QP (1.00s)
0.219	47.0	Neutral	52.9	-5.9	AVG	AVG (0.10s)
0.219	47.1	Neutral	62.9	-15.8	QP	QP (1.00s)
0.238	46.1	Neutral	52.2	-6.1	AVG	AVG (0.10s)
0.238	46.2	Neutral	62.2	-16.0	QP	QP (1.00s)
2.224	42.7	Neutral	46.0	-3.3	AVG	AVG (0.10s)
2.224	43.2	Neutral	56.0	-12.8	QP	QP (1.00s)

Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Radiated & Conducted 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: 5/12 & 5/15 & 5/16/2023
Test Engineer: M. Birgani / David Bare
Test Location: Fremont Chambers #2 & #4

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

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.

Ambient Conditions:

Temperature: 20-24 °C
Rel. Humidity: 35-48 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	Radiated Emissions 30 - 3000 MHz	FCC Part 15.109	Pass	32.4 dBµV/m @ 93.93 MHz (-11.1 dB)
3	30 - 3,000 MHz Receiver Conducted Spurious Emissions	FCC Part 15.111	Pass	-79.2 dBm @ 2980.5 MHz (-22.2 dB)

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.

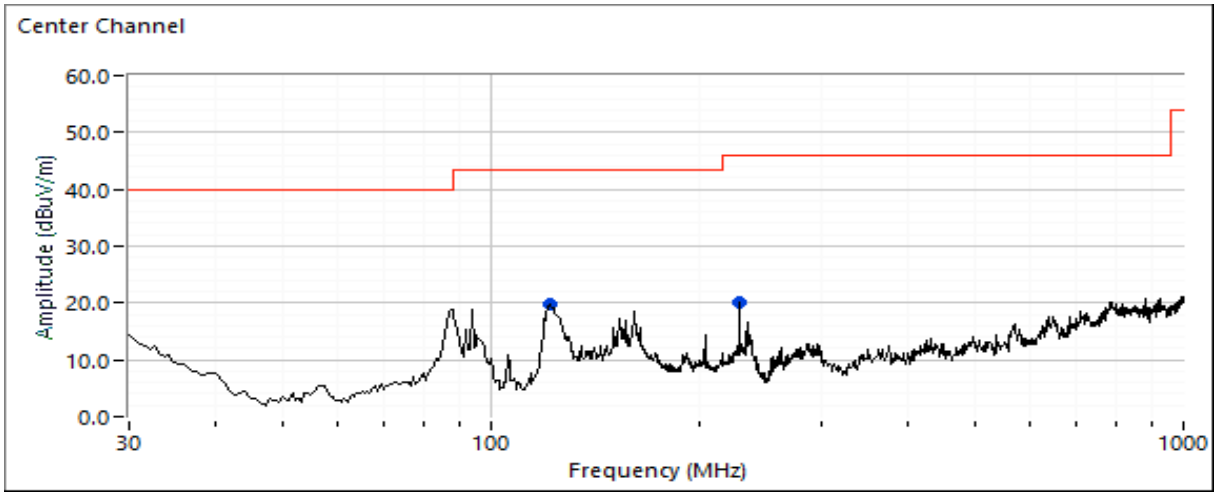
Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

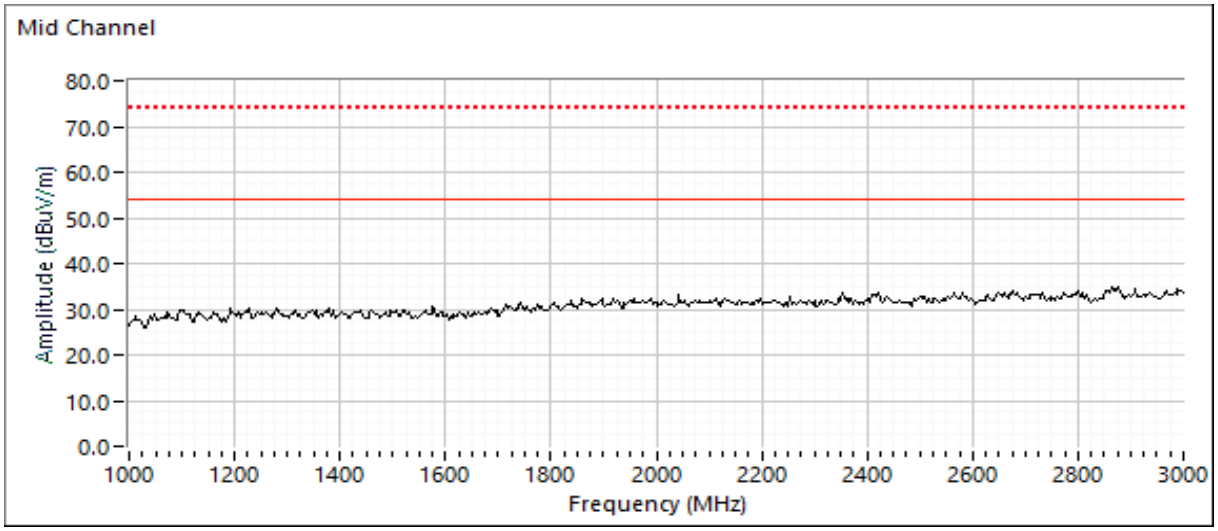
Run #2: Receiver Radiated Spurious Emissions, 30 - 3,000 MHz, Antenna port terminated

Date of Test: 5/12 & 5/15 & 5/16/2023 Test Engineer: M. Birgani

Run #2a: Receiver Radiated Spurious Emissions, 30 - 3,000 MHz. Center Channel @ 914.8 & 915 MHz

Frequency	Level	Pol	15.109 / RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
122.836	16.7	V	43.5	-26.8	QP	112	1.0	QP (1.00s)
229.911	5.6	V	46.0	-40.4	QP	310	1.5	QP (1.00s)

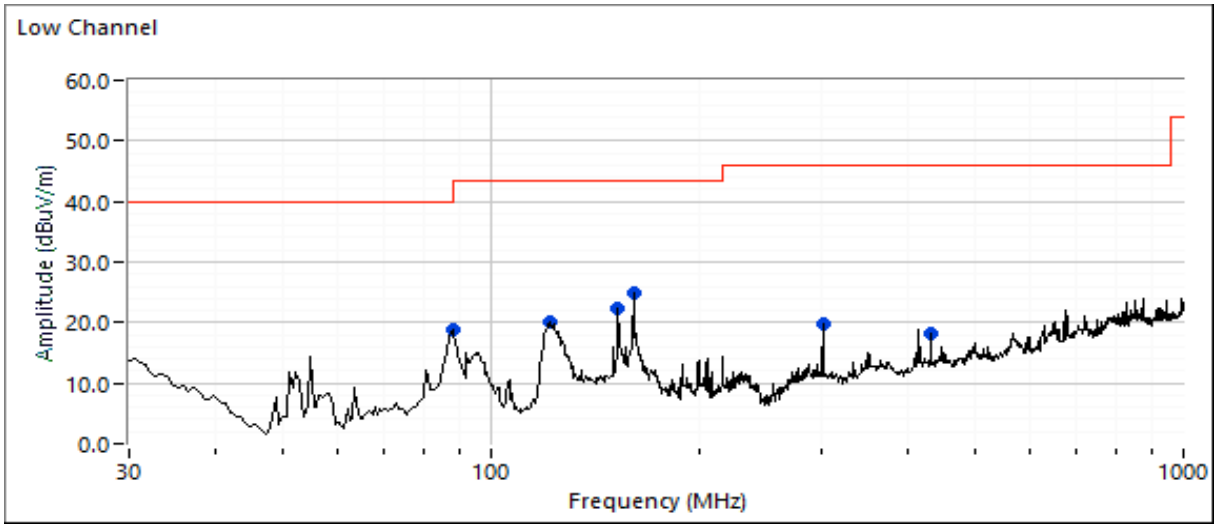


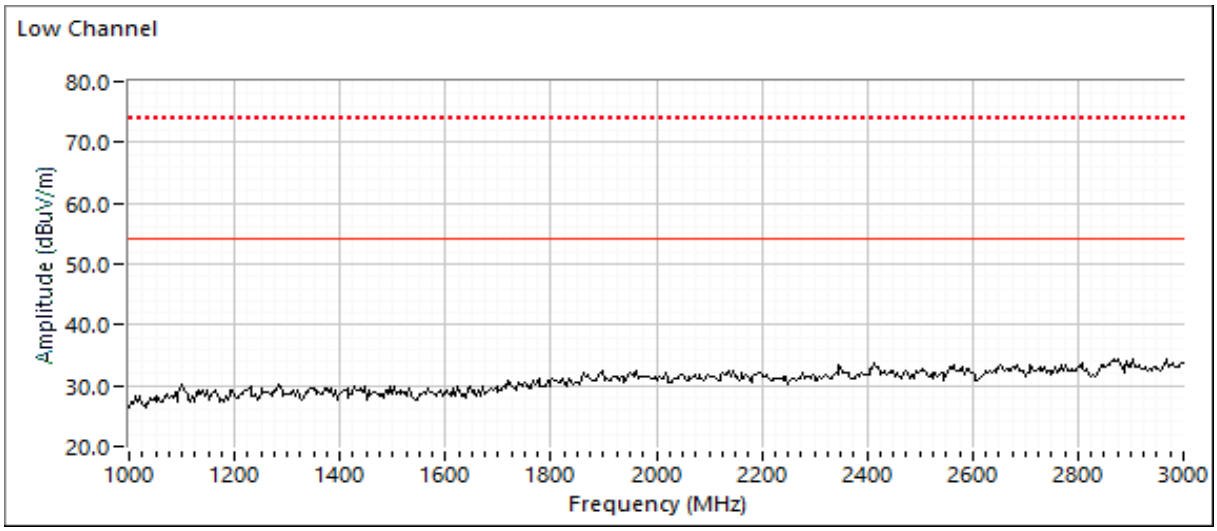


Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Run #2b: Receiver Radiated Spurious Emissions, 30 - 3,000 MHz. Low Channel @ 902.2 & 902.4 MHz

Frequency	Level	Pol	15.109 / RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
87.432	14.8	V	40.0	-25.2	QP	144	1.0	QP (1.00s)
121.232	18.1	V	43.5	-25.4	QP	90	1.0	QP (1.00s)
153.002	10.9	V	43.5	-32.6	QP	192	1.5	QP (1.00s)
160.943	10.6	V	43.5	-32.9	QP	165	1.0	QP (1.00s)
431.957	11.3	H	46.0	-34.7	QP	222	2.5	QP (1.00s)
300.449	6.5	V	46.0	-39.5	QP	289	2.0	QP (1.00s)

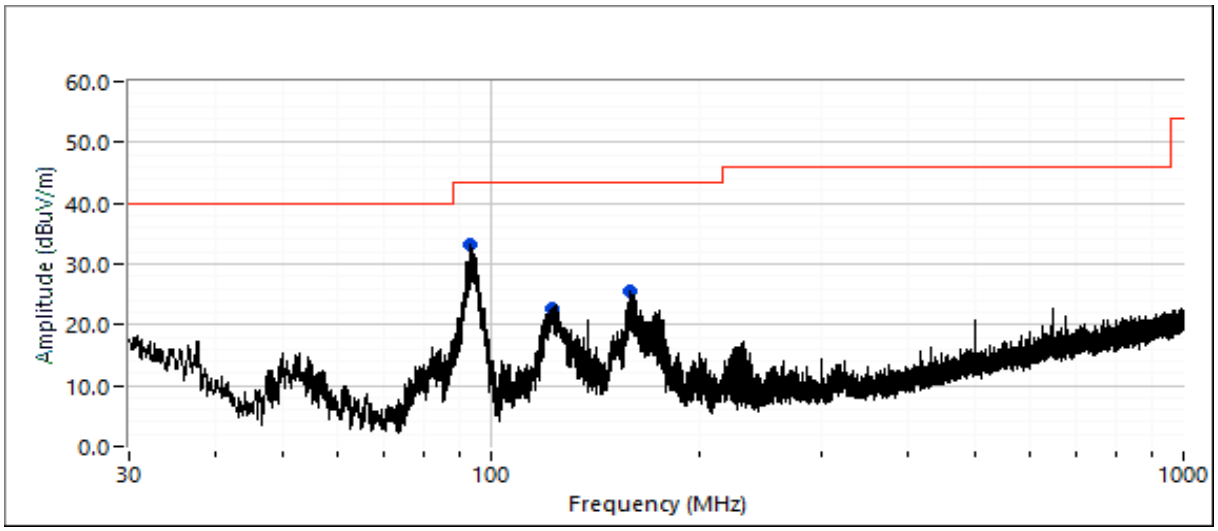


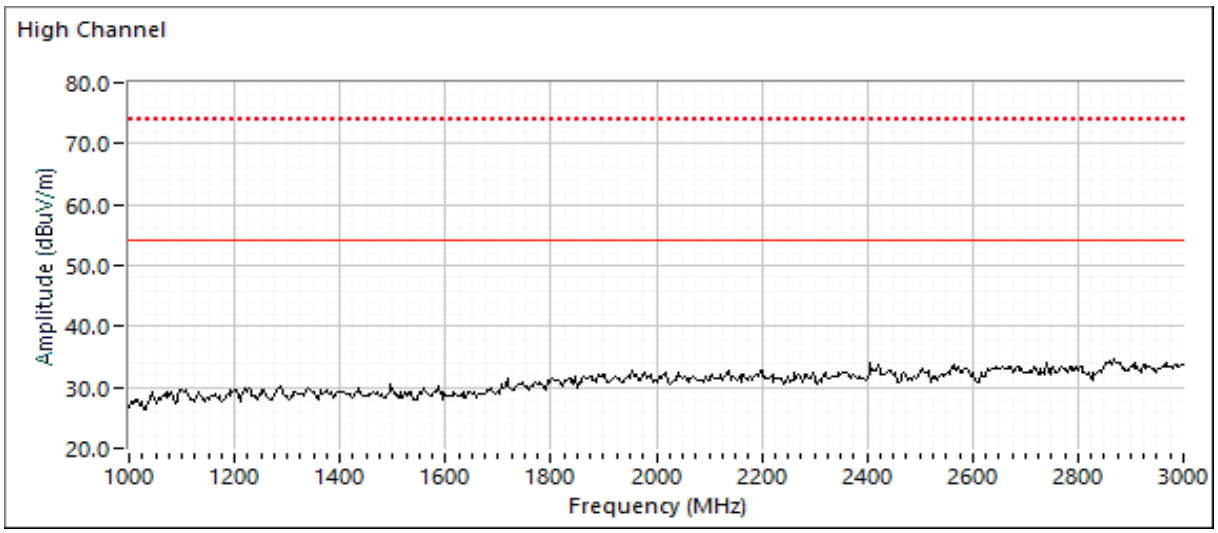


Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Run #2c: Receiver Radiated Spurious Emissions, 30 - 3,000 MHz. High Channels @ 927.4 & 927.6 MHz

Frequency	Level	Pol	15.109 / RSS GEN		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
93.931	**32.4**	V	43.5	**-11.1**	QP	167	1.2	QP (1.00s)
157.238	22.7	V	43.5	-20.8	QP	221	1.1	QP (1.00s)
124.385	20.6	V	43.5	-22.9	QP	294	1.0	QP (1.00s)





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Run #3: Receiver Antenna Port Emissions, 30 - 3,000 MHz

Date of Test: 5/16/2023 Test Engineer: David Bare

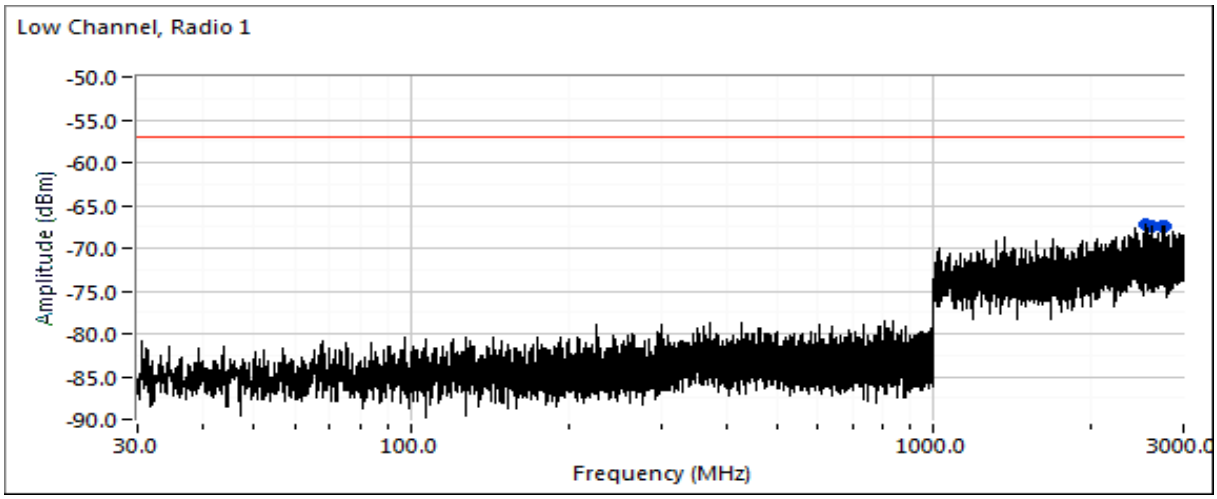
Test Location: Fremont Chamber #2

low, mid and high channels

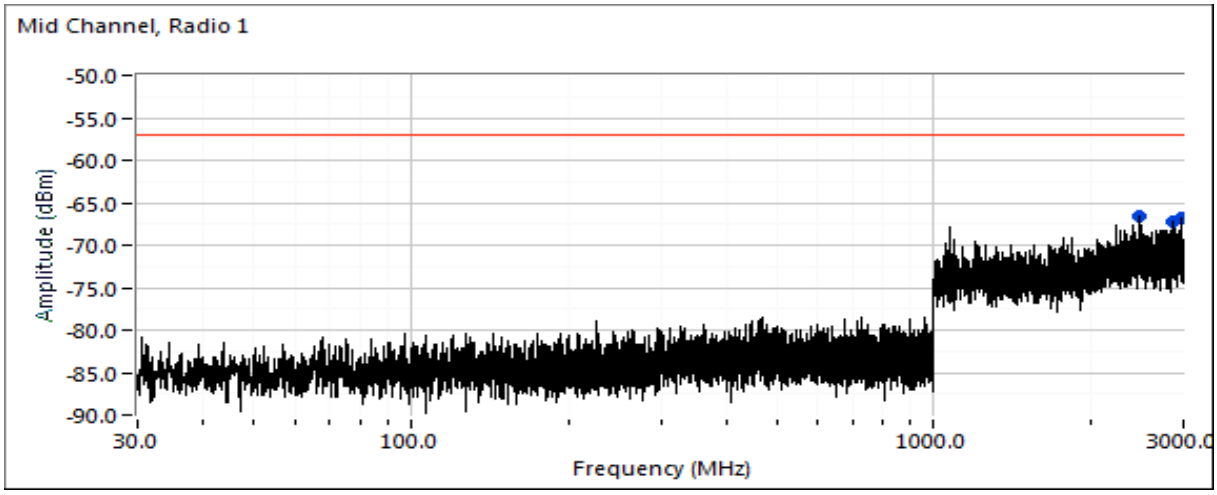
Radio 1

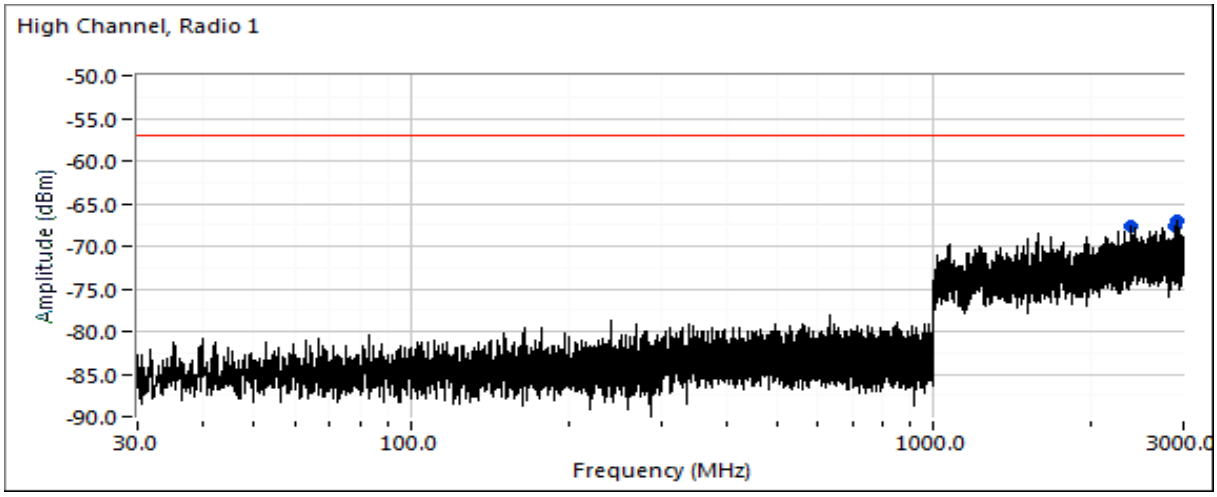
Preliminary peak readings captured during pre-scan

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments	Channel
2548.890	-67.3	RF Port	-57.0	-10.3	Peak		Low
2603.400	-67.5	RF Port	-57.0	-10.5	Peak		Low
2743.440	-67.5	RF Port	-57.0	-10.5	Peak		Low
2753.440	-67.4	RF Port	-57.0	-10.4	Peak		Low
2465.870	-66.7	RF Port	-57.0	-9.7	Peak		Mid
2853.460	-67.2	RF Port	-57.0	-10.2	Peak		Mid
2958.990	-66.8	RF Port	-57.0	-9.8	Peak		Mid
2388.350	-67.6	RF Port	-57.0	-10.6	Peak		High
2878.970	-67.6	RF Port	-57.0	-10.6	Peak		High
2917.480	-67.0	RF Port	-57.0	-10.0	Peak		High



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Final quasi-peak readings

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments
All emissions more than 20 dB below the limit						

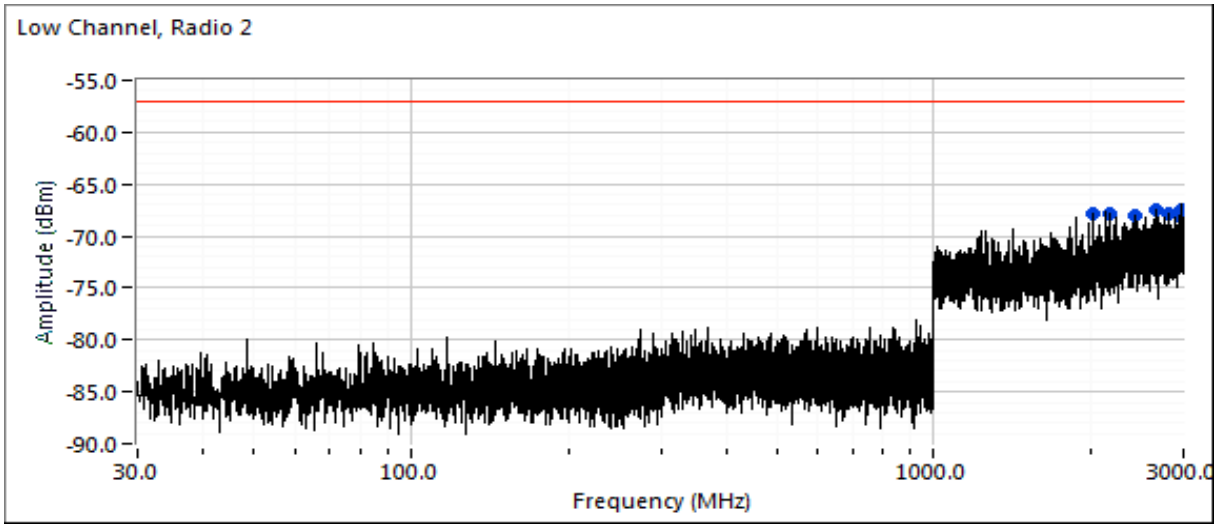
Final peak and average readings

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments	Channel
2549.240	-80.1	RF Port	-57.0	-23.1	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2548.540	-68.5	RF Port	-37.0	-31.5	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2602.440	-79.8	RF Port	-57.0	-22.8	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2603.670	-68.7	RF Port	-37.0	-31.7	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2741.950	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2743.080	-68.2	RF Port	-37.0	-31.2	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2752.490	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2752.490	-67.6	RF Port	-37.0	-30.6	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2465.910	-79.9	RF Port	-57.0	-22.9	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2466.090	-68.2	RF Port	-37.0	-31.2	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2854.510	-79.6	RF Port	-57.0	-22.6	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2854.050	-68.1	RF Port	-37.0	-31.1	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2959.600	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2958.300	-68.2	RF Port	-37.0	-31.2	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2389.500	-80.1	RF Port	-57.0	-23.1	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2387.670	-67.8	RF Port	-37.0	-30.8	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High
2877.910	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2877.540	-67.0	RF Port	-37.0	-30.0	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High
2916.590	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2916.960	-68.0	RF Port	-37.0	-31.0	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High

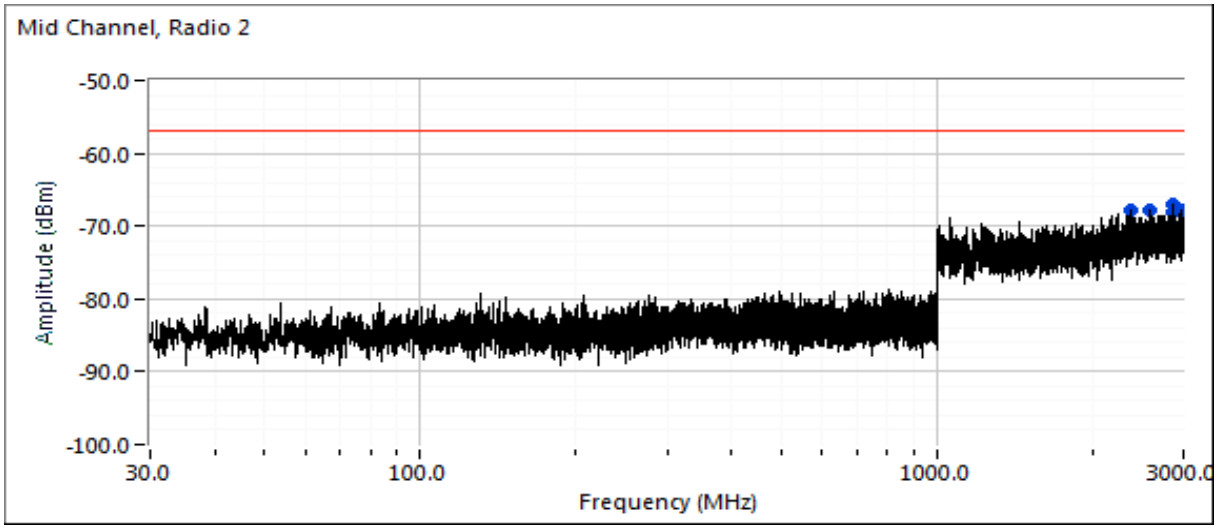
Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

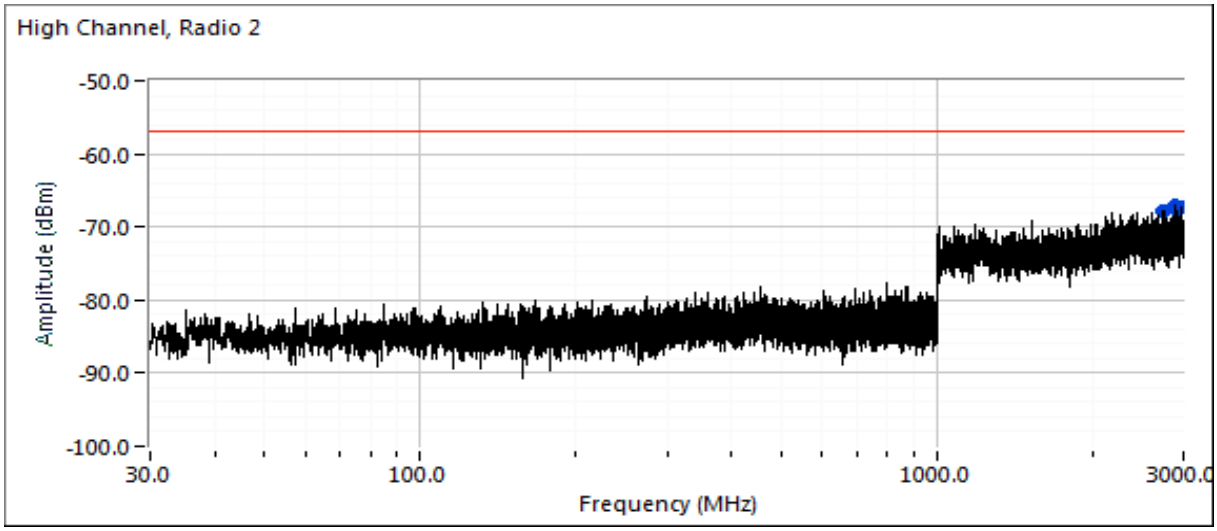
low, mid and high channels
Radio 2
Preliminary peak readings captured during pre-scan

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments	Channel
2013.750	-67.9	RF Port	-57.0	-10.9	Peak	Noise floor	Low
2168.790	-67.9	RF Port	-57.0	-10.9	Peak	Noise floor	Low
2422.860	-68.1	RF Port	-57.0	-11.1	Peak	Noise floor	Low
2652.910	-67.4	RF Port	-57.0	-10.4	Peak	Noise floor	Low
2817.950	-67.9	RF Port	-57.0	-10.9	Peak	Noise floor	Low
2937.980	-68.1	RF Port	-57.0	-11.1	Peak	Noise floor	Low
2978.990	-67.5	RF Port	-57.0	-10.5	Peak	Noise floor	Low
2376.340	-67.9	RF Port	-57.0	-10.9	Peak	Noise floor	Mid
2581.400	-67.8	RF Port	-57.0	-10.8	Peak	Noise floor	Mid
2849.960	-67.0	RF Port	-57.0	-10.0	Peak	Noise floor	Mid
2857.960	-68.1	RF Port	-57.0	-11.1	Peak	Noise floor	Mid
2872.970	-68.0	RF Port	-57.0	-11.0	Peak	Noise floor	Mid
2966.990	-67.8	RF Port	-57.0	-10.8	Peak	Noise floor	Mid
2730.930	-67.8	RF Port	-57.0	-10.8	Peak	Noise floor	High
2757.440	-67.9	RF Port	-57.0	-10.9	Peak	Noise floor	High
2767.940	-67.7	RF Port	-57.0	-10.7	Peak	Noise floor	High
2886.970	-67.0	RF Port	-57.0	-10.0	Peak	Noise floor	High
2929.480	-67.8	RF Port	-57.0	-10.8	Peak	Noise floor	High
2962.490	-67.4	RF Port	-57.0	-10.4	Peak	Noise floor	High



Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-





Client:	GE MDS LLC	PR Number:	PR171060
Model:	NET9S	T-Log Number:	TL171060-RA-NET9S
		Project Manager:	Christine Krebill
Contact:	Jonathan Viligy	Project Engineer:	David Bare
Standard:	FCC §15.247, RSS-247	Class:	-

Final quasi-peak readings

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments
All emissions more than 20 dB below the limit						

Final peak and average readings

Frequency MHz	Level dBm	RF Port	15.111 Limit	15.111 Margin	Detector QP/Ave	Comments	Channel
2013.850	-81.2	RF Port	-57.0	-24.2	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2014.570	-69.1	RF Port	-37.0	-32.1	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2170.090	-80.7	RF Port	-57.0	-23.7	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2167.760	-69.0	RF Port	-37.0	-32.0	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2422.720	-79.8	RF Port	-57.0	-22.8	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2423.840	-68.1	RF Port	-37.0	-31.1	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2653.300	-79.9	RF Port	-57.0	-22.9	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2653.750	-69.4	RF Port	-37.0	-32.4	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2819.120	-79.9	RF Port	-57.0	-22.9	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2818.340	-68.7	RF Port	-37.0	-31.7	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2980.470	-79.2	RF Port	-57.0	-22.2	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Low
2979.520	-67.1	RF Port	-37.0	-30.1	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Low
2376.290	-80.2	RF Port	-57.0	-23.2	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2376.810	-68.8	RF Port	-37.0	-31.8	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2580.450	-79.6	RF Port	-57.0	-22.6	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2582.330	-67.1	RF Port	-37.0	-30.1	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2850.580	-79.7	RF Port	-57.0	-22.7	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2850.050	-68.7	RF Port	-37.0	-31.7	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2968.460	-79.3	RF Port	-57.0	-22.3	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	Mid
2966.150	-68.6	RF Port	-37.0	-31.6	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	Mid
2732.410	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2731.470	-68.7	RF Port	-37.0	-31.7	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High
2766.950	-79.5	RF Port	-57.0	-22.5	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2766.450	-67.6	RF Port	-37.0	-30.6	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High
2886.160	-79.3	RF Port	-57.0	-22.3	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2887.510	-67.8	RF Port	-37.0	-30.8	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High
2962.250	-79.4	RF Port	-57.0	-22.4	AVG	AVG (CISPR)-RB 1 MHz; VB: 10 Hz	High
2962.990	-67.8	RF Port	-37.0	-30.8	PK	PK (CISPR)-RB 1 MHz; VB: 3 MHz	High

End of Report

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