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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-210 Issue 10
FCC Part 15 Subpart C

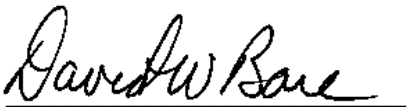
Model: SSEN-2

ISED CERTIFICATION #:	30107-SSEN2
FCC ID:	2BAE8-SSEN2
APPLICANT:	wtec GmbH Dornbachstrasse 1a' 61352 Bad Homburg, Germany
TEST SITE(S):	NTS Labs LLC 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4, 2845B-5, 2845B-7
PROJECT NUMBER:	PR168321
REPORT DATE:	January 27, 2023
RE-ISSUED DATE:	June 1, 2023
FINAL TEST DATES:	January 16 and 17, 2023
TOTAL NUMBER OF PAGES:	44

A2LA ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

PROGRAM MGR



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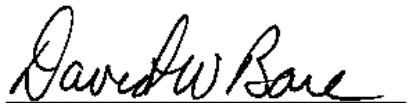

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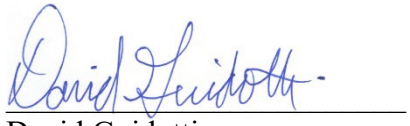

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	January 27, 2023	First release	
1	June 1, 2023	Revised to add support equipment used for CE, remove description of SSEN-2 variant, and corrected standard references	dwb

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SCOPE

Electromagnetic emissions tests have been performed on the wtec GmbH model SSEN-2, pursuant to the following rules:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 210 Issue 10 "Licence-Exempt Radio Apparatus: Category I Equipment"
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 wtec GmbH model SSEN-2 complied with the requirements of the following regulations:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 210 Issue 10 "Licence-Exempt Radio Apparatus: Category I Equipment"
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 wtec GmbH model SSEN-2 and therefore apply only to the tested sample. The sample was selected and prepared by Stewart Findlater of wtec GmbH.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

DEVICES OPERATING IN THE 902 – 928 / 2400 – 2483.5 / 5725 – 5850 MHz BANDS

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.249 (a)	RSS-210 B.10 (a)	Fundamental Signal Strength	89.2 dBµV/m @ 2480.2 MHz	50mV/m @ 3m	Complies
15.249 (a) / 15.209	RSS-210 B.10 (a) & RSS-GEN	Radiated Spurious Emissions, 5 – 25,000 MHz	43.7 dBµV/m @ 4960.3 MHz	Harmonics 500uV/m @ 3m or general limits (see page 17)	Complies
Note 1	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	Integral Antenna	Unique or integral antenna required	Complies
15.207	RSS-Gen Table 4	AC Conducted Emissions	22.0 dBµV @ 0.483 MHz (-24.3 dB)	Refer to page 17	Complies
-	RSS-Gen 8.4	User Manual	See separate exhibit, Installation Guide	Statement for all products	Complies
-	RSP-100 RSS-Gen 6.7	Occupied Bandwidth	1.068 MHz	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
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 wtec GmbH model SSEN-2 is a sensor of light, temperature, and motion plus bluetooth beacon generation and detection. Since the EUT would be placed in the ceiling during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 12-60 Volts DC.

The sample was received on January 13, 2023 and tested on January 16 and 17, 2023. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
wtec GmbH.	SSEN-2	Light, temperature and motion sensor plus BLE beacon	SVS1Y0601223200041	2BAE8-SSEN2

ANTENNA SYSTEM

The antenna system consists of an integral wire with a partial circle turn.

ENCLOSURE

The enclosure is primarily constructed of plastic. It measures approximately 2.5 cm in diameter by 5.2 cm long.

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
LumaStream	214-0405-MM-C	Luminaire	-	-
wtec, Inc.	SG-3-EMB-EHSH	Gateway	SVS2J0301223500001	-
Agilent	E3610	Power Supply	MY40001912	-

Note: The Agilent power supply was used to power the device during the conducted emission tests.

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

Company	Model	Description	Serial Number	FCC ID
wtec, Inc.	SENG-1-4834-250	Smartengine	SVS1E1302193600035	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Gateway Smartengine	Smartengine	Multiwire	Unshielded	7.6
Gateway Luminaire	Luminaire	Two wire	Unshielded	0.8

EUT OPERATION

During emissions testing the EUT was commanded to transmit a continuous modulated signal on the selected channel at max. power.

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 & 7	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.

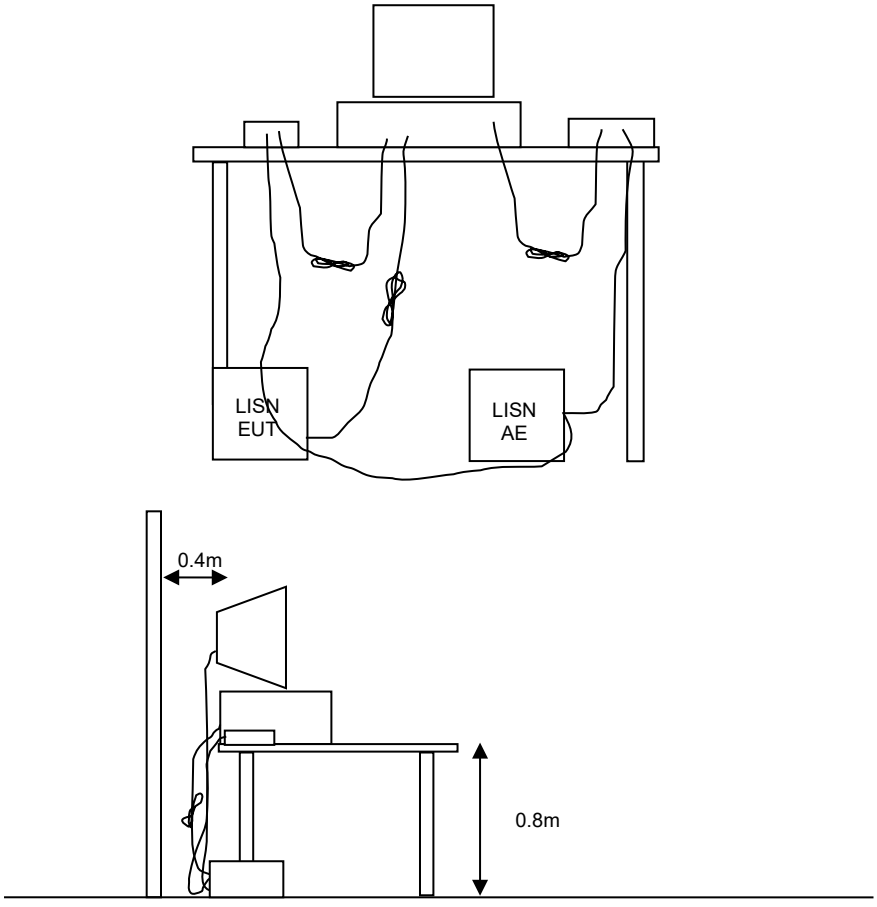


Figure 1 Typical Conducted Emissions Test Configuration

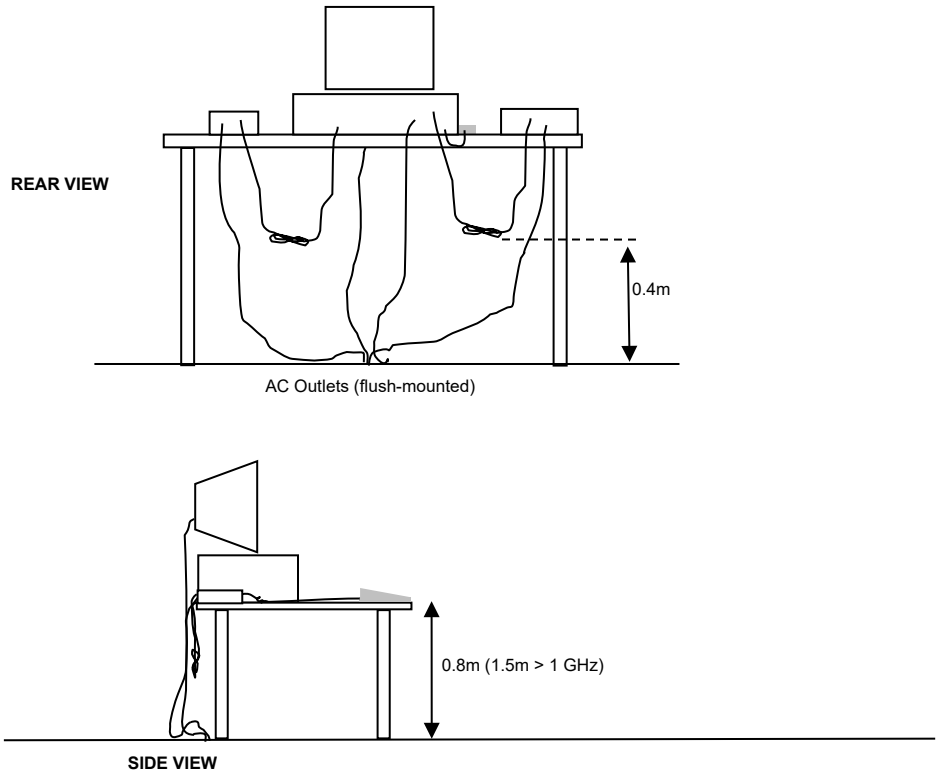
RADIATED EMISSIONS

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. This was repeated with the EUT oriented in the 2 other orthogonal orientations. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

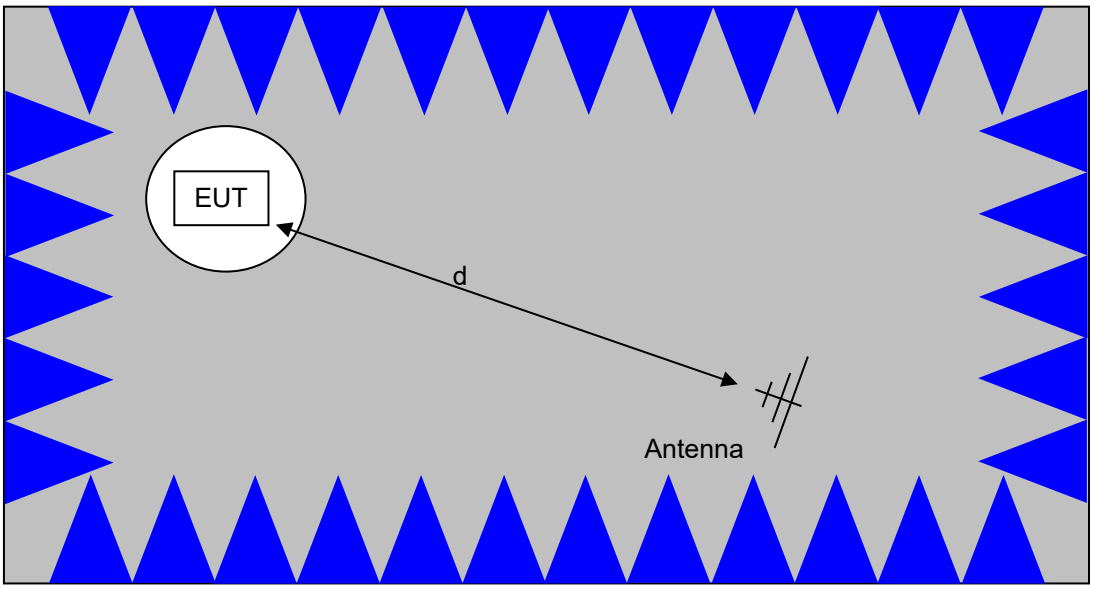
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

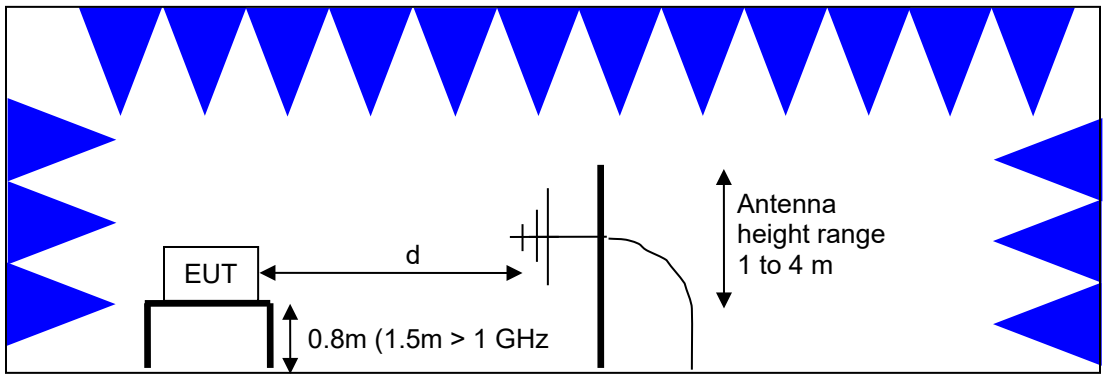


Typical Test Configuration for Radiated Field Strength Measurements



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
Semi-Anechoic Chamber, Plan and Side Views

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

RADIATEDFUNDAMENTAL & SPURIOUS EMISSIONS SPECIFICATION LIMITS – 15.249 and RSS-210 B.10

The table below shows the limits for the fundamental emission and for its harmonics. Harmonics that that fall in restricted bands[1] and all other spurious emissions are subject to the general limits of RSS-210 and FCC Part 15 Subpart C.

Frequency Range (MHz)	Limit for Fundamental @ 3m	Limit for Harmonics @ 3m
902 – 928	50,000 uV/m 94dBuV/m	500 uV/m 54dBuV/m
2400 – 2483.5	50,000 uV/m 94dBuV/m	500 uV/m 54dBuV/m
5725 - 5850	50,000 uV/m 94dBuV/m	500 uV/m 54dBuV/m

[1] The restricted bands are detailed in FCC 15.205, RSS-GEN Table 7

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[2].

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

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

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

SAMPLE CALCULATIONS - RADIATED EMISSIONS

A computer program reads the receiver levels and 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. The corrected receiver readings are compared directly to the specification limit (decibel form).

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

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 1,000 - 25,000 MHz, 16-Jan-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	
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Red)	84125C EMI Test Head	WC055586	11/7/2022	11/7/2023
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055670	10/24/2022	10/31/2023
Hewlett Packard	High Pass filter, 3.7 GHz	P/N 84300-80038	WC064434	2/9/2022	2/9/2023
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	WC064553	12/14/2022	12/14/2024
MITEQ	Preamplifier, 1-18 GHz	AFS44	WC080962	7/18/2022	7/18/2023
EMCO	Horn Antenna, 1-18 GHz (SA40-Purple)	3115	WC062583	9/12/2022	9/12/2024
Radiated Emissions, 30 - 1,000 MHz, 16-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
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
Rhode & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	WC071498	6/20/2022	6/20/2023
Radiated Emissions, 5 - 30 MHz, 16-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Rhode & Schwarz	Loop Antenna	HFH2-Z2	WC062457	2/17/2022	2/17/2024
Rhode & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	WC071498	6/20/2022	6/20/2023
Conducted Emissions - AC Power Ports, 16-Jan-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	WC064531	12/6/2022	12/6/2023
Rhode & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	WC071498	6/20/2022	6/20/2023
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	WC072358	6/30/2022	6/30/2023

Appendix B Test Data

TL168321-RANA SSEN-2 Pages 22 – 43

Client:	wtec, Inc.	PR Number:	PR168321
Product	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Emissions Standard(s):	FCC §15.249/RSS-210	Class:	-
Immunity Standard(s):	EN55035, EN 301 489-1, -17	Environment:	Radio

EMC Test Data

For The

wtec, Inc.

Product

SSEN-2

Date of Last Test: 1/24/2023

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	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: 1/17/2023
Test Engineer: Said A
Test Location: Fremont Chamber #7

Config. Used: 1
Config Change: -
Host Unit Voltage 120V/60Hz

General Test Configuration

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. 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: 18-19 °C
Rel. Humidity: 48-50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	Pass	22.0 dBµV (12.6 µV) @ 0.483 MHz (-24.3 dB)

Modifications Made During Testing

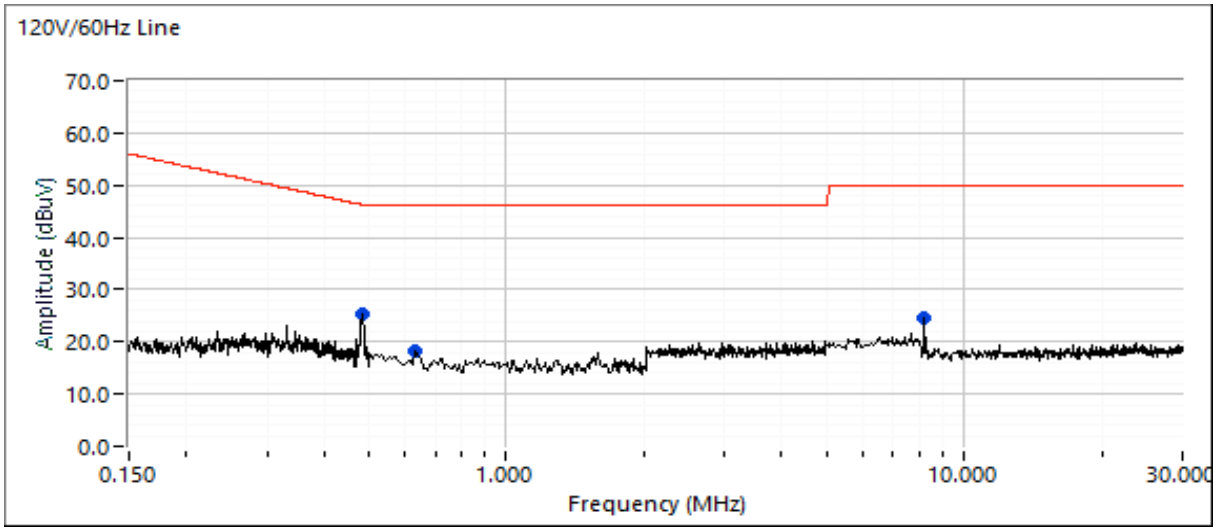
No modifications were made to the EUT during testing

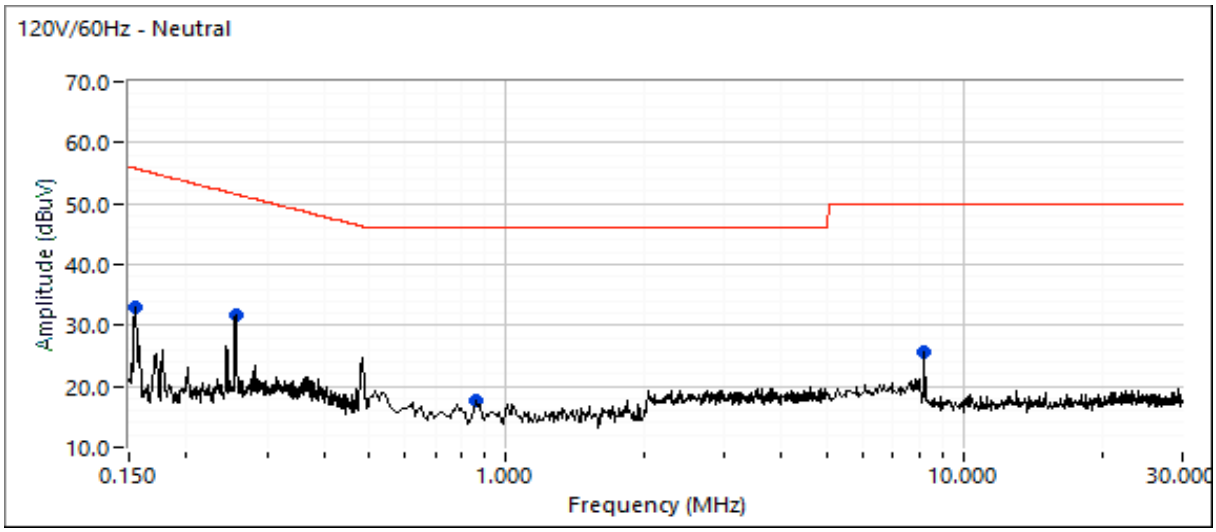
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

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





Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

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

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

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.483	25.2	Line	46.3	-21.1	Peak	
0.651	18.2	Line	46.0	-27.8	Peak	
8.199	24.7	Line	50.0	-25.3	Peak	
0.157	33.0	Neutral	55.7	-22.7	Peak	
0.253	31.6	Neutral	51.6	-20.0	Peak	
0.893	17.6	Neutral	46.0	-28.4	Peak	
8.201	25.7	Neutral	50.0	-24.3	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.483	**22.0**	Line	46.3	**-24.3**	QP	QP (1.00s)
0.483	20.6	Line	46.3	-25.7	AVG	AVG (0.10s)
8.201	23.0	Neutral	50.0	-27.0	QP	QP (1.00s)
8.199	21.6	Line	50.0	-28.4	QP	QP (1.00s)
8.201	21.5	Neutral	50.0	-28.5	AVG	AVG (0.10s)
8.199	20.6	Line	50.0	-29.4	AVG	AVG (0.10s)
0.157	23.6	Neutral	55.6	-32.0	QP	QP (1.00s)
0.253	14.2	Neutral	51.7	-37.5	QP	QP (1.00s)
0.651	7.9	Line	46.0	-38.1	QP	QP (1.00s)
0.892	7.3	Neutral	46.0	-38.7	QP	QP (1.00s)
0.651	4.1	Line	46.0	-41.9	AVG	AVG (0.10s)
0.253	9.3	Neutral	51.7	-42.4	AVG	AVG (0.10s)
0.892	3.4	Neutral	46.0	-42.6	AVG	AVG (0.10s)
0.157	8.2	Neutral	55.6	-47.4	AVG	AVG (0.10s)

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Radiated 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.

Date of Test: 1/16/2023
Test Engineer: Said A.
Test Location: Fremont Chamber #7
Config. Used: 1
Config Change: none
Host Unit Voltage 120V/ 60Hz

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Remote support equipment was located outside the chamber
The test distance and extrapolation factor (if used) 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: 18-19 °C
Rel. Humidity: 50-52 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	5 - 30 MHz	FCC 15.209	Pass	-45.5 dBµV/m @ 20.081 MHz (-75.0 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

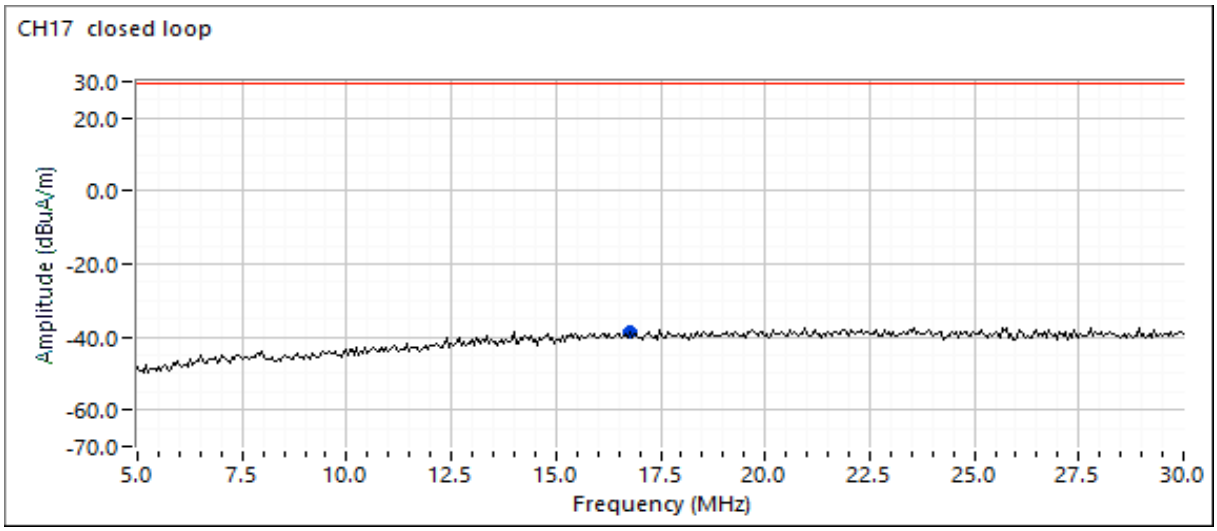
No deviations were made from the requirements of the standard.

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1.705 - 30.0 MHz	3	30	-40.0

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Run #1a: Radiated Emissions, 5- 30 MHz, FCC 15.209

Low Channel Closed loop



Preliminary readings

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
16.774	-38.4	V	29.5	-67.9	Peak	250	1.1	

Maximized readings (includes manipulation of EUT interface cables)

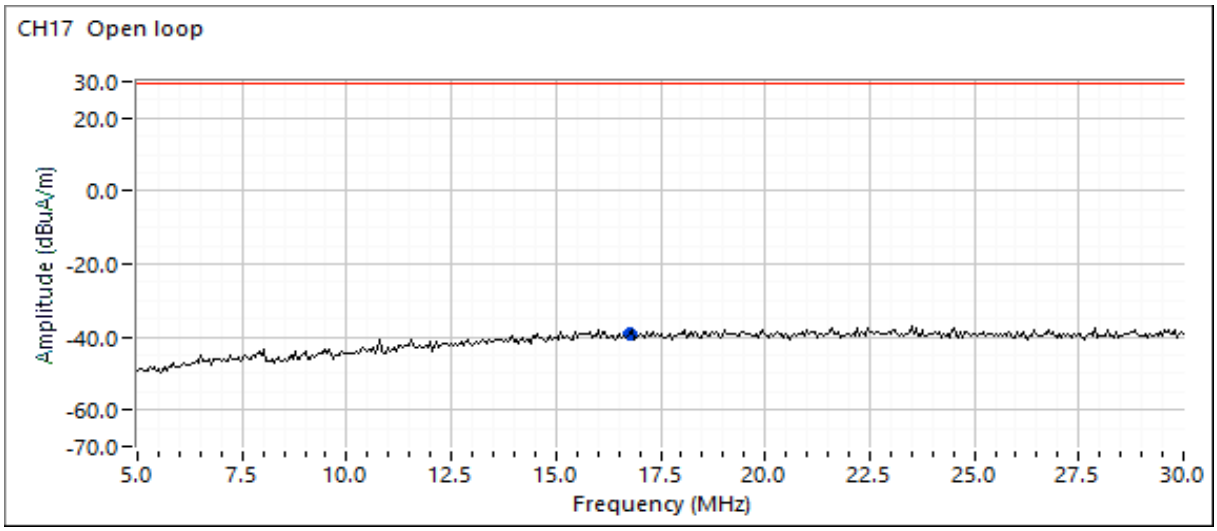
Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
16.774	-46.0	V	29.5	-75.5	QP	250	1.1	QP (1.00s)

Note 1:	The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, with a peak limit 20dB above the average limit.

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Run #1b: Radiated Emissions, 5- 30 MHz, FCC 15.209

Low Channel Open loop



Preliminary readings

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
16.743	-39.4	V	29.5	-68.9	Peak	26	1.1	

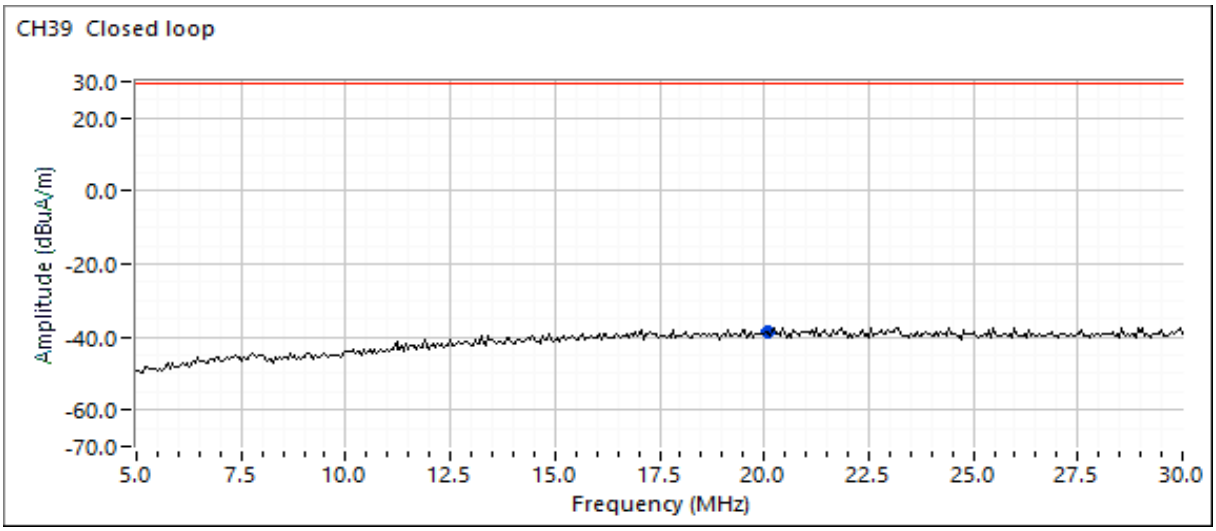
Maximized readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC Part 18		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
16.743	-46.3	V	29.5	-75.8	QP	26	1.1	QP (1.00s)

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Run #2a: Radiated Emissions, 5- 30 MHz, FCC 15.209

High Channel Closed loop



Preliminary readings

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
20.081	-38.4	V	29.5	-67.9	Peak	22	1.1	

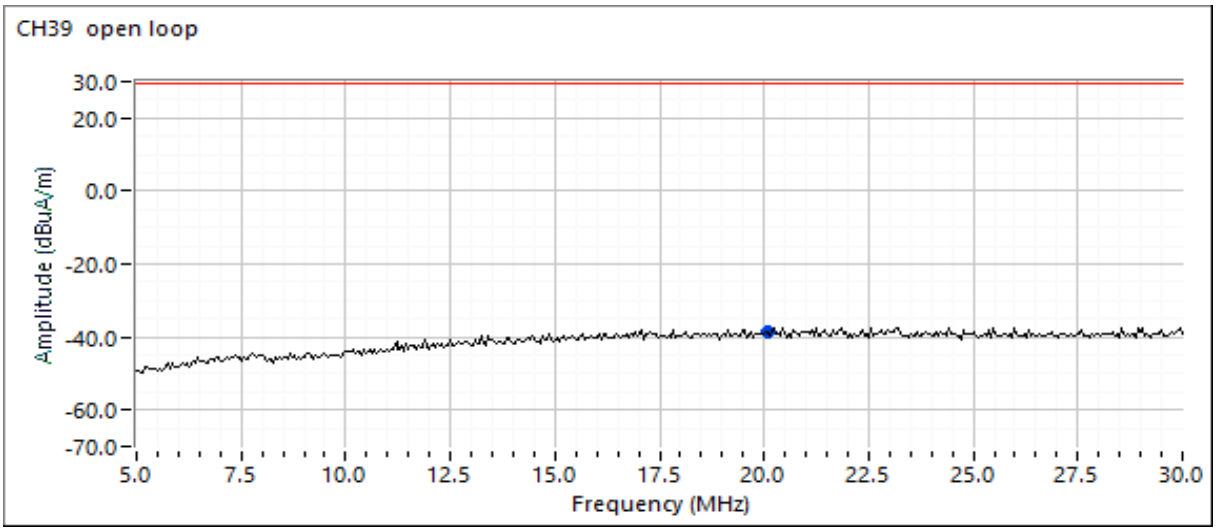
Maximized readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
20.081	**-45.5**	V	29.5	**-75.0**	QP	22	1.1	QP (1.00s)

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Run #2b: Radiated Emissions, 5- 30 MHz, FCC 15.209

High Channel Open loop



Preliminary readings

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
20.063	-38.8	V	29.5	-68.3	Peak	192	1.1	

Maximized readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
20.063	-45.5	V	29.5	-75.0	QP	192	1.1	QP (1.00s)

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	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: 1/16/2023
Test Engineer: Said A.
Test Location: Fremont Chamber #7

Config. Used: 1
Config Change: none
Host Unit Voltage 120V/ 60Hz

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: 19.2 °C
Rel. Humidity: 50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a	Radiated Emissions 30 - 1000 MHz, Preliminary	FCC §15.209	Eval	Refer to individual runs
1b	Radiated Emissions 30 - 1000 MHz, Preliminary	FCC §15.209	Eval	Refer to individual runs
2	Radiated Emissions 30 - 1000 MHz, Maximized	FCC §15.209	Pass	27.5 dBµV/m @ 105.68 MHz (-16.0 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:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

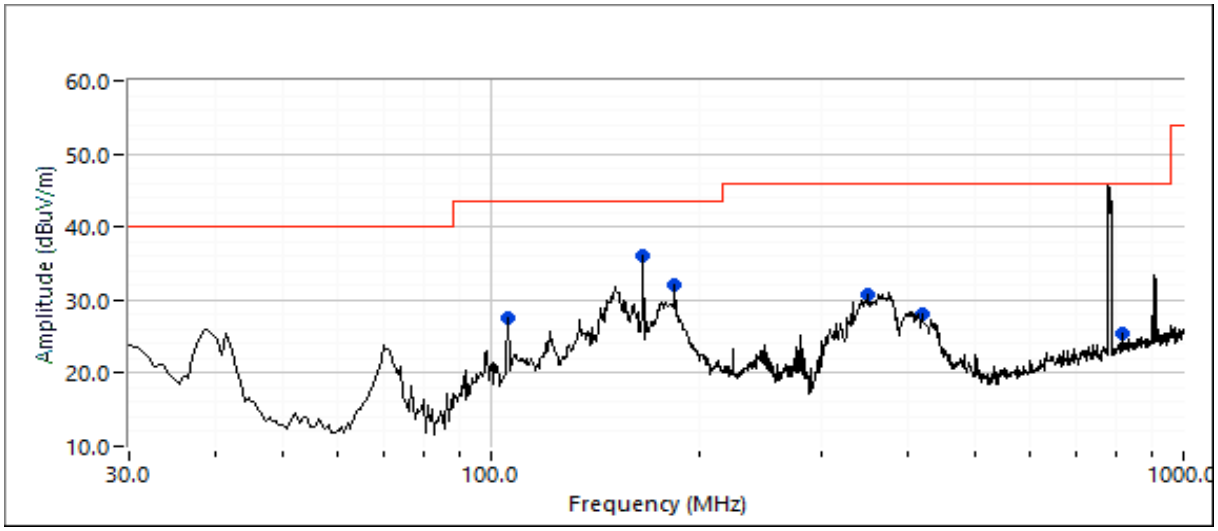
Procedure Comments:

Measurements performed in accordance with ANSI C63.10

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

low Channel



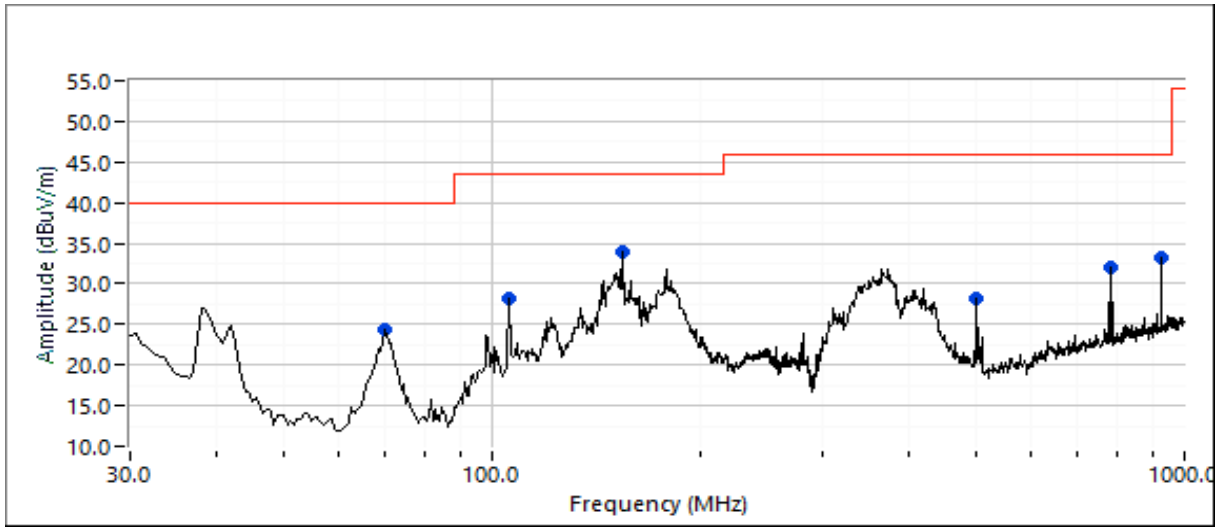
Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC §15.209		Detector	Azimuth	Height	Comments
105.682	27.5	H	43.5	-16.0	Peak	263	1.5	
165.949	36.1	H	43.5	-7.4	Peak	354	3.5	
184.237	32.2	V	43.5	-11.3	Peak	354	3.0	
349.673	30.7	H	46.0	-15.3	Peak	234	1.0	
419.600	28.1	H	46.0	-17.9	Peak	216	1.0	
814.008	25.3	H	46.0	-20.7	Peak	277	2.0	
914.162	34.8	V	46.0	-11.2	Peak	233	3.0	Ambient Signal
777.198	41.1	V	46.0	-4.9	Peak	293	1.5	Ambient Signal

Note 1:	None of the observed emissions are from the radio. Therefore testing at the middle channel is not necessary.

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

High Channel



Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC §15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
927.534	33.1	V	46.0	-12.9	Peak	12	4.0	
69.926	24.4	V	40.0	-15.6	Peak	227	1.0	
500.312	28.3	H	46.0	-17.7	Peak	289	1.5	
105.677	28.1	H	43.5	-15.4	Peak	290	3.0	
153.385	33.9	V	43.5	-9.6	Peak	300	1.0	
784.257	32.0	H	46.0	-14.0	Peak	329	3.5	

Note 1:	None of the observed emissions are from the radio. Therefore testing at the middle channel is not necessary.

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-

Run #2: Maximized Readings From Run #1 High Channel

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC §15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
105.677	27.5	H	43.5	-16.0	QP	284	3.0	QP (1.00s)
69.926	21.7	V	40.0	-18.3	QP	218	1.0	QP (1.00s)
500.312	22.6	H	46.0	-23.4	QP	292	4.0	QP (1.00s)
927.534	20.1	V	46.0	-25.9	QP	329	3.5	QP (1.00s)
784.257	19.0	H	46.0	-27.0	QP	298	1.0	QP (1.00s)
153.385	16.3	V	43.5	-27.2	QP	291	4.0	QP (1.00s)

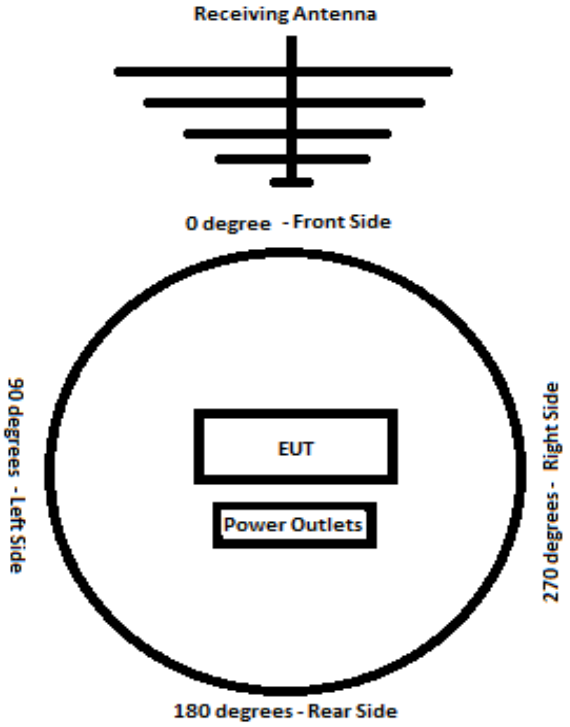
Run #2: Maximized Readings From Run #1 Low Channel

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC §15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
105.682	22.5	H	43.5	-21.0	QP	274	1.8	QP (1.00s)
165.949	16.1	H	43.5	-27.4	QP	328	1.8	QP (1.00s)
184.237	10.1	V	43.5	-33.4	QP	360	1.4	QP (1.00s)
349.673	28.9	H	46.0	-17.1	QP	232	1.0	QP (1.00s)
419.600	27.2	H	46.0	-18.8	QP	213	1.0	QP (1.00s)
814.008	20.5	H	46.0	-25.5	QP	280	2.0	QP (1.00s)

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	-



Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A

Radiated 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

The EUT was located on the turntable for radiated emissions testing. The EUT was tested in all three orthogonal orientations.

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 °C

Rel. Humidity: 51 %

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1	Fundamental Signal Field Strength	FCC 15.249 RSS 210 Annex B.10	Pass	89.2 dBµV/m @ 2480.2 MHz (-4.8 dB)
1	Transmitter Radiated Spurious Emissions, 1,000 - 25,000 MHz	FCC 15.209 & 15.249 RSS 210/RSS GEN	Pass	43.7 dBµV/m @ 4960.3 MHz (-10.3 dB)
3	99% Bandwidth	RSS-GEN	N/A	1.068 MHz

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.

Procedure Comments:

Measurements performed in accordance with ANSI C63.10

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A

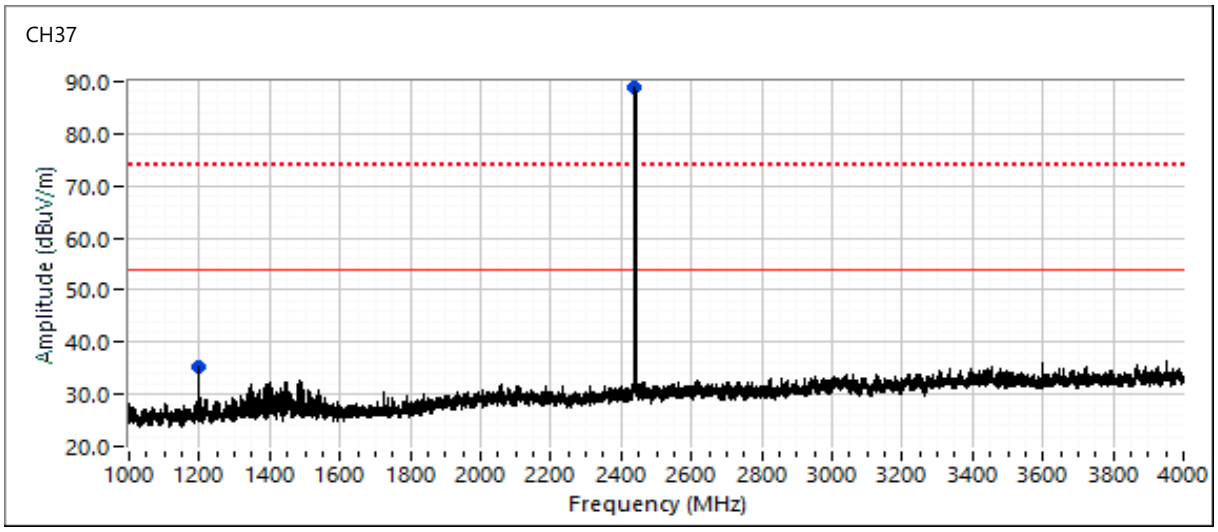
Run #1: Radiated Emissions, 1,000 - 25,000 MHz, Transmitter Fundamental and Spurious Emissions

Date of Test: 1/16/2023 Config. Used: 1
Test Engineer: Said A. Config Change: None
Test Location: Fremont Chamber #7 Host Unit Voltage: 120V/60Hz

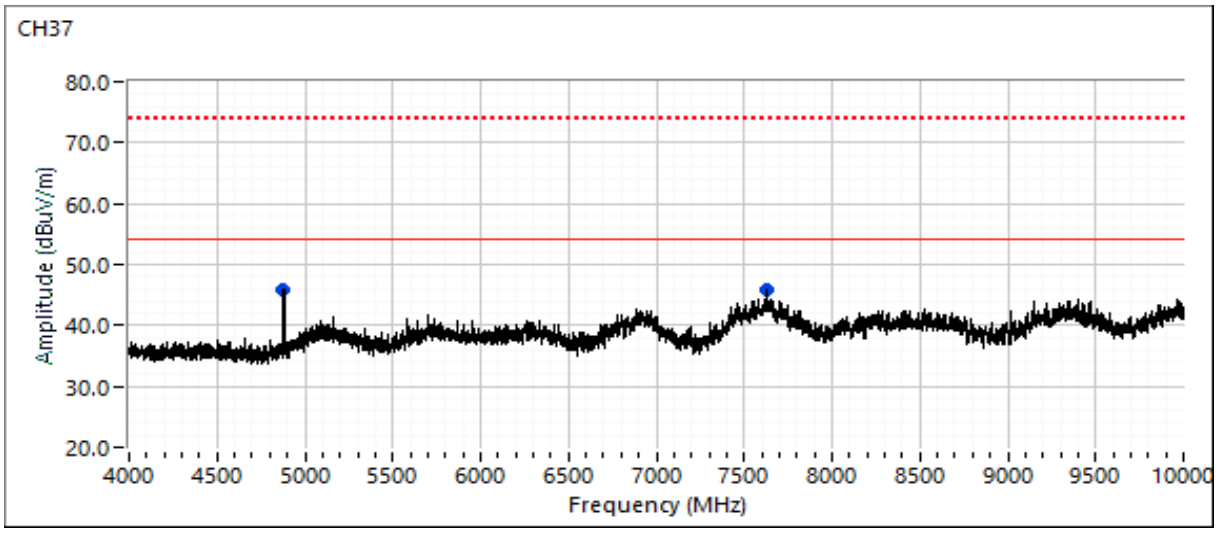
Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1,000 - 25,000 MHz	3	3	0.0

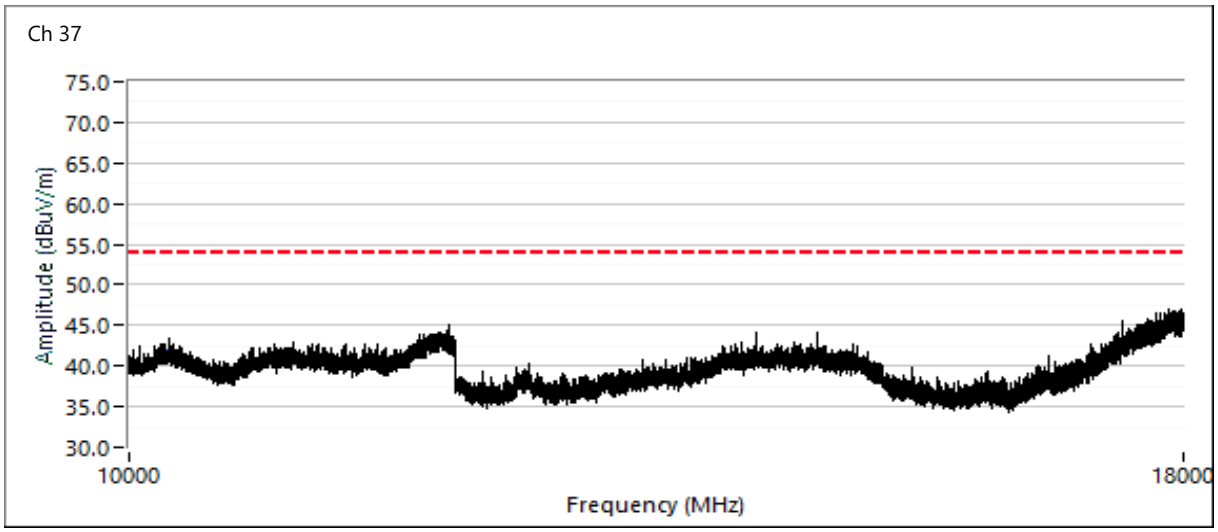
Note to engineer: Values below are for your help, please delete the rows that are not applicable.
Highlighted cells contain calculated values

Note:	The limit in 15.249 for a fundamental signal in the 2400 -2483.5 MHz is 50mV/m (94.0 dBuV/m), harmonics are limited to 500uV/m (54dBuV/m) and all other spurious are required to meet 15.209 limits.
Note:	The field strength of any spurious emissions may not exceed the field strength of the fundamental signal.
Note:	The field strength of any spurious emissions may not exceed the 15.209 limit when the spurious emission falls in a restricted band. Additionally the spurious emissions can exceed the limit calculated above if the 15.209 limit is higher.

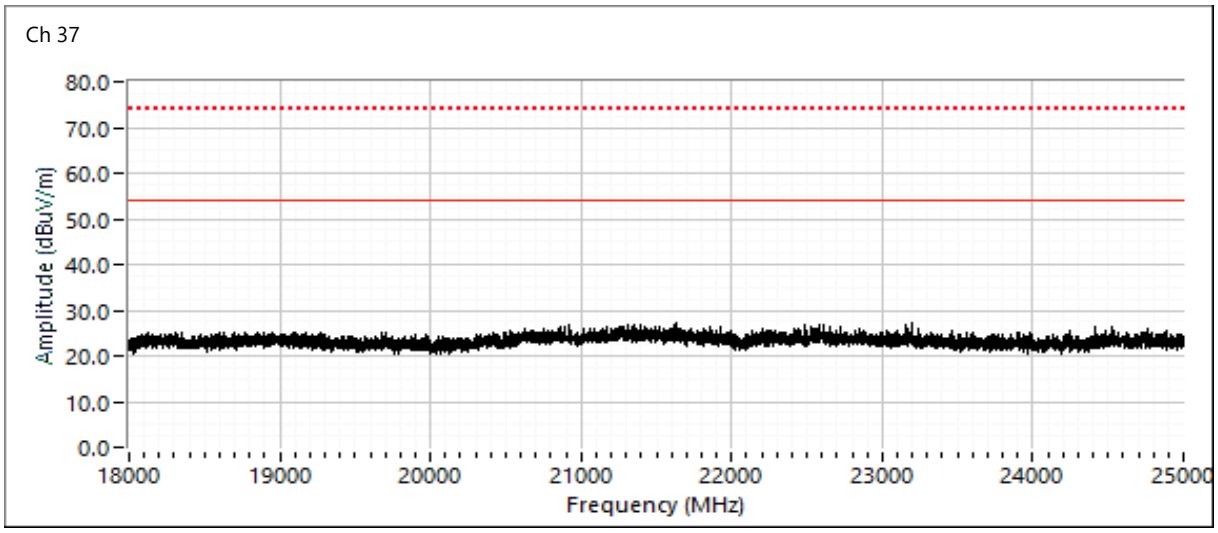


Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A





Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A

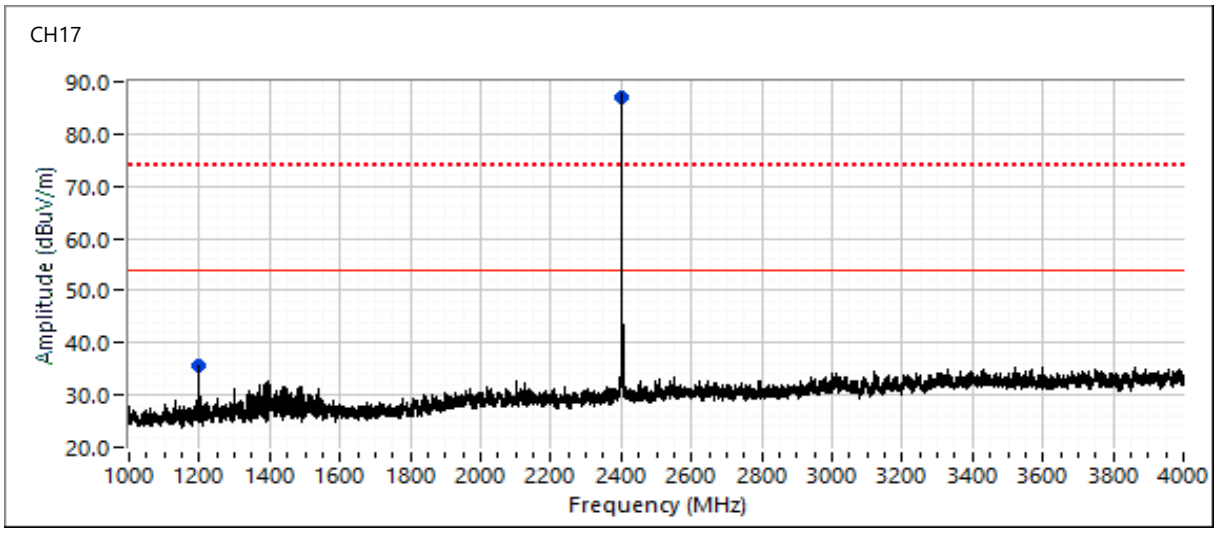


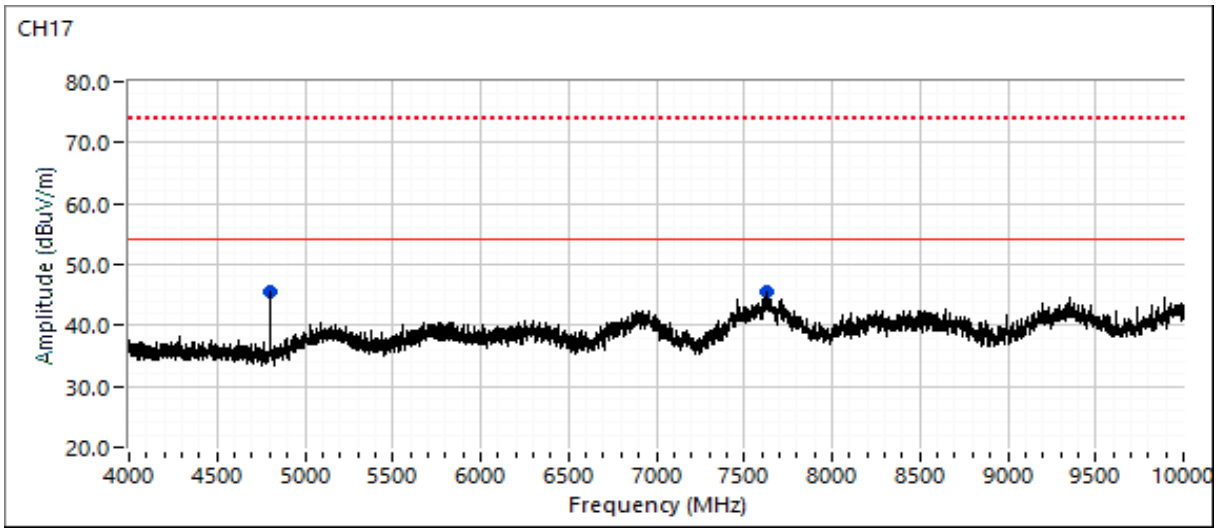
Low Channel

Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.160	86.7	V	94.0	-7.3	AVG	217	1.0	AVG -RB 1 MHz; VB: 10 Hz
2402.370	87.8	V	114.0	-26.2	PK	217	1.0	PK -RB 1 MHz; VB: 3 MHz
1199.990	29.9	H	54.0	-24.1	AVG	115	2.0	AVG -RB 1 MHz; VB: 10 Hz
1200.110	34.0	H	74.0	-40.0	PK	115	2.0	PK -RB 1 MHz; VB: 3 MHz
4804.290	40.6	H	54.0	-13.4	AVG	284	1.3	AVG -RB 1 MHz; VB: 10 Hz
4804.690	47.6	H	74.0	-26.4	PK	284	1.3	PK -RB 1 MHz; VB: 3 MHz
7622.360	36.3	V	54.0	-17.7	AVG	315	2.2	AVG -RB 1 MHz; VB: 10 Hz
7619.920	48.8	V	74.0	-25.2	PK	315	2.2	PK -RB 1 MHz; VB: 3 MHz

Note 1:	No emissions observed above the noise floor from 10-25 GHz.

Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A





Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A

Center Channel

Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2440.000	88.5	H	94.0	-5.5	Avg	134	2.1	PK-RB 1 MHz; VB 10 Hz
2440.000	89.3	H	114.0	-24.7	PK	134	2.1	PK-RB 1 MHz; VB 3 MHz
2440.160	87.8	V	94.0	-6.2	AVG	98	1.3	AVG -RB 1 MHz; VB: 10 Hz
2439.860	89.0	V	114.0	-25.0	PK	98	1.3	PK -RB 1 MHz; VB: 3 MHz
1200.020	26.7	H	54.0	-27.3	AVG	134	2.5	AVG -RB 1 MHz; VB: 10 Hz
1200.030	34.2	H	74.0	-39.8	PK	134	2.5	PK -RB 1 MHz; VB: 3 MHz
4880.310	43.5	V	54.0	-10.5	AVG	188	1.9	AVG -RB 1 MHz; VB: 10 Hz
4879.940	49.9	V	74.0	-24.1	PK	188	1.9	PK -RB 1 MHz; VB: 3 MHz
7622.600	36.3	V	54.0	-17.7	AVG	290	1.6	AVG -RB 1 MHz; VB: 10 Hz; Note 1
7620.410	47.9	V	74.0	-26.1	PK	290	1.6	PK -RB 1 MHz; VB: 3 MHz; Note 1

Note 1:	Noise Floor

High Channel

Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.150	89.2	H	94.0	-4.8	AVG	296	1.3	AVG -RB 1 MHz; VB: 10 Hz
2479.880	90.5	H	114.0	-23.5	PK	296	1.3	PK -RB 1 MHz; VB: 3 MHz
1200.020	34.1	H	54.0	-19.9	AVG	107	1.9	AVG -RB 1 MHz; VB: 10 Hz
1200.170	37.7	H	74.0	-36.3	PK	107	1.9	PK -RB 1 MHz; VB: 3 MHz
2138.670	22.5	V	54.0	-31.5	AVG	105	2.2	AVG -RB 1 MHz; VB: 10 Hz
2138.250	33.5	V	74.0	-40.5	PK	105	2.2	PK -RB 1 MHz; VB: 3 MHz
4960.250	43.7	V	54.0	-10.3	AVG	179	1.6	AVG -RB 1 MHz; VB: 10 Hz
4959.980	50.4	V	74.0	-23.6	PK	179	1.6	PK -RB 1 MHz; VB: 3 MHz
8295.160	33.1	V	54.0	-20.9	AVG	318	1.0	AVG -RB 1 MHz; VB: 10 Hz; Note 1
8296.090	45.1	V	74.0	-28.9	PK	318	1.0	PK -RB 1 MHz; VB: 3 MHz; Note 1

Note 1:	Noise Floor

Client:	wtec, Inc.	PR Number:	PR168321
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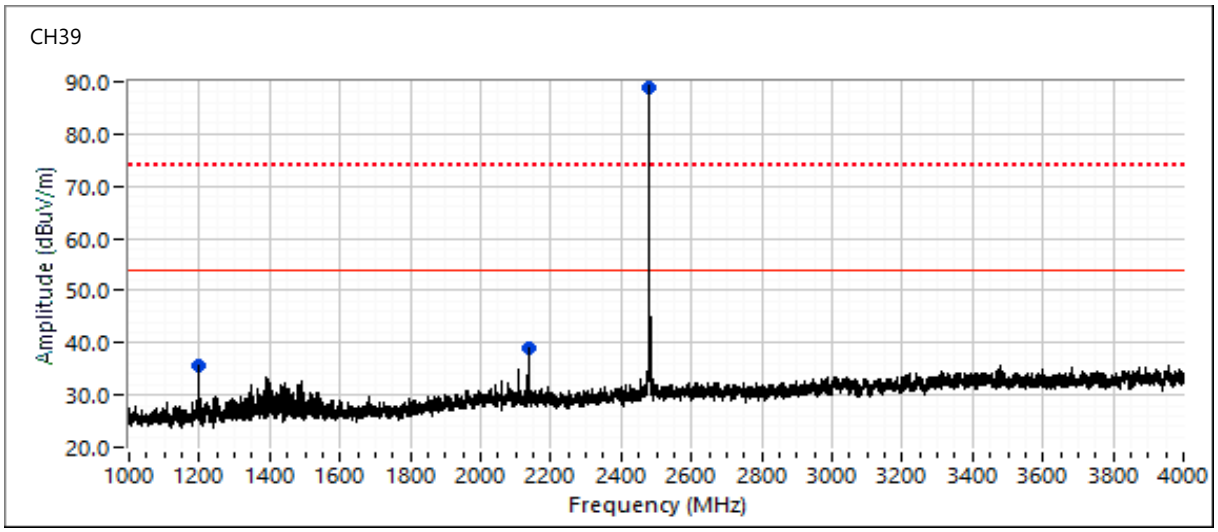
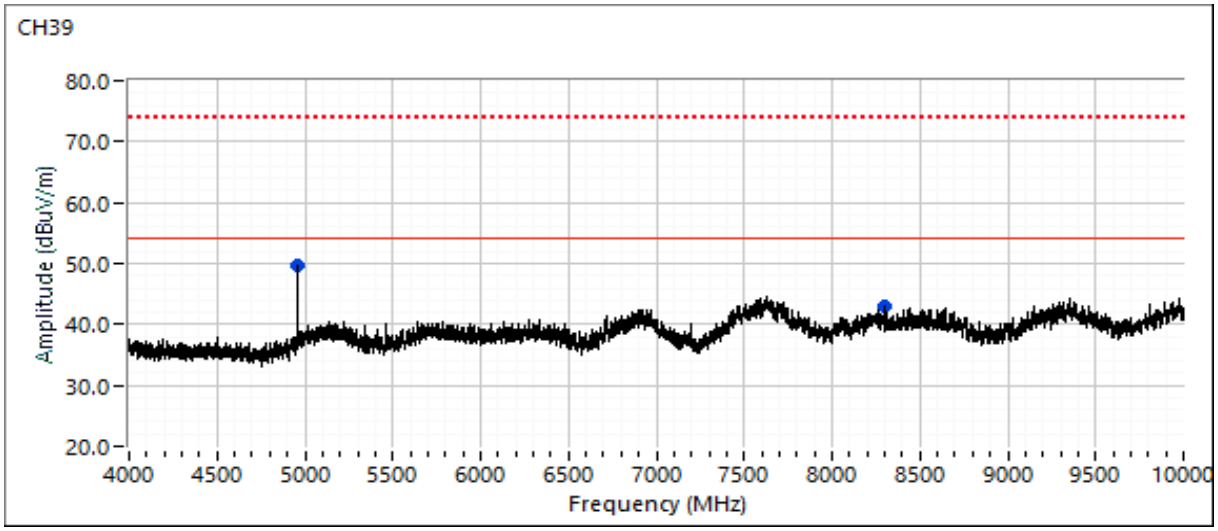
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A





Client:	wtec, Inc.	PR Number:	PR168321
Model:	SSEN-2	T-Log Number:	TL168321-RANA SSEN-2
		Project Manager:	Christine Krebill
Contact:	Stewart Findlater	Project Engineer:	David Bare
Standard:	FCC §15.249/RSS-210	Class:	N/A

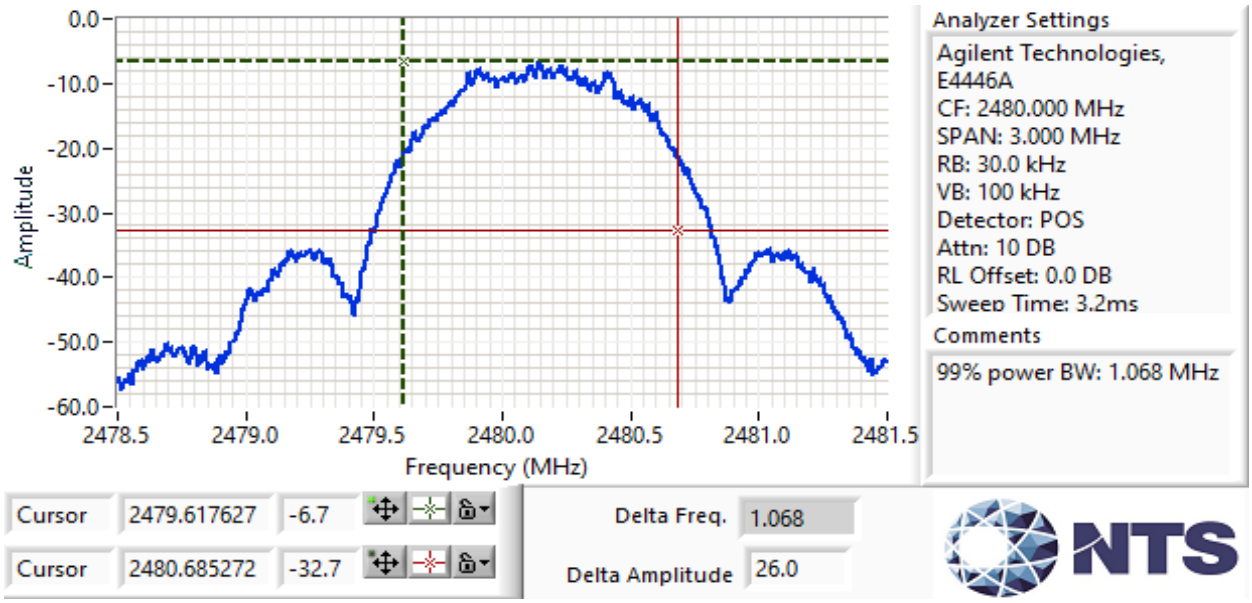
Run #3: Bandwidth Measurement(s)

Date of Test: 16-Jan
Test Engineer: Mehran Birgani
Test Location: Fremont Chamber #7

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

Power Setting	Frequency (MHz)	Resolution Bandwidth	Video Bandwidth	Bandwidth (kHz) 99%	
Max	2402		1.056		0.03
Max	2440		1.060		0.03
Max	2480		1.068		0.03

Note 1:	99% bandwidth measured in accordance with ANSI C63.10, with RB between 1% and 5% of the measured bandwidth and VB ≥ 3*RB and Span ≥ 1.5% and ≤ 5% of measured bandwidth.



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