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Radio Test Report

FCC Part 22 and RSS-132
(826.5 MHz to 846.5 MHz)

Model: V4 Base 3

IC CERTIFICATION #:	5266A-V4B3
FCC ID:	SEJ-V4B3
COMPANY:	Zonar Systems 18200 Cascade Ave South Suite 200 Seattle, WA 98188
TEST SITE(S):	Element Materials Technology Fremont Newark AKA: NTS Labs LLC 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B
PROJECT NUMBER:	PUS58004583
REPORT DATE:	September 18, 2026
FINAL TEST DATES:	August 17 thru September 16, 2026
TOTAL NUMBER OF PAGES:	33

FR-58004583.02-NARF Rev 0

Testing Cert #0214.26

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REVISION HISTORY

Rev#	Date	Comments	Modified By
1	September 18, 2026	First release	

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SCOPE

Tests have been performed on the Zonar Systems model V4 Base 3, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Innovation Science and Economic Development Canada.

- CFR 47 Part 22 Subpart H (Cellular Radiotelephone Service)
- RSS-132 Issue 4 January 2023 (Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz)

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Element Materials Technology Fremont Newark test procedures:

ANSI C63.26:2015
ANSI TIA-603-D June 2010
FCC KDB 971168 Licensed Digital Transmitters

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

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

Element Materials Technology Fremont Newark is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

The test results recorded herein are based on a single type test of the Zonar Systems model V4 Base 3 and therefore apply only to the tested sample. The sample was selected and prepared by David Pascoe of Zonar Systems.

OBJECTIVE

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

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Zonar Systems model V4 Base 3 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS

FCC Part 22 and RSS-132 (User Equipment)

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 22.905	RSS-132	824.2 – 848.8 MHz	826.5 MHz to 846.5 MHz	824.2 – 848.8 MHz	Pass
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 22.913(a)	RSS-132 4.4	EIRP	27.0 dBm to 27.5 dBm	7 Watts erp	Pass
§2.1033 (c) (4) §2.1047 § 22.917(b)	RSS-132 4.5.1.1	Emission limitations	Same as original	-13 dBm	Pass
	RSS-GEN 6.7	Occupied Bandwidth	Same as original	-	Pass
§2.1049		Occupied Bandwidth	Same as original	-	Pass
Transmitter spurious emissions					
§2.1053 §2.1057 §22.917	RSS-132 4.5	Field strength Band 5 + Wi-Fi	-14.9 dBm @ 2545.3 MHz (-1.9 dB)	-13 dBm	Pass
Receiver spurious emissions					
15.109	RSS-GEN Table 3	Field strength	37.0 dBµV/m @ 47.99 MHz (-3.0 dB)	See limit table on page 17	Pass
Other details					
§2.1055 §22.355	RSS-132 4.3	Frequency stability	Same as original	2.5 ppm	Pass
§2.1093	RSS-102	RF Exposure	Refer to RF exposure report		Pass
§2.1033 (c) (8)		Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	Same as original	-	N/A
-	-	Antenna Gain	Same as original	-	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 (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Zonar Systems model V4 Base 3 is a vehicle mounted telematics device that is designed to track vehicles. Since the EUT would be placed in heavy vehicles during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 8-32VDC, 0.5 Amps maximum.

The sample was received on August 17, 2026 and tested on August 17 thru September 16, 2026. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Zonar Systems	V4 Base 3	Aftermarket Telematics Device	0001, 0002, 0003, 0004	SEJ-V4B3

OTHER EUT DETAILS

The following EUT details should be noted: The EUT incorporates three radio modules (Wi-Fi, Bluetooth and Cellular/GNSS)

ENCLOSURE

The EUT enclosure is primarily constructed of polycarbonate. It measures approximately 9.8 cm wide, 15.2 cm deep and 3.2 cm high. Weight is approximately .23 KG

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Element Materials Technology Fremont Newark.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
EverStart	WDC31M	Battery	HSW0000005462	-

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

Company	Model	Description	Serial Number	FCC ID
hp	Z2 Tower G4 Workstation	Computer	MXL03735X1	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
GNSS	Termination	Coax	Shielded	4.0
Power	Battery	4 wire	Unshielded	3.0
Cellular communication	Unterminated	Multiwire	Shielded	3.0
Wi-Fi/BLE communication	Unterminated	Multiwire	Shielded	3.0
Input	Unterminated	Multiwire	Unshielded	0.5
CAN Bus	Unterminated	Multiwire	Unshielded	3.0
Programming	Remote computer	USB	Shielded	7.6

EUT OPERATION

During testing, the EUT was configured to continuously transmit a modulated signal at the specified power and channels for Wi-Fi and Cellular or BLE and Cellular at the specified bands/channels. All measurements were performed using radiated test methods as the device has an integral antenna.

TESTING

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, Element Materials Technology Fremont Newark 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 Element Materials Technology Fremont Newark.

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

ANSI C63.4 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.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

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

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 30 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is sued when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula or using the values specified in ANSI C63.10:

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

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\,P\,G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Bandedge, Power, PSD, Bandwidth, 17-Aug-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
NTS	NTS UNII Power Software (rev 4.0)		US58-A022700	N/A	
NTS	NTS Capture Analyzer Software (rev 4.0)		US58-A022706	N/A	
ETS-Lindgren	EMC Chamber #5, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 5 (FACT-5)	US58-A055567	5/24/2024	5/24/2027
EMCO	Antenna, Horn, 1-18 GHz	3115	US58-A064725	2/20/2024	12/8/2026
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB 7	US58-A064989	1/13/2026	1/12/2027
Radiated Emissions, 1 - 12.75 GHz, 19-Aug-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
ETS-Lindgren	EMC Chamber #5, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 5 (FACT-5)	US58-A055567	5/24/2024	5/24/2027
Hewlett Packard	Spectrum Analyzer (Blue)	8564E	US58-A055592	1/9/2026	1/9/2027
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	US58-A064416	10/10/2025	10/10/2026
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	US58-A064481	12/26/2025	12/26/2026
EMCO	Antenna, Horn, 1-18 GHz	3115	US58-A064725	2/20/2024	12/8/2026
Radiated Emissions, 1 - 25 GHz, 26-Aug-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
ETS-Lindgren	EMC Chamber #5, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 5 (FACT-5)	US58-A055567	5/24/2024	5/24/2027
Hewlett Packard	Spectrum Analyzer (Blue)	8564E	US58-A055592	1/9/2026	1/9/2027
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Blue)	84125C	US58-A055663	12/22/2025	12/22/2026
Narda	High Pass Filter 4.0 GHz	HXF-370	US58-A064405	12/26/2025	12/26/2026
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	US58-A064416	10/10/2025	10/10/2026
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	US58-A064553	12/30/2024	12/29/2026
EMCO	Antenna, Horn, 1-18 GHz	3115	US58-A064725	2/20/2024	12/8/2026
MITEQ	Microwave Preamplifier, 18-40 GHz	TTA1840-45-5P-HG-S	US58-A068003	12/22/2025	12/22/2026
EMCO	Standard Gain Horn	3160-08	US58-A072273	N/A	

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 30 - 1,000 MHz, 31-Aug-26					
ETS-Lindgren	EMC Chamber #5, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 5 (FACT-5)	US58-A055567	5/24/2024	5/24/2027
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	US58-A064481	12/26/2025	12/26/2026
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	US58-A064536	5/16/2025	1/27/2028
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB 7	US58-A064989	1/13/2026	1/12/2027
Com-Power	Preamplifier, 1-1000MHz	PAM-103	US58-A080961	1/6/2026	1/6/2027
Radiated Emissions, 30 - 1,000 MHz, 02-Sep-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
ETS-Lindgren	EMC Chamber #7, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 7 (FACT-5)	US58-A055569		2/2/2027
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	US58-A064573	8/13/2024	3/19/2027
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	US58-A064593	12/26/2026	12/26/2026
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	US58-A064733	10/7/2025	10/6/2026
Rohde & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	US58-A071498	7/29/2026	7/29/2027
Radiated Emissions, 30 kHz - 30 MHz, 02-Sep-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
ETS-Lindgren	EMC Chamber #7, Inner Dimensions (LxWxH): 24' x 38' x 20'	CH 7 (FACT-5)	US58-A055569		2/2/2027
Rohde & Schwarz	Loop Antenna	HFH2-Z2	US58-A062457	2/9/2026	2/9/2028
Rohde & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	US58-A071498	7/29/2026	7/29/2027
Radiated Emissions, 1 - 25 GHz, 16-Sep-26					
NTS	NTS EMI Software (rev 2.10)		US58-A022452	N/A	
Hewlett Packard	Spectrum Analyzer (Blue)	8564E	US58-A055592	1/9/2026	1/9/2027
Micro-Tronics	Filter (High Pass)	HPM50111-01	US58-A062506	6/22/2026	6/22/2027
EMCO	Horn Antenna, 1-18 GHz (SA40-Purple)	3115	US58-A062583	10/2/2024	10/1/2026
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	US58-A064416	10/10/2025	10/10/2026
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	US58-A064553	12/30/2024	12/29/2026
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Blue)	84125C	US58-A055663	12/22/2025	12/22/2026

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
SM Electronics	Attenuator	SA18B-10	US58-A072173	N/A	
EMCO	Standard Gain Horn	3160-08	US58-A072273	N/A	
Fairview Microwave	Attenuator, 10 dB, 18 GHz, 2Watt	SA18N-10	US58-A072307	N/A	
Signal Substitutions, 16-Sep-26					
NTS	NTS EMI Software (rev 2.10)	-	US58-A022452	N/A	
Hewlett Packard	Spectrum Analyzer (Blue)	8564E	US58-A055592	1/9/2026	1/9/2027
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Blue)	84125C	US58-A055663	12/22/2025	12/22/2026
Agilent Technologies	Signal Generator (Vector) (PSG)	E8267D	US58-A055673	6/25/2026	6/25/2027
Micro-Tronics	Filter (High Pass)	HPM50111-01	US58-A062506	6/22/2026	6/22/2027
EMCO	Horn Antenna, 1-18 GHz (SA40-Purple)	3115	US58-A062583	10/2/2024	10/1/2026
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	US58-A064416	10/10/2025	10/10/2026
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blue)	3115	US58-A064442	4/16/2026	4/16/2028
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	US58-A064456	6/26/2026	6/26/2027
Compliance Design	Tuned Dipole Antenna	Roberts (400-1000)	US58-A064523	10/27/2024	10/27/2026
Rohde & Schwarz	Power Sensor, 200 pW-10W, 10 MHz-18 GHz, 50ohms	NRV-Z1	US58-A064543	1/6/2026	1/6/2027
Agilent Technologies	Signal Generator 100kHz - 6GHz (MXG)	N5181A	US58-A064545	7/22/2026	7/22/2027
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	US58-A064553	12/30/2024	12/29/2026
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	US58-A064573	8/13/2024	3/19/2027
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	US58-A064733	10/7/2025	10/6/2026
Rohde & Schwarz	EMI Test Receiver, 20Hz-26.5GHz	ESI	US58-A071498	7/29/2026	7/29/2027
SM Electronics	Attenuator	SA18B-10	US58-A072173	N/A	
EMCO	Standard Gain Horn	3160-08	US58-A072273	N/A	
Fairview Microwave	Attenuator, 10 dB, 18 GHz, 2Watt	SA18N-10	US58-A072307	N/A	

Appendix B Test Data

TL004583-RA Pages 22 – 32

Client:	Zonar Systems	PR Number:	PUS58004583
Product	V4 Base 3	T-Log Number:	TL6004583-RA
System Configuration:		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Emissions Standard(s):	FCC Part 15.247, ANSI C63.10	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

Zonar Systems

Product

V4 Base 3

Date of Last Test: 9/16/2026

Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

RSS-132 and FCC Part 22

Power and Spurious Emissions

Test Specific Details

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

General Test Configuration

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

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

Ambient Conditions:

Temperature: 20-27 °C

Rel. Humidity: 41-50 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
6	Band 5 + Wi-Fi		Spurious emissions (radiated)	FCC Part 22H	Pass	-14.9 dBm @ 2545.3 MHz (-1.9 dB)

Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

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.

Sample Notes

Sample S/N: 39000007
Operating Software: Wifi Test Tool 1.6.5 dated 3/11/2025

Run #5: Output Power - Band 5

Date of Test: 9/8/2026
Test Engineer: Art Tham
Test Location: Fremont Chamber #5

Config. Used: 1+Simultaneous with 802.11b ch8 power 25
Config Change: None
EUT Voltage: 12 VDC

Power Setting[2]	Frequency (MHz)	EIRP (dBm) [1]	EIRP mW		Result
Max	824.5	27.5	562.3		Pass
Max	836.5	27.3	537.0		Pass
Max	848.5	27.0	501.2		Pass

Note 1:	Output power calculated (EIRP) from measured field strength

EMC Test Data

Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

Run #6: Out of Band Spurious Emissions, Radiated, Band 5, 30-9,000 MHz

Conducted limit (dBm): -13
Approximate field strength limit @ 3m: 82.2

The limit is taken from FCC Part 22H

Run #6a - Preliminary measurements - chamber scans

Date of Test: 9/3-10/2026
Test Engineer: Rafael Varelas, Art Tham
Test Location: FT Chamber #7

Config. Used: 1+Simultaneous with 802.11b ch8 power 25
Config Change: None
EUT Voltage: 12Vdc

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
Low CH				0.0					
875.150	*56.9*	*H*	*82.2*	*-25.3*	*Peak*	*334*	*1.0*	*Downlink only*	
834.469	*88.9*	*H*	*-*	*-*	*Peak*	*174*	*1.0*	*In Band*	
824.649	*123.1*	*H*	*-*	*-*	*Peak*	*178*	*1.0*	*Fundamental*	
816.232	*73.7*	*H*	*82.2*	*-8.5*	*Peak*	*171*	*1.0*		
799.399	*68.9*	*H*	*82.2*	*-13.3*	*Peak*	*174*	*1.0*		
2441.670	*100.4*	*H*	*-*	*-*	*Peak*	*104*	*1.3*	*WI-FI*	
1645.830	*64.3*	*H*	*82.2*	*-17.9*	*Peak*	*153*	*1.0*		
3083.330	*62.0*	*H*	*82.2*	*-20.2*	*Peak*	*319*	*1.0*	*Noise Floor*	
4894.170	*46.6*	*H*	*82.2*	*-35.6*	*Peak*	*63*	*1.0*		
7342.080	*56.7*	*H*	*82.2*	*-25.5*	*Peak*	*328*	*2.2*		
Mid CH				0.0					
775.551	*66.2*	*H*	*82.2*	*-16.0*	*Peak*	*169*	*1.0*		
837.275	*123.2*	*H*	*-*	*-*	*Peak*	*167*	*1.0*	*Fundamental*	
882.164	*57.0*	*H*	*82.2*	*-25.2*	*Peak*	*58*	*1.0*	*Downlink only*	
897.595	*58.8*	*H*	*82.2*	*-23.4*	*Peak*	*173*	*1.0*		
1670.830	*65.3*	*H*	*82.2*	*-16.9*	*Peak*	*145*	*1.0*		
2441.670	*99.7*	*H*	*-*	*-*	*Peak*	*104*	*1.3*	*Wi-Fi*	
2504.170	*66.0*	*H*	*82.2*	*-16.2*	*Peak*	*156*	*1.3*		
4888.330	*47.1*	*H*	*82.2*	*-35.1*	*Peak*	*61*	*1.0*		
7343.330	*51.4*	*H*	*82.2*	*-30.8*	*Peak*	*1*	*1.3*		

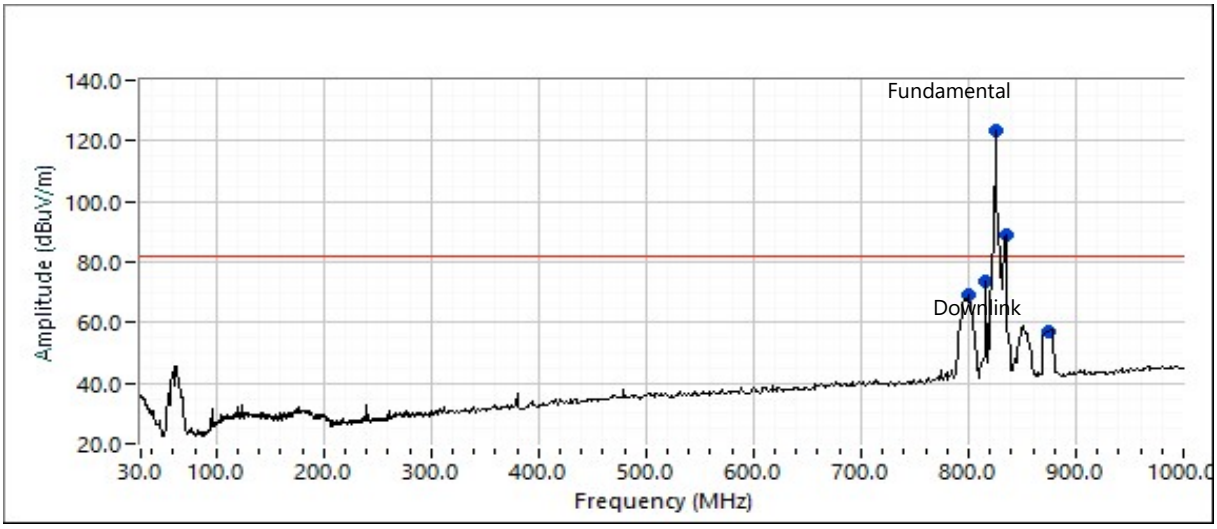
EMC Test Data

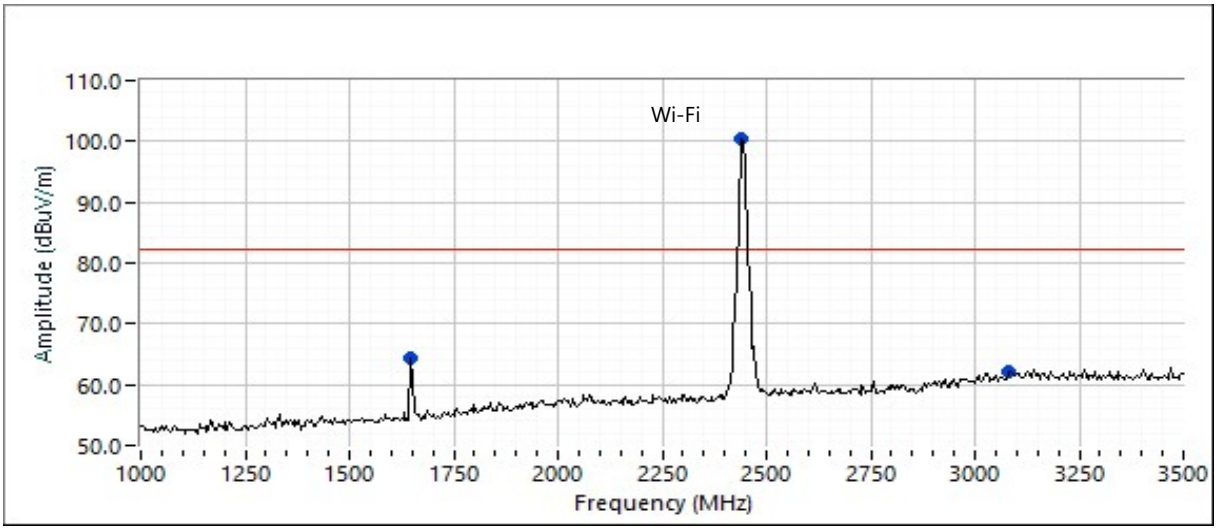
Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

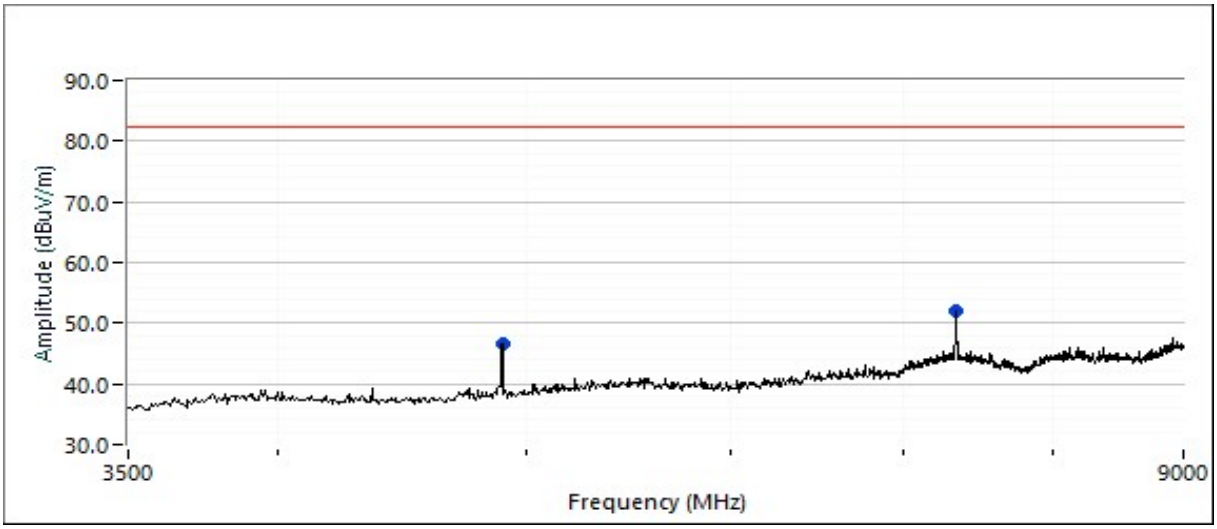
Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
High CH									
753.106	*68.6*	*H*	*82.2*	*-13.6*	*Peak*	*174*	*1.0*		
840.080	*86.5*	*H*	*-*	*-*	*Peak*	*174*	*1.0*	*In Band*	
848.497	*123.5*	*H*	*-*	*-*	*Peak*	*172*	*1.0*	*Fundamental*	
858.317	*74.9*	*H*	*82.2*	*-7.3*	*Peak*	*176*	*1.0*		
893.387	*58.2*	*H*	82.2	*-24.0*	*Peak*	*58*	*1.0*	*Downlink only*	
1696.830	68.2	H	82.2	*-14.0*	Peak	154	1.3		
2446.500	100.7	H	-	-	Peak	103	1.3	Wi-Fi	
2545.290	71.6	H	82.2	*-10.6*	Peak	161	1.3		
4894.210	47.1	H	82.2	*-35.1*	Peak	60	1.0		
7340.830	50.9	H	82.2	*-31.3*	Peak	309	1.0		

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than **20dB** of margin relative to this field strength limit is determined using substitution measurements.

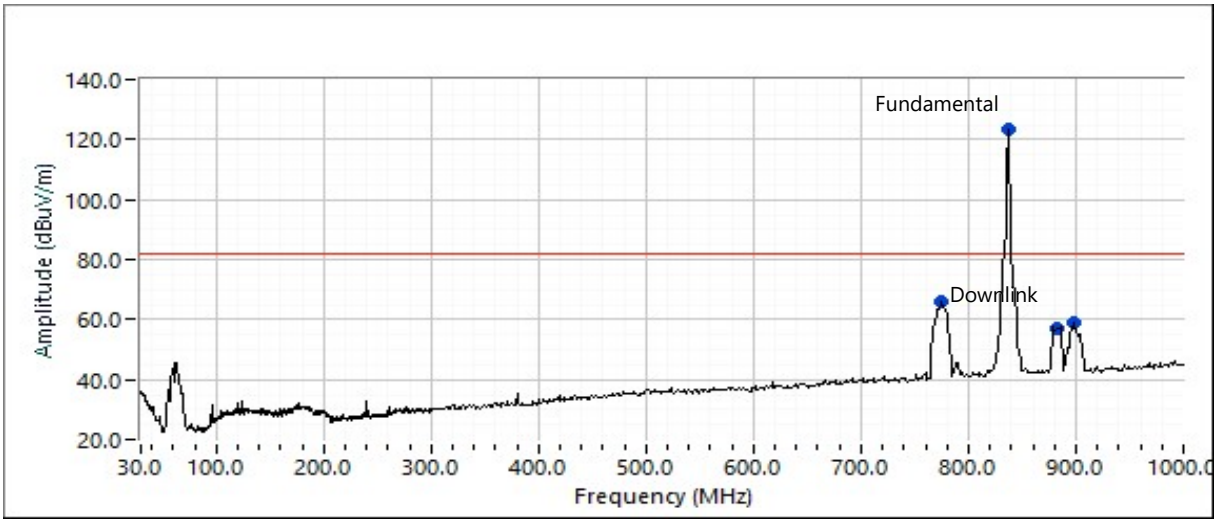
Plots for low channel, power setting(s) = Max Power

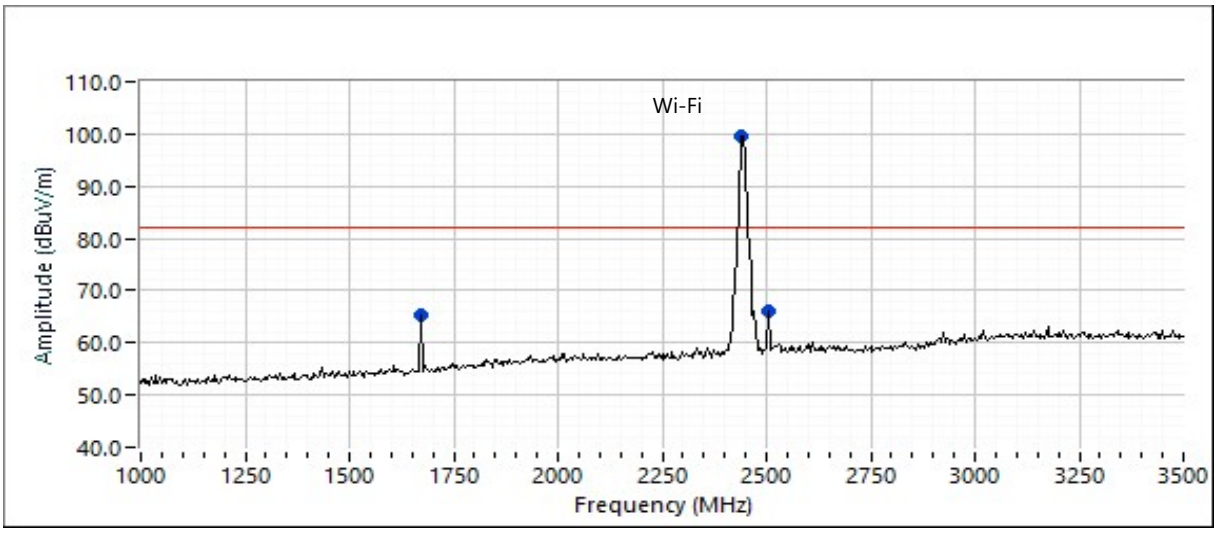


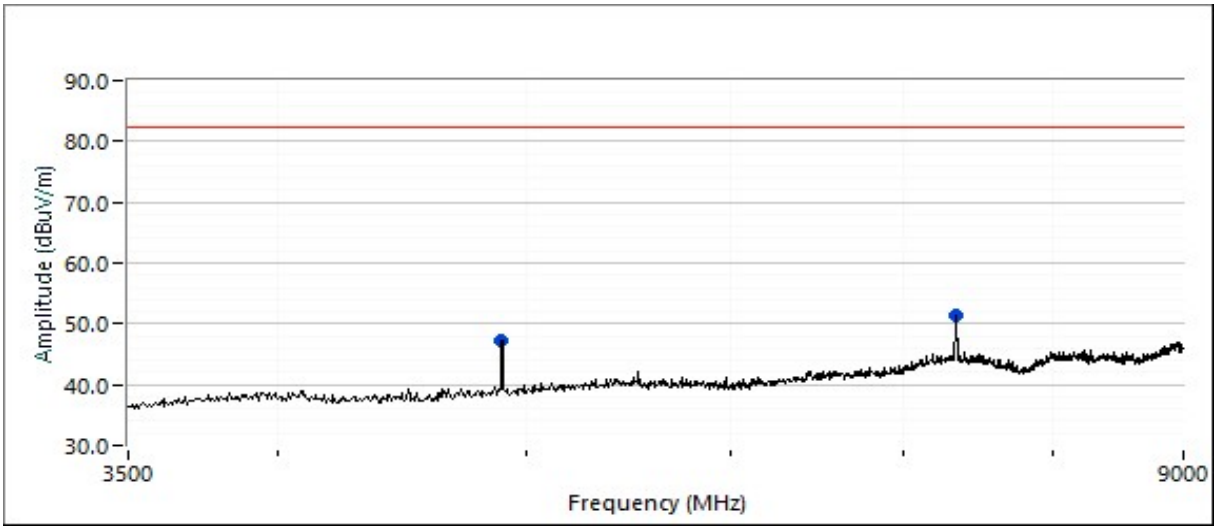

Wi-Fi
Amplitude (dBuV/m)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250
3500
Frequency (MHz)


Amplitude (dBuV/m)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
3500
9000
Frequency (MHz)

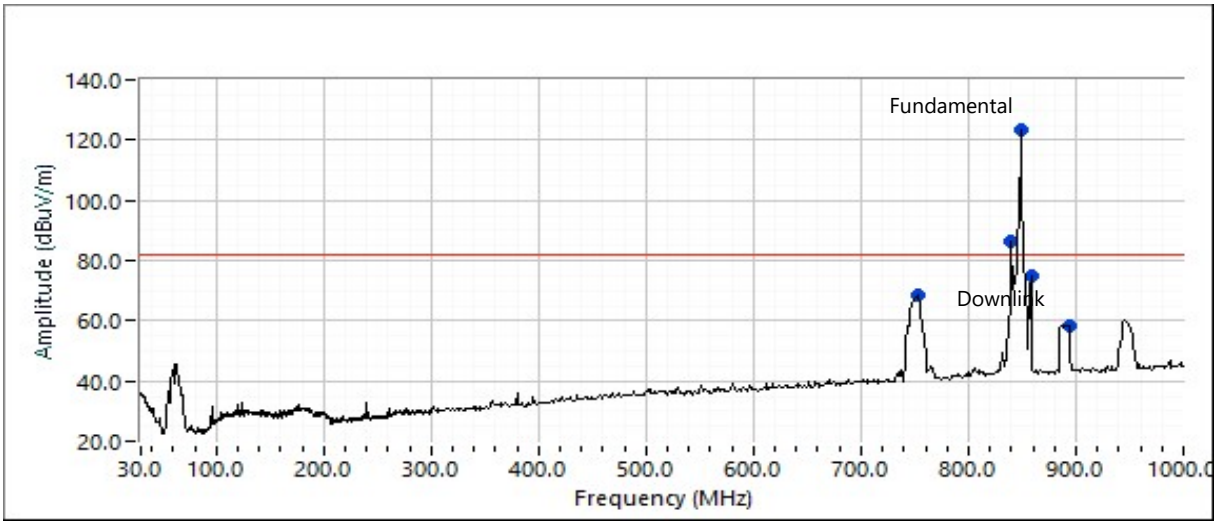
Plots for center channel, power setting(s) = Max Power

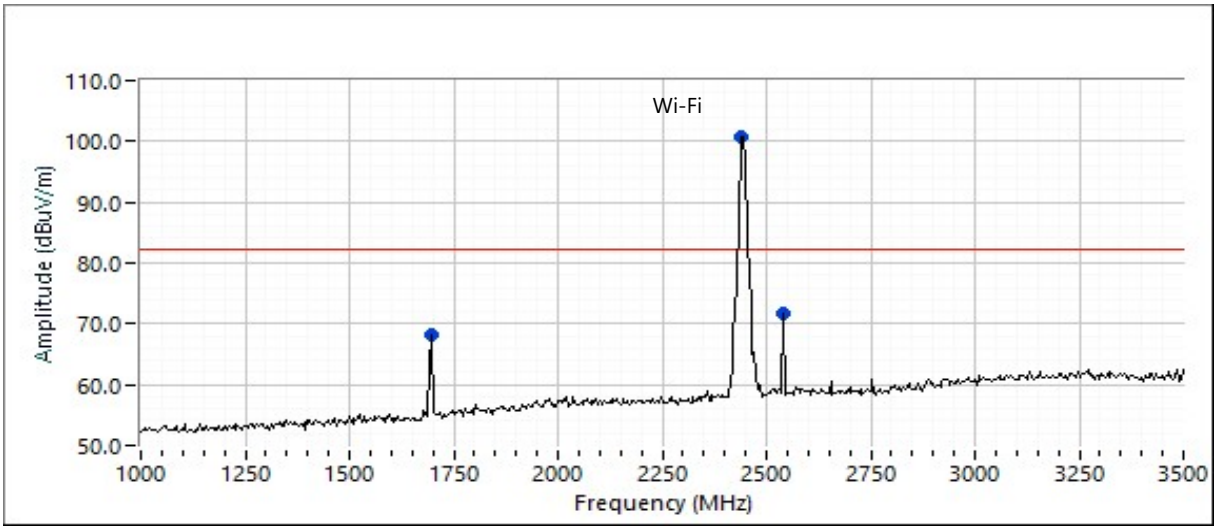


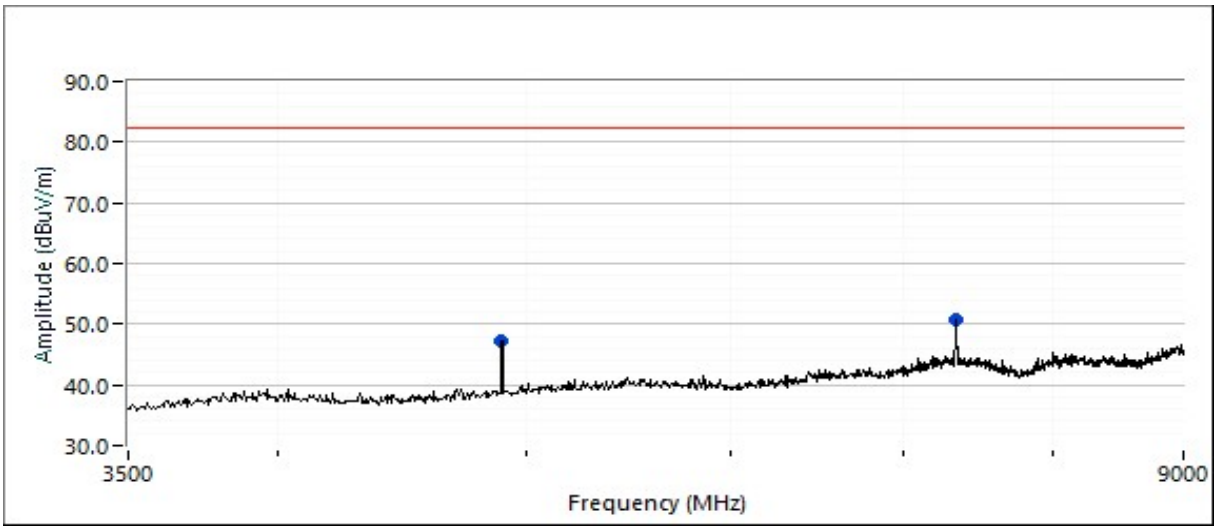




Plots for high channel, power setting(s) = Max Power




Wi-Fi
Amplitude (dBuV/m)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250
3500
Frequency (MHz)


Amplitude (dBuV/m)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
3500
9000
Frequency (MHz)

EMC Test Data

Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

Run #6b: - Final Field Strength Measurements and Substitution Measurements

Date of Test: 9/3-9/16/2026
Test Engineer: Rafael Varelas, Art Tham
Test Location: FT Chamber #7

Config. Used: 1+Simultaneous with 802.11b ch8 power 25
Config Change: None
EUT Voltage: 12Vdc

EUT Field Strength

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
LOW CH									
815.772	76.6	H	82.2	-5.6	PK	170	1.0	POS; RB 100 kHz; VB: 300 kHz	
798.409	68.1	H	82.2	-14.1	PK	169	1.0	POS; RB 100 kHz; VB: 300 kHz	
3088.120	62.0	H	82.2	-20.2	PK	328	1.0	RB 1 MHz;VB 3 MHz;Peak	
4894.090	50.6	H	82.2	-31.6	PK	60	1.0	RB 1 MHz;VB 3 MHz;Peak	
7342.080	56.7	H	82.2	-25.5	PK	328	2.2	RB 1 MHz;VB 3 MHz;Peak	
MID CH									
773.730	67.1	H	82.2	-15.1	PK	170	1.0	POS; RB 100 kHz; VB: 300 kHz	
898.063	59.1	H	82.2	-23.1	PK	173	1.0	POS; RB 100 kHz; VB: 300 kHz	
1672.740	69.5	H	82.2	-12.7	PK	145	1.0	RB 1 MHz;VB 3 MHz;Peak	
2509.280	73.8	H	82.2	-8.4	PK	158	1.4	RB 1 MHz;VB 3 MHz;Peak	
4894.090	50.8	H	82.2	-31.4	PK	59	1.0	RB 1 MHz;VB 3 MHz;Peak	
7340.930	55.3	H	82.2	-26.9	PK	0	1.2	RB 1 MHz;VB 3 MHz;Peak	
HIGH CH									
751.980	66.2	H	82.2	-16.0	PK	174	1.0	POS; RB 100 kHz; VB: 300 kHz	
857.247	74.7	H	82.2	-7.5	PK	172	1.0	POS; RB 100 kHz; VB: 300 kHz	
1696.900	73.8	H	82.2	-8.4	PK	157	1.3	RB 1 MHz;VB 3 MHz;Peak	
2545.270	79.6	H	82.2	-2.6	PK	160	1.3	RB 1 MHz;VB 3 MHz;Peak	
4894.270	50.4	H	82.2	-31.8	PK	58	1.0	RB 1 MHz;VB 3 MHz;Peak	
7340.750	55.9	H	82.2	-26.3	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak	

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than **20dB** of margin relative to this field strength limit is determined using substitution measurements.

EMC Test Data

Client:	Zonar Systems	PR Number:	PUS58004583
Model:	V4 Base 3	T-Log Number:	TL6004583-RA
		Project Manager:	Christine Krebill
Contact:	David Pascoe	Project Engineer:	Art Thammanavarat
Standard:	FCC Part 15.247, ANSI C63.10	Class:	N/A

Substitution measurements
Horizontal

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
751.980	-22.63	1.2	75.6	97.0	66.2	-30.8	-33.0		-13.0	-20.0
773.730	-22.65	1.2	75.1	96.5	67.1	-29.4	-31.6		-13.0	-18.6
798.409	-22.7	1.2	74.8	96.3	68.1	-28.2	-30.4		-13.0	-17.4
815.772	-22.7	1.2	74.6	96.1	76.6	-19.5	-21.7		-13.0	-8.7
857.247	-22.82	1.2	74.7	96.3	74.7	-21.6	-23.8		-13.0	-10.8
1672.740	-24.21	8.6	76.6	92.2	69.5	-22.7	-24.9	-13.0		-9.7
1696.900	-24.21	8.6	76.7	92.3	73.8	-18.5	-20.7	-13.0		-5.5
2509.280	-25.41	9.7	78.5	94.2	73.8	-20.4	-22.6	-13.0		-7.4
2545.270	-25.41	9.7	78.8	94.5	79.6	-14.9	-17.1	-13.0		-1.9

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

End of Report

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