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EMC Test Report

Application for Grant of Equipment Authorization

Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15 Subpart C

ARES / ATHENA Model UGWSX931SM0033U and UGWSX933SM0033U

IC CERTIFICATION #:	5125A-UGWSX931
FCC ID:	R8KUGWSX931
APPLICANT:	Unigen Corporation 45388 Warm Springs Blvd. Fremont, CA 94539
TEST SITE(S):	NTS Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4
REPORT DATE:	October 5, 2012
FINAL TEST DATES:	July 24 and 25, 2012
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A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	10/5/2012	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Unigen Corporation ARES / ATHENA Model UGWSX931SM0033U and UGWSX933SM0033U, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): 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 Silicon Valley test procedures:

ANSI C63.4:2003
FCC DTS Measurement Procedure KDB558074, March 2005

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.

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 samples of Unigen Corporation ARES / ATHENA Model UGWSX931SM0033U and UGWSX933SM0033U complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): 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 Unigen Corporation ARES / ATHENA Model UGWSX931SM0033U and UGWSX933SM0033U and therefore apply only to the tested samples. The samples were selected and prepared by Weerapol Seesanung of Unigen Corporation.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

DIGITAL TRANSMISSION SYSTEMS (902 – 928 MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	300kbps-922kHz 600kbps-1.2MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power, 902 – 928 MHz	300kbps-14.6 dBm 600kbps-14.7 dBm (0.029W) EIRP = 0.059 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	300kbps-7.9 dBm/3kHz 600kbps-7.6 dBm/3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 9.28 GHz	53.7 dBµV/m @ 3613.5 MHz (-0.3 dB)	Refer to the limits section (p17) for restricted bands, all others < -20dBc	Complies
Note 1: EIRP calculated using antenna gain of 3 dBi for the highest EIRP system.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	EUT uses a u.FL connector	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	46.5 dBµV @ 0.202 MHz (-17.0 dB)	Refer to page 16	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	39.1 dBµV/m @ 1595.05 MHz (-14.9dB)	Refer to page 17	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	300kbps-1.3MHz 600kbps-1.5MHz	Information only	N/A

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 (substitution method)	dBm	25 to 26500 MHz	± 2.5 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 Unigen Corporation ARES / ATHENA Model UGWSX931SM0033U and UGWSX933SM0033U are 900MHz transceiver modules that are designed to operate in the 902-928 MHz band. Since the EUTs would be placed on a table top during operation, the EUTs were treated as table-top equipment during testing to simulate the end-user environment. The devices are intended to be powered from a host device.

The sample was received on July 24, 2012 and tested on July 24 and 25, 2012. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Unigen	UGWSX931SM0033U 300kbps	Transceiver units with data rate 300kb/s	0000001	FCC ID: R8KUGWSX931 IC: 5125A-UGWSX931
Unigen	UGWSX933SM0033U 600kbps	Transceiver units with data rate 600kb/s	0000002	FCC ID: R8KUGWSX931 IC: 5125A-UGWSX931

OTHER EUT DETAILS

The following EUT details should be noted:
1) The two versions of the device are electrically identical. The data rate is fixed at manufacturing.

ANTENNA SYSTEM

Model: A1101R09C
Frequency range: 902-928 MHz
Impedance 50 ohm
Gain: 3dBi
VSWR: 1.7
Radiation: Omni directional

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
SEMTECH	SM12XX - USB Bridge	testing board	-	-

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

Company	Model	Description	Serial Number	FCC ID
HP	ProBook 4520s	Laptop	2CE0490T4M	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Laptop USB	testing board	USB	Unshielded	1m

EUT OPERATION

During testing, the EUT was configured to continuously transmit on the channel noted at the maximum power setting. The data rate is fixed to the particular sample.

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 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	2845B-4	

ANSI C63.4:2003 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. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. 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 C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

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

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the 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 Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

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 C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. 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. 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 C63.4:2003, 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.

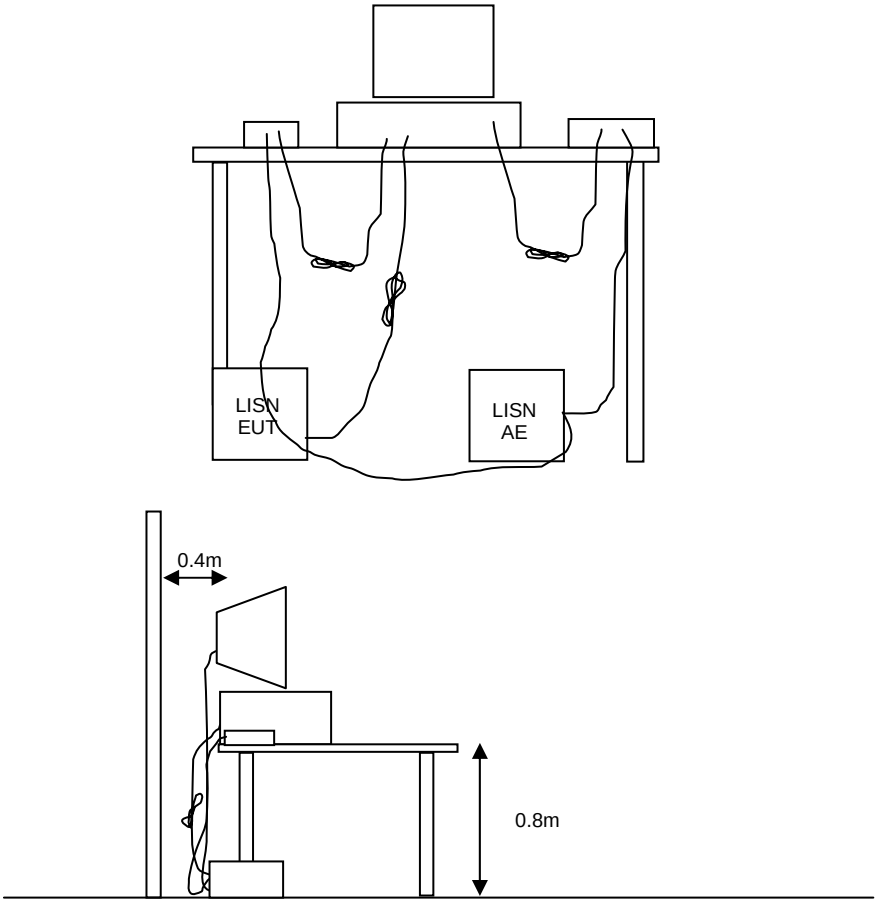


Figure 1 Typical Conducted Emissions Test Configuration

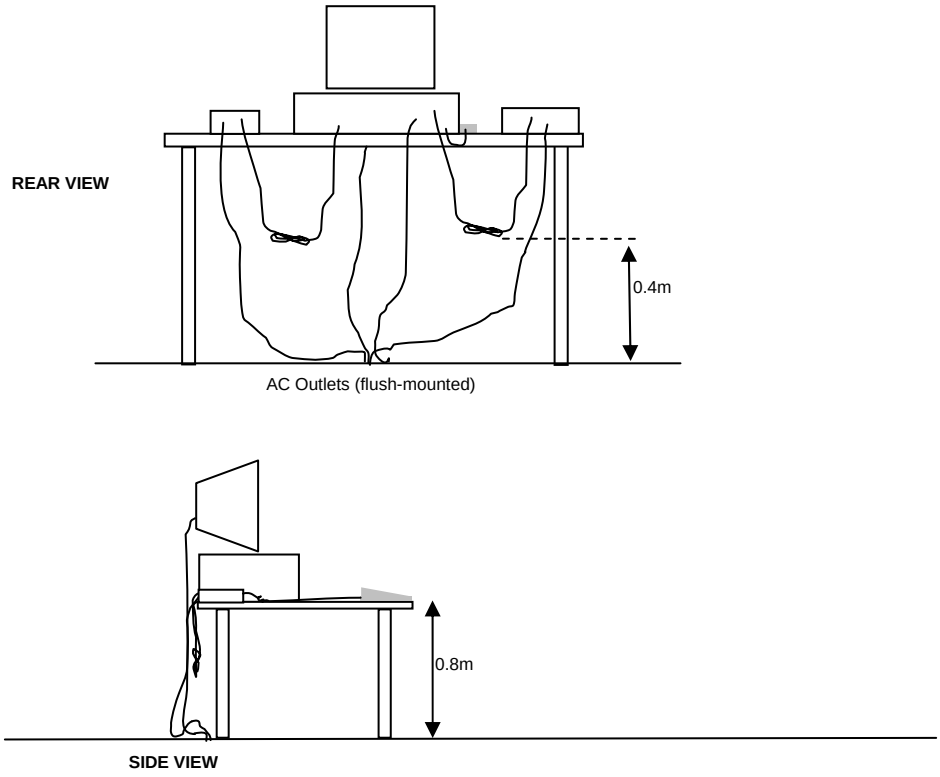
RADIATED EMISSIONS

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.

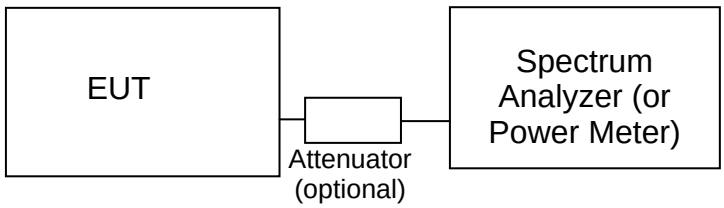
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements

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 Silicon Valley'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 and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

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; FCC 15.107(a), 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] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

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 210. 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

Radiated Emissions, 1,000 - 9,300 MHz, 24-Jul-12

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/21/2012
Hewlett Packard	High Pass filter, 1.5 GHz (Blu System)	P/N 84300-80037 (84125C)	1389	5/18/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/6/2012
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/23/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	7/28/2012

Radio Antenna Port (Power and Spurious Emissions), 24-Jul-12

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/6/2012

Radiated Emissions, 30 - 1,000 MHz, 24-Jul-12

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/6/2012
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	5/25/2013

Conducted Emissions - AC Power Ports, 25-Jul-12

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/22/2013
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2672	5/25/2013

Radio Antenna Port (Power and Spurious Emissions), 26-Jul-12

Manufacturer	Description	Model	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	2/23/2013

Appendix B Test Data

T88506 Pages 23 – 48

Client:	Unigen Corporation	Job Number:	J88443
Product	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		-
Emissions Standard(s):	FCC 15.247/RSS-210	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Unigen Corporation

Product

ARES / ATHENA

Date of Last Test: 8/6/2012

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 30 %

Summary of Results - Device Operating in the 900 MHz Band

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	600kb/s	low	16	-	Radiated Emissions, 30 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	53.7 dBµV/m @ 3613.5 MHz (-0.3 dB)
1b	600kb/s	center	17	-	Radiated Emissions, 30 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	52.6 dBµV/m @ 3661.1 MHz (-1.4 dB)
1c	600kb/s	High	17	-	Radiated Emissions, 30 MHz-9.3GHz	FCC Part 15.209 / 15.247(c)	49.9 dBµV/m @ 3709.2 MHz (-4.1 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.

Notes

Low channel = 903MHz , middle channel = 915MHz, high channel = 927MHz
Based on preliminary measurements, the 600kb/s data rate was tested as representative of the 300kB/s data rate.
230-000119 - 600kbps
NTS: 2012-2226

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 9300 MHz. Operating Mode: 600kb/s

Date of Test: 7/24/2012
Test Engineer: Jack Liu
Test Location: FT4

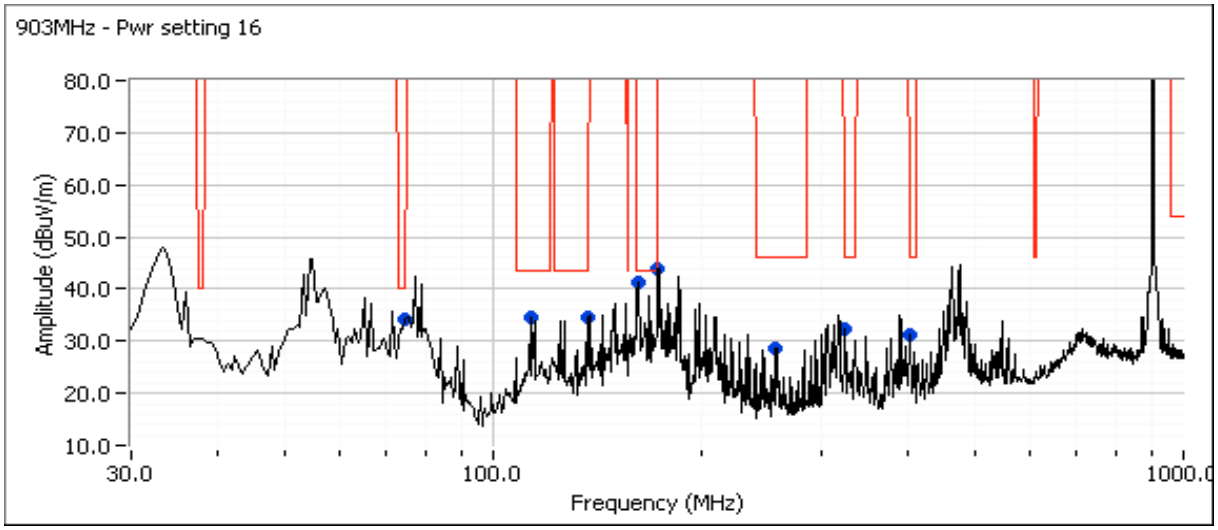
Run #1a: Low Channel @ 903 MHz

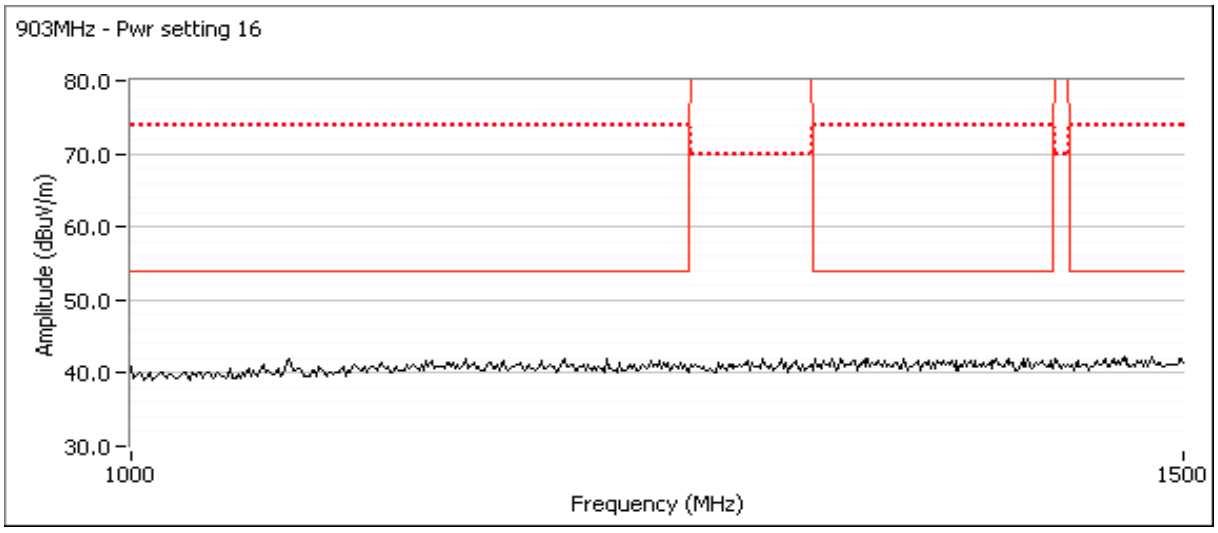
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
162.731	39.8	H	43.5	-3.7	QP	49	2.3	QP (1.00s)
168.051	29.6	H	43.5	-13.9	QP	86	1.4	QP (1.00s)
75.050	31.2	V	40.0	-8.8	QP	244	1.0	QP (1.00s)
113.259	32.6	V	43.5	-10.9	QP	285	1.0	QP (1.00s)
257.254	32.2	H	46.0	-13.8	Peak	216	1.0	
324.042	32.2	H	46.0	-13.8	Peak	98	1.0	
401.269	31.1	H	46.0	-14.9	Peak	91	2.0	
174.754	44.0	H	-	-	Peak	223	1.5	Note 4
2709.810	51.2	V	54.0	-2.8	AVG	70	1.1	
2708.050	59.5	V	74.0	-14.5	PK	70	1.1	
5419.670	52.4	V	54.0	-1.6	AVG	306	1.2	
5420.130	65.2	V	74.0	-8.8	PK	306	1.2	
8123.880	48.9	V	54.0	-5.1	AVG	253	1.4	
8123.830	58.9	V	74.0	-15.1	PK	253	1.4	
3613.510	53.7	V	54.0	-0.3	AVG	98	1.2	
3609.960	67.9	V	74.0	-6.1	PK	98	1.2	

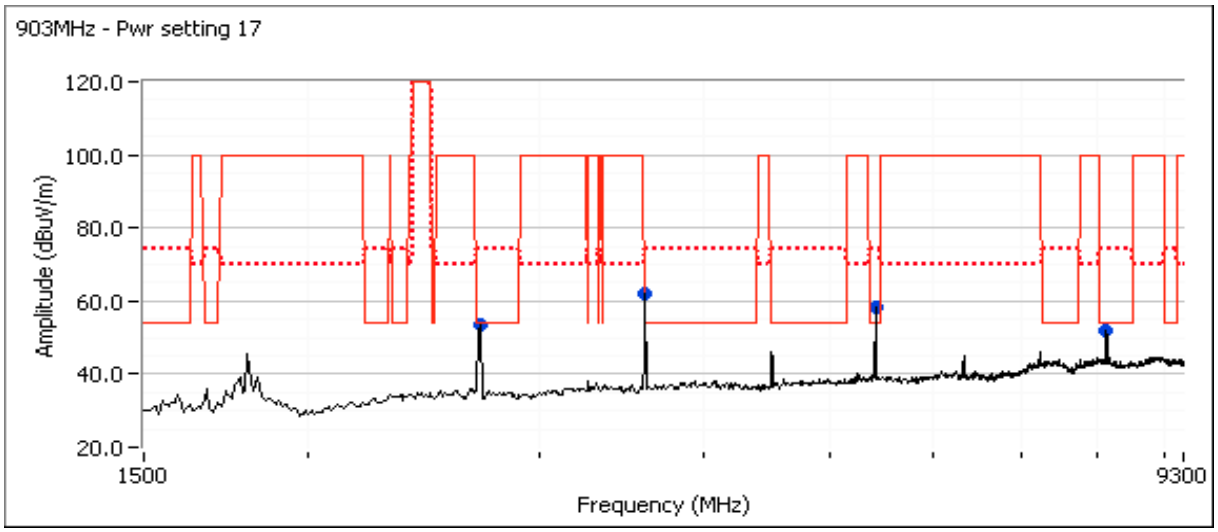
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	No emissions at 1 ~1.5GHz
Note 4:	Emission on non-restricted band. Refer to antenna port measurements.

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A





Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

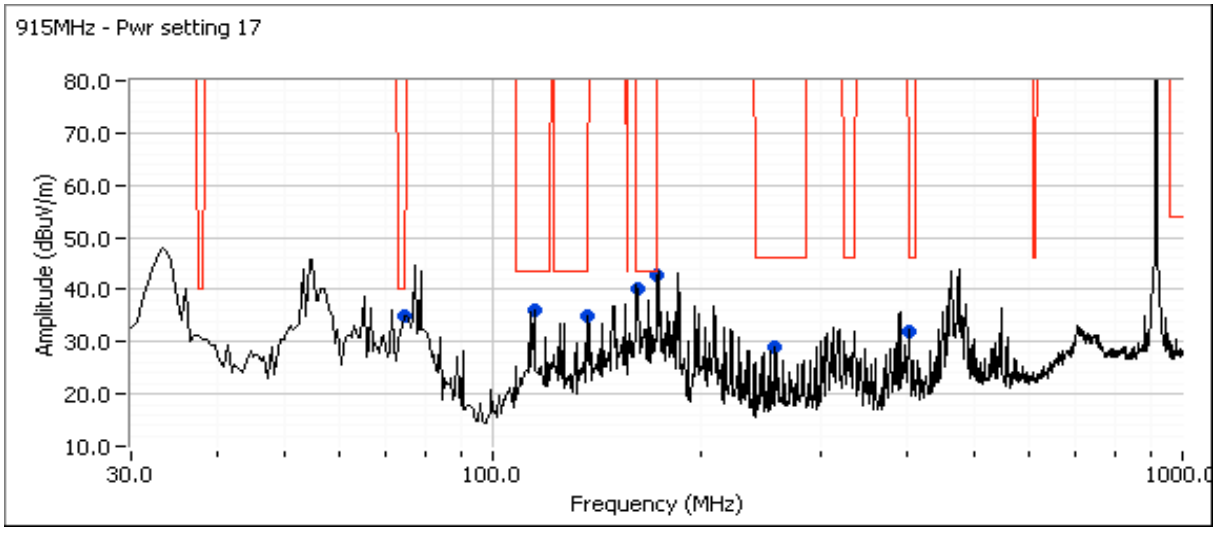


Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

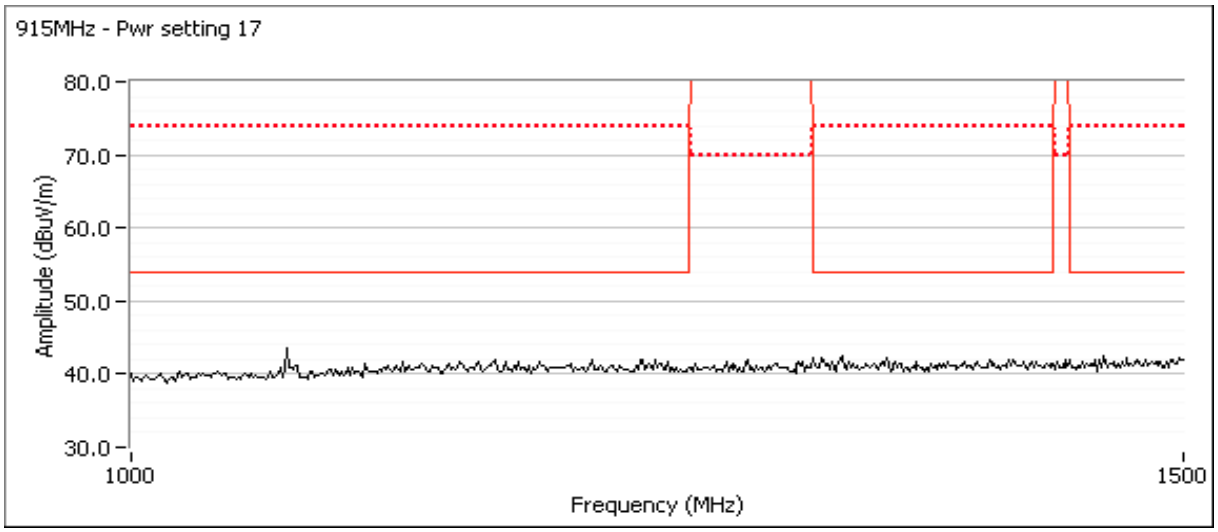
Run #1b: Center Channel @ 915 MHz
Other Spurious Emissions

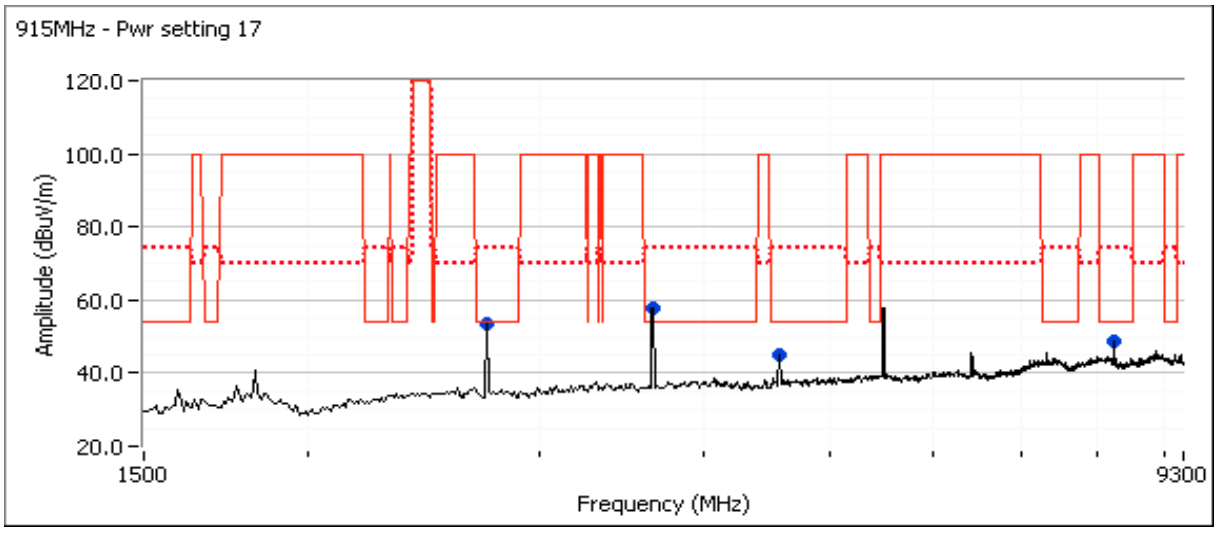
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
162.776	35.5	H	43.5	-8.0	QP	86	1.4	QP (1.00s)
137.280	30.1	H	43.5	-13.4	QP	239	2.1	QP (1.00s)
114.778	31.2	V	43.5	-12.3	QP	261	1.0	QP (1.00s)
75.186	32.3	V	40.0	-7.7	QP	274	1.0	QP (1.00s)
173.273	42.9	H	-	-	Peak	249	1.5	Note 4
257.252	28.9	H	46.0	-17.1	Peak	177	1.5	
401.269	32.1	H	46.0	-13.9	Peak	102	2.5	
2746.010	50.6	V	54.0	-3.4	AVG	70	1.6	RB 1 MHz;VB 10 Hz;Peak
2746.230	59.3	V	74.0	-14.7	PK	70	1.6	RB 1 MHz;VB 3 MHz;Peak
4573.140	42.7	V	54.0	-11.3	AVG	70	1.3	RB 1 MHz;VB 10 Hz;Peak
4573.030	52.1	V	74.0	-21.9	PK	70	1.3	RB 1 MHz;VB 3 MHz;Peak
3661.070	52.6	V	54.0	-1.4	AVG	83	1.0	RB 1 MHz;VB 10 Hz;Peak
3661.640	65.1	V	74.0	-8.9	PK	83	1.0	RB 1 MHz;VB 3 MHz;Peak
8231.500	45.5	H	54.0	-8.5	AVG	335	1.0	RB 1 MHz;VB 10 Hz;Peak
8238.600	55.5	H	74.0	-18.5	PK	335	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 and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	No emissions at 1 ~1.5GHz
Note 4:	Emission on non-restricted band. Refer to antenna port measurements.



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A





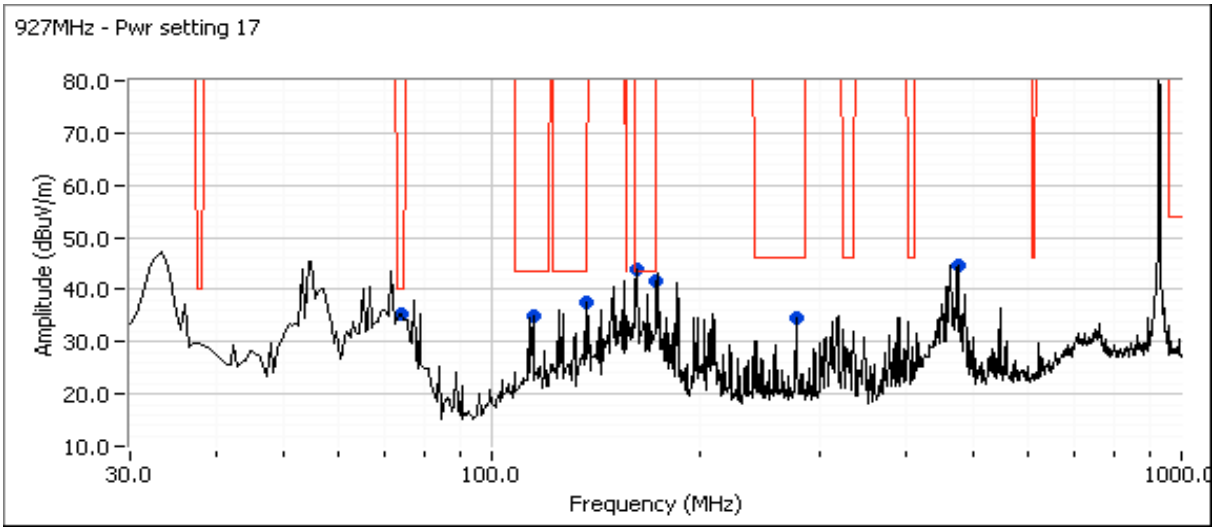
Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Run #1c: High Channel @ 927 MHz

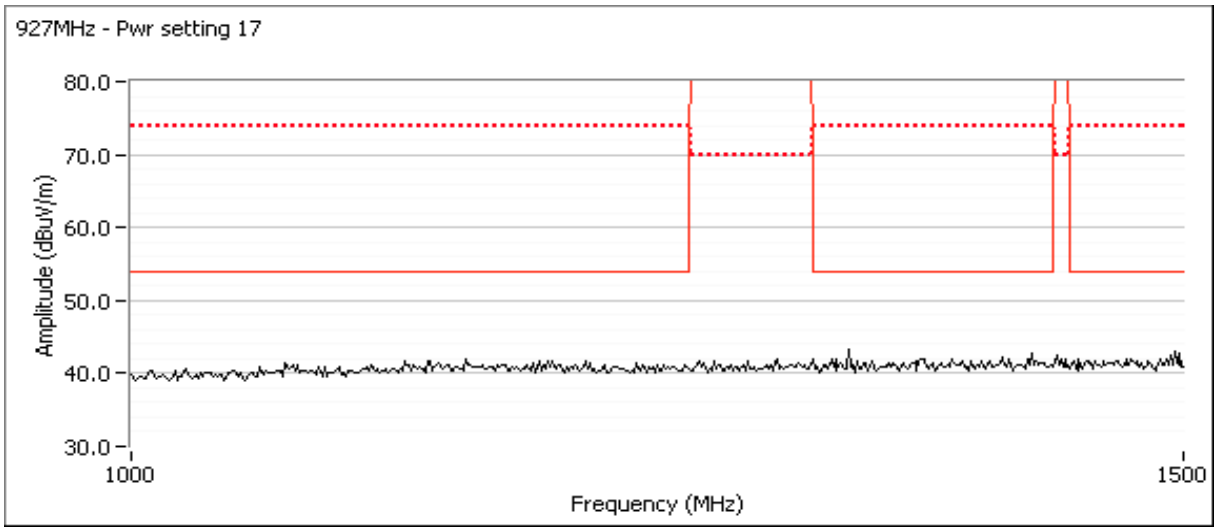
Other Spurious Emissions

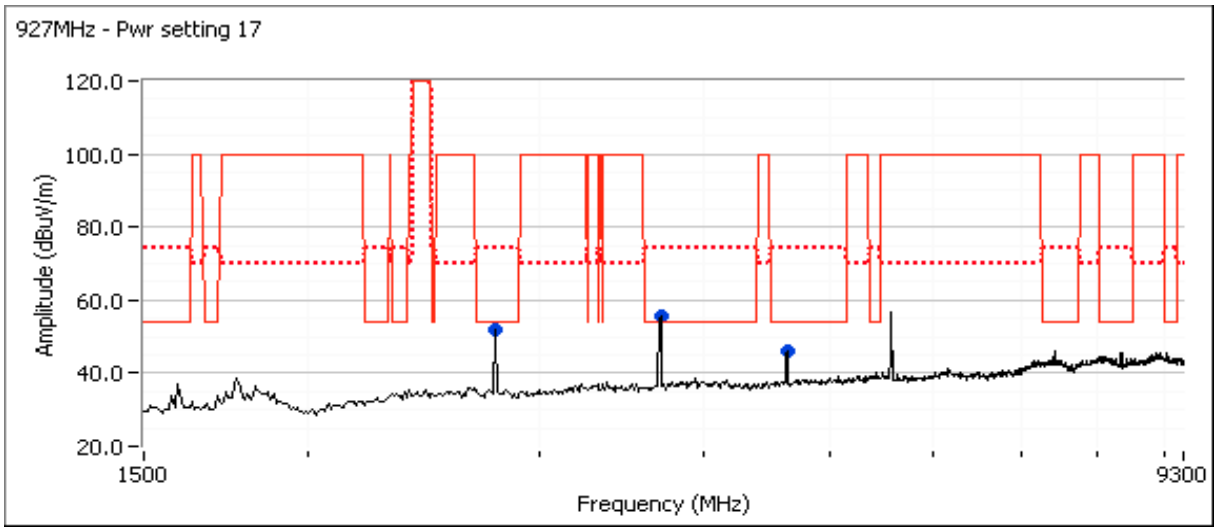
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
114.784	29.3	V	43.5	-14.2	QP	295	1.0	QP (1.00s)
73.509	31.9	V	40.0	-8.1	QP	260	1.0	QP (1.00s)
137.222	37.3	H	43.5	-6.2	QP	228	2.1	QP (1.00s)
162.146	30.2	H	43.5	-13.3	QP	225	1.6	QP (1.00s)
172.825	41.7	H	-	-	Peak	64	1.5	Note 4
276.012	34.6	H	46.0	-11.4	Peak	111	2.0	
474.259	44.6	H	-	-	Peak	118	2.0	Note 4
2782.030	48.5	V	54.0	-5.5	AVG	33	1.1	RB 1 MHz;VB 10 Hz;Peak
2779.920	58.1	V	74.0	-15.9	PK	33	1.1	RB 1 MHz;VB 3 MHz;Peak
4633.130	42.8	V	54.0	-11.2	AVG	58	1.3	RB 1 MHz;VB 10 Hz;Peak
4632.890	53.0	V	74.0	-21.0	PK	58	1.3	RB 1 MHz;VB 3 MHz;Peak
3709.220	49.9	V	54.0	-4.1	AVG	89	1.0	RB 1 MHz;VB 10 Hz;Peak
3706.250	63.5	V	74.0	-10.5	PK	89	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 and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	No emissions at 1 ~1.5GHz
Note 4:	Emission on non-restricted band. Refer to antenna port measurements.



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A





Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 30 %

Summary of Results - Device Operating in the 900 MHz Band

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	600kb/s	center	Rx	-	Radiated Emissions, 30 MHz-3GHz	RSS-210	39.1 dBµV/m @ 1595.05 MHz (-14.9dB)

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.

Notes

Low channel = 903MHz , middle channel = 915MHz, high channel = 927MHz
Based on preliminary measurements, the 600kb/s data rate was tested as representative of the 300kB/s data rate.
230-000119 - 600kbps
NTS: 2012-2226

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 3000 MHz. Operating Mode: 600kb/s

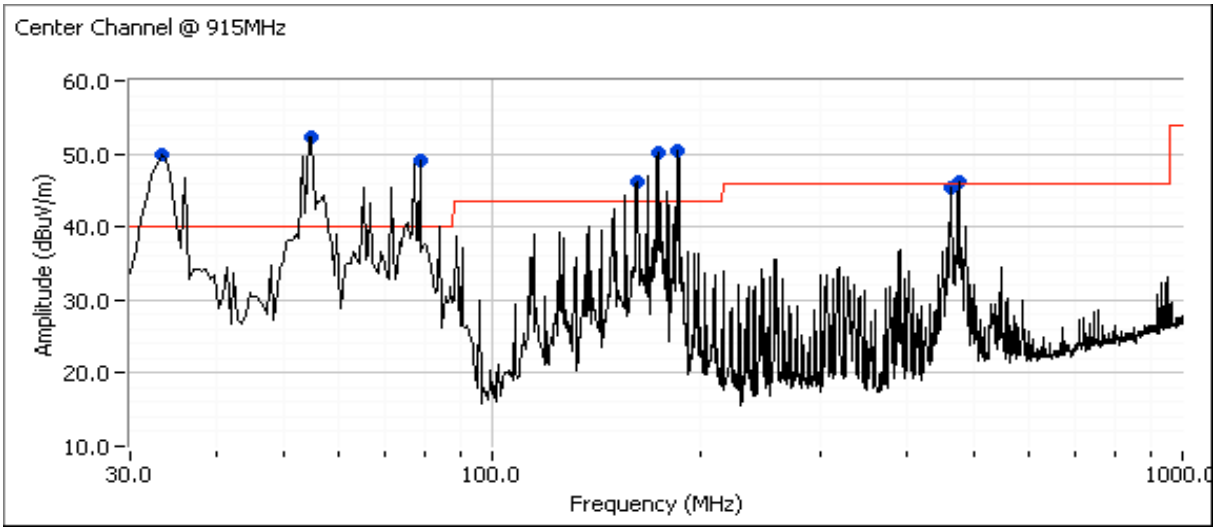
Date of Test: 7/24/2012
Test Engineer: Rafael Varelas
Test Location: FT4

1a: Center Channel @ 915 MHz

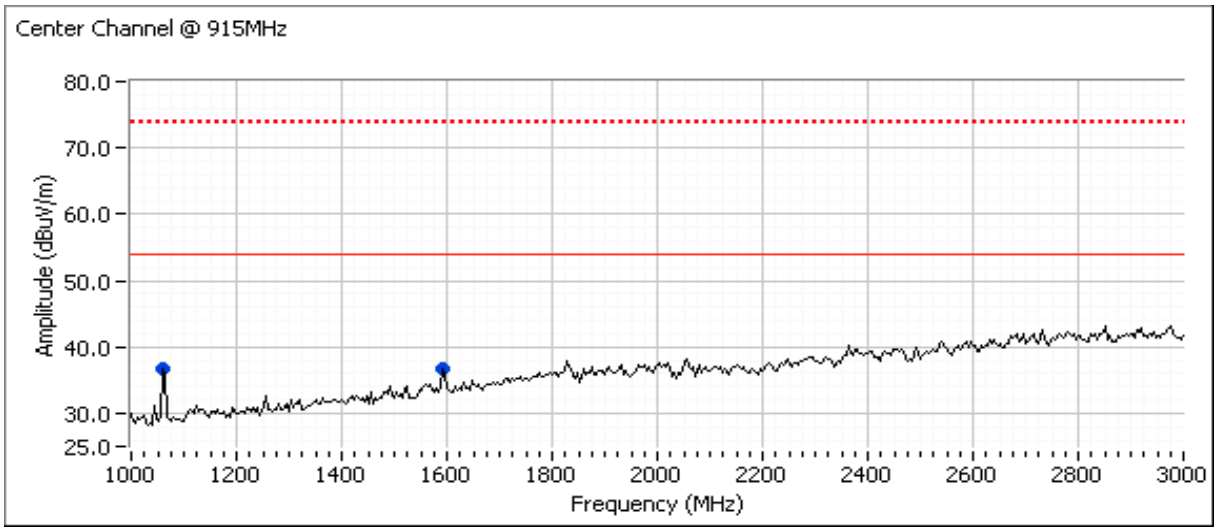
Other Spurious Emissions

Frequency	Level	Pol	RSS-210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.749	50.0	V	-	-	Peak	13	1.0	Note 1
54.744	52.4	V	-	-	Peak	286	1.0	Note 1
78.759	49.2	V	-	-	Peak	262	1.0	Note 1
162.737	46.2	H	-	-	Peak	54	2.5	Note 1
174.715	50.1	H	-	-	Peak	63	1.5	Note 1
185.281	50.4	H	-	-	Peak	212	1.5	Note 1
461.836	45.4	H	-	-	Peak	138	2.0	Note 1
474.007	46.1	V	-	-	Peak	132	1.5	Note 1
1596.050	39.1	V	54.0	-14.9	AVG	36	1.0	AVG (0.10s)
1596.050	51.8	V	74.0	-22.2	PK	36	1.0	PK (0.10s)
1059.570	33.3	V	54.0	-20.7	AVG	167	1.0	AVG (0.10s)
1059.570	45.6	V	74.0	-28.4	PK	167	1.0	PK (0.10s)

Note 1	Evaluation showed that these emissions are not related to the operation of the radio (channel, mode) and are from the test fixture.



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, 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.

Date of Test: 7/24/2012
Test Engineer: Jack Liu
Test Location: FT4

Config. Used: 1
Config Change: none
EUT Host Voltage: 120VAC

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	-	Output Power	15.247(b)	Pass	300kbps-14.6 dBm 600kbps-14.7 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	300kbps-7.9 dBm/3kHz 600kbps-7.6 dBm/3kHz
3	-	-	Minimum 6dB Bandwidth	15.247(a)	Pass	300kbps-922kHz 600kbps-1.2MHz
3	-	-	99% Bandwidth	RSS GEN	-	300kbps-1.3MHz 600kbps-1.5MHz
4	-	-	Spurious emissions	15.247(b)	Pass	All emissions below the limit

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:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Notes

Low channel = 903MHz , middle channel = 915MHz, high channel = 927MHz
230-000118 - 300kbps
NTS: 2012-2228
230-000119 - 600kbps
NTS: 2012-2226
Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
300kb/s									
13	903	13.6	22.6	3.0	Pass	16.6	0.045		
13	915	13.7	23.2	3.0	Pass	16.7	0.046		
14	927	14.6	28.9	3.0	Pass	17.6	0.058		
600kb/s									
14	903	14.5	28.1	3.0	Pass	17.5	0.056		
14	915	14.6	28.7	3.0	Pass	17.6	0.057		
14	927	14.7	29.4	3.0	Pass	17.7	0.059		

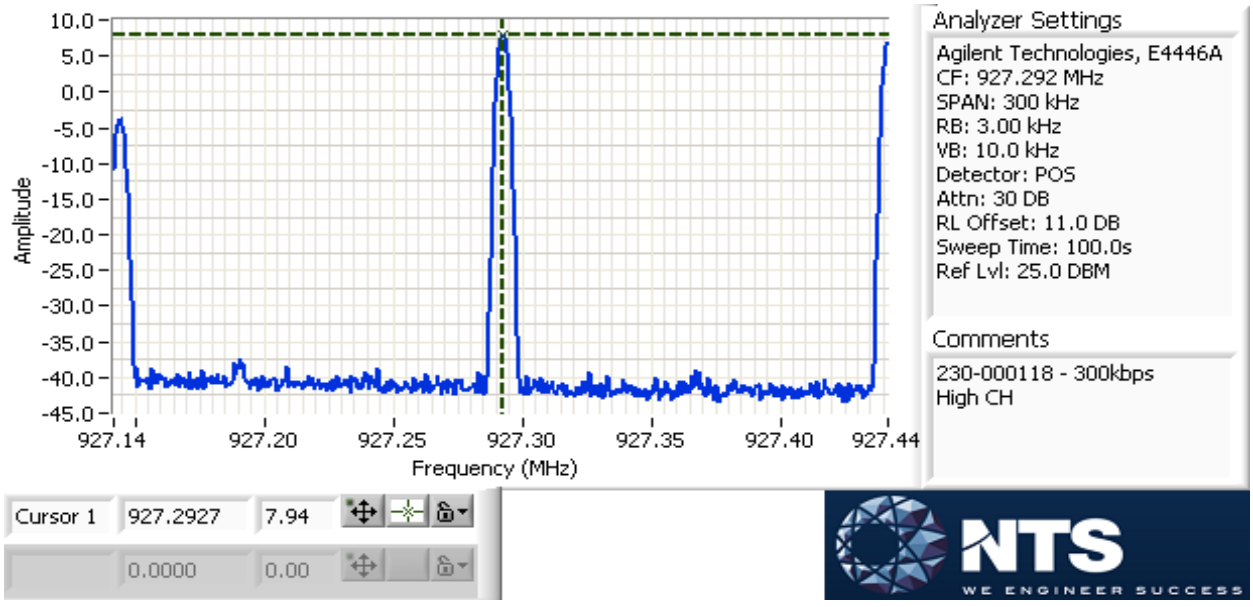
Note 1:	Output power measured using a peak power meter, spurious limit is -20dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter and is included for reference only.

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

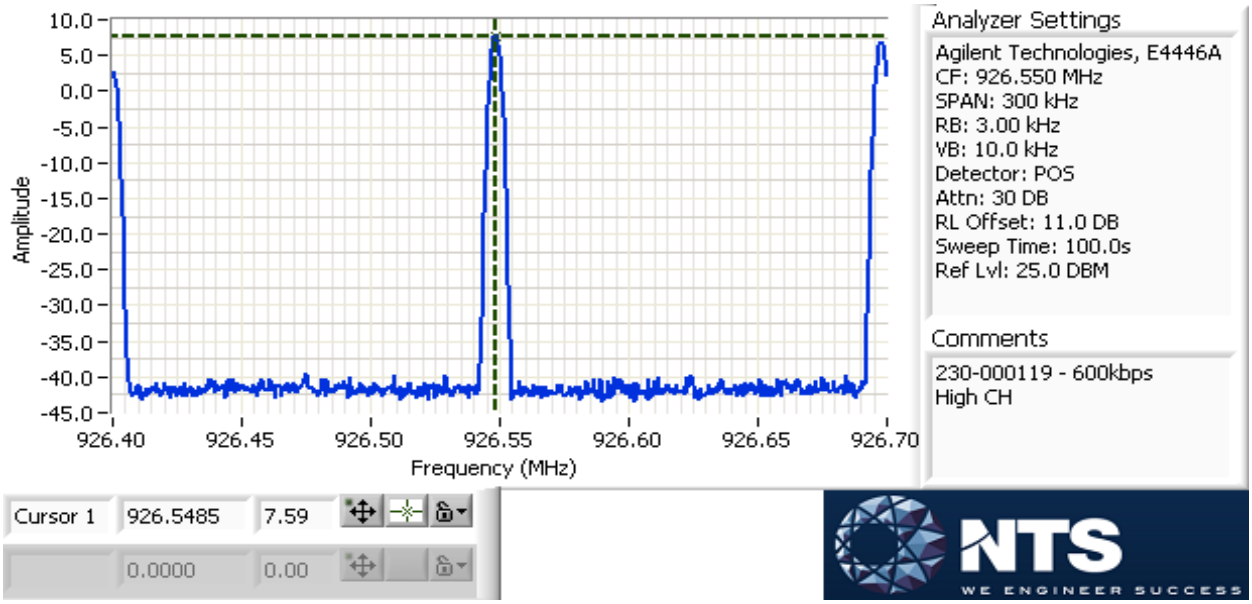
Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
300kb/s				
13	903	7.7	8.0	Pass
13	915	7.2	8.0	Pass
14	927	7.9	8.0	Pass
600kb/s				
14	903	7.5	8.0	Pass
14	915	7.5	8.0	Pass
14	927	7.6	8.0	Pass

Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

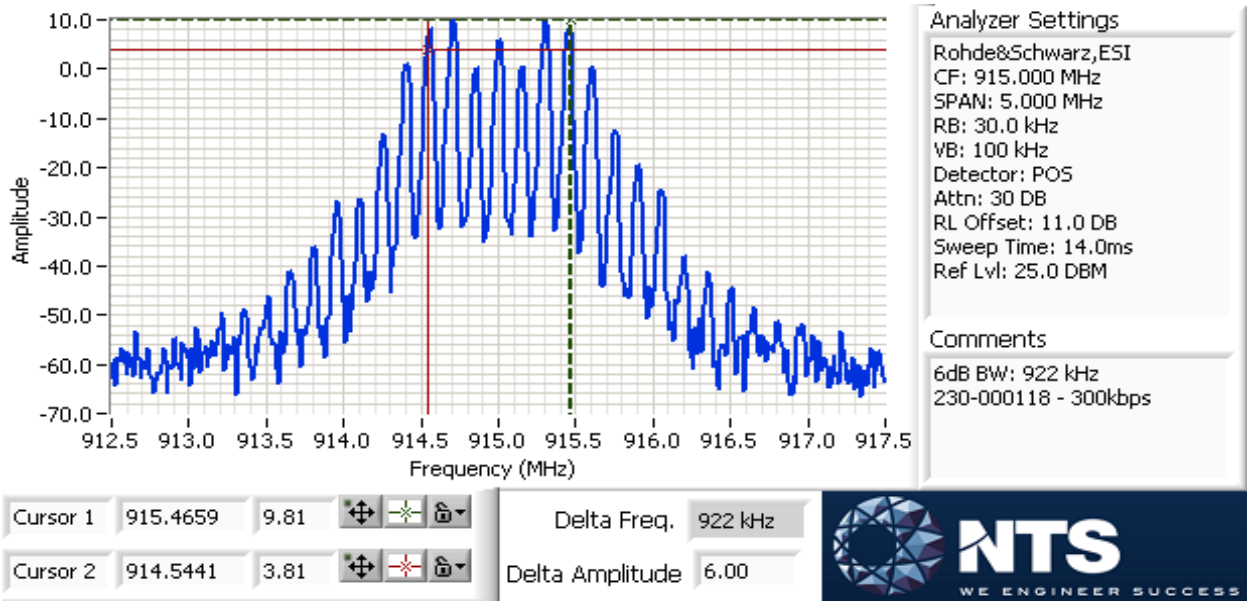


Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

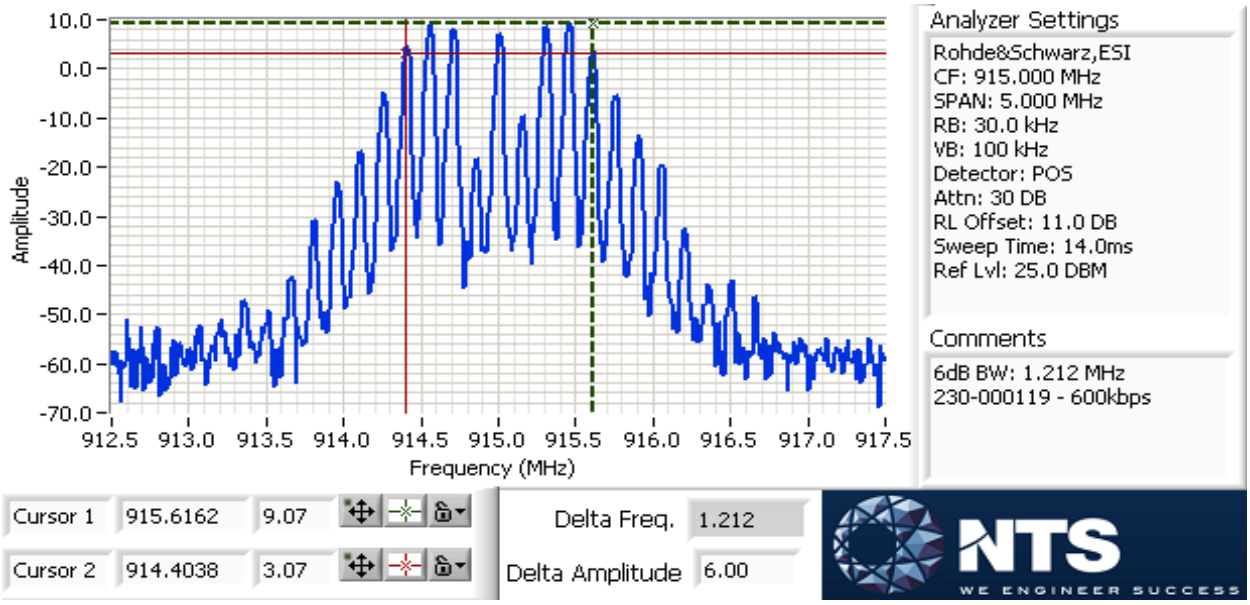
Run #3: Signal Bandwidth

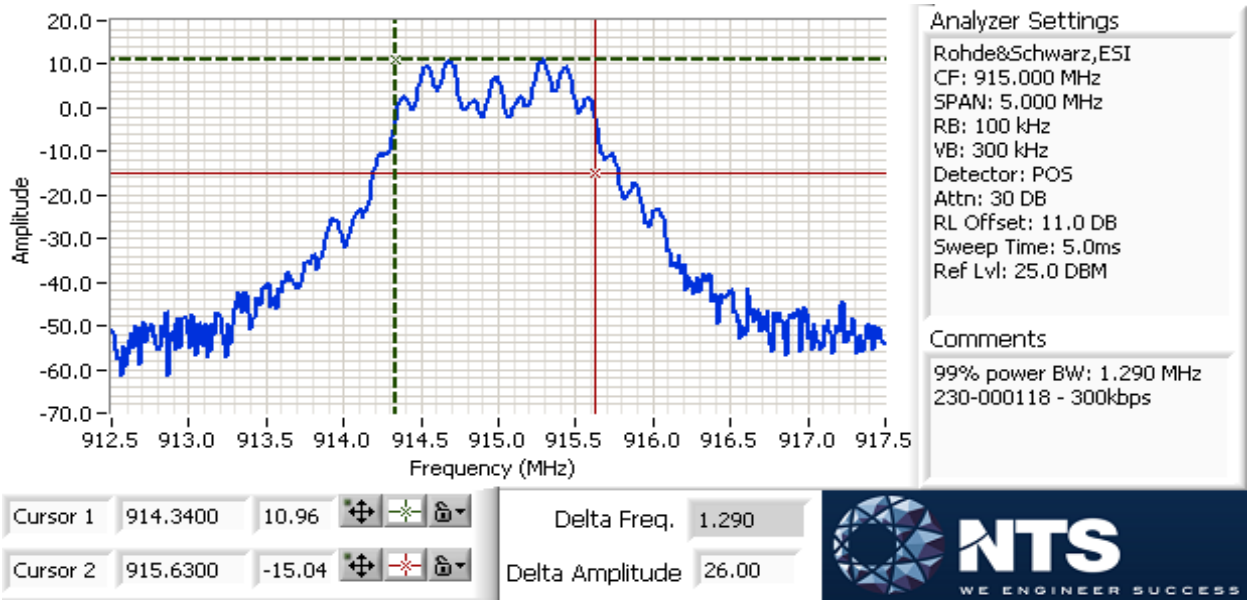
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz) 6dB	99%
300kb/s				
17	903	30k/100k	922	1210
17	915	30k/100k	922	1290
17	927	30k/100k	922	1330
600kb/s				
17	903	30k/100k	1212	1510
17	915	30k/100k	1212	1510
17	927	30k/100k	1212	1490

Note 1:	99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB

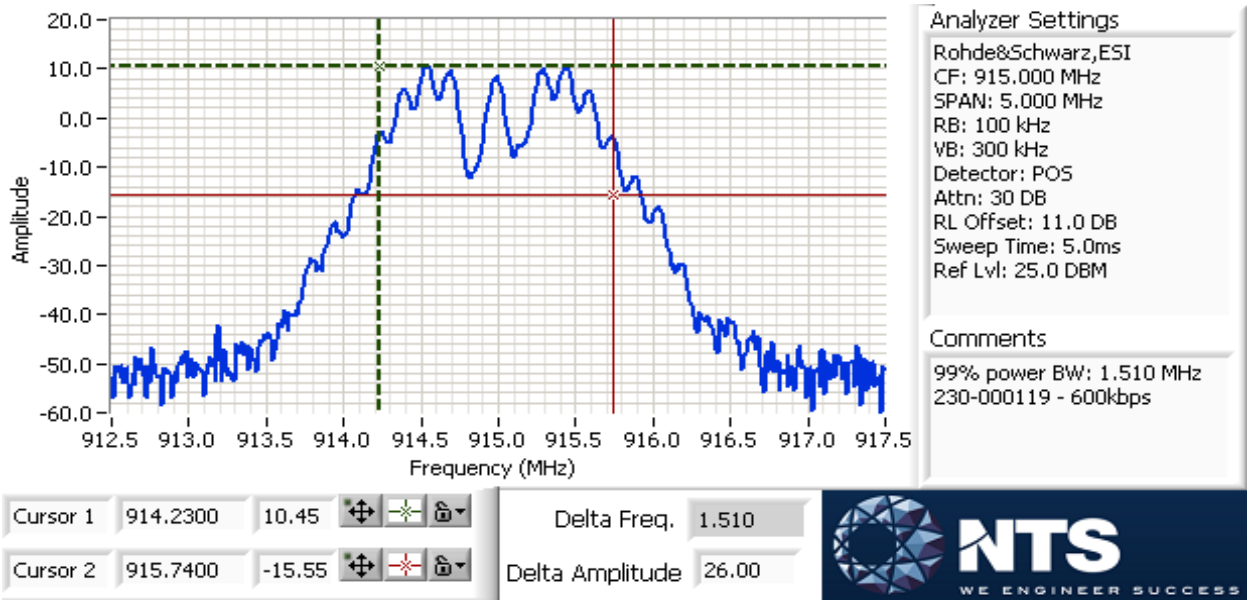


Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A





Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A



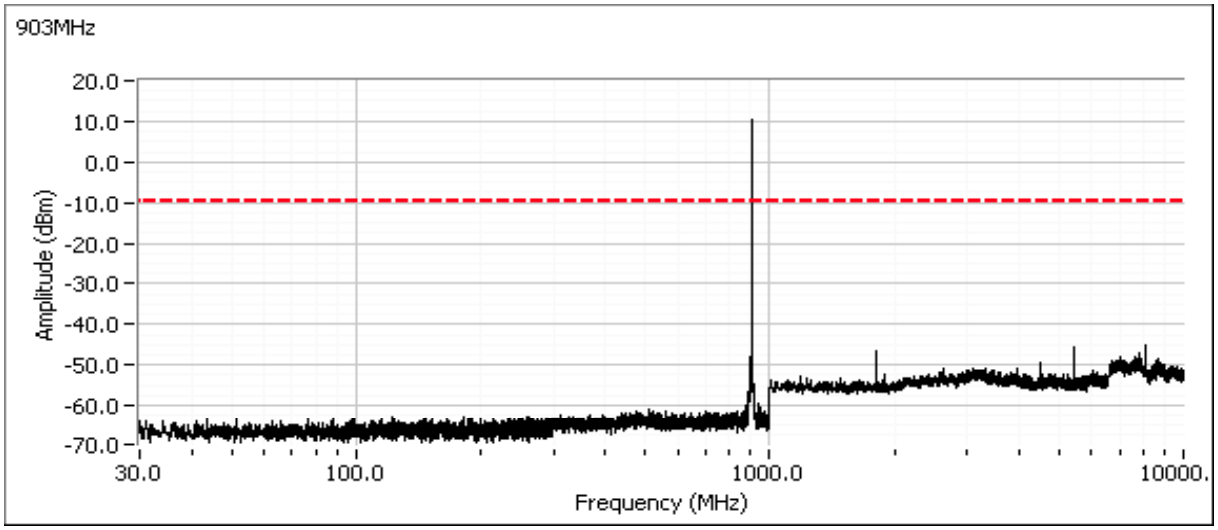
Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Run #4: Out of Band Spurious Emissions

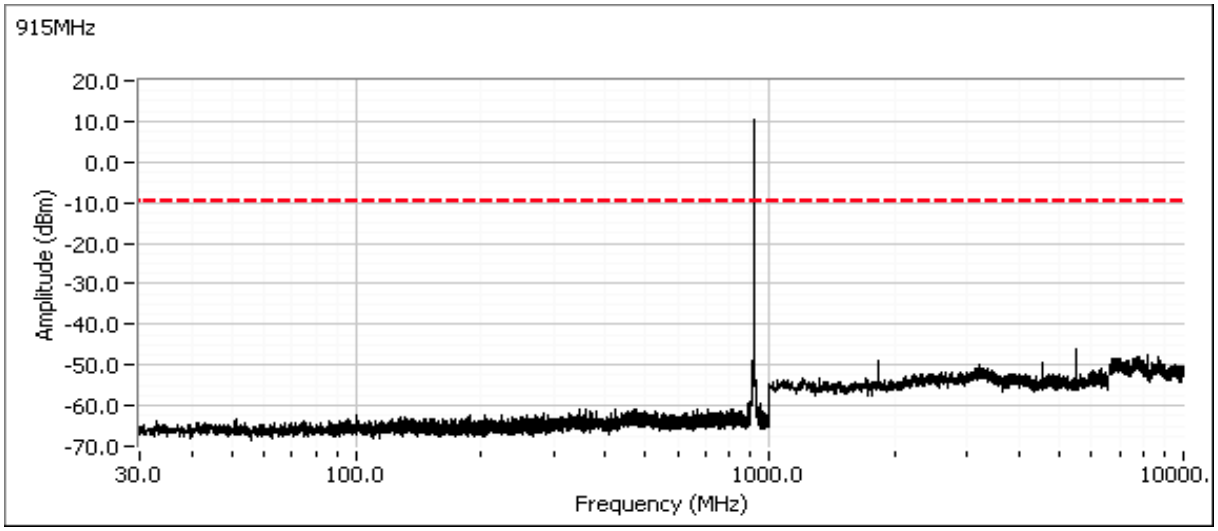
Based on preliminary measurements, the 600kb/s data rate was tested as representative of the 300kB/s data rate.

Frequency (MHz)	Limit	Result
903	-20dBc	Pass
915	-20dBc	Pass
927	-20dBc	Pass

Plots for low channel, power setting(s) = 17

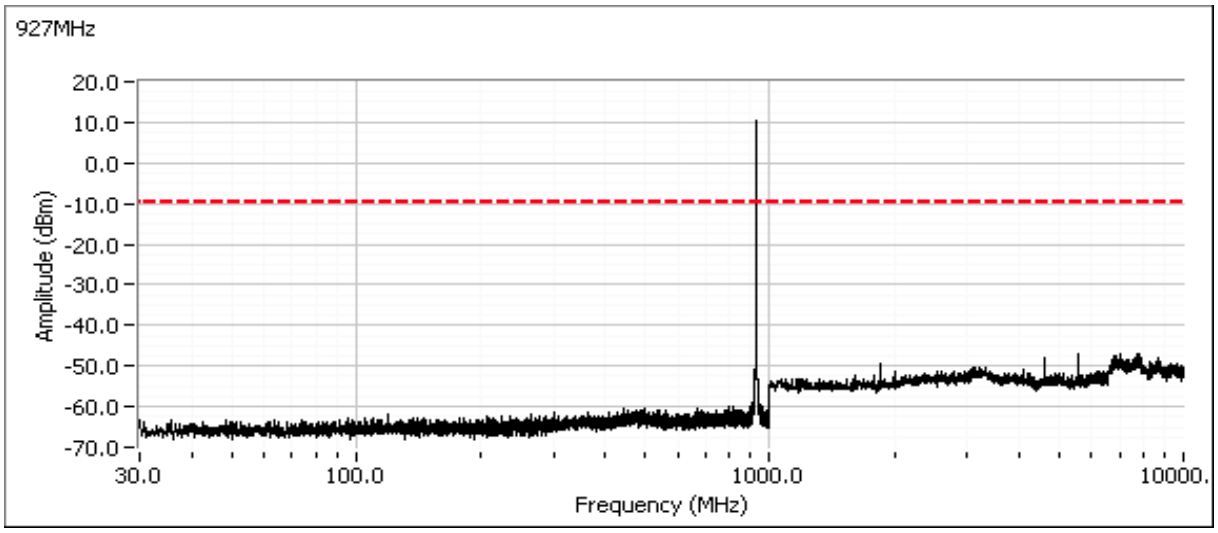


Plots for center channel, power setting(s) = 17



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	N/A

Plots for high channel, power setting(s) = 17



Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	-

Conducted Emissions

(Elliott Laboratories 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: 7/25/2012
Test Engineer: Jack Liu
Test Location: Fremont Chamber #3

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a wooden 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: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	15.247	Pass	46.5 dBµV @ 0.202 MHz (-17.0 dB)

Modifications Made During Testing

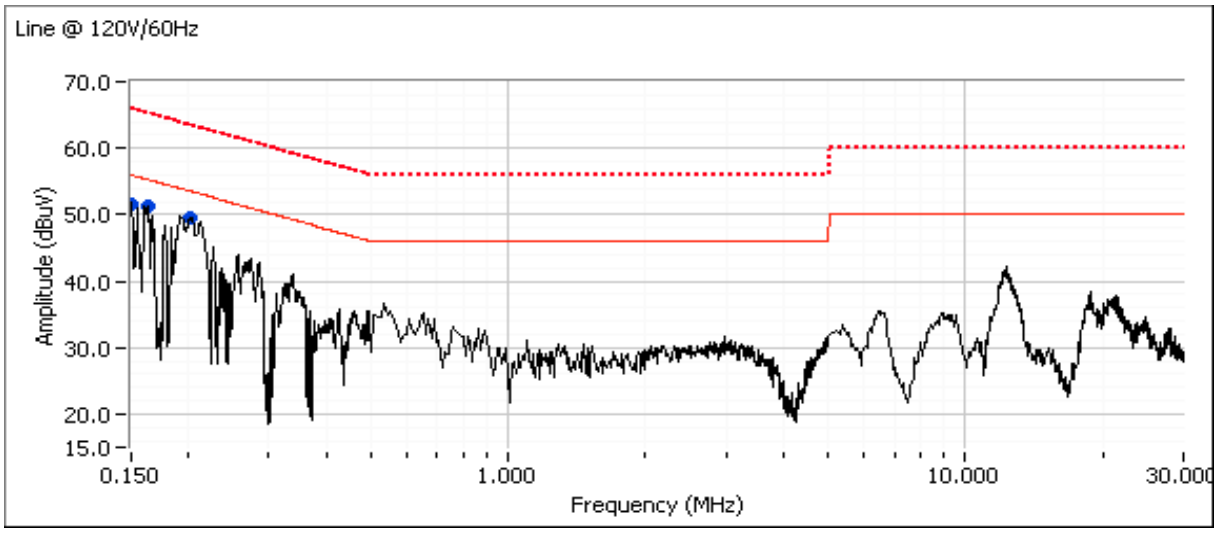
No modifications were made to the EUT during testing

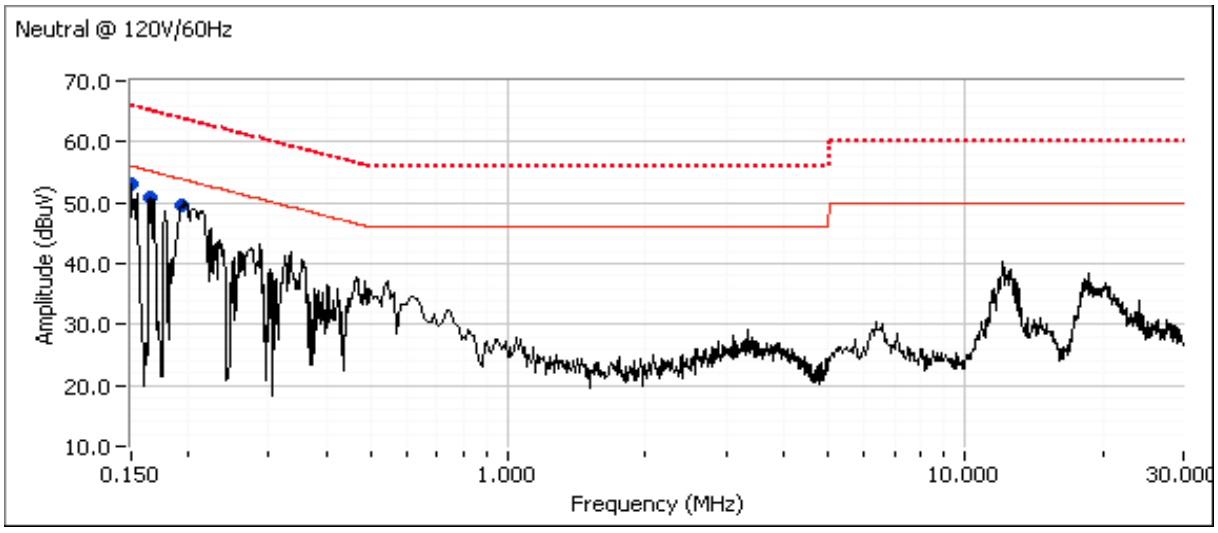
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz





Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	-

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

Frequency	Level	AC	15.247		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.151	51.5	Line 1	56.0	-4.5	Peak	
0.161	51.3	Line 1	55.3	-4.0	Peak	
0.202	49.4	Line 1	53.5	-4.1	Peak	
0.150	53.2	Neutral	56.0	-2.8	Peak	
0.163	50.9	Neutral	55.2	-4.3	Peak	
0.193	49.7	Neutral	53.9	-4.2	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	15.247		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.202	46.5	Line 1	63.5	-17.0	QP	QP (1.00s)
0.193	46.7	Neutral	63.9	-17.2	QP	QP (1.00s)
0.150	47.6	Neutral	66.0	-18.4	QP	QP (1.00s)
0.151	47.0	Line 1	65.9	-18.9	QP	QP (1.00s)
0.202	33.8	Line 1	53.5	-19.7	AVG	AVG (0.10s)
0.163	45.5	Neutral	65.3	-19.8	QP	QP (1.00s)
0.161	45.5	Line 1	65.4	-19.9	QP	QP (1.00s)
0.193	31.7	Neutral	53.9	-22.2	AVG	AVG (0.10s)
0.150	26.8	Neutral	56.0	-29.2	AVG	AVG (0.10s)
0.151	25.5	Line 1	55.9	-30.4	AVG	AVG (0.10s)
0.161	18.8	Line 1	55.4	-36.6	AVG	AVG (0.10s)
0.163	18.5	Neutral	55.3	-36.8	AVG	AVG (0.10s)

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	-

Test Configuration Photograph #1
(Conducted Emissions - Power Port)

Client:	Unigen Corporation	Job Number:	J88443
Model:	ARES / ATHENA	T-Log Number:	T88506
		Account Manager:	Christine Krebill
Contact:	Weerapol Seesanung		
Standard:	FCC 15.247/RSS-210	Class:	-

Test Configuration Photograph #2
(Conducted Emissions - Power Port)

End of Report

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