

EMC Test Report
Application for Grant of Equipment Authorization
FCC Part 15 Subpart C

Model: PX031ANI

FCC ID: PGRPX031ANI

APPLICANT: Pace Americas, Inc.
310 Providence Mine Road, Suite #200
Nevada City, CA 95959

TEST SITE(S): NTS Silicon Valley
41039 Boyce Road.
Fremont, CA. 94538-2435

IC SITE REGISTRATION #: 2845B-4, 2845B-5

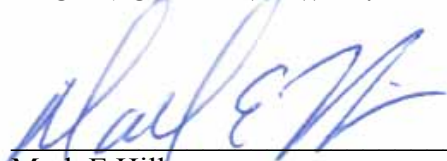
REPORT DATE: March 28, 2013

REISSUE DATE: April 10, 2013

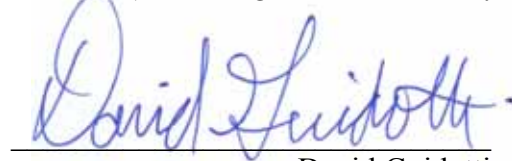
FINAL TEST DATES: January 31, February 5 and 6, 2013

TOTAL NUMBER OF PAGES: 46

PROGRAM MGR /
TECHNICAL REVIEWER:


Mark E Hill
Staff Engineer

QUALITY ASSURANCE DELEGATE /
FINAL REPORT PREPARER:


David Guidotti
Senior Technical Writer

NTS Silicon Valley is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise. This report and the information contained herein represent the results of testing test articles identified and selected by the client performed to specifications and/or procedures selected by the client. National Technical Systems (NTS) makes no representations, expressed or implied, that such testing is adequate (or inadequate) to demonstrate efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it represent any statement whatsoever as to its merchantability or fitness of the test article, or similar products, for a particular purpose. This report shall not be reproduced except in full

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	03-28-2013	First release	
1	04-10-2013	Reissued to correct model name	Dave Guidotti

TABLE OF CONTENTS

REVISION HISTORY	2
TABLE OF CONTENTS	3
SCOPE.....	4
OBJECTIVE	4
STATEMENT OF COMPLIANCE.....	5
DEVIATIONS FROM THE STANDARDS.....	5
TEST RESULTS SUMMARY	6
DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)	6
GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS	6
MEASUREMENT UNCERTAINTIES	7
EQUIPMENT UNDER TEST (EUT) DETAILS.....	8
GENERAL.....	8
ANTENNA SYSTEM	8
ENCLOSURE	8
MODIFICATIONS.....	8
SUPPORT EQUIPMENT	8
EUT INTERFACE PORTS	9
EUT OPERATION	9
TEST SITE.....	10
GENERAL INFORMATION	10
CONDUCTED EMISSIONS CONSIDERATIONS	10
RADIATED EMISSIONS CONSIDERATIONS	10
MEASUREMENT INSTRUMENTATION	11
RECEIVER SYSTEM	11
INSTRUMENT CONTROL COMPUTER	11
LINE IMPEDANCE STABILIZATION NETWORK (LISN).....	11
FILTERS/ATTENUATORS	12
ANTENNAS.....	12
ANTENNA MAST AND EQUIPMENT TURNABLE	12
INSTRUMENT CALIBRATION.....	12
TEST PROCEDURES	13
EUT AND CABLE PLACEMENT	13
CONDUCTED EMISSIONS.....	13
RADIATED EMISSIONS	14
BANDWIDTH MEASUREMENTS	15
SPECIFICATION LIMITS AND SAMPLE CALCULATIONS	16
CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(A), RSS GEN	16
GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS	17
OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS	17
TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS AND DTS SYSTEMS.....	17
SAMPLE CALCULATIONS - CONDUCTED EMISSIONS	18
SAMPLE CALCULATIONS - RADIATED EMISSIONS.....	18
SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION.....	19
APPENDIX A TEST EQUIPMENT CALIBRATION DATA	20
APPENDIX B TEST DATA	21
END OF REPORT	46

SCOPE

An electromagnetic emissions test has been performed on the Pace Americas, Inc. model PX031ANI, pursuant to the following rules:

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.

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 Pace Americas, Inc. model PX031ANI complied with the requirements of the following regulations:

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 Pace Americas, Inc. model PX031ANI and therefore apply only to the tested sample. The sample was selected and prepared by Mark Rieger of Pace Americas, Inc.

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 (2400 – 2483.5MHz)**

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	1.403 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	6.9 dBm (4.9 mW) EIRP = 13 mW ^{Note 1}	1 Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-12.9 dBm / 3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	N/A – EUT has fixed antenna, all tests performed radiated		
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	49.9 dBμV/m @ 3732.0 MHz (-4.1 dB)	15.207 in restricted bands, all others < -20dBc	Complies
Note 1: EIRP calculated using antenna gain of 4.2 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	Internal, Integral antenna	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions With AcBel Power supply model:WAC002	32.8 dBμV @ 0.360 MHz (- 15.9 dB)	Refer to page 16	Complies
		AC Conducted Emissions With NetBit Power supply model:NBS15A050300H U	34.0 dBμV @ 3.162 MHz (- 12.0 dB)	Refer to page 16	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	N/A – EUT receiver tunes above 960MHz		
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	Refer to manual	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Internal, Integral antenna	Statement for products with detachable antenna	N/A
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	2.320 MHz	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)	dB μ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB μ V	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Pace Americas, Inc. model PX031ANI is a TV set top box. Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120 Volts, 60 Hz, .5 Amps.

The sample was received on January 31, 2013 and tested on January 31, February 5 and 6, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Pace Americas	PX031ANI	Set top box	PAD	PGRPX031ANI
AcBel	WAC002	External power supply	-	N/A
NetBit	R5212	External power supply	-	N/A

ANTENNA SYSTEM

The peak gain for the 802.15.4 antennas: 4.17dBi.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 18 cm wide by 15 cm deep by 4.5 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No local support equipment was used during testing.

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

Company	Model	Description	Serial Number	FCC ID
Dell	Latitude D610	Laptop	-	-

EUT INTERFACE PORTS

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

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
USB	Laptop	Multiwire	Shielded	7
DC Power	External supply	2 wire	Unshielded	1.5
AC Pwr (external supply)	AC Mains	Direct connection	NA	NA
HDMI input	Not cabled	-	-	-
HDMI output	Not cabled	-	-	-
Ethernet	Not cabled	-	-	-
RF in	Not cabled	-	-	-

EUT OPERATION

During testing, the 802.15.4 radio was configured to transmit continuously, modulated, at the noted channel.

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 4	211948	2845B-4	41039 Boyce Road Fremont, CA 94538-2435
Chamber 5	211948	2845B-5	

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.

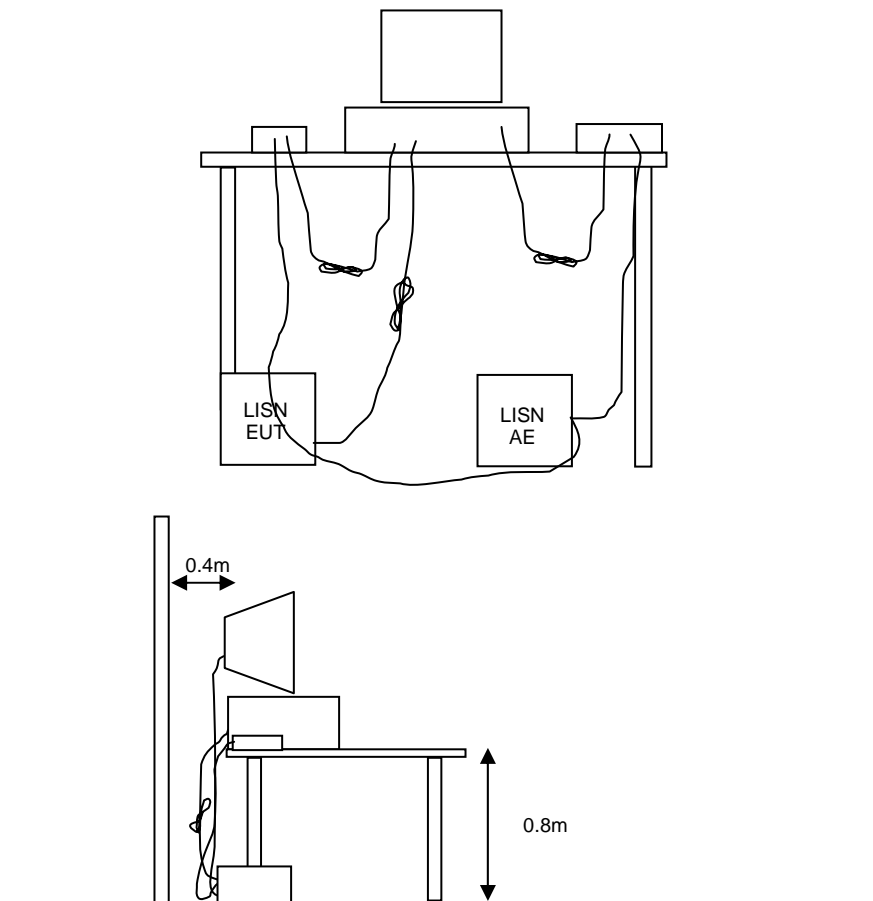


Figure 1 Typical Conducted Emissions Test Configuration

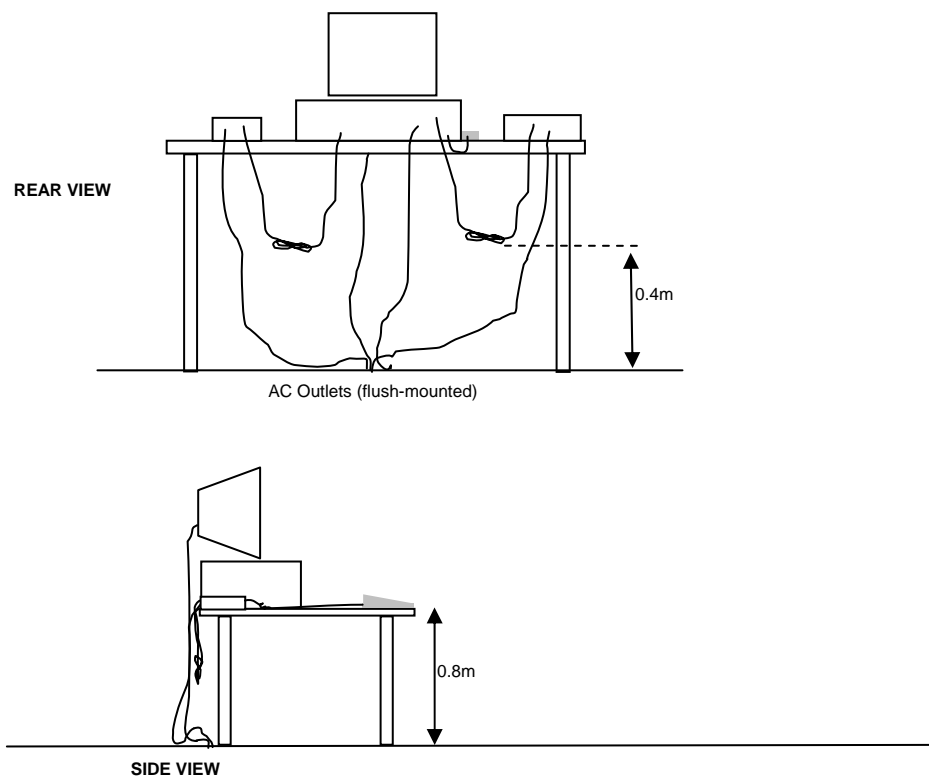
RADIATED EMISSIONS

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.

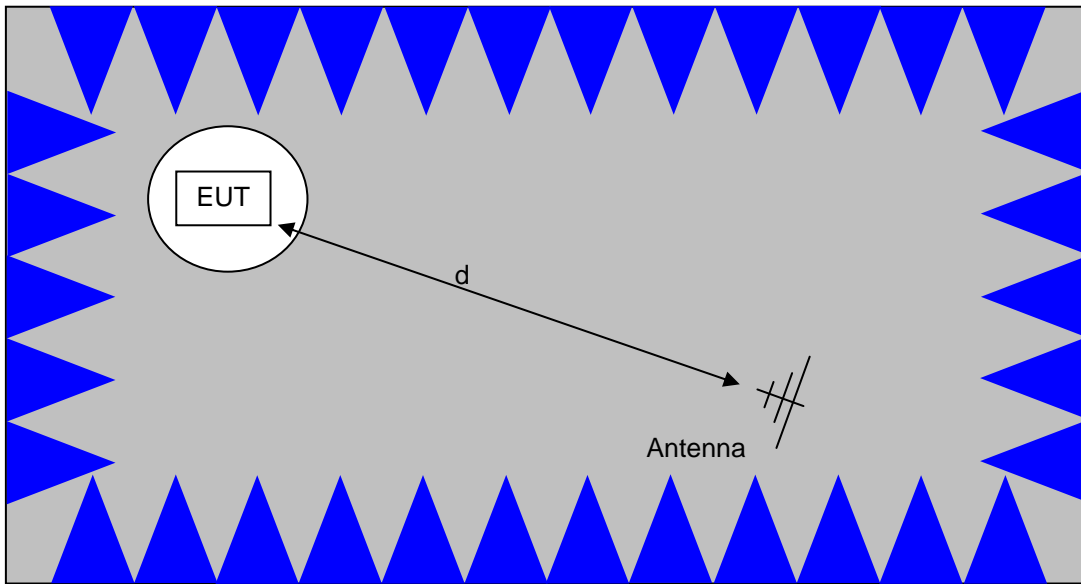
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

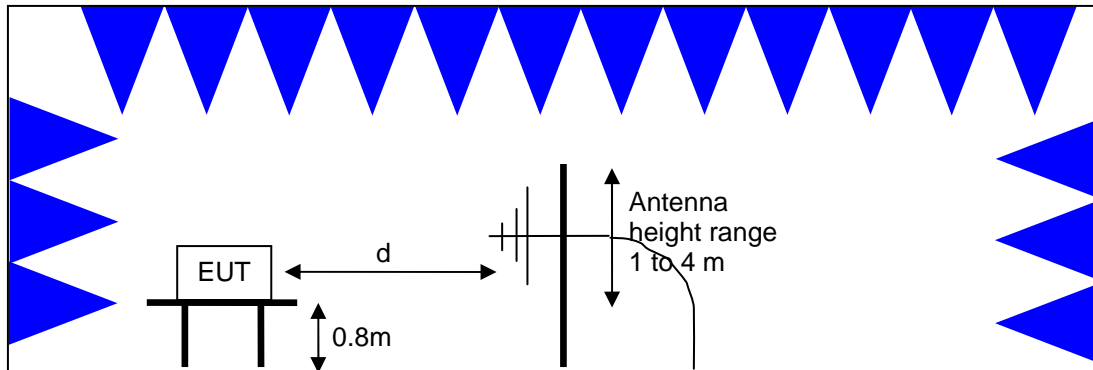


Typical Test Configuration for Radiated Field Strength Measurements



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 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 bands¹ (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

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).

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

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 Spurious Emissions, 30 - 25,000 MHz, 05-Feb-13**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/23/2013
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/10/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/12/2013
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	5/25/2013
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/25/2013

Radiated / Conducted Emissions, 06-Feb-13

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/12/2013
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	5/25/2013
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/22/2013
Hewlett Packard	Head (Inc W1-W4, 1946 , 1947) Purple	84125C	1772	5/1/2013
A.H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	4/17/2013
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/25/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/10/2013
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2671	5/25/2013

Appendix B Test Data

T90901 Pages 22 - 45



EMC Test Data

Client:	Pace	Job Number:	J90725
Product	PX031ANI	T-Log Number:	T90901
		Account Manager:	Michelle Kim
Contact:	Mark Rieger		
Emissions Standard(s):	FCC 15B, FCC 15.247, RSS-210	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Pace

Product

PX031ANI

Date of Last Test: 2/27/2013

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, 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 outside the chamber, with all I/O connections running under the groundplane & passing through a ferrite clamp upon exiting the chamber.

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

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 31 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	Zigbee	low	3	NA	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	39.2 dBµV/m @ 2390.0 MHz (-14.8 dB)
					Band Edge (2400 MHz)	15.247(c)	59.3 dBµV/m @ 2400.0 MHz (-18.4 dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	49.9 dBµV/m @ 3732.0 MHz (-4.1 dB)
1b		center			Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	49.7 dBµV/m @ 3732.1 MHz (-4.3 dB)
1c		high			Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	45.6 dBµV/m @ 2484.0 MHz (-8.4 dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	49.8 dBµV/m @ 3733.3 MHz (-4.2 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
		Account Manager:	Michelle Kim
Contact:	Mark Rieger		
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	N/A

Notes

The EUT has a fixed antenna, without provisions for a connector for test purposes. All measurements performed radiated

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

Run #1: Radiated Spurious Emissions, 30 - 25000 MHz, sample #1.

Date of Test: 1/31/2013 & 2/5/13
 Test Engineer: John Caizzi
 Test Location: Chamber 5

Run #1a: Low Channel @ 2405 MHz

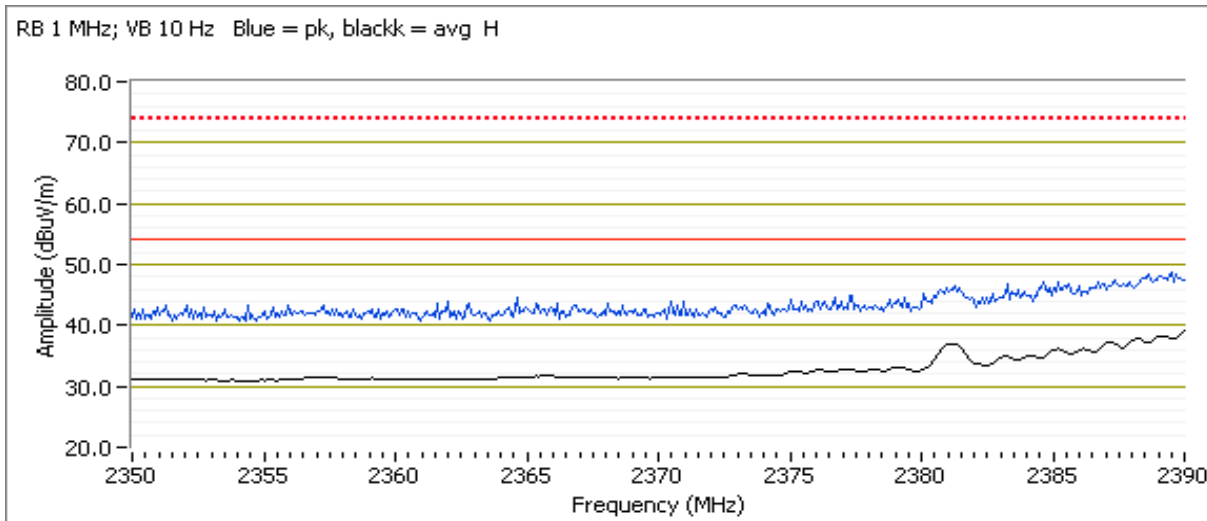
Fundamental Signal Field Strength: Peak measured in 100kHz/100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2404.940	84.6	V	-	-	Pk	179	1.00	Ant 0
2405.170	97.7	H	-	-	Pk	28	1.10	Ant 0
2404.970	83.8	V	-	-	Pk	347	1.17	Ant 1
2405.130	94.6	H	-	-	Pk	60	1.10	Ant 1

Fundamental emission level @ 3m in 100kHz RBW:	97.7	dB μ V/m	
Limit for emissions outside of restricted bands:	77.7	dB μ V/m	Limit is -20dBc (Peak power measurement)

Restricted Band Edge Signal Field Strength @ 2390MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	39.2	H	54.0	-14.8	AVG	40	1.11	
2388.000	47.7	H	74.0	-26.3	PK	40	1.11	

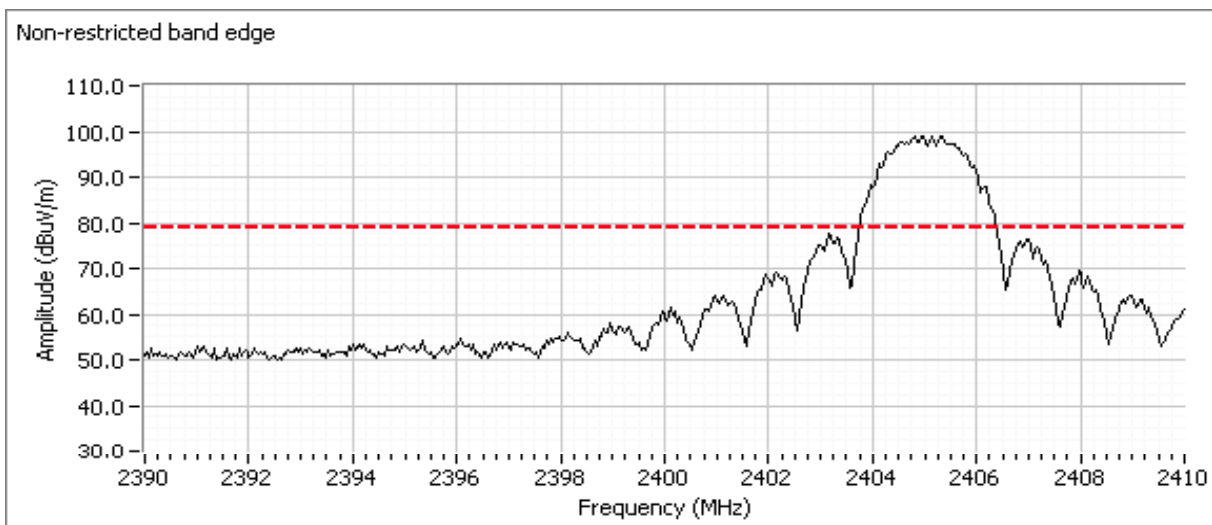


Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	N/A

Band Edge Signal Field Strength @ 2390-2400MHz

Measure 2390-2400MHz, using 100kHz/100kHz, limit based on -20dBc fundamental

Frequency	Level	Pol	15.2		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2400.020	59.3	H	77.7	-18.4	Peak	33	1.1	



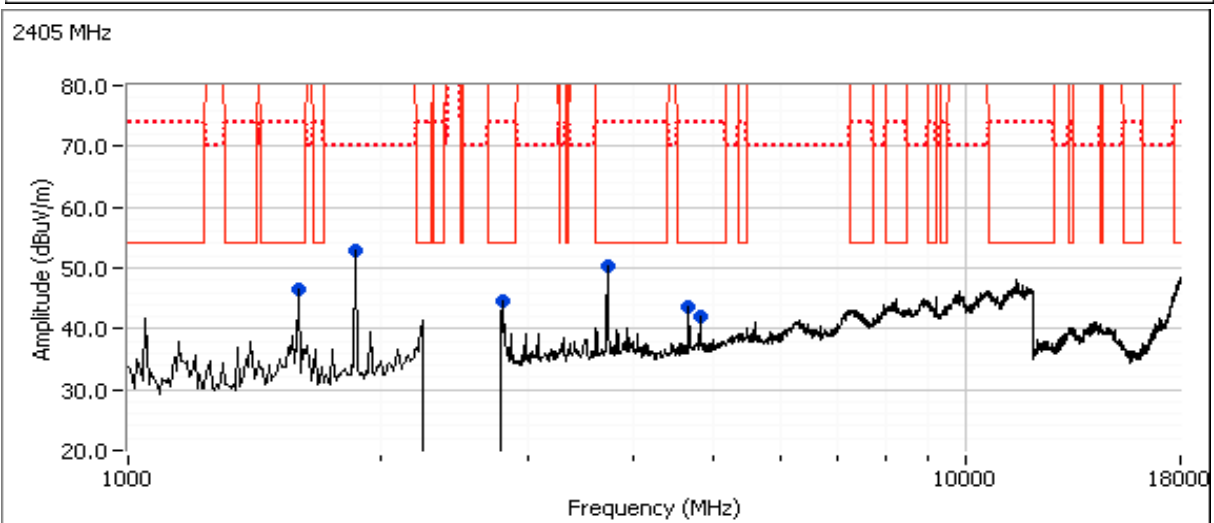
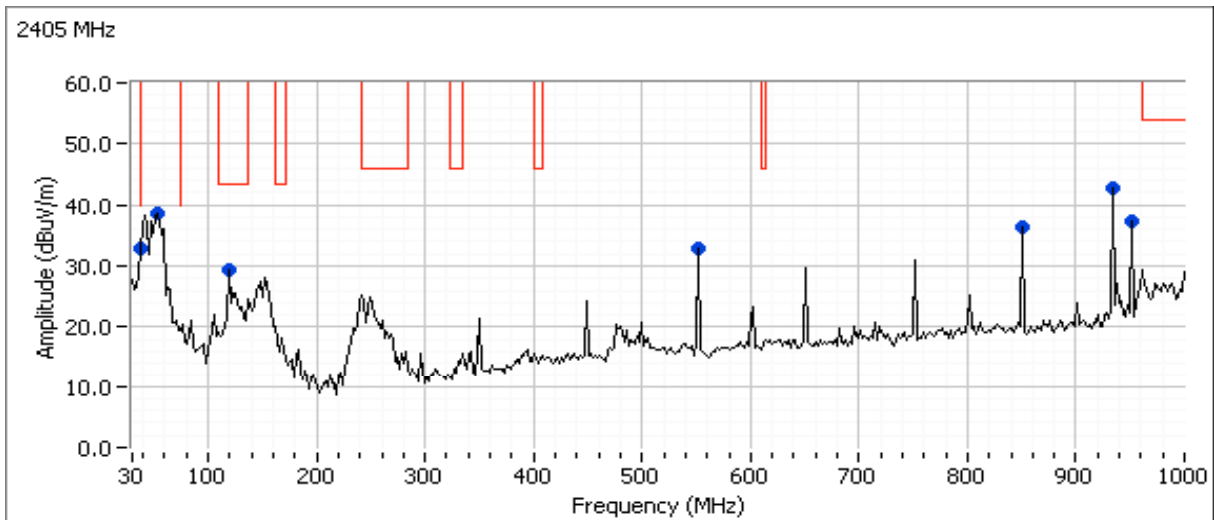
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
37.776	32.9	V	40.0	-7.1	Peak	294	1.0	
37.951	29.1	V	40.0	-10.9	QP	38	1.0	QP (1.00s)
53.327	38.6	V	77.7	-39.1	Peak	314	1.0	
119.419	29.3	V	43.5	-14.2	Peak	239	1.0	Note 2
550.962	32.8	H	77.7	-44.9	Peak	28	1.5	Note 2
850.321	36.5	H	77.7	-41.2	Peak	326	1.0	Note 2
933.908	42.8	H	77.7	-34.9	Peak	307	1.0	Note 2
951.403	37.2	H	77.7	-40.5	Peak	311	1.0	Note 2
3732.000	49.9	V	54.0	-4.1	AVG	9	1.32	
3732.360	53.5	V	74.0	-20.5	PK	9	1.32	
4664.940	43.2	V	54.0	-10.8	AVG	72	1.03	
4665.420	49.4	V	74.0	-24.6	PK	72	1.03	
4809.080	38.8	V	54.0	-15.2	AVG	111	1.00	
4810.880	47.9	V	74.0	-26.1	PK	111	1.00	
1599.960	44.7	H	54.0	-9.3	AVG	142	1.33	

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

1600.240	50.9	H	74.0	-23.1	PK	142	1.33	
1866.080	55.0	H	77.7	-22.7	Pk	117	1.12	RB = VB = 100kHz.
2799.080	44.6	V	54.0	-9.4	AVG	296	1.06	
2799.140	49.8	V	74.0	-24.2	PK	296	1.06	

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:	Emission measured previously on center channel.



Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	N/A

Run #1b: Center Channel @ 2440 MHz

Fundamental Signal Field Strength: peak value measured with RB = VB = 100kHz.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.770	97.0	H	-	-	Pk	29	1.08	Ant 0

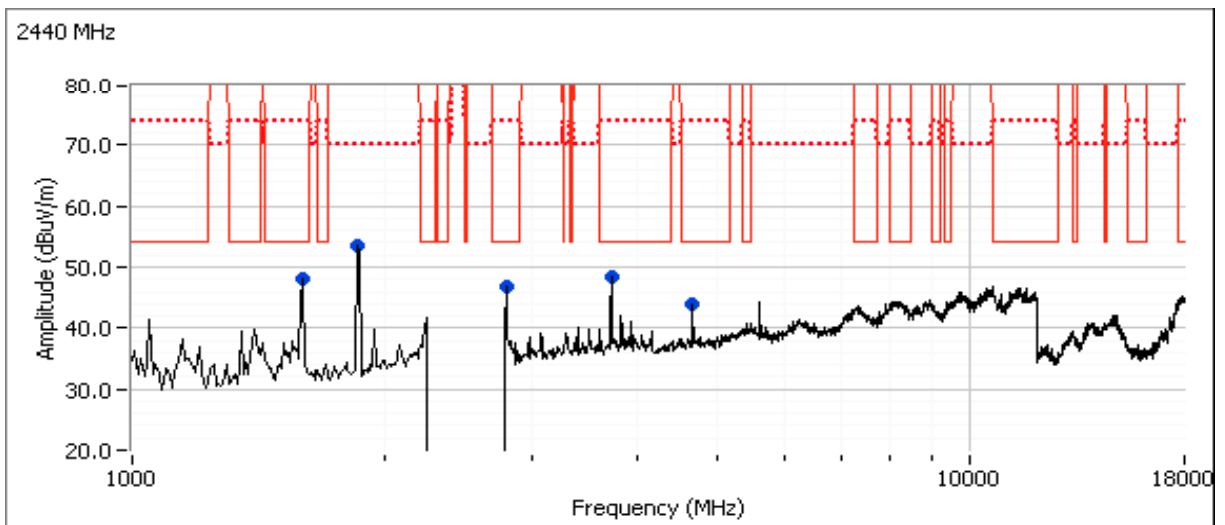
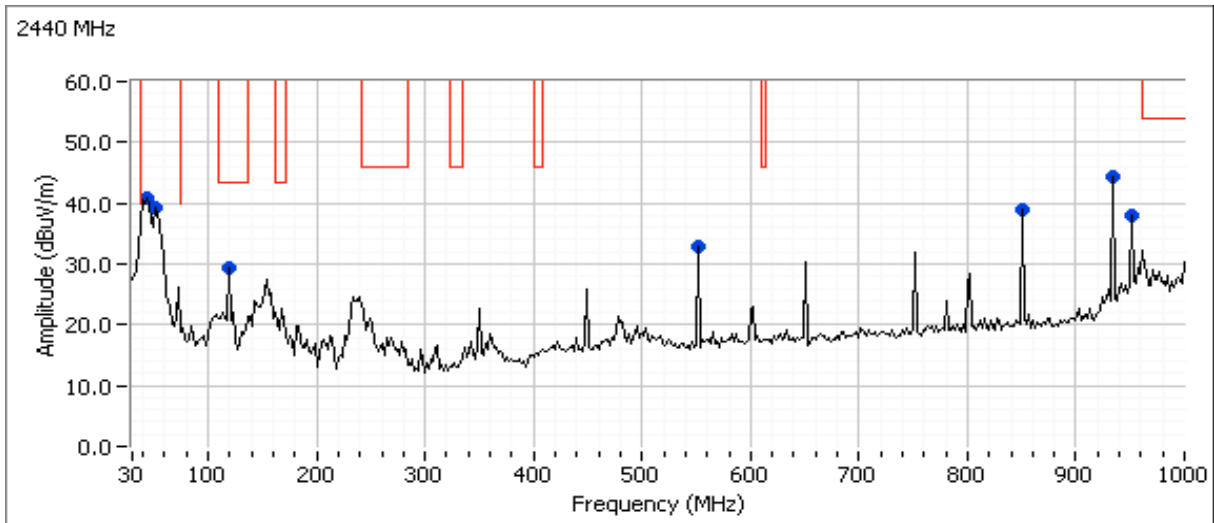
Fundamental emission level @ 3m in 100kHz RBW:	97.0	dBμV/m	Limit is -20dBc (Peak power measurement)
Limit for emissions outside of restricted bands:	77.0	dBμV/m	

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	
3732.050	49.7	V	54.0	-4.3	AVG	3	1.12	
3732.030	53.1	V	74.0	-20.9	PK	3	1.12	
4664.960	43.8	V	54.0	-10.2	AVG	69	1.00	
4664.630	50.0	V	74.0	-24.0	PK	69	1.00	
1866.110	54.5	H	77.0	-22.5	Pk	117	1.11	RB = VB = 100kHz.
1599.800	44.8	H	54.0	-9.2	AVG	149	1.29	
1600.830	50.9	H	74.0	-23.1	PK	149	1.29	
2798.990	45.1	V	54.0	-8.9	AVG	297	1.31	
2798.790	50.0	V	74.0	-24.0	PK	297	1.31	
120.013	28.9	H	43.5	-14.6	QP	121	2.96	
932.987	44.5	V	77.0	-32.5	Peak	359	2.50	RB = VB = 100kHz.
932.987	43.2	V	46.0	-2.8	QP	315	1.11	Note 2.
42.279	40.8	V	77.0	-36.2	Peak	282	1.00	RB = VB = 100kHz.
37.864	31.3	V	40.0	-8.7	QP	0	1.00	
52.779	39.1	V	77.0	-37.9	Peak	348	1.00	RB = VB = 100kHz.
850.321	39.0	H	77.0	-38.0	Peak	227	1.00	RB = VB = 100kHz.
951.403	37.9	H	77.0	-39.1	Peak	300	1.50	RB = VB = 100kHz.
550.962	32.9	H	77.0	-44.1	Peak	37	1.50	RB = VB = 100kHz.

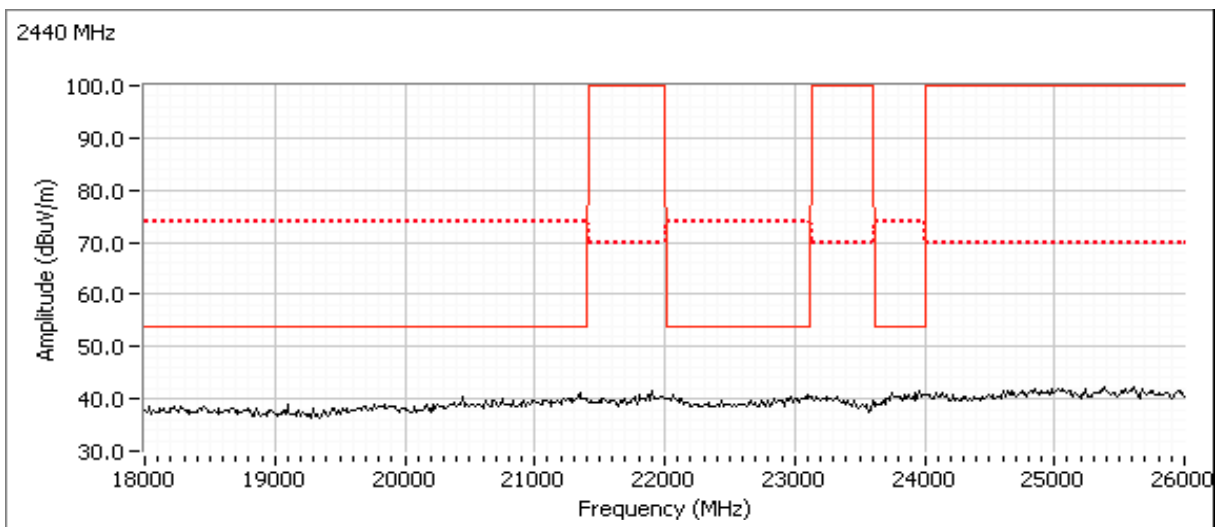
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	QP measurement vs Class B limit, measured at customer's request.
Note 3:	There were no emission observed between 18 GHz and 26 GHz hence low and high channel tests are not performed

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A



Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	N/A

Date of Test: 2/6/2013
 Test Engineer: Deniz Demirci
 Test Location: FT Ch# 4



Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

Run #1c: High Channel @ 2475 MHz

Date of Test: 1/31/2013 & 2/5/13
 Test Engineer: John Caizzi
 Test Location: Chamber 5

Fundamental Signal Field Strength: peak value measured with RB = VB = 100kHz.

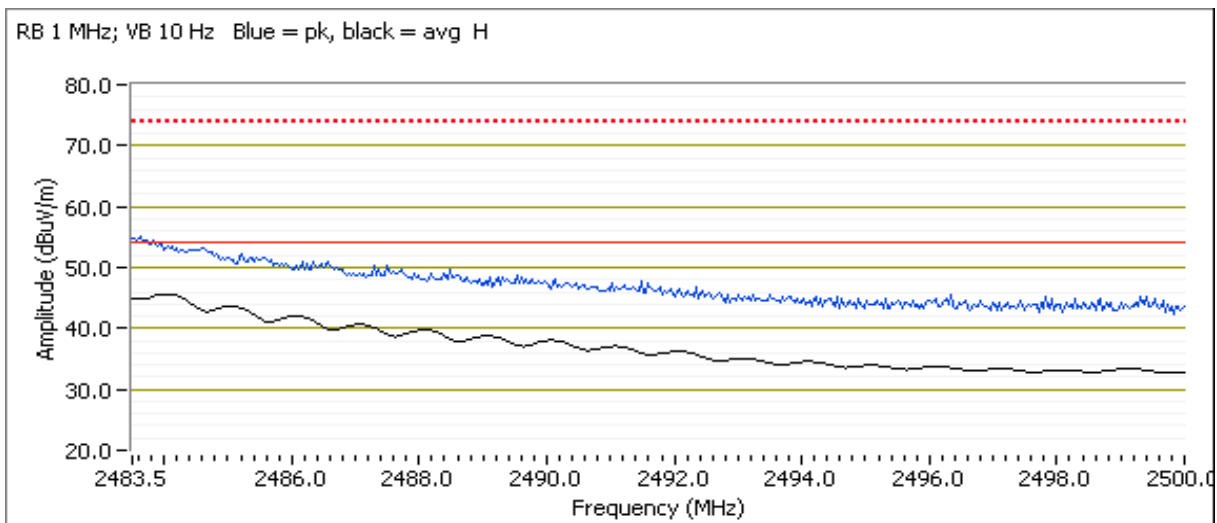
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2474.950	97.6	H	-	-	Pk	26	1.07	Ant 0

Fundamental emission level @ 3m in 100kHz RBW:	97.6	dB μ V/m
Limit for emissions outside of restricted bands:	77.6	dB μ V/m

Limit is -20dBc (Peak power measurement)

Restricted Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.030	45.6	H	54.0	-8.4	AVG	31	1.07	
2483.760	55.2	H	74.0	-18.8	PK	31	1.07	



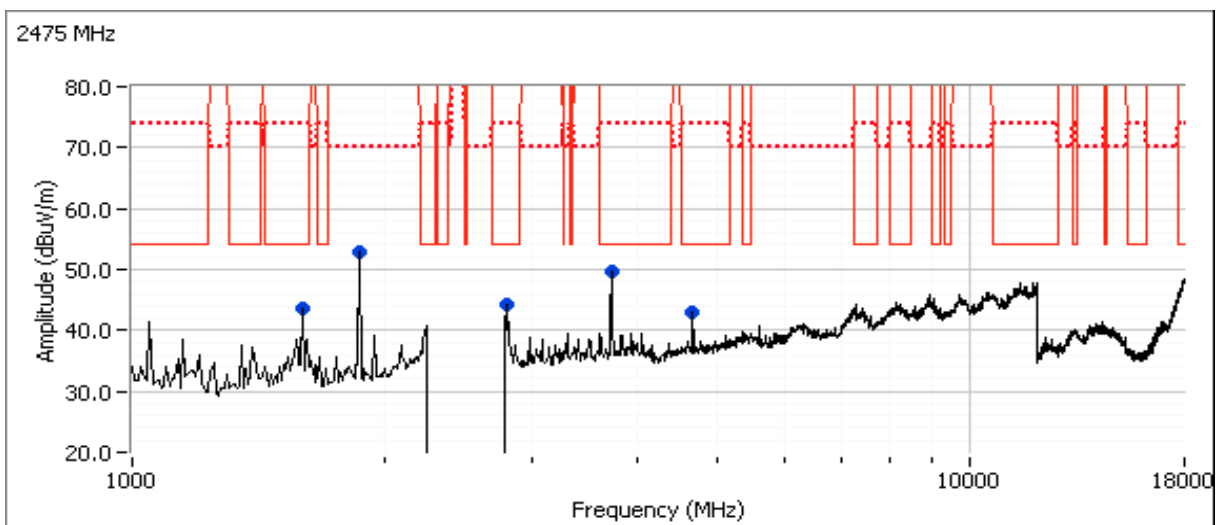
Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

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	
39.719	35.6	V	77.6	-42.0	Peak	72	1.0	RB = VB = 100kHz.
53.327	36.0	V	77.6	-41.6	Peak	42	1.0	RB = VB = 100kHz.
119.419	32.1	V	43.5	-11.4	Peak	123	1.0	RB = VB = 100kHz.
120.014	31.0	V	43.5	-12.5	QP	116	0.9	QP (1.00s)
241.884	26.9	H	46.0	-19.1	Peak	355	2.0	RB = VB = 100kHz.
242.767	26.2	H	46.0	-19.8	QP	357	2.0	QP (1.00s)
850.321	36.9	H	77.6	-40.7	Peak	217	1.0	RB = VB = 100kHz.
933.908	46.1	H	77.6	-31.5	Peak	298	1.0	RB = VB = 100kHz.
3733.330	49.8	V	54.0	-4.2	Peak	358	1.0	Note 2
2800.000	44.2	H	54.0	-9.8	Peak	86	1.0	Note 2
1600.000	43.7	H	54.0	-10.3	Peak	138	1.0	Note 2
4666.670	43.1	V	54.0	-10.9	Peak	66	1.0	Note 2
1866.670	53.0	H	77.6	-24.6	Peak	117	1.5	Note 2

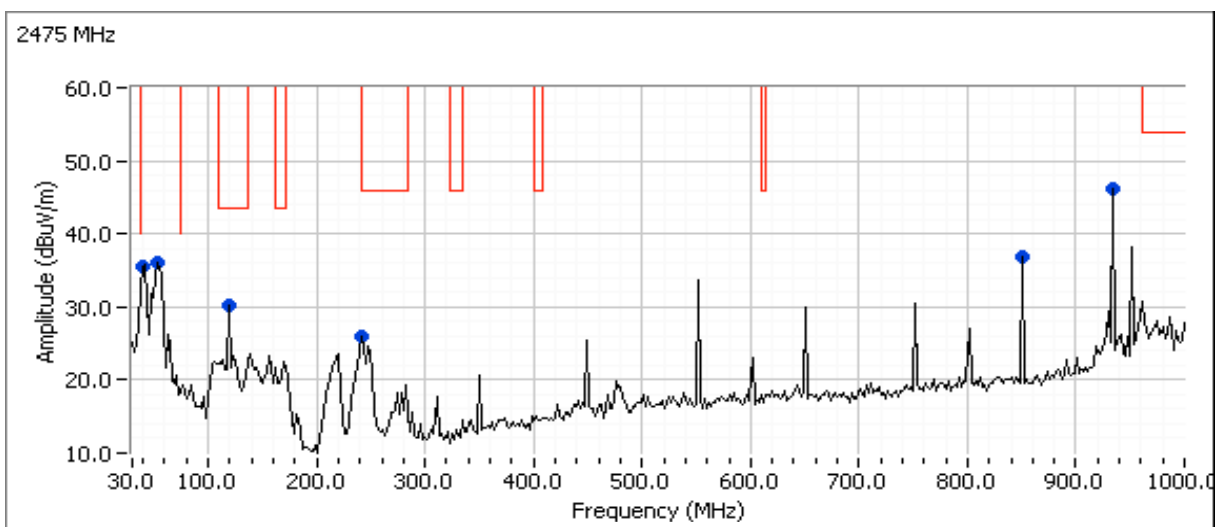
Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: Emission was measured on previous channels.



Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	N/A

Date of Test: 2/6/2013
 Test Engineer: Deniz Demirci
 Test Location: FT Ch# 4



Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, 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: 1/31/2013
 Test Engineer: John Caizzi
 Test Location: Chamber 5

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

General Test Configuration

The EUT does not provide an RF connector. All measurements performed radiated. For power and PSD measurements, the field strength was maximized at a distance of 3m.

All measurements have been corrected for any antennas, cables or attenuators used.

Ambient Conditions:

Temperature: 20 °C
 Rel. Humidity: 31 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	3		Output Power	15.247(b)	Pass	6.9 dBm (4.9mW)
2	3		Power spectral Density (PSD)	15.247(d)	Pass	-12.9 dBm/3kHz
3	3		Minimum 6dB Bandwidth	15.247(a)	Pass	1.403 MHz
3	3		99% Bandwidth	RSS GEN	-	2.320 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.

Notes

The EUT has a fixed antenna, without provisions for a connector for test purposes. All measurements performed radiated

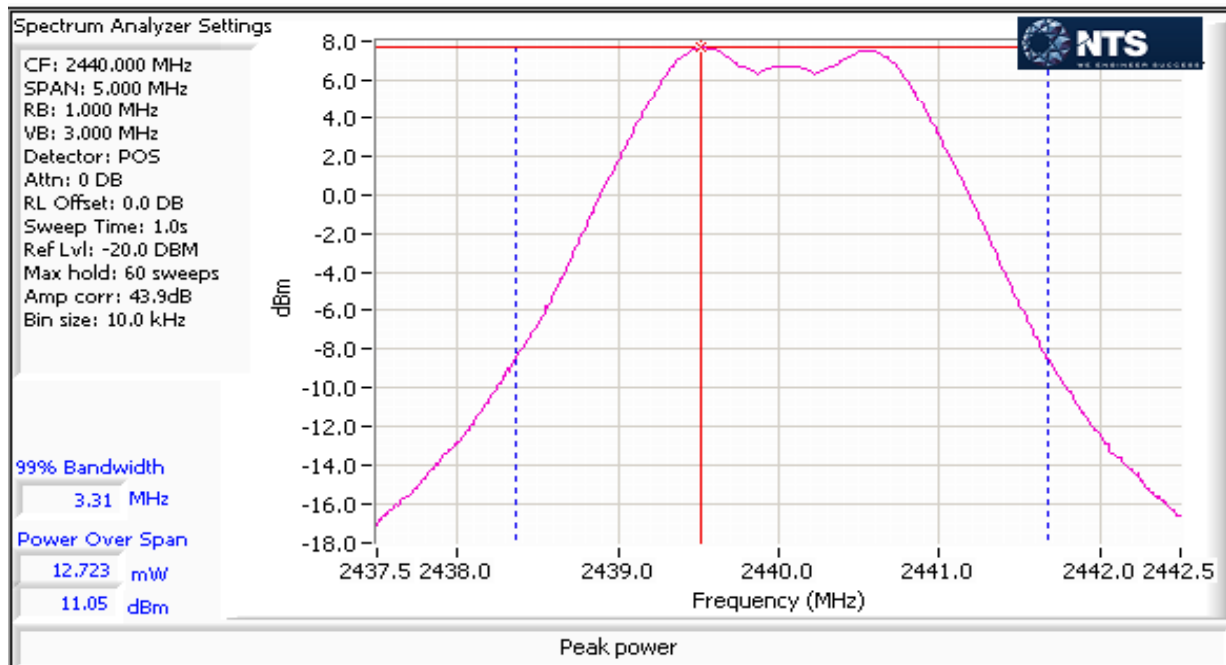
Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

Run #1: Output Power, sample #1.

Date of Test: 1/31/2013
 Test Engineer: John Caizzi
 Test Location: Chamber 5

Power Setting ²	Frequency (MHz)	EIRP ¹ dBm	EIRP ¹ W	Antenna Gain (dBi)	Output Power (dBm) ¹	Output Power mW	Result
3	2405	10.1	0.010	4.2	6.0	3.9	Pass
3	2440	11.1	0.013	4.2	6.9	4.9	Pass
3	2475	10.1	0.010	4.2	6.0	4.0	Pass

Note 1: Output power measured radiated using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 3 MHz (8.1.2, Option #2 of KDB 558074). Spurious limit becomes -20dBc. Output power calculated from the eirp value measured.





EMC Test Data

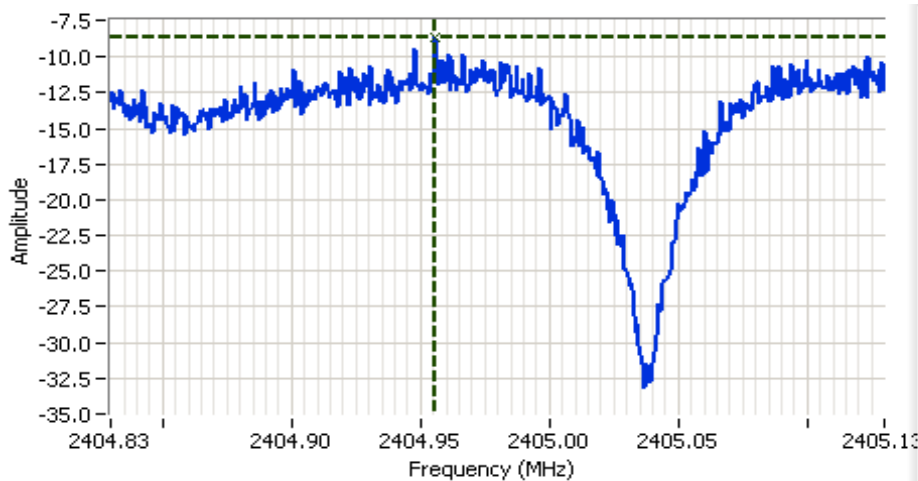
Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

Run #2: Power spectral Density, sample #1.

Date of Test: 1/31/2013
 Test Engineer: John Caizzi
 Test Location: Chamber 5

Power Setting	Frequency (MHz)	PSD (eirp) (dBm/3kHz) ^{Note 1}	Antenna Gain (dBi)	PSD (dBm/3kHz) ^{Note 1}	Limit dBm/3kHz	Result
3	2405	-8.7	4.2	-12.9	8.0	Pass
3	2440	-8.9	4.2	-13.1	8.0	Pass
3	2475	-9.5	4.2	-13.7	8.0	Pass

Note 1: Power spectral density measured radiated 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. Final PSD calculated from the measured eirp value.



Analyzer Settings

Rohde&Schwarz, ESI
 CF: 2404.980 MHz
 SPAN: 300 kHz
 RB: 3.00 kHz
 VB: 10.0 kHz
 Detector: POS
 Attn: 0 DB
 RL Offset: 43.7 DB
 Sweep Time: 100.0s
 Ref Lvl: 13.1 DBM

Comments

PSD = -8.73 dBm/3kHz

Cursor 1	2404.9555	-8.73	
	0.0000	0.00	



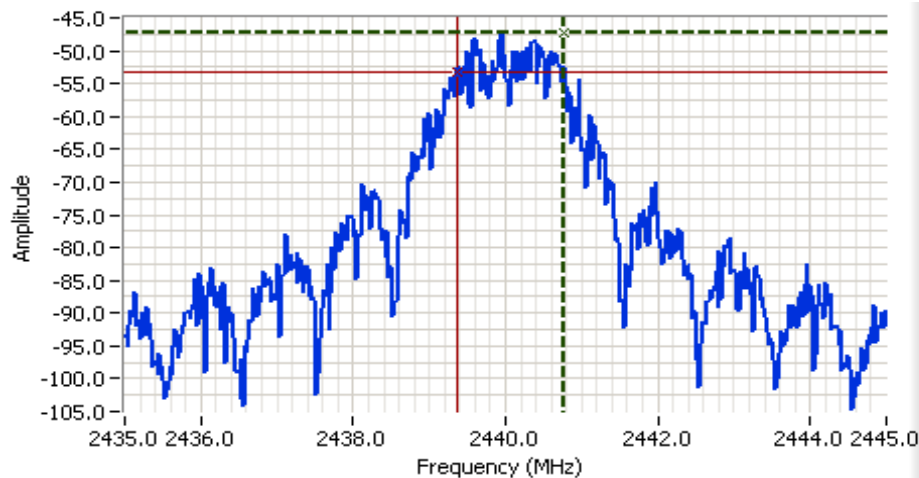
Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A

Run #3: Signal Bandwidth, sample #1.

Date of Test: 1/31/2013
 Test Engineer: John Caizzi
 Test Location: Chamber 5

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
3	2405	30 kHz	1.563	2.290
3	2440	30 kHz	1.403	2.290
3	2475	30 kHz	1.483	2.320

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



Analyzer Settings

Rohde&Schwarz, ESI
 CF: 2440.000 MHz
 SPAN: 10.000 MHz
 RB: 30.0 kHz
 VB: 100 kHz
 Detector: POS
 Attn: 0 DB
 RL Offset: 0.0 DB
 Sweep Time: 28.0ms
 Ref Lvl: -35.0 DBM

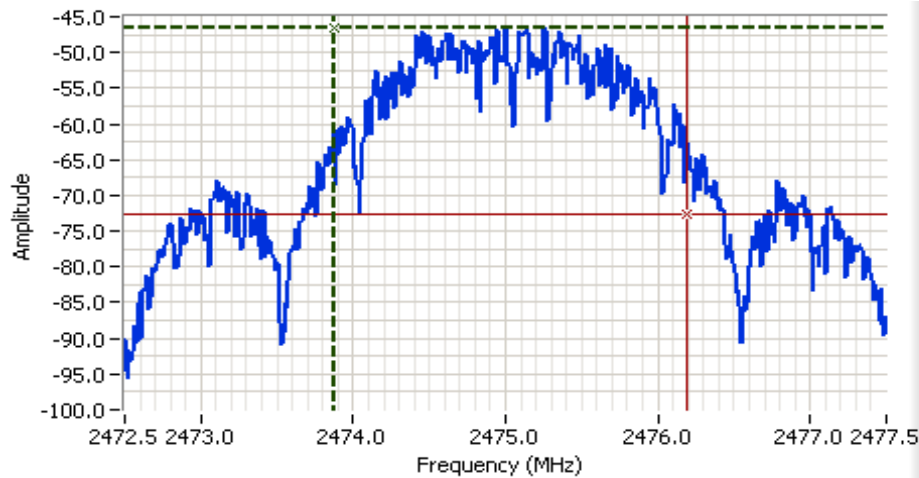
Comments

6dB BW: 1.403 MHz

Cursor 1	2440.7715	-47.28	
Cursor 2	2439.3687	-53.28	

Delta Freq. 1.403
 Delta Amplitude 6.00

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: N/A









Analyzer Settings

Rohde&Schwarz, ESI
 CF: 2475.000 MHz
 SPAN: 5.000 MHz
 RB: 50.0 kHz
 VB: 200 kHz
 Detector: POS
 Attn: 0 dB
 RL Offset: 0.0 dB
 Sweep Time: 5.0ms
 Ref Lvl: -35.0 DBM

Comments

99% power BW: 2.320 MHz

Cursor 1	2473.8700	-46.64			
Cursor 2	2476.1900	-72.64			

Delta Freq. 2.320

Delta Amplitude 26.00

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	B

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: 2/6/2013
 Test Engineer: Deniz Demirci
 Test Location: FT Ch# 4

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. Remote support equipment was located outside of 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.

Ambient Conditions:

Temperature:	20 °C
Rel. Humidity:	31 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	15.207 / Class B	Pass	32.8 dBμV @ 0.360 MHz (-15.9 dB)
2	CE, AC Power, 120V/60Hz	15.207 / Class B	Pass	34.0 dBμV @ 3.162 MHz (-12.0 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.



EMC Test Data

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	B

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

With AcBel Power supply model:WAC002, EUT is transmitting at center channel, max. power

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

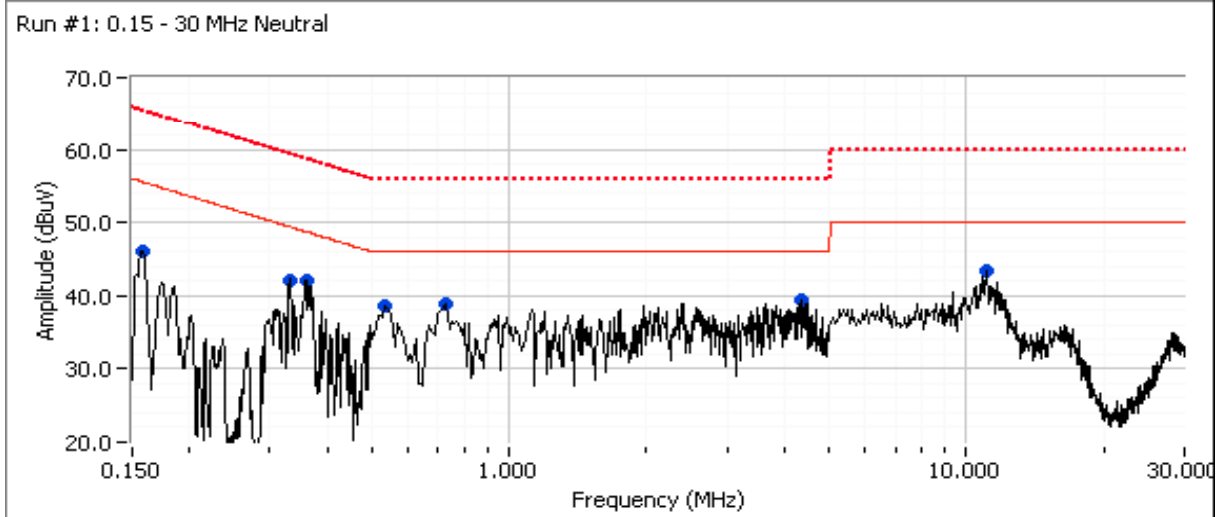
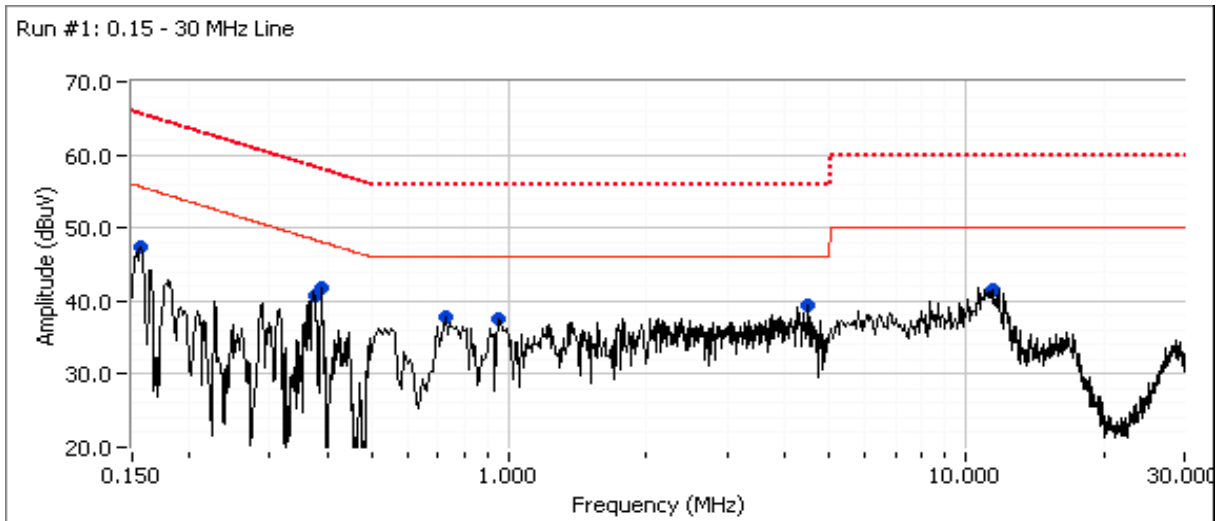
Frequency MHz	Level dB μ V	AC Line	15.207 / Class B Limit Margin		Detector QP/Ave	Comments
0.156	47.5	Line 1	55.7	-8.2	Peak	
0.375	40.8	Line 1	48.4	-7.6	Peak	
0.390	41.7	Line 1	48.1	-6.4	Peak	
0.726	37.8	Line 1	46.0	-8.2	Peak	
0.951	37.6	Line 1	46.0	-8.4	Peak	
4.495	39.3	Line 1	46.0	-6.7	Peak	
11.413	41.6	Line 1	50.0	-8.4	Peak	
0.158	46.1	Neutral	55.6	-9.5	Peak	
0.332	42.2	Neutral	49.4	-7.2	Peak	
0.360	42.2	Neutral	48.7	-6.5	Peak	
0.530	38.5	Neutral	46.0	-7.5	Peak	
0.728	38.9	Neutral	46.0	-7.1	Peak	
4.334	39.4	Neutral	46.0	-6.6	Peak	
11.161	43.4	Neutral	50.0	-6.6	Peak	

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	B

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	15.207 / Class B Limit	Margin	Detector QP/Ave	Comments
0.360	32.8	Neutral	48.7	-15.9	AVG	AVG (0.10s)
0.375	41.2	Line 1	58.4	-17.2	QP	QP (1.00s)
0.360	41.4	Neutral	58.7	-17.3	QP	QP (1.00s)
0.391	30.6	Line 1	48.0	-17.4	AVG	AVG (0.10s)
0.332	41.8	Neutral	59.4	-17.6	QP	QP (1.00s)
11.161	32.0	Neutral	50.0	-18.0	AVG	AVG (0.10s)
0.728	38.0	Neutral	56.0	-18.0	QP	QP (1.00s)
0.391	39.7	Line 1	58.0	-18.3	QP	QP (1.00s)
4.487	27.4	Line 1	46.0	-18.6	AVG	AVG (0.10s)
0.730	37.2	Line 1	56.0	-18.8	QP	QP (1.00s)
0.728	26.9	Neutral	46.0	-19.1	AVG	AVG (0.10s)
0.375	29.2	Line 1	48.4	-19.2	AVG	AVG (0.10s)
0.958	36.8	Line 1	56.0	-19.2	QP	QP (1.00s)
0.958	26.6	Line 1	46.0	-19.4	AVG	AVG (0.10s)
11.415	30.6	Line 1	50.0	-19.4	AVG	AVG (0.10s)
0.332	30.0	Neutral	49.4	-19.4	AVG	AVG (0.10s)
0.530	36.3	Neutral	56.0	-19.7	QP	QP (1.00s)
4.334	26.1	Neutral	46.0	-19.9	AVG	AVG (0.10s)
4.334	35.8	Neutral	56.0	-20.2	QP	QP (1.00s)
0.730	25.5	Line 1	46.0	-20.5	AVG	AVG (0.10s)
0.530	25.3	Neutral	46.0	-20.7	AVG	AVG (0.10s)
4.487	35.3	Line 1	56.0	-20.7	QP	QP (1.00s)
0.156	44.8	Line 1	65.7	-20.9	QP	QP (1.00s)
11.161	38.7	Neutral	60.0	-21.3	QP	QP (1.00s)
0.156	34.3	Line 1	55.7	-21.4	AVG	AVG (0.10s)
11.415	37.9	Line 1	60.0	-22.1	QP	QP (1.00s)
0.157	42.0	Neutral	65.6	-23.6	QP	QP (1.00s)
0.157	29.1	Neutral	55.6	-26.5	AVG	AVG (0.10s)

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: B





EMC Test Data

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	B

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

With NetBit Power supply model:NBS15A050300HU, EUT is transmitting at center channel, max. power

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

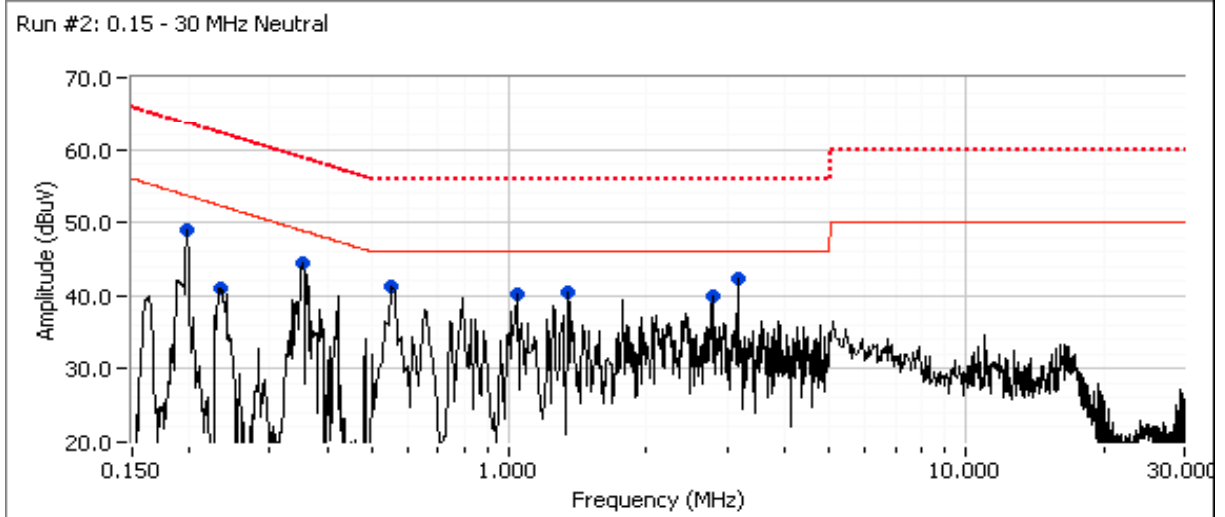
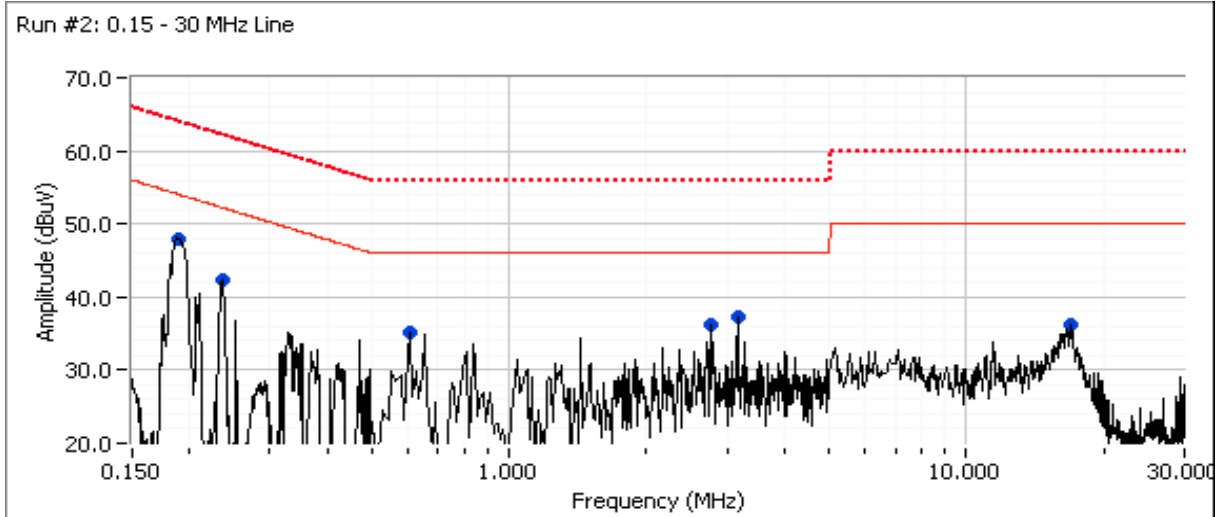
Frequency MHz	Level dB μ V	AC Line	15.207 / Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.189	47.8	Line 1	54.1	-6.3	Peak	
0.236	42.4	Line 1	52.2	-9.8	Peak	
3.160	37.4	Line 1	46.0	-8.6	Peak	
2.773	36.2	Line 1	46.0	-9.8	Peak	
0.608	35.2	Line 1	46.0	-10.8	Peak	
16.974	36.2	Line 1	50.0	-13.8	Peak	
0.198	49.0	Neutral	53.7	-4.7	Peak	
0.234	41.0	Neutral	52.3	-11.3	Peak	
0.354	44.5	Neutral	48.9	-4.4	Peak	
0.554	41.2	Neutral	46.0	-4.8	Peak	
1.041	40.3	Neutral	46.0	-5.7	Peak	
1.348	40.5	Neutral	46.0	-5.5	Peak	
2.782	39.9	Neutral	46.0	-6.1	Peak	
3.169	42.3	Neutral	46.0	-3.7	Peak	

Client:	Pace	Job Number:	J90725
Model:	PX031ANI	T-Log Number:	T90901
Contact:	Mark Rieger	Account Manager:	Michelle Kim
Standard:	FCC 15B, FCC 15.247, RSS-210	Class:	B

Final quasi-peak and average readings

Frequency MHz	Level dBμV	AC Line	15.207 / Class B Limit	Margin	Detector QP/Ave	Comments
3.162	34.0	Line 1	46.0	-12.0	AVG	AVG (0.10s)
3.162	32.2	Neutral	46.0	-13.8	AVG	AVG (0.10s)
2.777	30.8	Neutral	46.0	-15.2	AVG	AVG (0.10s)
2.776	29.6	Line 1	46.0	-16.4	AVG	AVG (0.10s)
0.355	41.7	Neutral	58.8	-17.1	QP	QP (1.00s)
0.557	38.9	Neutral	56.0	-17.1	QP	QP (1.00s)
3.162	38.4	Neutral	56.0	-17.6	QP	QP (1.00s)
0.189	46.2	Line 1	64.1	-17.9	QP	QP (1.00s)
3.162	37.5	Line 1	56.0	-18.5	QP	QP (1.00s)
2.777	36.7	Neutral	56.0	-19.3	QP	QP (1.00s)
1.037	36.3	Neutral	56.0	-19.7	QP	QP (1.00s)
0.197	43.8	Neutral	63.7	-19.9	QP	QP (1.00s)
2.776	36.0	Line 1	56.0	-20.0	QP	QP (1.00s)
0.355	28.7	Neutral	48.8	-20.1	AVG	AVG (0.10s)
0.237	42.1	Line 1	62.2	-20.1	QP	QP (1.00s)
1.347	34.9	Neutral	56.0	-21.1	QP	QP (1.00s)
0.189	32.8	Line 1	54.1	-21.3	AVG	AVG (0.10s)
0.234	40.9	Neutral	62.3	-21.4	QP	QP (1.00s)
0.234	29.0	Neutral	52.3	-23.3	AVG	AVG (0.10s)
1.037	22.2	Neutral	46.0	-23.8	AVG	AVG (0.10s)
0.603	32.0	Line 1	56.0	-24.0	QP	QP (1.00s)
16.994	25.8	Line 1	50.0	-24.2	AVG	AVG (0.10s)
0.237	26.7	Line 1	52.2	-25.5	AVG	AVG (0.10s)
0.197	26.0	Neutral	53.7	-27.7	AVG	AVG (0.10s)
0.603	18.1	Line 1	46.0	-27.9	AVG	AVG (0.10s)
16.994	31.3	Line 1	60.0	-28.7	QP	QP (1.00s)
1.347	17.1	Neutral	46.0	-28.9	AVG	AVG (0.10s)
0.557	16.8	Neutral	46.0	-29.2	AVG	AVG (0.10s)

Client: Pace	Job Number: J90725
Model: PX031ANI	T-Log Number: T90901
Contact: Mark Rieger	Account Manager: Michelle Kim
Standard: FCC 15B, FCC 15.247, RSS-210	Class: B



End of Report

This page is intentionally blank and marks the last page of this test report.