NTS Silicon Valley
www.nts.com
41039 Boyce Road
Fremont, CA 94538
510-578-3500 Phone
510-440-9525 Fax

# *EMC Test Report*

## *Application for Grant of Equipment Authorization*
## *Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8*
## *FCC Part 15 Subpart C*

## *ITrip Auto Universal model: P12382*

| | |
|---|---|
| IC CERTIFICATION #: | 6384A-P12382 |
| FCC ID: | PAV1131I |
| APPLICANT: | Griffin Technology<br>2030 Lindell Avenue<br>Nashville, TN 37203 |
| TEST SITE(S): | National Technical Systems - Silicon Valley<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845B-5 |
| REPORT DATE: | April 18, 2013 |
| REISSUED DATE: | May 17, 2013 |
| FINAL TEST DATES: | December 14, 2012 and January 10, 2013 |
| TOTAL NUMBER OF PAGES: | 33 |

PROGRAM MGR /
TECHNICAL REVIEWER:

Mark E Hill
Staff Engineer

QUALITY ASSURANCE DELEGATE /
FINAL REPORT PREPARER:

David Guidotti
Senior Technical Writer

A2LA ACCREDITED
Testing Cert #0214.26

## *REVISION HISTORY*

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| - | 04-18-2013 | First release | |
| 1.0 | 05-17-2013 | Added bandwidth results using 2.5kHz audio source | MEH |

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## *SCOPE*

An electromagnetic emissions test has been performed on the Griffin Technology iTrip Auto Universal model P12382, 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

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 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.).

Testing was performed only on iTrip Auto Universal model P12382. This model was considered representative of the following models:

P11312. The P11312 has the same radio circuitry as the P12382. They differ in the way that that audio input comes from the MP3 player. The P11312 connects to an Apple iPod via the 30pin connector. The P12382 connects to any MP3 player via the analog audio output.

## *STATEMENT OF COMPLIANCE*

The tested sample of Griffin Technology iTrip Auto Universal model P12382 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 Griffin Technology iTrip Auto Universal model P12382 and therefore apply only to the tested sample. The sample was selected and prepared by Michael O'Connor of Griffin Technology.

## *DEVIATIONS FROM THE STANDARDS*

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

## *TEST RESULTS SUMMARY*

### *DEVICES OPERATING IN THE 88-108 MHz FM BAND*

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.239 (a) | RSS 210 A2.8 | Bandwidth and operating range | 169kHz | Bandwidth less than 200kHz contained in the 88 – 108 MHz band | Complies |
| 15.239 (b) | RSS 210 A2.8 (1) | Fundamental Field Strength | 47.6 dBµV/m @ 98.100 MHz (-0.4 dB) | 250uV/m at 3m | Complies |
| - | RSS 210 A2.8 (2) | Fundamental Signal Strength - 88.1; 88.3; 88.5; 107.7; 107.9 and MHz | 47.6 dBµV/m @ 98.100 MHz (-0.4 dB) | 1000uV/m at 30m | Complies |
| 15.239 (c) / 15.209 | RSS 210 Table 2 | Radiated Spurious Emissions, 30 – 540 MHz | 42.2 dBµV/m @ 140.29 MHz (-1.3 dB) | Refer to table in limits section on page 18 | Complies |

### *GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS*

| FCC Rule Part | RSS Rule part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.203 | - | RF Connector | Antenna is integral to the device | Unique or integral antenna required | Complies |
| 15.207 | RSS GEN Table 2 | AC Conducted Emissions | N/A – The EUT is powered via 12V automotive cigarette lighter adapter. Note 1 | | |
| 15.109 | RSS GEN 7.2.3 Table 1 | Receiver spurious emissions | 42.2 dBµV/m @ 140.29 MHz (-1.3 dB) – Note 2 | Refer to page 18 | Complies |
| 15.247 (b) (5) 15.407 (f) | RSS 102 | RF Exposure Requirements | Refer to RSS 102 declaration | Refer to OET 65, FCC Part 1 and RSS 102 | Complies |
| - | RSP 100 RSS GEN 4.4.1 | 99% Bandwidth | 161kHz | For information only | N/A |

Note 1 – The EUT is powered from a 12VDC automotive cigarette lighter adapter. The iTrip Auto SE (P1131) does pass the power thru to the iPod for charging of the iPod.
Note 2 – Preliminary testing showed that emissions during the receive operation were equal to or less than the emissions during the transmit operation.

*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 Griffin Technology iTrip Auto Universal model P12382 is a 12V CLA Powered FM Transmitter which is designed to work with iOS devices / Smartphones and Digital Audio Players for in car use. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is (12-16) VDC, 2 Amps.

The sample was received on December 14, 2012 and tested on December 14, 2012 and January 10, 2013. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Griffin Technology | P12382 | 12VDC CLA powered FM Transmitter for iOS devices/Smartphones/DigitalAudioplayers | N/A | PAV1131I |

### OTHER EUT INFORMATION

The iTrip Auto SE (P11312) and the iTrip Auto Universal Plus SE (P12382) use the same radio circuitry and power configuration. They differ in the way that the audio input comes from the MP3 player. The iTrip Auto SE connects to an Apple iPod via the 30pin connector. The iTrip Auto Universal Plus SE (P12382) connects to any MP3 player via the analog audio output.

### ANTENNA SYSTEM

The antenna is integral to the device

### ENCLOSURE

The EUT enclosure measures approximately 6.6 by 1.2 by 2.9 centimeters. It is primarily constructed of plastic.

### 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 |
|---|---|---|---|---|
| Apple | iPod | 8Gb iPod | NA | - |

No remote support equipment was used during testing.

*EUT INTERFACE PORTS*

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

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Cigarette lighter adapter | 12V battery | Power Port | Unshielded | 0.5 |

*EUT OPERATION*

During emissions testing, the EUT was configured to play an audio file in a continuous loop. The audio file was comprised of instrumental music.

Additional bandwidth measurements were performed using a 2.5kHz audio source, per RSS-210. At the maximum input, the maximum FM deviation observed was 68kHz. Use of this source did not affect the fundamental field strength levels or the spurious emissions.

## *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 | | | 41039 Boyce Road<br>Fremont,<br>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.

### *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.

*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.

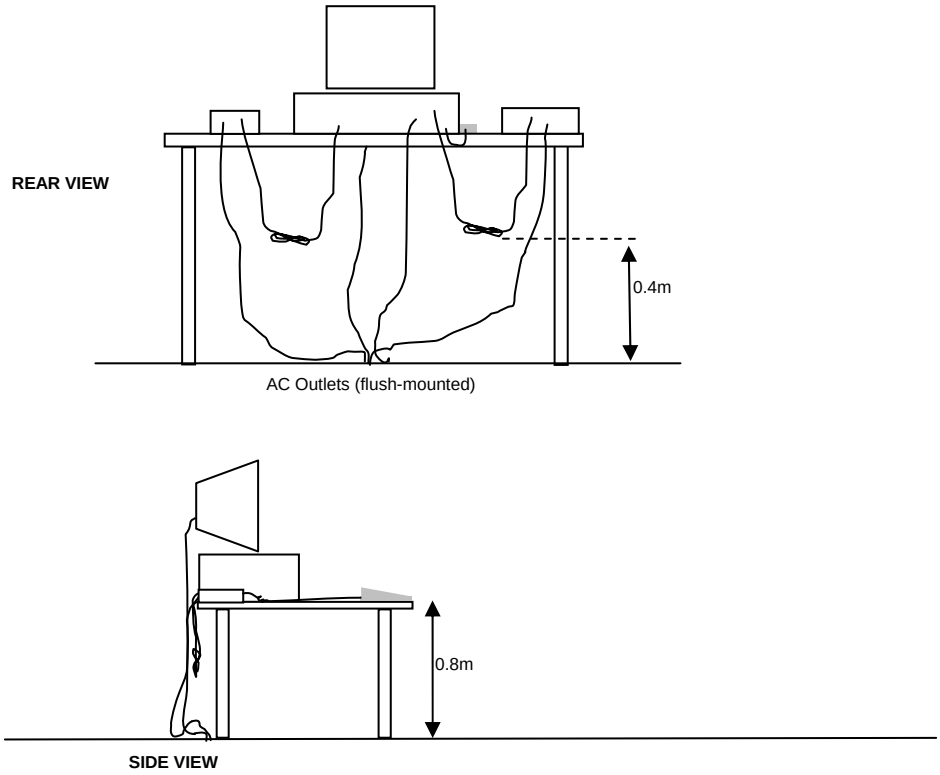
*RADIATED EMISSIONS*

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

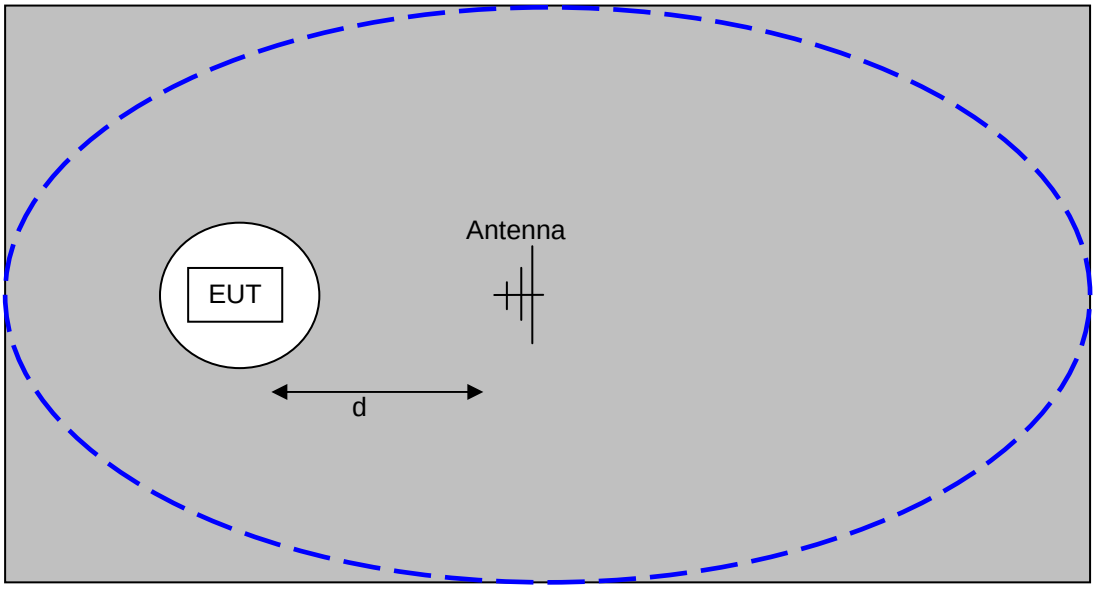
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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

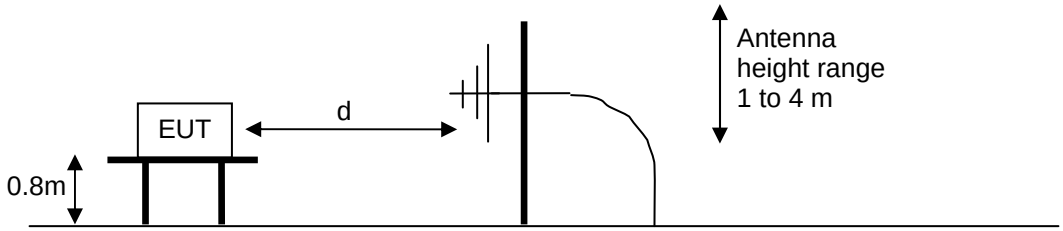
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



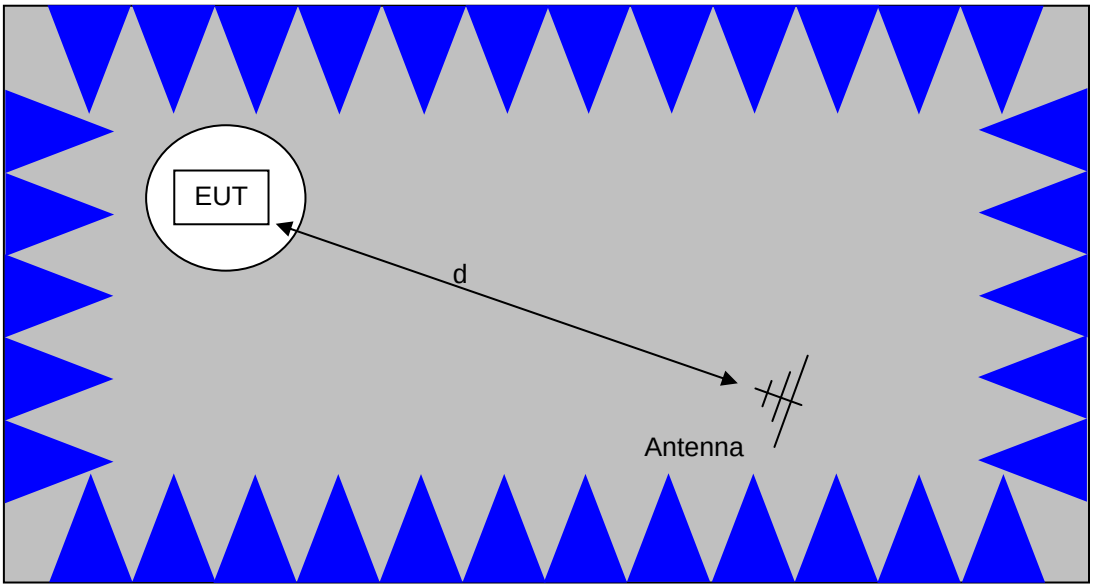

Typical Test Configuration for Radiated Field Strength Measurements




The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.

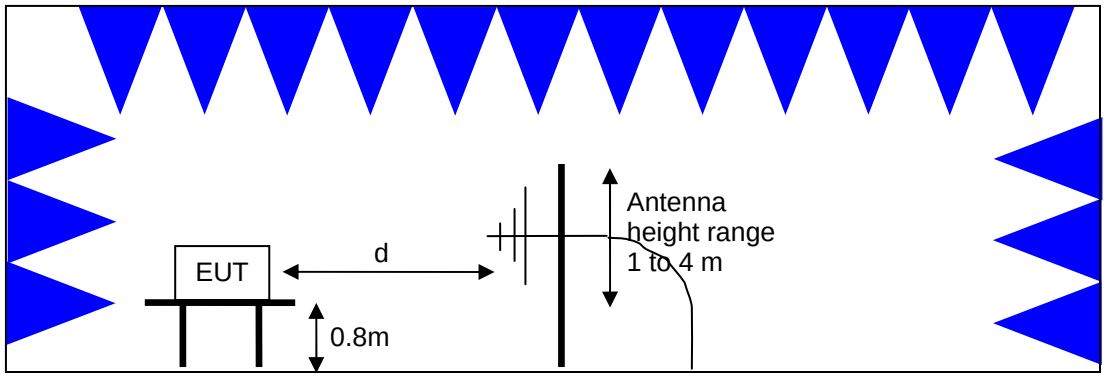



Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views




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 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 |

*RADIATEDFUNDAMENTAL & SPURIOUS EMISSIONS SPECIFICATION LIMITS – 15.239 and RSS 210 A2.9*

| Frequency Range (MHz) | Limit for Fundamental @ 3m | Limit for all signals outside of the occupied bandwidth @ 3m |
|---|---|---|
| 88 - 108 | 250 uV/m<br>48 dBuV/m | General limits apply |
| The occupied bandwidth is limited to 200kHz. | | |

[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 Emissions, 30 - 1,000 MHz, 15-Dec-12**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Preamplifier, 100 kHz - 1.3 GHz | 8447D OPT 010 | 1826 | 5/18/2013 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 2197 | 2/7/2014 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-40 GHz | ESIB40 (1088.7490.40) | 2493 | 1/9/2013 |

**Radiated Emissions, 30 - 2,000 MHz, 10-Jan-13**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 487 | 7/19/2014 |
| 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 |

**Bandwidth, 09-May-13**

| | | | | |
|---|---|---|---|---|
| Agilent Technologies | 3Hz -44GHz PSA Spectrum Analyzer | E4446A | 2796 | 28-Jan-14 |

# *Appendix B Test Data*

T89397 Pages 23 - 32

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Product | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Emissions Standard(s): | FCC 15.239, EN 301 357 | Class: | - |
| Immunity Standard(s): | - | Environment: | - |

# EMC Test Data

For The

# Griffin Technology

Product

P1238 / P2147

Date of Last Test: 5/10/2013

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

# Radiated 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: 1/10/2013
Test Engineer: M. Birgani
Test Location: FT Chamber #4

Config. Used: 1
Config Change: -
EUT Voltage: 12Vdc

## General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.
The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

## Ambient Conditions:

Temperature: 13-18 °C
Rel. Humidity: 35-45 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | Radiated Emissions<br>30 - 2000 MHz, Maximized | Class B | Pass | 42.2 dBµV/m @ 140.29 MHz<br>(Margin: -1.3 dB) |
| 3 | 20dB BW Measurements | FCC 15.209 & 15.239 | Pass | 156 kHz |
| 4 | 99% BW Measurements | RSS-GEN | - | 136 kHz |

## Modifications Made During Testing

No modifications were made to the EUT during testing

## Deviations From The Standard

No deviations were made from the requirements of the standard.

| Test Parameters for Preliminary Scan(s) | | | |
|---|---|---|---|
| Frequency Range | Prescan Distance | Limit Distance | Extrapolation Factor |
| 30 - 2000 MHz | 3 | 3 | 0.0 |

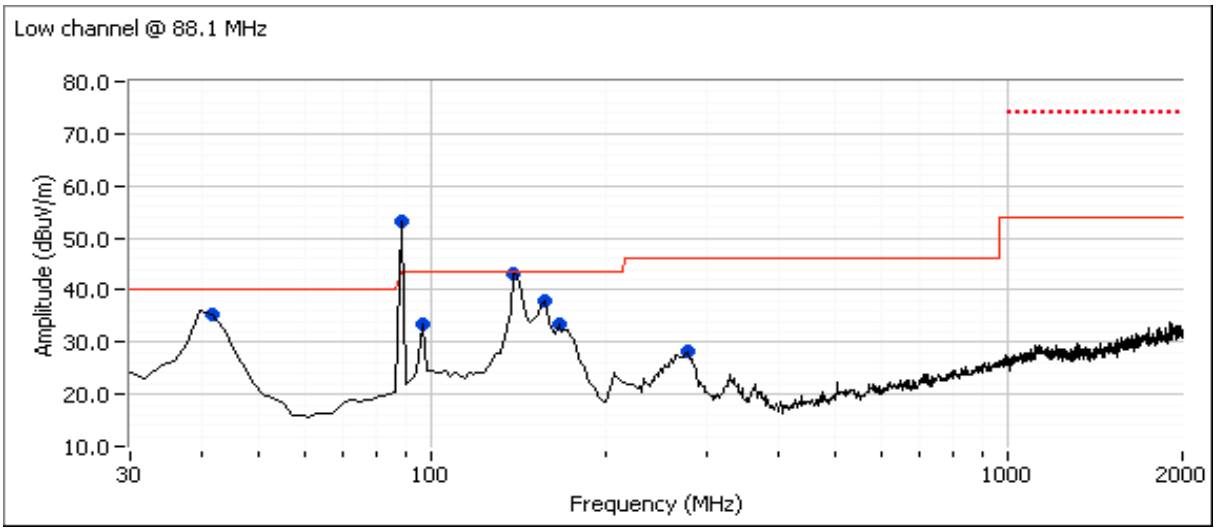
EUT and Test Configuration Details:

*EUT configured to transmit a song and volume was set to maximum.*
*FCC Sample, Elliott tag 2012-2532*

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Run #1: Preliminary Radiated Emissions, 30 - 2000 MHz

Run #1a: Low channel




Preliminary peak readings captured during pre-scan

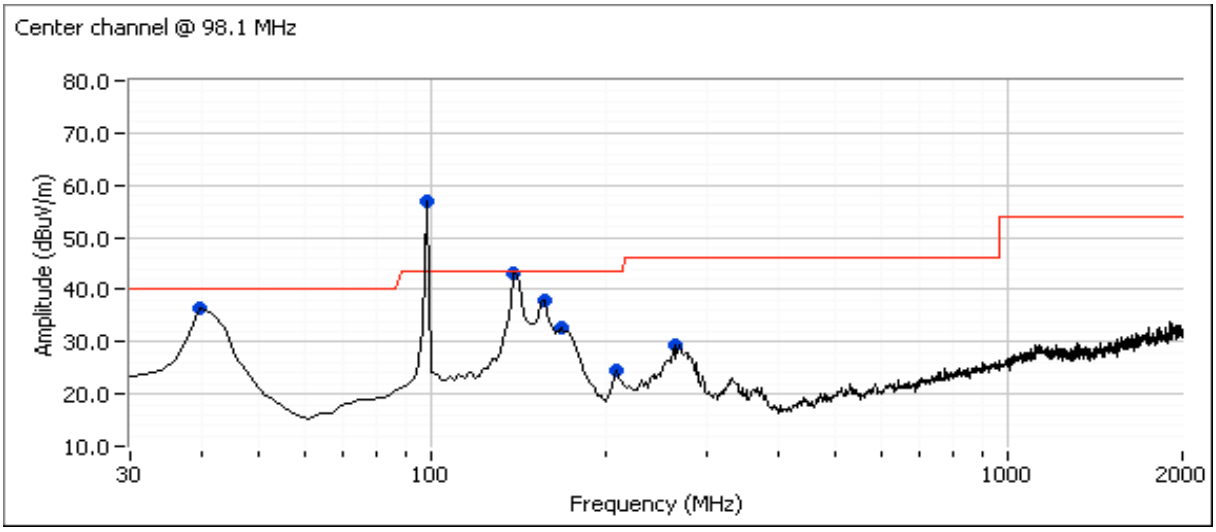
| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 88.100 | 53.3 | V | 43.5 | 9.8 | Peak | 115 | 1.0 | Fundamental |
| 140.293 | 43.0 | H | 43.5 | -0.5 | Peak | 145 | 3.0 | |
| 41.068 | 35.5 | V | 40.0 | -4.5 | Peak | 249 | 1.0 | |
| 154.499 | 38.1 | H | 43.5 | -5.4 | Peak | 146 | 2.0 | |
| 95.987 | 33.4 | V | 43.5 | -10.1 | Peak | 199 | 1.5 | |
| 168.696 | 33.3 | H | 43.5 | -10.2 | Peak | 239 | 2.5 | |
| 283.355 | 28.1 | H | 46.0 | -17.9 | Peak | 116 | 1.5 | |

Maximized readings (includes manipulation of EUT interface cables)

| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 140.293 | 42.2 | H | 43.5 | -1.3 | QP | 133 | 2.2 | QP (1.00s) |
| 41.068 | 31.4 | V | 40.0 | -8.6 | QP | 257 | 1.0 | QP (1.00s) |
| 154.499 | 34.4 | H | 43.5 | -9.1 | QP | 131 | 2.2 | QP (1.00s) |
| 168.696 | 29.0 | H | 43.5 | -14.5 | QP | 229 | 2.3 | QP (1.00s) |
| 95.987 | 22.7 | V | 43.5 | -20.8 | QP | 197 | 2.2 | QP (1.00s) |
| 283.355 | 24.7 | H | 46.0 | -21.3 | QP | 96 | 1.0 | QP (1.00s) |

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Run #1b: Center channel




Preliminary peak readings captured during pre-scan

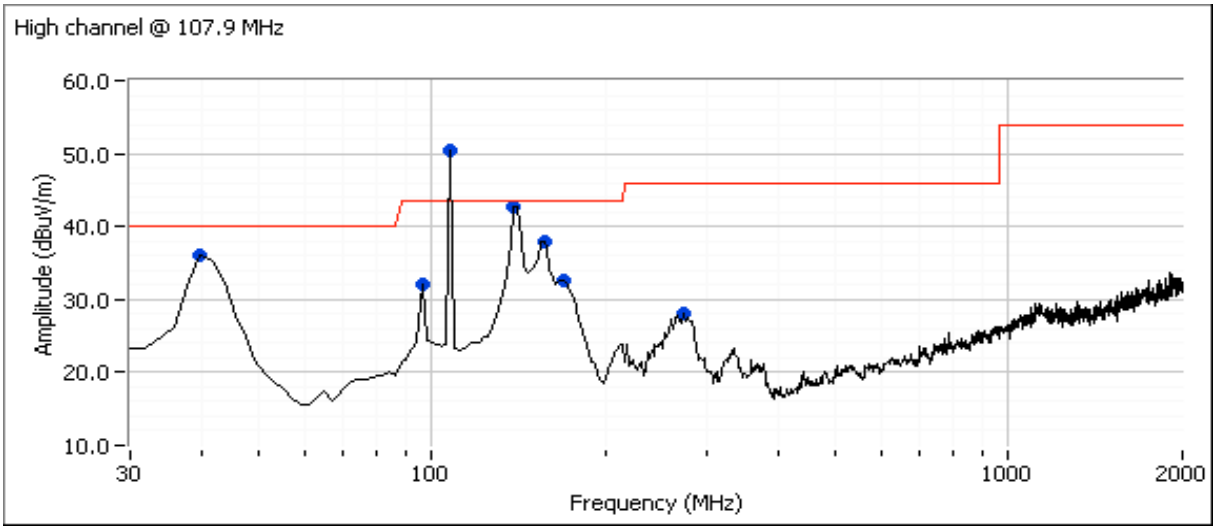
| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 98.118 | 56.8 | V | 43.5 | 13.3 | Peak | 155 | 1.0 | Fundamental |
| 140.339 | 43.2 | H | 43.5 | -0.3 | Peak | 139 | 2.5 | |
| 40.617 | 36.4 | V | 40.0 | -3.6 | Peak | 258 | 1.0 | |
| 153.519 | 37.8 | H | 43.5 | -5.7 | Peak | 144 | 2.0 | |
| 167.678 | 32.7 | H | 43.5 | -10.8 | Peak | 249 | 2.5 | |
| 265.828 | 29.4 | H | 46.0 | -16.6 | Peak | 108 | 1.0 | |
| 214.611 | 24.4 | H | 43.5 | -19.1 | Peak | 125 | 1.5 | |

Maximized readings (includes manipulation of EUT interface cables)

| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 140.339 | 40.9 | H | 43.5 | -2.6 | QP | 142 | 2.4 | QP (1.00s) |
| 153.519 | 34.2 | H | 43.5 | -9.3 | QP | 130 | 2.2 | QP (1.00s) |
| 40.617 | 29.6 | V | 40.0 | -10.4 | QP | 240 | 1.0 | QP (1.00s) |
| 167.678 | 27.9 | H | 43.5 | -15.6 | QP | 230 | 2.2 | QP (1.00s) |
| 265.828 | 20.4 | H | 46.0 | -25.6 | QP | 108 | 1.0 | QP (1.00s) |
| 214.611 | 16.4 | H | 46.0 | -29.6 | QP | 132 | 1.0 | QP (1.00s) |

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Run #1c: High channel




Preliminary peak readings captured during pre-scan

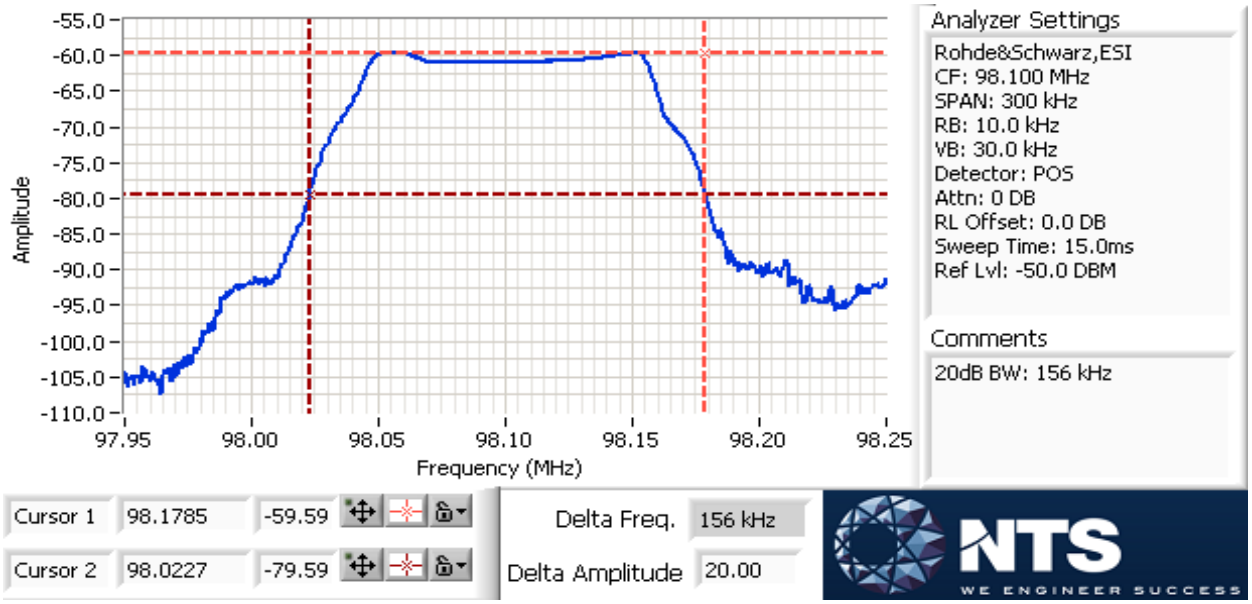
| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 107.908 | 50.3 | H | 43.5 | 6.8 | Peak | 175 | 2.5 | Fundamental |
| 139.849 | 42.7 | H | 43.5 | -0.8 | Peak | 120 | 2.5 | |
| 40.594 | 36.0 | V | 40.0 | -4.0 | Peak | 292 | 1.0 | |
| 155.455 | 37.9 | H | 43.5 | -5.6 | Peak | 150 | 2.0 | |
| 168.689 | 32.6 | H | 43.5 | -10.9 | Peak | 252 | 2.5 | |
| 95.917 | 32.0 | V | 43.5 | -11.5 | Peak | 180 | 1.0 | |
| 275.307 | 28.1 | H | 46.0 | -17.9 | Peak | 107 | 1.0 | |

Maximized readings (includes manipulation of EUT interface cables)

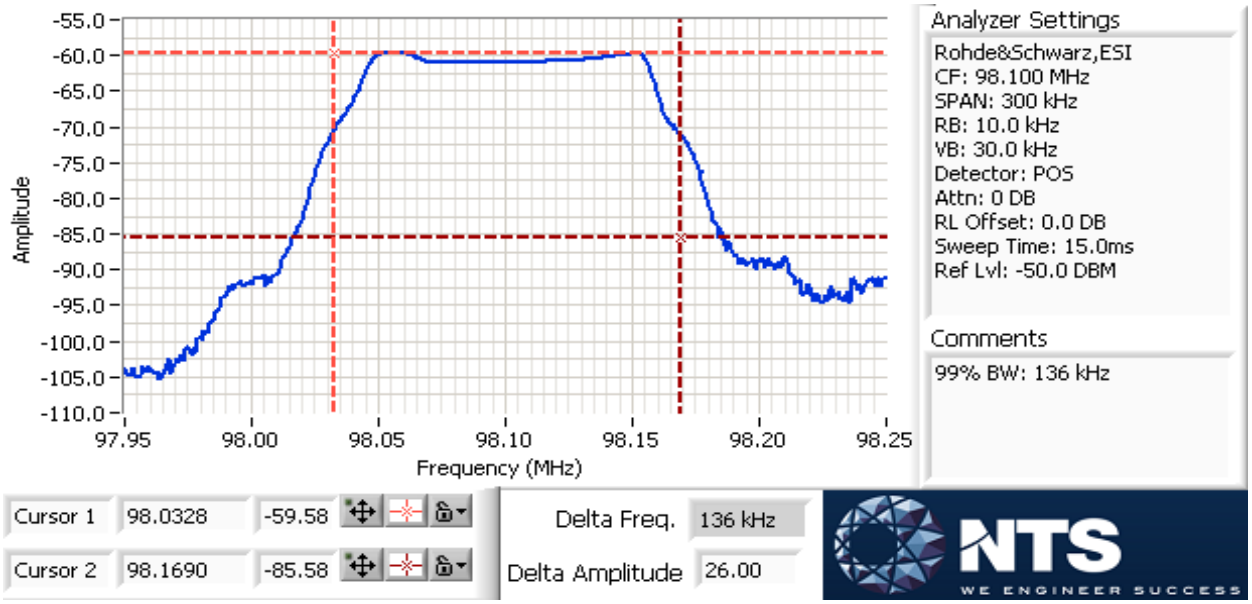
| Frequency | Level | Pol | Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | V/H | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 139.849 | 40.4 | H | 43.5 | -3.1 | QP | 136 | 2.3 | QP (1.00s) |
| 40.594 | 31.4 | V | 40.0 | -8.6 | QP | 278 | 1.0 | QP (1.00s) |
| 155.455 | 34.4 | H | 43.5 | -9.1 | QP | 153 | 2.0 | QP (1.00s) |
| 168.689 | 29.0 | H | 43.5 | -14.5 | QP | 250 | 2.3 | QP (1.00s) |
| 95.917 | 22.7 | V | 43.5 | -20.8 | QP | 180 | 1.0 | QP (1.00s) |
| 275.307 | 24.7 | H | 46.0 | -21.3 | QP | 100 | 1.0 | QP (1.00s) |

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Run #3: 20dB BW Measurements (typical audio file)



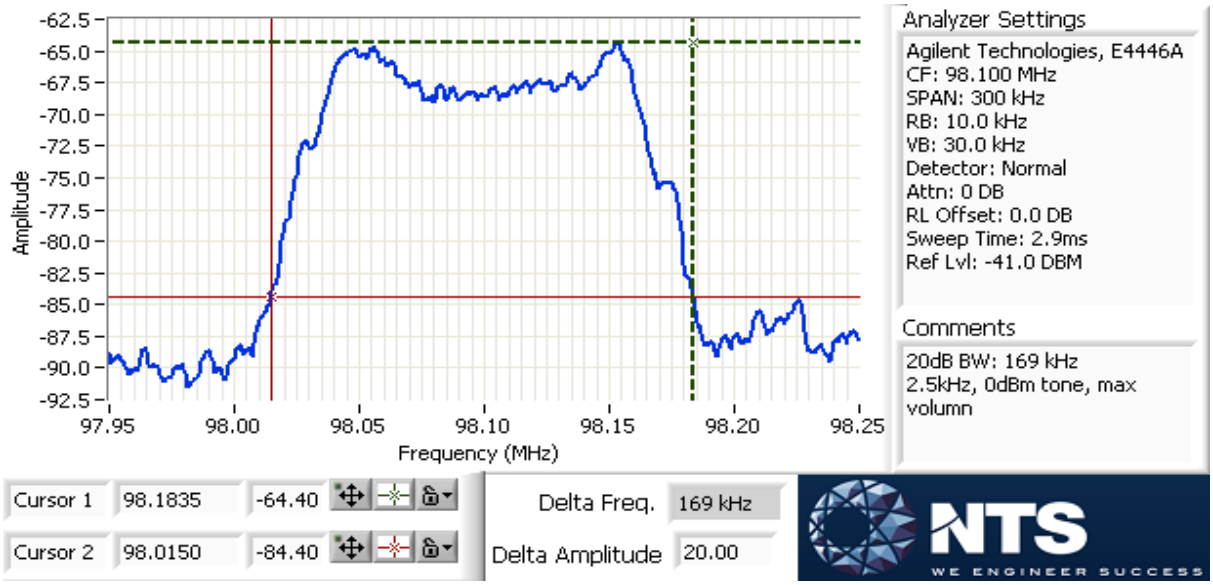

Run #4: 99% BW Measurements (typical audio file)



| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

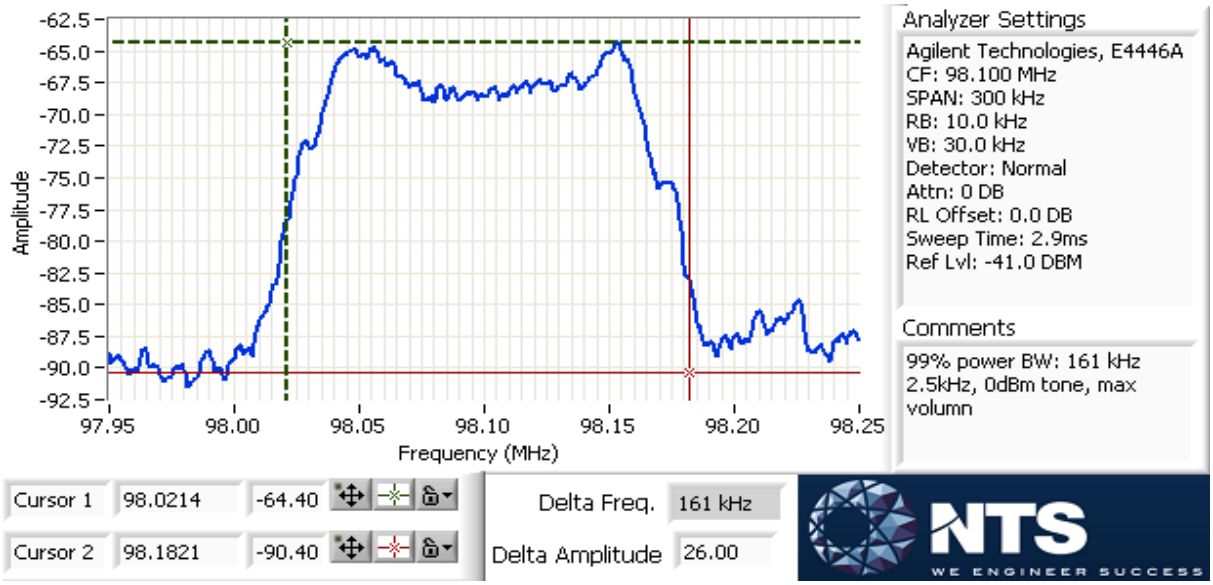
Run #3: 20dB BW Measurements (2.5kHz, 0dBm, max volumn, ~ 68kHz FM deviation)

Test date: 5/9/2013 Test Eng: Mark Hill




Run #4: 99% BW Measurements (2.5kHz, 0dBm, max volumn, ~ 68kHz FM deviation)

Test date: 5/9/2013 Test Eng: Mark Hill



| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

# Radiated 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: 12/14/2012
Test Engineer: Jospeh Cadigal
Test Location: FT Chamber#5
Config. Used: 1
Config Change: none
EUT Voltage: 12VDC

## General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.
Radiated emissions tests above 1 GHz to FCC Part 15 were performed without floor absorbers in place in accordance with the test methods of ANSI C63.4:2003.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measuremen

## Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 41 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | RE, Fundamental | FCC 15.239 | Pass | 47.6 dBµV/m @ 98.100 MHz (-0.4 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: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Run #1: Fundamental Field Strength

EUT and Test Configuration Details:

*EUT configured to transmit a song and volume was set to maximum.*

*FCC Sample, Elliott tag 2012-2532*

Fundamental Measurements

| Frequency | Level | Pol | FCC 15.239 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| EUT Flat | | | | | | | | |
| 88.092 | 47.9 | V | 48.0 | -0.1 | AVG | 176 | 1.0 | setting = 44 |
| 88.092 | 48.2 | V | 68.0 | -19.8 | PK | 176 | 1.0 | setting = 44 |
| 98.100 | 47.5 | V | 48.0 | -0.5 | AVG | 176 | 1.0 | setting = 39 |
| 98.100 | 49.2 | V | 68.0 | -18.8 | PK | 176 | 1.0 | setting = 39 |
| 107.900 | 47.1 | V | 48.0 | -0.9 | AVG | 176 | 1.0 | setting = 67 |
| 107.900 | 47.7 | V | 68.0 | -20.3 | PK | 176 | 1.0 | setting = 67 |
| EUT Side | | | | | | | | |
| 88.100 | 47.3 | V | 48.0 | -0.7 | AVG | 255 | 1.0 | setting = 42 |
| 88.100 | 48.3 | V | 68.0 | -19.7 | PK | 255 | 1.0 | setting = 42 |
| 98.100 | 47.6 | V | 48.0 | -0.4 | AVG | 255 | 1.0 | setting = 41 |
| 98.100 | 49.4 | V | 68.0 | -18.6 | PK | 255 | 1.0 | setting = 41 |
| 107.900 | 47.5 | V | 48.0 | -0.5 | AVG | 255 | 1.0 | setting = 66 |
| 107.900 | 47.9 | V | 68.0 | -20.1 | PK | 255 | 1.0 | setting = 66 |
| EUT Upright | | | | | | | | |
| 88.100 | 47.6 | V | 48.0 | -0.4 | AVG | 143 | 1.0 | setting = 43 |
| 88.100 | 47.9 | V | 68.0 | -20.1 | PK | 143 | 1.0 | setting = 43 |
| 98.100 | 47.6 | V | 48.0 | -0.4 | AVG | 143 | 1.0 | setting = 38 |
| 98.100 | 49.2 | V | 68.0 | -18.8 | PK | 143 | 1.0 | setting = 38 |
| 107.100 | 47.0 | V | 48.0 | -1.0 | AVG | 143 | 1.0 | setting = 60 |
| 107.100 | 48.0 | V | 68.0 | -20.0 | PK | 143 | 1.0 | setting = 60 |

| | | | |
|---|---|---|---|
| Client: | Griffin Technology | Job Number: | J89392 |
| Model: | P1238 / P2147 | T-Log Number: | T89397 |
| | | Account Manager: | Sheareen Jacobs |
| Contact: | Michael O'Connor | | |
| Standard: | FCC 15.239, EN 301 357 | Class: | - |

Fundamental Measurements, at previously failing frequencies.
Summary of worse case
Highest power setting the complies for any orientation

| Frequency | Level | Pol | FCC 15.239 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| EUT Side | | | | | | | | |
| 88.100 | 47.3 | V | 48.0 | -0.7 | AVG | 255 | 1.0 | setting = 42 |
| 88.100 | 48.3 | V | 68.0 | -19.7 | PK | 255 | 1.0 | setting = 42 |
| EUT Upright | | | | | | | | |
| 98.100 | 47.6 | V | 48.0 | -0.4 | AVG | 143 | 1.0 | setting = 38 |
| 98.100 | 49.2 | V | 68.0 | -18.8 | PK | 143 | 1.0 | setting = 38 |
| 107.100 | 47.0 | V | 48.0 | -1.0 | AVG | 143 | 1.0 | setting = 60 |
| 107.100 | 48.0 | V | 68.0 | -20.0 | PK | 143 | 1.0 | setting = 60 |

*End of Report*

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marks the last page of this test report.