EMC Test Report

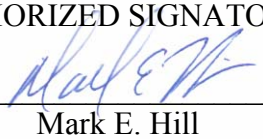
Application for Grant of Equipment Authorization
pursuant to

Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7
FCC Part 15 Subpart C

Model: P1591

UPN:	6384A-1591DAIP
FCC ID:	PAV1591
APPLICANT:	Griffin Technology 1930 Air Lane Drive Nashville, TN 37210
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC Site Registration #:	IC 2845B-4
REPORT DATE:	July 14, 2009
FINAL TEST DATES:	June 11, June 12 and July 2, 2009

AUTHORIZED SIGNATORY:



Mark E. Hill
Staff Engineer
Elliott Laboratories.

Testing Cert #2016-01

REVISION HISTORY

Rev#	Date	Comments	Modified By
1	July 24, 2009	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Griffin Technology model P1591, pursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "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 Elliott Laboratories 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.).

STATEMENT OF COMPLIANCE

The tested sample of Griffin Technology model P1591 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "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 model P1591 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	188kHz	Bandwidth less than 200kHz contained in the 88 – 108 MHz band	
15.239 (b)	RSS 210 A2.8 (1)	Fundamental Field Strength	47.8dBµV/m @ 98.100MHz (-0.2dB)	250uV/m at 3m	Complies
15.239 (c) / 15.209	RSS 210 Table 2	Radiated Spurious Emissions, 30 – 540 MHz	21.0dBµV/m @ 30.087MHz (-19.0dB)	Refer to table in limits section	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	EUT has integral antenna	Refer to standard	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	21.0dBµV/m @ 30.087MHz (-19.0dB)	Refer to standard	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	53.1dBµV @ 0.195MHz (-10.7dB)	Refer to standard	
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies

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	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Griffin Technology model P1591 is a portable FM transmitter that is designed to transmit audio information from an iPod. For this testing, the EUT was placed on a table-top. The EUT is powered from the iPod or from a computer via a USB connection.

The sample was received on June 11, 2009 and tested on June 11, June 12 and July 2, 2009. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Griffin	P1591	FM Transmitter	N/A	PAV1591

OTHER EUT INFORMATION

During startup, the EUT does a scan of the spectrum to determine clear frequencies. This is the receive mode.

ANTENNA SYSTEM

The antenna is integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic . It measures approximately 6 cm wide by 3 cm deep by 1 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for radiated testing:

Company	Model	Description	Serial Number	FCC ID
Gateway	Solo 2500	Laptop	BC699112514	-

The following equipment was used as support equipment for AC conducted testing:

Company	Model	Description	Serial Number	FCC ID
IBM	Thinkpad R61i	Laptop	-	-

No remote support equipment was used during testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	USB	Shielded	1.0
iPod port	iPod	-	-	-

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	USB	Shielded	1.0
iPod port	iPod	-	-	-
Ethernet	Hub	Cat-5	Unshielded	10.0
AC	Mains	2Wire	Unshielded	1.0

EUT OPERATION

During emissions testing the EUT was configured to play an audio file in a continuous loop.

Testing was performed on the lowest channel allowed by the EUT, a channel in the middle of the band, and the highest channel allowed by the EUT. The tuning of the channel was performed via the user control buttons on the EUT.

Preliminary tests were performed to ensure that changes in the volume setting or stereo vs mono mode would not change the results.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 2, 2009 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	IC 2845B-4	41039 Boyce Road Fremont, CA 94538-2435

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 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.

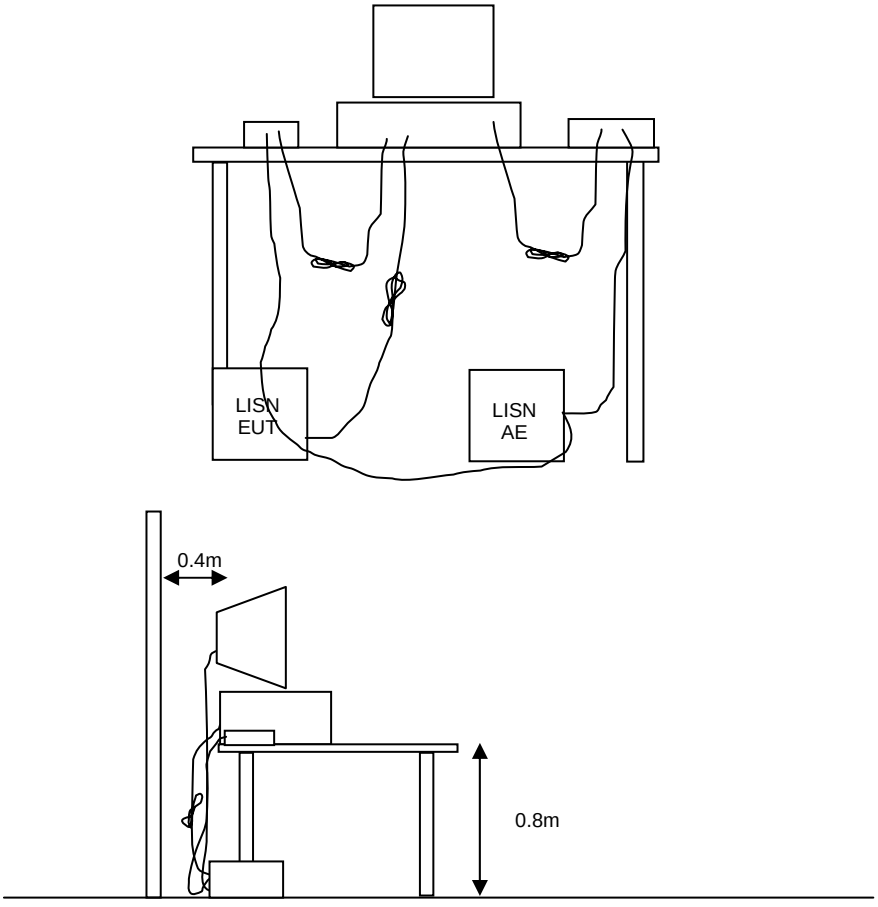
TEST PROCEDURES

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.



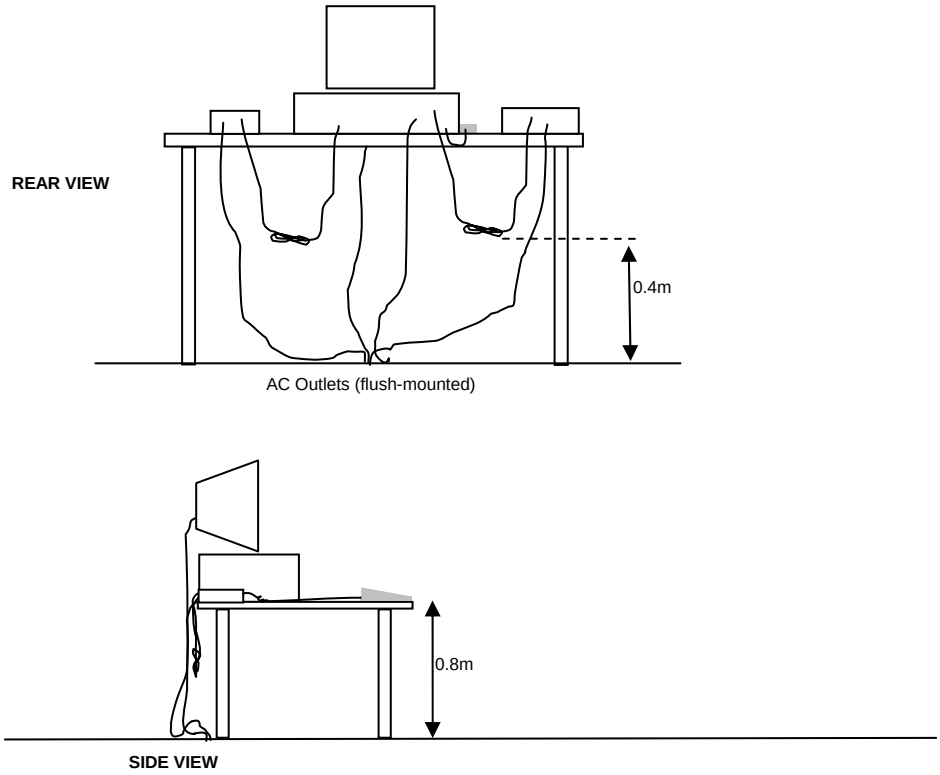
RADIATED EMISSIONS

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.

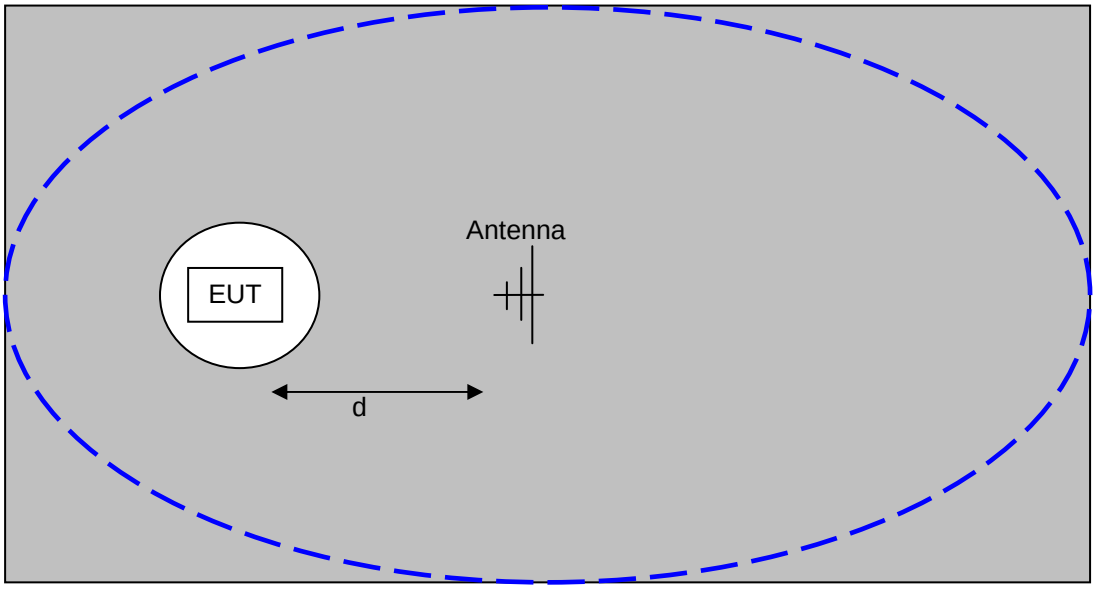
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

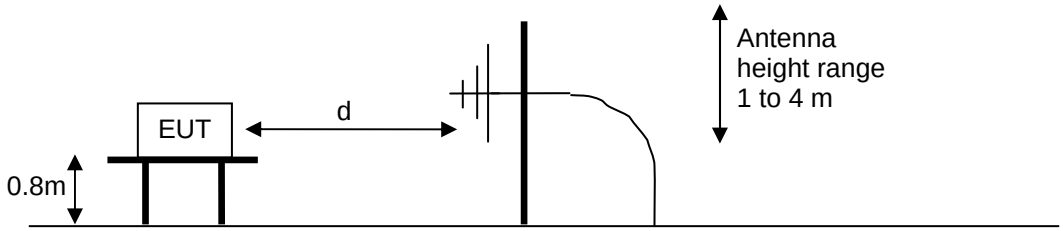
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



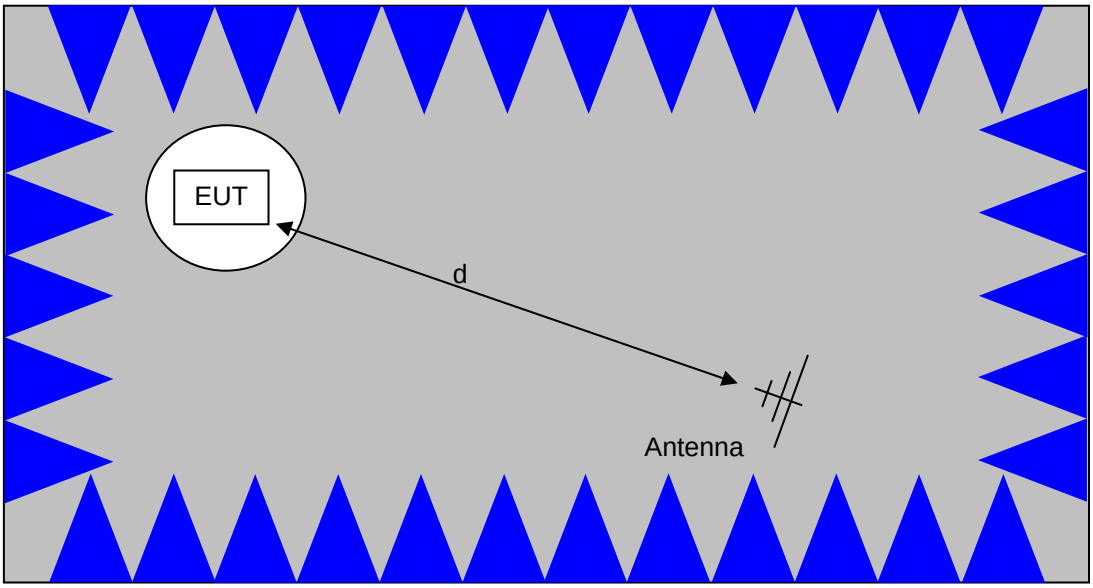
Typical Test Configuration for Radiated Field Strength Measurements



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.

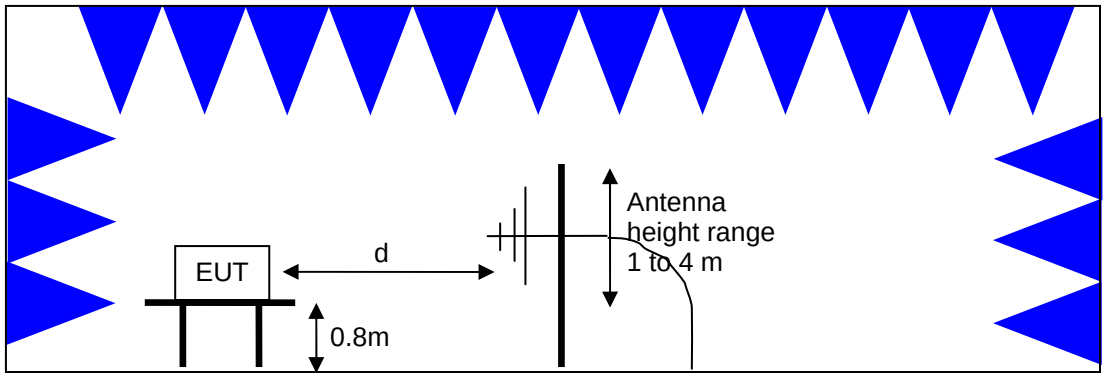


Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views



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:

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

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 48 dBuV/m	General limits apply
The occupied bandwidth is limited to 200kHz. RSS 210 allows the fundamental field strength to be 1000uV/m at 30m at these specific frequencies 88.1; 88.3; 88.5; 107.7; 107.9 MHz is1000uV/m at 30m for FM devices.		

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

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

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 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

Appendix A Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 1,000 MHz, 30-Apr-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	23-May-09
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	10-Feb-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT	2115	19-Nov-09

Radiated Emissions, 30 - 1,000 MHz, 09-May-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	23-May-09
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	10-Feb-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT	2115	19-Nov-09

Radiated Emissions, 30 - 1,000 MHz, 06-Jun-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	23-May-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	10-Feb-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT	2115	19-Nov-09

Radiated Emissions, 30 - 1,000 MHz, 13-Jun-09
Engineer: Joseph Cadigal

Manufacturer	Description	Model #	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	13-Jun-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	10-Feb-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT	2115	19-Nov-09

Radiated Emissions, 30 - 1,000 MHz, 02-Jul-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	19-Sep-09
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	13-Apr-10
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	23-May-10

Conducted Emissions - AC Power Ports, 02-Jul-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	LISN, 10 kHz-100 MHz	3825/2	1292	11-Mar-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	19-Sep-09
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1594	09-Jun-10

Appendix B Test Data

T75351 15 Pages

Elliott

EMC Test Data

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	Test-Log Number:	T75351
		Project Manager:	Sheareen
Contact:	Jeff Altheide		
Emissions Spec:	FCC 15.239	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Griffin Technology

Model

P1591 iTrip DA 2009

Date of Last Test: 7/2/2009

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	Test-Log Number:	T75351
		Project Manager:	Sheareen
Contact:	Jeff Altheide		
Emissions Spec:	FCC 15.239	Class:	B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

The following information was collected during the test sessions(s).

General Description

The EUT is a portable FM transmitter that is designed to transmit audio information from an iPod. For this testing, the EUT was placed on a table-top. The EUT is powered from the iPod or from a computer via a USB connection.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Griffin	P1591	FM Transmitter	N/A	PAV1591

Other EUT Information

During startup, the EUT does a scan of the spectrum to determine clear frequencies. This is the receive mode.

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic . It measures approximately 6 cm wide by 3 cm deep by 1 cm high.

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Project Manager:	Sheareen
Contact:	Jeff Altheide		
Emissions Spec:	FCC 15.239	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #1

The following information was collected during the test sessions(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Gateway	Solo 2500	Laptop	BC699112514	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	USB	Shielded	1.0
iPod port	iPod	-	-	-

EUT Operation During Emissions Tests

During emissions testing the EUT was configured to play an audio file in a continuous loop.

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Project Manager:	Sheareen
Contact:	Jeff Altheide		
Emissions Spec:	FCC 15.239	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #2

The following information was collected during the test sessions(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	Thinkpad R61i	Laptop	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	FS108	Hub	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	USB	Shielded	1.0
iPod port	iPod	-	-	-
Ethernet	Hub	Cat-5	Unshielded	10.0
AC	Mains	2Wire	Unshielded	1.0

EUT Operation During Emissions Tests

During emissions testing the EUT was configured to play an audio file in a continuous loop. The H pattern program was running during testing.

Testing was performed on the lowest channel allowed by the EUT, a channel in the middle of the band, and the highest channel allowed by the EUT. The tuning of the channel was performed via the user control buttons on the EUT.

Preliminary tests were performed to ensure that changes in the volume setting or stereo vs mono mode would not change the results.

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	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: 7/2/2009
Test Engineer: Rafael Varelas
Test Location: Fremont Chamber #5

Config. Used: 2
Config Change: None
EUT Voltage: Powered from laptop, host connected to 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 where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Ambient Conditions:

Temperature: 21.4 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 class B	Pass	53.1dBµV @ 0.195MHz (-10.7dB)

Modifications Made During Testing

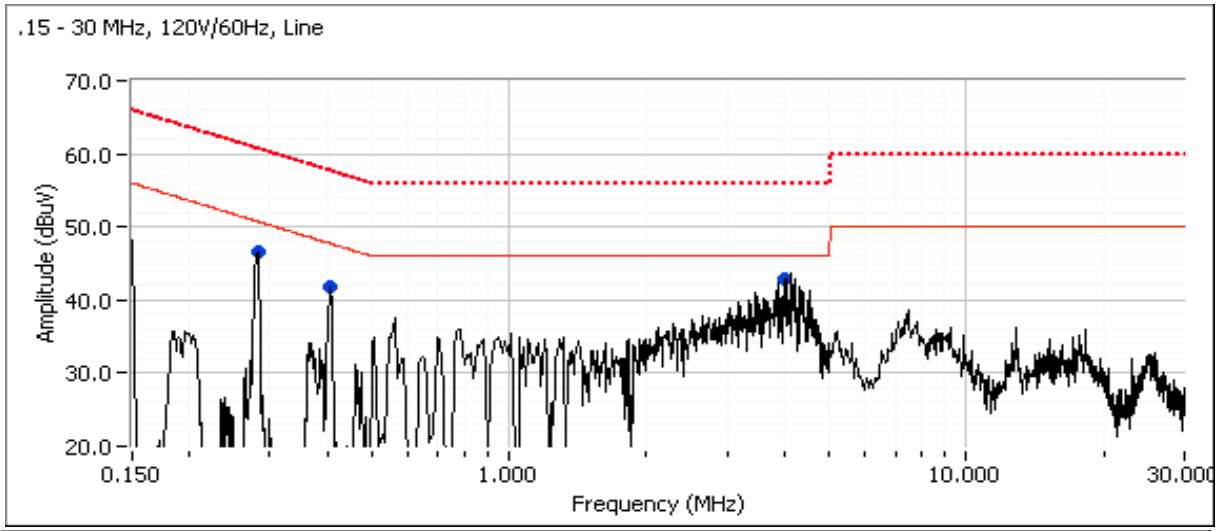
No modifications were made to the EUT during testing

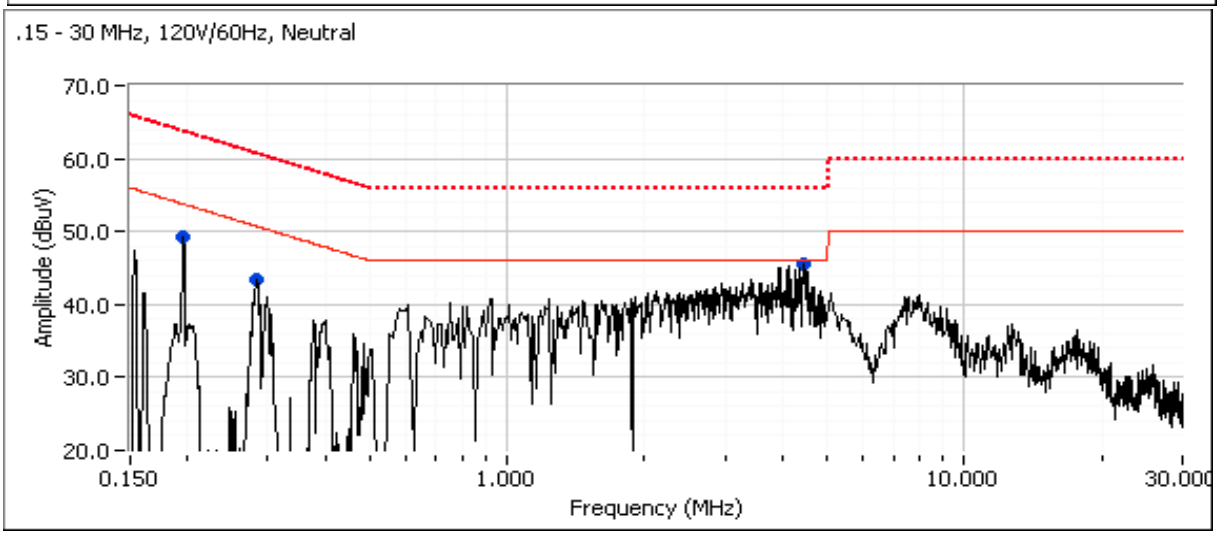
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

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





Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #2: Continued

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

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.283	46.5	Line 1	50.8	-4.3	Peak	
0.408	41.9	Line 1	47.7	-5.8	Peak	
4.020	42.9	Line 1	46.0	-3.1	Peak	
0.195	49.2	Neutral	53.8	-4.6	Peak	
0.286	43.3	Neutral	50.7	-7.4	Peak	
4.452	45.6	Neutral	46.0	-0.4	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.195	53.1	Neutral	63.8	-10.7	QP	QP (1.00s)
0.195	38.2	Neutral	53.8	-15.6	AVG	AVG (0.10s)
4.452	40.1	Neutral	56.0	-15.9	QP	QP (1.00s)
4.020	38.1	Line 1	56.0	-17.9	QP	QP (1.00s)
4.452	27.5	Neutral	46.0	-18.5	AVG	AVG (0.10s)
0.283	42.0	Line 1	60.7	-18.7	QP	QP (1.00s)
0.408	37.4	Line 1	57.7	-20.3	QP	QP (1.00s)
4.020	25.4	Line 1	46.0	-20.6	AVG	AVG (0.10s)
0.286	39.8	Neutral	60.6	-20.8	QP	QP (1.00s)
0.286	27.5	Neutral	50.6	-23.1	AVG	AVG (0.10s)
0.408	21.0	Line 1	47.7	-26.7	AVG	AVG (0.10s)
0.283	23.5	Line 1	50.7	-27.2	AVG	AVG (0.10s)

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

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: 6/11/2009
Test Engineer: Joseph Cadigal
Test Location: Fremont Chamber #4

Config. Used: 1
Config Change: None
EUT Voltage: Powered from iPod

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: 23.1 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, Fundamental Measurements	FCC 15.239	Pass	47.8dBµV/m @ 98.1 MHz (-0.2dB)
2	RE, 30 - 1000 MHz	FCC 15.239	Pass	21.0dBµV/m @ 30.087MHz (-19.0dB)
3	Bandwidth Measurements	FCC 15.239	Pass	188kHz

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Note: USB port loaded during testing

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #1: Fundamental

Date of Test: 6/12/2009 Config. Used: 1
Test Engineer: Joseph Cadigal Config Change: None
Test Location: Fremont Chamber #4 EUT Voltage: Powered from iPod

EUT and Test Configuration Details:

EUT configured to transmit a song and volume was set to maximum.
FCC Sample, Elliott tag 2009-2076

Frequency	Level	Pol	FCC 15.239		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat								
88.100	47.5	H	48.0	-0.5	AVG	148	2.5	setting = 47
88.100	54.1	H	68.0	-13.9	PK	148	2.5	setting = 47
88.100	42.0	V	48.0	-6.0	AVG	82	1.0	setting = 47
88.100	46.0	V	68.0	-22.0	PK	82	1.0	setting = 47
98.100	46.1	H	48.0	-1.9	AVG	147	3.0	setting = 44
98.100	49.8	H	68.0	-18.2	PK	147	3.0	setting = 44
98.100	38.1	V	48.0	-9.9	AVG	172	1.2	setting = 44
98.100	42.9	V	68.0	-25.1	PK	172	1.2	setting = 44
107.900	47.6	H	48.0	-0.4	AVG	152	4.0	setting = 42
107.900	47.8	H	48.0	-0.2	AVG	152	4.0	setting = 42
107.900	44.6	V	48.0	-3.4	AVG	190	2.4	setting = 42
107.900	49.3	V	68.0	-18.7	PK	192	2.4	setting = 42
EUT Side								
88.100	47.1	H	48.0	-0.9	AVG	152	2.2	setting = 48
88.100	50.3	H	68.0	-17.7	PK	152	2.2	setting = 48
88.100	39.6	V	48.0	-8.4	AVG	57	1.0	setting = 48
88.100	44.1	V	68.0	-23.9	PK	57	1.0	setting = 48
98.100	45.4	V	48.0	-2.6	AVG	35	1.0	setting = 48
98.100	49.1	V	68.0	-18.9	PK	35	1.0	setting = 48
98.100	47.7	H	48.0	-0.3	AVG	148	2.9	setting = 48
98.100	51.3	H	68.0	-16.7	PK	148	2.9	setting = 48
107.900	45.5	V	48.0	-2.5	AVG	199	2.5	setting = 53
107.900	49.5	V	68.0	-18.5	PK	199	2.5	setting = 53
107.900	47.7	H	48.0	-0.3	AVG	145	2.9	setting = 53
107.900	51.4	H	68.0	-16.6	PK	145	2.9	setting = 53

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #1: Fundamental

EUT Upright

88.100	47.1	H	48.0	-0.9	AVG	177	3.7	setting = 41
88.100	50.6	H	68.0	-17.4	PK	177	3.7	setting = 41
88.100	39.6	V	48.0	-8.4	AVG	133	2.1	setting = 41
88.100	43.5	V	68.0	-24.5	PK	133	2.1	setting = 41
98.100	47.8	H	48.0	-0.2	AVG	181	3.0	setting = 39
98.100	51.5	H	68.0	-16.5	PK	181	3.0	setting = 39
98.100	40.7	V	48.0	-7.3	AVG	117	1.0	setting = 39
98.100	45.0	V	68.0	-23.0	PK	117	1.0	setting = 39
107.900	46.4	H	48.0	-1.6	AVG	111	2.4	setting = 37
107.900	49.9	H	68.0	-18.1	PK	111	2.4	setting = 37
107.900	45.5	V	48.0	-2.5	AVG	360	4.0	setting = 37
107.900	49.5	V	68.0	-18.5	PK	360	4.0	setting = 37

Summary of Results (worse case EUT orientation, antenna polarization and power setting)

Frequency	Level	Pol	FCC 15.239		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
88.100	47.1	H	48.0	-0.9	AVG	177	3.7	setting = 41, upright
88.100	50.6	H	68.0	-17.4	PK	177	3.7	setting = 41, upright
98.100	47.8	H	48.0	-0.2	AVG	181	3.0	setting = 39
98.100	51.5	H	68.0	-16.5	PK	181	3.0	setting = 39
107.900	46.4	H	48.0	-1.6	AVG	111	2.4	setting = 37
107.900	49.9	H	68.0	-18.1	PK	111	2.4	setting = 37

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #2: Spurious Emissions

Note: A preliminary scan showed that the there was no difference between the RX mode and TX mode spurious emissions.

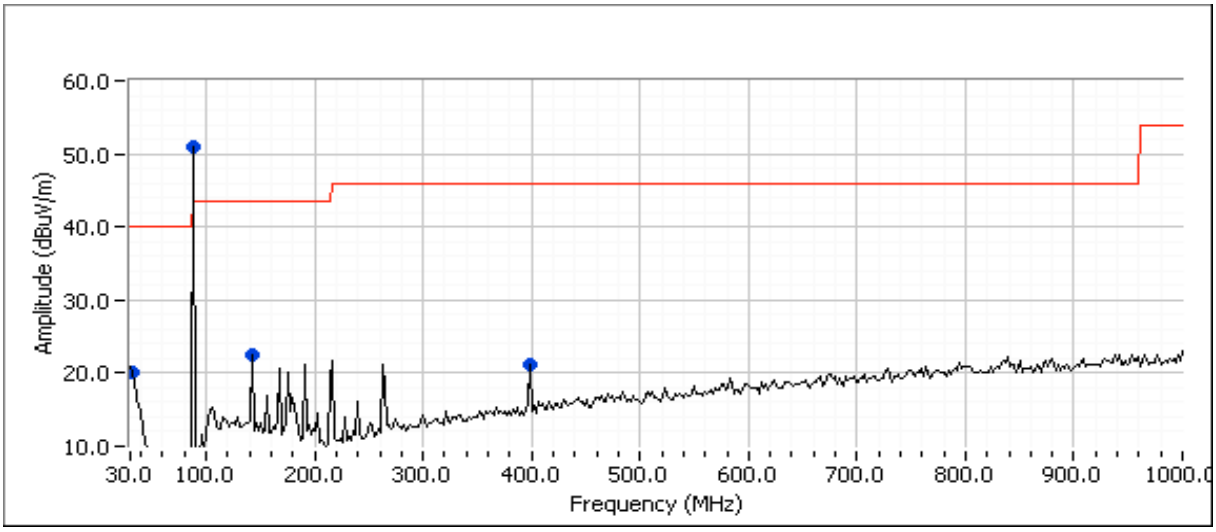
Run #2a: Radiated Emissions, 30 - 1000 MHz
Low Channel at 88.1 MHz

EUT and Test Configuration Details:

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

FCC Sample, Elliott tag 2009-2076

Setting = 47



Frequency	Level	Pol	FCC 15.239		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
401.129	21.2	H	46.0	-24.8	Peak	79	3.0	
88.100	51.0	H	-	-	Peak	148	3.5	Fundamental
31.128	20.2	V	40.0	-19.8	Peak	154	4.0	
144.010	22.6	V	43.5	-20.9	Peak	249	1.0	

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #2b: Radiated Emissions, 30 - 1000 MHz

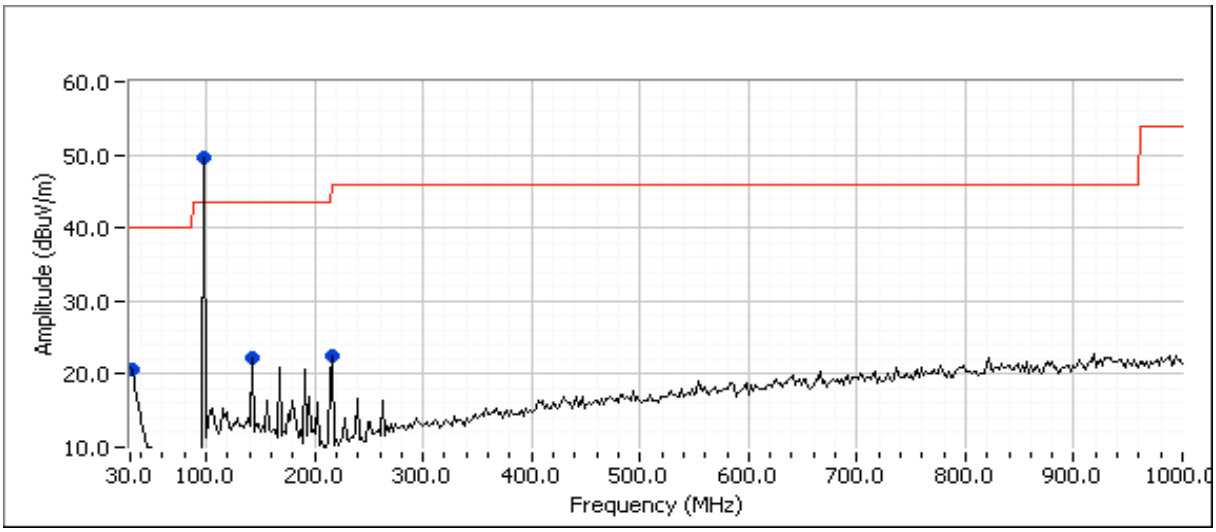
Middle Channel at 98.1 MHz

EUT and Test Configuration Details:

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

FCC Sample, Elliott tag 2009-2076

Setting = 44



Frequency	Level	Pol	FCC 15.239		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
98.100	49.6	H	-	-	Peak	151	2.0	Fundamental
144.010	22.2	V	43.5	-21.3	Peak	234	1.0	
31.761	20.7	V	40.0	-19.3	Peak	304	4.0	
216.012	22.4	H	46.0	-23.6	Peak	341	3.0	

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

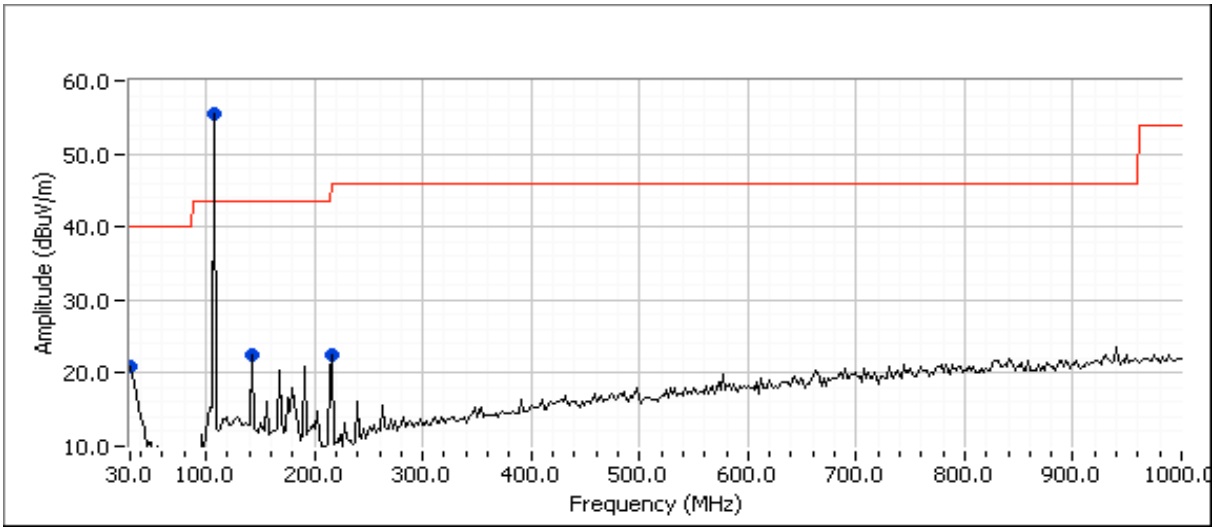
Run #2c: Radiated Emissions, 30 - 1000 MHz
High Channel at 107.9 MHz

EUT and Test Configuration Details:

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

FCC Sample, Elliott tag 2009-2076

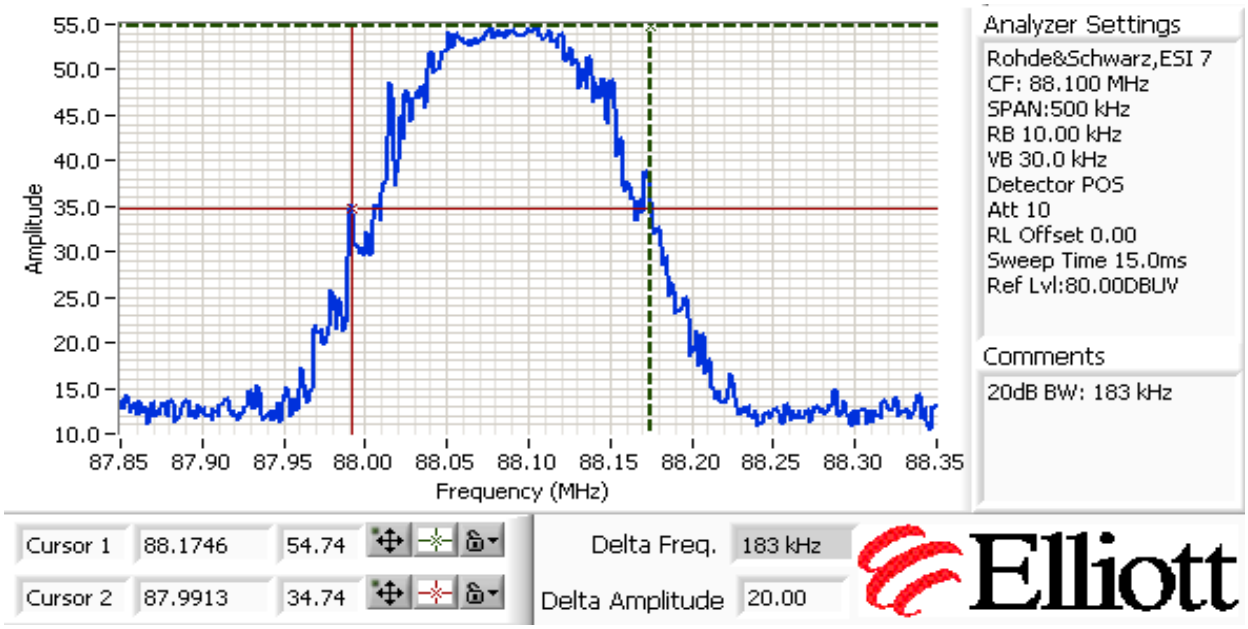
Setting = 42

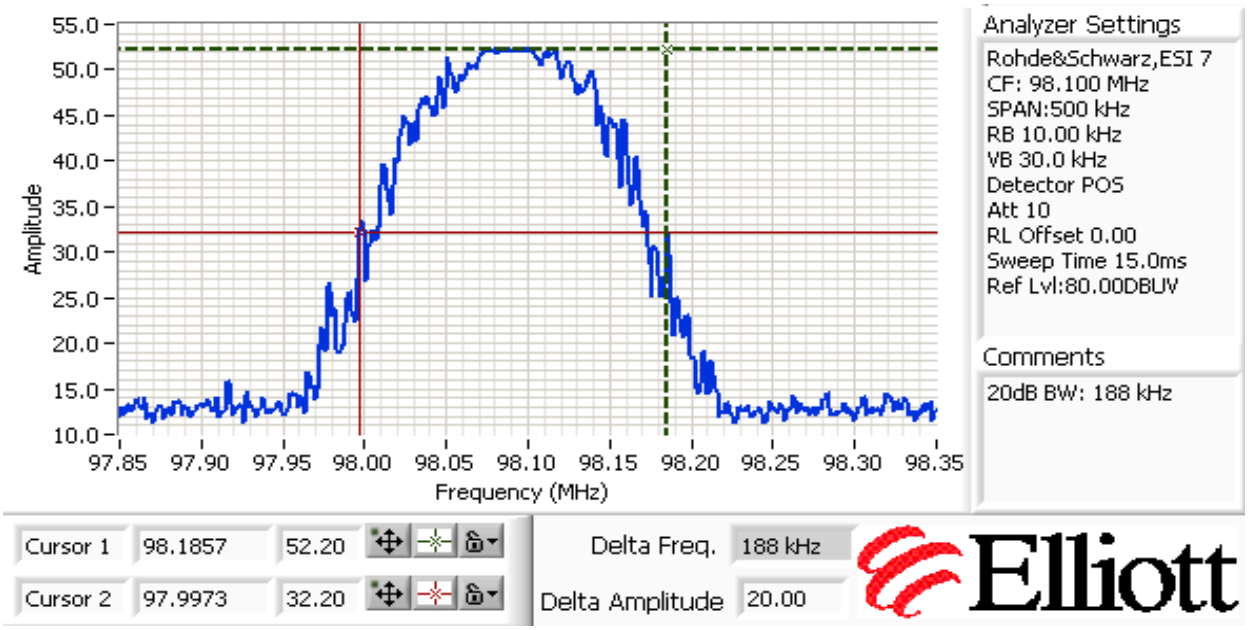


Frequency	Level	Pol	FCC 15.239		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
144.010	22.4	V	43.5	-21.1	Peak	93	1.0	
107.900	55.6	H	-	-	Peak	142	3.0	Fundamental
30.087	21.0	H	40.0	-19.0	Peak	152	4.0	
216.012	22.4	H	46.0	-23.6	Peak	231	3.0	

Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

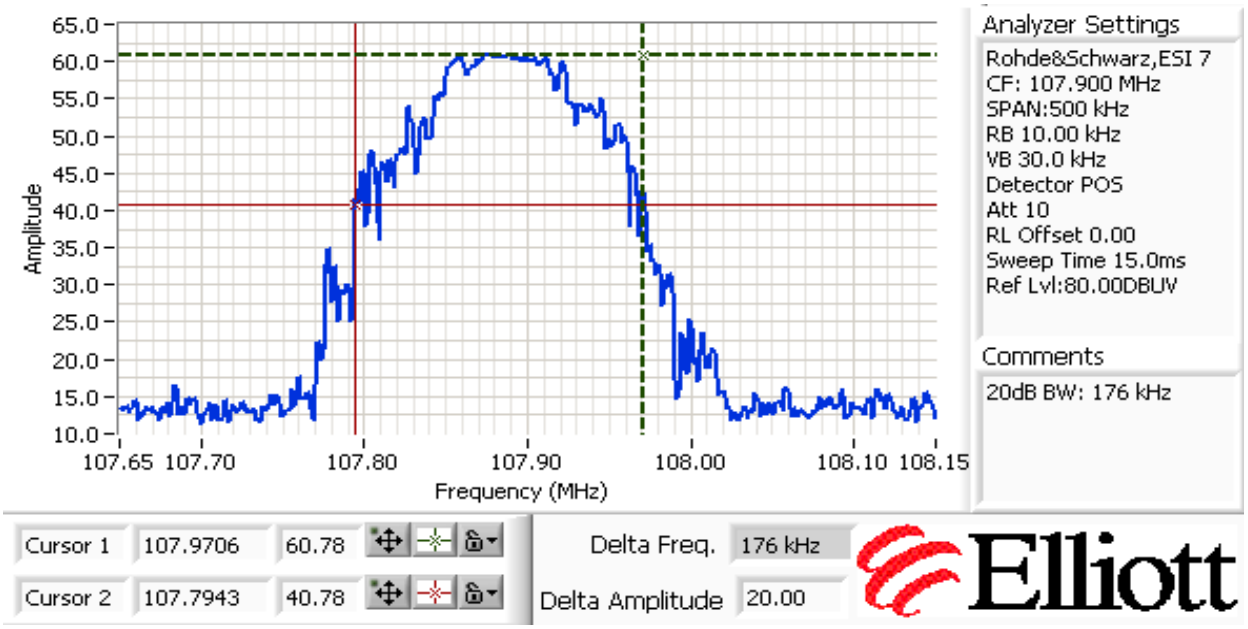
Run #3: Bandwidth Measurements



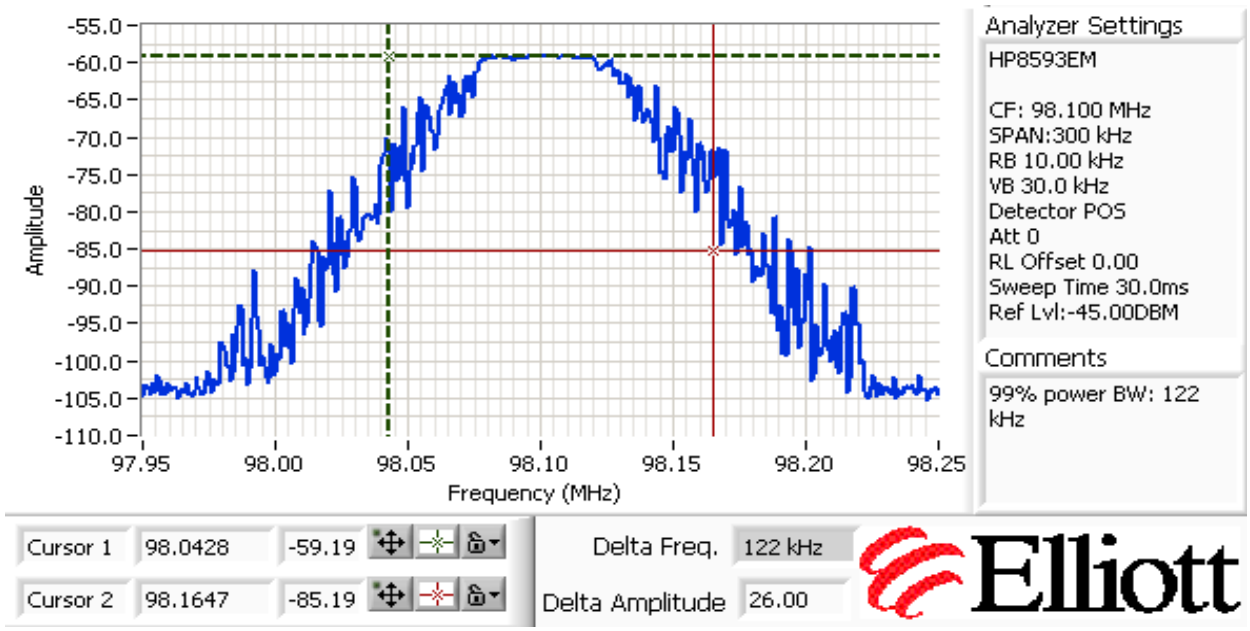


Client:	Griffin Technology	Job Number:	J75328
Model:	P1591 iTrip DA 2009	T-Log Number:	T75351
		Account Manager:	Sheareen
Contact:	Jeff Altheide		
Standard:	FCC 15.239	Class:	B

Run #3: Bandwidth Measurements



99% Bandwidth Measurement



Appendix C Photographs of Test Configurations

Uploaded as a separate exhibit

Appendix D Proposed FCC ID Label & Label Location

Uploaded as a separate exhibit

Appendix E Detailed Photographs

Uploaded as a separate exhibit

Appendix F Operator's Manual

Uploaded as a separate exhibit

Appendix G Block Diagram

Uploaded as a separate exhibit

Appendix H Schematic Diagrams

Uploaded as a separate exhibit

Appendix I Theory of Operation

Uploaded as a separate exhibit

Appendix J RF Exposure Information

Uploaded as a separate exhibit