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EMC Test Report

Application for Grant of Equipment Authorization

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

iTrip Auto MOD-36210

IC CERTIFICATION #:	6384A-36210
FCC ID:	PAV36210
APPLICANT:	Griffin Technology 2030 Lindell Avenue Nashville, TN 37203
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-5
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A2LA ACCREDITED
Testing Cert #0214.26

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	11-26-2013	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Griffin Technology iTrip Auto MOD-36210, 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 National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2009

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 iTrip Auto MOD-36210 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 model iTrip Auto MOD-36210 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	171kHz	Bandwidth less than 200kHz contained in the 88 – 108 MHz band	Complies
15.239 (b)	RSS 210 A2.8 (1)	Fundamental Field Strength	47.8 dBµV/m (246 uV/m)	250uV/m at 3m	Complies
15.239 (c) / 15.209	RSS 210 Table 2	Radiated Spurious Emissions, 30 – 540 MHz	33.6 dBµV/m @ 72.01 MHz (-6.4 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	Integral antenna used	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.		
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	33.6 dBµV/m @ 72.01 MHz (-6.4 dB) – Note 1	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 7.1.5	User Manual		Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	142kHz	Information only	N/A

Note 1- 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 MOD-36210 is a FM transmitter that is designed to send audio to FM radio. 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 12 VDC.

The sample was received on October 30, 2013 and tested on November 1, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Griffin Technology	iTrip Auto MOD-36210	FM Transmitter	2013-1144 (NTS Asset)	PAV36210

ANTENNA SYSTEM

The antenna is integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 1.5 cm wide by 3 cm deep by 0.6 cm high.

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	N/A	-
-	-	12V Battery	-	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Apple iPod – Lightning Connector	EUT	-	-	-
EUT – CLA	Battery	2wire	Unshielded	0.15

EUT OPERATION

During 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 approximately 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 5	211948	2845B-5	41039 Boyce Road Fremont, CA 94538-2435

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

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 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

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 C63.10 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 as specified in ANSI C63.4. 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 C63.10, and the worst-case orientation is used for final measurements.

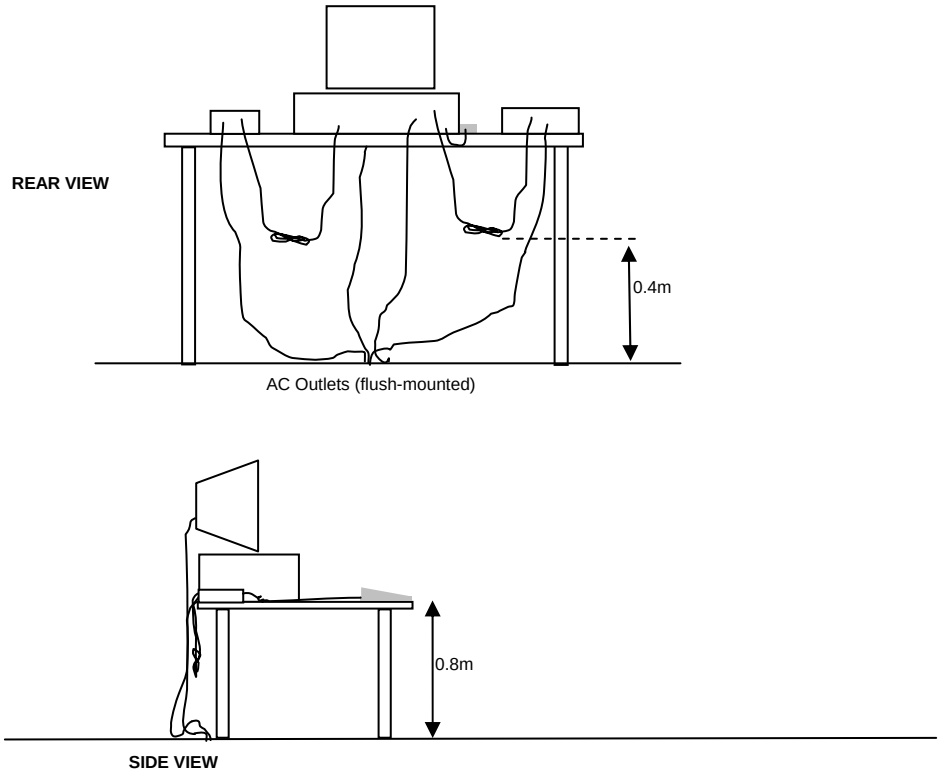
RADIATED EMISSIONS

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.

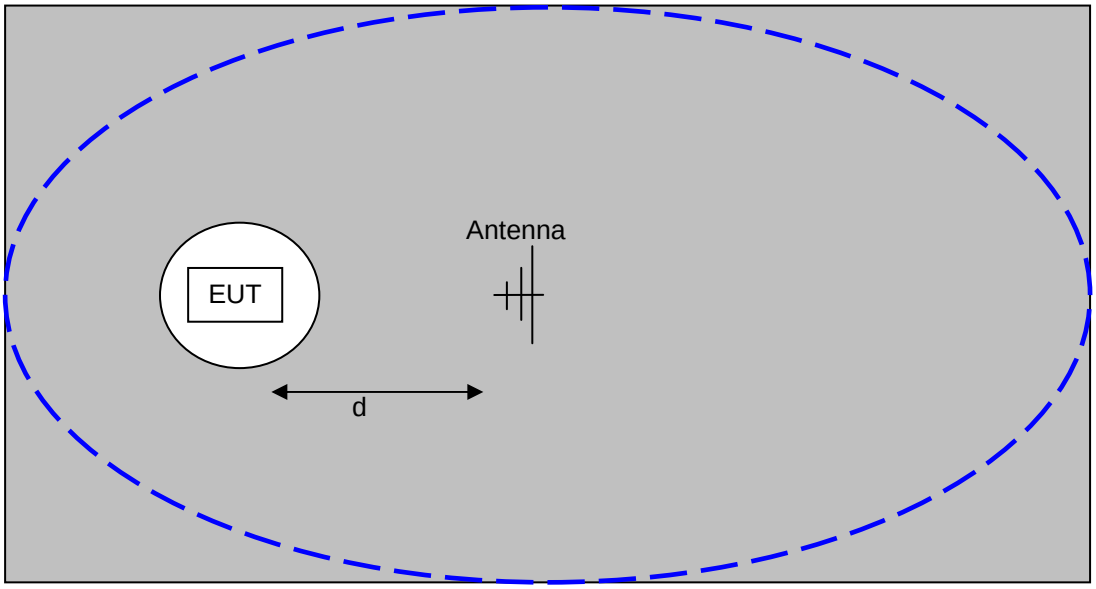
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

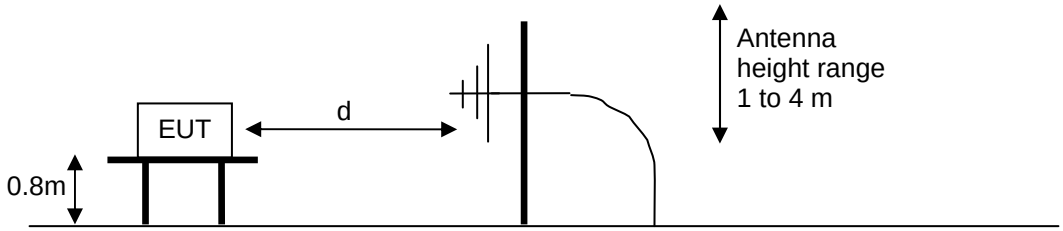
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



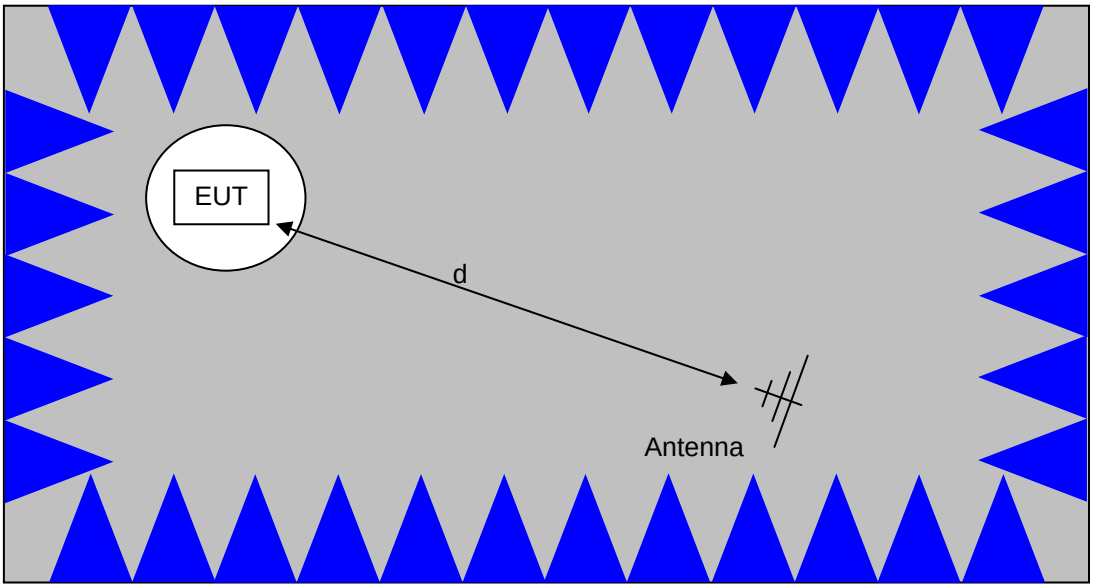
Typical Test Configuration for Radiated Field Strength Measurements



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.

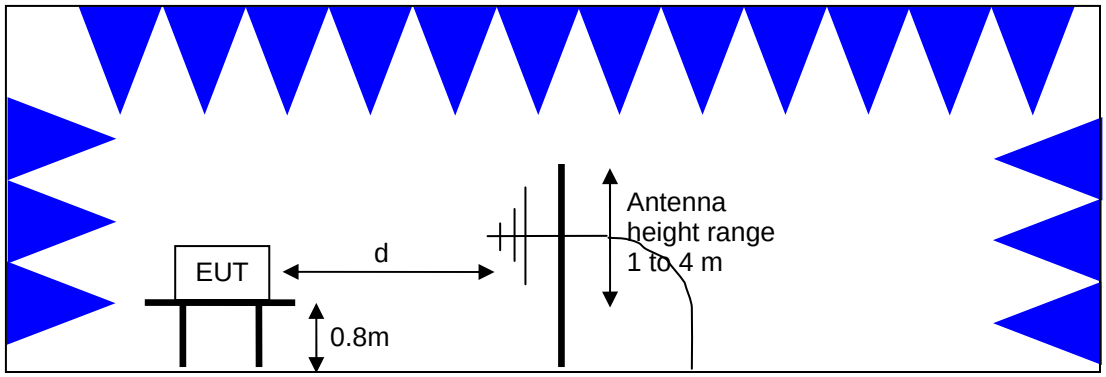


Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views



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, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and 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

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 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, 02-Nov-13

Manufacturer	Description	Model	Asset #	Cal Due
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
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	1/18/2014

Appendix B Test Data

T93485 Pages 23 - 32

Client:	Griffin	Job Number:	J93212
Product	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Emissions Standard(s):	15.239	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Griffin

Product

iTrip Auto Lightning

Date of Last Test: 11/25/2013

Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

Radiated 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 was located on the turntable for radiated emissions testing. The EUT was tested in all three orthogonal orientations.

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: 25 °C

Rel. Humidity: 30 %

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1	Fundamental Signal Field Strength	FCC 15.209 RSS 210/RSS GEN	Pass	47.8 dBµV/m @ 88.10 MHz (-0.2 dB)
1	Transmitter Radiated Spurious Emissions, 30 - 1000 MHz	FCC 15.209 RSS 210/RSS GEN	Pass	33.6 dBµV/m @ 72.01 MHz (-6.4 dB)
2	99% Bandwidth (center channel)	RSS-GEN	Pass	142kHz
2	200kHz bandwidth	15.239, RSS 210	Pass	171kHz

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	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

Run #1: Preliminary Radiated Emissions, 30-1000 MHz, Transmitter Spurious Emissions

EUT and Test Configuration Details:

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

FCC Sample, NTS tag 2013-1144

Date of Test: 11/1/2013 Config. Used: 1

Test Engineer: Joseph Cadigal Config Change: none

Test Location: FT Chamber#5 EUT Voltage: 12Vdc

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

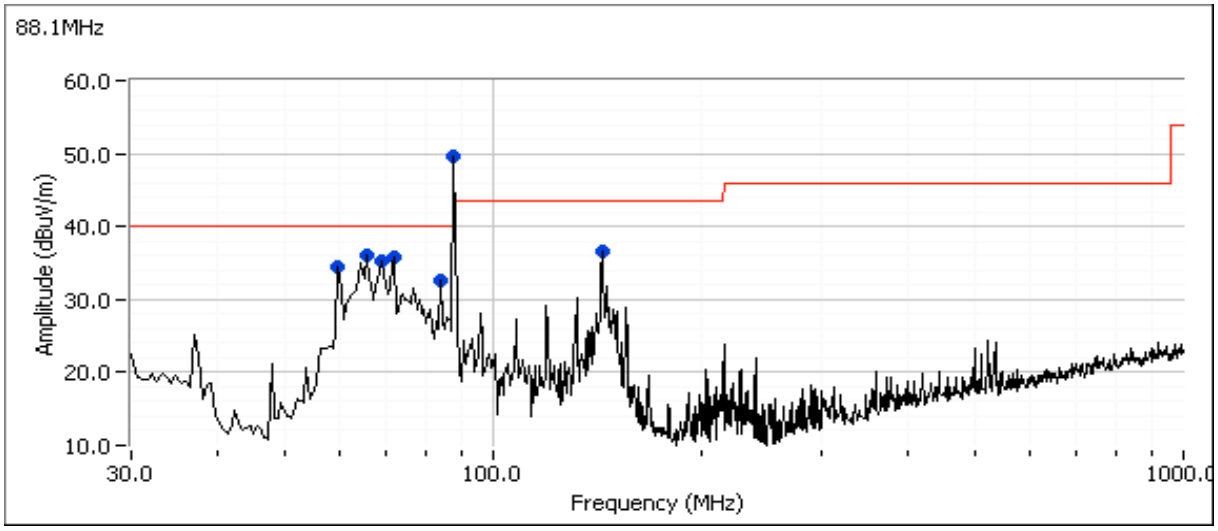
Note:	The limit in 15.239 for the fundamental signal is 250uV/m (48dBuV/m). Spurious emissions must comply with the 15.209 limit.
Note:	The field strength of any spurious emissions may not exceed the field strength of the fundamental signal.

Worst Case Orientation - Side

Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
107.900	47.4	H	48.0	-0.6	AVG	161	2.9	AVG (0.10s)	setting=83
107.900	51.1	H	68.0	-16.9	PK	161	2.9	PK (0.10s)	setting=83
107.900	41.2	V	48.0	-6.8	AVG	87	2.9	AVG (0.10s)	setting=83
107.900	44.9	V	68.0	-23.1	PK	87	2.9	PK (0.10s)	setting=83
98.100	47.4	H	48.0	-0.6	AVG	160	2.3	AVG (0.10s)	setting=80
98.100	51.3	H	68.0	-16.7	PK	160	2.3	PK (0.10s)	setting=80
98.100	39.8	V	48.0	-8.2	AVG	83	2.5	AVG (0.10s)	setting=80
98.100	43.6	V	48.0	-4.4	PK	83	2.5	PK (0.10s)	setting=80
88.100	47.8	H	48.0	-0.2	AVG	161	2.2	AVG (0.10s)	setting=60
88.100	50.0	H	68.0	-18.0	PK	161	2.2	PK (0.10s)	setting=60
88.100	41.8	V	48.0	-6.2	AVG	101	2.7	AVG (0.10s)	setting=60
88.100	43.1	V	68.0	-24.9	PK	101	2.7	PK (0.10s)	setting=60

Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

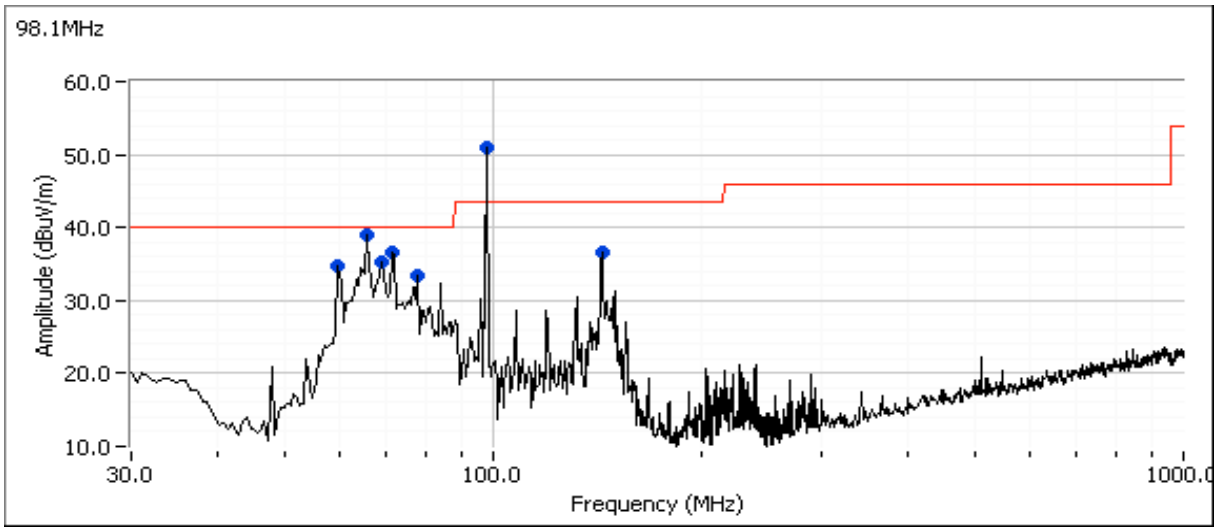
Low Channel



Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
60.016	33.2	H	40.0	-6.8	QP	22	4.0	QP (1.00s)
144.000	35.7	H	43.5	-7.8	QP	62	2.5	QP (1.00s)
66.004	22.0	H	40.0	-18.0	QP	119	3.0	QP (1.00s)
69.221	27.2	H	40.0	-12.8	QP	164	2.5	QP (1.00s)
88.096	49.2	H	-	-	Pk	177	2.5	QP (1.00s)
72.010	33.6	H	40.0	-6.4	QP	350	2.5	QP (1.00s)
84.001	31.9	H	40.0	-8.1	QP	358	2.5	QP (1.00s)

Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

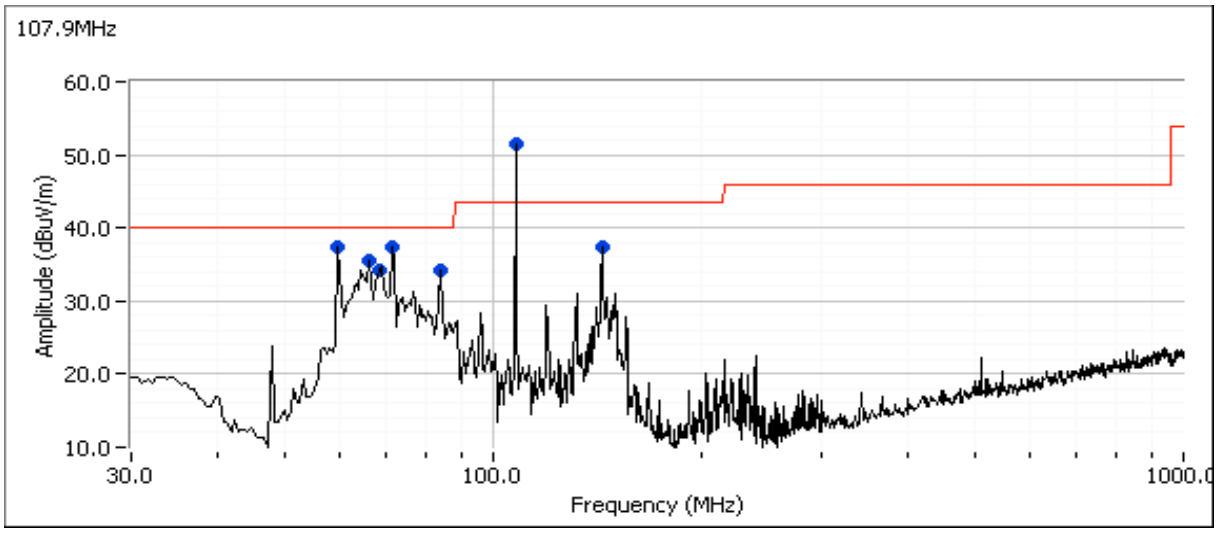
Center Channel



Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
60.003	32.1	H	40.0	-7.9	QP	0	3.0	QP (1.00s)
98.086	50.8	H	-	-	Pk	8	3.0	QP (1.00s)
65.874	24.6	H	40.0	-15.4	QP	17	3.0	QP (1.00s)
77.166	20.7	H	40.0	-19.3	QP	10	3.0	QP (1.00s)
72.006	32.8	H	40.0	-7.2	QP	20	1.5	QP (1.00s)
144.005	34.2	H	43.5	-9.3	QP	20	1.5	QP (1.00s)
68.881	25.3	H	40.0	-14.7	QP	181	2.5	QP (1.00s)

Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

High Channel



Frequency	Level	Pol	RSS 210 / FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
107.915	37.2	H	-	-	Pk	283	3.0	QP (1.00s)
67.966	24.7	H	40.0	-15.3	QP	159	4.0	QP (1.00s)
143.994	33.7	H	43.5	-9.8	QP	245	2.0	QP (1.00s)
66.622	25.5	H	40.0	-14.5	QP	318	4.0	QP (1.00s)
84.005	29.4	H	40.0	-10.6	QP	318	4.0	QP (1.00s)
72.006	32.6	H	40.0	-7.4	QP	326	4.0	QP (1.00s)
60.012	30.3	H	40.0	-9.7	QP	319	4.0	QP (1.00s)

Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

Run #3: Bandwidth Measurement(s)

EUT and Test Configuration Details:

EUT configured to transmit a 2.5 kHz tone and volume was set to maximum.

FCC Sample, NTS tag 2013-1144

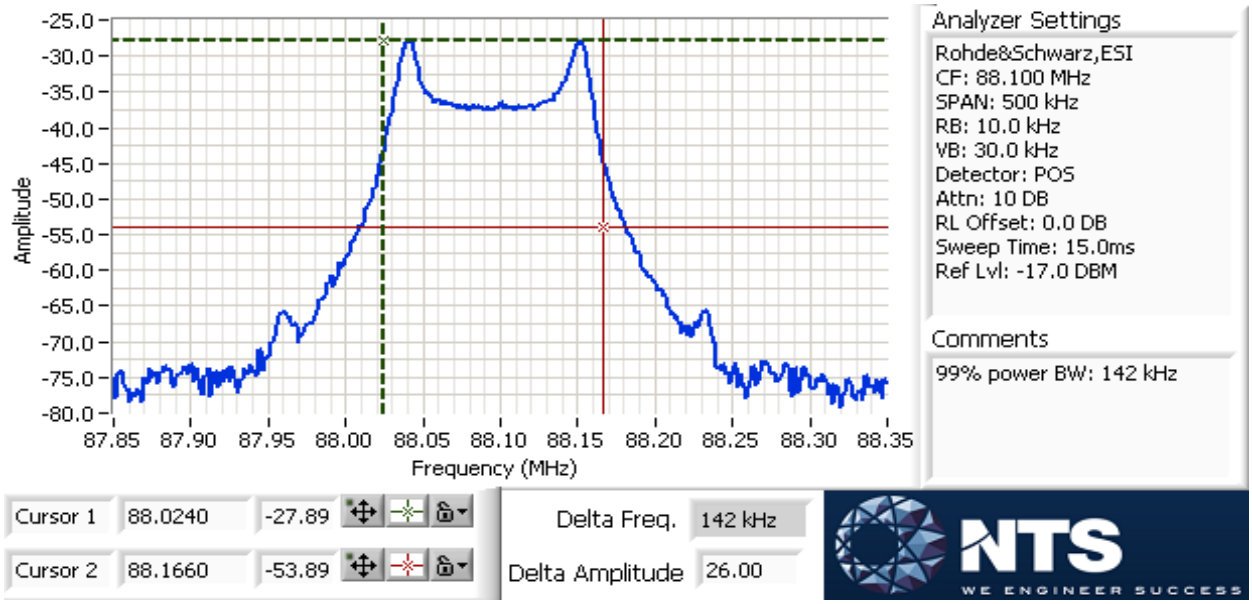
Date of Test: 11/1/2013 Config. Used: 1

Test Engineer: Joseph Cadigal Config Change: none

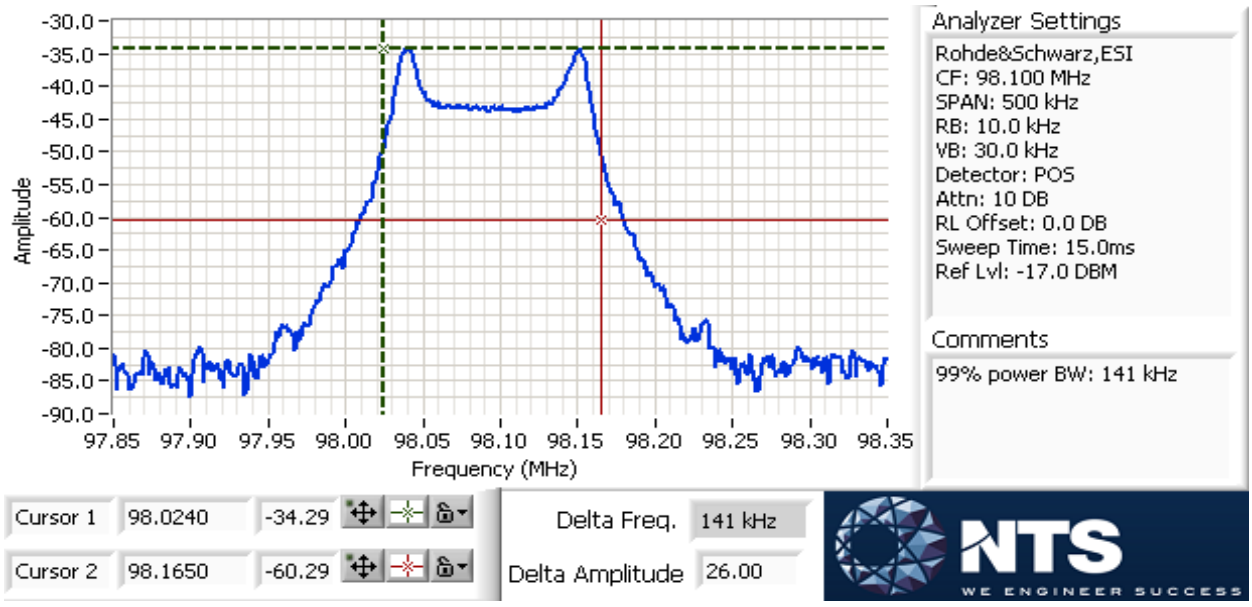
Test Location: FT Chamber#5 EUT Voltage: 12Vdc

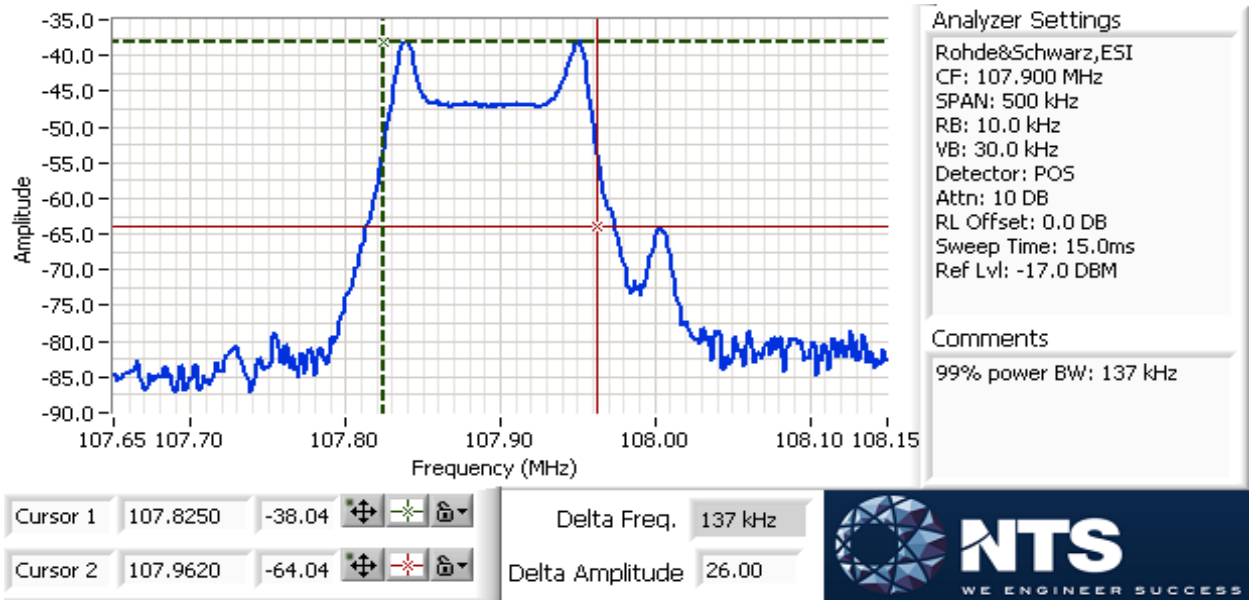
Power Setting	Frequency (MHz)	Resolution Bandwidth	Video Bandwidth	99% Bandwidth
85	88.1	10kHz	30kHz	142kHz
85	98.1	10kHz	30kHz	141kHz
85	107.9	10kHz	30kHz	137kHz

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



Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A





Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A

Compliance with 15.239 200kHz channel requirements

EUT and Test Configuration Details:

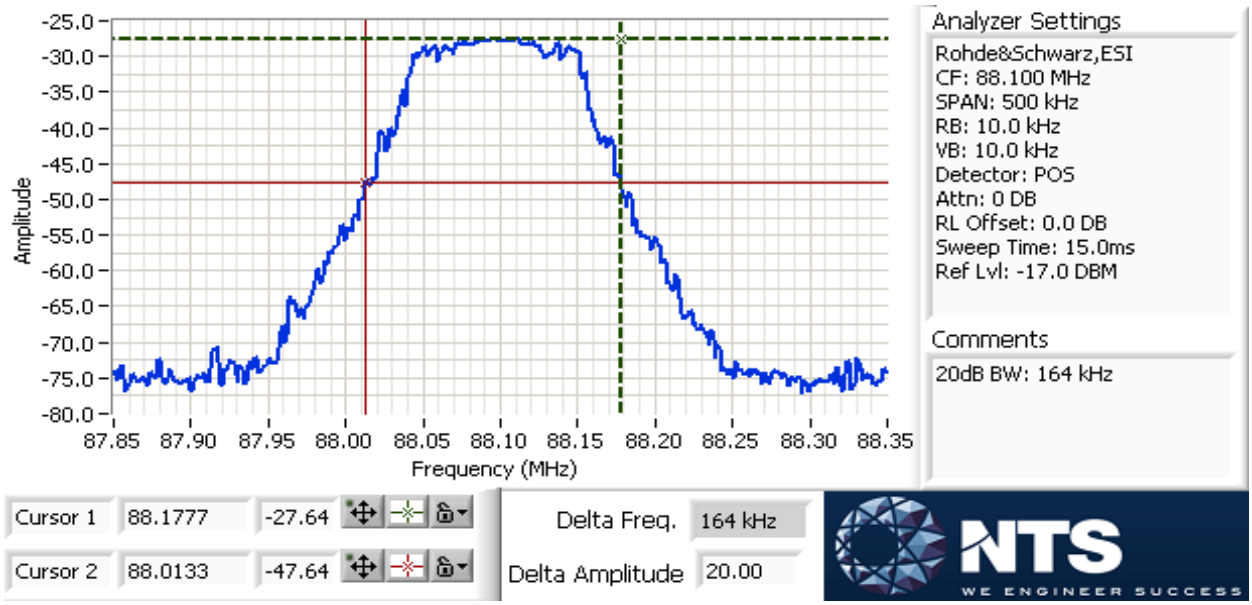
EUT configured to transmit a song and volume was set to maximum.

FCC Sample, NTS tag 2013-1144

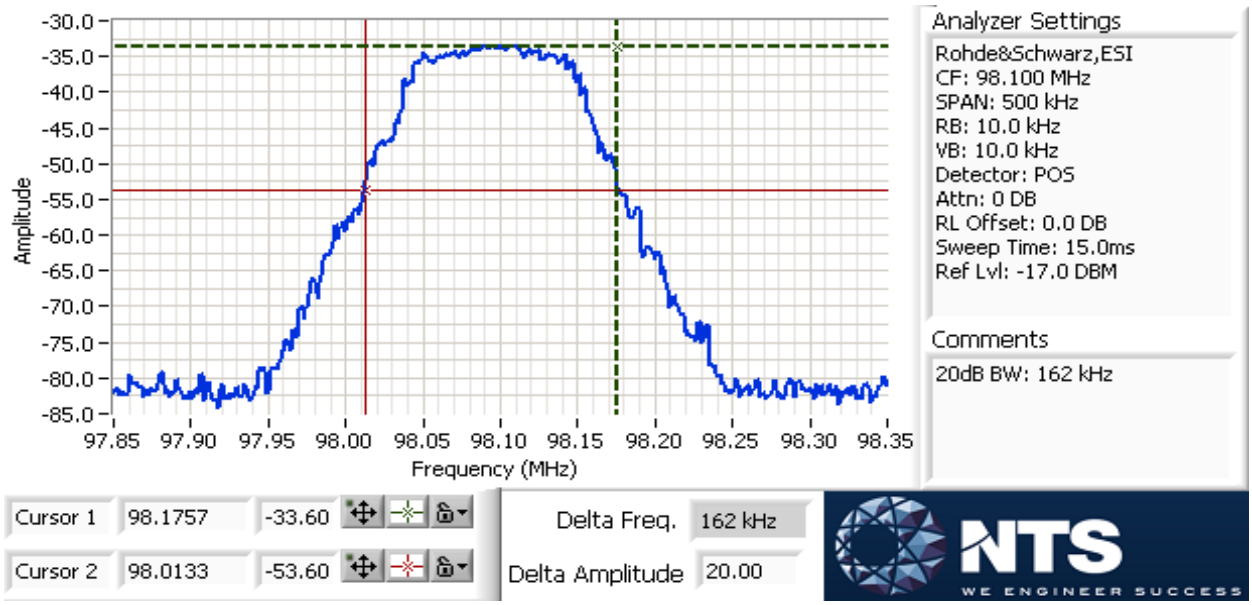
15.239 requires that all emissions outside of a 200kHz bandwidth, centered on the operating frequency, need to be below the 15.209 limit. In addition the 200kHz bandwidth for all channels must lie entirely in the range 88 - 108 MHz.

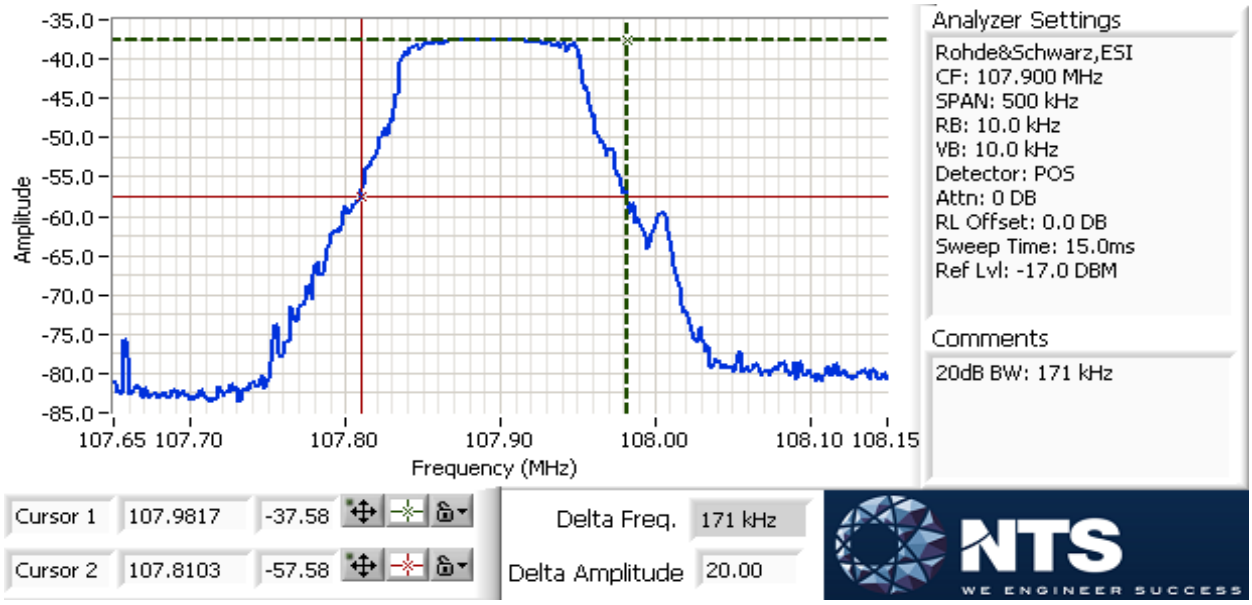
Power Setting	Channel	Freq (MHz)	20dB Signal Bandwidth			Result
			Bandwidth	F_L (MHz)	F_H(MHz)	
85	low	88.1	164	88.013		Pass
85	center	98.1	162			-
85	high	107.9	171		107.981	Pass

Note 1:	**Bandwidth** column is the 20dB signal bandwidth and must be 200kHz or less. Bandwidth is measured using RB=VB=10kHz.
Note 2:	F_L and F_H columns are the lowest and highest -20dB frequencies. These frequencies must lie entirely within the band 88 - 108 MHz.



Client:	Griffin	Job Number:	J93212
Model:	iTrip Auto Lightning	T-Log Number:	T93485
		Project Manager:	Sheareen Jacobs
Contact:	Michael O'Connor	Project Coordinator:	-
Standard:	15.239	Class:	N/A





End of Report

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