

*Electromagnetic Emissions Test Report*  
*Application for Grant of Equipment Authorization*  
*pursuant to*

*FCC Part 15 Subpart C*

*on the*  
*Altierre Corporation*  
*Transmitter*  
*Model: Altierre Electronic Shelf Label*

FCC ID: W22-ATAG250

GRANTEE: Altierre Corporation  
1980 Concourse Drive  
San Jose, CA 95131

TEST SITE(S): Elliott Laboratories  
684 W. Maude Ave  
Sunnyvale, CA 94086  
IC Site Registration #: IC 2845-2;

REPORT DATE: August 24, 2009

FINAL TEST DATE: December 22 and December 23, 2008

AUTHORIZED SIGNATORY:



Mark E. Hill  
Staff Engineer



Testing Cert #2016-01

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***REVISION HISTORY***

Rev #	Date	Comments	Modified By
-	August 24, 2009	First Release	-

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**SCOPE**

An electromagnetic emissions test has been performed on the Altierre Corporation model Altierre Electronic Shelf Label pursuant to the following rules:

FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003

FHSS test procedure DA 00-0705A1, March 2000

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.

The test results recorded herein are based on a single type test of the Altierre Corporation model Altierre Electronic Shelf Label and therefore apply only to the tested sample. The sample was selected and prepared by Sandro Brenciaglia of Altierre Corporation.

**OBJECTIVE**

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

**STATEMENT OF COMPLIANCE**

The tested sample of Altierre Corporation model Altierre Electronic Shelf Label complied with the requirements of the following regulations:

**FCC Part 15 Subpart C**

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.).

**TEST RESULTS SUMMARY****FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, 75 channels or more)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	623 kHz	Channel spacing > 20dB bandwidth	Complies
		Channel Separation	1017 kHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Channel Dwell Time (average time of occupancy)	0.7 ms per 5.2 seconds	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Number of Channels	79	75 or more	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	All channels are used equally - refer to the operational description for full explanation	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power (multipoint systems)	0.8 dBm (0.0012 W) <sup>Note 1</sup>	1 Watt, EIRP limited to 4 Watts.	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	49.8dBμV/m @ 4802.7MHz (-4.2dB)	15.207 in restricted bands, all others < -20dBc	Complies
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: Power calculated from a radiated measurement.

**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 integral to the EUT	-	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	22.1dBμV/m @ 30.00MHz (-17.9dB)	Refer to standard	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	-	Refer to standard	N/A – Note 2
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies

Note 2 – The EUT is battery powered.

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**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	$\pm 2.4$
Radiated Emissions	0.015 to 30	$\pm 3.0$
Radiated Emissions	30 to 1000	$\pm 3.6$
Radiated Emissions	1000 to 40000	$\pm 6.0$

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

The Altierre Corporation model Electronic Shelf Label is a wireless tag designed to display retail product information and pricing. Product information and pricing is updated through the Tag's wireless link. Normally, the EUT would be mounted to a retail shelf. The EUT was treated as tabletop equipment during testing to simulate the end user environment. The EUT is battery operated.

The sample was received on December 22, 2008 and tested on December 22 and December 23, 2008. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Altierre Corporation	Electronic Shelf Label	Tag	Prototype	N/A

**OTHER EUT DETAILS**

During testing, a black box was attached to the ESL to house D cell batteries to enable TX and RX continuous operation for testing purposes.

**ANTENNA SYSTEM**

The antenna system used with the Altierre Corporation model Altierre Electronic Shelf Label consists of a F shaped pcb/trace antenna.

**ENCLOSURE**

The EUT enclosure is primarily constructed injection molded plastic. It measures approximately 9cm wide by 2.5cm deep by 4.5cm high.

**MODIFICATIONS**

The EUT did not require modifications during testing in order to comply with emissions specifications.

**SUPPORT EQUIPMENT**

No support equipment was used during testing.

**EUT INTERFACE PORTS**

None. The EUT has no interface ports.

**EUT OPERATION**

The transmitter was continuously transmitting a modulated signal during radiated emissions tests. For receive mode tests the EUT was in receive mode with the LO and receiver circuit active.



**TEST SITE****GENERAL INFORMATION**

Final test measurements were taken on December 22 and December 23, 2008 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	
SVOATS #2	90593	IC 2845A-2	684 West Maude Ave, Sunnyvale CA 94085-3518

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 with the exception, on OATS sites, of predictable local TV, radio, and mobile communications traffic. 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.

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## 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.

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**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.

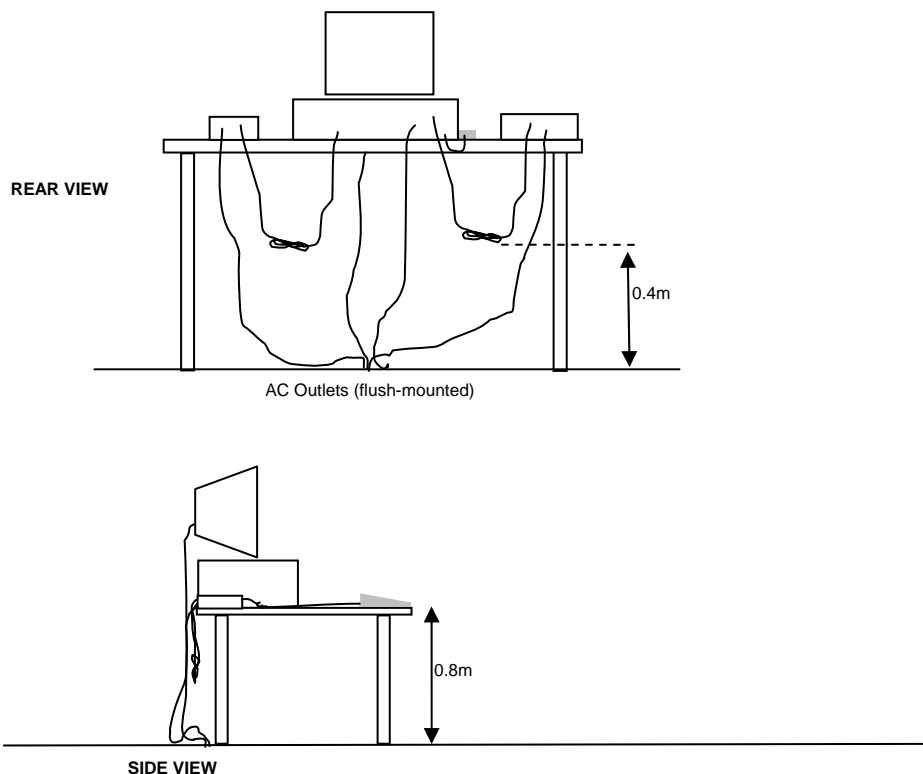
**RADIATED EMISSIONS**

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.

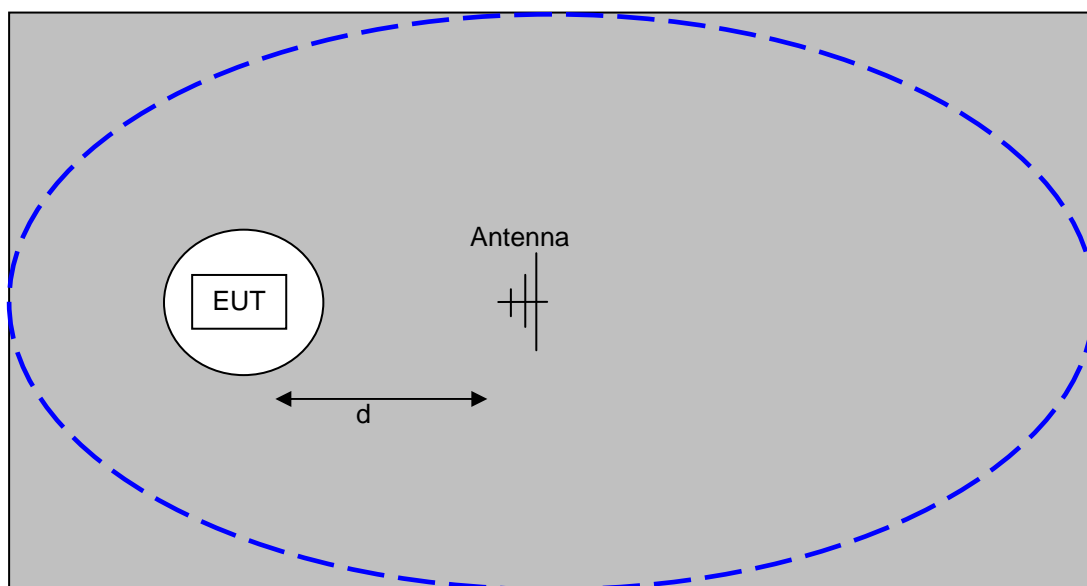
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

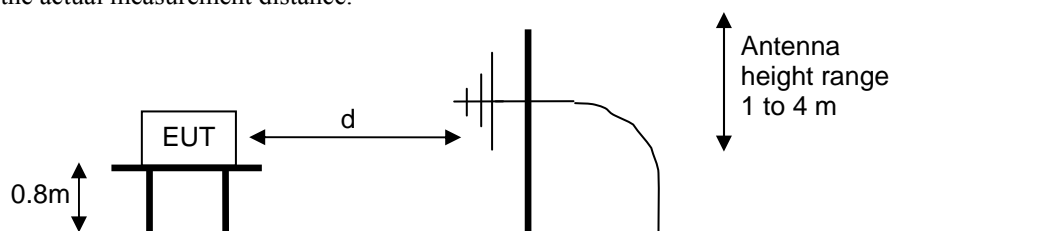
When testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements



The 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

#### **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<sup>1</sup> (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 <sub>KHz</sub> @ 300m	67.6-20*log <sub>10</sub> (F <sub>KHz</sub> ) @ 300m
0.490-1.705	24000/F <sub>KHz</sub> @ 30m	87.6-20*log <sub>10</sub> (F <sub>KHz</sub> ) @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

**OUTPUT POWER LIMITS – FHSS SYSTEMS**

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

**TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS**

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

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

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**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:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

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:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

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.

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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:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

#### *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:

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

where P is the eirp (Watts)



***EXHIBIT 1: Test Equipment Calibration Data***

1 Page

**Radiated Emissions, 30 - 25,000 MHz, 22 & 23 of Dec 08****Engineer: Mehran Birgani**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	15-Jul-10
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	06-Jun-09
Hewlett Packard	High Pass filter, 3.5 GHz (Purple System)	P/N 84300-80038 (84125C)	1768	03-Nov-09
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	20-Oct-09

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**Radiated Emissions, 30 - 1,000 MHz, 24-Dec-08****Engineer: Mehran Birgani**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1543	14-Nov-09
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	23-May-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	04-Feb-09

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***EXHIBIT 2: Test Measurement Data***

14 Pages

Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
		Account Manager:	Deepa Shetty
Contact:	Sandro Brenciaglia	Project Engineer:	Mehran Birgani
Emissions Spec:	FCC 15.247	Class:	A
Immunity Spec:	-	Environment:	-

## EMC Test Data

For The

**Altierre Corporation**

Model

**Altierre Electronic Shelf Label**

Date of Last Test: 8/18/2009

Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	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.

Date of Test: 12/24/2008  
 Test Engineer: Mehran Birgani  
 Test Location: FT Chamber #3

Config. Used: 1  
 Config Change: None  
 EUT Voltage: Battery

### General Test Configuration

The EUT and all 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: 12 °C  
 Rel. Humidity: 49 %

### Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	RE, 30 - 1000MHz Maximized Emissions	FCC Class B	Pass	22.1dBμV/m @ 30.00MHz (-17.9dB)

### Modifications Made During Testing

No modifications were made to the EUT during testing

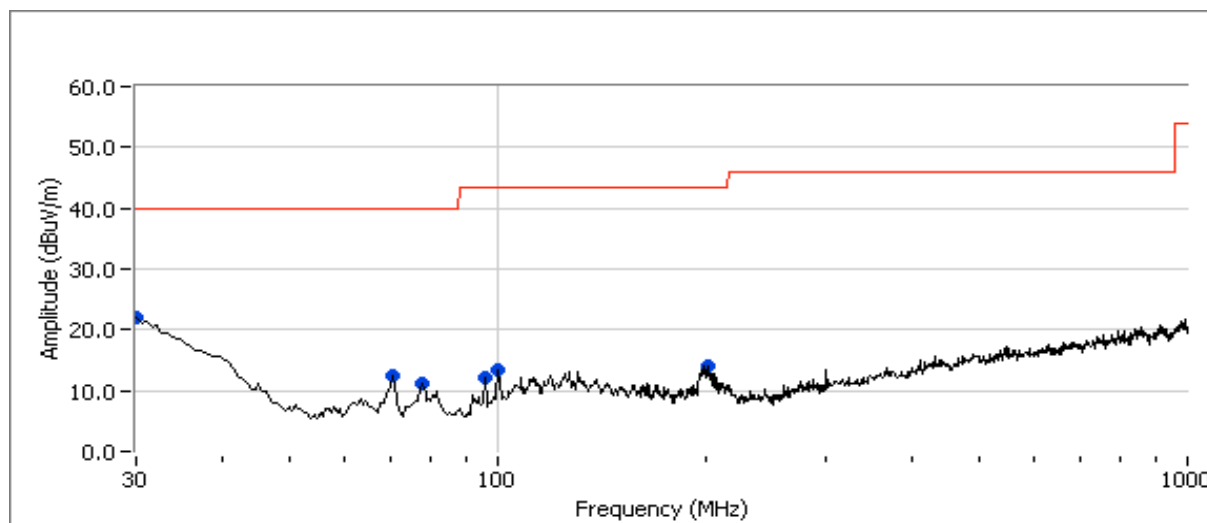
### Deviations From The Standard

No deviations were made from the requirements of the standard.

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

Client: Altierre Corporation	Job Number: J74101
Model: Altierre Electronic Shelf Label	T-Log Number: T74141
Contact: Sandro Brenciaglia	Account Manager: Deepa Shetty
Standard: FCC 15.247	Class: A

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



Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBuV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
30.000	22.1	H	40.0	-17.9	Peak	320	3.0	Peak reading with QP limit.
70.581	12.3	V	40.0	-27.7	Peak	97	3.5	Peak reading with QP limit.
77.615	11.1	H	40.0	-28.9	Peak	206	1.0	Peak reading with QP limit.
202.064	14.2	H	43.5	-29.3	Peak	204	1.5	Peak reading with QP limit.
100.341	13.3	V	43.5	-30.2	Peak	54	1.0	Peak reading with QP limit.
96.012	12.0	V	43.5	-31.5	Peak	75	1.0	Peak reading with QP limit.

## Run #3: Maximized Readings From Run #2

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBuV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
30.000	22.1	H	40.0	-17.9	Peak	320	3.0	Peak reading with QP limit.
70.581	12.3	V	40.0	-27.7	Peak	97	3.5	Peak reading with QP limit.
77.615	11.1	H	40.0	-28.9	Peak	206	1.0	Peak reading with QP limit.
96.012	12.0	V	43.5	-31.5	Peak	75	1.0	Peak reading with QP limit.
100.341	13.3	V	43.5	-30.2	Peak	54	1.0	Peak reading with QP limit.
202.064	14.2	H	43.5	-29.3	Peak	204	1.5	Peak reading with QP limit.

Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## FCC 15.247 FHSS - Power, Bandwidth and Spurious Emissions

### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/22 & 23/2008  
 Test Engineer: Mehran Birgani  
 Test Location: SVOATS #2

Config. Used: 1  
 Config Change: None  
 EUT Voltage: Battery

### General Test Configuration

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

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

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:                      Temperature:            11 °C  
    Rel. Humidity:            73 %

### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 25000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247( c)	Pass	49.8dBμV/m @ 4802.7MHz (-4.2dB)
2	Output Power	15.247(b)	Pass	0.8 dBm (0.0012 W)
3	20dB Bandwidth	15.247(a)	Pass	623 kHz
3	99% Bandwidth	15.247(a)	-	589 kHz
3	Channel Occupancy	15.247(a)	Pass	1017 kHz
3	Number of Channels	15.247(a)	Pass	79

### 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:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

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

Preliminary scans covering the frequency range 18 – 26GHz were made with the antenna located close to the EUT. No emissions were observed in that frequency range and so the test report does not include discrete measurements or scans above 18GHz.

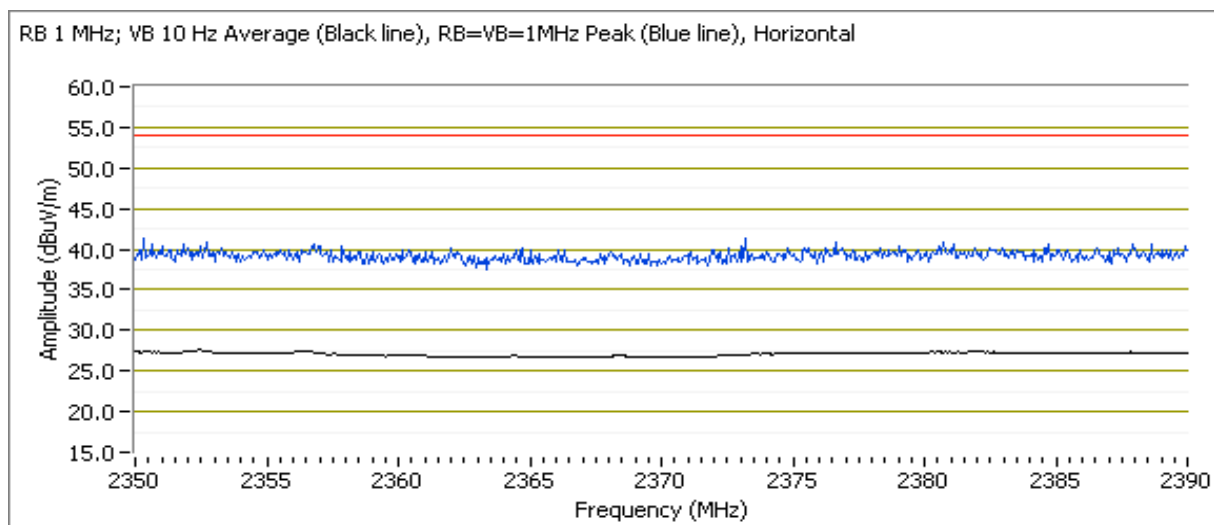
Run #1a: Low Channel @ 2401.5 MHz

Fundamental Signal Field Strength:

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.410	93.8	H	-	-	AVG	180	1.8	RB 1 MHz; VB: 10 Hz
2401.290	94.4	H	-	-	PK	180	1.8	RB 1 MHz; VB: 1 MHz
2401.400	81.8	V	-	-	AVG	86	1.4	RB 1 MHz; VB: 10 Hz
2401.250	82.2	V	-	-	PK	86	1.4	RB 1 MHz; VB: 1 MHz
2401.250	94.2	H	-	-	-	180	1.8	RB=VB= 100 kHz

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2352.130	29.0	H	54.0	-25.0	AVG	180	1.8	RB 1 MHz; VB: 10 Hz
2380.330	40.1	H	74.0	-33.9	PK	180	1.8	RB 1 MHz; VB: 1 MHz



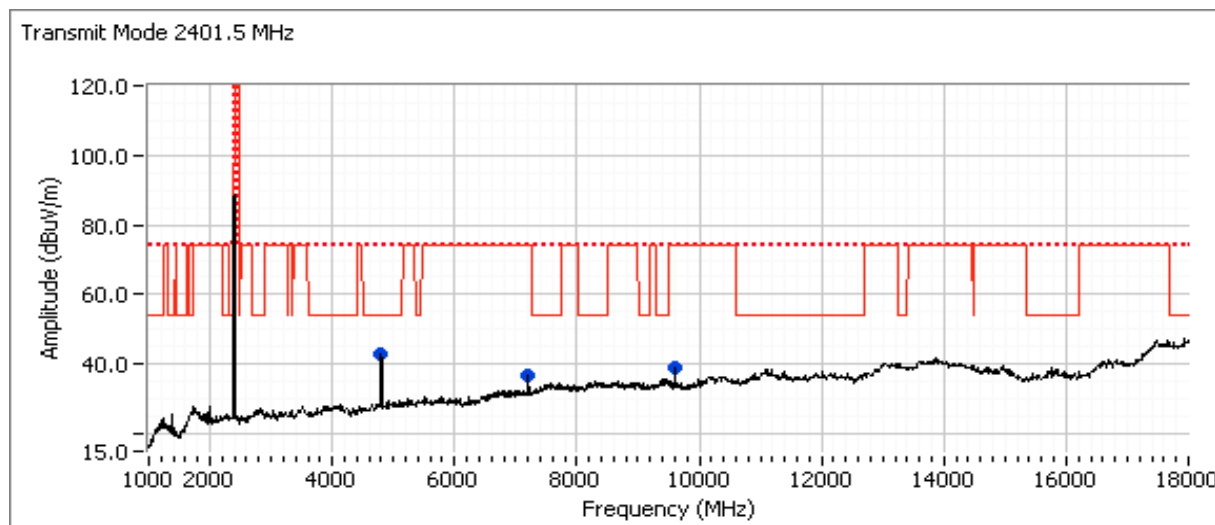


Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4802.690	49.8	H	54.0	-4.2	AVG	184	1.5	RB 1 MHz; VB: 10 Hz
4802.690	45.7	V	54.0	-8.3	AVG	78	1.0	RB 1 MHz; VB: 10 Hz
7203.850	38.1	H	54.0	-15.9	AVG	185	1.3	Note 2
7203.860	37.4	V	54.0	-16.6	AVG	344	1.5	Note 2, Noise Floor
9604.950	36.7	H	54.0	-17.3	AVG	105	1.0	Note 2, Noise Floor
4802.570	50.5	V	74.0	-23.5	PK	78	1.0	RB 1 MHz; VB: 1 MHz
4802.730	53.5	H	74.0	-20.5	PK	184	1.5	RB 1 MHz; VB: 1 MHz
7203.230	47.5	V	74.0	-26.5	PK	344	1.5	Note 2, Noise Floor
7203.900	47.8	H	74.0	-26.2	PK	185	1.3	Note 2
9605.680	48.2	H	74.0	-25.8	PK	105	1.0	Note 2, Noise Floor

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	All harmonics were measured; however, the signals that were more than 20dB below the limit or were within the noise floor were not recorded.



Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## Run #1b: Center Channel @ 2440 MHz

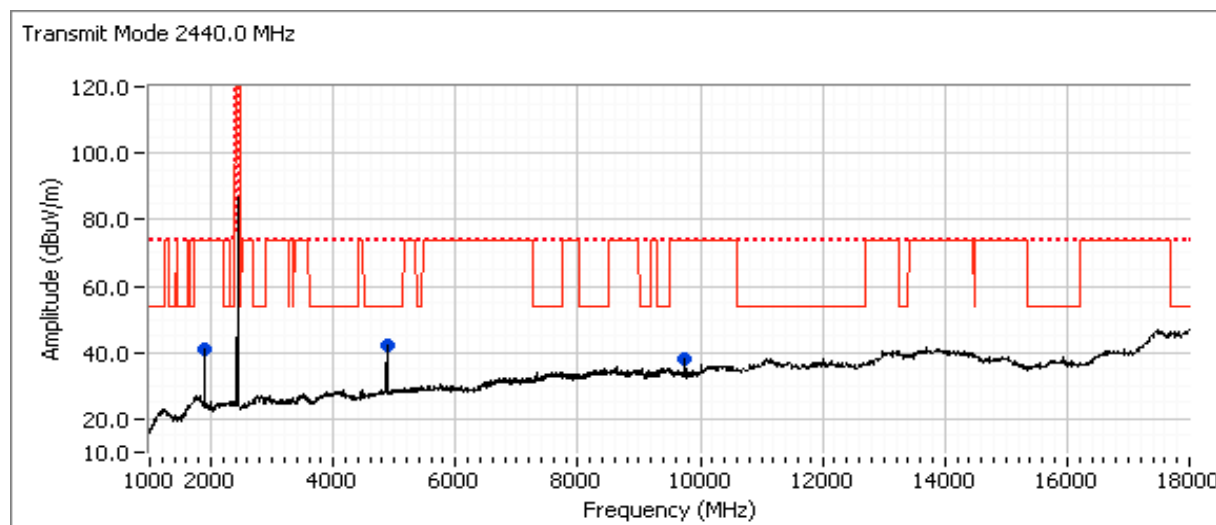
### Fundamental Signal Field Strength:

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.890	95.6	H	-	-	AVG	23	1.8	RB 1 MHz; VB: 10 Hz
2439.810	96.1	H	-	-	PK	23	1.8	RB 1 MHz; VB: 1 MHz
2439.900	89.5	V	-	-	AVG	326	1.1	RB 1 MHz; VB: 10 Hz
2439.750	90.1	V	-	-	PK	326	1.1	RB 1 MHz; VB: 1 MHz
2439.760	96.0	H	-	-	-	23	1.8	RB=VB= 100 kHz

### Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4879.770	47.5	H	54.0	-6.5	AVG	0	1.2	RB 1 MHz; VB: 10 Hz
4877.780	44.5	V	54.0	-9.5	AVG	60	1.0	RB 1 MHz; VB: 10 Hz
7319.520	39.2	H	54.0	-14.8	AVG	14	1.2	RB 1 MHz; VB: 10 Hz
7319.430	35.3	V	54.0	-18.7	AVG	220	1.0	Noise Floor
4879.730	51.8	H	74.0	-22.2	PK	0	1.2	RB 1 MHz; VB: 1 MHz
4877.800	48.6	V	74.0	-25.4	PK	60	1.0	RB 1 MHz; VB: 1 MHz
7320.180	48.3	H	74.0	-25.7	PK	14	1.2	RB 1 MHz; VB: 1 MHz
7317.100	45.8	V	74.0	-28.2	PK	220	1.0	Noise Floor

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	All harmonics were measured; however, the signals that were more than 20dB below the limit or were within the noise floor were not recorded.



Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## Run #1c: High Channel @ 2479.3 MHz

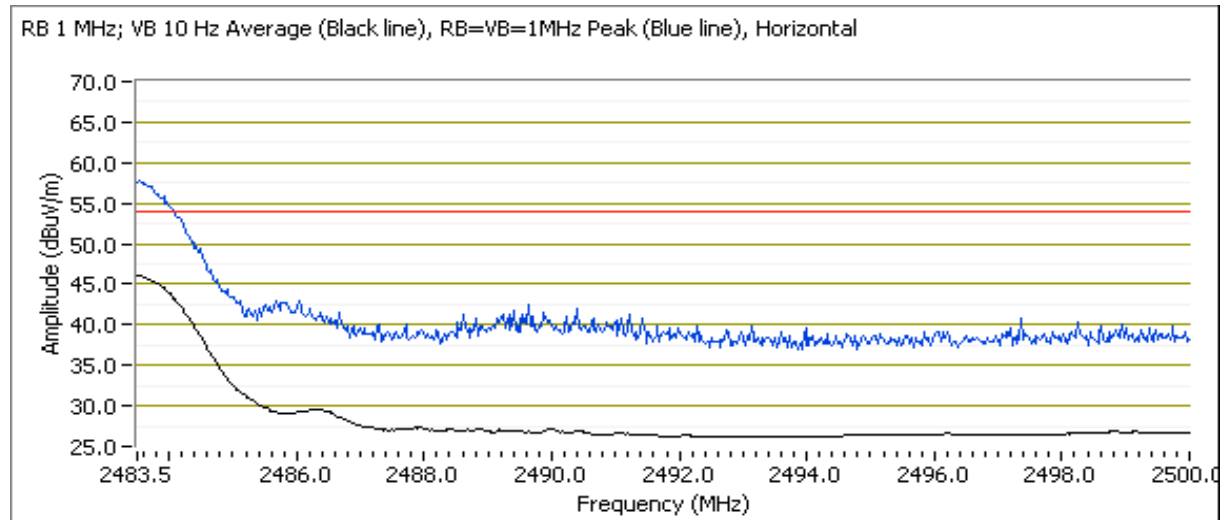
### Fundamental Signal Field Strength:

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2479.380	93.0	H	-	-	AVG	180	1.8	RB 1 MHz; VB: 10 Hz
2479.240	93.6	H	-	-	PK	180	1.8	RB 1 MHz; VB: 1 MHz
2479.390	80.1	V	-	-	AVG	108	1.1	RB 1 MHz; VB: 10 Hz
2479.230	80.8	V	-	-	PK	108	1.1	RB 1 MHz; VB: 1 MHz
2479.500	93.0	H	-	-	-	180	1.8	RB=VB=100 kHz

### Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	48.1	H	54.0	-5.9	AVG	180	1.8	RB 1 MHz; VB: 10 Hz
2483.500	57.3	H	74.0	-16.7	PK	180	1.8	RB 1 MHz; VB: 1 MHz

Note 1: Calculated by subtracting the marker delta values from the fundamental field strength measurements.

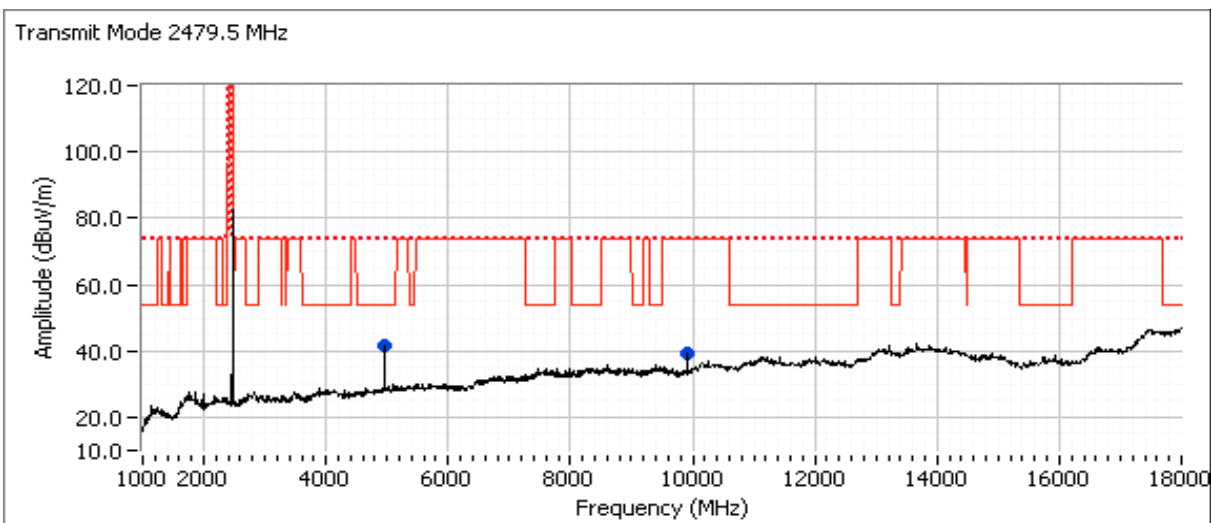


Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4958.750	46.4	H	54.0	-7.6	AVG	186	1.5	RB 1 MHz; VB: 10 Hz
4956.770	45.8	V	54.0	-8.2	AVG	236	1.0	RB 1 MHz; VB: 10 Hz
7437.900	38.0	H	54.0	-16.0	AVG	196	1.2	Noise Floor
7437.850	36.4	V	54.0	-17.6	AVG	360	1.5	Noise Floor
4958.930	51.1	H	74.0	-22.9	PK	186	1.5	RB 1 MHz; VB: 1 MHz
4956.680	50.0	V	74.0	-24.0	PK	236	1.0	RB 1 MHz; VB: 1 MHz
7438.550	48.1	H	74.0	-25.9	PK	196	1.2	Noise Floor
7441.620	47.8	V	74.0	-26.2	PK	360	1.5	Noise Floor

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	All harmonics were measured; however, the signals that were more than 20dB below the limit or were within the noise floor were not recorded.



Client:	Altierre Corporation	Job Number:	J74101
Model:	Altierre Electronic Shelf Label	T-Log Number:	T74141
Contact:	Sandro Brenciaglia	Account Manager:	Deepa Shetty
Standard:	FCC 15.247	Class:	N/A

## Run #2: Output Power

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW (MHz)	Signal Bandwidth	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2401.5	94.4	H	1	0.62	0	-0.9	0.0008128
Mid	2440.0	96.1	H	1	0.62	0	0.8	0.0012023
High	2479.3	93.6	H	1	0.62	0	-1.7	0.0006761

Note 1:	Output power calculated from field strength at 3m based on free space path loss formula $E = \sqrt{(30PG) / d}$ , where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.
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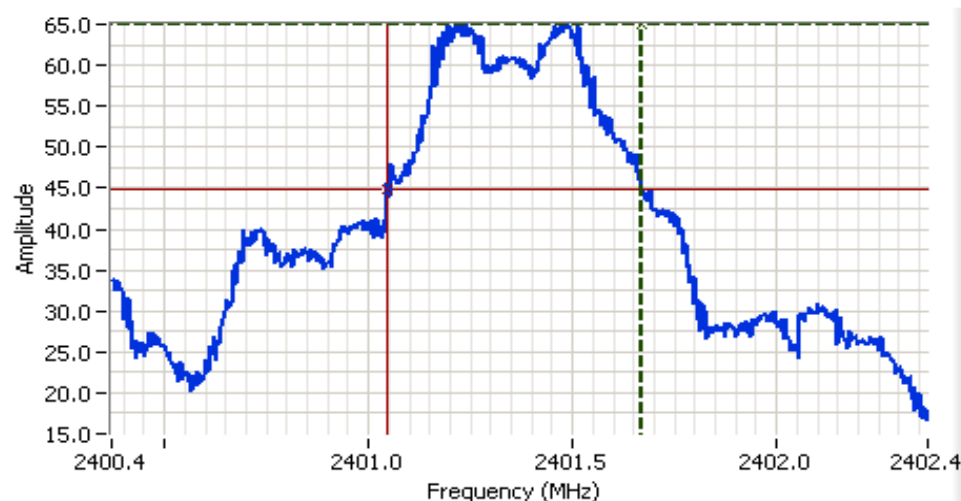
Client: Altierre Corporation	Job Number: J74101
Model: Altierre Electronic Shelf Label	T-Log Number: T74141
Contact: Sandro Brenciaglia	Account Manager: Deepa Shetty
Standard: FCC 15.247	Class: N/A

## Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2401.5	30 kHz	623	30 kHz	566
Mid	2440.0	30 kHz	623	30 kHz	579
High	2479.3	30 kHz	620	30 kHz	589

Note 1: 20dB bandwidth measured using RB = 30 kHz, VB = 100 kHz (VB > RB)

Note 2: 99% bandwidth measured using RB = 30 kHz, VB = 100 kHz (VB >= 3RB)



### Analyzer Settings

HP8564E,EMI  
CF: 2401.370 MHz  
SPAN:2.000 MHz  
RB 30.0 kHz  
VB 100 kHz  
Detector POS  
Att 0  
RL Offset 0.00  
Sweep Time 50.0ms  
Ref Lvl:74.80DBUV

### Comments

20dB BW: 623 kHz

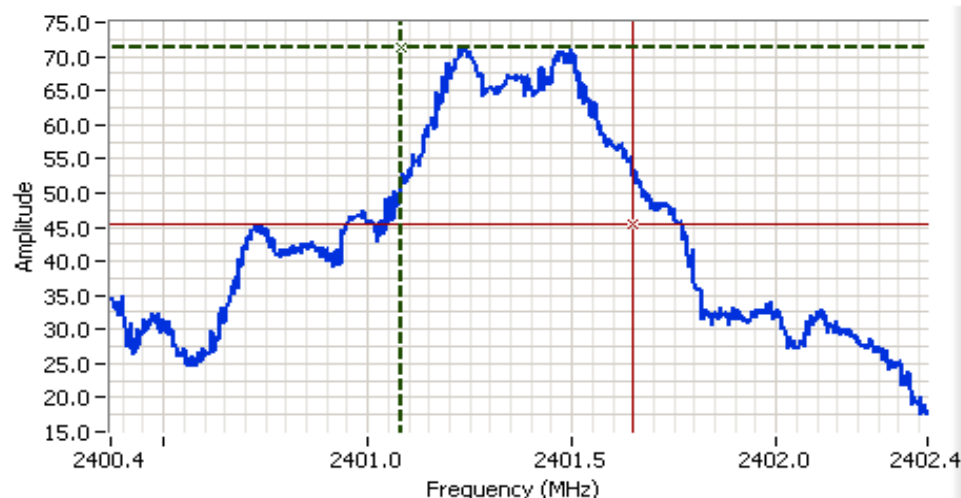
Cursor 1 2401.6701 64.97

Cursor 2 2401.0468 44.97

Delta Freq. 623 kHz

Delta Amplitude 20.00

Client: Altierre Corporation	Job Number: J74101
Model: Altierre Electronic Shelf Label	T-Log Number: T74141
Contact: Sandro Brenciaglia	Account Manager: Deepa Shetty
Standard: FCC 15.247	Class: N/A









## Analyzer Settings

HP8564E,EMI  
CF: 2401.370 MHz  
SPAN: 2.000 MHz  
RB 30.0 kHz  
VB 100 kHz  
Detector PO5  
Att 0  
RL Offset 0.00  
Sweep Time 50.0ms  
Ref Lvl: 78.80DBUV

## Comments

99% BW: 566 MHz

Cursor 1	2401.0823	71.30			
Cursor 2	2401.6480	45.30			

Delta Freq. 566 kHz  
Delta Amplitude 26.00



Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth: 623 kHz

Channel spacing: 1017 kHz

Transmission time per hop: 0.68 ms

The time between successive hops on a channel: 5229 ms

Number of channels (N): 78

Channel dwell time in 31.2 seconds: 53.04 ms

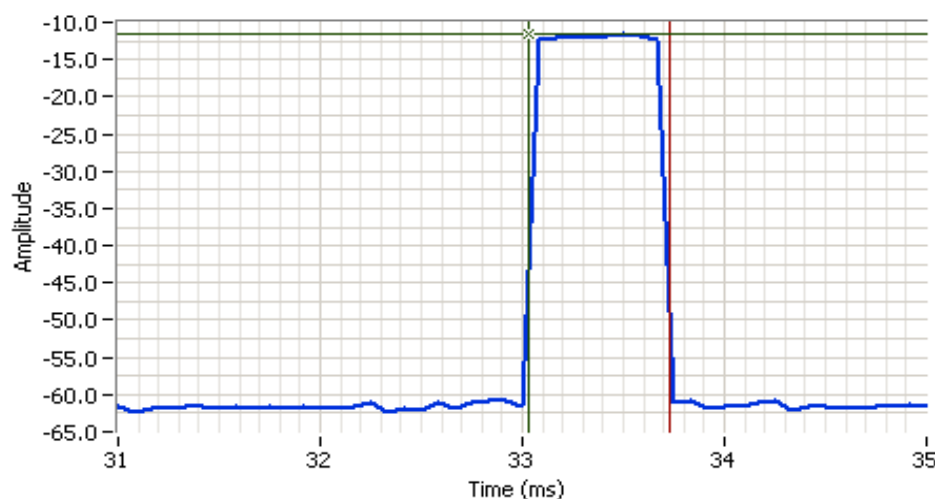
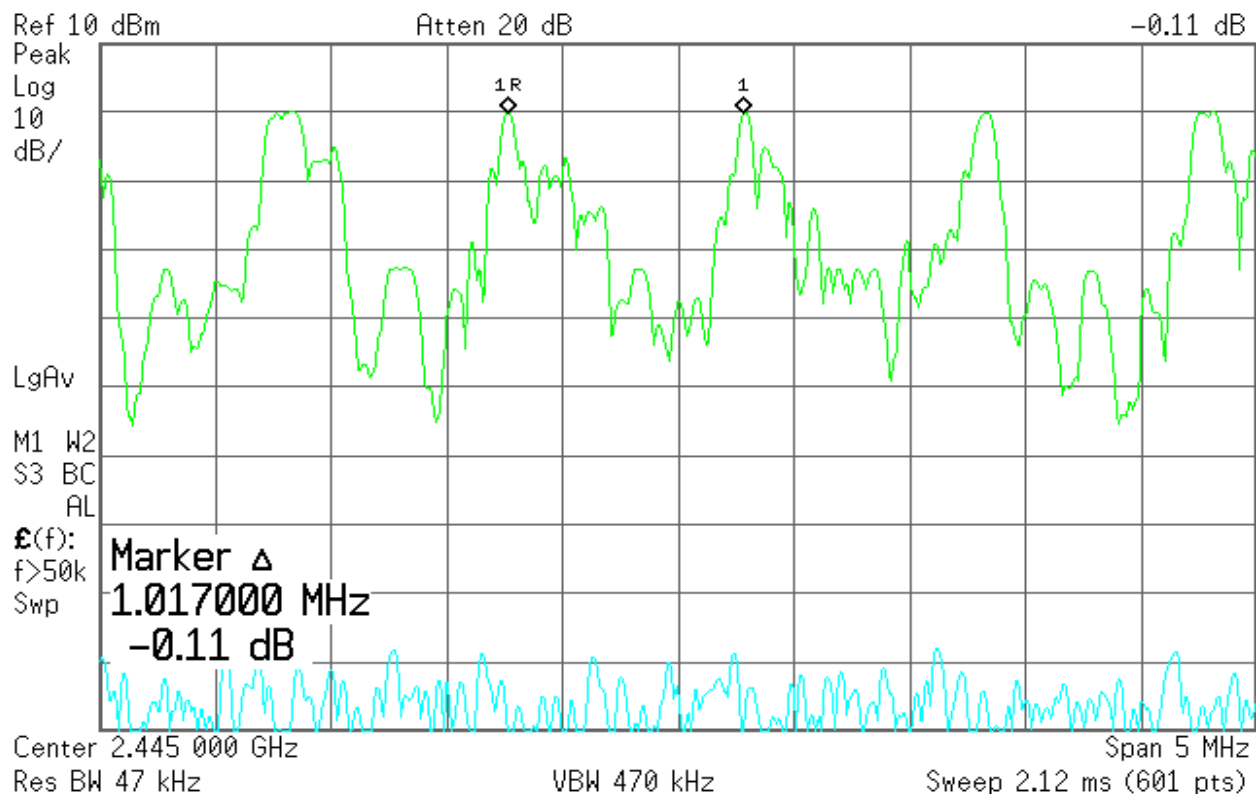
Pass Limit (kHz): 415

Pass

Pass

Note: Normally EUT will transmit every 4min. For testing purposes the transmission time was increased from 4min to 32ms.

Client: Altierre Corporation	Job Number: J74101
Model: Altierre Electronic Shelf Label	T-Log Number: T74141
Contact: Sandro Brenciaglia	Account Manager: Deepa Shetty
Standard: FCC 15.247	Class: N/A



## Analyzer Settings

HP8564E  
 CF: 2450.000 MHz  
 SPAN:0.000 MHz  
 RB 2.000 MHz  
 VB 30.0 kHz  
 Detector POS  
 Att 20  
 RL Offset 0.00  
 Sweep Time 50.0ms  
 Ref Lvl:10.00DBM

## Comments

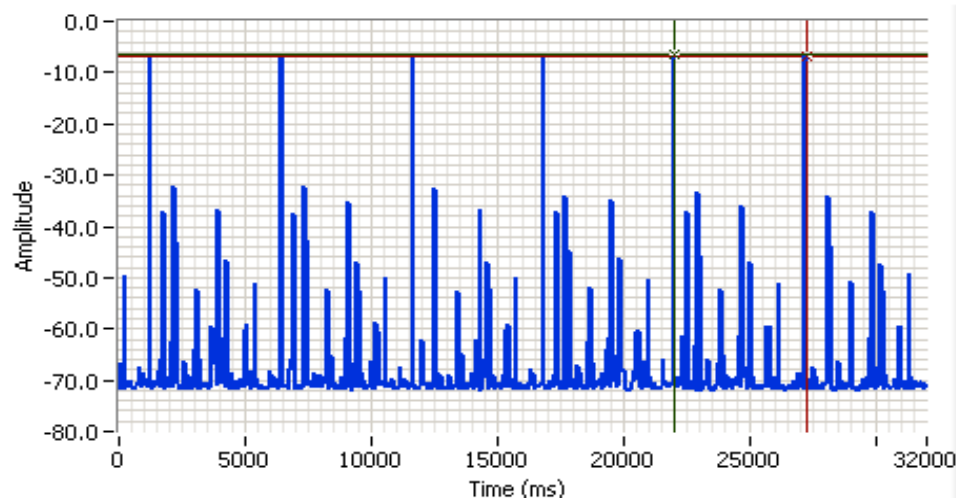
Longest Transmission  
 Time

Cursor 1 33.0339 -11.50    Delta Time (ms) 0.70

Cursor 2 33.7292 0.00    Delta Amplitude 11.50



Client: Altierre Corporation	Job Number: J74101
Model: Altierre Electronic Shelf Label	T-Log Number: T74141
Contact: Sandro Brenciaglia	Account Manager: Deepa Shetty
Standard: FCC 15.247	Class: N/A



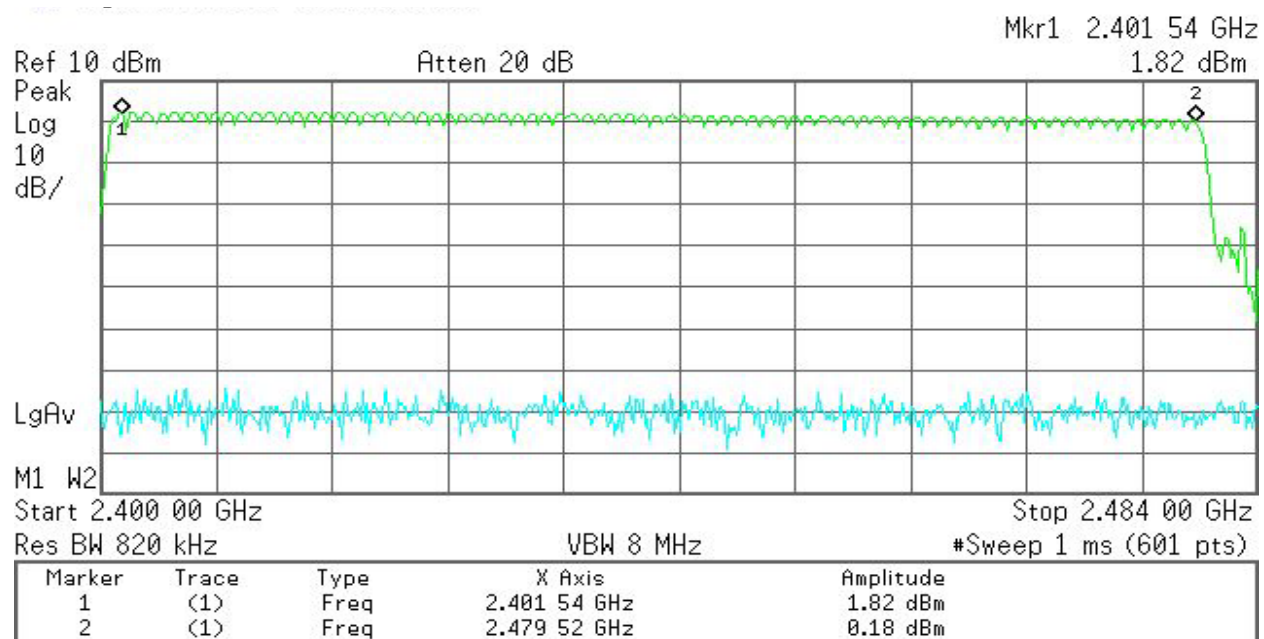
## Analyzer Settings

HP8564E  
 CF: 2450.500 MHz  
 SPAN: 0.000 MHz  
 RB 100 kHz  
 VB 10.00 kHz  
 Detector POS  
 Att 20  
 RL Offset 0.00  
 Sweep Time 32.0s  
 Ref Lvl: 10.00DBM

## Comments

Successive Hops on a channel

Cursor 1 21979.1667 -6.50  
 Cursor 2 27208.3333 -6.82  
 Delta Time (ms) 5229.17  
 Delta Amplitude 0.32



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***EXHIBIT 3: Photographs of Test Configurations***

Uploaded as a separate exhibit

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***EXHIBIT 4: Proposed FCC ID Label & Label Location***

Uploaded as a separate exhibit

***EXHIBIT 5: Detailed Photographs  
of Altierre Corporation Model Altierre Electronic Shelf Label Construction***

Uploaded as a separate exhibit

***EXHIBIT 6: Operator's Manual  
for Altierre Corporation Model Altierre Electronic Shelf Label***

Uploaded as a separate exhibit

***EXHIBIT 7: Block Diagram  
of Altierre Corporation Model Altierre Electronic Shelf Label***

Uploaded as a separate exhibit

***EXHIBIT 8: Schematic Diagrams  
for Altierre Corporation Model Altierre Electronic Shelf Label***

Uploaded as a separate exhibit

***EXHIBIT 9: Theory of Operation  
for Altierre Corporation Model Altierre Electronic Shelf Label***

Uploaded as a separate exhibit



***EXHIBIT 10: RF Exposure Information***

Uploaded as a separate exhibit