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Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 210 And FCC Part 15 Sections 15.245 on the Intellisense Transmitter Model: DT-7360

UPN: 1140- DT7360

FCC ID: C2DDUALTEC7360

GRANTEE: Intellisense
625 Coolidge Drive
Folsom, CA 95630

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Avenue
Sunnyvale, CA 94086

REPORT DATE: February 27, 2004

FINAL TEST DATE: February 19 and February 20, 2004

AUTHORIZED SIGNATORY:

Juan Martinez
Senior EMC Engineer

ACCREDITED

Equipment Name and Model:

Transmitter, DT-7360

Manufacturer:

Intellisense
625 Coolidge Drive
Folsom, CA 95630

Tested to applicable standard:
RSS210, Issue 5, February 1996
Low Power License-Exempt Radio Communication Devices

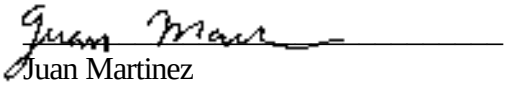
Test Report Prepared For:
Steve Aguilar
Intellisense
625 Coolidge Drive
Folsom, CA 95630

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC4549 3, Dated July 3, 1997

Declaration of Compliance

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4 as detailed in section 5.3 of RSS-210, Issue 5); and that the equipment performed in accordance with the data submitted in this report.

Signature 
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USA

Date: February 27, 2004

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SCOPE

An electromagnetic emissions test has been performed on the Intellisense, model DT-7360 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and Industry Canada Radio Standards Specification RSS-210 for Low Power, License-Exempt Radio Communication Devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The transceiver above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC 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 Intellisense model DT-7360 and therefore apply only to the tested sample. The sample was selected and prepared by Steve Aguilar of Intellisense

OBJECTIVE

The primary objective of the manufacturer is compliance with Subparts B and C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators and receivers. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their 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.

STATEMENT OF COMPLIANCE

The tested sample of Intellisense model DT-7360 complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators and Industry Canada specification RSS 210 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands).

Maintenance of FCC 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

15.209 / RSS 210 Table 3

FCC Part 15 Section	RSS 210 Section	Description	Comments	Result
15.207 / 15.107		AC Conducted Emissions, 0.15 – 30 MHz	Unit is DC operated, No conducted emissions performed	
	6.6 / 7.4	AC Conducted emissions 0.45 – 30 MHz	Unit is DC operated, No conducted emissions performed	
15.209	6.2.1	Transmitter Fundamental Signal Emissions, 24,142 MHz	105.7dBuV/m (-2.3dB)	Complies
15.231 (b)	6.2.1	Transmitter Radiated Spurious Emissions, 30 MHz - 100 GHz	48.4dBuV/m @ 96,568 MHz (–19.6dB)	Complies
		Bandwidth	5.6MHz	N/A
15.109	7.3	Receiver Spurious Emissions	N/A	N/A

Note 1 – As the device is intended for hand-held operation it was tested in all three orthogonal orientations.

MEASUREMENT UNCERTAINTIES

ISO Guide 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 NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Intellisense model DT-7360 is part of a burglar alarm system which is designed to detect motion. Normally, the EUT would be wall mounted during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 12 V dc, 50 mA.

The sample was received on February 19, 2004 and tested on February 19 and February 20, 2004. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number
IntelliSense/ DT-7360 DUAL TEC/motion Detector	N/A

ENCLOSURE

The EUT enclosure is primarily constructed of molded plastic. It measures approximately 18 cm wide by 6 cm deep by 18 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No local support equipment was used during testing.

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

Manufacturer	Model	Description	Serial Number
EMCO	PSV-5	DC power supply	none

EUT INTERFACE PORTS

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

Cable Description	Length (m)	From Unit/Port	To Unit/Port

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
power	dc power supply	22 AWG stranded	unshielded	20
signal	termination resistors	23 AWG stranded	unshielded	20

EUT OPERATION

The EUT was operating in a normal operating mode where it was detecting motion and signaling to the termination.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on February 19 and February 20, 2004 at the Elliott Laboratories Open Area Test Site #1 & 3 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC 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 of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

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. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

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.

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.

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 biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

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.

ANSI C63.4 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 FCC requires 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, and the worst-case orientation is used for final measurements.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

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. 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. Emissions, which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

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:

FUNDAMENTAL AND HARMONIC LIMITS 15.231 (e)

The table below shows the limits for both the Fundamental and Harmonic emissions (that do not fall in restricted bands) for each frequency band of operation detailed in Section 15.231 (e) for data signals.

Operating Frequency (MHz)	Field strength (microvolts/m)	Harmonics (microvolts/m)
70 - 130	500	50
130 - 174	500 - 1500	50 - 150
174 – 260	1500	150
260 – 470	1500 – 5000	150 - 500
Above 470	5000	500

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands.

Frequency Range (MHz)	Limit (uV/m @ 3m)	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	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.109(a) (RECEIVER)

The table below shows the limits for emissions from the receiver.

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

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, 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

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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 1,000 MHz, 19-Feb-04
Engineer: Jay Dickinson

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	13-May-04
EMCO	Log Periodic Antenna, 0.2-1 GHz	3146	1294	17-Apr-04
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	05-Jan-05

Radaited Emissions, 20-Feb-04
Engineer: Chris Byleckie

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Spectrum Analyzer 30Hz - 40 GHz	8564E (84125C)	1148	02-Apr-04
Hewlett Packard	Harmonic Mixer 50-75GHz	11970V		17-Jul-04
Hewlett Packard	Harmonic Mixer 40-60GHz	11970U		17-Jul-04
Hewlett Packard	Harmonic Mixer 75-110GHz	11970W		17-Jul-04
Dorado	Horn antenna 40 - 60GHz	A1197		
Dorado	Horn antenna 60 - 90GHz	A1242		
Dorado	Horn antenna 75 - 110	A1245		

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T54473_Radio 6 Pages

Elliott

EMC Test Data

Client:	Intellisense	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Emissions Spec:	FCC Part 15/EN55022	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Intellisense

Model

DT-7360

Date of Last Test: 2/19/2004

Client:	Intellisense	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Emissions Spec:	FCC Part 15/EN55022	Class:	B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is part of a burglar alarm system which is designed to detect motion. Normally, the EUT would be wall mounted during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 12 V dc, 50 mA.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
IntelliSense	DT-7360 DUAL TEC	motion detector	N/A	-

Other EUT Details

The EUT is part of a alarm system.

EUT Enclosure

The EUT enclosure is primarily constructed of molded plastic. It measures approximately 18 cm wide by 6 cm deep by 18 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:	Intellisense	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Emissions Spec:	FCC Part 15/EN55022	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment:
none

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
EMCO	PSV-5	DC power supply	none	n/a

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
power	dc power supply	22 AWG stranded	unshielded	20
signal	termination resistors	23 AWG stranded	unshielded	20

EUT Operation During Emissions

The EUT was operating in a normal operating mode where it was detecting motion and signaling to the termination.

Client:	Intellisens	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Spec:	FCC Part 15/EN55022	Class:	B

Radiated Emissions

Test Specifics

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

Date of Test: 2/20/2004
Test Engineer: Chris Byleckie
Test Location: SVOATS #3
Config. Used: 1
Config Change: Power supply was local support
EUT Voltage: 12VDC

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.
Unless otherwise specified, the measurement antenna was located 3 meters from the EUT for the measurement range 1000 - 26500 MHz.

Ambient Conditions:

Temperature: 12 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 1100000 MHz, Maximized Emissions	FCC 15.245	Pass	Refer to runs
2	50dBc attenuation	FCC 15.245	Pass	Refer to plots

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

EMC Test Data

Client:	Intellisens	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Spec:	FCC Part 15/EN55022	Class:	B

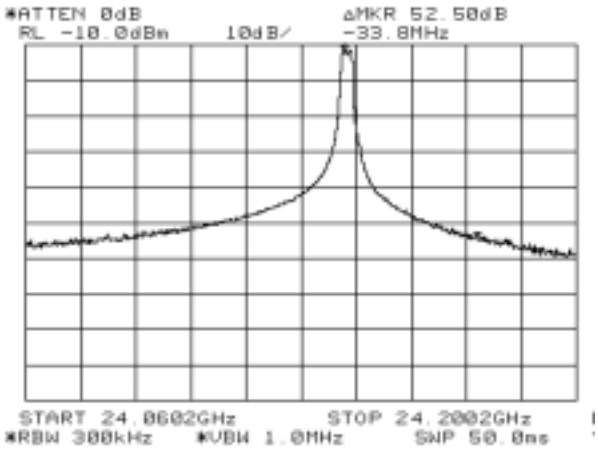
Run #1: Radiated Emissions, 1-110 GHz

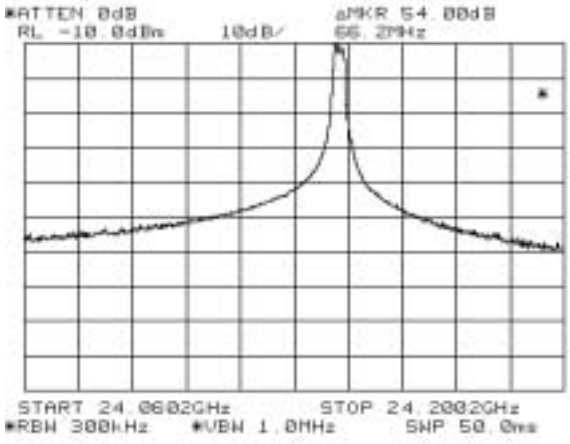
Frequency	Level	Antenna	Correction	Level	Pol	FCC 15.245 (b)(1)(i)		Detector	Azimuth	Height	Comments
GHz	dBµV	(dB)	(dB)	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Fundamental											
24.142	-	-	-	105.1	v	108.0	-2.9	Pk	241	1.3	Note 2
24.142	-	-	-	105.7	h	108.0	-2.3	Pk	130	1.1	Note 2
Harmonics											
48.284	45.4	35.0	-49.5	30.9	h	68.0	-37.2	Pk	-	-	Note 1
72.426	49.2	40.0	-49.5	39.7	h	68.0	-28.3	Pk	-	-	Note 1
96.568	52.9	45.0	-49.5	48.4	h	68.0	-19.6	Pk	-	-	Note 1

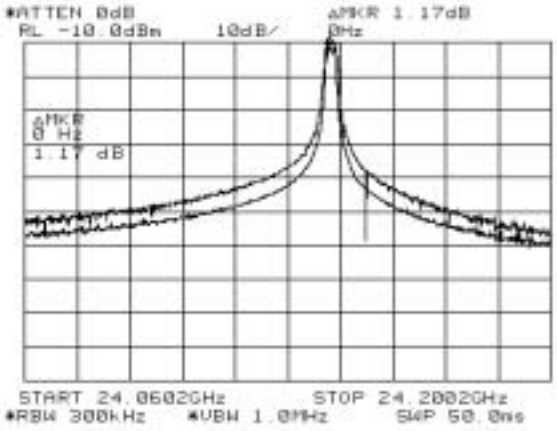
Note 1:	Measurement distance was 10cm and extrapolated to 3m using -49.5 correction factor
Note 2:	Measured at 3 meter distance.

Client:	Intellisens	Job Number:	J54417
Model:	DT-7360	T-Log Number:	T54473
		Account Manager:	Christine Vu
Contact:	Steve Aguilar		
Spec:	FCC Part 15/EN55022	Class:	B

Run #2 15.245 (b)(3)







Note 1:	Changing the RBW from 1MHz to 300kHz will show that the fundamental only dropped by 1.17dB. Edges of the operating band 24.06 and 24.2 GHz were more then -50dBc below the fundamental. To compansate for the change in RBW, the 1.17dB was added back into the bandedge readings. -51.33dBc (Low side) and -52.83dBc (High side).