



**ADDENDUM TO CERTIFICATION
TEST REPORT FC00-033**

FOR THE

DOMINO TAG, L-TG100

**FCC PART 15 SUBPART C
15.231**

COMPLIANCE

DATE OF ISSUE: DECEMBER 4, 2000

PREPARED FOR:

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W.O. No: 75737

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Date of test: January 31 - February 17
& November 8, 2000

Report No: FC00-033A

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ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); TUV Rheinland-Germany; TUV Rheinland-Korea; TUV Rheinland-Russia; Radio Communications Agency (RA); NEMKO (Norway).

ADMINISTRATIVE INFORMATION

DATE OF TEST: January 31 - February 17 & November 8, 2000

PURPOSE OF TEST: To demonstrate the compliance of the Domino Tag, L-TG100, with the requirements for FCC Part 15 Subpart C 15.231 devices.
The addendum report includes new duty cycle plots.

MANUFACTURER: Automated Identification Technologies (Pty)
P.O. Box 490
Parklands, South Africa 2121

REPRESENTATIVE: Andrew Evangelidis

TEST LOCATION: CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

TEST PERSONNEL: Skip Doyle & Randy Clark

TEST METHOD: ANSI C63.4 1992

EQUIPMENT UNDER TEST: **Domino Tag**
Manuf: Automated Identification Technologies (Pty)
Model: L-TG100
Serial: 21100
FCC ID: O6XLTG100

SUMMARY OF RESULTS

The Automated Identification Technologies (Pty) Domino Tag, L-TG100, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C 15.231.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C 15.231. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

This is a active tag, 433 MHz, pulsed, approximately 0.3mW.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

EUT OPERATING FREQUENCY

The EUT was operating at 433.9 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the highest worst case levels recorded during the tests performed on the Domino Tag, L-TG100. All readings taken are peak readings unless otherwise noted by a “Q” or “A”. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Fundamental Emission Levels									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
434.186	67.1	17.1	-27.3	4.1		61.0	72.6	-11.6	V Standing
434.191	66.4	17.1	-27.3	4.1		60.3	72.6	-12.3	V Side
434.193	69.8	17.1	-27.3	4.1		63.7	72.6	-8.9	H Flat
434.200	65.4	17.1	-27.3	4.1		59.3	72.6	-13.3	H Standing
434.203	66.0	17.1	-27.3	4.1		59.9	72.6	-12.7	H Side
434.210	53.5	17.1	-27.3	4.1		47.4	72.6	-25.2	V Flat

Test Method:
Spec Limit :
Test Distance:

ANSI C63.4 1992
FCC Part 15.231(e)
3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The active tag is placed on the wood table at the center of the turntable. Power is supplied by internal battery. Field Strength of Fundamental

Table 2: Six Highest Spurious Emission Levels									
FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS				CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
868.384	47.0	22.8	-27.4	6.4		48.8	54.0	-5.2	HA
1302.543	50.2	23.4	-35.7	5.1		43.0	54.0	-11.0	H
1736.757	47.5	25.5	-35.4	6.1		43.7	54.0	-10.3	VA
2170.930	45.2	27.7	-34.5	7.8		46.2	54.0	-7.8	VA
2605.122	27.2	29.8	-32.8	10.1		34.3	54.0	-19.7	VA
3473.446	20.7	31.6	-32.8	11.3		30.8	54.0	-23.2	VA

Test Method:
Spec Limit :
Test Distance:

ANSI C63.4 1992
FCC Part 15.231(e)
3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: The active tag is placed on the wood table at the center of the turntable. Power is supplied by internal battery. Spurious Emissions 30 – 5000 MHz. NOTE: In accordance with FCC Part 15.35(c) for averaging pulsed emissions, the on time of the EUT = 10mS. $20\text{Log}(10\text{mS}/100\text{mS}) = -20\text{dB}$, therefore -20dB from the peak was used for average readings.

TABLE A
LIST OF TEST EQUIPMENT

Barn Lab

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, CKC 1, S/N 2403A08241 (Display Unit), S/N 2209A01404 (rf Unit). Calibration date: November 3, 2000. Calibration due date: November 3, 2001.
2. Preamp (1-26.5GHz), Hewlett Packard, Model No. 8449B, S/N 3008A00301. Calibration date: October 13, 2000. Calibration due date: October 13, 2001.
3. Preamp, Hewlett Packard, Model No. 8447D, S/N 1937A02604. Calibration Date: April 3, 2000. Calibration Due: April 3, 2001.
4. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration Date: November 2, 2000. Calibration Due: November 2, 2000.
5. Biconical Antenna, A & H Systems, Model No. SAS-200/542, S/N 156. Calibration Date: May 8, 2000. Calibration Due: May 8, 2001.
6. Log Periodic Antenna, A & H Systems, Model No. SAS-200/512, S/N 154. Calibration Date: May 8, 2000. Calibration Due: May 8, 2001.
7. Horn Antenna, EMCO, Model No. 3115, S/N 4085. Calibration date: February 7, 2000. Calibration due date: February 2, 2001.
8. Mariposa Site B (Barn). Calibration date: August 11, 2000. Calibration due date: August 11, 2000.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for fundamental emissions, Table 2 for spurious emissions. Additionally, a complete description of the EUT is included on the information sheets contained in Appendix A.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect the radiated emissions data for the Domino Tag, L-TG100. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. For frequencies above 1000 MHz the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	5 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 & 2 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Domino Tag, L-TG100.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

TEST METHODS

The radiated emissions data of the Domino Tag, L-TG100, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart C emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode facing the antenna. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned with the biconical antenna in the same manner, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. For frequencies above 1000 MHz the horn antenna was used. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again positioned facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation and antenna height. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

FCC Part 15.215(c) - Occupied Bandwidth Measurements

In accordance with Part 15.231(c), the bandwidth of the emission was no wider than 0.25% of the center frequency.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1 & 2. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula:

$$\begin{aligned} & \text{Meter reading (dB}\mu\text{V)} \\ & + \text{Antenna Factor (dB)} \\ & + \text{Cable Loss (dB)} \\ & - \text{Distance Correction (dB)} \\ & - \text{Pre-amplifier Gain (dB)} \\ & = \text{Corrected Reading (dB}\mu\text{V/m)} \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dB μ V	Cable	Amp	Bicon	Horn	Log	Dist	Corr dB μ V/m	Spec	Margin	Polar
---	-------------	--------------------	-------	-----	-------	------	-----	------	----------------------	------	--------	-------

means reading number

Freq MHz is the frequency in MHz of the obtained reading.

Rdng dB μ V is the reading obtained on the spectrum analyzer in dB μ V.

Amp is short for the preamplifier factor or gain in dB.

Bicon is the biconical antenna factor in dB.

Log is the log periodic antenna factor in dB.

Horn is the horn antenna factor in dB.

Cable is the cable loss in dB of the coaxial cable on the OATS.

Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.

Corr dB μ V/m is the corrected reading which is now in dB μ V/m (field strength).

Spec is the specification limit (dB) stated in the agency's regulations.

Margin is the closeness to the specified limit in dB; + is over and - is under the limit.

Polar is the Polarity of the antenna with respect to earth.

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware:	Firmware V1.1
CRT was displaying:	N/A
Power Supply Manufacturer:	N/A
Power Supply Part Number:	N/A
AC Line Filter Manufacturer:	N/A
AC Line Filter Part Number:	N/A
The EUT has no power cord.	

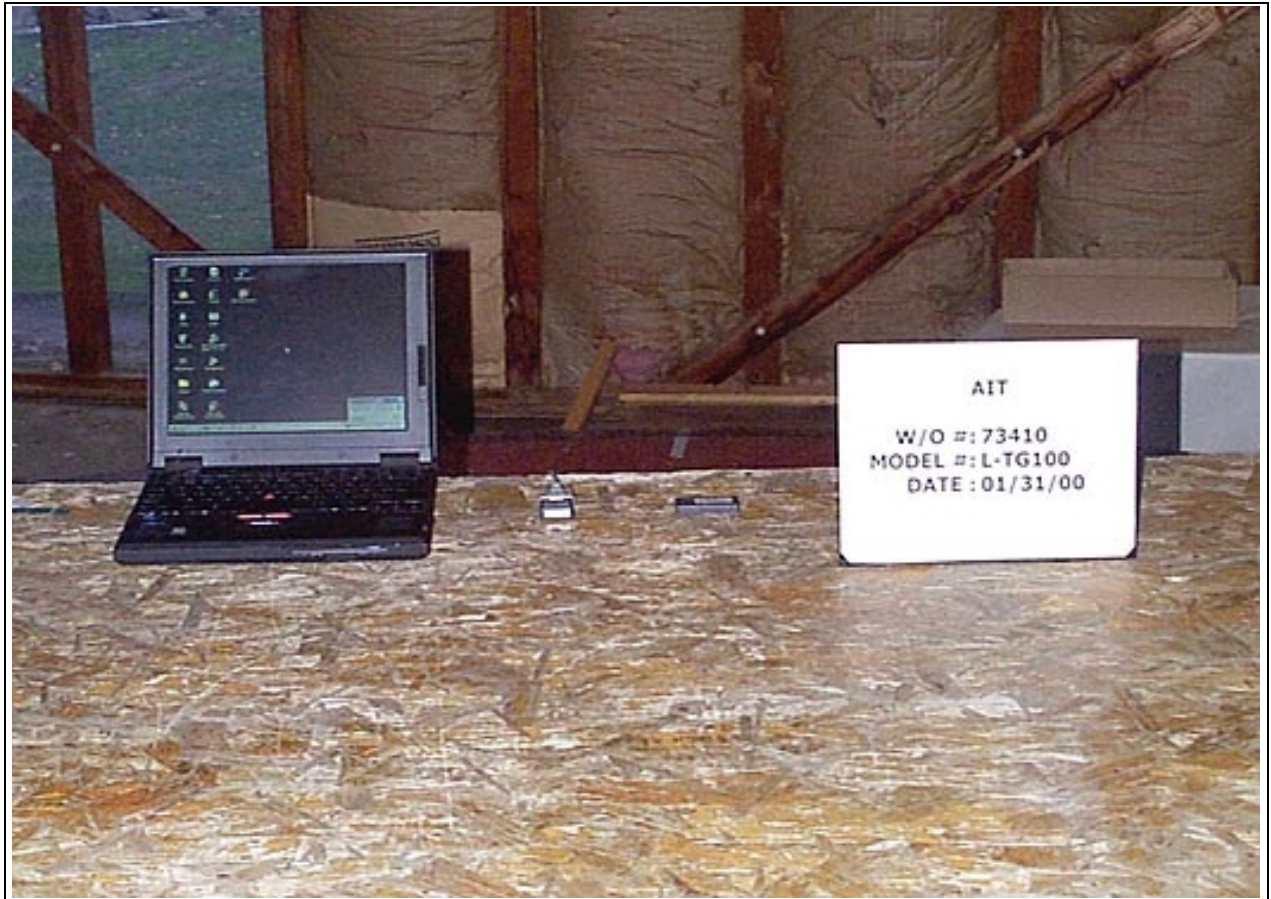
I/O PORTS	
Type	#
None	

CRYSTAL OSCILLATORS	
Type	Freq. In MHz
In chip LC circuit	4.0

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Main	Ver1.1	1, 4.00	2	Housing

REQUIRED EUT CHANGES TO COMPLY:
None.

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS

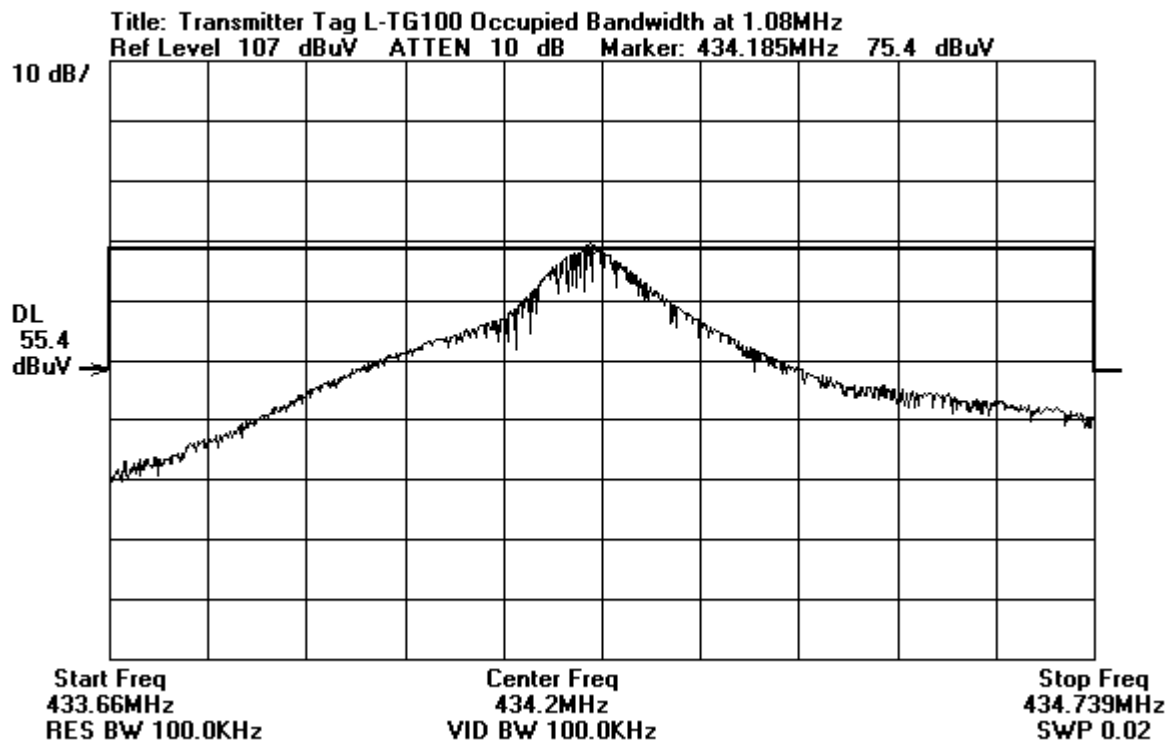


Radiated Emissions - Back View

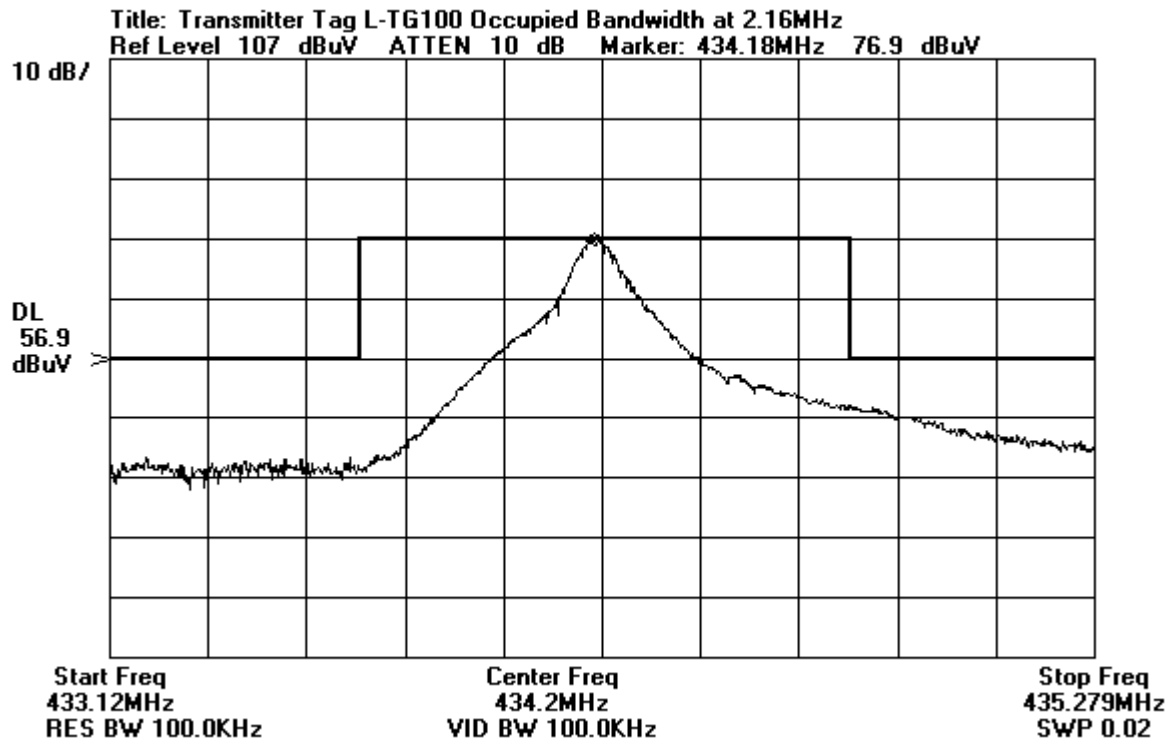
APPENDIX B

MEASUREMENT DATA SHEETS

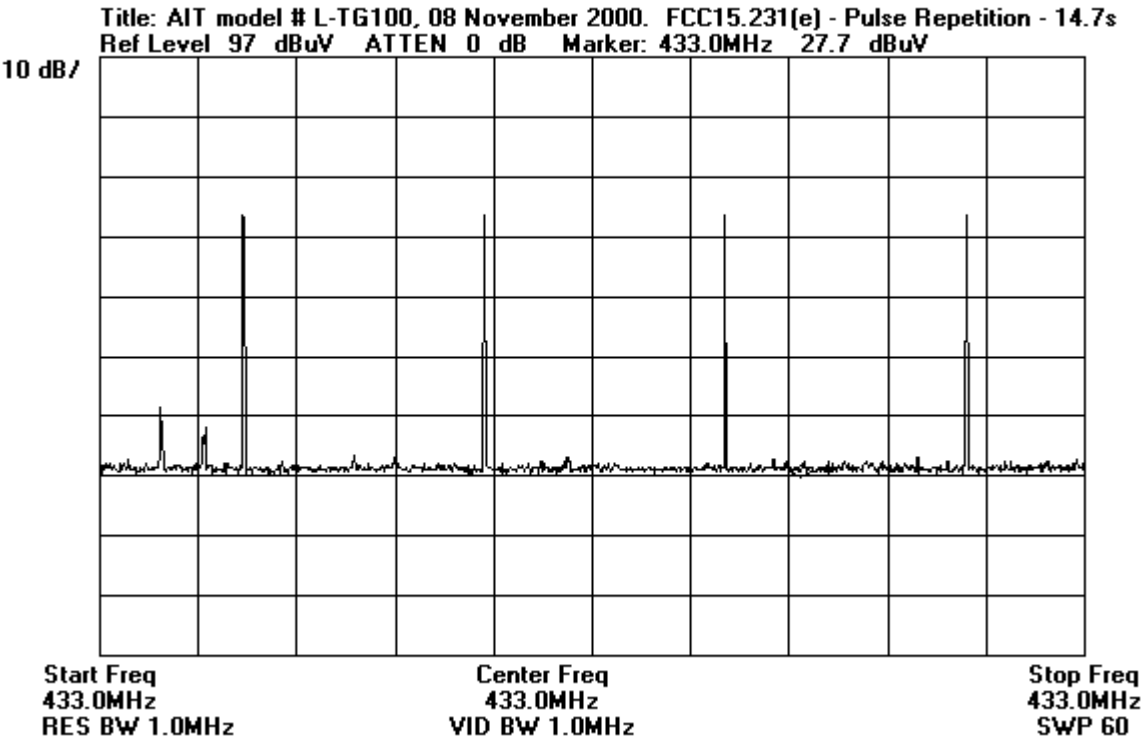
Occupied Bandwidth Plot



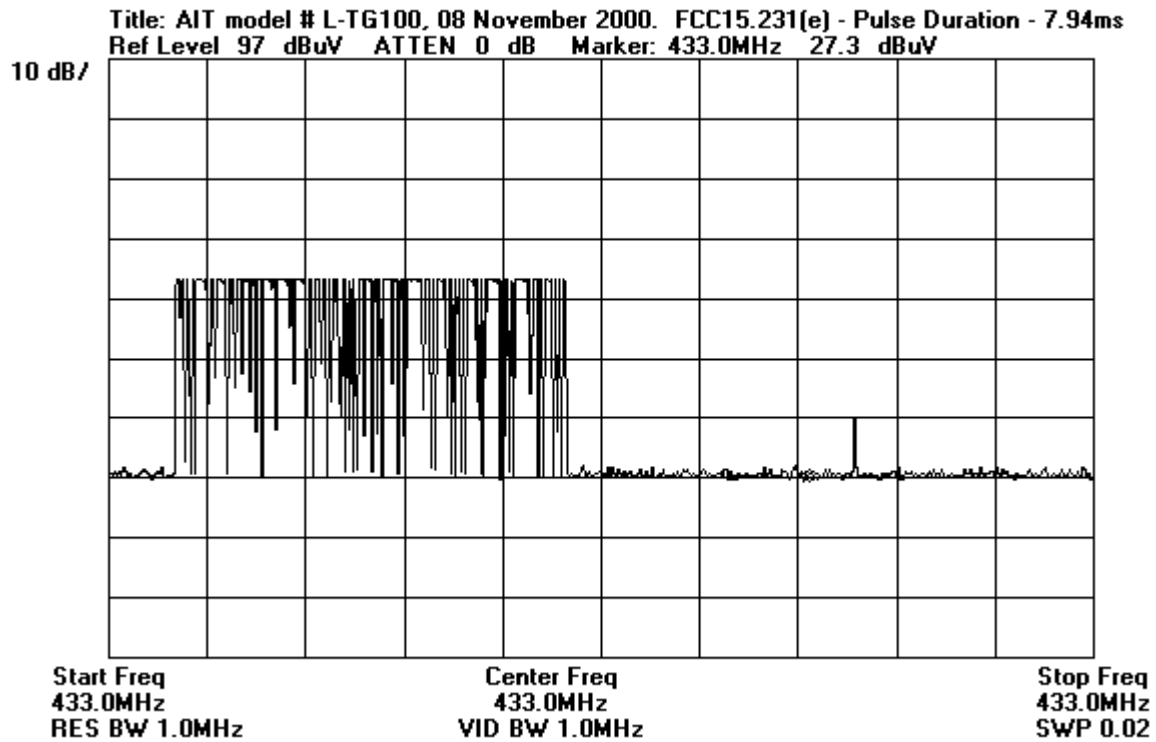
Occupied Bandwidth Plot



Duty Cycle Plot of Repetitions



Duty Cycle Plot of Duration



Test Location: 5473A Clouds Rest • • • Mariposa, CA 95338
 Customer: **AIT**
 Specification: **15.231(e)**
 Work Order #: **73410**
 Test Type: **Maximized Emissions**
 Equipment: **Active Tag**
 Manufacturer: AIT
 Model: L-TG100
 S/N: 21100

Date: 02/14/2000
 Time: 21:04:26
 Sequence#: 14
 Tested By: Skip Doyle

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Active Tag	AIT	L-TG100	21100

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

The active tag is placed on the wood table at the center of the turntable. Power is supplied by internal battery.
 Field Strength of Fundamental

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp dB	Bicon dB	Log dB	Cable dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	434.193M	69.8	-27.3	+0.0	+17.1	+4.1	+0.0	63.7	72.6	-8.9	Horiz
									Flat		
2	434.186M	67.1	-27.3	+0.0	+17.1	+4.1	+0.0	61.0	72.6	-11.6	Vert
									Standing		
3	434.191M	66.4	-27.3	+0.0	+17.1	+4.1	+0.0	60.3	72.6	-12.3	Vert
									Side		
4	434.203M	66.0	-27.3	+0.0	+17.1	+4.1	+0.0	59.9	72.6	-12.7	Horiz
									Side		
5	434.200M	65.4	-27.3	+0.0	+17.1	+4.1	+0.0	59.3	72.6	-13.3	Horiz
									Standing		
6	434.210M	53.5	-27.3	+0.0	+17.1	+4.1	+0.0	47.4	72.6	-25.2	Vert
									Flat		

Test Location: 5473A Clouds Rest • • • Mariposa, CA 95338
 Customer: **AIT**
 Specification: **FCC 15.231 (e)**
 Work Order #: **73410**
 Test Type: **Maximized Emissions**
 Equipment: **Active Tag**
 Manufacturer: AIT
 Model: L-TG100
 S/N: 21100

Date: 02/16/2000
 Time: 19:47:01
 Sequence#: 16
 Tested By: Skip Doyle

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Active Tag	AIT	L-TG100	21100

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

The active tag is placed on the wood table at the center of the turntable. Power is supplied by internal battery. Spurious Emissions 30 – 5000 MHz NOTE: In accordance with FCC Part 15.35(c) for averaging pulsed emissions, the on time of the EUT = 10mS. 20Log (10mS/100mS) = -20dB, therefore -20dB from the peak was used for average readings.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp dB	Bicon Cable dB	Log Horn dB	Cable dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	868.384M	47.0	-27.4	+0.0	+22.8	+6.4	+0.0	48.8	54.0	-5.2	Horiz
	Ave		+0.0	+0.0	+0.0						
^	868.388M	67.0	-27.4	+0.0	+22.8	+6.4	+0.0	68.8	54.0	+14.8	Horiz
			+0.0	+0.0	+0.0						
3	868.370M	45.3	-27.4	+0.0	+22.8	+6.4	+0.0	47.1	54.0	-6.9	Vert
	Ave		+0.0	+0.0	+0.0						
^	868.383M	65.3	-27.4	+0.0	+22.8	+6.4	+0.0	67.1	54.0	+13.1	Vert
			+0.0	+0.0	+0.0						
5	2170.930M	45.2	+0.0	+0.0	+0.0	+0.0	+0.0	46.2	54.0	-7.8	Vert
	Ave		-34.5	+7.8	+27.7						
^	2170.930M	65.2	+0.0	+0.0	+0.0	+0.0	+0.0	66.2	54.0	+12.2	Vert
			-34.5	+7.8	+27.7						
7	1736.757M	47.5	+0.0	+0.0	+0.0	+0.0	+0.0	43.7	54.0	-10.3	Vert
	Ave		-35.4	+6.1	+25.5						
^	1736.757M	67.5	+0.0	+0.0	+0.0	+0.0	+0.0	63.7	54.0	+9.7	Vert
			-35.4	+6.1	+25.5						
9	1302.543M	50.2	+0.0	+0.0	+0.0	+0.0	+0.0	43.0	54.0	-11.0	Horiz
			-35.7	+5.1	+23.4						
10	2170.892M	37.4	+0.0	+0.0	+0.0	+0.0	+0.0	38.4	54.0	-15.6	Horiz
	Ave		-34.5	+7.8	+27.7						
^	2170.892M	57.4	+0.0	+0.0	+0.0	+0.0	+0.0	58.4	54.0	+4.4	Horiz
			-34.5	+7.8	+27.7						

12	1736.707M	40.9	+0.0	+0.0	+0.0	+0.0	+0.0	37.1	54.0	-16.9	Horiz
	Ave		-35.4	+6.1	+25.5						
^	1736.707M	60.9	+0.0	+0.0	+0.0	+0.0	+0.0	57.1	54.0	+3.1	Horiz
			-35.4	+6.1	+25.5						
14	2605.122M	27.2	+0.0	+0.0	+0.0	+0.0	+0.0	34.3	54.0	-19.7	Vert
	Ave		-32.8	+10.1	+29.8						
^	2605.122M	47.2	+0.0	+0.0	+0.0	+0.0	+0.0	54.3	54.0	+0.3	Vert
			-32.8	+10.1	+29.8						
16	1302.580M	39.8	+0.0	+0.0	+0.0	+0.0	+0.0	32.6	54.0	-21.4	Vert
	Ave		-35.7	+5.1	+23.4						
^	1302.580M	59.8	+0.0	+0.0	+0.0	+0.0	+0.0	52.6	54.0	-1.4	Vert
			-35.7	+5.1	+23.4						
18	2605.062M	24.9	+0.0	+0.0	+0.0	+0.0	+0.0	32.0	54.0	-22.0	Horiz
	Ave		-32.8	+10.1	+29.8						
^	2605.062M	44.9	+0.0	+0.0	+0.0	+0.0	+0.0	52.0	54.0	-2.0	Horiz
			-32.8	+10.1	+29.8						
20	3473.446M	20.7	+0.0	+0.0	+0.0	+0.0	+0.0	30.8	54.0	-23.2	Vert
	Ave		-32.8	+11.3	+31.6						
^	3473.446M	40.7	+0.0	+0.0	+0.0	+0.0	+0.0	50.8	54.0	-3.2	Vert
			-32.8	+11.3	+31.6						