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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C Specifications for an Intentional Radiator on the Savi Technology, Inc. Model: SaviTag 412

FCC ID:	KL7-412-V1
GRANTEE:	Savi Technology, Inc. 615 Tasman Drive Sunnyvale, CA. 94089-1707
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	August 17, 2000
FINAL TEST DATE:	August 8, 2000

AUTHORIZED SIGNATORY: _____

Mark R. Briggs
Manager, EMC Consulting Services

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SCOPE

An electromagnetic emissions test has been performed on the Savi Technology, Inc. model SaviTag 412 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. 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 intentional radiator 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 Savi Technology, Inc. model SaviTag 412 and therefore apply only to the tested sample. The sample was selected and prepared by Eugene Schlindwein of Savi Technology, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. 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 Savi Technology, Inc. model SaviTag 412 complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators.

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.).

EMISSION TEST RESULTS

The following emissions tests were performed on the Savi Technology, Inc. model SaviTag 412. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

Conducted emissions were not performed as the EUT is a battery-powered device.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH – FUNDAMENTAL EMISSIONS

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.231(e) and 15.209 in the case of emissions falling within the frequency bands specified in Section 15.205 or at frequencies where the limit of 15.209 permitted higher field strengths than the limits of 15.231(e).

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

30 – 4330 MHz

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
433.955	88.8	V	92.8	-4.0	Pk	192	1.2	

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH – SPURIOUS EMISSIONS

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.231(e) and 15.209 in the case of emissions falling within the frequency bands specified in Section 15.205 or at frequencies where the limit of 15.209 permitted higher field strengths than the limits of 15.231(e).

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

30 – 4330 MHz

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
867.907	38.1	V	52.8	-14.7	QP	194	1.2	

LIMITS OF BANDWIDTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.231(c).

The minimum 26 dB bandwidth was 435kHz. The actual test data and any correction factors are contained in an exhibit of this report.

MEASUREMENT UNCERTAINTIES

ISO Guide 25 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	± 3.2

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Savi Technology, Inc. model SaviTag 412 is a receiver that is used with an intentional radiator that transmits at 433.955 MHz and uses 423.192 MHz as its local oscillator frequency. The EUT is an active RFID tag that is designed to track a container to which it is attached. (Information is sent from the TAG by means of RF to a reader that sends it to the host computer for processing.)

The sample was received on August 8, 2000 and tested on August 8, 2000. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
Savi Technology	SaviTag 412 (Transmitter)	Active RFID Tag	40002

ENCLOSURE

The EUT enclosure is primarily constructed of a polymeric material. It measures approximately 7 cm wide by 2 cm deep by 22 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No support equipment was used during emissions testing.

EUT INTERFACE PORTS

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

Cable Description	Length (m)	From Unit/Port	To Unit/Port
None	-	-	-

EUT OPERATION

The EUT was set to operate transmitting continuously at 433.948 MHz. In normal operation, the transmitter would only transmit for less than 10mS in a 100mS period. Average readings were, therefore, calculated by correcting the peak measurement by a factor of 20dB.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on August 8, 2000 at the Elliott Laboratories Open Area Test Site #1 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 and 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.

POWER METER

A power meter and thermister mount are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

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:

SPURIOUS RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

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

SPURIOUS RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.231(e)

Frequency Range (MHz)	Limit (uV/m @ 3m)
260 - 470	150 – 500

The limit for a fundamental transmit signal at 433 MHz was calculated to be 440 uV/m (52.9dBuV/m)

FUNDAMENTAL RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.231(e)

Frequency Range (MHz)	Limit (uV/m @ 3m)
260 - 470	1500 – 5000

The limit for a fundamental transmit signal at 433 MHz was calculated to be 4400 uV/m (72.9dBuV/m)

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

Radiated Emissions, 30 - 4400 MHz, 08-Aug-00 10:26 PM
Engineer: Mbirgani

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Chase	BiLog Antenna, 30 - 1000 MHz	CA 1030	RFI, A259	12	06/07/2000	06/07/2001
EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	487	12	03/24/2000	03/24/2001
Filtek	High Pass Filter	HP12/1000-5BA	956	12	03/29/2000	03/29/2001
Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	01/03/2000	01/03/2001
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	12/02/1999	12/02/2000
Rohde & Schwarz	Test Receiver, 20-1300 MHz	ESVP	M002	12	11/18/1999	11/18/2000

26dB Bandwidth Measurement, 22-Aug-00 06:32 PM
Engineer: Mark

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Conical Log Spiral Antenna	3101	608	12	03/10/2000	03/10/2001
Hewlett Packard	EMC Spectrum Analyzer, Opt. 026 ¸9 KHz -26.5GHz	8593EM	1141	12	12/22/1999	12/22/2000
Hewlett Packard	RF Preamplifier, 100 kHz - 1.3 GHz	8447D	999	12	05/03/2000	05/03/2001

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T 38898 6 Pages

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EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Emissions Spec:	FCC 15.231 / Subpart B	Class:	N/A
Immunity Spec:	N/A	Environment:	

EMC Test Data

For The

Savi Technology

Model

SaviTag 412

Elliott

EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Emissions Spec:	FCC 15.231 / Subpart B	Class:	N/A
Immunity Spec:	N/A	Environment:	

EUT INFORMATION

General Description

The EUT is a receiver that is used with an intentional radiator that transmits at 433.955 MHz and uses 423.192 MHz as its local oscillator frequency. The EUT is an active RFID tag that is designed to track a container to which it is attached. (Information is sent from the TAG by means of RF to a reader that sends it to the host computer for processing.)

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Savi Technology	SaviTag 412 (Reciever)	Active RFID Tag	40004	None
Savi Technology	SaviTag 412 (Transmitter)	Active RFID Tag	40002	None

EUT Enclosure

The EUT enclosure is primarily constructed of a polymeric material. It measures approximately 7 cm wide by 2 cm deep by 22 cm high.

Modification History

Mod. #	Test	Date	Modificaiton
1			
2			
3			

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EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Emissions Spec:	FCC 15.231 / Subpart B	Class:	N/A
Immunity Spec:	N/A	Environment:	

Test Configuration Information (1)

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

EUT Interface Ports

		Cable(s)		
EUT Port	Connected To	Description	Shielded or Unshielded	Length(m)
None				

EUT Operation During Emissions

The EUT was set to operate transmitting continuously at 433.948 MHz or in receive mode, with LO @ 423.192 MHz.

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EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Spec:	FCC 15.231 / Subpart B	Class:	N/A

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing the EUT relative to the specification defined above.

Date of Test: 08/08/2000
Test Engineer: Mehran Birgani
Test Location: OATS #1

Config. Used: 1
Config Change: None
EUT Voltage: 3.6 V Battery

General Test Configuration

The EUT was located on the turntable for radiated emissions testing.

For radiated emissions testing between 30 and 4400 MHz, the measurement antenna was located at 3 meters distance from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 15°C
Rel. Humidity: 55%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	RE, Receiver/Digital Device 30 - 1000 MHz	FCC B	Pass	-2.4dB @ 423.196MHz
3	Transmit Fundemental Field Strength @ 433.955 MHz	FCC 15.231(e)	Pass	-4.0dB @ 433.955MHz
4	RE, Transmitter Spurious Emissions	FCC 15.231(e) / 15.209	Pass	-14.7dB @ 867.907MHz

Modifications Made During Testing: None

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EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Spec:	FCC 15.231 / Subpart B	Class:	N/A

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

Config: Receive Mode only.

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
423.196	43.6	V	46.0	-2.4	QP	198	1.3	First LO
423.196	38.3	H	46.0	-7.7	QP	96	1.0	First LO
846.392	35.2	H	46.0	-10.8	QP	227	1.0	Second LO
40.000	27.2	V	40.0	-12.8	QP	166	1.0	
846.392	32.1	V	46.0	-13.9	QP	127	1.2	Second LO
267.980	25.8	V	46.0	-20.2	QP	195	1.3	
267.980	25.0	H	46.0	-21.0	QP	116	3.0	
40.000	18.5	H	40.0	-21.5	QP	0	4.0	

Run #2: Maximized Readings from Run #1

Config: Receive Mode only.

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
423.196	43.6	V	46.0	-2.4	QP	198	1.3	First LO
423.196	38.3	H	46.0	-7.7	QP	96	1.0	First LO
846.392	35.2	H	46.0	-10.8	QP	227	1.0	Second LO
40.000	27.2	V	40.0	-12.8	QP	166	1.0	
846.392	32.1	V	46.0	-13.9	QP	127	1.2	Second LO
267.980	25.8	V	46.0	-20.2	QP	195	1.3	

Elliott

EMC Test Data

Client:	Savi Technology	Job Number:	J38895
Model:	SaviTag 412	T-Log Number:	T38898
		Proj Eng:	Mark Briggs
Contact:	Eugene Schlindwein		
Spec:	FCC 15.231 / Subpart B	Class:	N/A

Run #3: Fundamental Frequency (General device operating under 15.231(e))

Config: Transmitter

Frequency	Level	Polarity	FCC 15.231(e)		Detector	Azimuth	Height	Comments
MHz	dBuV	H/V	Limit	Margin	Pk/QP/Avg	degrees	meters	
433.955	88.8	V	92.8	-4.0	Pk	192	1.2	100 kHz BW Pk.
433.955	68.8	H	72.8	-4.0	Avg	100	1.4	Average (Note 1)
433.955	80.8	H	92.8	-12.0	Pk	100	1.4	100 kHz BW Pk.
433.955	60.8	V	72.8	-12.0	Avg	192	1.2	Average (Note 1)

Note 1:	Average readings obtained by applying the average correction factor (-20dB) from the peak reading. Pulse width was measured to be 4.86 mS.

Run #4: Radiated Spurious Emissions, 30-4400 MHz.

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
867.907	38.1	V	52.8	-14.7	QP	194	1.2	
867.907	37.9	H	52.8	-14.9	QP	96	1.4	
2169.760	53.1	H	74.0	-20.9	Pk	267	1.5	
2169.760	33.1	H	54.0	-20.9	Avg	267	1.5	Note 2
1301.861	52.5	H	74.0	-21.5	Pk	266	1.5	
1301.861	32.5	H	54.0	-21.5	Avg	266	1.5	Note 2
1301.861	31.8	V	54.0	-22.2	Avg	94	1.0	Note 2
1301.861	51.8	V	74.0	-22.2	Pk	94	1.0	

Note 1:	The limit of 15.209 was used for emissions in restricted bands. For all other emissions, the limit from 15.231(e) for spurious emissions (52.8dBuV/m) or from 15.209 was used, whichever permitted the higher field strength.
Note 2:	Average readings obtained by applying the average correction factor (-20dB) from the peak reading. Pulse width was measured to be 4.86 mS.

Run #5: Bandwidth Measurement.

The 26dB bandwidth was measured on 8/22/00 by Mark Briggs to be 435kHz - refer to attached GPH/T38898/501.
The maximum permitted for a transmitter operating at 433.9 MHz is 1.08 MHz.

EXHIBIT 3: Radiated Emissions Test Configuration Photographs

APPENDIX 3: Radiated Emissions Test Configuration Photographs

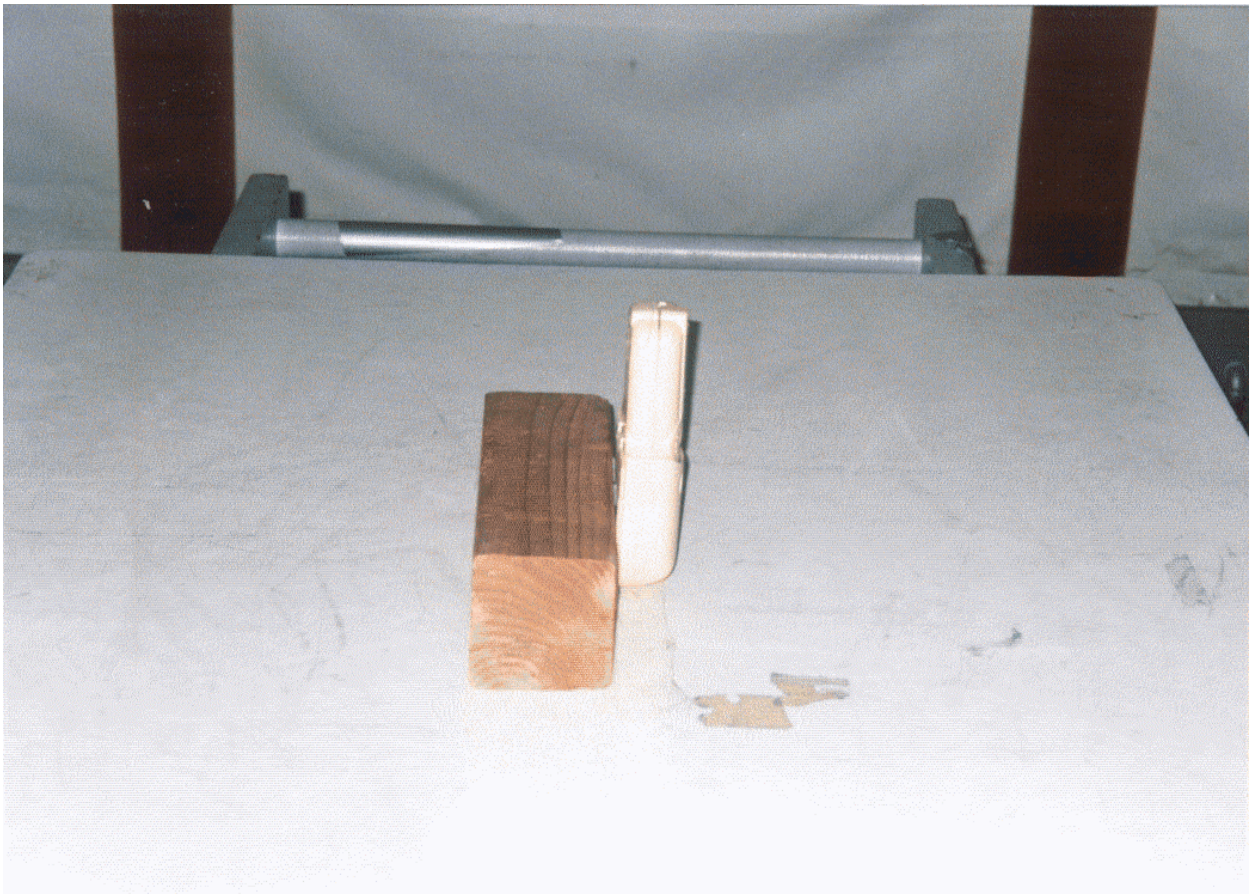

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of Savi Technology, Inc. Model SaviTag 412 Construction

5 Pages

EXHIBIT 6: Operator's Manual for Savi Technology, Inc. Model SaviTag 412

Draft of Users Manual 3 Pages
Users Manual Statements 2 Pages

EXHIBIT 7: Block Diagram of Savi Technology, Inc. Model SaviTag 412

1 Page

EXHIBIT 8: Schematic Diagrams for Savi Technology, Inc. Model SaviTag 412

9 Pages

EXHIBIT 9: Theory of Operation for Savi Technology, Inc. Model SaviTag 412

1 Page