Excellence in Compliance Testing

Certification Test Report

FCC ID: Q6K-MCU102A
IC: 5043A-MCU102A

FCC Rule Part: 15.231
IC Radio Standards Specification: RSS-210

ACS Report Number: 10-0184.W06.11.A

Manufacturer: 3SI Security Systems
Model: MCU-102A

Test Begin Date: June 10, 2010
Test End Date: June 14, 2010

Report Issue Date: June 18, 2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Prepared by: _____

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This report contains 16 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations.

1.2 Product description

The 3SI Octopus ATM Defense System is a wireless system designed to protect ATMs from theft and break-in attacks.

Manufacturer Information:
3Si Security Systems
118 Preston Ct.
Macon, GA 31210

Test Sample Serial Number(s):
#985290 and 985287

Test Sample Condition:
The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The MCU-102A was evaluated in the configuration stated in the installation manual for radiated emissions. Test setup photographs show additional detail.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

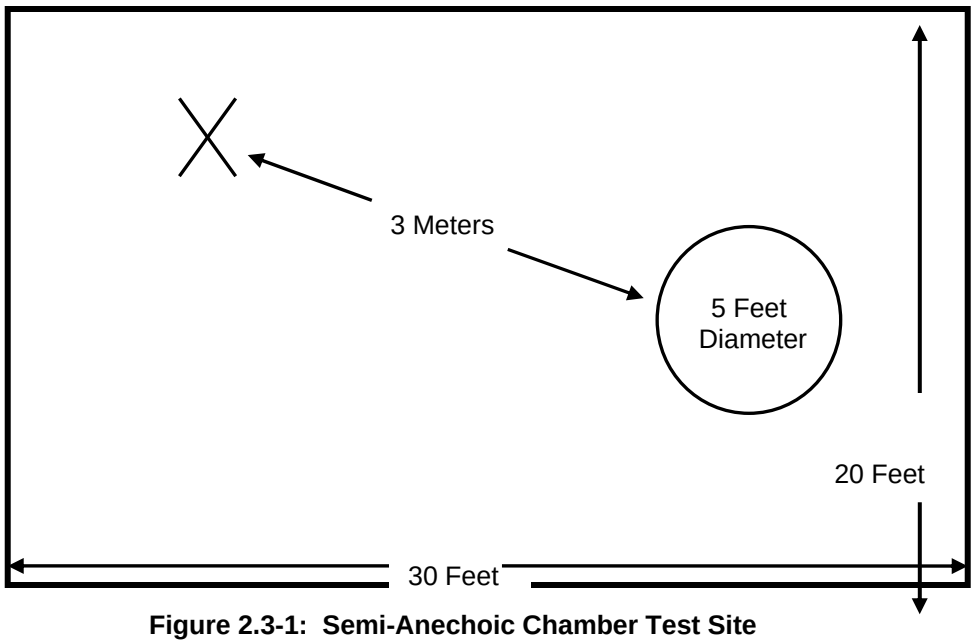


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2

Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

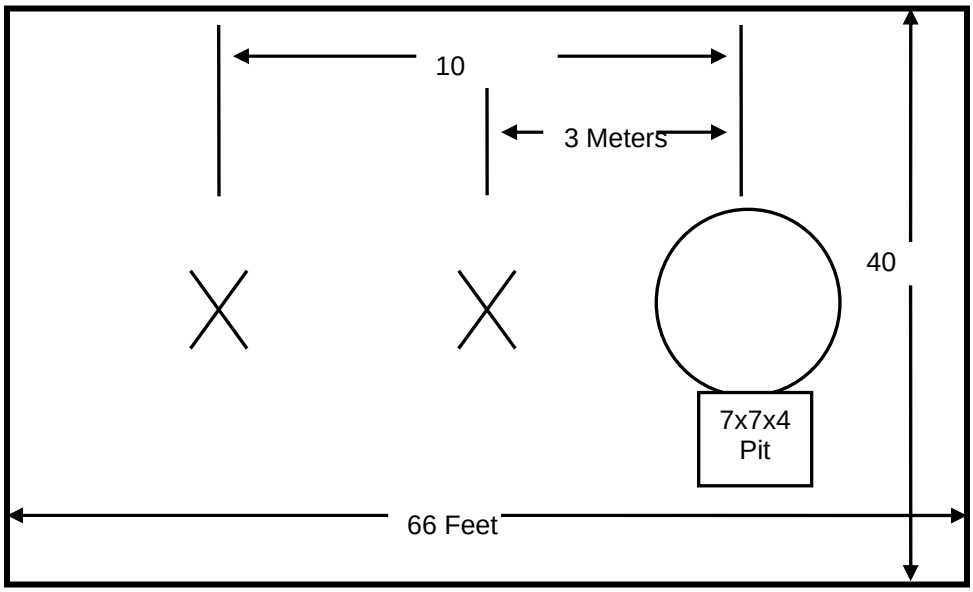


Figure 2.3-2: Open Area Test Site

2.4

Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

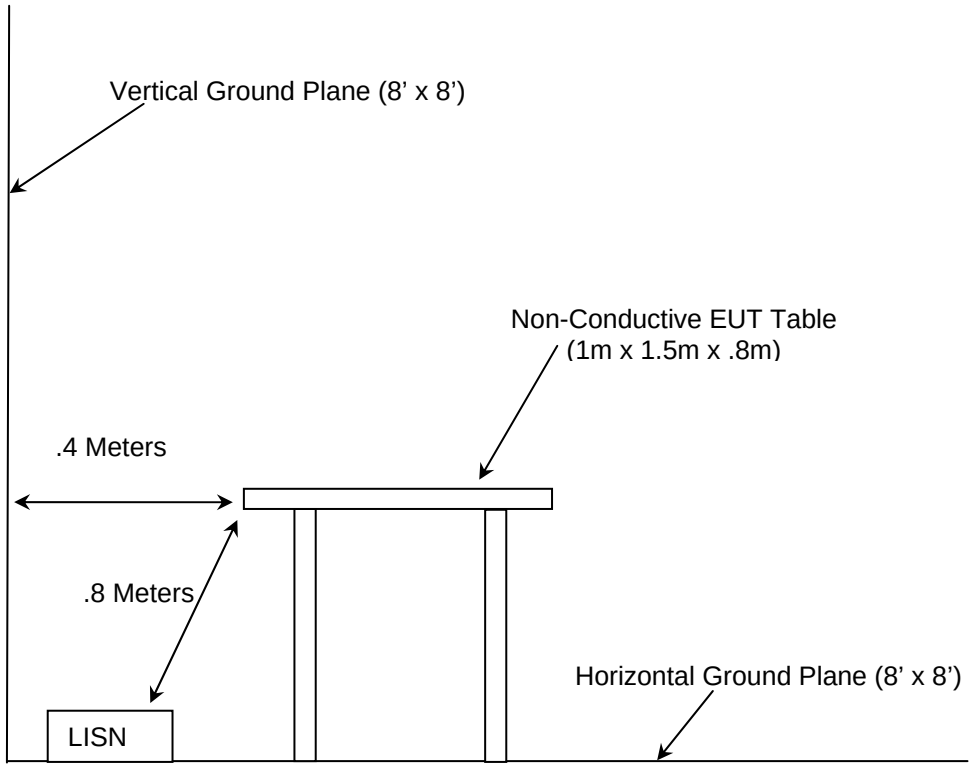


Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz.
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2010.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010.
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-21-2010
22	Agilent	Amplifiers	8449B	3008A00526	09-21-2010
25	Chase	Antennas	CBL6111	1043	09-02-2010
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2011
73	Agilent	Amplifiers	8447D	2727A05624	07-15-2010
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-21-2010
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2010 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2010 (See Note1)
NA	Mini-Circuits	Filter	NHP-600	15542	NA
339	Aeroflex/Weinschel	Attenuators	AS-18	7142	07-02-2010 (See Note2)
422	Florida RF Cables	Cables	SMS-200AW-72.0-SMR	0805	01-26-2011 (See Note1)

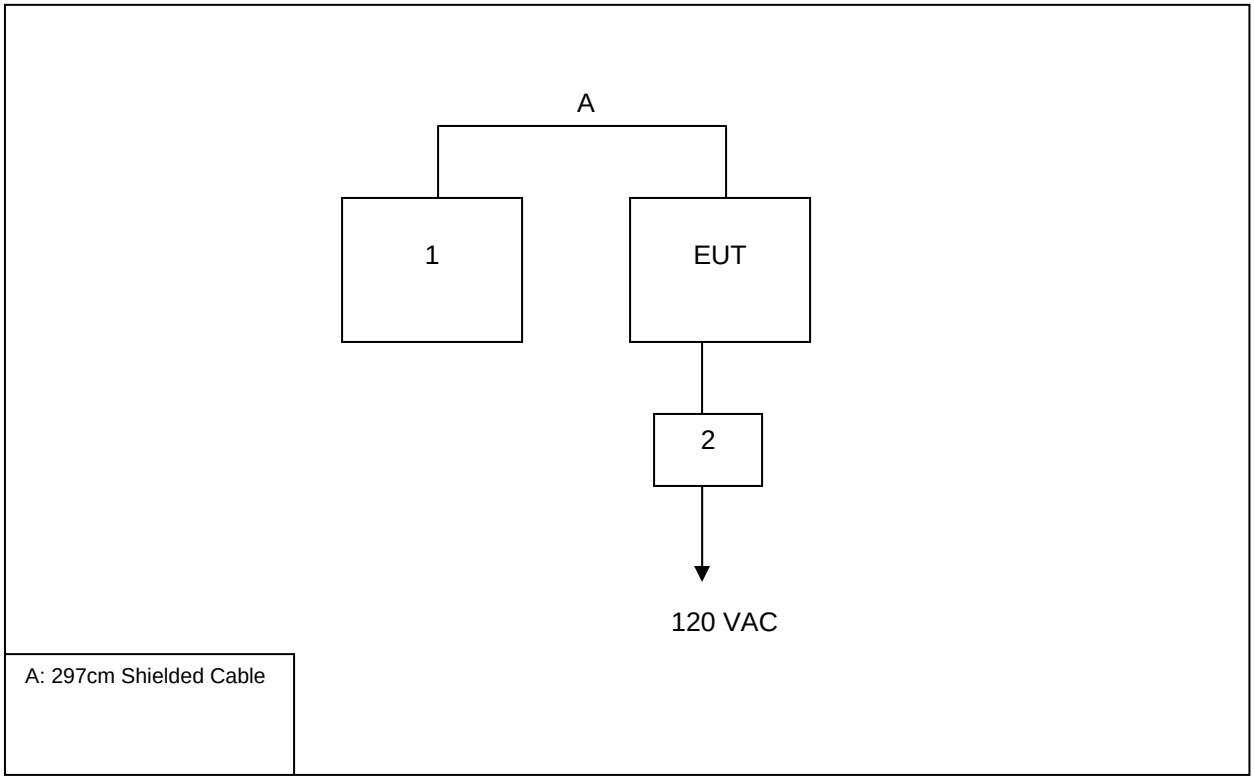
Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number	FCC ID
1	iButton Reader	3SI	N/A	ACS #3	N/A
2	PSU	CUI Inc.	3A-161WU06	EPS060250UH-P5P-SZ	N/A

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



*See test setup photos for more detailed description.

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: CFR 47 Part 15.203

The EUT utilizes a 31.5nH inductor soldered to the PCB board as the antenna thus satisfying 15.203.

7.2 Power Line Conducted Emissions – FCC: CFR 47 Part 15.207 IC: RSS-Gen 7.2.2

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Results of the test are shown below in and Table 7.2.2-1 to 7.2.2.2.

Table 7.2.2-1: Line 1 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.186	32.00	10.0	64	32.2	L1	GND	QP
0.492	11.80	10.0	56	44.3	L1	GND	QP
4.956	13.90	10.0	56	42.1	L1	GND	QP
6.552	26.20	10.0	60	33.8	L1	GND	QP
7.002	30.50	10.0	60	29.5	L1	GND	QP
7.212	28.30	10.0	60	31.7	L1	GND	QP
7.416	27.60	10.0	60	32.4	L1	GND	QP
7.458	27.50	10.0	60	32.5	L1	GND	QP
8.196	25.00	9.9	60	35.0	L1	GND	QP
8.742	19.50	9.9	60	40.5	L1	GND	QP
0.192	14.20	9.9	54	39.8	L1	GND	AVG
0.486	7.90	10.0	46	38.4	L1	GND	AVG
4.962	16.40	10.0	46	29.6	L1	GND	AVG
6.492	21.00	10.0	50	29.0	L1	GND	AVG
7.002	27.40	10.0	50	22.6	L1	GND	AVG
7.158	20.30	10.0	50	29.7	L1	GND	AVG
7.398	21.80	10.0	50	28.2	L1	GND	AVG
7.542	23.40	10.0	50	26.6	L1	GND	AVG
8.292	17.30	9.9	50	32.7	L1	GND	AVG
8.880	18.30	9.9	50	31.8	L1	GND	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.186	31.80	10.0	64	32.4	L2	FLO	QP
6.324	26.90	10.0	60	33.1	L2	FLO	QP
6.714	26.80	10.0	60	33.2	L2	FLO	QP
6.918	30.30	10.0	60	29.7	L2	FLO	QP
7.044	30.10	10.0	60	29.9	L2	FLO	QP
7.248	27.20	10.0	60	32.8	L2	FLO	QP
7.602	28.50	10.0	60	31.5	L2	FLO	QP
7.722	27.80	10.0	60	32.3	L2	FLO	QP
8.188	23.30	9.9	60	36.7	L2	FLO	QP
8.340	26.60	9.9	60	33.4	L2	FLO	QP
0.192	14.00	9.9	54	39.9	L2	FLO	AVG
6.366	22.80	10.0	50	27.2	L2	FLO	AVG
6.690	19.80	10.0	50	30.2	L2	FLO	AVG
6.900	26.40	10.0	50	23.6	L2	FLO	AVG
7.146	26.90	10.0	50	23.1	L2	FLO	AVG
7.332	22.20	10.0	50	27.8	L2	FLO	AVG
7.560	25.80	10.0	50	24.3	L2	FLO	AVG
7.750	19.50	10.0	50	30.5	L2	FLO	AVG
8.148	16.60	9.9	50	33.4	L2	FLO	AVG
8.298	22.10	9.9	50	27.9	L2	FLO	AVG

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.3.1 Measurement Procedure

Radiated emissions tests were performed over the frequency range of 30MHz to 5GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz.

7.3.2 Measurement Results

Results of the test are given in Table 7.3.2-1:

Table 7.3.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
33.816	---------	43.93	V	-8.68	---------	35.25	--------	40.0	---------	4.8
56.55	---------	40.52	V	-18.88	---------	21.64	--------	40.0	---------	18.4
64.143	---------	44.18	V	-19.58	---------	24.60	--------	40.0	---------	15.4
120.01	---------	34.28	V	-13.30	---------	20.98	--------	43.5	---------	22.5
475.1	---------	20.59	H	-5.79	---------	14.80	--------	46.0	---------	31.2
700.4	---------	20.39	H	-1.29	---------	19.10	--------	46.0	---------	26.9
939.6	---------	20.36	H	2.27	---------	22.63	--------	46.0	---------	23.4

* Note: All emissions above 939.6 MHz were attenuated below the permissible limit.

7.4 Periodic Operation – FCC: CFR 47 15.231(a)(1)/ IC: RSS-210 A1.1.1(a)

7.4.1 Test Methodology

The Octopus MCU only transmits when a security breach takes place.

According to KDB 151788, a tamper alarm transmission may exceed the 5 second limit only if the tamper alarm transmission occurs in very limited instances, such as when the likelihood of a security breach or emergency condition is very high.

In this case, the Commission permits the duration of tamper transmissions to extend beyond 5 seconds as provided for by Section 15.231(a)(4).

7.4.2 Test Results

After a security breach is detected, the transmitter is deactivated after 10.2 seconds. The results are shown in Figure 7.4.2-1.

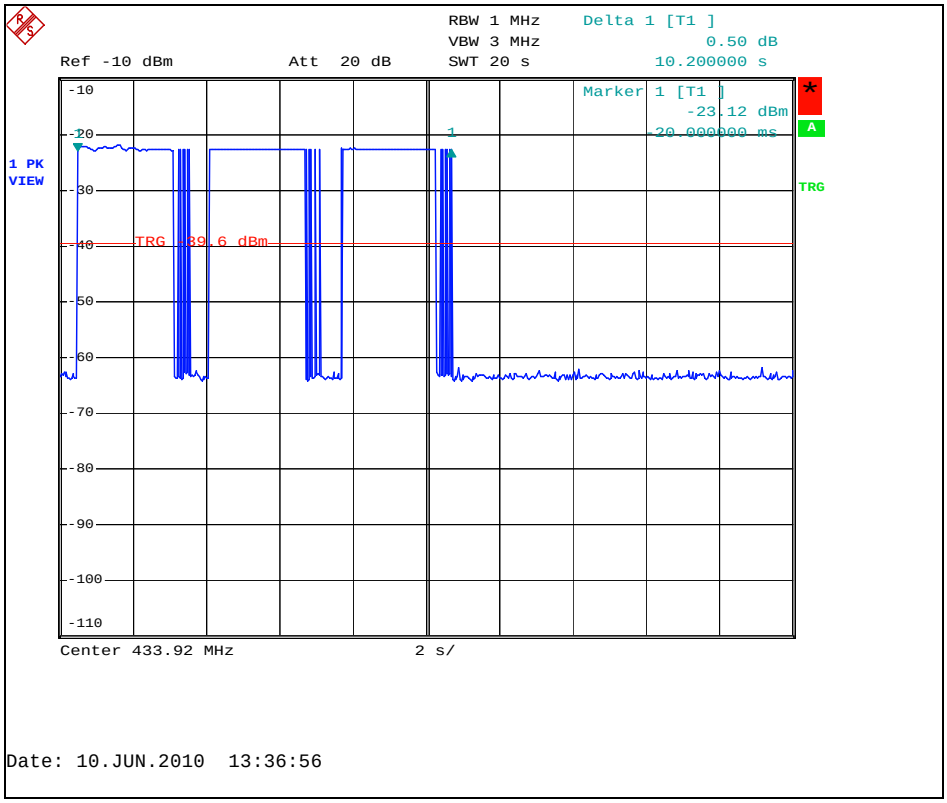


Figure 7.4.2-1: Transmitter Hold Time

7.5 Occupied Bandwidth – FCC: CFR 47 15.231(c)(1)/ IC: RSS-210 A1.1.3

7.5.1 Test Methodology

For devices operating above 70MHz and below 900 MHz, the bandwidth of the emission shall be no wider than 0.25% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier for FCC compliance. The 99% occupied bandwidth is also provided.

7.5.2 Test Results

The 20dB and 99% bandwidths were measured as 22kHz and 35.3kHz respectively. 0.25% of the 433.98MHz center frequency is equivalent to 1.08MHz. Therefore the 20dB and 99% bandwidths of the emission is less than 0.25% of the center frequency. The results are shown in Figure 7.5.2-1 and 7.5.2-2.

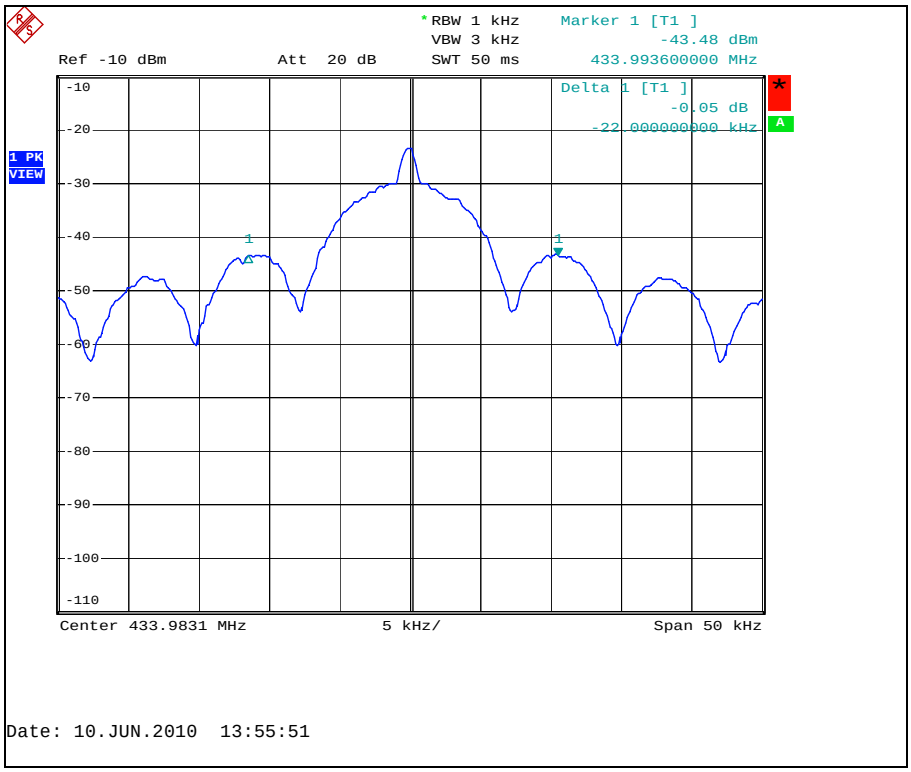


Figure 7.5.2-1: Occupied Bandwidth – 20dB

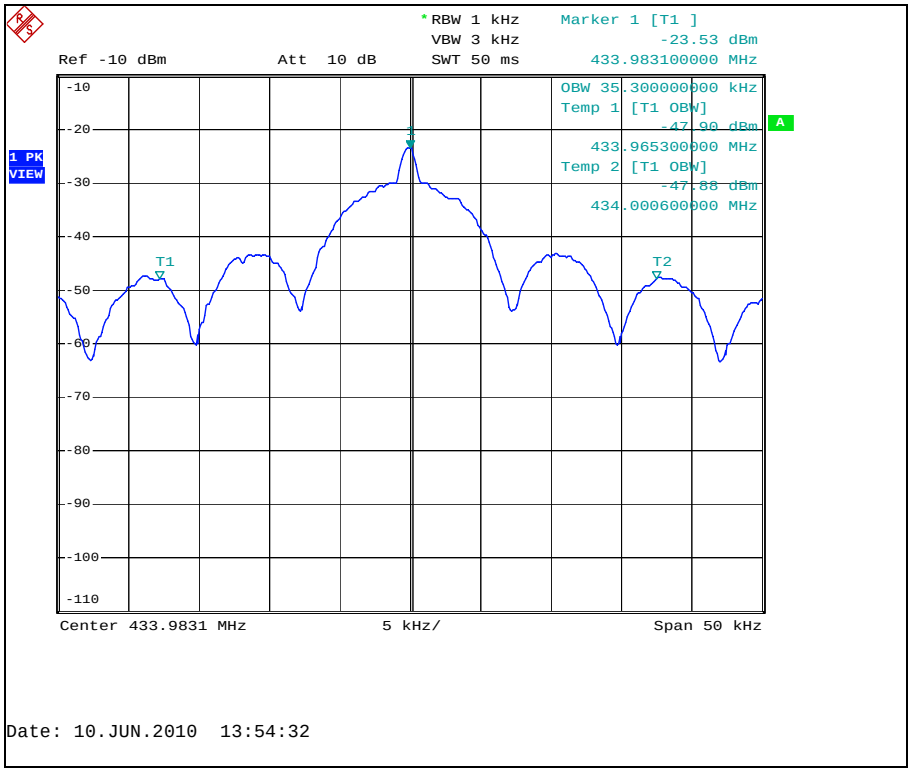


Figure 7.5.2-2: Occupied Bandwidth – 99%

7.6 Radiated Emissions (Field Strength/Spurious) – FCC: CFR 47 15.231(b)/ IC: RSS-210 A1.1.2

7.6.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 4.34GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, average measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. For frequencies above 1000MHz, average and peak measurements were made with RBW of 1 MHz and a VBW of 3 MHz.

Further, compliance with the provisions of 15.205 was demonstrated using the measurement instrumentation specified in that section where applicable.

The EUT was evaluated in the configuration stated in the installation manual. Data is presented below in section 7.6.2.

7.6.2 Test Results

Radiated spurious emissions are reported in Table 7.6.2-1. Emissions not reported were below the noise floor of the measurement system.

Table 7.6.2-1: Radiated Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Fundamental Frequency										
433.98	85.57	85.47	H	-6.66	78.91	78.81	100.8	80.8	21.9	2.0
433.98	81.20	81.07	V	-6.66	74.54	74.41	100.8	80.8	26.3	6.4
Spurious Emissions										
867.96	40.01	38.03	H	1.26	41.27	39.29	80.8	60.8	39.5	21.5
867.96	36.15	33.13	V	1.26	37.41	34.39	80.8	60.8	43.4	26.4
1301.94	49.24	49.24	H	-6.08	43.16	43.16	74.0	54.0	30.8	10.8
1301.94	50.67	50.67	V	-6.08	44.59	44.59	74.0	54.0	29.4	9.4
1735.92	51.63	51.63	H	-3.29	48.34	48.34	80.8	60.8	32.5	12.5
1735.92	56.20	56.20	V	-3.29	52.91	52.91	80.8	60.8	27.9	7.9
2169.9	46.81	46.81	V	-0.69	46.12	46.12	80.8	60.8	34.7	14.7

7.6.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Fundamental Frequency

PEAK:
Corrected Level: 85.57 - 6.66 = 78.91dBuV
Margin: 100.8dBuV – 78.91dBuV = 21.9dB

AVERAGE:
Corrected Level: 85.47 - 6.66 - 0 = 78.81dBuV
Margin: 80.8dBuV – 78.81dBuV = 2.0dB

8 CONCLUSION

In the opinion of ACS, Inc. 3SI Security Systems model MCU-102A, meets the requirements of FCC Part 15 subpart C.

END REPORT