
FCC Part 15 Certification
Test Report

433.92 MHz Alarm System

FCC ID: Q6K 1000-7251
FCC Rule Part: 15.231

ACS Report Number: 04-0056-15B

Manufacturer: 3SI Security Systems
Model: Octopus ATM Security System (MCU)

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Additional Exhibits Included In Filing

Internal Photographs
External Photographs
Test Setup Photographs
Product Labeling
RF Exposure – MPE Calculations
Technical Documentation
Installation/Users Guide
Theory of Operation
System Block Diagram
Parts List
Data Plots

1.0 GENERAL

1.1 Introduction

The purpose of this report is to demonstrate compliance with 15.231 of the FCC's Code of Federal Regulations.

1.2 Product Description

The Octopus ATM Security System master control unit or MCU consist of a printed wiring board house in a protective enclosure and is located in the ATM safe area. The unit contains several sensor devices such as tilt and motion. It also monitors external contact closures from several sources for specific events and if necessary command the CSU to activate the ink staining system.

The MCU is battery operated with a design target of two years of battery life.

1.2.1 Intended Use

The 3Si 1000-7251 Master Cassette Unit is intended to be installed into ATM machines for theft prevention. To be installed only by trained professionals.

2.0 LOCATION OF TEST FACILITY

All testing was performed by qualified ACS personnel located at the following address:

ACS, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518

2.1 DESCRIPTION OF TEST FACILITY

Both the 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.

The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 89450
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

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

2.1.1 Open Area Test Site

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 2.1-1 below:

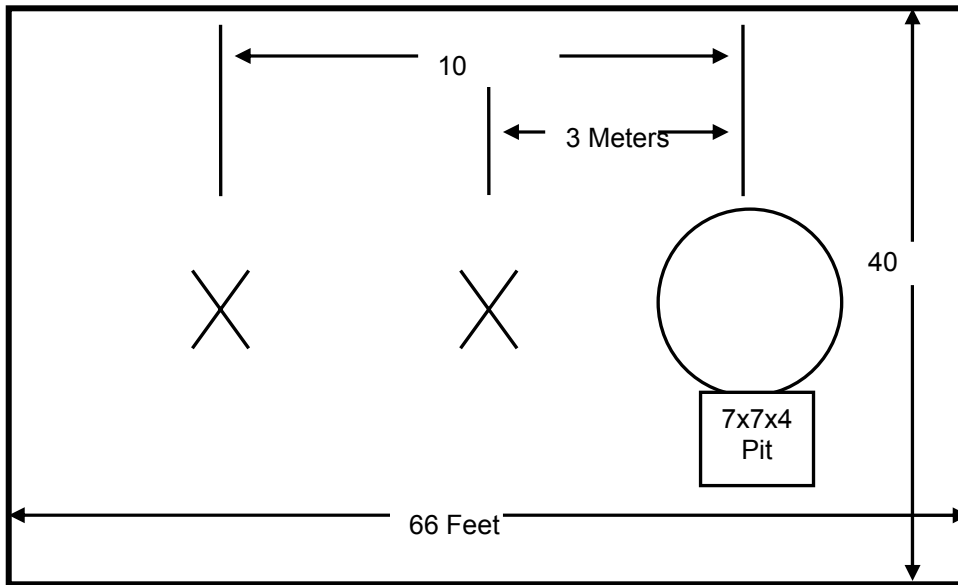


Figure 2.1-1: Open Area Test Site

2.1.2 Conducted Emissions Test Site Description

The AC mains conducted EMI site is a shielded room with the following dimensions:

- Height: 3.0 Meters
- Width: 3.6 Meters
- Length: 4.9 Meters

The room is manufactured by Rayproof Corporation and installed by Panashield, Inc. Earth ground is provided to the room via an 8' copper ground rod. Each panel of the room is connected electrically at intervals of 4".

Power to the room is filtered to prevent ambient noise from coupling to the EUT and measurement equipment. Filters are models 1B42-60P manufactured by Rayproof Corporation.

The room 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 2.1.2-1:

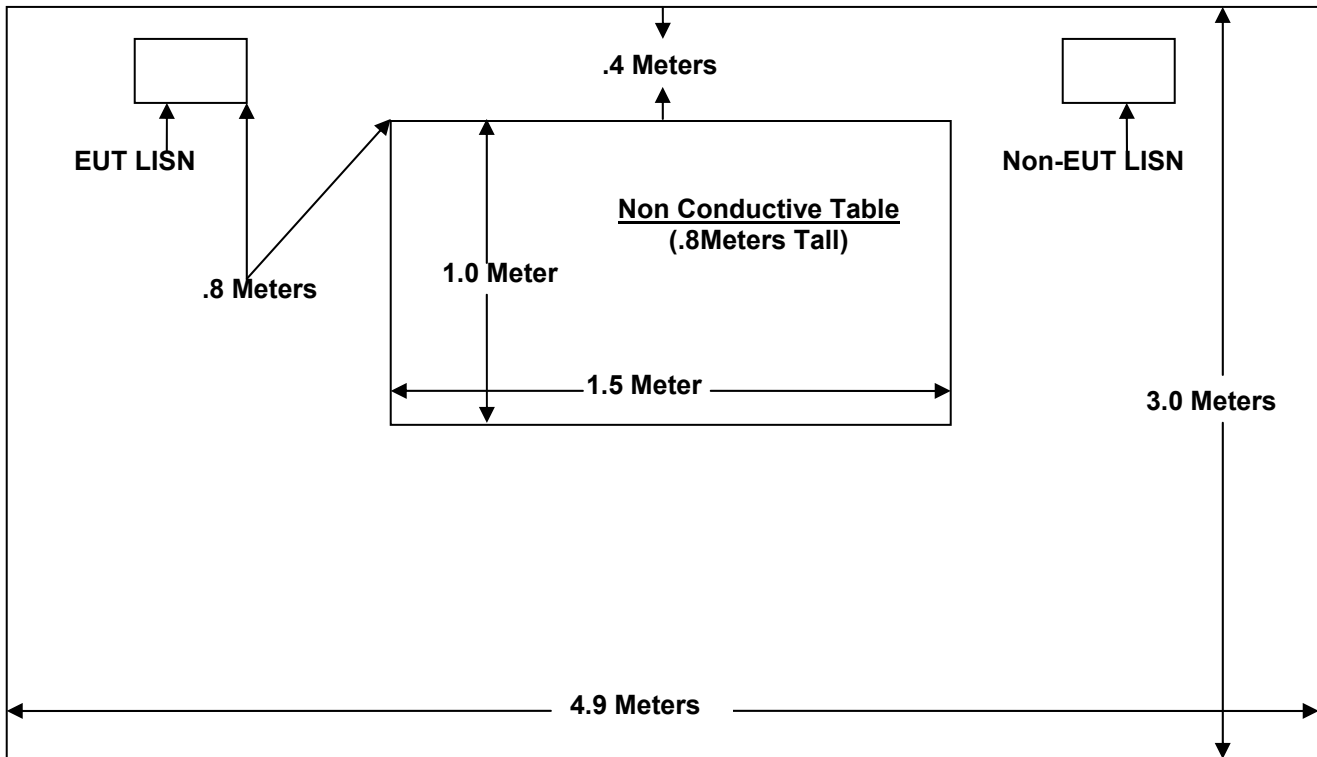


Figure 2.1.2-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.4-1992: 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 (October 2002)
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators (October 2002)
- ❖ FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
- ❖ ANSI/TIA/EIA – 603 – A – 2001: Land Mobile or PM Communications Equipment and Performance Standards (August 15, 2001)

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer’s specifications.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS #	Mfg.	Eq. type	Model	S/N	Cal. Due
---	Agilent	Spectrum Analyzer	E7402A	US40240259	11/08/04
---	Agilent	Spectrum Analyzer	8563EC	4111A01283	10/10/04
26	Chase	Bi-Log Antenna	CBL6111	1044	10/14/04
152	EMCO	LISN	3825/2	9111-1905	1/08/05
153	EMCO	LISN	3825/2	9411-2268	12/11/04
193	ACS	OATS Cable Set	RG8	193	1/09/05
167	ACS	Conducted EMI Cable Set	RG8	167	1/09/05
5	Harbour Industries	Cable	LL-335	None	8/20/04
6	Harbour Industries	Cable	LL-335	None	8/6/04
22	Agilent	Pre-Amplifier	8449B	3008A00526	9/18/04
73	Agilent	Pre-Amplifier	8447D	272A05624	4/15/04
30	Spectrum Technologies	Horn Antenna	DRH-0118	970102	5/8/04
105	Microwave Circuits	High Pass Filter	H1G810G1	2123-01 DC0225	6/17/04
40	EMCO	Biconical Antenna	3104	3211	9/19/04

5.0 SYSTEM BLOCK DIAGRAM

Table 5.0: System Block Diagram

Diagram Number	Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
1	EUT	Radio Module	MCU	None	Q6K 1000-7251

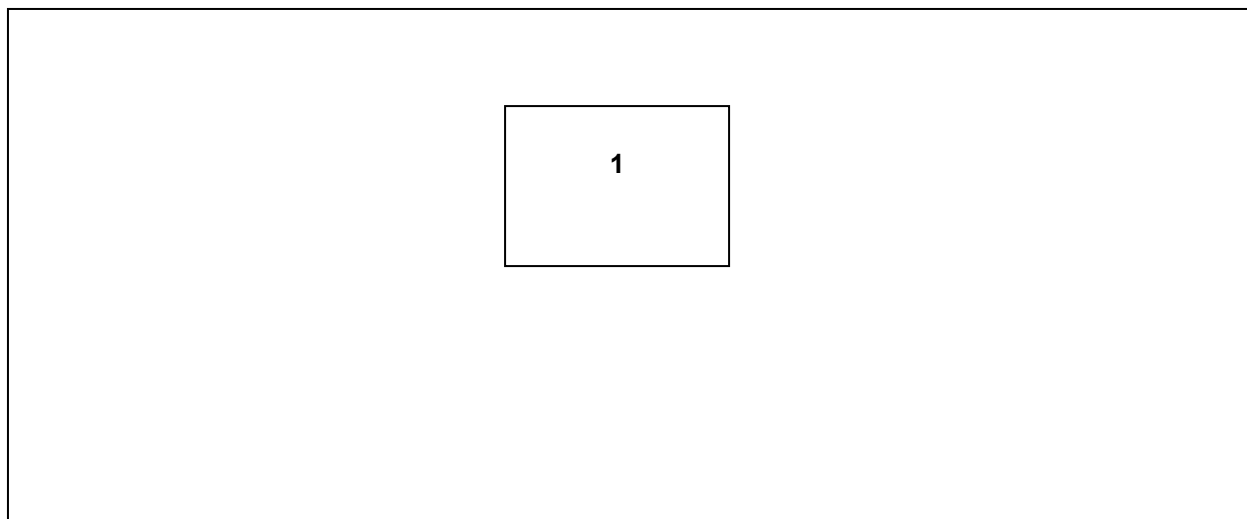


Figure 5.0-1: EUT Test Setup

6.0 SUMMARY OF TESTS

6.1 Power Line Conducted Emissions - FCC Section 15.207

6.1.1 Test Methodology

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.

6.1.2 Test Results

The EUT is powered from an internal battery. There is no connection to the AC mains, therefore this requirement is not applicable to the EUT.

6.2 Radiated Emissions - FCC Section 15.209(Unintentional Radiation)

6.2.1 Test Methodology

ANSI C63.4 Sections 6 and 8 were the guiding documents for this evaluation. Radiated emissions tests were performed over the frequency range of 30MHz to 1000. 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 were made with the Spectrum Analyzer’s resolution bandwidth set to 120KHz for measurements above 30MHz.

The EUT was caused to go into a “Standby” mode of operation for this test.

6.2.2 Test Results

Results of the test are given in Table 6.2.2-1 below:

Table 6.2.2-1: Radiated Emissions Tabulated Data (Unintentional Radiators)

Frequency (MHz)	Uncorrected Reading (dBµV)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Total Correction Factor (dB)	Corrected Reading (dBµV)	Limit (dBµV)	Margin (dB)	Results
81.733	22	H	100	0	8.51	30.51	40	9.5	Pass
121.611	26.11	H	125	140	12.76	38.87	43.5	4.6	Pass
129.155	26.57	H	200	430	12.90	39.47	43.5	4.0	Pass
136.7	24.99	H	250	113	12.87	37.86	43.5	5.6	Pass
139.933	20.27	H	250	397	12.80	33.07	43.5	10.4	Pass
144.244	25.25	H	220	175	12.63	37.88	43.5	5.6	Pass
147.477	21.68	H	200	144	12.45	34.13	43.5	9.4	Pass
151.788	23.6	H	200	448	12.30	35.90	43.5	7.6	Pass
195.977	24.98	H	150	93	10.82	35.80	43.5	7.7	Pass
897.611	22.2	V	100	0	-0.09	22.11	46	23.9	Pass

6.3 FCC Section 15.231 (a)(2) – Automatic Transmission Duration

6.3.1 Test Requirement

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

6.3.2 Test Methodology

The EUT provided by the client was not setup for normal transmission, therefore testing could not be performed on the sample provided. The manufacturer provided the timing diagram shown in section 6.3.3 indicating the timing on of the device. The manufacturer attests to the accuracy of this diagram.

6.3.3 Test Results

The timing diagram in figure 6.3.3-1 below, shows that the transmission ceases at 3765.7mS.

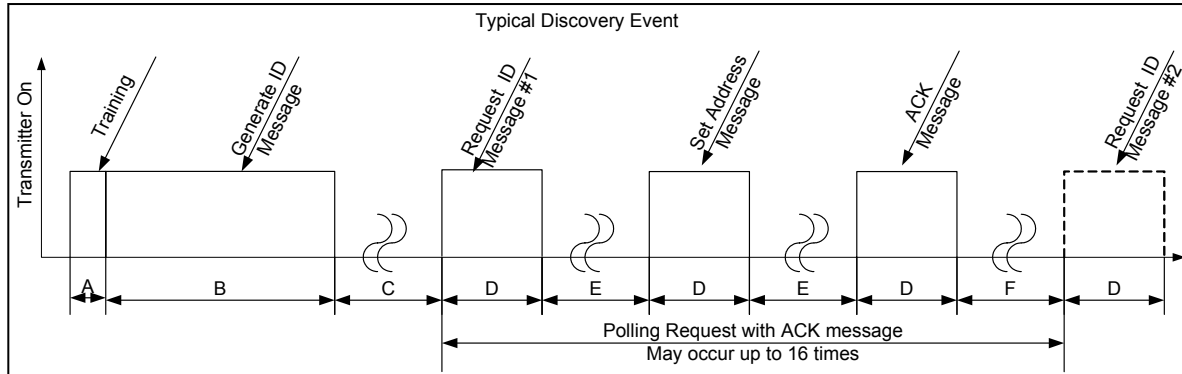


Figure 6.3.3-1: Transmission Duration Timing Diagram

- A = 6.084 ms
- B = 16.428 ms
- C = 153.846 ms
- D = 8.112 ms
- E = 50.000 ms
- F = 100 ms

Worst Case Transmission period = $A+B+C+3D+2E+F = 6.084+16.428+153.846+24.336+100+100 = 400$.

TXontime = $A+B+3D = 46.85mS$
 Duty Cycle = TXontime/100mS or period whichever is less
 Duty Cycle = 46.85%
 Correction Factor = $20\log(.4685)=-6.98$

6.4 FCC Section 15.231 (b) – Field Strength of Emissions

6.4.1 Test Requirement

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

6.4.2 Test Methodology

ANSI C63.4 Sections 6 and 8 were the guiding documents for this evaluation. Radiated emissions tests were performed over the frequency range of 30MHz to 5000MHz. 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 were made with the Spectrum Analyzer’s resolution bandwidth set to 120KHz for measurements below 1000MHz and 1MHz for measurements above 1000MHz. All measurements were made using a CISPR Quasi Peak Detector as allowed by 15.231(b)(2).

The EUT was caused to go into a “CW” mode of operation for this test.

6.4.3 Test Results

The results are shown in the table 6.4.3-1 below.

Fundamental Freq (MHz):	433.92
Fund. Field Strength(dBuV):	86.33
Correction Factor(dB):	-6.58
Corrected Level(dBuV)	73.2
Limit(uV/m):	10996.67
Limit(dBuV/m)	80.83
Margin(dB):	7.63

Frequency (MHz)	Uncorrected Reading (dBµV)	Restricted Band (Y/N)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Total Correction Factor (dB)	Corrected Reading (dBµV)	Limit (dBµV)	Margin (dB)
433.92	86.33	n	h	200	0	-7.75	78.78	80.83	2.1
867.97	39.83	n	h	0	233	-0.11	39.72	60.83	21.1
1302.08	51.5	y	v	100	133	-1.97	49.53	54.00	11.3
1735.96	47.5	n	v	100	456	0.89	48.39	60.83	12.4
2170.08	42.83	n	v	100	0	3.61	46.44	60.83	14.4
2603.82	42.17	n	v	100	0	5.95	48.12	60.83	12.7
3037.56	41.5	n	v	100	0	7.66	49.16	60.83	11.7

*Total Correction Factor includes Cable Attenuation, Antenna Factor, Pre-amp gain and Duty Cycle Correction

6.5 FCC Section 15.231 (c) – Bandwidth Limitation

6.5.1 Test Requirement

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.5.2 Test Methodology

The EUT was setup as shown below in figure 6.5.2-1. The EUT was caused to generate a CW signal and the bandwidth was measured at the 20dB points.

6.5.3 Test Results

For this EUT operating at 433 MHz the bandwidth shall be no wider than .25% of the emission or 1.08MHz. The measured bandwidth at the 20dB points was 352KHz as is shown below in figure 6.5.3-1 below:

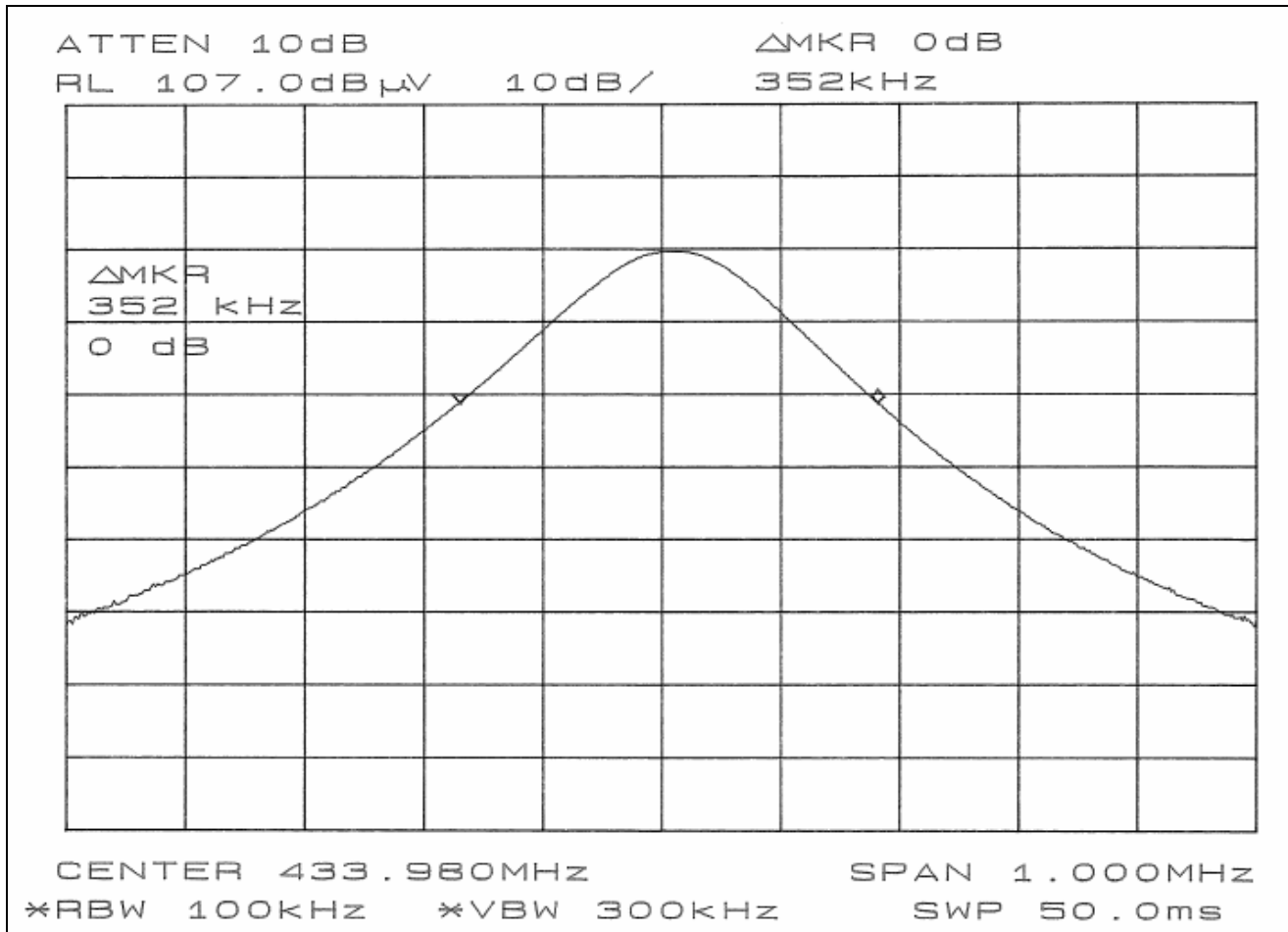


Figure 6.5.3-1: Bandwidth Limitation

7.0 CONCLUSION

In the opinion of ACS, Inc. the OCTOPUS ATM SECURITY SYSTEM (MCU), manufactured by 3Si meets the relevant requirements of FCC Part 15 as required.