



FCC Part 15 Transmitter Certification

Test Report

FCC ID: SPI-4XXKPMR

FCC Rule Part: 15.209

ACS Report Number: 05-0270-15C

Manufacturer: Single Access Lock Inc.
Model: 4XXKP/MR

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FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612

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This report contains 15 pages

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Additional Exhibits Included In Filing

Internal Photographs
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Product Labeling
BOM
Information to Users
Theory of Operation
System Block Diagram
Schematics

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 of the FCC's Code of Federal Regulations for the Single Access Lock model 4XXKP/MR.

1.2 Product Description

The 420 or 460 KP or MR models are microprocessor-controlled network system controllers which provide the ability for access control at a single point within a firm's network of access control situations be they any type of door. These single devices or access points may be powered by external low power 12 VDC or 24 VDC or batteries. They are linked to a network controlled authorization system that grants or limits access. On the KP models there are two methods to grant access at the device. They are through a keypad entry or proximity card (125 KHz only). On the MR models they can be through a keypad or magnet card reader that can read clock and data stream from Magnetic stripe Cards.

The controller electronics for each enclosure type are identical with the addition of a power board on the wall mount door controllers. The product variants are electrically identical with the exception of the 802.11 module for the 460 KP and 460 MR. Although the 802.11 radio module is not present in the 420 KP and 420 MR variants, the electrical connection is available.

1.3 Product Variants

Enclosure Variants:

Low Profile Standard Door Access Lock

Wall Mount Door Controller

Product Variants:

420 KP - Keypad & Proximity Sensor, Battery or low power DC with Network Connection

420 MR - Magnetic reader to locking device with Network Connection, Battery or low power DC

460 KP - Keypad & Proximity Sensor, 802.11 Radio, Battery or low power DC with Network Connection

460 MR - Magnetic reader to locking device with Network Connection, 802.11 Radio, Battery or low power DC

Note: For the purpose of this report both the Low profile Standard Door Access Lock and the Wall Mount Door Controller was evaluated. It represented the worst case configuration which contained the proximity sensor and 802.11b radio. The 802.11b radio module is modular approved under FCC ID: RTTAB-WLNB therefore testing was performed on the proximity sensor only to show compliance with Part 15 Subpart C.

2.0 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

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. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. 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
NVLAP Lab Code: 200612

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:

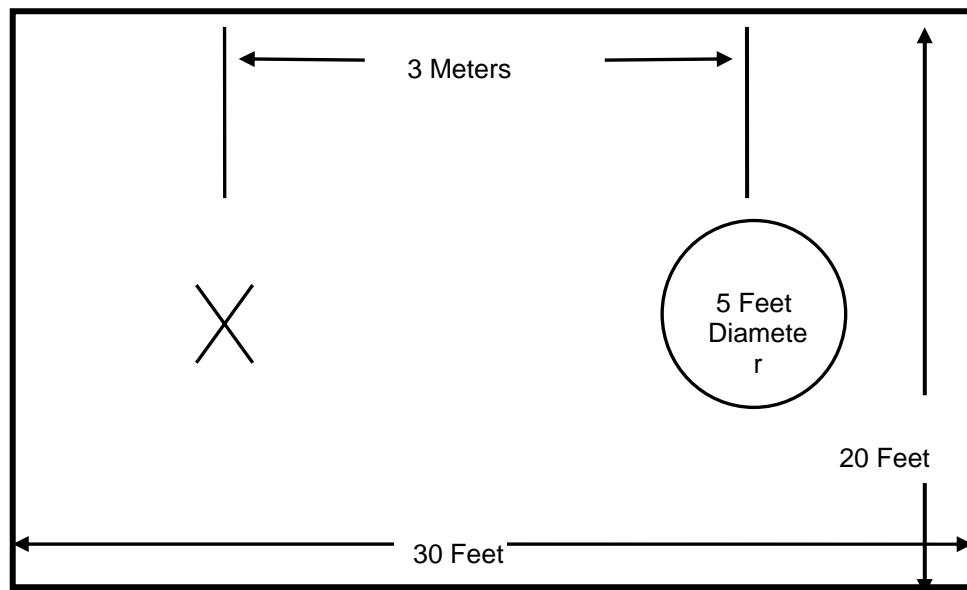


Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

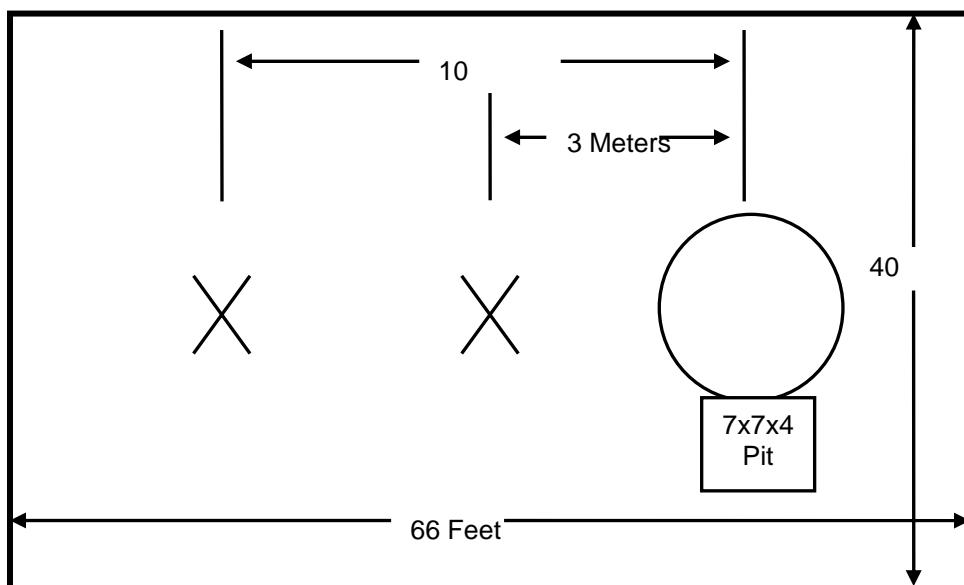


Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is 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 2.4-1:

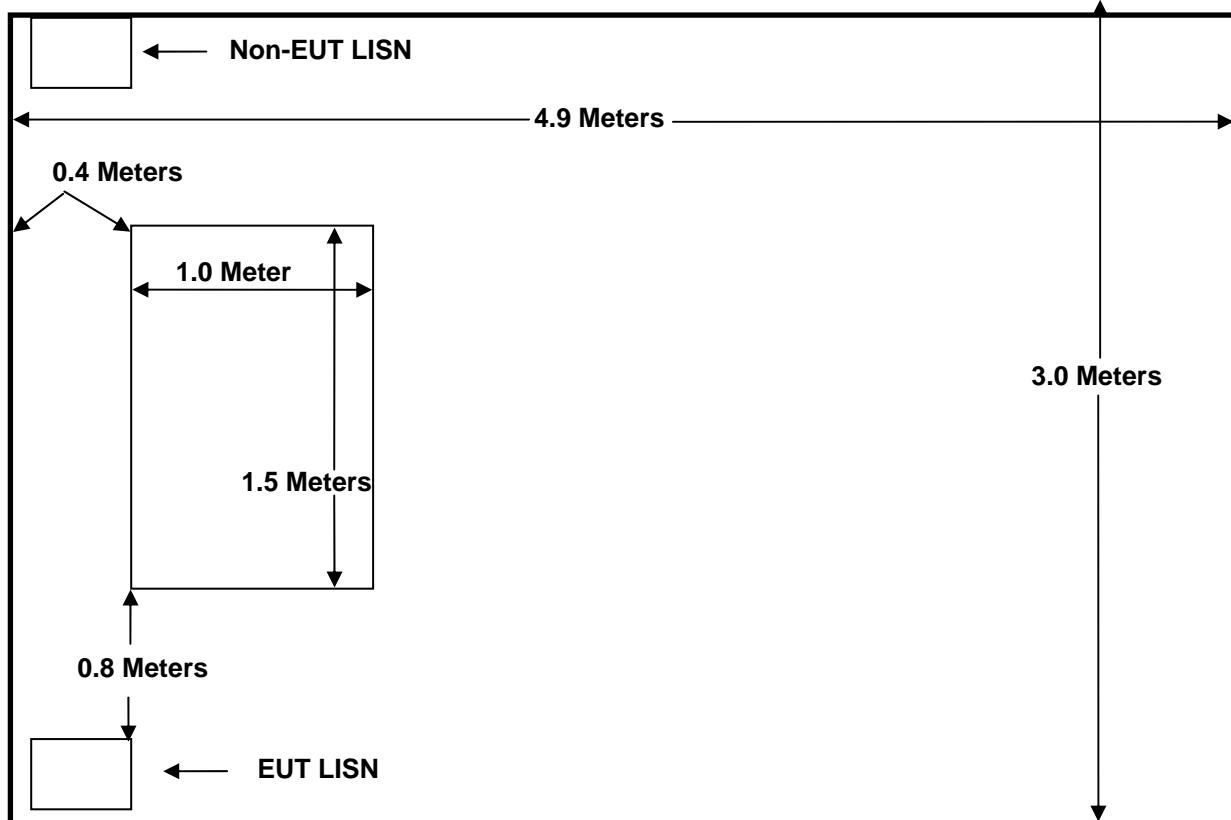


Figure 2.4-1: AC Mains Conducted EMI Site

3.0 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 (October 2004)
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart B & Subpart C: Radio Frequency Devices, (October 2004)

4.0 LIST OF TEST EQUIPMENT

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

Table 4.0-1: Test Equipment

Equipment Calibration Information					
ACS#	Mfg.	Eq. type	Model	S/N	Cal. Due
☒ 26	Chase	Bi-Log Antenna	CBL6111	1044	06/02/06
☒ 78	EMCO	Loop Antenna	6502	9104-2608	1/12/2006
☒ 152	EMCO	LISN	3825/2	9111-1905	01/18/06
☒ 153	EMCO	LISN	3825/2	9411-2268	12/20/05
☒ 193	ACS	OATS Cable Set	RG8	193	01/07/06
☒ 225	Andrew	OATS RF cable	Heliax	225	01/06/06
☒ 165	ACS	Conducted EMI Cable Set	RG8	165	01/06/06
☒ 22	Agilent	Pre-Amplifier	8449B	3008A00526	05/06/06
☒ 73	Agilent	Pre-Amplifier	8447D	272A05624	05/18/06
☒ 1	Rohde & Schwarz	Receiver Display	804.8932.52	833771/007	03/07/06
☒ 2	Rohde & Schwarz	ESMI Receiver	1032.5640.53	839587/003	03/07/06
☒ 3	Rohde & Schwarz	Receiver Display	804.8932.52	839379/011	12/15/05
☒ 4	Rohde & Schwarz	ESMI Receiver	1032.5640.53	833827/003	12/15/05
☒ 213	Test Equipment Corp.	Pre-Amplifier	PA-102	44927	06/29/06
☒ 211	Eagle	Band Reject Filter	C7RFM3NFM	n/a	01/06/06
☒ 168	Hewlett Packard	Pulse Limiter	11947A	3107A02268	01/06/06
☒ 204	ACS	Cable	RG8	204	12/29/05
☒ 167	ACS	Chamber EMI Cable Set	RG6	167	12/29/05
☒ 204	ACS	Chamber EMI RF cable	RG8	204	01/07/06

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

ID	Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
1	GlobTek, Inc.	Power Supply	GT-21097-5024	03084001/04	NA
2	ACER	Laptop Computer	730	9149C01NC5112 00039M	NA
3	Lite-ON Electronics, Inc.	Power Supply	PA-1600-02	2400004CA	NA

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

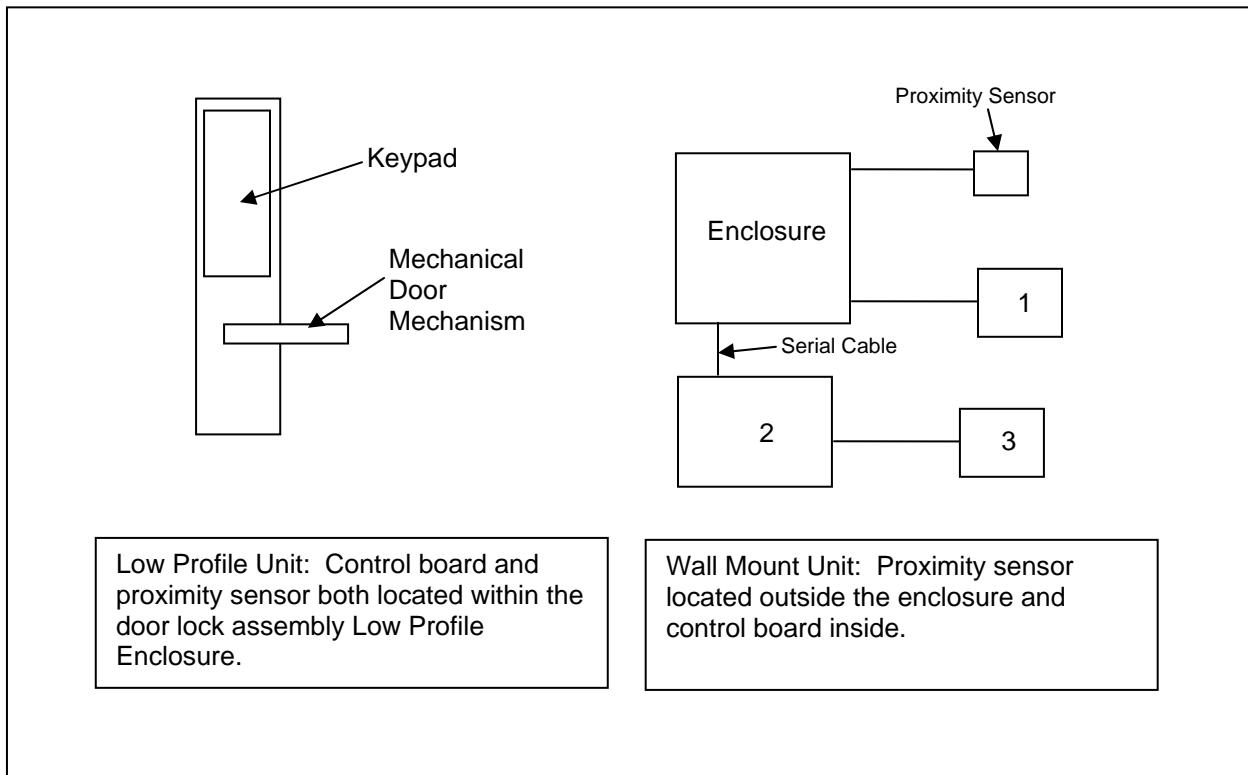


Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

7.1 Power Line Conducted Emissions - FCC Section 15.207

7.1.1 Test Methodology

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 EUT was tested in transmit mode and with the proximity sensor operating continuously. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss

Margin = Applicable Limit - Corrected Reading

Testing was performed on the wall mount enclosure only. The low profile enclosure is battery powered. Results of the test are shown below in and Tables 7.1.2-1 through 7.1.2-4 and Figure 7.1.2-1 through 7.1.2-2

7.1.2 Test Results – Wall Mount Enclosure

Table 7.1.2-1: Line 1 Conducted EMI Results (Quasi-Peak)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
25.548	49.6	10.4	60	10.3	L1	GND
25.854	49	10.3	60	10.9	L1	GND
25.86	51.7	10.3	60	8.2	L1	GND
26.16	51.6	10.3	60	8.3	L1	GND
26.166	51.9	10.3	60	8	L1	GND
26.46	51.2	10.3	60	8.7	L1	GND
26.76	50.2	10.3	60	9.7	L1	GND
27.066	49.8	10.3	60	10.1	L1	GND

Table 7.1.2-2: Line 1 Conducted EMI Results (Average)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
25.56	46	10.4	50	4	L1	GND
25.566	48.8	10.4	50	1.1	L1	GND
25.86	46	10.3	50	3.9	L1	GND
26.142	31.3	10.3	50	18.6	L1	GND
26.166	49.3	10.3	50	0.6	L1	GND
26.466	49.2	10.3	50	0.7	L1	GND
26.742	31.3	10.3	50	18.6	L1	GND
27.066	44.5	10.3	50	5.4	L1	GND

Table 7.1.2-3: Line 2 Conducted EMI Results (Quasi-Peak)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
25.266	48.3	10.4	60	11.6	L2	GND
25.566	47.6	10.4	60	12.3	L2	GND
25.866	48.5	10.3	60	11.4	L2	GND
25.872	50.2	10.3	60	9.7	L2	GND
26.172	50.7	10.3	60	9.2	L2	GND
26.478	50.4	10.3	60	9.5	L2	GND
26.778	49.7	10.3	60	10.2	L2	GND
27.078	48.5	10.3	60	11.4	L2	GND
27.378	47.7	10.3	60	12.2	L2	GND
27.678	46.9	10.3	60	13	L2	GND

Table 7.1.2-4: Line 2 Conducted EMI Results (Average)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
25.272	38.9	10.4	50	11	L2	GND
25.572	48.3	10.4	50	1.6	L2	GND
26.178	47.3	10.3	50	2.6	L2	GND
26.472	42.2	10.3	50	7.7	L2	GND
27.078	46.1	10.3	50	3.8	L2	GND
27.36	32.6	10.3	50	17.3	L2	GND
27.678	39.7	10.3	50	10.2	L2	GND

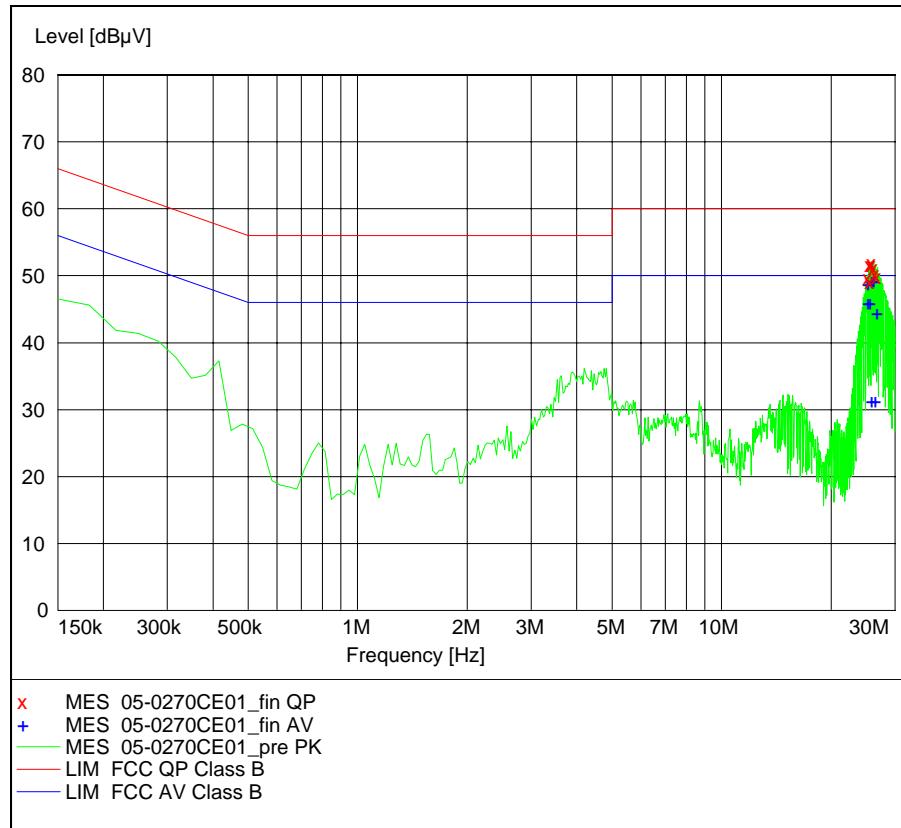


Figure 7.1.2-1: Conducted Emissions Graph – Line 1

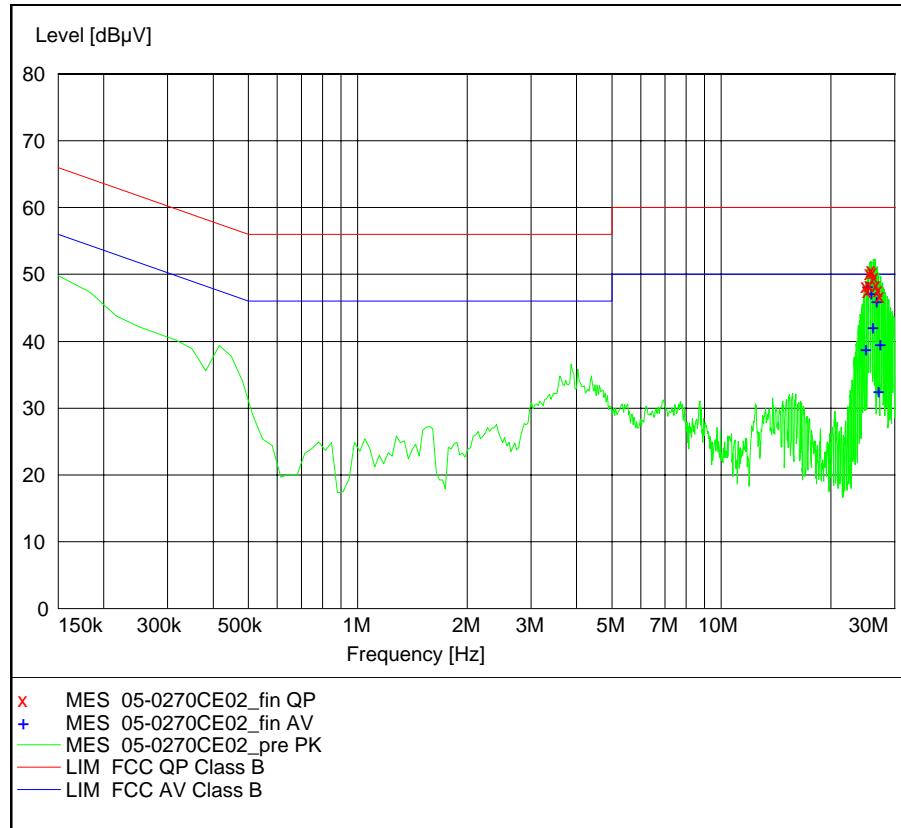


Figure 7.1.2-2: Conducted Emissions Graph – Line 2

7.2 Radiated Spurious Emissions - FCC Section 15.209 (Intentional Radiators)

7.2.1 Test Methodology

Radiated emissions tests were made over the frequency range of up to 10 times the highest fundamental frequency for both enclosure types (Low Profile/Wall Mount).

Measurements were performed at a 3 meters distance between the EUT and receiving antenna. The magnetic loop receiving antenna was positioned with its center 1 meter above the ground and rotated about its vertical axis to maximize emissions. The spectrum analyzer's resolution bandwidth was set to 200Hz for measurements below 150kHz and 9 kHz for measurements above 150kHz. For measurements in the frequency bands 9-90 kHz and 110-490 kHz an average detector was used for comparison to average limits. When average measurements are specified, the peak emissions were also compared to a limit corresponding to 20 dB above the maximum permitted average limit according to Part 15.35. All other emissions were measured using a Quasi-peak detector. The final measurements were then corrected by a distance correction factor, antenna correction factors, amplifier gain, and cable loss for comparison to the limits.

The band-edge at the restricted band was also evaluated to show the spurious emission levels complied with the emission limitations as specified in 15.209.

Radiated spurious emissions are reported in Tables 7.2.3-1 – 7.2.4.1 and the band-edge compliance is shown in Figure 7.1.5-1.

7.2.2 Distance Correction – Part 15.31

Some radiated measurements were performed at a distance closer than the 300 meters required according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The distance correction factor was determined as follows:

$$\begin{aligned} \text{Distance correction factor} &= 40 * \text{Log} (\text{Test Distance}/300) \\ &= 40 * \text{Log} (3/300) \\ &= -80 \text{ dB} \end{aligned}$$

7.2.3 Test Results – Low Profile Enclosure

Table 7.2.3-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Notes
	pk/Qpk	avg		pk/Qpk	avg	pk/Qpk	avg	pk/Qpk	avg	
Fundamental Frequency										
0.125	87.36	87.23	-95.30	-7.94	-8.07	45.67	25.67	53.61	33.74	
Spurious Emissions										
0.25	69.83	60.18	-96.70	-26.87	-36.52	39.65	19.65	66.52	56.17	*
0.375	67.09	57.11	-96.90	-29.81	-39.79	36.12	16.12	65.93	55.91	*
0.5	59.82	-----	-57.00	2.82	-----	33.62	-----	30.80	-----	*
0.625	57.71	-----	-57.10	0.61	-----	31.69	-----	31.08	-----	*
0.75	55.77	-----	-57.20	-1.43	-----	30.1	-----	31.53	-----	*
0.875	54.14	-----	-57.20	-3.06	-----	28.76	-----	31.82	-----	*
1	52.78	-----	-57.10	-4.32	-----	27.6	-----	31.92	-----	*
1.125	51.57	-----	-57.10	-5.53	-----	26.58	-----	32.11	-----	*
1.25	50.40	-----	-57.10	-6.70	-----	25.67	-----	32.37	-----	*

Note 1: * Indicates that measurements were below the noise floor of the measurement equipment and therefore the noise floor of the measurement system was reported.

7.2.4 Test Results – Wall Mount Enclosure

Table 7.2.4-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Notes
	pk/Qpk	avg		pk/Qpk	avg	pk/Qpk	avg	pk/Qpk	avg	
Fundamental Frequency										
0.125	94.52	94.36		-95.80	-1.28	-1.44	45.67	25.67	46.95	27.11
Spurious Emissions										
0.25	71.88	62.50	-97.10	-25.22	-34.60	39.65	19.65	64.87	54.25	*
0.375	69.88	62.70	-97.30	-27.42	-34.60	36.12	16.12	63.54	50.72	*
0.5	60.57	-----	-57.40	3.17	-----	33.62	-----	30.45	-----	*
0.625	58.92	-----	-57.50	1.42	-----	31.69	-----	30.27	-----	*
0.75	56.83	-----	-57.50	-0.67	-----	30.1	-----	30.77	-----	*
0.875	54.25	-----	-57.60	-3.35	-----	28.76	-----	32.11	-----	*
1	53.91	-----	-57.50	-3.59	-----	27.6	-----	31.19	-----	*
1.125	51.50	-----	-57.50	-6.00	-----	26.58	-----	32.58	-----	*
1.25	51.61	-----	-57.50	-5.89	-----	25.67	-----	31.56	-----	*

Note 1: * Indicates that measurements were below the noise floor of the measurement equipment and therefore the noise floor of the measurement system was reported.

7.2.5 Test Results – Band-edge

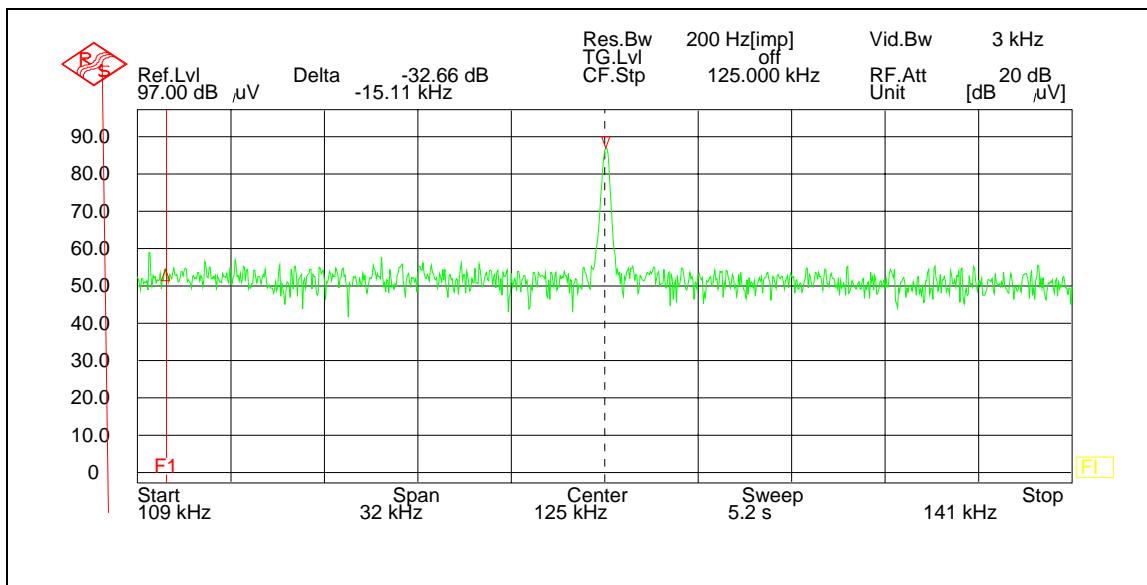


Figure 7.1.5-1: Radiated Spurious Emissions – Band-edge Compliance

7.3 Radiated Emissions - FCC Section 15.109(Unintentional Radiators)

7.3.1 Test Methodology

The radiated emissions test was performed over the frequency range of 30MHz to 1 GHz. 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 a Quasi-peak detector and the Spectrum Analyzer's resolution bandwidth set to 120 KHz.

Results of the test are given in Tables 7.3.2-1 – 7.3.2-2 below.

7.3.2 Test Results – Low Profile Enclosure

Table 7.3.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Corrected Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30.00	VERTICAL	221	27	16.8	40.0	23.2
42.32	VERTICAL	110	4	8.4	40.0	31.6
84.72	VERTICAL	170	353	8.5	40.0	31.5
97.12	VERTICAL	108	212	20.0	43.5	23.5
130.64	VERTICAL	301	74	13.0	43.5	30.5
212.08	VERTICAL	250	36	11.8	43.5	31.7
295.52	VERTICAL	310	49	16.3	46.0	29.7
494.40	VERTICAL	150	14	24.5	46.0	21.5
697.44	VERTICAL	290	14	28.5	46.0	17.5
952.40	VERTICAL	110	36	32.7	46.0	13.3

7.3.2 Test Results – Wall Mount Enclosure

Table 7.3.2-2: Radiated Emissions Tabulated Data

Frequency (MHz)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Corrected Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
32.4	VERTICAL	110	102	28.2	40	11.8
40.48	VERTICAL	110	80	21.6	40	18.4
46.64	VERTICAL	110	57	21	40	19
99.2	HORIZONTAL	229	14	25.4	43.5	18.1
103.76	HORIZONTAL	270	1	24.2	43.5	19.3
154	VERTICAL	111	345	31.8	43.5	11.7
160.72	VERTICAL	111	188	26.7	43.5	16.8
264	VERTICAL	181	146	44.6	46	1.4
748	VERTICAL	111	229	43.4	46	2.6
836	VERTICAL	105	0	39.6	46	6.4

8.0 CONCLUSION

In the opinion of ACS, Inc. the 4XXKP/MR, manufactured by Single Access Lock, Inc., meets all the requirements of FCC Part 15 Subpart C as applicable.