



**INDALA TEST REPORT**

**FOR THE**

**MIFARE READER, MX200-ttscf**

**FCC PART 15 SUBPART C SECTIONS 15.207, 15.209, 15.225 AND RSS-210**

**COMPLIANCE**

**DATE OF ISSUE: MAY 11, 2005**

**PREPARED FOR:**

Indala  
6850 B Santa Teresa Blvd.  
San Jose, CA 95119-1205

P.O. No.: 14002905  
W.O. No.: 83017

**PREPARED BY:**

Mary Ellen Clayton  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Date of test: January 17 - April 27, 2005

**Report No.: FC05-002**

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## ADMINISTRATIVE INFORMATION

**DATE OF TEST:** January 17 - April 27, 2005

**DATE OF RECEIPT:** January 17, 2005

**MANUFACTURER:** Indala  
6850 B Santa Teresa Blvd.  
San Jose, CA 95119-1205

**REPRESENTATIVE:** Steve Rose

**TEST LOCATION:** CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

**TEST METHOD:** ANSI C63.4 (2003) and RSS-212

**PURPOSE OF TEST:** To demonstrate the compliance of the Mifare Reader, MX200-ttscf with the requirements for FCC Part 15 Subpart C Sections 15.207, 15.209, 15.225 and RSS-210 devices.

## FCC TO CANADA STANDARD CORRELATION MATRIX

Canadian Standard	Canadian Section	FCC Standard	FCC Section	Test Description
RSS 210	5.5	47CFR	15.203	Antenna Connector Requirements
RSS 210	6.2.1	47CFR	15.209	General Radiated Emissions Requirement
RSS 210	6.2.2(e)	47CFR	15.225(a)*	Fundamental Requirements
RSS 210	6.2.2(e)	NA	NA	±150kHz to ±450kHz Emissions Requirement
RSS 210	6.3	47CFR	15.205	Restricted Bands of Operation
RSS 210	6.4	47CFR	15.215(c)	Frequency Stability Recommendation
RSS 210	6.6	47CFR	15.207	AC Mains Conducted Emissions Requirement
	IC 3082-D		784962	Site Filing No.

\* Indicates that FCC Requirements are more stringent than the Canadian Equivalent.

### CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply.

### APPROVALS

Steve Behm, Director of Engineering Services

#### QUALITY ASSURANCE:




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Joyce Walker, Quality Assurance Administrative Manager

#### TEST PERSONNEL:




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Randy Clark, EMC Engineer




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Mike Wilkinson, Lab Manager

**FCC 15.33(a) Frequency Ranges Tested**

15.207 Conducted Emissions: 150 kHz – 30 MHz

15.209/15.225 Radiated Emissions: 9 kHz – 1000 MHz

<b>FCC SECTION 15.35: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE</b>			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz

**FCC 15.203 Antenna Requirements**

The antenna is an integral part of the EUT and is non-removable; therefore the EUT complies with Section 15.203 of the FCC rules.

**FCC 15.205 Restricted Bands**

The fundamental operating frequency lies outside the restricted bands and therefore complies with the requirements of Section 15.205 of the FCC rules. Any spurious emission coming from the EUT was investigated to determine if any portion lies inside the restricted band. If any portion of a spurious emissions signal was found to be within a restricted band, investigation was performed to ensure compliance with Section 15.209.

**Eut Operating Frequency**

The EUT was operating at 13.56MHz.

**Temperature And Humidity During Testing**

The temperature during testing was within +15°C and + 35°C.

The relative humidity was between 20% and 75%.

## EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The customer declares the EUT tested by CKC Laboratories was representative of a production unit.

### 13.56 MHz Slim and Wall Switch

Product Families

Model	Name	Type (tt)	Style (s)	Color (c)	Format (f)
MX200-ttscf	Mifare Reader	01 = Slim	1 = Wave	1 = Black	A = Wiegand
DX200-ttscf	Desfire Reader	02 = Wall Switch	2 = Curve	2 = Blue	B = Buffered
IX200-ttscf	ISO 15693 Reader	03 = N/A	3 = Arch	3 = Gray	C = Magstripe
SX200-ttscf	Serial Number Reader	04 = N/A	4 = Linear	4 = Biege	D = 8 Bit Burst
PX200-ttscf	13.56 Reader	05 = N/A	5 = Euro	0 = Module	E = 4 Bit Burst
		06 = OEM Basic	0 = Module		F = Custom
		07 = OEM Full			S = Serial
		00 = Module			

Model numbers represent software selectable feature Sets within the reader software.

Type, Style, and Color Represent the different decorative Bezel options.

Format represents the software selectable data formats.

## EQUIPMENT UNDER TEST

### Mifare Reader

Manuf: Indala  
 Model: MX200-ttscf  
 Serial: 041804-002P  
 FCC ID: pending

## PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

### DC Power Supply

Manuf: Topward  
 Model: TPS-2000  
 Serial: 920035  
 FCC ID: NA

## REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the EUT. All readings taken were peak readings unless otherwise stated. The data sheets from which the emissions tables were compiled are contained in Appendix C.

**Table 1: FCC 15.207 Six Highest Conducted Emission Levels**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V	SPEC LIMIT dB $\mu$ V	MARGIN dB	NOTES
		Lisn dB	HPF dB	Cable dB					
13.560000	58.0	0.4	0.1	0.4		58.9	60.0	-1.1	BQ
13.560000	57.8	0.5	0.1	0.4		58.8	60.0	-1.2	WQ
13.560000	46.3	0.5	0.1	0.4		47.3	50.0	-2.7	WA
13.771000	21.4	0.5	0.1	0.4		22.4	50.0	-27.6	WA
27.118940	19.2	0.5	0.2	0.5		20.4	50.0	-29.6	B
27.120650	21.6	0.4	0.2	0.5		22.7	50.0	-27.3	W

Test Method: ANSI C63.4 (2003)  
Spec Limit: FCC Part 15 Subpart C Section 15.207

NOTES:  
Q = Quasi Peak Reading  
A = Average Reading  
B = Black Lead  
W = White Lead

COMMENTS: EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Frequency range investigated: 150kHz to 30MHz. Temperature: 17°C, Relative Humidity: 52%.

**Table 2: FCC 15.209 Highest Radiated Emission Levels: 9kHz to 30MHz**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V/m	SPEC LIMIT dB $\mu$ V/m	MARGIN DB	NOTES
		Ant dB	Cable dB	Corr dB					
27.119	20.1	4.9		1.1	-20.0	6.1	29.5	-23.4	V
27.120	15.2	4.9		1.1	-20.0	1.2	29.5	-28.3	H

Test Method: ANSI C63.4 (2003)  
 Spec Limit: FCC Part 15 Subpart C Section 15.209  
 Test Distance: 10 Meters

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization

COMMENTS: EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Frequency range investigated: 9kHz to 30MHz. Temperature: 17°C, Relative Humidity: 52%.



**Table 3: FCC 15.209 Six Highest Radiated Emission Levels: 30-1000MHz**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V/m	SPEC LIMIT dB $\mu$ V/m	MARGIN DB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
216.961	43.3	9.6	-26.3	3.4	10.0	40.0	46.0	-6.0	VQ
271.192	38.1	12.4	-26.0	3.8	10.0	38.3	46.0	-7.7	H
311.894	37.0	13.2	-26.3	4.2	10.0	38.1	46.0	-7.9	H
366.120	34.8	14.6	-26.6	4.7	10.0	37.5	46.0	-8.5	V
366.132	36.2	14.6	-26.6	4.7	10.0	38.9	46.0	-7.1	H
393.246	33.7	15.2	-26.8	5.0	10.0	37.1	46.0	-8.9	V

Test Method: ANSI C63.4 (2003)  
 Spec Limit: FCC Part 15 Subpart C Section 15.209  
 Test Distance: 10 Meters

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization  
 Q = Quasi Peak Reading

COMMENTS: EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Test distance correction factor used in accordance with 15.35, 20dB per decade. Frequency range investigated: 30-1000 MHz. Temperature: 17°C, Relative Humidity: 52%.

**Table 4: FCC 15.225 Fundamental Emission Levels**

FREQUENCY MHz	METER READING dB $\mu$ V	CORRECTION FACTORS				CORRECTED READING dB $\mu$ V/m	SPEC LIMIT dB $\mu$ V/m	MARGIN DB	NOTES
		Ant dB	Cable dB	Corr dB					
13.560	44.8	8.4		0.8	-20.0	34.0	84.0	-50.0	V
13.560	40.8	8.4		0.8	-20.0	30.0	84.0	-54.0	H

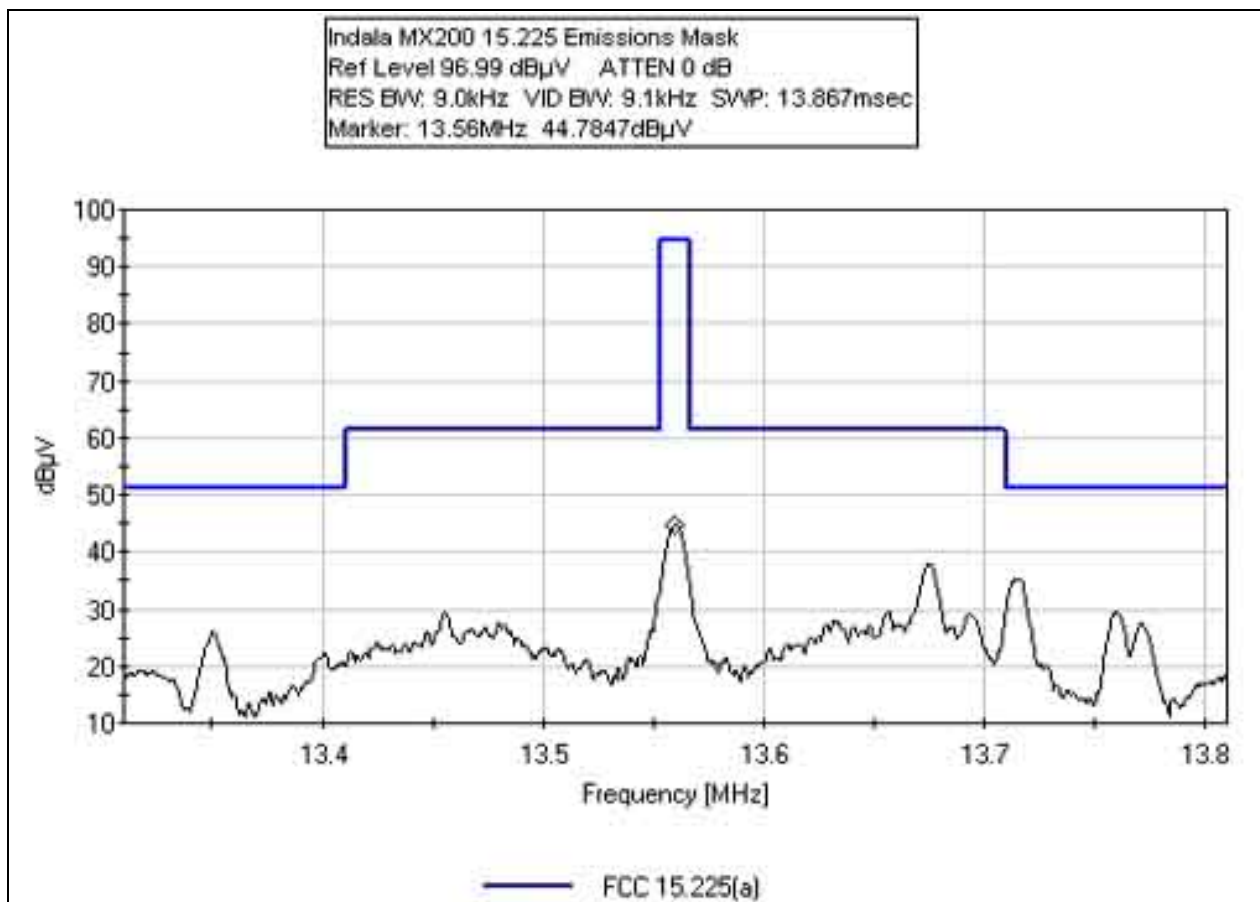
Test Method: ANSI C63.4 (2003)  
 Spec Limit: FCC Part 15 Subpart C Section 15.225  
 Test Distance: 10 Meters

NOTES: H = Horizontal Polarization  
 V = Vertical Polarization

COMMENTS: EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Test distance correction factor used in accordance with 15.31, 40dB per decade to correct 10m test data for comparison with the 30m spec limit. Frequency range investigated: Carrier. Temperature: 17°C, Relative Humidity: 52%.

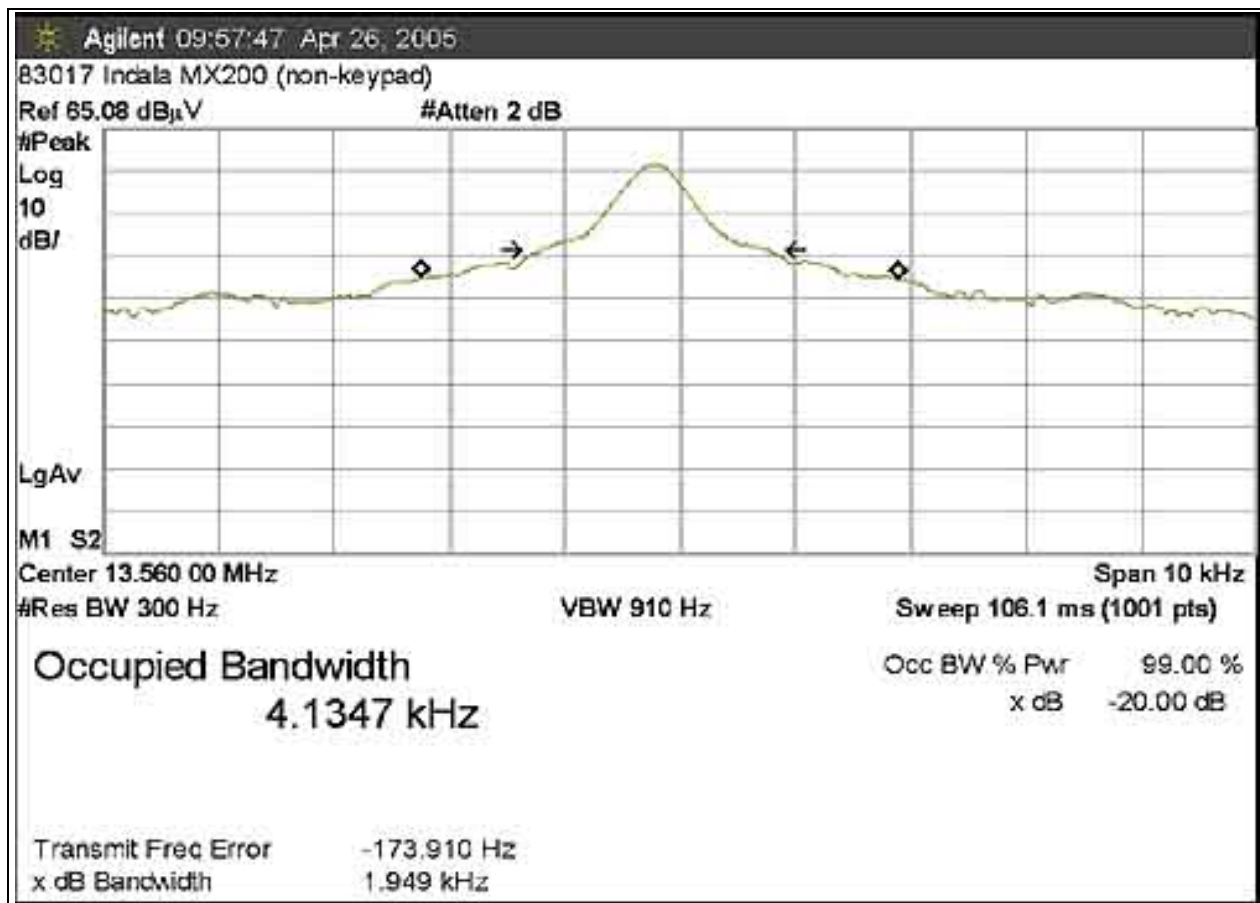
### FCC 15.225 EMISSIONS MASK

**Test Conditions:** EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common.



### OCCUPIED BANDWIDTH PLOT

**Test Conditions:** EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common.



## FREQUENCY STABILITY AND VOLTAGE VARIATIONS

**Test Conditions:** EUT is a Card Reader transmitting at 13.56 MHz. EUT was placed inside the temperature chamber where the frequency was monitored by the spectrum analyzer and antenna. The EUT was powered by a remote power supply which was monitored by the multimeter.

**Customer:** Indala  
**WO#:** 83017  
**Test Engineer:** Mike Wilkinson

**Device Model #:**  
**Operating Voltage:** 12 VDC/VAC  
**Frequency Limit:** 0.01 %

### Temperature Variations

		Channel 1 (MHz) Dev. (MHz)	
Channel Frequency:		13.5586	
Temp (C)	Voltage		
-20	12	13.55909	0.00049
-10	12	13.55905	0.00045
0	12	13.55904	0.00044
10	12	13.55904	0.00044
20	12	13.55860	0.00000
30	12	13.55921	0.00061
40	12	13.55883	0.00023
50	12	13.55900	0.00040

### Voltage Variations (±15%)

20	10.2	13.55860	0.00000
20	12	13.55860	0.00000
20	13.8	13.55890	0.00030

<b>Max Deviation (MHz)</b>	<b>0.00061</b>
<b>Max Deviation (%)</b>	<b>0.00450</b>
<b>PASS</b>	

## **EUT SETUP**

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The radiated and conducted emissions data of the EUT was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

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

## **CORRECTION FACTORS**

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB $\mu$ V/m, the spectrum analyzer reading in dB $\mu$ V was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

<b>TABLE A: SAMPLE CALCULATIONS</b>		
	Meter reading	(dB $\mu$ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB $\mu$ V/m)

## **TEST INSTRUMENTATION AND ANALYZER SETTINGS**

The test instrumentation and equipment listed in Appendix B were used to collect both the radiated and conducted emissions data. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. 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 from 30 to 1000 MHz, the biconilog antenna was used. Conducted emissions tests required the use of the FCC type LISNs.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB $\mu$ V, and a vertical scale of 10 dB per division.

## **SPECTRUM ANALYZER DETECTOR FUNCTIONS**

The notes that accompany the measurements contained in the Tables 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 six 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.

### **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**

For certain frequencies, 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.

## EUT TESTING

### Mains Conducted Emissions

During conducted emissions testing, the EUT was located on a wooden table measuring approximately 80 cm high, 1 meter deep, and 1.5 meters in length. One wall of the room where the EUT was located has a minimum 2 meter by 2 meter conductive plane. The EUT was mounted on the wooden table 40 cm away from the conductive plane, and 80 cm from any other conductive surface.

The vertical metal plane used for conducted emissions was grounded to the earth. Power to the EUT was provided through a LISN. The LISN was grounded to the ground plane. All other objects were kept a minimum of 80 cm away from the EUT during the conducted test.

The LISNs used were 50  $\mu\text{H}$  +/- 50 ohms. Above 150 kHz, a 0.15  $\mu\text{F}$  series capacitor was added in-line prior to connecting the analyzer to restore the proper impedance for the range. A 30 to 50 second sweep time was used for automated measurements in the frequency bands of 150 kHz to 500 kHz, and 500 kHz to 30 MHz. All readings within 20 dB of the limit were recorded, and those within 6 dB of the limit were examined with additional measurements using a slower sweep time.

### Radiated Emissions

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.

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. The frequency range of 30 MHz to 1000 MHz was scanned with the biconilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks at or near the limit were recorded. A scan of the FM band from 88 to 110 MHz was then made using a reduced resolution bandwidth and frequency span. The biconilog antenna was changed to the horizontal polarity and the above steps were repeated. 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.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable and raising and lowering the antenna from one to four meters as needed. The test engineer maximized the readings with respect to the table rotation, antenna height, and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor.



**APPENDIX A**

**TEST SETUP PHOTOGRAPHS**

**PHOTOGRAPH SHOWING MAINS CONDUCTED EMISSIONS**



Mains Conducted Emissions - Front View

**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



Radiated Emissions - Front View

**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



Radiated Emissions - Back View

**PHOTOGRAPH SHOWING TEMPERATURE TESTING**



## APPENDIX B

### TEST EQUIPMENT LIST

#### 15.207

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/12/2005	01/12/2007	02660
LISN, 8028-50-TS-24-BNC	8379276, 280	06/05/2003	06/05/2005	1248 & 1249
150kHz HP Filter TTE	G7754	04/20/2004	04/20/2006	02608

#### 15.209 <30 MHz & 15.225

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/12/2005	01/12/2007	02660
EMCO Loop Antenna	1074	05/21/2003	05/21/2005	00226

#### 15.209 30-1000 MHz and Emissions Mask and Bandwidth Plot

Function	S/N	Calibration Date	Cal Due Date	Asset #
Agilent E4446A SA	US44300407	01/12/2005	01/12/2007	02660
Chase CBL6111C Bilog	2456	06/26/2003	06/26/2005	01991
HP 8447D Preamp	1937A02604	03/11/2005	03/11/2007	00099

#### Frequency Stability

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer 1184 HP	2007A01066	02/16/2005	0/16/2007	1184
Spectrum Analyzer Display 1183 HP	2005A01550	02/16/2005	0/16/2007	1183
Spectrum Analyzer QP Adapter 69 HP	2043A00104	02/16/2005	0/16/2007	69
Antenna, Loop 226 EMCO	#	03/04/2005	03/04/2007	226
Temp Chamber 1879 Thermotron	#	01/24/2005	01/24/2007	1879
Thermometer 2242 Omega	T-202884	08/15/2003	08/14/2005	2242
Multimeter 2293 HP	2619A47270	05/15/2003	05/15/2005	2393

**APPENDIX C:**  
**MEASUREMENT DATA SHEETS**

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Indala**  
 Specification: **FCC 15.207 - AVE**  
 Work Order #: **83017**  
 Test Type: **Conducted Emissions**  
 Equipment: **Mifare Reader**  
 Manufacturer: **Indala**  
 Model: **MX200-ttscf-no keypad**  
 S/N: **041804-002P**

Date: 04/27/2005  
 Time: 11:02:30  
 Sequence#: 21  
 Tested By: Randal Clark  
 120V 60Hz

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Mifare Reader*	Indala	MX200-ttscf	041804-002P

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Topward	TPS-2000	920035

**Test Conditions / Notes:**

EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Frequency range investigated: 150kHz to 30MHz. Temperature: 17°C, Relative Humidity: 52%.

**Transducer Legend:**

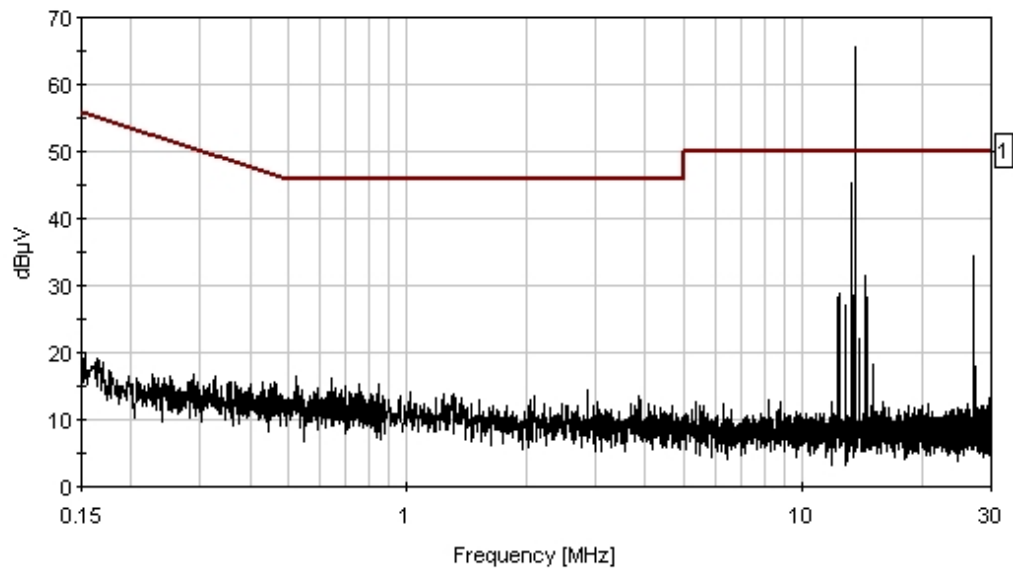
T1=Cable - Internal + cab	T2=LISN Insertion Loss s/n280
T3=HP Filter AN02608	

**Measurement Data:** Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist Table dB	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	13.560M	58.0	+0.4	+0.4	+0.1	+0.0	58.9	60.0	-1.1	Black
	QP									
^	13.560M	64.4	+0.4	+0.4	+0.1	+0.0	65.3	50.0	+15.3	Black
^	13.560M	45.2	+0.4	+0.4	+0.1	+0.0	46.1	50.0	-3.9	Black
4	27.119M	19.2	+0.5	+0.5	+0.2	+0.0	20.4	50.0	-29.6	Black
5	13.773M	18.3	+0.4	+0.4	+0.1	+0.0	19.2	50.0	-30.8	Black
	Ave									
^	13.772M	45.1	+0.4	+0.4	+0.1	+0.0	46.0	50.0	-4.0	Black
7	13.348M	15.5	+0.4	+0.4	+0.1	+0.0	16.4	50.0	-33.6	Black
	Ave									
^	13.348M	45.2	+0.4	+0.4	+0.1	+0.0	46.1	50.0	-3.9	Black



CKC Laboratories Date: 04/27/2005 Time: 11:02:30 Indala WVO#: 83017  
FCC 15.207 - AVE Test Lead: Black 120V 60Hz Sequence#: 21  
Indala MN MX200-ttscf-no keypad



— Sweep Data      — 1 - FCC 15.207 - AVE

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Indala**  
 Specification: **FCC 15.207 - AVE**  
 Work Order #: **83017**  
 Test Type: **Conducted Emissions**  
 Equipment: **Mifare Reader**  
 Manufacturer: **Indala**  
 Model: **MX200-ttscf**  
 S/N: **041804-002P**

Date: 04/27/2005  
 Time: 10:57:11  
 Sequence#: 22  
 Tested By: Randal Clark  
 120V 60Hz

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Mifare Reader*	Indala	MX200-ttscf	041804-002P

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Topward	TPS-2000	920035

**Test Conditions / Notes:**

EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Frequency range investigated: 150kHz to 30MHz. Temperature: 17°C, Relative Humidity: 52%.

**Transducer Legend:**

T1=Cable - Internal + cab	T2=LISN Insertion Loss s/n276
T3=HP Filter AN02608	

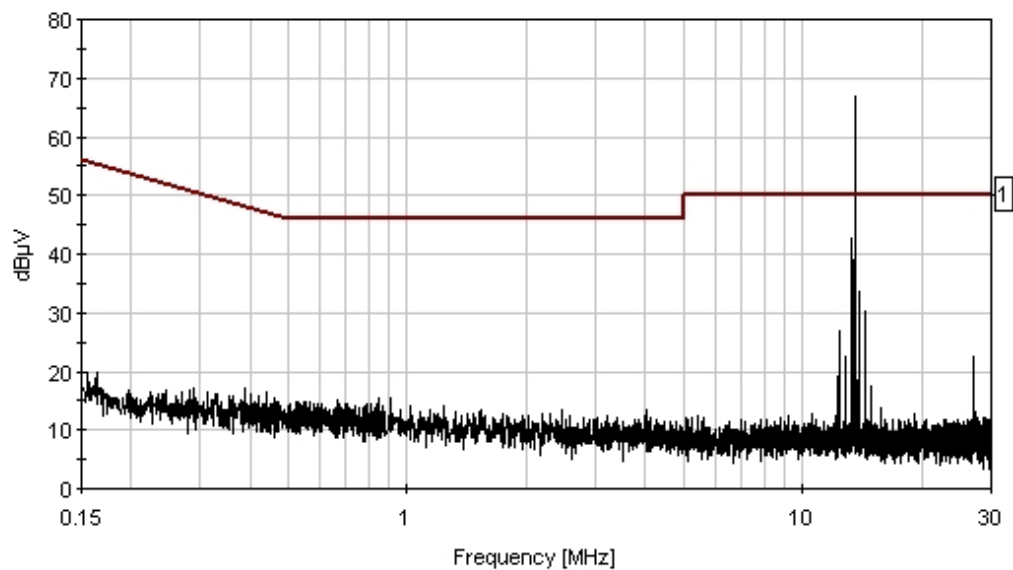
**Measurement Data:**

Reading listed by margin.

Test Lead: White

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	13.560M	57.8	+0.4	+0.5	+0.1	+0.0		58.8	60.0	-1.2	White
	QP										
2	13.560M	46.3	+0.4	+0.5	+0.1	+0.0		47.3	50.0	-2.7	White
	Ave										
^	13.560M	65.9	+0.4	+0.5	+0.1	+0.0		66.9	50.0	+16.9	White
4	27.121M	21.6	+0.5	+0.4	+0.2	+0.0		22.7	50.0	-27.3	White
5	13.771M	21.4	+0.4	+0.5	+0.1	+0.0		22.4	50.0	-27.6	White
	Ave										
^	13.770M	47.6	+0.4	+0.5	+0.1	+0.0		48.6	50.0	-1.4	White
7	13.349M	19.4	+0.4	+0.5	+0.1	+0.0		20.4	50.0	-29.6	White
	Ave										
^	13.348M	47.1	+0.4	+0.5	+0.1	+0.0		48.1	50.0	-1.9	White

CKC Laboratories Date: 04/27/2005 Time: 10:57:11 Indala WVO#: 83017  
FCC 15.207 - AVE Test Lead: White 120V 60Hz Sequence#: 22  
Indala MN MX200-ftsrf-no keypad



— Sweep Data      — 1 - FCC 15.207 - AVE

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Indala**  
 Specification: **FCC 15.209**  
 Work Order #: **83017** Date: 04/26/2005  
 Test Type: **Maximized Emissions** Time: 10:51:20  
 Equipment: **Mifare Reader** Sequence#: 18  
 Manufacturer: Indala Tested By: Randal Clark  
 Model: MX200-ttscf  
 S/N: IND44

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Mifare Reader*	Indala	MX200-ttscf	IND44

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Topward	TPS-2000	920035

**Test Conditions / Notes:**

EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Frequency range investigated: 9kHz to 30MHz. Temperature: 17°C, Relative Humidity: 52%.

**Transducer Legend:**

T1=Mag Loop - Site B - AN 00226 - 9kHz-30M	T2=Cable - 10 Meter
T3=15.31 10m 40dB/Dec Correction	

**Measurement Data:** Reading listed by margin. Test Distance: 10 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	27.119M	20.1	+4.9	+1.1	-20.0	+0.0		6.1	29.5	-23.4	Verti 100
2	27.120M	15.2	+4.9	+1.1	-20.0	+0.0		1.2	29.5	-28.3	Horiz 100

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Indala**  
 Specification: **FCC 15.209**  
 Work Order #: **83017** Date: 04/25/2005  
 Test Type: **Maximized Emissions** Time: 15:15:34  
 Equipment: **Mifare Reader** Sequence#: 12  
 Manufacturer: Indala Tested By: Randal Clark  
 Model: MX200-ttscf  
 S/N: IND44

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Mifare Reader*	Indala	MX200-ttscf	IND44

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Topward	TPS-2000	920035

**Test Conditions / Notes:**

EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Test distance correction factor used in accordance with 15.35, 20dB per decade. Frequency range investigated: 30-1000 MHz. Temperature: 17°C, Relative Humidity: 52%.

**Transducer Legend:**

T1=Amp - S/N 604	T2=Bilog Site D
T3=Cable - 10 Meter	

**Measurement Data:**

Reading listed by margin.

Test Distance: 10 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	216.961M	43.3	-26.3	+9.6	+3.4	+10.0	40.0	46.0	-6.0	Verti 129
	QP									
^	216.962M	44.2	-26.3	+9.6	+3.4	+10.0	40.9	46.0	-5.1	Verti 129
3	366.132M	36.2	-26.6	+14.6	+4.7	+10.0	38.9	46.0	-7.1	Horiz 164
4	271.192M	38.1	-26.0	+12.4	+3.8	+10.0	38.3	46.0	-7.7	Horiz 164
5	311.894M	37.0	-26.3	+13.2	+4.2	+10.0	38.1	46.0	-7.9	Horiz 164
6	366.120M	34.8	-26.6	+14.6	+4.7	+10.0	37.5	46.0	-8.5	Verti 105
7	393.246M	33.7	-26.8	+15.2	+5.0	+10.0	37.1	46.0	-8.9	Verti 105
8	230.521M	39.1	-26.2	+10.7	+3.4	+10.0	37.0	46.0	-9.0	Verti 149
9	81.360M	39.0	-27.0	+6.9	+2.0	+10.0	30.9	40.0	-9.1	Verti 105
10	108.480M	38.3	-26.8	+10.1	+2.4	+10.0	34.0	43.5	-9.5	Verti 105

11	393.232M	32.9	-26.8	+15.2	+5.0	+10.0	36.3	46.0	-9.7	Horiz 164
12	393.230M	32.4	-26.8	+15.2	+5.0	+10.0	35.8	46.0	-10.2	Verti 115
13	54.247M	37.6	-26.8	+7.3	+1.6	+10.0	29.7	40.0	-10.3	Verti 115
	QP									
^	54.247M	46.2	-26.8	+7.3	+1.6	+10.0	38.3	40.0	-1.7	Verti 115
15	203.406M	37.1	-26.5	+8.6	+3.3	+10.0	32.5	43.5	-11.0	Verti 105
16	311.899M	33.2	-26.3	+13.2	+4.2	+10.0	34.3	46.0	-11.7	Verti 115
17	216.952M	37.4	-26.3	+9.6	+3.4	+10.0	34.1	46.0	-11.9	Horiz 164
18	244.080M	34.8	-26.0	+11.6	+3.6	+10.0	34.0	46.0	-12.0	Verti 149
19	284.760M	32.9	-26.1	+12.6	+3.9	+10.0	33.3	46.0	-12.7	Horiz 105
20	257.640M	32.9	-26.0	+12.1	+3.7	+10.0	32.7	46.0	-13.3	Horiz 164
21	284.760M	31.0	-26.1	+12.6	+3.9	+10.0	31.4	46.0	-14.6	Verti 149
22	474.590M	26.5	-27.3	+16.9	+5.3	+10.0	31.4	46.0	-14.6	Verti 115
23	338.990M	29.4	-26.4	+13.9	+4.4	+10.0	31.3	46.0	-14.7	Verti 115
24	298.320M	29.8	-26.2	+12.8	+4.1	+10.0	30.5	46.0	-15.5	Verti 105
25	203.392M	31.7	-26.5	+8.6	+3.3	+10.0	27.1	43.5	-16.4	Horiz 164

Test Location: CKC Laboratories •4933 Sierra Pines Dr. • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Indala**  
 Specification: **FCC 15.225(a)**  
 Work Order #: **83017** Date: 04/26/2005  
 Test Type: **Maximized Emissions** Time: 09:33:49  
 Equipment: **Mifare Reader** Sequence#: 15  
 Manufacturer: Indala Tested By: Randal Clark  
 Model: MX200-ttscf  
 S/N: IND44

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Mifare Reader*	Indala	MX200-ttscf	IND44

**Support Devices:**

Function	Manufacturer	Model #	S/N
DC Power Supply	Topward	TPS-2000	920035

**Test Conditions / Notes:**

EUT is a MiFaire mullion reader operating on a carrier frequency of 13.56MHz. EUT is transmitting continuously with a tag in the field. Power supply chassis bonded to ground plane. Drain wire connected to DC common. Test distance correction factor used in accordance with 15.31, 40dB per decade to correct 10m test data for comparison with the 30m spec limit. Frequency range investigated: Carrier. Temperature: 17°C, Relative Humidity: 52%.

**Transducer Legend:**

T1=Mag Loop - Site B - AN 00226 - 9kHz-30M	T2=Cable - 10 Meter
T3=15.31 10m 40dB/Dec Correction	

**Measurement Data:** Reading listed by margin. Test Distance: 10 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	Dist dB	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	13.560M	44.8	+8.4	+0.8	-20.0	+0.0	34.0	84.0	-50.0	Verti 100
2	13.560M	40.8	+8.4	+0.8	-20.0	+0.0	30.0	84.0	-54.0	Horiz 100