TEST REPORT OF A MIFARE TERMINAL (CARD READER 13.56 MHZ), BRAND IOLAN, MODEL LA-TCT-PRXKY-Mx, WITH MOUNTING BLOCK, BRAND IOLAN, MODEL LA-RST-RSOMZ-F, IN CONFORMITY WITH CFR 47 PART 15 (2001-5-24)

Industry Canada : 31040/SIT
VCCI registered : IC3501

TNO Physics and Electronics Laboratory
P.O. Box 15
9822 ZG Niekerk (NL)
Smidshornerweg 18
9822 TL Niekerk (NL)

Telephone: +31 594 505005
Telefax: +31 594 504804

E-mail: eps@certi.tno.nl

MEASUREMENT/TECHNICAL REPORT

IOLAN B.V.

Model : LA-TCT-PRXKY-Mx and LA-RST-RSOMZ-F

FCC ID: PYSLATCTPRXKYMX

December 21, 2001

This report concerns:	Original grant/certification ~~Class 2 change~~ ~~Verification~~
Equipment type:	Inductive proximity card reader operating on 13.56 MHz
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	~~Yes~~ ~~No~~ n.a.

Report prepared by:		
	Name	: P.A.J.M. Robben, B.Sc.E.E.
	Company name	: TNO Certification EPS
	Address	: Smidshornerweg 18
	Postal code/city	: 9822 ZG Niekerk
	Mailing address	: P.O. Box 15
	Postal code/city	: 9822 TL Niekerk
	Country	: The Netherlands
	Telephone number	: + 31 594 505 005
	Telefax number	: + 31 594 504 804
	E-mail	: eps@certi.tno.nl

The data taken for this test and report herein was done in accordance with CFR 47 Part 15 and the measurement procedures of ANSI C63.4-1992. TNO Certification EPS at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: December 21, 2001 Signature:

P. de Beer
TNO Certification EPS

Description of test item

Test item	:	Mifare terminal (card reader 13.56 MHz), including mounting block
Manufacturer	:	IOLAN B.V.
Brand	:	IOLAN
Type	:	LA-TCT-PRXKY-Mx (card reader) / LA-RST-RSOMZ-F (mounting block)
Serial number	:	R114002 (card reader) / R124001 (mounting block)
Revision	:	n.a.
Receipt number	:	1
Receipt date	:	November 29, 2001

Applicant information

Applicant's representative	:	Mr. K. Tax
Company	:	IOLAN B.V.
Address	:	Mon Plaisir 26
Postal code	:	4879 AN
City	:	Etten-Leur
PO-box	:	3124
Postal code	:	4700 GC
City	:	Roosendaal
Country	:	The Netherlands
Telephone number	:	+31 76 503 8236
Telefax number	:	+31 76 503 8719
Order number	:	n.a.

Test(s) performed

Location	:	Niekerk
Test(s) started	:	November 29, 2001
Test(s) completed	:	December 5, 2001
Purpose of test(s)	:	Type approval / certification
Test specification(s)	:	CFR 47 Part 15.225 (2001-5-24)

Test engineer	:	O.H. Hoekstra
Project leader	:	P. de Beer
Report written by	:	P.A.J.M. Robben, B.Sc.E.E.
Report approved by	:	P. de Beer
Report date	:	December 21, 2001

Table of contents

1 General information

1.1 Product description

1.1.1 Introduction.

The inductive proximity card reader, brand IOLAN, type LA-TCT-PRXKY-Mx, is designed to function as a security measure in order to prevent unauthorized access to buildings (or parts of buildings). A person who wants to enter a secure building, or a secure area in the building, must have a key card in which a valid access code is stored. When the key card is in close proximity of the card reader the code will be transmitted and validated by a computer system, which is connected to the reader itself. Access will be granted to the secure area if it is determined that a valid code has been transmitted. The inductive proximity card reader, brand IOLAN, type LA-TCT-PRXKY-Mx, utilizes smartcard technology of Philips, named Mifare ©.

1.1.2 Choice of operating frequency.

The operating frequency of the inductive proximity card reader, brand IOLAN, type LA-TCT-PRXKY-MX, is 13.56 MHz (continuous carrier).

1.1.3 Operating principles.

The inductive proximity card reader is a DC powered system with an integral antenna. The inductive proximity card reader generates a RF-field at a frequency of 13.56 MHz (continuous carrier), which activates the electronics in the key card. The activated key card then sends an identification code to the inductive proximity card reader by modulating the RF-field. The modulation of the 13.56 MHz RF-field will be detected and demodulated by the inductive proximity card reader. The code is then transmitted through a wired connection to a computer system for validation.

1.2 Related submittal(s) and/or Grant(s)

Not applicable.

1.3 Tested system details

Details and an overview of the system and all of its components, as it has been tested, may be found in table 1 below. FCC ID's are stated in this overview where applicable. The EUT is listed in the first row of table 1.

Description	Manufacturer	Type number	Serial number	FCC ID	Cable descriptions
Mifare terminal	IOLAN B.V.	LA-TCT-PRXKY-MX	R114002	PYSLATCTPRXKYMX	Connector to mounting block
Mounting block	IOLAN B.V.	LA-RST-RSOMZ-F	R124001	n.a.	RS232; RS485; I/O +12VDC power supply input

Table 1 - Tested system details overview.

1.4 Test methodology

The test methodology used is based on the requirements of CFR 47 Part 15, issue of May 24, 2001, sections 15.207, 15.209 and 15.225.

The test methods, which have been used, are based on ANSI C63.4: 1992.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters. Below 30 MHz the radiated emission tests were carried out at measurement distances of 3 and 10 meters. The test results regarding the radiated emission tests on frequencies below 30 MHz have been extrapolated in order to determine the field strength of the measured values at measurement distances of 30 and 300 meters (as required by CFR 47 Part 15).

The bandwidth of the receiver is switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.5 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Certification EPS, located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of CFR 47 Part 15, section 2.948, per October 23, 2000, with reference 31040/SIT.

The description of the test facilities has been filed at the Office of the Federal Communications Commission. The facility has been added to the list of those laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at http://www.fcc.gov.

1.6 Product labeling

In accordance with CFR 47 Part 15.19 (a)(3) the following text shall be placed on a label which is attached to the EUT:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The FCC ID of the EUT must be placed on a label, which is attached to the EUT.

For further details about the labeling requirements (size, legibility, etc.) as set by the Federal Communications Commission see CFR 47 Part 15.19 (a)(3), CFR 47 Part 15.19 (b)(2), CFR 47 Part 15.19 (b)(4), CFR 47 Part 2.925 and CFR 47 Part 2.926.

The FCC ID label will be placed on the backside of the Mifare terminal.

2 System test configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). During all tests the EUT was set up to function in accordance with the manufacturer's instructions.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 1992.

Tests were performed at the operating frequency of 13.56 MHz.

The EUT was tested while mounted in the mounting block. The EUT was transmitting data on the RS232 cable during all tests. The supply voltage was varied between 85% and 115% of the nominal +12 VDC supply voltage in order to obtain worst-case measurement values.

2.2 EUT mode of operation

The EUT was decoding smart cards and transmitting codes, obtained from this decoding operation. The EUT was set into loop back mode, thus enabling the continuous transmission of data on the RS232 cable.

2.3 Special accessories

No special accessories are used and/or needed to achieve compliance with the appropriate sections of CFR 47 Part 15.

2.4 Equipment modifications

Inductor L3 was changed from 2.2 μH to 47 μH in order to achieve compliance with section 15.207 of CFR 47 Part 15.

2.5 Configuration of the tested system

Unit title	:	Mifare terminal and mounting block
Model number	:	LA-TCT-PRXKY-Mx and LA-RST-RSOMZ-F
Part number	:	n.a.
FCC ID	:	PYSLATCTPRXKYMX
Frequency range	:	13.56 MHz (continuous carrier)
Description/details	:	see section 1.1 of this test report
Power supply	:	+10.2 to +13.8 Volts DC
Clock Oscillator(s)	:	11.0592 MHz, 32768 kHz
Cabinet & Screening	:	Plastic
Interface Cable(s)	:	Shielded data/DC power cable
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	see section 1.3 of this test report

2.6 Block diagram of the EUT

The block diagram is available in the technical documentation package as an addendum to this test report.

2.7 Schematics of the EUT

The schematics are available in the technical documentation package as an addendum to this test report.

2.8 Part list of the EUT

The part list is available in the technical documentation package as an addendum to this test report.

3 Radiated emission data

3.1 Radiated field strength measurements (frequency range of 30-1000 MHz, E-field)

Frequency (MHz)	Measurement results dB(µV)/m @ 3 meters Quasi-peak		Limits dB(µV)/m @ 3 meters Quasi-peak
	Vertical	Horizontal	
40.68	24.5	23.5	40.0
54.24	23.0	16.3	43.5
122.0	30.8	28.9	43.5
135.6	31.2	33.6	43.5
149.2	25.0	30.1	43.5
162.7	31.9	34.4	43.5
176.2	24.2	29.2	43.5
189.9	24.4	29.5	43.5
217.0	25.9	30.8	46.0
244.1	32.4	35.5	46.0
339.0	35.8	31.8	46.0
406.8	39.1	33.4	46.0
447.5	38.1	33.6	46.0
461.1	33.1	28.7	46.0
583.1	34.8	28.2	46.0

Table 2

The results of the radiated emission tests, carried out in accordance with CFR 47 Part 15, sections 15.209 and 15.225 (b), with the EUT operating in continuous transmit mode on 13.56 MHz, are depicted in table 2.

Note: - Field strength values of radiated emissions at frequencies not listed in table 2 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : O.H. Hoekstra

Date : December 21, 2001

3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field)

Frequency (MHz)	Measurement results dBµV Quasi-peak	Antenna factor	Cable loss	Measurement results dB(µV)/m Quasi-peak (calculated @ 30/300 m)	Limits Part 15.209 dB(µV)/m (calculated)
	10 meters	dB	dB		
0.009 - 0.490	<10.0	19	1	<10.0	48.5 - 13.8 (300 m)
0.490 - 1.705	<10.0	19	1	<10.0	33.8 - 22.9 (30 m)
1.705 - 13.553	<10.0	19	1	<10.0	29.5 (30 m)
13.563	21.7	19	1	21.7	80.0 (30 m)
13.567 - 30.00	<10.0	19	1	<10.0	29.5 (30 m)

Table 3

The results of the radiated emission tests, carried out in accordance with CFR 47 Part 15, sections 15.209, 15.225 (a) and 15.225 (b), with the EUT operating in continuous transmit mode on 13.56 MHz, are depicted in table 3.

Notes: - Frequency range: 9-90 kHz Average detector used during measurements
110-490 kHz Average detector used during measurements

- The radiated field strengths were measured at a distance of 10 meters.
Measured field strengths at a distance of 10 meters were already below the limit of 30/300 meters

- Radiated emission tests have been performed with the supply voltage varied between 85% and 115% of the nominal value to obtain maximum radiation. However, due to the internal voltage regulator, no changes due to voltage variations are observed.

- An extrapolation factor of the square of an inverse linear distance (40 dB/decade) as required by CFR 47 Part 15.31 (f) (2) has been applied. This is also in conformance with the extrapolation factor found from measurements at 3 and 10 meters.

- Field strength values of radiated emissions at frequencies not listed in table 2 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : O.H. Hoekstra

Date : December 21, 2001

4 Conducted emission data

Frequency (MHz)	Measurement results dB(µV) Plus	Measurement results dB(µV) Minus	Limits dB(µV)	Margin (dB) Neutral	Margin (dB) Line 1	Result
	QP	QP	QP	QP	QP	
0.50	38.7	37.7	48.0	-9.3	-10.3	PASS
1.00	24.1	23.0	48.0	-23.9	-25.0	PASS
3.47	24.0	25.9	48.0	-24.0	-22.1	PASS
9.11	24.2	23.0	48.0	-23.8	-25.0	PASS
12.93	24.3	23.8	48.0	-23.7	-24.2	PASS
14.41	28.4	29.0	48.0	-19.6	-19.0	PASS
22.12	29.7	30.5	48.0	-18.3	-17.5	PASS
27.12	28.7	30.7	48.0	-19.3	-17.3	PASS

Table 4

The results of the conducted emission tests, carried out in accordance with CFR 47 Part 15, section 15.207, at the +12 Volts DC connection terminals of the EUT and with the EUT operating in continuous transmit mode on 13.56 MHz, are depicted in table 4.

Notes:

- During the measurement it was taken into account that the main operating frequency of 13.56 MHz of the EUT could be present on the +12 Volts DC connection terminals. The possible occurrence of this frequency of 13.56 MHz and its harmonics, throughout the range of 13.56 MHz to 30 MHz, was checked during the measurement.
- Disturbance voltage values of conducted emissions at frequencies not listed in table 4 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : O.H. Hoekstra

Date : December 21, 2001

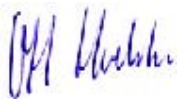
5 Frequency tolerance of the carrier signal

Normal operating mode		Frequency tolerance at which -80 dBm/Hz occurs	
Test conditions		Measured (kHz)	Deviation from normal (%)
T_{nom} = +21 °C	V_{nom} = +12.0 VDC	13561.364	0
T_{nom} = +21 °C	V_{min} = +10.2 VDC	13561.364	0
	V_{max} = +13.8 VDC	13561.364	0
T_{min} = -20 °C	V_{min} = +10.2 VDC	13561.505	+0.0010
	V_{max} = +13.8 VDC	13561.505	+0.0010
T_{max} = +50 °C	V_{min} = +10.2 VDC	13561.201	-0.0012
	V_{max} = +13.8 VDC	13561.200	-0.0012
Maximum tolerance		13561.201	-0.0012
Measurement uncertainty		**± 2.7 Hz @ fo = 13.5 MHz**	

Table 5

The results of the measurements regarding the frequency tolerance of the carrier signal, carried out in accordance with CFR 47 Part 15, section 15.225 (c), with the EUT operating in continuous transmit mode on 13.56 MHz, are depicted in table 5.

Test engineer

Signature : 

Name : O.H. Hoekstra

Date : December 21, 2001

6 List of utilized test equipment

Inventory number	Description	Brand	Type
12471	Biconical antenna 20MHz-200MHz	EATON	94455-1
12473	Log-per antenna 200-1000MHz	EATON	96005
12476	Antenna mast	EMCO	TR3
12477	Antenna mast 1-4 mtr	Poelstra	--
12482	Loop antenna	EMCO	6507
12483	Guidehorn	EMCO	3115
12484	Guidehorn	EMCO	3115
12488	Guidehorn 18 - 26.5 GHz	EMCO	RA42-K-F-4B-C
12533	Signalgenerator	MARCONI	2032
12559	Digital storage oscilloscope	Le Croy	9310M
12561	DC Power Supply 20A/70V	DELTA	SM7020D
12567	Plotter	HP	7440A
12605	calibrated dipole 28MHz-1GHz	Emco	3121c
12608	HF milliwattmeter	Hewlett Packard	HP435a
12609	Power sensor 10MHz-18GHz	Hewlett Packard	HP8481A
12636	Polyester chamber	Polyforce	--
12640	Temperature chamber	Heraeus	VEM03/500
13664	Spectrum analyzer	HP	HP8593E
13078	Preamplifier 0.1 GHz - 12 GHz	Miteq	AMF-3D-001120-35-14p
13452	Digital multi meter	HP	34401A
13526	Signalgenerator 20 GHz	Hewlett & Packard	83620A
13594	Preamplifier 10 GHz - 25 GHz	Miteq	AMF-6D-100250-10p
13886	Open Area testsite	Comtest	--
14051	Anechoic room	Comtest	--
14450	2.4 GHz bandrejectfilter	BSC	XN-1783
15633	Biconilog Testantenna	Chase	CBL 6111B
15667	Measuring receiver	R&S	ESCS 30
99045	DC Power Supply 3A/30V	DELTA	E030/3
99055	Non-conducting support	NMi	--
99061	Non-conducting support 150cm	NMi	--
99068	Detector N-F/BNC-F	Radiall	R451576000
99069	Cable 5m RG214	NMi	--
99071	Cable 10m RG214	NMi	--
99076	Bandpassfilter 4 - 10 GHz	Reactel	7AS-7G-6G-511
99077	Regulating trafo	RFT	LTS006
99112	Tripod	Chase	--
99136	Bandpassfilter 10 - 26.5 GHz	Reactel	9HS-10G/26.5G-S11