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TEST REPORT

REPORT CERTIFICATE issued by a FCC listed Test Laboratory

CUSTOMER AND MANUFACTURER: Precise Biometrics AB
Scheelevägen 19 C
SE-223 70 Lund
Sweden

Project no: 05263

EQUIPMENT UNDER TEST (EUT): Combined Fingerprint and Mi Fare contactless card Reader, Type Bio Access 200, s/n EMC Unit 1, V2.

TEST SPEC: 47 Cfr Ch. 1 (10-1-04 Edition):
Transmitter, Part 15, Subpart C:
§15.225, Operation within the band 13.110 – 14.010 MHz
Digital Device, Part 15, Subpart B, Class B.
§15.107: Conducted Emission, AC power line
§15.109: Radiated Emission

DATE OF TEST: August 18, 2005

TEST SITE: Svenska EMC Lab AB, Karlskrona, Sweden.
FCC registration number: 90967.

CONFORMITY: The EUT (Equipment Under Test), did pass the above mentioned tests. The test result shows full compliance with the above technical specifications provided modification steps outlined in this report are taken.

Approved, Karlskrona August 31, 2005

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Hans Östergren
Manager Svenska EMC Lab AB

Svenska EMC Lab
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Phone: +46 45580290, Fax: +46 45510288
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DATE OF RECEIPT:

August 17, 2005

CONDITION OF EUT:

No remarks. Operates as intended.

TEST PERSONNEL:

Svenska EMC Lab AB: Hans Östergren.

ASSISTANT PERSONNEL:

Precise Biometrics AB: Per Ola Olsson, Niklas Brogden, Jan-Peter Nilsson.

DESCRIPTION OF THE EUT:

The EUT is a combined fingerprint and Mi Fare contactless card reader that offers security for access control. It compared fingerprint with a template stored in a Mi Fare card to provide personal proof that people entering premises are who they claim to be.
The EUT has interface to one of the following ports: Data/Clock (Magstripe) and Wiegand, RS485, RS232 and Ethernet. The Mifare fundamental frequency is 13.56 MHz.
EUT size: 125 x 68 x 61 mm / 4.9 x 2.7 x 2.4 inches (H x W x D)

ESTIMATED UNCERTAINTY:

Expanded uncertainty (k = 2):

Conducted Emission, 0.15 – 30 MHz:	± 1.1 dB
Field Strength, emission 0.009 – 30 MHz:	± 2.8 dB
Field Strength, emission 30 – 300 MHz:	± 2.2 dB
Field Strength, emission 300 – 700 MHz:	± 2.3 dB
Field Strength, emission 700 – 1300 MHz:	± 2.4 dB
Field Strength, emission 1 to 10 GHz:	± 3.0 dB
Frequency, 0.009 – 30 MHz:	± 1 Hz
Frequency, 30 – 1000 MHz:	± 10 Hz
Frequency, 1 – 10 GHz:	± 100 Hz
Temperature:	± 0.2 °C
Voltage, DC:	± 0.01 %

The uncertainties are for a confidence level of not less than 95 %.

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TEST EQUIPMENT LIST:

Type/Manufacturer/Bandwidth	s/n	Calibration information	
		Date	**Interval**
EMI Test System, Monitor EZM, Rohde & Schwarz EP-6, 20 Hz - 1300 MHz	860157/014	2004-07	12 months
Test Receiver, Rohde & Schwarz ESH-3, 9 kHz - 30 MHz	894979/013	2004-07	12 months
Test Receiver, Rohde & Schwarz ESVP, 20 - 1300 MHz	893497/006	2004-07	12 months
Pulse Limiter, Rohde & Schwarz ESH3-Z2 DC - 30 MHz	357881052	2004-07	12 months
Plotter, Rohde & Schwarz DOP 2	893117/0108	NA	NA
LISN 50 OHM/50 µH, Electro Metrics EM-7820 10 kHz - 30 MHz, 16 A	2771	2004-07	12 months
LISN 50 OHM/50 µH, MEB NNB-4/200 0.15 - 30 MHz, 200 A	C96001/3	2004-07	12 months
Cable to Test Receiver, RG 223	006	2004-08	12 months
Cable to LISN, RG 223	015	2004-08	12 months
Loop Antenna, EMCO 6502, 9 kHz - 30 MHz	1057	2004-05	24 months
Biconical Antenna, Schwarzbeck BBA9106 30 - 300 MHz	93-92196.1	2004-07	24 months
Log-periodic Antenna, Schwarzbeck UHALP9107, 300 - 1000 MHz	91071205	2004-07	24 months
Double Ridged Guide Antenna, EMCO 3115, 1 - 18 GHz	2338	2003-09	36 months
Spectrum Analyzer Tektronix 2755AP, 10 kHz - 21 GHz	B010111	2005-07	12 months
Preamplifier, Mini-Circuits ZHL-42, 0.7 – 4.2 GHz	860701	2005-02	12 months
Antenna Cable, H-100	024	2004-08	12 months
Coaxial Cable, Sucoflex 104, l = 0.5 m	180067/4	2004-08	12 months
Coaxial Cable, Sucoflex 104, l = 5 m	171288/4	2004-08	12 months
Antenna Mast System, Jyske EMC, h = 1 - 4 m	02	NA	NA
Turn Table, Jyske EMC, h = 1 m	01	NA	NA
Shielded Chamber, Jyske EMC, 11 x 6 x 4.5 m	3	0003	36 months
Anechoic Chamber, 8 x 4.5 x 3 m	1	2003-04	36 months
Open Area Test Site for 3 m antenna distance	1	2003-12	36 months
DC Power Supply, Mascot , 0 – 30 V, 1.5 A	719	NA	NA
Digital Multimeter, Fluke 77	63430754R	2004-02	24 months
Temperature chamber, Weis Technich GmBh, Type KWP 30/80-180 DU	211/10182	NA	NA

TEST SET-UP AND PROCEDURE:

See Appendix 1 to 3. As laid out in ANSI C.63.4:2001 Document.

STANDARDS:

The EUT is designed with both digital circuits and a radio transmitter.
Applicable parts in 47 Cfr Ch. 1 (10-1-04 Edition) are for the
Transmitter:
Part 15, Subpart C:
§15.225, Operation within the band 13.110 – 14.010 MHz
Digital Device:
Part 15, Subpart B, Class B.
§15.107: Conducted Emission, AC power line
§15.109: Radiated Emission

TEST CONDITIONS:

Rating: 12 – 30 VDC, 0.3 A. Tested with 16 V.
Power Supply: 115VAC/16VDC Power Supply, IBM p/n 02K6543: Output 16 VDC 4.5 A.
Fundamental frequency: 13.56 MHz.
Effective radiated power: < 1 mW.
Transmitting: Data length 1 second. Repetition time 6 seconds.
Operating Conditions: Activated fingerprint and contactless Mifare card (RF powered tag).
The transmitter was continuously operating at 1 sec. on and 5 sec. off during the emission tests.
Measured frequency range: 9 kHz – 2 000 MHz.
Antenna: Fixed PCB Antenna. No external Antenna contact.
Clock Frequency: 12.0 MHz, 25.0 MHz and 200.0 MHz.
Modifications: On the Mi Fare PCB the capacitor C12 was changed to 0.001 µF and the capacitors C10 and C11 were removed.
Peripherals:
- PC, IBM ThinkPad, Type 2645-8BG, s/n 5537CNN 02/99. FCC ID: Tested to comply with FCC regulations.
- AC/DC Adapter to PC, IBM IZORV 860 PF, Type OZK6543, s/n 2M04T7782PF. FCC ID: Tested to comply with FCC regulations.
- Door Relay Control (DRC) Precise Biometrics BA200 EMC Unit, Onrox 549454.
- HUB, SOHO Type Soho -5B+.
- AC/DC Adapter to HUB, Mod. DC-751AUP. Output 7.5 VDC 1 A.

TEST CONDITIONS (CONTINUED):

Cables:
- Unshielded mains cable of 1.8 m length with safety ground to the AC/DC Adapter (PC).
- Shielded DC cable of 1.8 m length without safety ground from AC/DC Adapter to PC.
- Unshielded mains cable of 1.8 m length with safety ground to the AC/DC Adapter (EUT).
- Unshielded DC cable of 2 m length without safety ground from AC/DC Adapter to DRC.
- Shielded signal cable of 10 m length from DRC to EUT
- Shielded Ethernet cable Cat.5 of 10 m length from EUT to HUB.
- Shielded Ethernet cable Cat.5 of 2 m length from HUB to PC.

See also Appendix 3.
Configuration: See Appendix 5.
Ambient Humidity: 56 % RH
Ambient temperature: 24 °C.
Mains voltage at test: 116 VAC.

TEST PERFORMANCE AND RESULTS:

TRANSMITTER

1. Field strength of emission, fundamental.
§ 15.225(a). The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 µV/m (24 dBµV/m) at 30 meters.
Measured at an antenna distance of 3 m on the Open Area Test Site. At 3 m distance was the ambient noise sufficient low. The emission was maximized by rotating the turn table, put the EUT in X-Y-Z directions, varying the antenna height 1-4 m and with 0° and 90° antenna directions. Measured with CISPR quasi-peak detector with 10 seconds measuring time. Measured with modulation and card
(RF powered tag). The limit is 24 dBµV/m at 30 m. § 15.31(f) the square of an inverse linear distance extrapolation factor (40 dB/decade) was used to calculate the limit at the antenna distance of 3 m. The limit at 3 m is then 64 dBµV/m.
The test receiver is compensated for the low repetition frequency the transmitter was using.
Test Instruments: Rohde & Schwarz Receiver ESH-3, 0.009 - 30 MHz, Loop Antenna EMCO 6502, 9 kHz - 30 MHz. Worst case was recorded.
Test result: Pass.
Measured level was 57 dBµV/m(QP). The margin to limit was – 7 dB.

§ 15.225(b). Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 µV/m (50.5 dBµV/m) at 30 meters. (=90.5 dBµV/m at 3 m)
Measured as in § 15.225(a) above at 3 m distance.
Test result: Pass.
Measured level was 44.4 dBµV/m(QP) worst case. The margin to limit was more than – 46 dB.

TEST PERFORMANCE AND RESULTS (CONTINUED):

§ 15.225(c). Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 µV/m (40.5 dBµV/m) at 30 meters. (=80.5 dBµV/m at 3 m.) Measured as in § 15.225(a) above at 3 m distance.
Test result: Pass.
Measured level was 41.4 dBµV/m(QP) worst case. The margin to limit was more than – 39 dB.

2. Field strength of emission, except the fundamental.
§ 15.225(d). The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Pre-test: A pre-test was performed in the Anechoic Chamber at 3 m antenna distance in the frequency range 9 kHz to 2000 MHz to find any radiating frequencies except the fundamental.

Final test: Measured in the frequency range 9 kHz – 2 000 MHz at an antenna distance of 3 m, on the Open Area Test Site. The emission was maximized by rotating the table, put the EUT in X-Y-Z directions, varying the antenna height 1-4 m and with vertical and horizontal antenna polarizations. All directions were carefully investigated. Measured with CISPR quasi-peak detector up to 1 GHz. Measured with peak detector in max hold and with average detector in max hold from 1 – 2 GHz.
In the range 9 kHz to 30 MHz was the same method as for the fundamental frequency applied.Test instruments: Rohde & Schwarz EP-6 System, 9 kHz - 1300 MHz, Spectrum Analyzer, Tektronix 2755AP, 9 kHz – 22 GHz, Preamplifier Mini-Circuits ZHL-42, 0.7 – 4.2 GHz. Antennas: EMCO 6502, 9 kHz – 30 MHz, Schwarzbeck BBA9106, 30 - 300 MHz, Schwarzbeck UHALP9107, 300 - 1000 MHz, EMCO 3115, 1 - 18 GHz. Worst case was measured.
Test result: Pass.
See Appendix 6 and 7.

3. Frequency tolerance
§ 15.225(e). The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of: -20 °C to +50 °C at normal supply voltage and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C.
Test result: Pass.
See Appendix 8.

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TEST PERFORMANCE AND RESULTS (CONTINUED):

DIGITAL DEVICE

§ 15.107. Conducted emission on 115 VAC line.
The conducted emission was measured on the mains input terminals through a 50 ohm 50 micro-Henry LISN (Line Impedance Stabilisation Network) in the frequency range 0.15 to 30 MHz. The phase and the neutral line were measured with a quasi-peak detector and also with an average detector. See diagram in Appendix 4 and 5.
§ 15.109. Radiated emission.
Pretest: A pretest was performed in the Anechoic Chamber to determine the radiated frequencies. Tested with horizontal and vertical antenna polarisations at 3 m distance.
Final Test:
Measured in the frequency range 30 - 2000 MHz at an antenna distance of 3 m, on the open area test site. The emission was maximised by rotating the table, varying the antenna height and polarisation. Worst case was recorded. See diagram in Appendix 6 and in tabular form in Appendix 7.

SUMMARY OF RESULTS:

§ 15.225(a):
The fundamental radiated emission margin to limit was – 7.0 dB at 13.56 MHz (worst case).

§ 15.225(d) and 15.109:
Radiated emission margin to limit was – 2.5 dB(QP) at 40.684 MHz (worst case).

§ 15.107:
The conducted emission on the mains terminals:
The margin to limit was - 9.4 dB (QP) and – 12.7 dB(AV.) at 0.6102 MHz.

CONCLUSION:

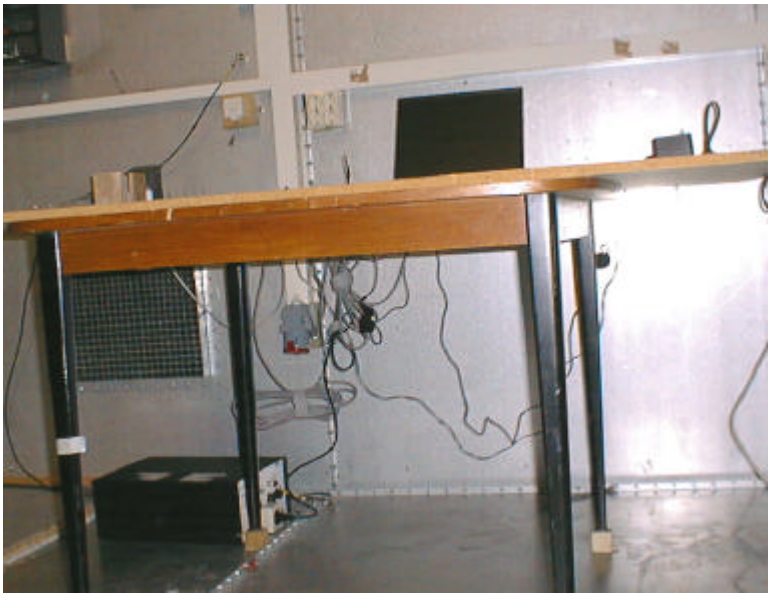
The Combined Fingerprint and Mi Fare contactless card Reader Type Bio Access 200, s/n EMC Unit 1, V2, did pass the above mentioned tests provided modification steps outlined in this report are taken.

Karlskrona August 31, 2005

Hans Östergren
Manager Svenska EMC Lab AB
Sr. EMC Test Engineer

Test set-up, Conducted Emission

Test set-up, Conducted Emission



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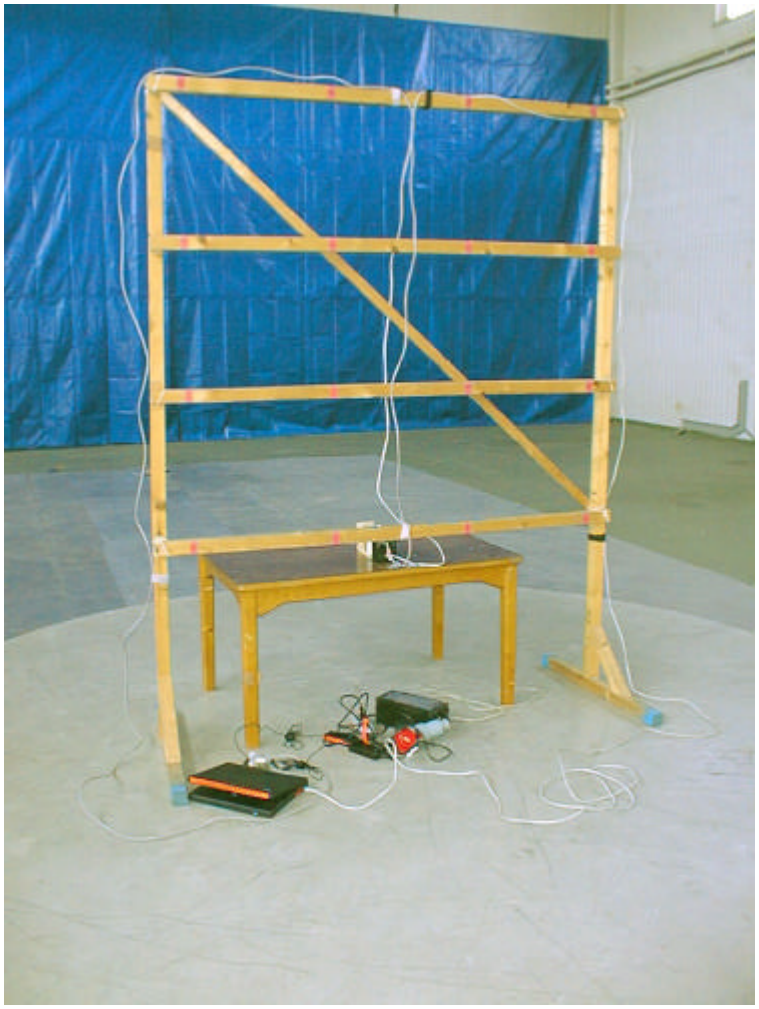
Test set-up, Radiated Emission



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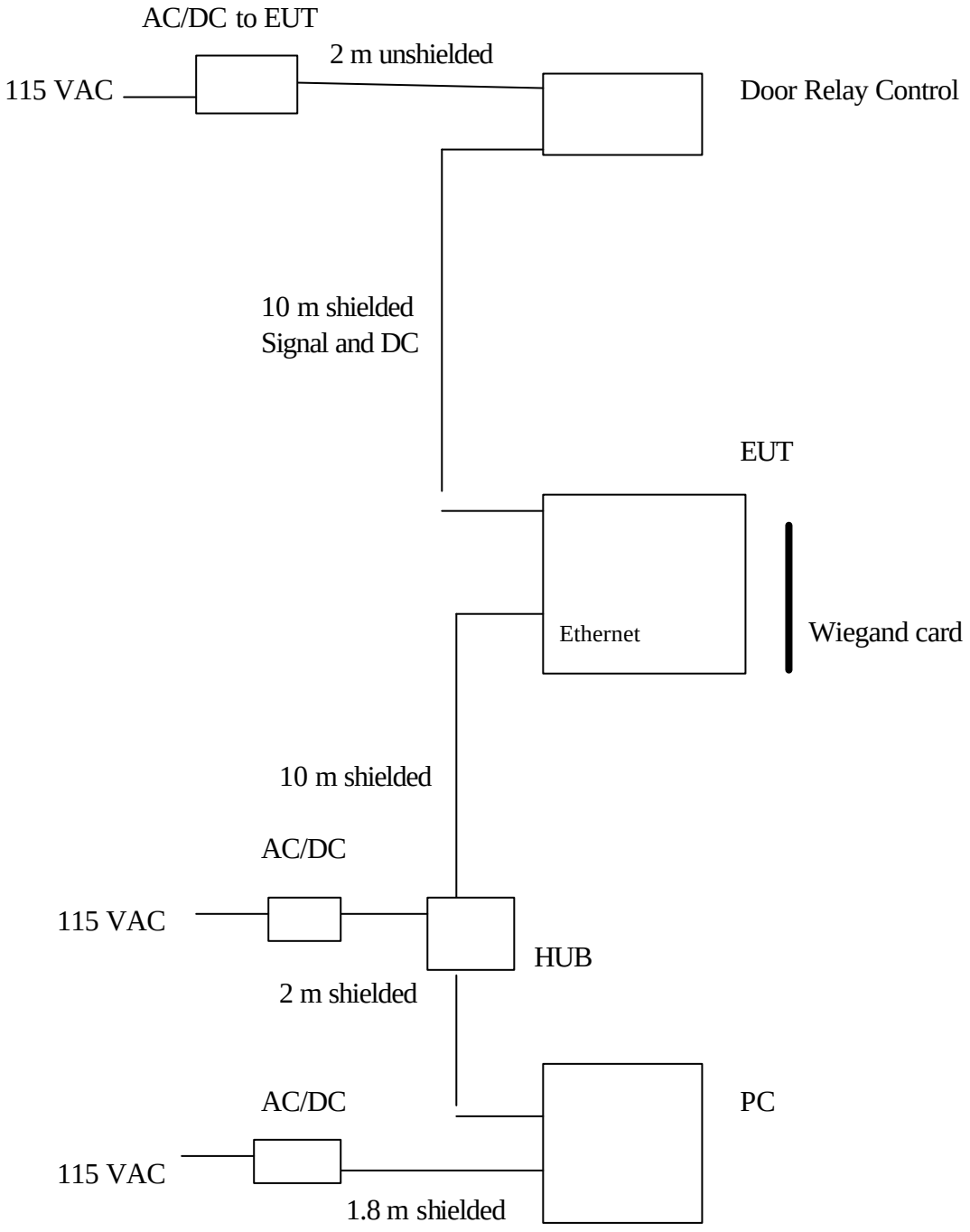
Test set-up



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Conducted Emission, L1

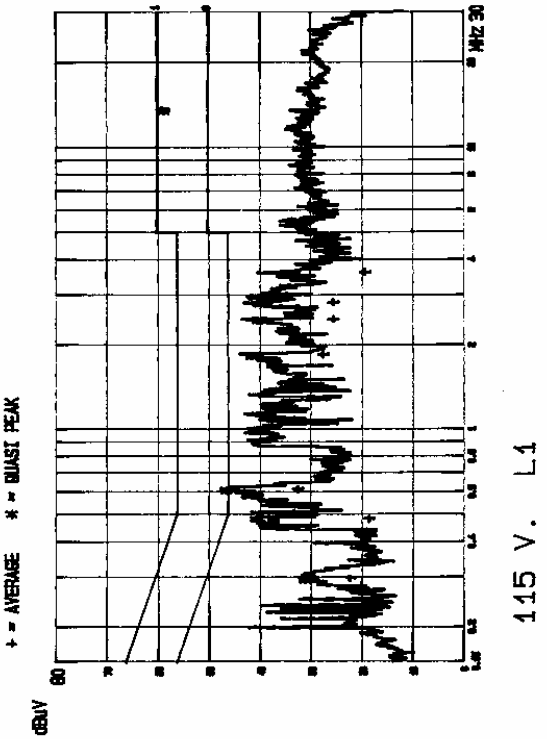
PRECISE BIOMETRICS AB
Conducted Emission Test

Start of Test: 18.AUG'05 . 17:10
E.U.T.: BIOACCESS 200 S/N EMC UNIT 1, V2
Oper. Condition: ACTIVE
Operator: HANS OSTERGREN
Test Spec: FCC Part 15, Subpart B Conducted RFI, Class B, 04 Ed

Start Fr. MHz | Stop Fr. MHz | IF-BW kHz | Display Mode | Att. dB | Transducer type
0.1500 | 30.0000 | 10.00 | Max Hold | 0 | EM7820L1

Frequency MHz	Average dBuV	AV-Margin dBuV	Quasi Peak dBuV	QP-Margin dBuV
0.2960	22.1	-28.3	31.1	-29.3
0.4810	18.3	-28.1	37.3	-19.1
0.6120	32.3	-13.7	46.5	-9.5
1.8334	27.2	-18.8	41.5	-14.5
2.4441	25.2	-20.8	40.3	-15.7
2.8000	25.0	-20.0	38.7	-17.3
3.5943	19.0	-27.0	33.1	-22.9
5.4480	33.2	-16.8	30.9	-29.1
13.5600	58.9 *	8.9	58.6	-1.4

* Limit exceeded



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Conducted Emission, L2

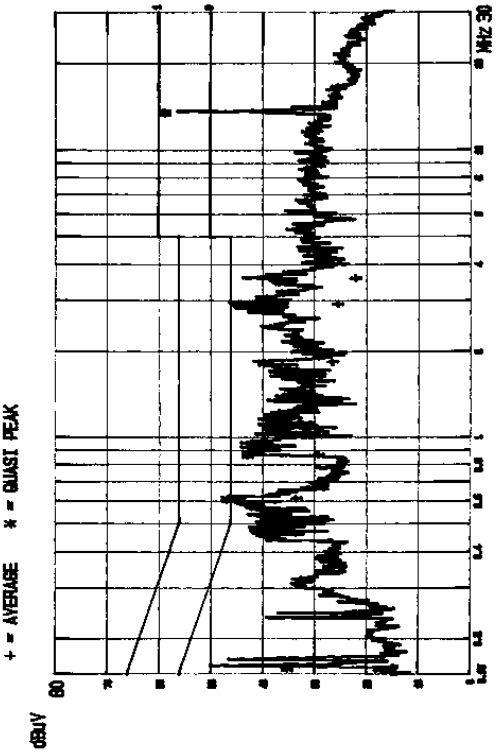
PRECISE BIOMETRICS AB
Conducted Emission Test

Start of Test: 18.AUG'05 . 17:50
E.u.T.: BIOACCESS 200 S/N EMC UNIT 1. V2
Oper. Condition: ACTIVE
Operator: HANS OSTERGREN
Test Spec: FCC Part 15, Subpart B Conducted RFI, Class B. 04 Ed

Start Fr. MHz | Stop Fr. MHz | IF-BW kHz | Display Mode | Att. dB | Transducer type
0.1500 | 30.0000 | 10.00 | Max Hold | 0 | EM7820L2

Frequency MHz	Average dBuV	AV-Margin dBuV	Quasi Peak dBuV	QP-Margin dBuV
0.1590	14.6	-41.0	36.0	-30.6
0.6102	33.3	-12.7	46.6	-13.4
0.8678	29.0	-17.0	42.6	-13.4
1.8239	26.3	-18.7	39.4	-16.6
2.9080	25.3	-20.7	39.1	-16.9
3.5670	21.8	-24.2	37.0	-19.0
13.5601	58.9 *	8.9	58.5	-1.4

* Limit exceeded



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Radiated Emission

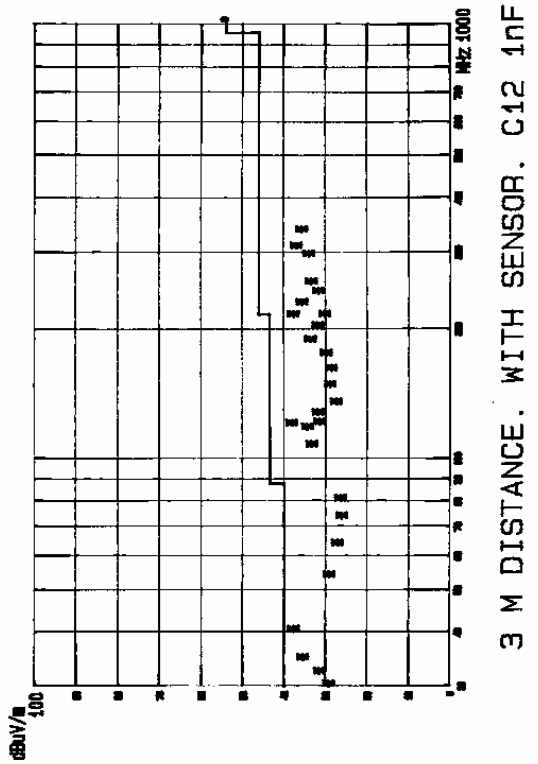
PRECISE BIOMETRICS AB
Radiated Emission test on OATS

Start of Test: 16.AUG'85 . 09:30
E.U.T.: BIOACCESS 200 S/N EMC UNIT 1, V2
Oper. Condition: ACTIVE
Operator: HANS OSTERGREN
Test Spec:
FCC Part 15, Subpart B, Class B, 3 m OATS

Start Fr. MHz	Stop Fr. MHz	IF-BW Detec kHz	Att. tor dB	Meas.T. s	Transd. type
30.0000	299.9999	120	Peak	LN	0.020	LOW9106
300.0000	1000.0000	120	Peak	LN	0.020	LOW9107

Frequency MHz	Measured Level dBuV/m	Margin dB	Q P	Pol h/v	Values Height m	Azimuth deg.
30.4730	29.1	-10.9		V	1.00	180
32.6599	31.3	-8.7		V	1.00	180
35.0700	36.4	-4.6		V	1.00	180
40.6840	37.5	-2.5		V	1.00	45
54.2450	29.2	-10.8		V	1.00	315
64.3330	27.1	-12.9		V	2.20	270
74.3210	25.2	-13.8		V	2.20	270
81.3630	26.4	-13.6		V	2.20	180
108.4810	33.3	-10.2		V	1.00	180
118.6980	34.4	-9.1		V	1.00	180
121.0940	38.2	-5.3		V	1.00	180
122.0420	31.4	-12.1		V	1.00	180
128.6850	31.9	-11.6		V	1.00	180
135.6000	27.4	-16.1		V	2.50	90
149.1600	28.9	-14.6		V	1.50	90
162.7200	28.9	-14.6		V	1.00	90
176.2800	29.9	-13.6		V	1.00	45
189.8400	33.5	-10.0		V	1.00	45
203.4000	31.9	-11.6		V	1.00	45
216.9600	37.7	-5.8		V	2.00	45
230.5200	30.0	-13.0		V	2.00	45
244.0800	35.6	-7.4		V	3.00	90
257.6400	31.6	-11.4		V	1.00	180
271.2000	33.4	-12.6		V	1.00	180
284.7600	33.8	-12.2		V	1.20	180
311.8800	36.8	-9.2		V	1.20	180
339.0000	35.7	-10.3		V	1.00	90

* Limit exceeded



3 M DISTANCE. WITH SENSOR. C12 1nF. WITHOUT C10 AND C11.

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Radiated Fieldstrength Test. Calculation of Final Emission Levels.

EUT: Combined Fingerprint and Mi Fare contactless card Reader,
Type Bio Access 200, s/n EMC Unit 1, V2.

TEST SPEC: 47 Cfr Ch. 1 (10-1-04 Edition):
Transmitter, Part 15, Subpart C:
§15.225, Operation within the band 13.110 – 14.010 MHz
Digital Device, Part 15, Subpart B, Class B.
§15.107: Conducted Emission, AC power line
§15.109: Radiated Emission

DATE OF TEST: August 18, 2005

OPERATION: Normal operating conditions. With normal modulation and Mifare card.

Tested frequency range: 9 kHz - 2 GHz. Measured maximum quasi-peak values.
Measuring time: 10 seconds.

Field strength (dBµV/m) = Amplitude (dBµV) + Antenna factor (dB/m) + cable loss (dB)

Freq.	Bw	Level	Cable loss	Antenna factor (E)	Field strength	Limit	Dist.	Margin to limit	Antenna height	Antenna polaris.
MHz	kHz	dBµV	dB	dB	dBµV/m	dBµV/m	m	dB	m	0°/90° or V/H
12.660	10	22.3	0.5	9.2	32	69.5	3	- 37.5	1.0	0°
13.110 – 13.410	10	28.3	0.5	9.2	38	80.5	3	- 42.5	1.0	0°
13.710 – 14.010	10	31.3	0.5	9.2	41	80.5	3	- 39.5	1.0	0°
13.410 – 13.553	10	34.3	0.5	9.2	44	90.5	3	- 46.5	1.0	0°
13.567 – 13.710	10	31.3	0.5	9.2	41	90.5	3	- 49.5	1.0	0°
13.553 – 13.567 (f_0)	10	47.3	0.5	9.2	57	64	3	- 7.0	1.0	0°
14.130	10	24.3	0.5	9.2	34	69.5	3	- 35.5	1.0	0°
27.1209	10	25.6	0.6	6.5	32.7	69.5	3	- 36.8	1.0	0°
30.473	120	9.2	1.3	18.6	29.1	40.0	3	- 10.9	1.0	V
32.6599	120	12.3	1.3	17.7	31.3	40.0	3	- 8.7	1.0	V
35.0700	120	17.2	1.4	16.8	35.4	40.0	3	- 4.6	1.0	V
40.6840	120	21.2	1.5	14.8	37.5	40.0	3	- 2.5	1.0	V
118.8980	120	18.7	2.8	12.9	34.4	43.5	3	- 9.1	1.0	V
121.0940	120	22.3	2.8	13.1	38.2	43.5	3	- 5.3	1.0	V
216.9600	120	17.0	4.0	16.7	37.7	46.0	3	- 8.3	2.0	H
311.8860	120	16.0	4.8	16.0	36.8	46.0	3	- 9.2	1.0	H

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FREQUENCY TOLERANCE

EUT: Combined Fingerprint and Mi Fare contactless card Reader, Type Bio Access 200, s/n EMC Unit 1, V2.

TEST SPEC: 47 Cfr Ch. 1 (10-1-04 Edition): Transmitter, Part 15, Subpart C: §15.225(e) Frequency tolerance

DATE OF TEST: August 19, 2005

OPERATION: **O**perating at 100% duty cycle without modulation

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 °C to +50 °C at normal supply voltage and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C.

Bw =10 Hz, VBw = 100 Hz, Span = 100 Hz

Frequency tolerance at normal supply voltage = 16.0 VDC

Temperature °C	Frequency MHz	Limit Hz	Pass/Fail
+ 50	13.560438	± 1356	Pass
+ 40	13.560408	-"-	Pass
+ 30	13.560428	-"-	Pass
+ 20	13.560332 (f_0)	-"-	Pass
+ 10	13.560250	-"-	Pass
± 0	13.560208	-"-	Pass
- 10	13.560174	-"-	Pass
- 20	13.560112	-"-	Pass
Deviation from fundamental:		Maximum + 106 Hz Minimum - 220 Hz (= - 0.0016 % of f_0)	

Frequency tolerance at ambient temperature = 20 °C

Supply voltage VDC	Frequency MHz	Limit Hz	Pass/Fail
1.15 x 16	13.560331	± 1356	Pass
1.10 x 16	13.560332	-"-	Pass
1.05 x 16	13.560331	-"-	Pass
1.00 x 16	13.560332 (f_0)	-"-	Pass
0.95 x 16	13.560332	-"-	Pass
0.90 x 16	13.560331	-"-	Pass
0.85 x 16	13.560331	-"-	Pass
Deviation from fundamental:		Maximum + 0.0 Hz Minimum - 1 Hz	