

TEST RESULT SUMMARY

FCC PART 15 SUBPART C Section 15.209

MANUFACTURER'S NAME	DataCard Corp
NAME OF EQUIPMENT	Gemplus Contactless SmartCard Coupler (Transmitter)
MODEL NUMBER	Micro 680
MANUFACTURER'S ADDRESS	11111 Bren Road W Minnetonka MN 55343
TEST REPORT NUMBER	W9189
TEST DATE	01 April 1999


According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

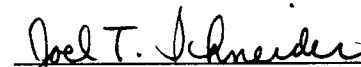
TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15.

Date: 16 April 1999

Location: Taylors Falls MN
USA



T. K. Swanson
Test Technician *TKS*



J. T. Schneider
NVLAP Signatory

EMC EMISSION - TEST REPORT

Test Report File No. : **WC1G918901** Date of issue: 16 April 1999

Model / Serial No. : **Micro 680 /**

Product Type : **Gemplus Contactless SmartCard Coupler (Transmitter)**

Applicant : **DataCard Corp**

Manufacturer : **DataCard Corp**

License holder : **DataCard Corp**

Address : **11111 Bren Road W**
 : **Minnetonka MN 55343**

Test Result : **Positive** **Negative**

Test Project Number Reference(s) : **W9189**

Total pages including Appendices : **24**

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- | | | |
|--|---|------------------------------------|
| <input type="checkbox"/> - EN 50081-1 / 1991 | <input type="checkbox"/> - Group 1 | <input type="checkbox"/> - Group 2 |
| <input type="checkbox"/> - EN 55011 / 1991 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55013 / 1990 | <input type="checkbox"/> - Household appliances and similar | |
| <input type="checkbox"/> - EN 55014 / 1987 | <input type="checkbox"/> - Portable tools | |
| | <input type="checkbox"/> - Semiconductor devices | |
| <input type="checkbox"/> - EN 55014 / A2:1990 | <input type="checkbox"/> - Household appliances and similar | |
| <input type="checkbox"/> - EN 55014 / 1993 | <input type="checkbox"/> - Portable tools | |
| | <input type="checkbox"/> - Semiconductor devices | |
| <input type="checkbox"/> - EN 55015 / 1987 | | |
| <input type="checkbox"/> - EN 55015 / A1:1990 | | |
| <input type="checkbox"/> - EN 55015 / 1993 | | |
| <input type="checkbox"/> - EN 55022 / 1987 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55022 / 1994 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - BS | | |
| <input type="checkbox"/> - VCCI | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input checked="" type="checkbox"/> - FCC Part 15 Subpart C Section 15.209 | | |
| <input type="checkbox"/> - AS 3548 (1992) | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 11 (1990) | <input type="checkbox"/> - Group 1 | <input type="checkbox"/> - Group 2 |
| | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 22 (1993) | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |

Environmental conditions in the lab:

	<u>Actual</u>
Temperature	: 21 °C
Relative Humidity	: 43 %
Atmospheric pressure	: 97.8 kPa
Power supply system	: 12 VDC

Sign Explanations:

- not applicable
- applicable

Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

- Test not applicable

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Oakwood Lab (Open Area Test Site)
- Wild River Lab Screen Room
- New Brighton Lab Shielded Room

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
--------------	--------------	-------------	---------------	----------

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Oakwood Lab (Open Area Test Site)

at a test distance of :

- 3 meters
- 30 meters

- Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
<input checked="" type="checkbox"/> - HFH2-Z2	Polarad	Loop Antenna	879285/036	9-98
<input checked="" type="checkbox"/> - ESH-3	Rohde-Schwarz	EMI Receiver	892473/004	5-98

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

- Test not applicable

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Oakwood Lab (Open Area Test Site)

at a test distance of :

- 3 meters
- 10 meters
- 30 meters

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
■ - 3146	Electro-Mechanics (EMCO)	Log Periodic Antenna	9406-3865	7-98
■ - 3108	Electro-Mechanics (EMCO)	Biconical Antenna	2119	7-98
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2430A00930	4-98
■ - 85662A	Hewlett-Packard	Analyzer Display	2403A08134	4-98
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2521A01006	4-98
■ - 8447D	Hewlett-Packard	Preamplifier	1937A02858	3-98

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: INTERFERENCE POWER

The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

- Test not applicable

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Oakwood Lab (Open Area Test Site)
- Wild River Lab Screen Room
- New Brighton Lab Shielded Room

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
--------------	--------------	-------------	---------------	----------

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 100 GHz were performed in a horizontal and vertical polarization at the following test location :

- Wild River Lab Large Test Site (Open Area Test Site)
- Wild River Lab Small Test Site (Open Area Test Site)
- Oakwood Lab (Open Area Test Site)
- Wild River Lab Screen Room

at a test distance of:

- 1 meters
- 3 meters
- 10 meters

- Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date
--------------	--------------	-------------	---------------	----------

Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- Standby
- Test program (H - Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal Operating Mode
- Transmitter on.

Configuration of the device under test:

- See Constructional Data Form in Appendix B - Page B2
- See Product Information Form in Appendix B - beginning on Page B3

The following peripheral devices and interface cables were connected during the measurement:

- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____

- unshielded power cable
- unshielded cables
- shielded cables
- customer specific cables

MPS.No.: _____

- _____
- _____

Emission Test Results:

Conducted emissions 10/150 kHz - 30 MHz

The requirements are - MET - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are - MET - NOT MET

Minimum limit margin for fundamental _____ 16 dB at _____ 13.56 MHz

Minimum limit margin for spurious _____ 35 dB at _____ 27.12 MHz

Remarks: The fundamental was measured to be 53 dBuV/m (446.7 uV/m) in quasi-peak mode, compared to a 3 meter limit of 69.5 dBuV/m (2985.4 uV/m) based on the square of an inverse linear distance extrapolation factor of 40 dB/decade. The second harmonic was measured to be 34 dBuV/m in quasi-peak mode (50.1 uV/m) compared to a limit of 69.5 dBuV/m (2985.4 uV/m).

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are - MET - NOT MET

Minimum limit margin _____ 9 dB at _____ 135.6 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: The tenth harmonic was measured to be 34.3 dBuV/m (51.9 uV/m) in quasi-peak mode, compared to a limit of 43.5 dBuV/m (150 uV/m).

Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are - MET - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent Radiated emissions 1 GHz - 4.2 GHz

The requirements are - MET - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

- met

- not met.

The device under test does

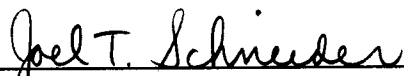
- fulfill the general approval requirements mentioned on page 3.

- not fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 01 April 1999

Testing End Date: 01 April 1999

- TÜV PRODUCT SERVICE INC -



J. T. Schneider
NVLAP Signatory

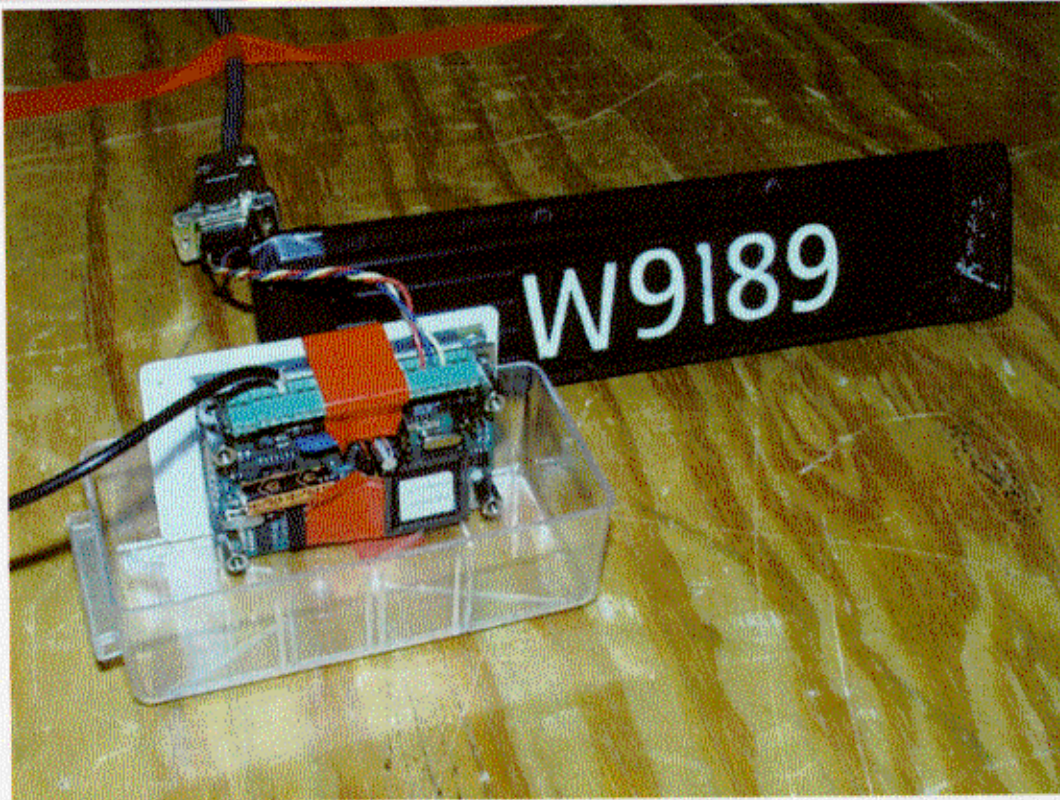


Tested By:
T. K. Swanson

Test-setup photo(s):
Conducted emission 10/150 kHz - 30 MHz

Not Applicable

Test-setup photo(s):
Radiated emission 9 kHz - 1 GHz



FCC ID: GDI-M680

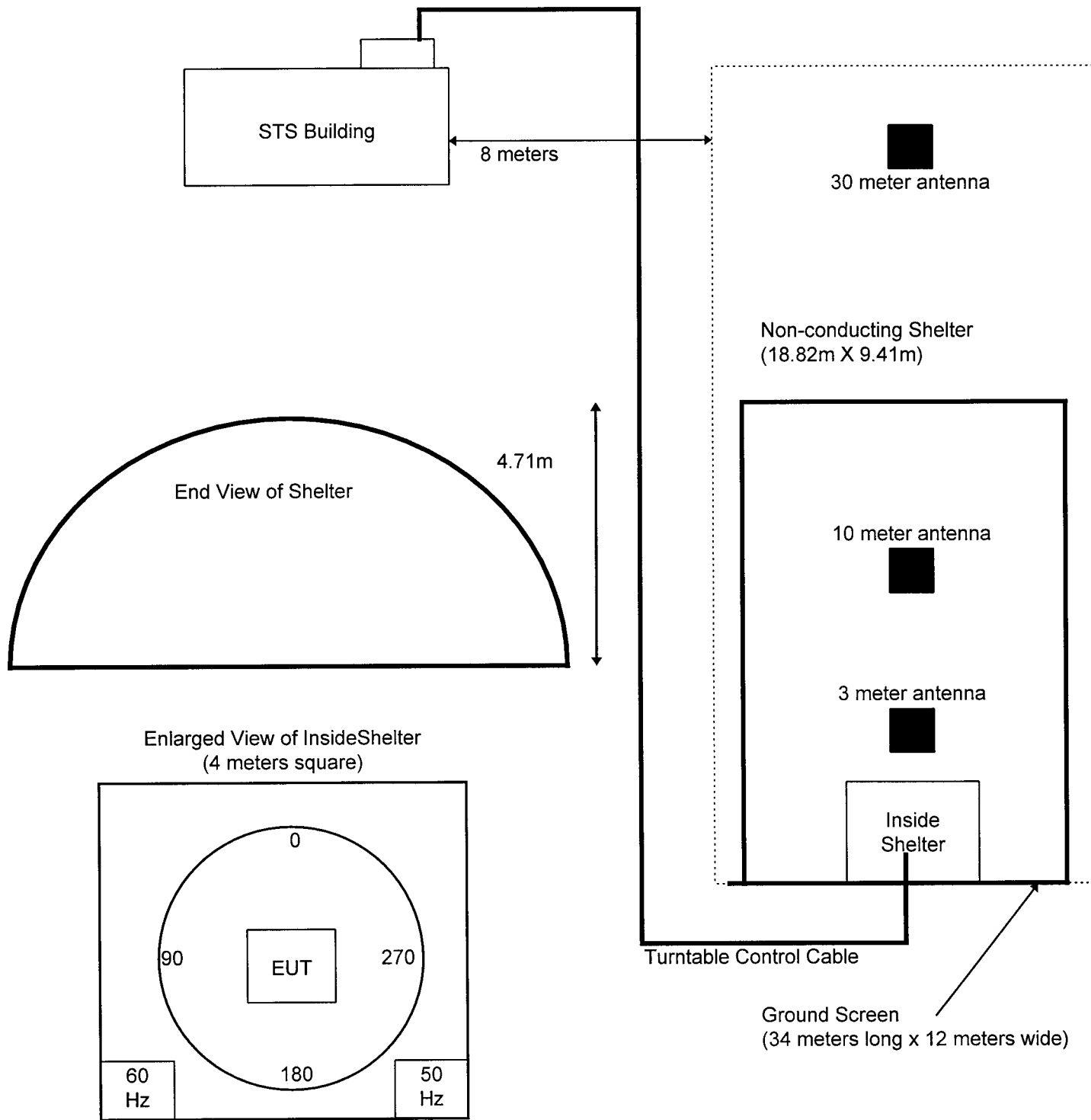


Appendix A

Test Data Sheets
and
Test Setup Drawing(s)

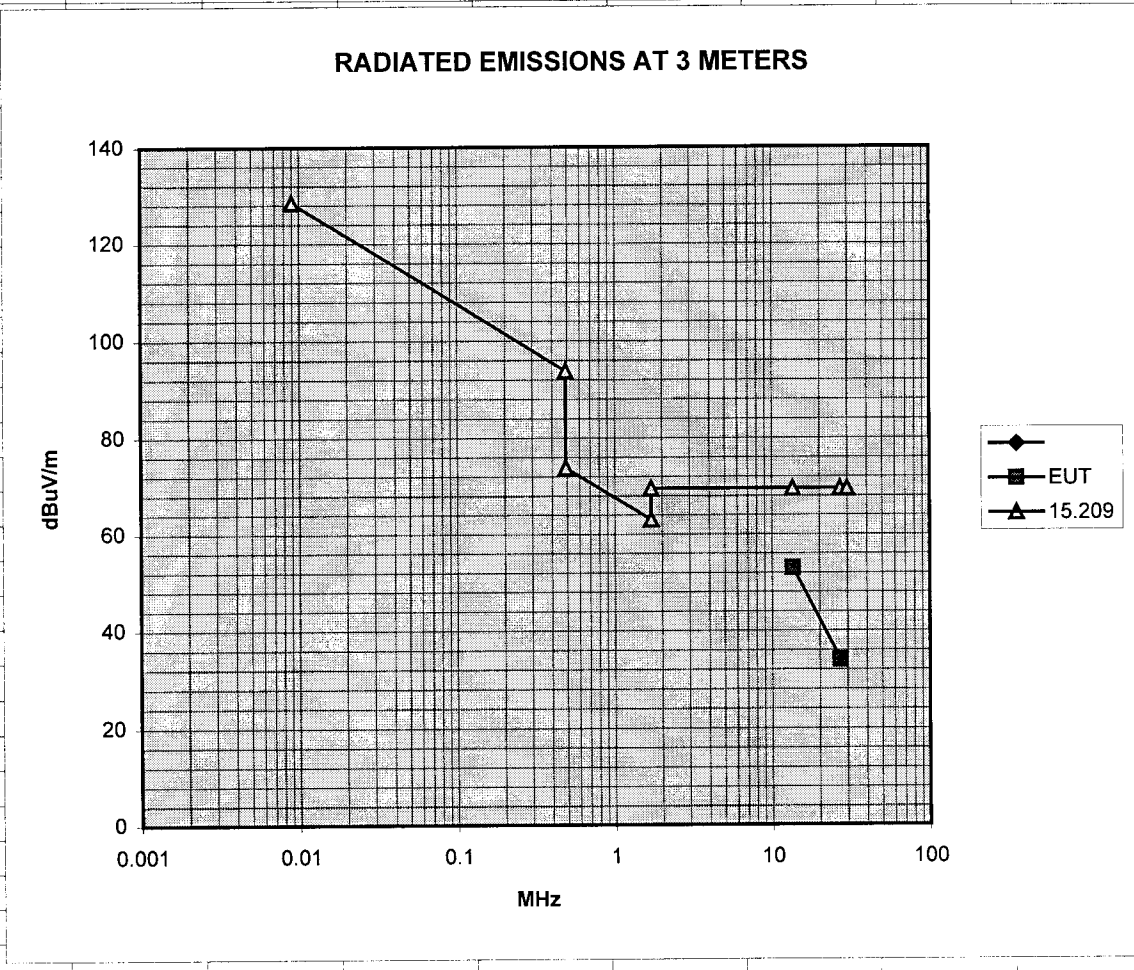
TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Small Test Site (STS)



Turntable is 1.2 meters in diameter

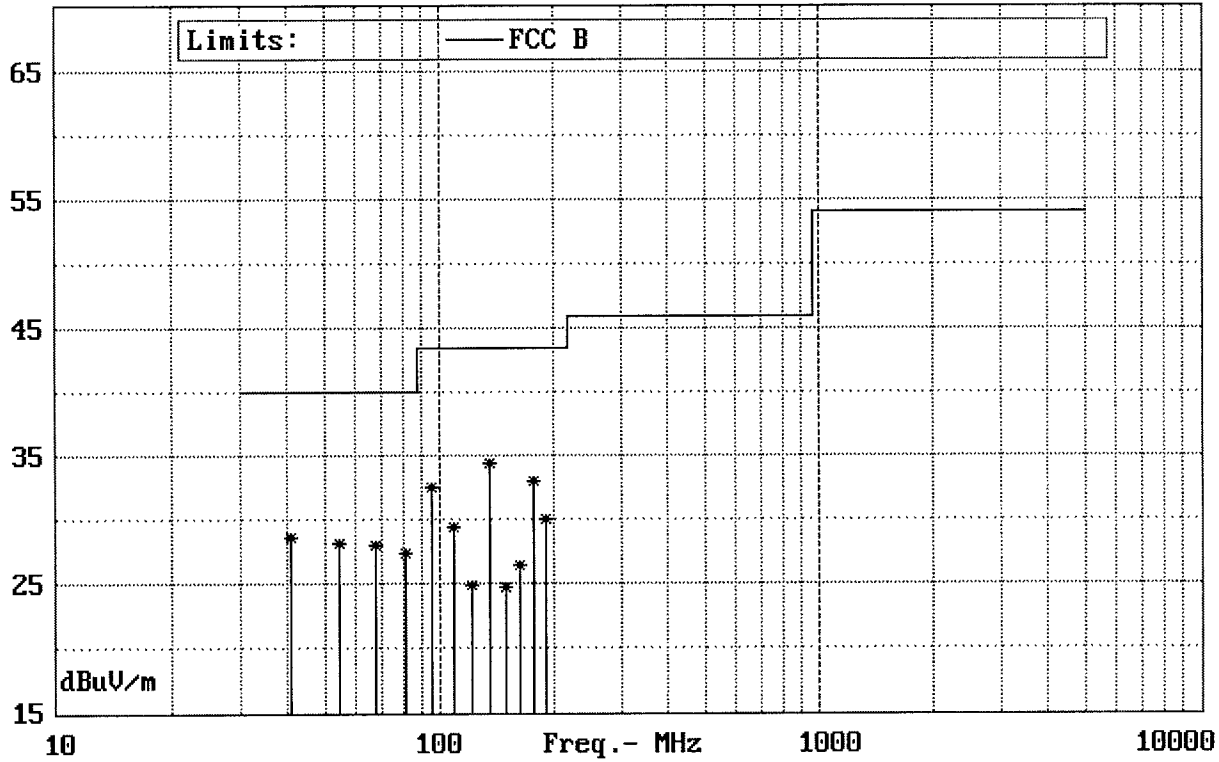
RADIATED EMISSIONS ON MICRO 680			
TEST REPORT #W9189 DATE 01 APRIL 1999			
MHz	dBuV/m	spec limit	margin-dB
	EUT	15.209	15.209
0.009		128.5	128.5
0.49		93.8	93.8
0.49		73.8	73.8
1.705		63	63
1.705		69.5	69.5
13.56	53	69.5	16.5
27.12	34	69.5	35.5
30		69.5	69.5



REPORT #W9189
RUN 1

TÜV PRODUCT SERVICE
RADIATED EMISSIONS AT 3 METERS
DATACARD GEMPLUS MICRO 680
SMARTCARD COUPLER

04-01-99



T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Small Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 DATACARD
 GEMPLUS MICRO 680
 Notes: SMARTCARD COUPLER

Report W9189 Run 1
 Date 04-01-99 Page 1
 Engineer _____
 Tech: TKS _____
 Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta FCC B	Delta
------------------	---------------	--------------	-------------	-----------------	-----------	------------------	----------------	-------

MAXED ANTENNA AND ROTATED 360 DEGREES

VERTICAL ANTENNA

40.68	14.91	12.6	1.1	28.6	--	V --	-11.4	
54.24	16.11	10.9	1.3	28.2	--	V --	-11.8	
67.8	17.65	8.9	1.4	28	--	V --	-12	
81.36	17.65	8.1	1.6	27.3	--	V --	-12.7	
94.928	22.5	8.3	1.7	32.5	--	V --	-11	
108.48	12.23	9.7	1.8	23.8	--	V --	-19.7	
122.04	11.49	11.4	1.9	24.8	--	V --	-18.7	
135.60	16.38	12.3	2	30.7	--	V --	-12.8	
149.16	10.08	12.5	2.2	24.7	--	V --	-18.8	
162.72	9.08	12.4	2.3	23.8	--	V --	-19.7	
176.28	12.79	12.4	2.4	27.6	--	V --	-15.9	
189.84	11.61	12.9	2.4	27	--	V --	-16.5	

HORIZONTAL ANTENNA

40.68	8.35	12.6	1.1	22	--	H --	-18	
54.24	13.29	10.9	1.3	25.4	--	H --	-14.6	
67.8	11.45	8.9	1.4	21.8	--	H --	-18.2	
81.36	14.52	8.1	1.6	24.2	--	H --	-15.8	
94.928	18.1	8.3	1.7	28.1	--	H --	-15.4	
108.48	17.85	9.7	1.8	29.4	--	H --	-14.1	
122.04	9.88	11.4	1.9	23.2	--	H --	-20.3	
135.60	19.95	12.3	2	34.3	--	H --	-9.2	
149.16	5.96	12.5	2.2	20.6	--	H --	-22.9	
162.72	11.74	12.4	2.3	26.4	--	H --	-17.1	
176.28	18.08	12.4	2.4	32.9	--	H --	-10.6	
189.84	14.65	12.9	2.4	30	--	H --	-13.5	

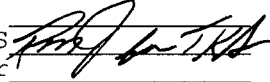
NO HIGHER EMISSIONS DETECTED - END OF SCAN

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Small Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 DATACARD
 GEMPLUS MICRO 680
 Notes: SMARTCARD COUPLER

Figure _____

Report W9189 Run 1
 Date 04-01-99 Page 2
 Engineer
 Tech: TKS 
 Requester _____

Measurement Summary

Frequency MHz	----- Final dBuV/m	----- uV/m	Azimuth deg	Polar\ Height	Delta FCC B	Delta
40.68	28.6	26.915	--	V --	-11.4	
54.24	28.2	25.703	--	V --	-11.8	
67.8	28	25.118	--	V --	-12	
81.36	27.3	23.173	--	V --	-12.7	
94.928	32.5	42.169	--	V --	-11	
108.48	29.4	29.512	--	H --	-14.1	
122.04	24.8	17.378	--	V --	-18.7	
135.60	34.3	51.88	--	H --	-9.2	
149.16	24.7	17.179	--	V --	-18.8	
162.72	26.4	20.892	--	H --	-17.1	
176.28	32.9	44.157	--	H --	-10.6	
189.84	30	31.622	--	H --	-13.5	

File W9189 Run 1

FCC ID: GDI-M680



Appendix B

Constructional Data Form
and
Product Information Form(s)

Constructional Data Form

Not Applicable

PRODUCT INFORMATION FORM

NOTE: It is required to complete both 1) a Product Information Form for each unit under test and 2) a Constructional Data Form for each system tested as outlined in the enclosed instructions.

*** Please show the exact spelling [including spacing, capitalization, etc] as you want shown on the After Test Documentation.**

*Company Name DataCard Corp

*Company Address 11111 Bren Road West
Minnetonka MN 55343

Customer Representatives Bill Myntti, Gary Gunderson

*Equipment Description Gemplus Micro 680 contactless SmartCard Coupler (PWB assembly plus
antenna

*Model Number Micro 680 *Serial Number _____

Type of Test
 Development
 Initial Design Verification
 Design Change (Please describe exact changes below)
 Production Sample (Audit Test)
 Final Product Verification

Changes Made

Oscillator Frequencies

13.56 MHz, 14.74 MHz

Power Interface	Power Supply	
Frequency _____	Description <u>Wall mount</u>	
Voltage _____	Manufacturer <u>Panasonic</u>	
# of Phases _____	Model Number <u>PBALA0001XA</u>	
Current _____	Switching Freq <u>Analog - output 12 vdc/100 ma</u>	

Power Cable
 Hardwired Flexible
 Shielded Unshielded
 Attached Removable

Power Line Filter
 Manufacturer _____ Model Number _____

Cabinet Shielding Provision

Software and/or Operating Modes

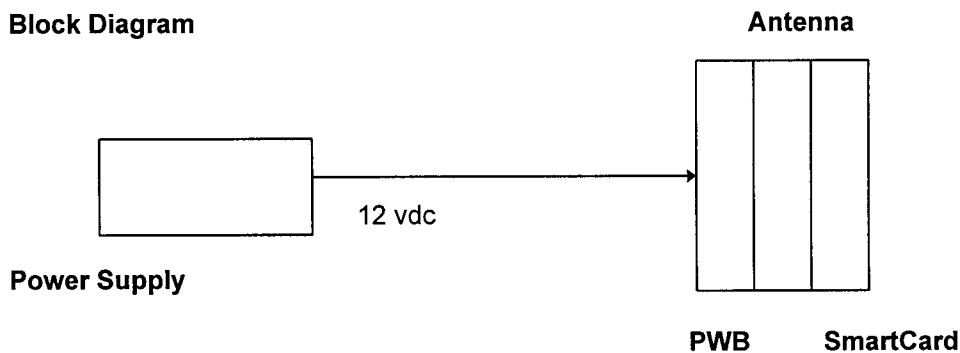
Interfacing Equipment or Simulators

Description	Model Number	Serial Number	FCC ID#
Laptop computer 200 MHz	Gateway Solo		

I/O Cables

Function	Length (meters)	Shielded	Analog/Digital	Active During Test
RS232	8 meters	Y	D	Y

Block Diagram



Appendix C

MEASUREMENT PROTOCOL FOR FCC

GENERAL INFORMATION

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ±4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dBµV and µV, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20(\log \mu\text{V}) \\ \mu\text{V} &= \text{Inverse log}(\text{dB}\mu\text{V}/20) \end{aligned}$$

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

Frequency (MHz)	Level (dBµV)	+	Factor & Cable (dB)	=	Final (dBµV/m)	-	FCC B Limit (dBµV/m)	=	Delta FCC B (dB)
32.21	13.9	+	16.3	=	30.2	-	40.0	=	-9.8

For radiated emission measurements made in the 9 kHz to 30 MHz range, the reading is taken directly from the receiver. The antenna correction factor and cable loss factor are stored in the receiver and included in the final reading.

DETAILS OF TEST PROCEDURES**General Standard Information**

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

Radiated emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection. A shielded loop antenna is positioned 3, 10 or 30 meters from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also be positioned horizontally. The center of the loop is 1 meter above the ground.