

TEST RESULT SUMMARY

FCC PART 15 SUBPART C

Section 15.225

FCC PART 15 SUBPART C

Section 15.207 Conducted Emission Requirements

MANUFACTURER'S NAME	DataCard Group
NAME OF EQUIPMENT	SP 55 CARD PRINTER
MODEL NUMBER	SP 55
MANUFACTURER'S ADDRESS	11111 Bren Road West Minnetonka MN 55343
TEST REPORT NUMBER	NC304618
TEST DATE	14 October 2003

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 Subpart C, Sections 15.207 and 15.225.

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.

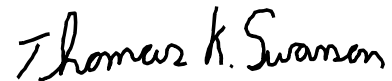
TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15 Subpart C, Sections 15.207 and 15.225.

Date: 07 January 2004

Location: Taylors Falls MN
USA



R. M. Johnson
Tested By



T.K. Swanson
Reviewed By

EMC EMISSION - TEST REPORT

Test Report File No. : **NC304618** Date of issue: 07 January 2004

Model / Serial No. : **SP 55 / F00007**

Product Name : **SP 55 CARD PRINTER**

Applicant : **DataCard Group**

Manufacturer : **DataCard Group**

License holder : **DataCard Group**

Address : **11111 Bren Road West**

: **Minnetonka MN 55343**

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number :
Reference(s) **NC304618**

Total pages including
Appendices **39**

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:

- | | | |
|--|---|------------------------------------|
| ☐ - EN 50081-1 / 1991 | ☐ - Group 1 | ☐ - Group 2 |
| ☐ - EN 55011 / 1991 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55013 / 1990 | ☐ - Household appliances and similar | |
| ☐ - EN 55014 / 1987 | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55014 / A2:1990 | ☐ - Household appliances and similar | |
| ☐ - EN 55014 / 1993 | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55015 / 1987 | | |
| ☐ - EN 55015 / A1:1990 | | |
| ☐ - EN 55015 / 1993 | | |
| ☐ - EN 55022 / 1987 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55022 / 1994 | ☐ - Class A | ☐ - Class B |
| ☐ - BS | | |
| ☐ - VCCI | ☐ - Class A | ☐ - Class B |
| ☒ - FCC Part 15 Subpart C Section 15.225 | | |
| ☒ - FCC Part 15 Subpart C Section 15.207 Conducted Emission Requirements | | |
| ☐ - FCC Part 15 Subpart B | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 11 (1990) | ☐ - Group 1 | ☐ - Group 2 |
| | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 22 (1993) | ☐ - Class A | ☐ - Class B |

Environmental conditions in the lab:

	<u>Actual</u>
Temperature	: 22 °C
Relative Humidity	: 40 %
Atmospheric pressure	: 98.0 kPa
Power supply system	: 60 Hz – 110 VAC – 1 Phase

Sign Explanations:

- ☐ - not applicable
☒ - applicable



Emissions Test Conditions: CONDUCTED EMISSIONS [FCC 15.207]

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:

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	2417	3825/2	Electro-Mechanics (EMCO)	50 Ω LISN	8812-1439	1-15-04
■ -	2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	12-03-03

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

Emissions Test Conditions: RADIATED EMISSIONS [FCC 15.225 (a),(b) 10 kHz - 30 MHz]

The **RADIATED EMISSIONS (MAGNETIC FIELD)** 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)

at a test distance of :

- ☐ - 0.3 meters
- - 1 meter
- - 3 meter
- - 10 meters
- - 30 meters

Test equipment used:

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	12-03-03
■ -	2517	HFH2-Z2	Polorad	Loop Antenna	879285/036	3-26-04

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

Emissions Test Conditions: RADIATED EMISSIONS [FCC 15.225 (b) Electric Field 30 - 1000 MHz]

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) – NSA measurements made 1-03, due 1-04.
- ☐ - 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 :

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	10-15-03
■ -	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	12-02-03
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	12-02-03
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-26-03
■ -	3203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	3-18-04

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

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

Emissions Test Conditions: RADIATED EMISSIONS Electric Field 1 to 100 GHz

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:

☒ - 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

at a test distance of:

- ☐ - 1 meters
- ☐ - 3 meters
- ☐ - 10 meters

Emissions Test Conditions: FREQUENCY TOLERANCE OF THE CARRIER SIGNAL [FCC 15.225 (c)]

The *FREQUENCY TOLERANCE* 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
- ☒ - Specialty Labs

Test equipment used:

	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	8591E	Hewlett-Packard	Spectrum Analyzer	3501A03603	10-25-03
■ -	901	Emco	Near Field Probe	7405-901	N/A
■ -	FXjj-62-CHV-25-25	Thermotron	Temperature Chamber	15767	N/A
■ -	HH23	Omega	Microprocessor Thermometer	SPL-240-011	11-19-03
■ -	8021B	Fluke	Multimeter	CQL-260-032	2-07-04

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

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
- - 1. FCC/ RTTE testing was done using a diagnostic program that ensure constant RF communications under the worst case circumstances, Highest power level, highest data duty cycle, high data transmission rate.
- 2. SP 55 CARD PRINTER testing all options except contacted smartcard option, this includes SP 55 CARD PRINTER printing full color images, encoding data on the magnetic stripe and reading a contactless smartcard
- 3. SP 55 CARD PRINTER testing contacted smartcard option. The printer repeatedly issued smartcard transaction using the contacted smartcard option.

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 : _____
- - unshielded power cable
- - unshielded cables
- - shielded cables MPS.No.: _____
- ☐ - customer specific cables
- ☐ - _____
- ☐ - _____

Emission Test Results:

FCC 15.207 - Conducted emissions 150 kHz - 30 MHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum margin of compliance _____ 0 dB at _____ 160.0 kHz

Maximum margin of non-compliance _____ dB at _____ MHz

Remarks: _____

FCC 15.225 (a)(b) - Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum limit margin for fundamental _____ 47 dB at _____ 13.56 MHz

Minimum limit margin for spurious/harmonics _____ >10 dB at _____ kHz

Remarks: The fundamental was measured to be 33 dBuV/m (44.67 microvolts/meter) in Quasi-Peak mode at 30 meters. The limit is 80 dBuV/m (10000 microvolts/meter) at 30 meters. No spurious emissions or other harmonics were detected within 10 dB of the 30 uV/m limit. For band edge compliance the carrier is below the spurious limit from 13.110 MHz to 14.010 MHz (see page A5).

FCC 15.225 (b) - Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum margin of compliance _____ 2 dB at _____ 40.68 MHz

Minimum limit margin for spurious _____ dB at _____ MHz

Remarks: Testing done up to 1000 MHz due to oscillator frequency of card printer (non-RF device) RF ID is contained in. This report only addresses emissions from RF ID.

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

The requirements are ☐ - MET ☐ - NOT MET ☒ - N/A

Remarks: _____

Equivalent Radiated emissions 1 GHz - 100 GHz

The requirements are ☐ - MET ☐ - NOT MET ☒ - N/A

Remarks: _____

FCC 15.225 (c) - Frequency Tolerance of the Carrier Signal

The requirements are ☒ - MET ☐ - NOT MET

Remarks: Limit is $\pm 0.01\%$ of 13.561 MHz, or ± 1.356 kHz, so allowed band is 13.559644 MHz to 13.562356 MHz.

Frequency deviates from 13.56138 MHz to 13.56163 MHz from -20 to 50 degrees C and 102 to 138 VAC.

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

The radiated measurements from 10 kHz to 30 MHz are made in quasi-peak detection, except for the levels noted between 110-490 kHz, which are made in average detection.

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

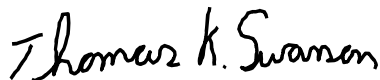
■ - fulfill the general approval requirements mentioned on page 3.

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

Testing Start Date: 14 October 2003

Testing End Date: 15 October 2003

- TÜV PRODUCT SERVICE INC -

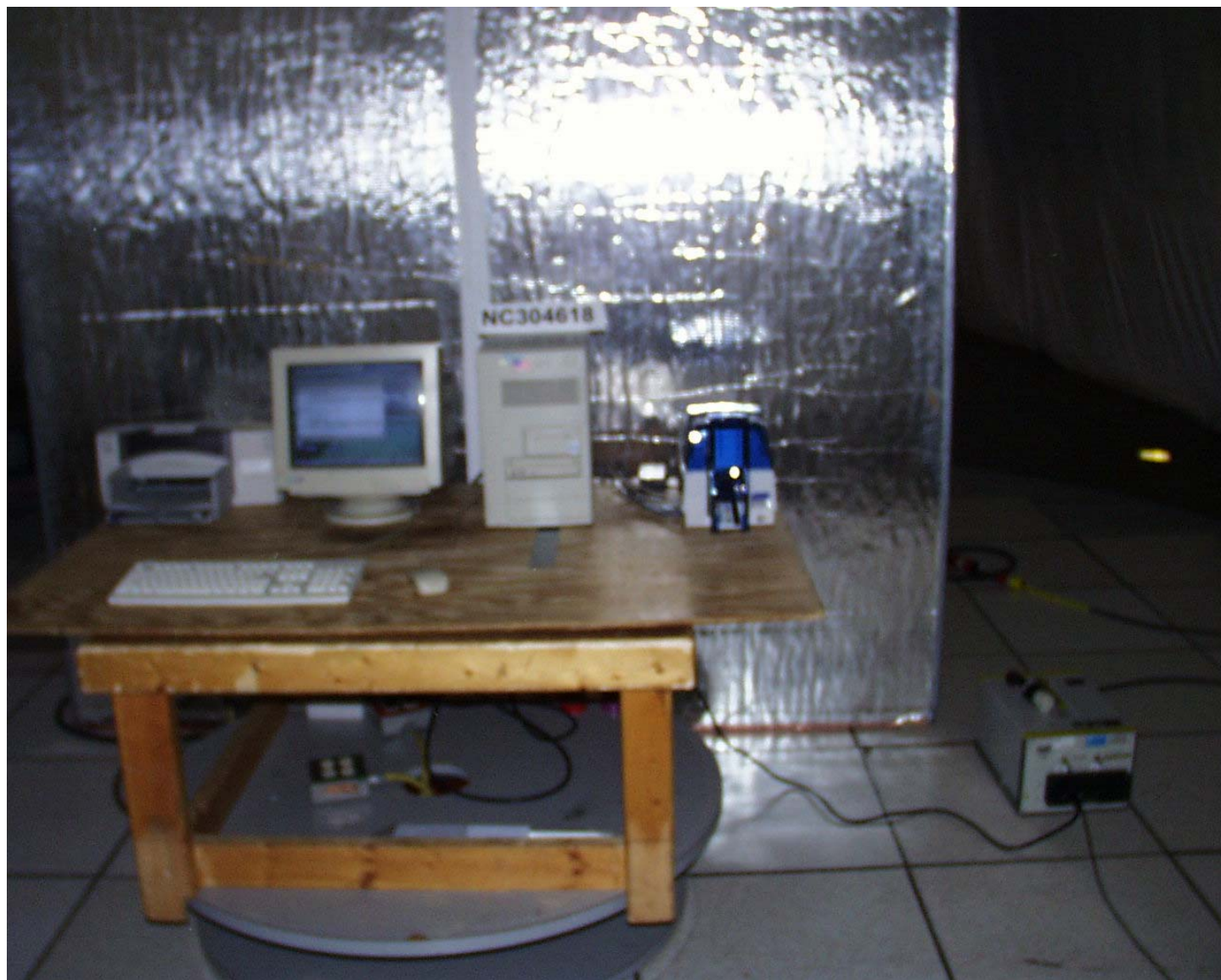


T. K. Swanson
Reviewed By



Tested By:
R. M. Johnson

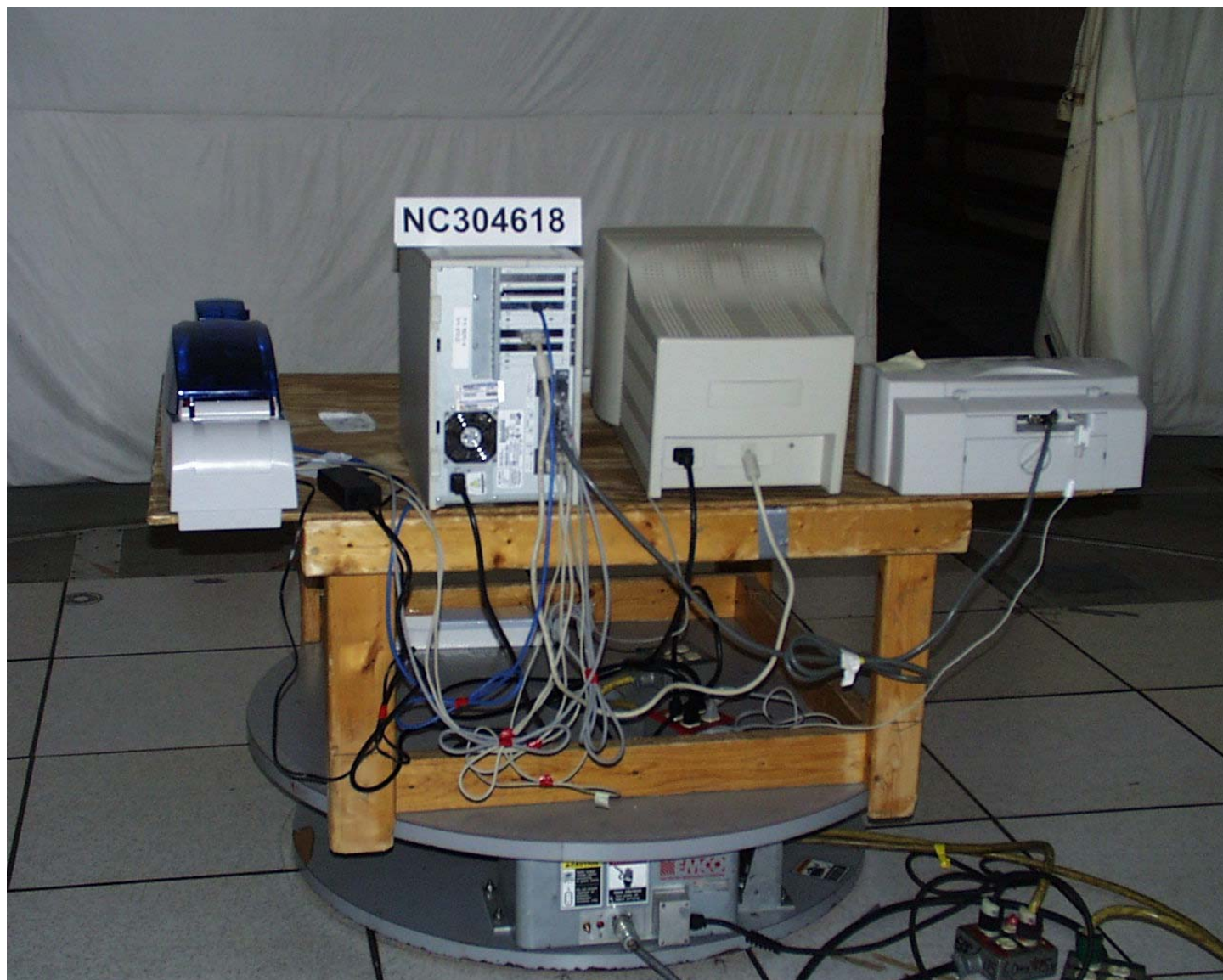
Test-setup photo(s): Conducted emission 150 kHz - 30 MHz



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



Test-setup photo(s):
Radiated emission 10 kHz - 1000 MHz



Test-setup photo(s):
Radiated emission 10 kHz - 1000 MHz



Appendix A

Test Data Sheets
and
Test Setup Drawing(s)

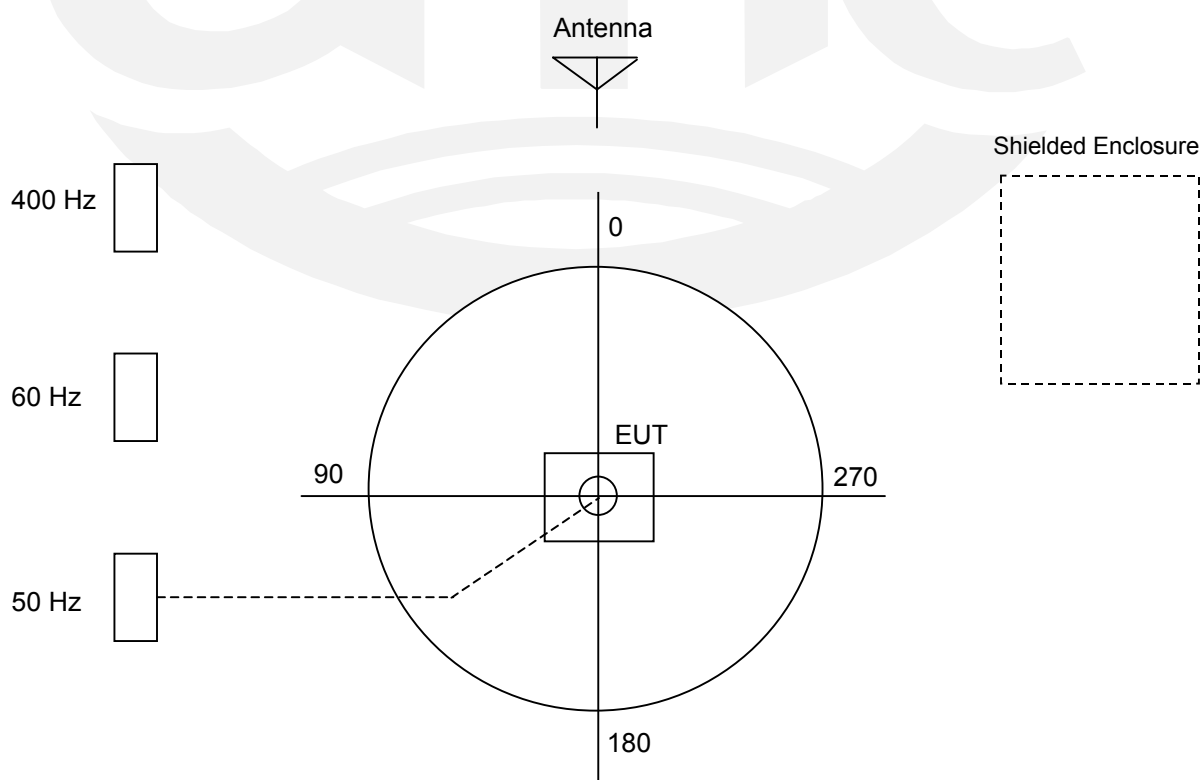


TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.
3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.
4. The circle is a 6.7 meter diameter turntable.
5. A ground plane is in the plane of this sheet.
6. The test sample is shown in the azimuthal position representing zero degrees.



FCC Part 15.225 Magnetic Field Radiated Emissions 10 kHz to 30 MHz							
Customer Name: DataCard							
EUT: SP55							
Test Report # NC304618							
Test Date: 14 October 2003							
	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	margin
MHz	0.3 m	1 m	3 m	10 m	30 m	30 m Limit	dB
0.009						80	
0.49						80	
0.49						80	
1.705						80	
1.705						80	
13.56		89	67	48	33	80	47
30						80	
Quasi-Peak							
All Levels are measured - No extrapolations							
No further harmonics or spurious emisison detected 10 kHz to 30 MHz							
Noise Floor level at 13.56 MHz is 25 dBuV/m							

Datacard SP55 Transmitter
October 27 2003

FCC frequency stability

Test Equipment List:

Thermotron FXjj-62-CHV-25-25 Temperature Chamber, s/n 15767.
Omega HH23 Microprocessor Thermometer, SPL-240-011, cal due 11/19/03
Fluke 8021B Multimeter, s/n CQL-260-032, cal due 2/7/04
HP8591E spectrum analyzer, TUV #2777, cal due 10/25/03.
EMCO 7405-901 loop probe.

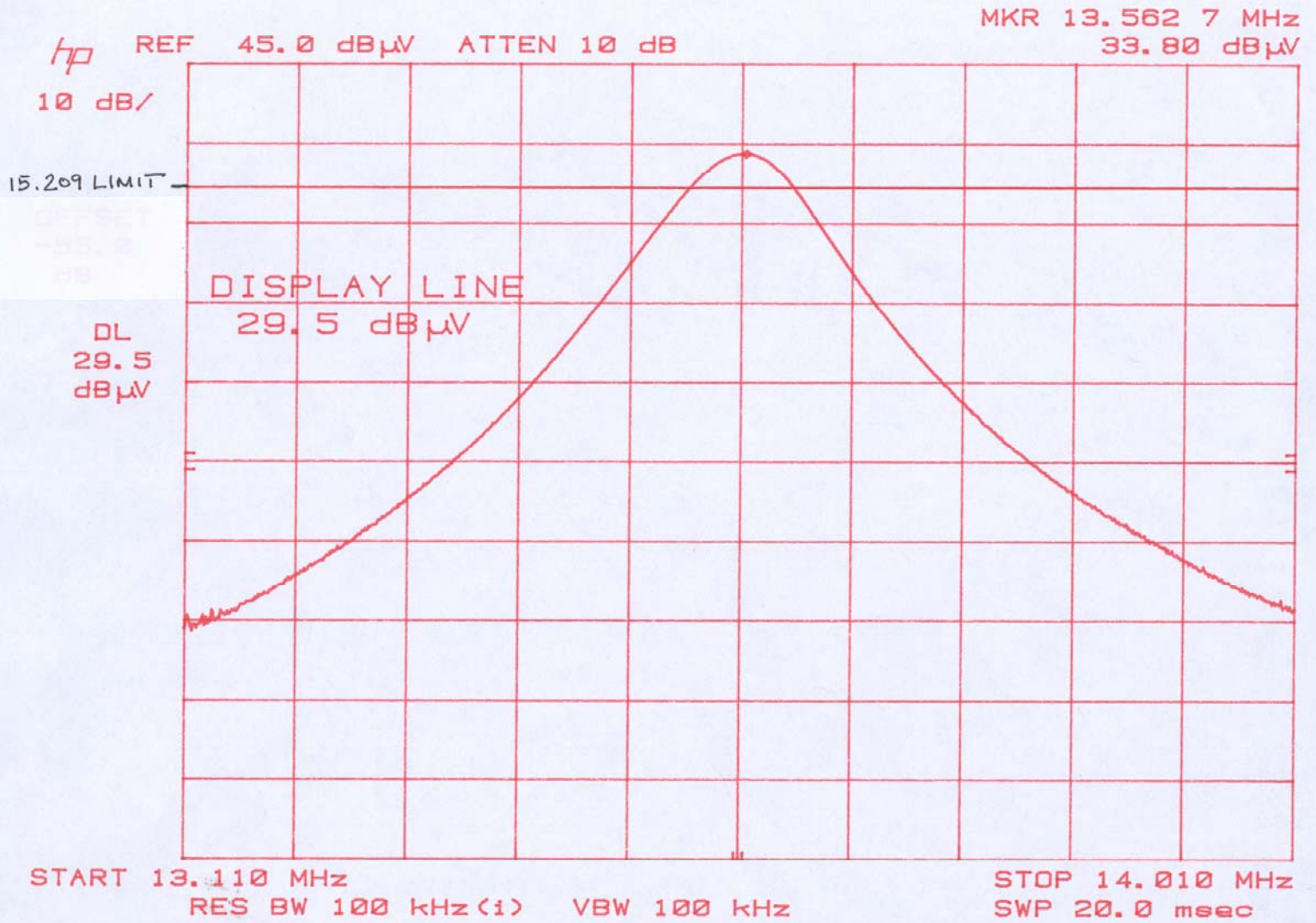
Limit is $\pm 0.01\%$ of 13.561 MHz, or ± 1.356 kHz

-20 degrees C	13.56163 MHz
-10 degrees C	13.56163 MHz
0 degrees C	13.56163 MHz
10 degrees C	13.56150 MHz
20 degrees C	13.56138 MHz
30 degrees C	13.56138 MHz
40 degrees C	13.56113 MHz
50 degrees C	13.56113 MHz

102 VAC	13.56163 MHz
138 VAC	13.56163 MHz

Total delta is 500 Hz, unit meets the requirement.

BAND EDGE COMPLIANCE



CONDUCTED EMISSIONS



Test Report #: NC304618 Run 6 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: FCC 15.207 Conducted Emissions Air Pressure: 98.0 kPa

Customer: DATACARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: _____

Data File Name: 4618.dat

Page: 1 of 4

List of measurements for run #: 6

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 EN55022 B Qp	DELTA2 EN55022 B Avg
60 Hz 110 VAC						
160.0 kHz	52.61 Qp	0.1 / 2.8 / 0.0 / 0.0	55.51	L1	-9.95	n/a
200.0 kHz	45.95 Qp	0.1 / 2.0 / 0.0 / 0.0	48.05	L1	-15.56	n/a
245.0 kHz	42.73 Qp	0.1 / 1.78 / 0.0 / 0.0	44.61	L1	-17.32	n/a
325.0 kHz	38.19 Qp	0.1 / 1.38 / 0.0 / 0.0	39.67	L1	-19.91	n/a
445.0 kHz	44.31 Qp	0.1 / 0.89 / 0.0 / 0.0	45.3	L1	-11.67	n/a
2.485 MHz	29.98 Qp	0.3 / 0.5 / 0.0 / 0.0	30.78	L1	-25.22	n/a
160.0 kHz	47.16 Av	0.1 / 2.8 / 0.0 / 0.0	50.06	L1	n/a	-5.4
200.0 kHz	38.95 Av	0.1 / 2.0 / 0.0 / 0.0	41.05	L1	n/a	-12.56
245.0 kHz	39.21 Av	0.1 / 1.78 / 0.0 / 0.0	41.09	L1	n/a	-10.84
325.0 kHz	34.6 Av	0.1 / 1.38 / 0.0 / 0.0	36.08	L1	n/a	-13.5
445.0 kHz	42.85 Av	0.1 / 0.89 / 0.0 / 0.0	43.84	L1	n/a	-3.13
2.485 MHz	17.78 Av	0.3 / 0.5 / 0.0 / 0.0	18.58	L1	n/a	-27.42
160.0 kHz	55.85 Qp	0.1 / 2.8 / 0.0 / 0.0	58.75	N	-6.71	n/a
200.0 kHz	47.87 Qp	0.1 / 2.0 / 0.0 / 0.0	49.97	N	-13.64	n/a
245.0 kHz	44.73 Qp	0.1 / 1.78 / 0.0 / 0.0	46.61	N	-15.32	n/a
325.0 kHz	43.56 Qp	0.1 / 1.38 / 0.0 / 0.0	45.04	N	-14.54	n/a
445.0 kHz	42.85 Qp	0.1 / 0.89 / 0.0 / 0.0	43.84	N	-13.13	n/a
2.485 MHz	0.0 Qp	0.3 / 0.5 / 0.0 / 0.0	0.8	N	-55.2	n/a
160.0 kHz	52.27 Av	0.1 / 2.8 / 0.0 / 0.0	55.17	N	n/a	-0.29

Tested by: RMJ

Printed

Signature

Reviewed by: TKS

Printed

Signature

CONDUCTED EMISSIONS



Test Report #: NC304618 Run 6 Test Area: LTS
EUT Model #: SP55 Date: 10/14/03
EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C
Test Method: FCC 15.207 Conducted Emissions Air Pressure: 98.0 kPa
Customer: DATA CARD Rel. Humidity: 40.0 %
EUT Description: CARD PERSONALIZATION SYSTEM

Notes: _____

Data File Name: 4618.dat

Page: 2 of 4

List of measurements for run #: 6

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 EN55022 B Qp	DELTA2 EN55022 B Avg
200.0 kHz	43.55 Av	0.1 / 2.0 / 0.0 / 0.0	45.65	N	n/a	-7.96
245.0 kHz	38.29 Av	0.1 / 1.78 / 0.0 / 0.0	40.17	N	n/a	-11.76
325.0 kHz	41.55 Av	0.1 / 1.38 / 0.0 / 0.0	43.03	N	n/a	-6.55
445.0 kHz	36.05 Av	0.1 / 0.89 / 0.0 / 0.0	37.04	N	n/a	-9.93
2.485 MHz	20.23 Av	0.3 / 0.5 / 0.0 / 0.0	21.03	N	n/a	-24.97

End of Scan

Tested by: RMJ

Printed

Signature

Reviewed
by: TKS

Printed

Signature

CONDUCTED EMISSIONS



Test Report #: NC304618 Run 6 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: FCC 15.207 Conducted Emissions Air Pressure: 98.0 kPa

Customer: DATA CARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: _____

Data File Name: 4618.dat

Page: 3 of 4

Measurement summary for limit1: EN55022 B Qp (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 EN55022 B Qp
160.0 kHz	55.85 Qp	0.1 / 2.8 / 0.0 / 0.0	58.75	N	-6.71
445.0 kHz	44.31 Qp	0.1 / 0.89 / 0.0 / 0.0	45.3	L1	-11.67
200.0 kHz	47.87 Qp	0.1 / 2.0 / 0.0 / 0.0	49.97	N	-13.64
325.0 kHz	43.56 Qp	0.1 / 1.38 / 0.0 / 0.0	45.04	N	-14.54

Measurement summary for limit2: EN55022 B Avg (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA2 EN55022 B Avg
160.0 kHz	52.27 Av	0.1 / 2.8 / 0.0 / 0.0	55.17	N	-0.29
445.0 kHz	42.85 Av	0.1 / 0.89 / 0.0 / 0.0	43.84	L1	-3.13
325.0 kHz	41.55 Av	0.1 / 1.38 / 0.0 / 0.0	43.03	N	-6.55
200.0 kHz	43.55 Av	0.1 / 2.0 / 0.0 / 0.0	45.65	N	-7.96
245.0 kHz	39.21 Av	0.1 / 1.78 / 0.0 / 0.0	41.09	L1	-10.84

Tested by: RMJ

Printed

Signature

Reviewed by: TKS

Printed

Signature

CONDUCTED EMISSIONS



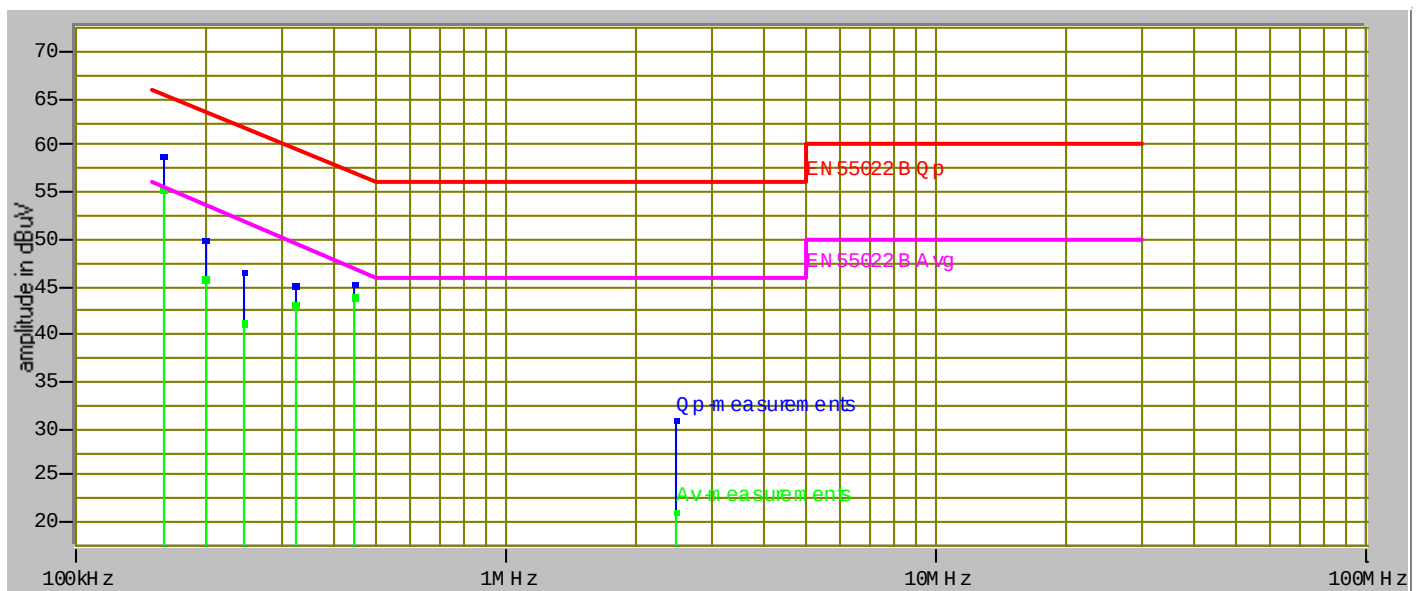
Test Report #: NC304618 Run 6 Test Area: LTS
EUT Model #: SP55 Date: 10/14/03
EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C
Test Method: FCC 15.207 Conducted Emissions Air Pressure: 98.0 kPa
Customer: DATA CARD Rel. Humidity: 40.0 %
EUT Description: CARD PERSONALIZATION SYSTEM

Notes: _____

Data File Name: 4618.dat

Page: 4 of 4

Graph:



Tested by: RMJ

Printed

Signature

Reviewed by: TKS

Printed

Signature

RADIATED EMISSIONS



Test Report #: NC304618 Run 4 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: FCC-15.209 Air Pressure: 98.0 kPa

Customer: DATA CARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 135.6MHz.

Data File Name: 4618.dat

Page: 1 of 3

List of measurements for run #: 4

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
94.92 MHz	44.28 Qp	0.8 / 8.18 / 25.3 / 0.0	27.96	V / 1.00 / 0	-15.54	n/a
108.48 MHz	48.98 Qp	0.9 / 9.3 / 25.44 / 0.0	33.74	V / 1.00 / 0	-9.76	n/a
122.04 MHz	50.13 Qp	0.9 / 9.33 / 25.5 / 0.0	34.86	V / 1.00 / 0	-8.64	n/a
135.6 MHz	44.27 Qp	0.96 / 8.44 / 25.44 / 0.0	28.23	V / 1.00 / 0	-15.27	n/a
40.68 MHz	43.6 Qp	0.5 / 16.9 / 25.2 / 0.0	35.8	V / 1.00 / 90	-4.2	n/a
54.24 MHz	37.75 Qp	0.6 / 13.2 / 25.1 / 0.0	26.45	V / 1.00 / 90	-13.55	n/a
81.36 MHz	42.05 Qp	0.8 / 7.55 / 25.3 / 0.0	25.1	V / 1.00 / 90	-14.9	n/a
94.92 MHz	45.3 Qp	0.8 / 8.18 / 25.3 / 0.0	28.98	V / 1.00 / 90	-14.52	n/a
135.6 MHz	44.95 Qp	0.96 / 8.44 / 25.44 / 0.0	28.91	V / 1.00 / 90	-14.59	n/a
67.8 MHz	38.6 Qp	0.7 / 9.6 / 25.26 / 0.0	23.64	V / 1.00 / 180	-16.36	n/a
94.92 MHz	46.25 Qp	0.8 / 8.18 / 25.3 / 0.0	29.93	V / 1.00 / 180	-13.57	n/a
122.04 MHz	52.68 Qp	0.9 / 9.33 / 25.5 / 0.0	37.41	V / 1.00 / 270	-6.09	n/a
135.6 MHz	48.75 Qp	0.96 / 8.44 / 25.44 / 0.0	32.71	V / 1.00 / 270	-10.79	n/a
MAXIMIZED.						
40.68 MHz	44.82 Qp	0.5 / 16.9 / 25.2 / 0.0	37.02	V / 1.00 / 151	-2.98	n/a
122.04 MHz	52.79 Qp	0.9 / 9.33 / 25.5 / 0.0	37.52	V / 1.00 / 254	-5.98	n/a
81.36 MHz	43.25 Qp	0.8 / 7.55 / 25.3 / 0.0	26.3	H / 3.00 / 0	-13.7	n/a
MAXIMIZED.						
81.36 MHz	46.28 Qp	0.8 / 7.55 / 25.3 / 0.0	29.33	H / 2.10 / 126	-10.67	n/a

Tested by: RMJ

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Reviewed by: TKS

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RADIATED EMISSIONS



Test Report #: NC304618 Run 4 Test Area: LTS
EUT Model #: SP55 Date: 10/14/03
EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C
Test Method: FCC-15.209 Air Pressure: 98.0 kPa
Customer: DATACARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 135.6MHz.

Data File Name: 4618.dat

Page: 2 of 3

Measurement summary for limit1: FCC-B <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m
40.68 MHz	44.82 Qp	0.5 / 16.9 / 25.2 / 0.0	37.02	V / 1.00 / 151	-2.98
122.04 MHz	52.79 Qp	0.9 / 9.33 / 25.5 / 0.0	37.52	V / 1.00 / 254	-5.98
108.48 MHz	48.98 Qp	0.9 / 9.3 / 25.44 / 0.0	33.74	V / 1.00 / 0	-9.76
81.36 MHz	46.28 Qp	0.8 / 7.55 / 25.3 / 0.0	29.33	H / 2.10 / 126	-10.67
135.6 MHz	48.75 Qp	0.96 / 8.44 / 25.44 / 0.0	32.71	V / 1.00 / 270	-10.79
54.24 MHz	37.75 Qp	0.6 / 13.2 / 25.1 / 0.0	26.45	V / 1.00 / 90	-13.55
94.92 MHz	46.25 Qp	0.8 / 8.18 / 25.3 / 0.0	29.93	V / 1.00 / 180	-13.57

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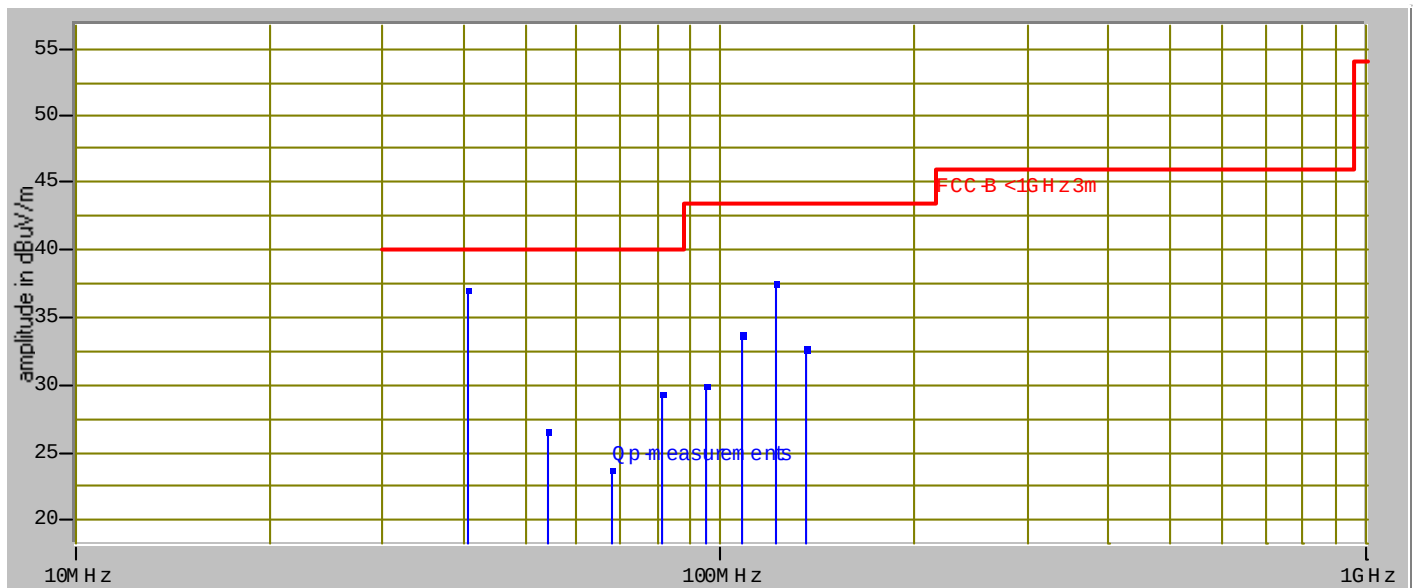
Signature

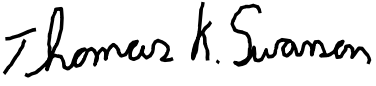
RADIATED EMISSIONS



Test Report #:	NC304618 Run 4	Test Area:	LTS		
EUT Model #:	SP55	Date:	10/14/03		
EUT Serial #:		EUT Power:	60/HZ/110VAC	Temperature:	22.0 °C
Test Method:	FCC-15.209	Air Pressure:	98.0 kPa		
Customer:	DATA CARD	Rel. Humidity:	40.0 %		
EUT Description: CARD PERSONALIZATION SYSTEM					
Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 135.6MHz.					
Data File Name: 4618.dat				Page:	3 of 3

Graph:



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	Printed	Signature
Reviewed by:	TKS	
	Printed	Signature

RADIATED EMISSIONS



Test Report #: NC304618 Run 5 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: EN300-330 Air Pressure: 98.0 kPa

Customer: DATA CARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 1GHZ

Data File Name: 4618.dat

Page: 1 of 4

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 EN 55011 A Grp 1 10 m	DELTA2
40.68 MHz	30.15 Qp	1.44 / 16.01 / 25.2 / 0.0	22.4	V / 1.00 / 0	-17.6	n/a
54.24 MHz	32.21 Qp	1.5 / 12.1 / 25.1 / 0.0	20.71	V / 1.00 / 0	-19.29	n/a
67.8 MHz	35.09 Qp	1.7 / 9.1 / 25.26 / 0.0	20.63	V / 1.00 / 0	-19.37	n/a
81.36 MHz	36.82 Qp	2.0 / 7.05 / 25.3 / 0.0	20.57	V / 1.00 / 0	-19.43	n/a
94.92 MHz	40.93 Qp	2.16 / 8.18 / 25.3 / 0.0	25.98	V / 1.00 / 0	-14.02	n/a
108.48 MHz	45.46 Qp	2.35 / 8.7 / 25.44 / 0.0	31.08	V / 1.00 / 0	-8.92	n/a
122.04 MHz	40.5 Qp	2.62 / 8.27 / 25.5 / 0.0	25.89	V / 1.00 / 0	-14.11	n/a
135.6 MHz	36.67 Qp	2.78 / 7.84 / 25.44 / 0.0	21.85	V / 1.00 / 0	-18.15	n/a
149.16 MHz	32.67 Qp	2.8 / 9.18 / 25.3 / 0.0	19.35	V / 1.00 / 0	-20.65	n/a
176.28 MHz	35.41 Qp	2.85 / 9.08 / 25.1 / 0.0	22.24	V / 1.00 / 0	-17.76	n/a
189.84 MHz	31.74 Qp	3.02 / 10.07 / 25.1 / 0.0	19.73	V / 1.00 / 0	-20.27	n/a
203.4 MHz	34.38 Qp	3.16 / 10.2 / 25.05 / 0.0	22.69	V / 1.00 / 0	-17.31	n/a
216.96 MHz	33.05 Qp	3.2 / 10.6 / 24.96 / 0.0	21.89	V / 1.00 / 0	-18.11	n/a
230.52 MHz	38.25 Qp	3.2 / 10.83 / 24.87 / 0.0	27.4	V / 1.00 / 0	-19.6	n/a
244.08 MHz	31.76 Qp	3.27 / 11.11 / 24.79 / 0.0	21.35	V / 1.00 / 0	-25.65	n/a
257.64 MHz	35.36 Qp	3.5 / 11.8 / 24.71 / 0.0	25.94	V / 1.00 / 0	-21.06	n/a
271.2 MHz	33.25 Qp	3.5 / 12.58 / 24.76 / 0.0	24.57	V / 1.00 / 0	-22.43	n/a
284.76 MHz	44.31 Qp	3.55 / 12.3 / 24.77 / 0.0	35.39	V / 1.00 / 0	-11.61	n/a
311.88 MHz	42.83 Qp	3.6 / 13.19 / 24.64 / 0.0	34.98	V / 1.00 / 0	-12.02	n/a
339.0 MHz	35.93 Qp	3.8 / 14.12 / 24.6 / 0.0	29.24	V / 1.00 / 0	-17.76	n/a
366.12 MHz	28.92 Qp	3.91 / 15.0 / 24.69 / 0.0	23.13	V / 1.00 / 0	-23.87	n/a
379.68 MHz	28.65 Qp	3.96 / 15.2 / 24.65 / 0.0	23.16	V / 1.00 / 0	-23.84	n/a
393.24 MHz	34.04 Qp	4.02 / 15.8 / 24.6 / 0.0	29.26	V / 1.00 / 0	-17.74	n/a
406.8 MHz	29.19 Qp	4.12 / 16.44 / 24.6 / 0.0	25.16	V / 1.00 / 0	-21.84	n/a
420.36 MHz	32.91 Qp	4.2 / 17.17 / 24.6 / 0.0	29.68	V / 1.00 / 0	-17.32	n/a

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RADIATED EMISSIONS



Test Report #: NC304618 Run 5 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: EN300-330 Air Pressure: 98.0 kPa

Customer: DATA CARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 1GHZ

Data File Name: 4618.dat

Page: 2 of 4

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 EN 55011 A Grp 1 10 m	DELTA2
447.498 MHz	34.4 Qp	4.2 / 16.22 / 24.68 / 0.0	30.13	V / 1.00 / 0	-16.87	n/a
474.6 MHz	25.55 Qp	4.28 / 18.2 / 24.7 / 0.0	23.33	V / 1.00 / 0	-23.67	n/a
501.72 MHz	25.32 Qp	4.43 / 18.11 / 24.6 / 0.0	23.25	V / 1.00 / 0	-23.75	n/a
705.12 MHz	24.01 Qp	5.31 / 19.85 / 24.5 / 0.0	24.67	V / 1.00 / 0	-22.33	n/a
366.12 MHz	33.75 Qp	3.91 / 15.0 / 24.69 / 0.0	27.96	V / 3.00 / 270	-19.04	n/a
108.48 MHz	41.07 Qp	2.35 / 8.7 / 25.44 / 0.0	26.69	V / 1.00 / 0	-13.31	n/a
122.04 MHz	41.55 Qp	2.62 / 8.27 / 25.5 / 0.0	26.94	V / 1.00 / 313	-13.06	n/a
284.76 MHz	44.19 Qp	3.55 / 12.3 / 24.77 / 0.0	35.27	V / 1.00 / 200	-11.73	n/a
311.88 MHz	43.96 Qp	3.6 / 13.19 / 24.64 / 0.0	36.11	V / 1.00 / 140	-10.89	n/a
447.498 MHz	36.99 Qp	4.2 / 16.22 / 24.68 / 0.0	32.72	V / 1.00 / 355	-14.28	n/a
420.36 MHz	33.36 Qp	4.2 / 17.17 / 24.6 / 0.0	30.13	V / 1.00 / 40	-16.87	n/a
MAXED ANTENNA AND ROTATED EUT 360 DEGREES.						
135.6 MHz	39.95 Qp	2.78 / 7.84 / 25.44 / 0.0	25.13	H / 3.00 / 90	-14.87	n/a
176.28 MHz	39.55 Qp	2.85 / 9.08 / 25.1 / 0.0	26.38	H / 3.00 / 90	-13.62	n/a
203.4 MHz	35.3 Qp	3.16 / 10.2 / 25.05 / 0.0	23.61	H / 3.00 / 90	-16.39	n/a
230.52 MHz	39.7 Qp	3.2 / 10.83 / 24.87 / 0.0	28.85	H / 3.00 / 90	-18.15	n/a
244.08 MHz	33.5 Qp	3.27 / 11.11 / 24.79 / 0.0	23.09	H / 3.00 / 90	-23.91	n/a
406.8 MHz	30.25 Qp	4.12 / 16.44 / 24.6 / 0.0	26.22	H / 3.00 / 90	-20.78	n/a
MAXIMIZED.						
176.28 MHz	40.38 Qp	2.85 / 9.08 / 25.1 / 0.0	27.21	H / 2.80 / 100	-12.79	n/a
MAXED ANTENNA AND ROTATED EUT 360 DEGREES.						
END OF SCAN 30 - 1000MHZ.						

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RADIATED EMISSIONS

Test Report #: NC304618 Run 5 Test Area: LTS
EUT Model #: SP55 Date: 10/14/03
EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C
Test Method: EN300-330 Air Pressure: 98.0 kPa
Customer: DATA CARD Rel. Humidity: 40.0 %
EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 1GHZ

Data File Name: 4618.dat

Page: 3 of 4

Measurement summary for limit1: EN 55011 A Grp 1 10 m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 EN 55011 A Grp 1 10 m
108.48 MHz	45.46 Qp	2.35 / 8.7 / 25.44 / 0.0	31.08	V / 1.00 / 0	-8.92
311.88 MHz	43.96 Qp	3.6 / 13.19 / 24.64 / 0.0	36.11	V / 1.00 / 140	-10.89
284.76 MHz	44.31 Qp	3.55 / 12.3 / 24.77 / 0.0	35.39	V / 1.00 / 0	-11.61
176.28 MHz	40.38 Qp	2.85 / 9.08 / 25.1 / 0.0	27.21	H / 2.80 / 100	-12.79
122.04 MHz	41.55 Qp	2.62 / 8.27 / 25.5 / 0.0	26.94	V / 1.00 / 313	-13.06
94.92 MHz	40.93 Qp	2.16 / 8.18 / 25.3 / 0.0	25.98	V / 1.00 / 0	-14.02
447.498 MHz	36.99 Qp	4.2 / 16.22 / 24.68 / 0.0	32.72	V / 1.00 / 355	-14.28
135.6 MHz	39.95 Qp	2.78 / 7.84 / 25.44 / 0.0	25.13	H / 3.00 / 90	-14.87

Tested by: RMJ

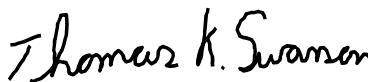
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Reviewed by: TKS

Printed



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RADIATED EMISSIONS



Test Report #: NC304618 Run 5 Test Area: LTS

EUT Model #: SP55 Date: 10/14/03

EUT Serial #: _____ EUT Power: 60/HZ/110VAC Temperature: 22.0 °C

Test Method: EN300-330 Air Pressure: 98.0 kPa

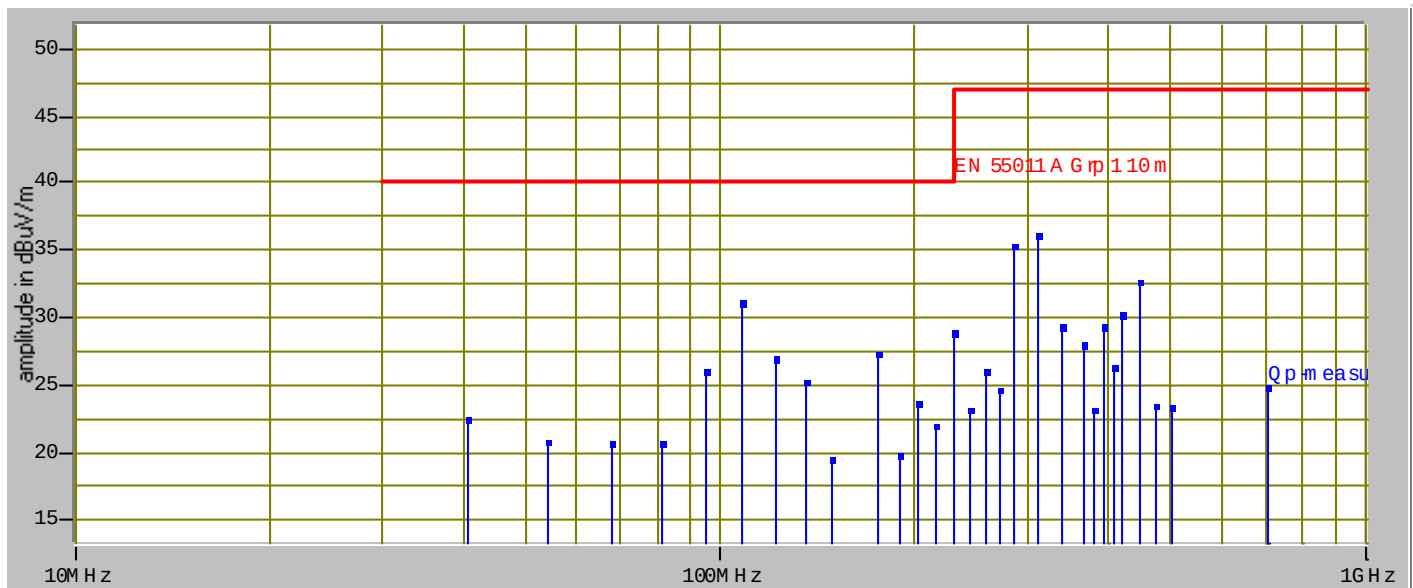
Customer: DATA CARD Rel. Humidity: 40.0 %

EUT Description: CARD PERSONALIZATION SYSTEM

Notes: TRANSMITTER SPURIOUS EMISSIONS SCAN TO 1GHZ

Data File Name: 4618.dat Page: 4 of 4

Graph:



Tested by: RMJ

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Appendix B

Constructional Data Form

and/or

Product Information Form(s)



EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- NOTE: This information will be input into your test report as shown below.
Press the F1 key at any time to get HELP for the current field selected.

Company: Datacard Group

Address: 11111 Bren Road West
Minnetonka, MN 55343

Contact: Steve Fitzsimmons Position: Electrical Engineer

Phone: 952 988 1838 Fax: 952 988 2658

E-mail Address: steve_fitzsimmons@datacard.co
m

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description Card Printer

EUT Name SP55

Model No.: SP55 Serial No.: F00007

Product Options: Magstripe, Smartcard, Supplies RFID, Graphics

Configurations to be tested: Printing full color card, encoding magentic stripe, operating Gemplus 680 contactless coupler and GemPC Serial-SL.

Test Objective

- | | |
|--|--|
| ☒ EMC Directive 89/336/EEC (EMC) | ☒ FCC: Class ☒ A ☐ B Part <u>b, c</u> |
| Std: <u>EN55022:1998</u> | ☒ VCCI: Class ☒ A ☐ B |
| ☐ Machinery Directive 89/392/EEC (EMC) | ☒ BCIQ: Class ☒ A ☐ B |
| Std: _____ | ☒ Canada: Class ☒ A ☐ B |
| ☐ Medical Device Directive 93/42/EEC (EMC) | ☒ Australia: Class ☒ A ☐ B |
| Std: _____ | ☒ Other: <u>RTTE Directive, EN 300 330 and EN301 489-3: 2000</u> |
| ☐ Vehicle Directive 72/245/EEC (EMC) | |
| Std: _____ | |
| ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | |

EMC Test Plan and Constructional Data Form

**TÜV Product Service Certification Requested**

- ☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)
☐ Certificate of Conformity (CoC) ☒ Compliance Document
Protection Class (N/A for vehicles) ☒ Class I ☐ Class II ☐ Class III
(Press **F1** when field is selected to show additional information on Protection Class.)

EUT Specifications and Requirements

Length: 20" Width: 8" Height: 10" Weight: 10 lbs.
: _____

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 100-230 (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: 1

Current (Amps/phase(max)): 2A Current (Amps/phase(nominal)): 1A

Other _____

Other Special Requirements**Typical Installation and/or Operating Environment**

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Office Environment

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 3
☐ Shielded OR ☒ Unshielded
☐ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE:												
RS232	☐	☒	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒	☐
USB	☐	☒	2	☒	☐	Foil	None	USB A-B	USB spec 1.1	2	☒	☐
RS232	☐	☒	1	☒	☐	Foil	None	Dsub9	None	2	☒	☐
10baseT	☐	☒	1	☐	☒	10baseT	none	RJ45	Magnetics	2	☒	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

EUT Software

Revision Level: 4.17.1

Description: Pre production firmware, fully capable of running all sub systems.

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. FCC/ RTTE testing was done using a diagnostic program that ensure constant RF communications under the worst case circumstances, Highest power level, highest data duty cycle, high data transmission rate.
2. SP55 testing all options including contacted and contactless smartcard option and magnetic stripe option, this includes SP55 printing full color images, encoding data on the magnetic stripe and reading smartcards
3. Gemplus driver utility used for testing smartcard options, TCP/IP ping test to test ethernet port, color printjob with magnetic stripe data for testing color engine and magnetic stripe feature, RFID system

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
SP55	SP55CIATUSBES C4/6	F00007	

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
Desktop PC	SSE2500MT64	SFST0072121	E186194
Keyboard	EO3601QUS201-C	J014405380	E139948JZ
Monitor	VCDTS21378-2M	E783732785	GSS15015
Mouse	ECM-S3902	1487209	EW4ECM-S3902

Oscillator Frequencies			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
4MHz	Fund.	Y4	Oscillator for system clock generation
13.56MHz	Fund.	Y3	RFID communication clock
12MHz	48MHz	U10	TPH logic control
48MHz	4MHz	U6, U7, U10	system clock

Power Supply			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
Protran	UP07231240		☒ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters		
<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>

Form

EMC Test Plan and Constructional Data Form



Critical EMI Components (Capacitors, ferrites, etc.)

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
Ferrite bead	Ferrite	0431164951	1	RFID cable

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures

Customer authorization to perform tests
according to this test plan.

Steve Fitzsimmons

Date

10/14/03

Test Plan/CDF Prepared By (please print)

Date

Reviewed by TÜV Product Service Associate

Date

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 dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, then subtracting the preamp gain. 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 A.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP				FINAL	POL/HGT/AZ			DELTA1
		(dB)	(dB/m)	(dB)		(dB μ V/m)	(m)	(deg)		FCC B
60.80	42.5Qp	+	1.2	+	10.9	- 25.5 = 29.1	V	1.0	0.0 -	-10.9

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 150 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.

In the frequency range of 9 kHz to 30 MHz, measurements are made with quasi-peak or average detection with a loop antenna. The antenna is positioned 1 meter above the ground plane and rotated about its vertical axis for maximum response at each azimuth about the EUT. The antenna is also positioned horizontally at the specified distances.