

# TEST RESULT SUMMARY

## FCC PART 15 SUBPART C

### Section 15.225

MANUFACTURER'S NAME	DataCard
NAME OF EQUIPMENT	SuppliesID
TYPE OF EQUIPMENT	Supplies RFID system
MODEL NUMBER	None
MANUFACTURER'S ADDRESS	11111 Bren Road West Minnetonka MN 55343
TEST REPORT NUMBER	NC303915
TEST DATE	27 August & 16 September 2003

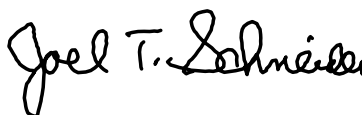
According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15 Subpart C, Section 15.225.

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, Section 15.225.

Date: 26 September 2003

Location: Taylors Falls MN  
USA



J. T. Schneider  
Tested By



T. K. Swanson  
Reviewed By

# EMC EMISSION - TEST REPORT

Test Report File No. : **NC303915** Date of issue: 26 September 2003Model / Serial No. : NONE / F00007Product Name : SuppliesIDProduct Type : Supplies RFID systemApplicant : DataCardManufacturer : DataCardLicense holder : DataCardAddress : 11111 Bren Road West: Minnetonka MN 55343Test Result :  **Positive**  **Negative**Test Project Number  
Reference(s) : NC303915Total pages including  
Appendices : 32

*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 15.225                      |   |                                    |
| <input type="checkbox"/> - FCC Part 15 Subpart C Section 15.207 Conducted Emission Requirements |   |                                    |
| <input type="checkbox"/> - FCC Part 15 Subpart B  | <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	: 22 °C
Relative Humidity	: 53 %
Atmospheric pressure	: 98.0 kPa
Power supply system	: 5 VDC

**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

**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
■ -	2517	HFH2-Z2	Polorad	Loop Antenna	879285/036	3-26-04
■ -	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 (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)
- Wild River Lab Small Test Site (Open Area Test Site) – NSA measurements made 2-03, due 2-04.
- 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
■ - 3203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	3-18-04
■ - 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
■ - 3927	ZHL-1042J-SMA	Mini-Circuits	Preamplifier	D113001-16	2-28-04

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
■ -	SPL-240-011	Thermotron	Temperature Chamber	16759-S	N/A
■ -	HH23	Omega	Microprocessor Thermometer	SPL-240-011	11-19-03
■ -	8447D	HP	Preamplifier		2-28-04
■ -	80213	Fluke	Multimeter	CQL-260-032	2-17-04

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
- Polling RFID tag on supply roll

**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  - N/A

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ 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 \_\_\_\_\_ 46 dB at \_\_\_\_\_ 13.56 MHz

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

Remarks: The fundamental was measured to be 34 dBuV/m (50.12 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 meets the spurious limits at 13.5583 MHz and 13.5627 MHz.

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

The requirements are  - MET  - NOT MET

Minimum margin of compliance \_\_\_\_\_ 5 dB at \_\_\_\_\_ 108.45 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.

#### 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 13.56 MHz, or  $\pm 1.356$  kHz, so allowed band is 13.558644 MHz to 13.561356 MHz. Frequency deviates from 13.5605 MHz to 13.5610 MHz from  $-20$  to  $50$  degrees C and 4.25 to 5.75 VDC.

**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: 27 August 2003

Testing End Date: 16 September 2003

- TÜV PRODUCT SERVICE INC -

*Thomas K. Swanson*

T. K. Swanson  
Reviewed By

*Joel T. Schneider*

Tested By:  
J. T. Schneider

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

**See Test-Setup Exhibit**



## Appendix A

Test Data Sheets  
and  
Test Setup Drawing(s)



**TEST SETUP FOR EMISSIONS TESTING**

WILD RIVER LAB  
Small Test Site (STS)

**See Test-Setup Exhibit**



FCC Part 15.225 Magnetic Field Radiated Emissions 10 kHz to 30 MHz							
Customer Name: DataCard							
EUT: SP55							
Test Report # NC303915							
Test Date: 27 Augsut 2003							
MHz	dBuV/m 0.3 m	dBuV/m 1 m	dBuV/m 3 m	dBuV/m 10 m	dBuV/m 30 m	dBuV/m 30 m Limit	margin dB
0.009						80	
0.49						80	
0.49						80	
1.705						80	
1.705						80	
<b>13.56</b>			<b>72</b>	<b>52</b>	<b>34</b>	<b>80</b>	<b>46</b>
30						80	
Quasi-Peak							
All Levels are measured - No extrapolations							
No further harmonics or spurious emisison detected 10 kHz to 30 MHz							

Frequency stability testing on SP55 13.56 MHz transmitter – 16 September 2003 – J. T. Schneider

-20 degrees C	13.5610 MHz
-10 degrees C	13.5610 MHz
0 degrees C	13.5610 MHz
10 degrees C	13.5610 MHz
20 degrees C	13.5610 MHz
30 degrees C	13.5610 MHz
40 degrees C	13.5610 MHz
50 degrees C	13.5605 MHz

4.65 VDC	13.5610 MHz (eut ceased to operate at 4.65 VDC)
5.75 VDC	13.5610 MHz

.01 % deviation permissible =  $\pm 1.356$  kHz.  
EUT meets requirements – measured  $\pm 0.5$  kHz



# RADIATED EMISSIONS



Test Report #: 3915 Run 2                      Test Area: STS  
 EUT Model #: SUPPLIESID                      Date: 8/27/03  
 EUT Serial #: \_\_\_\_\_ EUT Power: DC                      Temperature: 22.0 °C  
 Test Method: FCC B                      Air Pressure: 98.0 kPa  
 Customer: DATACARD GROUP                      Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: 3915RE2.dat                      Page: 1 of 6

## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
40.0 MHz	32.5 Qp	0.9 / 16.85 / 29.5 / 0.0	20.75	V / 1.00 / 0	-19.25	n/a
43.27 MHz	33.53 Qp	1.01 / 15.78 / 29.39 / 0.0	20.93	V / 1.00 / 0	-19.07	n/a
57.7 MHz	43.29 Qp	1.2 / 12.48 / 29.4 / 0.0	27.57	V / 1.00 / 0	-12.43	n/a
70.0 MHz	28.52 Qp	1.3 / 8.9 / 29.4 / 0.0	9.32	V / 1.00 / 0	-30.68	n/a
80.0 MHz	30.99 Qp	1.3 / 7.48 / 29.3 / 0.0	10.47	V / 1.00 / 0	-29.53	n/a
81.35 MHz	39.28 Qp	1.32 / 7.43 / 29.3 / 0.0	18.73	V / 1.00 / 0	-21.27	n/a
94.836 MHz	44.0 Pk	1.4 / 8.37 / 29.4 / 0.0	24.37	V / 1.00 / 0	-19.13*	n/a
108.45 MHz	56.36 Qp	1.5 / 9.45 / 29.5 / 0.0	37.81	V / 1.00 / 0	-5.69	n/a
110.0 MHz	31.5 Qp	1.5 / 9.5 / 29.5 / 0.0	13.0	V / 1.00 / 0	-30.5	n/a
122.05 MHz	46.06 Qp	1.61 / 8.93 / 29.61 / 0.0	26.99	V / 1.00 / 0	-16.51	n/a
135.6 MHz	49.32 Qp	1.7 / 8.26 / 29.7 / 0.0	29.58	V / 1.00 / 0	-13.92	n/a
149.15 MHz	54.29 Qp	1.8 / 9.79 / 29.7 / 0.0	36.18	V / 1.00 / 0	-7.32	n/a
150.0 MHz	29.93 Qp	1.8 / 9.71 / 29.69 / 0.0	11.75	V / 1.00 / 0	-31.75	n/a
162.7 MHz	49.09 Qp	1.82 / 8.89 / 29.6 / 0.0	30.21	V / 1.00 / 0	-13.29	n/a
176.25 MHz	43.73 Qp	1.9 / 8.98 / 29.64 / 0.0	24.97	V / 1.00 / 0	-18.53	n/a
189.85 MHz	36.26 Qp	1.95 / 10.2 / 29.75 / 0.0	18.66	V / 1.00 / 0	-24.84	n/a
203.4 MHz	42.26 Qp	2.05 / 10.8 / 29.8 / 0.0	25.3	V / 1.00 / 0	-18.2	n/a
216.95 MHz	36.77 Qp	2.14 / 10.9 / 29.8 / 0.0	20.01	V / 1.00 / 0	-25.99	n/a
230.5 MHz	41.41 Qp	2.23 / 11.02 / 29.8 / 0.0	24.86	V / 1.00 / 0	-21.14	n/a
244.05 MHz	33.45 Qp	2.3 / 11.31 / 29.8 / 0.0	17.26	V / 1.00 / 0	-28.74	n/a
257.65 MHz	28.15 Qp	2.3 / 12.3 / 29.8 / 0.0	12.95	V / 1.00 / 0	-33.05	n/a
339.0 MHz	34.33 Qp	2.68 / 14.42 / 30.0 / 0.0	21.43	V / 1.00 / 0	-24.57	n/a
379.65 MHz	29.53 Qp	2.85 / 15.55 / 30.2 / 0.0	17.72	V / 1.00 / 0	-28.28	n/a
406.8 MHz	28.15 Qp	2.95 / 15.9 / 30.2 / 0.0	16.8	V / 1.00 / 0	-29.2	n/a
488.15 MHz	29.37 Qp	3.22 / 17.3 / 30.5 / 0.0	19.39	V / 1.00 / 0	-26.61	n/a

Tested by: J. T. SCHNEIDER

\_\_\_\_\_  
Printed

\_\_\_\_\_  
Signature

Reviewed by: TKS

\_\_\_\_\_  
Printed

\_\_\_\_\_  
Signature

# RADIATED EMISSIONS



Test Report #: 3915 Run 2                      Test Area: STS  
 EUT Model #: SUPPLIESID                      Date: 8/27/03  
 EUT Serial #: \_\_\_\_\_ EUT Power: DC                      Temperature: 22.0 °C  
 Test Method: FCC B                      Air Pressure: 98.0 kPa  
 Customer: DATA CARD GROUP                      Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: 3915RE2.dat                      Page: 2 of 6

## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
515.25 MHz	30.01 Qp	3.37 / 18.2 / 30.5 / 0.0	21.08	V / 1.00 / 0	-24.92	n/a
569.5 MHz	28.54 Qp	3.53 / 18.58 / 30.5 / 0.0	20.15	V / 1.00 / 0	-25.85	n/a
640.0 MHz	27.56 Qp	3.8 / 19.9 / 30.5 / 0.0	20.76	V / 1.00 / 0	-25.24	n/a
680.0 MHz	27.51 Qp	3.89 / 20.12 / 30.41 / 0.0	21.11	V / 1.00 / 0	-24.89	n/a
745.8 MHz	27.8 Qp	4.14 / 21.29 / 30.28 / 0.0	22.95	V / 1.00 / 0	-23.05	n/a
760.0 MHz	27.48 Qp	4.19 / 21.2 / 30.25 / 0.0	22.62	V / 1.00 / 0	-23.38	n/a
800.05 MHz	27.84 Qp	4.3 / 21.5 / 30.2 / 0.0	23.44	V / 1.00 / 0	-22.56	n/a
176.25 MHz	45.76 Qp	1.9 / 8.98 / 29.64 / 0.0	27.0	V / 1.00 / 90	-16.5	n/a
189.85 MHz	39.22 Qp	1.95 / 10.2 / 29.75 / 0.0	21.62	V / 1.00 / 90	-21.88	n/a
216.95 MHz	46.7 Qp	2.14 / 10.9 / 29.8 / 0.0	29.94	V / 1.00 / 90	-16.06	n/a
230.5 MHz	47.51 Qp	2.23 / 11.02 / 29.8 / 0.0	30.96	V / 1.00 / 90	-15.04	n/a
244.05 MHz	41.06 Qp	2.3 / 11.31 / 29.8 / 0.0	24.87	V / 1.00 / 90	-21.13	n/a
339.0 MHz	38.5 Qp	2.68 / 14.42 / 30.0 / 0.0	25.6	V / 1.00 / 90	-20.4	n/a
135.6 MHz	51.23 Qp	1.7 / 8.26 / 29.7 / 0.0	31.49	V / 1.00 / 180	-12.01	n/a
149.15 MHz	57.07 Qp	1.8 / 9.79 / 29.7 / 0.0	38.96	V / 1.00 / 180	-4.54	n/a
176.25 MHz	49.81 Qp	1.9 / 8.98 / 29.64 / 0.0	31.05	V / 1.00 / 180	-12.45	n/a
189.85 MHz	43.93 Qp	1.95 / 10.2 / 29.75 / 0.0	26.33	V / 1.00 / 180	-17.17	n/a
216.95 MHz	40.81 Qp	2.14 / 10.9 / 29.8 / 0.0	24.05	V / 1.00 / 180	-21.95	n/a
230.5 MHz	43.19 Qp	2.23 / 11.02 / 29.8 / 0.0	26.64	V / 1.00 / 180	-19.36	n/a
244.05 MHz	43.59 Qp	2.3 / 11.31 / 29.8 / 0.0	27.4	V / 1.00 / 180	-18.6	n/a
339.0 MHz	39.83 Qp	2.68 / 14.42 / 30.0 / 0.0	26.93	V / 1.00 / 180	-19.07	n/a
135.6 MHz	51.52 Qp	1.7 / 8.26 / 29.7 / 0.0	31.78	V / 1.00 / 270	-11.72	n/a
149.15 MHz	57.77 Qp	1.8 / 9.79 / 29.7 / 0.0	39.66	V / 1.00 / 270	-3.84	n/a
162.7 MHz	51.63 Qp	1.82 / 8.89 / 29.6 / 0.0	32.75	V / 1.00 / 270	-10.75	n/a
176.25 MHz	46.22 Qp	1.9 / 8.98 / 29.64 / 0.0	27.46	V / 1.00 / 270	-16.04	n/a

Tested by: J. T. SCHNEIDER

Printed

Signature

Reviewed by: TKS

Printed

Signature

# RADIATED EMISSIONS



Test Report #: 3915 Run 2 Test Area: STS  
 EUT Model #: SUPPLIESID Date: 8/27/03  
 EUT Serial #: \_\_\_\_\_ EUT Power: DC Temperature: 22.0 °C  
 Test Method: FCC B Air Pressure: 98.0 kPa  
 Customer: DATACARD GROUP Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: 3915RE2.dat Page: 3 of 6

## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
189.85 MHz	43.71 Qp	1.95 / 10.2 / 29.75 / 0.0	26.11	V / 1.00 / 270	-17.39	n/a
203.4 MHz	46.64 Qp	2.05 / 10.8 / 29.8 / 0.0	29.68	V / 1.00 / 270	-13.82	n/a
216.95 MHz	46.91 Qp	2.14 / 10.9 / 29.8 / 0.0	30.15	V / 1.00 / 270	-15.85	n/a
230.5 MHz	43.15 Qp	2.23 / 11.02 / 29.8 / 0.0	26.6	V / 1.00 / 270	-19.4	n/a
244.05 MHz	36.74 Qp	2.3 / 11.31 / 29.8 / 0.0	20.55	V / 1.00 / 270	-25.45	n/a
149.15 MHz	58.71 Qp	1.8 / 9.79 / 29.7 / 0.0	40.6	V / 1.00 / 210	-2.9	n/a
108.45 MHz	57.03 Qp	1.5 / 9.45 / 29.5 / 0.0	38.48	H / 3.00 / 90	-5.02	n/a
257.65 MHz	33.54 Qp	2.3 / 12.3 / 29.8 / 0.0	18.34	H / 3.00 / 90	-27.66	n/a
108.45 MHz	57.24 Qp	1.5 / 9.45 / 29.5 / 0.0	38.69	H / 1.80 / 90	-4.81	n/a
244.05 MHz	46.02 Qp	2.3 / 11.31 / 29.8 / 0.0	29.83	H / 1.00 / 0	-16.17	n/a
162.7 MHz	54.61 Qp	1.82 / 8.89 / 29.6 / 0.0	35.73	H / 1.00 / 90	-7.77	n/a
203.4 MHz	49.49 Qp	2.05 / 10.8 / 29.8 / 0.0	32.53	H / 1.00 / 90	-10.97	n/a
216.95 MHz	46.69 Qp	2.14 / 10.9 / 29.8 / 0.0	29.93	H / 1.00 / 90	-16.07	n/a
257.65 MHz	40.45 Qp	2.3 / 12.3 / 29.8 / 0.0	25.25	H / 1.00 / 90	-20.75	n/a
162.7 MHz	55.8 Qp	1.82 / 8.89 / 29.6 / 0.0	36.92	H / 1.00 / 270	-6.58	n/a
176.25 MHz	51.04 Qp	1.9 / 8.98 / 29.64 / 0.0	32.28	H / 1.00 / 270	-11.22	n/a
162.7 MHz	58.33 Qp	1.82 / 8.89 / 29.6 / 0.0	39.45	H / 1.20 / 240	-4.05	n/a

SCANNED 30-1000 MHZ, 360 DEGREES, 1-4 METERS HIGH, VERT. AND HOR. POLARIZATION

Tested by: J. T. SCHNEIDER

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Printed

\_\_\_\_\_  
Signature

Reviewed by: TKS

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Printed

\_\_\_\_\_  
Signature

# RADIATED EMISSIONS



Test Report #: 3915 Run 2 Test Area: STS  
EUT Model #: SUPPLIESID Date: 8/27/03  
EUT Serial #: \_\_\_\_\_ EUT Power: DC Temperature: 22.0 °C  
Test Method: FCC B Air Pressure: 98.0 kPa  
Customer: DATACARD GROUP Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: <u>3915RE2.dat</u>	Page: <u>4 of 6</u>
------------------------------------	---------------------

READINGS FROM 10 KHZ TO 30 MHZ FOLLOW.

.0544 MHZ	68 DBUV/M@3 METERS	26 DBUV/M@10 METERS (AMBIENT LEVEL)	300 METER LIMIT = 32 DBUV/M
13.56 MHZ	72 DBUV/M@3 METERS		
13.56 MHZ	52 DBUV/M@10 METERS		
13.56 MHZ	34 DBUV/M@30 METERS	AMBIENT LEVEL=26 DBUV/M	30 METER LIMIT = 80 DBUV/M (15.225)

NO OTHER SIGNALS DETECTED AT 3 METERS.

BAND EDGE PLOT SHOWS FUNDAMENTAL ABOVE 15.209 LIMIT ONLY FROM 13.5583-13.5627 MHZ (ALLOWED BAND IS 13.553-13.567 MHZ). SEE PAGE A11.

Tested by: J. T. SCHNEIDER

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Printed

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Signature

Reviewed by: TKS

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Signature

# RADIATED EMISSIONS



Test Report #: 3915 Run 2 Test Area: STS  
 EUT Model #: SUPPLIESID Date: 8/27/03  
 EUT Serial #: \_\_\_\_\_ EUT Power: DC Temperature: 22.0 °C  
 Test Method: FCC B Air Pressure: 98.0 kPa  
 Customer: DATACARD GROUP Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

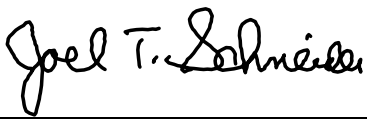
Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: 3915RE2.dat Page: 5 of 6

### 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
149.15 MHz	58.71 Qp	1.8 / 9.79 / 29.7 / 0.0	40.6	V / 1.00 / 210	-2.9
162.7 MHz	58.33 Qp	1.82 / 8.89 / 29.6 / 0.0	39.45	H / 1.20 / 240	-4.05
108.45 MHz	57.24 Qp	1.5 / 9.45 / 29.5 / 0.0	38.69	H / 1.80 / 90	-4.81
203.4 MHz	49.49 Qp	2.05 / 10.8 / 29.8 / 0.0	32.53	H / 1.00 / 90	-10.97
176.25 MHz	51.04 Qp	1.9 / 8.98 / 29.64 / 0.0	32.28	H / 1.00 / 270	-11.22
135.6 MHz	51.52 Qp	1.7 / 8.26 / 29.7 / 0.0	31.78	V / 1.00 / 270	-11.72
57.7 MHz	43.29 Qp	1.2 / 12.48 / 29.4 / 0.0	27.57	V / 1.00 / 0	-12.43

Tested by: J. T. SCHNEIDER  
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 Printed

  
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 Signature

Reviewed by: TKS  
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 \_\_\_\_\_  
 Signature

# RADIATED EMISSIONS



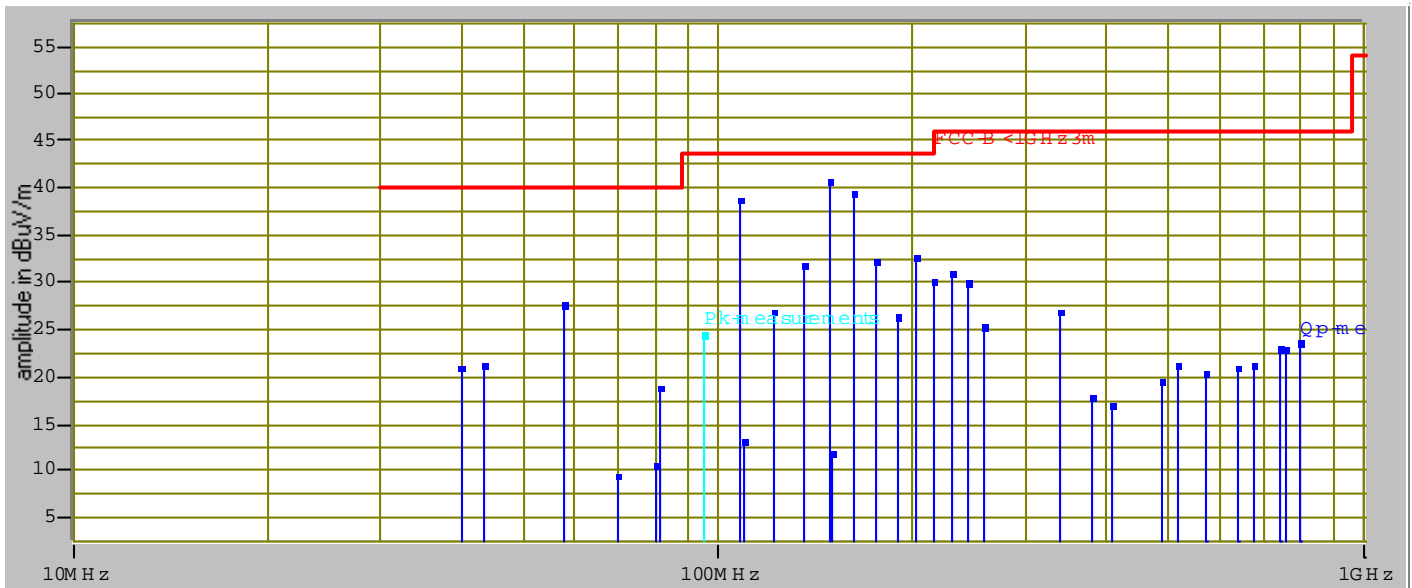
Test Report #: 3915 Run 2 Test Area: STS  
EUT Model #: SUPPLIESID Date: 8/27/03  
EUT Serial #: \_\_\_\_\_ EUT Power: DC Temperature: 22.0 °C  
Test Method: FCC B Air Pressure: 98.0 kPa  
Customer: DATACARD GROUP Rel. Humidity: 53.0 %

EUT Description: 13.56 MHZ RFID

Notes: ADDED TWO 0.1 UF CAPS FROM +5VDC INPUTS TO GROUND

Data File Name: 3915RE2.dat Page: 6 of 6

## Graph:



Tested by: J. T. SCHNEIDER

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Printed

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Signature

Reviewed by: TKS

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Signature

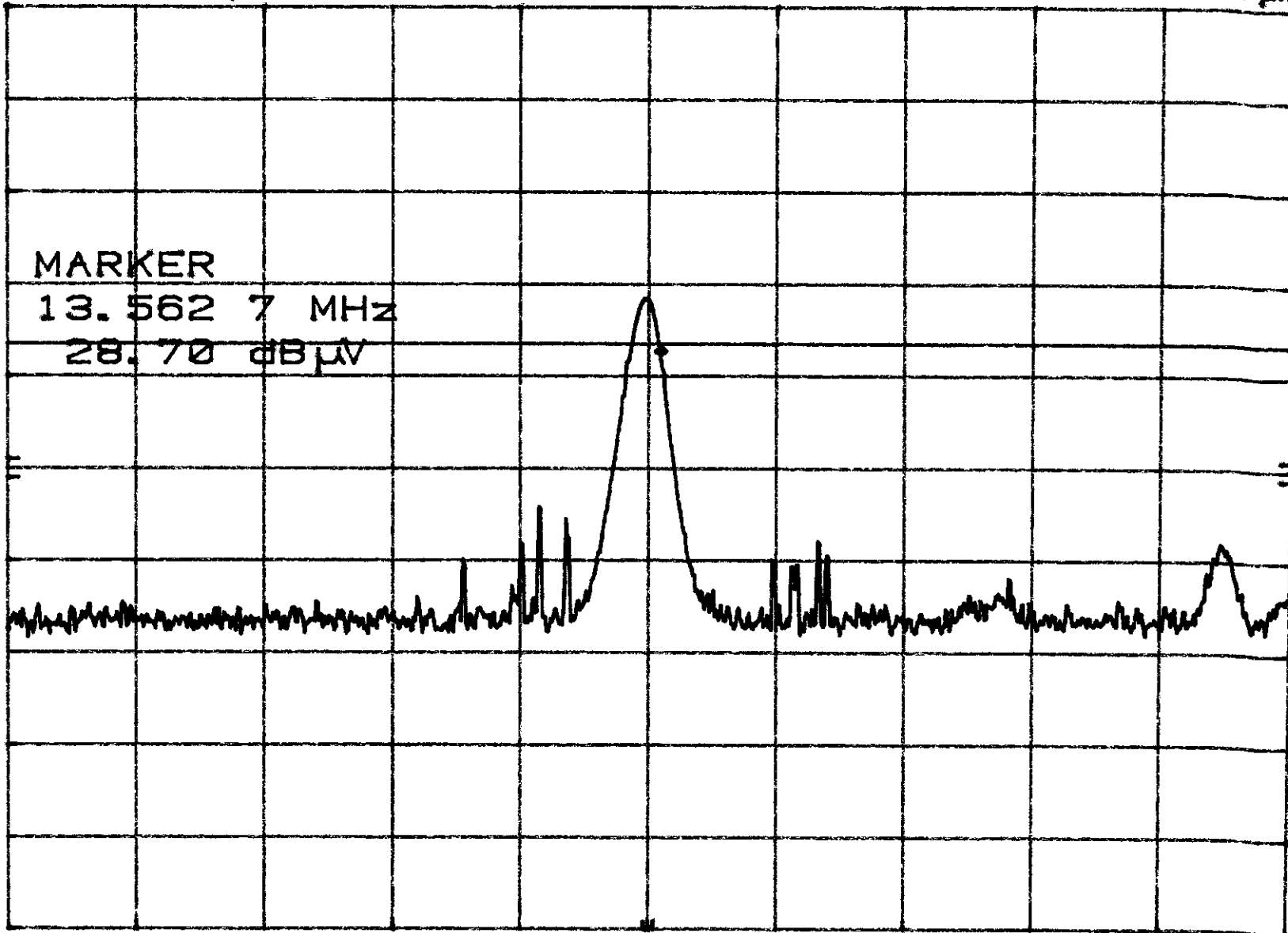
MKR 13.562 7 MHz  
28.70 dB $\mu$ V

hp REF 66.0 dB $\mu$ V ATTN 10 dB

10 dB/

OFFSET  
-23.0  
dB

DL  
28.5  
dB $\mu$ V



CENTER 13.560 MHz  
RES BW 3 kHz

VBW 10 kHz

SPAN 200 kHz  
SWP 100 msec

## 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 W.  
Minnetonka, MN 55343

Contact: Roger McCumber Position: Electrical Engineer

Phone: 952 988 1913 Fax: \_\_\_\_\_

E-mail Address: roger\_McCumber@datacard.com

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

EUT Description Supplies RFID system

EUT Name SuppliesID

Model No.: \_\_\_\_\_ Serial No.: \_\_\_\_\_

Product Options: \_\_\_\_\_

Configurations to be tested: \_\_\_\_\_

**Test Objective**

- EMC Directive 89/336/EEC (EMC)  FCC: Class  A  B Part 15c
- Std: \_\_\_\_\_  VCCI: Class  A  B
- Machinery Directive 89/392/EEC (EMC)  BCIC: Class  A  B
- Std: \_\_\_\_\_  Canada: Class  A  B
- Medical Device Directive 93/42/EEC (EMC)  Australia: Class  A  B
- Std: \_\_\_\_\_  Other: RTTE Directive: ETSI 300 330
- Vehicle Directive 72/245/EEC (EMC)
- Std: \_\_\_\_\_
- FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

**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

# EMC Test Plan and Constructional Data Form

(Press F1 when field is selected to show additional information on Protection Class.)

### Attendance

Test will be:  Attended by the customer     Unattended by the customer

### Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TUV Product Service should:

- Call contact listed above, if not available then stop testing. (After hrs phone): \_\_\_\_\_
- Continue testing to complete test series.
- Continue testing to define corrective action.
- Stop testing.

### EUT Specifications and Requirements

Length: \_\_\_\_\_ Width: \_\_\_\_\_ Height: \_\_\_\_\_ Weight: \_\_\_\_\_

### 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: 5V (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: 1

Current (Amps/phase(max)): \_\_\_\_\_ Current (Amps/phase(nominal)): \_\_\_\_\_

Other \_\_\_\_\_

### Other Special Requirements

### Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)  
Office, Card Processing Secure area

### EUT Power Cable

Permanent    OR     Removable    Length (in meters): \_\_\_\_\_  
 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
<b>EXAMPLE:</b> RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
t	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					0	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>

# EMC Test Plan and Constructional Data Form



**EUT Software.**

Revision Level:

Description:

**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. Polling RFID tag on supply roll
- 2.
- 3.

**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 #

## EMC Test Plan and Constructional Data Form

<b>Support Equipment</b> -- 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>
5V Power Supply	Any regulated 5V power supply		

<b>Oscillator Frequencies</b>			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
40 Mhz			Clock
13.56 Mhz		RFID Transmit frequency	

<b>Power Supply</b>			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

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

Form

# EMC Test Plan and Constructional Data Form



<b>Critical EMI Components (Capacitors, ferrites, etc.)</b>				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>

**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.

Roger McCumber

Test Plan/CDF Prepared By (please print)

Reviewed by TÜV Product Service Associate

Date

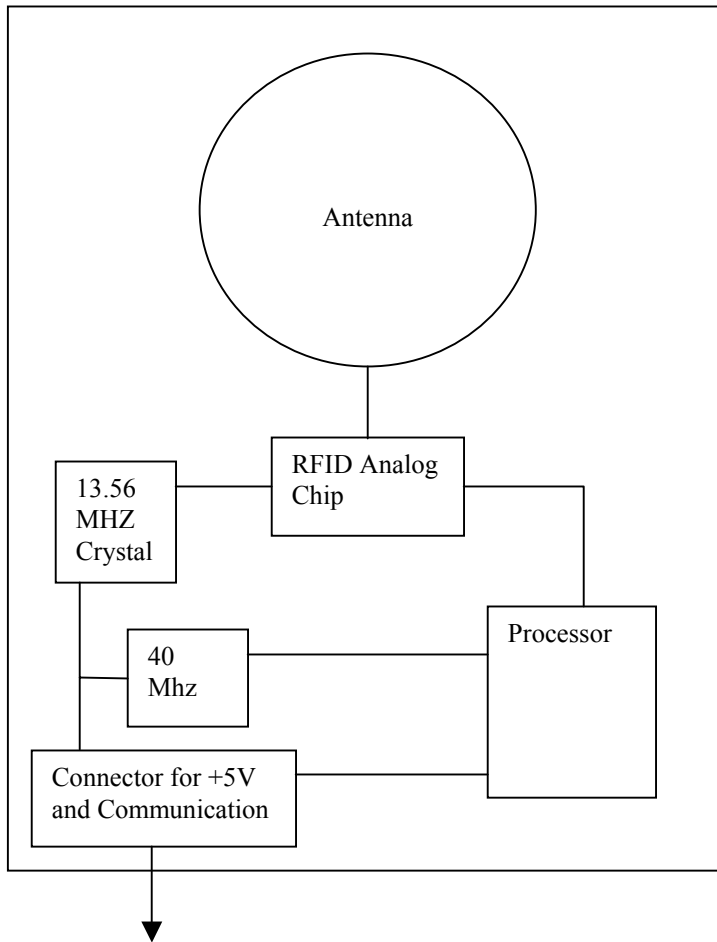
8/27/03

Date

Date

# EMC Block Diagram Form

**System Configuration Block Diagram** -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



## Authorization Signatures

\_\_\_\_\_  
 Customer authorization to perform tests according to this test plan.

\_\_\_\_\_  
 Date

\_\_\_\_\_  
 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  $\pm 4.5$  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 its 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  $\text{dB}\mu\text{V}$ , is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between  $\text{dB}\mu\text{V}$  and  $\mu\text{V}$ , 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  $\text{dB}\mu\text{V}/\text{m}$ , is arrived at by taking the reading from the spectrum analyzer (Level  $\text{dB}\mu\text{V}$ ), 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 ( $\text{dB}\mu\text{V}$ )	CABLE/ANT/PREAMP (dB)	FINAL ( $\text{dB}\mu\text{V}/\text{m}$ )	POL/HGT/AZ (m) (deg)	DELTA1 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  $\Omega$ /50  $\mu$ 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.