

*FCC PART 15, SUBPART B and C
TEST REPORT**for***CARD PRINTER with RFID****MODEL: DG420i**

Prepared for

**ZEBRA TECHNOLOGIES CORPORATION
1001 FLYNN ROAD
CAMARILLO, CALIFORNIA 93012**

Prepared by: _____

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DATE: JULY 14, 2003

	REPORT BODY	APPENDICES						TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	F	
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Device Tested: Card Printer with RFID
Model: DG420i
S/N: 2154609

Product Description: See Expository Statement.

Modifications: The EUT was not modified in order to meet the specifications.

Manufacturer: Zebra Technologies Corporation
1001 Flynn Road
Camarillo, California 93012

Test Dates: June 9 and 20, 2003

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.207, 15.209 and 15.225

Test Procedure: ANSI C63.4: 1992

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.207.
2	Radiated RF Emissions, 10 kHz - 1000 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.225.



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Card Printer with RFID Model: DG420i. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the Class B specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209 and 15.225.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823. The temperature testing was performed at Environmental Associates located at 2300 Cape Cod Way, Santa Ana, California.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Zebra Technologies Corporation

Shlomo Rozen Sr. Reliability Engineer

Compatible Electronics, Inc.

Benigno Chavez Test Technician

Kyle Fujimoto Test Engineer

Michael Christensen Test Engineer

2.4 Date Test Sample was Received

The test sample was received on June 9, 2003.

2.5 Disposition of the Test Sample

The sample has not been returned to Zebra Technologies Corporation as of June 24, 2003.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network



3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
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



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT:

The Card Printer with RFID Model: DG420i (EUT) was tested by continuously printing cards. During the testing, the EUT was connected to an ethernet hub via its ethernet port. The ethernet hub was connected to a computer via its ethernet port and the computer was connected to a keyboard, mouse, monitor, and modem via its keyboard, mouse, video, and serial ports, respectively. Also, during the testing, the RFID was continuously transmitting. The RFID antenna is a PCB trace.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The cables were moved to maximize the emissions. The final conducted as well as radiated data was taken in this mode of operation. All initial investigations were performed with the spectrum analyzer in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix D.



4.1.1 Cable Construction and Termination

Cable 1

This is a 1.25 meter braid and foil shielded cable connecting the computer to the monitor. It has a high density D-15 pin metallic connector at the computer end and is hard wired at the monitor end. The shield of the cable was terminated at the connector. The cable also has a molded ferrite at the computer end.

Cable 2

This is a 2 meter unshielded cable connecting the computer to the ethernet hub. It has an RJ-45 connector at both ends. The cable was bundled to a length of 1.4 meters.

Cable 3

This is a 4.5 meter unshielded cable connecting the EUT to the ethernet hub. It has an RJ-45 connector at both ends. The cable was bundled to a length of 1 meter.

Cable 4

This is a 1.5 meter braid and foil shielded cable connecting the computer to the modem. It has a D-9 pin metallic connector at the computer end and a D-25 metallic connector at the modem end. The shield of the cable was terminated via the connectors.

Cable 5

This is a 2 meter foil shielded cable connecting the computer to the keyboard. It has a 6 pin mini DIN connector at the computer end and is hard wired at the keyboard end. The shield of the cable was grounded to the chassis via the connector.

Cable 6

This is a 1.9 meter foil shielded cable connecting the computer to the mouse. It has a 6 pin mini DIN connector at the computer end and is hard wired at the mouse end. The shield of the cable was grounded to the chassis via the connector.

Cable 7

This is a 2 meter unshielded cable connecting the AC adapter to the modem. It is hard wired at the AC adapter end and has a 3 pin connector at the modem end.

Cable 8

This is a 2 meter unshielded cable connecting the AC adapter to the ethernet hub. It is hard wired at the AC adapter end and has a 3 mm barrel connector at the ethernet hub end.



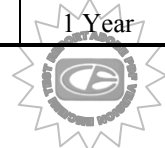
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIALNUMBER	FCC ID
CARD PRINTER with RFID (EUT)	ZEBRA TECHNOLOGIES CORPORATION	DG420i	2154609	I28DG420I-1356MHZ
COMPUTER	COMPAQ	SERIES PD1010	6914CBP4D295	DoC
MONITOR	DIGIVIEW	HR-1434	15B818310	AMPJD144
KEYBOARD	COMPAQ	RT101	1GD39CV19589	AQ6-MTN4XZ15
MOUSE	COMPAQ	M-S34	P/N: 141189-401	DZL211029
MODEM	HAYES	231AA	A0563100823	BFJ9D9231AA
ETHERNET HUB	LINKSYS	EZXS88W Ver. 3.0	RA30228012651	DoC
AC ADAPTER (MODEM)	HAYES	52-00008	N/A	N/A
AC ADAPTER (ETHERNET HUB)	LINKSYS	AD 9/8	P/N: PSA9P8-AM-H-2K	N/A



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
Radiate Emissions Data Capture Program	Compatible Electronics	2.0	N/A	N/A	N/A
Emissions Program	Compatible Electronics	2.3 (SR19)	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	2727A04757	November 12, 2002	1 Year
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	2648A15455	November 12, 2002	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	3303A01688	November 12, 2002	1 Year
Preamplifier	Com Power	PA-103	1582	March 6, 2003	1 Year
Biconical Antenna	Com Power	AB-900	15226	April 21, 2003	1 Year
Log Periodic Antenna	Com Power	AL-100	16202	February 3, 2003	1 Year
RF Attenuator	Weinschel Corp.	2	BJ6394	July 30, 2002	1 Year
LISN	Com Power	LI-215	12090	November 20, 2002	1 Year
LISN	Com Power	LI-215	12076	November 20, 2002	1 Year
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	4530	US91912319	N/A	N/A
Monitor	Hewlett Packard	D5258A	TW74500641	N/A	N/A
Loop Antenna	Com-Power	AL-130	17070	June 19, 2002	1 Year
Frequency Counter	Global Specialties	5003	G001742	September 26, 2002	1 Year
Variable Auto Transformer	Staco Energy Products	3PN1010	N/A	N/A	N/A
Multimeter	Fluke	87	51350019	July 11, 2002	1 Year



6. TEST SITE DESCRIPTION**6.1 Test Facility Description**

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

For all tests except for Frequency Tolerance of the Carrier Signal, the EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

For Frequency Tolerance of the Carrier Signal, the EUT was powered by a Staco Energy Products Variable Auto Transformer and placed inside a temperature chamber. The output of the Variable Auto Transformer was verified by a Fluke Multimeter.

The EUT was grounded only through the safety ground in its power cord.



7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the **Class B** limits of EN 55022: 1998 for conducted emissions; and the limits of CFR Title 47, Part 15, Subpart C, Section 15.207 for conducted emissions.



7.1.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. A preamplifier was used to increase the sensitivity of the instrument. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data. The final qualification data sheets are located in Appendix E.



7.2 Frequency Tolerance of Carrier Signal

Please see section 6.2 of this test report for mounting, bonding and grounding of the EUT. Please see appendix F for the temperature testing equipment and graph. The EUT had at least a 20 minute acclimation period before taking the readings in order to make sure the EUT was at the proper temperature. The EUT was checked with a frequency counter to determine whether the carrier signal was within 0.01% of the fundamental frequency at 0 minutes, 2 minutes, 5 minutes and 10 minutes after the acclimation period. The frequency tolerance of the carrier signal was also checked at 85% and 115% of the rated supply voltage at 20 degrees C. A data sheet of the Frequency Tolerance testing is located in Appendix E.

Test Results:

The EUT complies with the frequency tolerance requirements of CFR Title 47, Part 15, Subpart C, Section 15.225.



8. CONCLUSIONS

The Card Printer with RFID Model: DG420i meets all of the Class B specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.225.



APPENDIX A

LABORATORY RECOGNITIONS



LABORATORY RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200528-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)



APPENDIX B

MODIFICATIONS TO THE EUT

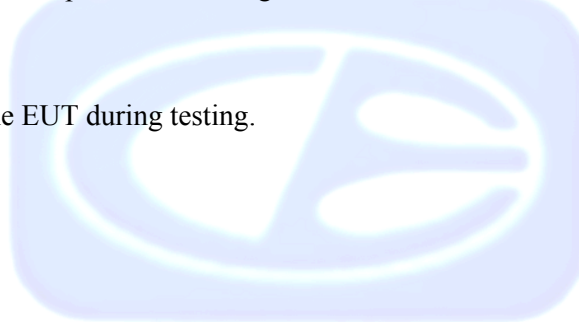


MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.225 or FCC Class B specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during testing.



APPENDIX C

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Card Printer with RFID
Model: DG420i
S/N: 2154609

There were no additional models covered under this report.



APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS



FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

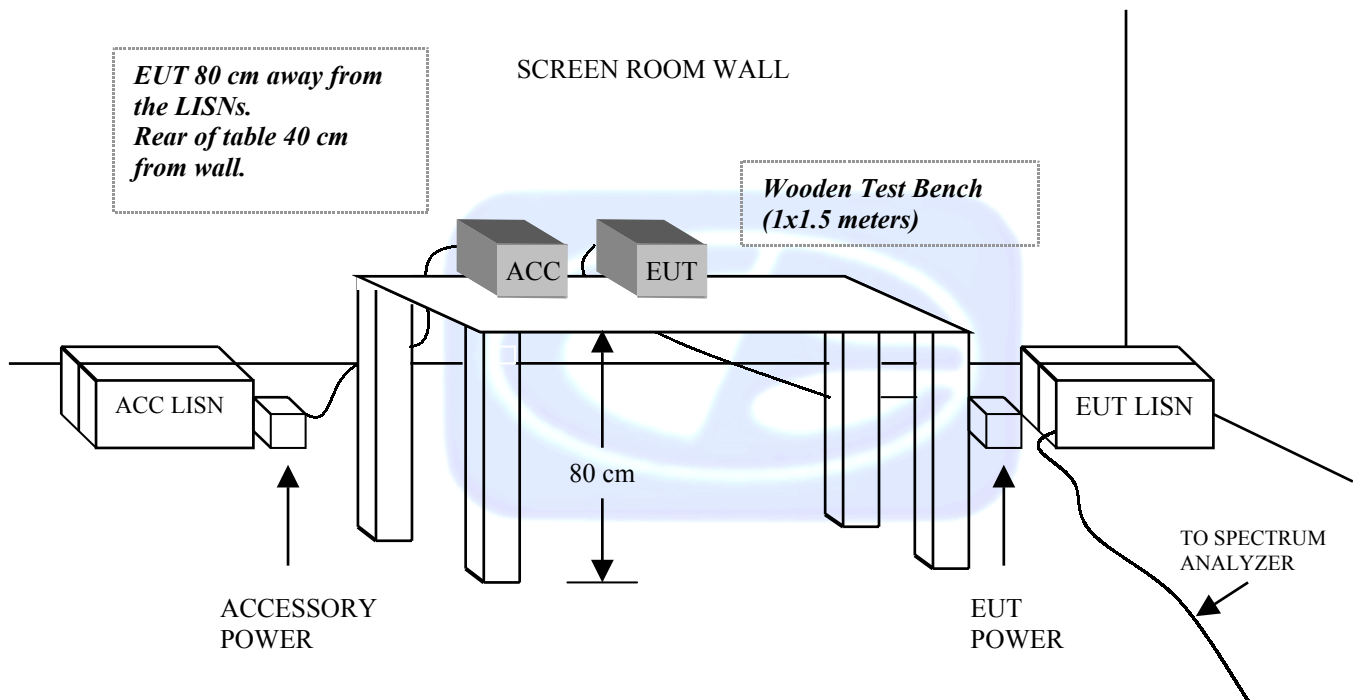
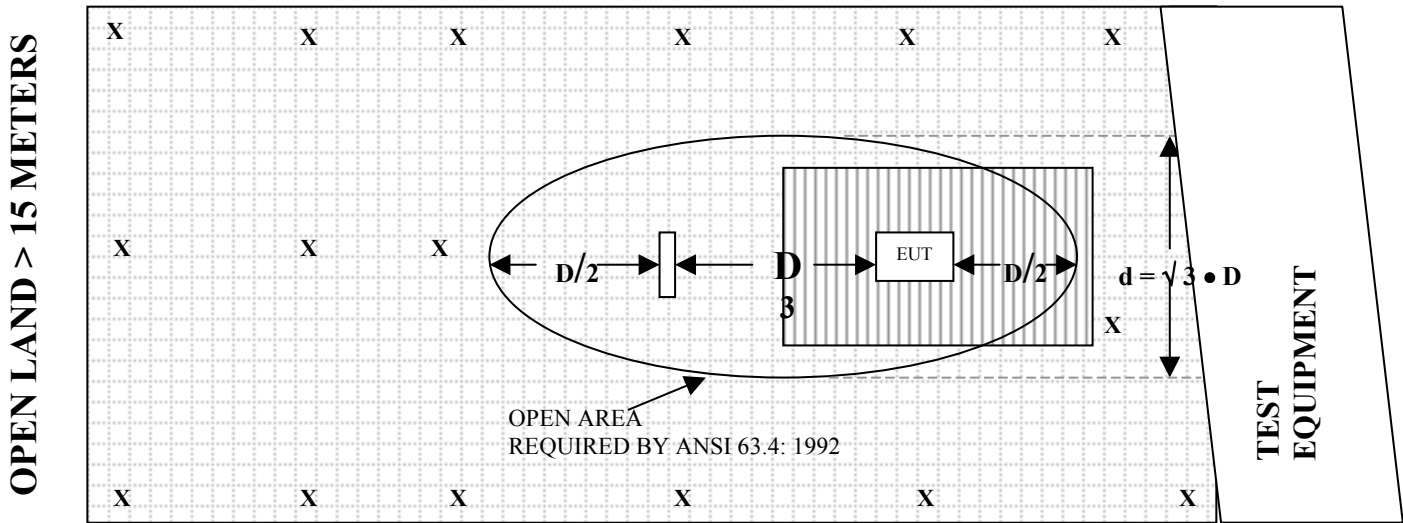


FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

- X** = GROUND RODS
- D** = TEST DISTANCE (meters)
- [Grid Pattern] = GROUND SCREEN
- [Vertical Lines] = WOOD COVER



COM-POWER AB-900

BICONICAL ANTENNA

S/N: 15226

CALIBRATION DATE: APRIL 21, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	11.20	120	13.80
35	10.40	125	12.50
40	10.20	140	12.50
45	11.00	150	10.90
50	11.30	160	11.50
60	9.60	175	14.90
70	7.40	180	15.50
80	6.10	200	16.90
90	7.70	250	15.50
100	10.50	300	23.80



COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16202

CALIBRATION DATE: FEBRUARY 3, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	12.70	700	20.60
400	15.40	800	21.80
500	16.50	900	21.00
600	17.20	1000	21.50



COM-POWER PA-103**PREAMPLIFIER**

S/N: 1582

CALIBRATION DATE: MARCH 6, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	33.6	300	33.3
40	33.6	350	33.3
50	33.6	400	33.1
60	33.6	450	33.0
70	33.5	500	32.9
80	33.5	550	33.0
90	33.5	600	32.8
100	33.6	650	32.6
125	33.6	700	32.7
150	33.4	750	32.4
175	33.5	800	32.4
200	33.4	850	32.7
225	33.3	900	31.9
250	33.2	950	31.8
275	33.3	1000	32.5



COM-POWER AL-130**LOOP ANTENNA**

S/N: 17070

CALIBRATION DATE: JUNE 19, 2002

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-40.4	11.1
0.01	-40.3	11.2
0.02	-41.2	10.3
0.05	-41.6	9.9
0.07	-41.4	10.1
0.1	-41.7	9.8
0.2	-44.0	7.5
0.3	-41.6	9.9
0.5	-41.3	10.2
0.7	-41.4	10.1
1	-40.9	10.6
2	-40.6	10.9
3	-40.5	11.0
4	-40.8	10.7
5	-40.2	11.3
10	-40.7	10.8
15	-41.4	10.1
20	-41.6	9.9
25	-41.7	9.8
30	-42.9	8.6





FRONT VIEW

ZEBRA TECHNOLOGIES CORPORATION
CARD PRINTER with RFID
MODEL: DG420i
FCC SUBPART B AND C - RADIATED EMISSIONS – 6-9-03

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





REAR VIEW

ZEBRA TECHNOLOGIES CORPORATION
CARD PRINTER with RFID
MODEL: DG420i
FCC SUBPART B AND C - RADIATED EMISSIONS – 6-9-03

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





FRONT VIEW

ZEBRA TECHNOLOGIES CORPORATION
CARD PRINTER with RFID
MODEL: DG420i
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 6-9-03

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



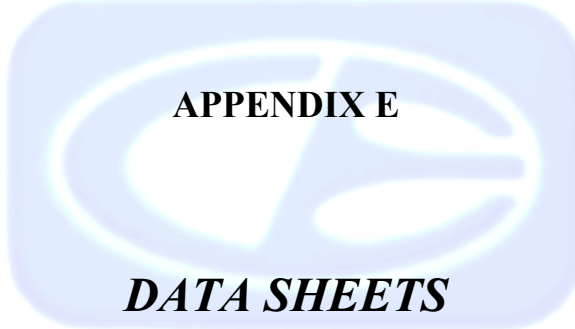


REAR VIEW

ZEBRA TECHNOLOGIES CORPORATION
CARD PRINTER with RFID
MODEL: DG420i
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 6-9-03

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**




APPENDIX E
DATA SHEETS



***RADIATED AND
CONDUCTED EMISSIONS
DATA SHEETS***



RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.225)

COMPANY	ZEBRA TECHNOLOGIES	DATE	6/9/03
EUT	CARD PRINTER	DUTY CYCLE	N/A %
MODEL	DG420i	PEAK TO AVG	N/A dB
S/N	2154609	TEST DIST.	3 Meters
TEST ENGINEER	Michael Christensen	LAB	A

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
13.5600	27.0	A	H	1.0	0			10.3	0.5	0.0	20.0	0.0	17.8	-62.2	80.0	DATA TAKEN AT 3 M
																NO NEED TO EXTRAPOLATE
																LIMIT FROM 30 METERS
13.5600	29.5	A	V	1.0	0			10.3	0.5	0.0	20.0	0.0	20.3	-59.7	80.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.225)

COMPANY	ZEBRA TECHNOLOGIES	DATE	6/9/03
EUT	CARD PRINTER	DUTY CYCLE	N/A %
MODEL	DG420i	PEAK TO AVG	N/A dB
S/N	2154609	TEST DIST.	3 Meters
TEST ENGINEER	Michael Christensen	LAB	A

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
27.1200	23.4	A	H	1.0	0			9.3	0.7	0.0	20.0	0.0	13.4	-16.1	29.5	
27.1200	23.3	A	V	1.0	0			9.3	0.7	0.0	20.0	0.0	13.3	-16.2	29.5	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

Test Location : Compatible Electronics Page : 1/4
 Customer : DIGIMARC Date : 6/09/2003
 Manufacturer : ZEBRA TECHNOLOGIES Time : 13:09:15
 Eut name : CARD PRINTER Lab : A
 Model : DG420i Test Distance : 3.0
 Serial # :
 Specification : FCC Class B
 Distance correction factor (20 * log(test/spec) : 0.00
 Test Mode : TESTED BY MICHAEL CHRISTENSEN

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	Li mit = L dBuV/m	Delta R-L dB
1V	32.111	55.20	0.95	11.26	33.60	33.81	40.00	-6.19
2H	64.068	49.60	1.34	8.55	33.56	25.93	40.00	-14.07
3V	64.081	58.20	1.34	8.55	33.56	34.53	40.00	-5.47
4H	67.849	50.50	1.38	7.80	33.52	26.16	40.00	-13.84
5V	67.862	50.70	1.38	7.80	33.52	26.36	40.00	-13.64
6V	67.862Qp	49.96	1.38	7.80	33.52	25.62	40.00	-14.38
7H	67.872	48.80	1.38	7.80	33.52	24.46	40.00	-15.54
8V	73.782	54.60	1.44	6.89	33.50	29.43	40.00	-10.57
9V	80.061	55.30	1.50	6.11	33.50	29.41	40.00	-10.59
10H	80.104	48.30	1.50	6.11	33.50	22.42	40.00	-17.58
11V	88.571	57.90	1.59	7.22	33.50	33.21	43.50	-10.29
12V	100.062	59.10	1.60	10.21	33.60	37.31	43.50	-6.19
13V	127.058	56.10	1.83	12.27	33.58	36.62	43.50	-6.88
14H	128.505	55.40	1.85	12.25	33.57	35.93	43.50	-7.57
15H	128.574	54.70	1.85	12.25	33.57	35.23	43.50	-8.27
16H	134.964	52.60	1.93	12.16	33.52	33.17	43.50	-10.33
17V	135.664Qp	44.40	1.93	12.16	33.51	24.98	43.50	-18.52
18V	135.664	46.10	1.93	12.16	33.51	26.68	43.50	-16.82
19V	143.463	55.00	2.03	11.78	33.45	35.36	43.50	-8.14
20H	144.099	52.40	2.03	11.72	33.44	32.71	43.50	-10.79
21H	147.518	50.70	2.07	11.42	33.42	30.77	43.50	-12.73
22V	147.559	50.40	2.07	11.41	33.42	30.47	43.50	-13.03
23V	147.874	60.10	2.08	11.39	33.42	40.15	43.50	-3.35
24V	147.880Qp	50.52	2.08	11.39	33.42	30.57	43.50	-12.93
25H	151.606	52.20	2.11	11.35	33.41	32.25	43.50	-11.25
26H	159.190	44.70	2.14	12.03	33.44	25.43	43.50	-18.07
27H	160.079	52.20	2.14	12.12	33.44	33.02	43.50	-10.48
28V	160.107	54.60	2.14	12.12	33.44	35.42	43.50	-8.08
29V	160.108	54.10	2.14	12.12	33.44	34.92	43.50	-8.58
30H	162.157	50.00	2.15	12.56	33.45	31.26	43.50	-12.24
31H	168.868	51.50	2.18	13.97	33.48	34.17	43.50	-9.33
32H	170.826	49.90	2.18	14.36	33.48	32.96	43.50	-10.54
33V	180.081	51.40	2.26	15.90	33.48	36.09	43.50	-7.41
34H	194.746	55.10	2.44	16.72	33.42	40.84	43.50	-2.66
35H	194.766Qp	52.31	2.44	16.72	33.42	38.05	43.50	-5.45



Test Location : Compatible Electronics Page : 2/4
 Customer : DIGIMARC Date : 6/09/2003
 Manufacturer : ZEBRA TECHNOLOGIES Time : 13:09:15
 Eut name : CARD PRINTER Lab : A
 Model : DG420i Test Distance : 3.0
 Serial # :
 Specification : FCC Class B
 Distance correction factor (20 * log(test/spec) : 0.00
 Test Mode : TESTED BY MICHAEL CHRISTENSEN

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	Li mit = L dBuV/m	Del ta R-L dB
36H	199.008	57.50	2.49	16.95	33.40	43.53	43.50	0.03
37H	199.011Qp	54.52	2.49	16.95	33.40	40.55	43.50	-2.95
38H	200.108	52.20	2.50	17.00	33.40	38.30	43.50	-5.20
39H	202.256	56.20	2.51	16.94	33.39	42.26	43.50	-1.24
40H	202.259Qp	52.93	2.51	16.94	33.39	38.99	43.50	-4.51
41H	207.046	58.80	2.53	16.83	33.37	44.79	43.50	1.29
42H	207.047Qp	54.18	2.53	16.83	33.37	40.17	43.50	-3.33
43V	217.000	48.40	2.57	16.60	33.33	34.24	46.00	-11.76
44H	217.000	50.40	2.57	16.60	33.33	36.24	46.00	-9.76
45V	217.001Qp	47.44	2.57	16.60	33.33	33.28	46.00	-12.72
46H	217.003Qp	48.11	2.57	16.60	33.33	33.95	46.00	-12.05
47H	217.018	50.60	2.57	16.60	33.33	36.44	46.00	-9.56
48H	224.071	54.70	2.60	16.44	33.30	40.43	46.00	-5.57
49V	224.102	51.50	2.60	16.44	33.30	37.23	46.00	-8.77
50H	227.001	53.00	2.61	16.38	33.29	38.69	46.00	-7.31
51V	228.896	49.10	2.62	16.33	33.28	34.77	46.00	-11.23
52V	230.565	47.00	2.62	16.30	33.28	32.65	46.00	-13.35
53V	230.565Qp	46.03	2.62	16.30	33.28	31.68	46.00	-14.32
54H	230.601	52.30	2.62	16.30	33.28	37.94	46.00	-8.06
55H	230.602	46.30	2.62	16.30	33.28	31.94	46.00	-14.06
56H	230.603Qp	51.35	2.62	16.30	33.28	36.99	46.00	-9.01
57H	232.198	54.70	2.63	16.26	33.27	40.32	46.00	-5.68
58H	235.880	52.40	2.64	16.19	33.26	37.98	46.00	-8.02
59H	240.026	44.30	2.66	16.10	33.24	29.82	46.00	-16.18
60H	243.444	47.80	2.67	16.03	33.23	33.28	46.00	-12.72
61V	250.074	48.70	2.70	15.91	33.20	34.11	46.00	-11.89
62V	256.060	43.70	2.73	16.40	33.23	29.60	46.00	-16.40
63H	257.511	49.20	2.73	16.52	33.23	35.22	46.00	-10.78
64H	288.061	40.40	2.85	18.85	33.30	28.81	46.00	-17.19
65V	311.909	49.60	2.98	13.07	33.30	32.34	46.00	-13.66
66V	320.062	50.00	3.03	13.31	33.30	33.03	46.00	-12.97
67H	320.070	48.70	3.03	13.31	33.30	31.73	46.00	-14.27
68H	320.103	49.60	3.03	13.31	33.30	32.63	46.00	-13.37
69H	324.221	52.90	3.05	13.43	33.30	36.08	46.00	-9.92
70V	325.518	52.00	3.06	13.47	33.30	35.23	46.00	-10.77



Test Location : Compatible Electronics Page : 3/4
 Customer : DIGIMARC Date : 6/09/2003
 Manufacturer : ZEBRA TECHNOLOGIES Time : 13:09:15
 Eut name : CARD PRINTER Lab : A
 Model : DG420i Test Distance : 3.0
 Serial # :
 Specification : FCC Class B
 Distance correction factor (20 * log(test/spec) : 0.00
 Test Mode : TESTED BY MICHAEL CHRISTENSEN

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor' d rdg = R dBuV	Li mi t = L dBuV/m	Del ta R- L dB
71V	339.028	53.30	3.14	13.85	33.30	36.99	46.00	-9.01
72V	339.031	54.90	3.14	13.85	33.30	38.59	46.00	-7.41
73H	339.043	51.00	3.14	13.85	33.30	34.69	46.00	-11.31
74V	340.732	53.90	3.15	13.89	33.30	37.64	46.00	-8.36
75V	343.324	52.50	3.16	13.97	33.30	36.33	46.00	-9.67
76H	346.533	48.40	3.18	14.05	33.30	32.33	46.00	-13.67
77H	352.058Qp	58.40	3.21	14.20	33.29	42.52	46.00	-3.48
78H	352.058	59.10	3.21	14.20	33.29	43.22	46.00	-2.78
79V	352.082	60.70	3.21	14.20	33.29	44.82	46.00	-1.18
80V	352.088Qp	59.46	3.21	14.20	33.29	43.58	46.00	-2.42
81V	352.608	54.80	3.22	14.22	33.29	38.94	46.00	-7.06
82V	352.613Qp	52.42	3.22	14.22	33.29	36.56	46.00	-9.44
83H	352.626Qp	49.52	3.22	14.22	33.29	33.66	46.00	-12.34
84H	352.636	50.60	3.22	14.22	33.29	34.75	46.00	-11.25
85V	360.134	52.20	3.26	14.41	33.26	36.62	46.00	-9.38
86V	366.186	56.90	3.30	14.57	33.23	41.54	46.00	-4.46
87V	366.190Qp	55.03	3.30	14.57	33.23	39.67	46.00	-6.33
88H	371.965	44.10	3.34	14.72	33.21	28.95	46.00	-17.05
89V	379.695	52.30	3.38	14.91	33.18	37.42	46.00	-8.58
90V	379.697Qp	49.31	3.38	14.91	33.18	34.43	46.00	-11.57
91V	379.712	52.40	3.38	14.91	33.18	37.52	46.00	-8.48
92V	384.066	51.60	3.41	15.02	33.16	36.87	46.00	-9.13
93H	384.091	43.00	3.41	15.02	33.16	28.27	46.00	-17.73
94V	393.285	49.10	3.46	15.24	33.13	34.68	46.00	-11.32
95H	400.070	43.90	3.50	15.40	33.10	29.70	46.00	-16.30
96V	406.840	46.30	3.53	15.48	33.09	32.23	46.00	-13.77
97H	416.044	41.90	3.57	15.59	33.07	27.99	46.00	-18.01
98V	416.070	47.00	3.57	15.59	33.07	33.09	46.00	-12.91
99V	420.376	46.30	3.58	15.64	33.06	32.47	46.00	-13.53
100V	433.318	46.00	3.64	15.79	33.03	32.40	46.00	-13.60
101V	448.081	40.90	3.69	15.96	33.00	27.55	46.00	-18.45
102H	448.091	44.70	3.69	15.96	33.00	31.35	46.00	-14.65
103H	479.970	42.70	3.82	16.30	32.94	29.88	46.00	-16.12
104V	480.082	42.50	3.82	16.30	32.94	29.68	46.00	-16.32
105H	500.103	50.00	3.90	16.50	32.90	37.50	46.00	-8.50



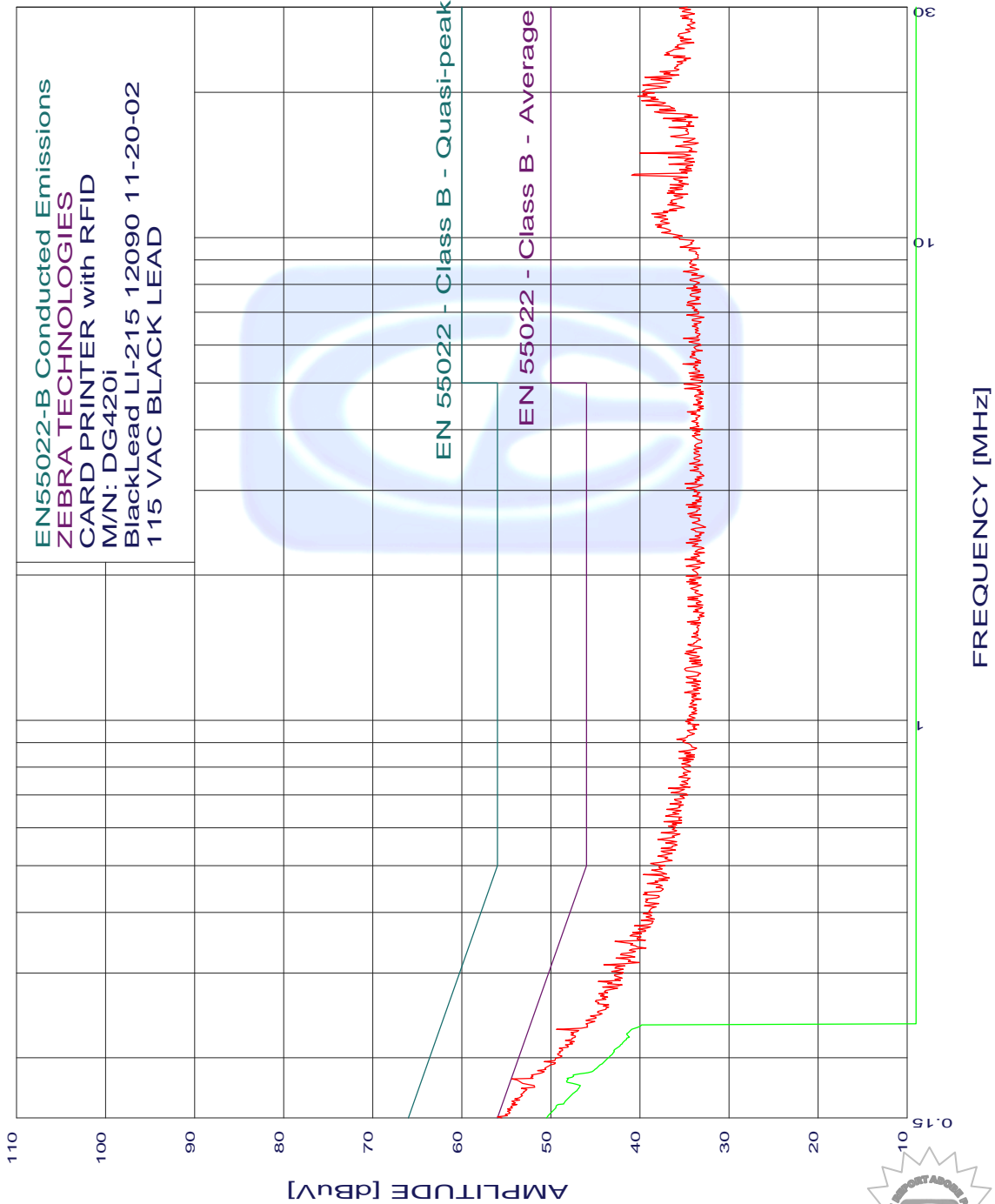
Test Location : Compatible Electronics Page : 4/4
 Customer : DIGIMARC Date : 6/09/2003
 Manufacturer : ZEBRA TECHNOLOGIES Time : 13:09:15
 Eut name : CARD PRINTER Lab : A
 Model : DG420i Test Distance : 3.0
 Serial # :
 Specification : FCC Class B
 Distance correction factor (20 * log(test/spec) : 0.00
 Test Mode : TESTED BY MICHAEL CHRISTENSEN

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor' d rdg = R dBuV	Li mi t = L dBuV/m	Del ta R- L dB
106H	510.527	50.30	3.94	16.58	32.92	37.90	46.00	-8.10
107V	512.028	46.50	3.95	16.59	32.92	34.12	46.00	-11.88
108H	512.043	41.60	3.95	16.59	32.92	29.22	46.00	-16.78
109V	528.088	43.10	4.01	16.71	32.96	30.87	46.00	-15.13
110H	544.079	40.30	4.08	16.82	32.99	28.21	46.00	-17.79
111V	544.083	43.70	4.08	16.82	32.99	31.61	46.00	-14.39
112V	576.101	51.50	4.15	17.04	32.89	39.80	46.00	-6.20
113H	589.819	36.30	4.18	17.13	32.84	24.78	46.00	-21.22
114V	608.029	45.20	4.27	17.49	32.77	34.19	46.00	-11.81
115H	608.066	42.10	4.27	17.49	32.77	31.09	46.00	-14.91
116H	640.031	44.40	4.52	18.62	32.64	34.91	46.00	-11.09
117V	640.041Qp	50.10	4.52	18.62	32.64	40.61	46.00	-5.39
118V	664.468	47.70	4.60	19.45	32.63	39.12	46.00	-6.88
119V	664.471Qp	46.41	4.60	19.45	32.63	37.83	46.00	-8.17
120V	664.485Qp	45.00	4.60	19.45	32.63	36.42	46.00	-9.58
121V	664.492	46.20	4.60	19.45	32.63	37.62	46.00	-8.38
122V	672.035	46.40	4.60	19.70	32.64	38.06	46.00	-7.94
123H	672.055	38.70	4.60	19.70	32.65	30.36	46.00	-15.64
124V	678.041	45.20	4.60	19.90	32.66	37.04	46.00	-8.96
125V	678.046Qp	43.34	4.60	19.90	32.66	35.18	46.00	-10.82
126V	691.585Qp	43.74	4.60	20.33	32.68	35.99	46.00	-10.01
127V	691.597	45.00	4.60	20.33	32.68	37.25	46.00	-8.75
128V	704.049	51.90	4.62	20.65	32.67	44.49	46.00	-1.51
129V	704.049Qp	50.44	4.62	20.65	32.67	43.03	46.00	-2.97
130V	736.027	42.50	4.75	21.05	32.48	35.81	46.00	-10.19
131V	768.035	50.20	4.80	21.43	32.40	44.03	46.00	-1.97
132V	768.036Qp	49.14	4.80	21.43	32.40	42.97	46.00	-3.03
133V	800.033	43.50	4.80	21.80	32.40	37.70	46.00	-8.30
134V	832.035	47.20	4.93	21.53	32.59	41.07	46.00	-4.93
135H	832.062	42.60	4.93	21.53	32.59	36.47	46.00	-9.53
136H	868.732	45.00	5.04	21.24	32.39	38.88	46.00	-7.12
137V	896.029	43.20	5.09	21.03	31.96	37.36	46.00	-8.64
138V	928.047	37.90	5.21	21.15	31.84	32.42	46.00	-13.58



6/09/2003 22:19:45

EMISSION LEVEL [dBuV] PEAK
 Graph for Peak & Average



ZEBRA TECHNOLOGIES
CARD PRINTER with RFID
M/N: DG420i
115 VAC BLACK LEAD
TEST ENGINEER : BENIGNO CHAVEZ

42 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line
Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.181	54.35	54.46	-0.10*
2	0.150	55.47	56.00	-0.53*
3	0.197	50.74	53.75	-3.01*
4	0.229	49.32	52.48	-3.16*
5	0.312	44.06	49.92	-5.86
6	0.288	44.68	50.58	-5.91
7	0.348	42.76	49.00	-6.24
8	0.262	44.99	51.38	-6.38
9	0.280	44.18	50.81	-6.62
10	0.479	39.56	46.36	-6.80
11	0.322	42.66	49.66	-7.00
12	0.302	43.17	50.19	-7.02
13	0.505	38.77	46.00	-7.23
14	0.327	42.16	49.53	-7.36
15	0.489	38.66	46.18	-7.52
16	0.459	39.16	46.71	-7.55
17	0.435	39.56	47.15	-7.59
18	0.358	41.06	48.78	-7.72
19	0.375	40.56	48.38	-7.82
20	0.363	40.76	48.65	-7.89
21	0.426	39.36	47.33	-7.96
22	0.567	37.97	46.00	-8.03
23	0.524	37.97	46.00	-8.03
24	0.413	39.46	47.59	-8.13
25	0.385	39.86	48.16	-8.30
26	0.398	39.56	47.90	-8.34
27	0.586	37.57	46.00	-8.43
28	0.544	37.57	46.00	-8.43
29	0.535	37.57	46.00	-8.43
30	0.469	37.86	46.53	-8.67
31	0.618	37.27	46.00	-8.73
32	0.634	37.07	46.00	-8.93
33	0.558	37.07	46.00	-8.93
34	0.655	36.97	46.00	-9.03
35	13.486	40.92	50.00	-9.08
36	0.724	36.77	46.00	-9.23
37	0.672	36.57	46.00	-9.43
38	0.709	36.47	46.00	-9.53
39	19.644	40.22	50.00	-9.78
40	14.991	39.97	50.00	-10.03
41	0.914	35.87	46.00	-10.13
42	30.000	34.67	50.00	-15.33



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ZEBRA TECHNOLOGIES
CARD PRINTER with RFID
M/N: DG420i
115 VAC BLACK LEAD
TEST ENGINEER : BENIGNO CHAVEZ

2 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line

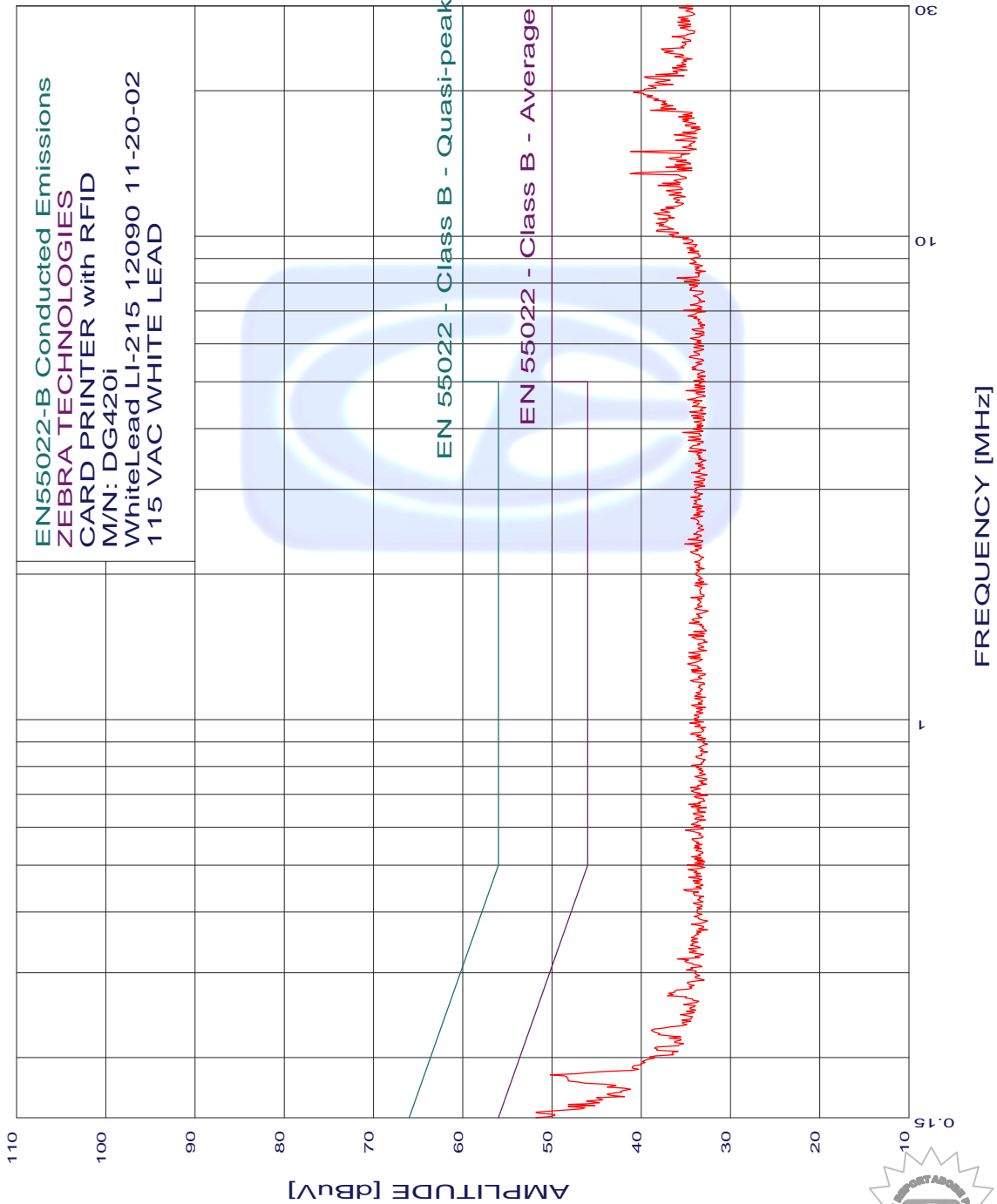
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.179	48.20	54.54	-6.34
2	0.224	41.49	52.65	-11.16



EMISSION LEVEL [dBuV] PEAK
 Graph for Peak

6/09/2003 22:25:14



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6/09/2003 22:25:14

ZEBRA TECHNOLOGIES
CARD PRINTER with RFID
M/N: DG420i
115 VAC WHITE LEAD
TEST ENGINEER : BENIGNO CHAVEZ

42 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	limit(dB)	Delta(dB)
1	0.154	51.77	55.78	-4.01
2	0.184	50.15	54.28	-4.13
3	0.150	51.77	56.00	-4.23
4	0.160	48.17	55.47	-7.30
5	0.158	48.17	55.56	-7.39
6	13.486	41.20	50.00	-8.80
7	14.991	41.16	50.00	-8.84
8	19.848	40.85	50.00	-9.15
9	0.162	46.06	55.34	-9.27
10	21.373	39.62	50.00	-10.38
11	3.924	35.33	46.00	-10.67
12	2.310	35.09	46.00	-10.91
13	0.592	35.05	46.00	-10.95
14	0.174	43.76	54.77	-11.01
15	4.799	34.96	46.00	-11.04
16	18.241	38.89	50.00	-11.11
17	0.500	34.85	46.01	-11.16
18	1.304	34.77	46.00	-11.23
19	4.600	34.75	46.00	-11.25
20	3.781	34.73	46.00	-11.27
21	2.358	34.70	46.00	-11.30
22	0.168	43.76	55.07	-11.31
23	1.496	34.67	46.00	-11.33
24	1.374	34.67	46.00	-11.33
25	1.352	34.67	46.00	-11.33
26	0.669	34.65	46.00	-11.35
27	3.841	34.63	46.00	-11.37
28	3.585	34.63	46.00	-11.37
29	1.586	34.58	46.00	-11.42
30	0.489	34.75	46.18	-11.44
31	0.984	34.56	46.00	-11.44
32	4.339	34.55	46.00	-11.45
33	3.644	34.53	46.00	-11.47
34	11.145	38.50	50.00	-11.50
35	2.226	34.49	46.00	-11.51
36	1.338	34.47	46.00	-11.53
37	1.204	34.47	46.00	-11.53
38	0.934	34.46	46.00	-11.54
39	0.724	34.45	46.00	-11.55
40	2.885	34.41	46.00	-11.59
41	2.610	34.40	46.00	-11.60
42	30.000	34.84	50.00	-15.16



FREQUENCY TOLERANCE

DATA SHEET



SECTION 15.225 [c] TESTING

COMPANY:	ZEBRA TECHNOLOGIES	DATE:	06-20-03
EUT:	CARD PRINTER with RFID	ENGINEER:	KYLE FUJIMOTO
MODEL:	DG420i	S/N	2154609

TEMPERATURE	FREQUENCY (MHz) AT 0 MINUTES	FREQUENCY (MHz) AT 2 MINUTES	FREQUENCY (MHz) AT 5 MINUTES	FREQUENCY (MHz) AT 10 MINUTES	% OF SUPPLY VOLTAGE
-20°C	13.559958	13.559956	13.559954	13.559951	100%
-10°C	13.559973	13.55976	13.559916	13.55976	100%
-0°C	13.559955	13.559967	13.559910	13.55970	100%
+10°C	13.559931	13.559940	13.559945	13.559948	100%
+20°C	13.559910	13.559910	13.559910	13.55910	85%
+20°C	13.559910	13.559910	13.559910	13.55910	100%
+20°C	13.559910	13.559910	13.559910	13.559910	115%
+30°C	13.559872	13.559875	13.559870	13.559890	100%
+40°C	13.559872	13.559875	13.559877	13.559875	100%
+50°C	13.559860	13.559860	13.559860	13.55986	100%

The Frequency Tolerance allowed is 0.01% (± 0.00135591 MHz) of the frequency measured at +20°C at 100% Supply Voltage. If the Frequency is between 13.557741 MHz and 13.561265 MHz, the EUT is considered within the specification limits of FCC 15.225 [c].

APPENDIX F

***TEMPERATURE TESTING GRAPH
AND EQUIPMENT LIST***



PRINTED IN U.S.A.

NOON

11PM

10PM

9PM

8PM

7PM

6PM

5PM

4PM

3PM

2PM

1PM

MIDNIGHT

1AM

2AM

3AM

4AM

5AM

6AM

7AM

8AM

9AM

10AM

11AM

-87.24 TO +190.56 °C

150

150

100

50

0

50

100

150

50

0

50

100

150

HONEYWELL

680015-051

06-20-83
FT. WASHINGTON, PA., U.S.A.

Compatible Electronics

Compatible Electronics

JOB NUMBER 0015592-061099f

ENVIRONMENT ASSOCIATES

EQUIPMENT LIST

TEST DESCRIPTION:

EQUIPMENT DESCRIPTION	MANUFACTURER	MODEL NUMBER	I.D. NUMBER	CALIBRATION LAST	CALIBRATION DUE
TEMPERATURE CHAMBER	RUSSELLS	RB-16-705-705	688603	NOT REQUIRED	
CHART RECORDER	HONEYWELL	DR4501	9305985398032	<i>02-13-03</i>	<i>08-13-03</i>