FCC PART 15, SUBPART C
TEST REPORT

for

THERMAL PRINTER with RFID
Model: R2844-Z
FCC ID: I28-R2844Z

Prepared for

ZEBRA TECHNOLOGIES CORP.
1001 FLYNN RD
CAMARILLO, CA 93012

Prepared by: 

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DATE: APRIL 1, 2004

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GENERAL REPORT SUMMARY

This electromagnetic emission 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 in any form except in full, without the written permission of Compatible Electronics.

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

Device Tested: Thermal Printer with RFID
Model: R2844-Z
S/N: None

Product Description: This is a 4" wide, 200 dpi Thermal Printer with RFID.

Modifications: The EUT was not modified during the testing.

Manufacturer: Zebra Technologies, Corp.
1001 Flynn Rd.
Camarillo, CA 93012

Test Date: February 17 & 19 and March 19, 2004

Test Specifications: EMI requirements
FCC CFR Title 47, Part 15 Subpart C
Test Procedure: ANSI C63.4: 2001.

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

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Radiated RF Emissions, 10kHz to 1GHz	Complies with the limits of FCC CFR Title 47, Part 15 Subpart C 15.209, 15.225 and 15.205
2	Conducted RF Emissions, 150 kHz – 30 MHz	Complies with the limits of FCC CFR Title 47, Part 15 Subpart C 15.207 (a).

1. PURPOSE

This document is a Qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Thermal Printer with RFID Model: R2844-Z. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2001. 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 specification limits defined in FCC CFR Title 47, Subpart C 15.207 (a), 15.209, 15.205 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, 2337 Troutdale Drive, Agoura, California 91301. The temperature cycle testing was performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

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, Corp.

Zaven Mangassarian	Compliance Engineer

Compatible Electronics Inc.

Michael Christensen	Senior Test Engineer
Andre D. Khan	Test Technician
Joey J. Madlangbayan	Test Engineer
Reynald O. Ramirez	Senior Test Engineer
Ruby A. Hall	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on February 19, 2004.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc.

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
RFID	Radio Frequency Identification

3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
FCC CFR Title 47, Subpart C.	FCC Rules – Intentional Radiators.
CISPR 16 1993	Specification for radio disturbance and immunity measuring apparatus and methods.
ANSI C63.4 2001	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

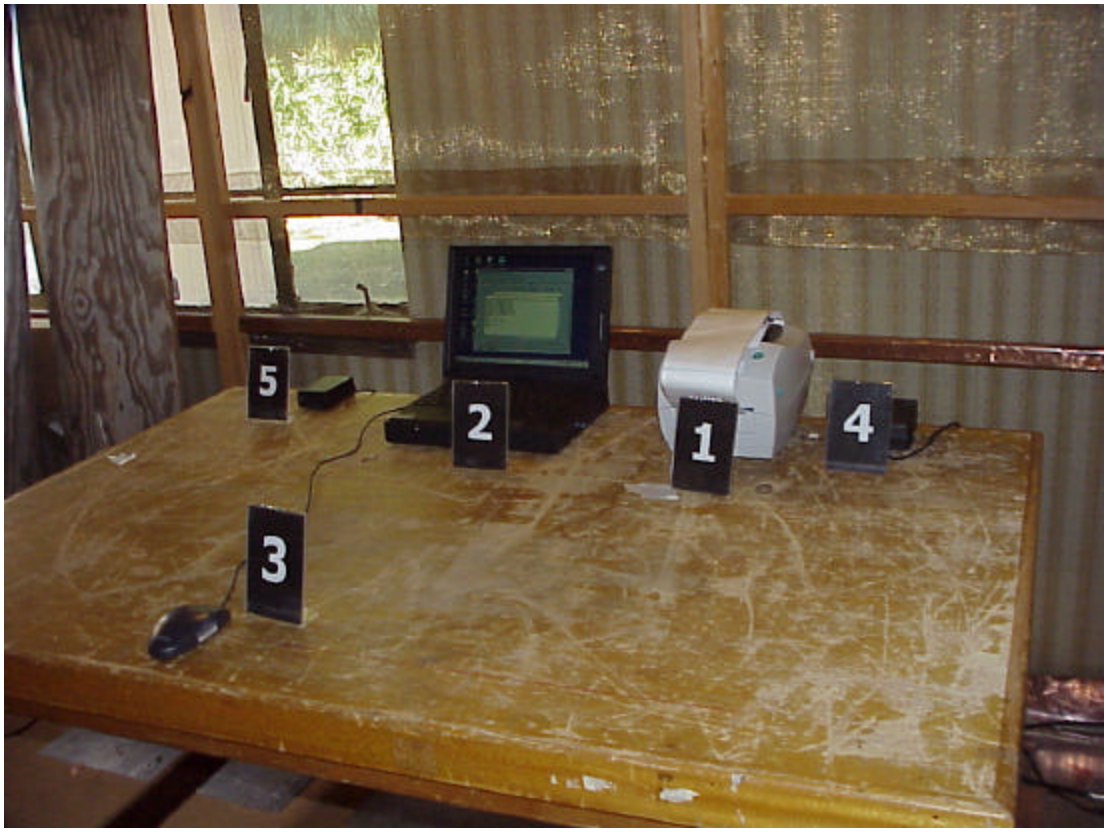
4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

The Thermal Printer with RFID was setup in a tabletop configuration. The Printer was connected to the laptop computer via the Serial, USB and parallel ports. A Mouse was also connected to the laptop computer via the mouse port. The EUT was continuously transmitting and reading the RFID tag on each label, while printing the ID number on each label.

The highest emissions were found when the EUT was running in the above configuration. The final radiated and conducted 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 EUT was setup and tested as shown in the photographs in Appendix D.

4.1.1 Photograph of Test Configuration – EMI



4.1.2 Cable Construction and Termination

Cable 1 This is a 2.5 meter, foil shielded, round serial cable connecting the EUT to the laptop computer. There is a metallic DB-9 pin connector at both ends of the cable. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 2

This is a 2 meter, braid and foil shielded, round parallel cable connecting the EUT to the laptop computer. There is a metallic 36 pin Centronics type connector at the EUT end and a metallic DB-25 pin connector at the computer end of the cable. A molded built-in ferrite was at both ends of the cable. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 3

This is a 1.5 meter, braid and foil shielded, round USB cable connecting the EUT to the laptop computer. There is a USB connector at both ends of the cable. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 4

This is a 1.5 meter, foil shielded, round cable connecting the mouse to the laptop computer. The cable has a metallic 6 pin mini DIN connector at the laptop end and the cable is hardwired into the mouse. The shield of the cable was grounded to the computer's chassis via the connector.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
1	THERMAL PRINTER with RFID (EUT)	ZEBRA TECHNOLOGIES CORP.	R2844-Z	FCC ID: I28-R2844Z
2	LAPTOP COMPUTER	IBM	2647-3CU	78-KMDCG
3	MOUSE	DELL	M-S34	LNA12843519
4	POWER SUPPLY (EUT)	HITEK POWER CORP.	PLUS120	C03225163C
5	POWER SUPPLY (LAPTOP COMPUTER)	IBM	P/N: 02K6661	11802K66612122JY13T5K4

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	2729A04566	Jan. 16, 2004	Jan. 16, 2005
Quasi-Peak Adapter	Hewlett Packard	85650A	2521A00682	Jan. 16, 2004	Jan. 16, 2005
LISN	Com Power	LI-215	12037	Oct. 16, 2003	Oct. 16, 2004
LISN (Accessory)	Com Power	LI-115	02030	Oct. 16, 2003	Oct. 16, 2004
Transient Limiter	Com Power	HZ560	3549	Jan. 12, 2004	Jan. 12, 2005
Preamplifier	Com Power	CPPA-102	01249	Jan. 16, 2004	Jan. 16, 2005
Biconical Antenna	Com Power	AB-100	01535	Mar. 10, 2003	Mar. 10, 2004
Log Periodic Antenna	Com Power	AL-100	01116	Jan. 23, 2004	Jan. 23, 2005
Active Loop Antenna	Com Power	AL-130	17067	Mar. 06, 2003	Mar. 06, 2004
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-106A	N/A	N/A	N/A
Computer	Hewlett Packard	Pavilion 4530	US91912022	N/A	N/A
Printer	Hewlett Packard	C6427B	MY066160TW	N/A	N/A
(Software) Radiated Emissions Transmitter Data Program	Compatible Electronics	DOC No: EMI_PART15TX-B-0-50	Rev. A	N/A	N/A
(Software) Compatible Electronics Emissions Program	Compatible Electronics	Version 2.3 (SR21)	N/A	N/A	N/A
(Software) Compatible Electronics Data Capture Program	Compatible Electronics	VCAP1A	Version 3.1	N/A	N/A

5.2.1 EMI Test Equipment (continued)

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Temperature Chamber	Despatch Industries, Inc.	16212A	149857	Mar. 09, 2004	Mar. 09, 2005
Spectrum Analyzer	Hewlett Packard	8566B	2727A04757	Nov. 14, 2003	Nov. 14, 2004
Quasi-Peak Adapter	Hewlett Packard	85650A	3303A01688	Nov. 14, 2003	Nov. 14, 2004
Preamplifier	Com Power	CPPA-102	1017	Jan. 06, 2004	Jan. 06, 2005
Probe Set	Com Power	PS-400	1810	N.C.R.	N/A
Variac	Staco Energy Products	3PN1010	None	N.C.R.	N/A
Step-up Transformer 110V to 220V	Magnetek Triad	N-5MG	None	N.C.R.	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

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 along with the quasi-peak adapter. 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 Spectrum Analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the Spectrum Analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions 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: 2001. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the computer in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The test data is located in Appendix E.

7.1.2 Radiated Emissions Test

The spectrum analyzer was used as a measuring meter along with a 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. This final reading is then recorded into the a Computer data recording program, which takes into account the cable loss, amplifier gain and antenna factors, so that a true reading is compared to the true limit. The quasi-peak was used only for those readings, which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was according to the frequency measured (200 Hz for 10kHz-150kHz, 9 kHz for 0.150kHz-30MHz and 120 kHz for 30-1000MHz).

Broadband loop, biconical and log periodic antennas were used as transducers during the measurement. The loop antenna was used from 10 kHz to 30 MHz, the biconical antenna was used from 30 MHz to 300 MHz and the log periodic antenna was used from 300 MHz to 1 GHz. The frequency spans were wide (13.56 MHz to 30 MHz, 30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz and 300 MHz to 1 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

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: 2001. 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 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 test distance of 3 meters to obtain final test data. The test data is located in Appendix E.

Preliminary Testing and Monitoring:

Preliminary testing was done at a distance of 1 meter instead of 3 meters to determine the predominant harmonics and spurious emission frequencies. An open field test site was used for the preliminary investigations. Broadband antennas were used to scan large frequency bands while manipulating the unit. If and when any frequency was found to be above 30 microvolts/meter level (at a 1 meter distance), this frequency was recorded as a significant frequency. All significant frequencies were further examined carefully at a frequency span on the spectrum analyzer while changing the antenna height and EUT orientation. The EUT was tested again at a test distance of 3 meters to obtain the final test data. The bandwidth of the spectrum analyzer was varied to ensure that pulse desensitization did not occur.

7.1.3 Radiated Emissions – Frequency Tolerance

The EUT was placed in a temperature cycling chamber. The chamber was set for –20 degrees and the EUT was exposed to this temperature for a period of 30 minutes. The temperature was subsequently increased in 10 degree steps up to + 50 degrees with a 30 minute acclimation periods between each temperature. At each temperature step the EUT was checked with a Spectrum Analyzer to determine whether the carrier signal remained within 0.01% of the fundamental frequency at startup, 2 minutes, 5 minutes and 10 minutes after removal from the temperature chamber. The frequency tolerance of the carrier signal was maintained within 0.01% of the operating temperature variation testing –20 degrees to + 50 degrees C at normal voltage and variations at 85% to 100% at 20 degrees C.

7.1.4 Radiated Emissions - Test Results

The fundamental and up to the 10th harmonic emissions are within the specifications.

ZEBRA TECHNOLOGIES, CORP.
THERMAL PRINTER with RFID

RADIATED EMISSIONS – SPURIOUS

The following bands were specifically scanned.
Frequency Band 10 kHz – 1000MHz

The spurious emissions were within the spec. limits.

RF Energy From The Thermal Printer with RFID
in MHz at 3 meters (µV/m)

0.090-0.110	<50	37.5-38.25	<100
0.495-0.505	<50	73-74.6	<100
2.1735-2.1905	<50	74.8-75.2	<100
4.125-1.128	<50	108-121.94	<100
4.17725-4.17775	<50	123-138	<150
4.20725-4.20775	<50	149.9-150.05	<150
6.215-6.218	<50	156.52-156.52	<150
6.26775-6.26825	<50	162.01-167.17	<150
6.31175-6.31225	<50	167.72-173.2	<150
8.291-8.294	<50	240-285	<200
8.362-8.366	<50	322-335.4	<200
8.37625-8.38675	<50	399.9-410	<200
8.41425-8.41475	<50	608-614	<200
12.29-12.293	<50	960-1000	<500
12.51975-12.52025	<50		
12.57675-12.57725	<50		
13.36-13.41	<50		
16.42-16.423	<50		
16.69475-16.69525	<50		
16.80425-16.80475	<50		
25.5-25.67	<50		

7.1.5 Sample Calculations

A correction factor for the antenna, cable and a distance factor (if any) must be applied to the meter reading before a true field strength reading can be obtained. For greater efficiency and convenience, instead of using these correction factors for each meter reading, the specification limit was modified to reflect these correction factors at each frequency, so that the meter readings can be compared directly to the modified specification limit, referred to henceforth as the corrected meter reading limit (CML).

The equation can be derived in the following manner:

Specification limit (uV/m) log x 20 = Specification Limit in dBuV

(Specification distance / test distance) log x 40 = distance factor

(Specification Limit dBuV + distance factor) + Antenna factor – effective gain = Corrected Meter Limit

Note: When using an Active Antenna, the Antenna factor shall be subtracted due to the combination of the internal amplification and antenna loss. At lower frequencies the cable loss is negligible.

OR

Corrected Meter Reading = meter reading + F – A + C

where: F = antenna factor
A= amplifier gain
C = cable loss

Therefore, the equation for determining the corrected meter reading is:

CMR = spec. limit - F - A + C

A table of corrected meter reading limits was used to permit immediate comparison of the meter reading and determine if the emission level exceeded the specification limit at that frequency. The correction factors for the antenna and the amplifier gain are attached in Appendix D of this report. The data sheets are attached in Appendix E.

The distance factor D is 0 when the test is performed at the required specification distance.

8. CONCLUSIONS

The Thermal Printer with RFID Model: R2844-Z meets all of the requirements of the FCC CFR, Title 47, Part 15, Subpart C 15.207 (a), 15.209, 15.205 and 15.225.

APPENDIX A

LABORATORY ACCREDITATIONS

LABORATORY ACCREDITATIONS

Compatible Electronics has the following agency Accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

Voluntary Control Council for Interference - Registration Numbers: R-826, C-862, R-653 and C-669

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

Nemko Laboratory Authorization – Authorization Number: ELA 108-c

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

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

Conformity Assessment Body for the EMC directive under the US/EU MRA appointed by NIST.

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

There were no modifications made to the EUT during the test.

APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	THERMAL PRINTER WITH RFID Model: R2844-Z

There were no additional models covered under this report.

APPENDIX D

DIAGRAMS, CHARTS AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP (LAB F)

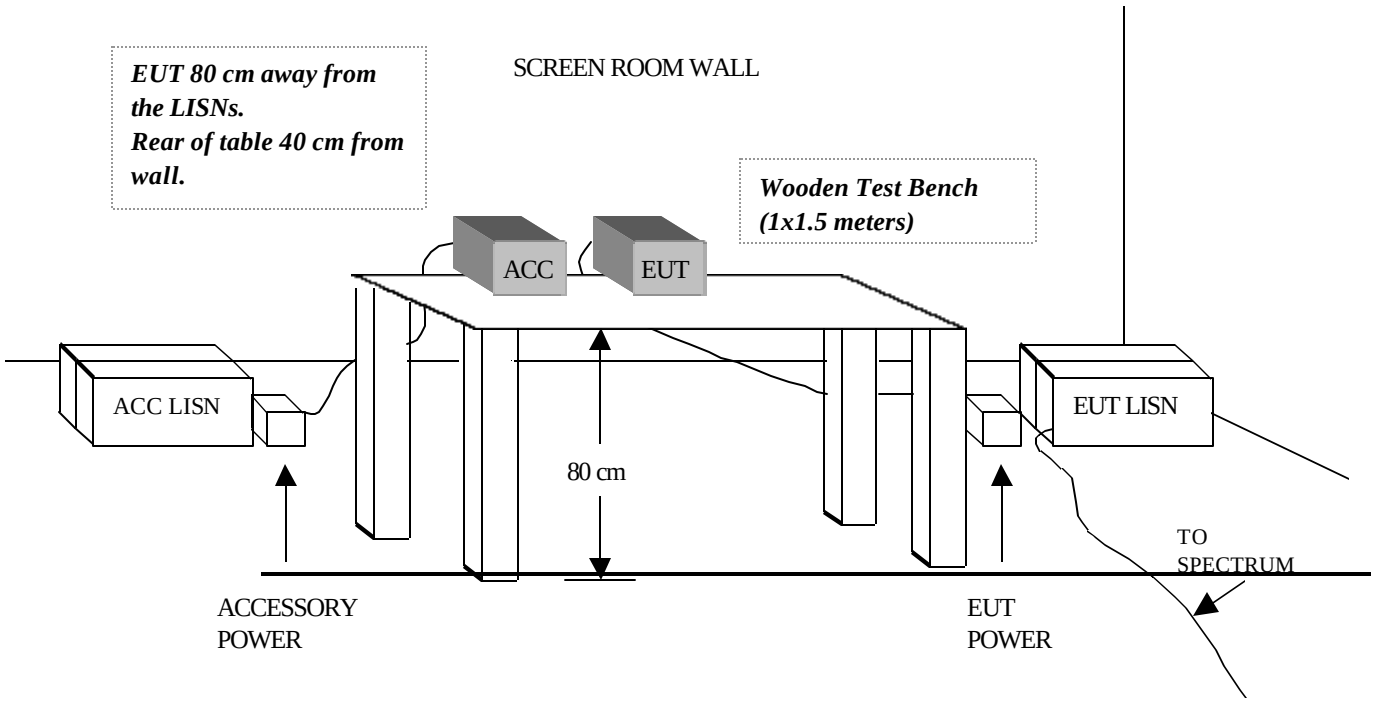
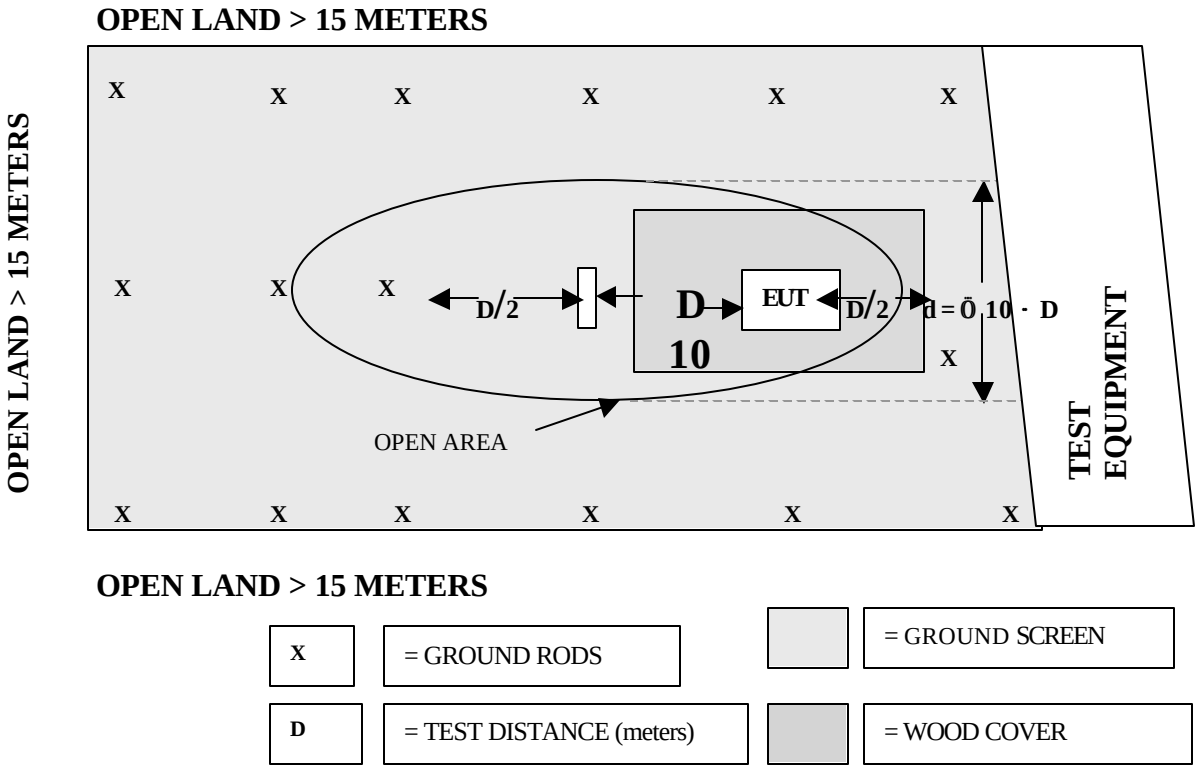


FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE
(LAB F)



COM-POWER AL-130

ACTIVE LOOP ANTENNA

S/N: 17067

CALIBRATION DATE: MARCH 6, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
0.009	11.9	1	10.8
0.01	11.8	2	11.5
0.02	10.7	3	11.0
0.03	12.4	4	10.9
0.04	12.1	5	11.6
0.05	10.5	6	11.5
0.06	10.9	7	11.4
0.07	10.6	8	11.2
0.08	10.2	9	11.6
0.09	10.1	10	11.0
0.1	10.0	12	10.2
0.2	7.8	14	10.3
0.3	10.1	15	10.3
0.4	10.1	16	10.3
0.5	10.3	18	10.4
0.6	10.4	20	10.3
0.7	10.5	25	10.0
0.8	10.5	30	8.4
0.9	10.5		

COM-POWER AB-100

BICONICAL ANTENNA

S/N: 1535

CALIBRATION DATE: MARCH 10, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	12.8	120	9.6
35	11.6	125	10.0
40	11.5	140	11.9
45	11.7	150	12.1
50	12.2	160	13.4
55	10.9	175	13.6
60	10.2	180	13.6
65	7.9	200	14.8
70	9.7	225	15.1
80	8.1	250	16.7
90	9.0	275	17.6
100	9.3	300	18.8

COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 01116

CALIBRATION DATE: JAN. 23, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	13.5	650	20.1
330	17.1	700	21.3
340	15.5	725	21.1
350	16.2	750	22.2
360	15.3	800	23.0
370	14.7	850	23.0
400	16.8	900	23.2
425	17.0	925	22.9
450	16.0	950	23.7
500	16.8	975	25.0
550	18.9	1000	26.6
600	19.0		

COM-POWER PA-102

PREAMPLIFIER

S/N: 1249

CALIBRATION DATE: JAN. 16, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	35.9	300	34.7
40	36.2	350	35.0
50	35.9	400	34.7
60	35.9	450	34.7
70	35.6	500	35.3
80	35.8	550	35.9
90	35.3	600	35.8
100	35.5	650	38.4
125	35.5	700	39.6
150	35.4	750	39.1
175	35.4	800	35.3
200	35.5	850	20.1
225	35.1	900	23.5
250	34.9	950	28.3
275	35.1	1000	30.6

FRONT VIEW

ZEBRA TECHNOLOGIES CORP.
THERMAL PRINTER with RFID
Model: R2844-Z
FCC PART 15 SUBPART C - RADIATED EMISSIONS – 2-19-04

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

ZEBRA TECHNOLOGIES CORP.
THERMAL PRINTER with RFID
Model: R2844-Z
FCC PART 15 SUBPART C - RADIATED EMISSIONS – 2-19-04

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

ZEBRA TECHNOLOGIES CORP.
THERMAL PRINTER with RFID
Model: R2844-Z
FCC PART 15 SUBPART C - CONDUCTED EMISSIONS – 2-17-04

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

ZEBRA TECHNOLOGIES CORP.
THERMAL PRINTER with RFID
Model: R2844-Z
FCC PART 15 SUBPART C - CONDUCTED EMISSIONS – 2-17-04

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

ZEBRA TECHNOLOGIES CORP.
THERMAL PRINTER with RFID
Model: R2844-Z
FCC PART 15 SUBPART C – FREQUENCY TOLERANCE EMISSIONS – 3-19-04

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

DATA SHEETS

RADIATED EMISSIONS

COMPANY NAME: Zebra Technologies, Corp. DATE: 2-19-04

EUT: Thermal Printer with RFID EUT S/N:

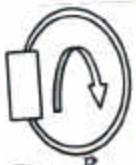
EUT MODEL: R2844z LOCATION: ☐ BREA ☐ SILVERADO ☑ AGOURA

SPECIFICATION: Fcc CLASS: B TEST DISTANCE: 3M LAB: F

ANTENNA: ☑ LOOP ☐ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☐ VERT ☐ HORIZ

☑ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: A. Khan

NOTES: 13.56MHz (Fund.) (40 Log)



Pol A

Pol. B

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi-Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
13.56	38.3		1M	270	-71.45	109.75	Pol A
13.56	38.5		1M	270	-71.25	109.75	Pol B
27.12	No Reading found					60.18	Pol A
27.12	No Reading found					60.18	Pol. B
EUT was Tested from 10KHz							

* DELTA = METER READING - CORRECTED LIMIT

COMPATIBLE ELECTRONICS

Test Location	: Compatible Electronics	**Page**	: 1/1
Customer	: Zaven Magnassarian	**Date**	: 02/19/2004
Manufacturer	: Zebra Technologies, corp.	**Time**	: 03:09:27 PM
Eut name	: Thermal Printer with RFID	**Lab**	: F
Model	: R2844Z	**Test Distance**	: 3.00 Meters
Serial #	:		
Specification	: FCC Pt. 15- Class B		
Distance correction factor (20 * log(test/spec))		:	0.00
Test Mode	: Clocks: 13.56 MHz Tx		

A. KHAN

Pol	Freq MHz	Reading dBuV	Cable loss dB	Antenna factor dB	Amplifier gain dB	Corr'd rdg = R dBuV/m	Limit = L dBuV/m	Delta R-L dB
1V	40.733	50.60	1.53	11.53	36.18	27.49	40.00	-12.51
2V	54.293	52.60	1.99	11.08	35.90	29.77	40.00	-10.23
3V	67.881	51.30	2.10	8.95	35.66	26.69	40.00	-13.31
4V	81.412	58.80	2.23	8.23	35.73	33.54	40.00	-6.46
5V	95.014	58.30	2.50	9.15	35.40	34.55	43.50	-8.95
6V	108.529	58.60	2.71	9.43	35.50	35.24	43.50	-8.26
7V	122.085	61.10	2.87	9.77	35.50	38.24	43.50	-5.26
8V	135.645	55.70	3.03	11.37	35.46	34.65	43.50	-8.85
9V	149.213	53.50	3.19	12.08	35.40	33.37	43.50	-10.13
10V	162.775	54.70	3.25	13.44	35.40	35.99	43.50	-7.51
11V	176.334	54.70	3.32	13.60	35.41	36.21	43.50	-7.29
12V	189.899	51.50	3.48	14.21	35.46	33.73	43.50	-9.77
13V	203.449	49.10	3.60	14.84	35.44	32.10	43.50	-11.40
14H	40.732	45.10	1.53	11.53	36.18	21.99	40.00	-18.01
15H	54.306	41.60	1.99	11.07	35.90	18.76	40.00	-21.24
16H	67.882	51.20	2.10	8.95	35.66	26.59	40.00	-13.41
17H	81.412	53.60	2.23	8.23	35.73	28.34	40.00	-11.66
18H	95.023	48.40	2.50	9.15	35.40	24.65	43.50	-18.85
19H	108.542	53.30	2.71	9.43	35.50	29.95	43.50	-13.55
20H	122.079	55.00	2.87	9.77	35.50	32.14	43.50	-11.36
21H	135.649	52.90	3.03	11.37	35.46	31.85	43.50	-11.65
22H	149.209	44.90	3.19	12.08	35.40	24.77	43.50	-18.73
23H	162.764	48.30	3.25	13.44	35.40	29.59	43.50	-13.91
24H	176.335	52.30	3.32	13.60	35.41	33.81	43.50	-9.69
25H	189.890	55.30	3.48	14.21	35.46	37.53	43.50	-5.97
26H	203.458	53.80	3.60	14.84	35.44	36.80	43.50	-6.70

COMPATIBLE ELECTRONICS

Test Location	: Compatible Electronics	**Page**	: 1/2
Customer	: Zaven Magnassarian	**Date**	: 02/17/2004
Manufacturer	: Zebra Technologies, Corp.	**Time**	: 01:01:14 PM
Eut name	: Thermal Printer with RFID	**Lab**	: F
Model	: R2844Z	**Test Distance**	: 3.00 Meters
Serial #	:		
Specification	: FCC Pt. 15- Class B		
Distance correction factor (20 * log(test/spec))		:	0.00
Test Mode	: Clocks: 13.56, 16.667, 48 MHz		

Test Engineer: A. KHAN

Pol	Freq	Reading	Cable loss	Antenna factor	Amplifier gain	Corr'd rdg = R	Limit = L	Delta R-L
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB
1V	34.153	50.20	1.45	11.79	36.04	27.40	40.00	-12.60
2V	39.761	52.30	1.50	11.50	36.19	29.11	40.00	-10.89
3V	48.047	50.70	1.83	12.01	35.95	28.59	40.00	-11.41
4V	53.872	47.20	1.98	11.18	35.90	24.46	40.00	-15.54
5V	57.333	48.40	2.05	10.57	35.90	25.12	40.00	-14.88
6V	61.297	51.50	2.10	9.59	35.86	27.33	40.00	-12.67
7V	63.343	50.50	2.10	8.64	35.79	25.45	40.00	-14.55
8V	66.525	52.80	2.10	8.46	35.70	27.66	40.00	-12.34
9V	71.254	51.10	2.11	9.49	35.63	27.07	40.00	-12.93
10V	74.710	53.20	2.15	8.92	35.70	28.57	40.00	-11.43
11V	85.899	53.90	2.32	8.64	35.50	29.37	40.00	-10.63
12V	96.068	52.00	2.52	9.19	35.42	28.29	43.50	-15.21
13V	122.302	58.00	2.87	9.79	35.50	35.16	43.50	-8.34
14V	128.886	52.90	2.95	10.51	35.48	30.88	43.50	-12.62
15V	177.824	46.90	3.34	13.60	35.41	28.42	43.50	-15.08
16V	182.738	49.10	3.40	13.77	35.43	30.84	43.50	-12.66
17V	196.538	51.20	3.56	14.60	35.49	33.87	43.50	-9.63
18V	241.560	45.10	3.87	16.18	34.97	30.18	46.00	-15.82
19H	32.939	55.40	1.43	12.07	36.00	32.91	40.00	-7.09
20H	40.035	47.10	1.50	11.50	36.20	23.90	40.00	-16.10
21H	50.042	45.90	1.90	12.19	35.90	24.09	40.00	-15.91
22H	66.377	51.10	2.10	8.41	35.70	25.91	40.00	-14.09
23H	71.273	45.20	2.11	9.48	35.63	21.17	40.00	-18.83
24H	85.940	47.60	2.32	8.65	35.50	23.07	40.00	-16.93
25H	96.090	47.40	2.52	9.19	35.42	23.69	43.50	-19.81
26H	120.057	47.80	2.85	9.60	35.50	24.75	43.50	-18.75
27H	133.526	47.00	3.01	11.11	35.46	25.65	43.50	-17.85
28H	144.044	46.60	3.13	11.98	35.42	26.29	43.50	-17.21
29H	159.730	44.20	3.24	13.37	35.40	25.41	43.50	-18.09
30H	171.858	48.10	3.29	13.56	35.40	29.55	43.50	-13.95
31H	240.081	45.90	3.85	16.09	34.98	30.85	46.00	-15.15
32V	300.060	43.70	4.30	13.51	34.70	26.81	46.00	-19.19
33V	333.412	44.10	4.37	16.55	34.91	30.11	46.00	-15.89
34V	336.091	45.80	4.37	16.12	34.92	31.37	46.00	-14.63
35V	361.559	45.90	4.55	15.21	34.93	30.72	46.00	-15.28

COMPATIBLE ELECTRONICS

Test Location	: Compatible Electronics	**Page**	: 2/2
Customer	: Zaven Magnassarian	**Date**	: 02/17/2004
Manufacturer	: Zebra Technologies, Corp.	**Time**	: 01:01:14 PM
Eut name	: Thermal Printer with RFID	**Lab**	: F
Model	: R2844Z	**Test Distance**	: 3.00 Meters
Serial #	:		
Specification	: FCC Pt. 15- Class B		
Distance correction factor (20 * log(test/spec))			: 0.00
Test Mode	: Clocks: 13.56, 16.667, 48 MHz		

Test Engineer: A. KHAN

Pol	Freq MHz	Reading dBuV	Cable loss dB	Antenna factor dB	Amplifier gain dB	Corr'd rdg = R dBuV/m	Limit = L dBuV/m	Delta R-L dB
36V	406.461	40.70	5.01	16.85	34.70	27.87	46.00	-18.13
37V	432.103	43.40	5.07	16.71	34.70	30.48	46.00	-15.52
38H	300.697	43.50	4.30	13.59	34.70	26.68	46.00	-19.32
39H	333.371	41.30	4.37	16.56	34.91	27.32	46.00	-18.68
40H	336.105	47.70	4.37	16.12	34.92	33.27	46.00	-12.73
41H	361.561	41.50	4.55	15.21	34.93	26.32	46.00	-19.68
42H	432.087	44.60	5.07	16.71	34.70	31.68	46.00	-14.32

The EUT was Tested to 1 GHz, No readings found above 432 MHz.

COMPATIBLE ELECTRONICS

2/17/2004 15:30:57

FCC Conducted Emissions
Zebra Technologies, Corp.
Thermal Printer with RFID
R2844Z
Neutral 120V
Lab F Neut. Due 10-16-04
TEST ENGINEER : A. KHAN

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26 highest peaks above -50.00 dB of New FCC Class B (Avg) limit line
Peak criteria : 0.10 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.299	50.03	50.28	-0.25**
2	0.155	55.13	55.73	-0.60**
3	0.285	50.03	50.67	-0.64**
4	0.324	48.36	49.62	-1.26**
5	0.179	53.14	54.54	-1.41**
6	0.177	53.20	54.63	-1.43**
7	0.309	48.55	50.01	-1.46**
8	0.168	53.60	55.07	-1.47**
9	0.197	52.22	53.75	-1.54**
10	0.165	53.54	55.20	-1.66**
11	0.151	54.04	55.95	-1.92**
12	0.183	52.42	54.37	-1.95**
13	0.163	53.21	55.29	-2.09**
14	0.223	50.60	52.70	-2.10**
15	0.242	49.70	52.04	-2.34**
16	0.510	43.62	46.00	-2.38
17	0.327	47.06	49.53	-2.46**
18	0.304	47.54	50.14	-2.60**
19	0.505	43.22	46.00	-2.78
20	0.157	52.68	55.60	-2.92**
21	0.152	52.87	55.86	-2.99**
22	0.160	52.43	55.47	-3.04**
23	0.208	50.17	53.27	-3.09**
24	0.170	51.76	54.94	-3.18**
25	0.194	50.65	53.88	-3.23**
26	0.150	46.52	56.00	-9.48**

COMPATIBLE ELECTRONICS

2/17/2004 15:30:57

FCC Conducted Emissions
Zebra Technologies, Corp.
Thermal Printer with RFID
R2844Z
Neutral 120V
Lab F Neut. Due 10-16-04
TEST ENGINEER : A. KHAN

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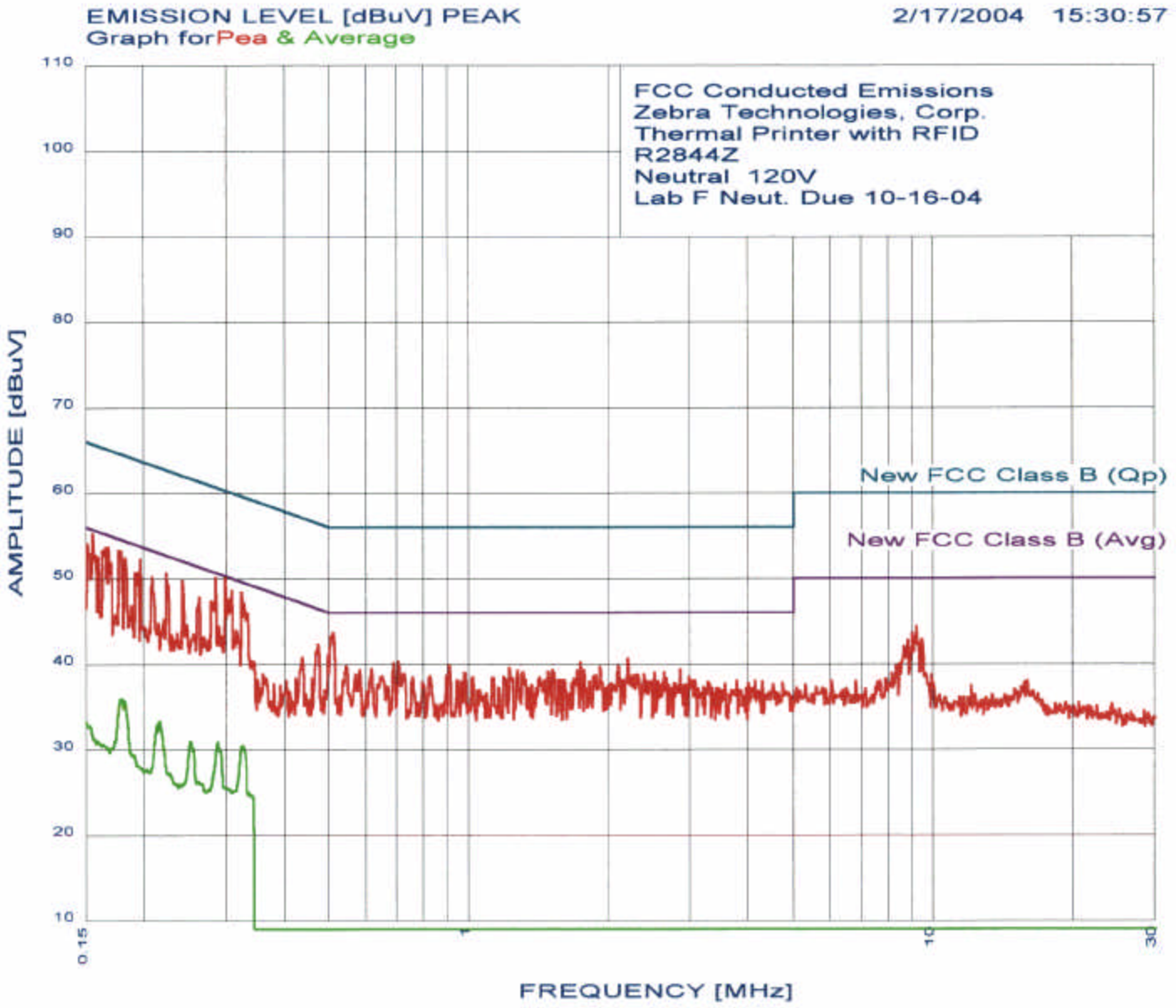
17 highest peaks above -50.00 dB of New FCC Class B (Avg) limit line
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.179	35.85	54.54	-18.70
2	0.182	35.68	54.41	-18.74
3	0.325	30.41	49.57	-19.16
4	0.288	30.83	50.58	-19.75
5	0.216	33.19	52.96	-19.76
6	0.213	32.71	53.09	-20.39
7	0.251	30.90	51.73	-20.83
8	0.255	30.08	51.60	-21.51
9	0.150	33.15	56.00	-22.85
10	0.336	24.89	49.31	-24.41
11	0.158	30.97	55.56	-24.59
12	0.163	30.57	55.29	-24.73
13	0.262	26.25	51.38	-25.13
14	0.227	27.22	52.57	-25.35
15	0.275	25.21	50.98	-25.77
16	0.203	27.63	53.49	-25.86
17	0.238	25.91	52.17	-26.25


EMISSION LEVEL [dBuV] PEAK
Graph forPea & Average
2/17/2004 15:30:57
FCC Conducted Emissions
Zebra Technologies, Corp.
Thermal Printer with RFID
R2844Z
Neutral 120V
Lab F Neut. Due 10-16-04
New FCC Class B (Qp)
New FCC Class B (Avg)
AMPLITUDE [dBuV]
110
100
90
80
70
60
50
40
30
20
10
0.15
1
10
30
FREQUENCY [MHz]

COMPATIBLE ELECTRONICS

2/17/2004 15:18:36

FCC Conducted Emissions
Zebra Technologies, Corp.
Thermal Printer with RFID
R2844Z
Line 120V
Lab F Line Due 10-16-04
TEST ENGINEER : A. KHAN

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26 highest peaks above -50.00 dB of New FCC Class B (Avg) limit line
Peak criteria : 0.10 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.291	52.92	50.49	2.43**
2	0.307	52.05	50.05	2.00**
3	0.300	51.52	50.23	1.28**
4	0.270	52.29	51.11	1.18**
5	0.315	50.90	49.84	1.06**
6	0.297	51.25	50.32	0.93**
7	0.294	51.19	50.41	0.78**
8	0.320	50.30	49.71	0.59**
9	0.152	55.93	55.91	0.02**
10	0.150	55.99	56.00	-0.01**
11	0.324	49.60	49.62	-0.02**
12	0.263	51.24	51.33	-0.09**
13	0.167	54.94	55.11	-0.17**
14	0.188	53.79	54.10	-0.32**
15	0.162	55.03	55.38	-0.35**
16	0.163	54.87	55.29	-0.42**
17	0.205	52.43	53.40	-0.97**
18	0.230	51.46	52.43	-0.97**
19	0.154	54.78	55.78	-1.00**
20	0.237	51.19	52.21	-1.02**
21	0.508	44.94	46.00	-1.06**
22	0.183	53.18	54.33	-1.14**
23	0.240	50.87	52.08	-1.22**
24	0.276	49.71	50.94	-1.23**
25	0.193	52.57	53.93	-1.36**
26	0.227	51.08	52.57	-1.49**

COMPATIBLE ELECTRONICS

2/17/2004 15:18:36

FCC Conducted Emissions
Zebra Technologies, Corp.
Thermal Printer with RFID
R2844Z
Line 120V
Lab F Line Due 10-16-04
TEST ENGINEER : A. KHAN

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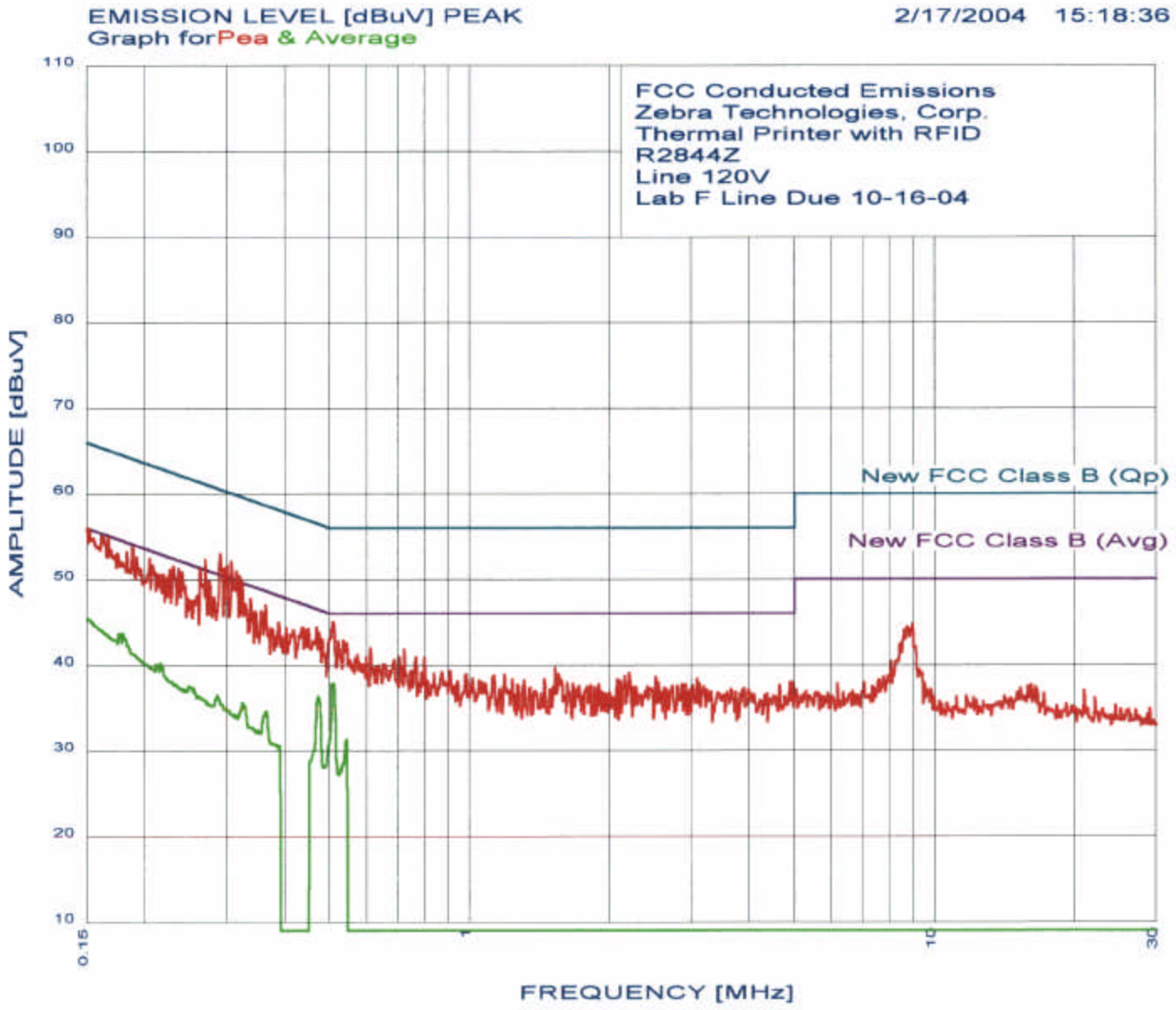
24 highest peaks above -50.00 dB of New FCC Class B (Avg) limit line
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.508	37.76	46.00	-8.24
2	0.471	36.24	46.49	-10.25
3	0.150	45.39	56.00	-10.61**
4	0.180	43.67	54.50	-10.82
5	0.176	43.63	54.68	-11.05
6	0.216	40.15	52.96	-12.81
7	0.212	40.02	53.14	-13.12
8	0.206	39.72	53.35	-13.63
9	0.324	35.53	49.62	-14.09
10	0.363	34.54	48.65	-14.11
11	0.286	36.38	50.63	-14.25
12	0.329	35.17	49.48	-14.31
13	0.248	37.50	51.82	-14.32
14	0.255	37.25	51.60	-14.35
15	0.232	37.70	52.39	-14.68
16	0.544	31.21	46.00	-14.79
17	0.243	37.15	52.00	-14.85
18	0.260	36.29	51.42	-15.13
19	0.299	34.88	50.28	-15.40
20	0.273	35.58	51.02	-15.45
21	0.313	34.09	49.88	-15.79
22	0.350	32.32	48.95	-16.64
23	0.389	30.56	48.08	-17.52
24	0.527	27.83	46.00	-18.17



COMPATIBLE ELECTRONICS

SECTION 15.225 [c] TESTING

COMPANY:	ZEBRA TECHNOLOGY	**DATE:**	3-19-04
EUT:	THERMAL PRINTER WITH RFID	**ENGINEER:**	MICHAEL CHRISTENSEN
MODEL:	R2844-Z	**S/N:**	N/A

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	13.5618	13.5618	13.5618	13.5620	100
+20°C	13.5618	13.5618	13.5618	13.5618	85
+20°C	13.5620	13.5618	13.5618	13.5618	100
+20°C	13.5618	13.5618	13.5618	13.5618	115
+50°C	13.5616	13.5618	13.5618	13.5618	100

The Frequency Tolerance allowed is 0.01% (±0.0013562 MHz) of the frequency measured at +20°C at 100% Supply Voltage. If the Frequency is between 13.5606438 MHz and 13.5633562 MHz, the EUT is considered within the specification limits of 15.225 [c].