Lab Code: 200167-0

FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

ZEBRA TECHNOLOGIES CORPORATION

333 Corporate Woods Parkway
Vernon Hills, IL 60061

FCCID: I28MD-ZLAN11G
Printer Model: MZ220

This Report Concerns:	**Product Type:**
☒ Class II permissive change	2.4GHz 802.11G modular

Test Engineer:	Oscar Au Choon Sian Ooi
Report No.:	R0608282 MZ220
Report Date:	2006-09-06
Reviewed By:	Test Engineer: James Ma
Prepared By:	Bay Area Compliance Laboratory Corporation 1274 Anvilwood Ave. Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732-9164

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

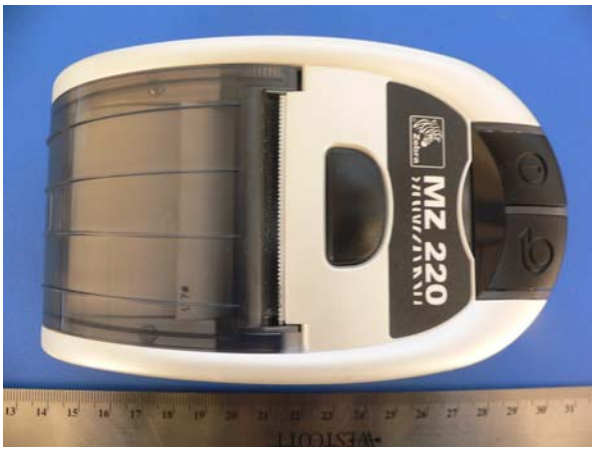
The *Zebra Technologies Corporation*'s product, *FCC ID: I28MD-ZLAN11G* or the "EUT" as referred to in this report is a 2.4GHz 802.11b/g wireless modular which is built in the printer. It is designed for mobile printing applications.

Mechanical Description

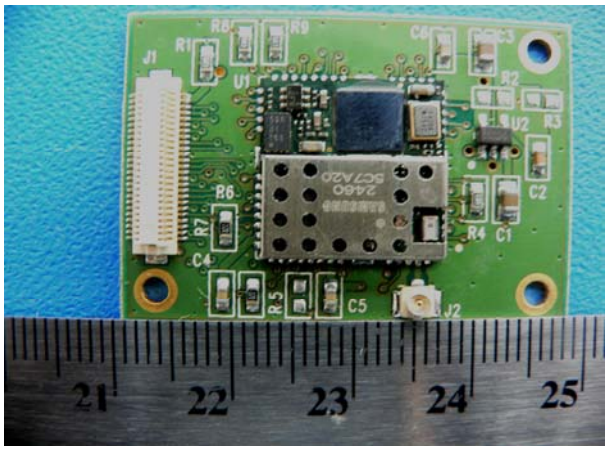
Model MZ 220 measures approximately 135 mmL x 80 mmW x 55 mmH.

** The test data gathered are from a production sample, Serial Number: 001 provided by the manufacturer.*

EUT Photo



Host (Printer)



802.11 G Modular

Additional photos in Exhibit C

Objective

This type approval report is prepared on behalf of *Zebra Technologies Corporation* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, and C.

Related Submittal(s)/Grant(s)

This is a Permissive Change II application. The original application was granted on 2006-05-08. Rhein Tech Laboratories, Inc.'s report number: 2006029.

Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

Test Facility

The Test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at it's facility in Sunnyvale, California, USA.

Test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003& TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations is attached hereinafter and can also be found at
http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

Special Accessories

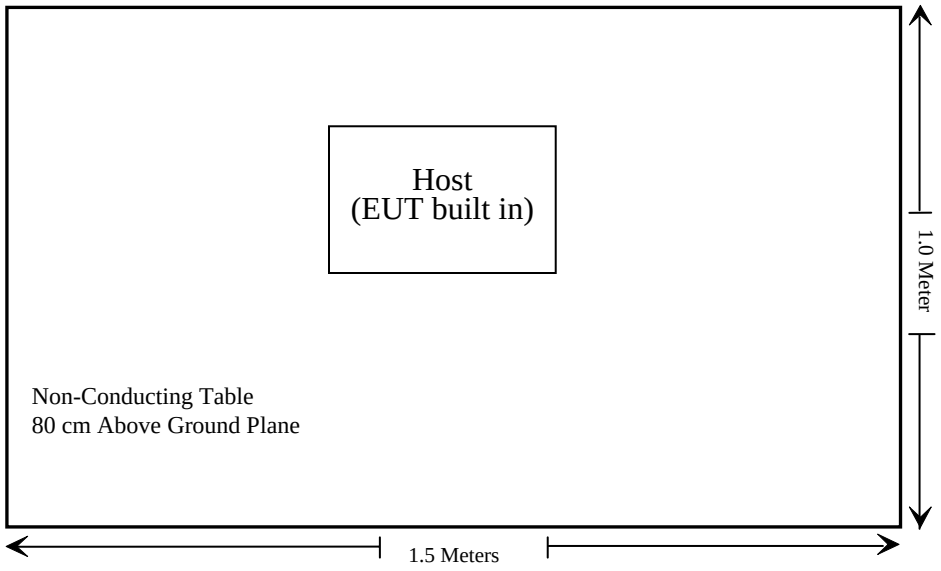
As shown in following test block diagram, all interface cables used for compliance testing are shielded.

Equipment Modifications

No modifications were made to the EUT.

Test Setup Block Diagram

Radiated Emissions



SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247(e)(i) §2.1091	RF Exposure	Pls. refer to SAR report
§15.203	Antenna Requirement	Pls. refer to original report
§ 15.207 (a)	Conducted Emissions	Pls. refer to original report
§2.1051 & §15.247(d)	Spurious Emissions at Antenna Port	Pls. refer to original report
§15.205, §15.209 & §15.247(c)	Radiated Emissions	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Pls. refer to original report
§15.247 (a) (1)	Channel Bandwidth	Pls. refer to original report
§15.247 (a) (1) (iii)	Number of Hopping Frequencies Used	Pls. refer to original report
§15.247 (a) (1) (iii)	Dwell Time of Each Frequency	Pls. refer to original report
§15.247 (b)(3)	Maximum Peak Output Power	Pls. refer to original report
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Pls. refer to original report

§15.205, §15.209 & §15.247(c) - RADIATED EMISSIONS

Test Setup

The radiated emissions tests were performed in the shield room, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Sonoma Instruments	Pre amplifier	317	260406	2006-02-03
Agilent	Pre amplifier	8449B	3008A01978	2006-08-21
Sunol Science	Combination Antenna	JB3 Antenna	A013105	2006-02-11
DRG	Horn Antenna	SAS-200/571	261	2006-04-20
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2005-12-14
Sunol Science	System Controller	SC99V	122303-1	N/R
Rohde & Schwarz	Artificial-Mains Network	ESH2-Z5	871884/039	2005-11-14
Agilent	Spectrum analyzer	8565EC	3946A00131	2006-01-11

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	40-50%
ATM Pressure:	1012-1014 mbar

**The testing was performed by Oscar Au and Choon Sian Ooi on 2006-09-01.*

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emissions are 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Class B Limit

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

For 30-1000MHZ (Spurious Emissions)

-7.2 dB at **63.703750 MHz** in the **Vertical** polarization, **Model MZ220**

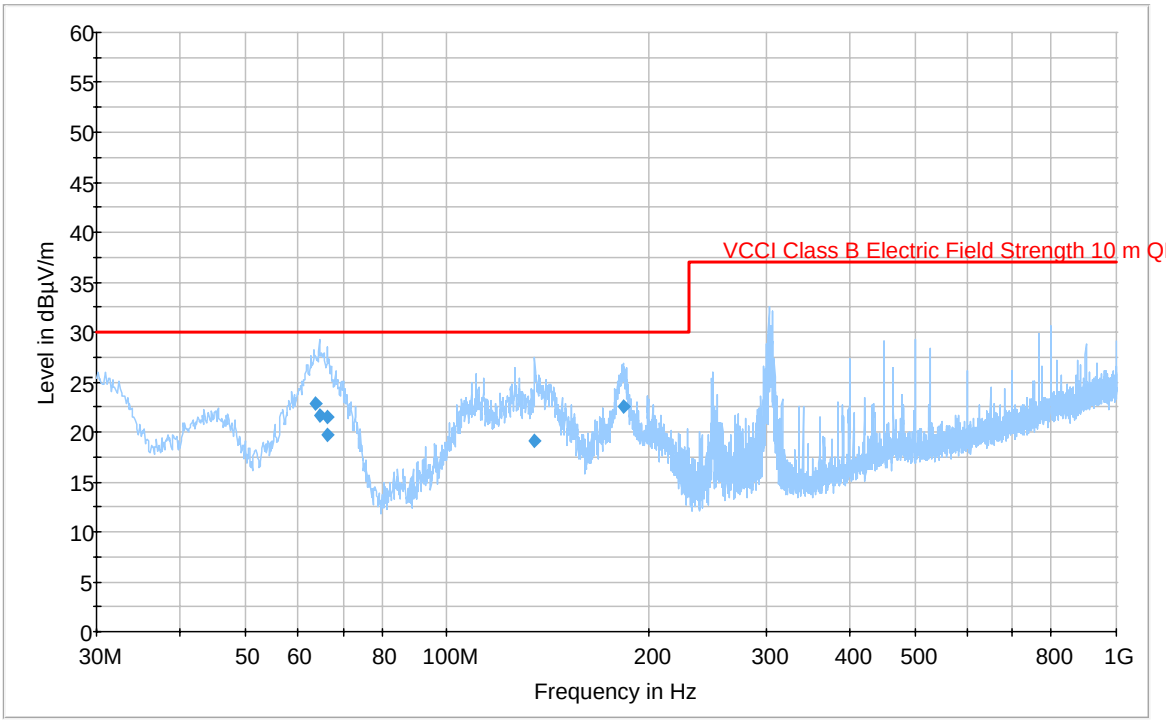
Radiated spurious emissions above 1GHz (MZ220)

-9.8 dB at **4824.0000 MHz** in the **Vertical** polarization, 1GHz –25GHz**, Low Channel**

-6.6 dB at **4874.0000 MHz** in the **Vertical** polarization, 1GHz – 25GHz**, Middle Channel**

-12.1 dB at **4924.0000 MHz** in the **Horizontal** polarization, 1GHz – 25GHz**, High Channel**

30-1000MHZ (Spurious Emissions for MZ220)



Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)
63.703750	22.8	238.0	V	155.0	30.0	-7.2
183.540000	22.6	122.0	V	82.0	30.0	-7.4
64.596250	21.7	166.0	V	142.0	30.0	-8.3
66.375000	21.5	218.0	V	128.0	30.0	-8.5
66.378750	19.8	176.0	V	108.0	30.0	-10.2
135.206250	19.1	100.0	V	101.0	30.0	-10.9

Radiated spurious emissions above 1GHZ (MZ220)

1GHz – 25GHz

Low Channel: 2412 MHz

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC15.247 Limit (dBuV/m)	FCC15.247 Margin	Comments
2412.0000	111.9	295	1.6	v	28.7	1.5	35.8	106.3	-	-	Fund/Peak
2412.0000	117.1	355	1.8	h	28.7	1.5	35.8	111.5	-	-	Fund/Peak
2412.0000	111.7	295	1.6	v	28.7	1.5	35.8	106.1	-	-	Ave
2412.0000	116.9	355	1.8	h	28.7	1.5	35.8	111.3	-	-	Ave
4824.0000	44.6	305	1.5	v	32.5	1.9	34.8	44.2	54	-9.8	Ave
4824.0000	42.6	340	1.9	h	32.5	1.9	34.8	42.2	54	-11.8	Ave
4824.0000	49.9	305	1.5	v	32.5	1.9	34.8	49.5	74	-24.5	Peak
4824.0000	48.5	340	1.9	h	32.5	1.9	34.8	48.1	74	-25.9	Peak

Middle Channel: 2437 MHz

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC15.247 Limit (dBuV/m)	FCC15.247 Margin	Comments
2437.0000	111.8	300	1.5	v	28.7	1.5	35.8	106.2	-	-	Fund/Peak
2437.0000	116.2	340	1.6	h	28.7	1.5	35.8	110.6	-	-	Fund/Peak
2437.0000	111.6	300	1.5	v	28.7	1.5	35.8	106.0	-	-	Ave
2437.0000	116.0	340	1.6	h	28.7	1.5	35.8	110.4	-	-	Ave
4874.0000	47.8	150	1.5	v	32.5	1.9	34.8	47.4	54	-6.6	Ave
4874.0000	44.5	300	1.3	h	32.5	1.9	34.8	44.1	54	-9.9	Ave
4874.0000	51.0	150	1.5	v	32.5	1.9	34.8	50.6	74	-23.4	Peak
4874.0000	49.0	300	1.3	h	32.5	1.9	34.8	48.6	74	-25.4	Peak

High Channel: 2462 MHz

Frequency MHz	Reading dBuV	Azimuth Degrees	Height m	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC15.247 Limit (dBuV/m)	FCC15.247 Margin	Comments
2462.0000	112.7	303	1.6	v	28.7	1.5	35.8	107.0	-	-	Fund/Peak
2462.0000	117.8	358	1.4	h	28.7	1.5	35.8	112.1	-	-	Fund/Peak
2462.0000	112.5	303	1.6	v	28.7	1.5	35.8	106.8	-	-	Ave
2462.0000	117.7	358	1.4	h	28.7	1.5	35.8	112.0	-	-	Ave
4924.0000	42.3	90	2.1	h	32.5	1.9	34.8	41.9	54	-12.1	Ave
4924.0000	42.1	14	1.4	v	32.5	1.9	34.8	41.7	54	-12.3	Ave
4924.0000	48.0	90	2.1	h	32.5	1.9	34.8	47.6	74	-26.4	Peak
4924.0000	47.9	14	1.4	v	32.5	1.9	34.8	47.5	74	-26.5	Peak