

**EMT****ELECTRO MAGNETIC TEST, INC.**  
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000*FCC PART 15.247, SUBPART C  
TEST REPORT**for**the*

COIN

MODEL: COIN BETA

Prepared for

Coin, Inc.  
370A Townsend Street  
San Francisco, CA 94107Prepared by: George Hsu

GEORGE HSU

Approved by: Kevin Bothmann  
KEVIN BOTHMANNELECTRO MAGNETIC TEST, INC.  
1547 PLYMOUTH STREET  
MOUNTAIN VIEW, CALIFORNIA 94043  
(650) 965-4000

DATE: SEPTEMBER 12, 2014

	REPORT BODY	APPENDICES				TOTAL
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
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## LIST OF APPENDICES

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A	Radiated and Conducted Data Sheets <ul style="list-style-type: none"> <li>• Radiated Emissions Test Data (General Requirements, and Restricted Bands)</li> <li>• Emissions in Non-Restricted Frequency Bands Test Data</li> <li>• Occupied Bandwidth Test Data</li> <li>• Maximum Peak Output Power Test Data</li> <li>• Maximum Peak Power Spectral Density Test Data</li> <li>• Band Edge Test Data</li> <li>• Conducted Emissions (AC Powerline) Test Data</li> </ul>
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2	Plot Map And Layout of Test Site
3	Layout of 5 Meter Semi-Anechoic Chamber



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## GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Electro Magnetic Test, Inc., which is an independent testing and consulting firm. The test report is based on testing performed Electro Magnetic Test, Inc. personnel according to the measurement procedure described in the test specification 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 unless done so in full.

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

The measurement data and conclusions contained in this test report are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003, Issue 5, August 2012.

Electro Magnetic Test, Inc. is recognized by the following agencies for performing EMI/EMC testing:

COUNTRY	AGENCY	IDENTIFYING #
USA	Federal Communications Commission (FCC) (EMT's test site is recognized by the FCC)	Registration Number: 90576
USA, Canada, Taiwan, Australia/New Zealand, European Community	National Voluntary Lab Accreditation Program (NVLAP) (EMT is accredited by NVLAP. A copy of the NVLAP Scope Of Accreditation is available upon request.)	Lab Code: 200147-0
Canada	Industry Canada	File No.: IC 2804
Japan	Voluntary Control Council For Interference (VCCI)	A-0118
	Open Field Test Site "A"	-
	Mains Conducted Emissions Test Site "A"	-
	Telecom Conducted Emissions Test Site "A"	-
	3 Meter Semi-Anechoic Chamber Site "E"	-
	3 Meter Semi-Anechoic Chamber Site "E" (1GHz – 6GHz)	-
	Mains Conducted Emissions Test Site "E"	-
	Telecom Conducted Emissions Test Site "E"	-
Korea	Ministry of Information and Communication's Radio Research Laboratory (RRL) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (A copy of the Scope Of Accreditation is available upon request)	US0036
Taiwan	Bureau Of Standards, Metrology and Inspection (BSMI)	Reference Number: SL2-IN-E-1024
Australia / New Zealand	Australian Communications Authority (AUSTEL)	*

\*These agencies do not issue an identifying number to test labs.



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### GENERAL REPORT SUMMARY (CONTINUED)

Device Tested: Coin  
 Model: Coin Beta  
 S/N: N/A

Product Description: The Coin device contains a microprocessor, which process input from proximity sensors and generates a magnetic field on the device, mimicking behavior of a magnetic stripe card when read by a magnetic strip reader. Consumers can configure their Coin device via Bluetooth Low Energy using the Coin app on their smart phones.

Modifications: The EUT was not modified during the testing.

Manufacturer: Coin, Inc.  
 370A Townsend Street  
 San Francisco, CA 94107

Test Date(s): September 4, and 5, 2014

Test Specifications: EMI requirements  
 Limits: FCC Title 47, Part 15 Subpart C  
 Test Procedure: ANSI C63.4: 2009

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

### SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	FCC STANDARD	REMARKS	RESULTS
7.1	Radiated Emissions (General Requirements and Emissions in Restricted Frequency Bands)	15.209, 15.247	Radiated	<b>PASS</b>
7.2	Conducted Emissions	15.207(a)	EUT is Battery Powered	<b>N/A</b>
7.3	Occupied Bandwidth	15.247(a)(2)	Conducted	<b>PASS</b>
7.4	Maximum Peak Output Power	15.247 (b)	Conducted	<b>PASS</b>
7.5	Maximum Peak Power Spectral Density	15.247(e)	Conducted	<b>PASS</b>
7.6	Emissions in Non-Restricted Frequency Bands	15.247(d)	Conducted	<b>PASS</b>
7.7	Bandedge	15.247(d)	Conducted	<b>PASS</b>
7.8	Antenna Requirement	15.203,15.247(b)(4))	N/A	<b>PASS</b>

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**TECHNICAL DESCRIPTION OF THE EUT**

<b>Manufacturer:</b>	Coin, Inc.
<b>Manufacturer Address:</b>	370A Townsend Street, San Francisco, CA 94107
<b>EUT Name:</b>	Coin
<b>Model No:</b>	Coin Beta
<b>Operation frequency:</b>	2402 MHz to 2480 MHz
<b>Channel Number:</b>	40
<b>Modulation Technology:</b>	DSSS
<b>Antenna Type:</b>	Internal Antenna
<b>Antenna Gain:</b>	2.3 dB
<b>Maximum Output Power:</b>	-23.96 dBm

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**TECHNICAL DESCRIPTION OF THE EUT (Continued)**

<b>Description of Channel:</b>			
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel</b>	<b>Frequency (MHz)</b>
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480



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## 1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the CoinModel: COIN BETA. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2009. 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 Title 47, Part 15, Subpart C.

## 2. ADMINISTRATIVE DATA

## 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Electro Magnetic Test, Inc., 1547 Plymouth Street, Mountain View, California, 94043.

## 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 measurement results in this report and the calibration of the test equipment are traceable to the National Institute of Standards and Technology (NIST).

## 2.3 Cognizant Personnel

Coin, Inc.

Karthik Balakirshnan CTO

## Electro Magnetic Test, Inc.

David Vivanco      Test Technician  
George Hsu      Test Technician  
Kevin Bothmann      Lab Manager

## 2.4 Date Test Sample was Received

The test sample was received on September 4, 2014.

## 2.5 Disposition of the Test Sample

The test sample was returned to Coin, Inc. on September 5, 2014.



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## 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
CISPR	International Special Committee On Radio Interference
FCC	Federal Communications Commission

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### 3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
FCC Title 47, Part 15, Subpart C	FCC Rules - Radio frequency devices (including digital devices).
ANSI C63.4 2009	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
FCC Publication KDB558074	Guidance for Performing Compliance Measurements on Digital Transmissions Systems (DTS) Operating Under 15.247, June 5, 2014



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## 4. DESCRIPTION OF TEST CONFIGURATION

### 4.1 Description of Test Configuration – EMI

The Coin Beta was constantly transmitting a modulated signal during testing.

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 EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix B.



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#### **4.1.1           Cable Construction and Termination**

The EUT has no cables.



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## 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

### 5.1 EUT and Accessory List

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID
COIN(EUT)	COIN, INC.	COIN BETA	N/A	N/A



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## 5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
Spectrum Analyzer	Hewlett Packard	8566B	3013A07296	July 30, 2014	1 Year
RF Preselector	Hewlett Packard	85685A	3010A01157	July 29, 2014	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2430A00451	July 29, 2014	1 Year
Radiated EMI Software	Sector Design	N/A	Ver.1.4.6	N/A	N/A
Conducted EMI Software	Hewlett Packard	85869PC	Ver. A.02.03	N/A	N/A
Preamplifier	Com Power	PA-102	1482	March 4, 2014	1 Year
RF Attenuator	Mini-Circuits	CAT-10	Asset #1000	December 19, 2013	1 Year
LISN	Com Power	LI-200	12012	October 1, 2013	1 Year
LISN	Com Power	LI-200	12214	October 1, 2013	1 Year
LISN	Com Power	LI-200	1767	October 1, 2013	1 Year
LISN	Com Power	LI-200	1768	October 1, 2013	1 Year
Biconical Antenna	Com Power	AB-100	01557	July 9, 2014	1 Year
Log Periodic Antenna	Com Power	AL-100	16001	July 9, 2014	1 Year
Horn Antenna	Com Power	AHA-118	711054	N/A	N/A
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Dell, Inc.	DHS	DNSV641	N/A	N/A
Printer	Hewlett Packard	C8124A	CN39A220ZD	N/A	N/A



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## 5.2 EMI Test Equipment (Continued)

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
EMI Receiver	Rohde & Schwarz	ESU40	100127	January 3, 2014	1 Year
EMI Test Software	Rohde & Schwarz	EMC32	V8.40.0	N/A	N/A
Passive Loop Antenna (9 KHz – 30 MHz)	ETS-Lindgren	6512	00128210	October, 28, 2010	4 Years
BiConiLog Antenna (30 MHz – 1 GHz)	ETS-Lindgren	3142D	00109337	July 24, 2014	1 Year
Horn Antenna (1 GHz – 18 GHz)	ETS-Lindgren	3117	00109294	July 24, 2014	1 Year
Preamplifier (1 GHz – 18 GHz)	Rohde & Schwarz	TS-PR18	100056	December 20, 2013	1 Year
Horn Antenna (18 GHz – 26.5 GHz)	ETS-Lindgren	3160-09	102646	June 17, 2014	1 Year
Preamplifier (18 GHz – 26.5 GHz)	Rohde & Schwarz	TS-PR26	100034	June 17, 2014	1 Year
Antenna Mast	ETS-Lindgren	2175	00095727	N/A	N/A
Turntable	ETS-Lindgren	2187-3.0	00118231	N/A	N/A
Computer	Dell, Inc.	OPTIPLEX 745	4T50WC1	N/A	N/A
Multi-Function Controller	ETS-Lindgren	2090	00102270	N/A	N/A

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## 6. TEST SITE DESCRIPTION

### 6.1 Test Facility Description

Please refer to the table below and section 7 of this report for the details of which sites were used for testing. All sites are located at 1547 Plymouth Street, Mountain View, California 94043.

Site Used For Test	Site Description
	Open Field Test Site "A"
X	Mains Conducted Emissions Test Site "A"
	Telecom Conducted Emissions Test Site "A"
X	3 Meter Semi-Anechoic Chamber Site "E"
	Mains Conducted Emissions Test Site "E"
	Telecom Conducted Emissions Test Site "E"

### 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.

### 6.3 Facility Environmental Characteristics

All tests were performed in a climate controlled building. The temperature was 22° C, humidity 45%, and barometric pressure 102.6 kPa.



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## 7. TEST PROCEDURES

### 7.1 Radiated Emissions Test – Semi-Anechoic Chamber

#### 7.1.1 General Requirements Limit (FCC PART 15 Section 15.209(a)(1))

Frequency of Emission (MHz)	Field Strength		Measurement Distance (Meters)
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	
0.009-0.49	2400/F(kHz)		300
0.49-1.705	24000/F(kHz)		30
1.705-30	30		30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

#### 7.1.2 Emissions in Restricted Bands Limit (FCC PART 15 Section 15.247(d), RSS 210 Issue 8[A2.6])

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
See General Limits Requirement In Above Chart

#### 7.1.3 Test Procedure

The Rohde & Schwarz ESU40 EMI receiver was used as a measuring meter while under software control by the Rohde & Schwarz EMC32 software. To increase the sensitivity of the instrument, the built in preamplifier was used from 9 KHz to 1 GHz and an external

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preamplifier was used from 1 GHz to 26.5 GHz. The EMI receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI receiver records the highest measured reading over all the sweeps. The built in quasi-peak or average detector 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 100 kHz from 9 kHz to 26.5 GHz.

The Loop Antenna, Broadband BiConiLog and horn antennas were used as transducers during the measurement. The Loop antenna was used from 9 KHz to 30 MHz, the BiConiLog antenna was used from 30 MHz to 1000 MHz and horn antennas were used from 1GHz – 26.5 GHz. The frequency spans were wide (9 kHz to 150 kHz, 150 kHz to 30 MHz, 30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz, 300 MHz to 1 GHz, 1 GHz to 18 GHz and 18 GHz to 26.5 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 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2009. 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. 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 non EUT signals was verified by turning the EUT off. In case a non EUT 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 other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 9 kHz to 26.5 GHz. to obtain final test data.

Calculation Of Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude

Corrected Amplitude - Limit = Margin



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## 7.2 Conducted Emissions Test – Mains Ports

### 7.2.1 Limit (FCC PART 15 Section 15.207(a))

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\*Note: Decreases with the logarithm of the frequency

### 7.2.2 Test Procedure

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A 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 detector 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 HP 8566B 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: 2009. 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 and peripheral 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 HP 85869PC software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

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## 7.3 Occupied Bandwidth

### 7.3.1 Limit (FCC PART 15 Section 15.247(a)(2))

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

Limit
6 dB Bandwidth $\geq$ 500 kHz

### 7.3.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 kHz

VBW:  $\geq$  3 X RBW

Detector: Peak

Trace Mode: Max Hold

- (1) When the trace is completed, mark the peak value
- (2) Measure the 6db bandwidth using Xdb down function, If this does not encompass the full bandwidth, then “Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission”

### 7.3.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

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## 7.4 Maximum Peak Output Power

### 7.4.1 Limit (FCC PART 15 Section 15.247(b)(3))

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Limit
Maximum Peak Output Power (Digital Modulation) $\leq$ 1Watt or 30 dBm

### 7.4.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

RBW > DTS Bandwidth  
VBW  $\geq$  3 x RBW  
Span  $\geq$  3 \* RBW  
Detector: Peak  
Trace Mode: Max Hold

- (1) When the trace is completed, mark the peak value

### 7.4.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

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## 7.5 Maximum Peak Power Spectral Density

### 7.5.1 Limit (FCC PART 15 Section 15.247(e))

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

Limit
8 dBm

### 7.5.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

3 kHz  $\leq$  RBW  $\leq$  100 kHz  
VBW  $\geq$  3 x RBW  
Span  $\geq$  1.5 \* DTS Bandwidth  
Detector: Peak  
Sweep Time auto

- (1) Use Peak Marker Function
- (2) If value Exceeds limit, reduce RBW ( no less than 3 kHz)

### 7.5.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.



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## 7.6 Emissions in Non-Restricted Frequency Bands

### 7.6.1 Limit (FCC PART 15 Section 15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
20db Below Peak Power Spectral Density
30db Below Average Power Spectral Density

### 7.6.2 Test Procedure

(1) Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 KHz  
 VBW:  $\geq 3 \times$  RBW  
 Detector: Peak  
 Trace Mode: Max Hold  
 Span  $\geq 1.5$  DTS Bandwidth

(2) Set Frequency Span to DTS Channel Center Frequency

(3) Use Peak Marker Function, This is your reference PSD

RBW: 100 KHz  
 VBW:  $\geq 3 \times$  RBW  
 Detector: Peak  
 Trace Mode: Max Hold

(4) Set Span to encompass frequency range

(5) Report 3 highest emissions



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### 7.6.3

### Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.



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## 7.7 Bandedge

### 7.7.1 Limit (FCC PART 15 Section 15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
20db Below Peak Power Spectral Density
30db Below Average Power Spectral Density

### 7.7.2 Test Procedure

(1) Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 KHz  
 VBW:  $\geq 3 \times$  RBW  
 Detector: Peak  
 Trace Mode: Max Hold  
 Span  $\geq 1.5$  DTS Bandwidth

(2) Set Frequency Span to DTS Channel Center Frequency

(3) Use Peak Marker Function, This is your reference PSD

RBW: 100 KHz  
 VBW:  $\geq 3 \times$  RBW  
 Detector: Peak  
 Trace Mode: Max Hold

(4) Set Span to encompass the bandedge

(5) Report 3 highest emissions



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### 7.7.3

### Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.



## 7.8 Antenna Requirement

### 7.8.1 Requirement (FCC PART 15 SECTION 15.203,15.247(b)(4))

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 7.8.2 Test Result

The antenna is integrated on the main PCB with no consideration for replacement on the EUT.



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## 8. CONCLUSIONS / COMPLIANCE STATEMENT

Based upon the results contained in this report, Electro Magnetic Test, Inc. has determined that the Coin, Model: COIN BETA meets all of the specification limits defined in FCC Title 47, Part 15, Subpart C.

**EMT**

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## **APPENDIX A**

### ***RADIATED AND CONDUCTED DATA SHEETS***



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### Radiated Emissions

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	9 KHz to 30 MHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value


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### Radiated Emissions

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	30 MHz to 1 GHz

#### Peak Measurement:

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
60.0000	14.9	175.0	V	342.0	8.0	25.10	40.00
105.6600	18.3	400.0	H	209.0	11.1	25.20	43.50
152.8200	15.5	128.0	V	319.0	11.5	28.00	43.50
263.0100	18.3	400.0	H	311.0	14.2	27.70	46.00
414.9900	22.4	128.0	V	298.0	18.4	23.60	46.00
501.2400	24.7	383.0	H	17.0	20.6	21.30	46.00

#### Quasipeak Measurement:

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
60.0000	11.4	175.0	V	342.0	8.0	28.60	40.00
105.6600	14.9	400.0	H	209.0	11.1	28.60	43.50
152.8200	10.0	128.0	V	319.0	11.5	33.50	43.50
263.0100	12.1	400.0	H	311.0	14.2	33.90	46.00
414.9900	16.6	128.0	V	298.0	18.4	29.40	46.00
501.2400	19.1	383.0	H	17.0	20.6	26.90	46.00


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### Radiated Emissions

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE, Channel 0	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

#### Peak Measurement:

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12101.0000	49.1	147.0	V	158.0	17.1	24.90	74.00
12115.7333	49.7	135.0	H	20.0	17.2	24.30	74.00
12289.7000	49.6	110.0	V	20.0	17.4	24.40	74.00
12290.8333	49.7	122.0	H	230.0	17.4	24.30	74.00
14486.6667	50.4	178.0	V	1.0	19.3	23.60	74.00
14488.9333	51.1	291.0	V	177.0	19.3	22.90	74.00
14512.1667	49.9	177.0	H	211.0	19.2	24.10	74.00
17177.7667	54.5	373.0	V	78.0	22.9	19.50	74.00
17231.0333	54.6	288.0	V	131.0	22.9	19.40	74.00

#### Average Measurement:

Frequency (MHz)	Average (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12101.0000	36.3	147.0	V	158.0	17.1	17.70	54.00
12115.7333	36.3	135.0	H	20.0	17.2	17.70	54.00
12289.7000	36.4	110.0	V	20.0	17.4	17.60	54.00
12290.8333	36.4	122.0	H	230.0	17.4	17.60	54.00
14486.6667	37.1	178.0	V	1.0	19.3	16.90	54.00
14488.9333	37.1	291.0	V	177.0	19.3	16.90	54.00
14512.1667	36.9	177.0	H	211.0	19.2	17.10	54.00
17177.7667	41.3	373.0	V	78.0	22.9	12.70	54.00
17231.0333	41.5	288.0	V	131.0	22.9	12.50	54.00



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### Radiated Emissions

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE, Channel 20	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

#### Peak Measurement:

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12278.3667	50.1	221.0	H	188.0	17.4	23.90	74.00
12295.9333	50.1	135.0	V	175.0	17.4	23.90	74.00
17258.2333	54.9	400.0	H	177.0	22.7	19.10	74.00

#### Average Measurement:

Frequency (MHz)	Average (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12278.3667	36.4	221.0	H	188.0	17.4	17.60	54.00
12295.9333	36.4	135.0	V	175.0	17.4	17.60	54.00
17258.2333	41.3	400.0	H	177.0	22.7	12.70	54.00


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### Radiated Emissions

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE, Channel 39	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

#### Peak Measurement:

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12401.9000	49.0	185.0	H	117.0	17.0	25.00	74.00
12427.9667	49.1	386.0	V	170.0	17.1	24.90	74.00
17270.7000	54.6	192.0	V	162.0	22.7	19.40	74.00

#### Average Measurement:

Frequency (MHz)	Average (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
12401.9000	35.5	185.0	H	117.0	17.0	18.50	54.00
12427.9667	35.6	386.0	V	170.0	17.1	18.40	54.00
17270.7000	41.1	192.0	V	162.0	22.7	12.90	54.00

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**Radiated Emissions**

EUT:	Coin, Inc.	Model Name:	Coin Beta
Test Mode:	Bluetooth LE	Test Date:	9/4/14
Test Engineer:	George Hsu	Measurement:	18 GHz to 26.5 GHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value

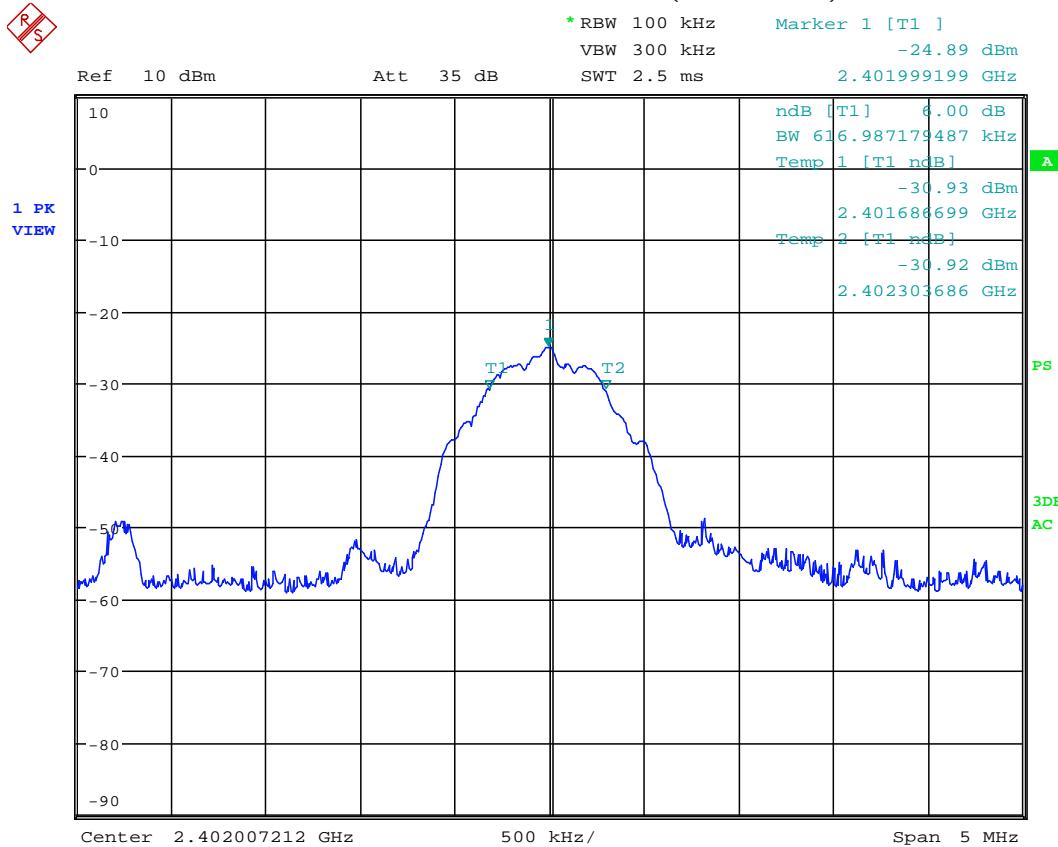


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**6dB Bandwidth Test Data (Conducted)**

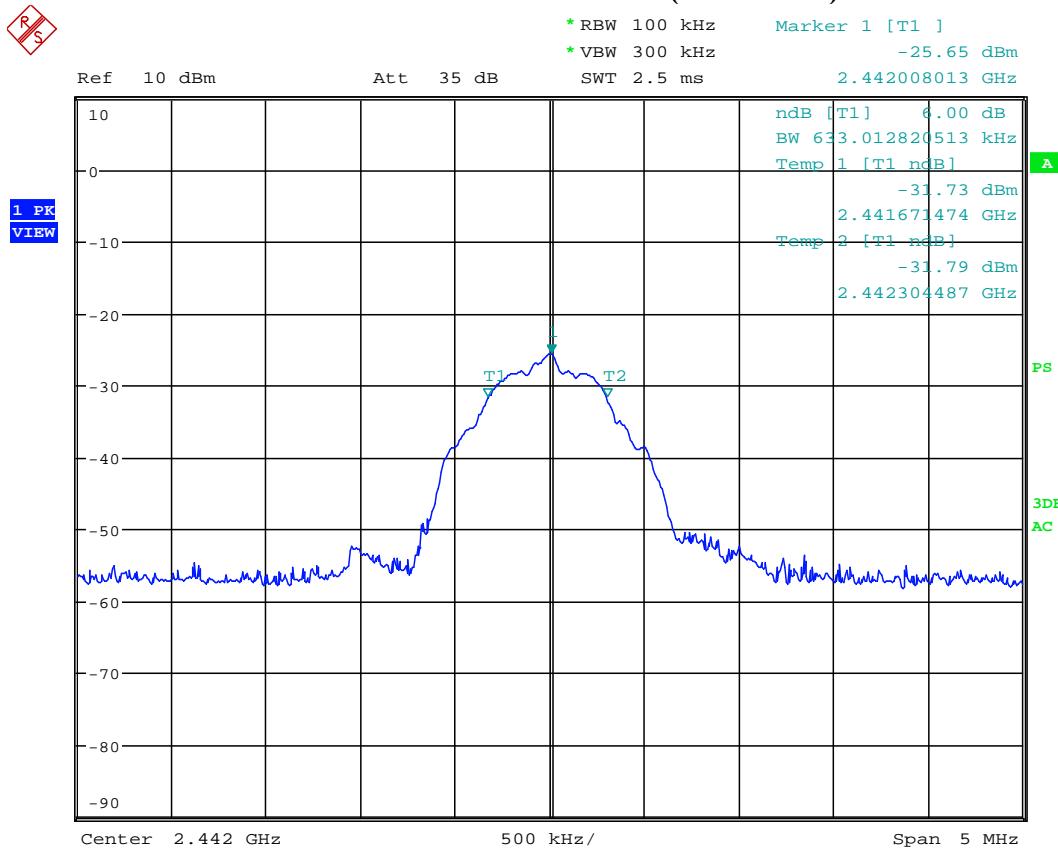
Company:	Coin, Inc.		Test Date	9/5/14	
EUT Name	Coin		Test Engineer	George Hsu	
Model:	Coin Beta		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	6 dB Bandwidth (KHz)	Limit (KHz)	Conclusion
Bluetooth LE	0	2402	616.987	$\geq 500$	PASS
	20	2442	633.012	$\geq 500$	PASS
	39	2480	616.987	$\geq 500$	PASS
Test Equipment: Please refer to section 5.2					

**EMT****ELECTRO MAGNETIC TEST, INC.**  
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EMT

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## 6dB Bandwidth Test Data (Conducted)

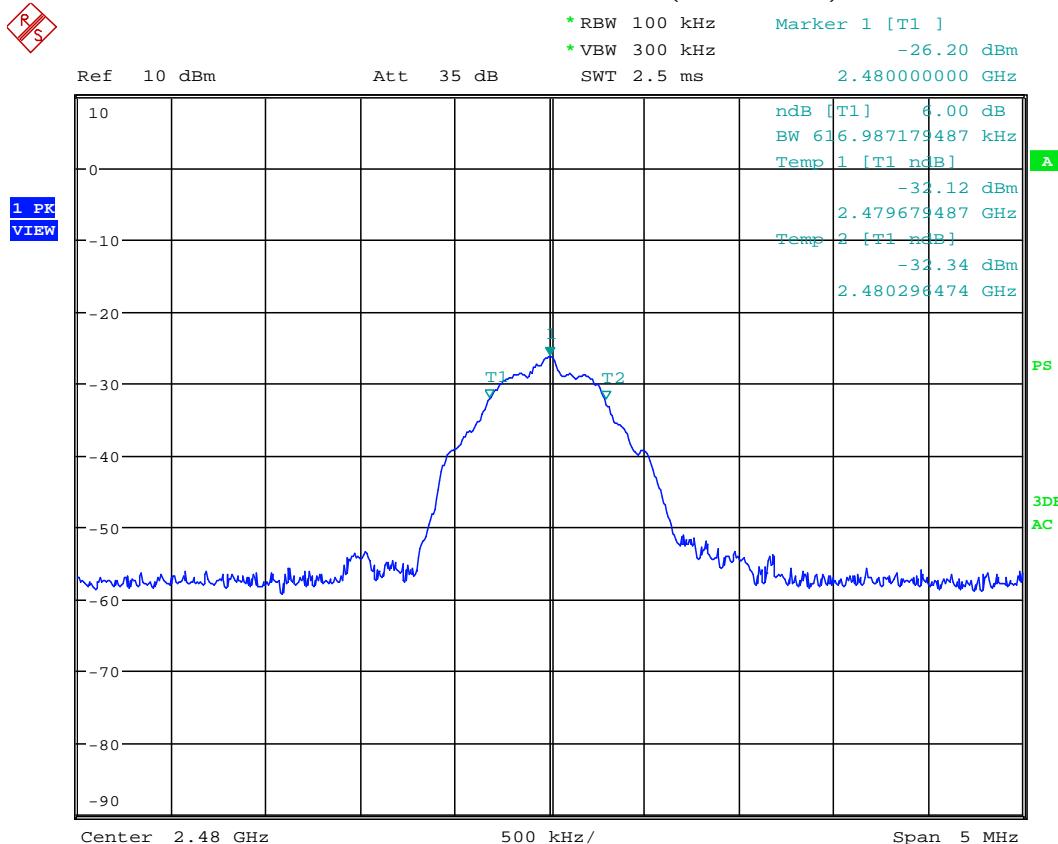


## Channel 20

EMT

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**6dB Bandwidth Test Data (Conducted)****Channel 39**



**ELECTRO MAGNETIC TEST, INC.**

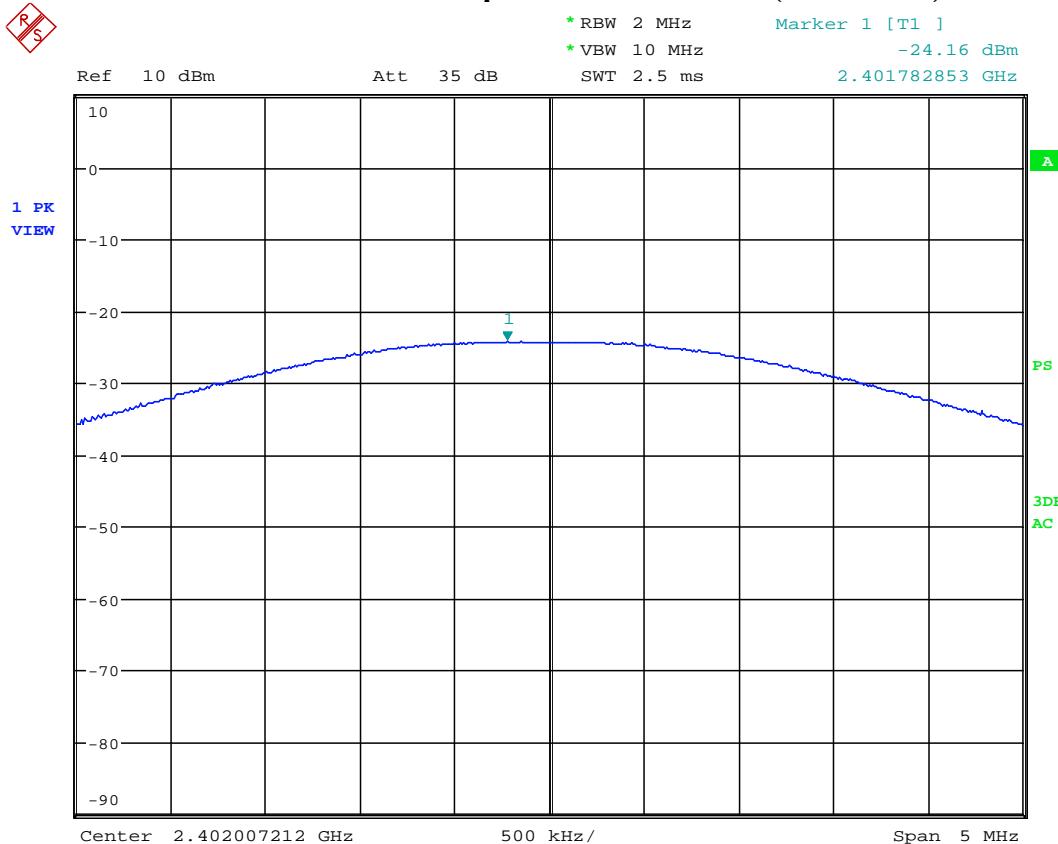
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

**Maximum Peak Output Power Test Data (Conducted)**

Company:	Coin, Inc.		Test Date	9/5/14	
EUT Name	Coin		Test Engineer	George Hsu	
Model:	Coin Beta		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	Corrected Peak Output Power (dBm)	Limit (dBm)	Conclusion
Bluetooth LE	0	2402	-23.96	$\leq 30$	Pass
	20	2442	-24.75	$\leq 30$	Pass
	39	2480	-25.15	$\leq 30$	Pass
Test Equipment: Please refer to section 5.2					

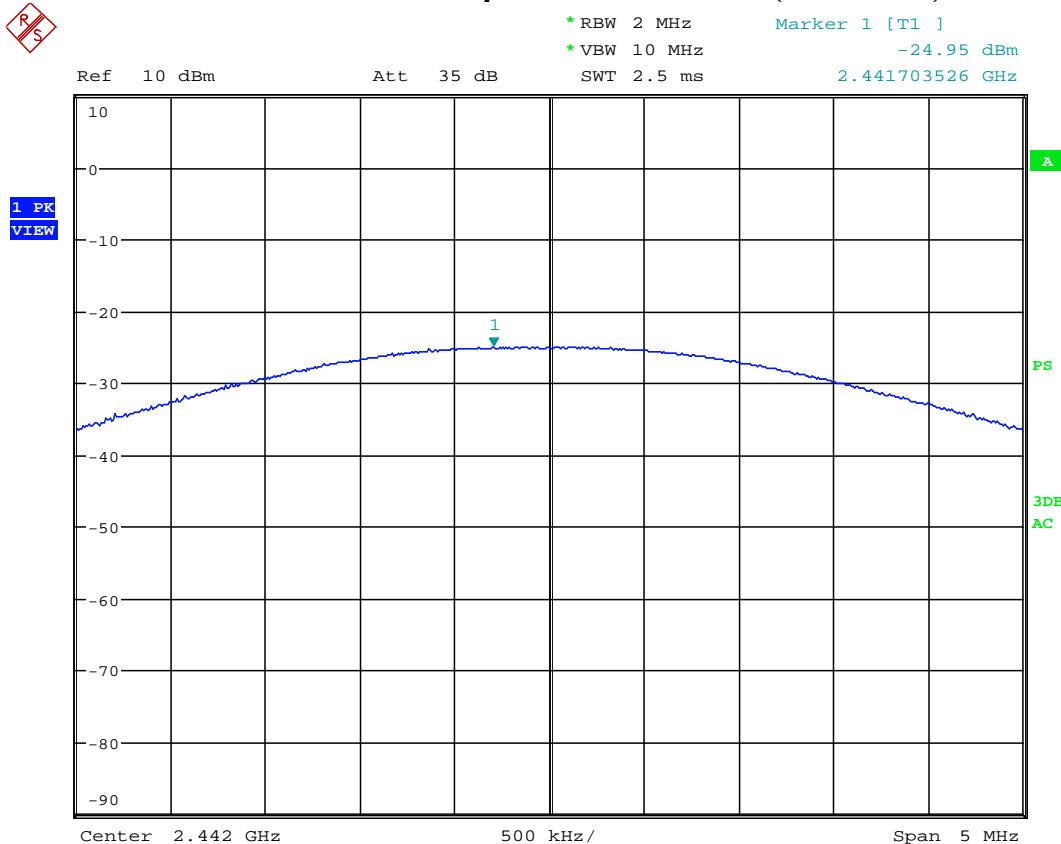
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**Maximum Peak Output Power Test Data (Conducted)****Channel 0**

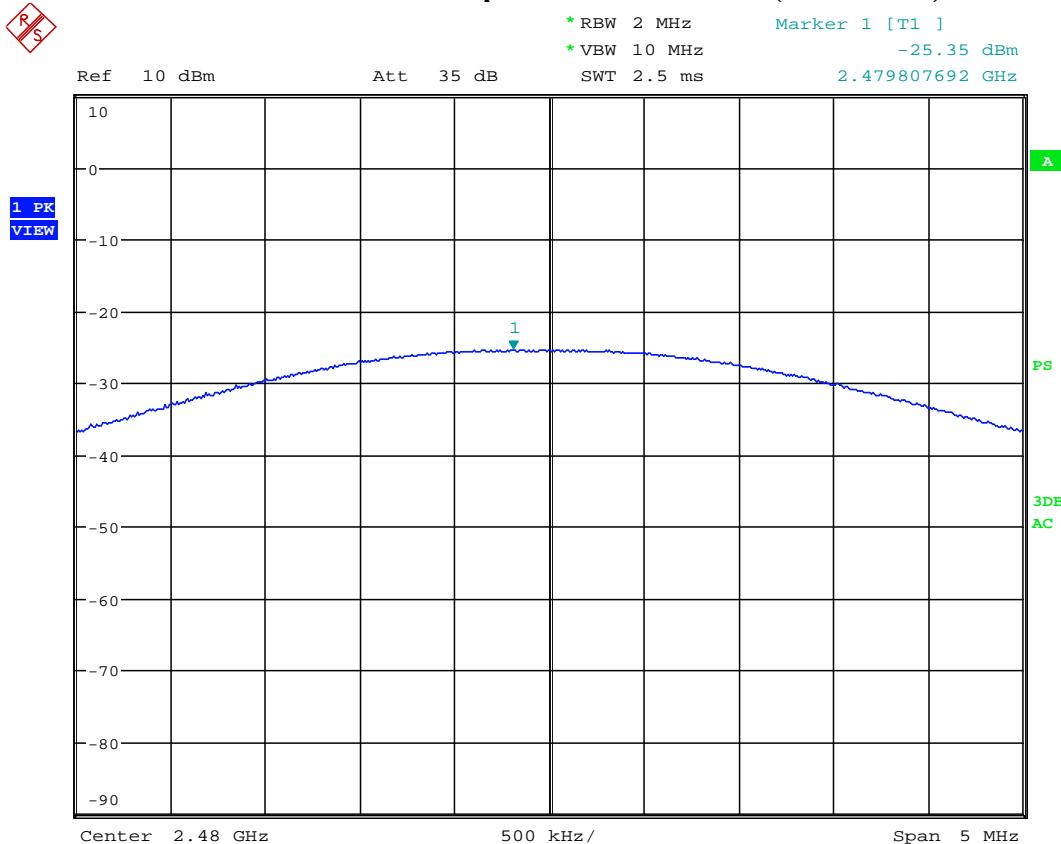
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**Maximum Peak Output Power Test Data (Conducted)****Channel 20**

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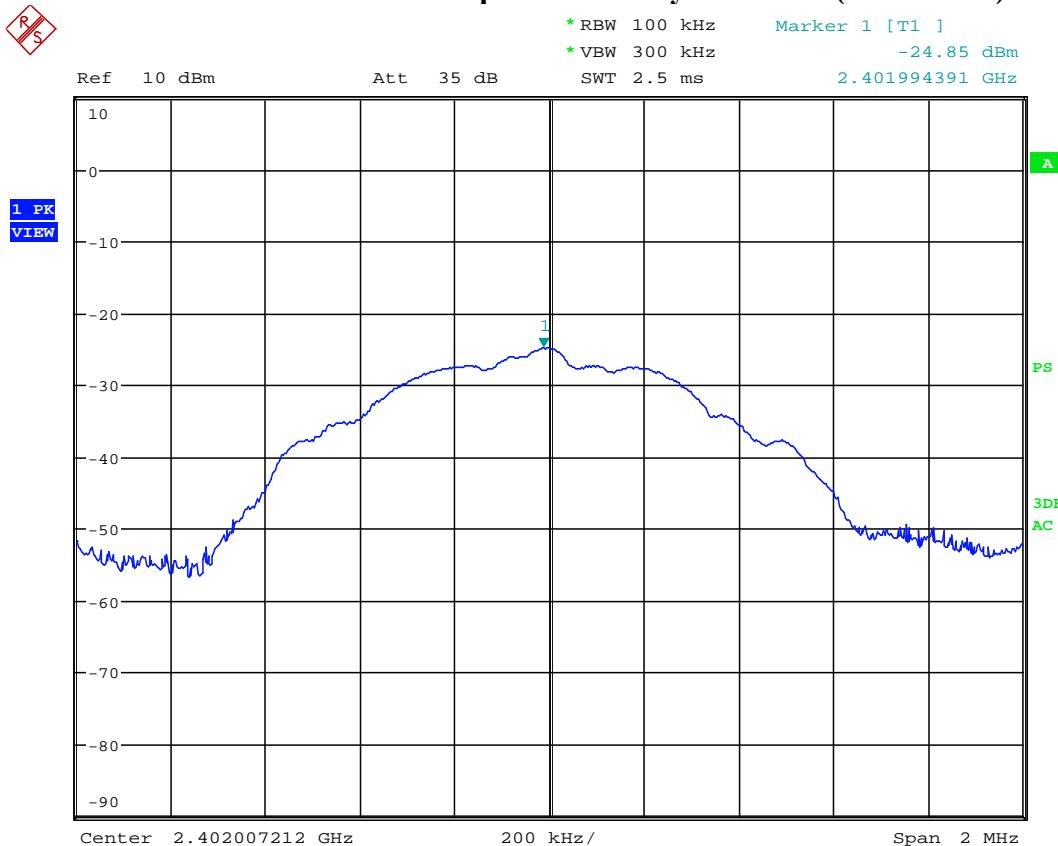
**Maximum Peak Output Power Test Data (Conducted)****Channel 39**

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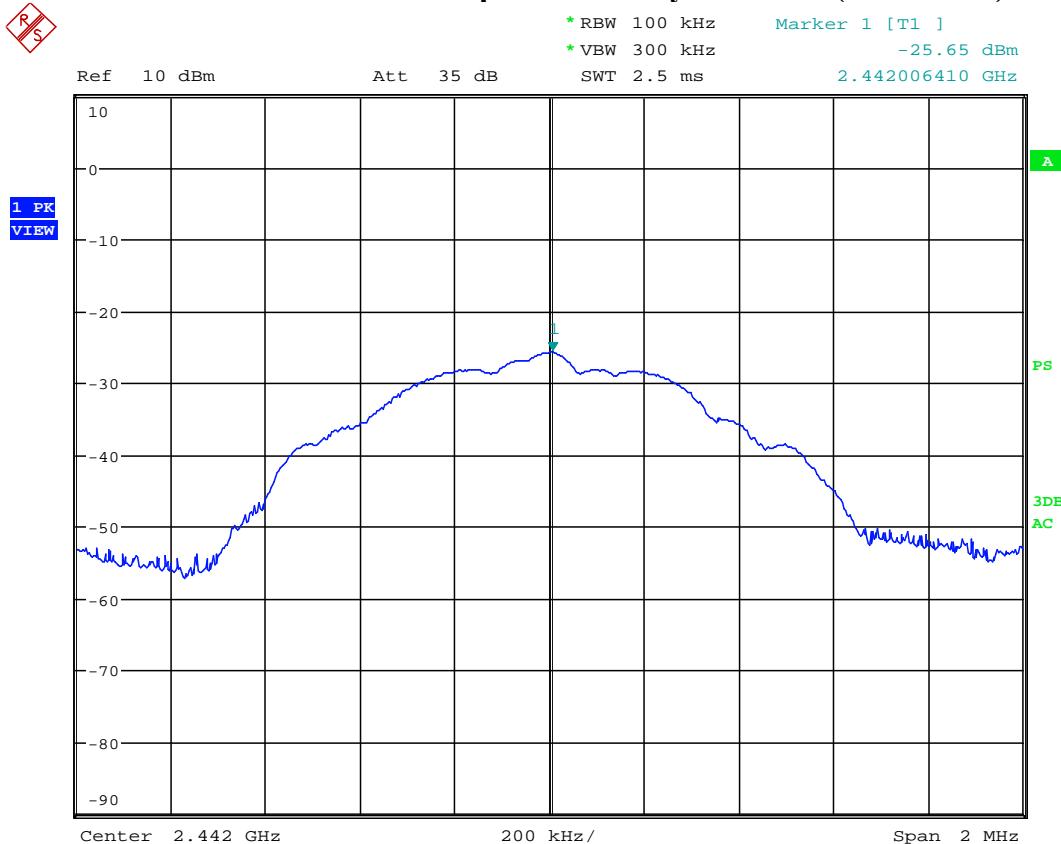
**Maximum Power Spectral Density Test Data (Conducted)**

Company:	Coin, Inc.		Test Date	9/5/14	
EUT Name	Coin		Test Engineer	George Hsu	
Model:	Coin Beta		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	Corrected Peak (dBm)	Limit (dBm)	Conclusion
Bluetooth LE	0	2402	-24.65	≤ 8	Pass
	20	2442	-25.45	≤ 8	Pass
	39	2480	-25.95	≤ 8	Pass
Test Equipment: Please refer to 5.2					

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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000**Maximum Peak Power Spectral Density Test Data (Conducted)****Channel 0**

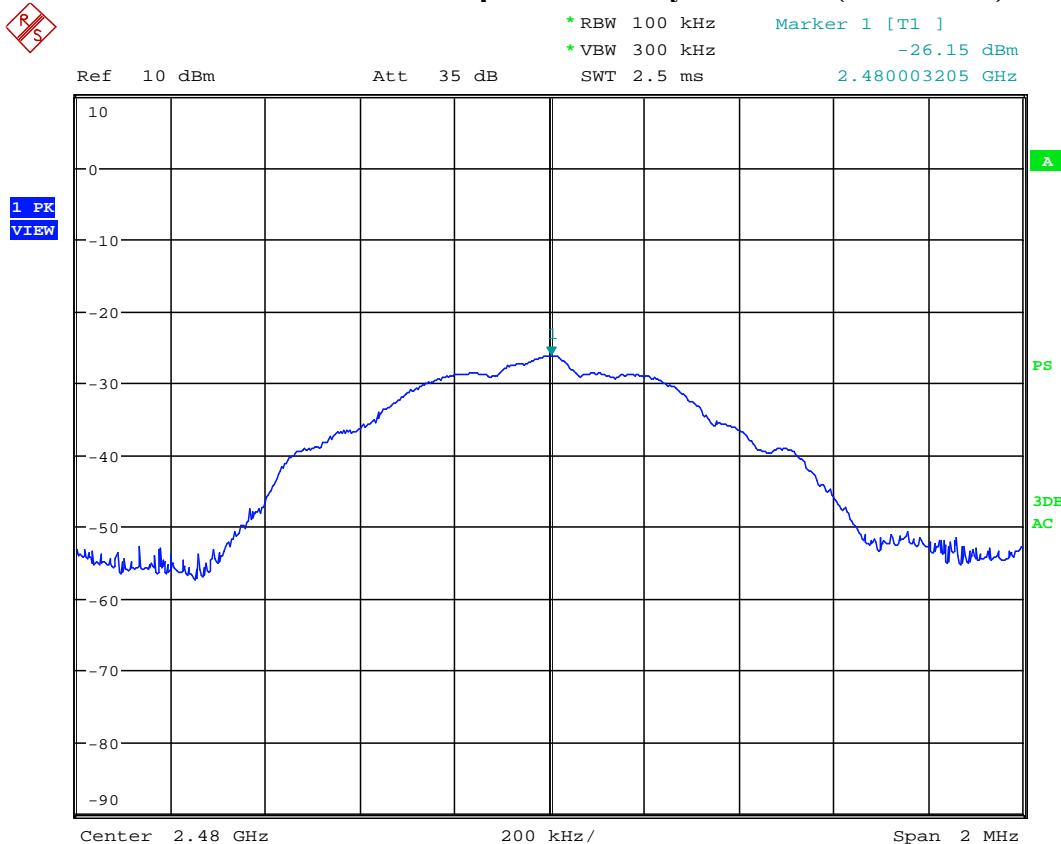
**EMT****ELECTRO MAGNETIC TEST, INC.**

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**Maximum Peak Power Spectral Density Test Data (Conducted)****Channel 20**

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**Maximum Peak Power Spectral Density Test Data (Conducted)****Channel 39**



**ELECTRO MAGNETIC TEST, INC.**

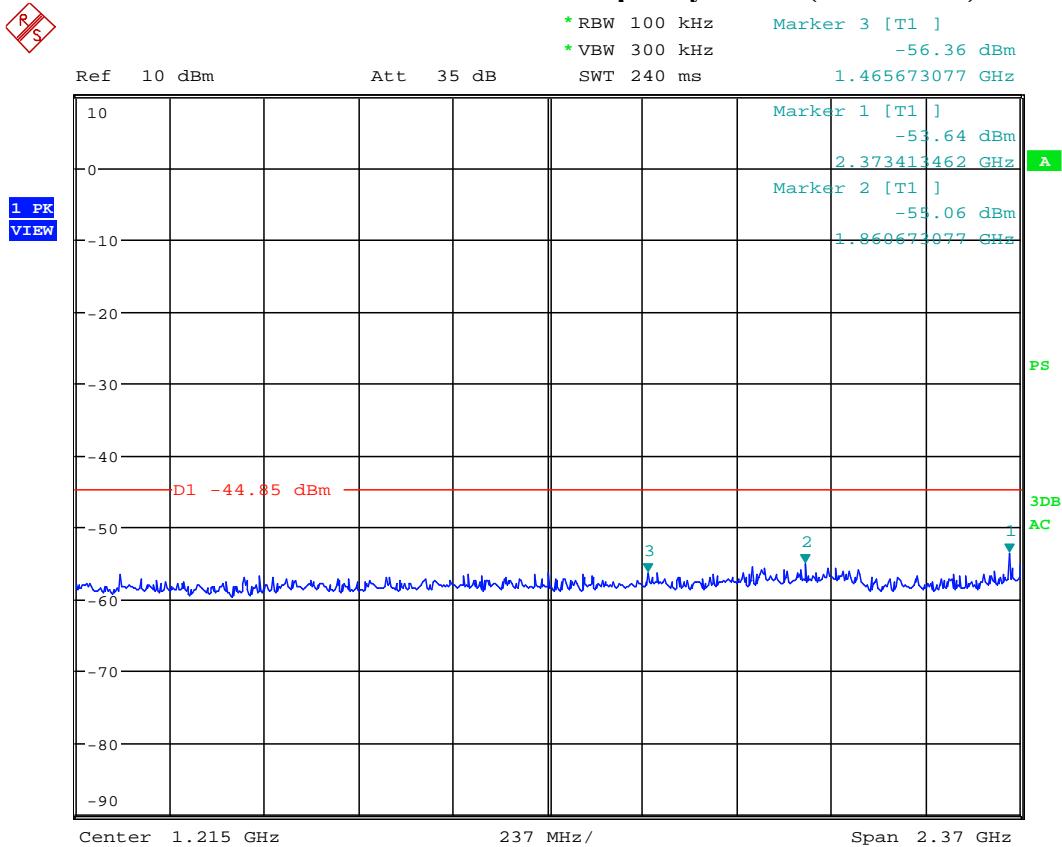
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**Emissions in Non-Restricted Frequency Bands (Conducted)**

Company:	Coin, Inc.		Test Date	9/5/14	
EUT Name	Coin		Test Engineer	George Hsu	
Model:	Coin Beta		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	Corrected Peak (dBm)	Limit (dBm)	Conclusion
Bluetooth LE	0	4792.884	-49.97	≤ -44.85	Pass
	0	21391.586	-51.17	≤ -44.85	Pass
	0	23087.540	-50.69	≤ -44.85	Pass
	20	4865.052	-50.50	≤ -45.65	Pass
	20	21644.175	-50.38	≤ -45.65	Pass
	20	24458.737	-50.58	≤ -45.65	Pass
	39	22185.437	-50.03	≤ -46.15	Pass
	39	22907.120	-50.68	≤ -46.15	Pass
	39	23592.718	-49.46	≤ -46.15	Pass
Test Equipment: Please refer to 5.2					

**EMT****ELECTRO MAGNETIC TEST, INC.**

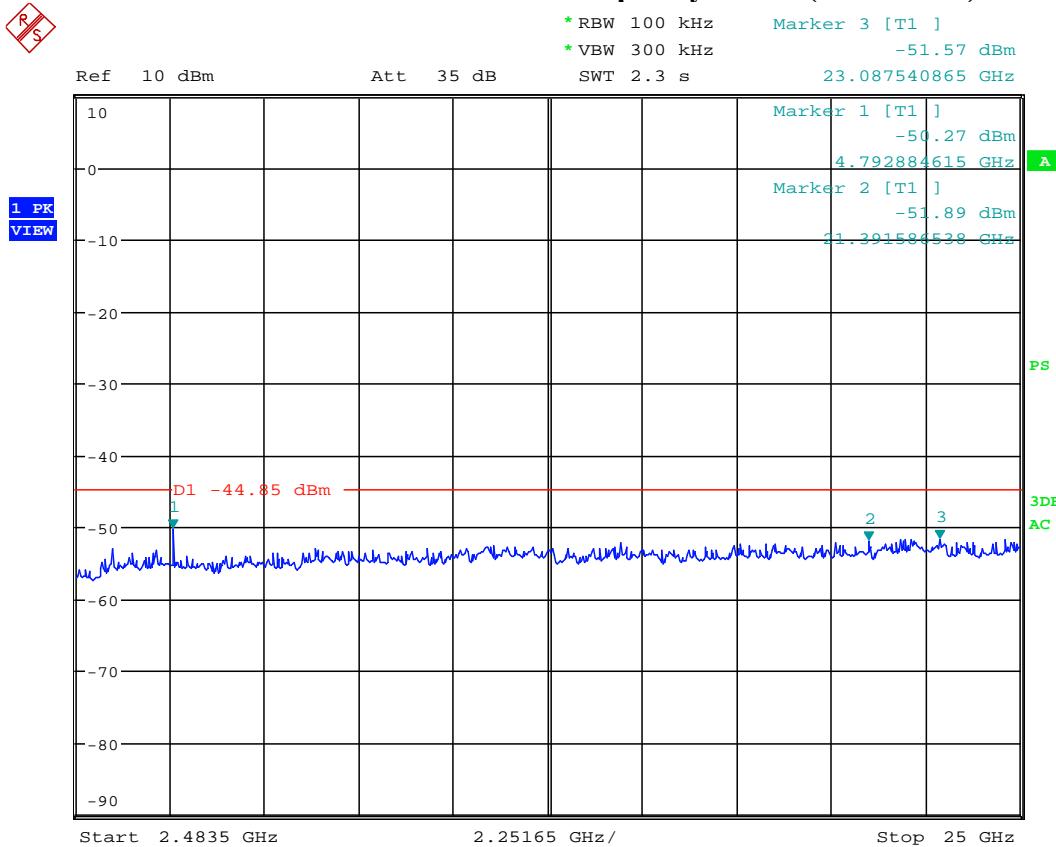
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**Emissions in Non-Restricted Frequency Bands (Conducted)****Channel 0 (30 MHz- 2.4 GHz)**



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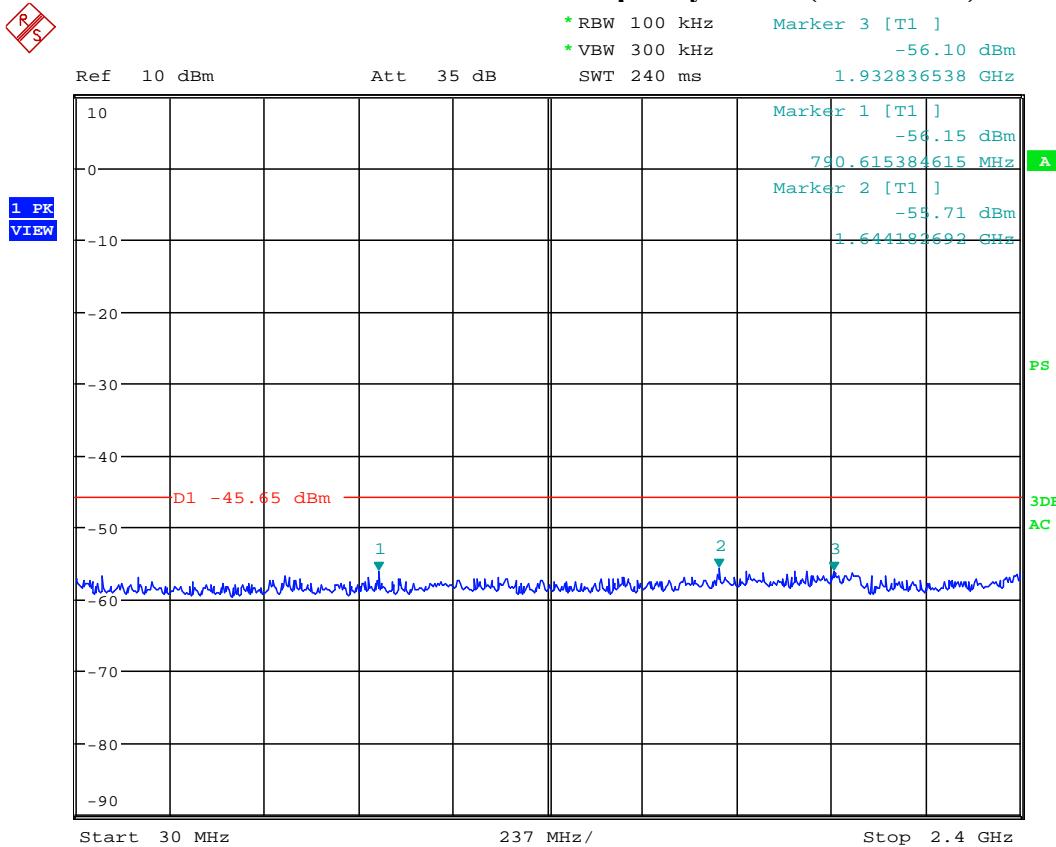
### Emissions in Non-Restricted Frequency Bands (Conducted)



### Channel 0 (2.5 GHz- 25 GHz)

**EMT****ELECTRO MAGNETIC TEST, INC.**

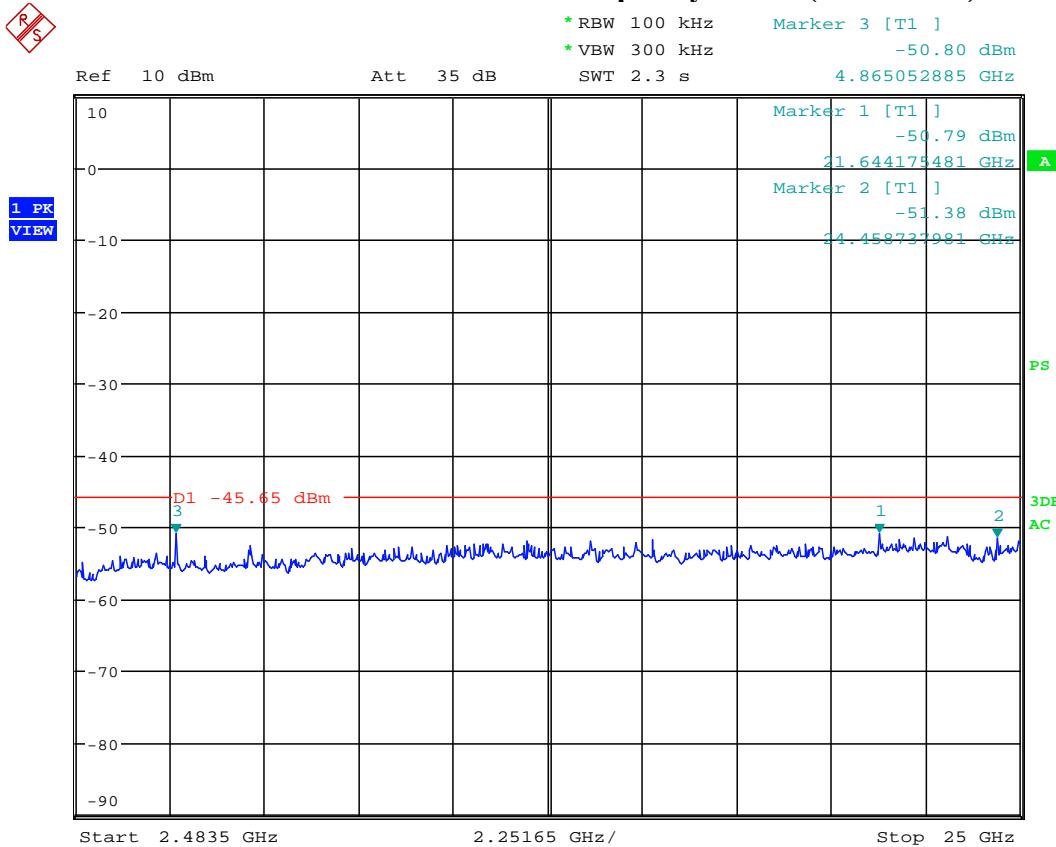
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**Emissions in Non-Restricted Frequency Bands (Conducted)****Channel 20 (30 MHz- 2.4 GHz)**



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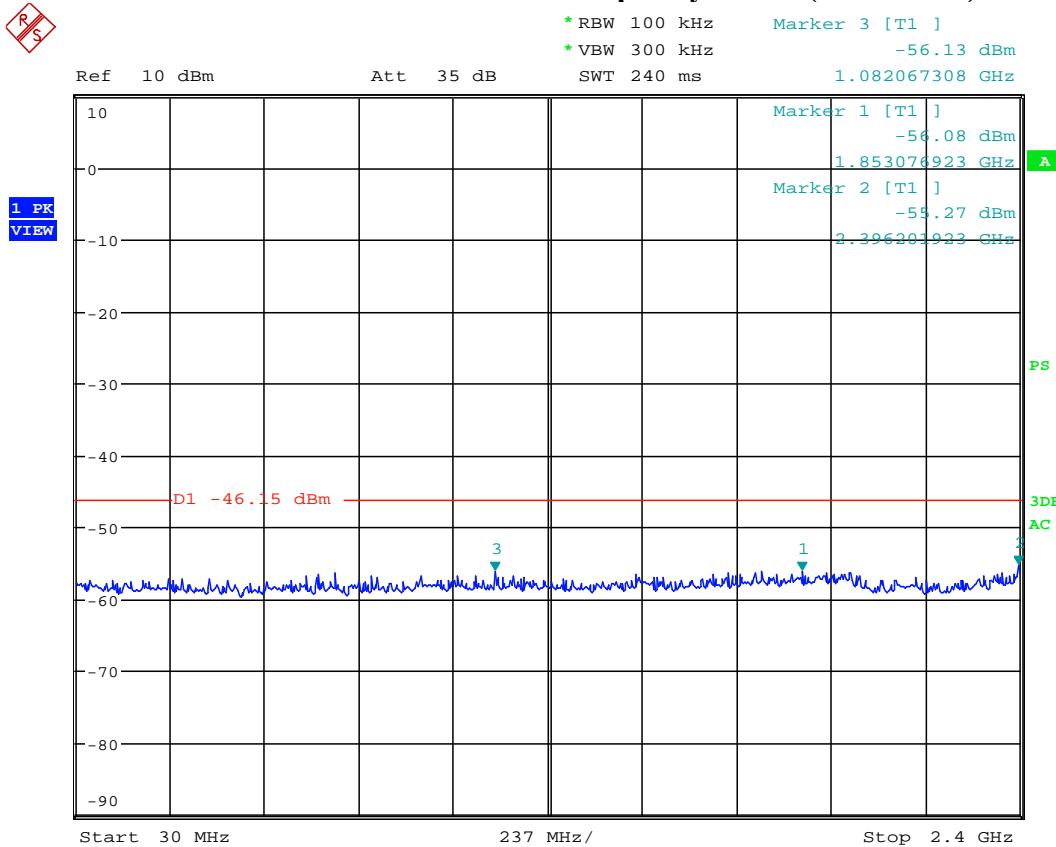
### Emissions in Non-Restricted Frequency Bands (Conducted)



### Channel 20 (2.5 GHz- 25 GHz)

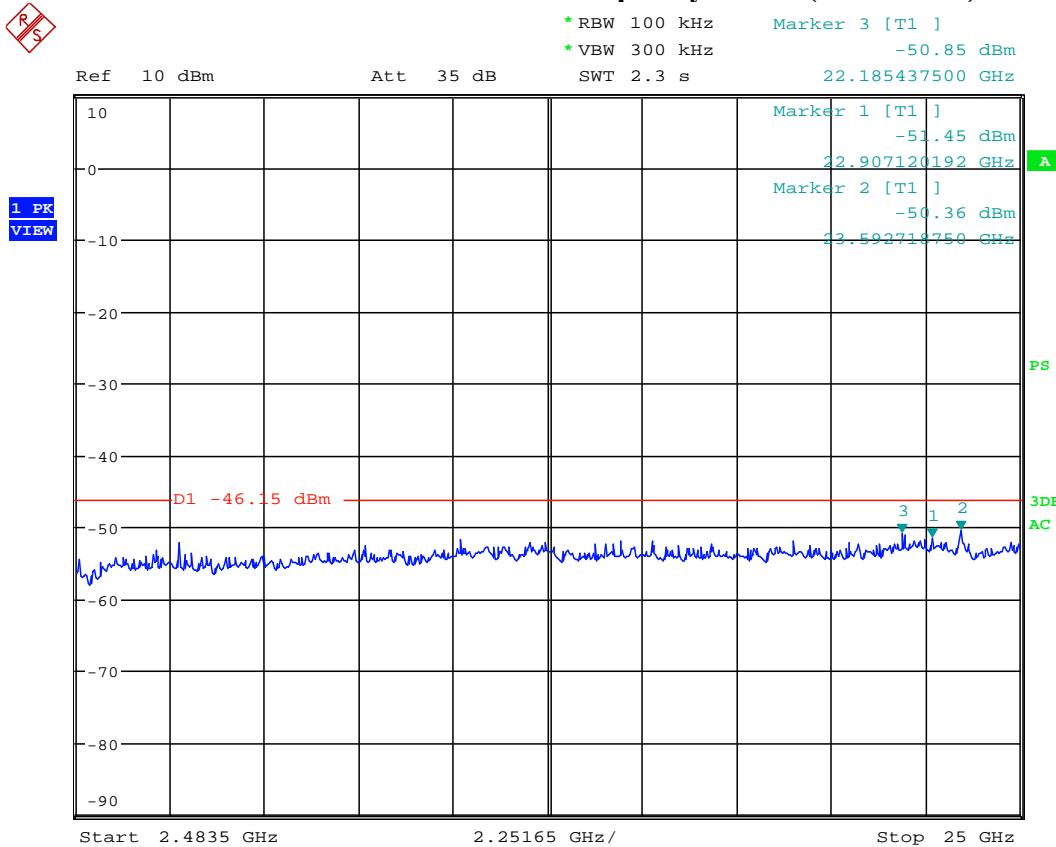
**EMT****ELECTRO MAGNETIC TEST, INC.**

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**Emissions in Non-Restricted Frequency Bands (Conducted)****Channel 39 (30 MHz- 2.4 GHz)**

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**Emissions in Non-Restricted Frequency Bands (Conducted)****Channel 39 (2.5 GHz- 25 GHz)**



**ELECTRO MAGNETIC TEST, INC.**

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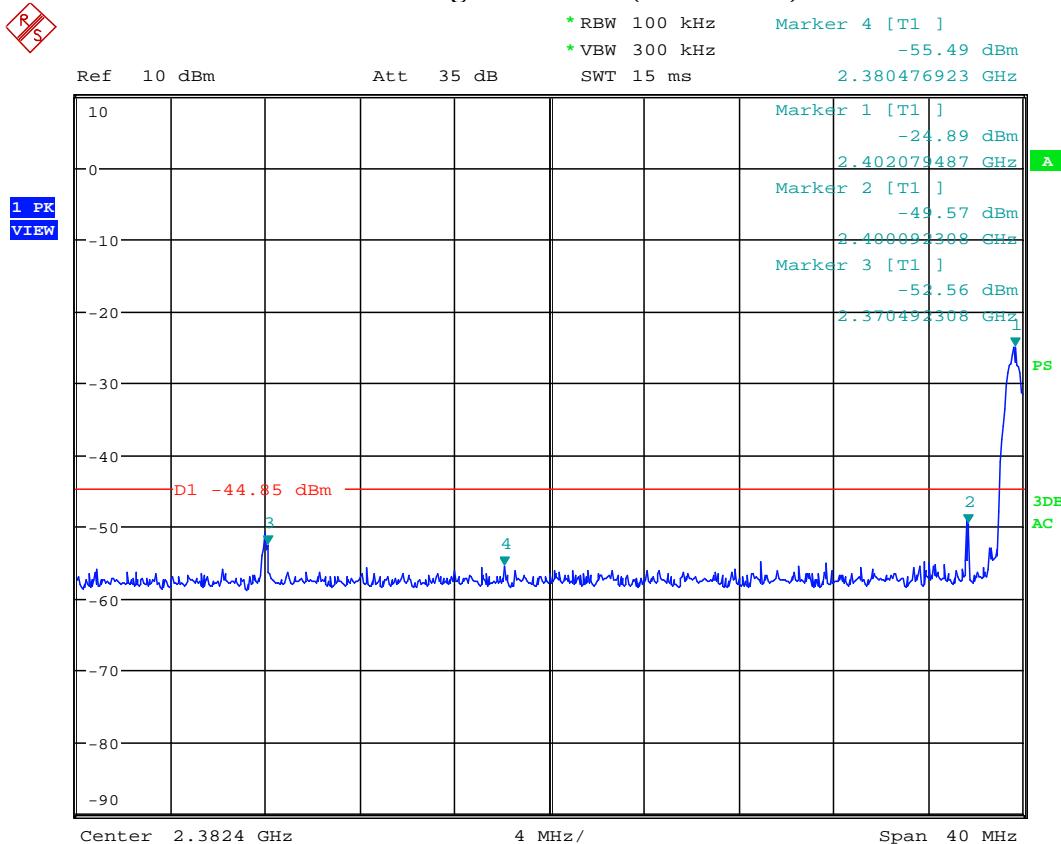
**Bandedge Test Data (Conducted)**

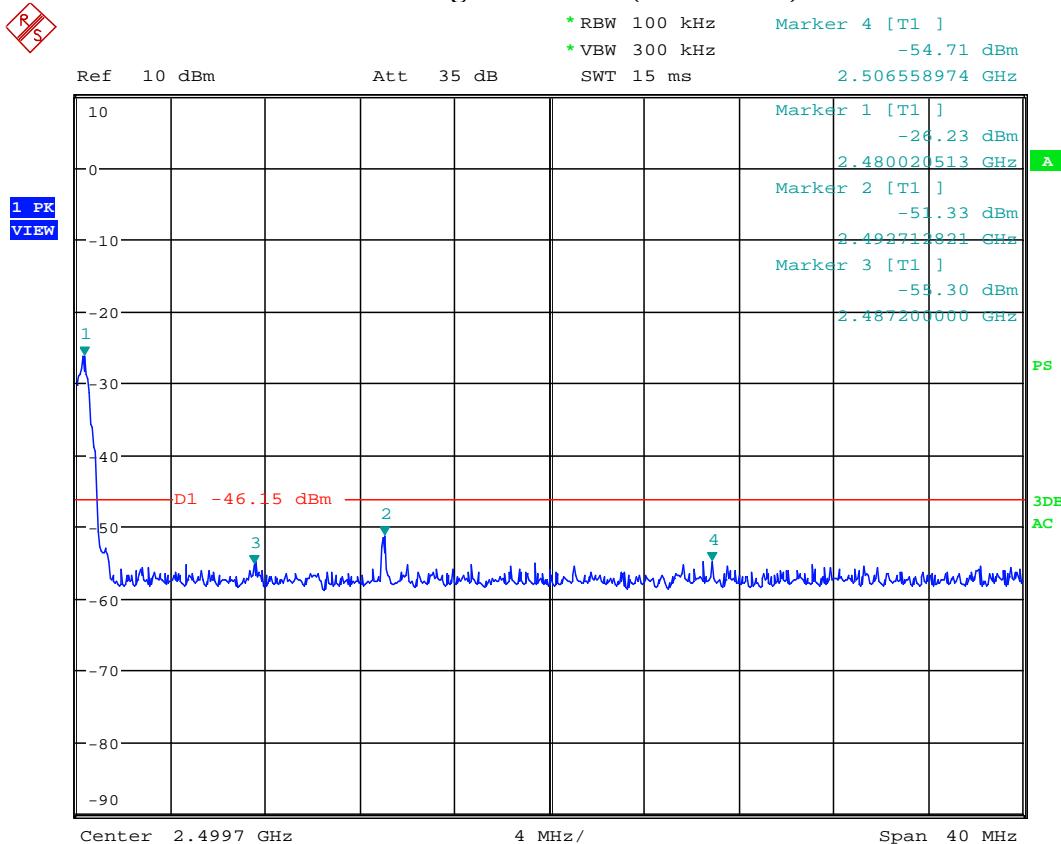
Company:	Coin, Inc.		Test Date	9/5/14	
EUT Name	Coin		Test Engineer	George Hsu	
Model:	Coin Beta		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	Corrected Peak (dBm)	Limit (dBm)	Conclusion
Bluetooth LE	0	2381.891	-54.85	≤ -44.85	Pass
	0	2387.243	-54.10	≤ -44.85	Pass
	0	2388.974	-55.35	≤ -44.85	Pass
	39	2487.200	-55.10	≤ -46.15	Pass
	39	2492.713	-51.13	≤ -46.15	Pass
	39	2506.559	-54.51	≤ -46.15	Pass
Test Equipment: Please refer to 5.2					

EMT

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**Bandedge Test Data (Conducted)****Channel 0**

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## **APPENDIX B**

### ***TEST SETUP DIAGRAMS***

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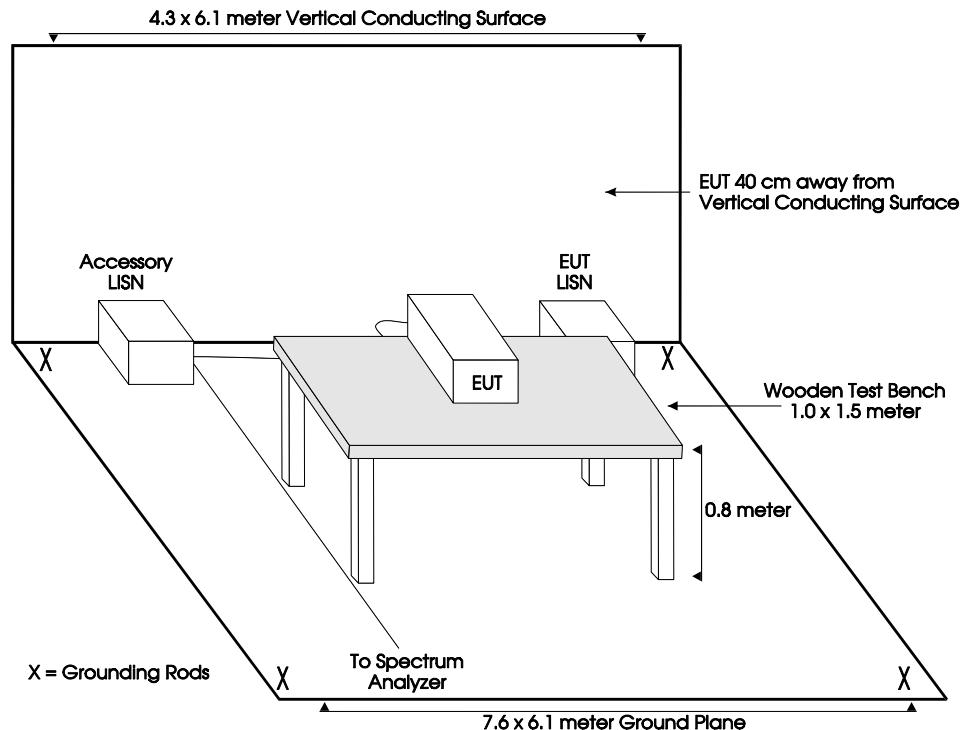


FIGURE 1 – TABLETOP CONDUCTED EMISSIONS TEST SETUP – SITE “A”

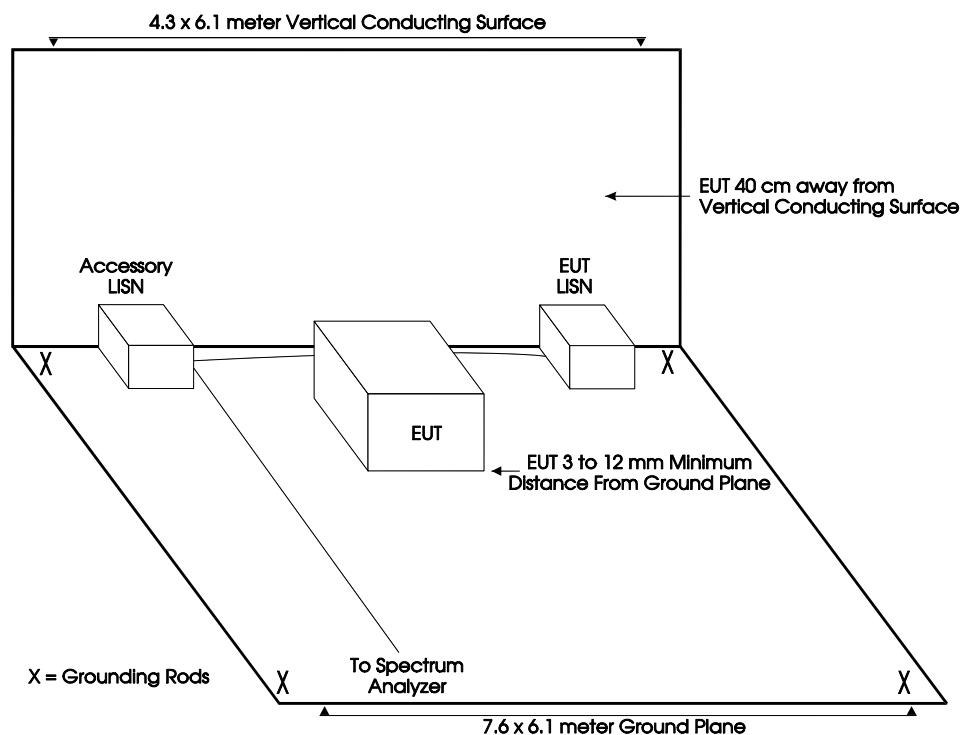
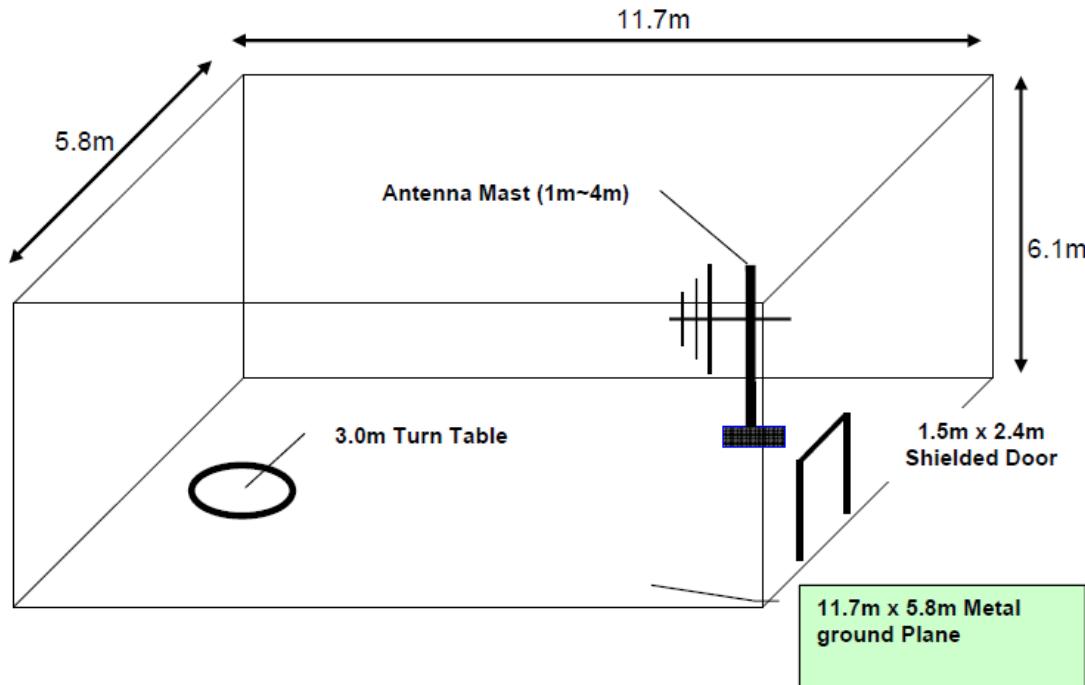


FIGURE 1a – FLOORSTANDING CONDUCTED EMISSIONS TEST SETUP – SITE “A”

**EMT****ELECTRO MAGNETIC TEST, INC.**  
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000**FIGURE 3 - LAYOUT OF 5 METER SEMI-ANECHOIC CHAMBER**

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## **APPENDIX C**

### ***MODIFICATIONS TO THE EUT***



***ELECTRO MAGNETIC TEST, INC.***  
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## **MODIFICATIONS TO THE EUT**

No modifications were made to the EUT by Electro Magnetic Test, Inc. personnel during the testing.

**EMT**

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## **APPENDIX D**

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



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**ADDITIONAL MODELS COVERED  
UNDER THIS REPORT**

There are no additional models to be covered under this report.