Excellence in Compliance Testing

Certification Test Report

FCC ID: 2AAC4-31990
IC: 12369A-CM031990

FCC Rule Part: 15.249
IC Radio Standards Specification: RSS-210

ACS Report Number: 14-0408.W06.1B

Manufacturer: Case-Mate, Inc.
Model: CM031990

Test Begin Date: November 10, 2014
Test End Date: November 26, 2014

Report Issue Date: January 16, 2014

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

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

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 15 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210 for Certification.

1.2 Product description

The EUT is a wearable BLE device in the form of a bracelet. It pairs to a smartphone and produces a vibration pattern when a text or phone call is received by the paired smartphone.

Technical Information:

Detail	Description
Frequency Range	2402 -2480 MHz
Number of Channels	40
Modulation Format	GFSK
Operating Voltage	3.0 VDC (Internal Battery) / 5.0 VDC (USB)
Antenna Type / Gain	Ceramic chip antenna / 1.7 dBi

Manufacturer Information:
Case-Mate, Inc.
2048 Weems Road
Tucker, GA 30084

EUT Serial Numbers: ACS#1

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

Preliminary measurements were collected for the EUT set in three orthogonal orientations. The measurements reported herein correspond to the worst case orientation with respect to the emission limit.

The EUT operates from internal batteries but can utilize the USB port for battery charging therefore AC power conducted emissions measurements were performed.

To facilitate continuous transmission for radiated emissions, the EUT was tested with the device connected to the AC mains via the USB charging port.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

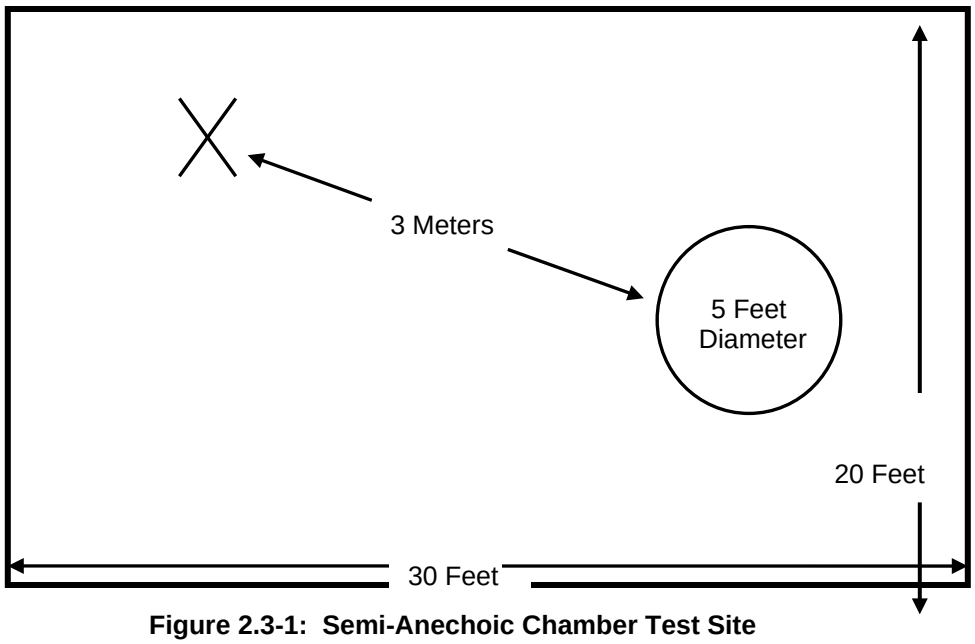

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

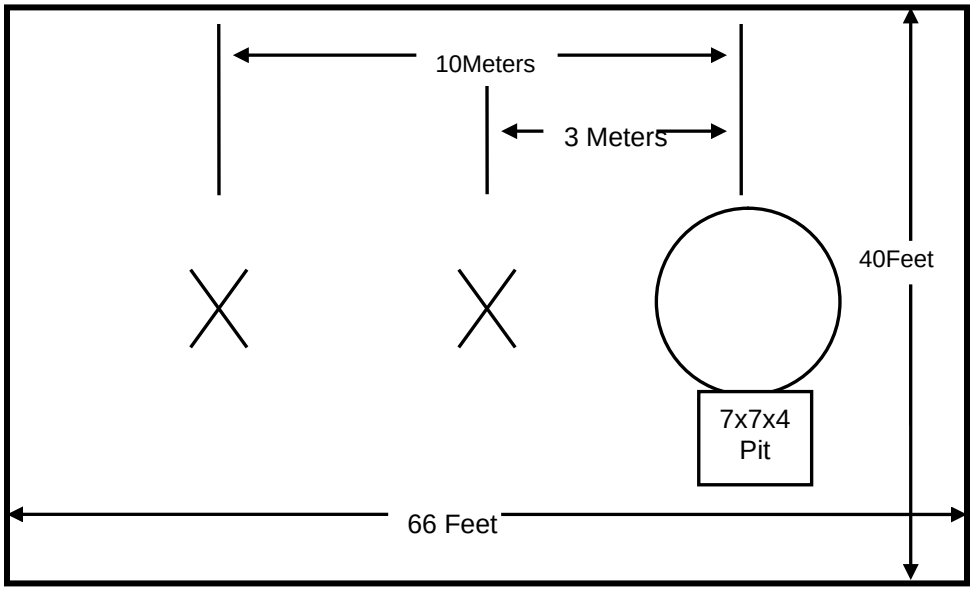

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal ground reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

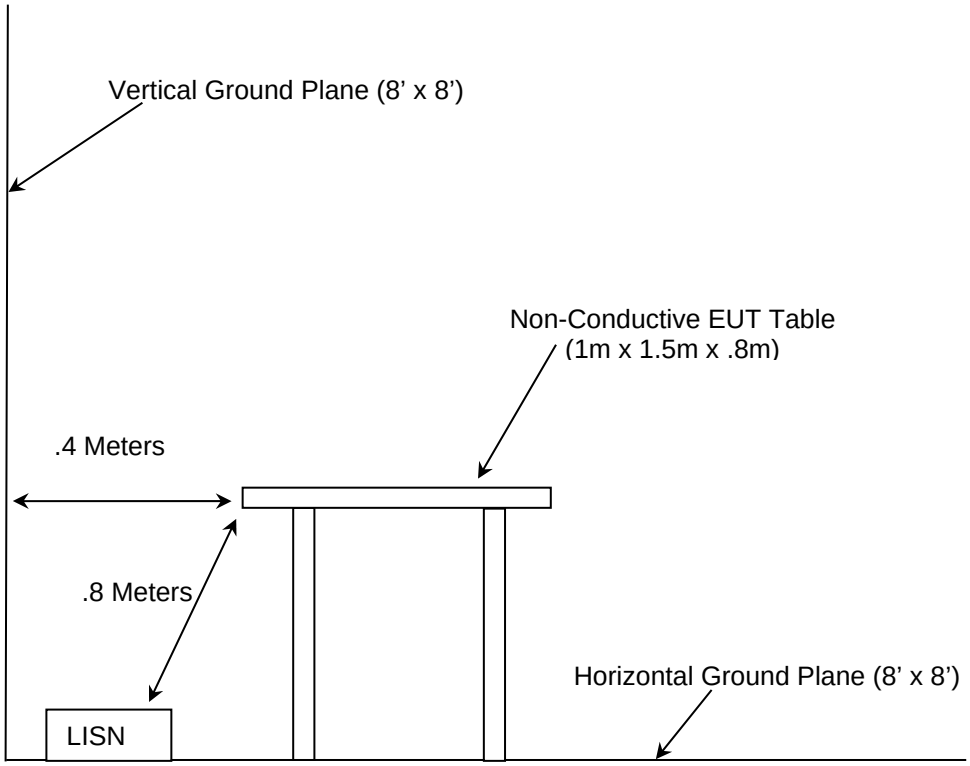

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2009: American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2014
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2014
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 4, November 2014.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	7/11/2014	7/11/2015
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	7/11/2014	7/11/2015
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/23/2013	4/23/2015
40	EMCO	3104	Antennas	3211	2/14/2013	2/14/2015
73	Agilent	8447D	Amplifiers	2727A05624	7/15/2014	7/15/2015
152	EMCO	3825/2	LISN	9111-1905	7/12/2014	7/12/2016
167	ACS	Chamber EMI Cable Set	Cable Set	167	10/28/2014	10/28/2015
168	Hewlett Packard	11947A	Attenuators	44829	1/27/2014	1/27/2015
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	3/17/2014	3/17/2015
316	Rohde Schwarz	ESH3-Z5	LISN	861189-010	10/30/2014	10/30/2015
324	ACS	Belden	Cables	8214	6/4/2014	6/4/2015
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/30/2013	7/30/2015
412	Electro Metrics	LPA-25	Antennas	1241	7/24/2014	7/24/2016
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/5/2014	11/5/2015
432	Microwave Circuits	H3G020G4	Filters	264066	6/2/2014	6/2/2015
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/10/2014	9/10/2015
622	Rohde & Schwarz	FSV40	Analyzers	101338	7/12/2014	7/12/2015
RE361	Agilent	AT/E7405A	Analyzers	MY42000089	5/30/2014	5/30/2016

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type (Host)	Manufacturer	Model Number	Serial Number
1	USB AC Adaptor	Apple	A1265	1X31741NFU8QZ

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

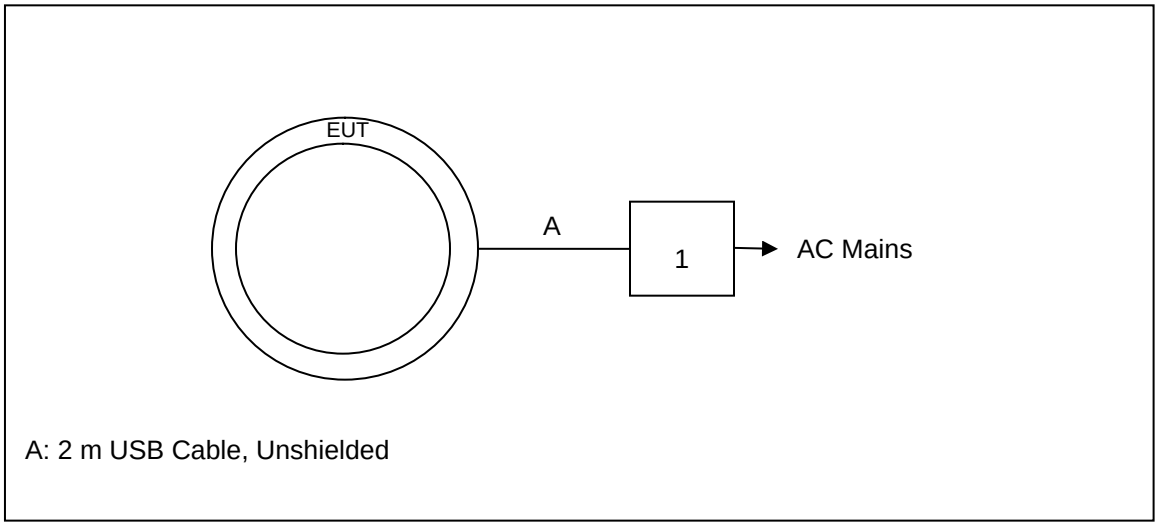

Figure 6-1: Test Setup Block Diagram

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC 15.203

The EUT utilizes an integral ceramic chip antenna with 1.7 dBi gain which cannot be removed without permanently damaging the device thus satisfying Part 15.203.

7.2 Power Line Conducted Emissions – FCC 15.207; IC RSS-Gen 8.8

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Results of the test are shown below in Tables 7.2.2-1 and 7.2.2-2.

Table 7.2.2-1: Conducted EMI Results – Line 1

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
4.44224	14.192	9.914	10.323	24.515	20.237	56	46	31.485	25.763
2.27987	13.425	8.026	10.37	23.795	18.396	56	46	32.205	27.604
0.783919	22.949	18.858	10.257	33.205	29.115	56	46	22.795	16.885
0.489149	14.806	10.257	10.198	25.004	20.455	56.31	46.31	31.306	25.855
0.356675	13.65	8.169	10.171	23.821	18.34	60.095	50.095	36.274	31.755
0.155669	23.15	13.982	10.204	33.354	24.186	65.838	55.838	32.484	31.652

Table 7.2.2-2: Conducted EMI Results – Line 2

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
6.31916	13.557	9.329	10.23	23.786	19.558	60	50	36.214	30.442
5.0056	9.31	4.53	10.21	19.52	14.74	60	50	40.48	35.26
3.45982	12.657	8.618	10.215	22.872	18.834	56	46	33.128	27.166
0.783488	22.736	15.356	10.21	32.946	25.566	56	46	23.054	20.434
0.5132	13.959	7.864	10.201	24.16	18.065	56	46	31.84	27.935
0.180231	20.604	11.307	10.193	30.797	21.501	65.136	55.136	34.339	33.636

7.3 20dB / 99% Bandwidth – FCC 15.215; IC RSS-210 A8.1(a)

7.3.1 Measurement Procedure

The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth. A sampling detector was used.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 to 7.3.2-6.

Table 7.3.2-1: 20dB / 99% Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
2402	1215.6	1085.4
2440	1222.9	1078.1
2480	1230.1	1063.7

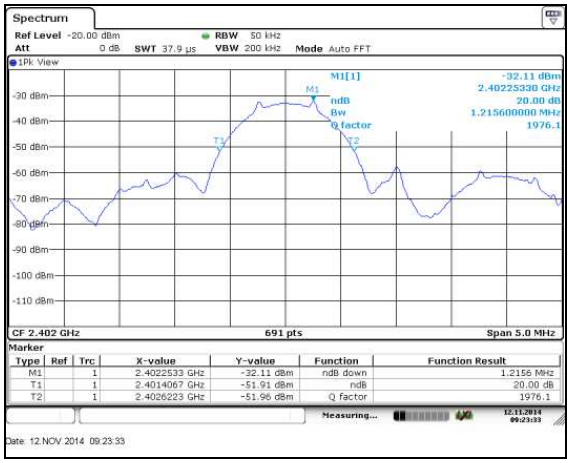

Figure 7.3.2-1: 20dB BW Low Channel

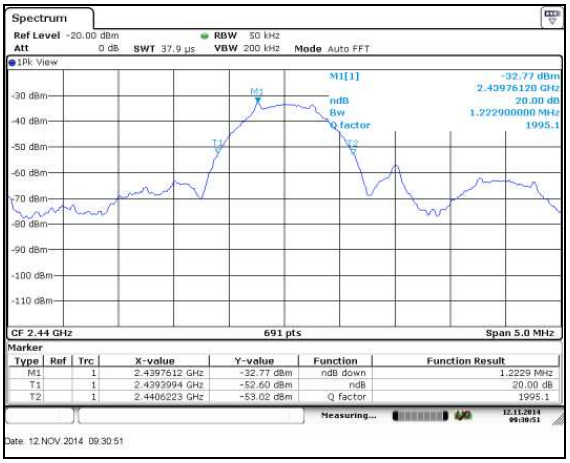

Figure 7.3.2-2: 20dB BW Mid Channel

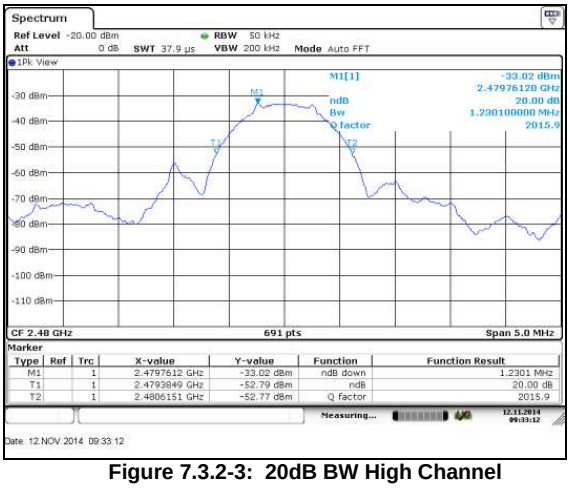

Figure 7.3.2-3: 20dB BW High Channel

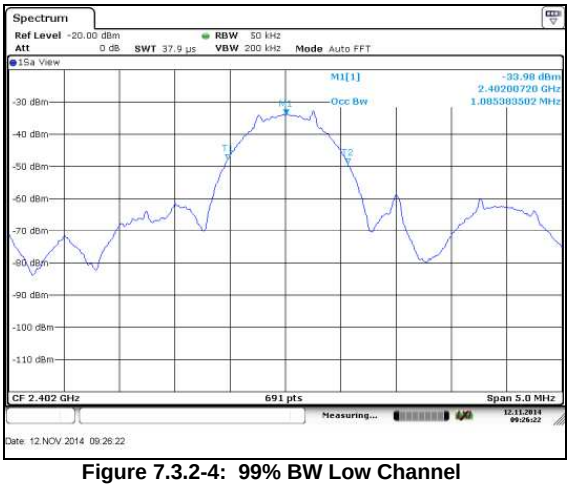

Figure 7.3.2-4: 99% BW Low Channel

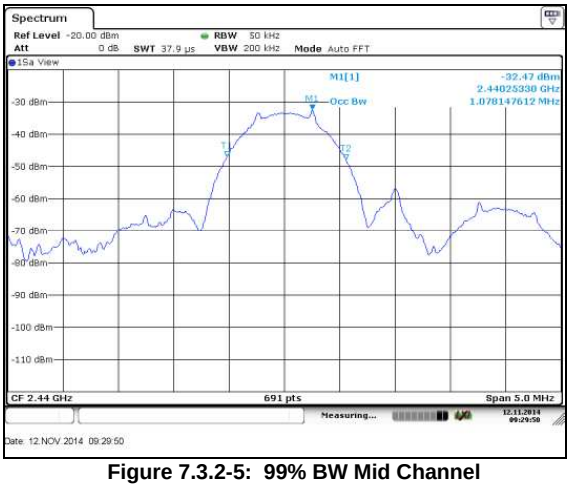

Figure 7.3.2-5: 99% BW Mid Channel

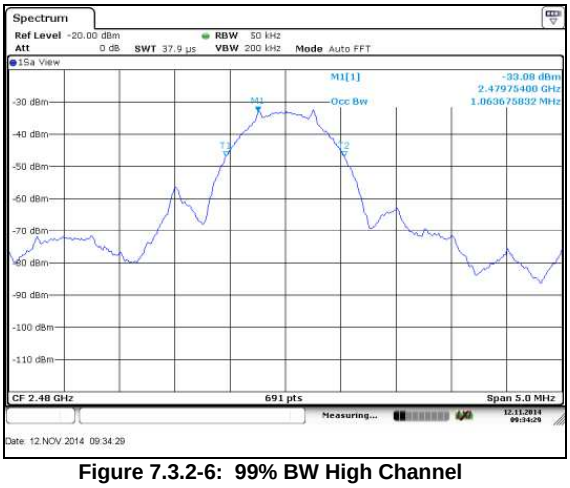

Figure 7.3.2-6: 99% BW High Channel

7.4 Fundamental Field Strength – FCC 15.249(a); IC RSS-210 A2.9(a)

7.4.1 Measurement Procedure

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Peak and average measurements were made with RBW and VBW of 3 MHz and 10 MHz respectively. (RBW >> EBW)

7.4.2 Measurement Results

Results are shown below in Table 7.4.2-1.

Table 7.4.2-1: Fundamental Field Strength

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2402	93.09	91.47	H	-6.42	86.67	85.05	114.0	94.0	27.3	8.9
2402	97.80	97.65	V	-6.42	91.38	91.23	114.0	94.0	22.6	2.7
2440	91.39	90.86	H	-6.21	85.18	84.65	114.0	94.0	28.80	9.30
2440	96.20	95.79	V	-6.21	89.99	89.58	114.0	94.0	24.00	4.40
2480	90.82	90.52	H	-5.99	84.83	84.53	114.0	94.0	29.20	9.50
2480	95.95	95.06	V	-5.99	89.96	89.07	114.0	94.0	24.00	4.90

7.5 Radiated Spurious Emissions – FCC 15.249(a)(d)(e); IC RSS-210 2.2, RSS-Gen 8.9/8.10

7.5.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, > 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3MHz respectively.

All out of band emissions were evaluated, including any emissions at or near the band-edge.

7.5.2 Measurement Results

Radiated spurious emissions are reported in the table 7.5.2-1 below.

Table 7.5.2-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2402 MHz (Low Channel)										
2400	61.06	52.02	H	-6.43	54.63	45.59	74.0	54.0	19.4	8.4
2400	66.17	58.49	V	-6.43	59.74	52.06	74.0	54.0	14.3	1.9
4804	50.55	33.89	H	1.62	52.17	35.51	74.0	54.0	21.8	18.5
4804	49.63	35.24	V	1.62	51.25	36.86	74.0	54.0	22.8	17.1
2440 MHz (Middle Channel)										
4880	51.37	35.44	H	1.77	53.14	37.21	74.0	54.0	20.9	16.8
4880	49.16	35.62	V	1.77	50.93	37.39	74.0	54.0	23.1	16.6
2480 MHz (High Channel)										
2485.5	53.46	42.63	H	-5.96	47.50	36.67	74.0	54.0	26.5	17.3
2485.5	56.89	47.86	V	-5.96	50.93	41.90	74.0	54.0	23.1	12.1
4960	52.09	34.27	H	1.92	54.01	36.19	74.0	54.0	20.0	17.8
4960	51.19	34.55	V	1.92	53.11	36.47	74.0	54.0	20.9	17.5

7.5.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 61.06 - 6.43 = 54.63dBuV
Margin: 74dBuV – 54.63dBuV = 19.4dB

Example Calculation: Average
Corrected Level: 52.02 - 6.43 - 0 = 45.59dBuV
Margin: 54dBuV – 45.59dBuV = 8.4dB

8 CONCLUSION

In the opinion of ACS, Inc. the CM031990, manufactured by Case-Mate, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT