RF Exposure Evaluation Report

FOR:

Manufacturer: Wi-MM Corp.

Model: BP200-2-2-1

FCC ID: 2ABUE-BP200-2-2-1
IC Certification Number: 11915A-BP200221

FCC CFR 47 Part 1.1310, 2.1091
IC RSS-102, Issue 5

TEST REPORT #: EMC-WIMML-004-15001-FCCICMPE

DATE: 04/30/2015

FCC: Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

1 Assessment

The following equipment, as detailed in section 3 of this test report, meets the RF exposure limits and/or the conditions for exemption from routine evaluation as defined in the following standards.

Standard	Version
FCC CFR 47 Part 1.1310	Current as of [04/16/2015]
FCC CFR 47 Part 2.1091	Current as of [04/16/2015]
FCC KDB 447498	v05r02
OET Bulletin 65	Edition 97-01, August 1997
RSS 102	Issue 5

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2015-04-30	Compliance	Franz Engert (Manager Compliance)	Franz Engert Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2015.04.30 10:07:15 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2015-04-30	Compliance	Douglas Antioco (EMC Engineer)	Douglas Antioco 2015.04.30 10:20:21 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name	CETECOM Inc.
Department	Compliance
Address	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone	+1 (408) 586 6200
Fax	+1 (408) 586 6299
Test Lab Manager	Josie Sabado
Project Manager	Franz Engert
Test Engineer	Douglas Antioco

2.2 Identification of the Client

Client Company	Wi-MM Inc.
Street Address	1885 De La Cruz Blvd. Suite 205
City, State, Zip Code	Santa Clara, CA, 95050
Country	USA

2.3 Identification of the Manufacturer

Manufacturer Company	Same as client
Street Address	
City, State, Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model Number	BP200-2-2-1
Hardware Version	BP200 HW-2-2-1
Software Version	BP200 SW-1.0
FCC ID	2ABUE-BP200-2-2-1
IC Certification Number	11915A-BP200221
Technical Product Description	battery powered asset tracker and sensor platform
Radios Included	1. U-Blox LISA-C200 Pre-certified Wireless Module FCC ID R5Q - LISAC200 2. Bluegiga BLE-113 Pre-certified module Antenna integrated on module FCC ID QQQBLE113 3. U-Blox MAX-7C Dual SAW filter + LNA front end Assisted GPS capability for fast start
Antenna Information	1. hexa-band cellular SMD antenna TAOGLAS 824 MHz: 1.5 dBi; 1850 MHz: 2.4 dBi 2. Integrated ceramic chip: 0.5 dBi
Co-located Transmitters/ Antennas	All of the above transmitters and antennas are collocated
Rated Operating Voltage Range	AC: 5V-50V DC: 5V-10V
Rated Operating Temperature Range	-20degC to +65degC
Prototype / Production Unit	Prototype
Device Category	☐ Fixed Installation ☒ Mobile ☐ Portable
Exposure Category	☐ Occupational/ Controlled ☒ General Population/ Uncontrolled

3.2 Description of Functions and Data Ports

Function #	Type	Exercise Method
1	NA	USB port is used for charging only.

3.3 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Hardware Version	Software Version	Comments
1	3158 4214 0117	BP200 HW-2-2-1	BP200 SW-1.0	

3.4 Identification of Accessory equipment (AE)

AE #	Type	Serial Number	Manufacturer	Model	Comments
1	Shielded USB cable				Type A to micro USB
2	USB charger	13221001004	Salcomp	SC1402	

3.5 Identification of Test Support Equipment (TSE)

TSE #	Type	Serial Number	Manufacturer	Model	Comments
1					

3.6 Environmental Conditions during test

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 22degC
Relative humidity: 15%

3.7 Miscellaneous Testing Information

The following screenshots are taken from the data sheets that have been used as reference:

BLE113

DATA SHEET

Monday, 10 March 2014

Version 1.3

bluegiga

2.8 RF Characteristics

Parameter	Min	Typ	Max	Unit
Transmit power	-1.5	0	1	dBm
Receiver Sensitivity		-93		dBm
Gain of the Antenna			0.5	dBi
Efficiency of the antenna		30		%

Table 8: RF Characteristic of BLE113

4 Gain Settings

In the following paragraph the power values for the corresponding max output power for each band class are reported. The appropriate gain settings are stored in each module individually. The user has no possibility to alter these settings later on. During manufacturing each module will be individually calibrated: the measurement is performed in a fully calibrated setup based on a base station simulator. For each channel (low, middle and high), the power level below displayed is firstly set and then verified in a call measurement. The tolerance level below applies for each channel on which the measurement is performed.

4.1 Maximum Output Power

Parameter	Min.	Typ.	Max.	Unit	Remarks
CDMA BC=0 (Cellular 800 MHz)	22	24	26	dBm	
CDMA BC=1 (PCS 1900 MHz)	22	24	26	dBm	

4 RF Exposure Evaluation Requirements

4.1 FCC:

Calculations can be made to predict RF field strength and power density levels around typical RF sources using the general equations (3) and (4) on page 19 of the following FCC document:
"OET Bulletin 65, Edition 97-01 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields".

The table below is excerpted from Table 1B of CFR 47 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm^2)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

Using the equation from page 19 of OET Bulletin 65, Edition 97-01:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Additionally, according to § 2.1091:
The limit for <1.5 GHz mobile operations where no routine evaluation is required is: 1.5W ERP
The limit for >1.5 GHz mobile operations where no routine evaluation is required is: 3W ERP

Note:

1. This report is based on the assumption that the product is only used for fixed and mobile applications.
2. For all use cases of the product the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons

4.2 IC:

RSS-102 Section 2.5.2
RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p of the device is equal to or less than 0.0131 x $f(MHz)^{0.6834}$ W.

RSS-102 4: RF Field strength limits for devices used by the General Public (Uncontrolled Environment):
Power density
300MHz- 6000 MHz = 0.02619 x $f(MHz)^{0.6834}$ W/m^2

5 Evaluation

5.1 Exlusion from routine evaluation

Peak radiated power is calculated as

EIRP (dBm) = Maximum average output power (including tune-up tolerance) (dBm) + Antenna Gain (dBi)

ERP (dBm) = EIRP (dBm) – 2.15

Maximum conducted output power values from presented radio module specifications (see section 3.7).
Antenna connection attenuations not taken into account.
Antenna gain as documented by the manufacturer (see section 3.1).

Analysis to Exclude Routine RF Exposure Evaluation for Stand Alone Operation						
Band of Operation	**EIRP**		**IC Limit**	**ERP**		**FCC Limit**
MHz	**dBm**	**W**	**W**	**dBm**	**W**	**W**
CDMA 850 824 to 849	26+1.5=27.5	0.562	1.288	25.35	0.343	1.5
CDMA 1900 1850 to 1910	26+2.4=28.4	0.692	2.239	26.25	0.422	3
Bluetooth LE 2400 to 2483.5	1.0+0.5=1.5	0.0014	2.675	-0.65	0.00086	3

Since the determined EIRP values are below the related IC limits all transmitters are exempt from routine evaluation for IC.

5.2 Power Density evaluation against FCC limits

Power Density Calculation						
Band of Operation	**EIRP**	**Maximum Duty Cycle**	**Distance**	**Power Density**	**FCC Limit**	**Verdict**
MHz	**dBm**	**%**	**cm**	**mW/cm^2**	**mW/cm^2**	
CDMA 850 824 to 849	27.5	100.00%	20	0.112	0.566	**Pass**
CDMA 1900 1850 to 1910	28.4	100.00%	20	0.138	1.000	**Pass**
Bluetooth LE 2400 to 2483.5	1.5	66.00%	20	0.0002	1.000	**Pass**

5.3 Simultaneous Transmission Exposure Estimation and Evaluation

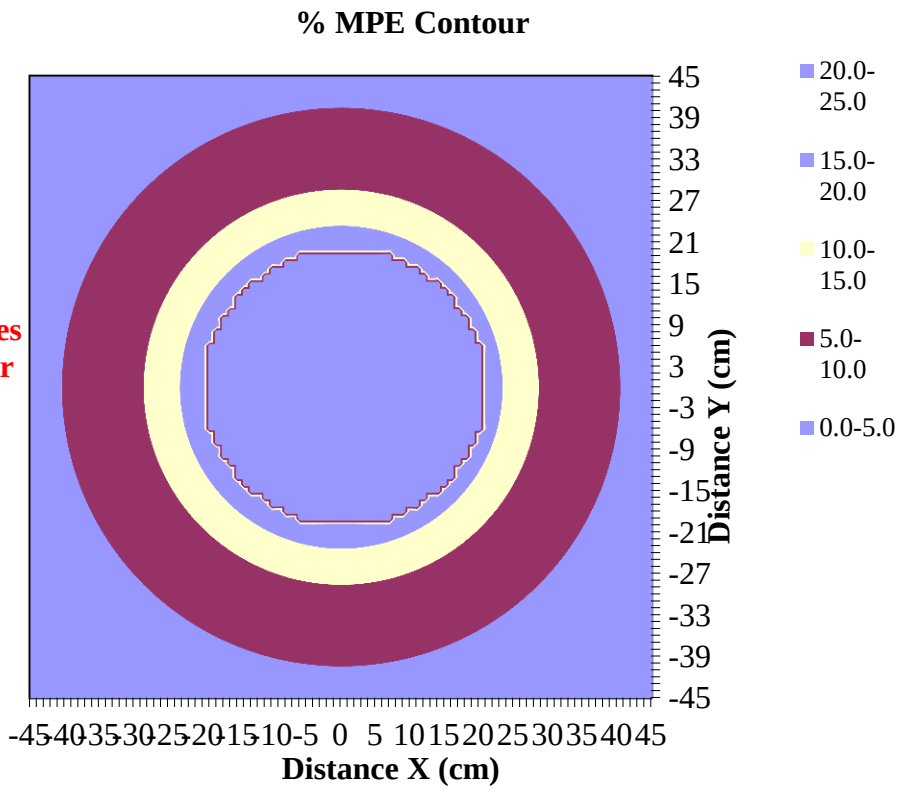
(based on FCC power density limits)

An antenna separation distance of 1 cm is used to represent worse case conditions.

5.3.1 CDMA 850 and Bluetooth LE

Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		824	2400
MPE Limit	mW/cm2		0.55	1.00
Max % MPE	%	20.4	20.4	0.0
Power	(W)	0.563	0.562	0.001
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	0.56	0.562	0.001
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0

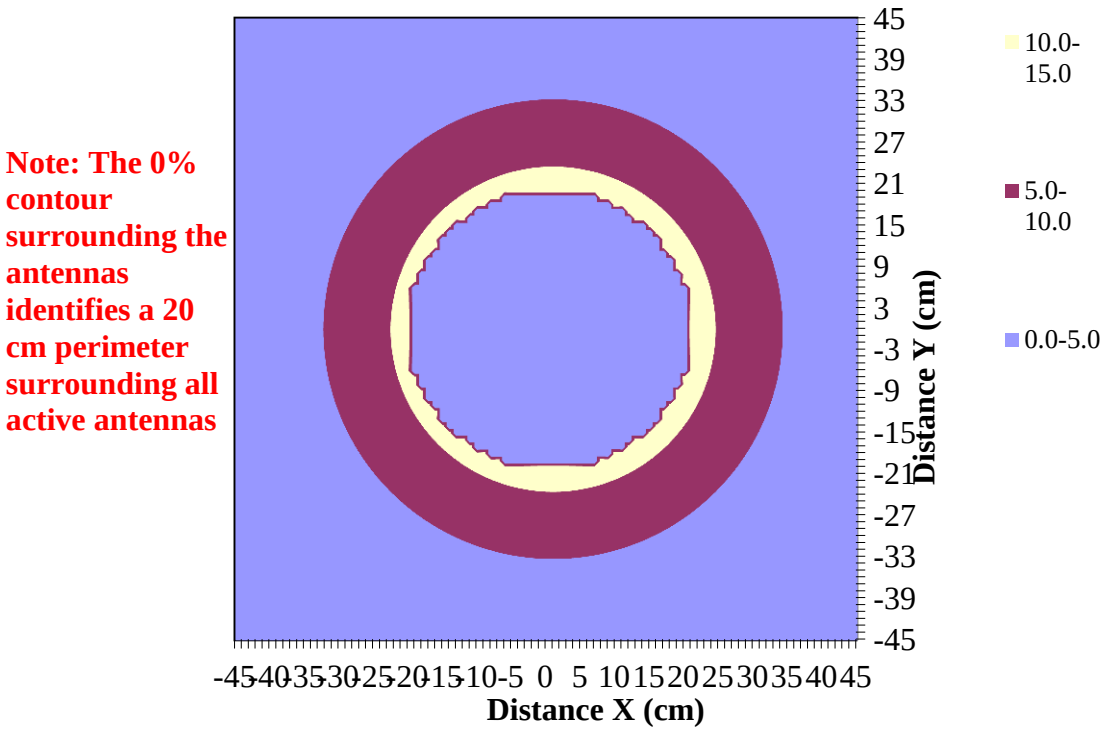
Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas



5.3.2 CDMA 1900 and Bluetooth LE

Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		2483.5	1850
MPE Limit	mW/cm2		1.00	1.00
Max % MPE	%	13.8	0.0	13.8
Power	(W)	0.693	0.001	0.692
Antenna Gain	dBi		0.00	0.00
EIRP	(W)	0.69	0.001	0.692
X	(cm)		0.0	1.0
Y	(cm)		0.0	0.0

% MPE Contour



Verdict: PASS
(The calculated accumulated MPE ratio remains below 100% of the MPE limit for all possible simultaneous transmission configurations.)

6 Revision History

Date	Report Number – Changes to Report	Report prepared by
04/30/2015	EMC-WIMML-004-15001-FCCICMPE 1. First Version	Franz Engert