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## ENGINEERING TEST REPORT #: 315075 RFx LSR Job #: C-2187

### RF Exposure Compliance of:

Bluetooth (BLE) Module

### Test Date(s):

3/10/15 – 4/27/15

### Prepared For:

Attn: Raman Mehta  
BRK Brands Inc.  
3901 Liberty Street Rd.  
Aurora, IL 60504  
USA

Attn: Joe Zhou  
Dicon Global Inc.  
845 Intermodal Drive, Unit #1  
Brampton, ON L6T 0C6  
Canada

### **This Test Report is issued under the Authority of:**

Michael Hintzke, EMC Engineer

Signature:

Date: 5/5/15

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Prepared For: BRK Brands Inc. Dicon Global Inc.	Name: Bluetooth BLE Module
Report: RF315075 RFx	Model: BLEMOD1
LSR: C-2187	Serial: 68C90B0FE70C (Conducted) 68C90B0F7D02 (Radiated)

## **Table of Contents**

i.	Title Page .....	1
ii.	Table of Contents .....	2
iii.	Research, LLC.....	3
1.0	Conformance Summary .....	4
2.0	SAR Test Exclusion Threshold .....	4
3.0	Client Information .....	5
3.1	Equipment Under Test (EUT) Information .....	5
3.2	Product Description .....	5
3.3	Modifications Incorporated In the EUT for Compliance Purposes.....	5
3.4	Deviations & Exclusions from Test Specifications.....	5
3.5	Additional Information .....	5
4.0	Measurement Data.....	6
5.0	SAR Test Exclusion Calculation.....	7
6.0	MPE Calculation .....	8
7.0	Industry Canada Low Power Exemption .....	9

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## LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation  
A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948  
FCC Registration Number: 90756



Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1

File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1

File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).

Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

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## 1.0 Conformance Summary

The EUT was found to MEET the 5mm minimum test separation distance threshold for SAR test exclusion per FCC §2.1091(mobile) and §2.1093(portable) using methods of FCC KDB 447498 D01 General RF Exposure Guidance v05r02 as a standalone device.

## 2.0 SAR Test Exclusion Threshold

SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq$  50 mm

1-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

10-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 7.5$$

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### 3.0 Client Information

<b>Manufacturer Name:</b>	BRK Brands Inc.
<b>Address:</b>	3901 Liberty Street, Aurora IL 60504
<b>Contact Person:</b>	Raman Mehta

<b>Manufacturer Name:</b>	Dicon Global Inc.
<b>Address:</b>	845 Intermodal Drive, Unit #1, Brampton ON L6T 0C6
<b>Contact Person:</b>	Joe Zhou

### 3.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the applicant.*

<b>Product Name:</b>	Bluetooth (BLE) Module
<b>Model Number:</b>	BLEMOD1
<b>Serial Number:</b>	68C90B0FE70C: Radiated measurements 68C90B0F7D02: Conducted measurements
<b>FCC/IC ID</b>	BT1IOT

### 3.2 Product Description

EUT utilizes Bluetooth Low Energy with an integral trace antenna that has a peak gain of -1.5 dBi.

### 3.3 Modifications Incorporated In the EUT for Compliance Purposes

None noted at time of test

### 3.4 Deviations & Exclusions from Test Specifications

None noted at time of test

### 3.5 Additional Information

EUT programmed for continuous transmit or receive on low (2402 MHz), middle (2440 MHz), and high (2480 MHz) via a TI CC Debugger connected to pin-holes on the EUT and USB cable connected to laptop running TI Smart RF Studio software.

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## 4.0 Measurement Data

### Tables

Frequency (MHz)	Power (dBm)
2402	4.75
2440	4.63
2480	4.49

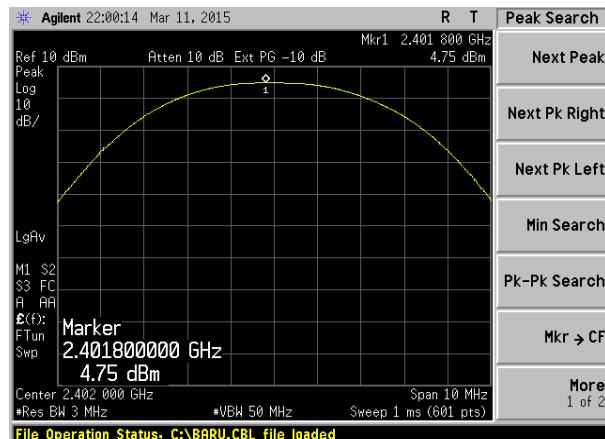
Conducted

Frequency (MHz)	Field Strength (dB $\mu$ V/m)	Power (dBm)
2402	99.91	4.71
2440	97.79	2.59
2480	98.51	3.31

Radiated

### Plots

#### Low Channel – 2402 MHz



Conducted



Radiated

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## 5.0 SAR Test Exclusion Calculation

**Note:** 100 % duty cycle

Description	Line #	Data	Unit	Additional Description
Transmit Packet on time:	1	100	(ms)	Worst case
Packet repetition time:	2	100	(ms)	Worst case
Duty factor:	3	1		Transmit Packet on time / Packet repetition time (Line # 1/2)
Maximum peak output power at antenna input terminal:	4	5.00	(dBm)	Measured worst case
Maximum peak power:	5	3.162	(mW)	dBm to mW conversion
Prediction distance:	6	5	(mm)	Minimum test separation distance
Prediction frequency:	7	2.402	(GHz)	Measured frequency
Square root of frequency (GHz):	8	1.549839		Calculation
Duty factor applied to maximum peak radiated power (mW):	9	3.162278	(mW)	duty factor * maximum peak power (Line # 11*3)
Source based power (mW) / min test separation distance (mm):	10	0.632456		Calculation (Line # 5/6)
SAR exclusion calculation:	11	0.98		Calculation (Line # 10*8)
Threshold:	12	3		
Margin:	13	2.02		Calculation (Line # 12-11)

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## 6.0 MPE Calculation

### Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

where: S = power density

P = power input to the antenna

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

Maximum peak output power at antenna input terminal: 5.00 (dBm)

Maximum peak output power at antenna input terminal: 3.162 (mW)

Antenna gain(typical): -1.5 (dBi)

Maximum antenna gain: 0.708 (numeric)

Prediction distance: 20 (cm)

Prediction frequency: 2402 (MHz)

MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm<sup>2</sup>)

Power density at prediction frequency: 0.000445 (mW/cm<sup>2</sup>)

Maximum allowable antenna gain: 32.0 (dBi)

Margin of Compliance at 20 cm = 33.5 dB

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## 7.0 Industry Canada Low Power Exemption

RSS 102 Issue 5 Section 2.5 states that all transmitters that meet the output power requirements as stated in section 2.5.1 and 2.5.2 of RSS 102 are exempt from routine SAR and RF exposure evaluation. The limit at the evaluation frequency of 2402 MHz has been interpolated from the SAR evaluation exemption limits of Table 1 of RSS-102 Issue 5 Section 2.5.1 at a separation distance of less than or equal to 5 mm.

### Output Power Evaluation.

Evaluation Frequency = 2402 MHz

Device Operation separation distance:  $\leq 5$  mm

Maximum Conducted Output Power (dBm) = 5 dBm

Maximum Conducted Output Power (mW) = 3.16 mW

Section 2.5.1 general public use limit at for devices operating less than 5 mm:

Frequency	Limit
$f = 2402$ MHz	4.26 mW

### Conclusion:

Since the maximum conducted output power is less than the applicable section limit, the Product is exempt from SAR/RF Evaluation

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## END OF REPORT

Date	Version	Person
5/4/15	V0	M.Hintzke
5/6/15	V1	M.Hintzke
5/14/15	V2	M.Hintzke
5/28/15	V3	M.Hintzke
6/1/15	V4	M.Hintzke

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