

# CE EMF Evaluation Report

Report No. : SE150902C17

Applicant : Seeed Technology Limited

Address : F2, Building 8, Shiling Industrial Park, Xili Town, Nanshan District, Shenzhen, Guangdong, PRC

Product : 802.11b/g/n IoT Module

Brand : Seeed

Model No. : LinkIt Smart 7688

Standards : EN 62311:2008

Sample Received Date : Sep.02, 2015

Date of Evaluation : Oct. 01, 2015

**CERTIFICATION:** The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch – Lin Kou Laboratories**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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## Table of Contents

Release Control Record .....	3
1. Description of Equipment Under Test .....	4
2. EMF (Electromagnetic Fields) Assessment .....	5
2.1 Introduction .....	5
2.2 Compliance Criteria.....	5
2.3 Low-Power Exclusion.....	6
2.4 EMF Assessment Method .....	6
2.5 Standalone EMF Calculation.....	7
3. Information on the Testing Laboratories.....	8



## Release Control Record

Report No.	Reason for Change	Date Issued
SE150902C17	Initial release	Oct. 05, 2015

## 1. Description of Equipment Under Test

<b>EUT Type</b>	802.11b/g/n IoT Module
<b>Brand Name</b>	Seeed
<b>Model Name</b>	LinkIt Smart 7688
<b>Tx Frequency Bands (Unit: MHz)</b>	WLAN : 2400 ~ 2483.5
<b>Uplink Modulations</b>	802.11b : DSSS 802.11g/n : OFDM
<b>Antenna Type</b>	Chip Antenna
<b>EUT Stage</b>	Identical Prototype

**Note:**

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

## 2. EMF (Electromagnetic Fields) Assessment

### 2.1 Introduction

The international standard of EN 62311 applies to electronic and electrical equipment for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies. The frequency range covered is 0 Hz to 300 GHz. The object of this generic standard is to provide assessment methods and criteria to evaluate such equipment against basic restrictions or reference levels on exposure of the general public related to electric, magnetic and electromagnetic fields and induced and contact current.

### 2.2 Compliance Criteria

The electronic and electro-technical apparatus shall comply with the basic restriction as specified in European Council Recommendation 1999/519/EC. A summary of the reference levels is given in below table.

Frequency Range	E-Field Strength (V/m)	H-Field Strength (A/m)	B-Field (μT)	Equivalent Plane Wave Power Density $S_{eq}$ (W/m <sup>2</sup> )
0-1 Hz	-	$3.2 \times 10^4$	$4 \times 10^4$	-
1-8 Hz	10000	$3.2 \times 10^4 / f^2$	$4 \times 10^4 / f^2$	-
8-25 Hz	10000	$4000 / f$	$5000 / f$	-
0.025-0.8 kHz	$250 / f$	$4 / f$	$5 / f$	-
0.8-3 kHz	$250 / f$	5	6.25	-
3-150 kHz	87	5	6.25	-
0.15-1 MHz	87	$0.73 / f$	$0.92 / f$	-
1-10 MHz	$87 f^{1/2}$	$0.73 / f$	$0.92 / f$	-
10-400 MHz	28	0.073	0.095	2
400-2000 MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	$f / 200$
2-300 GHz	61	0.16	0.2	10

**Reference levels for electric, magnetic and electromagnetic fields  
(0 Hz to 300 GHz, unperturbed rms values)**

#### Notes:

1.  $f$  as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz,  $S_{eq}$ , E, H, and B are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz,  $S_{eq}$ , E, H, and B are to be averaged over any  $68/f^{1.05}$  -minute period ( $f$  in GHz).
4. No E-Field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

## CE EMF Evaluation Report

### 2.3 Low-Power Exclusion

Compliance of electromagnetic emissions from electronic and electrical equipment with the basic restrictions usually is determined by measurements and, in some cases, calculation of the exposure level. If the electrical power used by or radiated by the equipment is sufficiently low, the electromagnetic fields emitted will be incapable of producing exposures that exceed the basic restrictions.

According to EN 62479, Low-power electronic and electrical equipment is deemed to comply with the provisions of this standard if it can be demonstrated that the available antenna power and/or the average total radiated power is less than or equal to the applicable low-power exclusion level ( $P_{\max}$ ).

When power density is the basic restriction, a conservative minimum value for  $P_{\max}$  can be derived, equal to the power density limit ( $S$ ) multiplied by the averaging area ( $a$ ):

$$P_{\max} = S \times a$$

**Note:**

ICNIRP guidelines provide power density limits of 10 W/m<sup>2</sup> and 50 W/m<sup>2</sup> for general public and occupational exposures, respectively. The averaging area is 20 cm<sup>2</sup> for both cases. Therefore, the equation yields conservative values for  $P_{\max}$  of 20 mW and 100 mW for general public and occupational exposures, respectively.

### 2.4 EMF Assessment Method

Since the electromagnetic field is far from source, that region of the field of an antenna where the angular field distribution is essentially independent of the distance from the antenna. In this free space region, the field has a predominantly plane-wave character. The electromagnetic field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas. The electromagnetic field can be calculated by the formula below:

$$\text{Power Density (S)} = E \times H = \frac{E^2}{\eta} = \frac{\text{EIRP}}{4\pi r^2} = \frac{PG}{4\pi r^2}$$

Where

EIRP = Radiated Power, unit in watts

P = Power input to the antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

r = Distance from observation point to the antenna

## CE EMF Evaluation Report

### 2.5 Standalone EMF Calculation

The manufacturer expects that the radiated component of this device will not close to the human body during normal usage and the warning statement was also stated in the user instruction. Since the transmitting antenna will be kept at least 20 cm away from the human body, the EMF level is calculated based on this condition and the result is listed in below table.

Band	Max. Time-averaged Power (dBm)	Peak Antenna Gain (dBi)	Max. Radiated Power (W)	Low Power Exclusion	Calculated Power Density (W/m <sup>2</sup> )	EMF Limit (W/m <sup>2</sup> )	Result
WLAN 2.4G	16.54	0.31	0.048	No	0.10	10	PASS

#### Summary:

Since the maximum conducted/radiated output power of this device is less than 20 mW and it applies the low power exclusion per EN 62479, this device complies with the basic restrictions and EMF calculation is not required.

### **3. Information on the Testing Laboratories**

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

**Taiwan HwaYa EMC/RF/Safety/Telecom Lab:**

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The road map of all our labs can be found in our web site also.

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