

RF Exposure Report

Report No.: SA190109C01

FCC ID: S6J2173

Test Model: 2173

Received Date: Jan. 30, 2019

Test Date: Feb. 15 ~ Mar. 08, 2019

Issued Date: Mar. 27, 2019

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FCC Registration / 788550 / TW0003
Designation Number:



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Table of Contents

Release Control Record.....	3
1 Certificate of Conformity.....	4
2 Evaluation Result.....	5
3 Smallest Distance from The Antenna and Radiating Structures or Outer Surface of The Device.....	6
4 SAR Test Exclusion Thresholds.....	9
5 Conclusion	9

Release Control Record

Issue No.	Description	Date Issued
SA190109C01	Original release	Mar. 27, 2019

1 Certificate of Conformity

Product: 2173 BLUETOOTH LF, HF & NFC RFID READER

Brand: TECHNOLOGY SOLUTIONS (UK) LTD

Test Model: 2173

Sample Status: Engineering sample

Applicant: Technology Solutions (UK) Ltd

Test Date: Feb. 15 ~ Mar. 08, 2019

Standards: FCC Part 2 (Section 2.1093)
KDB 447498 D01 General RF Exposure Guidance v06
IEEE C95.1-1992

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, 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 RF characteristics under the conditions specified in this report.

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Approved by : Bruce Chen , **Date:** Mar. 27, 2019
Bruce Chen / Project Engineer

2 Evaluation Result

Following FCC KDB 447498 D01 "General SAR test exclusion guidance"

The corresponding SAR Exclusion Threshold condition, listed below:

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$$
$$\leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$
 - $f(\text{GHz})$ is the RF channel transmit frequency in GHz.
 - Power and distance are rounded to the nearest mW and mm before calculation.
 - The result is rounded to one decimal place for comparison. The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- 2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:
 - a) [Threshold at 50 mm in step 1) + (test separation distance - 50mm) $\cdot$ ($f(\text{MHz})/150$)] mW, at 100MHz to 1500 MHz
 - b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm) $\cdot$ 10] mW at > 1500 MHz and ≤ 6 GHz
- 3) At frequencies below 100 MHz, the following may be considered for SAR test exclusion.
 - a) The threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by $[1 + \log(100/f(\text{MHz}))]$ for test separation distances > 50 mm and < 200 mm.
 - b) The threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$ for test separation distances ≤ 50 mm.
 - c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

3 Smallest Distance from The Antenna and Radiating Structures or Outer Surface of The Device

The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. (See below figure)

<Antenna Location>

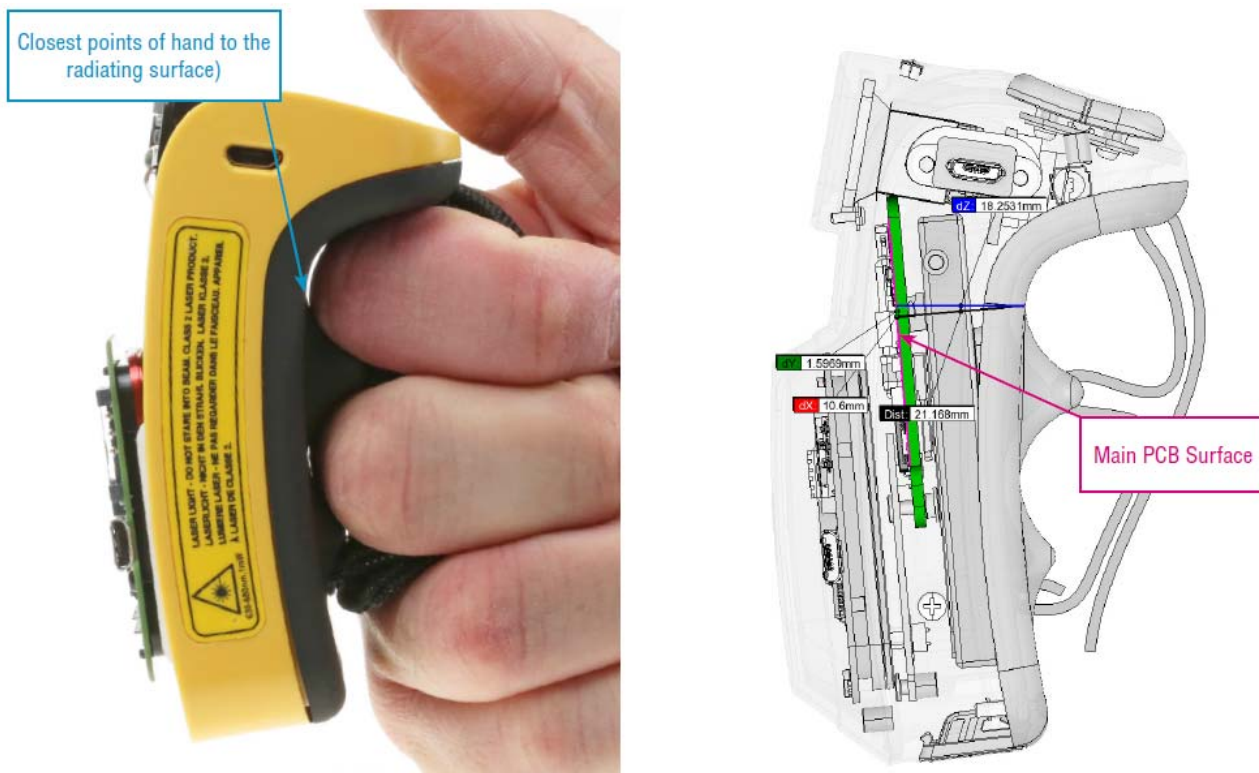


Figure 4: Distance from hand to Main PCB

Min. Distance	mm
Hand to upper surface of Main PCB	18.2
Main PCB to Bluetooth® antenna PCB	0.8
Total Separation Distance (Hand to Bluetooth® antenna)	19

Radiating Surface - High Frequency NFC/RFID Antenna (13.56MHz)

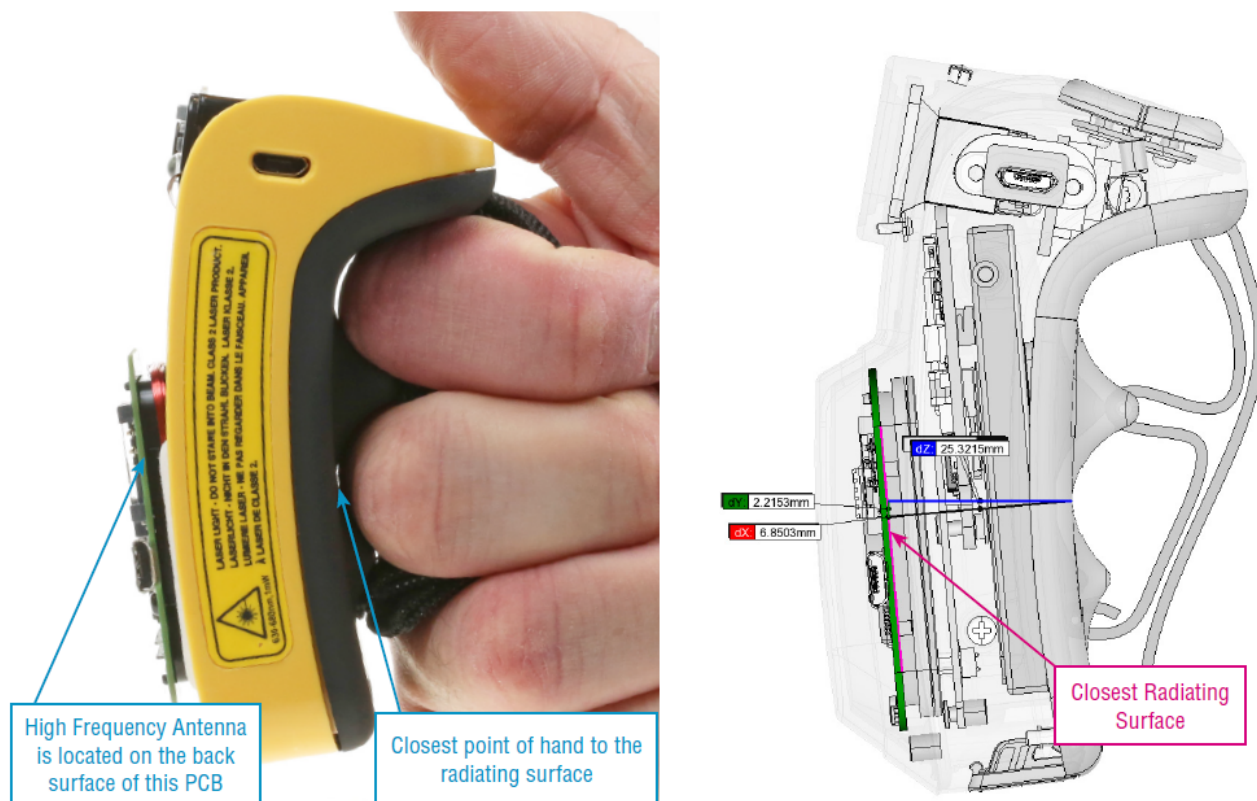


Figure 2: Measurements showing Separation Distance from HF Radiating Surface

Min. Distance	mm
Hand to High Frequency antenna	25.3

Radiating Surface - Low Frequency RFID Antenna (125kHz / 134.2kHz)

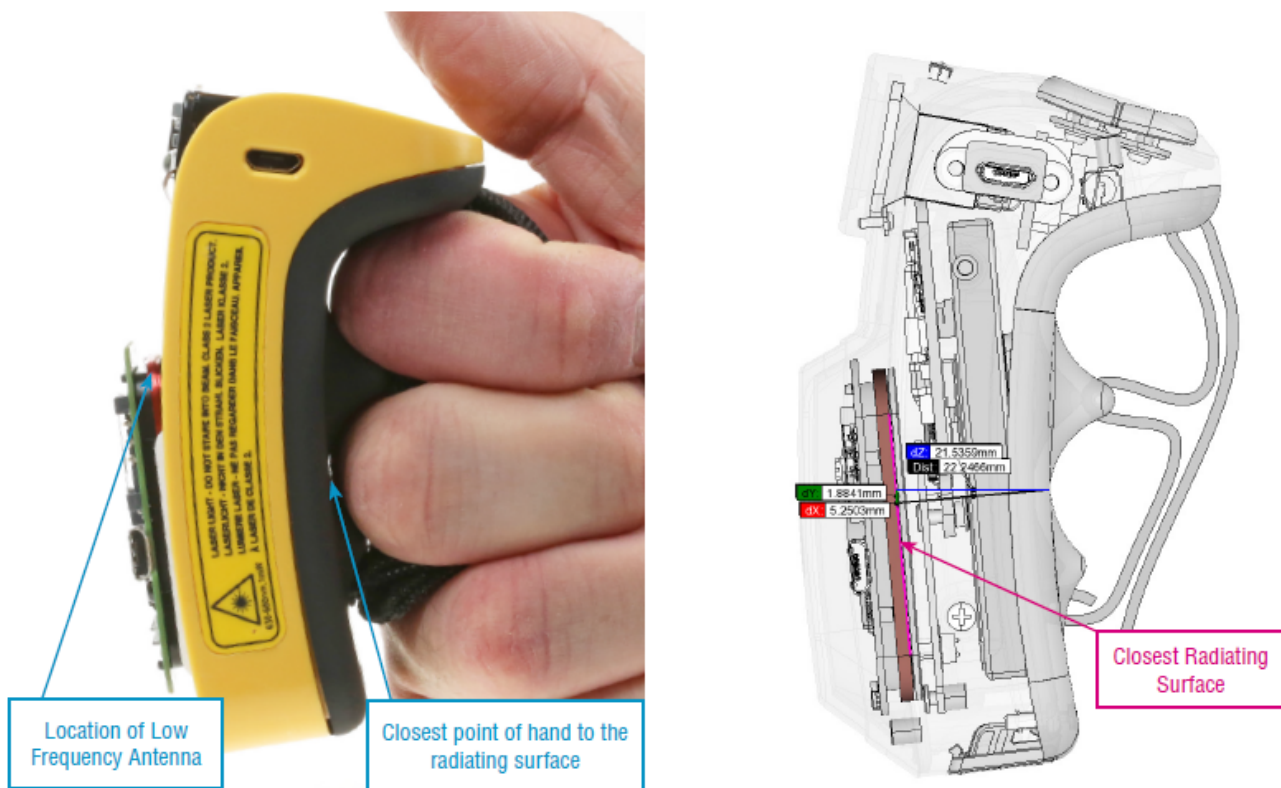


Figure 1: Measurements showing Separation Distance from LF Radiating Surface

Min. Distance	mm
Hand to Low Frequency antenna	21.5

The separation distance for antenna to edge:

Antenna	Distance from antenna to hand (mm)
Bluetooth	19
NFC / RFID (13.56MHz)	25.3
RFID (125kHz / 134.2kHz)	21.5

4 SAR Test Exclusion Thresholds

Function	Max. Power (dBm)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 2)	10-g-SAR test exclusion thresholds	Result
BT EDR	9.94	9.863	19	0.817	3	Pass
BT LE	3.93	2.472	19	0.205	3	Pass

Note: 1. The antenna type is Ceramic Chip Antenna with 1dBi gain.
2. Calculate SAR test exclusion thresholds from condition "1" formulas.

Function	Electric field (dBuV/m) @3m	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 3)	1-g-SAR test exclusion thresholds	Result
RFID	65.28	0.001012	25.3	0.001012	1107.433	Pass
NFC	62.47	0.0005297	25.3	0.0005297	1107.433	Pass
125kHz	72.33	0.00513	21.5	0.005129	2314.248	Pass
134.2kHz	71.27	0.00402	21.5	0.004018	2295.9603	Pass

Note: 1. NFC/ RFID (13.56MHz): The antenna type is PCB Trace Antenna.
2. RFID (125kHz/134.2kHz): The antenna type is Coil Antenna.
3. Calculate SAR test exclusion thresholds from condition "3" formulas.

Conclusion:

BT & NFC & RFID can transmit simultaneously, the value of the MPE is:

$$1. \text{ BT + NFC + RFID} = 0.817 + 0.001012 + 0.005129 = 0.823141 < 3$$

5 Conclusion

Since Source-base time average power is below SAR test exclusion power thresholds, the SAR evaluation is not required.

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