



# Radio Frequency Exposure Evaluation Report

FOR:

KS Technologies

Model Name:

KST1020

Product Description:

Bluetooth Low Energy Sensor Module

FCC ID: 2AA3A-UNITYV8

IC ID: 11487S-UNITYV8

Applied Rules and Standards:

CFR 47 Part 2 (2.1093),

FCC KDB 447498 D01 General RF Exposure Guidance v06

ISED Canada RSS-102 Issue 5

Report number: EMC\_KSTEC-003-17001\_SAR-EX

DATE: 2017-03-29



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**1. Assessment**

The following device was evaluated against the limits for general population uncontrolled exposure specified in CFR 47 Part 2.1093 according to SAR evaluation exclusion requirements specified in FCC regulation as listed in KDB 447498, and ISED Canada RSS-102 Issue 5.


The device meets the requirements for SAR exclusion as stipulated by the above given FCC/ISED rules.

Company	Description	Model #
KS Technologies	Bluetooth Low Energy Sensor Module	KST1020

**Responsible for Testing Laboratory:**

2017-04-19	Compliance	Peter Nevermann (Director Radio Communications and EMC)	 Digitally signed by CETECOMCA1\PNevermann DN: cn=CETECOMCA1, \PNevermann Date: 2017.04.23 00:15:41 -07'00'
Date	Section	Name	Signature

**Responsible for the Report:**

2017-04-19	Compliance	Kris Lazarov (EMC Engineer)	 Digitally signed by Kris Lazarov DN: cn=Kris Lazarov, c=US, o=CETECOM Date: 2017.04.19 12:07:49 -07'00'
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.



## 2. Administrative Data

### 2.1. Identification of the Testing Laboratory Issuing the Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
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<b>Director Radio Com. and EMC:</b>	Peter Nevermann
<b>Responsible Project Leader:</b>	James Donnellan

### 2.2. Identification of the Client / Manufacturer

<b>Applicant's Name:</b>	KS Technologies
<b>Street Address:</b>	1910 Vindicator Drive Suite 100
<b>City/Zip Code</b>	Colorado Springs, CO 80919
<b>Country</b>	USA
<b>Contact Person:</b>	Mark Rieker
<b>Phone No.</b>	(719) 694-8193
<b>e-mail:</b>	mark.rieker@kstechnologies.com

### 3. Equipment under Assessment

<b>Model No:</b>	KST1020
<b>HW Version :</b>	Rev E See note 1
<b>SW Version :</b>	Nrf52832_xxaa.hex
<b>FCC-ID :</b>	2AA3A-UNITYV8
<b>IC-ID:</b>	11487S-UNITYV8
<b>HVIN:</b>	KST1020
<b>PMN:</b>	Unity V8 Sensor Engine
<b>Product Description:</b>	Bluetooth Low Energy Sensor Module
<b>Device Category</b>	<input type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Mixed Mobile and Portable
<b>Frequency Range / number of channels</b>	Nominal band: 2402 MHz – 2480 MHz; Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
<b>Type(s) of Modulation</b>	Bluetooth version 4.0, Low Energy, GFSK modulation.
<b>Modes of Operation / Declared Output power</b>	Bluetooth LE= 4 dBm
<b>Max. declared antenna gain</b>	5.3 dBi
<b>Minimum distance of antenna or radiating parts to user</b>	5mm
<b>Power Supply/ Rated Operating Voltage Range</b>	Vmin: 1.7 VDC / Vmax: 3.6 VDC
<b>Operating Temperature Range</b>	-40 °C to 85 °C
<b>Other Radios included in the device</b>	N/A
<b>Co-located Transmitters / Antennas</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Sample Revision</b>	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production
<b>Exposure Category</b>	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled

#### 4. FCC and ISED Canada Exemption Limits for Routine Evaluation

##### 4.1. FCC SAR test exclusions by KDB 447498 D01 General RF Exposure Guidance v06

KDB 447498 Section: 4.3.1. Standalone SAR test exclusion considerations

a) For 100 MHz to 6 GHz and test separation distances  $\leq 50$  mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR, 30 where}$$

- $f(\text{GHz})$  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 values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) below

The test exclusions are applicable only when the minimum *test separation distance* is  $\leq 50$  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 according to 4.1 f) is applied to determine SAR test exclusion.

##### 4.2. IC SAR test exclusions are set by IC RSS-102 Issue 5

IC RSS-102 Section: 2.5.1 Exemption Limits for Routine Evaluation — SAR Evaluation

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

For a device operating at 2.45GHz the SAR evaluation exemption limit at distance 5mm or less is 4mW

#### 5. Stand-Alone SAR Evaluation Exclusion

According to KDB 447498, SAR evaluation can be excluded if the following equation is satisfied:

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

- The maximum RF channel power for the device under evaluation is 3.2mW.

Using the above equation:

$$[(3.2\text{mW}) / (5\text{mm})] \cdot [\sqrt{2.480}] = 1.0$$

#### Conclusion:

- SAR testing for FCC is excluded because above SAR exclusion calculation result for this transmitter is less than the 3.0 exclusion threshold numerical value for 1-g SAR
- SAR testing for ISED Canada is excluded because the maximum power of 3.2 mW is less than the 4 mW threshold



## 6. Revision History

<b>Date</b>	<b>Report Name</b>	<b>Changes to report</b>	<b>Report prepared by</b>
2017-03-29	EMC_KSTEC-003-17001_SAR-EX	Initial version	Kris Lazarov