



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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Contents

1. Assessment	3
2. Administrative Data	4
2.1. Identification of the Testing Laboratory Issuing the Test Report	4
2.2. Identification of the Client / Manufacturer	4
3. Equipment under Assessment	5
4. FCC and ISED Exemption Limits for Routine Evaluation	6
4.1. FCC SAR test exclusions by KDB 447498 D01 General RF Exposure Guidance v06	6
4.2. IC SAR test exclusions are set by IC RSS-102 Issue 5	6
5. Stand-Alone SAR Evaluation Exclusion.....	6
6. Revision History.....	7

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:

Peter Nevermann			
2017-04-19	Compliance	(Director Radio Communications and EMC)	
Date	Section	Name	Signature

Responsible for the Report:

Kris Lazarov			
2017-04-19	Compliance	(EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

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2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
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Director Radio Com. and EMC:	Peter Nevermann
Responsible Project Leader:	James Donnellan

2.2. Identification of the Client / Manufacturer

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

3. Equipment under Assessment

Model No:	KST1020
HW Version :	Rev E See note 1
SW Version :	Nrf52832_xxaa.hex
FCC-ID :	2AA3A-UNITYV8
IC-ID:	11487S-UNITYV8
HVIN:	KST1020
PMN:	Unity V8 Sensor Engine
Product Description:	Bluetooth Low Energy Sensor Module
Device Category	<input type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Mixed Mobile and Portable
Frequency Range / number of channels	Nominal band: 2402 MHz – 2480 MHz; Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Type(s) of Modulation	Bluetooth version 4.0, Low Energy, GFSK modulation.
Modes of Operation / Declared Output power	Bluetooth LE= 4 dBm
Max. declared antenna gain	5.3 dBi
Minimum distance of antenna or radiating parts to user	5mm
Power Supply/ Rated Operating Voltage Range	Vmin: 1.7 VDC / Vmax: 3.6 VDC
Operating Temperature Range	-40 °C to 85 °C
Other Radios included in the device	N/A
Co-located Transmitters / Antennas	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Sample Revision	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production
Exposure Category	<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 ≤ 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 ≤ 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 ISSED Canada is excluded because the maximum power of 3.2 mW is less than the 4 mW threshold

6. Revision History

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