Radio Frequency Exposure Evaluation Report

FOR: BI Incorporated.

Model Name: RF-2021

Product Description: The HomeGuard 20|20 Transmitter is a waterproof , battery-operated, RF device that is worn around an offender's ankle 24x7.

FCC ID: CSQ-RF2021
IC ID: 1499A-RF2021

Applied Rules and Standards:
CFR 47 Part 2.1093
FCC KDB 447498 D01 General RF Exposure Guidance v06

Test Report #: SAR_EX_BIINC-004-18001_FCC_ISED

DATE: 07/12/2018

A2LA Accredited

IC recognized # 3462B-2

***CETECOM* Inc.**
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Contents

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.

The device meets the requirements for SAR exclusion as stipulated by the above given FCC/ISED rules and PAG number: 449002.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
07/12/2018	Compliance	James Donnellan (Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
07/12/2018	Compliance	Issa Ghanma (EMC Engineer)	Digitally signed by ISSA GHANMA DN: cn=ISSA GHANMA, c=US, o=CETECOM Inc., email=issa.ghanma@cetecom.com Date: 2018.07.12 09:55:43 -07'00'

2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	James Donnellan
Responsible Project Manager:	Cathy Palacios

2.2. Identification of the Client

Applicant's Name:	BI Incorporated
Street Address:	6265 Gunbarrel Avenue, Suite B
City/Zip Code	Boulder CO 80301
Country	USA

2.3. Identification of the Manufacturer

Applicant's Name:	Same as applicant
Street Address:	----------
City/Zip Code	----------
Country	----------

3. Equipment under Assessment

Marketing name:	BI HomeGuard 20|20 Transmitter
PMN	BI HomeGuard 20|20 Transmitter
S/N:	Engineering sample #1, Engineering sample #3
Hardware Version:	2-10-81870-0 Rev2
Software Version:	Ver 1.22
Minimum distance of antenna or radiating parts to user	5mm
Operating Voltage Range:	Low: 3.0V / High: 3.6V DC
Operating Temperature Range:	Low: 0˚C / High: 50˚C
Modes of Operation:	Periodic operation
Other Radios included in the device:	Bluetooth (Disabled)
EUT Dimensions (mm) :	52.8 X 73.13 X 23 [L X W X H]
Weight (grams) :	~93
Co-located Transmitters/ Antennas:	☐ Yes ■ No
Exposure Category:	☐ Occupational/ Controlled ■ General Population/ Uncontrolled
Device Category	☐ Fixed Installation ☐Mobile ■ Portable ☐ Mixed Mobile and Portable
EUT Diameter	■ < 60 cm ☐ Other _____
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production

4. FCC Exemption Limits for Routine Evaluation

4.1. FCC SAR test exclusions are set 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:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, 30 where

- f(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. RSS-102

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.

- **Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance**

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW

- **Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance**[Footnote4][Footnote5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

- Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

5. Stand-Alone SAR Evaluation Exclusion

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

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0

FCC Standalone Transmission SAR Exclusion Calculations					
Frequency [GHz]	**Max. Output Power [mW]**	**Max. Output Power corrected by duty factor* [mW]**	**Distance [mm]**	**P/D*SQRT(F) at 5mm**	**≤ 3.0**
0.3182	14.39	0.13	5	1.62	Yes

- F: Frequency.
- P: Max. Output Power [mW].
- D: Distance.
- X: Min Distance to pass.
- SQRT(F): Square root(Frequency)

- * The results were corrected for the maximum for the device 0.083 duty cycle, by applying an offset of -21.6 dB calculated using the following formula: 20 * log (Duty Cycle) = 20 * log 0.083 = (-21.6 dB)

ISED Standalone Transmission SAR Exclusion Calculations				
Frequency [MHz]	**Max. Output Power [mW]**	**Distance [cm]**	**Limit [mW]**	**Exempt**
318.2	14.39	<20	68.69	Yes

6. Revision History

Date	Report Name	Changes to report	Report prepared by
07/12/2018	SAR_EX_BIINC-004-18001_FCC_ISED	Initial Version	Issa Ghanma