Radio Frequency Exposure Evaluation Report

FOR:

HAP Innovations

Model Name:

spn02

Product Description:

Smart in-home medication dispenser

FCC ID: 2AIA7-SPN02
IC ID: 21622-SPN02

Applied Rules and Standards:

CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
Industry Canada RSS-102, Issue 5 of March 2015

Report number: EMC_HAPIN_006_17501_MPE
DATE: 07-10-2017

A2LA Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecom.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

1. Assessment

This RF Exposure evaluation report provides information about compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091), and IC standard RSS-102, under given conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant). In addition, maximum antenna gain or minimum distance towards the human body is calculated, respectively, where relevant.

The device meets the limits as stipulated by the above given FCC / IC rule parts based on available specifications.

Company Name	Product Description	Model #
HAP Innovations	Smart in-home medication dispenser	spn02

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2017-07-17	Compliance	James Donnellan (Sr. EMC Test Engineer)	James Donnellan Digitally signed by James Donnellan DN: cn=James Donnellan, c=US, o=Cetecom Inc., ou=Compliance, email=james.donnellan@cetecom.com Date: 2017.07.17 12:29:20 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2017-07-17	Compliance	Kris Lazarov (EMC Engineer)	Digitally signed by Kris Lazarov Date: 2017.07.17 12:24:04 -07'00'

Contents

1. Assessment 2
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. RF Exposure Limits and FCC 6
4.1. Power Density Limits acc. To FCC 1.1310I 6
4.2. Routine Environmental Evaluation Categorical Exclusion Limits acc. To FCC 2.1091I 6
4.3. Exemption Limits for Routine Evaluation — RF Exposure Evaluation RSS-102 6
4.4. RF Exposure Estimation (MPE Estimation) 6
5. Evaluations 7
5.1. Routine Environmental Evaluation Applicability Stand Alone transmission 7
5.2. Compliance with MPE (Power Density) limits 7
6. Routine Environmental Evaluation Applicability Simultaneous Transmission 8
7. Maximum allowed Antenna Gain – Gmax 8
8. Revision History 8

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
Director Radio Com. and EMC:	Peter Nevermann
Responsible Project Leader:	Kris Lazarov

2.2. Identification of the Client / Manufacturer

Applicant's Name:	HAP Innovations
Street Address:	2501 Aerial Center Parkway, Suite 100
City/Zip Code	Morrisville, NC 27560
Country	USA
Contact Person:	Dominick Stellato
Phone No.	919-973-6340
e-mail:	dstellato@hapinnovations.com

3. Equipment under Assessment

Model No	spn02
HW Version	01
SW Version	1.8.14
FCC-ID	2AIA7-SPN02
IC-ID	21622-SPN02
Product Description	Smart in-home medication dispenser
Transceiver Technology / Type(s) of Modulation	ELS61-US: E-UTRA FDD: Band 2 Band 4 Band 5 Band 12 UMTS FDD: Band II Band IV Band V WL1835MOD: IEEE 802.11b/g/n standards, plus Bluetooth and Bluetooth Smart operation in the 2.4 GHz ISM band. 5.8 GHz operation is not supported
Frequency Range	Cellular: 699 MHz – 2155 MHz Wi-Fi/Bluetooth 2.4-2.4835 MHz
Max. declared antenna gain	5.8 dBi in Band 2, 5.2 dBi in Band 4, 4.8 dBi in Band 5, and 5.4 dBi in Band 12 3.6 dBi for WiFi and BT
Co-located Transmitters/ Antennas?	LTE & 802.11b/g/n LTE & BT EDR/BDR LTE & BT 4.0 (LE)
Power Supply/ Rated Operating Voltage Range	Vmin: 11.5V dc/ Vnom: 12.0V dc / Vmax: 16.8V dc
Operating Temperature Range	5°C to 40°C
Sample Revision	☐Prototype ■Production ☐ Pre-Production
Device Category	■Fixed Installation ☐Mobile ❑ Portable
Exposure Category	☐ Occupational/ Controlled ■ General Population/ Uncontrolled

4. RF Exposure Limits and FCC

For the specific described radio apparatus the following basic limits and rules apply

4.1. Power Density Limits acc. To FCC 1.1310I

Frequency Range (MHz)	Power density (mW/cm²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

4.2. Routine Environmental Evaluation Categorical Exclusion Limits acc. To FCC 2.1091I

Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

(20) They operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or

(ii) They operate at frequencies above 1.5 GHz and their ERP is 3 watts or more.

4.3. Exemption Limits for Routine Evaluation — RF Exposure Evaluation RSS-102

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;

4.4. RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (cm or m)

5. Evaluations

5.1. Routine Environmental Evaluation Applicability Stand Alone transmission

Transmission Mode	EIRP dBm	Duty Cycle %	Limits for Routine Environmental Evaluation Applicability, EIRP dBm	Exempt from Routine evaluation (Yes/No)
LTE 2	29.8	100	< 33.59	Yes
LTE 5	28.8	100	< 31.19	Yes
LTE 4	29.2	100	< 33.59	Yes
LTE12	29.4	100	< 31.19	Yes
WCDMA II	30.3	100	< 33.59	Yes
WCDMA IV	29.7	100	< 33.59	Yes
WCDMA V	29.3	100	< 31.19	Yes
Bluetooth BR	17.8	100	< 33.59	Yes
Bluetooth LE	13.1	100	< 33.59	Yes
802.11n	23.4	100	< 33.59	Yes

Note: EIRP is based on the RF output power values provided by in the operational description.

Conclusion:

- Since the EIRP is less than the FCC limit, this device is exempt from Routine evaluation.

5.2. Compliance with MPE (Power Density) limits

Power Density Calculation						
Band of Operation MHz	EIRP dBm	Maximum Duty Cycle %	Distance cm	Power Density mW/cm^2	FCC / IC Limit mW/cm^2	Verdict
LTE 2	29.8	100	20	0.190	< 1.000 / 0.458	Pass
LTE 5	28.8	100	20	0.150	< 0.566 / 0.263	Pass
LTE 4	29.2	100	20	0.165	< 1.000 / 0.458	Pass
LTE12	29.4	100	20	0.173	< 0.566 / 0.263	Pass
WCDMA II	30.3	100	20	0.213	< 1.000 / 0.458	Pass
WCDMA IV	29.7	100	20	0.186	< 1.000 / 0.458	Pass
WCDMA V	29.3	100	20	0.169	< 0.566 / 0.263	Pass
Bluetooth BR	17.8	100	20	0.012	< 1.000 / 0.458	Pass
Bluetooth LE	13.1	100	20	0.004	< 1.000 / 0.458	Pass
802.11n	23.4	100	20	0.043	< 1.000 / 0.458	Pass

Conclusion:

- The equipment fulfills the MPE limits for the minimum 20cm distance between the antenna and the human body

6. Routine Environmental Evaluation Applicability Simultaneous Transmission

- Possible simultaneous transmissions: According to the manufacturer the cellular radio modules incorporated within the device can only operate on one band with one of the broadband modes at the time. Theoretically the worst case of simultaneous transmission is with the two transmitters operating at the highest output power mode – WCDMA V and 802.11n.

Transmission Mode	Ratio of Power Density to Applicable limit for Stand Alone Operation	Sum of the Ratios for the Highest Possible Simultaneous Operation	Limits for the Highest Combined Ratio	Exempt from Routine evaluation
WCDMA V and 802.11n	0.213 and 0.043	0.256	< 1	Yes

Note: Power Density to Applicable limit for Stand Alone Operation are derived from table in section 5.2

Conclusion:

- The equipment is excluded from simultaneous transmission MPE test.

7. Maximum allowed Antenna Gain – Gmax

- Not applicable since fixed internal antenna is used in the product.

8. Revision History

Date	Report Name	Changes to report	Report prepared by
07-10-2017	EMC_HAPIN_006_17501_MPE	Initial Version	Kris Lazarov