



Radio Frequency Exposure Evaluation Report

FOR: Digi Wireless Design Services, Inc.

Model Name: 51914

Product Description: Accepts wireless transfer of end node sensor data. Uploads data to remote server periodically for tracking purposes.

FCC ID: 2AQVA-ONVAHUB51914

IC ID: 24318-ONVHUB51914

Per:

CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_DIGII_047_18001_FCC_ISED_MPE

DATE: 01/29/2019



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1 Assessment

This RF Exposure evaluation report provides evidence for 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 issue 5 under worst case 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 and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

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Report reviewed by: TCB Evaluator

01/29/2019	Compliance	Cindy Li (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

01/29/2019	Compliance	Issa Ghanma (EMC Engineer)	
Date	Section	Name	Signature

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
Lab Manager:	Cindy Li
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Digi Wireless Design Services, Inc.
Street Address:	11001 Bren Rd E
City/Zip Code	Minnetonka, MN 55343
Country	USA

Identification of the Manufacturer

Manufacturer's Name:	Kimberly-Clark Professional
Manufacturers Address:	1400 Holcomb Bridge Road
City/Zip Code	Roswell, GA 30076
Country	USA

3 Equipment under Assessment

Marketing name:	Onvation Hub
HW Version :	1.0
SW Version :	1.0
Firmware Version Identification Number (FVIN):	1.0
Hardware Version Identification Number (HVIN):	51914
Product Marketing Name (PMN):	HUB
Regulatory Band:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ GSM850: 824.2 ~ 848.8 ▪ GSM1900: 1850.2 ~ 1909.8 ▪ WCDMA/UMTS FDD BAND II : 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD BAND IV: 1712.4 ~ 1752.6 MHz ▪ WCDMA/UMTS FDD BAND V : 826.4 ~ 846.4 MHz ▪ LTE BAND 2 : 1852.5 ~ 1907.5MHz ▪ LTE BAND 4 : 1715.0 ~ 1750.0MHz ▪ LTE BAND 12 : 699.0 ~ 716.0MHz ❖ <u>Bluetooth low energy:</u> <ul style="list-style-type: none"> ▪ 2402 MHz (ch0) – 2480 MHz (ch39), 40 channels. ❖ <u>ZigBee:</u> <ul style="list-style-type: none"> ▪ 2405 MHz (ch 11) – 2480 MHz (ch 26), 16 channels.
Integrated Module Info:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ Telit LE910Ca-NA. ▪ FCC ID: RI7LE910C1NA ▪ IC ID: 5131A-LE910C1NA ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Module name: Nordic ▪ Model number: nRF52832 ❖ <u>ZigBee:</u> <ul style="list-style-type: none"> ▪ Product name: XBee-PRO S2C ▪ Model number: PRO S2C ▪ FCC ID: MCQ-PS2CTH ▪ IC ID:1846A-PS2CTH

<p>Antenna Type:</p>	<ul style="list-style-type: none"> ❖ <u>Cellular:</u> <ul style="list-style-type: none"> ▪ Primary antenna maximum gain: <ul style="list-style-type: none"> ○ 690 – 720 MHz: 1.32 dBi ○ 820 – 850 MHz: 2.71 dBi ○ 1690 – 1765 MHz: 3.82 dBi ○ 1855 – 1915 MHz: 2.56 dBi ▪ Diversity antenna maximum gain: <ul style="list-style-type: none"> ○ 690 – 720 MHz: 0.52 dBi ○ 820 – 850 MHz: 3.24 dBi ○ 1690 – 1765 MHz: 2.74 dBi ○ 1855 – 1915 MHz: 3.60 dBi ❖ <u>Bluetooth LE:</u> <ul style="list-style-type: none"> ▪ Internal antenna ▪ PCB trace ▪ Maximum peak gain: 3.30 dBi ❖ <u>ZigBee:</u> <ul style="list-style-type: none"> ▪ 2.4GHz Whip antenna ▪ Maximum peak: 1.5 dBi
<p>Maximum Conducted Output Power:</p>	<ul style="list-style-type: none"> ❖ <u>Cellular:</u> From modular grant [Watts]: <ul style="list-style-type: none"> ▪ GSM850: 2.2284 ▪ GSM1900: 0.9863 ▪ WCDMA Band II: 0.2382 ▪ WCDMA Band IV: 0.2851 ▪ WCDMA Band V: 0.0096 ▪ LTE Band 2: 0.2310 ▪ LTE Band 4: 0.2730 ▪ LTE Band 12: 0.2150 ❖ <u>Bluetooth LE:</u> Measured [Watts]: 0.00228 ❖ <u>ZigBee:</u> From modular grant [Watts]: 0.080538

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Power Supply/ Rated Operating Voltage Range:	Low 12VDC, Nominal 12VDC, High 24VDC
Operating Temperature Range:	Low 0° C, Nominal 27° C, High 50° C
Sample Revision:	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) ^{0.6834}	6
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4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC

operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz)^{0.6834} W

4.3 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 Analysis to Exclude Routine RF Exposure evaluation for Stand Alone Operation

Band	Lowest frequency [MHz]	FCC ERP/EIRP limit [dBm]	ERP/EIRP [dBm]	ISED ERP/EIRP limit [W]	ERP/EIRP [W]	Verdict
GSM850	824.2	33.90	29.590	1.29	0.910 ^{*1}	Exempt
GSM1900	1850.2	36.90	29.172	2.24	0.826 ^{*1}	Exempt
UMTS II	1852.4	36.90	27.369	2.24	0.546	Exempt
UMTS IV	1712.4	36.90	28.370	2.12	0.687	Exempt
UMTS V	826.4	33.90	24.700	1.29	0.295	Exempt
LTE 2	1852.5	36.90	27.236	2.24	0.529	Exempt
LTE 4	1715.0	36.90	28.182	2.13	0.658	Exempt
LTE 12	700.5	33.90	22.494	1.15	0.178	Exempt
BT-LE	2402	36.90	6.880	2.68	0.005	Exempt
Zigbee	2405	36.90	20.560	2.68	0.114	Exempt

*1: 50% Duty cycle correction factor applied to the ERP result by using the following formula:

$$\text{ERP} - (10 \cdot \log_{10}(1/0.5))$$

The single radios are exempt from routine environmental evaluation.

5.2 Analysis of RF Exposure for simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.
- Cellular can transmit simultaneously with either ZigBee or Bluetooth LE.

Radio	Frequency [MHz]	ERP/EIRP [W]	Actual [W/m ²]	FCC W/m ²	Canada [W/m ²]	How much of limit is used up [%]
GSM850	824.2	0.910	1.810	5.495	2.576	70.27%
GSM1900	1850.2	0.826	1.644	10.000	4.477	36.72%
UMTS II	1852.4	0.546	1.086	10.000	4.480	24.23%
UMTS IV	1712.4	0.687	1.367	10.000	4.246	32.19%
UMTS V	826.4	0.295	0.587	5.509	2.581	22.75%
LTE 2	1852.5	0.529	1.053	10.000	4.480	23.50%
LTE 4	1715.0	0.658	1.309	10.000	4.250	30.79%
LTE 12	700.5	0.178	0.353	4.670	2.305	15.33%
BT-LE	2402	0.005	0.010	10.000	5.351	0.18%
ZigBee	2405	0.114	0.226	10.000	5.355	4.23%

Conclusion:

- The worst case simultaneous transmission is GSM850 simultaneous with ZigBee which is using 74.49 of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

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6 Revision History

Date	Report Name	Changes to report	Report prepared by
01/29/2019	EMC_DIGII_047_18001_FCC_ISSED_MPE	Initial Release	Issa Ghanma

