



# Radio Frequency Exposure Evaluation Report

FOR:

**PetPomm, Inc dba Nuzzle**

Model:

NZL-DVC2016

Product Description:

Pet tracking device

FCC ID: 2AJ57-070114DVC

IC ID: 22069-070114DVC

Applied Rules and Standards:

CFR 47 Part 2 (2.1093),

FCC KDB 447498 D01 General RF Exposure Guidance v06

ISEDC RSS-102 Issue 5

Report number: EMC\_PETPO-001-16001\_SAR-EX

DATE: 2017-03-19



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**3462B-1**

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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 RSS-102 Issue 5.

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

| Company                 | Description         | Model #     |
|-------------------------|---------------------|-------------|
| PetPomm, Inc dba Nuzzle | Pet tracking device | NZL-DVC2016 |

### **Responsible for Testing Laboratory:**

| 2017-03-07 | Compliance | Peter Nevermann<br>(Director Radio Communications and EMC) |           |
|------------|------------|--|-----------|
| Date       | Section    | Name   | Signature |

### **Responsible for the Report:**

| 2017-03-07 | Compliance | Kris Lazarov<br>(EMC Engineer) |           |
|------------|------------|--------------------------------|-----------|
| Date       | Section    | Name                           | Signature |

The test results of this test report relate exclusively to the test item specified in Section3.  
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## 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 |
| <b>City/Zip Code</b>                | Milpitas, CA 95035     |
| <b>Country</b>                      | USA                    |
| <b>Telephone:</b>                   | +1 (408) 586 6200      |
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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> | PetPomm, Inc dba Nuzzle     |
| <b>Street Address:</b>   | 408 Tamiami Trail, Unit 122 |
| <b>City/Zip Code</b>     | Punta Gorda, FL 33950       |
| <b>Country</b>           | USA                         |
| <b>Contact Person:</b>   | Alex Andreeae               |
| <b>Phone No.</b>         | (941) 268-4955              |
| <b>e-mail:</b>           | alex@hellonuzzle.com        |

### **3. Equipment under Assessment**

|   |  |
|---|--|
| <b>Model No</b>   | NZL-DVC2016  |
| <b>HW Version</b>   | 1.0  |
| <b>SW Version</b>   | 0.4.4  |
| <b>FCC-ID</b>   | 2AJ57-070114DVC  |
| <b>IC ID</b>  | 22069-070114DVC  |
| <b>HVIN</b>   | NZL-DVC2016  |
| <b>Product Description</b>                                    | Pet tracking device. The device uses the same chipset as the NZL-BS2016 product with the PA section removed. This lowers the output power significantly and justifies the re-use of all conducted data collected for the NZL-BS2016 product. |
| <b>Device Category</b>  | <input type="checkbox"/> Fixed Installation<br><input type="checkbox"/> Mobile<br><input checked="" type="checkbox"/> Portable<br><input type="checkbox"/> Mixed Mobile and Portable   |
| <b>Frequency Range / number of channels</b>                   | UMTS FDD BAND V: 826 – 847 MHz; 288 channels;<br>UMTS FDD BAND II: 1852 – 1908 MHz; 107 channels;<br>BT LE: 2402(ch 0) – 2480(ch 39), 40 channels  |
| <b>Type(s) of Modulation</b>                                  | UMTS II/V: QPSK Modulation<br>Bluetooth version 4.0: GFSK modulation<br>802.11.b,g,n: BPSK, QPSK, 16 QAM, 64 QAM   |
| <b>Modes of Operation / Declared Output power</b>             | UMTS II/V = 22dBm<br>Bluetooth LE= 4dBm  |
| <b>Max. declared antenna gain</b>                             | 1.7dBi   |
| <b>Minimum distance of antenna or radiating parts to user</b> | 5mm  |
| <b>Power Supply/ Rated Operating Voltage Range</b>            | Vmin: 3.0V DC / Vmax: 4.2V DC  |
| <b>Operating Temperature Range</b>                            | -20 °C to 60 °C  |
| <b>Other Radios included in the device</b>                    | N/A  |
| <b>Co-located Transmitters / Antennas</b>                     | <input checked="" type="checkbox"/> Yes<br><input 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 ISEDC Exemption Limits for Routine Evaluation**

##### **4.1. FCC SAR test exclusions per KDB 447498**

KDB 447498 D01 General RF Exposure Guidance v06 Section: 4.3.1.

Standalone SAR test exclusion considerations states

- 4) 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*.

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. ISEDC SAR test exclusions per IC RSS-102 Issue 5**

ISEDC 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. 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.

Table with limits for the frequencies off interest

| Frequency (MHz) | d[mm] | Exemption Limits [mW] |
|-----------------|-------|-----------------------|
| 835             | 5     | 17                    |
| 1900            | 5     | 7                     |
| 2450            | 5     | 4                     |

## **5. Stand-alone Transmission SAR Exclusion Evaluation**

### **5.1. Justification for using the 5 mm Distance**

The device is intended to be used on pet and worn around the animal neck. The conservative distance of 5 mm is an estimate of how close a human body can be to the device in its typical application.

### **5.2. Justification for use of load based time averaging**

The worst case loading for each of the radios was determined from the following information provided by the manufacturer:

#### **EUT Operating Conditions**

The device only transmits periodically and has 2 operating modes for choosing how to send data either via Bluetooth at 2.4GHz or cell module at either 850MHz or 1900MHz. The modes and SAR exclusion calculations for each mode are presented below.

#### **Bluetooth Connected, Cellular Disabled**

To conserve power, the firmware in the device will preferentially choose to upload data over Bluetooth when such a connection is available. In this the cell module is in a low-power state and does not make any transmissions. The Bluetooth module is configured for a -1dBm conducted power output. Per Bluetooth specification, which is fully implemented by the chipset we're using, the maximum duty cycle is 5%.

#### **Bluetooth Advertising, Cellular Transmitting**

When a Bluetooth mobile phone is not connected to the device, all transmissions will take place over the cellular module using one of the available channels, band II (1900MHz) or band IV (850MHz). Transmissions never take place over both channels simultaneously. The cellular transmissions are limited to, at most, uploading every 3 minutes. This limitation is implemented in firmware and is required for multiple reasons:

- Data is aggregated on the device in minute increments. Uploading this data more frequently than every 3 minutes is of minimal benefit due to the power requirements and limitations of the board.
- The device is battery powered and cellular transmissions use a magnitude more power than any other feature. More frequent cellular data transmissions would have a significant impact on overall device life.

### **5.3. SAR Exclusion Calculation Table**

| FCC / IC Standalone Transmission SAR Exclusion Calculations |        |         |                          |                         |  |                                       |   |                                   |
|---|--------|---------|--------------------------|-------------------------|--|---------------------------------------|---|-----------------------------------|
| Band  | d [mm] | f [GHz] | Max Power + Tune Up [mW] | Source Based Duty Cycle | Load based duty cycle based on Maximum payload. <sup>2</sup> | Effective Time Average Max Power [mW] | FCC / IC Limit <sup>1</sup> @ 5 mm [mW] | SAR Exclusion applicable (Yes/No) |
| UMTS V  | 5      | 0.85    | 119                      | 1                       | 0.012  | 1.43                                  | 16.3 / 17                               | Yes                               |
| UMTS II   | 5      | 1.91    | 129                      | 1                       | 0.012  | 1.55                                  | 10.9 / 7                                | Yes                               |
| BTLE  | 5      | 2.48    | 0.8                      | 0.5                     | 0.05   | 0.04                                  | 9.7 / 4                                 | Yes                               |

Note 1: The FCC limit was derived by calculating the maximum output power passing the threshold for 1-g SAR exclusion

Note 2: The load base Duty cycle for UMTS is based on a worst case scenario with max of 2 kb payload within 2 min and using a worst case 12.2 kbit/s RMC uplink coding rate (excluding overhead, with lowest order modulation, and lowest coding rate).

The load base Duty cycle for BTLE is based on the broadcast packet of 33 bytes every second with a 2 Mb/s transfer rate.

### **6. Simultaneous Transmission SAR Exclusion Evaluation**

#### **6.1. FCC 1-g Standalone Transmitter Calculation for Simultaneous Transmitter SAR Exclusion**

| Band    | d [mm] | f [GHz] | Max Power + Tune Up [mW] | Source Based Duty Cycle | Load based duty cycle based on Maximum payload. <sup>1</sup> | Effective Time Average Max Power [mW] | FCC 1-g SAR Exclusion calculation [W/kg] |
|---------|--------|---------|--------------------------|-------------------------|--|---------------------------------------|--|
| UMTS V  | 5      | 0.85    | 119                      | 1                       | 0.012  | 1.43                                  | 0.16                                     |
| UMTS II | 5      | 1.91    | 129                      | 1                       | 0.012  | 1.55                                  | 0.26                                     |
| BTLE    | 5      | 2.48    | 0.8                      | 0.5                     | 0.05   | 0.04                                  | 0.002                                    |

Note 1: The load base Duty cycle for UMTS is based on a worst case scenario with max of 2 kb payload within 2 min and using a worst case 12.2 kbit/s RMC uplink coding rate (excluding overhead, with lowest order modulation, and lowest coding rate).

The load base Duty cycle for BTLE is based on the broadcast packet of 33 bytes every second with a 2 Mb/s transfer rate.

#### **6.2. Simultaneous Transmission FCC 1-g SAR Exclusion calculation**

Based on the information provided by the manufacturer there are only two modes of possible simultaneous transmission. The two modes were evaluated against the FCC 1-g SAR exclusion threshold in the table below.

| Transmission Mode | Simultaneous Transmission FCC 1-g SAR Exclusion calculation [W/kg] | FCC 1-g SAR Exclusion Threshold [W/kg] | SAR Exclusion applicable (Yes/No) |
|-------------------|--|--|-----------------------------------|
| UMTS V and BTLE   | 0.16+0.002=0.162   | < 0.4                                  | Yes                               |
| UMTS II and BTLE  | 0.26+0.002=0.262   | < 0.4                                  | Yes                               |

## 7. Revision History

| Date       | Report Name                | Changes to report | Report prepared by |
|------------|----------------------------|-------------------|--------------------|
| 2017-03-19 | EMC_PETPO-001-16001_SAR-EX | Initial version   | Kris Lazarov       |