Washington Laboratories, Ltd.
www.wll.com
7560 Lindbergh Drive . Gaithersburg, MD 20879
301.216.1500 . info@wll.com

Maximum Permissible Exposure Evaluation

For the

Specifi-Kali, LLC.

Laelaps Dog Tracking System Collar

FCC ID: 2AFKF-P01

August 24, 2016
Revised October 25, 2016

WLL JOB# 14626-MPE Rev 3

Prepared for:

SPECIFI-KALI, LLC
11675 JOLLYVILLE ROAD.
STE 100,
AUSTIN, TX, 78759

Prepared by:

WASHINGTON LABORATORIES, LTD.
7560 LINDBERGH DRIVE
GAITHERSBURG, MARYLAND 20879

Testing Certificate AT-1448

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Prepared by:

James Ritter
EMC Compliance Engineer

Reviewed by:

Steven D. Koster
President

Abstract

This report has been prepared on behalf of Specifi-Kali, LLC. Laelaps Dog Tracking System Collar to document the findings of the maximum permissible exposure evaluation on the Specifi-Kali, LLC. Laelaps Dog Tracking System Collar. The purpose of this evaluation is to establish a minimum safe distance as per the RF exposure requirements as defined in FCC §1.1307 & §1.1310.

This report documents the results of testing to the requirements of:

- CFR Title 47 Volume 1 Practice and Procedure; (1.1307) Environmental Assessments

The Evaluation was performed by Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Washington Laboratories, Ltd. has been accepted as an EMC Conformity Assessment Body (CAB) under the United States/European Union Memorandum of Agreement. Washington Laboratories, Ltd. is accredited by ANAB under Testing Certificate AT-1448.

Revision History	Reason	Date
Rev 0	Initial Release	September 19, 2016
Rev 1	Revised Calculations to include production tolerances on conducted power readings.	October 9, 2016
Rev 2	Revised Calculations to include a duty cycle reduction	October 24, 2016
Rev 3	Removed individual transmitter distances from table 3 and added TX colocation summation statement.	October 25, 2016

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1 Introduction

This report has been prepared on behalf of Specifi-Kali, LLC. Laelaps Dog Tracking System Collar Transmitter to show compliance with the RF exposure requirements as defined in FCC §1.1307.

Testing supporting this evaluation was performed at Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Washington Laboratories, Ltd. has been accepted as an EMC Conformity Assessment Body (CAB) under the United States/European Union Memorandum of Agreement. Washington Laboratories, Ltd. is accredited with ANAB under Testing Certificate AT-1448.

2 Requirements

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable. Additionally, the FCC categorizes the use of the devices based on the user's awareness and the ability to exercise control over his or her exposure. The two categories are defined as Occupational/Controlled Exposure and General Population/Uncontrolled Exposure.

2.1 Transmitter Categories

2.1.1 Fixed Installations

A fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.

2.1.2 Mobile Devices

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.

2.1.3 Portable Devices

A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

2.2 Exposure Categories

The limits for exposure are determined by the type of situation the individual is exposed to. Table 1 lists the limits for the particular environment.

2.2.1 Occupational/Controlled Exposure

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

2.2.2 General Population/Uncontrolled Exposure

The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category and the general population/uncontrolled exposure limits apply to these devices.

Table 1: MPE Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f2)	6
30–300	61.4	0.163	1	6
300–1500	N/A	N/A	f/300	6
1500–100,000	N/A	N/A	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f2)	30
30–300	27.5	0.073	0.2	30
300–1500	N/A	N/A	f/1500	30
1500–100,000	N/A	N/A	1	30

3 Device Summary

Table 1 below summarizes the criteria used to evaluate the Laelaps Dog Tracking System Collar. The EUT uses a low power 2,4GHz DTS spread spectrum and VHF MURS band radio .

Table 2: Device Summary of the Laelaps Dog Tracking System Collar

Model Evaluated:	Laelaps Dog Tracking System Collar models DTC 10.0 and DTC 10.1
Transmitter Category:	Mobile
Exposure Category:	General Population
Radio & Antenna Gain:	2.4GHz DTS Radio: -0.5dBi MURS band Radio: + 0.0dBi
Power Output (dBm):	2.4GHz DTS Radio: 1.96dBm (1.57mW) conducted MURS band Radio: 31.86 dBm (1.5W) conducted
Evaluation Distance:	20cm
Frequency Range:	2.4GHz DTS Radio: 2402-2480MHz MURS band Radio:151.82 – 154.60MHz
Limit:	1mW/cm2 for DTS, 0.200mW/cm2 for MURS

4 Radio Frequency Radiation Exposure Evaluation

The highest RF output power of the unit was measured and recorded. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is 1mW/cm^2.

The MPE shall be calculated at 20cm to show compliance with the power density limit. The following formula was used to calculate the Power Density:

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

Where:
S = Power Density
P = Output Power at the Antenna Terminals
G = Gain of Transmit Antenna (linear gain-isotropic)
R = Distance from Transmitting Antenna

As the stated Production Tolerance for the radios from the manufacturer is:

MURS Radio: 31.8 ±0.8dBm
BT Radio: 2.2 ±0.5dBm

With consideration to the above tolerances the following power levels will be used in the below calculations:

MURS Radio: 32.6dBm
BT Radio: 2.7dBm

Duty Cycle Corrections:

The MURS radio maximum transmission rate is 160ms per 2000ms. Using the standard 10*Log (on time /total time) or 10* Log (160/2000). This gives a duty cycle reduction of 10.97dB.

The MURS radio power used for the exposure calculation will be 32.6dBm – 10.97dB or 21.63dBm.

Table 3: Transmitter MPE Calculation Summary

One Transmitter			
Frequency	2402	MHz	
Limit	1.000	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	2.2	dBm	
TX Ant Gain (dBi), G =	-0.5	dB	
Power Density:	0.0003	mW/cm^2	**Separation<20 cm**
Second Transmitter			
Frequency	151.82	MHz	
Limit	0.200	mW/cm^2	
Distance (cm), R =	20	cm	
Power (dBm), P =	21.63	dBm	
TX Ant Gain (dB), G =	0	dB	
Power Density:	0.0290	mW/cm^2	**Separation<20 cm**

Co-location Statement:

FCC Rule: Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density.

Thus from table 3; (0.0003/1.000) + (0.0290/0.200)=0.0003+0.145= 0.1453

As 0.1453 is ≤ 1.0 This device qualifies for Simultaneous transmission MPE test exclusion.