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TEST REPORT #: 316243
LSR Job #: C-2558

Compliance Testing of:
VS2000

Prepared For:
Vulture Systems, LLC
Attn: Gregg Haensgen
1764 Koshkonong Rd
Stoughton, WI 53589

This Test Report is issued under the Authority of:
John Johnston, EMC Engineer

Signature:  Date: 10/20/16

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EXHIBIT 1 INTRODUCTION

1.1 Client Information

Manufacturer Name:	Vulture Systems LLC
Address:	1764 Koshkonong Rd, Stoughton, WI 53589
Contact Name:	Gregg Haensgen

1.2 Equipment Under Test (EUT) Information

Product Name:	VS2000
Model Number:	VS2000
Serial Number:	001

1.3 Product Description

The VS2000 is a base transceiver designed to report to handheld units (i.e., VS1000) in a VultureNet system. The VS2000 is powered by two AA batteries in series that present a 3.0 V nominal voltage to the board. The VS2000 includes a Semtech SX1272 LoRa radio configured to transmit at a fixed 922 MHz and exhibits at least a 500 kHz channel bandwidth.

1.4 Compliance Statement

The VS2000 was evaluated against the requirements and limits of OET Bulletin 65 and found to be compliant as a mobile device.

Exhibit 2: Limits

A. Mobile (MPE)

OET Bulletin 65 limits for General population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

RSS 102 limits for General population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Per RSS 102 issue 5 section 2.5.2, RF exposure evaluation is required if a 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:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- 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 $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

Exhibit 3: MPE Calculation

The following MPE calculations are based on the 18.542 dBm measured, average conducted output provided to the chip antenna. The peak gain of the chip antenna is 2.0 dBi.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

where: S = power density
P = power input to the antenna
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

Maximum peak output power at antenna input terminal:	18.54	(dBm)
Maximum peak output power at antenna input terminal:	71.483	(mW)
Antenna gain(typical):	2	(dBi)
Maximum antenna gain:	1.585	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	922	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.6	(mW/cm^2)
Power density at prediction frequency:	0.022539	(mW/cm^2)
Maximum allowable antenna gain:	16.3	(dBi)
Margin of Compliance at 20 cm =	14.3	dB

MPE Limit for Uncontrolled exposure at prediction frequency = f(MHz)/1500 = 922/1500 = 0.6

Power Density = **0.022539 mW/cm^2** = **0.22539 W/m^2**

RF Exposure Evaluation:

Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
Duty cycle used in evaluation: 68.9 %
Standard(s)/Procedure(s) used for evaluation (e.g. IEEE C95.3): OET Bulletin 65 and RSS 102
Measurement distance: 20 cm
RF field strength value: **0.225** V/m ☐ A/m ☐ W/m^2 ☒
Measured ☐ Computed ☐ Calculated ☒

Exhibit 4: Summary

The calculated power density of the EUT was found to be below the 0.6 mW/cm^2 OET Bulletin 65 MPE limit. Per RSS 102 issue 5 section 2.5.2, since the EUT operates at 113.3 mW, which is less than

$$1.31 \times 10^{-2} * (922)^{0.6834} W = 1.391W$$

The EUT is excluded from routine evaluation