FCC RF Exposure Report

Report No.:	MFBDWM-WTW-P24050507
FCC ID:	2AUWW-HALOWA2
Model No.:	Halo 4
Received Date:	2024/5/26
Issued Date:	2024/8/20
Applicant:	Protecct Animals with Satellites, LLC
Address:	5465 Legacy Dr., Suite 650, Plano, Texas 75024, United States
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
MFBDWM-WTW-P24050507	Original release	2024/8/20

1 Certificate of Conformity

Product:	Halo Collar 4
Brand:	Halo
Test Model:	Halo 4
Sample Status:	Engineering sample
Applicant:	Protecct Animals with Satellites, LLC
FCC Rule Part:	FCC Part 2 (Section 2.1091)
Standards:	KDB 447498 D01 General RF Exposure Guidance v06

We, **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, declare that the equipment above has been found compliance with the requirement limits of applicable standards. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate under the standards herein specified.

Prepared by : Vera Huang , **Date:** 2024/8/20

Vera Huang / Specialist

Approved by : Jeremy Lin , **Date:** 2024/8/20

Jeremy Lin / Project Engineer

2 General Information

2.1 General Description of EUT

Product	Halo Collar 4	
Brand	Halo	
Test Model	Halo 4	
Status of EUT	Engineering sample	
Input Power	5 Vdc from adapter	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	Bluetooth LE	GFSK
	WWAN	QPSK, 16QAM
Modulation Technology	WLAN	DSSS, OFDM
	Bluetooth LE	DTS
Transfer Rate	WLAN	Up to 72.2 Mbps
	Bluetooth LE	**Module: RS9116W** 1 Mbps / 2 Mbps / 125 kbps / 500 kbps **Module: NRF52840** 2 Mbps
Operating Frequency	WLAN	2412MHz ~ 2462MHz
	Bluetooth LE	2402MHz ~ 2480MHz
	WWAN	Cat-M1 Band 2: 1850MHz ~ 1910MHz Cat-M1 Band 4: 1710MHz ~ 1755MHz Cat-M1 Band 5: 824MHz ~ 849MHz Cat-M1 Band 12: 699MHz ~ 716MHz Cat-M1 Band 13: 777MHz ~ 787MHz
Number of Channel	WLAN	802.11b, 802.11g, 802.11n (HT20):11
	Bluetooth LE	40

Note:

1. The following modules can be configured in the EUT.

Item	Brand	Model	Specification
WWAN module	Quectel	BG770A-GL	Cat-M1
BT + WiFi module	Silicon labs	RS9116W	b/g/n+BT LE
BT module	Nordic	NRF52840	BT LE

2. The EUT uses following accessories.

Charging dock	Brand	VSO
	Model	N-841-079-05000002
Type C cable	Brand	VSO
	Model	N801-000-00025635
	Signal Line	1.2M with shielding

3. The module (brand: Silicon labs, model: RS9116W) provides 1 completed transmitter and 1 receiver.

2.4 GHz Band		
Modulation Mode	TX & RX Configuration	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX

4. The following WLAN and BT antennas are used in this EUT.

Antenna No.	RF Chain No.	Antenna Net Gain (dBi)	Frequency range	Antenna Type	Connector Type	Remark
1	BT0	-0.9	2.4~2.4835GHz	Chip	None (like solder)	For Module: RS9116W
2	BT1	2.3	2.4~2.4835GHz	Chip	None (like solder)	For Module: NRF52840

* Detail antenna specification please refer to antenna datasheet an antenna gain measurement report.

5. The following WWAN antennas are used in this EUT.

RF Chain No.	Frequency Bands	Antenna Net Gain (dBi)	Antenna Type	Connector Type
LTE0	Cat-M1 Band 2	-8.5	PCB	pogo pin
LTE1	Cat-M1 Band 4	-7.6	PCB	pogo pin
LTE2	Cat-M1 Band 5	-8.8	PCB	pogo pin
LTE3	Cat-M1 Band 12	-5.2	PCB	pogo pin
LTE4	Cat-M1 Band 13	-4.6	PCB	pogo pin

* Detail antenna specification please refer to antenna datasheet an antenna gain measurement report.

3 RF Exposure

3.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
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

3.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$
where
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
pi = 3.1416
r = distance between observation point and center of the radiator in cm

3.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

4 Calculation Result of Maximum Conducted Power

Frequency Band	EIRP (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
Cat-M1 Band 2	14.03	20	0.00503	1.000
Cat-M1 Band 4	13.00	20	0.00397	1.000

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Frequency Band	ERP (dBm)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
Cat-M1 Band 5	12.62	14.77	20	0.00597	0.550
Cat-M1 Band 12	16.42	18.57	20	0.01431	0.466
Cat-M1 Band 13	15.16	17.31	20	0.01071	0.520

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Frequency Band	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
Module: RS9116W					
WLAN 2.4GHz	13.91	-0.9	20	0.00398	1.00
Bluetooth LE	4.19	-0.9	20	0.00042	1.00
Module: NRF52840					
Bluetooth LE	7.67	2.3	20	0.00198	1.00

Note:

1. WWAN, WLAN, BT function cannot transmission at the same time.

2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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