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RF Exposure Evaluation Report

Report No.: CQASZ20210901525E-02
Applicant: Halo Properties Ltd.
Address of Applicant: M/F, 19 Gough Street, Central, HK
Equipment Under Test (EUT):
EUT Name: REV S.T W/BLUETH.SPK-GLS&RAW STEEL
Model No.: M-RVA-TS-0002
Test Model No.: M-RVA-TS-0002
Brand Name: Outlaw, Timothy Oulton
FCC ID: 2A253-MRVATS0002
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2021-09-07
Date of Test: 2021-09-07 to 2021-10-21
Date of Issue: 2021-11-23
Test Result: PASS*

*In the configuration tested, the EUT complied with the standards specified above

Tested By: Lewis Zhou
(Lewis Zhou)

Reviewed By: Rock Huang
(Rock Huang)

Approved By: Jack ai
(Jack ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210901525E-02	Rev.01	Initial report	2021-11-23

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3 General Information

3.1 Client Information

Applicant:	Halo Properties Ltd.
Address of Applicant:	M/F, 19 Gough Street, Central, HK
Manufacturer:	DG BLUEMAN TECHNOLOGY CO., LTD
Address of Manufacturer:	Room 101, No.5, Shunxing Five Road, Dajingtou, Dalang Town, Dongguan City, Guangdong Province
Factory:	DG BLUEMAN TECHNOLOGY CO., LTD
Address of Factory:	Room 101, No.5, Shunxing Five Road, Dajingtou , Dalang Town, Dongguan City, Guangdong Province

3.2 General Description of EUT

Product Name:	REV S.T W/BLUETH.SPK-GLS&RAW STEEL
Model No.:	M-RVA-TS-0002
Trade Mark:	Outlaw, Timothy Oulton
EUT Supports Radios :	Bluetooth mode 2402-2480MHz
Hardware Version:	V1.0
Software Version:	V2.0
Sample Type:	☒ Mobile ☐ Portable ☐ Fix Location
Power Supply:	INPUT: AC100-240V~50-60HZ / OUTPUT: DC18V 3.5A

3.3 General Description of BT

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Transfer Rate:	1Mbps/2Mbps/3Mbps
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	FCC Tool V2.24
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

3.4 Test Environment

Operating Environment:	
Temperature:	25.5 °C
Humidity:	53 % RH
Atmospheric Pressure:	1009 mbar

4 MPE Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 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)	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/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			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/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

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure Evaluation standalone operations

1) For BT Classic

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-2.330	-2.5±1	-1.5	0.71
Middle(2441MHz)	-1.520	-1.5±1	-0.5	0.89
Highest(2480MHz)	-1.020	-1.0±1	0	1.0
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.970	-2.0±1	-1.0	0.79
Middle(2441MHz)	-1.110	-1.0±1	0	1.0
Highest(2480MHz)	-0.790	-0.5±1	0.5	1.12
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-1.760	-1.5±1	-0.5	0.89
Middle(2441MHz)	-0.690	-0.5±1	0.5	1.12
Highest(2480MHz)	-0.410	-0.5±1	0.5	1.12

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
1.12	0	0.00026	1.0	PASS

Note: 1) Refer to report No. CQASZ20210901525E-01 for EUT test Max Conducted Peak Output Power value.

$$^2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (1.12 * 1) / (4 * 3.1416 * 20^2) = 0.00026 \text{ mW/cm}^2$$