FCC PART 15.229
TEST REPORT

For

Zeeva International Limited

Suite 1007B,10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong

FCC ID: 2ADM5-ET-0040-40

Report Type:	Product Type:
Original Report	1 24 CAR WHEEL ROMOTE-40MHz

Report Number:	RSZ191216831-00
Report Date:	2020-01-03
Reviewed By:	Kieron Luo RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION **3**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
TEST METHODOLOGY 3
TEST FACILITY 4
SYSTEM TEST CONFIGURATION **5**
DESCRIPTION OF TEST CONFIGURATION 5
EUT EXERCISE SOFTWARE 5
SPECIAL ACCESSORIES 5
EQUIPMENT MODIFICATIONS 5
BLOCK DIAGRAM OF TEST SETUP 5
SUMMARY OF TEST RESULTS **6**
TEST EQUIPMENT LIST **7**
FCC §15.203 – ANTENNA REQUIREMENT **8**
APPLICABLE STANDARD 8
ANTENNA CONNECTOR CONSTRUCTION 8
FCC §15.229, §15.205 & §15.209 - RADIATED EMISSIONS TEST **9**
APPLICABLE STANDARD 9
EUT SETUP 9
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 9
TEST PROCEDURE 10
CORRECTED AMPLITUDE & MARGIN CALCULATION 10
TEST RESULTS SUMMARY 10
TEST DATA 10
§15.215(c) - 20dB EMISSION BANDWIDTH TESTING **13**
APPLICABLE STANDARD 13
TEST PROCEDURE 13
TEST DATA 13
§15.229(d) - FREQUENCY TOLERANCE **15**
APPLICABLE STANDARD 15
TEST PROCEDURE 15
TEST DATA 15

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	1 24 CAR WHEEL ROMOTE-40MHz
Tested Model	ET-0040-V1
Multiple Model	ET-0040-V2
UPC Number	192234049013
SKU Number	3274156
Voltage Range	DC 1.5V*2 V from battery
Date of Test	2019-12-24 to 2019-12-25
Sample serial number	RSZ191216831-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2019-12-19
Sample/EUT Status	Good condition

Notes: This series products model: ET-0040-V2 and ET-0040-V1 are identical schematics. Model ET-0040-V1 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

Objective

This Type approval report is prepared on behalf of *Zeeva International Limited* in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.215 and 15.229 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz, and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 342867, the FCC Designation No. : CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

No exercise software was made to the EUT tested.

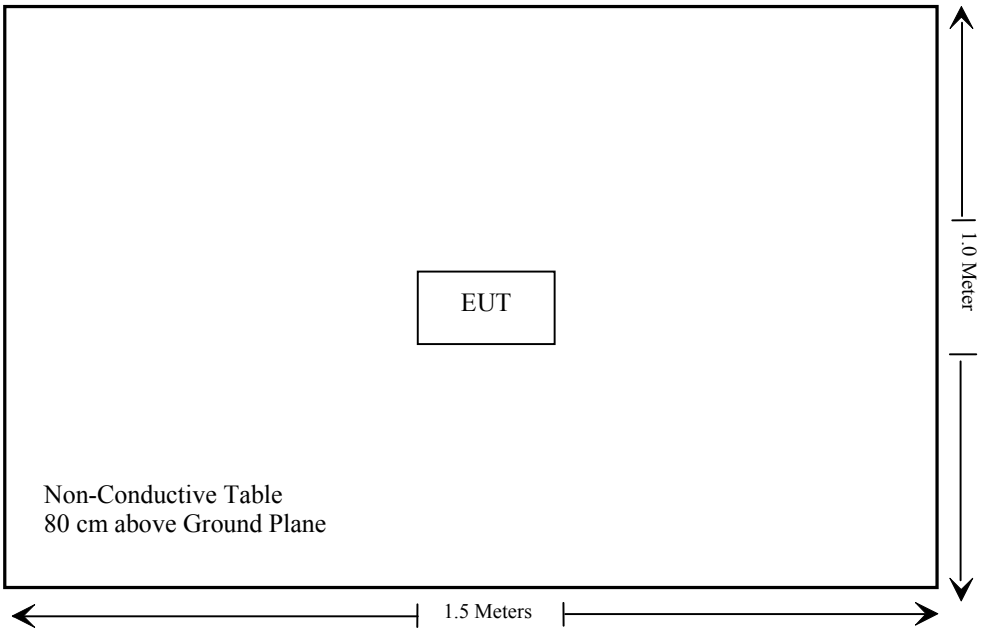
Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emissions	Not Applicable
§15.229 §15.209 §15.205	Radiated Emission Test	Compliance
§15.215(c)	20dB Emission Bandwidth Testing	Compliance
§15.229(d)	Frequency Tolerance	Compliance

Not Applicable: The EUT is powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	Unknown	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	Unknown	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Yijia	Temperature & Humidity Meter	TA218B	E0938	2019/10/14	2020/10/13

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has a monopole antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliance.

FCC §15.229, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

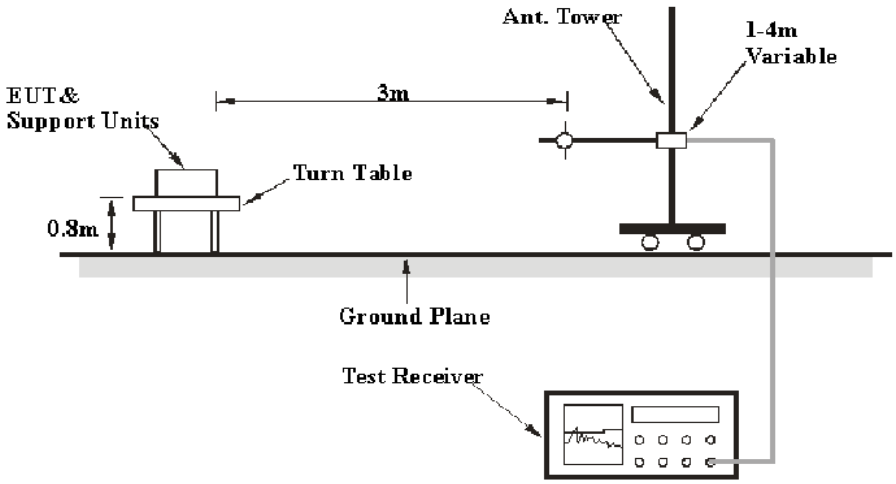
As per FCC Part 15.229

(a) Unless operating pursuant to the provisions in §15.231, the field strength of any emissions within this band shall not exceed 1,000 microvolts/meter at 3 meters.

(b) As an alternative to the limit in paragraph (a) of this section, perimeter protection systems may demonstrate compliance with the following: the field strength of any emissions within this band shall not exceed 500 microvolts/meter at 3 meters, as determined using measurement instrumentations employing an average detector. The provisions in §15.35 for limiting peak emissions apply where compliance of these devices is demonstrated under this alternative emission limit.

(c) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in §15.209.

EUT Setup



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.205 and 15.209 and 15.229 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 1000 MHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data out of band was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz, within the operating band was recorded in peak and average detection mode.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.229.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

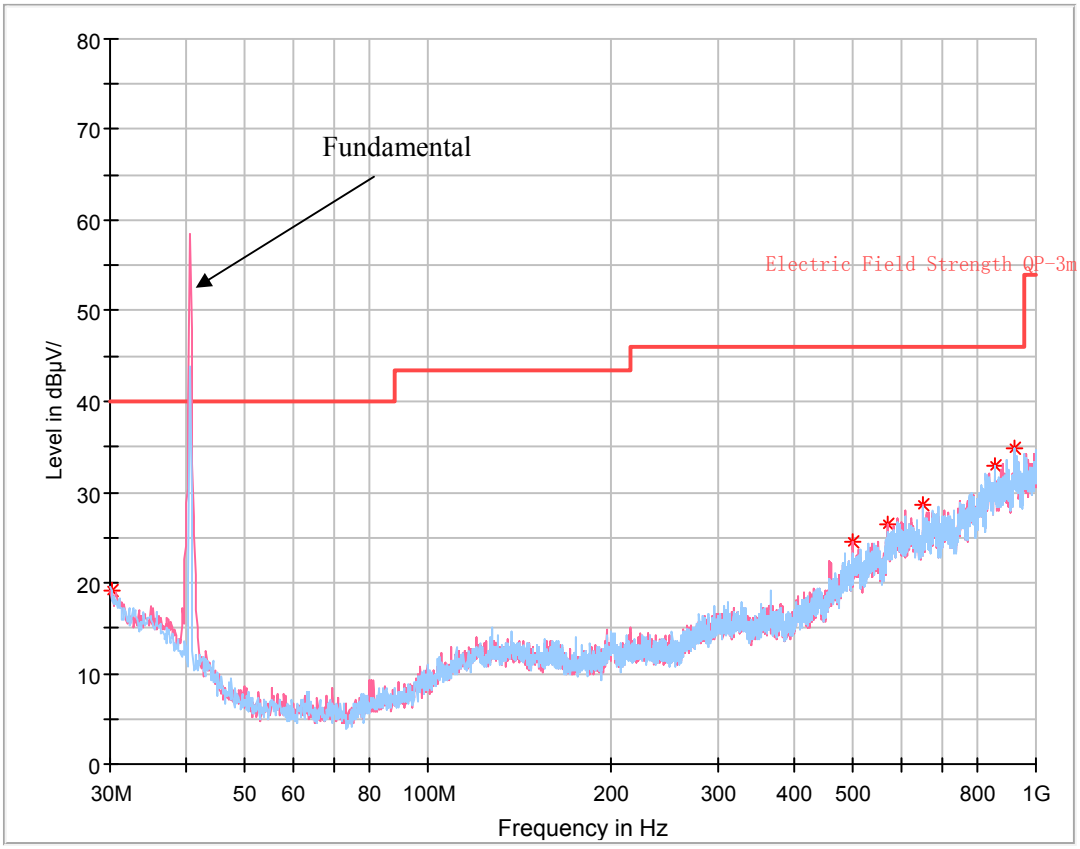
The testing was performed by Zero Yan on 2019-12-24 and 2019-12-25.

EUT operation mode: Transmitting

Frequency (MHz)	Corrected Amplitude (dBμV/m)	PK/QP/Ave.	Turntable Degree	Rx Antenna		Corrected Factor (dB)	FCC PART 15.229		Remark
				Height (m)	Polar (H / V)		Limit (dBμV/m)	Margin (dB)	
40.68	56.94	PK	148	1.0	H	-10.9	80	23.06	Fundamental
40.68	51.32	Ave.	148	1.0	H	-10.9	60	8.68	
40.68	59.42	PK	227	1.3	V	-10.9	80	20.58	
40.68	55.16	Ave.	227	1.3	V	-10.9	60	4.84	
40.66	29.61	PK	227	1.3	V	-14.5	40	10.39	Band edge
40.70	29.34	PK	227	1.3	V	-14.5	40	10.66	Band edge

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

30 MHz~1 GHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.242500	19.25	390.0	V	333.0	-7.8	40.00	20.75
500.692500	24.55	205.0	V	47.0	-5.2	46.00	21.45
569.562500	26.35	305.0	V	259.0	-3.1	46.00	19.65
650.921250	28.62	105.0	V	298.0	-1.7	46.00	17.38
858.986250	32.95	390.0	H	328.0	3.3	46.00	13.05
922.763750	34.74	205.0	H	310.0	4.6	46.00	11.26

§15.215(c) - 20dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.215 (c), Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

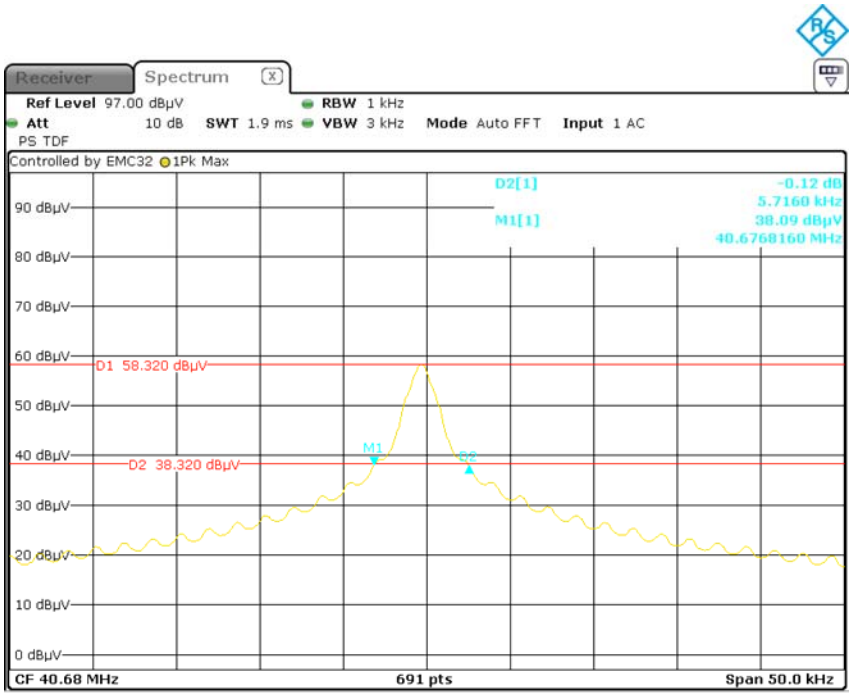
The testing was performed by Zero Yan on 2019-12-24.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table and plots

Fl(MHz)	Fh(MHz)	Permitted frequency range(MHz)	Result
40.6768160	40.6825320	40.66-40.70	Compliant

20 dB Emission Bandwidth



§15.229(d) - FREQUENCY TOLERANCE

Applicable Standard

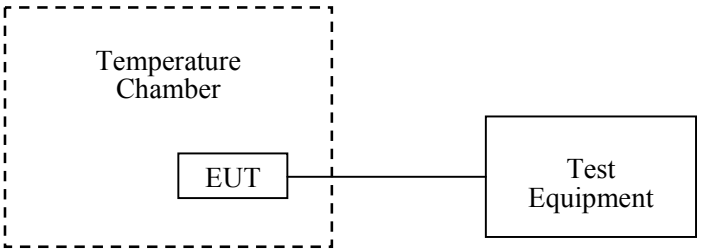
The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2019-12-24.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to following table

f_o =40.68 MHz, limit=±0.01%				
Temperature (℃)	**Power Supplied**	**Measured Frequency (MHz)**	**Frequency Error (%)**	**Limit (%)**
-20	New battery 3 V_{DC}	40.679385	-0.00151	±0.01
-10		40.679584	-0.00102	±0.01
0		40.679605	-0.00097	±0.01
10		40.679541	-0.00113	±0.01
20		40.679632	-0.00090	±0.01
30		40.679687	-0.00077	±0.01
40		40.679745	-0.00063	±0.01
50		40.679863	-0.00034	±0.01

******* END OF REPORT *******