

FCC Radio Test Report

FCC ID: VFK-RC-WM-108

Report No.	: BTL-FCCP-1-2008T050
Equipment	: REMOTE CONTROL
Model Name	 RC-WM-108, RC-WM-108-XXX (where "X" may be any alphanumeric character, blank or "-")
Brand Name	: Reverie
Applicant	: Ascion, LLC
Address	: 2066 Franklin Rd, Bloomfield Hills, MI, 48302 United States
Radio Function	: 433.97 MHz
FCC Rule Part(s) Measurement Procedure(s)	: FCC Part 15, Subpart C (15.231) : ANSI C63.10-2013
Date of Receipt Date of Test Issued Date	: 2020/8/7 : 2020/8/7 ~ 2020/8/18 : 2020/8/28

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.



CONTENTS					
REPOR ⁻	T ISSUED	HISTORY	4		
1	SUMMA	RY OF TEST RESULTS	5		
1.1	TEST	FACILITY	6		
1.2	MEAS	SUREMENT UNCERTAINTY	6		
1.3	TEST	ENVIRONMENT CONDITIONS	6		
1.4	DUTY	(CYCLE	7		
2	GENER	AL INFORMATION	8		
2.1	DESC	CRIPTION OF EUT	8		
2.2	TEST	MODES	8		
2.3	BLOC	X DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	9		
2.4	SUPF	PORT UNITS	9		
3	RADIAT	ED EMISSIONS TEST	10		
3.1	LIMIT		10		
3.2	TEST	PROCEDURE	11		
3.3	DEVI	ATION FROM TEST STANDARD	12		
3.4	TEST	SETUP	12		
3.5	EUT	OPERATING CONDITIONS	13		
3.6	TEST	RESULT – 30 MHZ TO 1 GHZ	13		
3.7	TEST	RESULT –ABOVE 1 GHZ	13		
4	20 DB S	PECTRUM BANDWIDTH MEASUREMENT	14		
4.1	LIMIT		14		
4.2	MEAS	SURING INSTRUMENTS AND SETTING	14		
4.3	TEST	PROCEDURE	14		
4.4	DEVI	ATION FROM TEST STANDARD	14		
4.5	EUT	OPERATING CONDITIONS	14		
4.6	TEST	RESULT	14		
5	TIMING	TESTING	15		
5.1			15		
5.2	MEAS	SURING INSTRUMENTS AND SETTING	15		
5.3	IESI		15		
5.4	DEVI	ATION FROM TEST STANDARD	15		
5.5	TEST		15		
5.6	EUI		15		
5.7	IESI		15		
6 7			16		
/	EUTIE		17		
8	EUTPH	0105	17		
APPEND	DIX A	RADIATED EMISSIONS - 30 MHZ TO 1 GHZ	18		
APPEND	DIX B	RADIATED EMISSIONS - ABOVE 1000 MHZ	23		
APPEND	DIX C	20 dB SPECTRUM BANDWIDTH	26		
APPEND	DIX D	TIMING TESTING	28		



REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	2020/8/28	2020/8/25
R01	Revised report to address TCB's comments.	2020/8/28

SUMMARY OF TEST RESULTS 1

Test procedures according to the technical standards.

FCC Part 15, Subpart C (15.231)							
Standard(s) Section	Description	Test Result	Judgement	Remark			
15.207	AC Power Line Conducted Emissions		N/A	NOTE(1)			
15.209 15.231(b)	Radiated Emissions	APPENDIX A APPENDIX B	Pass				
15.231(c)	20 dB Spectrum Bandwidth	APPENDIX C	Pass				
15.231(a) (1)	Timing Testing	APPENDIX D	Pass				

NOTE:

"N/A" denotes test is not applicable in this Test Report.
 The report format version is TP.1.1.1.



1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68 The te	-1, Ln. 169, Sec. st sites and facili	2, Da ties ar	tong Rd., Xizhi I e covered under	Dist., r FC0	New Taipei City C RN: 674415 an	221, ⁻ d DN	Taiwan : TW0659.	
	C05		CB08		CB11		CB15	CB16
	SR06							
No.18,	Ln. 171, Sec. 2,	Jiuzo	ng Rd., Neihu D	ist., ⁻	Taipei City 114, Ta	aiwan		
i ne te		lies ar	e covered under		5 RN. 270529 an			
	C03	\times	CB18		CB19	\bowtie	SR06	

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k = 2, providing a level of confidence of approximately 95 %. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. Radiated emissions test :

Test Site	Measurement Frequency Range	U,(dB)
	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
CDIO	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

C. Conducted test :

Test Item	U,(dB)
20 dB Spectrum Bandwidth	1.13

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Test Voltage	Tested by
Radiated emissions below 1 GHz	Refer to data	DC 4.5V	John Chuang
Radiated emissions above 1 GHz	Refer to data	DC 4.5V	John Chuang
20 dB Spectrum Bandwidth	24.3 °C, 43 %	DC 4.5V	Jay kao
Timing Testing	24.3 °C, 43 %	DC 4.5V	Jay kao



1.4 DUTY CYCLE

If duty cycle is \geq 98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered.

Remark	Delta 1			Delta 2	On Time/Period	20 log(1/Duty Cycle)
Mode	ON	Numbers	On Time (B)	Period (ON+OFF)	Duty Cycle	Duty Factor
	(ms)	(ON)	(ms)	(ms)	(%)	(dB)
433.97 MHz	0.380	1	0.380	1.420	26.76%	-11.45





2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	REMOTE CONTROL
Model Name	RC-WM-108, RC-WM-108-XXX (where "X" may be any alphanumeric character, blank or "-")
Brand Name	Reverie
Model Difference	Different model distribute to different area.
Power Source	Supplied from battery.
Power Rating	DC 4.5V
Products Covered	N/A
Frequency Range	433.97 MHz
Field Strength	56.07 dBuV/m (Average)
Test Model	RC-WM-108
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

(2) Channel List:

Channel	Frequency (MHz)
01	433.97

(3) Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Coil	N/A	N/A

2.2 TEST MODES

Test Items	Test mode	Channel	Note
Transmitter Radiated Emissions (below 1GHz)	433.97 MHz	01	-
Transmitter Radiated Emissions (above 1GHz)	433.97 MHz	01	-
20 dB Bandwidth	433.97 MHz	01	-
Timing Testing	433.97 MHz	01	-

NOTE:

(1) The Radiated emissions test was verified based on the worst conducted power and Bandwidth test results reported in the original report.



2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
-	-	-	-	-	-
Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-



3 RADIATED EMISSIONS TEST

3.1 LIMIT

LIMITS OF FIELD STRENGTH OF FUNDAMENTAL MEASUREMENT

Frequency Band (MHz)	Field strength of fundamental Limit(uV/m) at 3m
40.66-40.70	2250
70-130	1250
130-174	(**)1250 To 3750
174-260	3750
260-470	(**)3750 To 12500
AL (=0	10500

Above 470 12500
**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μ V/m at 3 meters = 22.72727×(operating frequency, MHz) - 2454.545.

(2) For the band 260 - 470 MHz, μV/m at 3 meters =16.6667×(operating frequency, MHz) - 2833.3333. So the field strength of emission limits has been calculated in below table.

Carrier Frequency (MHz)	Fundamental EmissionsLimit(dBuV/m) at 3m
433.92 MHz	72.87 (Average)
433.92 MHz	92.87 (Peak)

MEASURING INSTRUMENTS AND SETTING (FIELD STRENGTH OF FUNDAMENTAL EMISSIONS)

Receiver Parameter	Setting
Attenuation	Auto
Center Frequency	Fundamental Frequency
RBW	120 kHz
Detector	Peak / Average

RADIATED EMISSIONS MEASUREMENT

Devices complying with 47 CFR FCC part 15 subpart C, section 15.231(e). The field strength of emissions from intentional radiators at 3 meters operated under this Section shall not exceed the following:

Frequency Band (MHz)	Field strength of spurious emissions (uV/m) at 3m
40.66-40.70	225
70-130	125
130-174	(**)125 to 375
174-260	375
260-470	(**)375 to 1250
Above 470	1250

**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μ V/m at 3 meters = 22.72727×(operating frequency, MHz) - 2454.545.

(2) For the band 260 - 470 MHz, μ V/m at 3 meters = 16.6667×(operating frequency, MHz) - 2833.3333.

(3) The maximum permitted unwanted emissions level is 20 dB below the maximum

permitted fundamental level. In addition field strength of any emissions which appear inside

of the restriction band shall not exceed the general radiated emissions limits in Section 15.209(a).



Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000MHz for QP detector

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, AV Mode with Dwell time

3.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.(below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.



3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP





3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX A

3.7 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX B

NOTE:

(1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.



4 20 dB SPECTRUM BANDWIDTH MEASUREMENT

4.1 LIMIT

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. So the emission bandwidth limits have been calcuated in below table.

Fundamental Frequency	20 dB Bandwidth Limits (MHz)
433.92 MHz	1.0848

4.2 MEASURING INSTRUMENTS AND SETTING

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RB	10 kHz
VB	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were used.
- c. Measured the spectrum width with power higher than 20 dB below carrier.

4.4 DEVIATION FROM TEST STANDARD

No deviation.

5.4 TEST SETUP



SPECTRUM ANALYZER

4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT

Please refer to the APPENDIX C



5 TIMING TESTING

5.1 LIMIT

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

5.2 MEASURING INSTRUMENTS AND SETTING

Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	Zero Span
RB	1 MHz
VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	100 seconds

5.3 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 1 MHz and the video bandwidth of 1 MHz were used.

5.4 DEVIATION FROM TEST STANDARD

No deviation.

5.5 TEST SETUP



5.6 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.7 TEST RESULT

Please refer to the APPENDIX D



6 LIST OF MEASURING EQUIPMENTS

	Radiated Emissions										
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until					
1	Preamplifier	EMCI	EMC02325B	980217	2020/4/10	2021/4/9					
2	Preamplifier	EMCI	EMC012645B	980267	2020/4/10	2021/4/9					
3	Test Cable	EMCI	EMC104-SM-SM- 800	150207	2020/4/10	2021/4/9					
4	Test Cable	EMCI	EMC104-SM-SM- 3000	151205	2020/4/10	2021/4/9					
5	Test Cable	EMCI	EMC-SM-SM-700 0	180408	2020/4/10	2021/4/9					
6	MXE EMI Receiver	Agilent	N9038A	MY554200087	2020/6/10	2021/6/9					
7	Signal Analyzer	Agilent	N9010A	MY56480554	2020/6/4	2021/6/3					
8	Horm Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2020/6/12	2021/6/11					
9	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	VULB 9168-352	2020/7/24	2021/7/23					
10	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0625	2020/7/24	2021/7/23					

20 dB Spectrum Bandwidth										
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until				
1	Spectrum Analyzer	R&S	FSP 40	100129	2020/6/15	2021/6/14				

Timing Testing										
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until				
1	Spectrum Analyzer	R&S	FSP 40	100129	2020/6/15	2021/6/14				

Remark: "N/A" denotes no model name, no serial no. or no calibration specified. All calibration period of equipment list is one year.



7 EUT TEST PHOTO

Please refer to document Appendix No.: TP-2008T050-FCCP-1 (APPENDIX-TEST PHOTOS).

8 EUT PHOTOS

Please refer to document Appendix No.: EP-2008T050-1 (APPENDIX-EUT PHOTOS).



APPENDIX A RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

BIL

Test Mode			TX		Test Da	Test Date			2020/8/14		
Test Fred	luency		433.	97MHz	Polariza	ation		Vertical			
Temp			2	3°C	Hum.			6	7%		
130.0 dB	ıV/m									_	
120											
110										-	
100										-	
90										_	
80										4	
70										-	
60										_	
50					2					_	
40					×					-	
30										-	
20											
10.0											
428.970	429.97	430.97	431.97	432.97	433.97 43	34.97 43	35.97 436	.97	438.97	MHz	
No.	Mk.	Freq.	Reading	Correct Factor	Measure-	Limit	Margin				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comm	ent	
1		433.9700	33.39	23.45	56.84	100.83	-43.99	peak			
2	*	433.9700	21.94	23.45	45.39	80.83	-35.44	AVG			

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value - Limit Value.



Т	est Mo	de		ТХ		Test Date		202	0/8/14			
Tes	t Frequ	Frequency 433.97MHz Polarization Ho		433.97MHz Polarization H		433.97MHz Polarization		Polarization Horiz		orizontal		
	Temp		2	3°C		Hum.		6	7%			
130.0 dBu	iV/m									_		
120												
110												
100										-		
90												
80										-		
70					1							
60					2							
50					x							
40												
30												
20												
10.0												
428.970	429.97	430.97	431.97	432.97	433.97 4	34.97 435	.97 436.	97	438.97	MHz		
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin					
		MHz	dBuV	dB	dBu\//m	dBu\//m	dB	Detector	Comm	ent		
1		433 9700	44 07	23 45	67.52	100.83	-33.31	peak	Comm	ont		
2	*	433.9700	32.62	23.45	56.07	80.83	-24.76	AVG				

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value - Limit Value.

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REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.





REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.





APPENDIX B RADIATED EMISSIONS - ABOVE 1000 MHZ



Test Mode			ТХ		Test Date Polarization			2020/8/14 Vertical		
Т	Test Frequency		433.97MHz							
_	Temp		2	3°C		Hum.		6	7%	
130.0	dBu¥/m									_
120										
110										
100										
90										
80										
70 —										
60										
50										
40		1 X								
30		2								-
20		×								
10.0										
1000.	000 1400.00) 1800.00	2200.00	2600.00	3000.00	3400.00 38	00.00 420	0.00	5000.00	MHz
No.	Mk.	Freq.	Reading	Correct	Measure	- Limit	Margin			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comme	ent
1		1732.000	54.70	-18.41	36.29	81.94	-45.65	peak	001111	
2	*	1732.000	42.25	-18.41	23.84	61.94	-38.10	AVG		

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value - Limit Value.



	Test Mod	de		ТХ		Test Date	;	202	0/8/14	
T	Test Frequency		433.97MHz			Polarizatio	n	Horizontal		
	Temp		2	3°C		Hum.		6	7%	
130.0	dBuV/m									-
120										
110										
100										
90										
80										
70										
60										
50										
40		1×								
30		2								
20		×								
10.0										
1000.0	000 1400.00	1800.00	2200.00	2600.00	3000.00	3400.00 38	00.00 420	0.00	5000.00	MHz
No.	Mk.	Freq.	Reading	Correct	Measure	- Limit	Margin			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comme	ent
1		1732.000	54.74	-18.41	36.33	81.94	-45.61	peak	001111	
2	*	1732.000	42.21	-18.41	23.80	61.94	-38.14	AVG		

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value - Limit Value.



APPENDIX C 20 dB SPECTRUM BANDWIDTH







APPENDIX D	TIMING TESTING	



