

Report No. : FR711935-08



FCC RADIO TEST REPORT

FCC ID	:	H8NRAC2V1K
Equipment		DBDC ROUTER
Brand Name		Charter
Model Name	;	RAC2V1K
Applicant	-	Askey Computer Corp.
		10F, NO.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN
Manufacturer	:	Askey Computer Corp.
		10F, NO.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN
Standard	:	47 CFR FCC Part 15.247

The product was received on Dec. 05, 2018, and testing was started from Dec. 08, 2018 and completed on Dec. 27, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

NM

Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

Histo	ory of this test report	3
Sum	mary of Test Result	4
1	General Description	5
1.1	Information	5
1.2	Testing Applied Standards	7
1.3	Testing Location Information	7
1.4	Measurement Uncertainty	7
2	Test Configuration of EUT	8
2.1	The Worst Case Measurement Configuration	8
2.2	EUT Operation during Test	8
2.3	Accessories	9
2.4	Support Equipment	9
2.5	Test Setup Diagram	10
3	Transmitter Test Result	11
3.1	Emissions in Restricted Frequency Bands	11
4	Test Equipment and Calibration Data	14
Арре	endix A. Test Results of Emissions in Restricted Frequency Bands	

Appendix B. Test Photos

Photographs of EUT v01



History of this test report

Report No.	Version	Description	Issued Date
FR711935-08	01	Initial issue of report	Dec. 28, 2018



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen Report Producer: Cindy Peng



1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	4TX
2.4-2.4835GHz	802.11g	20	4TX
2.4-2.4835GHz	802.11n HT20	20	4TX
2.4-2.4835GHz	802.11n HT20-BF	20	4TX
2.4-2.4835GHz	802.11n HT40	40	4TX
2.4-2.4835GHz	802.11n HT40-BF	40	4TX

Note:

- 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.



1.1.2 Antenna Information

Ant Brand		Dort Number	Antonno Tuno	Connector	Ģ	Gain (dB	Domork	
Ant.	Бгапо	Part Number	Antenna Type	Antenna Type Connector 2.40		5G B1	5G B4	Remark
1	Airgain	N2420GS	PCB Antenna	I-PEX	1	-	-	2.4GHz TX/RX
2	Airgain	N2420GS	PCB Antenna	I-PEX	1	-	-	2.4GHz TX/RX
3	Airgain	N2420GS	PCB Antenna	I-PEX	1	-	-	2.4GHz TX/RX
4	Airgain	N2420GS	PCB Antenna	I-PEX	1	-	-	2.4GHz TX/RX
5	Airgain	M5x05C (Longer)	PCB Antenna	I-PEX	-	1.2	1.2	5GHz TX/RX
6	Airgain	M5x05C	PCB Antenna	I-PEX	-	1.2	1.2	5GHz TX/RX
7	Airgain	M5x05C	PCB Antenna	I-PEX	-	1.2	1.2	5GHz TX/RX
8	Airgain	M5x05C (Longer)	PCB Antenna	I-PEX	-	1.2	1.2	5GHz TX/RX

Note: The above information was declared by manufacturer.

Note: The EUT has eight antennas.

For 2.4GHz function (4TX/4RX):

Ant. 1 (P1), Ant. 2 (P2), Ant. 3 (P3) and Ant. 4 (P4) could transmit/receive simultaneously.

For 5GHz function (4TX/4RX):

Ant. 5 (P1), Ant. 6 (P2), Ant. 7 (P3) and Ant. 8 (P4) could transmit/receive simultaneously.

1.1.3 Mode Test Duty Cycle

For Non-beanforming mode

Mode	DC	DCF(dB)
802.11b	0.994	0.026
802.11g	0.972	0.123
802.11n HT40	0.973	0.119

Note:

DC is Duty Cycle.

DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	From power adapter				
Beamforming Function	\boxtimes	With beamforming		Without beamforming	
Function	\boxtimes	Point-to-multipoint		Point-to-point	
Test Software Version	The product has beamforming function for 802.11n/ac.				

Note: The above information was declared by manufacturer.



1.1.5 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR711935-03 Below is the table for the change of the product with respect to the original one.

	Modific	Performance Checking		
Changing the 2.4G original 2.4GHz filt	Hz filter on TOF	Emissions in Restricted Frequency Bands Above 1GHz for 802.11b 2412		
Original 2.4GHz filter New 2.4GHz filter				MHz, 802.11g 2437 MHz, 802.11n
Position	P/N	Position	P/N	case of original test report (The test
FL5,FL6,FL7,FL8	0906-011G000	FL5,FL6,FL7,FL8	0906-0130000	regulta are based on original output
FL1,FL2,FL3,FL4	0906-013CE00	FL1,FL2,FL3,FL4	0906-013HK00	power to re-test.)

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v05
- FCC KDB 662911 D01 v02r01

1.3 Testing Location Information

	Testing Location								
	HWA YA	ADD	:	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)					
		TEL	:	886-3-327-3456 FAX : 886-3-327-0973					
\boxtimes	JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.					
		TEL	:	886-3-656-9065 FAX : 886-3-656-9085					

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
Radiated	03CH01-CB	Welson Chen	22°C / 54%	Dec. 08, 2018~Dec. 27, 2018

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark			
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%			
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%			



2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests								
Tests Item	Emissions in Restricted Frequency Bands							
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.							
Operating Mode > 1GHz	СТХ							

Note: The EUT can only be used at Y axis position.

2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



2.3 Accessories

	Accessories									
No.	Equipment Name	Brand Name	Model No.	Rating						
1	Adapter 1	Sunny	SYS1564-3012-W2	INPUT: 100-240Vac, 50-60Hz, 1.0A MAX. OUTPUT: 12Vdc, 2.5A						
2	Adapter 2	Ktec	KSA-36W-120250HU	INPUT: 100-240Vac, 50/60Hz, 1.0A OUTPUT: 12Vdc, 2.5A						

Note: The power adapter does not affect the test result of RF tests, so only adapter 1 was tested and recorded in this report.

2.4 Support Equipment

For Test Site No: 03CH01-CB

Support Equipment								
No. Equipment Brand Name Model Name FCC ID								
А	NB	DELL	E4300	N/A				



2.5 Test Setup Diagram





3 Transmitter Test Result

3.1 Emissions in Restricted Frequency Bands

3.1.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit									
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)						
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300						
0.490~1.705	24000/F(kHz)	33.8 - 23	30						
1.705~30.0	30	29	30						
30~88	100	40	3						
88~216	150	43.5	3						
216~960	200	46	3						
Above 960	500	54	3						
Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance									

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.



3.1.3 Test Procedures

	Test Method							
•	 The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. 							
•	Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.							
•	For the transmitter unwanted emissions shall be measured using following options below:							
	 Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands. 							
	☐ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).							
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).							
	☐ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).							
	□ Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW \ge 1/T, where T is pulse time.							
	Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.							
	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.							
•	For the transmitter band-edge emissions shall be measured using following options below:							
	 Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below. 							
	 Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements. 							
	 Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz). 							
	 For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB 							
	 For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. 							



3.1.4 Test Setup



3.1.5 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix A



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 13, 2018	Nov. 12, 2019	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	1GHz ~ 26.5GHz Jan. 09, 2018		Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum anal yzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)

4 Test Equipment and Calibration Data

Note: Calibration Interval of instruments listed above is one year.



RSE TX above 1GHz Result

Appendix A

Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	
802.11n HT40_Nss1,(MCS0)_4TX	Pass	AV	2.4835G	53.98	54.00	-0.02	32.23	3	Horizontal	95	2.10	-















































