FCC/ISED RF Exposure Evaluation

Vista Labs
TEST • CERTIFY • COMPLY

Test Report Number……	**MTK-19111321-LC-FCC-IC-MPE**
Applicant……	**Mikrotikls SIA**
Applicant Address……	**Brivibas gatve 214i, Riga, LV-1039 LATVIA**
Product Name……	wAP R ac
Model Number……	RBwAPGR-5HacD2HnD-US
FCC ID……	N/A
ISED ID……	TV7WAPGR5AC2D
Date of EUT received……	12/04/2019
Date of Test……	12/04/2019 – 12/31/2019
Report Issue Date……	12/31/2019
Test Standards……	47 CFR §1.1307(b), 47 CFR §1.1310 RSS-102 Issue 5: March 2015
Test Result……	Pass

Issued By:

Vista Laboratories

1261 Puerta Del Sol, San Clemente, CA 92673 USA

www.vista-compliance.com

Tested by:	**Approved By:**
Bruce Li	
Bruce Li/Test Engineer	**David Zhang/Technical Manager**

Laboratory Introduction

Vista Labs is an A2LA accredited 17025 compliant regulatory compliance testing laboratories (Cert. number: 4848-01) strategically located in Orange County, providing services in the electrical and telecommunication industries. Vista labs is also recognized testing facility for Australia (ACMA), Chinese Taipei (BSMI), Chinese Taipei (NCC), Hong Kong (OFCA), Israel (MOC), Korea (RRA), Singapore (IMDA), Vietnam (MIC), etc.

Our comprehensive testing services include safety testing, EMC emission and susceptibility testing, RF and wireless testing (including DFS).
As your partner, Vista investigates appropriate test standards, develops test plans, performs troubleshooting & failure analysis, reviews documentation, and provides test reports for a complete compliance testing and certification package.

Accredited Laboratory

A2LA has accredited

VISTA LABORATORIES, INC.

San Clemente, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 21st day of June 2018.

President and CEO
For the Accreditation Council
Certificate Number 4848.01
Valid to July 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

17025 Product Testing Accreditation Certificate

Accredited Product Certification Body

A2LA has accredited

VISTA LABORATORIES, INC.

San Clemente, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This product certification body also meets the A2LA R308 – Specific Requirements – ISO-IEC 17065 – Telecommunication Certification Body Accreditation Program and R322 – Specific Requirements – Notified Body Accreditation Requirements. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 1st day of October 2018.

President and CEO
For the Accreditation Council
Certificate Number 4848.02
Valid to July 31, 2020

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

17065 Product Certification Accreditation Certificate

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REVISION HISTORY

Revision	Issue Date	Description	Note
Original	12/31/2019	Original release	N/A

1 General Information

1.1 Applicant

Applicant:	Mikrotikls SIA
Applicant address:	Brivibas gatve 214i, Riga, LV-1039 LATVIA
Manufacturer:	Mikrotikls SIA
Manufacturer Address:	Brivibas gatve 214i, Riga, LV-1039 LATVIA

1.2 Product information

Product Name	wAP R ac
Model Number	RBwAPGR-5HacD2HnD-US
Family Model Number	N/A
HVIN	RBwAPGR-5HacD2HnD-US
FVIN	V6.45.7
Serial Number	AEEA0A452D59/928/r2
Frequency Band	**For United states:** 802.11b/g/n-20MHz: 2412-2462MHz 802.11n-40MHz: 2422-2452MHz 802.11a/n-20MHz: 5180-5320MHz, 5500-5720MHz, 5725-5825MHz 802.11n-40MHz: 5190-5310MHz, 5510-5710MHz, 5755-5795MHz 802.11ac: 5210-5290MHz, 5530-5690MHz, 5775MHz **For Canada (5600-5650MHz blocked):** 802.11b/g/n-20MHz: 2412-2462MHz 802.11n-40MHz: 2422-2452MHz 802.11a/n-20MHz: 5180-5320MHz, 5500-5580MHz, 5660-5720MHz, 5725-5825MHz 802.11n-40MHz: 5190-5310MHz, 5510-5550MHz, 5630-5710MHz, 5755-5795MHz 802.11ac: 5210-5290MHz, 5530, 5690MHz, 5775MHz
Type of modulation	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM) 802.11a/n/ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Equipment Class/ Category	DTS, UNII
Maximum output power	See test result
Antenna Information	2 x Integral antenna, 2.5 dBi gain Directional Gain: WiFi1 & WiFi2 Antenna: 5.5 dBi
Clock Frequencies	N/A
Port/Connectors	DC In, PoE, Ethernet
Input Power	DC 10-57V
Power Adapter Manu/Model	FullPower / SAW30-240-0800U
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Simultaneous Transmission	N/A
Additional Info	EUT is DFS master device.

1.3 Test standard and method

Test standard	47 CFR §1.1307(b), 47 CFR §1.1310 RSS-102 Issue 5: March 2015
Test method	47 CFR §1.1307(b), 47 CFR §1.1310 RSS-102 Issue 5: March 2015

1.4 Test Purpose and statement

The purpose of this test report is intended to demonstrate the compliance of product listed in section 1.2, received from company listed in section 1.1, to the requirements of standard and method listed in section 1.3. Based on our test results, we conclude that the product tested complies with the requirements of the standards indicated.

2 Test site information

Lab performing tests	**Vista Laboratories, Inc.**
Lab Address	1261 Puerta Del Sol, San Clemente, CA 92673 USA
Phone Number	+1 (949) 393-1123
Website	www. Vista-compliance.com

3 Test summary and result

3.1 RF Exposure Evaluation – FCC MPE

RF Exposure Requirements: 47 CFR §1.1307(b)

RF Radiation Exposure Limits: 47 CFR §1.1310

RF Radiation Exposure Guidelines: FCC OST/OET Bulletin Number 65

EUT Frequency Band: 2400-2483.5MHz
5150-5350MHz
5470-5725MHz
5745-5850MHz

Limits for General Population/Uncontrolled Exposure in the band of: 300 - 1500 MHz,

Power Density Limit: f/1500 mW/cm2

Limits for General Population/Uncontrolled Exposure in the band of: 1500 - 100,000 MHz

Power Density Limit: 1 mW / cm^2

Equation: $S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

Where, S = Power Density

P = Power Input to Antenna

G = Antenna Gain

R = distance to the center of radiated antenna

This product is available in 4 different model options

- Wi-Fi only product
- wAP ac LTE Kit; FCC ID TV7R11ELTE
- wAP ac 4G Kit; FCC ID TV7R11E4G
- wAP ac LTE 6 Kit; FCC ID TV7R11ELTE6

1) <u>MPE calculation for Wi-Fi Radio only</u>

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (cm)	Power Density (mW/ cm^2)	MPE Limit (mW/ cm^2)
WLAN 11b/g	2412-2462	22.74	2.5	20	0.067	1
WLAN 11a/n/ac	5150-5250	19.49	2.5	20	0.031	1
WLAN 11a/n/ac	5350-5720	22.08	2.5	20	0.057	1
WLAN 11a/n/ac	5725-2825	22.08	2.5	20	0.057	1

The above results show that the device complies with the MPE requirement with separation distance of at least 20 cm.

2) MPE calculation for wAP ac LTE Kit; FCC ID TV7R11ELTE

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (cm)	Power Density (mW/ cm^2)	MPE Limit (mW/ cm^2)
WLAN 11b/g	2412-2462	22.74	2.5	20	0.067	1
WLAN 11a/n/ac	5150-5250	19.49	2.5	20	0.031	1
WLAN 11a/n/ac	5350-5720	22.08	2.5	20	0.057	1
WLAN 11a/n/ac	5725-2825	22.08	2.5	20	0.057	1
LTE Band 2	1850-1910	24.00	0.6	20	0.057	1

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.067/1 + 0.057/1= 0.124 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 20 cm.

3) MPE calculation for wAP ac 4G Kit; FCC ID TV7R11E4G

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (cm)	Power Density (mW/ cm^2)	MPE Limit (mW/ cm^2)
WLAN 11b/g	2412-2462	22.74	2.5	20	0.067	1
WLAN 11a/n/ac	5150-5250	19.49	2.5	20	0.031	1
WLAN 11a/n/ac	5350-5720	22.08	2.5	20	0.057	1
WLAN 11a/n/ac	5725-2825	22.08	2.5	20	0.057	1
LTE Band 41	2496-2690	24.26	1.16	20	0.069	1

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.067/1 + 0.069/1= 0.136 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 20 cm.

4) MPE calculation for wAP ac LTE 6 Kit; FCC ID TV7R11ELTE6

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (cm)	Power Density (mW/ cm^2)	MPE Limit (mW/ cm^2)
WLAN 11b/g	2412-2462	22.74	2.5	20	0.067	1
WLAN 11a/n/ac	5150-5250	19.49	2.5	20	0.031	1
WLAN 11a/n/ac	5350-5720	22.08	2.5	20	0.057	1
WLAN 11a/n/ac	5725-2825	22.08	2.5	20	0.057	1
LTE Band 12	699-716	24.00	5.0	20	0.158	0.466

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.067/1 + 0.158/0.466= 0.406 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 20 cm.

3.2 RF Exposure Evaluation – ISED

RF Exposure Requirements: RSS-102 Issue 5: March 2015

RF Radiation Exposure Limits: RSS-102 Issue 5: March 2015

RF Radiation Exposure Guidelines: RSS-102 Issue 5: March 2015

EUT Frequency Band: 2400-2483.5MHz
5150-5350MHz
5470-5725MHz
5745-5850MHz

Limits for General Population/Uncontrolled Exposure in the band of: **3**00 - 6,000 MHz

Exemption limit for Routine Evaluation: $0.02619\ f^{0.6834}$ W/ m2

This product is available in 4 different model options

- Wi-Fi only product
- wAP ac LTE Kit; FCC ID TV7R11ELTE
- wAP ac 4G Kit; FCC ID TV7R11E4G
- wAP ac LTE 6 Kit; FCC ID TV7R11ELTE6

1) MPE calculation for Wi-Fi Radio only

Radio	Frequency (MHz)	Max Average Conducted Output Power with tune up tolerance (dBm)	Antenna Gain (dBi)	Separation distance (m)	Power Density (W/ m^2)	MPE Limit (W/ m^2)
WLAN 11b/g	2412-2462	22.74	2.5	0.2	0.665	5.366
WLAN 11a/n/ac	5150-5250	19.49	2.5	0.2	0.315	9.011
WLAN 11a/n/ac	5350-5720	22.08	2.5	0.2	0.571	9.249
WLAN 11a/n/ac	5725-2825	22.08	2.5	0.2	0.571	9.687

The above results show that the device complies with the MPE requirement with separation distance of at least 0.2 m.

2) MPE calculatioin for wAP ac LTE Kit; FCC ID TV7R11ELTE

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (m)	Power Density (W/ m²)	MPE Limit (W/ m²)
WLAN 11b/g	2412-2462	22.74	2.5	0.2	0.665	5.366
WLAN 11a/n/ac	5150-5250	19.49	2.5	0.2	0.315	9.011
WLAN 11a/n/ac	5350-5720	22.08	2.5	0.2	0.571	9.249
WLAN 11a/n/ac	5725-2825	22.08	2.5	0.2	0.571	9.687
LTE Band 2	1850-1910	24.00	0.6	0.2	0.574	4.476

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.665/5.366 + 0.574/4.476= 0.235 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 0.2 m.

3) MPE calculatioin for wAP ac 4G Kit; FCC ID TV7R11E4G

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (m)	Power Density (W/ m²)	MPE Limit (W/ m²)
WLAN 11b/g	2412-2462	22.74	2.5	0.2	0.665	5.366
WLAN 11a/n/ac	5150-5250	19.49	2.5	0.2	0.315	9.011
WLAN 11a/n/ac	5350-5720	22.08	2.5	0.2	0.571	9.249
WLAN 11a/n/ac	5725-2825	22.08	2.5	0.2	0.571	9.687
LTE Band 41	2496-2690	24.26	1.16	0.2	0.693	5.493

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.665/5.366 + 0.693/5.493= 0.250 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 0.2 m.

4) MPE calculatioin for wAP ac LTE 6 Kit; FCC ID TV7R11ELTE6

Radio	Frequency (MHz)	Max Conducted Output Power (dBm)	Antenna Gain (dBi)	Separation distance (m)	Power Density (W/ m²)	MPE Limit (W/ m²)
WLAN 11b/g	2412-2462	22.74	2.5	0.2	0.665	5.366
WLAN 11a/n/ac	5150-5250	19.49	2.5	0.2	0.315	9.011
WLAN 11a/n/ac	5350-5720	22.08	2.5	0.2	0.571	9.249
WLAN 11a/n/ac	5725-2825	22.08	2.5	0.2	0.571	9.687
LTE Band 12	699-716	24.00	5.0	0.2	1.580	2.074

The Wi-Fi is able to transmit simultaneously with Cellular.

The ratio = 0.665/5.366 + 1.580/2.074= 0.886 < 1.0

The above results show that the device complies with the simultaneous transmission MPE requirement with separation distance of at least 0.2 m.