

FCC/ISED RF Exposure Evaluation



Test Report Number.....	MTK-19111321-LC-FCC-IC-MPE
Applicant.....	Mikrotiks 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

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Tested by:

Bruce Li/Test Engineer

Approved By:

David Zhang/Technical Manager

Report Number:	MTK-1911321-LC-FCC-IC-MPE
Product:	wAP R ac
Model Number:	RBwAPGR-5HacD2HnD-US



Laboratory Introduction

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REVISION HISTORY

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

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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.

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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.

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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

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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/cm ²
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) MPE calculation for Wi-Fi Radio only

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	5725-5825	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.

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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.

$$\text{The ratio} = 0.067/1 + 0.057/1 = 0.124 < 1.0$$

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.

$$\text{The ratio} = 0.067/1 + 0.069/1 = 0.136 < 1.0$$

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.

$$\text{The ratio} = 0.067/1 + 0.158/0.466 = 0.406 < 1.0$$

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



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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: 300 - 6,000 MHz

Exemption limit for Routine Evaluation: 0.02619 W/m^2

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	5725-5825	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.

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2) MPE calculation 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/ 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
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.

$$\text{The ratio} = 0.665/5.366 + 0.574/4.476 = 0.235 < 1.0$$

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 calculation 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/ 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
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.

$$\text{The ratio} = 0.665/5.366 + 0.693/5.493 = 0.250 < 1.0$$

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 calculation 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/ 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
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.

$$\text{The ratio} = 0.665/5.366 + 1.580/2.074 = 0.886 < 1.0$$

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