NVLAP®
Testing
NVLAP Lab Code 200087-0

ROGERS LABS, INC.

4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

Class 2 Permissive Change Application Report

For

Model: RBLtAP-2HnD

FCC ID: TV7LTAP2HND
IC: 7442A-LTAP2HND

FOR

Mikrotikls SIA

Brivibas gatve 214i
Riga, Latvia LV-1039

FCC Designation: US5305
IC Test Site Registration: 3041A-1
Test Report Number: 190514

Test Date: May 14, 2019

Authorized Signatory: Scot D Rogers

Scot D. Rogers
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Table of Contents

Revisions

Revision 1 Issued August 13, 2019

Foreword

The following information is submitted for consideration in processing Class 2 Permissive Change (C2PC) of authorized equipment. The product model: RBLtAP-2HnD, was granted an authorization (FCC ID: TV7LTAP2HND Issued 2/20/2019, and IC: 7442A-R11ELT6L) operating as digital Transmission System under 47CFR 15C in the 2412-2462 MHz frequency band. The original Grant prohibited collocation use with other transceivers. This report presents documentation supporting the use of this product in a configuration including another transceiver module (FCC ID: TV7R11ELT6L and IC:7442A-R11ELT6L).

Name of Applicant: Mikrotikls SIA
Brivibas gatve 214i
Riga, Latvia LV-1039

Model: RBLtAP-2HnD&R11e-LTE6
FCC ID: TV7LTAP2HND

Opinion / Interpretation of Results

Test Performed per 47CFR	Minimum Margin (dB)	Results
Radiated Emissions	-8.4	Complies

Equipment Tested

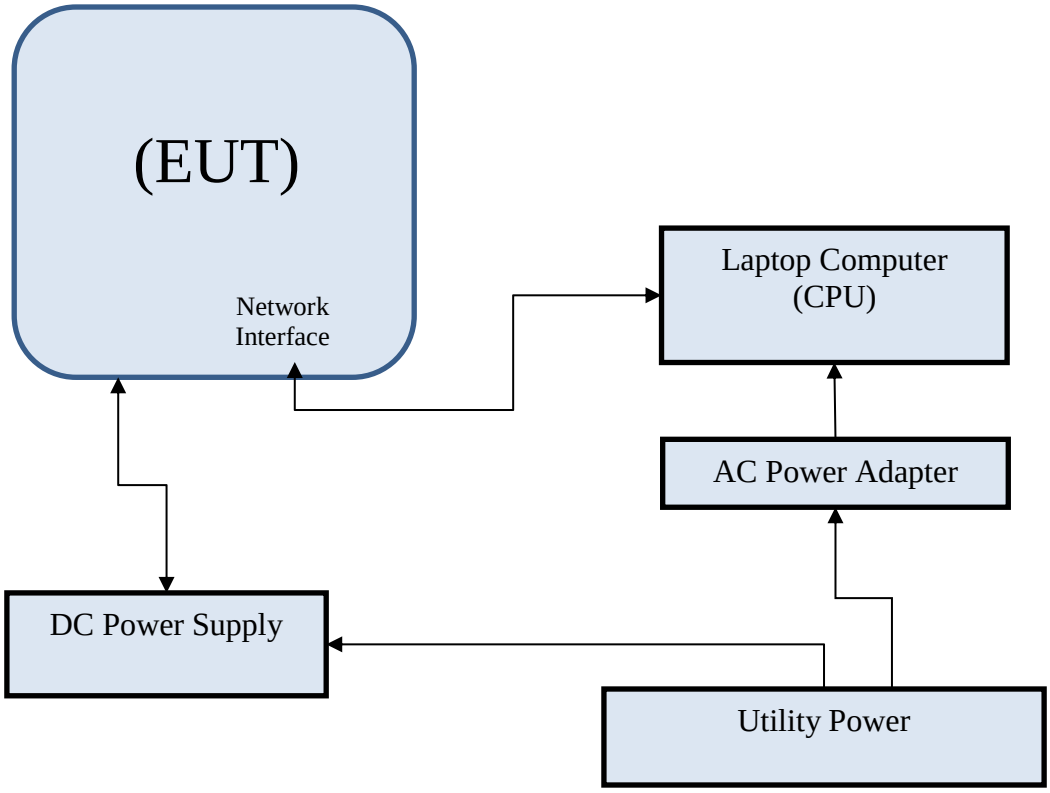
Equipment	Model / PN	FCC Identifier	IC Identifier
EUT	RBLtAP-2HnD	TV7LTAP2HND	7442A-LTAP2HND
Module	LHG LTE6 Kit	TV7R11ELT6L	7442A-R11ELT6L
AC Supply	SAW30-240-1200U R2A		
Dell Latitude	E6520		

Test results in this report relate only to the items tested

Equipment Function and Configuration

The EUT is a Digital Transmission System providing communications and network routing between computers and other digital equipment. The design provides input power ports, USB port, RJ45 network port, RS-232 interface and three SIM ports and incorporates an authorized module. The EUT tested was authorized under FCC ID: TV7LTAP2HND and incorporated the certified wireless transceiver module FCC ID:TV7R11ELTE6. The design provides no other interfacing options than those presented in this report. For testing purposes, the RBLtAP-2HnD&R11e-LTE6 test sample was configured as directed by the manufacturer with all transmitters active and communicating with the laptop computer during testing. As requested by the manufacturer the equipment was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

Equipment Configuration



Applicable Standards & Test Procedures

In accordance with the 47CFR, dated May 14, 2019, Part 2, Subpart J, Paragraph 2.932 and applicable parts of paragraph 15C the following information is submitted for process request to update the current Grant note restricting co-located transmitter.

Test Site Locations

Conducted EMI	AC line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259th Terrace, Louisburg, KS
Radiated EMI	The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 West 259th Terrace, Louisburg, KS
Registered Site information:	FCC Site: US5305 and ISED: 3041A, CAB Identifier: US0096
NVLAP Accreditation	Lab code 200087-0

Units of Measurements

Conducted EMI	Data is in dBµV; dB referenced to one microvolt
Radiated EMI	Data is in dBµV/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured
A.F. = Receive antenna factor, Gain = amplification gains and/or cable losses
RFS (dBµV/m @ 3m) = FSM (dBµV) + A.F. (dB) - Gain (dB)

Environmental Conditions

Ambient Temperature	24.2° C
Relative Humidity	46%
Atmospheric Pressure	1015.1 mb

List of Test Equipment

Equipment	Manufacturer	Model (SN)	Band	Cal Date(m/d/y)	Due
☒ LISN	FCC	FCC-LISN-50-25-10(1PA) (160611)	.15-30MHz	4/18/2019	4/18/2020
☒ LISN	Compliance Design	FCC-LISN-2.Mod.cd,(126)	.15-30MHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(303073)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303069)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303071)	9kHz-40 GHz	10/16/2018	10/16/2019
☒ Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	10/16/2018	10/16/2019
☒ Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	10/16/2018	10/16/2019
☐ Antenna	ARA	BCD-235-B (169)	20-350MHz	10/16/2018	10/16/2019
☐ Antenna	EMCO	3147 (40582)	200-1000MHz	10/16/2018	10/16/2019
☒ Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	5/2/2018	5/2/2020
☐ Antenna	Com Power	AH-118 (10110)	1-18 GHz	10/16/2018	10/24/2019
☒ Antenna	Com Power	AH-840 (101046)	18-40 GHz	4/18/2019	4/18/2021
☒ Antenna	Com Power	AL-130 (121055)	.001-30 MHz	10/16/2018	10/16/2019
☒ Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	10/16/2018	10/16/2019
☒ Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	4/18/2019	4/18/2020
☒ Analyzer	Rohde & Schwarz	ESW44 (101534)	20Hz-44GHz	1/31/2019	1/31/2020
☐ Analyzer	Rohde & Schwarz	FS-Z60, 90, 140, and 220	40GHz-220GHz	12/22/2017	12/22/2019
☒ Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	10/16/2018	10/16/2019
☒ Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	10/16/2018	10/16/2019
☒ Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	10/16/2018	10/16/2019
☒ Amplifier	Com-Power	PAM-840A (461328)	18-40 GHz	10/16/2018	10/16/2019
☐ Power Meter	Agilent	N1911A with N1921A	0.05-40 GHz	4/18/2019	4/18/2020
☐ Generator	Rohde & Schwarz	SMB100A6 (100150)	20Hz-6 GHz	4/18/2019	4/18/2020
☐ Generator	Rohde & Schwarz	SMBV100A6 (260771)	20Hz-6 GHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	BRC50722 (009).9G notch	30-1800 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	HPM50114 (017)1.5G HPF	30-18000 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	HPM50117 (063) 3G HPF	30-18000 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	HPM50105 (059) 6G HPF	30-18000 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	BRM50702 (172) 2G notch	30-1800 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	BRC50703 (G102) 5G notch	30-1800 MHz	4/18/2019	4/18/2020
☐ RF Filter	Micro-Tronics	BRC50705 (024) 5G notch	30-1800 MHz	4/18/2019	4/18/2020
☐ Attenuator	Fairview	SA6NFNF100W-14 (1625)	30-1800 MHz	4/18/2019	4/18/2020
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1436)	30-6000 MHz	4/18/2019	4/18/2020
☐ Attenuator	Mini-Circuits	VAT-3W2+ (1445)	30-6000 MHz	4/18/2019	4/18/2020
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1438)	30-6000 MHz	4/18/2019	4/18/2020
☐ Attenuator	Mini-Circuits	VAT-6W2+ (1736)	30-6000 MHz	4/18/2019	4/18/2020
☒ Weather station	Davis	6312 (A81120N075)		10/26/2018	10/26/2019

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with the CFR47 Parts 2, 15C, 22, 24, and 27 requirements. There were no deviations to the specifications.

Radiated EMI Testing Procedure

The EUT was arranged in the test configuration emulating worst-case equipment configuration and operated through available modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Investigations were performed to identify the frequencies, which produced the highest radiated emissions. Radiated emission investigations were performed from 9 kHz to 25,000 MHz with the EUT oriented in the manufacturer defined orientation. Frequencies of interest were recorded for use during testing on the OATS. Each investigated emission was then maximized at the OATS site before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open area test site at a distance of 3 meters between the EUT and the receiving antenna. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna polarization between horizontal and vertical. Antennas used were Loop from 0.009 to 30 MHz, Broadband Biconical from 30 MHz to 200 MHz, Log Periodic from 200 MHz to 1 GHz, and/or Biconilog from 30 MHz to 1000 MHz, and above 1 GHz, Double Ridge or Pyramidal Horns, notch filters and appropriate amplifiers and mixers were utilized.

Table 1 Radiated Emissions Data (worst-case)

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
72.9	34.5	29.8	N/A	33.5	29.5	N/A	40.0
76.2	34.6	29.7	N/A	36.8	29.6	N/A	40.0
125.0	35.8	31.6	N/A	34.0	30.9	N/A	40.0
156.6	36.0	30.7	N/A	33.3	28.9	N/A	40.0
166.3	36.6	31.5	N/A	35.5	30.1	N/A	40.0
172.7	32.3	27.4	N/A	31.8	25.9	N/A	40.0
178.0	33.5	27.5	N/A	30.8	24.1	N/A	40.0

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

Summary of Results for Radiated Emissions

The EUT demonstrated compliance with the radiated emissions The EUT demonstrated a minimum margin of -8.4 dB below general unintentional radiator equipment radiated emissions requirements. There are no other significantly measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the requirements.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Rogers Labs Test Equipment List
- Annex C Rogers Qualifications
- Annex D Laboratory Certificate of Accreditation

Annex A Measurement Uncertainty Calculations

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

Measurement	Expanded Measurement Uncertainty $U_{(lab)}$
3 Meter Horizontal 0.009-1000 MHz Measurements	4.16
3 Meter Vertical 0.009-1000 MHz Measurements	4.33
3 Meter Measurements 1-18 GHz	5.14
3 Meter Measurements 18-40 GHz	5.16
10 Meter Horizontal Measurements 0.009-1000 MHz	4.15
10 Meter Vertical Measurements 0.009-1000 MHz	4.32
AC Line Conducted	1.75
Antenna Port Conducted power	1.17
Frequency Stability	1.00E-11
Temperature	1.6˚C
Humidity	3%

Annex B Additional Test Equipment List

List of Test Equipment	Calibration Date (m/d/y)	Due
Antenna: Schwarzbeck Model: BBA 9106/VHBB 9124 (9124-627)	4/18/2019	4/18/2020
Antenna: Schwarzbeck Model: VULP 9118 A (VULP 9118 A-534)	4/18/2019	4/18/2020
Antenna: EMCO 6509	10/16/2018	10/16/2020
Antenna: EMCO 3143 (9607-1277) 20-1200 MHz	4/18/2019	4/18/2020
Antenna: EMCO Dipole Set 3121C	2/22/2019	2/22/2020
Antenna: C.D. B-101	2/22/2019	2/22/2020
Antenna: Solar 9229-1 & 9230-1	2/22/2019	2/22/2020
Cable: Belden 8268 (L3)	10/16/2018	10/16/2019
Cable: Time Microwave: 4M-750HF290-750	10/16/2018	10/16/2019
Frequency Counter: Leader LDC-825 (8060153	4/18/2019	4/18/2020
Oscilloscope Scope: Tektronix 2230	2/22/2019	2/22/2020
Wattmeter: Bird 43 with Load Bird 8085	2/22/2019	2/22/2020
R.F. Generators: HP 606A, HP 8614A, HP 8640B	2/22/2019	2/22/2020
R.F. Power Amp 65W Model: 470-A-1010	2/22/2019	2/22/2020
R.F. Power Amp 50W M185- 10-501	2/22/2019	2/22/2020
R.F. Power Amp A.R. Model: 10W 1010M7	2/22/2019	2/22/2020
R.F. Power Amp EIN Model: A301	2/22/2019	2/22/2020
LISN: Compliance Eng. Model 240/20	4/18/2019	4/18/2020
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08	4/18/2019	4/18/2020
Audio Oscillator: H.P. 201CD	2/22/2019	2/22/2020
ESD Test Set 2010i	2/22/2019	2/22/2020
Oscilloscope Scope: Tektronix MDO 4104	2/22/2019	2/22/2020
EMC Transient Generator HVT TR 3000	2/22/2019	2/22/2020
AC Power Source (Ametech, California Instruments)	2/22/2019	2/22/2020
Fast Transient Burst Generator Model: EFT/B-101	2/22/2019	2/22/2020
Field Intensity Meter: EFM-018	2/22/2019	2/22/2020
KEYTEK Ecat Surge Generator	2/22/2019	2/22/2020
ESD Simulator: MZ-15	2/22/2019	2/22/2020
Shielded Room not required		

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 35 years' experience in the field of electronics. Work experience includes six years working in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

Positions Held:

Systems Engineer:	A/C Controls Mfg. Co., Inc.	6 Years
Electrical Engineer:	Rogers Consulting Labs, Inc.	5 Years
Electrical Engineer:	Rogers Labs, Inc.	Current

Educational Background:

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University

2) Bachelor of Science Degree in Business Administration Kansas State University

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Annex D Laboratory Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200087-0

Rogers Labs, Inc.
Louisburg, KS

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2019-03-27 through 2020-03-31
Effective Dates

For the National Voluntary Laboratory Accreditation Program