Radio Frequency Exposure Evaluation Report

FOR:
ITRON NETWORKED SOLUTIONS, INC.

Model Name:
NIC 511-NA1-0312

Product Description:
The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously

FCC ID: OWS-NIC511-LTE
IC ID: 5975A-NIC511LTE

Per:
CFR Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_ITRO1_049_21001_FCC_ISED_MPE_ATT_Rev3

DATE: 11/10/2021

***CETECOM* Inc.**
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1 Assessment

This RF Exposure evaluation report, provides evidence for compliance of the below identified device, with the RF Exposure limits for mobile devices, as defined in FCC CFR Part1 (1.1307 &1.1310), Part 2 (2.1091), and IC standard ISED RSS-102 Issue 5, under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body. Multiple transmitter information as presented by the applicant).
In addition, maximum antenna gain, or minimum distance towards the human body calculated respectively where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company	Description	Model Name
ITRON NETWORKED SOLUTIONS, INC.	The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously	NIC 511-NA1-0312

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
11/10/2021	Compliance	Wang, Kevin (Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2021.11.10 12:57:23 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
11/10/2021	Compliance	Issa Ghanma (EMC Engineer)	Digitally signed by: Issa W Ghanma DN: CN = Issa W Ghanma email = issa.ghanma@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.11.10 12:24:17 -08'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	Wang, Kevin
Responsible Project Leader:	Saman, Rami

2.2 Identification of the Client / Manufacturer

Applicant's Name:	ITRON NETWORKED SOLUTIONS, INC.
Street Address:	230 W Tasman Avenue
City/Zip Code	San Jose, CA 95134
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	----------
City/Zip Code	----------
Country	----------

3 Equipment under Assessment

Model No:	NIC 511-NA1-0312
HW Version :	09
SW Version :	5.2.0
Product Description:	The MicroAP 5 is a unique product with cellular connectivity that supports both cellular and RF Mesh communications simultaneously.
Power Supply/ Rated Operating Voltage Range:	❖ Streetlight controller (Luminator): 102V (Low) / 277V (Max) AC ❖ Luminator output to EUT: 3.6 (Low) / 4.4 (Max) DC
Integrated Module Info:	❖ 900 MHz Mesh: • FCC / IC ID : OWS-NIC511-LTE / 5975A-NIC511LTE ❖ Cellular Module: • Name / Number : Telit / LE910-NA1 • FCC / IC ID : RI7LE910NAV2 / 5131A-LE910NAV2
Regulatory Band:	❖ 900 MHz Mesh: • FHSS: o Nominal band: 902.3 – 926.9 MHz o Center to center: 902.3 MHz (ch0) – 926.9 MHz (ch82), 83 Channels • DTS: o Nominal band: 903.2 – 926 MHz o Center to center: 903.2 MHz (ch0) – 926 MHz (ch19), 20 Channels ❖ Cellular Module: • 4G Band(s) : B 2, B 4, B 5, B 12, B 13
Maximum declared Output Power (dBm):	❖ Cellular: • 4G Band(s) B 2, B 4, B 5, B 12, B 13: 24 dBm ❖ Mesh Radio: • FHSS: +27 dBm with 155-0199-00 antenna • DTS: +27 dBm with 155-0199-00 antenna
Sample Revision:	☐ Prototype Unit; ■ Production Unit; ☐ Pre-Production

Antenna	Pattern	Operating frequency	Radio Technology	Peak Gain (dBi)
Itron Part Number: 155-0199-00 World Product Part Number: WPANT10311-C1D	Omni-Directional	698 – 894 MHz 1710 – 2690 MHz	LTE 2	-7.08
			LTE 4	-12.39
			LTE 5	-5.94
			LTE 12	-0.12
			LTE 13	-6.04
		902 – 928 MHz	900 MHz Mesh	-4.4

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e)/ RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) $^{0.6834}$	6

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC

$$P_{th}(\text{mW}) = ERP_{20\,cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

IC

300MHz < = operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz) $^{0.6834}$ W

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source, based average output power, and peak antenna gain, or the ERP/EIRP of the specified device, and for a known minimum distance of its radiating structures from the body of persons. According to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (cm or m)

5 Evaluation

5.1 Analysis to Exclude Routine RF Exposure evaluation for Stand Alone Operation

Band	Lowest frequency [MHz]	Max.Power [W]	EIRP [W]	ISED EIRP limit [W]	Max.Power [dBm]	EIRP [dBm]	FCC EIRP limit [dBm]	Verdict
LTE 2	1850.0	0.25	0.05	2.24	24.0	16.92	37.01	Complies
LTE 4	1710.0	0.25	0.01	2.12	24.0	11.61	37.01	Complies
LTE 5	824.0	0.25	0.06	1.29	24.0	18.06	34.41	Complies
LTE 12	699.7	0.25	0.24	1.15	24.0	23.88	33.70	Complies
LTE 13	777.0	0.25	0.06	1.24	24.0	17.96	34.15	Complies
900 MHz Mesh FHSS	902.3	0.50	0.18	1.37	27.0	22.60	34.80	Complies
900 MHz Mesh DTS	903.2	0.50	0.18	1.37	27.0	22.60	34.80	Complies

The single radios are exempt from routine environmental evaluation.

5.2 Analysis to Exclude Routine RF Exposure evaluation for Stand Alone Operation

- Calculation made for 20cm.
- Evaluations are based on EIRP measured or calculated from known gain and conducted output power, adding tune up tolerance.
- Cellular can transmit simultaneously with 900 MHz Mesh FHSS or DTS.

Band	Lowest frequency [MHz]	EIRP [W]	Actual [W/m2] @20cm	ISED [W/m2]	How much of ISED limit is used up	FCC [W/m2]	How much of FCC limit is used up
LTE 2	1850.0	0.05	0.10	4.48	2.19%	10.00	0.98%
LTE 4	1710.0	0.01	0.03	4.24	0.68%	10.00	0.29%
LTE 5	824.0	0.06	0.13	2.58	4.94%	5.49	2.32%
LTE 12	699.7	0.24	0.49	2.30	21.10%	4.66	10.42%
LTE 13	777.0	0.06	0.12	2.47	5.03%	5.18	2.40%
900 MHz Mesh FHSS	902.3	0.18	0.36	2.74	13.21%	6.02	6.02%
900 MHz Mesh DTS	903.2	0.18	0.36	2.74	13.20%	6.02	6.01%

Conclusion:

- **The worst-case simultaneous transmission is LTE Band 12 simultaneous with the 900 MHz Mesh FHSS, which is using 34.31% of ISED limit of 100% and 16.44% of FCC limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.**

6 Revision History

Date	Report Name	Changes to report	Report prepared by
10/8/2021	EMC_ITRO1_049_21001_FCC_ISED_MPE_ATT	Initial Version	Issa Ghanma
10/26/2021	EMC_ITRO1_049_21001_FCC_ISED_MPE_ATT_Rev1	• Section 4.2: Update the FCC limit according to FCC 2.1091(c) • Section 5.1: Update the FCC EIRP limit values according to FCC 2.1091(c)	Issa Ghanma
11/5/2021	EMC_ITRO1_049_21001_FCC_ISED_MPE_ATT_Rev2	• Section 3: o Correction to the cellular module information. o Update the Mesh radio maximum conducted output power with the measured values. o Correction to the cellular antenna gain values. • Section 5.1: o Update the EIRP accounting for the corrected antenna gains. o Update the Mesh radio max.Power with the measured output power, and the EIRP accordingly. • Section 5.2: o Update the EIRP accounting for the corrected antenna gains, and Actual W/m^2, limit usage accordingly. o Update the Mesh radio EIRP accounting for the measured output power, and Actual W/m^2, limit usage accordingly. o Conclusion: Update the total usage of the limit of 100%	Issa Ghanma

11/10/2021	EMC_ITRO1_049_21001_FCC_ISED_MPE_ATT_Rev3	• Section 3: o Replace the measured conducted output power with the declared output power. • Section 5.1: o Update the EIRP accounting for the declared output power. • Section 5.2: o Update the EIRP accounting for the declared output power, and Actual W/m^2, limit usage accordingly. o Add FCC limit usage column. • Conclusion: Update the total usage of the limit of 100%	Issa Ghanma

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