



MPE Report For On-Ramp Wireless eNode

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IC: 8655A- ULPENODE100

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Register of revisions

Revision	Date	Description of Revisions
1	March 9, 2010	Initial release
2	May 10, 2010	Added chapter 4 RSS-102 Issue 4, RF Exposure evaluation

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1.0 INTRODUCTION

1.1 PURPOSE

This Maximum Permissible Exposure report demonstrates compliance with FCC CFR 47 1.1310, 2.1091 and RSS-102 Issue 4, RF Exposure evaluation for Model ULPN100 which is categorized as “mobile”.

The mobile classification applies when 20 cm or greater separation distance is maintained between the end user and all transmission antennas.

The user documentation available to consumers indicates that the Module and antenna must not be used closer than 20 cm to head or body.

1.2 ANTENNA SPECIFICATIONS

The Model ULPN100 has the following antenna gain specifications:

- 5dBi Antenna NEARSON Part # S151FL-L-RMM-2450S
- 2dBi Antenna NEARSON Part # S181FL-L-RMM- 2450S
- 1dBi Antenna Hyperlink Technologies Part # HG2401RD-MMCX

2.0 RF EXPOSURE LIMITS AND EQUATIONS

In compliance with FCC CFR 47 1.1310, the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1303 (b).

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mw/cm ²)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures (f=frequency)				
30-300	61.4	0.2	1.0	6.0
300-1500	-	-	f/300	6.0
1500-100,000	-	-	5.0	6.0
(B) Limits for General Population/Uncontrolled Exposure (f=frequency)				
30-300	27.5	0.1	0.2	30.0
300-1500	-	-	f/1500	30.0
1500-100,000	-	-	1.0	30.0

Friis Transmission Formula:

$$Pd = (Pout * G) / (4\pi R^2)$$

Where,

Pd = power density (mW/cm²)

Pout = output power to antenna (mW)

G = gain of antenna in linear scale

R = distance between observation point and center of the radiator (cm)

The resulted power density at a distance of 20cm can be calculated as follows:

$$\text{Power Density} = (\text{EIRP} * \text{Duty cycle}) / (4\pi R^2)$$

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3.0 MPE FIGURE

For the purposes of this report worst case MPE value is provided for highest gain antenna

3.1 OPERATING MODE: 2.4 GHZ

Maximum EIRP = Conducted power + Antenna gain = 18.60 + 5.0 = 23.60 dBm or 229 mW

Worst Case = 100% duty cycle

S (power density) = $(\text{EIRP} * \text{Duty Cycle}) / (4\pi R^2) = (229 \text{ mW} * 1.0) / (4\pi * 20^2) = 0.0456 \text{ mW/cm}^2$

S (power density) = 0.00456 W/m²

Duty cycle corrected maximum EIRP mW	RF Exposure @ d= 20 cm mW/cm ²	Limit mW/cm ²
229	0.0456	1.00

Result

Compliant.

Note: For the purposes of this report worst case MPE value is provided for highest gain antenna

4.0 RSS-102 ISSUE 4, RF EXPOSURE EVALUATION

2.5.1 Exemption from Routine Evaluation Limits – SAR Evaluation

The chapter 4.3 (Page 8) of eNode User Manual defines the distance as;

This device must be installed to ensure a separation distance of at least 20cm (8 inches) from the antenna to a person.

2.5.2 Exemption from Routine Evaluation Limits – RF Exposure Evaluation

The peak power output of the device is 18.60 dBm at 2440 MHz

The maximum antenna gain is 5 dBi

The calculated maximum radiated e.i.r.p. is 23.60 dBm (0.229 W) which is less than 5 W

Therefore the unit is exempt from RSS-102 Issue 4, routine evaluation limits

END OF DOCUMENT

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