

Universal Notebook Data Platform (UNDP) MPE Evaluation Report

FCC Part 22 & 24 Certification	
FCC ID:	J9CUNDP-1
Model:	UNDP-1

STATEMENT OF CERTIFICATION

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

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In this application we seek modular approval to the UNDP-1 wireless modem for use in mobile configuration. Based on the FCC CFR 47 §1.1310, 2.1091, we have concluded that the UNDP-1 will comply with the FCC rules on RF exposure for mobile devices if the antenna again does not exceed 4 dBi in cellular and 3.5 dBi in PCS. The following analysis will demonstrate such compliance. The analysis will be done in both cellular and PCS bands which operates in North America.

RF Exposure Limit

According to FCC CFR 47 §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(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	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

Friis Transmission Formula

Friis transmission formula:

$$P_d = (P_{out} * G) / (4\pi R^2)$$

Where,

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna in linear scale

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

UNDP-1 Operating in Cellular Band (824 - 849 MHz)

The highest peak conducted output power of UNDP-1 measured in cellular band is 32.98 dBm while the UNPD-1 operates in GSM/GPRS mode. Take the worst case as an example, in which an antenna with 4dBi gain is used. The resulted power density at a distance of 20cm can be calculated as follows:

$$\text{EIRP} = 32.98 + 4 = 36.98 \text{ dBm} = 4988.8 \text{ mW}$$

$$\begin{aligned} \text{Power Density} &= (\text{EIRP} * \text{DutyCycle}) / (4\pi R^2) \\ &= 4988.8 * 0.5 / (4 * \pi * 20^2) \\ &= 0.496 \text{ mW/cm}^2 \end{aligned}$$

Where DutyCycle is 0.5 for GPRS multislots class 12 operation supporting 4 uplink transmission time slots (the worst case) and R is 20cm.

The MPE limit for General Population/Uncontrolled Exposure is shown in the table above and can be derived as follows:

$$\text{MPE limit} = 824/1500 = 0.55 \text{ mW/cm}^2$$

As per the above analysis, the resulted power density is below the MPE limit. Therefore the UNDP-1 in cellular band is compliant with the FCC rules on RF exposure.

UNDP-1 Operating in PCS Band (1850 - 1910 MHz)

The highest peak conducted output power of UNDP-1 measured in PCS is 29.41 dBm. In the worst case, where an antenna gain is 3.5dBi, the resulted ERP can be expressed as follows:

$$\text{ERP} = 29.41 + 3.5 - 2.15 = 30.76 \text{ dBm} (1.19\text{W}) < 3 \text{ W}$$

This ERP value does not include a reduction in power due to the GPRS duty cycle of 0.5, and therefore represents a conservative peak power rather than the average power.

In FCC CFR 47 §2.1091, it states that mobile devices identified in the section §2.1091(c) that operate at frequencies above 1.5 GHz with an ERP of 3 watts or more are required to perform routine environmental evaluation for RF exposure prior to equipment authorization or use; otherwise, they are categorically excluded.

Therefore, as we can see this resulted ERP is below 3W, the routine environmental evaluation for RF exposure prior to equipment authorization or use for UNDP-1 in PCS band is categorically excluded.

In summary, the following table lists the calculated power density for each technology that UNDP-1 supports. As have been stated above, the worse case is in cellular band while operating in GPRS mode.

Technology	Band	Frequency (MHz)	Duty Cycle	Measured Max Conducted Power (dBm)	Antenna Gain (dBi)	Peak EIRP		Average EIRP Adjusted For Duty Cycle		Distance (cm)	Resulted Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)			
GPRS Class 12	Cell	824	0.5	32.98	4.00	36.98	4.99	33.97	2.49	20.00	0.496	0.549
GPRS Class 12	PCS	1850	0.5	29.41	3.50	32.91	1.95	29.90	0.98	20.00	0.194	1.000
CDMA2000	Cell	824	1.00	24.92	4.00	28.92	0.78	28.92	0.78	20.00	0.155	0.549
CDMA2000	PCS	1850	1.00	24.61	3.50	28.11	0.65	28.11	0.65	20.00	0.129	1.000
UMTS	Cell	824	1.00	24.42	4.00	28.42	0.70	28.42	0.70	20.00	0.138	0.549
UMTS	PCS	1850	1.00	24.57	3.50	28.07	0.64	28.07	0.64	20.00	0.128	1.000

Conclusion

The UNDP-1 meets the mobile 20 cm separation distance as specified in Section 2.1091 of the FCC rules. An appropriate RF exposure compliance statement will be placed in the User’s Guide.