



## Evaluation of RF Exposure

Date: 9/27/2013  
FCC ID: OWS-NIC411-3C

Part Number: 174-0408-00  
Description: NIC 411-3C-0509  
Frequency: 902 - 928 MHz FHSS, 2400-2483.5 FHSS, CDMA-2000/EV-DO

	900 MHz	2400 MHz	BC0 (850)	BC1 (1900)	
Max RF Power	30		27	24.5	24.5 dBm
Source Based Time Average Correction	-20		-20	-12	-12 dB
Tx Antenna	1.2		5.6	-1.2	-1.9 dBi
EIRP	11.2		12.6	11.3	10.6 dBm
EIRP	13.18256739	18.19700859		13.48962883	11.48153621 mW
EIRP	0.013182567	0.018197009		0.013489629	0.011481536 W
MPE dist			3.1		cm

Equation 1 - 
$$S = \frac{EIRP}{4\pi R^2}$$

Equation 2 - 
$$R = \sqrt{\frac{EIRP}{4\pi S}}$$

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Appendix A: FCC Exposure Criteria, FCC Limits for Maximum Permissible Exposure (MPE)

Radio	F(MHz)	Actual F, MHz	Limit		Calculated			
			$S_{max, occupational}$	$S_{max, general public}$	$S, mW/cm^2$	$S, mW/cm^2$	$R_{min, occupational}$	$R_{min, general public}$
			Controlled, Ave 6 min	Uncontrolled, Ave 30 min	@ 20cm dist	@ 3.1 cm dist	cm	cm
	0.3-1.34*	--	100	100	--	--	--	--
	1.34-30	--	900/f <sup>2</sup>	180/f <sup>2</sup>	--	--	--	--
	30-300	--	1	0.2	--	--	--	--
900FHSS	300-1500	902	3.006666667	0.601333333	0.002622588	0.10916081	0.590680218	1.320801121
BC0 (850)	300-1500	815.04	2.7168	0.54336	0.002683676	0.111703492	0.628588214	1.405565976
2400FHSS	1500-100,000	2400.8	5	1	0.00362018	0.150683864	0.538158329	1.203358605
BC1 (1900)	1500-100,000	1850	5	1	0.002284179	0.095075091	0.427474355	0.955861717

\* upper frequency range is 3 MHz for occupational limit

**NOTE:** For mobile or fixed location transmitters, minimum separation distance for FCC compliance is 20 cm, even if calculations indicate MPE distance is less

% 900 MHz RFx	18.15%
% BC0 (850) RFx	20.56%
% 2.4 GHz RFx	15.07%
Total RFx	53.78%

% 900 MHz RFx	18.15%
% BC1 (1900) RFx	9.51%
% 2.4 GHz RFx	15.07%
Total RFx	42.73%



## Evaluation of RF Exposure

Date: 9/27/2013  
FCC ID: OWS-NIC411-3C

Part Number:  
Description: NIC 411-3G-0512  
Frequency: 902 - 928 MHz FHSS, 2400-2483.5 FHSS, CDMA-2000/EV-DO

	900 MHz	2400 MHz	BC0 (850)	BC1 (1900)	
Max RF Power	30		27	24.5	24.5 dBm
Tx Antenna	3		4	3.9	2.5 dBi
Source Based Time Average Co	-20		-20	-12	-12 dB
EIRP	13		11	16.4	15 dBm
EIRP	19.95262315	12.58925412		43.65158322	31.6227766 mW
EIRP	0.019952623	0.012589254		0.043651583	0.031622777 W
MPE dist			4.8		cm

Equation 1 - 
$$S = \frac{EIRP}{4\pi R^2}$$

Equation 2 - 
$$R = \sqrt{\frac{EIRP}{4\pi S}}$$

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			$S_{max, occupational}$	$S_{max, general public}$	$S, mW/cm^2$	$S, mW/cm^2$	$R_{min, occupational}$	$R_{min, general public}$
			Controlled, Ave 6 min	Uncontrolled, Ave 30 min	@ 20cm dist	@ 4.8 cm dist		
			mW/cm <sup>2</sup>	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>		cm	cm
	0.3-1.34*	--	100	100	--		--	--
	1.34-30	--	900/f <sup>2</sup>	180/f <sup>2</sup>	--		--	--
	30-300	--	1	0.2	--		--	--
900FHSS	300-1500	902	3.006666667	0.601333333	0.003969448	0.068914032	0.726695426	1.624940371
BC0 (850)	300-1500	815.04	2.7168	0.54336	0.008684207	0.150767475	1.130749056	2.528431754
2400FHSS	1500-100,000	2400.8	5	1	0.002504553	0.043481815	0.447620601	1.000910092
BC1 (1900)	1500-100,000	1850	5	1	0.006291152	0.10922138	0.709430843	1.58633559

\* upper frequency range is 3 MHz for occupational limit

**NOTE: For mobile or fixed location transmitters, minimum separation distance for FCC compliance is 20 cm, even if calculations indicate MPE distance is less**

% 900 MHz RFx	11.46%
% BC0 (850) RFx	27.75%
% 2.4 GHz RFx	4.35%
Total RFx	43.56%

% 900 MHz RFx	11.46%
% BC1 (1900) RFx	10.92%
% 2.4 GHz RFx	4.35%
Total RFx	26.73%



## Evaluation of RF Exposure

Date: 9/27/2013  
FCC ID: OWS-NIC411-3C

Part Number:  
Description: NIC 411-3G-0511  
Frequency: 902 - 928 MHz FHSS, 2400-2483.5 FHSS, CDMA-2000/EV-DO

	900 MHz	2400 MHz	BC0 (850)	BC1 (1900)	
Max RF Power	30		27	24.5	24.5 dBm
Tx Antenna	1.2		5.6	3.9	2.5 dBi
Source Based Time Average Co	-20		-20	-12	-12 dB
EIRP	11.2		12.6	16.4	15 dBm
EIRP	13.18256739	18.19700859		43.65158322	31.6227766 mW
EIRP	0.013182567	0.018197009		0.043651583	0.031622777 W
MPE dist			4.8		cm

Equation 1 - 
$$S = \frac{EIRP}{4\pi R^2}$$

Equation 2 - 
$$R = \sqrt{\frac{EIRP}{4\pi S}}$$

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Radio	F(MHz)	Actual F, MHz	Limit		Calculated			
			$S_{max, occupational}$	$S_{max, general public}$	$S, mW/cm^2$	$S, mW/cm^2$	$R_{min, occupational}$	$R_{min, general public}$
			Controlled, Ave 6 min	Uncontrolled, Ave 30 min	@ 20cm dist	@ 4.8 cm dist		
			mW/cm <sup>2</sup>	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>		cm	cm
	0.3-1.34*	--	100	100	--		--	--
	1.34-30	--	900/f <sup>2</sup>	180/f <sup>2</sup>	--		--	--
	30-300	--	1	0.2	--		--	--
900FHSS	300-1500	902	3.006666667	0.601333333	0.002622588	0.04553105	0.590680218	1.320801121
BC0 (850)	300-1500	815.04	2.7168	0.54336	0.008684207	0.150767475	1.130749056	2.528431754
2400FHSS	1500-100,000	2400.8	5	1	0.00362018	0.062850344	0.538158329	1.203358605
BC1 (1900)	1500-100,000	1850	5	1	0.006291152	0.10922138	0.709430843	1.58633559

\* upper frequency range is 3 MHz for occupational limit

**NOTE: For mobile or fixed location transmitters, minimum separation distance for FCC compliance is 20 cm, even if calculations indicate MPE distance is less**

% 900 MHz RFx	7.57%
% BC0 (850) RFx	27.75%
% 2.4 GHz RFx	6.29%
Total RFx	41.60%

% 900 MHz RFx	7.57%
% BC1 (1900) RFx	10.92%
% 2.4 GHz RFx	6.29%
Total RFx	24.78%



## Evaluation of RF Exposure

Date: 9/27/203  
FCC ID: OWS-NIC411-3C

Part Number:  
Description: NIC 411-3G-050A  
Frequency: 902 - 928 MHz FHSS, 2400-2483.5 FHSS, CDMA-2000/EV-DO

	900 MHz	2400 MHz	BC0 (850)	BC1 (1900)	
Max RF Power	30		27	24.5	24.5 dBm
Tx Antenna	3		4	-1.2	-1.9 dBi
Source Based Time Average Co	-20		-20	-12	-12 dB
EIRP	13		11	11.3	10.6 dBm
EIRP	19.95262315	12.58925412		13.48962883	11.48153621 mW
EIRP	0.019952623	0.012589254		0.013489629	0.011481536 W
MPE dist			3.1		cm

Equation 1 - 
$$S = \frac{EIRP}{4\pi R^2}$$

Equation 2 - 
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			Controlled, Ave 6 min	Uncontrolled, Ave 30 min	@ 20cm dist	@ 3.1 cm dist		
			mW/cm <sup>2</sup>	mW/cm <sup>2</sup>	mW/cm <sup>2</sup>		cm	cm
	0.3-1.34*	--	100	100	--		--	--
	1.34-30	--	900/f <sup>2</sup>	180/f <sup>2</sup>	--		--	--
	30-300	--	1	0.2	--		--	--
900FHSS	300-1500	902	3.006666667	0.601333333	0.003969448	0.165221571	0.726695426	1.624940371
BC0 (850)	300-1500	815.04	2.7168	0.54336	0.002683676	0.111703492	0.628588214	1.405565976
2400FHSS	1500-100,000	2400.8	5	1	0.002504553	0.104247764	0.447620601	1.000910092
BC1 (1900)	1500-100,000	1850	5	1	0.002284179	0.095075091	0.427474355	0.955861717

\* upper frequency range is 3 MHz for occupational limit

NOTE: For mobile or fixed location transmitters, minimum separation distance for FCC compliance is 20 cm, even if calculations indicate MPE distance is less

% 900 MHz RFx	27.48%
% BC0 (850) RFx	20.56%
% 2.4 GHz RFx	10.42%
Total RFx	58.46%

% 900 MHz RFx	27.48%
% BC1 (1900) RFx	9.51%
% 2.4 GHz RFx	10.42%
Total RFx	47.41%

PVS8 tolerances from tune up procedure

Band	RMS Target	Tolerance
CDMA BC0, BC10 subclass 2+3 (800)	24dBm	-1 / +0,5dB
CDMA BC1 (1900)	24dBm	-1 / +0,5dB

Antenova antenna gain for PVS8

	Typical performance	Conditions
<b>Peak gain</b>	-1.2dBi @ 960 MHz -1.9dBi @ 1740 MHz	All data measured on Antenova's reference board, part number <b>A10376-U1</b>  Data given for the 824MHz-960MHz and 1710MHz - 1990MHz frequency ranges
<b>Average gain (Linear)</b>	-1.6dBi 824-960 MHz  -2.4dBi 1710-1990 MHz	
<b>Minimum efficiency</b> 824-960 MHz 1710-217 MHz	>60% >50%	
<b>Minimum Return Loss</b>	6.8 dB	

NIC 410 sheet metal antenna gain

902 - 928 MHz: 0.5 - 1.2 dBi  
2.4 - 2.4835 GHz: 3.7 - 5.6 dBi

WP WPANT30017-CA antenna gain

Parameter	Antenna Performance		
	860 – 880 MHz	902 – 928 MHz	2.4 – 2.5 GHz
Operating Frequency	860 – 880 MHz	902 – 928 MHz	2.4 – 2.5 GHz
Recommended Impedance of the customer Radio Module[Ω]	50Ω	50Ω	50Ω
VSWR - Typical	<1.5:1	<1.5:1	<2.5:1
Peak Gain [dBi] (Typical)	3.5 dBi @ Horizon	2.5 – 3 dBi @ Horizon	3 – 4 dBi @ Horizon
Efficiency [%] (Typical)	~ 80%	~ 80%	~ 70%
Polarization	Linear		
Pattern	True-Omni Directional		
Accepted Power [W] (Max)	2 Watts		
Lightning Protection	DC ground		