

## RF EXPOSURE EVALUATION

### EUT Specification

<b>EUT</b>	300Mbps Wireless N Router
<b>FCC ID</b>	<b>S8J-WR2000</b>
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna diversity</b>	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	17.77dBm for 802.11b; 16.76dBm for 802.11g; 15.21dBm for 802.11n(H20); 13.74dBm for 802.11n(H40);
<b>Antenna gain (Max)</b>	5dBi
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

**Applicable Standard:**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J. Section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m Normally can be maintained between the user and the device.

**Limits for Maximum Permissible Exposure(MPE)**

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm <sup>2</sup> )	Average Time
<b>(A) Limits for Occupational/Control Exposures</b>				
<b>0.3-3.0</b>	<b>614</b>	<b>1.63</b>	<b>(100)*</b>	<b>6</b>
<b>3.0-30</b>	<b>1842/f</b>	<b>4.89/f</b>	<b>(900/f)*</b>	<b>6</b>
<b>30-300</b>	<b>61.4</b>	<b>0.163</b>	<b>1.0</b>	<b>6</b>
<b>300-1500</b>	<b>--</b>	<b>--</b>	<b>F/300</b>	<b>6</b>
<b>1500-100000</b>	<b>--</b>	<b>--</b>	<b>5</b>	<b>6</b>
<b>(B) Limits for General Population/Uncontrol Exposures</b>				
<b>0.3-1.34</b>	<b>614</b>	<b>1.63</b>	<b>(100)*</b>	<b>30</b>
<b>1.34-30</b>	<b>824/f</b>	<b>2.19/f</b>	<b>(180/f)*</b>	<b>30</b>
<b>30-300</b>	<b>27.5</b>	<b>0.073</b>	<b>0.2</b>	<b>30</b>
<b>300-1500</b>	<b>--</b>	<b>--</b>	<b>F/1500</b>	<b>30</b>
<b>1500-100000</b>	<b>--</b>	<b>--</b>	<b>1</b>	<b>30</b>

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

Where

$P_d$ = Power density in mW/cm<sup>2</sup>,  $P_{out}$ =output power to antenna in Mw

$G$ = gain of antenna in linear scale,  $\pi$ =3.1416

$R$ = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## Measurement Result

Max power Result:

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)			Limit (dBm)	Verdict
			Ant1	Ant2	Sum		
802.11b	1	2412	17.05	17.77	--	30	PASS
	6	2437	16.15	15.37	--	30	PASS
	11	2462	14.08	13.92	--	30	PASS
802.11g	1	2412	16.76	16.08	--	30	PASS
	6	2437	15.32	14.12	--	30	PASS
	11	2462	13.72	12.49	--	30	PASS
802.11n (HT20)	1	2412	12.54	11.82	15.21	30	PASS
	6	2437	10.38	10.04	13.22	30	PASS
	11	2462	8.49	9.26	11.90	30	PASS
802.11n (HT40)	3	2422	11.09	10.34	13.74	30	PASS
	6	2437	10.75	9.46	13.16	30	PASS
	9	2452	9.75	8.29	12.09	30	PASS

Note: For MIMO system, Maximum Conducted Output Power is summed at the total transmit power delivered to all antennas.

Antenna 1:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
802.11b	1	17±1	18	63.10	5	3.162	0.039691	1
	6	16±1	17	50.12	5	3.162	0.031528	1
	11	14±1	15	31.62	5	3.162	0.019893	1
802.11g	1	16±1	17	50.12	5	3.162	0.031528	1
	6	15±1	16	39.81	5	3.162	0.025043	1
	11	13±1	14	25.12	5	3.162	0.015801	1
802.11n (H20)	1	12±1	13	19.95	5	3.162	0.012551	1
	6	10±1	11	12.59	5	3.162	0.007919	1
	11	8±1	9	7.94	5	3.162	0.004997	1
802.11n (H40)	3	11±1	12	15.85	5	3.162	0.009970	1
	6	10±1	11	12.59	5	3.162	0.007919	1
	9	9±1	10	10.00	5	3.162	0.006291	1

Antenna 2:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
802.11b	1	17±1	18	63.10	5	3.162	0.039691	1
	6	15±1	16	39.81	5	3.162	0.025043	1
	11	13±1	14	25.12	5	3.162	0.015801	1
802.11g	1	16±1	17	50.12	5	3.162	0.031528	1
	6	14±1	15	31.62	5	3.162	0.019893	1
	11	12±1	13	19.95	5	3.162	0.012551	1
802.11n (H20)	1	11±1	12	15.85	5	3.162	0.009970	1
	6	10±1	11	12.59	5	3.162	0.007919	1
	11	9±1	10	10.00	5	3.162	0.006291	1
802.11n (H40)	3	10±1	11	12.59	5	3.162	0.007919	1
	6	9±1	10	10.00	5	3.162	0.006291	1
	9	8±1	9	7.94	5	3.162	0.004997	1

MPE Result:

Operation Mode	Channel Number	Channel Frequency (MHz)	Power density at 20cm (mW/cm <sup>2</sup> )			Power density Limits (mW/cm <sup>2</sup> )	Verdict
			Ant1	Ant2	Sum		
802.11b	1	2412	0.039691	0.039691	--	1	PASS
	6	2437	0.031528	0.025043	--	1	PASS
	11	2462	0.019893	0.015801	--	1	PASS
802.11g	1	2412	0.031528	0.031528	--	1	PASS
	6	2437	0.025043	0.019893	--	1	PASS
	11	2462	0.015801	0.012551	--	1	PASS
802.11n (HT20)	1	2412	0.012551	0.009970	0.022521	1	PASS
	6	2437	0.007919	0.007919	0.015838	1	PASS
	11	2462	0.004997	0.006291	0.011288	1	PASS
802.11n (HT40)	3	2422	0.009970	0.007919	0.017889	1	PASS
	6	2437	0.007919	0.006291	0.014210	1	PASS
	9	2452	0.006291	0.004997	0.011288	1	PASS