



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Joseph D.A. De Los Santos</b>	<b>Project Number</b> <b>J0809</b>
<b>Project Title</b> <b>Wi-Fi: How Do Different Antennas Affect the Performance of Signals?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective is to determine which Wi-Fi antennas perform the best when examining distance, speed, and packet dropping.</p> <p><b>Methods/Materials</b> The antennas tested are the Omni-Directional and the Directional Panel. I used a 2.4 MicroTik radio and a laptop with an integrated wireless card. I set up the node with one of the antennas(test variable), and I used the laptop command prompt to ping it 100 times with one Kilobyte of data at each distance. The distances were 0-5 feet, 100 feet, 200 feet, 275 feet, 350 feet, 500 feet, 575 feet, 650 feet. I found the packet dropping, the range, and the time it took for the signal to be sent and received for each of the test variables at each distance.</p> <p><b>Results</b> Overall the Omni-Directional was the worst performer. At home, a rural setting with no interference, the Omni Directional antenna had the least quality performance and the most packet dropping. In the alley, the signal bounced off of the surroundings and affected the signals. The Directional Panel had two polarities, vertical and horizontal. At home, I found the horizontal polarity had equal packet loss at 650 feet as the vertical polarity and was slightly slower. It also had sort of, a "donut" effect, where there was a poor quality signal right in front of the node. The performance increased until about 200 feet, then the signal started to degrade. In the alley, the horizontal polarity did not perform as well as Vertical Polarity but still performed better than the Omni-Directional antenna.</p> <p><b>Conclusions/Discussion</b> Overall all antennas had a sort of "Donut" effect, where there was a poor signal right in front of the node. The Directional panel outperformed the Omni-Directional antenna. For speed and packet dropping the fastest was the Directional Panel on vertical polarity. On range, the Directional Panel vertical polarity was the best performer, but vertical polarity was mainly useful for point-to-point across nodes, as it covers a smaller focus. The Omni-Directional covers 360 degrees but has the least performance as well as some spots with degraded signals. In conclusion, I would use Omni-Directional for cost efficiency, four Directional panels at horizontal polarity for speed broadcasting in an area very heavily populated with clients, and I would use the Directional panel antenna vertical polarity for point to point to other nodes.</p>	
<b>Summary Statement</b> My project is about determining the affects of different antennas on the performance of Wi-Fi signals.	
<b>Help Received</b> Grandfather provided materials for the project	