



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Dhruv Aggarwal	Project Number J0901
Project Title Turbocharge Your Wireless Signal	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to increase the wireless signal strength in my house. I created parabolic reflectors, which attach to the antenna of the router to direct the electromagnetic waves. I also wanted to shield the waves from outside my house.</p> <p>Methods/Materials My preliminary design was per the Deep Dish Parabolic Reflector template from FreeAntennas.com by M.Erskine. I opened up a tin can, aligned it with the antennas focal length and measured the strength using the InSSIDer software. I conducted these tests with an aluminum foil sheet and with a thinner sheet, and found a similar strength increase, which confirmed that the thickness did not matter. However, it was difficult to align the reflectors with the antennae i.e. low reliability. I researched and found the Windsurfer template, which slides onto a dipole rod-like antenna. I picked points that had a weak signal and maintained them to control the distance. My prototype was 6-inch reflectors, and my measurements confirmed a signal strength increase, however, I also found that it varied, and so, I took multiple measurements over 9 days. I statistically analyzed the data and compared using distribution charts and boxplots. While the signal strength was higher everywhere, it was better outside too, where I had expected it to drop. I noticed that the 6-inch reflector did not cover the length of the antenna, and so I built 9-inch reflectors. I also measured speed using Speedtest.net and throughput using Ixia QCheck, which simulated a 100kB signal from my laptop to the router.</p> <p>Results Both reflectors increased the signal strength inside the house, however, the 6-inch reflectors did not decrease the strength outside. The 9-inch reflectors increased the signal inside, and decreased it outside (>10dBm). This proved that the reflectors must be tall enough to shield the antennae backwards.</p> <p>Conclusions/Discussion The 9-inch parabolic reflector was the best design for my router. The 6-inch reflector increased the signal everywhere, including outside the house, where it should have decreased. The tin can design was not helpful since it was difficult to position. Since the reflectors are made from everyday materials, they are cheap and easy to build, easy to service, and my statistical analysis showed that they are reliable. The parabolic reflectors worked well with the external antennae, and I would like to investigate a similar solution for the internal antenna routers.</p>	
Summary Statement This project evaluates the effect of a parabolic reflector on wireless signal strength.	
Help Received My sister, Shruti Aggarwal mentored me through the process.	