



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Jessica R. Conrad	Project Number S1908
Project Title Wi-Fi = Cancer?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal is to find out whether Wi-Fi routers increase the risk of cancer and if you can block the radiation with metal shielding, mainly copper.</p> <p>Methods/Materials An antenna, RF detector, amplifier and audio speaker were used to listen to radio frequencies coming from a MIMO and dipole router. I graphed the points on grid paper where the sound level changed from the router after placing different sheets of metal to act as shields in front of the router. I tested copper, steel, aluminum, brass, and lead shields.</p> <p>Results The signals from the dipole router were blocked best by copper, then aluminum, brass, steel and lead. For the MIMO router, the signal was not blocked, but it dissipated faster, losing strength within 6 inches with the lead shield, though the weak signal continued on. Cell phones emit RF energy at a faster rate than routers and are used next to your head. In order to account for both factors, we must first take the max amount of absorption (1,600 mW) that cell phones can emit and reduce it by both the reduction in power and extended distance. We estimate the power reduction to be about 1/12 the original, then further reduce this due to a distance of one inch compared to 36 inches. We will do the distance reduction linearly because you are in a closed room. The reduction of power becomes (1/12) X (1/36), or 1/432 of the power at your head compared to a cell phone. The study was not specific on the SAR levels needed to raise your risk by 5%, but, if the dosage is cumulative, it will take 43,200 hours of exposure to raise your risk level 5%, but it only takes the cell phone 100 hours for the same risk level. Assuming a person spends 4 hours a day on the computer near the router, it will take 30 years before the risk of cancer will rise 5%. This number will vary depending on the distance from the router. Extend the distance by two more feet (5 feet) and it will take 50 years before the risk rises 5%. Therefore, wireless internet does not seem to be a problem compared to cell phones.</p> <p>Conclusions/Discussion Copper worked best as a shield for Wi-Fi frequencies on the dipole router in terms of blocking the signals. A metal shield is not effective at blocking the energy from a MIMO router. Each antenna is sending a signal all around to bounce off the walls and increase coverage, and when this signal bounces back it creates coverage in front of the shield again, though weaker.</p>	
Summary Statement My project was about whether Wi-Fi signals emitted from routers are dangerous and whether they can be blocked with metal shielding.	
Help Received Engineer Bruce Erikson gave me the equipment; Dad helped supervise the experiment ; Mom helped me glue the board together; Mrs. O'Donnell proofread my report	