



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

Name(s) Sina Moshfeghi	Project Number S1013
Project Title Comparing the Radiation Effects of Cellular vs. WiFi Calling	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The Radio Frequency (RF) radiation emitted from cell phones exposes humans to potentially harmful radiation that may cause cancer. It is therefore important to discover methods that reduce the RF radiation of cellphones. The objective of this project was to determine whether WiFi (Wireless LAN) calling exposes humans to less RF radiation than cellular calling because of the shorter distance to the WiFi access point.</p> <p>Methods/Materials Innovative measurement and calibration methods were designed to compare the transmit powers of WiFi calling and cellular calling. These procedures overcame challenges such as antenna efficiency, antenna gain, interference, reflections, and the surrounding environment. The power transmissions of an iPhone were measured in the near-field of the phone using a magnetic loop probe and a spectrum analyzer. Magnetic loops were built and calibrated for their frequency-dependent response because WiFi calling and cellular calling used different frequencies. Power measurements were repeated at different distances from the WiFi access point to determine if separation distance affected transmission power.</p> <p>Results The results of the experiments showed that WiFi calling used more transmission power than cellular calling; in some instances up to 1000 times more power. Transmission power measurements of WiFi calling did not change as the cell phone got closer to the WiFi access point, demonstrating that WiFi calling did not use power control effectively. On the other hand, cellular calling used adaptive power control, which lowered its power transmission and radiation effects.</p> <p>Conclusions/Discussion Contrary to conventional thinking, the experiments illustrated that current system implementations of WiFi calling emit greater RF radiation than cellular calling. This discovery means that improved voice calling methods with lower power transmit are needed to reduce RF exposure to the human brain.</p>	
Summary Statement This project designed innovative measurement and calibration methods that measured and compared the RF radiation of two cell phone voice calling techniques in order to identify a safer voice calling technique that reduces the RF radiation.	
Help Received Ed Roth provided me with his spectrum analyzer and signal generator and showed me how to use them for my measurements.	