



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Iman H. Siddiqi	Project Number J0912
Project Title Effective RF Shielding with Partial Faraday Cages	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project was to determine whether an enclosure based on the Faraday cage principles can still be effective in reducing the strength of radio frequency (RF) radiation when it does not completely enclose a radio device.</p> <p>Methods/Materials I constructed three Faraday cages using metals commonly used for Faraday cages in electric shielding. I designed a transmitter to broadcast a 1000 Hz tone being played on an iPod Shuffle at a 1000 kHz carrier frequency. I set an AM radio to channel 1000 kHz to receive the signal, and connected an oscilloscope and multimeter to the radio's speaker to measure the voltage of the radio signal. I measured the strength of the radio transmission first without any barrier, then when the transmitter was fully enclosed in the Faraday cage, and then using 12 other varying configurations on the Faraday cage. I repeated each configuration experiment for three trials per Faraday cage material.</p> <p>Results Decreasing the Faraday cage enclosure configurations or shielding resulted in a progressively cleaner sine wave of the broadcasted tone, and a higher RMS voltage. I observed that signal blocking with a fully enclosed cage and one with only the top removed is about the same (90-100% shielding). I also observed that a three-sided enclosure can block approximately 85% of RF radiation, and that removing the bottom of a cage significantly increases signal strength, as compared to removing the top.</p> <p>Conclusions/Discussion My conclusion is that a partially-enclosing Faraday cage can be effective at reducing RF radiation and, additionally, that such cages can potentially directionally reduce RF radiation. My conclusion gives rise to the possibility of constructing practical solutions for reducing RF radiation exposure, including from mobile phones.</p>	
Summary Statement Can an enclosure based on the Faraday cage principles still be effective in reducing the strength of radio frequency (RF) radiation when it is not completely enclosed?	
Help Received I conducted my experiment using lab equipment at the UCI Physics Lab. My uncle provided me with a diagram for my transmitter and helped me to construct it.	