



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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Project Title Exploring a Method for Cell Phone Signals to Penetrate Energy Efficient Windows	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to design a prototype of a heat-reflecting energy efficient window that does not block cell phone signal (radio waves). In every energy efficient window, there is a thin film of conducting material that blocks infrared radiation (heat) from penetrating the window. The challenge is that, while energy efficient windows aim to block infrared radiation, it also blocks all electromagnetic radiation that has a lower frequency than that of infrared waves, including cell phone waves.</p> <p>Methods/Materials A building was simulated by a cardboard box wrapped in aluminum foil. One side was cut open. The energy efficient window prototypes were put above the open side of the box for each test. A regular piece of glass was wrapped with aluminum foil, which simulates the energy efficient window coating. This is effective because both materials block infrared and radio waves. We cut the aluminum foil in different designs and tested how much cell phone signal was received with an iPhone 4. Depending on results in the tests, we made changes to the size, shape, and pattern on the aluminum foil to improve the cell phone signal.</p> <p>Results Our Grid C prototype was able to let in nearly the same amount of cell phone signal as with a regular window. Grid C was also able to greatly reduce the transfer of heat through radiation because only around 10% of the aluminum foil was removed.</p> <p>Conclusions/Discussion In this project, we have designed a prototype (Grid C) that was able to effectively block nearly all heat radiation (infrared radiation) yet still allow essentially all cell phone signals (radio waves) to pass through. Such design could potentially be manufactured and introduced to the market. In addition, we have designed a new experimental method for testing radio and infrared radiation using aluminum foil wrapped glass instead of actual energy efficient windows. It is not only more efficient than before, it is also more accurate.</p>	
Summary Statement We created an energy efficient window prototype that not only blocks heat (infrared) radiation to save energy, but also allows cell phone signals (radio waves) to penetrate.	
Help Received We built the energy efficient window prototype by ourselves at home and got help from Guowen Ding (Partner's Dad) to help explain the theory behind the energy efficient windows.	