Name(s)

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Project Number

J1301

Project Title

Defend Your Household Electronic Devices from Disruptive Electromagnetic Frequencies

Abstract

Objectives

When we have a natural disaster such as solar flares or hurricanes, any electronics can be destroyed and power grids can also completely shut down. The objective of our experiment was to test the shielding effectiveness of the Faraday Cage using household electronic devices. We target to experiment this objective with different thermal conductors.

Methods

Identify the frequencies of all devices without any variables using the radiation detector app to obtain the baseline.
First, take an aluminum paint can with a lid. Seal off all of the cracks with aluminum tape. (Bottom, and lid)
Turn both walkie talkies on the same channel
Place the 1st walkie talkie inside the can
Close the lid
Put aluminum foil on top of the whole can, to seal any gaps (This is the Faraday cage.)
Take the 2nd walkie talkie and go 100 meters away from the cage
Speak into the 2nd walkie talkie sending the signal
Listen to see if there is sound coming from the 1st walkie talkie placed inside the Faraday cage
Follow the same steps for placing other devices such as a Bluetooth speaker and a phone.
Repeat the steps with the other conductors (copper jug with a lid, metal container.)
To extend the experiment we used two laptops and tried to connect them wirelessly. We were able to see that one of the laptops was able to copy the files of the other laptop. We tested the same process keeping one laptop inside the Faraday cage. Inside the Faraday cage to check if the laptops stay connected.

Results

We observed that compared to steel container and copper jug, the homemade aluminum cage proved to be the best Faraday cage since it effectively shielded the electromagnetic frequency between devices inside and outside the cage.

Conclusions

After repeated experiments, we concluded that Aluminum was the best thermal conductor that reduced the electromagnetic frequencies. We also observed that regardless of how high the electromagnetic frequency is, the Faraday cage is still effective to shield the electronic devices.

Summary Statement

We concluded that Faraday cages made out of aluminum have the best shielding effectiveness to protect our household electronic devices.

Help Received

We received tips on materials to build the Faraday cage from Mr. Ken Kojima - Agency Information Security Officer, Department of Corrections and Rehabilitations