



Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Strength of EMF Waves Radiating from High Powered Electrical Lines

Finalist's Name: Jessa Book

School and City: Miami Yoder, Rush

Sponsor's Name: Angela Grimes

Category: Physics & Astronomy (PHYS)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

I tested the strength of EMF (electro-magnetic frequency) waves radiating from high-voltage overhead power lines. I chose this topic because Xcel Energy is currently trying to take part of our 6th generation ranch by eminent domain to build a 345 kV double-circuit transmission line that stretches over 60 meters into the sky through our land. To measure these frequencies, I used a Trifeild TF2 EMF meter and measured the standard electric (at three varying heights) and magnetic, weighted electric and magnetic, and radio frequencies. I tested a 275 kV, 138 kV, and a 35 kV distributor line at distances from directly under to 80 meters away. I found that the frequencies decreased from over 1000 V/m directly under to below 100 V/m at 80 meters away. I also found that the frequencies change rapidly by vertical distance from the ground and they were minimal at ground level because the ground absorbs the waves.

EMF has been directly correlated with free radicals that can damage cells, DNA, lipids, and proteins. Free radicals cause a rapid increase of oxidative stress, and these frequencies have also been linked to mitochondrial dysfunction, including decreased electron transport chain activity and ATP generation which causes oxidative stress. I used a Chi-Square Test of Independence to see if the distance from the source and the height above the ground were statistically dependent on each other. The results were statistically significant and they are dependent on one another. The quality of ranching is severely affected by companies forcing their harmful infrastructure onto land that nurtures a primary food source.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with your Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.