



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> <b>Andrew B. Nazareth</b>	<b>Project Number</b> <b>J0918</b>
<b>Project Title</b> <b>Radiation: How Safe Are You with Your Daily Devices?</b>	
<b>Abstract</b> <b>Objectives/Goals</b> My project compares electromagnetic radiation levels emitted from our daily devices at multiple measured distances and times, investigates which device exceeds the federal safety limit of .001mW/cm <sup>2</sup> to 1mW/cm <sup>2</sup> for the various devices, assesses the effect of aluminum foil as an effective radiation absorber, and determines a safe distance to use these devices to avoid the harmful effects of radiation. <b>Methods/Materials</b> 44 trials were conducted with each trial from 3-7 times and at 4-7 distances to measure the electromagnetic radiation level with a 8 GHz Basic RF Meter, emitted from the cell phone tower, microwave oven, cell phone, smart meter and AT&T U-Verse modem. The readings were then compared to the current FCC/FDA safety limits for each device. For 9 trials, the radiation levels from the cell phone tower, AT&T U-verse modem and microwave oven were measured using aluminum foil to investigate if aluminum could absorb and reduce radiation levels emitted from these devices. <b>Results</b> The cell phone tower readings ranged from 3.9 mW/m <sup>2</sup> at 25 m to 0.2 mW/m <sup>2</sup> at 125 m. The smart meter readings ranged from 3.1 mW/m <sup>2</sup> at 1 m to 0.005 mW/m <sup>2</sup> at 10 m. The cell phone readings ranged from 5.1 mW/m <sup>2</sup> at 5 mm to 0.01 mW/m <sup>2</sup> at 15 mm. The microwave oven readings ranged from 1827 mW/m <sup>2</sup> at 2 in to 48 mW/m <sup>2</sup> at 18 in. The AT&T U-Verse modem readings ranged from 317 mW/m <sup>2</sup> at 5 in to 12 mW/m <sup>2</sup> at 15 in. With measuring 3 devices with aluminum foil, the microwave oven readings dropped by 90% to 182 mW/m <sup>2</sup> (total average) at 2 in. The AT&T U-Verse readings dropped by 44% to 179 mW/m <sup>2</sup> (total average) at 5 in. The cell phone tower readings dropped by 45% to 2.14 mW/m <sup>2</sup> (total average) at 25 m. <b>Conclusions/Discussion</b> All the measured devices showed decreases in EMF wave field strength, with increased distance from the devices. All devices (except possibly for the microwave oven at 2 inches) did not exceed the FCC/FDA limit for uncontrolled exposure. The microwave oven and AT&T U-Verse readings were comparatively higher than the cell phone tower, cell phone and smart meter readings. People should be aware that there is a bigger risk of radiation exposure especially to children, when using microwave ovens, AT&T U-Verse modems and other wifi devices than from cell phone towers, smart meters and cell phones. The FCC/FDA should consider a separate safety limit for children. Aluminum foil is an effective absorber of radiation.	
<b>Summary Statement</b> My project compares radiation levels emitted from our daily devices at various times and distances and determines if they are within the FCC/FDA safety limit of .001mW/cm <sup>2</sup> to 1mW/cm <sup>2</sup> for the various devices.	
<b>Help Received</b> Dr. Youssef Ismail helped me understand the concepts related to EMF emission from wireless devices and guided me through the various stages of the experiment.	