

# Study of Electromagnetic Fields and Effects on the Human Body



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## ABSTRACT

Exposure of radio frequencies electromagnetic fields (EMF) in recent decades, demands has increased. Bringing new variables into the effects of EMF with human bodies. Our objective is to present an approach into the effects of EMF and how it reaches human beings. Moreover, with higher demand comes interests on health influence, social and scientific backup, the standards must be met. Previous research on EMF has relied on the magnitude and environment effects. EMF in human environment have been in past research studies yet, most of the research targeting effects, the most influential process impacts on direct tissue on living organisms. We used data from the college library database to decompose the relationship between electromagnetic fields and the human body. Which learning established standards EMF is based on thermal effect. Base on standards it is well known how weak EMF can cause different effects in the body cells, tissues and organs. However, the symptoms seen from EMF are hardly factors occurs simultaneously in human environment. Contrary to often assumptions, the rise of demand in EMF search has gotten new research studies and often overlooked symptoms to be taken seriously. Our findings based on the study from the Iowa State University of Science and Technology indicates general electromagnetic fields exposure cannot exceed 0.1 mT (or 1000 mG) with the rise in EMF requests new trials and with this new research opportunities to show the process generated and effects in full research backup, explained by our hypotheses centered on the effects on the human body.

## INTRODUCTION

Electromagnetic fields are a property or a field of force which dwells on either electric or magnetic factors that in turn results from the advance of an electric charge that contains a precise amount of electromagnetic energy. During 1820 Danish scientist Hans Christian Oersted invented the electrical current from a battery in a wire. The 1820s was a very active decade for science discoveries, especially in electrical engineering. Also, William Sturgeon discovered that an iron core wrapping around the wire would enhance the magnetic effect of said wire in 1825 which in turn added on to Oersted's research on the electrical currents transmitted to a wire. Lastly, in 1888 in Karlsruhe, Germany physicist Heinrich Hertz published an experimental publication validating Maxwell's equations and proving that electromagnetic effects propagation at a determined speed.

To demonstrate these claims, we know the public debate over what the electromagnetic fields focuses on and the potential of these. From the WHO (World Health Organization) there have been different types of research that are needed to guarantee the absolute safety of the devices yet, there are difficulties as said by Barnabas Kunsch, Austrian research Center Seibersdorf "The absence of evidence of detrimental effects does not seem to suffice in modern society. The evidence of their absence is demanded more and more instead" the human health studies are good when identifying large effects, such as a connection between cancer and smoking but, there are less studies to distinguish between electromagnetic fields in typical environments. To extend the research, in the future the aim of WHO with the international EMF Project wants to initiate more research on long term exposure to weak magnetic fields.

## OBJECTIVES

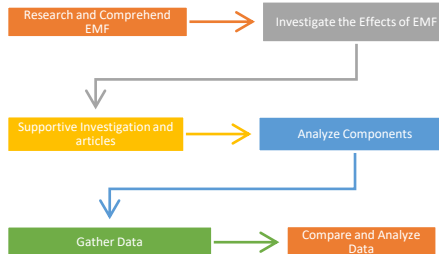


Figure 1: Objective Process

## METHODOLOGY

Our biggest challenge within the research has been to acquire the necessary cases to develop our collection of data. However, we have gathered articles from credible sources to instate new data from our daily environment, to compare with gathered data. Moreover, in this image we demonstrate the common symptoms of EMF in the body, how most are taken for "normal symptoms" this investigation with cell towers, revealed how the distance between these artefacts is crucial to the safety of neighborhoods etc. Surely, these effects bring us to effects in low EMF on daily exposure, these are details to be taken into consideration once we achieve measurements and complete data gathering. Knowing our goal, we will use a main device to measure EMF and gather data, including other potential devices to be used:



Figure 2: Gauss Meter Measures Direction and Intensity of Magnetic Field

## DATA

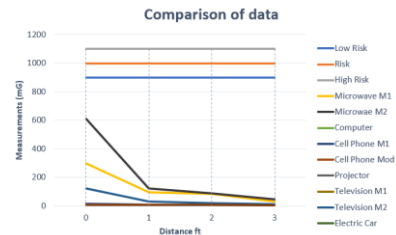


Figure 3: Data Comparison vs Risk Level

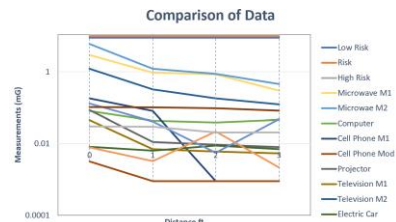


Figure 4: Data comparison vs Risk Level Lowest Levels

Low Risk	Risk	High Risk
$\leq 1,000$ mG (or 0.1 $\mu$ T)	$1,000$ mG (or 0.1 $\mu$ T)	$\geq 1,000$ mG (or 0.1 $\mu$ T)

Figure 5: Risk Levels

## ANALYSIS AND RESULTS

Our research based on conventional objects include projectors, cellphones, computers, TV's, microwaves, and an electric car. Furthermore, by conventional we mean objects we use every day one way or another that may cause health concerns in the future with extended usage, by unconventional we mean objects that are ionizing or non-ionizing (alter molecules or remove atoms that include air or water). This does not exclude conventional objects that are also ionizing/non-ionizing such as microwaves.

From the data analysis we gathered, we can further detail how distance will always be key to safety from cellphones to projectors. Keeping a safe distance of one to three feet will benefit you in the long run, EMF will always raise concern and there are plans to further study how EMF could affect you in daily bases. Moreover, the highest measurement recorded was with 609.10 MG (microwave in use model 2) and lowest being 0.01 MG (microwave off) both from the microwave model 1 and model 2 measurements. Even so, with the highest measurement it is within the limits and standards of the device. However, we find the risk very low on daily conventional objects used by the average person and little to no effect short or long term with the safety precautions and needed distance. Lastly, as mentioned on figure 5, the risks are divided in three sections, a high risk is considered after 1,000 mG to pose any threat to human health.

## CONCLUSIONS AND RECOMMENDATIONS

In conclusion, it is observed by the graphs produced how electromagnetic waves vary while a device is either on or off. For example, on the graph designed for the microwave utility while this is turned on, it is observed that the closer one is to the device the more a person is exposed to electromagnetic frequencies generated by microwaves, but one is still at low risk to radiation exposure. This can be observed while the appliance in isolation on and off there is low risk of radiation exposure.

There is no danger of electromagnetic frequency exposure when the device is not in use. Although, television are not the only devices used by professors and students but another commonly used device are digital projects which allow professors to give classes on a day-to-day basis. The exposure of electromagnetic fields radiated by digital projectors while the device is on is high the closer a person gets but as the person positions themselves about half a foot or so of distance the exposure lowers significantly. Meanwhile, if the projector is turned off the exposure is concluded to be minimal.

## FUTURE WORK

On our research the measurements have been made with different devices used to compare the diverse EMF based on them. Consequently, working with EMF brings a lot of questions on many aspects that we could spend much longer that we have on, so we hope this can give someone an idea to help the study of EMF and expand all our knowledge. More so, EMF can have a correlation with the rise in cancer cases in adults and children.

## ACKNOWLEDGEMENTS AND REFERENCES

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