

Model for the Generation of Electromagnetic Distortion During Collision between Metallic Conductors

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Abstract- The collision between metallic conductors can build a distortion in the form of an electromagnetic wave. The intra atomic forces are fundamentally involved for the cause of generation. Because, the kind of intra atomic force changes with the distance between the colliding bodies due to a change in charge distribution carried. Therefore, the change in charge distribution during the attraction and repulsion between the conductors is mainly discussed to provide the system to propagate both electrical and magnetic vectors mutually associated with the e.m distortion. This type of distortion is transmitted due to its appearance in space. The signal of distortion is received by the radio set as evidenced by the same voice of collision reproduced by it. For the existence of such transverse nature of electromagnetic distortion, compensating cycles of electric and magnetic field vectors must originate during the process of keeping conductors at closure distances while undergoing for the collision. Therefore, the magnitude and the kind of intra atomic force plays a dominant role to provide charge content and it's direction of motion responsible for the development of e.m wave respectively.

Keywords- Electro Magnetic, Metallic Conductors

I. INTRODUCTION

Electromagnetic radio waves are set up when electrical and magnetic vectors associated with the wave are changed in it's respective values of magnitudes as well as in its direction with the same frequency of oscillation. Both the field vectors must occupy positions mutually perpendicular in space along the directions normal to the line of propagation [1].

In radio receiving, the generation of electromagnetic distortion is traced due to nearby collision between metallic conductor atoms. For collision to take place between the conductors, the conductors are kept at nearer to each other. When colliding conductors are placed in front of each other, intra atomic forces act in between the atoms of colliding conductors. The type of force depends upon the distance between the atoms of two colliding conductors. Firstly, the attractive force begins to appear. In this duration, the atoms of colliding conductors behave as if both have opposite charges. The opposite charges attract each other and also move towards each other due to attraction. During collision when the distance between the conductors goes on decreasing, the charge distribution goes to change. Now, the atoms of colliding conductors apply a force of repulsion on each other due to having same charge consistence. The charge within the conductor atoms move in opposite to each other due to repulsion. Thus, the distribution and motion of charge on conductor atoms attained as a result of intra atomic forces of attraction and repulsion acting during the process of

collision is assumed to be the cause for the generation of electromagnetic signal of distortion.

II. EXPERIMENTAL ACCESSORIES

- A stepdown transformer of 18 V for running electromagnetic set up by a.c source.
- An apparatus related with the investigation of finding a vibratory rotational motion of a spherically solid body caused by residual magnetism during electro magnetization by a.c source of electricity [2]. The apparatus is shown in figure 1. The rotatory system of iron spherical body of 2 cm. in radius is kept over the electromagnetic set up for rotation. The collision is made either by knocking the spherical body by any other type of metallic conductor or by touching the rotatory system by the finger of hand. Electromagnetic distortion is resulted if a collision is made by a metallic conductor with the apparatus designed for rotatory dance of a spherically solid body of iron.
- A radio set is used for receiving a kind of electromagnetic distortion produced and also for reproducing the same transformed noise of collision.

III. THEORY AND DISCUSSION

During the collision, as the two types of conductors begin to come towards each other, firstly at this distance, the attractive force between those increases gradually due to opposite and increasing charge distribution possessed.

There is a positive charge in one type of the conductor while the other type of the conductor behaves like to have a negative charge. Both the charge conductors going towards each other also pass through enhancing charge inducted. This causes attractive force between opposite charges to increase. This movement of charged conductors resulted increment in magnitudes of both electrical and magnetic fields simultaneously. In this time duration, the presence of attractive force and related electrical and magnetic fields are shown in figure 2 and figure 3.

During the collision, when the conductors come from far to near each other, increasing attraction between the conductors is shown in figure 2 in the intra atomic force curve from the point [af1] to [af2], while the respective increase in electric and magnetic fields are shown in figure 3 from [e1] to [e2] and from [m1] to [m2]. The increasing attractive force in this duration allows electrical and magnetic vectorial to increase in magnitudes. When the attractive force is maximum at [af2], then carrying conductors further close resulted decreasing attractive force to act in between conductors due to less charge distribution in each of the conductor. The electrical and magnetic vectors will start to appear with decreasing magnitudes. This portion of discussion is correlated with the part of the curve of figure 2 from [af2] to [af3] and with figure 3 from [e2] to [e3] of electrical and from [m2] to [m3] of magnetic oscillating vectors.

During the attractive force acting on conductors due to opposite charges on each, the movement of both types of charges occur along the direction of movement of conductors. Thus in this duration, the movement of charges within the conductors is dominant towards inside of line of keeping conductors for undergoing collision, hence is responsible for establishing direction for each oscillating vectorial. Both the electrical as well as magnetic vectors are found to compensate along two mutually different perpendicular axes respectively.

When the conductors are further approached at nearby distances, the nature of intra atomic force changes in its kind due to same kind of charge consistence in both types of the conductors. The repulsive force appear to act in between the conductors. However, during the beginning of appearance of repulsive force, the conductors are put near by the external force applied to provide collision, the charges inside the conductors go towards opposite directions of the movement of conductors. As a result of increasing charge distribution assisted by increasing force of repulsion and the movement of charge within the conductors towards out side of the line of collision, the provided electrical and magnetic vectors associated are reversed in its directions with increasing magnitudes of field vectors. This type of change is related with the figure 2 and figure 3 assisted by the repulsive part of the curve from [rf1] to [rf2] which shows increasing repulsive force to act in between the conductors and the corresponding change in electric and magnetic

vectors occur from [e3] to [e4] and from [m3] to [m4] respectively.



Figure 1. Model for the generation of electromagnetic distortion due to the collision between the conductors

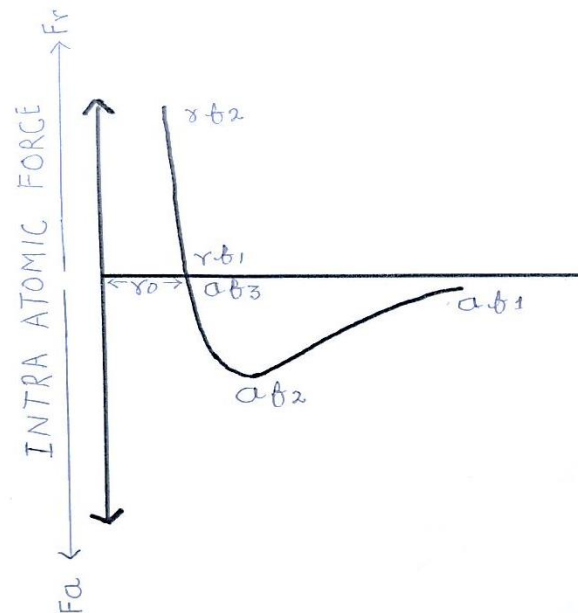


Figure 2. Variation of kind of intra atomic force with distance during collision

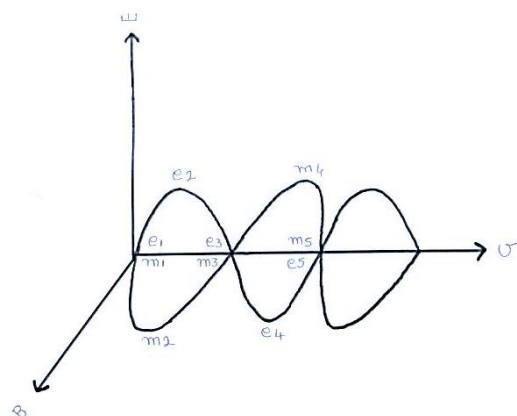


Figure 3. Association of electrical and magnetic field vectors with electromagnetic wave.

At the end of last duration of collision, when the distance between the colliding conductors reaches to at least distance of approach, the outer agency of force can not keep the conductors further very close, because of the much enhancement in repulsive force acting in between the conductors. Now, the external force is unable to carry the conductors inside the distance of closest approach due to very high repulsive force arising. This high class repulsive force tends to separate the conductors back. Consequently, the distance between the conductors goes to increase. The increasing distance due to separation of conductors now results repeatedly less charge distribution and decreasing force of repulsion to act. This amount of repulsive movement of charge within the conductors towards outside of line of collision is responsible for the decreasing magnitudes of electric and magnetic vectorial change from [e4] to [e5] and from [m4] to [m5] respectively.

In this way, we can estimate that a full cycle of an electromagnetic distortion is being generated during the collision between the conductors. The radio which is built for only to receive e.m signals, reproduce the sound of collision as a distortion.

IV. CONCLUSION

Generally, during the collision between the conductors, longitudinal sound waves are produced but by considering the existence of intra atomic forces, one can investigate and predict the generation of transverse e.m wave during the collision between the electric conductors. By touching the rotatory body, the apparatus behaves very sensitively

to find the disturbance occurring in collision. This disturbance is generated as an electromagnetic distortion due to collision between metallic conductors. During the collision between the conductors, the intra atomic force changes in nature due to change of distance between colliding conductors as a result of change of charge distribution. This is evidenced by the reception of e.m signal of distortion and reproduction as an audio sound of distortion. Only touching either by finger or by any metallic conductor can generate the distortion. This concept of sensitiveness of the apparatus can be applicable to detect the presence of atoms and molecules of iron metal viz. in FeO, Fe₂O₃ & Fe₃O₄ mineral ores during the geological survey [3].

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REFERENCES

- [1] D. Halliday "Fundamentals of Physics", Thomson's Publications, India, Pp. 845, 2020.
- [2] S. Prakash "Hand Book of Physics", Nageen Publisher, India, Pp. 523 – 525, 2011.
- [3] J. K. Khanna "General Inorganic Chemistry", Raj Hans Publisher, India, Pp. 597, 1994.