The MM Theory:
Challenging the Constancy of the Speed of Light Using a Rotary Magnet Accelerator
Part (4)

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Summary: This research provides a framework for exploring and analyzing the propagation of light and its behavior utilizing what is denoted as the Rotary Magnet Accelerator (RMA). Experimental results suggest that the speed of light and its direction can be influenced by magnetic effects.

Abstract

The speed of light is widely acknowledged as a fundamental constant of nature and as being central to the theories of special and general relativity. This research explores the potential for the acceleration or deceleration of the speed of light in a vacuum via a new machine denoted here as the Rotary Magnet Accelerator (RMA). The RMA, designed and created based on the MM Theory, is shown to induce specific effects on the M particles, which are stated to impact the speed and the direction of propagation of light. The primary objective of this study, then, is to present experimental results and novel theoretical perspectives on this interaction, challenging the traditional notions regarding light's behavior.

While recent advancements in optics have shown that light's speed can be altered in various media due to their refractive indices, direct manipulation of light’s speed in a vacuum has not been previously experimented on. Previous experiments conducted by the author, demonstrated that the speed of light can indeed be altered utilizing an alternative longitudinal magnet. Despite this, broader empirical evidence and substantiation remains limited. As a result, in this paper, the aim will be to bridge this gap by utilizing the RMA to examine whether dynamic magnetic effects can influence the speed of light in a vacuum.

The experimental setup and arrangements involve a system of rotating magnets to create specific effects on the M particles and consequently on light. Results from trials conducted under various experimental conditions are presented, demonstrating that the speed and the direction of light can be altered in a vacuum. As such, it is suggested that there may be a need for reassessing the foundations of special and general relativity based on these outcomes. Additionally, these findings hold significant implications for cosmology and astrophysics that would potentially revolutionize our comprehension of how the universe operates. By aiming to redefine our understanding of light propagation, this study marks a bold stride into unexplored scientific domains with an ambition to refine our knowledge about light behaviors.

Key words

The MM Theory, Theory of Everything, M particle, Speed of Light, Magnetism, Rotary Magnet Accelerator, RMA

1. Introduction

Traditionally, the speed of light in a vacuum regarded as a universal constant at around 299,792 kilometers per second, is a fundamental concept and cornerstone of modern physics. This constancy, being central to the theories of relativity and the structure of space-time, is deeply embedded in the current understanding of the universe and its operations [1]. The invariability of the speed of light, as first formalized by Albert Einstein and rooted in the earlier work of James Clerk Maxwell, underlies many facets of both theoretical and applied physics, ranging from the fundamental equations governing electromagnetic waves to practical applications in telecommunications and navigational systems [2].

Where it has been shown that the speed of light can significantly be altered due to refractive indices, recent advancements have now highlighted the effects of the propagation of light through various media [3] [4]. Moreover, in controlled environments that are distinct from a pure vacuum, innovative approaches in nonlinear optics and ultracold atomic gases have demonstrated the potential for the manipulation of the speed of light [3] [5]. As such, new questions have arisen regarding the boundaries of this constancy of the speed of light, which previously has been seen as seemingly immutable.

The notion of directly being able to alter the speed of light in a vacuum remains a largely uncharted frontier despite these significant advances. In addition, there is a notable gap in both experimental evidence and practical methodologies for achieving such modifications in a true vacuum as existing literatures in this field predominantly address light speed manipulation within media or using specific electromagnetic structures. Some theoretical frameworks suggest mechanisms for altering the speed of light using nonlinear optical effects [4] and gain-assisted media [6], yet these hypotheses have not been empirically validated. This underscores a critical limitation in the current research and highlights the necessity for innovative experimental approaches to test the potential for altering the speed of light.

In 2021, an experiment showcased by the author provided evidence that it is feasible to reduce the speed of light in a vacuum using an alternating longitudinal magnet [7]. In challenging the long-held belief in the constancy of light speed, this experiment demonstrated that magnetic effects could directly influence the propagation of light in a vacuum.

Building on this foundational work, the current study aims to further investigate the potential for accelerating and decelerating the speed of light in a vacuum using a novel machine, here denoted as the Rotary Magnet Accelerator (RMA). The RMA, a machine conceptualized to generate specific effects on the motion of the M particles, to influence the propagation of light in a vacuum, thereby altering its speed. As such, by potentially challenging and reshaping our understanding of how light propagates, this research seeks to provide empirical evidence and theoretical insights for the effects of a moving magnet on the speed of light in a vacuum.

The RMA's design draws from MM Theory principles employing rotating magnets configured to generate dynamic magnetic effects capable of displacing M particles, which would consequently alter the velocity of light. This hypothesis is based on the notion that the moving magnets are capable of displacing the surrounding M particles along with them.

The successfully manipulation of the speed of light in a vacuum would have profound implications. Such an achievement would not only challenge existing perceptions about how light behaves but also pave the way for technological advancements, such as enhanced data transmission speeds and innovative forms of optical computing. Furthermore, it would have significant ramifications for our understanding of the universe and leads to new insights in the fields of cosmology and astrophysics.

This paper begins with a study of pertinent literature regarding the effects of moving magnets on the M particles and the manipulation of the speed of light and its direction. Following this, the design and theoretical basis for the building of the RMA are described, detailing the principles that underpin its operation. Next, experimental setups for various apparatuses are outlined. Subsequent parts of this paper then present the experimental results, analyzing data collected from trials conducted under various conditions. These findings are then assessed and discussed in relation to the MM Theory and the manner by which they pertain to the non-constancy of light speed. The study then concludes by considering the broader implications of these findings on both theoretical and practical applications, while also suggesting avenues for further research.

This study represents a significant exploration into uncharted scientific realms, aiming to challenge one of the most foundational of the theoretical constants in physics. It is anticipated that studying the behavior of light provides new perspectives which may lead to potentially ground-breaking advancements in our understanding of how the universe operates.

In 2012, guided by the aforementioned concepts and theories, the author developed and constructed the RMA machine, conducting numerous experiments. To complement the RMA, a series of Light System Apparatuses (LSA) were necessary to be devised and employed. Here in this paper, four notable experiments using various apparatuses each with a specific design, are presented and the results of the experiments utilizing the RMA and the four distinct LSA are analyzed and studied.

As a side note, the publication of this part of the MM Theory (this paper) was delayed primarily due to the extensive experimental work required for refining the accelerator settings, the time needed for modifying the light system apparatus (LSA) designs, and the necessary time required to finalize the research papers within the broader MM Theory to elaborate on physics' phenomena.

2. Theory

In Part (1) of the MM Theory, an experiment was introduced and conducted which demonstrated that the speed of light can be decreased via the vibration of M particles [7]. This theory posits that M particles permeate all space, playing a pivotal role in various physical phenomena, including in the behavior of light. This foundational experiment presented the initial evidence for the role of M particles in the propagation of light.

Further examination of the MM Theory entails conducting additional experiments to validate the results and findings from Part (1). In this Part of the MM theory, the various factors that could impact the speed of light propagation are explored and considered. As discussed, the speed at which particles momentums are transmitted is directly correlated to the distance between M particles. Moreover, given that M particles are responsible for light propagation, altering their spacings should lead to deviations in the speed of light as per the MM theory.

Expanding on the theory's premise that light travels through M particles as a motion of momenta, the MM Theory proposes that the displacement of M particles during light propagation can also alter the speed and possibly the direction of light. That is, if the direction of the displacement of M particles is aligned with the direction of propagation of light, this will alter the speed. And if the direction of the displacement of the M particles is in any other direction, this will also influence the direction of travel of light. More specifically, it is posited that the speed of light will increase if M particles are displaced in the same direction as that of the propagation of light. Conversely, if these particles are moved in the opposing direction, it is expected that the speed of light will decrease.

As per the MM theory, in the vicinity of a magnet, M particles are influenced and are oriented to a single orientation based on the direction of the magnet. If the magnet is in any way displaced, then the M particles in its vicinity will also be displaced accordingly. That is, if a beam of light is shone and a magnet is moved, then the M particles which carry the momentums will also shift due to this displacement and exert an influence on the speed of light. This will also alter the direction of propagation of light if the displacement of the magnet is not aligned with the direction of travel of light. This notion sets the stage for further experimental investigation to validate these predictions. It was based on this idea that the Rotary Magnet Accelerator (RMA) and a series of Light System Apparatuses (LSA) to study the effects of movement and displacement of M particles on the speed of light were designed and produced.

To explore the effect of magnetic acceleration on M particles and its cumulative effects on the speed of light, [Fig. 1] can be taken as a reference illustration.

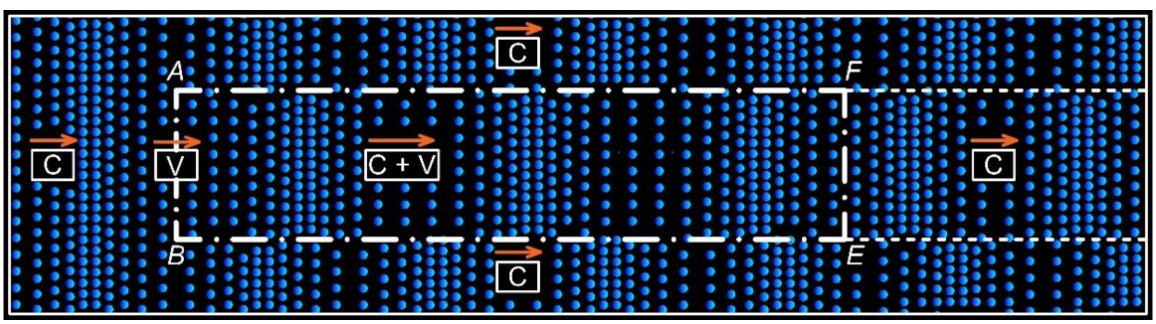

Fig. 1. Motion effects of a magnet on the M particles resulting in the increase in the speed of light in the ABEF region, change in the wavelength of light and particle densities, and the displacement of particles themselves.

In this reference case, the enclosed region denoted as ABEF is taken as a region under a magnetic influence where an external magnet is in motion. It is assumed that the magnetic motion is aligned with the path of light travel which is travelling across and moving from left to right of the Figure. Above and below the ABEF region illustrates the control M particles which are carrying light in those regions with no external magnetic influence and at a defined normal wavelength, frequency, and speed. Now noting the M particles "onboarding" at AB and transferring their momentums to the ABEF region, it is readily apparent that they firstly gain a given speed (V), which is the speed at which the magnetic influence is being applied to the particles. This gain in speed (V) is theoretical only, and in reality, for practical purposes it can only be a reflection of a degree or portion of the magnetic influence and not the full degree of it. As such, the result is that there is immediate effect on the speed of light in that it increases to (C+V).

However, this increase in the speed of light comes with a number of parallel effects. Concurrently, there is a "Spacing Effect" that occurs here. To explain this, as the particles gain motion at the entering AB boundary, the M particles gain an increase in the spacings from one another. Per the MM theory, as the spacing between the M particles increases (i.e., "spacing effect"), there is a decrease in the speed of light due to this effect. In contrast, at the FE boundary the spacing between M particles decrease such that the spacing effects that occur at the FE boundary will cancel out with the effects at the AB boundary. Another perspective of this case is that since the frequency of light has not changed and has been emitting from its source at the same frequency, the wavelength must also increase accordingly to achieve this new speed.

Additionally, there is a third effect to consider with the speed of light in the ABEF region. This is the effect from the adjacent M particles along AF and BE boundaries and external to the region of magnetic influence. This effect arises due to the vibration of M particles, as mentioned in Part (1) of the MM theory, which means that these particles continuously endeavor to fill in the gaps between them due to the space pressure in their surroundings. In filling the gaps in the spacings created in the ABEF region, these regions revert to normal particle densities.

Now, noting the exit of the M particles along the FE boundary, it is found that the speed recovers to its original value, (C), and accordingly so does the wavelength. The reason for this is that the average distances between the M particles return to the same as they were before entering the region and they are no longer under the magnetic influence. The only remanent change is the displacement in the waves of momentums which are the waves of light. As the momentum of light is transferred and carried by M particles to the ABEF region, the particles within this region gain a combined momentum, which exits the region along the FE boundary with an increase in the intensity of the light. The gained combined momentum from the origin of light in conjunction with the momentum gained from the magnetic influence in the ABEF region results in an increase in the intensity of light.

Therefore, considering the three effects above together, it can be deduced that the second and third effects roughly cancel out, leaving only the first effect which results in an overall increase in the speed of light in the ABEF region. That said, it is important to note that there are also various other miscellaneous effects that can influence these broader effects. However, the above three effects can be noted among the most important effects to attribute to the change in the direction and speed of light.

To clarify the above scenario, in [Fig. 1], the direction of propagation of light and the direction of displacement of M particles are from left to right. M particles convey and transfer momentum as light with the average speed of (C) under normal conditions for each region. Each particle gains its previous M particle's momentum and transfers it to the particles ahead, while the average speed of transferring momentum, (C), depends on the distances between M particles. Now then, one can imagine a magnet as a conveyor. When the light (momentums) reaches the region ABFE, the momentums are conveyed and transferred by the M particles which are now in motion with the speed of (V). As a consequence, the total speed of momentums is the resultant speed of (C+V).

Now, imagining that such a "conveyor" runs in the opposite direction (i.e., the magnetic influence is applied in the opposite direction), the exact opposite effects would be occurring. That is, in this region of ABEF, the speed of light would reduce and the wavelength would shorten while frequency would remain unchanged. Again, immediately exiting this region, light would return to its unaltered speed of (C) and its original wavelength.

Further to this and to expand on the study here, one can consider another scenario similar to the above where there is a rotational influence of a magnet on M particles and light. As exemplified, all of the concepts from above can be taken together to paint a clear picture of how light travels under a region of rotational magnetic influence [Fig. 2].

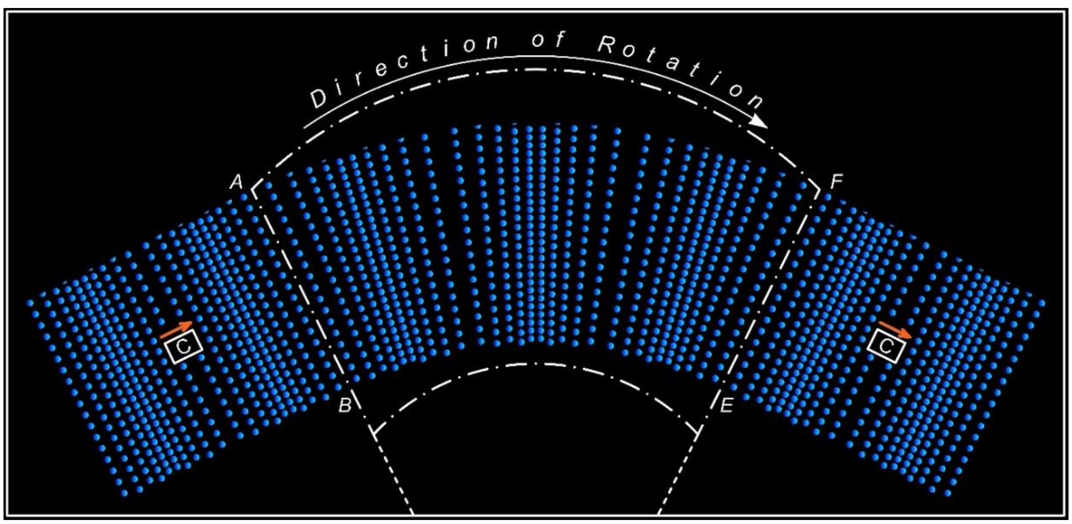

Fig. 2. Influence on the propagation of light in the ABEF region per the rotation motion of an external magnet and illustrating how this influence guides the direction of travel in a manner that is imperfect and correlated by the strength of the magnet.

First, it can be noted how light travelling unhindered with speed (C) enters the boundary AB, which marks the beginning of the boundary of the ABEF region under rotational magnetic influence. Upon entering this region, light takes a curved pathway via varying spacings between the M particles and ultimately exits along the FE boundary. The Figure shows an increase in the spacing of M particles in the ABEF region. The spacing increases more significantly near the outer edges of the light wave, particularly closer to the AF curvature, as compared to the increase in the spacing of M particles near the BE curvature.

In other words, the wavelength of light at the outer edges increases more so than at the inner edges of the ABEF region. In addition to this, the effect from the magnetic influence is not such that the particles reposition perfectly along the rotational curvatures like AF or BE as one may expect. In fact, what would occur is that the magnetic influence is only affected to a degree correlated to its strength or value. Light takes a path that is simply only guided by the magnetic curvature's influence and is curved rather slightly less so than the perfect curvature of pathway in the ABEF region. This is as the initial momentum of light combined with the magnetic influence produce a path of travel as per [Fig. 2]. The intensity of light increases after the EF boundary due to the increase in momentums of M particles, and it does so more so for the particles closer to the F than those that are nearer to E.

Per the above theoretical frameworks, a series of experiments were designed with the intention of testing and validating the above criteria and concepts as described. The details of these experiments, the manner by which they were conducted, the results, as well as their analyses are outlined in the following sections.

3. Experiment

The experimental equipment consisted of a Rotary Magnet Accelerator (RMA), and a Light System Apparatus (LSA). These experimental setups are detailed as follows.

3.1. Rotary Magnet Accelerator (RMA)

The purpose of the design and manufacturing of an RMA was to accelerate and decelerate M particles by accelerating and decelerating a series of magnets in a rotary manner. [Fig. 3] shows a rotary magnet accelerator. If the magnets rotate around a central axis, then M particles are displaced and will rotate accordingly.

Fig. 3. An RMA machine with two rotary disks in parallel and rotating in sync with one another. The disks within each boxed section contain magnets assembled in a circular manner evenly at a distance of 23 cm from the axis of rotation.

RMA was designed to have two rotary disks with a diameter of 50 cm. Each disk had 24 permanent magnets with the total of 48 magnets mounted on two disks [Fig. 4 (a, b)]. The disks could rotate in two opposite rotations by a coupled shaft to an electric motor with the specification of 4 kW and 1,435 rpm. They could rotate in the same direction as that of the light propagation, 'lightwise' (LW), or rotate in the opposite direction 'counter-lightwise' (CLW). RMA was equipped by a brake to decelerate the rotational speed after the machine gained its maximum speed and as the power was turned off to control the rate of deceleration. The magnets were mounted equidistant from each other and on each disk at a radius of 23 cm from the central rotational axis. Both disks were assembled and mounted to a shaft, which was able to rotate the two disks together with the same rotational speed as that of the electric motor.

Fig. 4. a) Display of one of the two disks in the experiment illustrating the arrangement of 24 magnetics in a circular manner, b) the same with the magnetics facing away and showing the back of the disk, c) and a close-up of the several magnets facing one another in the actual configuration used in these experiments with the two disks.

Each magnet was mounted on each disk at exactly opposite to the corresponding magnet on the other disk. All magnets were oriented and mounted on the disks with their poles in the same directions. For example, the (S) poles of all magnets on one disk were oriented towards (N) poles of the other disk's magnets [Fig. 4 (c)]. The distance between any two magnets on each of the two corresponding disks was 8 cm. This distance was considered and designed with the spacing required for the placement of the LSA.

To minimize the vibrational effects of RMA to the LSA, the following actions were taken. First, the electric motor, which was coupled to the disks by a shaft, was mounted about 1 meter apart from the magnetic disks and the LSA to avoid the magnetic and vibrational effects of the motor on the LSA. Second, prior to the assembling the machine, both disks with the mounted magnets were mechanically balanced. Third, to prevent the vibrational effect of the RMA on the light beam system, the machine was placed on a damping material. Fourth, each of the two disks and the rotary system were covered with metal boxes on five sides, which were surrounded by foam to prevent errors caused by air movement and internal vibrations from the rotary system [Fig. 5].

Fig. 5. Illustration of the foam system used to cover the metal boxes surrounding the rotatory disks in the experiments, the purpose of which was to avoid the effects of any errors as caused by the movement of air from the rotation of disks and internal vibrations of the system.

Fifth, adjacent to each magnet disks, with the sides facing one another, these were covered by glass, polycarbonate or pure iron sheets for each experiment accordingly. Sixth, to minimize any vibrational effects from the motor itself, it was exclusively operated in the 'star configuration.' And finally, a few bags filled with sand were placed on the side and on the top of the accelerator to increase the weight of RMA in order to minimize any vibrations from the machine itself.

In these experiments, the effects of the rotating magnets on light after the machine achieved its maximum speed and the electric motor was turned off were also studied. After turning off the motor, the speed of the rotating magnetic disks gradually slowed down from maximum to zero. During this time, there would be no electric or magnetic vibration effects caused by the motor on the system and if the results of the experiments for this time be invers with the time that machine accelerate, then it would be a confirmation of the results.

3.2. Light System Apparatus (LSA)

For studying the effects of rotary magnets sets on M particles and, ultimately, on light, several light apparatuses were designed and utilized. Light apparatus consisted of an 8 mm thick flat glass and a mounting frame with a laser beam system. For all experiments, two light beams were generated using a laser source with the wavelength of 532 nm. The configuration of beams and setup of light apparatus were in such a way that one of the beams or both of them were affected by the rotary magnet set. On a case-by-case basis by arrangement a series of prisms and mirrors, the two beams were directed towards two separate paths in the opposite directions with respect to each other and eventually they were directed toward a double-slit and ultimately to a screen to produce an interference pattern. The shifts of the fringes of interference on the screen located at roughly 6-7 m from the accelerator were measured. The support structure of LSA was independent of the accelerator and its structure. The base of the structure of LSA which was placed on the ground on a damping material was about 2 meters from each side of the accelerator. In this paper only four kinds with their specific designs of LSA are presented and the results of these experiments are explained and analyzed.

3.3. First Experiment

3.3.1. Design of the Light System Apparatus

In the initial LSA setup, the system shown as per [Fig. 6] was arranged and experimented with. The entire setup was surrounded and covered on all sides by glass sheets so as to avoid any interference from air movement.

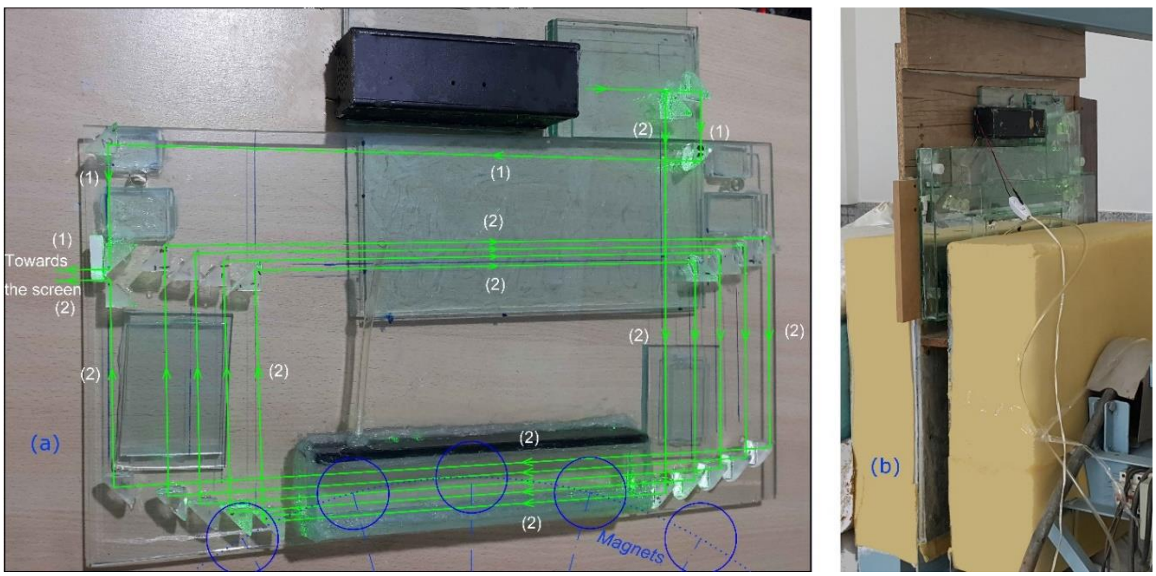

Fig. 6. a) pathways (1) and (2) illustrating the travel from a laser beam emitter and its redirection via various setups of prisms and through a final double-slit towards a display screen, b) the LSA embedded within the RMA, illustrating the combined experimental setup which also included the magnetic disks and their surrounding boxes covered with foams.

As can be seen in [Fig. 6 (a)], the laser beam from an emitting source took two separate pathways to create an interference pattern on a screen. In the case of pathway (1), the laser beam was directed towards a prism which directed light to three other prisms and which ultimately resulted in the routing of it through a slit and towards the interference screen. Pathway (2) directed the incoming beam towards multiple other prisms as shown in Figure. These other prisms were configured so as to direct the laser beam through a glass chamber under magnetic influence as can be seen. The purpose was to study the effects, if any, of the adjustment of this chamber's internal pressure anywhere from the ambient pressure down to 6-8 mmHg. The setup was so as to direct the laser beam five times in total through this chamber. The magnetic influence that this system was subjected was outlined in [Fig. 6(a)] and shown photographically in [Fig.6(b)]. This magnetic influence was via the magnets affixed to the disks rotating adjacent to this system and positioned on both sides of the hollow vacuum chamber as per the Figure. After the laser beam passed through the chamber for the fifth time, it was directed to two additional prisms and then through a slit, ultimately projecting onto the screen to produce an interference pattern. Finally, the interference pattern was studied and the results are presented as follows.

3.3.2. Results

Through numerous trials and under various conditions and parameters, whenever the RMA was activated and their disks with the affixed magnets began to rotate, the results consistently demonstrated that the fringes of the interference pattern on the screen shifted toward pathway (2). This indicated that pathway (2) took a longer time to reach the screen as when compared to pathway (1). It was also observed that when the accelerator was turned off, and either the brake was applied or the system itself gradually slowed down without braking, the fringes gradually returned to their original position. This shifting effect was evident in both LW and CLW cases, but it was more pronounced in the CLW case.

3.4. Second Experiment

3.4.1. Design of the Light System Apparatus

Another arrangement of the Light System Apparatus was implemented by generating two light beams from a light beam emitter. The generated beams, upon emission, were directed along curvature pathways at a radius of 23 cm, utilizing a system of prisms and mirrors [Fig. 7].

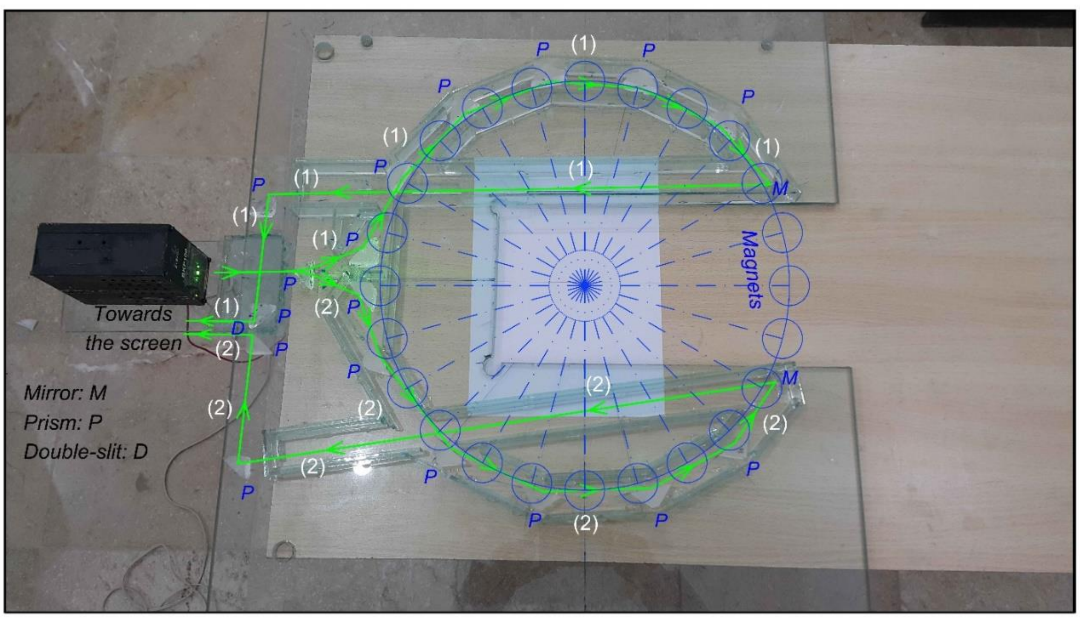

Fig. 7. Experimental setup of two beams from an emitted illustrating their distinct paths of travel in a hollow glass enclosure in preparation for the positioning of this system in a rotary magnetic accelerator. The positions of the prisms (P), mirrors (M) and the double slit (D) are highlighted in this photo.

The beams followed semicircular trajectories adjacent to the rotary magnets, with one beam traveling along one side of the circular pathway while the other was directed to the opposite side. Upon completion of the curved pathways, the beams were further redirected by other mirrors and prisms. The final end pathways of both beams were directed to be projected onto a screen. The design was such that as the RMA rotated, the direction of rotary magnets is lightwise for one beam and counter lightwise for the other.

A number of prisms and mirrors were arranged on an 8mm-thick glass base sheet and utilized to guide the beams along the 23 cm radius as per the arrangement of the magnets per [Fig. 7]. To position this system into the RMA machine, an adequately sized cut was made in the base glass, allowing to be placed correctly in its final configuration. Various other glass pieces were cut and positioned to form a hollow chamber via which the beams could travel within. This entire assembly was then encompassed by other glass fragments to create a fully sealed system.

As per the prior setups, this hollow chamber was vacuumed down to a pressure of 6-8 mm Hg. Pathways (1) and (2), as shown in [Fig. 7], were redirected and led to follow two different paths, each of which were equal in the total distanced travelled from the beam emitter. As changes in atmospheric pressure and temperature can influence the speed of light, this was crucial to maintaining the validity of the experimental results.

3.4.2. Results

In various pressure ranges, free-floating or enclosed systems, and in the two directions (LW or CLW) and experimented over several days, there were no noticeable shifts in the fringes of interference patterns that were observed. The only exception to this experiment was noted at approximately 1390-1430 rpm, where it was observed that there is a breakdown in the interreference pattern and that there is an apparent momentary reversal of the crests and the troughs.

3.5. Third Experiment

3.5.1. Design of the Light System Apparatus

Another iteration of the circular arrangement of the LSA was designed with the arranging of the configuration of the beam of light this time in such a way that only one of the two paths was under magnetic influence. As can be seen in [Fig. 8], the emitted light beam was directed by a mirror at an opposite end of the frame and the reflected path, designated as path (1), was again redirected by other mirrors outside the area of magnetic influence to a prism and towards a screen. This was the control beam. In contrast, the exiting beam path (2) from the prism positioned at the corner of the frame was such that this light beam was reflected off of mirrors arranged carefully inside a hollow framework of a vacuum chamber that was constructed of glass and of pure ironclad pieces that conjoined together on both sides. The arrangement, as shown in [Fig. 8], was such that this second beam of path (2) then exited this hollow framework via other mirrors placed at the sides and corners and then exited towards the double-slit and on to the screen. The measurements that the framework was constructed on was identical to that presented for the second experiment (e.g., 8mm glass sheet). As prior, the total length travelled by either paths (1) and (2) were identical to each other in the total distance travelled. The experimental consequence was that both beams were made to emit back towards the double-slit at a position significantly above the location of the beam emitter.

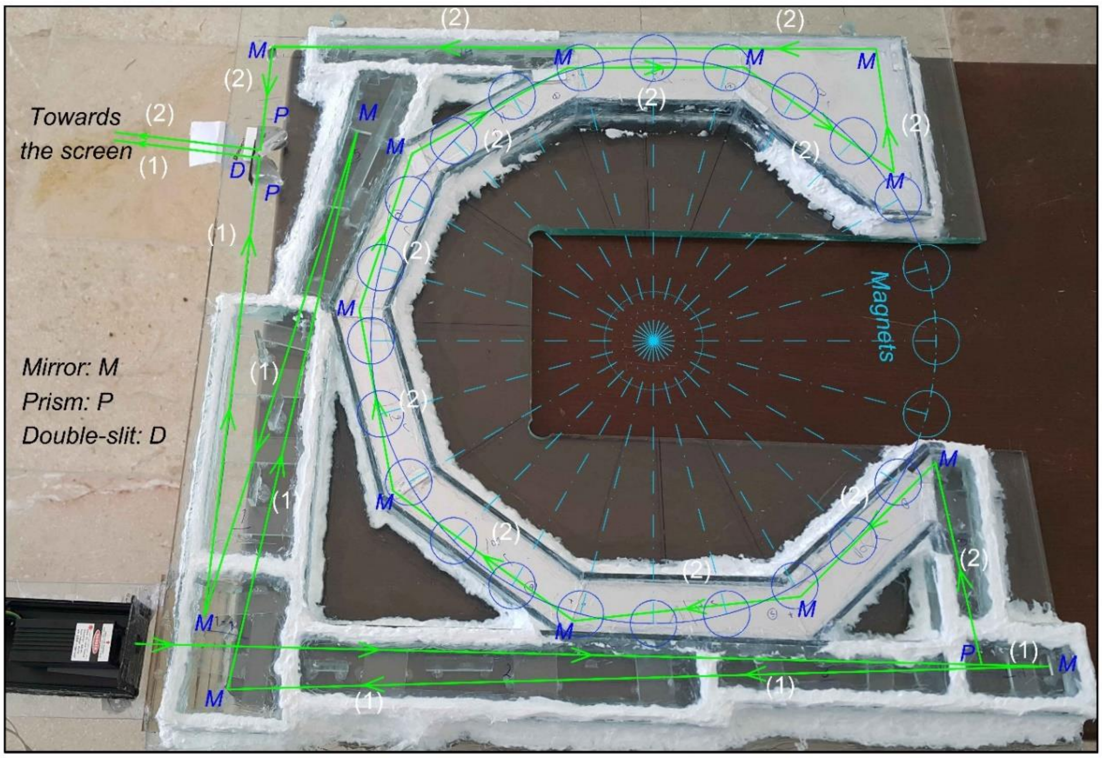

Fig. 8. The design and arrangement of the LSA for the third experiment, demonstrating Pathways (1) and (2). Both pathways travelled in a chamber, where Pathway (2) was directed along a circular pathway under magnetic influence. This was designed such that the total distance travelled by this Pathway (2) was identical to that to the control Pathway (1).

3.5.2. Results

Under various temperature and pressure conditions and even utilizing various setups of the double-slits, the results of the experiment was such that the fringes of the interference pattern on the screen shifted toward pathway (2) (i.e., upwards). This indicated that pathway (2) took a longer time to reach the screen as when compared to pathway (1). It was also observed that when the accelerator was turned off, and either the brake was applied or the system itself gradually slowed down without braking, the fringes gradually returned to their original position. Additionally, the degree of the shift in the interference pattern on the screen was more pronounced in the direction of the CLW orientation of the accelerator than in the LW case.

3.6. Fourth Experiment

3.6.1. Design of the Light System Apparatus

In the fourth and final iteration of the experiment, rather than creating another vacuuming chamber it was thought to use optical fiber cables to study the effect of rotary magnets on light. This setup was the same as Experiment 1, with the only difference being that fiber optics were utilized to allow for easier and practical turns of the light beam.

In this experiment, two optical cables of varying lengths were utilized. The arrangement was in a manner that the light from the laser source could simultaneously be carried by both cables. One fiber optic cable was arranged to pass the beam 50 turns about a series of magnetics along a straight path. This beam from the optical cable was then finally directed to one of the slits in a double-slit, which was then projected on towards the screen. Simultaneously, the light beam from the other fiber optic cable was directed to other slit and also projected on the screen, allowing the study of the shifts in the interference pattern.

3.6.2. Results

Under all conditions, the result of the experiment either in the LW or CLW directions from a starting position up to 700-800 rpm of the RMA was such that there was no apparent change in the fringes of the interference pattern on the screen. Above this speed, this pattern was observed to have collapsed.

3.7. Effects of the rotary magnets on light

1. **Movement Effect** ($\boldsymbol{E_m}$) - First effect as discussed above, involves the change in the speed of light along with its wavelength due to the movement of M particles directly as caused by the magnets. This involves the displacement of the waves which increases or decreases the speed of light directly and accordingly with the movement of the magnets relative to the direction of light. This is while there is a secondary effect which increases or decreases the distance between the M particles themselves, which results in a simultaneous slight reduction or slight increase in the speed of light. The overall effect is a modest increase in the speed of light in the case that the direction of movement of the magnets are in the same direction as that of light. In contrast, if the direction of the movement of magnetics is in the opposite direction, there is a correspondingly decrease.

2. **Vibration Effect** ($\boldsymbol{E_v}$) - There are twofold manifestations of vibrations on the M particles in the experiments. The first is that of a vibrational effect from the initial application of the magnets on the M particles in the affected region. The reason for this vibration is the non-uniform magnetic influences on M particles. Due to the arrangements of the magnets on the disks, there are varying levels of magnetic influence along the path of light travel. The second manifestation is that, since the

magnetic influence is not applied uniformly due to the rotational aspect of the experiment, this causes secondary vibrations on the system. The overall effect is that there are more vibration and this causes a reduction in the speed of light.

3. **Curvature Effect** $(\boldsymbol{E_c})$ - Due to the rotational motion of the magnets and per the influence of these magnets along a curvature, the momentums will not be conveyed and transferred along a perfectly straight path. What will ensue, instead, is a curved pathway where light travels in a curved manner as per [Fig. 9], illustrating here only one possible scenario. This means that the total distance that the momentum of light has to travel increases and thus, solely considering this effect, light will reach the end of the pathway at a lengthier time than at the direct straight pathway. This means that we will detect light at a later time. Considering, for instance, that the magnetic influence is in the region ABEF of [Fig. 9], one can compare the straight path of light travel from point (1) to point (2) under no magnetic influence to the curved path illustrated in this Figure.

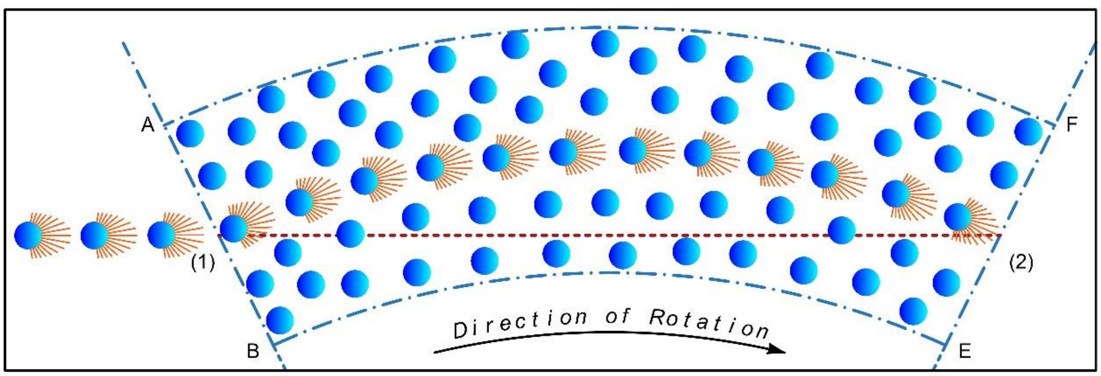

Fig. 9. Curved pathway of light by and through M particles in the ABEF region due to an external magnetic influence on this region and the increase in the distance of travel along the curvature in comparison to the straight pathway illustrated via line 1-2 under no magnetic influence.

4. **Rotation Effect** $(\boldsymbol{E_r})$ - As per the experiment, the magnets are rotating along a central axis and thus affect the M particles accordingly. The effect is such that in the affected regions, the M particles are thrown outward and apart continuously from one another. In other words, they were spaced apart due to the applications of the magnets in such a way that this causes an overall increase in the distance between the M particles. This means that, since the M particles are spaced farther apart from one another the speed of light will theoretically reduce**.**

If considering the Rotation Effect (E_r) with the Curve Effect (E_c), the result is as per [Fig. 10], an illustration of the modified pathway of light travel under magnetic influence with the rotational outward motion of M particles.

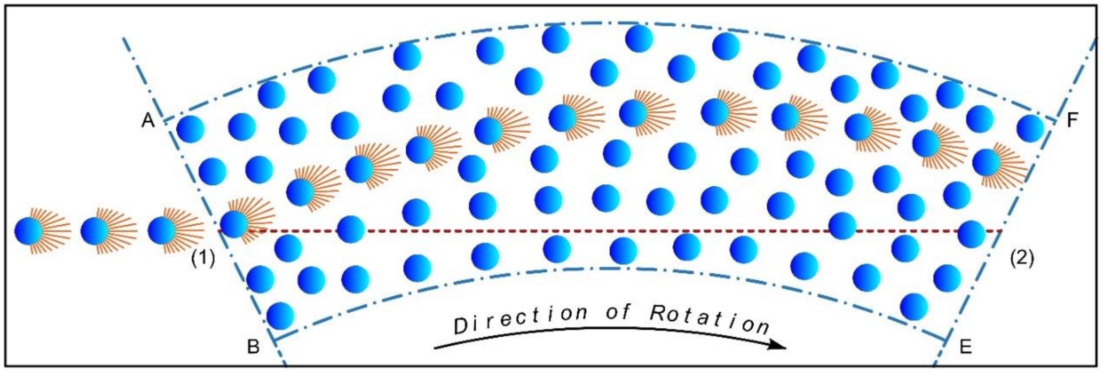

Fig. 10. the combination of curvature and rotation effects is illustrated in this figure and shows the corrected pathway from [Fig. 9], when also considering the outward rotation effect of the M particles in the ABEF magnetic region.

3.8. Analyses

3.8.1. Analysis of the first experiment

The results of the experiment have provided compelling support to the theoretical framework presented for the propagation and behavior of light. The observed consistent shift of the interreference fringes towards pathway (2) when the Rotating Magnet Apparatus was activated, confirms that the required time for light to travel along this pathway has increased as compared to pathway (1). This observation is in agreement with the expected outcomes from the presented theoretical framework on the various presented effects that influence the propagation of light. A breakdown of the influence of these factors can be provided as per the below:

Movement Effect ($\mathbf{E_m}$)

The observed shift was apparent in both the lightwise (LW) and the counter lightwise (CLW) cases, with a more prominent effect in the CLW case. This demonstrates the contributing influence of the movement effect, which would be expected to increase the speed of light in the LW direction while decreasing it in the CLW direction. In observing the greater shift that was present in the CLW case indicates that (E_m) affected a noticeable reduction in the speed of light in pathway (2), thereby increasing the delay.

Vibration Effect ($\mathbf{E_v}$)

Despite the fact that the experiment itself did not directly measure the speed of light, the consistent shift towards pathway (2) implies that the vibration effect may have been a contributory factor in the reduction of light's speed along this pathway. Since the theoretical framework posits that (E_v) would always decrease the speed of light, it is reasonable to assess that the vibrations caused by the rotating magnets had a contribution to the propagation of light such that this caused further delay along pathway (2).

Curvature Effect (E_c) and Rotation Effect (Er)

In further study the shifting of the fringes towards pathway (2), it can be assessed that light along this pathway was subjected to additional time delays due to the curve and rotational effects. Per the study along the pathway influenced by the rotating disks, these effects would have a more prominent effect as to cause light to reach the screen at a later time due to their inherent nature to cause delays. The observation of the shift of the fringes towards path (2) further confirms that these effects played a contributory role in lengthening the travel time of the light beam.

Combined Effects

The combined effects from (E_m), (E_v), (E_c), and (E_r), appear to have had a cumulative effect to increase the total time required for light to travels along pathway (2), and most prominently under the CLW case. The gradual return of fringes to their baseline positions upon the slow down of the RMA further supports this interpretation. This baseline return implies that the effects of the rotary magnets on the speed of light and total time travelled are reversable and are closely related to the observed changes in the fringes of the interference pattern.

Conclusion of the first experiment

The experimental results above can be summarized to have validated the theoretical framework presented earlier regarding the effects of movement, vibration, curvature, and rotation on the propagating of light. The observed consistent shift towards pathway (2) underlies the importance of these effects, with the greatest prominent impact being observed under the CLW conditions which underscores the significance of the movement effect.

3.8.2. Analysis of the second experiment

The idea behind the design for the second apparatus was to have the system in such a way that the vibration, curvature and rotation effects were identical for both beams, while having the movement effect being setup to be opposite for each. Consequently, this arrangement allows for the isolation and accurate observation of the (E_m), effect in the absence of the contribution from the other effects. The reason for this is that since the two beams traveled equal semicircular trajectories, the effects of vibration, curvature, and rotation cancel out, leaving only the movement effect impacted. The interpretations of the results of this experiment are outlined as follows:

Lack of Noticeable Shifts

The non-observance of any shifts in the interference patterns may imply that the movement effects, as presented by the earlier theoretical framework, may not be detected due to the following factors:

1. **Insufficient Magnitude of the Movement Effect:** The movement effect does not possess sufficient magnitude to be capable of causing a detectable shift in the light pathways. The parameters and the conditions of the experiment may have been below the threshold needed to produce a considerably observable change in the interference pattern.

2. **Experimental Sensitivity:** The sensitivity of the apparatus to detect small changes in the speed or direction of light may not have been sufficient. Despite the presence of the movement effect, the detection methodology may not have been adequate to be capable of capturing the subtle shifts.

Momentary Reversal of Crests and Troughs

The observed reversal of the crests and troughs that occurs momentarily in the interference pattern at the 1390-1430 rpm is an intriguing observation that merits further study. Despite the fact that the exact cause behind this phenomenon is not readily apparent, several hypotheses may be considered:

1. **Spatial/Distinct Arrangements of the Apparatus Relative to the Rotary Magnets:** The spatial arrangement of the magnets or apparatus components and their relative positioning may lead to specific interaction at the mentioned rotation speeds, and this causes the temporarily observed reversal in the interference pattern.

2. **Distinct Behavior of M Particles at Specific Speeds:** Distinct behaviors may be exhibited by M particles at certain specific speeds of the rotating magnets. These behaviors may influence and affect how momentums are transferred and conveyed via M particles and may be responsible for the temporary reversal of crests and troughs as per what is observed.

3. **Mechanical Vibration and Resonance Phenomenon:** As the rotational speed increases, mechanical vibrations within the apparatus might amplify, introducing disturbances that momentarily may alter the light's trajectory. In addition, the observed reversal in the interference pattern could be due to a resonance effect that unfolds in the system at the specified rpm. At the 1390-1430 rpm, it may be the case that either the apparatus itself or the rotary magnets experience a resonance frequency which causes a disturbance to the interference pattern. This disturbance can manifest as a reversal of the crests and troughs.

4. **Nonlinear Effects:** Complex phase shifts may momentarily reverse the interference pattern due to the nonlinear interactions that the light beams have at the higher rotation speed of the rotary magnets.

5. **Increased Travel Time Due to Vibration, Curvature, and Rotation**: As the speed of the accelerator increased, the combined effects of vibration, curvature, and rotation may cause that the two beams took lengthier time to reach the screen. This increasing in travel time could shift the positions of the crests and troughs toward the middle of the interference pattern, leading to the observed reversal of the crests and troughs.

Conclusion of the second experiment

The absence of any noticeable shifts in the interference pattern fringes indicates that the movement effect (E_m) may have been too subtle to detect under the given parameters for sensitivity and the associated experimental conditions. The sudden reversal of the crests and troughs at a specific rotation speed may be attributed to one or more of the following factors: a specific spatial arrangement within the system, distinct behavior of M particles, mechanical vibrations and resonance, nonlinear, and increasing travel time. As such, further experimentation with equipment featuring enhanced sensitivity and a broader range of experimental parameters is needed to fully understand these phenomena and isolate each cause of the observed effect.

3.8.3. Analysis of the third experiment

The third experiment and its results shed further insight into magnetic and rotational effects on the propagation of light. By a setup where only one of the pathways (i.e., pathway 2) was under magnetic influence, the aim of the experiment was to isolate and observe the specific effects of these conditions on the speed and behavior of light. The consistent shift of the interference fringes towards pathway (2) indicates that light along this pathway underwent a lengthier time as compared to the control pathway (1) to reach the screen and produce the pattern. Considering that pathway (2) is the only pathway subject to magnetic influence, the observed shift can be credited due to magnetic influence with the associated mentioned effects within the vacuum chamber.

Movement Effect

The more pronounced shift observed in the counter lightwise (CLW) direction of the accelerator's orientation as compared to its lightwise (LW) direction underlies the role of the movement effect. This effect is conjectured to have caused a speed of light reduction in the CLW orientation, which likely added to the observed delay along pathway (2).

Vibration, Curvature, and Rotation Effects

Despite the experiment being conducted under various conditions including varying temperature ranges and pressure parameters, the results consistently showed a shift of the interference pattern fringes toward pathway (2). This consistency across various setups and external environmental conditions implies that vibration, curvature, and rotation effects played a major role in increasing the travel time along pathway (2). The utilization of ironclad components may have enhanced these effects, leading to further redirection of light and speed alterations which may have affected to additional delay in the arrival time of light on the screen.

Reversibility of the Effects

The observation that the interference fringes gradually returned to their original starting positions upon the turning off of the accelerator and having it slowed down, provides for a strong indication that the magnetic and rotation effects are reversible. This reversibility in itself also indicates that the light delay in propagation is directly correlated to the conditions along pathway (2) and are not permanent effects on light's properties.

Conclusion of the third experiment

The impact of magnetic influences and rotational effects on the speed of light is highlighted in the third experiment. The observed upward shift of the interference pattern fringes towards pathway

(2) underscores the pronounced effect of the magnetic and rotational conditions along this path. In addition, the prominent shift in the CLW orientation further appears to confirm the dominant impact of the movement effect. Along with this observation, consistent results along various experimental and parametric conditions illustrate the roles of the vibration, curvature, and rotation effects. The results in such a controlled environment as per the vacuum chamber further the understanding of external influences and their impact on the modulation of the behavior of light.

3.8.4. Analysis of the fourth experiment

From the start up to 700-800 rpm, no observable changes were seen in the fringes of the interference pattern, regardless of whether the light was traveling in the lightwise (LW) or counter-lightwise (CLW) direction. Considering that the experimental setup included 50 turns of the fiber optic cable, this would have provided a sufficient length of cable under the influence of the magnets to produce any observable effects. Therefore, no effects acted on the light within this speed range. The collapse of the interference pattern above these speeds may be attributed to mechanical vibrations.

The conjectured reason for the lack of any change in the light propagation is that light transfers via M particles. In the previous experiments, light traveled through free space and the M particles were able to move freely, allowing for various effects (i.e., movement, vibration, curvature, and rotation) to disturb the speed and/or direction of light. However, in this experiment, the M particles are confined within the structure of the cable. This limitation inhibits their ability to move freely, ultimately inhibiting any of the external effects to influencing the speed of light or its direction. As such, no alteration in the light interference pattern was observed, which led to the deduction that the fiber optic cable effectively isolated the light from the influences that were present in the other experimental setups.

This result indicates that the medium through which light travels plays a crucial role in its behavior and shows how external factors can influence it. This highlights the importance of considering the medium when analyzing light's behavior under various experimental conditions.

Final Analysis and Conclusion of the experiments

Through a series of experiments, a comprehensive understanding of the effects of movement, vibration, curvature, and rotation on the propagation of light under various experimental conditions has been attained. Notably, the first and third experiments led to observable shifts in the interference patterns, highlighting that these effects can significantly impact the behavior of light when subjected to magnetic influences. The second experiment, highlighted that the movement effect may be too subtle to detect under certain experimental conditions. In addition, the temporary reversal of the interference pattern revealed the presence of further complex phenomena. The fourth and final experiment underscored the critical role of the medium in which light travels and demonstrated that fiber optics can effectively isolate light from external influences, shielding it from changes in speed or direction. Overall, considering these four experiments together, it can be deduced that there is a necessity for more accurate experimental conditions and mediums to fully capture and comprehend the various factors that may affect light's propagation.

4. Future Work

This study holds promising results and can be the basis for additional work in this field, which can include designing and conducting experiments with more advanced RMA's and LSA's to further explore their applications. Future work could also focus on exploring the potential for altering the speed of light using a Linear Magnet Accelerator (LMA) based on the findings of this study. Unlike the Rotary Magnet Accelerator (RMA) used in the above experiments, the LMA would employ a series of magnets mounted in two parallel lines to create distinct magnetic effects, which is conjectured to influence light propagation in a straight path. The results are projected to be more accurate since there would be no curvature and rotation effects on the system. This new approach would provide further insights into the effects of moving magnets on the speed of light, potentially unveiling additional mechanisms for modulating the speed of light. As such, via a comparative analysis between the influences of RMA and LMA on speed of light, it is plausible to attain a more comprehensive understanding of the fundamental principles governing this phenomenon. The purpose of such an experiment would be to broaden the theoretical framework and empirical foundation, thereby challenging the traditional understanding of the nature of light and its propagation.

To protect the originality of this idea, the author will develop and document further details in preparation for designing and validating the experiments.

5. Conclusion

This study was conducted with the objective of exploring the feasibility of altering the speed of light in a vacuum via a Rotary Magnet Accelerator (RMA). The RMA was designed to generate dynamic magnetic effects capable of influencing light propagation by leveraging principles taken from MM Theory. As such, this study provided new empirical evidence that questions the traditionally upheld notion of a constant speed of light in a vacuum.

It was shown that the speed and direction of light can indeed be altered by the dynamic magnetic effects produced by an RMA, as demonstrated by the experimental results in this paper. These findings present exciting possibilities for further investigation into the mechanisms behind this phenomenon and show promise for broader implications in physics. The discoveries in this paper carry significant ramifications for theoretical physics and additionally hold practical applications, extending into cosmology and astrophysics and providing fresh insights into the behavior of the universe.

Beyond theoretical significance, this research has practical technological implications such as the enhancement of data transmission speeds and innovative optical computing methods. Furthermore, within cosmology and astrophysics domains, the reality that the speed of light is indeed not constant leads to novel models and implications regarding cosmic phenomena, enriching our understanding of fundamental processes in the universe.

In summary, in opening up new avenues for scientific exploration and technological innovation, this study marks a milestone advancement in physics and demonstrates how dynamic magnetic effects can affect the speed of light in a vacuum. Further research is necessary to fully comprehend the underlying mechanisms and to harness this phenomenon for practical purposes, however, its transformative potential is evident. Additionally, the proposed future areas of research with the Linear Magnet Accelerator offers exciting prospects for further advancing our understanding and capabilities via the manipulation of the speed of light. Finally, this work challenges longstanding assumptions held within special and general relativity theories and paves the way for discoveries that can fundamentally alter our comprehension of light, cosmos dynamics, and the underlying behavior and fabric of the universe.

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Conflict of Interest

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6. References

[1] A. Einstein, "On the Electrodynamics of Moving Bodies," *Annalen der Physik,* vol. 322, no. 10, pp. 891-921, 1905, https://doi.org/10.1002/andp.19053221004.

[2] J. C. Maxwell, "A dynamical theory of the electromagnetic field," *Philosophical Transactions of the Royal Society of London,* vol. 155, pp. 459-512, 1865, https://doi.org/10.1098/rstl.1865.0008.

[3] R. W. Boyd, "Material slow light and structural slow light: similarities and differences for nonlinear optics," *Journal of the Optical Society of America B,* vol. 28, pp. A38-A44, 2011, https://doi.org/10.1364/JOSAB.28.000A38.

[4] R. W. Boyd, "Nonlinear Optics," Academic Press, 2003, p. 578.

[5] L. H. S. D. Z. e. a. Hau, "Light speed reduction to 17 metres per second in an ultracold atomic gas," *Nature,* vol. 397, p. 594–598, 1999, https://doi.org/10.1038/17561.

[6] L. K. A. &. D. A. Wang, "Gain-assisted superluminal light propagation," *Nature,* vol. 406, p. 277–279, 2000, https://doi.org/10.1038/35018520.

[7] M. Mahvelati, "The MM Theory - The Theory of Everything - Part (1)," 2021-2022-2023. [Online]. Available: https://vixra.org/abs/2106.0130.