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Verification of the Validity of Relativity Principle

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Abstract: *Galileo's relativity principle could be verified, as it included mechanical phenomena only. Einstein included electromagnetic phenomena also under relativity principle. But Einstein's relativity principle could not be verified scientifically. This is because of the immense speed of light, which do not allow the contemporary measurement techniques, to avail a readable result. Hence, the relativity principle remains a postulate, ie. a basic assumption which is beyond the scope of experimental verification. But here is a solution for the problem. Using the earth as a frame of reference, the experiment can be conducted successfully. The validity of relativity principle can be fixed.*

Keywords: *electromagnetic phenomena, frame of reference, light, postulate, relativity principle, validity, verification.*

I. Introduction

Galilieo's relativity principle included only mechanical phenomena. Einstein generalized the principle, by including electromagnetic phenomena, including light. Since the speed of light is immense, the validity of the principle with regard to light could not be verified scientifically. Hence, the principle remains a postulate. In this paper, a suitable method for verifying the validity of relativity principle, with regard to light is proposed.

II. Galelio's Relativity Principle

The hypothesis that mechanical phenomena occur identically in all inertial frames is called Galileo's relativity principle, This hypothesis was first put forth by Galileo, and hence the name. This principle is otherwise called classical relativity principle. If we drop a material object, from the ceiling of a cabin at rest, it will follow a straight down path, towards the floor. The movement of the material object will not make any difference, as observed by a man stationed inside the cabin, even if the cabin is in motion at any speed, provided the speed is uniform. Hence he will not be able to determine the speed of the cabin, by performing any experiment, from within the cabin. Galileo had established the validity of his theory by conducting an experiment namely the 'ship's mast experiment'. Galileo's relativity principle included only mechanical phenomena, and not any other phenomena like electromagnetic events.

III. Einstein's Relativity Principle

Einstein generalized the relativity principle to include electromagnetic phenomena, including light. Then he used the principle as one of the two postulates to build up the special theory of relativity. But the validity of the principle with regard to light has not been verified scientifically, apart from the fact that, certain experimental results agreed with the principle. This is because of the immense speed of light, which do not permit, the contemporary measurement techniques, to avail a readable result. Hence the relativity principle, remains a postulate, ie. a basic assumption which is beyond the scope of experimental verification.

IV. The Insufficiency Of Contemporary Measurement Techniques

The validity of relativity principle with regard to mechanical events can be verified by dropping an object from the top of a cabin, or any vehicle, while at rest and in motion and by observing the difference in paths followed by the object. This is how the ship's mast experiment was conducted. Since the mechanical events are comparatively slow, readable and accurate results can be obtained with this type of contemporary measurement techniques.

But, in the case of electromagnetic events, with such simple experiments where the speed of the cabin is very low, and the distance to be travelled by light is very short, a readable and accurate result cannot be expected. The observer will not be able to distinguish the difference between the paths of light, while the cabin is at rest and while in motion. If we want to verify scientifically the validity of relativity principle with regard to light, we have to avail a suitable frame of reference with very high speed and larger height or width perpendicular to its motion, to accommodate with the immense speed of light, so that a readable result can be obtained. Unfortunately there is no such manmade frames available. The best one available may be a space ship, which also is not sufficient to give a readable result.

V. Solution To The Problem

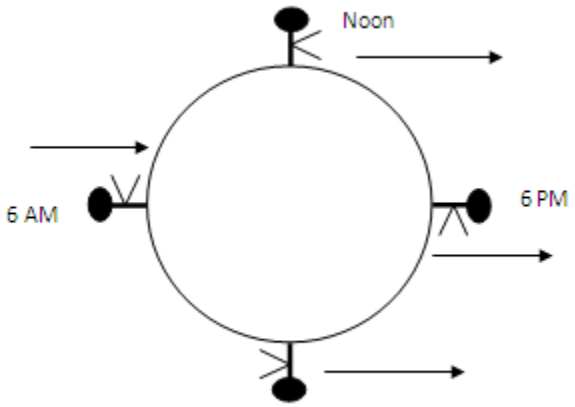
Here I am to suggest a new experiment which I think will be capable of solving the problem. Instead of any manmade frame, in this experiment we are using the earth as the frame of reference.

The earth undergoes dual type of movement, namely, the spinning movement on its own axis and the revolving movement around the sun. Comparing with the revolving movement, the speed of spinning movement is negligible. But Making use of these two types of movements of the earth, an experiment can be designed, to get a readable result through which, the validity of the relativity principle can be fixed. All that we want is a large ground, having enough space in the North- South direction, say 10 kilometers.

V.1 The Experiment

Imagine an observer standing on the surface of the earth, facing east or west. The following statements will come true for him (see diagram-1)

1. For the observer, the movement of the earth around the sun will be in opposite directions during noon and midnight.
2. During noon and midnight, the earth's movement around the sun will be perpendicular to his vertical position.
3. The observer's position will be Perpendicular to the surface of the earth, round the clock.
4. At 6AM and 6PM, the movement of the earth around the sun will be parallel to the vertical position of the observer.



[Diagram -1]

All these things happen due to the dual type of movement of the earth.

Now, we may select a suitable point, at one end of the ground (northern or southern end) and a meter stick having two meters length is fixed there vertically. All the statements applicable to the observer will be applicable to the meter stick also. Then arrange a continuous, and fixed source of light at the other end of the ground at a distance of say, 10 kilometers from the meter stick. Pin holes must be arranged intermittently, between the source of light and the meter stick in such a way that, the rays of light, from the source pass through all the pin holes, to fall at the middle point of the meter stick. All these arrangements must be done, at noon.

Then, without making any changes to the experimental arrangements, observations may be made during various hours of the day.

Now there are two possibilities namely.

1) The light rays to obey Einstein's relativity principle. If this is true, the light rays from the source will pass through all the pinholes and fall on the middle point of the meter stick round the clock (See Diagram No. 2)

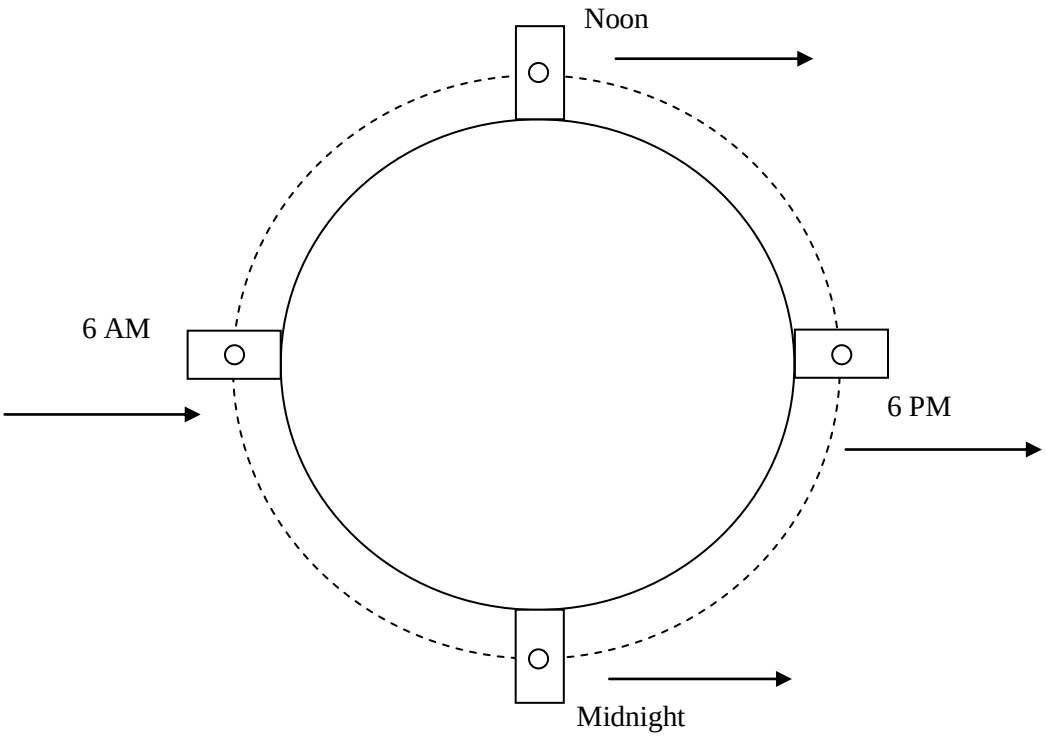


Diagram No. 2 : The dotted line represents the space around the earth, where the light rays from the source fall round the clock, if relativity principle is valid.

2) The light rays not to obey Einstein's relativity principle. In this case, within a short time after noon, the light rays from the source will be blocked, and will not fall on the meter stick (see diagram No. 3)

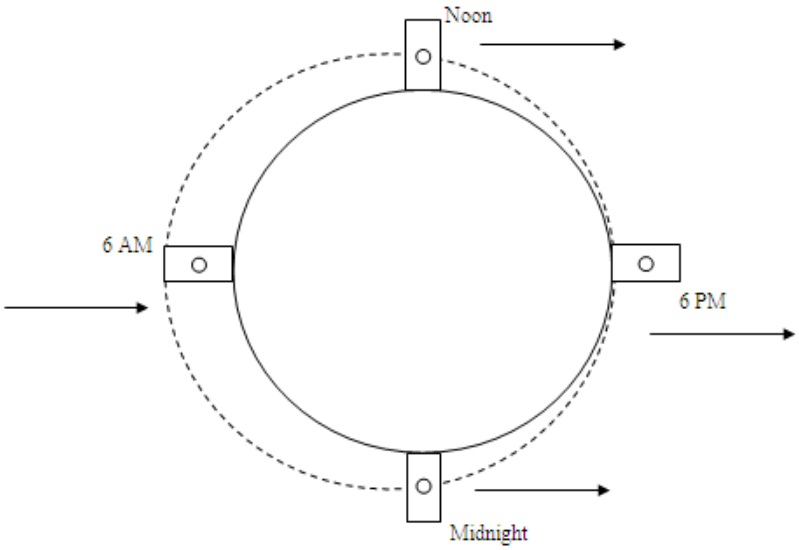


Diagram No.3 The dotted line represents the space around earth where the light rays fall round the clock. The light rays fall at the midpoint of the meter stick only at noon, and at midnight. The diagram is self explanatory.

The above experiment will give readable results since the frame of reference used is very large and has comparatively higher speed.

VI. Conclusion

The physicists, have almost dropped the task of verifying the validity of relativity principle with regard to light, due to the lack of suitable methods of experiments. The suggested experiment will be a perfect solution to the problem. If the experiment is conducted in a proper way, one cannot get away without obtaining a clear

answer - either Positive or negative - to the problem. Once the validity is fixed, the principle can either be upgraded or discarded; there will be no need to maintain the principle as a postulate any more. The existence of Einstein's special theory of relativity also can be fixed doubtlessly.

Acknowledgement

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Books

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