

Speed of light

Preparatory questions

1. Describe the function and operation of each of the following components of the apparatus:
 - a. Half wave plate
 - b. Acousto-Optic modulator
 - c. Cube beam splitter
 - d. Time interval counter
2. It was thought in the 1800's that the frame-independence of the speed of light predicted by Maxwell's equations should be interpreted as the speed with reference to the *ether*, a mythical medium supporting the propagation of electro-magnetic waves. Assuming that the average speed of the earth with respect to the ether is $v = 30$ km/s estimate the minimum accuracy for measuring the speed of light in order to detect the motion of the earth through the ether. (It was not possible to detect differences in the speed of light accurately enough to do these experiments convincingly until late in the 1800's).
3. Estimate the accuracy of the measurement of the speed of light in this experiment. Is it sufficient to detect the presence of ether?
4. Does wave-nature of light play a role in this experiment? If yes explain how. If not discuss under what circumstance will the finite wavelength of light become important.