CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
J1504

Project Title
The Power of Colored Light

Abstract

Objectives/Goals
The objective of this experiment is to determine which color filter will make the radiometer spin the fastest.

Methods/Materials
To conduct this experiment, I will be using a radiometer, different color filters, a laser, a photo-diode, an electrical filter, and an oscilloscope. The radiometer will spin in proportion to the amount of light that reaches it. The radiometer spins because the light hitting the internal vanes is heating them up unevenly (the black side absorbs more than the white). The more the light, the faster the radiometer spins.
To conduct this experiment, all the equipment must be powered on. The filter to be tested is inserted into the filter holder. The oscilloscope measures the time between pulses which is the time of ¼ revolution. The speed of the radiometer can be calculated by the formula
Speed = 60/4 x Trace Length x time base unit /1000

Results
The experiment showed that the red filter made the radiometer spin the fastest. Each of the graphs had great variation. In some of the trials, the red filter caused the radiometer to spin the fastest. While in other trials, the red filter had the slowest spin. The blue filter was one of the slowest but it caused the least variation in spin rate.

Conclusions/Discussion
In conclusion, my hypothesis was incorrect. The Medium Red filter made the radiometer spin the fastest. The Red filter spin the fastest because it allowed more infra-red light through than ultra-violet light. The output of the radiometer had a lot of variation. The trace on the oscilloscope bounced around. The radiometer was not very sensitive. It took a 100-watt light bulb to make the radiometer turn so that the oscilloscope could show the trace.
Some uncontrolled variables are: the radiometer seems to change speed with temperature, the friction of the radiometer vanes spinning on a needle, and the light source does not have the same light output level for every color.

Summary Statement
What color of light will make the radiometer spin the fastest.

Help Received
I'd like to thank my father for helping me build the light trap box for the radiometer and showing me how to use the oscilloscope. A thanks to Edmund Scientifics, where I purchased the radiometer and colored filters. Finally, a thank you to The Optical Society of San Diego for providing a helium-neon laser.