

TSAAPT

Texas Section of the American Association of Physics Teachers

Connecting physics teachers in the state of Texas

Solar Cell IR and Visible Light Detector

What's going on?

Visible light is only a small fraction of the total electromagnetic spectrum yet we tend to only focus on what we see. Using a remote control, a solar cell, and an amplifier allows us to detect something invisible to us. The remote control is producing IR that is invisible to your eye. However, when it hits the solar cell it produces a current that flows into the amplifier and produces a sound.

Procedure

1. Connect the solar cell to the alligator clips and plug the other end of the alligator clip wire into the “input” hole on the mini amplifier. Make sure the solar cell is facing up flat on the table. Turn the volume up on the amplifier. Place your hand over the solar cell. What happens? (The amplifier is making a humming sound because the ceiling fluorescent lights are actually turning on and off 60 times a second. This is too fast for your eyes to notice but can be heard as the voltage provided by the solar cell to the amplifier rises and falls 60 times a second. When this light is blocked the sound stops)
2. Point the remote control at the solar cell. Press any button and then adjust the volume on the amplifier so it is not too loud. Based on your observations, does the solar cell detect something coming from the remote? Do your eyes detect anything coming from the remote?
3. Place objects such as clear plastic bags, paper towels, etc over the solar cell (one at a time) and determine if the ceiling light is passing through and/or the IR from the remote can pass through. You may need to adjust the volume to hear the ceiling light hum. Record your observations in a data table.
4. Astronomers have difficulty learning about the center of our galaxy because the light from the stars and objects is blocked by interstellar dust. If they want to study IR being produced by galaxies and other objects in the universe they will need to build IR telescopes. Telescopes use mirrors and lenses to collect and concentrate light. An IR telescope will only work if IR reflects from mirrors and refracts (bends) when it passes through the glass in a lens. Use a mirror to try and reflect the signal from the remote to the solar cell. Can a mirror reflect IR? Can you reflect IR around a corner to the solar cell?
5. Hold a mirror about 12 inches above the solar cell. Press a button and hold it. Record your observations.
6. Place a magnifying lens about halfway between the solar cell and the remote. Record your observations. What happened to the loudness of the sound coming from the amplifier when the magnifying lens is placed in the path? Is there a place other than the halfway point where it gets the loudest