

## *PocketLab Voyager: Inverse Square Law of Light—Quick and Easy*

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Virtually every student of physics has done an experiment to verify the *inverse square law of light*—*light intensity is inversely proportional to the square of the distance from the source of the light*. With PocketLab Voyager this is a quick and easy experiment that is also a lot of fun to perform!

All you need to do is set up a light bulb close to a wall. If you are using an iPhone with the PocketLab app, simply use some double-stick tape and tape Voyager to the back of the iPhone. Use two-graph mode in the PocketLab app and select the *Light Intensity* and *Rangefinder* sensors. Hold the iPhone in your hands with the PocketLab sensors centered about 10 to 15 cm from the light. Then over a period of about 10 seconds, gradually move away from the light until you are about 2 meters from the light. Using the PocketLab video option, you can record a video with the two graphs superimposed. Figure 1 shows a snapshot of the author's screen after recording the video. A link to the video is also included for those wishing to view it. It is *not* necessary to move at a constant speed away from the light, but doing so as well as you can makes the range finder graph look linear. In the meantime, the light intensity graph clearly indicates some kind of an inverse power relationship to distance.

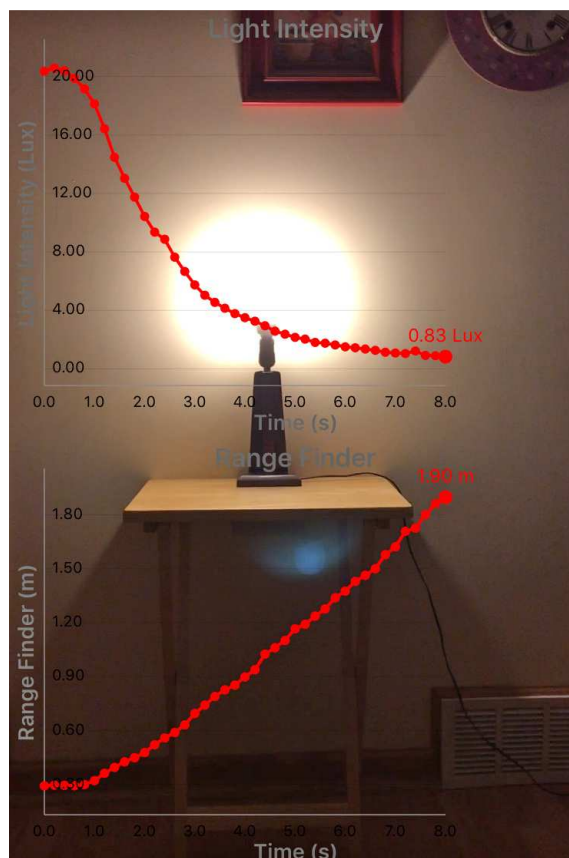


Figure 1

The csv file created by the PocketLab app was exported and opened in Excel. The graph of light intensity vs. distance shown in Figure 2 was then constructed. Several of the initial data points, when Voyager was very close to the light source, were eliminated from the analysis since the size of the light bulb meant that the source was far from being a point source of light. The further from the light, the more the light source approximated a point light source.

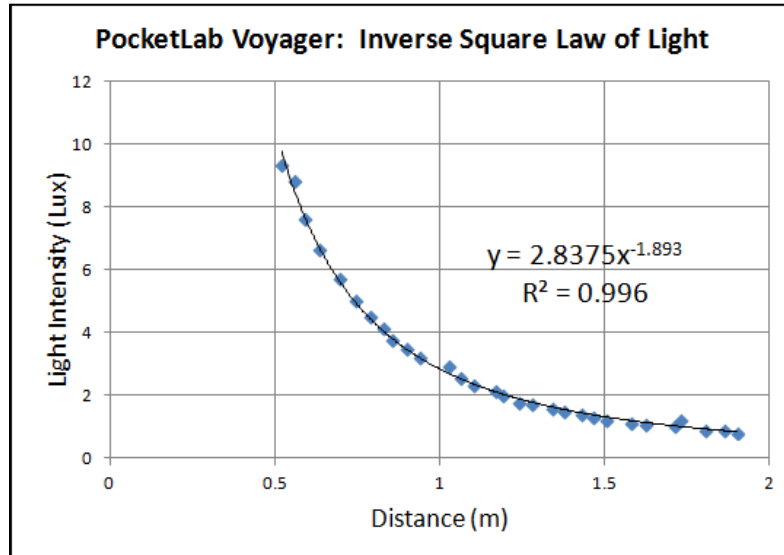


Figure 2

Excel's "Add Trendline" feature was used, and "Power" was selected as the regression type. The resulting power is -1.893, which is reasonably close to the power 2 that would be expected for an inverse square relationship between light intensity and distance.

*Note: The light intensity values (shown in Lux) are about 50 times lower than the actual values. This is due to the fact that this experiment was done during Voyager's development, prior to the calibration of the light sensor.*