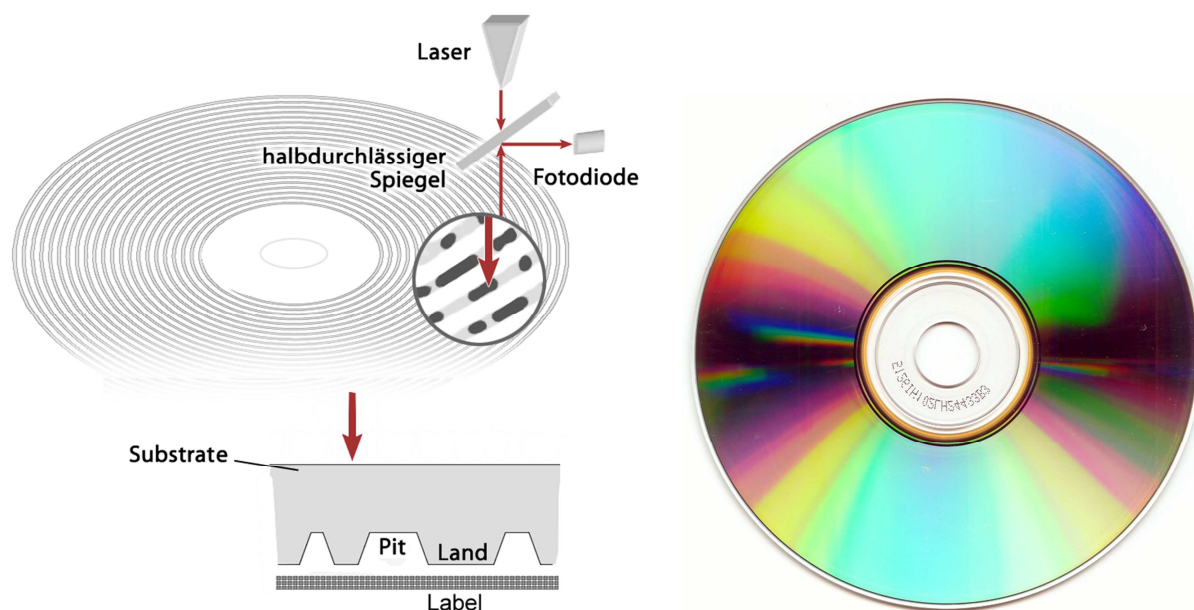


Extra Credit Laboratory Experiment

Measuring Pitch Using Diffraction Orders

As we have seen in our discussion on diffraction, an array of lines and spaces illuminated by a monochromatic plane wave leads to a diffraction pattern made up of discrete diffraction orders. In this lab, you will use your understanding of this diffraction phenomenon to measure the pitch of the data grooves found on a compact disc (CD), DVD, or Blu-ray disc.



(Images from Wikimedia Commons)

Compact discs and DVDs record data as a series of pits formed in a polycarbonate substrate that are then coated with aluminum to make a reflective surface that can be read with a focused laser. The pits are formed in circular grooves with a set pitch. It is the goal of this experiment to measure the pitch of those grooves.

Part 1: Using a laser pointer (be sure to read the laser pointer safety sheet first), reflect the laser off the polycarbonate side of the disc in such a way that the diffraction pattern can be seen on a wall or screen. The beam is small enough that the circular grooves are essentially straight in the illuminated area, but big enough that a large number of grooves are illuminated. By measuring the spacing between diffraction orders, calculate the pitch of disc. It is important to think about the geometry carefully.

Part 2: Repeat the above experiment using a different color laser pointer on the same disc, and/or using a different disc type (for example, CD versus DVD).

Write up a short lab report with your findings (be sure to make uncertainty estimates for the results!).