# Diffraction Grating

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January 17, 2024

**Aim**

In this experiment we first find the distance between slits ina diffraction grating first using a LASER of known wavelength. Then we use that data to calculate the wavelength of another LASER using the previously calculated slit spacing.

## 1 Theory

Diffraction is the phenomenon where the wave bends around corners while interference is the phenomenon where two or more waves meet and interact. The name diffraction grating is a misnomer as the the phenomenon we see here is just N-slit interference rather than diffraction. What essentially we have here is a bunch of very small slits spaced at a distance $d$ to find which is the aim of our experiment.

Now we come to the phenomenon of interference. There are some important conditions that have to be met for interference to occur, a concept called Coherence. Physically, it represents the ability of a wave two waves to interfere. Coherence dictates visibility in the interference pattern. Interference requires the interfering waves to be coherent, something that can be achieved by having a constant phase relative phase difference between the interfering waves. Now keeping a broader discussion of coherence, we proceed to the nice mathematics that lies behind interference. We will take an approach that is purely geometric in nature(Thanks Morin)

### 1.1 N-slit interference

First we have to address how to write a wave mathematically. A very general way is to use complex exponentials, which takes care of the fact that it includes both the sine and the cosine components of a wave.