**Experiment 6: Interference Fringes and Newton’s Rings**

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**Abstract**

Interference patterns are observed when coherent light is split and a portion is forced to travel a different distance such that it reconverges at a relative phase difference. Using this fact, and a set of optical flats, which are separated by a strand of hair we determine that the width of a hair is \_\_\_. The radius of a glass surface is also calculated to be \_\_\_ from measurements taken to characterize interference observed as newton rings.

**Introduction**

The electric and magnetic field oscillations that light waves are made of undergo one full oscillation at a distance known as its wavelength. This characteristic distance is what makes one color different from another, and it plays a role in understanding interference patterns.

When waves, or their wave-fronts, cross paths, the field strength at any position where they both exist is described as the sum of their constituent fields—a concept known as superposition. In this way, waves interfere with each other: when they negate each other, they are said to be in destructive interference, and when their strengths build on each other it is said to be constructive. It’s necessary to note that these kinds of measurements require the waves to be coherent with each other, their relative phases do not shift for reasons other than a difference in path. If their fields are oscillating at different frequencies—their wavelengths differ—then the phase of one will slip relative to another and their interference will evolve differently.

Optical flats are blocks of glass with reflective surfaces being smooth to about , where lambda is the wavelength. However, as these are still not perfectly flat. This fact allows us to observe an interference pattern when placing one on top of the other. In this configuration, a very thin layer of air gets wedged in-between the two flats. As light travels through the top flat, a portion gets reflected upwards while the remaining continues across the airgap only to get reflected itself before making the trip back up then along-side the first portion. Of the two light waves, the second travels an extra distance of . Where C is a constant due to a pi shift or dust on either surface.

*Picture of wedge*

Placing a strand of hair between two flats raises one edge of the top flat, creating a wedge of air much like before but where the height of the wedge increases to the thickness of said hair. Where we measure the distance from where the plates make contact to the location of the hair, and can make a reasonable estimate of the distance between the plates by calculating the optical path difference using the same equation as before. Then with x and theta, known, the hairs thickness d can be estimated using the assumption that the angle is small enough to make the approximation sin(theta)=theta.

With a convex curved surface against a flat, there is a single point of contact which, creates a special type of interference pattern known as Newton’s Rings. The concept with these patterns is the same as the others, however it’s rings are

**Analysis & Discussion**

**Conclusion**