The Quantum Erasure Experiment

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Step-Wise Approach to Quantum erasure:

1. Michelson Interferometer.


3. Quantum erasure.
Starting with Michelson Interferometer

Working and theory

Measurement of Laser’s wavelength

Measurement of refractive index of glass
Measuring the Measured!

Measuring wavelength of laser light is quite a easy-to-do task.

Happy Wavelength Finding Recipe:

1. Start servo in sequence mode.
2. Count the number of fringes against the move.
3. Put the measurements in the formula.

Happy wavelength found 😊
Graph between No. of Fringes and Distance Moved

\[ y = 3.2 \times 10^6 x + 0.12 \]

Result

\[ \lambda = 28.5 \text{ nm} \]
Guessing, Counting, Recounting Fringes

• The measurement of refractive index of glass with the help of Michelson Interferometer is a delicate and painstaking task**

• **(if you seriously want to measure theta from -30 to +30 degrees)
The curve desire...
Mach-Zehnder Interferometer (MZI)

- Working and theory.
- Setup
- Refractive index measurements
- Reasoning between the refractive index measurements
- Intensity pattern recording and description of utility of the tools used for this purpose
Behind the scenes; Unveiling the MZI paradox monster

The Quantum mechanically working of MZI actually, I mean to say...
Building up MZI (not to be confused with UZI)

Setup
Some more photographs
The Fringe Pattern!
Reviving memories of Refractive Index with MZI
### Measuring Refractive Index of Glass using Mach-Zehnder Interferometer

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<th>Sr.</th>
<th>Initial Angle</th>
<th>Final Angle</th>
<th>Difference (θ)</th>
<th>θ in Radians</th>
<th>No of Fringes</th>
<th>Refractive Index</th>
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### Parameters
- t = 0.00102 meters
- 2t = 0.00204 meters
- Wavelength = 0.000000633 meters

\[ y = 2.5x + 8.8571 \]

Mean = 1.52
St. dev = 0.02
Keeping Record of Tracks; Some photographs
Quantum Erasure

Use of polarizers and their purpose.
• How photons are marked and unmarked?
• How it is a delayed choice experiment?
• What are the outcomes of when this is done?
• Procedure of performing this experiment.
• Intensity variation pattern when P4 is rotated
• Interpretation and explanation of results in Quantum language.
The Good, The Bad and the Ugly Photons

• What are Marked and Unmarked Photons?
Forgetting to Remember; The Delayed Choice Experiment
Checking if it Really works
Thank you