

Quantum Mechanics
Physics 237
 Frank L. H. Wolfs
 Department of Physics and Astronomy
 University of Rochester

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 1

1


Course Announcements

- **Recitations have started this week:**
 - I asked the TAs to keep track of attendance. It is one indication of how much effort you put into this course.
- **Solutions to homework # 1 are now posted on the PHY 237 website. You need to use the username and password distributed via email to access the restricted pages of the website.**
- **Homework # 2 is due on Friday (at noon, 12 pm EST, 12:00 EST).**
- **Details of the office hours can be found on the PHY 237 website.**


Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 2

2

Impact of eruptions can be felt around the world.



A satellite image of the Hunga Tonga-Hunga Ha'apai volcano on Jan. 6, before the eruption, as it was sending up steam plumes and gases. Maxar Technologies

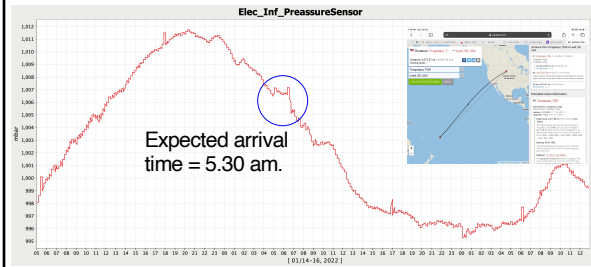


A satellite image of the volcano on Tuesday, after the eruption. Hunga Tonga has been a source of simmering fear for years. Maxar Technologies

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 3

3

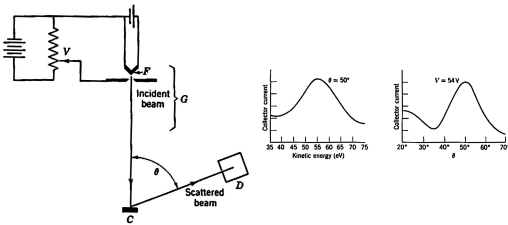
Distance Tonga – Lead (SD) = 10,260 km.
Travel time = 8 hours 22 min.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 4

4

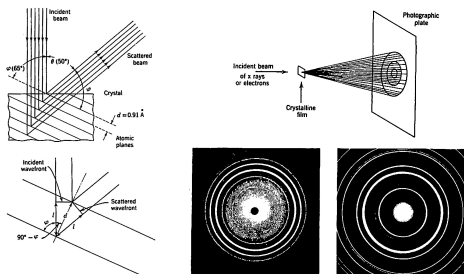
Electron Diffraction



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 5

5

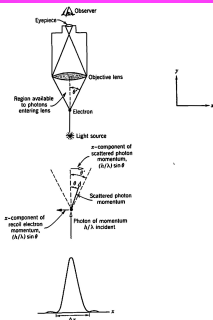
Electron Diffraction.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 6

6

Measuring Position.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 7

7



4 Minute 29 Second Intermission.

• Since paying attention for 1 hour and 15 minutes is hard when the topic is physics, let's take a 4 minute 29 second intermission.

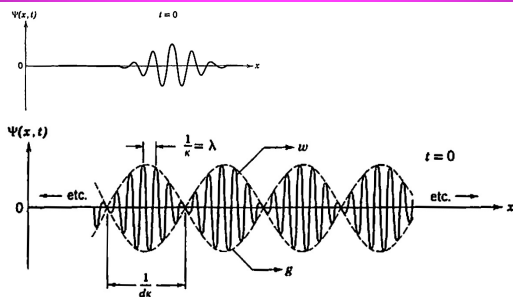
- You can:
 - Stretch out.
 - Talk to your neighbors.
 - Ask me a quick question.
 - Enjoy the fantastic music.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 8

8

Describing a Particle in terms of Waves. Different Velocities.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 9

9

Adding waves to form a particle.

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 10

10

Add two matter waves with equal amplitude. $(\kappa, v) = (1 \text{ m}^{-1}, 1 \text{ s}^{-1}) + (1.05 \text{ m}^{-1}, 1.05 \text{ s}^{-1})$

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 11

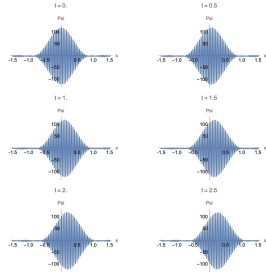
11

Add 201 matter waves with equal amplitude. $(\kappa, v) = (19 \text{ m}^{-1}, 0.9 \text{ s}^{-1}) + \dots + (21 \text{ m}^{-1}, 1.1 \text{ s}^{-1})$

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 12

12

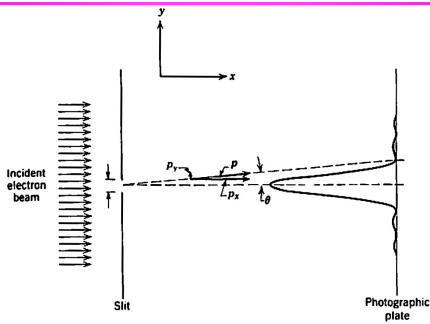
Add 201 matter waves with Gaussian amplitude.
 $(\kappa, \nu) = (19 \text{ m}^{-1}, 0.9 \text{ s}^{-1}) + \dots + (21 \text{ m}^{-1}, 1.1 \text{ s}^{-1})$



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 13

13

Electron Diffraction.



Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 14

14

ENOUGH FOR TODAY?

Frank L. H. Wolfs Department of Physics and Astronomy, University of Rochester, , Lecture 4, Page 15

15
