

Core practical 6: Determine the speed of sound in air using a 2-beam oscilloscope, signal generator, speaker and microphone

Objective

- To use appropriate instrumentation to measure a sound signal

Safety

- The electromotive forces are small and electric currents negligible.
- The sound should not need to be so loud that any discomfort is felt.
- Follow the usual electrical precautions for mains apparatus including a visual inspection of the supply lead.

Specification links

- Practical techniques 1, 3, 8, 9
- CPAC 2a, 2d, 4a

Notes on procedure

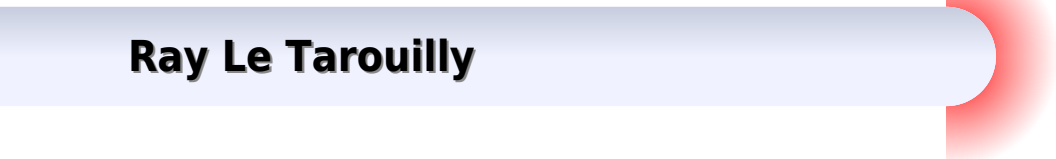
- This experiment is reasonably straightforward for students familiar with manipulating the controls of an oscilloscope. Time will need to be devoted to training them to set up a trace from which they can take measurements.
- Since the set up depends on the local circumstances this is something of an investigation and the students should be encouraged to try things out for themselves using the instructions as a framework.

Procedure

- The oscilloscope will display on two traces the signal fed to the loudspeaker and the signal received by the microphone. As the distance between the microphone and the speaker is increased, the phase of the signals varies and the traces on the screen move past each other.
- Place the microphone next to the oscilloscope and place the speaker about 50 cm away, facing the microphone. Turn on the signal generator and set it to about 4 kHz. Adjust the oscilloscope to show the microphone signal with about three cycles on the screen.
- Connect the signal generator output to the second oscilloscope input (as well as the speaker) and adjust the controls to display three cycles of this signal.
- Adjust the spacing on the screen and the distance between the speaker and microphone so that the bottom of one trace is just level with the top of the other.
- Adjust the separation so that a trough on the top trace exactly coincides with a peak on the lower trace. Place the metre ruler alongside the microphone and speaker and record the distance between the microphone and speaker.
- Move the speaker away from the microphone and observe one trace sliding over the other. Move the speaker so that the trace has moved exactly one cycle. The troughs and peaks should just touch again. Record the new distance between the microphone and speaker. The difference between the two distances is one wavelength.
- Continue to move the speaker away from the microphone and record each successive distance where the peaks of one trace coincide with the troughs of the other.
- Calculate a mean value for the wavelength of the sound and estimate the uncertainty in this measurement.
- Use one of the traces to determine the frequency of the sound. You will achieve a greater resolution this way than using the scale on the signal generator. Estimate the uncertainty in this measurement. You should be able to measure the frequency to three significant figures and the wavelength to at least two.
- Using the scale on the signal generator, halve the frequency and repeat the measurements for frequency and wavelength. You might need to increase the separation beyond 1 m.
- You might try this experiment at much higher and lower frequencies to observe the effect.

Technician Physics Level

Ray Le Tarouilly



Technician Physics Level :

NUREG/CR. U.S. Nuclear Regulatory Commission,1982 **Technician Physics** Eric Deeson,1984 **Technician Physics Level 1** Eric Deeson,1983 **Quantum (Un)speakables** R.A. Bertlmann,A. Zeilinger,2013-11-11 issues raised by quantum theory a topic not very popular during his student days at Queen s University Belfast Apparently John Bell who had been interested in the Bohr Einstein dialogue always took the position of Albert Einstein on philosophical issues He also felt that a completion of quantum mechanics using so called hidden variables would be highly desired as it would help to regain a realistic and objective picture of the world That way Bell hoped one would be able to arrive at a physics where measurement would not play such a central role as in the Copenhagen interpretation of quantum mechanics Then a most interesting sequence of events set in In 1952 David Bohm had achieved something which had earlier been proclaimed impossible It had been proved by John von Neumann that no hidden variable theory could agree with quantum mechanics Bohm actually formulated such a theory where each particle at any time has both a well defined position and a well defined momentum The conflict raised between von Neumann and Bohm was elegantly resolved by Bell who showed that von Neumann s proof contained a physically unjustifiable assumption So while John Bell had flung open the door widely for hidden variable theories he immediately dealt them a major blow In 1964 in his celebrated paper On the Einstein Podolsky Rosen Paradox he showed that any hidden variable theory which obeys Einstein s requirement of locality i e *Choose the right A levels* Ray Le Tarouilly,2017-11-03 Selecting the right A levels is more important than ever in helping you shape your future path whether through securing a place at your ideal university or starting out on your chosen career But with such a huge variety of subject options and combinations on offer where do you begin and indeed what are the right choices In truth what s right is what s best for you and any decisions you make about your future should therefore be informed and personal to you to ensure you find the perfect match to suit your own individual interests skills and learning style Giving you all the knowledge you need at your fingertips to support you in making these important decisions Choose the Right A levels is your one stop source of practical information answering key questions such as What does the course outline look like and how is the subject assessed What key skills does the subject draw on and develop Which subjects are preferred or required for certain degree courses and careers What will I need at GCSE to study the subject and how does the subject compare to GCSE What subjects combine well together This comprehensive and impartial guide also features comparative data on national pass rates for each subject and insightful student case studies on what did and didn t work well for others Written by an expert Careers Adviser and laid out in a simple format for ease of use this accessible guide is your essential aid to navigating the wide range of subject options available and making the best choices for you and your future Inorganic Chemistry for Higher Education John Brockington,Peter Stamper,1983 *Occupational Outlook Handbook* ,2004 *Bulletin of the United States Bureau of Labor Statistics* ,1998 **New Scientist** ,1969 *Radiation Data and Reports* ,1971

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Table of Contents Technician Physics Level

1. Understanding the eBook Technician Physics Level
 - The Rise of Digital Reading Technician Physics Level
 - Advantages of eBooks Over Traditional Books
2. Identifying Technician Physics Level
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Technician Physics Level
 - User-Friendly Interface
4. Exploring eBook Recommendations from Technician Physics Level
 - Personalized Recommendations
 - Technician Physics Level User Reviews and Ratings
 - Technician Physics Level and Bestseller Lists
5. Accessing Technician Physics Level Free and Paid eBooks
 - Technician Physics Level Public Domain eBooks
 - Technician Physics Level eBook Subscription Services
 - Technician Physics Level Budget-Friendly Options
6. Navigating Technician Physics Level eBook Formats

- ePub, PDF, MOBI, and More
- Technician Physics Level Compatibility with Devices
- Technician Physics Level Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Technician Physics Level
 - Highlighting and Note-Taking Technician Physics Level
 - Interactive Elements Technician Physics Level
- 8. Staying Engaged with Technician Physics Level
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Technician Physics Level
- 9. Balancing eBooks and Physical Books Technician Physics Level
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Technician Physics Level
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Technician Physics Level
 - Setting Reading Goals Technician Physics Level
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Technician Physics Level
 - Fact-Checking eBook Content of Technician Physics Level
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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