General Physics Laboratory I

Week 06: Report Guideline

Experiment 6. Resonance Tube

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General Report Guideline

1. You can use either Korean or English.
2. I suggest you to write a report with a language with which you can write rigorously. (There is no need to be shy about writing in Korean)
3. However, do not mix two languages. (ex: newton's law는 다음과 같이… → X)
4. No more than 5 pages. The font size must be greater than 9 pts.
5. Only *.doc, *.docx, *.hwp extensions are allowed.
6. Do not make a cover page.
7. **Do not repeat the details in the manual.**
8. Make the report simple but it should contain rigorous answers. / **You should merge different data in one plot.**
9. **If you suggest the origin of the error, please show your systematic justification. (No explanation → No points)**
10. You have to cite every source of theory and information beyond the manual.
11. Clarify a theme and a purpose of each part.

6. Resonance Tube

1. Abstract (5pts, < 300 words)
2. Introduction (10pts): Show your conceptual understanding about the subject.

Wave Equation: $\frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2}$

3. Theoretical Background (15pts)
   - ✓ (2pts) Show that y = A sin (ωt - kx) satisfies wave equation. The derivative in the equation is partial derivative. What is 'y' in the sound waves?
   - ✓ (1pts) Give the relationship between wave velocity (v), angular frequency (ω), wave number (k), coefficient (c), and mass (m).
   - ✓ (5pts) Explain about the opened and closed boundary conditions in terms of energy dissipation. (Think about sound wave oscillation at the boundaries)
   - ✓ (5pts) Explain why standing wave make resonance in the experiment. Give a resonant wavelength condition for both boundary conditions.
   - ✓ (2pts) Explain and give the equation of speed of sound (v) in terms of temperature. Reference is necessary.

$$v(T) = 331.38\, m/s \sqrt{\frac{T_{air,Kelvin}}{273.16\, K}}$$

4. Methods (5pts)
5. Results (15pts)
   - ✓ (5pts) Exp 1: Calculate the expected resonant frequencies (f) using the v(T) and the length of tubes. → Calculate v from the frequency data
   - ✓ (5pts) Exp 2: Count numbers of node and anti-node in each case. → Calculate wavelengths (1) using the distance data and (2) using v(T) and f data.
   - ✓ (5pts) Exp 3: Calculate wavelengths using the v(T). → Calculate ratio between tube lengths and wavelengths.
6. Discussion (30pts)
   - ✓ (5pts) Exp 1: Why two resonant frequencies or two speeds of sound are different? (5pts) Describe your theory and justify it systematically.
   - ✓ (5pts) Exp 2: Discuss about two kinds of wavelengths and speeds of sound (5pts) Describe your theory about the error and justify it systematically.
   - ✓ (5pts) Exp 3: Why the ratios are not integers or half integers? (5pts) Describe your theory and justify it systematically.
   - ✓ (Additional) Discuss about your own question and analysis.
7. Conclusion (10pts): Summarize the report effectively.
8. References (10pts)