Physics 112: Standing Waves Lab

Purpose: To analyze standing waves and their properties in a known string.

Part 1: Changing the Tension on the String (fixed length)

- Place a mass on the holder (max of 300 g). The tension, T = total mass in kg x 9.81.
- Record the length of the string, in metres, that will be vibrated.
- Turn on the power source.
- Slowly increase the voltage until you observe f_1.
- Note: You may not observe the fundamental frequency in this part as it is a low voltage; if you do not you can calculate it from your data.
- Continue increasing the voltage until standing waves are observed and record the voltage at each harmonic.
- Double the total mass and repeat.

Part 2: Changing the Length of the String (fixed tension)

- Increase the length of the vibrating string and repeat the experiment using your initial total mass from Part 1.

Calculations

- Enter your data into Excel (the formulas and graphs are pre-programmed).

Discussion Questions

1. What effect did increasing tension have on the harmonic frequency?
2. What effect did decreasing the length of the spring have on the harmonic frequency?
3. What combination of tension and length gives rise to the lowest harmonic frequencies? Highest?
4. Does the data support the theory that each harmonic is an integer multiple of the fundamental frequency (f_1), support your answer?
5. What is the rate of frequency increase (of the machine) as voltage is increased?
6. What voltage and frequency is necessary to see the 10^{th} harmonic for each part?
7. When you doubled the tension, by what factor did the frequency change?

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Part 1a: Tension, T (N) = _____ L (m) = _____ Part 2a: Tension, T (N) = _____ L (m) = _____

Part 1b: Tension, T (N) = _____ L (m) = _____ Part 2b: Tension, T (N) = _____ L (m) = _____

Part 1a

Harmonic (N)	V (volts)
1	
2	
3	
4	
5	
6	
7	
8	

Part 1b

Harmonic (N)	V (volts)
1	
2	
3	
4	
5	
6	
7	
8	

Part 2a

Harmonic (N)	V (volts)
1	
2	
3	
4	
5	
6	
7	

Part 2b

Harmonic (N)	V (volts)
1	
2	
3	
4	
5	
6	