

Experiment #12 Waves Pre-lab Questions

**** Disclaimer: This pre-lab is *not* to be copied, in whole or in part, unless a proper reference is made as to the source. (It is strongly recommended that you use this document *only* to generate ideas, or as a reference to explain complex physics necessary for completion of your work.) Copying of the contents of this web site and turning in the material as “original material” is *plagiarism* and will result in serious consequences as determined by your instructor. These consequences may include a failing grade for the particular pre-lab or a failing grade for the entire semester, at the discretion of your instructor. ****

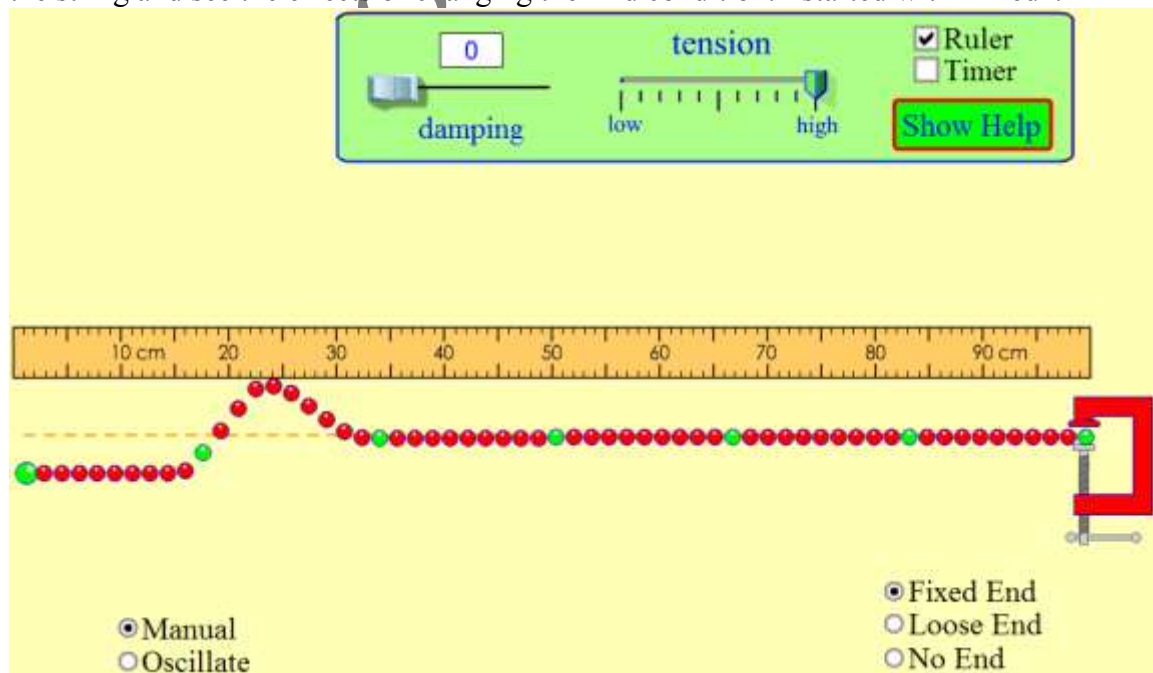
Go to the following web address:

<http://www.colorado.edu/physics/phet/simulations/stringwave/stringWave.swf> or you can use the link on the web page to take you to the same place.

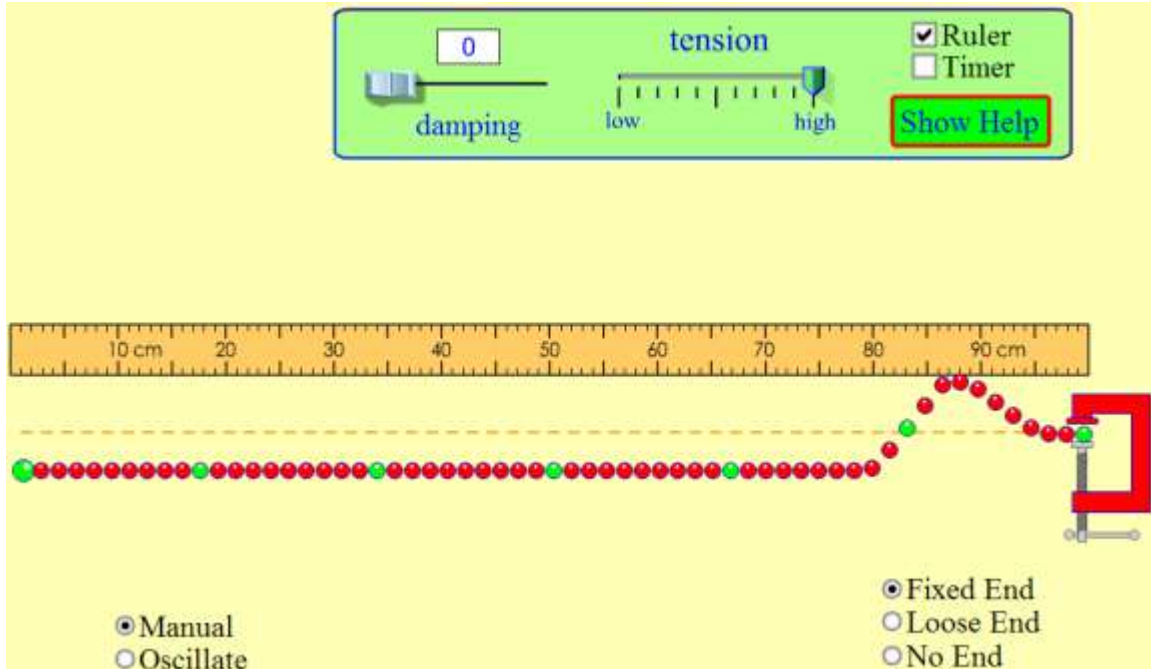
Describe what happens to the waves under different conditions. (Manual mode will allow you to send pulses down the string. Oscillate mode will start a mechanical oscillator that you can control. Change how the string is attached at the other end [we are using a fixed end in this lab]. Experiment and see what happens to identical waves hitting different types of ends):

- Fixed end

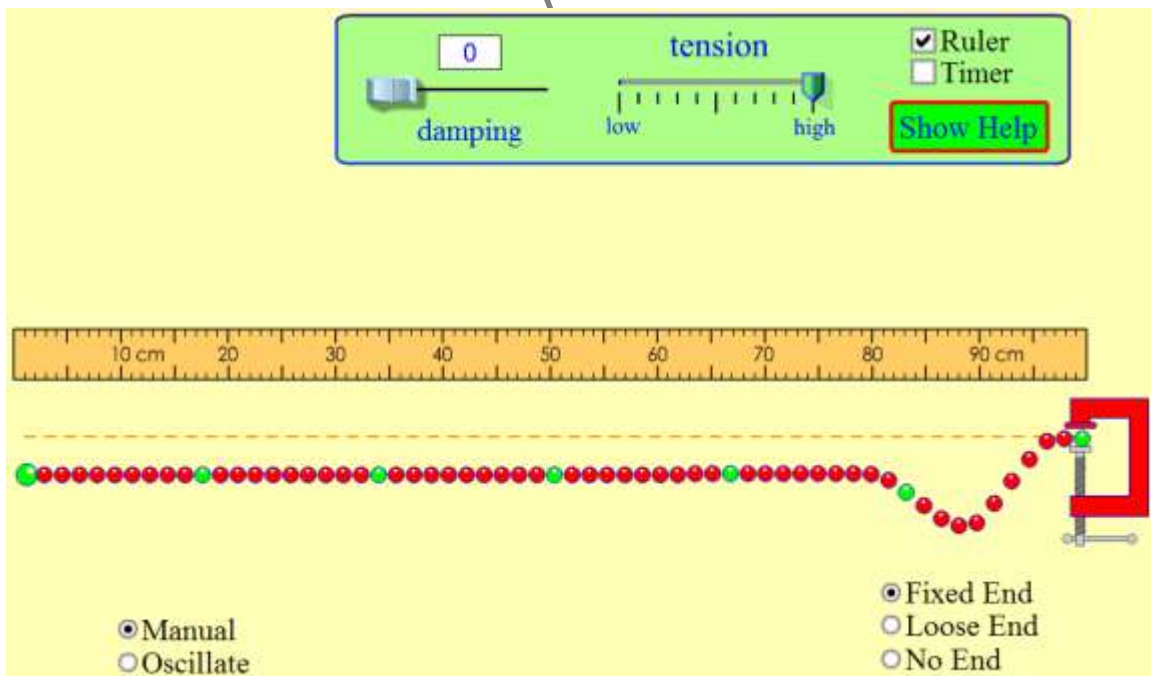
I started by putting the program in “Manual Mode” so I could send a single pulse down the string and see the effects of changing the End condition. I started with “fixed”:



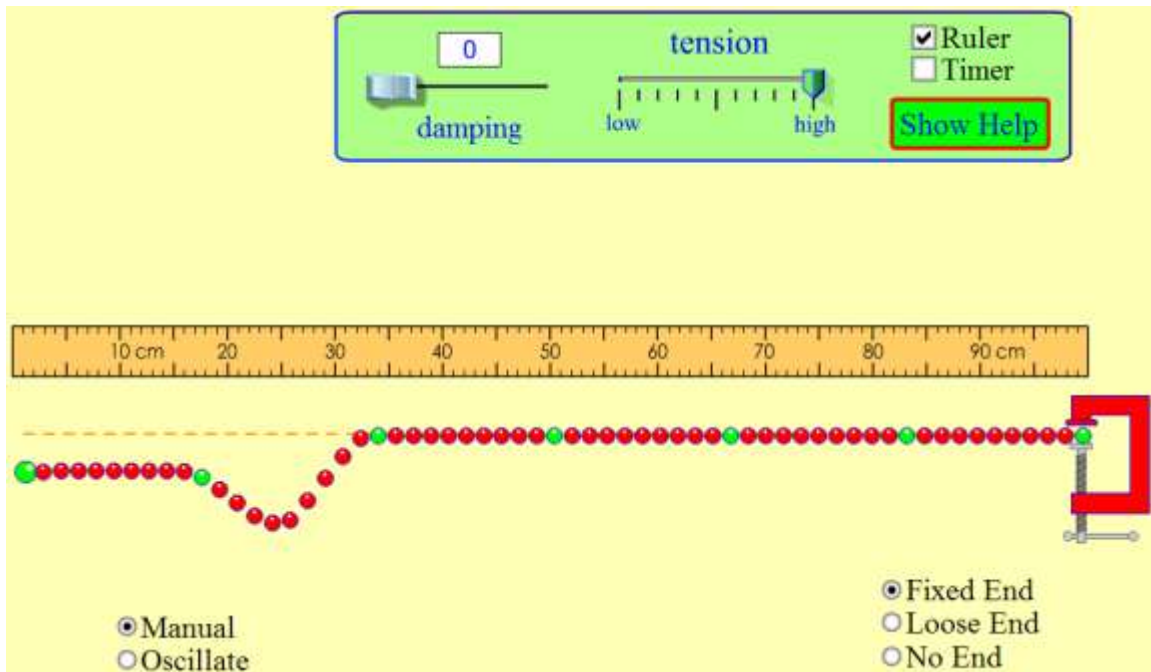
The pulse traveled down the string maintaining its shape during the whole traverse.



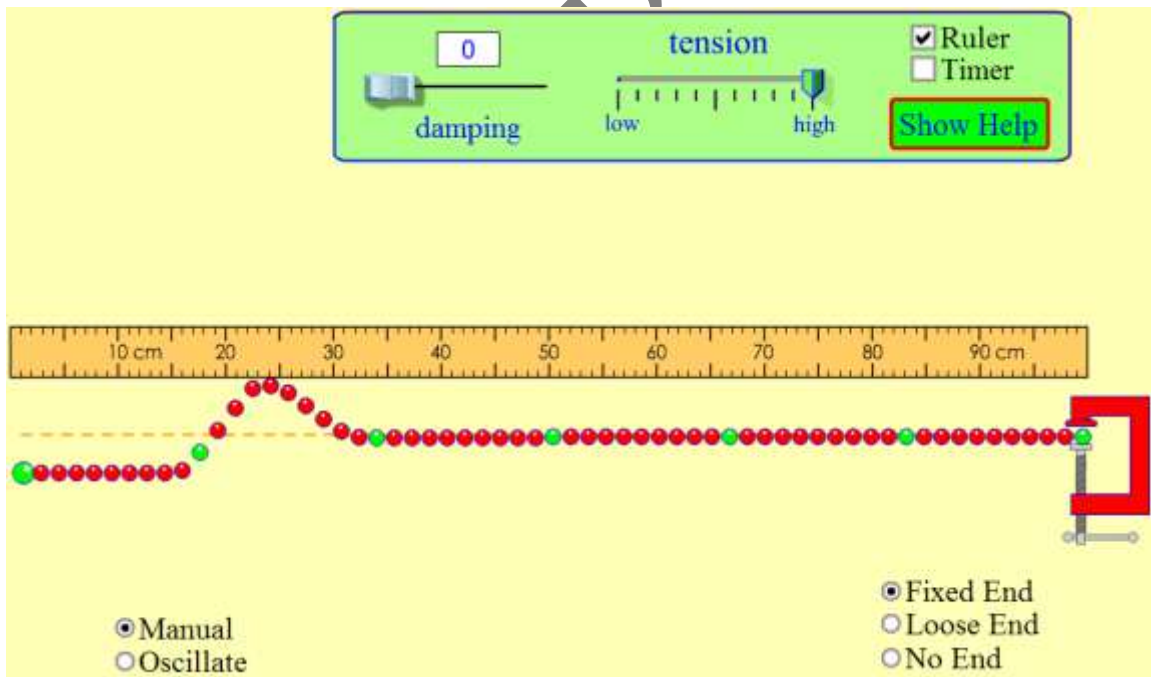
Once it hit the fixed end, it flipped over (inverted) and started traveling back at the same speed.



Again, the pulse traveled down the string maintaining its shape during the whole traverse.

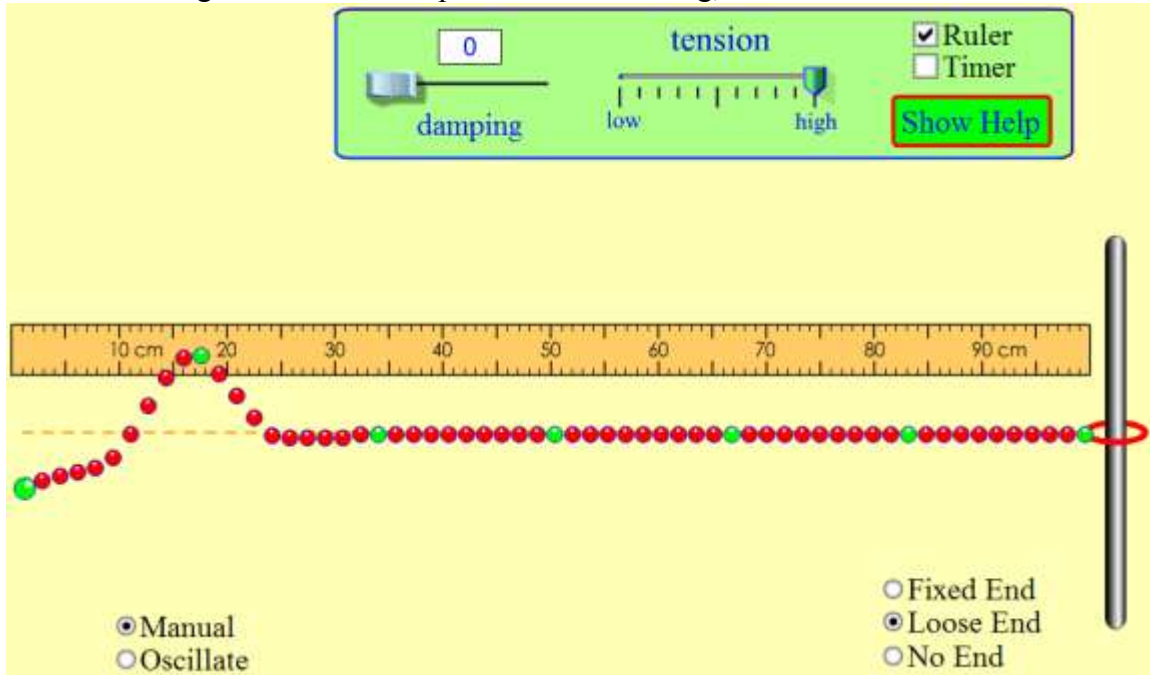


Once it hit the beginning end, it once again flipped over and started traveling back down the string at the same speed.

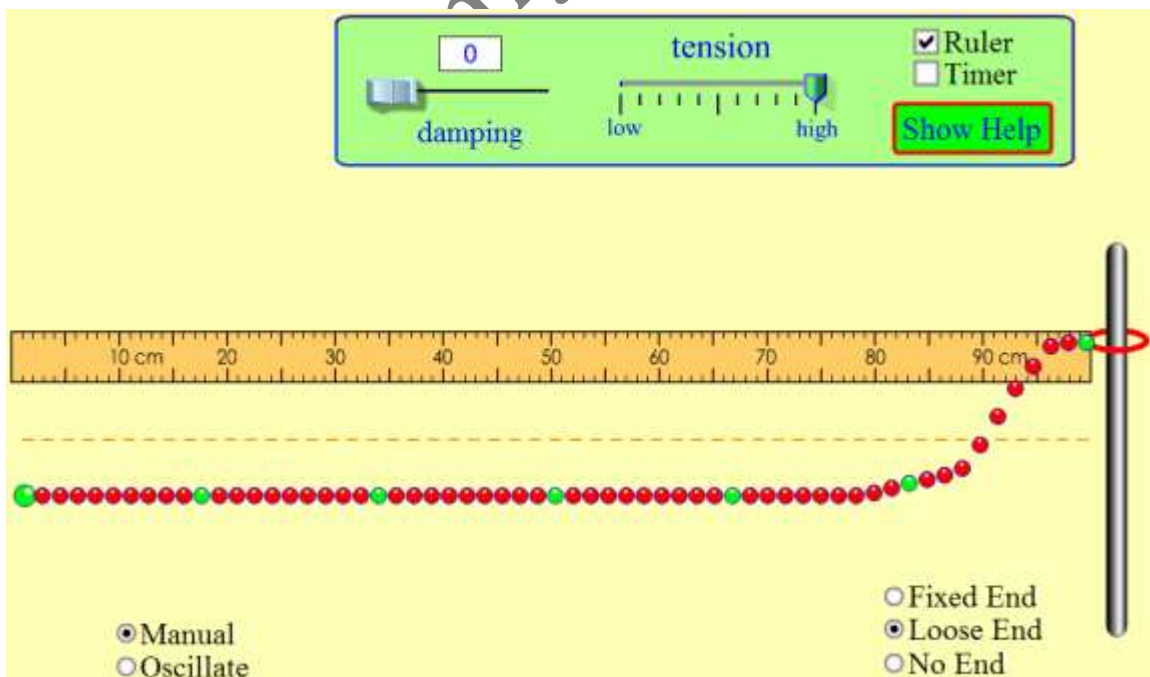


- **Loose end**

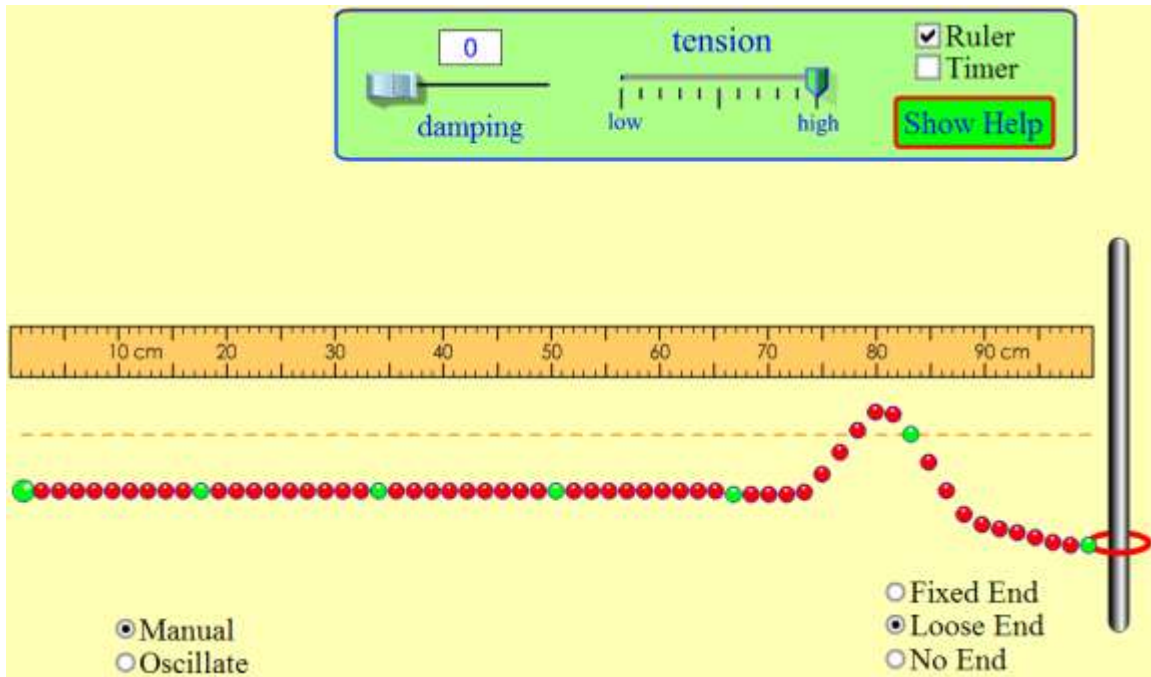
I reset the string and sent another pulse down the string, this time with the end “loose”.



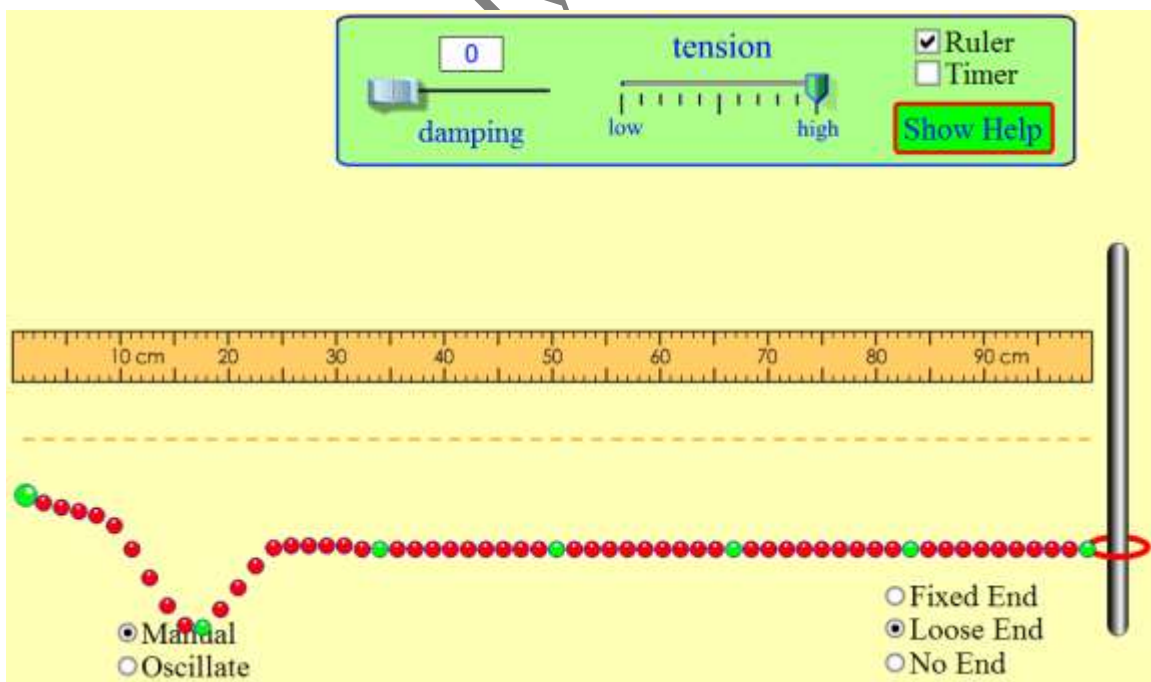
Just like before, the pulse traveled down the string maintaining its shape during the whole traverse, until it hit the end where it moved the ring up to its maximum amplitude then down to its minimum amplitude (where it stayed).



The wave maintained its shape and speed but was traveling in the opposite direction. (Unlike the fixed end, it was not inverted, but mirrored and upright).

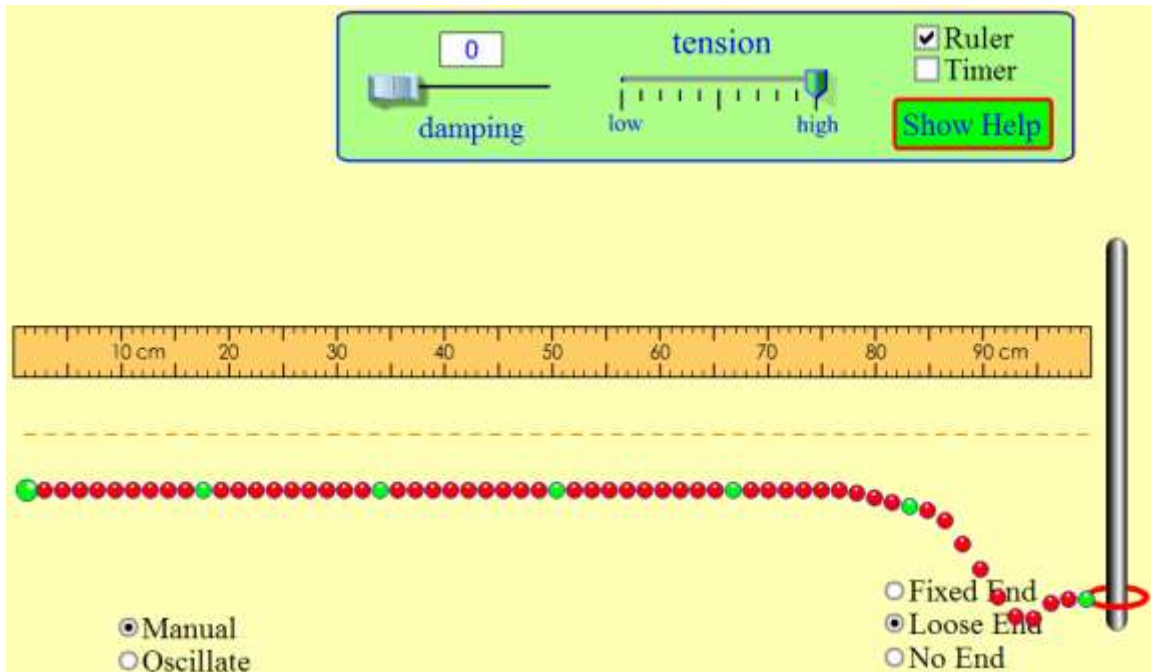


Once it hit the beginning end (since that side was fixed), it flipped over (inverted) and started traveling back down the string at the same speed.

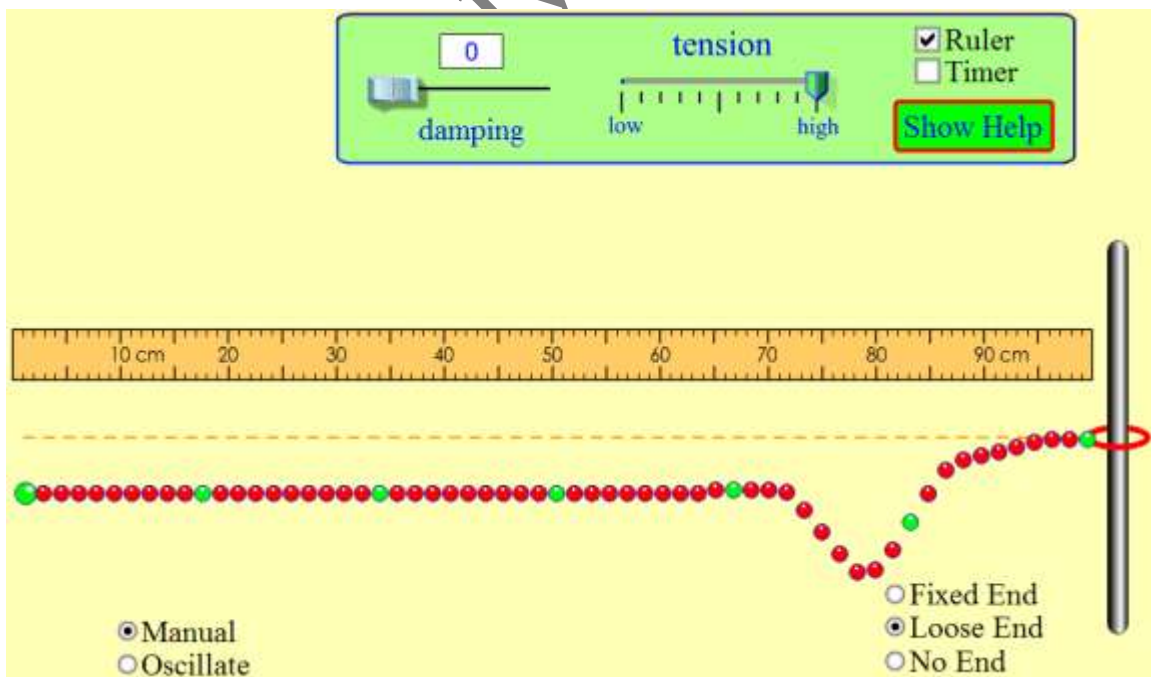


Again, the pulse traveled down the string maintaining its shape during the whole traverse, until it hit the end where it moved the ring down to its new minimum amplitude then up

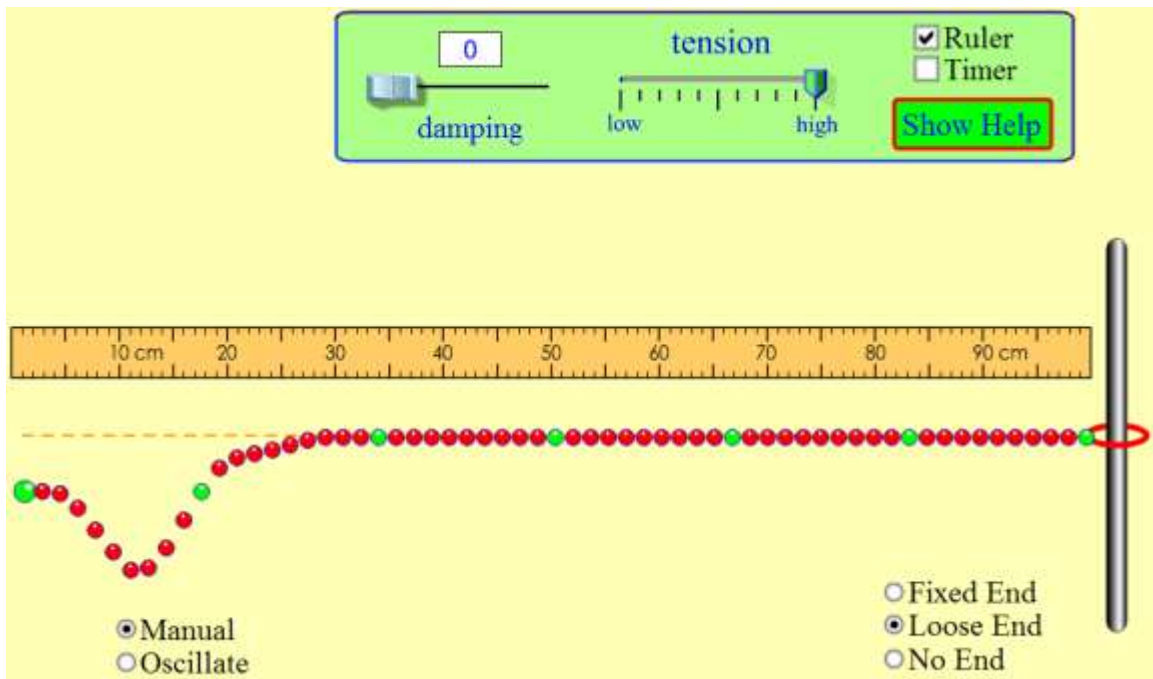
to its new maximum amplitude (which coincidentally was the starting point of the loose end).



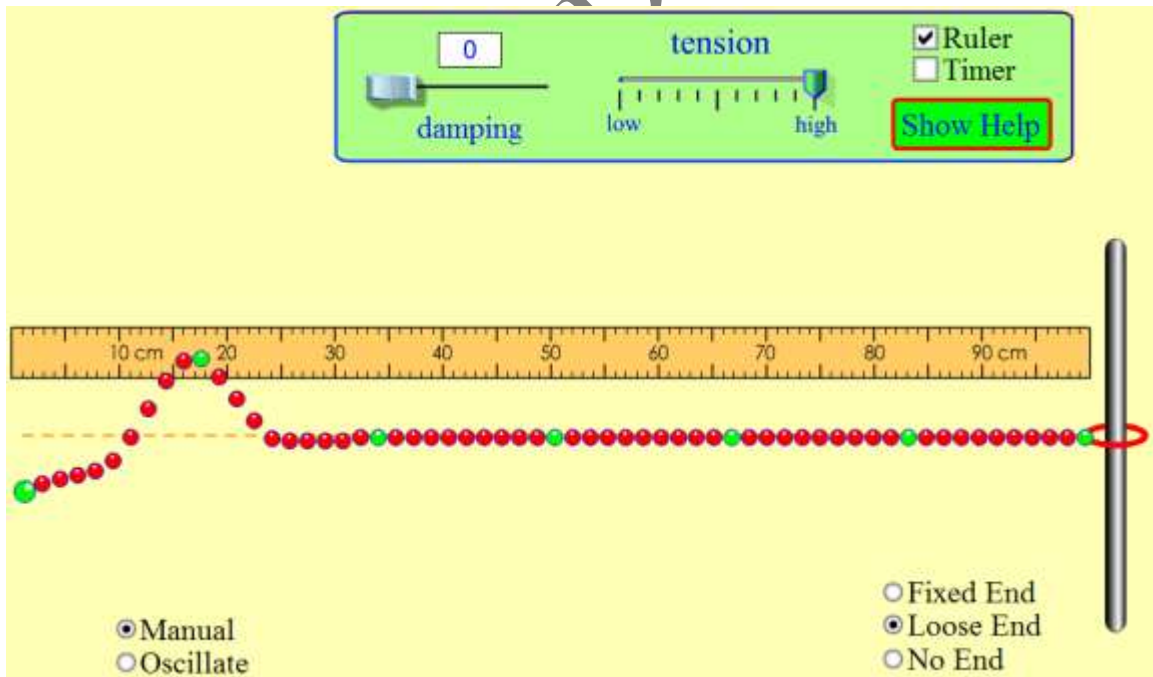
Again, the wave maintained its shape and speed but was traveling in the opposite direction. (Again, it did not once again invert, but mirrored).



Once it hit the beginning end (since that side was fixed), it flipped over again (once again upright) and started traveling back down the string at the same speed.

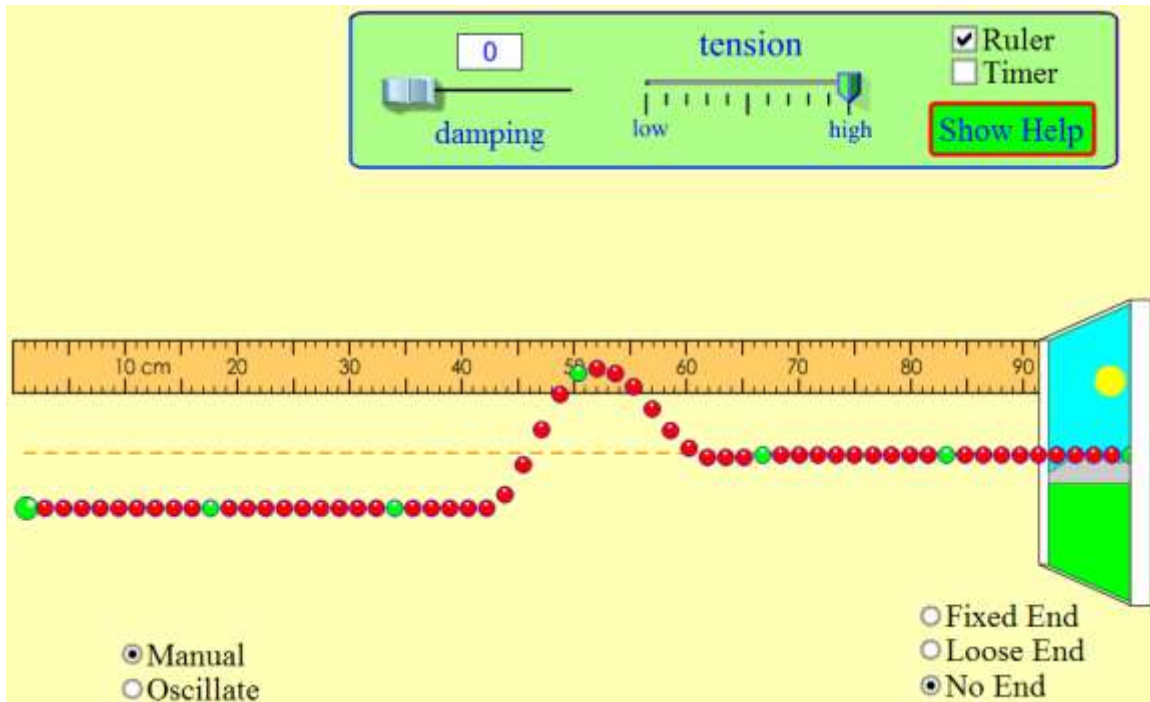


This effectively restarted the process that was initially set-up.

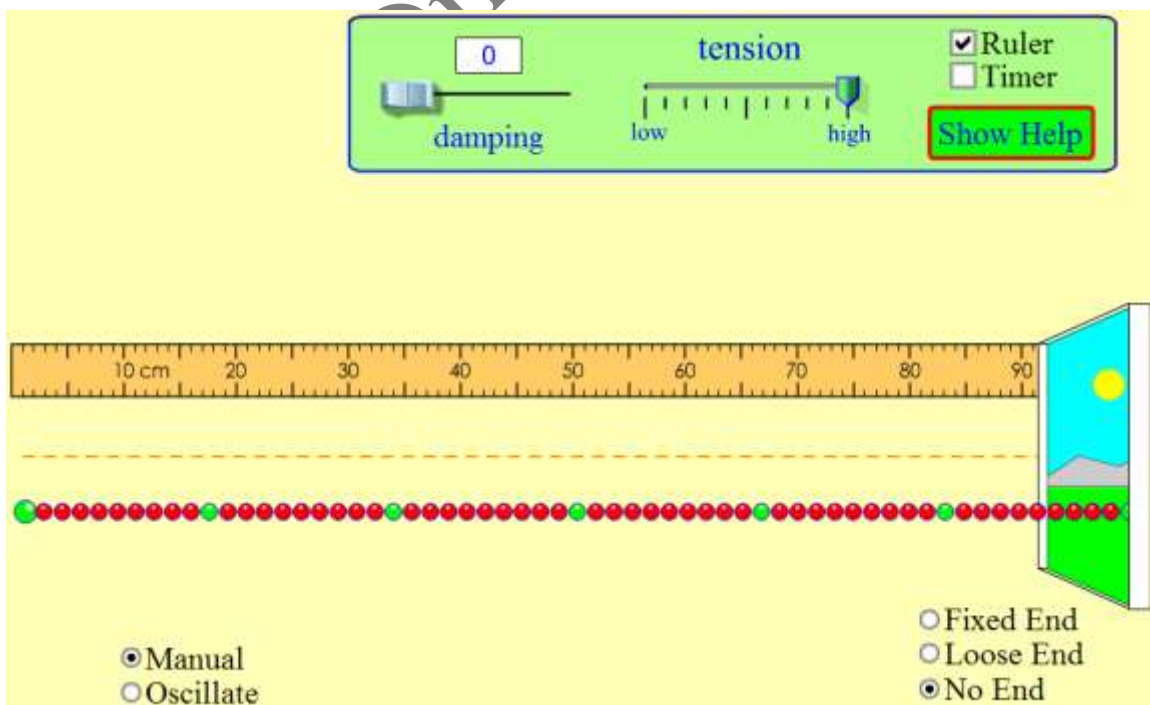


- **No end**

I again reset the string and sent another pulse down the string, this time with the end “none”. Just like before, the pulse traveled down the string maintaining its shape during the whole traverse.



Once it hit the end, it disappeared forever! Poor wave... ☹ Bye! (Well, that's boring.)



The “damping” control determines how quickly the string want to return to a non-vibrating state. To get a good like at a standing wave set the wave to “oscillate” and the damping to 0. Can you generate a standing wave such that the green dots do not move? Record the settings.

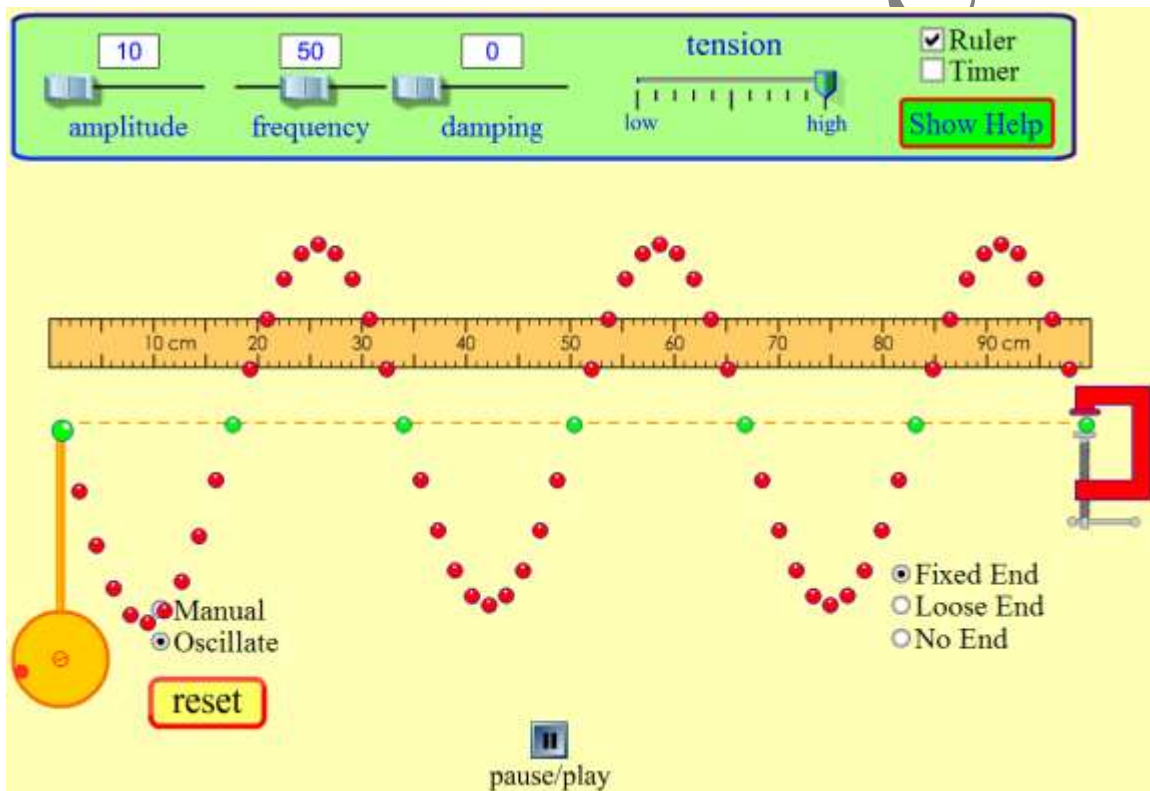
I got a standing wave at the following settings:

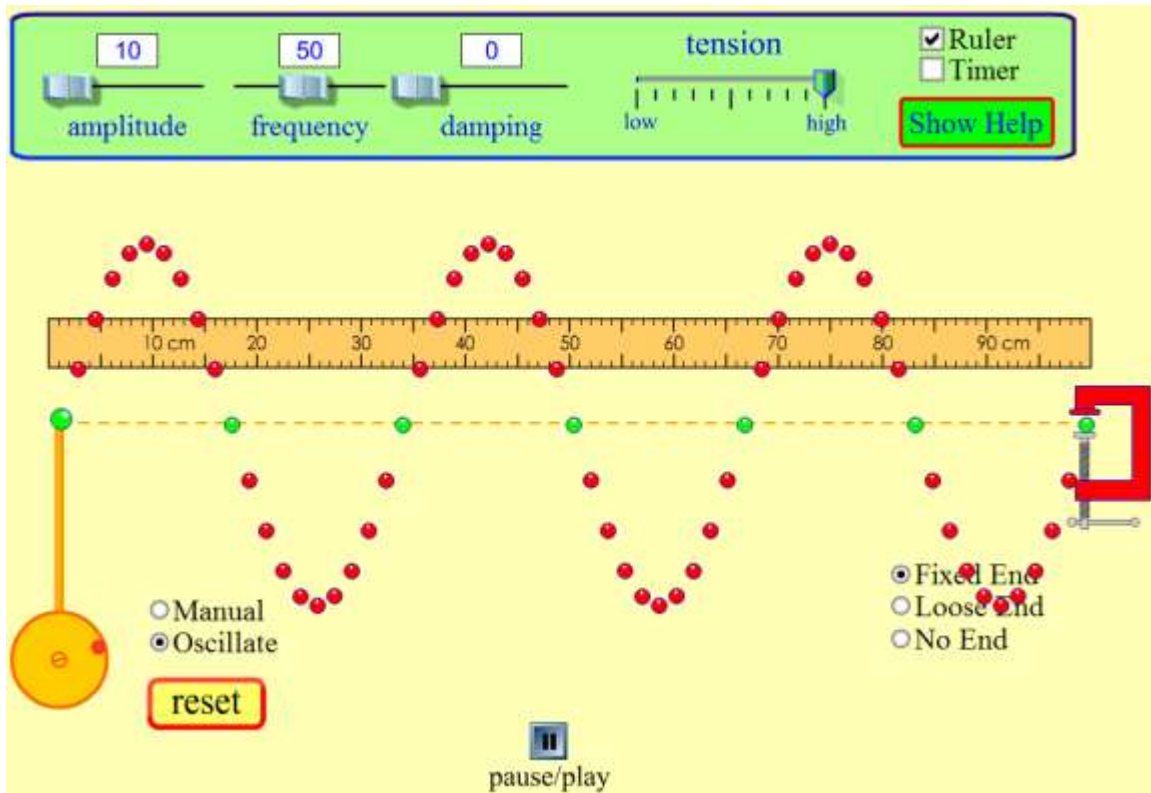
Amplitude: 10

Frequency: 50

Damping: 0

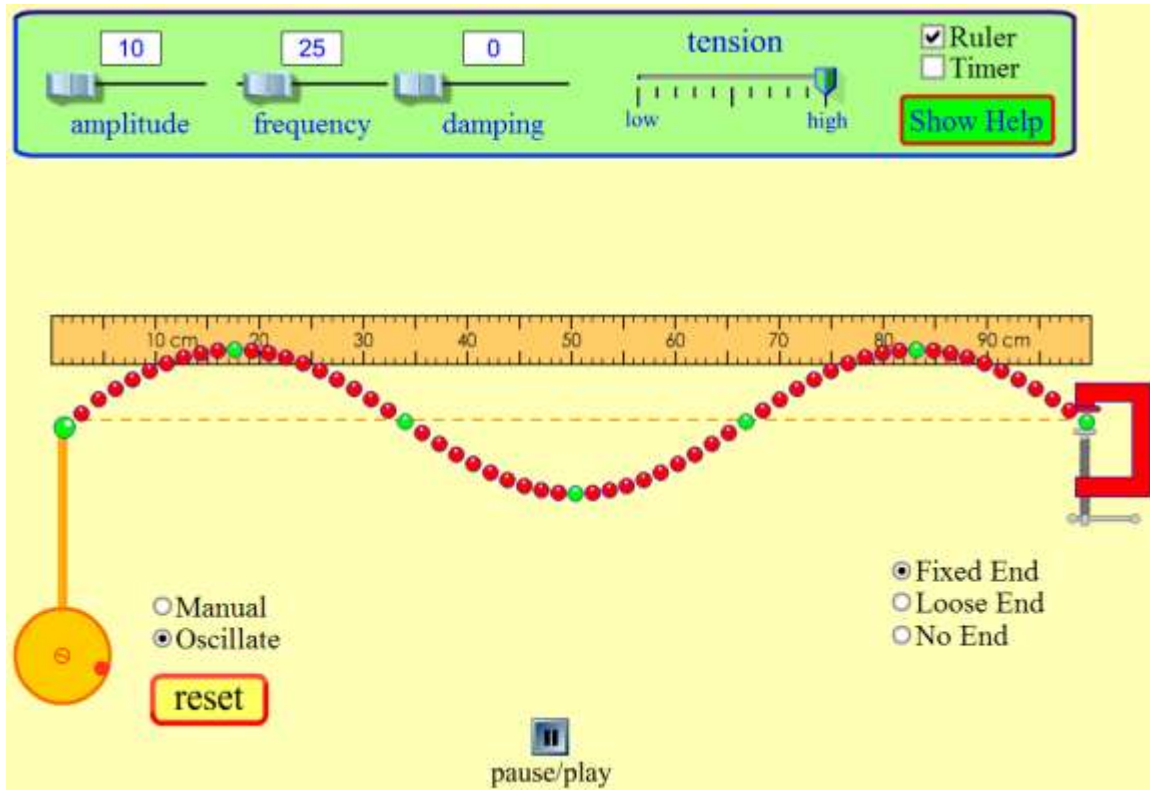
Tension: High





Try changing the tension, while keeping everything else constant, and see how it affects the waves.

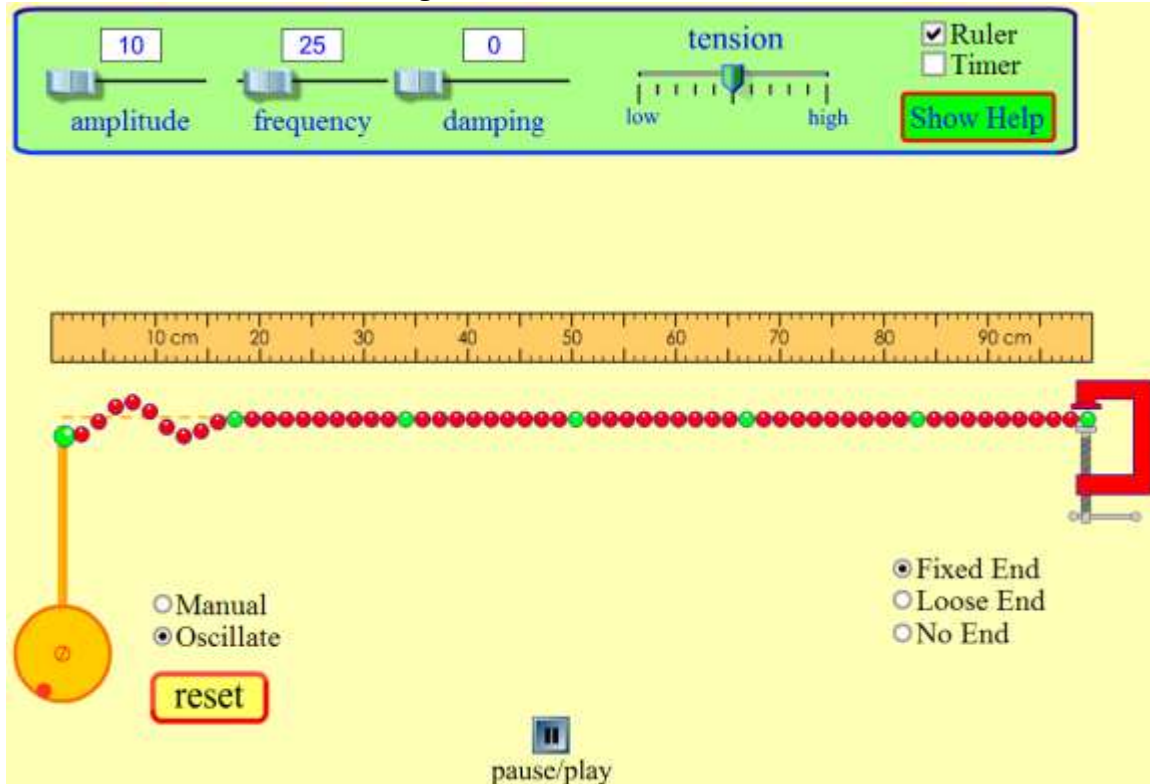
- High tension



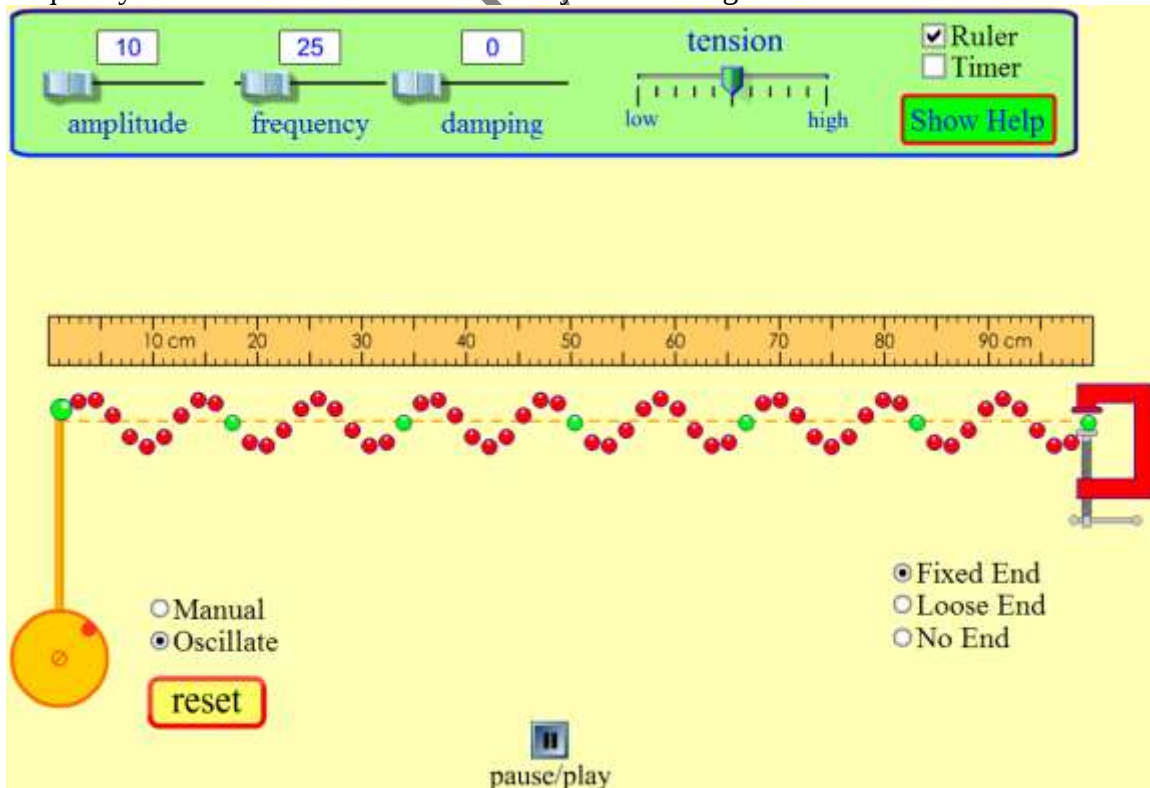
After some time, the wave was set-up and had a long wavelength and short frequency.

- **Medium tension**

The wave moved down the string slower.

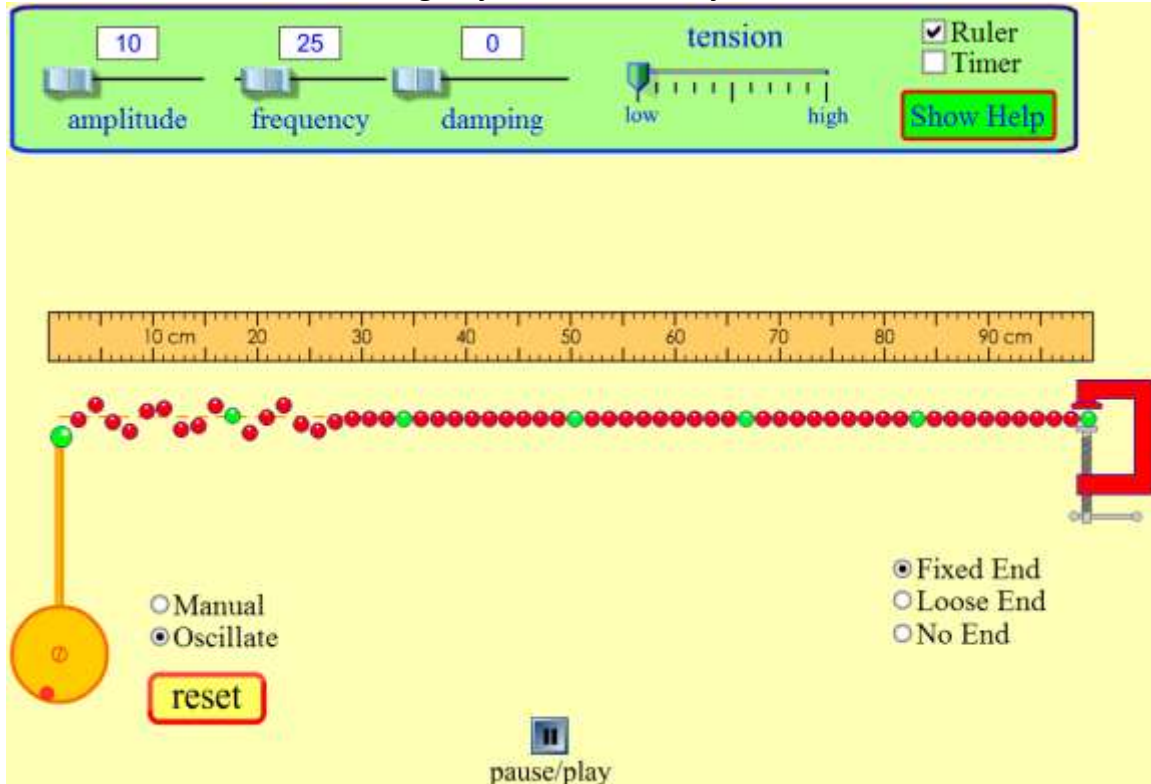


After some time, the wave was set-up and had a shorter wavelength and higher frequency. This was to maintain the velocity of the string.



- **Low tension**

The wave moved down the string very slow. So velocity is a function of tension.



After some time, the wave was set-up and had a very short wavelength and very high frequency. This was to maintain the velocity of the string.

