

# Doppler Effect

**Note that the velocities are specified in terms of the wave velocity, where positive is directed right. Thus, a source speed of 1 means that the observer moves at the speed of the waves.**

1. Start with the source at rest and the observer at rest, and observe the pattern produced when you press the Play button.
2. Now, keep the source at rest, and give the observer an initial velocity. Explore how the frequency of the waves reaching the observer changes as you vary the observer's velocity. Does this depend on whether the observer is moving toward the source or away from the source? Explain. Does the motion of the observer effectively change the speed of the waves or the wavelength? Explain.
3. Now, keep the observer at rest and explore the effect of the motion of the source. How does the frequency of the waves reaching the observer depend on the source velocity? Does the frequency shift depend on whether the motion of the source is toward or away from the observer? Explain. Does the motion of the source effectively change the speed of the waves or the wavelength? Explain.
4. What happens when the source travels at the same speed of the waves? What happens when the source travels faster than the wave speed?
5. Is the Doppler effect for sound a relative velocity phenomenon? For example, if the source moves with some speed toward a stationary observer, is that the same as if the observer moves at the same speed toward a stationary source? In other words, does the result depend only on the relative velocity between the source and the observer? Explain.