Fill in the 400 MHz, 800 MHz, and 1200 MHz rows of the following table. (Ignore the other rows: there's no point in repeating this exercise that many times!)

Frequency	Time of First Pulse	Time of Last Pulse	Number of Periods	Period of Pulsar
400 MHz				
600 MHz				
800 MHz				
1000 MHz				
1200 MHz				
1400 MHz				

12. From what you have measured, make state briefly how the period of the pulsar depends on the frequency:

13. How does the pulsar signal strength depend on frequency? Clearly it does, since you have to reset the vertical gain and horizontal seconds controls at different frequencies. But to see how it changes in a more systematic fashion, lets keep those controls set—for example, 4 for the vertical gain and 4 for the horizontal seconds. Then look at the signal at various frequencies from 1400 MHz back down to 400 MHz. Answer the following questions.

- The pulsar signal is stronger at _____(lower/higher) frequencies.
- If I am hunting for pulsars in the sky, or want to measure the period of a pulsar I've never investigated before, the best frequency to tune my receiver would be _____ MHz.

14. You can now click the **x** at the upper right of the receiver window to close the receiver and return to the telescope control, where you will investigate several other pulsars.

Part 3: Measurement of the Distance of Pulsars Using Dispersion

A. Method

Most pulsars can't be seen with optical telescopes, so we can't use their luminosities to determine distance. In addition, they are much too far for parallax measurements. How can we determine their distance then? One powerful method is to use the phenomenon of ***dispersion***.

All forms of electromagnetic radiation, including radio waves, travel at the same speed in a *vacuu*m. This speed is speed of light

$$c = 3 \times 10^8 \, meters/sec$$

However, interstellar space is not quite a vacuum. On the average the interstellar medium consists of a few atoms and a few free electrons in each cubic centimeter. It isn't much, but it's enough to slow down electromagnetic waves slightly. The lower the frequency, the slower the radiation travels. This means that, though the effect is small, pulses from a pulsar arrive a fraction of a second earlier at higher frequencies than at lower frequencies, because the higher frequency pulses travel faster through the interstellar medium.