

Exercise: Introduction to Digital Audio

Summary:

For this exercise we will use an audio file that includes tones at two frequencies: 1 kHz and 10 kHz. We will create selections of short duration that will allow us to zoom in on the waveform and compare differences in the oscillations of the sound pressure waveform for each of the two frequencies.

Learning objectives:

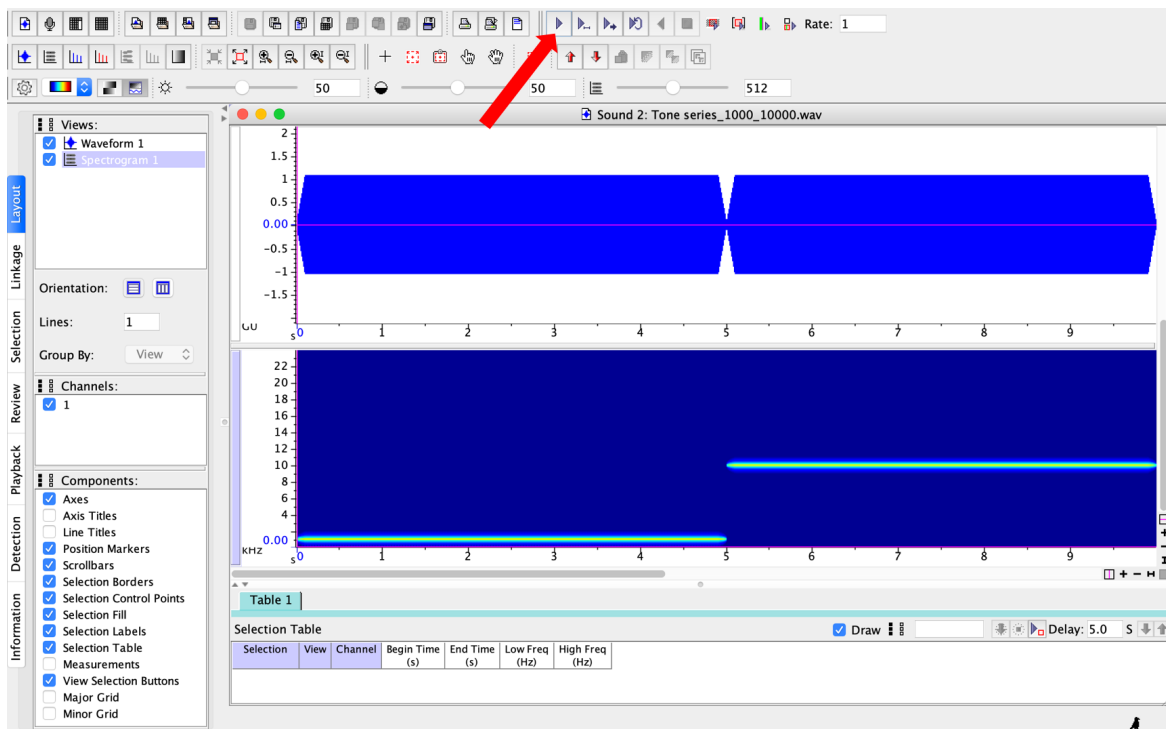
- Understand how different frequencies are represented in the digital waveform and spectrogram
- Become familiar with using Raven selection tables and playing sounds

Prerequisite knowledge:

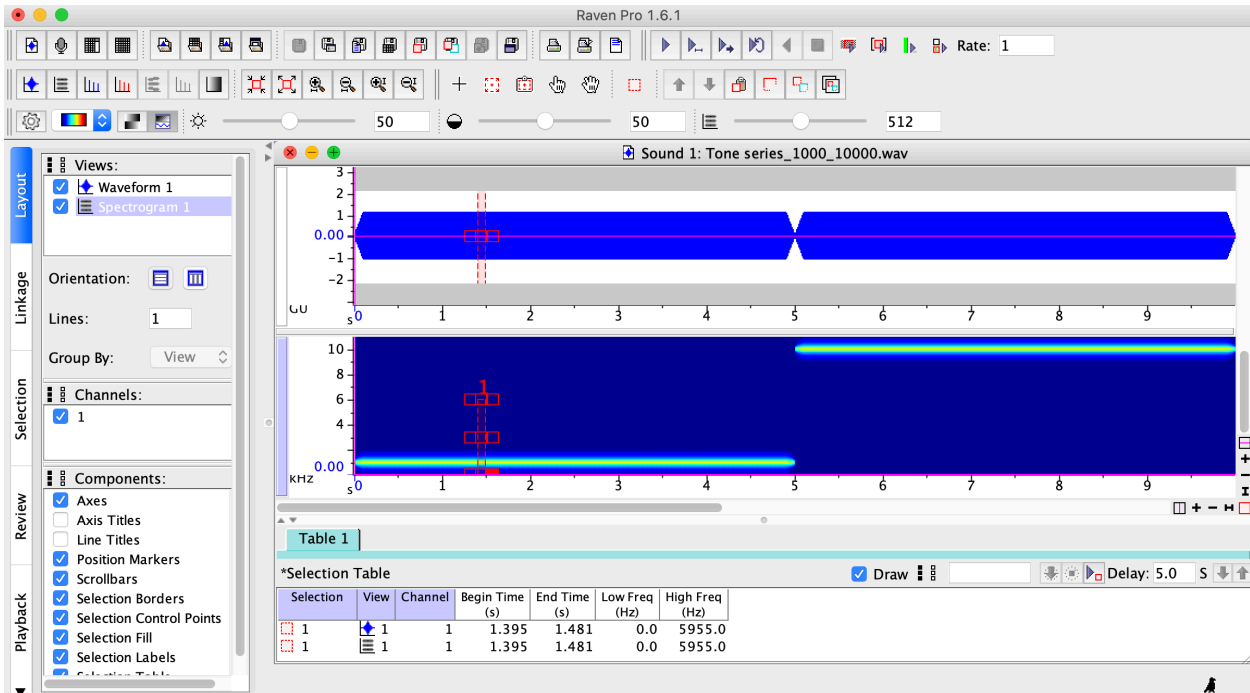
- Assumes knowledge of how to open files and make selections

Exercise:

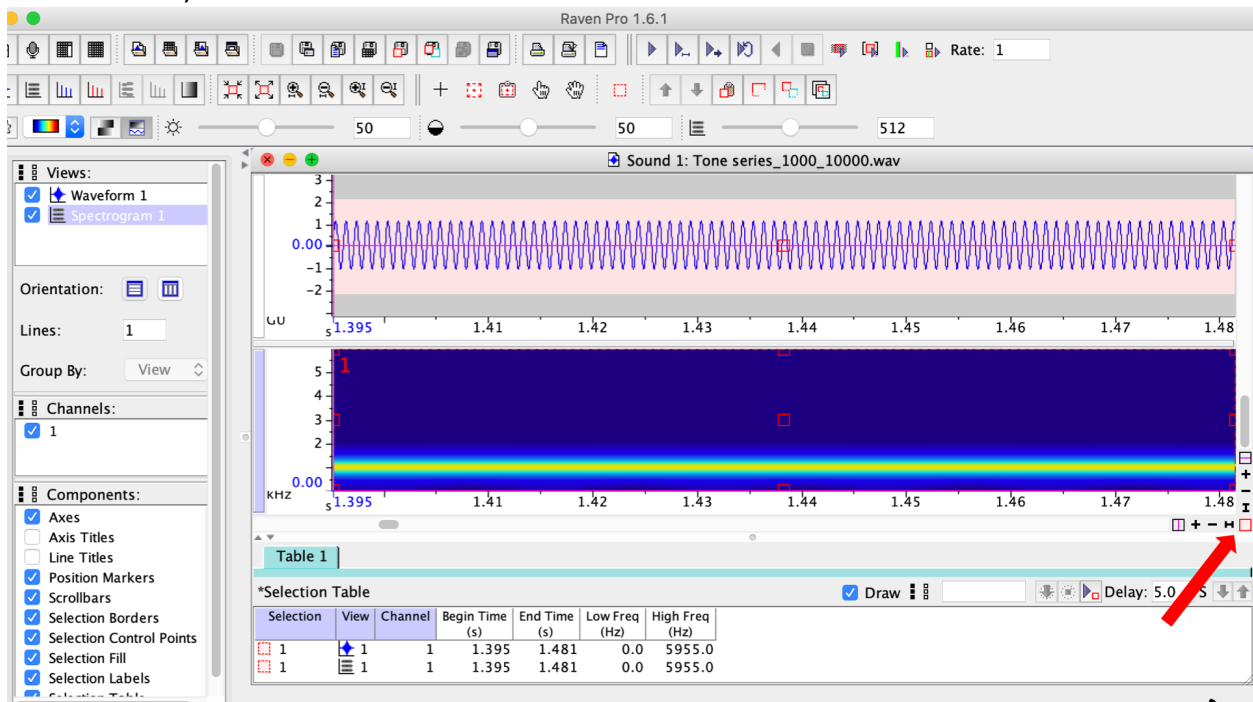
1. Open sound file *Tone series_1000_10000.wav* in Raven.
2. To play the sounds you can press the play button as indicated below.



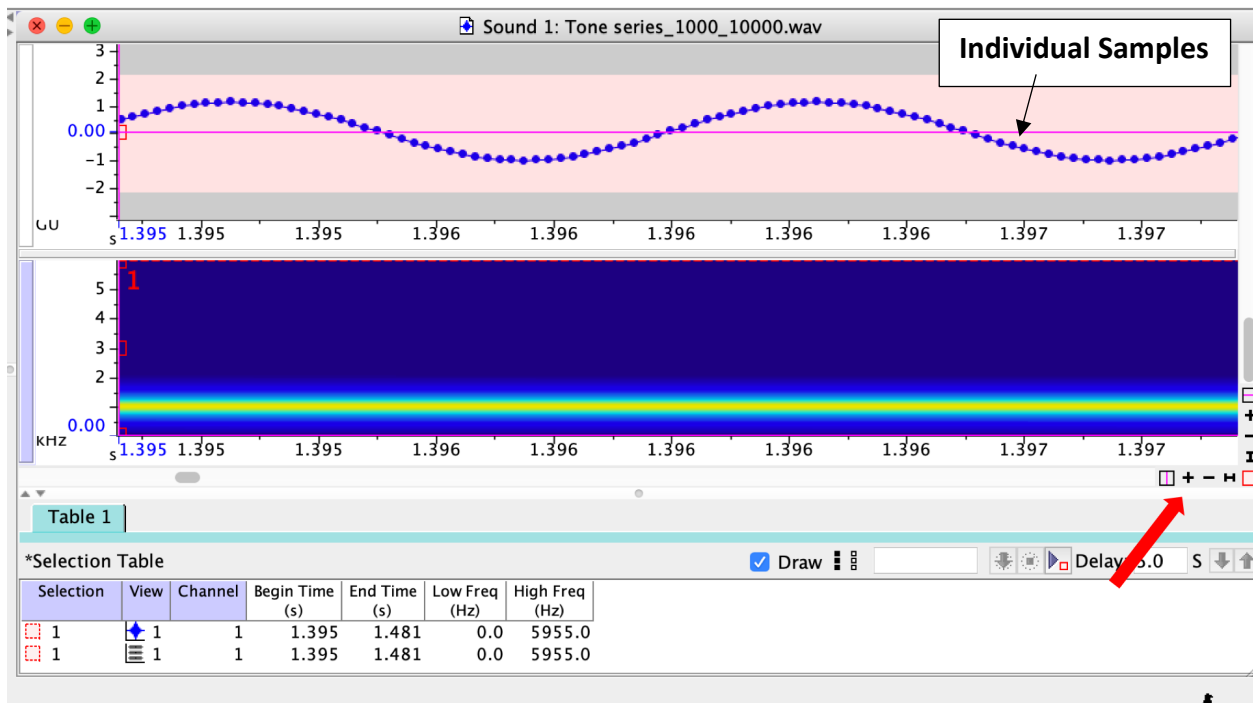
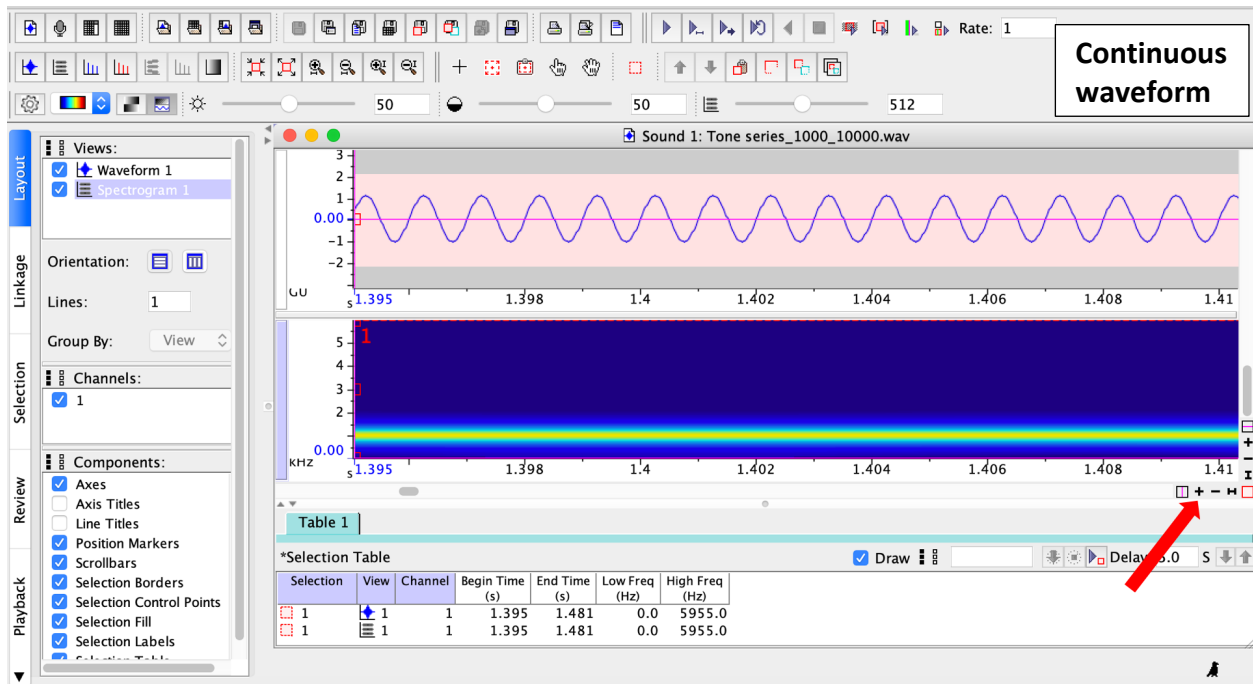
3. Create a selection within the 1 kHz tone. Make sure that selection is relatively short in duration (< 0.09 seconds) to ensure effective visualization of the waveform.



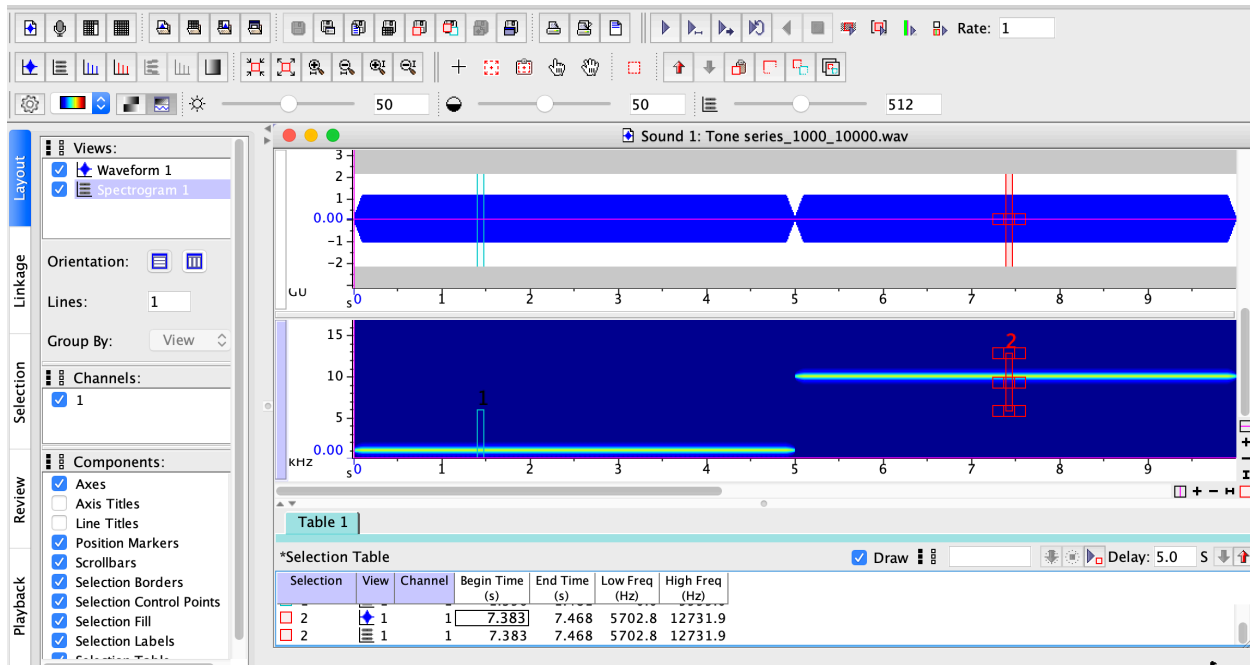
4. Then click on the 'Zoom to selection button' to zoom in on the selection (red arrow below). You should be able to see the waveform in this new zoomed-in view.



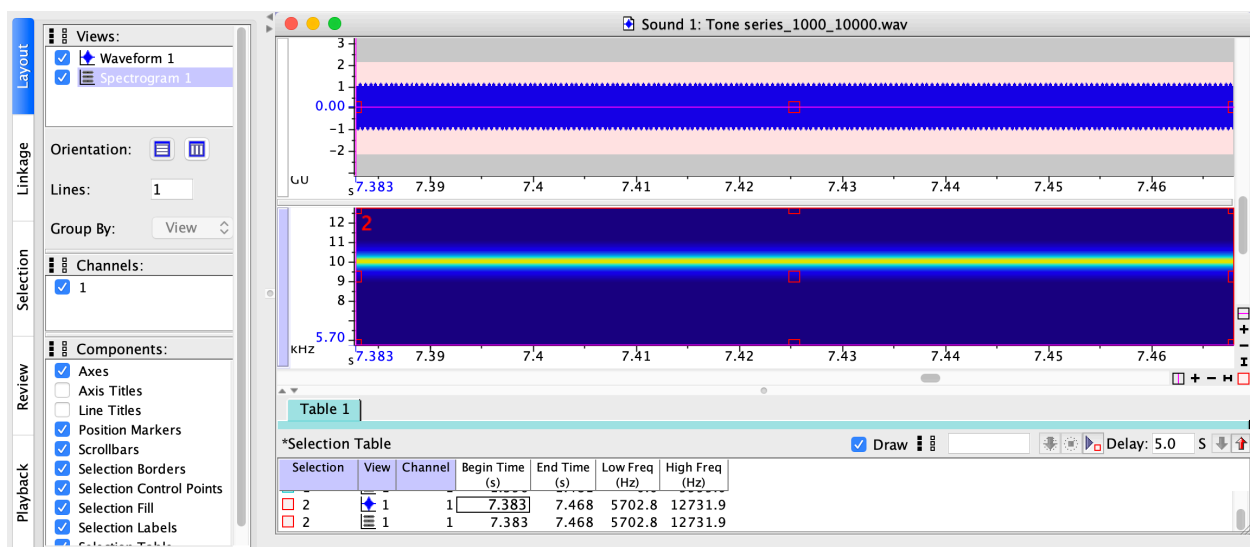
5. You can use the 'Zoom in X' button to keep zooming in on the waveform, and eventually Raven will switch from showing a continuous waveform to showing the individual sample points.



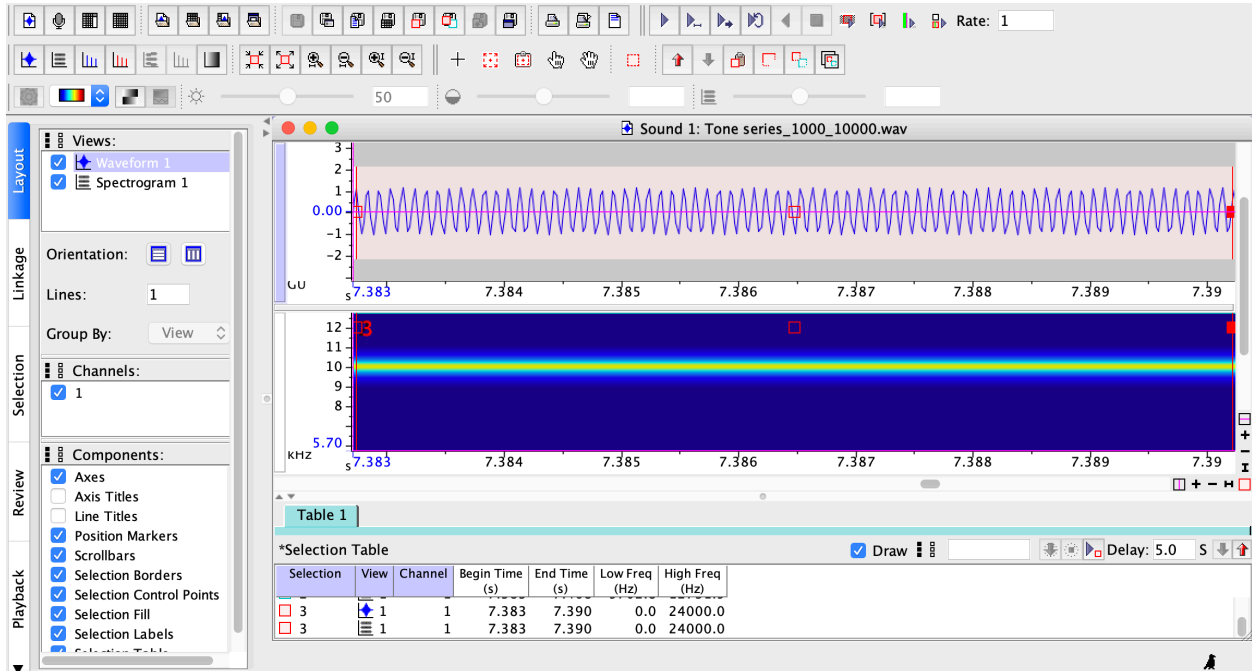
- Now we will zoom back out and draw a small selection around the higher frequency tone. Our first selection was 0.085 seconds long, so we will start by making our new selection the same duration. Note that you can change the duration of the selection by typing directly in 'Begin Time' and 'End Time' in the selection table.



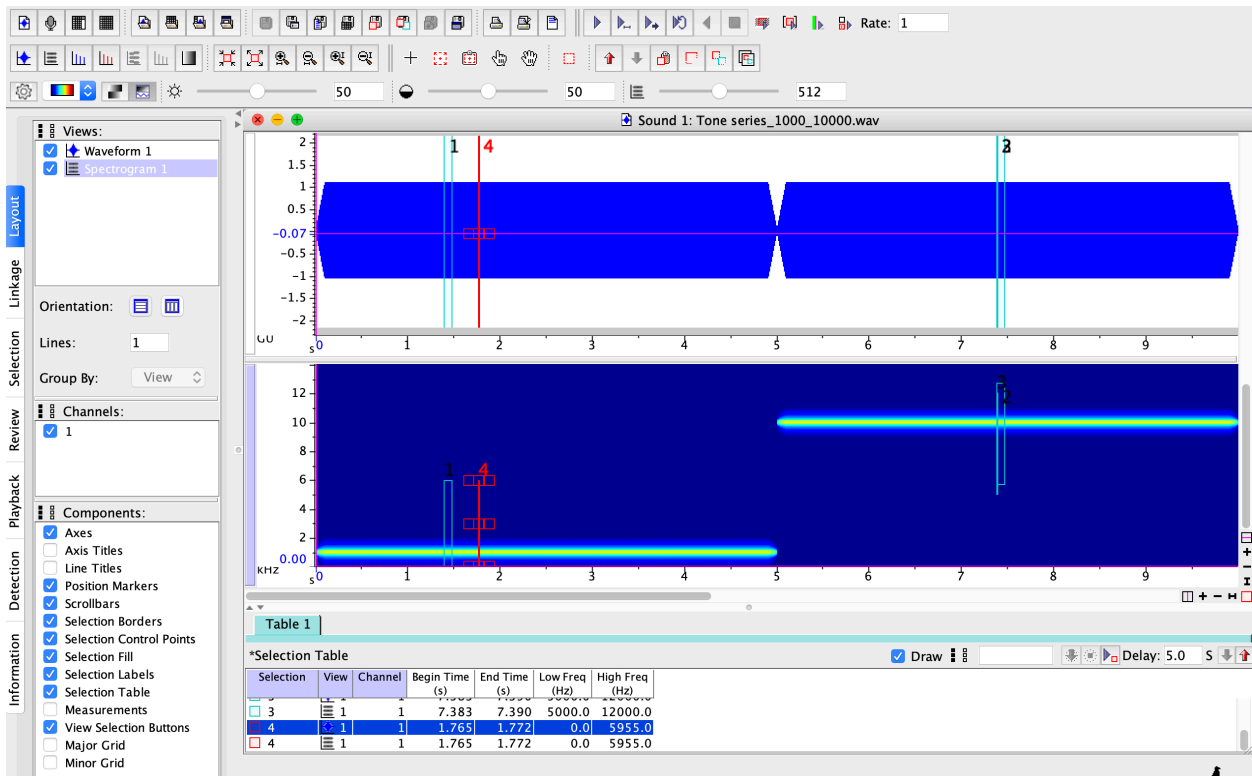
- Now we will use the 'Zoom to selection' to zoom in on the waveform. We can't see the individual waveform oscillations because they are happening at a much higher frequency in this tone than the 1 kHz tone.



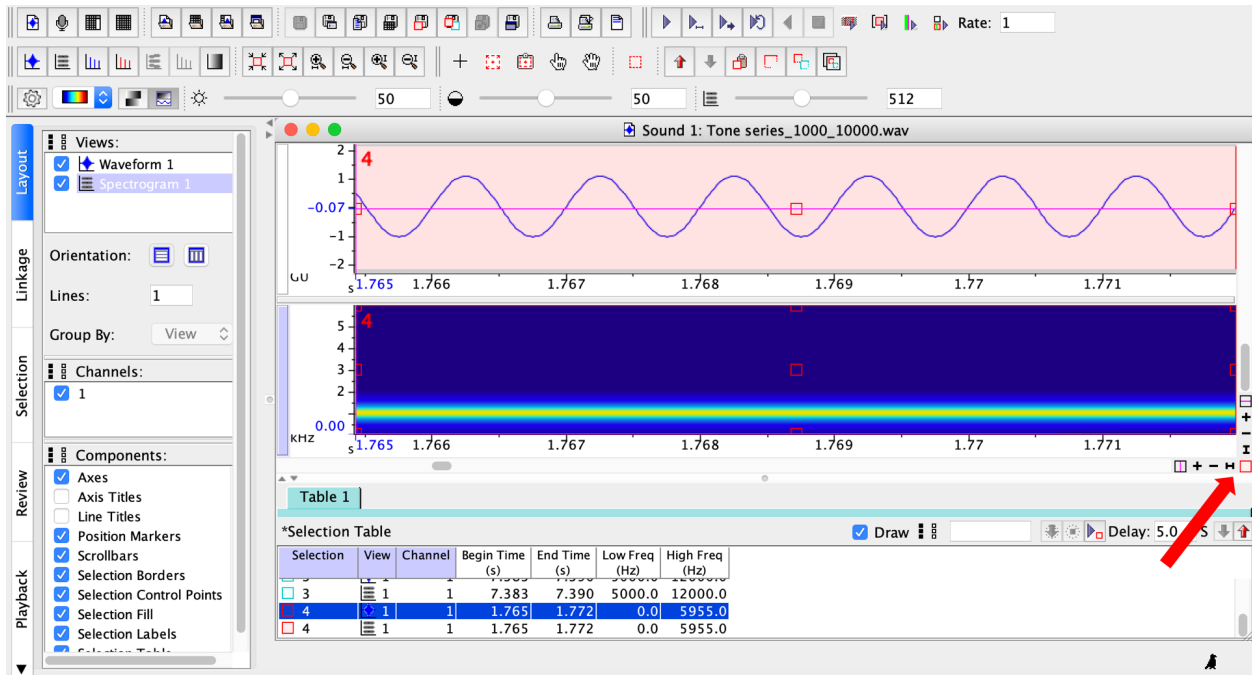
- Using the 'Zoom in X' button keep zooming in until you can clearly see the individual oscillations. Then draw a selection around the entire window and save that selection.



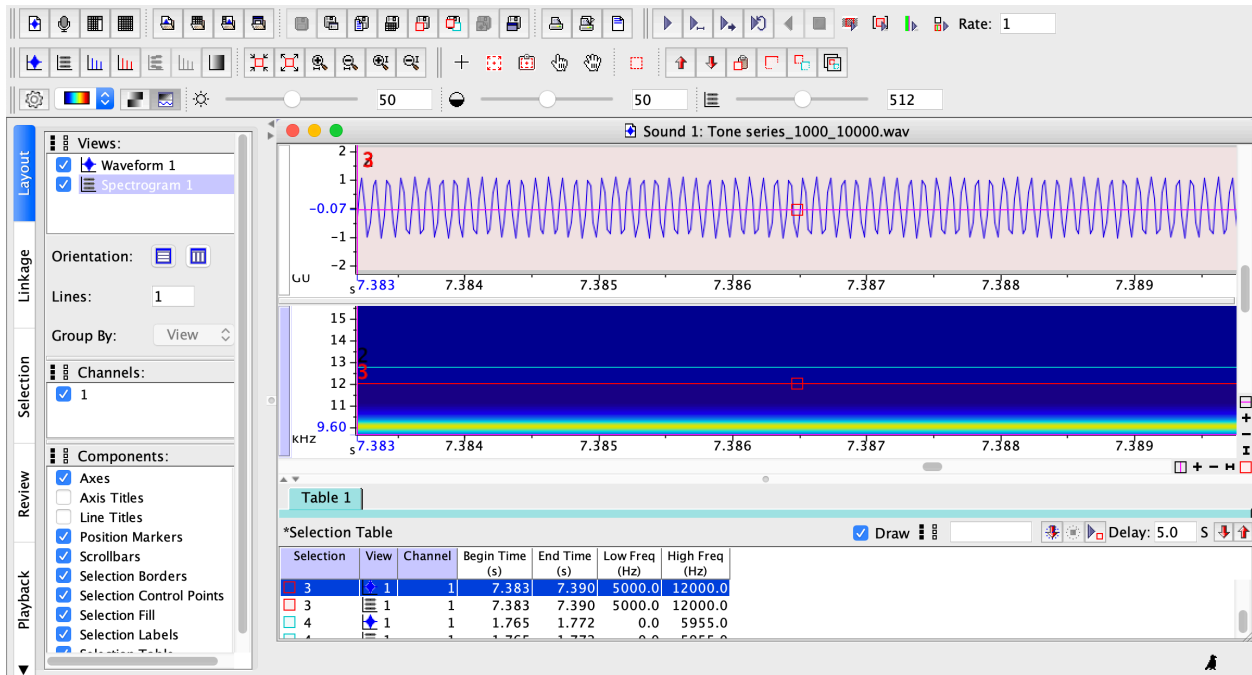
- Zoom back out so that you can see the entire sound again, and then draw a selection around the 1 kHz tone that is the same duration as the previous box you drew for the 10 kHz selection (in our example the box was 0.007 seconds). Remember that you can manually change 'Begin Time' and 'End Time' in the selection table.



10. Use the 'Zoom to selection' button to show the entire selection.



11. Compare this waveform to the earlier selection you made for the 10 kHz tone, noting differences in the number of cycles captured in the selection.



Synthesis

1. How many oscillations are there in the short window for the 1 kHz tone? Were there more or less oscillations for the 10 kHz tone in the same window?

2. Are there differences in the number of samples in time windows of the same duration for the 1 kHz and 10 kHz tone? Why or why not?

Answers

1. There are 6 complete oscillations in the 1 kHz tone shown in the above image; there are many more for the 10 kHz tone.
2. Both selections contain the same number of samples, as both tones were recorded at the same sampling rate.