Down Sampling

*-The spectrograms in Figures 2 and 3 only go to 2756 Hz instead of 5512 Hz. Why is this?*

A: This is because the the signal is being sampled at a rate half of its original frequency therefore cutting out the higher frequencies.

*-How should the bandwidth of the filter we used to get Figure 3 (i.e. wc) depend on D, theinteger value of downsampling?*

A: D is the decreasing factor meaning that only the Dth point will be kept. If the value of D is too low this could couse distortion in the higher frequencies.

-*The sound in Figure 3 is not aliased, but it does seem very muffled compared to the original signal. Why?*

A: The reason for the muffled sound is that the higher frequencies where cut off and therefore the the higher frequencies sounds are played at a lower frequency.

*-Why couldn't we have used an ideal lowpass filter instead of the Kaiser filter?*

A: An ideal lowpass filter wouldn’t have been practical to use in a real situation. The Kaiser filter is more appropriate in this situation because we need a moving winow.

Up sampling

-*Can we use the same kind of Kaiser filter for upsampling as we used in Case I for*

*downsampling?*

A: Since the cutoff frequency and sampling rate are different, the user is unable to use the same kind of Kaiser filter for up sampling.

-*How does the bandwidth of the upsampling filter (i.e. wc) depend on U?*

A: The multiplier being used is U, to increase or modify the frequency. The changes in frequency are causing an alternation between different values on the bandwidth.

-*Why does the spectrogram in Figure 2 extend to 11 kHz?*

A: The sample is being stretched so it will extend to 11kHz. The sample rate is being doubled in correlation with the frequency being doubled.

-*Why does it appear as if, for the spectrogram in Figure 2, the data at frequencies above 5500 Hz is the mirror image of the data below 5500 Hz?*

A: As is the case when down sampling, at higher frequencies aliasing occurs that essentially causes the plot to fold. Then as the user begins to upsample the plot will unravel itself.