# DSP Project

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THE following report will show the main result of project step by step. I developed this project during the academic year 2019/2020 and with the help of the various example files on the course website. If you are interested more about the code development of the project you can take a look at this git repository.

I. INPUT SIGNAL

The input signal is modulated for double sideband reduced-carrier transmission with two real audio information signal. The aim of this project is to extract the two signals and remove any audible distorsions.
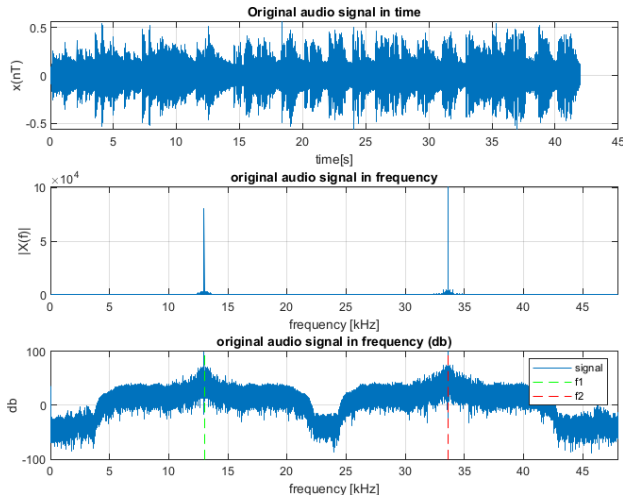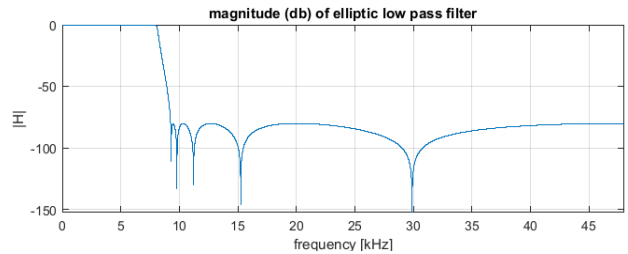

II. CARRIERS

To find the frequencies of the carriers a naive approach was implemented. I looked at the frequencies between 10000 Hz and 38000 Hz and then estracted the two peak frequencies by looking at the spectrum of the signal computed via FFT. I found the two carriers at frequencies: f1= 13kHz and f2= 33.6kHz. Two second order IIR band pass filters with very narrow bandwidth (10Hz) were implemented in order to extract the two carriers. The two signals were then demodulated using the extracted carriers.
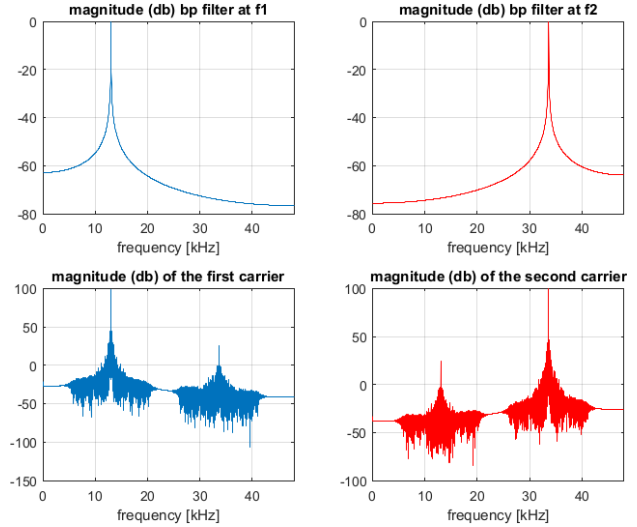

III. FILTERS TO REMOVE DISTORSION

To remove distorsions i implemented a cascade of two filters to filter the frequencies in the 20-8000 Hz band.

For the low pass filter i used an IIR elliptic filter of order 10 at cutoff frequency of 8000 Hz and a stop band attenuation of 80dB.

For the high pass filter i implemented an high-pass notch IIR filter with a very narrow bandwidth (centered in f_0 = 0Hz with Δ f_{3db}= 20Hz).
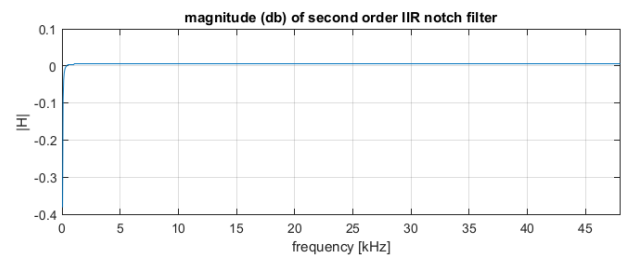
IV. RESULTS

Below you can see the two information signals demodulated using the extracted carriers. I filtered the two demodulated signals with the cascade of the two filters you've seen above and proceeded to write the stereo audio file with the first signal on left channel and the second signal on the right channel.