

Assignment 1: Generate and plot the first 5 prolate spheroidal wave functions. Compute the eigen values as well. Generate the results for $c = \Omega T/2 = 0.5, 1, 2, 4$.

Show that the wave functions are orthonormal on the infinite support (the real line). Show that the wave functions are orthogonal when only the finite time support is considered $([-T/2, T/2])$. Show that the wave functions are indeed eigen functions of the finite Fourier transform (the operator BD).

Take any arbitrary L2 function (say, sinc function) truncated at $[-T/2, T/2]$. Expand using those 5 wavefunctions as the bases in the finite time support scenario. Compute the percentage energy loss due to that operation. What would have been the percentage energy loss if the signal is not time truncated and the 5 wave functions are used as bases in the infinite time support? Compare.

Submit a pdf file containing all plots, tables, discussions. Submit code files (.m) separately. Read the paper given for generating the wave functions.