Ultrasonics 2025
Demo exercise 3 (Exercise 8)

Be prepared to present your solutions in the exercise session on Wed 19.3.

1. **USM setup (4 pts)**
   Draw a schema of a scanning acoustic microscope - explain the parts and their working principles. Describe the signal path in the device and how the signal changes in each part of the system.

2. **USM signal analysis (4 pts)**
   A template MATLAB code is provided to aid in this exercise – feel free to use any software. With the given A-line signal (.csv):
   a. Plot the raw data in time and frequency domains. The sampling frequency used was 1 GHz.
   b. Determine signal envelope and find the peak amplitude. Use for example Hilbert transform.
   c. Use the following reference measurements to determine the impedance of the material under test (using a linear fit). Guess the material measured based on the impedance you calculated (https://signal-processing.com/table/).

Calibration	Amplitude (V)	Acoustic Impedance (MRayls)
PVC	0.15	2.854
Aluminium	3.08	16.65
Steel	3.83	45.45