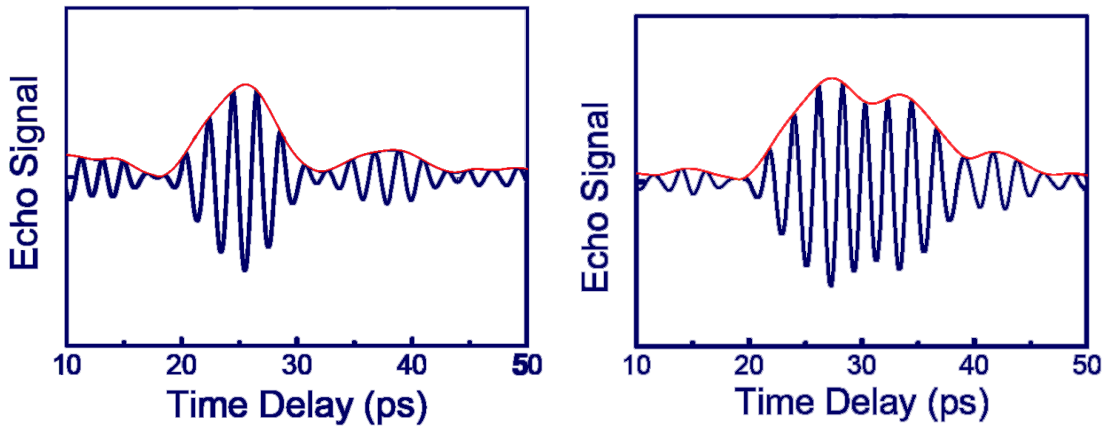
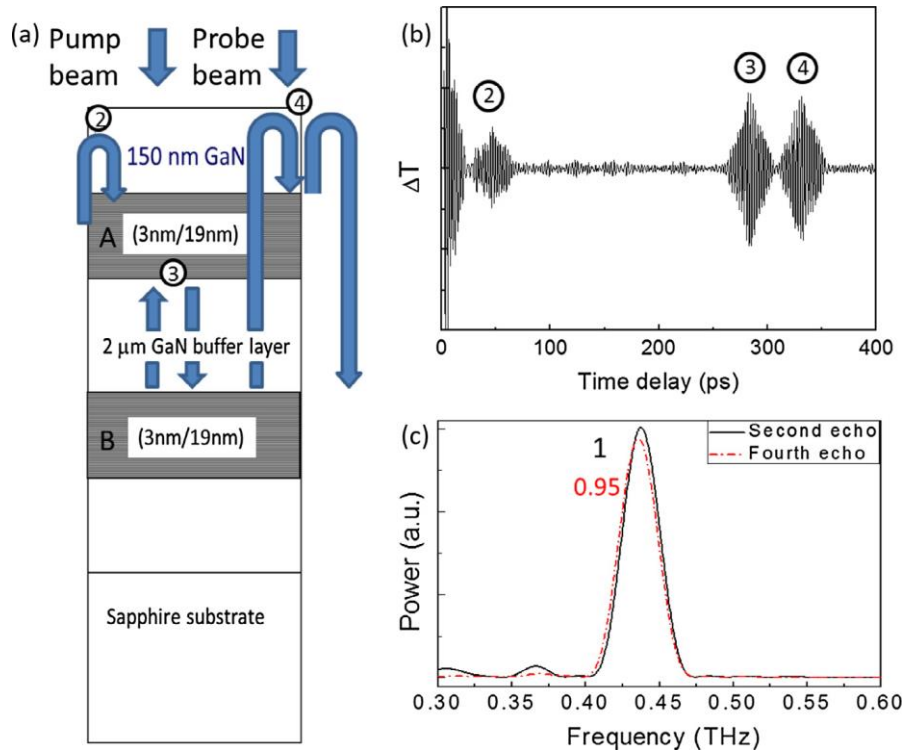
1. Nanoacoustic pulse-echo measurements

You have done two pulse-echo measurements for two separate samples (SiO_2 layer on top of a GaN substrate) with an OPT (Lin *et al*., Applied Physics Letters **89**, 2006) and obtained the following waveforms. Determine the approximate thickness of the GaN and SiO_2 layers. In addition, determine the frequency and bandwith of the signals.



2. Attenuation in nanoacoustics

Mante *et al*., 2015, show the following measurement setup and results:

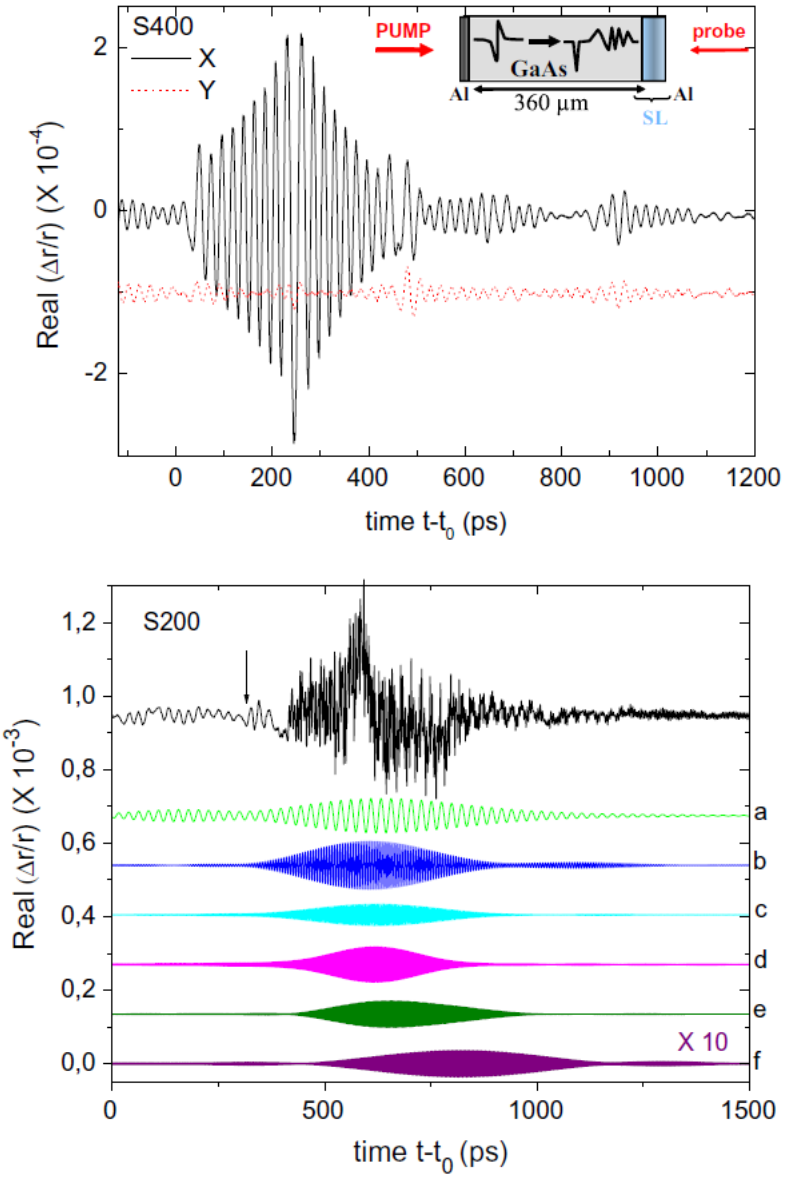


Calculate the attenuation in the GaN layer.

3.-4. Expected time of arrival

In the experiment by Huynh *et al*., 2015, the dispersion relation is of the form

$$\omega = v_0\, q - \gamma q^3$$



Calculate the expected delays in the times of arrival for the frequency components (a = 42 GHz, b = 161 GHz, c = 249 GHz, d = 365 GHz, e = 450 GHz and f = 567 GHz) and compare to the experiments.