­Exercise 4: Rewrite to improve structure

The following paragraph is designed to be the last paragraph in the introduction section of a scientific paper. The paper reports measurements of the Stark shift of an optical transition of Er ions in a common crystal, LiNbO3. Rewrite the paragraph to improve the structure and make the key points clearer.

"The Stark effect is the shift in the frequency of a transition line by an electric field. The size of the Stark shift in rare earth crystals is 10-100 kHz/(V.cm-1). The Stark shift is linear in crystal sites that do not have inversion symmetry (also called non-centrosymmetric sites).

The Stark shift is measured in rare earth crystals using many different methods. These methods involve detecting shifts in frequency when an external electric field is applied.Typically, an electric field is applied to the crystal by placing it inside a set of capacitive plates. Fields of around 1000 V.cm-1 can be applied with capacitive plates to crystals around 5 mm in diameter. As a result of this process, the Stark shifts achieved are much smaller than the spectral width of the rare earth transition.

The aforementioned shifts in frequency are detected using some sort of spectroscopic measurement. The spectroscopy technique that is used can be absorption spectroscopy or high-resolution techniques like holeburning and optical coherent transients. The resolution of these methods is limited only by the laser linewidth, not the spectral width of the transition.

It is important to know the Stark shift of Er in LiNbO3 for quantum information applications of this crystal. The Stark shift of Er in LiNbO3 has been measured [12] using an absorption technique to be 90±10 kHz/V.cm-1. However, this measurement can be improved upon. Firstly, absorption techniques are not very sensitive compared to holeburning techniques. Also, these measurements were made along only one direction, and Li NbO3 is completely anisotropic. Three orthogonal measurements are needed to measure the full Stark shift tensor.

In this work, to improve upon the existing measurement, we remeasure the Stark shift of Er in LiNbO3 along all three unit cell directions using a holeburning method.”