The helium atom is the prototype two-electron system, and consequently it has been immensely studied over the years. The analysis of the photoabsorption spectrum associated with doubly excited states by Fano and co-workers in the sixties was a touchstone for the understanding of VUV photoabsorption. The fluorescence yield (FY) spectrum [1,2] demonstrated that it is essential to include radiative decay and relativistic effects to understand the excitations at the present level of experimental accuracy.

The FY spectrum turns out to be extremely sensitive to static electric fields. Pronounced changes are seen already at a field strength of a few V/cm. Close to the N=2 threshold there is a rich phenomenology, and Stark effects persist through the whole spectrum below threshold. The main reason for the strong effect is the redistribution of intensity between the radiative and autoionization decay channels.

The observations are in good agreement with the predictions of R-matrix calculations.

We have also observed a dramatic magnetic-field dependence on the FY spectrum, although these effects are confined to the higher Rydberg states. The magnetic-field dependence can also be understood in terms of a redistribution of intensity between the two decay channels.

Finally, we present new fluorescence yield data recorded in a moderate microwave field, varied in the 10-18 GHz frequency range, corresponding to the 2s-2p transition in the He ion.

References