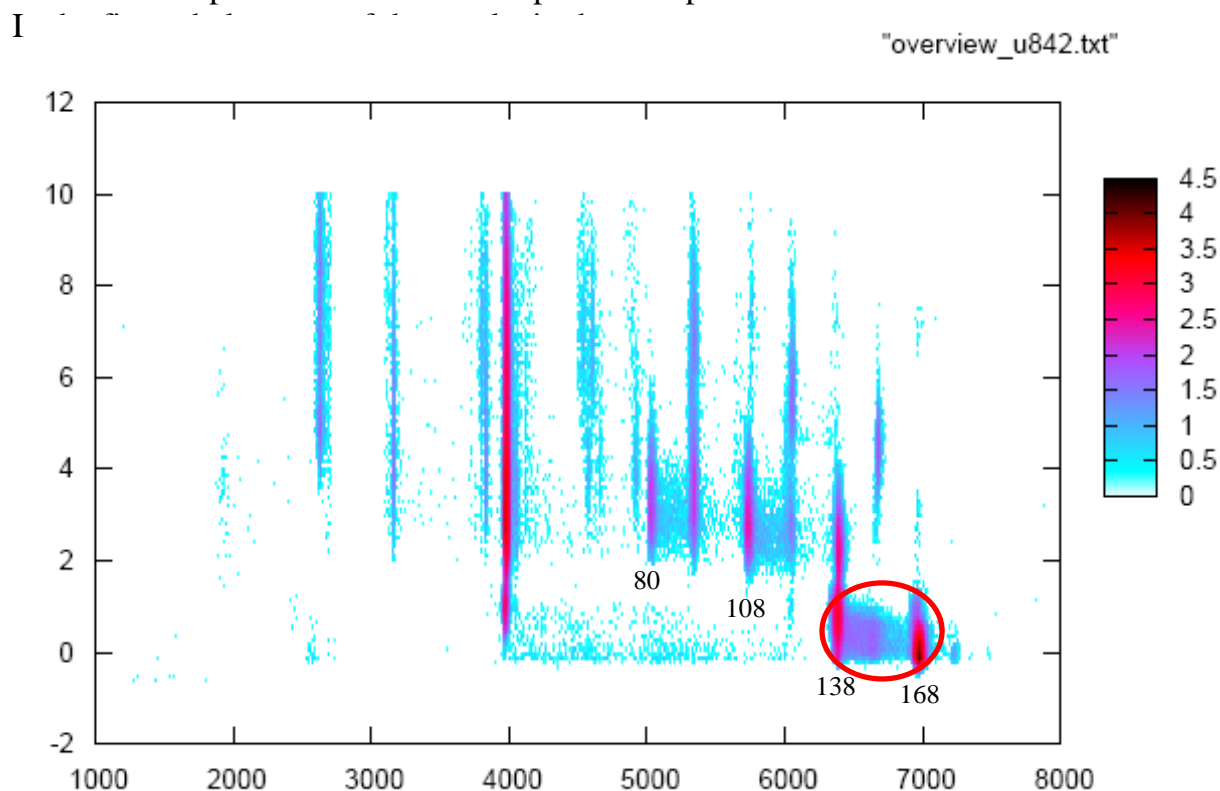


Scientific report of the short visit in Belfast

The main goal of this short visit at the Centre for Atomic and Molecular Quantum Dynamics of the Department of Physics and Astronomy was to examine the metastable decay reaction of 1,3-dinitrobenzene of anions formed close to 0°eV. High electron energy resolution studies in Innsbruck show up to three narrow features for the parent anions of the nitro-aromatic molecules but the instrument that is utilized to probe the stability of the anions cannot resolve these features due to its poor electron energy resolution. In Belfast the group of Tom Field uses an electron monochromator to attach electrons at a well defined energy to neutral molecules in gas phase. These anions are analysed with an time-of-flight mass spectrometer. During my stay in Belfast a new gas inlet system had to be tested because of the low vapour pressure of the 1,3-dinitrobenzene. The old gas inlet system was not suitable to reach a high signal for measurements. But this problem was fixed within the first day. The rest of the time I assisted Karola Graupner, a PhD-student of Tom Field, who carries out the experiments. We made measurements to different settings of the apparatus and luckily there were no problems which interrupted the experiments.



On the y-axis the electron energy is shown in eV and on the x-axis the time of flight is shown in nanoseconds. The intensity of the signal has a logarithmic scale and is shown to the right. Just for an orientation I have marked the signal of some masses. As we have known from our experiments in Innsbruck we can see here the metastable decay reaction from the parent anion into mass 138. This region I have marked in red. We see here two regions with different strong signals. This is because the anions are accelerated twice. But we were also able to find two new metastable decay reaction at higher electron energies. There are two metastable decays from mass 138 into mass 108, and from mass 108 into mass 80. We can be sure that these signals are produced

by metastable anions because Karola Graupner made simulations of similar decay reactions.

The present project had triggered a collaboration between the bio-nanophysics group of the Institut für Ionenphysik und Angewandte Physik in Innsbruck and the Centre for Atomic and Molecular Quantum Dynamics of the Department of Physics and Astronomy in Belfast. And also the computational chemistry group of the Institut für Ionenphysik und Angewandte Physik in Innsbruck will join this collaboration to complete the experiments with quantum chemical calculations.