Analysis of time-of-flight spectra in electron acetylene collision experiment

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Synopsis The coincidence time-of-flight (TOF) spectra of the Coulomb explosion process of $C_2H_2^{2+}$dication have been simulated with Monte Carlo method to extract proper kinetic energy release(KER).

Acetylene is an important molecule in various fields such as the semiconductor industry, edge plasmas in fusion reactors and interstellar plasmas [1]. Among the possible ions generated from the ionization of acetylene, the $C_2H_2^{2+}$dication received much attention in recent years.

We have performed electron acetylene collision experiment with a cold target recoil ion spectroscopy at Fudan university [2]. With a relatively low extraction field (~45V/cm) and acceleration length of 11cm, the 2D coincidence map of the Coulomb explosion process has been recorded. To calculate the momentum of the fragment ions, normally one assume that the tof for C^+ is smaller than that for the CH^+. However, this is not valid if the initial momentum is relatively large in comparison with the extraction field, like e.g. in the case of Coulomb explosion with extraction field given above. One might increase the extraction field to solve the problem, with a decreasing resolution.

We have simulated the data with Monte Carlo method to extract proper KER information from current experimental configuration as shown in Fig. 1. Further details will be presented at the conference.

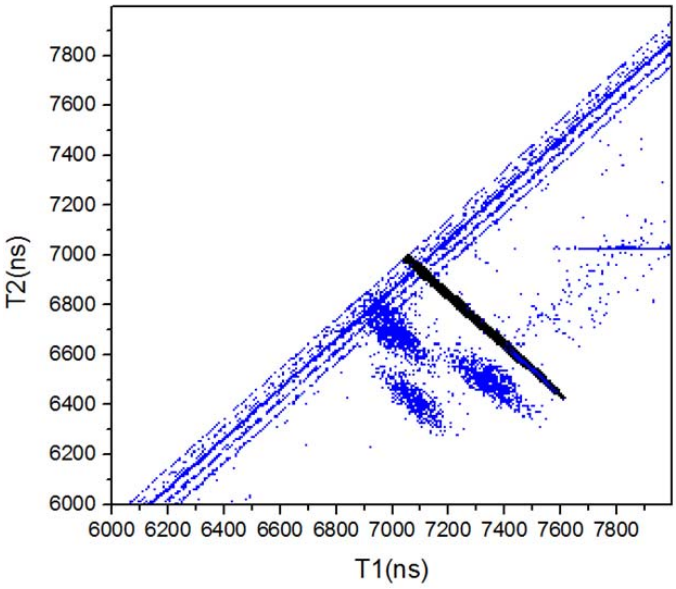

Figure 1. simulated coincidence spectrum for CH-CH channel of Coulomb explosion of $C_2H_2^{2+}$ dication.

References

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[2] Y. Zhang, *et al.* 2014 *NIM B* **337** 39

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