

## 4 - 13 Velocity Map Imaging Spectrometer for Photon-fullerene Collision Experiments\*

Zhang Xujie<sup>1</sup>, Shi Fudong, Qian Dongbin, Zhu Xiaolong, Yang Jie and Ma Xinwen

(<sup>1</sup>School of Physics and Engineering, Henan University of Science and Technology, Luoyang, 471003, China)

Imaging detector is an increasingly popular tool for measuring kinetic energy distributions of photoelectrons or ions from photoionization and photodissociation<sup>[1,2]</sup>. An important advance in imaging is Velocity Map Imaging (VMI)<sup>[3]</sup>, where the electron/ion optics consists of a lens, which significantly reduces the sensitivity of the position of impact on detector on the position of creation of the ion or electron, while maintaining the dependence of the position of impact on the initial velocity.

Recently, we were working on the study of the fragmentation phase transition in C<sub>60</sub> systems and established a “molecular thermometer” based on the kinetic energy distributions of fragments to measure the temperature of C<sub>60</sub> prior to fragmentation<sup>[4]</sup>. To improve the measurement precision, we have designed and built a VMI spectrometer. The schematic diagram of the whole spectrometer is showed in Fig. 1. The ionic fragments are produced at the crossing point of laser and C<sub>60</sub> beam, and are accelerated using a direct-current electric field towards a MCP detector followed by a phosphor screen and a camera system to record the positions of impact on the detector surface.

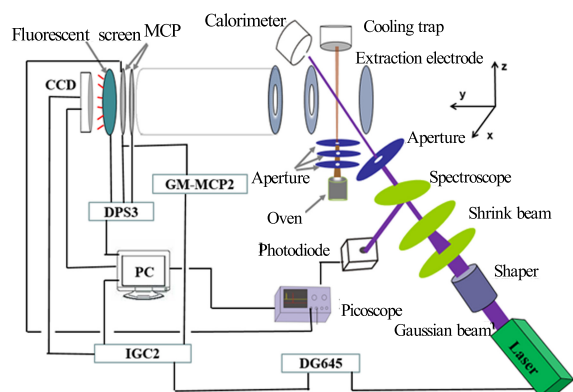


Fig. 1 (color online) Beam time distribution in terms of affiliation.

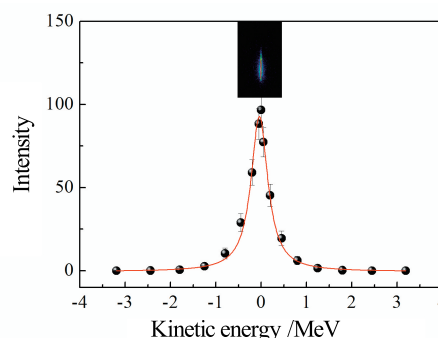


Fig. 2 (color online) Beam time distribution in terms of research area.

We tested the performance of the spectrometer using the C<sub>60</sub><sup>+</sup> ions from photoionization induced by nanosecond laser. The 2D imaging of parent ions is shown in Fig. 2. The resolution of our apparatus is quantified by the average kinetic energy of C<sub>60</sub><sup>+</sup> and is determined by the projection of the 2D imaging on the x axis. It implies that the resolution of VMI spectrometer (about 0.5 MeV) is improved by one order of magnitude compared with our previous experiments where the kinetic energy distribution was measured by time-of-flight mass spectrometry technique.

### References

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