Scientific Report on the CNR-STM visit at the IMRAM Institute in Japan
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My visit at the Tohoku University, Sendai (Japan) lasted from September 4th to September 29th .

During this time I joined the group of Prof. K. Ueda at the Institute of Multidisciplinary Research for Advanced Materials (IMRAM). In particular I was involved in a new activity of this group, consisting in setting up, testing and operating a newly built velocity map imaging (VMI) apparatus to be used in conjunction with a cluster source for FEL experiment at Spring8. The incoming four days of beamtime is allocated for the 15th of October, i.e. well beyond my departure from Japan, so that I was not able to participate to the experiments.

During my stay at the IMRAM the activity consisted in

1) testing and optimising the VMI operating conditions. At the time of my arrival, the new experimental apparatus was just switch on for the first time. An O_2 molecular beam, multiphoton ionised by a 100fs, 800nm laser beam, provided a source of ions/electrons for testing the detection capabilities of the spectrometer.
   - The working condition of the detector (MPC+CCD camera) where checked and optimised
   - The aligning procedures to maximise the overlap between the two beams and place the focusing of the laser at the interaction region were established.
   - Different modes of operation of the spectrometer (with gated and triggered acquisition) where implemented. These will be of vital importance in the low repetition rate FEL beam at Spring8.
   - The performance of the VMI was tested for different voltage settings; the optimal focusing condition was found to be in good accordance with the simulated one.
   - The new software for data acquisition and data analysis was tested.

When the tests were considered successfully concluded, some preliminary feasibility studies for future laboratory experiments were performed with the new apparatus.

2) Feasibility studies for above threshold ionisation (HATI) in molecules of increasing complexity.

The tests were performed with a supersonic jet of Xe atoms, with high laser power and the VMI spectrometer set for the collection of electron kinetic energies up to 40-50eV (see figure 1). Main goal was to produce with the VMI spectrometer results to be compared to former achievements by this same group [1] with an electron time of flight (TOF) spectrometer. This provided an estimate of counting rates and expected acquisition times. A substantial advantage of the present setting with respect to the TOF apparatus will be the possibility to simultaneously measure the energy and angular distribution of the photoelectrons, with no need to rotate the laser polarisation. This will lead to a substantial reduction of the acquisition times.

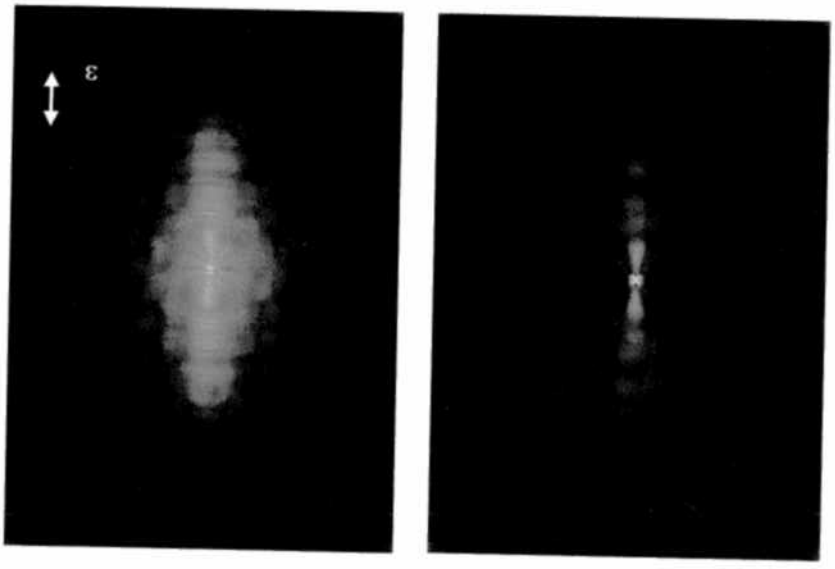

Figure 1.
Left: preliminary photoelectron energy/angular distribution acquired by the new VMI apparatus at IMRAM in the multiphoton ionisation of Xe atom at 800mn. Rigth: the same image ha been inverted using pBasex program. The interference patterns generated by the electrons ionised at different times during the 100fs laser pulse are clearly visible. The kinetic energy range in the present image is about 10eV for an acquisition time of about 3 hours.

Roma, 2 novembre 2010

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