Monitoring of Fast Processes by TOFMS

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Introduction

There is an increasing need for mass analysis of fast processes. Part of this need arises from the popularity of fast multi-dimensional analysis methods like GC-TOF, Mobility-TOF, or EM-TOF (electron monochromator) to just name a few. In those instruments, the TOF serves as a mass monitor scanning the elute of the prior separation method.
A second field of application is the investigation of fast original processes like gas discharges where the chemistry taking place during discharges is investigated, or Photo Assisted Reactive Ion Etching where the chemical processes in a plasma during irradiance with laser pulses are investigated.

Methods

We present two strategies to increase the TOF repetition rate in order to reduce the acquisition time scale.

1) Time Interleaved TOF acquisition

Interleaved acquisition is the method of acquiring time series in several passes. This allows monitoring processes or chromatograms at time steps of 2 µs (see Figure 2), which is considerably shorter than the time between TOF extractions. Figure 1 illustrates the interleave timing scheme used to acquire the spectra of Figure 2.

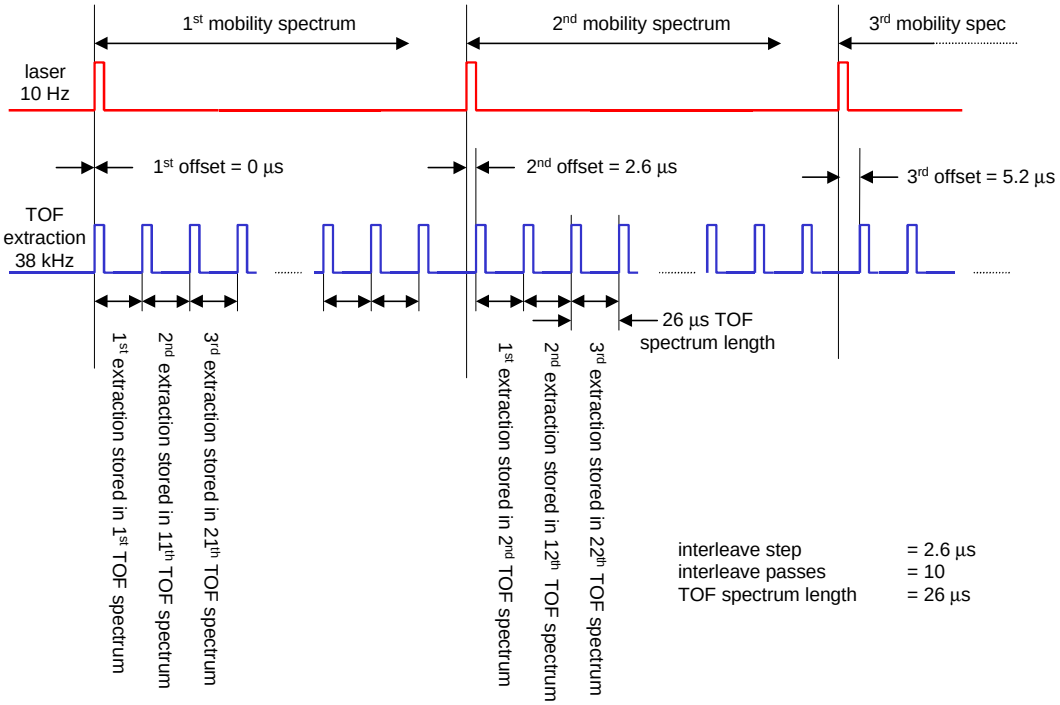

Figure 1: Interleaved timing acquisition scheme

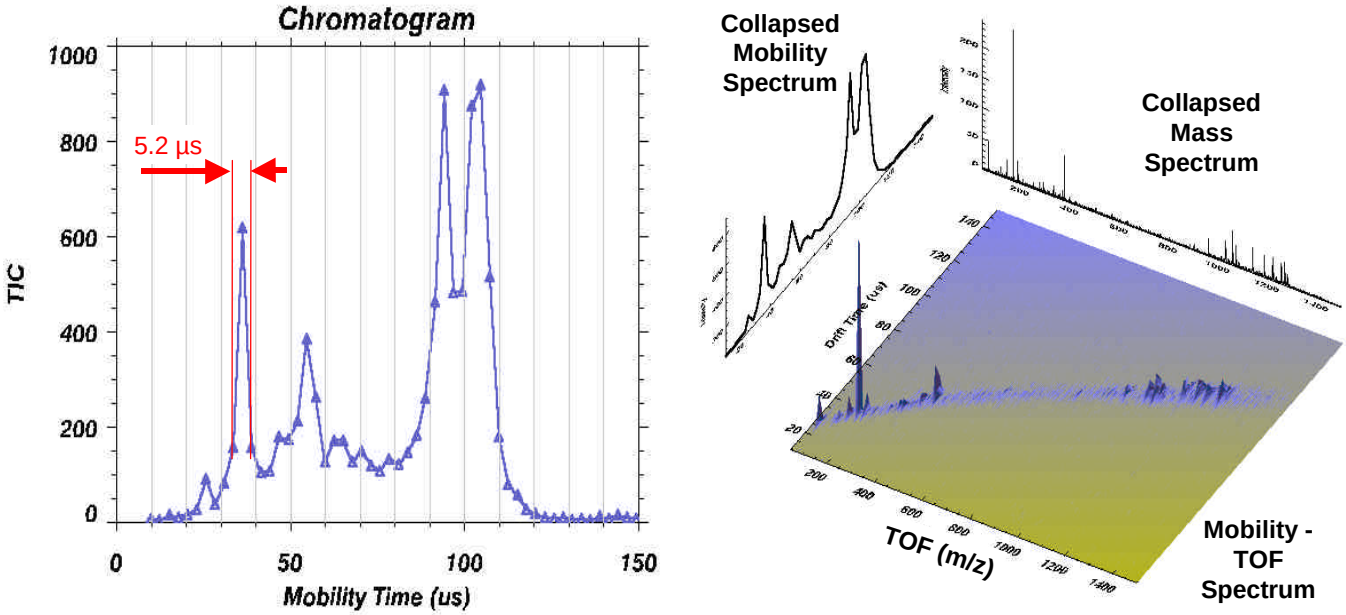

Figure 2: Data acquired with the interleaved acquisition scheme of Figure 1.

2) Position Sensitive Detector

A second method to monitor fast processes is using a Position Sensitive Detector (PSD), as illustrated in Figure 3. An ion (red) which elutes slightly earlier from the mobility spectrometer than an other ion (blue), impinges on the right side of the position sensitive detector.

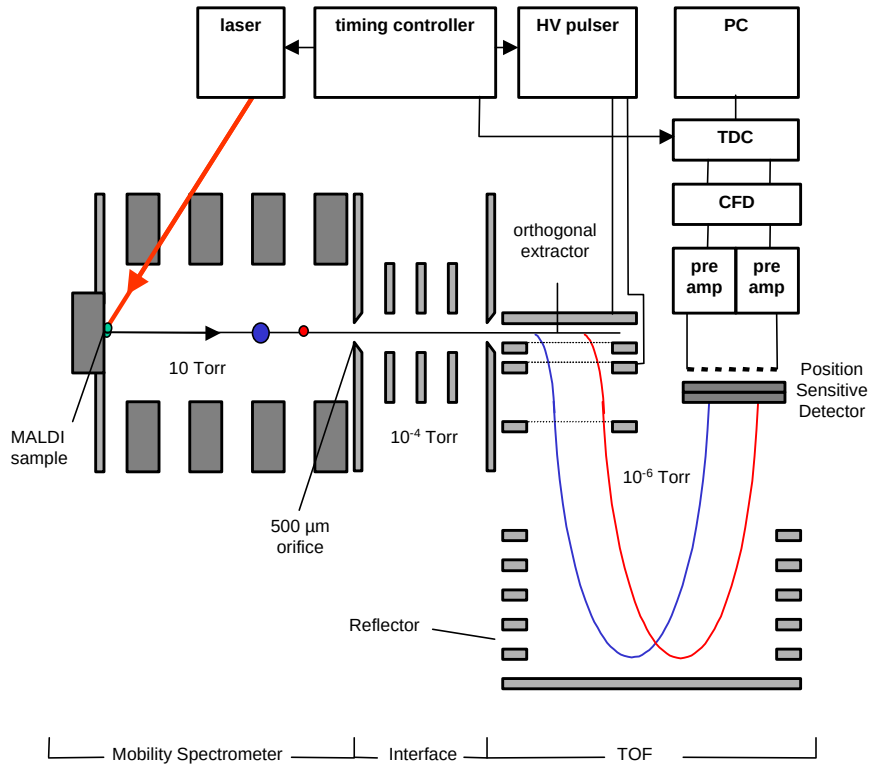

Figure 3: Monitoring of fast processes with TOF incorporating a position sensitive detector.