

# Mass Analysis using Ion Trap Array (ITA)

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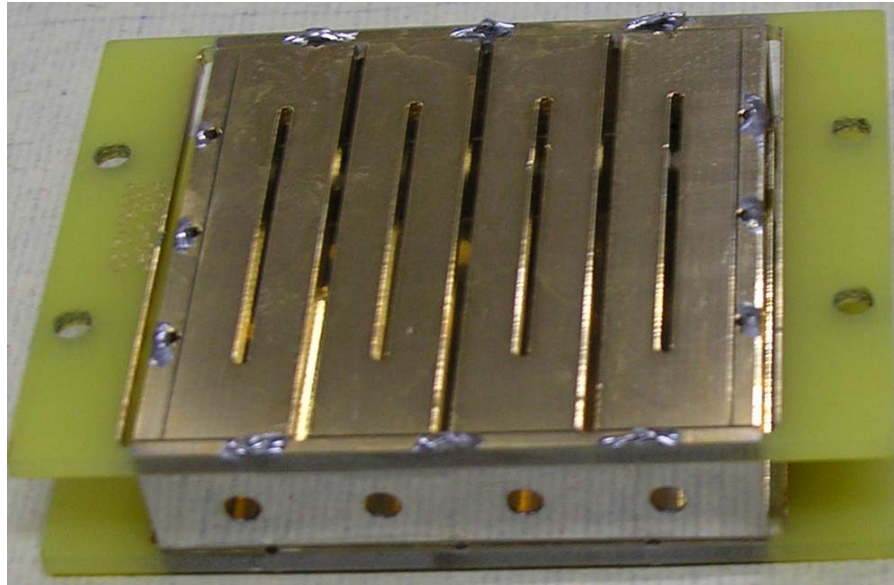
Li Ding

*Shimadzu Research Laboratory (Shanghai) Co. Ltd.*

## *Acknowledgements:*

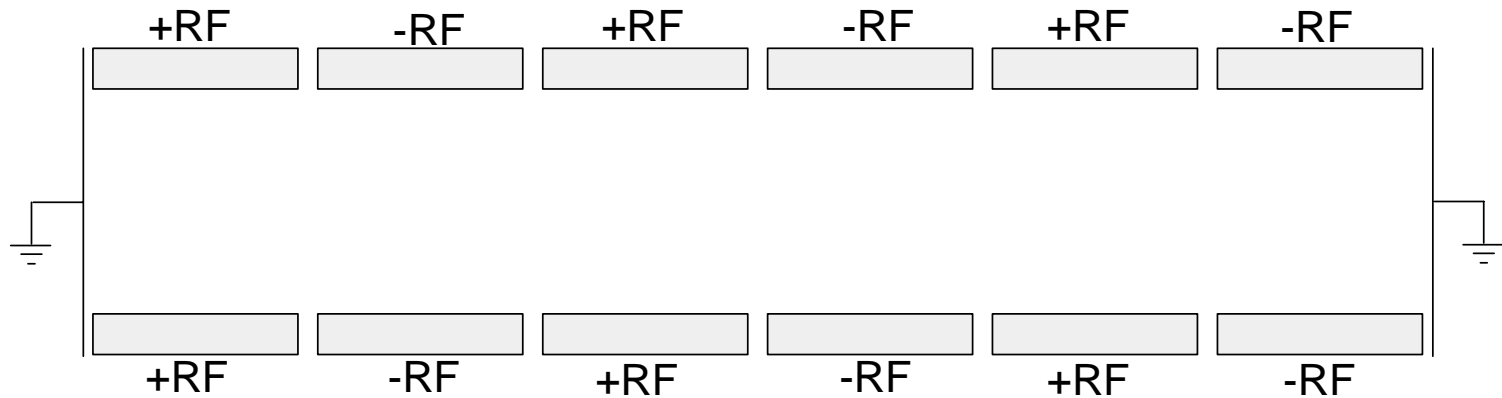
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# Overview



An Ion Trap Array (ITA) with four ion traps is constructed by two parallel printed circuit board plates. Each ion trap in the ITA has the normal performance of an ion trap.

# Introduction

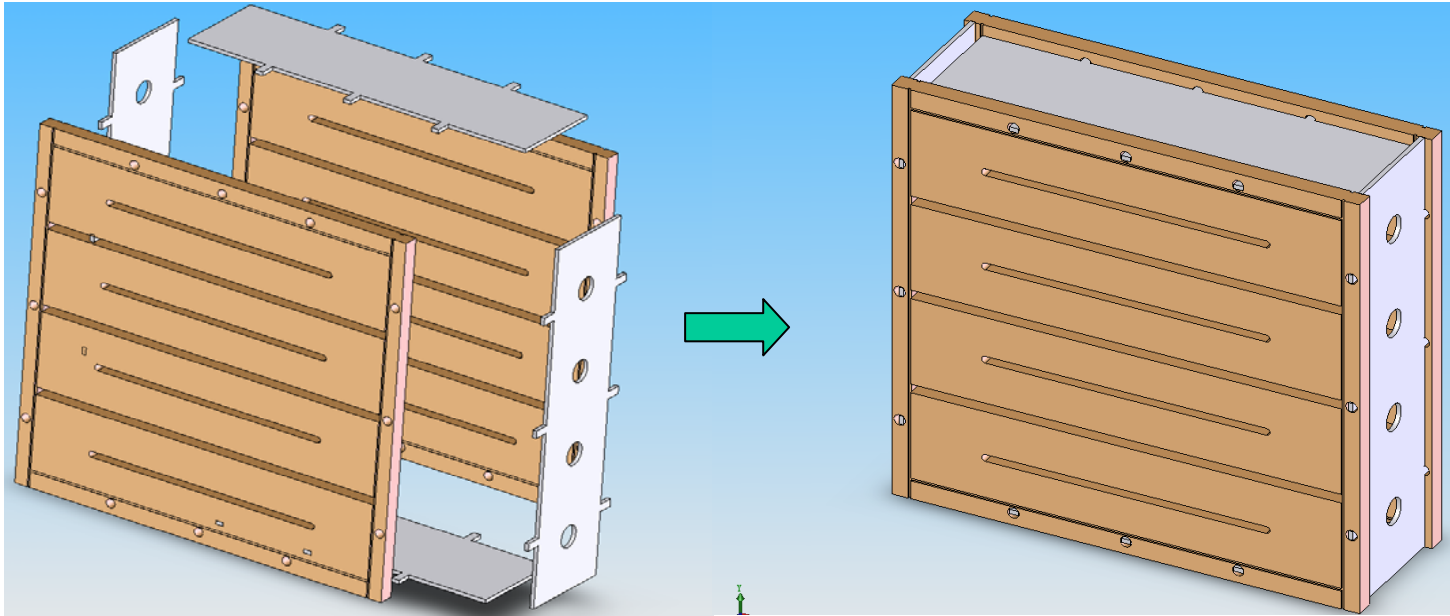


- The ITA was built by two parallel plates, and each plate was fabricated to several electric segments. They were placed symmetrically to those on the opposite plate. There is not any electrode between the two parallel electric segments.

- Every segment was supplied with a RF voltage, and the voltage polarity of adjacent electric segment is opposite.
- There are mainly quadrupole field with some higher order fields produced between the opposite electric segments, so multiple ion trapping regions are formed.
- Ions can be trapped, analyzed, isolated and mass-selected ejected by each ion trap in the ITA.

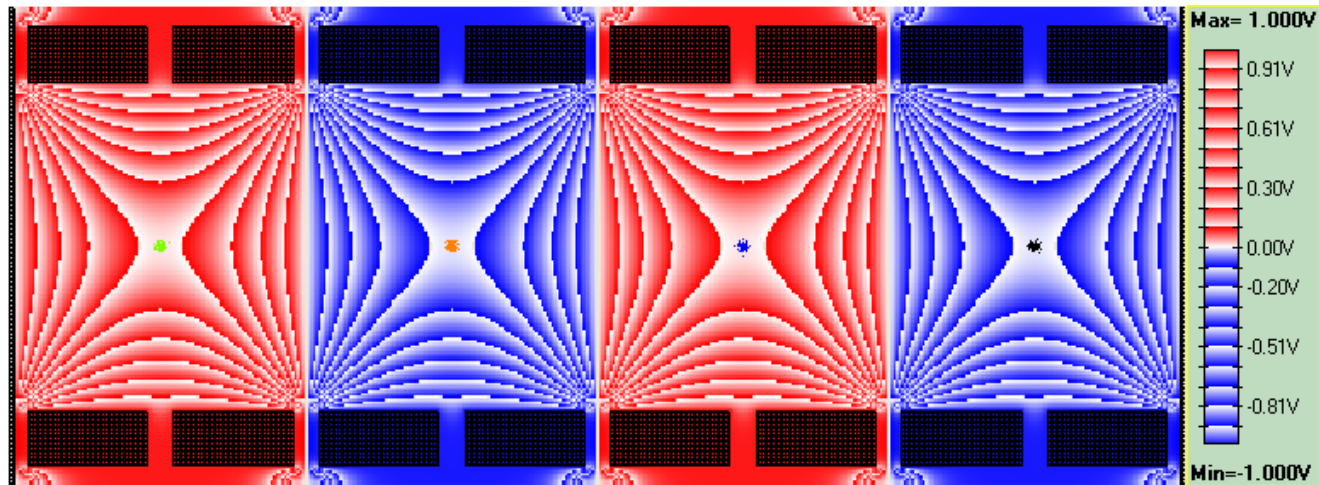
# Method

## 1, Construction and structure of an ITA



## 2, Geometry & multipoles

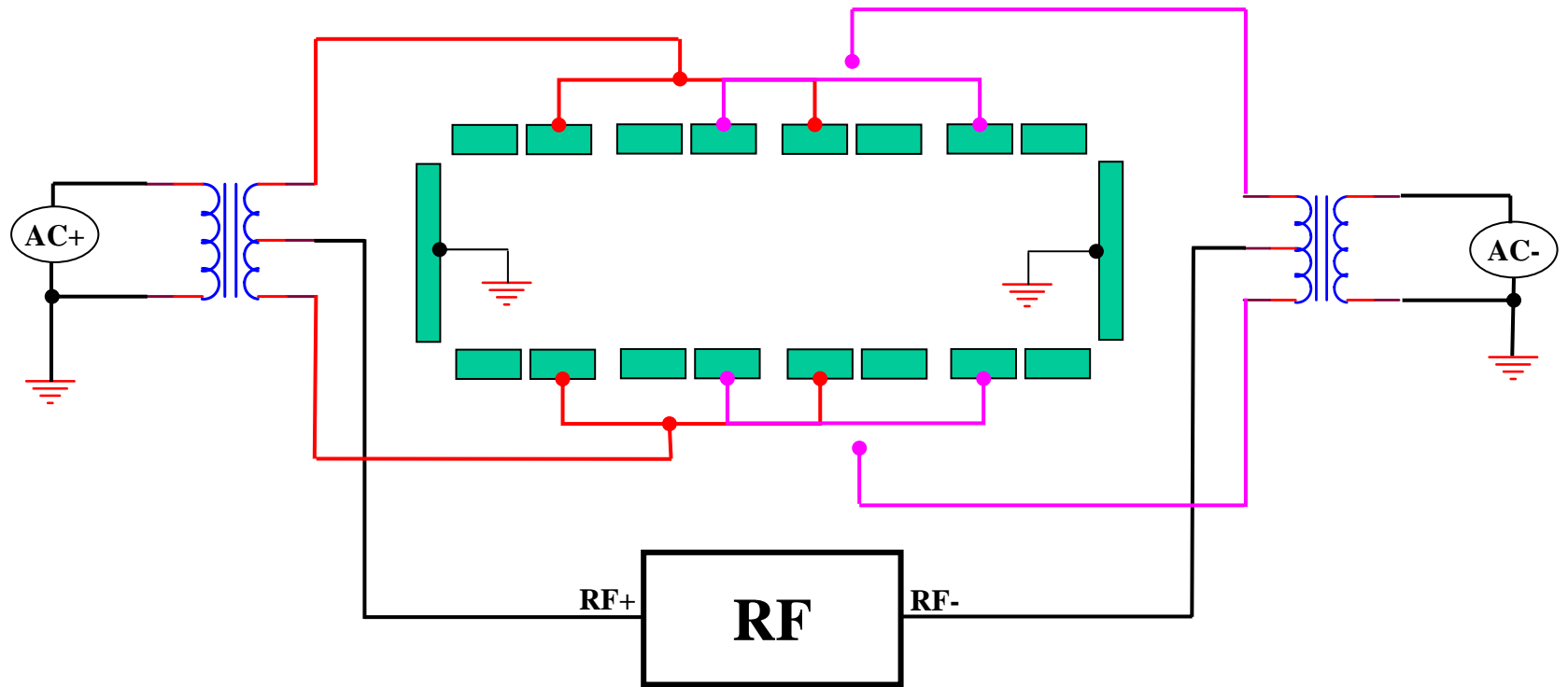
Geometry: 11x12.5x40 mm



Multipoles:

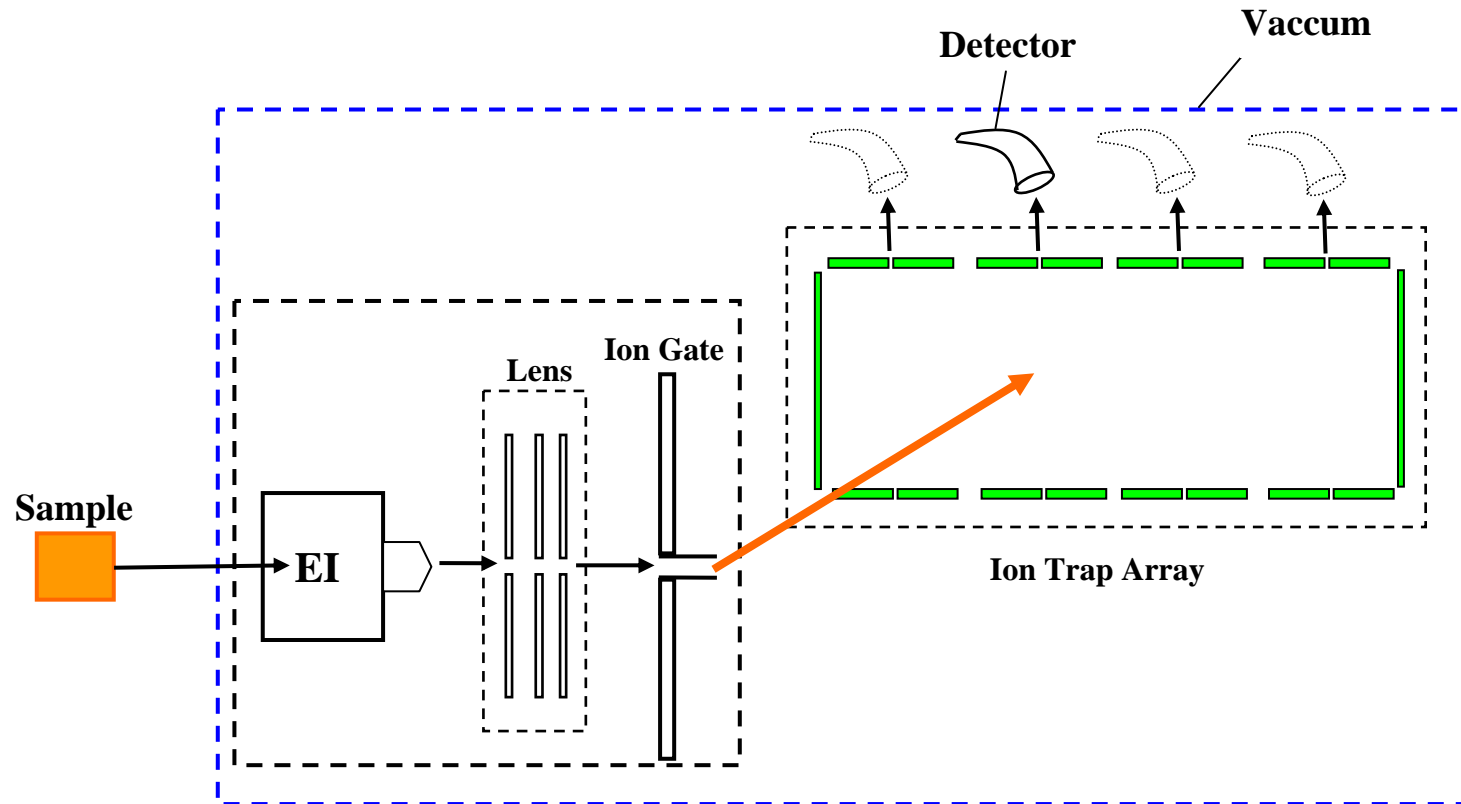
	$A_2$	$A_4$	$A_6$	$A_8$	$A_{10}$
	0.4725	- 0.03165	- 0.03514	0.006858	0.002589

# 3, Connections of Power Supplies



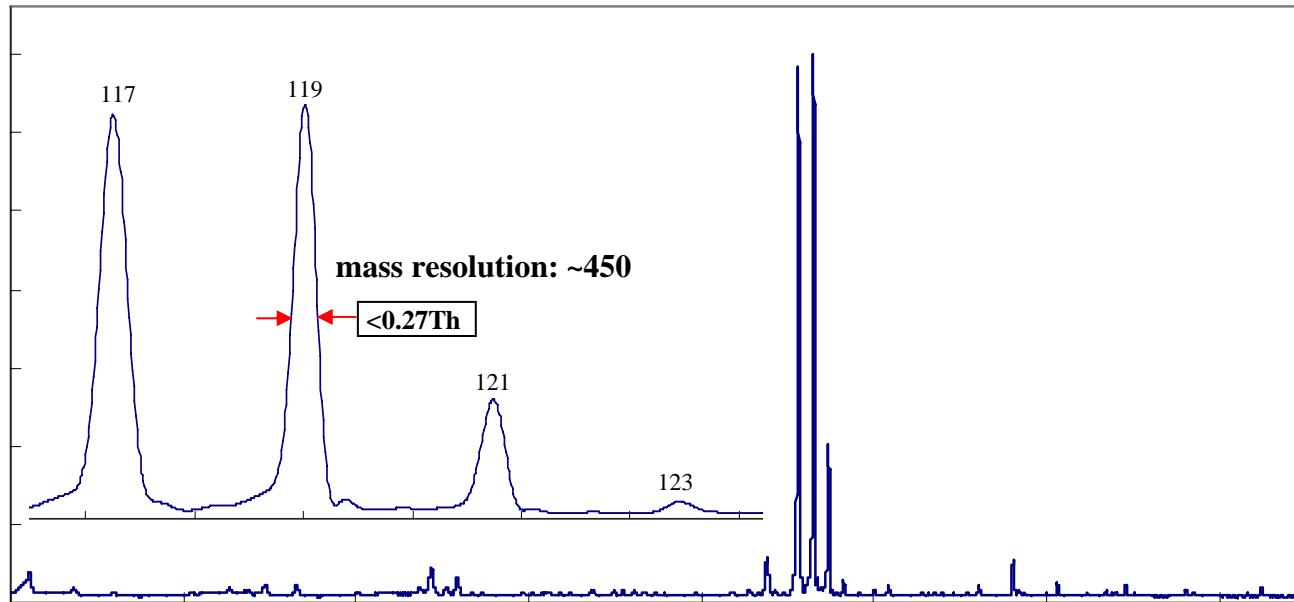
# 4, Experimental diagram of an ITA system.

(Only one ion trap with EI source in the ITA was tested so far)



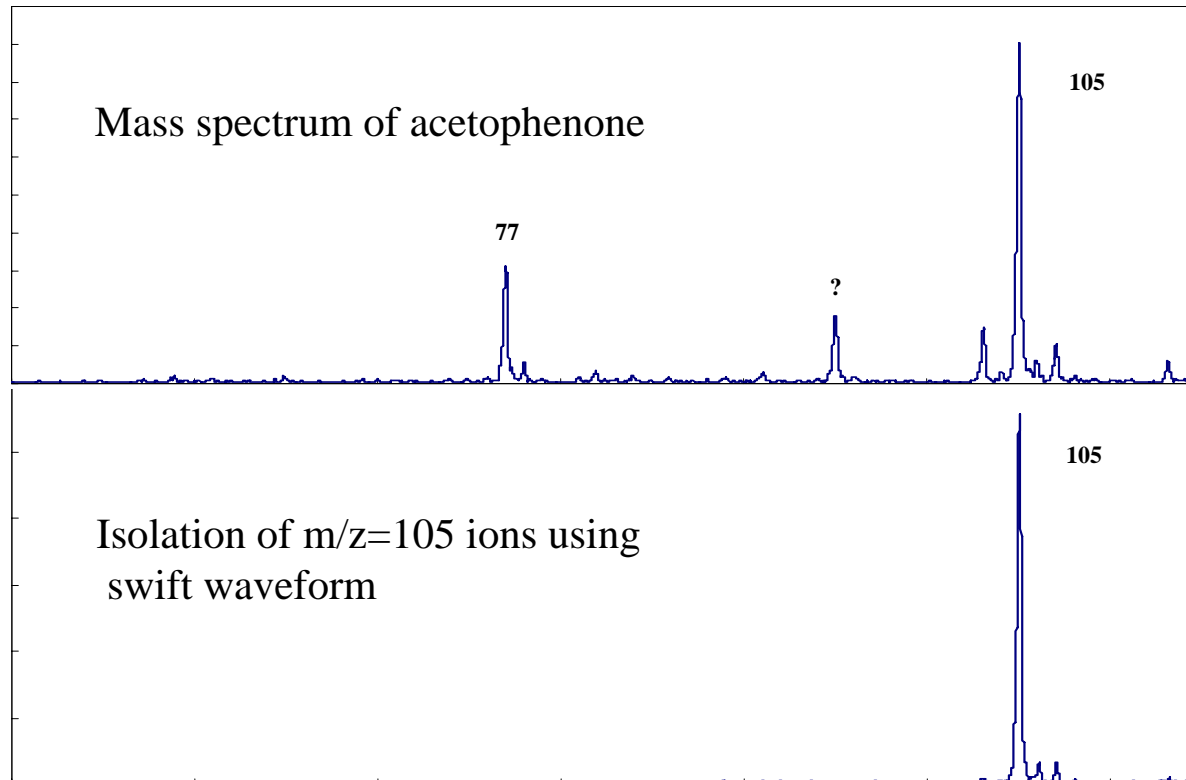
# Results

## 1, Mass analysis



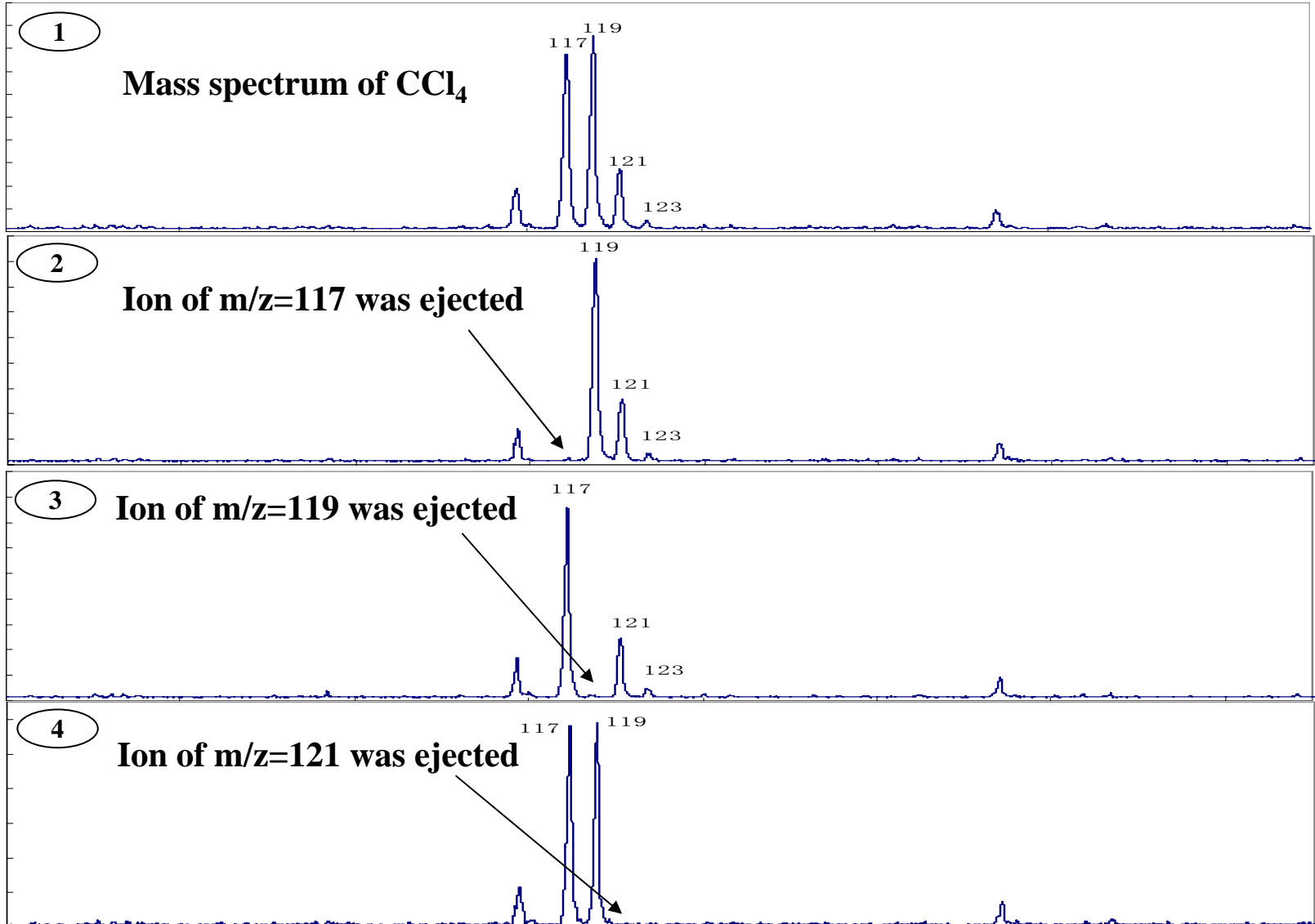
**Figure 1. Mass spectrum of carbon tetrachloride(CCl<sub>4</sub>) using an ion trap in Ion Trap Array**

## 2, Ion isolation



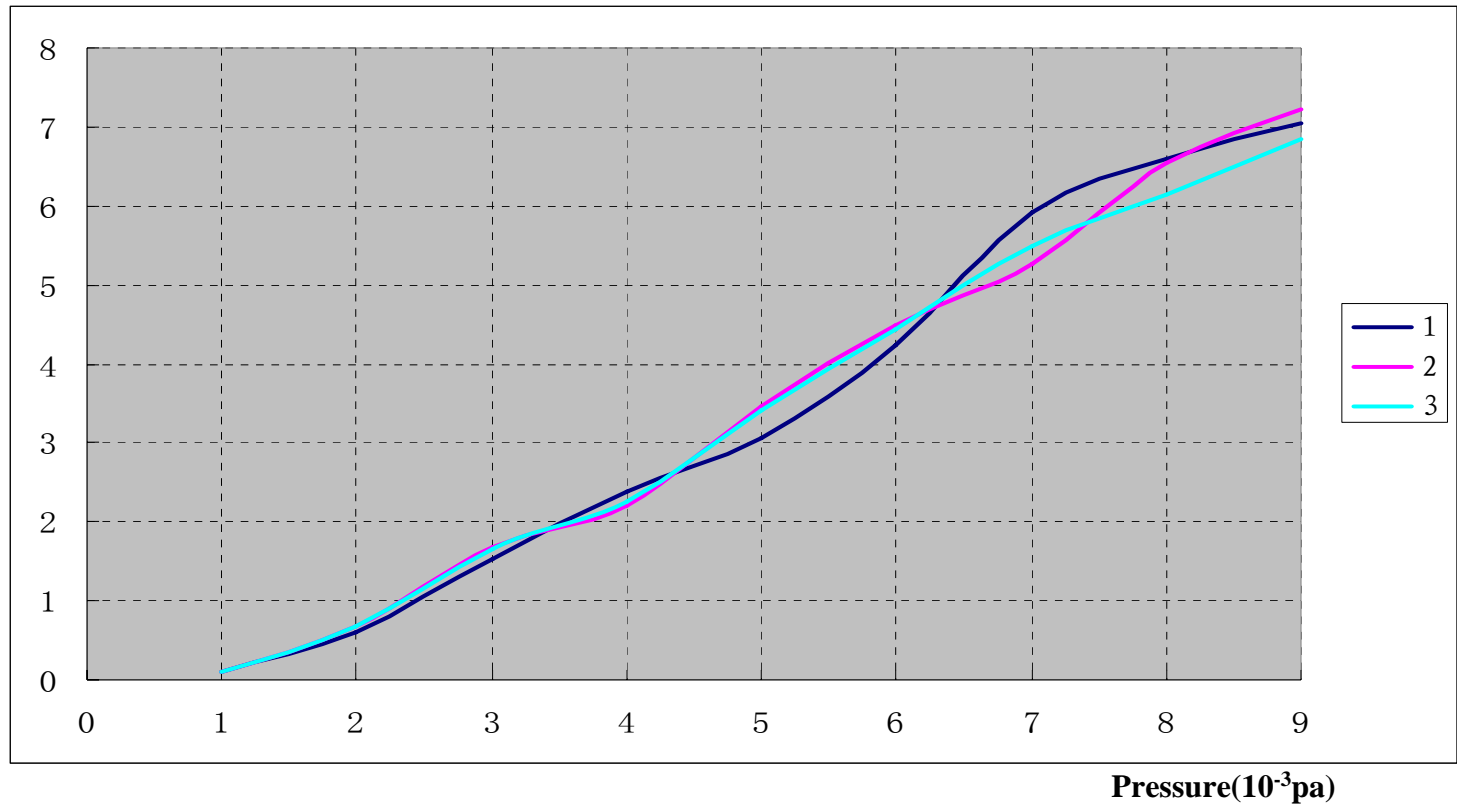
**Figure 2. Mass isolation of acetophenone ions ( $m/z=105$ ) using an ion trap in ITA.**

# 3. Mass-selected ejection

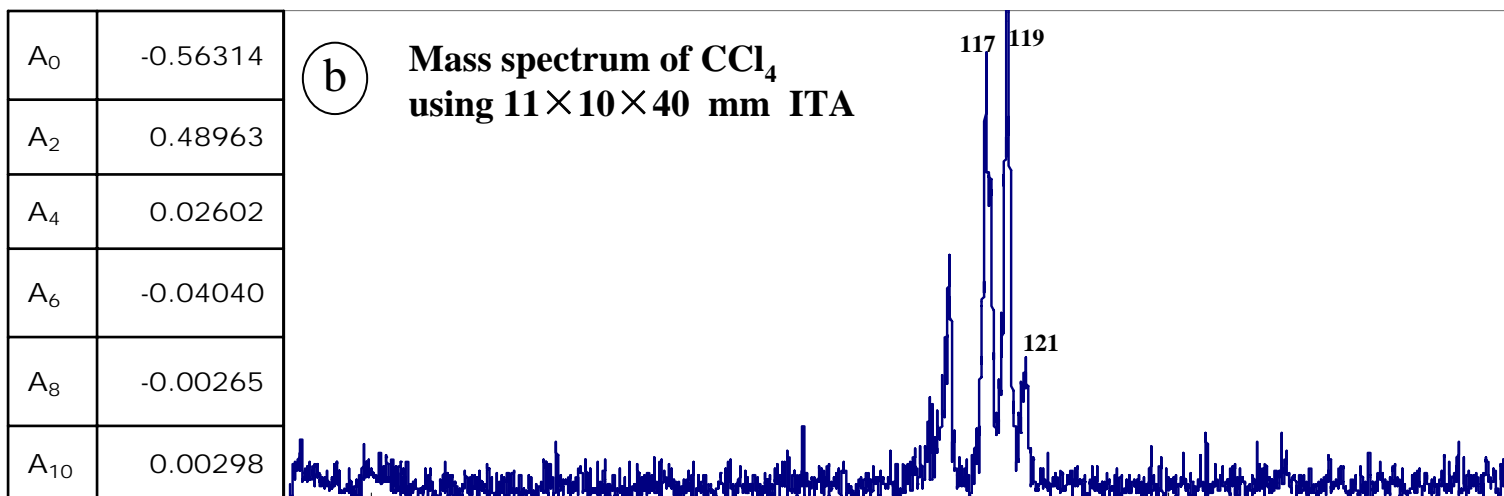
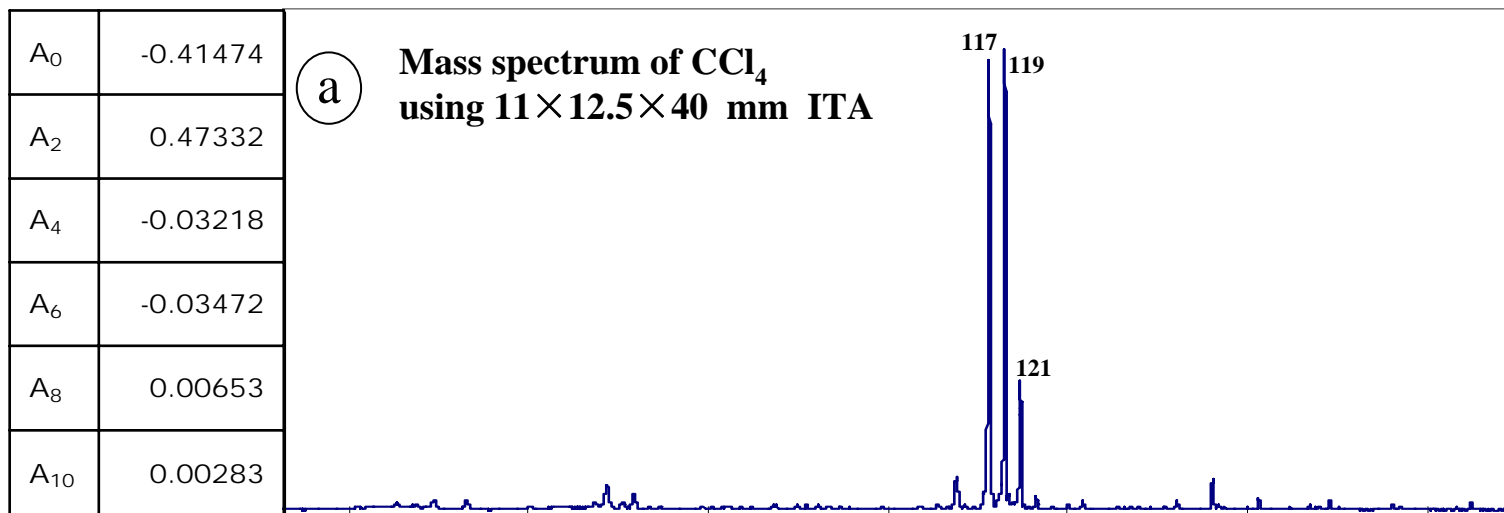


# 4, Ion Intensity vs Helium Pressure in ITA

Intensity (Arb. Unit)



# 5, Mass resolution vs geometry

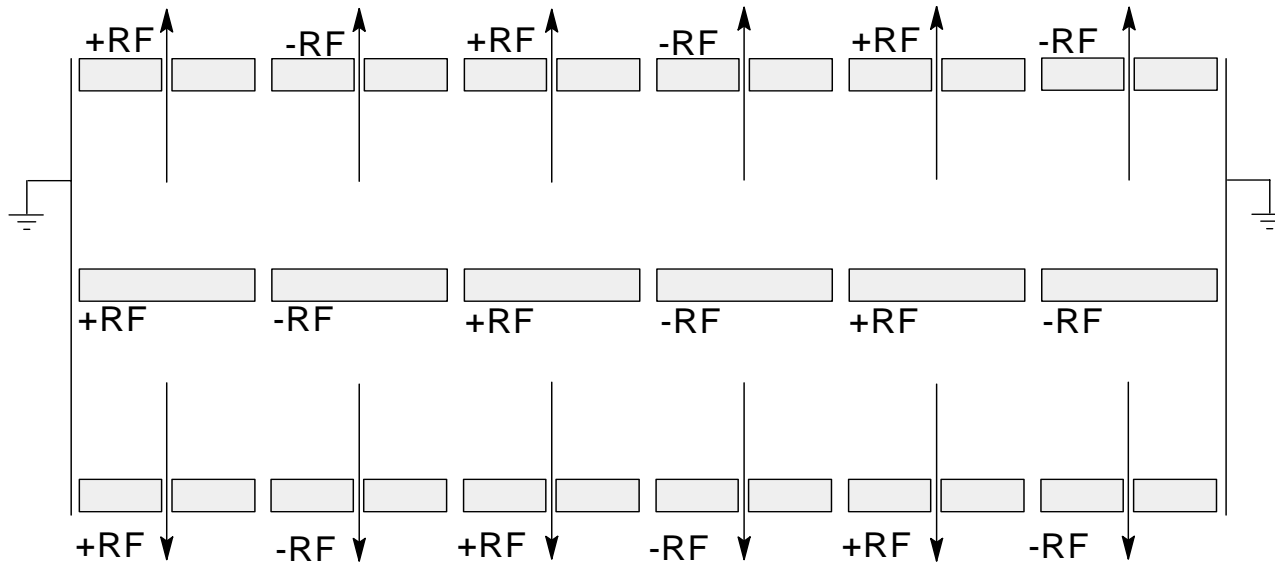


# Conclusion

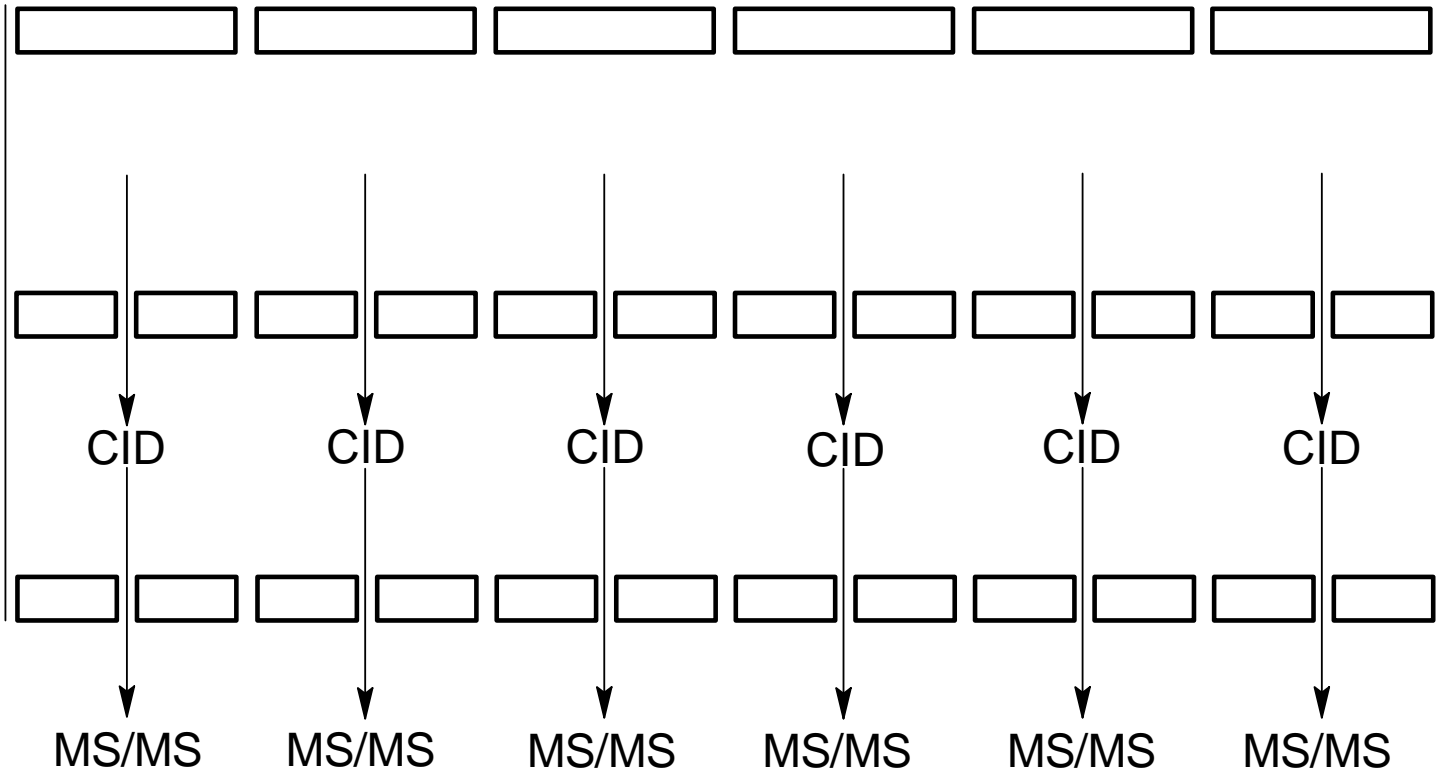
- Ion Trap Array (ITA) with many ion traps can be simply built by two printed circuit board (PCB) plates, or two flat, or two other shape electrodes;
- Each ion trap in an ITA has the normal functions of a “conventional” ion trap, such as,
  - (1). Ion storage;
  - (2). Mass analysis;
  - (3). Ion isolation;
  - (4). Mass selected ejection;
  - (5). CID and MS/MS;

# Next

- Optimization of ITA geometry and performance.
- Multiple ion sources for parallel ion storage, mass analysis of multiple samples.
- Two dimensional ITA.



- Multiple MS/MS.



- Other shape electrodes.