

ION TRAP TIME OF FLIGHT

Addition of the Ion Trap to the Time of Flight Mass Spectrometer (TOFMS) has the following advantages:

1. The ion trap will capture and store ions with large initial **energy** distribution (up to 10eV), large **spatial** distribution and large **temporal** distribution. These three variables are the principal limitation of the performance of any TOFMS.
2. The trapped ions can be **selectively** stored with the use of an end cap modulation apparatus. This prevents saturation of the trap with isotopes which are not of interest such as fragments. It also prevents saturation of the detector and data system, especially when used with pulse counting.
3. The stored ions are injected into the TOF, and as soon as the stored ions are extracted (3 microseconds) the trap can begin storing ions for the next shot during the flight time of approximately 100 microseconds. Thus the **duty cycle** of the instrument is increased to near 97%. This increase in sensitivity compensates for another major limitation of TOFMS performance.

By the same token, addition of a TOF can improve the performance of an ion trap in the following ways:

1. Eliminate the relatively long extraction times required for the mass selective instability mode of operation. The resulting high repetition rate allows the tracking of rapid changes in sample composition such as in GCMS detection or other fast response applications.
2. Pulse extraction is much more forgiving of slightly dirty traps which can cause lack of repeatability in the necessarily precise extraction process. This results in improved mass accuracy and uniformity of sensitivity over time.

Specifications of the Ion Trap:

1. Diameter of the ring electrode (r_0) = 10mm
2. Distance between the center of an ion trap and the end cap (z_0) = 7.07mm