

Simulating a Charged Particle Entering a Quadrupole Ion Trap

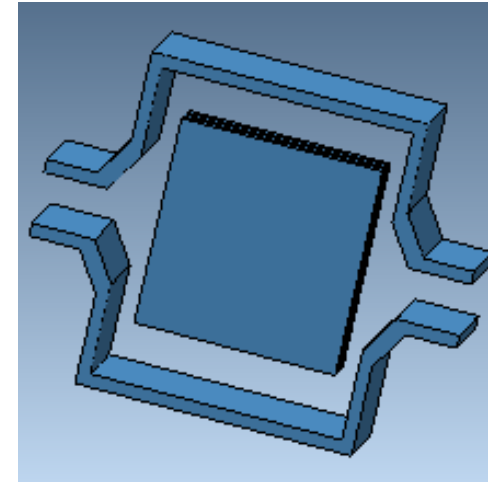
Simulating a Charged Particle Entering a Quadrupole Ion Trap

Using ElecNet and the Trajectory Evaluator add-on, the trajectories of charged particles entering a Quadrupole Ion Trap can be simulated.

The results presented are based on a particle with an electric charge (of value $-1.6e-29$) being placed at the center of the ion trap while the side electrode is subjected to a frequency of 100 Hz.

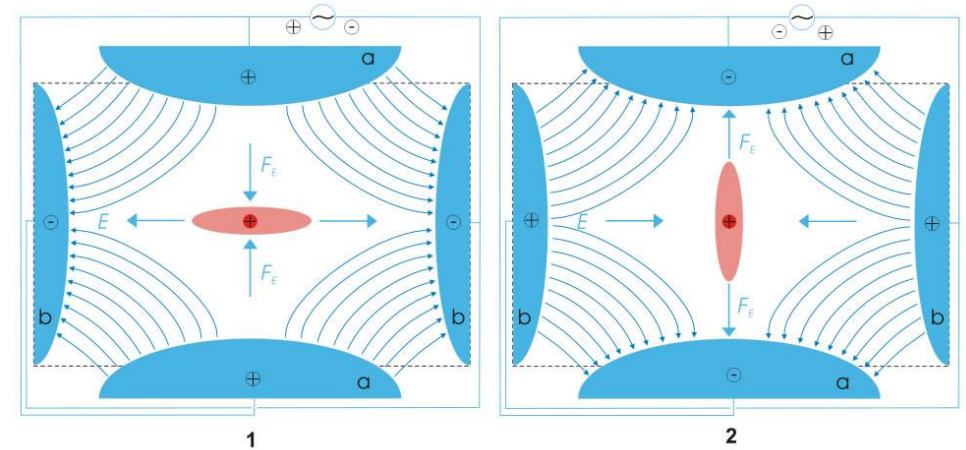
The electric field strength as well as the position, velocity and acceleration of the particle can be determined.

For more information about this type of ion trap, please visit http://en.wikipedia.org/wiki/Quadrupole_ion_trap.



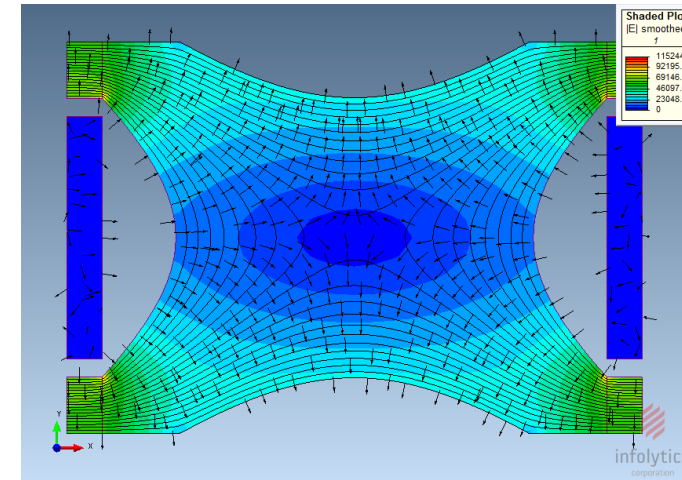
Schematic of a Ion Trap

To the right is a schematic representation of the electrostatic solution and particle trajectory expected in a quadrupole ion trap. The device has been modeled using ElecNet with the electrode components set to their initial voltage values: top (0 V), bottom (0 V) and the side (200 V).



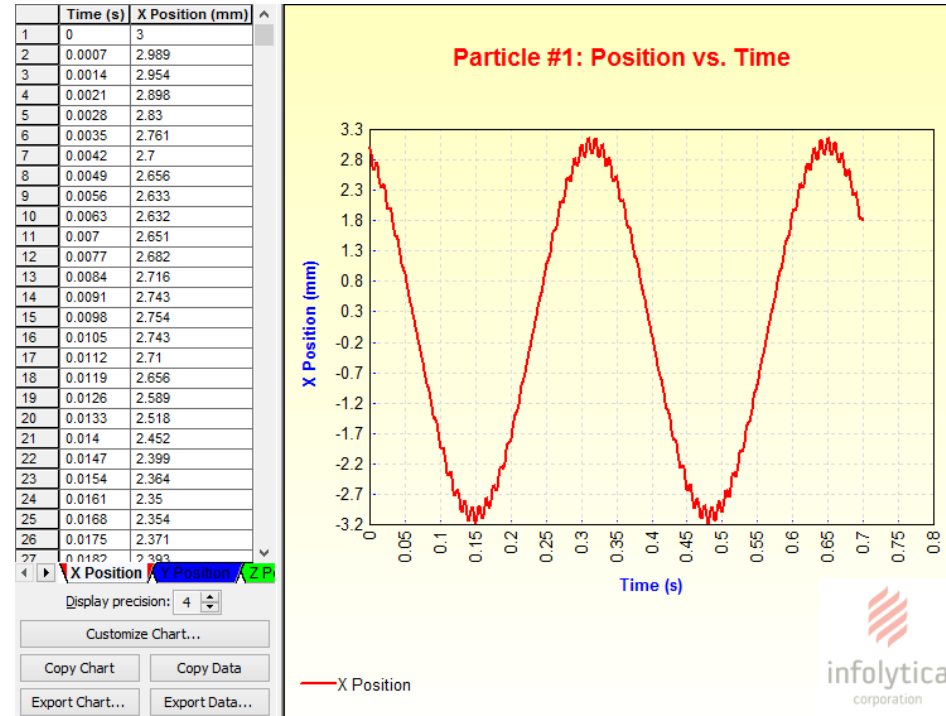
Electric Charge

The model has been simulated and a 2D slice taken along the axis of symmetry of the electrostatic simulation of this device, with the magnitude and equipotential lines marked. The dynamics of this charge is tracked as a function of time. The results are shown below.



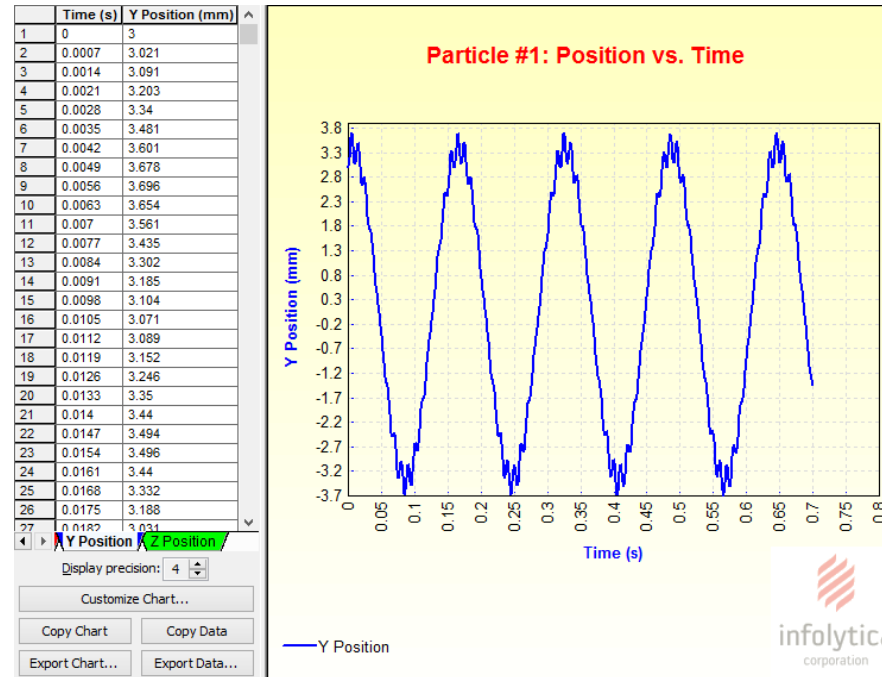
Position of the Charged Particle along X-axis

x position of test charge versus time



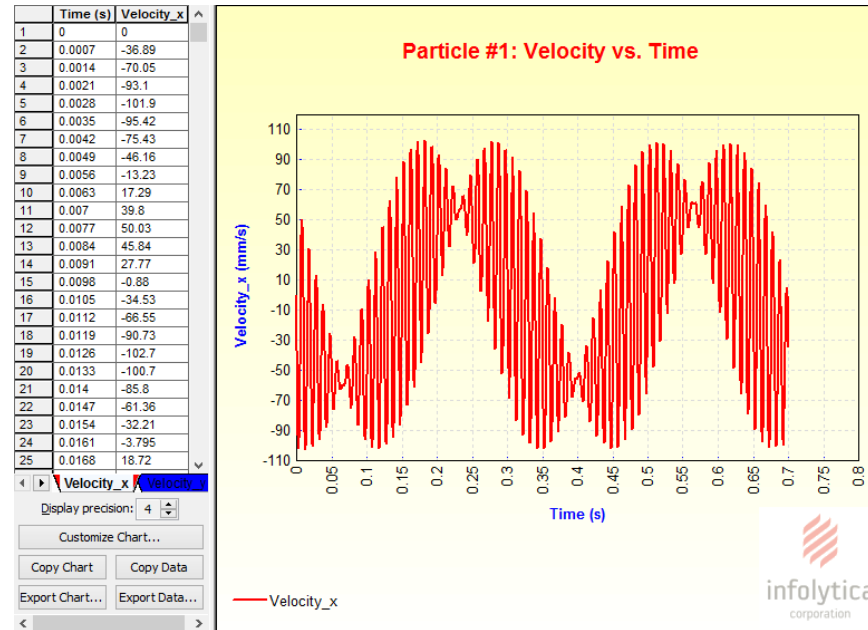
Position of the Charged Particle along Y-axis

y position of test charge versus time



Velocity along X-axis of the Charged Particle

x component of charged particle velocity versus time.



Acceleration along X-axis of the Charged Particle

x component of charge particle acceleration versus time.

