

# **Simulation study for tolerance of six degrees of freedom in two-plate linear ion trap**

Qinghao Wu, Yuan Tian, Ailin Li, Daniel E. Austin

*Department of Chemistry and Biochemistry, Brigham Young University, Provo, UT*

The misalignments in linear ion trap are crucial to the performance but hard to fully test in experiments due to mechanical accuracy and too many degrees of freedom in traditional linear ion trap. Two-plate linear ion trap has only six degrees of freedom, which allows us to completely study the impact of all degrees of freedom on performance.

In this study, a model in SIMION for two-plate linear ion trap was built. Based on this model, misalignments in six degrees of freedom of a planar-linear ion trap were studied regarding to the resolving power and ion detection efficiency. The results demonstrate the important impacts of pitch angle and Y axis misalignments on the resolving power, compared with the other four degrees of freedom, yaw, roll, x and z. The study also shows that the X axial misalignment significantly impacts the ion detection efficiency. As a guideline, the results are helpful in the design and fabrication process of two-plate linear ion trap as well as other types of linear ion traps.