Pacific Northwest NATIONAL LABORATORY

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30321-E, 30579-E, and 30580-E

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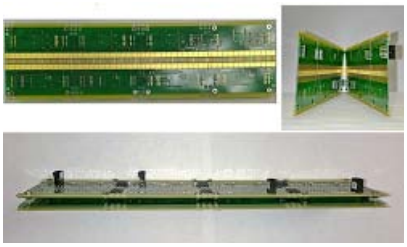
Available Technologies

Structures for Lossless Ion Manipulation (SLIM)

SUMMARY



Ion mobility spectrometry is a well-known means of separating and characterizing ions, and widely used in chemical analysis. However, it commonly suffers from relatively poor resolution and relatively large ion losses. In addition, the ability of current technology to trap and analyze ions within current ion mobility devices is limited. The SLIM technology addresses these issues by using radio frequency (RF) and direct current (DC) electrical fields to transport and/or confine ions in a lossless fashion so that they can be analyzed in an ion mobility device and also be manipulated in extended sequences and in a number of different ways that have not previously been possible, including ion-molecule reactions, ion-ion reactions, and very-high-resolution ion mobility separations.

SLIM can be constructed using conventional printed circuit board technology with individual components in which RF and DC potentials are superimposed to central electrodes flanked by guard electrodes to which a DC field is applied. The combined effect of RF and DC fields creates a central conduit in the space between the surfaces where ions can be moved or trapped in virtually any manner desired by the user. The SLIM technology is designed to be very flexible and low cost to produce. Although initial efforts are focused on developing the technology as a separations and ion manipulation device in front of a mass spectrometer, it has a variety of other potential applications.

ADVANTAGES

* Provides high-resolution, lossless ion mobility separation
* Allows for flexible, low-cost manufacturing
* Enables new applications utilizing ion mobility and trapping that are not possible with current technology

RELATED LINKS

» **"Characterization of Ion Dynamics in Structures for Lossless Ion Manipulations"**
Tolmachev, AV; Webb, IK; Ibrahim, YM; Garimella, S; Zheng, X; Anderson, GA; and Smith, RD.
Accepted in Anal. Chem., 2014
http://pubs.acs.org/doi/abs/10.1021/ac502054p

» **"Experimental Evaluation and Optimization of Structures for Lossless Ion Manipulations for Ion Mobility Spectrometry with Time-of-Flight Mass Spectrometry"**
Webb, IK; Garimella, SBV; Tolmachev, AV; Chen, T-C; Zhang, X; Norheim, RV; Prost, SA; LaMarche, B;

U.S. DEPARTMENT OF ENERGY

Anderson, GA; Ibrahim, YM; and Smith, RD. Accepted in Anal. Chem. 2014
http://pubs.acs.org/doi/abs/10.1021/ac502055e

Technology Portfolio(s)

» Mass Spectrometry Instrumentation

Potential Industry Applications

» Chemicals

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