

Field Optimization of Ion Trap Performance

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A new generation of residual gas analyzers based on autoresonant ion trap mass spectrometry (ARTMS) technology has recently become commercially available and is rapidly gaining market acceptance for both laboratory and field applications. Our latest investigations into this novel ion trap technology have focused on a detailed understanding of the role of ion generation and storage on the mass spectrometer's performance. (1) The rate of ion formation, (2) the initial energetics of the ions stored inside the trap, (3) the shape of the electrostatic trapping potential and (3) the characteristics of the radiofrequency signal sweep used to eject the ions all have significant impact on the overall performance of an ART MS instrument. Variability in ion formation rates and energetics due to mechanical assembly tolerances, can lead to detectable unit-to-unit variations in ion trap performance which can be easily corrected through adjustment of (1) the electron beam focusing and (2) the shape of the electrostatic trapping potential. This presentation describes a straight forward methodology that has been developed in our research laboratory to systematically optimize ion trap performance and also an automated tuning procedure (Auto-Tune) that is built into the control software and can be used to restore trap performance each time an ART MS sensor is fitted with a new filament assembly or modified in any way for field applications