

# Fast Ion Polarity Switching With the Agilent 500 Ion Trap LC/MS System

## Technical Overview

### Introduction

The Agilent 500 Ion Trap changes polarity every 200 msec. This is fast enough to observe positive and negative ions in real time, while many competitive systems require > 1 sec, making them ineffective for real-time  $\pm$  polarity detection.

### Product Description

Figure 1 shows the actual voltages of the electrospray needle and the conversion dynode as the system is switched from positive to negative ion modes, as well as the RF trap voltage used to scan the ions from the trap. The needle voltage can switch from + 6 kv to -6 kv in less than 50 msec, while the conversion dynode voltage will change from -15 kv to + 15 kv in 200 msec. All other ion optics voltages will switch polarity in less than 10 msec. When polarity switching is initiated, ions of the opposite polarity are being formed and injected into the trap in less than 50 msec. Therefore, ions are in the trap and ready to be ejected as soon as the conversion dynode voltage has reached the proper value after 200 msec.



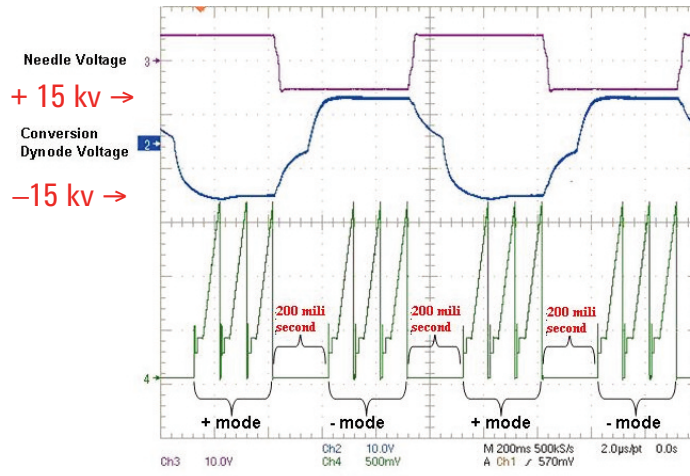


Figure 1. Voltage diagram for ESI needle conversion dynode used in the Agilent 500 Ion Trap.

## Discussion and Results

### The result of fast polarity switching

The pesticide thiazuron dropp can be observed in both positive and negative ion mode using ESI. Therefore, this compound was selected to demonstrate the benefits of fast polarity switching with the Agilent 500 Ion Trap. A three-point calibration curve (1000 pg, 100 pg, and 20 pg on-column) was prepared to illustrate the capability of the trap to quantitate, even in switching mode. The work was completed in positive mode only, in negative mode only, and in alternating positive and negative modes. The signal levels were observed to show little change when the samples were run in switching mode as opposed to just positive or just negative mode.

Standard calibration curves for Thiazuron Dropp under different scanning conditions: 20, 100 and 1000 pg

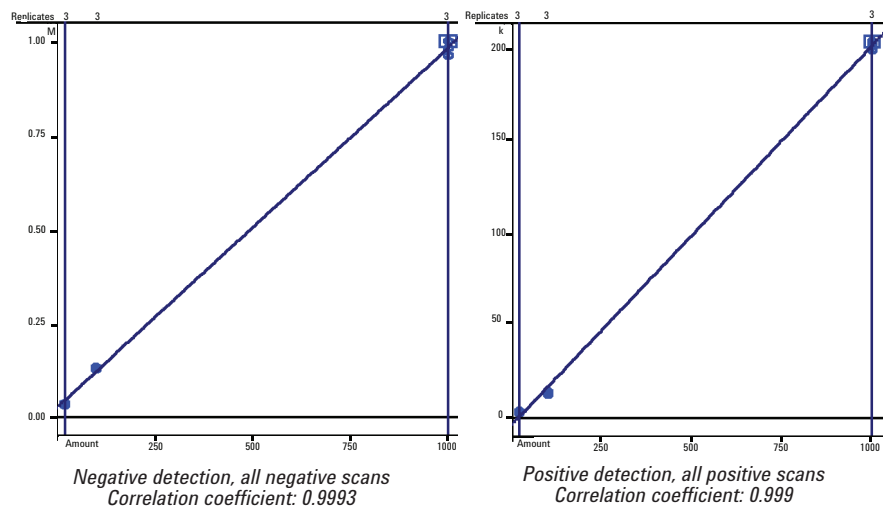


Figure 2. Excellent linearity obtained under separate polarity conditions.

Neither the detection level nor the linearity was changed by introducing the alternating positive and negative scan mode. Figure 3 shows the negative only (upper, red) and positive only (lower, green), separate acquisitions. The signal-to-noise is 1443 for negative, and 1404 for the positive only runs. The alternating positive and negative acquisition (Figure 4), negative (upper, red) and positive (lower, green) data were generated simultaneously. It resulted in similar intensities and signal-to-noise values: 1851 for negative and 1881 for positive scanning.

**Standard calibration curves for Thidiazuron Dropp under different scanning conditions: 20, 100 and 1000 pg**

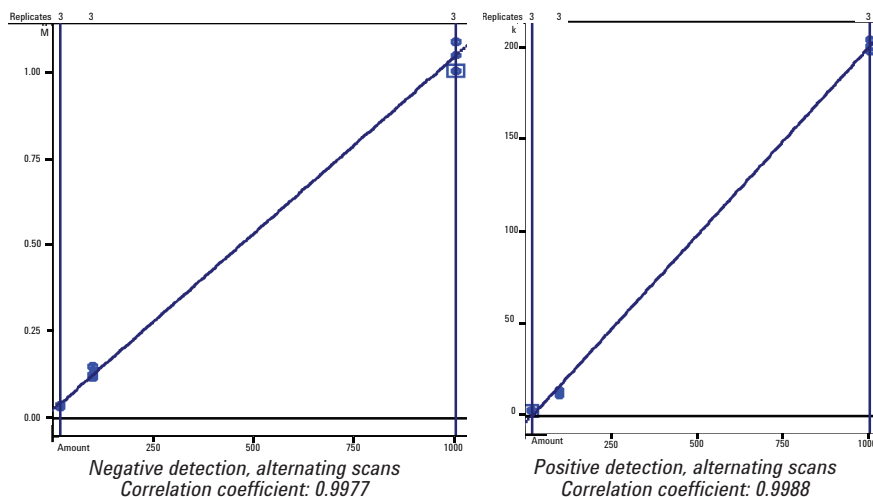


Figure 3. Excellent linearity obtained under polarity switching mode.

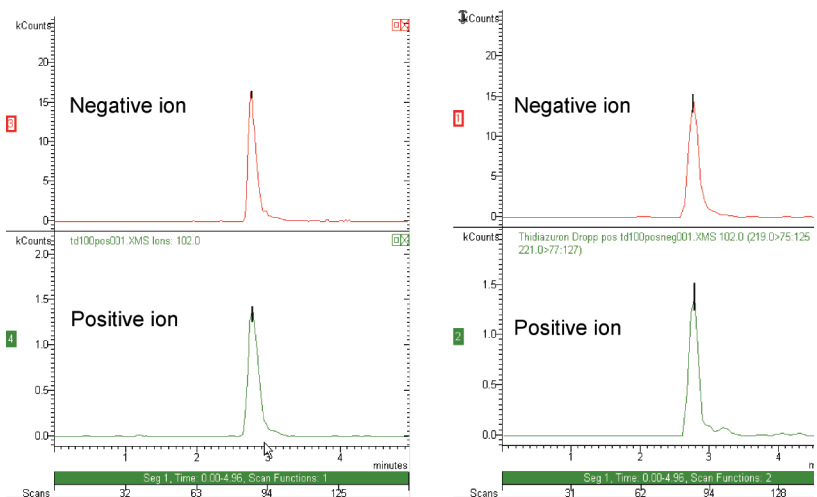


Figure 4. Mass chromatograms of thidiazuron dropp acquired under separate polarity scan mode (left) and under alternating polarity scan mode (right).

## Benefits

Rapid polarity switching increases productivity by allowing effective detection of both positive and negative ions in a single run.

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