

# Varian LC/MS

## nano-Electrospray Ionization Source (nESI)

**Advantage Statement:** Adding the Varian nano-Electrospray Ionization Source (nESI) to existing LC/MS systems allows users to add nano-flow capability to their analyses for improved sensitivity and reduced sample consumption. The interface is fully integrated into the instrument software and easily optimized for maximum performance.

The nESI is complementary to the existing Varian electrospray ionization (ESI) interface, essentially extending the flow rate range to less than 100 nL/min. Sensitivity increases due to a combination of higher ionization efficiency of the sample, smaller droplets to desolvate into ions, and less solvent contributing to the background noise. The combination of nano-flow LC pumps and 75-micron diameter columns increases the sample concentration, which can provide orders of magnitude more sensitivity than larger diameter columns at higher flow rates. Such interfaces are popular in low sample-volume applications as is often the case in proteomics research because they offer low rate of sample consumption.

The nESI couples to all current Varian LC/MS systems.

Figure 1 shows the nESI installed on the 500-MS. The micro-position controllers allow locating the spray emitter for optimum sensitivity and minimum noise. Access to the spray assembly is made easy by a removable front window and a retractable spray assembly. This allows fast and easy changing of the spray emitters for routine maintenance, as shown in Figure 2.

Final optimization and status of the spray conditions can be determined by directly viewing the spray through a high resolution camera with the viewing output incorporated in the MS instrument control software as shown in Figure 3. Micro-position controllers allow the view of the camera to be adjusted to view all regions of the spray.

Changing solvent composition for nano-spray applications is particularly challenging at nano-flow rates. The nESI makes it easy with time programming of both the electrospray voltage and the drying gas temperature to allow optimum spray and noise management as the solvent composition changes. Figure 3 shows relative response during an optimization process.

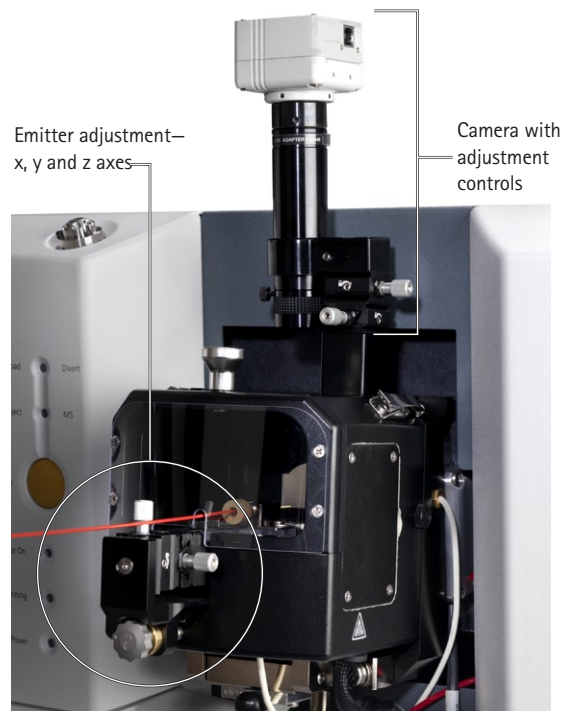


Figure 1. nESI on the 500-MS Ion Trap.

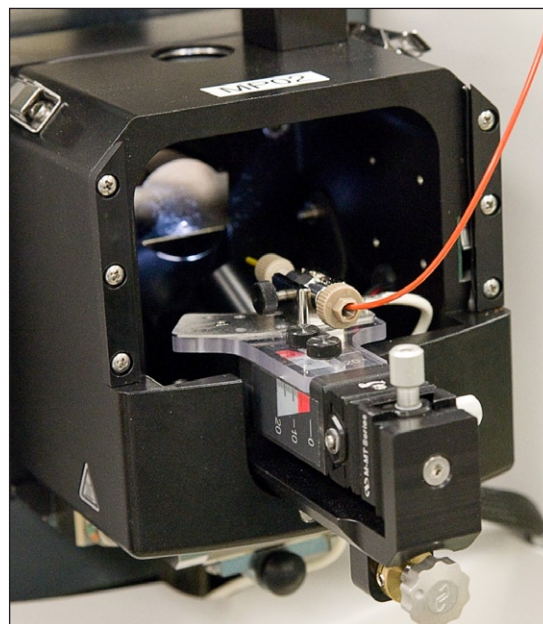


Figure 2. nESI source with the window removed and the assembly retracted, for easy access and maintenance.

NOTICE: This document contains references to Varian. Please note that Varian, Inc. is now part of Agilent Technologies. For more information, go to [www.agilent.com/chem](http://www.agilent.com/chem).

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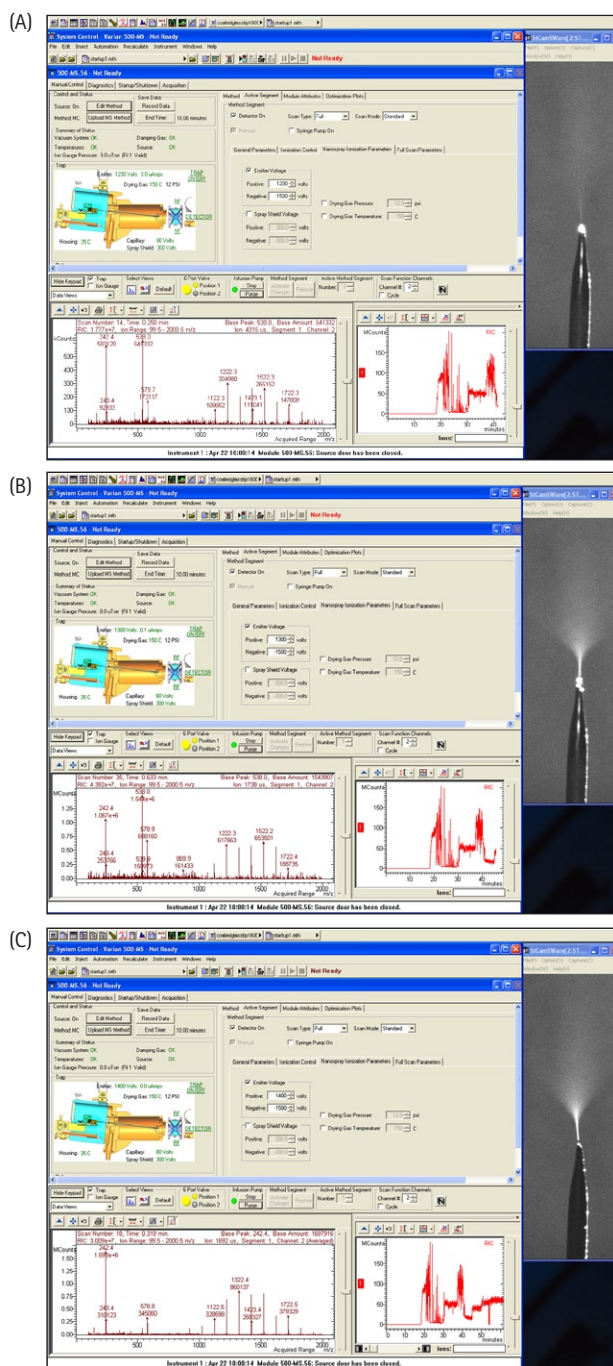


Figure 3. Screen capture of MS instrument control and camera image of emitter, allowing for easy spray optimization. (A) Beginning: 1200 V (poor spray); (B) Next: 1300 V (better spray); (C) End: 1400 V (optimized spray).



Figure 4. Varian 500-MS ion trap mass spectrometer with nESI.

Varian NanoLC columns with 75  $\mu\text{m}$  ID are compatible with the nESI for protein and peptide mapping. The silica-bonded Pursuit™ and Polaris™ phases provide high-resolution power for peptide mapping. The wide-pore polymeric materials, RP and IEX, provide the orthogonal chemistries needed for 2-D separations and have the thermal and chemical stability to enable separations to be optimized using a wider range of MS compatible eluents.

## Varian NanoLC Columns

Reverse Phase	Media	Application
Pursuit	alkyl- and diphenyl-bonded silica phases	peptide mapping
Polaris	polar modified alkyl-bonded silica phases	peptide mapping
PLRP-S	wide-pore polymer phase	peptide mapping and protein analysis
<b>Ion Exchange</b>		
PL-WAX, PL-WCX, PL-SAX, PL-SCX:	wide-pore polymer phase	peptide mapping and protein analysis

The Varian trap and analytical column are integrated with a minimum number of fittings and constructed to be mechanically sturdy to minimize leaks, dead volumes, and accidental breakage.

The Varian nESI source provides:

- True nano-flow capability for flow rates less than 100 nL/min and enhanced sensitivity – easily exchangeable with the conventional ESI source
- Easy viewing of the spray tip and spray characteristics with high-resolution camera for optimization
- Programmable drying gas temperature and electrospray voltage for spray optimization
- Easy access for routine maintenance

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