

HPLC-Chip/MS Technology

Frequently Asked Questions

Developing technology: HPLC-Chip/MS

A breakthrough microfluidics-based technology for high-pressure nanoflow LC/MS systems

- **What is a microfluidics device?**

Microfluidics is the manipulation of minute amounts of liquid in miniaturized systems. The most familiar application of microfluidics technology is ink-jet printing. In the life sciences, the most widely used microfluidics-based device today is known as the "**lab-on-a-chip**". Lab-on-a-chip technology allows various qualitative and quantitative biochemical analyses to be conducted quickly and efficiently, with minimum handling by the user. The [Agilent 2100 Bioanalyzer](#) is Agilent's highly successful microfluidics-based platform for the analysis of DNA, RNA, proteins and cells.

- **How do microfluidic devices work?**

Microfluidic devices are circuits of tiny closed channels and wells, etched onto a glass or plastic microchip. Pressure or electrokinetic forces push small volumes of fluids through selected pathways in a controlled manner. These mini-laboratories may include elements such as pumps, valves, mixing and reaction chambers and separation channels.

- **What is Agilent's new HPLC-Chip technology?**

Agilent's **HPLC-Chip** is the first microfluidic chip-based device that can carry out nanoflow high performance liquid chromatography (HPLC).

The centerpiece of Agilent's new **HPLC-Chip technology** is a reusable microfluidic **polymer chip**. Smaller than a credit card, the HPLC-chip seamlessly integrates the sample enrichment and separation -columns of a nanoflow LC system with the intricate connections and spray tip used in electrospray mass spectrometry directly on the polymer chip. The technology eliminates 50% of the traditional fittings and connections typically required in a nanoflow LC/MS system, dramatically reducing the possibility of leaks and dead volumes and significantly improving ease of use, sensitivity, productivity and reliability during analysis.

The second component of the HPLC-Chip technology is the **HPLC-Chip/MS interface**. A chip is inserted into the interface, which mounts on an Agilent mass spectrometer. The design configuration guarantees that the electrospray tip is in the optimal position for mass analysis when the chip is inserted. Replacement of the chip is simple and can be completed in a few seconds as opposed to much longer times required to change out nanoLC columns. The HPLC-Chip interface will be available as a standard module within the Agilent 1100 Series LC system.



[View demo](#) on how HPLC-Chip technology works!

- **What can it be used for? What advantages does the HPLC-Chip offer over conventional technology?**

Agilent's **HPLC-Chip** carries out nanoflow HPLC to obtain maximum sensitivity with minimal sample sizes. The HPLC-Chip integrates sample preparation, separation, and electrospray tip on a single chip. It significantly reduces the number of fittings, connections, valves and tubing required for nanoflow HPLC. It also includes a sprayer that interfaces efficiently with a mass spectrometer, allowing separated compounds such as peptides to then be identified and quantified via mass spectrometry. This highly integrated, automated system promises to improve the analysis of complex samples of unknown composition, increasing productivity and throughput. Compared with conventional column-based nanoflow HPLC, HPLC-Chip offers unparalleled ease of use, greater reliability and robustness and higher sensitivity. HPLC-Chip technology has potential uses across a range of applications including proteomics research, pharmaceutical development and manufacturing, CombiChem, compound analysis, DMPK, food safety, environmental monitoring and homeland security.

- **What are the performance (detection, peptide coverage, sequence coverage, protein ID) levels of the HPLC-Chip/MS technology for proteomics applications?**

We achieve better performance using the HPLC-Chip technology compared to conventional nanospray techniques. Our studies have demonstrated improved peptide coverage from complex protein samples. Additionally, the HPLC-Chip has inherent advantages related to robust operation, usability, and ease of use.

- **What are the performance levels of the HPLC-Chip for small molecule applications?**

Many small molecule applications benefit from the automated sample enrichment and direct injection workflow of the current HPLC-Chip design. We have achieved superior chromatographic performance and significantly enhanced sensitivity with the HPLC-Chip for several pharmaceutical and toxicology applications compared to conventional nanospray techniques while maintaining the same robustness, reliability and ease of use advantages.

- **Can I put this HPLC-Chip interface on my non-Agilent mass spectrometer?**

Agilent developed the HPLC-Chip using our LC/MSD Trap mass spectrometer and 1100 Series Nanoflow LC System for MS. The HPLC-Chip interface is available for this system and can be added to existing older Agilent Ion Traps. The HPLC-Chip interface is also available for the Agilent LC/MSD TOF and will be available for the Agilent LC/MSD (quadrupole) and the new Agilent QTOF in 2006. We are investigating the feasibility of using the HPLC-Chip interface for use with other types of MS instruments. At this time, which MS instrument we target and the eventual availability of the interface are still under evaluation. Customer feedback and collaborations will definitely play a significant part in our decision.