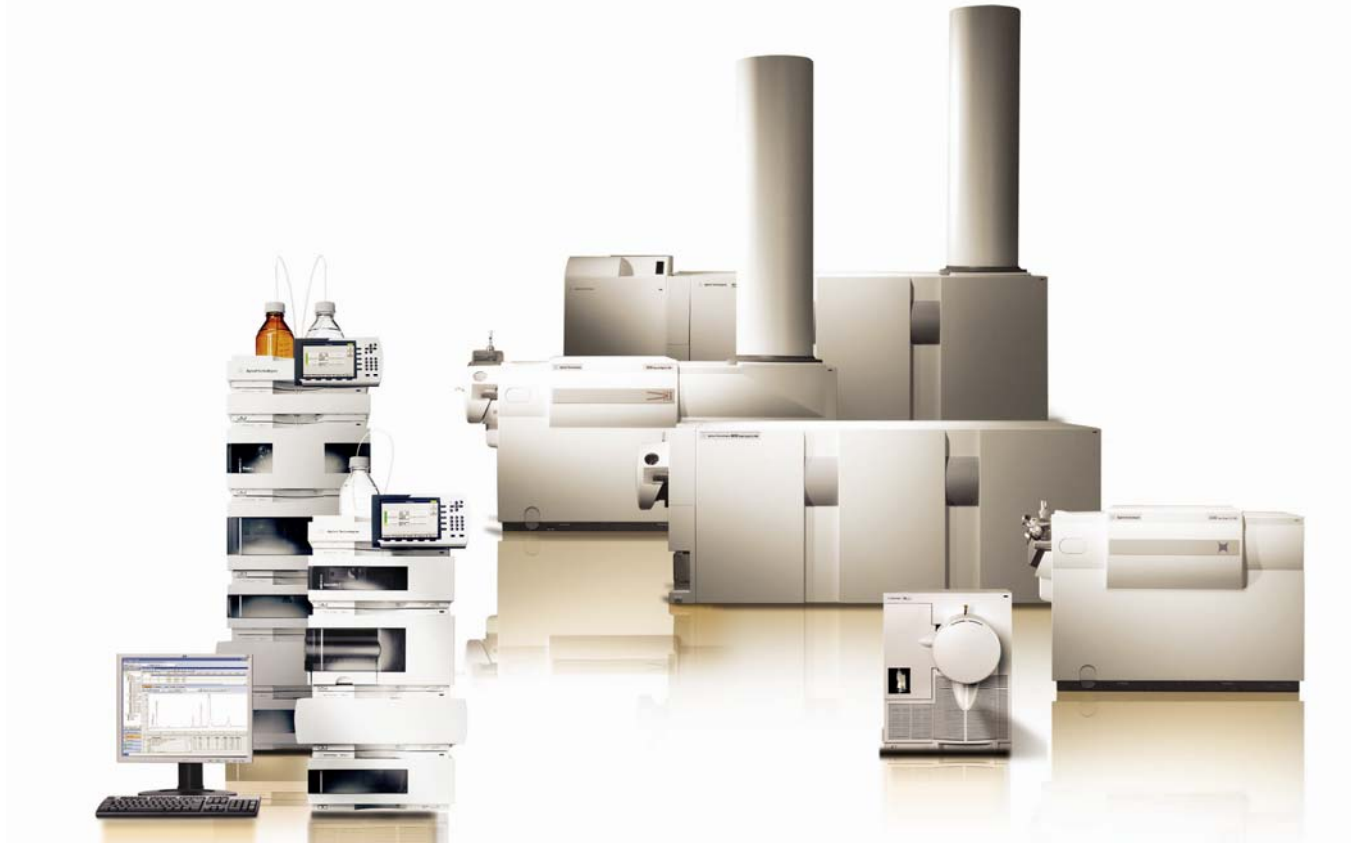


# Agilent LC/MS Overview

Leading the Industry in Performance and Reliability



LC/MS Innovations Tour: Fall 2008



Agilent Technologies

# Agilent's 37 Year Heritage in Mass Spectrometry

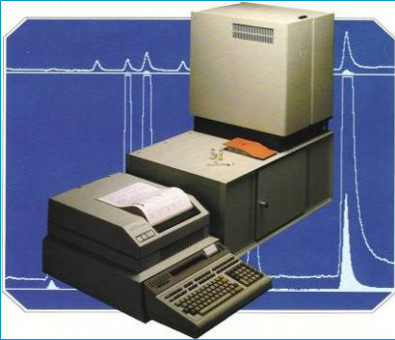
## GC/MS 1971 - 2007

1971



5930A

1976



5992A

1986



5970B MSD

2007



5975C

## ICP-MS 1994 - 2006

1994



4500

2006



7500cx

## LC/MS 1994 - 2004

1996, 2000



LC/MSD, LC/MSD Ion Trap

2003, 2006



LC/MSD TOF

- Over 27,000 GC/MS, 2,500 ICP-MS and 4,500 LC/MS systems
- Agilent (and previously, as HP) has sold more quadrupole MS systems than any other mfr.

# Agilent Commitment to LC/MS

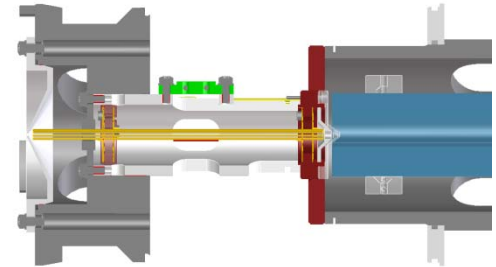
- **Corporate commitment to become a major LC/MS player**

- \$125 M investment in LC/MS portfolio since 2005
- Expectation to triple our market share



- **Apply world class engineering to LC/MS design**

- Innovating exceptional MS analytical performance
- Agilent quality and reliability
- New software and ease of use
- Integration with “state of the art” LC



- **“Best in industry” service and support**

- **Confidence to deliver**

- Market leader in HPLC, GC, GC/MS, ICP/MS



# Major Milestone!!

In July 2008 we received our

# 700<sup>th</sup> Agilent Triple Quad Order!

**Building momentum and taking Market Share!**



Agilent Technologies

# Agilent LCMS at Beijing 2008 Olympics



- CADA Lab (China Anti-Doping Lab)
- 18 Agilent LCMS Systems
- 19 Agilent GC/MS Systems
- 10 Agilent Application Engineers

- >4,500 samples
- 24 hr turnaround time
- 100 CADA scientists



*"Agilent's liquid chromatography and mass spectrometry instrumentation will help make China's Anti-Doping Agency testing in the 2008 Olympic Games the most technologically advanced yet."*

**Dr. Du Lijun**, Director of China's Anti-Doping Agency



**Agilent Technologies**

# New 6000 Series LC/MS Portfolio



**6500 Series QTOFs**  
Ultimate MS/MS system value with high analytical performance for accurate mass based structural studies and identification of proteins and small molecules



**6400 Series Triple Quadrupoles**  
High sensitivity MS/MS system for targeted quantitative, confirmatory analysis

**6300 Series Ion Traps**  
sensitivity MS<sup>n</sup> system for the screening and identification of unknowns



**6100 Series Single Quads**  
Easy to use, inexpensive, high selectivity MS system for screening and routine quantitation



**6200 Series TOFs**  
High throughput walk-up accurate mass system for screening and compound confirmation



**Powered by: 1200 Series LC and Rapid Resolution System**



# LC/MS – Ion Sources

## Wide range of sampling conditions

Sources are interchangeable between mass spectrometer platforms

### Multimode source

- Flow rates up to 2 mL/min
- Simultaneous operation

### HPLC-Chip/MS

- Nanoelectrospray without the fuss
- Reproducible response and retention times
- On-chip enrichment for speed and sensitivity

Multimode



HPLC-Chip



APCI



ESI



NanoESI



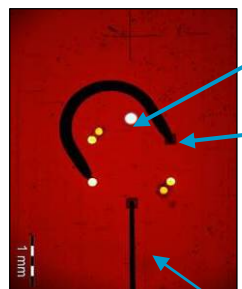
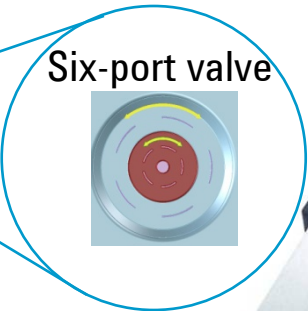
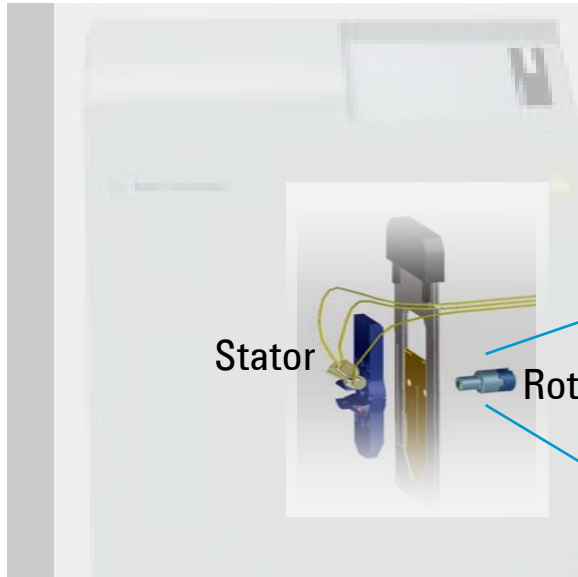
APPI



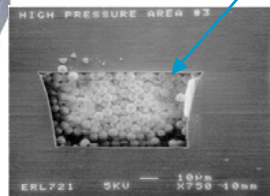
AP-MALDI



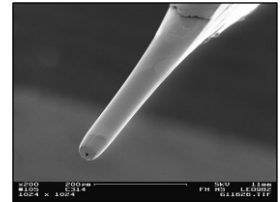
# HPLC-Chip Technology



- Sample Ports
- Enrichment Column  
40 nL, 160 nL  
500 nL - **NEW**



- Analytical Column  
75 x 50  $\mu\text{m}$   
cross section  
43 mm, 150 mm



- Laser Ablated ESI Tip



# HPLC Chip Makes Nano-Spray Reliable and Easy

1

Set up method



1200 Nano HPLC

2

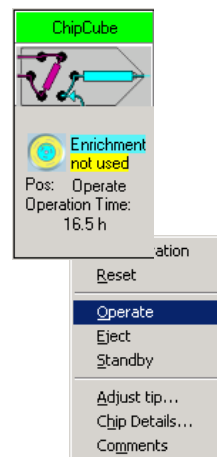
Insert Chip



Chip Cube on QTOF

3

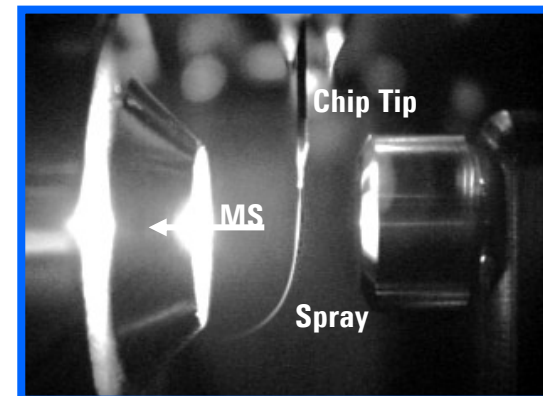
Click



Mass Hunter software

4

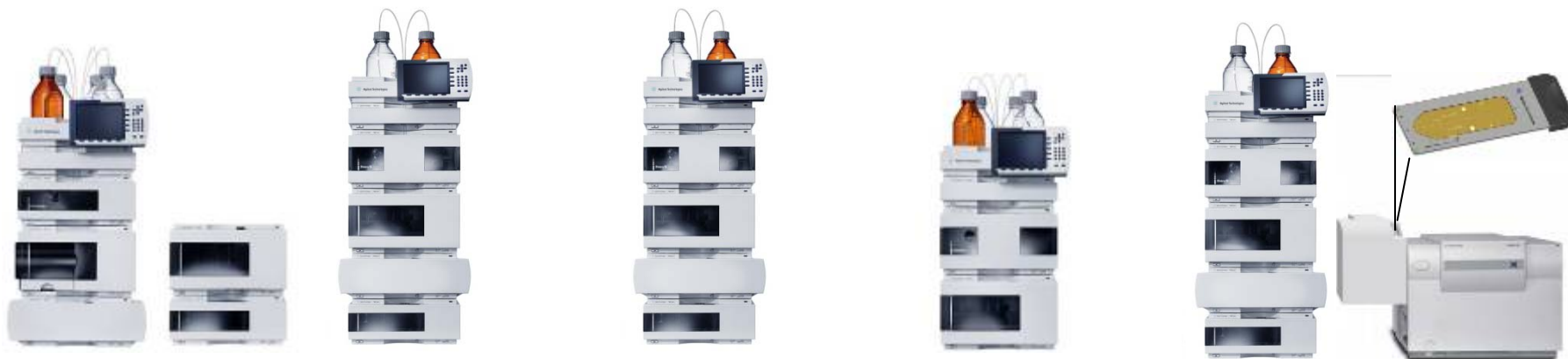
Chip automatically moves into spray position



Camera visualises nanospray



# Agilent High Performance 1200 Series LC: Best in Class “Front End” Systems for MS



**Preparative LC**

**Standard LC**

**Rapid Resolution  
LC**

**Capillary &  
Nano LC**

**High Sensitivity  
HPLC-Chip/MS**

***Chose from the industry's most comprehensive LC portfolio to  
configure an integrated LC/MS system***



# Innovations with New “Agilent Jet Stream” Technology: 5-10X Increase in Sensitivity

**6460 LC/QQQ**

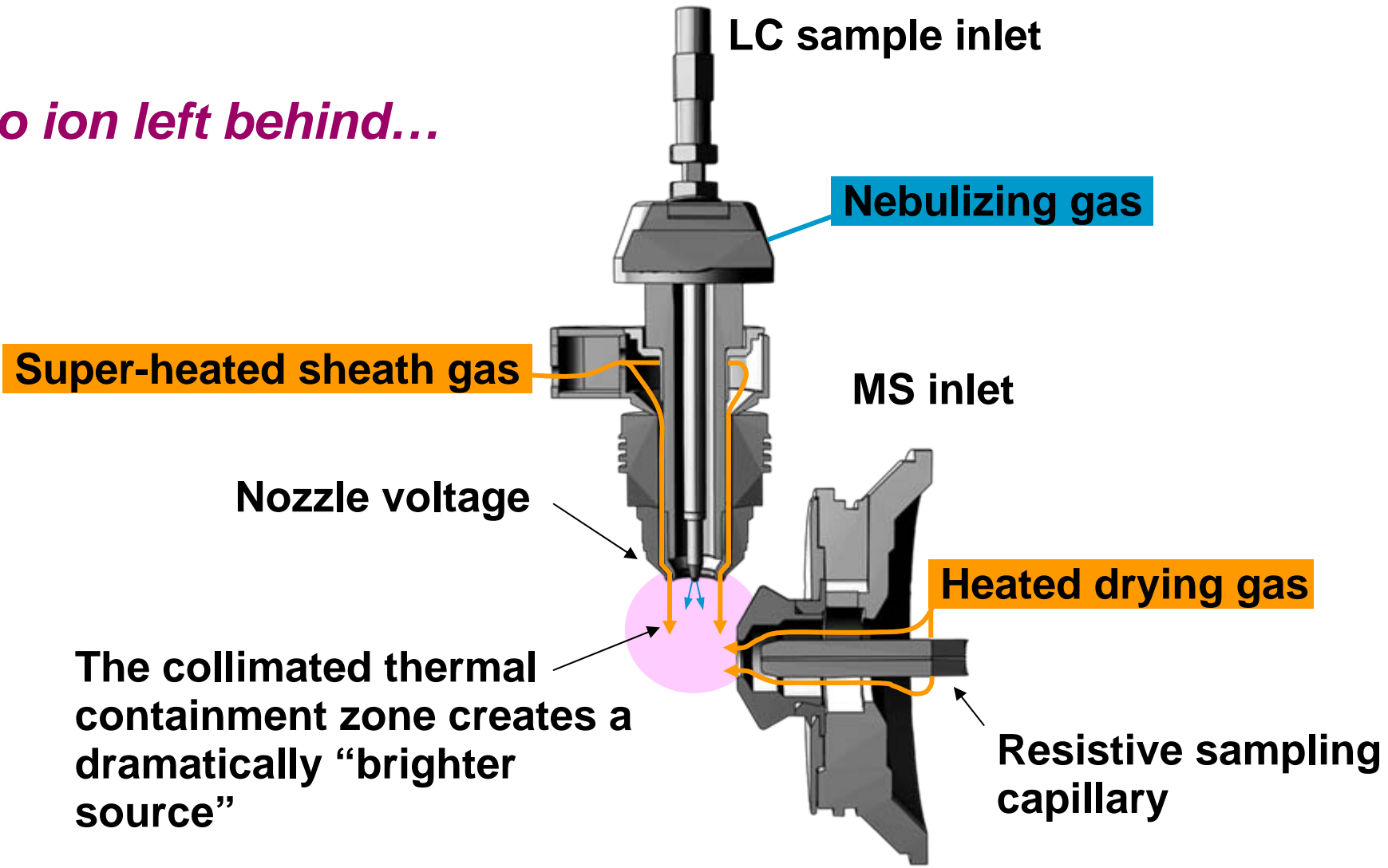


**6530 LC/Q-TOF**



# Agilent Jet Stream Ion Generation

*No ion left behind...*



The collimated thermal containment zone creates a dramatically “brighter source”

# Cutting Edge 6530 Q-TOF Performance

*With...*

**Agilent Jet Stream Technology**

**True Hi-Def TOF Technology**

**Unmatched sensitivity, speed  
and mass accuracy**

**Unique data mining tools for  
faster compound ID**



- ✓ Mass accuracy – approaching FTMS mass accuracy
- ✓ Sensitivity- high femtogram level detection
- ✓ Increased resolving power: >20,000
- ✓ Extended dynamic range: 5 Decades in-Scan
- ✓ Acquisition speed: 10 MS/MS per second

Leads the industry  
in all dimensions\*

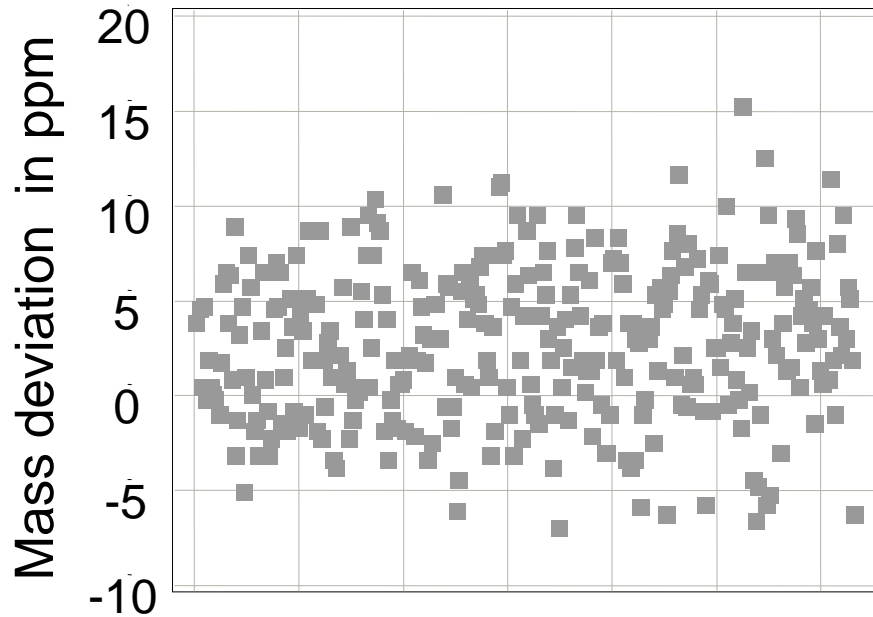
\* For systems less than 0.5 Ton and 9 feet in height



Agilent Technologies

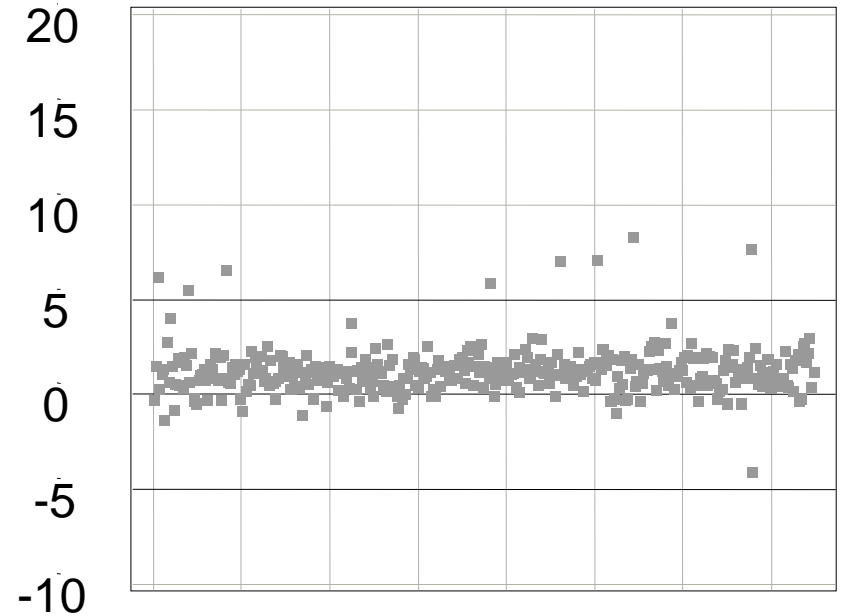
# TOF Mass Accuracy: Terfenadin

## Brand X



35 % <  $\pm 2$  ppm  
70 % <  $\pm 5$  ppm  
98 % <  $\pm 10$  ppm

## Agilent 6210 TOF



85 % <  $\pm 2$  ppm  
98 % <  $\pm 5$  ppm



# Relentless QQQ LC/MS Innovation

**6460 Fall 2008**  
5-10X Sensitivity Improvement  
100 ms Polarity Switching  
2 ms MRMs



**6410B 2008**  
500 ms Polarity Switching  
HotBox Option (2X)



**Scheduled MRMs  
MassHunter MS  
Optimizer**

**Excel 2007 Reporting 2-5x Faster  
MassHunter MS Optimizer**

**6410A 2007**  
2,000 m/z Mass Range  
Chip Cube Compatible



**Compliance SW support  
for 21 CFR Part 11**

**6410 2006**  
500 fg Sensitivity Spec  
High Reliability  
Very Affordable



**MassHunter Quant DA – Batch at a Glance  
Parameter-less Integrator  
Excel Reporting**

# New 6460 Triple Quad: World's Most Sensitive QQQ with Agilent Jet Stream Technology

## Triple Quad LC/MS

### NEW Agilent 6460 Triple Quad LC/MS The World's Most Sensitive Triple Quad!

- Breaking Sensitivity Barriers with Agilent Jet Stream Technology
- Ultra-sensitive food safety and water analysis
- New MassHunter MS Optimizer Software for automated method development

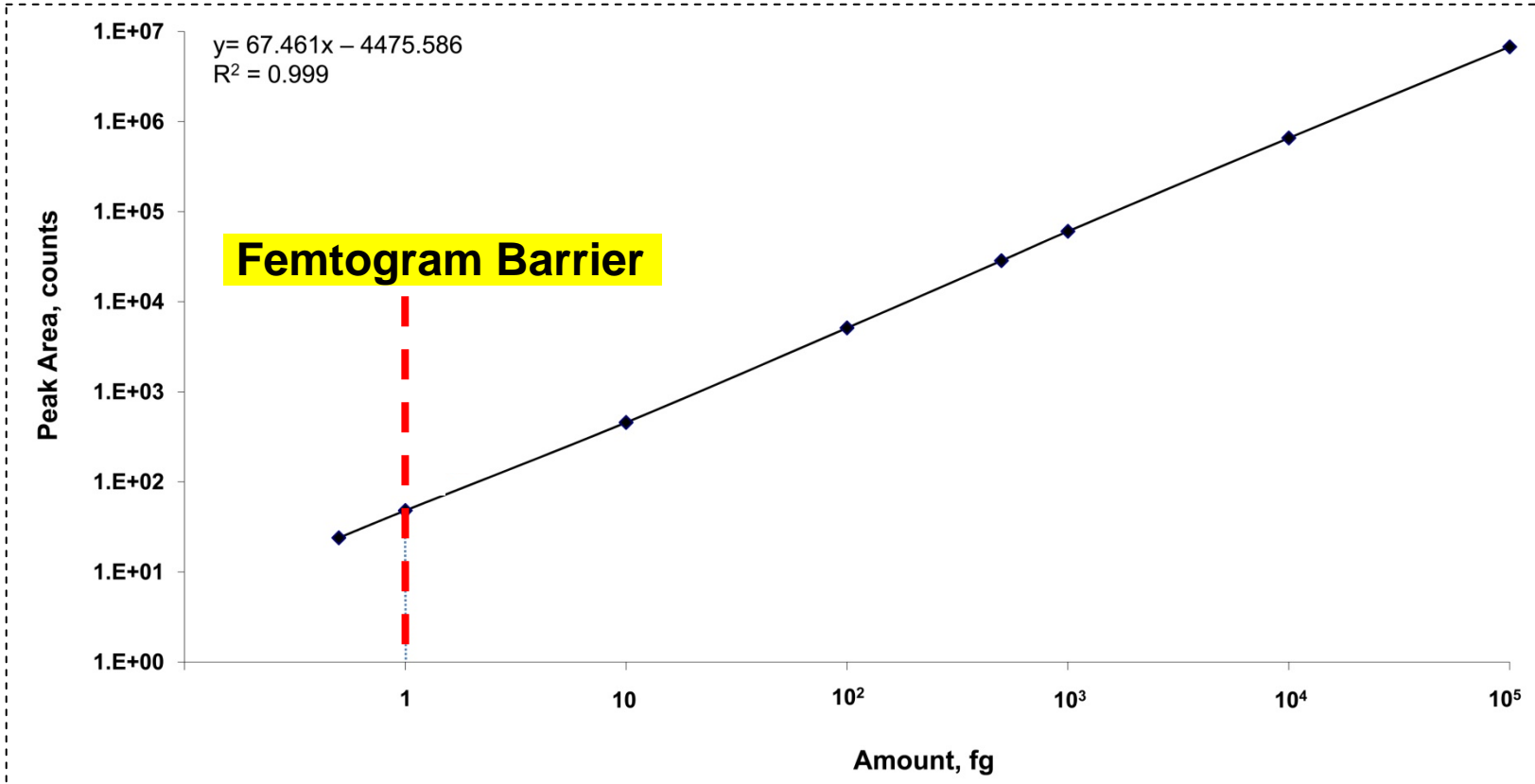


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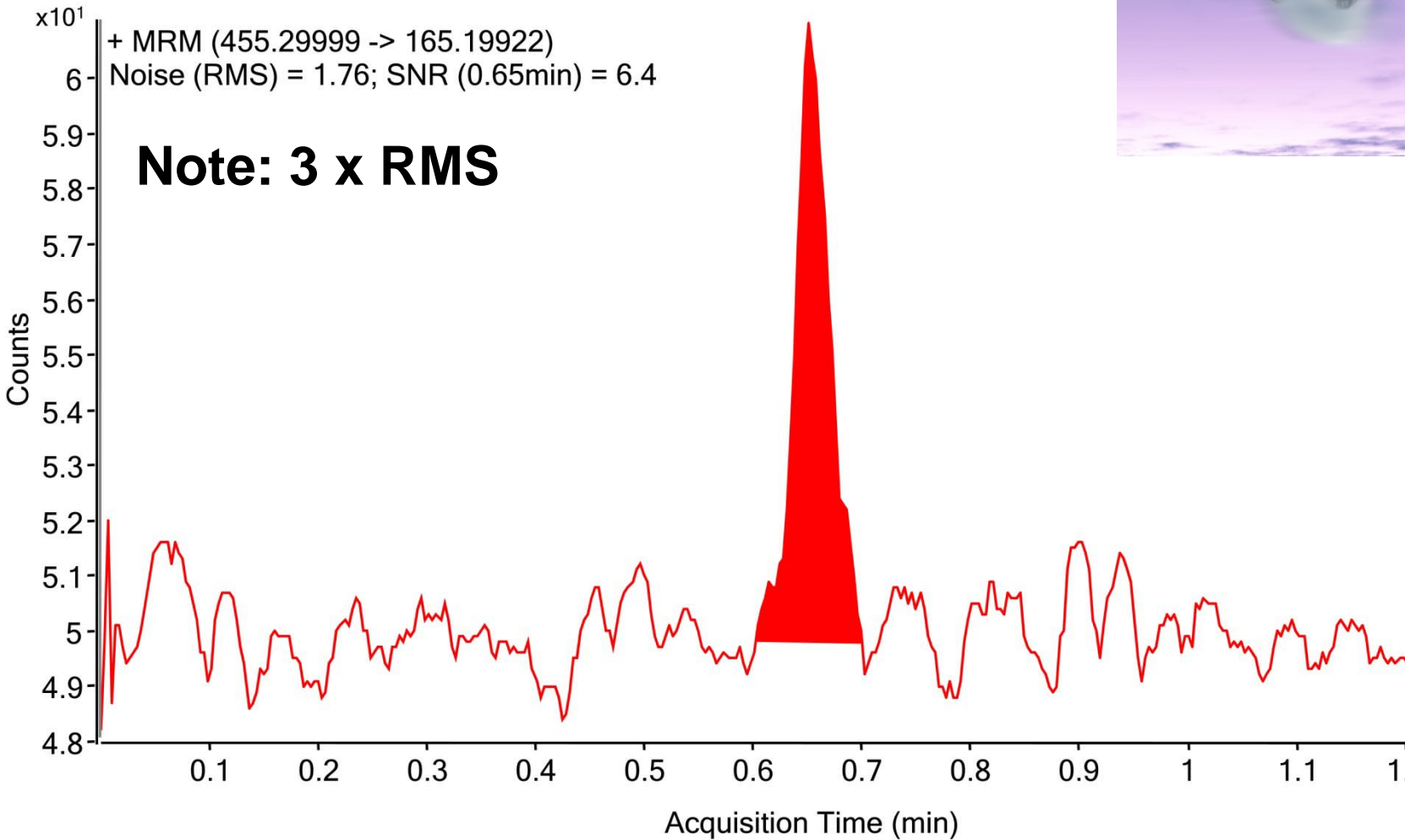


# Five Orders of Linearity with Agilent's 6460 QQQ

outstanding linearity and sensitivity from sub-femtogram to 100 pg verapamil



# Breakthrough Sensitivity: 500 attograms verapamil on-column



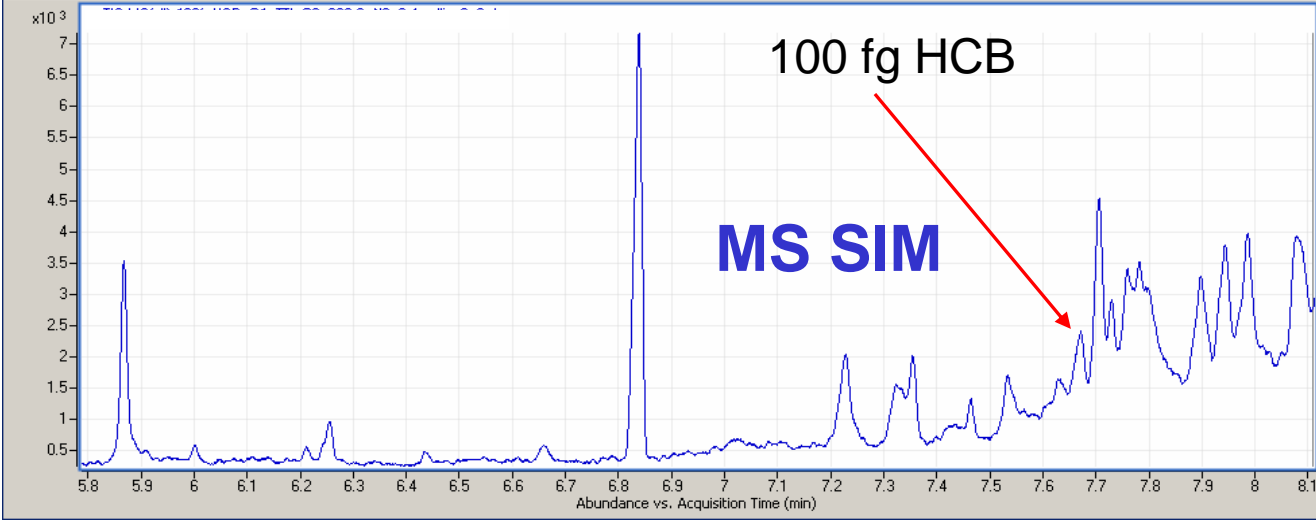
# Introducing the Agilent 7000 Series GC Triple QQQ: Shipping Feb'09



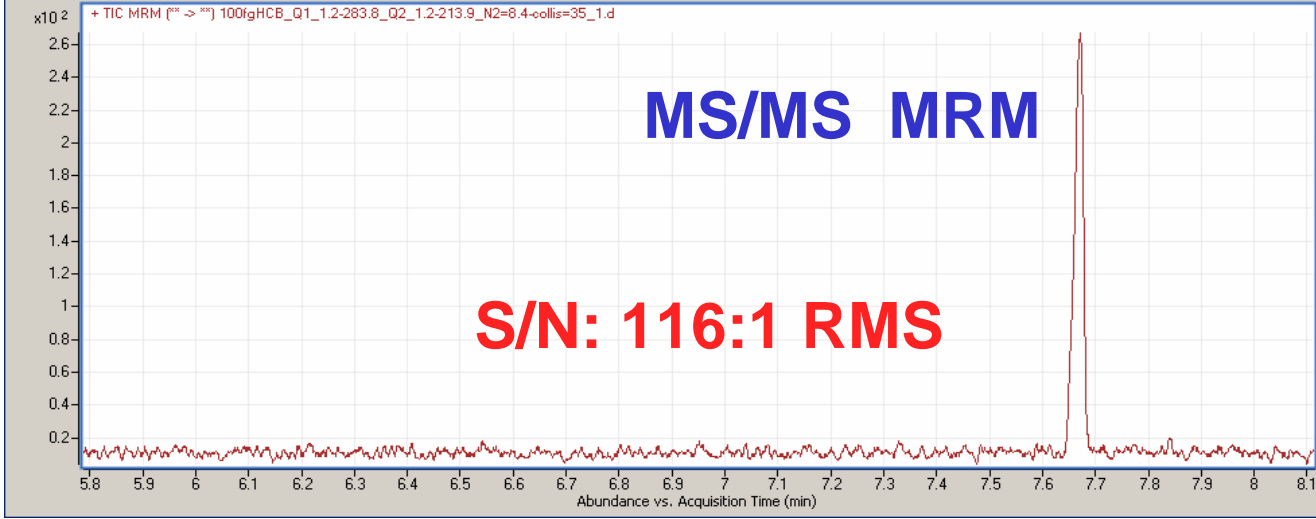
Agilent Technologies

# Why a Triple Quadrupole?

A picture is worth a thousand words.



GC/MS Single Quad SIM



GC/MS/MS QQQ MRM  
EI 100 fg HCB in  
"DIRTY" Matrix

# New Agilent MassHunter Workstation Software

The image displays several windows from the Agilent MassHunter software interface:

- Agilent TOF Software Console:** Shows instrument parameters such as flow rate (0.8 mL/min), column temperature (23.88°C), and MS TOF settings. A digital display shows a value of 0.4.
- TOF Spectrum:** Displays abundance versus m/z, with a baseline at 0 and a maximum abundance of 2616.
- Agilent Qualitative Data Analysis:** Shows a chromatogram with peaks at 1.917 and 2.130 minutes. The y-axis is Abundance (x10<sup>4</sup>) and the x-axis is Time (min).
- Batch Table:** A table listing sample names, positions, types, data paths, and retention times. The table has columns for Sample Name, Sample Position, Sample Type, Data Path, M/Z, Abstraction d, Abstraction d/ISTD, Concoun, Area, RT, and Target Response.
- Sample Properties:** A window for configuring acquisition parameters like step time, mass range, and cycles.
- Compound Information:** A window showing mass spectra for specific compounds, such as EIC (205.60-206.60 m/z) and EIC (376.4-345 m/z).
- Calibration Curve:** A plot showing Abundance versus Concentration (µg/mL) with a linear fit line.

## Instrument Control

- Real-time monitoring
- Method set-up
- Autotune

## Qualitative Analysis

- Chromatographic results
- Spectral results
- Find compounds

## Quantitative Analysis

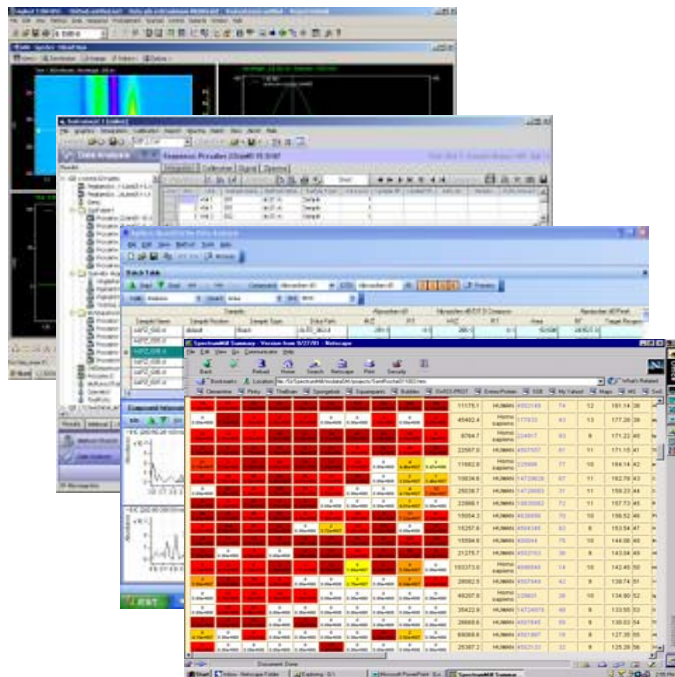
- User filters
- Compound results
- Calibration curve

# What's So Great About Mass Hunter Workstation Software?

- **One software for all Agilent MS instruments and applications**
  - Agilent 6000 Series LC/MS (QQQ, TOF, Q-TOF, SQ control **Feb-09**)
  - ICP/MS (**May-08**), GC/MS and GC/MS/MS (**Feb-09**)
- **Easy and intuitive to learn and use**
  - Intuitive, “flat” user interface lets you see all relevant info at a glance.
- **Unprecedented productivity in data processing**
  - Compound-centric data processing
  - High degree of automation and many productivity tools
- **Unique and innovative data mining algorithms**
  - Fully exploit high information content of accurate mass MS and MS/MS
- **Software specifically designed around customer workflows**
  - Qual, Quant, MetID, BioConfirm, Spectrum Mill
  - Mass Profiling for Metabolomics and Biomarker discovery
- **Highly customizable reporting via Excel**
- **It's not Analyst!**



# Numerous Updates for Mass Hunter Software



MH Acquisition

MH Qualitative

MH Quantitative

Mass Profiling

Easy Access

BioConfirm

Spectrum Mill

METLIN Database

GeneSpring MS

Metabolite ID

21CFR Part 11 Compliance

*New Analytical Studio Browser*

*New Optimizer for QQQ MRM*





**Agilent Technologies**