VARIAN, INC.

225-MS

ION TRAP MASS SPECTROMETER

VARIAN, INC.

The First True Benchtop GC/MS System

The Varian 225-MS is the world's first benchtop mass spectrometer to enclose all of its components, including the foreline pump, in one compact design. The simplicity and convenience of the built-in vacuum module adds to the outstanding performance of Varian's ion trap MS system. The 225-MS, together with the 431-GC, is an easy-to-use, reliable, flexible and powerful analytical tool suitable for both routine and research laboratories.

The Varian 225-MS provides:

- Small footprint with built-in vacuum module
- Exceptional Electron Ionization (EI) full scan sensitivity
- Outstanding Chemical Ionization (CI) sensitivity
- Easy upgrade path to powerful MS/MS
- Selected Ion Storage (SIS) for matrix elimination
- Simple and robust analyzer for maximum productivity
- Accurate identification and quantitation
- Intuitive software that makes operation simple
- Extensive standard and custom reporting

The 225-MS offers advanced ionization and scanning techniques to enhance selectivity and lower limits of detection. MS/MS and MS^n reduce matrix influences and provide more detailed structural information. Take advantage of liquid or gas reagent based chemical ionization for compound confirmation and increased selectivity.

The Varian 431-GC completes the 225-MS package. A choice of autosamplers and other sample introduction devices, such as headspace, and purge and trap, are available.

The Varian 225-MS, delivered with the 431-GC, offers powerful performance and ease of use. Both the turbomolecular pump and the foreline pump are contained within the MS chassis.

Simplicity, Convenience, Performance

The built-in vacuum module of the Varian 225-MS provides sufficient pumping capacity to accommodate commonly used capillary columns and also provides adequate vacuum during CI and MS/MS operation. The self-contained vacuum module eliminates the need for a separate, standalone foreline pump, which typically sits on the laboratory floor. This also eliminates the hose from the foreline pump to the turbomolecular pump, reducing the space requirement significantly. The vacuum module operates in a much quieter manner, reducing noise in the laboratory. Additionally, the module does not require oil changes (or oil disposal) during its lifetime. The vacuum module can be refurbished when necessary to reduce the long-term cost of ownership.

The convenience of maintenance-free vacuum operation, compact design and a simple robust analyzer makes the Varian 225-MS the instrument of choice for GC/MS.

Confidence in Your Data

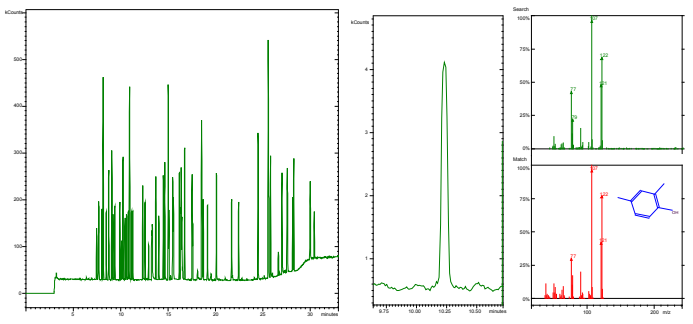
The 225-MS offers excellent sensitivity, wide linear range and reliable qualitative and quantitative results week after week. Single digit picogram (pg) levels of detection can be achieved for most analytes with accurate identification using standard libraries. The 225-MS extends EI full scan capabilities with SIS mode, allowing the selective elimination of matrix, column bleed or other common backgrounds. This easy-to-use feature provides lower detection limits, while still delivering library searchable spectra.

Calibration and Detection Limit Results for Selected Pollutants: Full Scan Analyses

Compound	Correlation Coefficient (r^2)*	%RSD	MDL** (pg)
Benzene, 1-methyl-2, 4-dinitro-	0.999	4.0	6
Simazine	0.998	8.3	12
Atrazine	0.999	8.4	10
Heptachlor	0.998	8.2	10
Aldrin	0.999	3.6	6
cis-Chlordane	0.998	3.4	5

*Calibration range: 50 pg-10 ng on column. **MDLs were statistically derived using 99% confidence level. Nine injections were performed at 50 pg level.

The self-contained vacuum module eliminates the need for a separate, standalone foreline pump and the hose from the foreline pump to the turbomolecular pump, reducing the space requirement significantly. What you see is all you need.



Total ion chromatogram of selected semi-volatile compounds, 1 ng on column. In the insert the quantitation ion chromatogram (*m/z* 107) is shown for 2,4-dimethylphenol (50 pg on column) with readily quantifiable response and confident identification using the NIST08 library. Note that the whole run was completed in less 35 minutes for increased productivity.

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Outstanding CI Performance

Productivity and Performance Enhancements Chemical Ionization (CI)

The sensitivity of low-pressure CI in an internal ion trap can be over 50-fold greater than single quadrupole mass spectrometers using high-pressure sources.

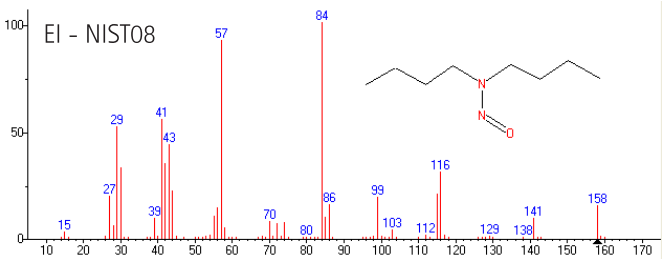
Extend the confident identification of compounds by effortlessly switching to CI, even within a single run. Use CI to increase selectivity and reduce background for better qualitative and quantitative data employing gas or liquid reagents.

In many cases, EI analysis will result in a spectrum with no molecular ion or one of low intensity, making identification difficult, as demonstrated by the spectrum of N-nitrosodibutylamine (NDBA *m/z* 158). Chemical Ionization delivers a spectrum dominated by the protonated molecule $[M + H]^+$ for easy identification (*m/z* 159). This intense ion is an excellent starting point for CI/MS/MS, which in addition to increased selectivity, provides more spectral information. CI/MS/MS measurements offer increased sensitivity with reliable quantitation in a wide concentration range (0.5-50 pg) as demonstrated by 0.9999 correlation coefficient for NDBA.

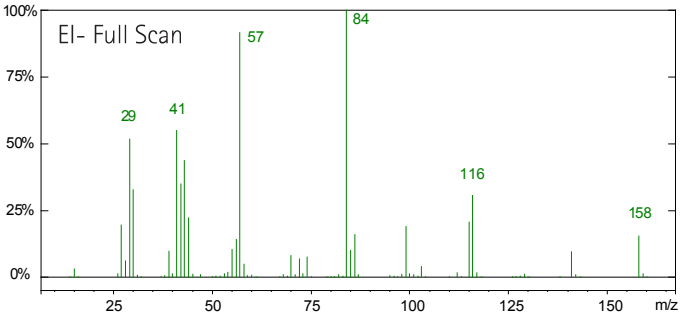
Low pressure CI allows the use of liquid reagents such as methanol and acetonitrile. Using common solvents extends the range of available soft to hard CI reagents and widens selectivity, while reducing costs. Eliminating the need for gas cylinders increases safety and convenience.

Liquid CI Reagents

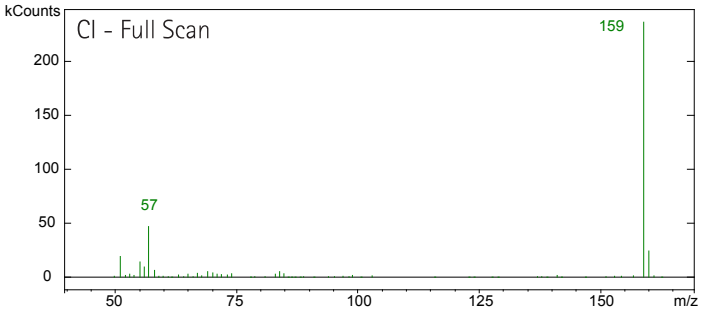
The amount of liquid in this vial represents a typical one month supply of CI reagent, replacing bulky and costly gas cylinders.



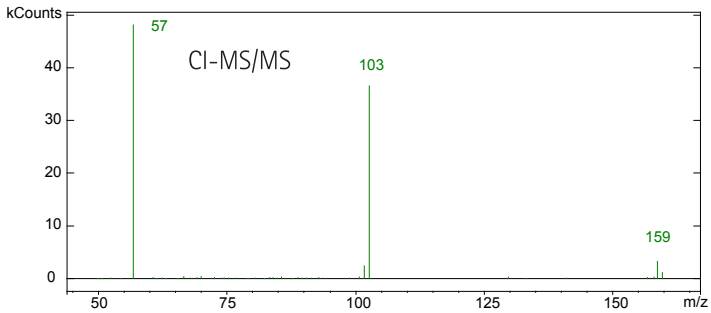
EI spectrum from the NIST08 library for N-nitrosodibutylamine.



225-MS EI full scan spectrum. The low molecular ion intensity at *m/z* 158 renders the spectrum non-distinctive and makes identification difficult if matrix is present.



Using methanol positive chemical ionization, the characteristic, protonated molecule (*m/z* 159) is the base peak of the spectrum.



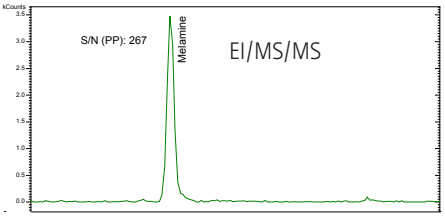
CI/MS/MS provides added, unique spectral information about the compound while enhancing detection levels. The precursor ion was *m/z* 159 and collision induced dissociation (CID) was performed using resonant mode at 0.48 V.

The MS/MS Advantage

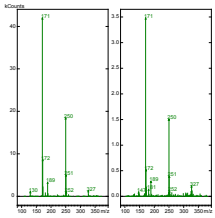
Lower Detection Limits, Higher Confidence

Take advantage of MS/MS to reliably eliminate background and matrix ions for increased selectivity. MS/MS makes trace level detection possible while still delivering excellent quantitative and qualitative information.

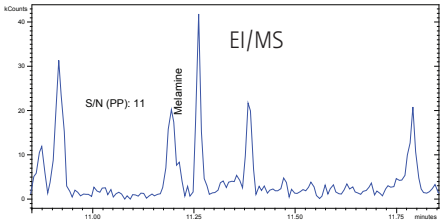
During MS/MS, the precursor ion is isolated from the full scan spectrum, while all other masses are eliminated from the trap, effectively removing background or matrix ions. In the collision induced dissociation (CID) process, the isolated precursor ion is broken into smaller fragments, creating a characteristic product ion spectrum. The result is enhanced spectral clarity, improved signal to noise and lower detection levels as shown in the figure below.



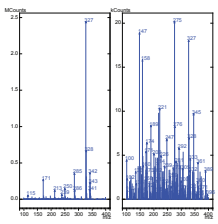
Detection of trace amounts of TMS derivatized melamine in dog food extract using EI/MS/MS. Extracted ion chromatogram of quan ion 171.



TMS-Melamine MS/MS spectrum from standard (left). TMS-Melamine spectrum from dog food extract at trace level (right).

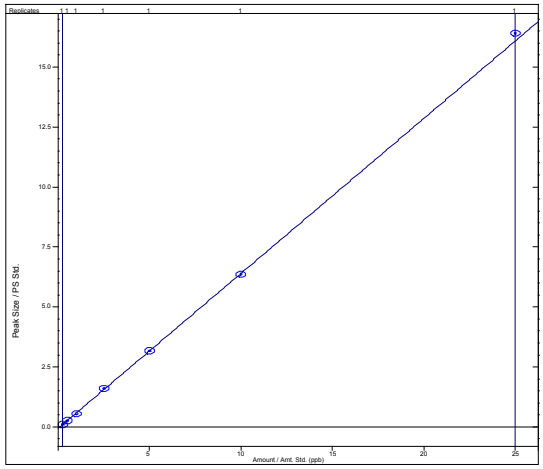


Detection of trace amounts of TMS derivatized melamine in dog food extract using EI/MS. Extracted ion chromatogram of quan ion 327.

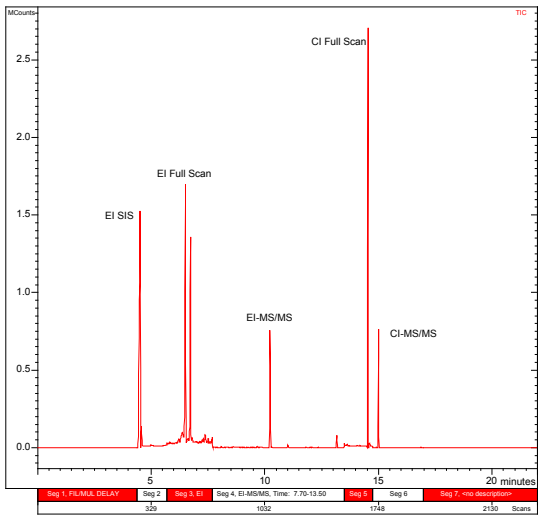


TMS-Melamine spectrum from standard (left). TMS-Melamine MS full scan spectrum from dog food extract at trace level (right).

Use MS/MS to detect environmental contaminants, pesticide residues or other contaminants in food, drugs of abuse in biological matrices or to analyze fire debris for the presence of accelerants.



The measurement of nitrosamines in drinking water (EPA Method 521) by methanol CI/MS/MS. Calibration range from 0.5 to 50 pg/µL generated excellent results for all analytes as shown above with r^2 of 0.9999 for N-nitrosodibutylamine.



The 225-MS allows automated switching between EI and CI, even in the same run, along with different scanning modes such as full scan, SIS and MS/MS. The result is enhanced qualitative and quantitative information about the sample.

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Enhanced Productivity

Dedicated GC Inlet

The Varian 431-GC single channel system is designed for the routine laboratory with space-saving in mind. Requiring only 31 cm (12 in.) of linear bench space, installation is easy while conveniently allowing the use of standard capillary columns.

Versatile Automatic Liquid Samplers Increase Productivity and Ensure Accuracy

For high throughput needs, the Varian 8400 accommodates up to 100 samples (2-mL vials). For laboratories that also require the ability to conduct pre-injection sample processing, we offer the Combi PAL™ AutoSampler.

The Varian 8400 – Flexible and Practical

Automatic access to two injection ports allows you to double your throughput. These can be installed in addition to the valve oven for optimum flexibility.

Our Most Flexible GC

For laboratories that need more flexibility, Varian's 450-GC with a choice of inlets, detectors and autosamplers, is available as an option. It provides the flexibility and performance to suit the widest range of applications needs. It is:

- Easily modified or expanded as requirements change
- Capable of either manual or completely unattended operation
- A very versatile platform, with up to three injectors and three GC detectors

Combi PAL for Comprehensive Sample Preparation and Automation

Detector	Selective Response
FID	Flame Ionization Detector
TCD	Thermal Conductivity Detector
PDHID or HID	Pulsed Discharge Helium Ionization Detector
MS	Mass Spectrometer (Scan mode)

Detector	Selective Response	Selective to
ECD	Electron Capture Detector	Halogens
PFPD	Pulsed Flame Photometric Detector	S,P,N and 25 other elements
TSD or NPD	Thermionic Specific Detector	N and P
MS	Mass Spectrometer	Specified ions (SIM mode)

The Complete Solution

Gas Clean™ Filters

Varian's new Gas Clean filter products improve productivity and data quality while lowering operation costs.

Filters available:

- Gas Clean GC/MS is a single filter that removes oxygen, moisture and hydrocarbons
- Gas Clean Moisture filter improves stabilization times for higher productivity

GC Columns

FactorFour™ low bleed columns deliver faster separations without sacrificing resolution. You'll enjoy greater accuracy and increased instrument uptime. Some applications include:

- Research and Toxicology
- Pesticide Analysis
- Food, Fragrances and Beverages

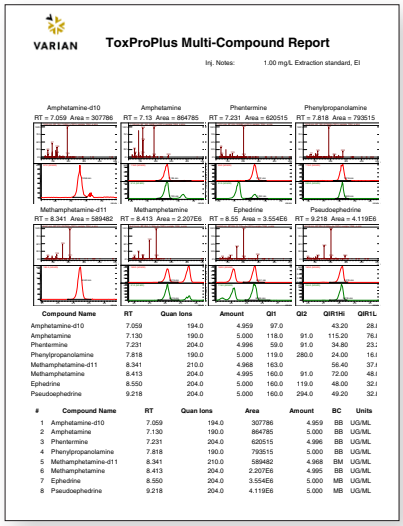
Single Point Control

Varian MS Workstation Software offers convenient and effortless control of the GC, the 225-MS system and related accessories. It provides:

- Simultaneous collection of GC and MS data allowing detection of specific compound classes, e.g. sulfur or halogens
- Sequential, automated library search of up to 16 libraries for compound identification (NIST, PMW, Wiley and more)
- Extensive diagnostics to report on vital instrument functions

The software also includes a selection of standard and custom reporting capabilities designed to fulfill specific needs:

- EnviroPro™ for general and EPA-specific report requirements
- ToxPro™ Plus includes three-ion ratio reports for toxicology applications
- Access control and audit trail software for 21 CFR Part 11 compliance
- Automatic Mass Spectral Deconvolution and Identification System (AMDIS)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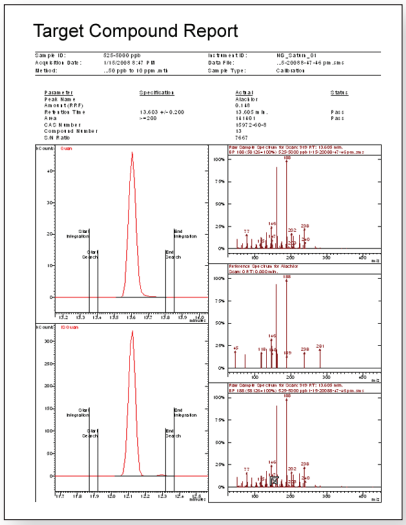
ToxProPlus Multi-Compound Report

Inj. Notes: 1.00 mg/L Extraction standard, EI

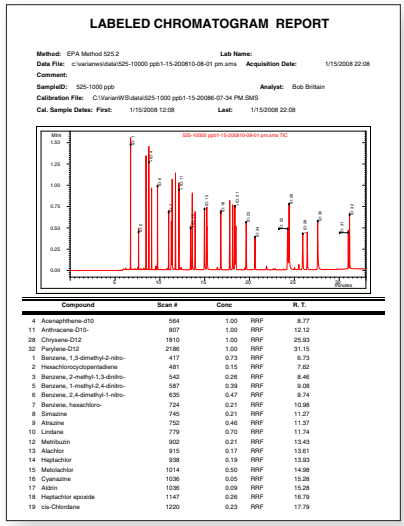
Amphetamine-d10 RT = 7.059 Area = 307786
Amphetamine RT = 7.13 Area = 864785
Phentermine RT = 7.231 Area = 620515
Phenylpropanolamine RT = 7.818 Area = 793515
Methamphetamine-d11 RT = 8.341 Area = 589482
Methamphetamine RT = 8.413 Area = 2.207E6
Ephedrine RT = 8.55 Area = 3.554E6
Pseudoephedrine RT = 9.218 Area = 4.119E6

Compound Name	RT	Quan Ions	Amount	QI1	QI2	QIR1Hi	QIR1L
Amphetamine-d10	7.059	194.0	4.959	97.0		43.20	28.8
Amphetamine	7.130	190.0	5.000	118.0	91.0	115.20	76.8
Phentermine	7.231	204.0	4.996	59.0	91.0	34.80	23.2
Phenylpropanolamine	7.818	190.0	5.000	119.0	280.0	24.00	16.0
Methamphetamine-d11	8.341	210.0	4.968	163.0		56.40	37.6
Methamphetamine	8.413	204.0	4.995	160.0	91.0	72.00	48.0
Ephedrine	8.550	204.0	5.000	160.0	119.0	48.00	32.0
Pseudoephedrine	9.218	204.0	5.000	160.0	294.0	49.20	32.8

#	Compound Name	RT	Quan Ions	Area	Amount	BC	Units
1	Amphetamine-d10	7.059	194.0	307786	4.959	BB	UG/ML
2	Amphetamine	7.130	190.0	864785	5.000	BB	UG/ML
3	Phentermine	7.231	204.0	620515	4.996	BB	UG/ML
4	Phenylpropanolamine	7.818	190.0	793515	5.000	BB	UG/ML
5	Methamphetamine-d11	8.341	210.0	589482	4.968	BM	UG/ML
6	Methamphetamine	8.413	204.0	2.207E6	4.995	BB	UG/ML
7	Ephedrine	8.550	204.0	3.554E6	5.000	MB	UG/ML
8	Pseudoephedrine	9.218	204.0	4.119E6	5.000	MB	UG/ML



Target Compound Report



LABELED CHROMATOGRAM REPORT

Method: EPA Method 525.2 Lab Name:
Data File: c:\varianws\data\525-10000 ppb\1-15-200810-08-01 pm.sms Acquisition Date: 1/15/2008 22:08
Comment:
SampleID: 525-1000 ppb Analyst: Bob Brittain
Calibration File: C:\VarianWS\data\525-1000 ppb\1-15-20086-07-34 PM.SMS
Cal. Sample Dates: First: 1/15/2008 12:08 Last: 1/15/2008 22:08

Compound	Scan #	Conc	R. T.		
4 Acenaphthene-d10	564	1.00	RRF	8.77	
11 Anthracene-D10-	807	1.00	RRF	12.12	
28 Chrysene-D12	1810	1.00	RRF	25.93	
32 Perylene-D12	2186	1.00	RRF	31.15	
1 Benzene, 1,3-dimethyl-2-nitro-	417	0.73	RRF	6.73	
2 Hexachlorocyclopentadiene	481	0.15	RRF	7.62	
3 Benzene, 2-methyl-1,3-dinitro-	542	0.26	RRF	8.46	
5 Benzene, 1-methyl-2,4-dinitro-	587	0.39	RRF	9.08	
6 Benzene, 2,4-dimethyl-1-nitro-	635	0.47	RRF	9.74	
7 Benzene, hexachloro-	724	0.21	RRF	10.98	
8 Simazine	745	0.21	RRF	11.27	
9 Atrazine	752	0.46	RRF	11.37	
10 Lindane	779	0.70	RRF	11.74	
12 Metribuzin	902	0.21	RRF	13.43	
13 Alachlor	915	0.17	RRF	13.61	
14 Heptachlor	938	0.19	RRF	13.93	
15 Metolachlor	1014	0.50	RRF	14.98	
16 Cyanazine	1036	0.05	RRF	15.28	
17 Aldrin	1036	0.09	RRF	15.28	
18 Heptachlor epoxide	1147	0.26	RRF	16.79	
19 cis-Chlordane	1220	0.23	RRF	17.79	

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ION TRAP MASS SPECTROMETER

Varian offers robust instrumentation, application-based consumables, and customer-focused services, backed by our global team of product and applications experts, ready to help you solve your analytical challenges. Whether you're monitoring impurities in drinking water, designing new therapeutic drugs, or developing cleaner fuels, our solutions deliver the sensitivity, flexibility and productivity your laboratory requires.

Varian Care Program

Our goal is to help you increase your productivity, maximize your uptime and achieve the highest return possible on your investment. Our experienced and highly-qualified support organization is strategically located throughout the world to ensure rapid response.

Be confident knowing that your instrument will deliver maximum performance, your users are fully trained and expert technicians will respond quickly to your support needs — because Varian cares.

Shop Online

Varian offers the added convenience of purchasing products online. The products you need are just a few clicks away at www.varianinc.com

We are committed to meeting your needs with a full range of consumable products and supplies. Call today to request your free copy of our comprehensive analytical supplies catalog or download it from our web site.

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