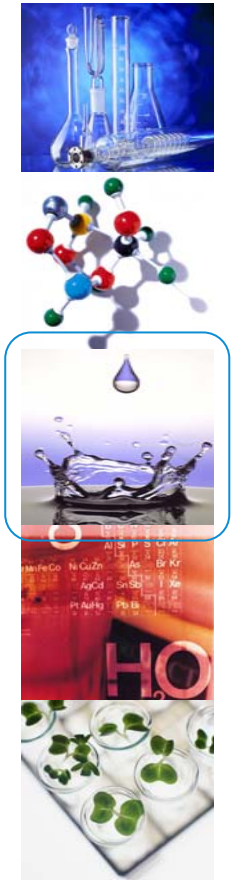
DANI A SCENT OF FUTURE

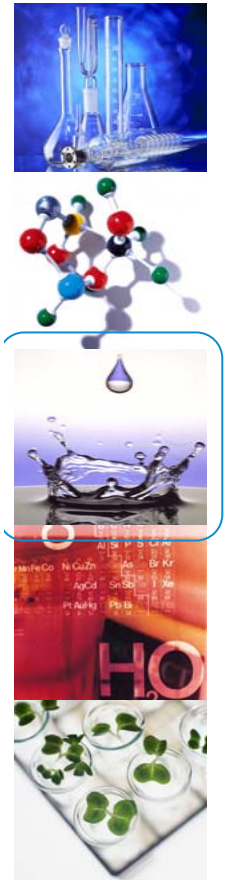


DANI Chromatographic Products

- GC and GC/MS
- Automatic samplers for GC

MASTER GC - Fast Gas Chromatograph

DANI A SCENT OF FUTURE

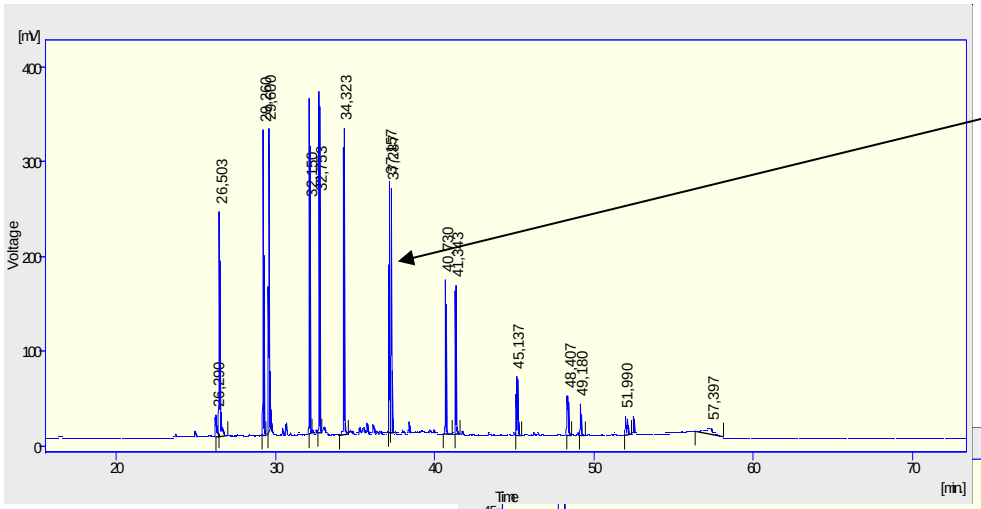


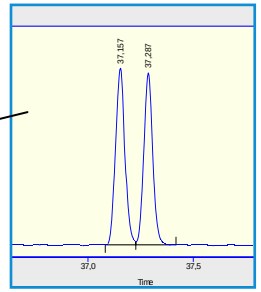
... FAST Gas Chromatograph

MASTER GC dramatically **increases** the laboratory **productivity** decreasing the analysis run time while preserving chromatographic resolution:

- fastest oven heating rate (up to 140 °C/min)
- fast cooling time
- carrier gas pressure range up to 120 psi
- up to 1:10000 split ratio *(...or fast on-column injector..)*

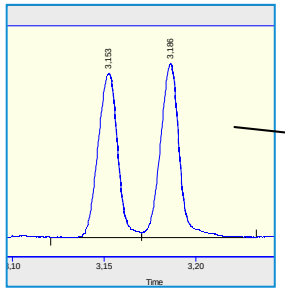
Fast GC application - PAHs

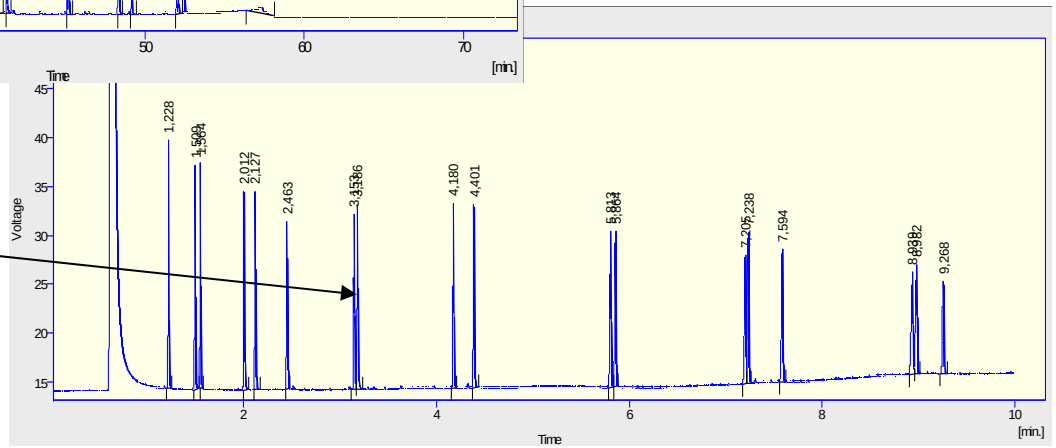




Conventional GC
Rs = 1,48

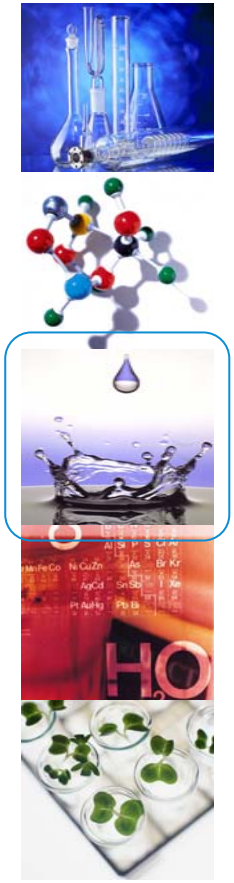
Fast GC
Rs = 1,35





Column: DN-5, 15 m, 0.1 mm, 0.1 um; Oven: 140°C, 0.5min, 30°C/min, 220°C, 15°C/min, 300°C (1,5min); Carrier H2, 0.5mL/min, constant flow; Injector: PTV, 80°C-999°C/min-400°C; Split 1:100; Sample: 0.5µL

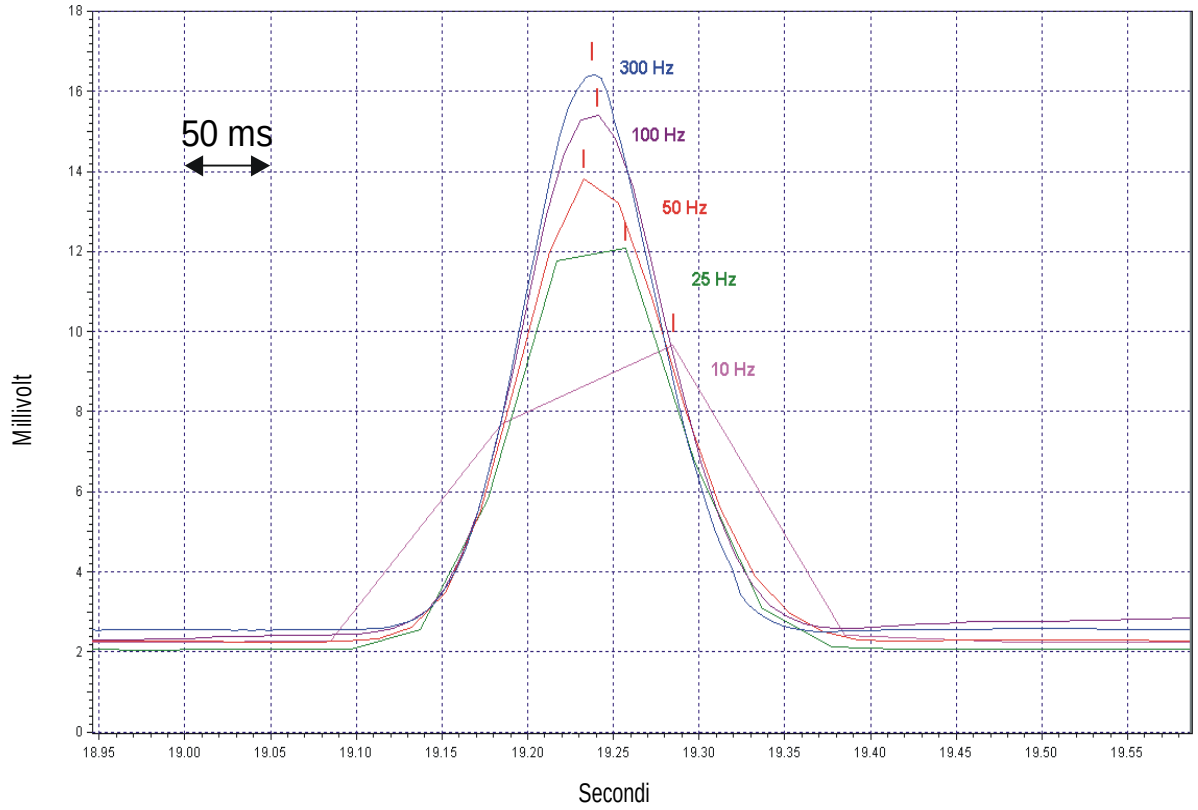
6 times faster
constant resolution

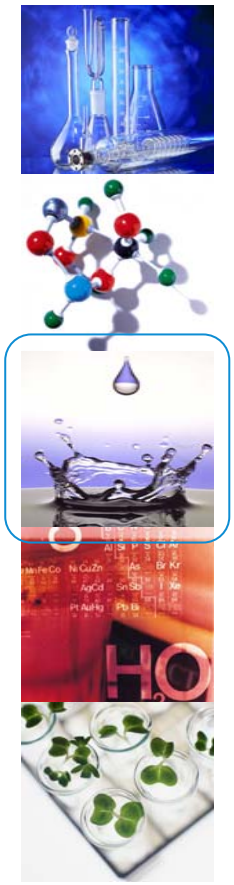


DANI A SCENT OF FUTURE

... Fast peak detection requirements

- A fast response and data acquisition rate is necessary to properly detect fast peaks and avoid distortion in peak shape, peak height and apex location

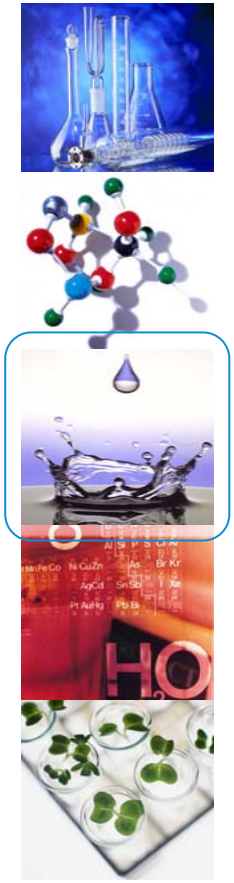




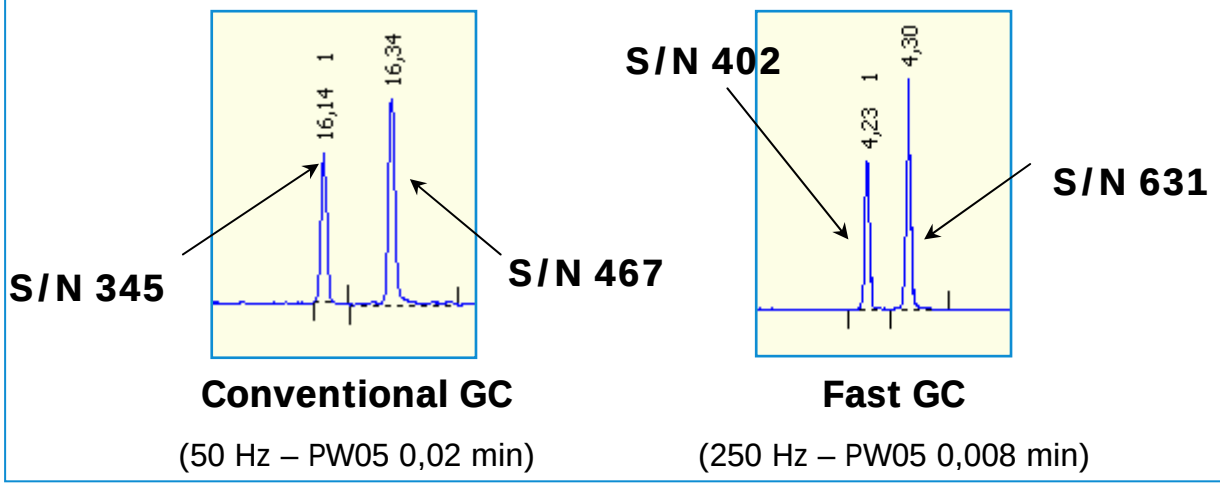
DANI A SCENT OF FUTURE

... full range of highly sensitive detectors

- MASTER GC features a full range of highly sensitive detectors.
- The digital setting of all the detector gas flow rates is included carrier
- A fast response and data acquisition rate up to 300 Hz for FID, ECD, NPD and FPD allows a reproducible and accurate acquisition also **of narrow fast GC peaks** keeping the sensitivity unaffected.



Pesticides with NPD detector



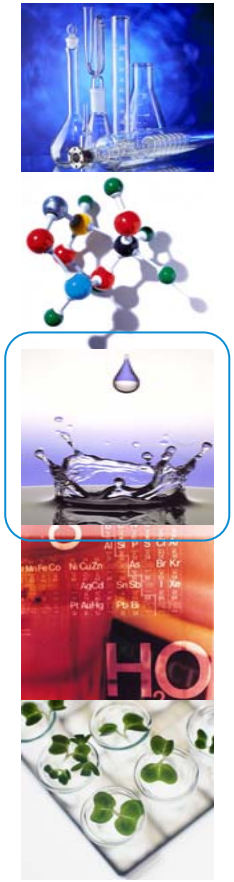
DANI A SCENT OF FUTURE

… unsurpassed repeatability

A patent pending Digital Flow Control (DFC) combined with a highly accurate control of the oven temperature assures an **unsurpassed retention time repeatability** and split flow **linearity** in both conventional and fast GC.

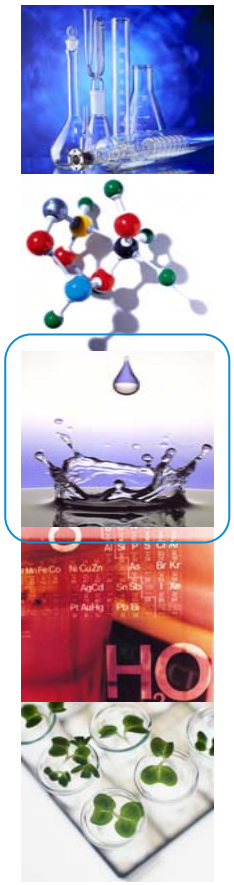
	C8	C10	C12	C14	C16	C18	C20	C22	C24	C26	C28
1	1,68	2,1905	2,6052	3,0072	3,4175	3,8249	4,2129	4,577	4,9161	5,2343	5,5505
2	1,6793	2,1892	2,6042	3,0072	3,4175	3,8249	4,2119	4,5757	4,9151	5,233	5,5495
3	1,6786	2,1888	2,6045	3,0075	3,4185	3,8259	4,2129	4,5767	4,9155	5,2343	5,5505
4	1,6803	2,1905	2,6052	3,0079	3,4182	3,8252	4,2133	4,577	4,9148	5,2326	5,5485
5	1,6786	2,1892	2,6038	3,0065	3,4172	3,8249	4,2126	4,576	4,9151	5,233	5,5485
6	1,6796	2,1902	2,6042	3,0065	3,4175	3,8245	4,2119	4,5763	4,9151	5,2336	5,5491
7	1,6793	2,1892	2,6042	3,0072	3,4175	3,8249	4,2119	4,5757	4,9151	5,233	5,5495
8	1,679	2,1888	2,6042	3,0072	3,4182	3,8249	4,2113	4,5757	4,9145	5,232	5,5475
9	1,6786	2,1898	2,6045	3,0062	3,4172	3,8245	4,2113	4,576	4,9148	5,2316	5,5485
10	1,6793	2,1898	2,6048	3,0075	3,4182	3,8255	4,2123	4,5757	4,9145	5,2323	5,5475
Media	1,6793	2,1896	2,6045	3,0071	3,4178	3,8250	4,2122	4,5762	4,9151	5,2330	5,5490
Dev st	**0,0006**	**0,0007**	**0,0005**	**0,0005**	**0,0005**	**0,0004**	**0,0007**	**0,0005**	**0,0005**	**0,0009**	**0,0011**

RETENTION TIME REPEATABILITY
SD < 0.001min



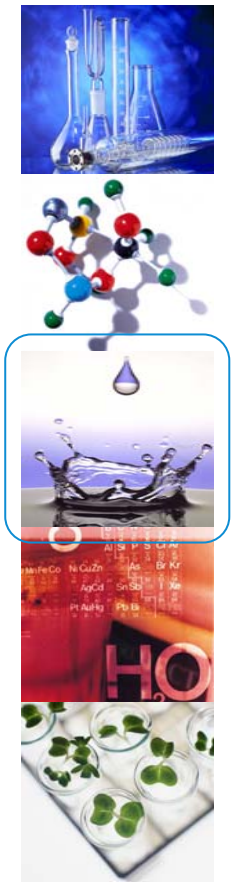
DANI A SCENT OF FUTURE

Oven Max Temperature	500 °C
Oven Max Heating Ramp Rate	140°C/min
Oven Temperature programming	25 ramps, 26 isotherms
Oven cool-down rate	300°C to 50°C in 4 min
Injectors installed simultaneously	3
Injectors available	Packed (PK) Split/splitless (SL/IN) Programmable Temperature Vaporizer (PTV) Automated Fast On-Column Gas sampling valves (GSV)
Injectors Gas Control (Carrier, Split, Purge)	Digital Flow Control (DFC) Range: 0-120 psi
Injector Pressure/Flow programming	Constant or programmed flow Constant or programmed pressure Constant linear velocity Pulsed Injection Flow programming: 25 ramps/26 cost. flows Pressure programming: 25 ramps/26 isobars Atmospheric pressure and temperature compensation

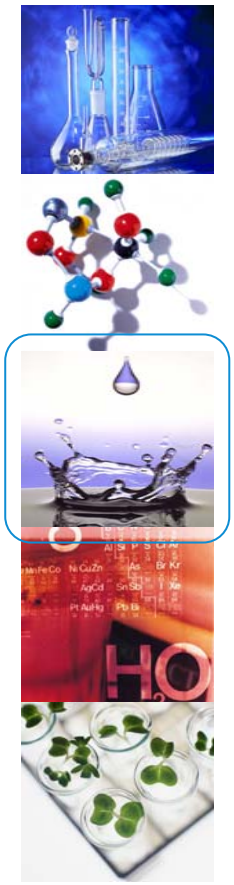


DANI A SCENT OF FUTURE

Detectors installed simultaneously	3
Detectors available	FID flame ionization detector NPD nitrogen and phosphorous detector ECD electron capture detector PID photo ionization detector TCD thermal conductivity detector mTCD micro thermal conductivity detector FPD flame photometric detector
Detectors Gas Control	Digital Pressure Control (DPC) Range: 0-120 psi
Data Acquisition Rate	300 Hz (for all detectors)
GC User Interface	Touch Screen - LCD TFT, 5.7”
Output Signals	Digital (LAN, USB, RS-232) Analog outputs (0-1V, 0-10V)
Inside Oven Lamp	YES

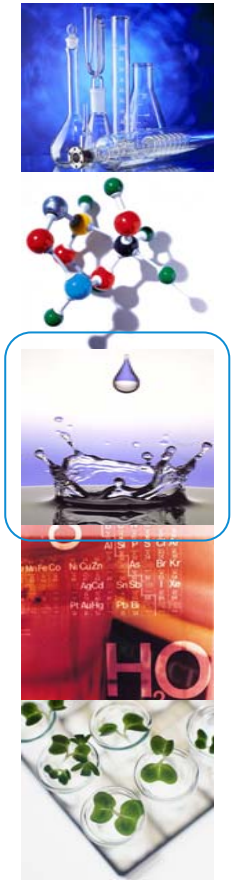


DANI A SCENT OF FUTURE



MASTER AS – Automatic liquid Sampler

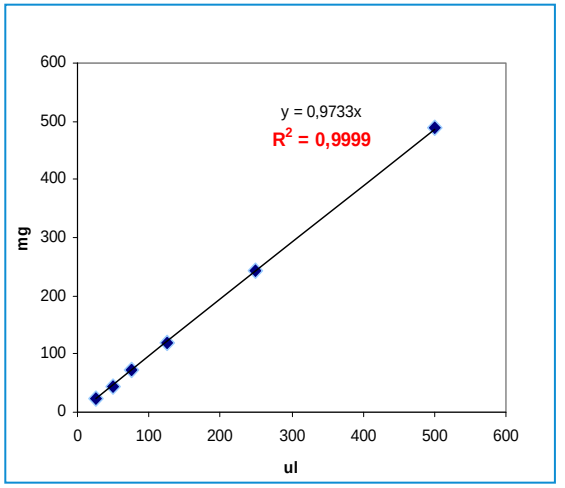
DANI A SCENT OF FUTURE



… maximized productivity

MASTER AS maximizes the laboratory productivity:

- **large sample capacity** (up to 160 vials)
- **extended capabilities** in injection techniques (sandwich injection, hot needle, internal standard, wide range of syringe volume..)
- **high flexibility** in the control of sample sequence (stored sample sequence, 25 lines, 100 repetitions, priority sequence, sensor for vial presence,..)



… with the highest accuracy and precision

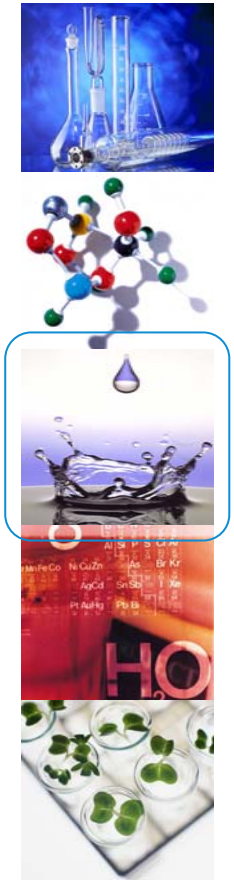
MASTER AS assures a high degree of precision:

- RSD% area **repeatability** better than 0.3%
- outstanding sample volume **linearity**

	C8	C10	C12	C14
1	188,749	157,419	102,825	101,723
2	188,317	156,319	102,568	101,577
3	187,259	155,916	101,847	101,07
4	187,479	156,438	101,89	101,644
5	188,231	156,458	102,241	102,004
6	188,108	156,314	102,214	101,828
7	188,109	156,861	102,165	101,956
8	188,024	156,89	101,859	101,196
9	188,73	156,865	102,498	101,875
10	188,891	156,833	102,431	101,771
11	188,518	157,469	102,749	101,401
Media (mV.s)	**188,220**	**156,707**	**102,299**	**101,640**
SD	**0,512**	**0,474**	**0,347**	**0,305**
RSD%	**0,272**	**0,303**	**0,339**	**0,300**

DANI A SCENT OF FUTURE

System Type	X-Y-Z Robot
Sample Capacity (2ml vials)	160
Sample Capacity (10/20 ml vials)	65
Solvent / Waste Vials	5 / 5
Minimum Sample Injection	0.1 µl
Maximum Sample Injection	500 µl
Syringe sizes	5, 10, 25, 50, 100, 250, 500 µl
Injection per Vial	up to 100
Injection port	up to 3
Vial presence sensor	YES
Parameter control	Pre/Post injection solvent washing, Sample/IS rinse (number/volume), Sample vial depth Syringe strokes before injection, Plunger sampling speed, Plunger injection speed, Pre/Post injection delay, Viscosity delay, Solvent plug volume, Internal standard volume, Sample volume, Air plug volume, Priority vial/sequence

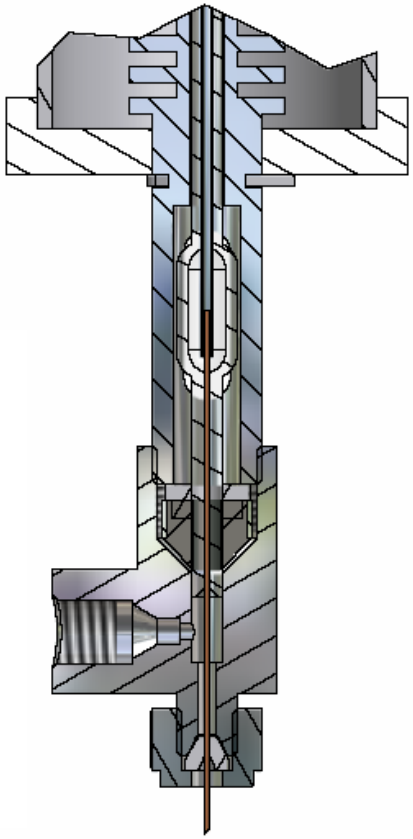


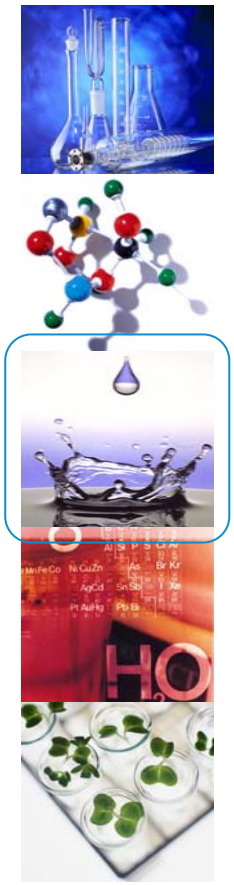
DANI A SCENT OF FUTURE

… on-column injection in FAST GC

Automated **FAST ON-COLUMN** injector allows the injection of nano to macro volume of liquid sample direcly into narrow and ultra narrow (50-250 microns) capillary columns.

- True cold on-column injection in FastGC
- No sample dilution
- No use of pre-column
- Fully automatic

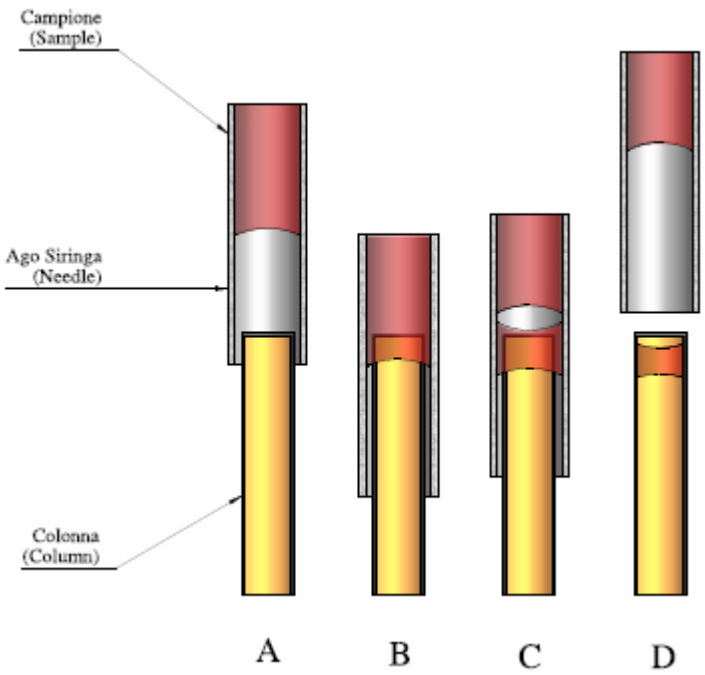




… takes advantage of

- No discrimination effect on wide range boiling points
- No sample degradation of thermally-labile compounds
- No impurities from septa
- Wide range of injection volume (from nanoliters to microliters)

Principle of operation

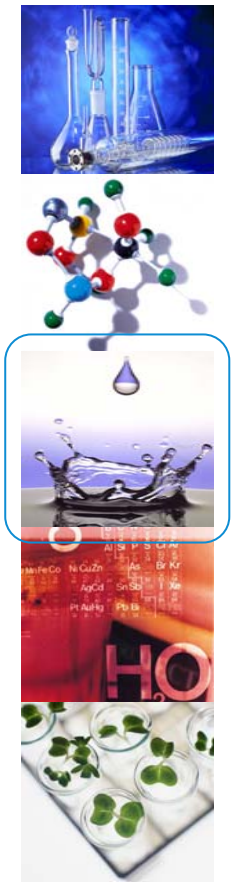


A) The syringe needle slides over the capillary column

B) The column comes in contact with the liquid

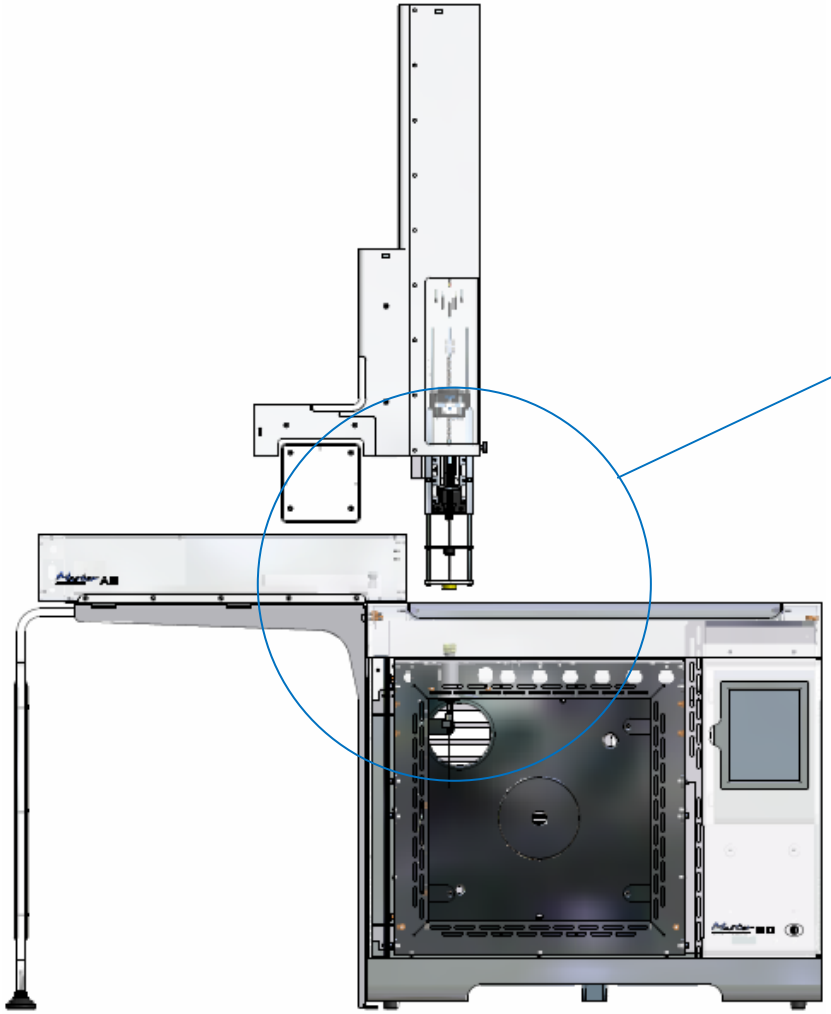
C) The liquid is sampled by capillarity

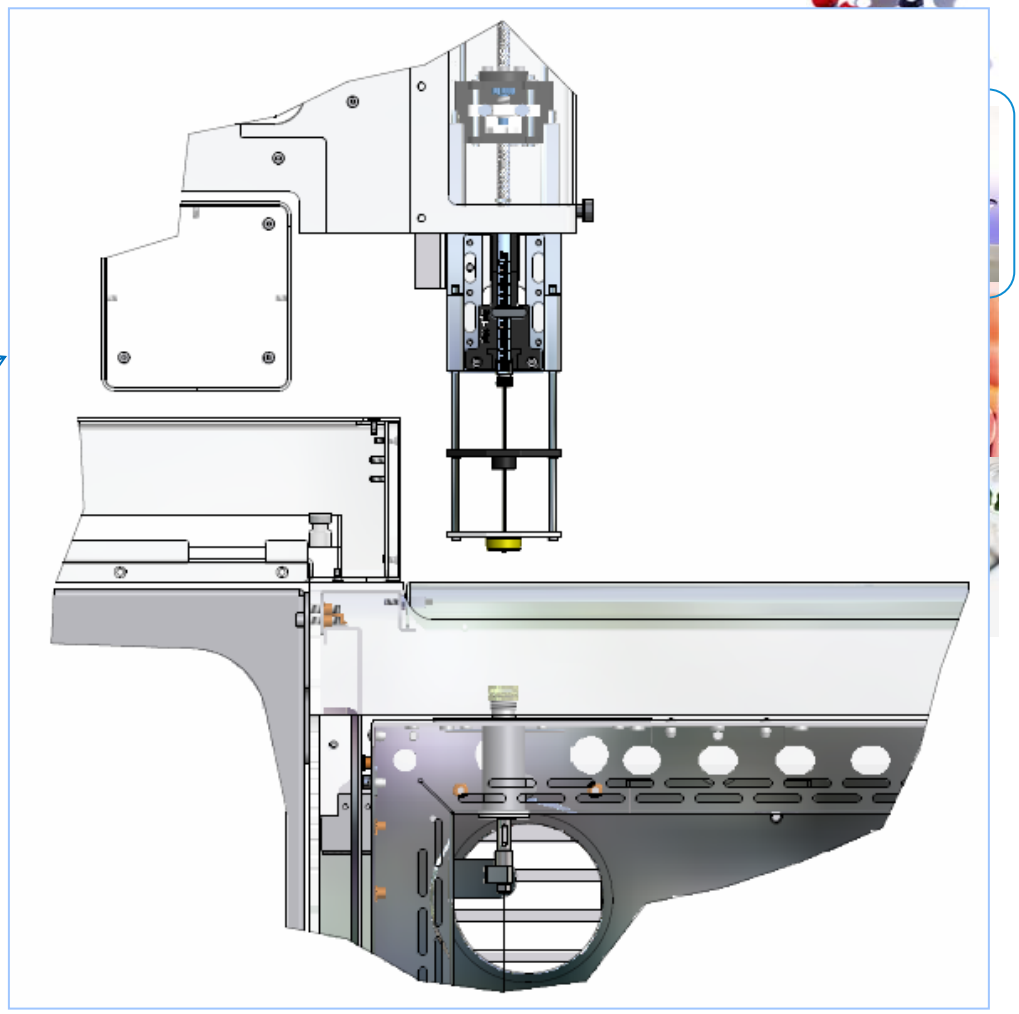
D) The needle withdraws and the analysis starts



DANI A SCENT OF FUTURE

Automated Fast On-column

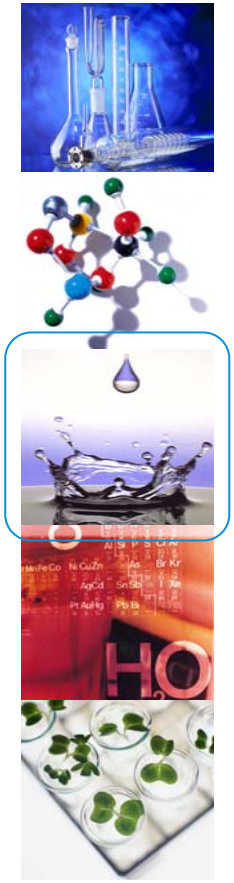




Automated FAST ON-COLUMN

DANI A SCENT OF FUTURE

SAGE Essential Oil FAST-GC



Hot Injection

Split Ratio 1:1000

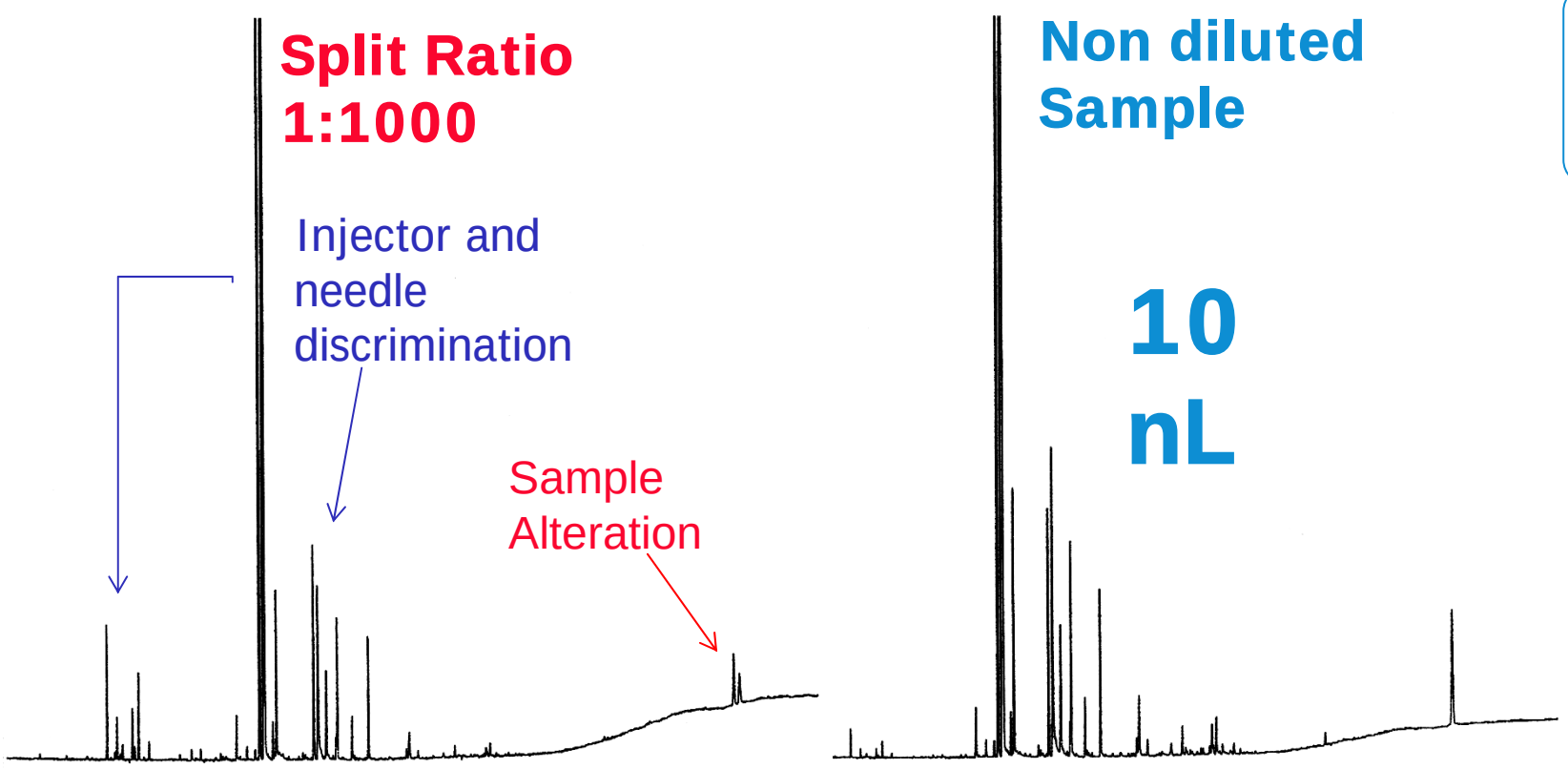
Injector and needle discrimination

Sample Alteration

FAST ON-COLUMN*

Non diluted Sample

10 nL



Column:	10 m L x 100 µm i.d., 0.1 µm f.t. DN-WAX
Oven:	40°C – 15°C/min – 230°C
Carrier gas:	Hydrogen at 59 cm/s

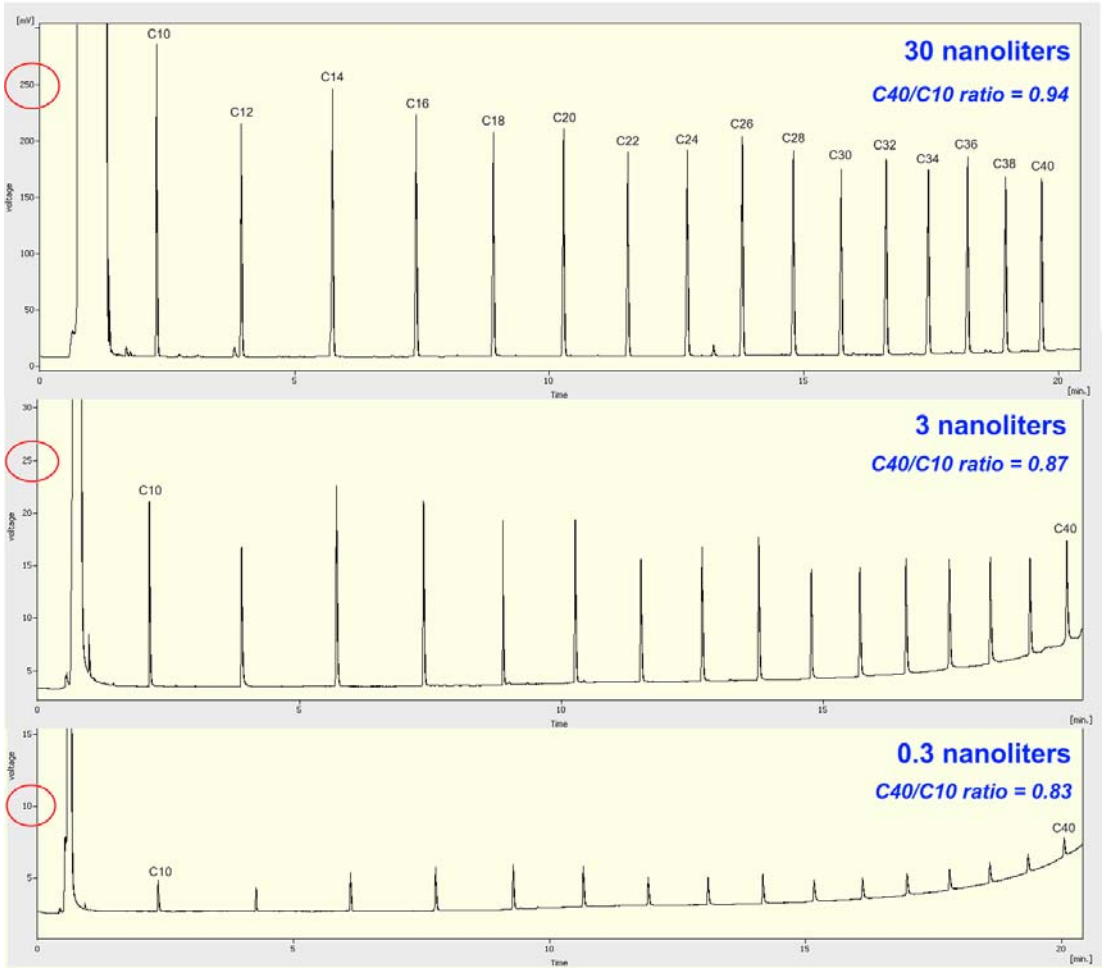
10 min analisys time

* Patent Pending System

Automated FAST ON-COLUMN

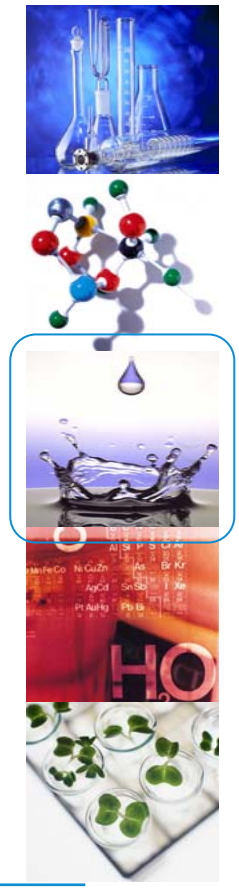
DANI A SCENT OF FUTURE

Automated Fast On-column Performances



This application show the performances of the FAST On-Column Inlet system (*) with an introduction of Alkane Mixture from 30nL down to 0.3nL direct liquid injection into the column! The discrimination is minimized like a traditional On-Column injection.

FLUKA Cat.# 68281, "Alkane Standard Mixture for the assay of the system efficiency of GC's C10-C40"



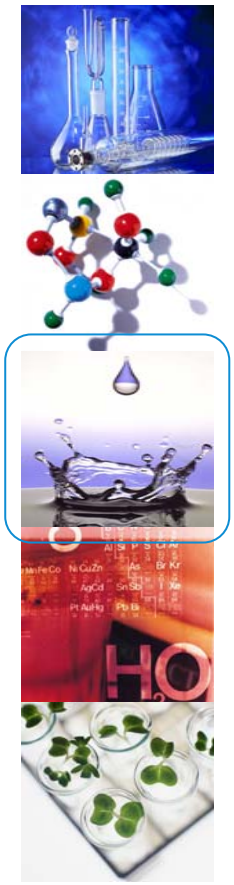
Column:
5 m L x 250 µm i.d., 0.1 µm f.t. DN-1

Oven:
40°C – 15°C/min – 350°C

Carrier gas:
Helium at 30 kPa

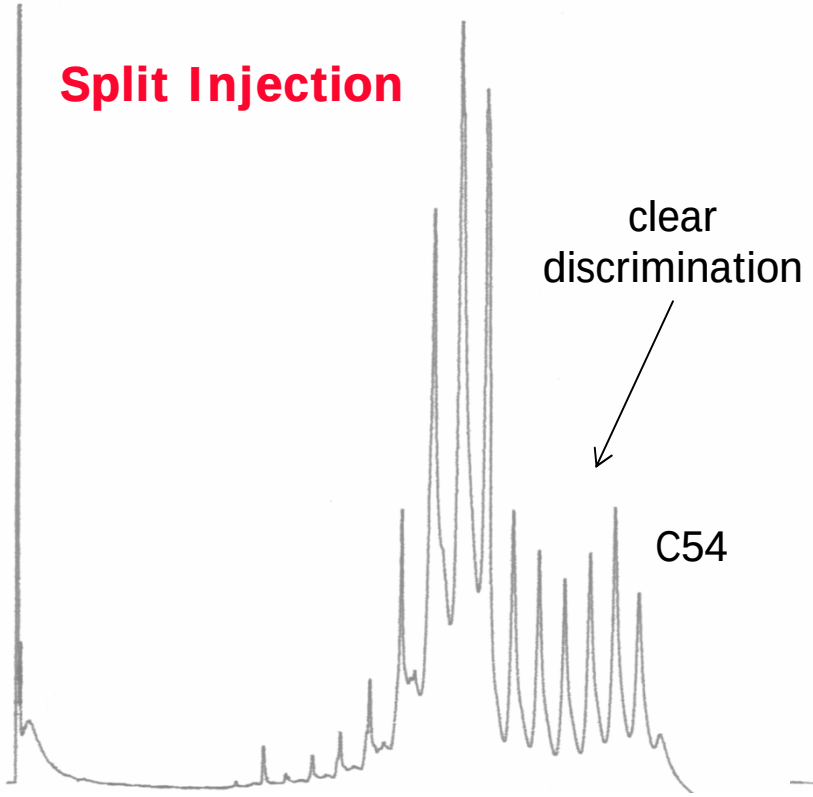
DANI A SCENT OF FUTURE

Butter TRIGLYCERIDES FAST-GC



Hot Injection

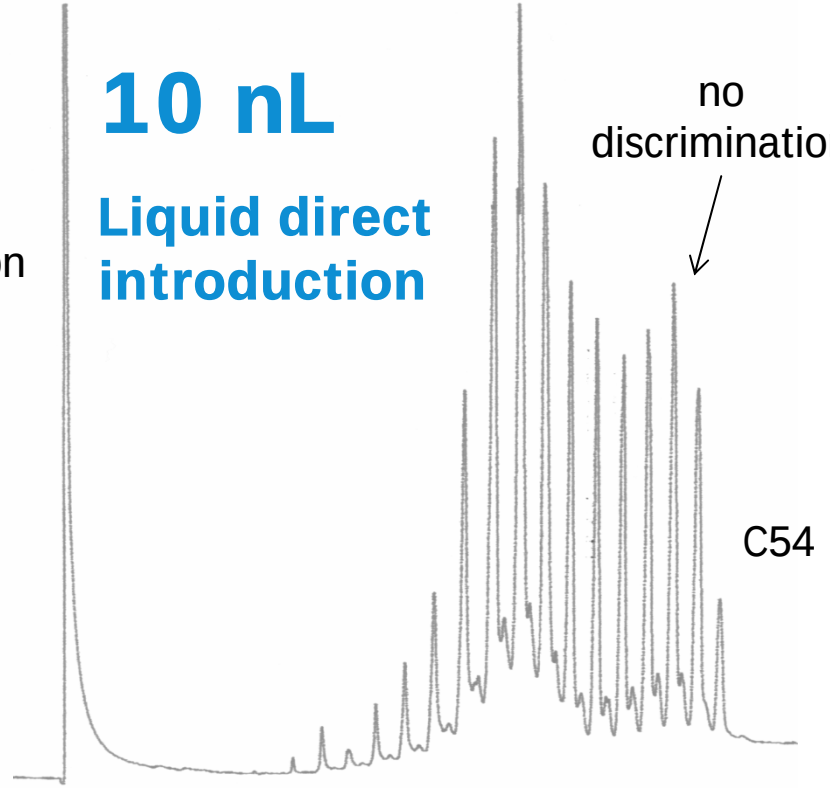
Split Injection



FAST ON-COLUMN*

10 nL

Liquid direct introduction

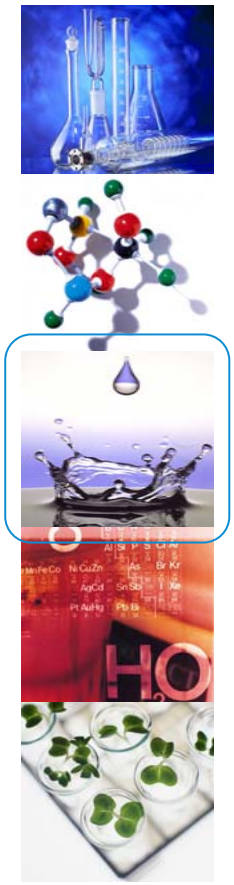


Column:	1.5 m L x 100 µm i.d., 0.1 µm f.t. DN-1	**8 min analisys time**
Oven:	100°C – 30°C/min – 350°C	
Carrier gas:	Hydrogen at 150 kPa	

* Patent Pending System

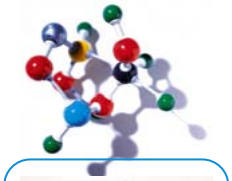
Automated FAST ON-COLUMN

DANI A SCENT OF FUTURE



MASTER TOF – Time of Flight GC-MS

Master TOF
Time of Flight Mass Spectrometer


... the true Fast GC-MS

- only Time of Flight Mass Spectrometer offers the required performance for the acquisition of very fast peak
- MasterTOF Time of Flight MS has been especially designed for Fast GC and GCxGC applications.
- With an acquisition rate up to 500 spectras/s, **MASTER TOF** guarantees a proper peak **identification** and **quantitation** also in complex matrices

... wide linearity

- a wide dynamic range (10^5) **decreases** the need of dilution of highly concentrated sample, increasing the throughput of the laboratory

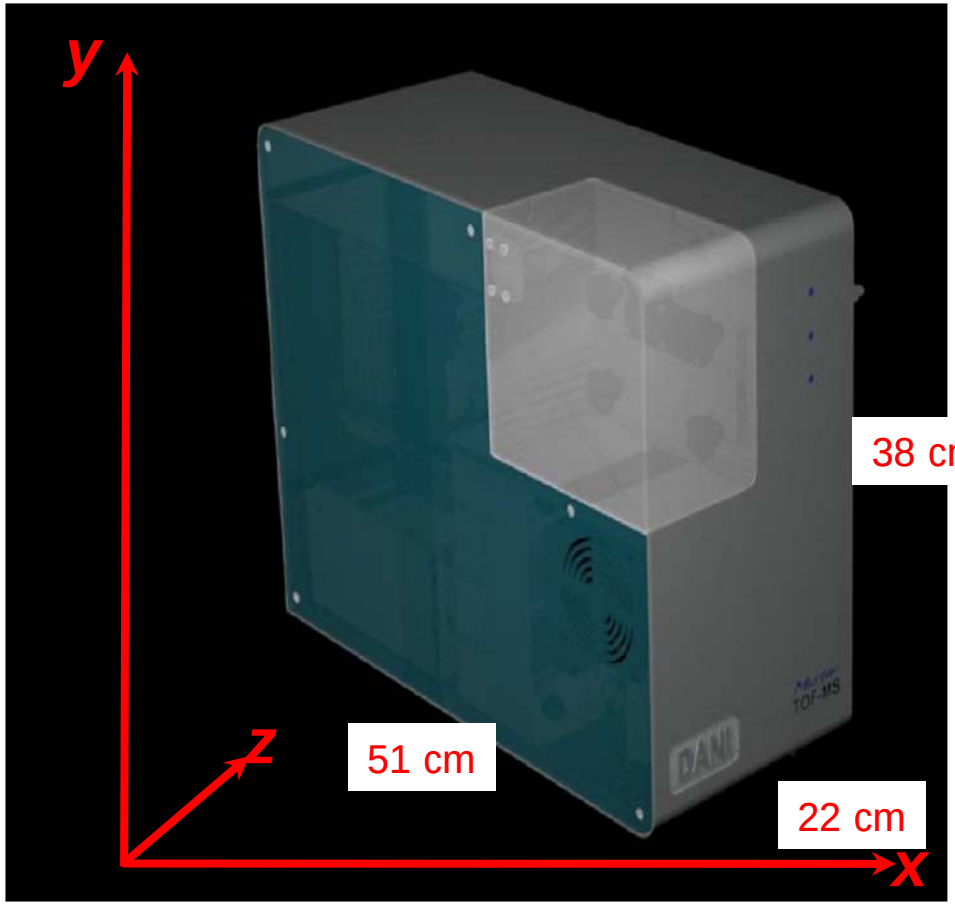
... powerful Deconvolution Software

- mass spectra automatically extracted free of interferences from system, matrix background and coeluting analytes
- analyte identification by spectral identification or by library search using **NIST library** or operator-prepared databases.

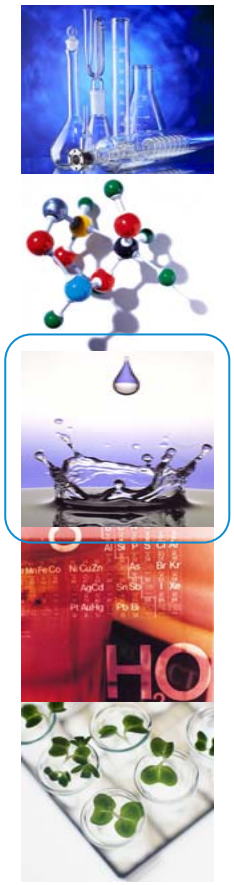
DANI A SCENT OF FUTURE

Master TOF

Time of Flight Mass Spectrometer

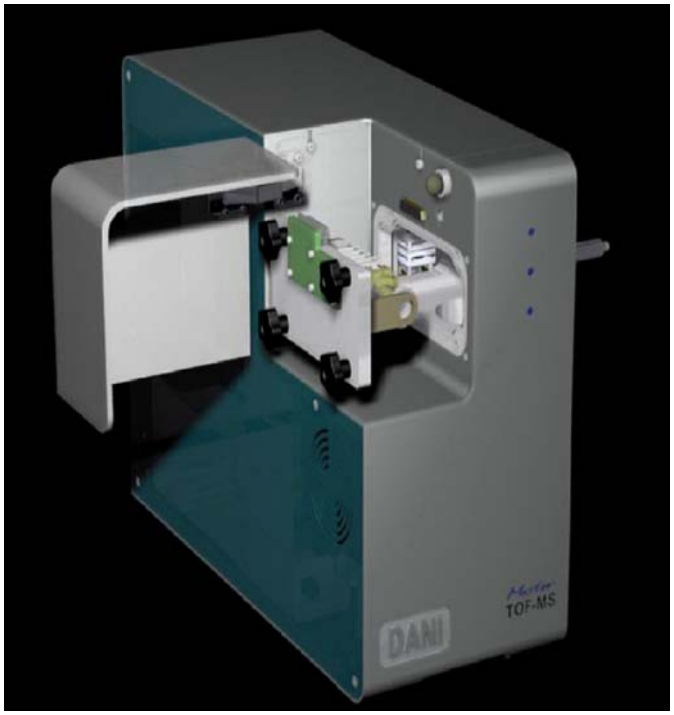


Extremely compact design for bench top space saving

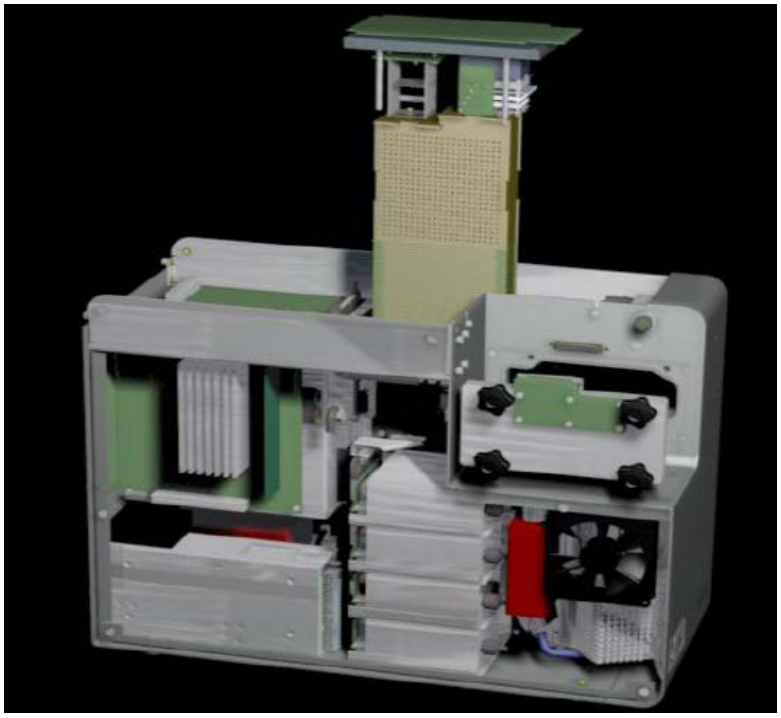


DANI A SCENT OF FUTURE

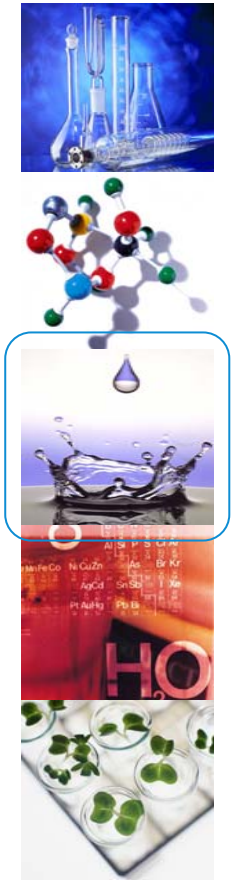
Master TOF
Time of Flight Mass Spectrometer



- Fast and efficient maintenance procedure
- No special tools needed



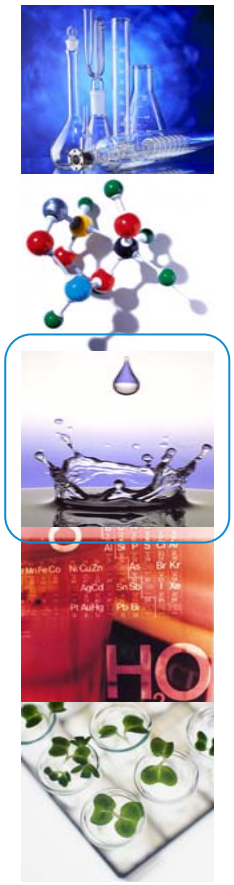
Extremely easy access to the ion source and flight chamber for an effective, complete cleaning and replacement of all the components



DANI A SCENT OF FUTURE

Master TOF

Time of Flight Mass Spectrometer



DANI Master TOF Acquisition Numbers

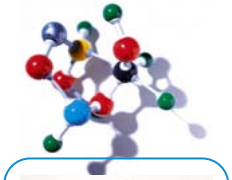
- Acceleration field pulsed at 30 KHz
- This generates 30,000 spectra/s
- The system averages the spectra to “only” 500 centroid spectra/s to disk, to ensure more feasible transfer rates and more representative spectra
- 1000 spectra/s are possible under extreme conditions

DANI Master TOF Software Package

- Master AS/GC software control included
- Peak assignment based on automatic deconvolution procedure
- Library search with NIST MS Search

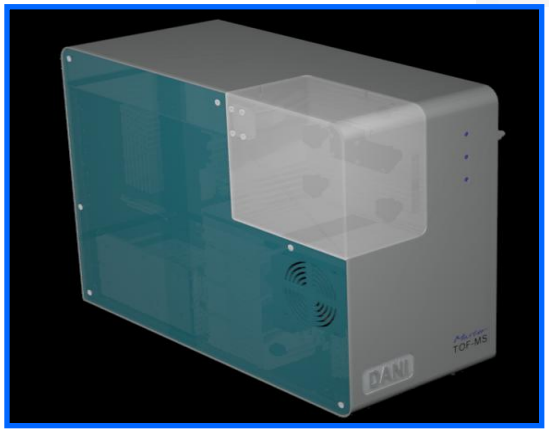
DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

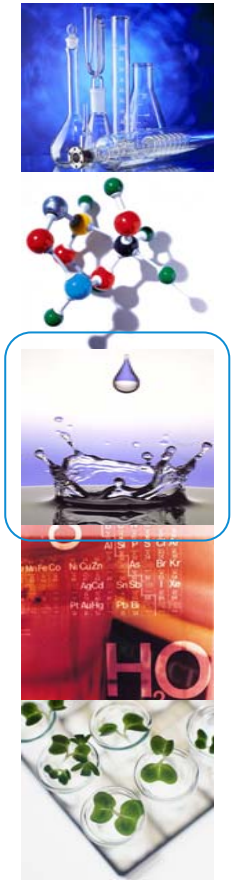

Specifications

Mass Range	5 to 1500 amu
Acquisition rate	Up to 1000 spectra/s
Sensitivity	1 pg Octafluoronaphthalene s/n > 10:1 at m/z 272
Resolution	1500
Linearity	10^5
Tune mode	Automatic Full Autotune Automatic Autotune Manual Tune
Ion Source	EI – Standard CI (+/-) Optional
Vacuum System	Internal Diaphgragm Pump 2 Turbomolecular pumps 260-70 L/s

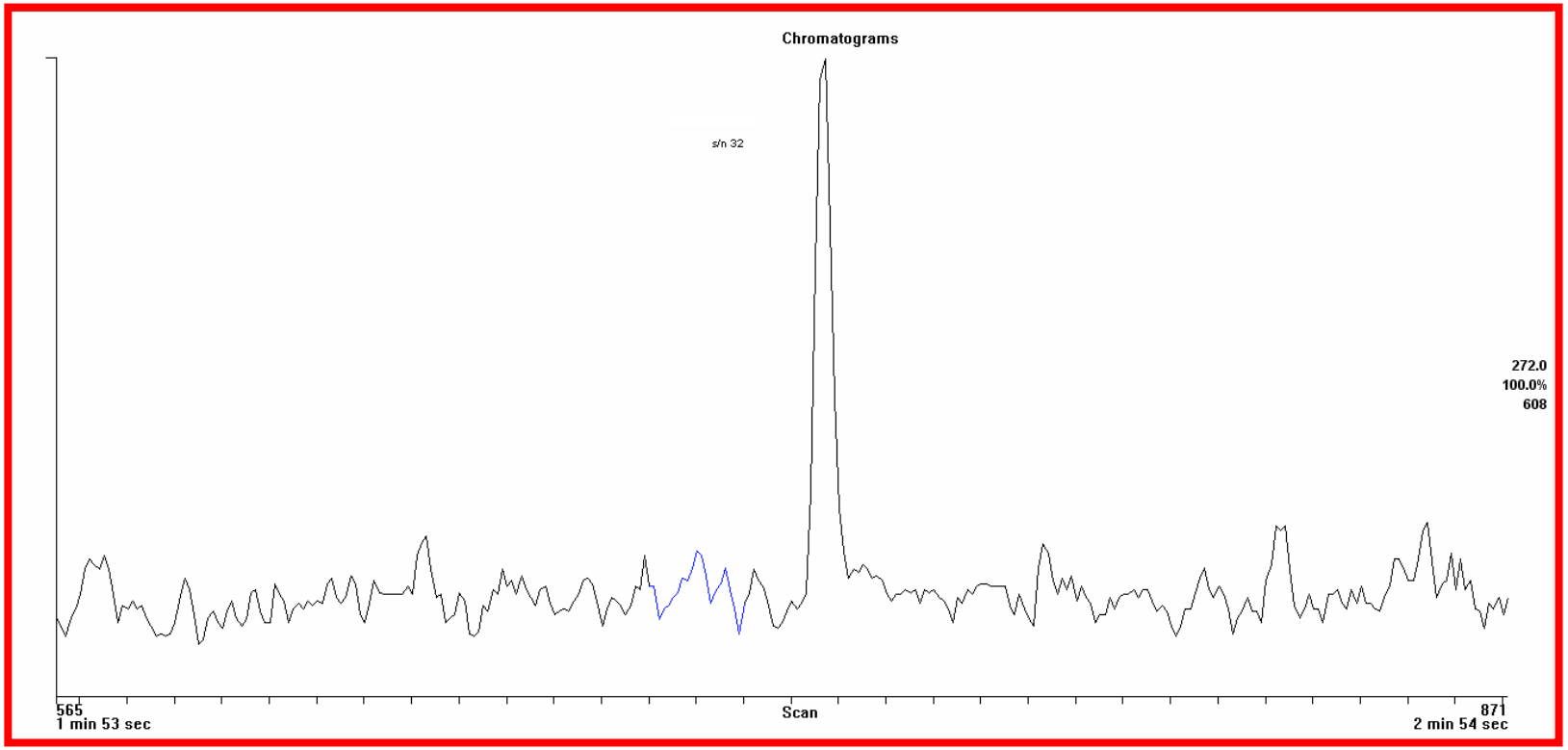


DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer



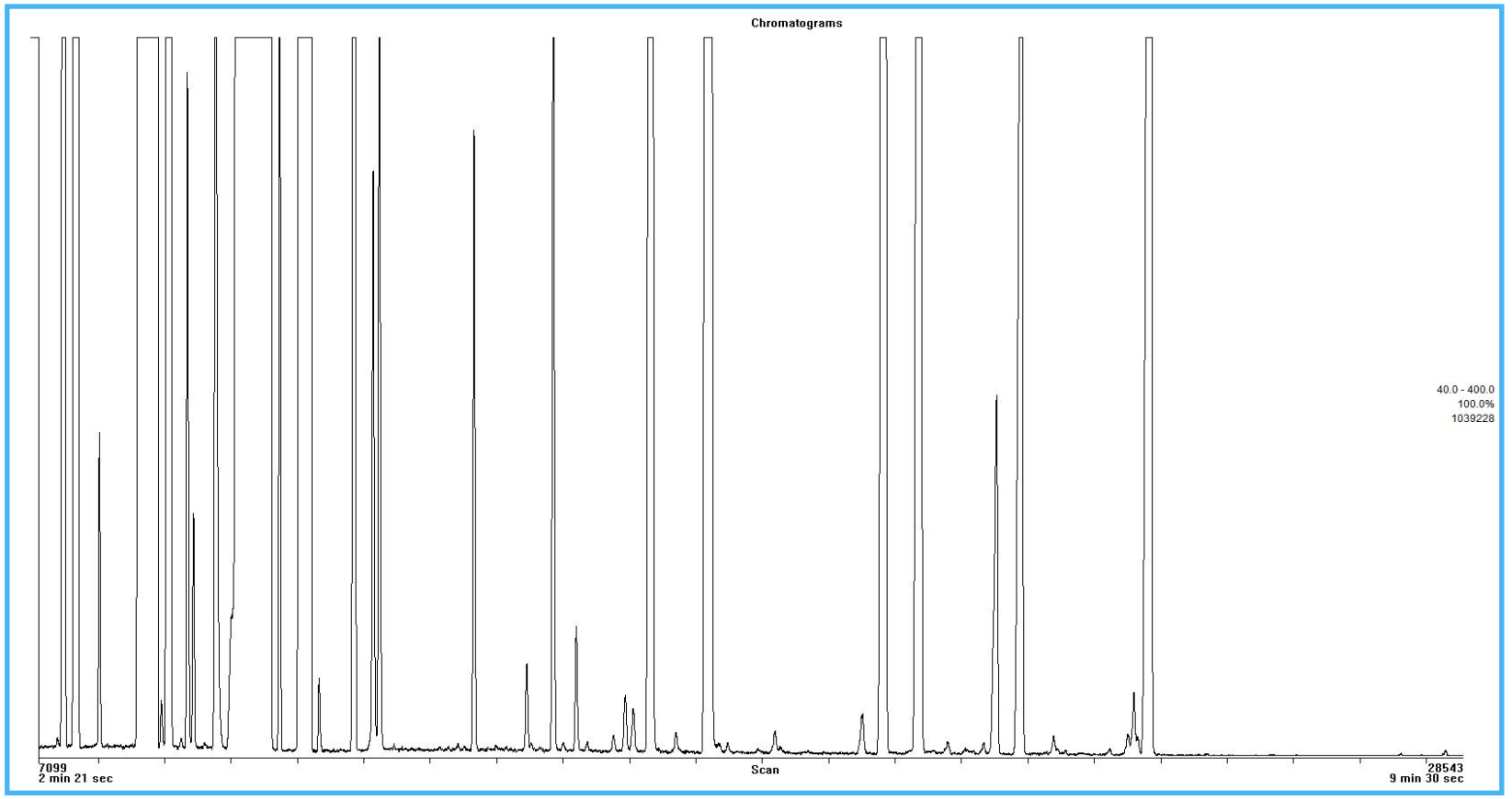
Sensitivity

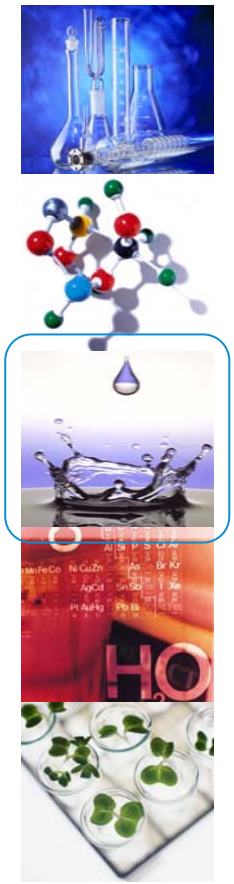


1 pg OFN (Octafluoronaphthalene)

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF CITRUS ESSENTIAL OILS





LEMON OIL

Sample: Lemon oil 1:100 in Heptane

Gas Chromatograph Method

Injector: Split-Splitless, *Injector Temperature*: 250°C, *Injector Volume*: 1.0 µl, *Split Ratio*: 1:20, *Column*: DN-5 10 m x 0.1 mm x 0.1 µm

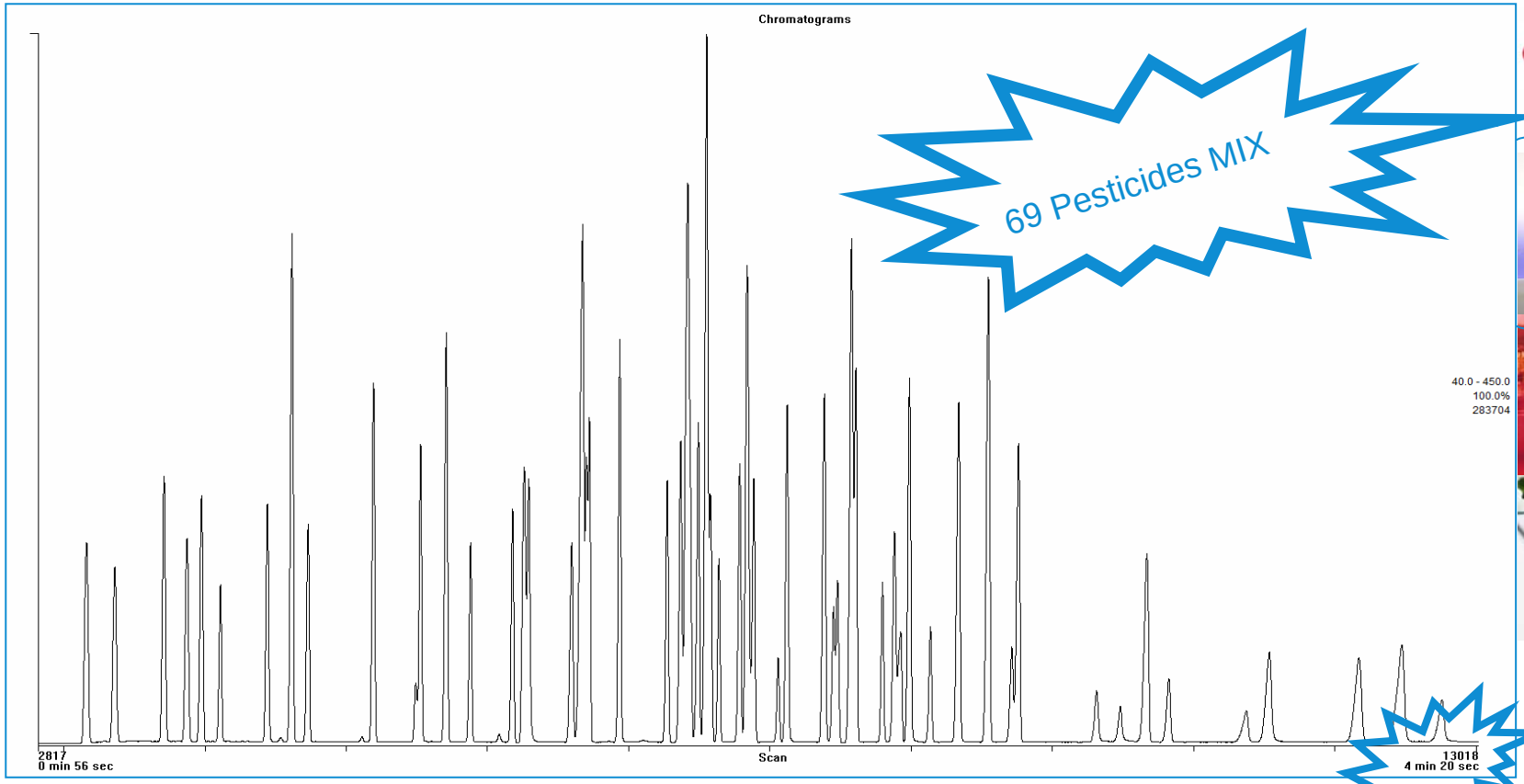
Linear Velocity: 40 cm/sec at constant linear velocity, *Oven Temperature Program*: from 50°Cto 250°C (0.72 min) at 14°C/min

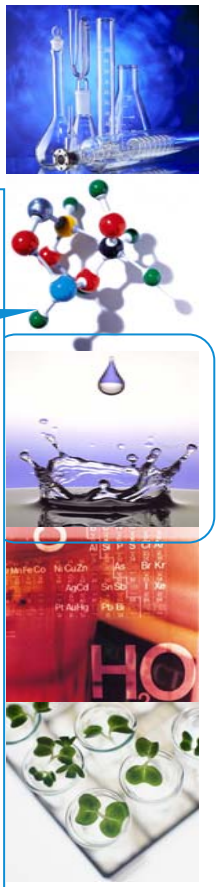
Time of Flight

Transfer line temperature: 220°C, *Sampling rate: 50 Hz, Mass range: 40-400 amu, Solvent delay*: 120 sec, *Acquisition time*: 10 min

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF PESTICIDES





Sample: Pesticides Mix, *Solvent and concentration*: 100 ppm in Acetone

Gas Chromatograph Method

Injector: Split-Splitless, *Injector Temperature*: 250°C, *Injector Volume*: 1.0 µl, *Split Ratio*: 1:50, *Column*: DN-1701 10 m x 0.1 mm x 0.1 µm

Column Flow: 0.5 ml/min at constant flow, *Oven Temperature Program*: from 100°C to 280°C (for 1.5 min) at 50°C/min

Time of Flight

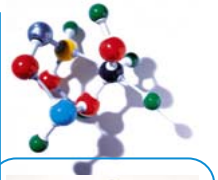
Transfer line temperature: 220°C

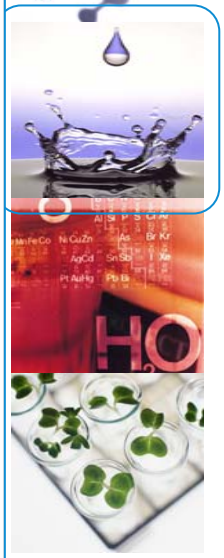
Sampling rate: 100 Hz, Mass range: 40-450 amu, Solvent delay: 60 sec, *Acquisition time*: 4.5 min

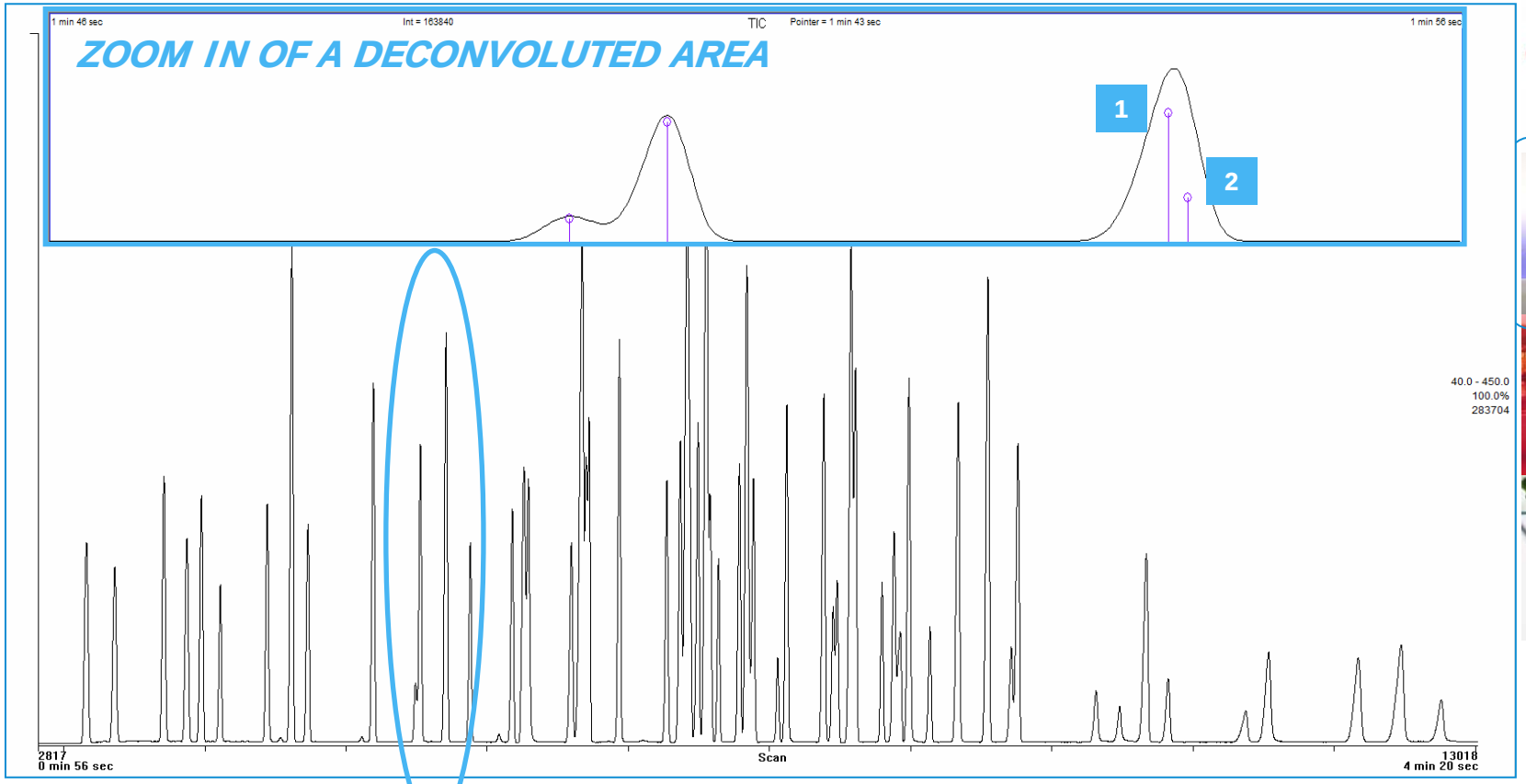
DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF PESTICIDES
AUTOMATIC SOFTWARE DECONVOLUTION







Sample: Pesticides Mix, *Solvent and concentration*: 100 ppm in Acetone

Gas Chromatograph Method

Injector: Split-Splitless, *Injector Temperature*: 250°C, *Injector Volume*: 1.0 μl, *Split Ratio*: 1:50, *Column*: DN-1701 10 m x 0.1 mm x 0.1 μm

Column Flow: 0.5 ml/min at constant flow, *Oven Temperature Program*: from 100°C to 280°C (for 1.5 min) at 50°C/min

Time of Flight

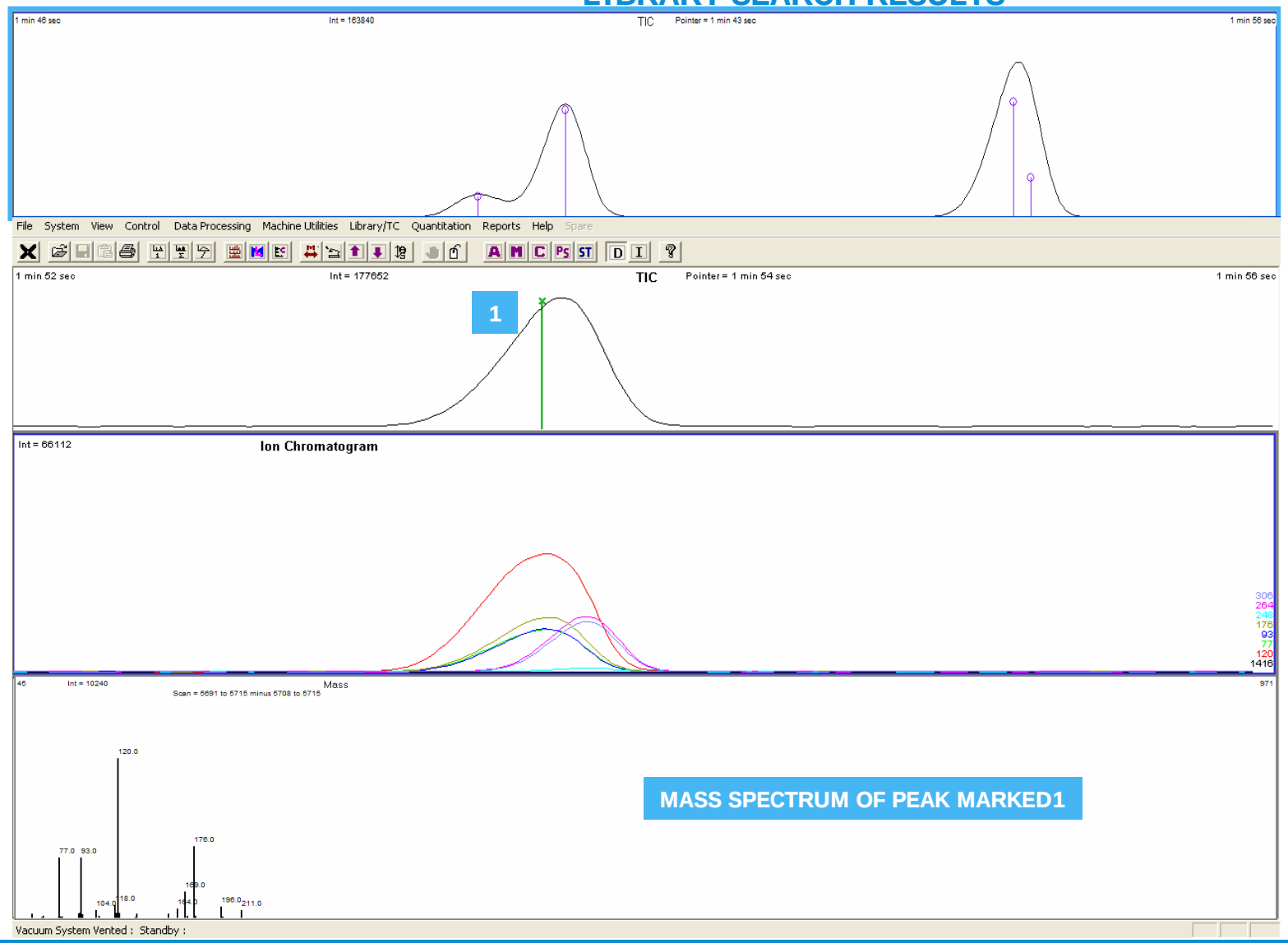
Transfer line temperature: 220°C

Sampling rate: 100 Hz, Mass range: 40-450 amu, Solvent delay: 60 sec, *Acquisition time*: 4.5 min

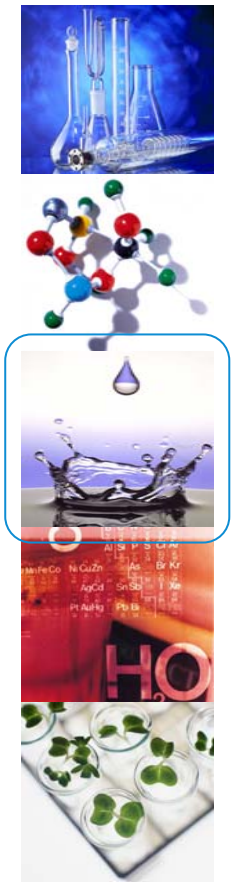
DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF PESTICIDES
LIBRARY SEARCH RESULTS



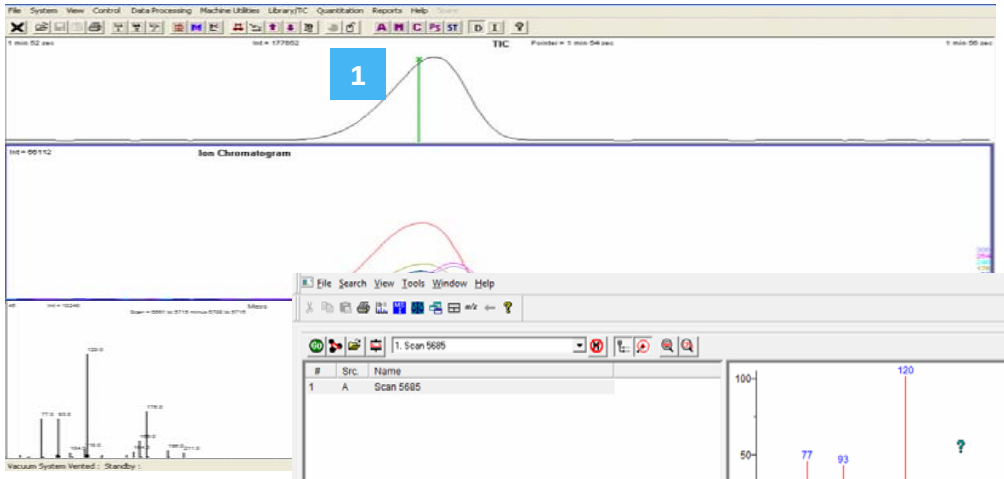
MASS SPECTRUM OF PEAK MARKED1

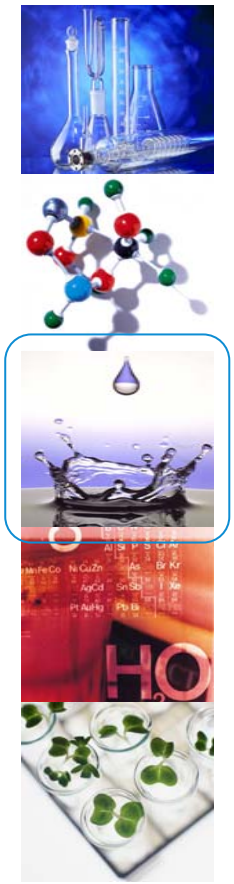


DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF PESTICIDES
LIBRARY SEARCH RESULTS

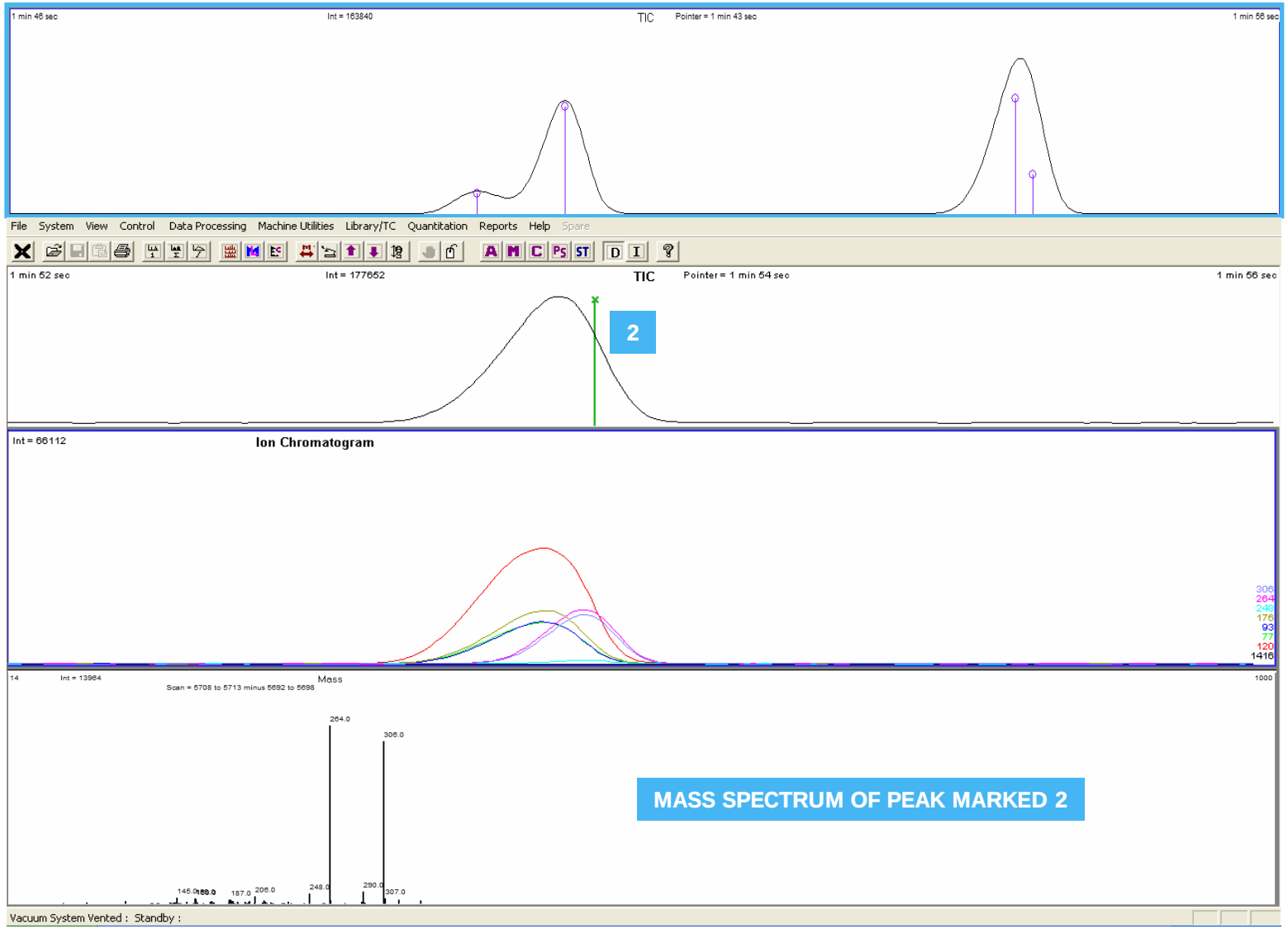


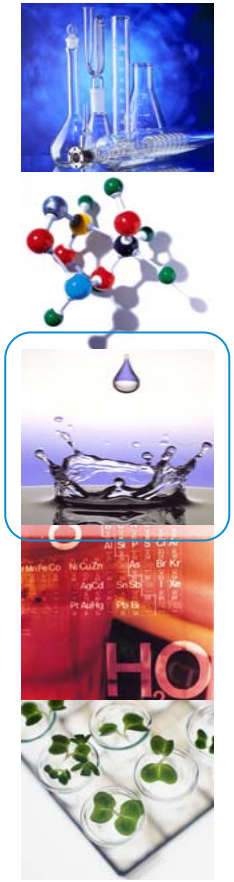


DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

FAST GC ANALYSIS OF PESTICIDES
LIBRARY SEARCH RESULTS





DANI A SCENT OF FUTURE

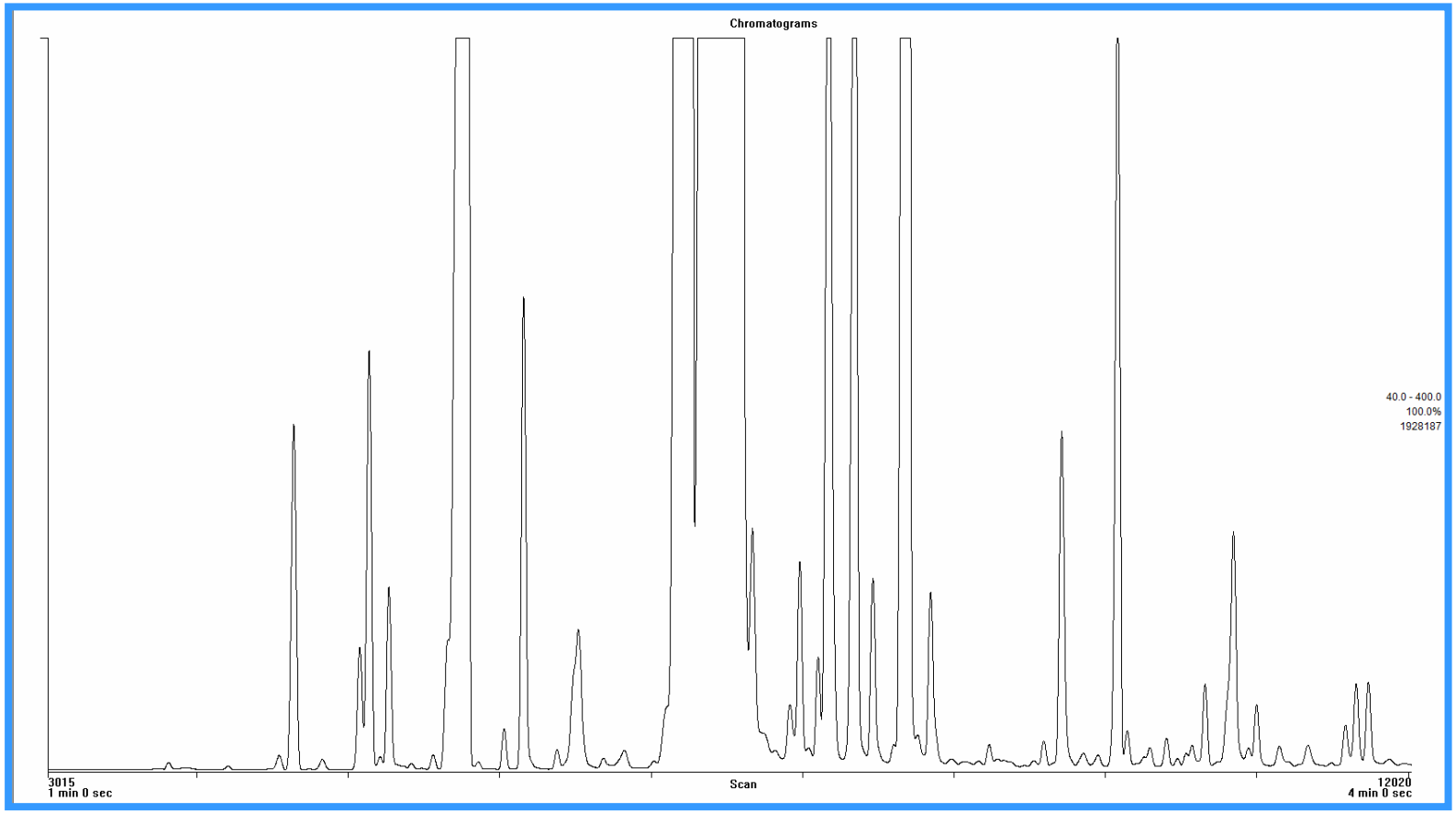
Master TOF Time of Flight Mass Spectrometer

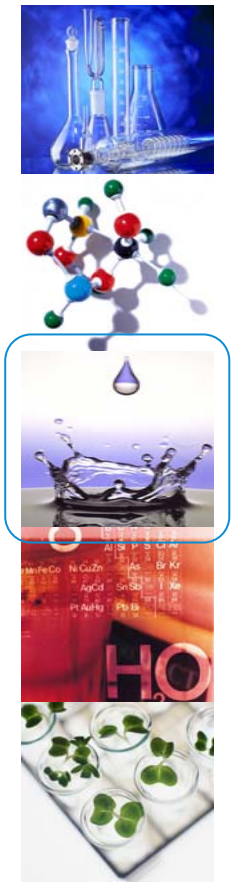
FAST GC ANALYSIS OF PESTICIDES
LIBRARY SEARCH RESULTS

DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

Pesticides Determination in Essential Oil





Gas Chromatograph
Injector: Split-Splitless
Injector Temperature: 250°C
Injector Volume: 0.5 µl
Split Ratio: 1:10
Column: DN-5 10 m x 0.1 mm, 0.1 µm
Linear Velocity: 40 cm/sec at constant linear velocity
Oven Temperature Program: from 50°C to 250°C at 40°C/min

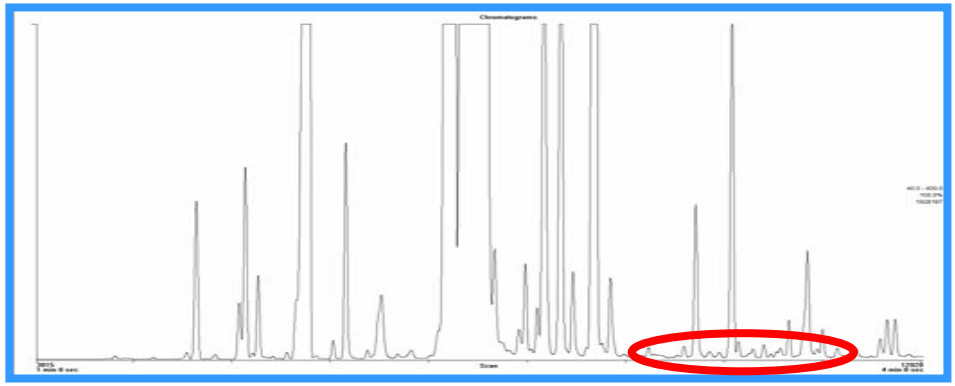
Time of Flight
Transfer line temperature: 220°C
Sampling rate: 50 Hz
Mass range: 40-400 amu
Solvent delay: 60 sec
Acquisition time: 5 min

Mint Oil

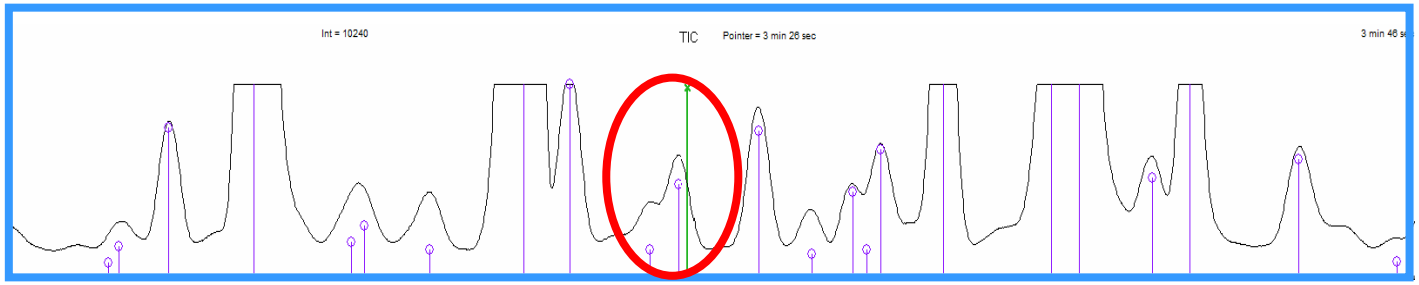
DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

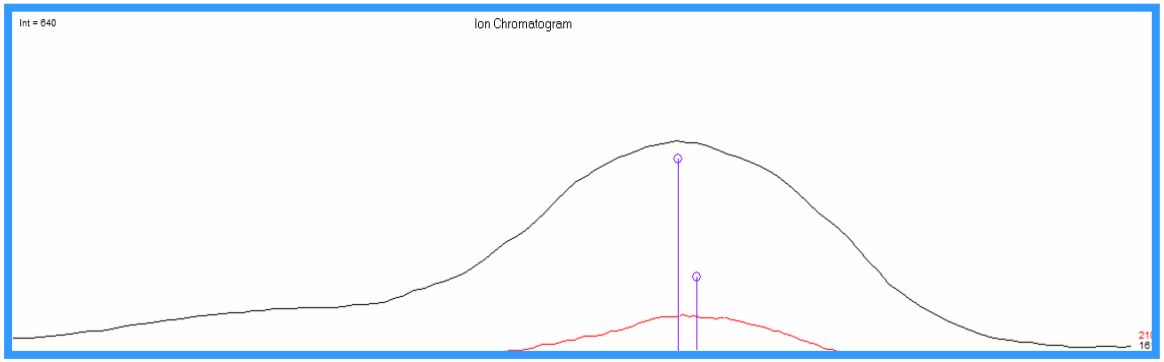
Automatic Deconvolution Procedure



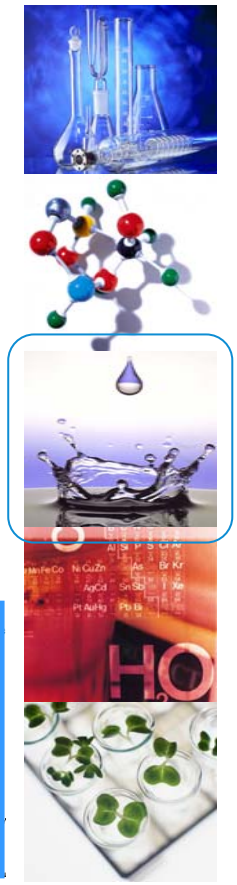
Mint oil total ion chromatogram (TIC)



Peaks automatically software deconvoluted



Etridiazole automatically deconvoluted

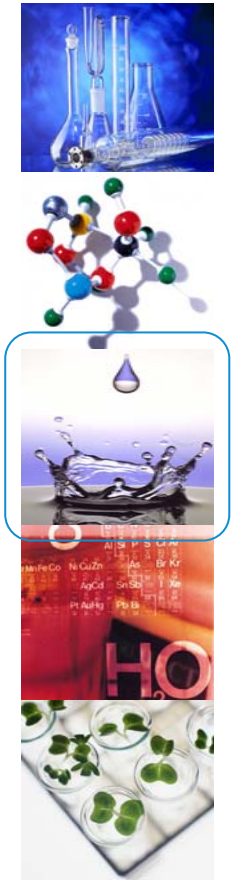


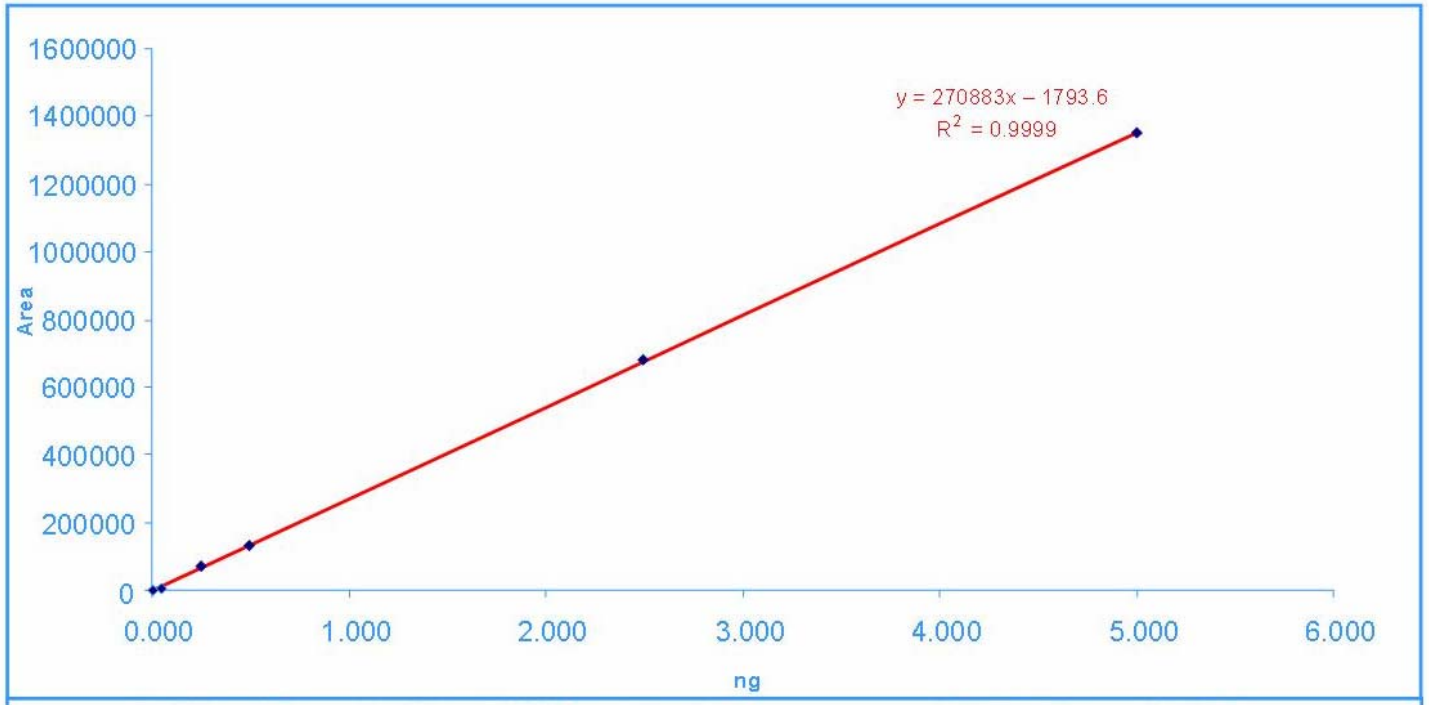
Mint Oil

DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

Pesticides Determination in Essential Oil

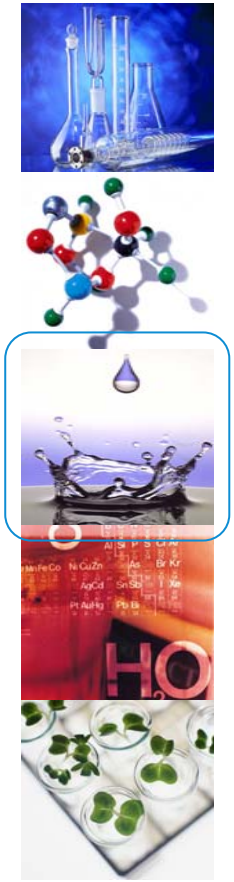


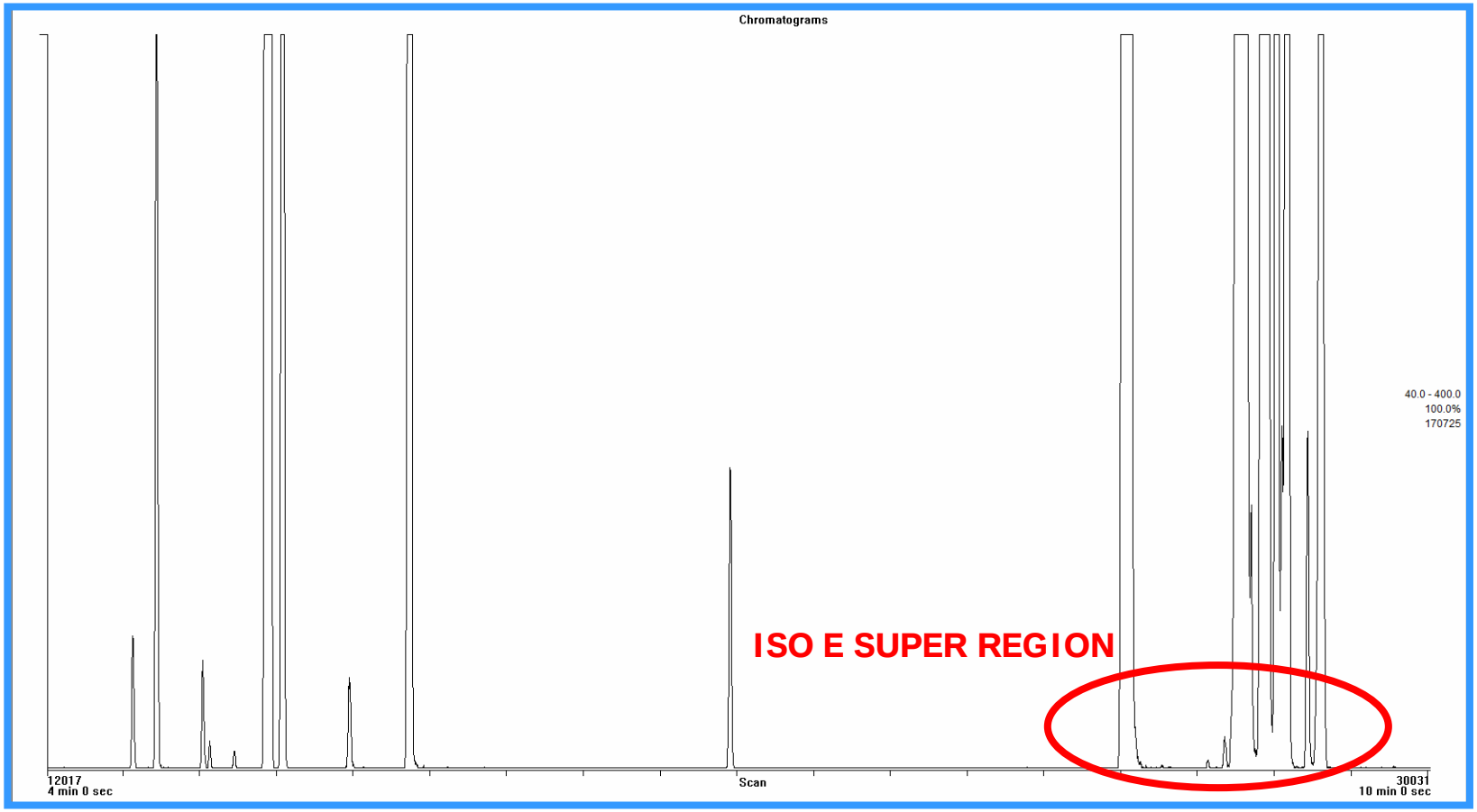


Calibration plot for Etridiazole in the range of 0.005 ng to 50 ng.

Master TOF Time of Flight Mass Spectrometer

Fast GC with Short Micro Bore Column





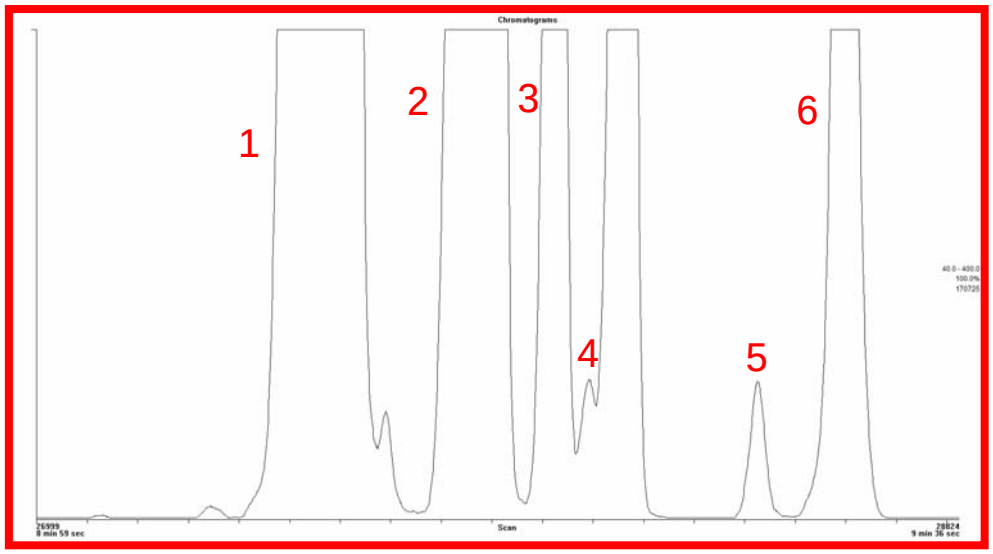
Gas Chromatograph
Injector: Split-Splitless
Injector Temperature: 250°C
Injector Volume: 0.5 µl
Split Ratio: 1:400
Column: DN-5 10 m x 0.1 mm, 0.1 µm
Linear Velocity: 40 cm/sec at constant linear velocity
Oven Temperature Program: from 50°C to 250°C at 14°C/min

Time of Flight
Transfer line temperature: 220°C
Sampling rate: 50 Hz
Mass range: 40-400 amu
Solvent delay: 60 sec
Acquisition time: 14 min

DANI A SCENT OF FUTURE

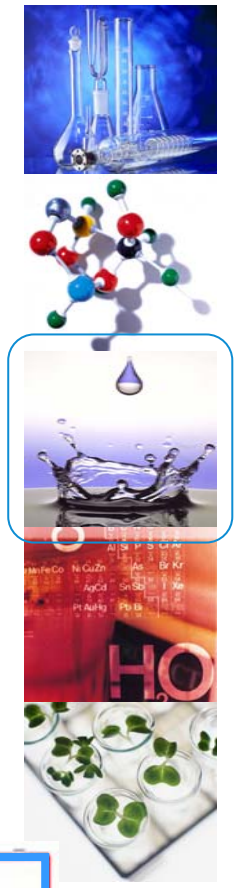
Master TOF Time of Flight Mass Spectrometer

Fast GC with Short Micro Bore Column

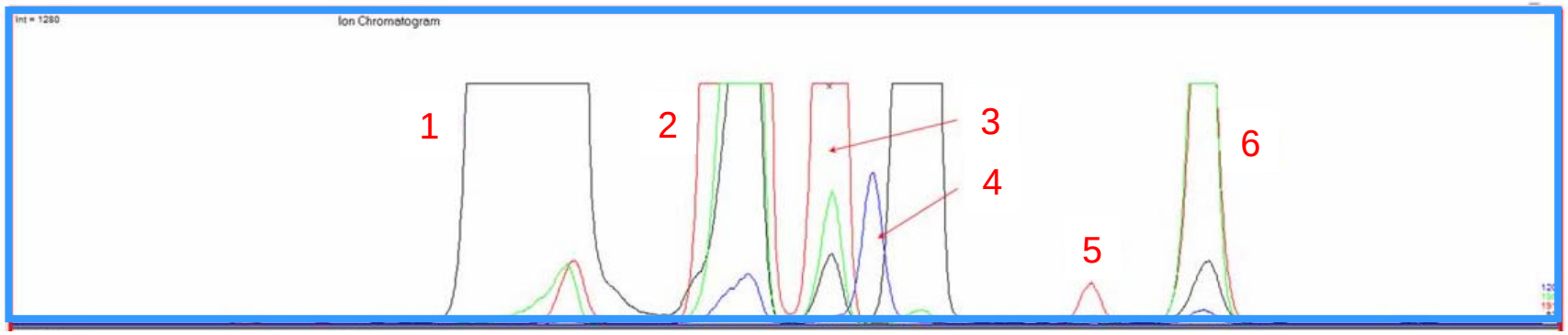


ISO E SUPER REGION EXPANSION

1	hedione
2	iso E super (isomer 1)
3	iso E super (isomer 2)
4	salicylate hexile
5	hedione (isomer)
6	iso E super (isomer 3)

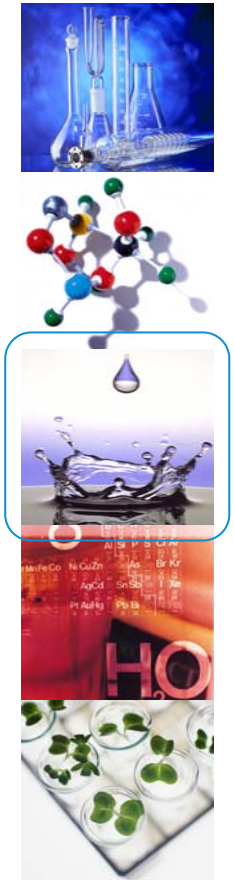


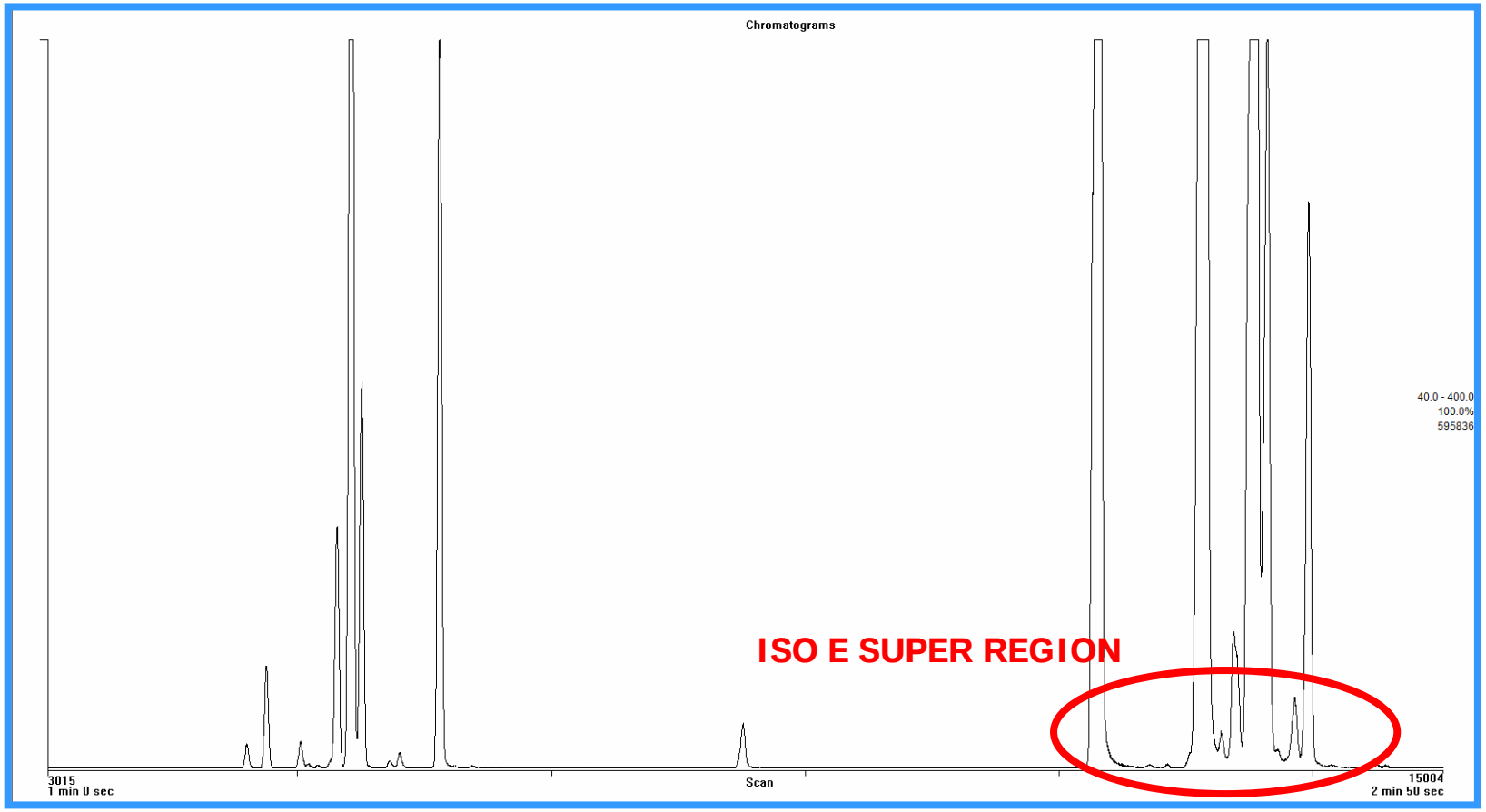
AUTOMATIC DECONVOLUTION RESULTS



Master TOF Time of Flight Mass Spectrometer

Fast GC with Short Micro Bore Column





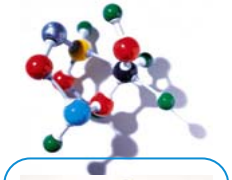
Gas Chromatograph
Injector: Split-Splitless
Injector Temperature: 250°C
Injector Volume: 0.5 µl
Split Ratio: 1:800
Column: DN-5 3 m x 0.1 mm, 0.1 µm
Linear Velocity: 40 cm/sec at constant linear velocity
Oven Temperature Program: from 100°C to 250°C at 50°C/min

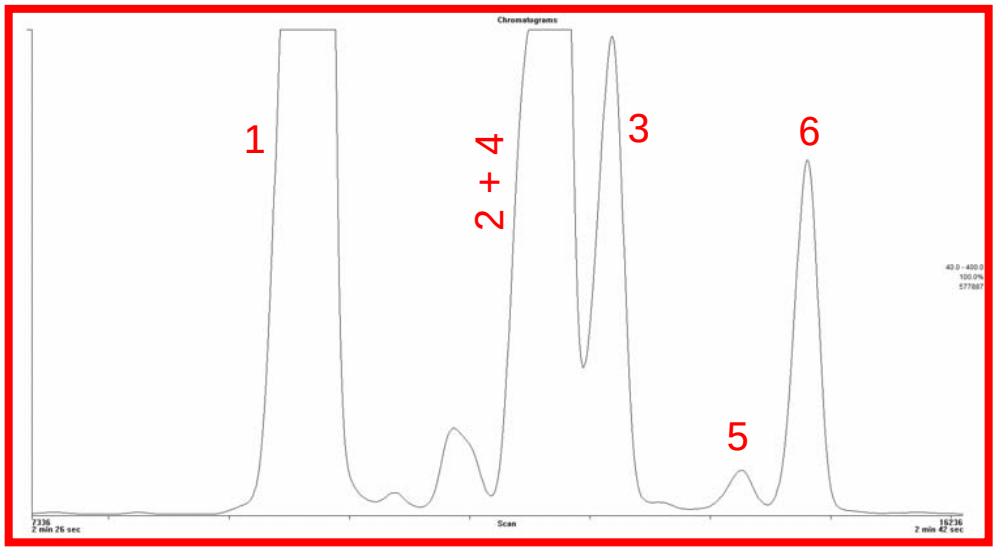
Time of Flight
Transfer line temperature: 220°C
Sampling rate: 100 Hz
Mass range: 40-400 amu
Solvent delay: 60 sec
Acquisition time: 3 min

DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

Fast GC with Short Micro Bore Colum

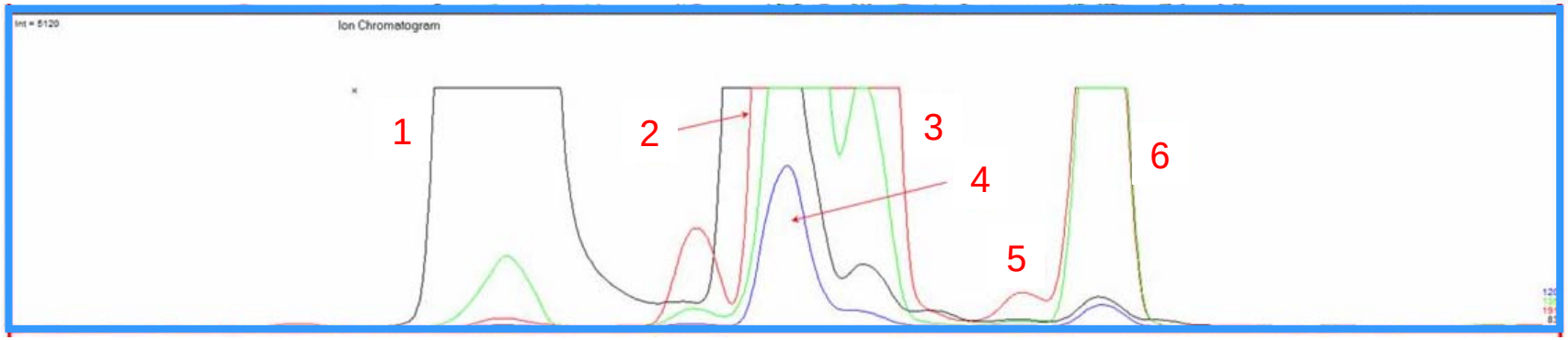




ISO E SUPER REGION EXPANSION

1	hedione
2	iso E super (isomer 1)
3	iso E super (isomer 2)
4	salicylate hexile
5	hedione (isomer)
6	iso E super (isomer 3)

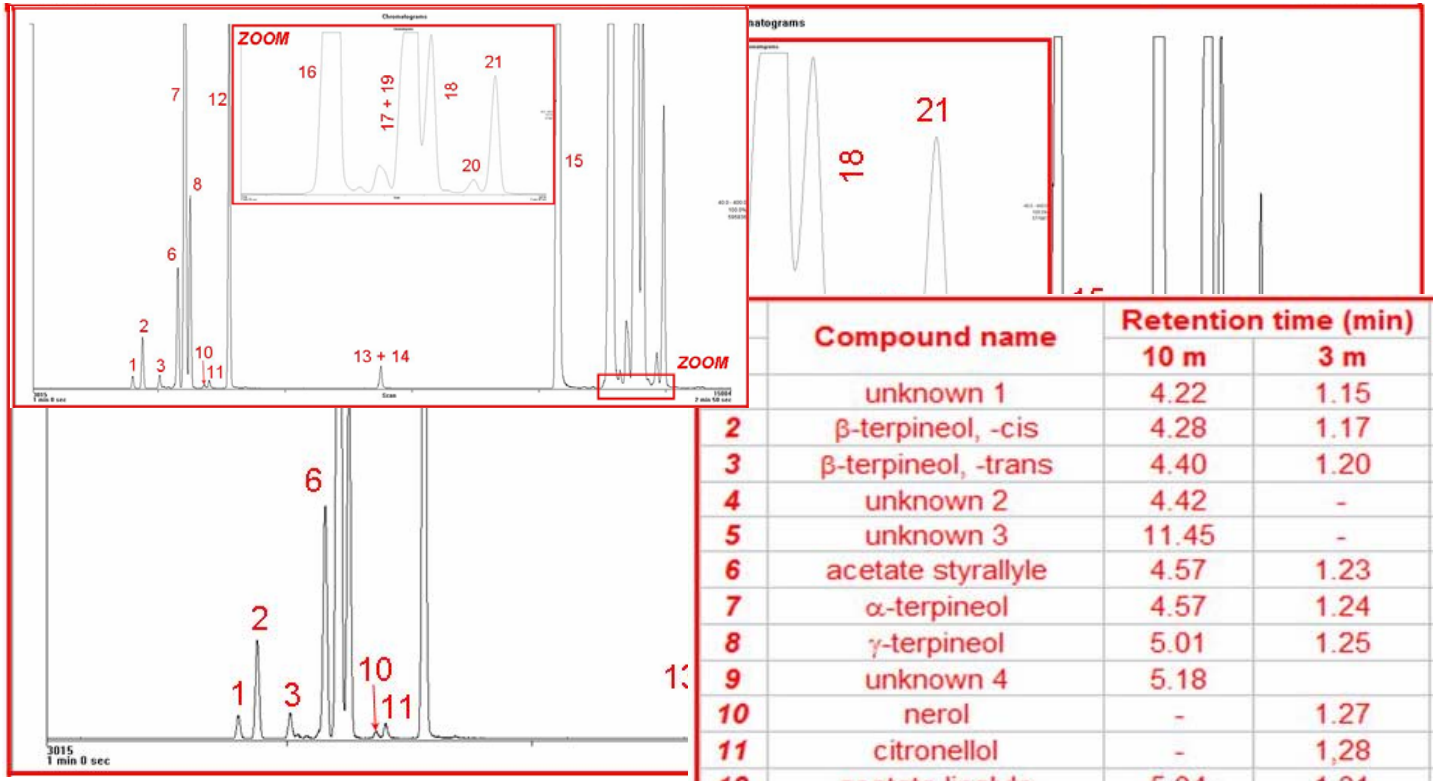
AUTOMATIC DECONVOLUTION RESULTS



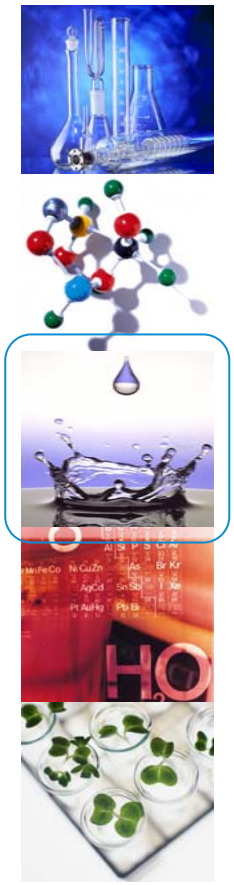
Master TOF Time of Flight Mass Spectrometer

APPLICATIONS

Fast GC with Short Micro Bore Column

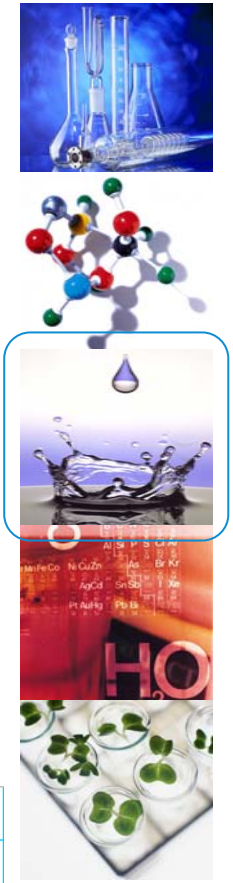


	Compound name	Retention time (min)		Masses
		10 m	3 m	
	unknown 1	4.22	1.15	-
2	β-terpineol, -cis	4.28	1.17	**71**, 93, 136
3	β-terpineol, -trans	4.40	1.20	**71**, 93, 136
4	unknown 2	4.42	-	-
5	unknown 3	11.45	-	-
6	acetate styrallyle	4.57	1.23	**122**, 104, 164
7	α-terpineol	4.57	1.24	**59**, 93, 121
8	γ-terpineol	5.01	1.25	**121**, 93, 154
9	unknown 4	5.18		-
10	nerol	-	1.27	**69**, 84, 93
11	citronellol	-	1,28	**69**, 95, 156
12	acetate linalyle	5.34	1.31	**93**, 80, 136
13	jasmone, trans-	6.58	1.55	**79**, 91, 164
14	vanilline	6.58	1.55	**151**, 81, 109
15	diethyl phtalate	8.41	2.23	**149**, 177, 222
16	hedione	9.12	2.31	**83**, 156, 226
17	iso E super (isomer 1)	9.17	2.35	**191**, 135, 219
18	iso E super (isomer 2)	9.20	2.36	**135**, 191, 219
19	salicylate hexile	9.21	2.35	**120**, 138, 222
20	hedione (isomer)	9.23	2.34	**83**, 156, 226
21	iso E super (isomer 3)	9.31	2.39	**135**, 191, 219



DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer



DETERMINATION of ALLERGENES in COSMETIC PRODUCTS

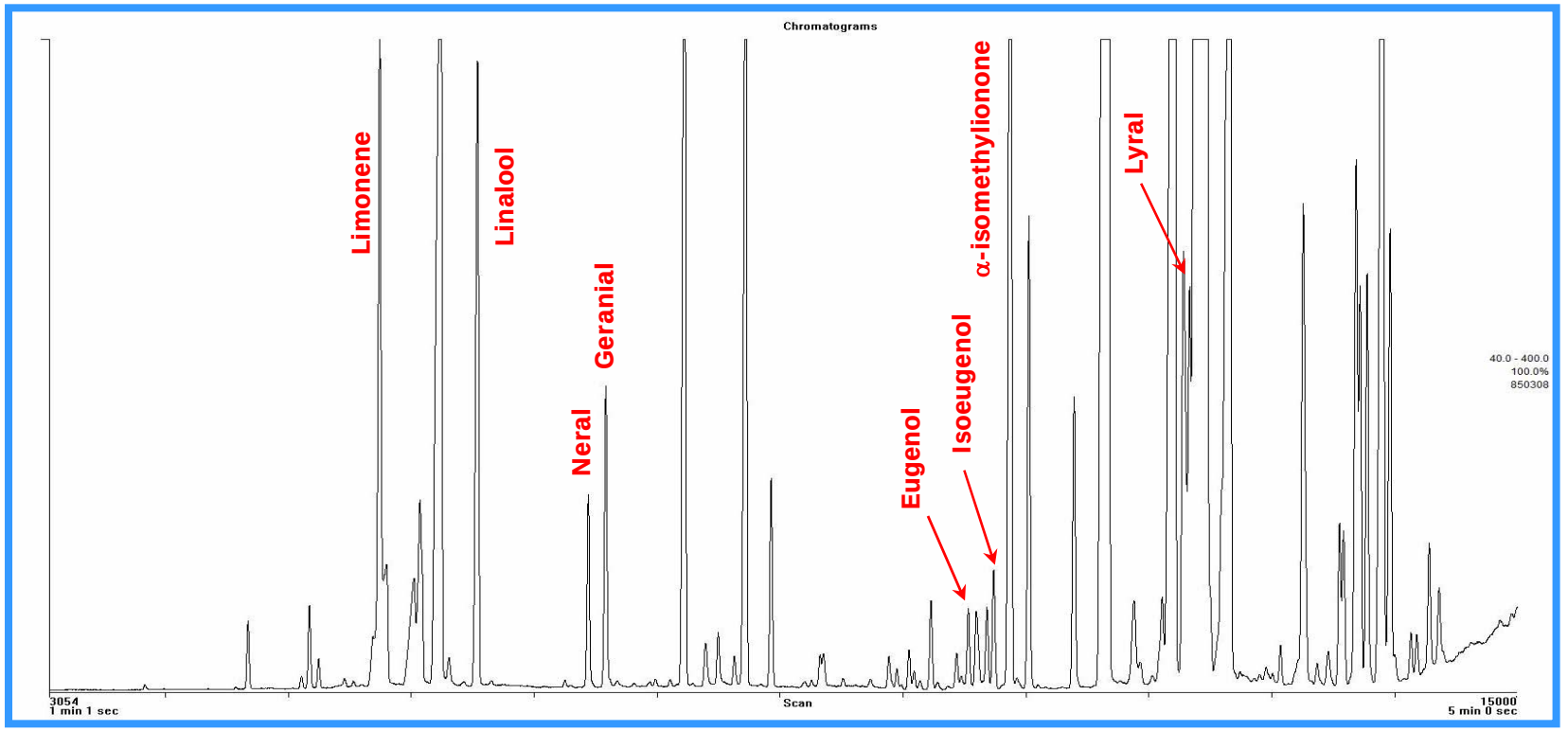
In the 7th Amendment to the European Cosmetics Directive, the Scientific Committee for Cosmetics & Non-Food Products (SCCNFP) established a list of components as being responsible, or suspected to be, of a series of skin allergies. According to the aforementioned regulation the maximum residue limit for “leave-on” and “rinse-off” cosmetic products is fixed at 0.001% and 0.01%, respectively. The regulation foresees that any allergen, present in excess must be reported on the product label.

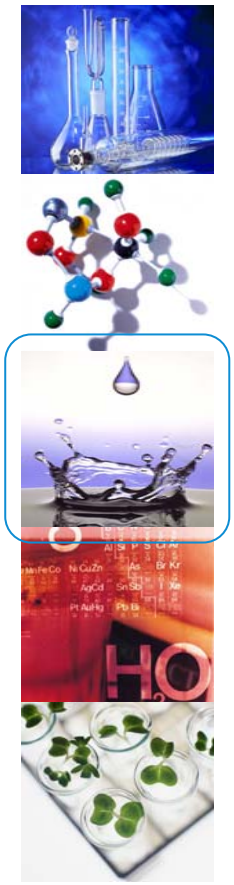
SCCNFP Allergens List

Limonene	Citral (Geranial)	Isoeugenol	Hexyl cinnamaldehyde
Benzyl alcohol	Cinnamic aldehyde	α-isomethylionone	Benzyl benzoate
Linalool	Anysil Alcohol	Lilial	Benzyl salicylate
Methyl 2-octynoate	Hydroxycitronellal	Amyl cinnamal	Benzyl cinnamate
Citronellol	Cinnamyl alcohol	Lyral	oak moss
Citral (Neral)	Eugenol	Amylcinnamil alcohol	tree moss
Geraniol	Coumarin	Farnesol	

…… 24 are volatiles.

ALLERGENES DETERMINATION IN COSMETIC PRODUCTS





Gas Chromatograph

Injector: Split-Splitless
Injector Temperature: 250°C
Injector Volume: 1.0 µl
Split Ratio: 1:20
Column: DN-5 10 m x 0.1 mm, 0.1 µm
Linear Velocity: 40 cm/sec at constant linear velocity
Oven Temperature Program: from 50°C to 250°C at 40°C/min

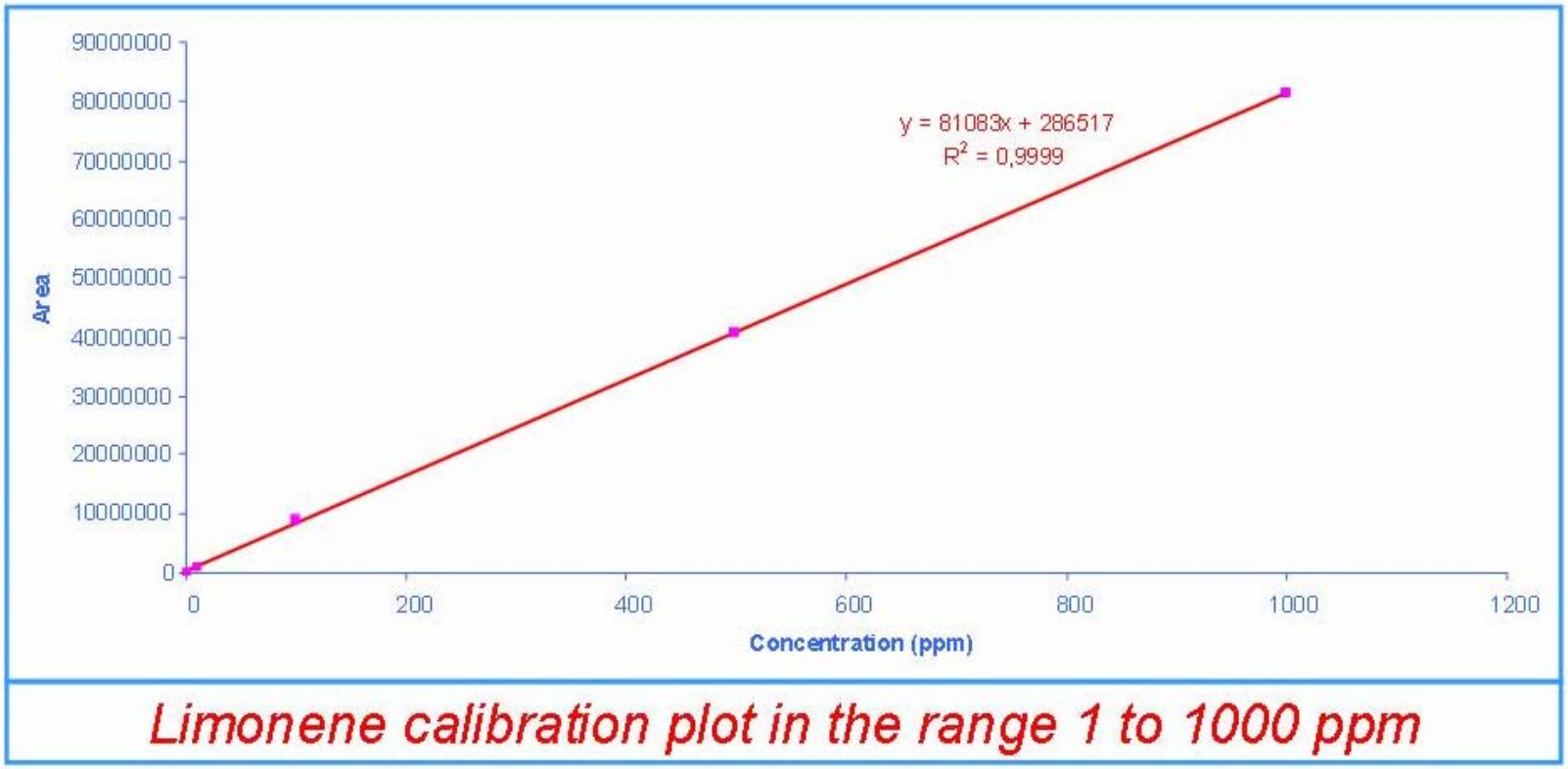
Time of Flight

Transfer line temperature: 220°C
Sampling rate: 50 Hz
Mass range: 40-400 amu
Solvent delay: 60 sec
Acquisition time: 5 min

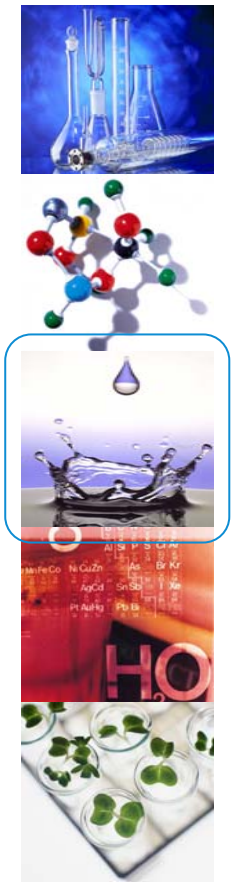
Perfume Analysis

DANI A SCENT OF FUTURE

ALLERGENES DETERMINATION IN COSMETIC PRODUCTS



Limonene calibration plot in the range 1 to 1000 ppm



ALLERGEN	Quant. Mass	ppm
Limonene	68	98
Linalool	93	82
Citral (Neral)	69	60
Citral (Geranial)	69	43
Eugenol	164	40
Isoeugenol	164	52
α-isomethylionone	206	280
Lyral	192	97

Quantitative Results of 8 Allergenes determined in the perfume

Mass Range:

Acquisition Speed: up to 80 spectra/s

GC/MS Ion Source: EI (standard) and CI (optional)

Sensitivity: 2 pg Hexaclorobenzene s/n 10:1

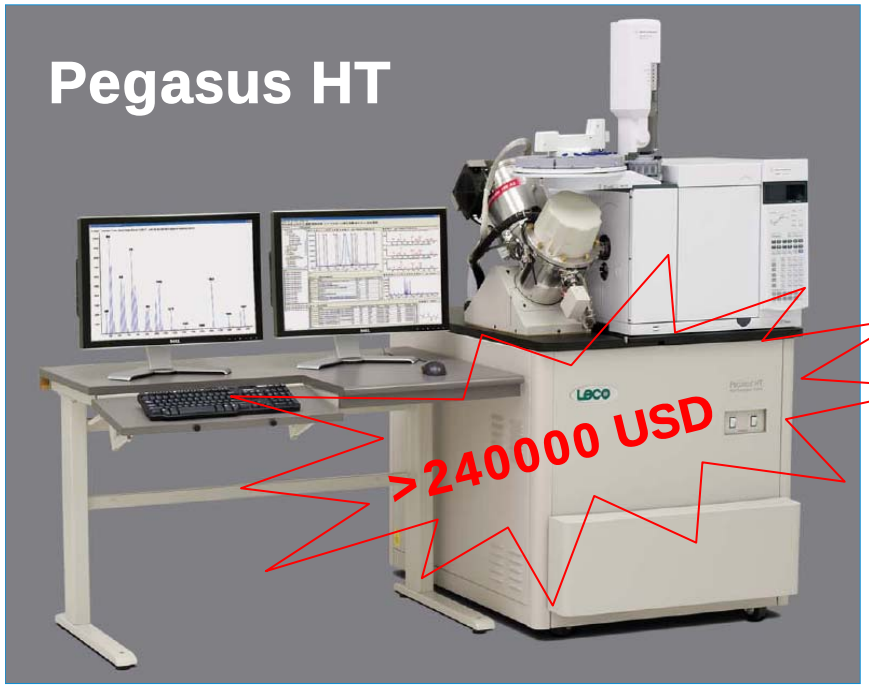
Linearity: 10^4

Resolution: N.D.

Pumps:

Software: Total Control MS TOF, GC7890 and AS

Library: NOT COMPATIBLE NIST



Mass Range: up to 1000

Acquisition Speed: up to 500 spectra/s

GC/MS Ion Source: EI (standard) and CI (optional)

Sensitivity: 2 pg Hexaclorobenzene s/n 10:1

Linearity: 10^4

Resolution: N.D.

Pumps:

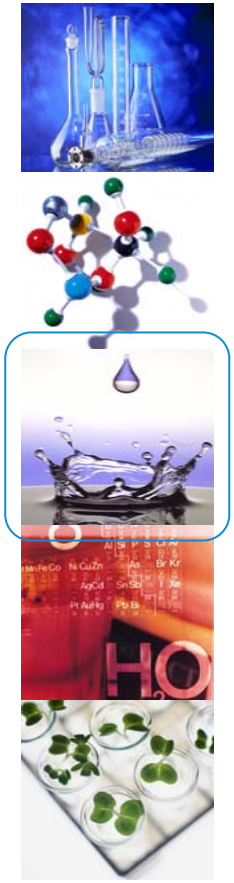
Software: Total Control MS TOF, GC7890 and AS

Library: NOT COMPATIBLE NIST

MASTER TOF – Competitors

DANI A SCENT OF FUTURE

Master TOF Time of Flight Mass Spectrometer

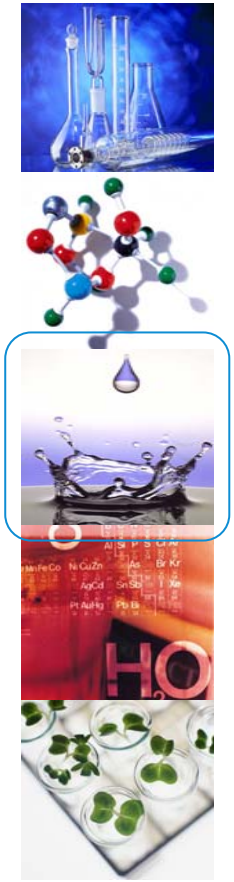


130000 Euro

Specifications

Mass Range	5 to 1500 amu
Acquisition rate	Up to 1000 spectra/s
Sensitivity	1 pg Octafluoronaphthalene s/n > 10:1 at m/z 272
Resolution	1500
Linearity	10^5
Tune mode	Automatic Full Autotune Automatic Autotune Manual Tune
Ion Source	EI – Standard CI (+/-) Optional
Vacuum System	Internal Diaphgragm Pump 2 Turbomolecular pumps 260-70 L/s

DANI A SCENT OF FUTURE



... the MASTER TOF GC/MS system offers ...

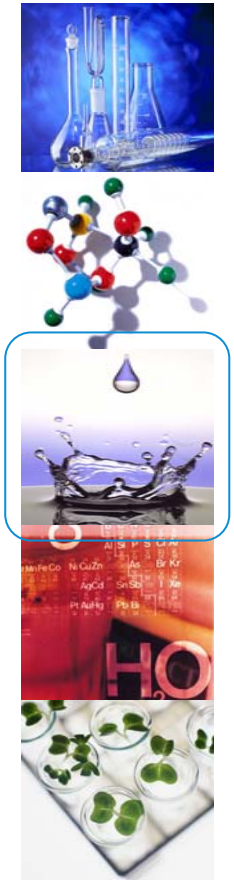
... a **complete solution**, starting from the injector, passing through the GC oven and the detector up to the software

... the **appropriate acquisition** for MS detection in FastGC and GCXGC..

... all in a **reduced bench space**..

... at a strongly **competitive price**

DANI A SCENT OF FUTURE



DANI Chromatographic Products

- GC and GC/MS
- Automatic samplers for GC

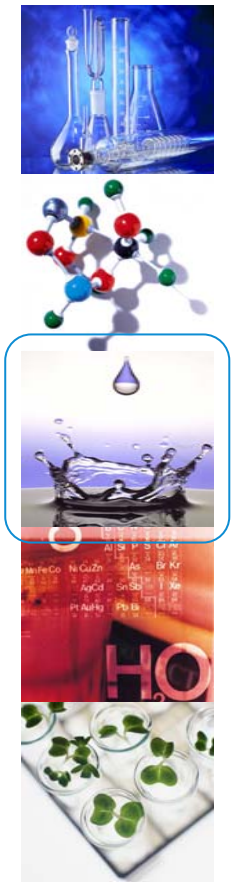
MASTER TD – Thermal Desorber

DANI A SCENT OF FUTURE

... low analysis costs & improved sensitivity

As an alternative method to traditional solvent extraction, **Master TD** offers:

- up to 1000-10000 times increase in sensitivity
- higher recovery (over 95% for all volatile substances)
- minimal sample handling and the reuse of the sampling tubes
- total reduction of cost/sample
- easy connection to any kind of GC

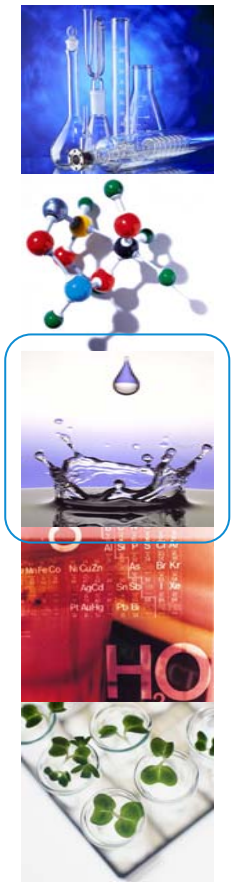


... high sample throughput

MASTER TD operates automatically from thermal extraction to injection to maximize the laboratory productivity. It includes:

- a **50-place carousel** for standard ¼”x 3.5 inch tubes
- **cryogen-free trap cooling** (down to -40°C) for continuous and unattended operation
- **overlapping mode** - desorption of a subsequent sample begins while GC analysis of a previous sample continues

DANI A SCENT OF FUTURE



... two stage Thermal Desorber

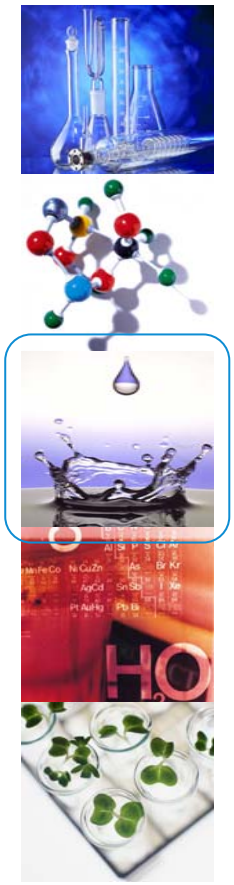
MASTER TD excellent analytical performances are provided through:

- a **two-stage thermal desorption** process - the compounds are desorbed from the sample tube by heating in a flow of inert gas and refocused in a narrow-bore packed trap kept a low temperature
- **instant trap desorption** (Patented) to introduce the components in a narrow band directly into the analytical column through a heated transfer line
- extended range of application from volatile to semi-volatile compounds **up to C44** boiling point equivalent
- completely **inert** sample path
- **cryogen-free trap cooling** down to -40°C for efficient trapping of very volatile compounds (from C2, CFC,..)
- optional ***Air Sampler*** device for on-line monitoring
- Simple and intuitive *Control Manager* software

DANI A SCENT OF FUTURE

Master TD Thermal Desorber

Fields of Applications



- **VOCs in Ambient**

  BTEX; Chlorinated hydrocarbons; 1,3-butadiene; Ozone Precursors; Formaldehyde; Acrylonitrile;

- **Indoor Air Pollution**

  Building products; Cleaning agents; Air conditioning;

- **Emission Monitoring**

  Stack emissions; Industrial emissions;

- **Products Quality Control**

  Residual solvents; Pharmaceutical; Food packaging; Food Industry;

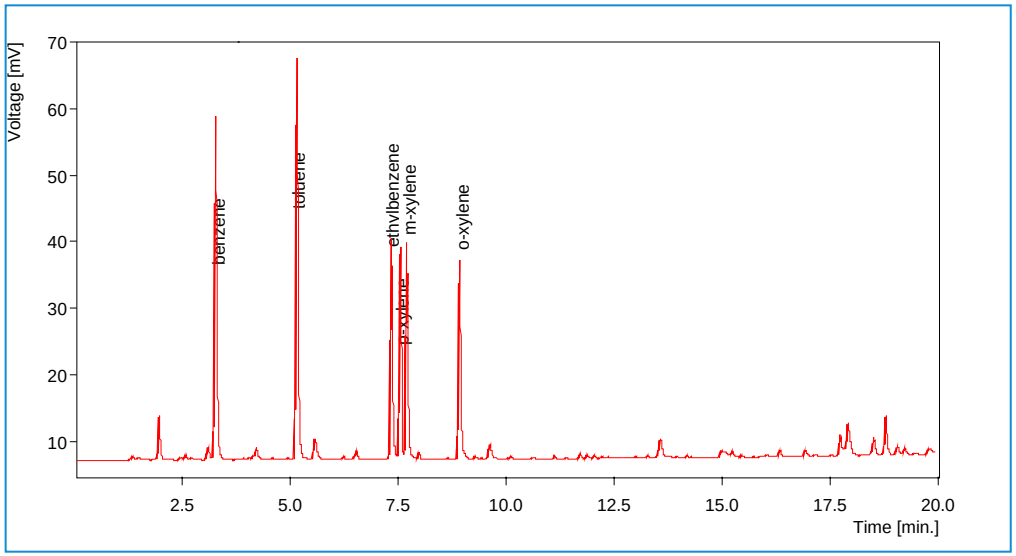
- **Workplace Monitoring**

  Styrene; Ethylene oxide; plastics; polymers;

DANI A SCENT OF FUTURE

Master TD Thermal Desorber

VOCs - BTEX analysis



GC Conditions

Column: Carbowax 30m, 0,32mm

Inj: SL/IN 350°C

Det: FID 350°C

Carrier: He

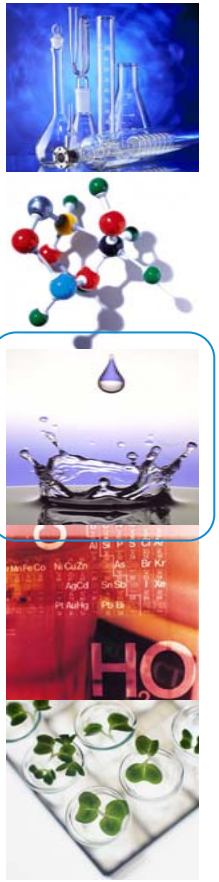
TD Conditions

Trap: Tenax GR

Tube: Tenax GR

Sample Volume: 1000ml

Minimum detectable level: 0.1ppm



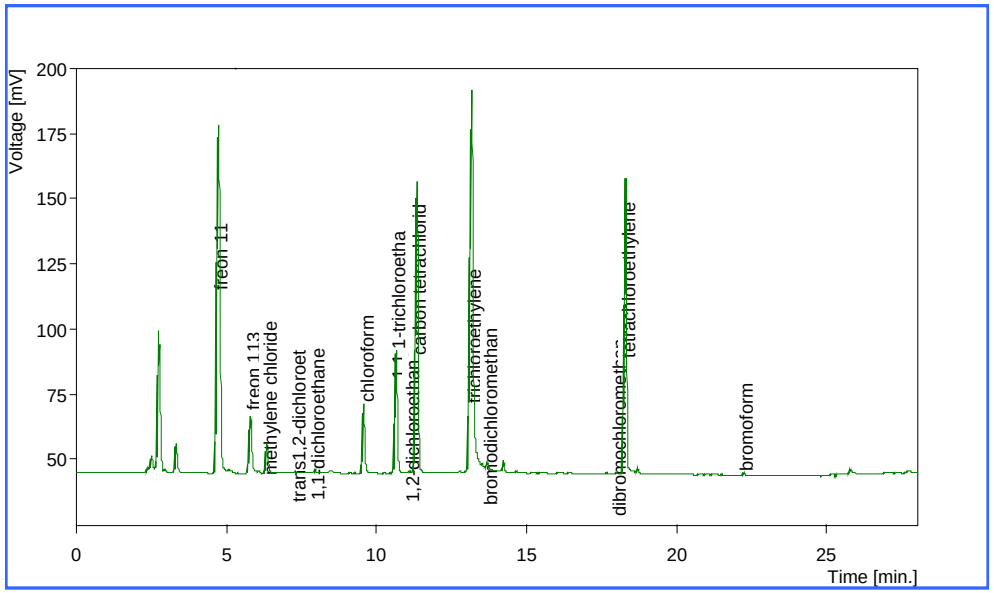
Repeatability on 10 replicates

	Benzene	Toluene	Ethylbenzene	p-Xylene	m-Xylene	o-Xylene
Average	8,05	8,04	8,03	8,06	8,03	8,17
St.dev.	0,06	0,09	0,07	0,09	0,10	0,09
RSD%.	**0,70**	**1,09**	**0,86**	**1,13**	**1,20**	**1,10**

DANI A SCENT OF FUTURE

Master TD Thermal Desorber

VOCs - Chlorinated hydrocarbons analysis



GC Conditions

Column: DB624, 60m, 0,32mm

Inj: SL/IN 350°C

Det: ECD 350°C

Carrier: He

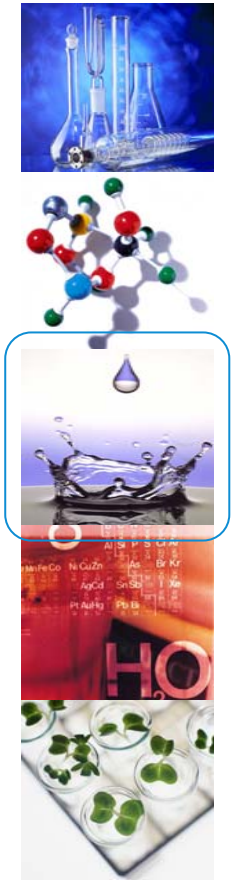
TD Conditions

Trap: CarbopackB-Carbosieve SIII

Tube: CarbopackB-Carbosieve SIII

Sample Volume: 250ml

Minimum detectable level: ppt

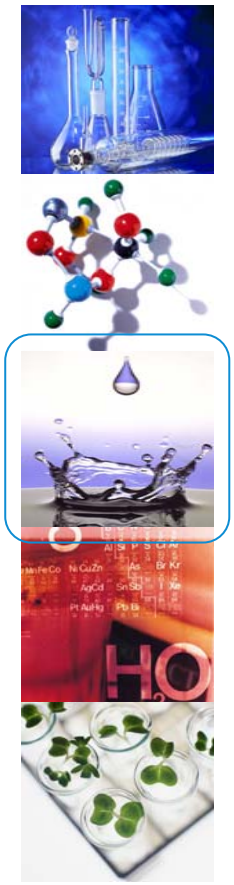


Repeatability on 10 replicates

	CFC11	CFC113
Average	1011,8	385,6
Std. Dev.	17,7	3,5
RSD %	**1,8**	**0,9**

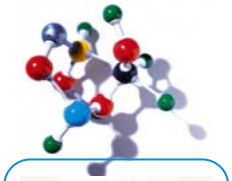
DANI A SCENT OF FUTURE

Desorption Mode	Two-Stage
Sample Tube Capacity	50
Tube Temperature Range	40 to 400°C
Dry-step	YES
Trap Desorption Flow	Back Flush
Trap Cooling system	Electrically powered Peltier
Trap Low temperature	-40°C
Trap High temperature	450°C
Trap Heating rates	“instant heating”
Transfer Line Temperature range	50 to 290°C
Valve Temperature range	50 to 300°C
Valve	Electrically actuated
Tube Leak test	YES
Trap Leak test	YES
Volatility Range	C2-C44
Sample Flow path	inert deactivated Siltek®
Compatibility	any kind of GC or GC/MS
ON-LINE sampling	YES (10 lines)



MASTER DHS – Dynamic Headspace Sampler

DANI A SCENT OF FUTURE



… analysis of VOCs in liquid and solid

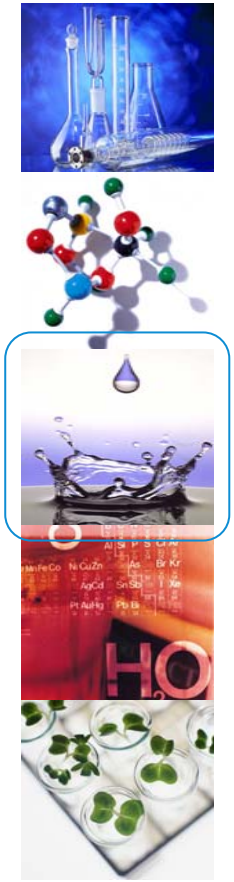
Master DHS allows the recovery of VOCS at low detection limits in both liquid and solid samples on the same instrument:

- Environmental applications (water, wastewater, sludge, soil)
- Q.C. applications in:
  - Flavour and fragrances (spices, herbs, foods, soaps);
  - Chemicals (plastics, papers,..);
  - Pharmaceutical (residual solvents).

… flexible and extended automation

- 18-seat internal vial carousel
- sample capacity extended to 65 vials with MasterAS
- sample overlapping minimizes overall analysis time
- precise external addition of IS, surrogates, spiking solution, reagents..

Master DHS Dynamic Head Space Sampler

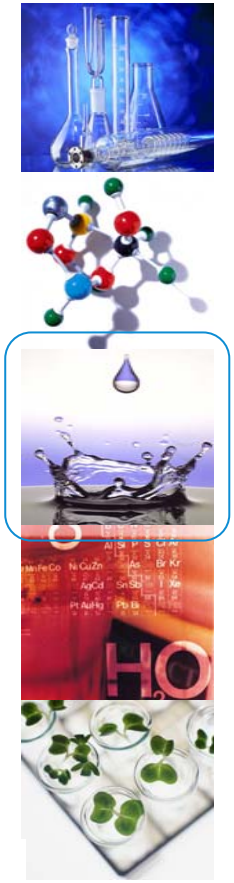


2 solvent vials,
2 waste vials

6 vials for internal standard, surrogates, spiking solution

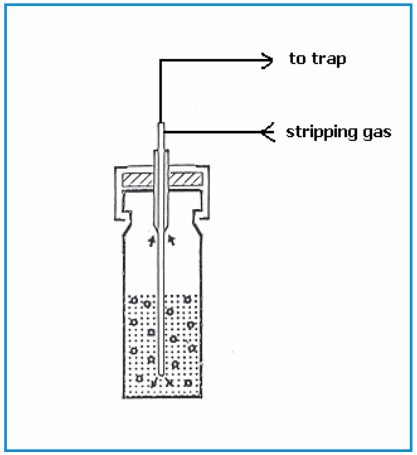
65-seat sample tray

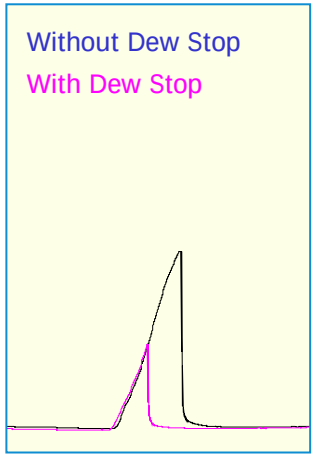
DANI A SCENT OF FUTURE



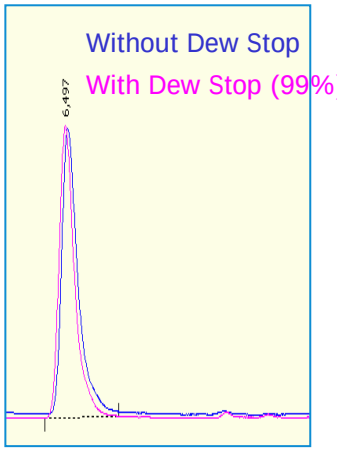
… enhanced sensitivity & easy sample management

- VOCs are purged/stripped and focused on a packed trap for the maximum sensitivity
- easy and convenient sample preparation using standard 20 ml HS vials
- no cross-contamination





Humidity

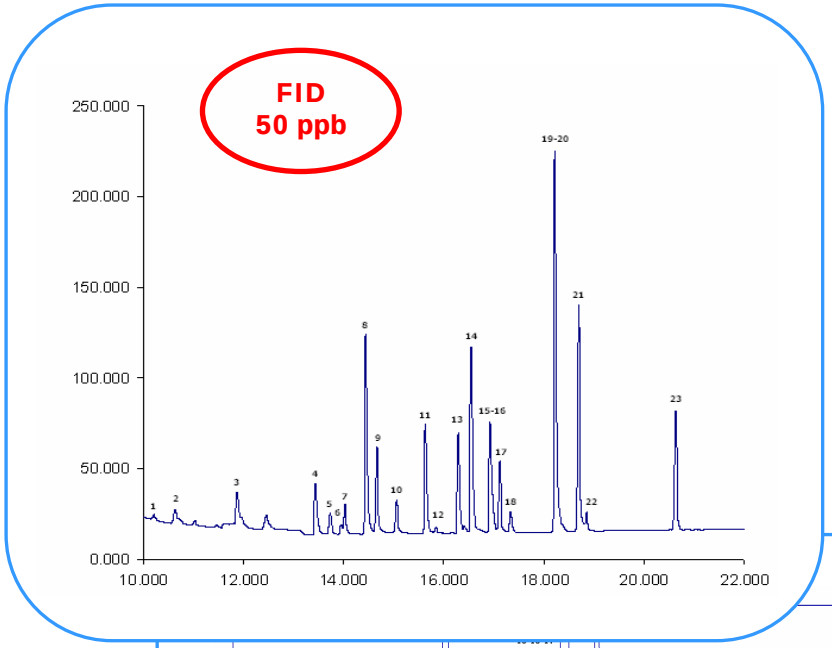


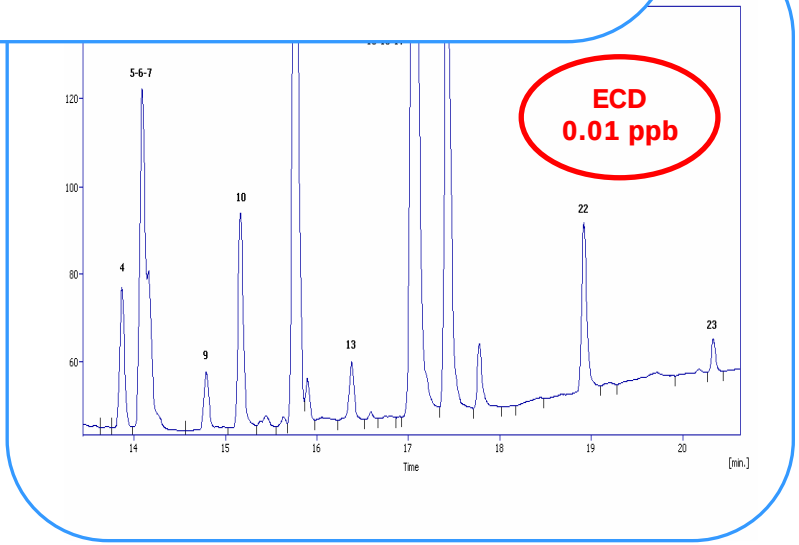
Propanol

- "Dew Stop" removes most of the humidity keeping the volatiles unaffected
- completely inert sample path preserves sample integrity

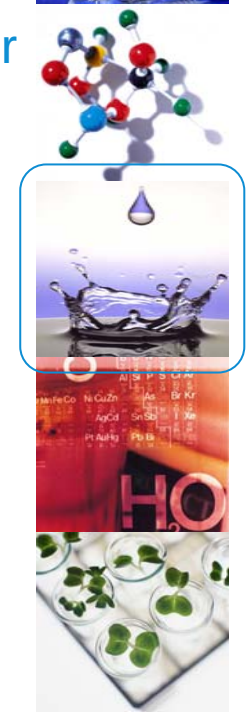
Master DHS Dynamic Headspace

Chlorinated hydrocarbons in water



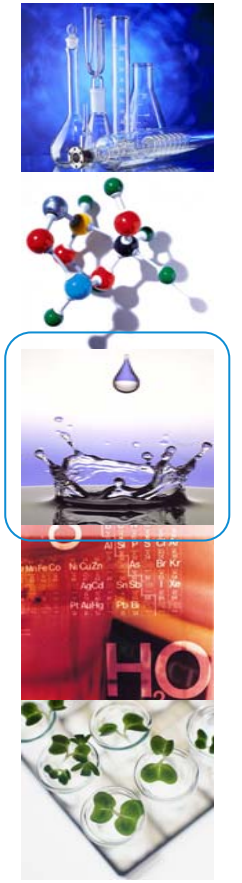


1	1,1-Dichlorethene
2	Methylene Chloride
3	*trans*-1,2- Dichloroethene
4	*cis*-1,2- Dichloroethene
5	Chloroform
6	Carbon Tetrachloride
7	1,1,1-Trichloroethane
8	Benzene
9	1,2-Dichloroethane
10	Trichloroetheene
11	1,2-Dichlropropane
12	Bromodichloromethane
13	*cis*-1,3-Dichloropropene
14	Toluene
15	*trans*-1,3-Dichloropropene
16	Tetrachloroethane
17	1,1,2-Trichloroethane
18	Dibromochloromethane
19	m-Xylene
20	p-Xylene
21	o-Xylene
22	Bromoform
23	1,4-Dichlrobenzene



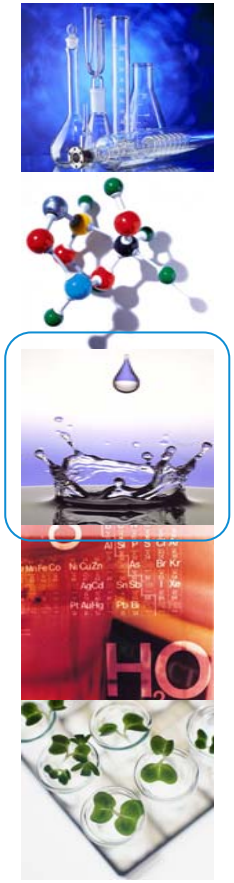
DANI A SCENT OF FUTURE

Operating Principle	Two stage dynamic head space
Capacity	65 vials
Sampling Vials	20ml sample vial
Incubation oven capacity	18 vials
Incubation oven temperature	Amb.- 250°C
Overlapping sample processing	Yes
Focusing Trap	Quartz packed
Trap Temperature	Amb. - 450°C
Desorption Time	From 0 up to 999.9 min, 0,1 min resolution
Trap Heating	1000°C/min direct heating
Transfer Line Temperature	50°C - 300°C
Sampling Valve Temperature	50°C - 300°C
Sample Flow-path	Siltek®
Water Removal	Yes (Dew Stop)
Solvent/ IS addition	2 solvent, 2 waster vials 6 standard vials
Compatibility	Each kind of GC or GC/MS



HSS 86.50 – Static Headspace Sampler

DANI A SCENT OF FUTURE



… the most reliable sampling technique

Static headspace technique offers many advantages

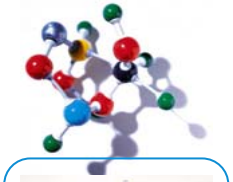
- Little or no sample preparation
- Higher sensitivity
- No solvent peak
- Column life increase

… the most reliable automatic sampler

HSS 86.50 offers the highest precision and repeatability (RSD% < 1%) through

- **accurate** temperature and pressure control
- **constant** incubation time
- **Valve&Loop** sampling technique, introducing a highly repeatable gas volume
- no risk of condensation, no influence on carrier gas flow/pressure

DANI A SCENT OF FUTURE



... sample integrity & negligible carryover

- the **chemical inertness** of the sample path
- the **low dead volumes** and
- the **constant washing** flow of the sample path

provide absolutely negligible levels of contamination and unaffected sample integrity

... high sample throughput

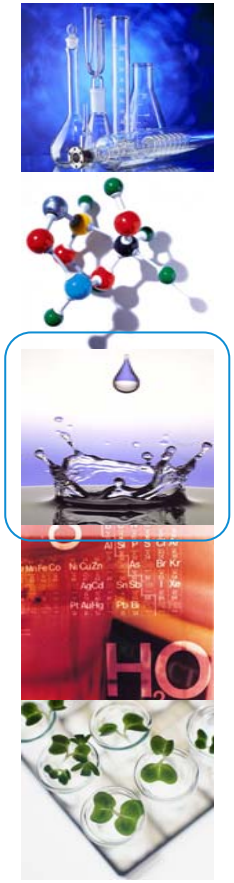
HSS 86.50 features

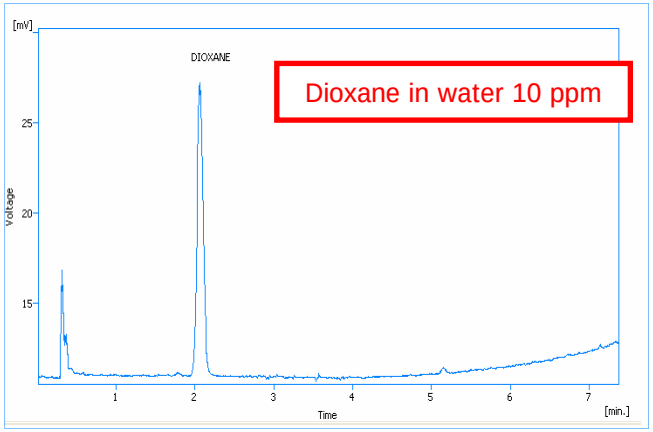
- up to **44 samples** in 20 or 10 ml vials
- sample overlapping of up to 12 vials to optimise analysis times for high productivity

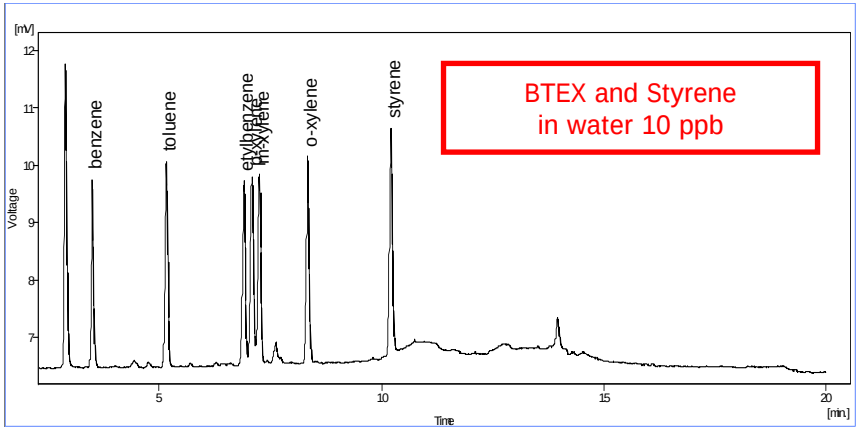
DANI A SCENT OF FUTURE

… HSS 86.50 applies to

- **Plastic industry**
  Acetaldehyde determination in polymers
- **Pharmaceutical industry**
  Residual volatile solvents in pharmaceutical
- **Food industry**
  Flavours in food
- **Industrial quality control**
  Ethylene oxide in sterilized products
- **Environmental**
  Volatile pollutants in water and soil







Sampling Method	Valve & Loop
Sample Loops	1 ml standard (0.5 and 3 ml optional)
Sample Flow Path	Siltek®
Sample Capacity	44 vials
Vials	20ml or 10ml
Sampling device temperature	from 50°C to 220°C
Incubation Oven Capacity	6 vials
Incubation Oven Temperature	from 40°C to 200°C
Constant Heating Time	YES
Sample Shaking	YES (fast and slow)
Overlapping sample processing	YES
Transfer Line Temperature	from 50°C to 220°C
Transfer Line material	Siltek®
MHE (Multiple Headspace Extraction)	YES, 10 steps each vials
Compatibility	any kind of GC or GC/MS