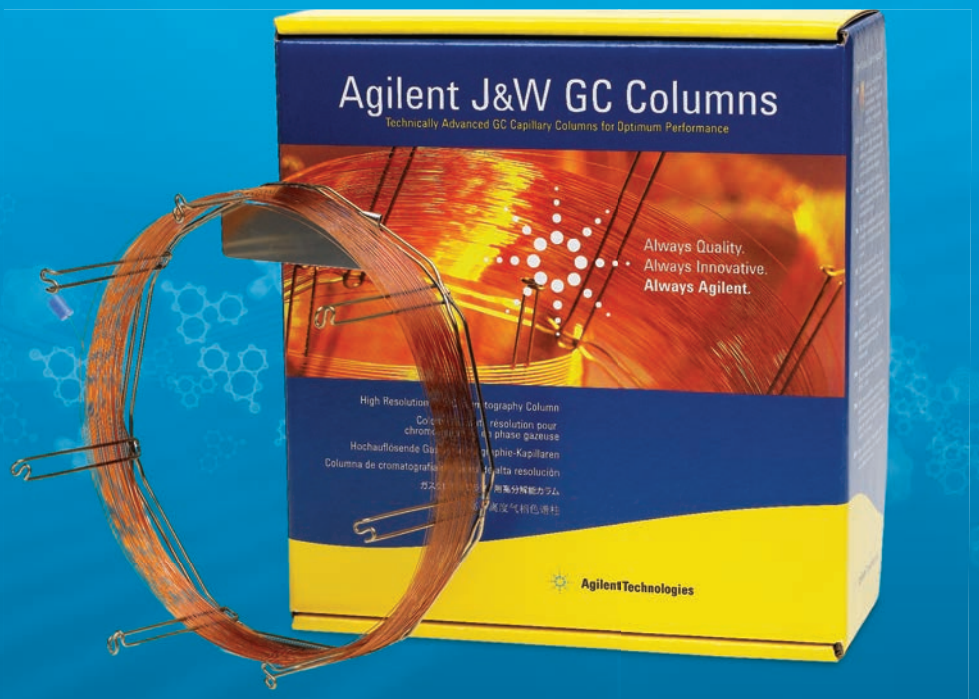
Agilent J&W GC Columns For Environmental Applications

MEASURE TRACE-LEVEL CONTAMINANTS AND MEET REGULATORY REQUIREMENTS WITH CONFIDENCE

The Measure of Confidence



Agilent Technologies

Reliably and efficiently analyze increasingly small quantities of active solutes

Every day, you are on the front lines in the battle to safeguard our natural resources from potentially harmful organic and inorganic contaminants in water, soil, air, and food. To succeed, you must be able to run a high volume of samples under increasingly heavy time and cost pressures.

From testing volatile organic compounds (VOCs) in drinking water to quantifying semivolatile waterborne pollutants… you simply cannot afford interferences or reduced sensitivity caused by column bleed or activity. For starters, having to redo a run or verify suspect analytes wastes valuable resources, hinders productivity, and hurts your bottom line. Even worse, unreliable results could have catastrophic implications in terms of environmental safety.

The Agilent J&W GC column portfolio is designed and tested to help you achieve the lowest possible detection limits for difficult analytes.

Backed by 40 years of GC column innovation and applications expertise, Agilent J&W GC columns deliver low column bleed and the lowest column activity for your sensitive, trace-level applications – regardless of detector type. So you can confidently detect compounds at trace levels and comply with global regulations for continuous monitoring.

Inside: the Agilent J&W GC column portfolio covering the very latest environmental applications

Agilent J&W Ultra Inert GC columns

Consistently analyze trace levels of pesticides, phenols, and other active compounds

Flow path inertness isn't just vital to your analysis; it is also on the cutting edge of GC. That is why the Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes.

Every Agilent J&W Ultra Inert GC column is tested with the most demanding Ultra Inert test probe mixture in the industry, and we prove it with an individual performance summary sheet that is shipped with each column.

Test probes in Agilent's Ultra Inert test probe mixture have low molecular weights, low boiling points, and no steric shielding of their active groups. These characteristics allow the probative portion of the test molecules to penetrate – and fully interact with – the stationary phase and column surface. So you can be sure you're getting all the benefits of column inertness, including:

- Minimal compound loss and degradation for more accurate quantitation
- Minimum peak tailing for active analytes
- Increased signal-to-noise for improved sensitivity at trace levels

To complete your Ultra Inert GC flow path, choose Agilent GC/MS instruments as well as Agilent Ultra Inert Inlet liners. These liners deliver high trace-level sensitivity, accuracy, and reproducibility *even when containing glass wool*.

Agilent Ultra Inert Inlet liners, great companion tools with the **Agilent J&W Ultra Inert GC columns**, are available in convenient 100 packs to meet the productivity demands of the environmental industry.

Application-specific Columns

TAILORED TO INDIVIDUAL METHODS AND COMPOUND CLASSES

Agilent J&W DB-UI 8270D Ultra Inert GC columns

Satisfy the rigorous demands of EPA 8270D

With **Agilent J&W DB-UI 8270D Ultra Inert GC columns**, you can count on excellent peak shape performance for active semivolatile organic compounds targeted by EPA Method 8270D. These specialized columns support your analysis with:

- Industry leading Ultra Inert deactivation and manufacturing with no trade-offs in bleed or stationary phase selectivity.
- Unmatched testing protocol: columns are individually tested with the most probative active compounds of any GC column sold for semivolatiles.
- Convenient, economical multi-packs for high-throughput labs (available only in the U.S).

Agilent J&W Select PAH and DB-EUPAH GC columns

Conform to stringent regulatory requirements

Engineered and manufactured to the tightest QC specifications, Agilent J&W PAH columns deliver exceptional thermal stability, low column bleed at elevated temperatures, consistent column inertness, and accurate baseline resolution for critical isomer pairs.

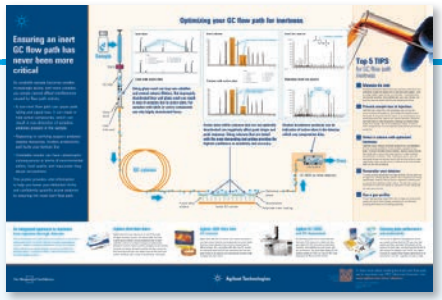
- **Agilent J&W Select PAH GC columns** accurately quantitate EPA PAHs in less than seven minutes. They also help you avoid false positives by reliably separating all PAH isomers.
- **Agilent J&W DB-EUPAH GC columns** are designed, optimized, and tested for analyzing 15+1 EU-regulated priority PAHs.

Agilent J&W DB-624UI Ultra Inert GC columns

Analyze VOCs and unknowns with confidence

Agilent J&W DB-624UI Ultra Inert GC columns are optimized for fast analysis of volatile compounds, and are ideal for environmental samples with unknown components. Their unique deactivation process enhances peak shape, improving signal-to-noise levels and increasing sensitivity for qualitative and quantitative analysis. These columns provide the following:

- Industry leading Ultra Inert deactivation and manufacturing in this mid-polarity stationary phase.
- Highest degree of column inertness for improved peak shape and linearity let you lower your detection limits and quantify active analytes with more confidence.
- All of the analytical benefits of proven inertness performance when you upgrade your existing 624 column to Agilent J&W DB-624UI.



Learn how to optimize your flow path for inertness so you can achieve the ultra low detection levels today's demanding analyses require.

Order your **FREE poster** today at
www.agilent.com/chem/uiorder

Agilent J&W DB-CLP1 and DB-CLP2 universal column pair

Perform more EPA DUAL-ECD pesticide methods

The EPA Contract Lab Program (CLP) for organochlorine pesticides mandates dual-column separation and confirmation with dual electron capture detection (ECD). A specifically designed, yet versatile, column pair can make this process easier by letting you execute more methods on the same instrument without switching columns.

Now you can simplify your operations with Agilent J&W DB-CLP1 and DB-CLP2 columns – the most flexible universal column pair for 9 EPA pesticides methods.

Together, these fast, reliable columns deliver excellent resolving power with exceptionally low bleed while eliminating the need for time-consuming column switching. You'll also gain the advantages of:

- High productivity: complete resolution and confirmation of 22 CLP pesticides can be performed in less than 7.5 minutes.
- Accurate identification and confirmation of trace-level pesticides.
- Optimal selectivity and stability: the mid-polarity arylene stationary phases provide "MS-grade" low bleed at temperatures up to 360 °C.
- Excellent column-to-column performance.
- Useful for pesticides analyses using MS and Nitrogen-Phosphorus Detectors (NPD).

We also subject our Agilent J&W DB-CLP1 and DB-CLP2 GC columns to the industry's most stringent testing – which includes challenging pesticides in the test mixture – and we *prove* it with a performance summary sheet shipped with every column.

Agilent J&W DB-CLP1 and DB-CLP2 columns cover 9 EPA methods – more than any other CLP column pair

EPA Contract Lab Program Pesticides	Organochlorine pesticides
EPA Method 504.1	Halogenated pesticides
EPA Method 505	Organohalide pesticides
EPA Method 508.1	Organochlorine pesticides and herbicides
EPA Method 551	Chlorinated solvents, trihalomethanes and disinfectant by-products
EPA Method 552.3	Haloacetic acids and dalapon
EPA Method 8081B	Organochlorine pesticides
EPA Method 8082A	PCBs and arachlors
EPA Method 8151A	Chlorophenoxy acid herbicides

Here are some examples of our most popular columns for environmental applications

Analyte	Column
Semivolatiles	DB-UI 8270D
	HP/DB-5ms Ultra Inert
	DB-5.625
CLP Pesticides (dual column configuration)	DB-CLP1 (primary) / DB-CLP2 (confirmation)
	DB-35ms or DB-17ms (primary) / DB-XLB (confirmation)
Pesticides	DB-CLP1 (primary) / DB-CLP2 (confirmation) *For multiple EPA methods using ECD*
	DB-35ms Ultra Inert
	DB-XLB or VF-XMS
	DB-5ms Ultra Inert
	HP-5ms Ultra Inert
PAHs	Select PAH
	DB-EUPAH
	DB-UI 8720D
PCBs	DB-XLB or VF-XMS
	CP-Sil 5/C18 CB for PCBs
Volatile organic compounds (VOCs)	DB-624 Ultra Inert
	DB-VRX
	Select mineral oil
Dioxins and Furans	CP-SII 88 for Dioxins
	DB-Dioxin
Total Petroleum Hydrocarbons	Select mineral oil
	DB-TPH
	DB-MTBE
Volatile Amines	CP-Volamine

For information on these and more environmental application columns, order your GC Column Selection Guide or visit **www.agilent.com/chem/mygccolumns**

Speed up your GC column selection with our one-stop resource

The Agilent J&W GC Column Selection Guide makes it easier to choose the right GC column for all your environmental applications. It guides you step-by-step through:

- Choosing a stationary phase based on factors such as selectivity, polarity, and phenyl content.
- Understanding how column diameter influences factors like efficiency, solute retention, head pressure, and carrier gas flow rates.
- Determining which column length will affect solute retention, column head pressure, column bleed – and cost.

To order your FREE *Agilent J&W GC Column Selection Guide*, visit **www.agilent.com/chem/getguides**

Proof that Agilent J&W GC columns deliver reliable results and low column bleed for benign and difficult sample types

Agilent J&W HP-5ms Ultra Inert GC columns outperform Restek Rxi-5ms columns in the recovery of active compounds

Column: **Agilent J&W HP-5ms Ultra Inert 20 m x 0.18 mm, 0.18 µm**

Conditions

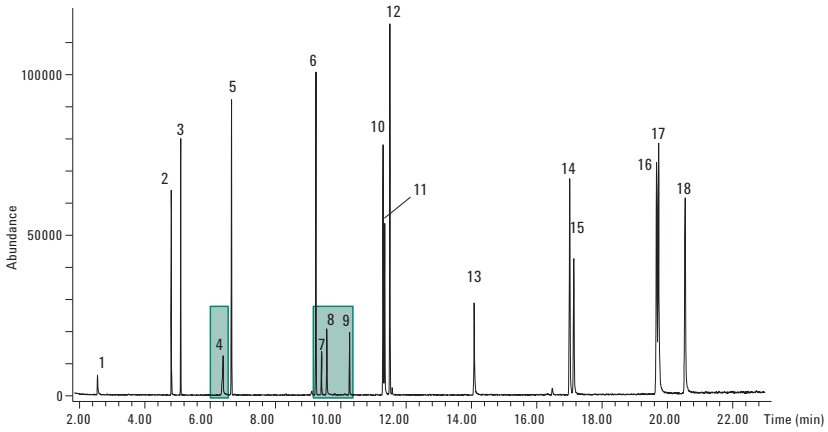
Carrier: Helium 37 cm/s, Ramped flow; 0.7 mL/min (0.1 min) to 1.3 mL/min (15 mL/min)

Oven: 35 °C (2.5 min) to 80 °C (40 °C/min), 15 °C/min to 200 °C, 8 °C/min to 275 °C (2 min)

Injection: 0.5 µL, splitless. 280 °C purge flow 30 mL/min at 0.75 min

MSD: Transfer line 290 °C, Source 300 °C, Quad 180 °C

Sample: 0.5 ng on-column loading of Short Mix Components with ISTD



Peak identification

1. n-Nitrosodimethylamine
2. Aniline
3. 1,4-Dichlorobenzene-d4
4. Benzoic acid
5. Naphthaline-d8
6. Acenaphithene-d10
7. 2,4-Dinitrophenol
8. 4-Nitrophenol
9. 2-Me-4,6-dinitrophenol
10. 4-Aminobiphenyl
11. Pentachlorophenol
12. Phenanthrene-d10
13. Benzidine
14. Chrysene-d12
15. 3,3'-Dichlorobenzidine
16. Benzo[b]fluoranthene
17. Benzo[k]fluoranthene
18. Perylene-d12

Column: **Restek Rxi-5ms 20 m x 0.18 mm, 0.18 µm**

Conditions

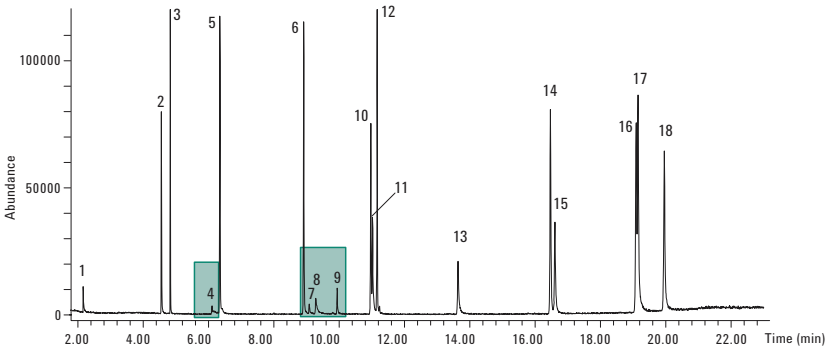
Carrier: Helium 37 cm/s, Ramped flow; 0.7 mL/min (0.1 min) to 1.3 mL/min (15 mL/min

Oven: 35 °C (2.5 min) to 80 °C (40 °C/min), 15 °C/min to 200 °C, 8 °C/min to 275 °C (2 min)

Injection: 0.5 µL, splitless. 280 °C purge flow 30 mL/min at 0.75 min

MSD: Transfer line 290 °C, Source 300 °C, Quad 180 °C

Sample: 0.5 ng on-column loading of Short Mix Components with ISTD

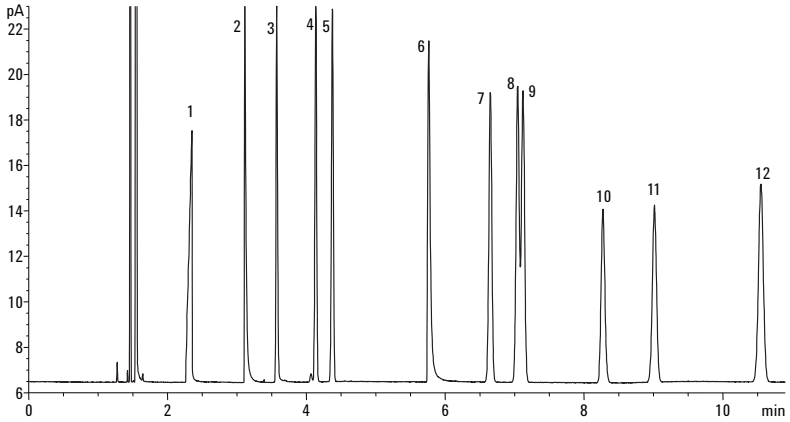


Peak identification

1. n-Nitrosodimethylamine
2. Aniline
3. 1,4-Dichlorobenzene-d4
4. Benzoic acid
5. Naphthaline-d8
6. Acenaphithene-d10
7. 2,4-Dinitrophenol
8. 4-Nitrophenol
9. 2-Me-4,6-dinitrophenol
10. 4-Aminobiphenyl
11. Pentachlorophenol
12. Phenanthrene-d10
13. Benzidine
14. Chrysene-d12
15. 3,3'-Dichlorobenzidine
16. Benzo[b]fluoranthene
17. Benzo[k]fluoranthene
18. Perylene-d12

*In these examples, the **Agilent J&W HP-5ms Ultra Inert GC column** provides excellent peak shape for acids and bases, while the Restek Rxi-5ms column shows poor peak shape for some active compounds. (Acidic analytes are highlighted).*

Agilent J&W DB-UI 8270D Example test chromatogram



Peak identification

1. Propionic acid
2. Pyridine
3. 1-Pentanol
4. 1-Octene
5. n-Octane
6. 1,2-Butanediol
7. 1-Chloro-2-fluorobenzene
8. m-Xylene
9. p-Xylene
10. 2-Heptanone
11. n-Nonane
12. Isopropylbenzene

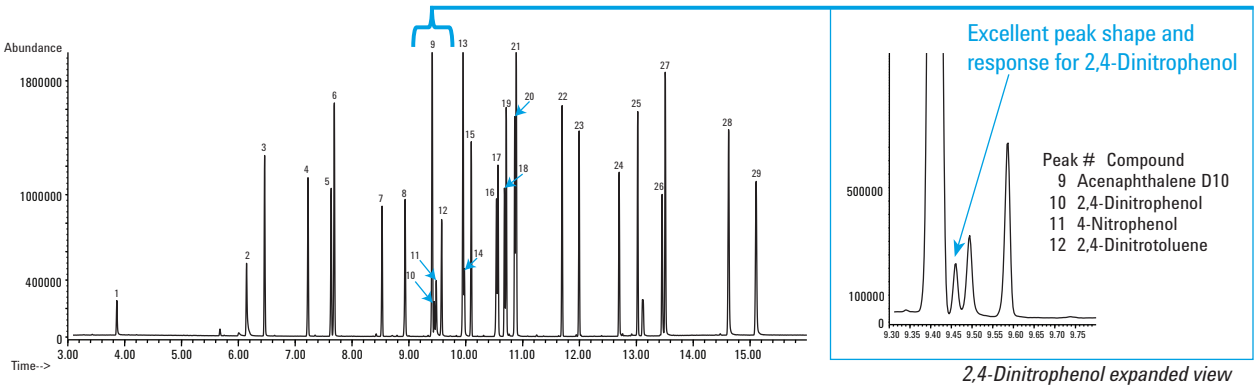
*Test chromatogram of semivolatiles run on an **Agilent J&W DB-UI 8270D column**. Results from individual test chromatograms provide proof of inertness performance with every column shipped.*

High-volume lab? Try our convenient column multi-packs

Agilent J&W DB-UI 8270D Ultra Inert GC columns are available in economical multi-packs that give you six columns for the price of five (US only).

Learn more at
www.agilent.com/chem/UI8270D

10 ng/µL Semivolatile Checkout Standard on an 20 m x 0.18 mm, 0.36 µm Agilent J&W DB-UI 8270D Capillary GC Column using an Ultra Inert Liner with Wool



2,4-Dinitrophenol expanded view

Peak identification

1. N-Nitrosodimethylamine
2. Aniline
3. 1,4-Dichlorobenzene-d4
4. Isophorone
5. 1,3-Dimethyl-2-nitrobenzene
6. Naphthalene
7. Hexachlorocyclopentadiene
8. Mevinphos
9. Acenaphthene-d10
10. 2,4-Dinitrophenol
11. 4-Nitrophenol
12. 2,4-Dinitrotoluene
13. Flourene
14. 4,6-Dinitro-2-methyl phenol
15. Trifluralin
16. Simazine
17. Atrazine
18. Pentachorophenol
19. Terbufos
20. Chlorothanlonil
21. Phenanthrene-d10
22. Aldrin
23. Heptachlor epoxide
24. Endrin
25. 4,4′-DDT
26. 3,3′-Dichlorobenzidine
27. Chrysene d-12
28. Benzo[b]flouranthene
29. Perylene-d12

*29-component mix run on an **Agilent J&W DB-UI 8270D** 20 m x 0.18 mm, 0.36 µm capillary GC column. Note the excellent peak shapes – achieved in less than 16 minutes.*

Analyzing fire retardant PBDEs

Polybrominated Diphenyl Ethers PBDEs

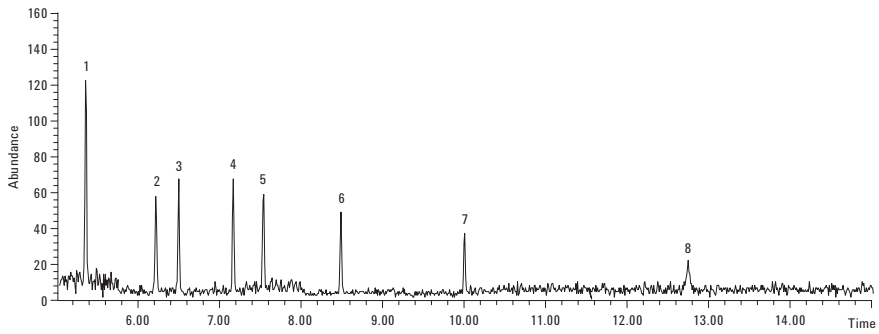
Column: Agilent J&W DB-5ms Ultra Inert, Agilent Part No. 122-5512UI, 15 m x 0.25 mm, 0.25 µm

Conditions

Instrument:	Agilent 6890N/5973B MSD
Sampler:	Agilent 7683B, 5.0 µL syringe, (Agilent Part No. 5188-5246), 1.0 µL splitless injection, 5 ng each component on-column
Carrier:	Helium 72 cm/s, constant flow
Inlet:	Pulsed splitless; 325 °C, 20 psi until 1.5 min, purge flow 50 mL/min at 2.0 min
Oven:	150 to 325 °C (17 °C/min), hold 5 min
Detector:	MSD source at 300 °C, quadropole at 150 °C, transfer line at 300 °C, scan range 200-1000 amu

Supplies

Liner:	Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Syringe:	Autosampler syringe, 0.5 µL, 23g, cone, 5188-5246



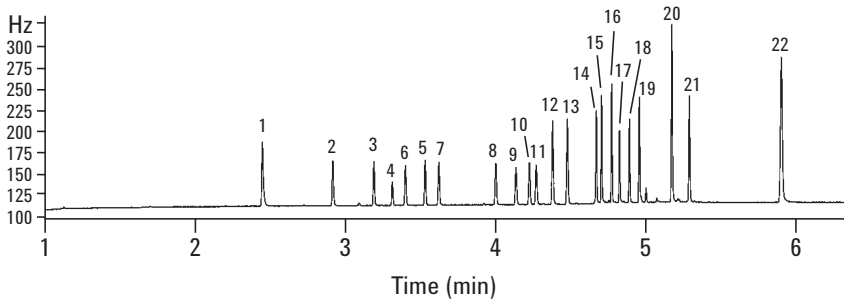
Peak identification

1. BDE-47
2. BDE-100
3. BDE-99
4. BDE-154
5. BDE-153
6. BDE-183
7. BDE-205
8. BDE-209

When it comes to speed and resolution, Agilent J&W High Efficiency GC columns outperform a leading competitor – and we can *prove* it

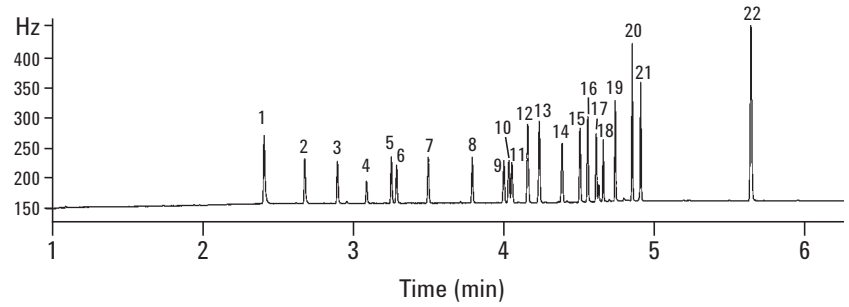
Rapid CLP (Contract Laboratory Program) Pesticide Analysis: A side-by-side column comparison

Agilent J&W DB-17ms primary column Agilent Part No. 121-4722



*Here, the **Agilent J&W DB-17ms primary analysis column** resolved all 22 peaks of interest in less than 6 minutes with sharp symmetry and minimal baseline drift. Conversely, Restek's primary analysis column resolved only 20 of 22 peaks – and displayed evidence of peak tailing. See Restek's results on page 11.*

Agilent J&W DB-XLB confirmatory column Agilent Part No. 121-1222



***Agilent J&W DB-XLB** confirmatory analysis column resolved 20 peaks of interest in less than 6 minutes (the remaining peaks were close to being baseline resolved and were sufficient for peak confirmation.)*

Peak identification

1. Tetrachloro-m-xylene
2. α BHC
3. γ BHC
4. β BHC
5. δ BHC
6. Heptachlor
7. Aldrin
8. Heptachlor Epoxide
9. γ Chlordane
10. α Chlordane
11. Endosulfan I
12. 4,4′ DDE
13. Dieldrin
14 Endrin
15. 4,4′ DDD
16. Endosulfan II
17. 4,4′ DDT
18. Endrin Aldehyde
19. Endosulfan Sulfate
20. Methoxychlor
21. Endrin Ketone
22. Decachlorobiphenyl

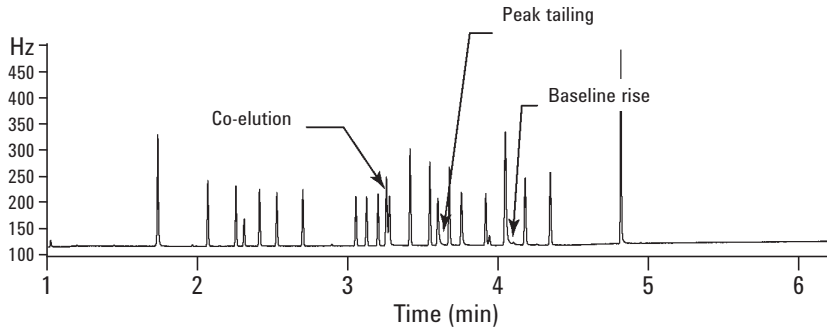
Conditions

Carrier	Hydrogen (69 cm/sec at 120 °C, ramped at 99 mL/min to 106 cm/sec at 4.4 minutes)
Oven	120 °C (0.32 min); 120 °C/min to 160 °C; 30 °C/min to 258 °C (0.18 min); 38.81°C/min to 300 °C (1.5 min)
Injection	Split/splitless; 220 °C, pulsed splitless (35 psi for 0.5 min, purge flow of 40 mL/min at 1 minute, gas saver flow 20 mL/min on 3 minutes)
Detector	µECD 320 °C; nitrogen makeup; constant column + makeup flow 60 mL/min

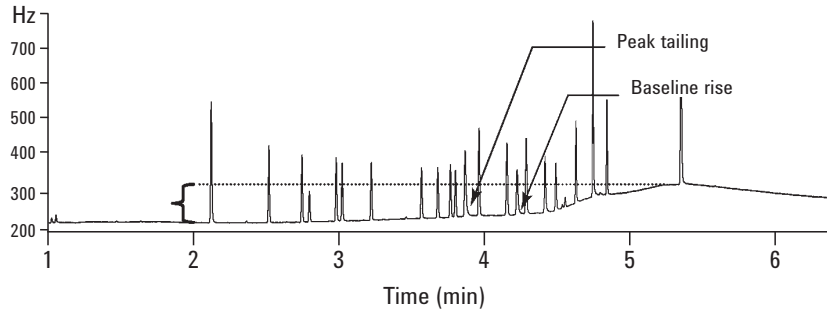
Peak identification

1. Tetrachloro-m-xylene
2. α BHC
3. γ BHC
4. β BHC
5. δ BHC
6. Heptachlor
7. Aldrin
8. Heptachlor Epoxide
9. γ Chlordane
10. α Chlordane
11. Endosulfan I
12. 4,4′ DDE
13. Dieldrin
14. Endrin
15. 4,4′ DDD
16. Endosulfan II
17. 4,4′ DDT
18. Endrin Aldehyde
19. Endosulfan Sulfate
20. Methoxychlor
21. Endrin Ketone
22. Decachlorobiphenyl

Restek primary column



Restek confirmatory column



*Although **Restek's confirmatory column** resolved all 22 peaks of interest, there is evidence of peak tailing – as well as an unacceptable level of temperature-dependent baseline drift. Compare that to Agilent's results, which show sharp, symmetrical peaks and minimal temperature-dependent baseline drift.*

Agilent J&W High Efficiency Capillary GC columns

Decrease your run times by 50% or more, without compromising resolution

Agilent's high efficiency GC column family has expanded to include both 0.15 mm id and 0.18 mm id columns.

Agilent J&W High Efficiency Capillary GC columns can reduce your sample run time by 50% or more (compared to conventional GC), so you can get the reliable results you need using the resources you *have*. They are ideal for applications that require faster run times, and offer:

- **The flexibility to choose between helium and hydrogen carrier gases.** You can stay with a helium carrier if you wish to simplify method development, or switch to a hydrogen carrier if faster analysis is desired.
- **The ability to separate samples using less carrier gas**, which can lead to longer intervals between cylinder changes, increased uptime, and a lower cost per sample.

As an added benefit, Agilent J&W High Efficiency Capillary GC columns are compatible with all standard-pressure capillary GC and GC/MS instruments without expensive high-pressure modifications.

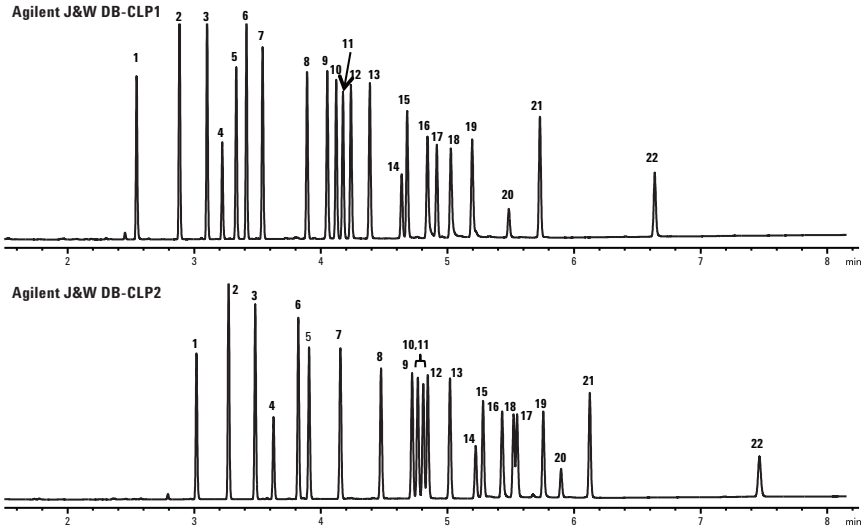
Fast CLP Pesticides – Chlorinated Pesticides

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

Conditions

Carrier:	Helium, constant flow, 3.5 mL/min
Injection temperature:	250 °C
Injection:	1 µL, splitless
Oven:	150 °C, hold 0.2 min, 45 °C/min to 250 °C, 18 °C/min to 300 °C, 30 °C/min to 330 °C, hold 2.5 min
Detector:	µECD, 340 °C



Peak identification

1. Tetrachloro-m-xylene (surrogate standard)
2. a-BHC
3. g-BHC
4. b-BHC
5. Heptachlor
6. d-BHC
7. Aldrin
8. Heptachlor epoxide
9. g-Chlordane
10. a-Chlordane
11. Endosulfan I
12. 4,4′-DDE
13. Dieldrin
14. Endrin
15. 4,4′-DDD
16. Endosulfan II
17. 4,4′-DDT
18. Endrin aldehyde
19. Endosulfan sulphate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (surrogate standard)

*In 7.5 minutes, the **Agilent J&W CLP1/CLP2 column** pair analyzed chlorinated pesticides according to the CLP Pesticides method.*

Achieve fast, high-resolution analysis of CLP pesticides

To learn more about the Agilent J&W DB-CLP1 & CLP2 Universal Column Pair, visit **www.agilent.com/chem/CLP**

EPA Method 8081B (extended) – Organochlorine Pesticides

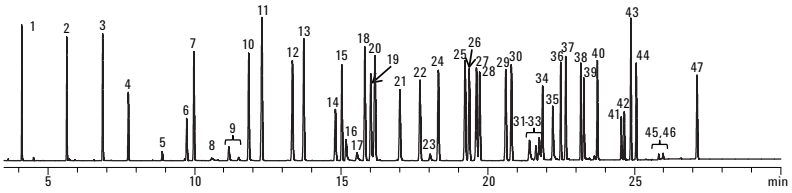
Column 1: **Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film**

Column 2: **Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film**

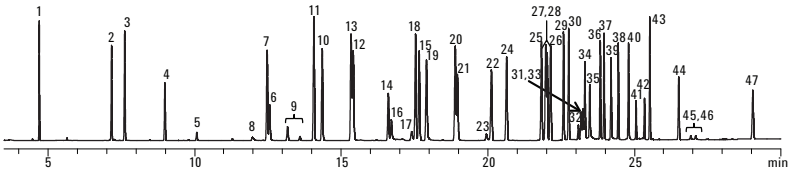
Conditions

Carrier:	Helium, constant flow, 43.5 cm/s
Injection temperature:	250 °C
Injection:	2 µL, splitless
Oven:	80 °C, hold 0.5 min, 20 °C/min to 150 °C, 5 °C/min to 235 °C, 15 °C/min to 300 °C, hold 5 min
Detector:	µECD, 325 °C

Agilent J&W DB-CLP1



Agilent J&W DB-CLP2



Peak identification

1. 1,2-Dibromo-3-chloropropane
2. Hexachlorocyclopentadiene
3. 1-Bromo-2-nitrobenzene
4. Etradiazole
5. Chloroneb
6. Trifluralin
7. Terachloro-m-xylene (surrogate standard)
8. Propachlor
9. Diallate isomers (250 ng/mL)
10. Hexachlorobenzene
11. a-BHC
12. Pentachloronitrobenzene
13. g-BHC
14. b-BHC
15. Heptachlor
16. Dichlone
17. Alachlor
18. d-BHC
19. Chlorothalonil
20. Aldrin
21. DCPA
22. Isodrin
23. Kelthane
24. Heptachlor epoxide
25. g-Chlordane
26. trans-Nonachlor
27. a-Chlordane
28. Endosulfan I
29. 4,4′-DDE
30. Dieldrin
31. Chlorobenzilate (250 ng/mL)
32. Perthane (250 ng/mL)
33. Chloropropylate (250 ng/mL)
34. Endrin
35. Nitrofen
36. 4,4′-DDD
37. Endosulfan II
38. 4,4′-DDT
39. Endrin aldehyde
40. Endosulfan sulphate
41. Captafol
42. Methoxychlor
43. Endrin ketone
44. Mirex
45. cis-Permethrin
46. trans-Permethrin
47. Decachlorobiphenyl (surrogate standard)

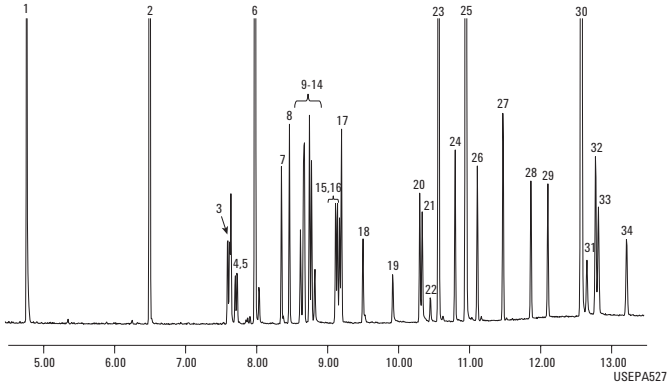
*In this example, the **Agilent J&W CLP1 and CLP2 column** pair separated 47 organochlorine pesticides in less than 30 minutes, according to EPA method 8081B (extended).*

Pesticides and Fire Retardants (US EPA 527)

Column: **Agilent J&W DB-5ms Ultra Inert, Agilent Part No. 122-5532UI, 30 m x 0.25 mm, 0.25 µm**

Conditions

Carrier:	Helium, 52 cm/sec, constant flow
Oven:	60 °C (1 min) to 210 °C (25 °/min), 20 °C/min to 310 °C (3 min)
Injection:	Splitless, 250 °C, purge flow 50 mL/min @ 1 in, gas saver 80 mL/min on @ 3 min
Detector:	Transfer line 290 °C, source 300 °C, quad 180 °C
Sample:	Pesticide/PBDE standards, 1 ng with 5 ng IS/SS on-column



Peak identification

1. 1,2-Dimethyl-2-nitrobenzene
2. Acenaphthalene-D10
3. Dimethoate
4. Atrazine
5. Propazine
6. Anthracene-D10
7. Vinclozoline
8. Prometryne
9. Bromacil
10. Malathion
11. Thiazopyr
12. Dursban
13. Benthiocarb
14. Parathion
15. Terbus sulfone
16. Bioallethrin
17. Oxychlordane
18. Fenamiphos
19. Nitrophen
20. Norflurazone
21. Kepone
22. Hexazinone
23. Triphenyl phosphate
24. Bifenthrin
25. Chrysene-D12
26. BDE-47
27. Mirex
28. BDE-100
29. BDE-99
30. Perylene-D12
31. Fenvalerate
32. Esfenvalerate
33. Hexabromobiphenyl
34. BDE-153

*Despite the challenging mass range of this analysis, the **Agilent J&W DB-5ms Ultra Inert GC column** met the method's recovery criteria.*

EPA Method 508.1 Analytical Results

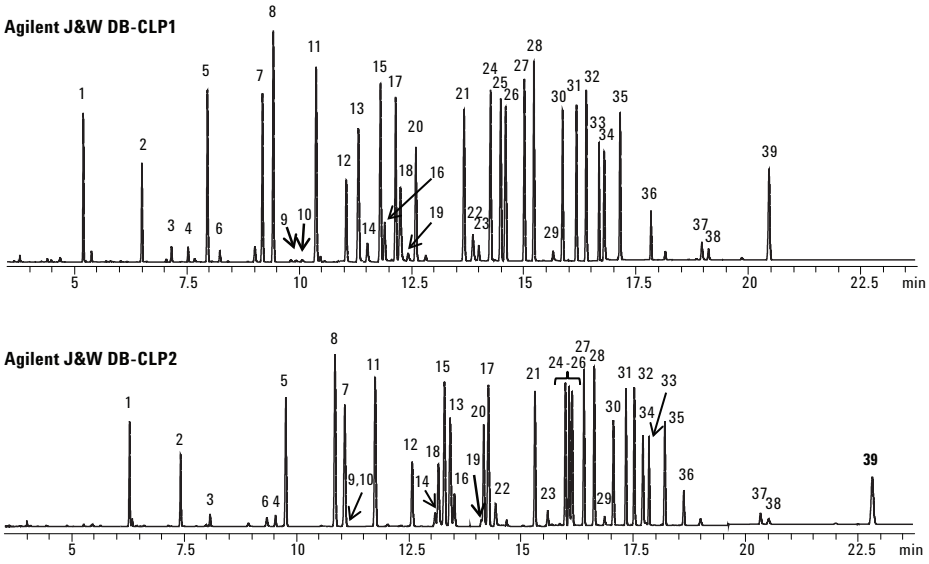
EPA Method 508.1 – Chlorinated Pesticides and Herbicides

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

Conditions

Carrier:	Helium, constant flow, 35 cm/s
Injection temperature:	250 °C
Injection:	2 µL, splitless
Oven:	80 °C, hold 0.5 min, 26 °C/min to 175 °C, 6.5 °C/min to 235 °C, 15 °C/min to 300 °C, hold 6 min
Detector:	µECD, 340 °C
Sample:	100 ng/mL EPA 508.1 analytes, 100 ng/mL pesticide surrogate mix



Peak identification

1. Hexachlorocyclopentadiene
2. Etradiazole
3. Chloroneb
4. Trifluralin
5. Tetrachloro-m-xylene (surrogate standard)
6. Propachlor
7. Hexachlorobenzene
8. α-BHC
9. Atrazine
10. Simazine
11. γ-BHC
12. β-BHC
13. Heptachlor
14. Alachlor
15. δ-BHC
16. Chlorothalonil
17. Aldrin
18. Metribuzin
19. Metolachlor
20. DCPA
21. Heptachlor epoxide
22. Cyanazine
23. Butachlor
24. γ-Chlordane
25. α-Chlordane
26. Endosulfan I
27. 4,4′-DDE
28. Dieldrin
29. Chlorobenzilate
30. Endrin
31. 4,4′-DDD
32. Endosulfan II
33. 4,4′-DDT
34. Endrin aldehyde
35. Endosulfan sulfate
36. Methoxychlor
37. cis-Permethrin
38. trans-Permethrin
39. Decachlorobiphenyl (surrogate standard)

*The **Agilent J&W CLP1 column** separates all chlorinated pesticide and herbicide analytes according to EPA Method 505.*

Confidently identify organochlorine pesticides in soil

Organochlorine Pesticides I EPA Method 8081A (GC/MS)

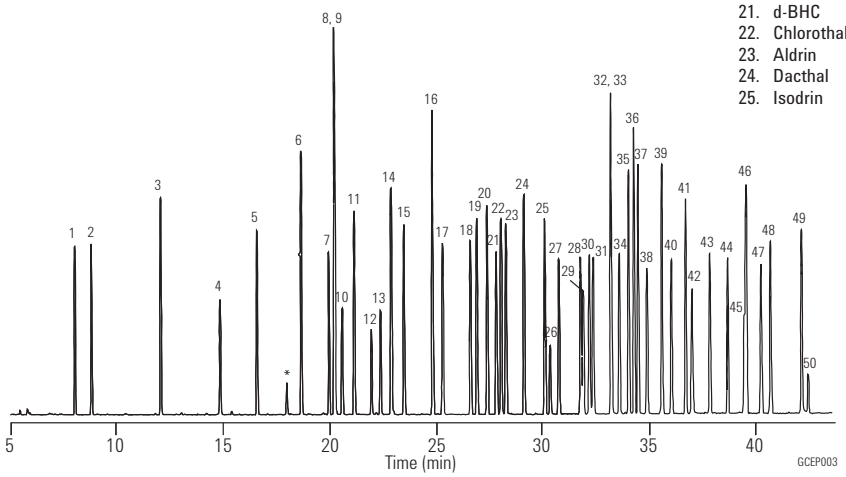
Column: **Agilent J&W DB-35ms, Agilent Part No. 122-3832, 30 m x 0.25 mm, 0.25 µm**

Conditions

Carrier:	Helium at 35 cm/sec, measured at 50 °C
Oven:	50 °C for 1 min, 50-100 °C at 25 °C/min
	100-300 °C at 5 °C/min, 300 °C for 5 min
Injection:	Splitless, 250 °C, 30 sec purge activation time
Detector:	MSD, 300 °C transfer line, Full scan at m/z 50-500
Sample:	1 µL of 35 µg/mL composite 8081A, standards, AccuStandard Inc.

Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe:	10 µL tapered, FN 23-26s/42/HP, 5181-1267



Peak identification

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. a, a-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. a-BHC
16. Pentachloronitrobenzene (IS)
17. g-BHC
18. b-BHC
19. Heptachlor
20. Alachlor
21. d-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. g-Chlordane
29. trans-Nonachlor
30. a-Chlordane
31. Endosulfan I
32. Captan
33. p,p′-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p′-DDD
40. Endosulfan II
41. p,p′-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard

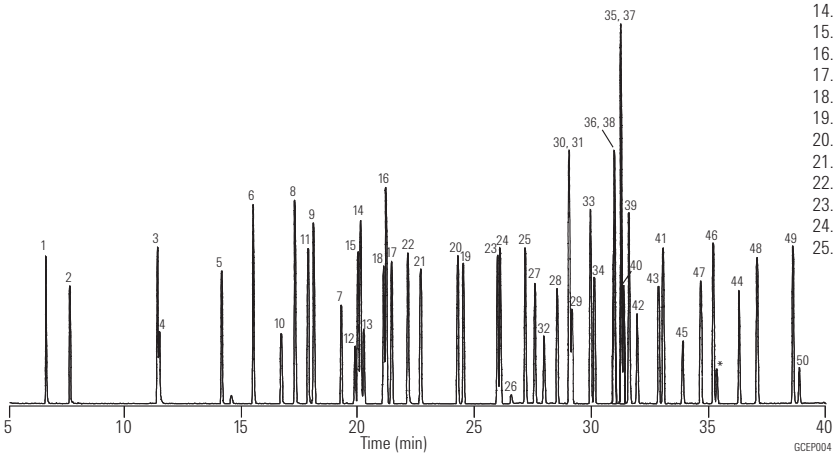
Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

Soil analysis: Identifying organochlorine pesticides

Organochlorine Pesticides II EPA Method 8081A (GC/MS)

Column: Agilent J&W DB-5ms, Agilent Part No. 122-5532, 30 m x 0.25 mm, 0.25 µm
Conditions

Carrier: Helium at 35 cm/sec, measured at 50 °C
Oven: 50 °C for 1 min, 50-100 °C at 25 °C/min
100-300 °C at 5 °/min, 300 °C for 5 min
Injection: Splitless, 250 °C, 30 sec purge activation time
Detector: MSD, 300 °C transfer line, Full scan at m/z 50-500
Sample: 1 µL of 35 µg/mL composite 8081A, standards, AccuStandard Inc.



Peak identification

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. a, a-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. a-BHC
16. Pentachloronitrobenzene (IS)
17. g-BHC
18. b-BHC
19. Heptachlor
20. Alachlor
21. d-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. g-Chlordane
29. trans-Nonachlor
30. a-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

Get superior performance, reliability and productivity with industry-leading 5975C Series GC/MSD. Learn more at **www.agilent.com/chem/5975C**

Analyzing carcinogenic PAHs: Agilent J&W Select PAH GC columns provide excellent separation and resolution for PAH isomers

Column: Agilent J&W Select PAH, 15 m x 0.15 mm, 0.10 µm (Agilent Part No. CP7461)

Conditions

Instrument: 450-GC/320-MS

Injection: 1 µL

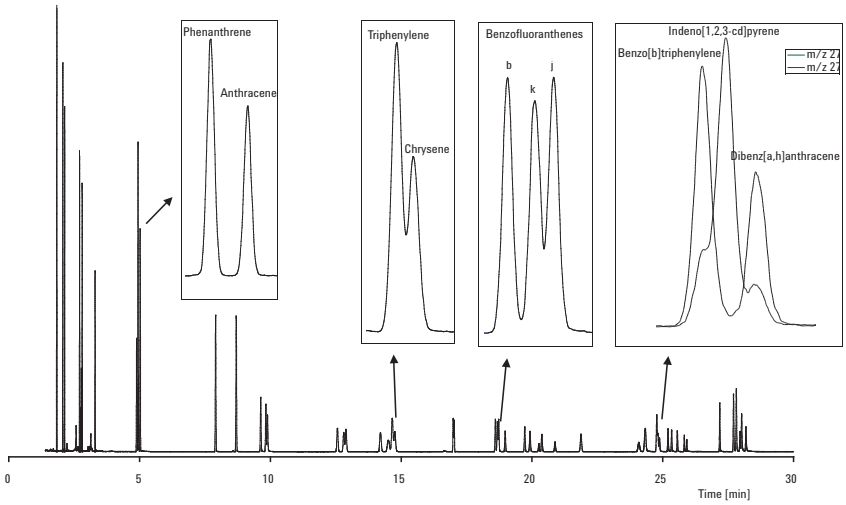
Temp: 70 °C (0.4 min), 70 °C/min, 180 °C, 7 °C/min, 230 °C (7 min), 50 °C/min, 280 °C (7 min), 30 °C/min, 350 °C (4 min)

Carrier Gas: Helium, constant flow 1.2 mL/min

Injector: 300 °C, Splitless mode, 0.5 min @ 100 mL/min

Detector: Triple Quad 320-MS, EI in SIM mode, ion source 275 °C, transfer line 300 °C

Sample: Approx. 0.1-0.3 µg/mL



Peak identification

1. Naphthalene-d8
2. Naphthalene
3. 2-Methylnaphthalene
4. 1-Methylnaphthalene
5. Acenaphthylene
6. Acenaphthene-d10
7. Acenaphthene
8. Fluorene
9. Phenanthrene-d10
10. Phenanthrene
11. Anthracene
12. Fluoranthene
13. Pyrene
14. Benzo[a]fluorene
15. Benzo[b]fluorene
16. 7H-Benzo[c]fluorene
17. Benzo[b]naphtho[2,1-d]thiophene
18. Benzo[g,h,i]fluoranthene
19. Benzo[c]phenanthrene
20. Benz[a]anthracene
21. Cyclopenta[c,d]pyrene
22. Chrysene-d10
23. Triphenylene
24. Chrysene
25. 6-Methylchrysene
26. 5-Methylchrysene
27. Benzo[b]fluoranthene
28. Benzo[k]fluoranthene
29. Benzo[j]fluoranthene
30. Benzo[a]fluoranthene
31. Benzo[e]pyrene
32. Benzo[a]pyrene
33. Perylene-d12
34. Perylene
35. 3-Methylcholanthrene
36. 9,10-diphenylanthracene
37. Dibenzo[a,h]acridine
38. Dibenzo[a,j]acridine
39. Dibenz[a,j]anthracene
40. Dibenzo[a,h]anthracene D14
41. Benzo[b]triphenylene
42. Indeno[1,2,3-cd]pyrene
43. Dibenz[a,h]anthracene
44. Benzo[b]chrysene
45. Picene
46. Benzo[g,h,i]perylene
47. Dibenzo[def,mno]chrysene
48. 7H-Dibenzo[c,g]carbazole
49. Dibenzo[a,l]pyrene
50. Dibenzo[a,e]pyrene
51. Coronene
52. Benzo[b]perylene
53. Dibenzo[a,i]pyrene
54. Dibenzo[a,h]pyrene

Fast Separation of 16 US EPA 610 Regulated PAHs

Column: **Agilent J&W Select PAH, 30 m x 0.25 mm, 0.15 µm (Agilent Part No. CP7462)**

Conditions

Instrument: 450-GC/320-MS

Injection: 1 µL

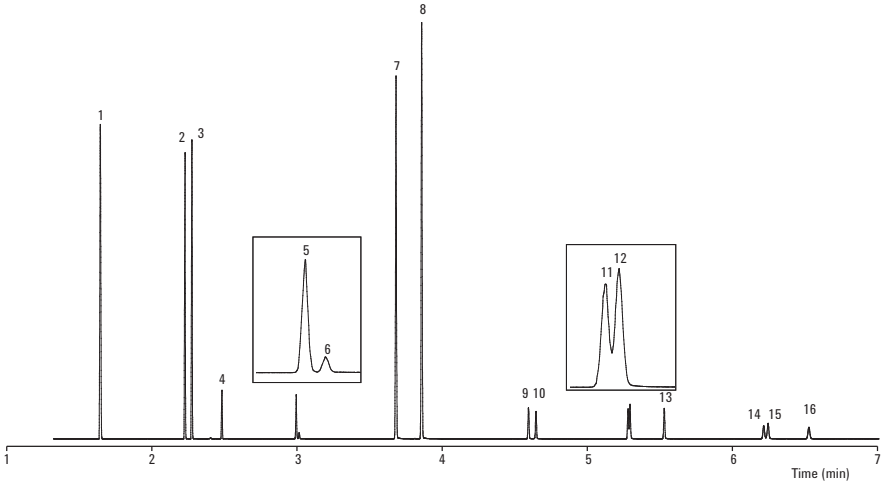
Temperature: 70 °C (0.80 min), 60 °C/min, 180 °C, 20 °C/min 350 °C (5 min)

Carrier Gas: Helium, constant flow 2.0 mL/min

Injector: 300 °C, Splitless mode, 0.75 min @ 50 mL/min

Detector: Triple Quad 320-MS, EI in SIM mode, ion source 275 °C, transfer line 300 °C

Sample: SRM 1647c, concentration appr. 0.8-21 µg/mL (www.nist.com)



Peak identification

1. Naphtalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benz[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[a]pyrene
14. Indeno[1,2,3-cd]pyrene
15. Dibenz[a,h]anthracene
16. Benzo[ghi]perylene

*Many polycyclic aromatic hydrocarbons (PAHs) have the same mass, making GC/MS separation difficult. The enhanced resolution of **Agilent J&W Select PAH columns** prevent co-elution of interfering PAHs that can cause false positives and inaccurate results.*

Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at **www.agilent.com/chem/sampleprep**

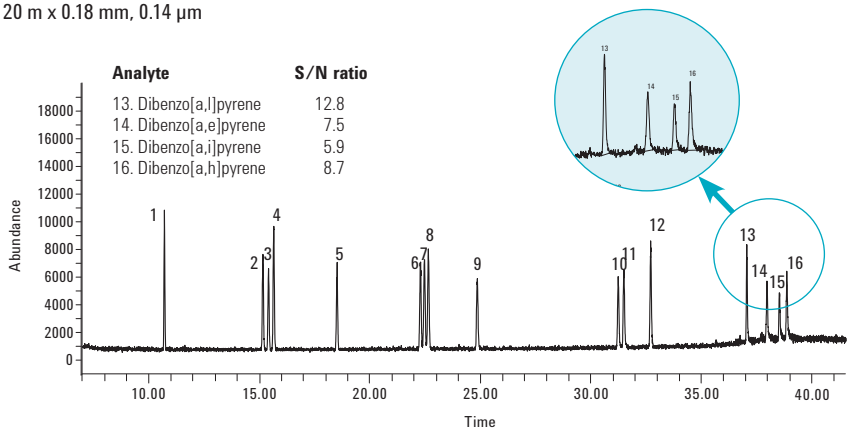
Agilent J&W DB-EUPAH GC columns clearly surpass the competition in detecting dangerous PAHs

Performance Comparison for 15+1 EU-Regulated Priority PAHs

Column: 1 Agilent J&W DB-EUPAH 20 m x 0.18 mm, 0.14 µm, (Agilent Part No. 121-9627)
Column: 2 Restek Rxi-17 20 m x 0.18 mm, 0.18 µm (results on page 20)
Conditions

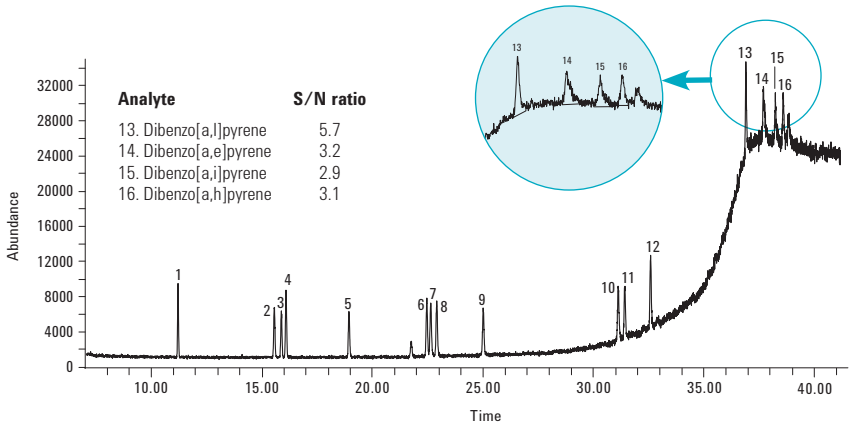
Instrument: Agilent 6890N/5975B MSD
Sampler: Agilent 7683B, 5.0 µL syringe (Agilent Part No. 5181-1273) 0.5 µL splitless injection, injection speed 75 µL/min
Carrier: Helium, ramped flow 1.0 mL/min (0.2 min), 5 mL/min 2 to 1.7 mL/min
Inlet: 325 °C splitless, purge flow 60 mL/min at 0.8 min
Oven: 45 °C (0.8 min) to 200 °C (45 °C/min), 2.5 °C/min to 225 °C, 3 °C/min to 266 °C, 5 °C/min to 300 °C, 10 °C/min to 320 °C (4.5 min)
Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 330 °C, Scan range 50-550 AMU

Agilent J&W DB-EUPAH
20 m x 0.18 mm, 0.14 µm



*In the chromatogram above, all 15+1 EU-regulated priority PAHs are well resolved with the **Agilent J&W DB-EUPAH column**. Challenging Benzo[b,k,j]fluoranthene isomers are baseline resolved, allowing accurate quantitation of each isomer. Baseline resolution is also achieved for three critical pairs: benz[a]anthracene and cyclopenta[c,d]pyrene, cyclopenta[c,d]pyrene and chrysene, and indeno[1,2,3-cd]pyrene and dibenzo[a,h]anthracene.*

Restek Rxi-17
20 m x 0.18 mm, 0.18 µm



Peak identification

1. Benzo[c]fluorene
2. Benz[a]anthracene
3. Cyclopenta[c,d]pyrene
4. Chrysene
5. 5-Methylchrysene
6. Benzo[b]fluoranthene
7. Benzo[k]fluoranthene
8. Benzo[j]fluoranthene
9. Benz[a]pyrene
10. Indeno[1,2,3-cd]pyrene
11. Dibenzo[a,h]anthracene
12. Benzo[g,h,i]perylene
13. Dibenzo[a,l]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo[a,i]pyrene
16. Dibenzo[a,h]pyrene

Here, the Restek Rxi-17 column shows significantly higher bleed than the DB-EUPAH column, even at 320°C. As a result, the signal-to-noise ratios are less than half of those achieved by the DB-EUPAH columns. The Rxi-17 column's excess bleed at higher temperatures makes trace-level detection difficult and unreliable for the four late-eluting dibenzopyrene isomers.

*With its higher upper temperature limit, superior thermal stability and greater column inertness, the **Agilent J&W DB-EUPAH column** improves peak shape and sensitivity. This translates to consistently lower detection limits – a **must** for analyzing EU-priority PAHs.*

Ensure the highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at **www.agilent.com/chem/gasclean**

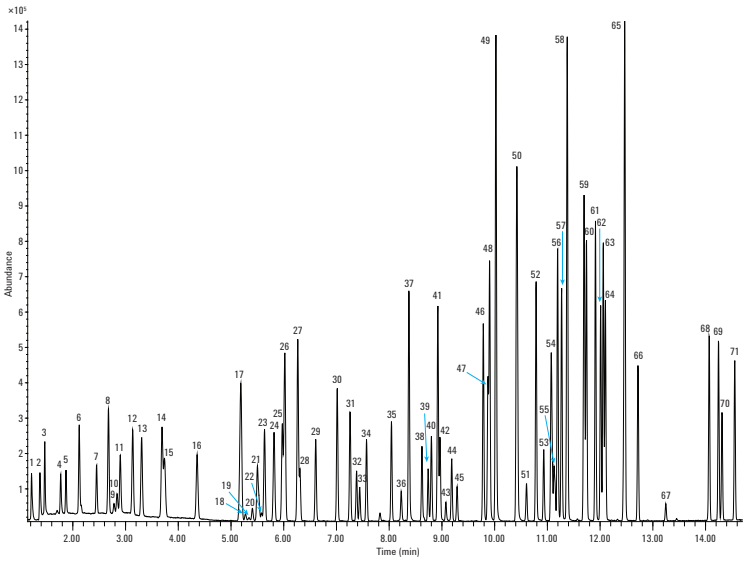
Lower detection limits (PPT/PPQ levels)

Total Ion Chromatogram of EPA Method 524.2 ICAL standard

Column: **Agilent J&W DB-624UI, Agilent Part No. 121-1324UI**
20 m x 0.18 mm id, 1.0 µm

Conditions

Sampler:	Purge and Trap (Teledyne Tekmar Atomx)
Preheat:	245 ºC
Desorb Temp:	250 ºC for 4 minutes
P&T Transfer line:	125 ºC
Trap:	VOCARB 3000
Carrier:	Helium, 0.7 mL/min constant flow mode
Injection:	Split, 150:1 at 200 °C
Liner:	Single taper 1 mm Ultra Inert p/n 5190-4047
Oven:	35 °C hold 4 minutes, 15 °C/min to 240 °C hold 0.33 minutes
Detector:	MSD, transferline at 250 °C Scan parameters 35-360 amu
Sample:	5 mL sample EPA 524.2 VOCs, 1 ppb each compound



Peak identification

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile, trans-1,2-dichloroethene
15. Methyl tert-butyl ether (MTBE)
16. 1,1-Dichloroethane
17. 2,2-Dichloropropane, cis-1,2-Dichloroethene
18. 2-Butanone (MEK)
19. Propionitrile
20. Methyl acrylate
21. Bromochloromethane, Methacrylonitrile
22. THF
23. Chloroform
24. 1,1,1-Trichloroethane
25. 1-Chlorobutane
26. Carbon tetrachloride, 1,1-Dichloro-1-propene
27. Benzene
28. 1,2-Dichloroethane
29. Fluorobenzene
30. Trichloroethene
31. 1,2-Dichloropropane
32. Dibromomethane
33. Methyl methacrylate
34. Bromodichloromethane
35. cis-1,3-Dichloropropene
36. 1,1-Dichloropropanone, 2-Nitropropane, 4-methyl-2-pentanone (MIBK)
37. Toluene
38. trans-1,3-Dichloropropene
39. Ethyl methacrylate
40. 1,1,2-Trichloroethane
41. Tetrachloroethene
42. 1,3-Dichloropropane
43. 2-Hexanone
44. Dibromochloromethane
45. 1,2-Dibromoethane
46. Chlorobenzene
47. 1,1,1,2-Tetrachloroethane
48. Ethylbenzene
49. m+p-Xylene
50. o-Xylene, Styrene
51. Bromoform
52. Isopropylbenzene
53. Bromofluorobenzene
54. Bromobenzene, 1,1,2,2-Tetrachloroethane
55. 1,2,3-Trichloropropane, trans-1,4-Dichloro-2-butene
56. n-Propylbenzene
57. 2-Chlorotoluene
58. 1,3,5-Trimethylbenzene, 4-Chlorotoluene
59. tert-Butylbenzene
60. 1,2,4-Trimethylbenzene
61. sec-Butylbenzene
62. 1,3-Dichlorobenzene
63. p-Isoproyltoluene
64. 1,4-Dichlorobenzene
65. 1,2-Dichlorobenzene-d4, 1,2-Dichlorobenzene, n-Butylbenzene
66. Hexachloroethane
67. 1,2-Dibromo-3-chloropropane (DBCP)
68. 1,2,4-Trichlorobenzene
69. Hexachlorobutadiene
70. Naphthalene
71. 1,2,3-Trichlorobenzene

*The **Agilent J&W DB-624UI GC column** provided excellent stability, robustness, and peak shape – lowering detection limits to PPT or PPQ levels.*

For more details on optimizing your GC/MS volatiles analyses, visit **www.agilent.com/chem/library** and search for **Agilent Application Note 5995-0029EN**

EPA Method 504.1 Analytical Results

EPA Method 504.1 - 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (123TCP)

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232, 30 m x 0.32 mm id; 0.25 µm film

Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film

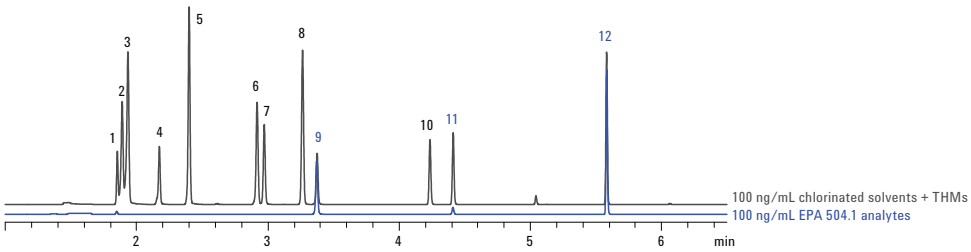
Conditions

Carrier:	Helium, constant flow, 3.75 mL/min
Injection temperature:	200 °C
Injection:	2 µL, splitless
Oven:	50 °C, hold 1.5 min, 20 °C/min to 95 °C, 40 °C/min to 175 °C, hold 1.25 min
Detector:	µECD, 300 °C
Sample:	100 ng/mL EPA 504.1 analytes, 100 ng/mL chlorinated solvents + trihalomethanes

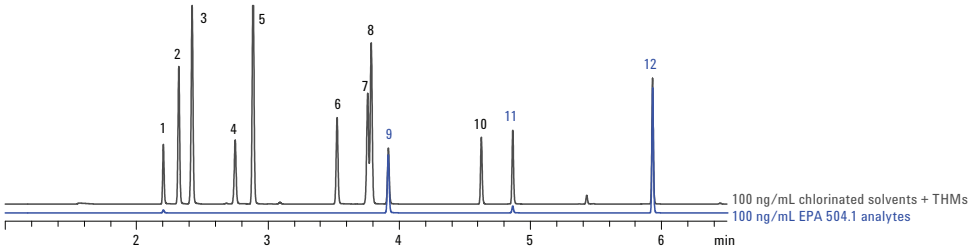
Peak identification

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroethene
5. Bromodichloromethane
6. Tetrachloroethene
7. 1,1,2-Trichloroethane
8. Dibromochloromethane
9. 1,2-Dibromoethane (EDB)
10. Bromoform
11. 1,2,3-Trichloropropane (123TCP)
12. 1,2-Dibromo-3-chloropropane (DBCP

Agilent J&W DB-CLP1



Agilent J&W DB-CLP2



Agilent J&W CLP1/CLP2 columns *analyze 1,2-dibromoethane (EDB), 1,2-dibromo-3-chloropropane (DBCP), and 1,2,3-trichloropropane (123TCP) according to EPA Method 504.1, with cooler analysis temperatures allowing a faster GC cycle time.*

Confirmed speed and accuracy for VOCs

High Speed VOC, EPA Method 8260

Column: **Agilent J&W DB-VRX Agilent Part No. 121-1524, 20 m x 0.18 mm, 1.00 µm**

Conditions

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven: 45 °C for 3.0 minutes
45-190 °C at 36 °C/min
190-225 °C at 20 °C/min
225 °C for 0.5 min

Sampler: Purge and Trap (Tekmar 3100)
Purge: 11 min
Trap: Vocarb 3000
Preheat: 245 °C
Desorb: 250 °C for 1min
Bake: 260 °C for 10 min
Line & valve: 100 °C

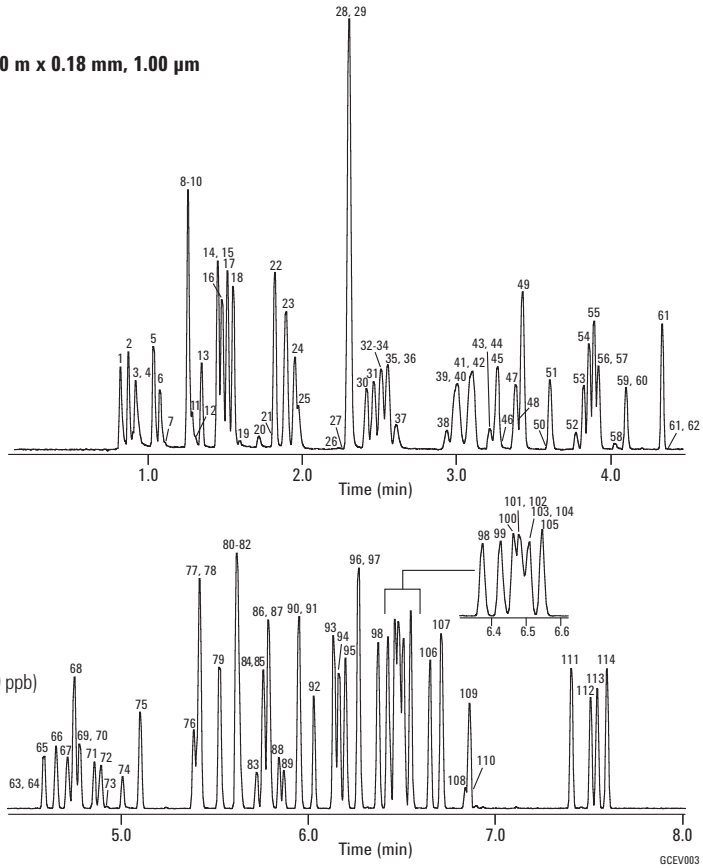
Injection: Split, 150 °C
Split ratio 60:1

Detector: Agilent 5973 MSD,
Scan range: 35-260 amu
Scan rate: 3.25 scans/sec
Quad temperature: 150 °C
Source temperature: 200 °C
Transfer line temp: 200 °C

Sample: 5 mL
- Halogentated and aromatic analytes at 40 ppb
- Internal standards at 20 ppb
- Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)

Suggested Supplies:

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885



Peak identification

1. Dichlorodifluoromethane
2. Chloromethane
3. Hydroxypropionitrile
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Ethanol
8. Acetonitrile
9. Acrolein
10. Trichlorofluoromethane
11. Isopropyl alcohol
12. Acetone
13. Ethyl ether
14. 1,1-Dichloroethene
15. tert-Butyl alcohol
16. Acrylonitrile
17. Methylene chloride
18. Allyl chloride
19. Allyl alcohol
20. 1-Propanol
21. Propargyl alcohol
22. trans-1,2-Dichloroethene
23. MTBE
24. 1,1-Dichloroethane
25. Propionitrile
26. 2-Butanone
27. Diisopropyl ether
28. cis-1,2-Dichloroethene
29. Methacrylonitrile
30. Bromochloromethane
31. Chloroform
32. 2,2-Dichloropropane
33. Ethyl acetate
34. Ethyl-tert-butyl ether
35. Methyl acrylate
36. Dibromofluoromethane (IS)
37. Isobutanol
38. Dichloroethane-d4 (IS)
39. Pentafluorobenzene
40. 1,2-Dichloroethane
41. 1,1,1-Trichloroethane
42. 1-Chlorobutane
43. Crotonaldehyde
44. 2-Chloroethanol
45. 1,1-Dichloropropene
46. 1-Butanol
47. Carbon tetrachloride
48. Chloroacetonitrile
49. Benzene
50. tert-Amylmethyl ether
51. Fluorobenzene (IS)
52. 2-Pentanone
53. Dibromomethane
54. 1,2-Dichloropropane
55. Trichloroethene
56. Bromodichloromethane
57. 2-Nitropropane
58. 1,4-Dioxane
59. Epichlorohydrin
60. Methyl methacrylate
61. cis-1,3-Dichloropropene
62. Propiolactone
63. Bromoacetone
64. Pyridine
65. trans-1,3-Dichloropropene
66. 1,1,2-Trichloroethane
67. Toluene-d8 (IS)
68. Toluene
69. 1,3-Dichloropropane
70. Paraldehyde
71. Ethyl methacrylate
72. Dibromochloromethane
73. 3-Chloropropionitrile
74. 1,2-Dibromoethane
75. Tetrachloroethene
76. 1,1,1,2-Tetrachloroethane
77. 1-Chlorohexane
78. Chlorobenzene
79. Ethylbenzene
80. Bromoform
81. m-Xylene
82. p-Xylene
83. trans-Dichlorobutene
84. 1,3-Dichloro-2-propanol
85. Styrene
86. 1,1,2,2-Tetrachloroethane
87. o-Xylene
88. 1,2,3-Trichlropropane
89. cis-Dichlorobutene
90. 4-Bromofluorobenzene (IS)
91. Isopropylbenzene
92. Bromobenzene
93. Propylbenzene
94. 2-Chlorotoluene
95. 4-Chlorotoluene
96. 1,3,5-Trimethylbenzene
97. Pentachloroethane
98. tert-Butylbenzene
99. 1,2,4-Trimethylbenzene
100. sec-Butylbenzene
101. 1,3-Dichlorobenzene
102. Benzylchloride
103. 1,4-Dichlorobenzene-d4 (IS)
104. 1,4-Dichlorobenzene
105. Isopropyltoluene
106. 1,2-Dichlorobenzene
107. Butylbenzene
108. 1,2-Dibromo-3-chloropropane
109. Hexachloroethane
110. Nitrobenzene
111. 1,2,4-Trichlorobenzene
112. Naphthalene
113. Hexachlorobutadiene
114. 1,2,3-Trichlorobenzene

IS – Internal Standard

114 VOCs resolved in under 8 minutes EPA Method 8260 with P&T sample introduction is one of the most widely used water analysis methods. As the chromatogram above demonstrates, ***Agilent J&W DB-VRX columns*** *ensure the fewest chromatographic coelutions and the highest degree of mass spectral integrity for VOC analysis.*

EPA Volatiles by GC/MS (Split Injector)

Column: Agilent J&W DB-VRX, Agilent Part No. 122-1564, 60 m x 0.25 mm, 1.40 µm

Conditions

Carrier: Helium at 30 cm/sec, measured at 45 °C

Oven: 45 °C for 10 min, 45-190 °C at 12 °/min, 190 °C for 2 min
190-225 °C at 6 °C/min, 225 °C for 1 min

Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C, Split flow 30 mL/min

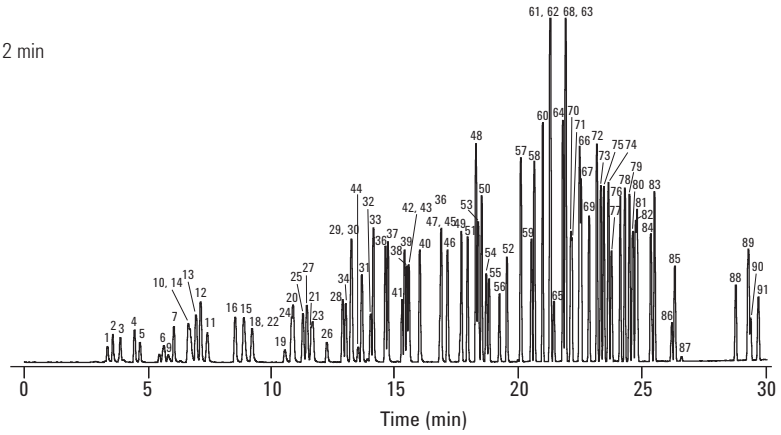
Detector: MSD, 235 °C transfer line scan 35-260 amu
(m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal kit, 5188-5367



Column: Agilent J&W DB-624, Agilent Part No. 122-1364, 60 m x 0.25 mm, 1.40 µm

Conditions

Carrier: Helium at 31 cm/sec, measured at 40 °C

Oven: 45 °C for 3 min, 45-90 °C at 8 °/min, 90 °C for 4 min
90-200 °C at 6 °C/min, 200 °C for 5 min

Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C, Split flow 30 mL/min

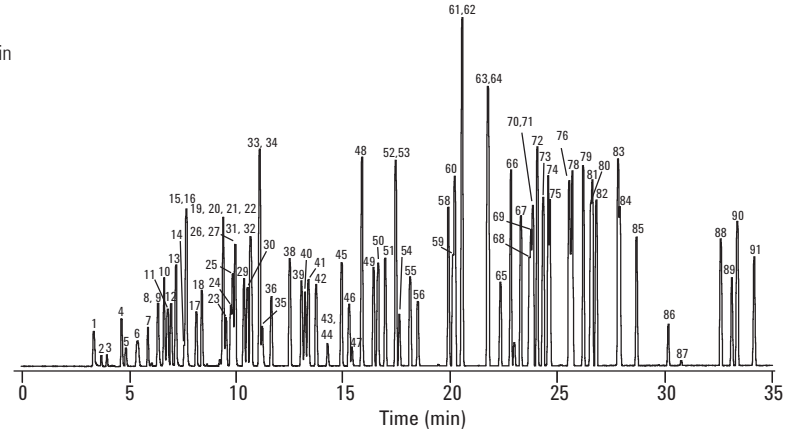
Detector: MSD, 235 °C transfer line, Full scan 35-260 amu
(m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal kit, 5188-5367



Peak identification

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile
15. Methyl-tert-butyl ether
16. trans-1,2-Dichloroethene
17. Hexane
18. 1,1-Dichloroethane
19. 2-Butanone
20. cis-1,2-Dichloroethene
21. 2,2-Dichloropropane
22. Propionitrile
23. Methyl acrylate
24. Methacrylonitrile
25. Bromochloromethane
26. Tetrahydrofuran
27. Chloroform
28. Pentafluorobenzene (IS)
29. 1,1,1-Trichloroethane
30. 1-Chlorobutane
31. 1,1-Dichloropropene
32. Carbon tetrachloride
33. Benzene
34. 1,2-Dichloroethane
35. 2,2-Dimethylhexane
36. Fluorobenzene (IS)
37. 1,4-Difluorobenzene (IS)
38. Trichloroethene
39. 1,2-Dichloropropane
40. Methyl methacrylate
41. Dibromomethane
42. Bromodichloromethane
43. 2-Nitropropane
44. Chloroacetonitrile
45. cis-1,3-Dichloropropene
46. 4-Methyl-2-pentanone
47. 1,1-Dichloro-2-propanone
48. Toluene
49. trans-1,3-Dichloropropene
50. Ethyl methacrylate
51. 1,1,2-Trichloroethane
52. Tetrachloroethene
53. 1,3-Dichloropropane
54. 2-Hexanone
55. Dibromochloromethane
56. 1,2-Dibromoethane
57. 1-Chloro-3-fluorobenzene (IS)
58. Chlorobenzene
59. 1,1,1,2-Tetrachloroethane
60. Ethylbenzene
81. p-Isopropyltoluene
82. 1,4-Dichlorobenzene
83. n-Butylbenzene
84. 1,2-Dichlorobenzene
85. Hexachloroethane
86. 1,2-Dibromo-3-chloropropane
87. Nitrobenzene
88. 1,2,4-Trichlorobenzene
89. Hexachlorobutadiene
90. Naphthalene
91. 1,2,3-Trichlorobenzene

IS - Internal Standard
SS - Surrogate Standard

Note: Some compounds not present in both chromatograms

***Agilent J&W DB-VRX and DB-624GC columns** are optimized for fast analysis of volatile compounds, and are ideal for environmental and chemical samples with unknown components.*

C_1 and C_2 Halocarbons (Freons)

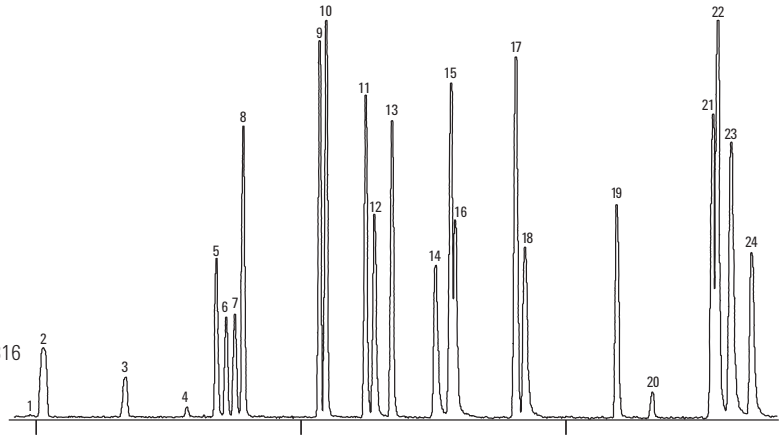
Column: **Agilent J&W GS-GasPro, Agilent Part No. 113-4362, 60 m x 0.32 mm, 1.40 µm**

Conditions

Carrier:	Helium at 35 cm/sec, constant velocity
Oven:	40 °C for 2 min, 40-120 °C at 10 °C/min
	120 °C for 3 min, 120-200 °C at 10 °C/min
Injection:	Splitless, 250 °C
	0.20 min purge activation time
Detector:	MSD, 280 °C,
	full scan 45-180 amu
Sample:	1.0 µL of 100 ppm mixture of AccuStandard M-REF & M-REF-X in methanol

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal:	Gold plated seal, 18740-20885
Syringe:	10 µL tapered, FN 23-26s/42/HP, 5181-1267



Peak identification

		Freon #
1.	Chlorotrifluoromethane*	13
2.	Trifluoromethane	23
3.	Bromotrifluoromethane	13B1
4.	Chloropentafluoroethane	115
5.	Pentafluoroethane	125
6.	1,1,1-Trifluoroethane	143a
7.	Dichlorodifluoromethane	12
8.	Chlorodifluoromethane	22
9.	1,1,1,2-Tetrafluoroethane	134a
10.	Chloromethane	40
11.	1,1,2,2-Tetrafluoroethane	134
12.	Bromochlorodifluoromethane	12B1
13.	1,1-Difluoroethane	152a
14.	1,2-Dichloro-1,1,2,2-tetrafluoroethane	114
15.	2-Chloro-1,1,1,2-tetrafluoroethane	124
16.	1-Chloro-1,1-difluoroethane	142b
17.	Dichlorofluoromethane	21
18.	Trichlorofluoromethane	11
19.	Chloroethane	160
20.	Dichloromethane	30
21.	1,1-Dichloro-1-fluoroethane	141b
22.	2,2-Dichloro-1,1,1-trifluoroethane	123
23.	1,1,2-Trichloro-1,2,2-trifluoroethane	113
24.	1,2-Dibromo-1,1,2,2-tetrafluoroethane	114B2

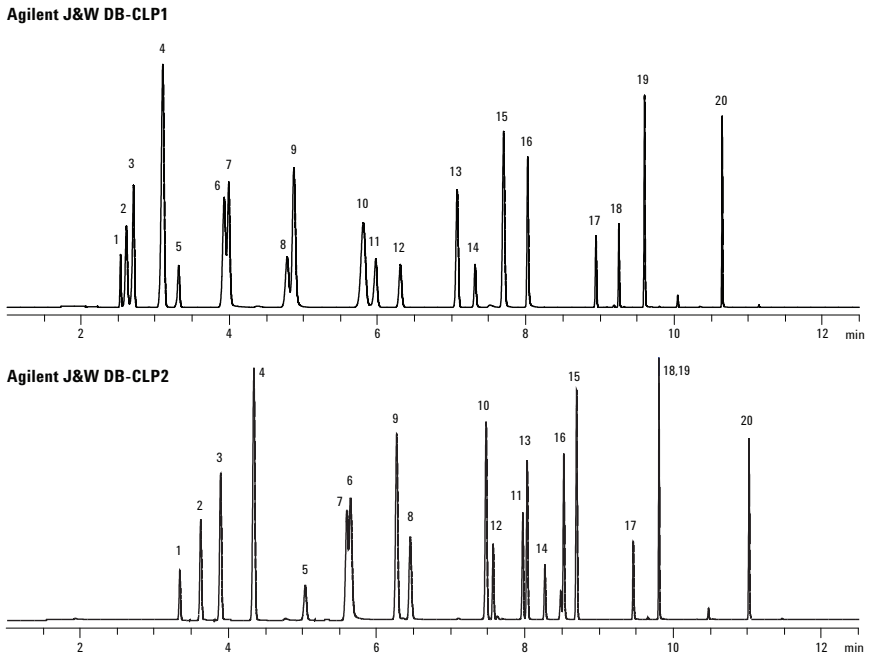
*Peak not shown

Ultimate confidence for EPA dual-ECD pesticide applications

EPA Method 551-Chlorinated Solvents, Trihalomethanes (THMs), and Disinfection Byproducts (DBPs)

Column 1: Agilent J&W DB-CLP1, Agilent Part No. 123-8232 30 m x 0.32 mm id; 0.25 µm film
Column 2: Agilent J&W DB-CLP2, Agilent Part No. 123-8336, 30 m x 0.32 mm id; 0.50 µm film
Conditions

Carrier:	Helium, constant flow, 45 cm/s
Injection temperature:	200 °C
Injection:	2 µL, splitless
Oven:	35 °C, hold 5.75 min, 20 °C/min to 95 °C, 40 °C/min to 200 °C, hold 1.25 min
Detector:	µECD, 300 °C



Peak identification

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroacetonitrile
5. Trichloroethene
6. Chloral hydrate
7. Bromodichloromethane
8. 1,1-Dichloro-2-propanone
9. Dichloroacetonitrile
10. Chloropicrin
11. Tetrachloroethene
12. 1,1,2-Trichloroethane
13. Dibromochloromethane
14. 1,2-Dibromoethane
15. 1,1,1-Trichloro-2-propanone
16. Bromochloroacetonitrile
17. Bromoform
18. 1,2,3-Trichloropropane
19. Dibromoacetonitrile
20. 1,2-Dibromo-3-chloropropane

*Here, the **Agilent J&W CLP1/CLP2 columns** separated all 20 EPA Method 551 analytes in only 11 minutes.*

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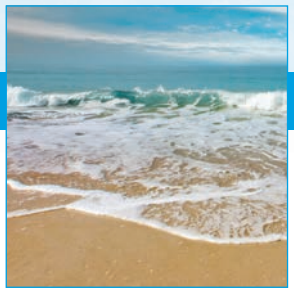

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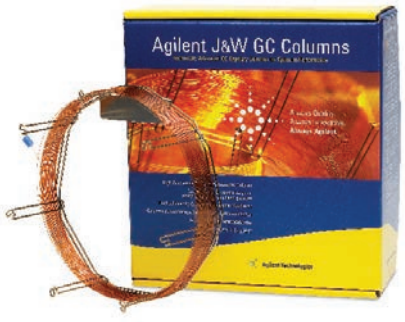

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Printed in the USA August 28, 2012
5990-5873EN

Agilent Technologies