# Increasing Sample Throughput with High-Speed Megabore Columns

## Application

### Greater than 20% More Plates Per Meter

### Improved Resolution and/or Faster Run Times Compared to 0.53-mm ID Columns

### No Special Hardware Required

Decreasing the diameter of a capillary column is an effective way of increasing column efficiency. This increase in the number of theoretical plates per meter (N/m) can be utilized to improve compound resolution. A significant decrease in analysis time can also be achieved by adjusting the analysis conditions or shortening the column length.

For the chromatographer using Megabore (that is, 0.53-mm ID) columns, going to smaller internal diameter columns has not always been an option, due in part to capacity issues and injector and/or detector hardware incompatibilities. The 0.45-mm ID, High-Speed Megabore column introduces the traditional Megabore chromatographer to a column that can increase the resolution of analytes and/or reduce some analysis times by as much as 45%. Because Agilent's High-Speed Megabore columns retain the same outer diameter as 0.53-mm ID columns, no special ferrules or adaptors are required.

High-Speed Megabore columns also have the same phase ratio (ß) as 0.53-mm ID columns, making it very easy to translate the method conditions. Methods can easily be optimized for speed or resolution using free method translation software available from the Agilent Web site or by speaking with our Technical Support Department (call 800-227-9770 in the U.S. or Canada or visit www.agilent.com/chem).

On average, the High-Speed Megabore provides 24% more theoretical plates per meter than the comparable 0.53-mm ID column (Table 1). At some point, increasing a column's length can begin to work against chromatographic efficiency gain due to high carrier gas pressure drop in long capillaries. This is exemplified with the 105 m, DB-502.2. Figure 1 compares the two DB-502.2 columns for the analysis of volatile organics by purge and trap (for example, EPA Method 502.2). Most notable in these chromatograms are the essentially identical resolution of analytes and the 23-minute decrease in run time with the High-Speed Megabore column.

High-Speed Megabore columns are ideally suited to applications where dual 0.53-mm columns are currently being used. Figure 2a and 2b show one such application.

**Table 1. Column Efficiencies**

| Column phase | Column length | Internal diameter | Film thickness [1] | Plates/meter (% increase) [2] |
|---|---|---|---|---|
| DB-VRX | 75 meters | 0.449 mm | 2.55 µm | 1997 (28) |
| | 75 meters | 0.540 mm | 3.00 µm | 1447 |
| DB-624 | 75 meters | 0.446 mm | 2.55 µm | 1402 (22) |
| | 75 meters | 0.546 mm | 3.00 µm | 1090 |
| DB-502.2 | 75 meters | 0.453 mm | 2.55 µm | 1526 (20) |
| | 105 meters | 0.544 mm | 3.00 µm | 873 |
| DB-WAX | 30 meters | 0.447 mm | 0.85 µm | 1656 (25) |
| | 30 meters | 0.544 mm | 1.00 µm | 1357 |
| DB-1 | 30 meters | 0.455 mm | 1.30 µm | 1477 (27) |
| | 30 meters | 0.551 mm | 1.50 µm | 1357 |
| DB-5 | 30 meters | 0.446 mm | 1.30 µm | 1895 (23) |
| | 30 meters | 0.540 mm | 1.50 µm | 1454 |
| DB-608 | 30 meters | 0.450 mm | 0.71 µm | 1477 (23) |
| | 30 meters | 0.535 mm | 0.83 µm | 1134 |

[1] Phase ratio (ß) held constant for all columns

[2] Average 24%

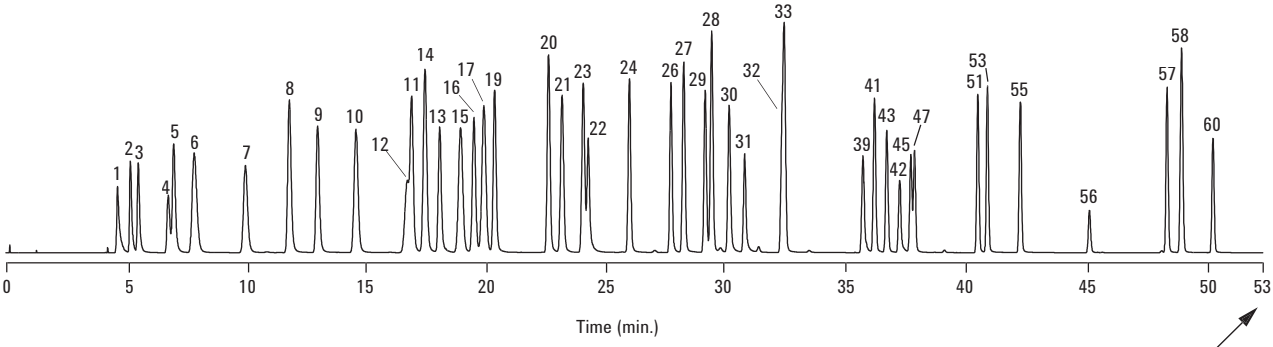
## Compound List for all Chromatograms

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene chloride
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. cis-1,2-Dichlorethene
12. 2,2-Dichloropropane
13. Bromochloromethane
14. Chloroform
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon Tetrachloride
18. Benzene
19. 1,2-Dichloroethane
20. Silica trichloroethene
21. 1,2-Dichloropropane
22. Dibromomethane
23. Bromodichloromethane
24. cis-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. Tetrachloroethene
29. 1,3-Dichloropropane
30. Dibromochloromethane
31. 1,2-Dibromomethane
32. Chlorobenzene
33. 1,1,1,2-Tetrachloroethane
34. Ethylbenzene
35. meta-Xylene
36. para-Xylene
37. ortho-Xylene
38. Styrene
39. Bromoform
40. Isopropylbenzene
41. 1,1,2,2-Tetrachloroethane
42. Bromobenzene
43. 1,2,3-Trichloropropane
44. n-Propylbenzene
45. 2-Chlorotoluene
46. 1,2,3-Trimethylbenzene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. 1,3-Dichlorobenzene
52. para-Isopropyltoluene
53. 1,4-Dichlorobenzene
54. n-Butylbenzene
55. 1,2-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropane
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene

**Conditions**

**Column:** **DB-502.2, 105 m x 0.53-mm ID, 3.0 µm**
**Part no.: 125-14A4**
Carrier: Helium at 10 mL/min, measured at 35 °C
Oven: 35 °C for 10 min
35 °C - 200 °C at 4 °C/min
200 °C for 5 min

Injector: Purge and trap (OIA 4560)
40 ppb per component in 5 mL water
Trap: Tenax™/Silica gel/Charcoal
Detector: Electrolytic conductivity detector (ELCD) (OIA 4420) with NiCat™ reaction tube in the halogen mode




**Conditions**

**Column:** **DB-502.2, 75 m x 0.45-mm ID, 2.55 µm**
**Part no.: 124-1474**
Carrier: Helium at 9 mL/min, measured at 35 °C
Oven: 35 °C for 6 min
35 °C - 200 °C at 8 °C/min
200 °C for 3.5 min

Injector: Purge and trap (OIA 4560)
40 ppb per component in 5 mL water
Trap: Tenax/Silica gel/Charcoal
Detector: ELCD (OIA 4420) with NiCat reaction tube in the halogen mode

High-Speed Megabore saves 23 minutes!

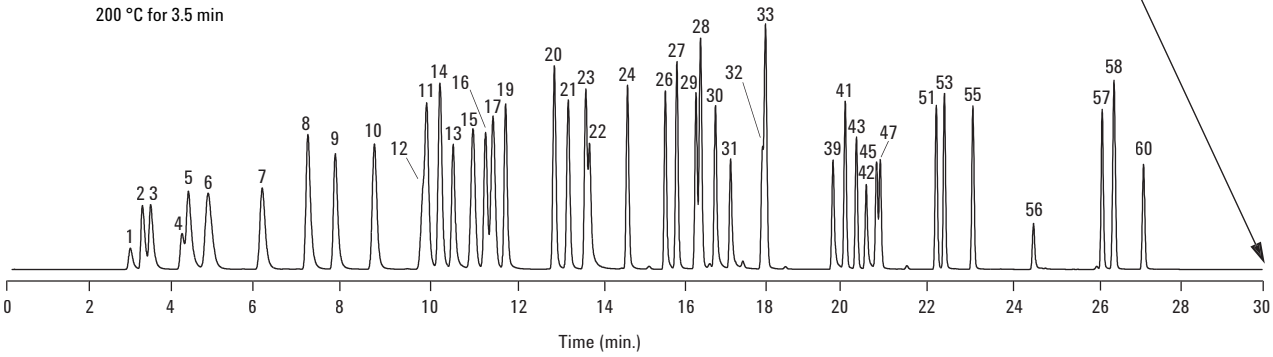



**Figure 1. Analysis time comparison**

**Conditions**
**Figure 2a and 2b**

| | |
|---|---|
| Columns: | **DB-624**<br>75m x 0.45-mm ID, 2.55 µm<br>Part no.: 124-1374<br>**DB-VRX**<br>75m x 0.45-mm ID, 2.55 µm<br>Part no.: 124-1574 |
| Guard Column: | 5m x 0.53-mm ID deactivated fused silica tubing<br>3-way universal glass union |
| Carrier: | Helium at 9 mL/min (18 mL/min total), measured at 35 °C |
| Oven: | 35 °C for 12 min<br>35 °C - 60 °C at 5 °C/min<br>60 °C for 1 min<br>60 °C - 200 °C at 17 °C/min<br>200 °C for 4 min |
| Injector: | Purge and trap (OIA 4560)<br>40 ppb per component in 5 mL water |
| Trap: | Tenax/Silica gel/Charcoal |
| Detector A: | Photoionization detector (PID) (OIA 4430) at 220 °C |
| Detector B: | Electrolytic conductivity detector (ELCD) (OIA 4420) with NiCat reaction tube in the halogen mode |

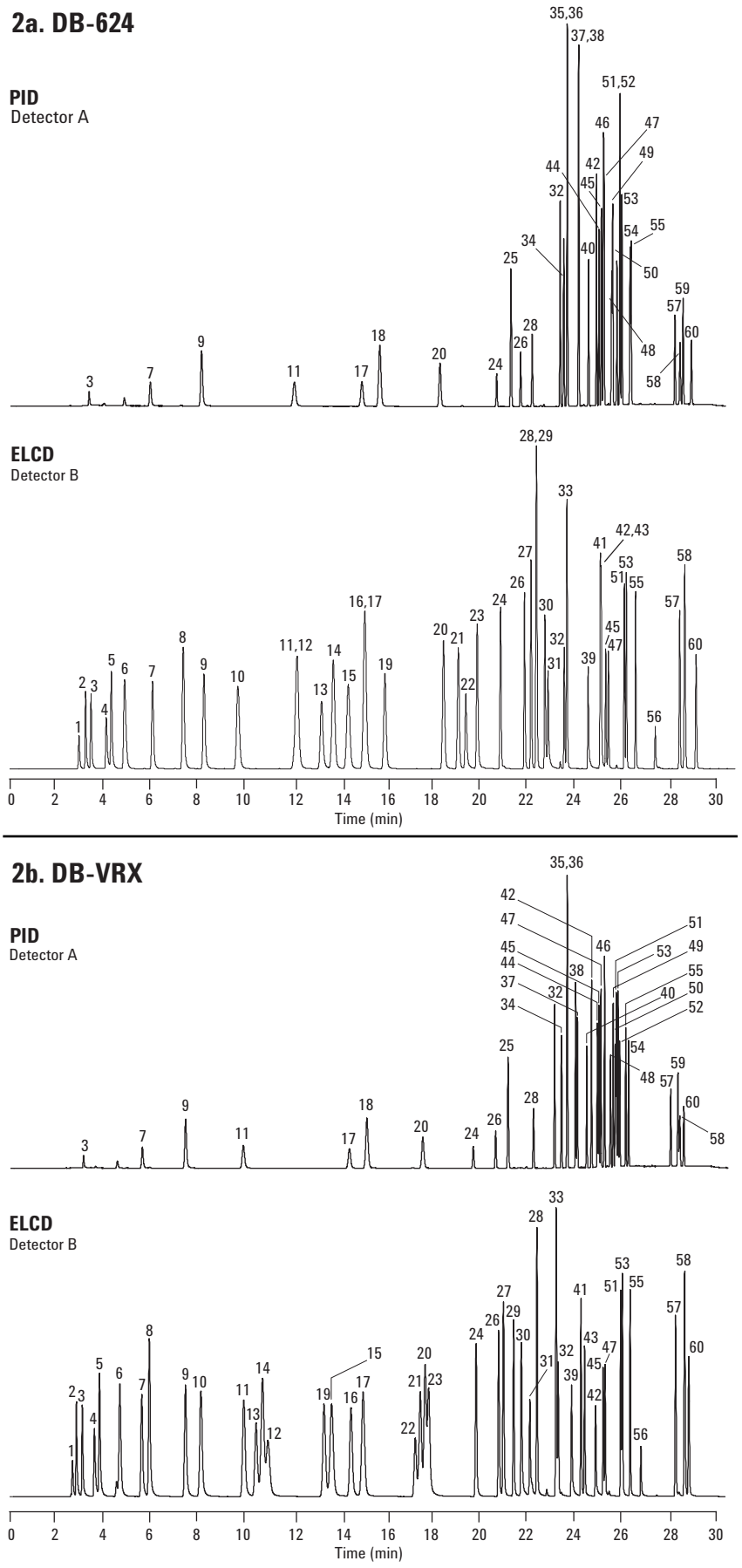



**Figure 2a and 2b. High-Speed Megabore dual column applications.**

# 0.45-mm ID High-Speed Megabore Column Order Guide

| Phase[1] | Inner diameter (mm) | Length (meter) | Film thickness (µm) | Temperature limits (°C) | Part number |
|---|---|---|---|---|---|
| DB-1 | 0.45 | 15 | 1.27 | -60 to 300/320 | 124-1012 |
| DB-1 | 0.45 | 15 | 2.55 | -60 to 260/280 | 124-1014 |
| DB-1 | 0.45 | 30 | 0.42 | -60 to 300/320 | 124-1037 |
| DB-1 | 0.45 | 30 | 1.27 | -60 to 300/320 | 124-1032 |
| DB-1 | 0.45 | 30 | 2.55 | -60 to 260/280 | 124-1034 |
| DB-1 | 0.45 | 30 | 4.25 | -60 to 260/280 | 124-1005 |
| DB-1 | 0.45 | 60 | 1.27 | -60 to 300/320 | 124-1062 |
| DB-5 | 0.45 | 15 | 1.27 | -60 to 300/320 | 124-5012 |
| DB-5 | 0.45 | 30 | 0.42 | -60 to 300/320 | 124-5037 |
| DB-5 | 0.45 | 30 | 1.27 | -60 to 300/320 | 124-5032 |
| DB-5 | 0.45 | 30 | 4.25 | -60 to 260/280 | 124-5035 |
| DB-17 | 0.45 | 15 | 0.85 | 40 to 260/280 | 124-1712 |
| DB-17 | 0.45 | 30 | 0.85 | 40 to 260/280 | 124-1732 |
| DB-1701 | 0.45 | 30 | 0.42 | -20 to 260/280 | 124-0737 |
| DB-1701 | 0.45 | 30 | 0.85 | -20 to 260/280 | 124-0732 |
| DB-200 | 0.45 | 30 | 0.85 | 30 to 280/300 | 124-2032 |
| DB-210 | 0.45 | 30 | 0.85 | 45 to 220/240 | 124-0232 |
| DB-2887 | 0.45 | 10 | 2.55 | -60 to 350 | 124-2814 |
| DB-502.2 | 0.45 | 75 | 2.55 | 0 to 260/280 | 124-1474 |
| DB-502.2 | 0.45 | 105 | 2.55 | 0 to 260/280 | 124-14A4 |
| DB-608 | 0.45 | 30 | 0.42 | 40 to 260/280 | 124-6837 |
| DB-608 | 0.45 | 30 | 0.70 | 40 to 260/280 | 124-1730 |
| DB-624 | 0.45 | 30 | 2.55 | -20 to 260 | 124-1334 |
| DB-624 | 0.45 | 75 | 2.55 | -20 to 260 | 124-1374 |
| DB-FFAP | 0.45 | 15 | 0.85 | 40 to 250/250 | 124-3212 |
| DB-FFAP | 0.45 | 30 | 0.85 | 40 to 250 | 124-3232 |
| DB-MTBE | 0.45 | 30 | 2.55 | 35 to 260/280 | 124-0034 |
| DB-TPH | 0.45 | 30 | 1.00 | -10 to 290/290 | 124-1632 |
| DB-VRX | 0.45 | 30 | 2.55 | -10 to 260 | 124-1534 |
| DB-VRX | 0.45 | 75 | 2.55 | -10 to 260 | 124-1574 |
| DB-WAX | 0.45 | 60 | 0.85 | 20 to 230/240 | 124-7062 |
| DB-WAX | 0.45 | 15 | 0.85 | 20 to 230/240 | 124-7012 |
| DB-WAX | 0.45 | 30 | 0.85 | 20 to 230/240 | 124-7032 |
| DB-WAXetr | 0.45 | 5 | 1.70 | 50 to 230/250 | 124-7304 |
| DB-XLB | 0.45 | 30 | 1.27 | 30 to 320/340 | 124-1232 |

[1]Additional phases, lengths, and film thickness can be made with a 0.45-mm ID High-Speed Megabore column. If you do not find the column you are looking for, ask for a custom column quote (order part number 100-2000 and specify the phase, ID, length, and film thickness).

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