# Tips for Using Method Translation Software

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The Method Translation Software is available free from Agilent. It can be downloaded by visiting www.agilent.com/chem/methodtranslation

Agilent J&W High Efficiency columns are GC columns with a 0.18 mm internal diameter. They are available in most stationary phases. Transferring your method from a .25 mm ID column can save 30% - 90% analysis time.

## IMPORTANT BACKGROUND INFORMATION ABOUT GAS CHROMATOGRAPHY:

Variables You Can Change to Shorten Run Times:

- Shorten Column Length
- Decrease Internal Diameter
- Change Temperature Programming
- Change Carrier Gas: Type and Linear Velocity

The ways these variables impact your analysis can be seen in the Simplified Resolution Equation:

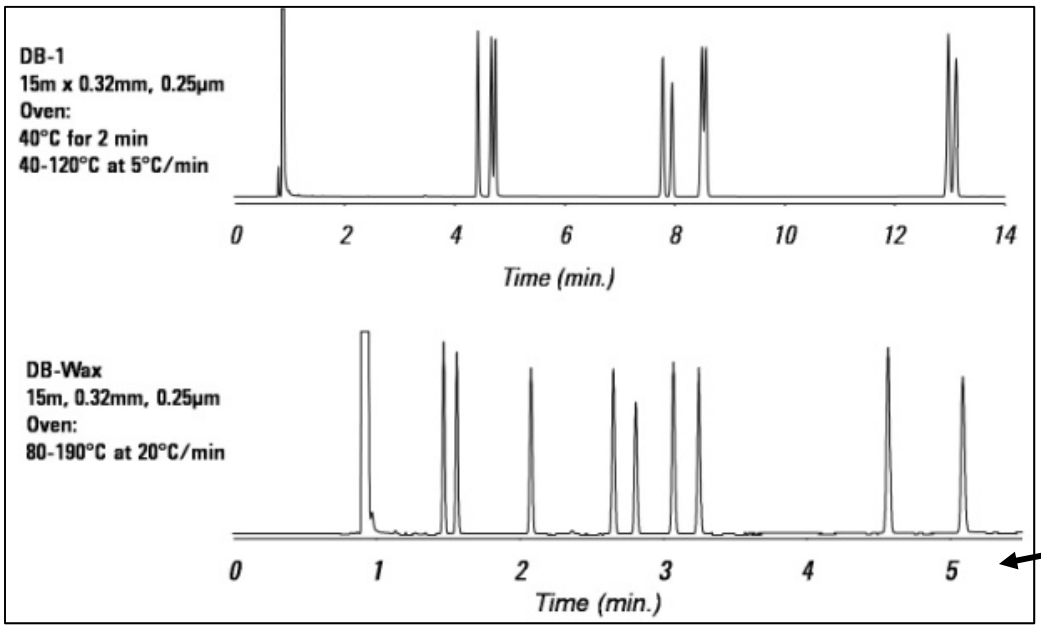
$$R_s = \frac{\sqrt{N}}{4}\left(\frac{k}{k+1}\right)\left(\frac{\alpha-1}{\alpha}\right)$$

Efficiency N= ***f*** (gas, L, $R_C$)
Retention k = ***f*** (T, $d_f$, $r_c$)
Selectivity a = ***f*** (T, phase)

L = column length
$R_C$ = column radius
$d_f$ = film thickness
T = temperature

## THE IMPORTANCE OF STARTING WITH THE RIGHT PHASE:

Using the optimum stationary phase is going to give you the most resolution in the shortest analysis time. An example of the impact of using the wrong phase follows on the next page.



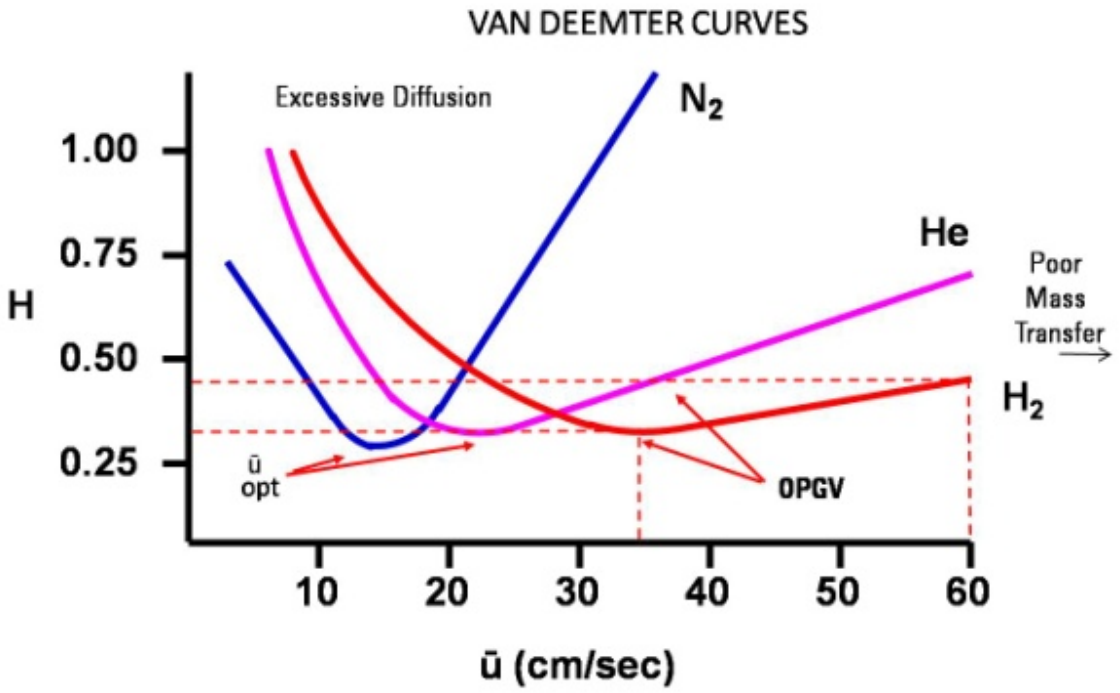

Wrong Phase

**Correct Phase:** Better resolution and shorter analysis time

**For help selecting your column phase, refer to Agilent's publication "GC Column Selection Guide", publication # 5989-6159 which can be ordered at [www.agilent.com/chem/getguides](www.agilent.com/chem/getguides)**

**CARRIER GASES:**

There are optimal ranges of velocities for carrier gases: Too low or too high results in a loss of resolution. You need to balance resolution and analysis time. The VAN DEEMTER curves illustrate the relative efficiency you will realize at various velocities with different gas types.




H = height equivalent of theoretical plates (goal is shorter height, to achieve more plates/meter)

**COLUMN LENGTH**

Efficiency is a direct measure of the column's ability to make a peak very narrow. The higher the number of theoretical plates, the more efficient the column is.

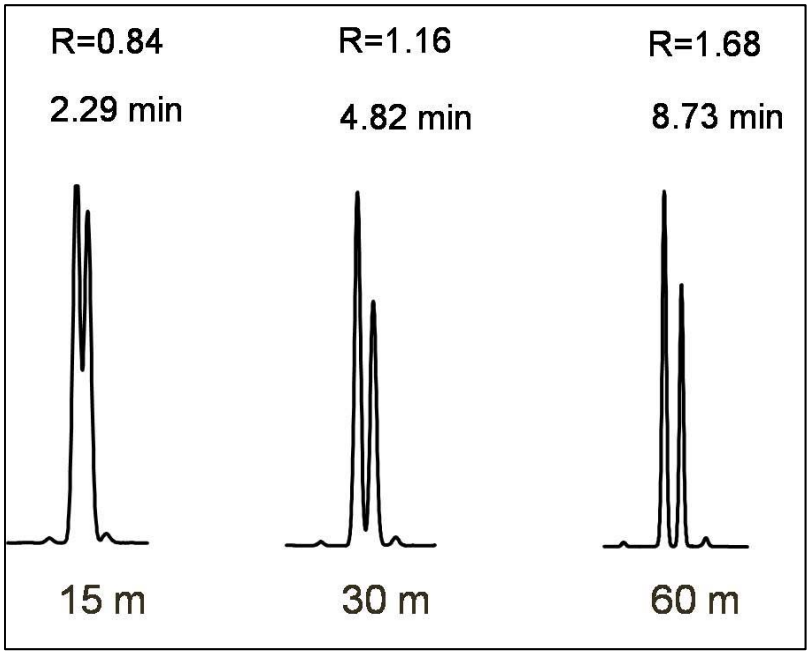
| Length (m) | n |
|---|---|
| 15 | 69,450 |
| 30 | 138,900 |
| 60 | 277,800 |

"n" = number of theoretical plates

There's a square root relationship between length and resolution, so when you double the length, you double the plates, but it takes *four times* the length to double the resolution.

Length x 4 = Resolution x 2

Because of the relationship between length and resolution, the rate of loss of resolution is smaller than the rate of speed gain you'll get when shortening your column. See the comparison chromatogram peaks below for illustration.

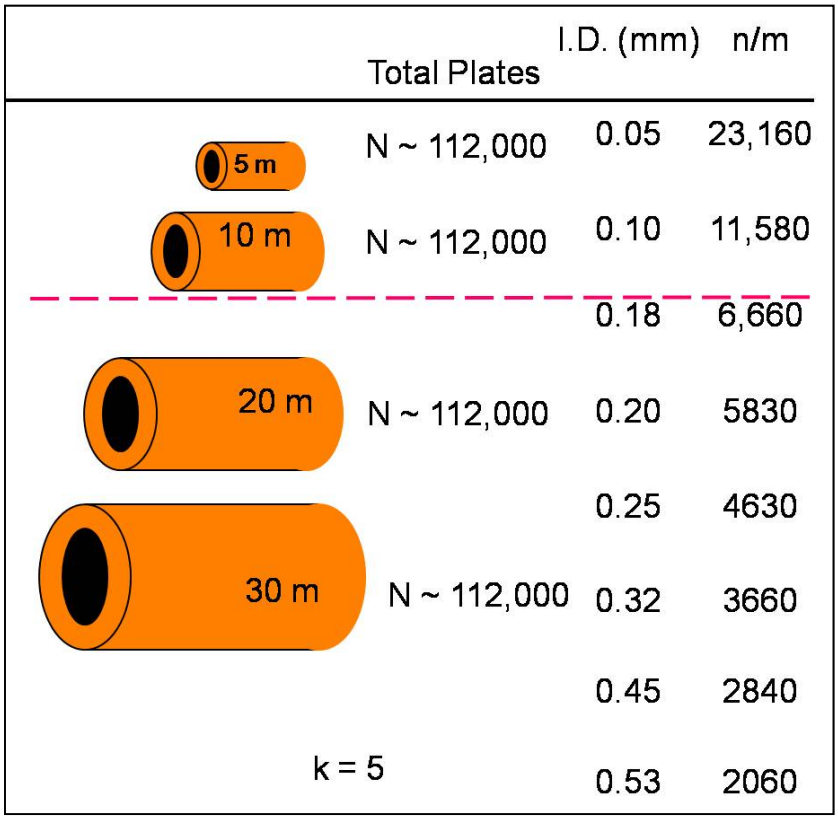



**COLUMN LENGTH: SUMMARY**

If you **decrease** the column length...

Efficiency **decreases**
Resolution **decreases**
Analysis time **decreases**
Cost **decreases**

**COLUMN DIAMETER**




n/m = theoretical plates per meter

**The *combination* of the reduced column length and the narrower radius is what gives you the real power in Fast GC.**

**CONSIDERATIONS: PHASE RATIO**

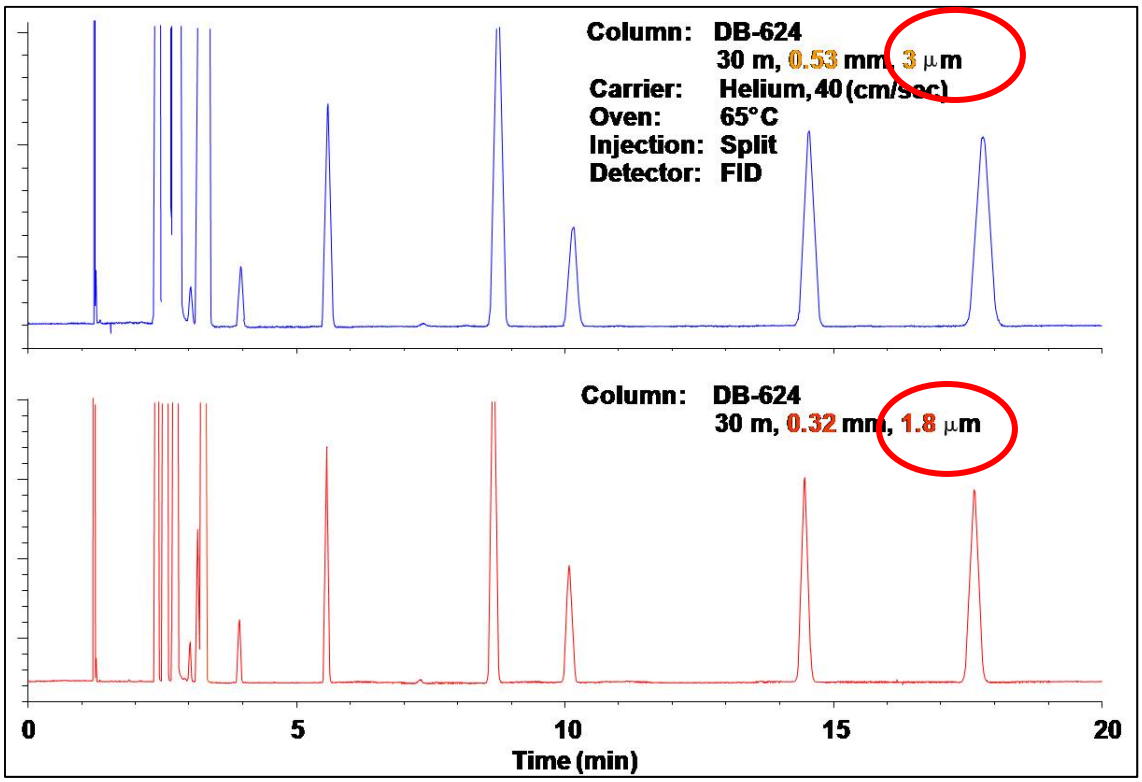
Phase ratios vary depending on column dimensions.

| Column Dimensions | Ratio (β) |
|---|---|
| 30 m x .53 mm x 3.0 µm | 44 |
| 30 m x .32 mm x 1.8 µm | 44 |

$K_C = K_\beta$

$\beta = r / 2d_f$

Film thickness may need to be adjusted for changes in dimension, so that phase ratio stays consistent. This helps ensure consistent results. See the chromatogram that follows for illustration.




**CONSIDERATIONS: CAPACITY**

| I.D. (mm) | Capacity (ng) |
|---|---|
| 0.05 | **1 - 2** |
| 0.10 | **6 - 13** |
| 0.18 | **25 - 55** |
| 0.20 | **35 -70** |
| 0.25 | **80 - 160** |
| 0.32 | **110 - 220** |
| 0.45 | **600 - 800** |
| 0.53 | **1000 - 2000** |

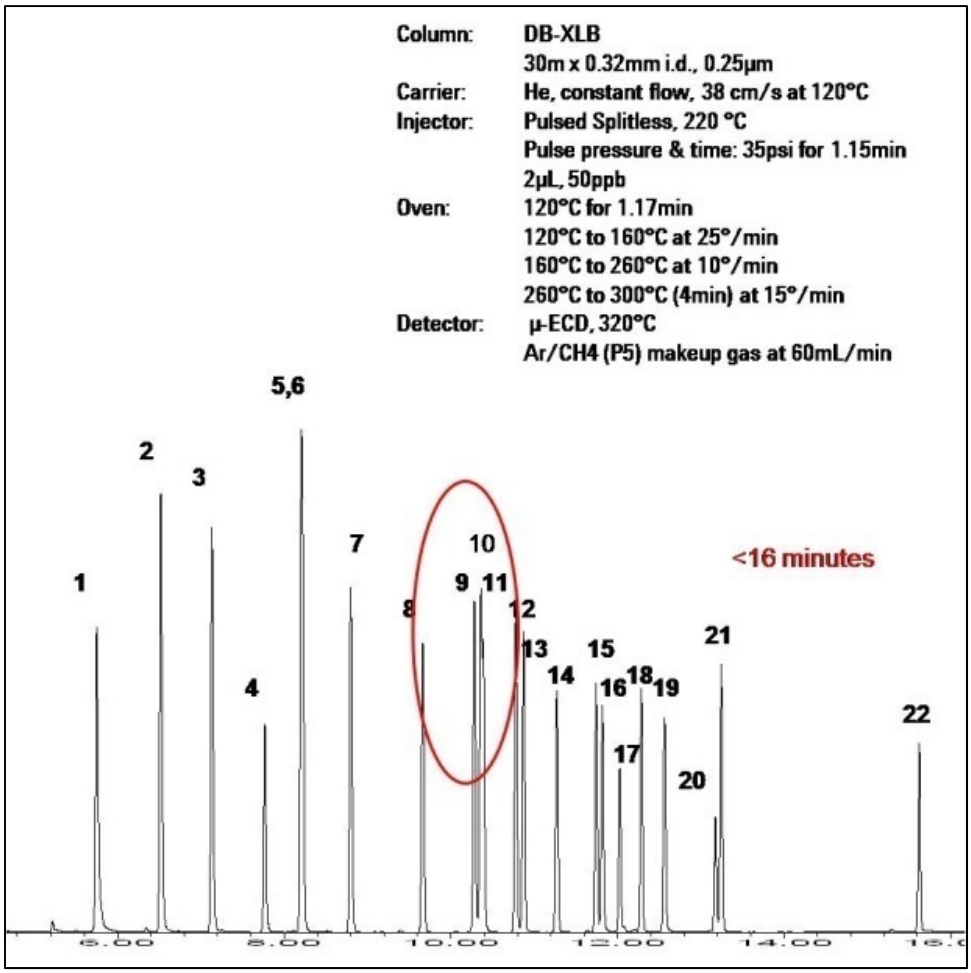
When making a method transfer, it's always best to make smaller incremental changes, rather than a large one. Agilent J&W High Efficiency columns are .18 mm ID columns.

**SUMMARY: COLUMN DIAMETER**

If you **decrease** the inside diameter...

Efficiency **increases**
Resolution **increases**
Pressure **increases**
Capacity **decreases**
Flow rate **decreases**

**USING METHOD TRANSLATION SOFTWARE:**
**EXAMPLE: ORIGINAL CLP METHOD**




**USING METHOD TRANSLATION SOFTWARE:**

Four modes of operation:

- **"Translate Only"**: the best place to start
- **"Best Efficiency" :** optimum linear velocity
- **"Fast Analysis"**: The Optimum Practical Gas Velocity (OPGV) option
- **"None":** Frees up all parameters for maximum freedom in changing parameters

You'll likely use "Translate Only" and "None" modes most often.

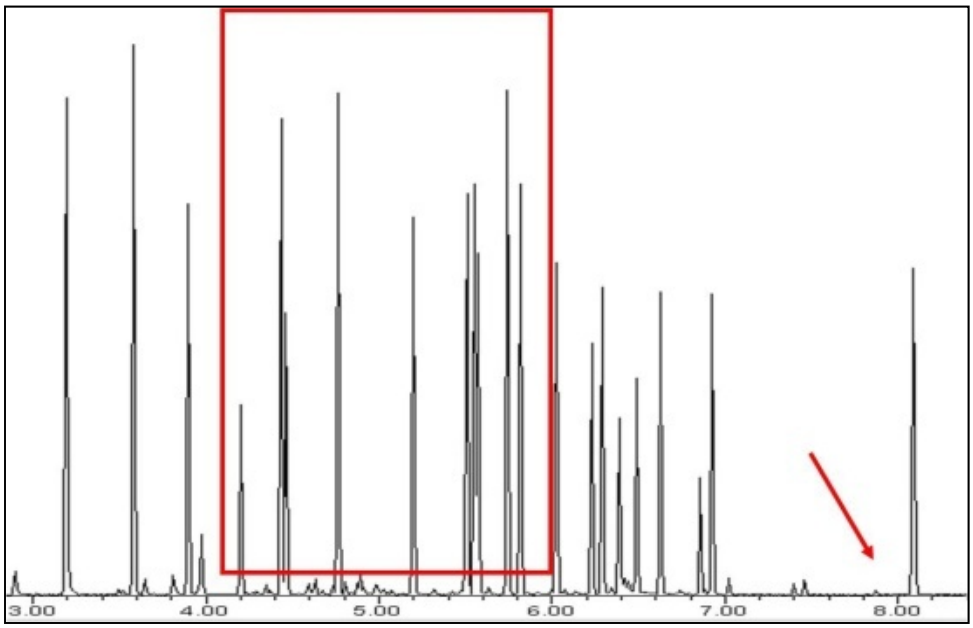
"Translate only" mode will allow you to put in your original method, change one parameter, and see how all the other parameters – phase ratio, film thickness, etc. – should change in your new method.

"Best Efficiency" mode uses optimum linear velocity. It shows you the flow rate and head pressure to generate the most theoretical plates from your column. It is likely to reflect the slowest analysis time you'll likely want to run.

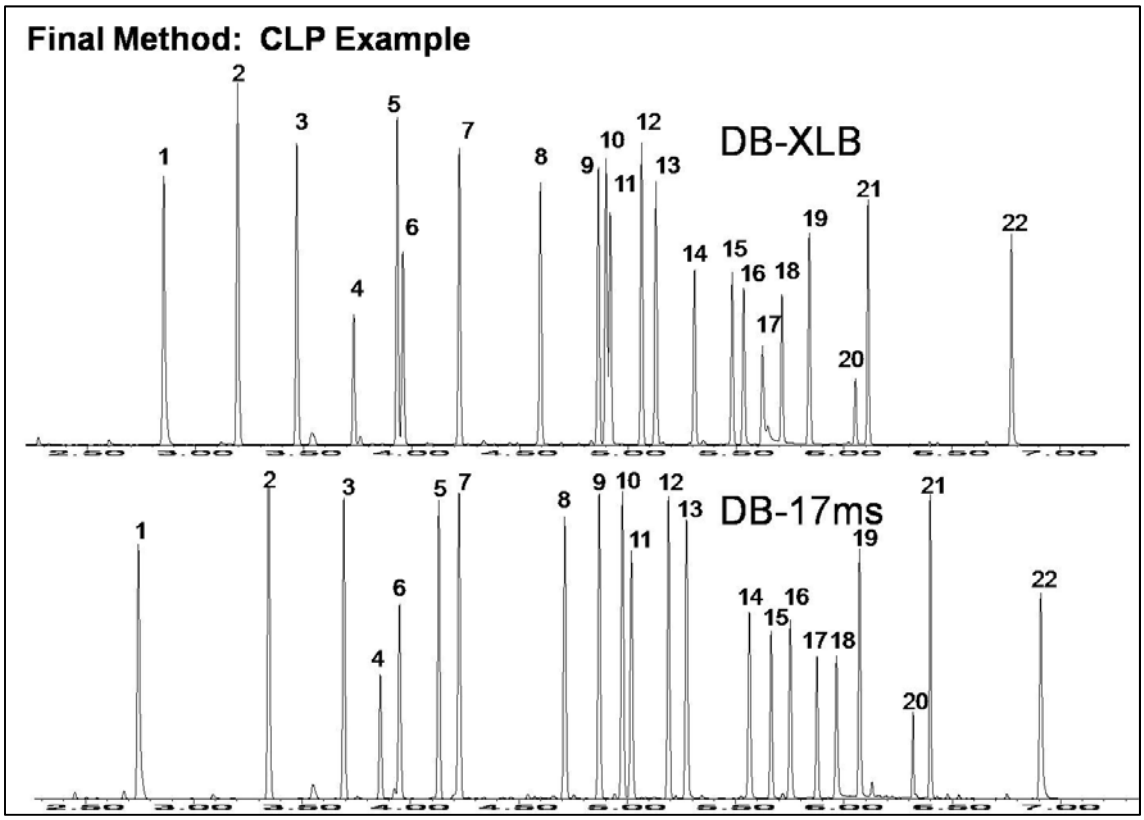
"Fast Analysis" mode will not always provide you with a faster analysis. It reflects the Optimum Practical Gas Velocity (OPGV). If your original method's velocity is already faster than OPGV, this mode may reflect a loss of speed.

The "None" button enables you to open up the other parameters and try out various scenarios.

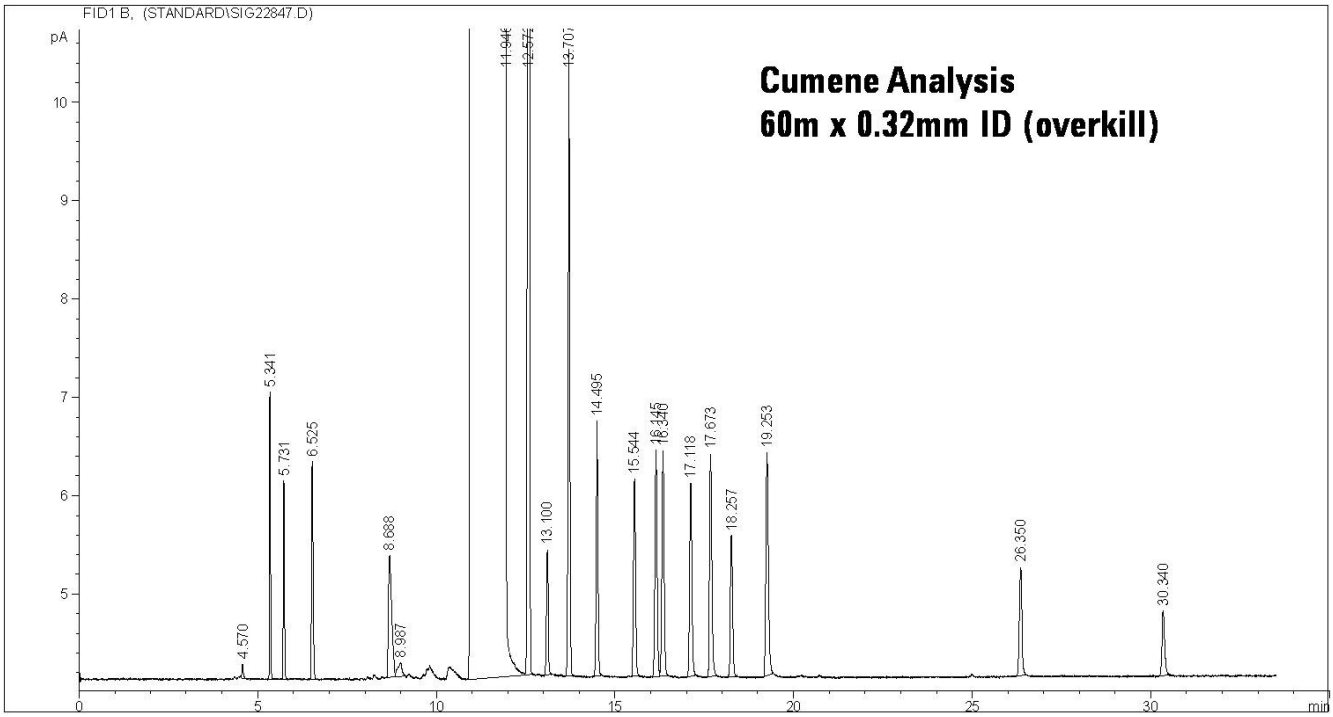
**EFFECTS OF CHANGING DIAMETER**

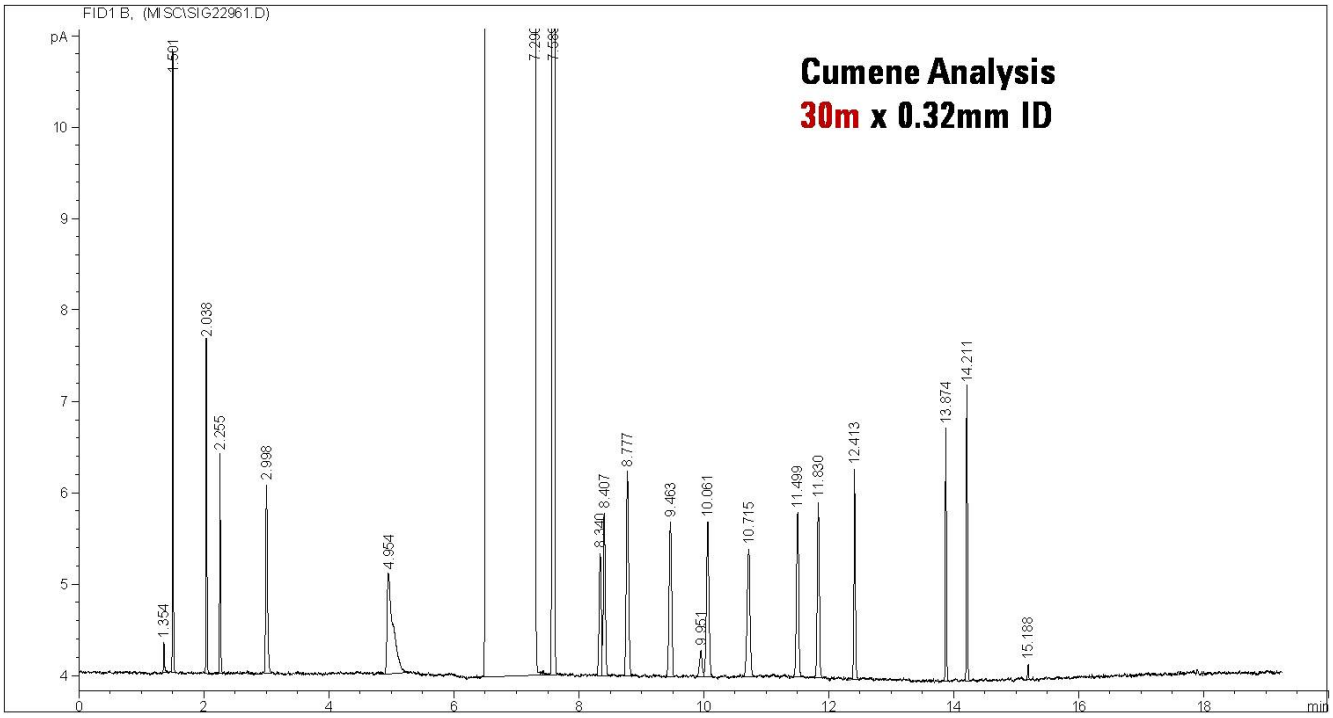


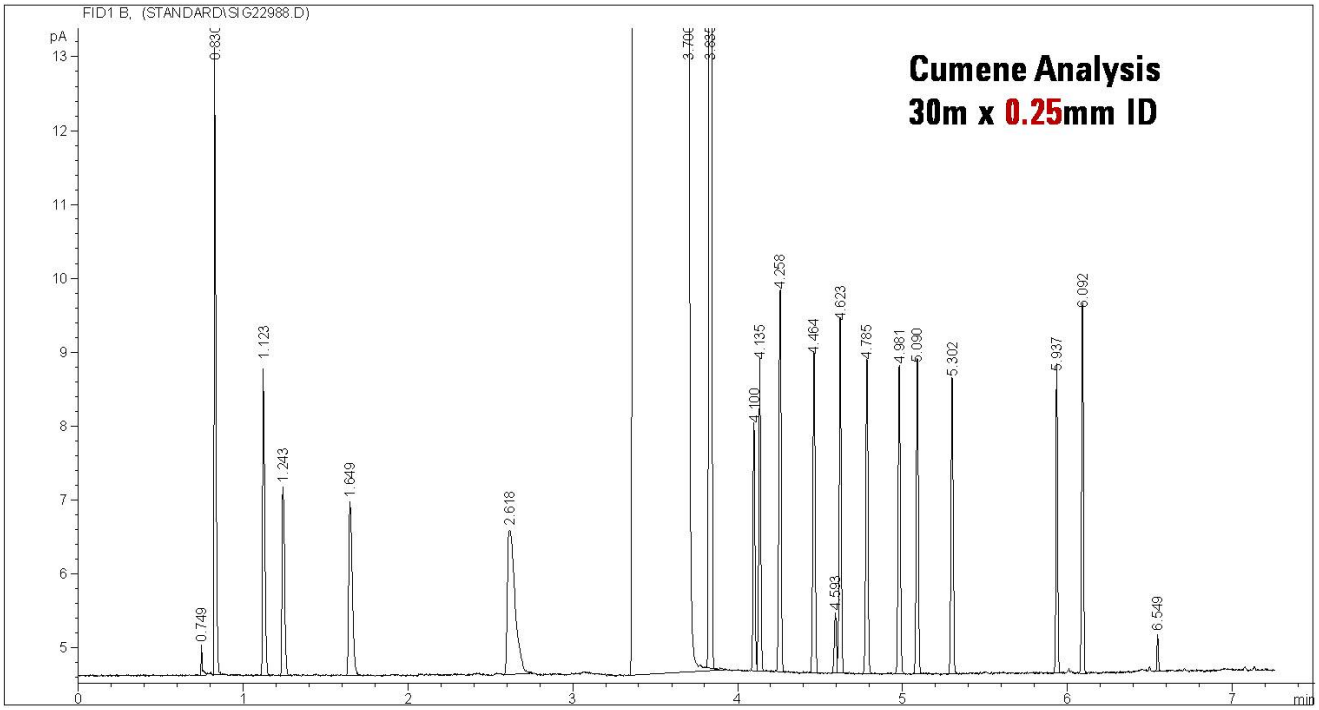

Similar resolution,
in half the analysis time!

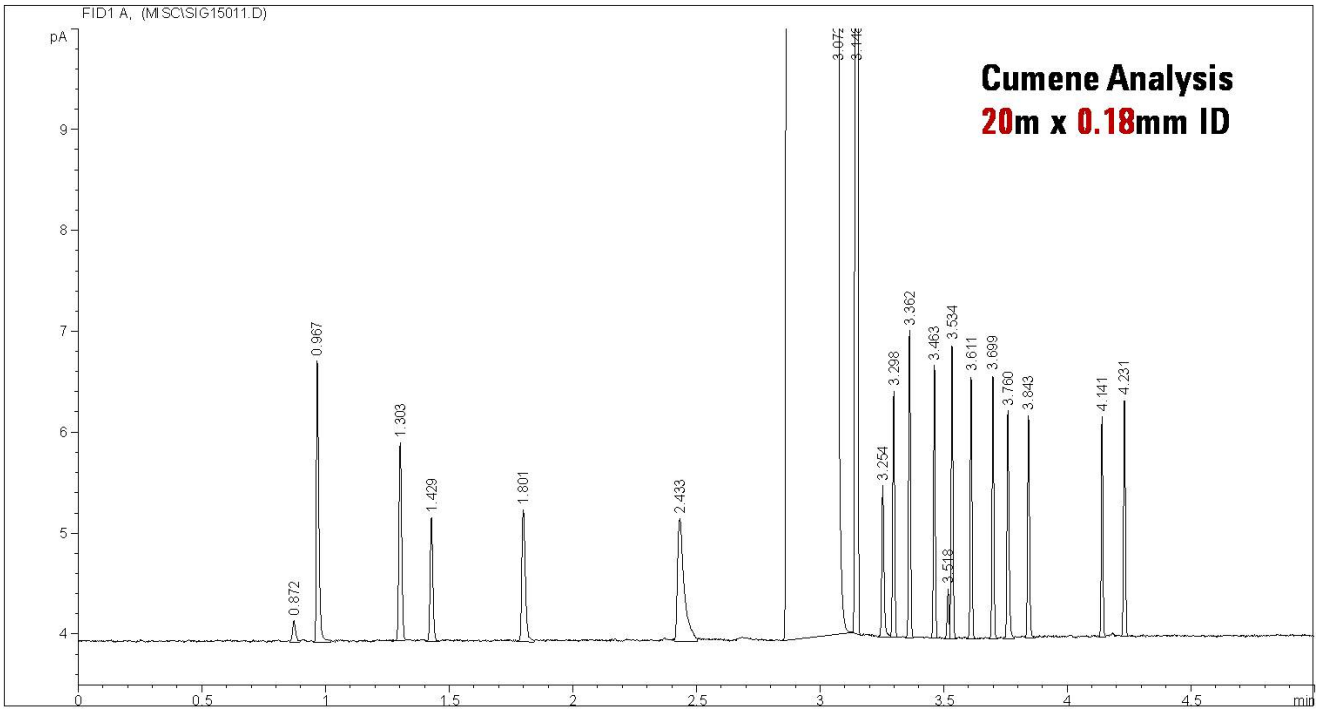


## CUMENE ANALYSIS






**OTHER WAYS TO USE METHOD TRANSLATION SOFTWARE**:

You can simulate how your method will run with a mass spectrometer by setting outlet pressure to 0. The software will show you what pressure is needed on the mass spec.

The mass spec creates a vacuum, and that causes things to change in your analysis, versus other detectors. You can use the Method Translation Software to help you assess the feasibility of certain parameters.

You can use the Method Translation Software to help you determine the dimensions of the new column you should purchase.

Tip: Enter your true column length in the Method Translation Software, factoring in any trimming that has taken place. As your column gets shorter, it can change your pressure, and consequently change other parameters for optimal results.

**SUMMARY:**

Stationary Phases: Chosen for optimized selectivity

Diameter: Smaller allows higher efficiency but has less capacity

Make Small Changes: Again, think capacity

Length: Shorter columns decrease run times and are less expensive

Carrier Gas: Choose hydrogen for higher velocity, but you can still go fast with Helium

Temperature Program: Scale properly to preserve elution pattern

Method Translation Software: Free, reliable. Download at www.agilent.com/chem/methodtranslation

**TECHNICAL SUPPORT**

Agilent 1-800-227-9770

E-mail: gc_column_support@Agilent.com

Download the Method Translation Software at www.agilent.com/chem/methodtranslator

**Here are some additional Agilent publications that you may find useful:**

*To locate these articles, go to www.chem.agilent.com and select "Literature Library", then "Online Literature" along the left hand navigation. When the search page opens, type the publication number or title in the "keywords" field.*

**Analysis of Semivolatiles Using High Efficiency Capillary GC Columns** (Agilent Publication # 5989-7500EN)

**Rapid Analysis of Food and Fragrances Using High-Efficiency Capillary GC Columns** (Agilent Publication # 7509EN)

**Agilent J&W High-Efficiency Capillary Columns: Productivity-Enhancing Tools for Fast GC Applications** (Agilent Publication # 5989-7499EN)