

# How to Go Fast and Make Your Carrier Gas Last

Scaling GC columns to improve speed and sustainability

Ashlee Gerardi  
GC Columns Product Manager  
November 16, 2023



# Today's Presentation



**FAST**

*High Sample Throughput*

**SUSTAINABLE**

*Low Use & Consumption*

**RELIABLE**

*Low unplanned downtime*

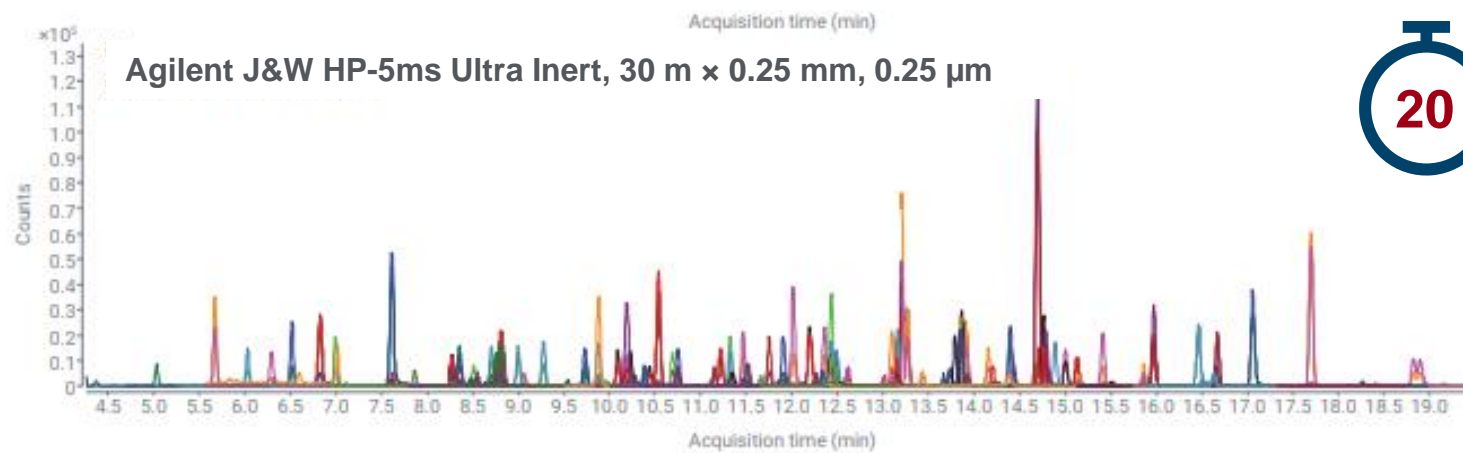
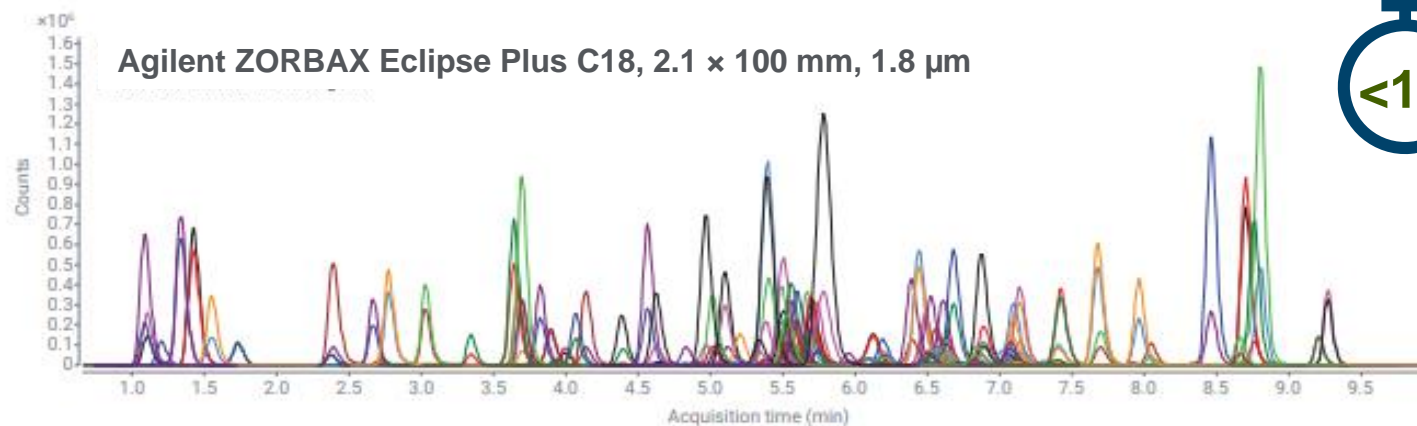
**FLEXIBLE**

*Alternate carrier capable*

- Review GC column parameters and choices for fast GC
- Scaling GC dimensions for speed
- Conversion to hydrogen carrier
- Five quick tips to conserve helium

# Conventional GC/MS Analysis Can Be 2x Longer UHPLC Analysis

240 multiresidue pesticides in bell peppers using LC/MS/MS and GC/MS/MS



# Comparing Fast LC Columns to Fast GC Columns



Fast GC can be configured on the 8890, 7890, 6890 GC Systems and Intuvo 9000 GC System



Technique	Particle Diameter (dp)	Internal Diameter (id)	Length (L)
Conventional HPLC	5 $\mu\text{m}$	4.6 mm	150 mm
Conventional LC(MS)	3 $\mu\text{m}$	2.1 mm	100 mm
Ultra High-Performance LC	1.9 $\mu\text{m}$	2.1 mm	50 mm

Technique	Length (L)	Internal Diameter (id)	Film Thickness (df)
Conventional GC	30	0.53 mm	0.5 $\mu\text{m}$
Conventional GC(MS)	30	0.25 mm	0.25 $\mu\text{m}$
Ultra High-Performance GC	20	0.18 mm	0.18 $\mu\text{m}$

- Lower particle diameter increases efficiency
- Lower particle diameter greatly increases backpressure (requires specific instrumentation)
- Internal diameter and length are scaled

- Lower internal diameter increases efficiency
- Lower internal diameter increases backpressure
- Film thickness and length are scaled

# Scaling GC Columns

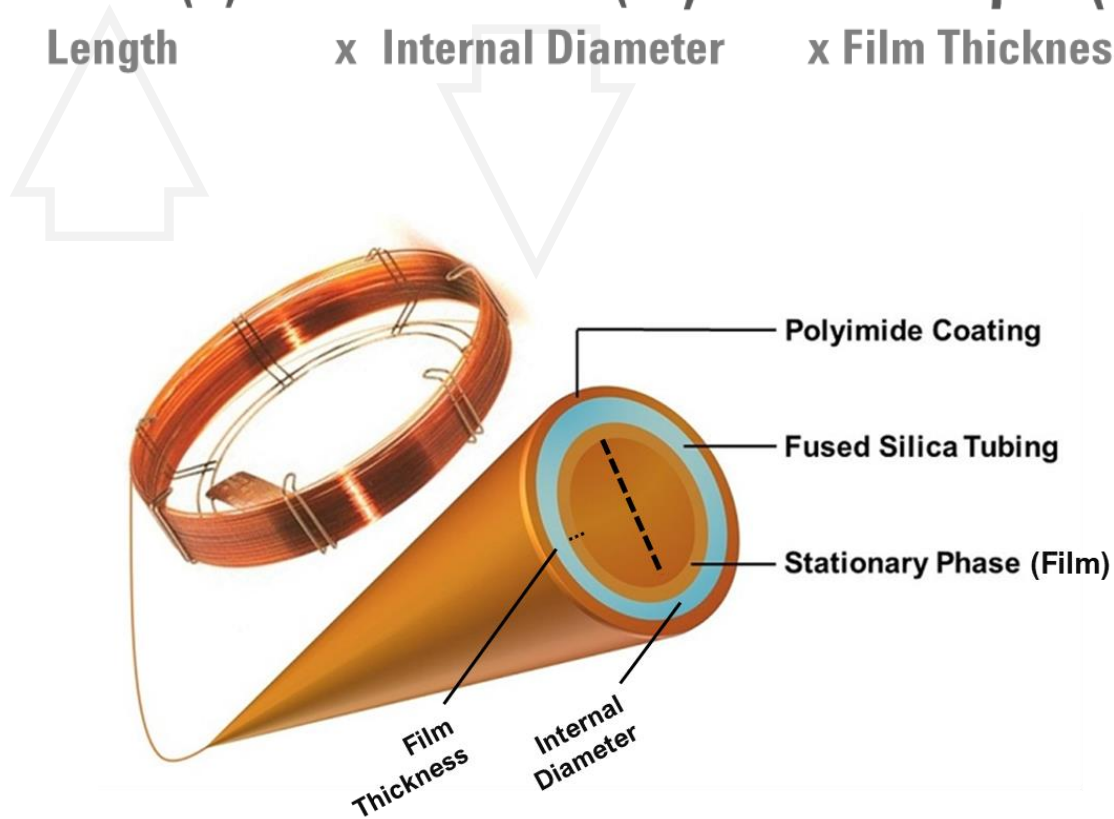
How to maintain your chromatography when increasing your speed



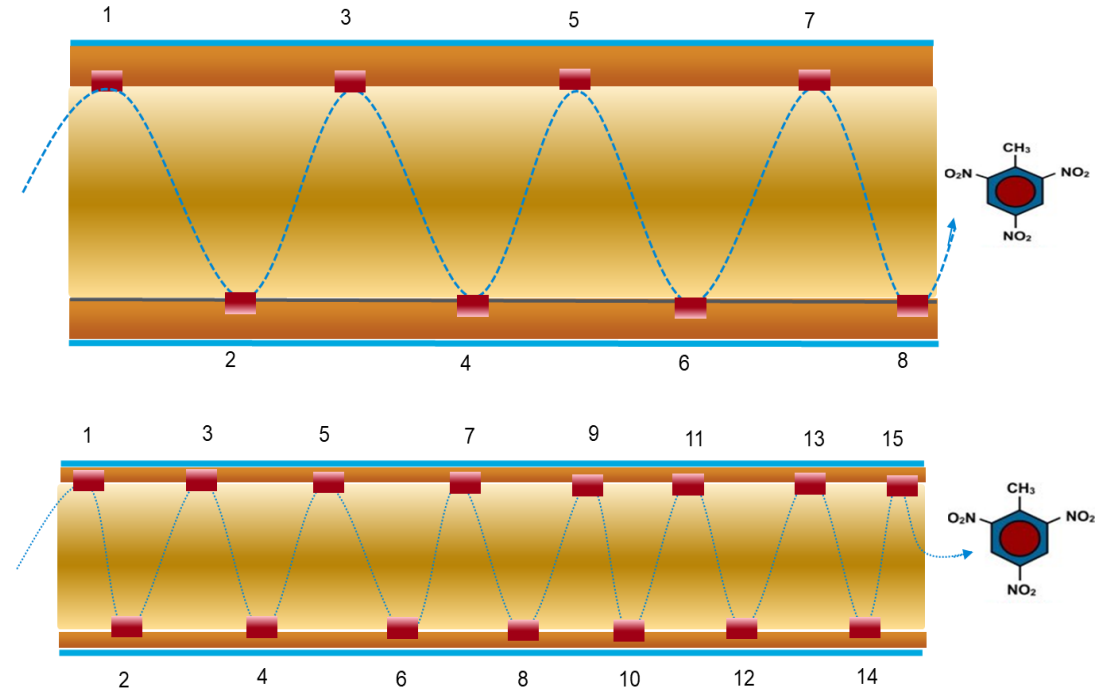
# Reviewing the Parameters of a GC Column

**DB-5** (Stationary Phase Type)

**30<sub>m</sub>** (L) **x** **0.25<sub>mm</sub>** (ID) **x** **0.25<sub>μm</sub>** (df)  
Length x Internal Diameter x Film Thickness



GC column interactions (efficiency) can be increased by increasing column length or by decreasing column id



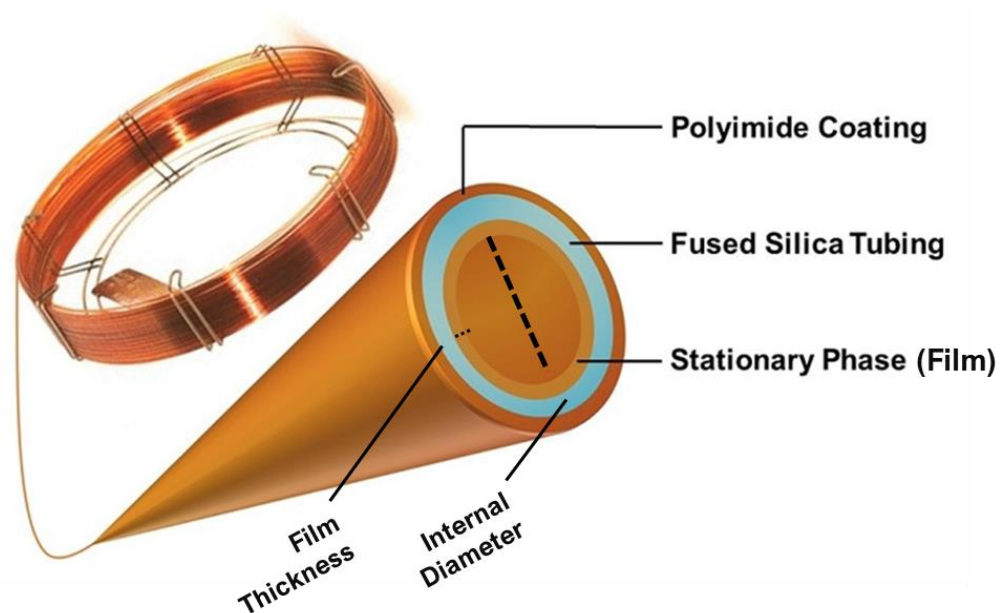
# The Impact of GC Column Length

## DB-5 (Stationary Phase Type)

**30m (L)**  
Length

**x 0.25mm (ID)**  
x Internal Diameter

**x 0.25 $\mu$ m (df)**  
x Film Thickness



Column length has minimal impact on resolution, but significantly increases analysis time



R=0.84  
2.29 min



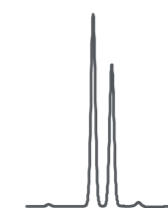
15 m

R=1.16  
4.82 min



30 m

R=1.68  
8.73 min



60 m

Column length



Resolution



Analysis time



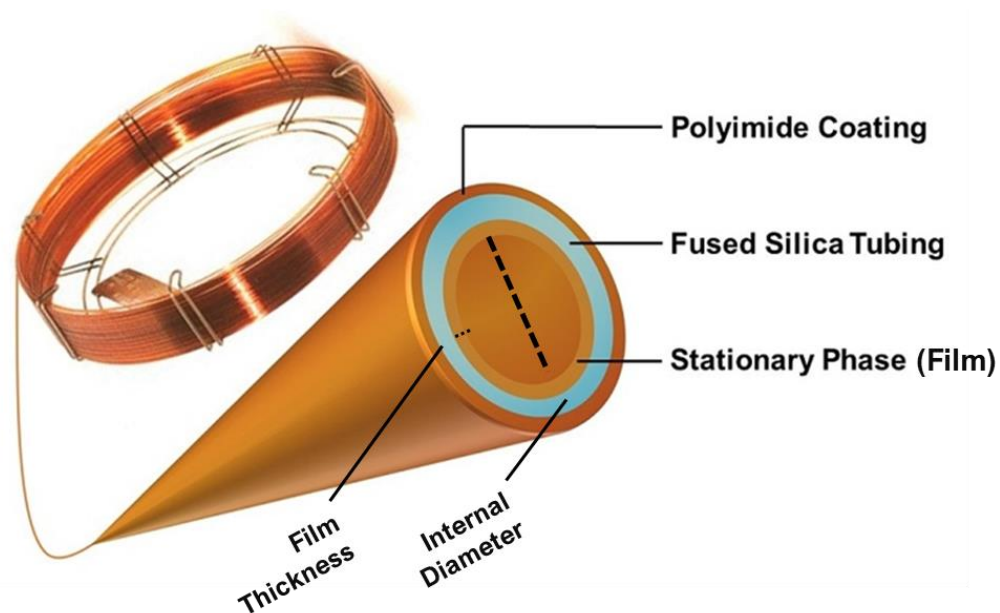
# The Impact of GC Column Internal Diameter

**DB-5** (Stationary Phase Type)

**30<sub>m</sub>** (L)  
Length

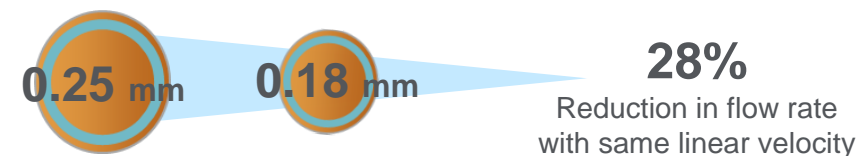
**x 0.25mm** (ID)  
x Internal Diameter

**x 0.25 $\mu$ m** (df)  
x Film Thickness



## Column internal diameter reduces analysis time, gas consumption

Column Internal Diameter (ID)	Common Name	Capacity	Efficiency
0.53 mm	Mega-bore	High	Low
0.32 mm	Wide-bore	Medium-High	Medium
0.25 mm	Narrow-bore	Medium	High
0.18 mm	Mini-bore	Low-Medium	Very High
0.10 mm	Micro-bore	Low	Extremely High



Column id	Analysis time	Capacity	Gas consumption
↓	↓	↓ ⚠	↓



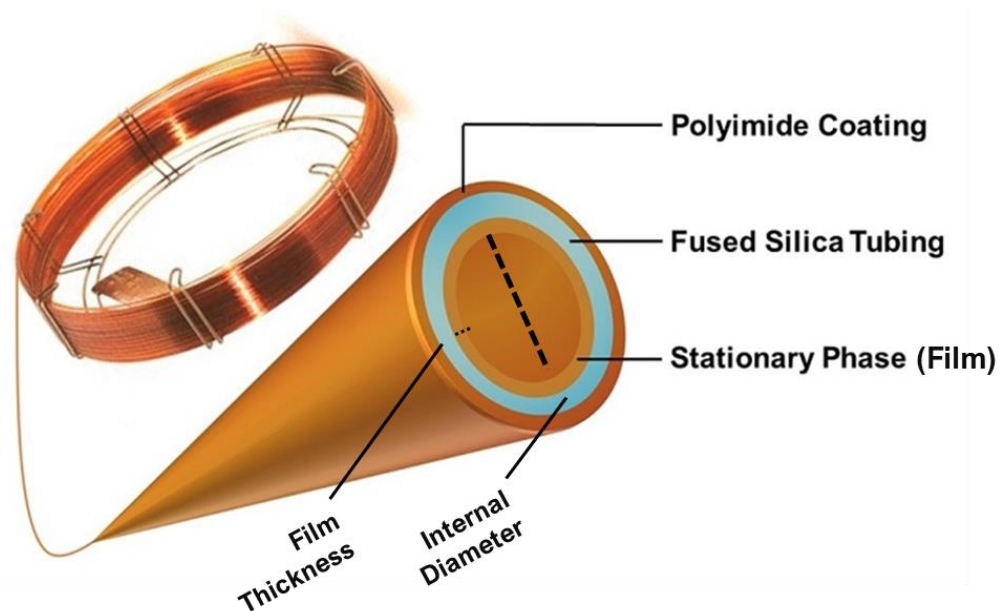
# The Impact of GC Column Film Thickness

**DB-5** (Stationary Phase Type)

**30<sub>m</sub>** (L)  
Length

**x 0.25<sub>mm</sub>** (ID)  
x Internal Diameter

**x 0.25<sub>µm</sub>** (df)  
x Film Thickness



Film thickness can be used to maintain retention and selectivity when adjusting column parameters

$$\text{Phase ratio } (\beta) = \frac{\text{Column radius (mm)}}{2 \times \text{film thickness } (\mu\text{m})}$$

$$\text{Phase ratio } (\beta) = \frac{125 \mu\text{m}}{2 \times 0.25 \mu\text{m}}$$

$$\text{Phase ratio } (\beta) = 250$$

Common scaling example for GC/MS:

**0.25 mm (id) x 0.25 µm (df)**

$$(\beta) = \frac{125 \mu\text{m}}{2 \times 0.25 \mu\text{m}}$$

$$(\beta) = 250$$

**0.18 mm (id) x 0.18 µm (df)**

$$(\beta) = \frac{90 \mu\text{m}}{2 \times 0.25 \mu\text{m}}$$

$$(\beta) = 250$$

# Column Scaling Example

When scaling GC columns:

Column id



Column length



Column film



Resulting in:

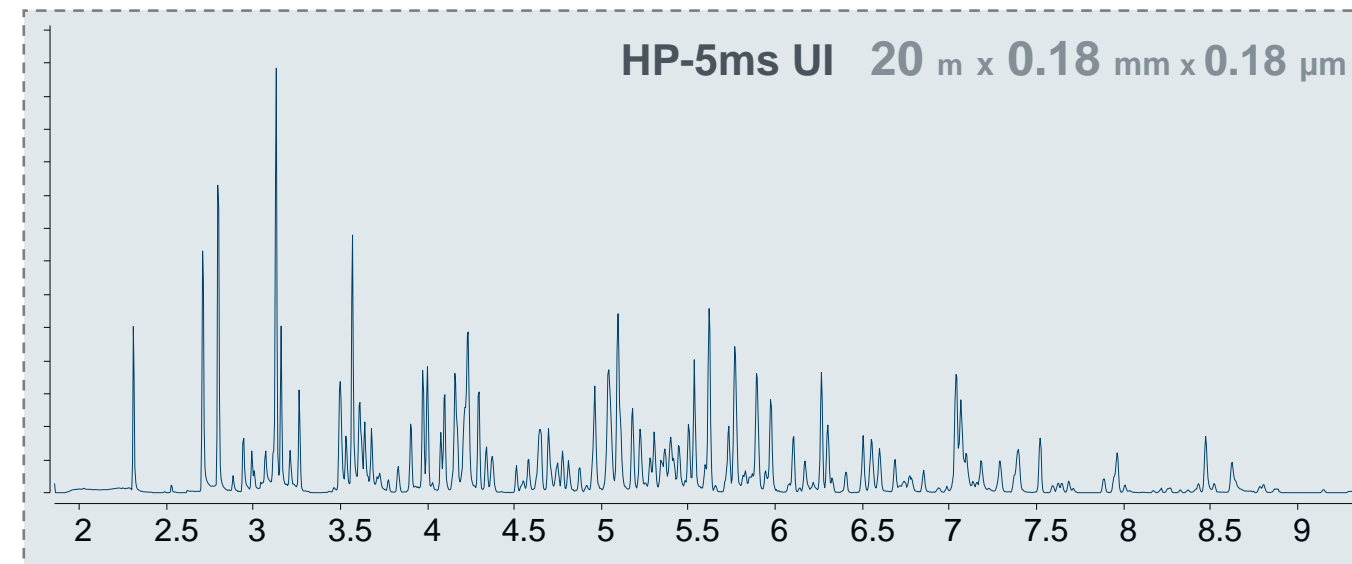
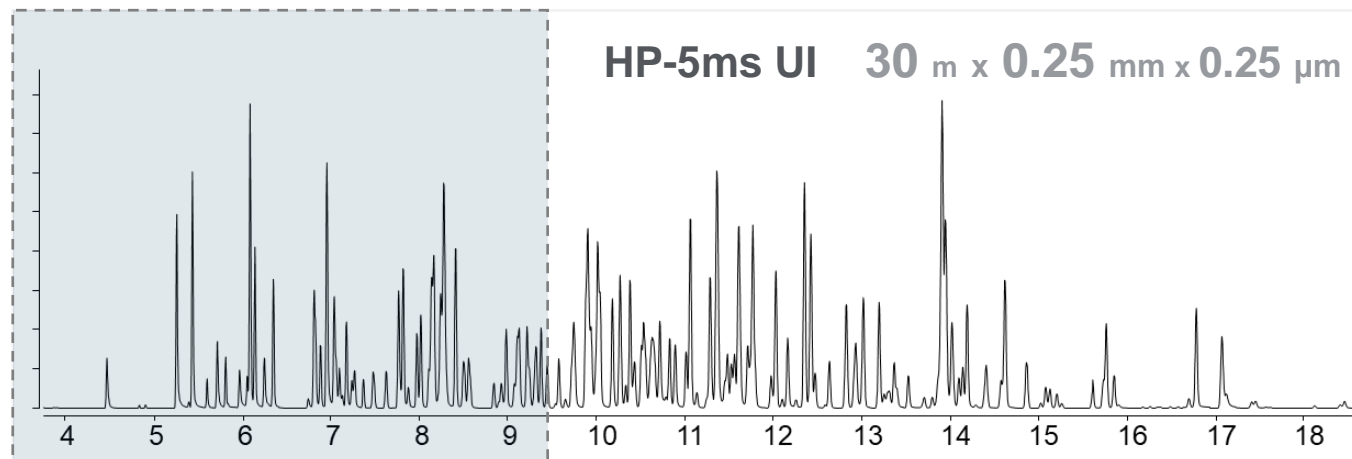
Analysis time



Gas use



Column capacity



Agilent publication 5994-4967EN

# Scaling Your GC method

GC Method Translator Software can guide and simplify

The screenshot displays the 'Method Translator' software interface. It features a 'Last file imported:' field with icons for search, print, and save. Below this are two main columns: 'Original Method Parameters' (Gas: He) and 'Calculated Method Parameters' (Gas: H2). The parameters are listed with sliders and input fields, showing the translation of values from He to H2. At the bottom, there are tables for 'Isothermal' and 'Ramps' parameters, and a 'Pressure Units' dropdown set to 'PSI'.

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	0.39
1	25.874	200	0.39
2	25.874	300	1.16

- Allows you to port a current GC method to another GC, while ensuring that relative retention order is maintained.
- This tool can be used to:
  - **Speed up an analysis**
  - Change detectors (for example, from FID to MS)
  - **Change carrier gas type**
  - Adjust column dimensions

**Download GC tools**

*Free download available*

[GC Calculators and Method Translator Software | Agilent](#)

# Scaling Your GC Method Using the Method Translation Software

Method Translator

Speed gain: 2.5874

Translate (selected)

Best Efficiency

Last file imported:

Original Method Parameters: Gas He

Calculated Method Parameters: Gas H2

Parameter	Original Method Parameters	Calculated Method Parameters
Length (m)	30 m	20 m
Inner Diameter (µm)	250 µm	180 µm
Film Thickness (µm)	0.25 µm	0.18 µm
Phase Ratio	249.25	249.25
Inlet Pressure (gauge)	5.591 psi	5.7225 psi
Outlet Flow (mL/min)	0.64712 mL/min	0.5824 mL/min
Average Velocity (cm/s)	30 cm/sec	51.748 cm/sec
Outlet Pressure (abs)	0 psi	0 psi
Holdup Time	1.6667 min	0.64415 min
Outlet Velocity (cm/s)	Infinity cm/sec	Infinity cm/sec

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

Total Run Time: 25.00 min

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	0.39
1	25.874	200	0.39
2	25.874	300	1.16

Total Run Time: 9.67 min

Pressure Units: PSI

Original Column Capacity: 1.71

Translated Column Capacity: 0.61

The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.

Speed gain: 2.5874

Translate (selected)

Best Efficiency

## To begin:

- Choose translate option
- **2-3x** improvement in analysis time can be expected
- Input original method parameters

# Scaling Your GC Method Using the Method Translation Software

Method Translator

Speed gain: 2.5874

Translate

Best Efficiency

Last file imported:

Original Method Parameters

Gas: He

Length (m): 30

Inner Diameter (µm): 250

Film Thickness (µm): 0.25

Phase Ratio: 249.25

Inlet Pressure (gauge): 5.591 psi

Outlet Flow (mL/min): 0.64712

Average Velocity (cm/s): 30

Outlet Pressure (abs): 0 psi

Holdup Time: 1.6667 min

Calculated Method Parameters

Gas: H2

Length (m): 20

Inner Diameter (µm): 180

Film Thickness (µm): 0.18

Phase Ratio: 249.25

Inlet Pressure (gauge): 5.7225 psi

Outlet Flow (mL/min): 0.5824

Average Velocity (cm/s): 51.748

Outlet Pressure (abs): 0 psi

Holdup Time: 0.64415 min

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

Total Run Time: 25.00 min

Pressure Units: PSI

Original Column Capacity: 1.71

Translated Column Capacity: 0.61

The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.

## Carrier gas and flows:

Original Method Parameters

Gas: He

Calculated Method Parameters

Gas: H2

- Alternate carrier gases can be selected

Inlet Pressure (gauge): 5.591 psi

Outlet Flow (mL/min): 0.64712

Average Velocity (cm/s): 30

Outlet Pressure (abs): 0 psi

Holdup Time: 1.6667 min

Inlet Pressure (gauge): 5.7225 psi

Outlet Flow (mL/min): 0.5824

Average Velocity (cm/s): 51.748

Outlet Pressure (abs): 0 psi

Holdup Time: 0.64415 min

- Adjust linear velocity (reduction in gas consumption dependent on id and flow)
- Be sure to check for positive inlet pressure
- Match outlet pressure to detector
  - Atmospheric -14.696
  - Vacuum (MS) - 0

# Scaling Your GC Method Using the Method Translation Software

Method Translator

Speed gain: 2.5874

Translate

Best Efficiency

Last file imported:

**Original Method Parameters**

Gas: He

Length (m)	30 m
Inner Diameter (µm)	250 µm
Film Thickness (µm)	0.25 µm
Phase Ratio	249.25
Inlet Pressure (gauge)	5.591 psi
Outlet Flow (mL/min)	0.64712 mL/min
Average Velocity (cm/s)	30 cm/sec
Outlet Pressure (abs)	0 psi
Holdup Time	1.6667 min
Outlet Velocity (cm/s)	Infinity cm/sec

**Calculated Method Parameters**

Gas: H2

Length (m)	20 m
Inner Diameter (µm)	180 µm
Film Thickness (µm)	0.18 µm
Phase Ratio	249.25
Inlet Pressure (gauge)	5.7225 psi
Outlet Flow (mL/min)	0.5824 mL/min
Average Velocity (cm/s)	51.748 cm/sec
Outlet Pressure (abs)	0 psi
Holdup Time	0.64415 min
Outlet Velocity (cm/s)	Infinity cm/sec

Pressure Units: PSI

Original Column Capacity: 1.71

Translated Column Capacity: 0.61

The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.

## Column parameters:

Parameter	Original Method (He)	Translated Method (H2)
Length (m)	30 m	20 m
Inner Diameter (µm)	250 µm	180 µm
Film Thickness (µm)	0.25 µm	0.18 µm
Phase Ratio	249.25	249.25

- Reduce column length  
(10 m, 20 m, 30 m, 60 m are the standard lengths)
- Reduce id  
(530 µm, 320 µm, 250 µm, 180 µm are the standard ids)
- Match phase ratios  
(to maintain retention/selectivity)

# Scaling Your GC Method Using the Method Translation Software

Method Translator

Speed gain: 2.5874

Translate

Best Efficiency

Last file imported:

**Original Method Parameters**

Gas: He

Length (m): 30 m

Inner Diameter (µm): 250 µm

Film Thickness (µm): 0.25 µm

Phase Ratio: 249.25

Inlet Pressure (gauge): 5.591 psi

Outlet Flow (mL/min): 0.64712 mL/min

Average Velocity (cm/s): 30 cm/sec

Outlet Pressure (abs): 0 psi

Holdup Time: 1.6667 min

Outlet Velocity (cm/s): Infinity cm/sec

**Calculated Method Parameters**

Gas: H2

Length (m): 20 m

Inner Diameter (µm): 180 µm

Film Thickness (µm): 0.18 µm

Phase Ratio: 249.25

Inlet Pressure (gauge): 5.7225 psi

Outlet Flow (mL/min): 0.5824 mL/min

Average Velocity (cm/s): 51.748 cm/sec

Outlet Pressure (abs): 0 psi

Holdup Time: 0.64415 min

Outlet Velocity (cm/s): Infinity cm/sec

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	0.39
1	25.874	200	0.39
2	25.874	300	1.16

Total Run Time: 25.00 min

Total Run Time: 9.67 min

Pressure Units: PSI

Original Column Capacity: 1.71

Translated Column Capacity: 0.61

The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.

## Oven program:

Isothermal

Ramps

2

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

Total Run Time: 25.00 min

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	0.39
1	25.874	200	0.39
2	25.874	300	1.16

Total Run Time: 9.67 min

- Adjustable and predictive
- Be sure to ramp within instrument specifications – direct heating versus air-batch
- Consider cycle times (run-time + cool-down)
- Consider backflushing instead of “bake-out” steps

# Scaling Your GC Method Using the Method Translation Software

Method Translator

Speed gain: 2.5874

Translate

Best Efficiency

Last file imported:

Original Method Parameters: Gas He

Calculated Method Parameters: Gas H2

Parameter	Original Method Parameters	Calculated Method Parameters
Length (m)	30 m	20 m
Inner Diameter (µm)	250 µm	180 µm
Film Thickness (µm)	0.25 µm	0.18 µm
Phase Ratio	249.25	249.25
Inlet Pressure (gauge)	5.591 psi	5.7225 psi
Outlet Flow (mL/min)	0.64712 mL/min	0.5824 mL/min
Average Velocity (cm/s)	30 cm/sec	51.748 cm/sec
Outlet Pressure (abs)	0 psi	0 psi
Holdup Time	1.6667 min	0.64415 min
Outlet Velocity (cm/s)	Infinity cm/sec	Infinity cm/sec

Pressure Units: PSI

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	1
1	10	200	1
2	10	300	3

Total Run Time: 25.00 min

#	Ramp Rate (°C/min)	Final Temp (°C)	Final Time (min)
Init		100	0.39
1	25.874	200	0.39
2	25.874	300	1.16

Total Run Time: 9.67 min

Original Column Capacity: 1.71

Translated Column Capacity: 0.61


The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.

## Column capacity:

Original Column Capacity: 1.71

Translated Column Capacity: 0.61

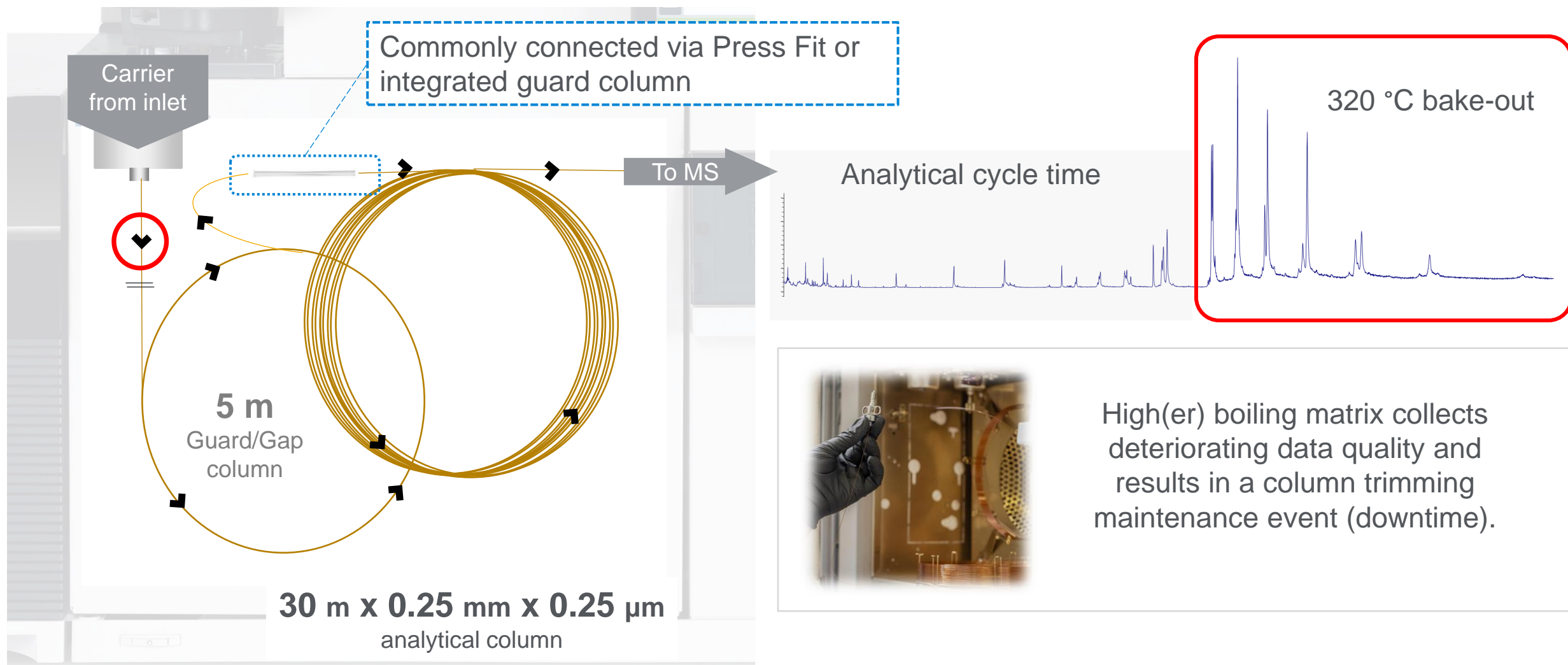
The column capacity of the translated method is 36% of the original column capacity. You may need to adjust your injection volume.



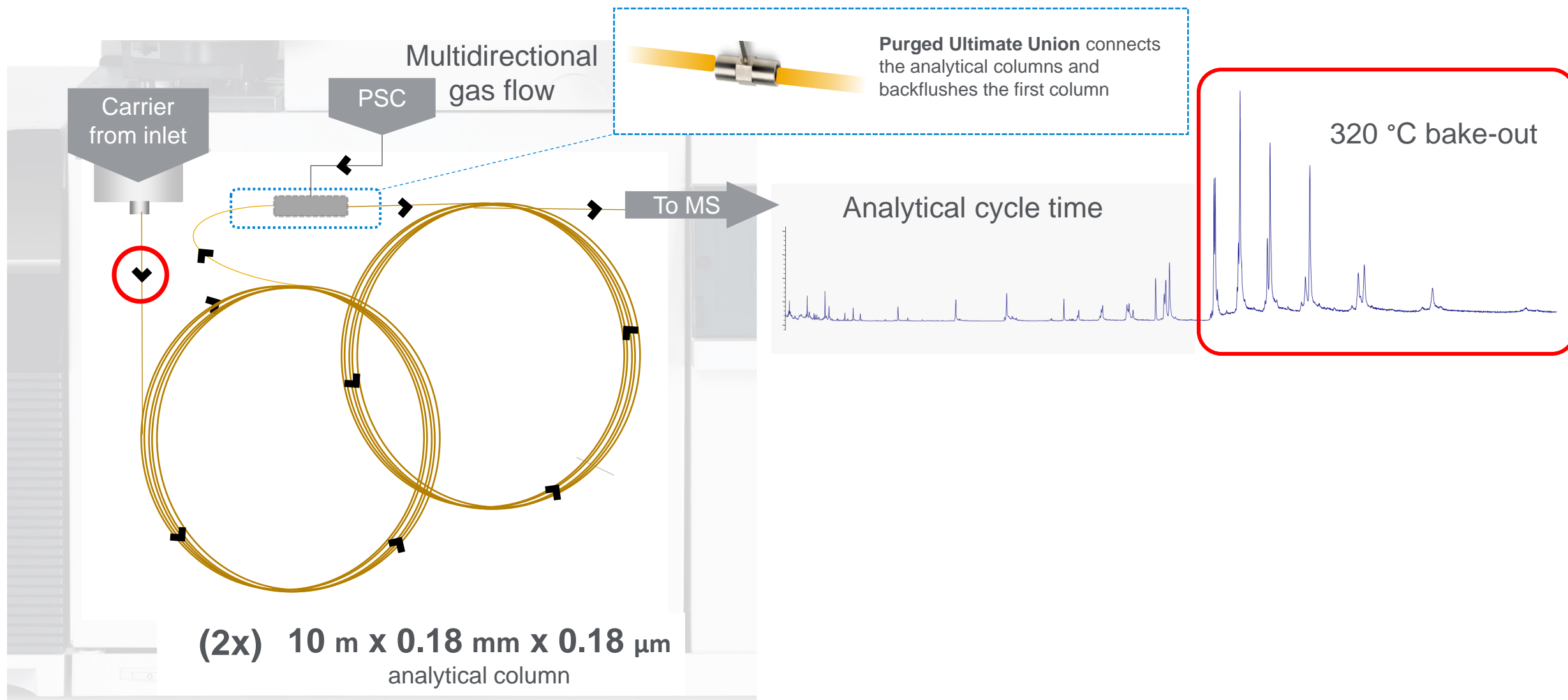
- Injection volume should be scaled proportionally
  - Trace analysis may be impacted
- Smaller column ids have been observed to increase maintenance intervals due to matrix accumulation
  - Loss of analyte response (sensitivity)
  - Loss of peak shape (integration accuracy)
  - Loss of resolution (analyte identity)



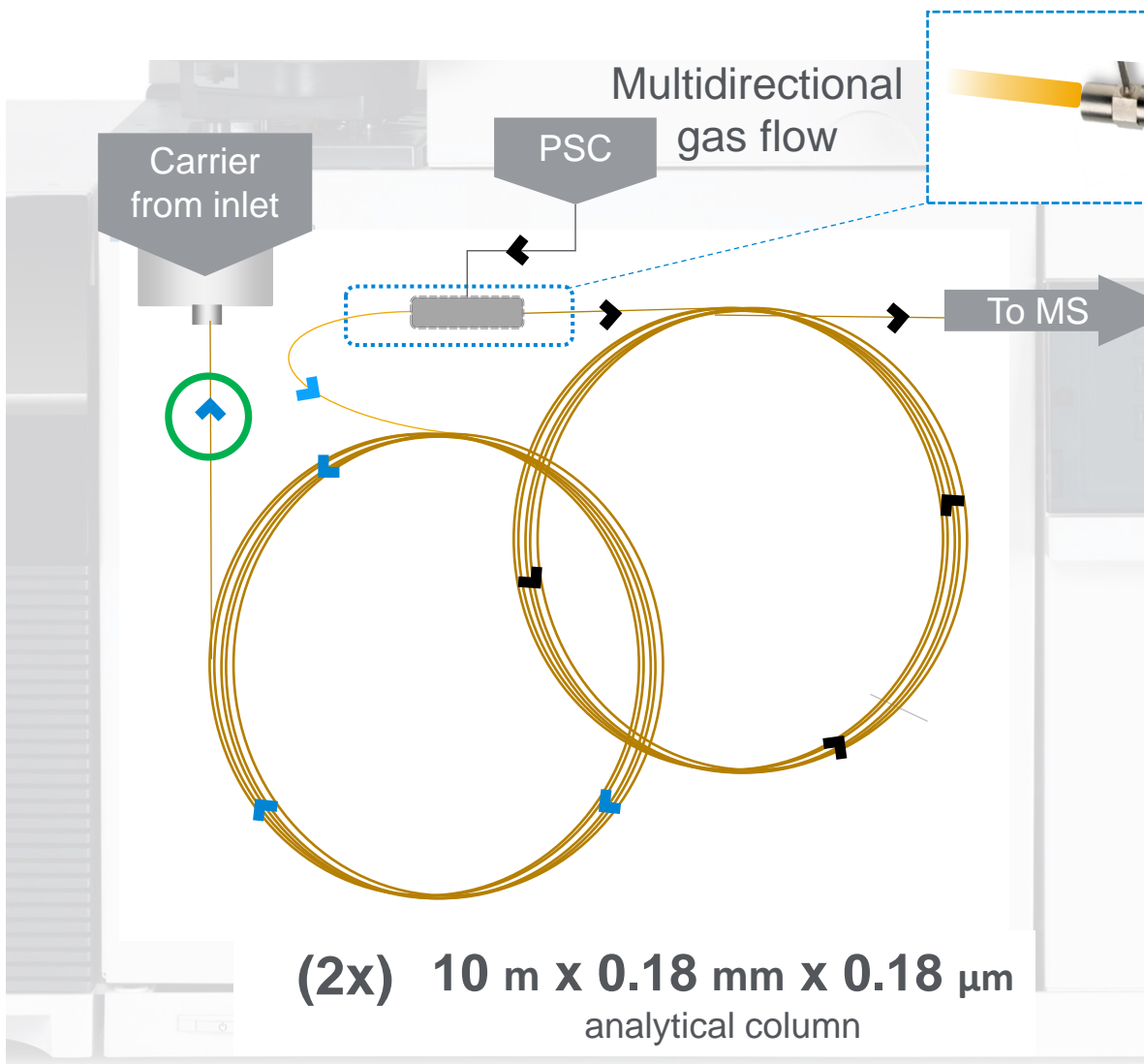
# Conventional Single-Column Analysis



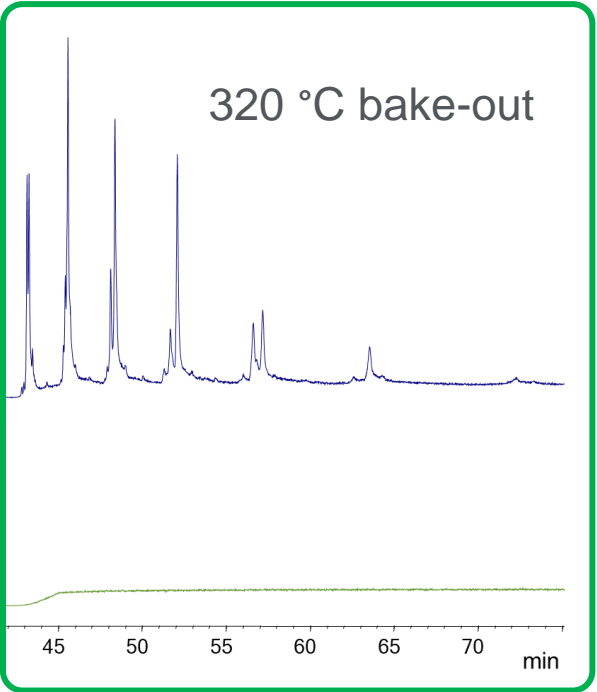
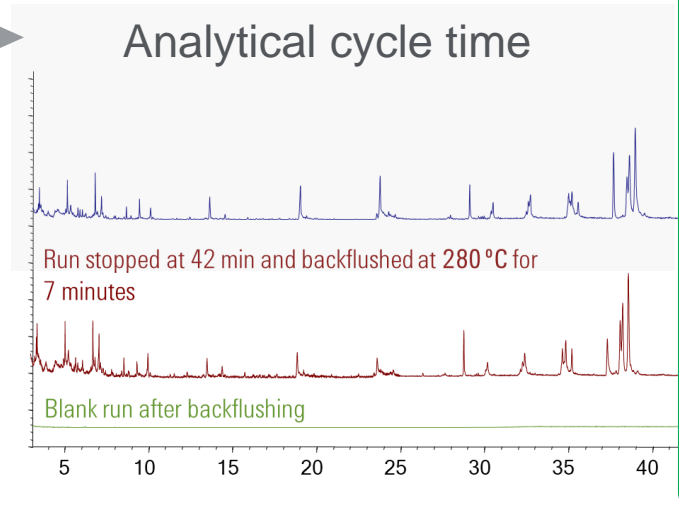
# Midcolumn Backflushing Analysis



# Midcolumn Backflushing Analysis



**Purged Ultimate Union** connects the analytical columns and backflushes the first column

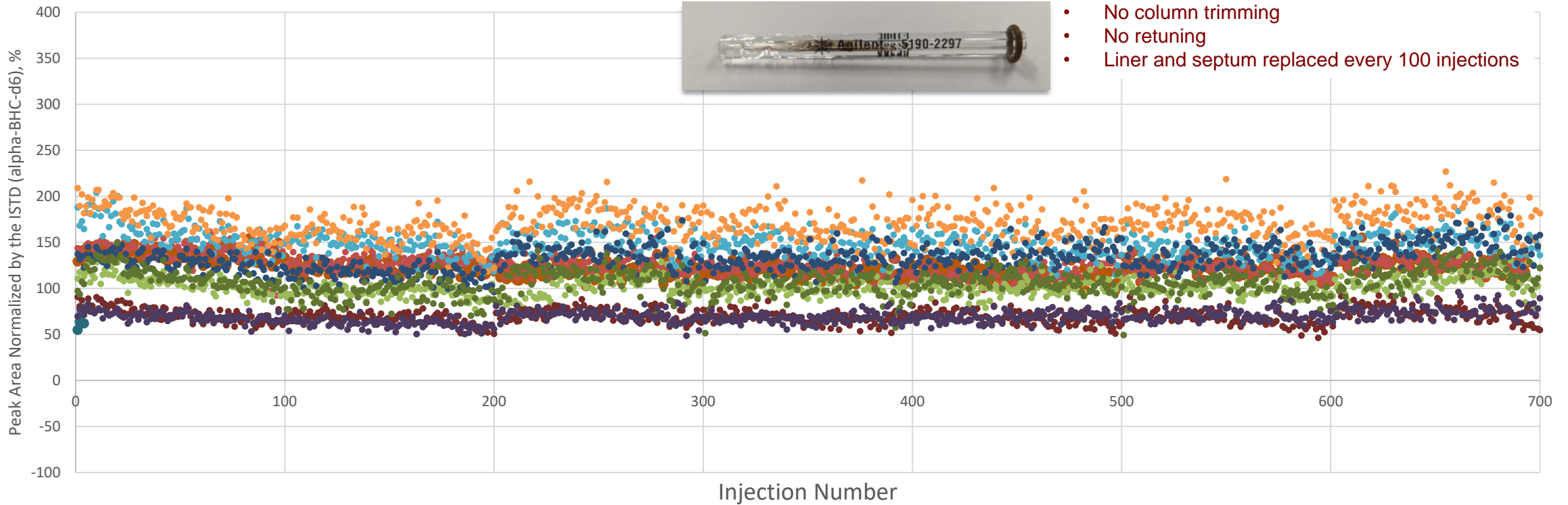


High(er) boiling matrix is backflushed out of the split vent, lessening the need for column and source maintenance events.

# Normalized Response of Pesticides - 20 ppb Spiked QuEChERS EMR-HCF Spinach

Longevity: Area normalized by the ISTD, 20 ppb in Spinach with 7000E (10 min)

Area normalized by alpha-BHC-d6, %



- BHC-alpha (benzene hexachloride), 8%
- Pirimiphos-methyl, 9%
- Bupirimate, 11%
- Metalaxyl, 10%
- BHC-beta, 9%
- Bromophos-ethyl, 10%
- Chlorthiophos, 11%
- Atrazine, 11%
- Prothiofos, 10%
- Fluquinconazole, 13%

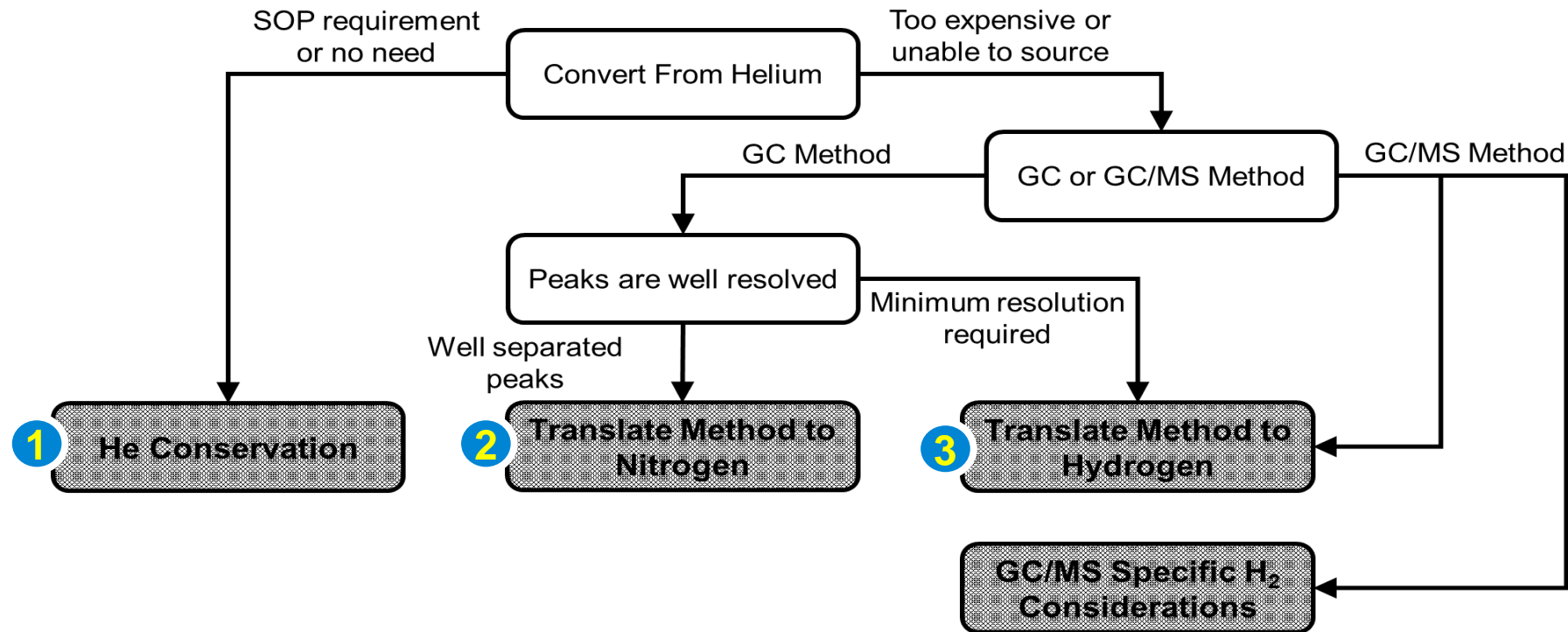
Agilent publication 5994-4967EN

# Converting to Hydrogen Carrier

How to maintain your chromatography and reduce speed



# Alternate Carrier Decision Tree



- **Helium is the best carrier gas option**
- Hydrogen and nitrogen are viable alternatives to Helium, but require special considerations
- Changes in chromatographic results and methods should be expected when converting – **not “Plug & Play”**

# Review of Alternate Carrier Gases

	Helium Carrier	Nitrogen Carrier	Hydrogen
Pros	<ul style="list-style-type: none"> <li>Inert</li> <li>Excellent MS performance</li> <li>Reference spectra libraries available</li> <li>Fits common consumable dimensions</li> </ul>	<ul style="list-style-type: none"> <li>Inexpensive and widely available</li> <li>No additional safety concerns</li> <li>Generator available</li> </ul>	<ul style="list-style-type: none"> <li>Fast</li> <li>Generator available</li> </ul>
Cons	<ul style="list-style-type: none"> <li>Unplanned supply disruptions</li> <li>Cost fluctuations</li> </ul>	<ul style="list-style-type: none"> <li>Long run times</li> <li>Not recommended for MS (sensitivity)</li> </ul>	<ul style="list-style-type: none"> <li><b>Requires additional safety precautions</b></li> <li><b>Analyte activity</b></li> </ul>



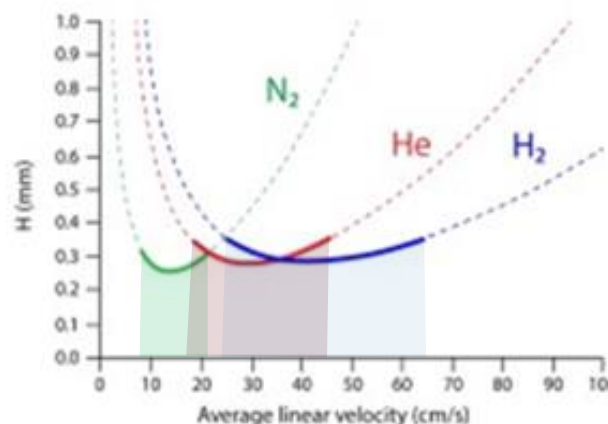
### Recommended use:

- Nonselective detectors
- Low-sample throughput
- Small panels, well-separated

### Recommended use:

- Mass selective detectors
- High-sample throughput
- Large, multicomponent methods

## The practical linear velocity ranges of common carrier gases



**Hydrogen is capable of high linear velocity, shortening run times**  
*Additional considerations are needed for safety and analyte activity*

**Nitrogen can be used with low linear velocity, extending run times**

# Review of Alternate Carrier Market Position

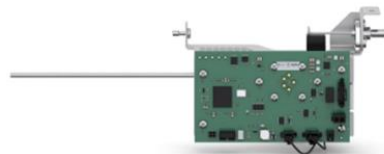
	Helium Carrier	Nitrogen Carrier	Hydrogen Carrier
Pros	<ul style="list-style-type: none"> <li>• Inert</li> <li>• Excellent MS performance</li> <li>• Reference spectra libraries available</li> <li>• Fits common consumable dimensions</li> </ul>	<ul style="list-style-type: none"> <li>• Inexpensive and widely available</li> <li>• No additional safety concerns</li> <li>• Generator available</li> </ul>	<ul style="list-style-type: none"> <li>• Fast</li> <li>• Generator available</li> </ul>
Cons	<ul style="list-style-type: none"> <li>• Unplanned supply disruptions</li> <li>• Cost fluctuations</li> </ul>	<ul style="list-style-type: none"> <li>• Long run times</li> <li>• Not recommended for MS (sensitivity)</li> </ul>	<ul style="list-style-type: none"> <li>• Requires additional safety precautions</li> <li>• Reactive</li> </ul>
		<p><b>Recommended use:</b></p> <ul style="list-style-type: none"> <li>• Nonselective detectors</li> <li>• Low-sample throughput</li> <li>• Small panels, well-separated</li> </ul>	<p><b>Recommended use:</b></p> <ul style="list-style-type: none"> <li>• Mass selective detectors</li> <li>• High sample throughput</li> <li>• Large, multicomponent methods</li> </ul>



**Be sure to use a hydrogen sensor and an Ultra Inert carrier gas flow path**



Ultra Inert liners and columns



Hydrogen sensor module



HydroInert MS source



# Carrier Gas Choice Impacts Column Internal Diameter

Column ID Compatibility by Carrier Gas					
Column Internal Diameter (mm)	Common Name		Helium	Nitrogen	Hydrogen
0.53 mm	Mega-bore	Capacity	✓	✓	✗
0.32 mm	Wide-bore		✓	✓	✗
0.25 mm	Narrow-bore	Efficiency	✓	✓	> 40 m
0.18 mm	Mini-bore		✓	✓	✓
0.10 mm	Micro-bore		✓	✓	✓

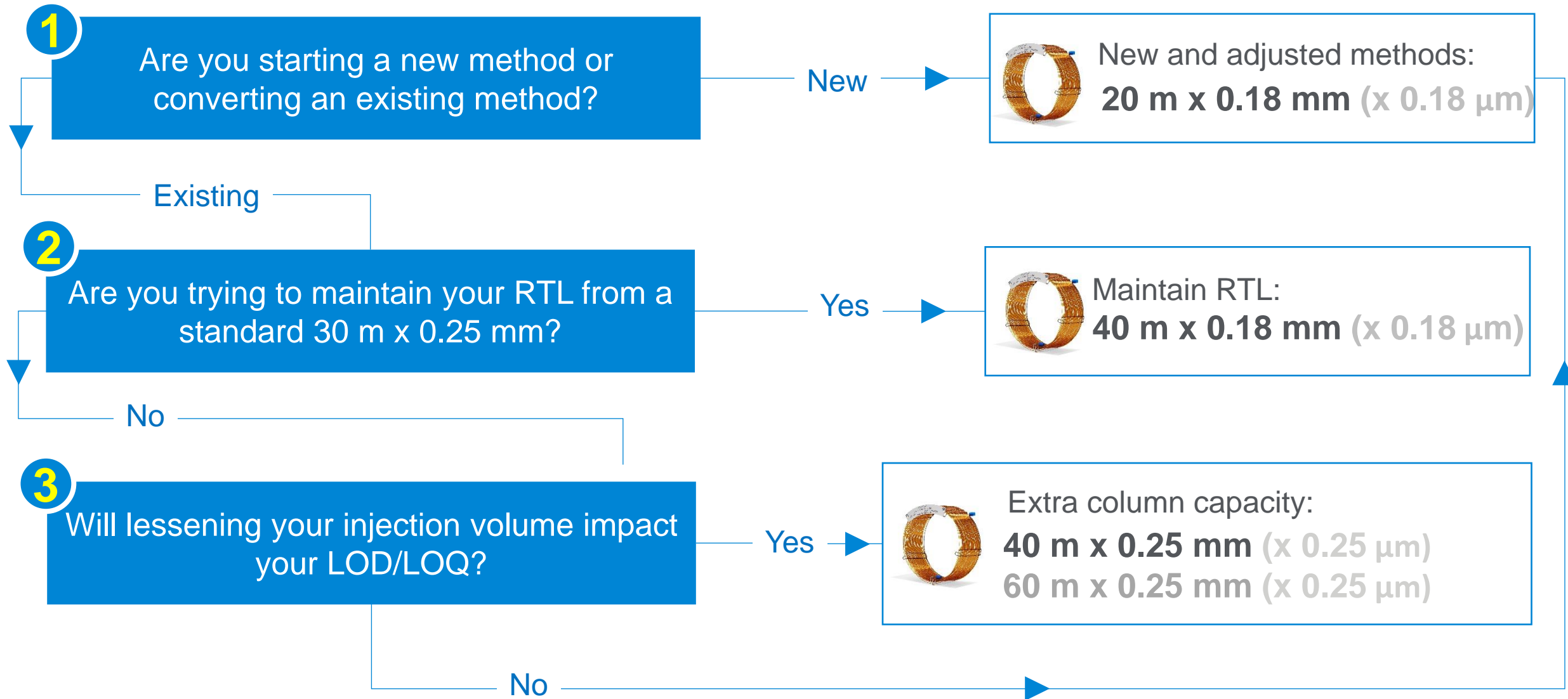
GC Conditions	Hydrogen Carrier	
GC Column Length (m)	30	40
GC Column ID (mm)	0.25	0.25
Inlet Pressure (psi)	-0.161	2.088
Column Flow	1.00	1.00

*40 m of column length is needed to maintain positive inlet pressure for 0.25 mm id columns*

- Nitrogen carrier gas can be used with all common Helium dimensions
- **Hydrogen carrier gas use limited to smaller ids complicating conversion**

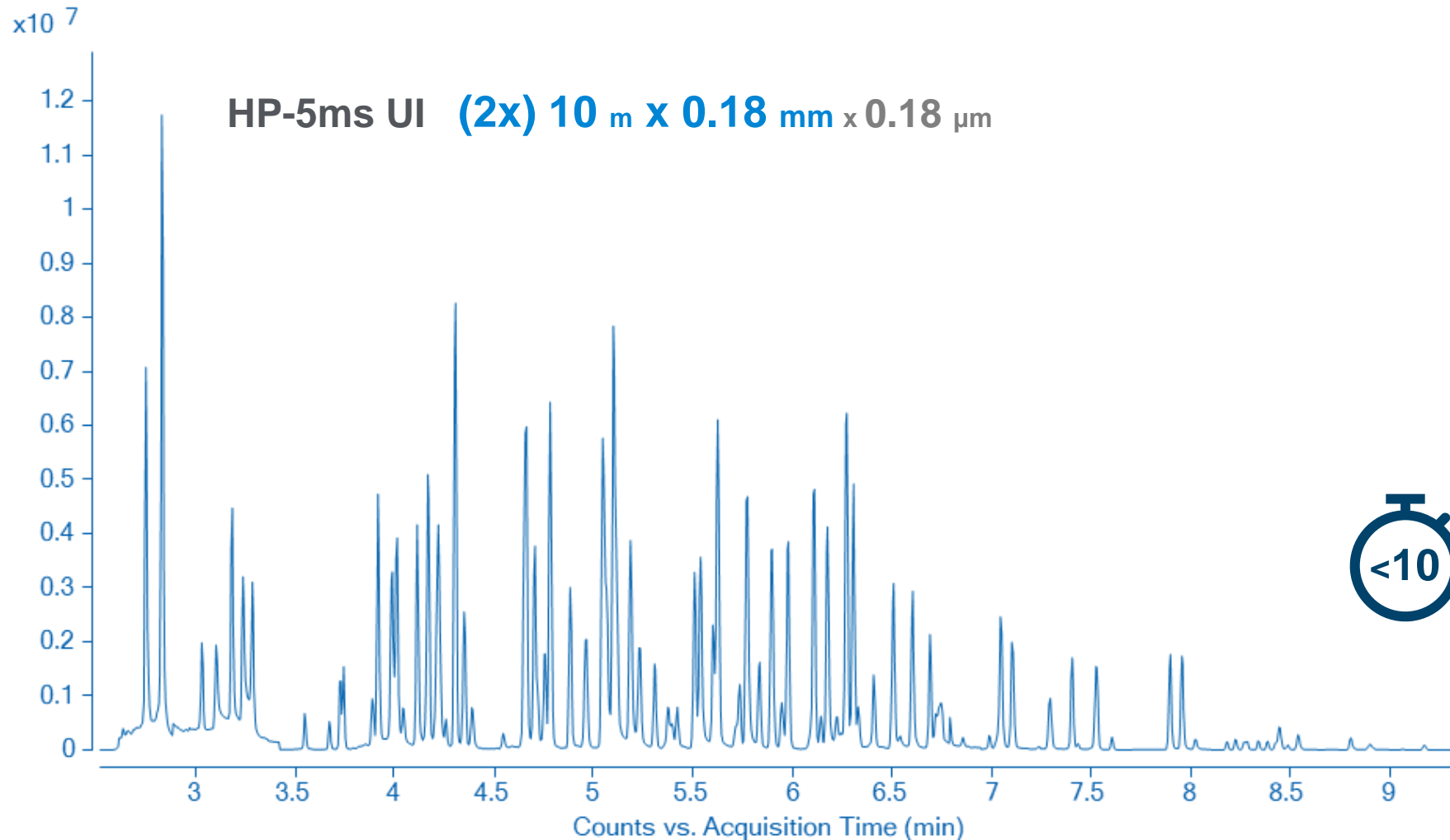


# Column Selection for Hydrogen Conversion



# New Hydrogen Carrier Method

238 pesticides analyzed with midcolumn backflushing and H<sub>2</sub> carrier

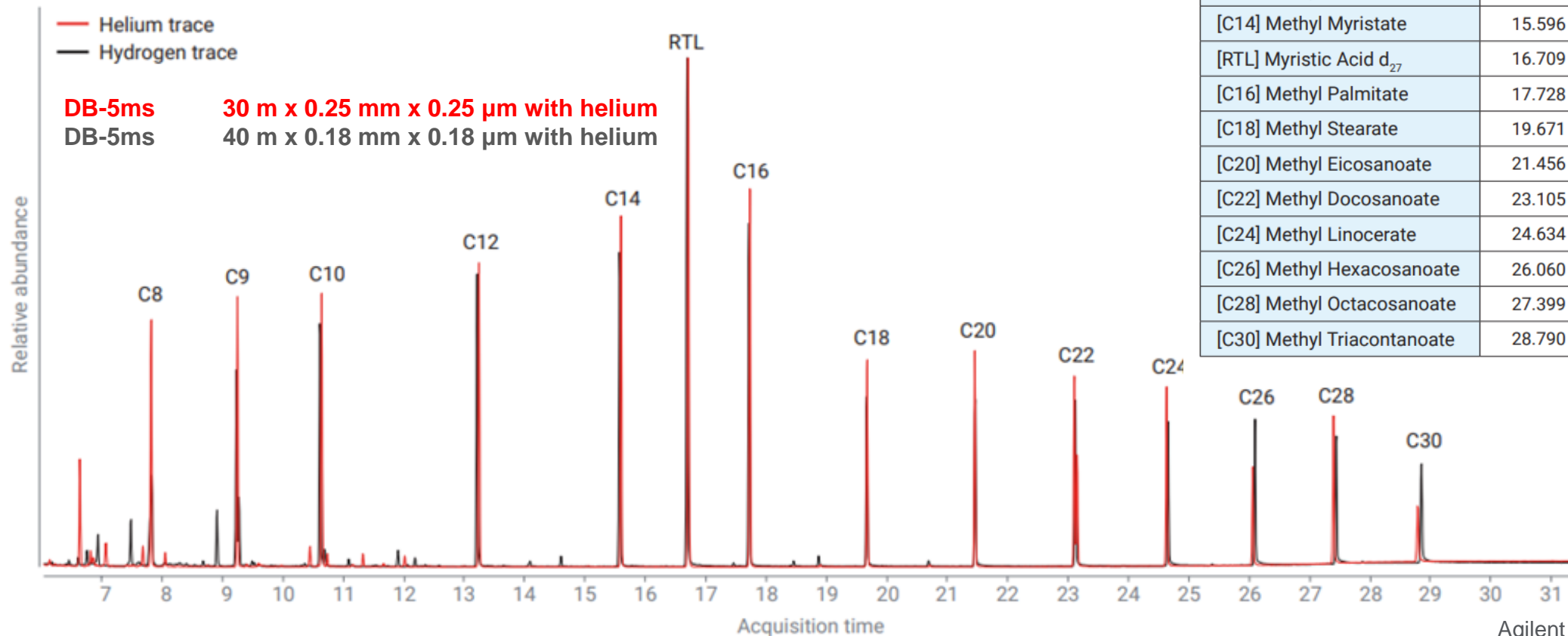


Agilent publication 5994-4967EN

# Maintaining Retention Time Locking When Converting to Hydrogen

## Comparison of FAMEs using helium and hydrogen carrier

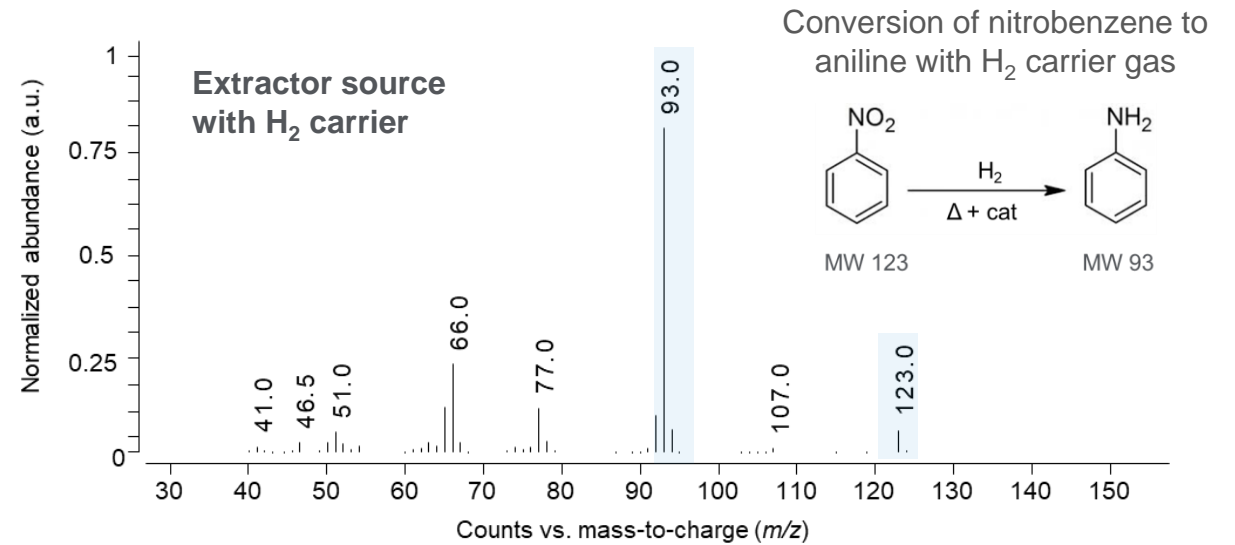
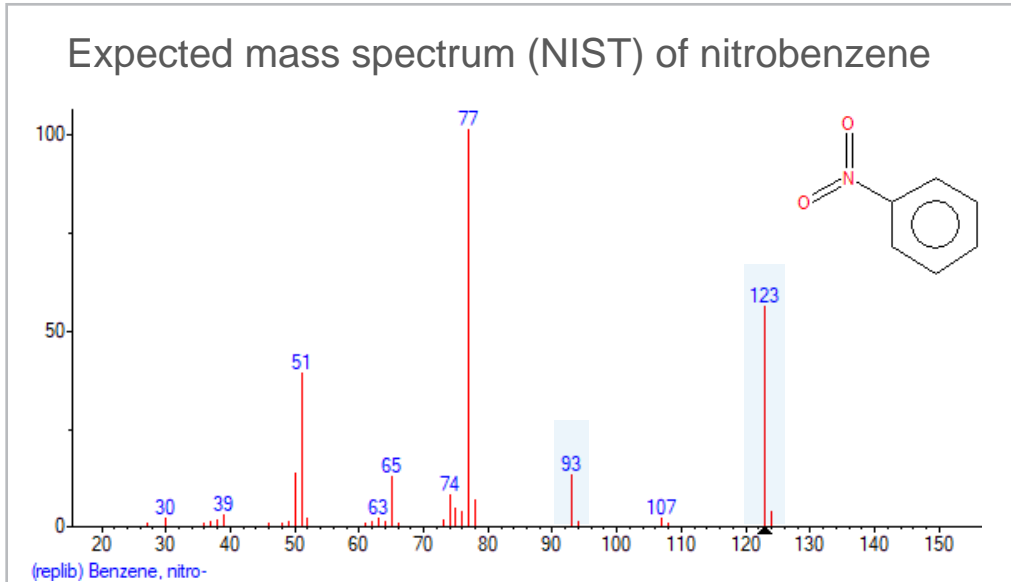
A standard 30 m x 0.25 mm column will retention time lock with 40 m x 0.18 mm mini-bore columns



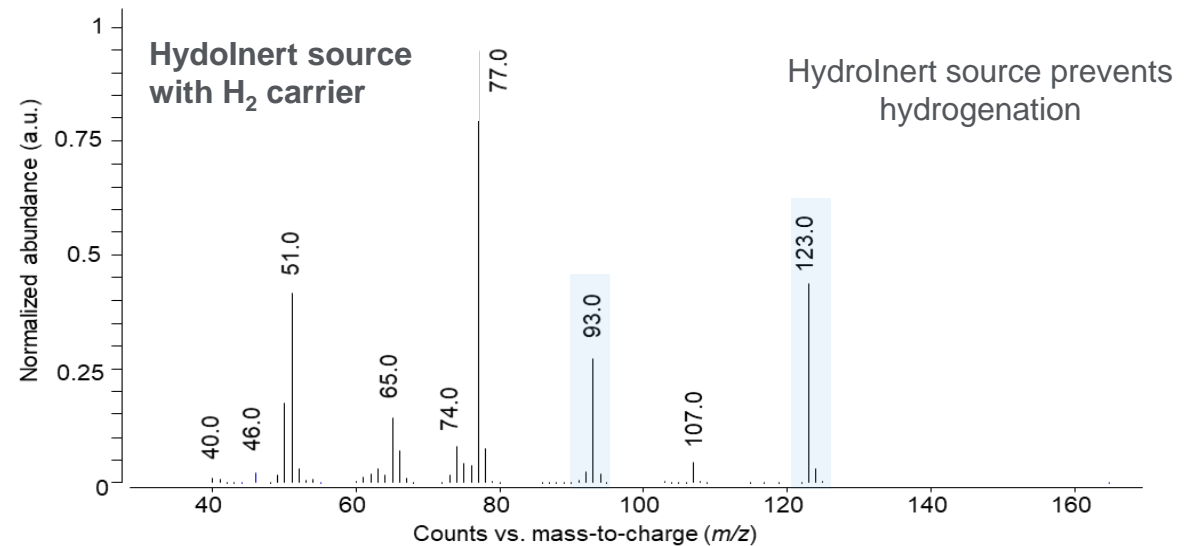
Compound Name	Helium RT (min)	Hydrogen RT (min)	RT Delta (min)
[C8] Methyl Caprylate	7.818	7.82	0.006
[C9] Methyl Pelargonate	9.245	9.23	0.016
[C10] Methyl Caprate	10.640	10.61	0.028
[C12] Methyl Laurate	13.243	13.21	0.031
[C14] Methyl Myristate	15.596	15.57	0.024
[RTL] Myristic Acid d <sub>27</sub>	16.709	16.69	0.020
[C16] Methyl Palmitate	17.728	17.71	0.014
[C18] Methyl Stearate	19.671	19.67	0.005
[C20] Methyl Eicosanoate	21.456	21.46	0.006
[C22] Methyl Docosanoate	23.105	23.12	0.015
[C24] Methyl Linocerate	24.634	24.66	0.026
[C26] Methyl Hexacosanoate	26.060	26.10	0.036
[C28] Methyl Octacosanoate	27.399	27.44	0.041
[C30] Methyl Triacontanoate	28.790	28.85	0.060

Agilent publication 5994-6561EN

# Hydrogen Carrier Activity Can Impact Spectral Fidelity in MS



## Hydrolnert source

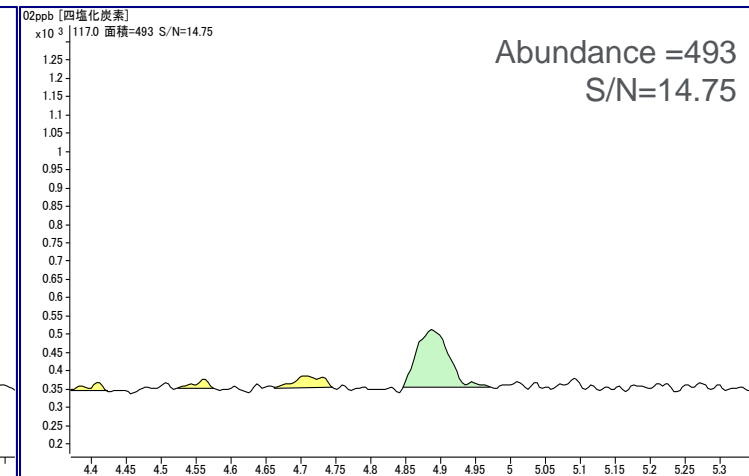
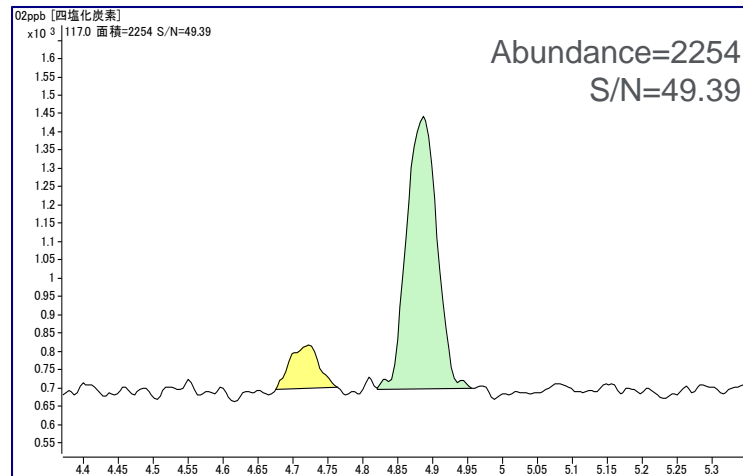


# Hydrogen Carrier Can Impact Analyte Sensitivity

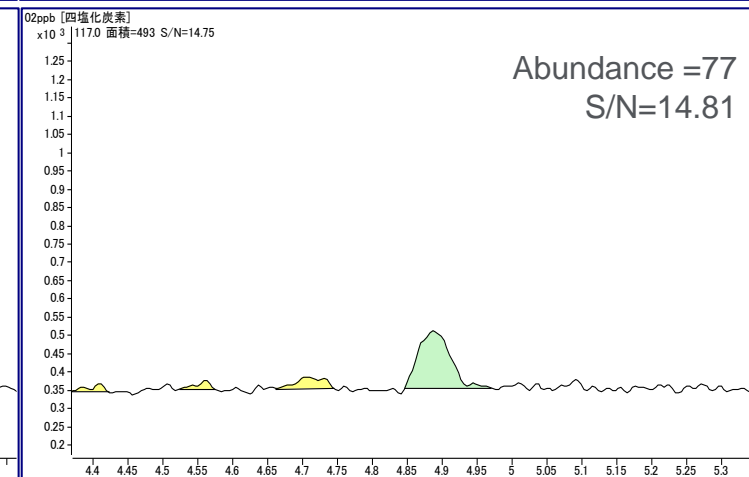
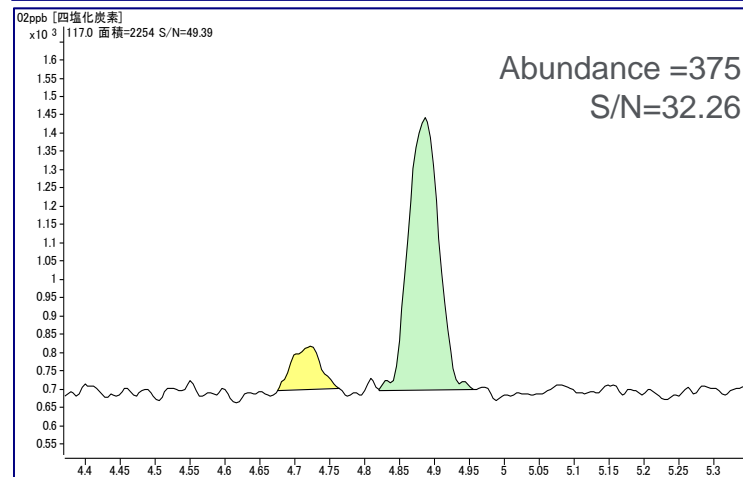
**Carbon tetrachloride**

HydroInert

Extractor



**Bromoform**



# Conserving Carrier Gas

## Five tips to conserve helium



# Five Tips for Conserving Carrier Gas

## 1. Implement a leak check strategy



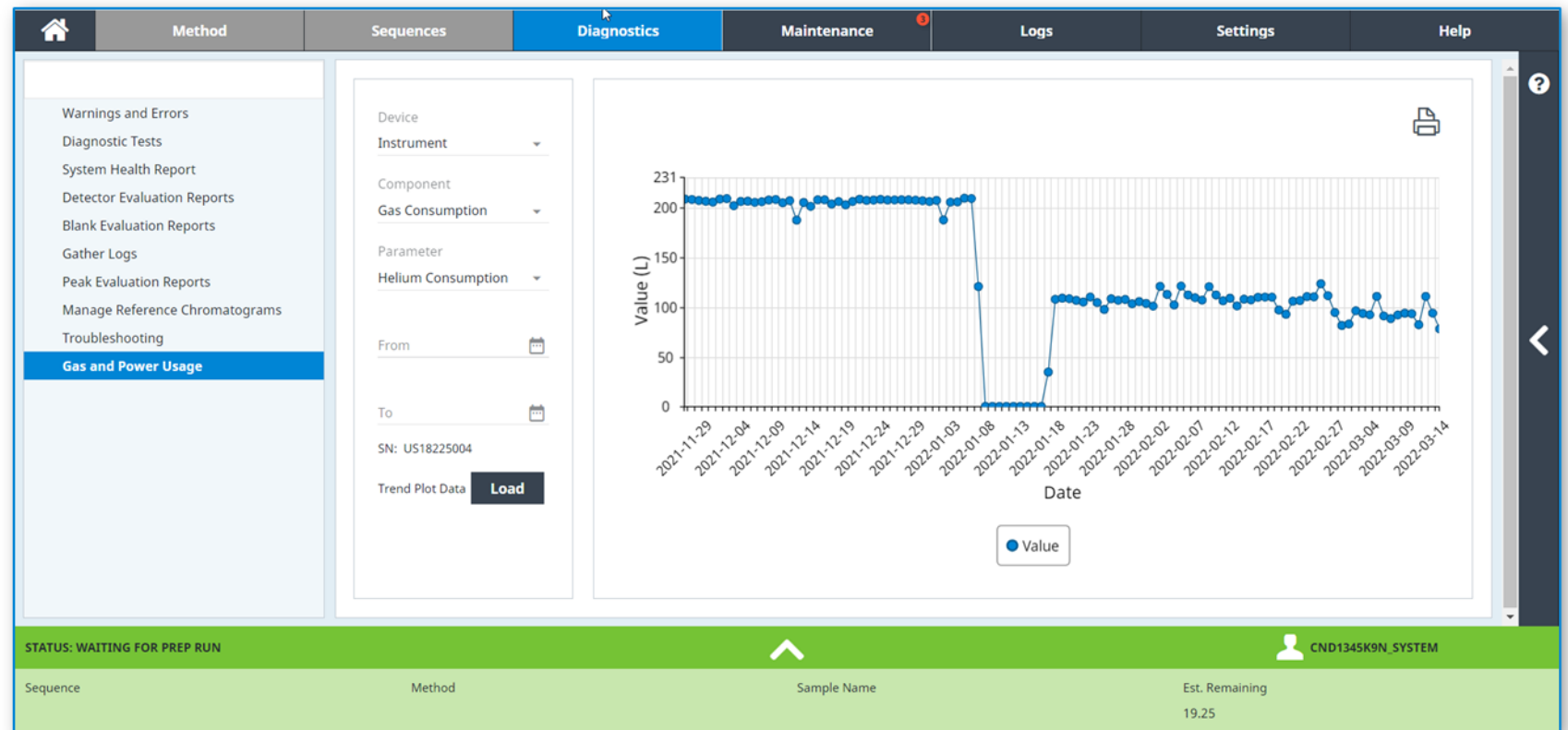
- Inlet and column connections
- Valves for applicated GCs
- MS transfer lines and seals
- All gas connections to the GC
- Do not forget the rest of the lab



# Five Tips for Conserving Carrier Gas

1. Implement a leak check strategy
2. Chart gas usage trends

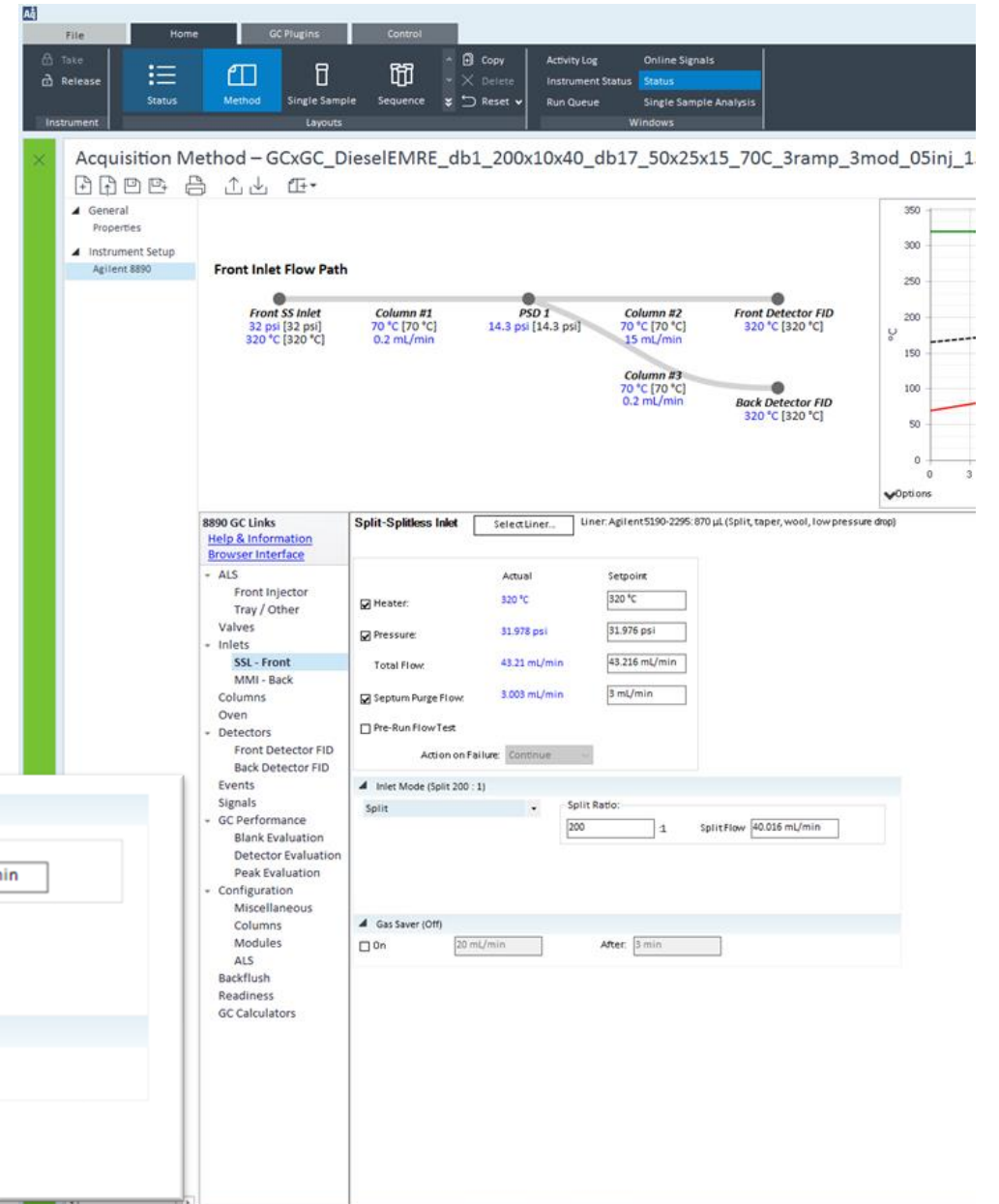
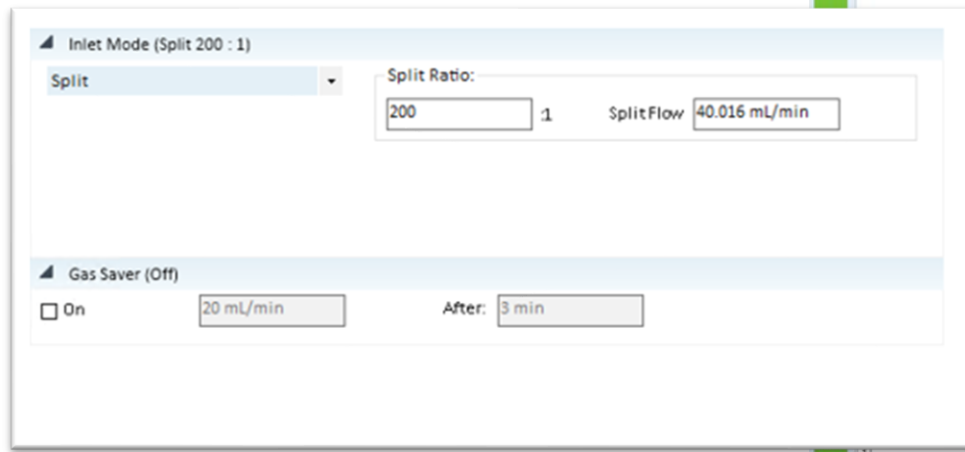
Plot gas (and power) use from touchscreen or browser interface to find anomalies and to visualize the impacts of gas usage during idle periods, sleep/wake methods, and shutdown of the system.



# Five Tips for Conserving Carrier Gas

1. Implement a leak check strategy
2. Chart gas usage trends
3. Use Gas Saver

Simple selection on the GC inlet method will decrease the split vent flow after the sample is loaded on the column.



# Five Tips for Conserving Carrier Gas

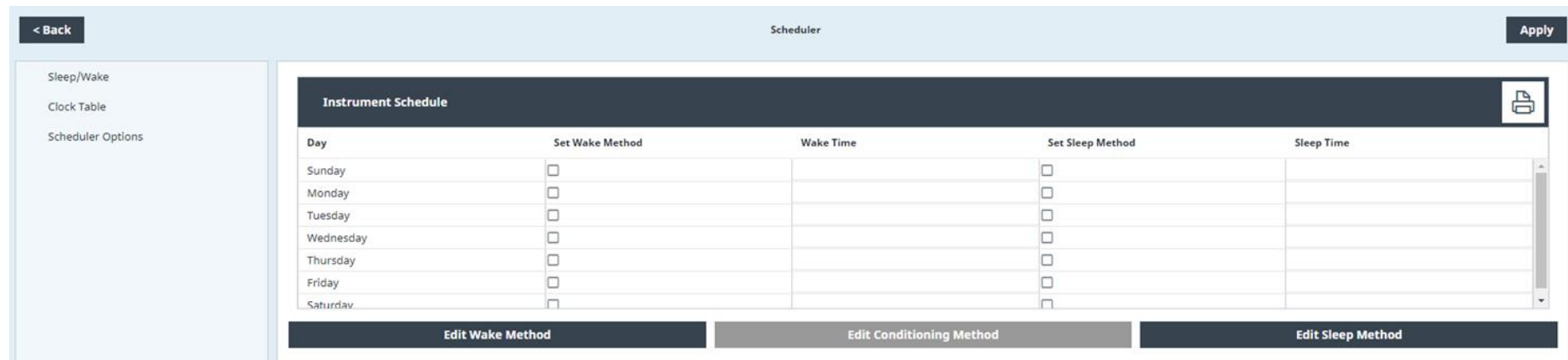
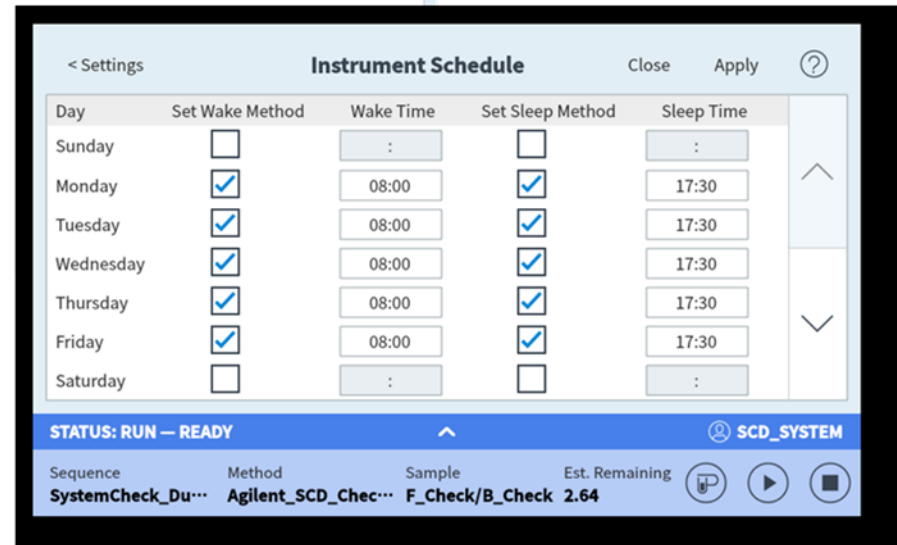
1. Implement a leak check strategy
2. Chart gas usage trends
3. Use Gas Saver
4. Use a Helium Conservation Module



- Extends the life of helium tanks by up to 30 times
- Works with any GC inlet, backflush, and dual simultaneous injection
- Carrier gas id and setpoints are part of your analytical method for easy compliance and transfer
- GC alerts you if system setpoints are not reached
- Switch from nitrogen standby to helium carrier in 15 to 30 minutes (depending on the GC detector)

# Five Tips for Conserving Carrier Gas

1. Implement a leak check strategy
2. Chart gas usage trends
3. Use Gas Saver
4. Use a Helium Conservation Module
5. Use a Scheduler



# Maintain Good Gas Hygiene

- High-quality carrier gas (four 9s or greater)
- Leak-free injector and carrier lines
  - Change septa
  - Maintain gas regulator fittings
- Appropriate impurity traps
- Check for leaks
  - Leak detector



# Additional Resources Available

Agilent | Trusted Answers

ABOUT AGILENT | CONTACT US | UNITED STATES

All Search

PRODUCTS | APPLICATIONS & INDUSTRIES | TRAINING & EVENTS | SERVICES | SUPPORT & RESOURCES | ORDER CENTER

Home > Products > Gas Chromatography > GC Systems > Handle the Helium Shortage - Convert to Alternative Carrier Gas

## Calculating the savings

### Conserve your GC carrier gas to help control costs

This calculator will determine the cost savings that could be realized by implementing Gas Saver with and without nitrogen standby. Simply complete the required fields at the top and the results will display below.

Agilent Gas Saver works with split/splitless and multimode inlets by reducing the GC split flow rate at a specified time after the injection while maintaining constant septum purge and column flow rates throughout the analytical run.

Combining Gas Saver with nitrogen standby can save even more if your system is not in continuous operation. This approach requires the helium conservation module for Agilent 8890, 8860, and 7890 GCs. Using the OpenLab CDS "SLEEP.M" and "WAKE.M" methods, the module automatically switches the carrier gas supply from helium to nitrogen during idle time, further conserving helium.

### See how much you can save

Replace the default values in the fields below with information for your specific method and click the calculate button to see the results. All costs are assumed to be in your local currency and the calculator assumes the helium and nitrogen cylinders are the same size.

He carrier gas flow rate (mL/min)	<input type="text" value="1.2"/>
He split flow rate (mL/min)	<input type="text" value="50"/>
He septum purge rate (mL/min)	<input type="text" value="3"/>
Gas Saver flow rate (mL/min)	<input type="text" value="20"/>
Gas Saver start time (min)	<input type="text" value="3"/>

	Normal use (constant He flow)	Gas Saver	Gas Saver with N2 standby
Daily He usage (L)	78	37	11
He cylinder life (days)	103	218	697
Daily N2 usage (L)	n/a	n/a	25
N2 cylinder life (days)	n/a	n/a	318
Annual He cost	1068	502	157
Annual N2 cost	n/a	n/a	34
<b>Annual total gas cost</b>	<b>1068</b>	<b>502</b>	<b>192</b>
<b>Annual savings vs. normal use*</b>	<b>0</b>	<b>567</b>	<b>877</b>

\*Actual savings will depend on the accuracy of the information provided, integrity of the carrier gas flow path, and other factors.

Calculate your savings



Handle the helium shortage | Conserve helium | **Convert to alternative carrier gas** | Resources | FAQs

## Switch to hydrogen or nitrogen as alternate carrier gas | Agilent

# Contact Agilent Chemistries and Supplies Technical Support



1-800-227-9770 option 3, option 3:

[Option 1 for GC and GC/MS columns and supplies](#)

Option 2 for LC and LC/MS columns and supplies

Option 3 for sample preparation, filtration, and QuEChERS

Option 4 for spectroscopy supplies

Option 5 for chemical standards

**Available in the U.S. and Canada, 8–5, all time zones**



[gc-column-support@agilent.com](mailto:gc-column-support@agilent.com)

[lc-column-support@agilent.com](mailto:lc-column-support@agilent.com)

[spp-support@agilent.com](mailto:spp-support@agilent.com)

[spectro-supplies-support@agilent.com](mailto:spectro-supplies-support@agilent.com)

[chem-standards-support@agilent.com](mailto:chem-standards-support@agilent.com)



# Agilent

Trusted Answers