

New Developments in Polyethylene Glycol (WAX) Columns

*KVCV GC studiedag
Grobbendonk, Oct 12th 2017*

Katrien Sabbe
Product Specialist Columns and Supplies
Agilent Technologies

Striving to Improve GC analyses and Lab Productivity?

Challenges:

- Variable column to column peakshape performance
- Limited column lifetime
- Instrument downtime for GC system troubleshooting
- Rerunning samples due to questionable results
- Increased cost of lab operations

For active and complex polar compounds, adsorption caused by GC flow path activity can be easily avoided

Agilent Inert Flow Path Solution Focus

Optimize GC flow path for reliable performance



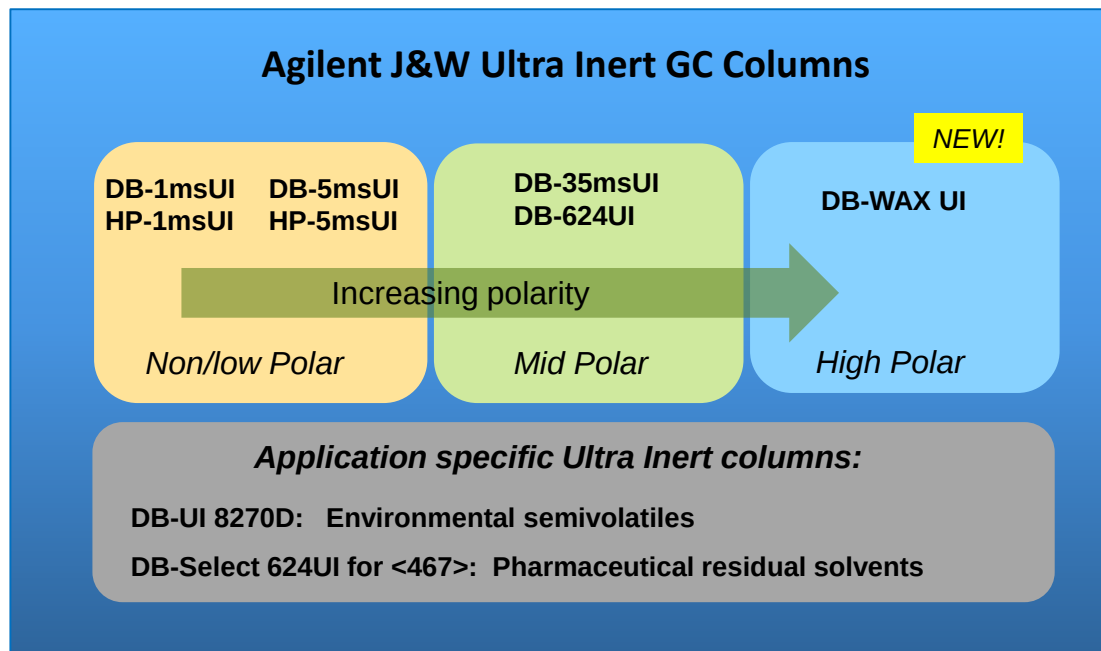
The diagram illustrates the Agilent Inert Flow Path Solution Focus, highlighting various components that optimize GC flow path for reliable performance. The central image shows an Agilent GC system with several components highlighted by blue arrows:

- Ultra Inert Inlet Liner:** A box of Agilent Ultra Inert Inlet Liners is shown in the top left.
- Deactivated Inlet Weldments, Shell and Transfer Lines:** A metal inlet assembly is shown in the top right.
- Deactivated – FPD, TCD, NPD/FID Jets:** A close-up of a deactivated jet is shown in the top right.
- Flexible Metal Ferrules:** Three metal ferrules are shown in the middle left.
- Deactivated Capillary Flow Technology Devices:** A metal device with multiple ports is shown in the bottom left.
- Ultra Inert Gold Seal:** Two gold seals are shown in the center.
- Ultra Inert GC Column:** A box of Agilent J&W GC Columns is shown in the center.
- Gas Clean Gas Purifier:** A gas purifier unit is shown in the bottom right.

A new WAX GC column for analysis of challenging polar compounds: DB-WAX Ultra Inert

DB-WAX UI GC columns are part of the Agilent J&W Ultra Inert GC column family, which pushes industry standards for consistent column inertness.

Every Ultra Inert GC column is rigorously tested to ensure optimal, active analyte delivery to the GC or MS detector.



The result: lower detection limits and more accurate identification of challenging polar analytes

DB-WAX UI Applications

Food, Flavor and Fragrance labs

Applications:

- Essential and flavor oils
- Personal care products
- Fragrance standards/allergens
- Free fatty Acids, Alcohols, Glycols
- Beverages and aroma analysis
- Solvents

- ✓ Production quality control
- ✓ Analysis of feed stocks and raw materials
- ✓ Support for production operations troubleshooting
- ✓ Method development
- ✓ R&D

Industrial chemical labs

Applications:

- Solvent purity – alcohols, ketones, aldehydes etc
- Mixed solvent/chemical formulations (cleaners, paint additives etc.)
- BTEX

Pharmaceutical labs

Application: USP regulated Residual Solvents confirmation column

Improve Lab Productivity and Lower Operational Cost

- **Spend less time on troubleshooting and reruns:** With DB-WAX UI GC columns, excellent peak shape and column-to-column inertness reproducibility, as well as retention time stability.
- **Save money on columns and maintenance:** DB-WAX UI has extended inertness lifetime that withstands repeated temperature cycling to the upper temperature limits of the column (250-260°C).
- **No need for prequalifying columns:** Specific inertness testing during quality control guarantees out-of-the-box inertness performance for every DB-WAX UI column.
- **Implement easily, with minimal workflow interruption:** DB-WAX UI GC columns have the **same selectivity** as standard DB-WAX GC columns. Upgrade to Ultra Inert performance easy with minimal validation. No need to recreate or modify existing compound libraries that are based on DB-WAX selectivity.

Combine with Agilent Inert Flow Path GC Supplies for optimized performance

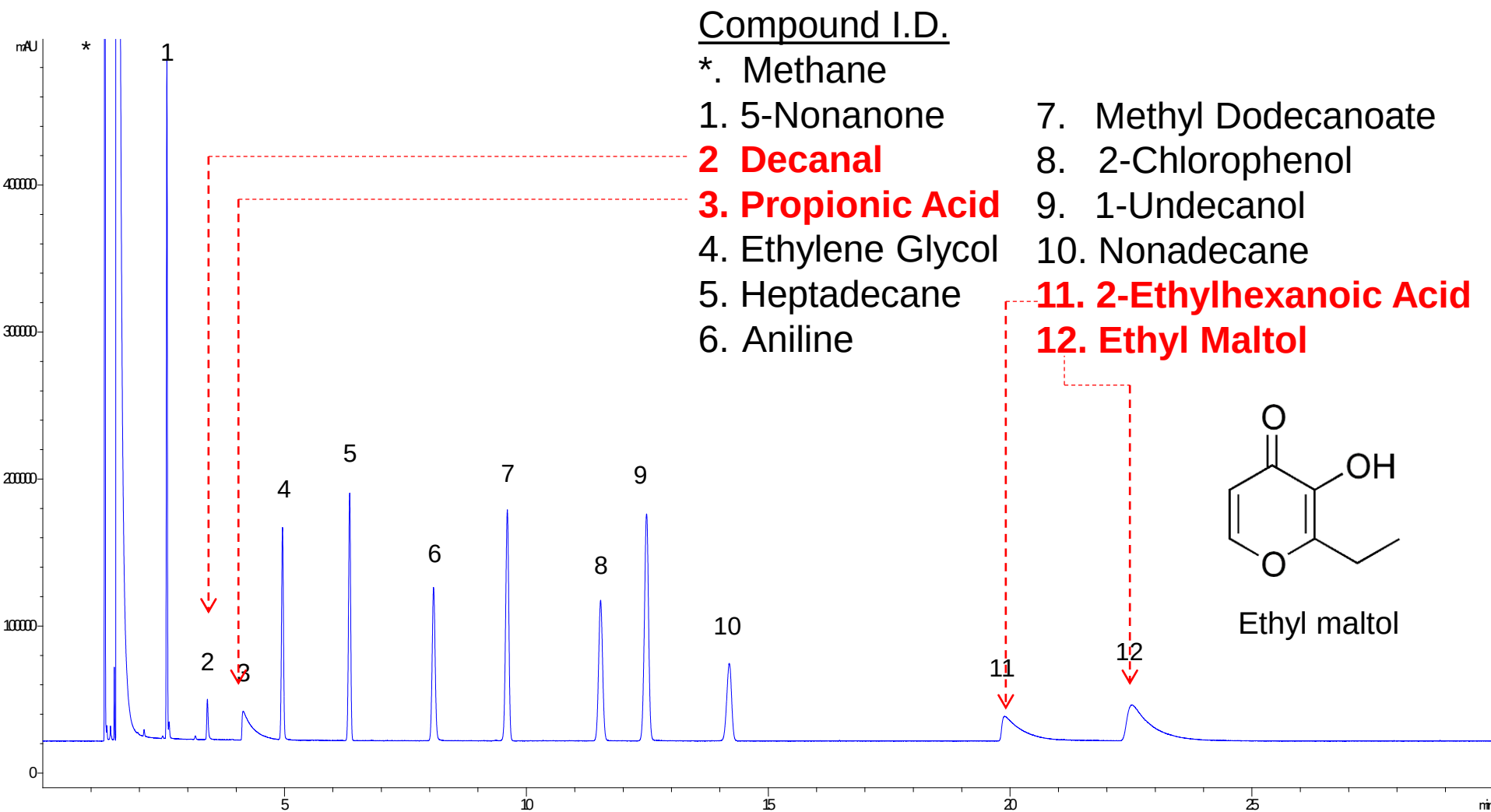
Proof of Inertness: the DB-WAX Ultra Inert Testing

- A strong test probe mixture can highlight deficiencies in column activity, while a weak mixture can actually mask such deficiencies.
- Like all of Agilent's Ultra Inert GC columns, DB-WAX UI GC columns are tested with the industry's most demanding test probe mixture based on real-world requirements—and we prove it with a performance summary sheet shipped with each column.
- The DB-WAX Ultra Inert test probe mixture includes decanal, propionic acid, ethyl hexanoic acid, and ethyl maltol to ensure inertness performance for these active polar compounds.



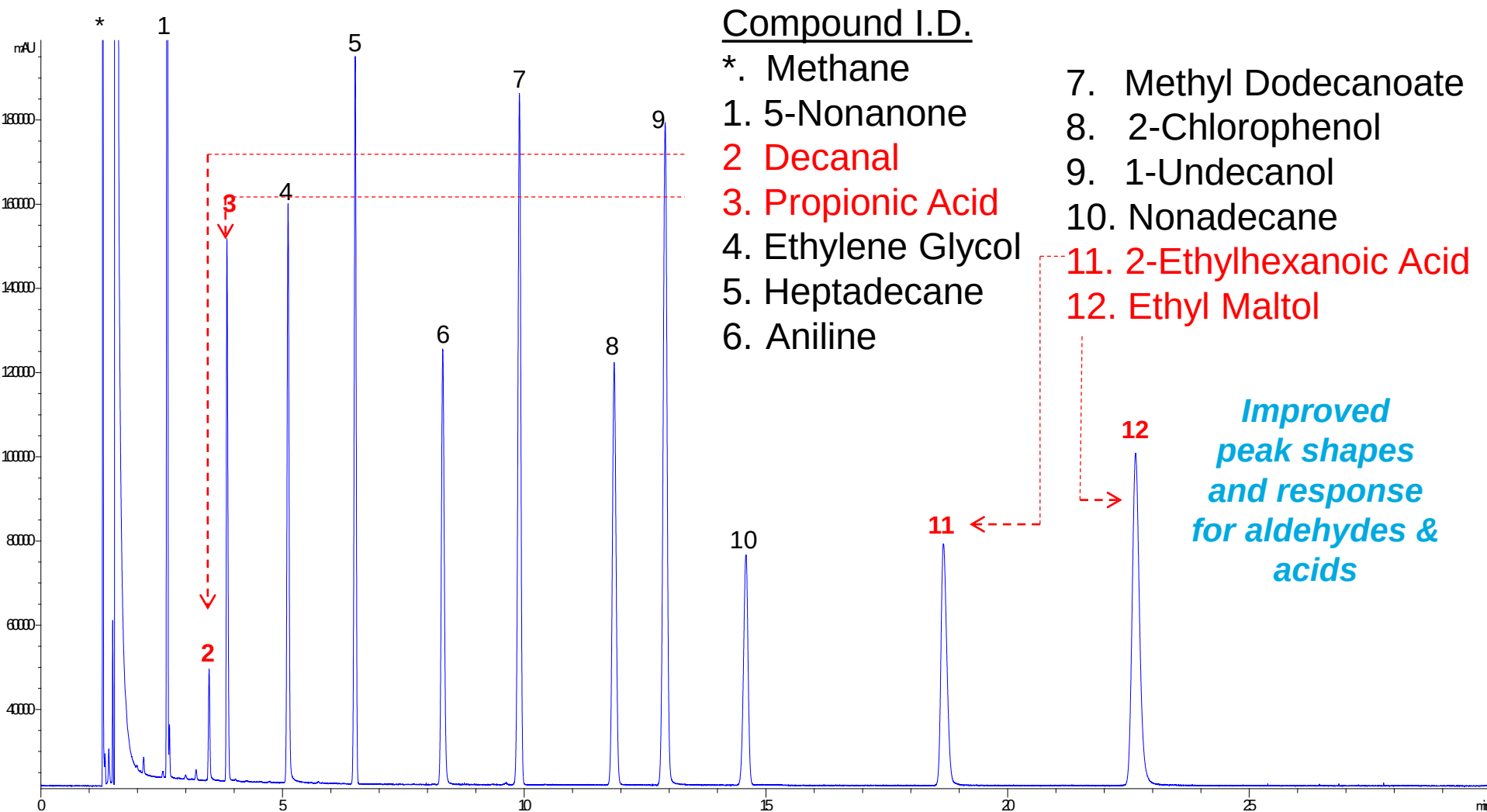
DB-WAX UI Test mix on Standard WAX column

30 m x 0.25 mm x 0.25 μ m



DB-WAX UI testmix on DB-WAX Ultra Inert

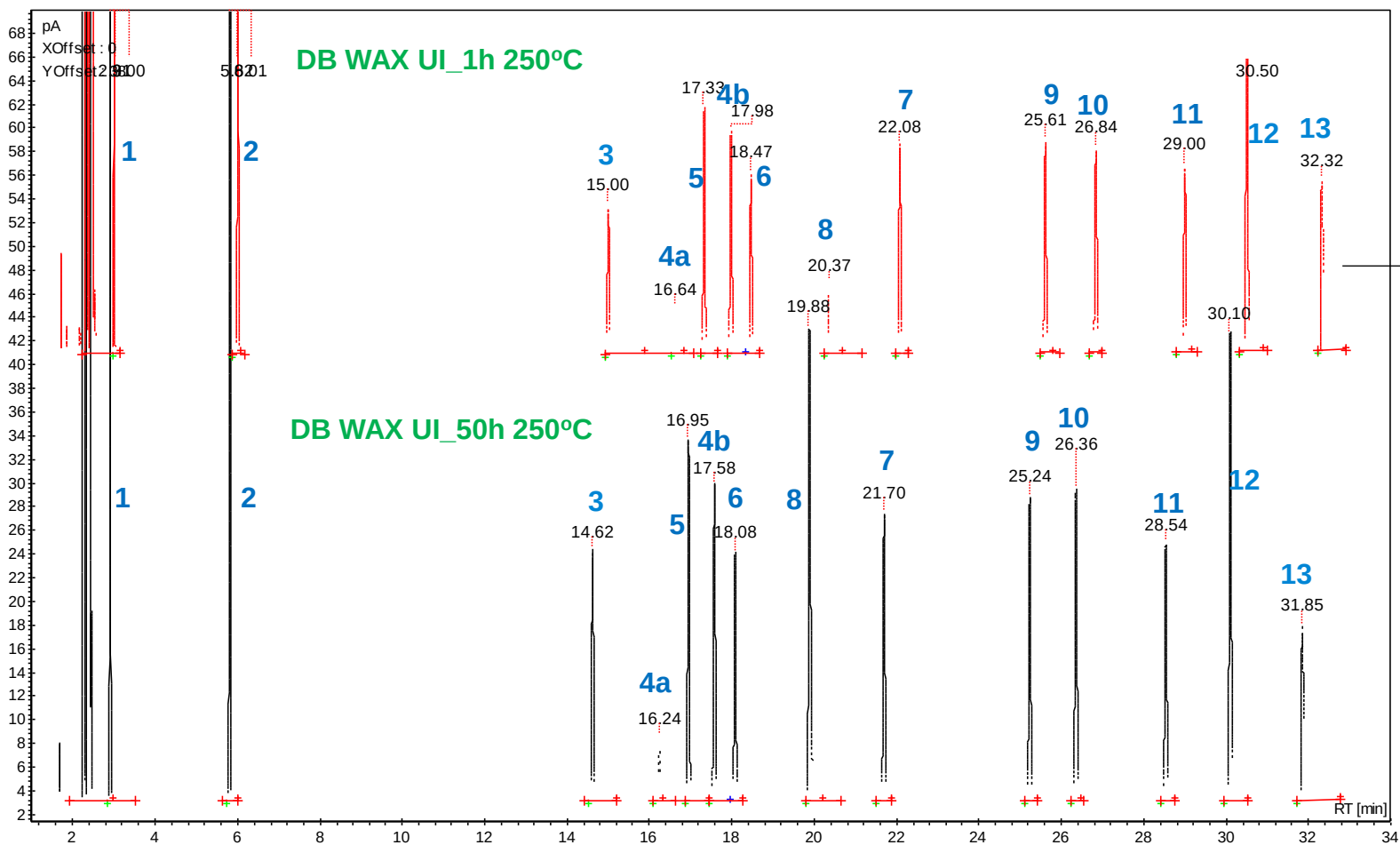
30 m x 0.25 mm x 0.25 μ m



Durability of Inertness of DB-WAX UI

(modified Grob mix)

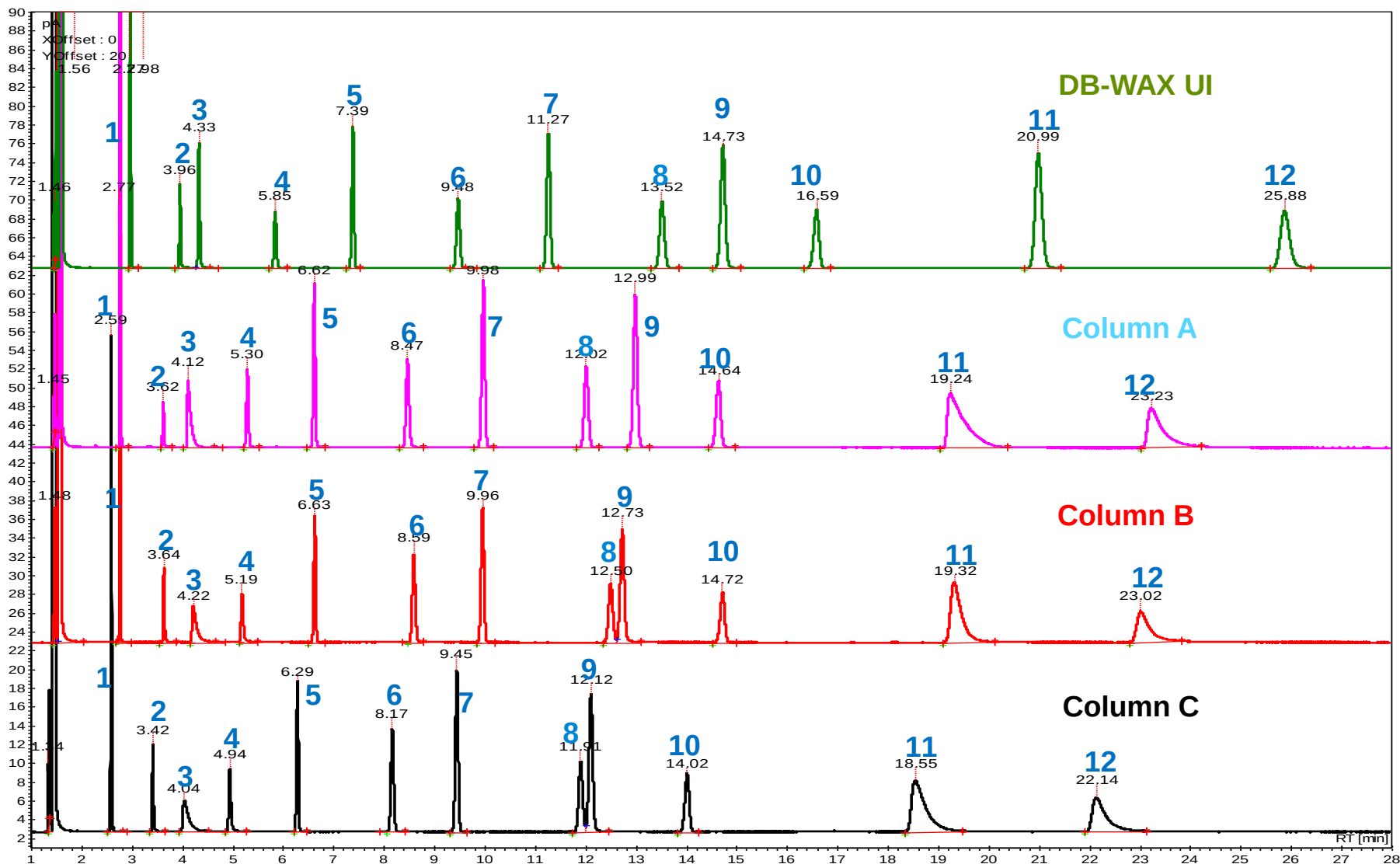
Compounds	Modified Grob
1	Decane
2	Dodecane
3	Decanal
4	2,3-Butanediol
5	1-Octanol
6	C10 FAME
7	nC11-FAME
8	Dicyclohexylamine
9	nC12-FAME
10	2,6-Dimethylaniline
11	2,6-Dimethylphenol
12	2-Ethylhexanoic acid
13	Ethyl maltol



Excellent peak shapes are maintained across all compound classes!

DB-WAX UI Test mix after conditioning 1h at 250°C

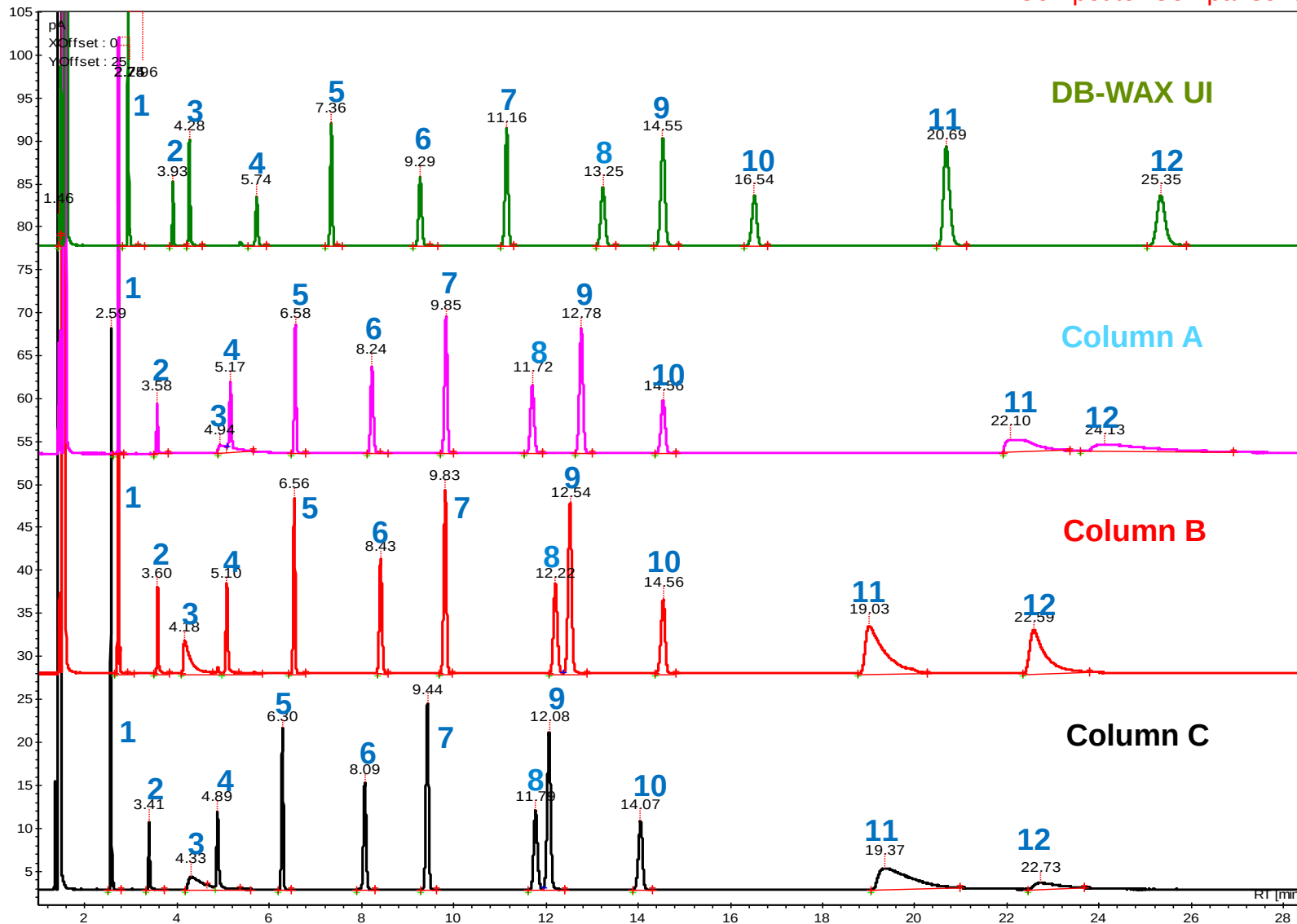
Competitor Comparisons

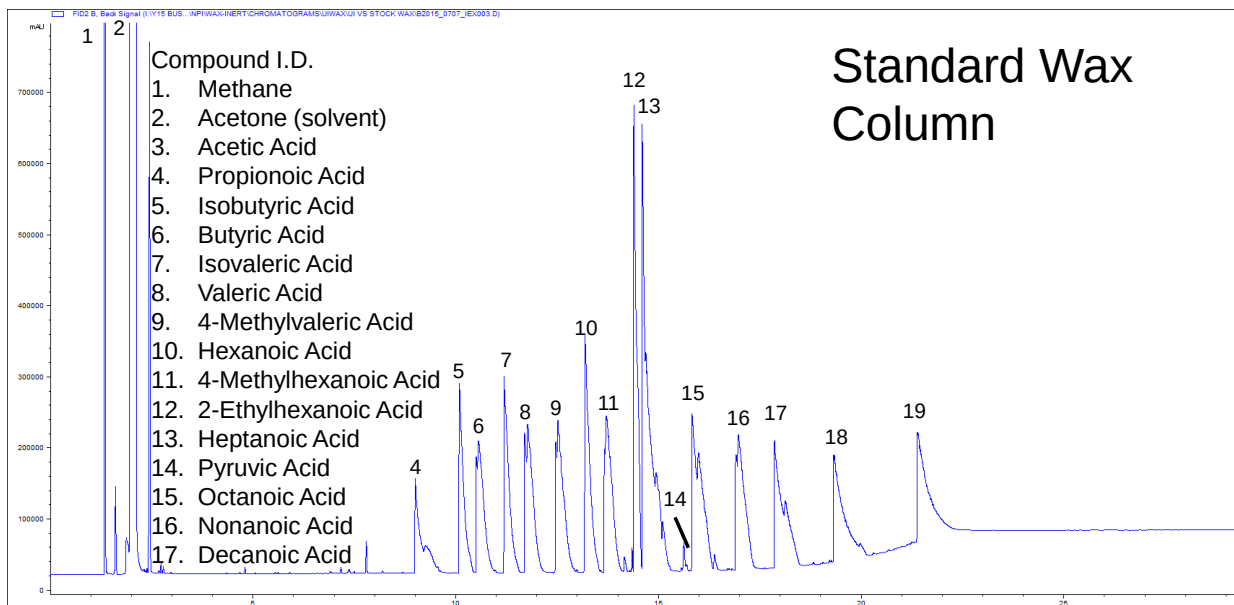


DB-WAX UI Test mix after conditioning 50 h at 250°C

50hrs @ 250C = 600 analyses with 5min bake-out @ 250C

Competitor Comparisons





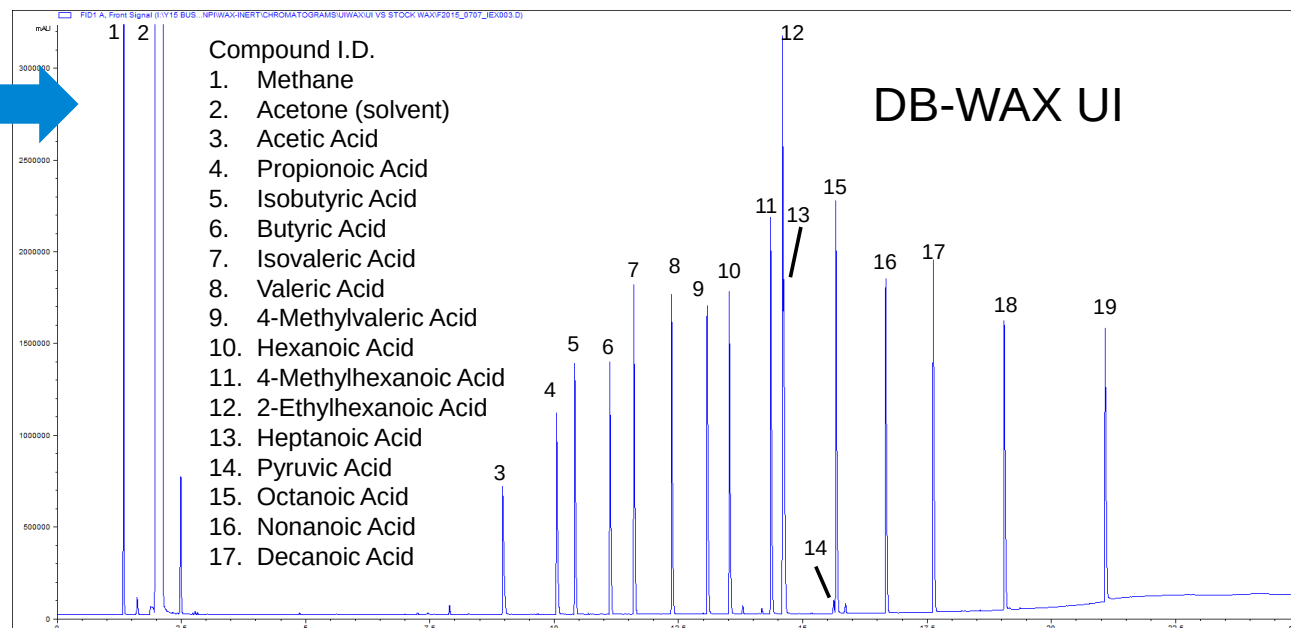
Analysis of Organic Acids



Excellent Peakshape
with DB-WAX Ultra Inert

No need to run a
separate FFAP column
for organic acids

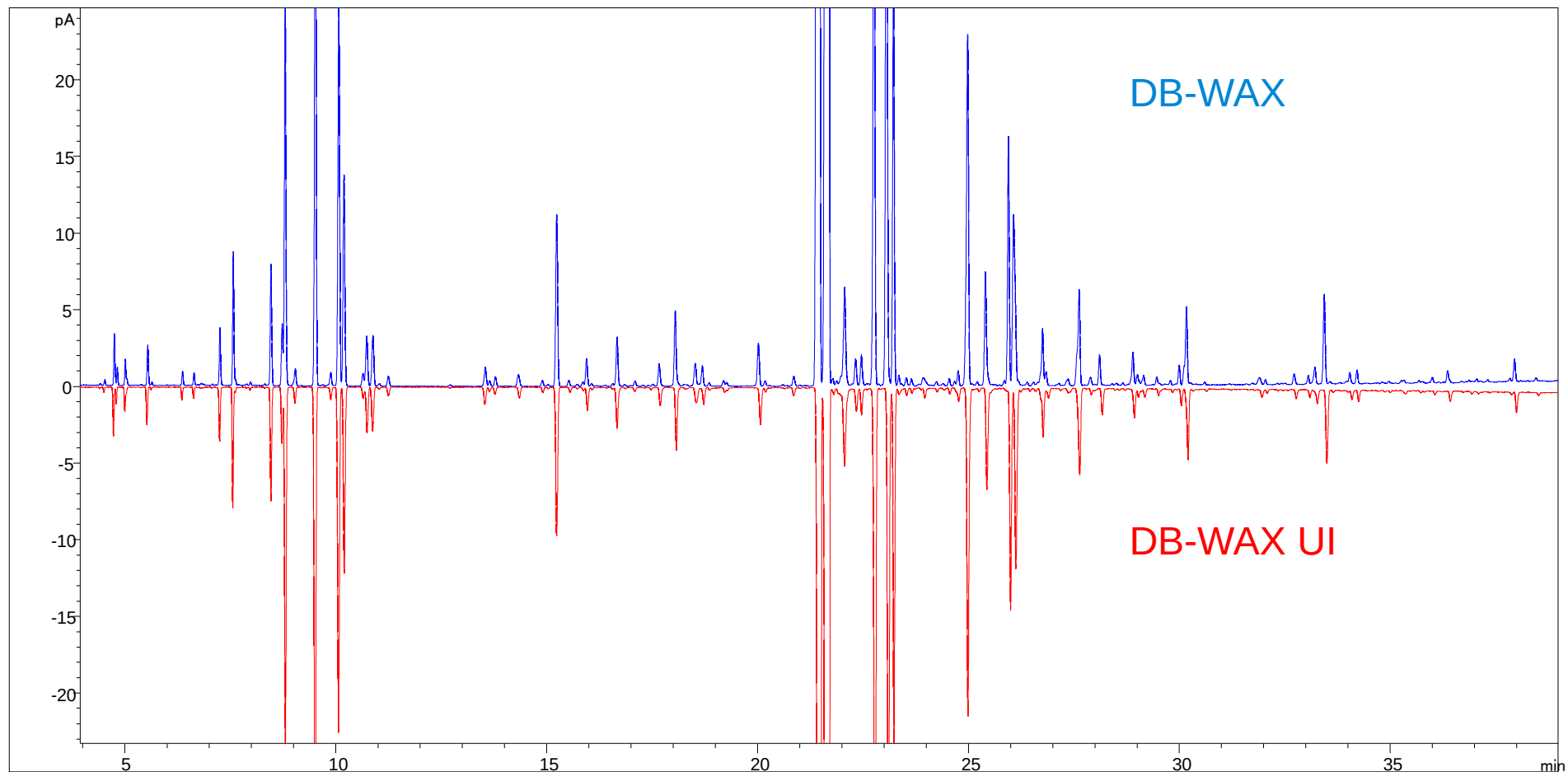
Standardize on DB-WAX
UI to broaden application
range



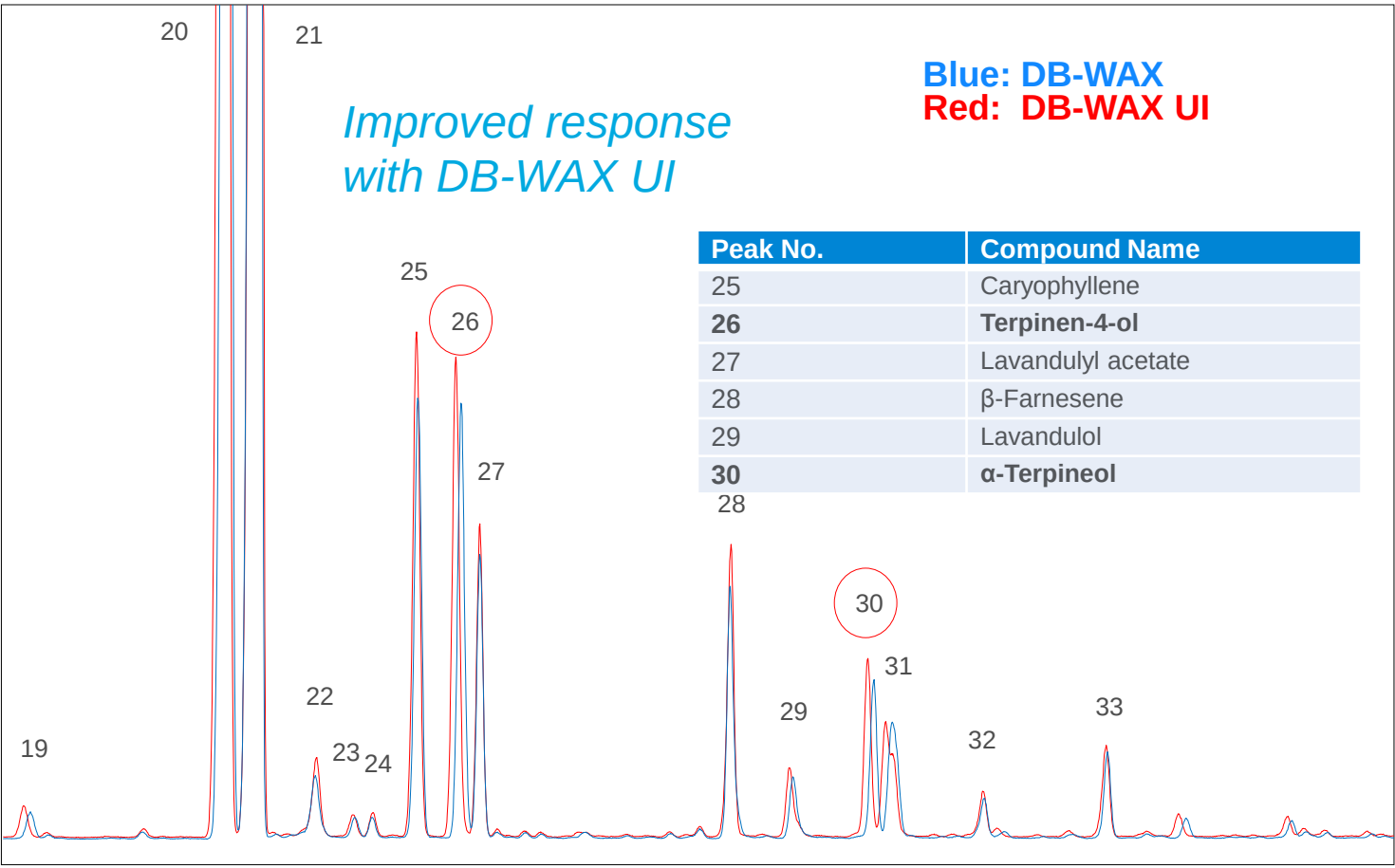
Lavender Oil: DB-WAX / DB-WAX UI

30 m x 0.25 mm x 0.25 μm

Identical Selectivity



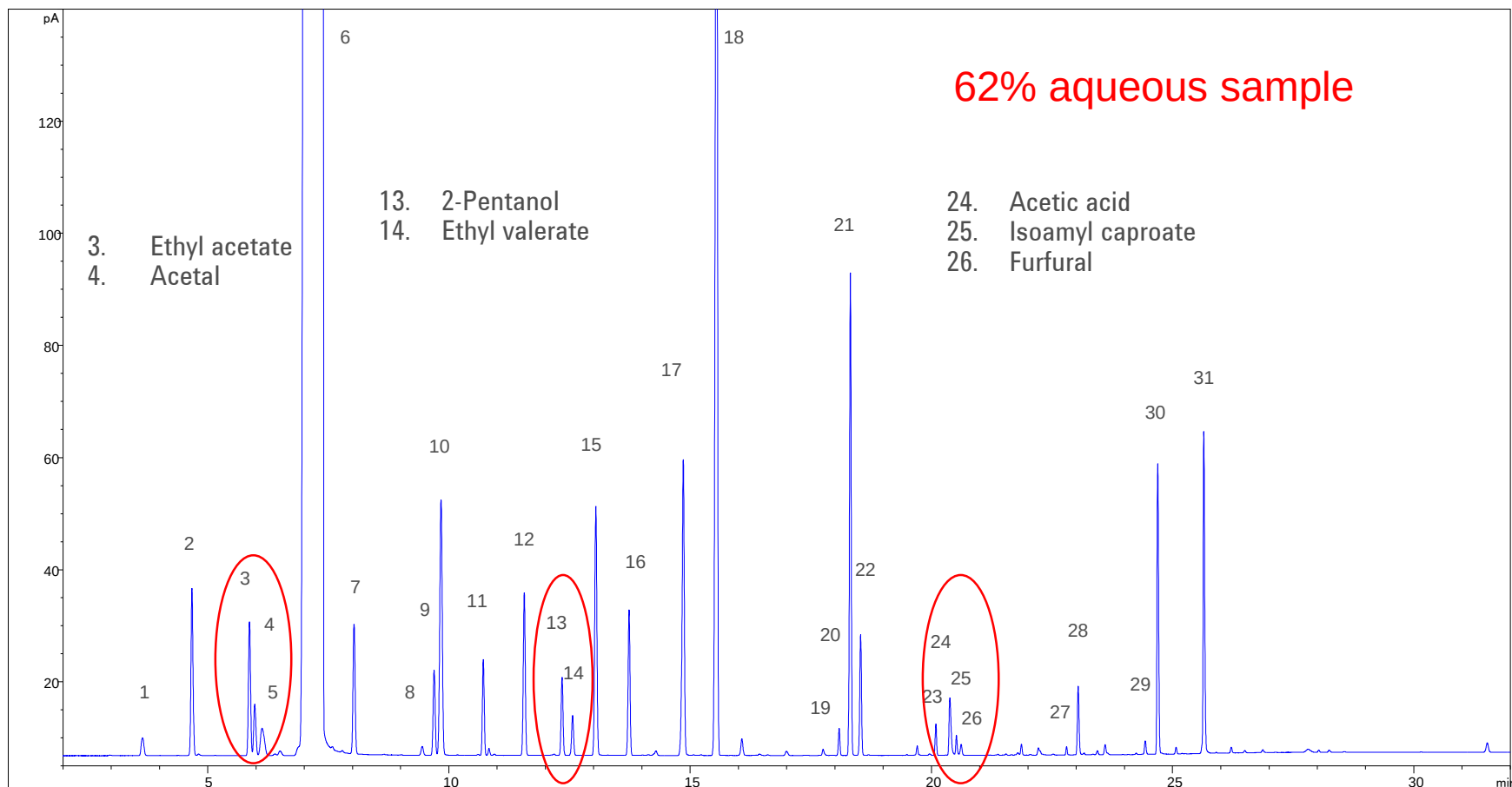
Lavender Oil: Enlarged section GC/MS chromatogram



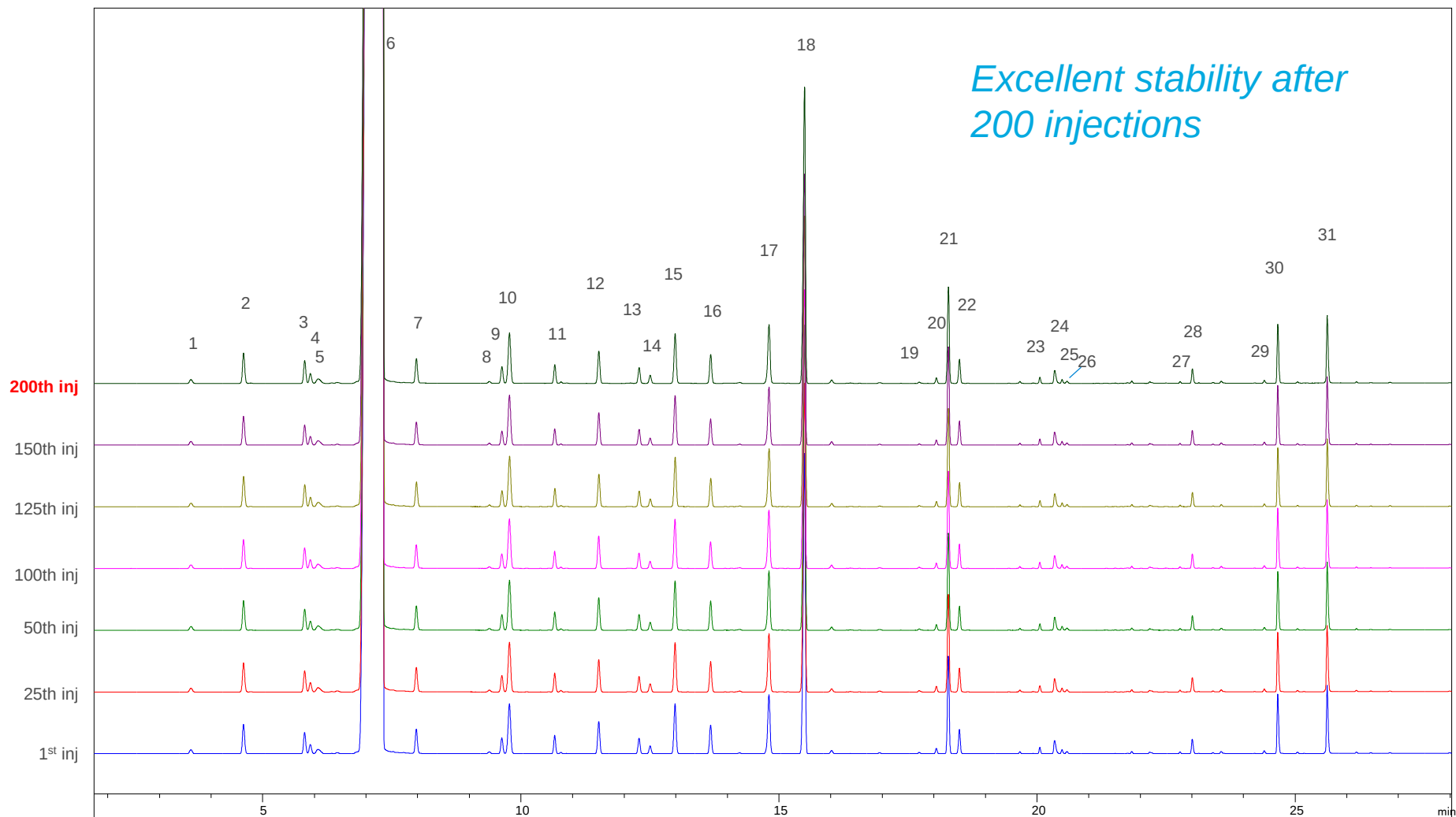
Identical column selectivity is crucial for customers in flavor / fragrance industry who have built extensive compound libraries using DB-WAX

GC/FID Distilled Spirit Analysis

DB-WAX Ultra Inert 30 m x 0.25 mm x 0.25 μm



DB-WAX UI: Robust for Aqueous Samples



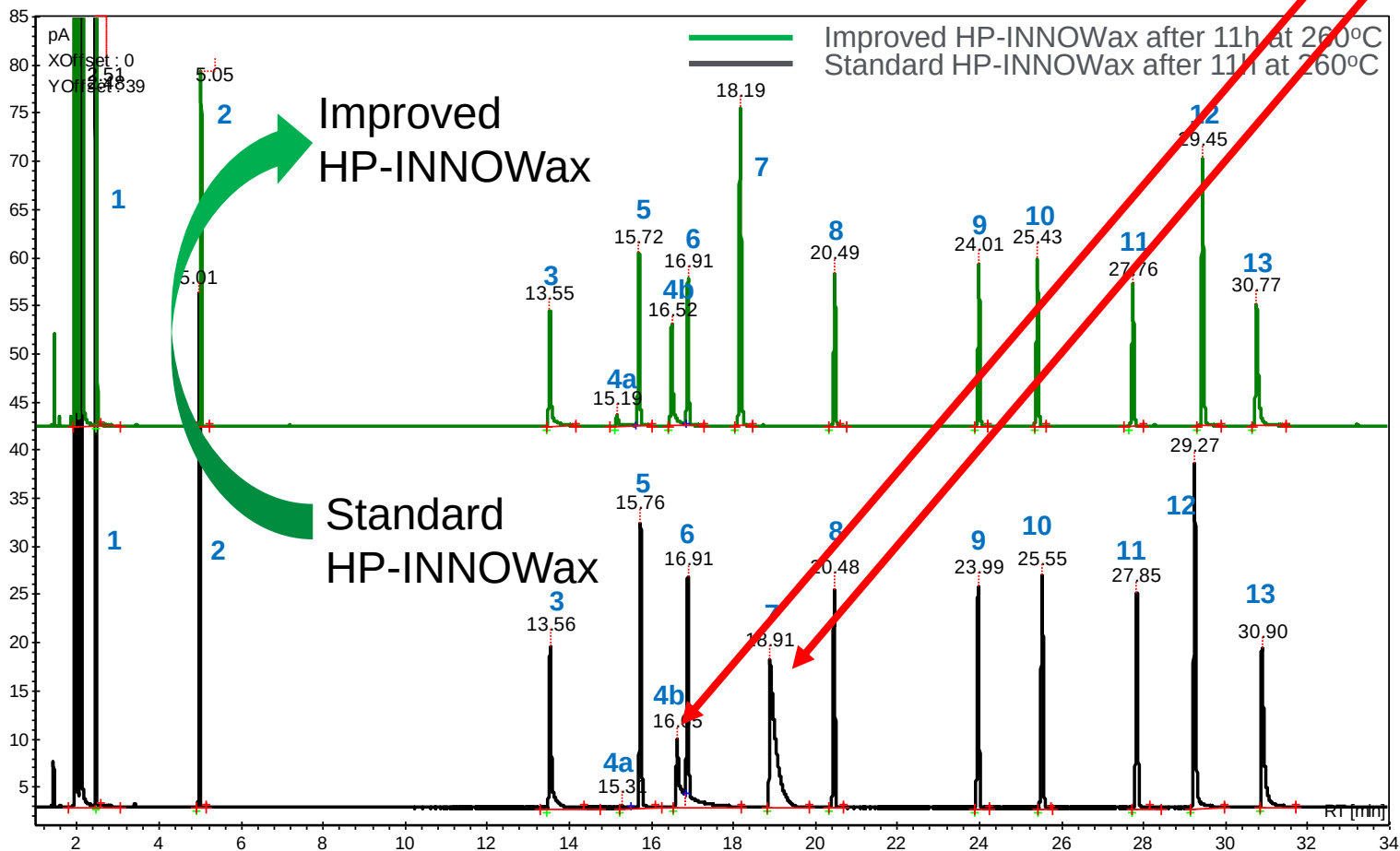
Improved HP-INNOWax and CP-Wax 52 CB

- Leveraging UI technology story for process innovation
- Customer feedback on standard HP-INNOWax and CP-Wax 52 CB :
 - Poor inertness for diols, amines, acids, ethyl maltol
 - Poor column-to-column inertness reproducibility – peak shape
 - Inertness longevity issues (150-500 runs < expected 800 runs)
- DB-WAX UI technology was applied to HP-INNOWax and CP-Wax 52 CB
- Applied to all configurations
- Improved HP-INNOWax and CP-Wax 52 CB do not have UI label
 - DB-WAX UI best overall performance
 - Product names HP-INNOWax and CP-Wax 52 CB remain unchanged
 - Identical selectivity as current HP-INNOWax and CP-Wax 52 CB

Improved HP-INNOWax

Modified Grob test mix

Peak no.	Compound
1	Decane
2	Dodecane
3	Decanal
4	2,3-Butanediol*
5	1-Octanol
6	C10 FAME
7	Dicyclohexylamine
8	nC11-FAME
9	nC12-FAME
10	2,6-Dimethylaniline
11	2,6-Dimethylphenol
12	2-Ethylhexanoic acid
13	Ethyl maltol

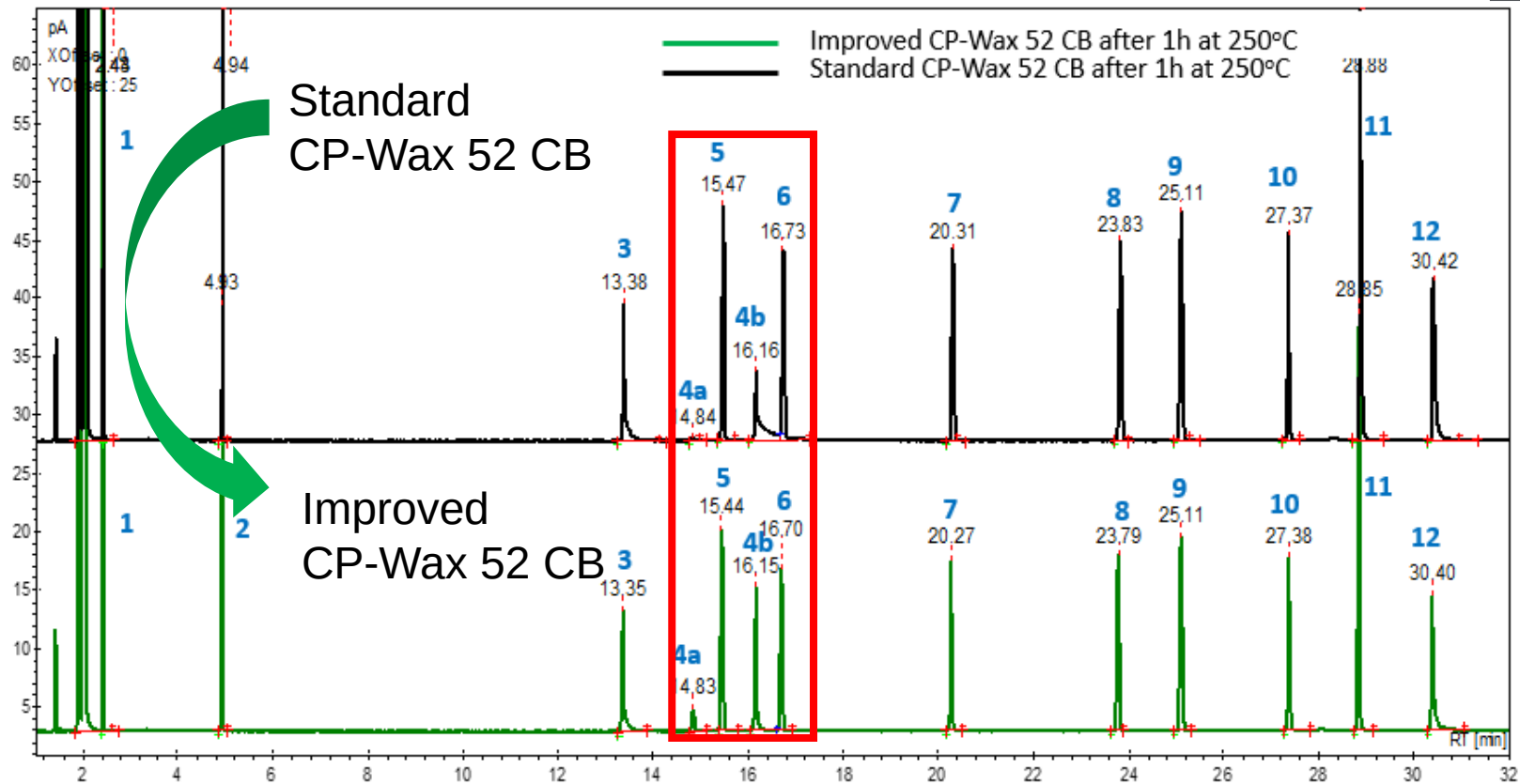


*2,3-Butanediol is present at 2 isomers, RR/SS and meso isomers, respectively

Improved CP-Wax 52 CB

Modified Grob test mix (w/o Dicyclohexylamine)

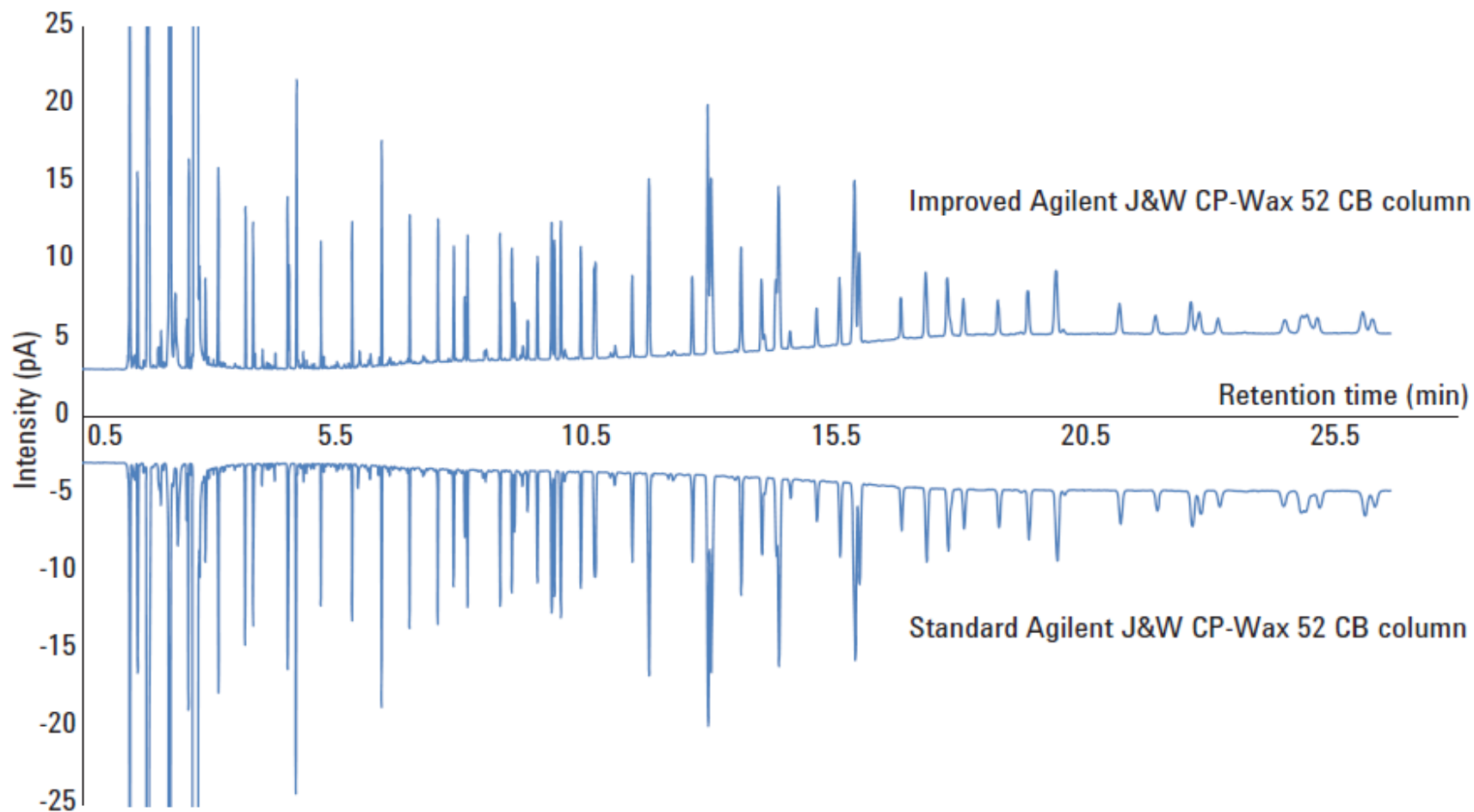
Peak no.	Compound
1	Decane
2	Dodecane
3	Decanal
4	2,3-Butanediol*
5	1-Octanol
6	C10 FAME
7	nC11-FAME
8	nC12-FAME
9	2,6-Dimethylaniline
10	2,6-Dimethylphenol
11	2-Ethylhexanoic acid
12	Ethyl maltol



*2,3-Butanediol is present at 2 isomers, RR/SS and meso isomers, respectively

FAMEs Analysis: improved/standard CP-Wax 52

Identical Selectivity



*GC-FID chromatogram of extended FAMEs mixture (72 compounds).
RTL locked using methylstearate*

NEW!! DB-FATWAX UI

COMING DECEMBER 1ST, 2017



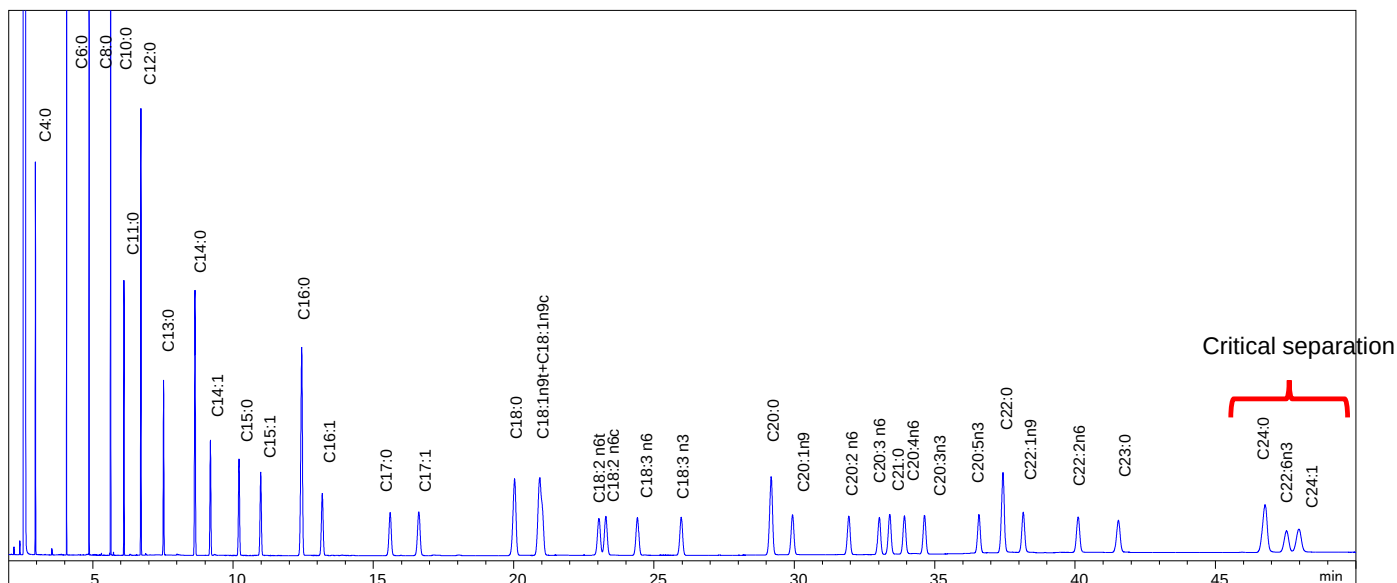
What is New?

New WAX GC Column for fats: FAMES, FAEEs, and free fatty acids

- Based on new ultra inert technology, this WAX column is able to separate FAMES and free fatty acids in food and beverage matrices.
- Eliminates the need to use acid-modified GC Columns for most free fatty acids
- DB-FATWAX UI is specifically tested for FAMES per AOCS and AOAC requirements
- Ideal column for Omega 3 and Omega 6 FAMES, fish oil and animal fat
- Offers competitive differentiation over other WAX columns for FAME analysis

Analysis of 37 FAMES Using a 30m DB-FATWAX UI

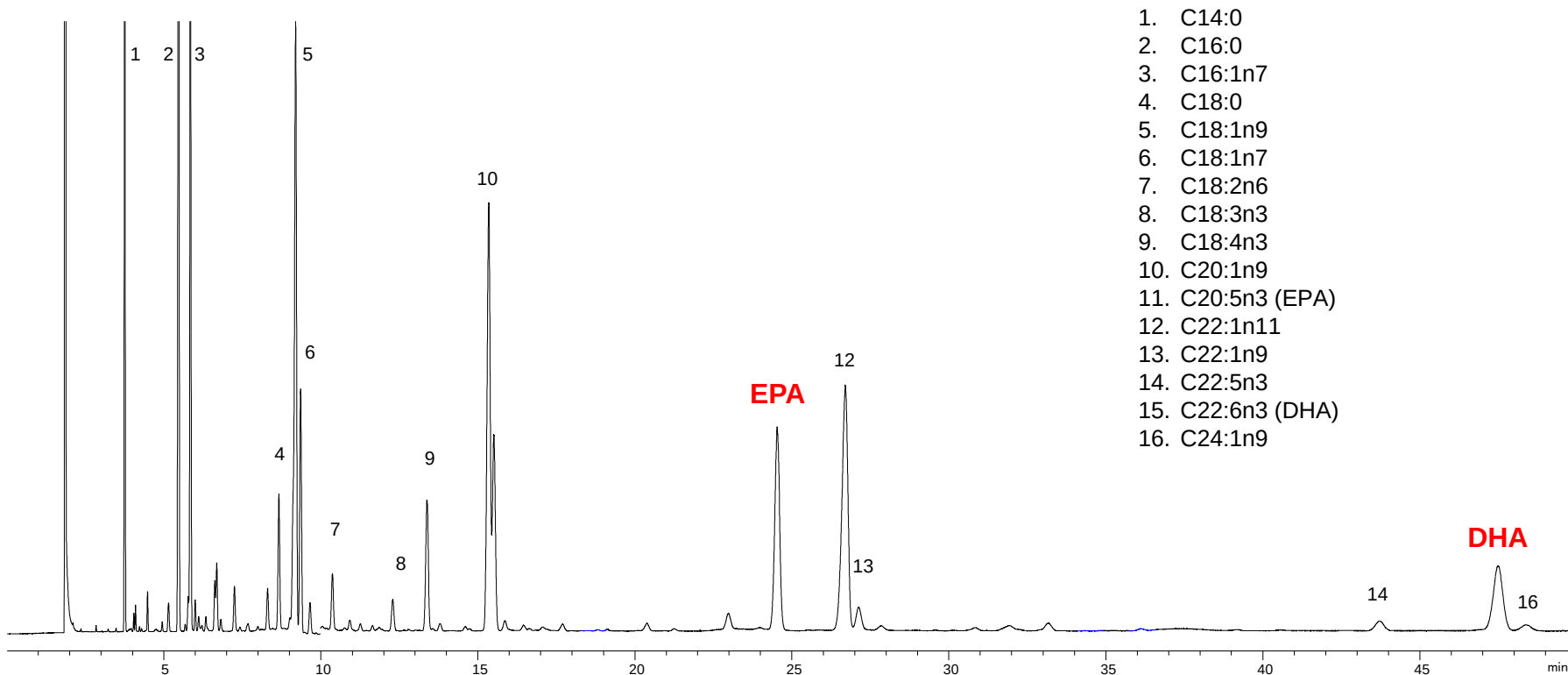
GC System: Agilent 7890B
Column: DB-FATWAX UI, 30m*0.25mm I.D., 0.25um
Inlet: 250°C, split/splitless mode, split ratio 50:1
Carrier: Helium, constant flow, 40cm/s@50°C
Oven: 50°C(2min), 50°C/min to 174°C(14min), 2°C/min to 215°C(25min)
FID: 280°C, Hydrogen:40mL/min, Air:400mL/min, make-up gas:25mL/min
Injection: 1uL



Analysis of PUFA No.1(Fish Oil)

GC System: Agilent 7890B
Column DB-FATWAX UI, 30m, 0.25mm i.d., 0.25 μ m (G3903-63007)
Inlet 250°C, split/splitless mode, split ratio 100:1
Carrier Helium, constant flow, 30cm/s
Oven 205°C
FID 280°C, Hydrogen:40mL/min, Air:400mL/min, make-up gas:25mL/min
Injection 1 μ L
Sample PUFA No.1 (diluted)

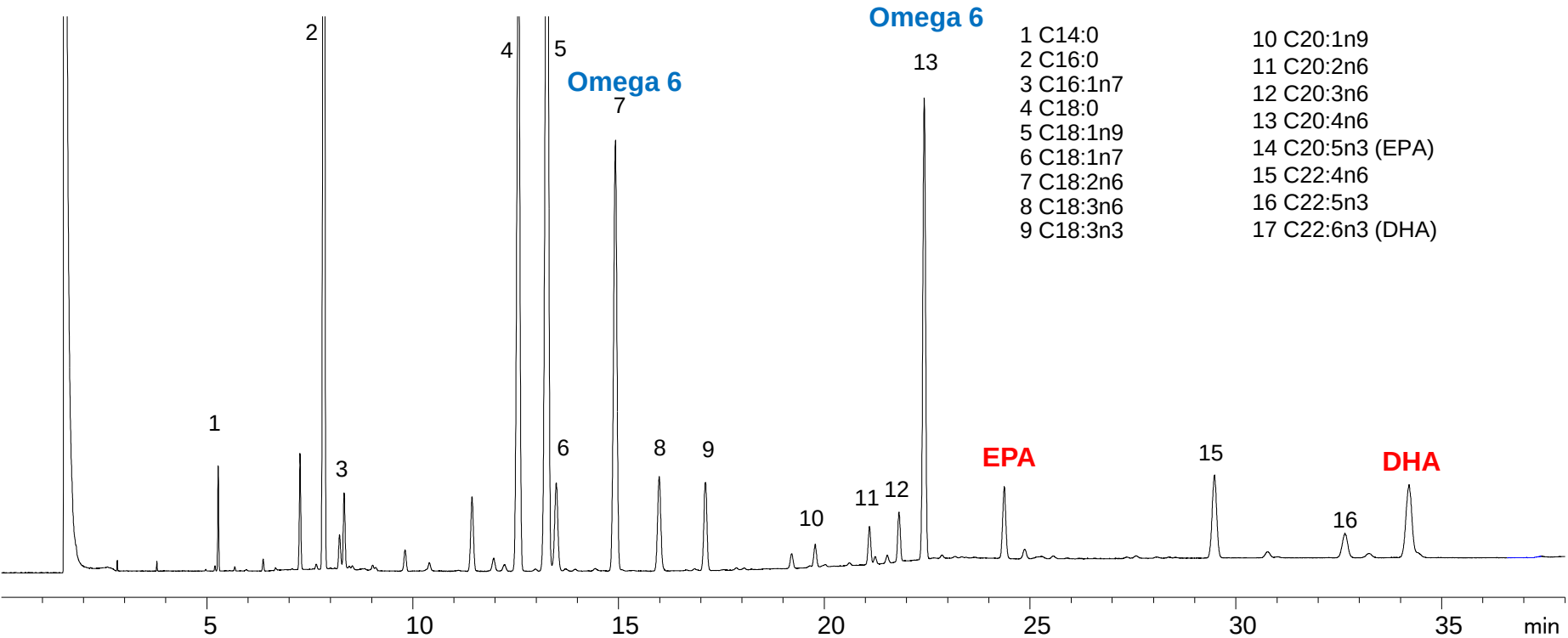
Baseline resolution of
EPA and DHA



Analysis of PUFA No.2 (Animal Fat)

GC System:Agilent 7890B
Column DB-FATWAX UI, 30m, 0.25mm i.d., 0.25µm (G3903-63007)
Inlet 250°C, split/splitless mode, split ratio 100:1
Carrier Helium, constant flow, 1.4ml/min
Oven 140°C, 15 °C/min to 190 °C (11mn) , 4 °C/min to 220 °C(20mn)
FID 280°C, Hydrogen:40mL/min, Air:400mL/min, make-up gas:25mL/min
Injection 1uL
Sample PUFA No.2 (diluted)

Baseline resolution of
EPA and DHA



For More information:

DB-WAX UI Application notes:

A New PEG GC Column with Improved Inertness reliability and Column Lifetime **5991-6683EN**

Analysis of Distilled spirits Using Agilent J&W DB-WAX Ultra Inert Capillary GC Column **5991-6638EN**

Analysis of Lavender Essential Oil by Agilent J&W DB-WAX Ultra Inert Capillary GC Column **5991-6635EN**

Analysis of Glycols in Toothpaste Using Agilent J&W DB-WAX Ultra Inert Capillary GC Column **5991-6637EN**

Improved HP-Innowax and CP-Wax 52 CB technical overviews:

Agilent J&W CP-Wax 52 CB Columns with Improved Inertness Consistency from Column to Column **5991-7525EN**

Enhanced Performance of the Improved Agilent J&W HP-INNOWax Column **5991-6638EN**

Brochures:

Inert Flow Path Solutions **5990-8532EN**

Increase Your Analytical Confidence for Polar Compounds **5991-6709EN**

Webinar GC Analysis Fats and Oils - 18th October



UPCOMING WEBINAR

Complete and Smart Solutions for Your Fatty Acids, FAMES & Oils Analysis

Separation Science, in association with Agilent Technologies, offers you the chance to take part in a webinar that will provide you with a guideline and tips to find out if you are using the right GC column and supplies choice for the right fat and oil application.

We will also use this opportunity to introduce DB-FATWAX UI, a new WAX column based on Agilent's Ultra Inert technology that can be used to analyse most free fatty acids, FAMES and FAEs, simplifying column selection for your fats and oils applications.

By attending this webinar you will learn:

- how to know if you are using the best column and supplies for fat & oil applications.
- how to improve the efficiency of your GC analysis.

[REGISTER FOR THIS WEBINAR>>](#)

PLUS - Participation Bonus: Register and attend the webinar to receive a special offer from Agilent Technologies.

This webinar will be broadcast at three different times. Please select the broadcast that is most appropriate for you. If the times of this event are not convenient, still register and you'll automatically receive a link to the on-demand version as soon as it is ready.

If you have any colleagues that may be interested in this webinar, please forward your email to them.

Best regards,

Janet Kelsey
Separation Science

Date: 18 & 19 October
Start Times:

Broadcast #1

Wednesday, 18 October

7 AM PDT (California)
10 AM EDT (New York)
3 PM BST (London)
4 PM CEST (Paris)

Broadcast #2

Wednesday, 18 October

12 PM PDT (California)
2 PM CDT (New Orleans)
3 PM EDT (New York)

Broadcast #3

Thursday, 19 October

9.30 AM IST (Delhi)
12 PM SGT (Singapore)
3 PM AEDT (Sydney)

Presenter:

Gustavo Serrano
(Agilent Technologies, Wilmington, Delaware, USA)

in collaboration with



Agilent Technologies

Click for FREE
registration >>

*Thank
You*

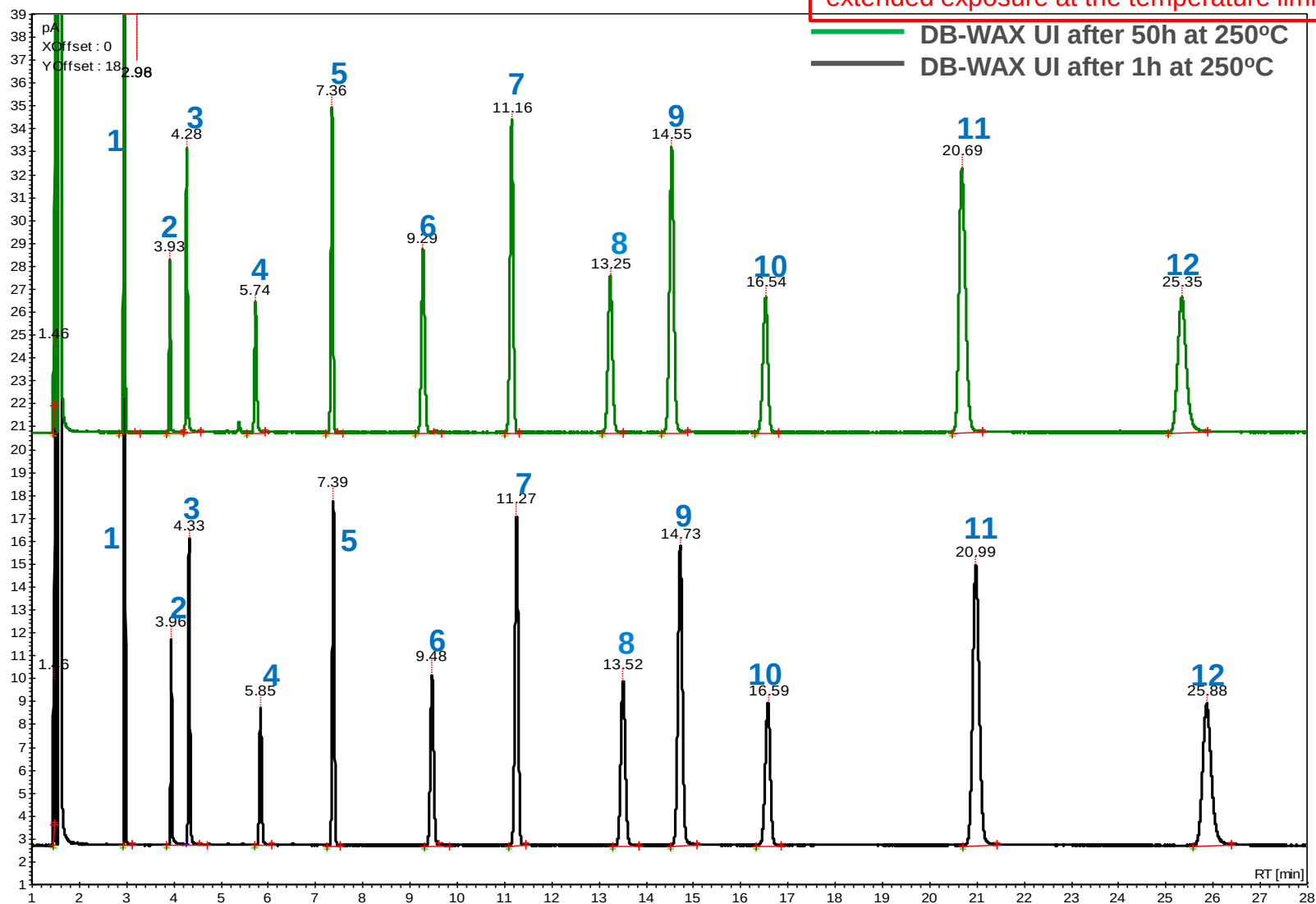


Appendix

DB-WAX UI test mix on DB-WAX UI column

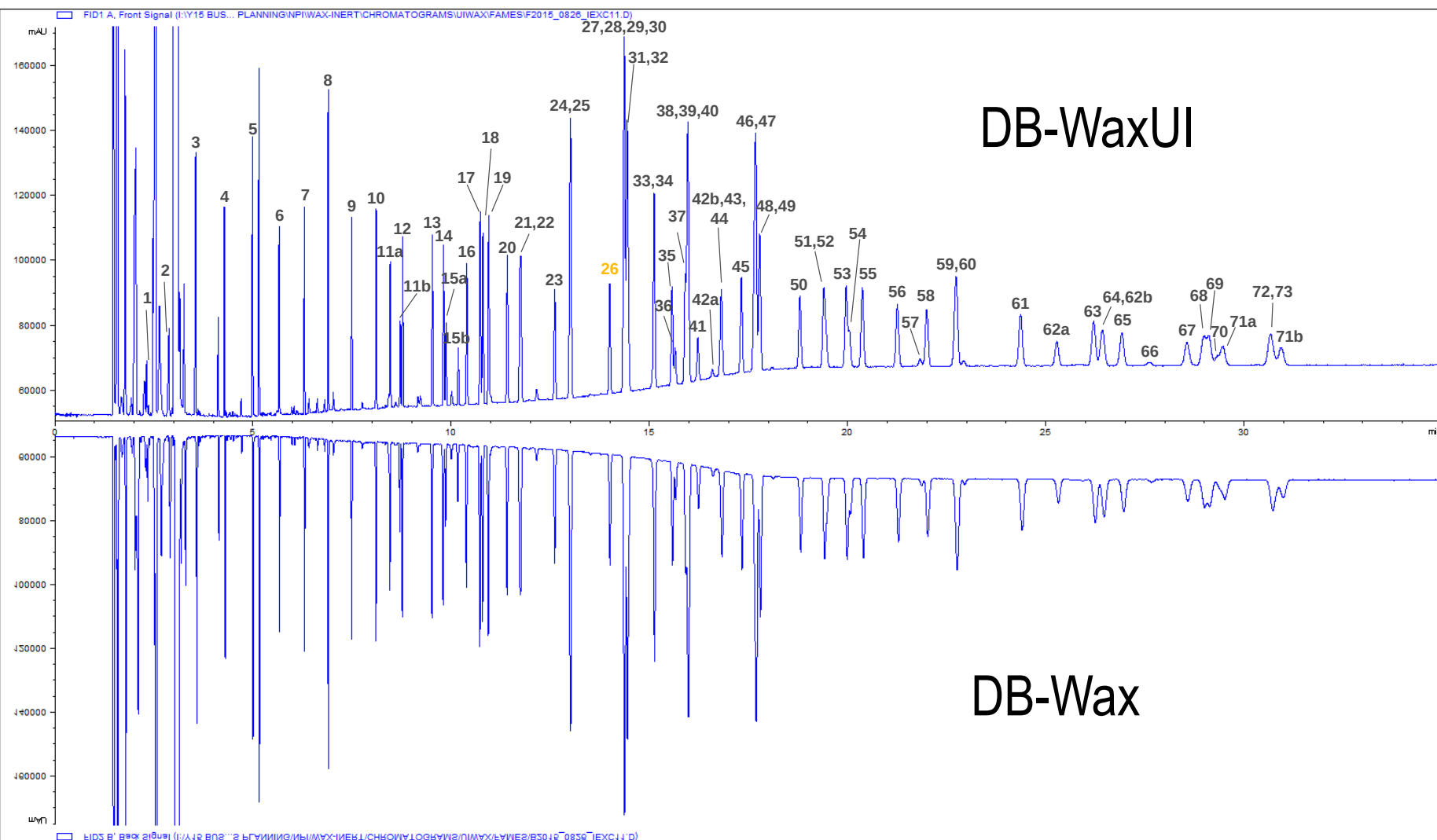
1h @ 250°C and 50h @ 250°C conditioning

Excellent stability and peakshape after extended exposure at the temperature limit



FAMEs Analysis: DB-WAX / DB-WAX UI

Identical Selectivity



* Retention time locked on peak 26, Methyl Stearate

“With DB-WAX UI, we are seeing better reproducibility of total aldehyde content and less tailing because of the improved inertness. No selectivity change compared to the standard DB-Wax is essential for complex citrus oil analysis. In addition, time spent for pre-testing new columns is eliminated.”

Dr. Andreas Böker

MCI Miritz Citrus

Research & Development

Director QC

DB-WAX UI Configurations

Part Number	Description
121-7022UI	DB-WAX Ultra Inert 20m, 0.18mm, 0.18um
121-7023UI	DB-WAX Ultra Inert 20m, 0.18mm, 0.30um
122-7012UI	DB-WAX Ultra Inert 15m, 0.25mm, 0.25um
122-7032UI	DB-WAX Ultra Inert 30m, 0.25mm, 0.25um
122-7033UI	DB-WAX Ultra Inert 30m, 0.25mm, 0.50um
122-7062UI	DB-WAX Ultra Inert 60m, 0.25mm, 0.25um
122-7063UI	DB-WAX Ultra Inert 60m, 0.25mm, 0.50um
123-7012UI	DB-WAX Ultra Inert 15m, 0.32mm, 0.25um
123-7032UI	DB-WAX Ultra Inert 30m, 0.32mm, 0.25um
123-7033UI	DB-WAX Ultra Inert 30m, 0.32mm, 0.50um
123-7062UI	DB-WAX Ultra Inert 60m, 0.32mm, 0.25um
123-7063UI	DB-WAX Ultra Inert 60m, 0.32mm, 0.50um
125-7012UI	DB-WAX Ultra Inert 15m, 0.53mm, 1.00um
125-7031UI	DB-WAX Ultra Inert 30m, 0.53mm, 0.25um
125-7032UI	DB-WAX Ultra Inert 30m, 0.53mm, 1.00um
125-7037UI	DB-WAX Ultra Inert 30m, 0.53mm, 0.50um
125-7062UI	DB-WAX Ultra Inert 60m, 0.53mm, 1.00um
127-7012UI	DB-WAX Ultra Inert 10m, 0.10mm, 0.10um
128-7022UI	DB-WAX Ultra Inert 25m, 0.20mm, 0.20um

* Custom orderable for 5" diameter cage format for 6850 GC