

Backflush Software



Agilent Technologies

What is the New Backflush Software?



Overcomes the need for users to be experts



Step-by-Step guidance, including:

- choosing the right configuration
- setting it up
- testing it
- contextual help throughout the process

- SW “Assistant” to facilitate adding backflush to an existing 7890 GC or GC/MS method
- Powerhouse of underlying proprietary algorithms and processes that help verify setup and predict backflush times
- SW component of 7890 driver (no additional charge) for GC and GC/MS data systems



Backflush SW User Interface

The image displays several overlapping windows from the Backflush SW User Interface:

- Convert to Backflush - My Third Favorite GC Method:**
 - Buttons: Backflush Time, Backflush Conditions, Method Overview, Setpoints Check, Trial Run, Blank Run.
 - Section: Specify which compounds should be backflushed.
 - Chromatographic Attributes data: My Favorite Method CA -run1
 - Data File Location: C:\Chem32\1\data\NEW_CONFIG.D\newdata.csv
 - Graph: Signal (1 pA) vs Time (Min.) showing peaks 5 through 11.
 - Backflush Start Time: 6.4 minutes.
- Select Last Peak of Interest:**

#	Time	Area	Height	Width	Area%	Symmetry
5	6.456	405.4	130.2	0.3268	0.047	3.662
6	6.521	19.4	29.7	0.3213	0.000	0.81
7	7.310	11.8	20.1	0.3193	0.014	1.039
8	7.423	108.2	70.4	0.3196	0.013	1.068
9	7.477	106.7	70.4	0.3195	0.012	0.98
10	8.650	205.4	130.2	0.010	0.012	1.100
11	8.857	105.9	75.6	0.3205	0.024	1.206
- Backflush Kit Preparation:**
 - Configuration: PID Update, Zero Pressure Sensors, Gas Check, Frit Check, Setpoint Attainability, Run Verification.
 - Diagram: Coated Pre-Column w/ Retention Gap. Components include Front Split-Splitless Inlet, Composite Column 1 (Retention Gap to Coated Pre-Column), Column 2 (Analytical Column), and Back Flame Ionization Detector.
 - Buttons: Update with Kit PIDs, Launch PID Tool, View Modified Method.
- System Status/Check:**
 - Time: 0.4 min.
 - Messages:
 - ! Lowly Stable: Not ready
 - ! Front Inlet: Pressure not ready
 - ! Front Inlet: Flow not ready
 - Buttons: Item Status, Close, Save, Next >

Selecting Chromatograms Graphical Review

Select Chromatograms for Verification ... BFSetupSteps LHA [April 16 2010]

Verification Run

Compare data previously collected with data collected on new configuration and relock RTL method if appropriate. To access GC Chemstation data, use the BLAST menu to select, run and transfer BLAST.CSV files here for analysis.

Data from original configuration [Click to get help](#)

Chromatographic Attributes

File on disk [Click to get help](#)

Data from backflush-ready configuration [Click to get help](#)

Perform run and compare

File on disk [Click to get help](#)

Run Interview

Reference Chromatogram and a Selecting Last Peak of Interest

Select sample and signal source from {0}

Standard Data File

C:\ccviews\cachance_view7\Blast\parts\BF5SetupSt



Comparison Data File

C:\ccviews\cachance_view7\Blast\parts\BF5SetupSt



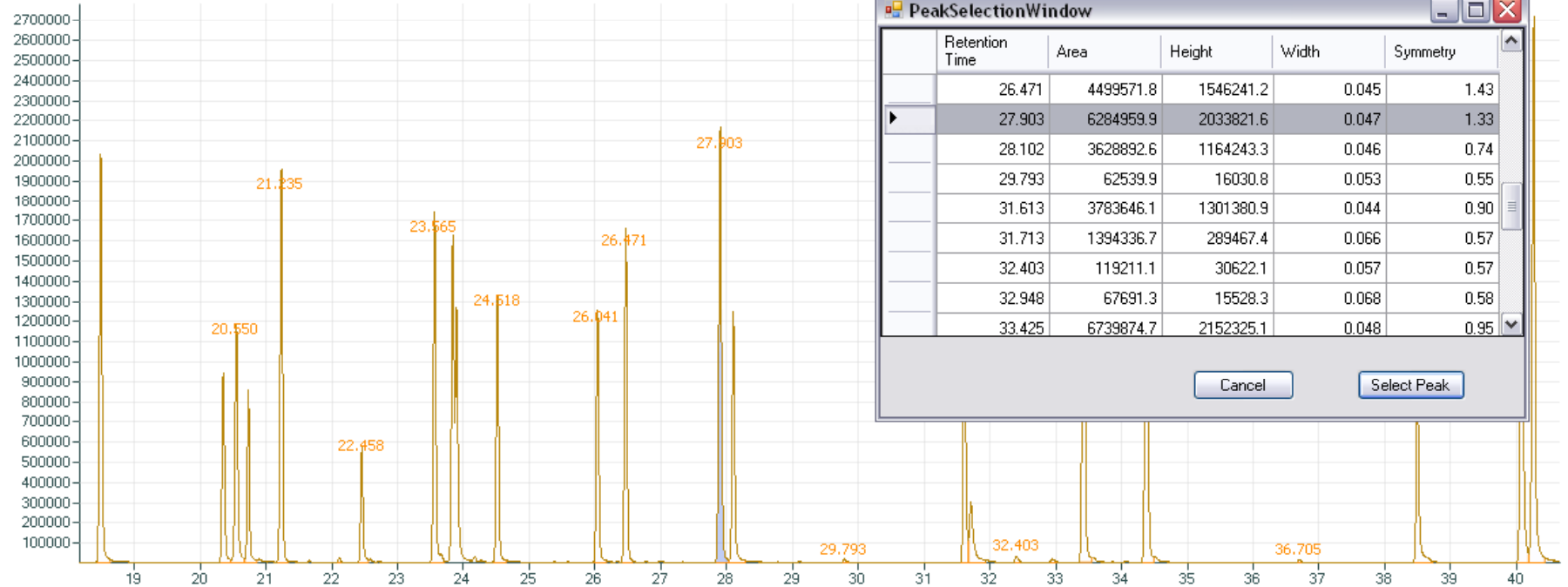
MSD Data

MSD Data

Compare Data Files

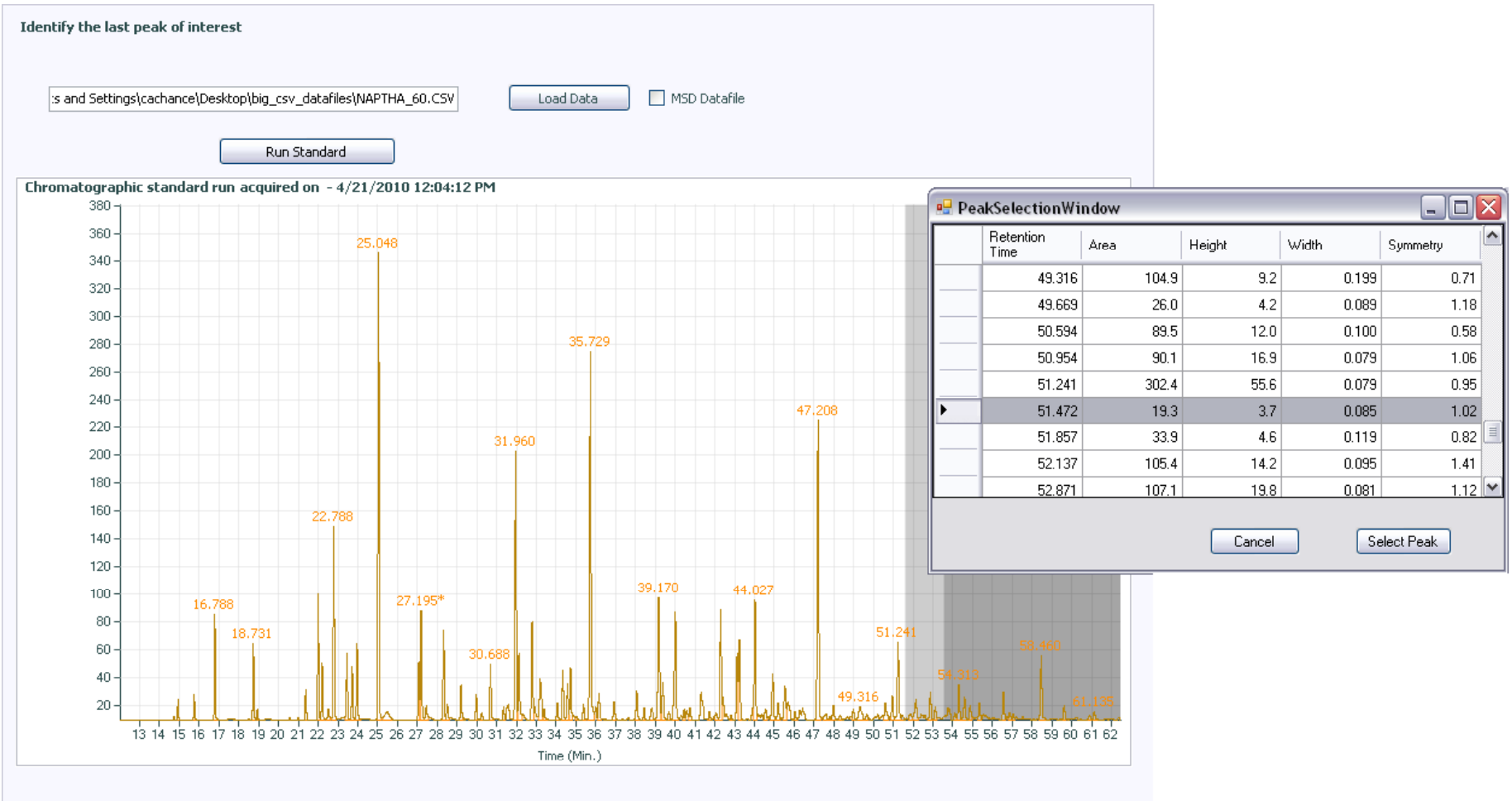
Only the plot

Chromatographic standard run "" acquired on - 4/21/2010 1:04:24 PM

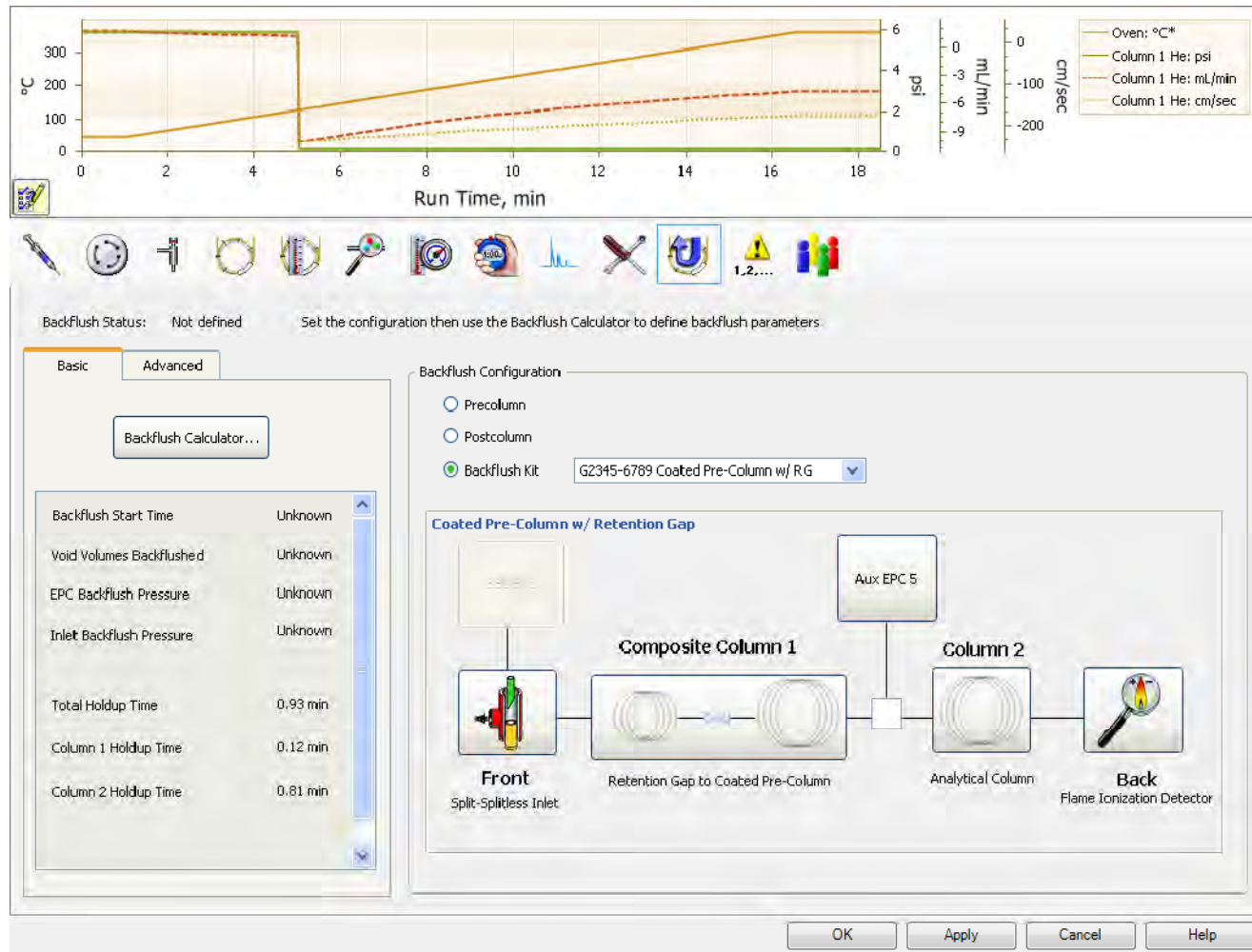


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Backflush timing is estimated based on configuration and last peak of interest



Method conditions are Automatically Updated



What Are Key Features of New Backflush SW

- Ability to handle the three possible backflush configurations
 - Post-column, post-run
 - Coated pre-column, concurrent and post run
 - Uncoated pre-column, concurrent
- Backflush devices change Retention Times (RT's)...
 - Agilent BF SW provides ability to migrate RTL calibrations
 - Guided set-up yields RT's close to the the original RT's



References for Backflush

GC, GC/MS, GC/QQQ brochures

5990- 5358EN

Backflush brochure

[Capillary Flow Technology Webpage](#) (see Applications)

[Backflush Video \(YouTube\)](#) (includes new SW)

5989-8664EN

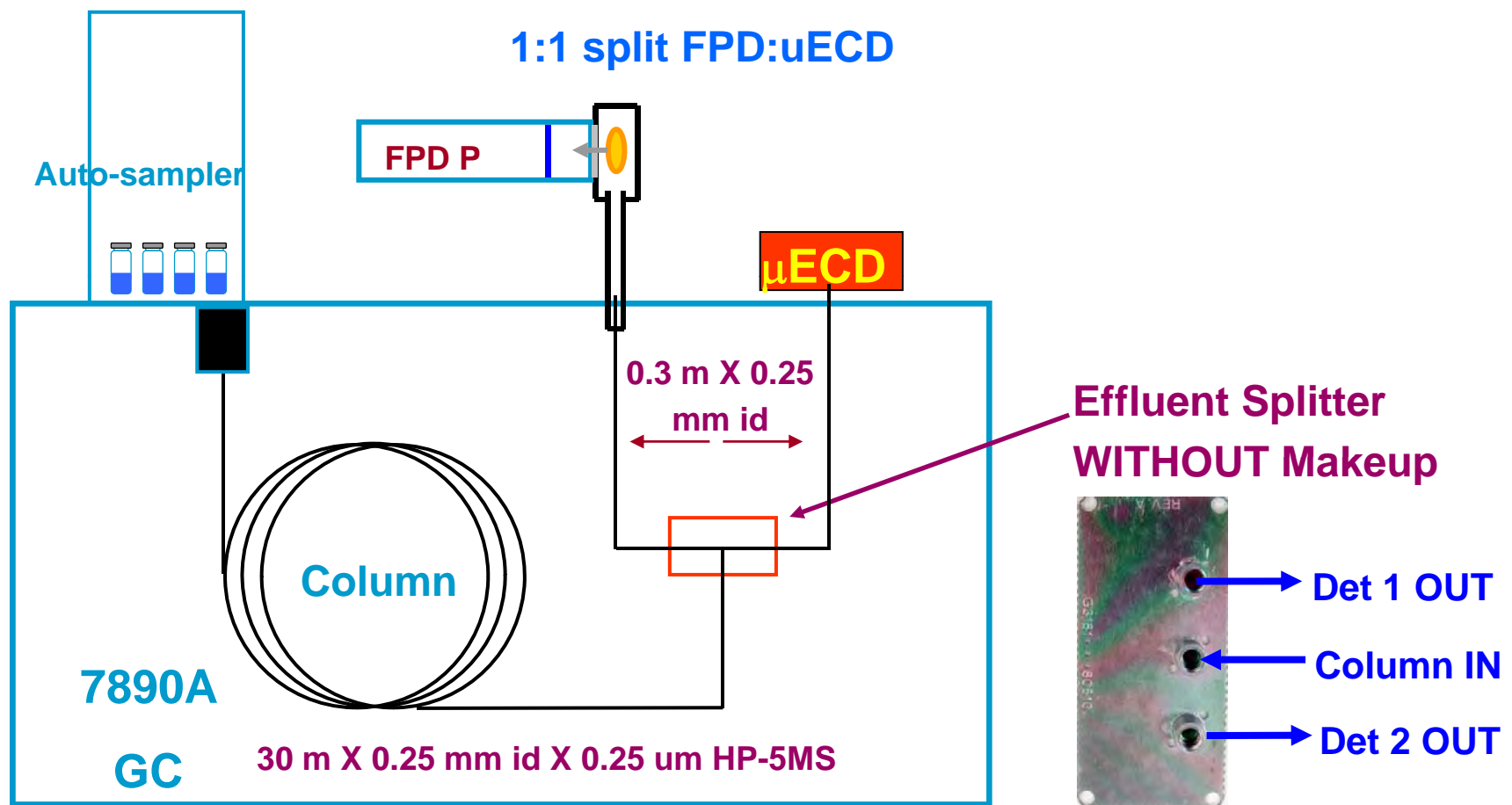
Capillary Flow Technology for GC/MS: a Simple Tee Configuration for Analysis at trace Concentrations with Rapid Backflushing for Matrix Elimination (June 08, Prest)

5989-9359EN

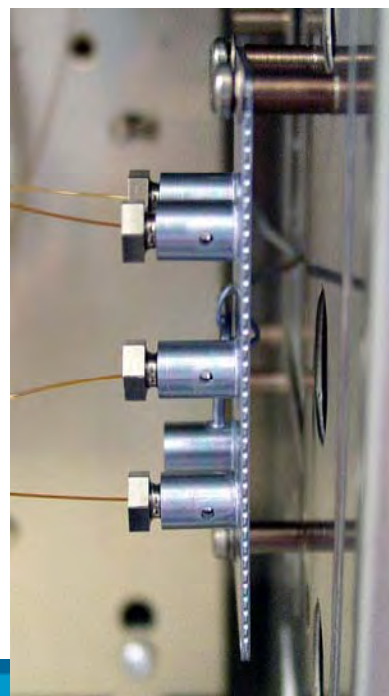
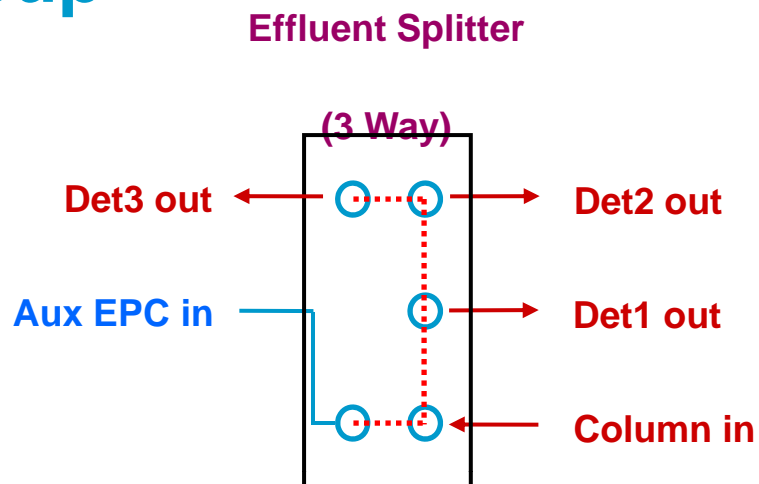
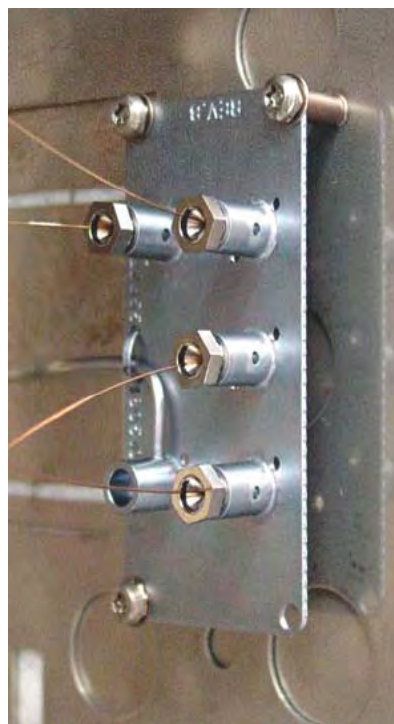
Capillary Flow Technology for GC/MS: Efficacy of the Simple Tee Configuration for Robust Analysis Using Rapid Backflushing for Matrix Elimination (Aug 08, Prest, Foucault, and Aubut)

Splitters: Unpurged Tee

Simultaneous detection with 2 detectors

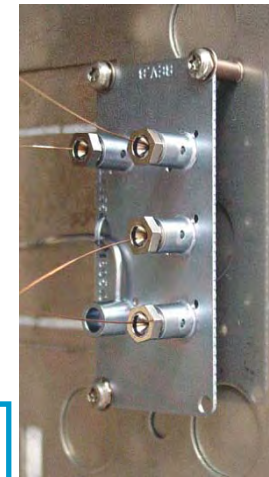
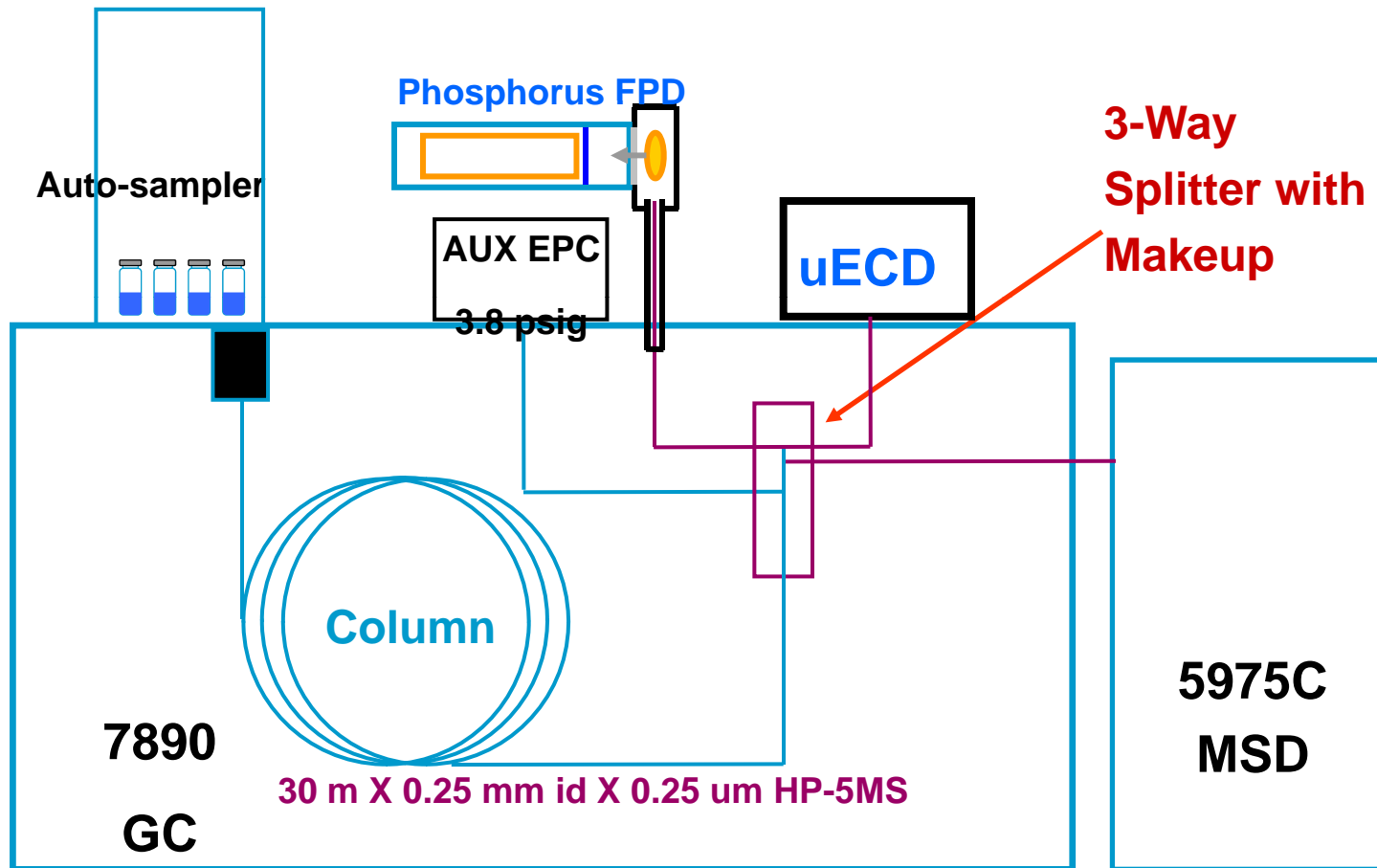


3-Way Splitter With Makeup

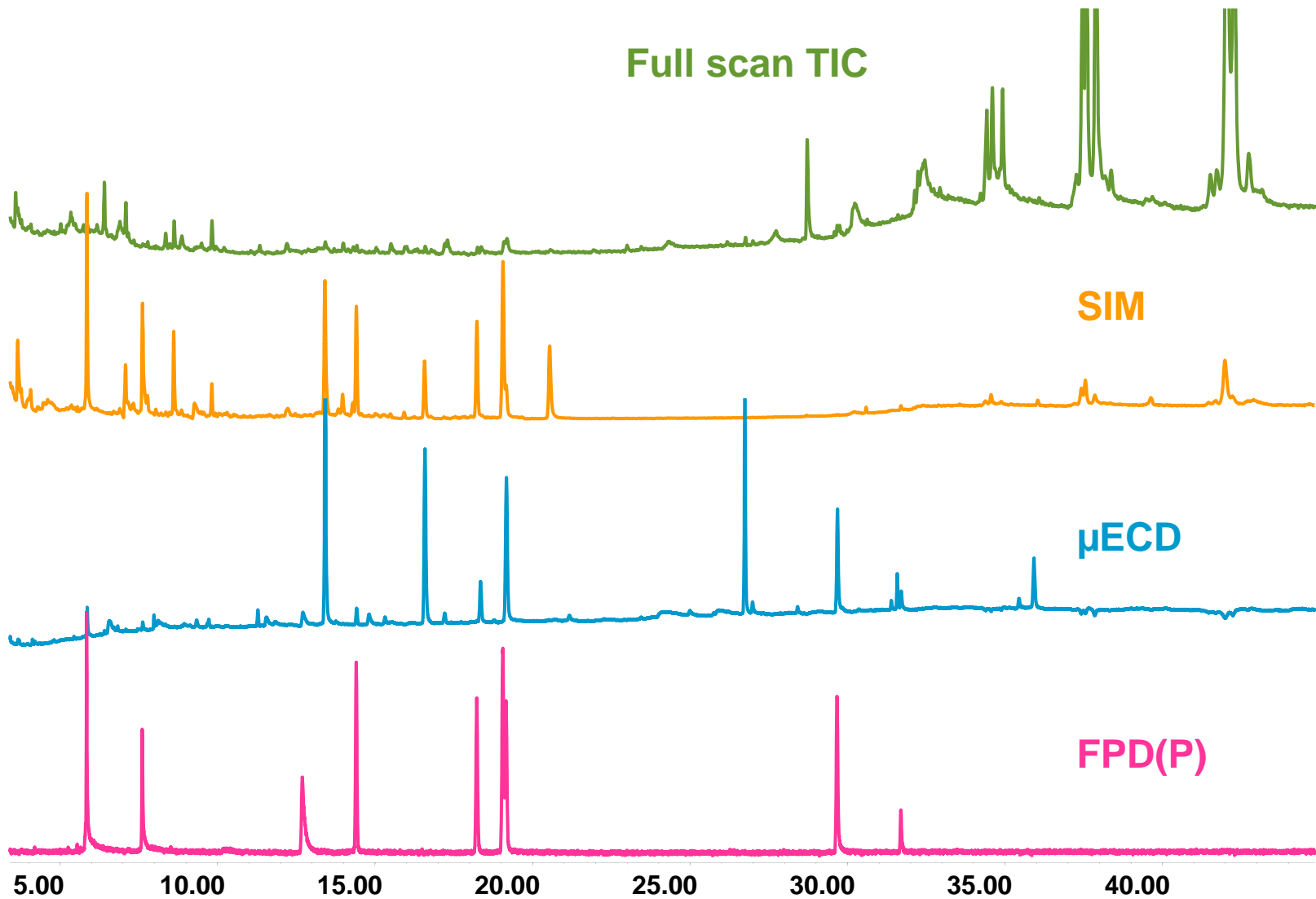


Pesticides: Three Way Splitter with Makeup

1X method with 1:1:0.1 split FPD:MSD:ECD

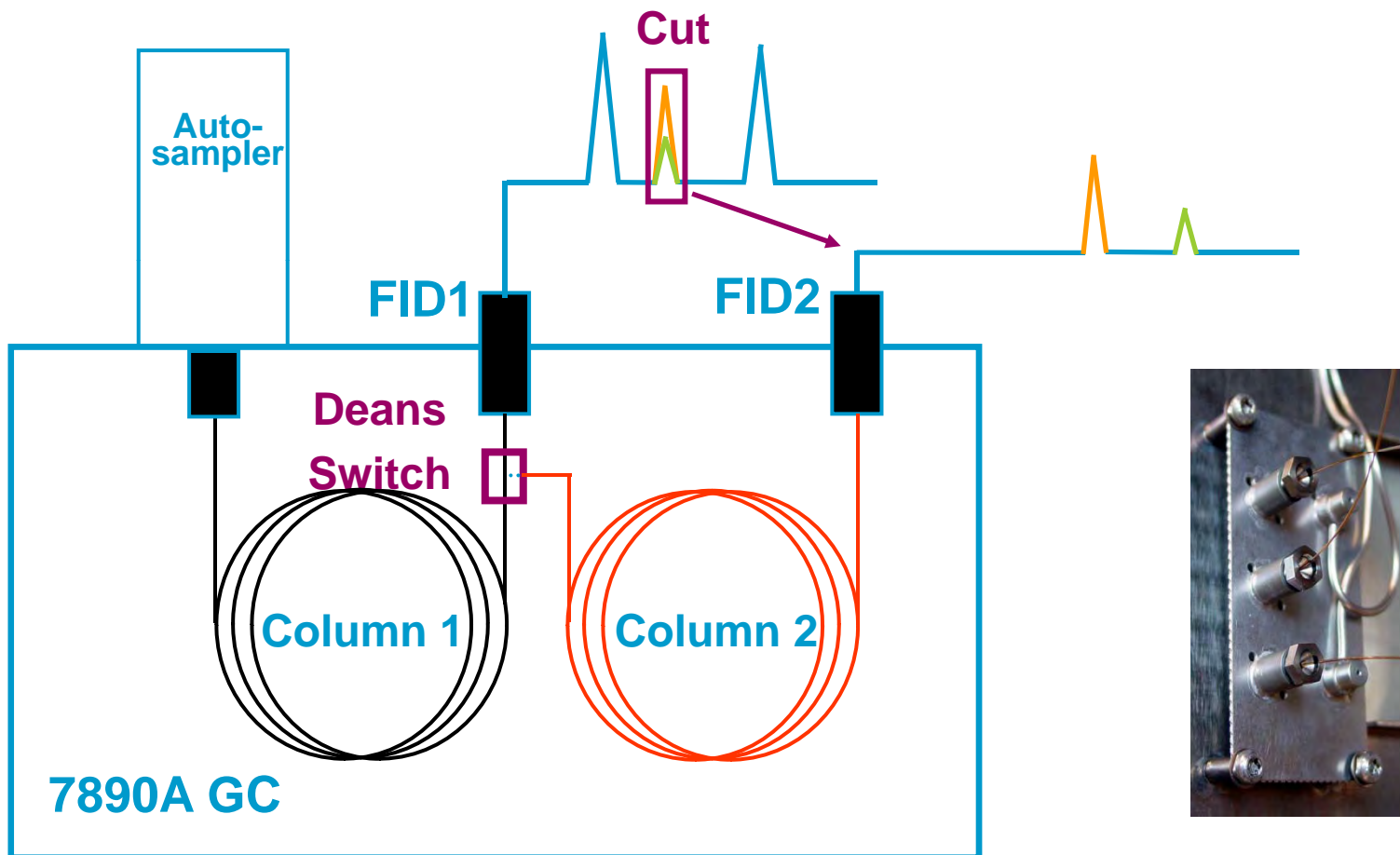


Milk Extract (1 injection)



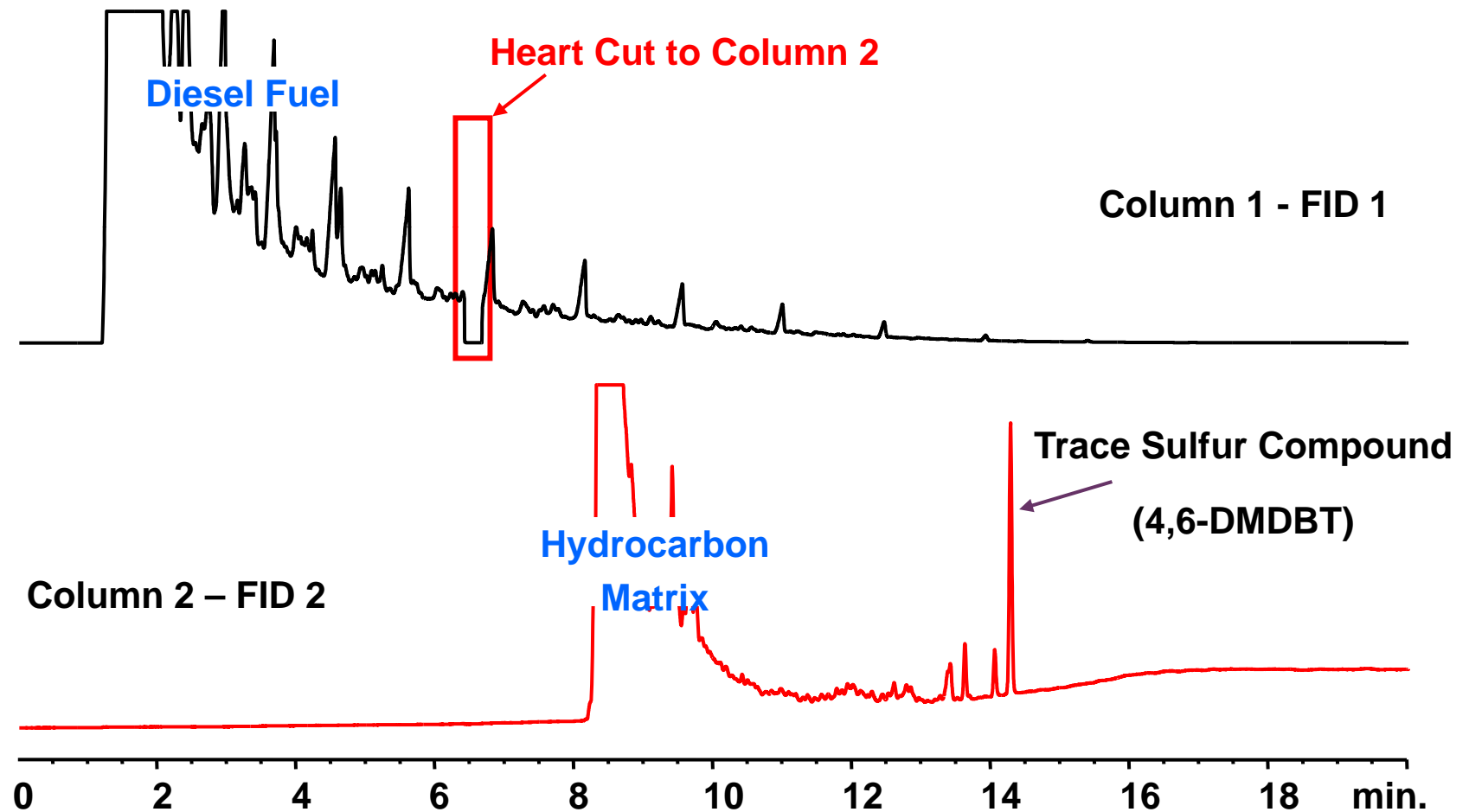
Dean Switch

Heartcutting 2-D GC provides extremely high chromatographic resolution



2-D Separation of Sulfur Compound in Diesel Fuel

Compound is completely resolved and can be analyzed with FID



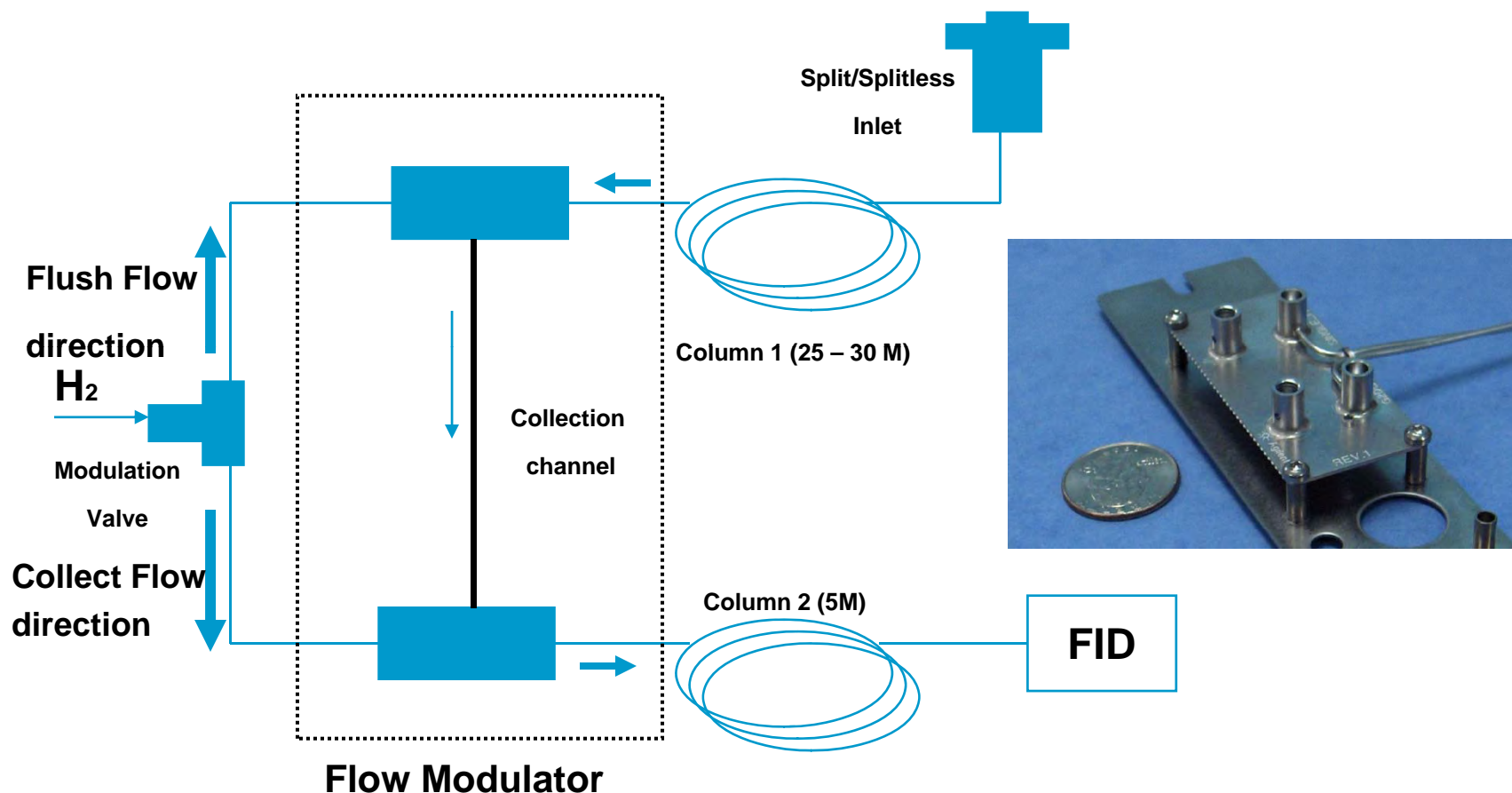
Agilent Deans Switch Application Notes

HPI, Environmental, Forensic, Pharma, Foods

- **Lavender Oil Characterization Using Agilent J&W DB-1ms Ultra Inert Capillary GC Columns (5990-3700EN)**
- **Independent Column Temperature Control Using an LTM Oven Module for Improved Multidimensional Separation of Chiral Compounds (5990-3428EN)**
- **Capillary Flow Technology for GC/MS: a simple Tee configuration for analysis at trace concentrations with rapid backflushing for matrix elimination (5989-8664EN)**
- **GC/MS Analysis of PCBs in Waste Oil Using the Backflush Capability of the Agilent QuickSwap Accessory (5989-7601EN)**
- **Simultaneous dual capillary column headspace GC with flame ionization confirmation and quantification of residual solvents according to USP 467 (5989-8085EN)**
- **Analysis of Fatty Acid Methyl Ester (FAME) Content and Distribution in Biodiesel Blends Using Heart-Cutting 2D Gas Chromatography (5989-8107EN)**
- **Simultaneous Analysis of Trace Oxygenates and Hydrocarbons in Ethylene Feedstocks Using Agilent 7890A GC Capillary Flow Technology (5989-6082EN)**
- **Direct Injection of Fish Oil for the GC-ECD Analysis of PCBs: Results Using a Deans Switch With Backflushing (5989-6095EN)**
- **Detection of Cannabinoids in Oral Fluid Using Inert-Source GC/MS (5989-5860EN)**
- **Confirmation of THC in Oral Fluids Using High-Resolution 2-D GC/MS (5989-5668EN)**
- **Two-Dimensional Gas Chromatographic Analysis of Trace Benzene in Styrene (5989-0594EN)**
- **Using a New Gas Phase Micro-Fluidic Deans Switch for the 2-D GC Analysis of Trace Methanol In Crude Oil by ASTM Method D7059 (5989-1840EN)**
- **Two-Dimensional Gas Chromatographic Analysis of Oxygenates and Aromatics in Gasoline Using a Heart-Cutting Technique (5988-6696EN)**
- **Analysis of Trace (mg/kg) Thiophene in Benzene Using Two-Dimensional Gas Chromatography and Flame Ionization Detection (5988-9455EN)**
- **Fast Determination of Denatured Fuel Ethanol Purity by Two-Dimensional Gas Chromatography (5988-9460EN)**

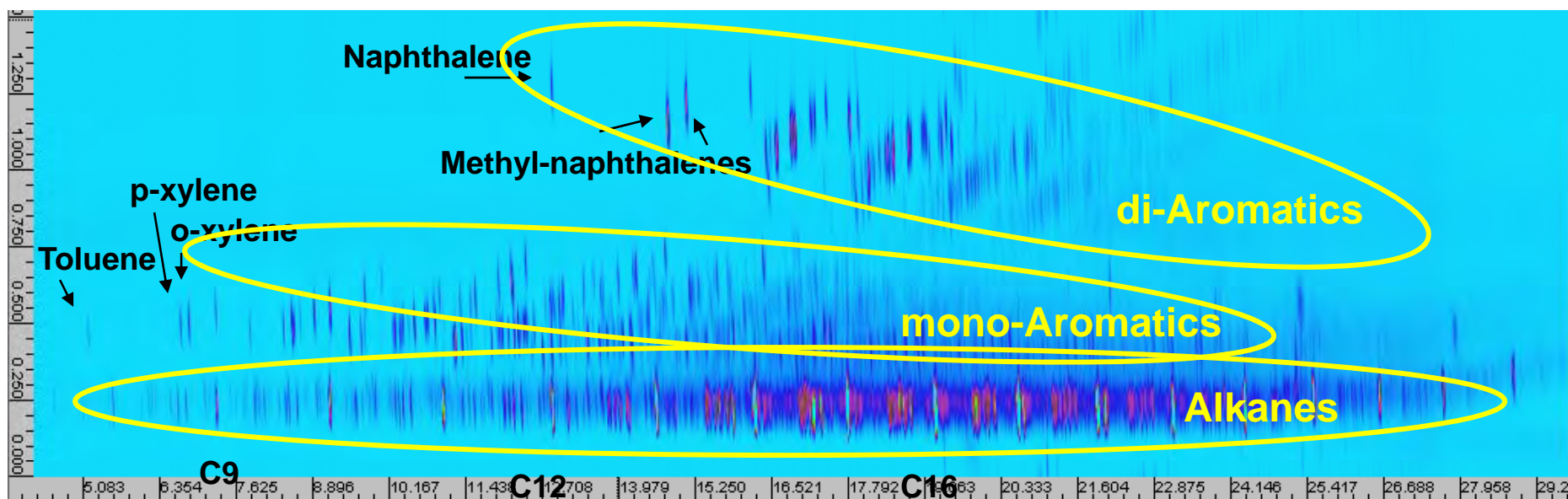


Agilent's flow modulator design : Differential Flow Using Design by John V. Seeley, Oakland University



Flow modulator eliminates the need for cryo. Sample compression controlled by flow ratios occurs in the collection loop and is quickly injected into the second column, resulting in very narrow and tall peaks.

Flow modulation: (GC x GC) of diesel fuel: 7890A



GC x GC Chromatogram:

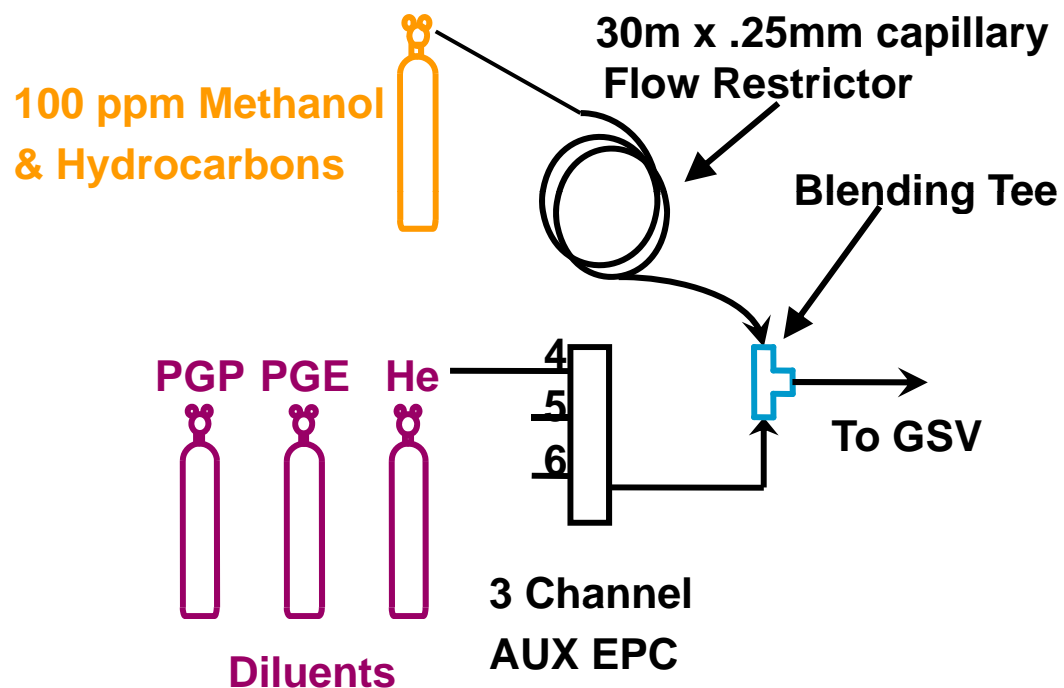
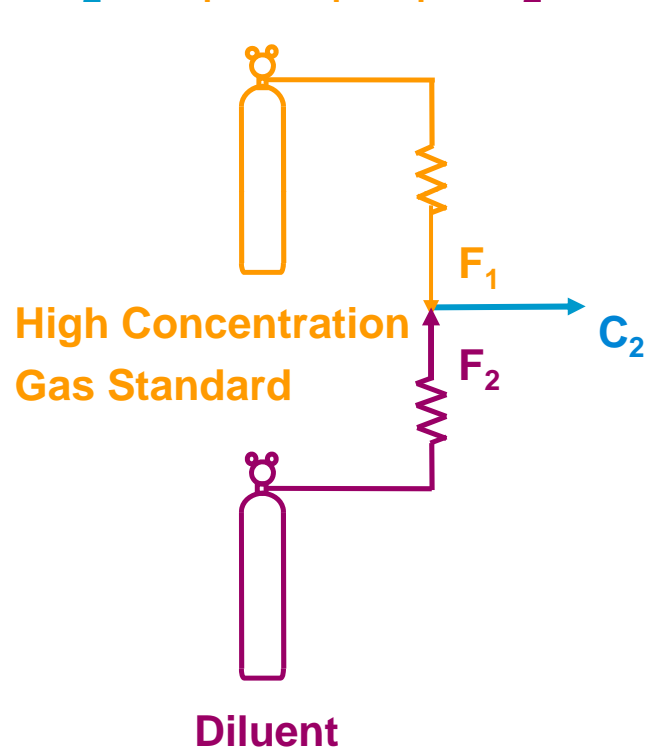
- Showing the normal B.P. distribution (1st dimension)
- Also shows hydrocarbon classes in clusters
- Consistent RT for alkanes in 1st dimension showing precise modulation
- Comparable peak in 2nd dimension band shows minimum peak broadening with flow modulation

Agilent Flow Modulation GC x GC

- **Reliable Setup:** Based on capillary-flow- technology, easy to setup, high performance chromatography, and reliable.
- **No Cryogen Required:** Flow modulation means no tanks of Liquid N₂ or CO₂
- **7890A Enabled GC x GC:** Capillary- flow-technology ready, synchronized periodic events ensure precise modulation, control from a modified TCD board
- **Comparable resolution without Liquid N₂:** Cap Flow Technology allows low dead volume and precise flow control, resulting in minimum peak broadening even without cryo-focusing . Peak widths on the second column are typically 70 to 100 ms at half maximum.
- **Sensitivity:** Approaches that obtained by thermally modulated systems

Dynamic Blending System for Automated Gas Standard Calibration (SP1 7890-0084)

$$C_2 = C_1 \times (F_1 / (F_1 + F_2))$$



Automated Dilution Sequence

Sequence Table: Instrument 1

Currently Running

Line: Method:

Sample Info for Vial 1:

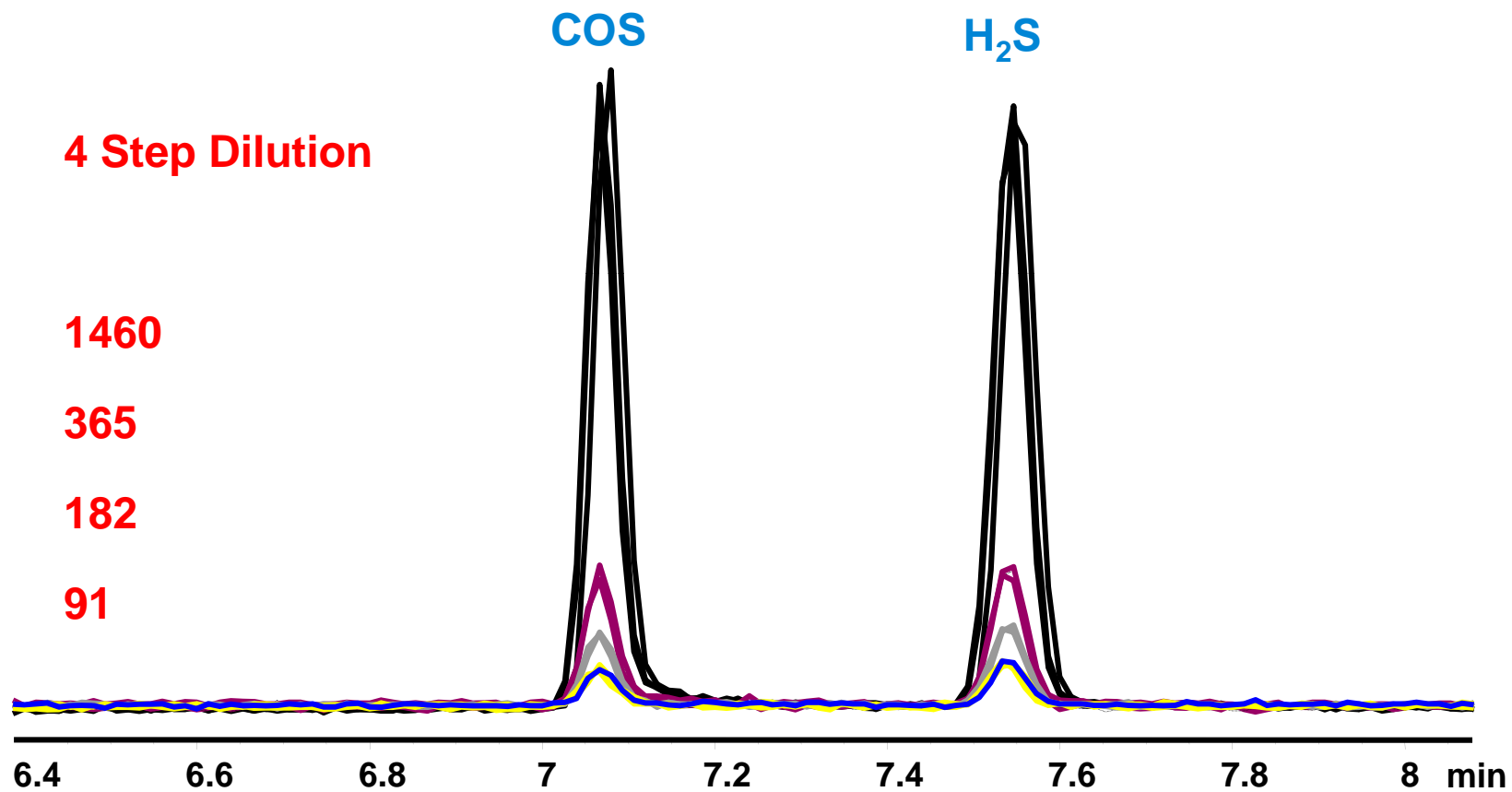
Sulfur Calibration Mix set to deliver 0.6 ml/min

Line	Vial	Sample Name	Method Name	Inj/Vial	Sample Type
1	1	sul mix	S400	1	Sample
2	1	sul mix	S400	1	Sample
3	1	sul mix	S250	1	Sample
4	1	sul mix	S250	1	Sample
5	1	sul mix	S120	1	Sample
6	1	sul mix	S120	1	Sample
7	1	sul mix	S80	1	Sample
8	1	sul mix	S80	1	Sample
9	1	sul mix	S50	1	Sample
10	1	sul mix	S50	1	Sample

Sulfur calibration mix set to constant flow for each method

Each method uses a different diluent flow to prepare a precise standard concentration

COS and H₂S: 1.46 ppm (1460 ppb) to 91 ppb



Calibration of Trace Compounds in Ethylene using Dynamic Blending

