Using the Agilent Deans Switch and Capillary Flow Technology Splitters for Analysis of Complex Matrices

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DE44215.5892939815

CFT is a Technology That Provides Easy, Reliable Flow Structures In The GC Oven...

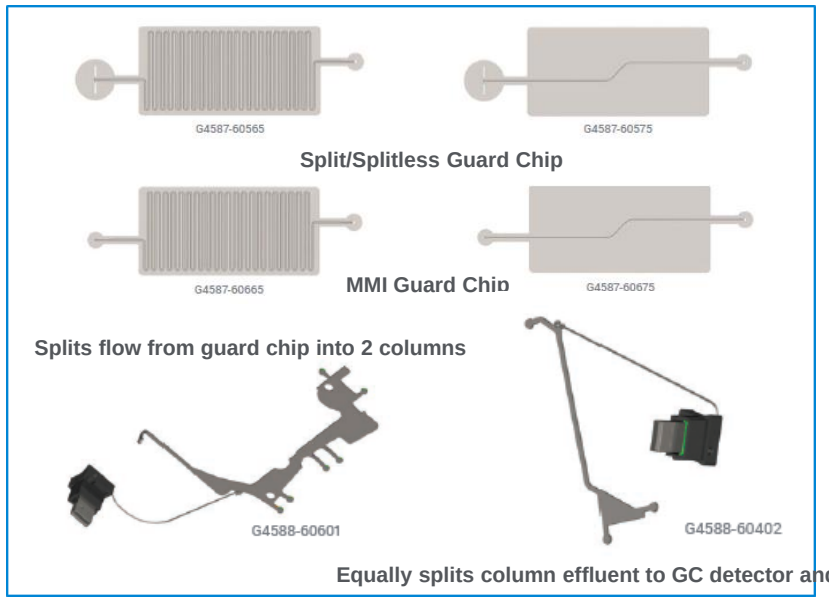
It opens up many capabilities for GC

- **Column connections** (connect pre-column)
- **Change MSD columns** (without venting)
- **Backflush** (Reverse flow through column)
- **Detector splitter** (effluent split to two or more detectors)
- **Merge flows** (2 columns to 1 MSD)
- **Deans switch** (heart cut select peaks to 2nd column)

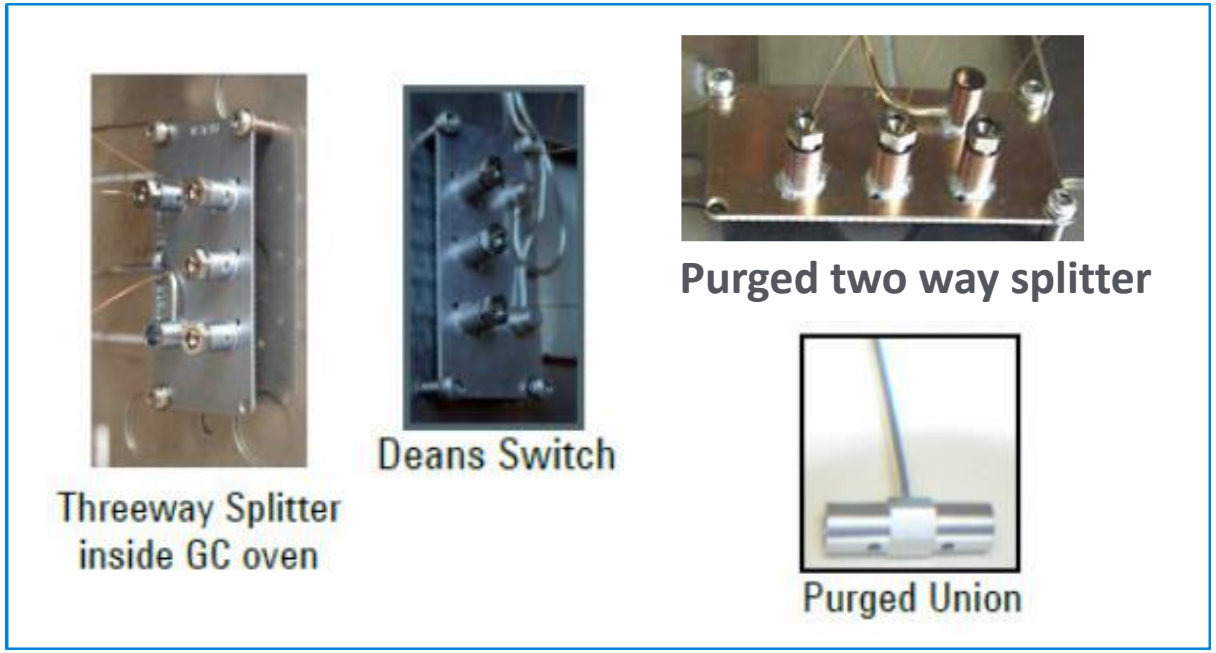
Capillary Flow Technology (CFT)

- Purged Union
- 2-Way Splitter
- 3-Way Splitter
- Dean Switch

Intuvo CFT Devices



8890 CFT Devices

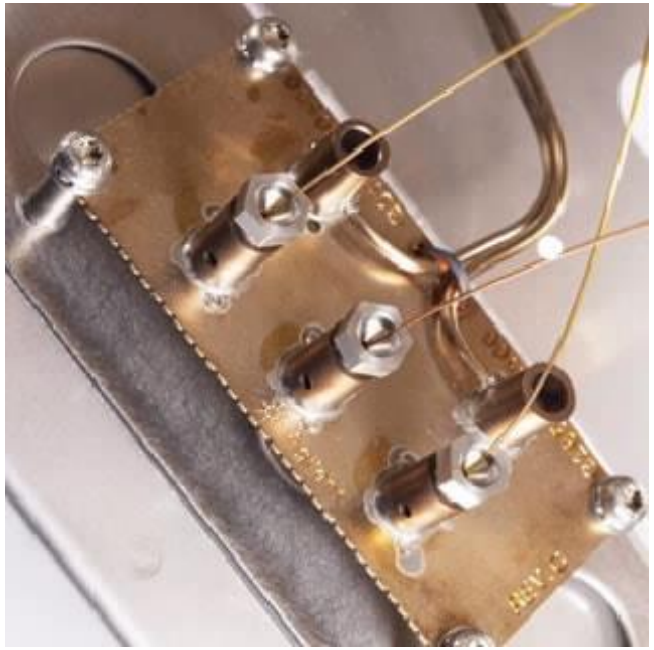


Agilent

Capillary Flow Technology Design

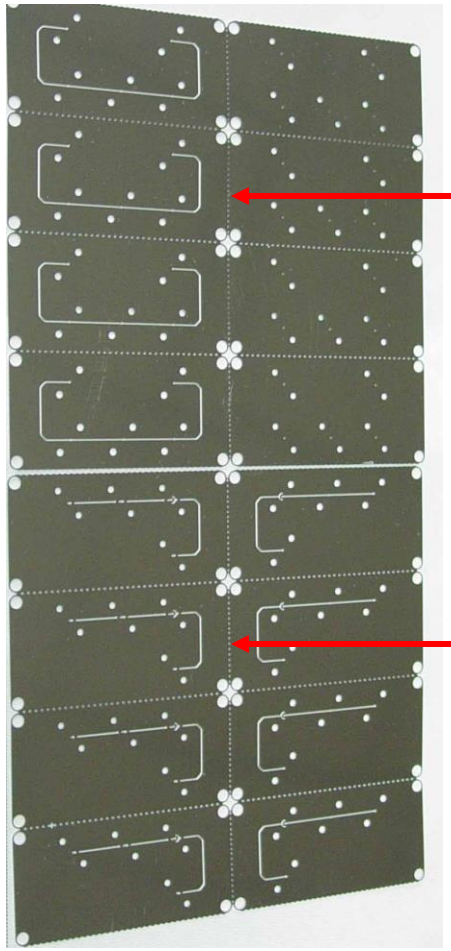
… a proprietary Agilent technology

- Photolithographic chemical milling for low dead volume connections
- Diffusion bonded halves to form a single flow plate
- Small, thin profile provides fast thermal response
- Projection welded connection for leak tight fittings
- Deactivation of all internal surfaces for inertness



Gas Phase CFT Plate Technology

Photolithography and Chem-milling technologies used to produce a Gas Phase Micro-Fluidic Deans Switch (EPC Technology)



G2855B Deans Switch

G3180B Splitter

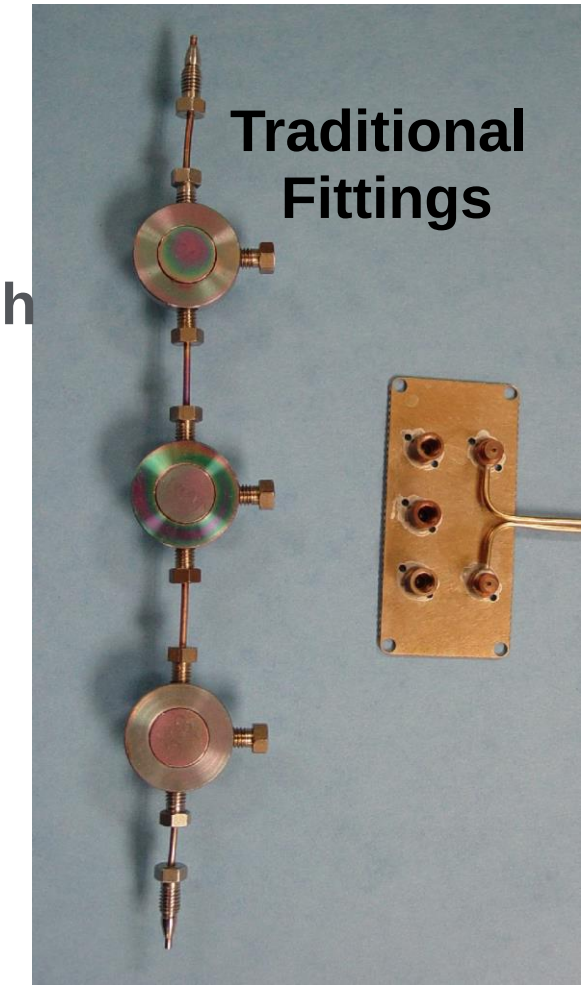
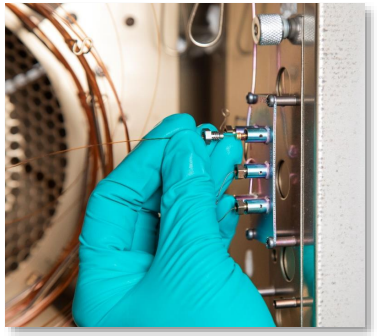


Plate Technology



Capillary Flow Technology

Agilent Gold-Plated Flexible Metal Ferrules (FMFs)

Agilent is excited to announce the release of our new gold-plated Flexible Metal ferrules!

- These newly launched ferrules improve upon the existing Flexible Metal ferrule (FMF) design by applying a gold coating to ensure a leak-free connection ***with Capillary Flow Technology (CFT) devices*** while providing enhanced ease of use.

How do they work?

Softness is key!

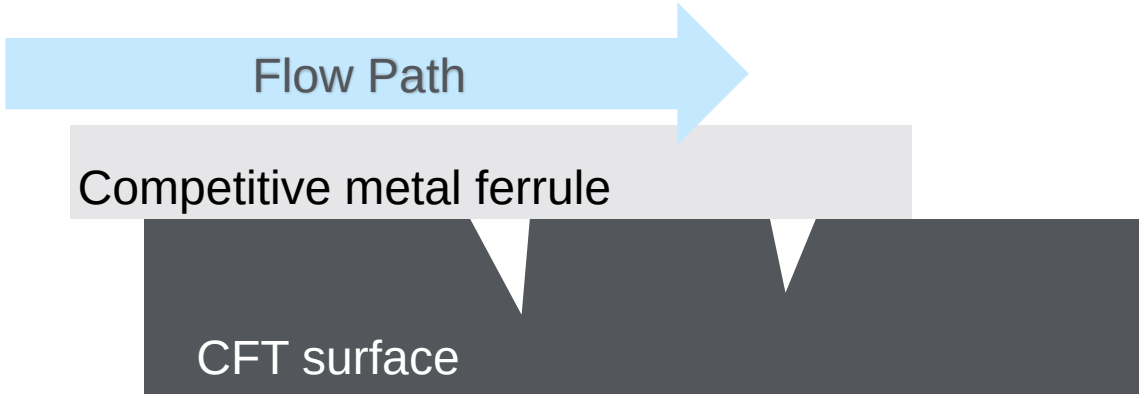
- The softness of the gold coating allows the material to flow into microscratches and striations on the inner surface of the CFT surface
- This fills any potential gaps or voids in the connection and prevents leaks
- The result is leak-free seal, that prevents corrupt data or damaged down-stream columns

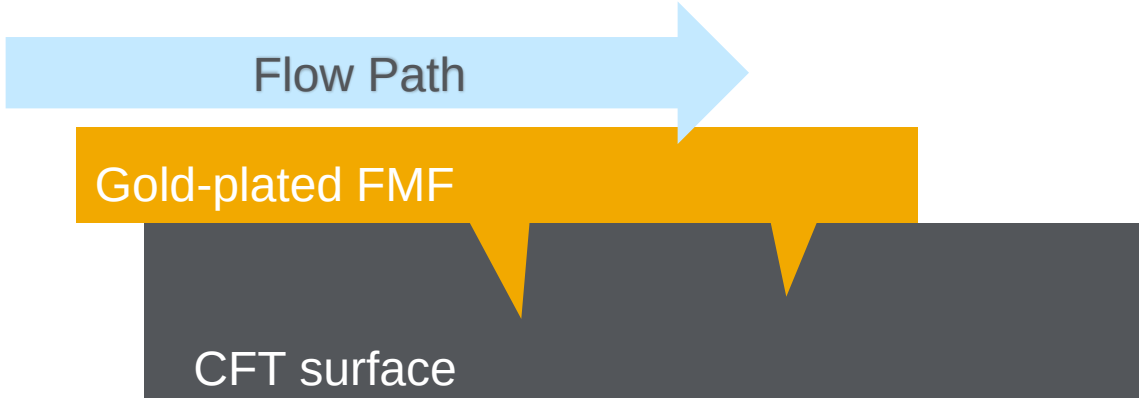
Improved Installation

- Thanks to the softness of the gold, a tight, leak- seal is achieved on the first installation attempt
- **No longer need to retighten fittings and run multiple leaks checks!**

Touchless Dial Pack

- Easily thread the ferrule onto your column
- Eliminates potential contamination point





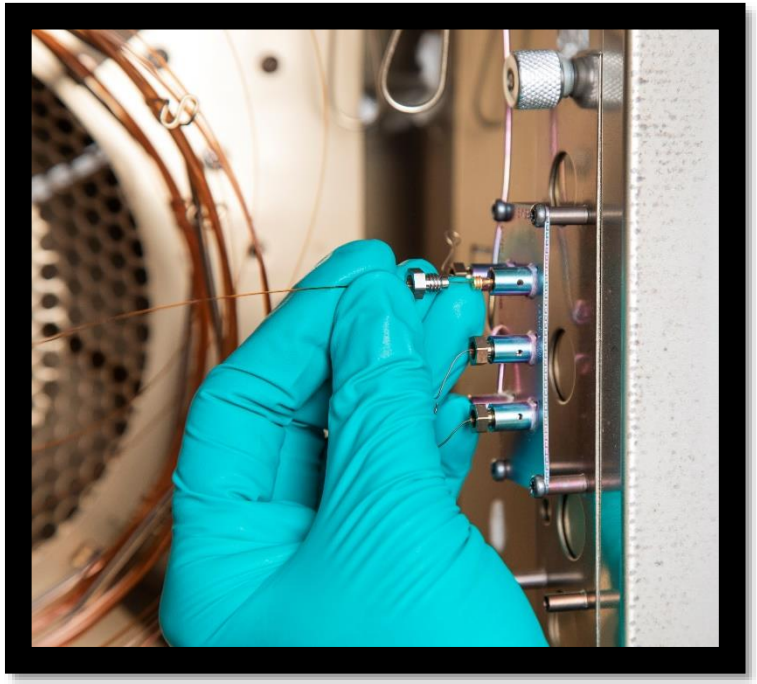
Are these ferrules right for me?

Gold-plated FMFs have been designed specifically for usage with Capillary Flow Technology (CFT) devices such as:

- Purged ultimate unions
- Flow splitters
- Learn more here!

These devices are required for running analytical techniques such as:

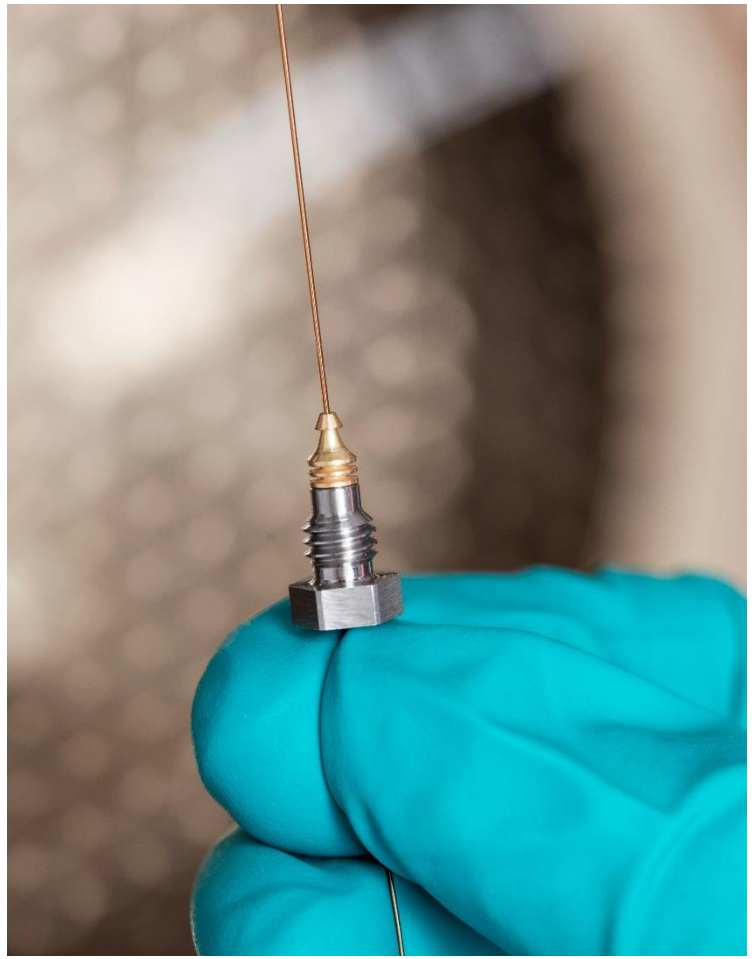
- Backflush
- Deans Switch
- Heart Cutting
- GC X GC



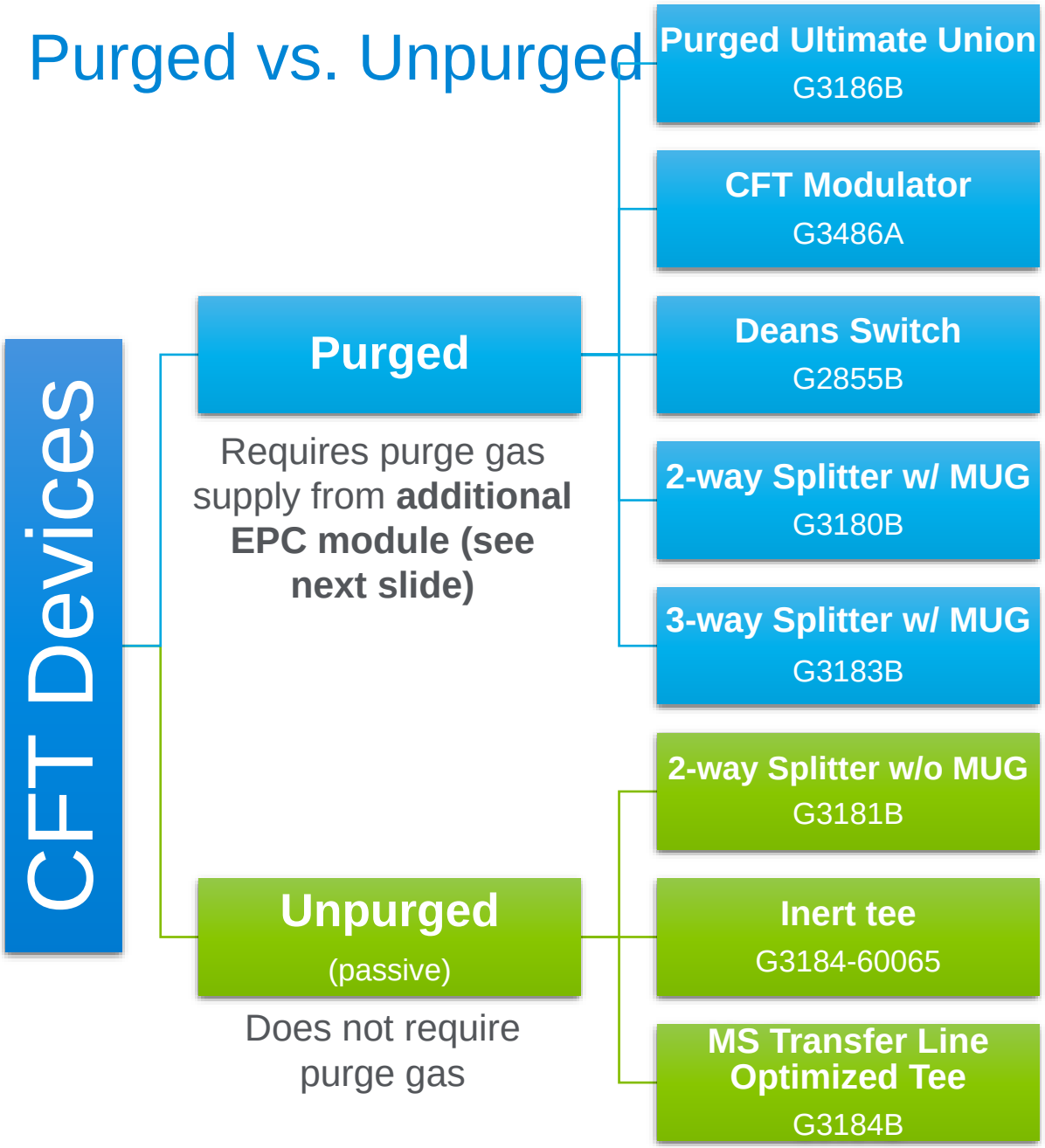
How do I get them?!

Part Number	Description
G2855-28501	CFT Ferrule, Flexi, Gold 0.25mm ID Col 10/PK
G2855-28502	CFT Ferrule, Flexi, Gold 0.32mm ID Col 10/PK
G2855-28503	CFT Ferrule, Flexi, Gold 0.53mm ID Col 10/PK
G2855-28505	CFT Ferrule, Flexi, Gold UM Small, 10/PK
G2855-28506	CFT Ferrule, Flexi, Gold UM Large, 10/PK

For more information on these new products, please visit the Flexible Metal ferrule product page.



Purged vs. Unpurged



Enables capillary column backflush using purge gas from additional EPC. Extremely popular. Common application: pesticide residue analysis with backflush, vent-free MS column change.

Reverse flow modulator continuously and rapidly switches between two capillary columns of differing phases in series. Enables comprehensive multidimensional GC/GC of complex mixtures. Common in flavors/fragrances, petroleum.

Divides primary column effluent between detector #1 and column #2 → detector #2. Advanced technique used for heart cutting of samples that are not resolved by on the column #1.

Divides column effluent to 2 different detectors or flow paths. Column flow mixes with makeup flow in splitter. Commonly used to divide effluent between two columns and/or detectors.

Divides column effluent to 3 different detectors; or 2 columns in → 2 detectors. Column flow mixes with makeup flow in the splitter.

Divides column effluent to 2 different detectors or flow paths.

Precolumn splitter divides restrictor effluent to 2 different columns. Common application: Blood Alcohol, CLP Pesticides.

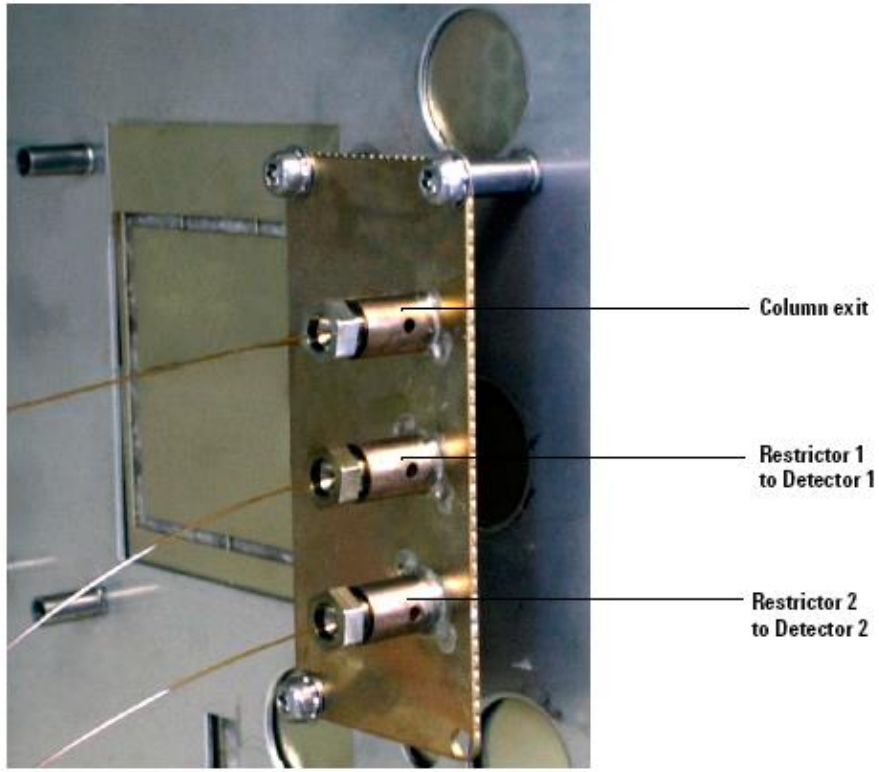
Post-column splitter divides column effluent to MS and GC detector.

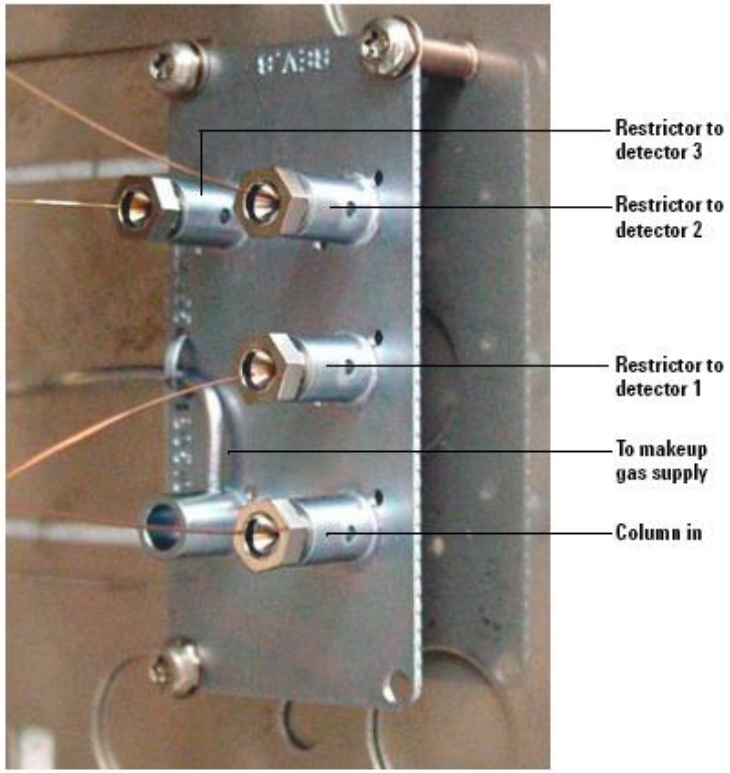
Capillary Flow Technology

- 2-way Splitter G3181B
- 2-way splitter with purge G3180B
- 3-way splitter with MUG G3183B
- Inert Tee G3184-60065

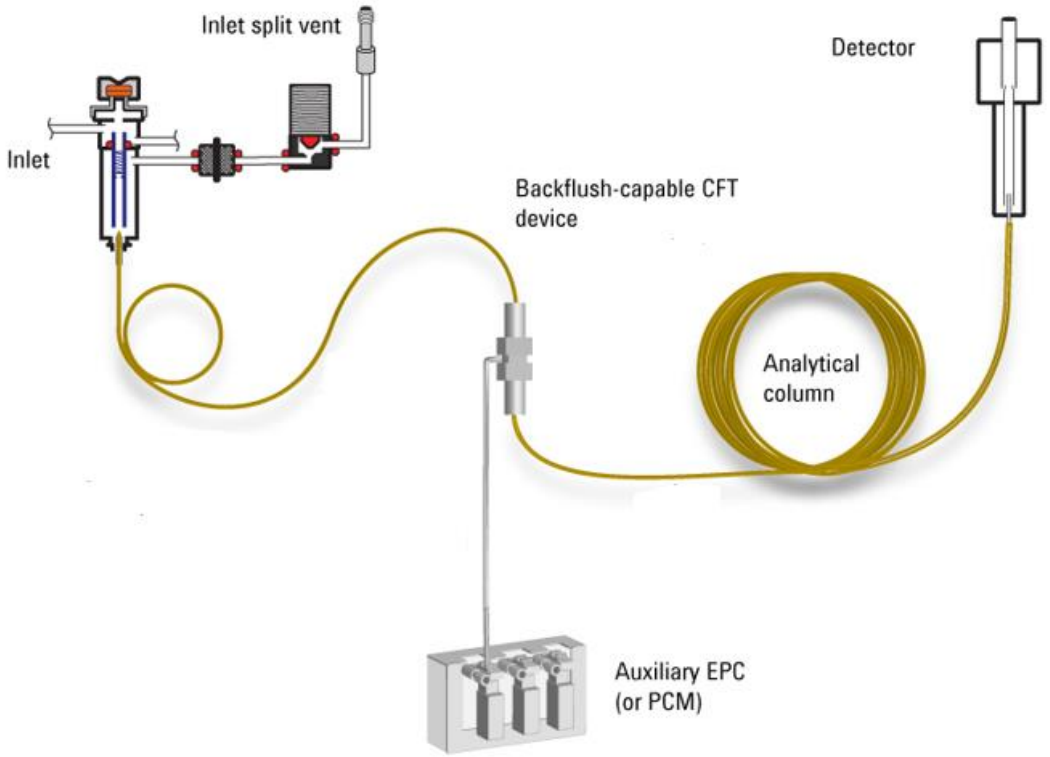
Typical Uses:

- Splitting Column effluent between. 2 detectors
- Injecting into 2 different columns
- Back-flushing





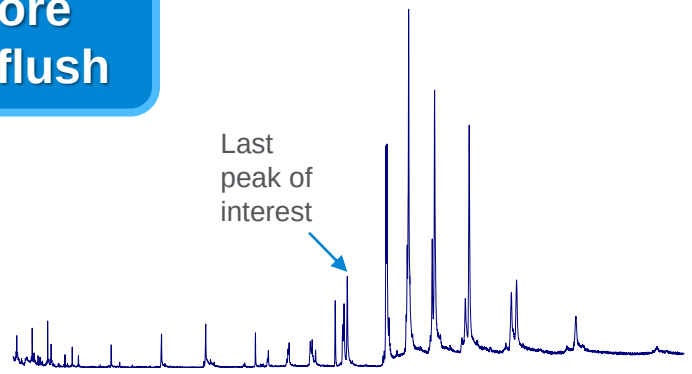
What is GC Capillary Column backflush?



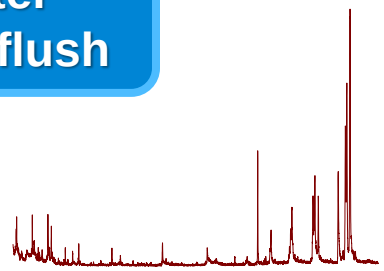
Backflush is a technique that is used to chromatographically remove mainly high boiling compounds from samples.

Backflush is performed either at the end of, or during, an analytical run.

Before Backflush

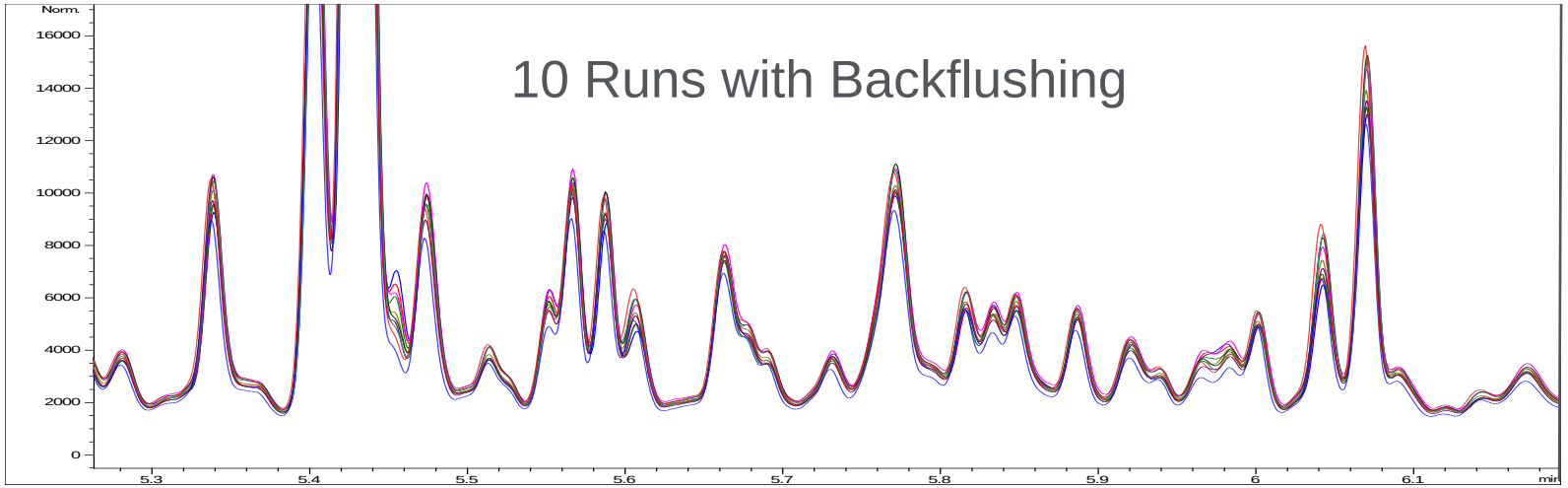


After Backflush



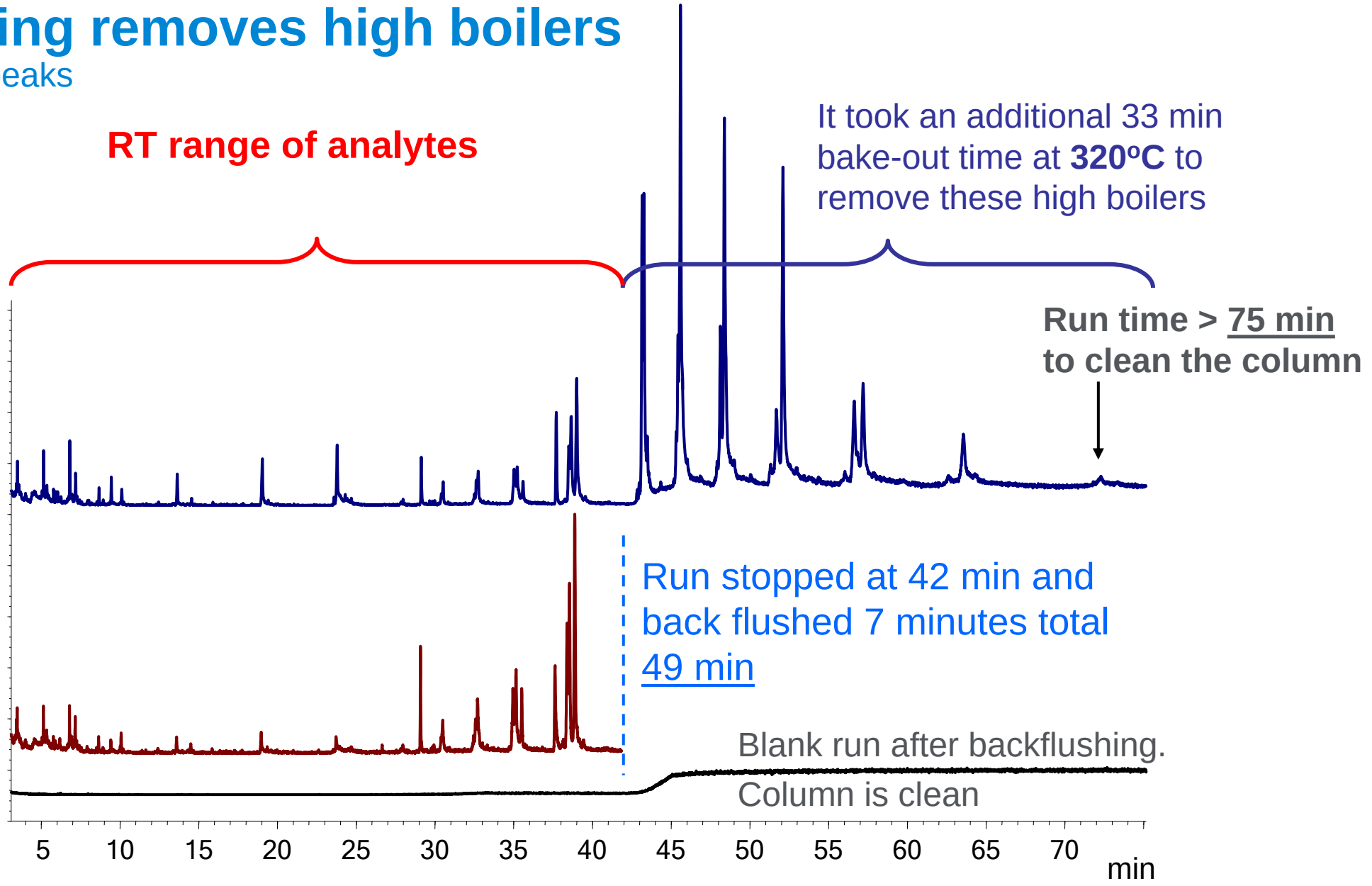
PCBs in Fish Oil. GC Analysis with ECD

- Residual Sample Matrix Affects RTs

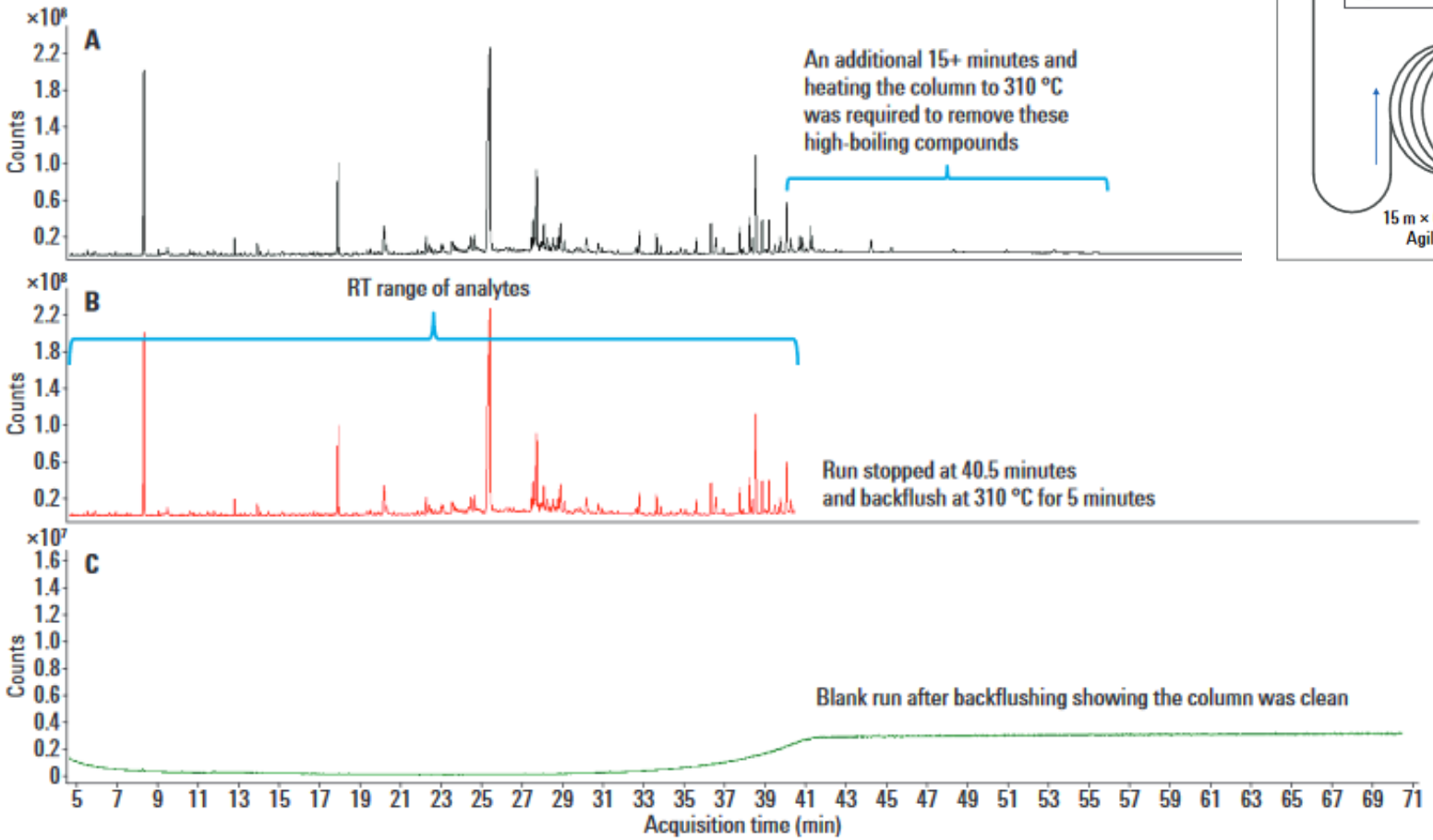


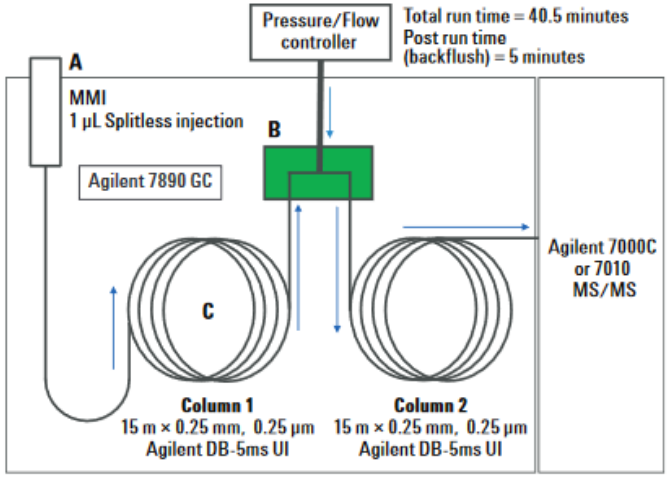
Back flushing removes high boilers

eliminates ghost peaks

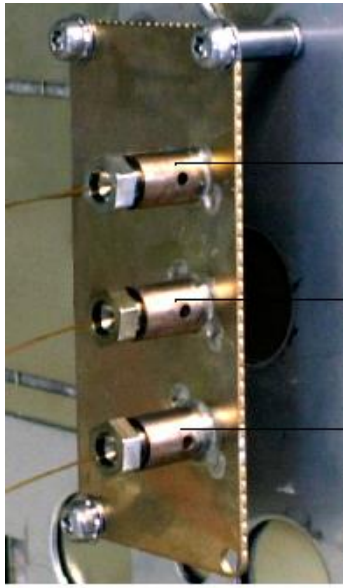


2-way Splitter w/o MUG
Analysis of Multi-pesticide Residues in Crop Plant
Agilent Application Note: 5991-5763EN



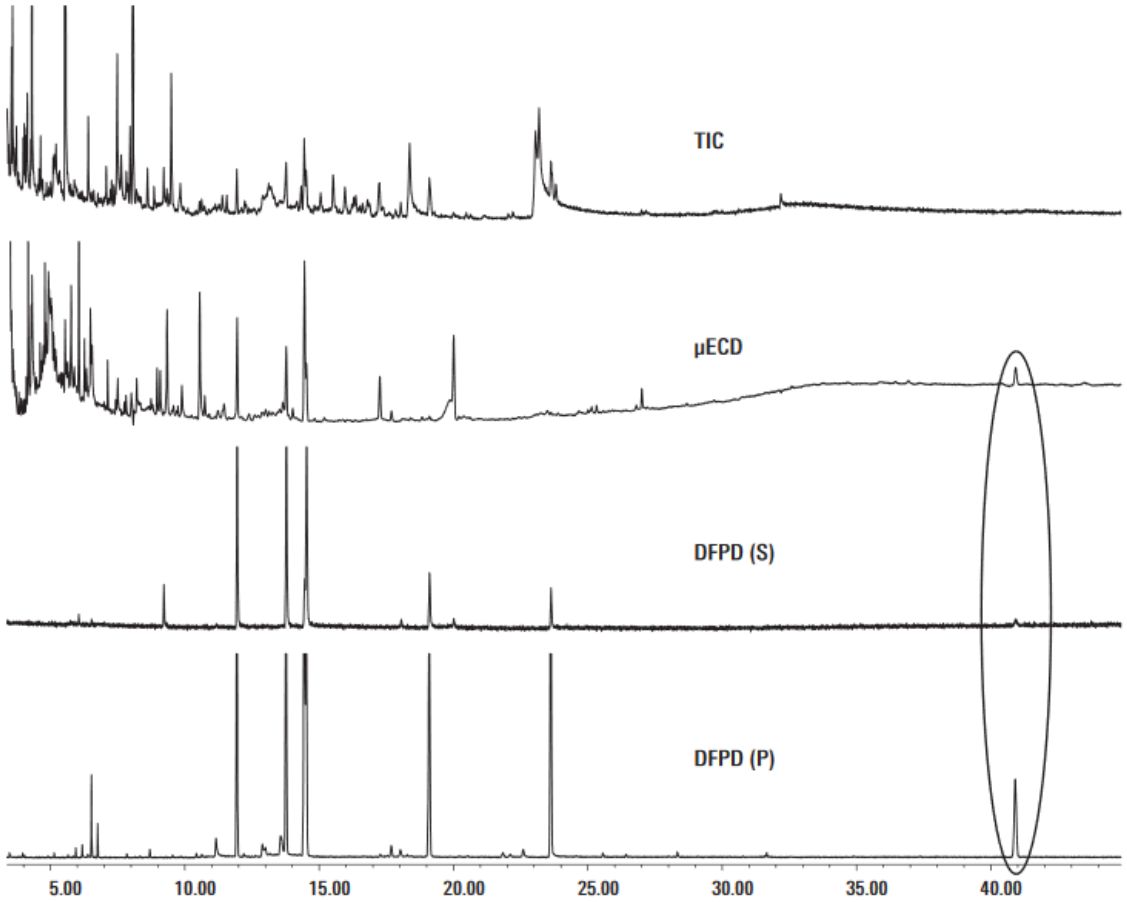


Unpurged Two-way Splitter



Using RTL and 3-Way Splitter w/ MUG to Identify Unknown in Strawberry Extract

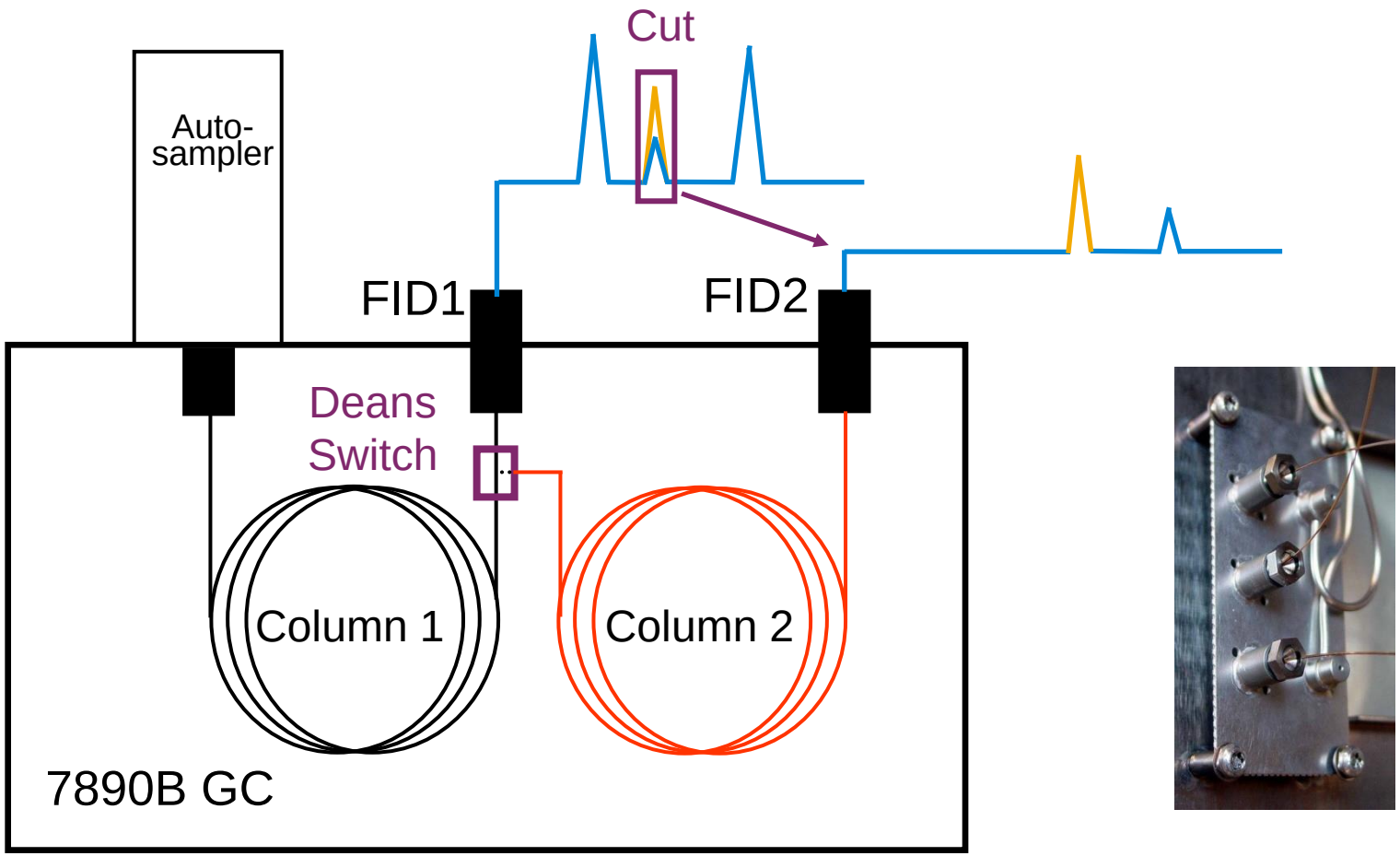
Agilent Application Note: 5989-6007EN



Threeway Splitter inside GC oven

Deans Switch

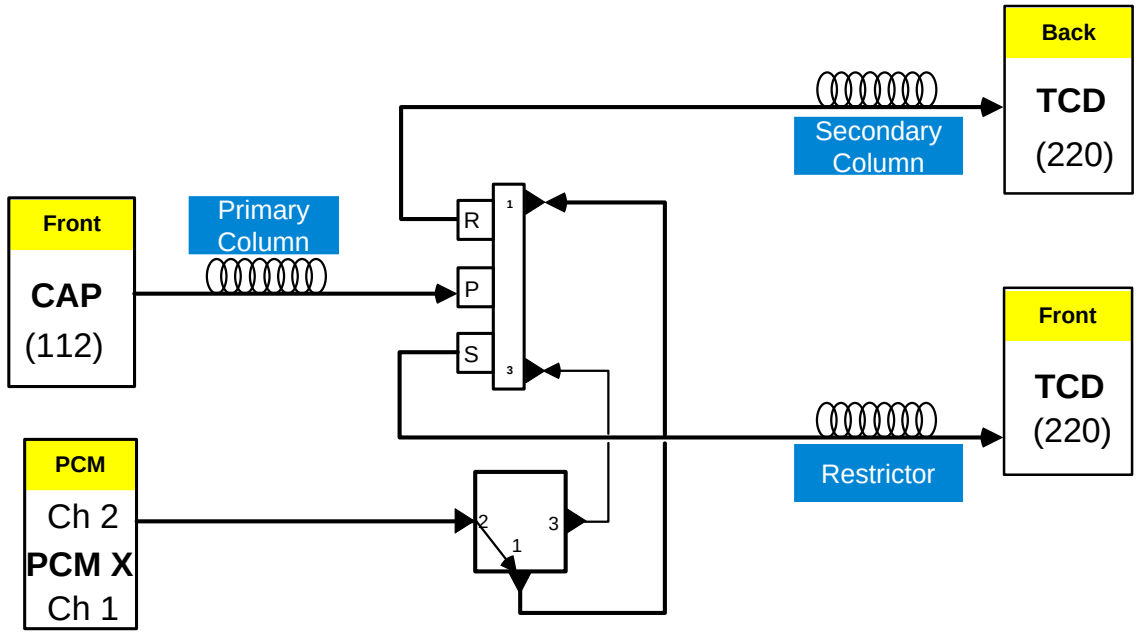
Heart-cutting 2-D GC provides extremely high chromatographic resolution

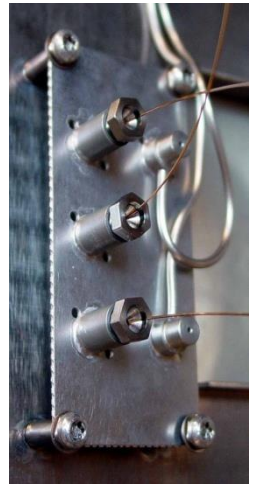


Two-dimensional GC by Deans Switch Advantages

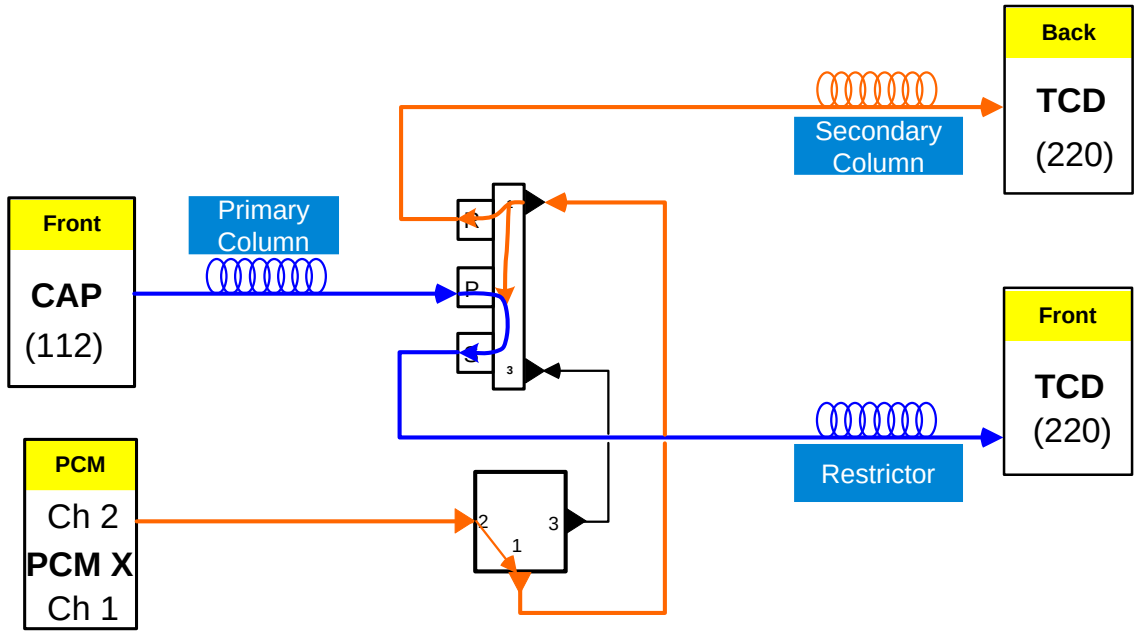
- High resolution of target compounds in complex matrices
- Improvement in analysis speed
- High level of precision
- Ease of setup
- Use of readily available capillary columns and hardware
- Allows for backflush

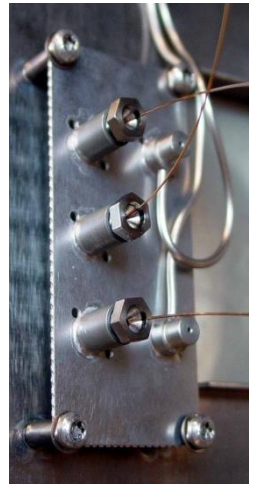
How does a Deans Switch work?



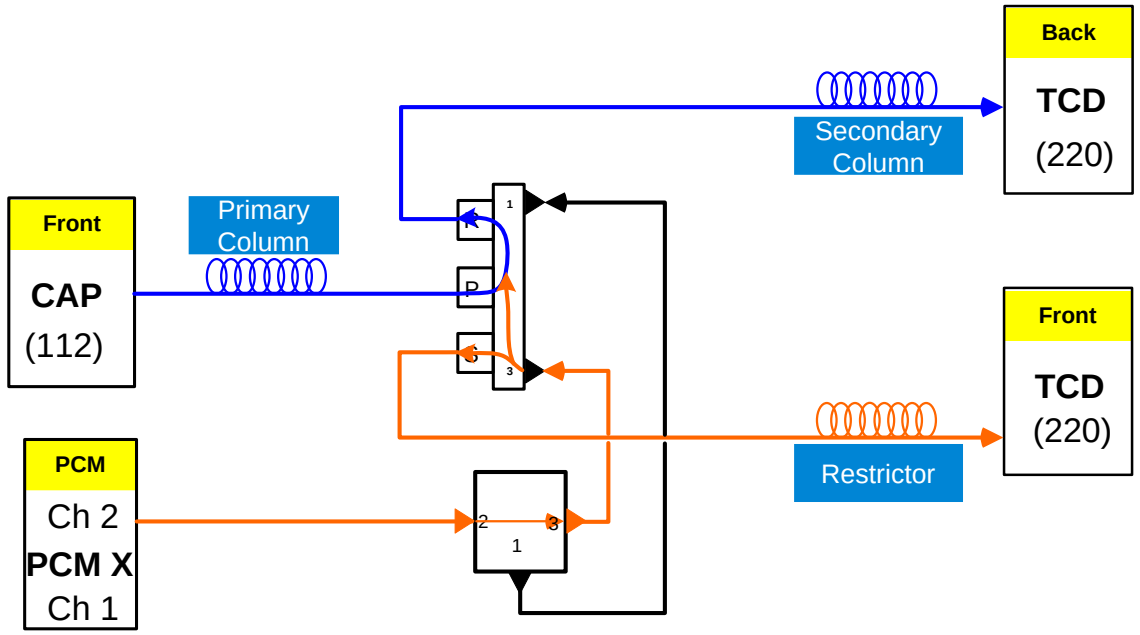


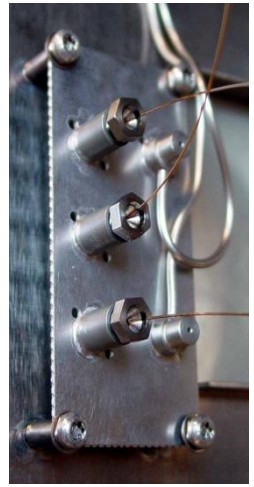
Deans Switch “OFF”





Deans Switch “ON”





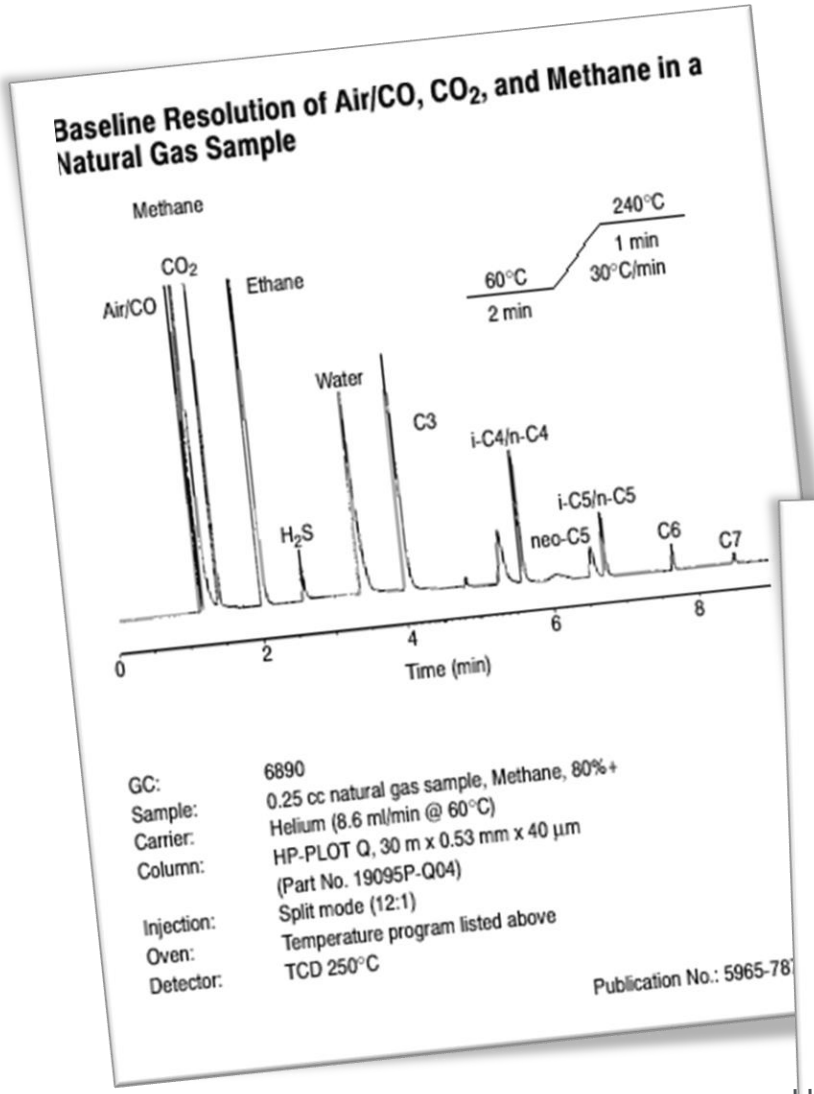
Example: Bio-Ethanol Fermentation Monitoring

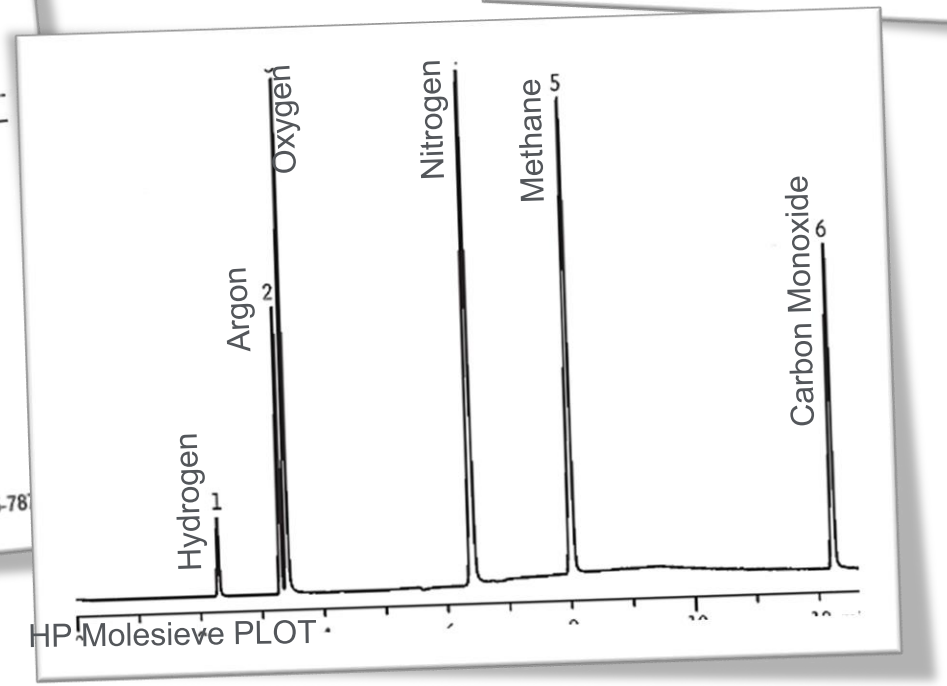
Sample Name : Bio-Ethanol Headspace from Reactor

Phase : Gas_____ Pressure :30 psi___ psi/bar Temperature at the GC: Ambient___

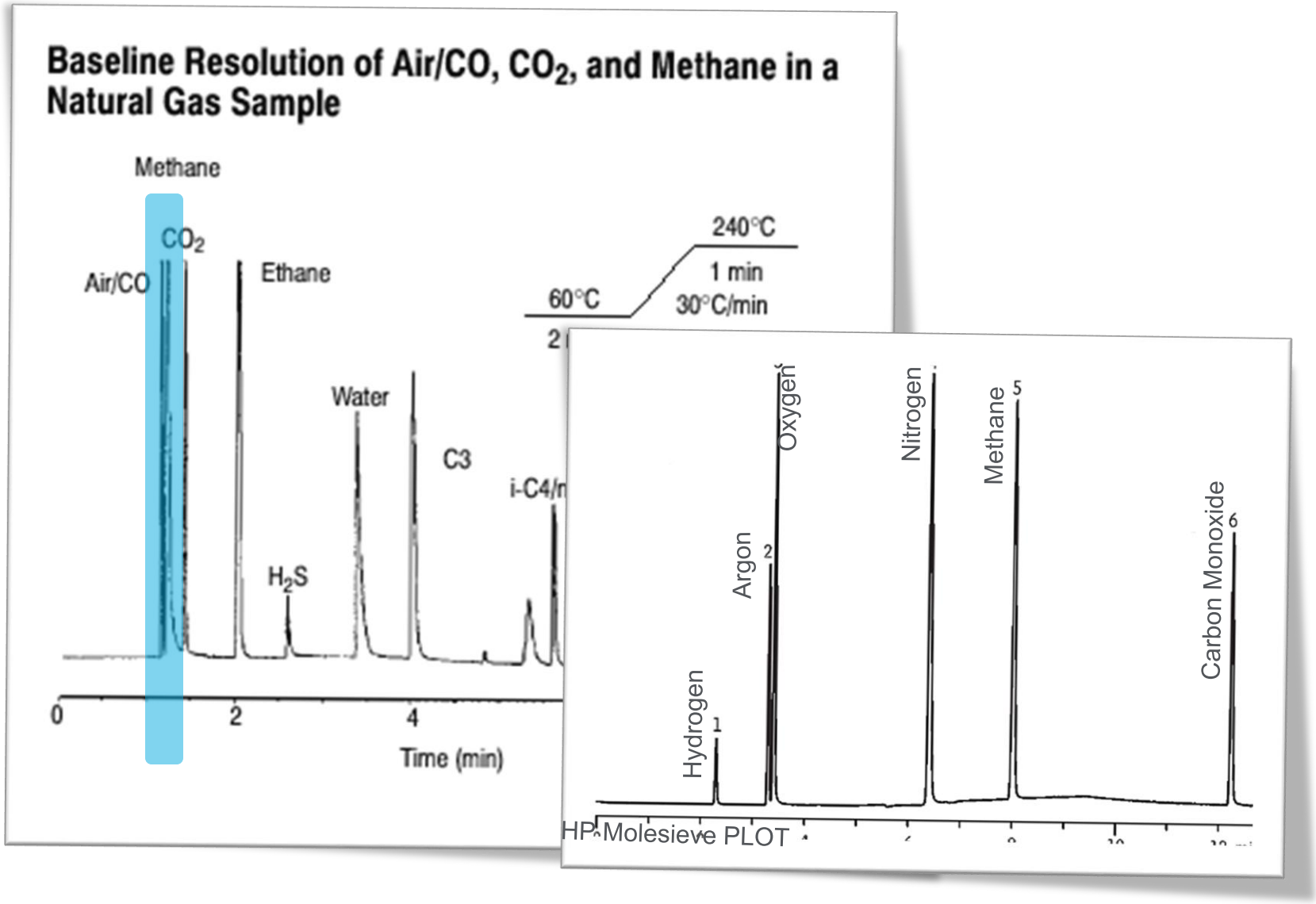
*Components of interest, MW, CAS #	Critical, Desired or NQ ***	Sample 1 Concentration Range (ppm or %) (wt, mol, or vol)		Sample 2 Concentration Range (ppm or %) (wt, mol, or vol)		Sample 3 Concentration Range (ppm or %) (wt, mol, or vol)	
		Min. **	Max	Min. **	Max	Min. **	Max
*Please ensure that you set realistic Detection limits (Zero is not viable)							
Oxygen	C	0.1%	20%				
Nitrogen	C	0.1%	100%				
Carbon Monoxide	C	0.1%	20%				
Carbon Dioxide	C	0.1%	20%				
Hydrogen Sulfide	C	0.1%	1%				
Ethanol	C	0.1%	100%				
Water	NQ						
Ethane	C	?					
Propane	C	?					

System Design: Picking Columns



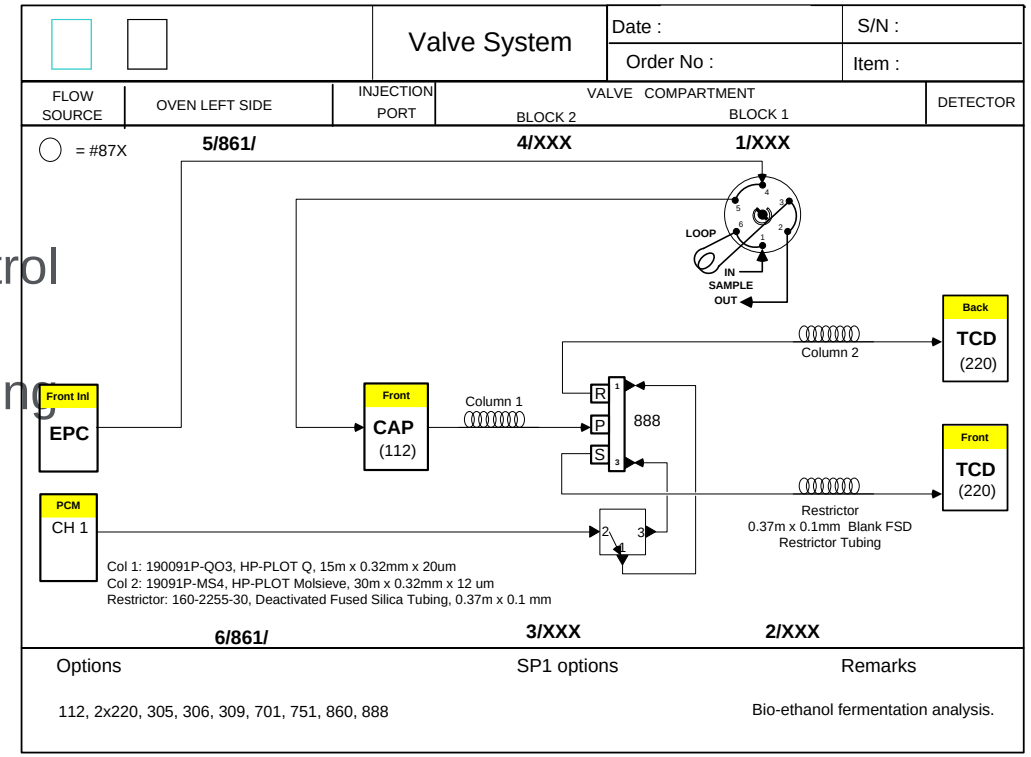


Deans Switch Heart Cut…

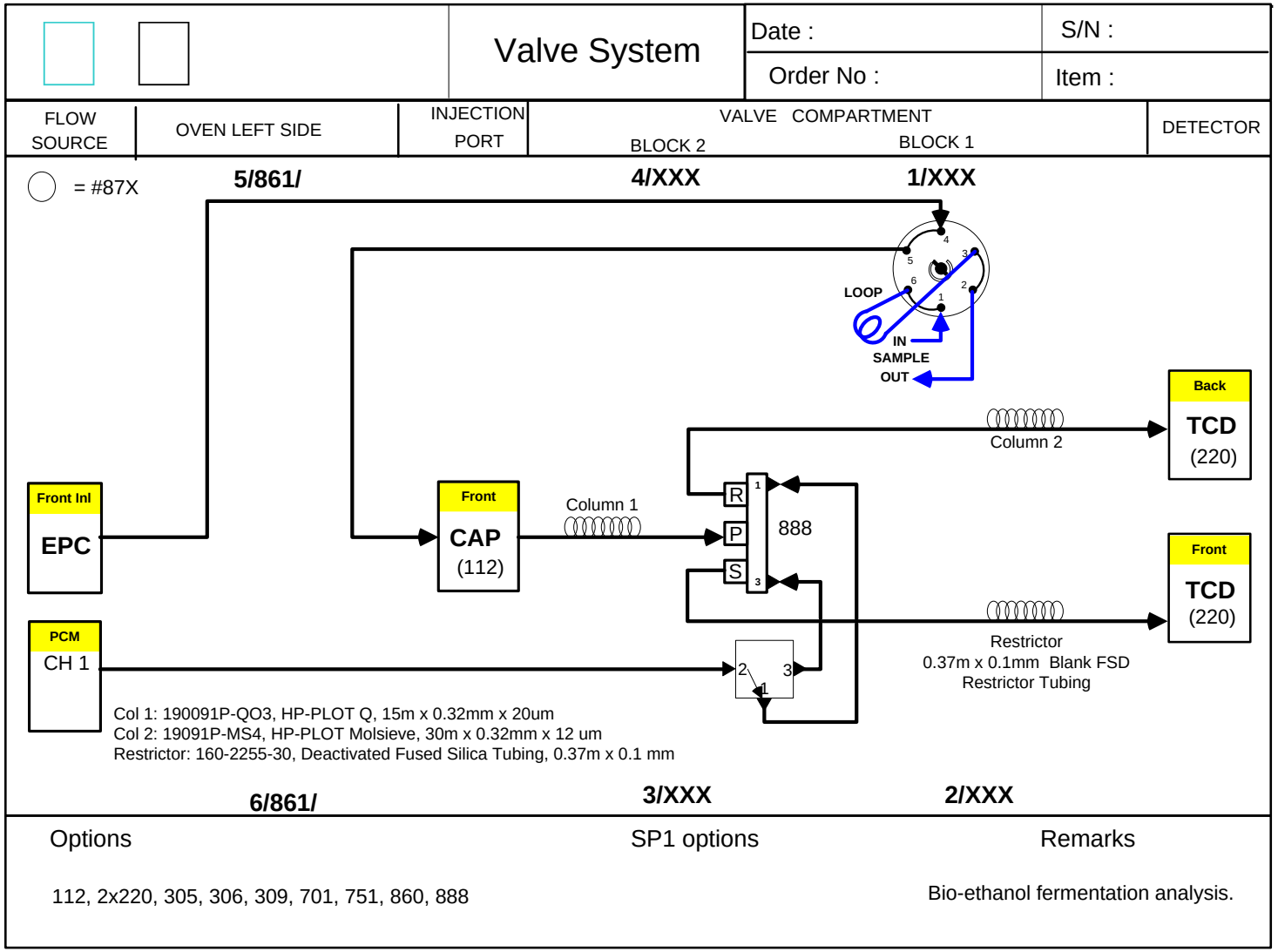


System Design

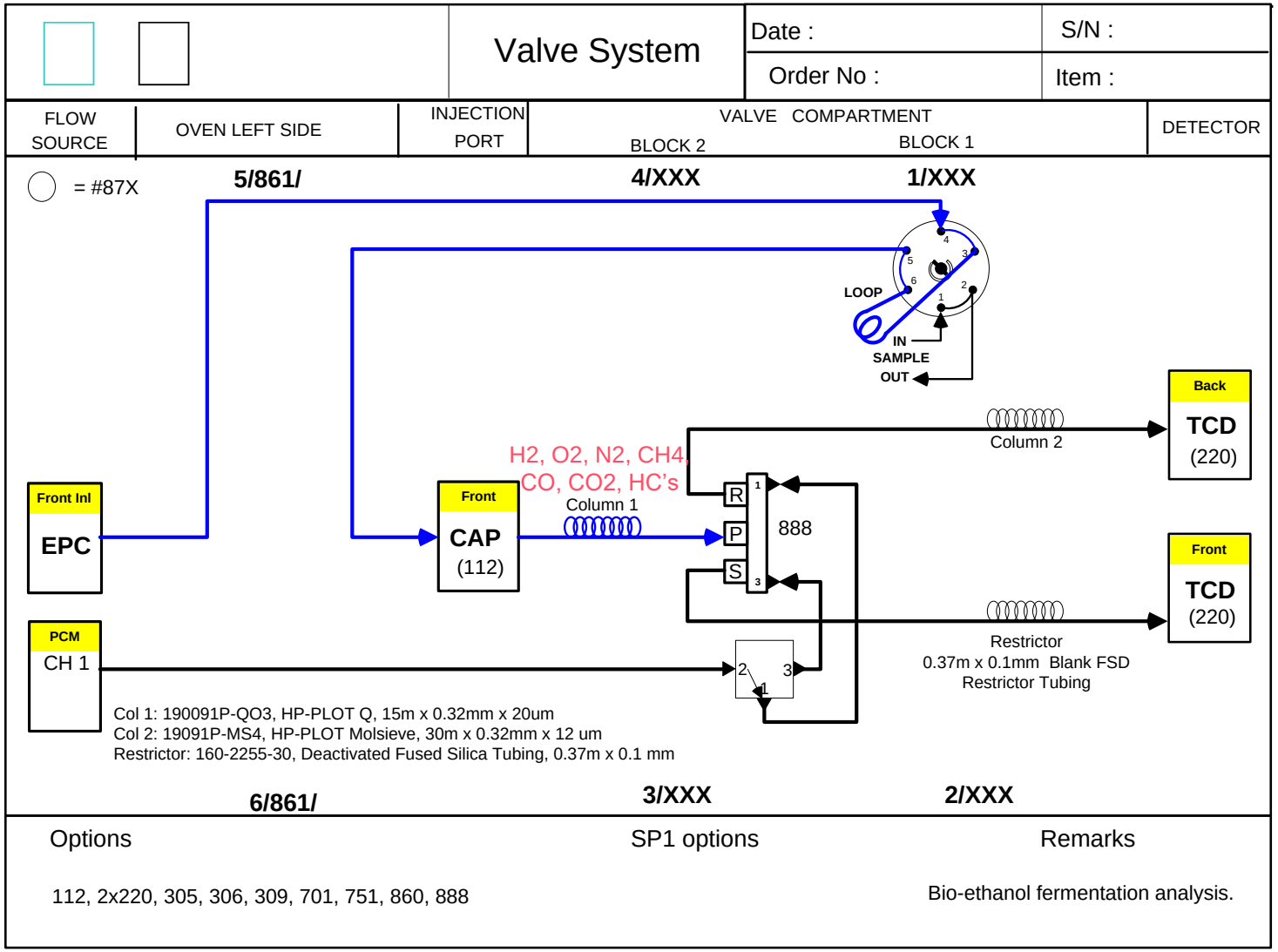
- System designed for analysis of permanent gases and organics
- Gas sample valve for sample introduction
- Split inlet for injection volume control and alternative injection source
- Deans switch allows for heart cutting permanent gases to Molsieve column
- Dual detectors for simultaneous analysis from two columns



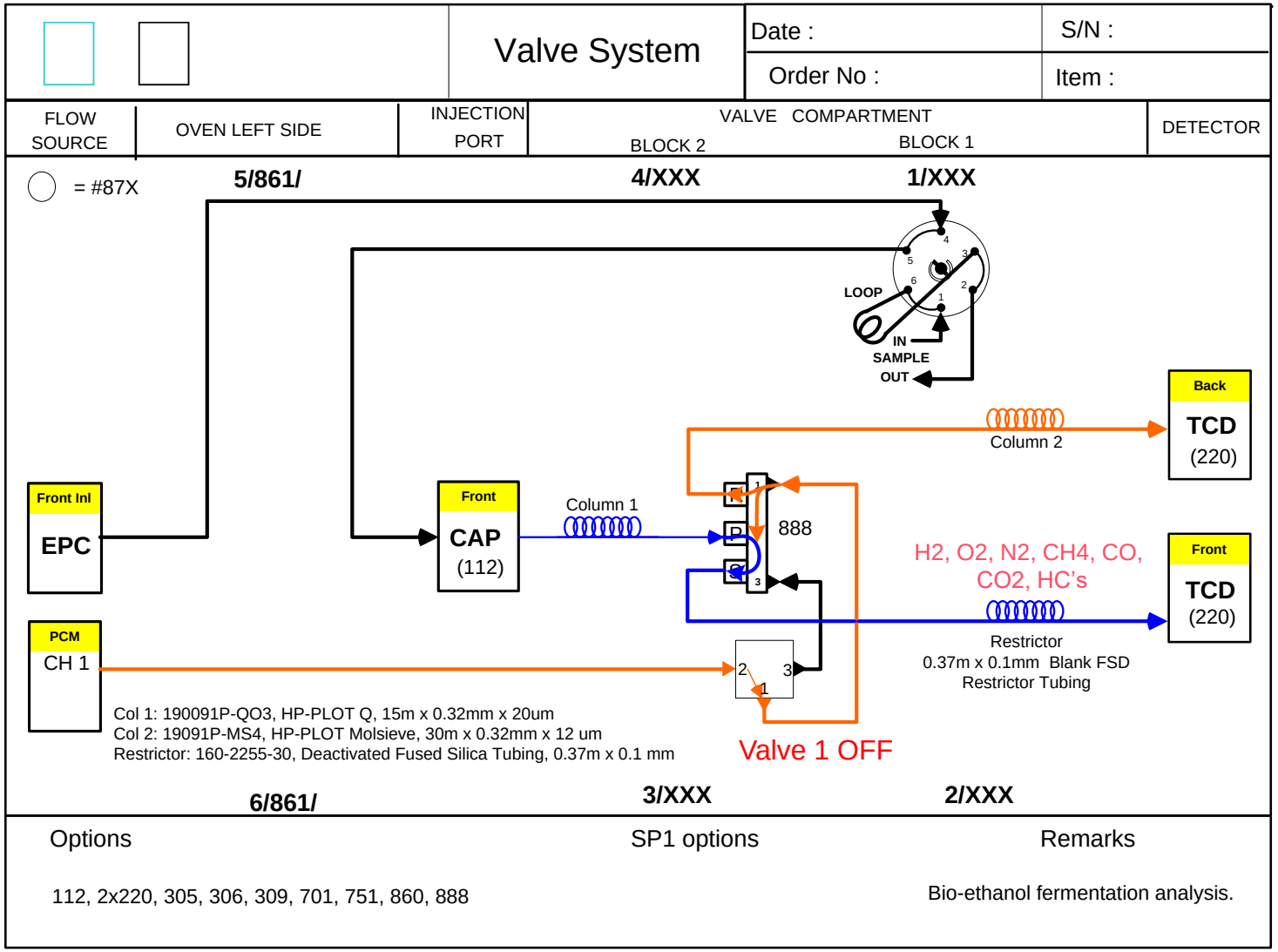
System Operation: Sample Load



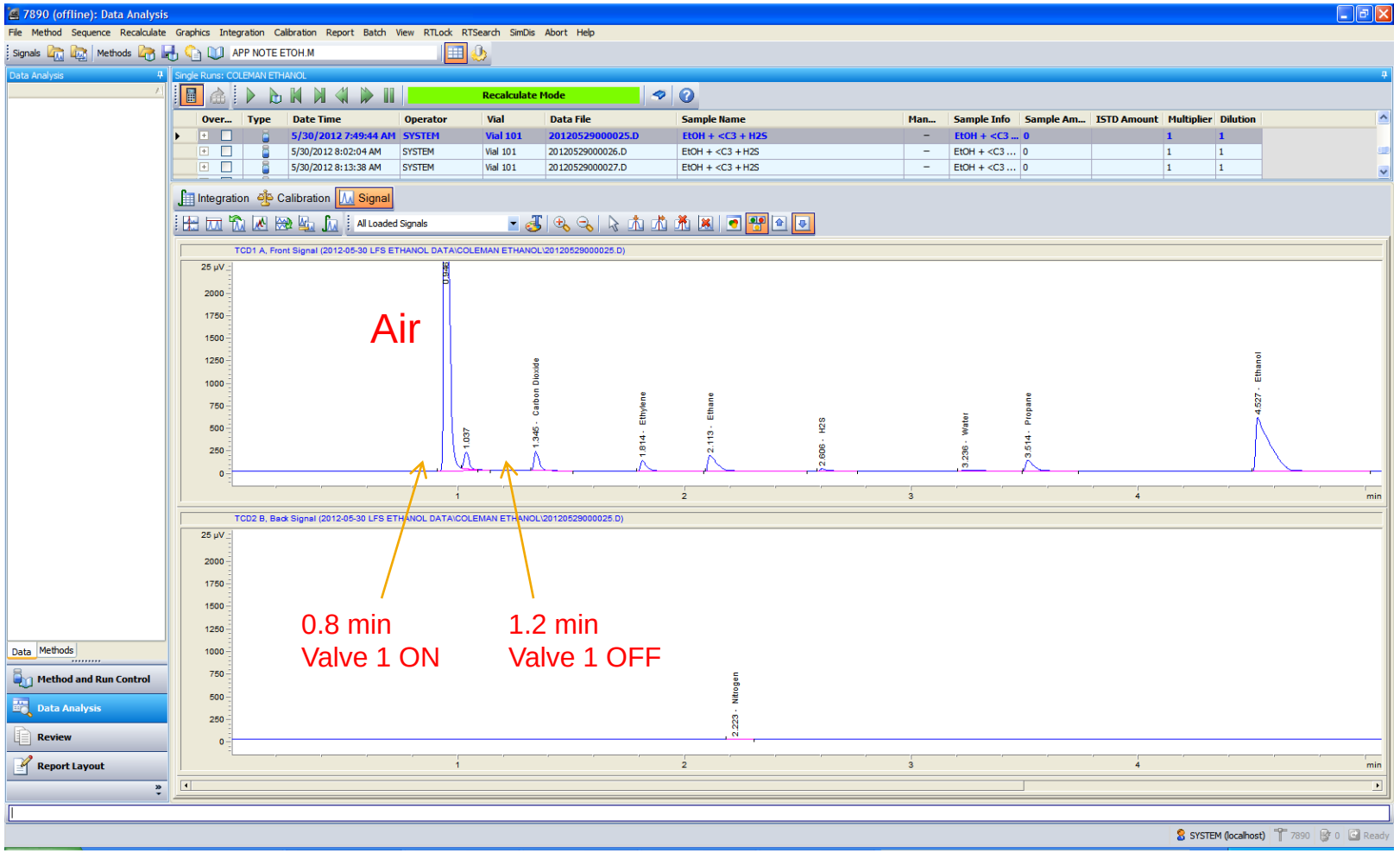
System Operation: Sample Inject



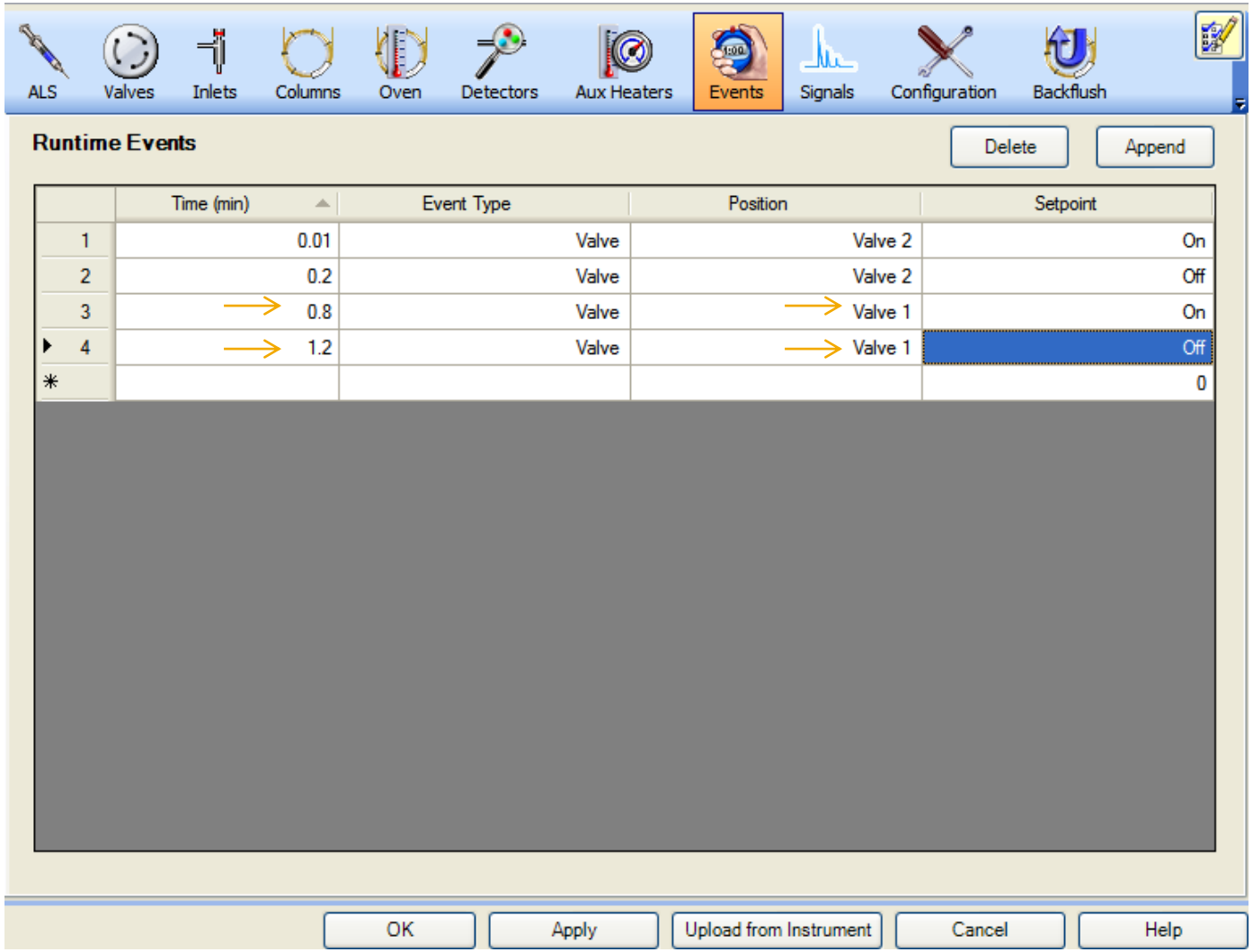
System Operation:



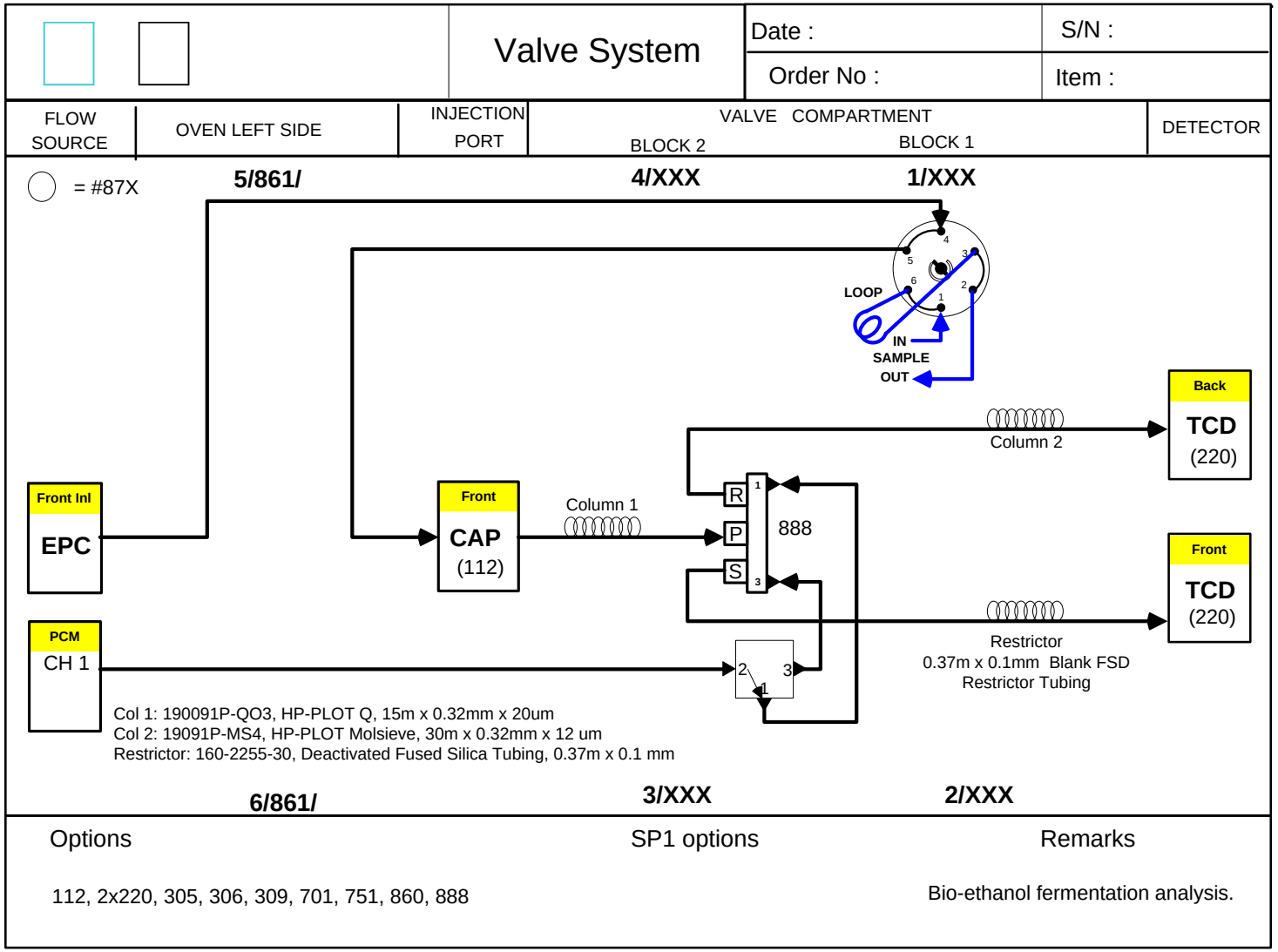
Finding the Cut Time for the Deans Switch Valve



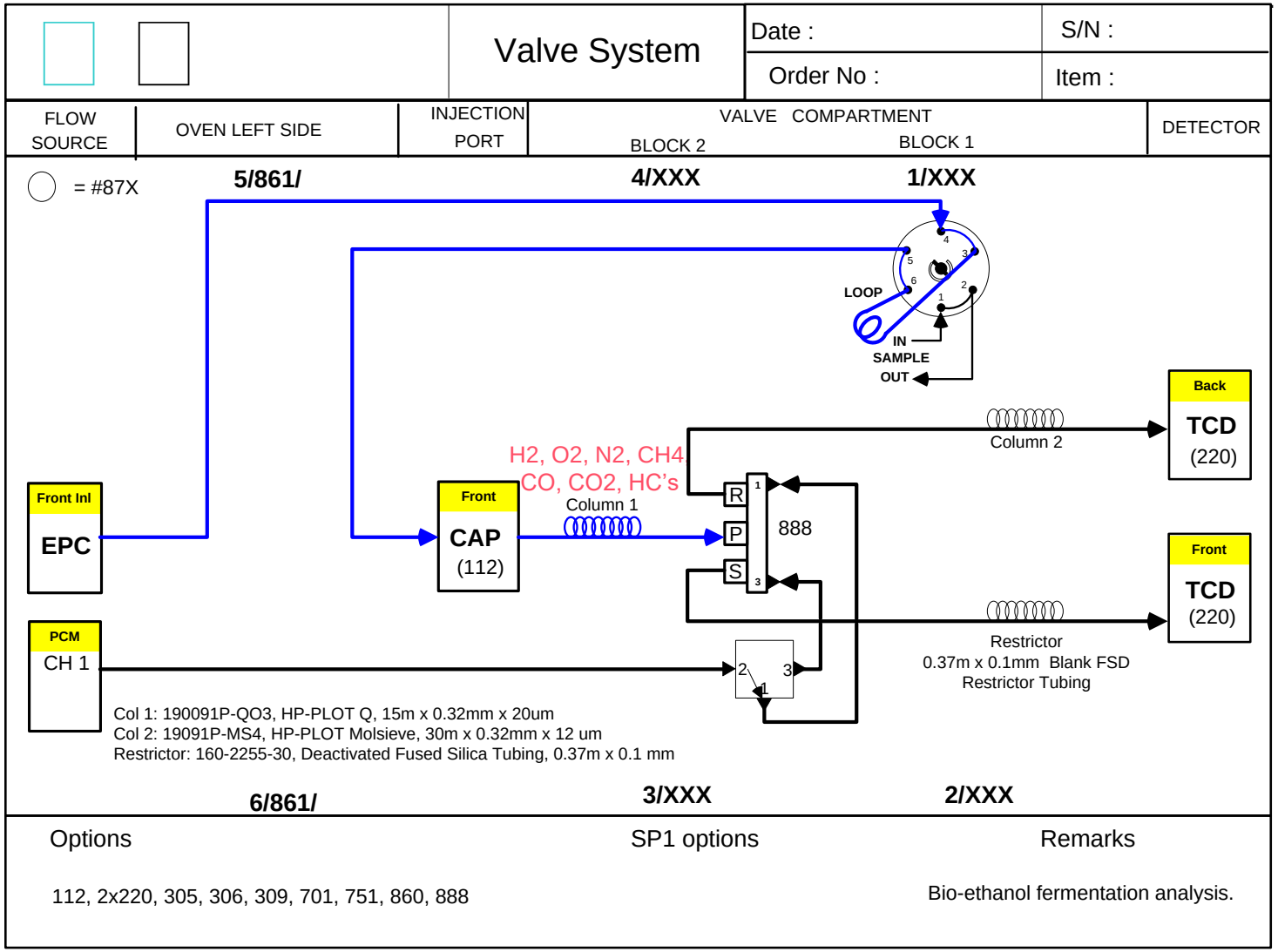
Add Valves Times to Run Time Events Table



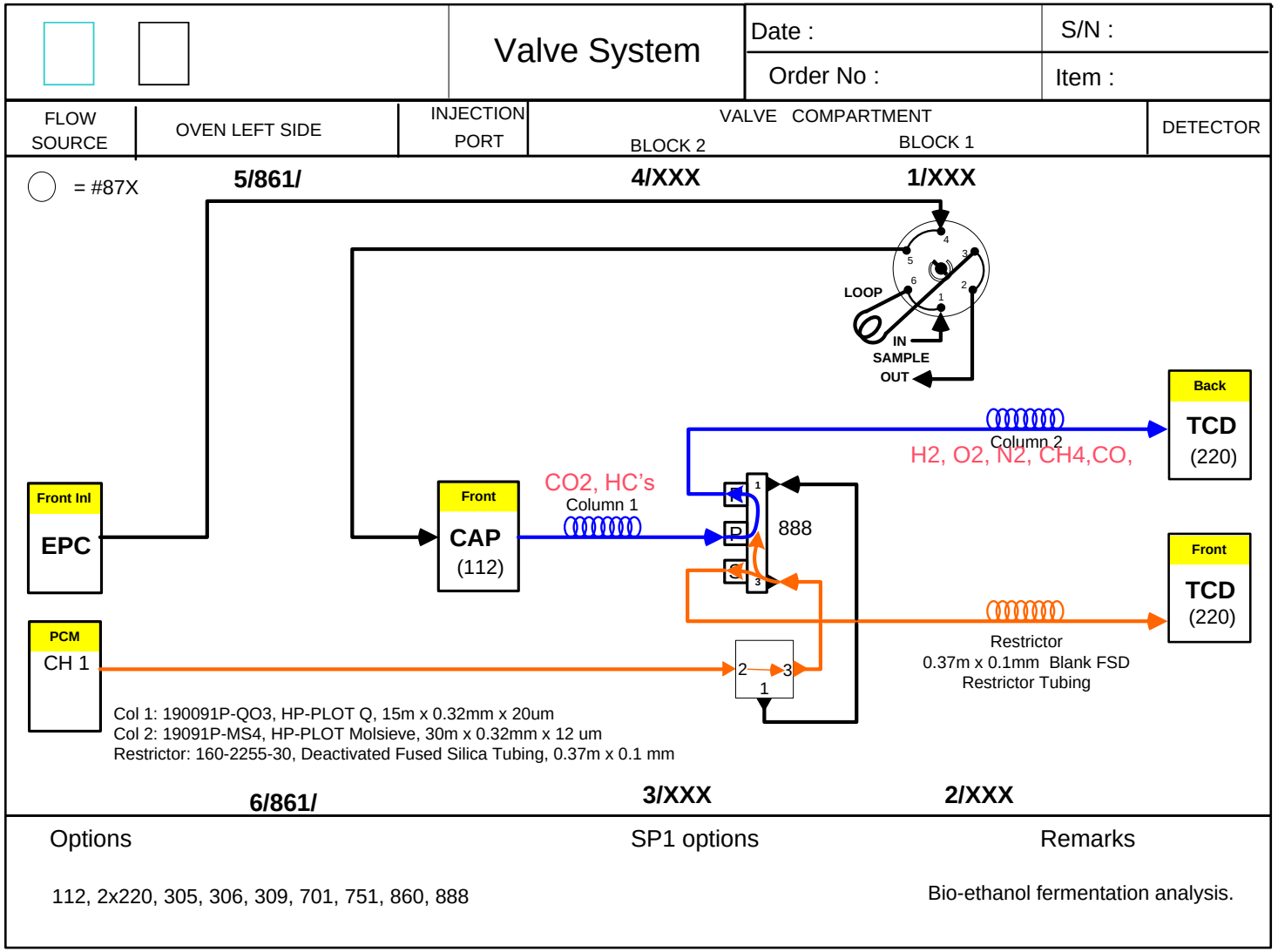
System Operation: Sample Load



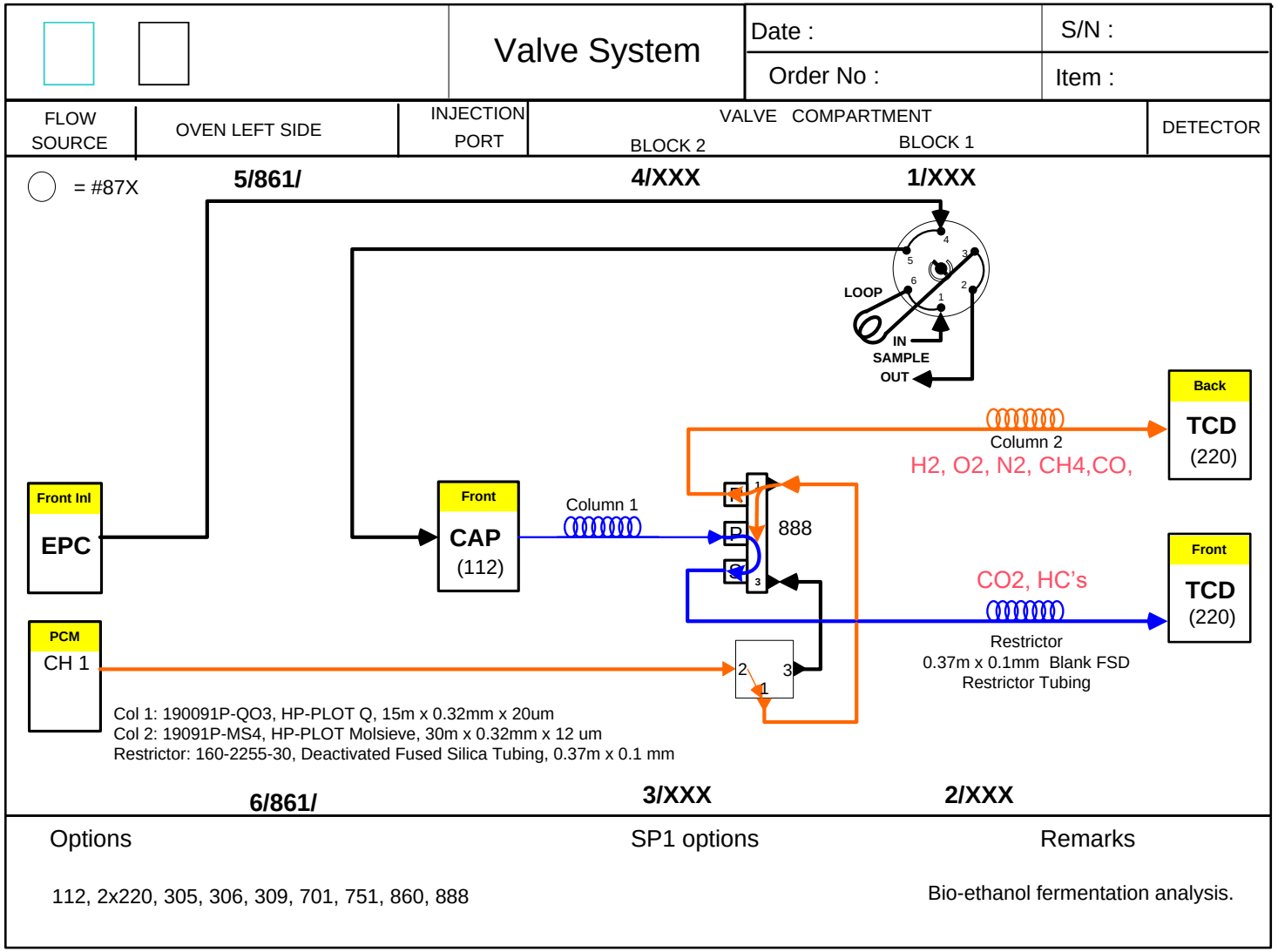
System Operation: Sample Inject



System Operation, Valve 1 ON @ 0.8 min

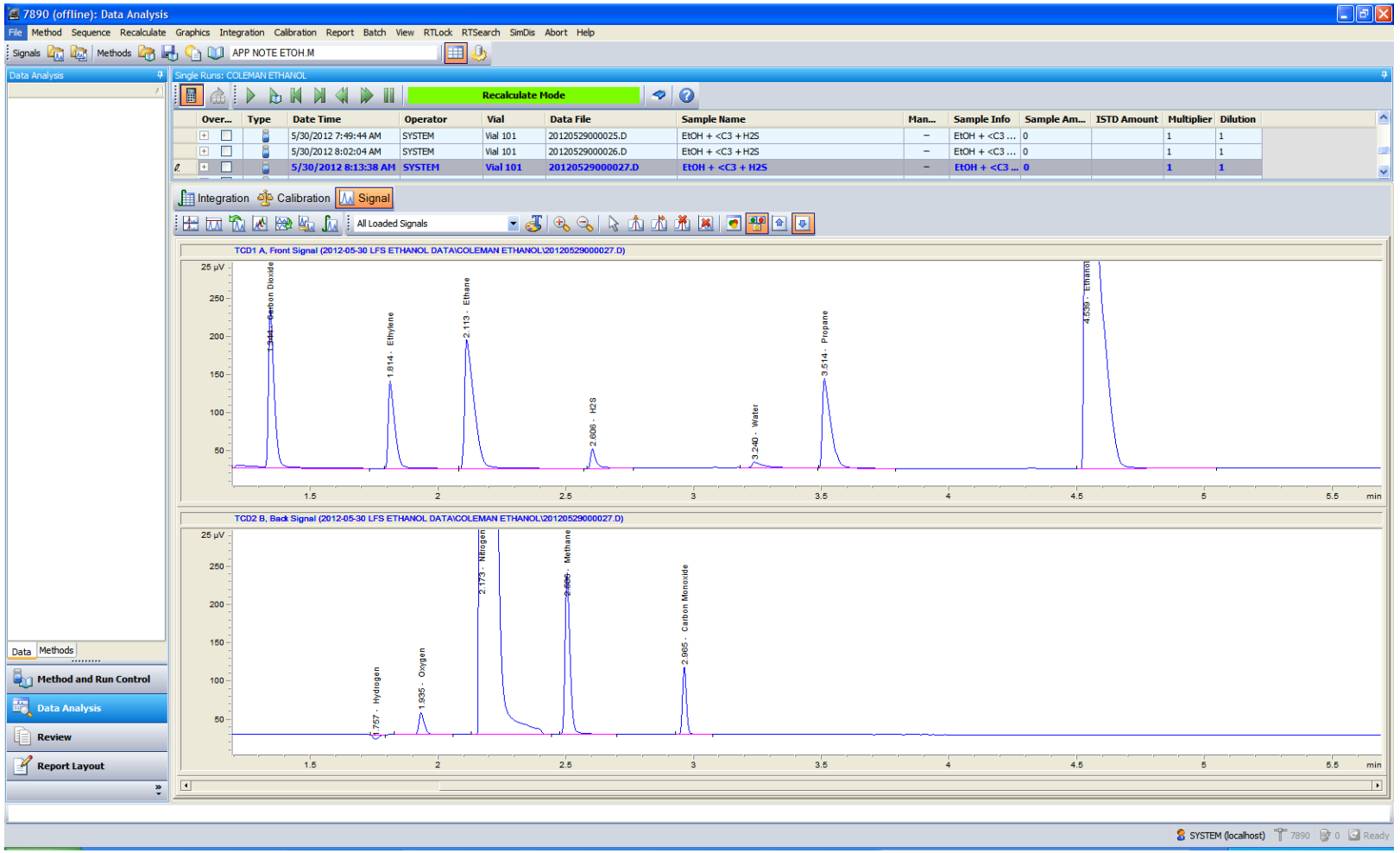


System Operation: Valve 1 OFF @ 1.2 min

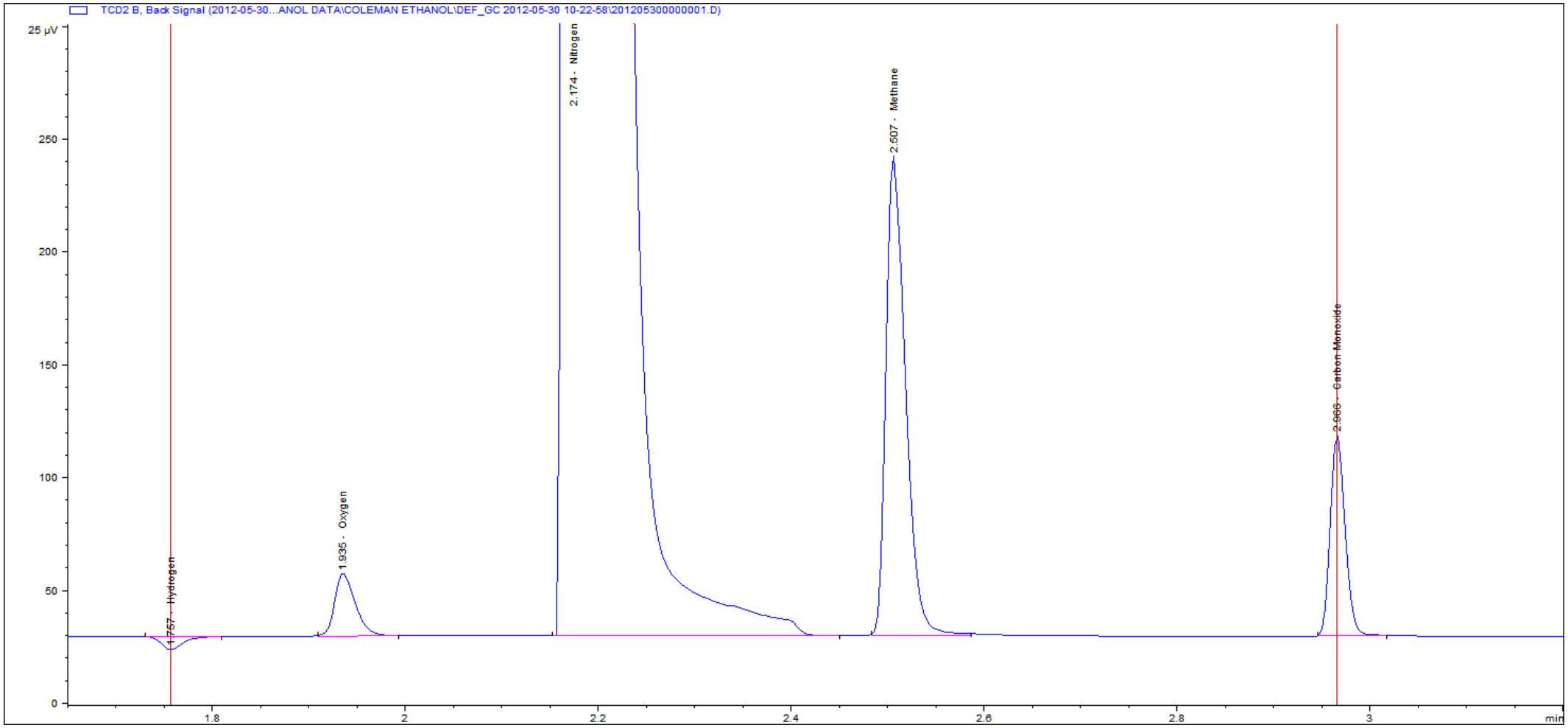


Results

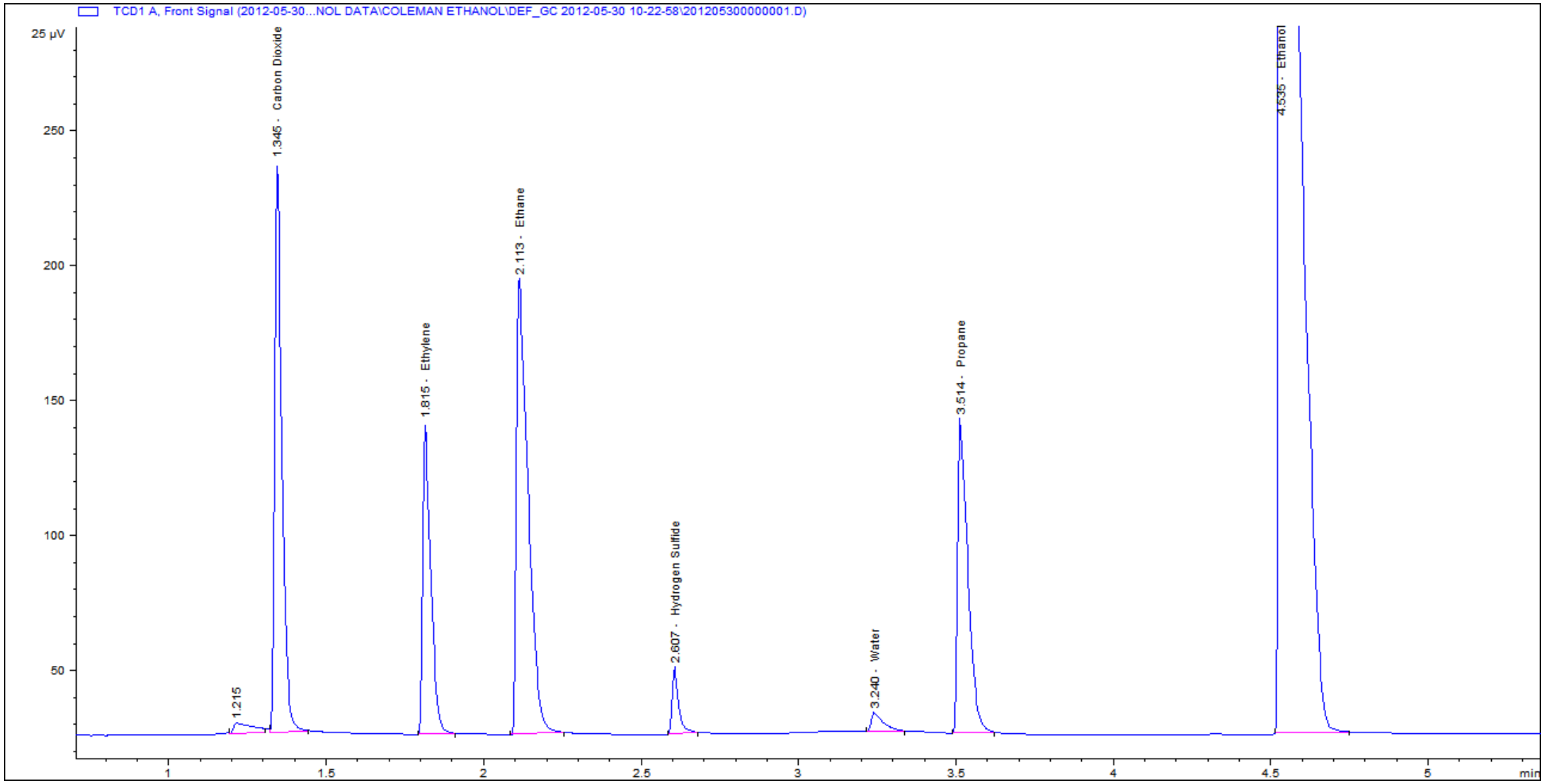
PPQ Channel: CO2, ethylene, ethane, H2S, water, propane, and ethanol
Molsieve Channel: H2, O2, N2, CH4, CO



Molsieve Channel: H2, O2, N2, CH4, CO



PPQ Channel: CO2, ethylene, ethane, H2S, water, propane, and ethanol



Thank You!

Any Questions?

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