

# How to: Gas Chromatography

## Agilent 8890 GC system

Shaw research group

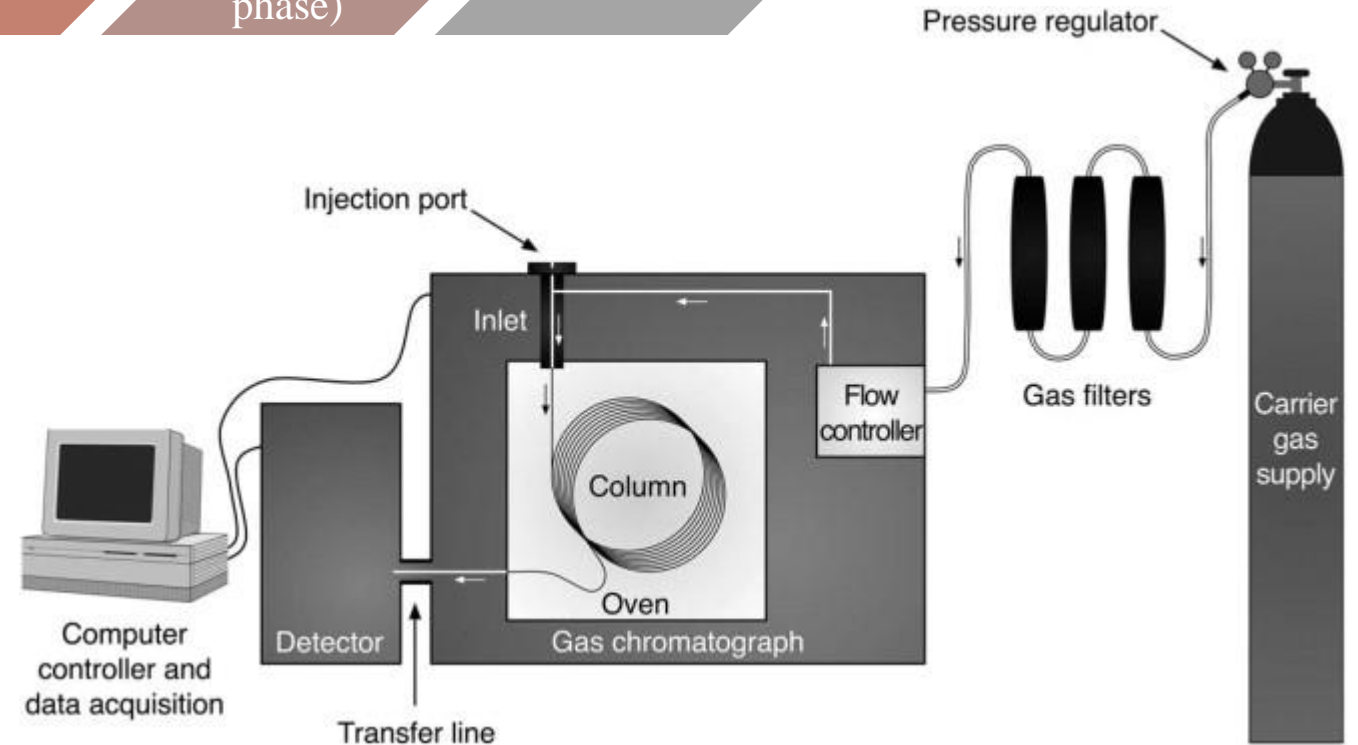
Setayesh Parsapour

Feb 2024

# Gas chromatography instrumentation



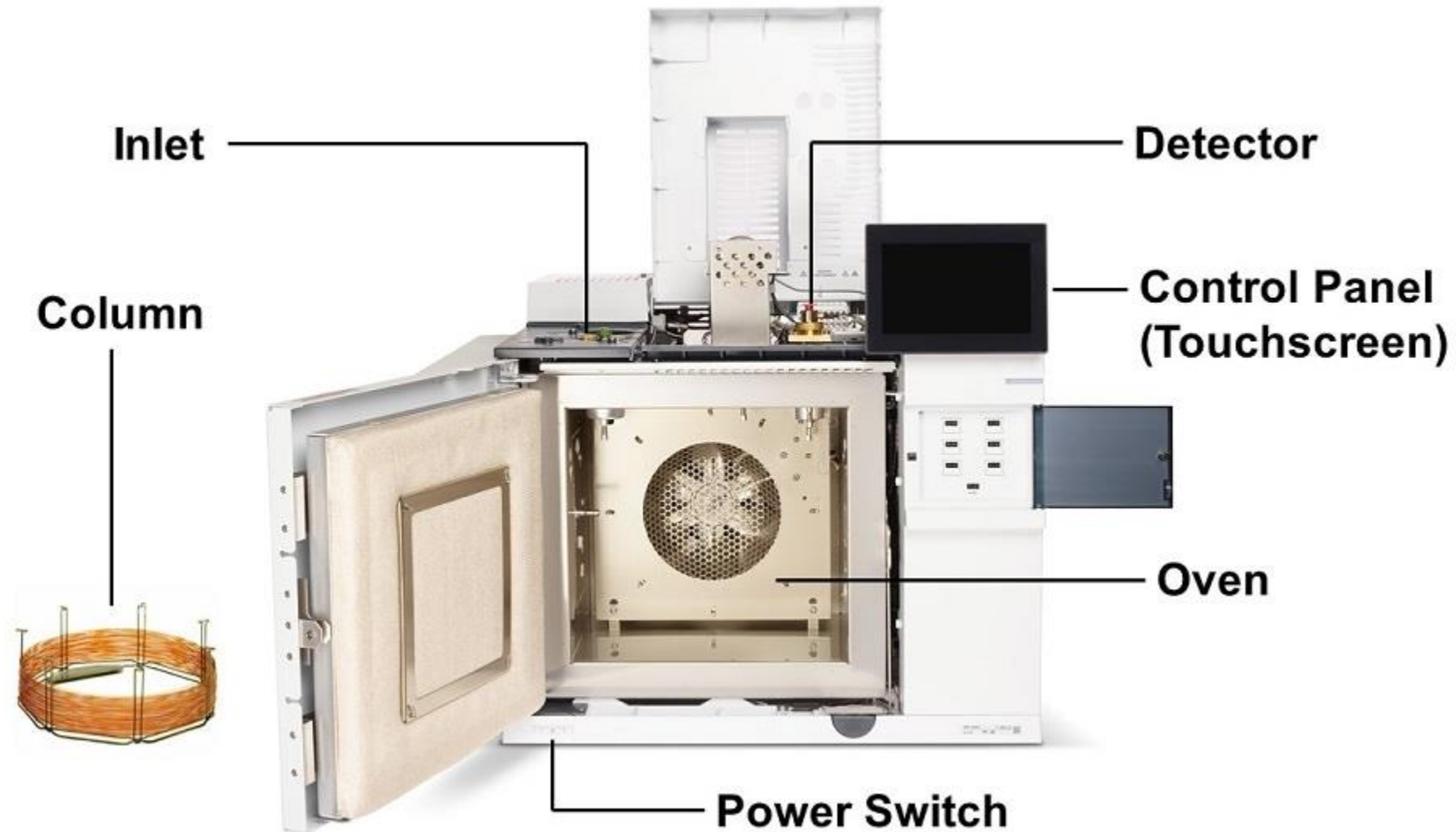
Most popular carrier gas:  
Helium  
Nitrogen  
Hydrogen  
Argon



# Agilent 8890 GC system

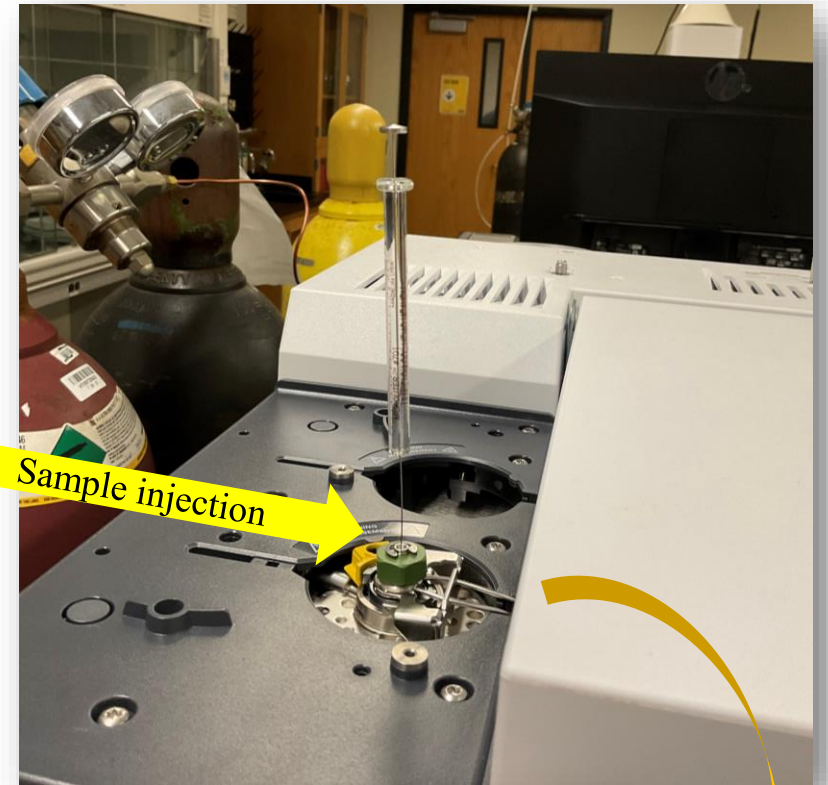
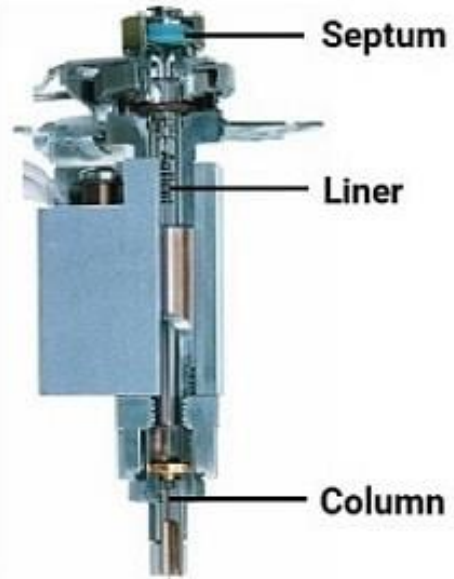


# Agilent 8890 GC system



# Inlet

Mobile phase (carrier gas) is connected to the instrument



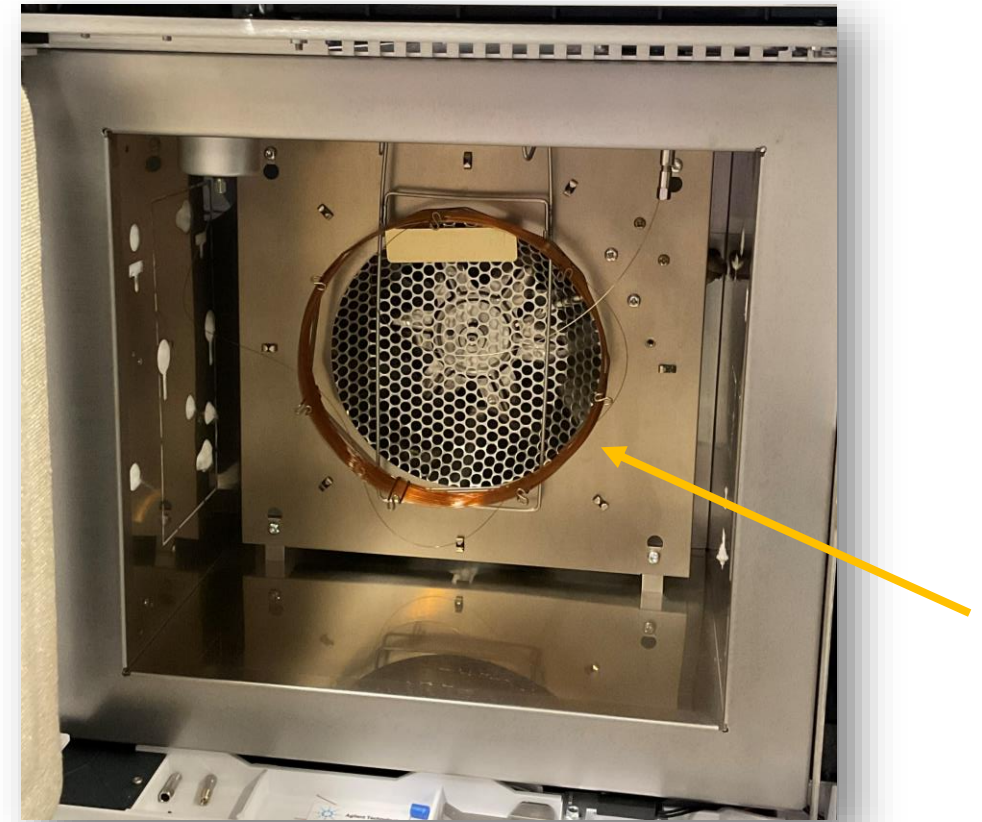
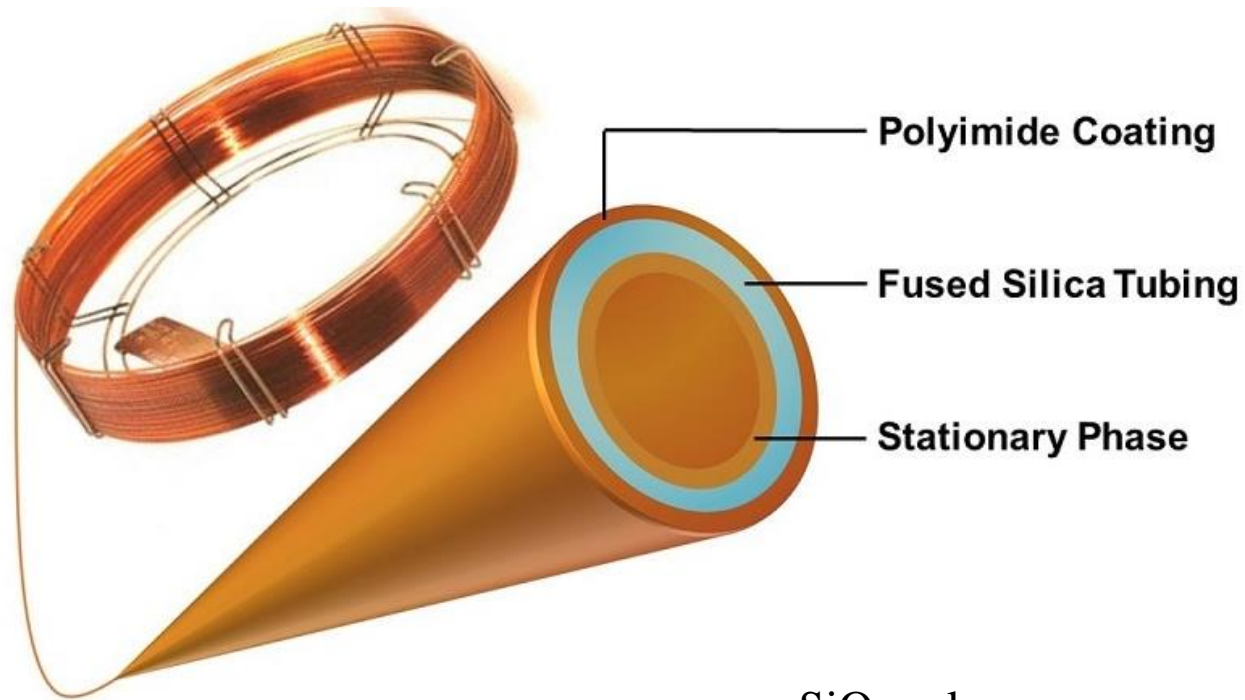
Helium cylinder



Syringe

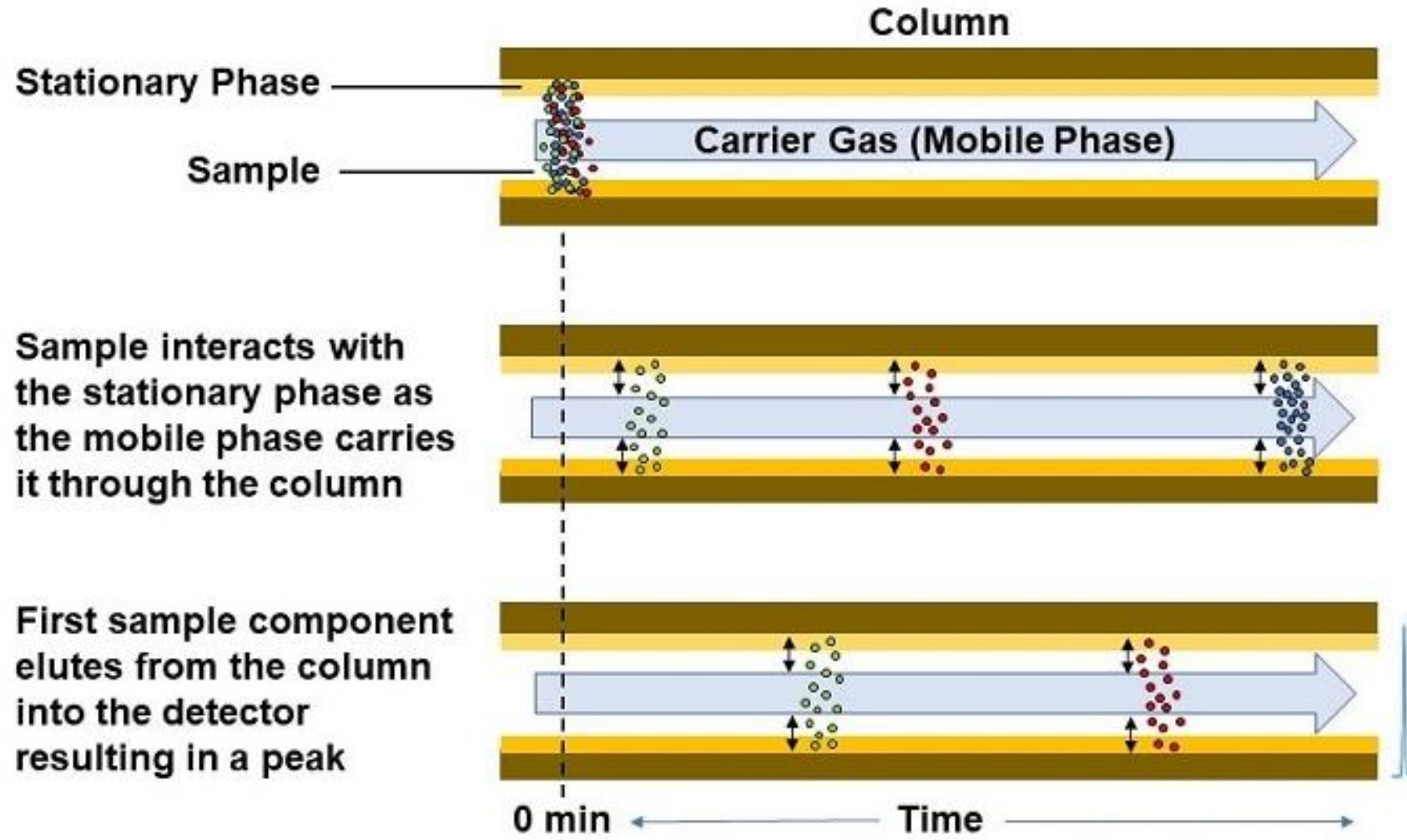


# Column



SiO<sub>2</sub> column  
Length: 30 m  
Diameter: 0.320 mm  
Thickness of coating: 0.25 μm  
Temperature limits: -60 to 325 °C

# Column (stationary phase)



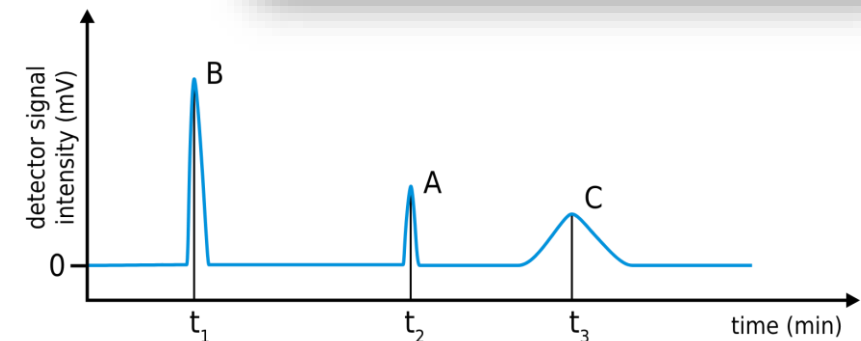
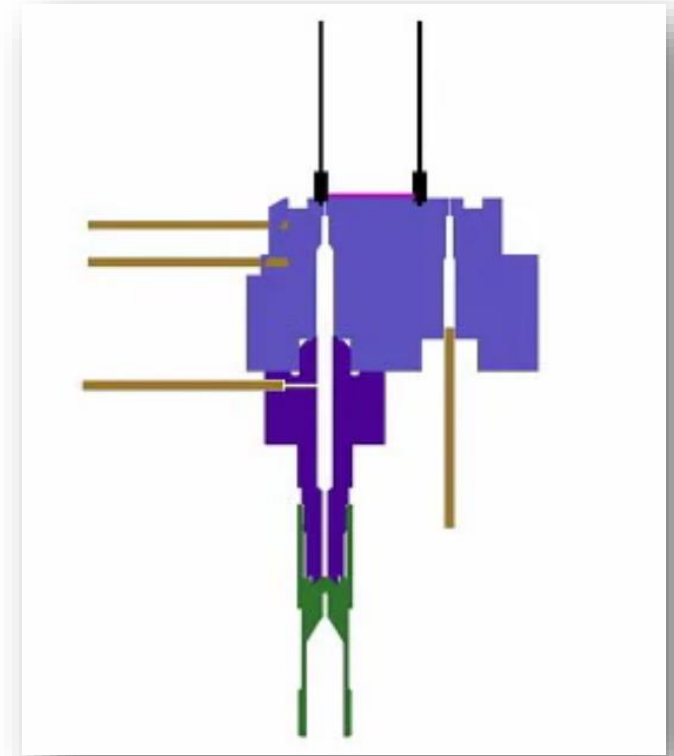
# Detector (TCD)

## Thermal Conductivity Detector (TCD)

- Universal detector
- For most organic molecules
- Non-specific and non-destructive detector

Different gas compositions cause heat to be conducted away from the filament at different rates, which in turn causes a change in the filament temperature and electrical resistance.

Different temperatures  $\rightarrow$  different resistance and conductivity  
 $\rightarrow$  Change in voltage as a function of time



# Start up and data acquisition



1. Open the “control panel” software

A screenshot of the Agilent GC - Control Panel software interface. The window title is 'Agilent GC - Control Panel'. The interface is divided into several sections. At the top, there is a 'MANAGEMENT' toolbar with icons for 'Edit Instrument', 'Delete Instrument', 'Refresh All', 'Lock Instrument', 'Create Desktop Shortcut', 'Configure Instrument', 'Close Connection', and 'Copy to Clipboard'. Below this is a navigation pane on the left with 'Instruments' selected. The main area shows 'Agilent GC' with a 'Not Connected' status. There is a 'Project' dropdown set to 'Default' and two buttons: 'Launch' and 'Launch Offline'. A blue arrow points to the 'Launch' button. Below the 'Launch' button, there are sections for 'Status', 'Details', and 'Activity Log (last 7 days)'. At the bottom, it says 'Current user: SYSTEM (SYSTEM)'.

2. Launch the “acquisition” window

### 3. Open the "Method" tab

The screenshot displays the Agilent GC - Acquisition software interface. The top menu bar includes File, Home, GC Plus, and Control. The 'Method' button in the Home tab is circled in red. The main window shows the 'Acquisition Method - Ramp Test.amx' configuration. The 'Front Inlet Flow Path' section includes parameters for Front SS Inlet (6 psi [6 psi], 249.7 °C [250 °C]), Column #1 (75 °C [75 °C], 1 mL/min), and Front Detector TCD (300.1 °C [300 °C]). A graph on the right shows the temperature profile over a 6-minute run time, with the oven temperature (red line) ramping up from approximately 75 °C to 300 °C, and the column flow rate (green line) increasing from 1 mL/min to 15 mL/min. The left sidebar contains a tree view with 'Inlets' selected. The configuration area for the 'Split-Splitless Inlet' is also visible, showing parameters for Heater, Pressure, Total Flow, and Septum Purge Flow.

4. Upload a default acquisition method  
or  
setup your own method

8890 GC Links  
[Help & Information](#)  
[Browser Interface](#)

- ALS
- Inlets**
- Columns
- Oven
- Detectors
- Events
- Signals
- GC Performance
  - Blank Evaluation
  - Detector Evaluation
  - Peak Evaluation
- Configuration
  - Miscellaneous
  - Columns
  - Modules
  - ALS
- Readiness
- GC Calculators

### Split-Splitless Inlet

	Setpoint
<input checked="" type="checkbox"/> Heater:	<input type="text" value="250 °C"/>
<input checked="" type="checkbox"/> Pressure:	<input type="text" value="5.9552 psi"/>
Total Flow:	<input type="text" value="5 mL/min"/>
<input checked="" type="checkbox"/> Septum Purge Flow:	<input type="text" value="3 mL/min"/>
<input type="checkbox"/> Pre-Run Flow Test	
Action on Failure:	<input type="text" value="Continue"/>

**5. Setup Inlet (heat, pressure, flow, ...)** ←

#### Inlet Mode (Split 1 : 1)

Split  :1 SplitFlow

#### Gas Saver (On)

On  After:

## 6. Setup column (heat, pressure, flow rate, time,...)

8890 GC Links  
[Help & Information](#)  
[Browser Interface](#)

**Columns**

#	Selection
1	Front SS Inlet He ---> Locked Agilent 19091J-413: 3402944H HP-5 -60 °C—325 °C (350 °C): 30 m x 320 µm x 0.25 µm ---> Front Detector TCD

ALS  
Inlets  
**Columns**  
Oven  
Detectors  
Events  
Signals  
GC Performance  
  Blank Evaluation  
  Detector Evaluation  
  Peak Evaluation  
Configuration  
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  Columns  
  Modules  
  ALS  
Readiness  
GC Calculators

Control Mode

On

Setpoint

Flow:  ←

Pressure:

Average Velocity:

Holdup Time:

Constant Flow

Post Run:

Column #1 Configuration

(Initial): 0 min  
He @ 75 °C Oven  
Out: Ambient Pressure  
30 m x 320 µm x 0.25 µm

## 7. Setup oven (heat, pressure, flow rate, time, temp ramp, ...)



8890 GC Links

[Help & Information](#)

[Browser Interface](#)

ALS

Inlets

Columns

**Oven**

Detectors

Events

Signals

▼ GC Performance

Blank Evaluation

Detector Evaluation

Peak Evaluation

▼ Configuration

Miscellaneous

Columns

Modules

ALS

Readiness

GC Calculators

### Oven

Oven Temp On

75 °C

Equilibration Time

3 min

Maximum Oven Temperature

200 °C

Override Column Max: 350 °C

	Rate °C/min	Value °C	Hold Time min	Run Time min
▶ (Initial)		75	0.5	0.5
Ramp 1	20	190	0	6.25
*				

Post Run: 50 °C

Post Run Time: 0 min

### 3. Open the “Method” tab

### 8. Setup detector (heat, pressure, flow rate,...)

**8890 GC Links**  
[Help & Information](#)  
[Browser Interface](#)

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**TCD**

Setpoint

Heater: 300 °C

Reference Flow: 30 mL/min

Makeup Flow: (He) 2 mL/min

Carrier Gas Flow Correction (None)

Column Flow: (He) 1 mL/min

Column + Makeup = Constant

Constant Makeup Flow

Filament

Negative Polarity

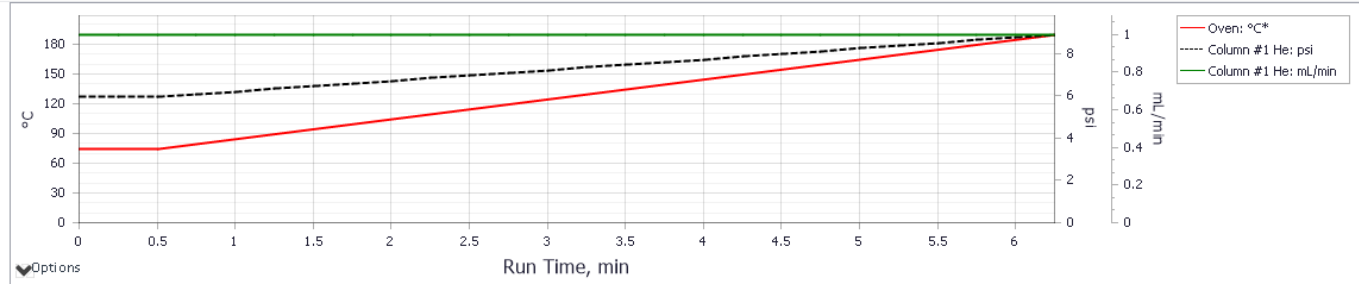
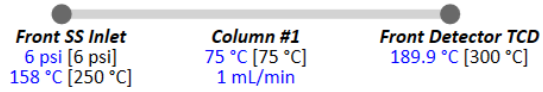
### Acquisition Method – Standby 8890.amx



- General Properties
- Instrument Setup Agilent 8890

Send the current method to the instrument

#### Front Inlet Flow Path



9. send you current method to the instrument

#### 8890 GC Links

[Help & Information](#)  
[Browser Interface](#)

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#### TCD

	Actual	Setpoint
<input checked="" type="checkbox"/> Heater:	189.9 °C	300 °C
<input checked="" type="checkbox"/> Reference Flow:	30 mL/min	30 mL/min
<input checked="" type="checkbox"/> Makeup Flow: (He)	2 mL/min	2 mL/min
Carrier Gas Flow Correction (None)		
Column Flow: (He)	1 mL/min	1 mL/min
<input type="radio"/> Column + Makeup = Constant <input checked="" type="radio"/> Constant Makeup Flow		
<input checked="" type="checkbox"/> Filament	0 (25 µV)	
<input type="checkbox"/> Negative Polarity		

Agilent GC - Not Ready

File Home GC Plugins Control

Take Release Ad Hoc Mode Instrument

Method Single Sample Sequence Layouts

Copy Delete Reset

Activity Log Run Queue Online Signals

Status

Windows

10. Open the "Status" tab

11. Make sure GC is ready

### Instrument Status

Dashboard Agilent 8890

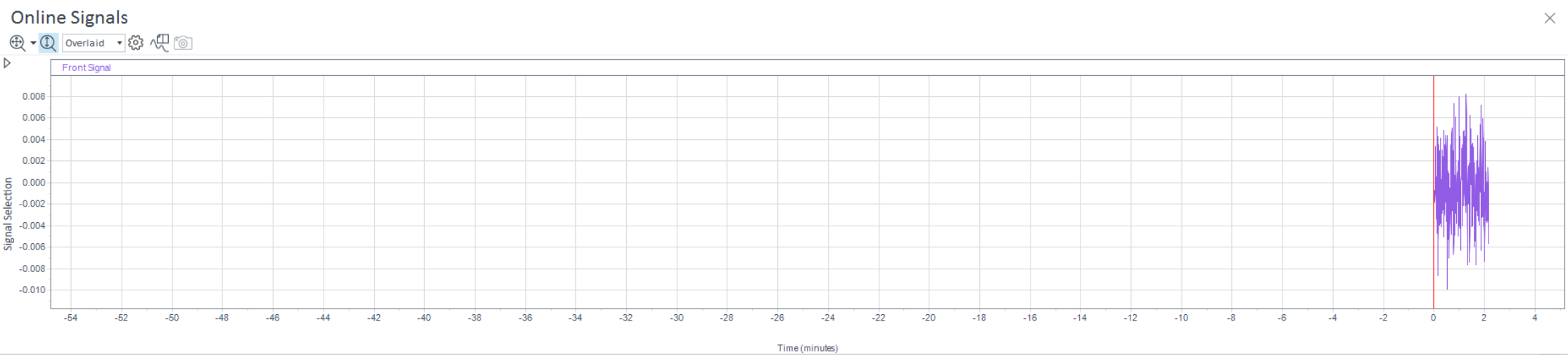
Agilent 8890 at IP Address: 192.168.254.11  
Serial Number: US2323A017  
Firmware Revision: 2.7.0.207  
Product Version: 3.7.189  
Driver Version: DSA GC 7.7 [189]

PC Clock: 2/6/2024 12:38:50 PM  
GC Clock: 2/6/2024 3:38 PM  
GC Connection State: Online

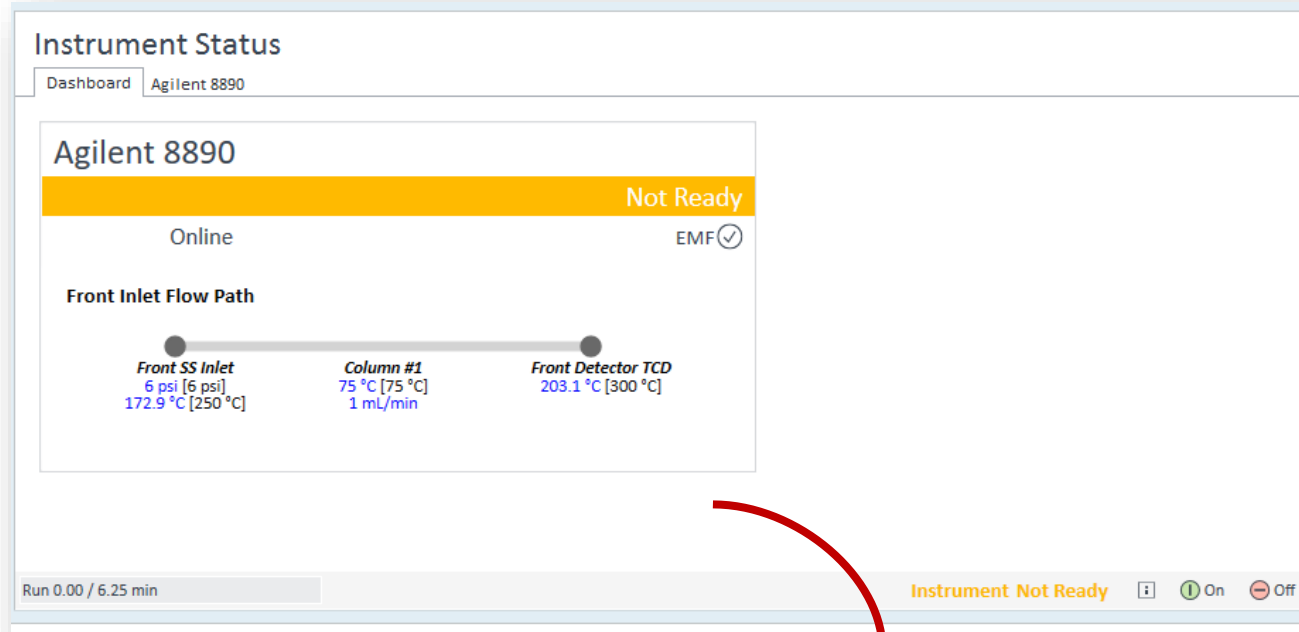
GC RunState: Idle  
GC Run Time: 6.25 min

GC Mode: Normal  
GC Ready State: Not Ready  
Front Detector: TCD State Not Ready  
Front Inlet: Gas Saver  
Oven: Temperature Not Ready  
Front Inlet: Temperature Not Ready  
Front Detector: Temperature Not Ready

Oven Temperature: 75.0 °C



Agilent GC - Not Ready



12. It might take 5-10 min for the instrument to reach to the selected temp and pressure

13. After it turned to “Ready” run a “Prep run”



Prep run

Agilent GC - Acquisition

File Home GC Plugins Control

Take Release Ad Hoc Mode Instrument

Method Single Sample Sequence

Copy Delete Reset

Activity Log Instrument Status Run Queue

Online Signals Status Acquisition Method

Layouts Windows

### Single Sample Analysis

Run Information

Sample name: trial

Acq. method: C:\CDSProjects\Default\Methods\Ramp Test.amx

Proc. method:

Inj. report printer: [Printer specified in processing method]

Result path: C:\CDSProjects\Default\Results

Result name: method devs <S>

Autosampler

Injection source: External

Injection volume: 0

Vial:

Priority Sample **Run**

### Run Queue

State	Type	Submission Time	Result Name	User	Acquisition Meth	Details
-------	------	-----------------	-------------	------	------------------	---------

Active History

Shutdown Method

Path: C:\CDSProjects\Default\Results

### Online Signals

Front Signal

Signal Selection

Time (minutes)

Current user: SYSTEM (SYSTEM), Active project: Default

14. Open the "Single Sample" tab

15. Setup all the run information (name, method, save path, ...)

16. Inject your sample

17. Hit the "Run" button

Default - Data Analysis

File Home Processing Audit/E-Sign

Open Data Close Data Open Method Save Method Close Method Reprocess All Save All Results Print All View PDF Results Chromatograms Compounds Copy Delete Reset Acquisition Setpoints Injection List Peak Details Calibration Curve Injection Results Sample Information Chromatograms Processing Method Peak Explorer

Data Processing

by Sequence

MeOH test

MeOH test - MeOH test.dx

Apply any change to the chromatogram

Sample information

Chromatograms

MeOH test | TCD1A | MeOH test.dx

Response [25 µV] x10<sup>2</sup>

Retention time [min]

18. Now you can see your chromatogram

Sample Information

Sequence

Name	MeOH test
Description	
Creation date (yyyy-MM-dd)	2023-11-03 07:32:30-07:00
Created by	SYSTEM (SYSTEM)
Modification date (yyyy-MM-dd)	2023-11-03 07:38:55-07:00
Modified by	SYSTEM (SYSTEM)

Sample

Name	MeOH test
Description	
Type	Sample
Level	
Sample amount	0
Multiplier	1; 1; 1; 1; 1
Dil. factor	1; 1; 1; 1; 1
Order No	1
Injector position	

Injection Results

Peaks Summary

No peak detected

Data Selection

Data Processing

Reporting

Current user: SYSTEM (SYSTEM) Connected