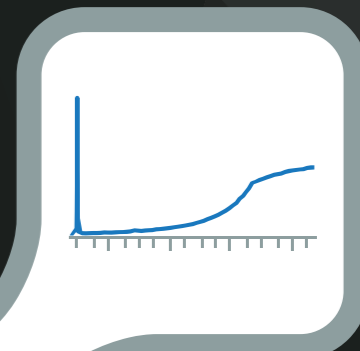
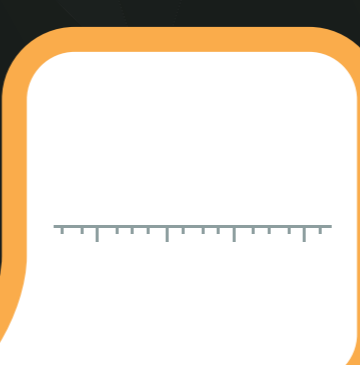
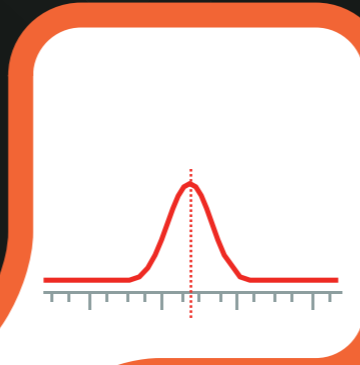


# GC Troubleshooting Tips



## Broad Peaks

Causes	Solutions
High dead volume	<ul style="list-style-type: none"> <li>Minimise dead volume in the GC system; verify proper column installation, proper connectors, proper liners, etc.</li> </ul>
Low flow rates	<ul style="list-style-type: none"> <li>Verify inlet and detector flow rates and adjust if needed.</li> <li>Verify make-up gas flow and adjust if needed.</li> </ul>
Slow GC oven program	<ul style="list-style-type: none"> <li>Increase GC oven programming rate.</li> </ul>
Poor analyte/solvent focusing	<ul style="list-style-type: none"> <li>Lower GC oven start temperature.</li> </ul>
Column film is too thick	<ul style="list-style-type: none"> <li>Reduce retention of compounds by decreasing film thickness and length.</li> </ul>
Sample carryover	<ul style="list-style-type: none"> <li>See Carryover/Ghost Peaks solutions.</li> </ul>

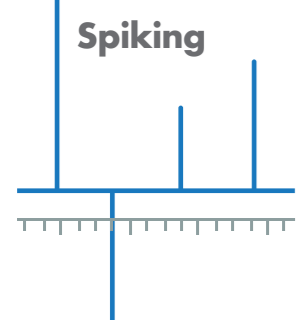
## No Peaks

Causes	Solutions
Injection problems	<ul style="list-style-type: none"> <li>Blocked syringe; clean or replace syringe.</li> <li>Verify there is sample in the syringe.</li> <li>Injecting into wrong inlet; reset autosampler.</li> <li>Verify carrier gas is flowing.</li> </ul>
Broken column	<ul style="list-style-type: none"> <li>Replace column.</li> </ul>
Column installed into wrong inlet or detector	<ul style="list-style-type: none"> <li>Reinstall column.</li> </ul>
Detector problems	<ul style="list-style-type: none"> <li>Signal not recorded; check detector cables and verify that detector is turned on.</li> <li>Detector gas turned off or wrong flow rates used; turn detector on and/or adjust flow rates.</li> </ul>

## High Baseline (Column Bleed)

Causes	Solutions
Improper column conditioning	<ul style="list-style-type: none"> <li>Increase conditioning time and/or temperature.</li> </ul>
Contamination	<ul style="list-style-type: none"> <li>Trim column and/or heat to maximum temperature to remove contaminants.</li> <li>Replace carrier gas and/or detector gas filters.</li> <li>Clean injector and detector.</li> </ul>
Leak in system causing oxidation of stationary phase	<ul style="list-style-type: none"> <li>Check for oxygen leaks across the entire system and replace seals and/or filters.</li> <li>Replace column.</li> </ul>

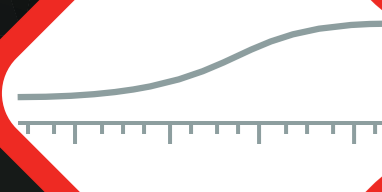
## Spiking



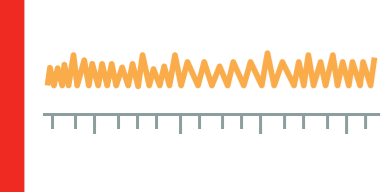
## Unstable Baseline (Spiking, Noise, Drift)

Causes	Solutions
Carrier gas leak or contamination	<ul style="list-style-type: none"> <li>Leak check connections and replace seals if needed.</li> <li>Replace carrier gas and/or detector gas filters.</li> </ul>
Inlet or detector contamination	<ul style="list-style-type: none"> <li>Clean system and perform regular maintenance.</li> </ul>
Column contamination or stationary phase bleed	<ul style="list-style-type: none"> <li>Condition, trim, and rinse column.</li> </ul>
Septum coring/bleed	<ul style="list-style-type: none"> <li>Replace septum.</li> <li>Inspect inlet liner for septa particles and replace liner if needed.</li> </ul>
Leak or poor quality gases	<ul style="list-style-type: none"> <li>Check GC and gas lines for leaks and confirm gas supply purity is adequate. If necessary, install gas filters.</li> </ul>
Variable carrier gas or detector gas flows	<ul style="list-style-type: none"> <li>Leak check system and check AFC/APC functionality.</li> </ul>
Detector not ready	<ul style="list-style-type: none"> <li>Allow enough time for detector temperatures and flows to equilibrate.</li> </ul>

## Drift



## Noise



## Changes in Response

Causes	Solutions
Sample issues	<ul style="list-style-type: none"> <li>Check sample concentration.</li> <li>Check sample preparation procedure.</li> <li>Check sample decomposition/shelf life.</li> </ul>
Syringe problems	<ul style="list-style-type: none"> <li>Replace syringe.</li> <li>Check autosampler operation.</li> </ul>
Electronics	<ul style="list-style-type: none"> <li>Verify signal settings and adjust if needed.</li> </ul>
Dirty or damaged detector	<ul style="list-style-type: none"> <li>Perform detector maintenance or replace parts.</li> </ul>
Flow/temperature settings wrong or variable	<ul style="list-style-type: none"> <li>Verify steady flow rates and temperatures, then adjust settings and/or replace parts if needed.</li> </ul>
Adsorption/reactivity	<ul style="list-style-type: none"> <li>Remove contamination and use properly deactivated liner and column.</li> </ul>
Leaks	<ul style="list-style-type: none"> <li>Check for leaks at all connections and repair connections as needed.</li> </ul>
Change in sample introduction/injection method	<ul style="list-style-type: none"> <li>Verify injection technique and change back to original technique.</li> <li>Check that split ratio is correct.</li> <li>Verify that the splitless hold time is correct.</li> </ul>

## Basic Steps

Follow these three steps to isolate where the problems is.

Check the obvious explanations first and change only one thing at a time!



## Check the Basics:

- Power supply
- Electrical connections
- Signal connections
- Syringe condition
- Sample preparation
- Analytical conditions
- Temperature settings
- Gas purity
- Gas flows

## Identify the Cause:

- Define the problem clearly; for example, "Over the last four days, only the phenols in my sample have been tailing."
- Review sample and maintenance records to identify trends in the data or problem indicators, such as area counts decreasing over time or inlet maintenance not being performed as scheduled.
- Use a logical sequence of steps to isolate possible causes.

## Document Everything:

- Document all troubleshooting steps and results; this may help you identify and solve the next problem faster.
- Always inject a test mix and compare to previous data to ensure restored performance.

## Still having problems?

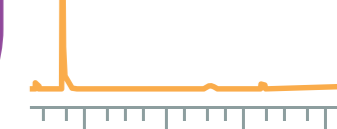
Still struggling? Let us know!!!

[gc@shimadzu.co.uk](mailto:gc@shimadzu.co.uk)

## Tailing Peaks

Causes	Solutions
Adsorption due to surface activity or contamination	<ul style="list-style-type: none"> <li>Use properly cleaned and deactivated liner and column.</li> <li>Trim inlet end of column.</li> <li>Replace column if damaged.</li> </ul>
Adsorption due to chemical composition of compound	<ul style="list-style-type: none"> <li>Derivatise compound.</li> </ul>
Leak in system	<ul style="list-style-type: none"> <li>Check for leaks at all connections, replace critical seals if needed.</li> </ul>
Column installation issues	<ul style="list-style-type: none"> <li>Minimise dead volume.</li> <li>Verify that the column is cut properly (square).</li> <li>Verify correct installation depth.</li> </ul>

## Injection 1



## Carryover/Ghost Peaks

Causes	Solutions
Contaminated syringe or rinse solvent	<ul style="list-style-type: none"> <li>Replace rinse solvent.</li> <li>Rinse or replace syringe.</li> </ul>
Backflash (sample volume exceeds liner volume)	<ul style="list-style-type: none"> <li>Inject a smaller amount.</li> <li>Use a liner with a large internal diameter.</li> <li>Increase head pressure (i.e., flowrate) to contain the vapour cloud.</li> <li>Use slower injection rate.</li> <li>Lower inlet temperature.</li> <li>Use liner with packing.</li> <li>Use pressure-pulse injection.</li> <li>Use online calculator to check expansion volume.</li> </ul>
Last analysis ended too soon	<ul style="list-style-type: none"> <li>Extend analysis time to allow all components and/or matrix interferences to elute.</li> </ul>

## Injection 2



## Fronting Peaks

Causes	Solutions
Incompatible stationary phase	<ul style="list-style-type: none"> <li>Choose appropriate stationary phase.</li> </ul>
Column overloading	<ul style="list-style-type: none"> <li>Reduce amount injected, dilute sample or increase split ratio.</li> <li>Increase column inner diameter and/or film thickness.</li> </ul>

## Poor Peak Resolution

Causes	Solutions
Non-selective stationary phase	<ul style="list-style-type: none"> <li>Choose an appropriate stationary phase and column dimensions.</li> </ul>
Poor efficiency	<ul style="list-style-type: none"> <li>Optimise carrier gas linear velocity and GC oven temperature program.</li> </ul>
Sample overload	<ul style="list-style-type: none"> <li>Adjust sample concentration or amount on column by increasing split ratio.</li> </ul>
Incorrect analytical conditions used	<ul style="list-style-type: none"> <li>Verify temperature program, flow rates, and column parameters.</li> </ul>

## Split Peaks

Causes	Solutions
Mismatched solvent/stationary phase polarity	<ul style="list-style-type: none"> <li>Adjust solvent or stationary phase to allow wetting.</li> </ul>
Incomplete vaporisation	<ul style="list-style-type: none"> <li>Add surface area, such as wool, to the inlet liner to enhance vaporisation.</li> <li>Use proper inlet temperature.</li> </ul>
Sample loading capacity exceeded	<ul style="list-style-type: none"> <li>Inject less sample (dilute, use split injection, reduce injection volume).</li> </ul>
Fast autosampler injection into open liner	<ul style="list-style-type: none"> <li>Use wool or slow injection speed.</li> </ul>

## Retention Time Variability

Causes	Solutions
Leaks	<ul style="list-style-type: none"> <li>Leak check inlet and any column connections.</li> <li>Replace septa, O-rings, etc.</li> </ul>
Analyte adsorption	<ul style="list-style-type: none"> <li>Maintain inlet liner and GC column.</li> <li>Use properly deactivated liners and columns.</li> </ul>
Resolution/integration issues	<ul style="list-style-type: none"> <li>Avoid sample overload by diluting sample or increasing split ratio.</li> </ul>
Incorrect column/oven temperature program	<ul style="list-style-type: none"> <li>Verify column temperature and oven temperature program.</li> </ul>
Incorrect or variable carrier gas linear velocity	<ul style="list-style-type: none"> <li>Verify the carrier gas linear velocity.</li> <li>Repair or replace parts if necessary.</li> </ul>
Poor control of oven temperature programming	<ul style="list-style-type: none"> <li>Confirm GC oven program falls within instrument specifications.</li> </ul>
Incorrect oven equilibration time	<ul style="list-style-type: none"> <li>Extend GC oven equilibration time.</li> </ul>
If manual injection, inconsistencies between pushing start and injection procedure.	<ul style="list-style-type: none"> <li>Use autosampler or standardise manual injection procedure.</li> </ul>