

## ACQUITY UPLC Systems with 2D Technology

Enhanced UPLC Technology – now with 2D capability

### THE SEPARATION POWER ONLY TWO DIMENSIONS CAN BRING YOU

For research and development chromatographers, the ACQUITY UPLC® System with 2D Technology adds a new magnitude of orthogonal separations, providing the superior sensitivity and selectivity required for complex sample analysis.

Now, with a holistically designed 2D system installed and certified by Waters technicians, your laboratory can achieve the benefits of 2D analysis easily and efficiently.

ACQUITY UPLC Systems with 2D Technology:

- Provide ready-to-use configurations allowing for faster 2D UPLC® analysis, with less troubleshooting, and more confidence
- Offer a full range of sub-2- $\mu\text{m}$  ACQUITY UPLC column chemistries for true UPLC results
- Enhance the ability to eliminate unwanted interferences
- Increase peak capacity and resolution for characterizing the most complex samples
- Provide flexibility in utilization of mobile phases for mass spectrometry detection
- Minimize sensitivity drift in mass spectrometers by reducing source contamination
- Improve assay ruggedness and overall speed of analysis

### WITH 2D YOU GET A RANGE OF FUNCTIONALITY FOR YOUR LAB

- **Trapping**  
Increases sensitivity by loading more sample
- **Heart cutting**  
Increases resolution by incorporating orthogonal chemistries
- **At-Column Dilution**  
Enables large volume injections of sample in strong solvent
- **Parallel column regeneration**  
Increases throughput

*ACQUITY UPLC I-Class System  
with 2D Technology.*



## PURPOSEFULLY DESIGNED FOR 2D

The ACQUITY UPLC Column Manager is specifically designed for 2D applications. Two columns with different chemistries can be housed with independent temperature control for each column, providing versatility for orthogonal separations.

- Standardized with easy-to-access, low-volume, active solvent pre-heaters, resulting in the same efficiency run-to-run and system-to-system
- Two easy-to-access, six-port, two-position high pressure valves enable a wide range of applications
- Two independent heating/cooling zones with an extended temperature range of 4 to 90 °C for optimal performance
- Supports two 150-mm or four 50-mm length columns



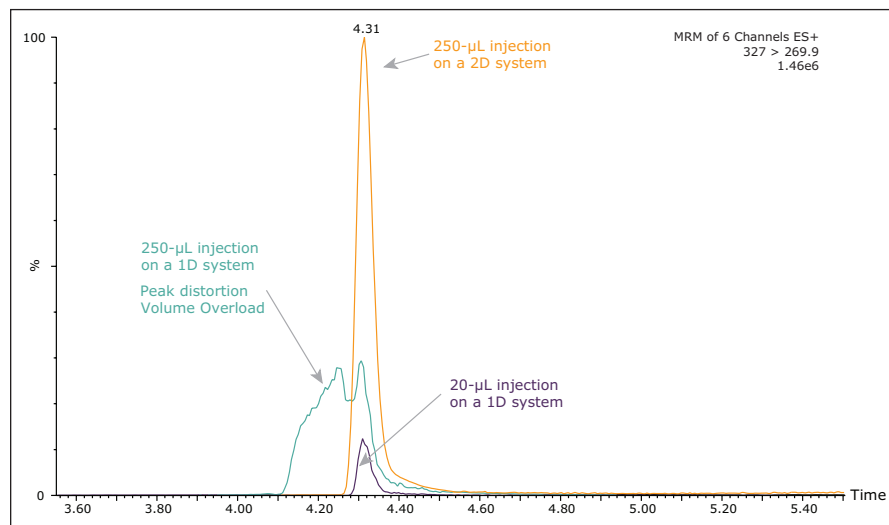
ACQUITY UPLC Column Manager for 2D applications.

## FUNCTIONALITY TO SUIT YOUR LABORATORY'S NEEDS

### Trapping

Trapping can be utilized to increase sensitivity or eliminate interference from a sample.

- To increase sensitivity, more sample is loaded onto the trapping column.
- To trap impurities, the trapping column can trap interferences allowing the analyte of interest to flow through.



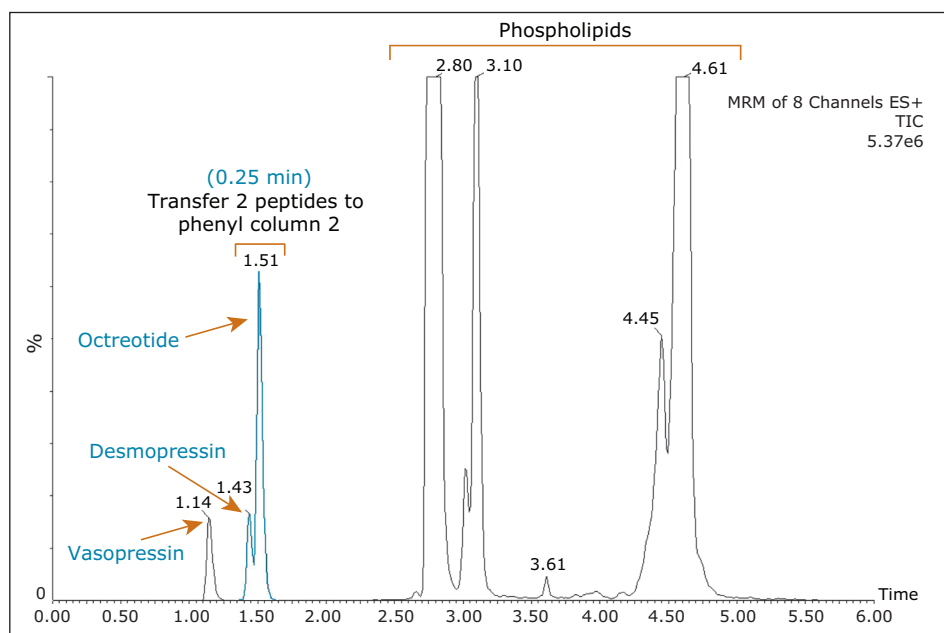
**Comparison of clozapine separation on 1D and 2D systems.** 20 µL of clozapine was injected onto a 1D system. To increase sensitivity, 250 µL of clozapine was injected onto a 1D system and peak distortion was observed. Next, 250 µL of clozapine was injected onto an ACQUITY UPLC System with 2D Technology where the analyte of interest was trapped onto a trapping column, then eluted using a rapid gradient onto an analytical column. The results showed increased sensitivity and peak shape maintenance. Ion chromatograms of clozapine were extracted at a concentration of 1 ppb (327.0 > 269.9) using an ACQUITY® TQD.

### Parallel column regeneration

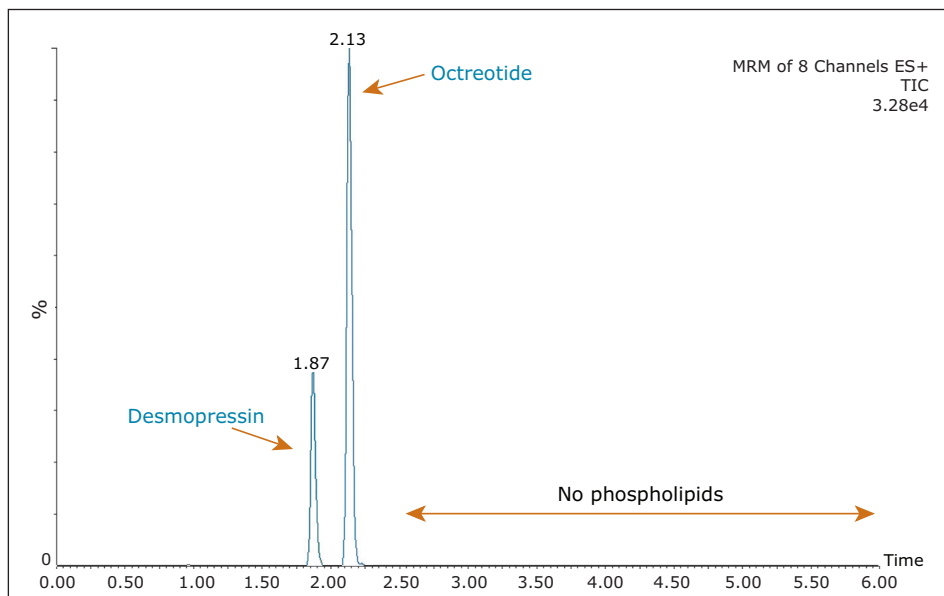
This configuration reduces run times by performing parallel tasks, resulting in increased throughput. As one column performs an analytical separation, the second column is regenerated and re-equilibrated to prepare for the next injection.

### Heart cutting

Heart cutting increases resolution by using orthogonal chemistries. This option is generally used to determine if additional chemical entities are co-eluting with a target analyte during a single dimension separation. Analytes of interest eluting off a column are diverted and loaded onto a second column for a second analytical separation. This is a powerful technique that increases separation power by using orthogonal chemistries.



**\*1D separation of a peptide mixture.** 1D separation of a peptide mixture with the ACQUITY UPLC System and the Xevo® TQ MS using an ACQUITY UPLC BEH C<sub>8</sub>, 1.7 μm Column. Analytes of interest co-elute at 1.43 and 1.51 minutes followed by phospholipid interferences.



**\*2D heart cut separation of analytes of interest in peptide mixture.** Analytes of interest that co-eluted from the first dimension are diverted in a 0.25-minute window and loaded onto an ACQUITY UPLC BEH Phenyl, 1.7 μm Column for a second separation, increasing resolution and preventing phospholipid interferences from reaching the source of the Xevo TQ MS using an ACQUITY UPLC System with 2D Technology.

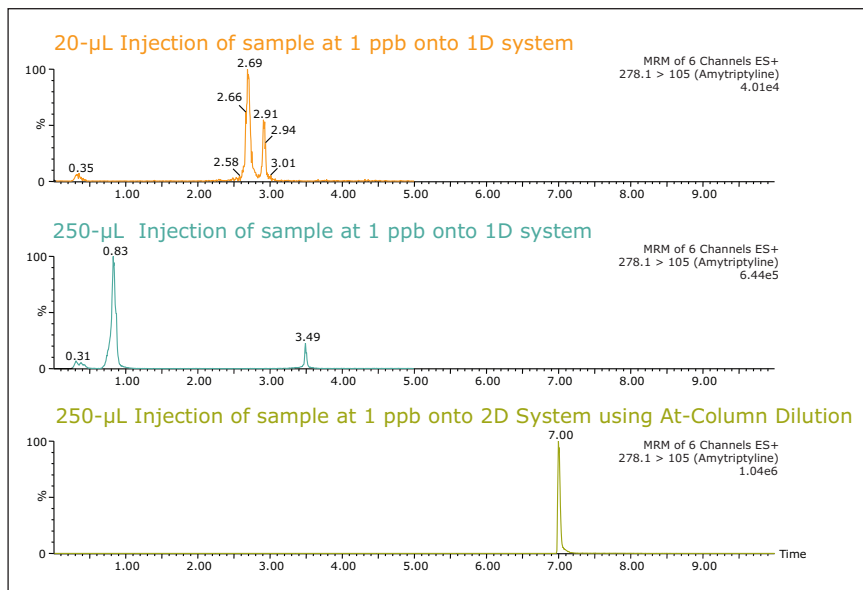
“The ability to perform two-dimensional UPLC separations with Waters technologies has provided my bioanalytical laboratory with a robust tool with powerful benefits for high-sensitive assays, from assay ruggedness to instrument uptime.”

**RAND JENKINS,**  
Scientific Director  
for Chromatographic  
Sciences, PPD

\*Data courtesy of PPD, Inc.

### At-Column Dilution

ACQUITY UPLC Systems with 2D Technology can be configured with Waters patented At-Column Dilution technique to allow direct injection of large volume sample extracts in strong solvent while maintaining peak shape. This will eliminate extraneous dry-down steps, reduce the possibility of sample loss, and improve sensitivity, accuracy, and precision by injecting more analyte.



*Comparison of organic eluent samples on 1D and 2D systems. Injections of 20 µL and 250 µL of sample in 100% organic eluent were made on a 1D system resulting in poor peak shape. Next, an injection of 250 µL of the same sample in 100% organic eluent was made onto an ACQUITY UPLC System with 2D Technology using At-Column Dilution where peak shape was maintained. MRM chromatograms demonstrating effective focusing of analyte at a concentration of 1 ppb in 100% ACN injected onto an XBridge™ C<sub>18</sub> Direct Connect HP Column, 2.1 x 30 mm, 10 µm and separated with ACQUITY UPLC BEH C<sub>18</sub> Column, 2.1 x 50 mm, 1.7 µm using the ACQUITY UPLC with 2D Technology and the ACQUITY TQD.*

### ACQUITY UPLC SYSTEM OPTIONS for 2D

- ACQUITY UPLC I-Class
- ACQUITY UPLC
- ACQUITY UPLC H-Class
- ACQUITY UPLC H-Class Bio

# Waters

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