

Quality Control Reference Material Products

The Neutrals Quality Control Reference Material (QCRM), the Reversed-Phase QCRM, LCMS QCRM, and HILIC QCRM are part of the Reference Material Portfolio. They are qualitative tools that allow the user to better evaluate and benchmark their HPLC, UPLC®, or LC/MS system before analysis of critical material. These particular standards are specially formulated depending on the customer need and instrumentation being utilized. The compounds were vigorously evaluated and chosen because they provide the following advantages:

- Assess system readiness on a regular basis
- Characterize the benchmark performance easily and reproducibly
- Range from simple mixtures to more complex
- Acceptable for use on a variety of columns and systems under different conditions

It is highly recommended that every customer who is running an HPLC, UPLC, or LC/MS system regardless of the type of lab, use one of these standards as an initial benchmark/performance test as well as on a regular basis to continually monitor the health of their system to add confidence in real sample results.



NEUTRALS QCRM

The Neutrals QCRM is extremely versatile and appropriate for a vast variety of column chemistries and dimensions, and system hardware. It is adaptable to a wide variety of separation methods. The injected quantity should be scaled for other column diameters. To properly transfer the separation across column dimensions, the [ACQUITY UPLC Columns Calculator](#) may be used. The L/dp (length to particle size ratio) for both columns should be kept comparable to maintain resolution.

The table below shows the three compounds that make up the Neutrals QCRM. The first is a void volume marker, and the other two are later eluting neutral compounds.

Compound
Acetone (V_0)
Naphthalene
Acenaphthene

Table 1: Neutrals QCRM.

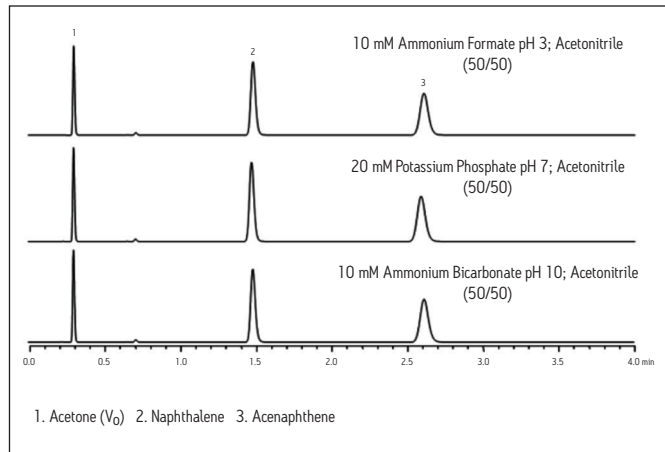


Figure 1. Example of the chromatography obtained for the Neutrals QCRM mixture via UV using a BEH C_{18} 1.7 μ m, 2.1 x 50 mm.

REVERSED-PHASE QCRM

The Reversed-Phase QCRM contains 7 compounds including uracil, butyl paraben, naphthalene, propranolol, dipropylphthalate, acenaphthene, and amitriptyline at pH 7.

The compounds in the Reversed-Phase QCRM are listed in Table 2. These compounds were chosen for their varying chemical properties and retention on reversed-phase stationary phases. Under the appropriate method conditions, the compounds can be resolved. The Reversed-Phase QCRM is significantly more complex than the Neutrals QCRM in that it contains compounds which could be challenging to separate. It is designed to provide this complexity and is appropriate when complex assays are routinely performed. It can be used with a variety of column chemistries and dimensions, and system hardware. On different column chemistries or dimensions, methods may need to be modified or re-developed to obtain sufficient resolution.

Compound	Type
Amitriptyline	Base
Acenaphthene	Neutral
Naphthalene	Neutral
Dipropyl phthalate	Polar neutral
Butyl paraben	Weak acid
Propranolol	Base
Uracil	Void marker

Table 2. The seven compounds contained in the Reversed-Phase QCRM.

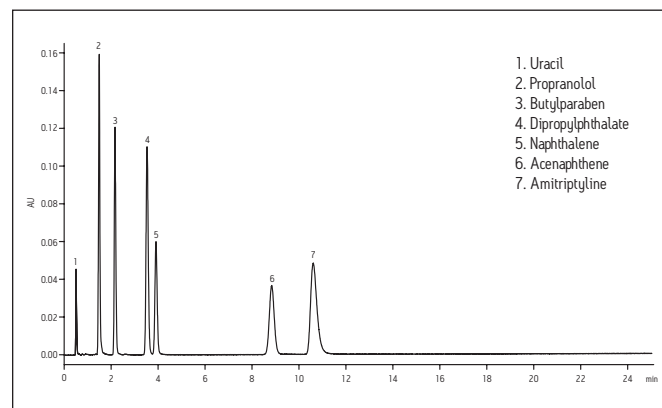


Figure 2. A sample chromatogram of the Reversed-Phase QCRM on an ACQUITY UPLC HSS C_{18} 2.1 x 50 mm, 1.7 μ m column, held at 30 °C. The separation is isocratic using 65:35 Methanol: 20 mM phosphate buffered mobile phase at pH 7. The injection volume is 1.5 μ L. The method uses a flow rate of 0.25 mL/min and a UV detection wavelength of 254 nm.

LCMS QCRM

The LCMS QCRM is a 9 component mix used to provide a comprehensive reference standard for use with LC/MS or MS instrumentation with a wide variety of conditions and methods.

- The compounds in this mix give a mixture of responses in ESI (+-) and APCi+.
- Covers a wide range of m/z.
- Optimized concentration to provide a more equal response by component in ESI+ mode.
- Provides a separation in a range of chromatographic conditions used to benchmark instrument performance.

Component	Empirical Formula	Exact Mass (as [M+H] ⁺)	Exact Mass (as [M+H] ⁻)	Concentration for analysis (µg/mL)
Acetaminophen	C ₈ H ₉ NO ₂	152.0712	150.0555	10
Caffeine	C ₈ H ₁₀ N ₄ O ₂	195.0882		1.5
Sulfaguanidine	C ₇ H ₁₀ N ₄ O ₂ S	215.0603	213.0446	5
Sulfadimethoxine	C ₁₂ H ₁₄ N ₄ O ₄ S	311.0814	309.0658	1
Val-Tyr-Val	C ₁₉ H ₂₉ N ₃ O ₅	380.2185	378.2029	2.5
Verapamil	C ₂₇ H ₃₈ N ₂ O ₄	455.2910		0.2
Terfenadine	C ₃₂ H ₄₁ NO ₂	472.3216		0.2
Leucine-Enkephalin	C ₂₈ H ₃₇ N ₅ O ₇	556.2771	554.2615	2.5
Reserpine	C ₃₃ H ₄₀ N ₂ O ₉	609.2812		0.6

Table 3. Individual Components in the LCMS QCRM Mix

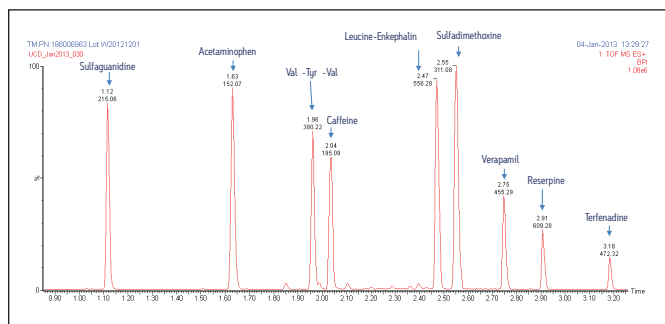


Figure 3: TOF MS ES+ Spectrum of the LCMS QCRM Standard using methanol mobile phase with a SYNAPT® G2-S MS operated in positive ion mode in high resolution mode.

HILIC QCRM

The HILIC QCRM was designed as a standard to help benchmark this type of separation. It is a 4 component mix containing an un-retained void marker, a polar neutral compound and two polar basic compounds that provides a stable chromatographic separation for HILIC columns and was specifically designed as a batch test standard for ACQUITY UPLC® BEH HILIC columns.

Compound Name	Property	Concentration in Vial (mg/mL)
Acenaphthene	VO marker	0.0190
Thymine	Polar neutral	0.0037
Adenine	Polar basic	0.0037
Cytosine	Polar basic	0.0077

Table 4. HILIC QCRM Components

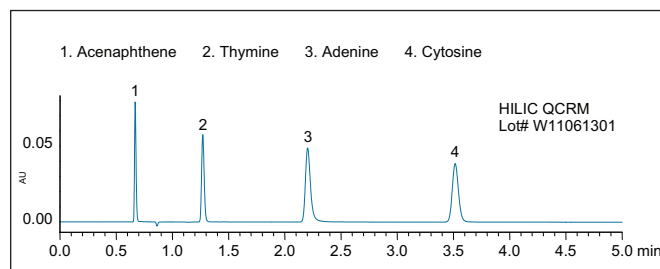


Figure 4. Chromatographic Resolution using the HILIC QCRM.

WATERS QUALITY COMMITMENT

Waters understands that the quality of the standards and reagents you use directly correlates to the quality of your results and final products. That is why we have made analytical standards and reagents our business. Our seal symbolizes Waters commitment to you.



Precise Formulation

In the field of analytical measurement, the ability to repeatedly prepare reference materials identically over long periods of time is critical for data comparability and defensibility.

Absolute Traceability

In order to be true, the properties of the measurement must be directly linked to a source reference material through an unambiguous, unbroken and fully documented chain of comparisons.

Waters recommends that customers benchmark their chromatographic system with a QCRM prior to system usage when it is in good working order. Run and compare the QCRM results to previous benchmarks before running any critical assay, and after any hardware, column or mobile phase changes.

ORDERING INFORMATION

Description	Part No.
Neutrals QC Reference Material	186006360
Reversed-Phase QC Reference Material	186006363
LCMS QC Reference Material	186006963
HILIC QC Reference Material	186007226
Preparative Chromatography Standard	186006703

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