## Waters<sup>™</sup>

Application Note

# Bioanalytical Method Development with UNIFI: Gradient and Temperature Optimization

Robert S. Plumb, Stuart Chadwick, Jennifer Simeone, Paul D. Rainville

Waters Corporation

### Abstract

The Waters UNIFI Scientific Information System employs a workflow approach with acquisition templates and promotable parameters to enable the rapid simple screening and optimization of gradient and column temperature conditions. Further optimization of the chromatographic parameters can significantly improve assay robustness and analytical throughput.

#### **Benefits**

Maximize bioanalytical assay productivity and throughput using promoted parameters and template acquisition with the Waters UNIFI Scientific Information System.

## Introduction

Developing and optimizing the chromatographic conditions for a bioanalytical method is a multi-step process that includes screening column chemistries, mobile phase organic modifier, mobile phase pH, and column

temperature. This entails not only the evaluation of the basic chromatographic performance of the system (retention time, peak shape, tailing factor, etc.), but also resolution of the target analyte from endogenous components in the matrix.

After the mobile phase solvents and column chemistry have been selected, the gradient steepness, starting concentration and final composition can be optimized to maximize analyte resolution and minimize the analytical run time to improve sample throughput.

Screening the various gradient conditions to select the best conditions requires multiple experimental runs and careful review and comparison of the elution characteristic of the target analyte(s) from the endogenous components in the sample. Previously we have described the use of functionality of promoted parameters and templated data acquisition within the UNIFI Scientific Information System to streamline the acquisition of LC-MS data and thus simplify the method development process.



Figure 1. UNIFI Scientific Information System.

### Experimental

#### **UPLC** Conditions

LC system:	Waters ACQUITY UPLC
LC column:	ACQUITY UPLC BEH C <sub>18</sub> 1.7-µm, 2.1 x 50 mm

#### **MS** Conditions

MS system:

Waters Xevo TQ-S

The separations were performed using a mobile phase of 0.1% (v/v) formic acid and acetonitrile as the organic modifier

The gradient steepness and column temperature were was adjusted as a variable during the analytical acquisition process.

The mass spectrometer was operated in electrospray positive ion mode with MRM data collection, RADAR full scan data collection and precursors of m/z = 184 to monitor the phospholipid elution profile.

Biological samples were prepared by spiking the target analyte into control human plasma. The spiked sample was then precipitated using a 2:1 ratio of acetonitrile to plasma. The resulting sample was centrifuged at 13,000 RPM and the supernatant removed for analysis by LC-MS.

## **Results and Discussion**

The acquisition of data within the Waters UNIFI Scientific Information System is workflow-driven, allowing scientific managers to develop and administer templates for their scientist to employ for multiple tasks, including routine batch analysis, matrix effects calculation, gradient screening and gradient optimization. This use of a workflow-driven approach ensures consistency and allows the less experienced scientist a structured route to analytical method development and optimization.

Within the UNIFI Scientific Information System, the user is presented with a series of workflows to select from, Figure 2.



Figure 2. Selecting workflows.

After selection of the analysis method and sample list to be used, the user then saves the analysis to the appropriate folder. The scientist can then select the different gradient steepness and shapes to be evaluated via a drop-down menu, as shown in Figure 3. This prevents the propagation of numerous methods, by different scientists and ensures consistent operation.

ire Review Investigate Rep	ort									
Home									👔 Edit 👻 🌼 Tool	ls 💌 🛃 F
les	41									1.000
	Sample list controls	State of the local division in the local div	and the second second	and the second second			-			10 <b>1</b> %
Sample tray: 1 🦓 🗄	Stad	Pauco	Stop		Sample list run	status:				
	Start	Fause	Stop		Ready t	o start run		-		
		Modify Promoted Parameter	U		Cost for	CALIFORNIA COLUMN	×			
		Make desired modifications	to this method paramet	ter.						
0000000	Sample list -									
	Add Delete	Display Name Gradient								_
0000000	Item name							able Ford time Acquis	sition status	
	1 Test Injection	Gradient settings	Pressure limits fr	om: 0 p	si to: 18	000 psi 🖒	6 <b>6</b> A	5.00		
	2 MP Screen1	Add Delete						nt 5.00		
	3 MP Screen2	Time (min) Flow rat	e (mL/min) Composit	ion A (%) Composition	B (%) Curve			nt 5.00		
	4 MP Screen3	1 0.00	0.600	95.0	5.0 Initial		and the second	int 5.00		
	5 MP Screen4	2 3.00	0.600	5.0	95.0 6			nt 5.00		
	6 MP Screen5	3 3.50	0.600	5.0	95.0 6			mt 5.00		
	7 MP Screen6	4 3.51	0.600	95.0	5.0 6			nt 5.00		
	8 MP Screen7							nt 5.00		
	9 MP Screen8					OK	Cancel	nt 5.00		
	10 MP Screen9							ent 5.00		
	11 MP Screen10	Unknown pH High, I	MeOH 1:A,3	3.50	1	0.00 1	Grad	lient 5.00		
	12 MP Screen11	Unknown pH High, 1	MeOH 1:A.3	3.50	1	0.00 1	Grad	lient 5.00		
	13 MP Screen12	Unknown pH High, I	MeOH 1:A.3	3.50	1	0.00 1	Grad	lient 5.00		
	*							]		
dwick. Stuart (Chemist)					Grad	lient Screen 1 (Reg I	Bio 1 TQ Sy 🚈 Plavix .	Analysis (Reg Bio 1 TQ Syste		9

Figure 3. Selecting gradient steepness and shapes.

Once the various gradient slopes to be evaluated have been selected the acquisition can be started and the data acquired. Following data acquisition the data can be reviewed to select not only the system that will allow the greatest throughput, but also that which will deliver the greatest robustness.

In this case four different gradient slopes were evaluated: A 5-95%; B 5-50%; C 25-75%; and D 50-75%. The evaluation of the resolution and effectiveness of the different gradient shapes was performed by comparing the retention time of the target analytes with that of the endogenous components in the sample. The endogenous components were monitored by the simultaneous acquisition of full scan MS data and precursors of m/z = 184 to track the elution profile of the phospholipids. The data displayed in Figure 4 shows the elution profile of the target compound and the endogenous components in the sample



Figure 4. Elution profile.

We can see from this data that composition A gave clear resolution of the analytes from the endogenous components as did gradients B and C, with gradient C delivering the shortest analysis time of the three. Gradient D had the greatest throughput of the four, however the analyte peak eluted in the same region of the chromatogram as the endogenous components. Thus for this assay gradient C would be the best option, delivering the best compromise of throughput and resolution. By employing gradient C for the assay the compound elution time has been reduced from 2.01 minutes to 0.81 minutes allowing the LC condition to be modified to effectively double the throughput.

Chromatographic column temperature can be evaluated in a similar manner to that employed for gradient steepness and slope for method development. Using a similar template approach, the column temperature can be varied, Figure 5. In this case column temperatures of 40 °C, 50 °C, and 60 °C were evaluated. The results generated showed that, in this case, little benefit is gained in terms of peak shape or retention time when the column temperature is varied from 40 to 60 °C, Figure 6.

to be Description Cannot Mande Inchase			The states sumply not county name		in the second second	a set a shore of			Letter the second se	
kurringness saved work instrum	nent Systems Reports to Sig	n (0)								
Home										
	Work in Progress								(7 ×	tiol 12
	(a) Apphysis (4)									1000
reate	Playis Analysis	Browse	for sample list						Litera Bio 1 10 S	luctor
lysis lysis method	Cal Line, QCs an	Folder:	Company/Bioanalysis			6	1		Trad one start of	
	- Chadwick, Stuar	Ine	n name L A	Description					Nov 30, 2011 9,54341	AMI
lo	Plavix Optimize	1 M	ethDev01 Nov 28, 2011 3:55:12PM EST	Sample test					[ Reg Bio 1 TQ 5	syster
se	Chadwick, Stuar	2 M	ethDev01 Nov 28, 2011 4:21:25PM EST						Nov 30, 2011 9:21:23	MA
rt data from file system it UNIEL data	A Shut down	3 M	ethDev2	Reture					[ Reg Bio 1 TQ 5	Syste
r oniri una	Chadwick, Stuar	4 ps	avix Analysis	Cal Line, QCs and Unknow	ns using UNIFI Method	Development Workf			Nev 29, 2011 5:07:26	(PM
onby Viewed	人 😰 Plavix Column	Tee 5 Pk	avix Column Temperature Screen	Screening of column temp	eratures for Plavix meth	hod development			[ Reg Bio 1 TQ S	iyste
o 2 TO-S System	Screening of col Chadwick, Stuar	um 6 Ps	avix Gradient Screen and Optimisation	Uses a 'gradient table' pro	motable parameter to a	assess optimal gradie	nt.		Nov 29, 2011 4:40:21	IPM
Analysis		7 Pb	avix Optimized Analysis							
Optimized Analysis		8 Ph	avix Selectivity Screen 1	Selectivity screening for P	avix in protein crashed	plasma. BEH C18 colv				
Column Temperature Screen		<u>9</u> _sh	ut down	1						
own										
in Temperature Screen 1										
ivity Screen 1										
				1		1	81			
					OK	Cancel				
rs UNGT - Column Temperature Screen	a Analysis Center S Welcome to UNIT	Plante	Analysis: Analysis. 🔰 📝 Plance	Optimized Analysis	) Reg 80 2 TQ-5 Sy		Column Temperature 1	σ_ X	Search felders.	•••
UNTI - Column Temperature Screen Signal - Jac Review Investigate Report Home S	: Antopolis Center Welcome to UNICI Sample list controls	1 Park	Analysis: Analysis 👘 👔 Mariar	Optimized Analysi	) Reg Boo 2 TQ-5 Sy	- A	Column Temperature S	α_ X	Search feiders	0 0
UCTL Column Temperature Son Column Temperature Son Review Investigate Report Home S 40 mple toy 1	Chatyra Center Welcome to UNIT Sample list controls	Pine Pine	Andyns Andyns 🦳 💆 Manne	Optimized Analysi	) Neg becz tięłsky nole list nun status:	aan T	Column Temperature S	ø_ x 0	Search feiders	3
SUSTI Column Temperature Series Review Investigate Report Home S 4 mplo tray 1 2 2	Analysis Center Welcome to UNIT Sample list controls Start	Plause	Stop	Opsmized Anaya . Sa	) Reg 802 TQ-5 Sy nple list run status:		Column Temperature !	α. x	Search felders.	0 ) 0
UST Control Co	Analysis Center Mackows to Uhas Sample list controls Start	Pause	Mayas Mayas	Openniced Analysis	nple list run status: Ready to start sub	nam ni current sample i	Column Temperature 1	σ X	Search feiders	9
Review Investigate Report Home	Anthold Control Welcone to Unot Sample list controls	Pause		Opennized Analysi	Reg Boo2 TQ-559 nple list run status: Ready to start r Cick Start to sube	num mit current sample 1	Column Temperature S	α. ×	Sourch felders	9
NCT Colone Tenservice Series	Analysis Centre Musicune to UNo1 Sample list controls Start Control of the set	Pause	Stadyne Waayse.	openniced Akalya	nple list run status: Ready to start i Click Start to subr	nun nut current, sample J	Column Temperature S	α. ×	Snorch folders.	5
UCT. Colone Tenserative Series 2 Review Investigate Report Home 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Analysis Centre Analysis Centre Semple list controls Sample list • Sample list • Md. Palme	Pause	Anayos Avayos.	openneed Analys.	nple list run status: Ready to start to sube	nun nut current, sample J	Column Temperature 1	α. ×	Dearch folders.	3
UST Committee Co	Analysis Center Analysis Center Semple list controls Start Sample list • Add Delete	Pause		Openneed Analys	nple list run status: Ready to start I Click Start to subr	run ni cunert, sangle i	Column Temperature S Bl	α. × 9	Search fublics.	
UK3 Com True Solar Com Color Com True Solar Com Perior Investigate Report Home Color Com Com Color	AnalysisCentro Autocome do Union Sample list controls Sample list • Add Delete Delete Delete	Pause	Analyses Mulyan . Constant of	Openneed Analys -	nobe list run status: Ready to start / Cick Start is subr n volume (4) Repla	nan at a sample l	Column Temperature 3	a_ x	Search feiliers.	
UK1         Column Temperature Street           Review Investigate         Report           Home         4           Operators         0	Analysis Center Meccane to UNo1 Sample Sci controls Sample Sci controls Sample Sci • Add Delete Calumo Remo Science 1 Calumo Remo Science 1 Calumo Remo Science 1	Pause Pause Sample type Unknown	Analyse: Waryse: Stop Stop Oescription 40 2.43	openneed Analyse	neeg laoo 2 10 c Sky nple Tist run status: Ready to start i Click Start to subr n volume (u.S.   Repsi 2020	nun nun nit current, sample l corres Level	Column Temperature 5	a. ×	Dearch folders.	3
Unit of an intervention of an in	Analysis Centro Welcome for Data Sample list controls Sample list e Sample list • Add Delete Centrol Tents Centrol Centrol Tents Centrol	Pause Pause Winneen Unknown Unknown	Analysis Analysis . 2 Water Stop	reprovided Acadya	ngle list run status: Ready to start to sub- Ready to start to sub- n obume (L) Repti 2000 2000	nom	Column Temperature 1	C. X 2	Search feitilers.	
UCT Colom Traversion Series Review Investigate Report Home	AnalysisCentri Addicard &o UNOT   Sample list controls  Sample list  Add Delete  Column Temp Screes 1  Column Temp Screes  Co	Pause Pause Sample type Unknown Unknown	Analyse Mulyse. Constant Stop Construction Construction Sample position 40 SA1 40 SA2 40 SA3	Spermandel Advalges	Neg likes ng-stigs ngle list run status: Reddy to start i Cot Start to sole no others (L) Rept 10.00 10.00 10.00	num nit current sample I 2 1 1	Column Temperature 1 Column temperature Column temperature Column temperature Column temperature Column temperature	C X	Search folders.	
UCT_Column Treperature Street Period Investigate Report Home	Analysis Center Analysis Center Semple list controls Sample list controls Sample list - Add Delete Control Reng Sereng J Column Reng Sereng J	Pause Pause Without Unknoun Unknoun Unknoun	Stopyna:         Warysa:           Stopyna:         Stopyna:           Stopyna:         Stopyna:           Obecrypton         Sample position           40         3A3           40         1A3           50         1A4	Connected Analyse	negle list nun status: Reddy to start i Reddy	num a dente a	Column Temperature 1 Column temperature 40 °C 40 °C 40 °C 50 °C	c. ×	Dearch folders.	
Util Colored Torus View Sorre ( Review Investigate Report Home	Analysis Centro  Automate Na Dials  Sample list Contracts  Sample list Contracts  Sample list •  Add Delete  Penname Control Temp Screen 1  Column Temp S	Pause Pause Witkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness Unkness	Analysis: Analysis	Ryamitadi Atalya Run tine (me) 150 150 150 150 150 150 150 150	neg loca troj stava rple list run status: Cick Start to suber noture (J.) Rept 10.00 20.00 20.00 20.00 20.00 20.00	Colles Level	Column Temperature 1 Column temperature 40 °C 40 °C 50 °C 50 °C	a_ x	Search feiliers.	
UCT Column Traversion Series Review Investigate Report Home COLUMN COLUMN CO	Analysis Genzol Autocome do Likol Sample list controls Sample list • Add Delete Column Temp Screent Column Temp Screent	Pause Pause Winnen Unknown Unknown Unknown Unknown	Stop         Stop           Unscription         Sample position           40         SA1           50         SA3	Ren tore (mot) 350 350 350 350 350 350 350 350 350 350	Neg Nova no-Stay	num (Level)	Column Temperature 1 Column temperature Column temperature 40 °C 40 °C 50 °C 50 °C 50 °C 50 °C	C X	Search folders.	
UCL Column Trevension Street Review Investigate Report Home	Analysis Center Analysis Center Semple Ist controls Sample Ist Controls Sample Ist - Add Delete Calum Temp Screen J Colum Temp Screen J	Pause Pause Withoun Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun	Stop         Stop           Operciption         Sample position           40         2A2           40         2A2           50         2A4           50         1A4           50         1A5           60         1A7	Run time (min) 359 359 359 359 359 359 359 359 359 359	n volume (J.) Repú 2009 2009 2009 2009 2009 2009 2009 200	nun nun cotes Level 3 1 3 3 4 3 4 3 3 3 4 3 3 3 3 4 3 3 3 3	Column Temperature 1 Column temperature 40 % 40 % 50 % 50 % 50 %		Snorch folders.	
Review Investigate Report	Analysis Centro  Automate Na Diale  Sample list controls  Sample list controls  Sample list •  Add Delete  Column Temp Screen	Pause Pause Without Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun	Analysis: Analysis: 2 Wooks Stopp Stopp Conception Sample position 40 5A3 40 5A3 50 5A4 50 5A3 50 5A4 50 5A3 50 5A3 50 5A3 50 543 50 543 50 543 50 543 50 543 50 50 50 50 50 50 50 50 50 50	Rum Sine (me) Rum Sine (me) 150 150 150 150 150 150 150 150	Neg lace treating      Negle list run status:     Repedy to start:     Cick Start to solo      Novelume GLI     Novelume	Cons Level	Column Temperature 1 Column temperature 40 °C 40 °C 50 °C 50 °C 50 °C 50 °C 50 °C	c. x	Search folders.	3
Review Investigate Report	Analysis Control  Automatic As Dial  Sample list controls  Sample list controls  Sample list •  Add Delete  Column Temp Screed	Pause Pause Winnoun Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun Unknoun	Stop         Stop           0escripton         Sample position           40         2A3           50         2A4           50         2A4           50         2A5           60         1A7           60         1A7	Commended Analyse	Negative	Cafes Level	Column Temperature 1 Column temperature 90 % 40 % 90 % 90 % 90 % 90 %		Search feiliers.	
USUL Column Trouverland Orter Review Investigate Report Home	Analysis Control Automatic As Dial Sample list controls Sample list controls Sample list • Add Delete Column Temp Screent Column Temp Screent	Pause Pause Company Distances Unitances Unitances Unitances Unitances Unitances Unitances Unitances Unitances Unitances	Stop         Stop           0         Stop           0         Stop           0         Sample position           40         SA1           50         SA4           50         SA4           60         SA5           60         SA2           60         SA2           60         SA2           60         SA3	Ren See (mer) Ren See (mer) 350 350 350 350 350 350 350 350	Neglinos nejškým npie list run status: Redy to start 1 Cick Start to sche 1000 1000 1000 1000 1000	Cates Level	Column Temperature 1 Column temperature 40 °C 40 °C 50 °C 50 °C 60 °C 60 °C	C X	Search feiliers.	
Province Investigate Report	Analysis Center Analysis Center Sample Sist controls Sample Sist * Add Delete Column Temp Screect Column Temp Screect	Pause Pause Distribution Sample type Unishoom Unishoom Unishoom Unishoom Unishoom Unishoom Unishoom Unishoom	Stop         Stop           Users/stop         Sample position           40         SAL           40         SAL           50         SAL           50         SAL           50         SAL           60         SAL           60         SAL	Connector Analyse	n kog kica ng siya ngle lisit nun status: Resdy to start t Cot Start to addr 1000 1000 1000 1000 1000 1000 1000 1	run cates Level 1 1 1 3 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1	Column Temperature 1 Column temperature 40 % 40 % 50 % 50 % 50 %		Snorth folders.	
Aview Investigate Report	Analysis Gentro Watcome Ka Dial Sample list controls Stat Stat Stat Stat Add Delete Course Temp Screen 1 Course Temp Screen 2 Course Temp Screen 2 Course Temp Screen 3 Course Temp Screen	Pause Pause Company Sample type Unknown Unknown Unknown Unknown Unknown Unknown	Analysis: Analysis: 2005ani Stopping Description Sample position 40 2A3 40 2A3 50 2A4 50 2A3 50 2A4 50 2A3 50 2A4 50 2A3 50 2A4 50 2A3 50 2A4 50 2A3 50 50 50 50	Commissed Analyse	<ul> <li>Negalasizat ingle list nun status:</li> <li>Rendry to start:</li> <li>Rendr</li></ul>	Cons Level	Column Temperature S Column temperature 40 °C 40 °C 50 °C 50 °C 60 °C 60 °C	Acquisition status	Inderth folders.	
Review Investigate Report	Analysis General Matcanet do Livos Sample list controls Sample list entrols Add Delete Column Temp Screes 1 Column Temp Screes	Pause Pause Different Unterent Unterent Unterent Unterent Unterent Unterent Unterent Unterent	Stop         Stop           Unscription         Sample position           40         SA1           50         SA4           50         SA4           50         SA4           60         SA5           60         SA4	Run tone (mm) Run tone (mm) 350 350 350 350 350 350 350 350	nobelist run status: Ready to start i Cot Start to solve nobelist run status: Ready to start i 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000	cates Level 1 1 1 1 1 1 1 1 1 1 1 1 1	Column Temperature 1 Column temperature Column temp	C X	Search folders.	
Unit of a second	Analysis Center Welcome to UNo1 Semple list controls Sample list with Add Delete Column Temp Screek Column Temp Screek	Pause Pause Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse Discourse	Stop         Stop           Users Mulyse:         Water           Stop         Sample pooloon           40         2A2           40         2A2           40         2A3           50         2A4           50         1A5           50         1A5           60         181	Coonnector Analyse	n volume (J.) República 110,554 (J.) Rebely to start 1 Colo Start 10, objective 3000 1000 1000 1000 1000 1000 1000	run cates Level 1 1 3 1 3 1 1 3 1 1 1 3 1 1 1 1 3 1	Column Temperature 1 Column temperature 40 % 40 % 50 % 50 % 50 %		Snorth folders.	
Review Investigate Report	Analysis Centrol  Accord to Local  Sample list controls  Sample list controls  Sample list e  Add Delete  Courn Temp Screent	Parase Parase Distances Uniteres Distances Distances Distances Distances Distances Distances Distances Distances	Analysis: Analysis: 2 Wooks Stopp Description Sample position 40 104 20 20 20 20 20 20 20 20 20 20	Rum Sine (me) Rum Sine (me) 1940 1950	Negalasca Tegisrisya     nyake lisit nun sitatus:     Resedy to start:     100     1000     1000     1000     1000     1000     1000	Cons Level	Column Temperature 1 Column temperature 40 °C 40 °C 50 °C 50 °C 50 °C 50 °C 50 °C		Inderth folders.	
Util Column Terusville Column Review Investigate Report Home	Analysis Gentri Version of the United State Sample list controls Sample list • Add Delete Column Temp Sereet Column Temp Sereet	Pause Pause Wanaan Ukanaan Ukanaan Ukanaan Ukanaan Ukanaan Ukanaan Ukanaan Ukanaan	Stop         Stop           Escription         Sample position           40         2A1           40         2A3           50         2A4           50         1A5           50         1A5           60         1A7           60         1A3	Ren Seve (more) Asso 350 350 350 350 350 350 350 350 350 350	nycle lisit run status: Ready to start i Ready to start i Ready to start i Class Start to addr 1000 1000 1000 1000 1000 1000 1000 1000	Cates Level	Column Temperature 5 Column temperature 40 °C 40 °C 50 °C 50 °C 50 °C 60 °C		Insert folies.	
UK3 Colum Tenerous Column Perior Investigate Report Home	Analysis Centrol Additional Society of Society 1 Sample list controls Sample list controls Sample list * Add Detre Calum Temp Society 1 Colum Temp	Paose Paose Discourt Unicourt Unicourt Unicourt Unicourt Unicourt Unicourt Unicourt Unicourt Unicourt	Stop         Stop           Userstyles         Stop           Userstyles         Sample position           40         3A1           40         1A2           40         1A3           50         1A4           60         1A5           60         1A5           60         1A5           60         1A4           60         1A4	Run tone (mont) Run tone (mont) 309 309 309 309 309 309 309 309 309 309	n kege kinoz ingolski jedni ingolski	net Internet Length I I I I I I I I I I I I I I I I I I I	Column Temperature 1 Column temperature 00% 00% 00% 00% 00%	C N N	Search folders.	

Figure 5. Evaluating varying column temperatures.



Figure 6. Effect of column temperature on separation of clopidogrel in plasma.

## Conclusion

The Waters UNIFI Scientific Information System employs a workflow approach with acquisition templates and promotable parameters to enable the rapid simple screening and optimization of gradient and column temperature conditions. Further optimization of the chromatographic parameters can significantly improve assay robustness and analytical throughput. This workflow approach delivers:

- · Streamlines data acquisition
- · Promotes consistency of the method development process
- · Allows expert users to define templates to be used by less experienced scientists
- Utilizes promotable parameters to allow multiple parameters such as gradient profile and column temperature to be evaluated using a pre-determined template

## Featured Products

ACQUITY UPLC System <https://www.waters.com/514207> Xevo TQ-S <https://www.waters.com/10160596> UNIFI Scientific Information System <https://www.waters.com/134801648> Regulated Bioanalysis Platform Solution with UNIFI <https://www.waters.com/134613325>

720004288, February 2012

©2019 Waters Corporation. All Rights Reserved.