

7000x Autotune

With Collision Cell Gases ON

With Collision Cell Gases OFF



7000x/7010x Collision Cell

The collision cell collects parents of precursor ions and ion fragments, thermalizes the ion beam, and focuses the beam into the second analyzer.

The collision cell contains nitrogen and helium. Helium has been shown by Agilent to provide more control over the fragmentation process, especially with higher mass ions. It was added to the nitrogen stream to reduce neutral noise by thermalizing metastables without letting them hit the detector. The helium is then eliminated by the vacuum pump along with carrier gas and unfragmented sample ions. (from G7000-90031 Agilent 7000 Series Triple Quadrupole GC/MS System Concepts Guide)

It takes some time for the collision cell temperature to stabilize after collision cell gas flow changes. If the standby method has the collision cell gases off, load the run method and wait at least 15 minutes before tuning and/or running.

7000x/7010x Collision Cell flows

7000x Flows

2.25 ml/min He

1.5 ml/min N2

The screenshot shows the 'GC Edit Parameters' window for a 7000x instrument. The 'Columns' section is selected in the left sidebar. The 'Collision Cell EPC' table shows the following settings:

	Actual	Setpoint
<input checked="" type="checkbox"/> He Quench Gas	2.25 mL/min	2.25 mL/min
<input checked="" type="checkbox"/> N2 Collision Gas	1.5 mL/min	1.5 mL/min

A red arrow points from the '2.25 ml/min He' text above to the 'He Quench Gas' row in the table.

7010x Flows

4.0 ml/min He

1.5 ml/min N2

The screenshot shows the 'GC Edit Parameters' window for a 7010x instrument. The 'Columns' section is selected in the left sidebar. The 'Collision Cell EPC' table shows the following settings:

	Actual	Setpoint
<input checked="" type="checkbox"/> He Quench Gas	4.0 mL/min	4.00 mL/min
<input checked="" type="checkbox"/> N2 Collision Gas	1.5 mL/min	1.5 mL/min

A red arrow points from the '4.0 ml/min He' text above to the 'He Quench Gas' row in the table.

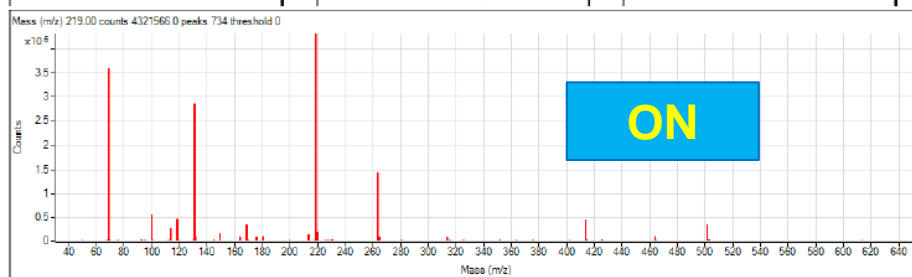
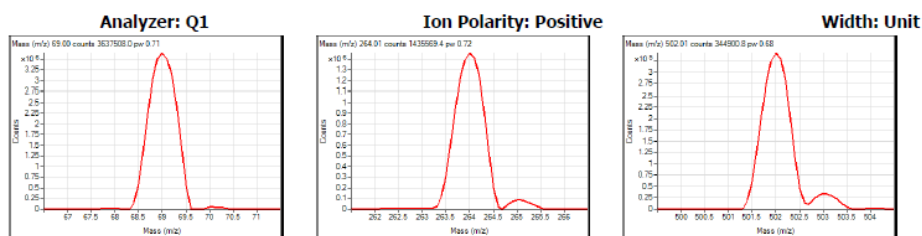
7000x/7010x Collision Cell flows

What happens if you forget to turn on the collision cell gases?

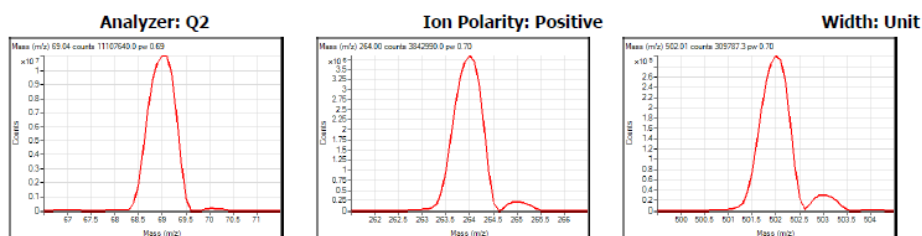
Tune Report Page 1

Triple Quadrupole GC/MS Autotune Report

Instrument Name 7000D / US1821U102 MS Model 7000D
Tune Date & Time 5/24/2018 7:17:48 AM Source EI with Extractor
Tune File D:\MassHunter\GCMS\3\7000\US1821U102.eiex.tune.xml

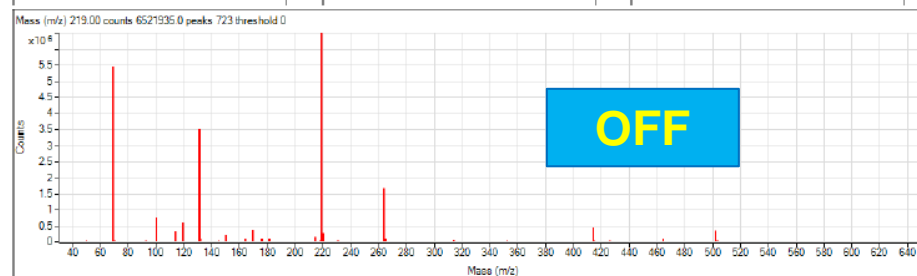
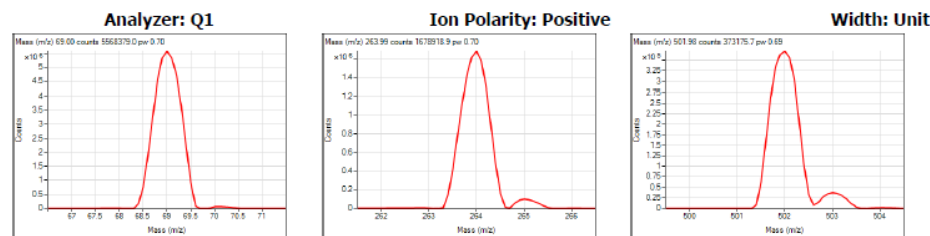


m/z	Abundance	Rel. Abund	Isotope	Iso Abund	Iso Ratio
69.00	3590644.3	100.0%	70.10	40109.4	1.1%
219.00	4321566.0	120.4%	220.00	186396.8	4.3%
264.00	1427004.3	39.7%	265.00	82336.6	5.8%
414.00	434079.7	12.1%	415.00	38684.4	8.9%
502.00	339061.7	9.4%	503.00	32024.5	9.4%

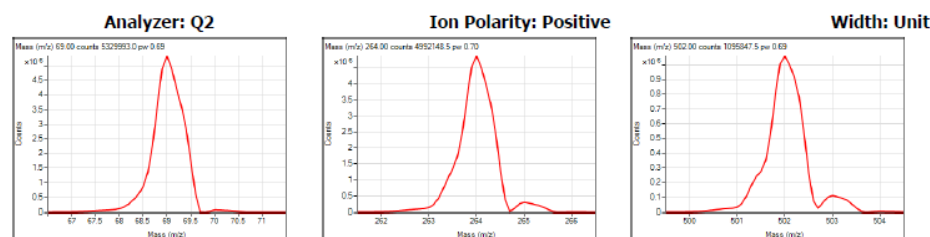


Triple Quadrupole GC/MS Autotune Report

Instrument Name DOROTHY / US1821U1M2 MS Model 7000D
Tune Date & Time 7/9/2018 12:41:32 PM Source EI with Extractor
Tune File D:\MassHunter\GCMS\1\7000\atunes.eiex.tune.xml



m/z	Abundance	Rel. Abund	Isotope	Iso Abund	Iso Ratio
69.00	5482618.0	100.0%	70.10	56705.8	1.0%
219.00	6521934.5	119.0%	220.00	287068.3	4.4%
264.00	1685229.4	30.7%	265.00	98316.2	5.8%
414.00	460007.4	8.4%	415.00	40326.0	8.8%
502.00	372194.5	6.8%	503.10	37584.4	10.1%



7000x/7010x Collision Cell flows

What happens if you forget to turn on the collision cell gases?

Tune Report Page 2

Triple Quadrupole GC/MS Autotune Report

Instrument Name	7000D / US1821U102	MS Model	7000D
Tune Date & Time	5/24/2018 7:17:48 AM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\3\7000\US1821U102.eiex.tune.xml		

Instrument Actuals

Source Temp.	230 °C	Rough Vac	1.25E+2 mTorr
MS1 Quad Temp.	150 °C	High Vac	7.47E-5 Torr
MS2 Quad Temp.	150 °C	Turbo 1 Speed	100.0 %
Filament Current	35.0 µA	Turbo 1 Power	22.5 W

Ion Source

Type/mode	EI+	Repeller	8.1 V
Source Temp.	230 °C	Ion Body	12.2 V
Emission	35.0 µA	Ion Focus	-77.0 V
Energy	70 eV	Entrance Lens	Dynamic V
Filament	1		

ON

Quadrupoles

		Q1		Q2	
DC		5.6 V		-5.4 V	
Post/Pre Filter		5.6 V		-15.4 V	
Temperature		150 °C		150 °C	
Polarity		Positive		Negative	
DIP Mass	100.00	1000.00 m/z	100.00	1000.00 m/z	
DIP Value	4.3	62.6 %	4.9	63.6 %	

Resolution	Unit	Wide	Widest	Unit	Wide	Widest
Mass Gain	4.61	4.42	3.78	1.67	1.77	1.40
Mass Offset	Dynamic	-1.616	-1.095	Dynamic	-1.782	-1.296
Width Gain	21.4	21.4	21.4	20.4	20.4	20.4
Width Offset	Dynamic	-0.225	-0.745	Dynamic	-0.254	-0.774

Collision Cell

		Detector	
Cell Entrance	6.6 V	Detector Type	Triple Axis Series 2
Hex DC	5.6 V	Iris	Dynamic V
Hex RF	400 V	HED	-10.0 kV
Hex Accel	-5.0 V	EMV (Gain=1.0E+005)	914 V
Cell Exit	-0.4 V	Gain Parameter a	12.30116
Collision Energy	0 eV	Gain Parameter b	-72.35545
		Max Gain Factor	2233899

Fast Scan

Fast Scan Offset	-4.0 V		
Q1 Mass Gain	24.96	Q2 Mass Gain	6.73
Q1 Mass Offset	0.905	Q2 Mass Offset	-1.593
Q1 Width Gain	21.4	Q2 Width Gain	21.4
Q1 Width Offset	-0.745	Q2 Width Offset	-0.679

Triple Quadrupole GC/MS Autotune Report

Instrument Name	DOROTHY / US1821U1M2	MS Model	7000D
Tune Date & Time	7/9/2018 12:41:32 PM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\1\7000\atunes.eiex.tune.xml		

Instrument Actuals

Source Temp.	230 °C	Rough Vac	7.93E+1 mTorr
MS1 Quad Temp.	150 °C	High Vac	1.18E-6 Torr
MS2 Quad Temp.	150 °C	Turbo 1 Speed	100.0 %
Filament Current	34.9 µA	Turbo 1 Power	16.0 W

Ion Source

Type/mode	EI+	Repeller	7.5 V
Source Temp.	230 °C	Ion Body	11.2 V
Emission	35.0 µA	Extractor	6.4 V
Energy	70 eV	Ion Focus	-81.0 V
Filament	1	Entrance Lens	Dynamic V

OFF

Quadrupoles

		Q1		Q2	
DC		5.6 V		-5.4 V	
Post/Pre Filter		5.6 V		-15.4 V	
Temperature		150 °C		150 °C	
Polarity		Positive		Negative	
DIP Mass	100.00	1000.00 m/z	100.00	1000.00 m/z	
DIP Value	4.3	62.7 %	4.7	64.3 %	

Resolution	Unit	Wide	Widest	Unit	Wide	Widest
Mass Gain	4.33	4.12	3.56	1.62	1.53	1.27
Mass Offset	Dynamic	-1.596	-1.058	Dynamic	-1.712	-1.313
Width Gain	21.0	21.0	21.0	20.0	20.0	20.0
Width Offset	Dynamic	-0.253	-0.773	Dynamic	-0.296	-0.816

Collision Cell

		Detector	
Cell Entrance	6.6 V	Detector Type	Triple Axis Series 2
Hex DC	5.6 V	Iris	Dynamic V
Hex RF	400 V	HED	-10.0 kV
Hex Accel	-5.0 V	EMV (Gain=1.0E+005)	904 V
Cell Exit	-0.4 V	Gain Parameter a	11.96376
Collision Energy	0 eV	Gain Parameter b	-69.92885
		Max Gain Factor	1697224

Fast Scan

Fast Scan Offset	-4.0 V		
Q1 Mass Gain	21.42	Q2 Mass Gain	5.06
Q1 Mass Offset	-0.039	Q2 Mass Offset	-1.688
Q1 Width Gain	21.0	Q2 Width Gain	19.9
Q1 Width Offset	-0.773	Q2 Width Offset	-0.681

7000x/7010x Collision Cell flows

What happens if you forget to turn on the collision cell gases?

Tune Report Page 3

Triple Quadrupole GC/MS Autotune Report

Instrument Name	7000D / US1821U102	MS Model	7000D
Tune Date & Time	5/24/2018 7:17:48 AM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\3\7000\US1821U102.elex.tune.xml		

Dynamic Ramp Tables

MS1 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.795	-1.773	-1.771	-1.803	-1.803	
MS1 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.029	-0.010	-0.016	-0.020	-0.021	
MS2 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.943	-1.927	-1.951	-1.929	-1.927	
MS2 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.057	-0.052	-0.056	-0.055	-0.057	
Iris						
m/z	69.00	219.00	264.00	414.00	502.00	1050.00
Setting	-0.500	-9.500	-13.500	-21.500	-23.500	-36.000
Entrance Lens						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-6.600	-11.000	-12.200	-14.400	-14.800	

Scan Speed Correction Factor

	Q1	Q2
a0	-0.005255	0.024780
a1	1.058610	0.588405
a2	0.045643	-0.225532
b0	-0.017916	-0.108291
b1	7.390142	0.984890
b2	-1.173221	0.692545

Diagnostic Information

Air/Water Check: H2O 13.81% (<=20.00%), O2 0.68% (<=2.50%), N2 2.54% (<=10.00%)

Detector Dark Current Check: Baseline 461, Threshold 368, HED On Pulse Count 2, HED Off Pulse Count 0

Triple Quadrupole GC/MS Autotune Report

Instrument Name	DOROTHY / US1821U1M2	MS Model	7000D
Tune Date & Time	7/9/2018 12:41:32 PM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\1\7000\atunes.elex.tune.xml		

Dynamic Ramp Tables

MS1 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.764	-1.765	-1.770	-1.809	-1.778	
MS1 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.053	-0.045	-0.048	-0.052	-0.047	
MS2 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.830	-1.817	-1.841	-1.839	-1.866	
MS2 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.085	-0.107	-0.089	-0.098	-0.076	
Iris						
m/z	69.00	219.00	264.00	414.00	502.00	1050.00
Setting	-10.500	-10.500	-11.000	-20.000	-22.000	-34.500
Entrance Lens						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-7.000	-11.000	-12.400	-15.200	-16.200	

Scan Speed Correction Factor

	Q1	Q2
a0	-0.001127	-0.000252
a1	0.620581	0.258864
a2	0.031619	-0.016777
b0	-0.078144	-0.007142
b1	6.528421	1.294652
b2	-1.056670	-0.057532

Diagnostic Information

Air/Water Check: H2O 0.65% (<=20.00%), O2 0.20% (<=2.50%), N2 0.74% (<=10.00%)

Detector Dark Current Check: Baseline 465, Threshold 297, HED On Pulse Count 0, HED Off Pulse Count 0

ON

OFF

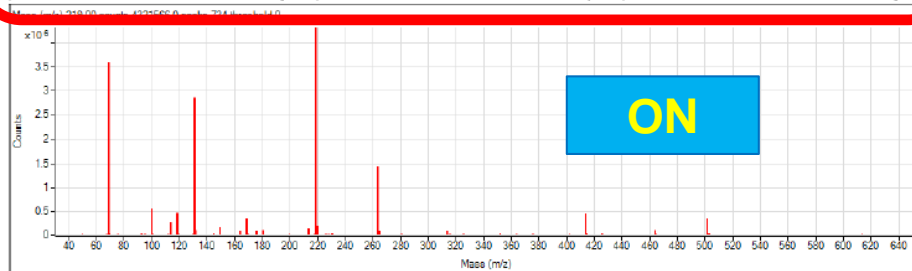
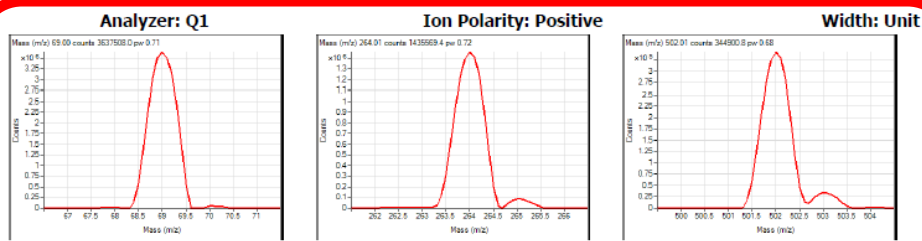
7000x/7010x Collision Cell flows

Very few obvious symptoms...

Tune Report Page 1

Triple Quadrupole GC/MS Autotune Report

Instrument Name 7000D / US1821U102 MS Model 7000D
Tune Date & Time 5/24/2018 7:17:48 AM Source EI with Extractor
Tune File D:\MassHunter\GCMS\3\7000\US1821U102.elex.tune.xml

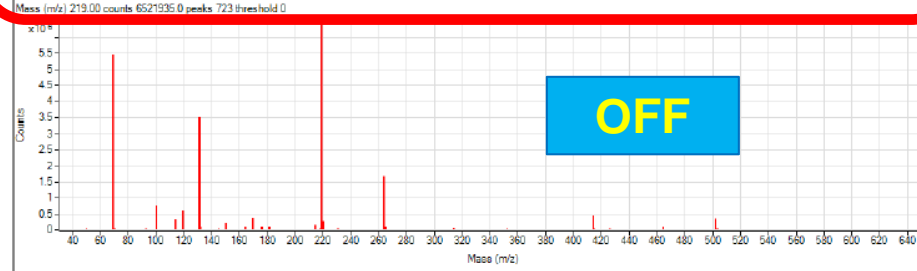
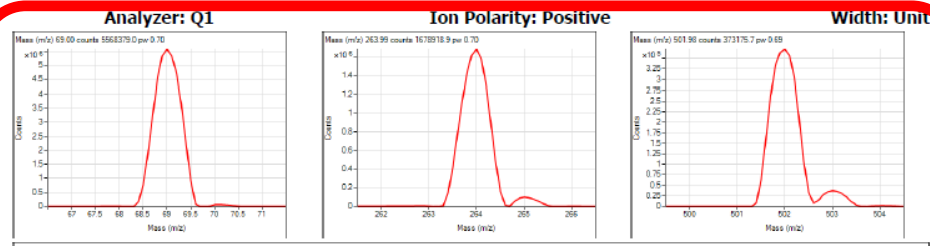


m/z	Abundance	Rel. Abund	Isotope	Iso Abund	Iso Ratio
69.00	3590644.3	100.0%	70.10	40109.4	1.1%
219.00	4321566.0	120.4%	220.00	186396.8	4.3%
264.00	1427004.3	39.7%	265.00	82336.6	5.8%
414.00	434079.7	12.1%	415.00	38684.4	8.9%
502.00	339061.7	9.4%	503.00	32024.5	9.4%

Q1 peak shapes are both good

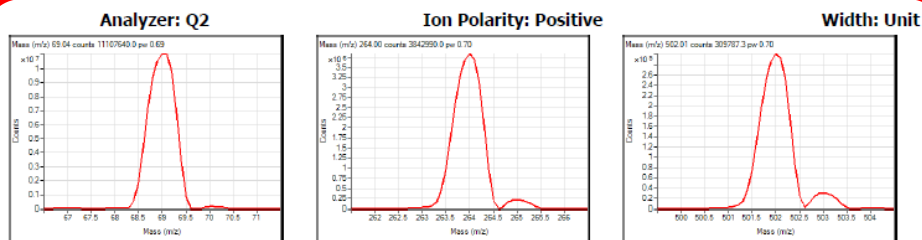
Triple Quadrupole GC/MS Autotune Report

Instrument Name DOROTHY / US1821U1M2 MS Model 7000D
Tune Date & Time 7/9/2018 12:41:32 PM Source EI with Extractor
Tune File D:\MassHunter\GCMS\1\7000\atunes.elex.tune.xml

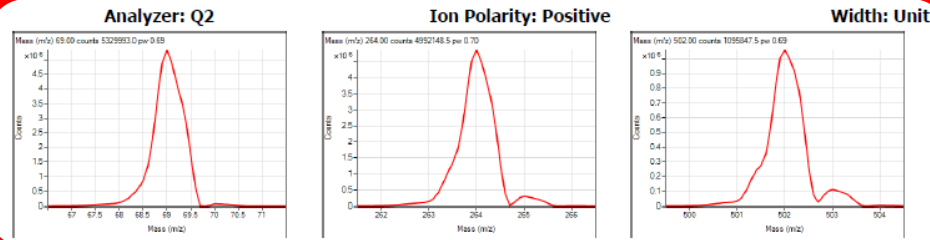


m/z	Abundance	Rel. Abund	Isotope	Iso Abund	Iso Ratio
69.00	5482618.0	100.0%	70.10	56705.8	1.0%
219.00	6521934.5	119.0%	220.00	287068.3	4.4%
264.00	1685229.4	30.7%	265.00	98316.2	5.8%
414.00	460007.4	8.4%	415.00	40326.0	8.8%
502.00	372194.5	6.8%	503.10	37584.4	10.1%

OFF



Q2 peak shapes are BAD



7000x/7010x Collision Cell flows

Very few obvious symptoms...

Tune Report Page 2

Triple Quadrupole GC/MS Autotune Report

Instrument Name	7000D / US1821U102	MS Model	7000D
Tune Date & Time	5/24/2018 7:17:48 AM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\3\7000\US1821U102.eiex.tune.xml		

Instrument Actuals

Source Temp.	230 °C
MS1 Quad Temp.	150 °C
MS2 Quad Temp.	150 °C
Filament Current	35.0 µA

Vacuum

Rough Vac	1.25E+2 mTorr
High Vac	7.47E-5 Torr
Turbo 1 Speed	100.0 %
Turbo 1 Power	22.5 W

Ion Source

Type/mode	EI+	Repeller	8.1 V
Source Temp.	230 °C	Ion Body	12.2 V
Emission	35.0 µA	Ion Focus	-77.0 V
Energy	70 eV	Entrance Lens	Dynamic V
Filament	1		

Quadrupoles

DC	ON		5.6 V		-5.4 V	
Post/Pre Filter			5.6 V		-15.4 V	
Temperature			150 °C		150 °C	
Polarity			Positive		Negative	
DIP Mass	100.00	1000.00 m/z	100.00	1000.00 m/z		
DIP Value	4.3	62.6 %	4.9	63.6 %		
Resolution	Unit	Wide	Widest	Unit	Wide	Widest
Mass Gain	4.61	4.42	3.78	1.67	1.77	1.40
Mass Offset	Dynamic	-1.616	-1.095	Dynamic	-1.782	-1.296
Width Gain	21.4	21.4	21.4	20.4	20.4	20.4
Width Offset	Dynamic	-0.225	-0.745	Dynamic	-0.254	-0.774

Collision Cell

Cell Entrance	6.6 V	Detector	Triple Axis Series 2
Hex DC	5.6 V	Detector Type	Dynamic V
Hex RF	400 V	Iris	Dynamic V
Hex Accel	-5.0 V	HED	-10.0 kV
Cell Exit	-0.4 V	EMV (Gain=1.0E+005)	914 V
Collision Energy	0 eV	Gain Parameter a	12.30116
		Gain Parameter b	-72.35545
		Max Gain Factor	2233899

Fast Scan

Fast Scan Offset	-4.0 V		
Q1 Mass Gain	24.96	Q2 Mass Gain	6.73
Q1 Mass Offset	0.905	Q2 Mass Offset	-1.593
Q1 Width Gain	21.4	Q2 Width Gain	21.4
Q1 Width Offset	-0.745	Q2 Width Offset	-0.679

Vacuum
is better



Turbo
pump
power is
lower

Triple Quadrupole GC/MS Autotune Report

Instrument Name	DOROTHY / US1821U1M2	MS Model	7000D
Tune Date & Time	7/9/2018 12:41:32 PM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\1\7000\atunes.eiex.tune.xml		

Instrument Actuals

Source Temp.	230 °C
MS1 Quad Temp.	150 °C
MS2 Quad Temp.	150 °C
Filament Current	34.9 µA

Vacuum

Rough Vac	7.93E+1 mTorr
High Vac	1.18E-6 Torr
Turbo 1 Speed	100.0 %
Turbo 1 Power	16.0 W

Ion Source

Type/mode	EI+	Repeller	7.5 V
Source Temp.	230 °C	Ion Body	11.2 V
Emission	35.0 µA	Extractor	6.4 V
Energy	70 eV	Ion Focus	-81.0 V
Filament	1	Entrance Lens	Dynamic V

Quadrupoles

DC	<div>OFF</div>		5.6 V		-5.4 V	
Post/Pre Filter			5.6 V		-15.4 V	
Temperature			150 °C		150 °C	
Polarity			Positive		Negative	
DIP Mass	100.00		1000.00 m/z	100.00	1000.00 m/z	
DIP Value	4.3		62.7 %	4.7	64.3 %	
Resolution	Unit	Wide	Widest	Unit	Wide	Widest
Mass Gain	4.33	4.12	3.56	1.62	1.53	1.27
Mass Offset	Dynamic	-1.596	-1.058	Dynamic	-1.712	-1.313
Width Gain	21.0	21.0	21.0	20.0	20.0	20.0
Width Offset	Dynamic	-0.253	-0.773	Dynamic	-0.296	-0.816

Collision Cell

Cell Entrance	6.6 V	Detector	Triple Axis Series 2
Hex DC	5.6 V	Detector Type	Dynamic V
Hex RF	400 V	Iris	Dynamic V
Hex Accel	-5.0 V	HED	-10.0 kV
Cell Exit	-0.4 V	EMV (Gain=1.0E+005)	904 V
Collision Energy	0 eV	Gain Parameter a	11.96376
		Gain Parameter b	-69.92885
		Max Gain Factor	1697224

Fast Scan

Fast Scan Offset	-4.0 V		
Q1 Mass Gain	21.42	Q2 Mass Gain	5.06
Q1 Mass Offset	-0.039	Q2 Mass Offset	-1.688
Q1 Width Gain	21.0	Q2 Width Gain	19.9
Q1 Width Offset	-0.773	Q2 Width Offset	-0.681

7000x/7010x Collision Cell flows

Very few obvious symptoms...

Tune Report Page 3

Triple Quadrupole GC/MS Autotune Report

Instrument Name	7000D / US1821U102	MS Model	7000D
Tune Date & Time	5/24/2018 7:17:48 AM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\3\7000\US1821U102.elex.tune.xml		

Dynamic Ramp Tables

MS1 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.795	-1.773	-1.771	-1.803	-1.803	
MS1 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.029	-0.010	-0.016	-0.020	-0.021	
MS2 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.943	-1.927	-1.951	-1.929	-1.927	
MS2 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.057	-0.052	-0.056	-0.055	-0.057	
Iris						
m/z	69.00	219.00	264.00	414.00	502.00	1050.00
Setting	-0.500	-9.500	-13.500	-21.500	-23.500	-36.000
Entrance Lens						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-6.600	-11.000	-12.200	-14.400	-14.800	

Scan Speed Correction Factor

	Q1	Q2
a0	-0.005255	0.024780
a1	1.058610	0.588405
a2	0.045643	-0.225532
b0	-0.017916	-0.108291
b1	7.390142	0.984890
b2	-1.173221	0.692545

Diagnostic Information

Air/Water Check: H2O 13.81% (<=20.00%), O2 0.68% (<=2.50%), N2 2.54% (<=10.00%)

Detector Dark Current Check: Baseline 461, Threshold 368, HED On Pulse Count 2, HED Off Pulse Count 0

ON

The Scan Speed Correction Factors for Q1 (MS1 Scan) are slightly different and for Q2 (MS2 Scan) are very different. The collision cell gases slow down the tune ions, so the speed difference with them off is noticeable.

Triple Quadrupole GC/MS Autotune Report

Instrument Name	DOROTHY / US1821U1M2	MS Model	7000D
Tune Date & Time	7/9/2018 12:41:32 PM	Source	EI with Extractor
Tune File	D:\MassHunter\GCMS\1\7000\atunes.elex.tune.xml		

Dynamic Ramp Tables

MS1 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.764	-1.765	-1.770	-1.809	-1.778	
MS1 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.053	-0.045	-0.048	-0.052	-0.047	
MS2 Mass Axis Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-1.830	-1.817	-1.841	-1.839	-1.866	
MS2 Width Offset						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-0.085	-0.107	-0.089	-0.098	-0.076	
Iris						
m/z	69.00	219.00	264.00	414.00	502.00	1050.00
Setting	-10.500	-10.500	-11.000	-20.000	-22.000	-34.500
Entrance Lens						
m/z	69.00	219.00	264.00	414.00	502.00	
Setting	-7.000	-11.000	-12.400	-15.200	-16.200	

Scan Speed Correction Factor

	Q1	Q2
a0	-0.001127	-0.000252
a1	0.620581	0.258864
a2	0.031619	-0.016777
b0	-0.078144	-0.007142
b1	6.528421	1.294652
b2	-1.056670	-0.057532

Diagnostic Information

Air/Water Check: H2O 0.65% (<=20.00%), O2 0.20% (<=2.50%), N2 0.74% (<=10.00%)

Detector Dark Current Check: Baseline 465, Threshold 297, HED On Pulse Count 0, HED Off Pulse Count 0

OFF

7000x/7010x Collision Cell

If the gases are on while tuning, but off in the method:

- The apparent sensitivity will be different.
 - No MRM ions will be created.
 - In MS1 or MS2 Scan modes, the mass assignments may be incorrect.
 - It may appear to be an instrument problem.
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- Load an older/different method.
 - Manually verify that the CC gases are turned on from the GC front panel.

7000x Flows	2.25 ml/min He
	1.5 ml/min N2
7010x Flows	4.0 ml/min He
	1.5 ml/min N2