

Stimulation of Natural Killer Cells with Small Molecule CD38 Inhibitors for the Treatment of Neuroblastoma

Catherine M. Mills,^a Thomas Z. Benton,^a Ivett Piña,^a Megan J. Francis,^a Leticia Reyes,^b Nathan G. Dolloff,^b Yuri K. Peterson^a
and Patrick M. Woster^{a*}

^aDepartment of Drug Discovery and Biomedical Sciences, Medical University of South Carolina; 70 President St, Charleston, SC, 29425, USA

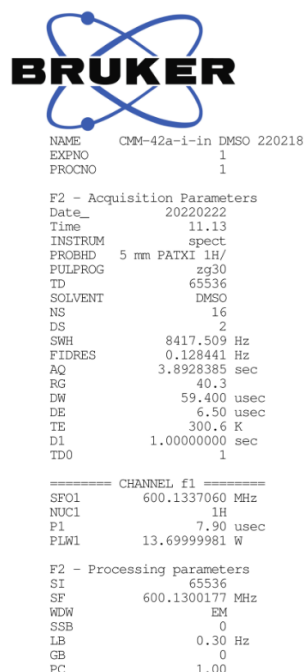
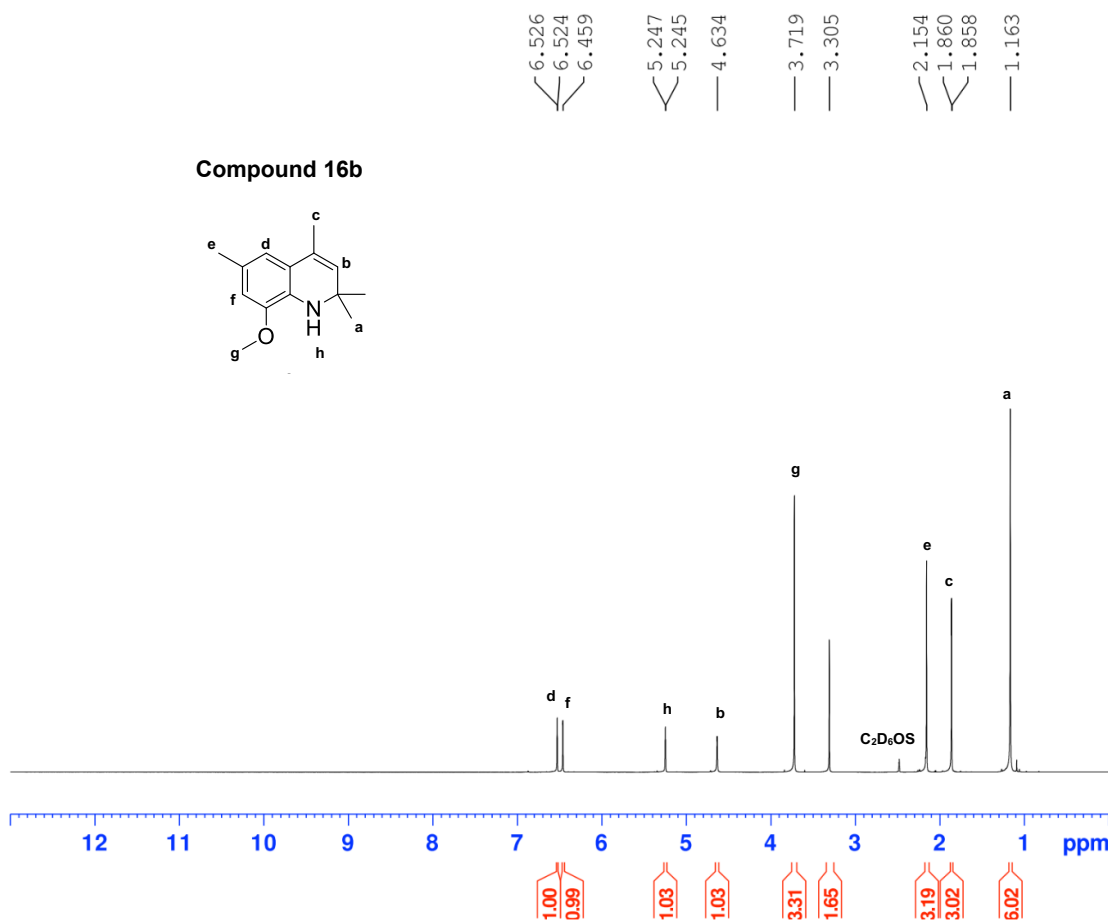
^bDepartment of Cell and Molecular Pharmacology and Experimental Therapeutics, Medical University of South Carolina; 70 President St, Charleston, SC, 29425, USA

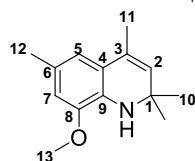
Supplementary Information

¹H-NMR and ¹³C-NMR Data for Compounds 16b, 16c, 18b, 18c, 2 and 3

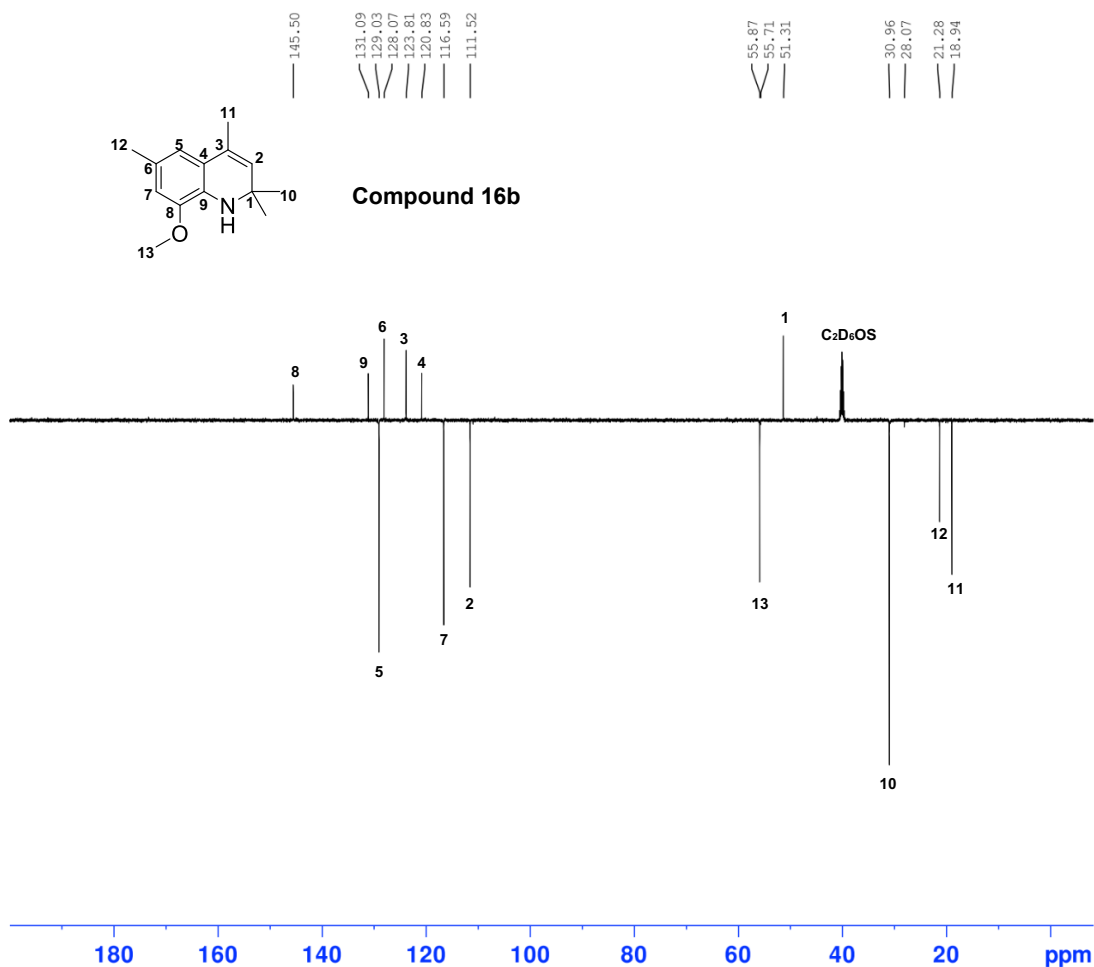
Compound 16b

CMM-42a-i-in DMSO





Compound 16b



Current Data Parameters
NAME CMM-42a-i-in DMSO 220218
EXPNO 3
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220222
Time 11.58
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 881
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.5 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.00000000 sec
D20 0.00689655 sec
TD0 1

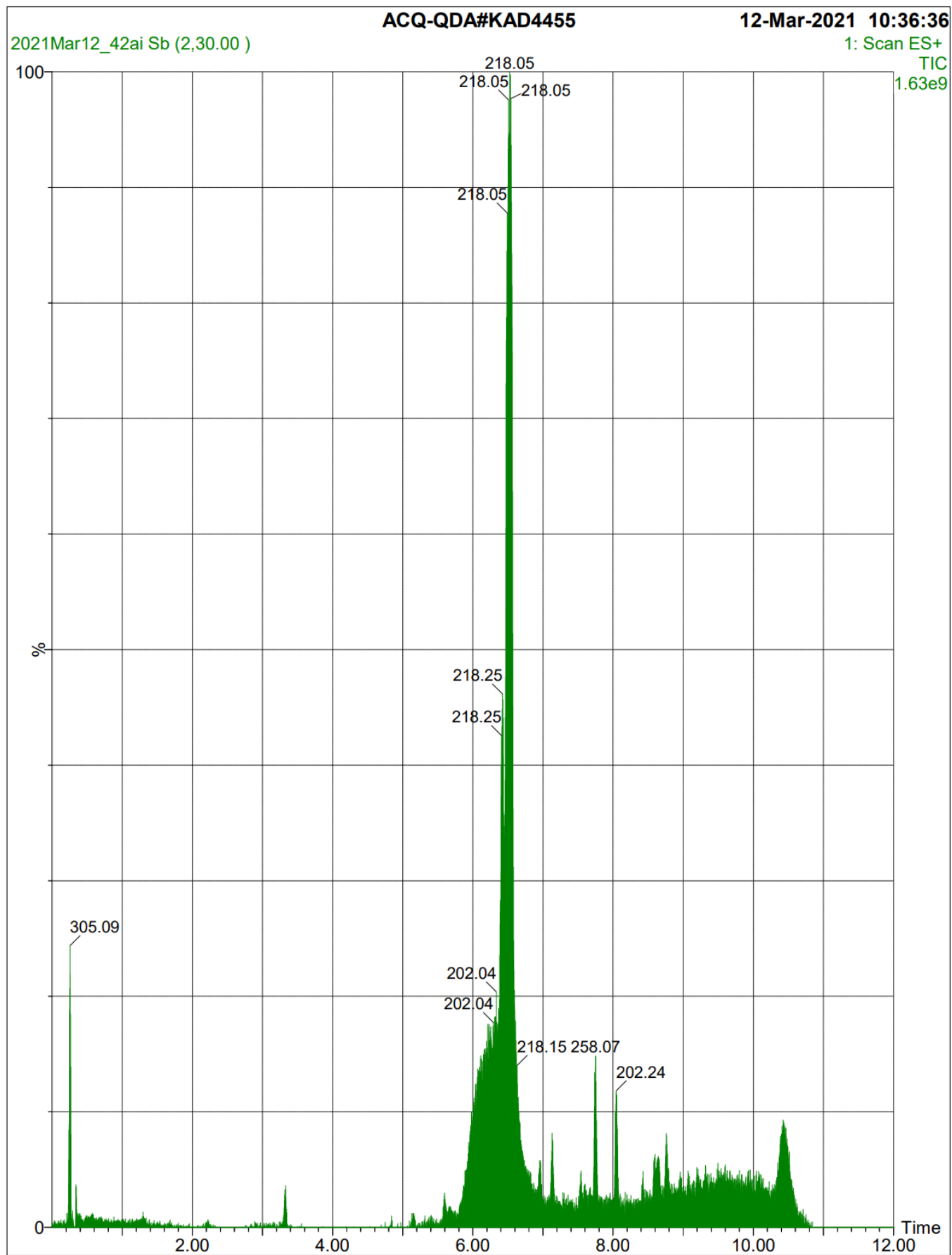
===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 11.80 usec
P2 23.60 usec
PLW1 202.10000610 W

===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG[2] waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

F2 - Processing parameters
SI 32768
SF 150.9028090 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Compound 16b

LC-MS

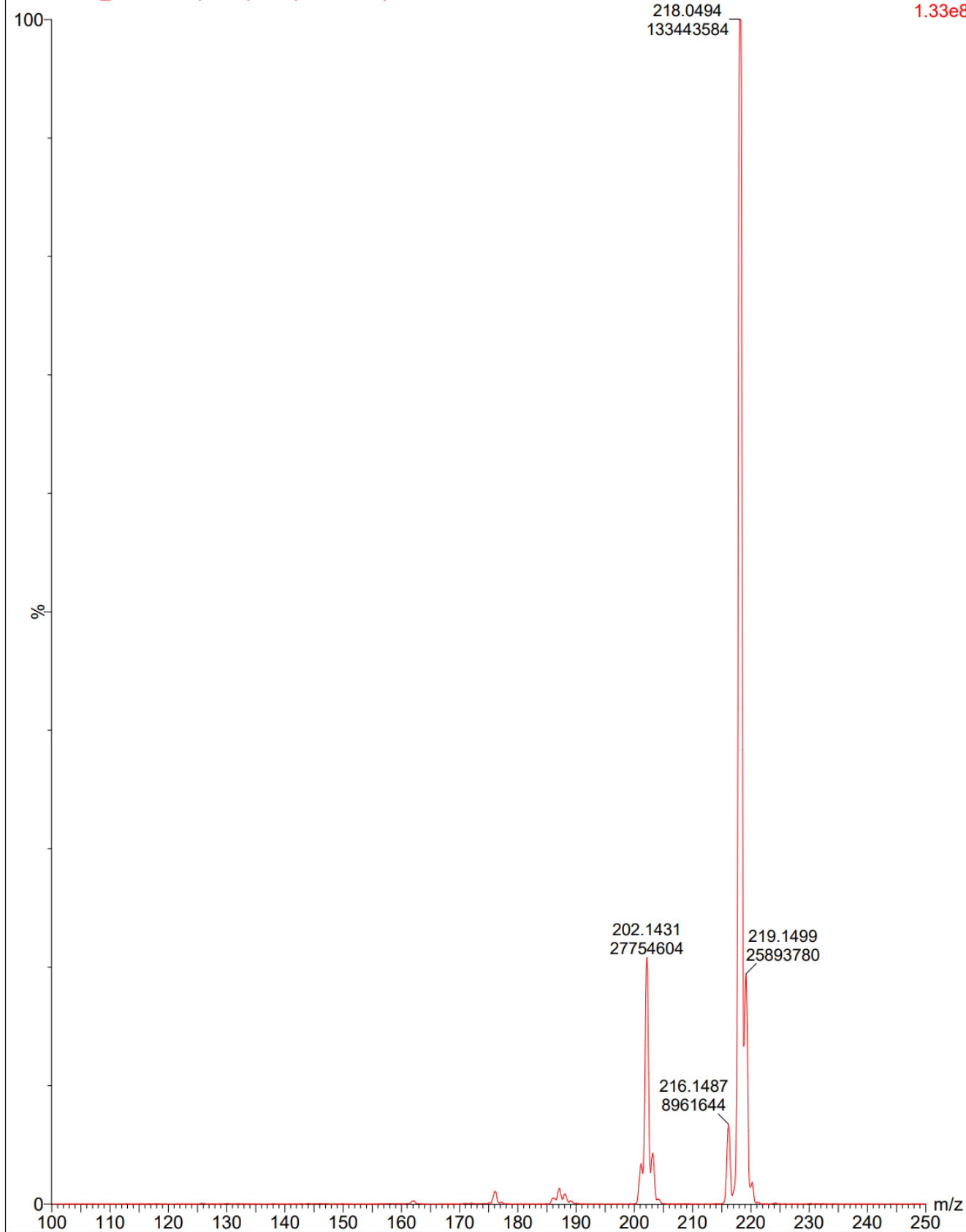


MS

Compound 16b

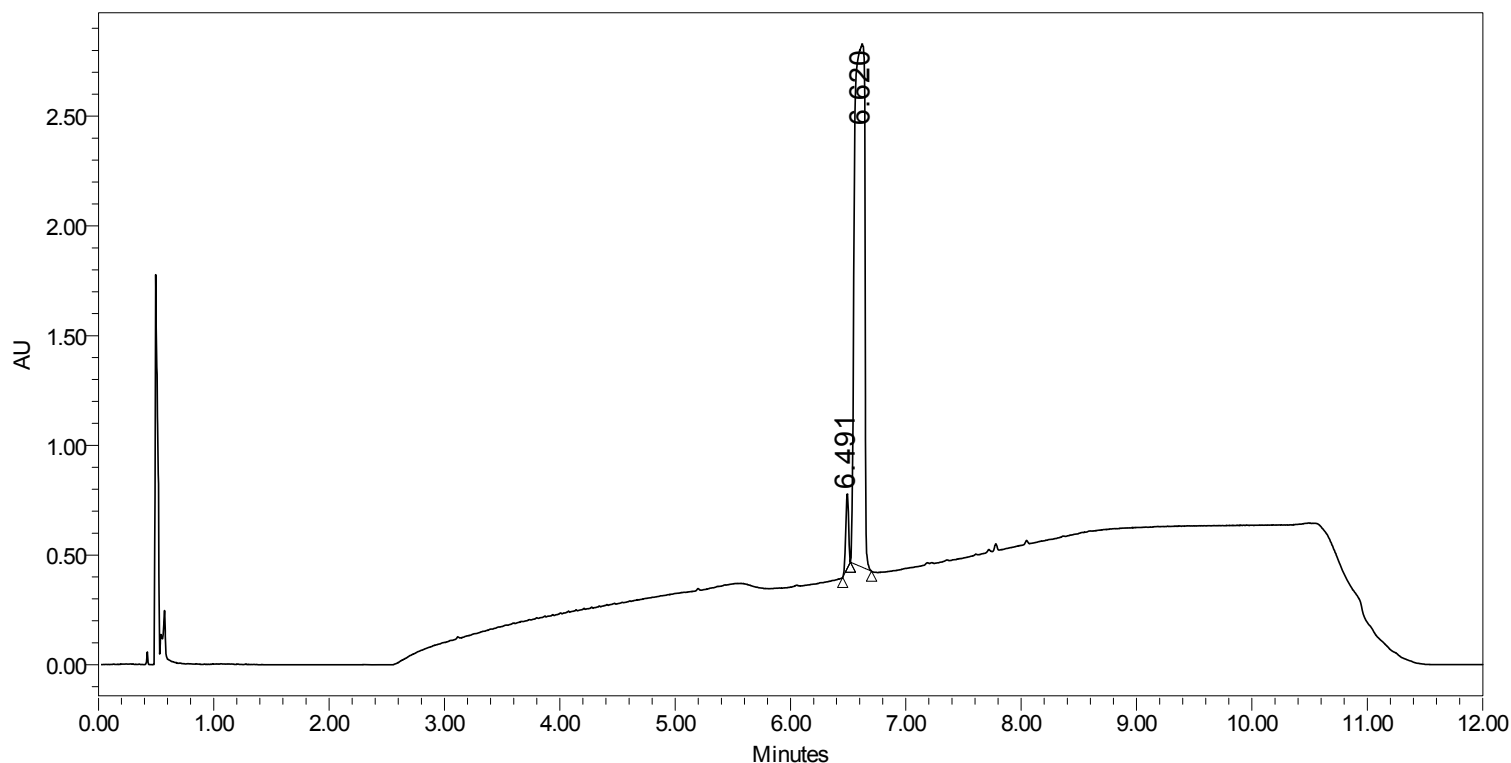
2021Mar12_42ai 2177 (6.524) Cm (2165:2183)

1: Scan ES+
1.33e8



SAMPLE INFORMATION

Sample Name:	42ai	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM210108_42 analogs
Vial:	1:A,6	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0
Date Acquired: 10/6/2022 8:35:24 AM EDT			
Date Processed: 10/6/2022 9:44:26 AM EDT			



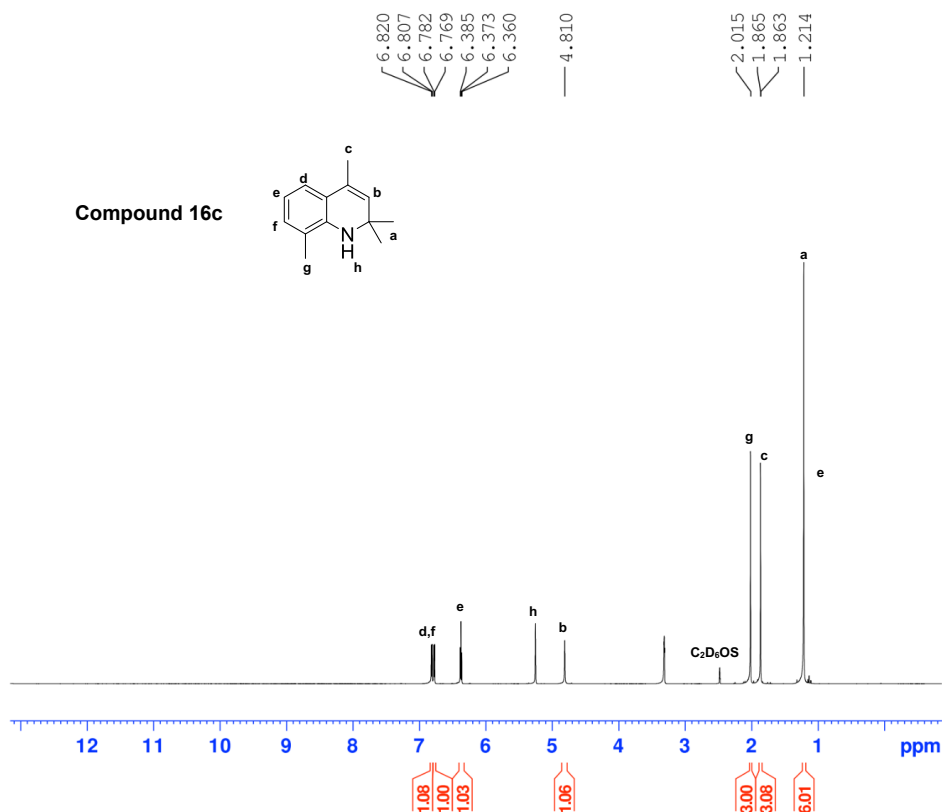
	RT	Area	% Area	Height
1	6.491	577324	3.92	338388
2	6.620	14135264	96.08	2384331

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		6.491	0.759	0.777			
2		6.620	6.725	4.005			

Compound 16c

CMM-42j-i-in DMSO



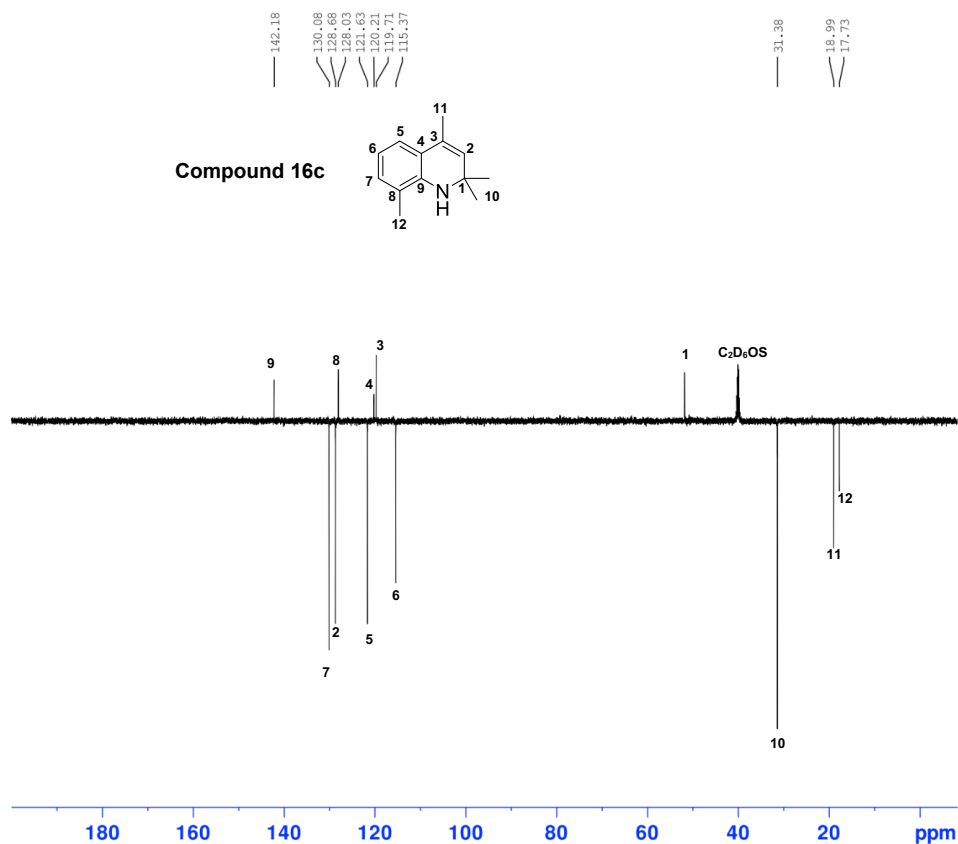
Current Data Parameters
NAME CMM-42j-i-in DMSO
EXPNO 11
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220222
Time 12.29
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 16
DS 2
SWH 8417.509 Hz
FIDRES 0.128441 Hz
AQ 3.8928385 sec
RG 40.3
DW 59.400 usec
DE 6.50 usec
TE 300.4 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 7.90 usec
PLW1 13.69999981 W

F2 - Processing parameters
SI 65536
SF 600.1300177 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

CMM-42j-i-in DMSO



Current Data Parameters
NAME CMM-42j-i-in DMSO
EXPNO 3
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220222
Time 12.38
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 156
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.1 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.00000000 sec
D20 0.00689655 sec
TD0 1

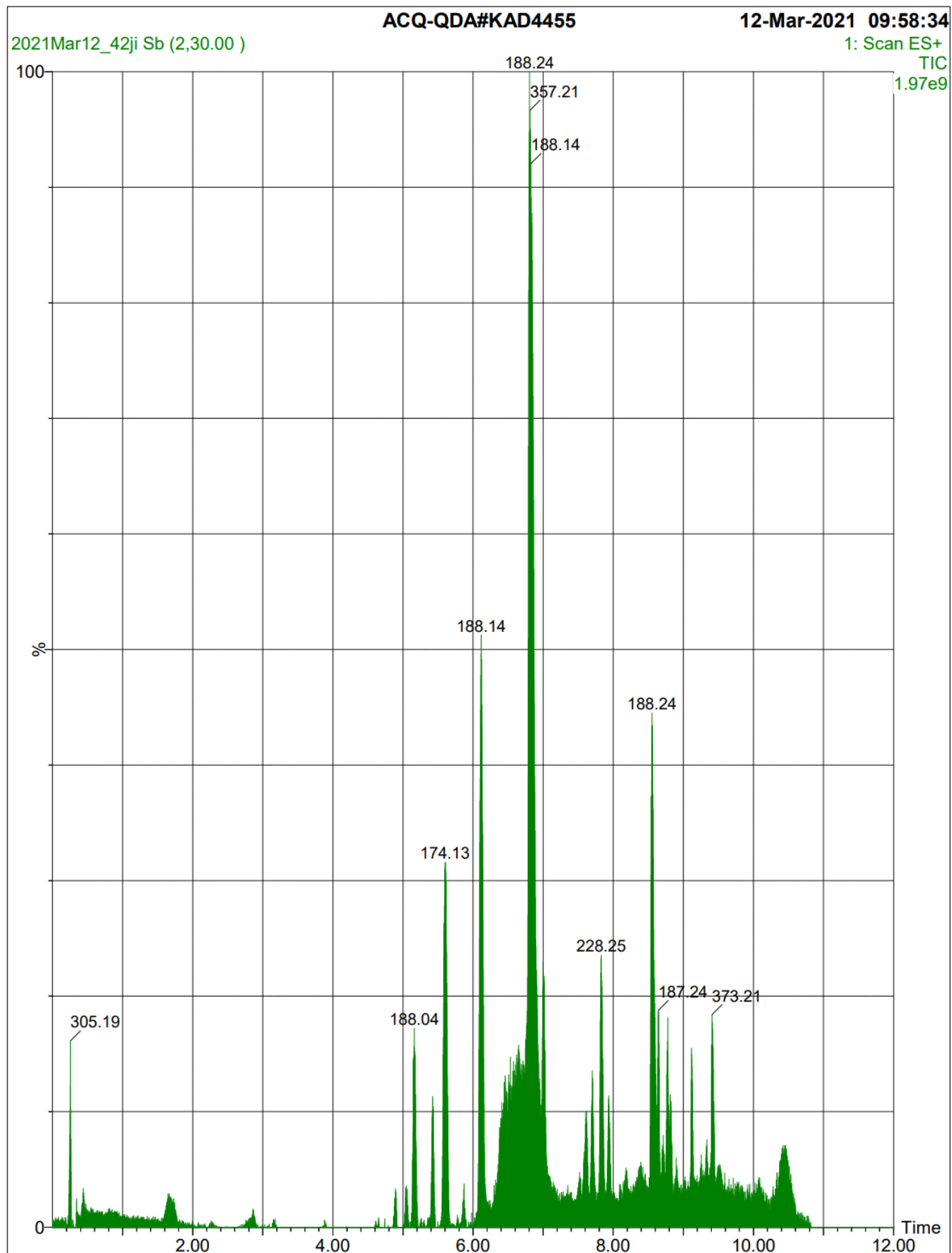
===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 11.80 usec
P2 23.60 usec
PLW1 202.10000610 W

===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG2 waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

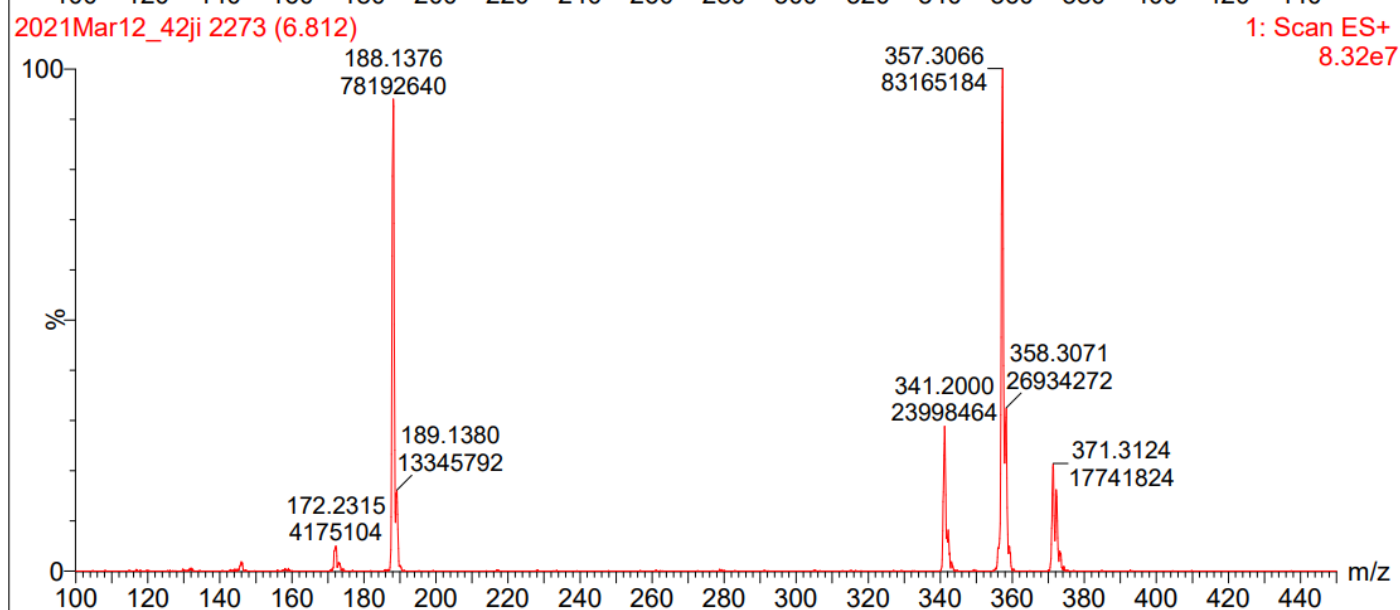
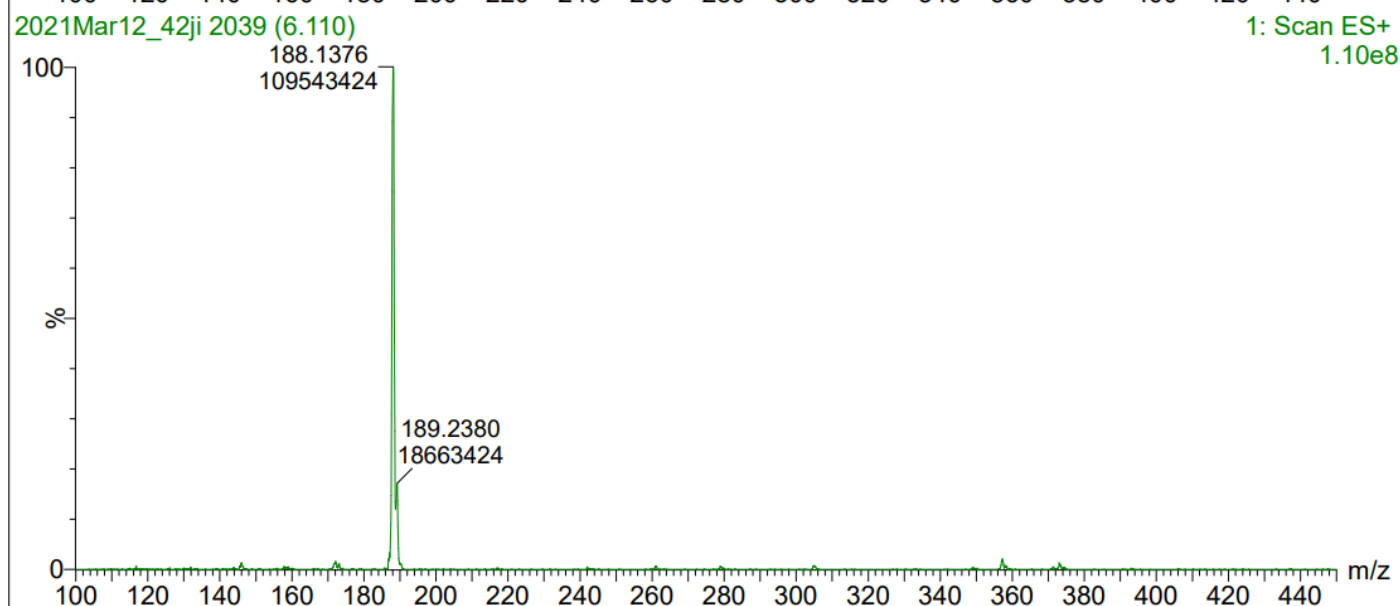
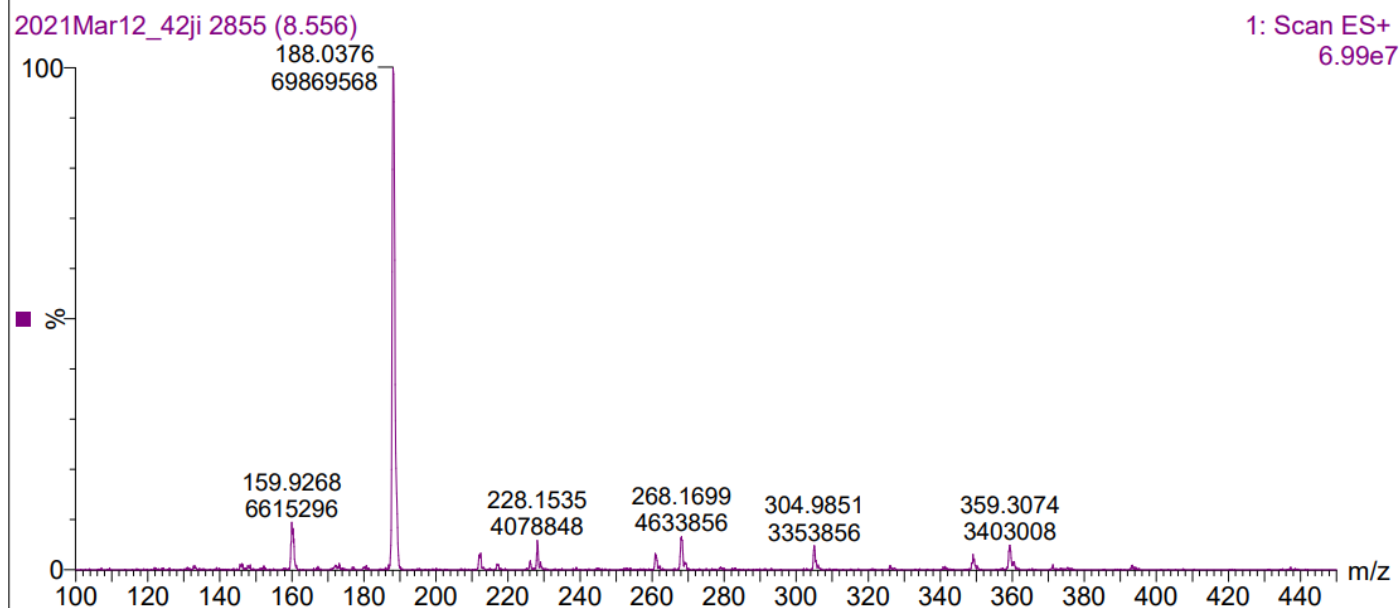
F2 - Processing parameters
SI 32768
SF 150.9028090 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Compound 16c

LC-MS

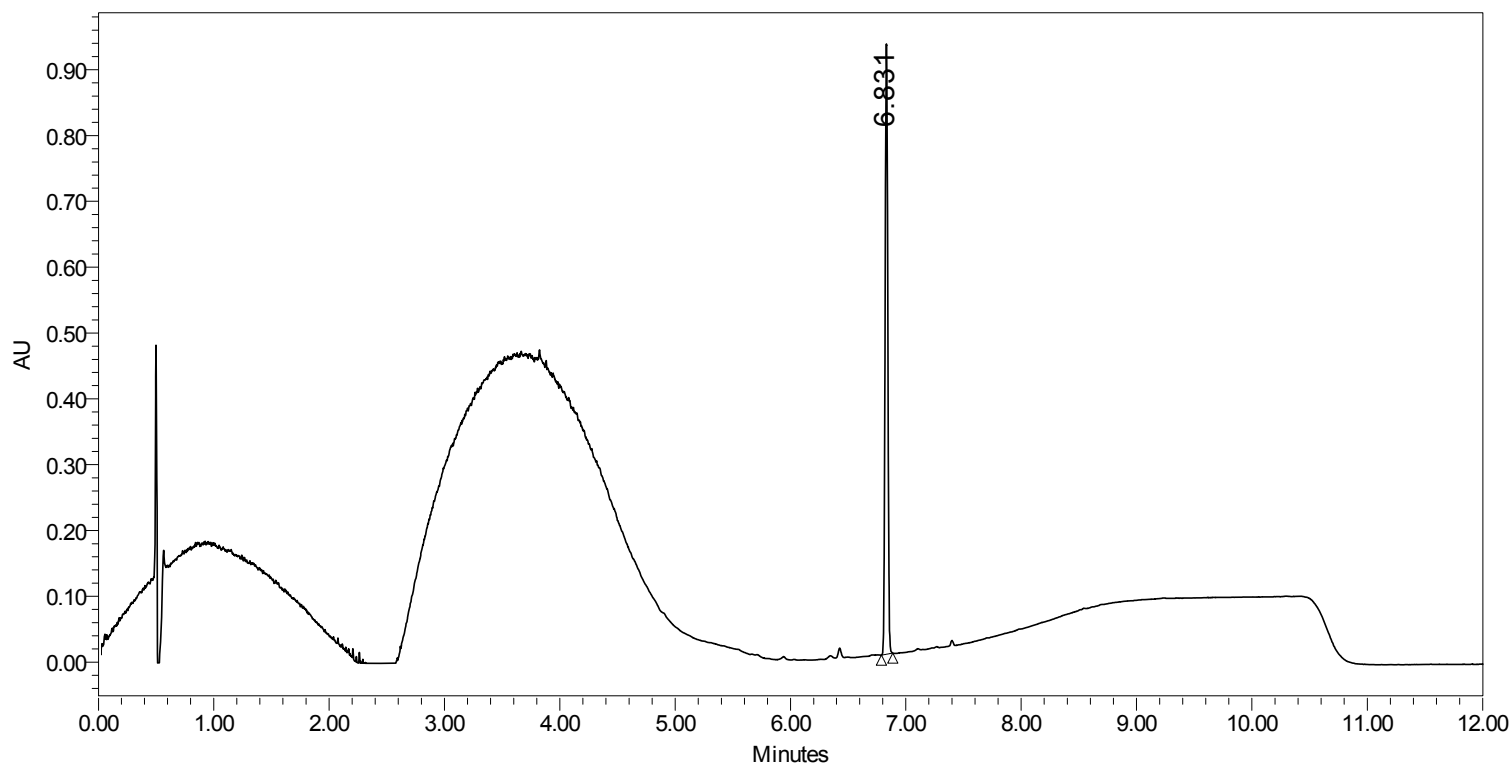


Compound 16 c



SAMPLE INFORMATION

Sample Name:	42j_i	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM221005_42 analogs
Vial:	1:A,3	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0
Date Acquired:	10/5/2022 2:08:31 PM EDT		
Date Processed:	10/5/2022 2:22:05 PM EDT		



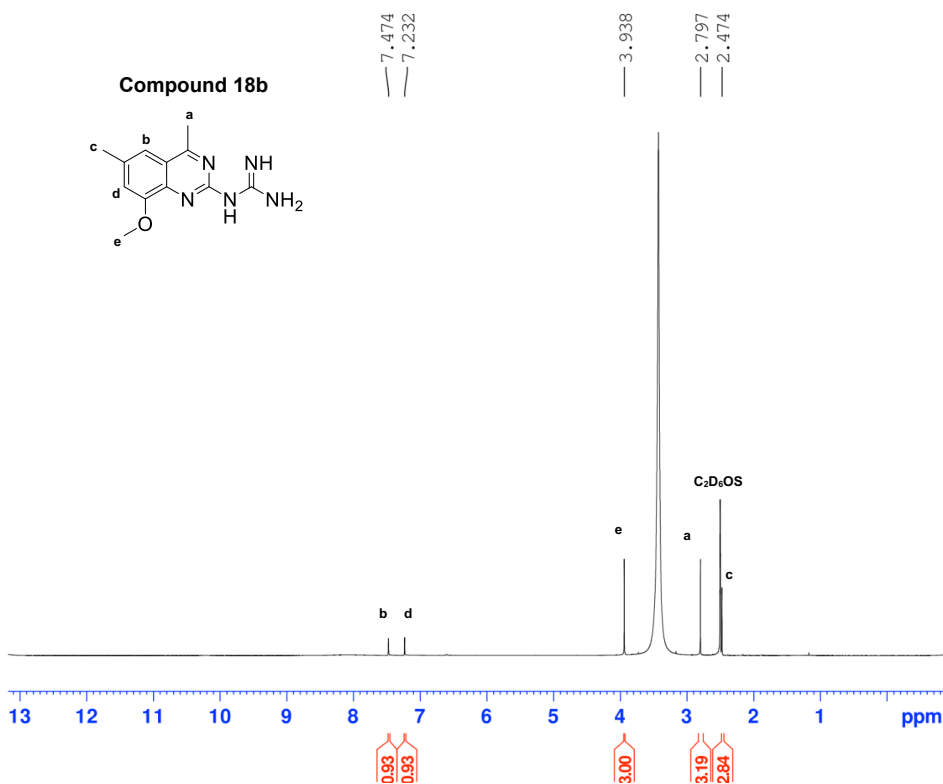
	RT	Area	% Area	Height
1	6.831	1501833	100.00	927736

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		6.831	1.435	0.466			

Compound 18b

CMM-42a-iii-in DMSO



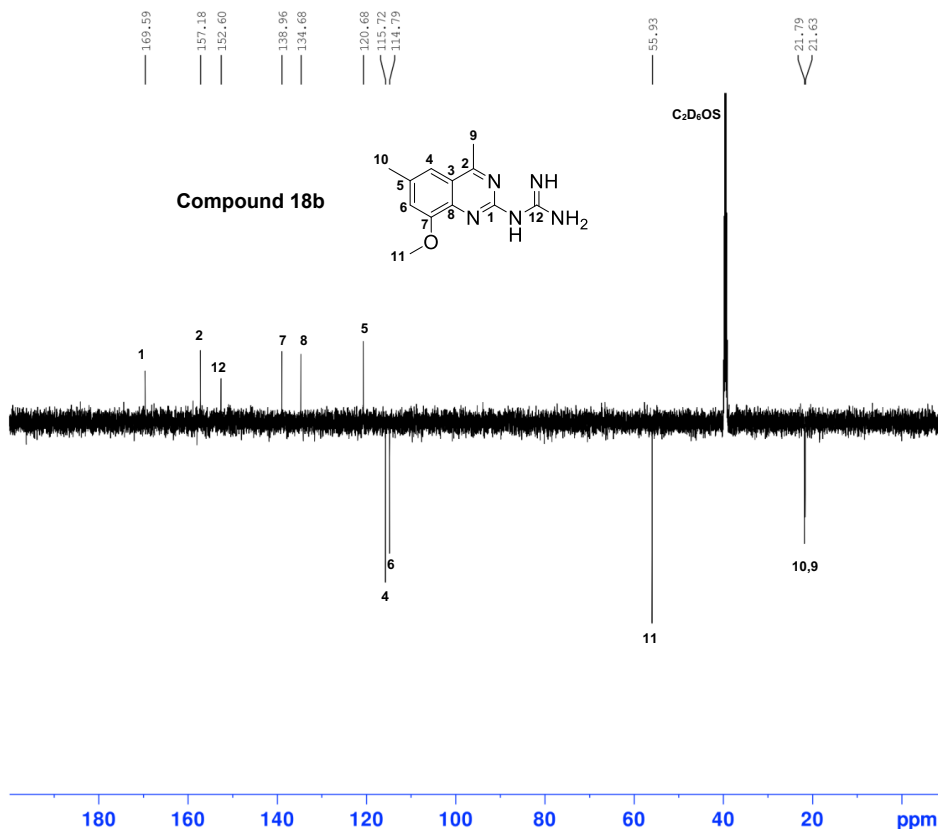
Current Data Parameters
NAME CMM-42a-iii-in DMSO
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220217
Time 14.34
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 8
DS 2
SWH 8417.509 Hz
FIDRES 0.128441 Hz
AQ 3.8920385 sec
RG 40.3
DW 59.400 usec
DE 6.50 usec
TE 300.0 K
D1 1.0000000 sec
TD0 1

===== CHANNEL f1 =====
SF01 600.1337060 MHz
NUC1 1H
P1 7.90 usec
PLW1 13.69999981 W

F2 - Processing parameters
SI 65536
SF 600.1300052 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

CMM-42a-iii-in DMSO



Current Data Parameters
NAME CMM-42a-iii-in DMSO
EXPNO 333
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220316
Time 11.49
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 515
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.1 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.0000000 sec
D20 0.00689655 sec
TD0 1

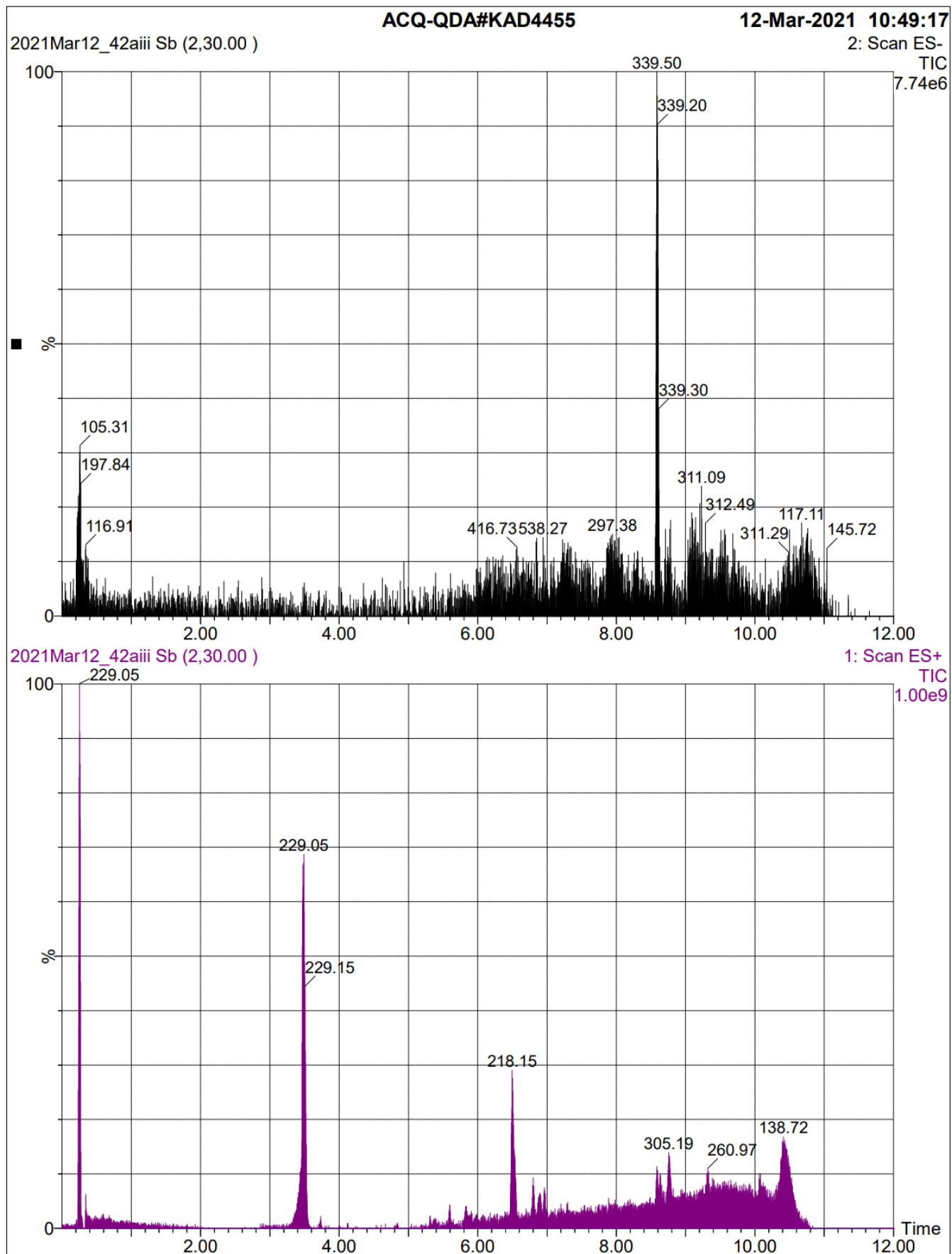
===== CHANNEL f1 =====
SF01 150.9178988 MHz
NUC1 13C
P1 11.80 usec
P2 23.60 usec
PLW1 202.10000610 W

===== CHANNEL f2 =====
SF02 600.1324005 MHz
NUC2 1H
CPDPRG2 waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

F2 - Processing parameters
SI 32768
SF 150.9028869 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

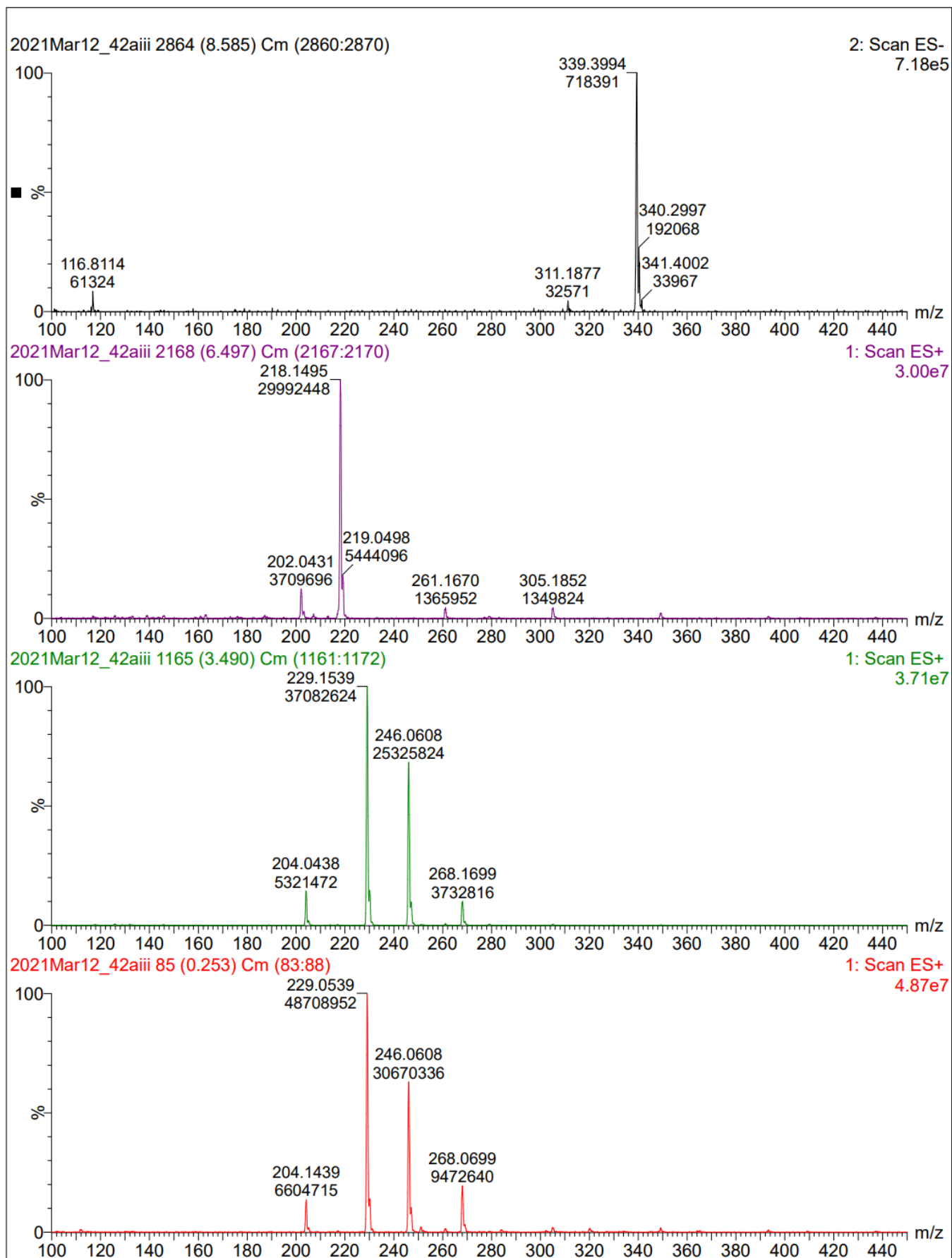
Compound 18b

LC-MS



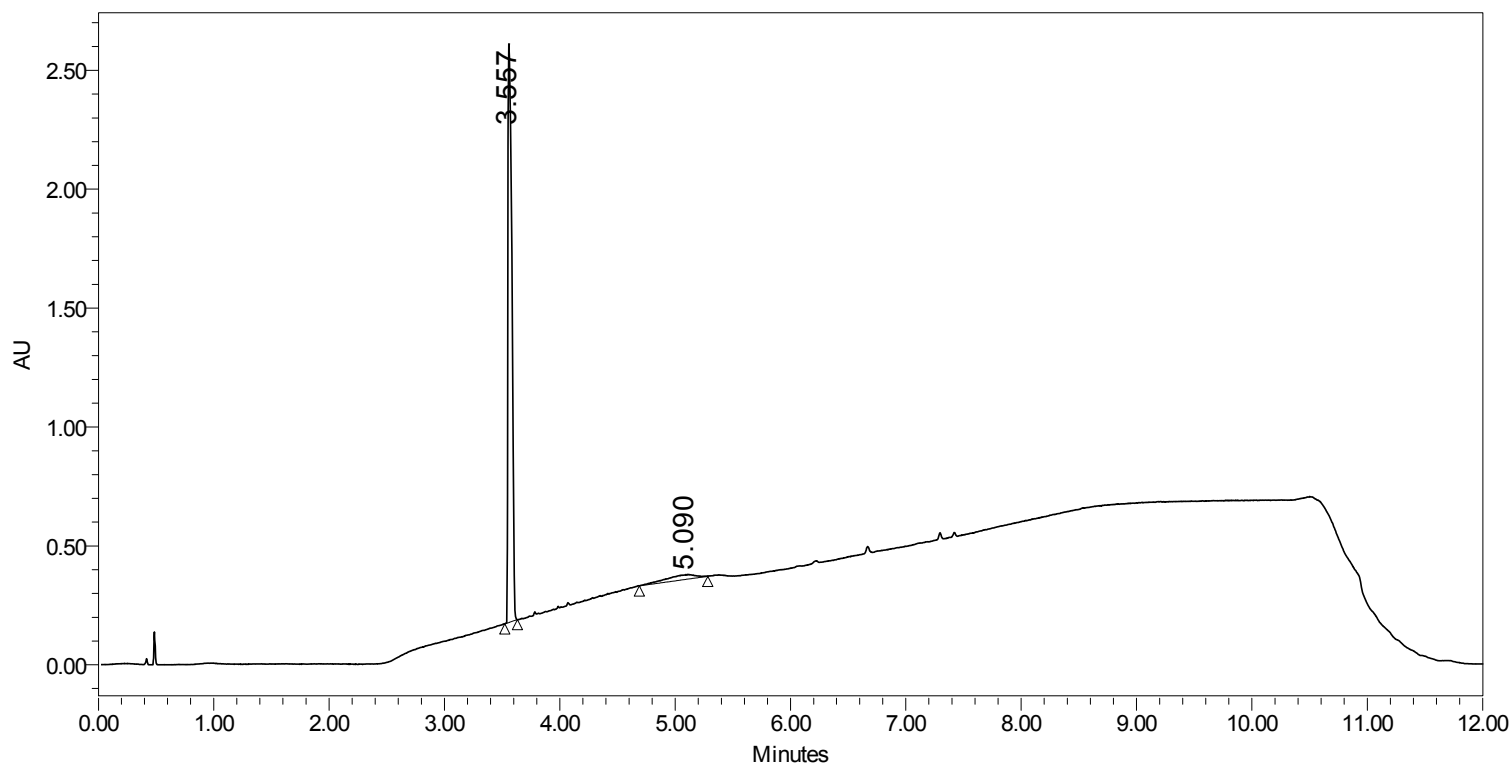
Compound 18b

MS



SAMPLE INFORMATION

Sample Name:	42aii	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM210108_42 analogs_42aii
Vial:	1:A,7	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0
Date Acquired:	10/6/2022 9:51:55 AM EDT		
Date Processed:	10/6/2022 10:05:02 AM EDT		



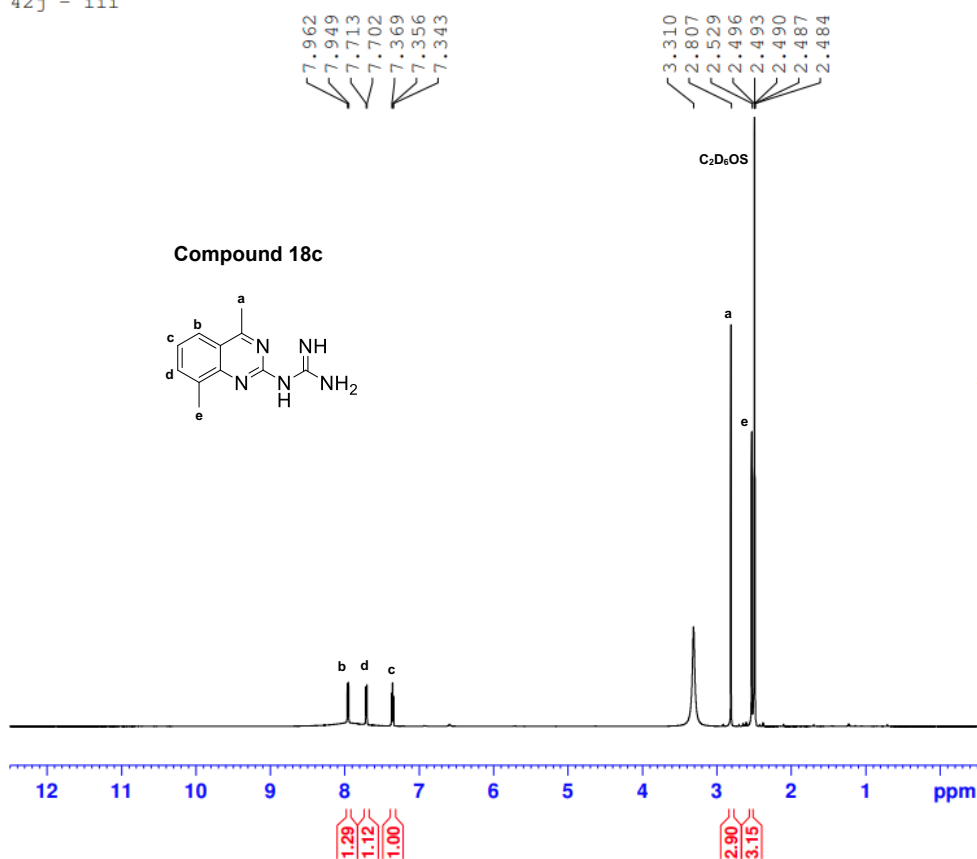
	RT	Area	% Area	Height
1	3.557	5878715	94.01	2434338
2	5.090	374643	5.99	20002

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		3.557	3.629	3.002			
2		5.090	24.589	33.076			

Compound 18c

42j - iii



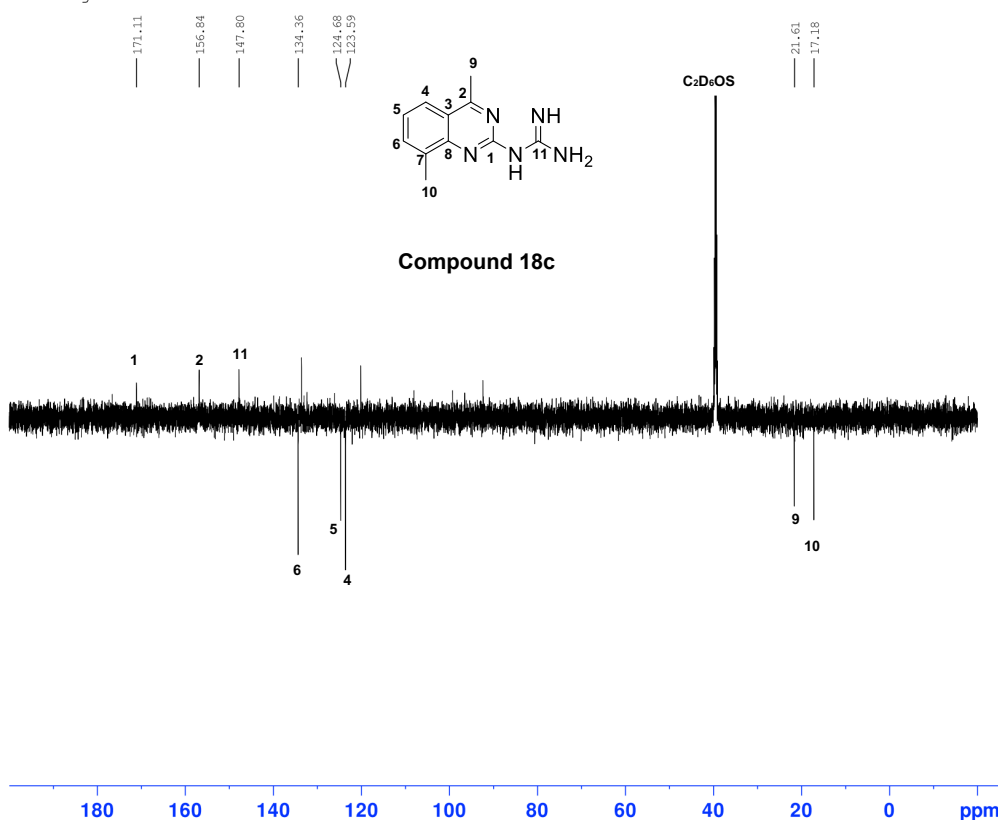
Current Data Parameters
NAME CMM210129
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20210129
Time 8.23
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 32
DS 2
SWH 8417.509 Hz
FIDRES 0.128441 Hz
AQ 3.8928385 sec
RG 287
DW 59.400 usec
DE 6.50 usec
TE 300.2 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 7.90 usec
PLW1 13.69999981 W

F2 - Processing parameters
SI 65536
SF 600.1300109 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

CMM-42j-iii-in DMSO



Current Data Parameters
NAME CMM-42j-iii-in DMSO
EXPNO 33
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220316
Time 12.22
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 493
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.5 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.00000000 sec
D20 0.00689655 sec
TD0 1

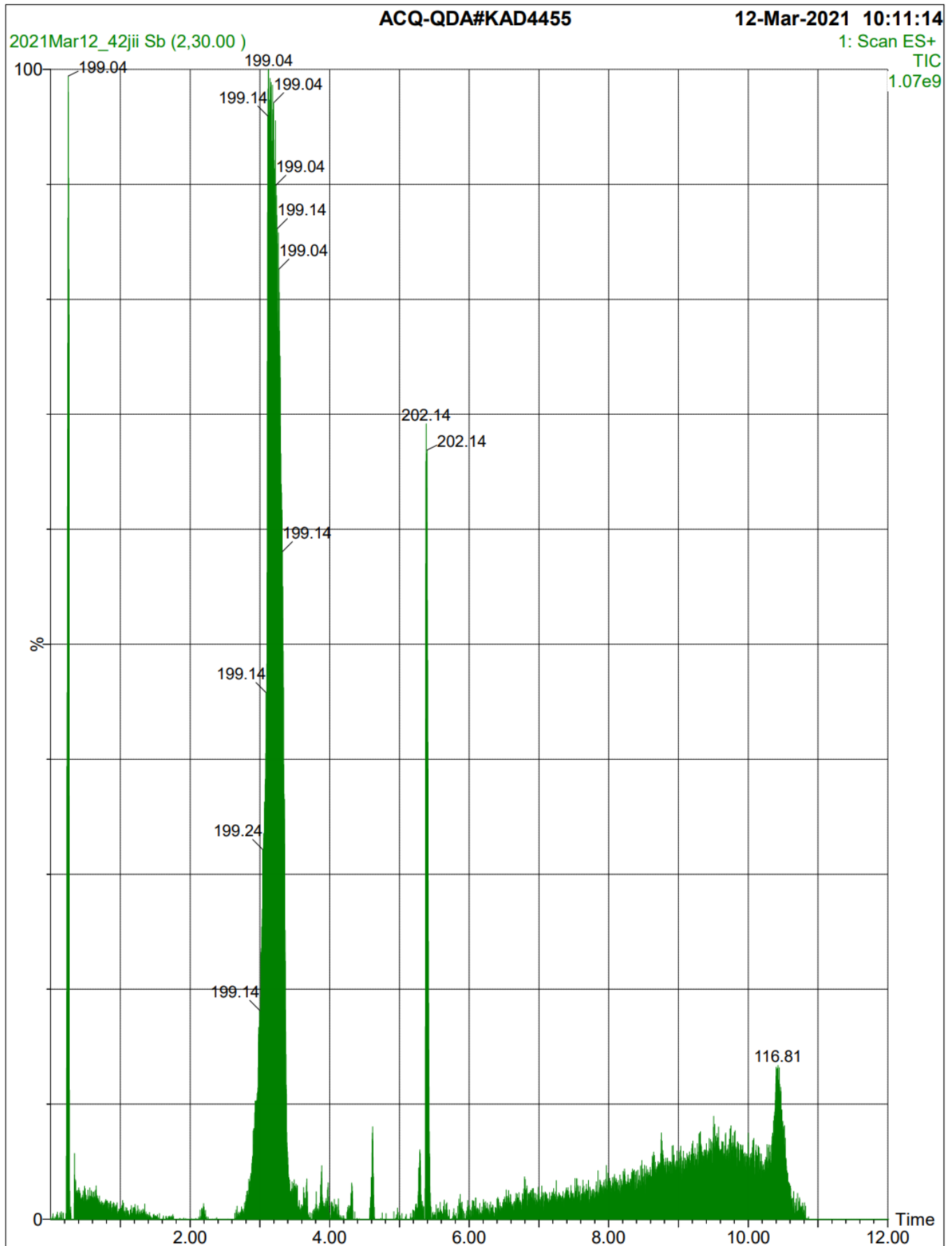
===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 11.80 usec
P2 23.60 usec
PLW1 202.10000610 W

===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG12 waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

F2 - Processing parameters
SI 32768
SF 150.9028895 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

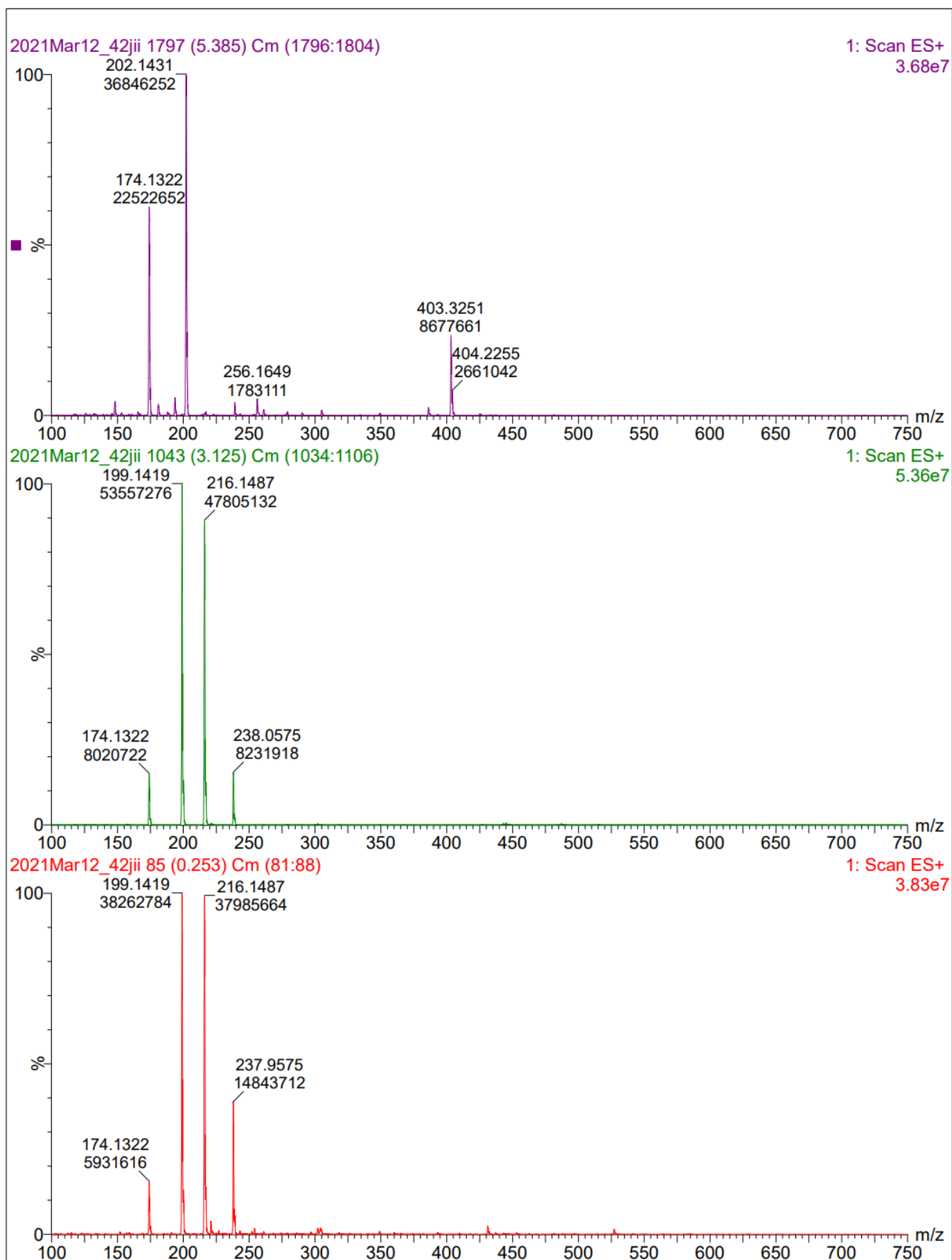
Compound 18c

LC-MS



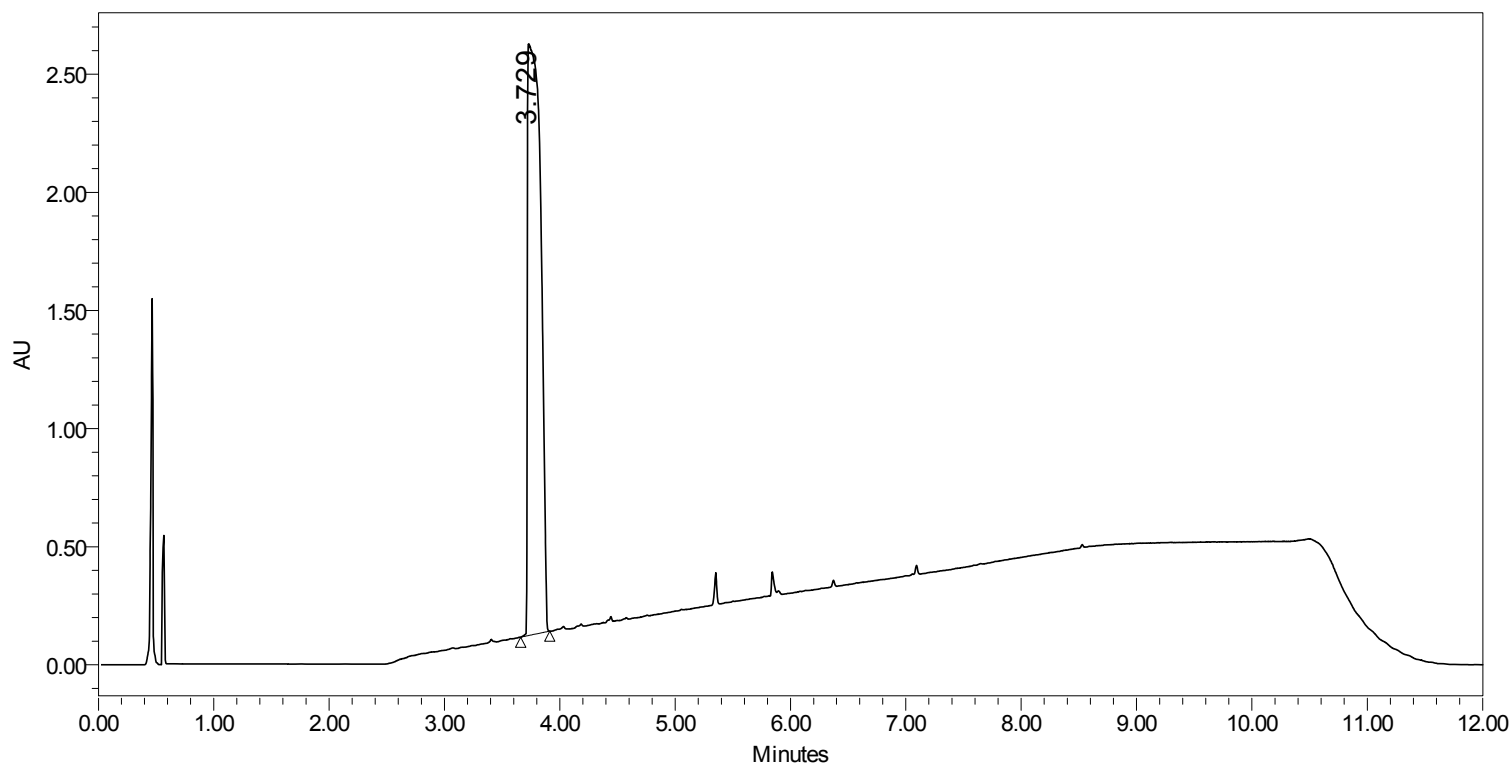
Compound 18c

MS



SAMPLE INFORMATION

Sample Name:	42j_iii	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM210107_42 analogs
Vial:	1:A,5	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0)
Date Acquired:	2/3/2021 12:01:30 PM EST		
Date Processed:	10/6/2022 8:15:52 AM EDT		



	RT	Area	% Area	Height
1	3.729	19637019	100.00	2504119

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		3.729	4.102	5.813			

Compound 2

CMM-42a-pure-in DMSO



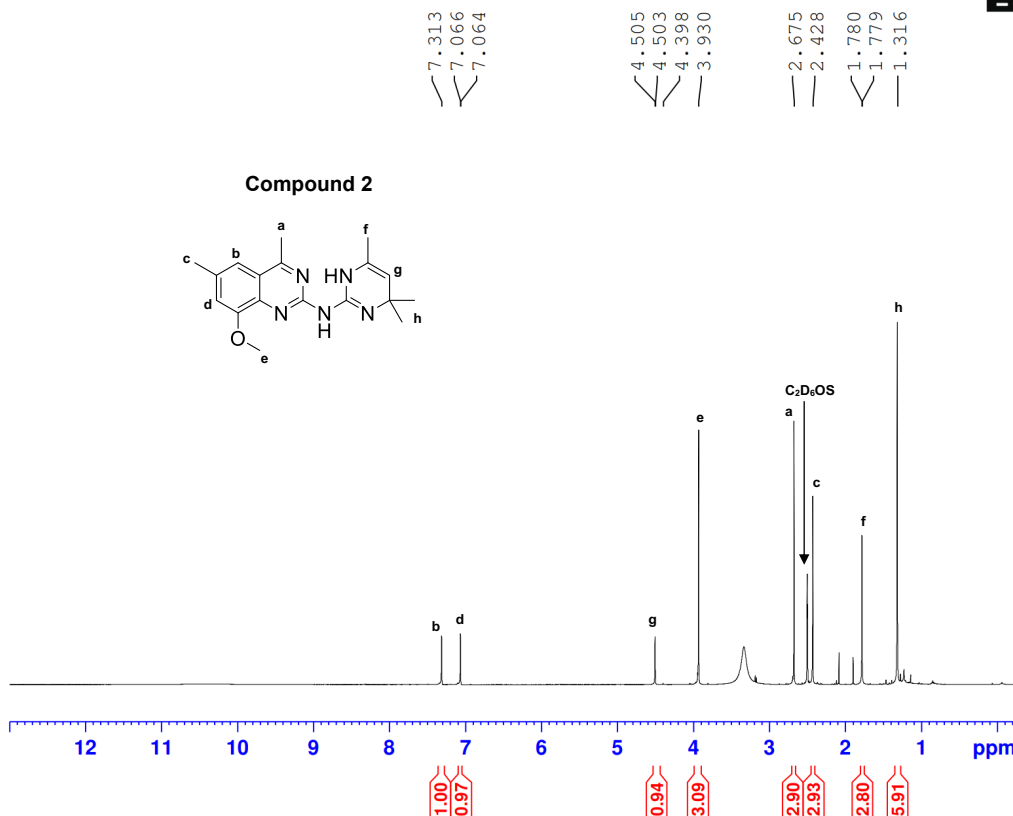
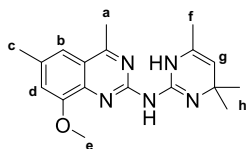
Current Data Parameters
NAME CMM-42a-pure-in DMSO
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220218
Time 10.18
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 16
DS 2
SWH 8417.509 Hz
FIDRES 0.128441 Hz
AQ 3.8928385 sec
RG 161
DW 59.400 usec
DE 6.50 usec
TE 300.3 K
D1 1.0000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 7.90 usec
PLW1 13.69999981 W

F2 - Processing parameters
SI 65536
SF 600.1300050 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

Compound 2



CMM-42a-pure-in DMSO



Current Data Parameters
NAME CMM-42a-pure-in DMSO
EXPNO 3
PROCNO 1

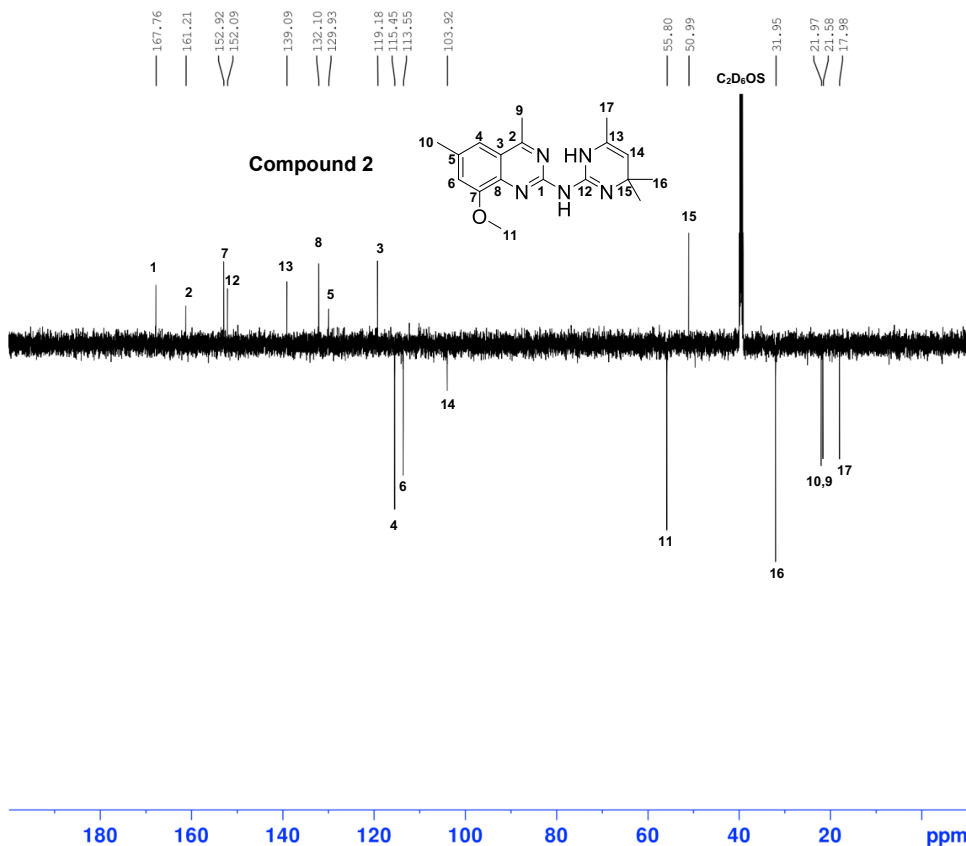
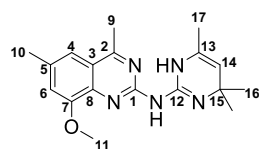
F2 - Acquisition Parameters
Date_ 20220218
Time 11.31
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 1402
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.4 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.0000000 sec
D20 0.00689655 sec
TD0 1

===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 11.80 usec
P2 23.60 usec
PLW1 202.10000610 W

===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG2 waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

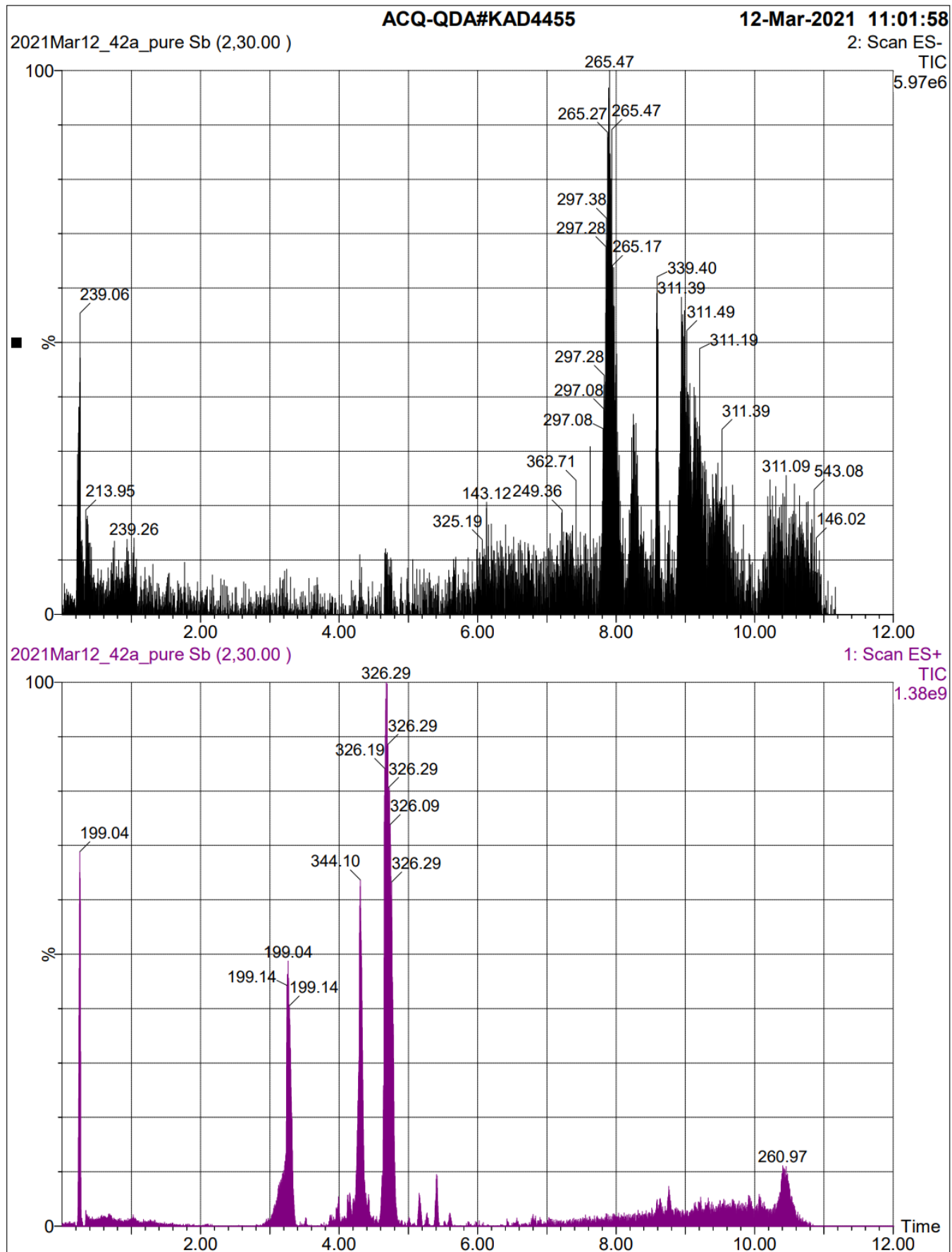
F2 - Processing parameters
SI 32768
SF 150.9028901 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Compound 2



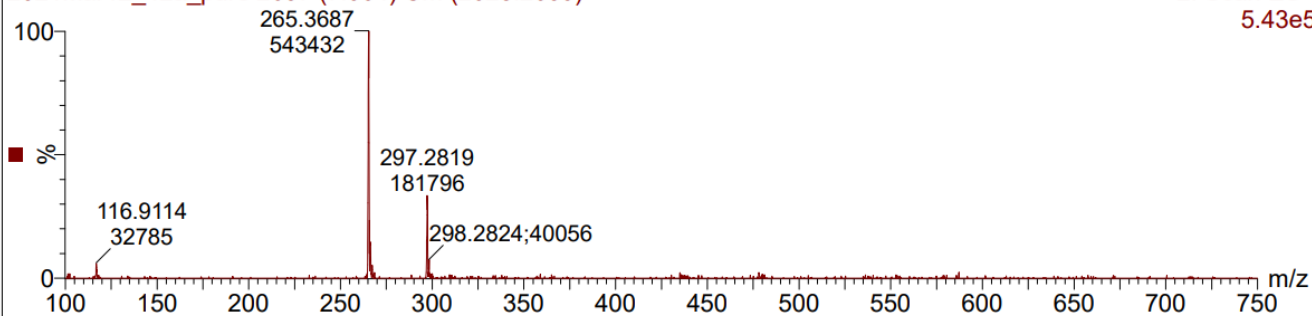
Compound 2

LC-MS

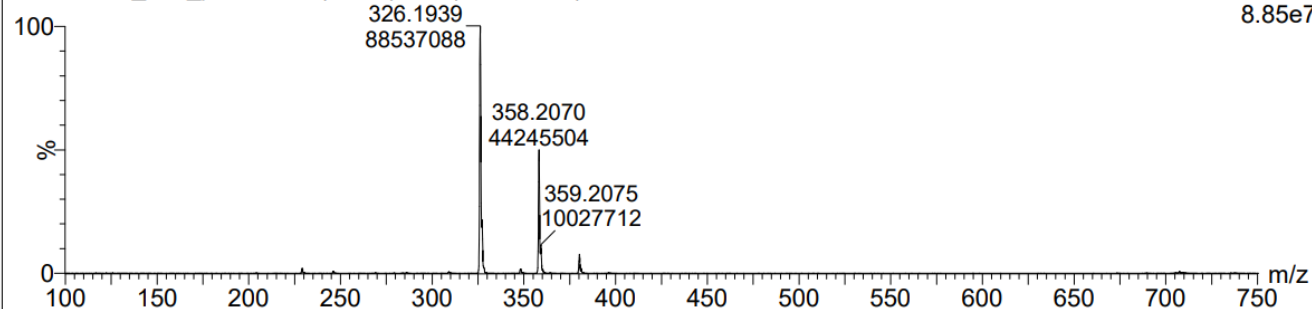


Compound 2

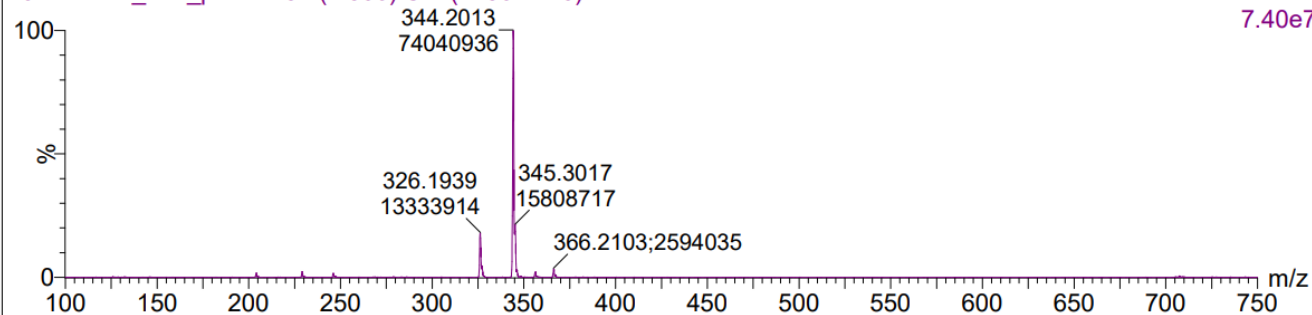
2021Mar12_42a_pure 2637 (7.904) Cm (2628:2639)

2: Scan ES-
5.43e5

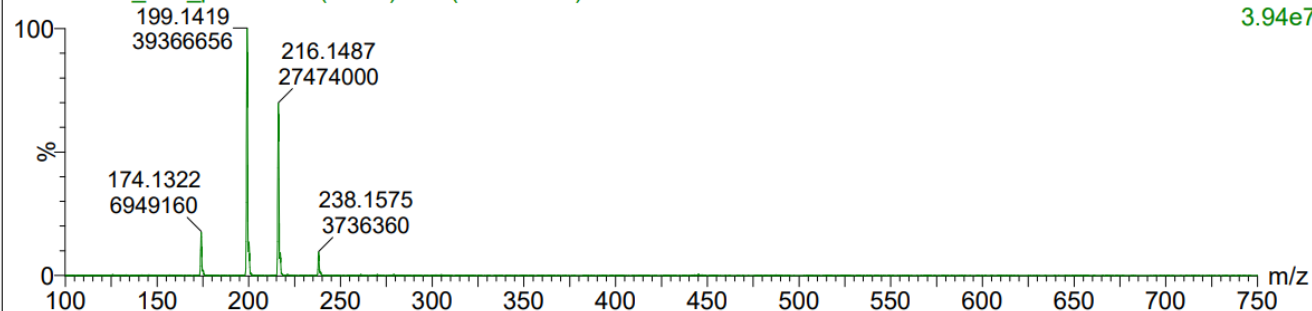
2021Mar12_42a_pure 1561 (4.677) Cm (1560:1567)

1: Scan ES+
8.85e7

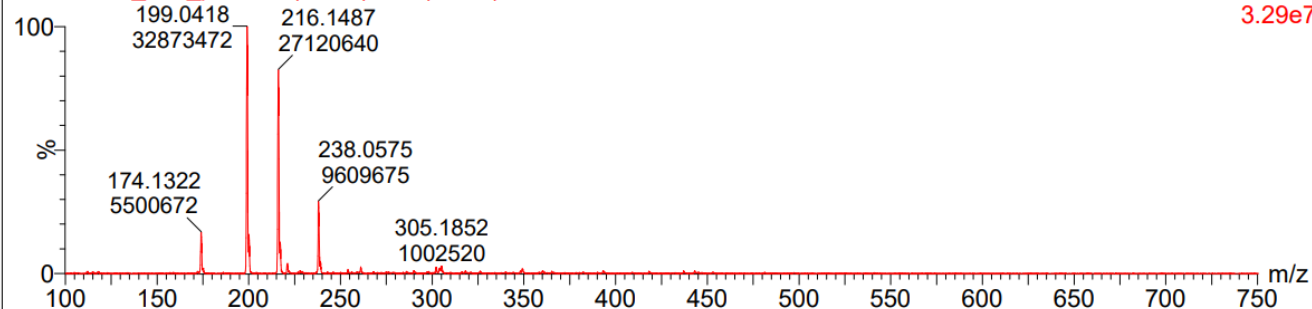
2021Mar12_42a_pure 1437 (4.306) Cm (1436:1440)

1: Scan ES+
7.40e7

2021Mar12_42a_pure 1089 (3.263) Cm (1086:1098)

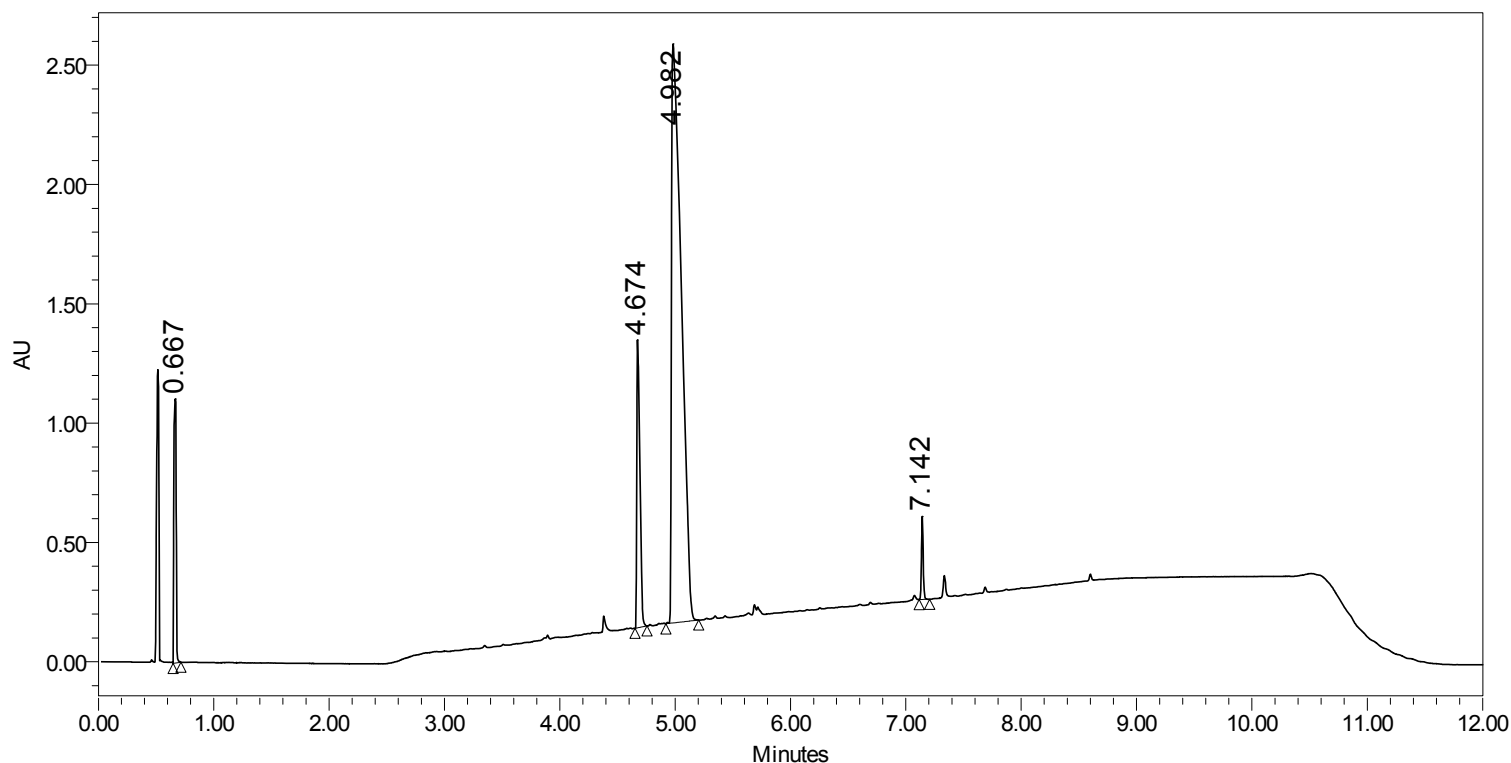
1: Scan ES+
3.94e7

2021Mar12_42a_pure 86 (0.256) Cm (82:87)

1: Scan ES+
3.29e7

SAMPLE INFORMATION

Sample Name:	42a	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM210107_42 analogs
Vial:	1:A,4	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0)
Date Acquired:	3/1/2021 2:11:46 PM EST		
Date Processed:	10/6/2022 8:06:48 AM EDT		



	RT	Area	% Area	Height
1	0.667	1591450	8.57	1107687
2	4.674	2308564	12.43	1206308
3	4.982	14318658	77.07	2426136
4	7.142	359628	1.94	348184

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		0.667	45.991	90.000			

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
2		4.674	1.834	1.373			
3		4.982	1.824	3.177			
4		7.142	13.590	9.673			

Compound 3

CMM-42j-pure-in DMSO-220218



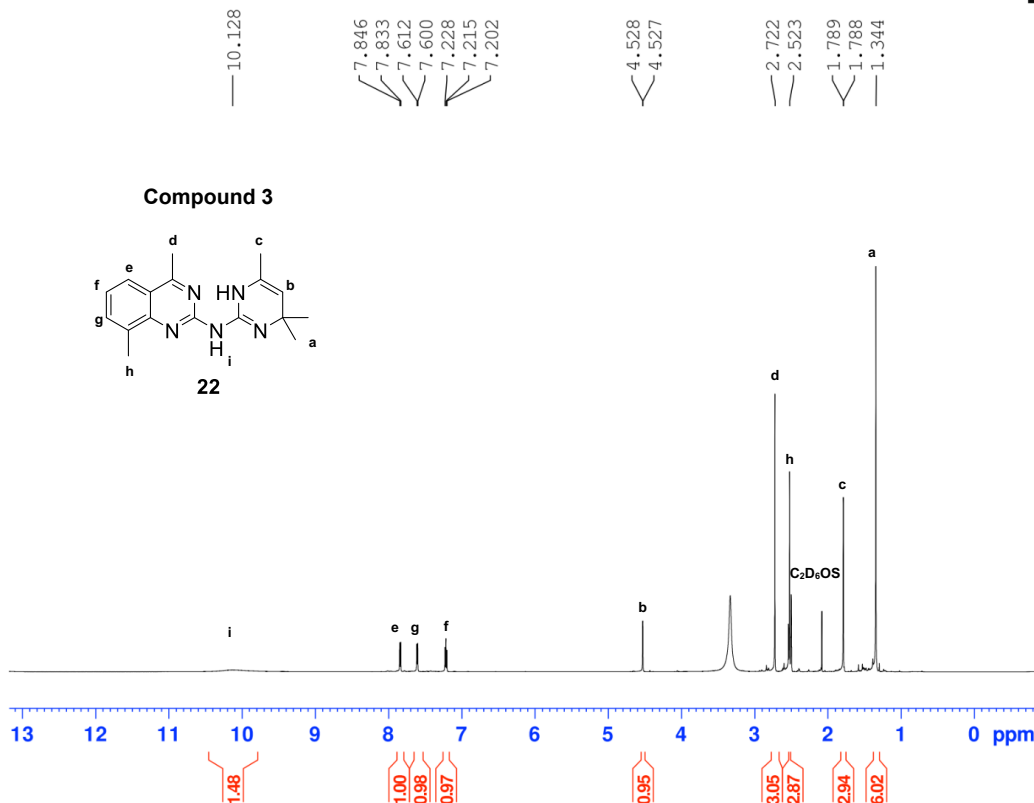
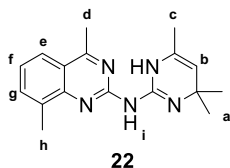
Current Data Parameters
NAME CMM-42j-pure-in DMSO-220218
EXPNO 11
PROCNO 1

F2 - Acquisition Parameters
Date_ 20220218
Time 11.40
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG zg30
TD 65536
SOLVENT DMSO
NS 9
DS 2
SWH 8417.509 Hz
FIDRES 0.128441 Hz
AQ 3.892895 sec
RG 114
DW 59.400 usec
DE 6.50 usec
TE 300.6 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 9.42 usec
PLW1 13.69999981 W

F2 - Processing parameters
SI 5536
SF 600.1300050 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

Compound 3



CMM-42j-pure-in DMSO-220218



Current Data Parameters
NAME CMM-42j-pure-in DMSO-220218
EXPNO 33
PROCNO 1

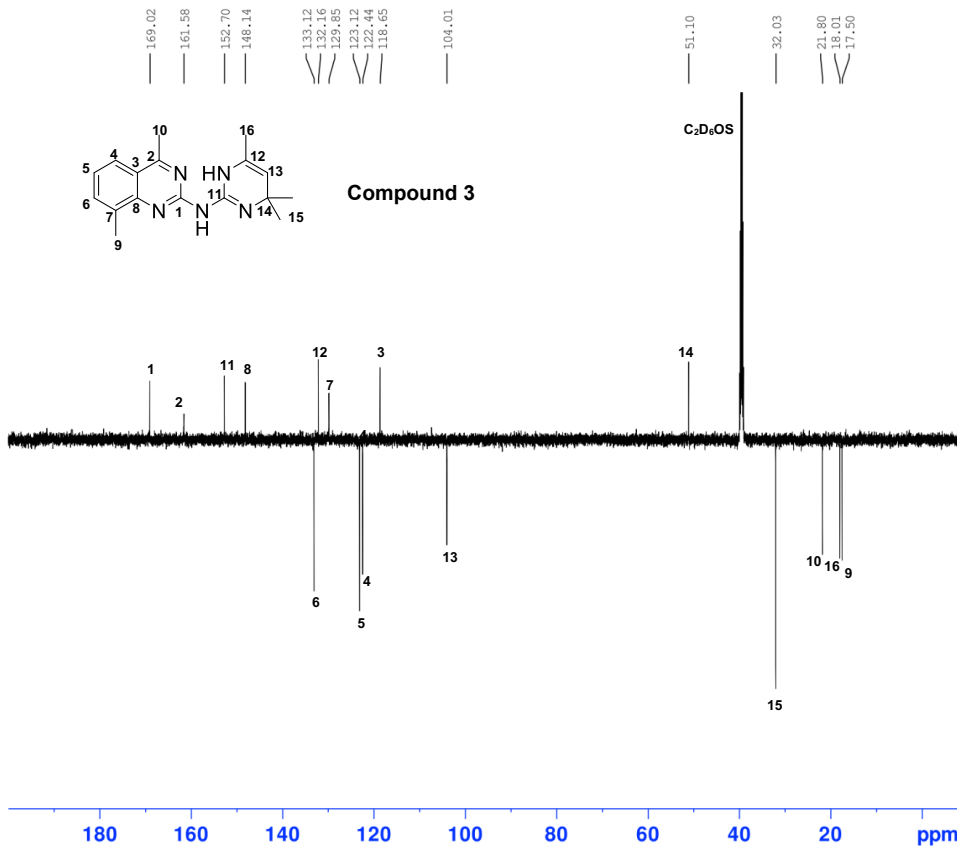
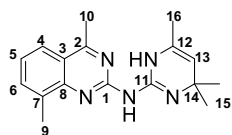
F2 - Acquisition Parameters
Date_ 20220218
Time 13.31
INSTRUM spect
PROBHD 5 mm PATXI 1H/
PULPROG jmod
TD 65536
SOLVENT DMSO
NS 2224
DS 4
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 301.3 K
CNST2 145.0000000
CNST11 1.0000000
D1 2.00000000 sec
D20 0.00689655 sec
TD0 1

===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 11.80 usec
PLW1 202.10000610 W

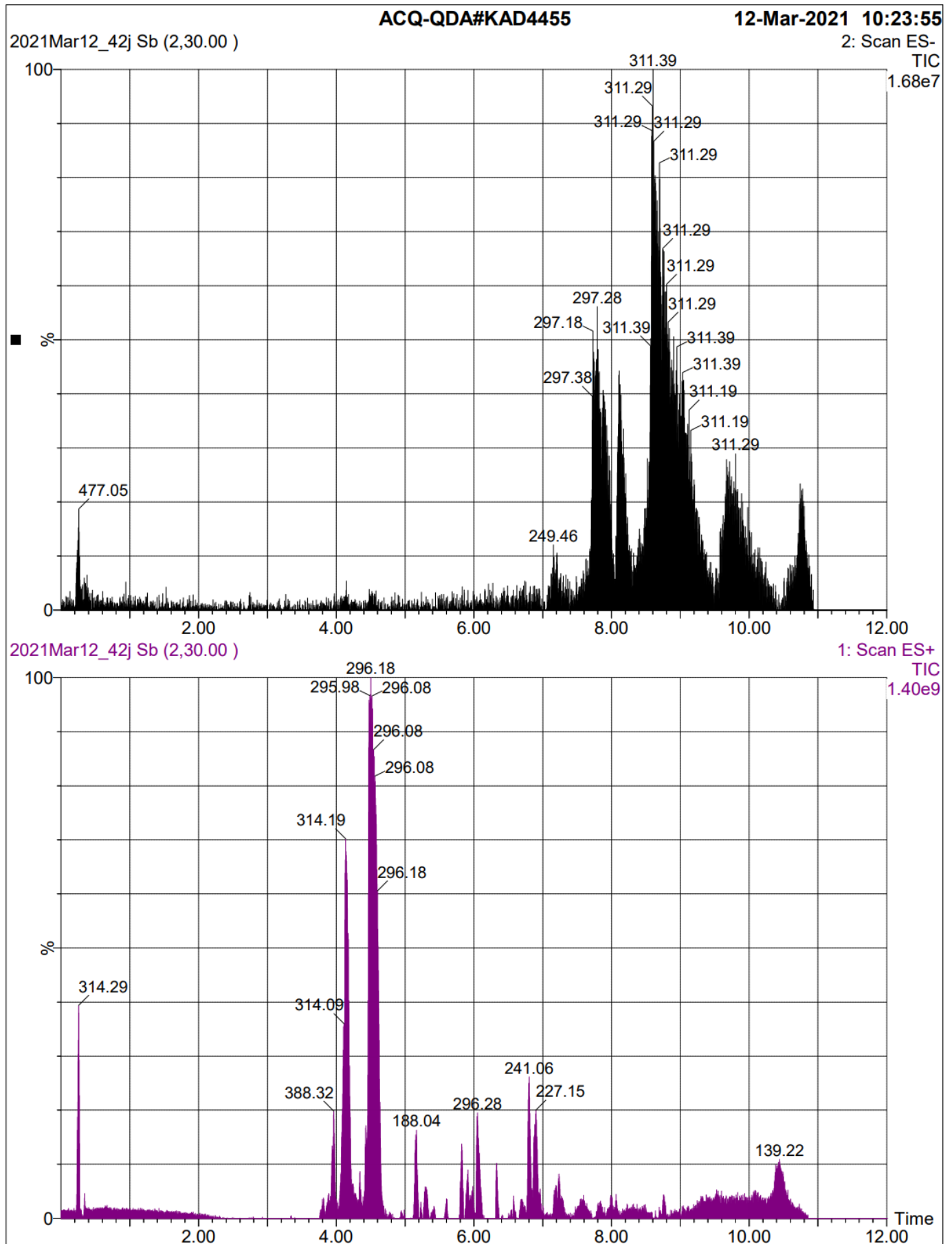
===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPOPRG2 waltz16
PCPD2 70.00 usec
PLW2 13.69999981 W
PLW12 0.17449000 W

F2 - Processing parameters
SI 32768
SF 150.9028907 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Compound 3

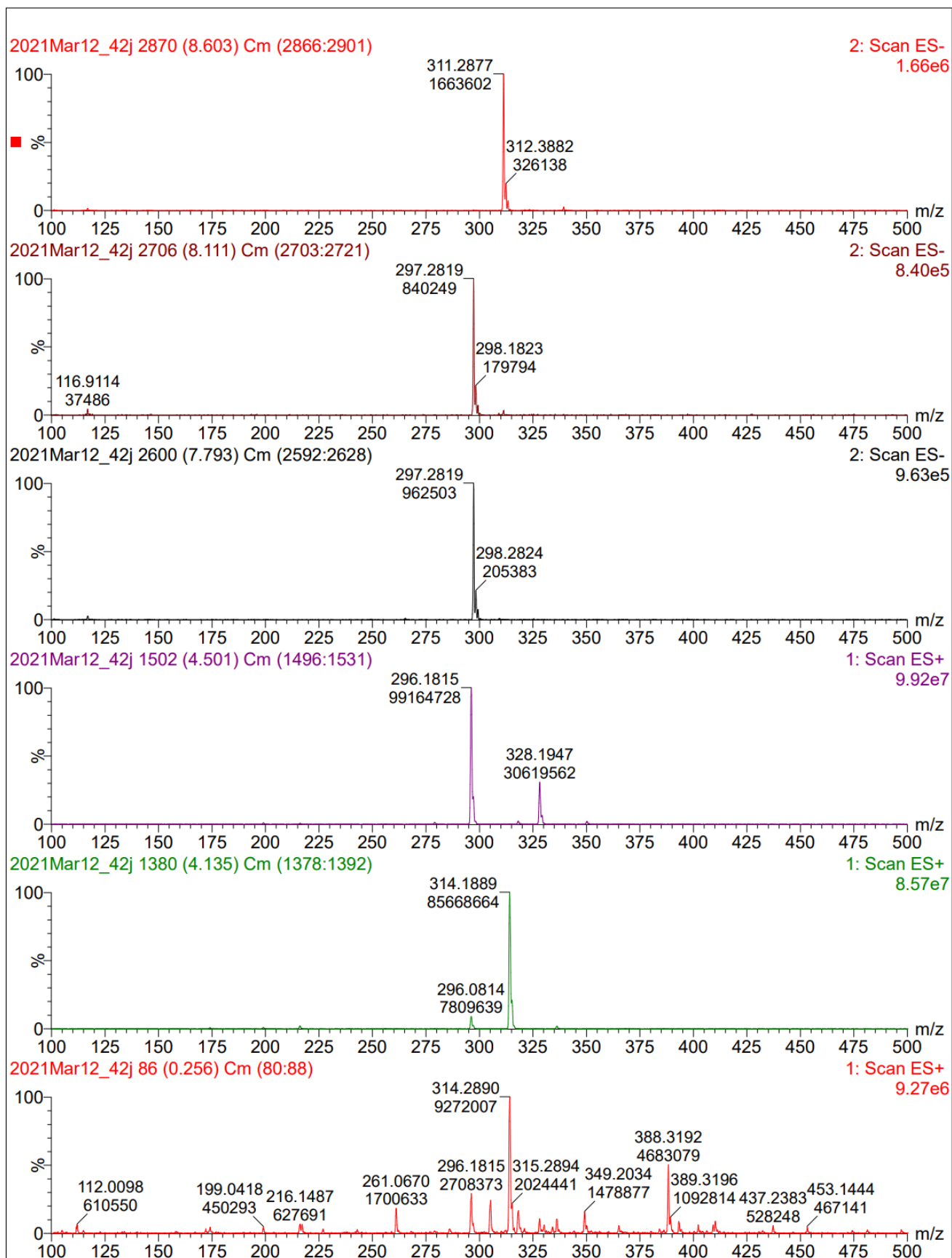


LC-MS



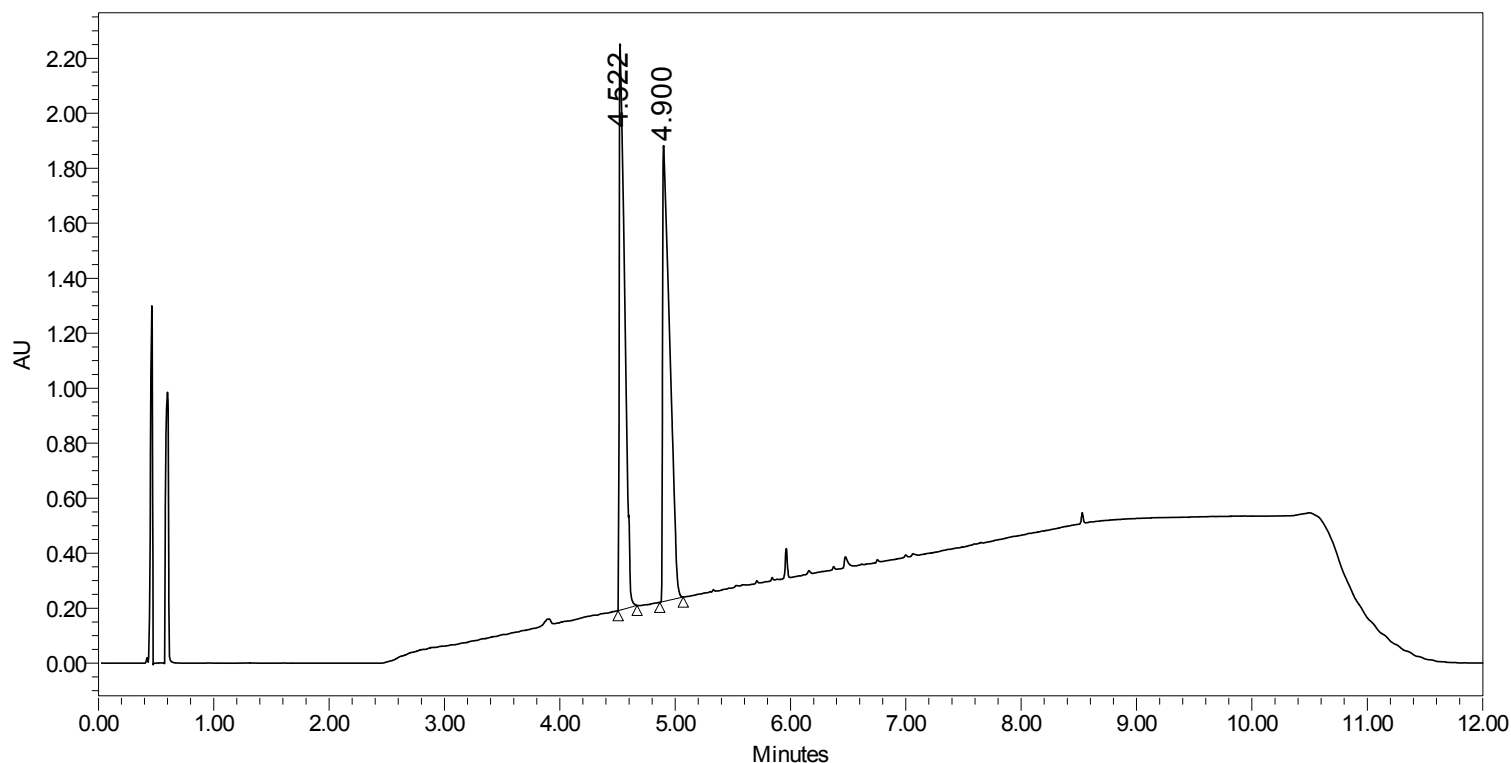
Compound 3

MS



SAMPLE INFORMATION

Sample Name:	42j	Acquired By:	System
Sample Type:	Unknown	Sample Set Name	CMM210107_42 analogs
Vial:	1:A,4	Acq. Method Set:	Default
Injection #:	1	Processing Method	Default
Injection Volume:	5.00 ul	Channel Name:	PDA Max Plot 190.0 - 800.0
Run Time:	12.0 Minutes	Proc. Chnl. Descr.:	PDA MaxPlot (190.0 nm to 800.0)
Date Acquired: 2/4/2021 11:26:35 AM EST			
Date Processed: 10/6/2022 8:10:59 AM EDT			



	RT	Area	% Area	Height
1	4.522	6715472	48.67	2060098
2	4.900	7081426	51.33	1658818

PDA Result Table

	Name	RT	Purity1 Angle	Purity1 Threshold	Match1 Spect. Name	Match1 Angle	Match1 Threshold
1		4.522	2.517	2.091			
2		4.900	1.135	1.025			