

Supplementary Material

Reduction Chemistry of Natural Pyrethrins and Preliminary Insecticidal Activity of Reduced Pyrethrins

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4R-(4a) NMR Characterisation



6.759
6.731
6.087
6.069
6.050
5.425
5.409
5.362
5.356
5.350
5.345
5.250
5.222
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4.900
4.887
4.495
3.145
3.131
3.065
3.053
2.795
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2.771
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2.043
2.031
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1.120

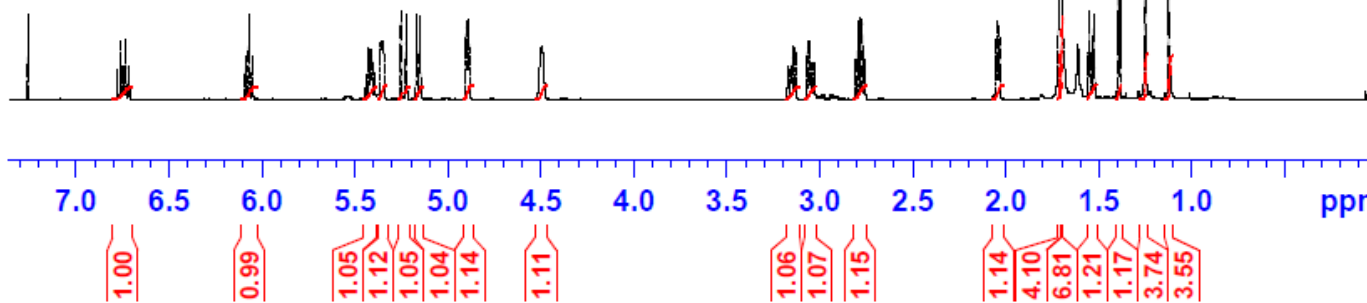
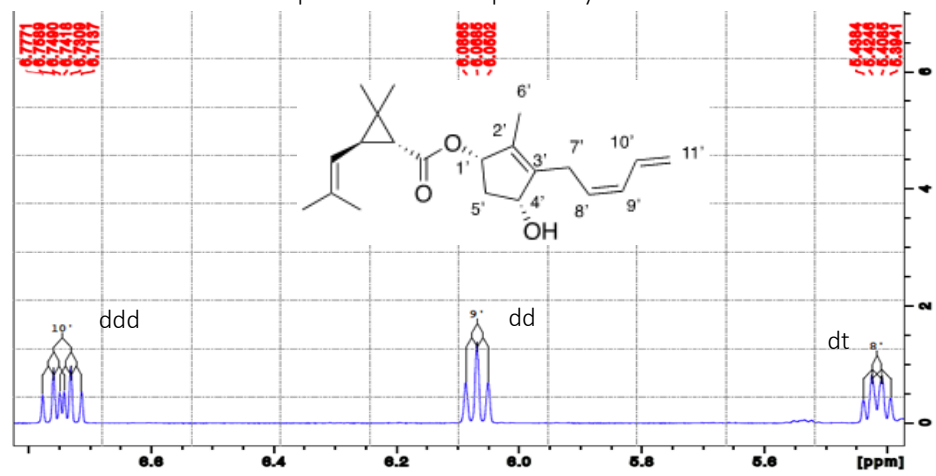
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PROCNO    1

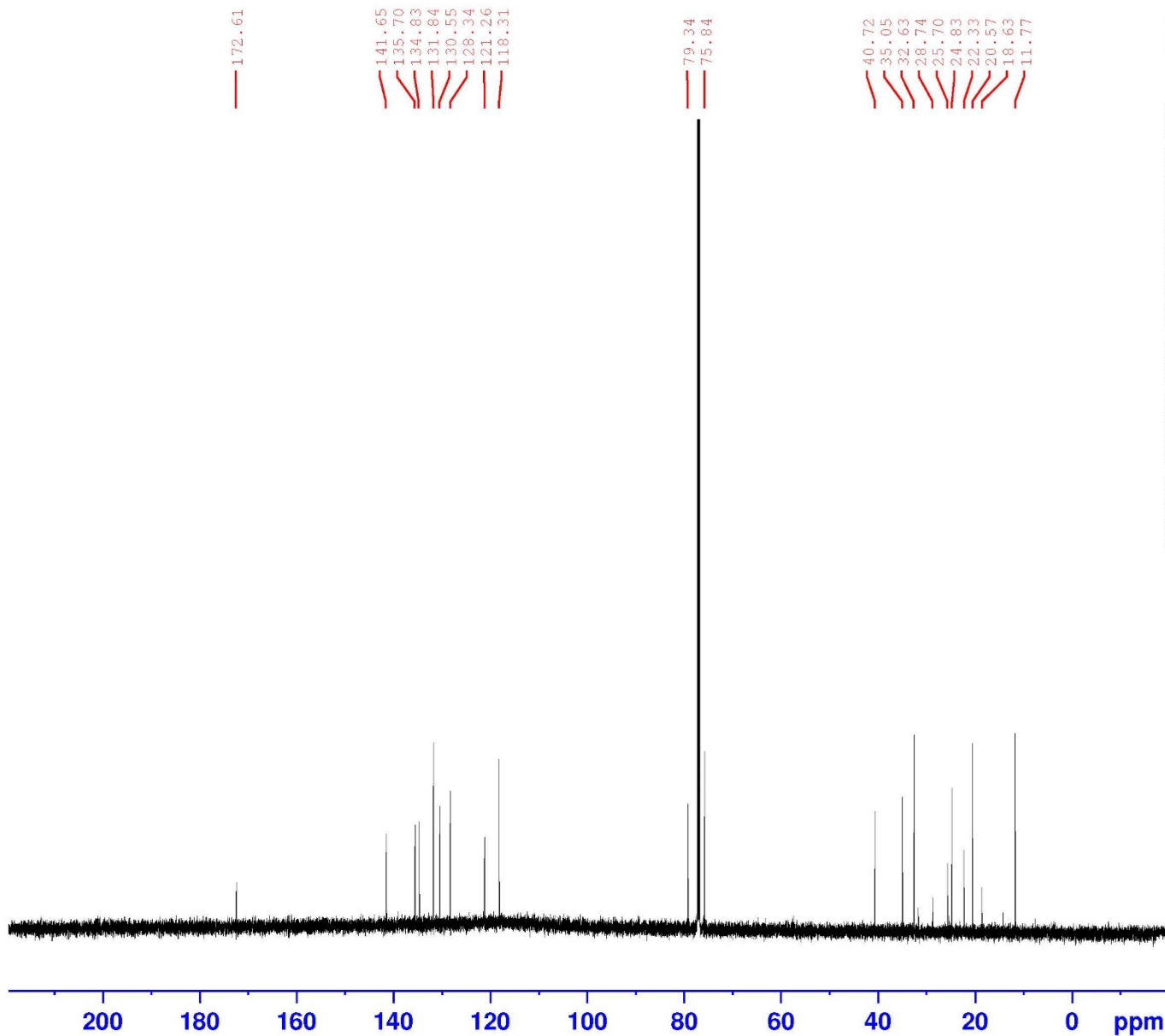
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FIDRES    0.183399 Hz
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RG         80.6
DW         41.600 usec
DE         6.50 usec
TE         298.2 K
D1         1.00000000 sec
TD0        1

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NUC1       1H
P1         8.40 usec
PLW1      12.55000019 W

F2 - Processing parameters
SI         65536
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WDW        no
SSB        0
LB         0 Hz
GB         0
PC         1.00
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Representative multiplet analysis





Current Data Parameters
 NAME 20190118 Pyrethrin I Alcohol Major diastereomer
 EXPR0 12
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190113
 Time 23.30
 INSTRUM spect
 PROBHD 5 mm PABBI H17
 PULPROG zgpg30
 TD 6536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1620
 PC 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 ID0 1

----- CHANNEL f1 -----
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

----- CHANNEL f2 -----
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG2 waltz16
 PCPD2 70.00 usec
 PLW2 13.5500019 W
 PLW12 0.1807300 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027905 MHz
 NQR no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40



Current Data Parameters
NAME 20190118 Pyrethrin 1 Alcohol Major diastereomer
EXPNO 11
PROCNO 1

F2 - Acquisition Parameters
Date_ 20190119
Time 20.13
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG cosygmphpp
TD 2048
SOLVENT cnc13
NS 10
DS 4
SWH 4504.504 Hz
FIDRES 2.199463 Hz
AQ 0.2273280 sec
RG 2050
DM 111.000 usac
DE 6.50 usac
TE 298.2 K
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D11 0.03000000 sec
D12 0.00002000 sec
D16 0.00020000 sec
RG 0.00022000 sec

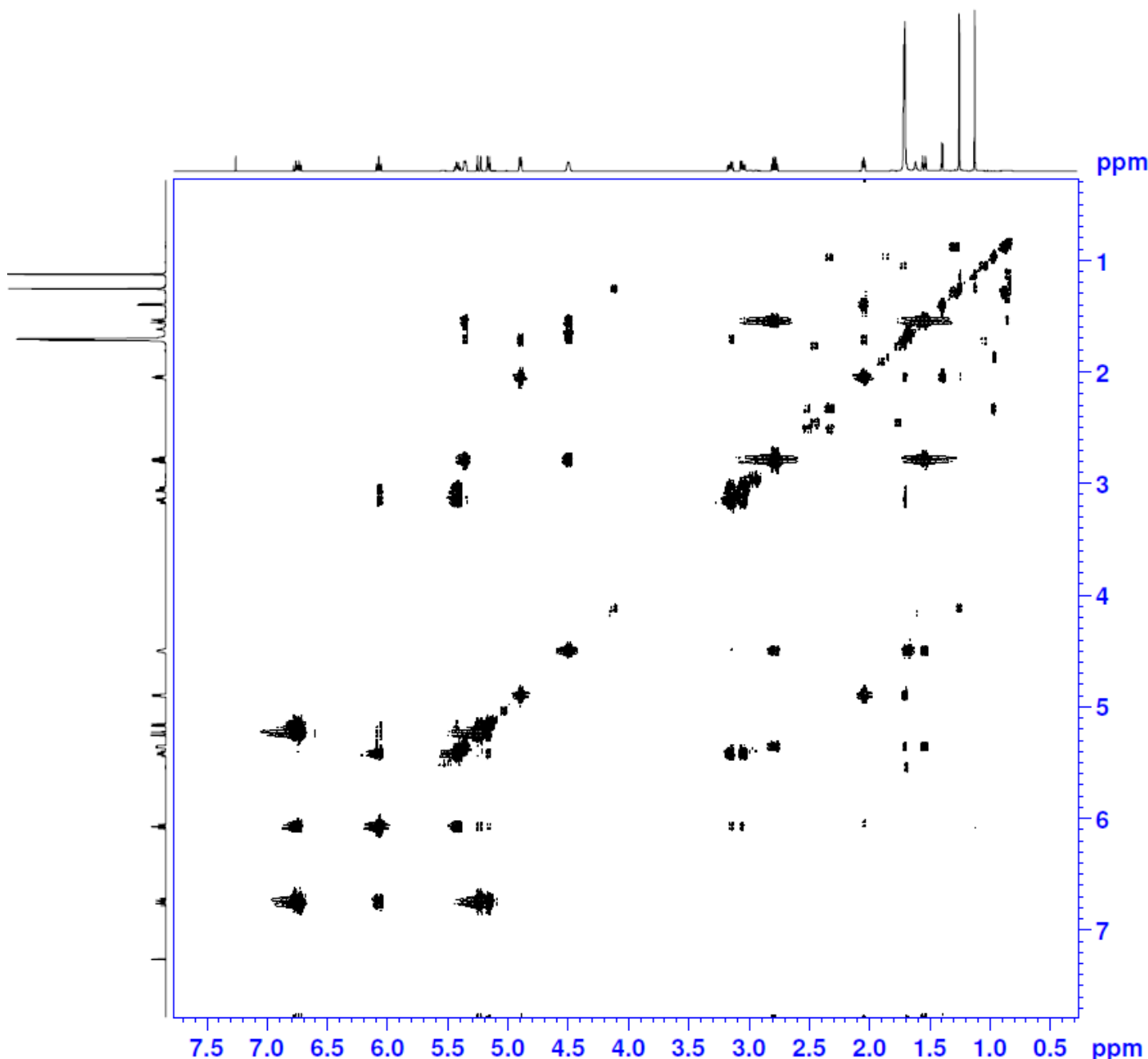
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NUC1 1H
P1 8.40 usac
P2 16.80 usac
P17 2500.00 usac
PWR1 12.55000019 W
PWR2 1.30999994 W

GRADIENT CHANNEL
GPRAM[1] SMOG10.100
GPRAM[2] SMOG10.100
GPE1 10.00 Hz
GPE2 20.00 Hz
P16 1000.00 usac

F1 - Acquisition parameters
TD 256
SFO1 600.1324 MHz
FIDRES 17.595720 Hz
SW 7.506 ppm
F0MODE States-TFF1

F2 - Processing parameters
SI 1024
SF 600.1300294 MHz
WDW QWINE
SSB 2
LB 0 Hz
GB 0
PC 1.40

F1 - Processing parameters
SI 1024
MC2 States-TFF1
SF 600.1300214 MHz
WDW QWINE
SSB 2
LB 0 Hz
GB 0



ppm

ppm

Current Data Parameters
 NAME 20190118 Pyrethrin I Alcohol Major diastereomer
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190119
 Time 23.35
 INSTRUM spect
 PROBRD 5 mm PABBI 1H/
 PULPROG hzgqetgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4629.629 Hz
 FIDRES 4.521122 Hz
 AQ 0.1105920 sec
 RG 2050
 DM 108.000 usec
 DE 6.50 usec
 TE 298.3 K
 CHST2 145.000000
 D0 0.0000300 sec
 D1 1.45494401 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 IN0 0.00020000 sec
 EPGPFGS

CHANNEL F1
 SFO1 600.1324577 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 P1M1 12.55000019 W

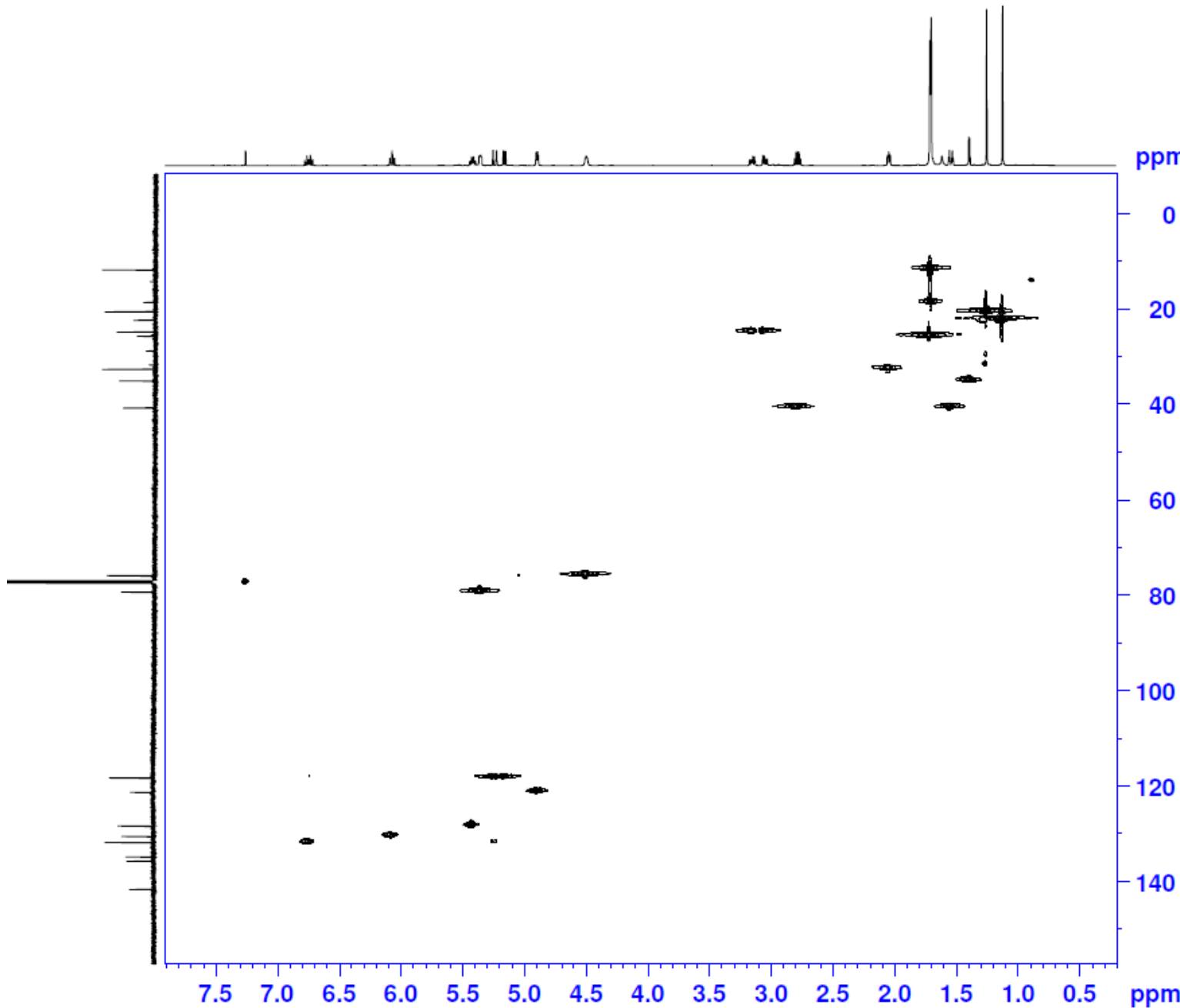
CHANNEL F2
 SFO2 150.9140636 MHz
 NUC2 13C
 CPDPRG2 garp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 P1M2 110.76000214 W
 P1M12 7.87610006 W

GRADIENT CHANNEL
 G1MAM[1] SMSQ10.100
 G1MAM[2] SMSQ10.100
 GP11 80.00 s
 GP22 20.10 s
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 145.657 ppm
 P1M28 Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300245 MHz
 WDM QZINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028261 MHz
 WDM QZINE
 SSB 2
 LB 0 Hz
 GB 0



ppm

0

20

40

60

80

100

120

140

7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm

Current Data Parameters
 NAME 20190122 Pyrethrin I Alcohol MAJOR
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190122
 Time 9.11
 INSTRUM spect
 PROBHID 5 mm PABBI 1H/
 PULPROG noesygpph
 ID 4096
 SOLVENT cdc13
 NS 2
 DS 16
 SWH 5411.255 Hz
 FIDRES 1.321107 Hz
 AQ 0.3784704 sec
 RG 203
 DW 92.400 usec
 DE 8.50 usec
 TE 298.2 K
 D0 0.00008170 sec
 D1 3.00000000 sec
 D8 0.60000002 sec
 D16 0.00020000 sec
 INU 0.00018480 sec

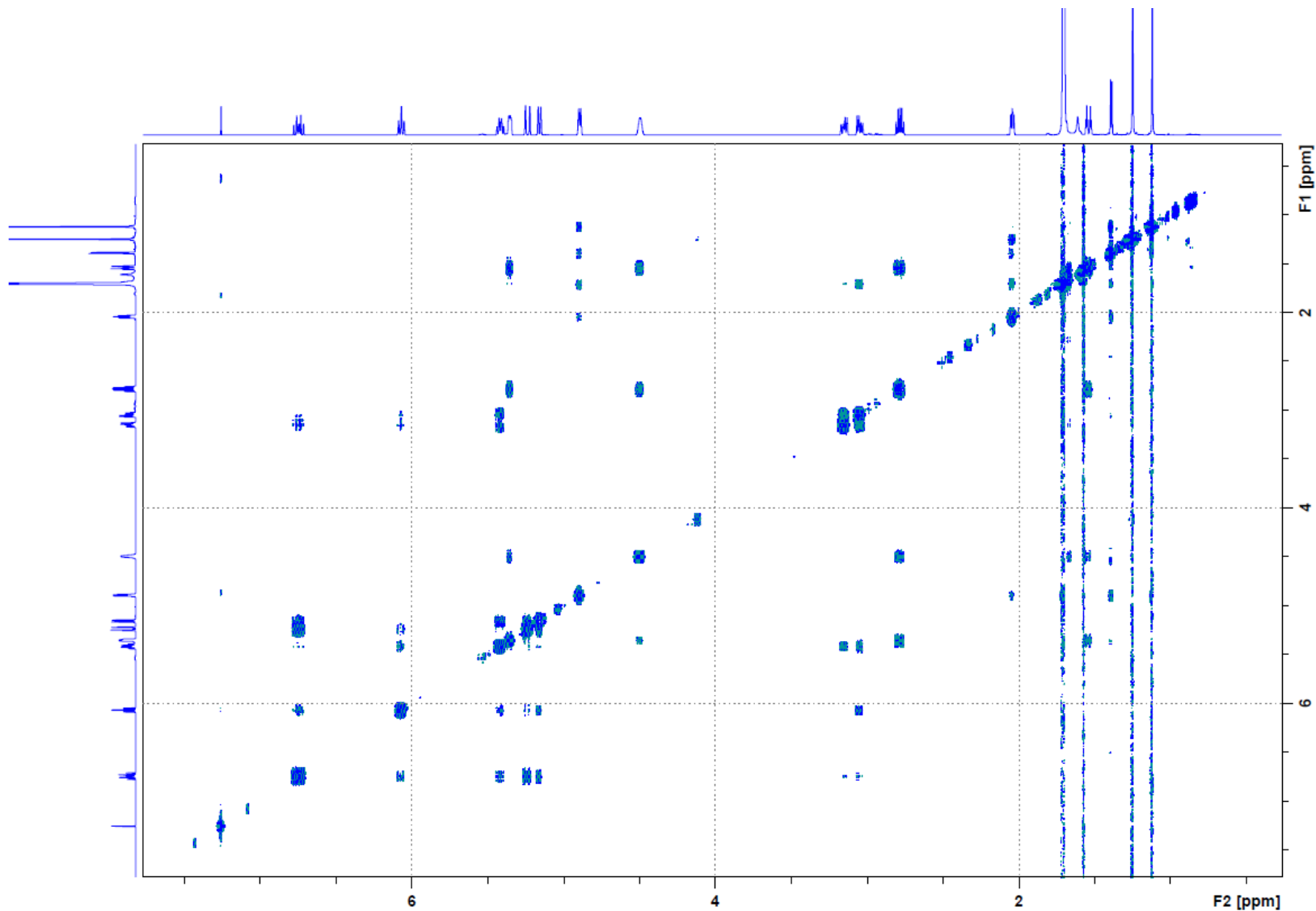
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 SFO1 600.1323960 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P1M1 12.55000019 W

==== GRADIENT CHANNEL ====
 GPNAM[1] SMSq10.100
 GPZ1 40.00 %
 P16 1000.00 usec

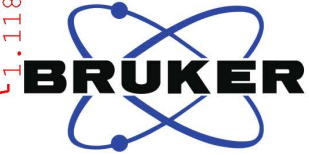
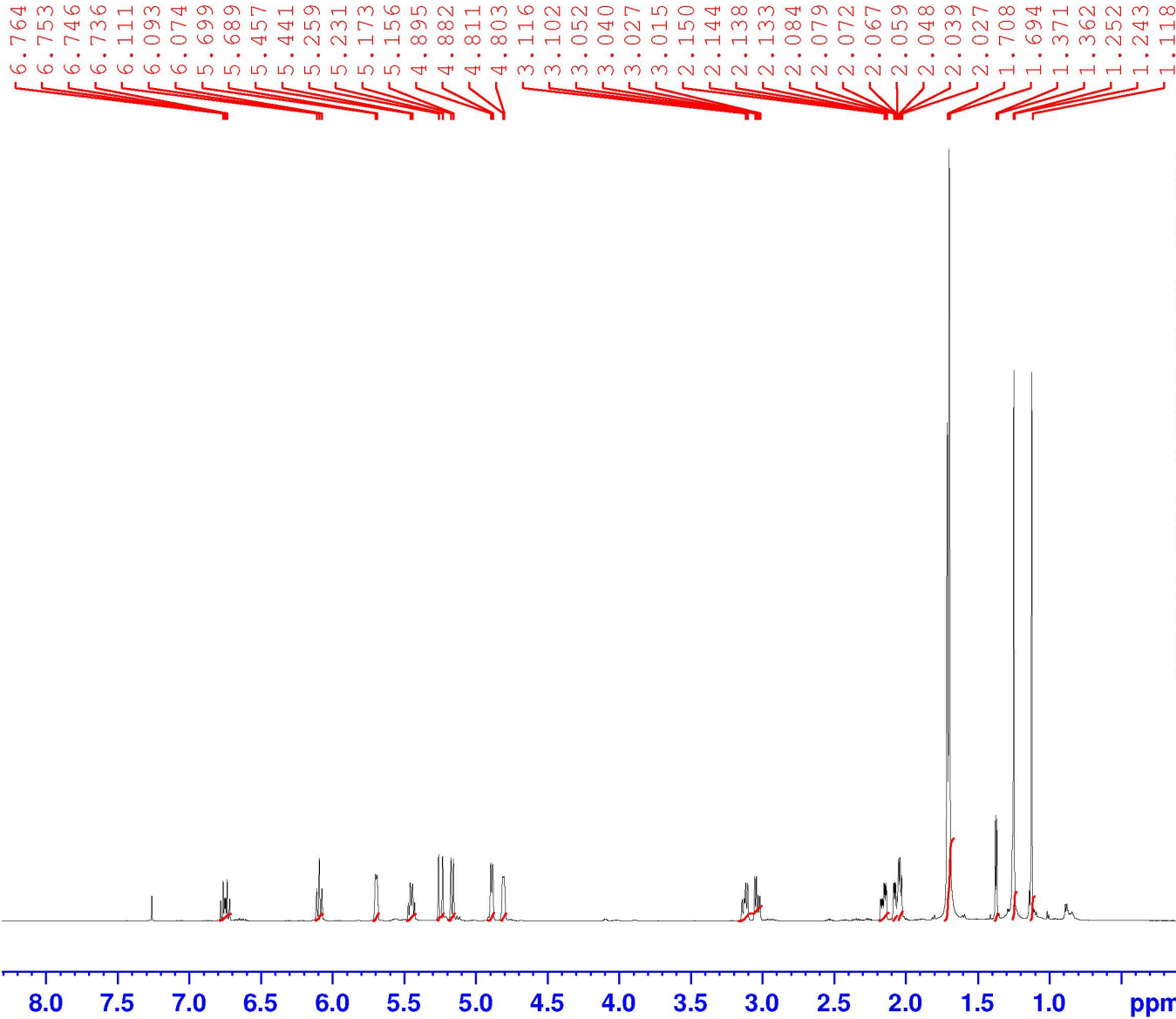
F1 - Acquisition parameters
 TD 472
 SFO1 600.1324 MHz
 FIDRES 11.464524 Hz
 SW 9.017 ppm
 FvMODE States-IPPI

F2 - Processing parameters
 SI 4096
 SF 600.1300254 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00

F1 - Processing parameters
 SI 1024
 MC2 States-IPPI
 SF 600.1300234 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0



4S-(4a) NMR Characterisation



Current Data Parameters
 NAME 20190123 Pyrethrin I OH MINOR
 EXPNO 20
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190123
 Time 18.09
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 32
 DW 41.600 usec
 DE 6.50 usec
 TE 298.2 K
 D1 1.00000000 sec
 TDO 1

==== CHANNEL f1 =====
 SFO1 600.1337060 MHz
 NUC1 1H
 P1 8.40 usec
 PLW1 12.55000019 W

F2 - Processing parameters
 SI 65536
 SF 600.1300240 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



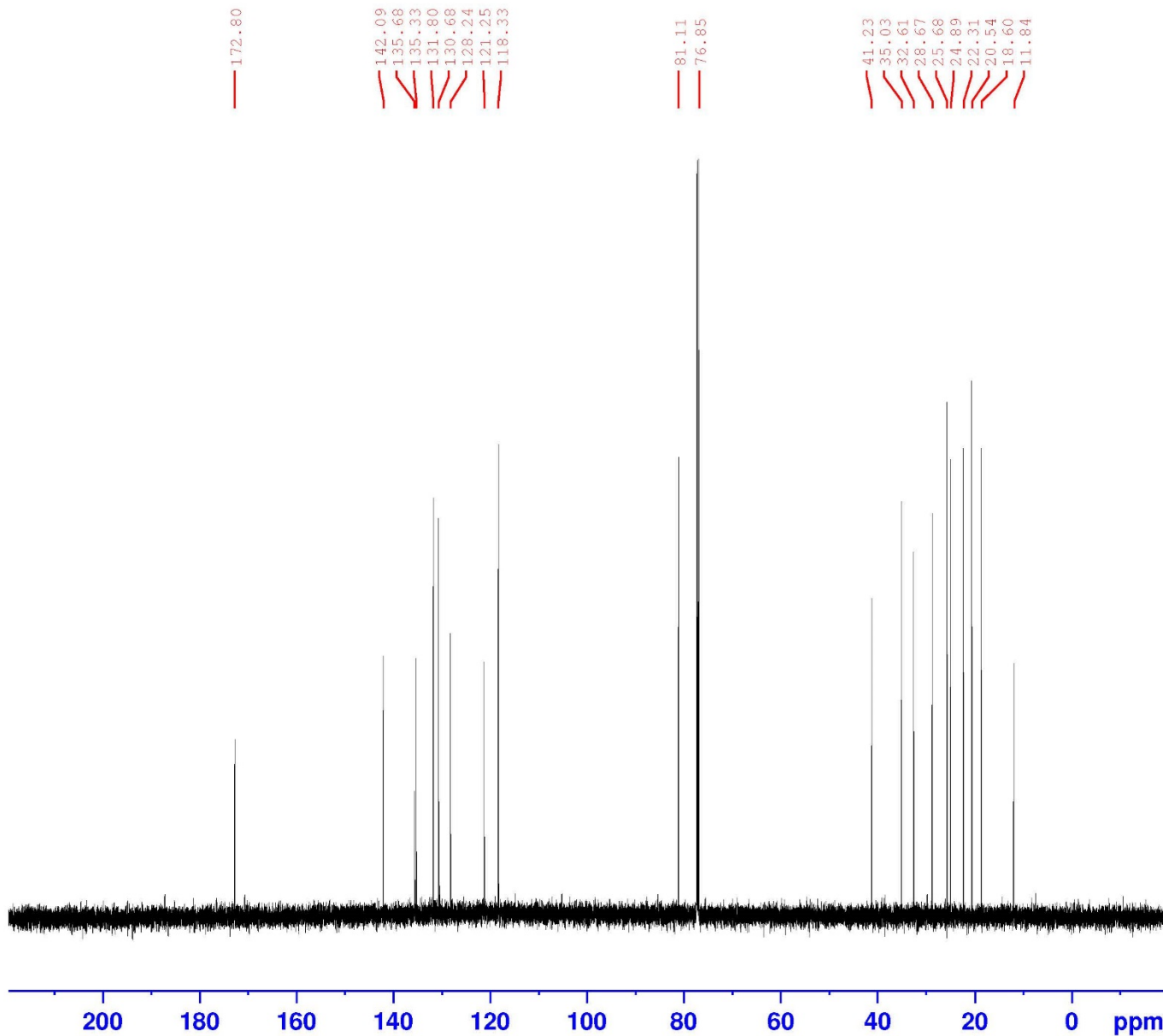
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 NAME 20190122 Pyrethrin I OH MINOR
 EXPNO 10
 PROCNO 1

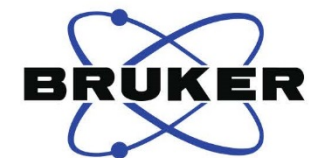
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 Date_ 20190122
 Time 16.43
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 PROBHD 5 mm PABBI 1H/7
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1440
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TDO 1

----- CHANNEL f1 -----
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

----- CHANNEL f2 -----
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 12.55000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027917 MHz
 WDW no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20190118 Pyrethrin I Alcohol Minor diastereomer
 EXPR0 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190120
 Time 7.29
 INSTRUM spect
 F2QSHD 5 mm PABBI HLT
 PULPROG cosygpm1p3pp
 TD 2048
 SOLVENT CDCl3
 NS 20
 DS 4
 SWH 4716.961 Hz
 FIDRES 2.303213 Hz
 AQ 0.2170880 sec
 RG 2050
 DW 106.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.0009530 sec
 D1 1.32135704 sec
 D11 0.03000000 sec
 D12 0.00020000 sec
 D16 0.00020000 sec
 INO 0.00021200 sec

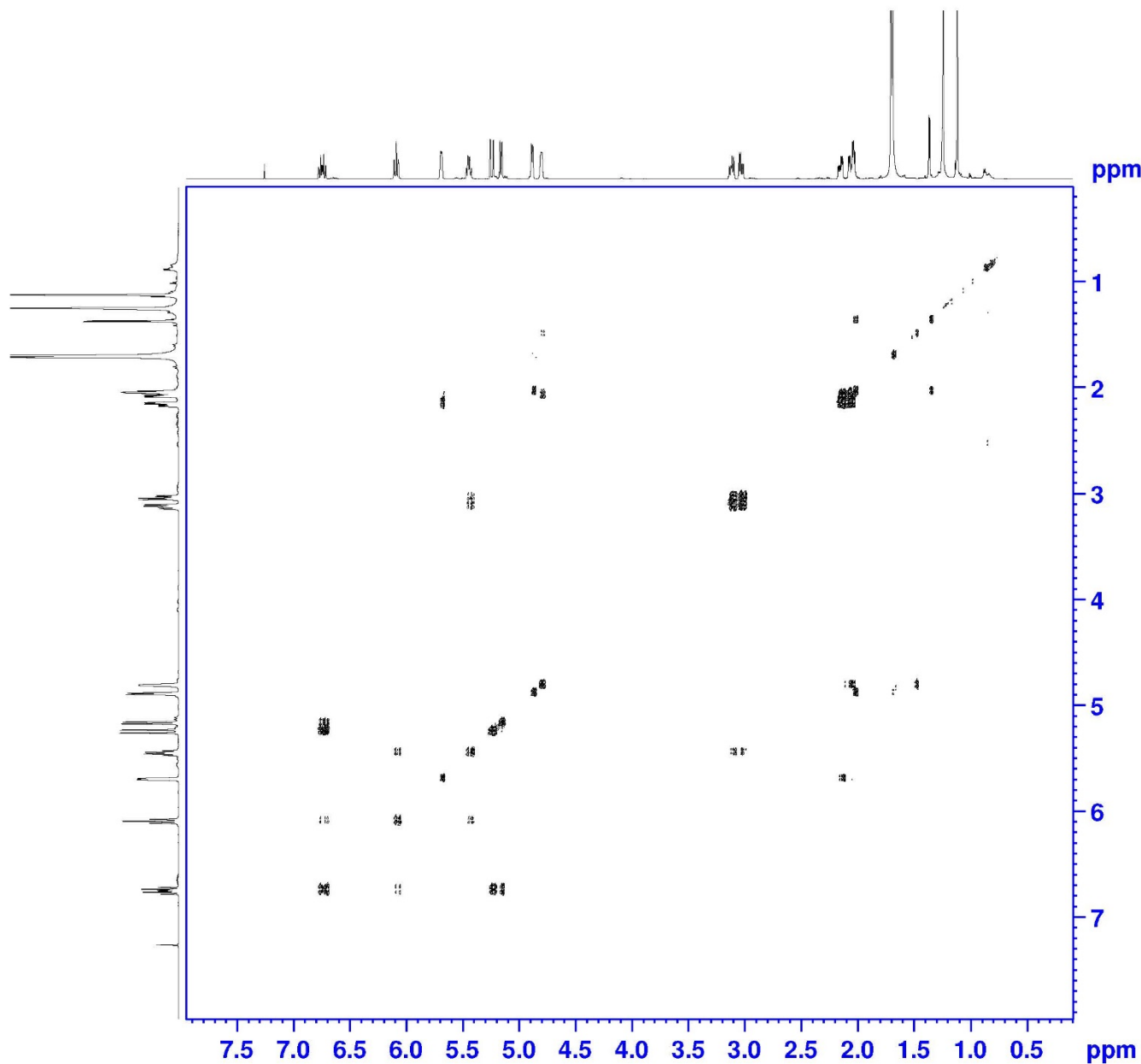
===== CHANNEL f1 =====
 SF01 600.1324547 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GPM1(1) SMSQ10.100
 GPM1(2) SMSQ10.100
 GS1 10.00 %
 GS2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SF01 600.1325 MHz
 FIDRES 18.425707 Hz
 SW 7.860 ppm
 FWHMODE States-TPP1

F2 - Processing parameters
 SI 1024
 SF 600.1300392 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TPP1
 SF 600.1300336 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0





Current Data Parameters
NAME 20190118 Pyratrithrin I Alcohol Minor diastereomer
EXPO 14
PROCNO 1

F2 - Acquisition Parameters
Date_ 20190120
Time 14.57
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG hzgqcpg
TD 1024
SOLVENT CDCl3
NS 70
DS 16
SWH 4629.629 Hz
FIDRES 4.321122 Hz
AQ 0.11205920 sec
RG 2050
DW 108.500 usec
DE 6.50 usec
TE 298.3 K
CHST2 145.0000000
DO 0.000000000 sec
D1 1.45494401 sec
D4 0.00272414 sec
D11 0.03000000 sec
D16 0.00020000 sec
TMO 0.00000000 sec
SFOPTMS

===== CHANNEL f1 =====
SFO1 600.1324815 MHz
NUC1 1H
P1 8.40 usec
P2 16.80 usec
E28 1000.00 usec
PLW1 12.85000019 W

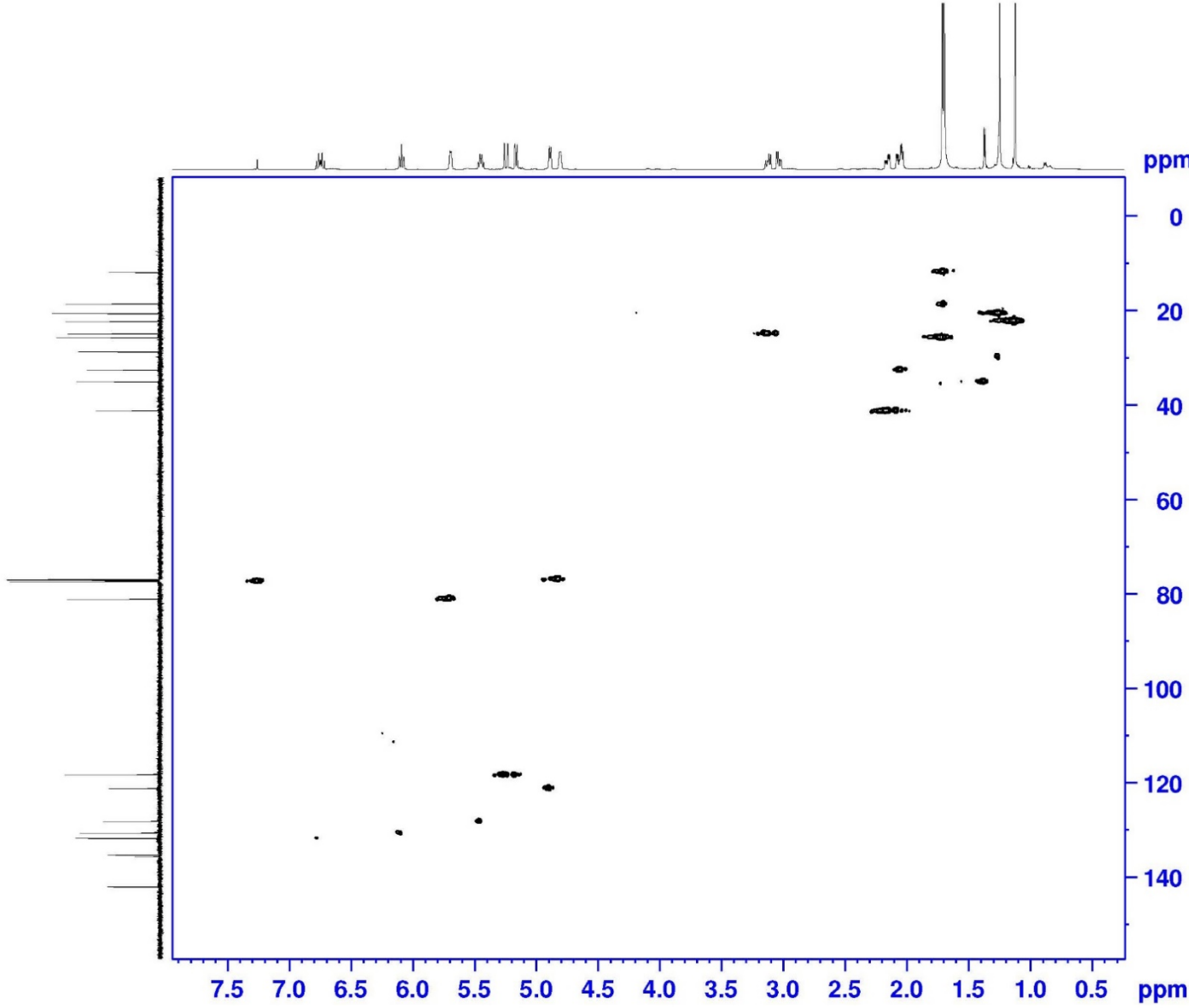
===== CHANNEL f2 =====
SFO2 150.9140636 MHz
NUC2 13C
CPDPRG2 garrp
P3 16.00 usec
P4 32.00 usec
PCPD2 60.00 usec
PLW2 110.76000014 W
PLW12 7.87610006 W

===== GRADIENT CHANNEL =====
GPRAM[1] SMSQ10.100
GPRAM[2] SMSQ10.100
GFE1 80.00 %
GFE2 20.10 %
P16 1000.00 usec

F1 - Acquisition parameters
TD 256
SFO1 150.9141 MHz
FIDRES 97.656250 Hz
SW 165.557 ppm
PRMODE Echo-Antiecho

F2 - Processing parameters
SI 1024
SF 600.1300297 MHz
WDW QSINE
SSB 2
LB 0 Hz
GB 0
PC 1.40

F1 - Processing parameters
SI 1024
MC2 echo-antiecho
SF 150.9028140 MHz
WDW QSINE
SSB 2
LB 0 Hz
GB 0





Current Data Parameters
 NAME 20190122 Pyrethrin I OH MINOR
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190122
 Time 16.54
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG noesygpph
 ID 4096
 SOLVENT CDC13
 NS 2
 DS 16
 SWH 5411.255 Hz
 FIDRES 1.321107 Hz
 AQ 0.3784704 sec
 RG 50.8
 DW 92.400 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00008170 sec
 D1 3.00000000 sec
 D8 0.60000002 sec
 D16 0.00020000 sec
 INO 0.00018480 sec

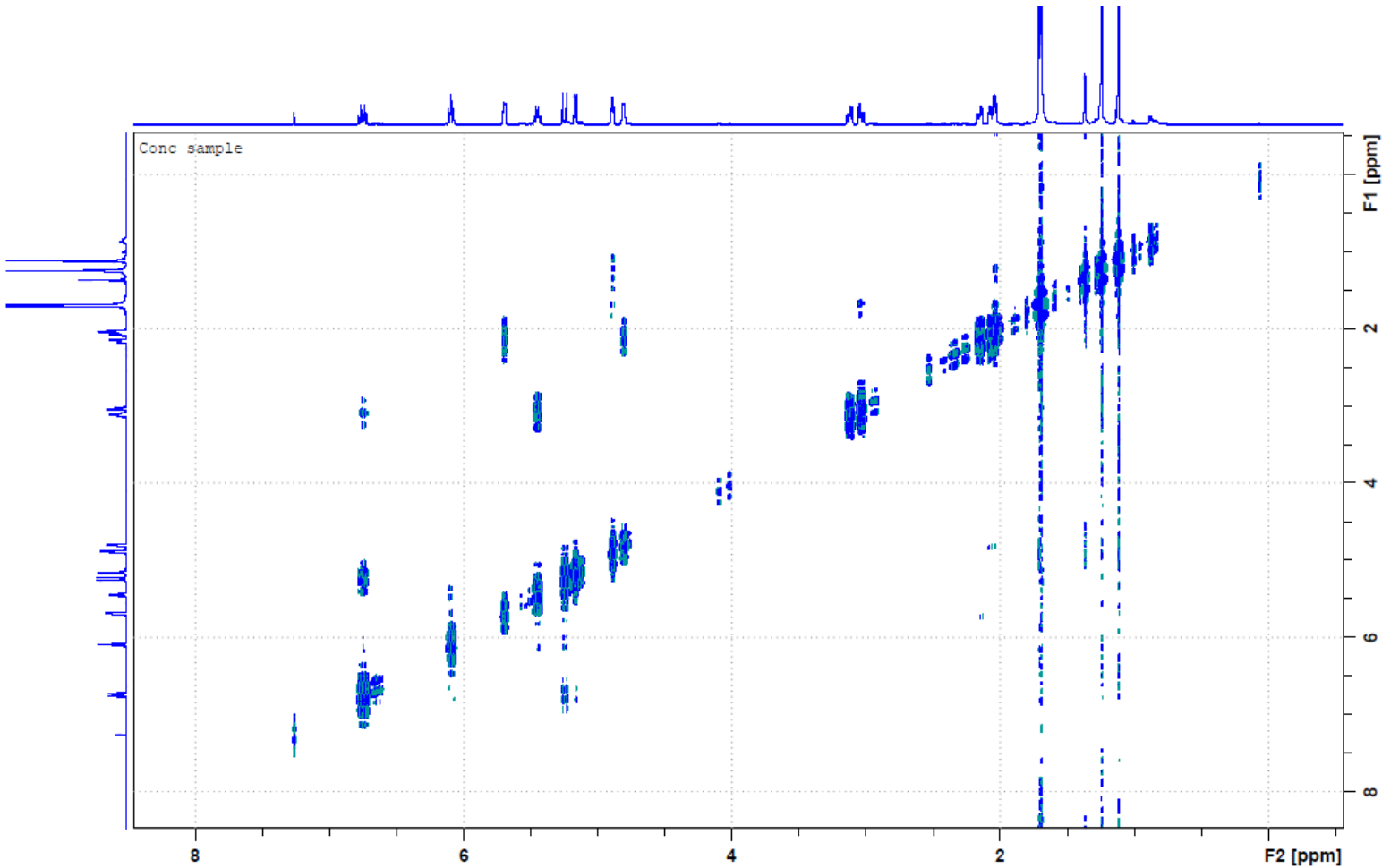
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 SFO1 600.1323960 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 PLW1 12.55000019 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 40.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 ID 127
 SFO1 600.1324 MHz
 FIDRES 42.608311 Hz
 SW 9.017 ppm
 FMODE States-TPPI

F2 - Processing parameters
 SI 4096
 SF 600.1300253 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00

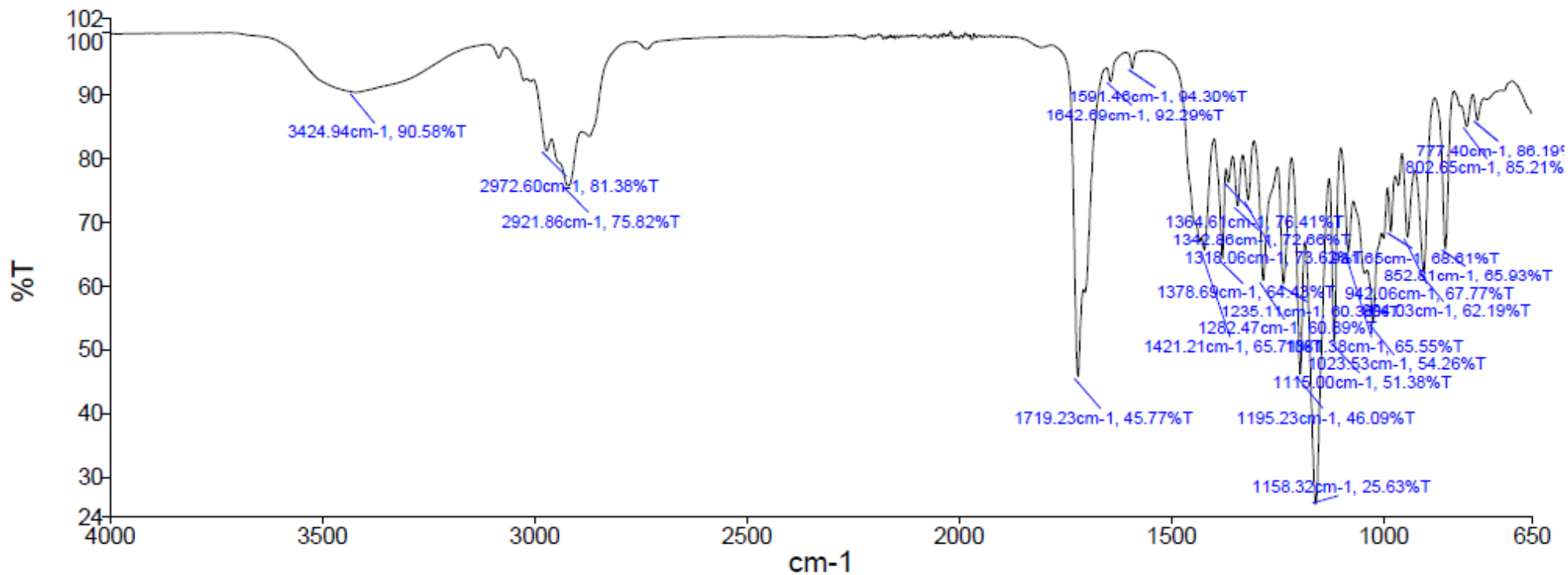
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 SF 600.1300135 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0



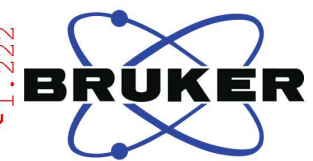
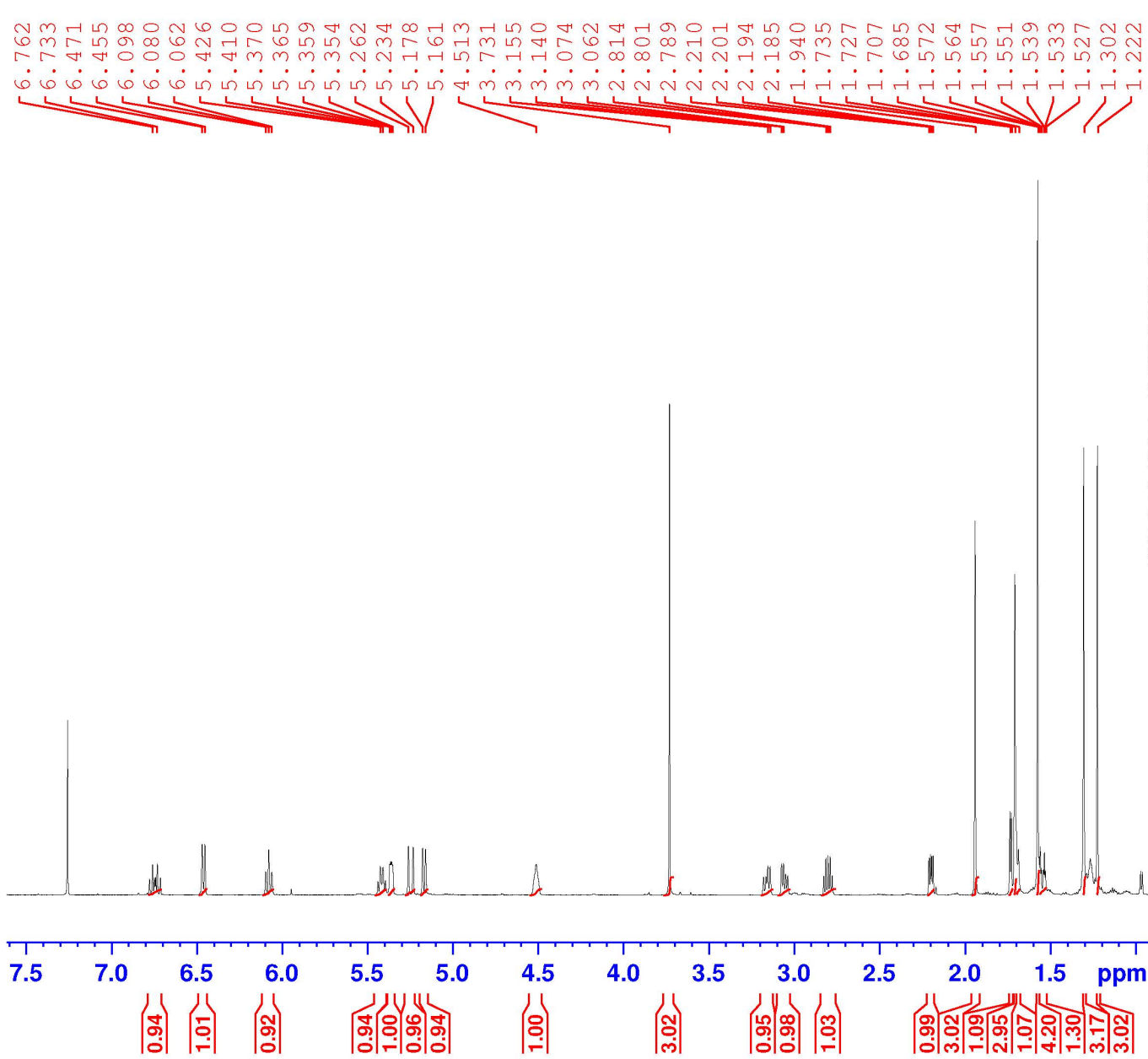
(4a) IR Spectrum

PerkinElmer Spectrum Version 10.4.2
Monday, 5 November 2018 1:51 PM

Analyst
Date
Analyst
Monday, 5 November 2018 1:51 PM



4R-(4b) NMR Characterisation



```

Current Data Parameters
NAME      20190117 Pyrethrin II Allylic alcohol
EXPNO    10
PROCNO    1

F2 - Acquisition Parameters
Date_    20190117
Time     17.14
INSTRUM  spect
PROBHD   5 mm PABBI 1H/
PULPROG  zg30
TD       65536
SOLVENT  CDCl3
NS       64
DS       2
SWH      12019.230 Hz
FIDRES   0.183399 Hz
AQ       2.7262976 sec
RG       228
DW       41.600 usec
DE       6.50 usec
TE       298.2 K
D1       1.00000000 sec
TDO      1

----- CHANNEL f1 -----
SFO1    600.1337060 MHz
NUC1    1H
P1      8.40 usec
PLW1    12.55000019 W

F2 - Processing parameters
SI      65536
SF      600.1300258 MHz
WDW     EM
SSB     0
LB      0.30 Hz
GB      0
PC      1.00
    
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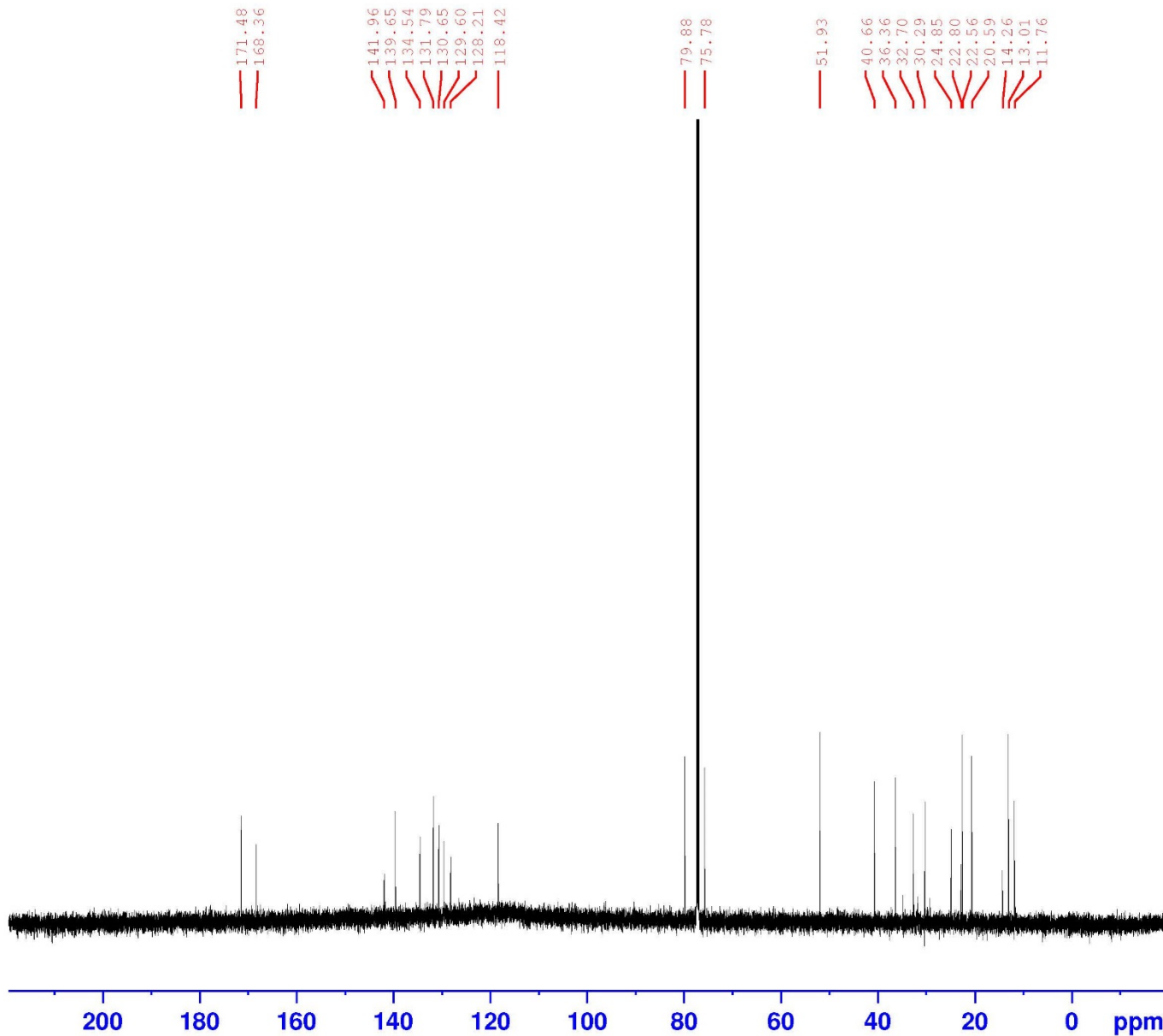
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 EXPNO 12
 PROCNO 1

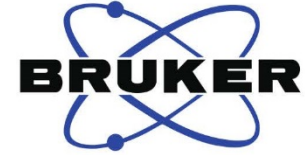
F2 - Acquisition Parameters
 Date_ 20190117
 Time_ 19.45
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9027659 sec
 RG 1440
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

----- CHANNEL f1 -----
 SF01 150.9178968 MHz
 NUC1 13C
 P1 16.00 usec
 PLM1 110.76000214 W

----- CHANNEL f2 -----
 SF02 600.1324005 MHz
 NUC2 1H
 CPDPRG2 waltz16
 PCPD2 70.00 usec
 PLM2 12.55000019 W
 PLM12 0.18072000 W
 PLM13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027891 MHz
 WDW no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20190117 Pyrethrin II Allylic alcohol
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190117
 Time_ 17.16
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygmfphpp
 TD 2948
 SOLVENT CDCl3
 NS 5
 DS 4
 SWH 4464.286 Hz
 FIDRES 2.179927 Hz
 AQ 0.2293760 sec
 RG 2050
 DW 112.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00010130 sec
 D1 1.90906894 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D16 0.00020000 sec
 INO 0.00022400 sec

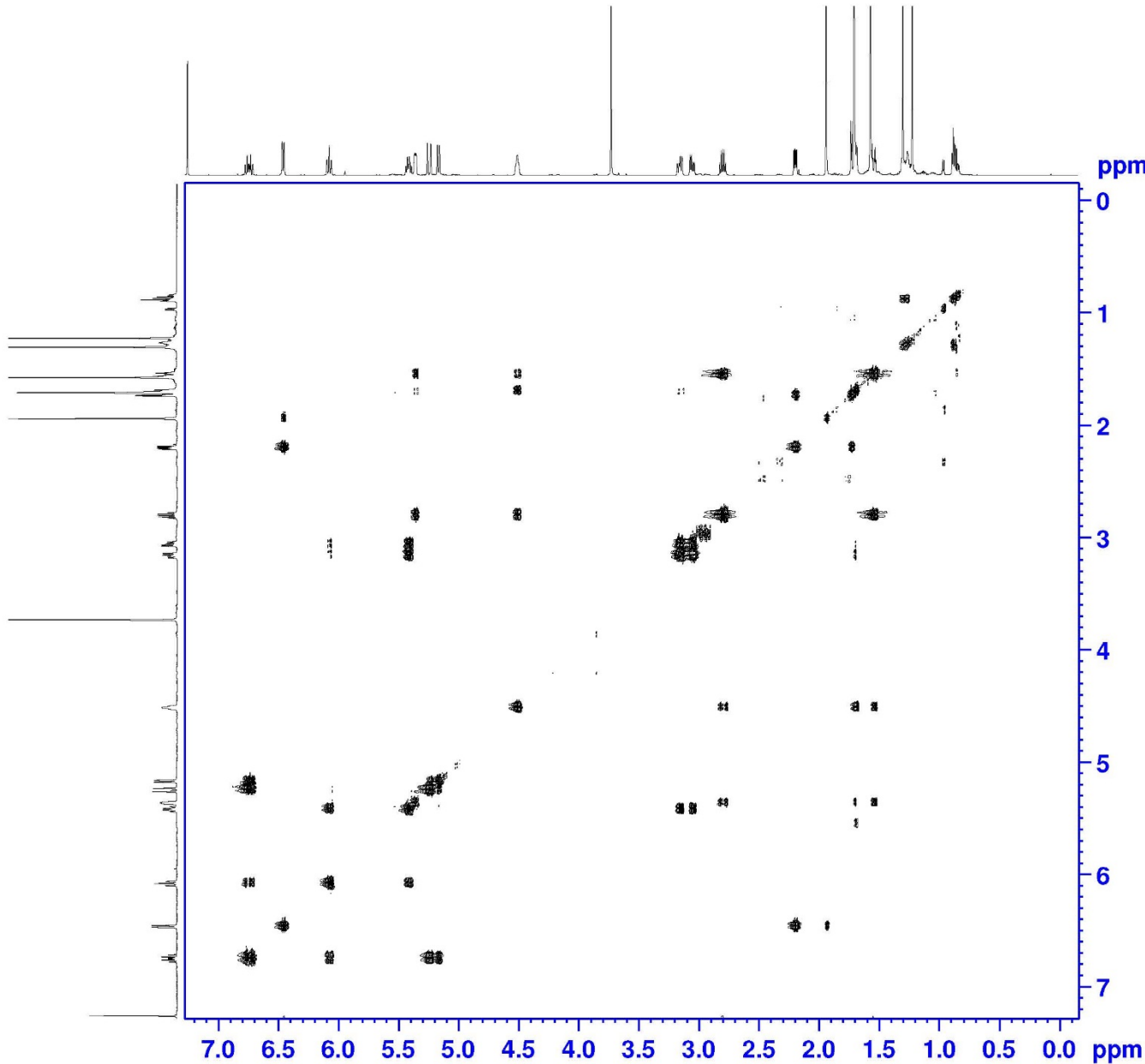
===== CHANNEL f1 =====
 SFO1 600.1321673 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLM1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GPNAM[1] SMSQ10.100
 GPNAM[2] SMSQ10.100
 SP21 10.00 %
 SP22 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 600.1322 MHz
 FIDRES 17.438616 Hz
 SW 7.439 ppm
 FxMODE States-TPPI

F2 - Processing parameters
 SI 1024
 SF 600.1300296 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 Fx2 States-TPPI
 SF 600.1300274 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20190117 Pyrethrin II Allylic alcohol
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190117
 Time_ 19.51
 INSTRUM spect
 PROBHD 5 mm PABZ 1H/
 PULPROG hsqzsgp
 TD 1024
 SOLVENT CDCl3
 NS 45
 DS 16
 SWH 4201.681 Hz
 FIDRES 4.103204 Hz
 AQ 0.1218560 sec
 RG 2050
 DW 119.000 usec
 DE 6.50 usec
 TE 298.2 K
 CNST2 145.000000
 DO 0.00000300 sec
 D1 1.44368005 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGPTNS

----- CHANNEL f1 -----
 SF01 600.1322686 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

----- CHANNEL f2 -----
 SF02 150.9140636 MHz
 NUC2 13C
 CPOPRG[2] garp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPNAM[2] SMSQ10.100
 GP21 80.00 %
 GP22 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SF01 150.9141 MHz
 FIDRES 97.856250 Hz
 SW 145.687 ppm
 F1MODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300209 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 F1MODE echo-antiecho
 SF 150.9027813 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

ppm

0

20

40

60

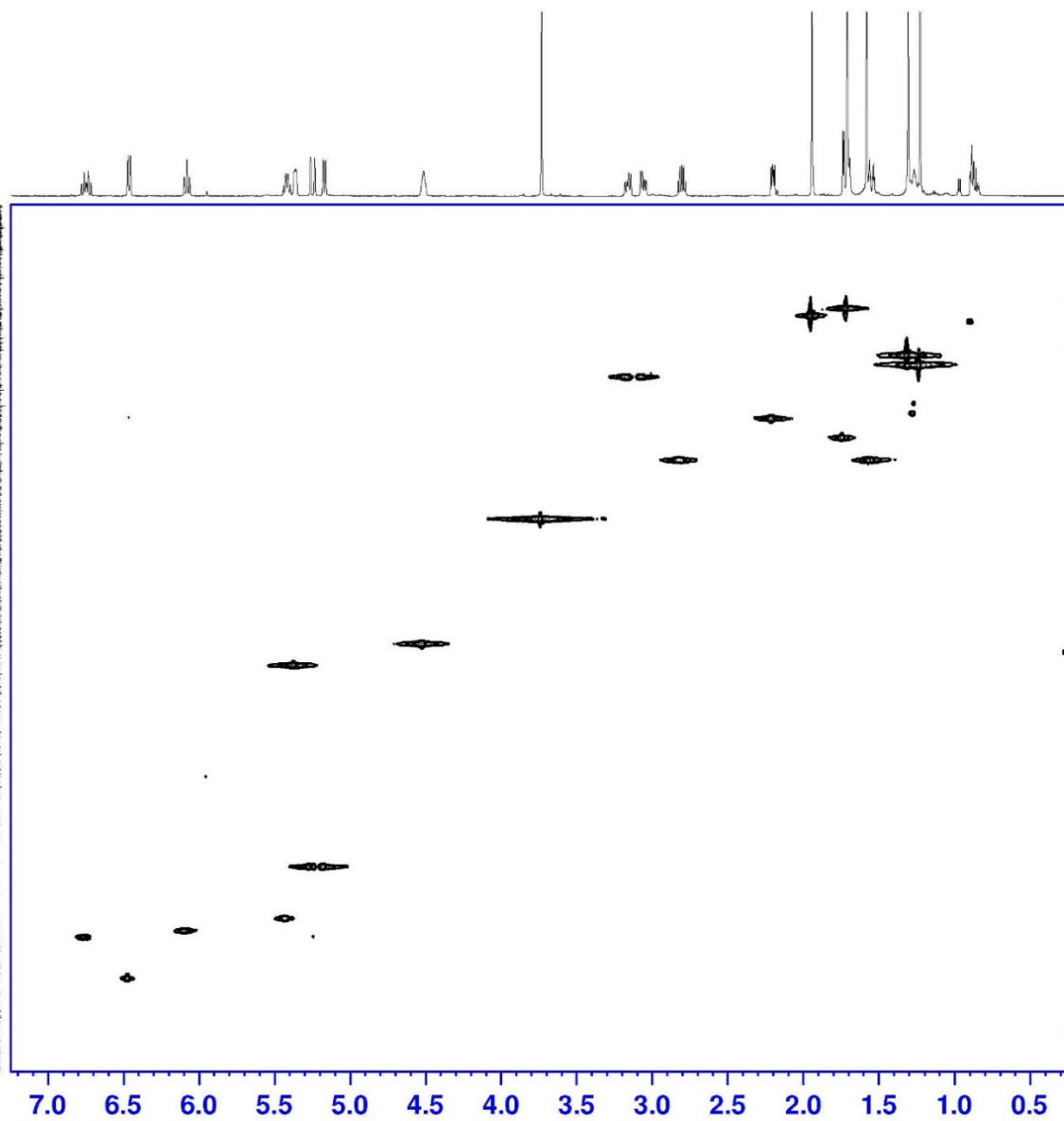
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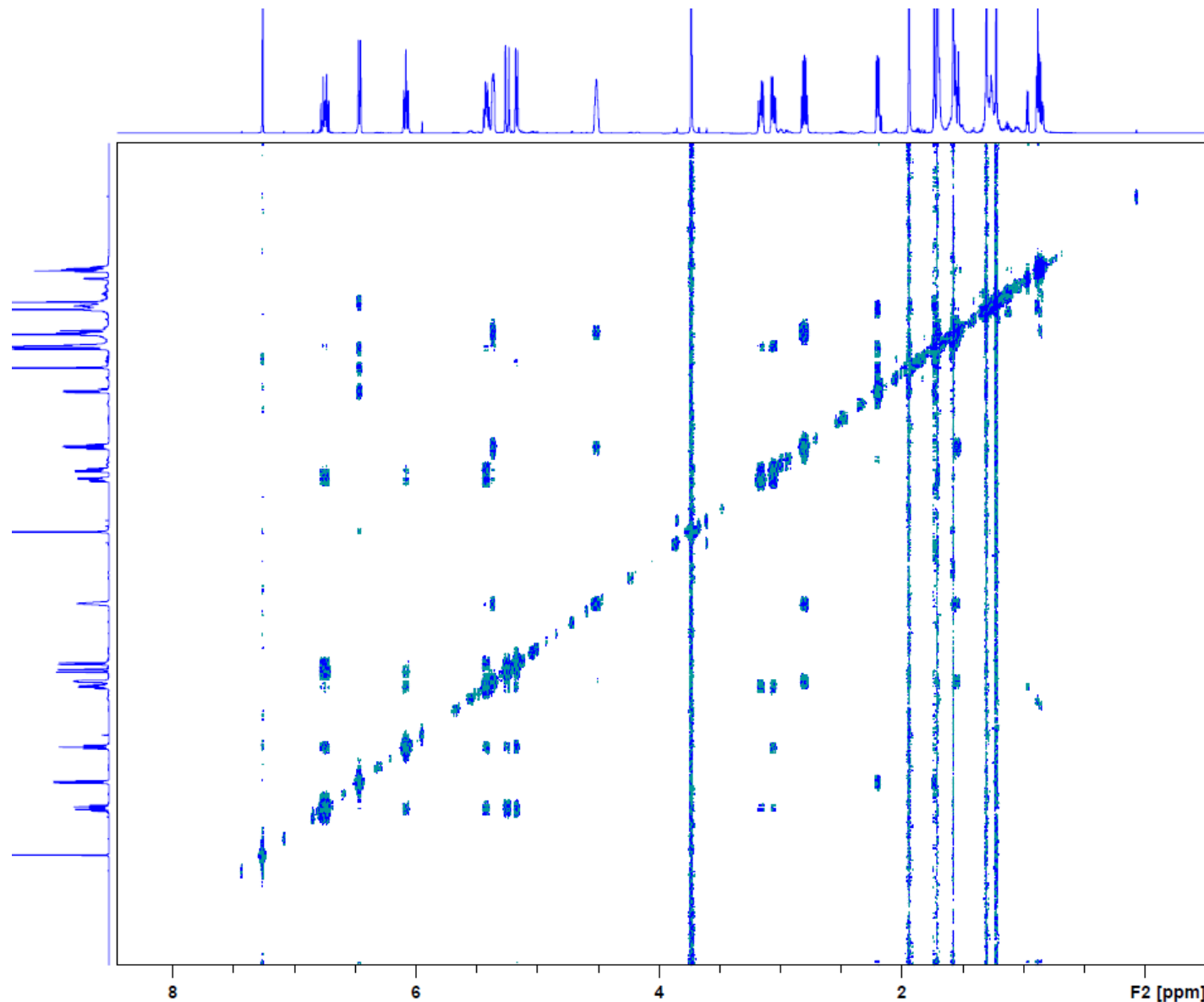
100

120

140

ppm





Current Data Parameters
 NAME 20190121 Pyrethrin II OH MAJOR
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20190121
 Time 8.41
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG noesygpph
 TD 4096
 SOLVENT CDC13
 NS 2
 DS 16
 SWH 5411.255 Hz
 FIDRES 1.321107 Hz
 AQ 0.3784704 sec
 RG 203
 DW 92.400 usec
 DE 6.50 usec
 TE 298.2 K
 DO 0.00008170 sec
 D1 3.00000000 sec
 D8 0.60000002 sec
 D16 0.00020000 sec
 INO 0.00018480 sec

----- CHANNEL f1 -----

SFO1 600.1323960 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 PLW1 12.55000019 W

----- GRADIENT CHANNEL -----

GPNAME[1] SMSQ10.100
 GPZ1 40.00 %
 P16 1000.00 usec

F1 - Acquisition parameters

TD 397
 SFO1 600.1324 MHz
 FIDRES 13.630366 Hz
 SW 9.017 ppm
 FnMODE States-TPPI

F2 - Processing parameters

SI 4096
 SF 600.1300252 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00

F1 - Processing parameters

SI 1024
 MC2 States-TPPI
 SF 600.1300210 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0

4S-(4b) NMR Characterisation

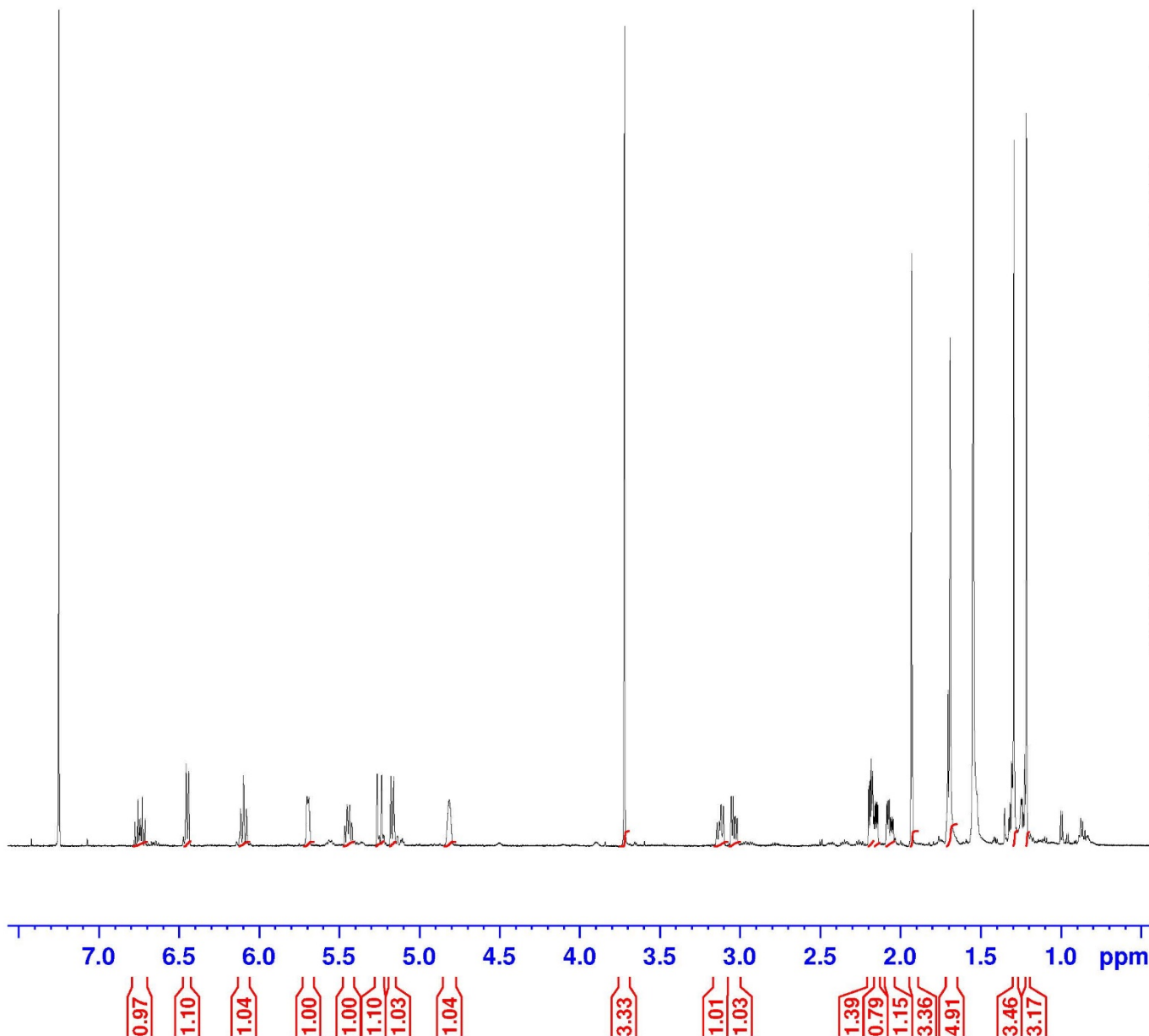


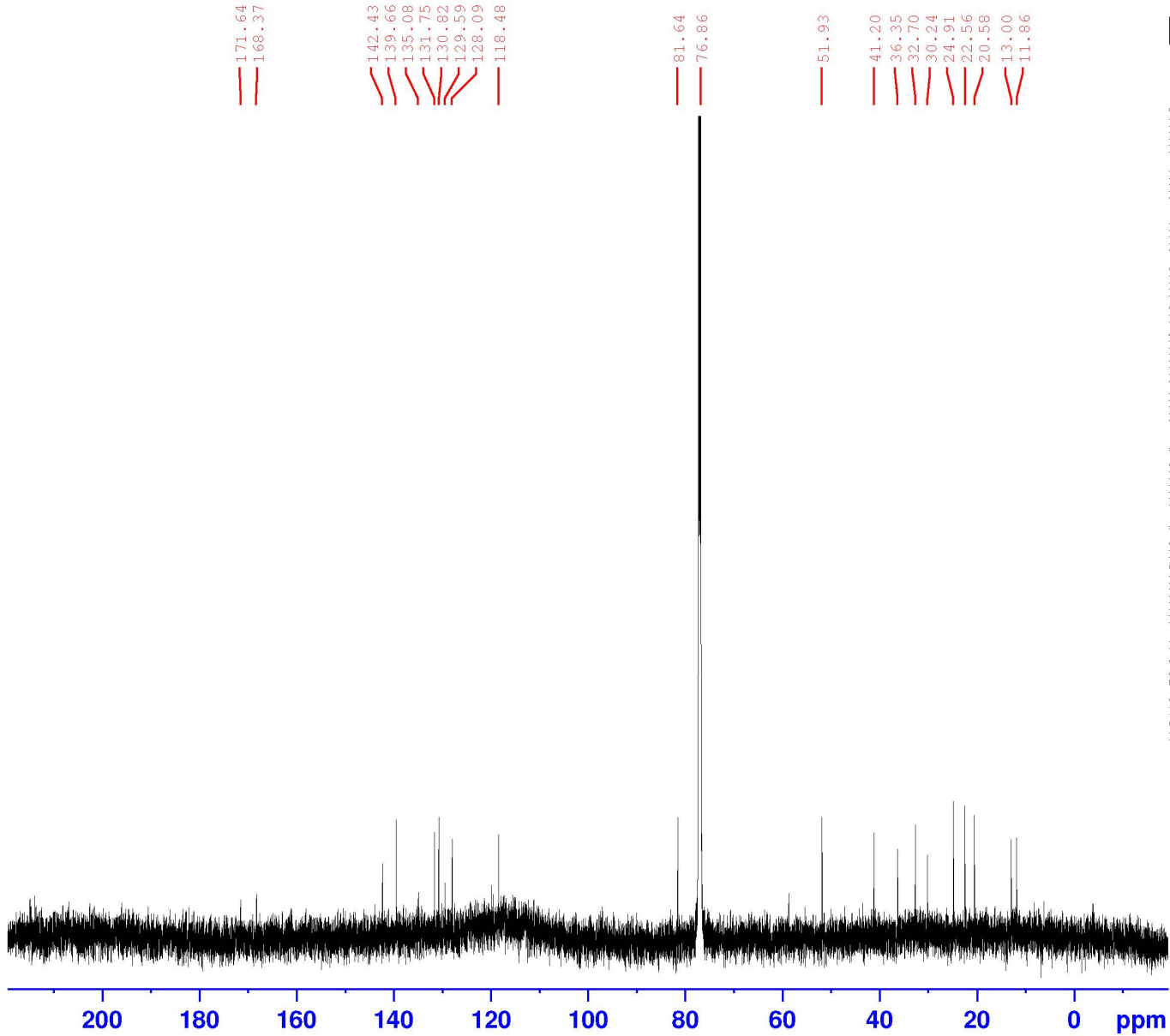
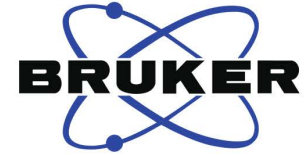
Current Data Parameters
 NAME 20190123 Pyrethrin II OH MINOR
 EXPNO 20
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190123
 Time 18.28
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 64
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 362
 DW 41.600 usec
 DE 6.50 usec
 TE 298.2 K
 D1 1.00000000 sec
 TDO 1

----- CHANNEL f1 -----
 SF01 600.1337060 MHz
 NUC1 1H
 P1 8.40 usec
 PLW1 12.55000019 W

F2 - Processing parameters
 SI 65536
 SF 600.1300305 MHz
 WDW no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00





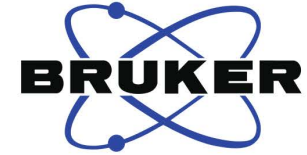
Current Data Parameters
 NAME 20190121 Pyrethrin II Minor OH
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190121
 Time 22.33
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDC13
 NS 6144
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1440
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 12.55000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027895 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME 20190125 Pyrethrin II OH MINOR
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190125
 Time_ 10.54
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygpmfphpp
 TD 2048
 SOLVENT CDC13
 NS 6
 DS 4
 SWH 4201.681 Hz
 FIDRES 2.051602 Hz
 AQ 0.2437120 sec
 RG 2050
 DW 119.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00010830 sec
 D1 1.89473295 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D16 0.00020000 sec
 INO 0.00023800 sec

===== CHANNEL f1 =====
 SF01 600.1322665 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GPNAM[1] SMSQ10.100
 GPNAM[2] SMSQ10.100
 GPZ1 10.00 %
 GPZ2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 124
 SF01 600.1323 MHz
 FIDRES 33.884521 Hz
 SW 7.001 ppm
 FhMODE States-TPPI

F2 - Processing parameters
 SI 1024
 SF 600.1300272 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TPPI
 SF 600.1300209 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

ppm

0.5

1.0

1.5

2.0

2.5

3.0

3.5

4.0

4.5

5.0

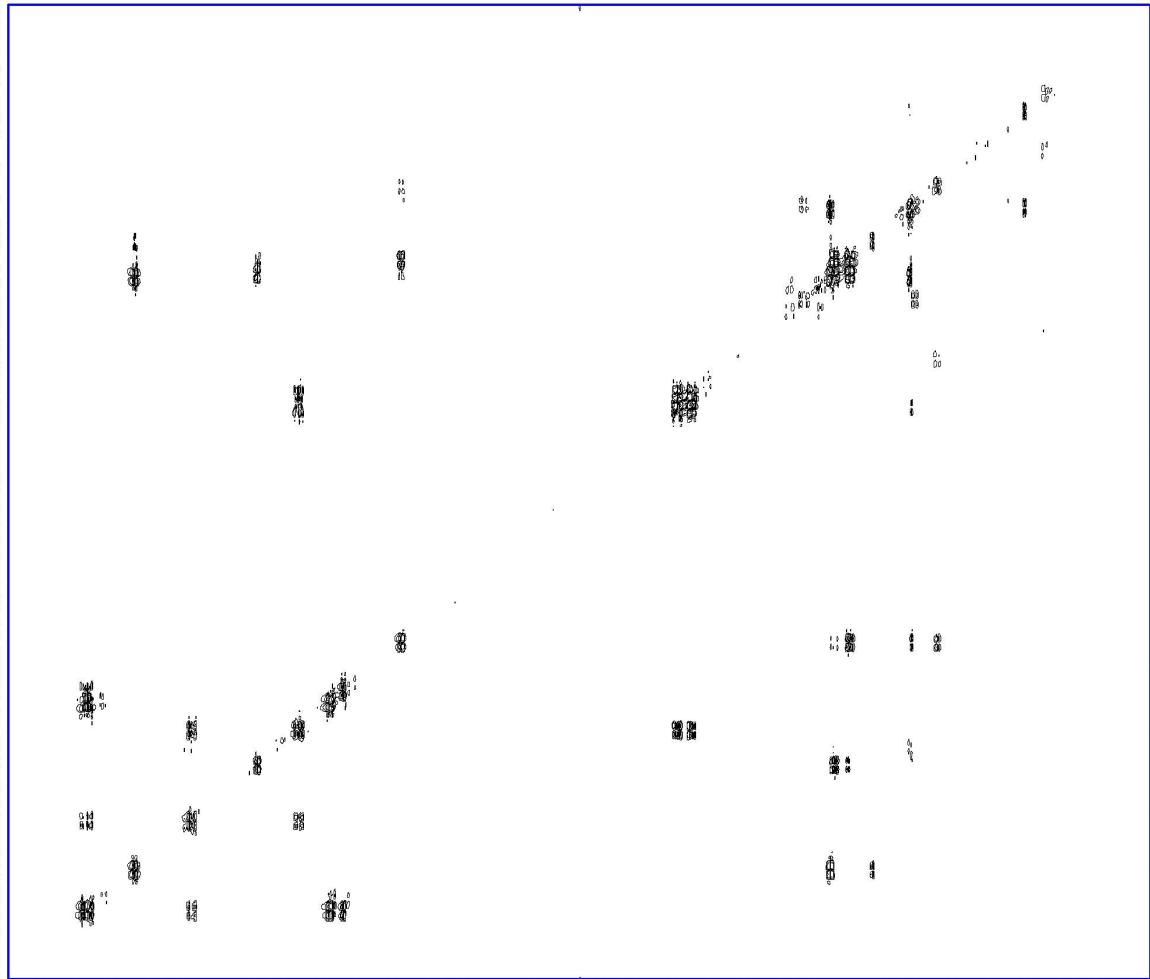
5.5

6.0

6.5

7.0

ppm



7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm



Current Data Parameters
 NMK 20190118 Pyrethrin II Alcohol Minor diastereomer
 KCHWD 12
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190119
 Time 8.26
 INSTRUM spect
 PROBRD 5 mm PABBI 1H/
 PULPROG hsqcetcp
 TD 1924
 SOLVENT1 CDCl3
 NS 16
 DS 16
 SWH 4347.926 Hz
 FIDRES 4.245924 Hz
 AQ 0.1177500 sec
 RG 2050
 DW 115.000 usec
 DE 6.50 usec
 TE 298.3 K
 SFO12 145.000000
 D0 0.0000000 sec
 D1 1.4477596 sec
 D4 0.0072414 sec
 D11 0.0300000 sec
 D16 0.0002000 sec
 IRO 0.0002000 sec
 ZCPRTNS

----- CHANNEL F1 -----
 SFO1 600.1322032 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P21 1000.00 usec
 PLM1 12.5300019 W

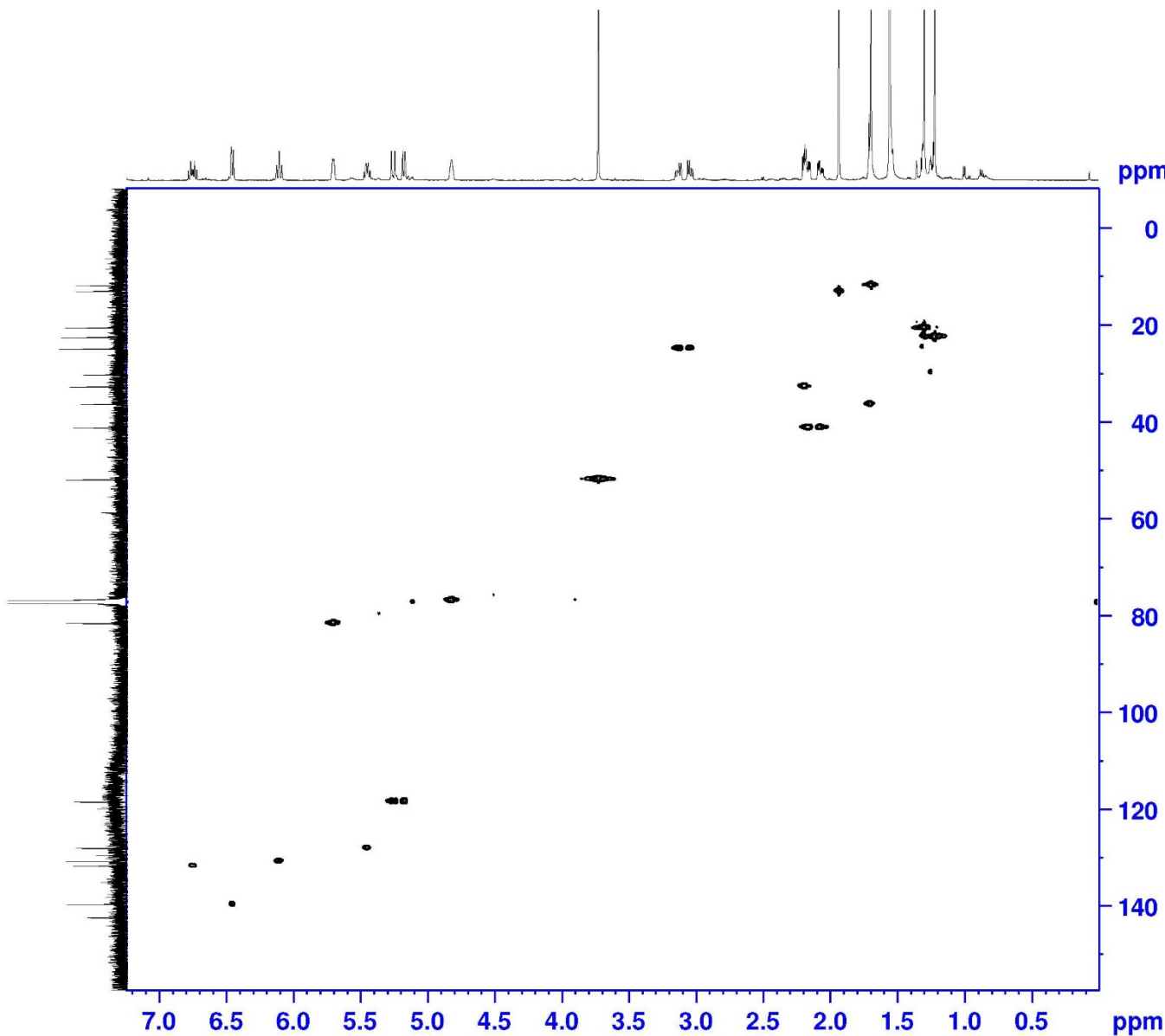
***** CHANNEL 12 *****
 SFO2 150.9140536 MHz
 NUC2 13C
 CDEPRG(2) garrp
 P3 16.00 usec
 P4 32.00 usec
 PCDR2 60.00 usec
 PZM2 110.7600014 W
 PLM12 7.87610006 W

***** GRADIENT CHANNEL *****
 GRAM[1] SMSQ10.100
 GRAM[2] SMSQ10.100
 GF1 80.00 %
 GF2 20.10 %
 F16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.456250 Hz
 SW 145.857 ppm
 FMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300289 MHz
 WOK QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028085 MHz
 WOK QSINE
 SSB 2
 LB 0 Hz
 GB 0





Current Data Parameters
NAME 20190121 Pyrethrin II OH MINOR
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters

Date_ 20190121
Time 13.10
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG noesygpph
TD 4096
SOLVENT CDCl3
NS 2
DS 16
SWH 5411.255 Hz
FIDRES 1.321107 Hz
AQ 0.3784704 sec
RG 575
DW 92.400 usec
DE 6.50 usec
TE 298.2 K
D0 0.00008170 sec
D1 3.00000000 sec
D8 0.60000002 sec
D16 0.00020000 sec
IN0 0.00018480 sec

CHANNEL f1

SFO1 600.1323960 MHz
NUC1 1H
P1 8.40 usec
P2 16.80 usec
PLW1 12.55000019 W

GRADIENT CHANNEL

GPNAME[1] SMSQ10.100
GPZ1 40.00 %
P16 1000.00 usec

F1 - Acquisition parameters

ID 384
SFO1 600.1324 MHz
FIDRES 14.091811 Hz
SW 9.017 ppm
FnMODE States-TPPI

F2 - Processing parameters

SI 4096
SF 600.1300256 MHz
WDW QSINE
SSB 0
LB 0 Hz
GB 0
PC 1.00

F1 - Processing parameters

SI 1024
MC2 States-TPPI
SF 600.1300184 MHz
WDW QSINE
SSB 0
LB 0 Hz
GB 0

F1 [ppm]

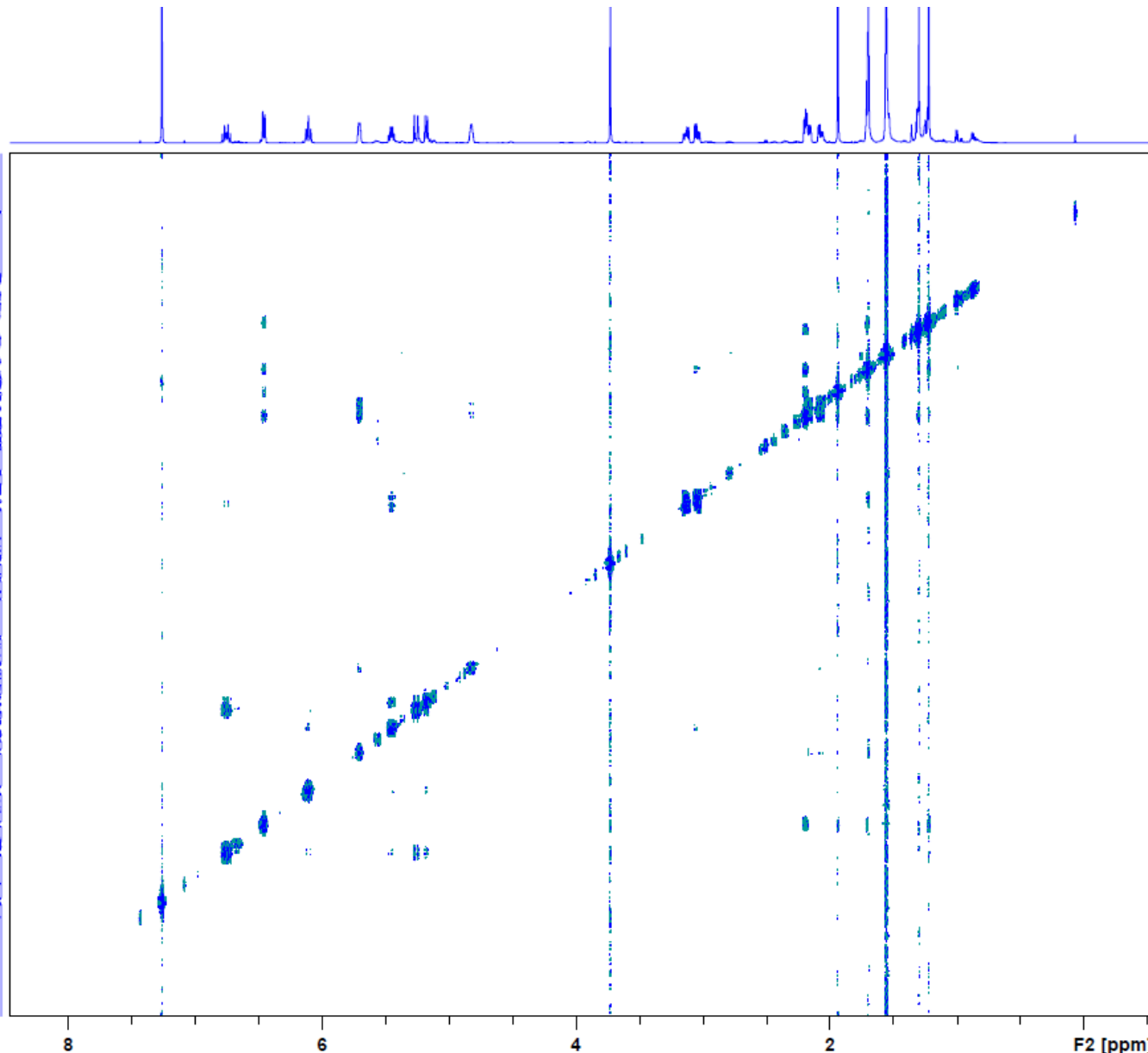
2

4

6

8

F2 [ppm]



(4b) IR Spectrum

PerkinElmer Spectrum Version 10.4.2
Monday, 5 November 2018 1:52 PM

Analyst
Date
Analyst
Monday, 5 November 2018 1:52 PM

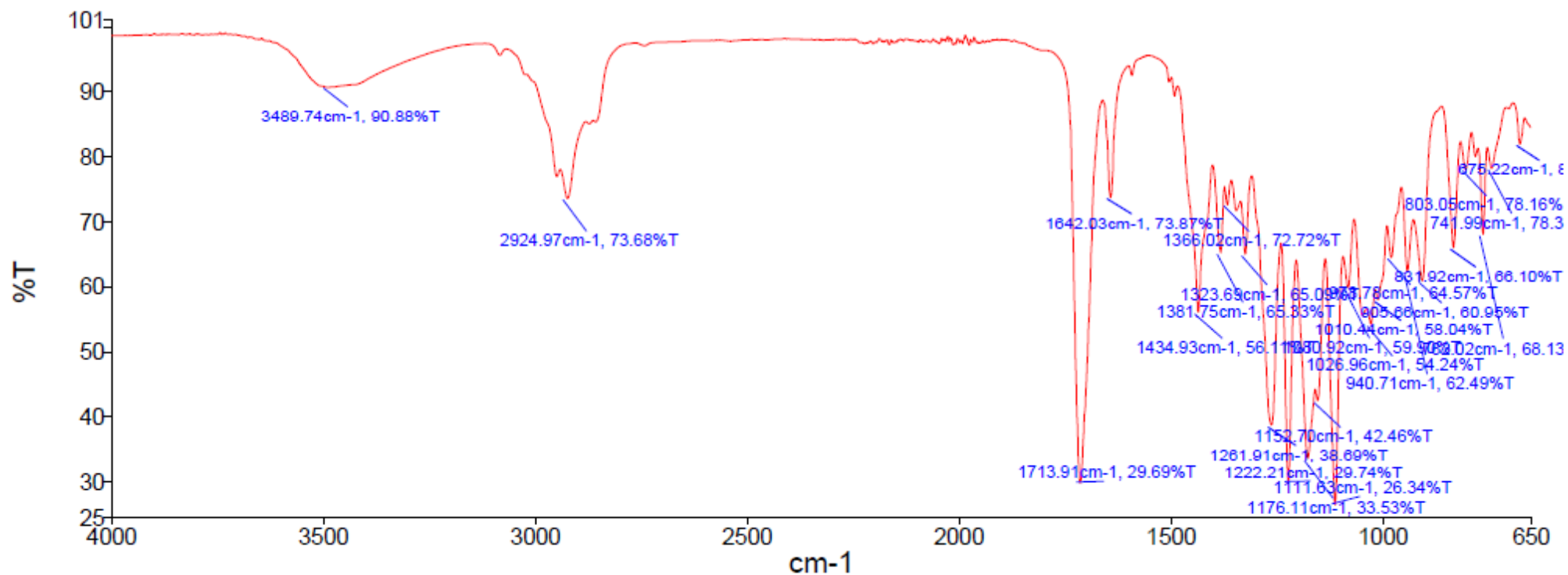
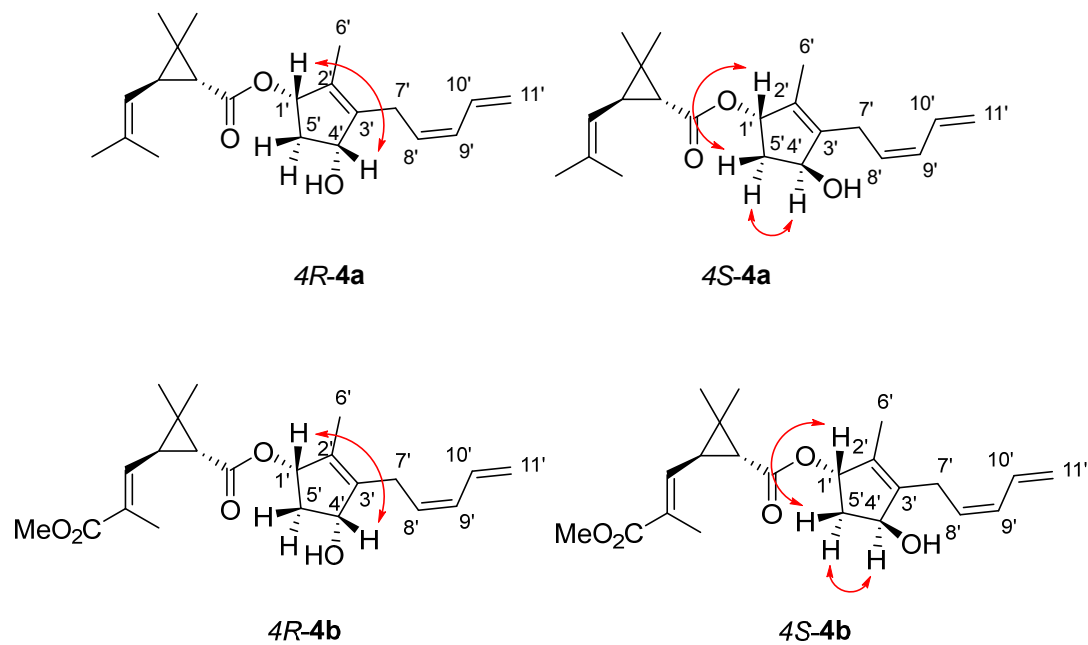
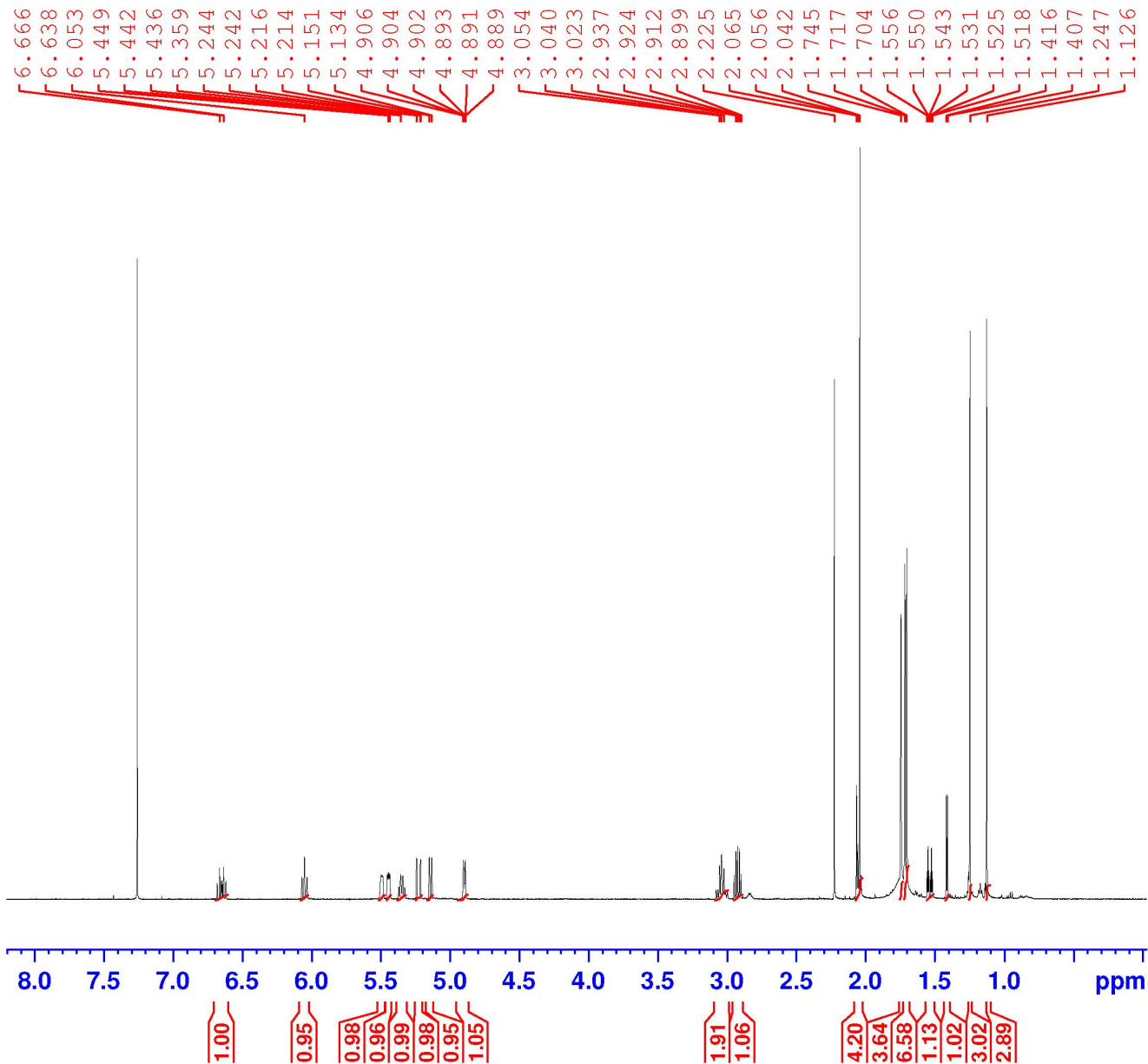


Figure showing nOe correlations for **4a** and **4b** epimers

4R-(5a) NMR Characterisation



```

Current Data Parameters
NAME      20190218 Pyrethrin I Acetate MAJOR
EXPNO     10
PROCNO    1

F2 - Acquisition Parameters
Date_     20190218
Time      18.32
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         32
DS         2
SWH        12019.230 Hz
FIDRES     0.183399 Hz
AQ         2.7262976 sec
RG         322
DW         41.600 usec
DE         6.50 usec
TE         298.1 K
D1         1.00000000 sec
TDO        1

===== CHANNEL f1 =====
SFO1      600.1337061 MHz
NUC1      1H
P1        13.50 usec
PLW1      17.00000000 W

F2 - Processing parameters
SI        65536
SF        600.1300256 MHz
WDW       no
SSB       0
LB        0 Hz
GB        0
PC        1.00
    
```



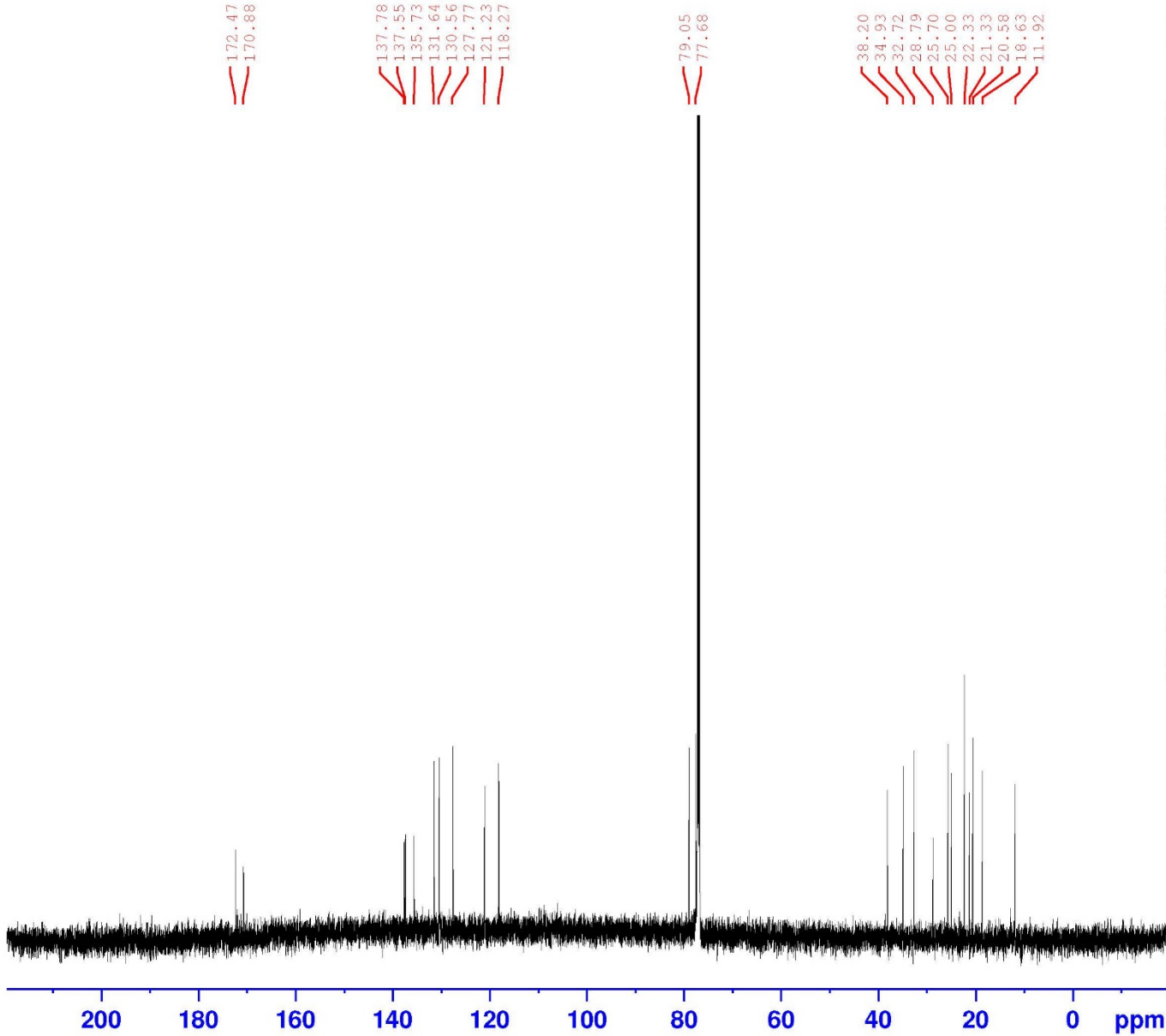
Current Data Parameters
NAME 20190218 Pyrethrin I Acetate MAJOR
EXPNO 22
PROCNO 1

F2 - Acquisition Parameters
Date_ 20190218
Time 21.23
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2048
DS 2
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 2050
DW 13.867 usec
DE 6.50 usec
TE 298.2 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1

----- CHANNEL f1 -----
SFO1 150.9178988 MHz
NUC1 13C
P1 12.00 usec
PLW1 80.00000000 W

----- CHANNEL f2 -----
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG[2] waltz16
PCPD2 70.00 usec
PLW2 17.00000000 W
PLW12 0.63230002 W
PLW13 0.30983001 W

F2 - Processing parameters
SI 32768
SF 150.9027902 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40





Current Data Parameters
 NAME 20190218 Pyrethrin I Acetate MAJOR
 EXPNO 21
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190218
 Time 18.54
 INSTRUM spect
 PROBRD 5 mm PARBO BB/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4587.156 Hz
 FIDRES 2.239822 Hz
 AQ 0.2232320 sec
 RG 161
 DW 109.000 usec
 DE 6.50 usec
 TE 298.2 K
 DQ 0.0000300 sec
 D1 1.90456295 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00021800 sec

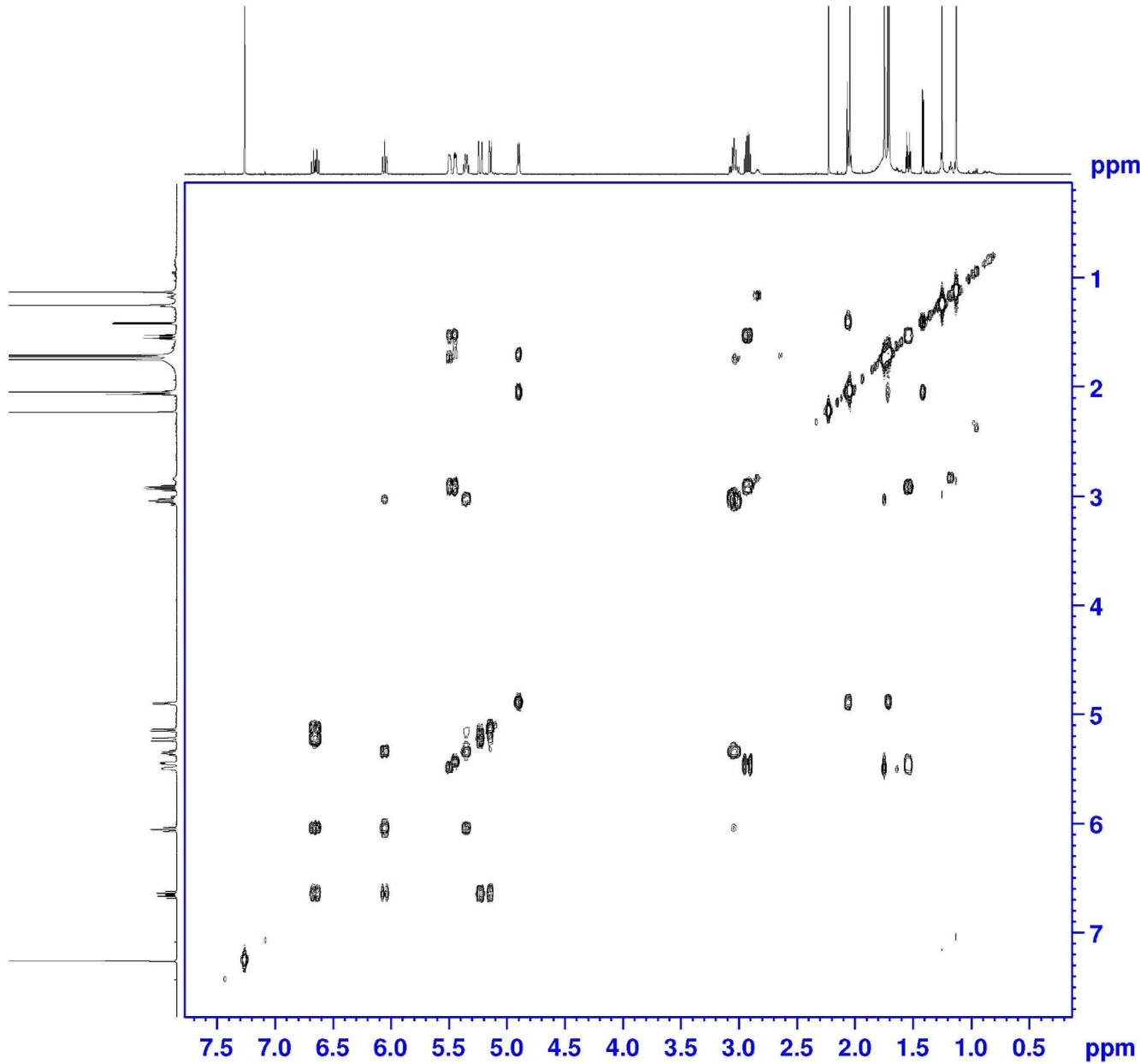
===== CHANNEL f1 =====
 SFO1 600.1323992 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

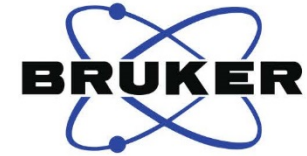
===== GRADIENT CHANNEL =====
 GPNAM[L] SMSQ10.100
 GP21 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1324 MHz
 FIDRES 35.837154 Hz
 SW 7.644 ppm
 PrMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300252 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300274 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20190218 Pyrethrin I Acetate MAJOR
 EXPNO 24
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190218

Time 21.31
 INSTRUM spect
 PROBRD 5 mm PABBO BB/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4672.897 Hz
 FIDRES 4.563376 Hz
 AQ 0.1095680 sec
 RG 2050
 DW 107.000 usec
 DE 6.50 usec
 TE 298.3 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.45596802 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGPGTNS

===== CHANNEL f1 =====
 SFO1 600.1324365 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

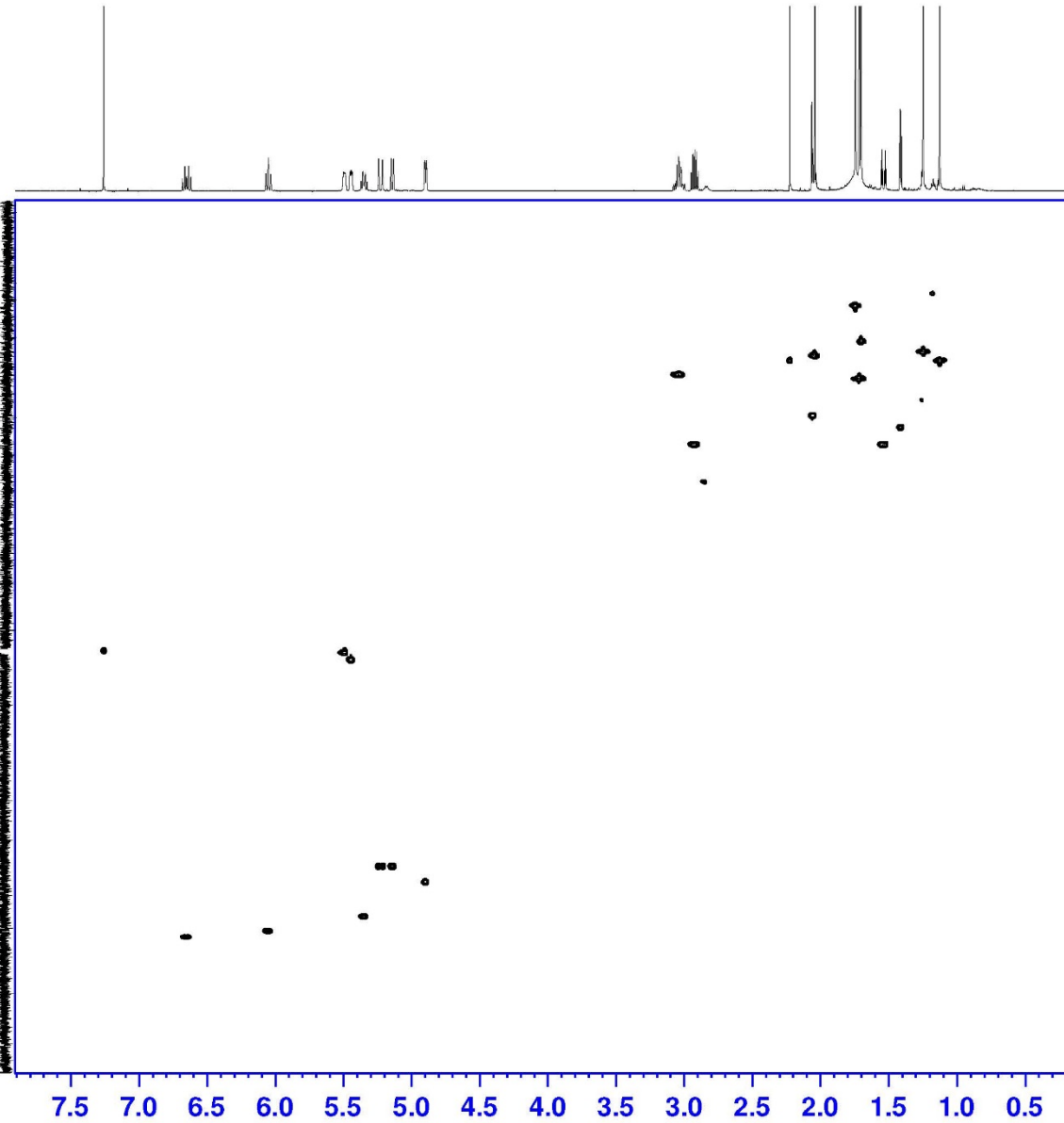
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 garrp
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 60.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPNAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

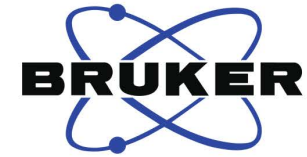
F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 F1MODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300252 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MZ2 echo-antiecho
 SF 150.9028159 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



4S-(5a) NMR Characterisation

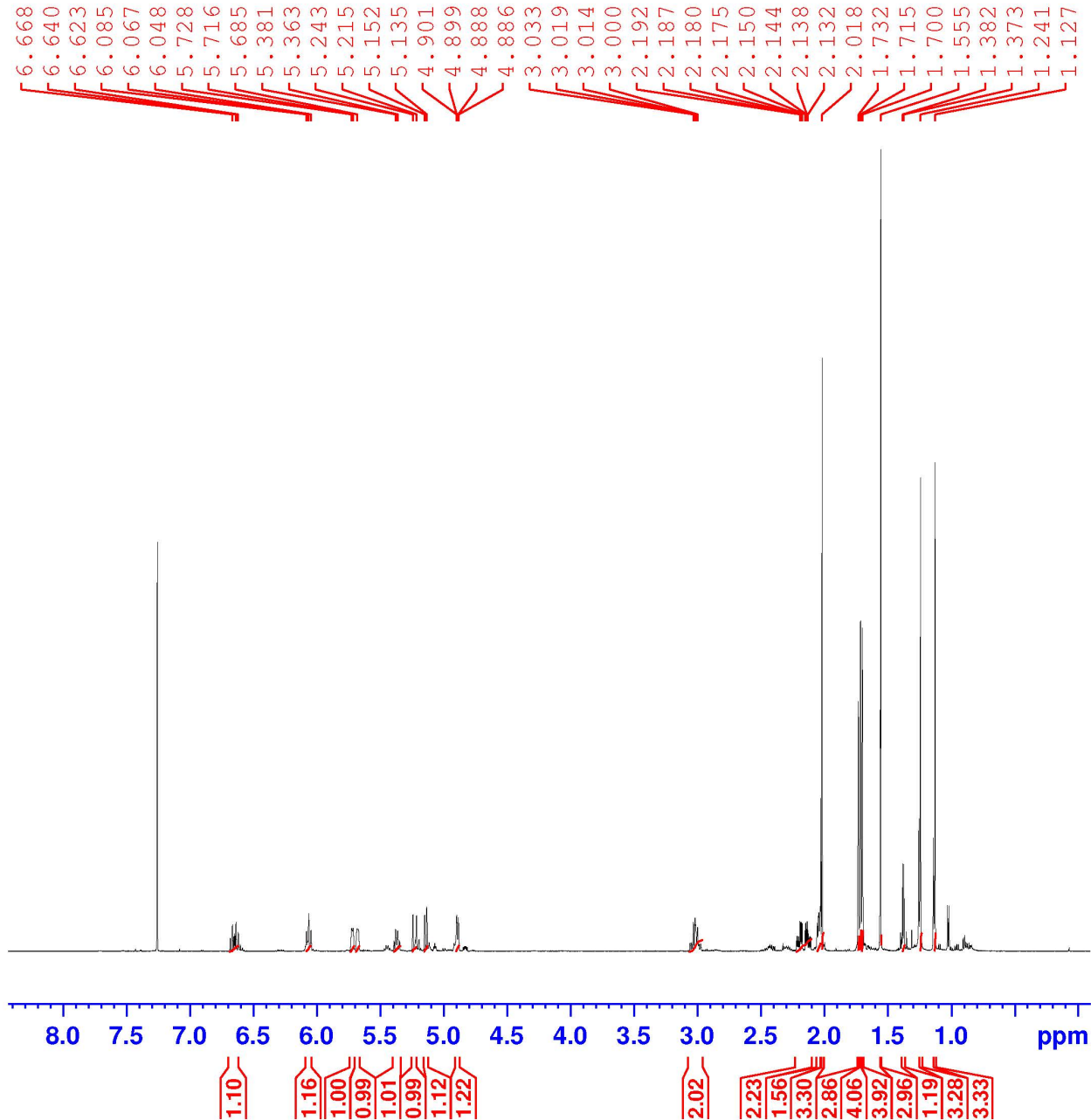


Current Data Parameters
 NAME 20190225 PI Acetate Minor
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190225
 Time 18.41
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 32
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 256
 DW 41.600 usec
 DE 6.50 usec
 TE 298.2 K
 D1 1.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SF01 600.1337061 MHz
 NUC1 1H
 P1 13.50 usec
 PLW1 17.00000000 W

F2 - Processing parameters
 SI 65536
 SF 600.1300258 MHz
 WDW no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00





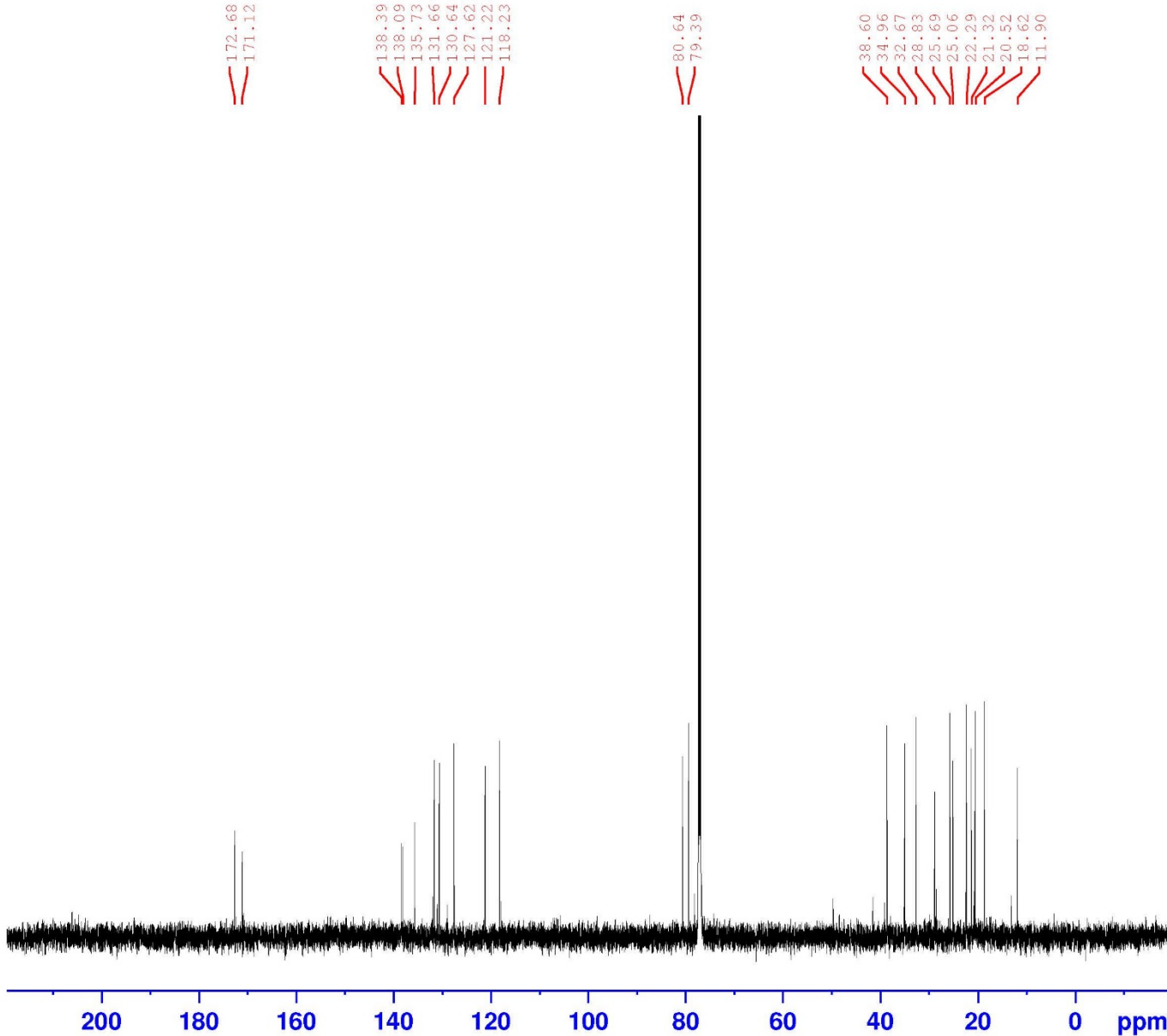
Current Data Parameters
 NAME 20190225 PI Acetate Minor
 EXPNO 22
 PROCNO 1

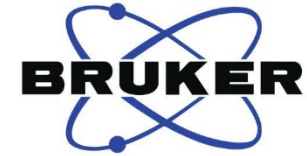
F2 - Acquisition Parameters
 Date_ 20190225
 Time 21.28
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.0000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCDP2 70.00 usec
 PLW2 17.0000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9027908 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20190225 PI Acetate Minor
 EXPNO 21
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190225
 Time 18.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4587.156 Hz
 FIDRES 2.239822 Hz
 AQ 0.2232320 sec
 RG 144
 DW 109.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.90456295 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00021800 sec

----- CHANNEL f1 -----
 SFO1 600.1323978 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1324 MHz
 FIDRES 35.837154 Hz
 SW 7.644 ppm
 FnMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300256 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300261 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0

ppm

1

2

3

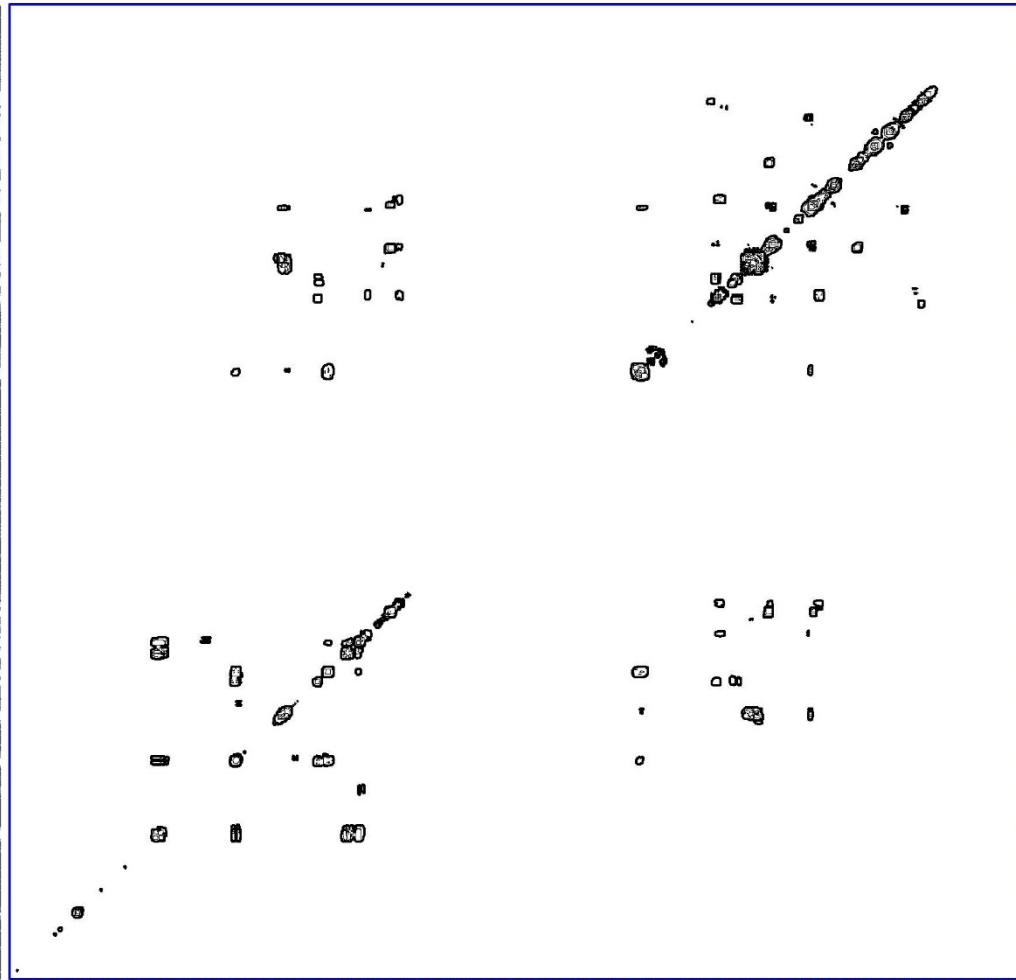
4

5

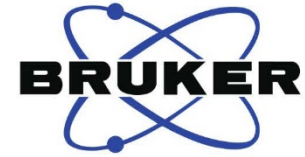
6

7

ppm



7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5



Current Data Parameters
 NAME 20190225 PI Acetate Minor
 EXPNO 24
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190225
 Time 21.37
 INSTRUM spect
 PROBRD 5 mm PABBO BB/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4587.156 Hz
 FIDRES 4.479644 Hz
 AQ 0.1116160 sec
 RG 2050
 DW 109.000 usec
 DE 6.50 usec
 TE 298.3 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.45392001 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

==== CHANNEL f1 =====
 SFO1 600.1324175 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

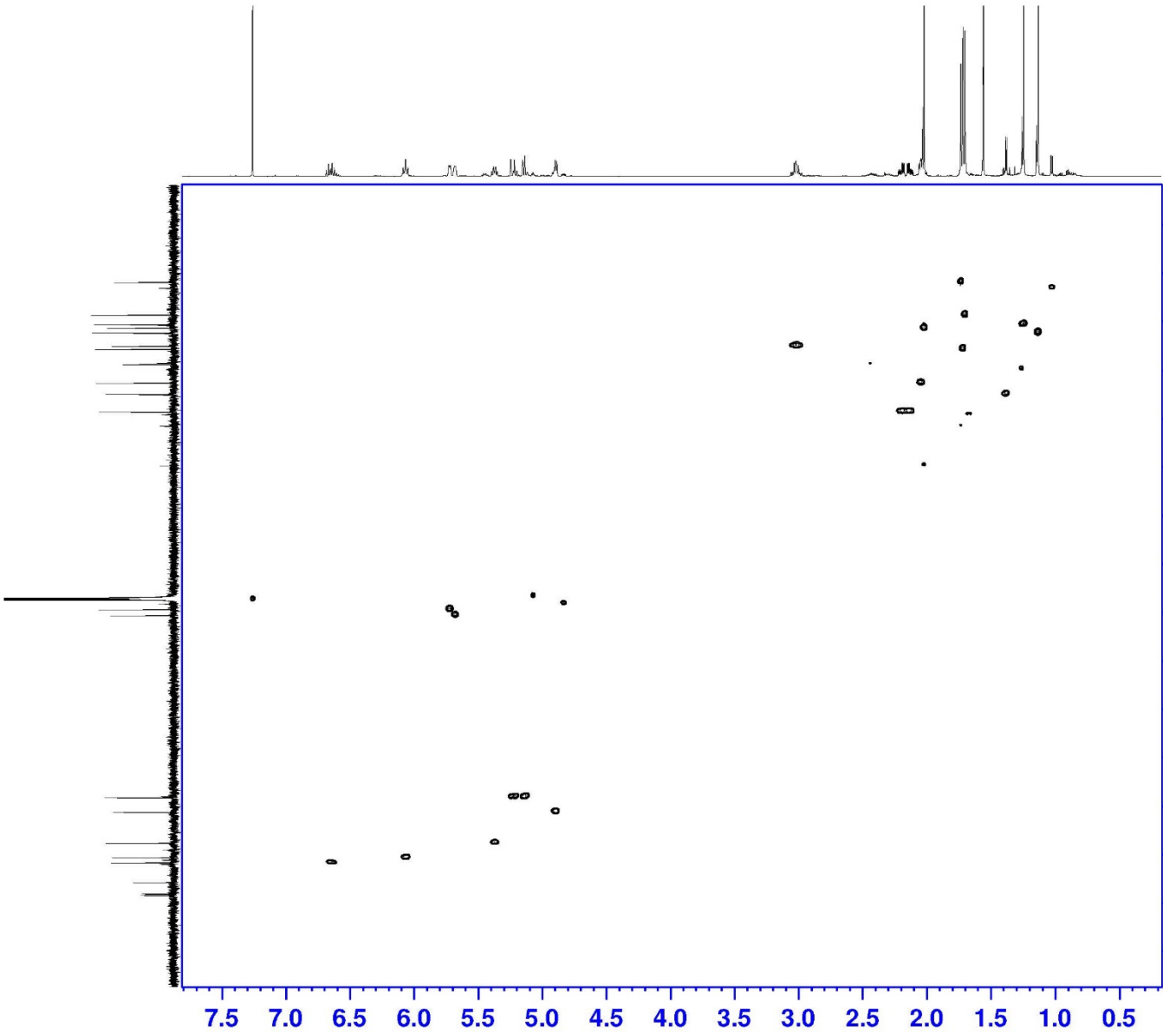
==== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 gaff
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 60.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

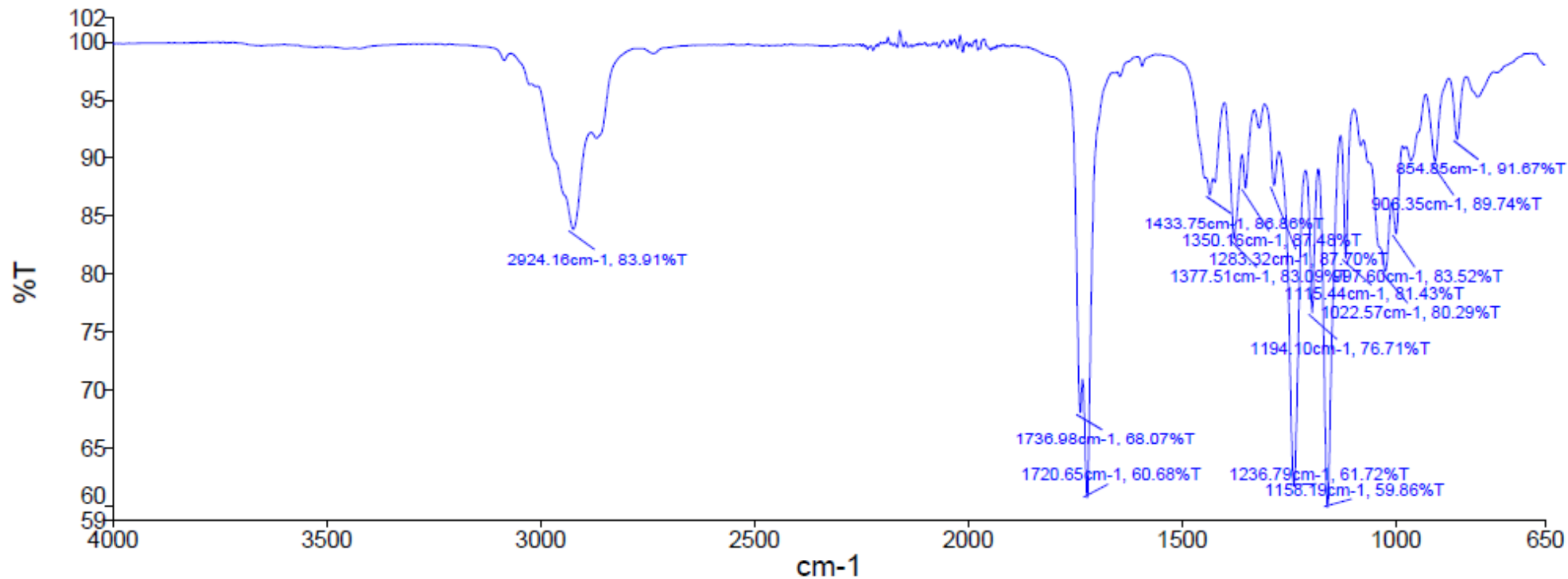
F2 - Processing parameters
 SI 1024
 SF 600.1300234 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9026227 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

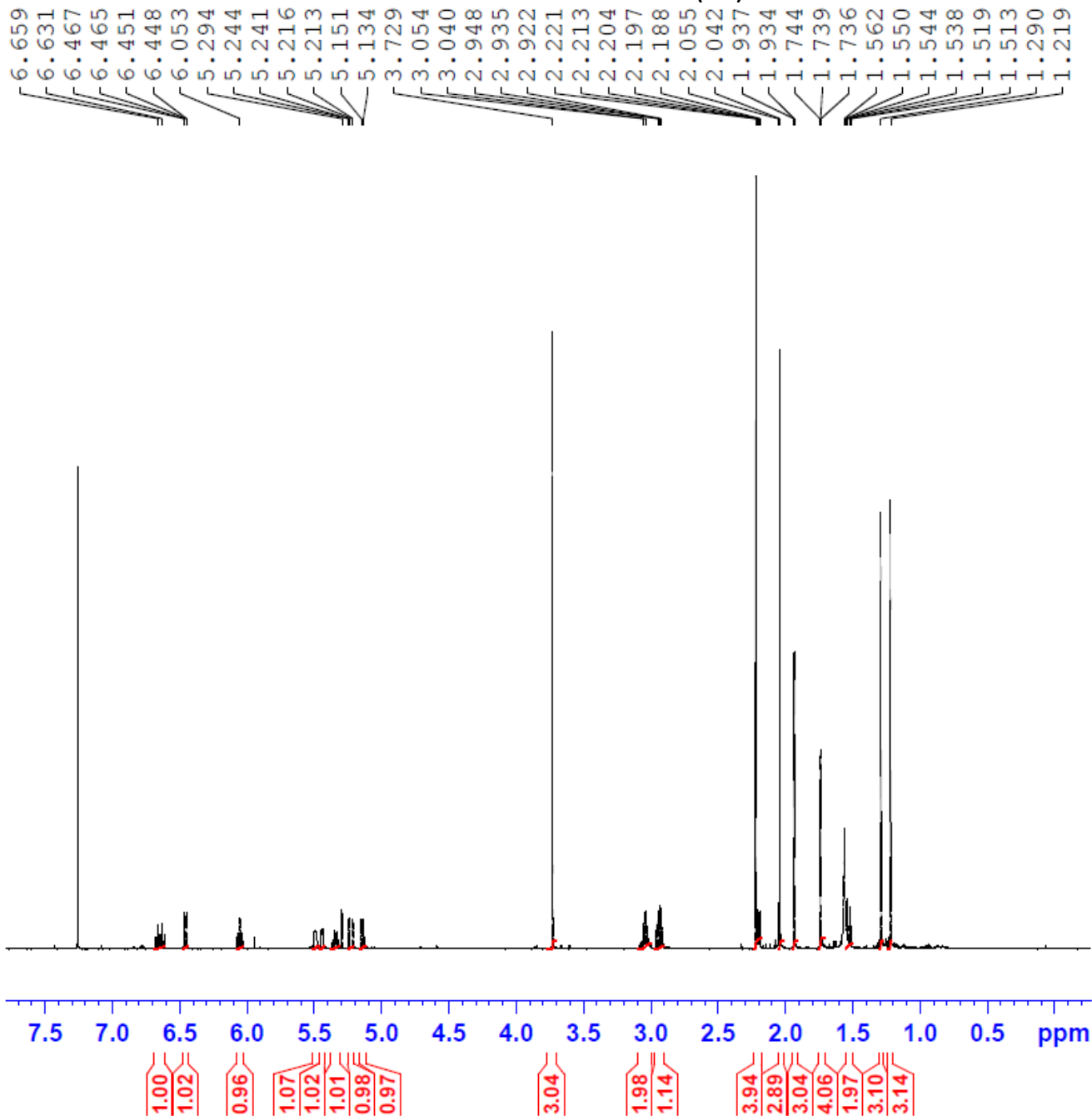


PerkinElmer Spectrum Version 10.4.2
Monday, 5 November 2018 1:53 PM

Analyst Date
Analyst
Monday, 5 November 2018 1:53 PM



4R-(5b) NMR Characterisation



Current Data Parameters
 NAME 20190220 FII Acetate MAJOR
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190220
 Time_ 17.35
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg30
 TD 65536
 SOLVENT CDC13
 NS 16
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 322
 DW 41.600 usec
 DE 6.50 usec
 TE 298.2 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 SF01 600.1337061 MHz
 NUC1 1H
 P1 13.50 usec
 PLW1 17.00000000 W

F2 - Processing parameters
 SI 65536
 SF 600.1300283 MHz
 WDW no
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.00



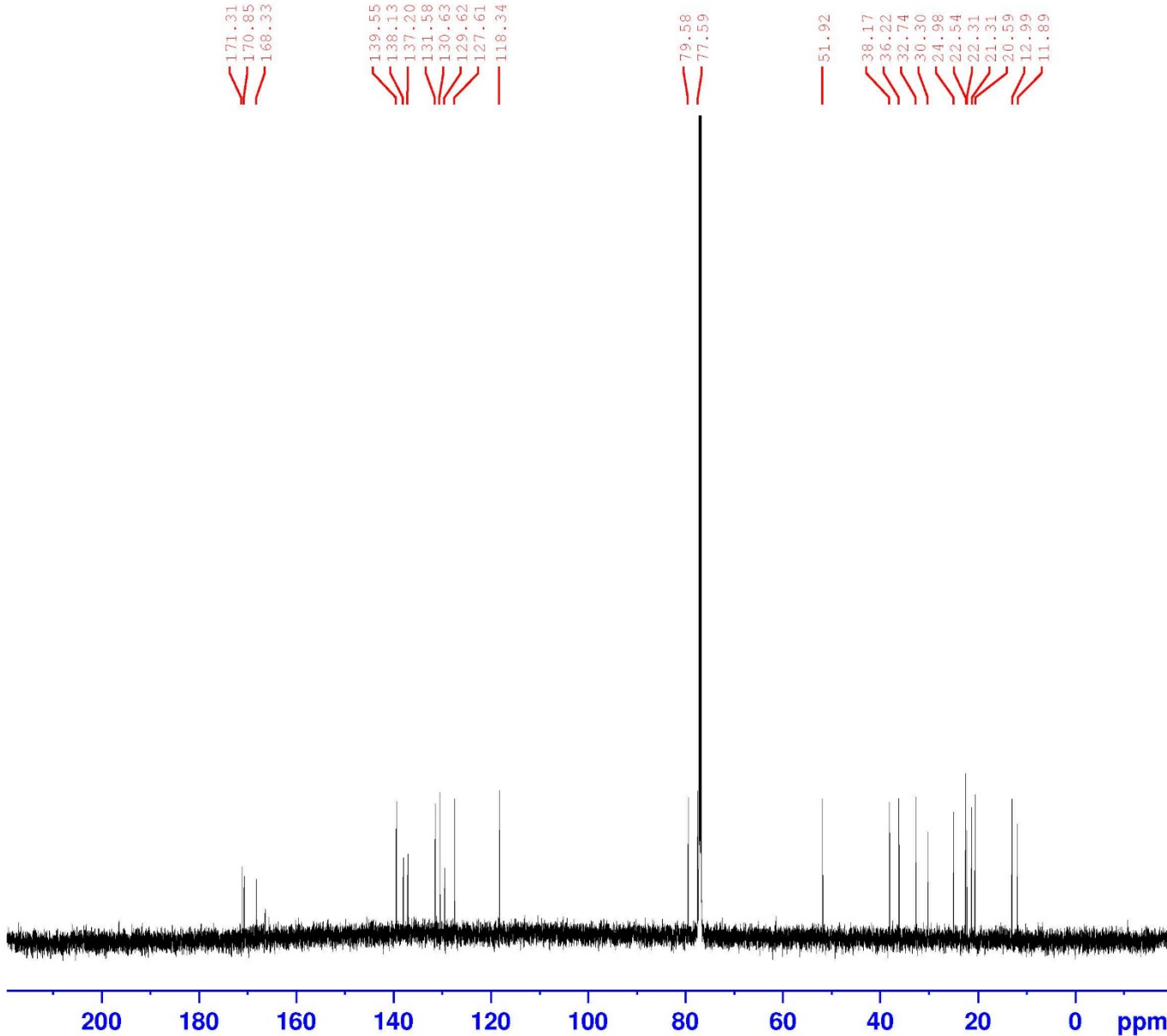
Current Data Parameters
 NAME 20190220 PII Acetate MAJOR
 EXPNO 22
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190220
 Time 20.14
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.00000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 17.00000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9027925 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20190220 PII Acetate MAJOR
 EXPNO 21
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190220
 Time 17.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4237.288 Hz
 FIDRES 2.068988 Hz
 AQ 0.2416640 sec
 RG 161
 DW 118.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.88613105 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00023600 sec

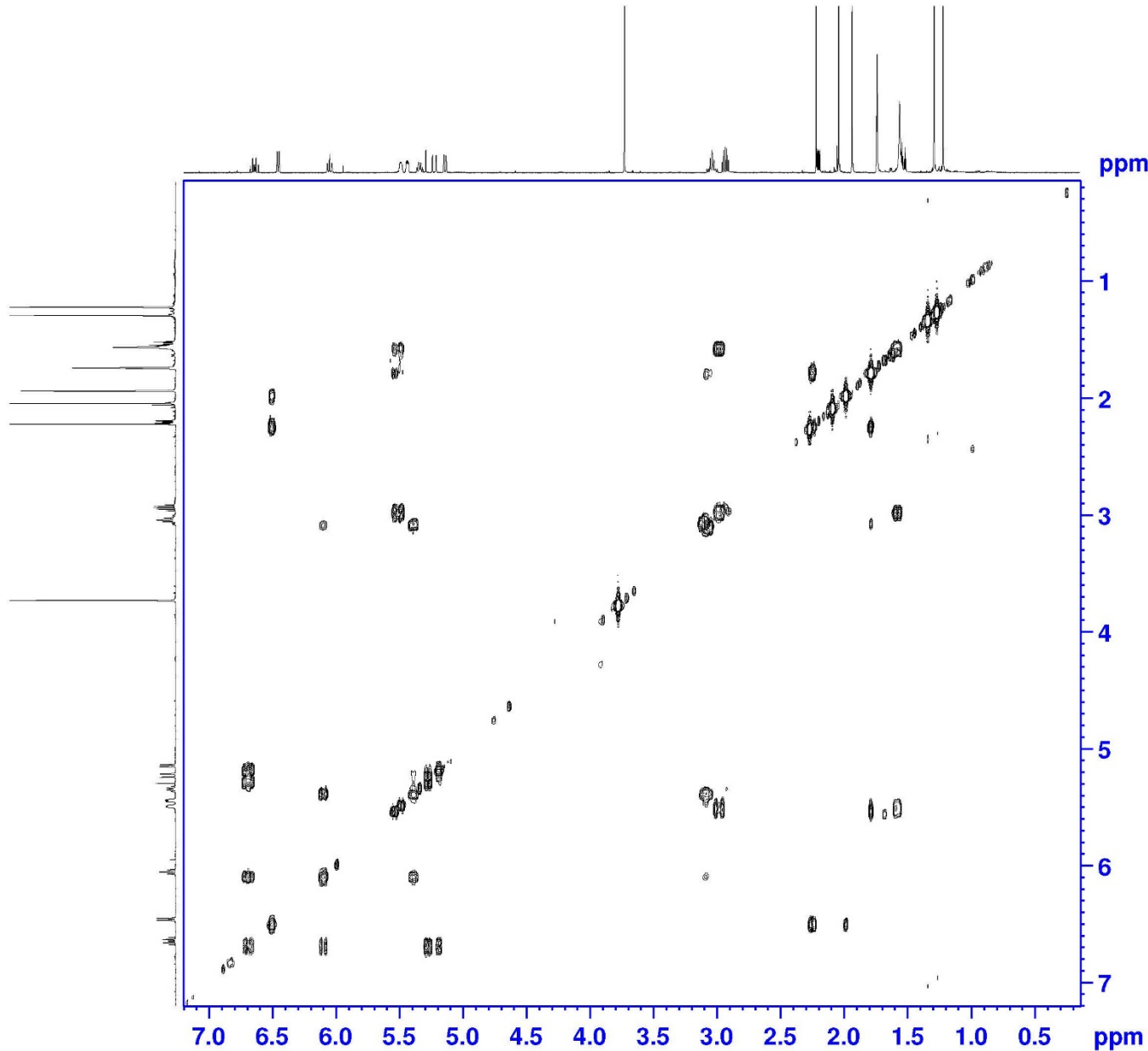
----- CHANNEL f1 -----
 SFO1 600.1322008 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1322 MHz
 FIDRES 33.103813 Hz
 SW 7.061 ppm
 FnMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1299971 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1299966 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20190220 PII Acetate MAJOR
 EXPNO 24
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20190220
 Time 20.22
 INSTRUM spect
 PROBRD 5 mm PABBO BB/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4201.681 Hz
 PIDRES 4.103204 Hz
 AQ 0.1218560 sec
 RG 2050
 DW 119.000 usec
 DE 6.50 usec
 TE 298.3 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.44368005 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1322258 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

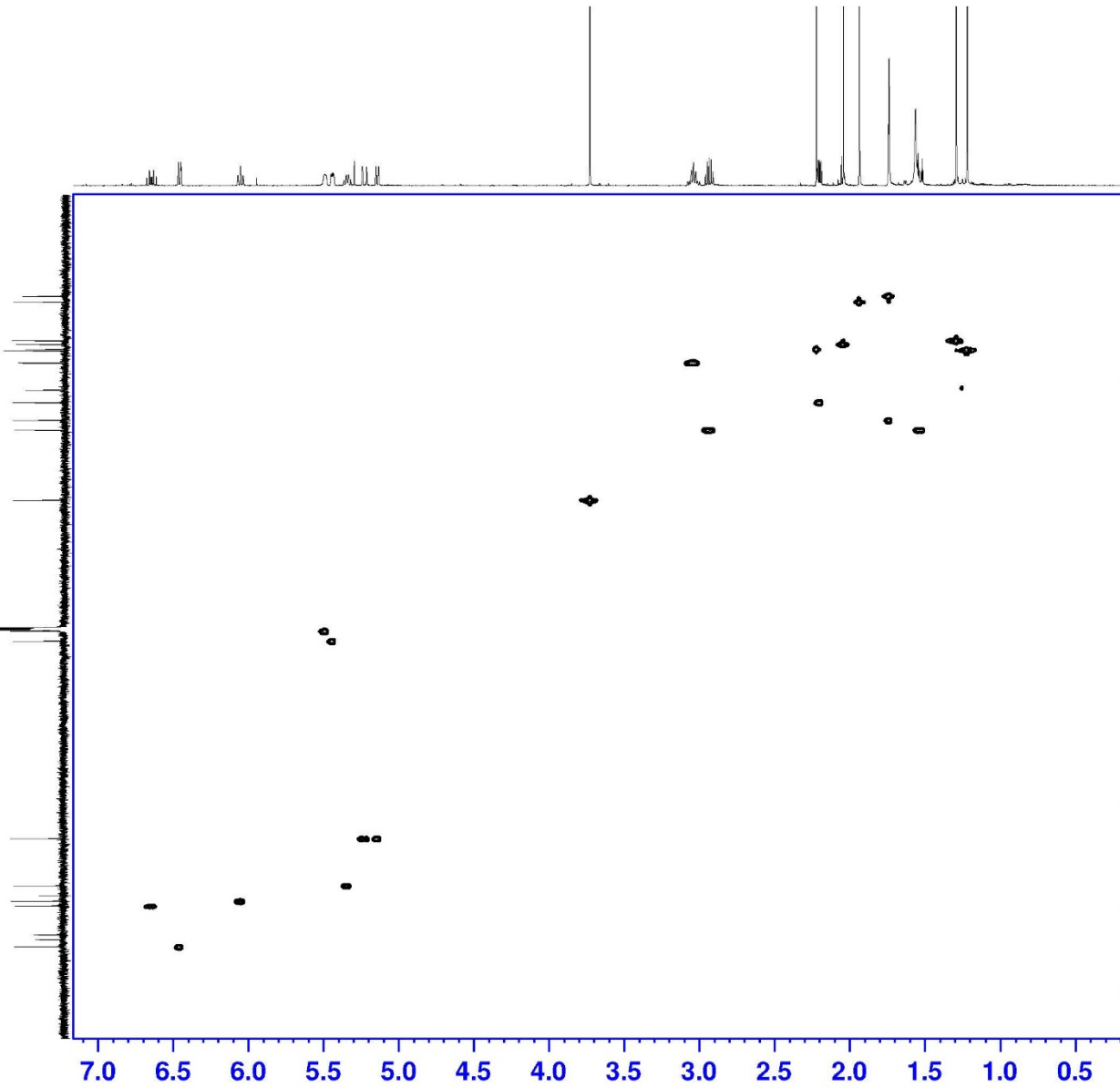
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 garrp
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 60.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

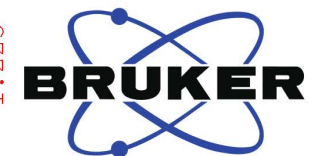
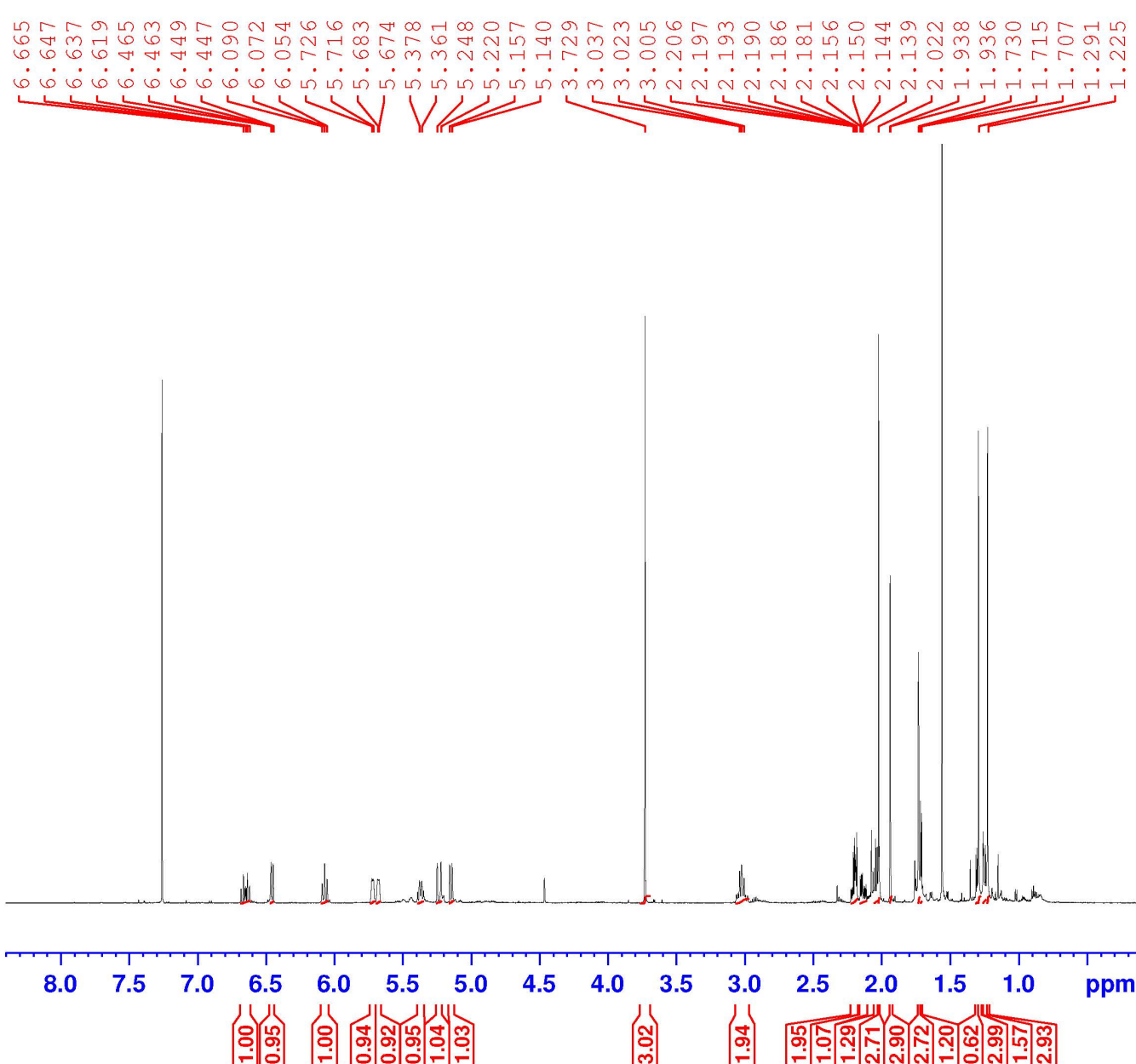
F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 PIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300260 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9027807 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



4S-(5b) NMR Characterisation



```

Current Data Parameters
NAME      20190226 Pyrethrin II Acetate Minor
EXPNO    10
PROCNO   1

F2 - Acquisition Parameters
Date_    20190226
Time     17.31
INSTRUM  spect
PROBHD   5 mm PABBO BB/
PULPROG  zg30
TD       65536
SOLVENT  CDCl3
NS       64
DS       2
SWH      12019.230 Hz
FIDRES   0.183399 Hz
AQ       2.7262976 sec
RG       287
DW       41.600 usec
DE       6.50 usec
TE       298.2 K
D1       1.00000000 sec
TDO      1

===== CHANNEL f1 =====
SFO1     600.1337061 MHz
NUC1     1H
P1       13.50 usec
PLW1     17.00000000 W

F2 - Processing parameters
SI       65536
SF       600.1300261 MHz
WDW      no
SSB      0
LB       0 Hz
GB       0
PC       1.00
    
```



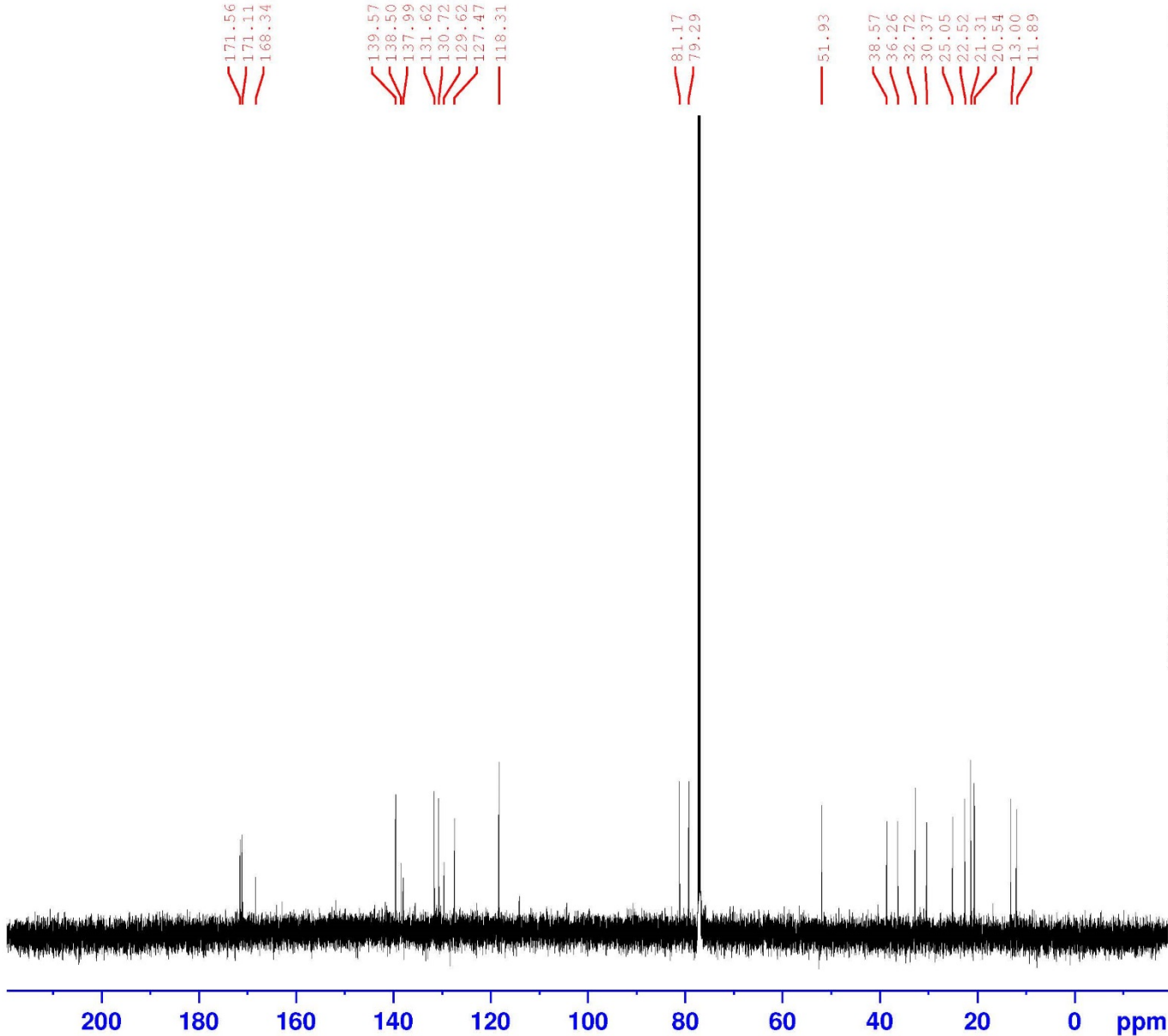

Current Data Parameters
 NAME 20190226 Pyrethrin II Acetate Minor
 EXPNO 22
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190226
 Time 21.20
 INSTRUM spect
 PROBHD 5 mm FAPBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 3096
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.00000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG2 waltz16
 PCPD2 70.00 usec
 PLW2 17.00000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9027906 MHz
 WDW no
 SSB 0
 LE 0 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20190226 Pyrethrin II Acetate Minor
 EXPNO 21
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190226
 Time 17.59
 INSTRUM spect
 PROBHD 5 mm FAPBO BB/
 PULPROG cosypppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4629.629 Hz
 PIDRES 2.260561 Hz
 AQ 0.2211840 sec
 RG 144
 DW 108.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.90661097 sec
 D11 0.03000000 sec
 D12 0.00020000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00021600 sec

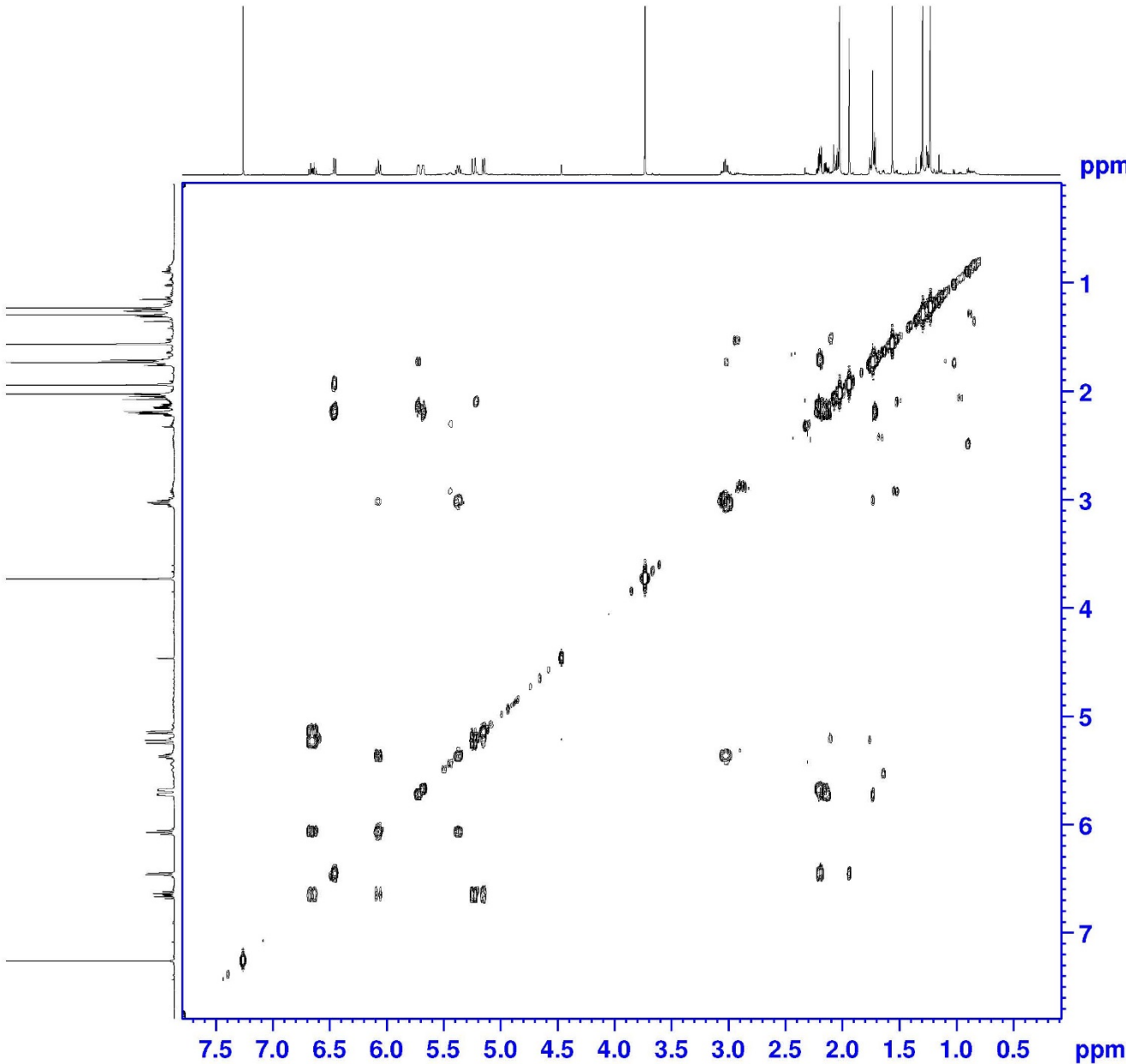
===== CHANNEL f1 =====
 SFO1 600.1323879 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

===== GRADIENT CHANNEL =====
 GENAM[L1] SMSQ10.100
 GP21 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1324 MHz
 PIDRES 36.168980 Hz
 SW 7.714 ppm
 PrMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300249 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300256 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20190226 Pyrethrin II Acetate Minor
 EXPNO 24
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190226
 Time 21.28
 INSTRUM spect
 PROBHD 5 mm FAPBO BB/
 PULPROG hsqcqtcp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4629.629 Hz
 PIDRES 4.521122 Hz
 AQ 0.1105920 sec
 RG 2050
 FW 108.000 usec
 DE 6.50 usec
 TE 298.3 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.45494401 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 IN0 0.00002000 sec
 ZGPGTNS

===== CHANNEL f1 =====
 SFO1 600.1323895 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

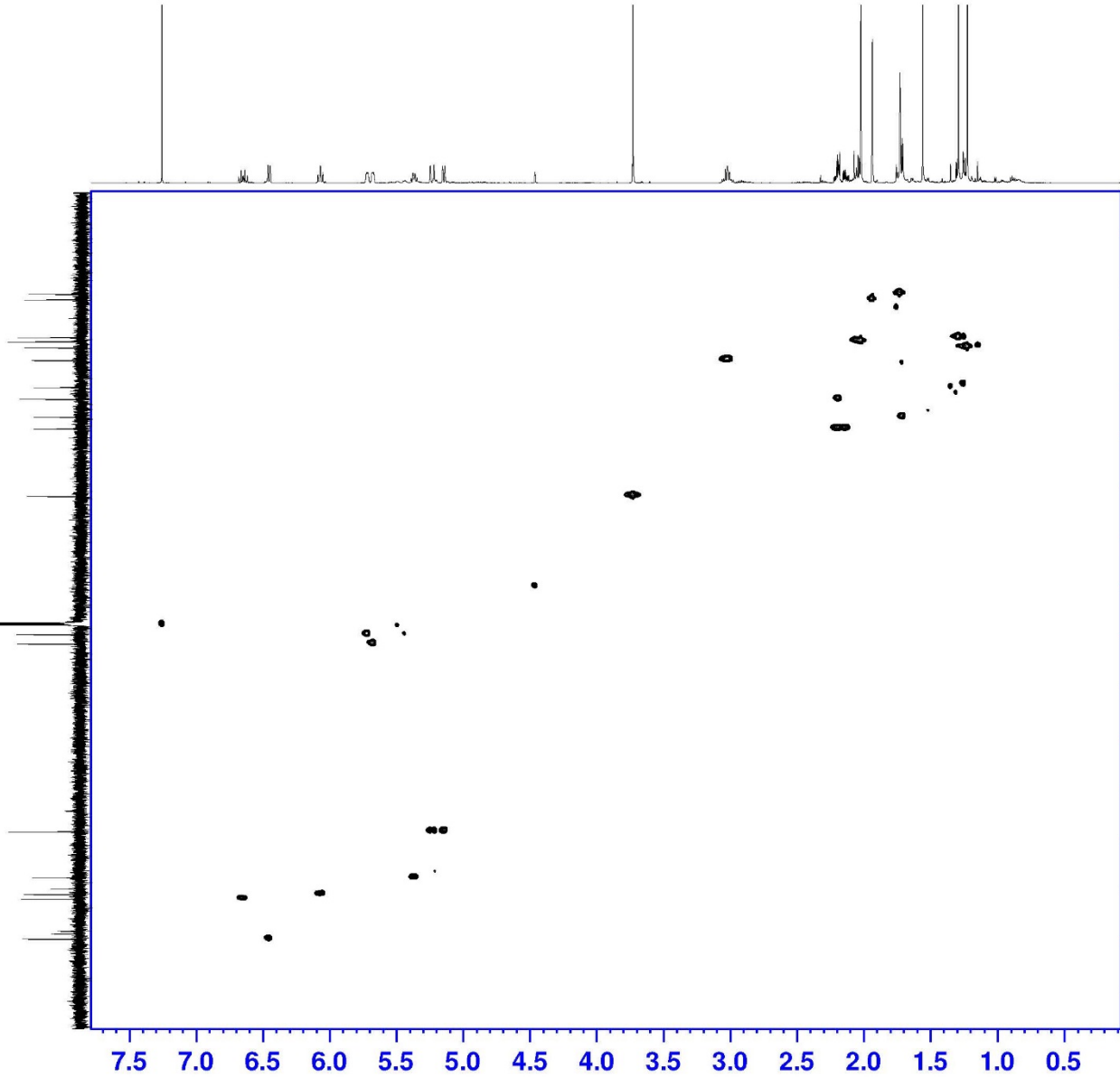
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CPDPRG[2] garp
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 50.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GEF1 30.00 %
 GEF2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 PIDRES 97.656250 Hz
 SW 165.657 ppm
 PhMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1302550 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028175 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

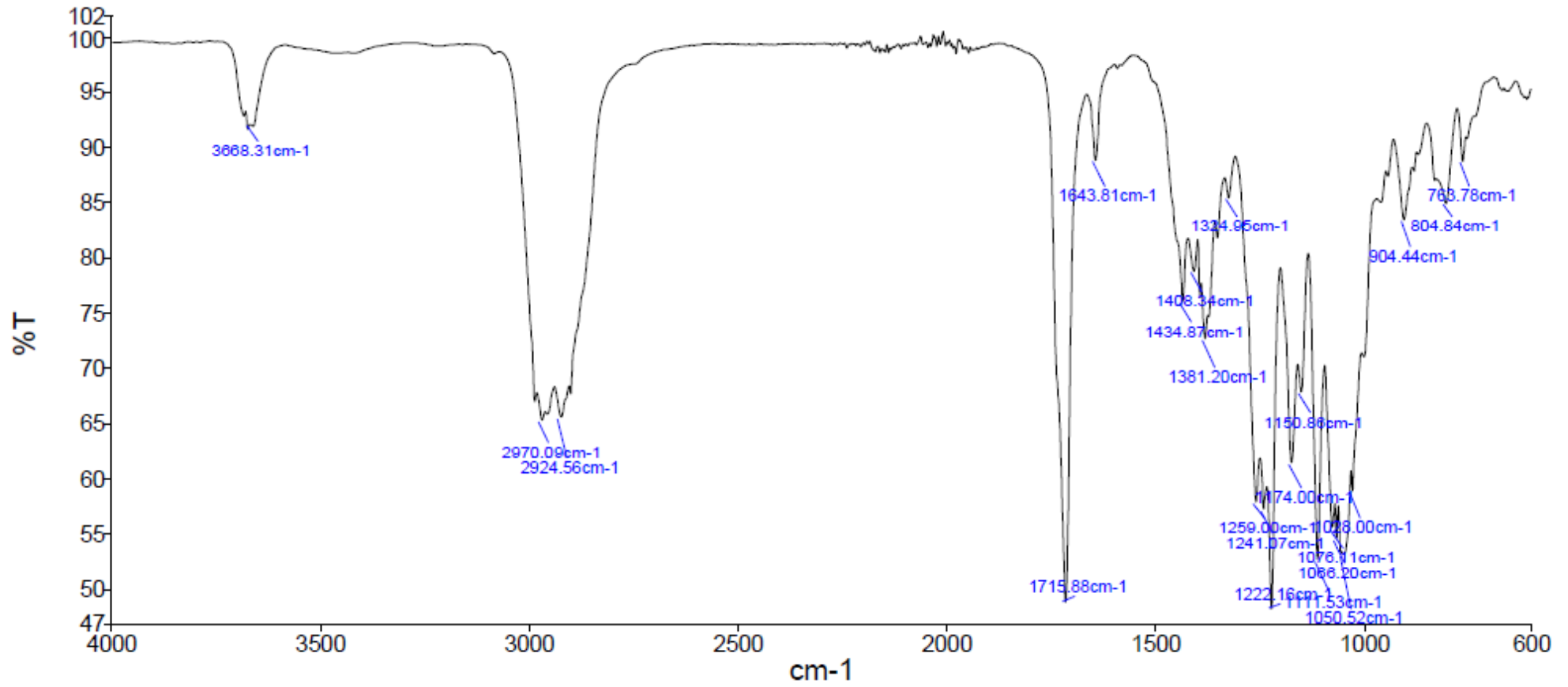


(5b) IR Spectrum

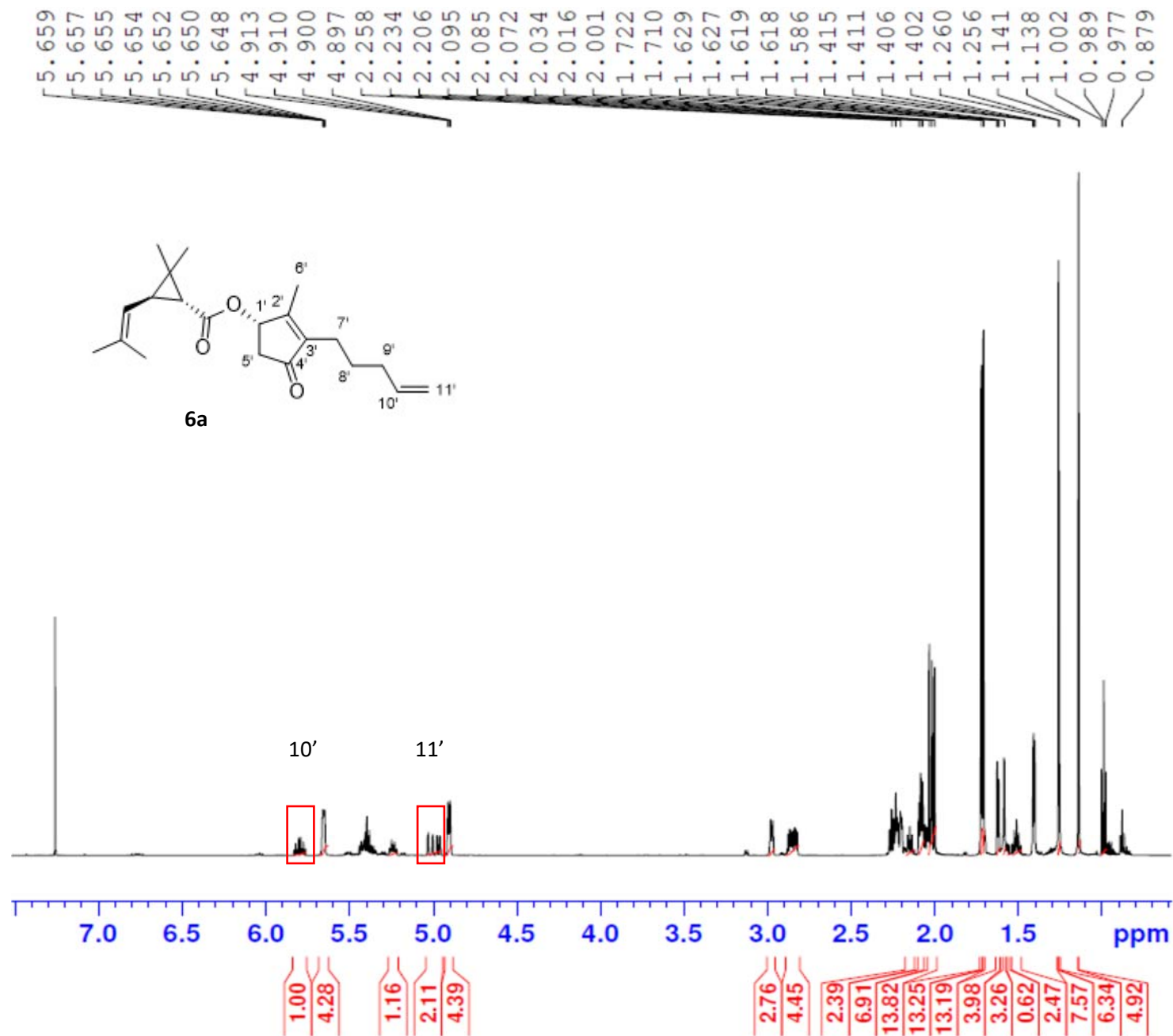
PerkinElmer Spectrum Version 10.4.00
Friday, 30 November 2018 9:10 AM

Analyst
Date

Analyst
Friday, 30 November 2018 9:10 AM



Representative ^1H NMR spectrum of partially hydrogenated pyrethrin I (**1a**) showing characteristic peaks for compound **6a**



(7a) NMR Characterisation



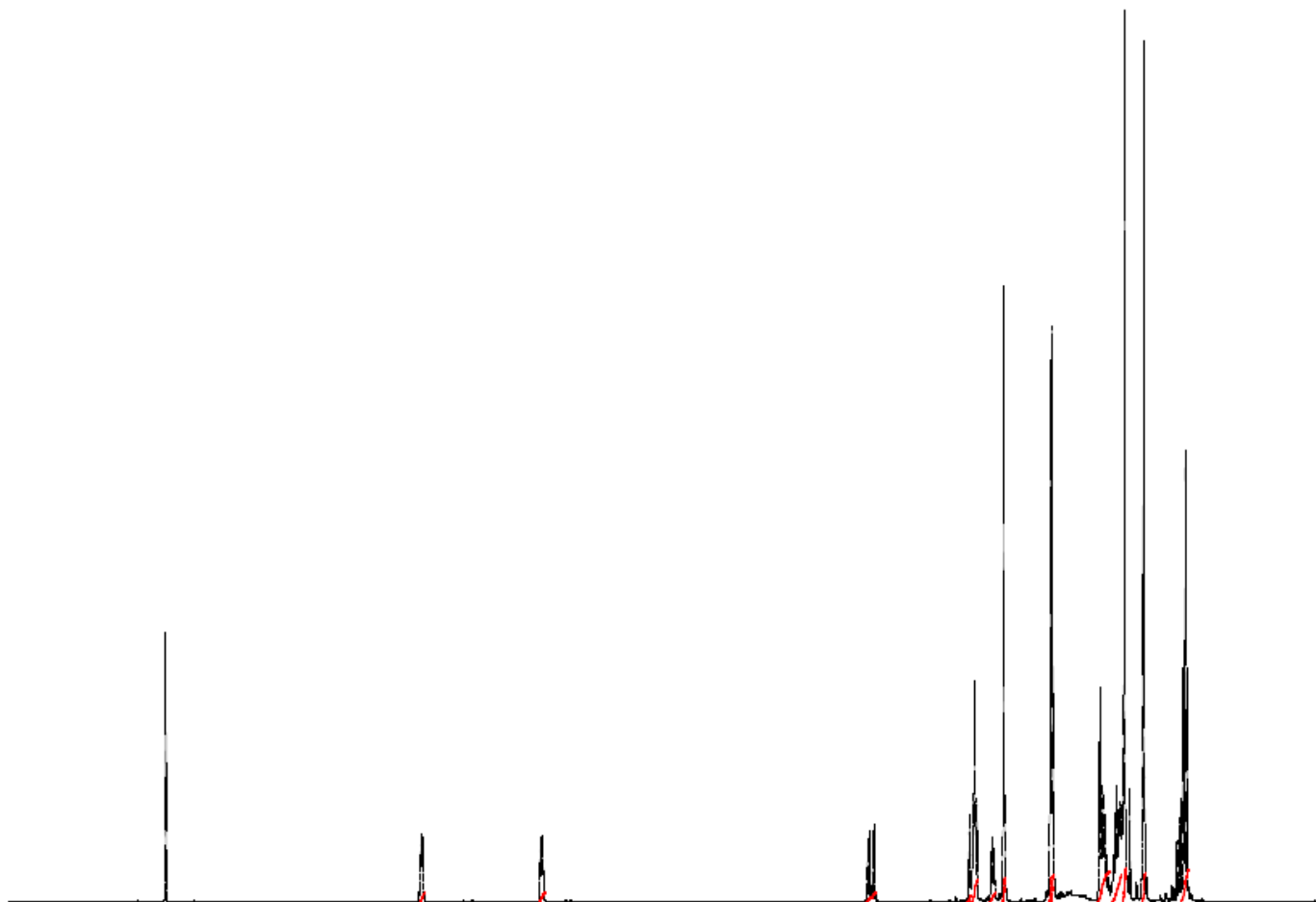
5.654
5.644
4.907
4.896
4.894
2.860
2.850
2.829
2.819
2.225
2.222
2.203
2.191
2.177
2.090
2.080
2.068
2.009
2.002
1.717
1.705
1.411
1.402
1.390
1.377
1.313
1.301
1.290
1.281
1.274
1.268
1.254
1.219
1.135
1.128
0.926
0.915
0.909
0.898
0.885
0.873
0.861

Current Data Parameters
NAME 20180904 Hydrogenation PI
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180904
Time 18.28
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG zg30
TD 65536
SOLVENT CDC13
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 161
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

----- CHANNEL f1 -----
SF01 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PLW1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300297 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 ppm

0.96
1.00
1.07
0.70
2.60
1.02
2.84
2.87
3.14
3.45
3.09
3.89
3.22
3.65



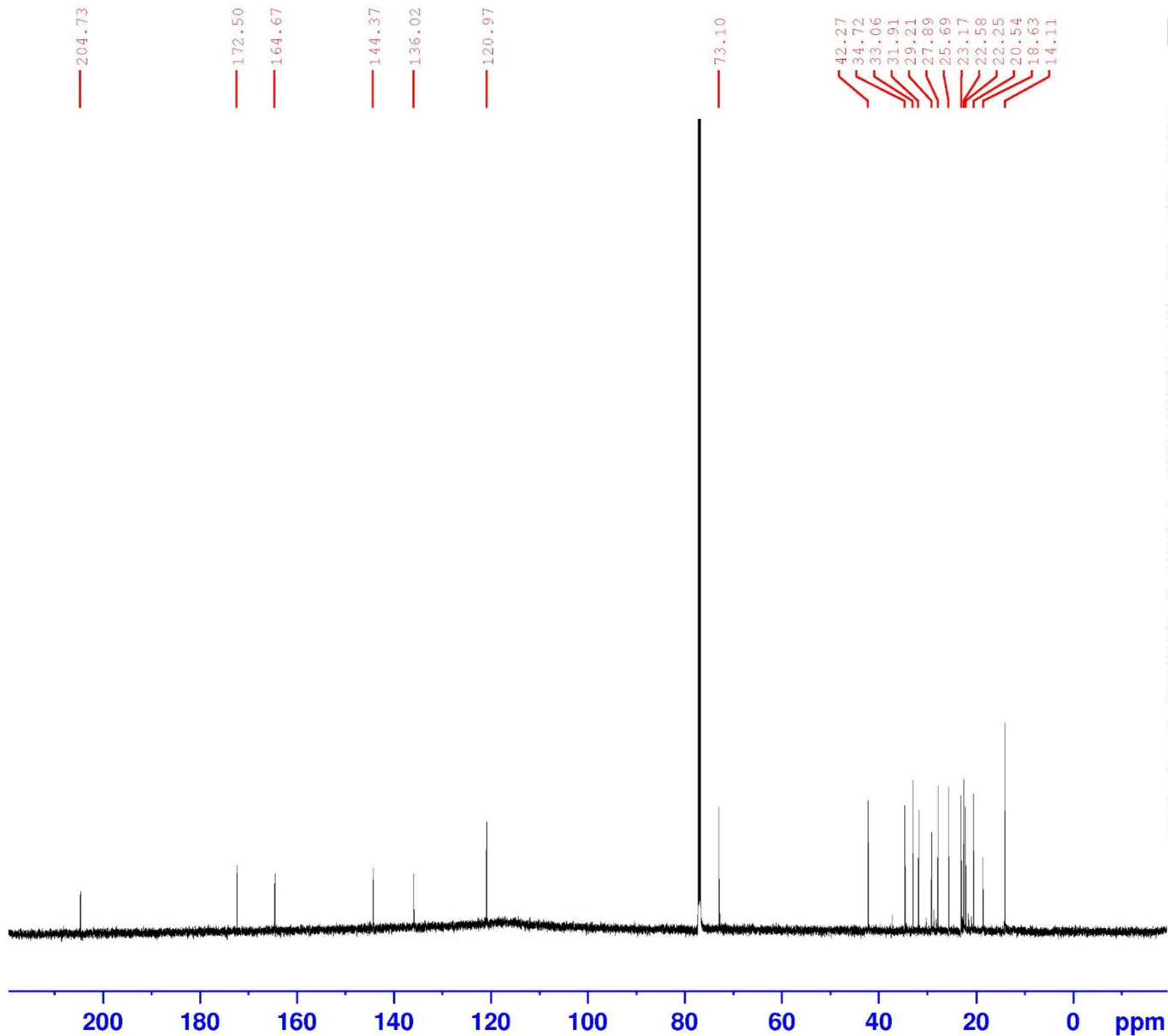
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 NAME 20180904 Hydrogenation PI
 EXPNO 11
 PROCNO 1

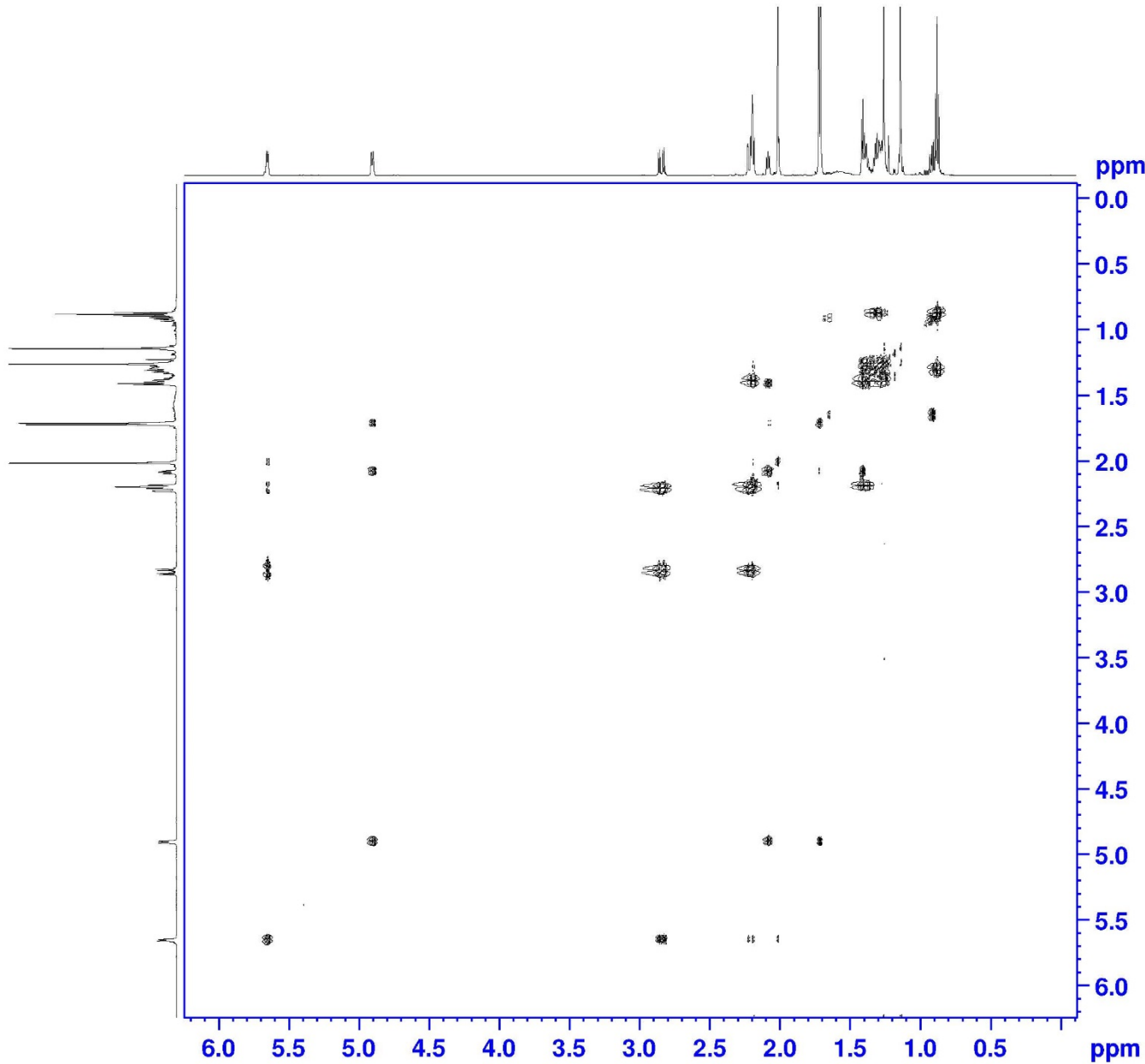
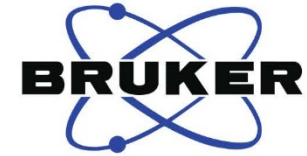
F2 - Acquisition Parameters
 Date_ 20180904
 Time 20.13
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1820
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCDP2 70.00 usec
 PLW2 12.55000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027920 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20180904 Hydrogenation PI
 EXPNO 13
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180904
 Time 20.20
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygpmfphpp
 TD 2048
 SOLVENT CDCl3
 NS 5
 DS 4
 SWH 3816.794 Hz
 FIDRES 1.863669 Hz
 AQ 0.2682880 sec
 RG 2050
 DW 131.000 usec
 DE 6.50 usec
 TE 298.2 K
 DO 0.00012030 sec
 D1 1.87015700 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D16 0.00020000 sec
 IN0 0.00026200 sec

===== CHANNEL f1 =====
 SF01 600.1318677 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GFNAM[1] SMSQ10.100
 GFNAM[2] SMSQ10.100
 GPZ1 10.00 %
 GPZ2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SF01 600.1319 MHz
 FIDRES 14.909351 Hz
 SW 6.360 ppm
 EnMODE States-TPPI

F2 - Processing parameters
 SI 1024
 SF 600.1300271 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TPPI
 SF 600.1300277 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



Current Data Parameters
 NAME 20180904 Hydrogenation PI
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180904
 Time 21.10
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 3816.794 Hz
 PIDRES 3.727338 Hz
 AQ 0.1341440 sec
 RG 2050
 DW 131.000 usec
 DE 6.50 usec
 TE 298.0 K
 CNST2 145.0000000
 D0 0.00000300 sec
 D1 1.43139195 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1318677 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

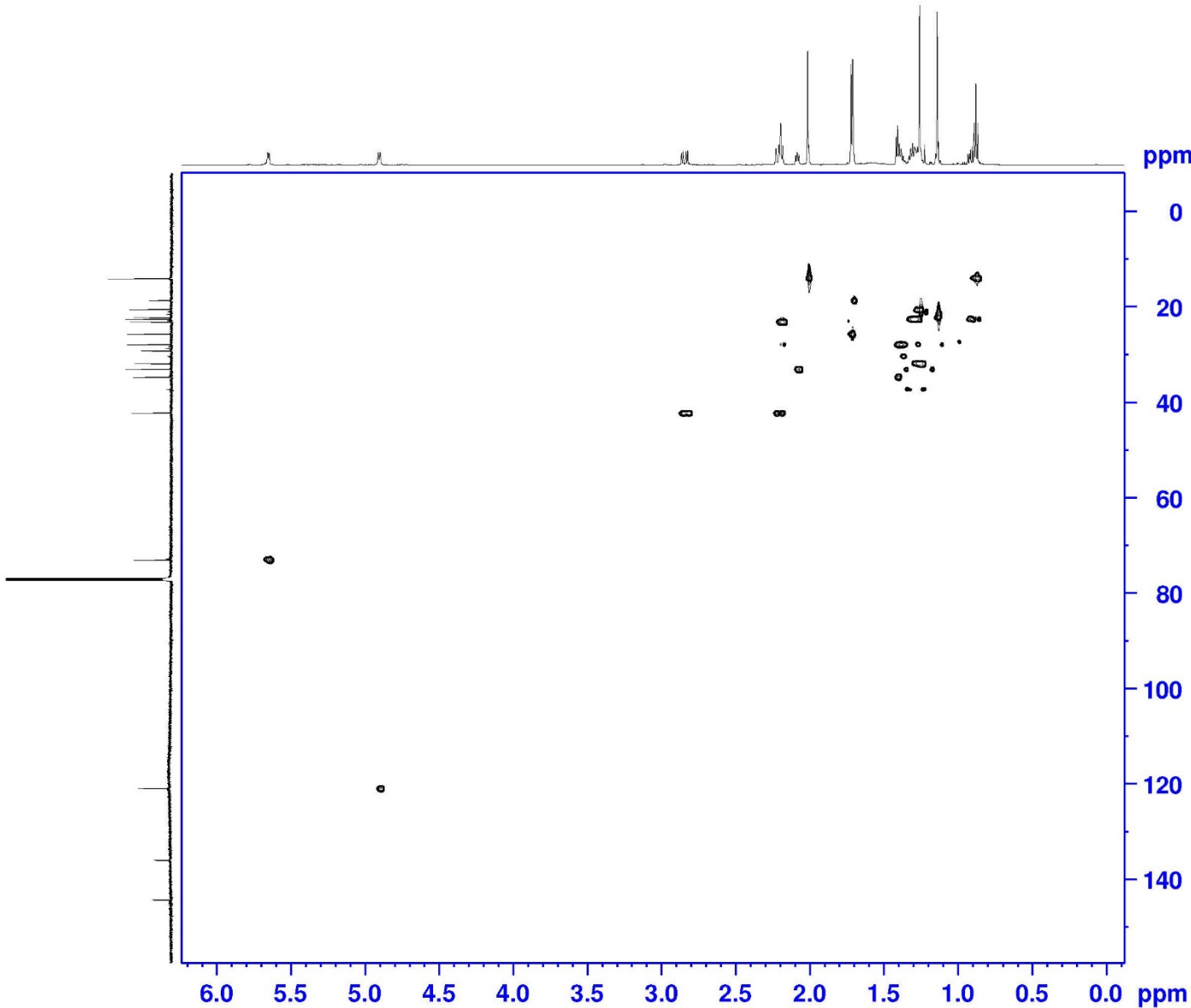
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 gaff
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 PIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300315 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9027851 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

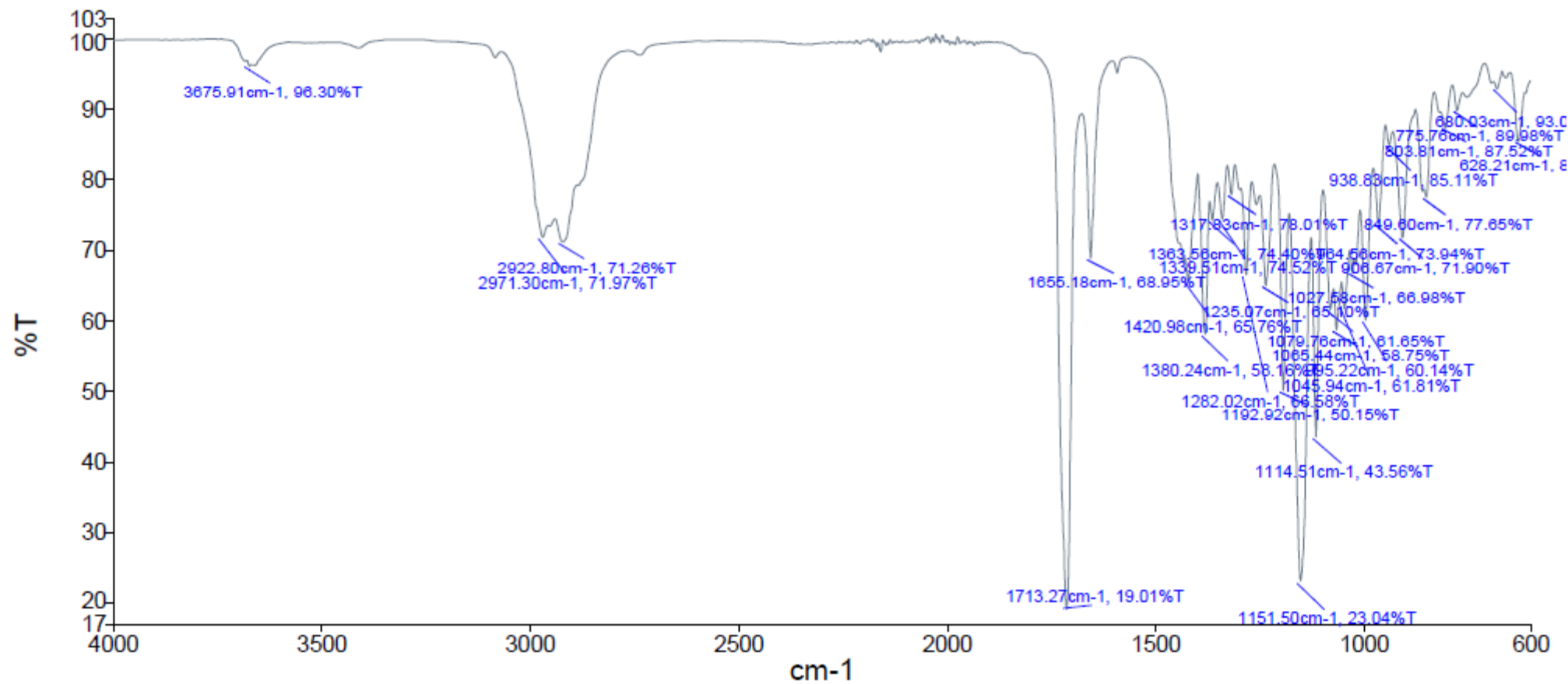


(7a) IR Spectrum

PerkinElmer Spectrum Version 10.4.2
Wednesday, 17 October 2018 3:00 PM

Analyst
Date

Analyst
Wednesday, 17 October 2018 3:00 PM



(7b) NMR Characterisation

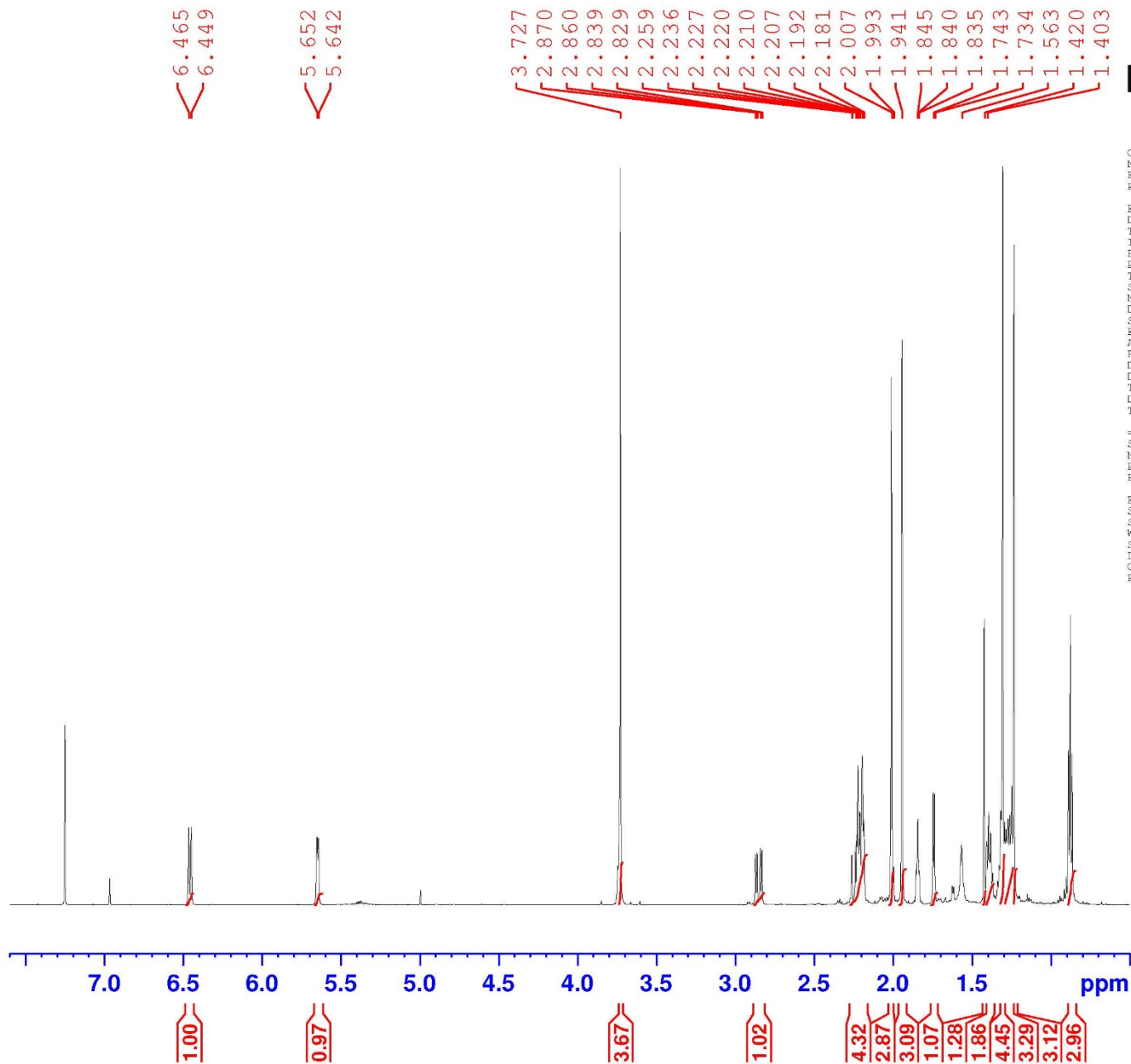


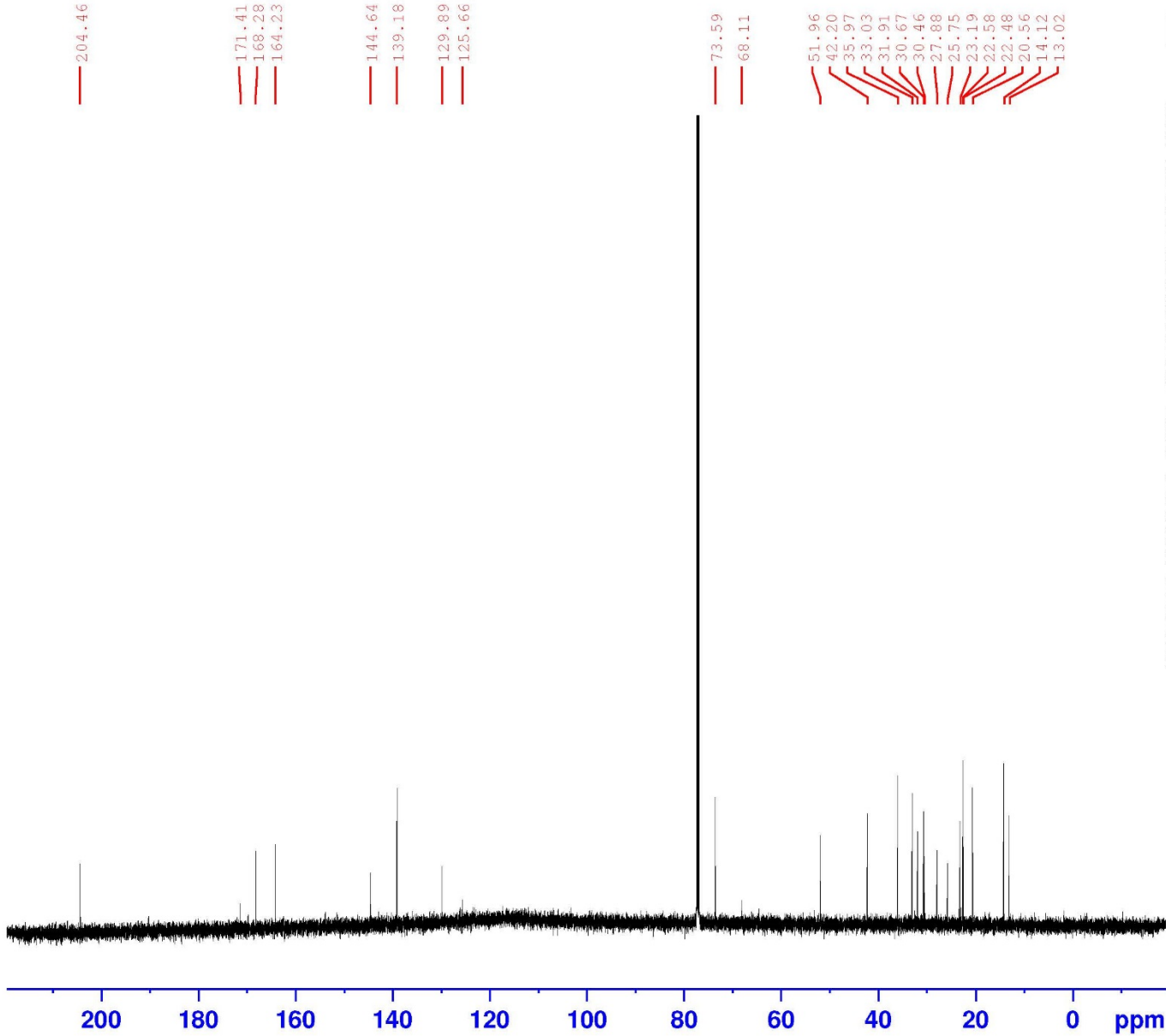
Current Data Parameters
NAME 20180914 Hydrogenation Pyrethrin II
EXPNO 31
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180914
Time 21.24
INSTRUM spect
PROBHD 5 mm FABBI 1H/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 161
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TDO 1

==== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PLW1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300304 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00





Current Data Parameters
NAME 20180914 Hydrogenation Pyrethrin II
EXPNO 30
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180914
Time 21.08
INSTRUM spect
PROBHD 5 mm FABBI 1H/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2048
DS 2
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 1440
DW 13.867 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
SFO1 150.9178988 MHz
NUC1 13C
P1 16.00 usec
PLW1 110.76000214 W

===== CHANNEL f2 =====
SFO2 600.1324005 MHz
NUC2 1H
CPDPRG2 waltz16
PCPD2 70.00 usec
PLW2 12.95000019 W
PLW12 0.18072000 W
PLW13 0.08855400 W

F2 - Processing parameters
SI 32768
SF 150.9027904 MHz
WDW no
SSB 0
LE 0 Hz
GB 0
PC 1.40



Current Data Parameters
 NAME 20180914 Hydrogenation Pyrethrin II
 EXPNO 32
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180914
 Time 21.35
 INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG cosygmfphpp
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 4
 SWH 4132.231 Hz
 FIDRES 2.017691 Hz
 AQ 0.2478080 sec
 RG 2050
 DW 121.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00011030 sec
 D1 1.89063704 sec
 D11 0.03000000 sec
 D12 0.00020000 sec
 D16 0.00020000 sec
 IN0 0.00024200 sec

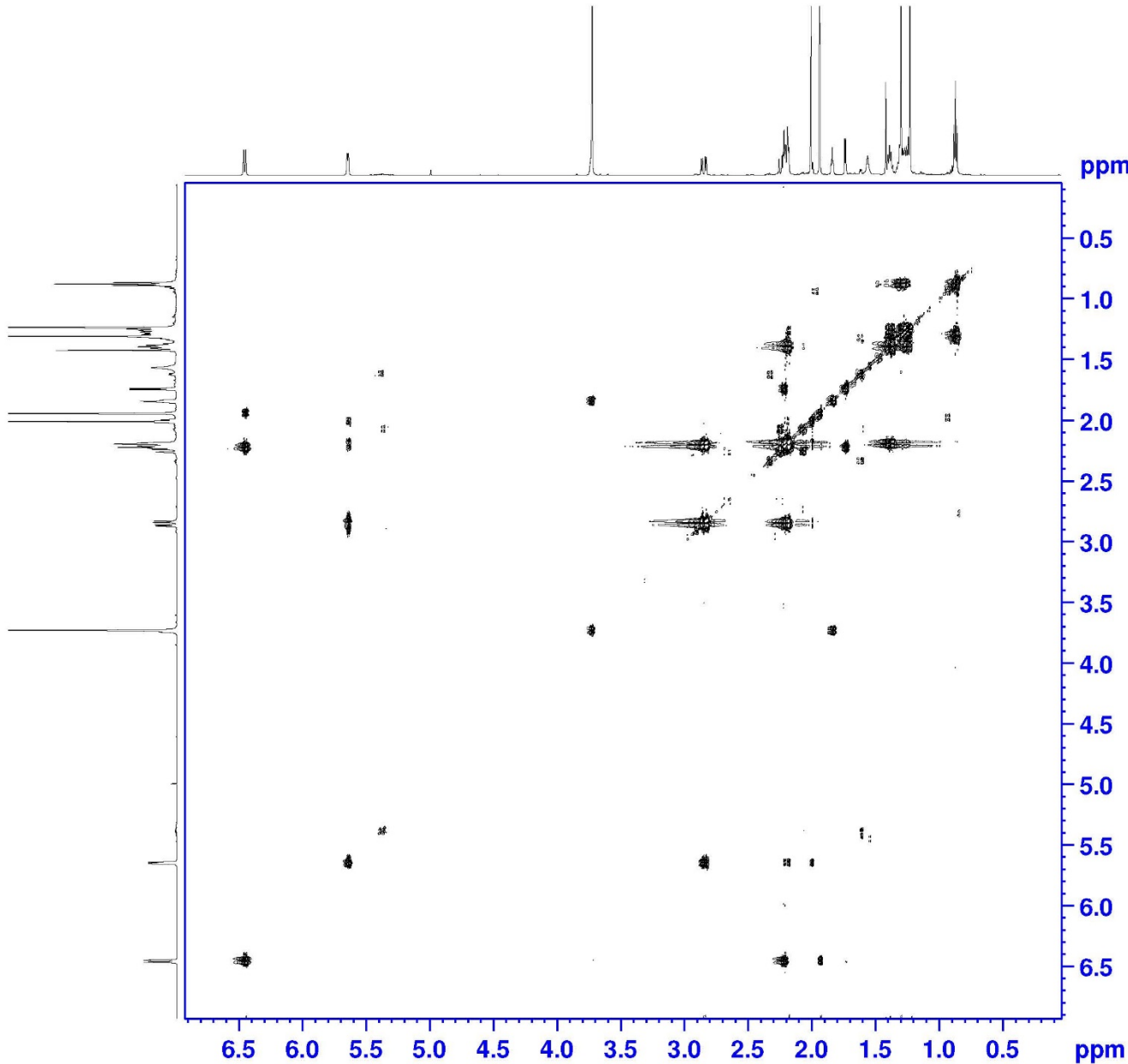
===== CHANNEL f1 =====
 SFO1 600.1321235 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.309999994 W

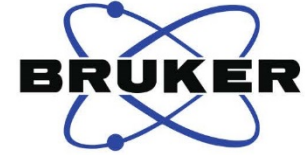
===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GEZ1 10.00 %
 GEZ2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 600.1321 MHz
 FIDRES 16.141529 Hz
 SW 6.886 ppm
 PhMODE States-TFPI

F2 - Processing parameters
 SI 1024
 SF 600.1300327 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TFPI
 SF 600.1300295 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20180914 Hydrogenation Pyrethrin II
 EXPNO 34
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180914
 Time 23.37

INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG hsqcsetgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4464.286 Hz
 PIDRES 4.359654 Hz
 AQ 0.1146880 sec
 RG 2050
 FW 112.000 usec
 DE 6.50 usec
 TE 298.0 K
 CNS12 145.0000000
 D0 0.00000300 sec
 D1 1.45084798 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 IN0 0.00002000 sec
 ZGOFINS

===== CHANNEL f1 =====
 SFO1 600.1319837 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

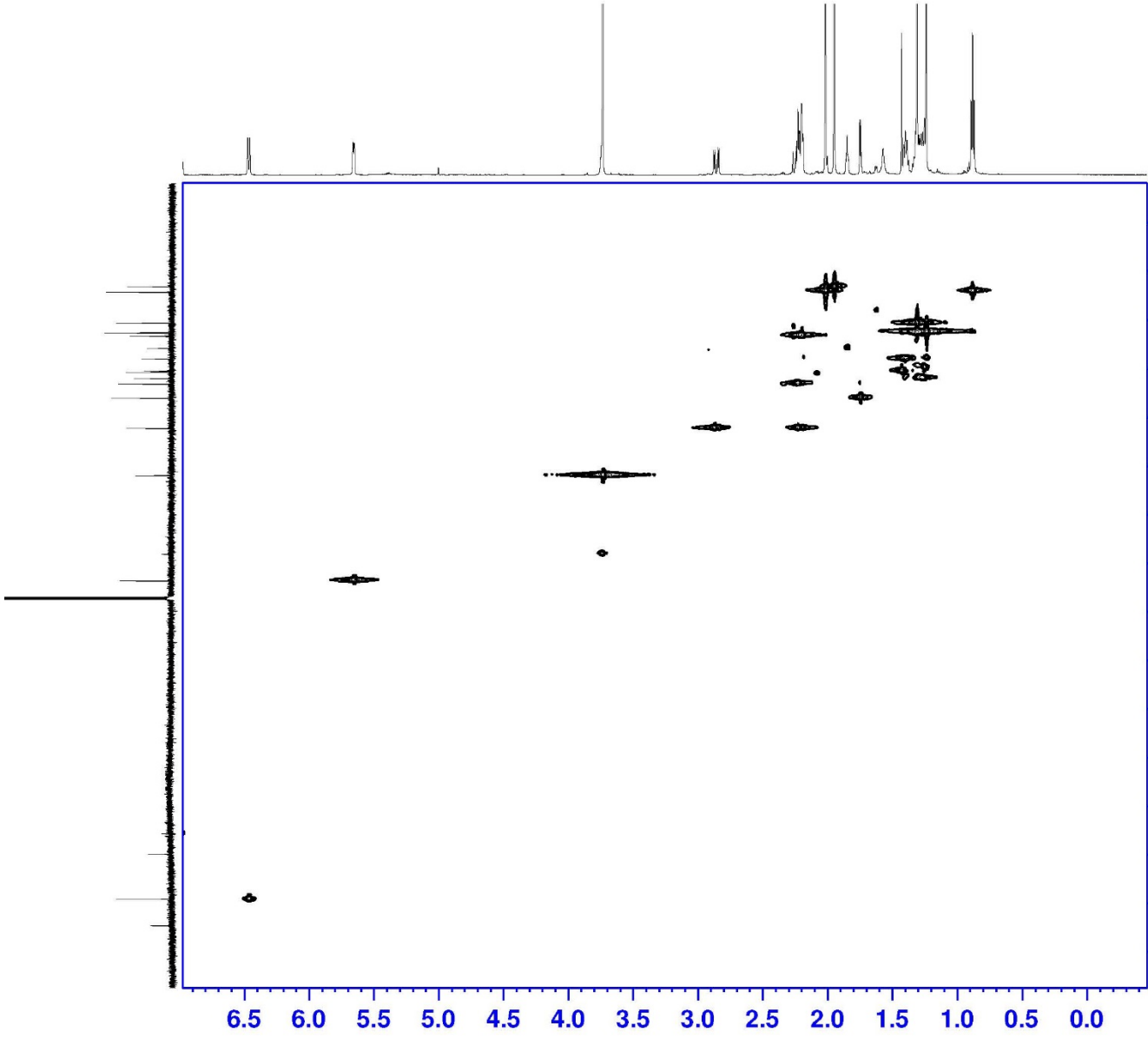
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CPDPRG[2] garp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 50.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GEF1 30.00 %
 GEF2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 PIDRES 97.656250 Hz
 SW 165.657 ppm
 PhMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300288 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

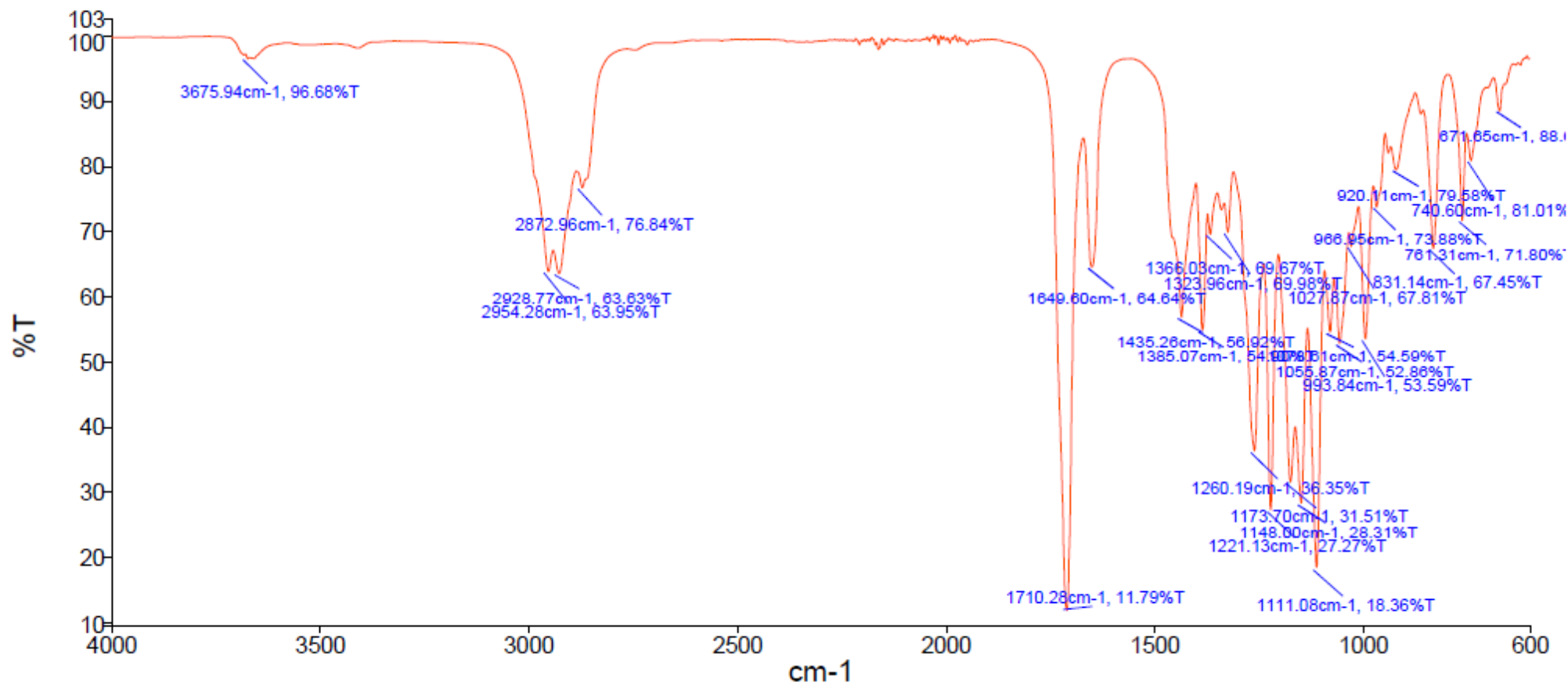
F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028085 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



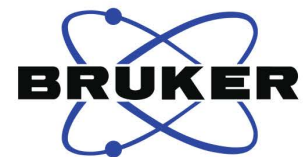
(7b) IR Spectrum

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Analyst Date
Analyst
Wednesday, 17 October 2018 3:01 PM



(8a) NMR Characterisation

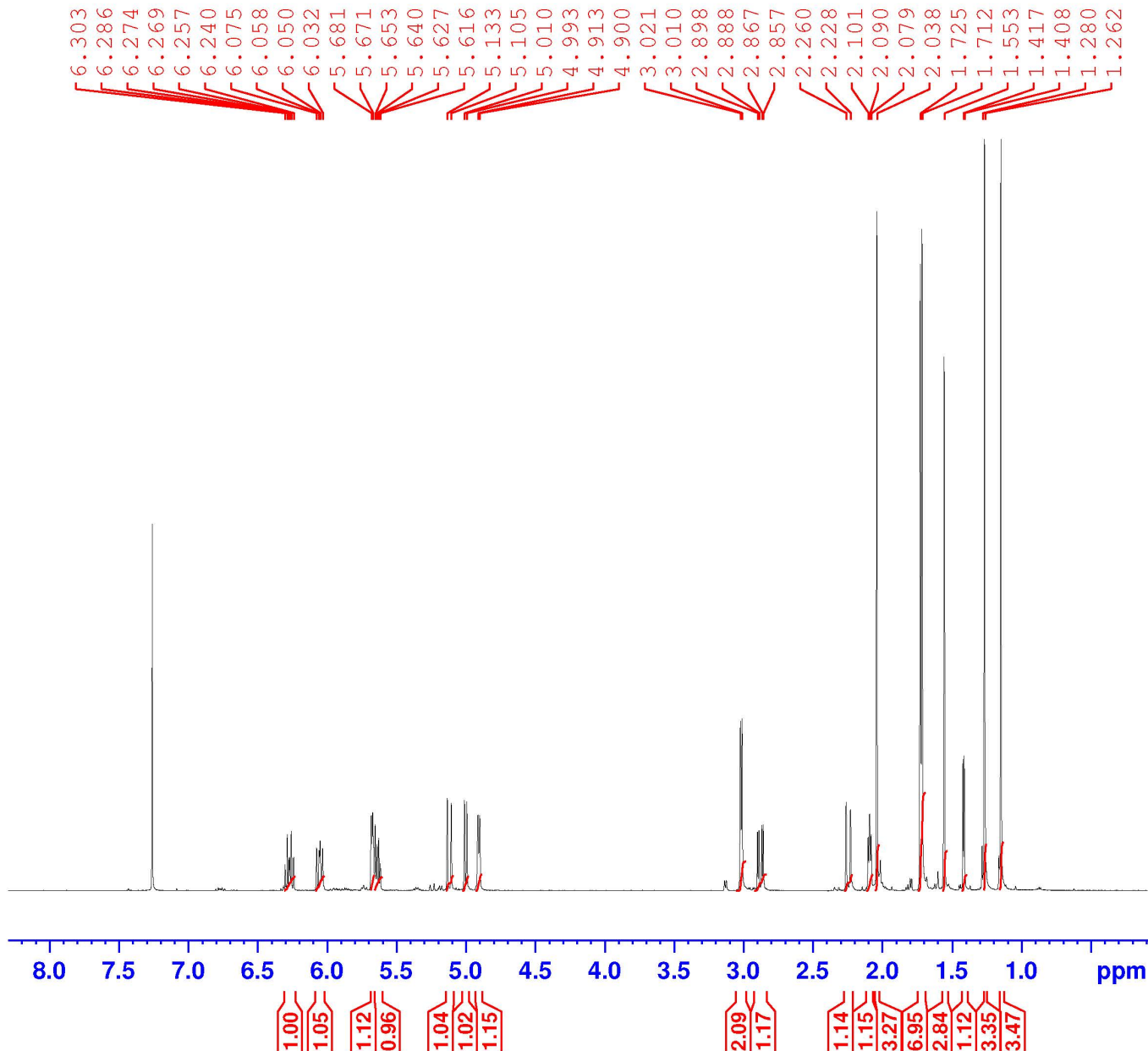


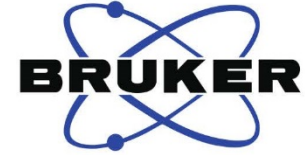
Current Data Parameters
NAME 20190404 Trans PI CLEAN
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20190405
Time 3.28
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 287
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

==== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 13.50 usec
PLW1 17.00000000 W

F2 - Processing parameters
SI 65536
SF 600.1300263 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00





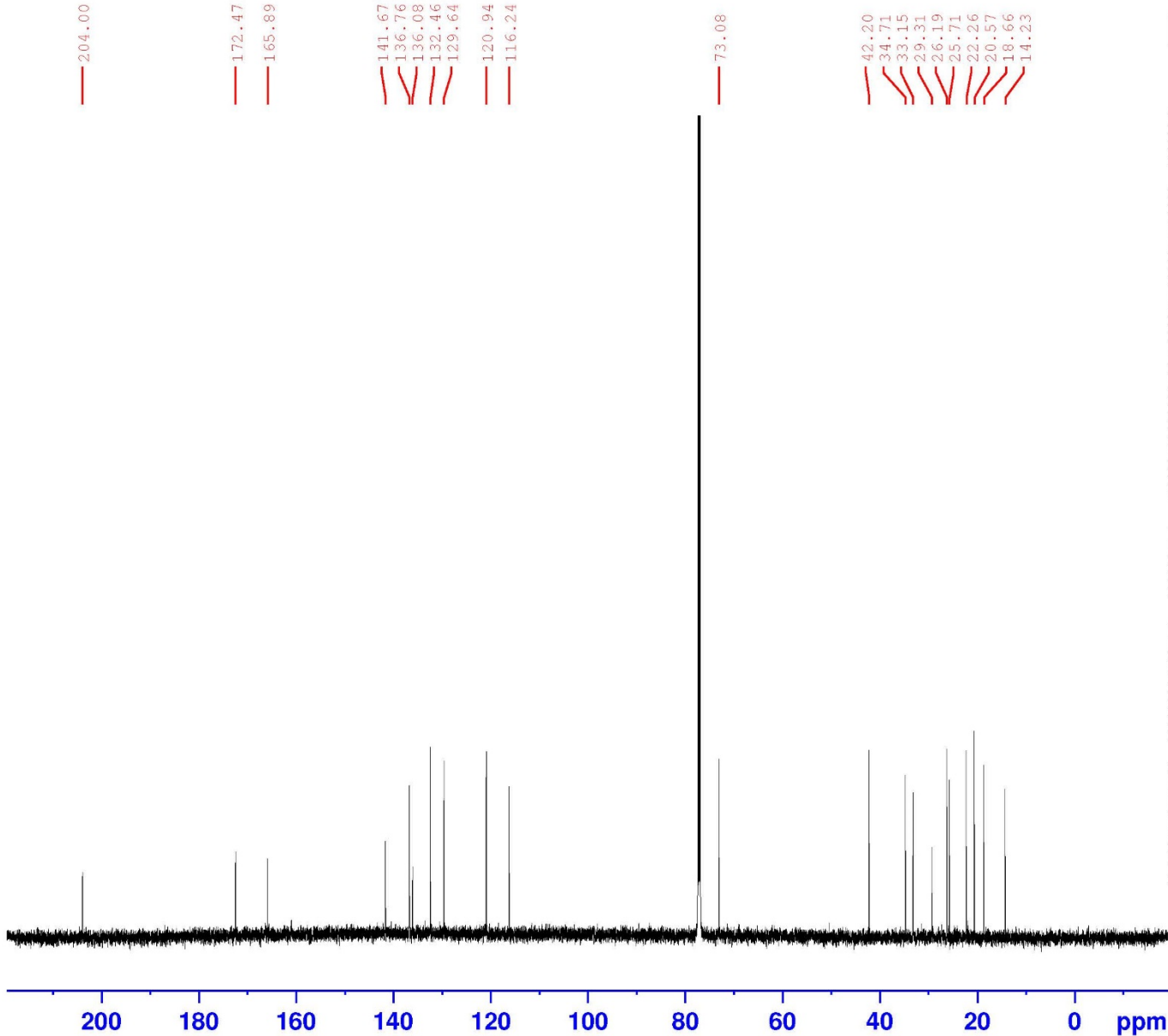
Current Data Parameters
 NAME 20190404 Trans PI CLEAN
 EXPNO 12
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190405
 Time 5.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.00000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 17.00000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9027893 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GE 0
 PC 1.40





Current Data Parameters
 NAME 20190404 Trans PI CLEAN
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190405
 Time 3.30
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4545.455 Hz
 FIDRES 2.219460 Hz
 AQ 0.2252800 sec
 RG 144
 DW 110.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.90251505 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00022000 sec

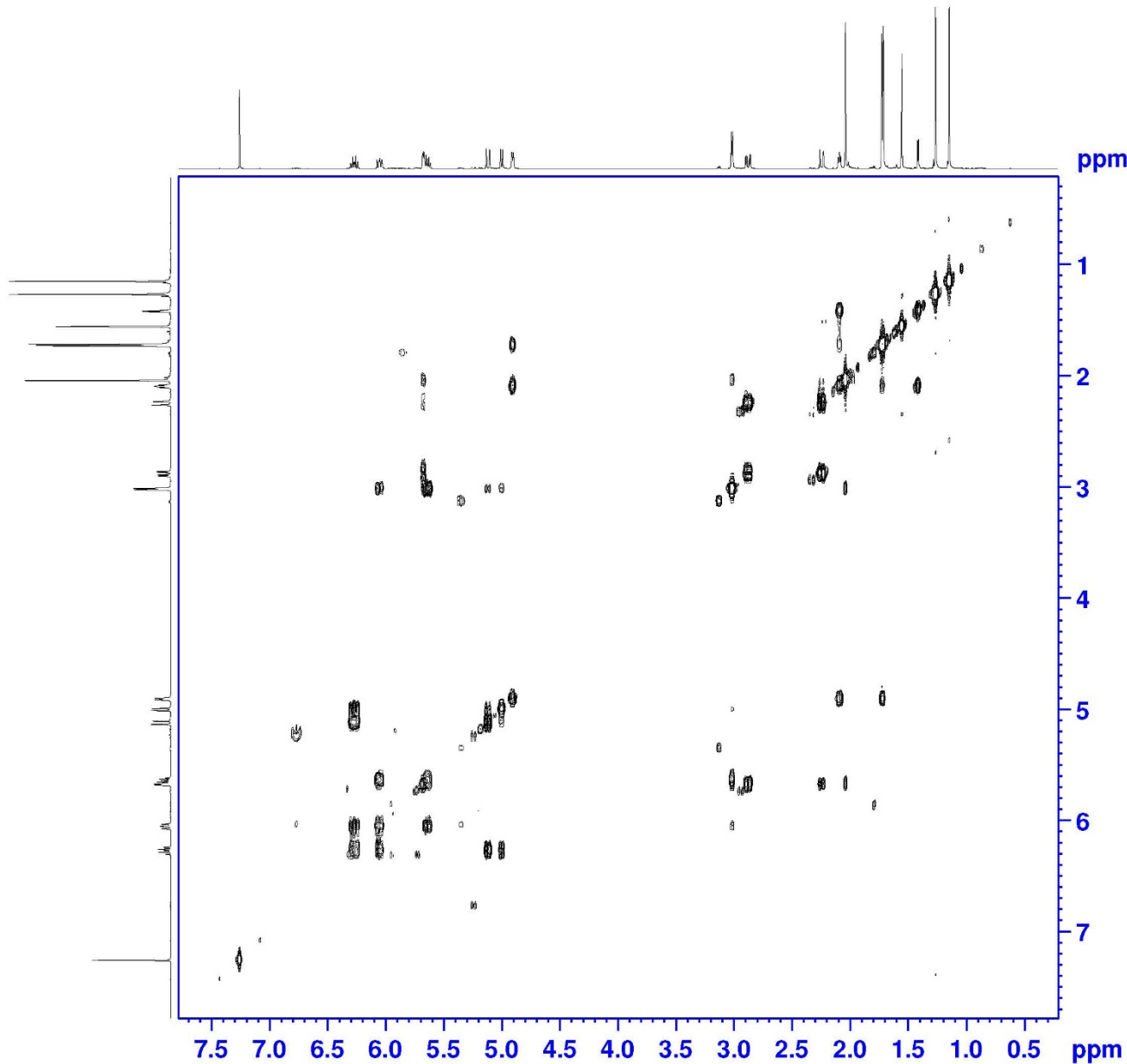
----- CHANNEL f1 -----
 SFO1 600.1324241 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1324 MHz
 FIDRES 35.511364 Hz
 SW 7.574 ppm
 FnMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300250 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300264 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20190404 Trans PI CLEAN
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190405
 Time 6.04
 INSTRUM spect
 PROBRD 5 mm PABBO BB/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4464.286 Hz
 FIDRES 4.359654 Hz
 AQ 0.1146880 sec
 RG 2050
 DW 112.000 usec
 DE 6.50 usec
 TE 298.2 K
 CNST2 145.0000000
 D0 0.00000300 sec
 D1 1.45084798 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1324484 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

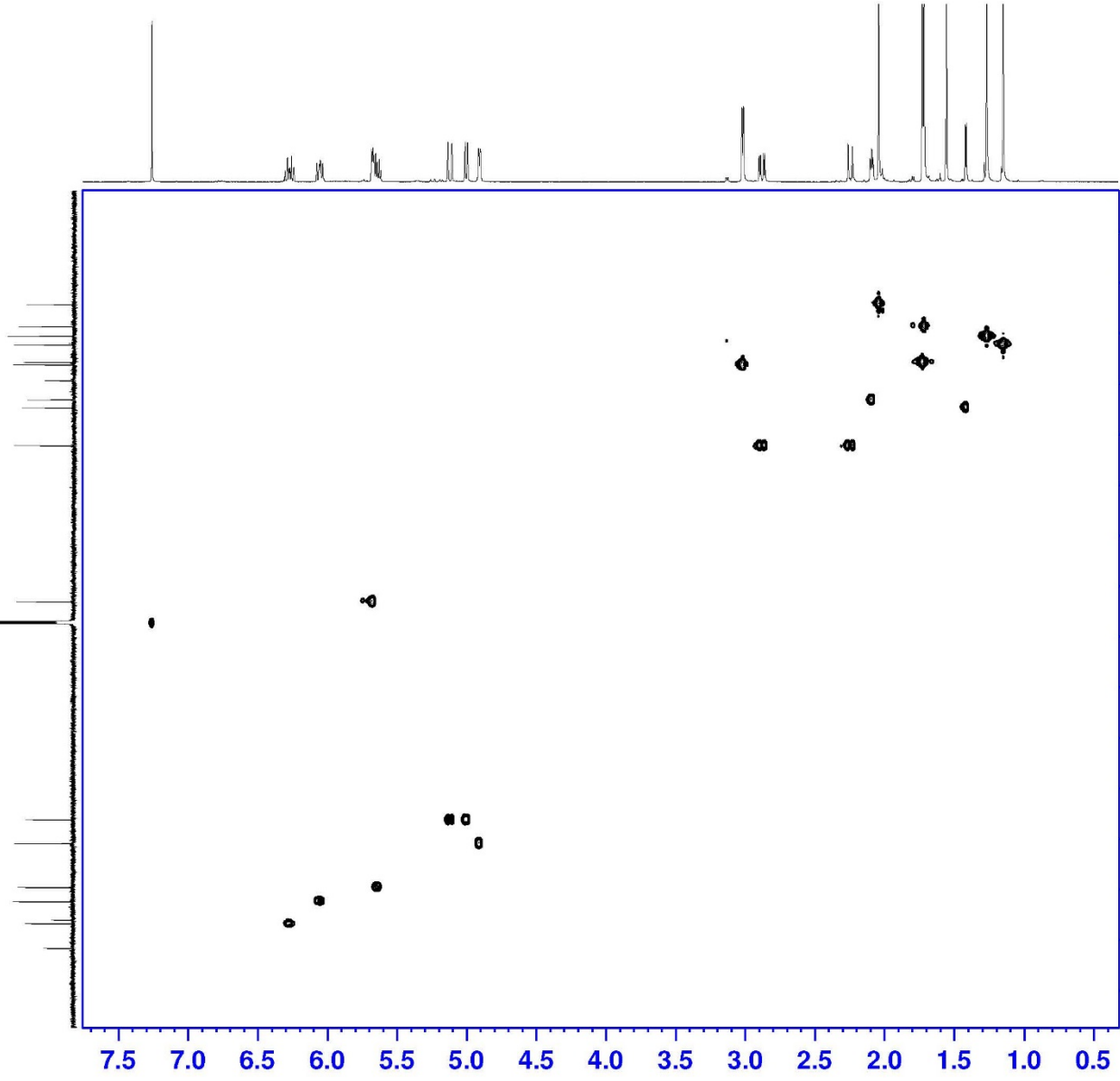
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 gaff
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 60.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 137
 SFO1 150.9141 MHz
 FIDRES 182.481750 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300246 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028116 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

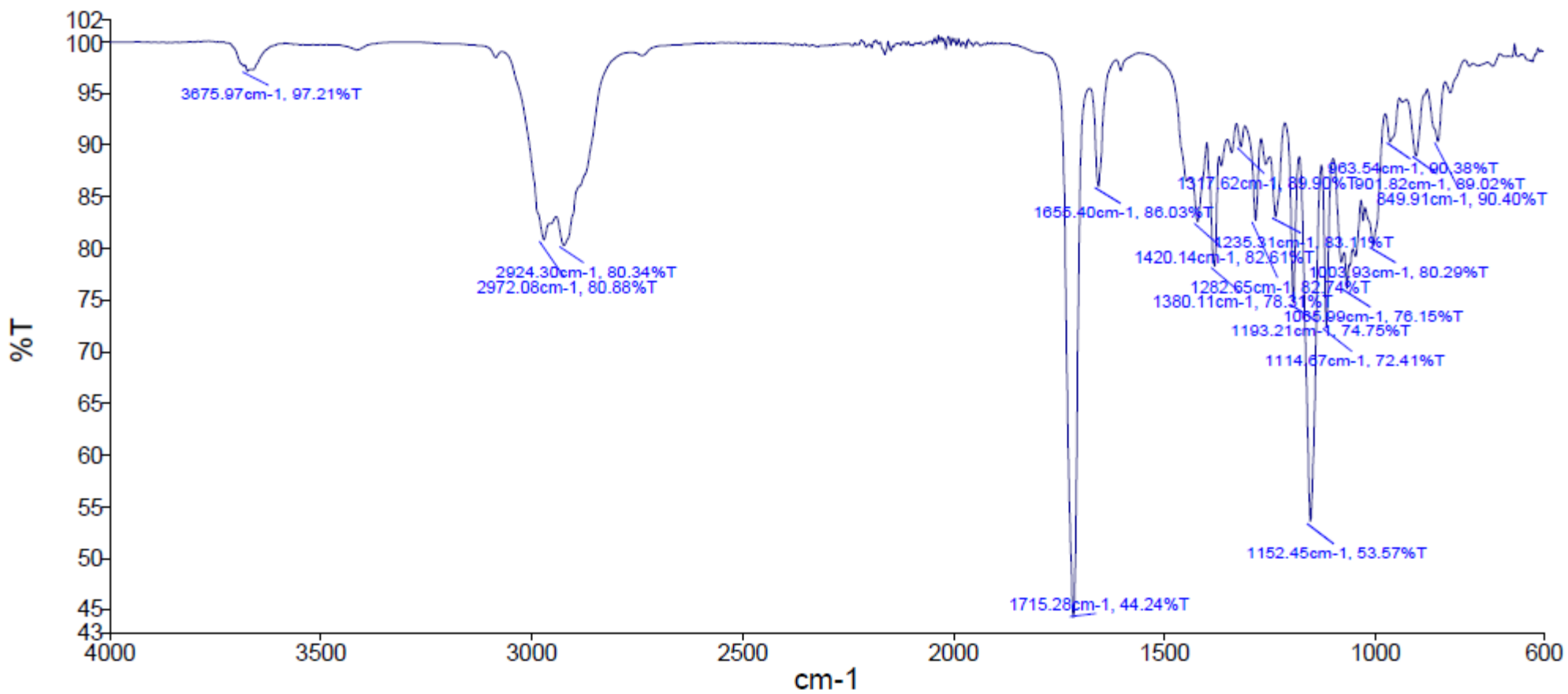


(8a) IR Spectrum

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Analyst
Date

Analyst
Wednesday, 17 October 2018 3:01 PM



(8b) NMR Characterisation

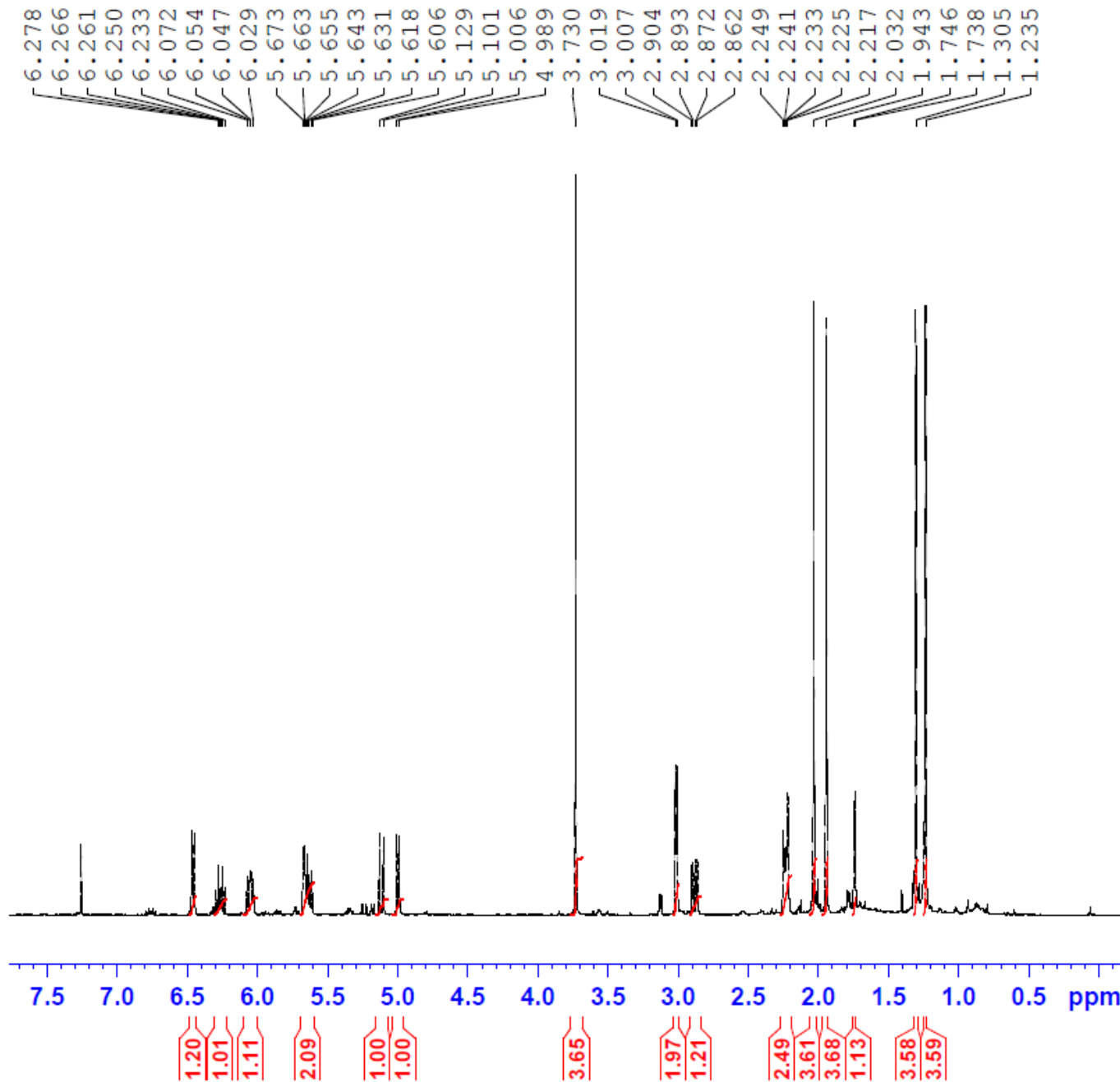


Current Data Parameters
NAME 20181008 Transfer Hydrogenation PII
EXPNO 20
PROCNO 1

F2 - Acquisition Parameters
Date_ 20181008
Time_ 17.10
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 90.5
EW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
SF01 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PLW1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300270 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00





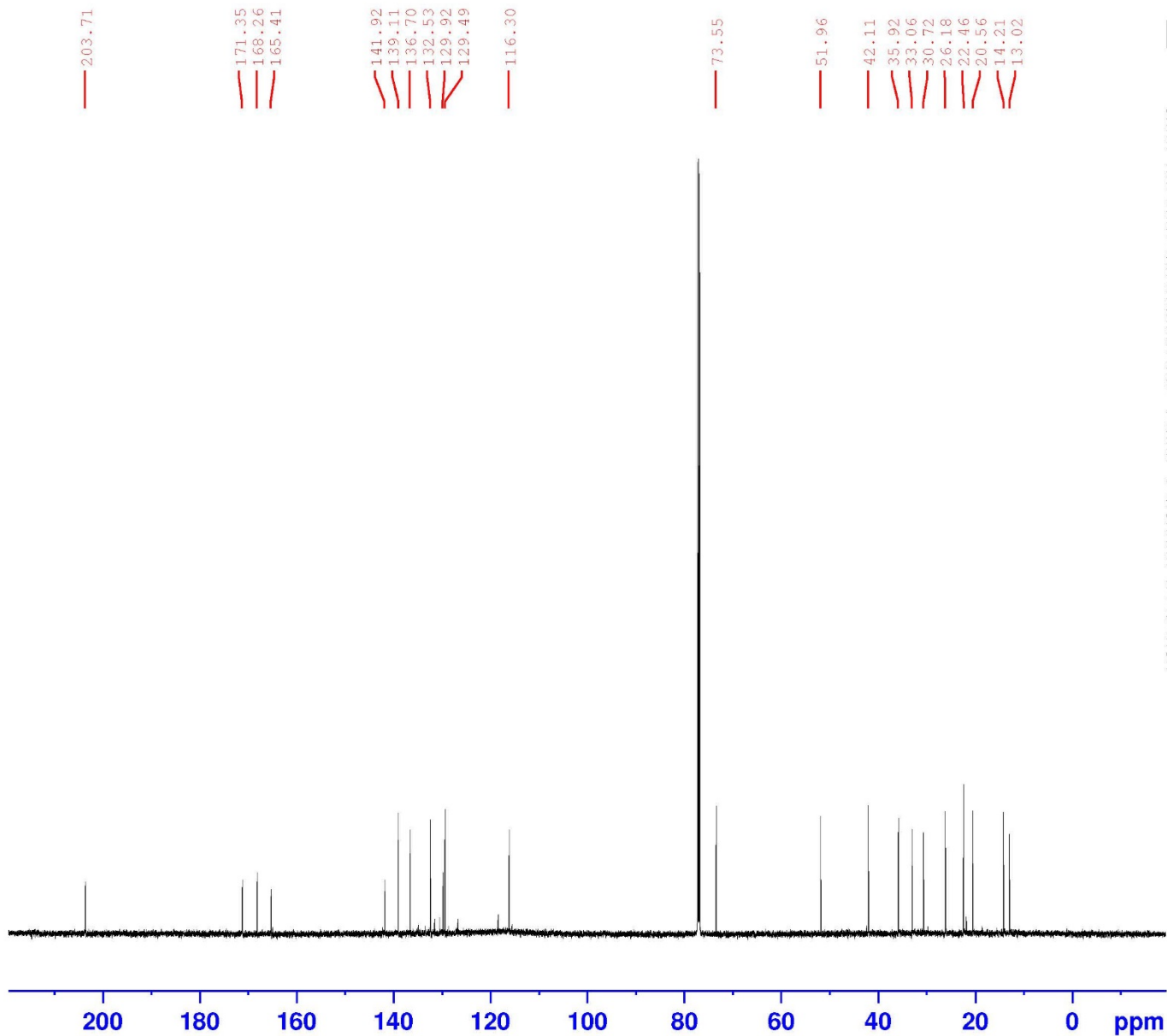
Current Data Parameters
 NAME 20181008 Transfer Hydrogenation PII
 EXPNO 21
 PROCNO 1

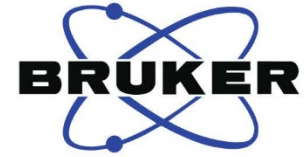
F2 - Acquisition Parameters
 Date_ 20181008
 Time 18.16
 INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1620
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 12.95000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027908 MHz
 WDW EM
 SSB 0
 LE 1.00 Hz
 GB 0
 PC 1.40





Current Data Parameters
 NAME 20181008 Transfer Hydrogenation PII
 EXPNO 23
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20181008
 Time 18.23
 INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG cosygpmfphpp
 TD 2048
 SOLVENT CDCl3
 NS 5
 DS 4
 SWH 4716.981 Hz
 FIDRES 2.303213 Hz
 AQ 0.2170880 sec
 RG 2050
 DW 106.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00009530 sec
 D1 1.92135704 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D16 0.00000000 sec
 IN0 0.00021200 sec

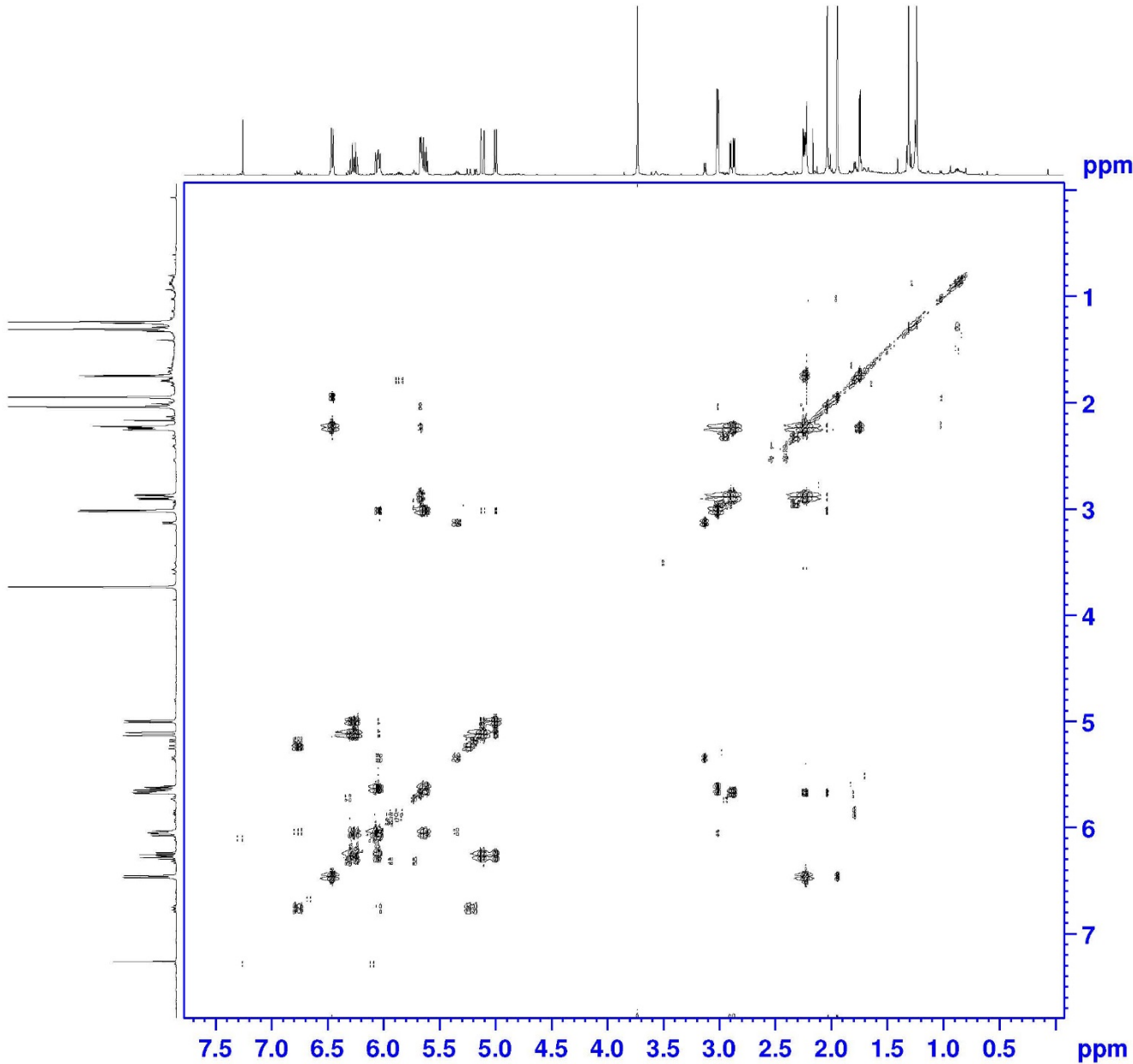
===== CHANNEL f1 =====
 SFO1 600.1323382 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 10.00 %
 GPZ2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 600.1323 MHz
 FIDRES 18.425707 Hz
 SW 7.860 ppm
 FhMODE States-TPPI

P2 - Processing parameters
 SI 1024
 SF 600.1300250 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TPPI
 SF 600.1300203 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20181008 Transfer Hydrogenation PII
 EXPNO 24
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20181008
 Time 19.12

INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG hsqcqtcp
 TD 1024
 SOLVENT CDCl3
 NS 35
 DS 16
 SWH 4716.981 Hz
 FIDRES 4.606427 Hz
 AQ 0.1085440 sec
 RG 2050
 DE 106.000 usec
 TE 298.1 K
 CNST2 145.0000000
 D0 0.00000300 sec
 D1 1.45699203 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 IN0 0.00002000 sec
 ZGOFINS

===== CHANNEL f1 =====
 SFO1 600.1323382 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CPDPRG[2] garp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 50.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GEF1 30.00 %
 GEF2 20.10 %
 PL6 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 PhMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300239 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028240 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

ppm

ppm

0

20

40

60

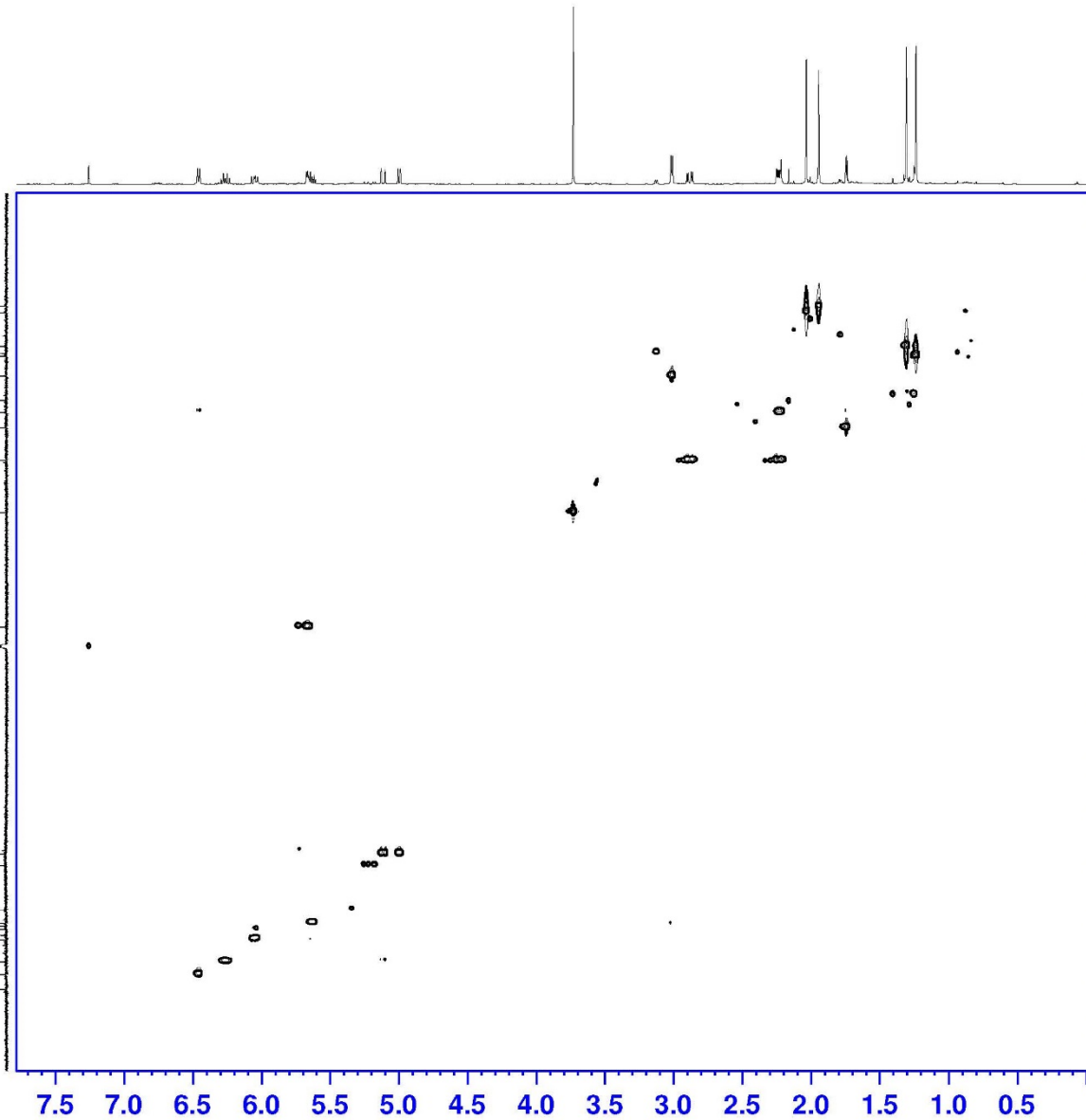
80

100

120

140

ppm

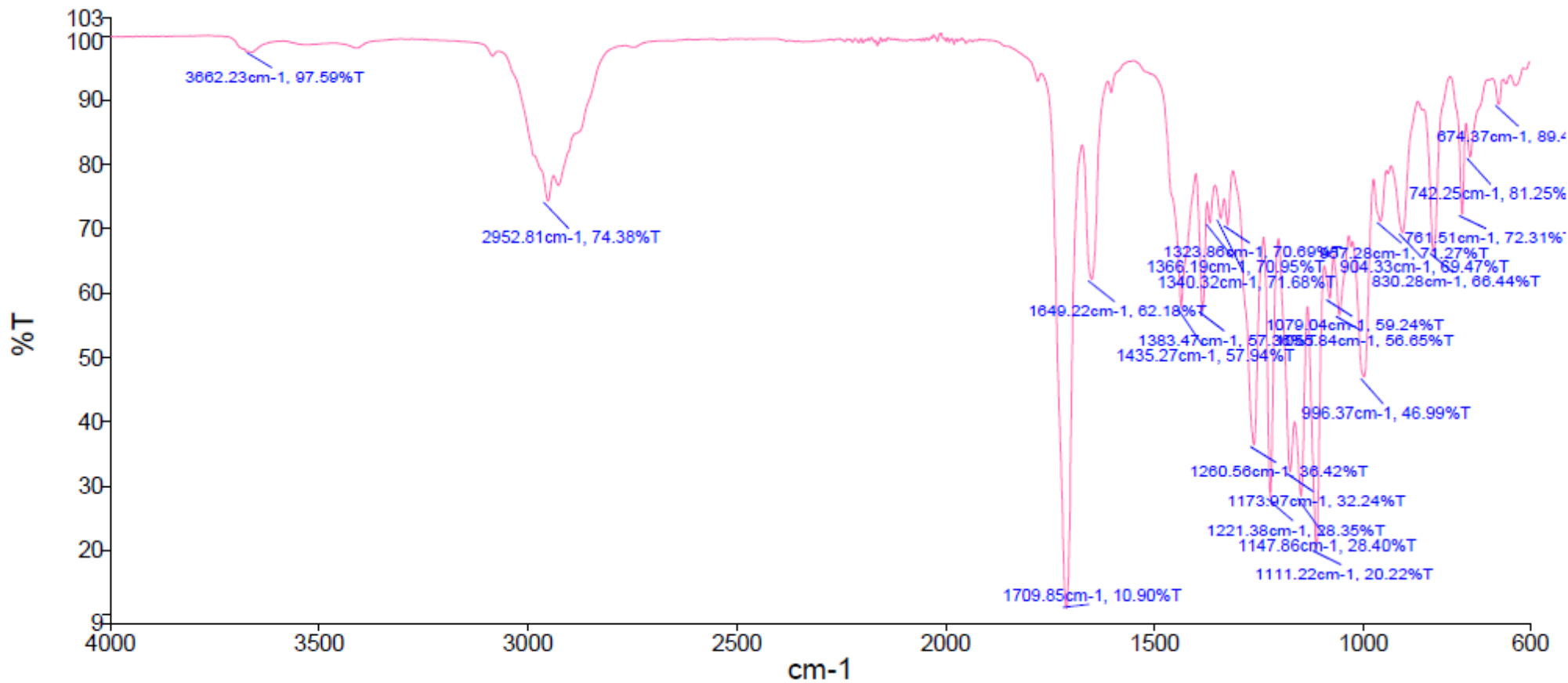


(8b) IR Spectrum

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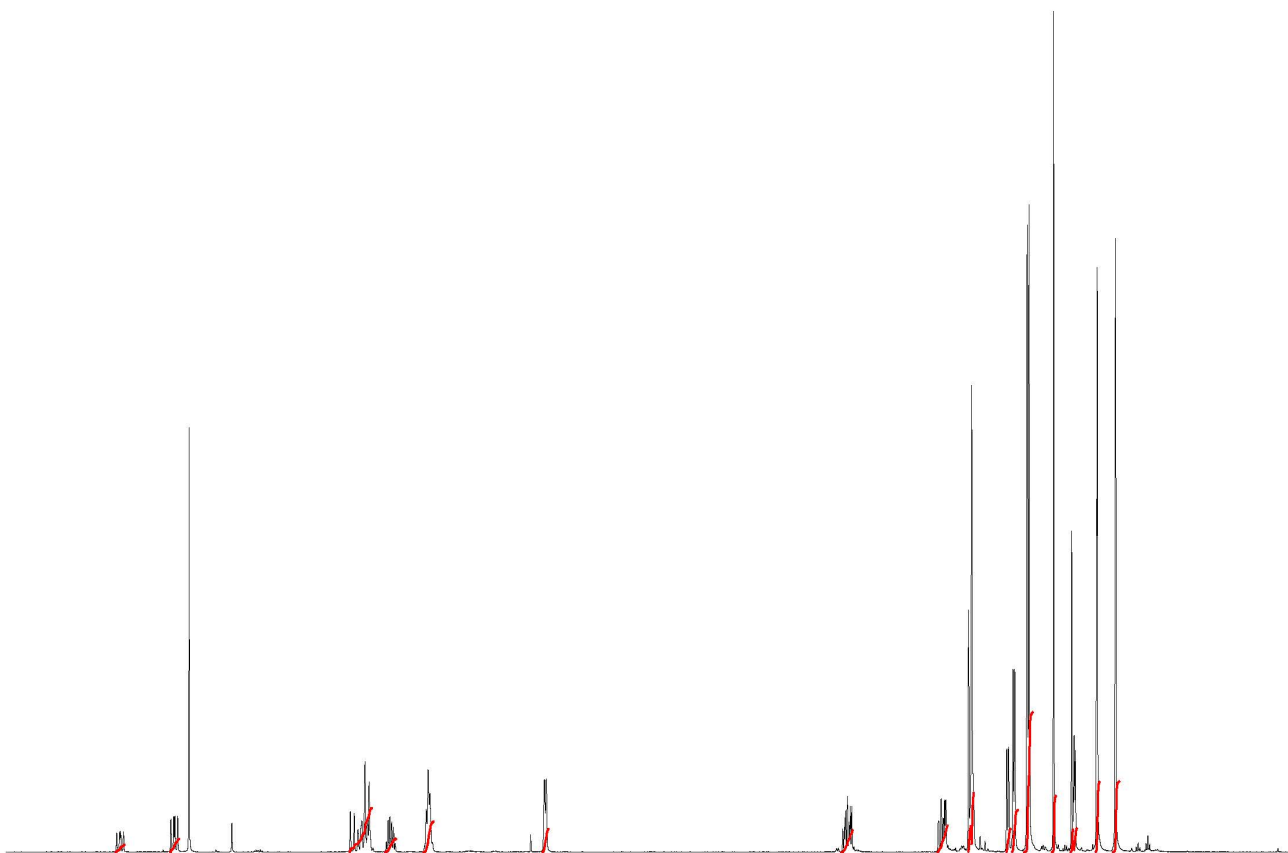
Analyst
Wednesday, 17 October 2018 3:02 PM



(9a) NMR Characterisation



7.377
7.359
7.351
7.333
6.193
6.167
6.117
6.095
6.068
5.943
5.932
5.691
5.679
5.667
4.911
4.898
2.922
2.911
2.891
2.880
2.292
2.289
2.276
2.268
2.261
2.258
2.109
2.089
1.857
1.845
1.816
1.804
1.722
1.710
1.548
1.428
1.418
1.413
1.404
1.264
1.260
1.138



Current Data Parameters
NAME 20190404 Iso PI CLEAN
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20190404
Time 19.08
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 287
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

==== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 13.50 usec
PLW1 17.00000000 W

F2 - Processing parameters
SI 65536
SF 600.1300277 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

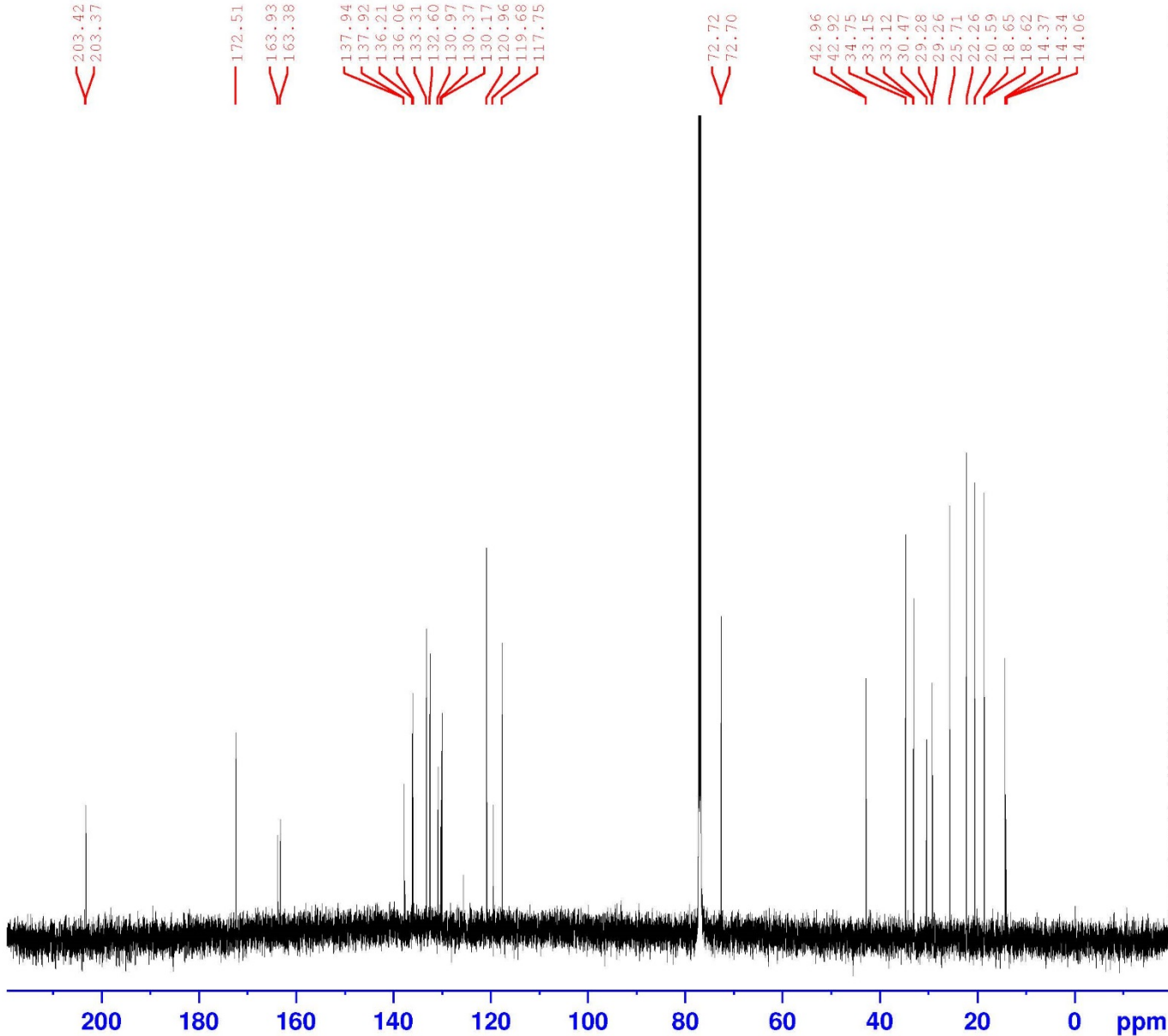
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 ppm

0.34
0.58

1.92
0.59
1.33

1.00

0.99
1.17
1.16
2.67
1.02
1.84
6.08
2.47
1.01
1.05
3.07
3.09



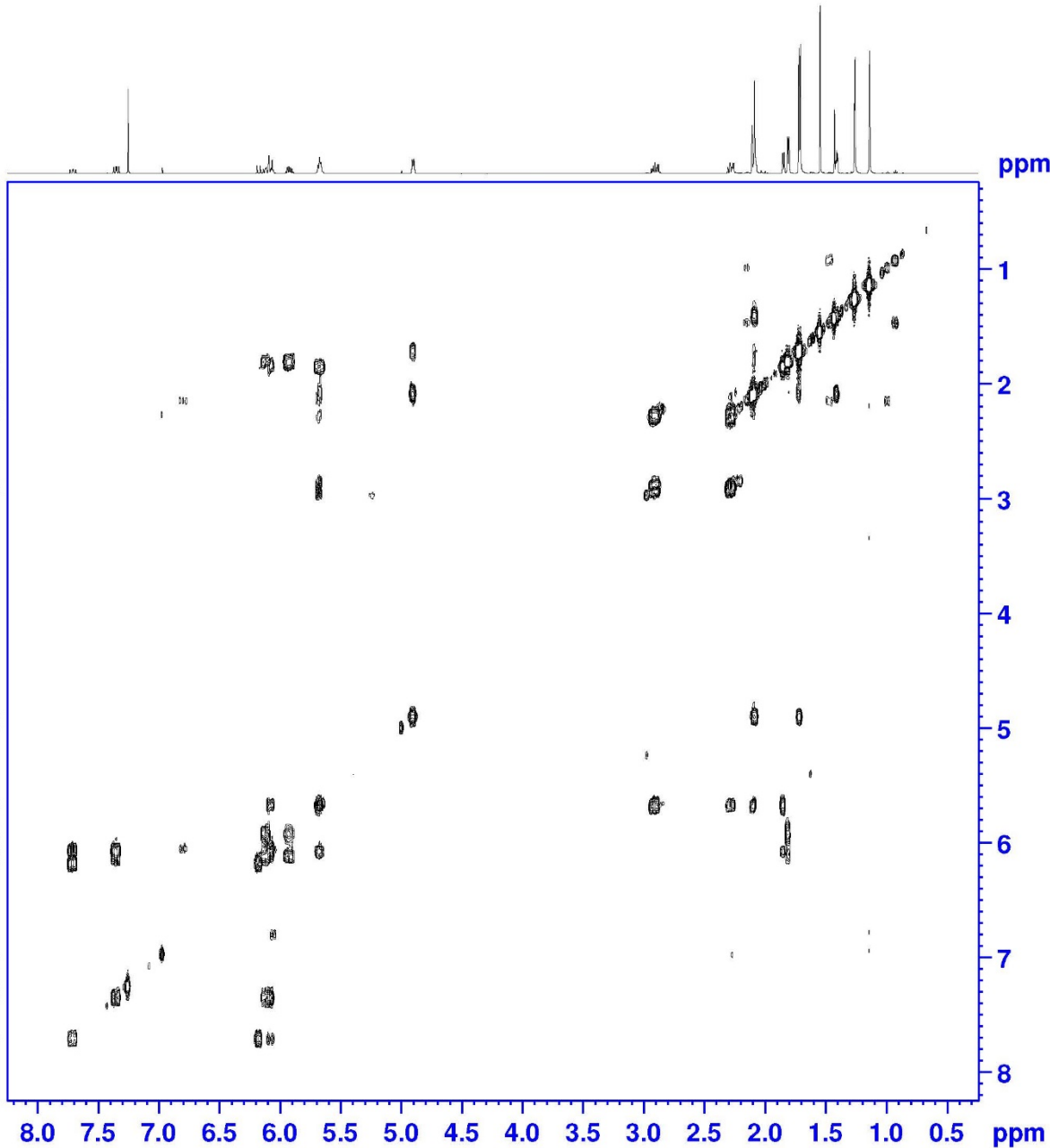
Current Data Parameters
 NAME 20190404 Iso PI CLEAN
 EXPNO 12
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190404
 Time 21.39
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.00000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 17.00000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9027898 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME 20190404 Iso PI CLEAN
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20190404
 Time 19.10
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 10
 DS 8
 SWH 4807.692 Hz
 FIDRES 2.347506 Hz
 AQ 0.2129920 sec
 RG 144
 DW 104.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.91480303 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00020800 sec

----- CHANNEL f1 -----
 SFO1 600.1325742 MHz
 NUC1 1H
 P0 13.50 usec
 P1 13.50 usec
 P17 2500.00 usec
 PLW1 17.00000000 W
 PLW10 4.58319998 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1326 MHz
 FIDRES 37.560097 Hz
 SW 8.011 ppm
 FnMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300254 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300271 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0



Current Data Parameters
 NAME 20190404 Iso PI CLEAN
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20190404
 Time 21.44
 INSTRUM spect
 PROBRD 5 mm PABBO BB/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4761.905 Hz
 FIDRES 4.650298 Hz
 AQ 0.1075200 sec
 RG 2050
 DW 105.000 usec
 DE 6.50 usec
 TE 298.3 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.45801604 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1325854 MHz
 NUC1 1H
 P1 13.50 usec
 P2 27.00 usec
 P28 1000.00 usec
 PLW1 17.00000000 W

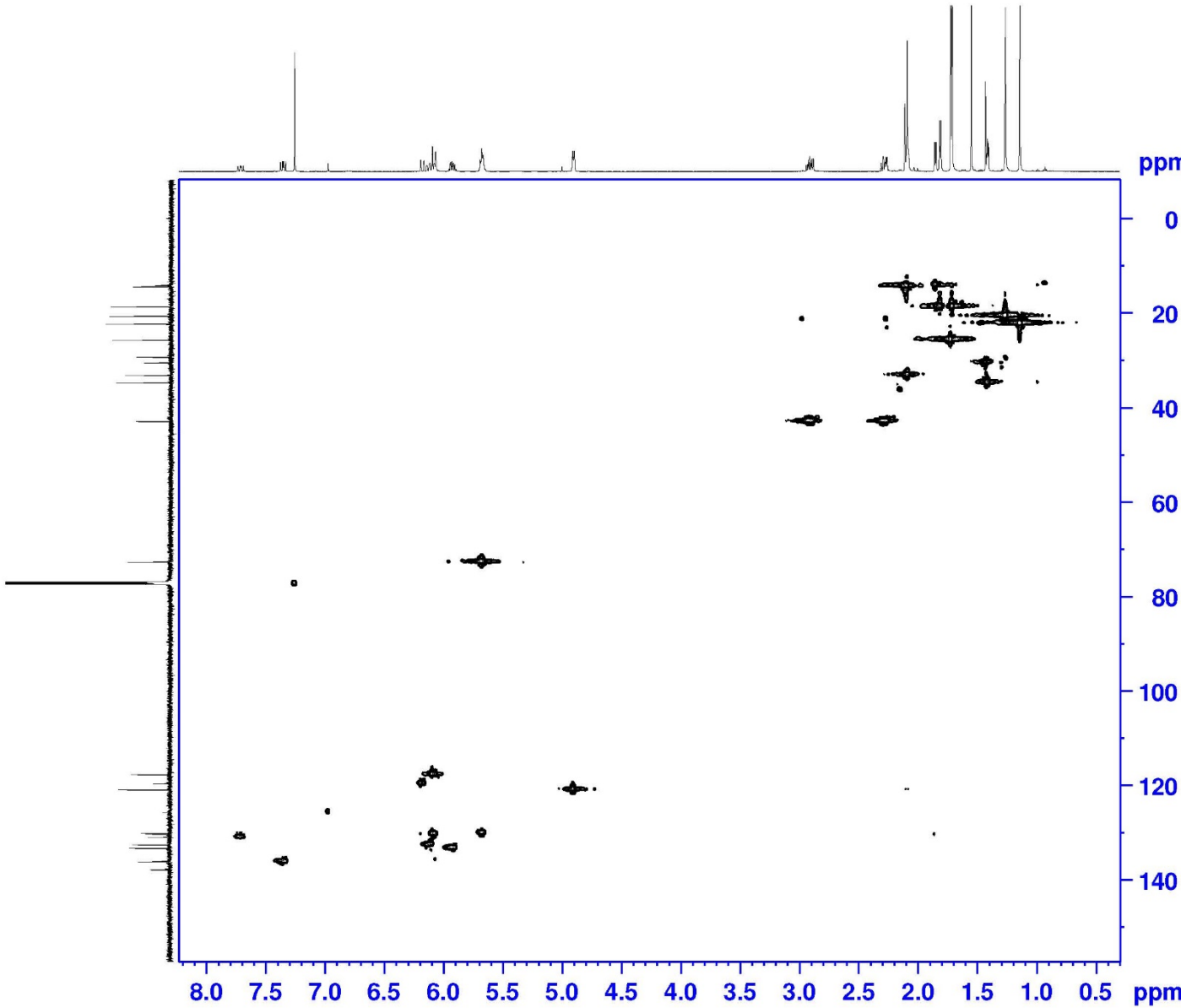
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 garr
 P3 12.00 usec
 P4 24.00 usec
 PCPD2 60.00 usec
 PLW2 80.00000000 W
 PLW12 3.20000005 W

----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300256 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

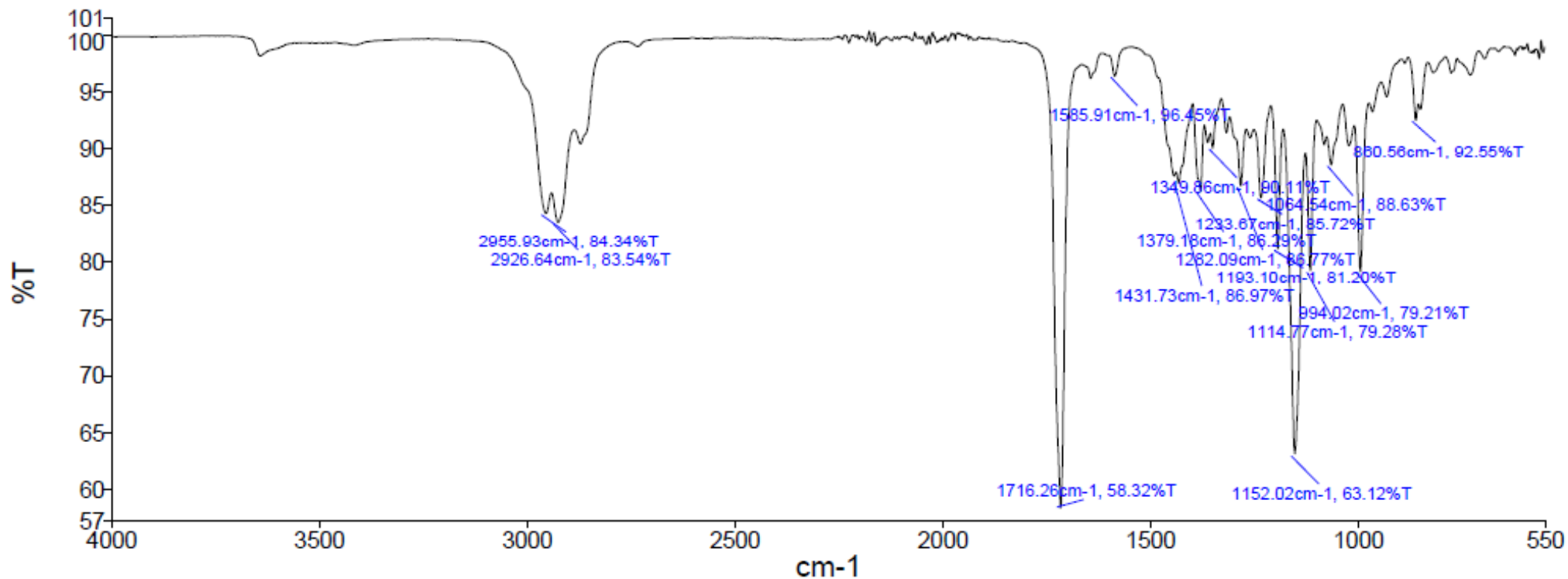
F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028165 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



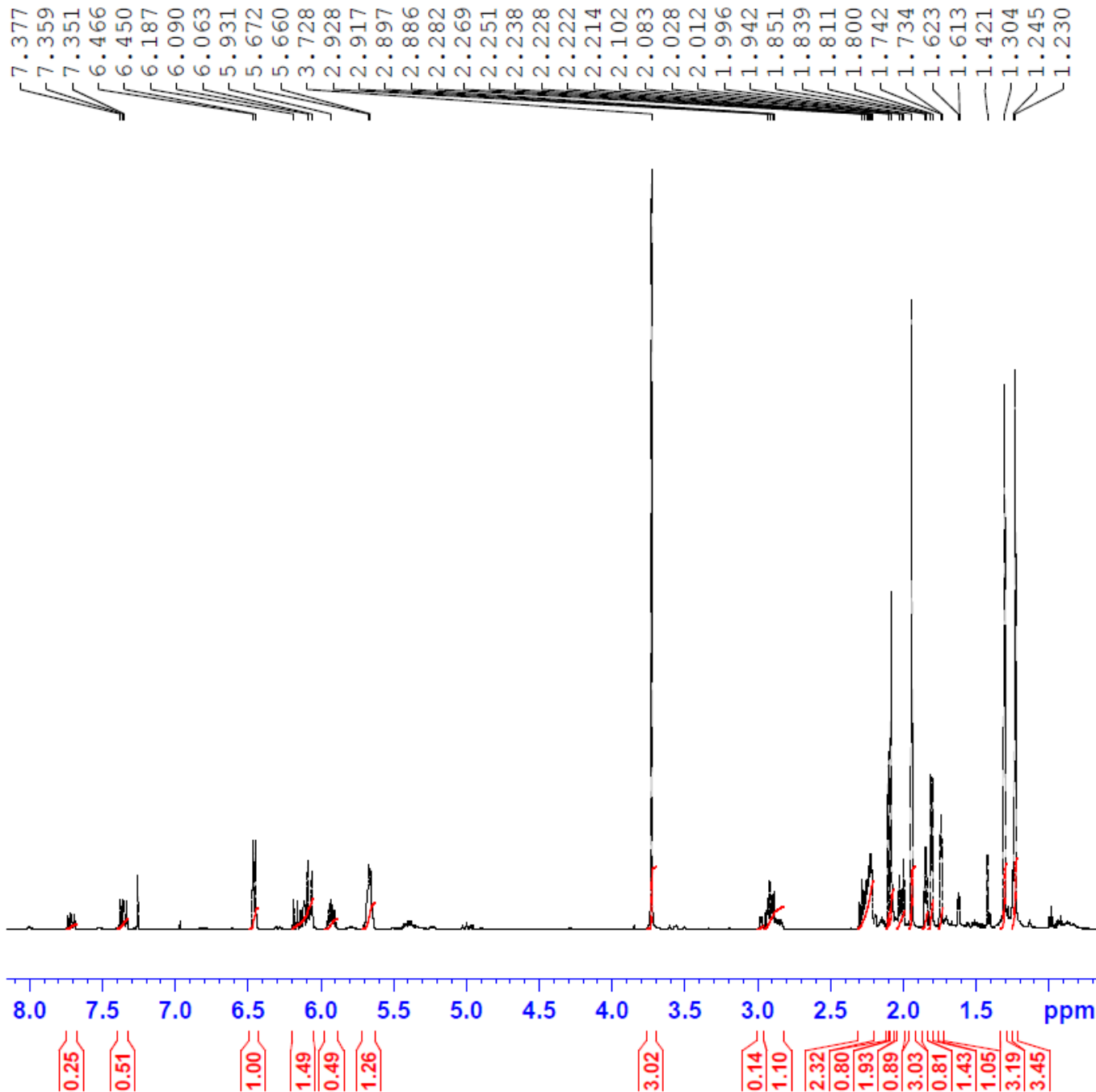
(9a) IR Spectrum

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Analyst
Date
Analyst
Friday, 16 November 2018 2:10 PM



(9b) NMR Characterisation

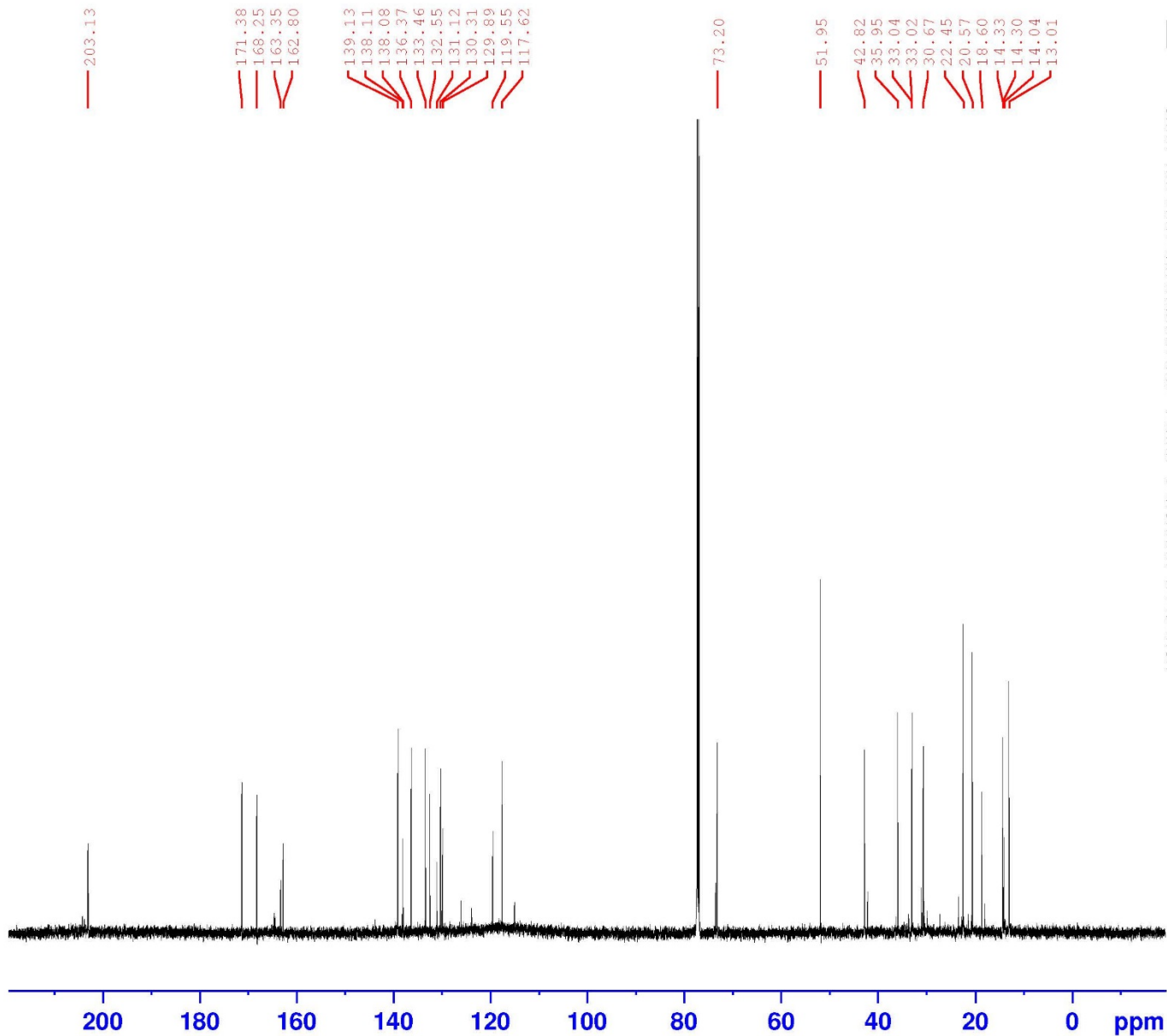


Current Data Parameters
NAME 20181008 Transfer Hydrogenation PII
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20181008
Time 17.03
INSTRUM spect
PROBHD 5 mm PABBI 1H/
FULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 71.8
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.0000000 sec
TDO 1

===== CHANNEL f1 =====
SF01 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PL1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300267 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



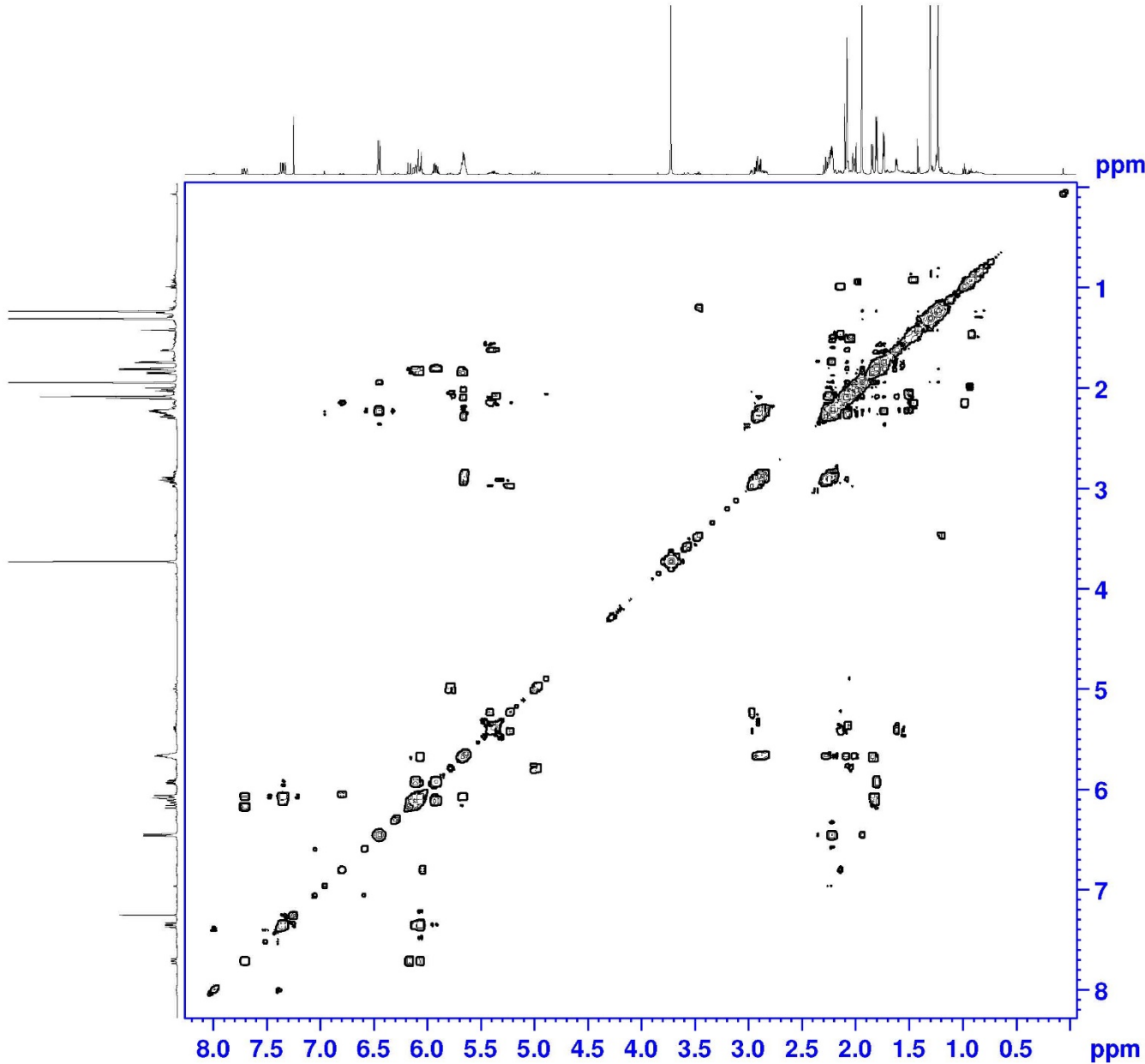
Current Data Parameters
 NAME 20181008 Transfer Hydrogenation PII
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20181009
 Time 3.59
 INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1820
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG2 waltz16
 PCPD2 70.00 usec
 PLW2 12.95000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027924 MHz
 WDW EM
 SSB 0
 LE 1.00 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME 20181107 Isopyrethrin II
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20181107
 Time 9.58
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygpppqf
 TD 2048
 SOLVENT CDCl3
 NS 5
 DS 8
 SWH 5000.000 Hz
 FIDRES 2.441406 Hz
 AQ 0.2048000 sec
 RG 64
 DW 100.000 usec
 DE 6.50 usec
 TE 298.2 K
 D0 0.00000300 sec
 D1 1.92299497 sec
 D11 0.03000000 sec
 D12 0.00002000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00020000 sec

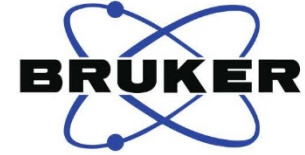
----- CHANNEL f1 -----
 SFO1 600.1324960 MHz
 NUC1 1H
 P0 8.40 usec
 P1 8.40 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.309999994 W

----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1325 MHz
 FIDRES 39.062500 Hz
 SW 8.331 ppm
 F1MODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300342 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300265 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0



Current Data Parameters
 NAME 20181008 Transfer Hydrogenation PII
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20181009
 Time 4.55
 INSTRUM spect
 PROBHD 5 mm FABBI 1H/
 PULPROG hsqcqtcp
 TD 1024
 SOLVENT CDCl3
 NS 35
 DS 16
 SWH 5050.505 Hz
 FIDRES 4.932134 Hz
 AQ 0.1013760 sec
 RG 2050
 FW 99.000 usec
 DE 6.50 usec
 TE 298.1 K
 CNS12 145.0000000
 D0 0.0000300 sec
 D1 1.46415997 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 IN0 0.00002000 sec
 ZGOFINS

===== CHANNEL f1 =====
 SFO1 600.1324643 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

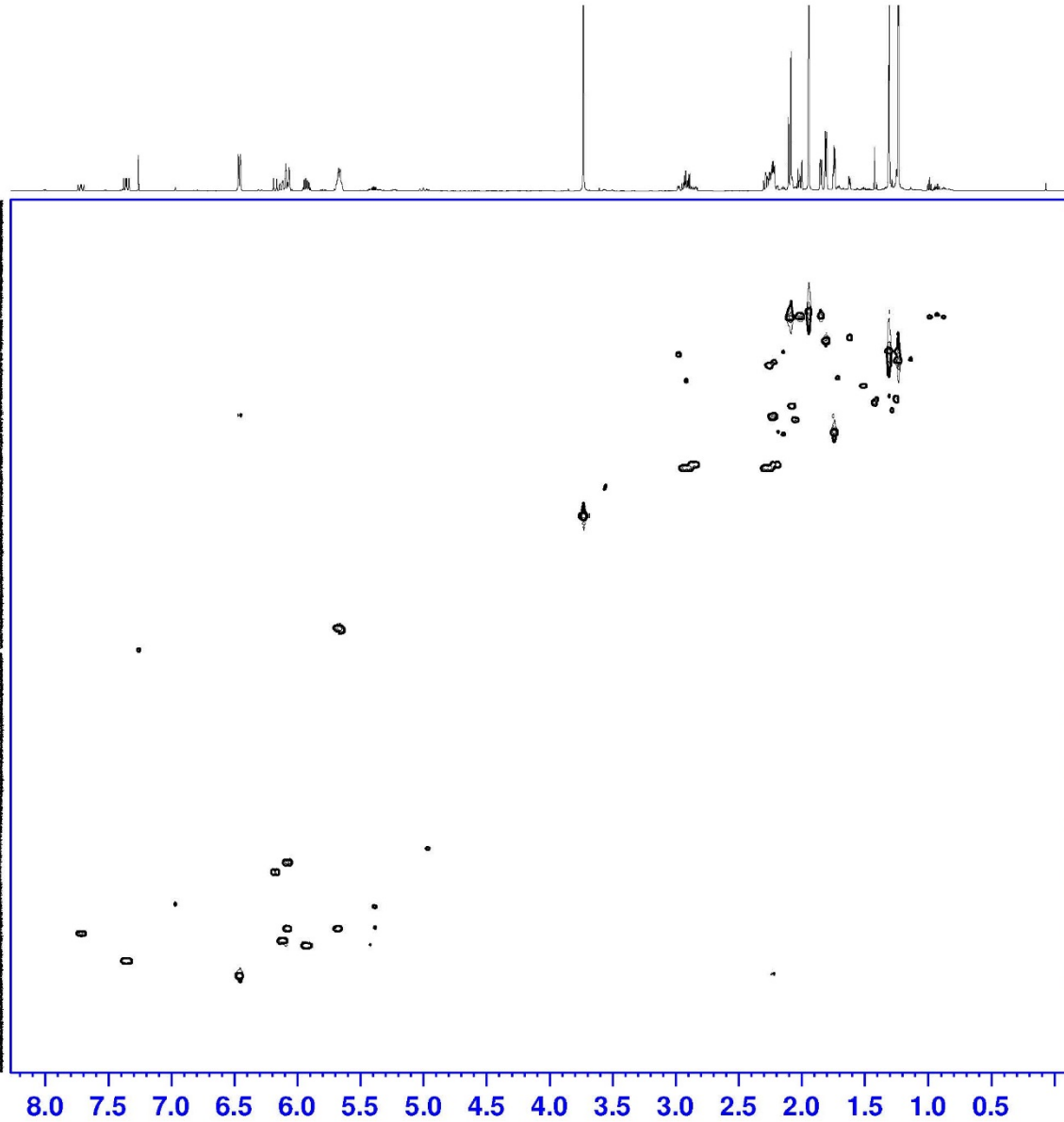
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CPDPRG[2] garp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GEF1 30.00 %
 GEF2 20.10 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 PhMODE Echo-Antiecho

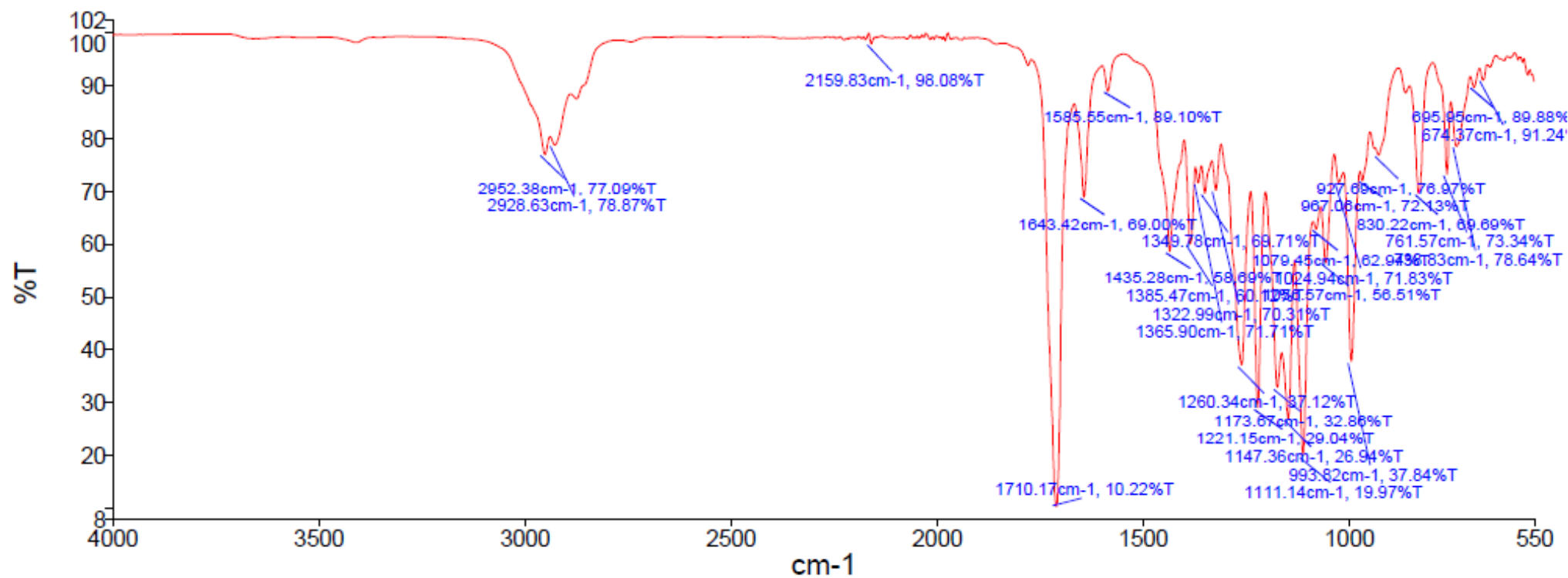
F2 - Processing parameters
 SI 1024
 SF 600.1300237 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 echo-antiecho
 SF 150.9028198 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



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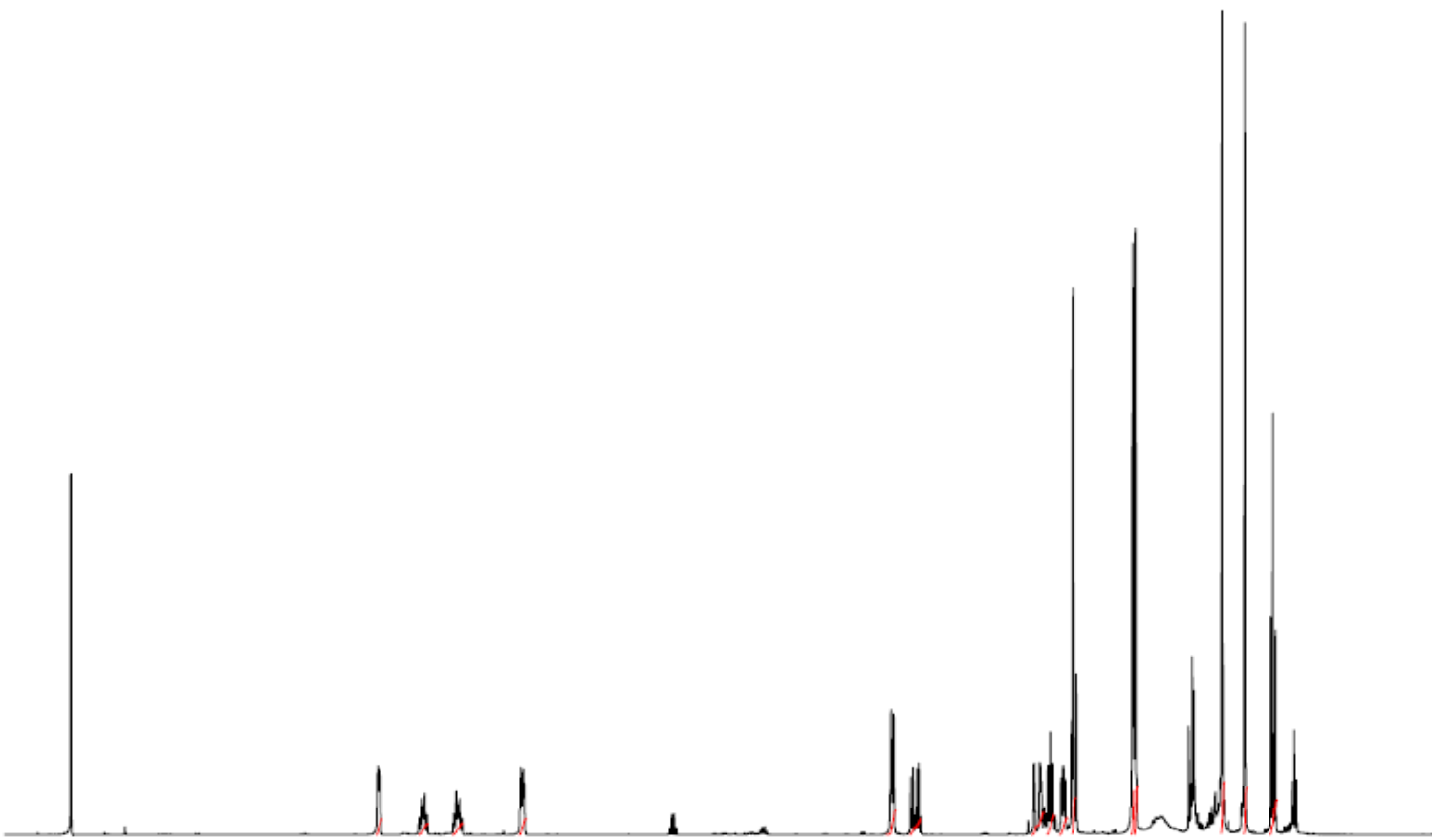
Analyst
Date
Analyst
Friday, 16 November 2018 2:11 PM



Semi-synthetic (2a) + (7a) mixture NMR Characterisation



5.660
5.650
5.432
5.415
5.403
5.263
5.251
5.233
4.913
4.900
2.984
2.972
2.881
2.871
2.850
2.840
2.240
2.237
2.209
2.205
2.200
2.166
2.153
2.141
2.098
2.088
2.076
2.044
2.036
2.018
1.725
1.712
1.431
1.414
1.405
1.262
1.259
1.141
1.005
0.993
0.980



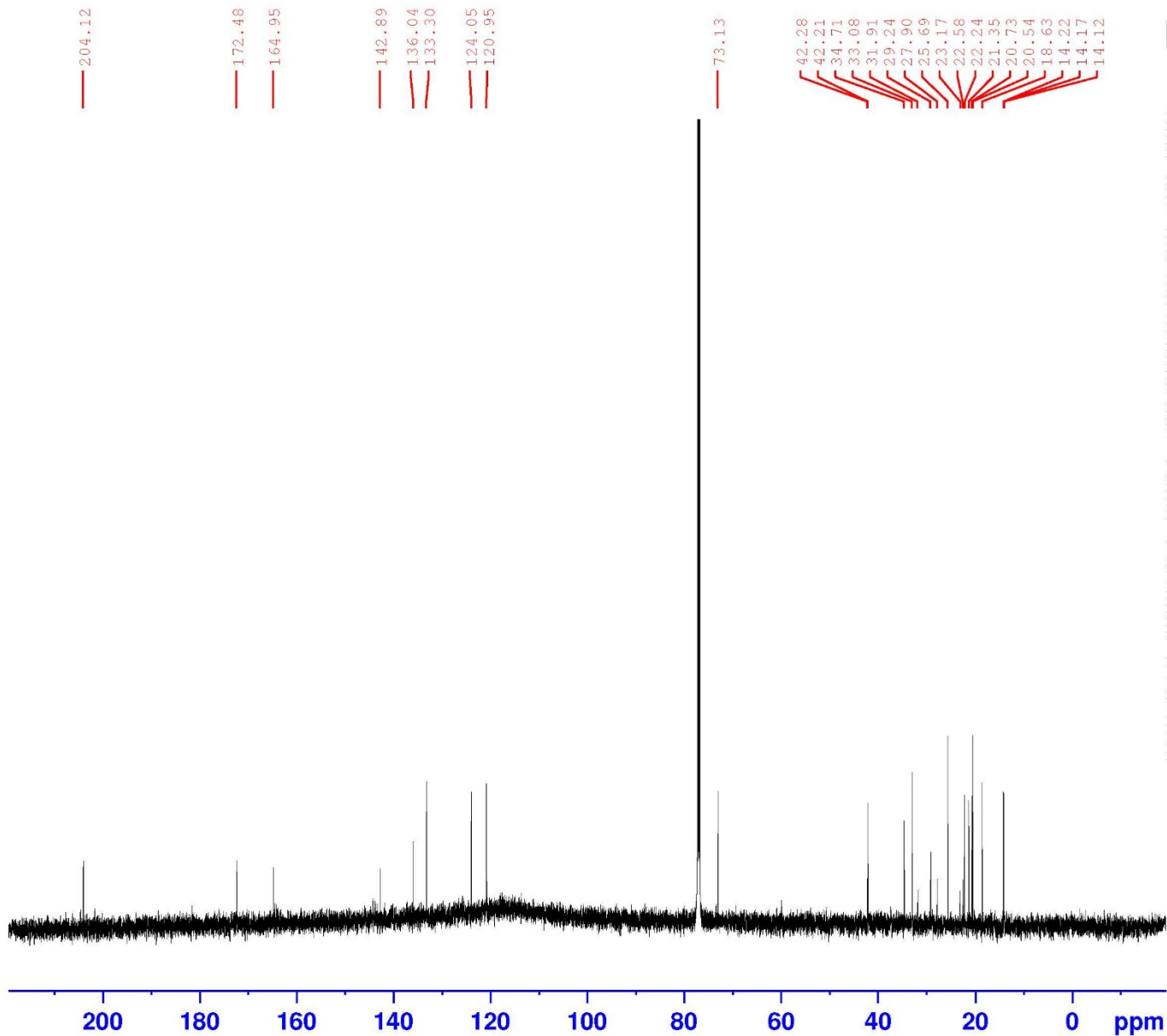
1.34
1.00
1.02
1.38
2.16
1.36
1.94
1.85
1.51
3.24
4.25
4.23
4.67
4.14
3.07

Current Data Parameters
NAME 20180704 Diimide Reduction PI
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180704
Time 18.13
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 181
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

----- CHANNEL f1 -----
SFO1 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PLW1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300237 MHz
WDW no
SSB 0
LB 0 Hz
GB 0
PC 1.00



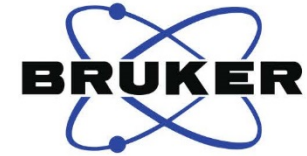
Current Data Parameters
 NAME 20180704 Diimide Reduction PI
 EXPNO 12
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180704
 Time 19.12
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 1820
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

----- CHANNEL f1 -----
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 16.00 usec
 PLW1 110.76000214 W

----- CHANNEL f2 -----
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 12.55000019 W
 PLW12 0.18072000 W
 PLW13 0.08855400 W

F2 - Processing parameters
 SI 32768
 SF 150.9027915 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



Current Data Parameters
 NAME 20180704 Diimide Reduction PI
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180704
 Time 18.15
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygppptf
 TD 2048
 SOLVENT CDCl3
 NS 1
 DS 8
 SWH 4672.897 Hz
 FIDRES 2.281688 Hz
 AQ 0.2191360 sec
 RG 64
 DW 107.000 usec
 DE 6.50 usec
 TE 298.2 K
 DO 0.00000300 sec
 D1 1.90865898 sec
 D11 0.03000000 sec
 D12 0.00020000 sec
 D13 0.00000400 sec
 D16 0.00020000 sec
 IN0 0.00021400 sec

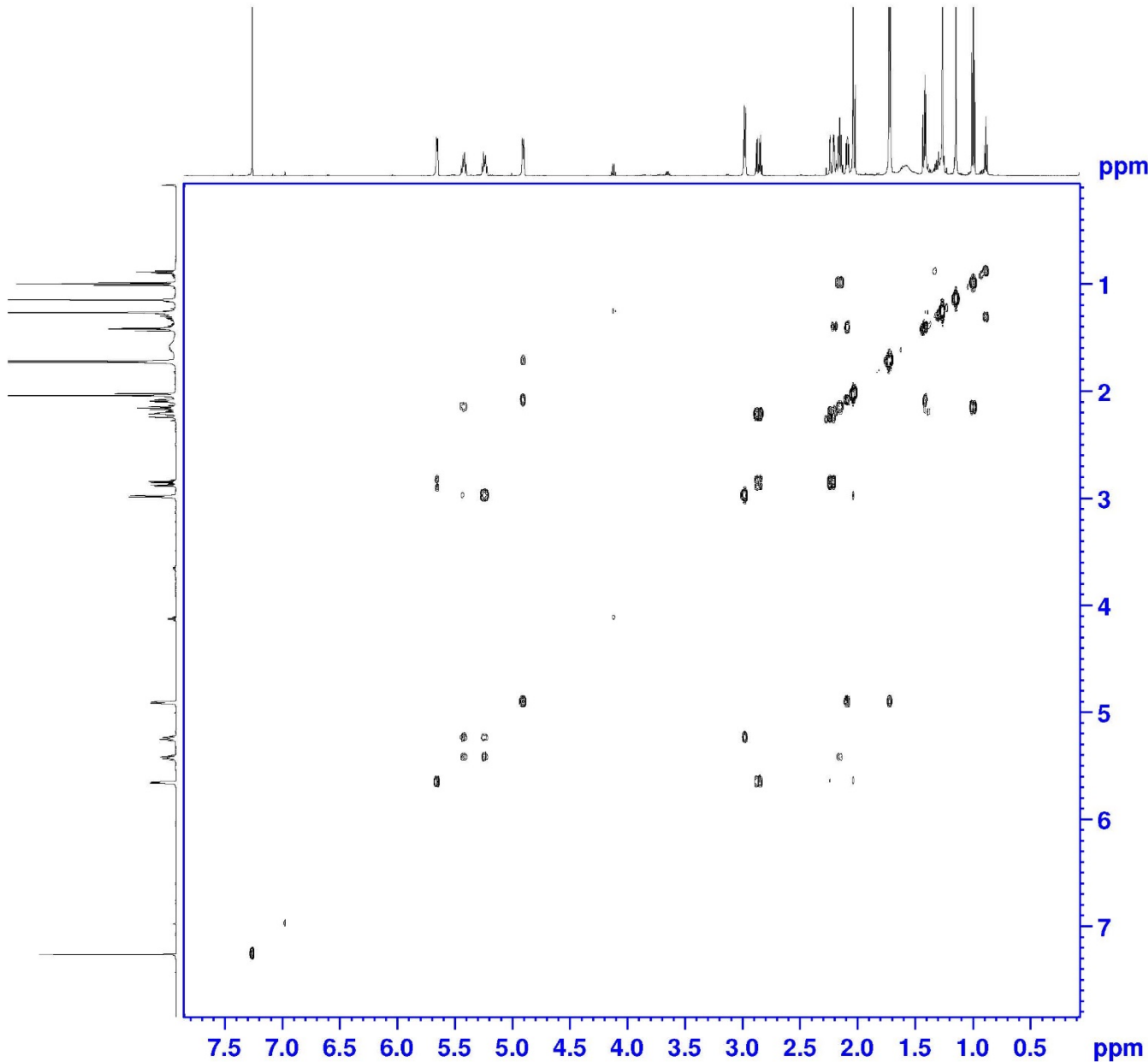
===== CHANNEL f1 =====
 SFO1 600.1323996 MHz
 NUC1 1H
 P0 8.40 usec
 P1 8.40 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW0 1.309999994 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GFZ1 10.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 128
 SFO1 600.1324 MHz
 FIDRES 36.507008 Hz
 SW 7.786 ppm
 EnMODE QF

F2 - Processing parameters
 SI 1024
 SF 600.1300204 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 QF
 SF 600.1300260 MHz
 WDW QSINE
 SSB 0
 LB 0 Hz
 GB 0





Current Data Parameters
 NAME 20180704 Diimide Reduction PI
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180704
 Time 19.18

INSTRUM spect
 PROBRD 5 mm PABBI 1H/
 PULPROG hsqcstgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4807.692 Hz
 FIDRES 4.695012 Hz
 AQ 0.1064960 sec
 RG 2050
 DW 104.000 usec
 DE 6.50 usec
 TE 298.0 K
 CNST2 145.0000000
 D0 0.0000300 sec
 D1 1.45904005 sec
 D4 0.00172414 sec
 D11 0.03000000 sec
 D16 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1323536 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

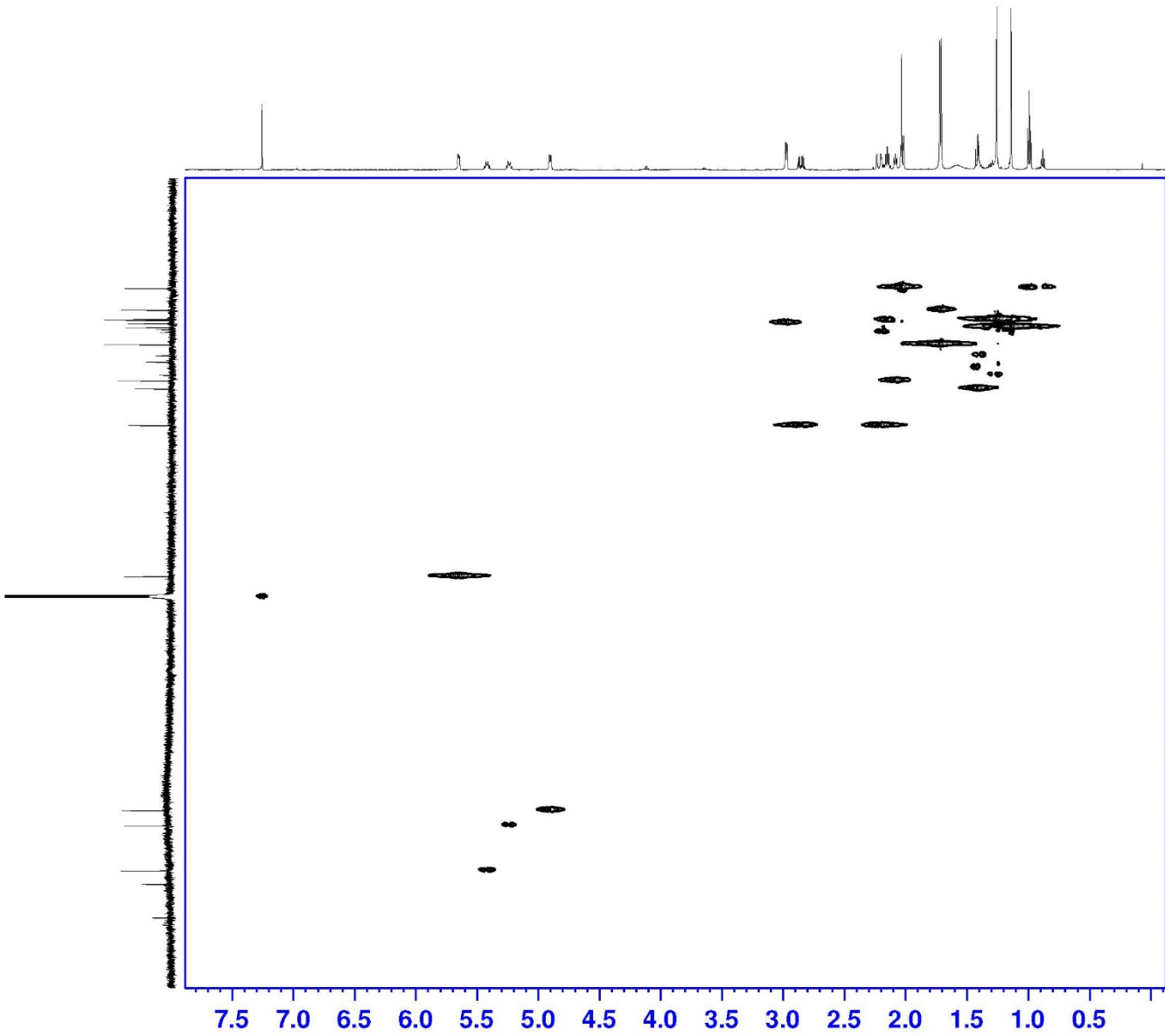
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 garrp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

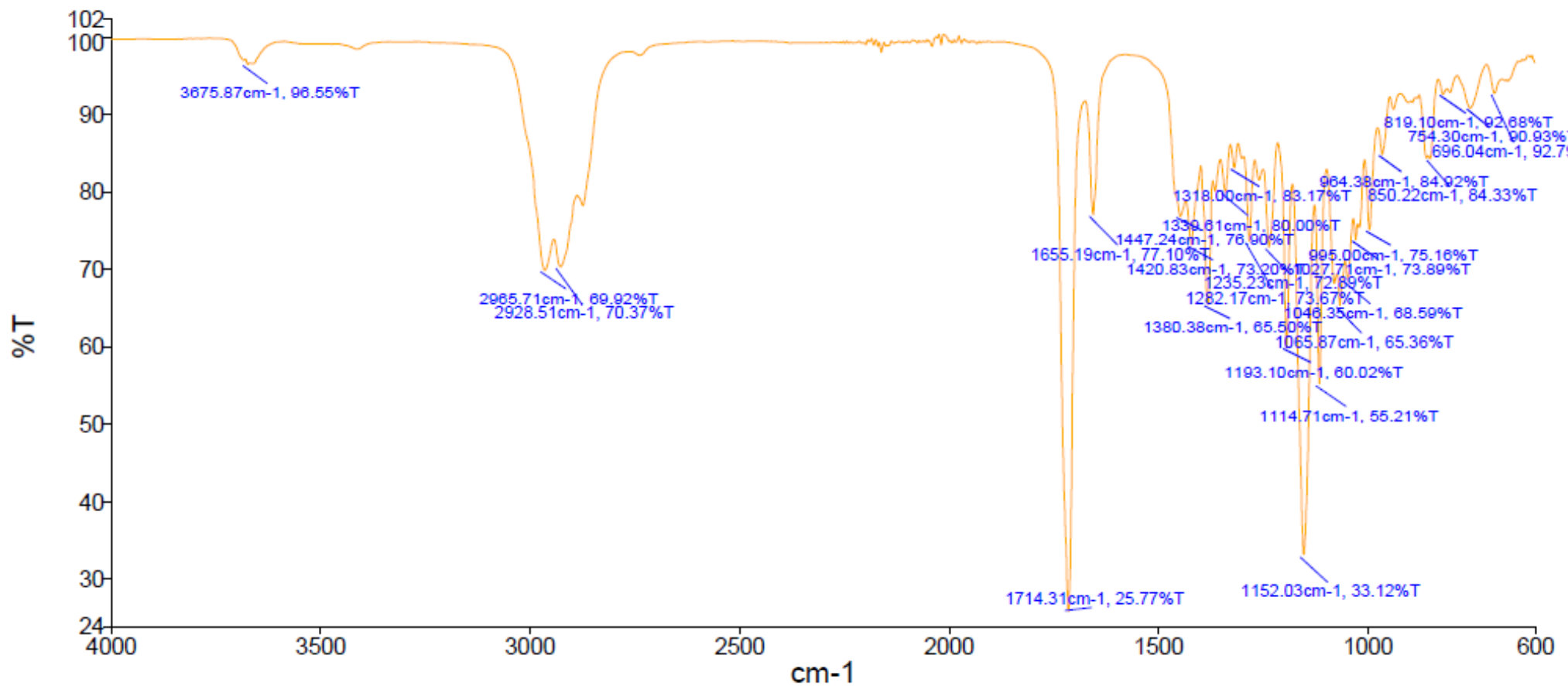
----- GRADIENT CHANNEL -----
 GPNAM[1] SMSQ10.100
 GPNAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

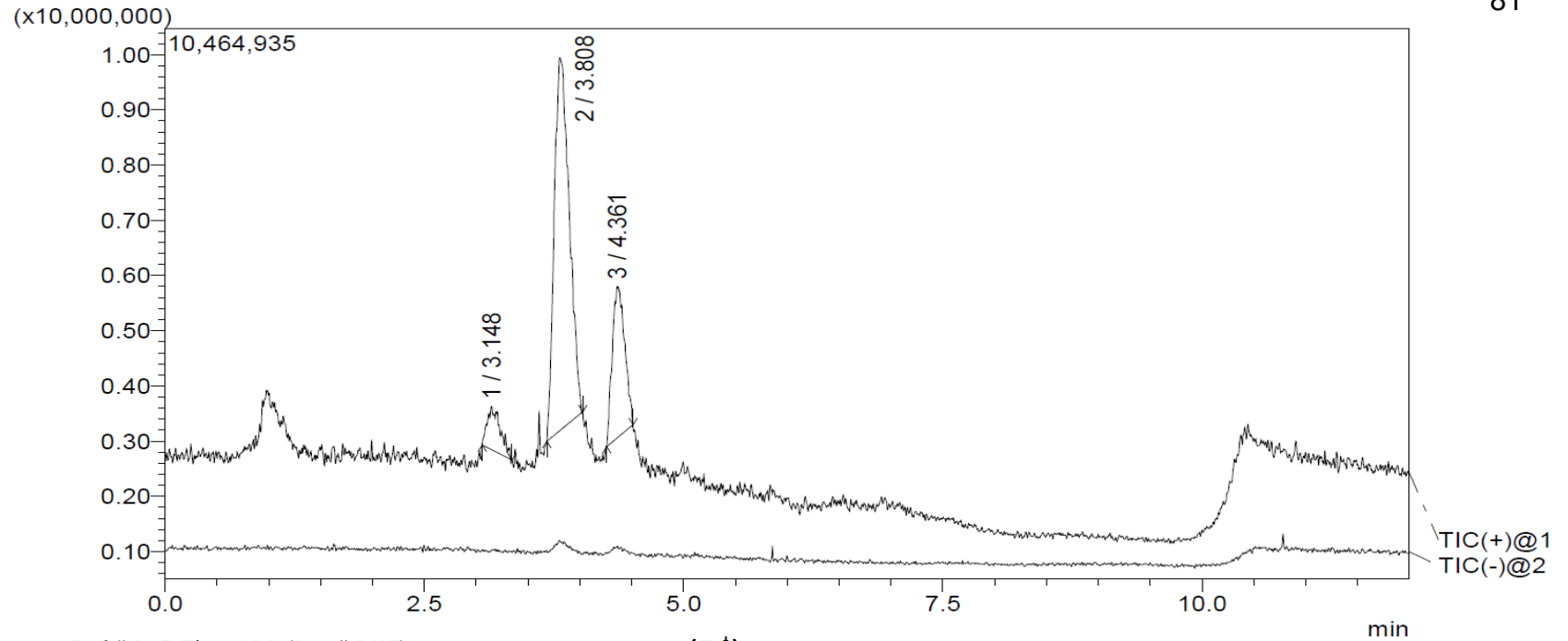
F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 FIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300242 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MZ2 echo-antiecho
 SF 150.9026278 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

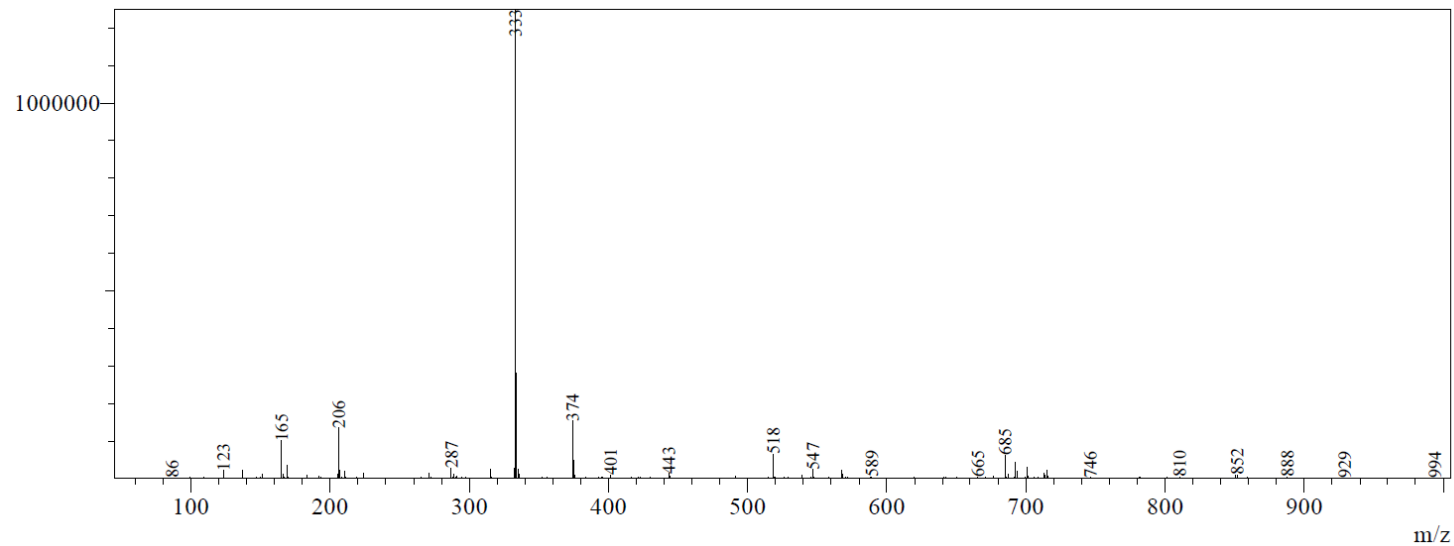


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DateAnalyst
Wednesday, 17 October 2018 2:58 PM



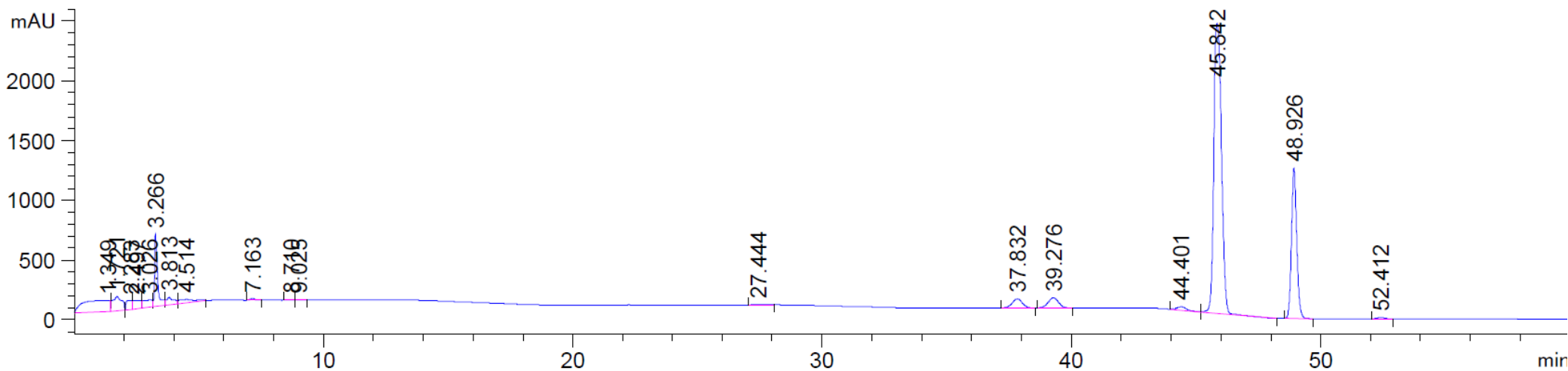
Peak#:3 R.Time:4.361(Scan#:2617)
MassPeaks:557
Spectrum Mode:Averaged 4.357-4.363(2615-2619)
BG Mode:Calc Segment 1 - Event 1

(7a) MS



HPLC analysis Semi-synthetic (2a) + (7a) mixture

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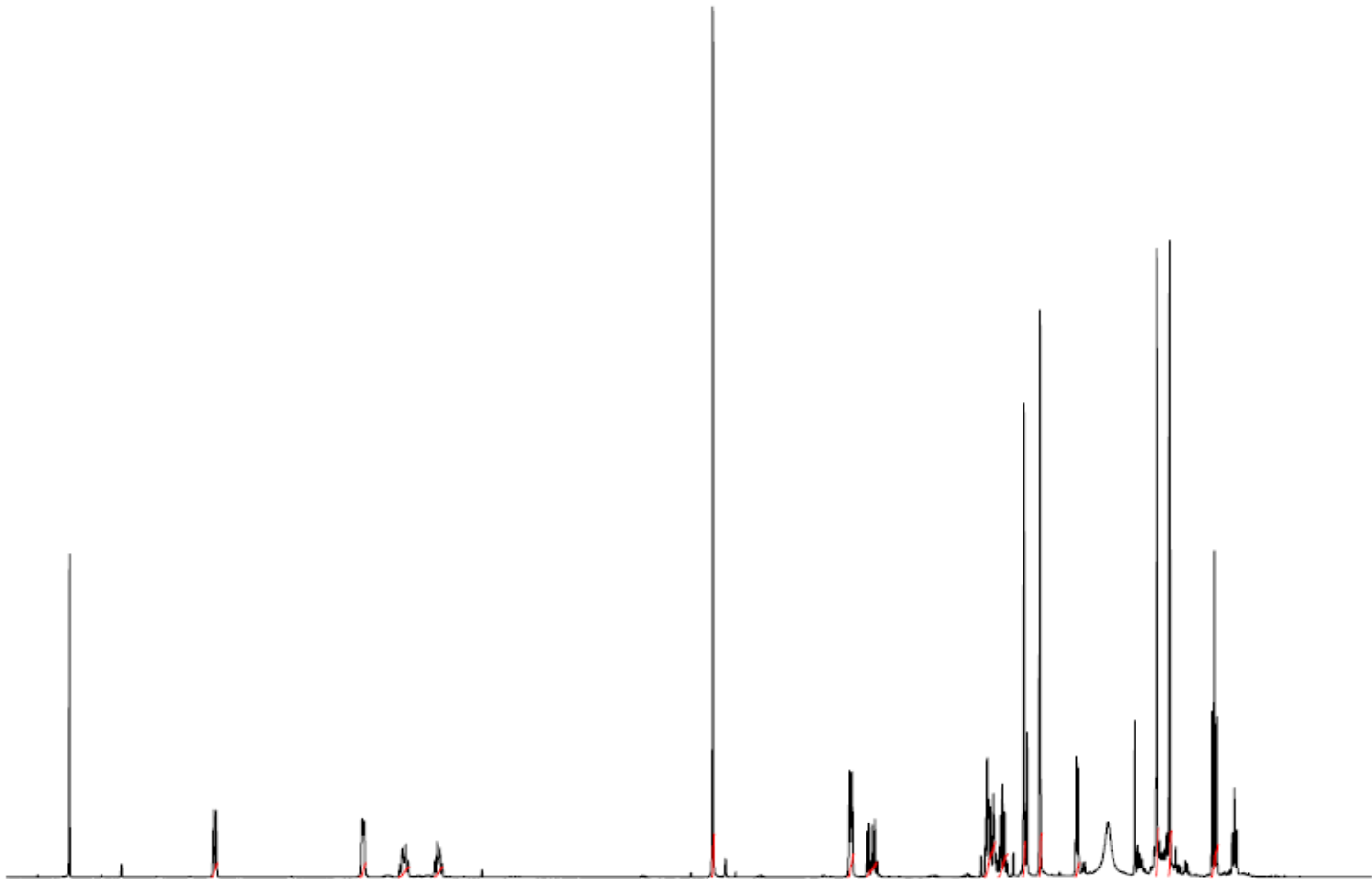


Retention time (min)	Compound (#)	Area (mAU)	% Area
45.842	2a	51507.4	68.0
48.926	7a	18624.9	24.7

Semi-synthetic (2b) + (7b) mixture NMR Characterisation



6.471
6.455
5.657
5.648
5.436
5.419
5.407
5.259
5.247
5.229
5.217
3.736
2.988
2.976
2.892
2.881
2.861
2.850
2.243
2.235
2.227
2.218
2.204
2.202
2.177
2.165
2.152
2.140
2.128
2.035
2.016
1.948
1.746
1.737
1.429
1.307
1.236
1.004
0.992
0.979



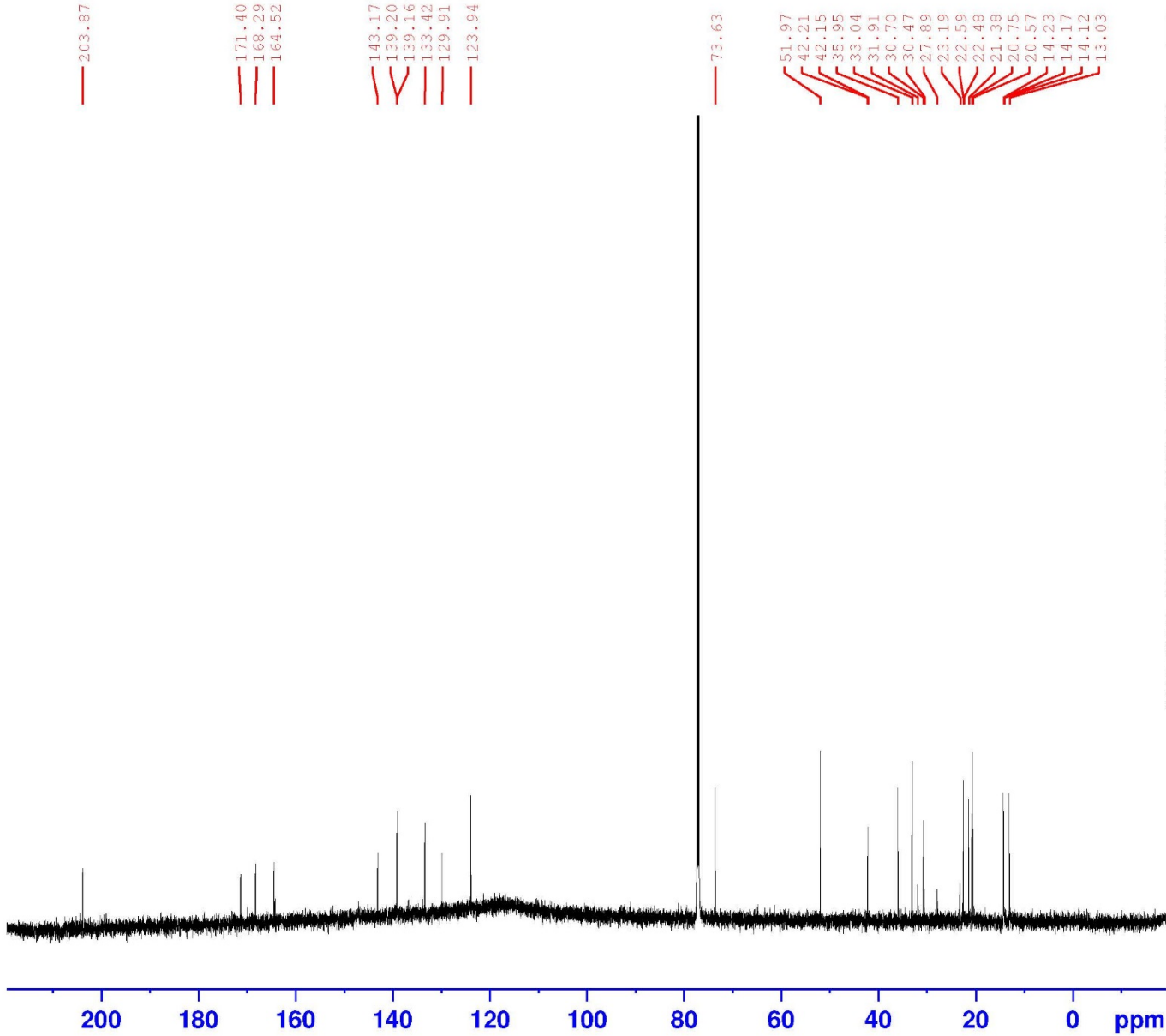
1.38
1.39
1.00
1.00
4.13
2.22
1.37
3.37
2.18
3.40
4.17
1.45
4.63
4.41
3.13

Current Data Parameters
NAME 20180831 JII (diimide reduction)
EXPNO 10
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180831
Time 18.02
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 64
DS 2
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 203
DW 41.600 usec
DE 6.50 usec
TE 298.2 K
D1 1.00000000 sec
TD0 1

==== CHANNEL f1 =====
SFO1 600.1337060 MHz
NUC1 1H
P1 8.40 usec
PLW1 12.55000019 W

F2 - Processing parameters
SI 65536
SF 600.1300252 MHz
WDW no
SSB 0
LB 0 Hz
GB 0
PC 1.00



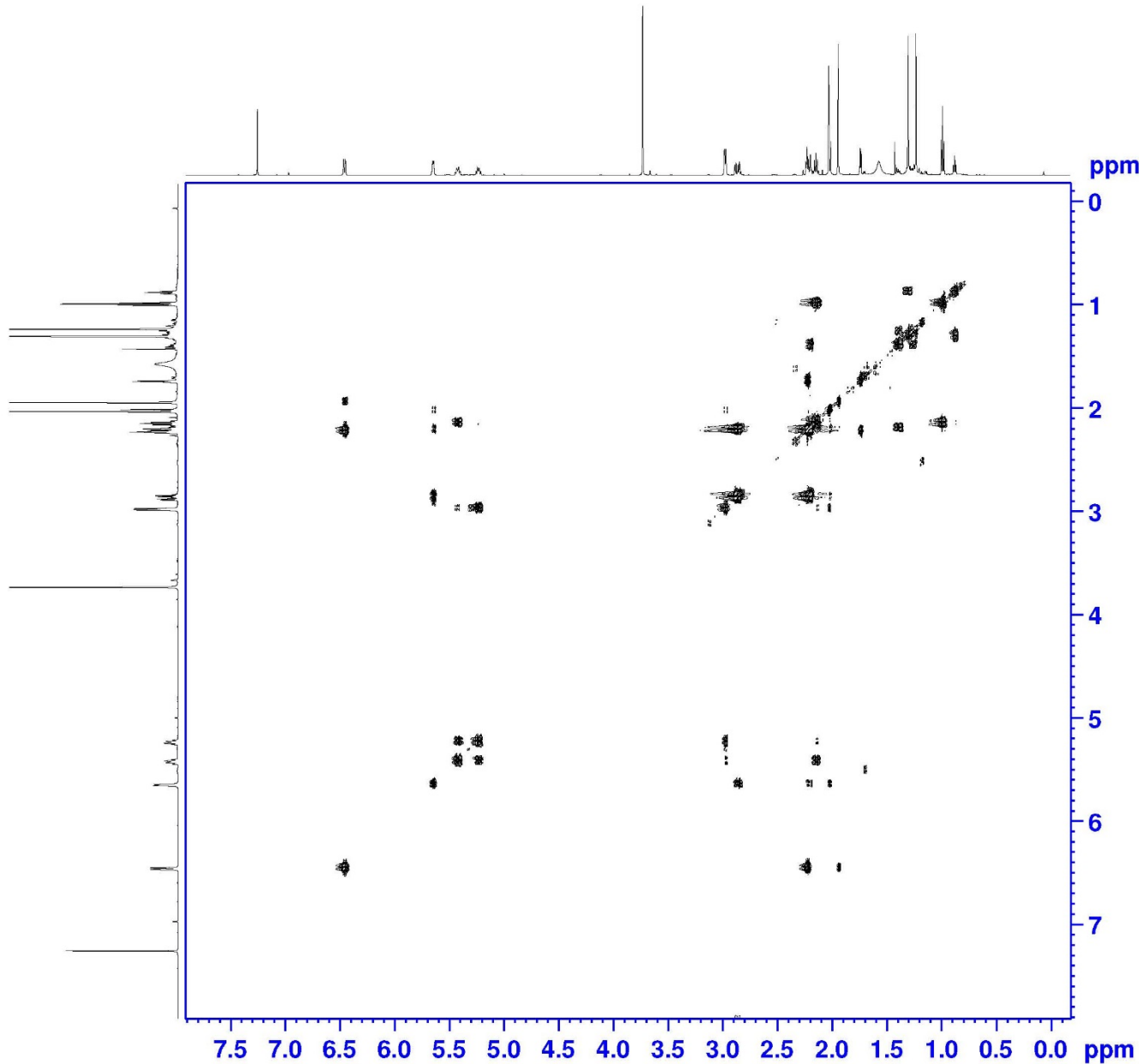
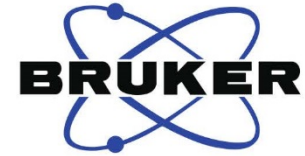
Current Data Parameters
NAME 20180831 J11 (Diimide reduction)
EXPNO 11
PROCNO 1

F2 - Acquisition Parameters
Date_ 20180831
Time 19.55
INSTRUM spect
PROBHD 5 mm PABBI 1H/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2048
DS 2
SWH 36057.691 Hz
FIDRES 0.550197 Hz
AQ 0.9087659 sec
RG 1820
DW 13.867 usec
DE 6.50 usec
TE 298.2 K
D1 2.0000000 sec
D11 0.3300000 sec
TD0 1

----- CHANNEL f1 -----
SFO1 150.9178988 MHz
NUC1 13C
P1 16.00 usec
PLW1 110.76000214 W

----- CHANNEL f2 -----
SFO2 600.1324005 MHz
NUC2 1H
PCPD2 waltz16
PCPD2 70.00 usec
PLW2 12.55000019 W
PLW12 0.18072000 W
PLW13 0.08855400 W

F2 - Processing parameters
SI 32768
SF 150.9027891 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



Current Data Parameters
 NAME 20180831 J11 (Diimide reduction)
 EXPNO 13
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180831
 Time 20.19
 INSTRUM spect
 PROBHD 5 mm PABBI 1H/
 PULPROG cosygpmfphpp
 TD 2048
 SOLVENT CDCl3
 NS 15
 DS 4
 SWH 4854.369 Hz
 FIDRES 2.370297 Hz
 AQ 0.2109440 sec
 RG 2050
 DW 103.000 usec
 DE 6.50 usec
 TE 298.2 K
 DQ 0.00009230 sec
 D1 1.32750096 sec
 D11 0.03000000 sec
 D12 0.0002000 sec
 D16 0.0002000 sec
 INO 0.00020600 sec

===== CHANNEL f1 =====
 SFO1 600.1323522 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P17 2500.00 usec
 PLW1 12.55000019 W
 PLW10 1.30999994 W

===== GRADIENT CHANNEL =====
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 10.00 %
 GPZ2 20.00 %
 P16 1000.00 usec

F1 - Acquisition parameters
 TD 256
 SFO1 600.1324 MHz
 FIDRES 18.962379 Hz
 SW 8.089 ppm
 FMODE States-TPPI

F2 - Processing parameters
 SI 1024
 SF 600.1300312 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MC2 States-TPPI
 SF 600.1300305 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0



Current Data Parameters
 NAME 20180831 JII (Diimide reduction)
 EXPNO 14
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20180831
 Time 22.52

INSTRUM spect
 PROBRD 5 mm PABBI 1H/
 PULPROG hsqcsetgp
 TD 1024
 SOLVENT CDCl3
 NS 50
 DS 16
 SWH 4854.369 Hz
 PIDRES 4.740595 Hz
 AQ 0.1054720 sec
 RG 2050
 DW 103.000 usec
 DE 6.50 usec
 TE 298.0 K
 CNST2 145.0000000
 D0 0.00000300 sec
 D1 1.46006405 sec
 D4 0.00172414 sec
 D16 0.03000000 sec
 DL6 0.00020000 sec
 INO 0.00002000 sec
 ZGOPTNS

===== CHANNEL f1 =====
 SFO1 600.1323522 MHz
 NUC1 1H
 P1 8.40 usec
 P2 16.80 usec
 P28 1000.00 usec
 PLW1 12.55000019 W

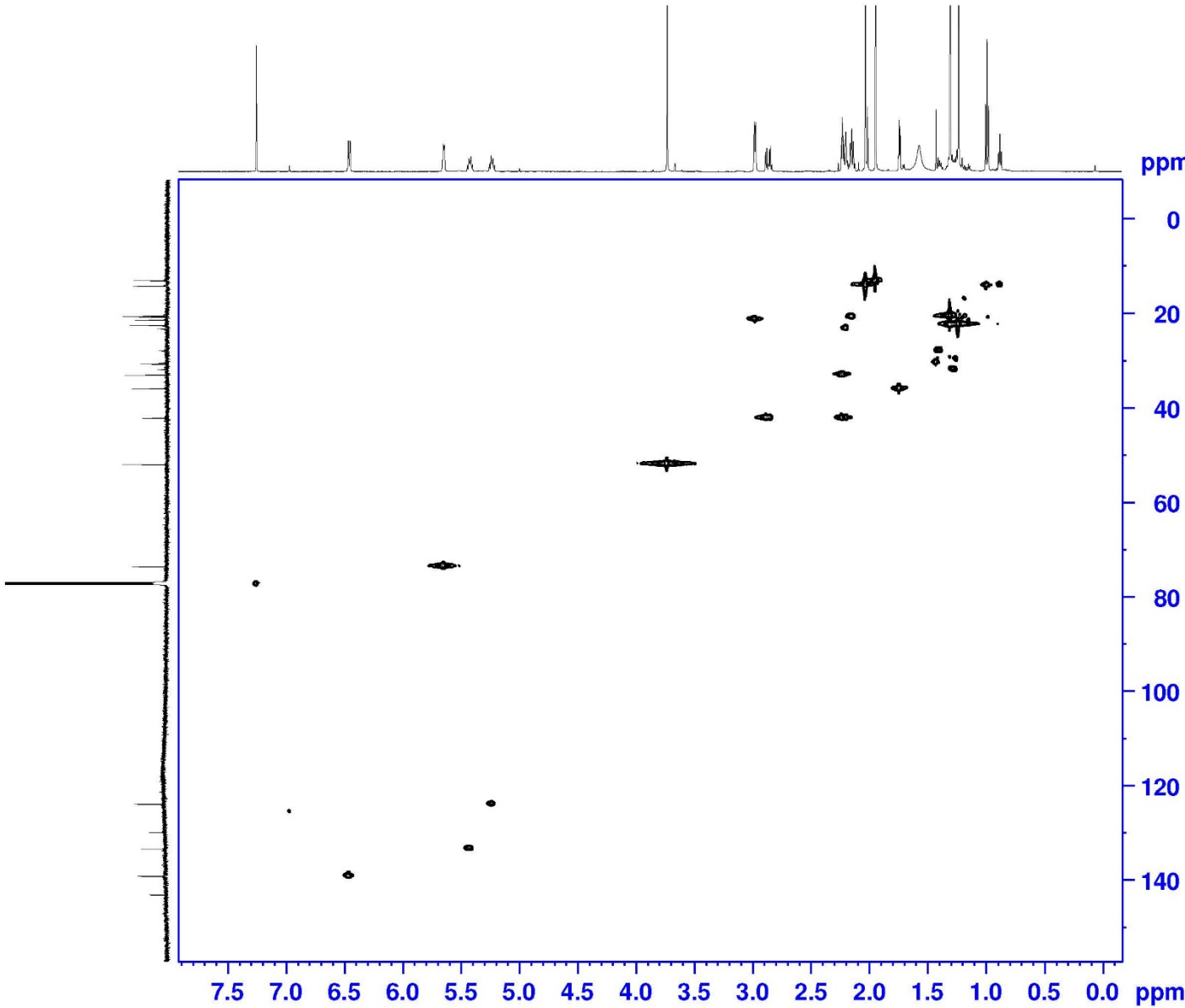
===== CHANNEL f2 =====
 SFO2 150.9140636 MHz
 NUC2 13C
 CDDPRG2 garrp
 P3 16.00 usec
 P4 32.00 usec
 PCPD2 60.00 usec
 PLW2 110.76000214 W
 PLW12 7.87610006 W

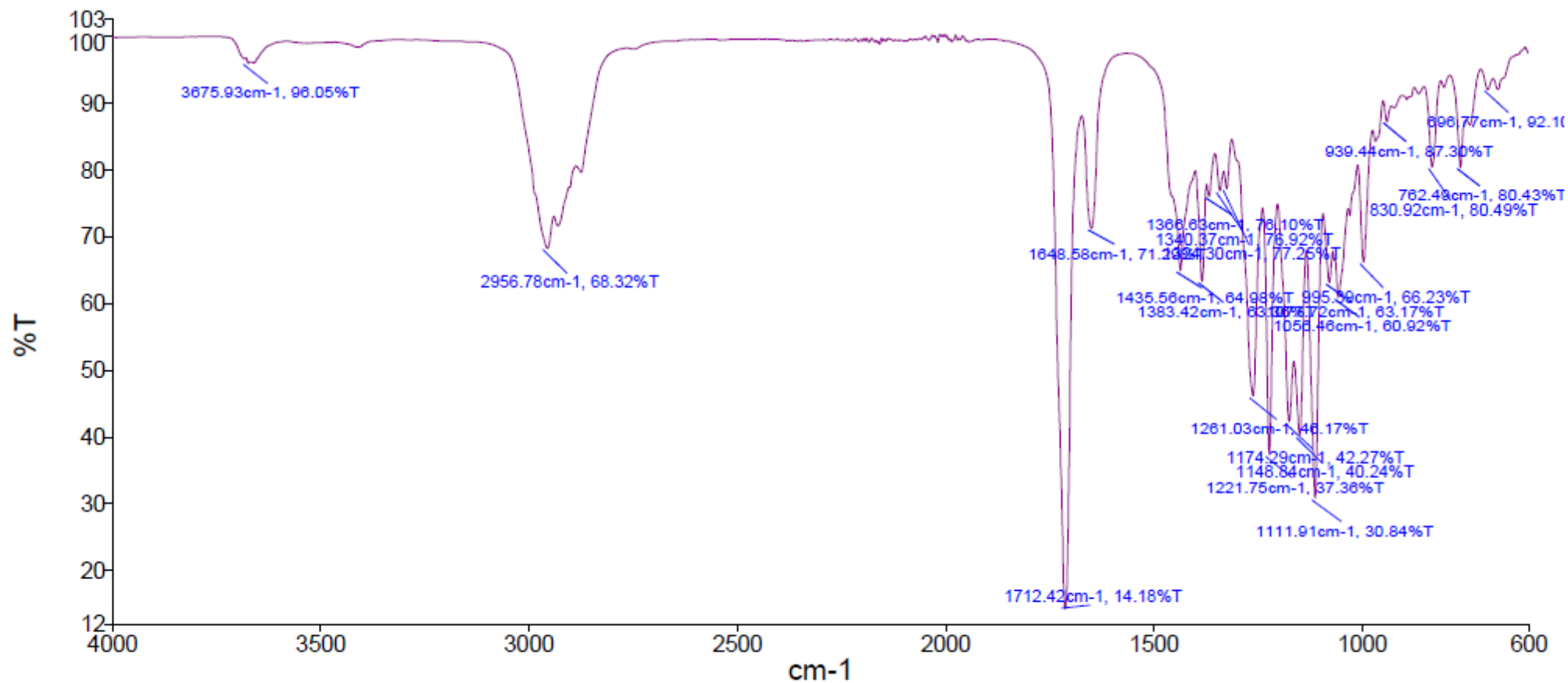
----- GRADIENT CHANNEL -----
 GENAM[1] SMSQ10.100
 GENAM[2] SMSQ10.100
 GPZ1 80.00 %
 GPZ2 20.10 %
 P16 1000.00 usec

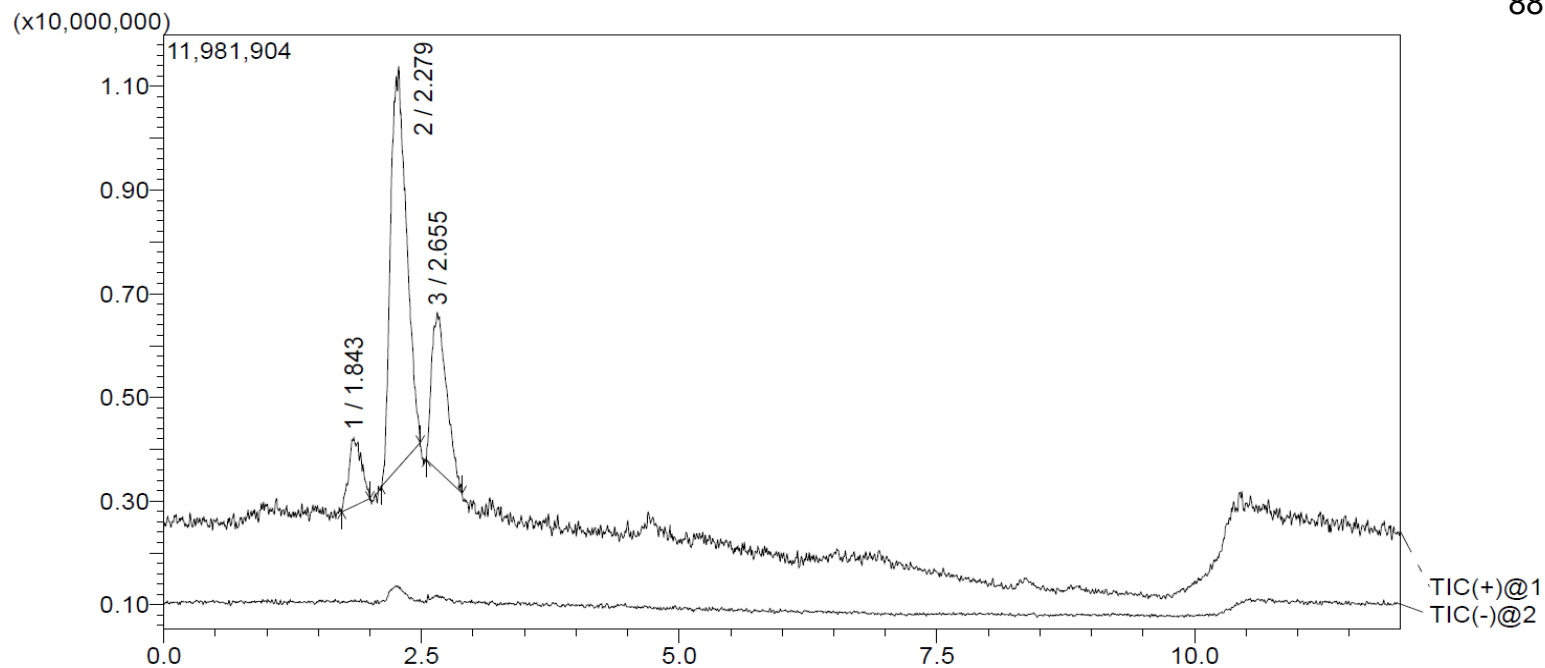
F1 - Acquisition parameters
 TD 256
 SFO1 150.9141 MHz
 PIDRES 97.656250 Hz
 SW 165.657 ppm
 FwMODE Echo-Antiecho

F2 - Processing parameters
 SI 1024
 SF 600.1300246 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0
 PC 1.40

F1 - Processing parameters
 SI 1024
 MZ2 echo-antiecho
 SF 150.9028254 MHz
 WDW QSINE
 SSB 2
 LB 0 Hz
 GB 0

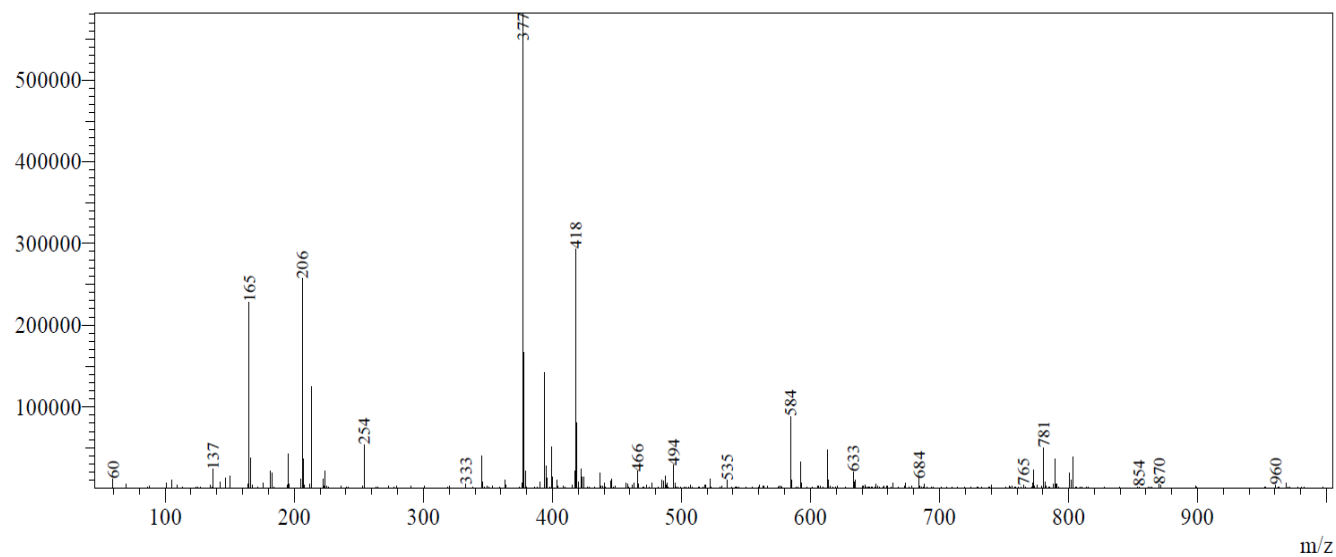


PerkinElmer Spectrum Version 10.4.2
Wednesday, 17 October 2018 2:59 PMAnalyst
DateAnalyst
Wednesday, 17 October 2018 2:59 PM

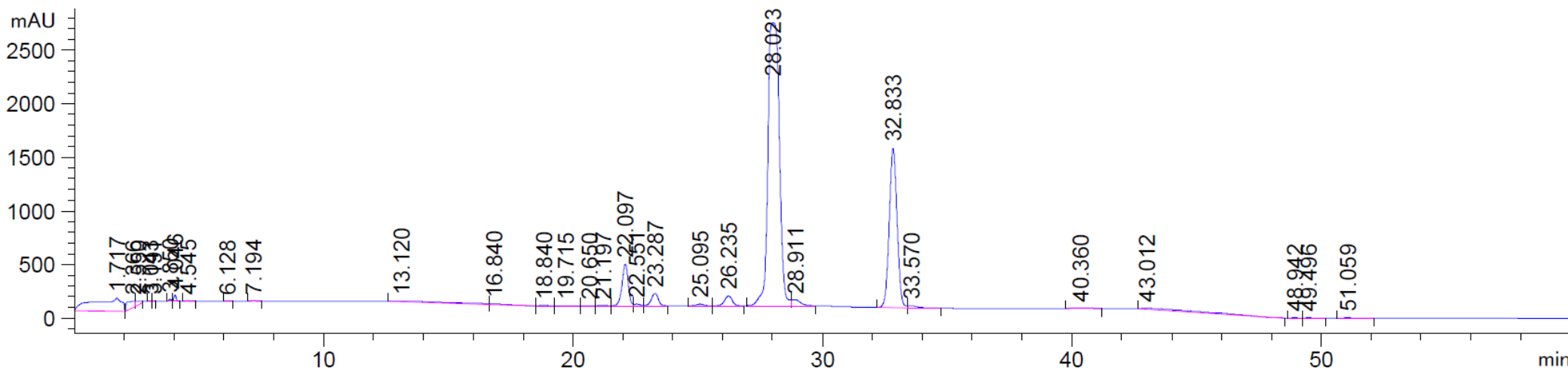


Peak#3 R.Time:2.655(Scan#:1593)
MassPeaks:607
Spectrum Mode:Averaged 2.650-2.657(1591-1595)
BG Mode:Calc Segment 1 - Event 1

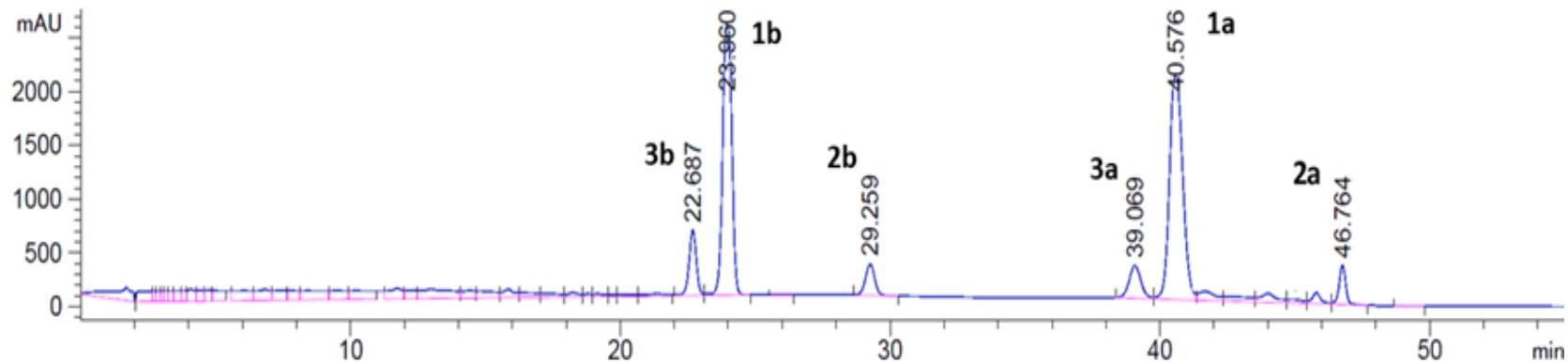
(7b) MS



HPLC analysis Semi-synthetic (2b) + (7b) mixture

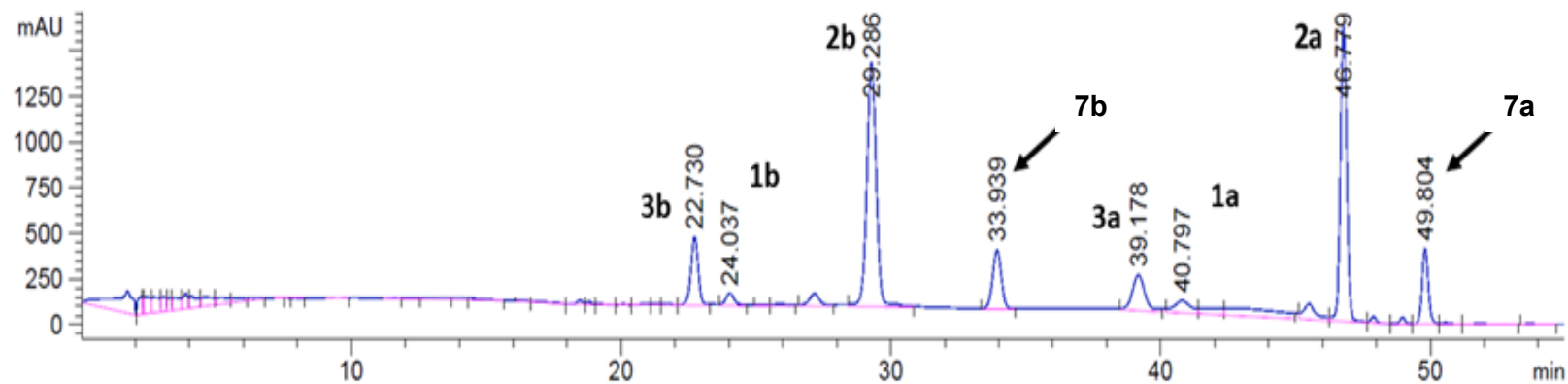


Retention time (min)	Compound (#)	Area (mAU)	% Area
28.023	2b	83793.2	65.8
32.833	7b	32642.4	25.6



Retention time (min)	Compound (#)	Area (mAU)	% Area
23.960	1b	60141.1	36.2
29.259	2b	7049.85	4.3
40.576	1a	71498.3	43.1
46.764	2a	6303.67	3.8

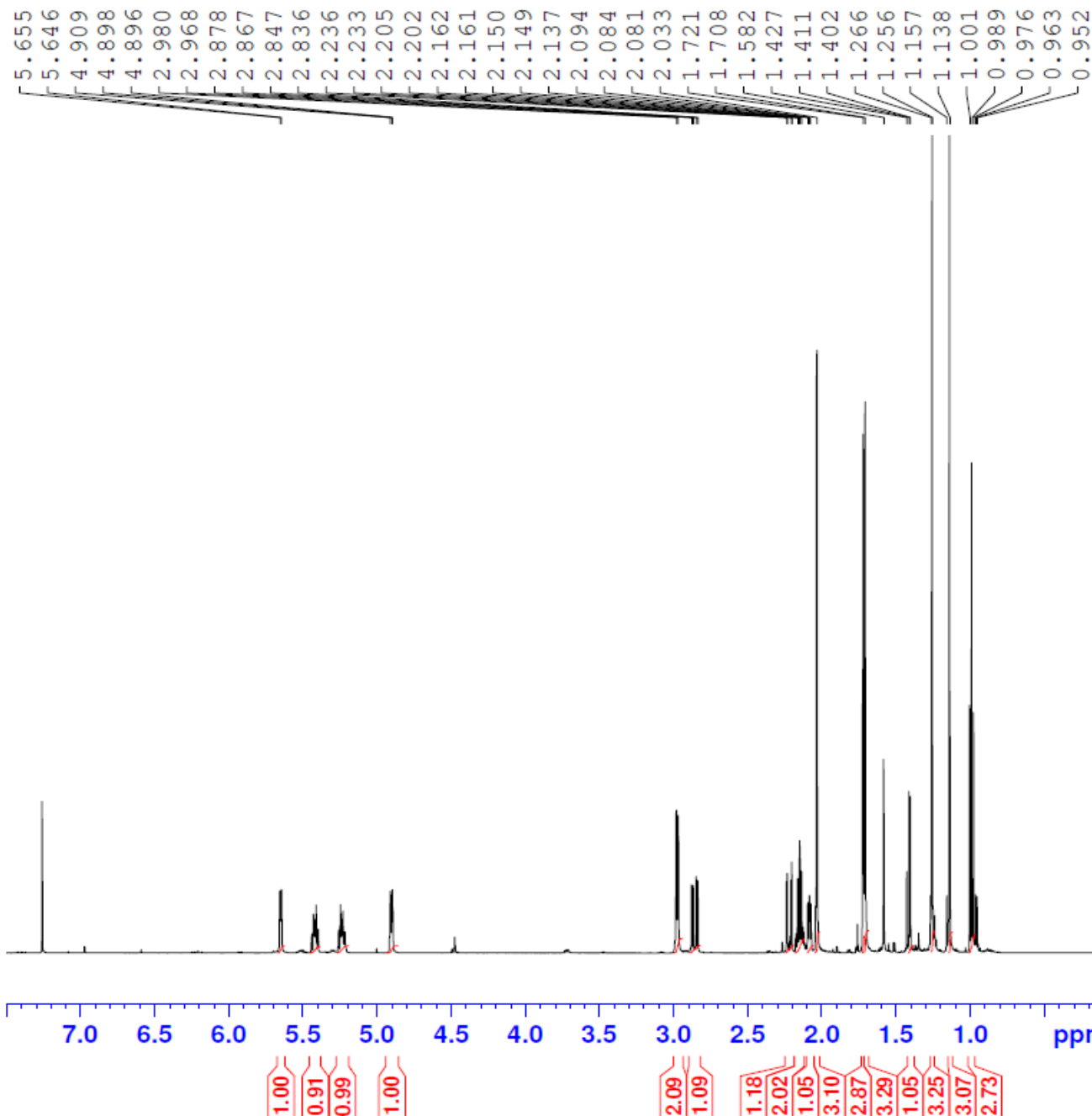
Constituents	Peaks (min)	% Concentrate
Pyrethrins 1	23.960, 40.576	79.3
Jasmolins 2	29.259, 46.764	8.1



Retention time (min)	Compound (#)	Area (mAU)	% Area
24.037	1b	1587.85	1.8
29.286	2b	32595.5	35.7
40.797	1a	2928.08	3.2
46.779	2a	26629.8	29.2
33.939	7b	7251.37	8.0
49.804	7a	6641.69	7.3

Constituents	Peaks (min)	% Concentrate
Pyrethrins 1	24.037, 40.797	5.0
Jasmolins 2	29.286, 46.779	64.9
Tetrahydropyrethrins 7	33.939, 49.804	15.3

Natural (2a) NMR Characterisation

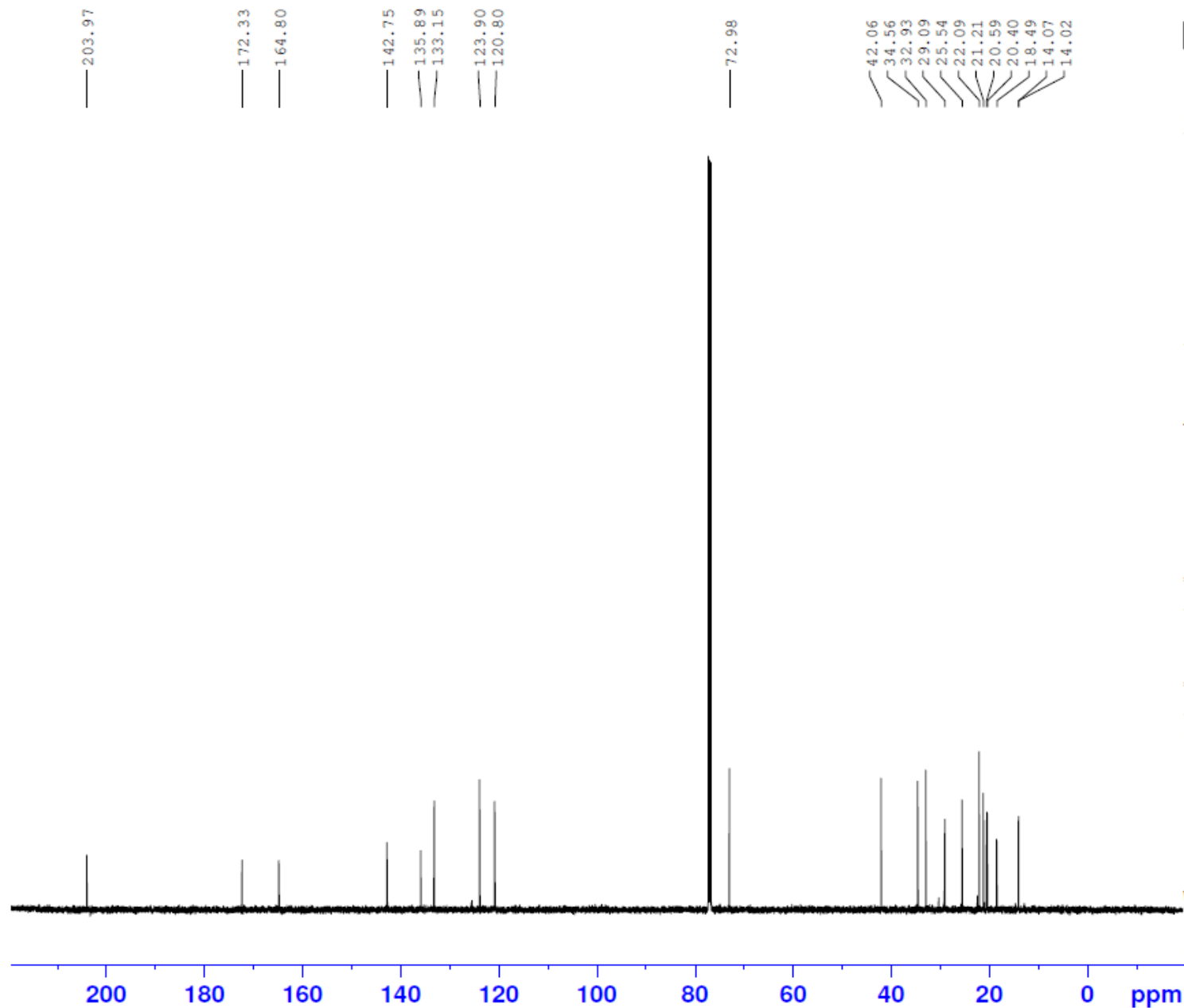


Current Data Parameters
 NAME Natural Jasmolin I
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191022
 Time 17.17
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 32
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 161
 DW 41.600 usec
 DE 6.50 usec
 TE 298.2 K
 D1 1.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 600.1337060 MHz
 NUC1 1H
 P1 13.50 usec
 PLW1 17.00000000 W

F2 - Processing parameters
 SI 65536
 SF 600.1300262 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Natural Jasmolin I
 EXPNO 11
 PROCNO 1

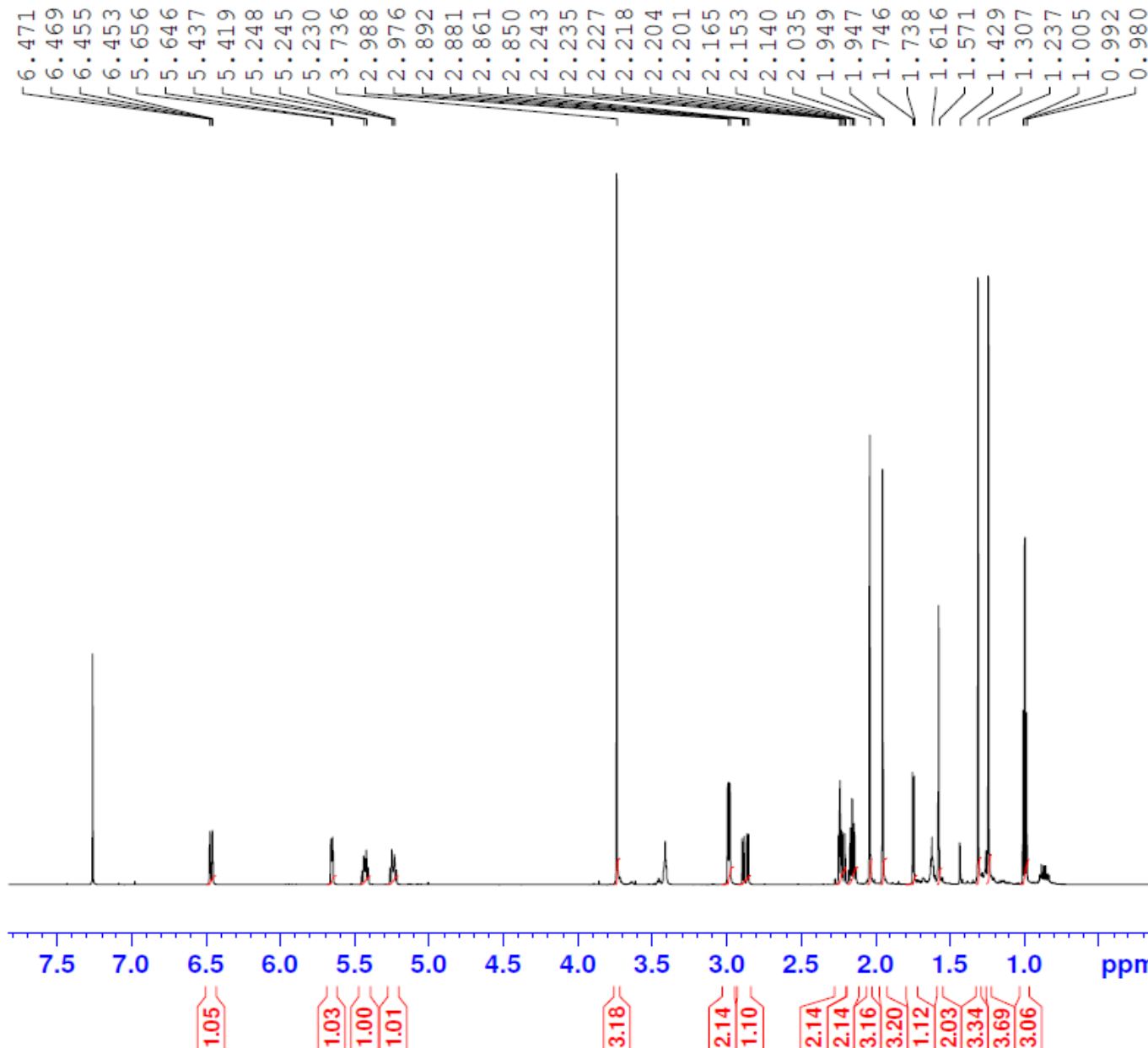
F2 - Acquisition Parameters
 Date_ 20191022
 Time 17.48
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 603
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.0000000 W

===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 17.0000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9028135 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

Natural (2b) NMR Characterisation



Current Data Parameters
 NAME Natural Jasmolin II
 EXPNO 10
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20191022
 Time 17.55
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zg30
 TD 65536
 SOLVENT CDC13
 NS 32
 DS 2
 SWH 12019.230 Hz
 FIDRES 0.183399 Hz
 AQ 2.7262976 sec
 RG 228
 DW 41.600 usec
 DE 6.50 usec
 TE 298.3 K
 D1 1.0000000 sec
 TD0 1

==== CHANNEL f1 =====
 SFO1 600.1337060 MHz
 NUC1 1H
 P1 13.50 usec
 PLW1 17.0000000 W

F2 - Processing parameters
 SI 65536
 SF 600.1300260 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



Current Data Parameters
 NAME Natural Jasmolin II
 EXPNO 11
 PROCNO 1

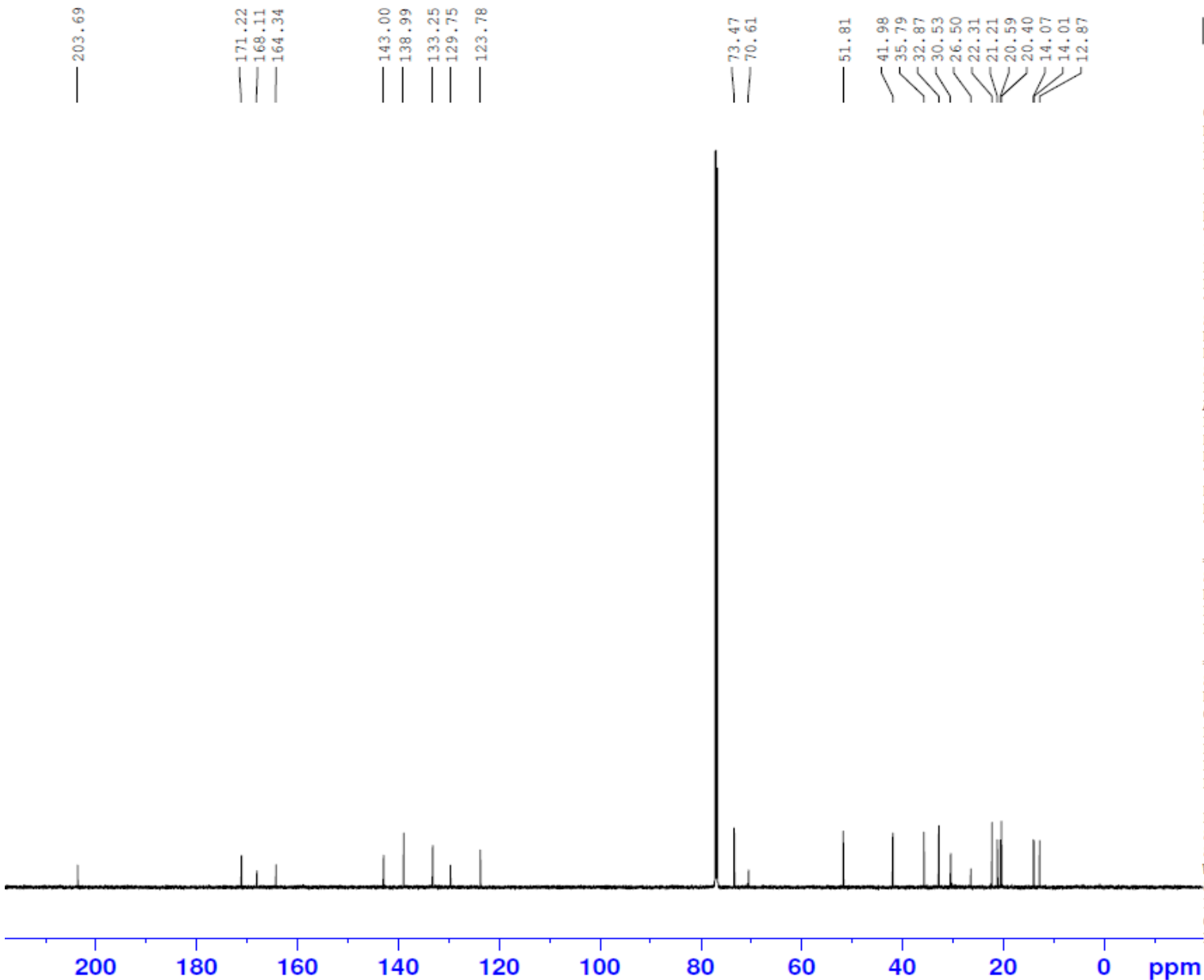
F2 - Acquisition Parameters

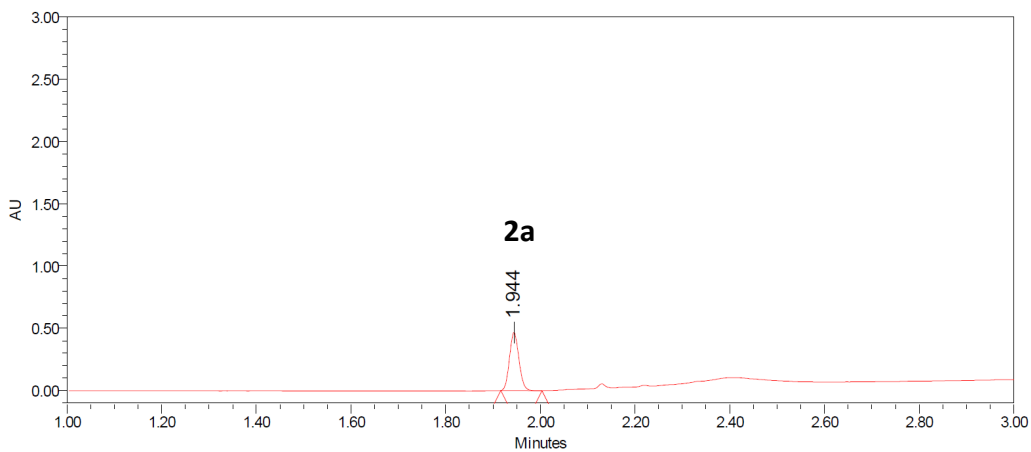
Date_ 20191022
 Time 19.38
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDC13
 NS 2048
 DS 2
 SWH 36057.691 Hz
 FIDRES 0.550197 Hz
 AQ 0.9087659 sec
 RG 2050
 DW 13.867 usec
 DE 6.50 usec
 TE 298.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 150.9178988 MHz
 NUC1 13C
 P1 12.00 usec
 PLW1 80.00000000 W

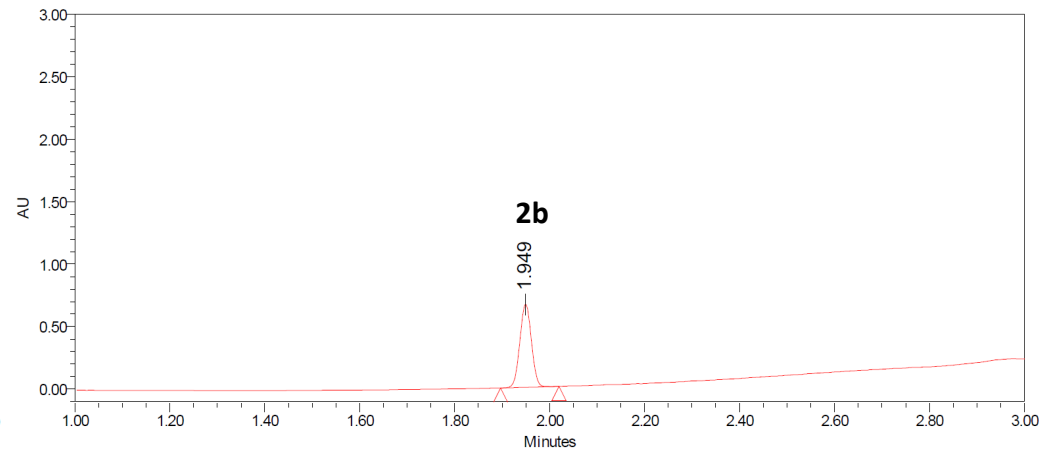
===== CHANNEL f2 =====
 SFO2 600.1324005 MHz
 NUC2 1H
 CPDPRG[2] waltz16
 PCPD2 70.00 usec
 PLW2 17.00000000 W
 PLW12 0.63230002 W
 PLW13 0.30983001 W

F2 - Processing parameters
 SI 32768
 SF 150.9028144 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

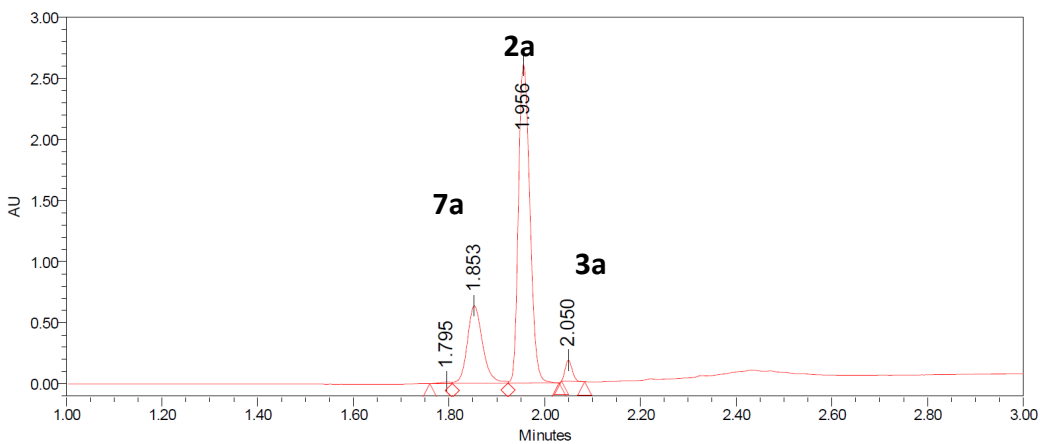




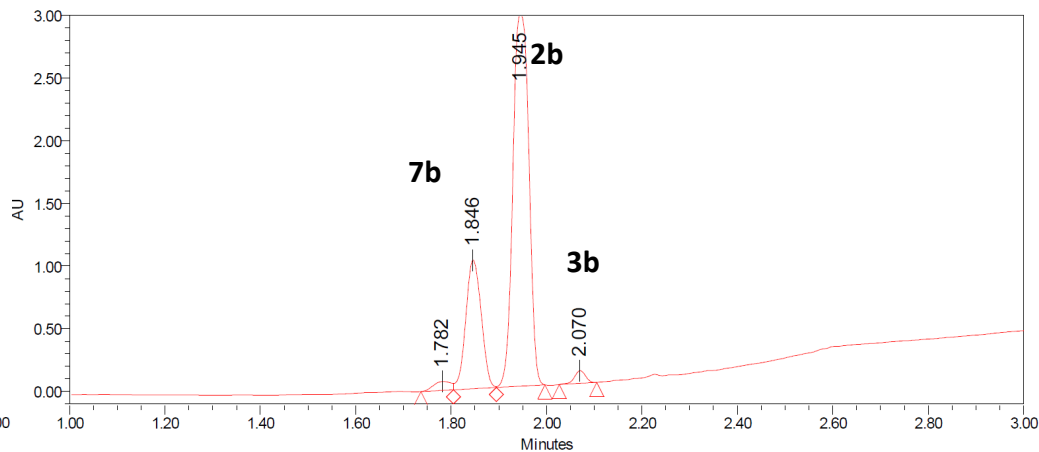
Representative chromatogram natural jasmolin I **2a**



Representative chromatogram natural jasmolin II **2b**



Representative chromatogram of diimide-reduced **1a**



Representative chromatogram of diimide-reduced **1b**