

Supplementary Material

Cerium (IV) ammonium nitrate (CAN) promoted reaction: A selective synthesis of 2-arylbenzimidazoles *via* reaction of *o*-phenylenediamine and arylidene malononitriles at ambient temperature

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1. NMR SPECTRA

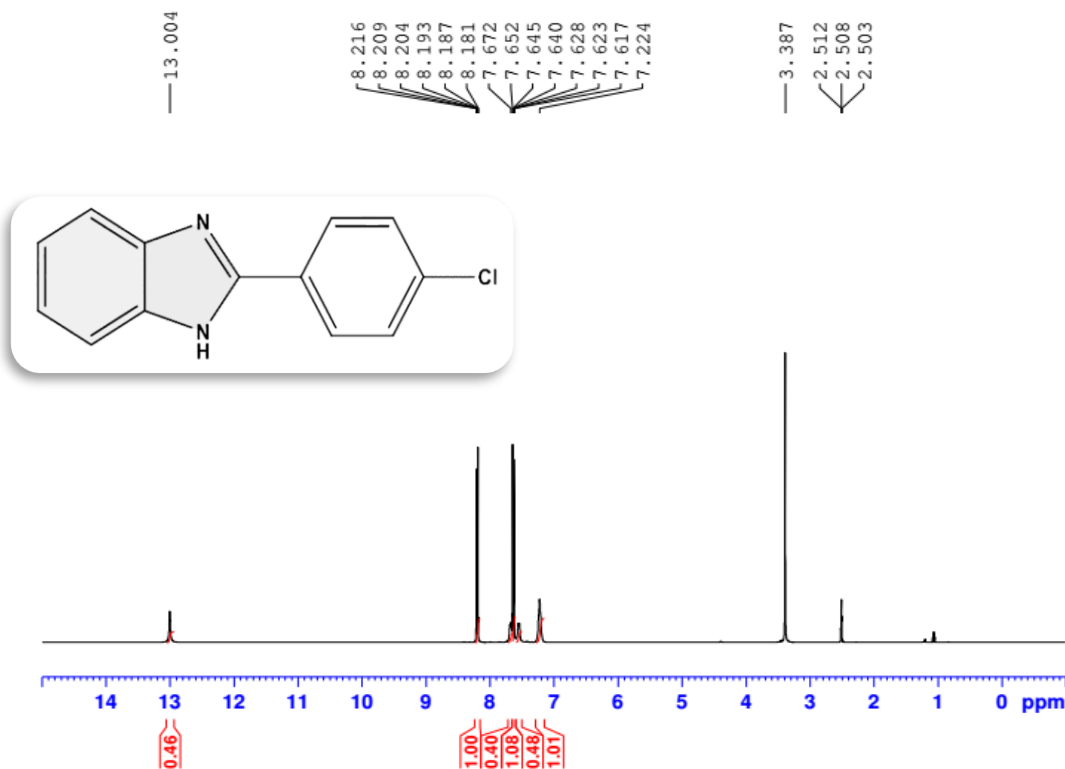
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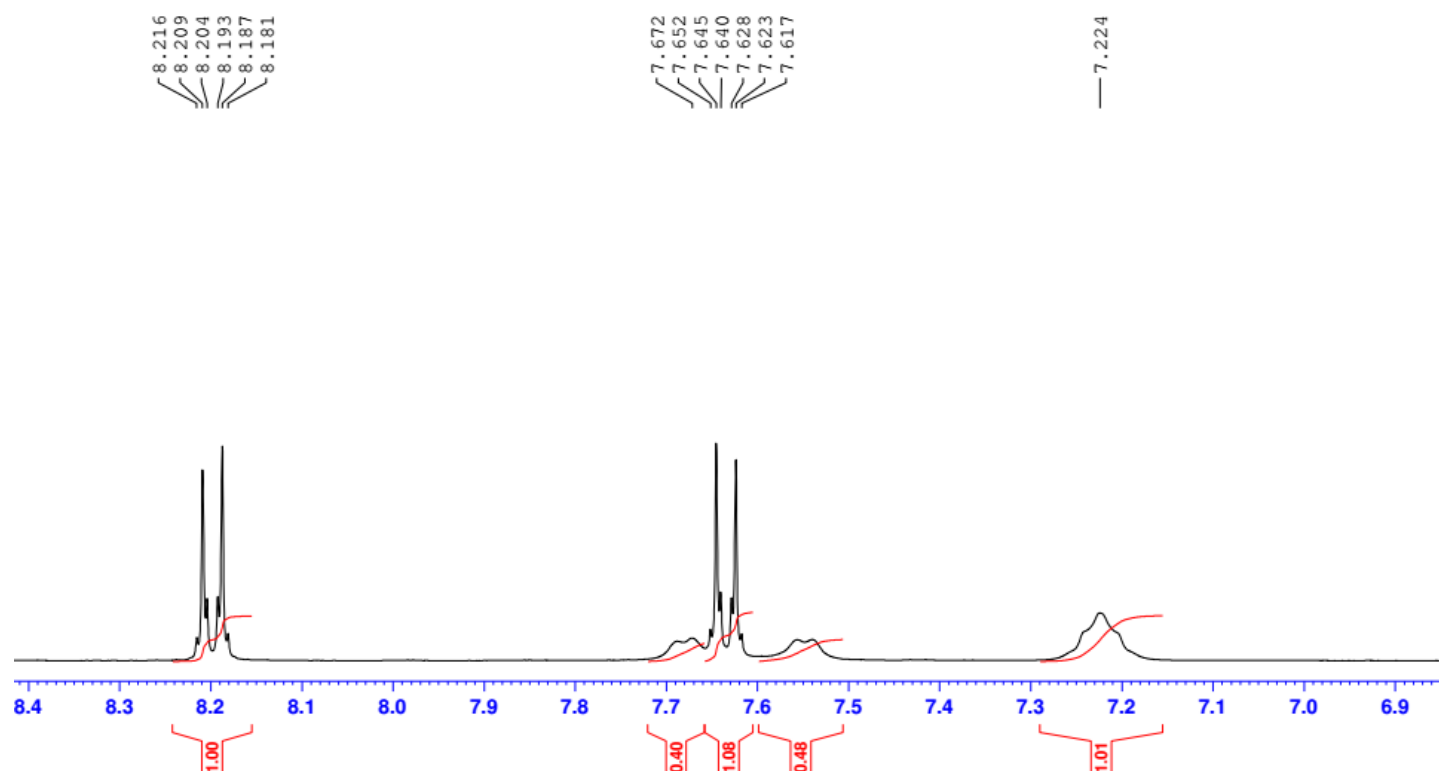
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 P1 14.00 usec
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1H SPECTRUM DR.SALEH P4 N DMSO



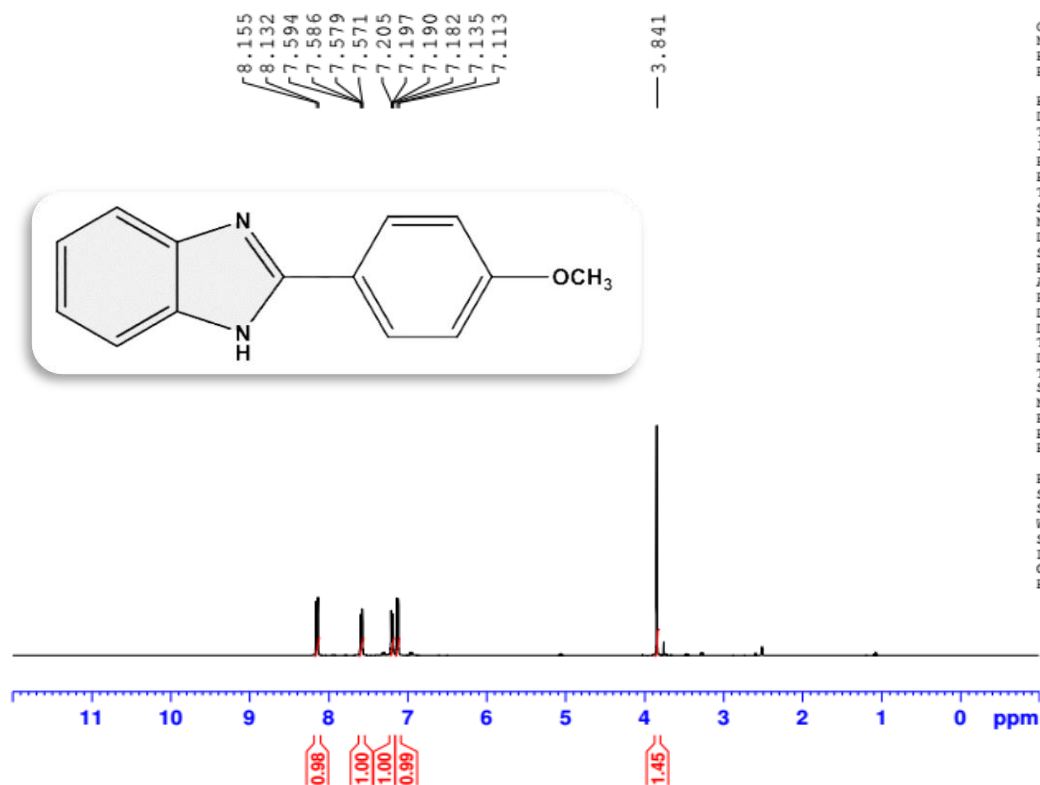
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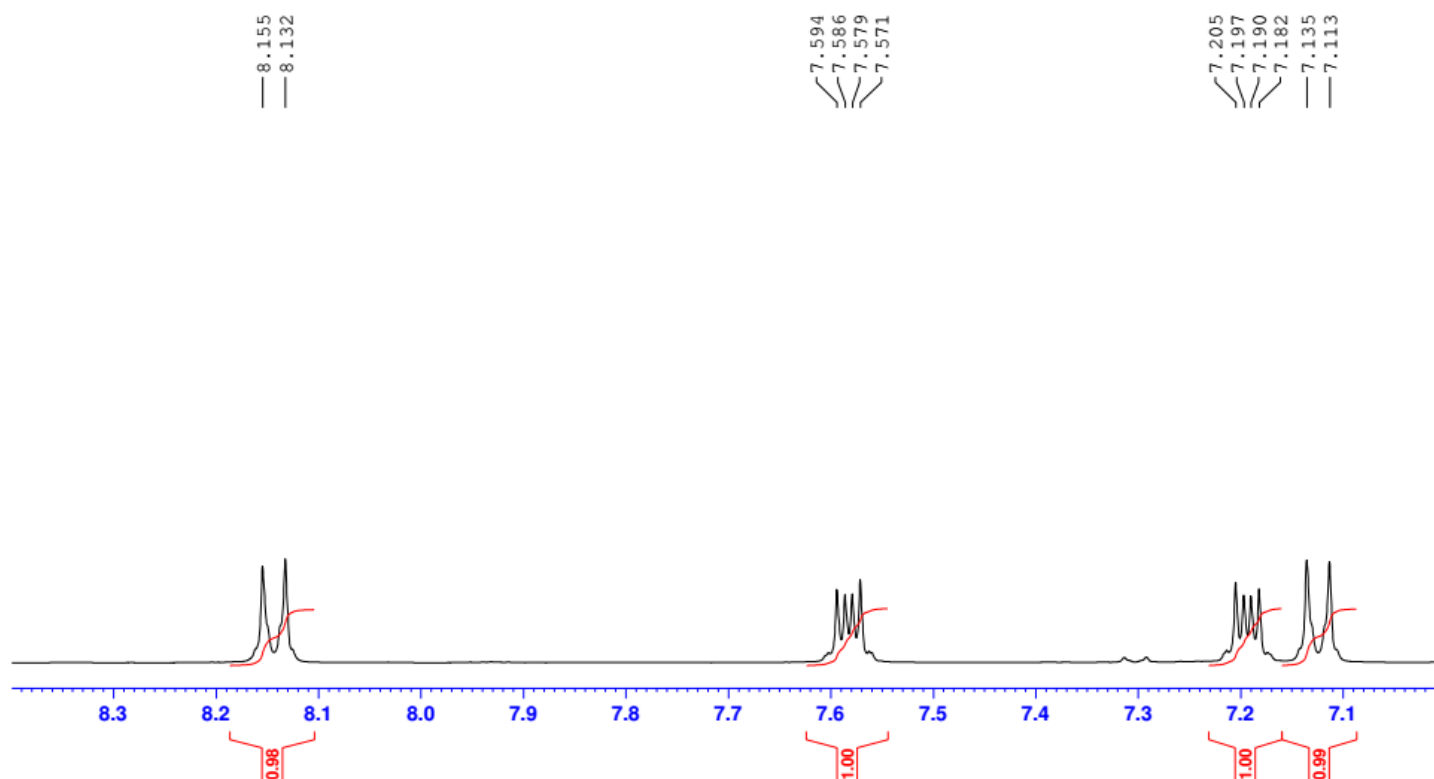
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1H SPECTRUM DR.SALEH P6 N DMSO



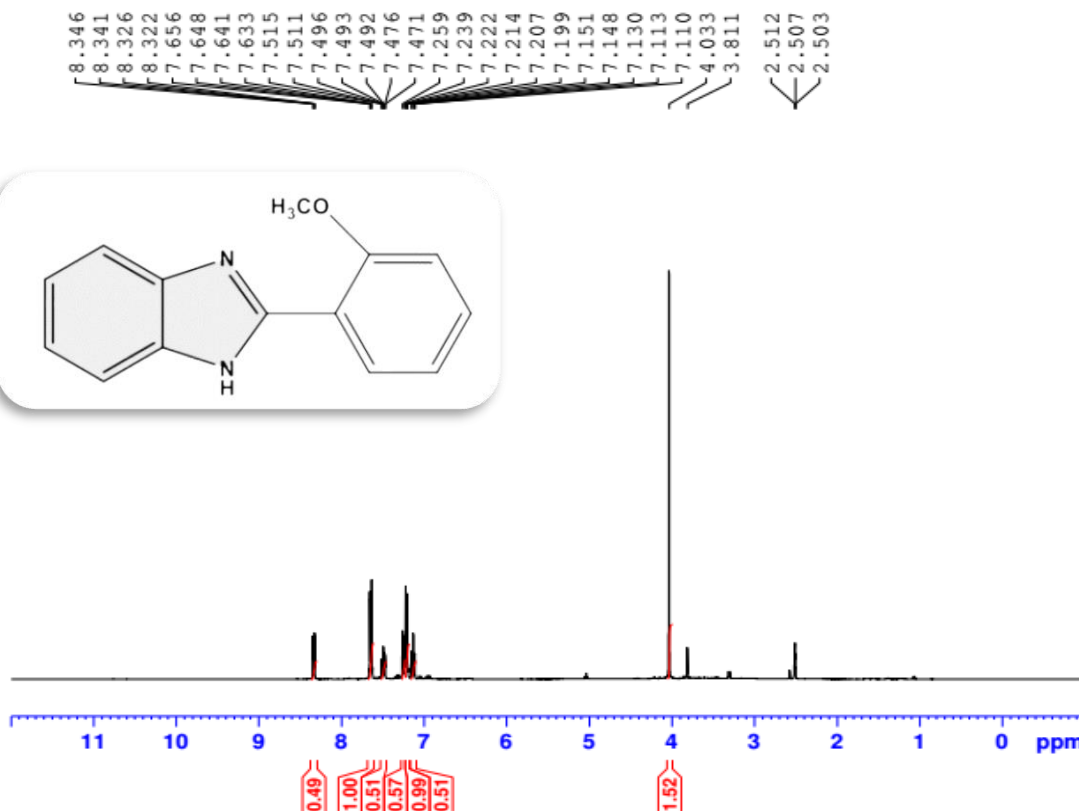
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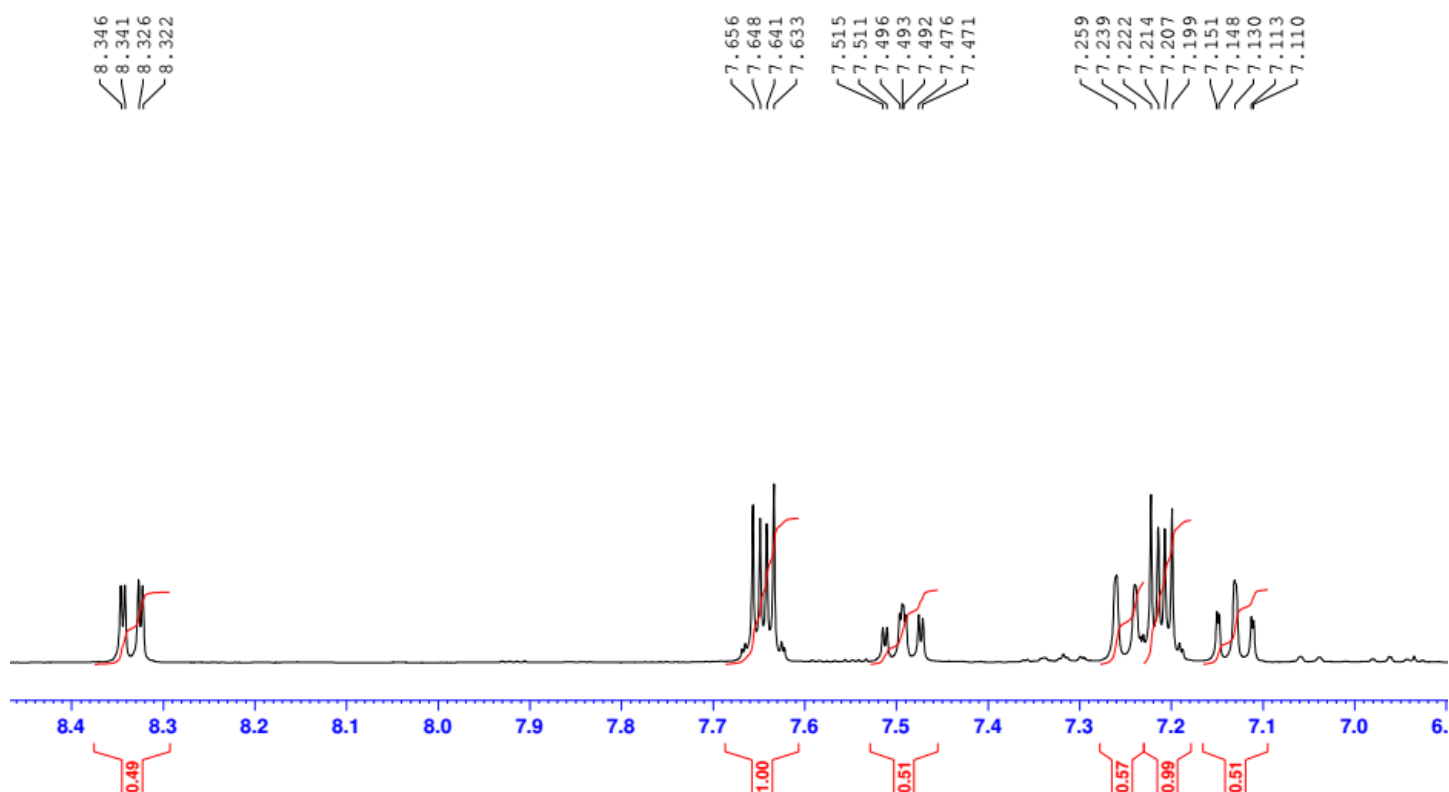
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 P1 14.00 usec
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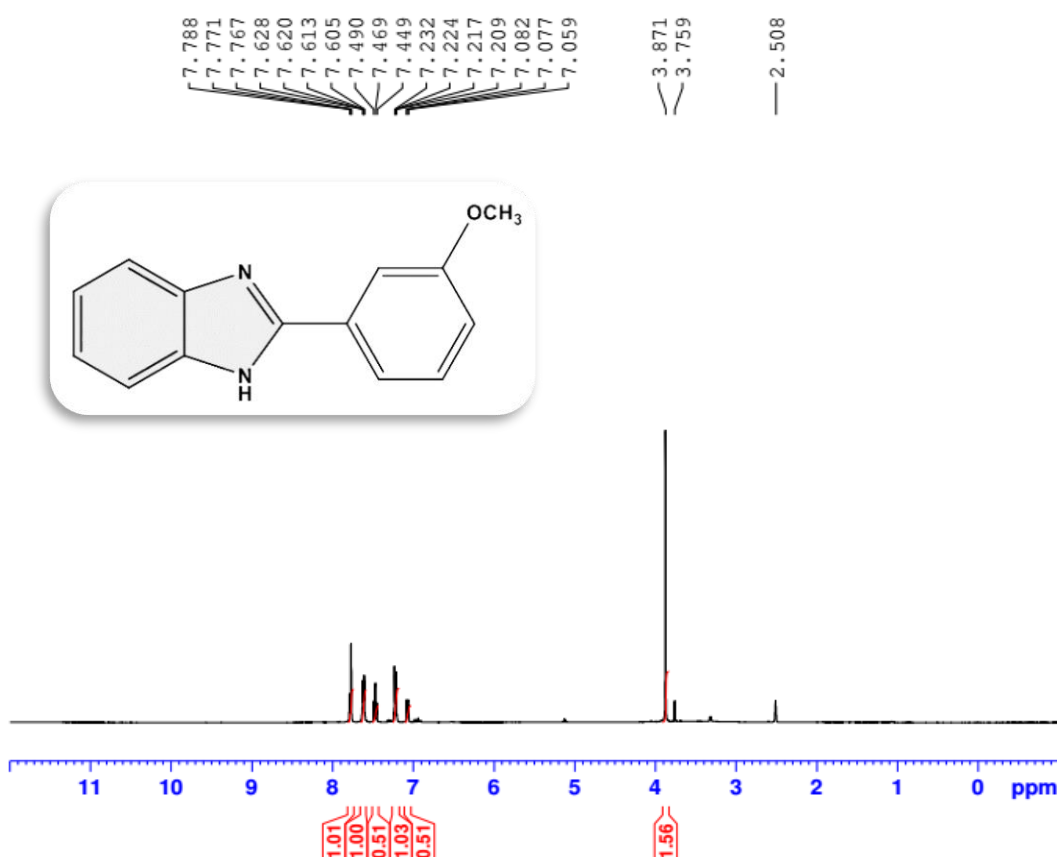
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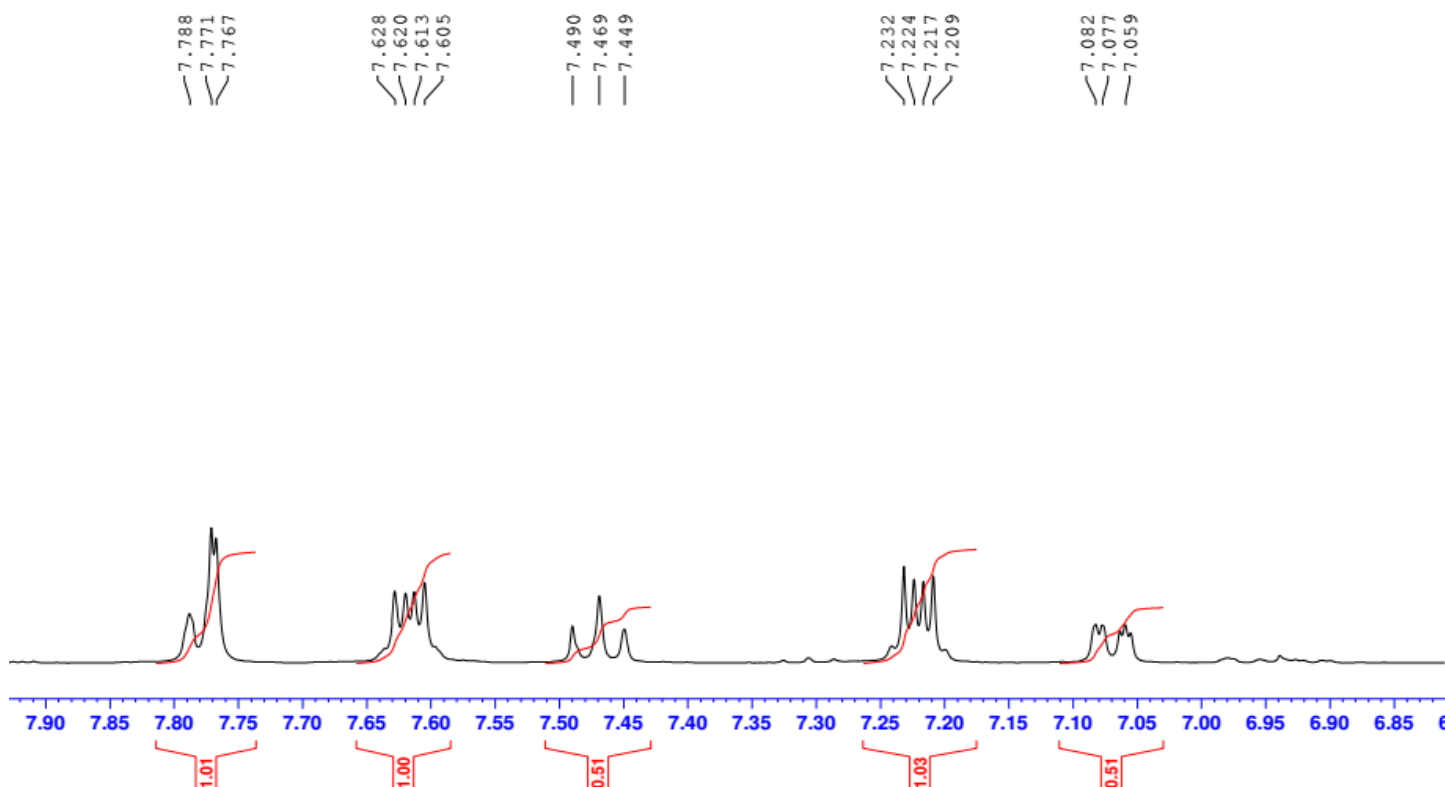
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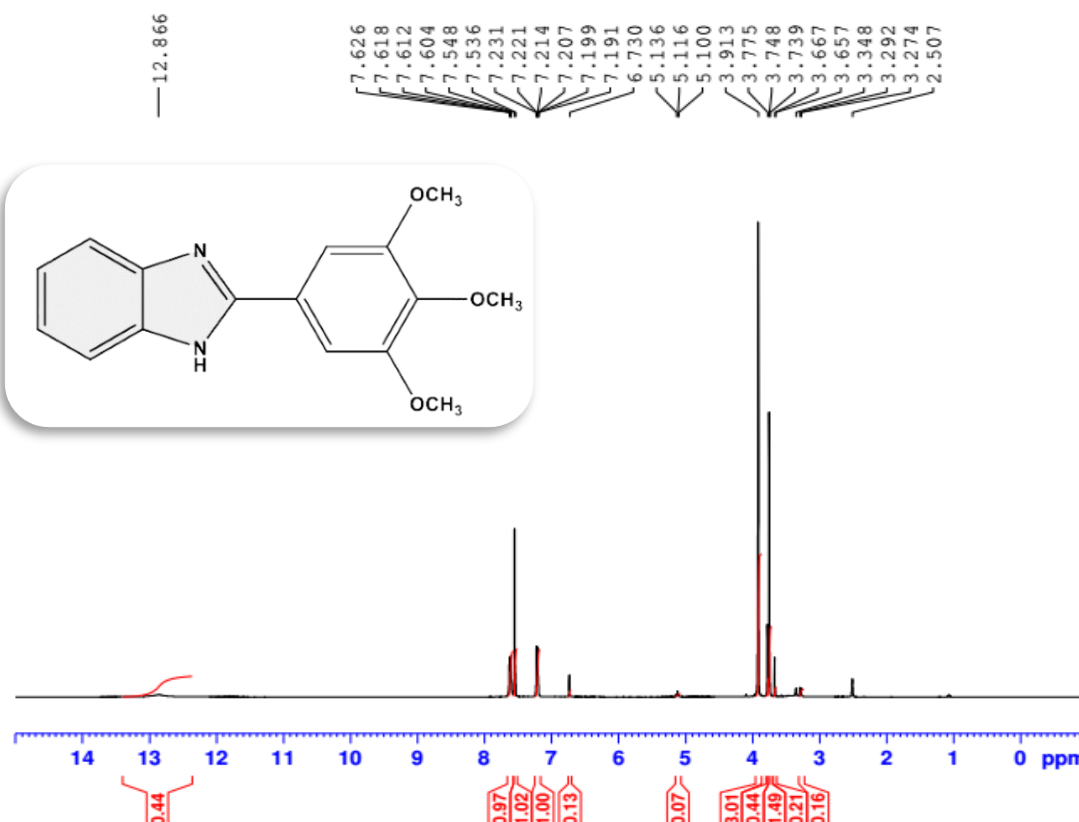
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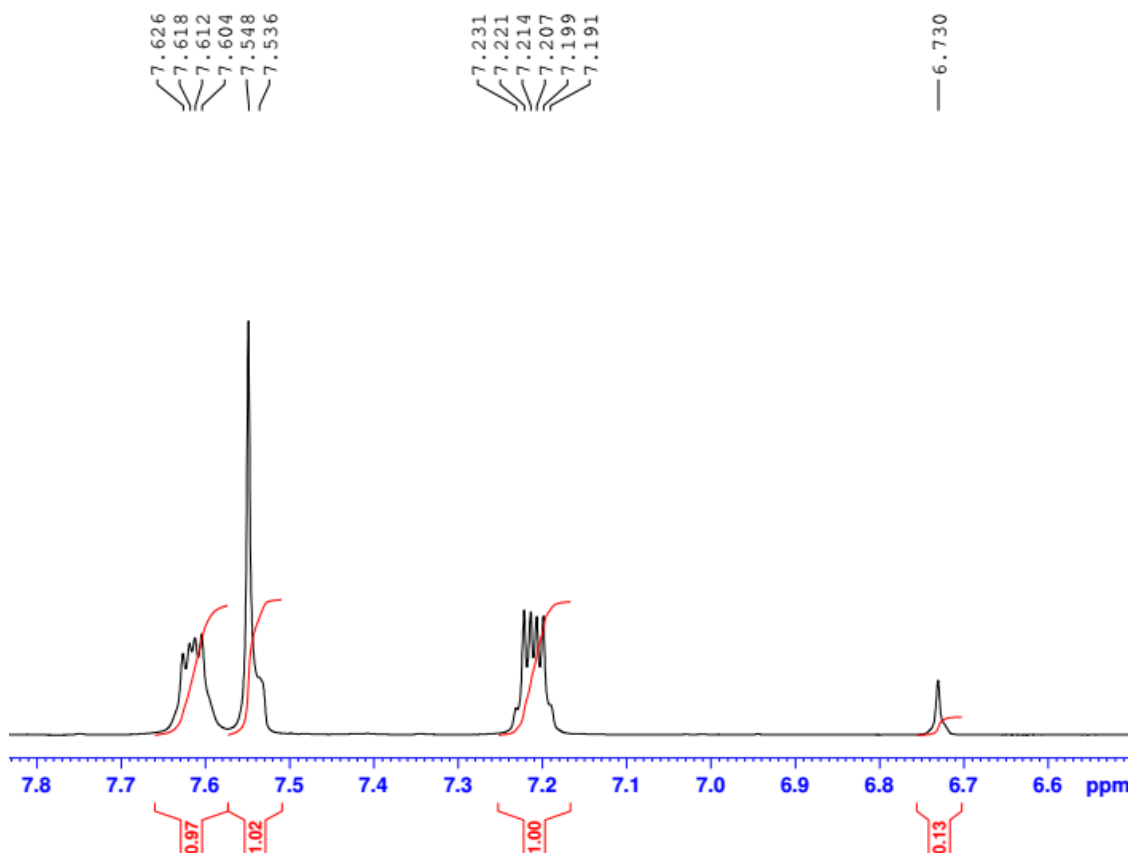
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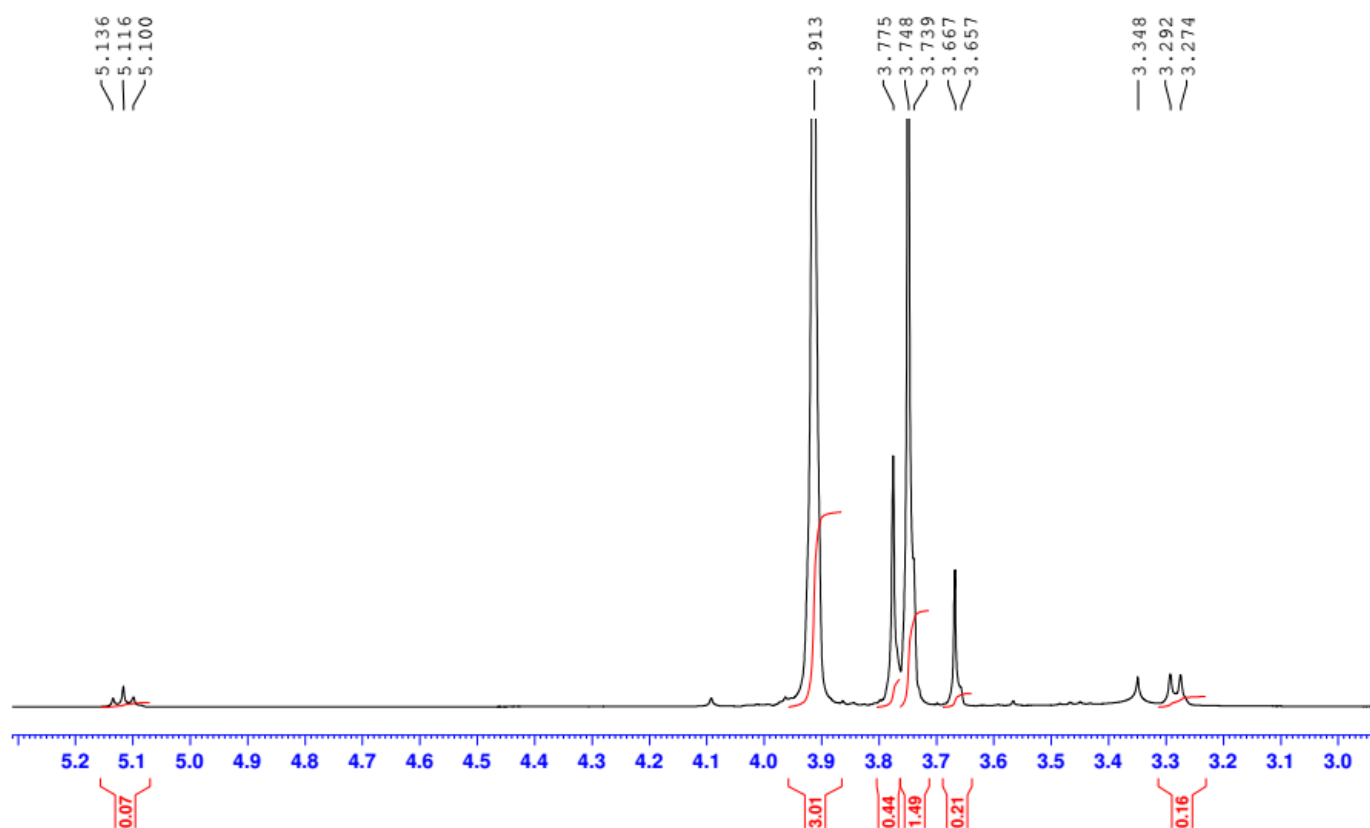
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SOLVENT DMSO
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DE 12.86 usec
TE 296.2 K
D1 1.00000000 sec
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SFO1 400.1324708 MHz
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P0 4.67 usec
P1 14.00 usec
PLW1 17.11499977 W

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PC 1.00



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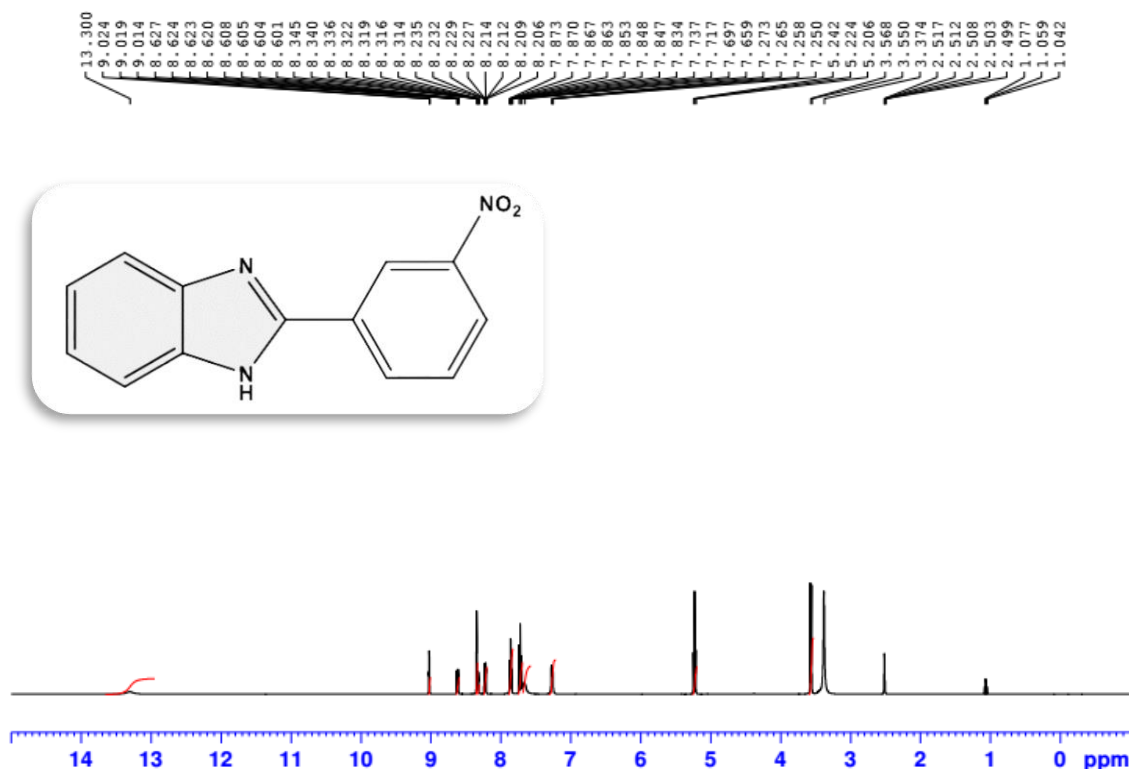
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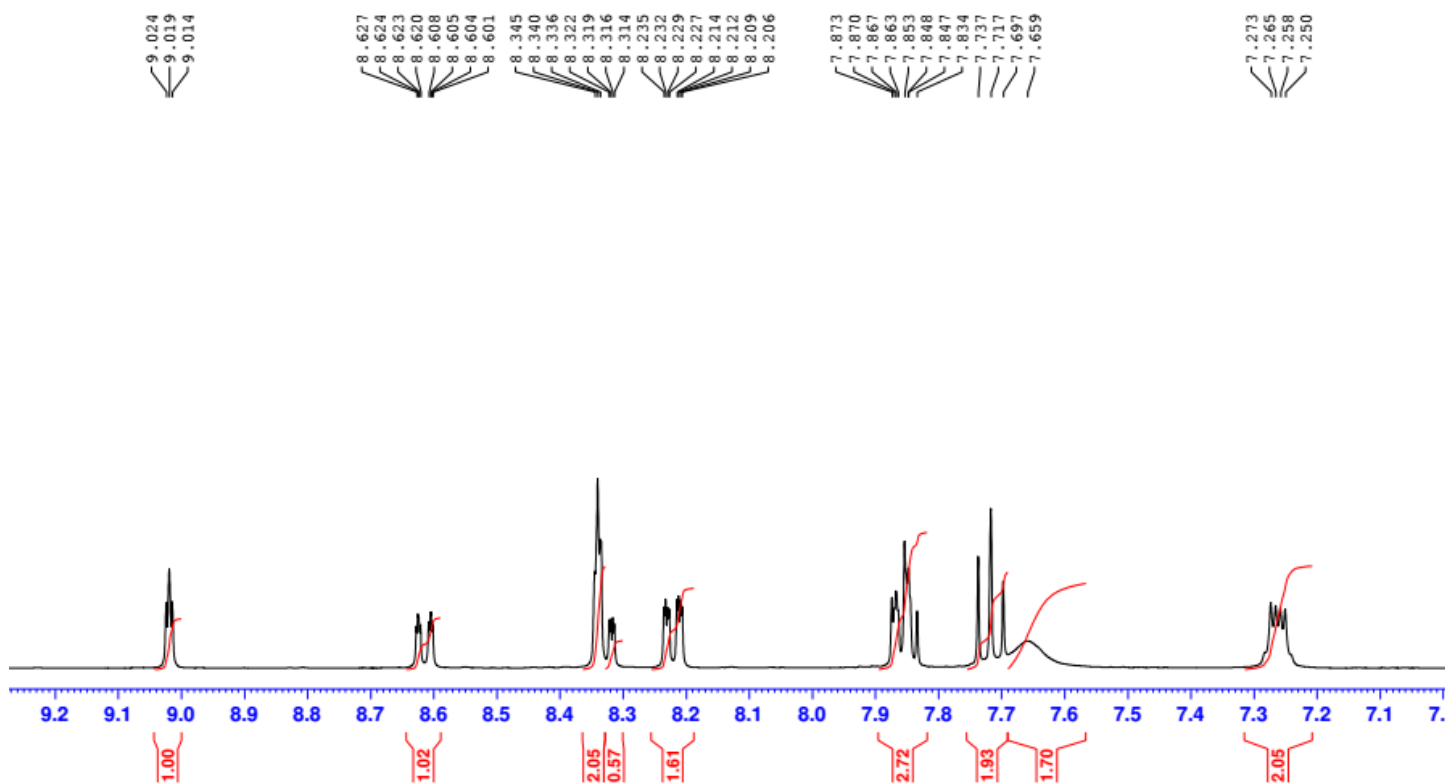
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 RG 101
 DW 61.000 usec
 DE 12.86 usec
 TE 295.9 K
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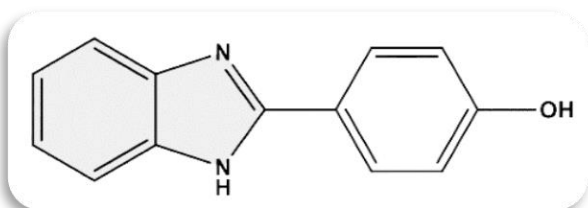
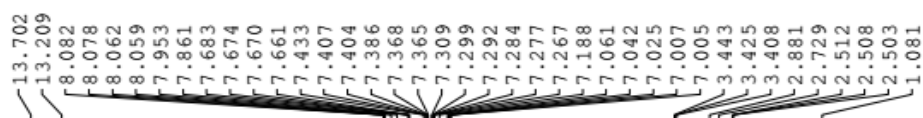
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1H SPECTRUM DR.SALEH P2 IN DMSO



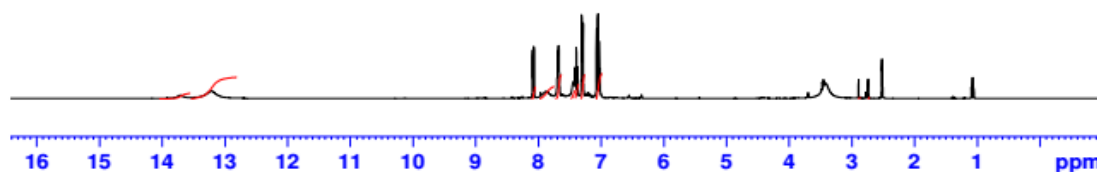
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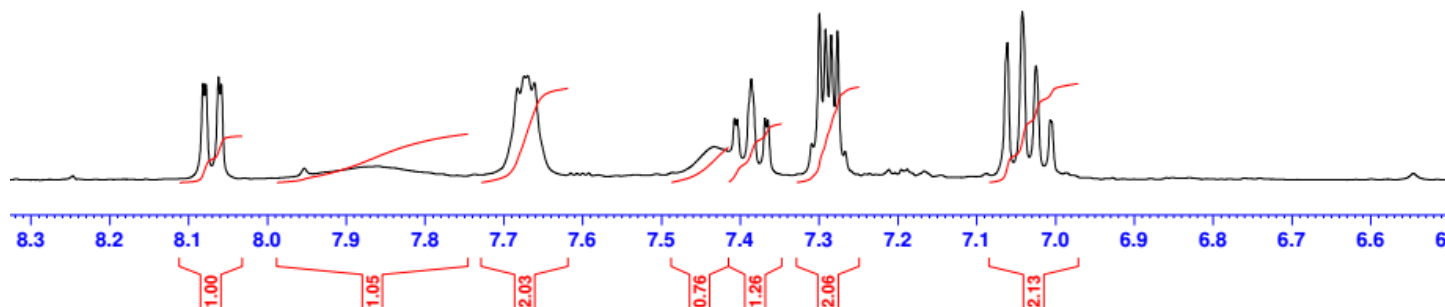
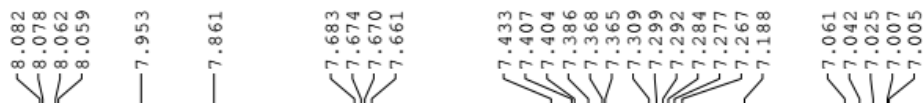
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AQ 3.9976959 sec
RG 101
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DE 12.86 usec
TE 295.7 K
D1 1.00000000 sec
TD0 1
SFO1 400.1324708 MHz
NUC1 1H
PO 4.67 usec
P1 14.00 usec
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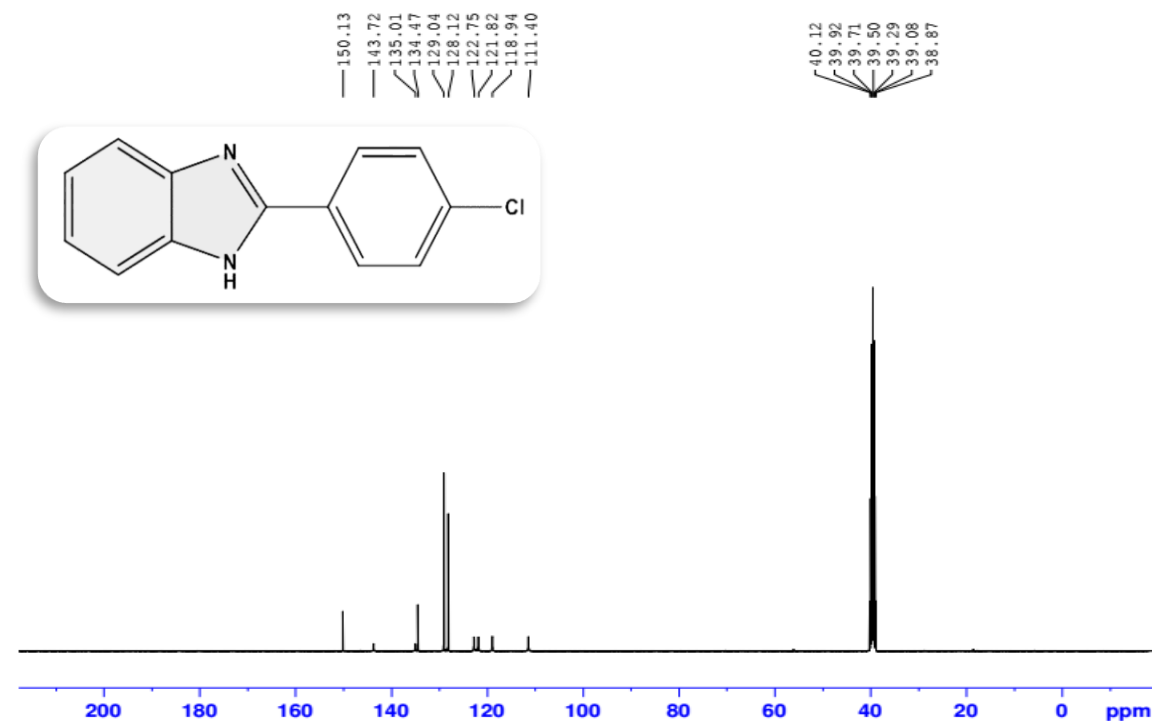


1H SPECTRUM DR.SALEH P7 N DMSO

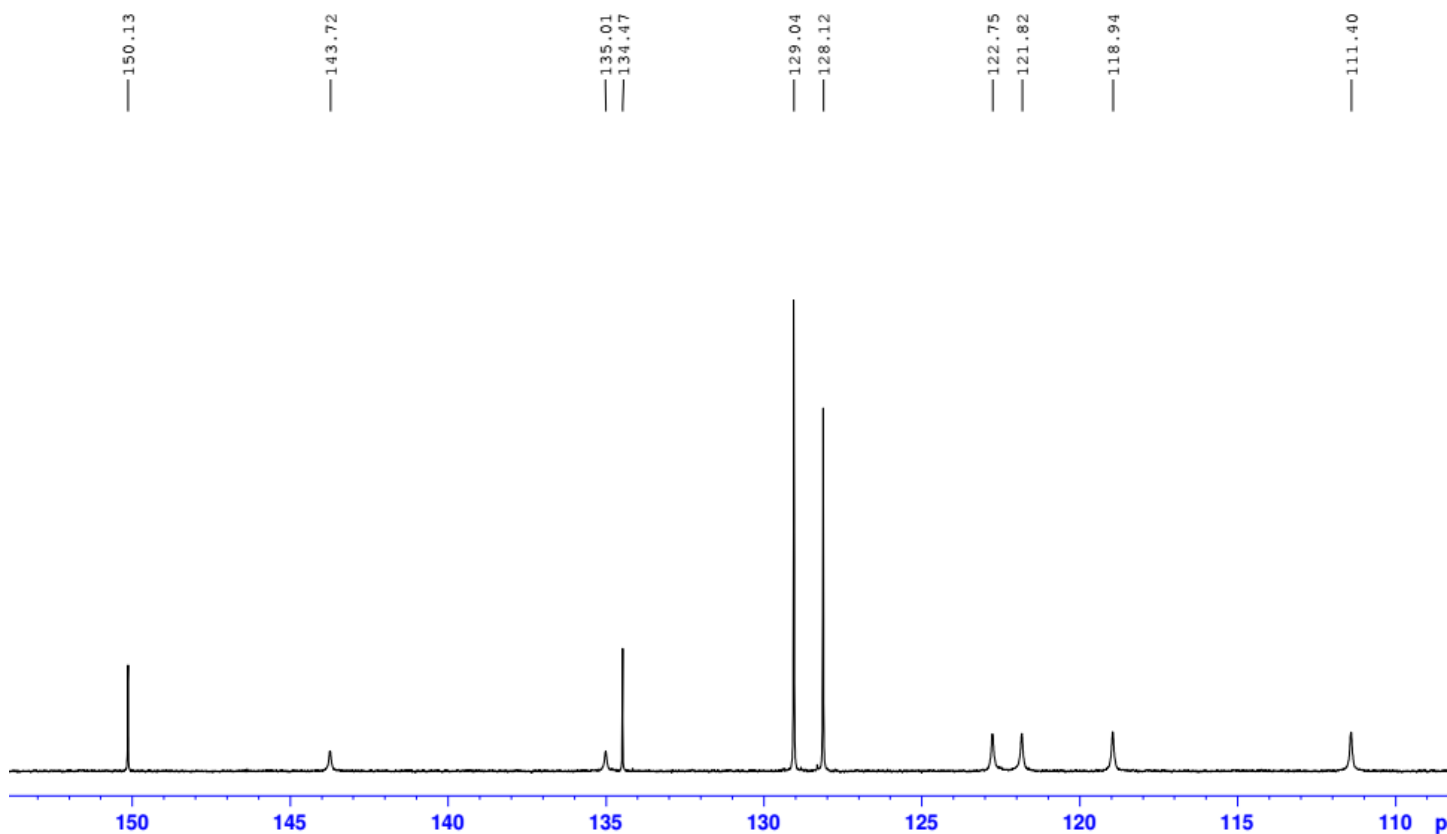


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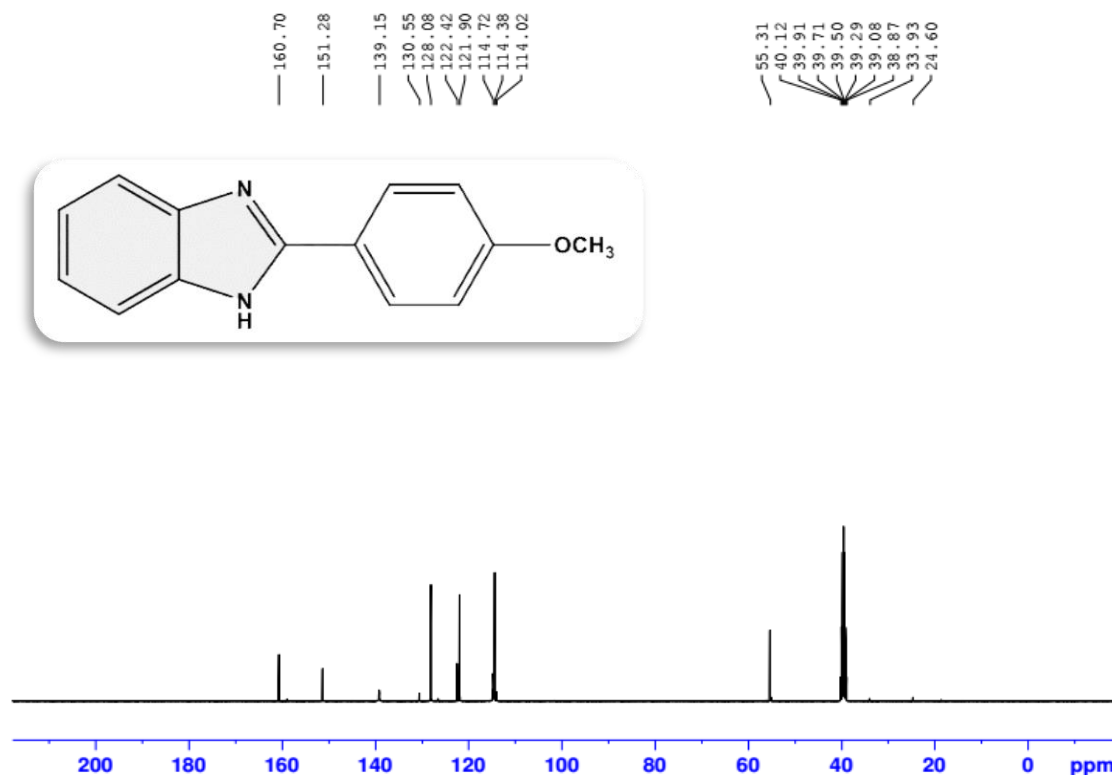
13C DECOUPLED SPECTRUM DR.SALEH P4 N DMSO



13C DECOUPLED SPECTRUM DR.SALEH P4 N DMSO



13C DECOUPLED SPECTRUM DR.SALEH P6 IN DMSO

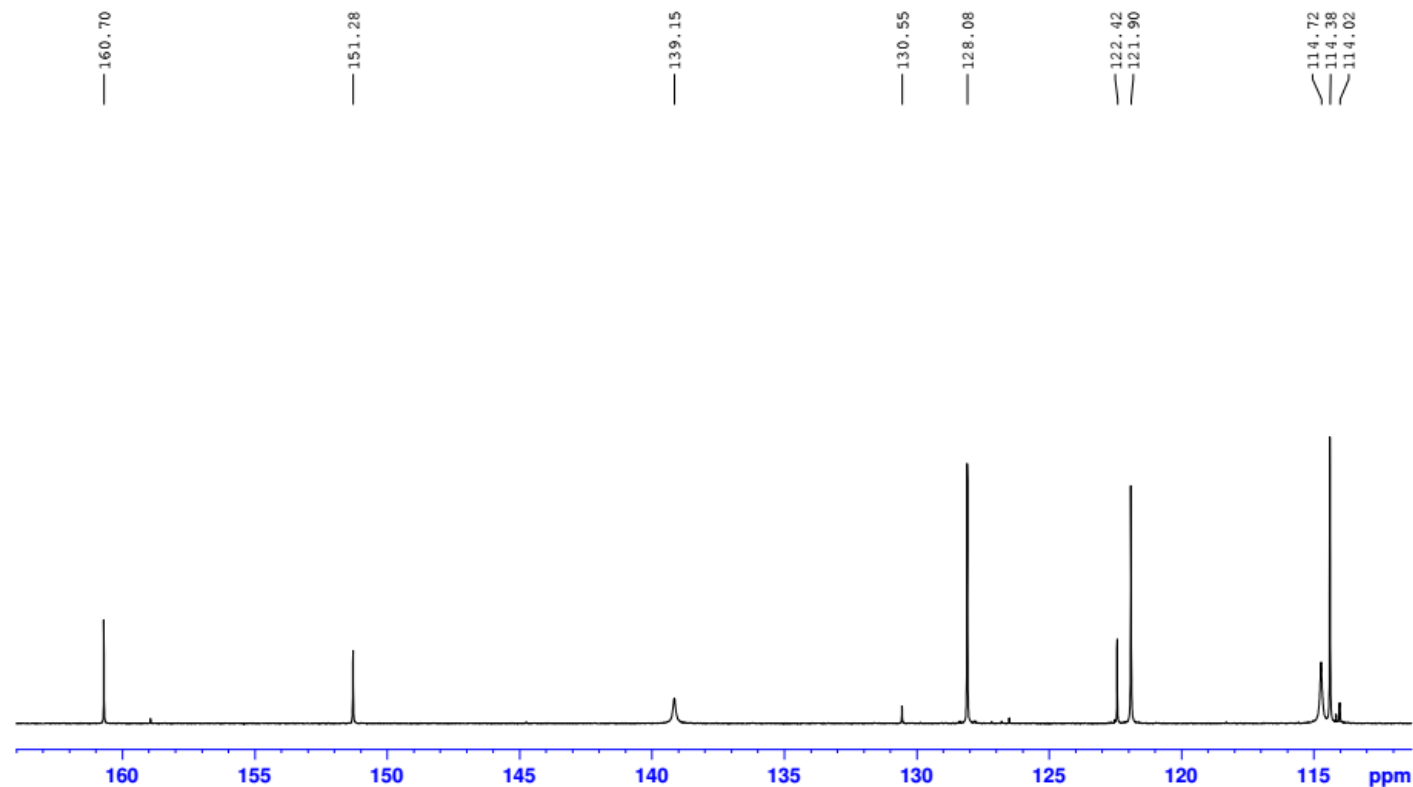


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 NS 5120
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 FIDRES 0.726609 Hz
 AQ 1.3762560 sec
 RG 36
 DW 21.000 usec
 DE 6.50 usec
 TE 297.9 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1
 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 P1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
 NUC2 1H
 CPDPRG[2] waltz65
 PCPD2 90.00 usec
 PLW2 17.11499977 W
 PLW12 0.41413999 W
 PLW13 0.20830999 W

F2 - Processing parameters
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 LB 1.00 Hz
 GB 0
 PC 1.40

13C DECOUPLED SPECTRUM DR.SALEH P6 IN DMSO



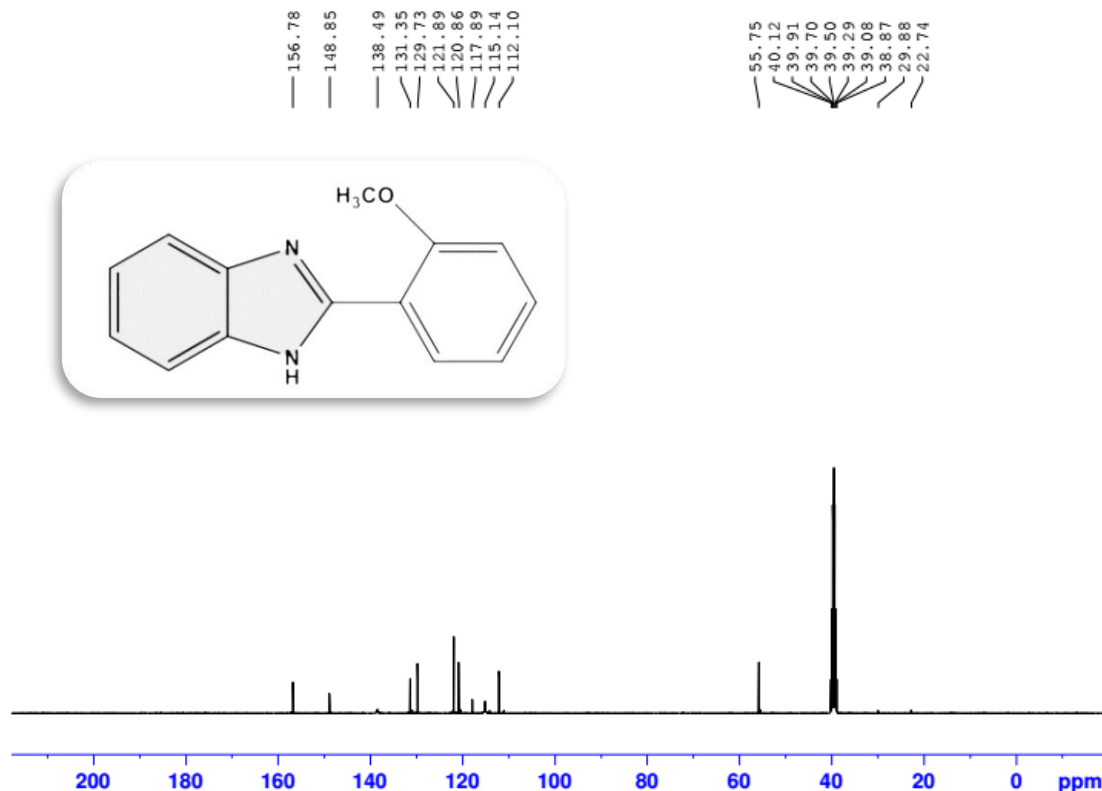
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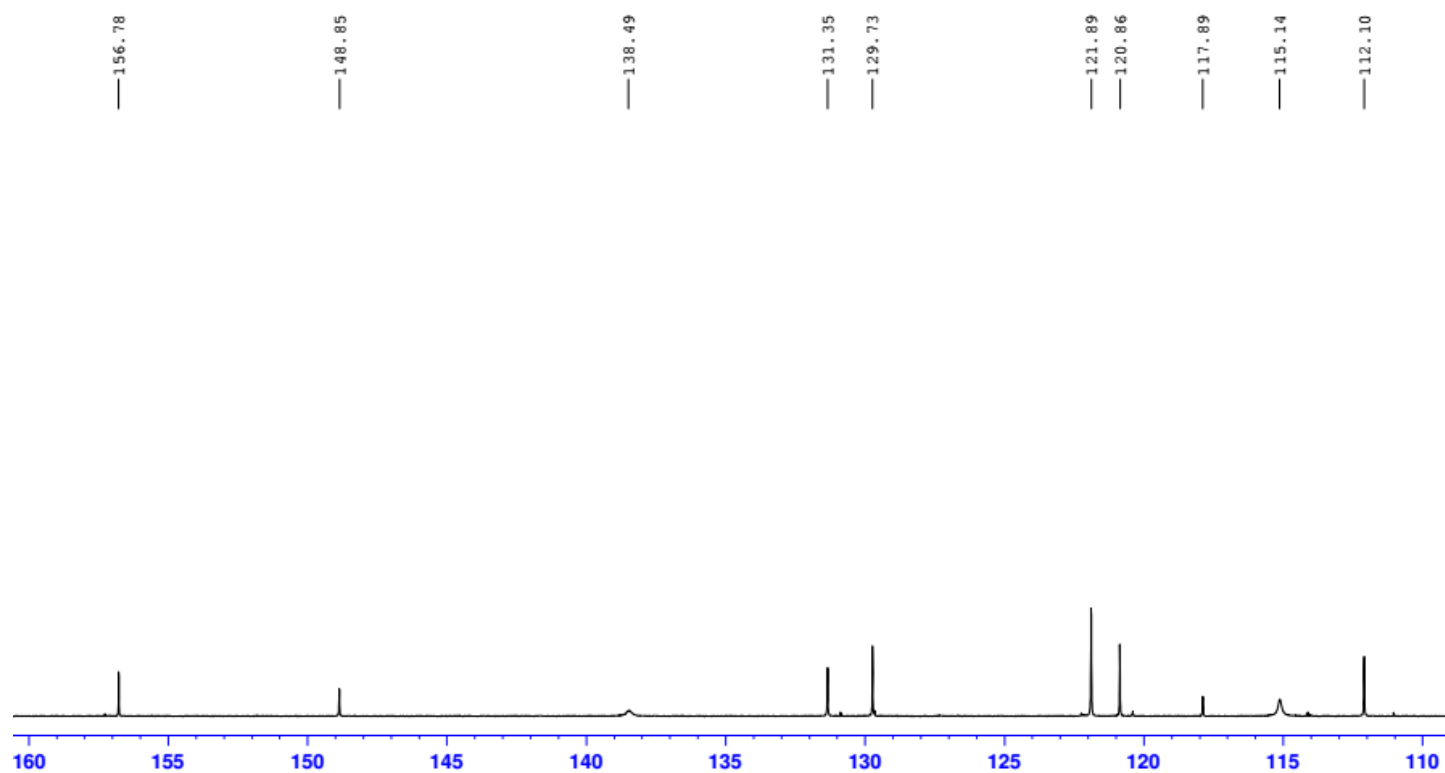
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 FIDRES 0.726609 Hz
 AQ 1.3762560 sec
 RG 36
 DW 21.000 usec
 DE 6.50 usec
 TE 297.9 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1
 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 P1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
 NUC2 1H
 CPDPRG2 waltz65
 PCPD2 90.00 usec
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 PLW12 0.41413999 W
 PLW13 0.20830999 W

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13C DECOUPLED SPECTRUM DR.SALEH P10 N DMSO



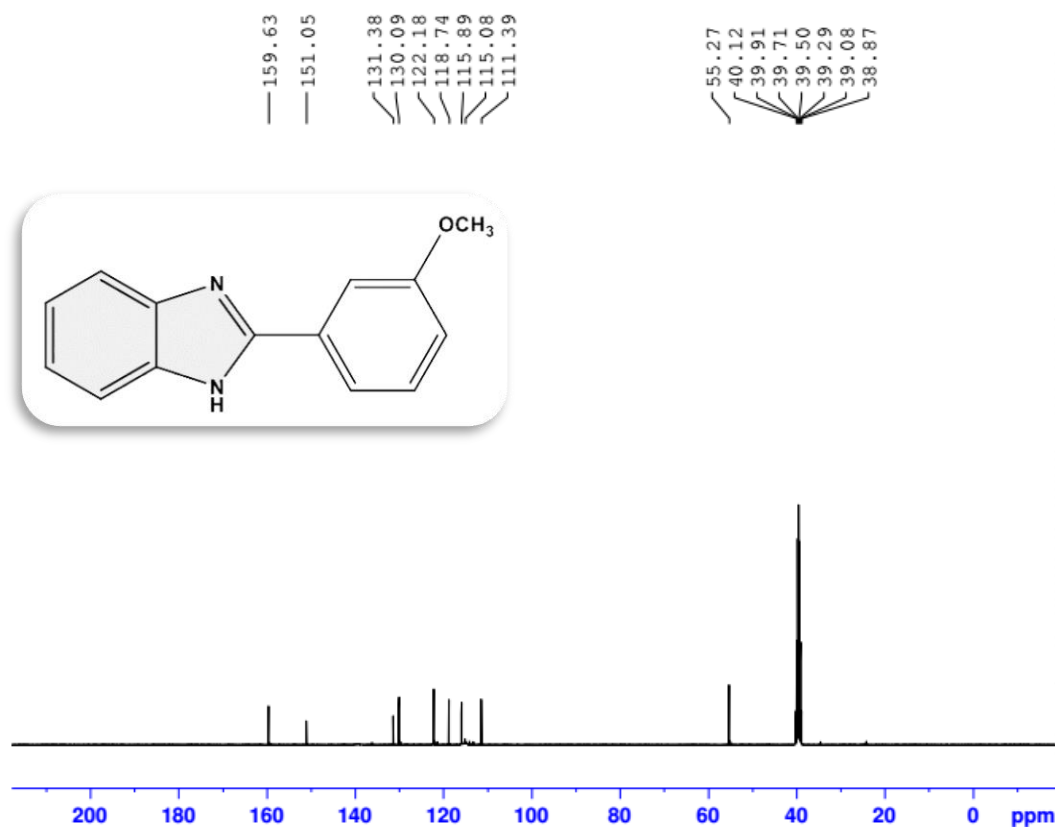
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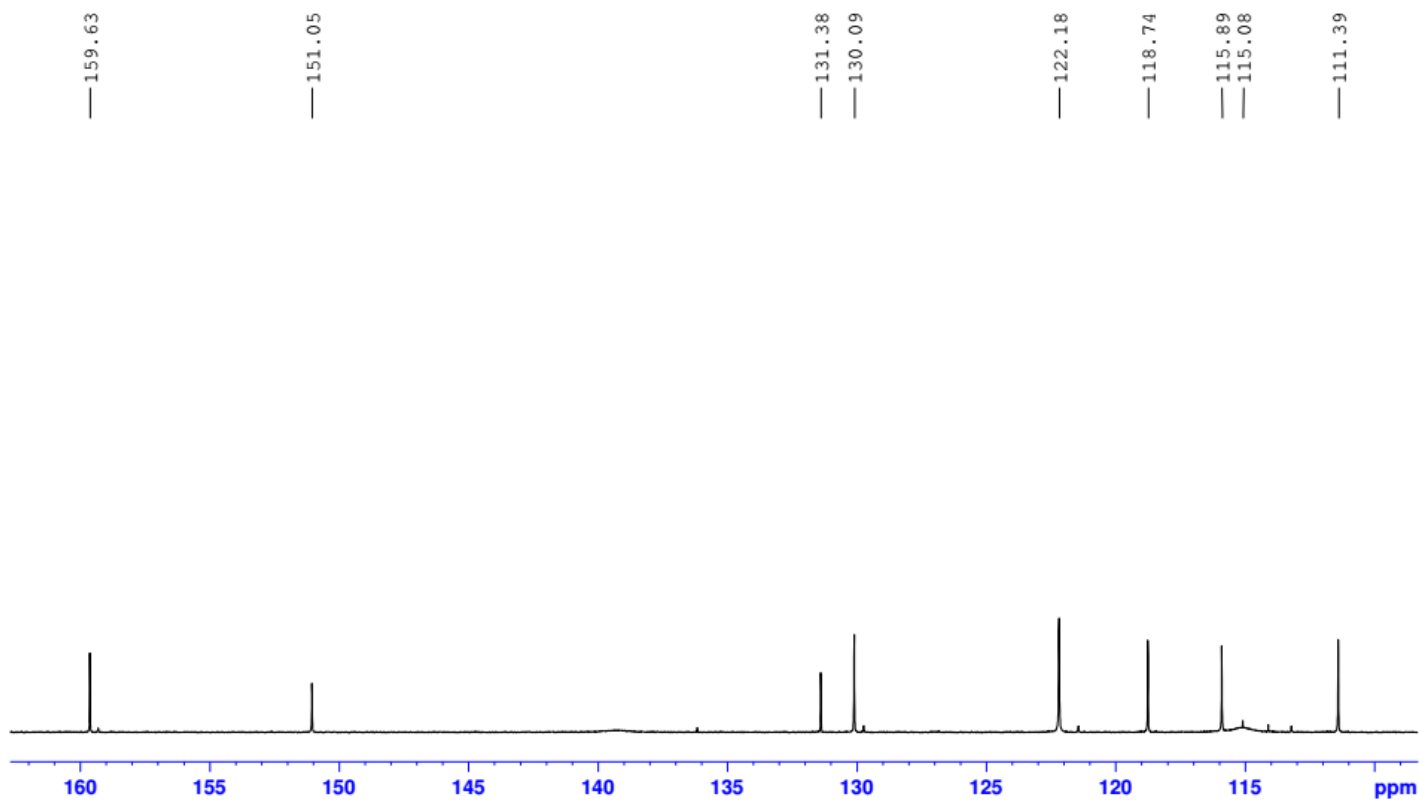
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 TE 297.5 K
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 NUC2 1H
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13C DECOUPLED SPECTRUM DR.SALEH P12 N DMSO

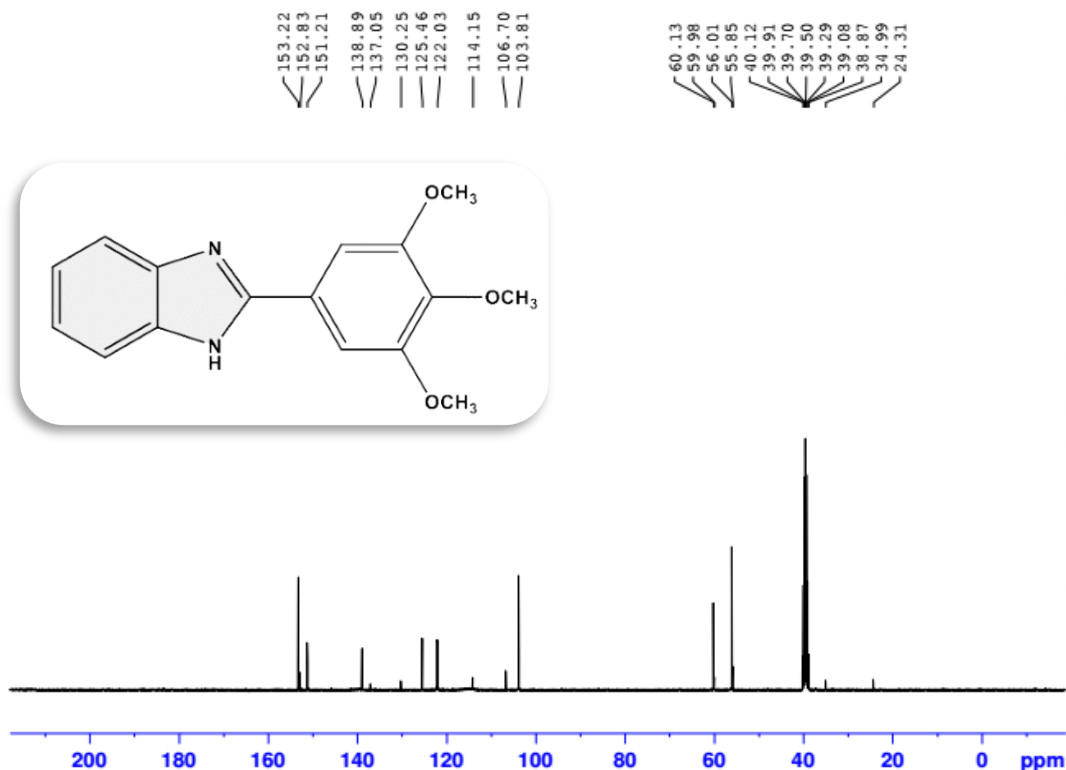
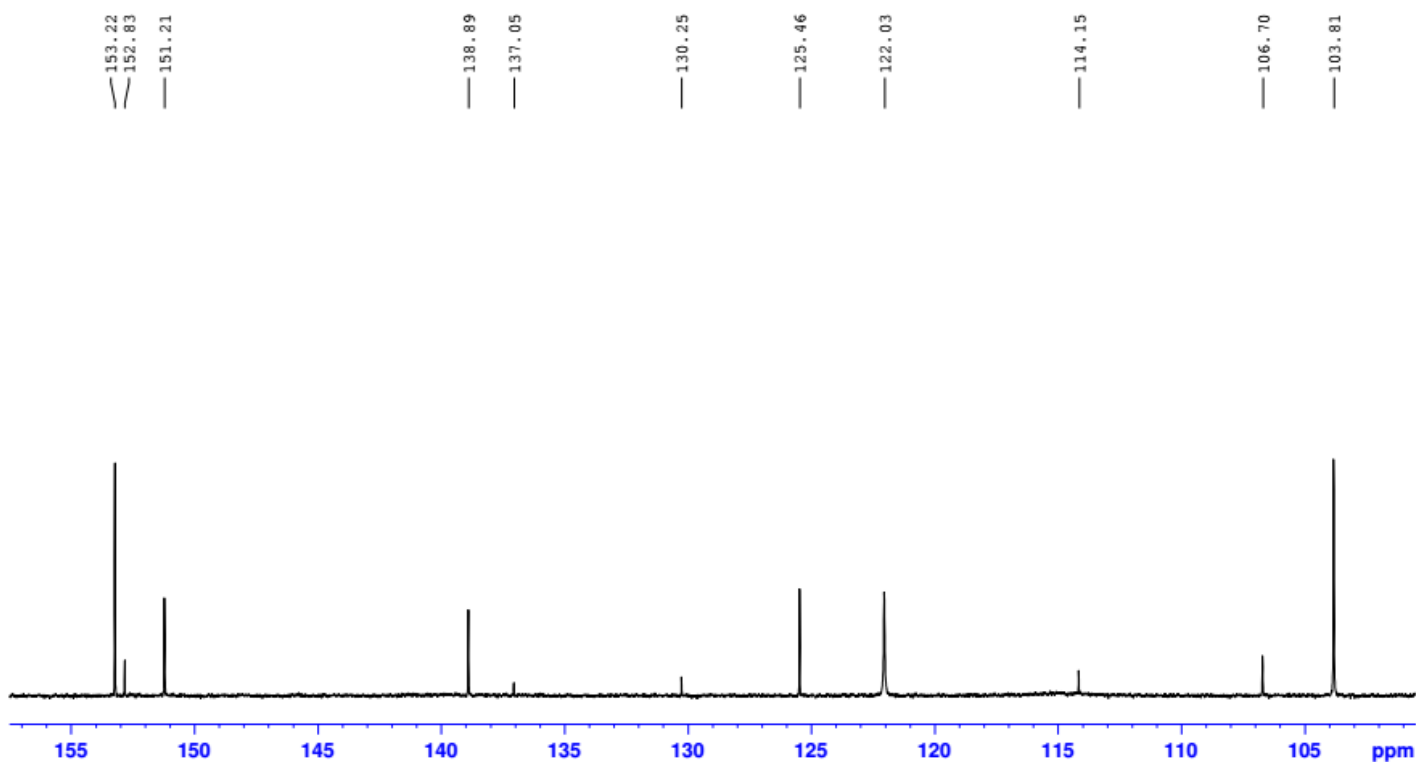


¹H SPECTRUM DR.SALEH P13 IN DMSO

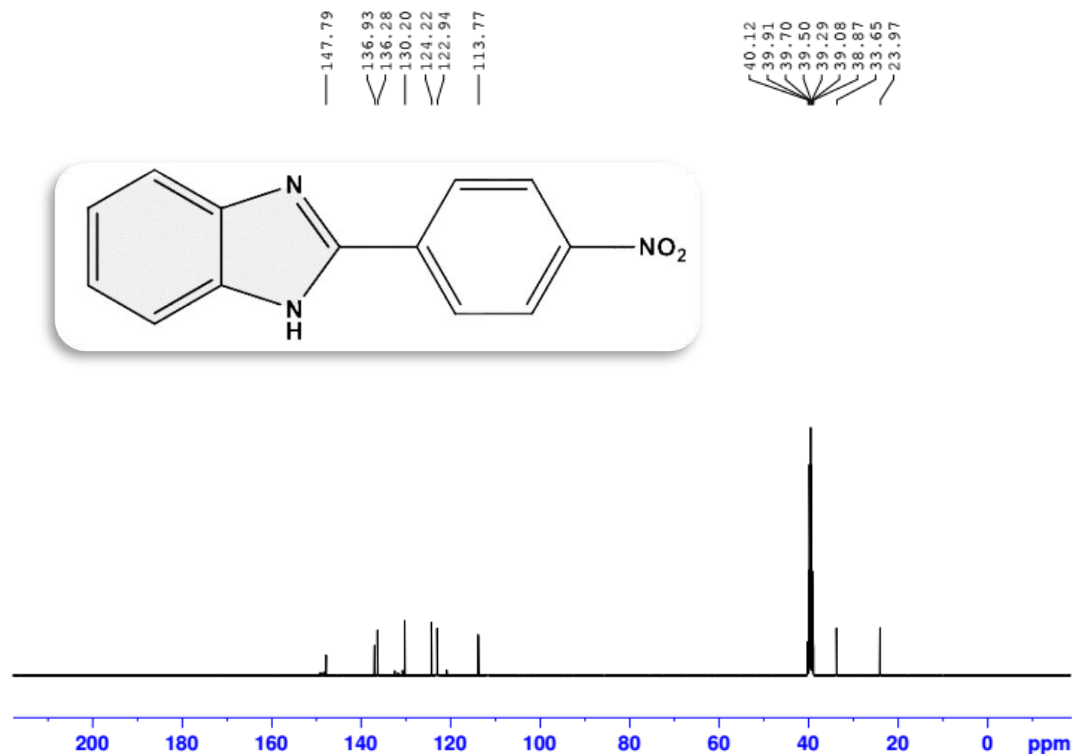
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 DE 6.50 usec
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 D11 0.03000000 sec
 TD0 1
 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 F1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
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 PLW13 0.20830999 W

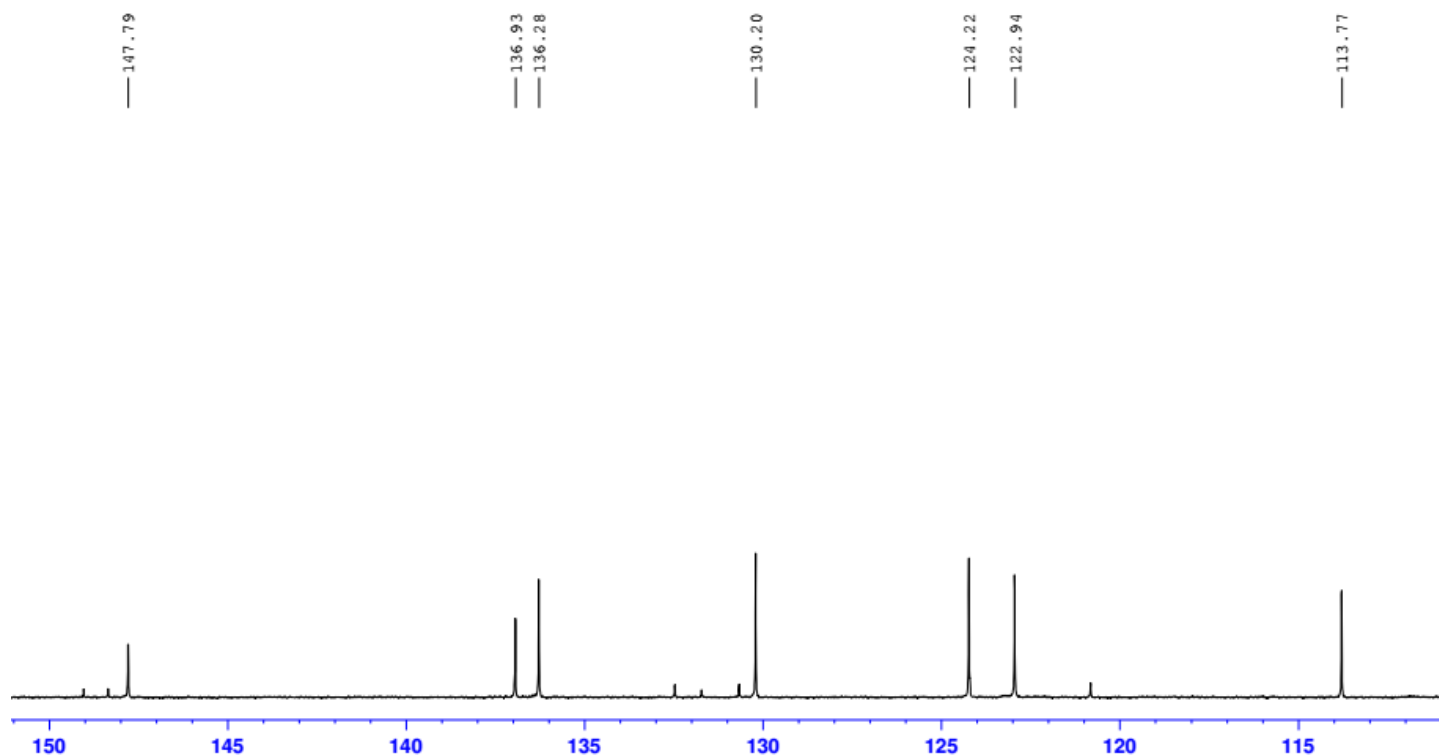
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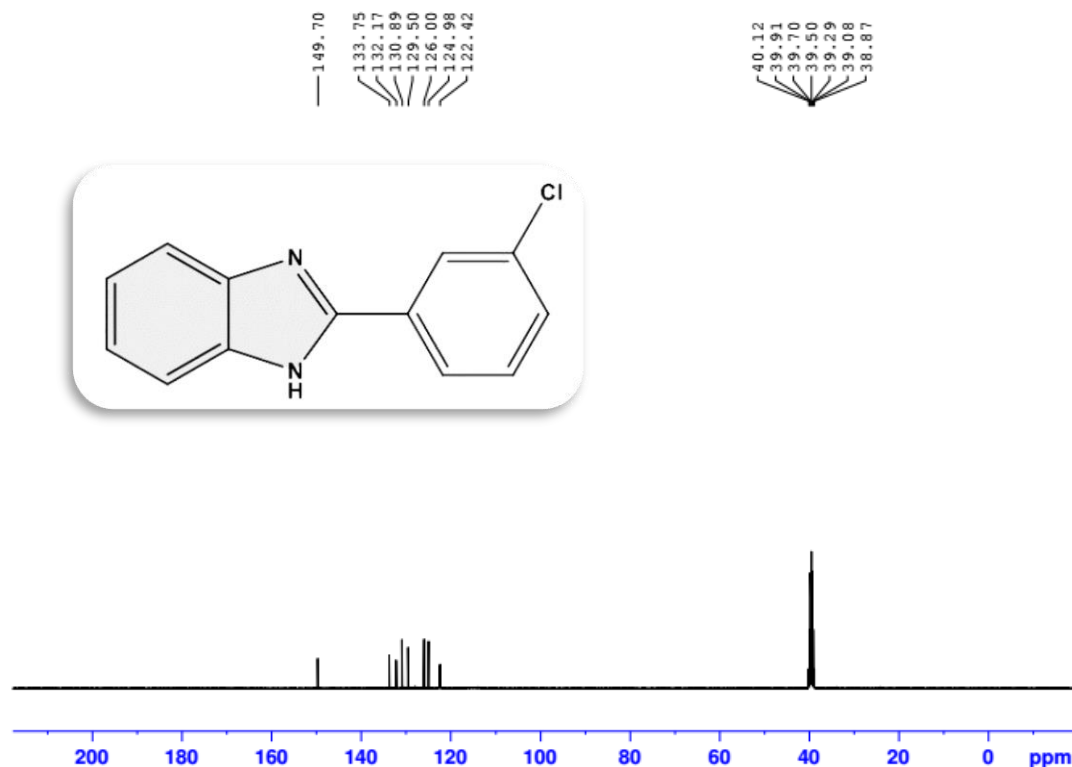
¹H SPECTRUM DR.SALEH P13 IN DMSO

13C DECOUPLED SPECTRUM DR.SALEH P14 IN DMSO



13C DECOUPLED SPECTRUM DR.SALEH P14 IN DMSO

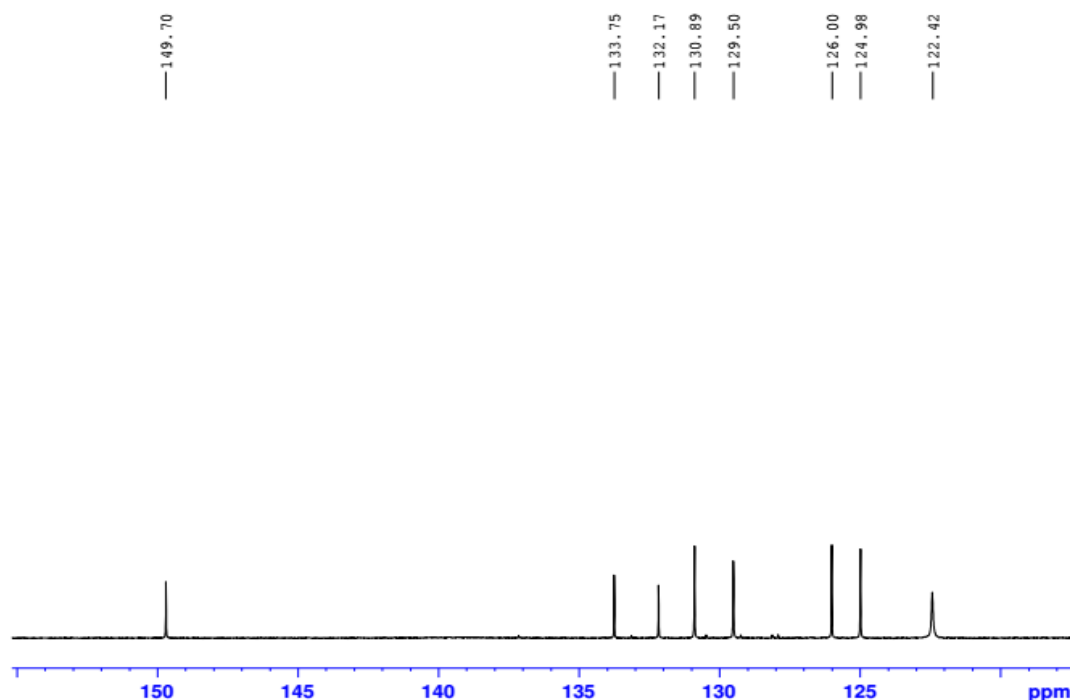


¹³C DECOUPLED SPECTRUM DR.SALEH P16 IN DMSO

Current Data Parameters
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 TD 65536
 SOLVENT DMSO
 NS 1453
 DS 4
 SWH 23809.523 Hz
 FIDRES 0.726609 Hz
 AQ 1.3762560 sec
 RG 36
 DW 21.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1
 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 P1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
 NUC2 1H
 CPDPRG[2] waltz65
 PCPD2 90.00 usec
 PLW2 17.11499977 W
 PLW12 0.41413999 W
 PLW13 0.20830999 W

F2 - Processing parameters
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 SF 100.6128188 MHz
 WDW EM
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 LB 1.00 Hz
 GB 0
 PC 1.40

¹³C DECOUPLED SPECTRUM DR.SALEH P16 IN DMSO

Current Data Parameters
 NAME P16
 EXPNO 11
 PROCNO 1

F2 - Acquisition Parameters
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 PROBHD Z108618_0912 ()
 PULPROG zgpg30
 TD 65536
 SOLVENT DMSO
 NS 1453
 DS 4
 SWH 23809.523 Hz
 FIDRES 0.726609 Hz
 AQ 1.3762560 sec
 RG 36
 DW 21.000 usec
 DE 6.50 usec
 TE 297.5 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1
 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 P1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
 NUC2 1H
 CPDPRG[2] waltz65
 PCPD2 90.00 usec
 PLW2 17.11499977 W
 PLW12 0.41413999 W
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 LB 1.00 Hz
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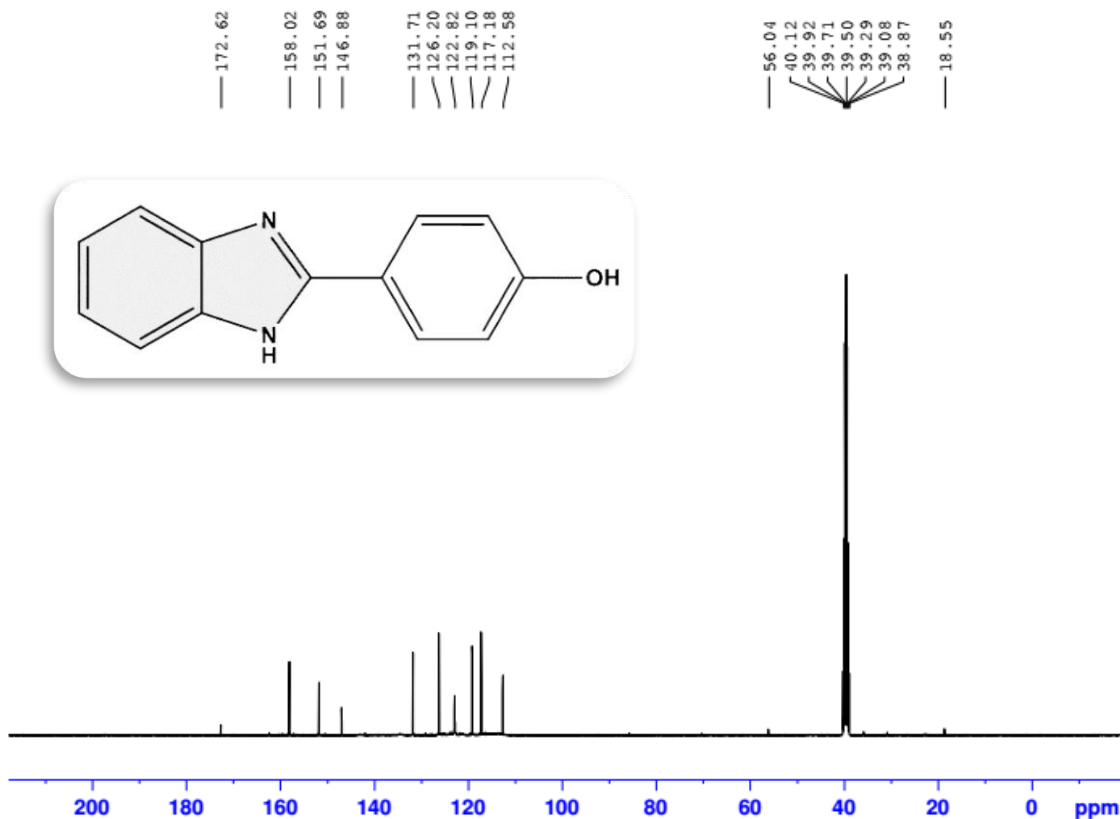
13C DECOUPLED SPECTRUM DR.SALEH P7 N DMSO



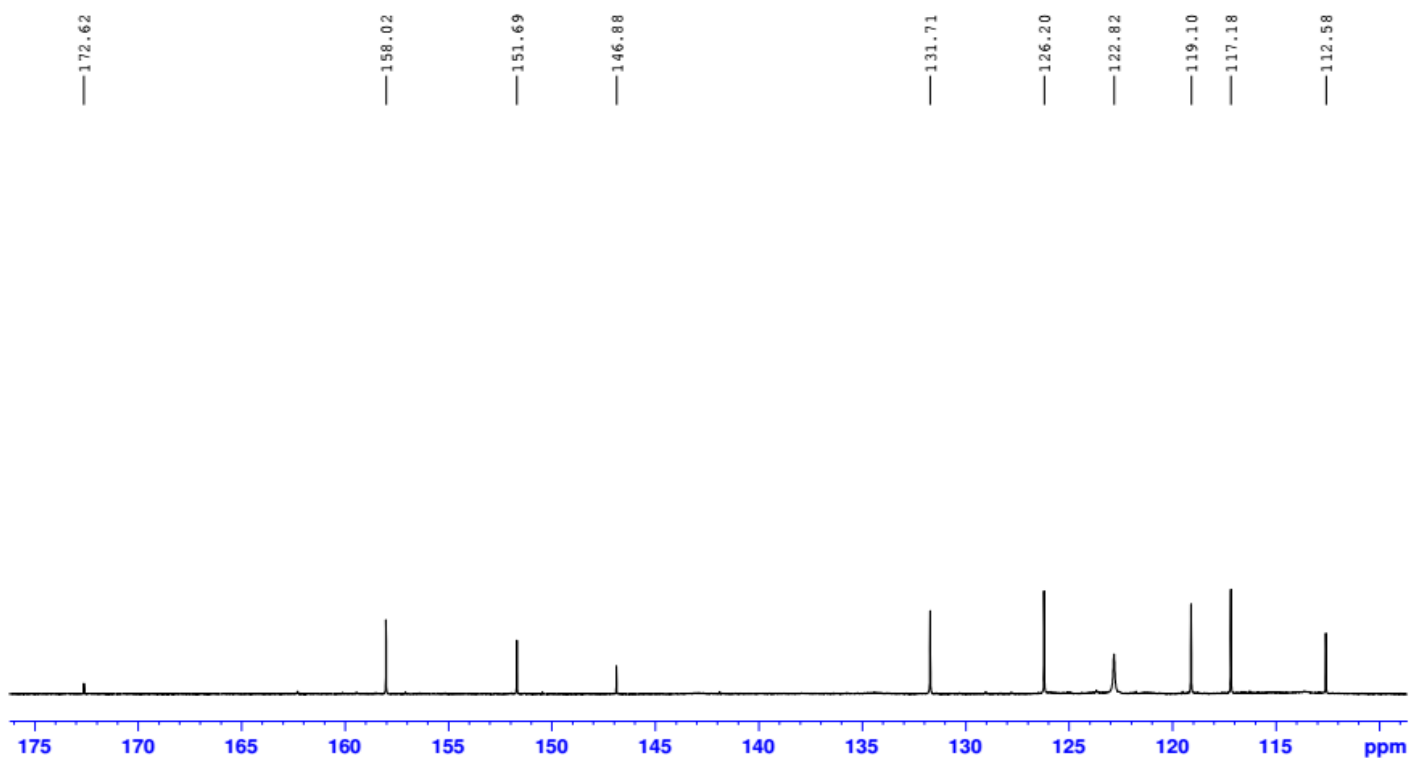
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 FIDRES 0.726609 Hz
 AQ 1.3762560 sec
 RG 32
 DW 21.000 usec
 DE 6.50 usec
 TE 298.0 K
 D1 2.00000000 sec
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 SFO1 100.6228298 MHz
 NUC1 13C
 P0 3.33 usec
 P1 10.00 usec
 PLW1 56.20800018 W
 SFO2 400.1316005 MHz
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 PLW12 0.41413999 W
 PLW13 0.20830999 W

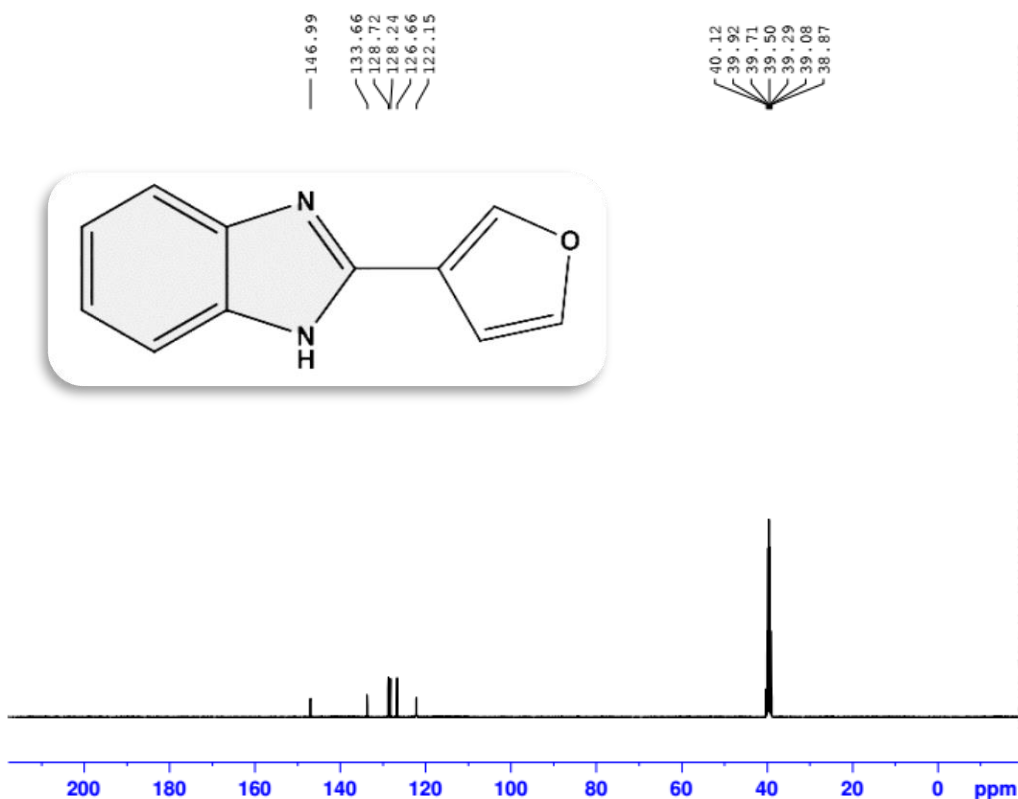
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 PC 1.40



13C DECOUPLED SPECTRUM DR.SALEH P7 N DMSO



13C DECOUPLED SPECTRUM SPECTRUM DR.SALEH P15 IN DMSO

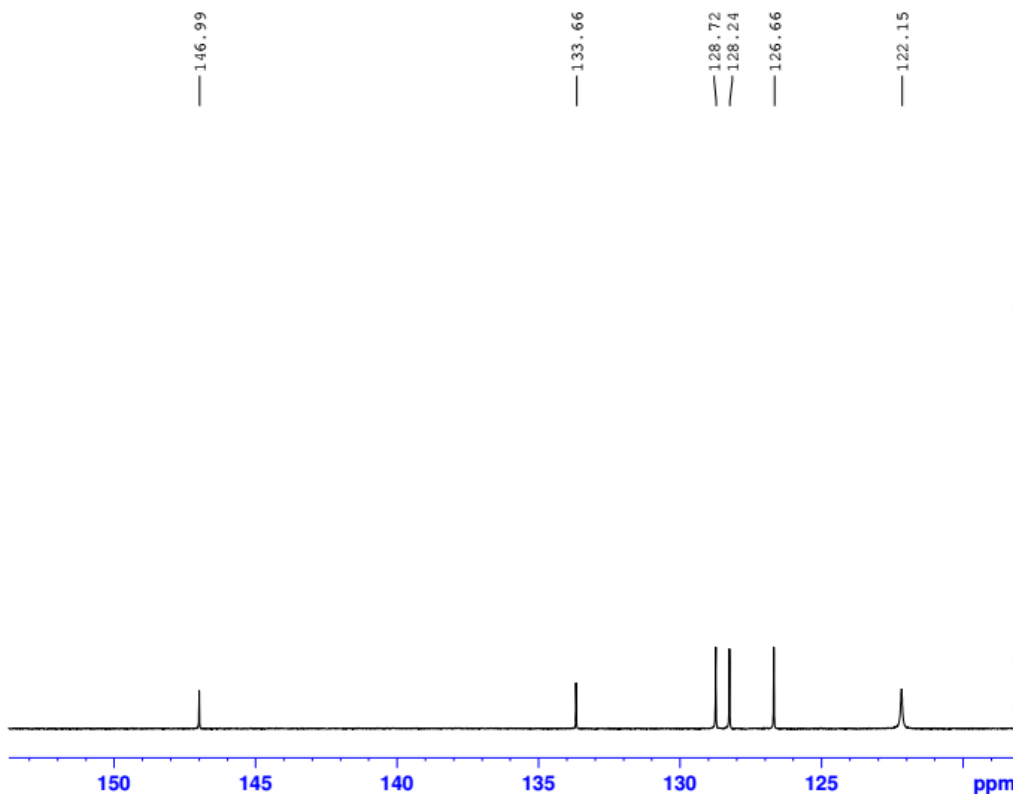


Current Data Parameters
NAME P15
EXPNO 11
PROCNO 1

F2 - Acquisition Parameters
Date_ 20221102
Time 7.32 h
INSTRUM Avance AV Neo 400
PROBHD Z108618_0912 ()
PULPROG zgpg30
TD 65536
SOLVENT DMSO
NS 4096
DS 4
SWH 23809.523 Hz
FIDRES 0.726609 Hz
AQ 1.3762560 sec
RG 32
DW 21.000 usec
DE 6.50 usec
TE 298.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
SFO1 100.6228298 MHz
NUC1 13C
P0 3.33 usec
P1 10.00 usec
PLW1 56.20800018 W
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG2 waltz65
PCPD2 90.00 usec
PLW2 17.11499977 W
PLW12 0.41413999 W
PLW13 0.20830999 W

F2 - Processing parameters
SI 32768
SF 100.6128192 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

13C DECOUPLED SPECTRUM SPECTRUM DR.SALEH P15 IN DMSO



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EXPNO 11
PROCNO 1

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GB 0
PC 1.40

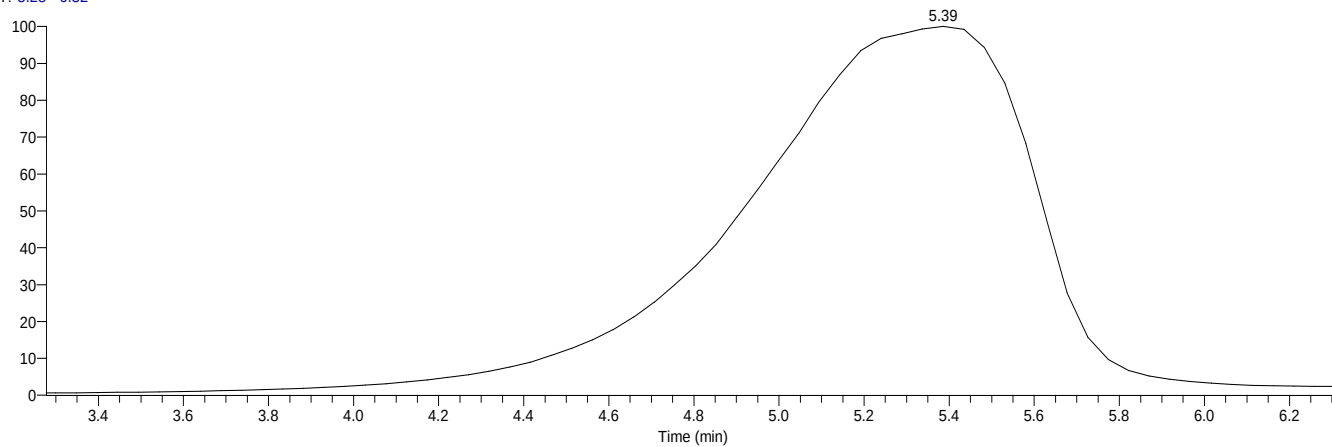
3. Mass SPECTRA

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10/20/2022 1:45:13 PM

GC MS DFS- Thermo
Project No: GS01/03

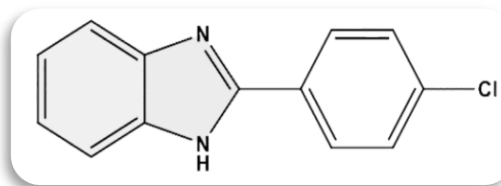
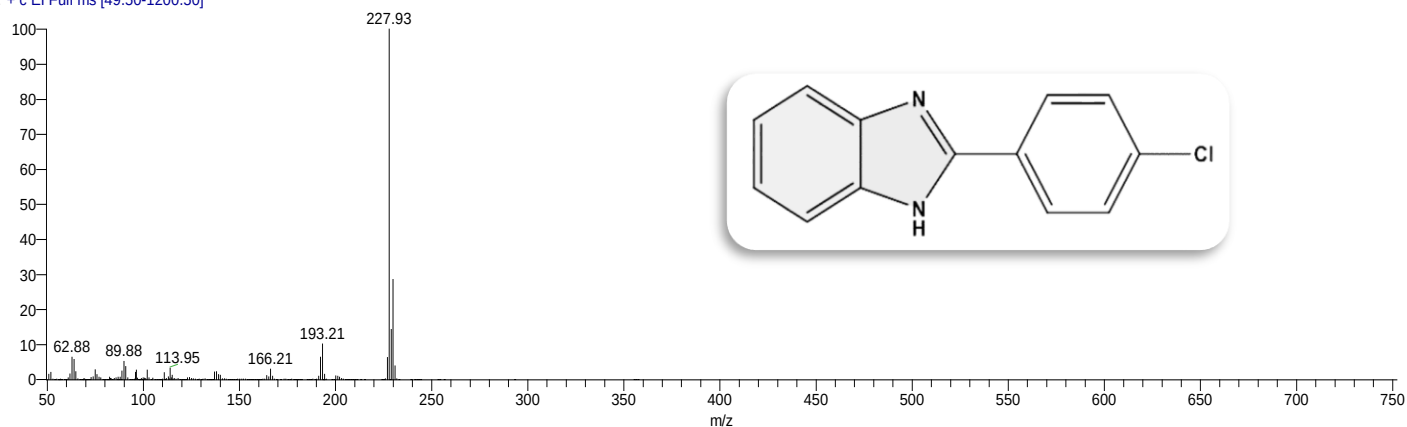
P4

RT: 3.28 - 6.32



NL:
1.26E8
TIC MS P4

P4 #110 RT: 5.29 AV: 1 NL: 4.74E7
T: + c EI Full ms [49.50-1200.50]

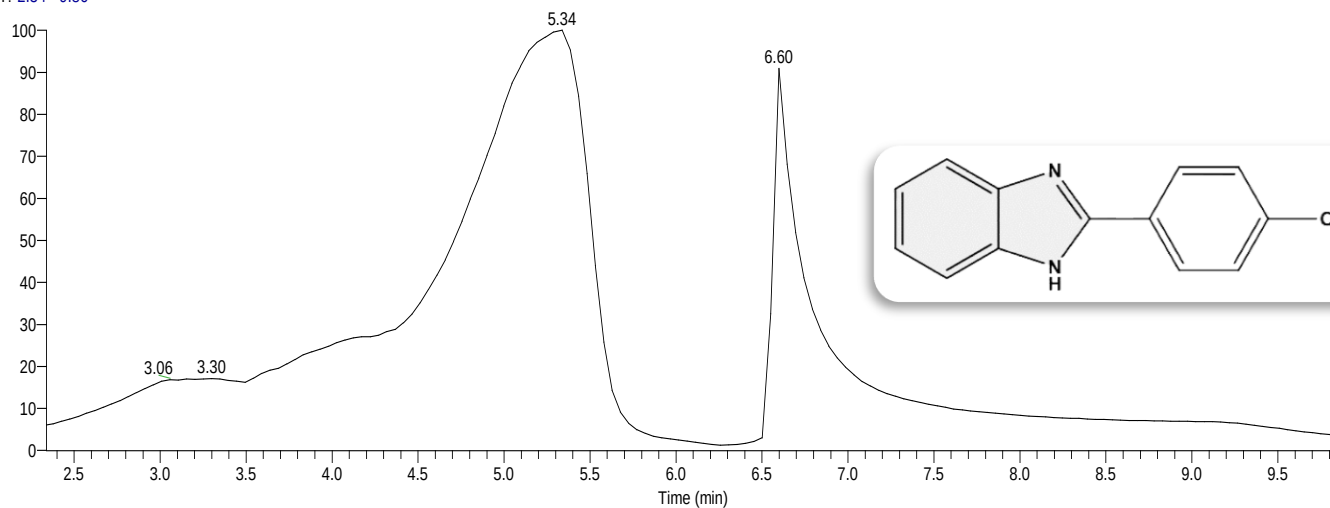


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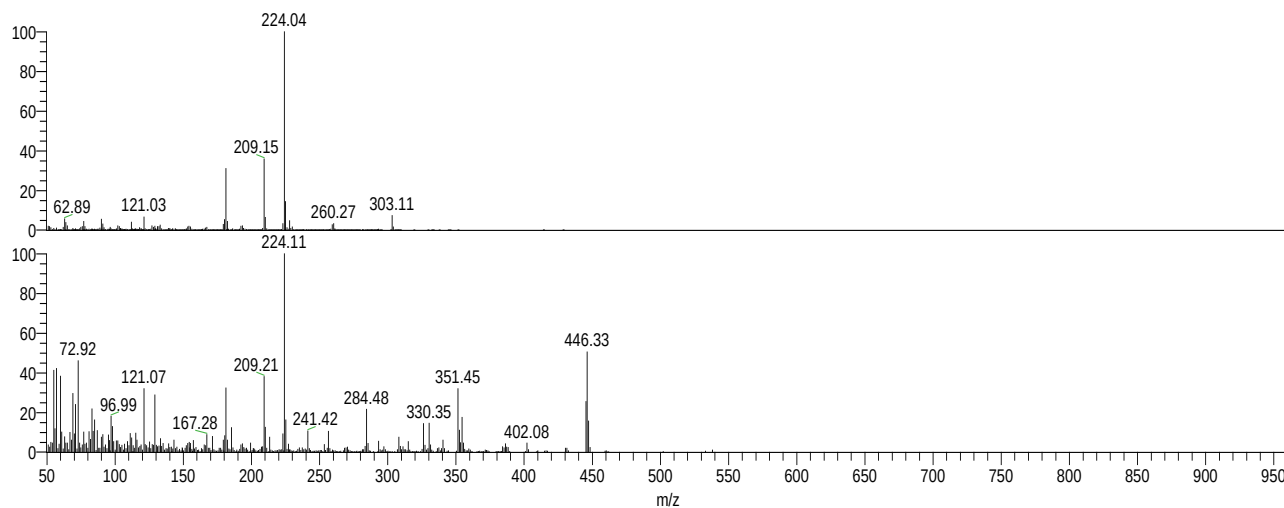
GC MS DFS- Thermo
Project No: GS01/03

P6

RT: 2.34 - 9.86



NL:
1.21E8
TIC MS P6



NL:
2.98E7
P6#105 RT:
5.05 AV: 1 T: +
c EI Full ms
[49.50-1200.50]

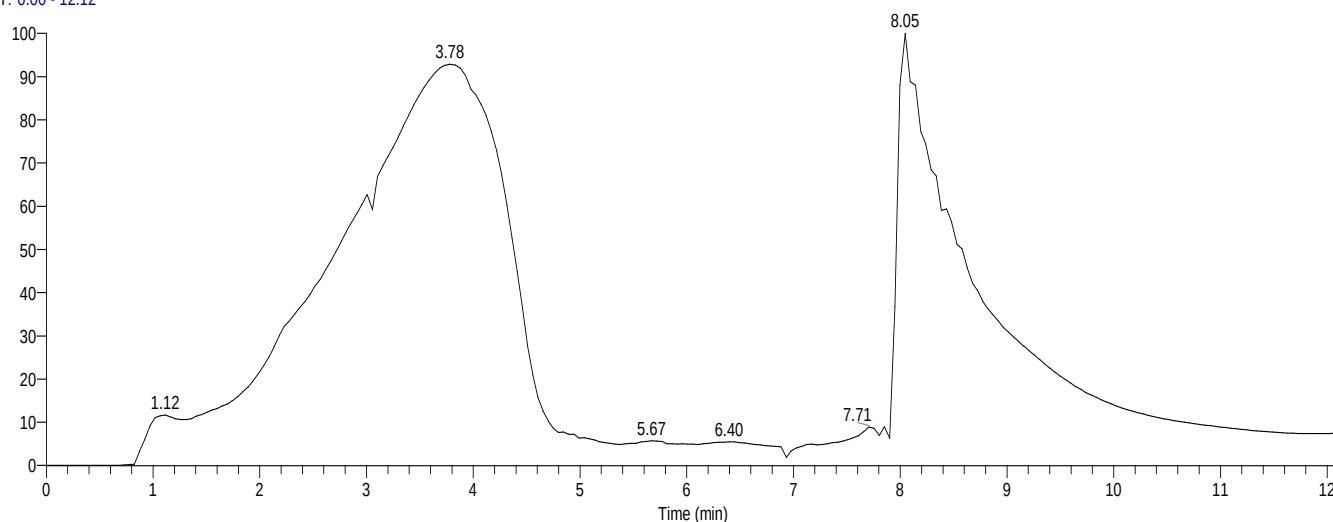
NL:
6.19E5
P6#171 RT:
8.25 AV: 1 T: +
c EI Full ms
[49.50-1200.50]

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10/23/2022 12:47:11 PM

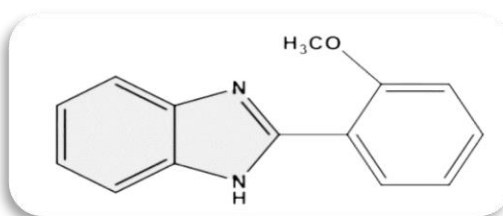
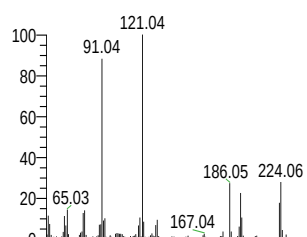
GC MS DFS- Thermo
Project No: GS01/03

P10

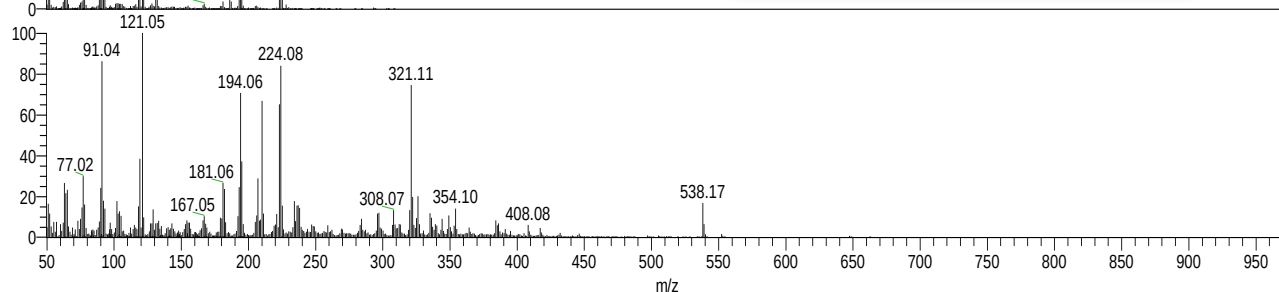
RT: 0.00 - 12.12



NL:
7.86E7
TIC MS
P10



NL:
1.27E7
P10#79 RT: 3.78
AV: 1 T: + c EI
Full ms
[49.50-1200.50]



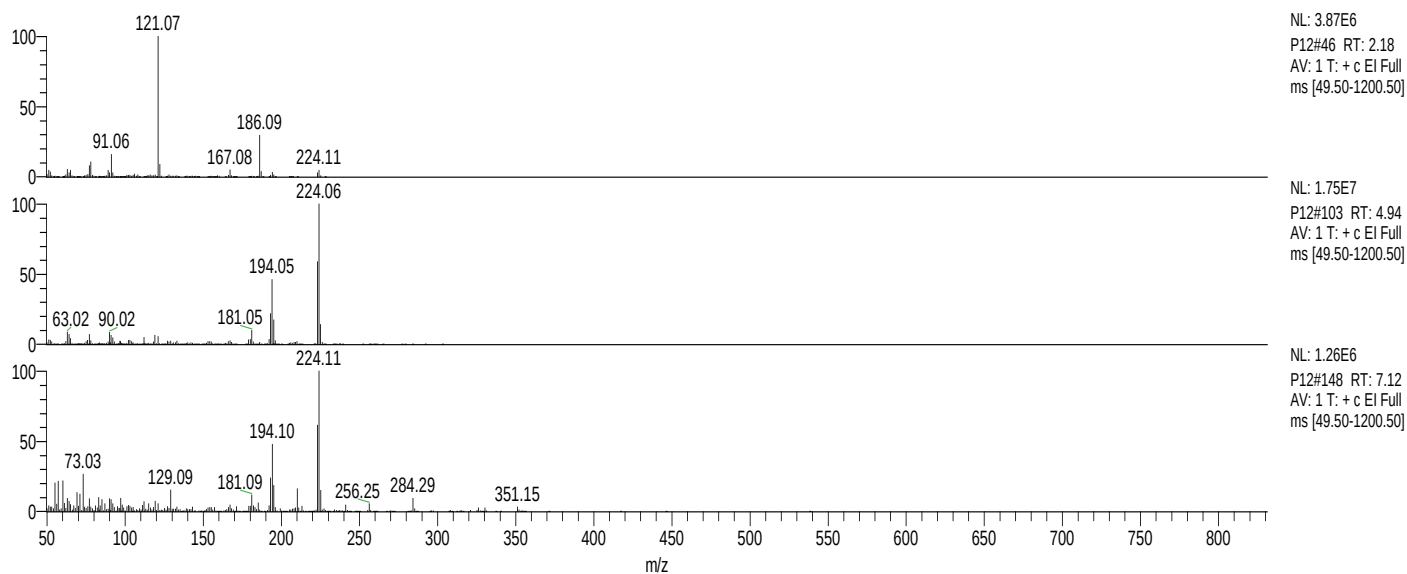
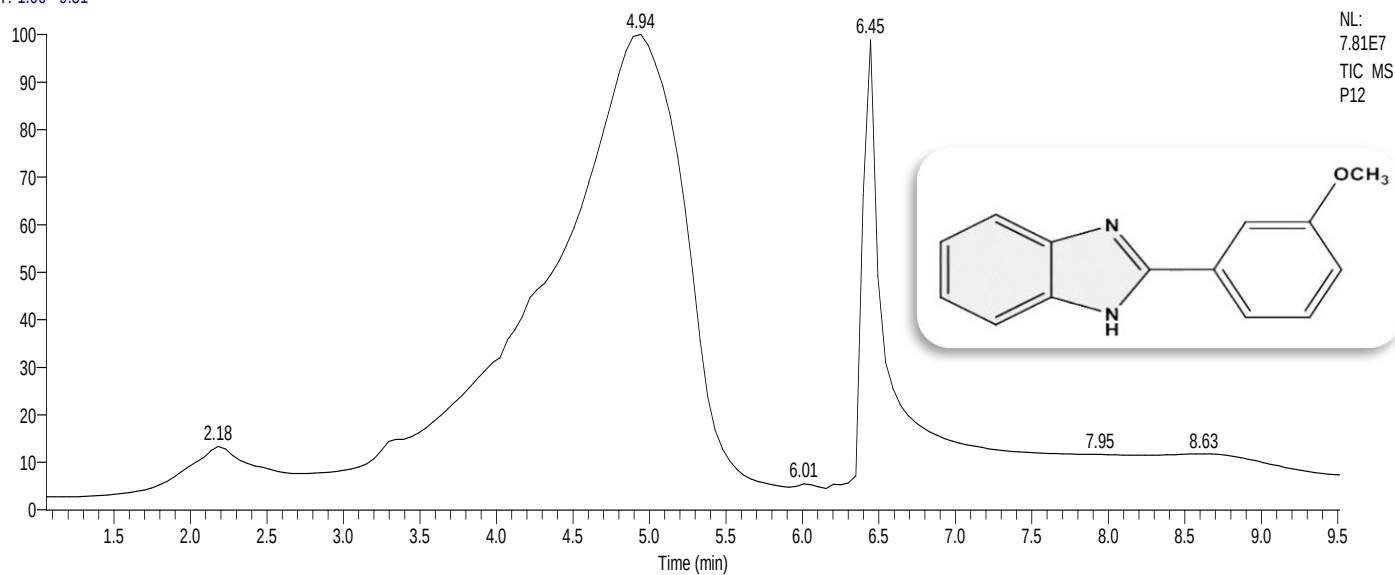
NL:
3.04E6
P10#168 RT:
8.09 AV: 1 T: + c
EI Full ms
[49.50-1200.50]

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GC MS DFS- Thermo
Project No: GS01/03

P12

RT: 1.06 - 9.51

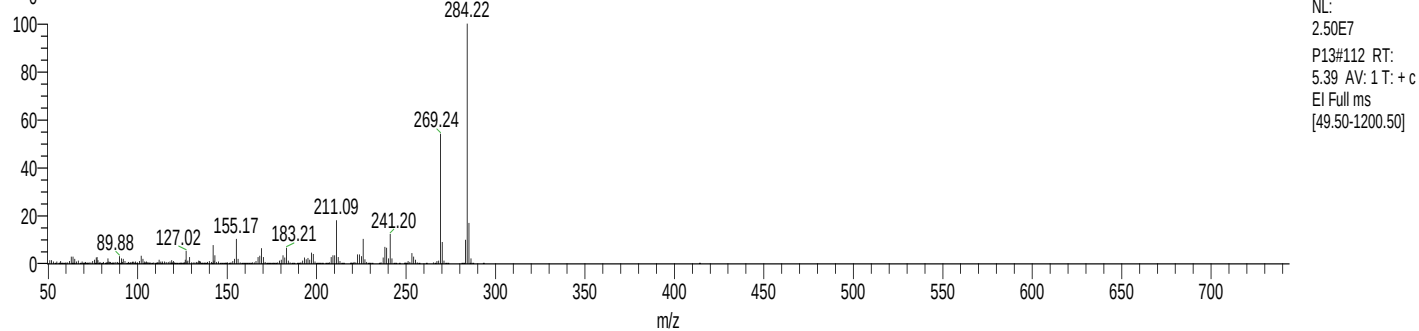
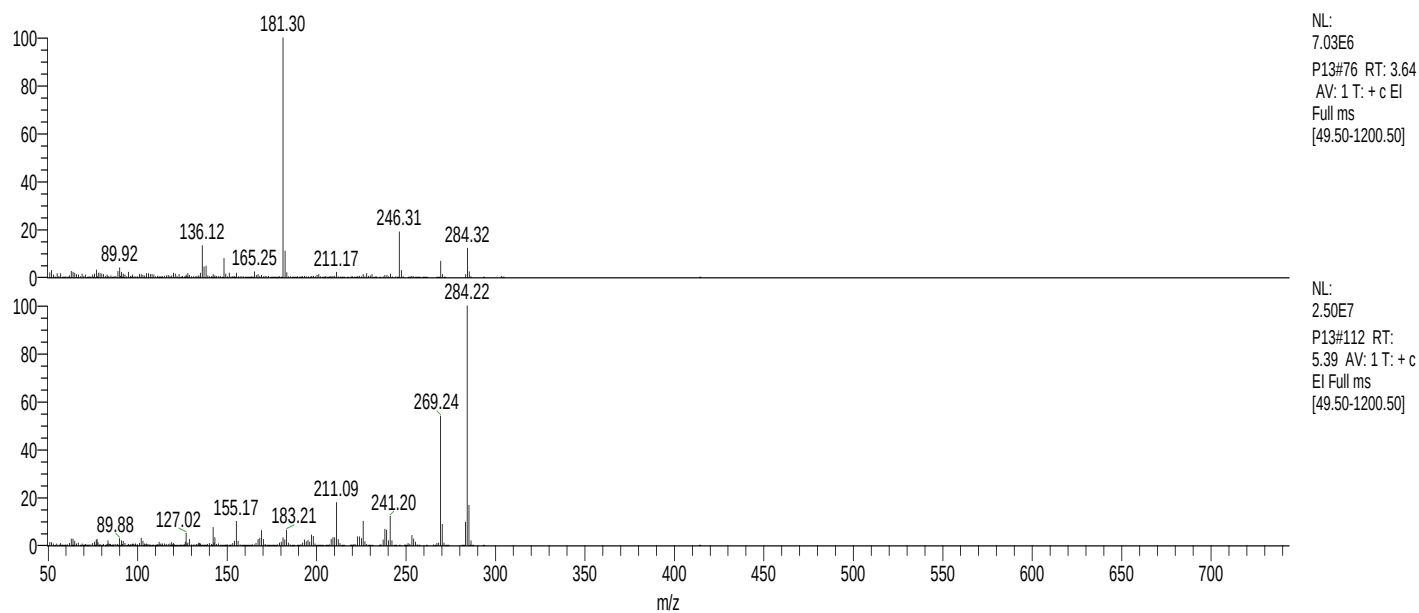
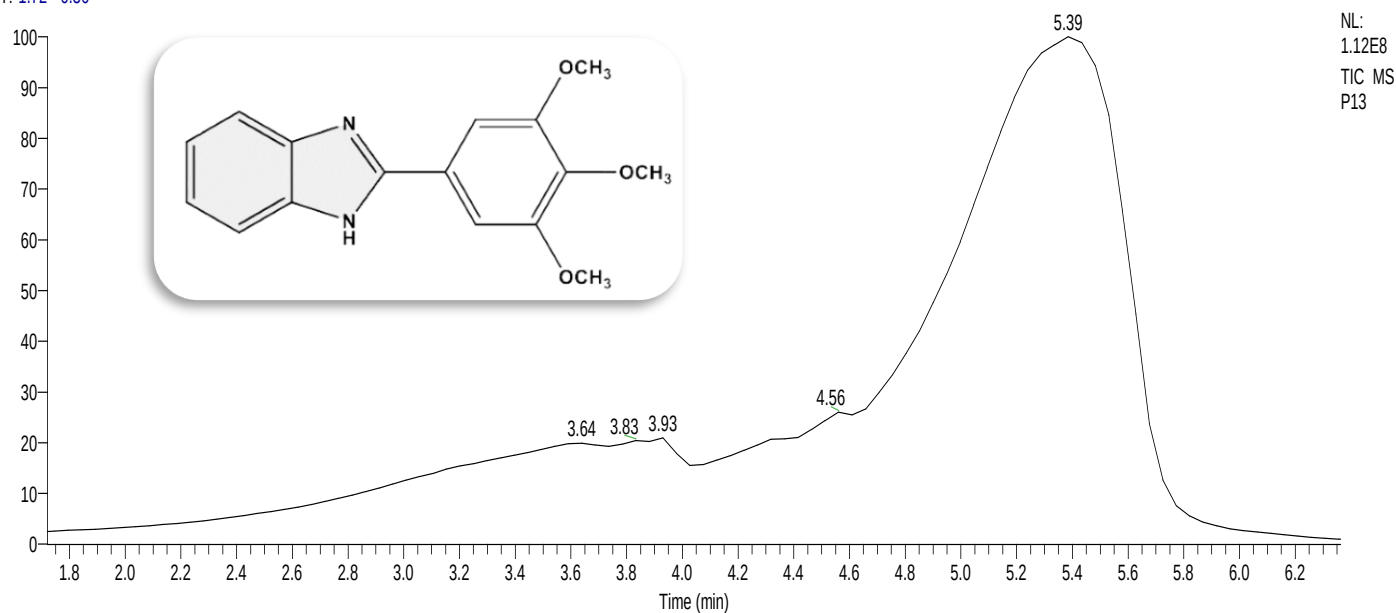


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GC MS DFS- Thermo
Project No: GS01/03

P13

RT: 1.72 - 6.36

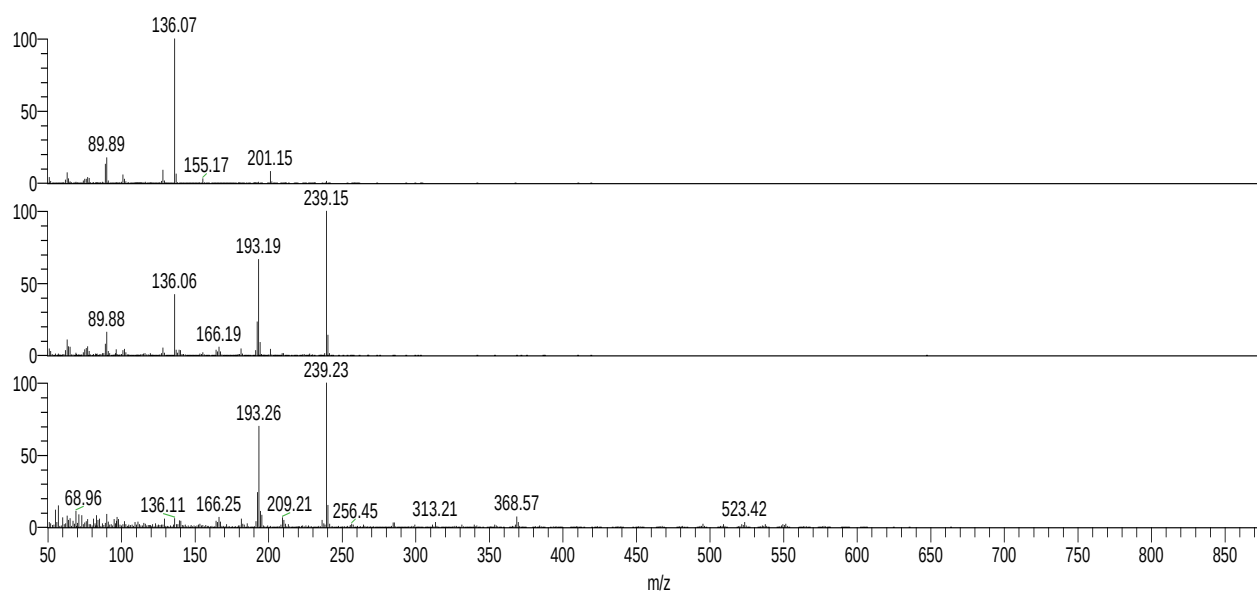
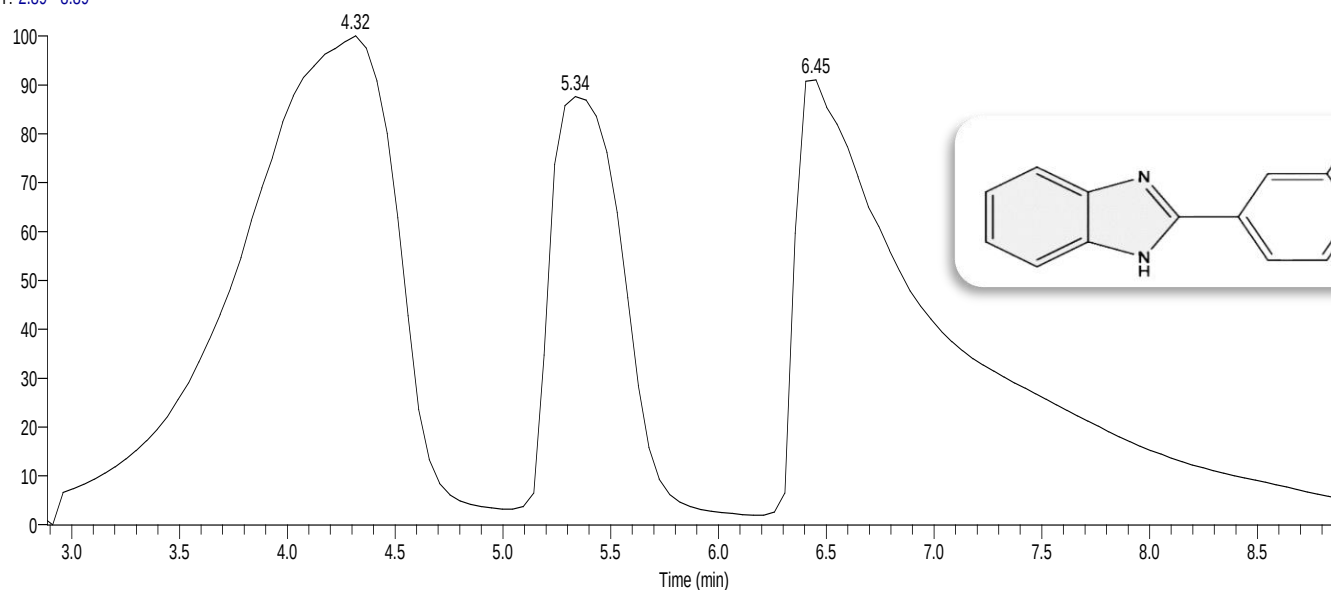


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GC MS DFS- Thermo
Project No: GS01/03

P2

RT: 2.89 - 8.89

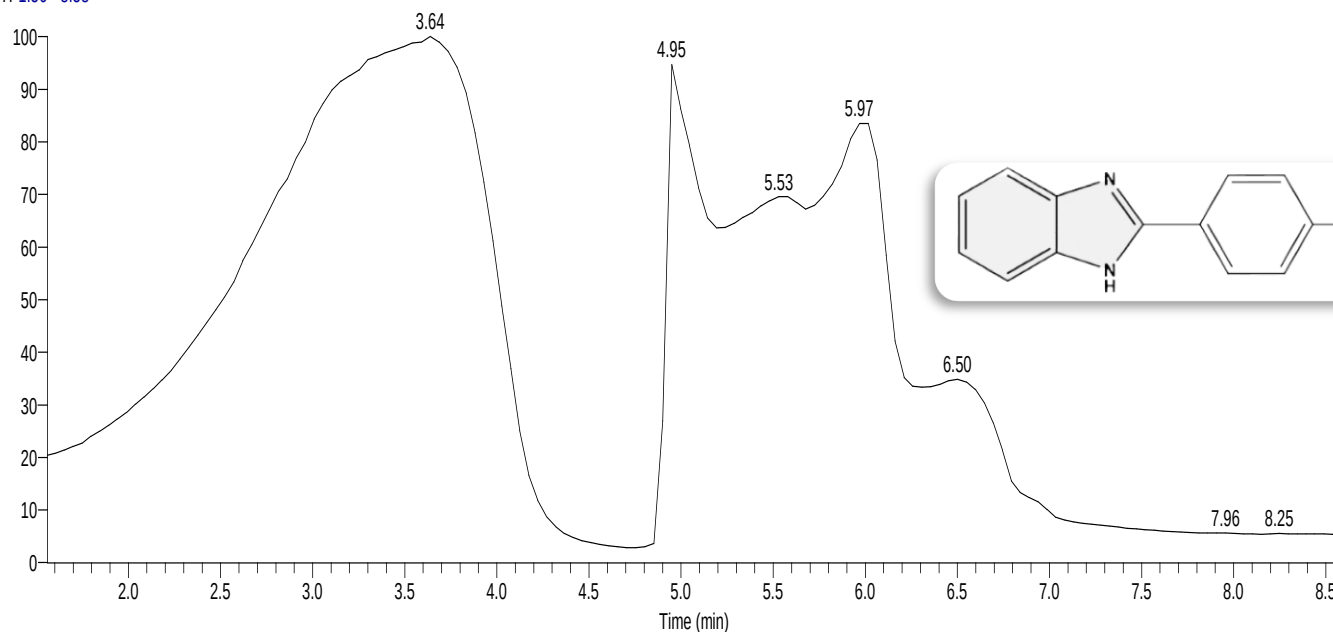


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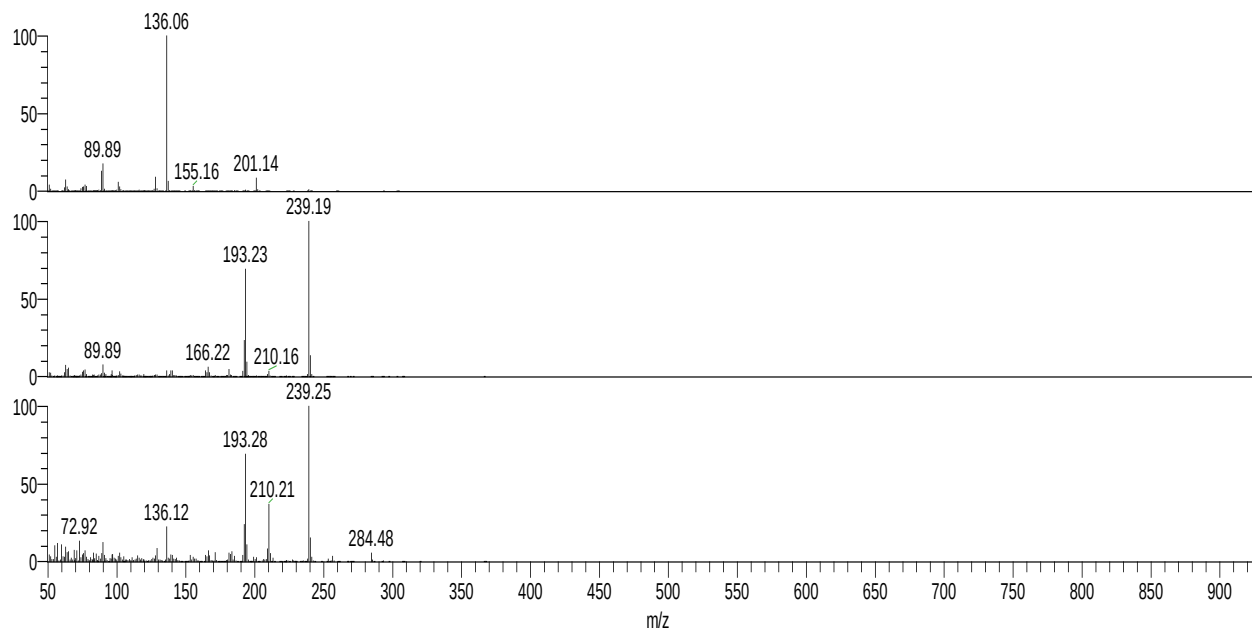
GC MS DFS- Thermo
Project No: GS01/03

P14

RT: 1.56 - 8.58



NL:
1.33E8
TIC MS
P14



NL: 5.92E7
P14#78 RT: 3.74
AV: 1 T: + c EI Full
ms [49.50-1200.50]

NL: 3.08E7
P14#125 RT: 6.02
AV: 1 T: + c EI Full
ms [49.50-1200.50]

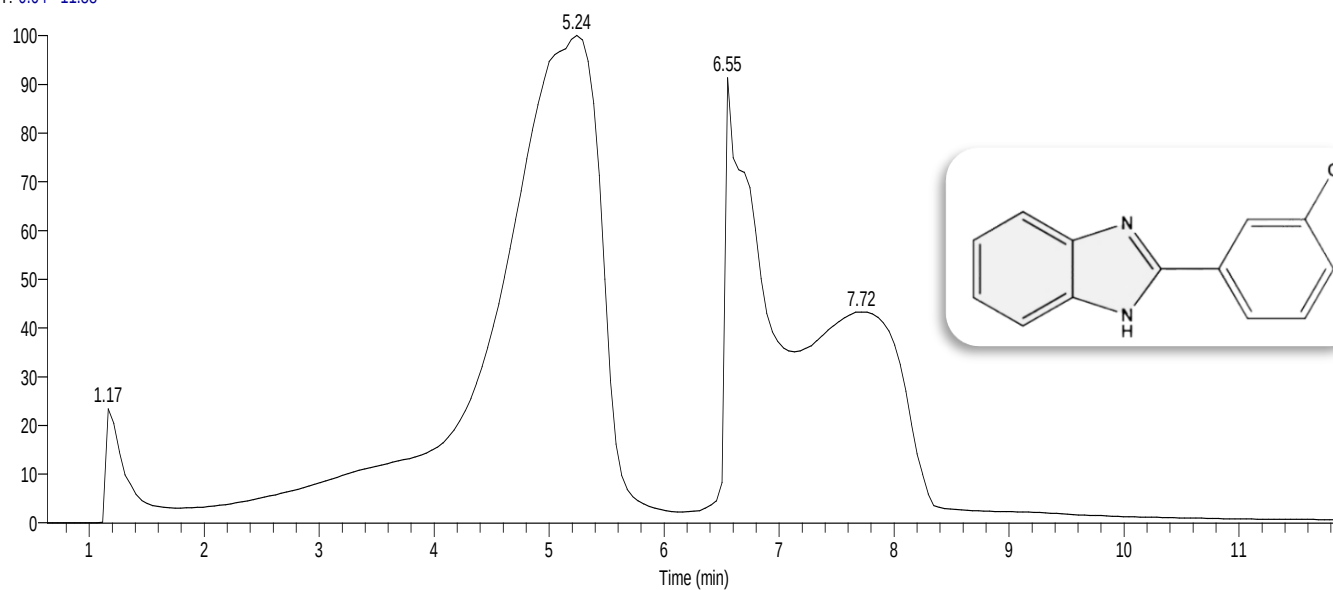
NL: 2.26E6
P14#144 RT: 6.94
AV: 1 T: + c EI Full
ms [49.50-1200.50]

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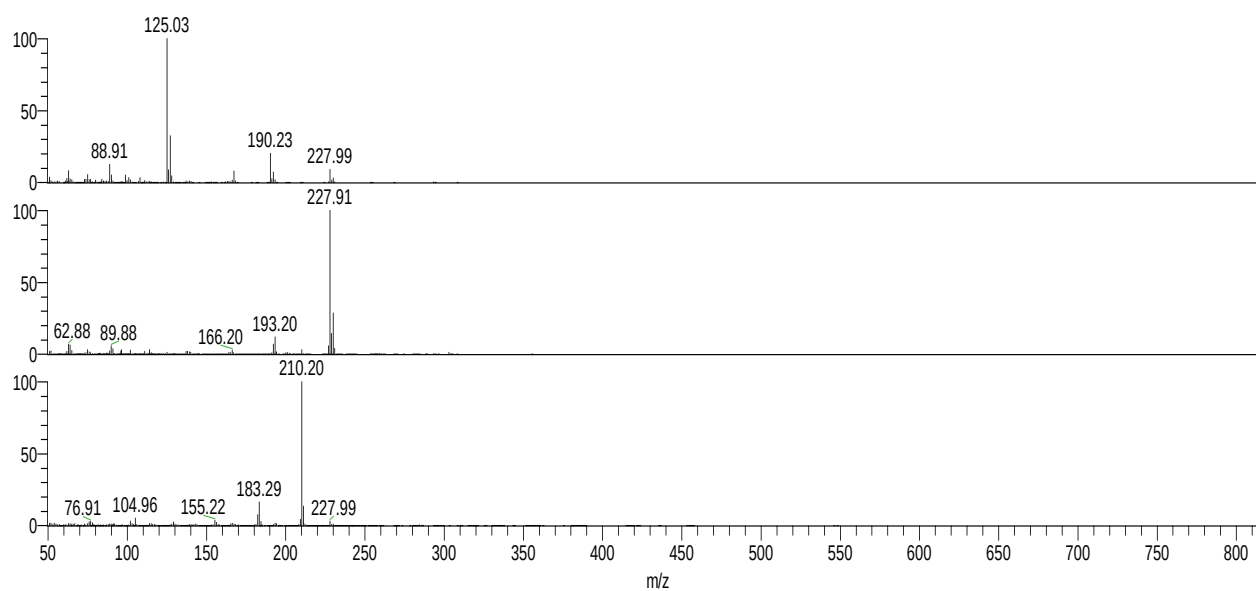
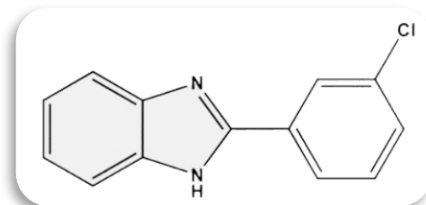
GC MS DFS- Thermo
Project No: GS01/03

P16

RT: 0.64 - 11.88



NL:
1.28E8
TIC MS
P16



NL: 8.44E6
P16#26 RT: 1.21
AV: 1 T: + c EI Full
ms [49.50-1200.50]

NL: 4.56E7
P16#110 RT: 5.29
AV: 1 T: + c EI Full
ms [49.50-1200.50]

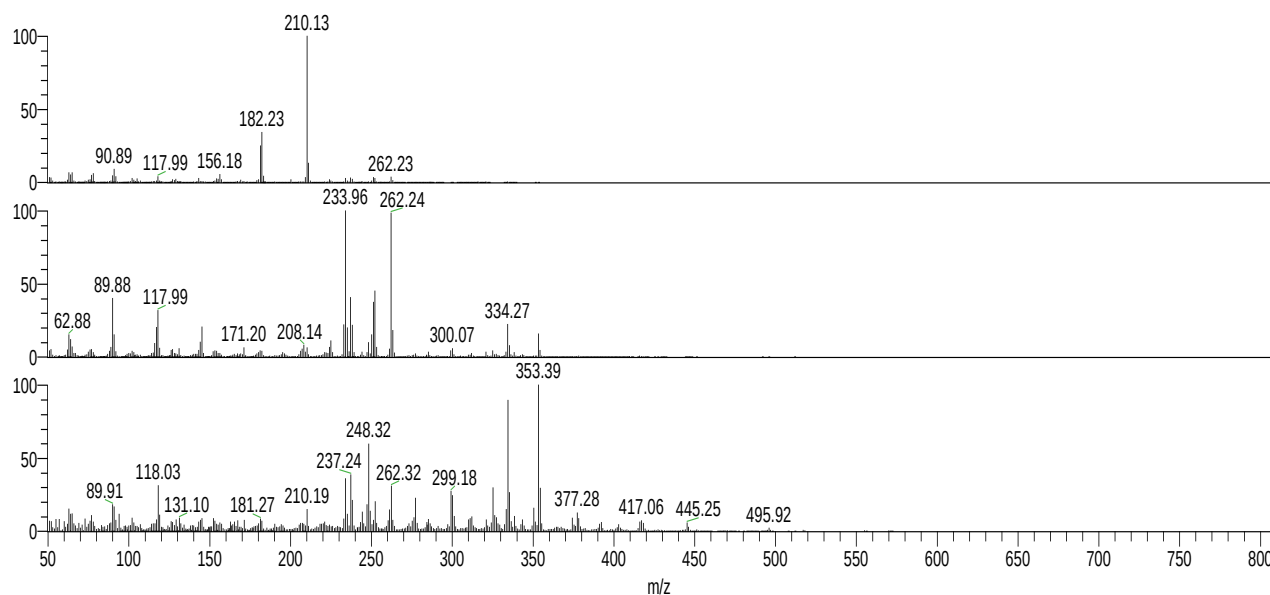
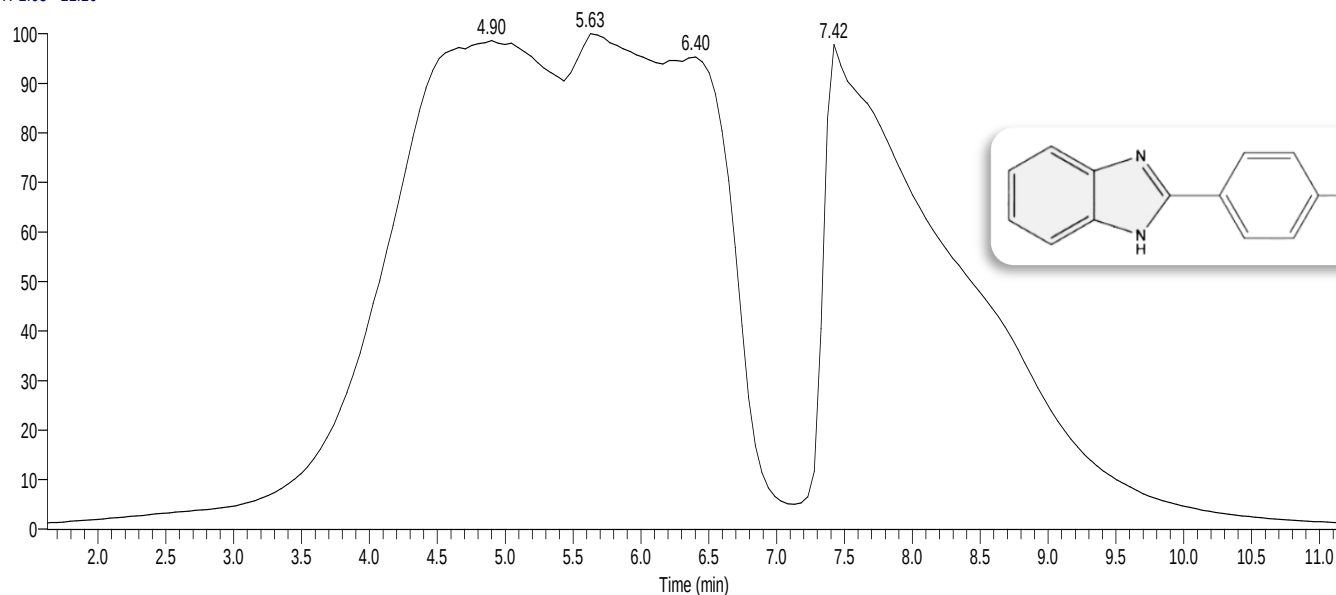
NL: 2.24E7
P16#162 RT: 7.81
AV: 1 T: + c EI Full
ms [49.50-1200.50]

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GC MS DFS- Thermo
Project No: GS01/03

P7

RT: 1.63 - 11.16



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GC MS DFS- Thermo
Project No: GS01/03

P15

RT: 2.52 - 8.75

