Supporting Information

Hydrothermal Preparation and Characterization of $ZnFe_2O_4$ Magnetic Nanoparticles as an Efficient Heterogeneous Catalyst for the Synthesis of Multi-Substituted Imidazoles (MSI) and Study of their Anti-inflammatory Activity

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Fig. S1 : ^{1}H, ^{13}C NMR and dept-135 spectra of 5a

I-1
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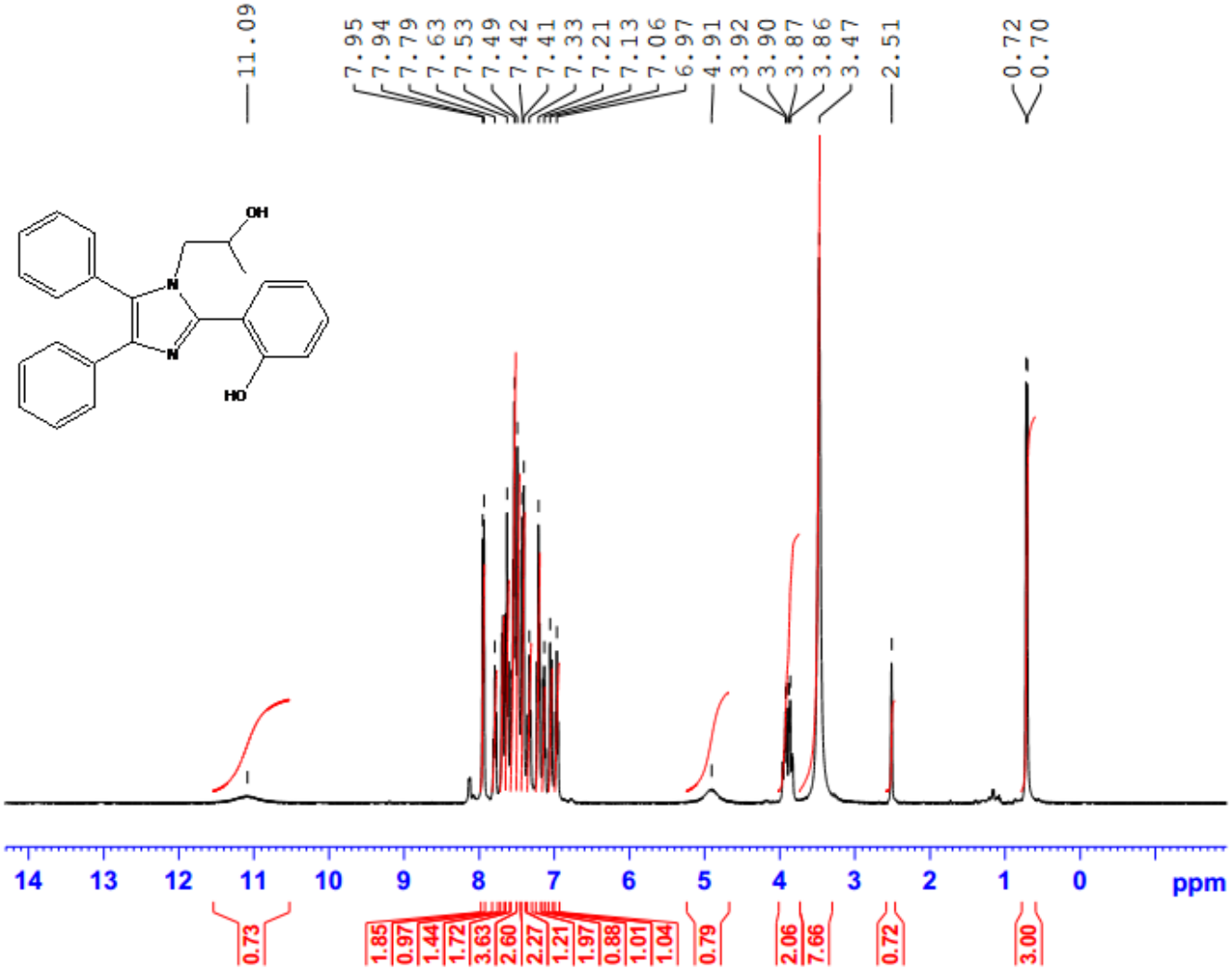


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F2 - Processing parameters
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I-1
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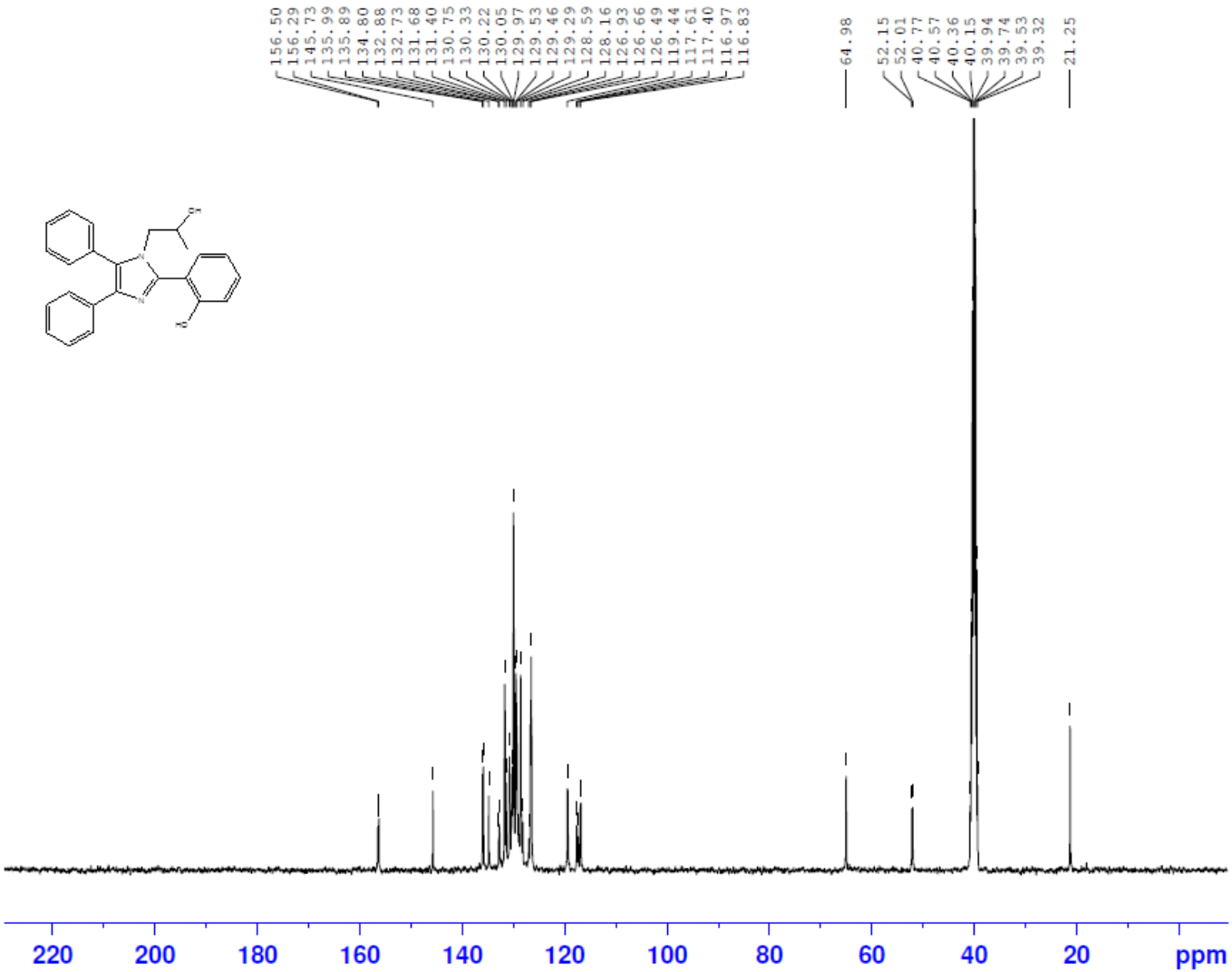


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TD                65536
SOLVENT            DMSO
NS                   512
DS                     4
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FIDRES          0.366798 H
AQ             1.3631488 s
RG                100.43
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DE                  6.50 u
TE                 323.2 K
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NUC1                 13C
P1                  9.50 u
PLW1         56.00000000 W

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NUC2                  1H
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PCPD2              90.00 u
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing paramete
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GB        0
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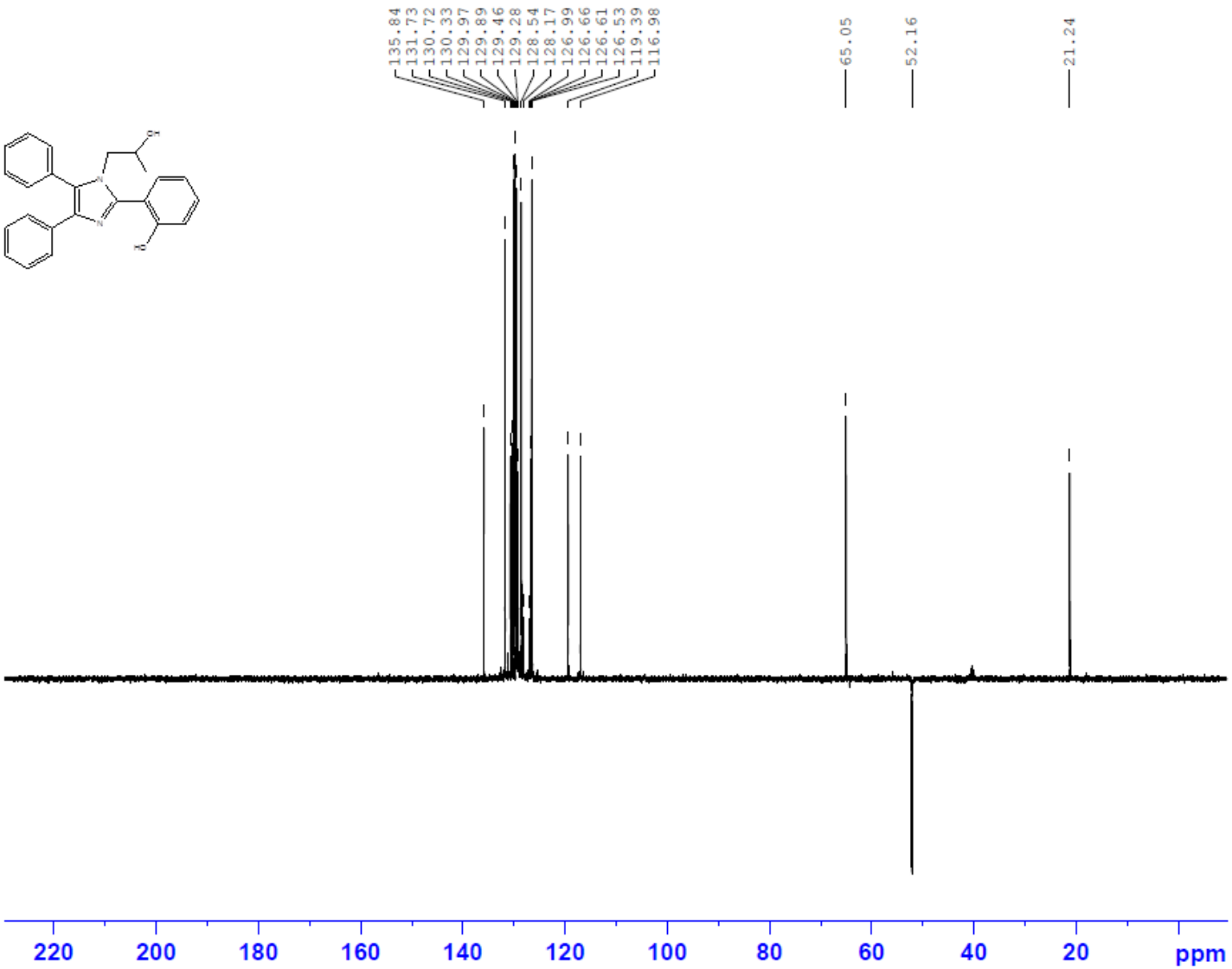
I-1
dept135_su DMSO {C:\nmr-data} Student 19

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PULPROG       deptsp135
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SOLVENT            DMSO
NS                   256
DS                     4
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FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG               199.04
DW               20.800 usec
DE                6.50 usec
TE               323.1 K
CNST2        145.0000000
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D2            0.00344828 sec
D12           0.00002000 sec
TD0                    1

======== CHANNEL f1 ========
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NUC1                  13C
P1                  9.50 usec
P13              2000.00 usec
PLW0      0 W
PLW1         56.00000000 W
SPNAM[5]     Crp60comp.4
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SPOFFS5   0 Hz
SPW5          7.72189999 W

======== CHANNEL f2 ========
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NUC2                   1H
CPDPRG[2         waltz16
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P4                 24.60 usec
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W

F2 - Processing parameters
SI                 32768
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PC                  1.40
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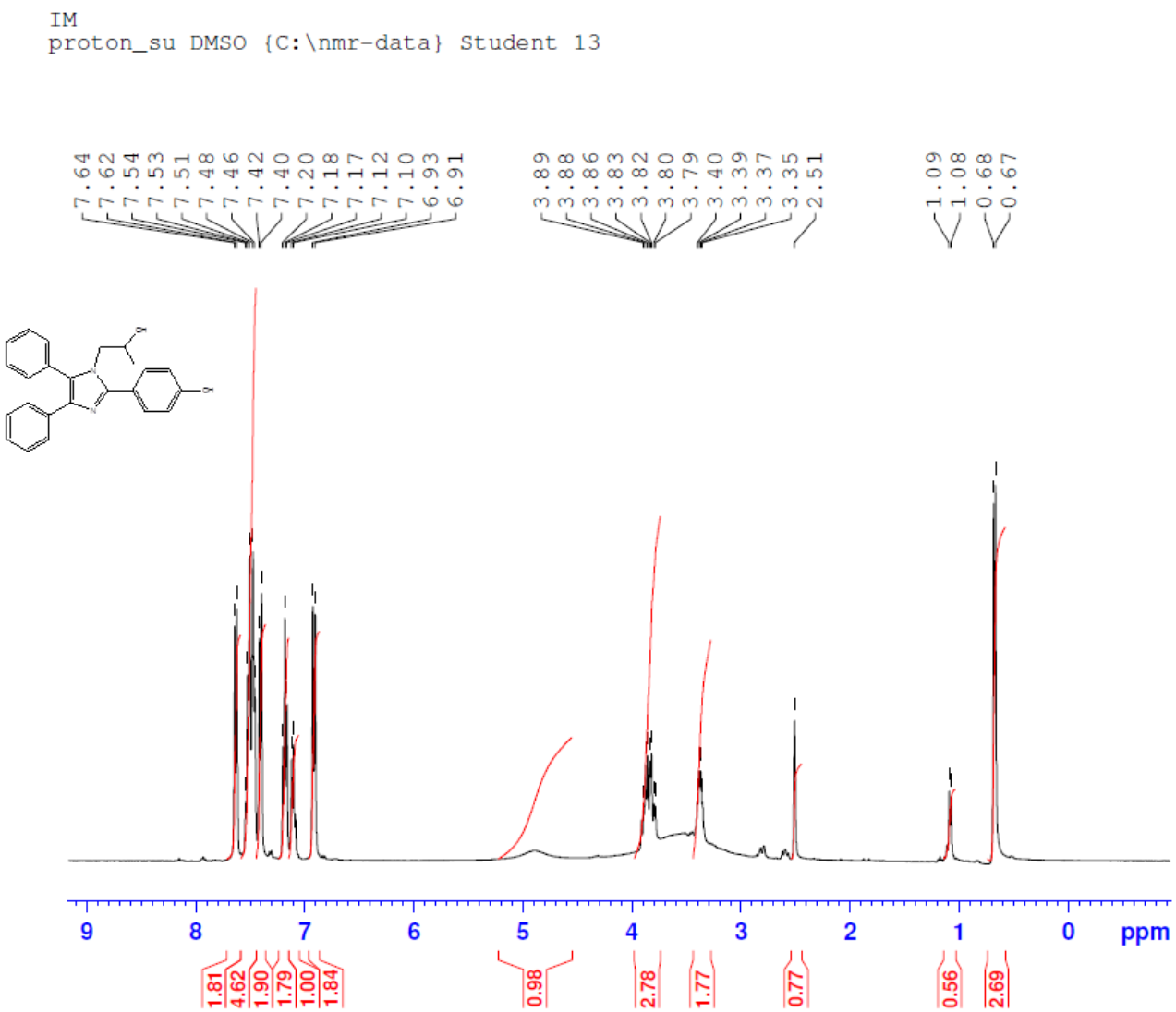
Fig. S2 : ^{1}H, ^{13}C NMR and dept-135 spectra of 5b

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PULPROG             zg30
TD                 65536
SOLVENT             DMSO
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RG                 68.22
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DE                 6.50 usec
TE                298.2 K
D1           1.00000000 sec
TD0                    1

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NUC1                  1H
P1                12.00 usec
PLW1        22.00000000 W

F2 - Processing parameters
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SF          400.1300000 MHz
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IM
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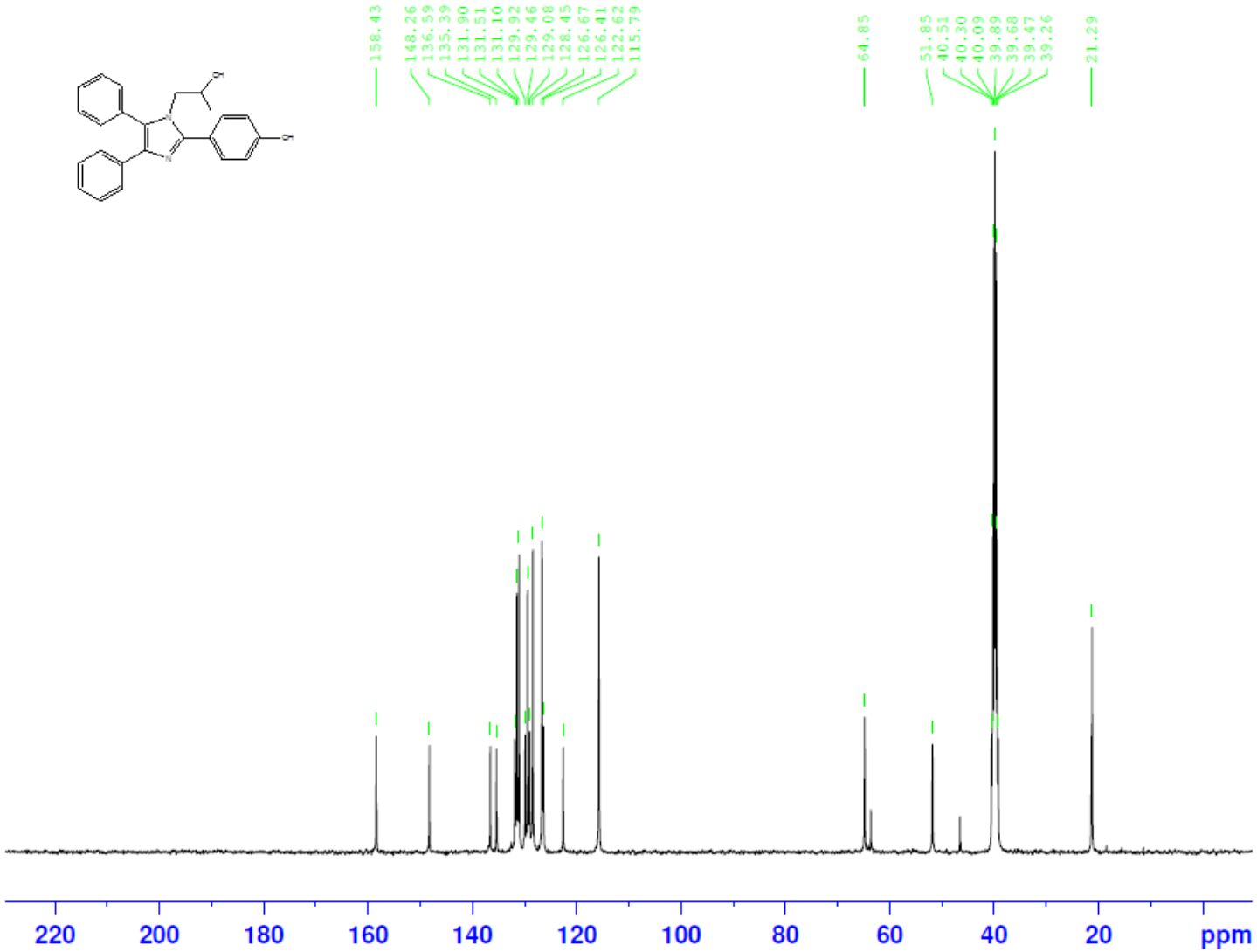


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TD                65536
SOLVENT            DMSO
NS                   512
DS                     4
SWH            24038.461 H
FIDRES          0.366798 H
AQ             1.3631488 s
RG                106.18
DW                20.800 u
DE                  6.50 u
TE                298.2 K
D1             2.00000000 s
D11            0.03000000 s
TD0                    1

======== CHANNEL f1 ====
SFO1         100.6238364 M
NUC1                 13C
P1                  9.50 u
PLW1         56.00000000 W

======== CHANNEL f2 ====
SFO2         400.1316005 M
NUC2                  1H
CPDPRG[2         waltz16
PCPD2               90.00 u
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing paramete
SI                 32768
SF          100.6127690 M
WDW                   EM
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LB                  6.00 H
GB       0
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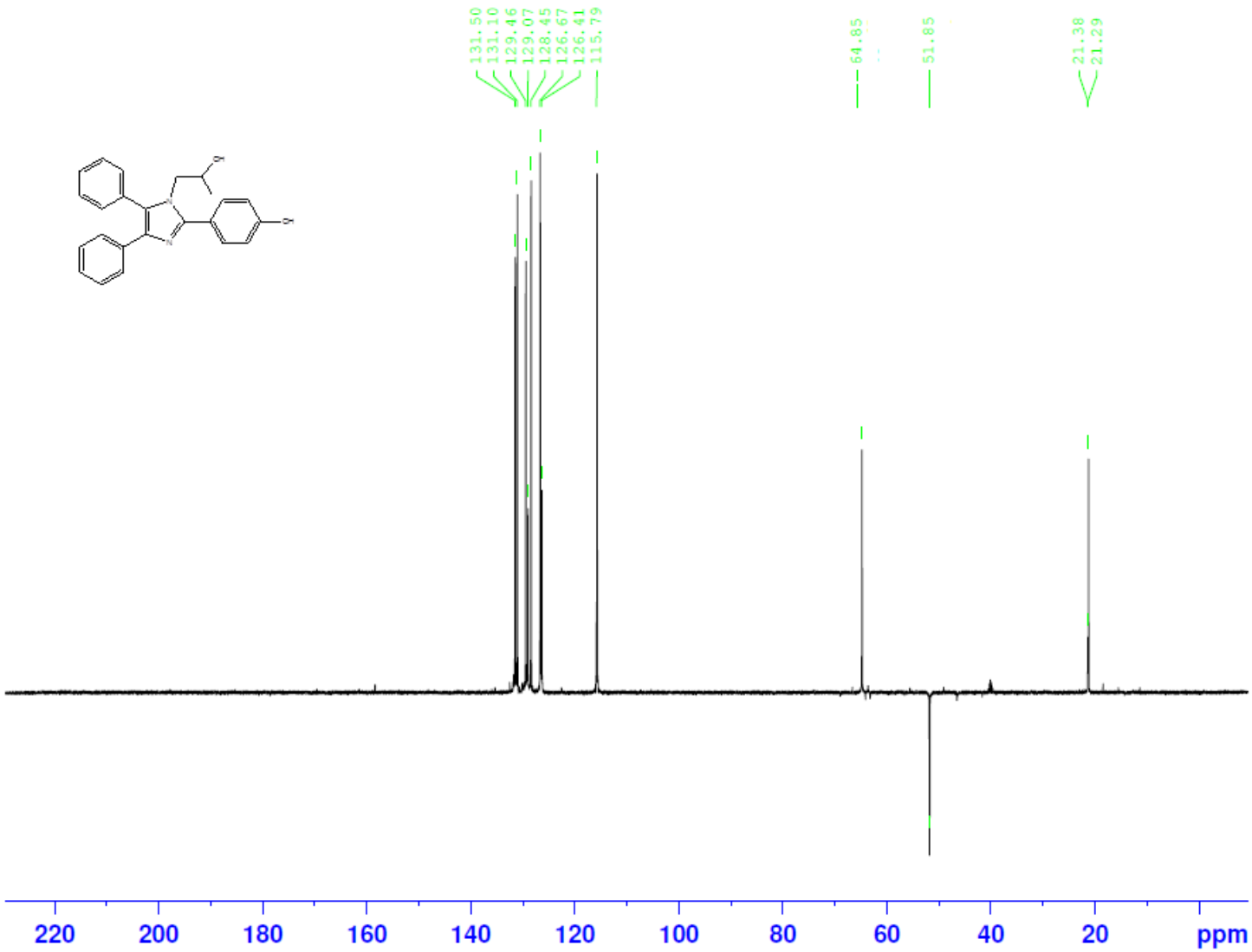
IM
dept135_su DMSO {C:\nmr-data} Student 13

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Date_           20140930
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INSTRUM            spect
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PULPROG       deptsp135
TD                65536
SOLVENT            DMSO
NS                   256
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                199.04
DW                20.800 usec
DE                  6.50 usec
TE                 298.1 K
CNST2        145.0000000
D1            2.00000000 sec
D2            0.00344828 sec
D12           0.00002000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
P13              2000.00 usec
PLW0      0 W
PLW1         56.00000000 W
SPNAM[5]     Crp60comp.4
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SPOFFS5   0 Hz
SPW5          7.72189999 W

======== CHANNEL f2 ========
SFO2         400.1312797 MHz
NUC2                  1H
CPDPRG[2          waltz16
P3                 12.30 usec
P4                 24.60 usec
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
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LB                  1.00 Hz
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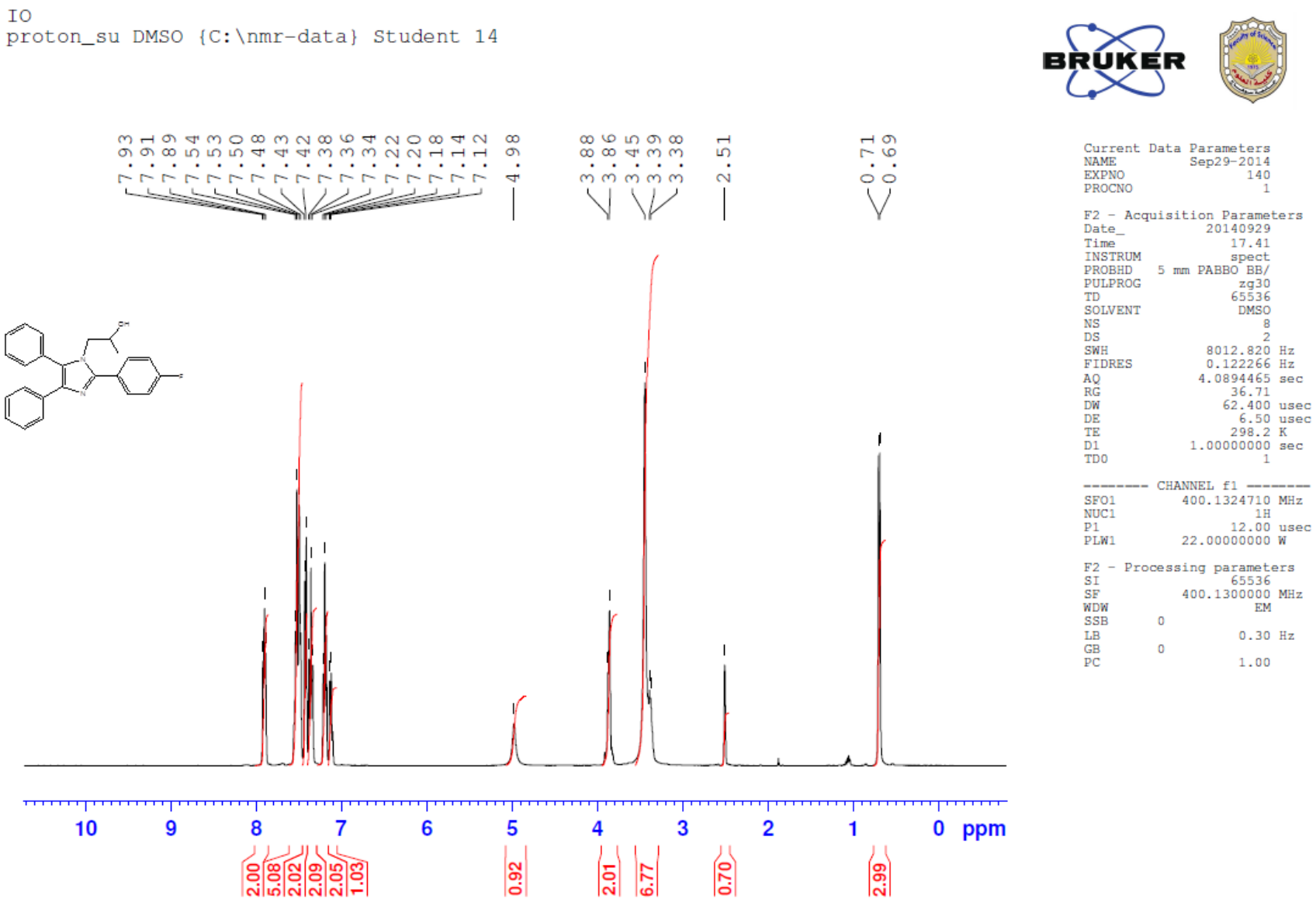
PC                  1.40
```

Fig. S3 : ^{1}H, ^{13}C NMR and dept-135 spectra of 5c



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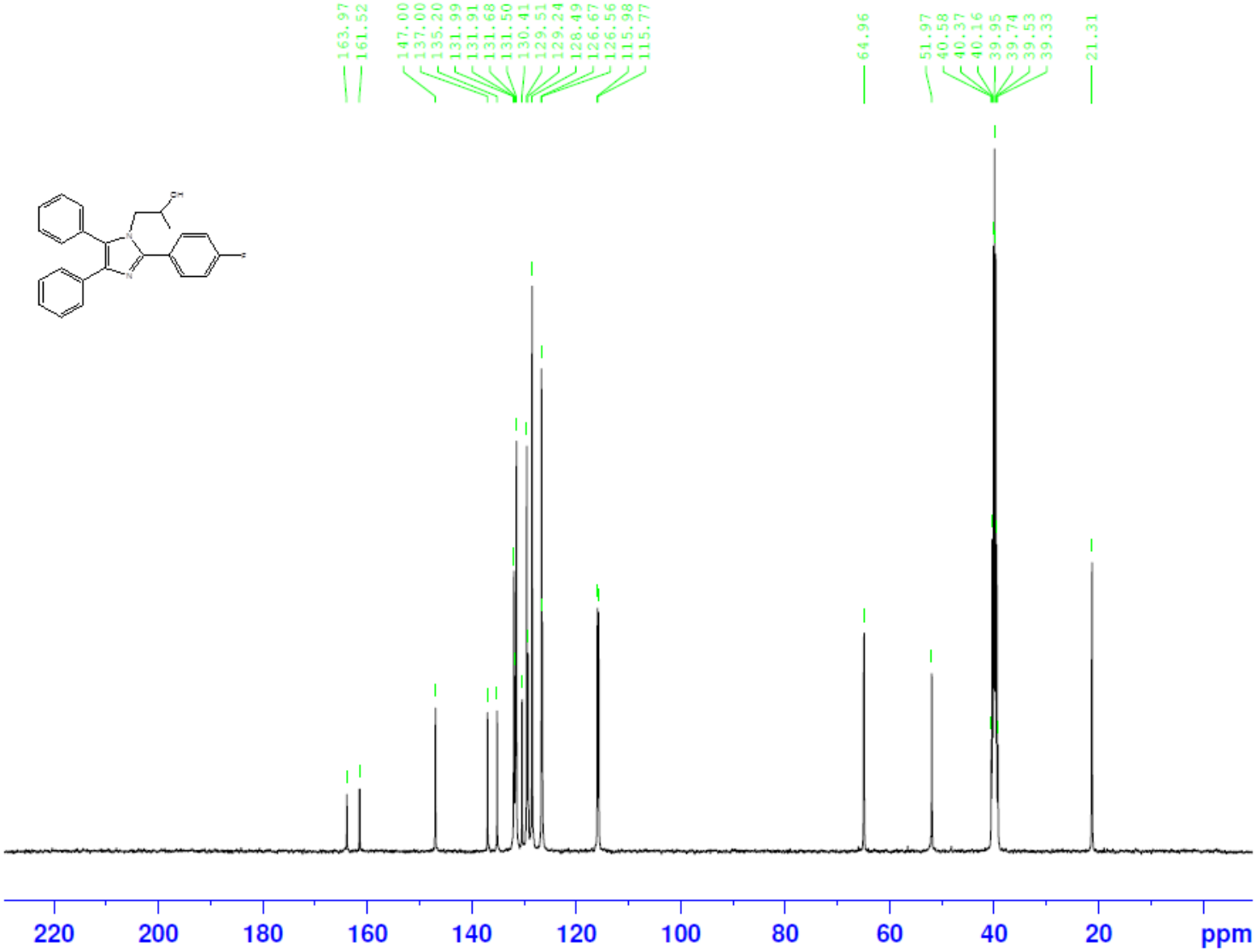


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PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                   512
DS                     4
SWH            24038.461 H
FIDRES          0.366798 H
AQ             1.3631488 s
RG                100.43
DW                20.800 u
DE                  6.50 u
TE                298.1 K
D1            2.00000000 s
D11           0.03000000 s
TD0                    1

======== CHANNEL f1 ====
SFO1         100.6238364 M
NUC1                 13C
P1                  9.50 u
PLW1         56.00000000 W

======== CHANNEL f2 ====
SFO2         400.1316005 M
NUC2                  1H
CPDPRG[2         waltz16
PCPD2              90.00 u
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing paramete
SI                 32768
SF          100.6127690 M
WDW                   EM
SSB       0
LB                  6.00 H
GB        0
PC                  1.40
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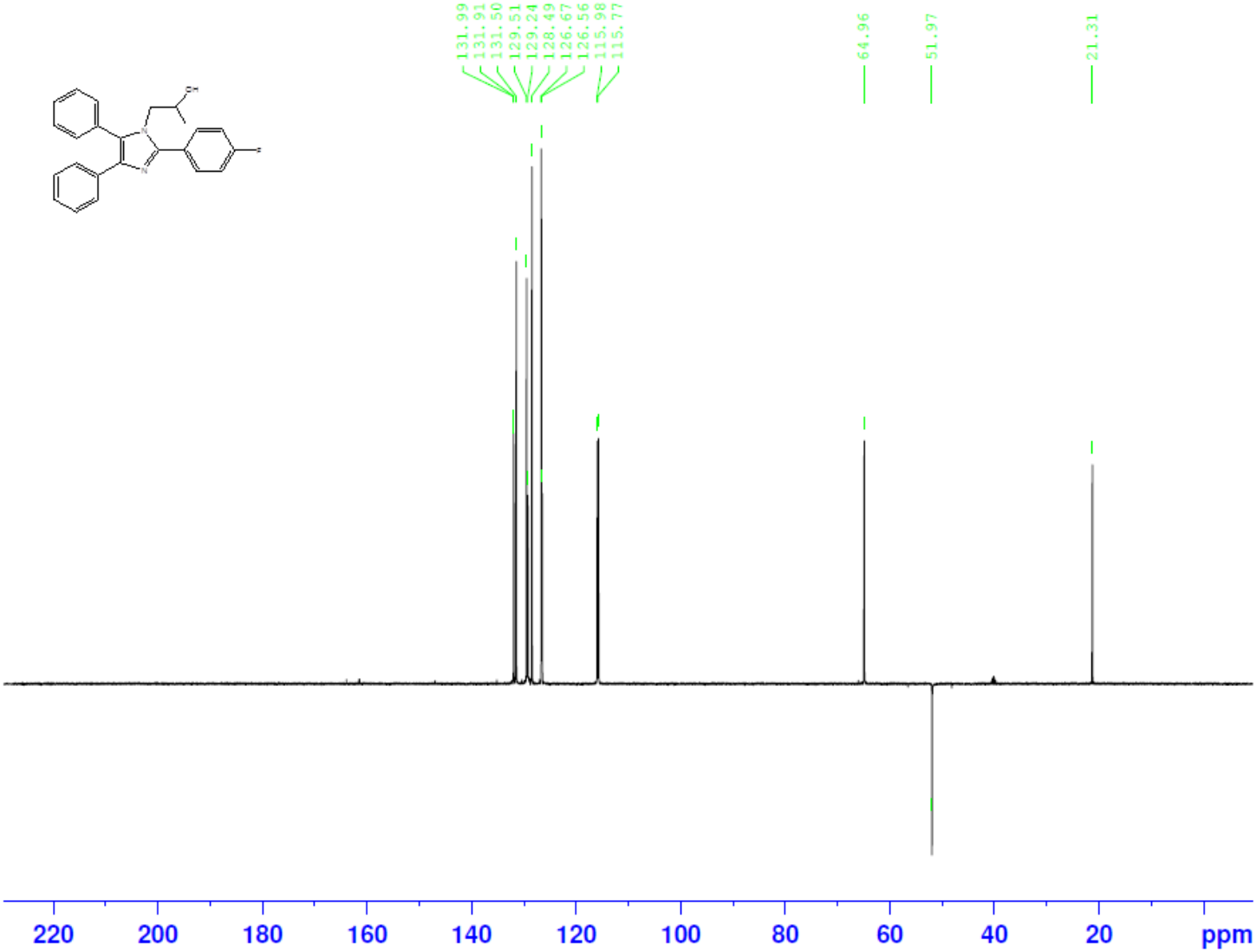
IO
dept135_su DMSO {C:\nmr-data} Student 14

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PULPROG       deptsp135
TD                65536
SOLVENT            DMSO
NS                   256
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                199.04
DW                20.800 usec
DE                  6.50 usec
TE                298.2 K
CNST2        145.0000000
D1            2.00000000 sec
D2            0.00344828 sec
D12           0.00002000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
P13              2000.00 usec
PLW0      0 W
PLW1         56.00000000 W
SPNAM[5]     Crp60comp.4
SPOAL5             0.500
SPOFFS5   0 Hz
SPW5          7.72189999 W

======== CHANNEL f2 ========
SFO2         400.1312797 MHz
NUC2                  1H
CPDPRG[2         waltz16
P3                 12.30 usec
P4                 24.60 usec
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.40
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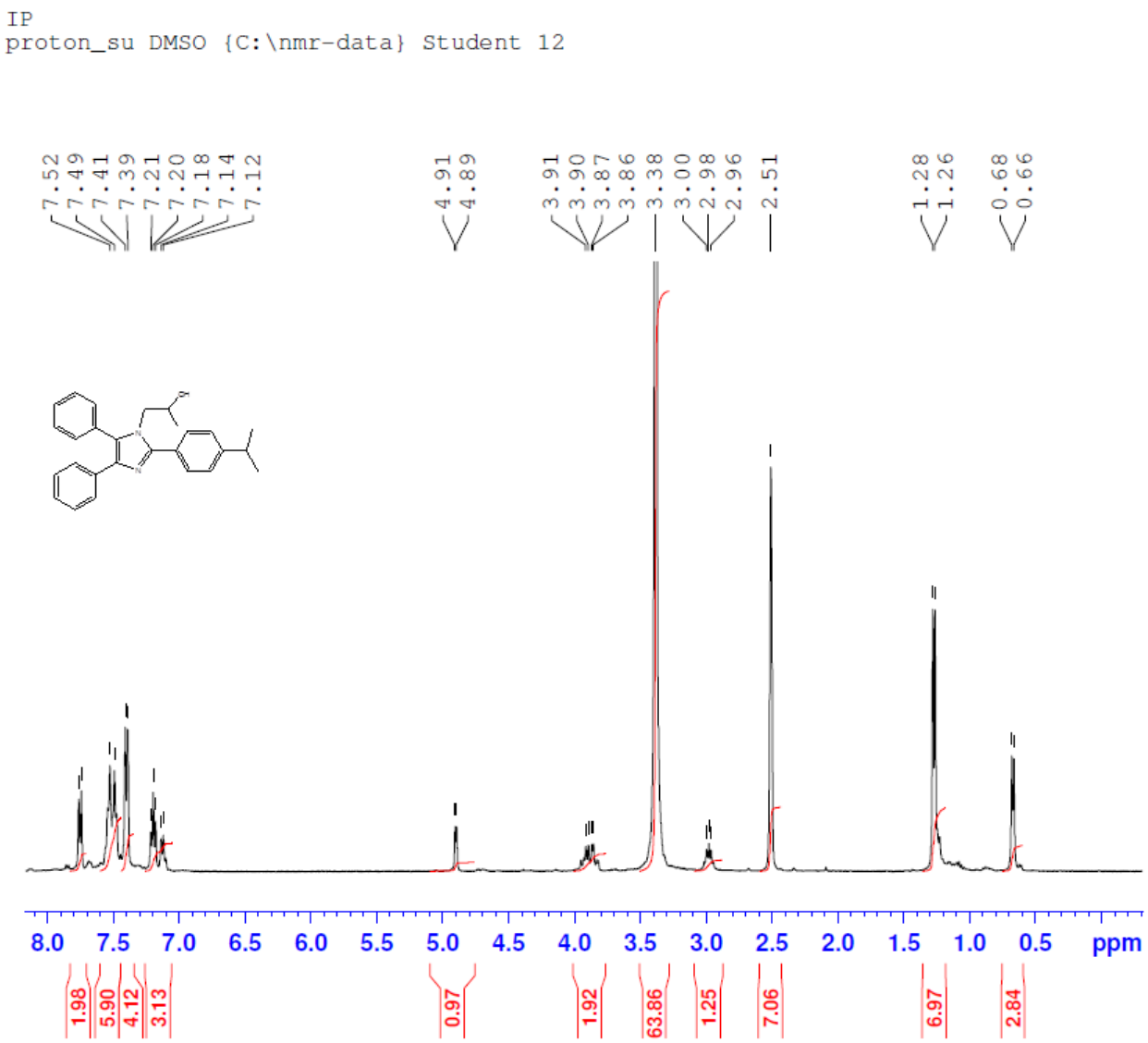
Fig. S4 : 1H, 13C NMR and dept-135 spectra of 5d

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PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                      8
DS                      2
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ           4.0894465 sec
RG               120.97
DW               62.400 usec
DE                 6.50 usec
TE                298.1 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 =======
SFO1        400.1324710 MHz
NUC1                  1H
P1                12.00 usec
PLW1        22.00000000 W

F2 - Processing parameters
SI                 65536
SF          400.1300000 MHz
WDW                    EM
SSB      0
LB                 0.30 Hz
GB       0
PC                 1.00
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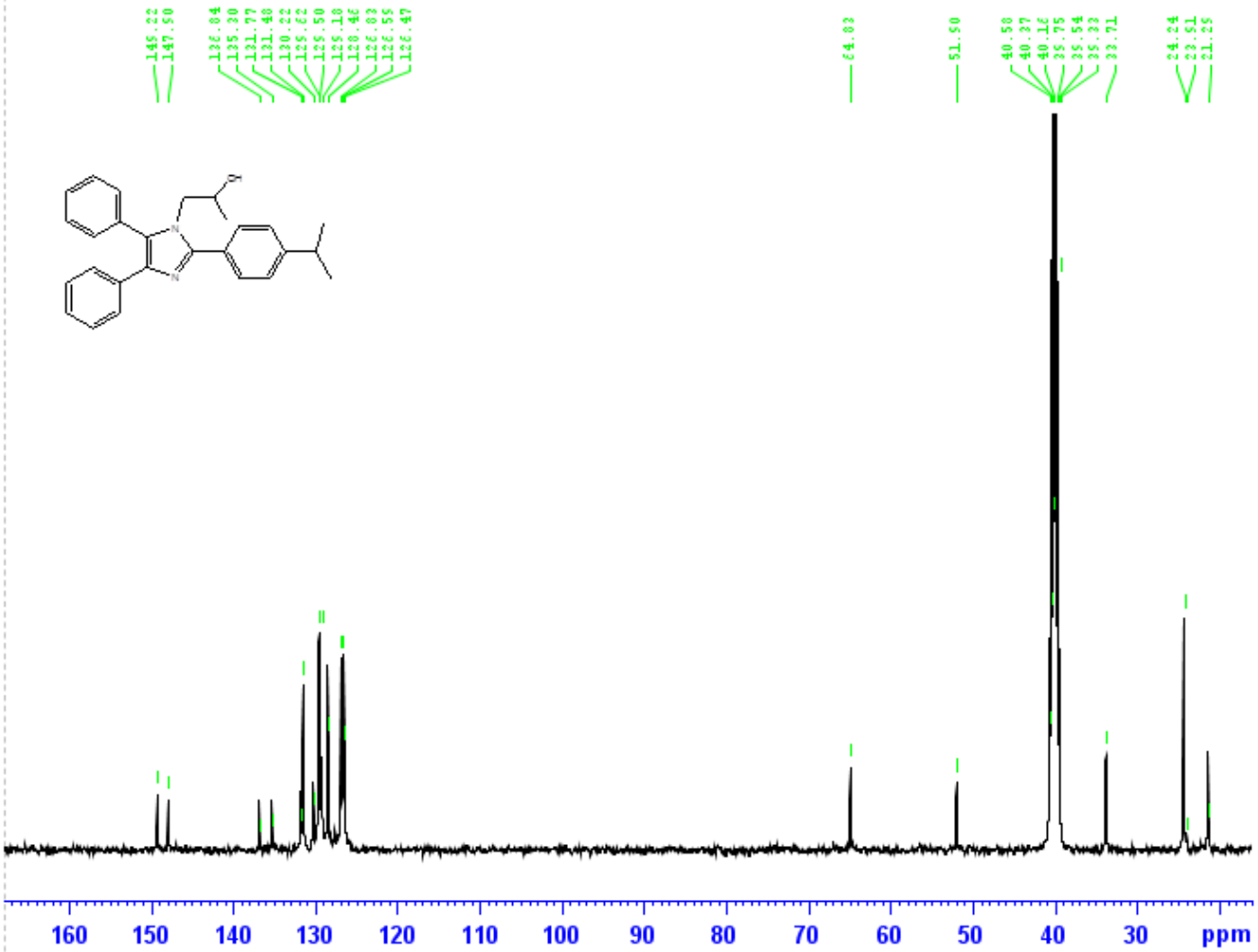
IP
c13_su DMSO {C:\nmr-data} Student 12

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PULPROG          zgpg30
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SOLVENT            DMSO
NS                   512
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SWH            24038.461 Hz
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AQ             1.3631488 sec
RG                199.04
DW                20.800 usec
DE                 6.50 usec
TE                298.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        100.6238364 MHz
NUC1                 13C
P1                 9.50 usec
PLW1        56.00000000 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2        22.00000000 W
PLW12        0.41091001 W
PLW13        0.33284000 W

F2 - Processing parameters
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB       0
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PC                 1.40
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IP
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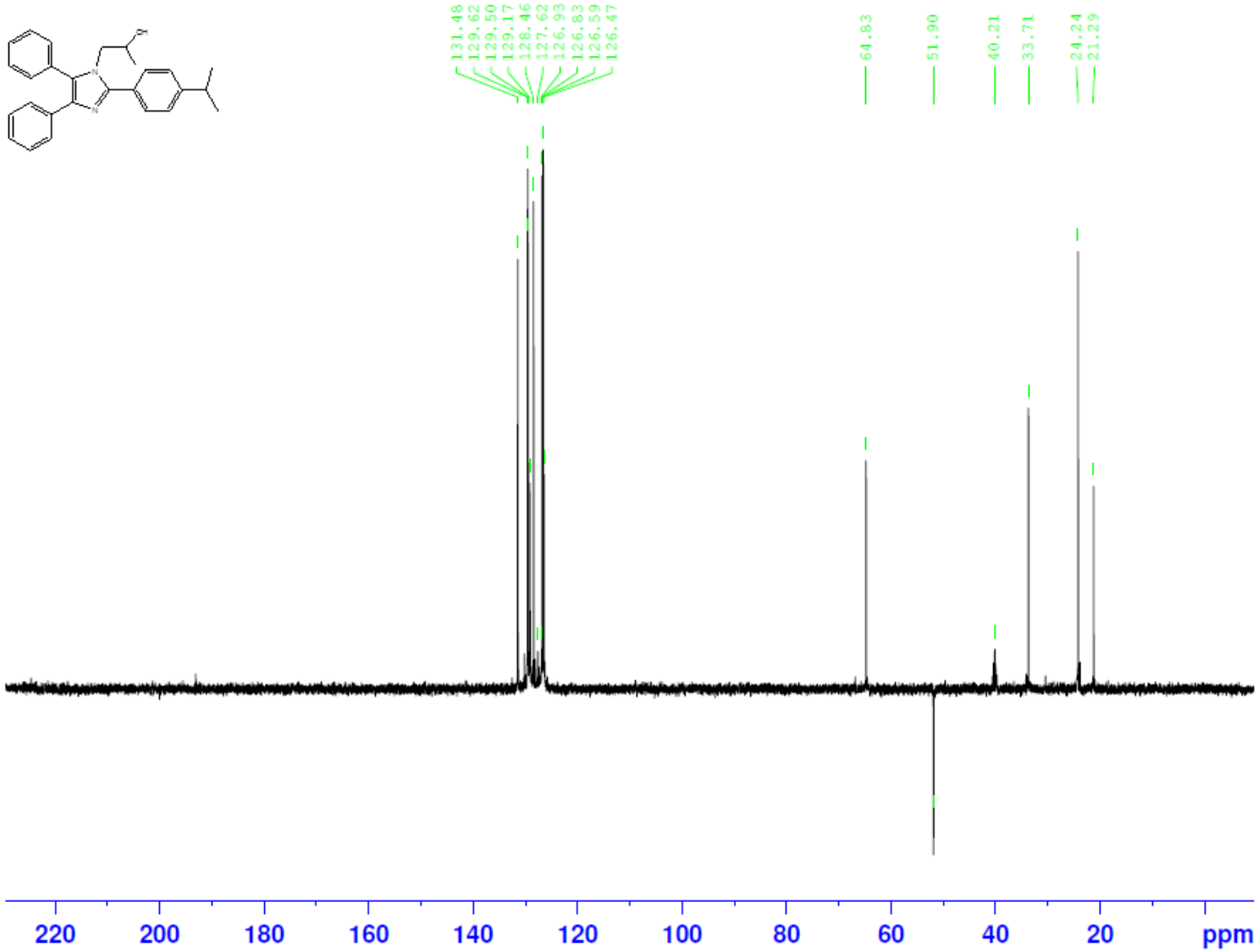


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PULPROG        deptsp135
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SOLVENT             DMSO
NS                    256
DS                      4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                199.04
DW                20.800 usec
DE                  6.50 usec
TE                 298.2 K
CNST2        145.0000000
D1            2.00000000 sec
D2            0.00344828 sec
D12           0.00002000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
P13              2000.00 usec
PLW0      0 W
PLW1         56.00000000 W
SPNAM[5]     Crp60comp.4
SPOAL5             0.500
SPOFFS5   0 Hz
SPW5          7.72189999 W

======== CHANNEL f2 ========
SFO2         400.1312797 MHz
NUC2                  1H
CPDPRG[2          waltz16
P3                 12.30 usec
P4                 24.60 usec
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W

F2 - Processing parameters
SI                 32768
SF          100.6127690 MHz
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LB                  1.00 Hz
GB        0
PC                  1.40
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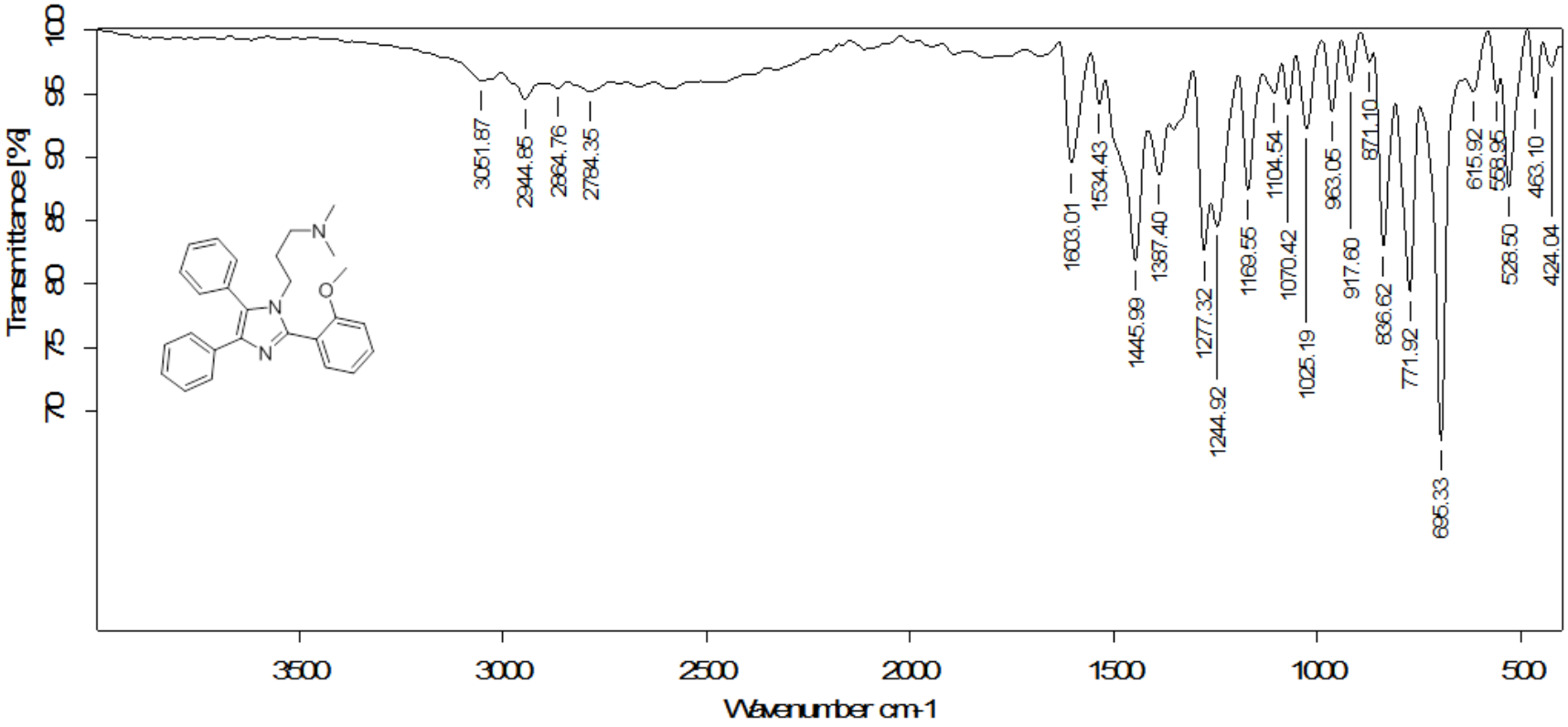
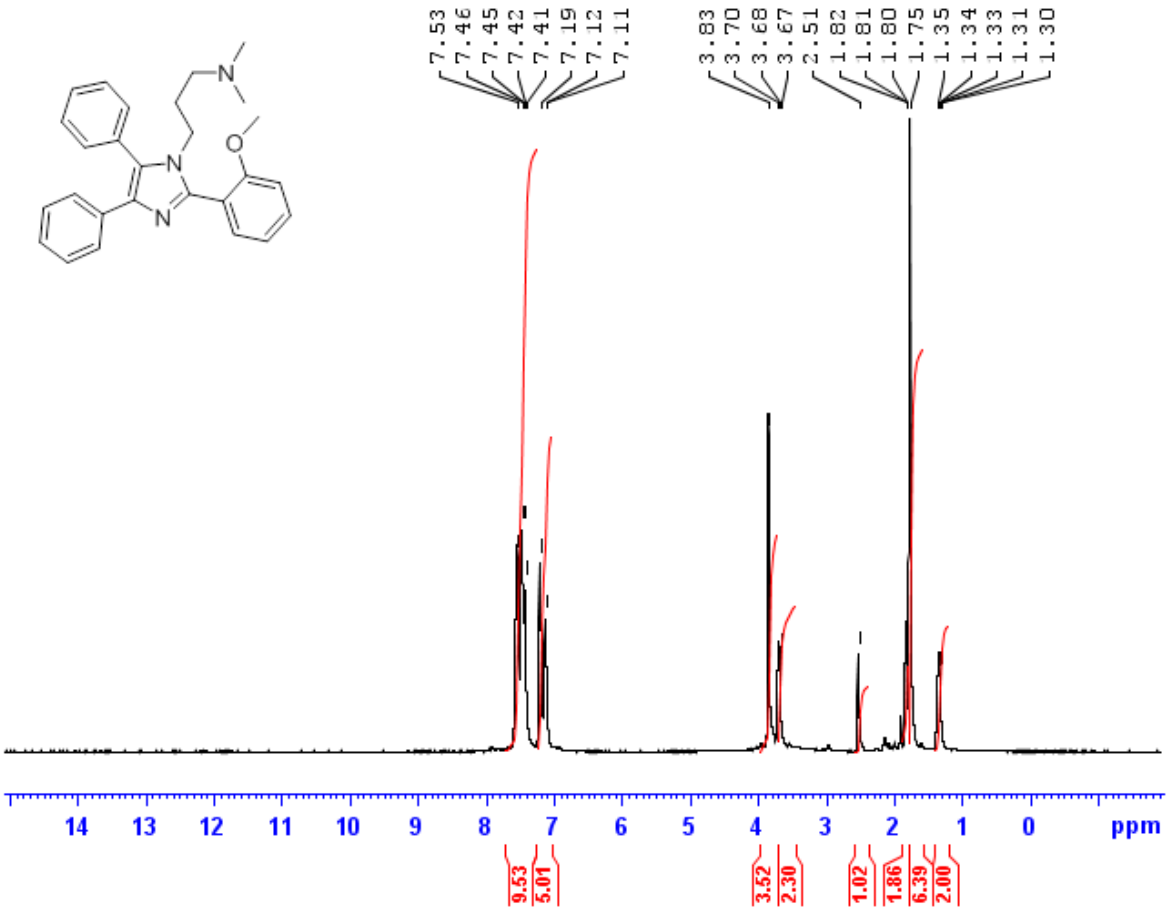
Fig. S5 : IR, ^{1}H and ^{13}C NMR spectra of 5e



T-2
proton_su DMSO {C:\nmr-data} Student 10

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Time               12.23
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                65536
SOLVENT            DMSO
NS                    20
DS                     2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894465 sec
RG                 68.22
DW                62.400 usec
DE                 6.50 usec
TE                308.2 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.1300000 MHz
WDW                    EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
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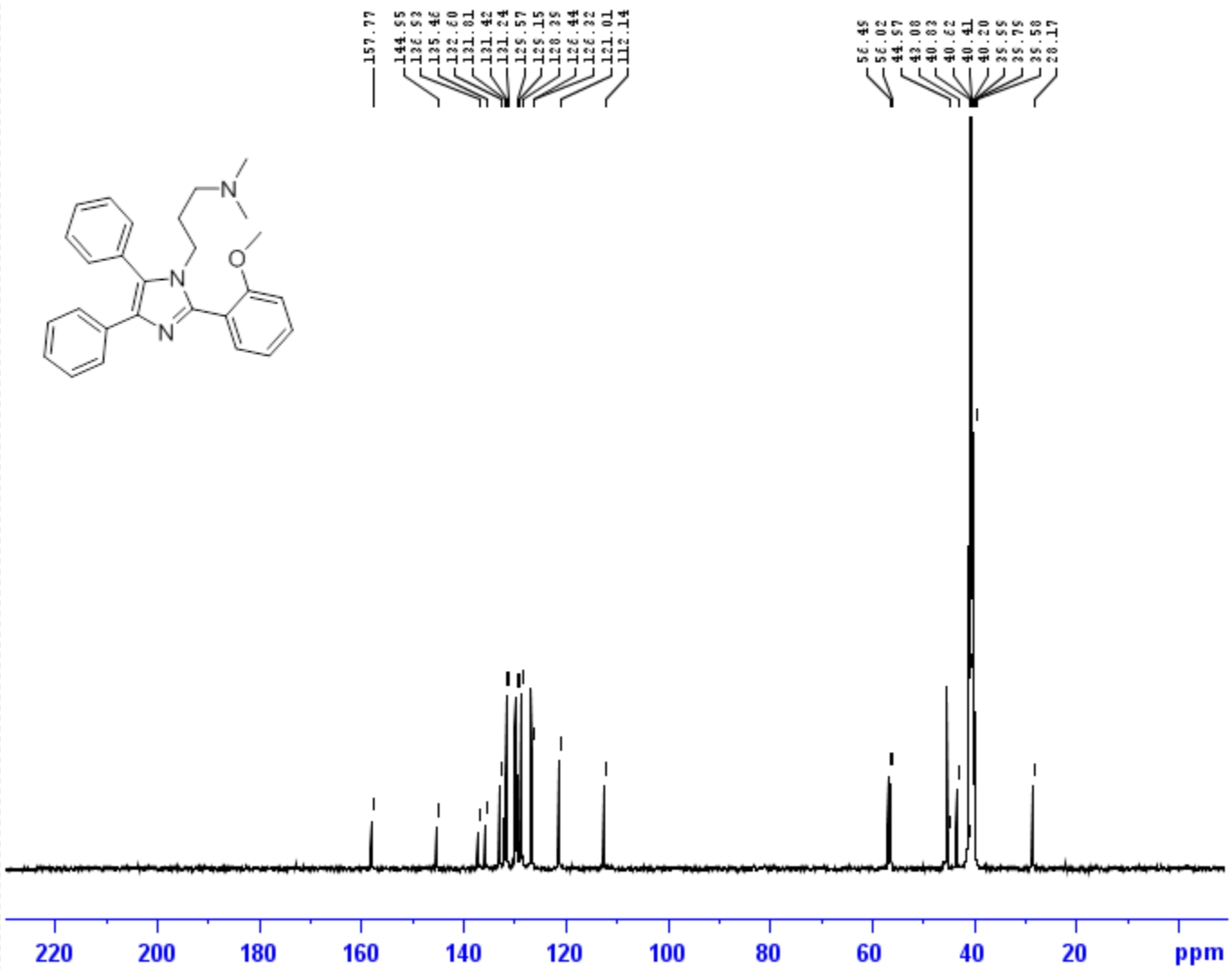
T-2
c13_su DMSO (C:\nmr-data) Student 18

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PULPROG          zgpg30
TD               65536
SOLVENT           DMSO
NS                2200
DS                   4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               199.04
DW               20.800 usec
DE                6.50 usec
TE               323.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        100.6238364 MHz
NUC1                 13C
P1                 9.50 usec
PLW1        56.00000000 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2        22.00000000 W
PLW12        0.41051001 W
PLW13        0.33284000 W

F2 - Processing parameters
SI                32768
SF          100.6127690 MHz
WDW                  EM
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LB                6.00 Hz
GB        0
PC                1.40
```
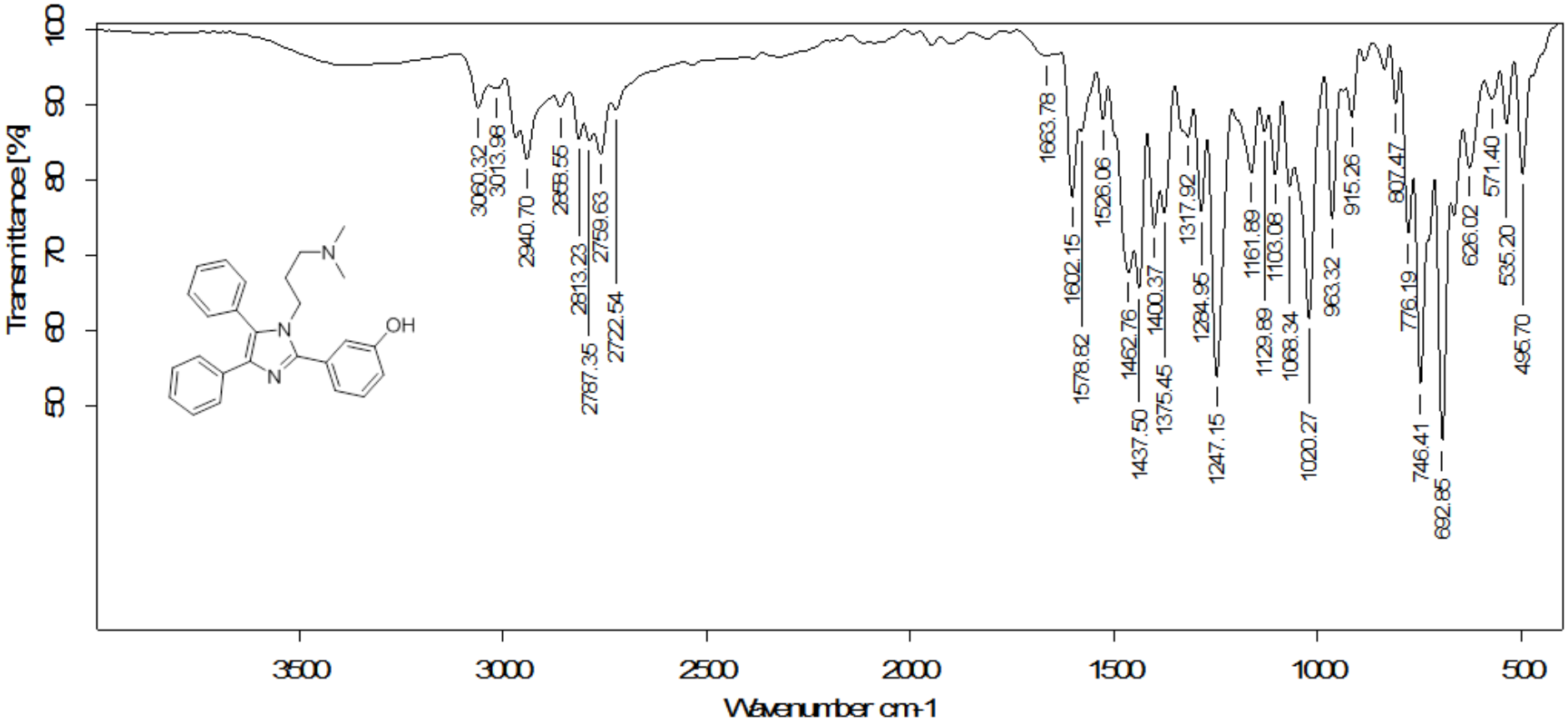

Fig. S6 : IR, ^{1}H and ^{13}C NMR spectra of 5f



T-9
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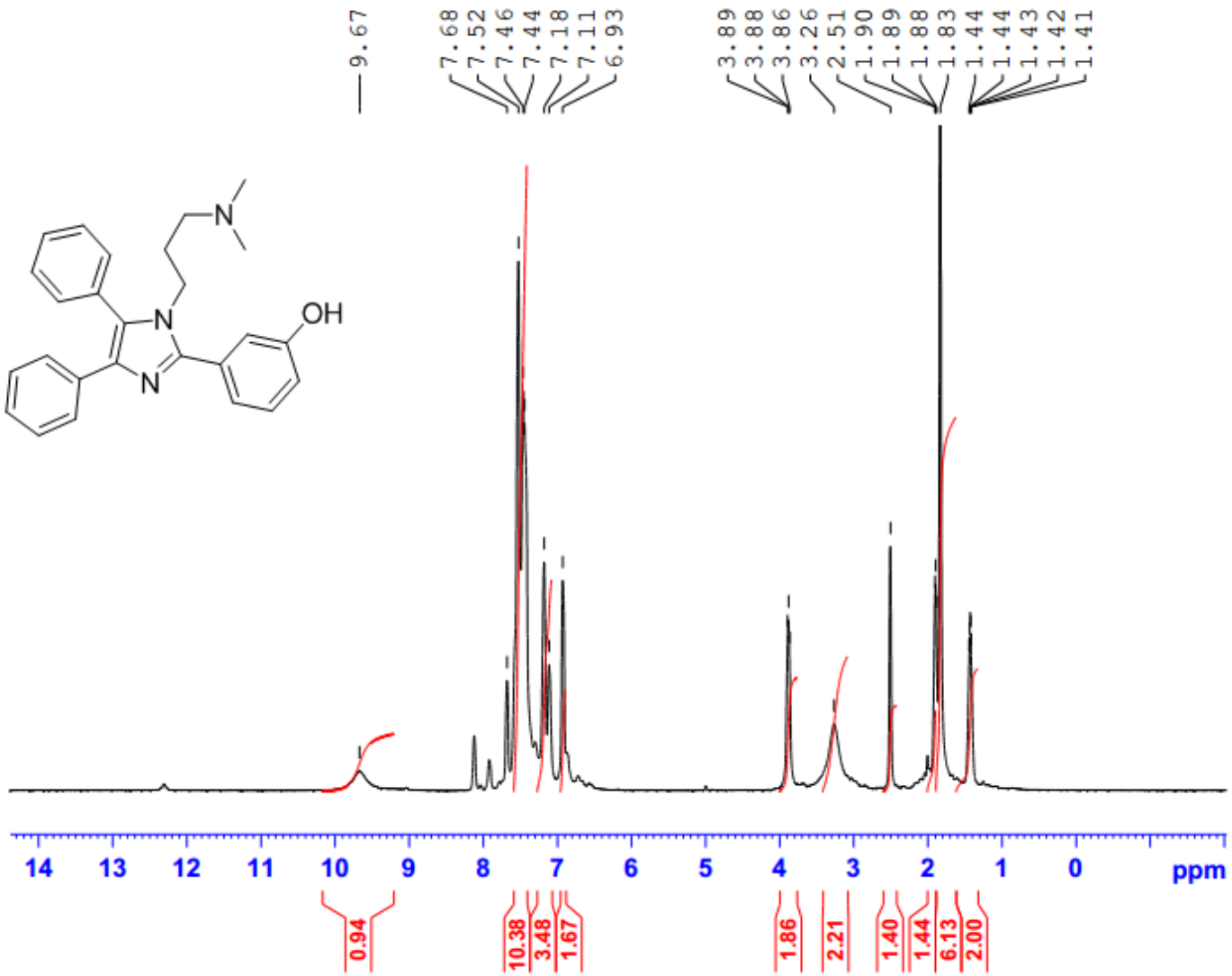


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PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                    20
DS                     2
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ           4.0894465 sec
RG               120.97
DW               62.400 usec
DE                 6.50 usec
TE                323.2 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1                12.00 usec
PLW1        22.00000000 W

F2 - Processing parameters
SI                 65536
SF          400.1300000 MHz
WDW                   EM
SSB      0
LB                 0.30 Hz
GB       0
PC                 1.00
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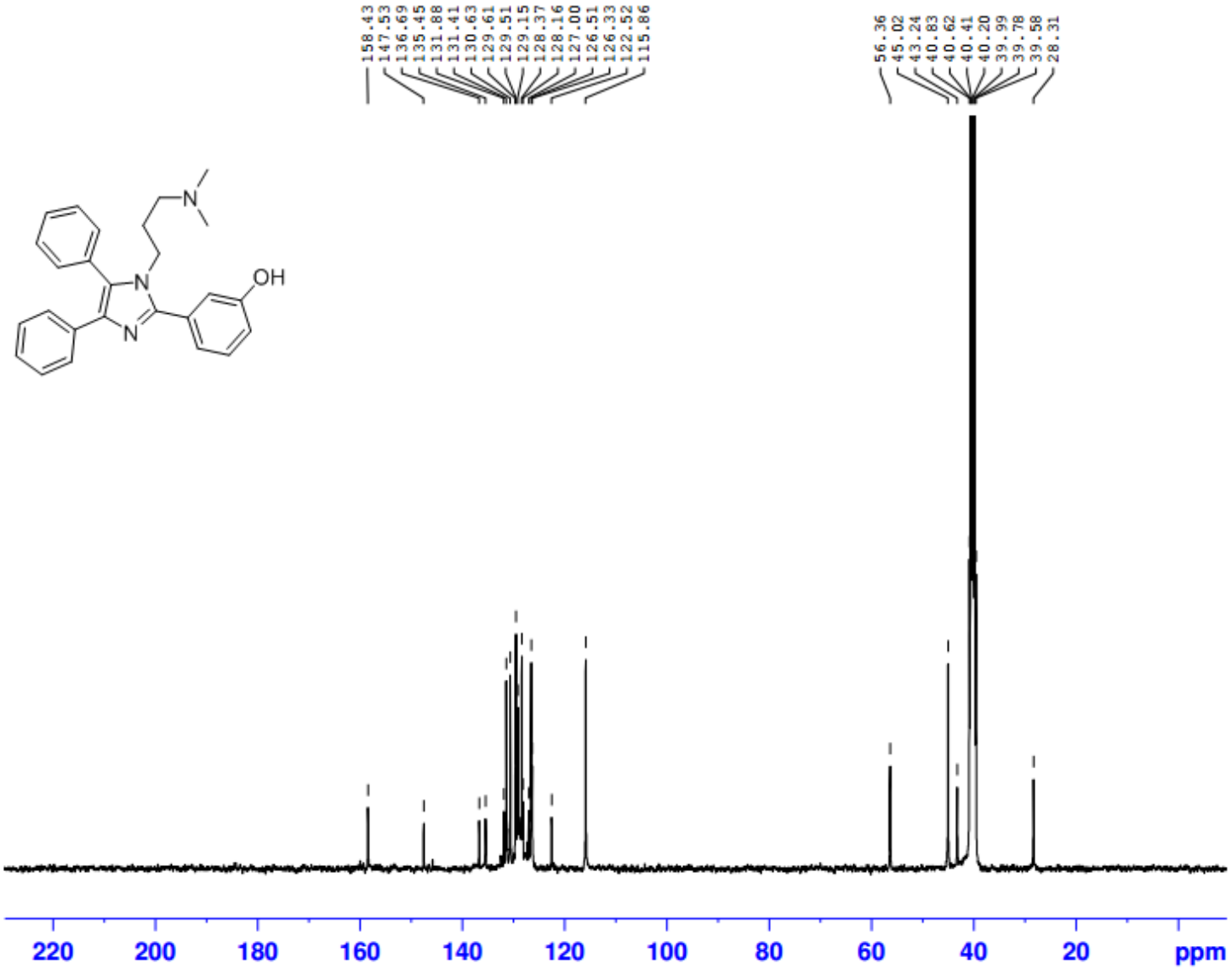
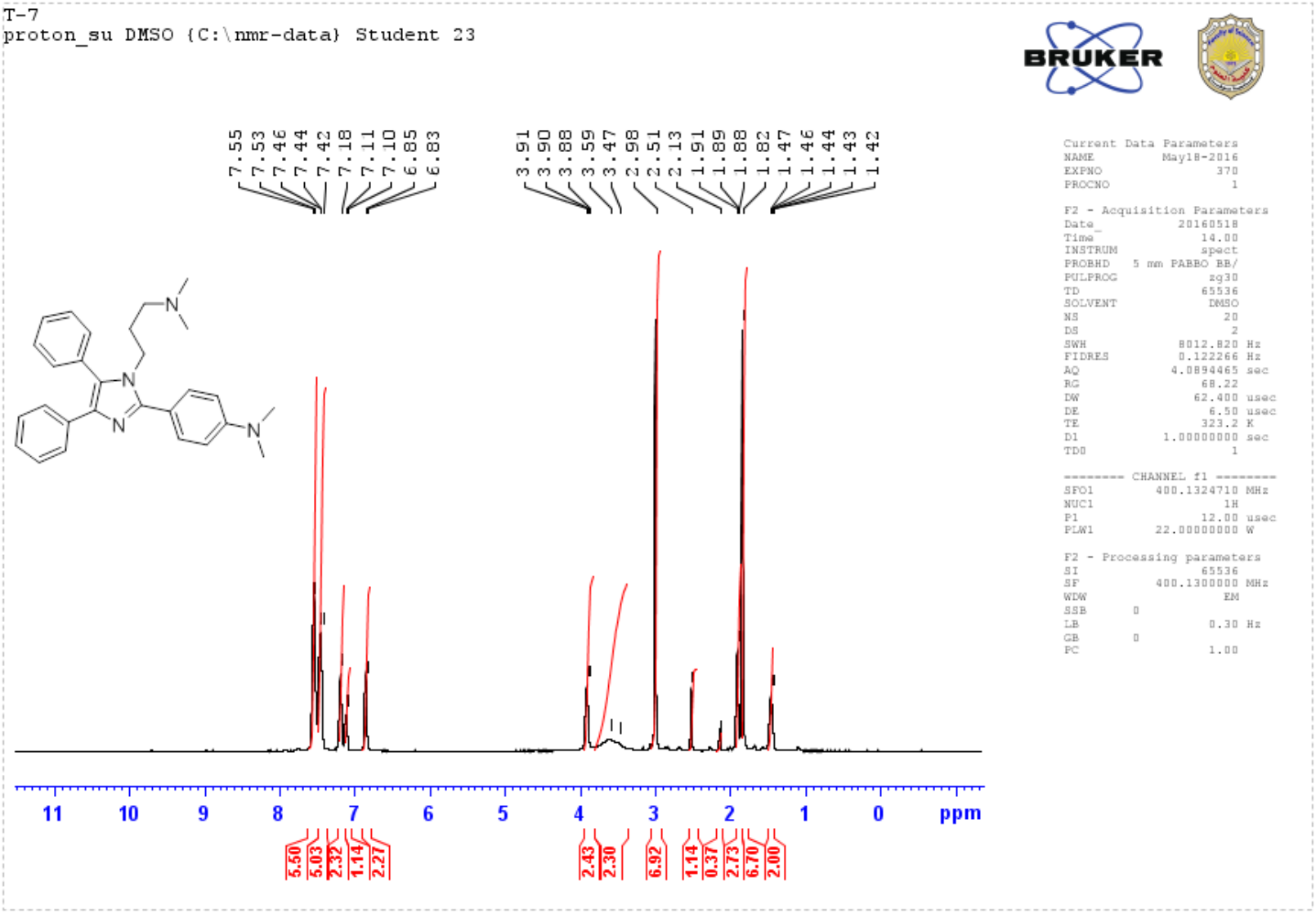
T-9
c13_su DMSO {C:\nmr-data} Student 24

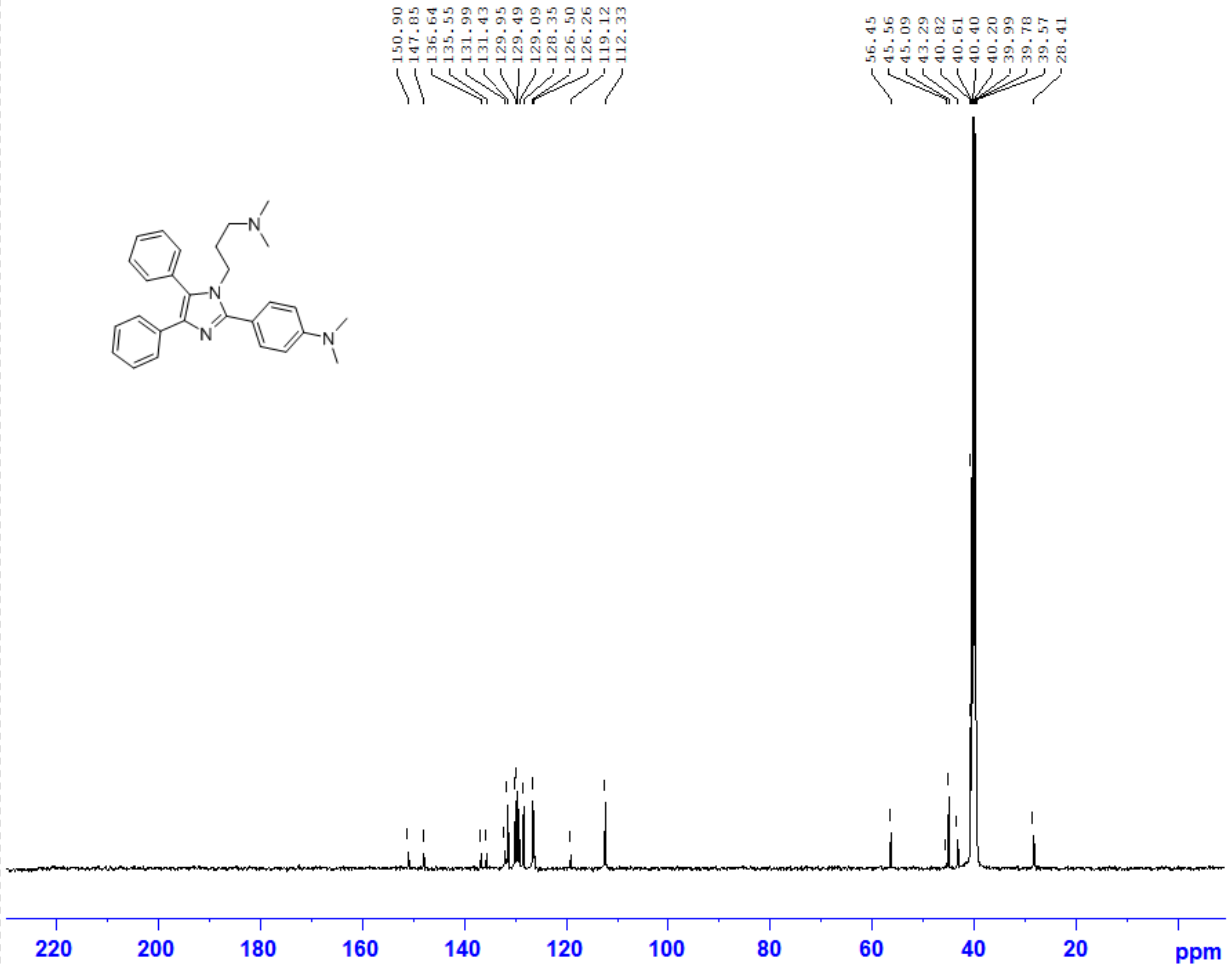



```
Current Data Parameters
NAME          May22-2016
EXPNO                240
PROCNO                 1

F2 - Acquisition Paramete
Date_           20160523
Time               21.02
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH            24038.461 H
FIDRES          0.366798 H
AQ             1.3631488 s
RG                175.84
DW                20.800 u
DE                  6.50 u
TE                 323.2 K
D1             2.00000000 s
D11            0.03000000 s
TD0                    1

-------- CHANNEL f1 -----
SFO1         100.6238364 M
NUC1                 13C
P1                  9.50 u
PLW1         56.00000000 W

-------- CHANNEL f2 -----
SFO2         400.1316005 M
NUC2                  1H
CPDPRG[2         waltz16
PCPD2              90.00 u
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing parameter
SI                 32768
SF          100.6127690 M
WDW                   EM
SSB       0
LB                  6.00 H
GB        0
PC                  1.40
```

Fig. S7 : ^{1}H and ^{13}C NMR spectra of 5g

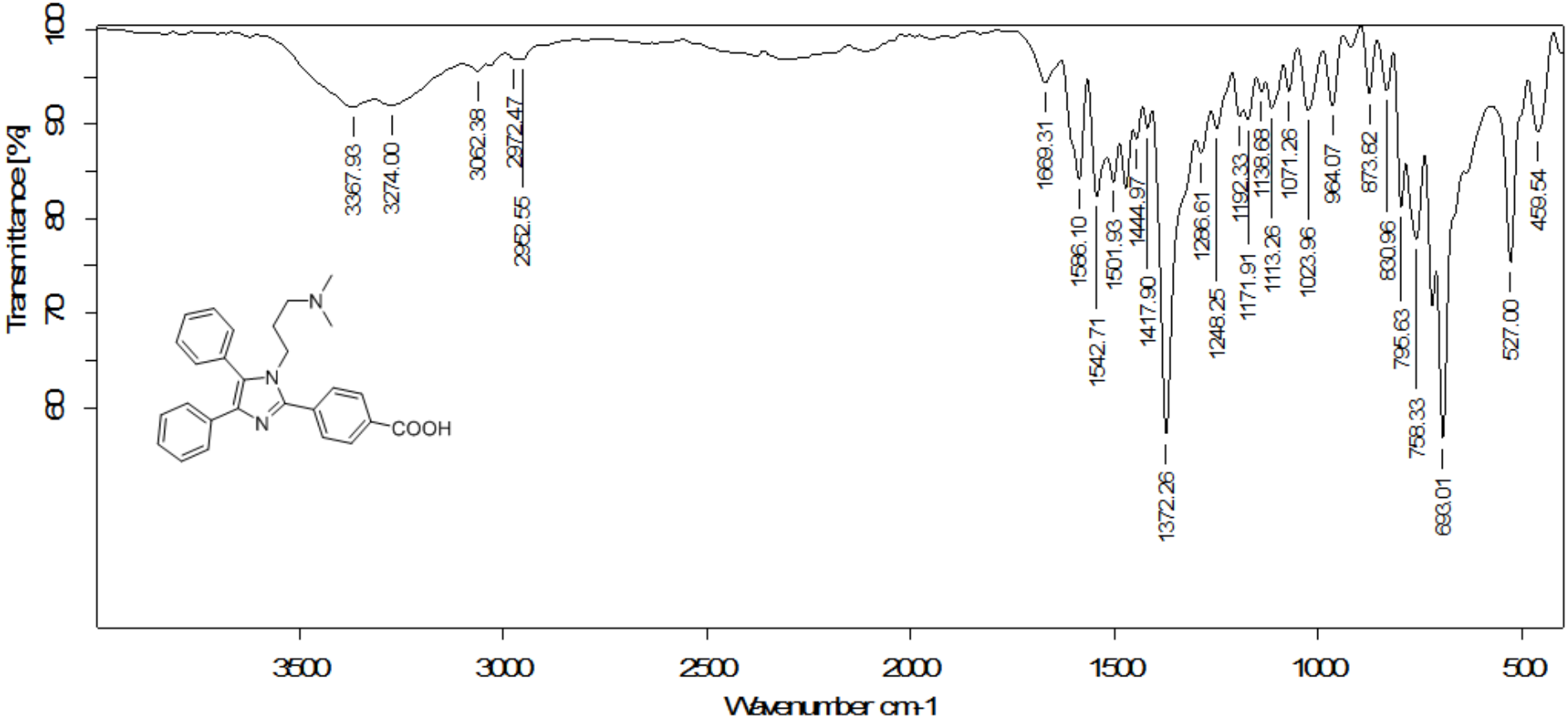


T-7
c13_su DMSO {C:\nmr-data} Student 22

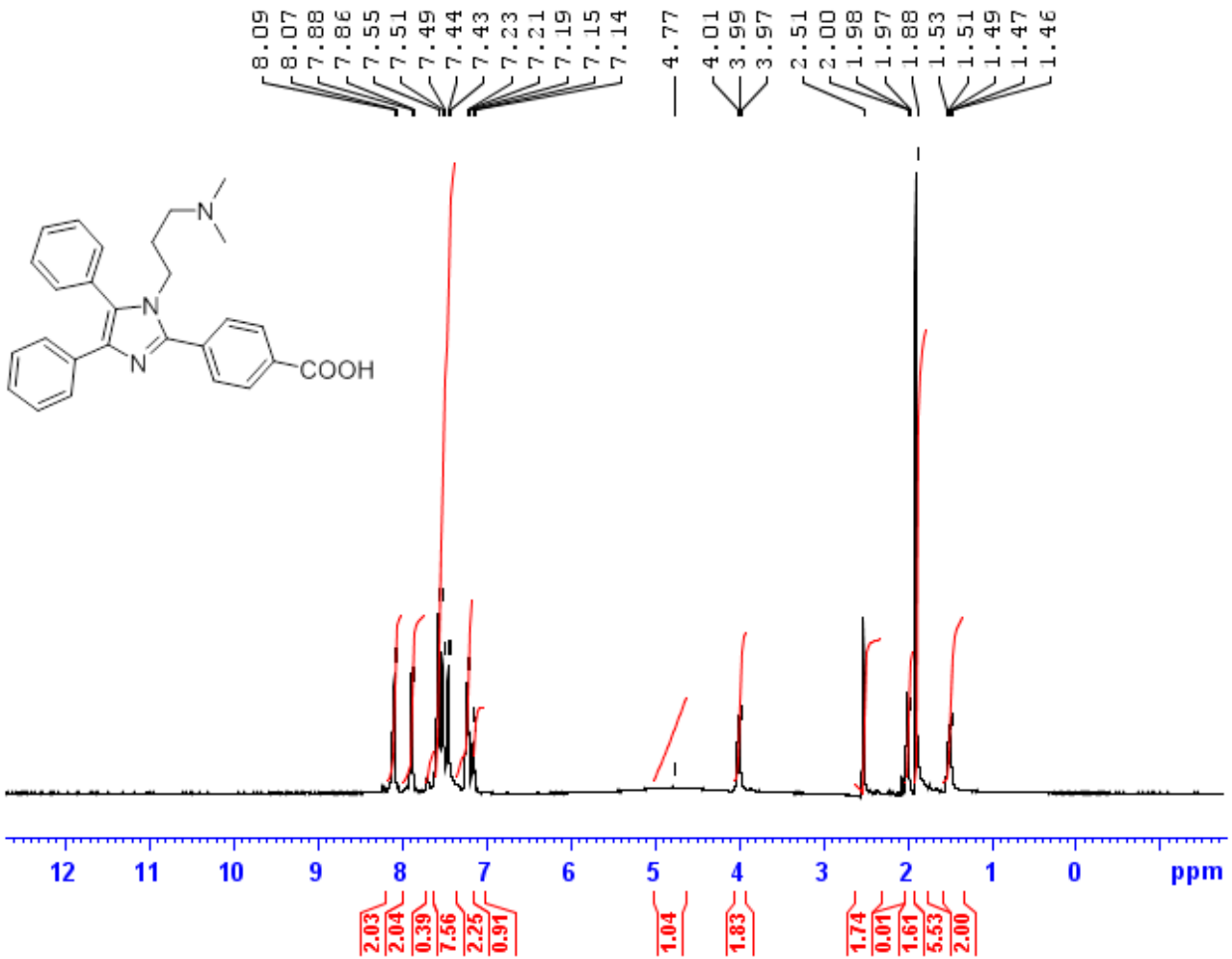



```
Current Data Parameters
NAME          May22-2016
EXPNO                210
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160523
Time               16.41
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                100.43
DW                20.800 usec
DE                  6.50 usec
TE                 323.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
PLW1         56.00000000 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing parameters
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB       0
LB                  6.00 Hz
GB        0
PC                  1.40
```

Fig. S8 : IR, ^{1}H and ^{13}C NMR spectra of 5h

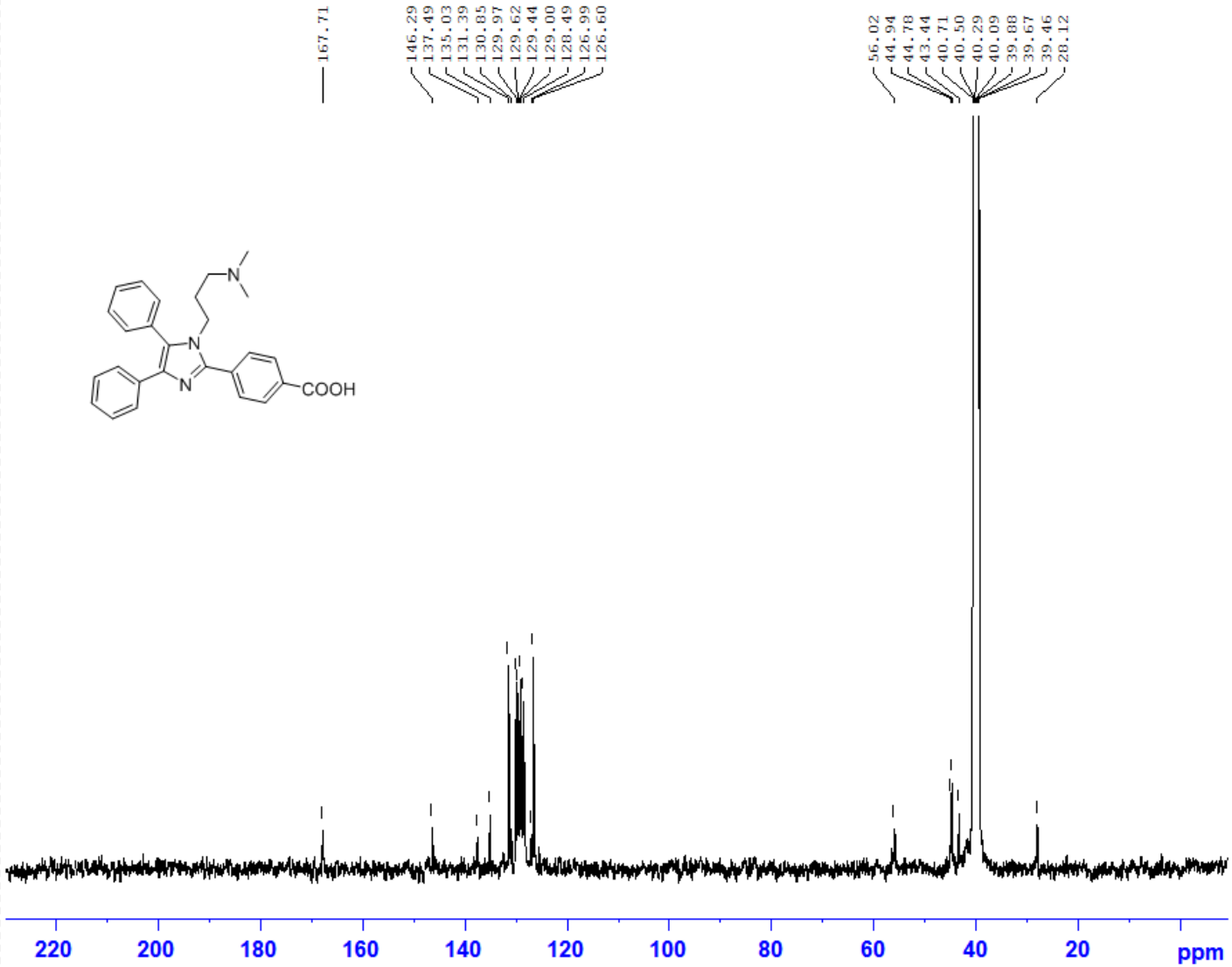


T-10
proton_su DMSO {C:\nmr-data} Student 11



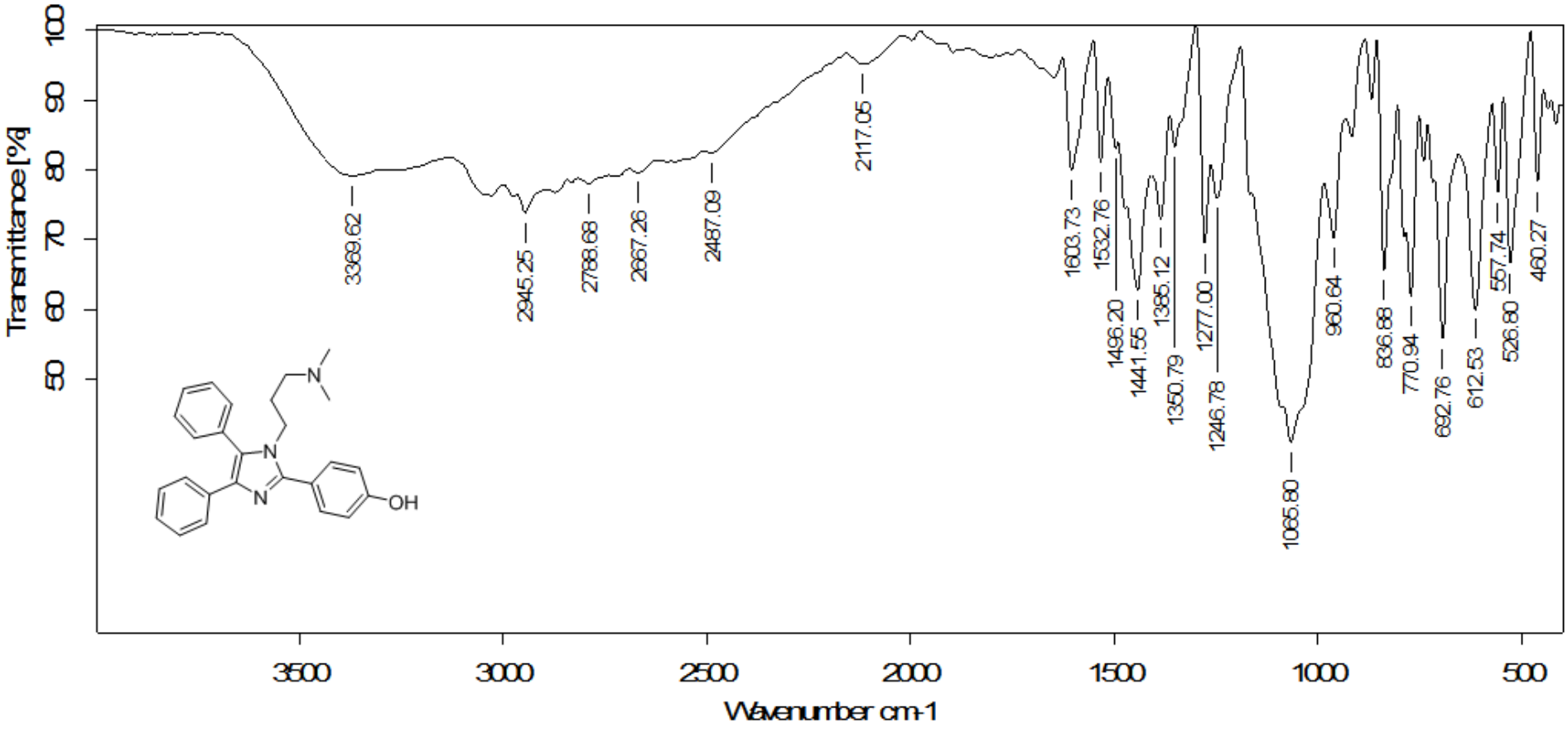

```
Current Data Parameters
NAME          Jun01-2016
EXPNO                110
PROCNO                 1

F2 - Acquisition Parameters
Date_            20160601
Time               12.43
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                    20
DS                     2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894465 sec
RG                158.76
DW                62.400 usec
DE                  6.50 usec
TE                 308.1 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.1300000 MHz
WDW                   EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
```

T-10
c13_su DMSO {C:\nmr-data} Student 17

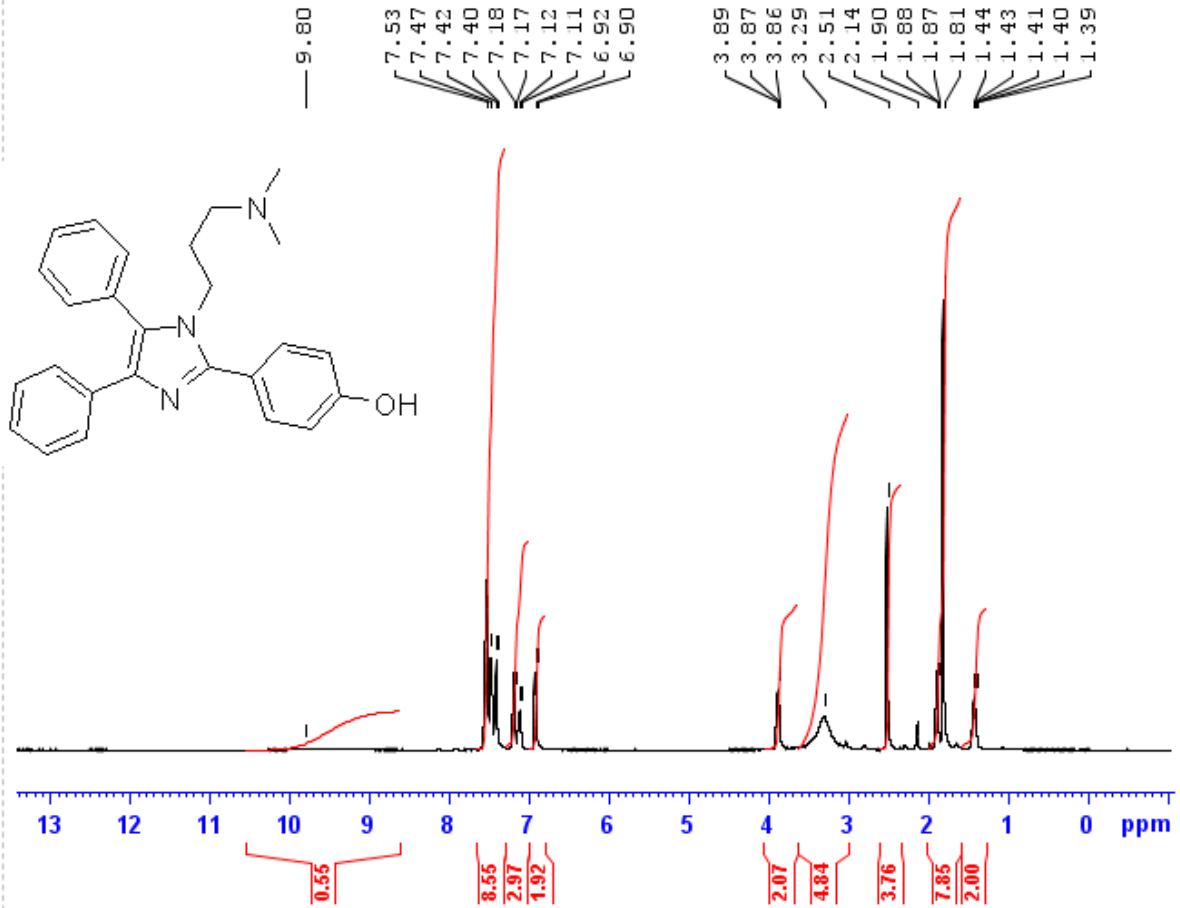



```
Current Data Parameters
NAME          Jun20-2016
EXPNO                150
PROCNO                 1

F2 - Acquisition Parameters
Date_            20160620
Time               15.31
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ           1.3631488 sec
RG              175.84
DW              20.800 usec
DE                6.50 usec
TE               313.1 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
PLW1        56.00000000 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2        22.00000000 W
PLW12        0.41091001 W
PLW13        0.33284000 W

F2 - Processing parameters
SI                32768
SF          100.6127690 MHz
WDW                  EM
SSB       0
LB                6.00 Hz
GB        0
PC                1.40
```

Fig. S9 : IR, ^{1}H and ^{13}C NMR spectra of 5i

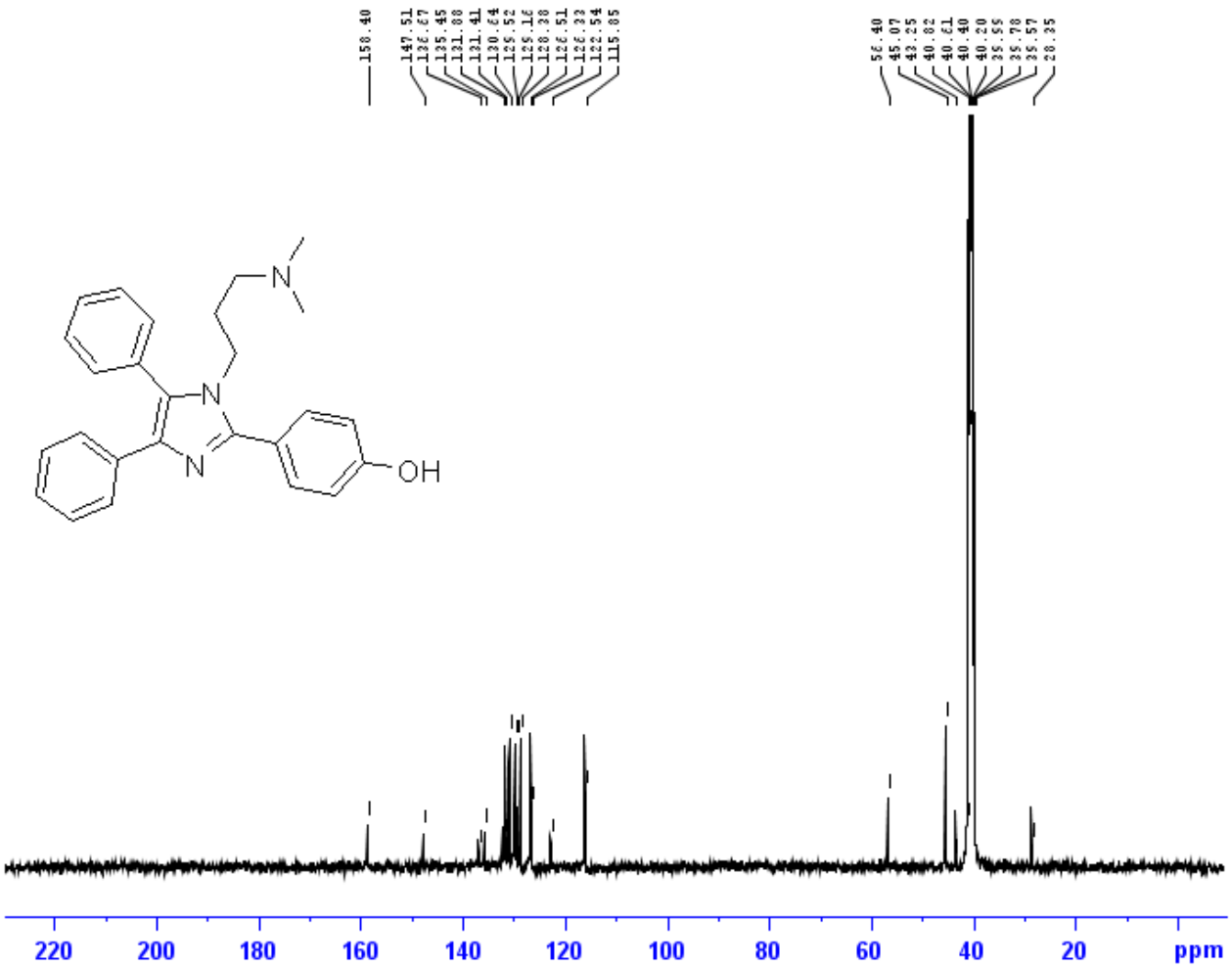


T-12
proton_su DMSO {C:\nmr-data} Student 4



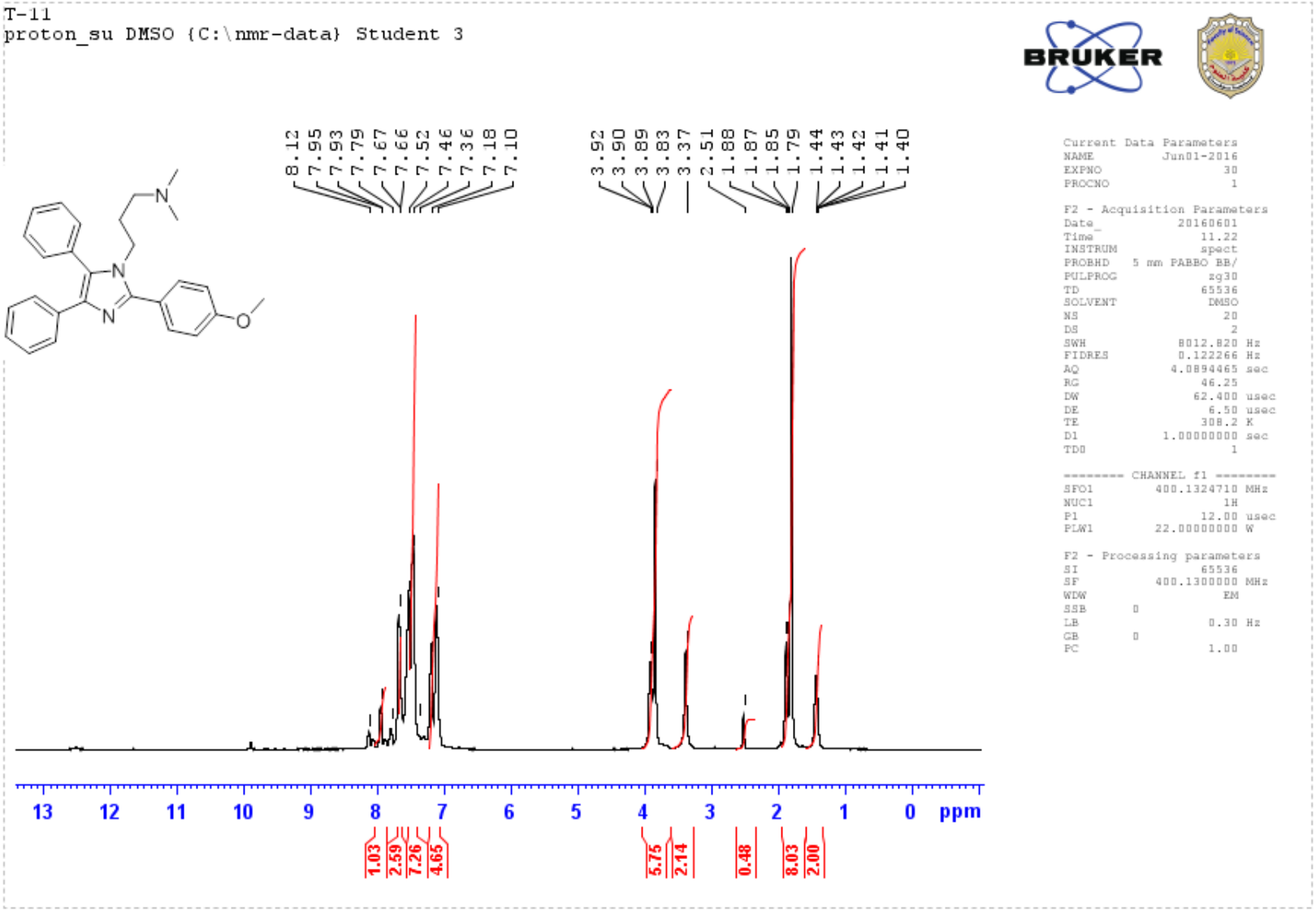

```
Current Data Parameters
NAME          Jun01-2016
EXPNO                 40
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160601
Time               11.35
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                65536
SOLVENT            DMSO
NS                   100
DS                     2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894465 sec
RG               199.04
DW               62.400 usec
DE                 6.50 usec
TE                308.1 K
D1             1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                65536
SF           400.1300000 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```

T-12
c13_su DMSO {C:\nmr-data} Student 20

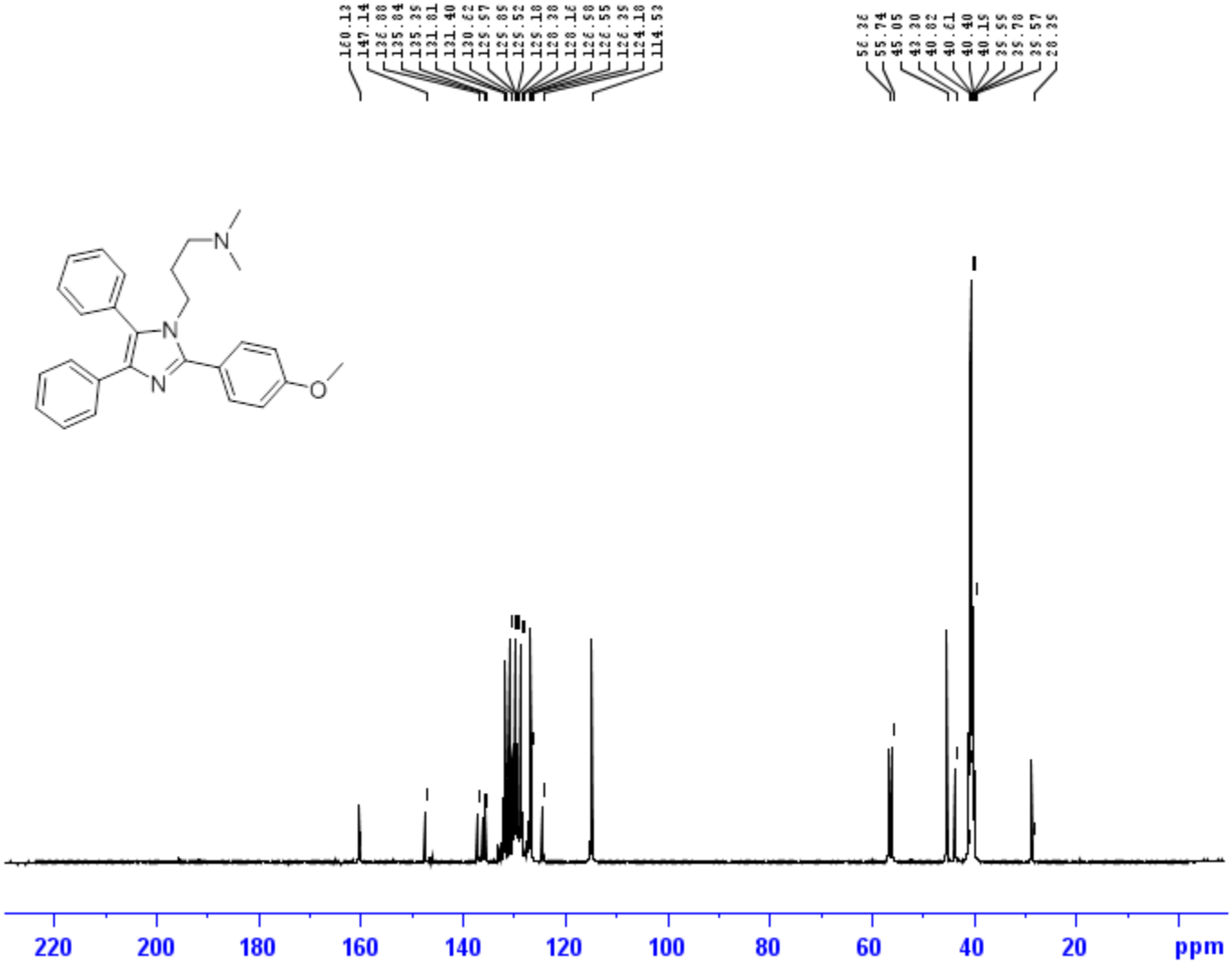



```
Current Data Parameters
NAME          Jun13-2016
EXPNO                130
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160613
Time               21.39
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                199.04
DW                20.800 usec
DE                 6.50 usec
TE                 323.2 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
PLW1         56.00000000 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                  1H
CPDPRG[2          waltz16
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB       0
LB                 6.00 Hz
GB        0
PC                 1.40
```

Fig. S10 : ^{1}H and ^{13}C NMR spectra of 5j



T-11
c13_su DMSO (C:\nmr-data) Student 19



Current Data Parameters
NAME Jun13-2016
EXPNO 120
PROCNO 1

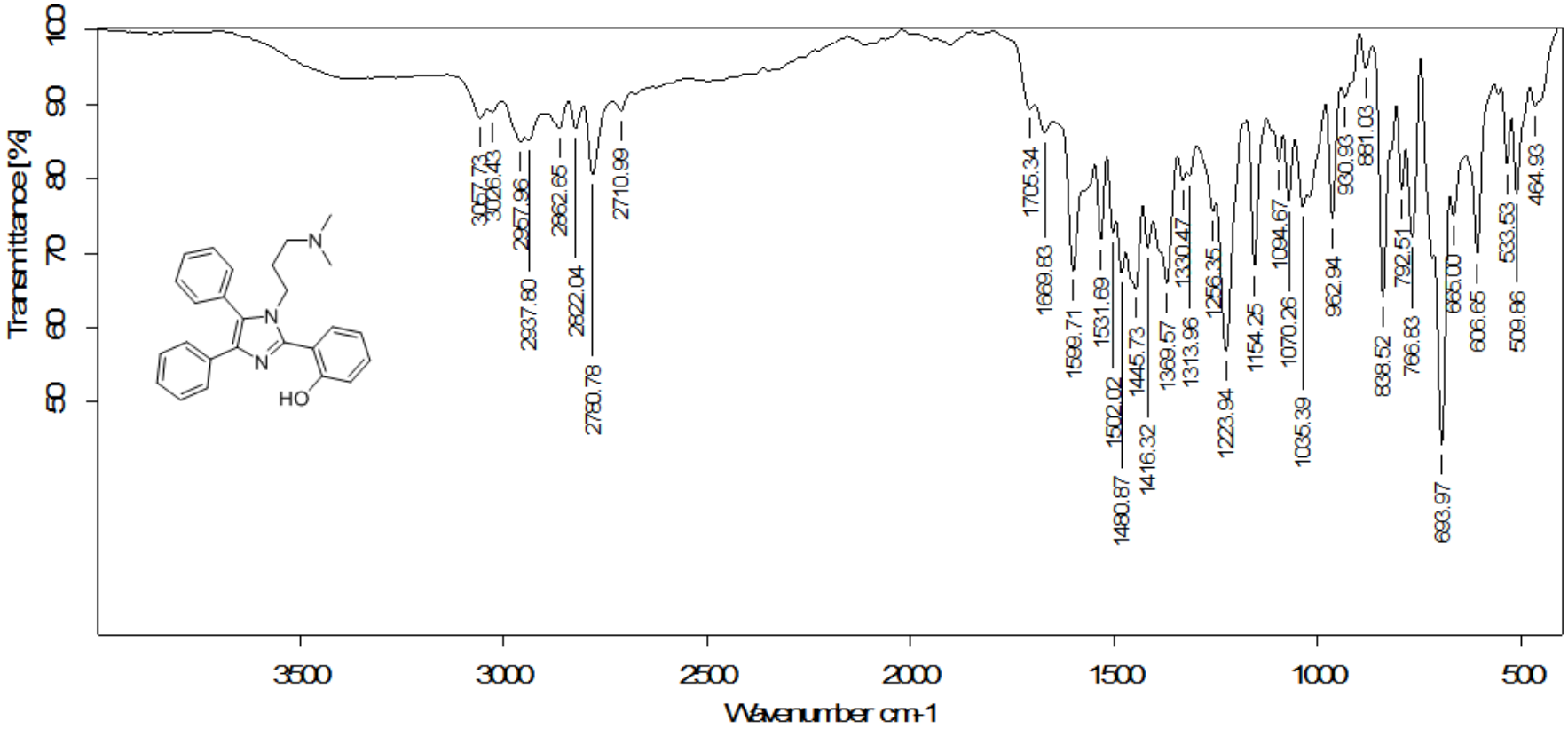
F2 - Acquisition Parameters
Date_ 20160613
Time 19.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT DMSO
NS 2200
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631488 sec
RG 175.84
DW 20.800 usec
DE 6.50 usec
TE 323.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6238364 MHz
NUC1 13C
P1 9.50 usec
PLW1 56.00000000 W

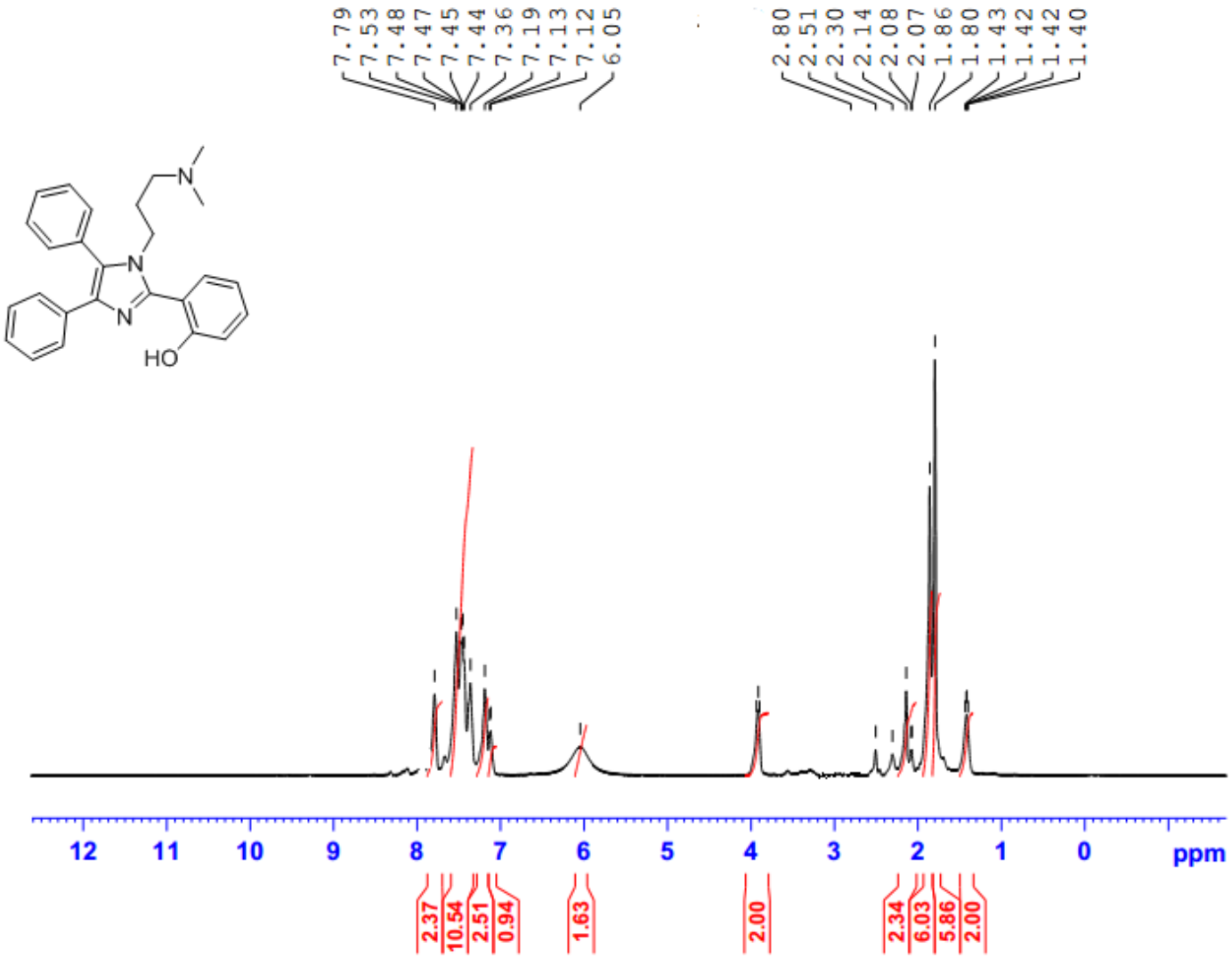
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 22.00000000 W
PLW12 0.41091001 W
PLW13 0.33284000 W

F2 - Processing parameters
SI 32768
SF 100.6127690 MHz
WDW EM
SSB 0
LB 6.00 Hz
GB 0
PC 1.40

Fig. S11 : IR, ^{1}H, and ^{13}C NMR spectra of 5k

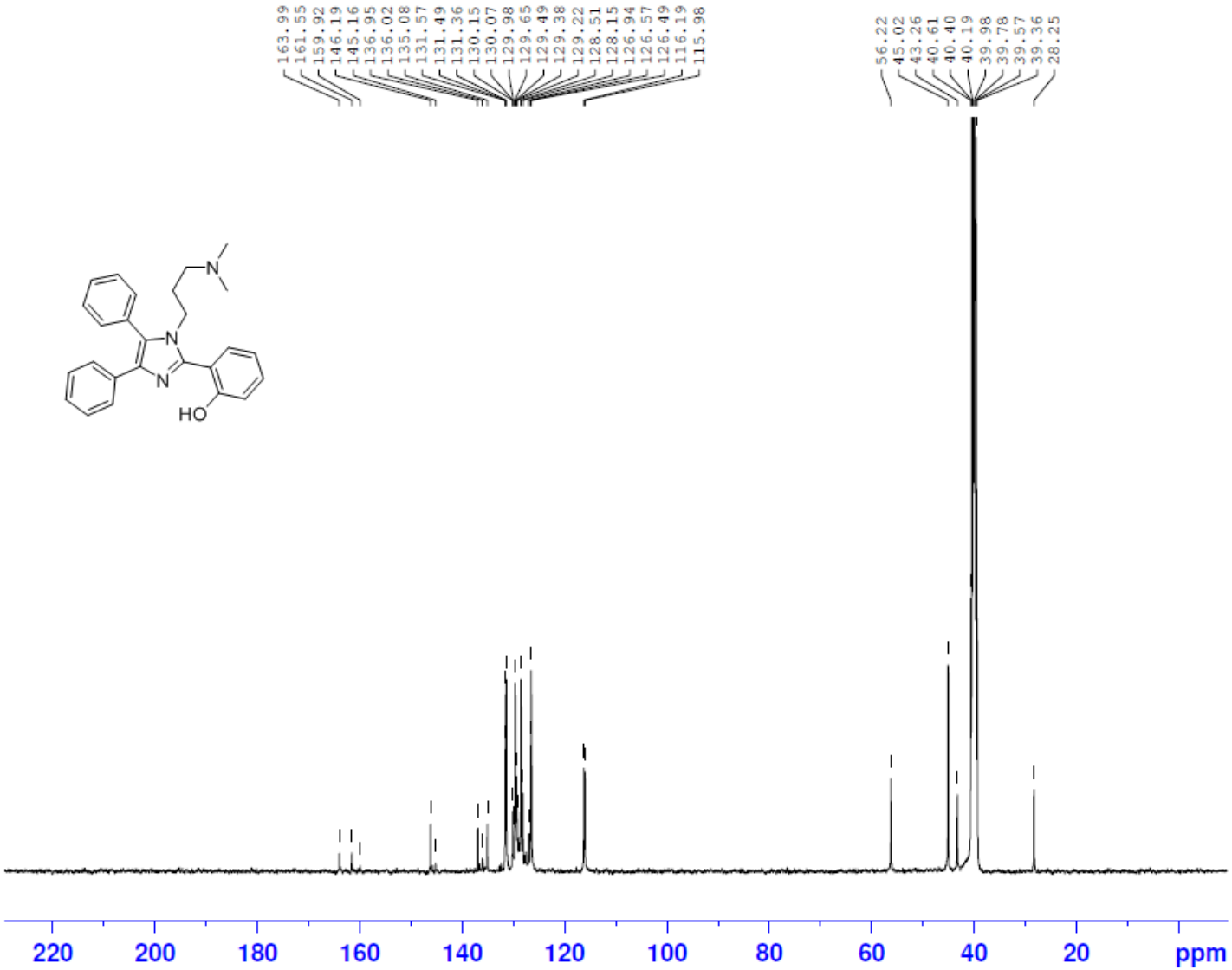


T-1
proton_su DMSO {C:\nmr-data} Student 9



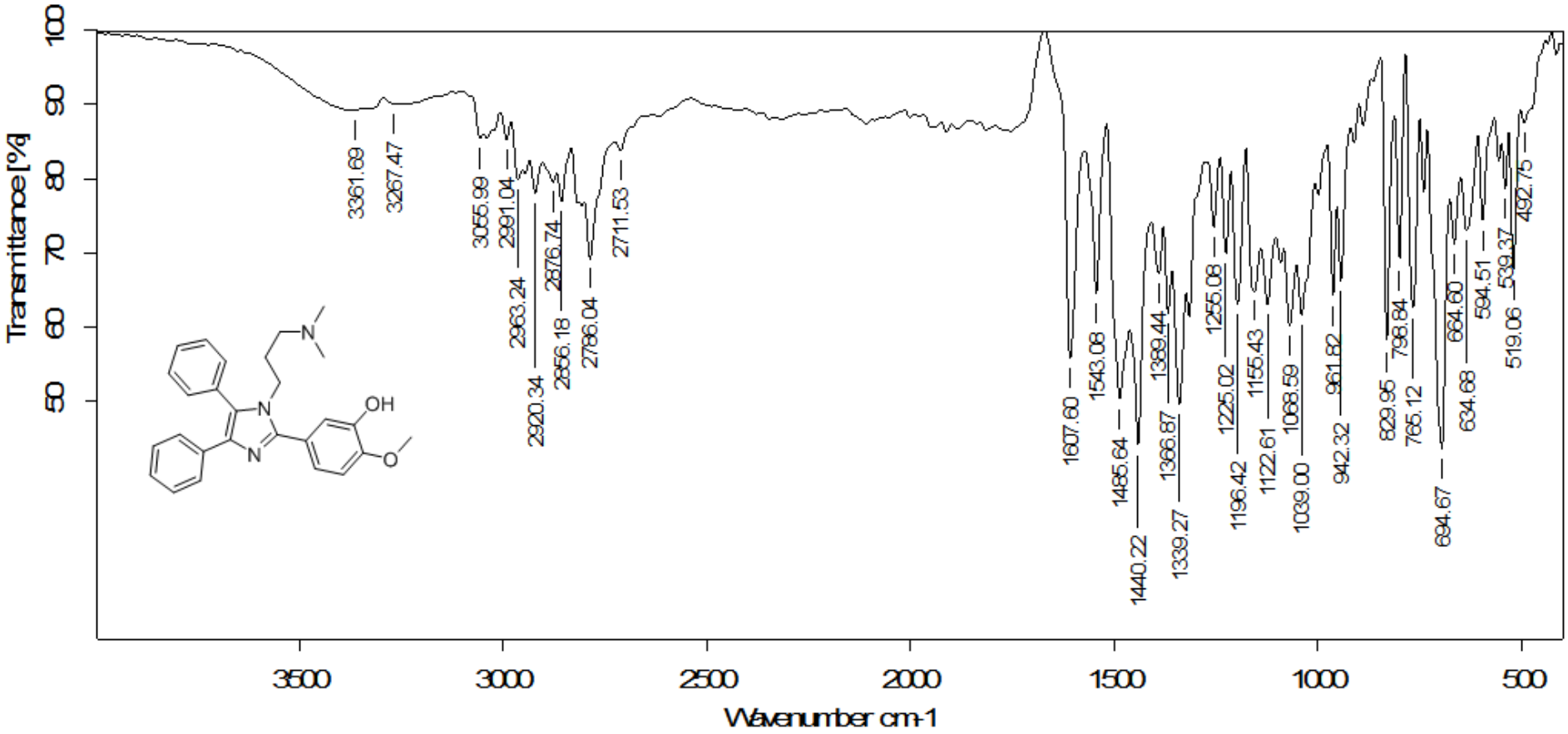

```
Current Data Parameters
NAME          Jun01-2016
EXPNO                 90
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160601
Time               12.18
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                     20
DS                      2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ            4.0894465 sec
RG                 24.76
DW                62.400 usec
DE                 6.50 usec
TE                308.2 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.1300000 MHz
WDW                    EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
```

T-1
c13_su DMSO {C:\nmr-data} Student 13

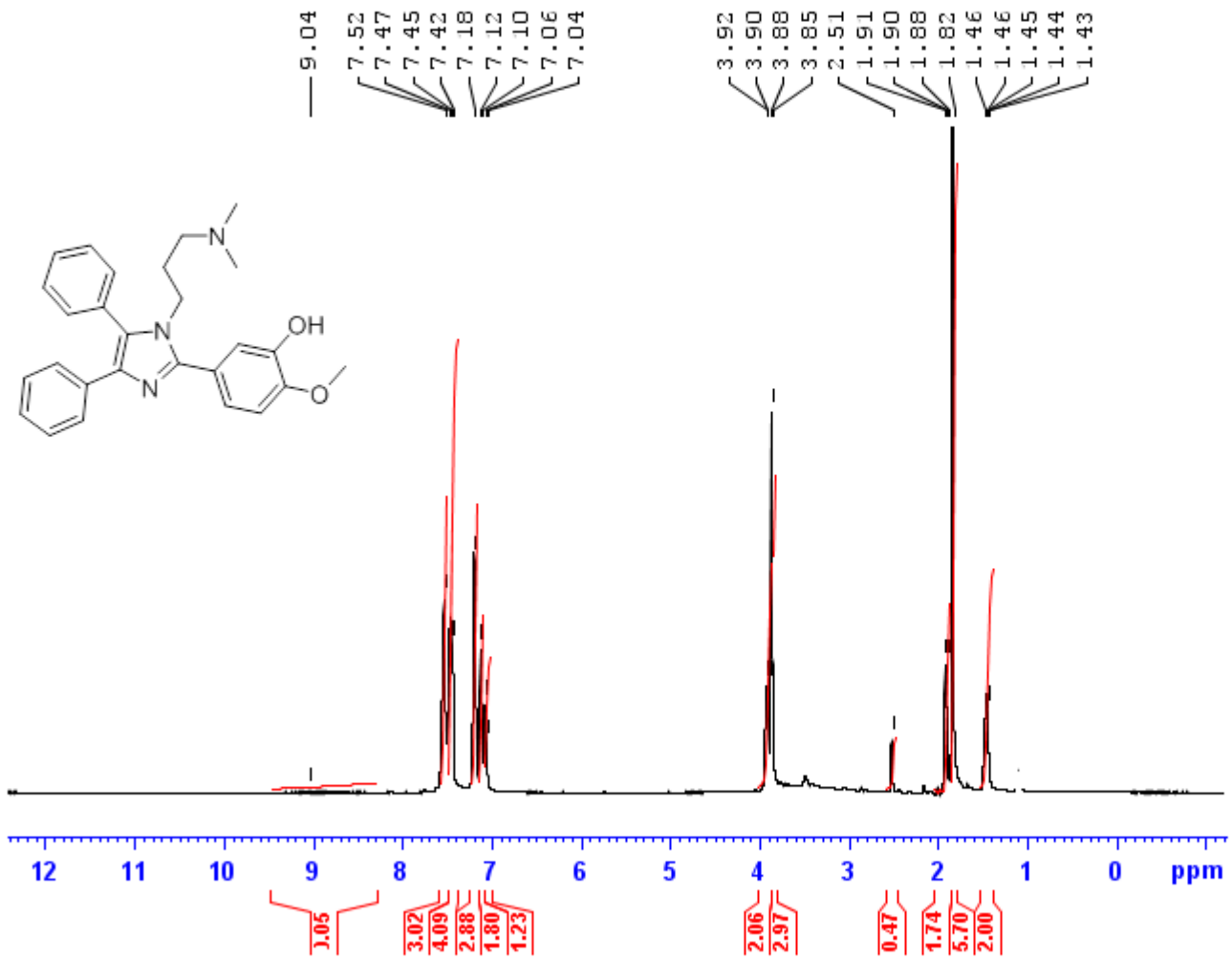



```
Current Data Parameters
NAME          Aug24-2016
EXPNO                120
PROCNO                 1

F2 - Acquisition Paramete
Date_           20160824
Time              20.51
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH           24038.461 H
FIDRES         0.366798 H
AQ            1.3631488 s
RG               100.43
DW               20.800 u
DE                 6.50 u
TE                295.9 K
D1            2.00000000 s
D11           0.03000000 s
TD0                    1

======== CHANNEL f1 =====
SFO1        100.6238364 M
NUC1                13C
P1                 9.50 u
PLW1        56.00000000 W

======== CHANNEL f2 =====
SFO2        400.1316005 M
NUC2                 1H
CPDPRG[2         waltz16
PCPD2             90.00 u
PLW2        22.00000000 W
PLW12        0.41091001 W
PLW13        0.33284000 W

F2 - Processing paramete
SI                32768
SF          100.6127690 M
WDW                  EM
SSB       0
LB                6.00 H
GB        0
PC                1.40
```

Fig. S12 : IR, ^{1}H, ^{13}C NMR and dept-135 spectra of 5l

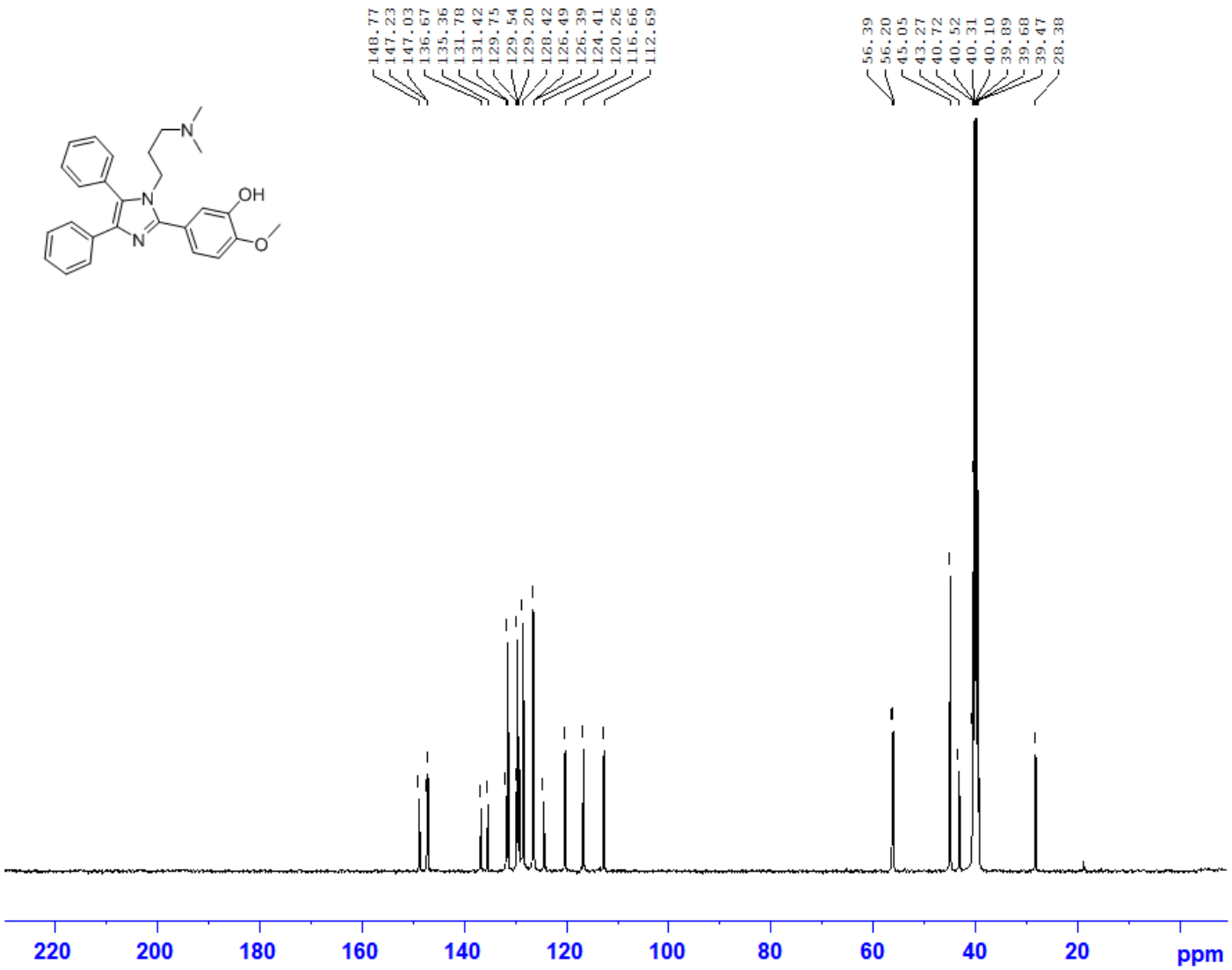


T-5
proton_su DMSO {C:\nmr-data} Student 22



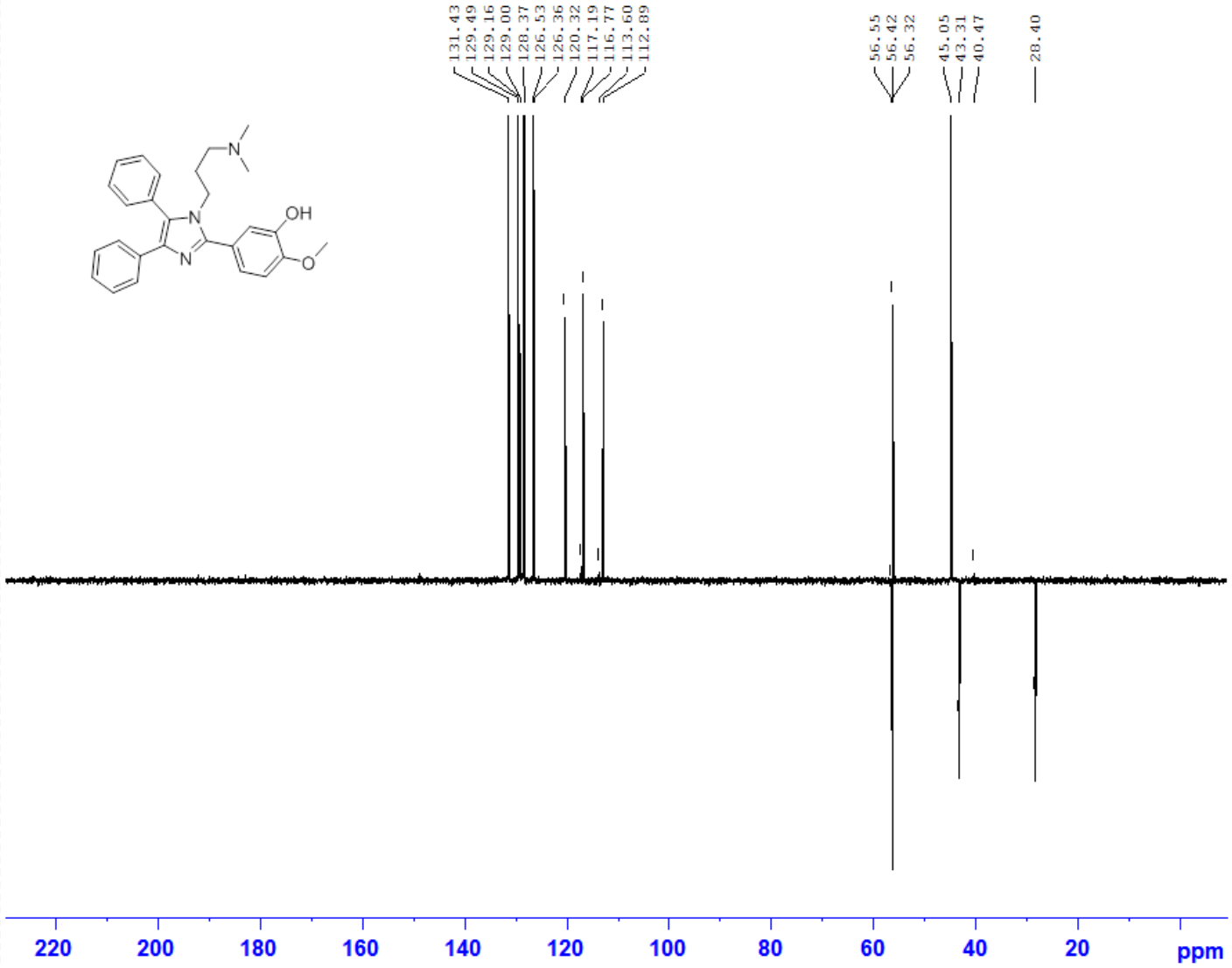

```
Current Data Parameters
NAME          May18-2016
EXPNO                360
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160518
Time               13.55
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                     20
DS                      2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894465 sec
RG                 68.22
DW                62.400 usec
DE                 6.50 usec
TE                323.2 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                 65536
SF           400.1300000 MHz
WDW                    EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
```

T-5
c13_su DMSO {C:\nmr-data} Student 21



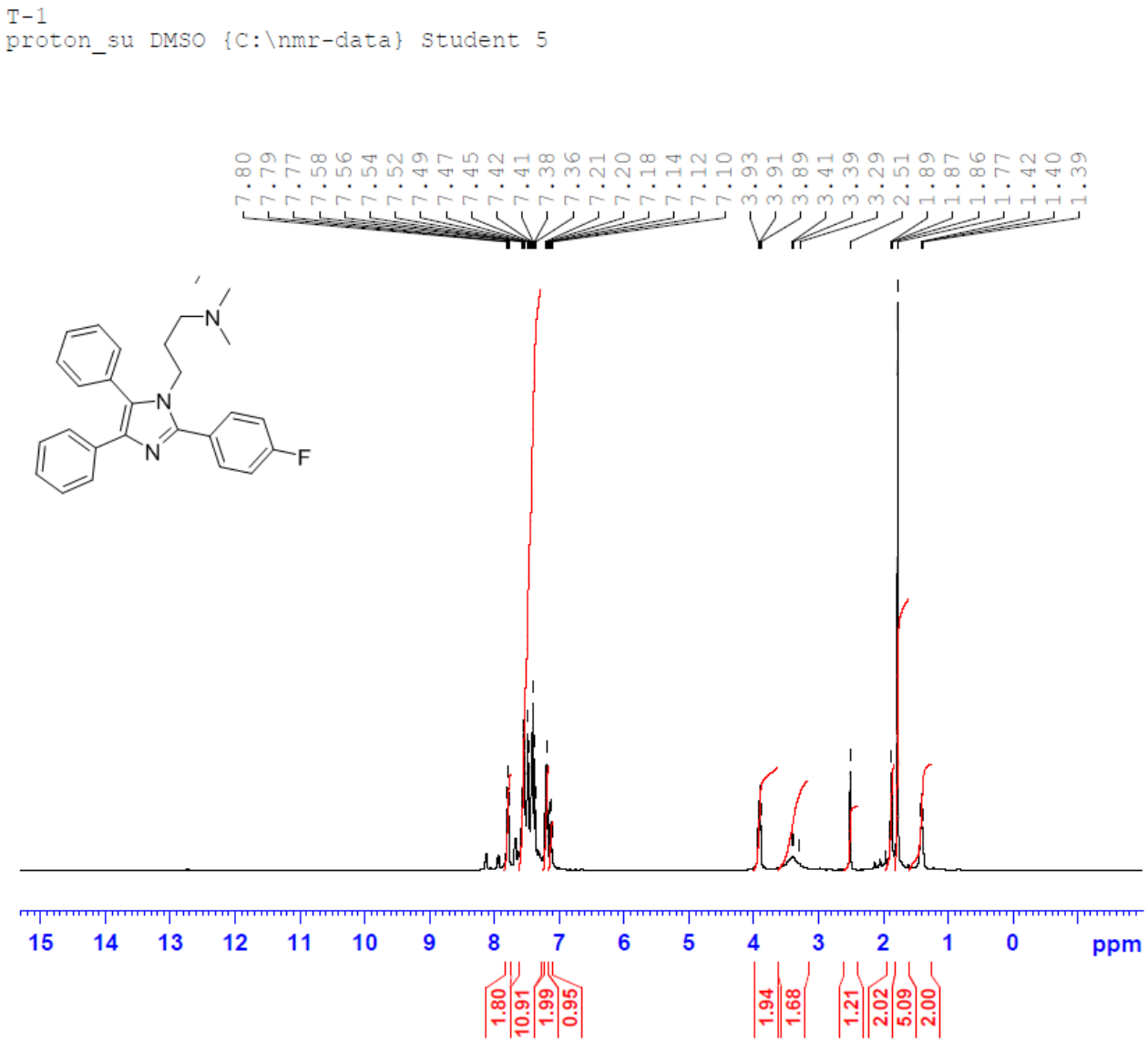

```
Current Data Parameters
NAME          May22-2016
EXPNO                200
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160523
Time               14.32
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               100.43
DW               20.800 usec
DE                 6.50 usec
TE                313.1 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        100.6238364 MHz
NUC1                13C
P1                 9.50 usec
PLW1        56.00000000 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                 1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2        22.00000000 W
PLW12        0.41091001 W
PLW13        0.33284000 W

F2 - Processing parameters
SI                32768
SF          100.6127690 MHz
WDW                  EM
SSB      0
LB                6.00 Hz
GB       0
PC                1.40
```

T-5
dept135_su DMSO {C:\nmr-data} Student 19



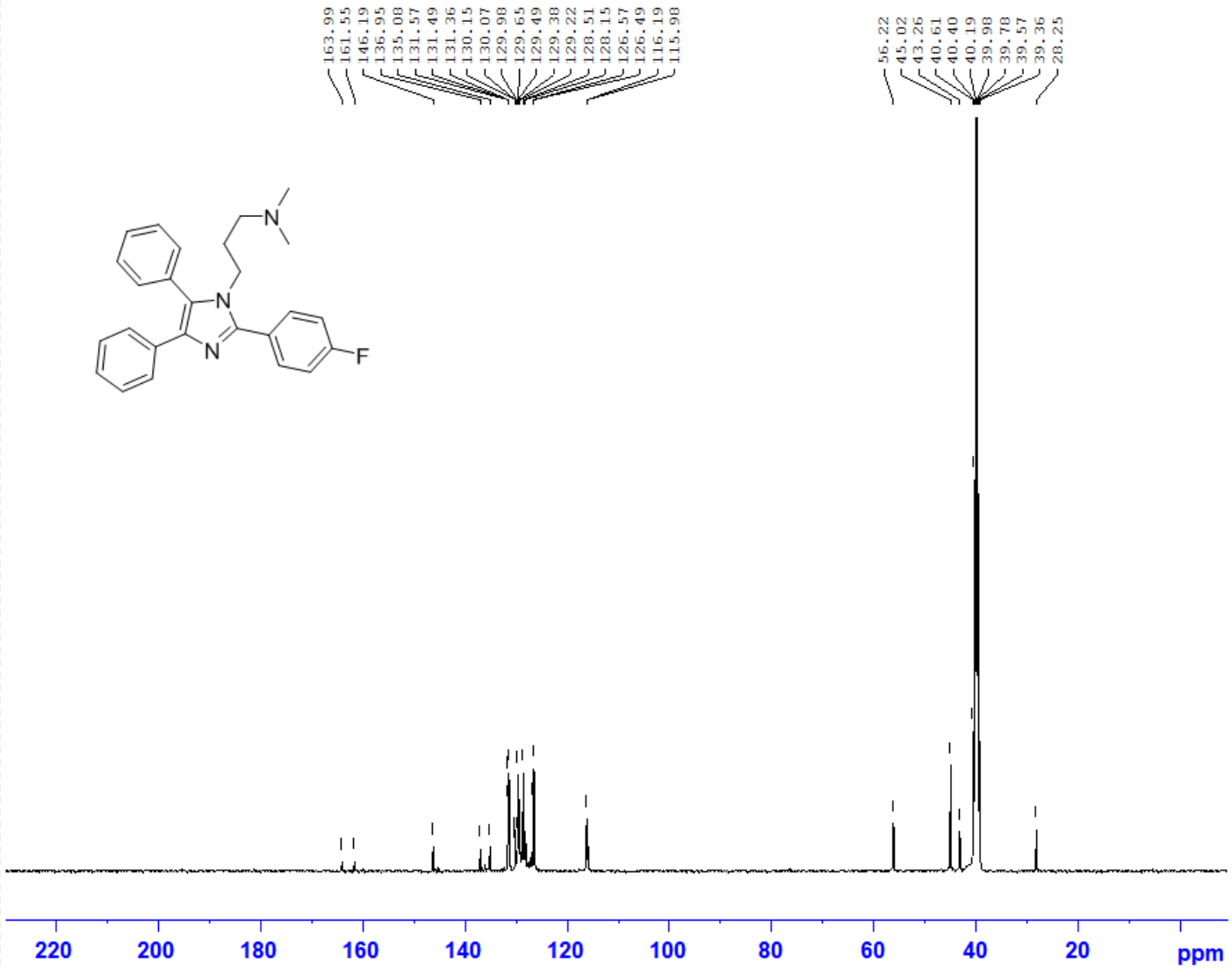

```
Current Data Parameters
NAME          May29-2016
EXPNO                390
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160529
Time               23.53
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG        deptsp135
TD                 65536
SOLVENT             DMSO
NS                    256
DS                      4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                 199.04
DW                20.800 usec
DE                  6.50 usec
TE                 328.2 K
CNST2        145.0000000
D1            2.00000000 sec
D2            0.00344828 sec
D12           0.00002000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                  13C
P1                   9.50 usec
P13               2000.00 usec
PLW0      0 W
PLW1         56.00000000 W
SPNAM[5]     Crp60comp.4
SPOAL5             0.500
SPOFFS5   0 Hz
SPW5          7.72189999 W

======== CHANNEL f2 ========
SFO2         400.1312797 MHz
NUC2                   1H
CPDPRG[2         waltz16
P3                  12.30 usec
P4                  24.60 usec
PCPD2               90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W

F2 - Processing parameters
SI                  32768
SF           100.6127690 MHz
WDW                    EM
SSB       0
LB                   1.00 Hz
GB        0
PC                   1.40
```

Fig. S13 : ^{1}H and ^{13}C NMR spectra of 5m



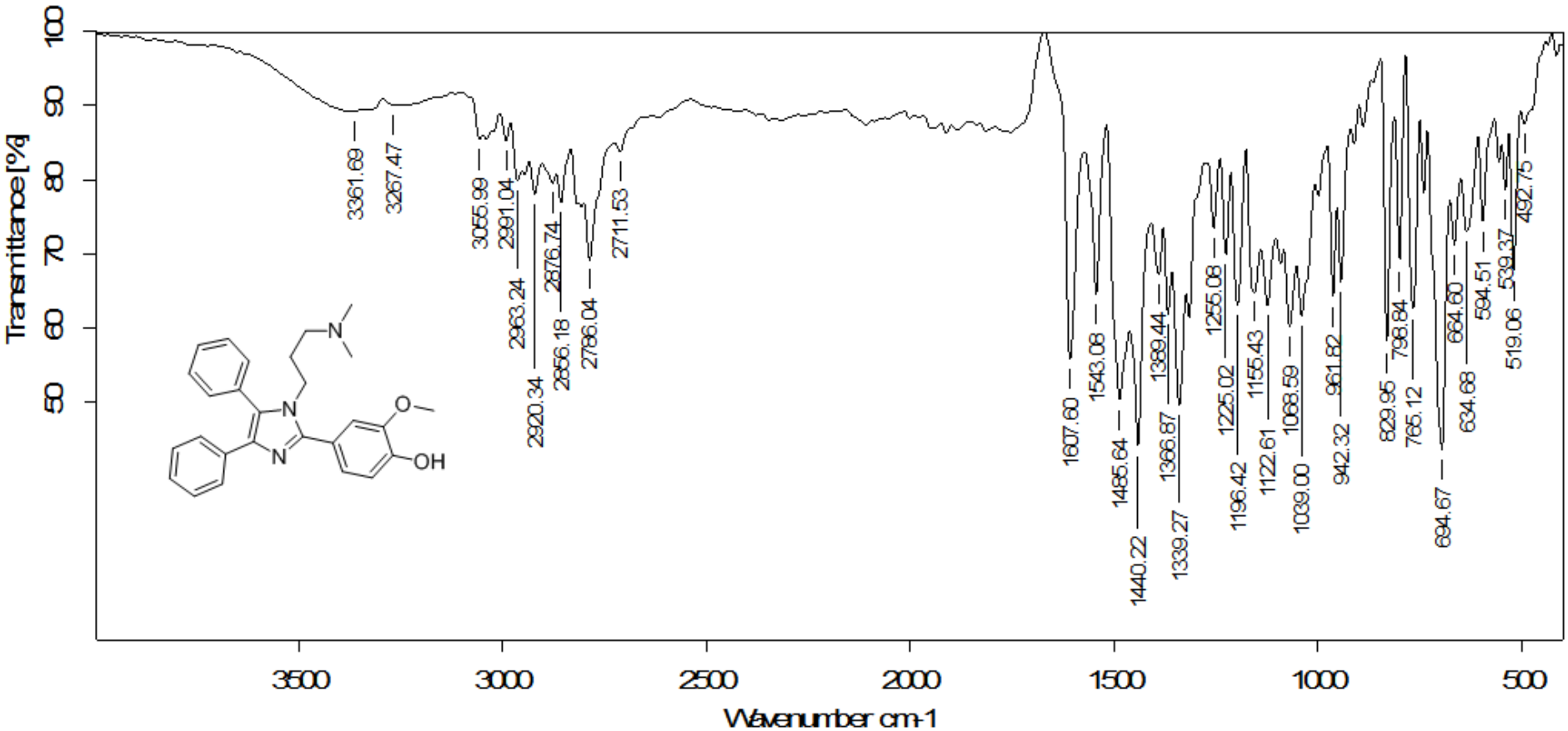

```
Current Data Parameters
NAME          Aug07-2016
EXPNO                192
PROCNO                 1

F2 - Acquisition Parameters
Date_            20160810
Time                9.38
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                    50
DS                     2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ            4.0894465 sec
RG                 68.22
DW                62.400 usec
DE                 6.50 usec
TE                294.5 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                   1H
P1                 12.00 usec
PLW1         22.00000000 W

F2 - Processing parameters
SI                 65536
SF          400.1300000 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```

T-1
c13_su DMSO {C:\nmr-data} Student 13

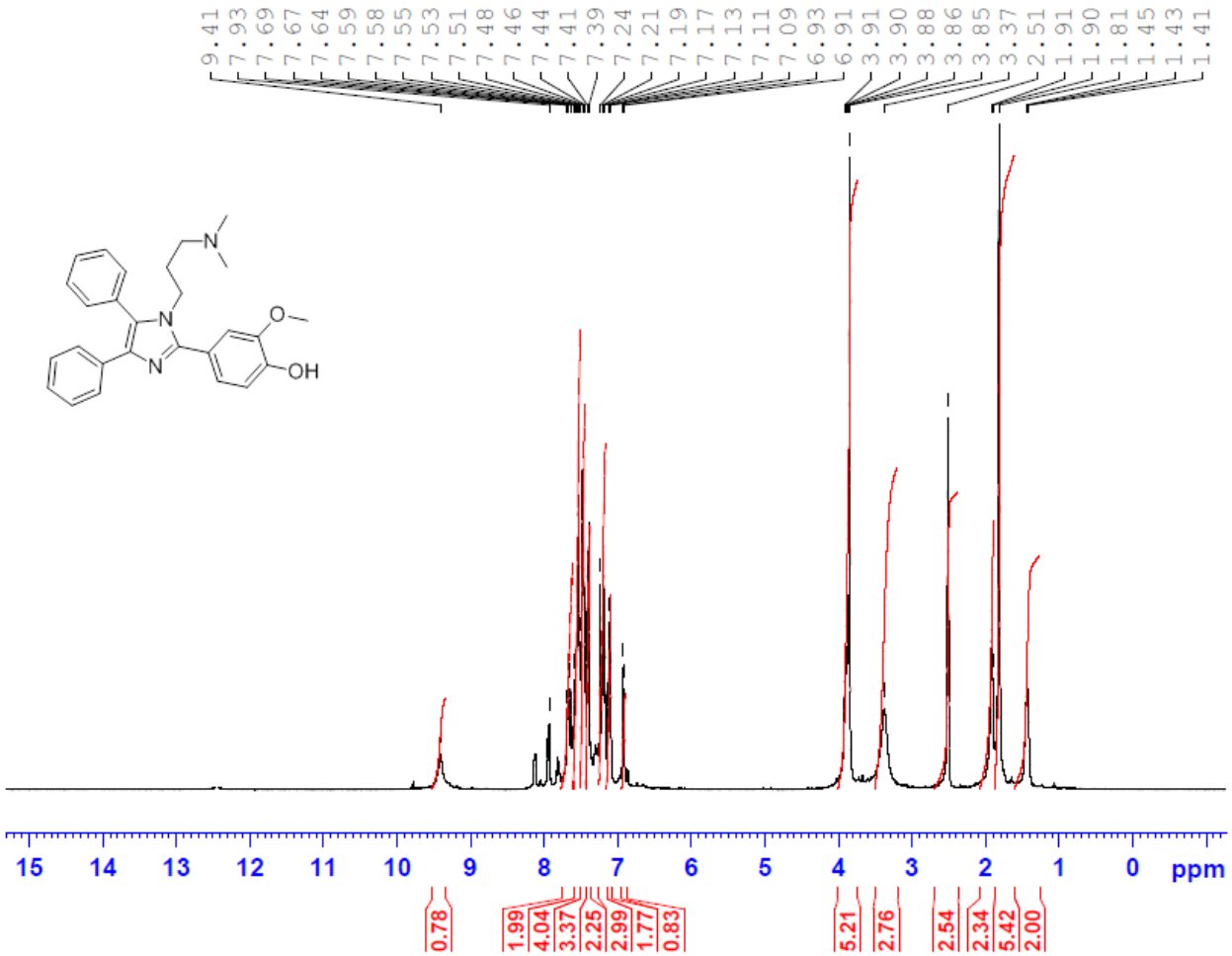



```
Current Data Parameters
NAME          Aug24-2016
EXPNO                120
PROCNO                 1

F2 - Acquisition Parameters
Date_           20160824
Time               20.51
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                65536
SOLVENT            DMSO
NS                 2200
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               100.43
DW               20.800 usec
DE                 6.50 usec
TE                295.9 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
PLW1        56.00000000 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2              90.00 usec
PLW2        22.00000000 W
PLW12        0.41091001 W
PLW13        0.33284000 W

F2 - Processing parameters
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB       0
LB                  6.00 Hz
GB        0
PC                  1.40
```

Fig. S14 : IR, ^{1}H and ^{13}C NMR spectra of 5n

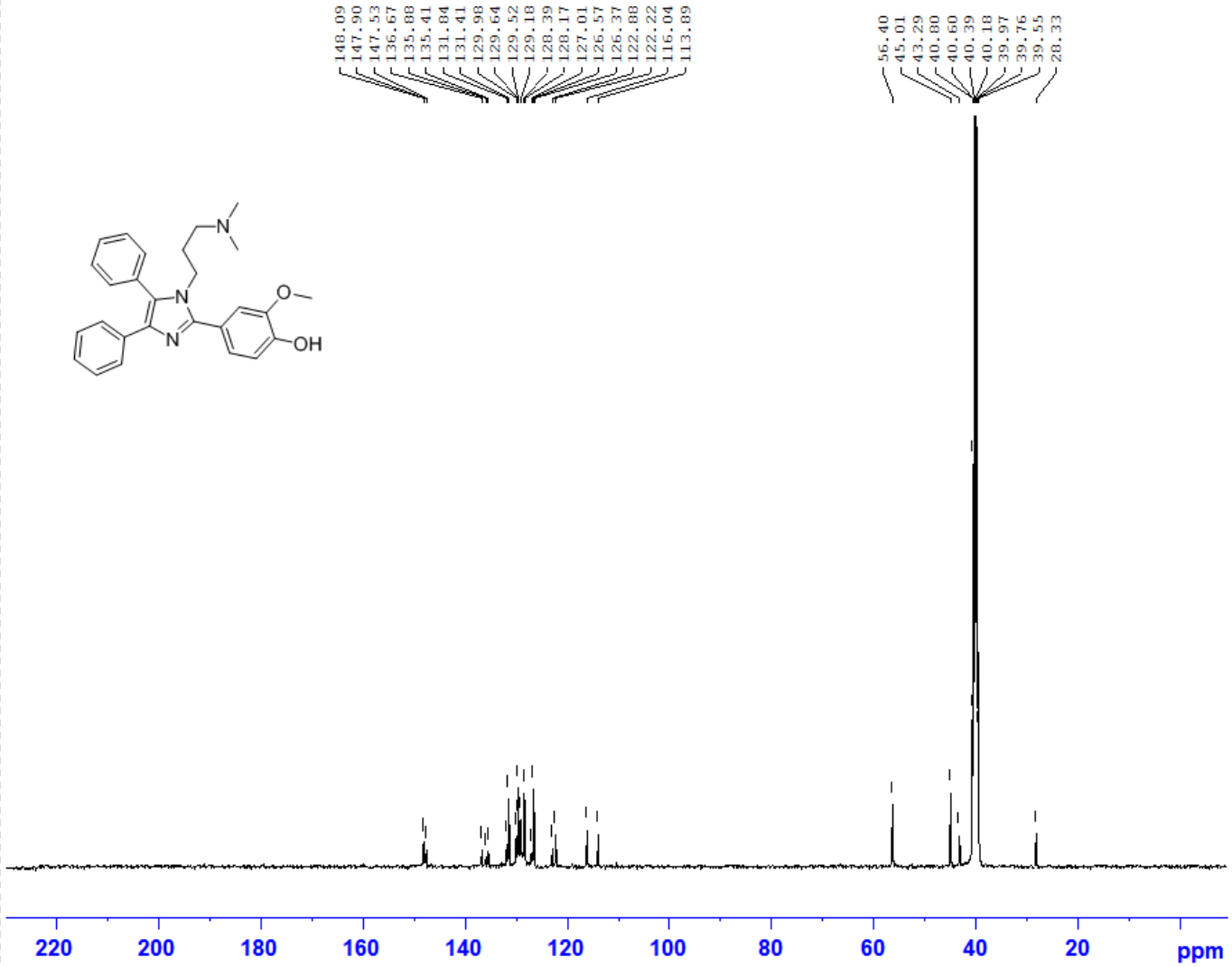


T-13
proton_su DMSO {C:\nmr-data} Student 6




```
Current Data Parameters
NAME          Aug07-2016
EXPNO                200
PROCNO                 1

F2 - Acquisition Parameters
Date_            20160810
Time               10.05
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 65536
SOLVENT             DMSO
NS                    20
DS                     2
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894465 sec
RG                   135
DW                62.400 usec
DE                 6.50 usec
TE                294.6 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1                12.00 usec
PLW1        22.00000000 W

F2 - Processing parameters
SI                 65536
SF          400.1300000 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```

T-13
c13_su DMSO {C:\nmr-data} Student 16




```
Current Data Parameters
NAME          Aug25-2016
EXPNO                 20
PROCNO                 1

F2 - Acquisition Parameters
Date_            20160825
Time                14.15
INSTRUM             spect
PROBHD   5 mm PABBO BB/
PULPROG           zgpg30
TD                 65536
SOLVENT             DMSO
NS                  2200
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                100.43
DW                20.800 usec
DE                  6.50 usec
TE                 323.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6238364 MHz
NUC1                 13C
P1                  9.50 usec
PLW1         56.00000000 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2              90.00 usec
PLW2         22.00000000 W
PLW12         0.41091001 W
PLW13         0.33284000 W

F2 - Processing parameters
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB       0
LB                  6.00 Hz
GB        0
PC                  1.40
```

Figure S15: FT-IR spectra for as prepared Zn Fe_2O_4 nanoparticles

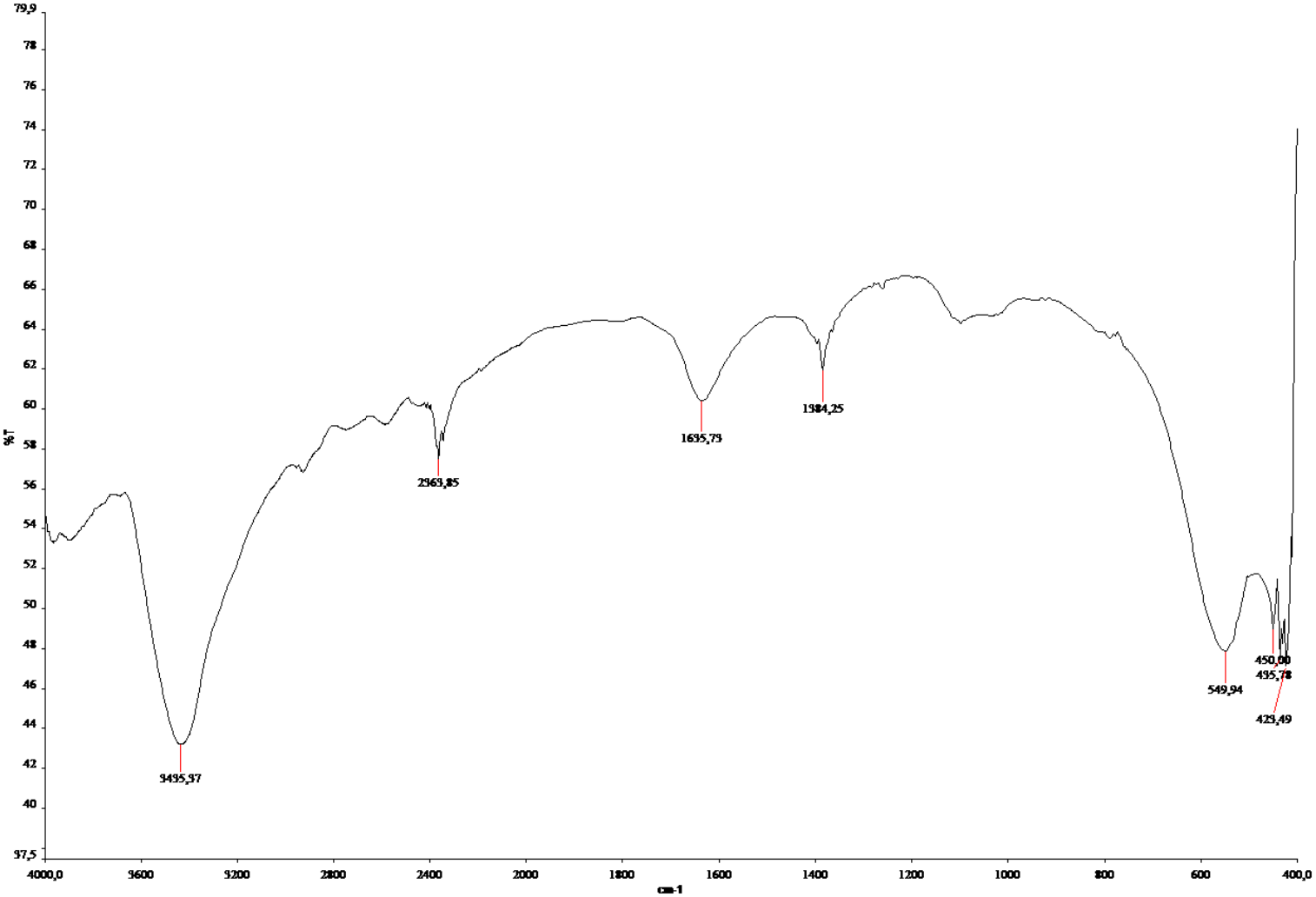


Figure S16: TGA/DTG curves of **as prepared Zn Fe_2O_4 nanoparticles**

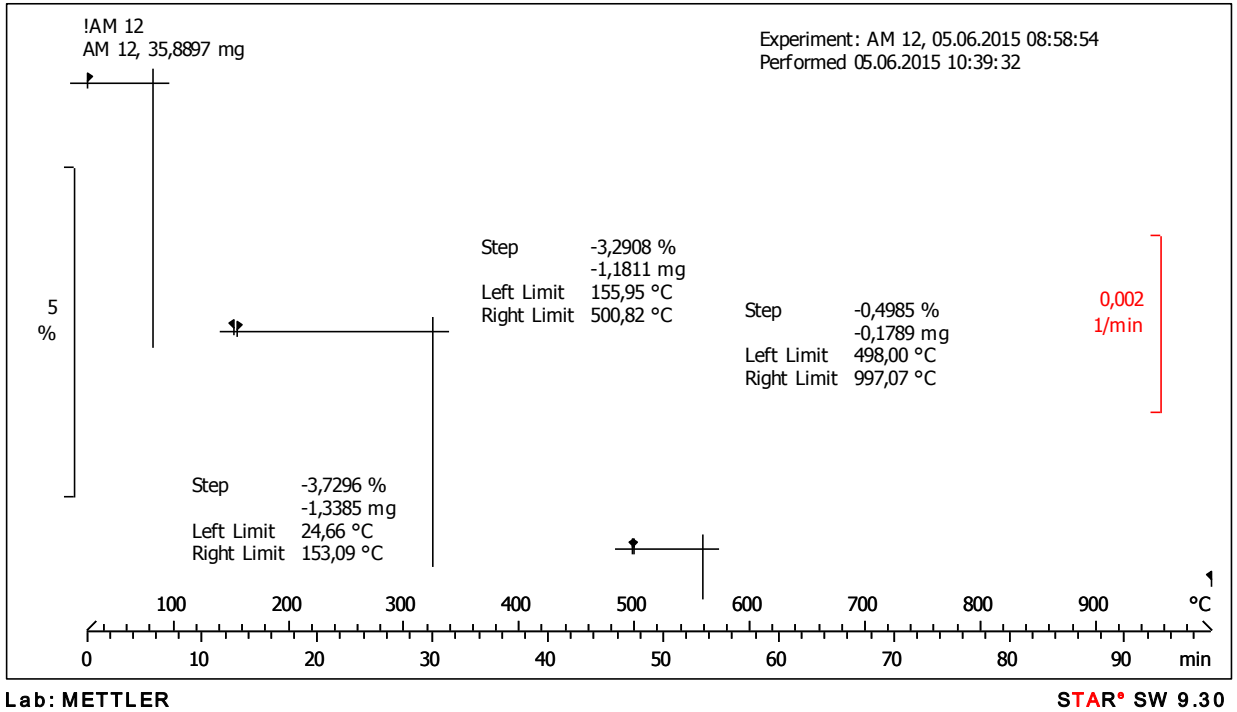


Figure S17: SEM image for the recyclable catalyst after 5 cycles