Electronic Supplementary Information

Asymmetric Esterification of Ketenes Catalyzed by N-Heterocyclic Carbene

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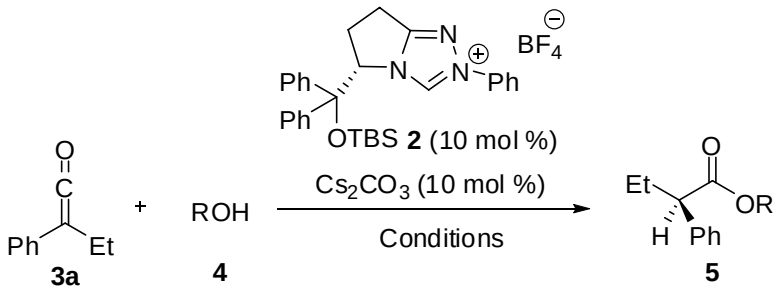
Table of Contents

Part I Experimental Part

1.1 General Information

Unless otherwise indicated, all starting materials were obtained from commercial supplies and used as received. Anhydrous toluene and Et_2O were distilled from sodium and benzophenone, Chiral triazolium salt **2** was synthesized according to previously report[1]. 2-Phenylethanol was purified by shaking with a solution of ferrous sulfate, and the alcohol layer was washed with distilled water and fractionally distilled. Ketenes were prepared according to literature [2]. All reactions were carried out under an argon atmosphere in oven-dried glassware with magnetic stirring. Column chromatograph was performed with silica gel 200~300 mesh. All ^1H NMR (300 MHz), ^{13}C NMR (75 MHz) spectra were recorded on a Bruker-DMX 300 spectrometer in $CDCl_3$, with tetramethylsilane as an internal standard and reported in parts per million (ppm, δ). ^1H NMR spectroscopy splitting patterns were designated as singlet (s), doublet (d), triplet (t). Splitting patterns that could not be interpreted or easily visualized were designated as multiplet (m) or broad (br). Infrared spectra were recorded on a JASCO FT/IR-480 spectrophotometer and reported as wave number (cm^{-1}). Optical rotations were measured on Perkin Elmer/Model-343 digital polarimeter operating at the sodium D line with a 100 mm path cell, and reported as follows: $[\alpha]_D^T$ (concentration (g/100 mL), solvent).

1.2 Screening of alcohols and optimization of reaction conditions



General Procedure A (Method A). To the mixture of triazolium salt **2** (10 mol %), Cs_2CO_3 (10 mol %), and alcohol in toluene (9 mL) was added the solution of ketene in toluene (10 mL). The reaction mixture was stirred under N_2 at the specified temperature for the specified amount of time, and then it was quenched by the addition of silica gel, the mixture was further stirred for ten minutes. The reaction mixture was diluted with diethyl ether, and passed through a short silica pad. The solvent was removed under reduced pressure and the residue was purified by chromatography on silica gel (Et_2O/petroleum ether, typically 1:90) to give the desired product.

General Procedure B (Method B). The same as Method A, except that the solution of ketene was added via a syringe pump over 30 min**.**

General Procedure C (Method C). To the mixture of ketene (0.5 mmol) and benzhydrol (184 .3 mg, 1.0 mmol) in toluene (2 mL) at -40^{o}C was added the solution of NHC **2'**, which was freshly prepared from NHC precursor **2** (34.2 mg, 0.06 mmol) and Cs_2CO_3 (16.3 mg, 0.05 mol) in toluene/ether (1/1, 2 mL) at rt for 1 h. The

reaction mixture was stirred at -40 ^{o}C for specified time (See below). After quenched with silica gel and further stirred for 10 min, the reaction mixture was diluted with diethyl ether, and passed through a short silica pad. The solvent was removed under reduced pressure and the residue was purified by chromatography on silica gel to give the desired product.

Racemic samples of esters for the standard of chiral HPLC spectra were prepared using 10 mol % Cs_2CO_3 as catalyst.

(*R*)-methyl 2-phenylbutanoate[3]

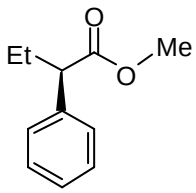


Table 1, entry 1. General Procedure A was followed: To the mixture of triazolium salt **2** (57.0 mg, 0.1 mmol), Cs_2CO_3 (32.6 mg, 0.1 mmol), methanol (40.5 μL, 1.0 mmol) in toluene (9 mL) was added the solution of ketene (1.5 mmol) in toluene (10 mL) in one portion. Reaction temperature: -78 ^{o}C. Reaction time: 15 h. Yield: 149.6 mg, 84%; R_f = 0.24 (Et_2O/petroleum ether = 1:90); colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.16 (m, 5H), 3.57 (s, 3H), 3.44 (t, *J* = 7.7 Hz, 1H), 2.16-2.01 (m, 1H), 1.85-1.70 (m, 1H), 0.86 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 174.5, 139.1, 128.5, 127.9, 127.1, 53.3, 51.8, 26.7, 12.1; HPLC analysis: 13% ee [Daicel CHIRALPAK OD-H column; 20 ^{o}C; 0.5 mL/min; solvent system: 2-propanol/hexane = 0.5:99.5; retention times: 9.6 min (major), 10.4 min (minor)].

(*R*)-phenethyl 2-phenylbutanoate

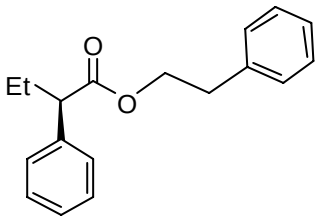


Table 1, entry 2. General Procedure A was followed: To the mixture of triazolium salt **2** (57.0 mg, 0.1 mmol), Cs_2CO_3 (32.6 mg, 0.1 mmol), 2-Phenylethanol (119.8 μL , 1.0 mmol) in toluene (9 mL) was added the solution of ketene (1.5 mmol) in toluene (10 mL) in one portion. Reaction temperature: -78 ^oC. Reaction time: 20 h. Yield: 284.0 mg, 99%; R_f = 0.34 (Et_2O/petroleum ether = 1:80); colorless oil. ^1H NMR (300 MHz, $CDCl_3$) δ 7.24-7.13 (m, 8H), 7.04-7.02 (m, 2H), 4.23 (t, *J* = 6.8 Hz**,** 2H), 3.40 (t, *J* = 7.6 Hz**,** 1H), 2.80 (t, *J* = 6.8 Hz**,** 2H), 2.10-1.98 (m, 1H), 1.79-1.69 (m, 1H), 0.82 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.5, 138.9, 137.6, 128.6, 128.3, 128.2, 127.8, 126.9, 126.2, 64.8, 53.39, 34.7, 26.4, 11.9; IR (KBr) ν 3029, 2964, 2934, 1732, 1496, 1455, 1263, 1199, 1163, 799, 748, 698 cm^{-1}; MS (EI): *m/z* 268 (M^+, 1.2), 119 ($PhCH^+C_2H_5$, 9.6), 105 ($PhCH_2CH_2^+$, 15.5), 104 ($PhCH{=}CH^+$, 100), 91 ($PhCH_2^+$, 26.9); HRMS (EI) calcd for $C_{18}H_{20}O_2$ $[M]^+$ 268.1463, found 268.1465; HPLC analysis: 11% ee [Daicel CHIRALPAK OD-H column; 20 ^oC ; 0.7 mL/min; solvent system: 2-propanol/hexane = 0.4:99.6; retention times: 21.6 min (major), 28.1 min (minor)].

(*R*)-benzyl 2-phenylbutanoate [4]

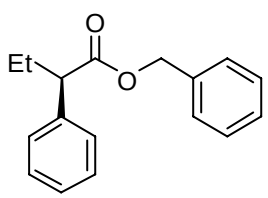


Table 1, entry 3. General Procedure A was followed: To the mixture of triazolium salt **2** (57.0 mg, 0.1 mmol), Cs_2CO_3 (32.6 mg, 0.1 mmol), benzyl alcohol (109.3 μL, 1.0 mmol) in toluene (9 mL) was added the solution of ketene (1.5 mmol) in toluene (10 mL) in one portion.

Reaction temperature: -78 °C. Reaction time: 21 h. Yield: 166.5 mg, 65%; R_f = 0.33 (Et_2O/petroleum ether = 1:80); colorless oil. ^1H NMR (300 MHz, $CDCl_3$) δ 7.26-7.15 (m, 10H), 5.07 (d, *J* = 12.5 Hz, 1H), 4.99 (d, *J* = 12.5 Hz, 1H), 3.44 (t, *J* = 7.7 Hz, 1H), 2.10-2.00 (m, 1H), 1.80-1.70 (m, 1H), 0.81 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 173.8, 138.9, 136.0, 128.5, 128.4, 128.0, 128.0, 127.8, 127.1, 66.3, 53.4, 26.6, 12.1; HPLC analysis: 36% ee [Daicel CHIRALPAK OD-H column; 20 °C; 0.5 mL/min; solvent system: 2-propanol/hexane = 0.4:99.6; retention times: 11.2 min (major), 12.4 min (minor)].

1.3 References and notes

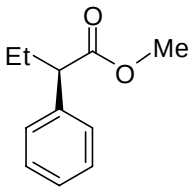
(1) Y.-R. Zhang, L. He, X. Wu, P.-L. Shao, Ye, S. *Org. Lett.* **2008**, *10,* 277-280.

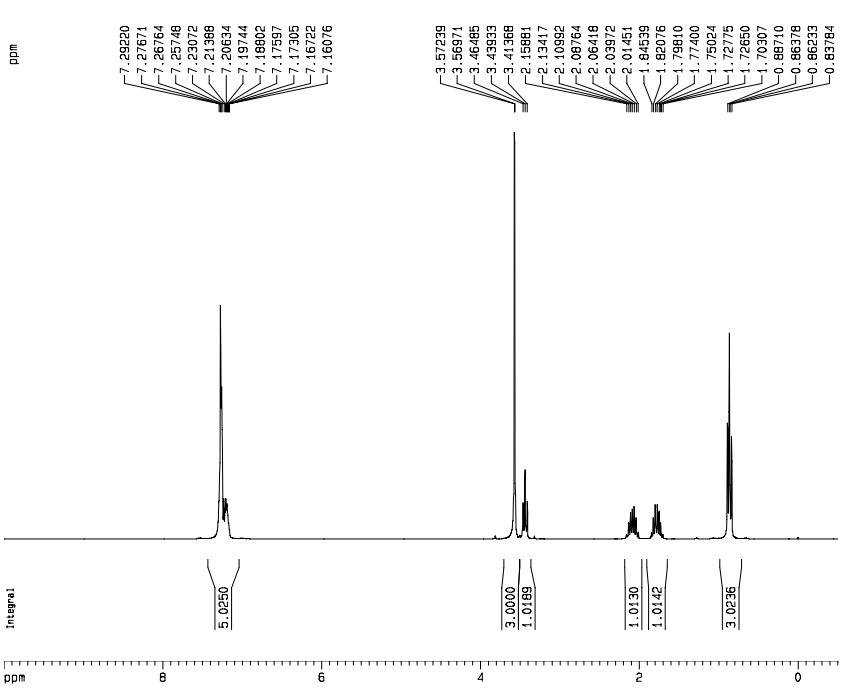
(2) (a) L. M. Baigrie, H. R. Seiklay, T. T. Tidwelll, *J. Am. Chem. Soc.* **1985**, *107,* 5391-5396. (b) A. D. Allen, L. M. Baigrie, L. Gong, T. T. Tidwelll, *Can. J. Chem.* **1991**, *69,* 138-145.

(3) B. L. Hodous, J. C. Ruble, G. C. Fu, *J. Am. Chem. Soc.* **1999**, *121*, *2637-2638.*

(4) J. C. Ruble, G.. C. Fu, *J. Org. Chem.* **1996**, *61,* 7230-723.

Part II Copies of ^{1}H NMR and ^{13}C NMR Spectra



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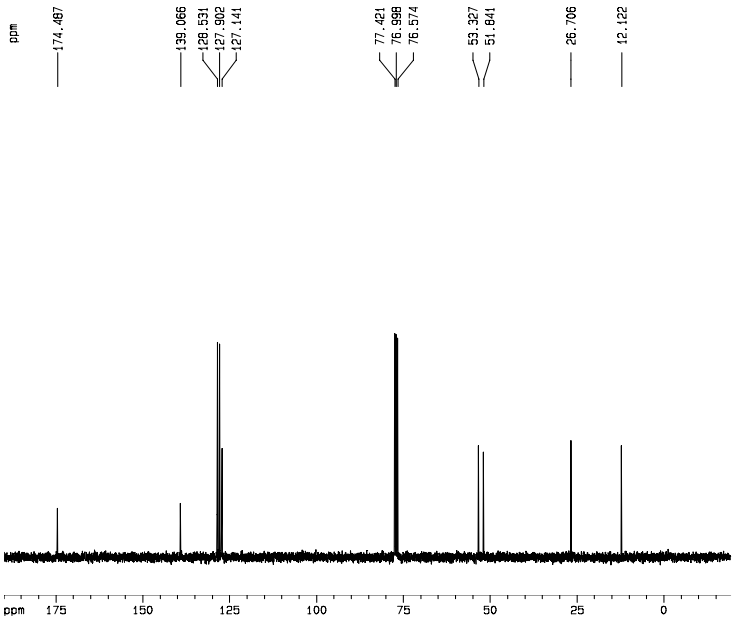


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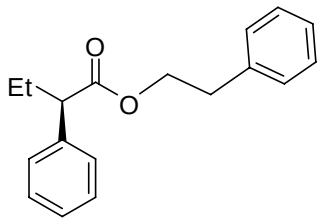

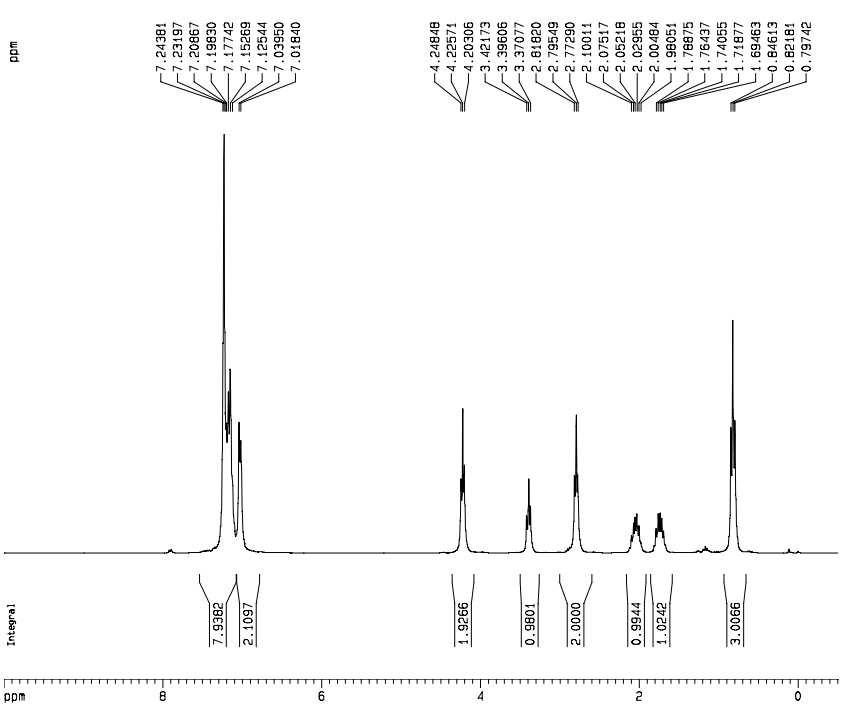


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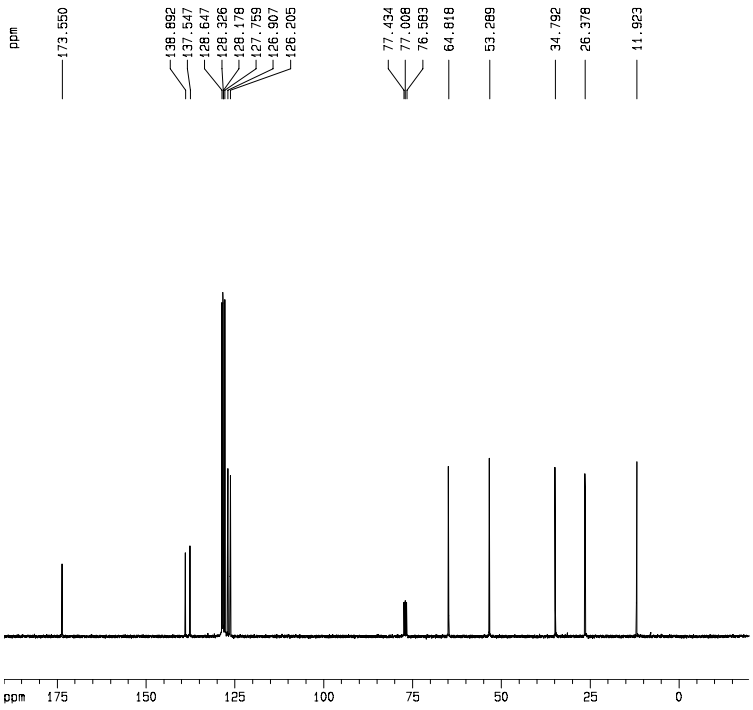


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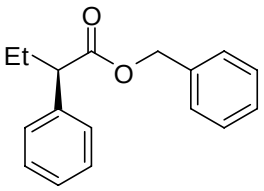

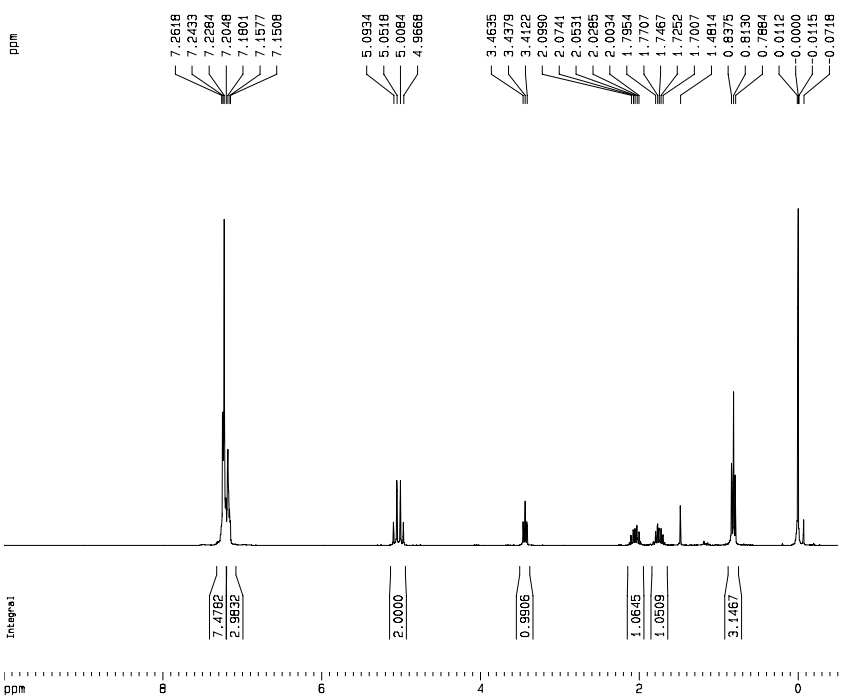


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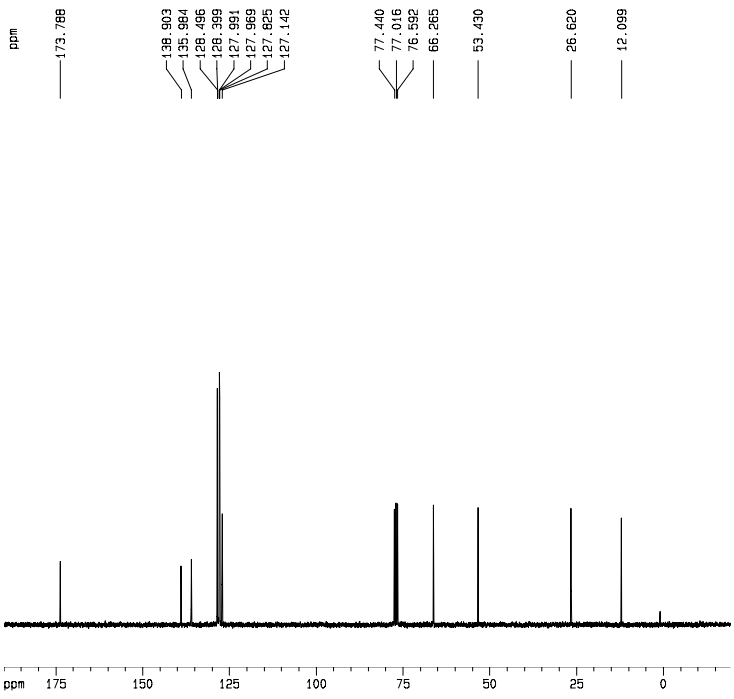


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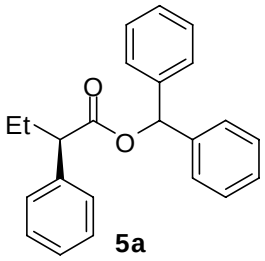

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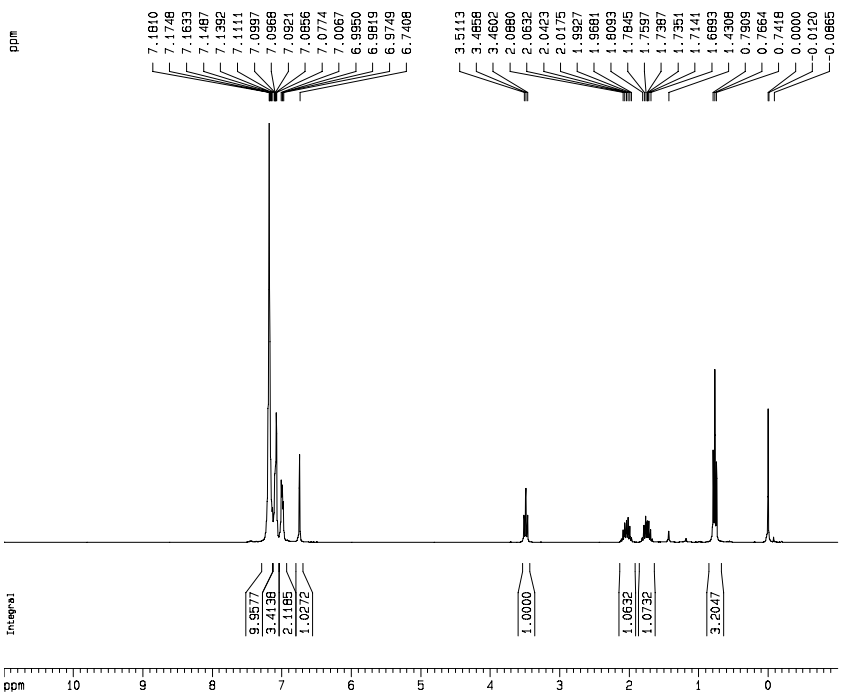


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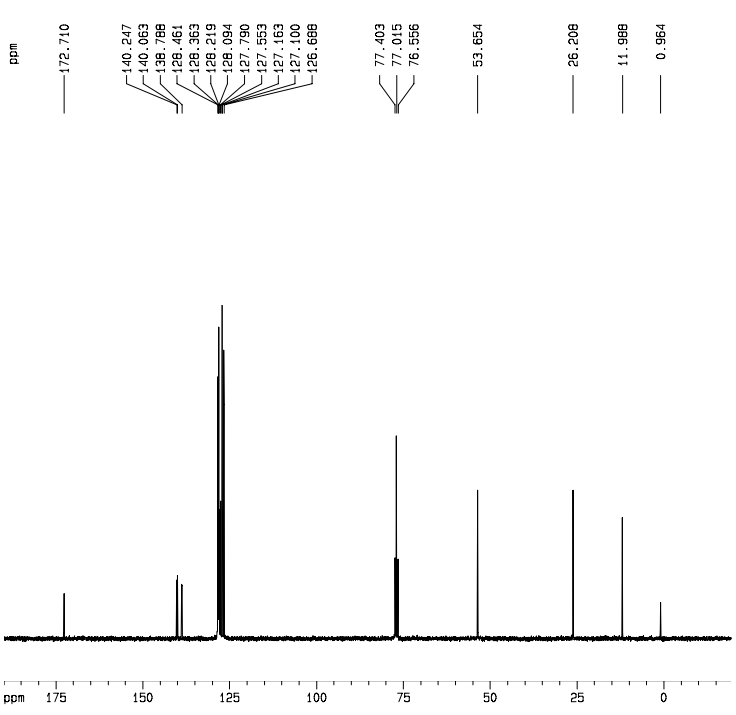


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HZCM                905.61310 Hz/cm
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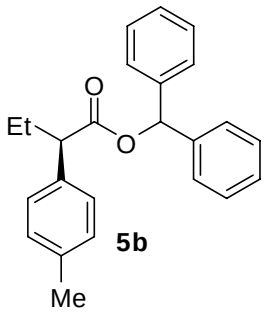
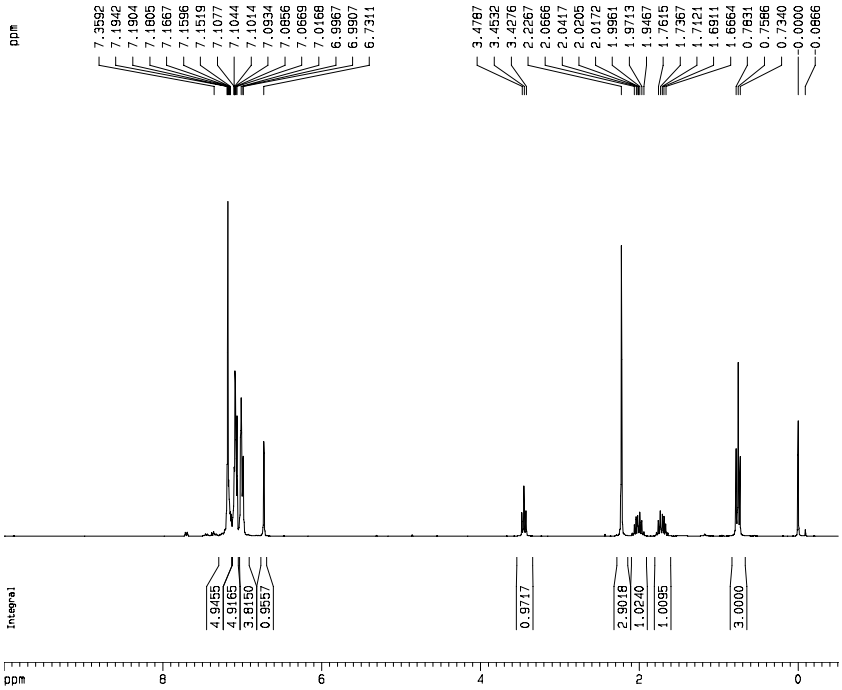
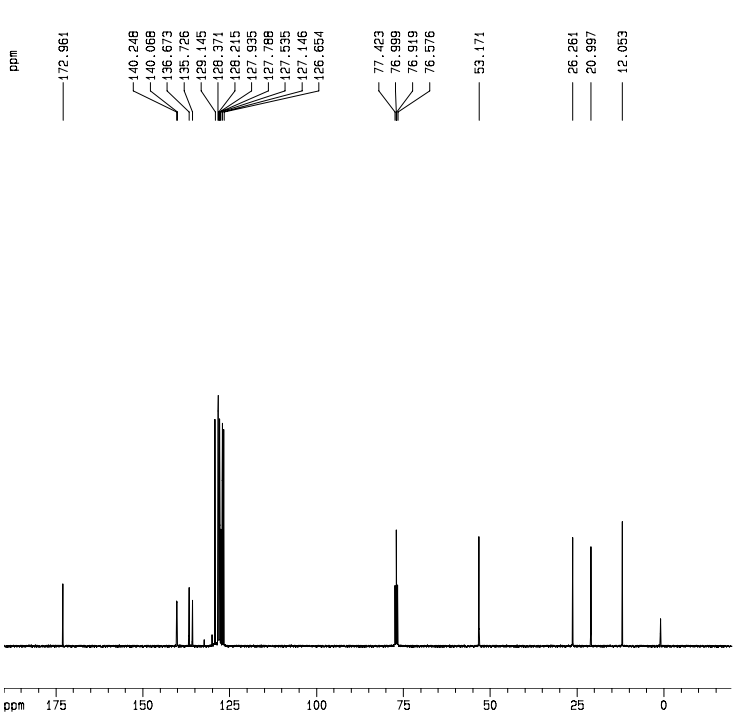


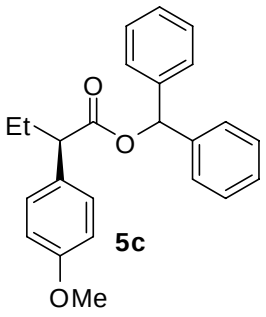
5b

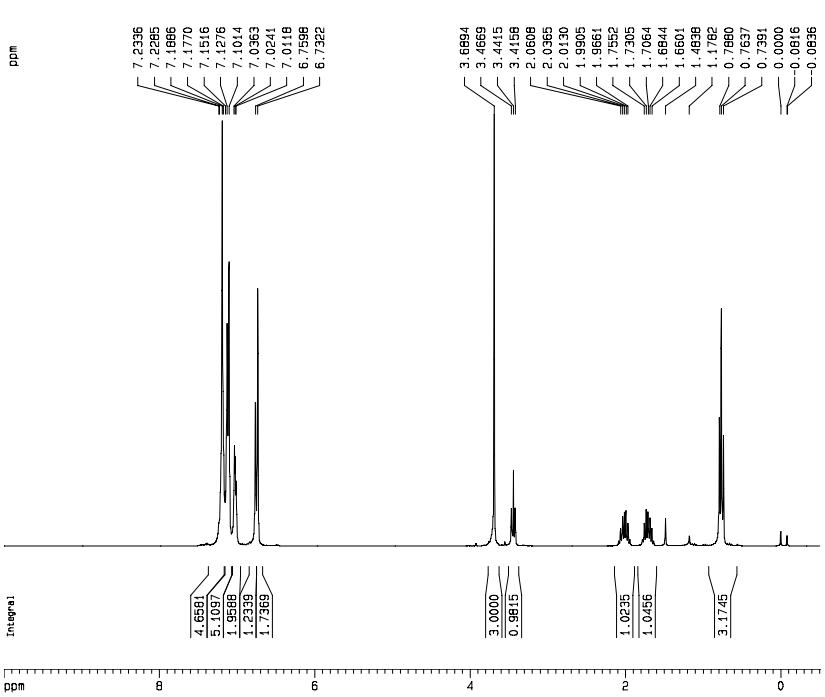



```
Current Data Parameters
NAME                wxn83-4
EXPNO                    20
PROCNO                    1

F2 - Acquisition Parameters
Date_              20080828
Time                   8.54
INSTRUM                spect
PROBHD   5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT                CDCl3
NS                       16
DS                        0
SWH                8992.806 Hz
FIDRES             0.137219 Hz
AQ                 3.6438515 sec
RG                     50.8
DW                   55.600 usec
DE                    6.00 usec
TE                   673.2 K
D1                1.00000000 sec
MCREST            0.00000000 sec
MCWRK             0.01500000 sec

======== CHANNEL f1 ========
NUC1                     1H
P1                    7.00 usec
PL1                  -1.00 dB
SFO1            300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                300.1300567 MHz
WDW                         EM
SSB                          0
LB                    0.30 Hz
GB                           0
PC                    1.00

1D NMR plot parameters
CX                   20.00 cm
CY                    8.00 cm
F1P                 10.000 ppm
F1                 3001.30 Hz
F2P                 -0.500 ppm
F2                 -150.07 Hz
PPMCM               0.52500 ppm/cm
HZCM              157.56828 Hz/cm
```

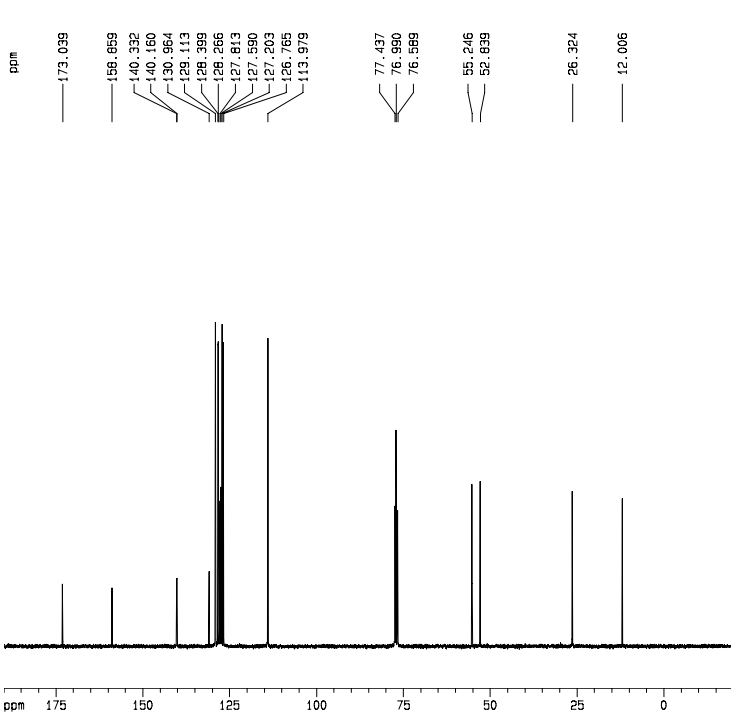



```
Current Data Parameters
NAME                wxn83-4
EXPNO                    11
PROCNO                    1

F2 - Acquisition Parameters
Date_              20080828
Time                   7.42
INSTRUM                spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT                CDCl3
NS                      778
DS                        4
SWH               17985.611 Hz
FIDRES             0.274439 Hz
AQ                 1.8219508 sec
RG                      512
DW                   27.800 usec
DE                    6.00 usec
TE                   673.2 K
D1                2.00000000 sec
D11               0.03000000 sec
DELTA             1.89999998 sec
MCREST            0.00000000 sec
MCWRK             0.01500000 sec

======== CHANNEL f1 ========
NUC1                    13C
P1                   12.50 usec
PL1                   2.00 dB
SFO1            75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                     1H
PCPD2                80.00 usec
PL2                  -1.00 dB
PL12                 20.16 dB
PL13                 16.98 dB
SFO2            300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                75.4677597 MHz
WDW                         EM
SSB                          0
LB                    1.00 Hz
GB                           0
PC                    1.40

1D NMR plot parameters
CX                   20.00 cm
CY                    6.00 cm
F1P                 190.000 ppm
F1                14338.87 Hz
F2P                 -50.000 ppm
F2                 -3773.39 Hz
PPMCM              12.00000 ppm/cm
HZCM              905.61310 Hz/cm
```

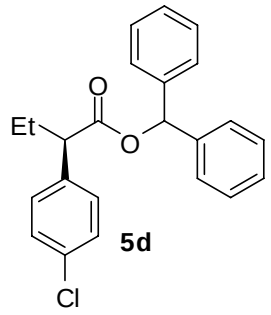




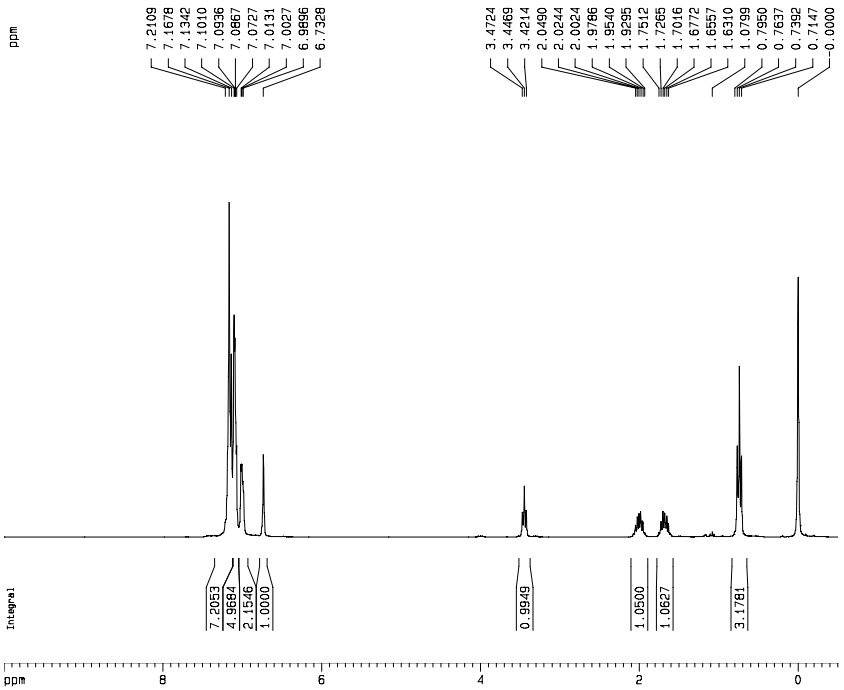

```
Current Data Parameters
NAME                  wxn86-2
EXPNO                      10
PROCNO                      1

F2 - Acquisition Parameters
Date_               20080526
Time                    8.08
INSTRUM                spect
PROBHD   5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         16
DS                          0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6438515 sec
RG                       80.6
DW                     55.600 usec
DE                      6.00 usec
TE                     299.0 K
D1                  1.00000000 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                      7.00 usec
PL1                    -1.00 dB
SFO1             300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                  300.1300452 MHz
WDW                         EM
SSB                          0
LB                        0.30 Hz
GB                           0
PC                        1.00

1D NMR plot parameters
CX                       20.00 cm
CY                       12.50 cm
F1P                     10.000 ppm
F1                      3001.30 Hz
F2P                     -0.500 ppm
F2                     -150.07 Hz
PPMCM                  0.52500 ppm/cm
HZCM                 157.56827 Hz/cm
```



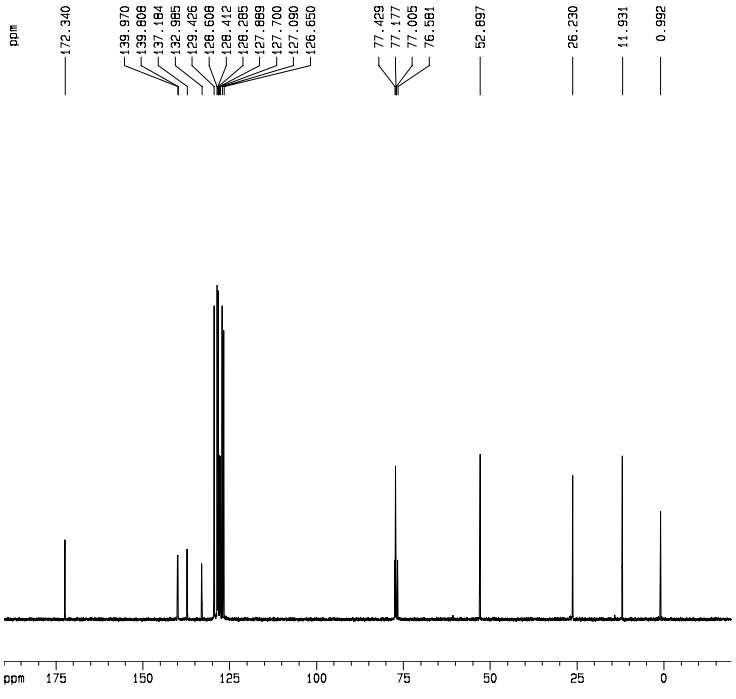

```
Current Data Parameters
NAME                  wxn86-2
EXPNO                      11
PROCNO                      1

F2 - Acquisition Parameters
Date_               20080526
Time                    8.14
INSTRUM                spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                     65536
SOLVENT                CDCl3
NS                        747
DS                          4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                      1149.4
DW                     27.800 usec
DE                      6.00 usec
TE                     301.2 K
D1                  2.00000000 sec
D11                 0.03000000 sec
DELTA               1.89999998 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                     12.50 usec
PL1                     2.00 dB
SFO1             75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                    -1.00 dB
PL12                   20.16 dB
PL13                   16.98 dB
SFO2             300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                  75.4677509 MHz
WDW                         EM
SSB                          0
LB                        1.00 Hz
GB                           0
PC                        1.40

1D NMR plot parameters
CX                       20.00 cm
CY                        8.00 cm
F1P                    190.000 ppm
F1                     14338.87 Hz
F2P                    -50.000 ppm
F2                     -3773.39 Hz
PPMCM                 12.00000 ppm/cm
HZCM                 905.61298 Hz/cm
```



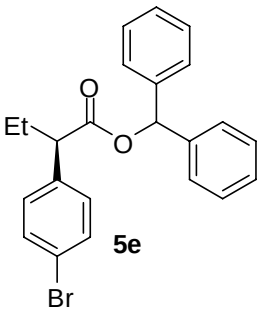
5d



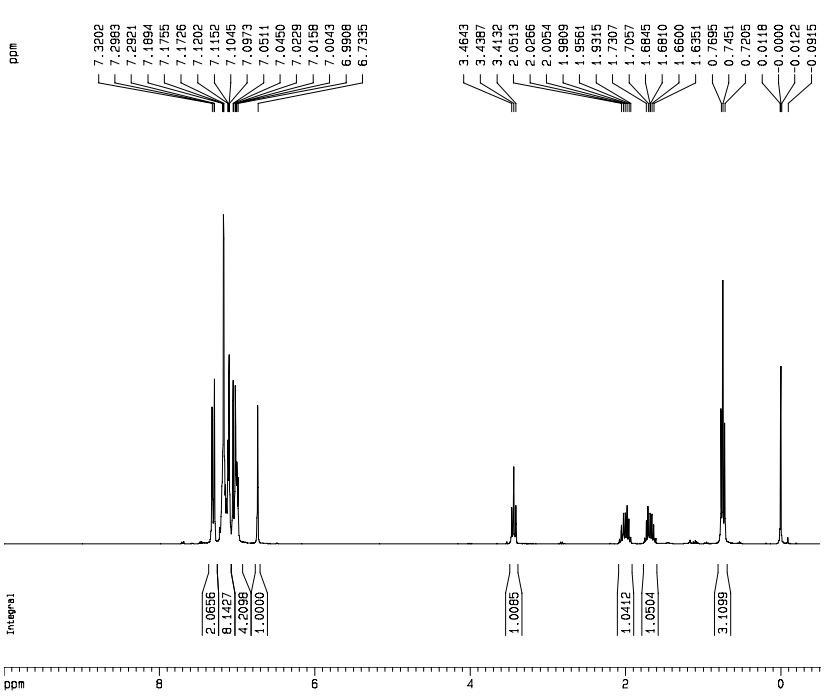

```
Current Data Parameters
NAME                  wxn77-1
EXPNO                      20
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080530
Time                   16.43
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT                CDCl3
NS                        16
DS                         0
SWH                8992.806 Hz
FIDRES             0.137219 Hz
AQ                 3.6438515 sec
RG                      40.3
DW                    55.600 usec
DE                     6.00 usec
TE                     673.2 K
D1                 1.00000000 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                      7.00 usec
PL1                     -1.00 dB
SFO1              300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                300.1300023 MHz
WDW                        EM
SSB                         0
LB                       0.30 Hz
GB                          0
PC                       1.00

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                     10.000 ppm
F1                    3001.30 Hz
F2P                     -0.500 ppm
F2                    -150.07 Hz
PPMCM                 0.52500 ppm/cm
HZCM                157.56828 Hz/cm
```



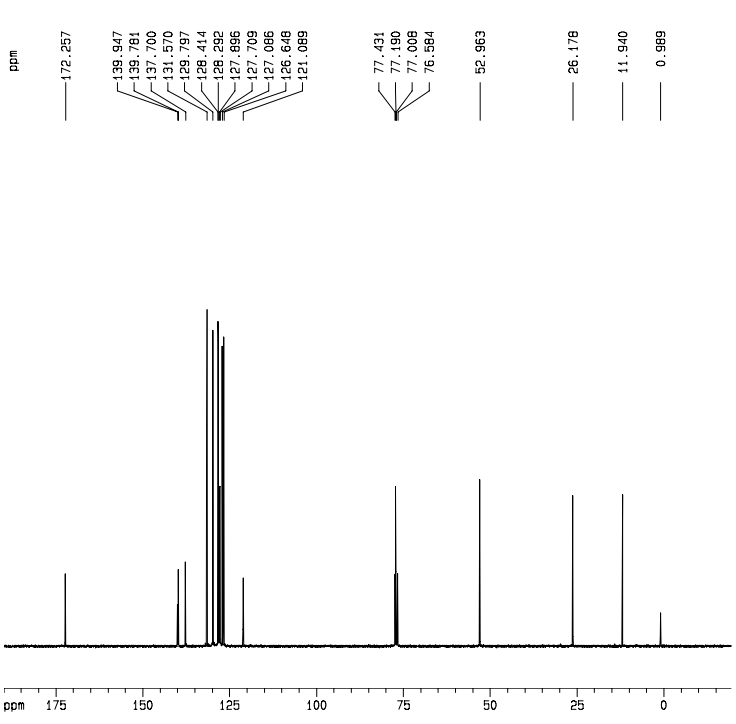

```
Current Data Parameters
NAME                  wxn77-1
EXPNO                      21
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080530
Time                   16.48
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT                CDCl3
NS                       225
DS                         4
SWH               17985.611 Hz
FIDRES             0.274439 Hz
AQ                 1.8219508 sec
RG                      645.1
DW                    27.800 usec
DE                     6.00 usec
TE                     673.2 K
D1                 2.00000000 sec
D11                0.03000000 sec
DELTA              1.89999998 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                     12.50 usec
PL1                     2.00 dB
SFO1              75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                    -1.00 dB
PL12                   20.16 dB
PL13                   16.98 dB
SFO2              300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                75.4677608 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                    190.000 ppm
F1                   14338.87 Hz
F2P                    -50.000 ppm
F2                   -3773.39 Hz
PPMCM                12.00000 ppm/cm
HZCM                905.61310 Hz/cm
```



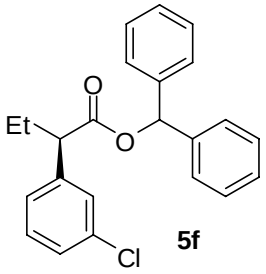
5e



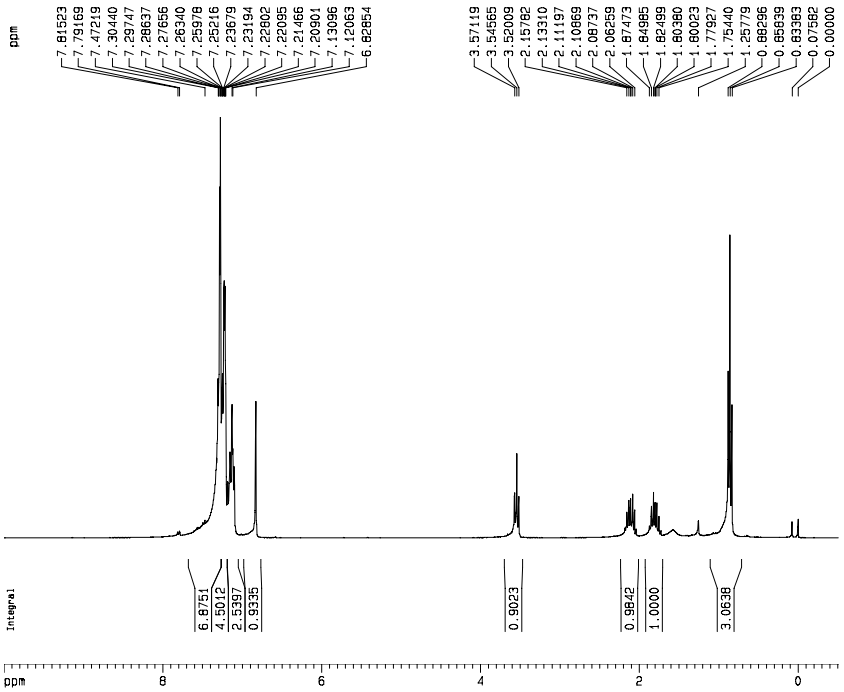

```
Current Data Parameters
NAME              wxn78-1
EXPNO                  60
PROCNO                  1

F2 - Acquisition Parameters
Date_           20080530
Time               17.04
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                   16
DS                    0
SWH             8992.806 Hz
FIDRES          0.137219 Hz
AQ              3.6438515 sec
RG                 45.3
DW                55.600 usec
DE                 6.00 usec
TE                673.2 K
D1              1.00000000 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                1H
P1                7.00 usec
PL1               -1.00 dB
SFO1        300.1324010 MHz

F2 - Processing parameters
SI                 32768
SF          300.1300572 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00

1D NMR plot parameters
CX                 20.00 cm
CY                  8.00 cm
F1P               10.000 ppm
F1              3001.30 Hz
F2P               -0.500 ppm
F2              -150.07 Hz
PPMCM           0.52500 ppm/cm
HZCM          157.56828 Hz/cm
```



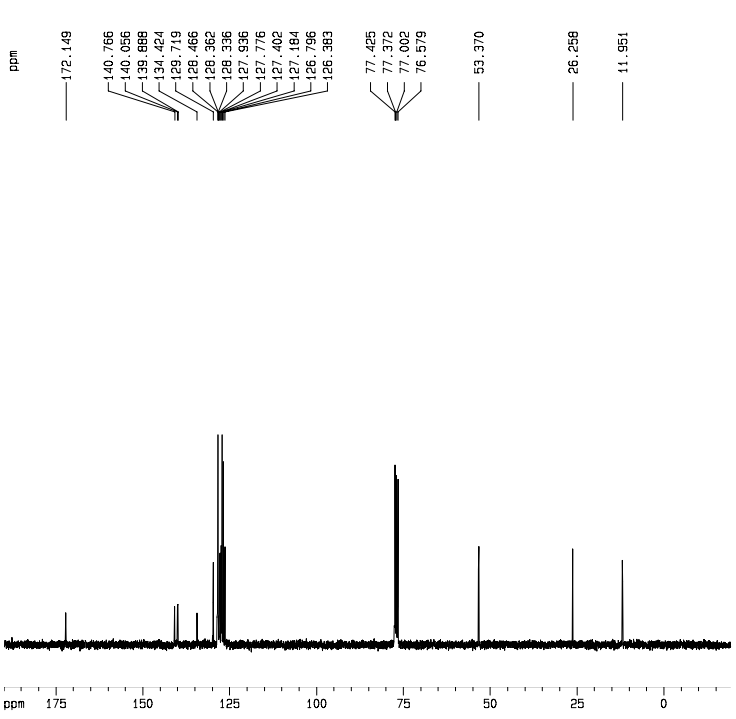

```
Current Data Parameters
NAME              wxn78-1
EXPNO                  61
PROCNO                  1

F2 - Acquisition Parameters
Date_           20080530
Time               17.09
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  390
DS                    4
SWH            17985.611 Hz
FIDRES          0.274439 Hz
AQ              1.8219508 sec
RG                 724.1
DW                27.800 usec
DE                 6.00 usec
TE                673.2 K
D1              2.00000000 sec
D11             0.03000000 sec
DELTA           1.89999998 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1               13C
P1                12.50 usec
PL1                2.00 dB
SFO1        75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              20.16 dB
PL13              16.98 dB
SFO2        300.1312005 MHz

F2 - Processing parameters
SI                 32768
SF          75.4677603 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40

1D NMR plot parameters
CX                 20.00 cm
CY                  8.00 cm
F1P              190.000 ppm
F1             14338.87 Hz
F2P              -50.000 ppm
F2             -3773.39 Hz
PPMCM          12.00000 ppm/cm
HZCM          905.61310 Hz/cm
```



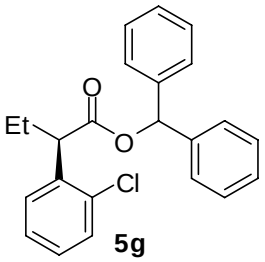
5f



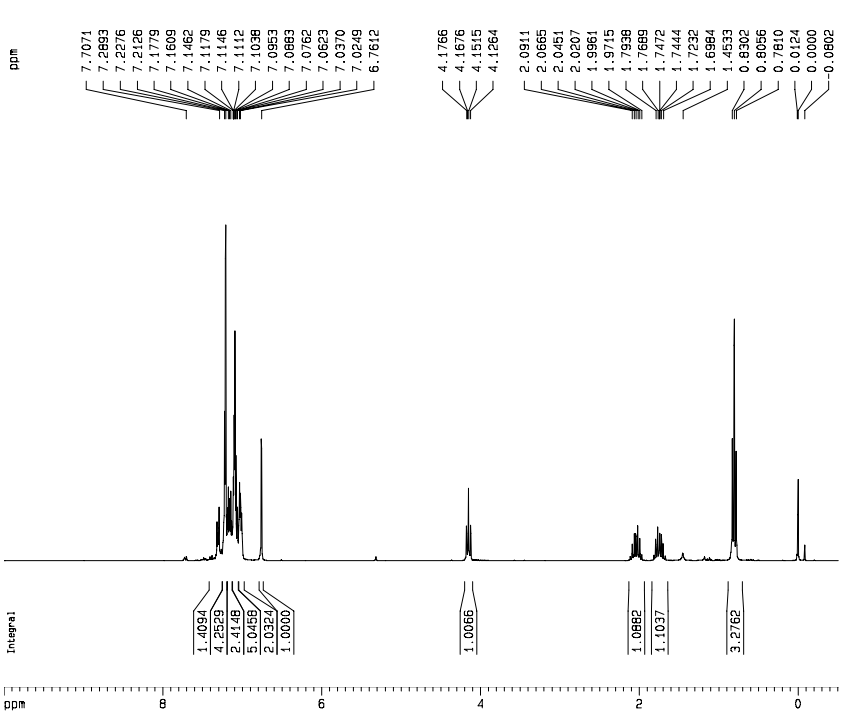

```
Current Data Parameters
NAME                 wxn76-2
EXPNO                     10
PROCNO                     1

F2 - Acquisition Parameters
Date_               20080714
Time                   15.58
INSTRUM                spect
PROBHD     5 mm DUL 13C-1
PULPROG                zg30
TD                     65536
SOLVENT                CDCl3
NS                        16
DS                         0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6438615 sec
RG                       128
DW                    55.600 usec
DE                     6.00 usec
TE                     300.7 K
D1                 1.00000000 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                      1H
P1                     7.00 usec
PL1                   -1.00 dB
SFO1              300.1324010 MHz

F2 - Processing parameters
SI                        32768
SF                300.1300127 MHz
WDW                       EM
SSB                        0
LB                      0.30 Hz
GB                         0
PC                      1.00

1D NMR plot parameters
CX                     20.00 cm
CY                     10.00 cm
F1P                   10.000 ppm
F1                  3001.30 Hz
F2P                   -0.500 ppm
F2                   -150.06 Hz
PPMCM                0.52500 ppm/cm
HZCM               157.56825 Hz/cm
```



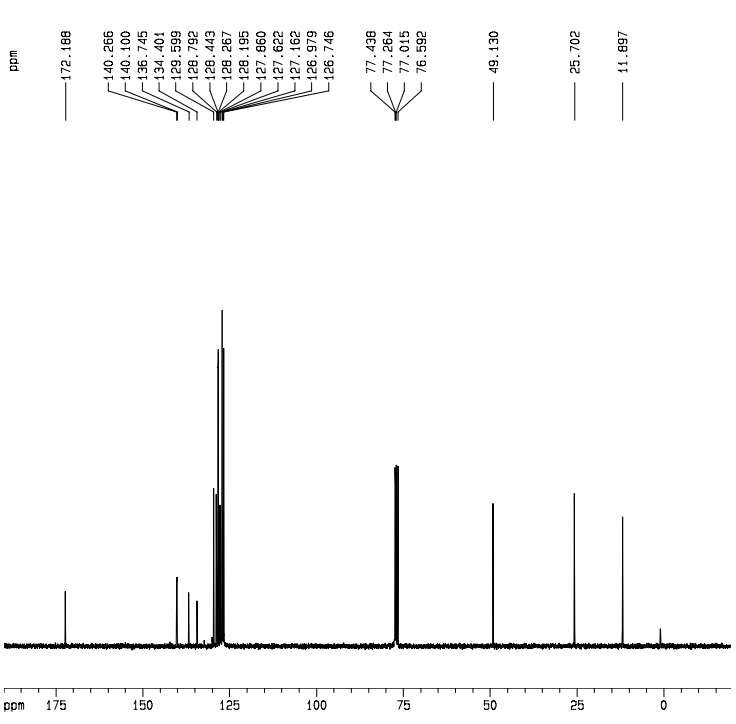

```
Current Data Parameters
NAME                 wxn76-2
EXPNO                     11
PROCNO                     1

F2 - Acquisition Parameters
Date_               20080714
Time                   16.02
INSTRUM                spect
PROBHD     5 mm DUL 13C-1
PULPROG             zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       379
DS                         4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                      1448.2
DW                    27.800 usec
DE                     6.00 usec
TE                     302.0 K
D1                 2.00000000 sec
D11                0.03000000 sec
DELTA              1.89999998 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                    12.50 usec
PL1                    2.00 dB
SFO1              75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                      1H
PCPD2                 80.00 usec
PL2                   -1.00 dB
PL12                  20.16 dB
PL13                  16.98 dB
SFO2              300.1312005 MHz

F2 - Processing parameters
SI                        32768
SF                75.4677482 MHz
WDW                       EM
SSB                        0
LB                      1.00 Hz
GB                         0
PC                      1.40

1D NMR plot parameters
CX                     20.00 cm
CY                      5.00 cm
F1P                   190.000 ppm
F1                  14338.87 Hz
F2P                   -50.000 ppm
F2                   -3773.39 Hz
PPMCM               12.00000 ppm/cm
HZCM               905.61298 Hz/cm
```



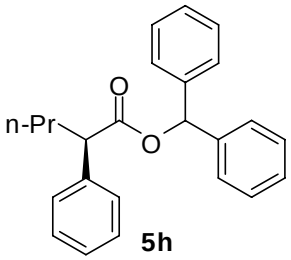
5g



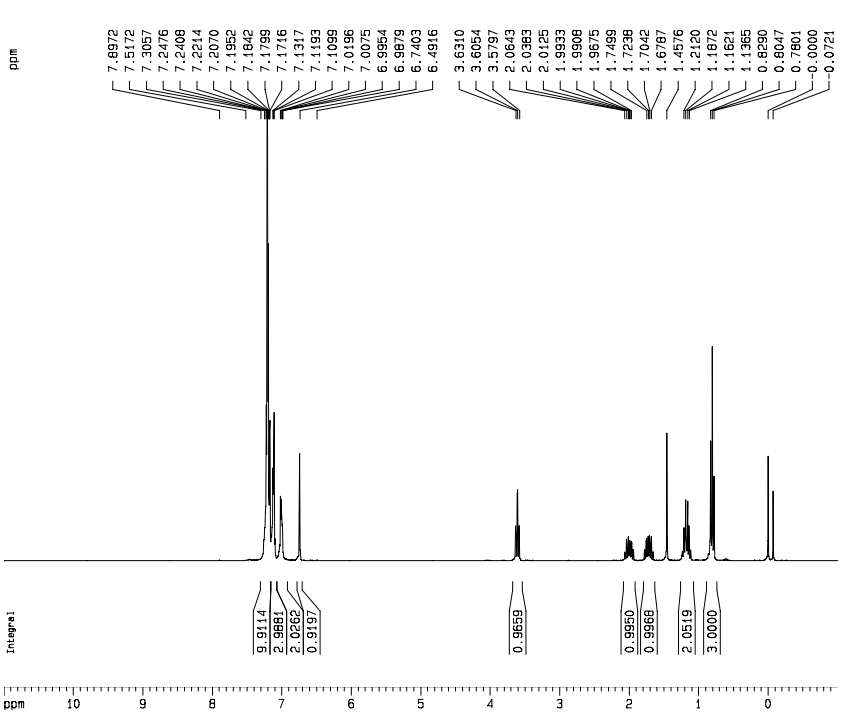

```
Current Data Parameters
NAME                  wxn84-2
EXPNO                      10
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080523
Time                    21.44
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                 CDCl3
NS                         16
DS                          0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6438515 sec
RG                      101.6
DW                     55.600 usec
DE                      6.00 usec
TE                      301.1 K
D1                 1.00000000 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                      7.00 usec
PL1                     -1.00 dB
SFO1              300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                300.1300425 MHz
WDW                        EM
SSB                         0
LB                       0.30 Hz
GB                          0
PC                       1.00

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                     10.000 ppm
F1                    3001.30 Hz
F2P                     -0.500 ppm
F2                    -150.07 Hz
PPMCM                 0.52500 ppm/cm
HZCM                157.56827 Hz/cm
```



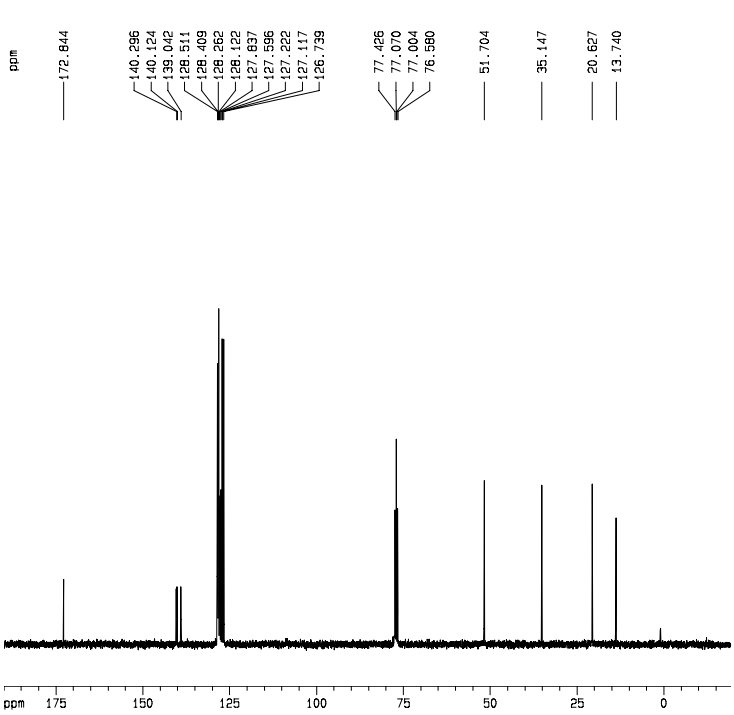

```
Current Data Parameters
NAME                  wxn84-2
EXPNO                      11
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080523
Time                    21.48
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                     65536
SOLVENT                 CDCl3
NS                        419
DS                          4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                        362
DW                     27.800 usec
DE                      6.00 usec
TE                      302.0 K
D1                 2.00000000 sec
D11                0.03000000 sec
DELTA              1.89999998 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                     12.50 usec
PL1                     2.00 dB
SFO1              75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                    -1.00 dB
PL12                   20.16 dB
PL13                   16.98 dB
SFO2              300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                75.4677493 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                    190.000 ppm
F1                   14338.87 Hz
F2P                    -50.000 ppm
F2                   -3773.39 Hz
PPMCM                12.00000 ppm/cm
HZCM                905.61298 Hz/cm
```



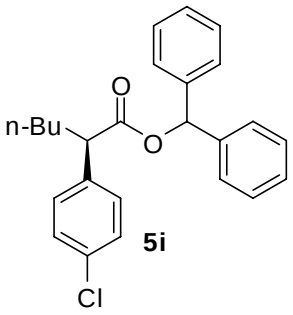
5h



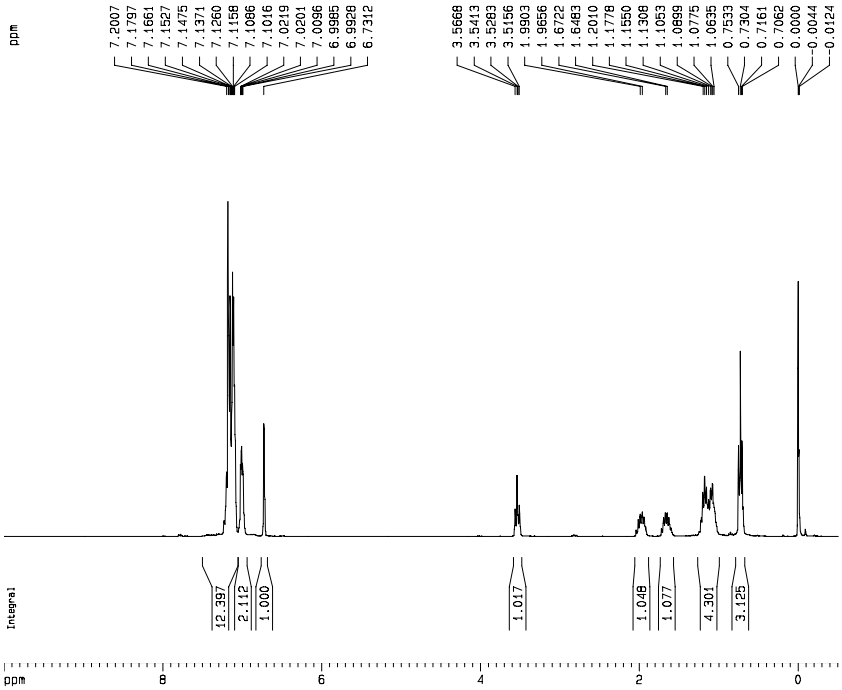

```
Current Data Parameters
NAME                  wxn99
EXPNO                    10
PROCNO                    1

F2 - Acquisition Parameters
Date_              20080714
Time                  16.30
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG               zg30
TD                   65536
SOLVENT               CDCl3
NS                       12
DS                        0
SWH                8992.806 Hz
FIDRES             0.137219 Hz
AQ                 3.6438515 sec
RG                     228.1
DW                    55.600 usec
DE                     6.00 usec
TE                    302.1 K
D1                 1.00000000 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                      1H
P1                     7.00 usec
PL1                   -1.00 dB
SFO1            300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                 300.1300324 MHz
WDW                      EM
SSB                       0
LB                     0.30 Hz
GB                        0
PC                     1.00

1D NMR plot parameters
CX                    20.00 cm
CY                    12.50 cm
F1P                  11.000 ppm
F1                  3301.43 Hz
F2P                  -1.000 ppm
F2                  -300.13 Hz
PPMCM                0.60000 ppm/cm
HZCM               180.07802 Hz/cm
```



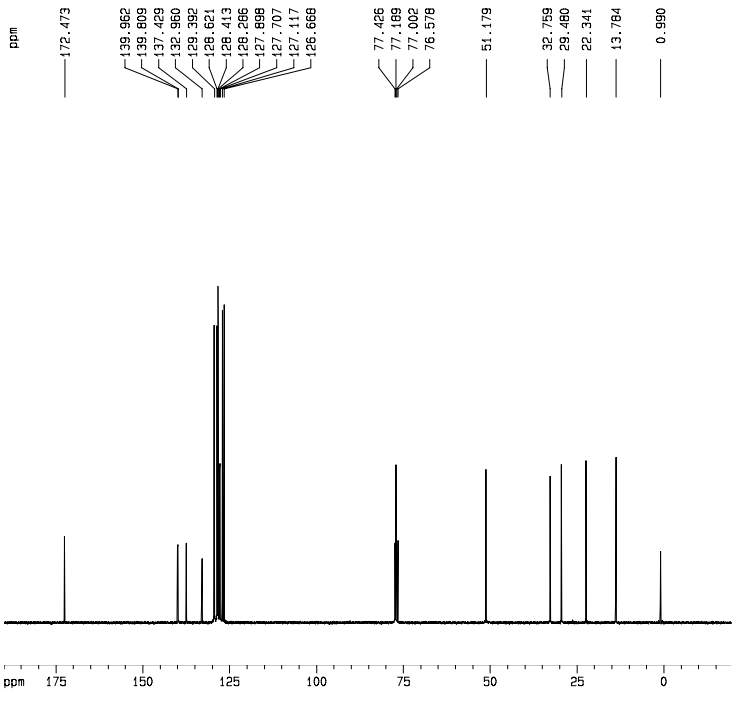

```
Current Data Parameters
NAME                  wxn99
EXPNO                    30
PROCNO                    1

F2 - Acquisition Parameters
Date_              20080715
Time                  18.39
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG            zgpg30
TD                   65536
SOLVENT               CDCl3
NS                      454
DS                        4
SWH                17985.611 Hz
FIDRES             0.274439 Hz
AQ                 1.8219508 sec
RG                      512
DW                    27.800 usec
DE                     6.00 usec
TE                    301.6 K
D1                 2.00000000 sec
D11                0.03000000 sec
DELTA              1.89999998 sec
MCREST             0.00000000 sec
MCWRK              0.01500000 sec

======== CHANNEL f1 ========
NUC1                     13C
P1                    12.50 usec
PL1                    2.00 dB
SFO1            75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2              waltz16
NUC2                      1H
PCPD2                 80.00 usec
PL2                   -1.00 dB
PL12                  20.16 dB
PL13                  16.98 dB
SFO2            300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                 75.4677498 MHz
WDW                      EM
SSB                       0
LB                     1.00 Hz
GB                        0
PC                     1.40

1D NMR plot parameters
CX                    20.00 cm
CY                     8.00 cm
F1P                 190.000 ppm
F1                14398.87 Hz
F2P                 -50.000 ppm
F2                 -3773.39 Hz
PPMCM                12.00000 ppm/cm
HZCM               905.61298 Hz/cm
```



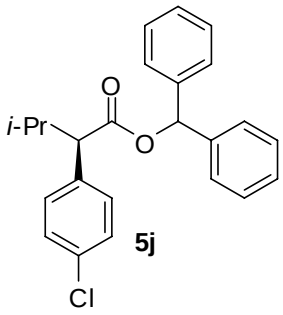
5i



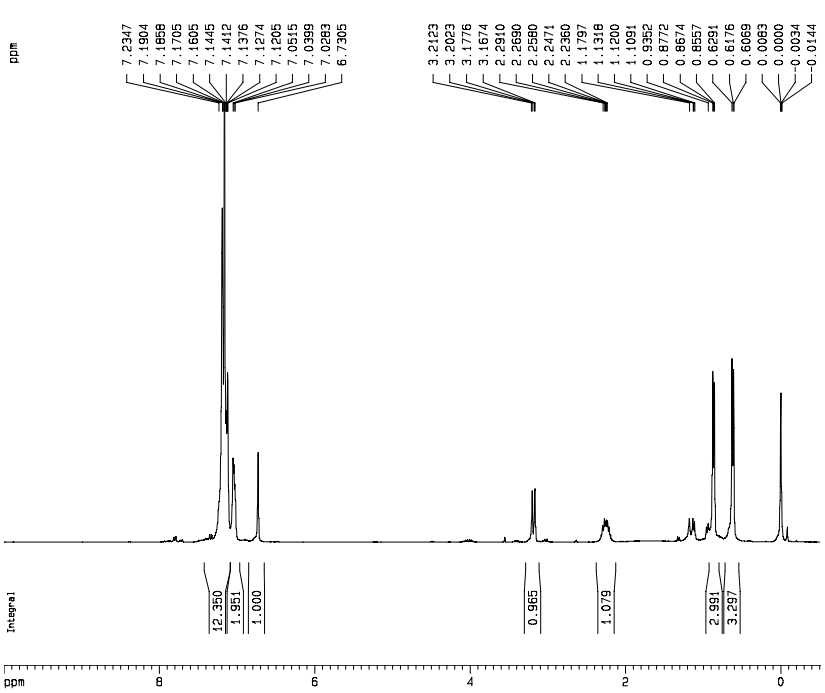

```
Current Data Parameters
NAME                  wxn80
EXPNO                    10
PROCNO                    1

F2 - Acquisition Parameters
Date_           20080829
Time                 21.15
INSTRUM              spect
PROBHD    5 mm DUL 13C-1
PULPROG              zg30
TD                  65536
SOLVENT              CDCl3
NS                      16
DS                       0
SWH               8992.806 Hz
FIDRES            0.137219 Hz
AQ                3.6438515 sec
RG                     50.8
DW                 55.600 usec
DE                  6.00 usec
TE                  673.2 K
D1                1.00000000 sec
MCREST            0.00000000 sec
MCWRK             0.01500000 sec

======== CHANNEL f1 ========
NUC1                     1H
P1                   7.00 usec
PL1                  -1.00 dB
SFO1           300.1324010 MHz

F2 - Processing parameters
SI                      32768
SF             300.1300504 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00

1D NMR plot parameters
CX                   20.00 cm
CY                    8.00 cm
F1P                 10.000 ppm
F1                 3001.30 Hz
F2P                 -0.500 ppm
F2                 -150.07 Hz
PPMCM              0.52500 ppm/cm
HZCM             157.56627 Hz/cm
```



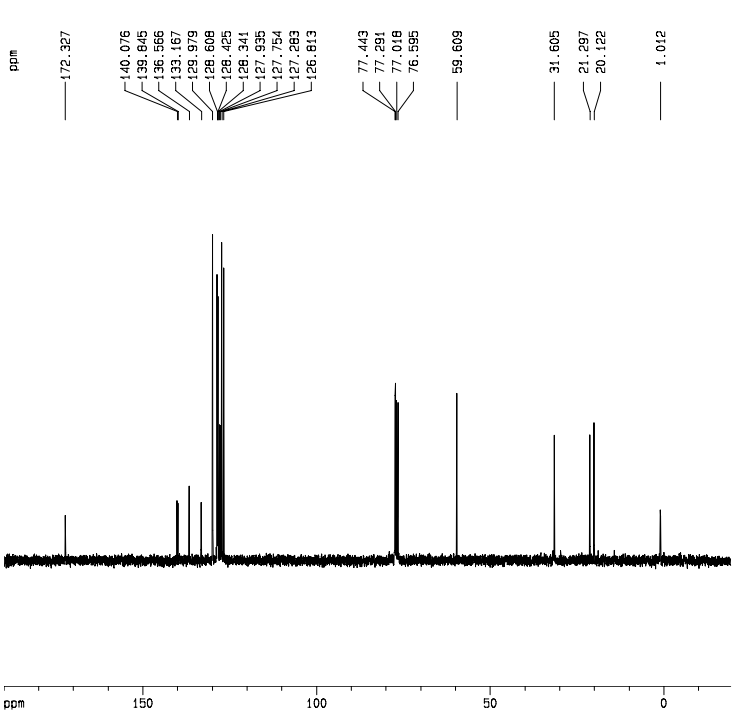

```
Current Data Parameters
NAME                  wxn80
EXPNO                    20
PROCNO                    1

F2 - Acquisition Parameters
Date_           20080830
Time                 16.08
INSTRUM              spect
PROBHD    5 mm DUL 13C-1
PULPROG           zgpg30
TD                  65536
SOLVENT              CDCl3
NS                     462
DS                       4
SWH              17985.611 Hz
FIDRES            0.274439 Hz
AQ                1.8219508 sec
RG                     512
DW                 27.800 usec
DE                  6.00 usec
TE                  673.2 K
D1                2.00000000 sec
D11               0.03000000 sec
DELTA             1.89999998 sec
MCREST            0.00000000 sec
MCWRK             0.01500000 sec

======== CHANNEL f1 ========
NUC1                    13C
P1                  12.50 usec
PL1                  2.00 dB
SFO1           75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                     1H
PCPD2               80.00 usec
PL2                  -1.00 dB
PL12                 20.16 dB
PL13                 16.98 dB
SFO2           300.1312005 MHz

F2 - Processing parameters
SI                      32768
SF             75.4677586 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40

1D NMR plot parameters
CX                   20.00 cm
CY                    8.00 cm
F1P                190.000 ppm
F1               14338.87 Hz
F2P                -50.000 ppm
F2               -3773.39 Hz
PPMCM             12.00000 ppm/cm
HZCM            905.61310 Hz/cm
```



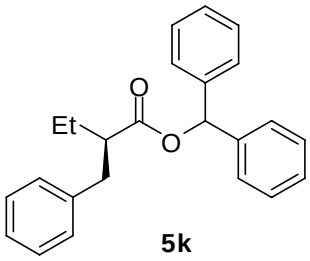
5j



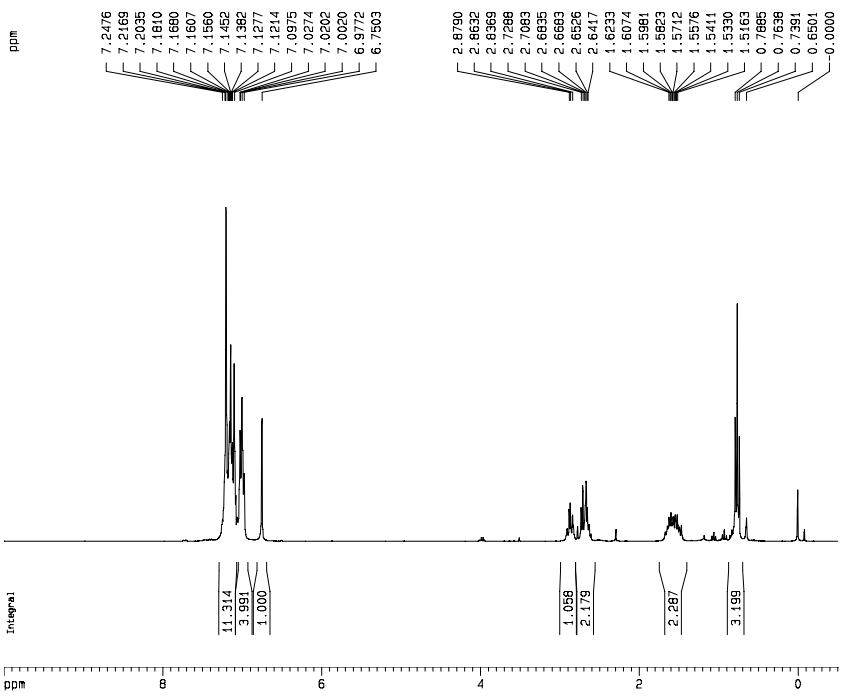

```
Current Data Parameters
NAME                  wxn84-3
EXPNO                      10
PROCNO                      1

F2 - Acquisition Parameters
Date_               20080714
Time                   16.39
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                     65536
SOLVENT                CDCl3
NS                        16
DS                         0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6438515 sec
RG                       90.5
DW                    55.600 usec
DE                     6.00 usec
TE                     301.9 K
D1                  1.00000000 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                      7.00 usec
PL1                     -1.00 dB
SFO1              300.1324010 MHz

F2 - Processing parameters
SI                        32768
SF                300.1300396 MHz
WDW                          EM
SSB                           0
LB                         0.30 Hz
GB                            0
PC                         1.00

1D NMR plot parameters
CX                        20.00 cm
CY                        12.50 cm
F1P                     10.000 ppm
F1                     3001.30 Hz
F2P                     -0.500 ppm
F2                     -150.07 Hz
PPMCM                 0.52500 ppm/cm
HZCM                157.56827 Hz/cm
```



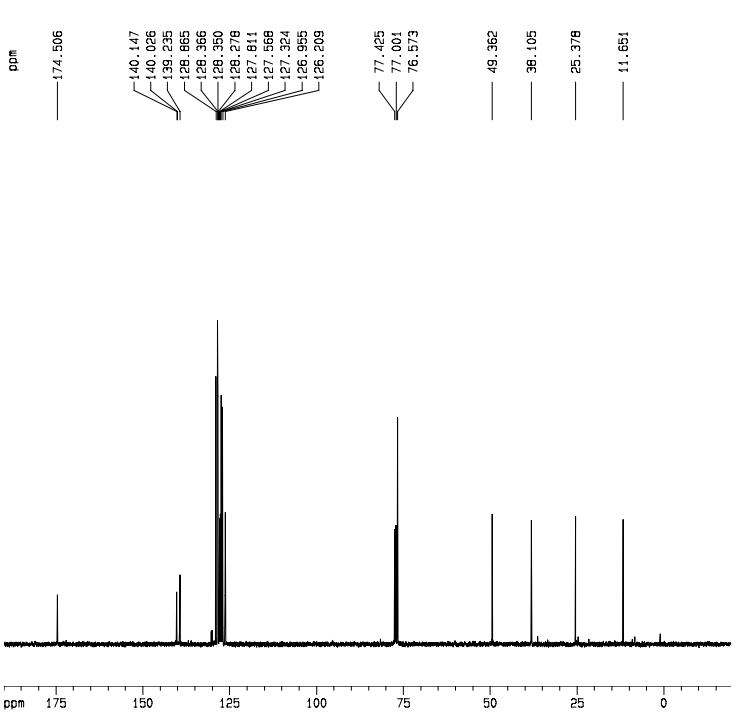

```
Current Data Parameters
NAME                  wxn84-3
EXPNO                      11
PROCNO                      1

F2 - Acquisition Parameters
Date_               20080714
Time                   16.45
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       180
DS                         4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                     2898.3
DW                    27.800 usec
DE                     6.00 usec
TE                     303.4 K
D1                  2.00000000 sec
D11                 0.03000000 sec
DELTA               1.89999998 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                     12.50 usec
PL1                     2.00 dB
SFO1              75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                    -1.00 dB
PL12                   20.16 dB
PL13                   16.98 dB
SFO2              300.1312005 MHz

F2 - Processing parameters
SI                        32768
SF                75.4677482 MHz
WDW                          EM
SSB                           0
LB                         1.00 Hz
GB                            0
PC                         1.40

1D NMR plot parameters
CX                        20.00 cm
CY                         8.00 cm
F1P                     190.000 ppm
F1                    14338.87 Hz
F2P                     -50.000 ppm
F2                    -3773.39 Hz
PPMCM                 12.00000 ppm/cm
HZCM                905.61298 Hz/cm
```



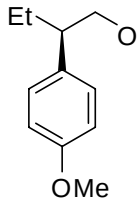
5k



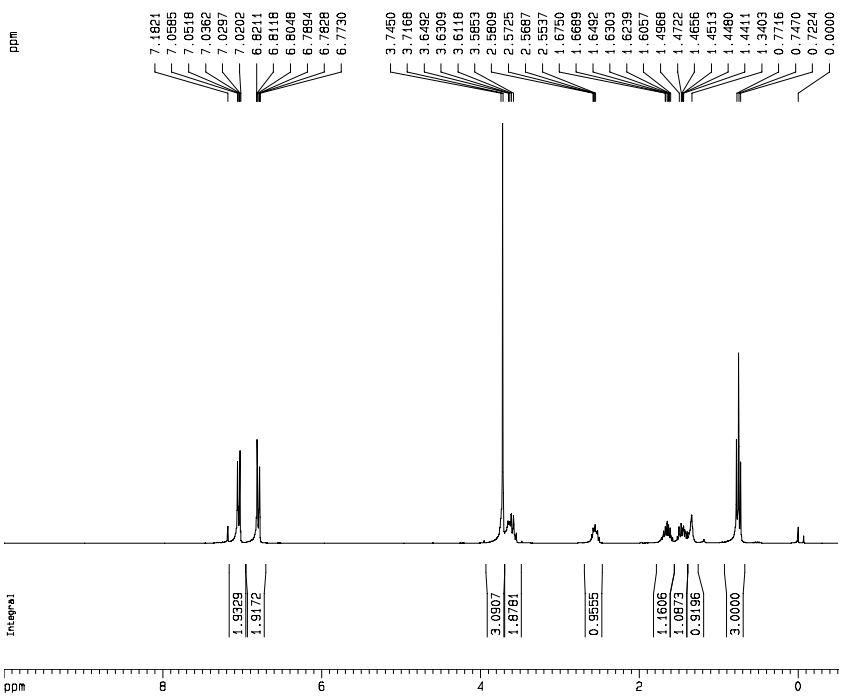

```
Current Data Parameters
NAME                  wxn87-1
EXPNO                      10
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080529
Time                    20.51
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                 CDCl3
NS                         16
DS                          0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6436615 sec
RG                        71.8
DW                     55.600 usec
DE                      6.00 usec
TE                     673.2 K
D1                  1.00000000 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                      7.00 usec
PL1                     -1.00 dB
SFO1              300.1324010 MHz

F2 - Processing parameters
SI                        32768
SF                300.1300455 MHz
WDW                        EM
SSB                         0
LB                       0.30 Hz
GB                          0
PC                       1.00

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                     10.000 ppm
F1                    3001.30 Hz
F2P                    -0.500 ppm
F2                    -150.07 Hz
PPMCM                 0.52500 ppm/cm
HZCM                157.56827 Hz/cm
```



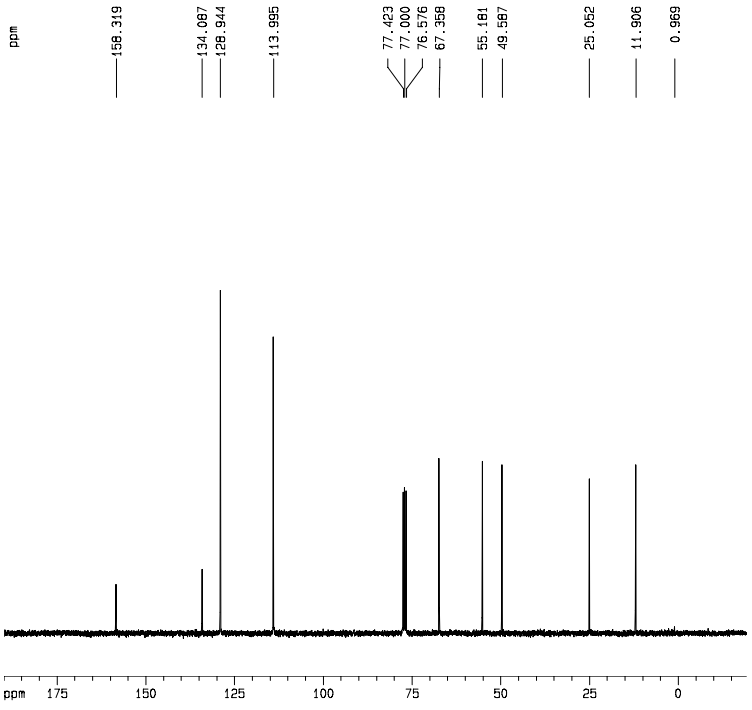

```
Current Data Parameters
NAME                  wxn87-1
EXPNO                      11
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080529
Time                    20.59
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                     65536
SOLVENT                 CDCl3
NS                        256
DS                          4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                      456.1
DW                     27.800 usec
DE                      6.00 usec
TE                     673.2 K
D1                  2.00000000 sec
d11                 0.03000000 sec
DELTA               1.89999998 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                     12.50 usec
PL1                     2.00 dB
SFO1              75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2             waltz16
NUC2                       1H
PCPD2                  80.00 usec
PL2                     -1.00 dB
PL12                    20.16 dB
PL13                    16.98 dB
SFO2              300.1312005 MHz

F2 - Processing parameters
SI                        32768
SF                75.4677559 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                    190.000 ppm
F1                   14338.87 Hz
F2P                    -50.000 ppm
F2                   -3773.39 Hz
PPMCM                12.00000 ppm/cm
HZCM                905.61310 Hz/cm
```



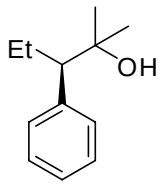
6



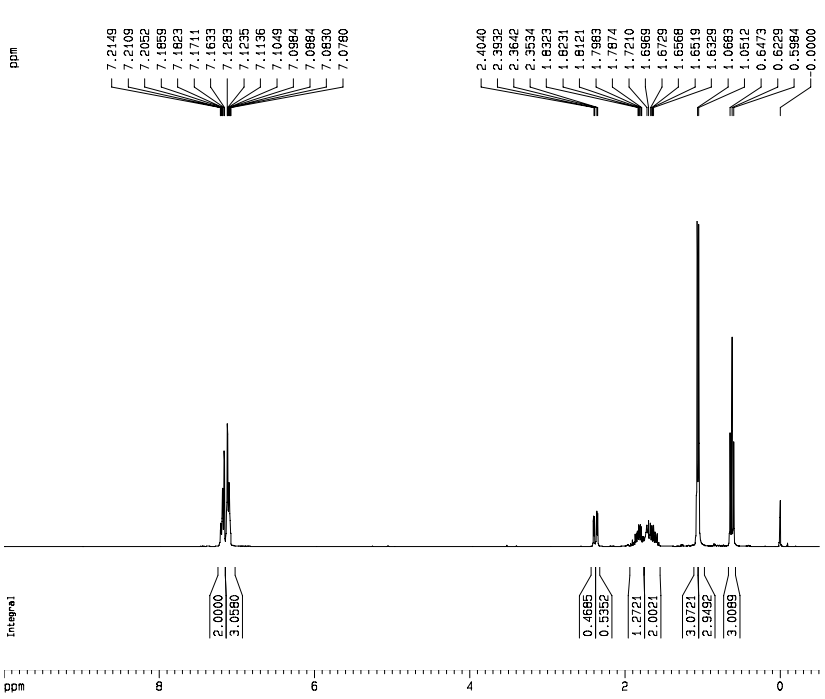

```
Current Data Parameters
NAME                  wxn88-2
EXPNO                      10
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080528
Time                    22.28
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                 CDCl3
NS                         16
DS                          0
SWH                 8992.806 Hz
FIDRES              0.137219 Hz
AQ                  3.6438615 sec
RG                       90.5
DW                   55.600 usec
DE                    6.00 usec
TE                    673.2 K
D1                  1.00000000 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                       1H
P1                    7.00 usec
PL1                   -1.00 dB
SFO1             300.1324010 MHz

F2 - Processing parameters
SI                       32768
SF                300.1300291 MHz
WDW                        EM
SSB                         0
LB                     0.30 Hz
GB                          0
PC                       1.00

1D NMR plot parameters
CX                      20.00 cm
CY                      10.00 cm
F1P                   10.000 ppm
F1                  3001.30 Hz
F2P                   -0.500 ppm
F2                  -150.07 Hz
PPMCM                0.82500 ppm/cm
HZCM               157.56827 Hz/cm
```



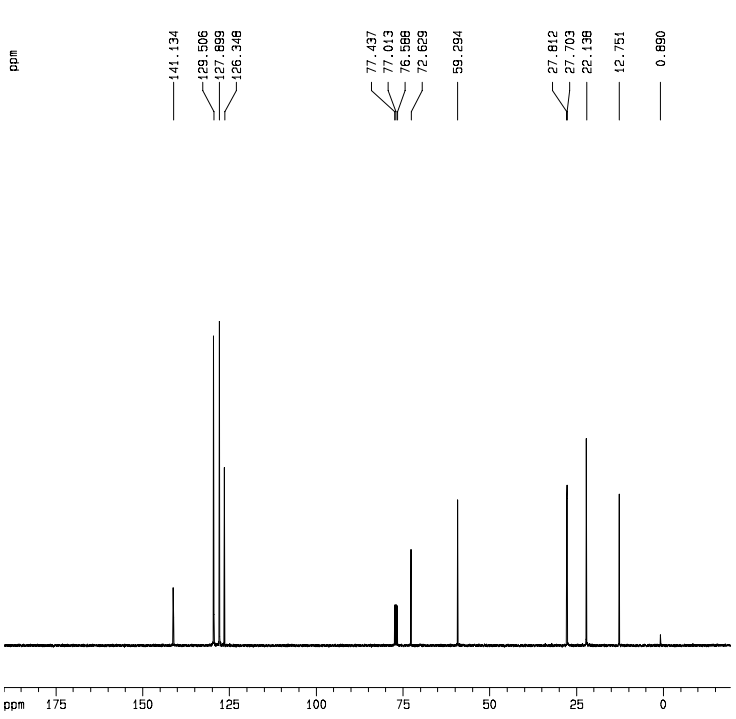

```
Current Data Parameters
NAME                  wxn88-2
EXPNO                      11
PROCNO                      1

F2 - Acquisition Parameters
Date_              20080528
Time                    22.31
INSTRUM                 spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                     65536
SOLVENT                 CDCl3
NS                        318
DS                          4
SWH                17985.611 Hz
FIDRES              0.274439 Hz
AQ                  1.8219508 sec
RG                       456.1
DW                   27.800 usec
DE                    6.00 usec
TE                    673.2 K
D1                  2.00000000 sec
D11                 0.03000000 sec
DELTA               1.89999998 sec
MCREST              0.00000000 sec
MCWRK               0.01500000 sec

======== CHANNEL f1 ========
NUC1                      13C
P1                   12.50 usec
PL1                   2.00 dB
SFO1             75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                80.00 usec
PL2                   -1.00 dB
PL12                  20.15 dB
PL13                  16.98 dB
SFO2             300.1312005 MHz

F2 - Processing parameters
SI                       32768
SF                75.4677531 MHz
WDW                        EM
SSB                         0
LB                     1.00 Hz
GB                          0
PC                       1.40

1D NMR plot parameters
CX                      20.00 cm
CY                       8.00 cm
F1P                   190.000 ppm
F1                  14338.87 Hz
F2P                   -50.000 ppm
F2                  -3773.39 Hz
PPMCM               12.00000 ppm/cm
HZCM               905.61298 Hz/cm
```



7



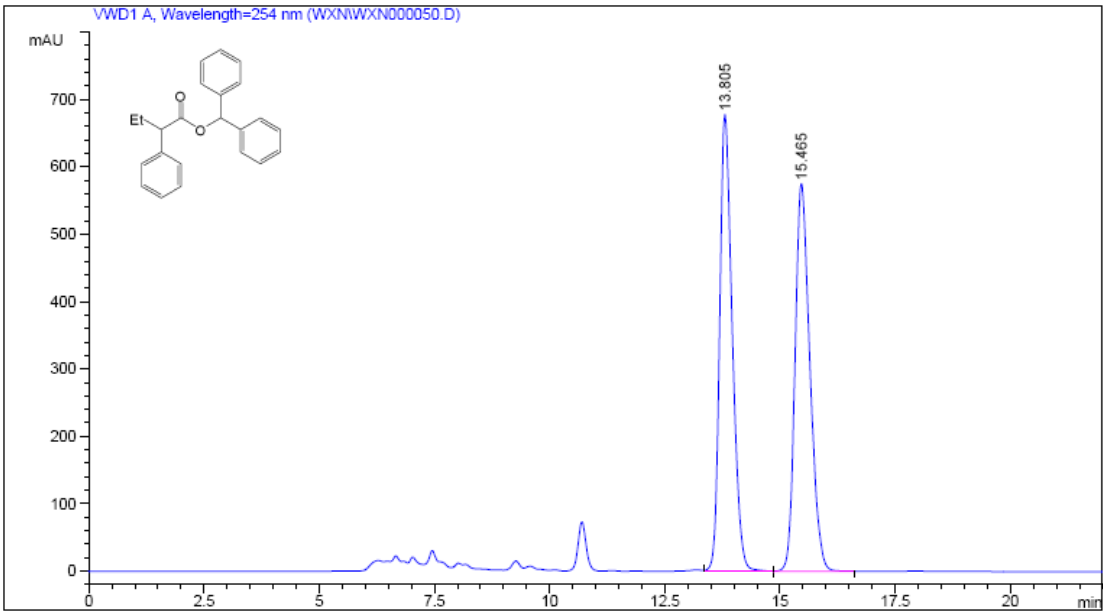

```
Current Data Parameters
NAME                wxn109
EXPNO                   10
PROCNO                   1

F2 - Acquisition Parameters
Date_            20080625
Time                23.26
INSTRUM             spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT             CDCl3
NS                     16
DS                      0
SWH              8992.806 Hz
FIDRES           0.137219 Hz
AQ               3.6438515 sec
RG                   22.6
DW                 55.600 usec
DE                  6.00 usec
TE                 298.5 K
D1              1.00000000 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                   1H
P1                  7.00 usec
PL1                -1.00 dB
SFO1          300.1324010 MHz

F2 - Processing parameters
SI                  32768
SF            300.1300409 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00

1D NMR plot parameters
CX                  20.00 cm
CY                   8.00 cm
F1P                 10.000 ppm
F1                3001.30 Hz
F2P                -0.500 ppm
F2                -150.07 Hz
PPMCM             0.52500 ppm/cm
HZCM            157.56827 Hz/cm
```



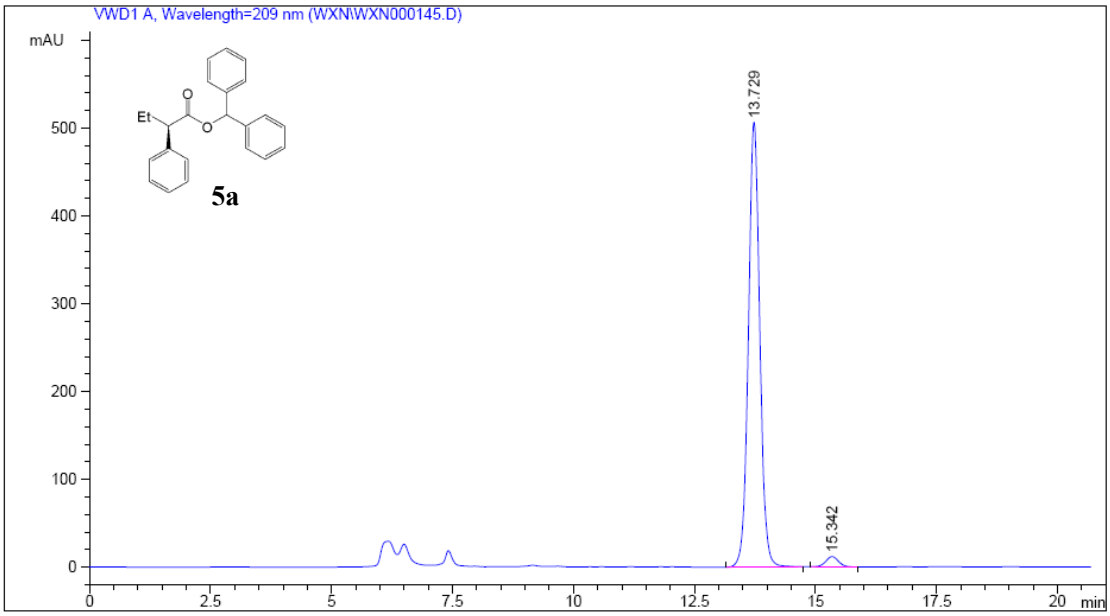

```
Current Data Parameters
NAME                wxn109
EXPNO                   11
PROCNO                   1

F2 - Acquisition Parameters
Date_            20080625
Time                23.31
INSTRUM             spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                 65536
SOLVENT             CDCl3
NS                     99
DS                      4
SWH             17985.611 Hz
FIDRES           0.274439 Hz
AQ               1.8219508 sec
RG                    512
DW                 27.800 usec
DE                  6.00 usec
TE                 300.3 K
D1              2.00000000 sec
d11             0.03000000 sec
DELTA           1.89999998 sec
MCREST          0.00000000 sec
MCWRK           0.01500000 sec

======== CHANNEL f1 ========
NUC1                  13C
P1                 12.50 usec
PL1                 2.00 dB
SFO1          75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                   1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               20.16 dB
PL13               16.98 dB
SFO2          300.1312005 MHz

F2 - Processing parameters
SI                  32768
SF            75.4677597 MHz
WDW                    EM
SSB                     0
LB                   1.00 Hz
GB                      0
PC                   1.40

1D NMR plot parameters
CX                  20.00 cm
CY                   8.00 cm
F1P                190.000 ppm
F1               14338.87 Hz
F2P                -50.000 ppm
F2               -3773.39 Hz
PPMCM            12.00000 ppm/cm
HZCM            905.61310 Hz/cm
```

Part III Copies of HPLC spectra

Sample Information: AD-H Hex:Ipr=90:10 0.5ml/min



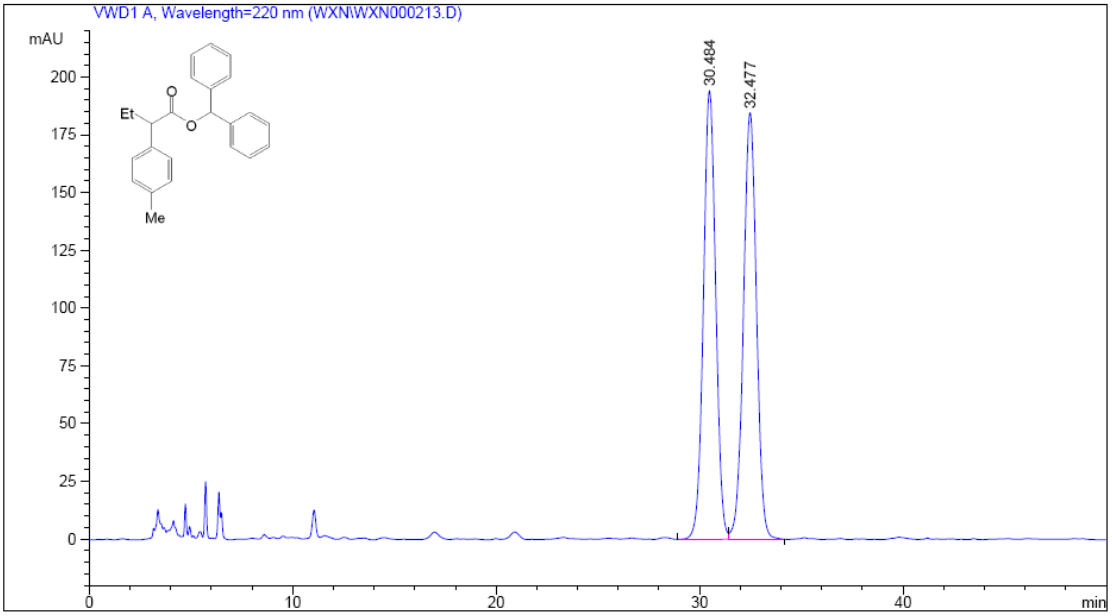
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	13.805	VV	0.2867	1.28539e4	677.92267	49.9968
2	15.465	VB	0.3409	1.28555e4	575.05573	50.0032



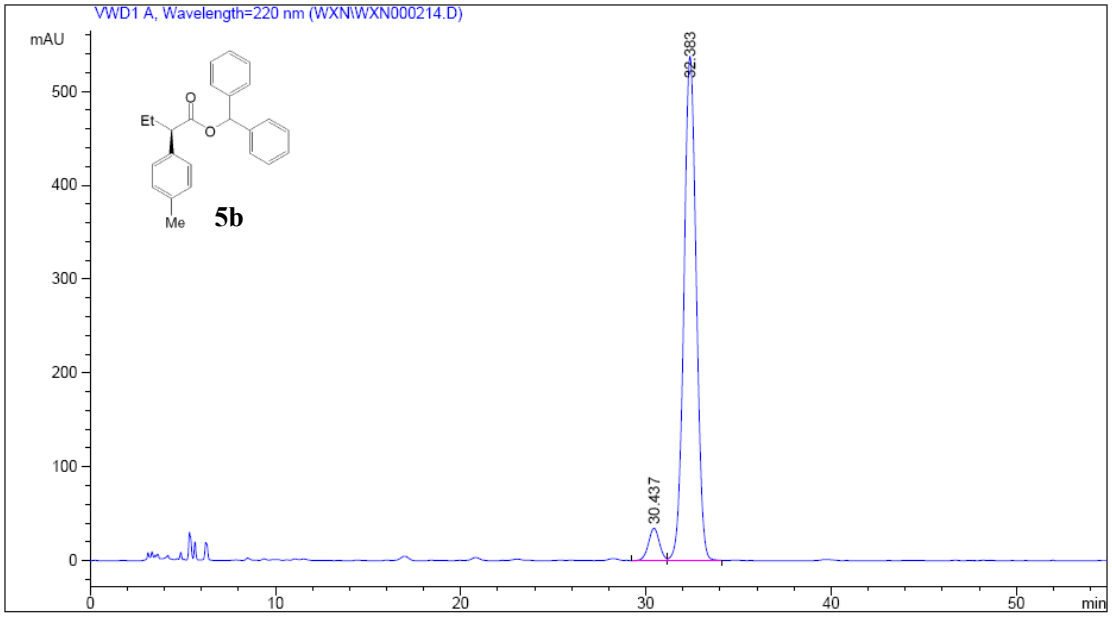
5a

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	13.729	BB	0.2509	8303.67969	506.62173	97.4700
2	15.342	BB	0.2818	215.53758	11.78757	2.5300

Sample Infomation: AD-H Hex:Ipr=99.5:0.5,1.0ml/min

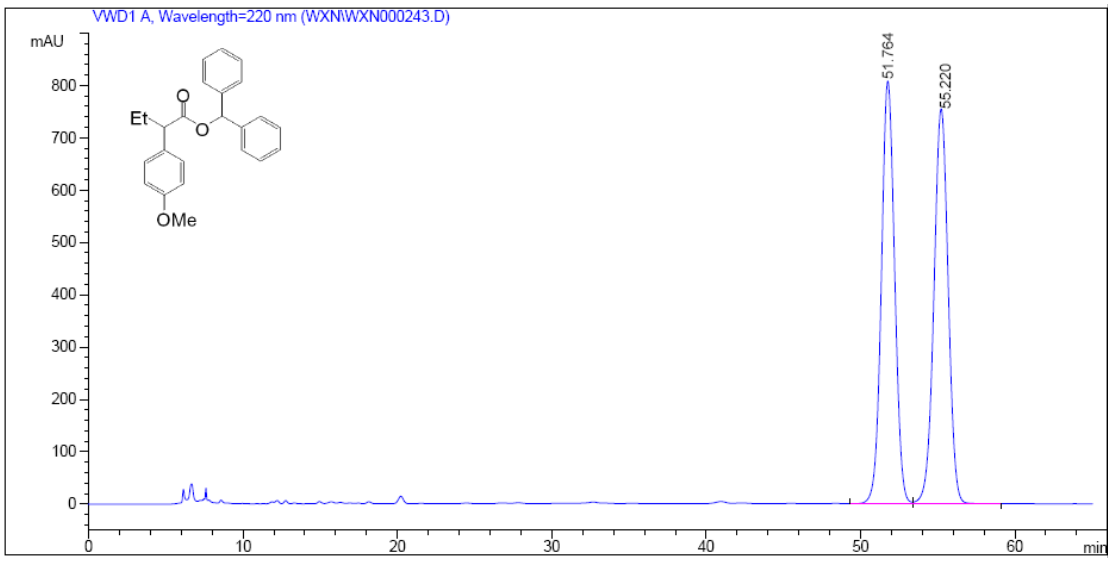


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	30.484	VV	0.6509	8167.45459	194.18037	49.8475
2	32.477	VB	0.6882	8217.41211	184.59479	50.1525

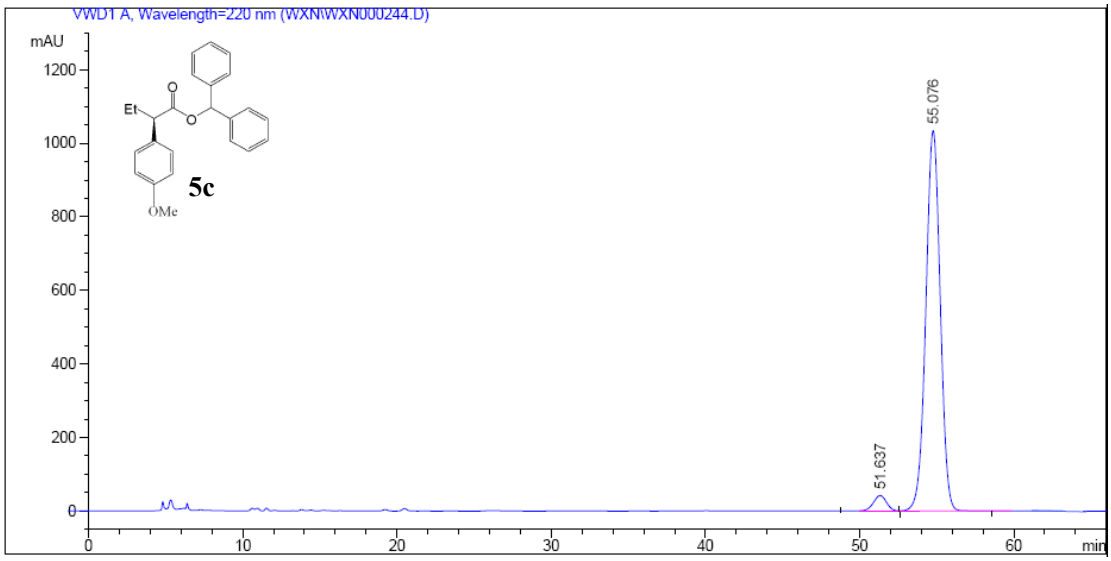


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	30.437	VV	0.6424	1419.97632	34.45510	5.4142
2	32.383	VB	0.7180	2.48071e4	537.03394	94.5858

Sample Information : AD-H Hex:Ipr=99:1 1mL/min

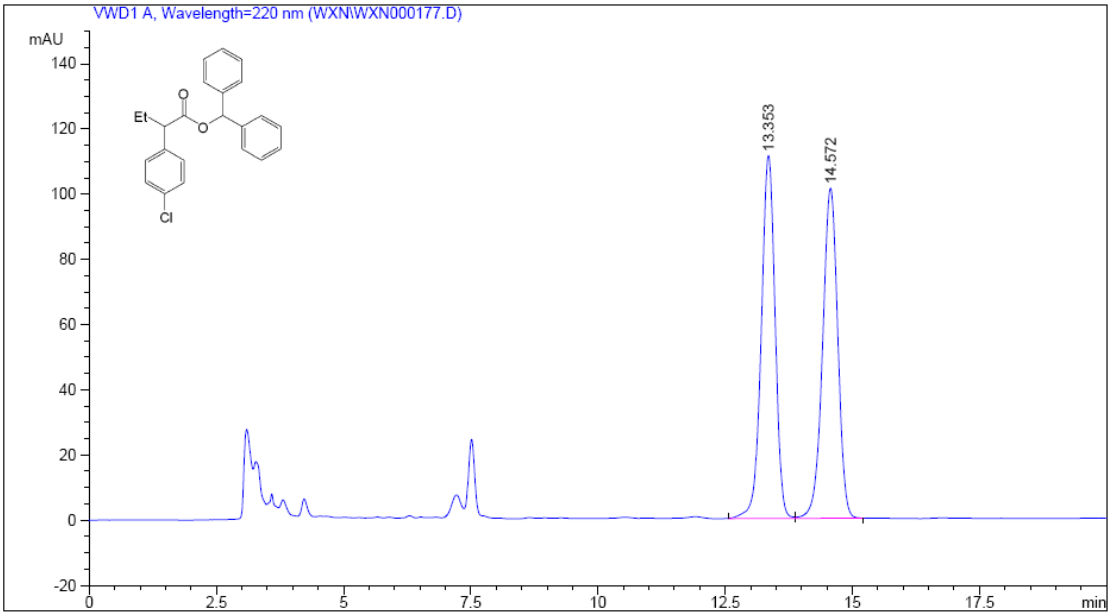


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	51.764	VV	0.9296	4.81979e4	807.13147	49.8362
2	55.220	VB	1.0066	4.85148e4	754.37280	50.1638

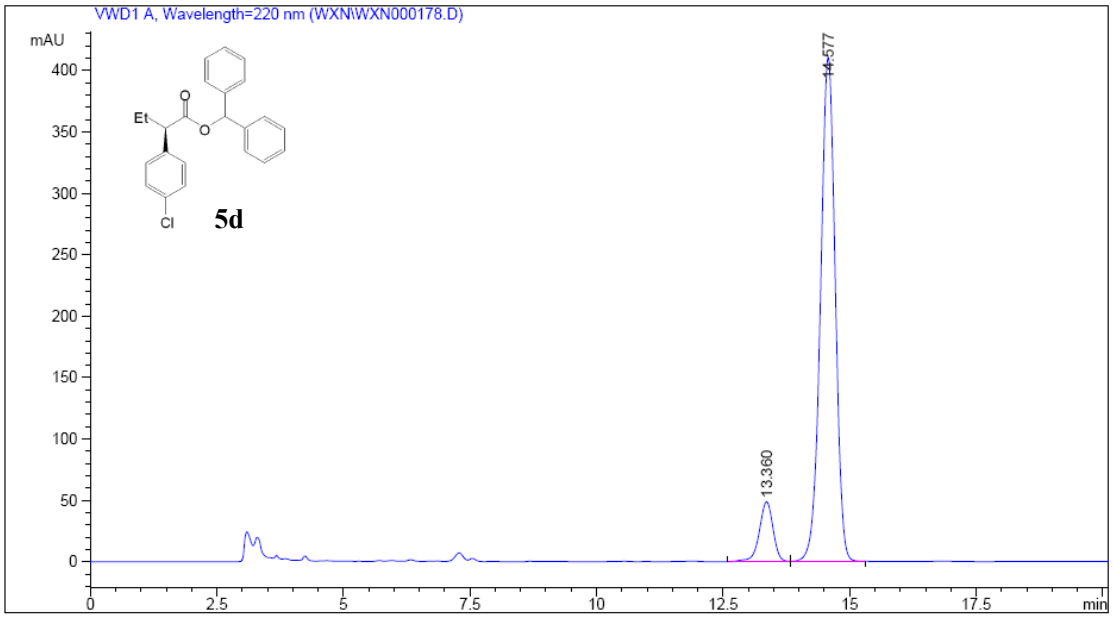


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	51.637	VV	0.9266	2526.59692	42.14457	3.6268
2	55.076	VB	1.0076	6.71390e4	1034.49780	96.3732

Sample Information : AD-H Hex:Ipr=95:5 1.0mL/min

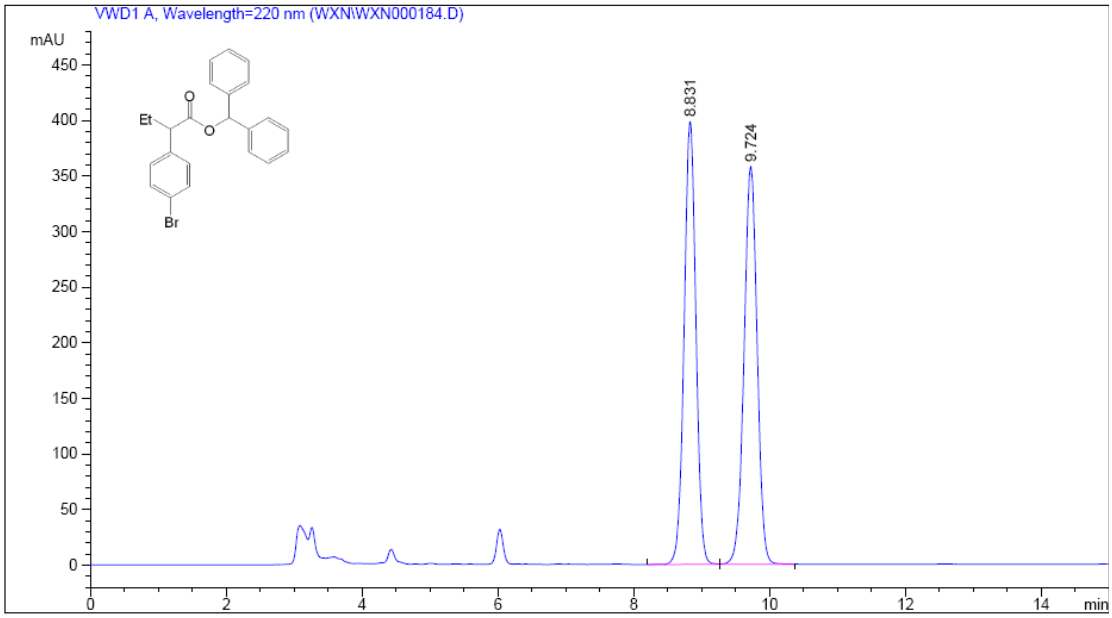


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	13.353	BV	0.2921	2107.19995	111.34898	50.0893
2	14.572	VB	0.3205	2099.68530	101.27441	49.9107

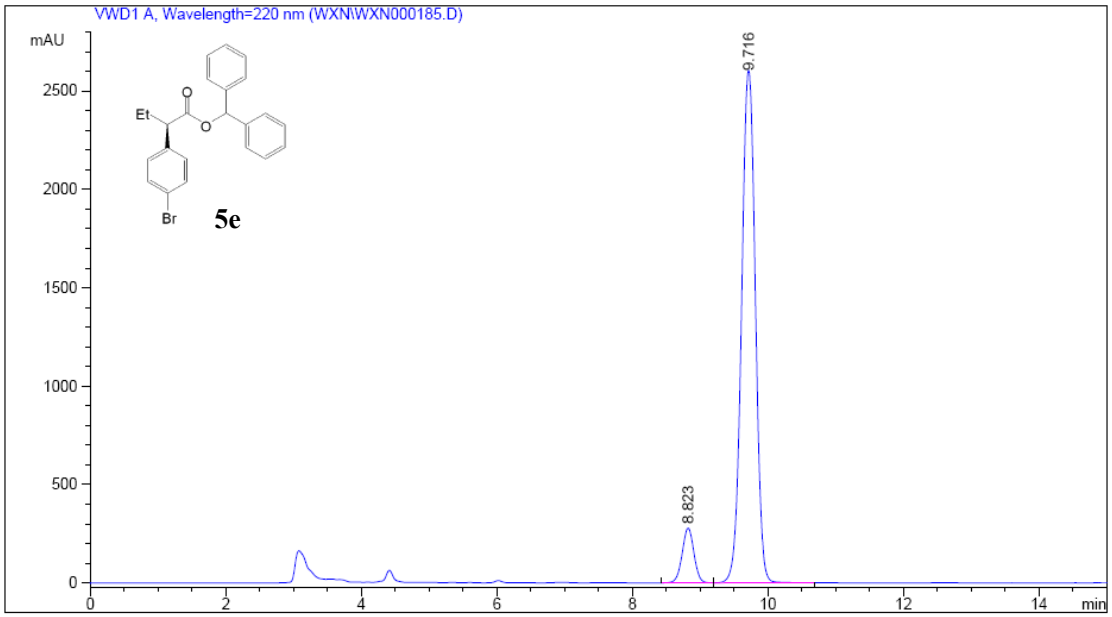


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	13.360	BV	0.2916	919.51868	48.70133	9.9822
2	14.577	VB	0.3128	8292.06445	410.60495	90.0178

Sample Information : AD-H, Hex:Ipr=95:5, 1.0mL/min



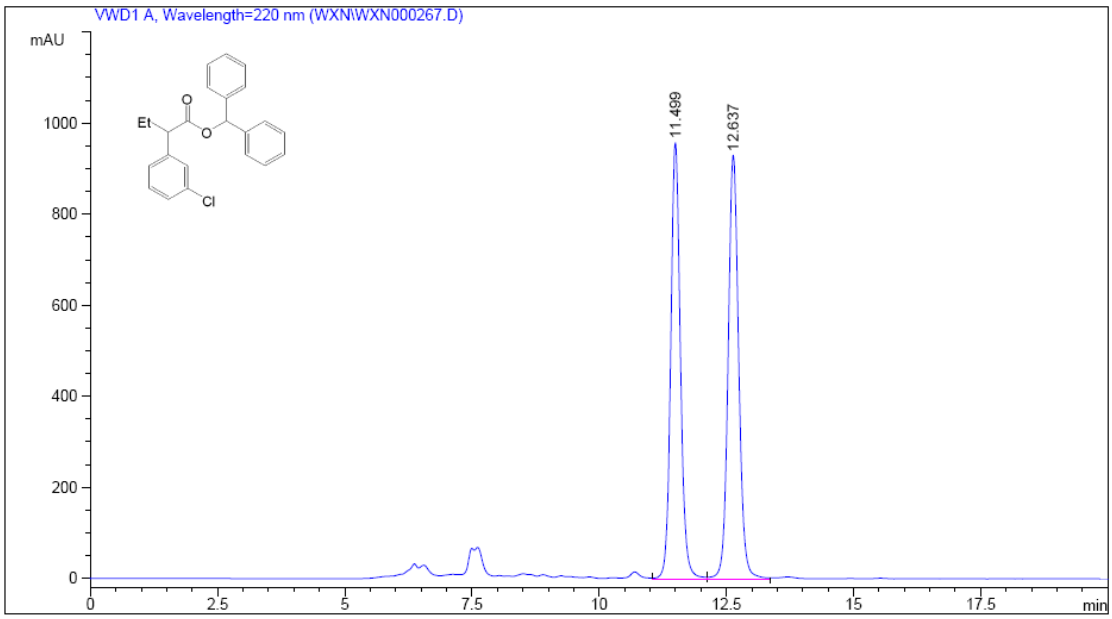
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.831	VV	0.1871	4799.52881	398.59085	49.9389
2	9.724	VB	0.2092	4811.26709	358.07864	50.0611



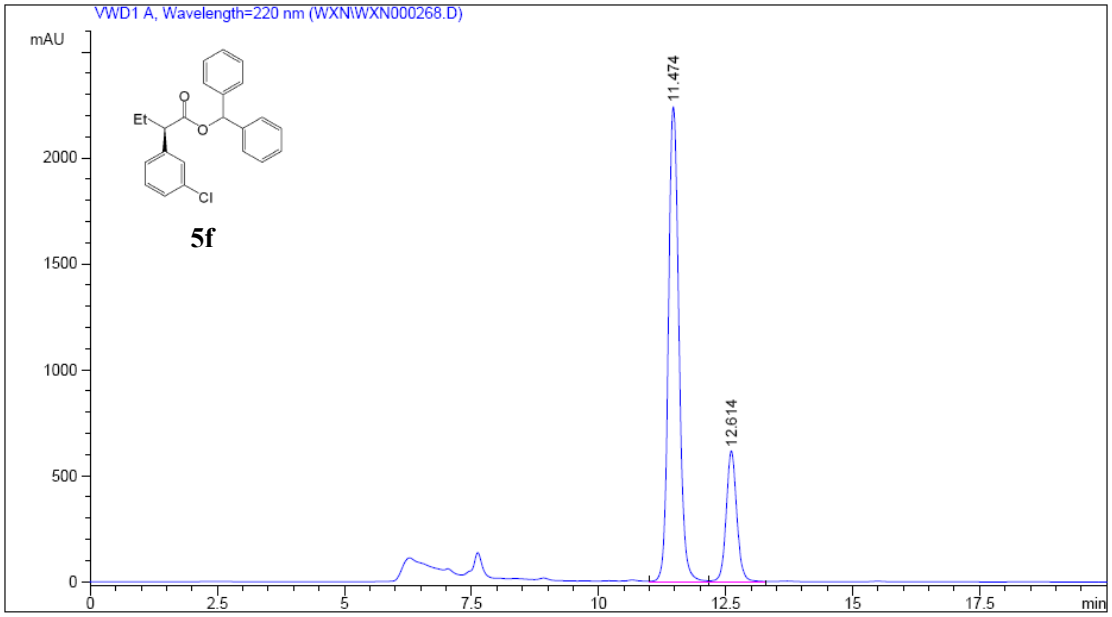
5e

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.823	BV	0.1858	3357.23071	278.35046	8.3653
2	9.716	VB	0.2215	3.67755e4	2604.95117	91.6347

Sample Information : AD-H Hex:Ipr=90:10, 0.5mL/min



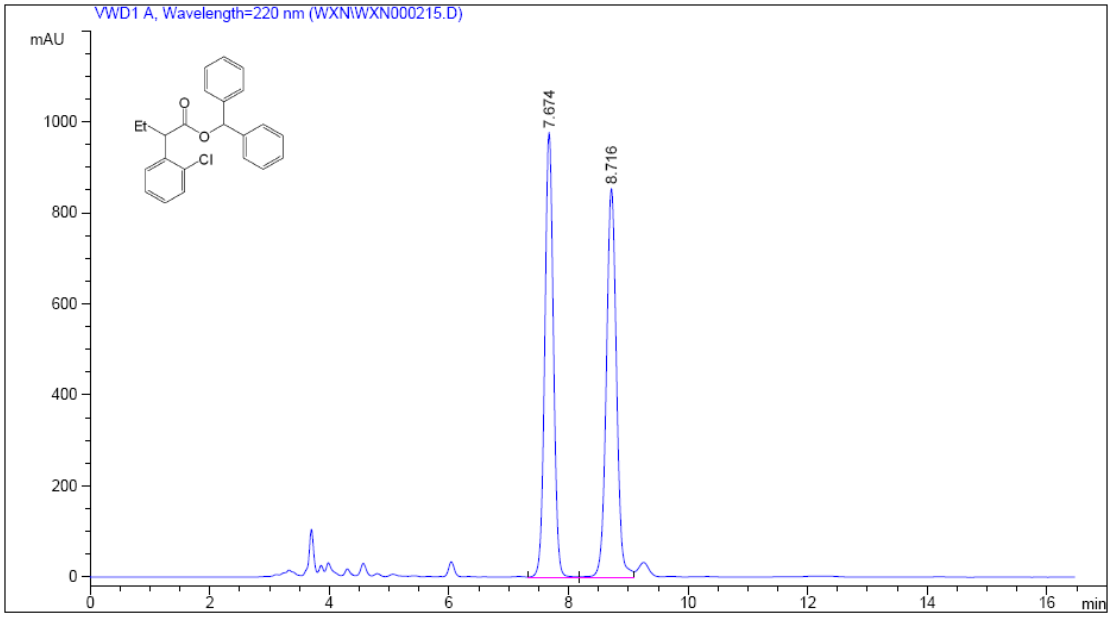
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.499	VV	0.2018	1.26280e4	957.99084	48.4341
2	12.637	VV	0.2224	1.34446e4	930.62634	51.5659



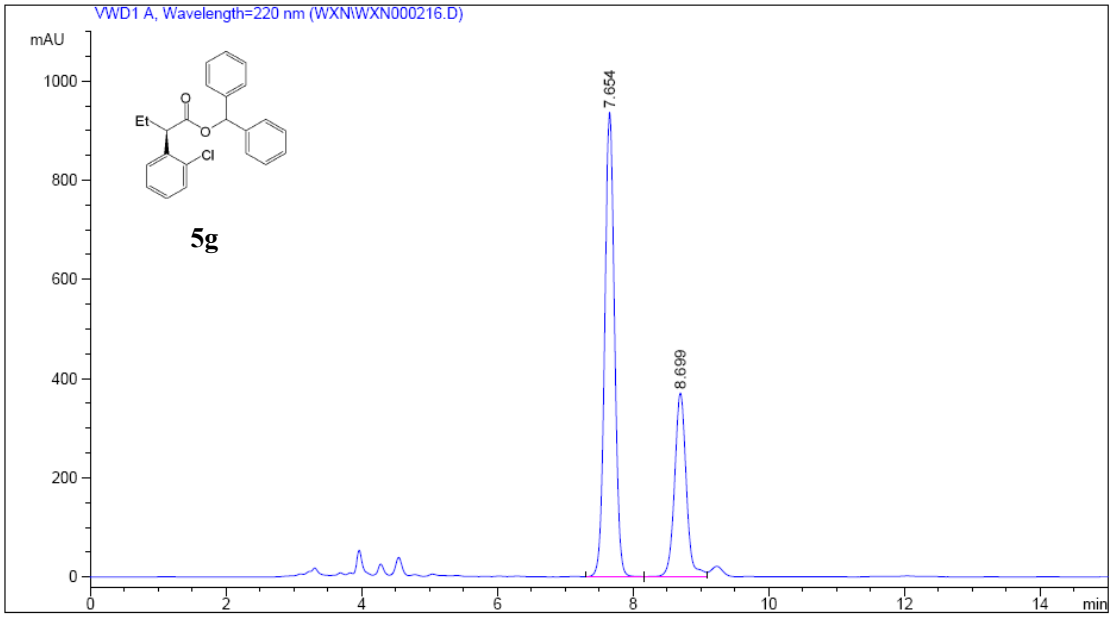
5f

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.474	VV	0.2233	3.22782e4	2242.08472	78.2415
2	12.614	VV	0.2235	8976.37695	617.40021	21.7585

Sample Information : AD-H Hex:Ipr=95:5,1.0ml/min



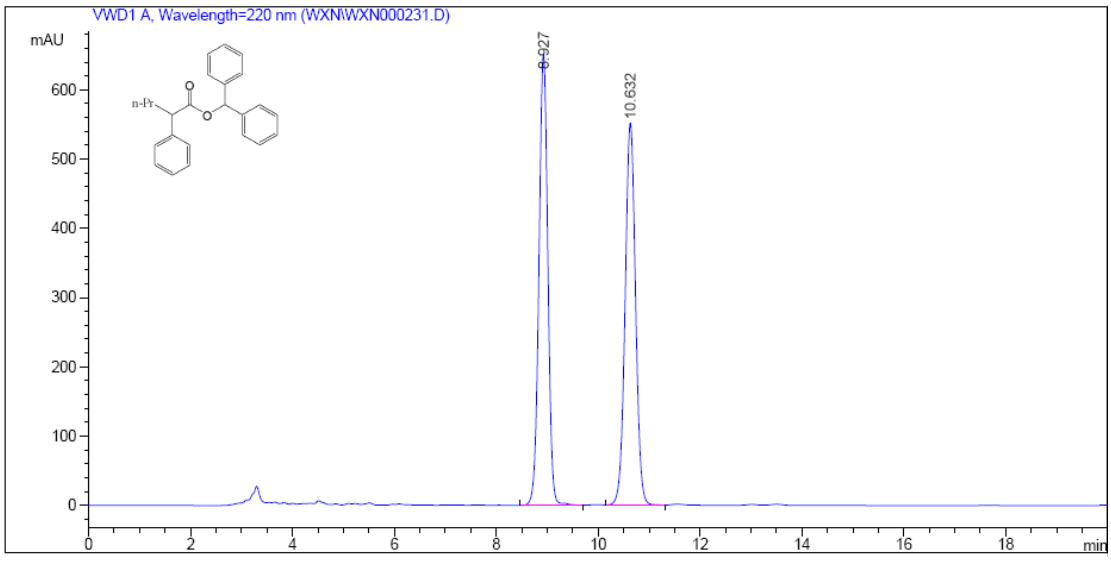
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	7.674	VV	0.1562	9786.94629	976.90363	49.3089
2	8.716	VV	0.1827	1.00613e4	853.38440	50.6911



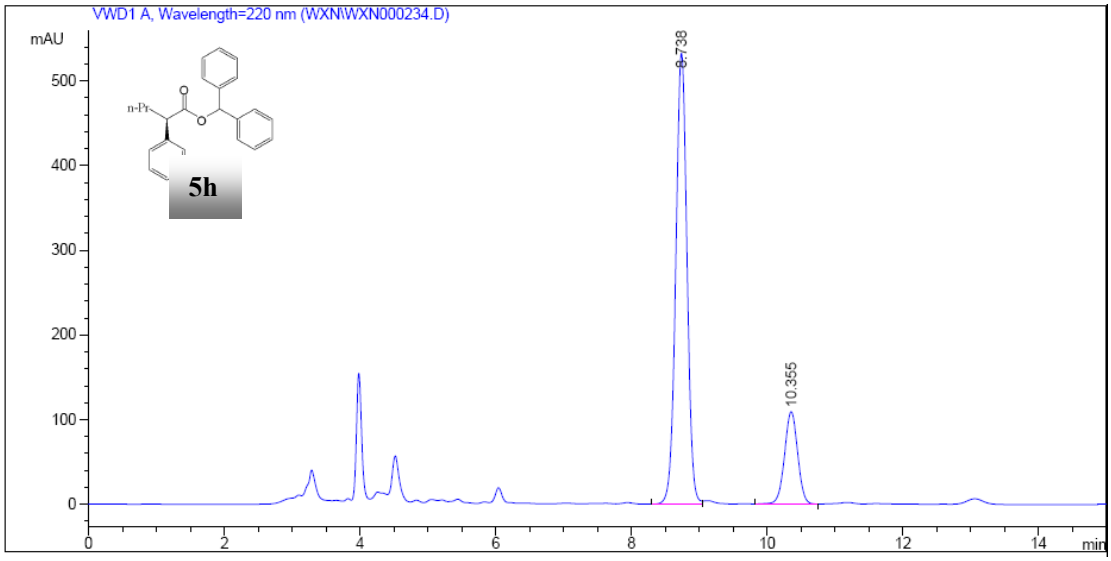
5g

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	7.654	VV	0.1566	9419.89063	936.89575	67.9113
2	8.699	VV	0.1836	4450.97559	371.02631	32.0887

Sample Information : AD-H Hex:Ipr=95:5 1mL/min

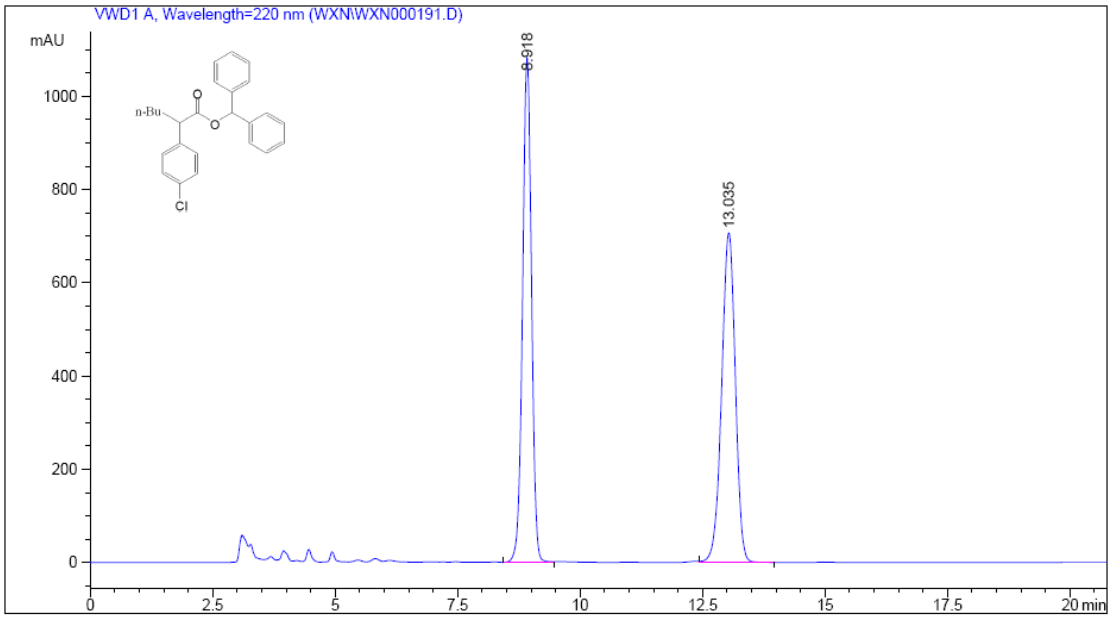


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.927	VV	0.1883	7908.24414	651.26709	50.0827
2	10.632	VV	0.2218	7882.13672	552.29883	49.9173

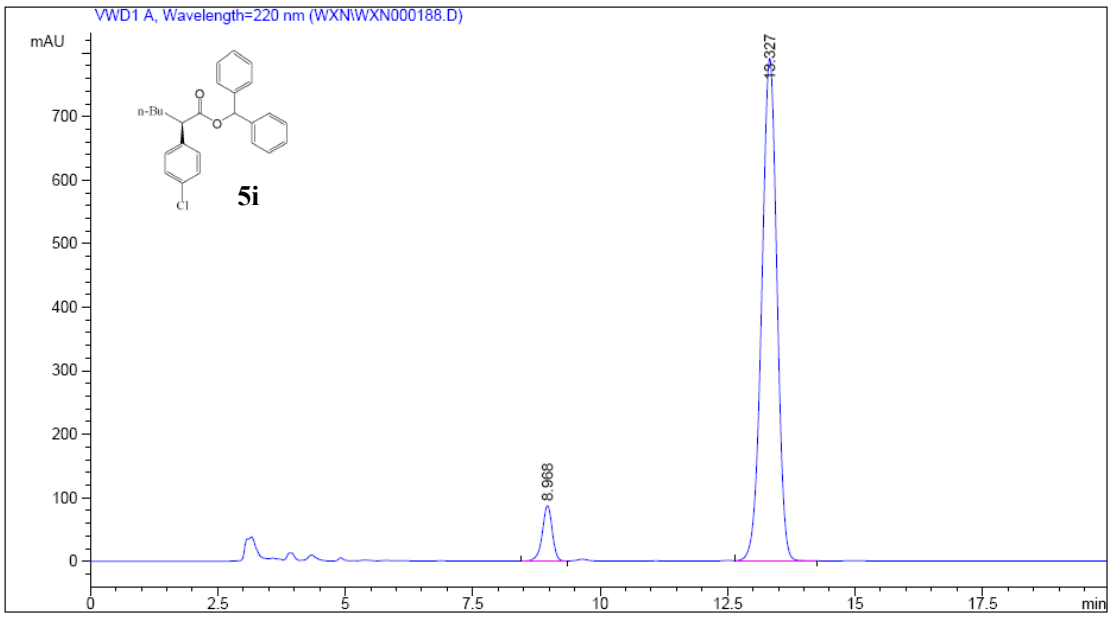


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.738	VV	0.1779	6130.53320	532.82599	80.4082
2	10.355	VV	0.2114	1493.73279	109.58608	19.5918

Sample Information : AD-H, Hex:Ipr=95:5, 1ml/min

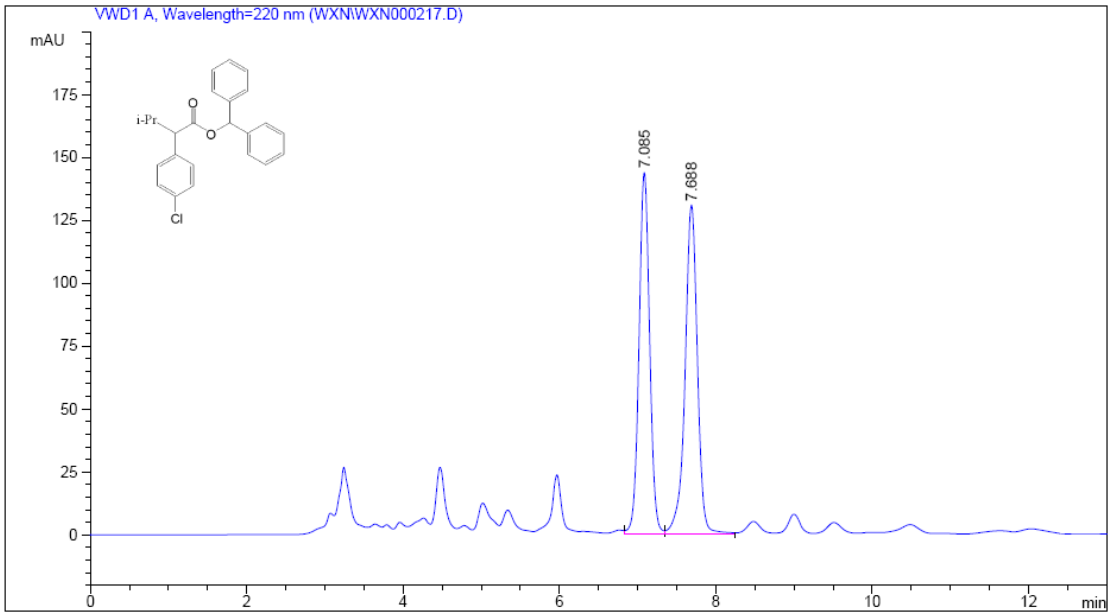


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.918	VV	0.1964	1.37846e4	1083.73401	50.0686
2	13.035	VB	0.3026	1.37468e4	706.96381	49.9314

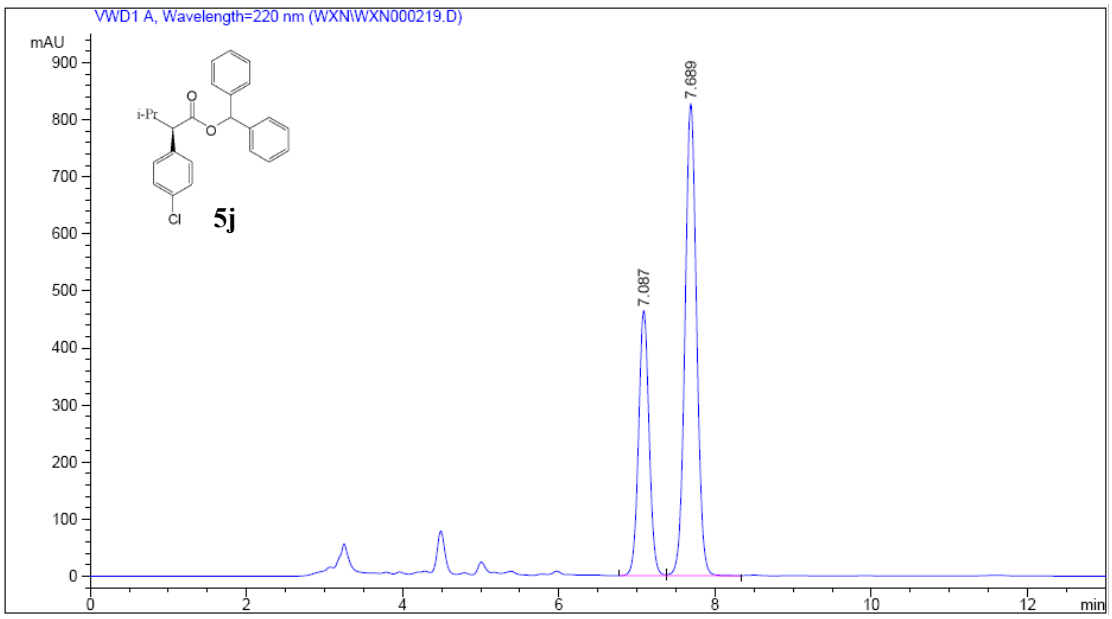


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.968	VV	0.2094	1188.17761	87.50921	6.7755
2	13.327	VB	0.3212	1.63483e4	790.92108	93.2245

Sample Information : AD-H Hex:Ipr=95:5 ,1ml/min

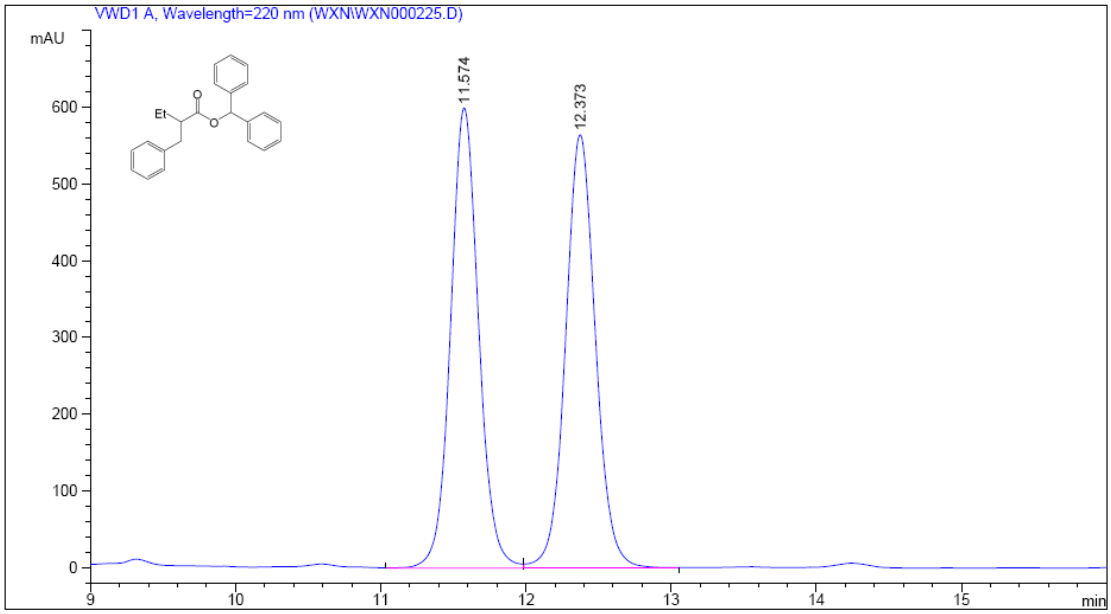


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	7.085	VV	0.1471	1364.36475	143.83299	48.5089
2	7.688	VV	0.1669	1448.24023	130.94727	51.4911

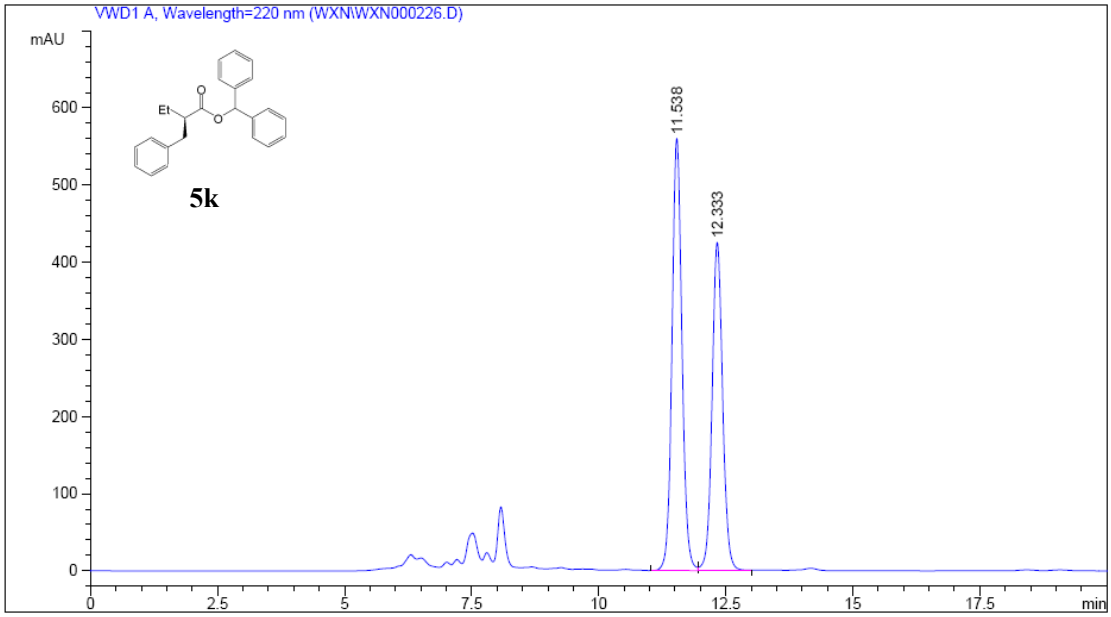


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	7.087	VV	0.1441	4348.72900	464.83844	33.7182
2	7.689	VB	0.1598	8548.53223	827.70355	66.2818

Sample Information : AD-H Hex:Ipr=90:10 0.5mL/min

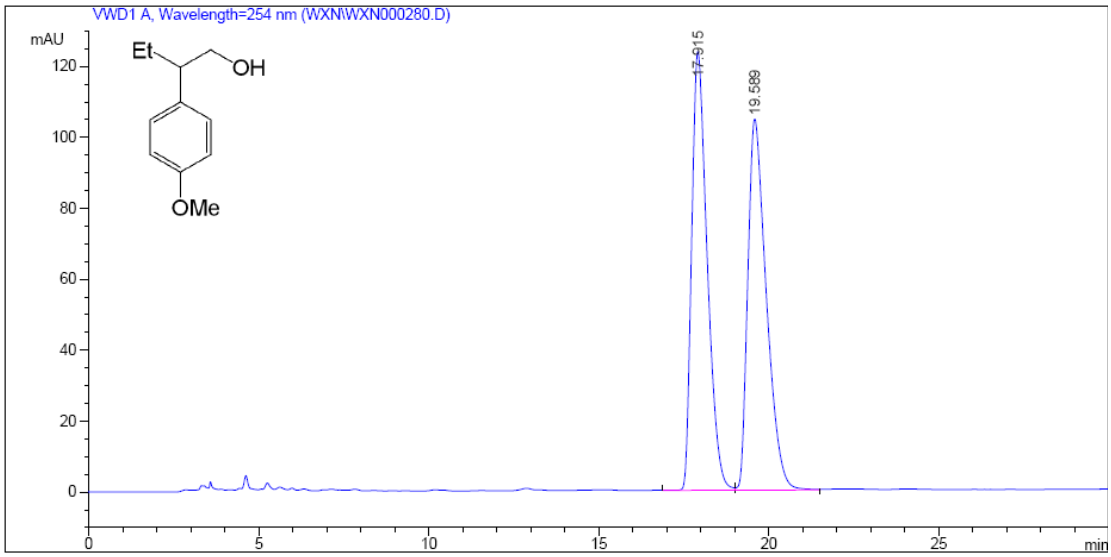


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.574	VV	0.2062	8052.43311	599.69244	49.8551
2	12.373	VB	0.2197	8099.25049	564.84424	50.1449

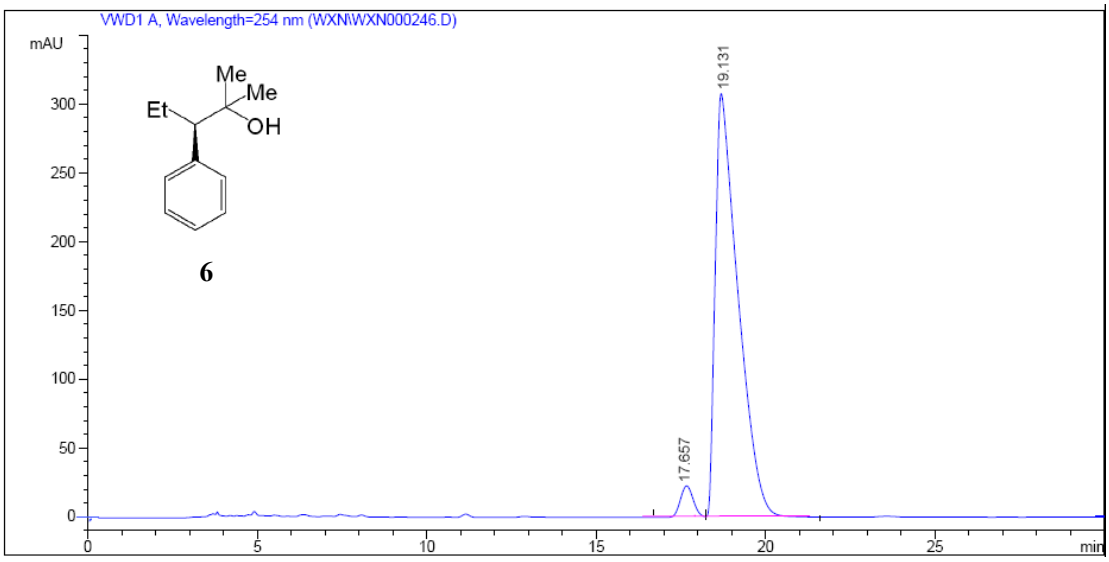


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.538	BV	0.2080	7611.61182	560.29803	55.3198
2	12.333	VB	0.2224	6147.67480	425.45969	44.6802

Sample Information : OD-H Hex:Ipr=99:1 1mL/min



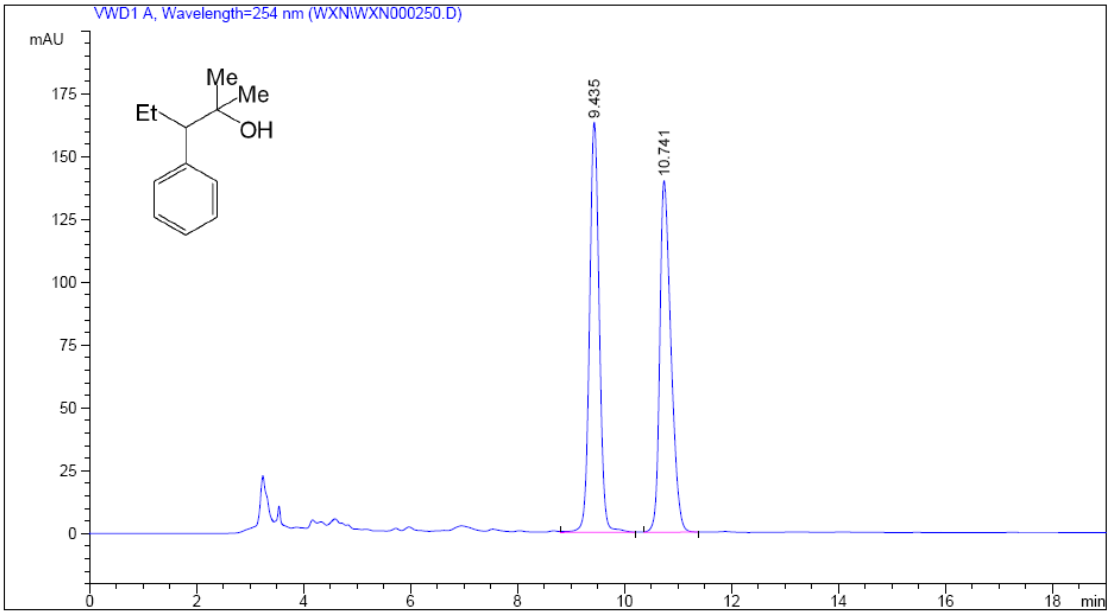
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	17.915	BV	0.4897	3926.88916	123.71674	49.7819
2	19.589	VB	0.5814	3961.30005	104.65126	50.2181



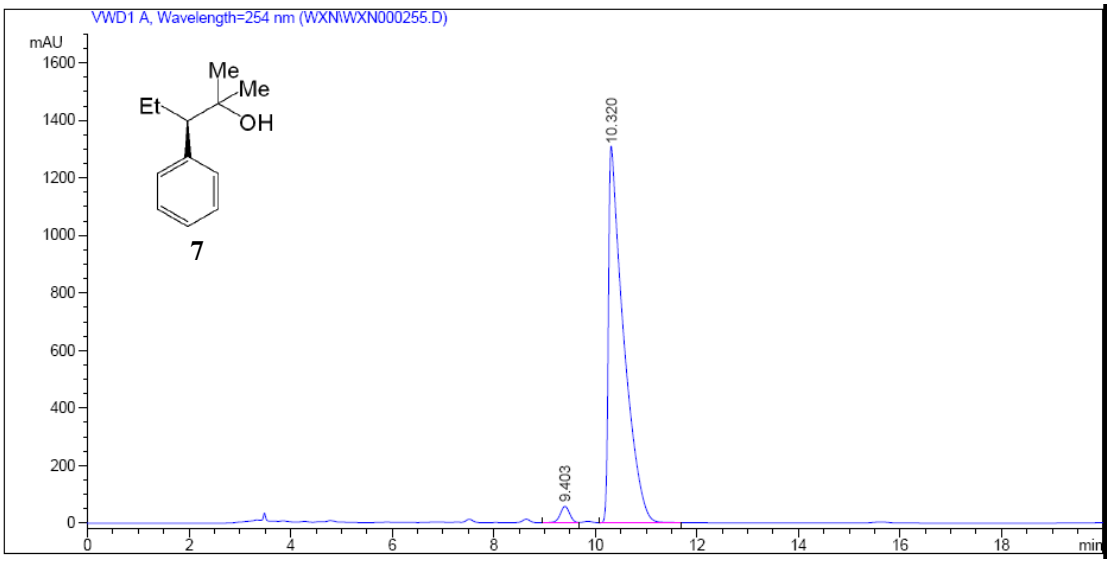
6

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	17.657	VV	0.4203	605.43195	22.81477	4.0348
2	19.131	VB	0.6620	1.43999e4	307.96243	95.9652

Sample Information : AD-H Hex:Ipr=99:1 1mL/min



Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	9.435	VB	0.1952	2058.22656	163.17094	50.3700
2	10.741	BB	0.2202	2027.98865	139.82823	49.6300



Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	9.403	VV	0.2097	776.27460	57.57655	2.7817
2	10.320	VV	0.2805	2.71298e4	1304.20923	97.2183