Supporting Information for

Formal Intermolecular [2+2] Cycloaddition Reaction of Alleneamides with Alkenes via Gold Catalysis

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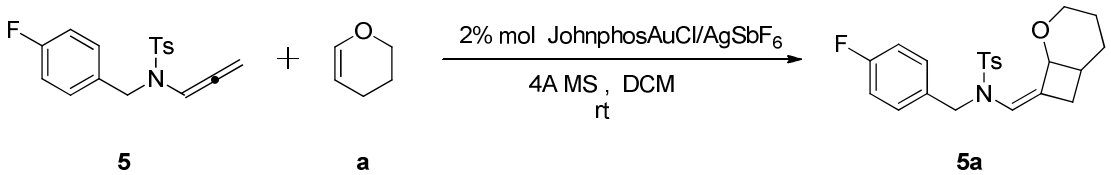
Contents

General Conditions

All reactions were run under an inert atmosphere (N_2) with flame-dried glassware using standard techniques for manipulating air-sensitive compounds. THF and CH_2Cl_2 were obtained by fresh distilled over sodium/benzophenone or Calcium hydride respectively. Commercial reagents were used as supplied or purified by standard techniques where necessary. Column chromatography was performed using 200-300 mesh silica with the proper solvent system according to TLC analysis using $KMnO_4$ stain and UV light to visualize the reaction components. Unless otherwise noted, nuclear magnetic resonance spectra were recorded on 400 MHz spectrometer. NMR data were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet and bs = broad singlet), coupling constant in Hz and integration. Chemical shifts for ^{13}C NMR spectra were recorded in parts per million from tetramethylsilane using the central peak of deuterochloroform (77.0 ppm) as the internal standard. IR spectra were recorded on an FTIR spectrometer (KBr) and reported in reciprocal centimeters (cm^{-1}). Low-resolution MS and HRMS data were obtained using ESI ionization. Mp data were measured with micro melting point apparatus.

Allenamides **2**-**10** were prepared according to the published methods.[1, 2, 3] Alkenes were obtained commercially and used without further purification.

General Procedure for [2+2] cycloaddition reaction.



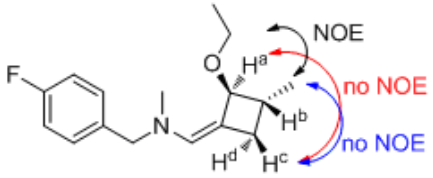
To a solution of JohnphosAuCl/$AgSbF_6$ (2 mol%) in dry CH_2Cl_2 (1 mL) containing 100mg activated 4Å MS, was added ether **a** (0.3 mmol) and a solution of alleneamide **5** (0.1 mmol) in CH_2Cl_2 (1 mL) consecutively. The reaction mixture was stirred at rt until the complete consumption of the starting material (TLC monitoring). Then the mixture was concentrated in vacuum, and the residue was purified by chromatography

on silica gel using hexane/EtOAc (20:1) as the eluent to afford **5a** in 86% yield**.**

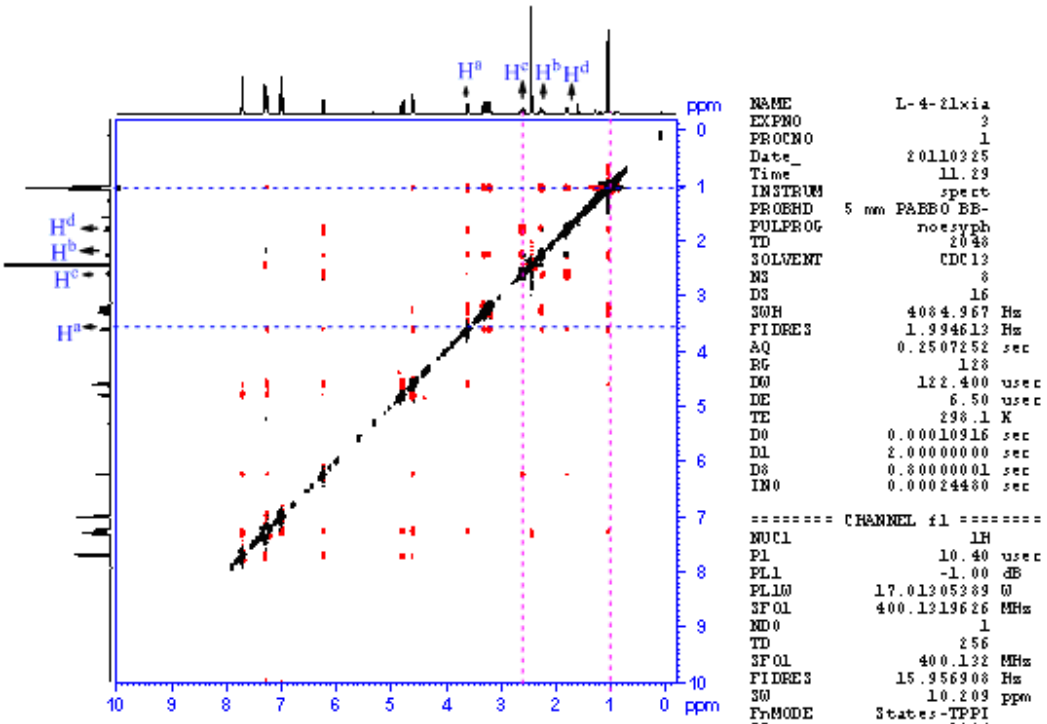
General Procedure for the Synthesis of *D-5*

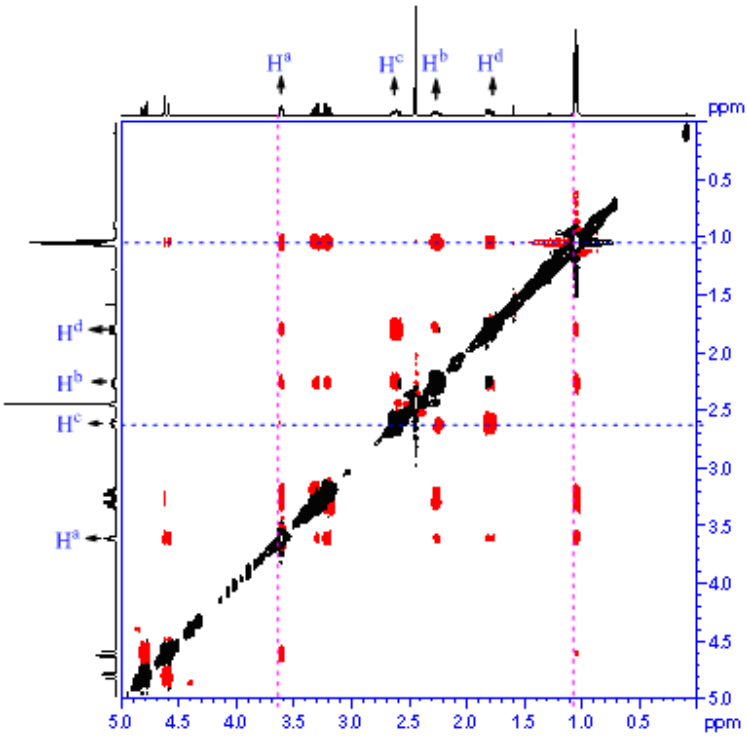
To a solution of $Ph_3PAuCl/AgSbF_6$ (2 mol%) in dry CH_2Cl_2 (1 mL) containing 100mg activated 4Å MS, was added alleneamide **5** (0.1 mmol) in 1 mL CH_2Cl_2. The reaction mixture was stirred at rt until the complete consumption of the starting material (TLC monitoring). Then the mixture was concentrated in vacuum, and the residue was purified by chromatography on silica gel using hexane/EtOAc (5:1) as the eluent to afford ***D-5*** in 90% yield**.**

NOE data for compound *anti*-5i, *syn*-5i and 5n, 5o.

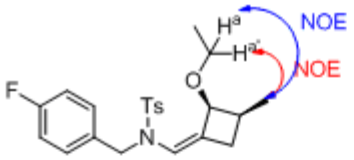


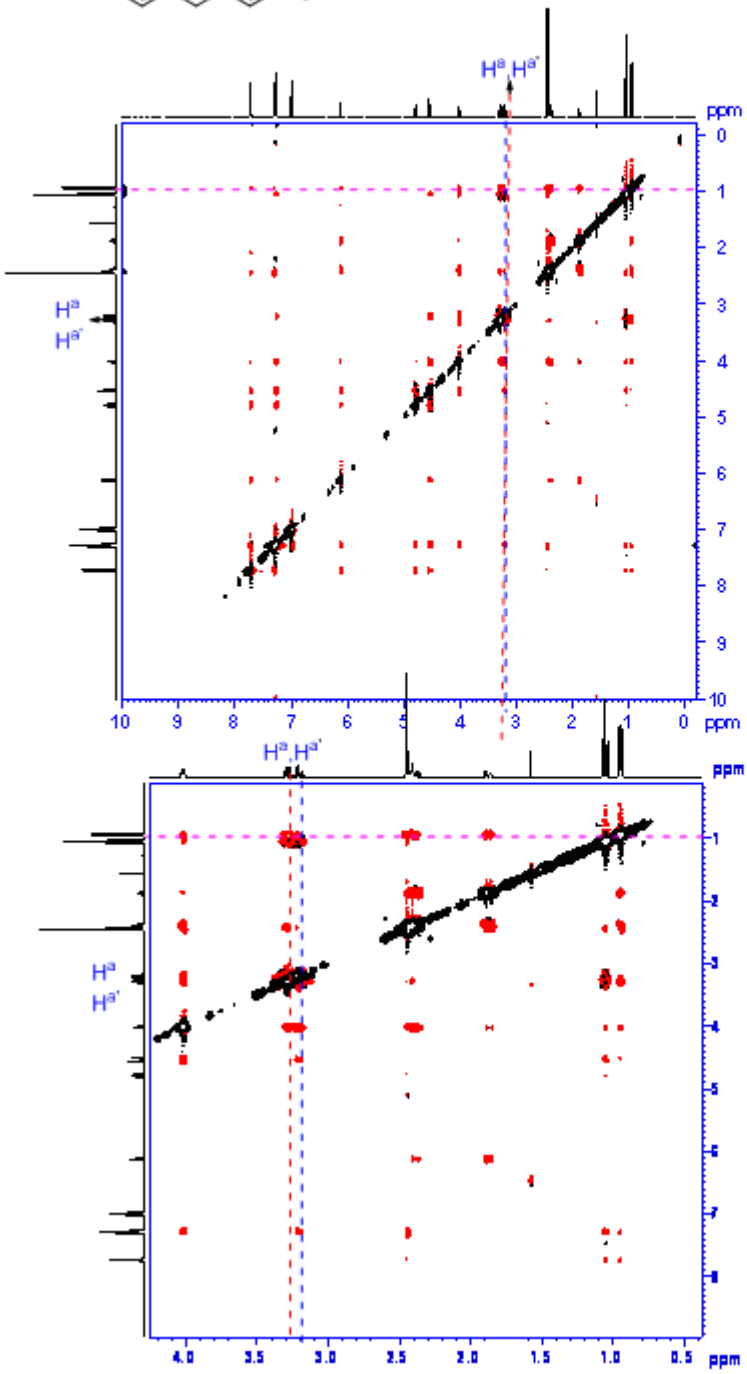
Compound ***anti*-5i**





Compound ***syn*-5i**



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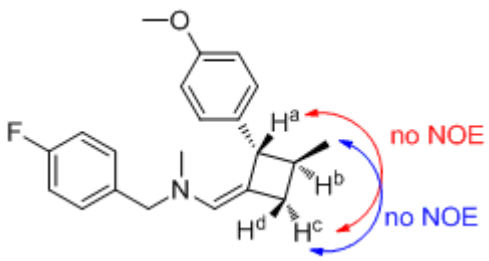
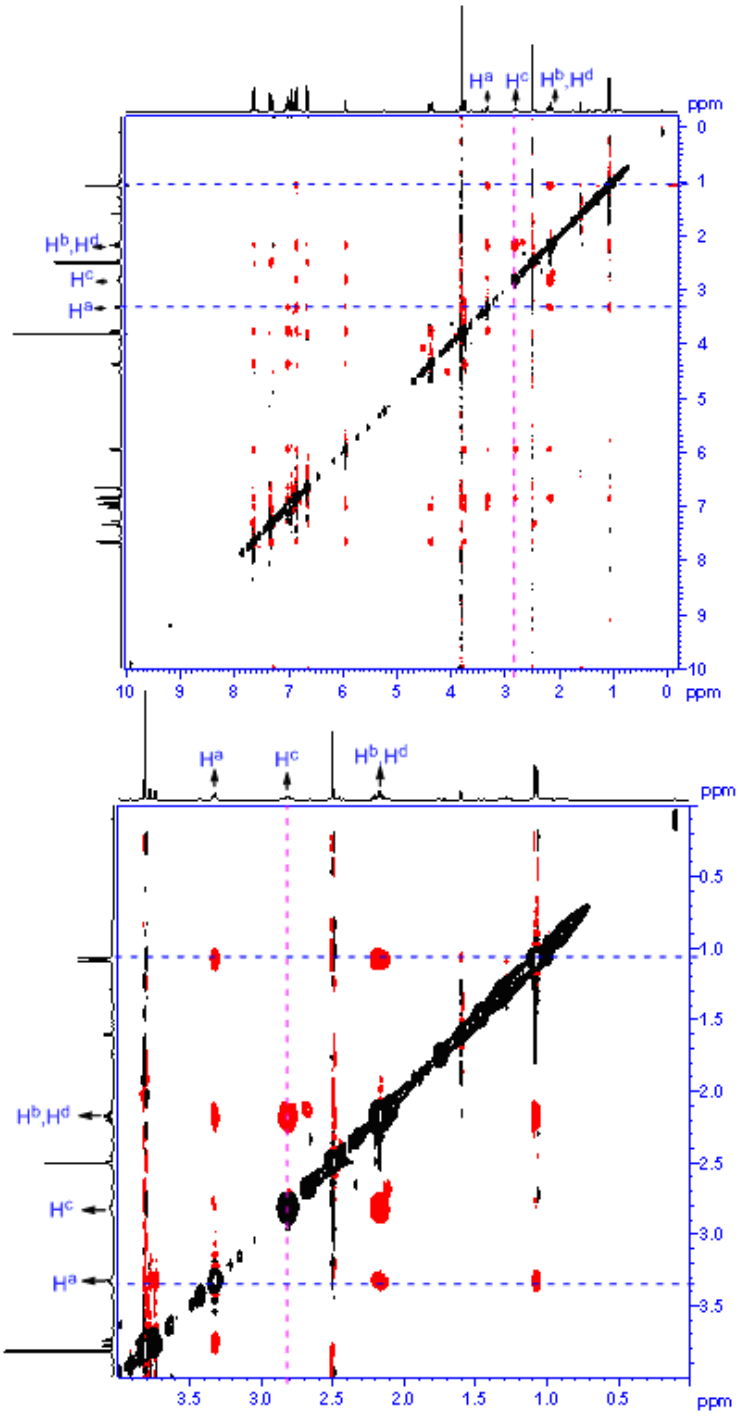


Compound **5n**

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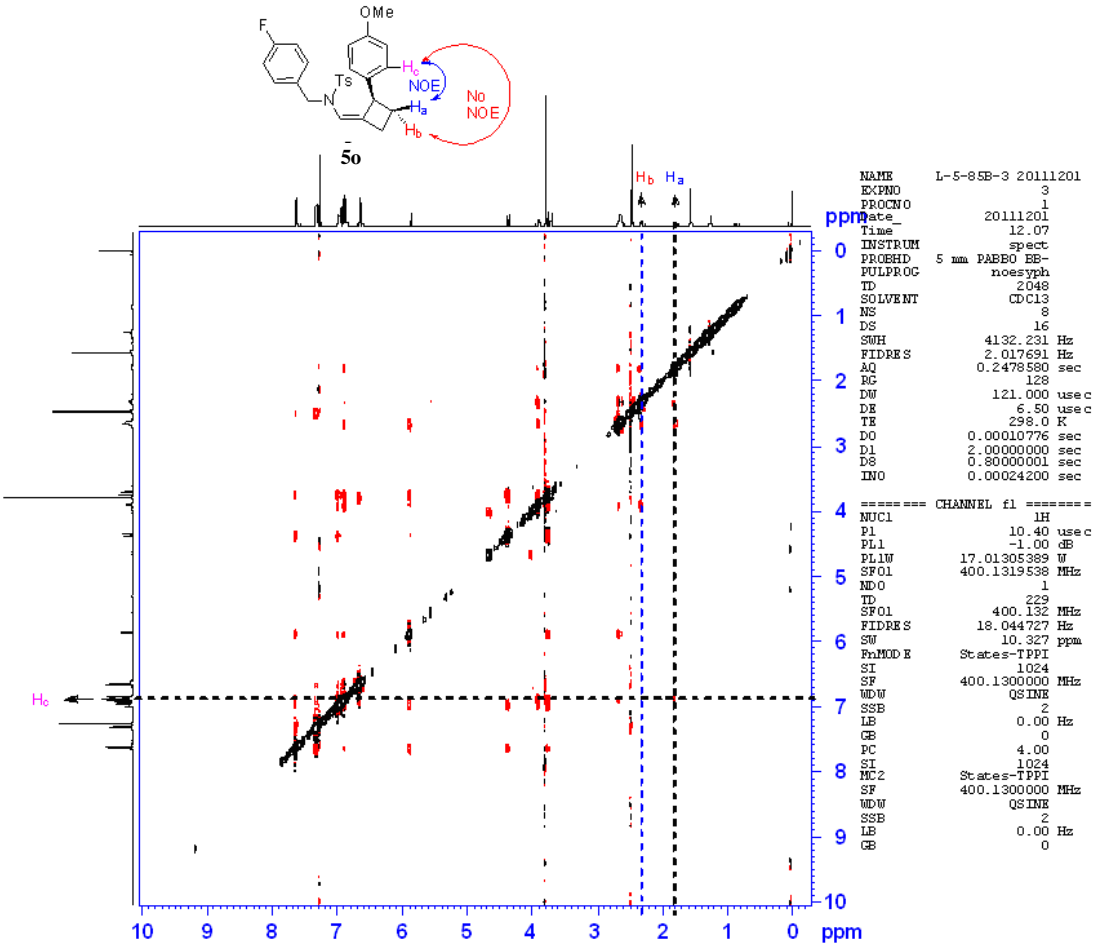
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======== CHANNEL f1 ========
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SSB 2
LB 0.00 Hz
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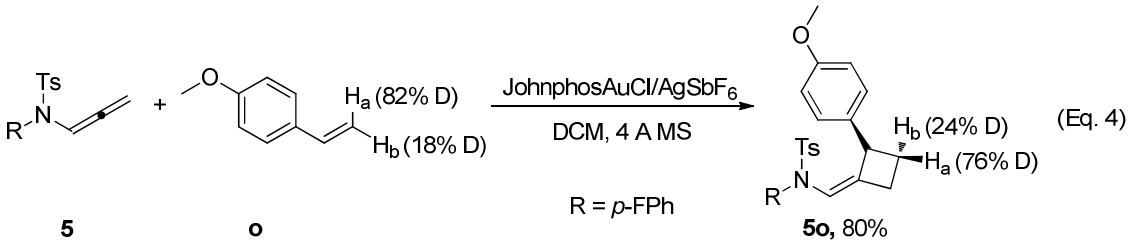
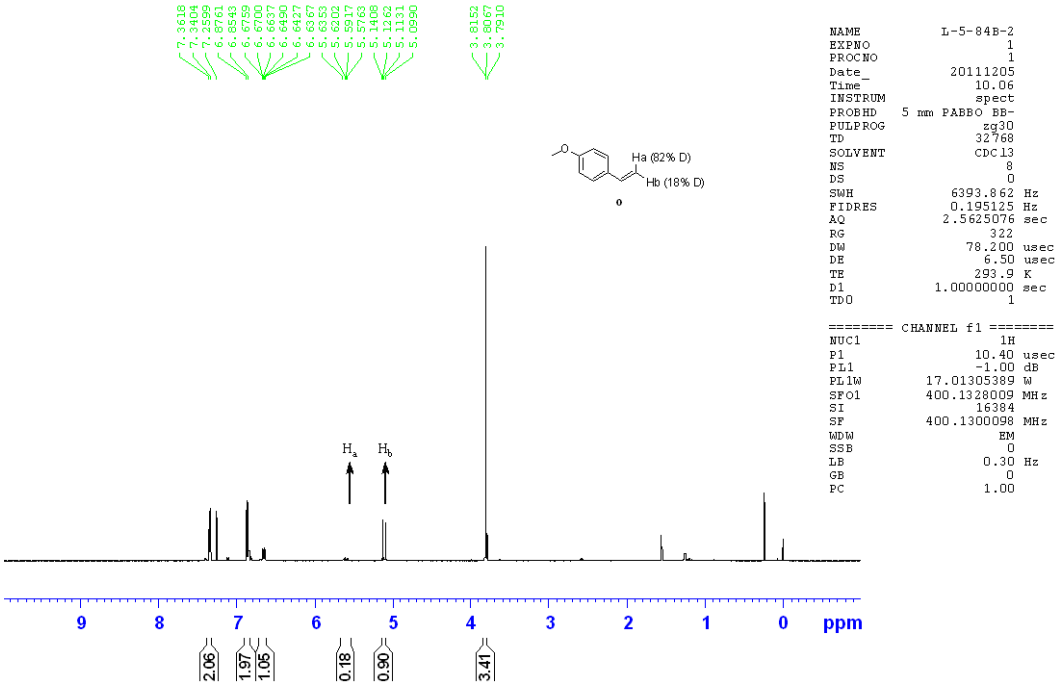
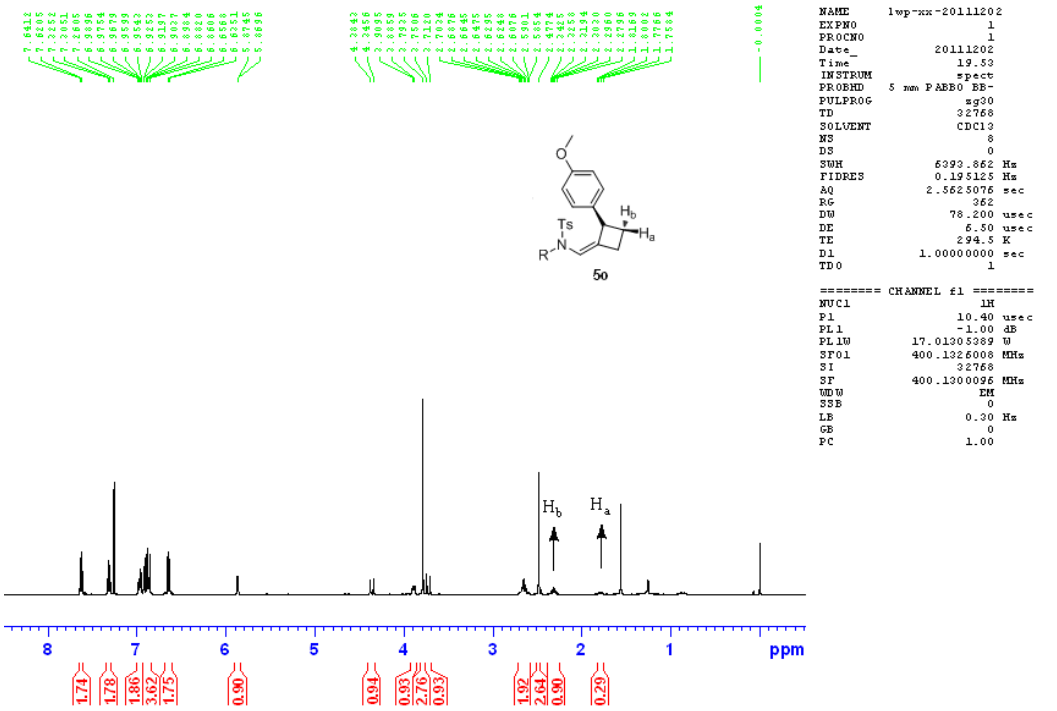
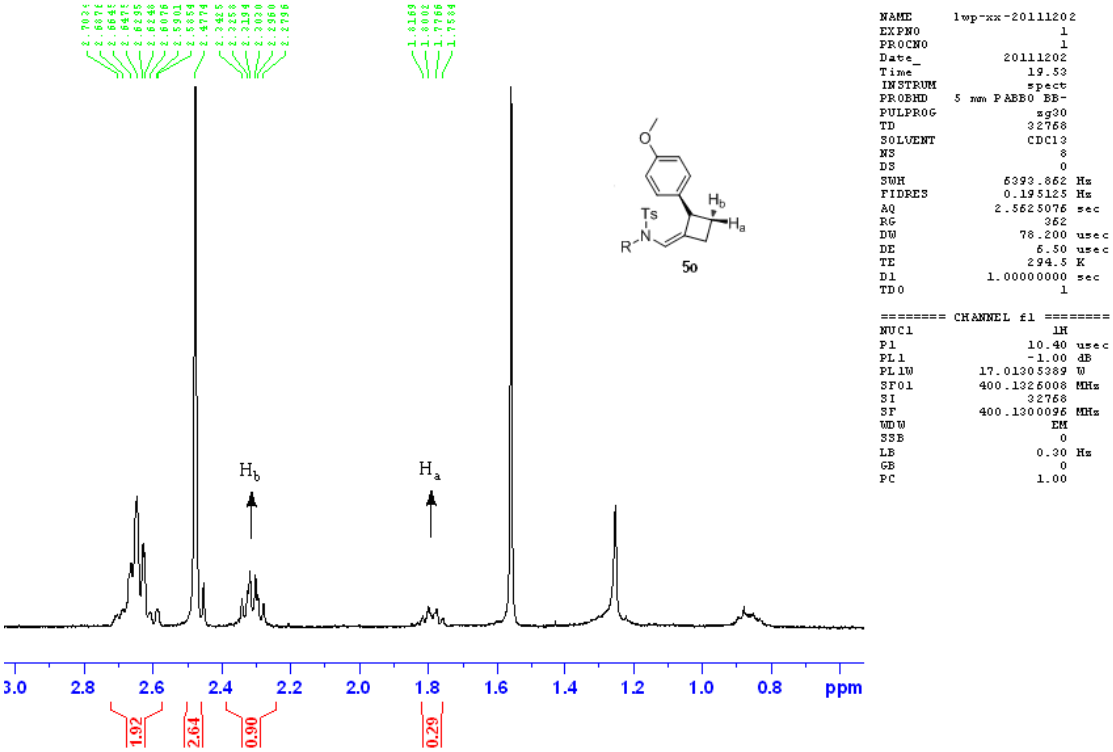
The reaction of allene 5 with deuterated substrate o.





The 400 MHz ^{1}H NMR NMR spectrum of **5o** was shown as below.

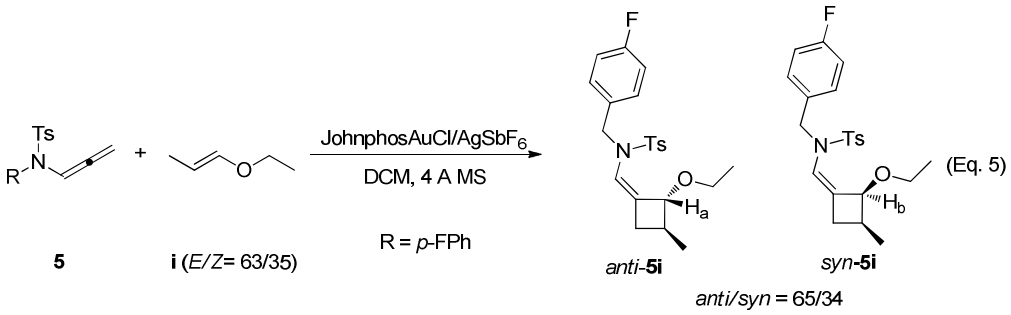


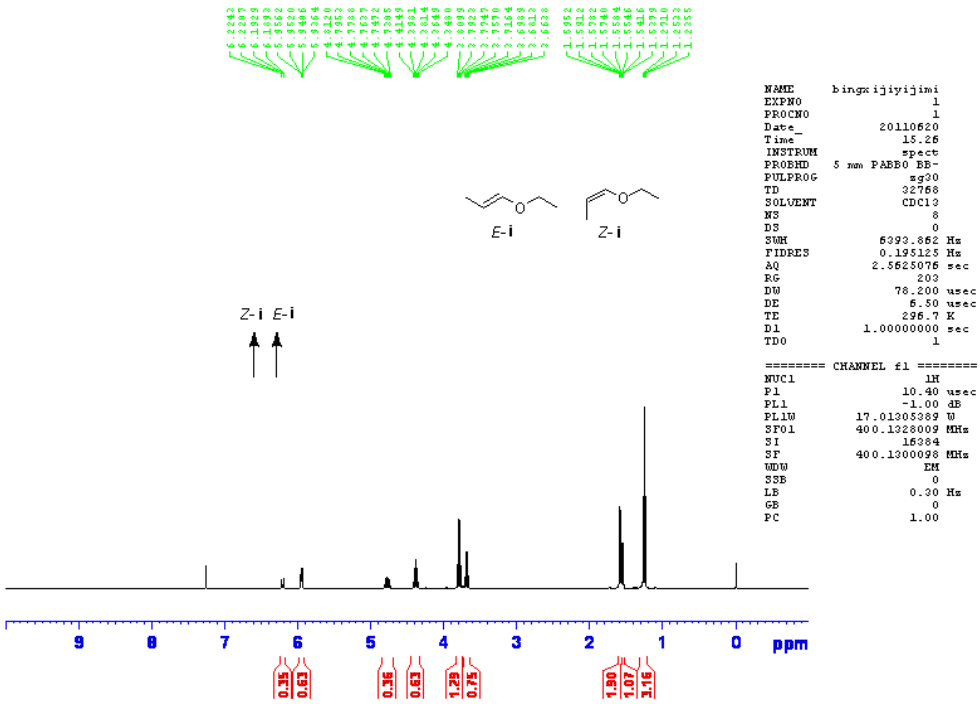


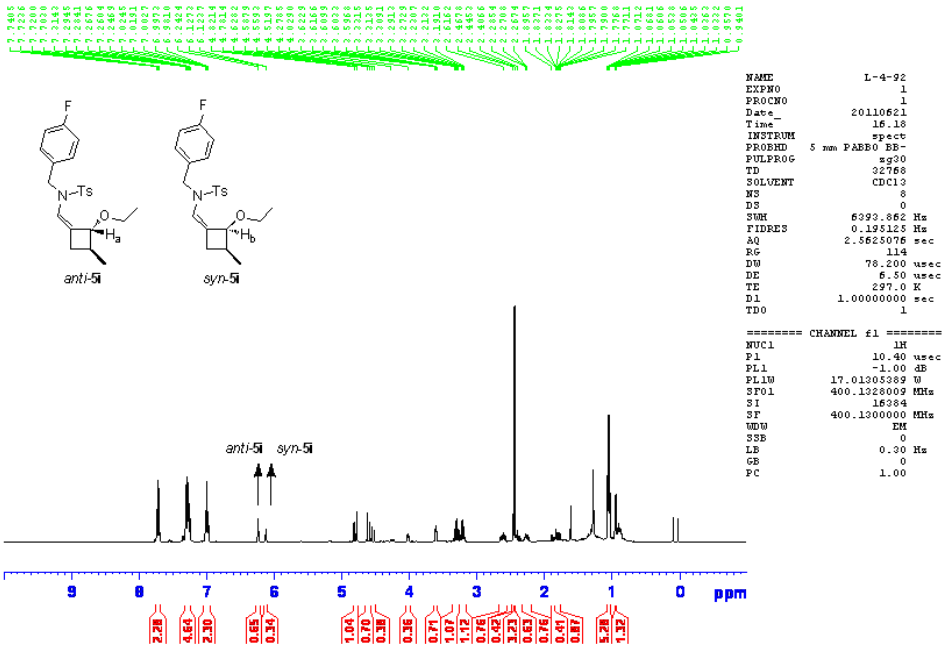
In the above spectrum, the total integral data for H_a and H_b is more than 1.19. The ratio of H_a / H_b is equal to 0.76/0.24. We repeated this reaction three times, similar results were obtained.

As compared with the ratio of H_a / H_b = 82% /18% in compound **o**, 6% of product underwent a possible isomerization to give the isomerized product.

The reaction of allene 5 with deuterated substrate i.



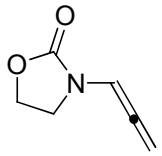




However, in the reaction of vinyl ether **i** with allene **5** (Eq. 5), The *E/Z* ratio of the substrate is equal to the anti/syn ratio of the product.

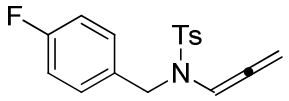
Characterization Data

3-(propa-1,2-dien-1-yl)oxazolidin-2-one 4, [2]



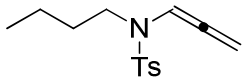
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.81 (t, J = 6.4Hz, 1H), 5.39 (d, J = 6.3Hz, 2H), 4.37 (t, J = 7.9Hz, 2H), 3.56 (t, J = 8.2Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 201.4, 155.2, 96.9, 87.8, 62.3, 43.1.

N-(4-fluorobenzyl)-4-methyl-N-(propa-1,2-dien-1-yl)benzenesulfonamide 5



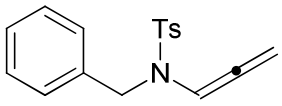
White solid; Mp 104.5-106.5^{o}C; IR(neat) 1597, 1510, 1346, 1220, 1163, 1093, 908, 885, 588, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J =8.2Hz, 2H), 7.32 (d, J =8.1Hz, 2H), 7.27 (dd, J =8.2, 5.4Hz, 2H), 6.96 (t, J = 5.3Hz, 2H), 6.81 (t, J = 6.2Hz, 1H), 5.15 (d, J = 6.2Hz, 2H), 4.30 (s, 2H), 2.42 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.1, 162.1 (d, J = 244.3Hz), 143.9, 135.2, 131.8, 129.7, 129.5 (d, J = 8.1Hz), 127.1, 115.1 (d, J = 21.3Hz), 99.9, 88.0, 49.3, 21.5; HRMS (ESI) calcd for $C_{17}H_{17}FNO_2S$ $[M+H]^+$ 318.0964; found, 318.0963.

N-butyl-4-methyl-N-(propa-1,2-dien-1-yl)benzenesulfonamide 6



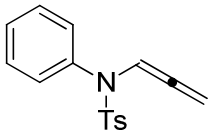
yellow oil; IR(neat) 2958, 1699, 1597, 1456, 1355, 1166, 1089, 920, 813, 665, 592, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, J = 8.3Hz, 2H), 7.30 (d, J = 8.2Hz, 2H), 6.81 (t, J = 6.2Hz, 1H), 5.28 (d, J = 6.2Hz, 2H), 3.09 (t, J = 7.2Hz, 2H), 2.42 (s, 3H), 1.55-1.47 (m, 2H), 1.35-1.26 (m, 2H), 0.89 (t, J = 7.3Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 201.6, 143.6, 135.6, 129.7, 127.2, 100.2, 87.4, 46.4, 30.0, 21.6, 19.8, 13.7; HRMS (ESI) calcd for $C_{14}H_{20}NO_2S$ $[M+H]^+$ 266.1215; found, 266.1208.

N-benzyl-4-methyl-N-(propa-1,2-dien-1-yl)benzenesulfonamide 7, [4]



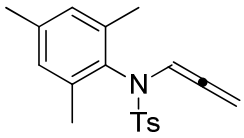
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, J = 8.3Hz, 2H), 7.32 (d, J = 7.9Hz, 2H), 7.30-7.24 (m, 5H), 6.83 (t, J = 6.2Hz, 1H), 5.15 (d, J = 6.2Hz, 2H), 4.30 (s, 2H), 2.45 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.2, 143.8, 136.2, 135.4, 129.7, 128.3, 127.8, 127.4, 127.2, 100.1, 87.9, 50.0, 21.5.

4-methyl-N-phenyl-N-(propa-1,2-dien-1-yl)benzenesulfonamide 8, [5]



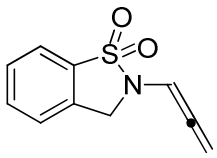
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, J = 8.3Hz, 2H), 7.31-7.26 (m, 5H), 7.10 (t, J = 6.3Hz, 1H), 7.01-6.98 (m, 2H), 5.02 (d, J = 6.3Hz, 2H), 2.43 (S, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 201.0, 143.8, 137.1, 135.2, 129.5, 129.4, 128.6, 128.5, 127.6, 102.3, 87.4, 21.5.

N-mesityl-4-methyl-N-(propa-1,2-dien-1-yl)benzenesulfonamide 9



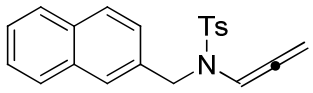
White solid; mp 135.5-137.5^{o}C; IR(neat) 1597, 1355, 1249, 1165, 1031, 979. 812, 661, 594, 542; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 8.2Hz, 2H), 7.29 (d, J = 6.3Hz, 2H), 7.15 (t, J = 6.2Hz, 1H), 6.82 (s, 2H), 5.01 (d, J = 6.2Hz, 2H), 2.43 (s, 3H), 2.25 (s, 3H), 1.92(s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 200.5, 143.6, 138.6, 138.4, 137.7, 132.1, 129.7, 129.3, 127.3, 101.2, 86.9, 21.5, 21.0, 18.2; HRMS (ESI) calcd for $C_{19}H_{22}NO_2S$ $[M+H]^+$ 328.1371; found, 328.1367.

2-(propa-1,2-dien-1-yl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide 10



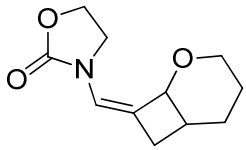
Yellow solid; mp 100.5-102.5°C; IR(neat) 1460, 1361, 1296, 1172, 1136, 750, 599, 567, 439; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (d, J = 7.8Hz, 1H), 7.63 (td, J = 7.5, 0.9Hz, 1H), 7.54 (t, J = 7.7Hz, 1H), 7.42 (d, J = 7.7Hz, 1H), 6.76 (t, J = 6.2Hz, 1H), 5.51 (d, J = 6.2Hz, 2H), 4.46 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.0, 134.8, 133.1, 132.8, 129.2, 124.6, 121.4, 95.3, 88.6, 48.6; HRMS (ESI) calcd for $C_{10}H_{10}NO_2S$ $[M+H]^+$ 208.0432; found, 208.0423.

4-methyl-N-(naphthalen-2-ylmethyl)-N-(propa-1,2-dien-1-yl)benzenesulfonamide 11



Yellow oil; IR(neat) 2956, 2924, 1726, 1286, 1165, 1122, 1074, 744, 665, 592; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.77 (m, 3H), 7.75 (d, J = 8.2Hz, 2H), 7.71 (s, 1H), 7.49-7.44 (m, 3H), 7.32 (d, J = 8.1Hz, 2H), 6.88 (t, J = 6.2Hz, 1H), 5.14 (d, J = 6.2Hz, 2H), 4.48 (s, 2H), 2.43 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 202.3, 143.9, 135.3, 133.6, 133.2, 132.8, 129.8, 128.1, 127.7, 127.6, 127.2, 126.9, 126.1, 125.9, 125.7, 100.1, 88.1, 50.3, 21.6; HRMS (ESI) calcd for $C_{21}H_{20}NO_2S$ $[M+H]^+$ 350.1215; found, 350.1209.

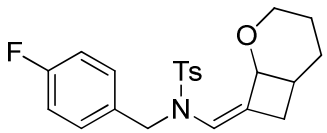
(Z)-3-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)oxazolidin-2-one (4a)



18.2 mg white solid was obtained from 0.1 mmol scale reaction (82% yield), Rf = 0.25 (PE/EA = 5:1); mp 95.2-97.2°C; IR (neat) 2920, 1732, 1693, 1417, 1122, 1056, 1029, 752, 634; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.42 (d, J = 1.8Hz, 1H), 4.71 (dt, J = 6.8, 1.9Hz, 1H), 4.34 (t, J = 8.7Hz, 2H), 4.20-4.14 (m, 1H), 3.73 (q, J = 9.2Hz, 1H),

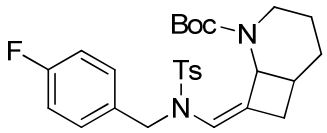
3.68-3.63 (m, 1H), 3.56-3.51 (m, 1H), 2.47-2.36 (m, 2H), 2.26-2.21 (m, 1H), 1.99-1.90 (m, 1H), 1.63-1.56 (m, 1H), 1.54-1.44 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.2, 121.5, 118.4, 72.5, 63.3, 62.4, 44.3, 30.4, 30.3, 25.2, 22.0; HRMS (ESI) calcd for $C_{11}H_{15}NNaO_3$ $[M+Na]^+$ 232.0950; found, 232.0961.

(*Z*)-N-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide (5a):



35.1 mg white solid was obtained from 0.1 mmol scale reaction (87% yield), Rf = 0.25 (PE/EA = 30:1); mp 102.7-104.7^{o}C; IR (neat) 2926, 2852, 1508, 1348, 1220, 1165, 813, 663, 572, 545 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, J = 8.2 Hz, 2H), 7.30 (d, J = 8.2 Hz, 2H), 7.28-7.26 (m, 2H), 6.96 (t, J = 8.6 Hz, 2H), 6.35 (s, 1H), 4.84 (d, J = 15.7 Hz, 1H), 4.55 (d, J = 15.7Hz, 1H), 4.15 (d, J = 6.3Hz, 1H), 3.22 (dt, J = 11.2, 3.8 Hz, 1H), 2.72 (td, J = 11.4, 3.2 Hz, 1H), 2.42 (s, 3H), 2.25-2.17 (m, 2H), 1.98-1.92 (m, 2H), 1.33-1.26 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.3 (d, J = 243.9 Hz), 143.5, 136.3, 133.2, 129.6, 128.6 (d, J = 7.9 Hz), 127.1, 126.5, 120.0, 115.1 (d, J = 21.3 Hz), 72.2, 62.2, 49.4, 30.5, 30.0, 25.8, 22.3, 21.5; HRMS (ESI) calcd for $C_{22}H_{24}FNO_3NaS$ $[M+Na]^+$ 424.1359; found, 424.1358.

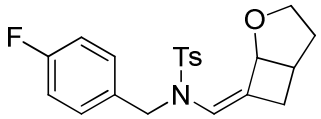
(*Z*)-tert-butyl 8-((N-(4-fluorobenzyl)-4-methylphenylsulfonamido)methylene)-2-azabicyclo[4.2.0]octane-2-carboxylate (5b)



39 mg colorless oil was obtained from 0.1 mmol scale reaction (78% yield), Rf = 0.25 (PE/EA = 15:1); IR (neat) 2920, 2870, 1680, 1508, 1263, 1093, 1020, 800, 550, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ (major) 7.65 (d, J = 7.7Hz, 2H), 7.32-7.26 (m, 4H), 6.99-6.92 (m, 2H), 6.01 (s, 1H), 5.20 (d, J = 7.9Hz, 1H), 4.70 (d, J = 15.3Hz, 1H),

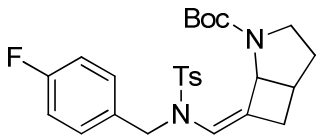
4.32 (d, J = 15.8Hz, 1H), 3.35-3.29 (m, 1H), 2.48-2.37 (m, 5H), 2.10-2.04 (m, 1H), 1.95 (s, 1H), 1.85-1.77 (m, 1H), 1.47-1.43 (m, 11H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1(d, J = 242.6Hz), 154.7, 143.2, 137.2, 134.9, 132.8, 129.6(d, J = 25.6Hz), 127.0, 118.9, 115.0(d, J = 21.6Hz), 79.6, 51.9, 50.8, 41.2, 31.0, 30.6, 28.3, 26.7, 21.4, 20.8; HRMS (ESI) calcd for $C_{27}H_{33}FN_2O_4NaS$ $[M+Na]^+$ 523.2043; found, 523.2043.

(Z)-N-(2-oxabicyclo[3.2.0]heptan-7-ylidenemethyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide (5c)



34.5 mg white solid was obtained from 0.1 mmol scale reaction (89% yield), Rf = 0.25 (PE/EA = 20:1); mp 109.0-111.0^{o}C; IR (neat) 2924, 2856, 1672, 1510, 1346, 1220, 1165, 813, 665, 563, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, J = 8.2Hz, 2H), 7.31 (d, J = 8.2Hz, 2H), 7.26-7.23 (m, 2H), 6.99 (t, J = 8.7Hz, 2H), 6.43 (s, 1H), 4.87 (d, J = 16.6Hz, 1H), 4.61 (d, J = 16.6Hz, 1H), 4.41 (d, J = 5.8Hz, 1H), 3.87 (t, J = 7.9Hz, 1H), 3.56-3.50 (m, 1H), 2.77-2.70 (m, 1H), 2.63-2.56 (m, 1H), 2.43 (s, 3H), 2.06-2.01 (m, 1H), 1.77-1.69 (m, 1H), 1.67-1.61 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1(d, J = 240.6Hz), 143.7, 136.2, 133.1, 129.7, 127.8 (d, J = 8.1), 126.8, 122.3, 122.1, 115.3 (d, J = 21.4Hz), 79.9, 66.2, 48.9, 35.7, 32.3, 30.3, 21.5; HRMS (ESI) calcd for $C_{21}H_{22}FNO_3NaS$ $[M+Na]^+$ 410.1202; found, 410.1201.

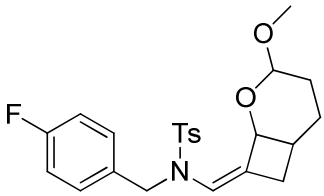
(Z)-tert-butyl 7-((N-(4-fluorobenzyl)-4-methylphenylsulfonamido)methylene)-2-azabicyclo[3.2.0]heptane-2-carboxylate (5d)



42.3 mg yellow solid was obtained from 0.1 mmol scale reaction (87% yield), Rf = 0.25 (PE/EA = 20:1); mp 139.1-141.1^{o}C; IR (neat) 2974, 2929, 1685, 1510, 1402, 1161, 815, 746, 570, 551, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ (major) 7.62 (d, J = 8.1Hz, 2H), 7.38-7.26 (m, 4H), 6.98 (t, J = 8.7Hz, 2H), 6.16 (s, 1H), 5.21-5.07 (m,

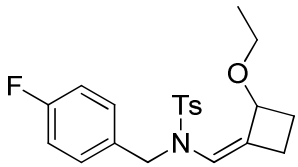
1H), 4.93-4.84 (m, 1H), 4.73 (d, J = 15.4Hz, 1H), 3.88-3.80 (m, 1H), 2.95-2.79 (m, 2H), 2.60-2.56 (m, 1H), 2.42 (s, 3H), 2.11-2.03 (m, 1H), 1.72-1.59 (m, 1H), 1.53-1.40 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1 (d, J = 242.1Hz), 153.2, 143.3, 136.8, 132.9, 129.6, 129.0 (d, J = 15.3Hz), 126.9, 126.7, 115.2 (d, J = 20.6Hz), 79.6, 60.4, 48.3, 44.8, 35.9, 31.4, 30.5, 28.3, 21.5; HRMS (ESI) calcd for $C_{26}H_{31}FN_2O_4NaS$ $[M+Na]^+$ 509.1886; found, 509.1886.

(Z)-N-(4-fluorobenzyl)-N-((3-methoxy-2-oxabicyclo[4.2.0]octan-8-ylidene)methyl)-4-methylbenzenesulfonamide (5e)



34 mg white solid was obtained from 0.1 mmol scale reaction (79% yield), Rf = 0.25 (PE/EA = 15:1); mp 127.6-129.6^{o}C; IR (neat) 2926, 2856, 1510, 1346, 1222, 1163, 813, 565, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ (major) 7.69 (d, J = 8.2Hz, 2H), 7.29 (d, J = 8.1Hz, 2H), 7.26-7.22 (m, 2H), 6.97 (t, J = 8.6Hz, 2H), 6.38 (s, 1H), 4.82 (d, J = 16.4Hz, 1H), 4.59 (d, J = 16.3Hz, 1H), 4.31 (t, J = 5.2Hz, 1H), 4.20 (d, J = 6.5Hz, 1H), 3.18 (s, 3H), 2.50-2.46 (m, 1H), 2.43 (s, 3H), 2.41-2.36 (m, 1H), 2.31-2.18 (m, 1H), 1.89-1.82 (m, 1H), 1.78-1.72 (m, 1H), 1.70-1.59 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.0 (d, J = 243.5Hz), 143.6, 136.2, 133.0, 129.6, 128.3 (d, J = 7.9Hz), 127.1, 123.9, 121.1, 115.3 (d, J = 21.3Hz), 98.5, 69.9, 55.2, 49.2, 31.5, 30.1, 27.1, 21.9, 21.5; HRMS (ESI) calcd for $C_{23}H_{26}FNO_4NaS$ $[M+Na]^+$ 454.1464; found, 454.1464.

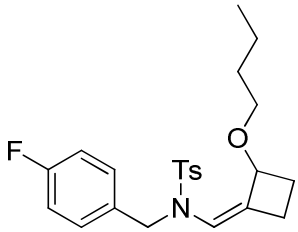
(Z)-N-((2-ethoxycyclobutylidene)methyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide (5f)



28.4 mg colorless oil was obtained from 0.1 mmol scale reaction (73% yield), Rf =

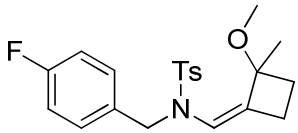
0.25 (PE/EA = 30:1); IR (neat) 2926, 2850, 1598, 1515, 1336, 1222, 1163, 813, 572, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 8.2Hz, 2H), 7.29 (d, J = 8.1Hz, 2H), 7.24 (dd, J = 8.3, 5.6Hz, 2H), 6.98 (t, J = 8.7Hz, 2H), 6.28 (s, 1H), 4.80 (d, J = 16.2Hz, 1H), 4.62 (d, J = 16.2Hz, 1H), 4.04-3.99 (m, 1H), 3.25-3.18 (m, 1H), 3.16-3.11 (m, 1H), 2.51-2.44 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9 (d, J = 245.0Hz), 143.5, 136.5, 133.3, 129.6, 128.2 (d, J = 7.9Hz), 127.0, 126.0, 120.3, 115.1 (d, J = 21.3Hz), 75.8, 61.9, 49.5, 25.5, 22.7, 21.5, 15.3; HRMS (ESI) calcd for $C_{21}H_{24}FNO_3NaS$ $[M+Na]^+$ 412.1359; found, 412.1357.

(*Z*)-N-((2-butoxycyclobutylidene)methyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide (5g)



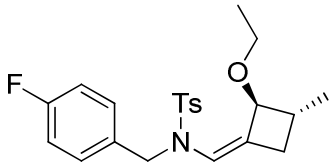
33.4 mg colorless oil was obtained from 0.1 mmol scale reaction (80% yield), Rf = 0.25 (PE/EA = 40:1); IR (neat) 2956, 2931, 2872, 1728, 1602, 1510, 1336, 1222, 1161, 815, 663, 576, 549; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 8.2Hz, 2H), 7.28 (d, J = 8.1Hz, 2H), 7.24 (dd, J = 8.5, 5.5Hz, 2H), 6.98 (t, J = 8.7Hz, 2H), 6.29 (s, 1H), 4.78 (d, J = 16.2Hz, 1H), 4.62 (d, J = 16.2Hz, 1H), 4.04-3.99 (m, 1H), 3.20-3.15 (m, 1H), 3.12-3.06 (m, 1H), 2.50-2.45 (m, 1H), 2.42 (s, 3H), 2.29-2.21 (m, 1H), 2.08-1.99 (m, 1H), 1.90-1.81 (m, 1H), 1.40-1.33 (m, 2H), 1.27-1.17 (m, 2H), 0.86 (t, J = 7.3Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9 (d, J = 243.6Hz), 143.4, 136.5, 133.3, 129.6, 128.2 (d, J = 7.9Hz), 127.0, 125.9, 120.2, 115.1 (d, J = 21.4Hz), 75.8, 66.4, 49.3, 31.9, 25.6, 22.6, 21.5, 19.5, 13.9; HRMS (ESI) calcd for $C_{23}H_{29}FNO_3S$ $[M+Na]^+$ 440.1672; found, 440.1644.

(*Z*)-N-(4-fluorobenzyl)-N-((2-methoxy-2-methylcyclobutylidene)methyl)-4-methylbenzenesulfonamide(5h)



26.8 mg white solid was obtained from 0.1 mmol scale reaction (69% yield), Rf = 0.25 (PE/EA = 20:1); mp 108.6-110.6°C; IR (neat) 2949, 2929, 1602, 1510, 1346, 1220, 1163, 813, 663, 570, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 (d, J = 8.2Hz, 2H), 7.25 (d, J = 8.8Hz, 2H), 7.19 (dd, J = 8.5, 5.5Hz, 2H), 6.94 (t, J = 8.7Hz, 2H), 6.32 (s, 1H), 4.80 (s, 2H), 2.91 (s, 3H), 2.41 (s, 3H), 2.32-2.23 (m, 3H), 1.62-1.57 (m, 1H), 1.09 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9 (d, J = 243.4Hz), 143.6, 136.5, 132.8, 129.5, 128.5 (d, J = 7.9Hz), 127.1, 119.6, 115.1 (d, J = 21.3Hz), 81.7, 50.6, 50.3, 28.0, 24.2, 21.8, 21.5; HRMS (ESI) calcd for $C_{21}H_{24}FNO_3NaS$ $[M+Na]^+$ 412.1359; found, 412.1386.

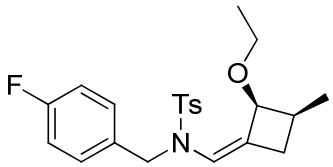
***N*-((*Z*)-((*2S**,*3R**)-2-ethoxy-3-methylcyclobutylidene)methyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide(*anti*-5i)**



33.8 mg yellow oil was obtained from 0.1 mmol scale reaction (84% yield), Rf = 0.25 (PE/EA = 30:1); IR (neat) 2927, 2873, 1724, 1602, 1510, 1332, 1222, 1161, 1091, 813, 663, 576, 549; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 8.3Hz, 2H), 7.28 (d, J = 8.2Hz, 2H), 7.24 (dd, J = 8.4, 5.5Hz, 2H), 6.98 (t, J = 8.7Hz, 2H), 6.22 (s, 1H), 4.78 (d, J = 16.1Hz, 1H), 4.58 (d, J = 16.1Hz, 1H), 3.59-3.56 (m, 1H), 3.32-3.24 (m, 1H), 3.22-3.15 (m, 1H), 2.63-2.55 (m, 1H), 2.42 (s, 3H), 2.29-2.19 (m, 1H), 1.78 (qd, J = 7.6, 2.3Hz, 1H), 1.04-1.00 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1 (d, J = 243.4Hz), 143.4, 136.5, 133.3, 129.6, 128.4 (d, J = 7.9Hz), 127.1, 120.3, 115.2 (d, J = 21.3Hz), 82.9, 62.5, 49.7, 34.3, 30.2, 21.5, 19.9, 15.4; HRMS (ESI) calcd for $C_{22}H_{26}FNO_3NaS$ $[M+Na]^+$ 426.1515; found, 426.1516.

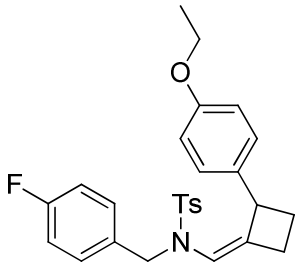
***N*-((*Z*)-((*2S**,*3S**)-2-ethoxy-3-methylcyclobutylidene)methyl)-N-(4-fluorobenzyl)-**

4-methylbenzenesulfonamide(*syn*-5i)



33.8 mg yellow oil was obtained from 0.1 mmol scale reaction (84% yield), Rf = 0.25 (PE/EA = 80:1); IR (neat) 2972, 2927, 1600, 1510, 1338, 1222, 1163, 663, 584, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 8.3Hz, 2H), 7.28 (d, J = 7.9Hz, 2H), 7.26-7.23 (m, 2H), 6.97 (t, J = 8.7Hz, 2H), 6.10 (d, J = 1.4Hz, 1H), 4.78 (d, J = 15.8Hz, 1H), 4.52 (d, J = 15.8Hz, 1H), 4.00-3.98 (m, 1H), 3.31-3.23 (m, 1H), 3.22-3.14 (m, 1H), 2.42 (s, 3H), 2.40-2.32 (m, 2H), 1.87-1.83 (m, 1H), 1.03 (t, J = 7.0Hz, 3H), 0.92 (d, J = 6.8Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1 (d, J = 249.6Hz), 143.2, 136.4, 133.2, 130.0, 129.5, 128.7 (d, J = 7.9Hz), 127.2, 120.8, 115.2 (d, J = 21.3Hz), 64.4, 50.4, 31.4, 30.7, 21.5, 15.2, 14.1 (one peak was hided in the cdcl3); HRMS (ESI) calcd for $C_{22}H_{26}FNO_3NaS$ $[M+Na]^+$ 426.1515; found, 426.1516.

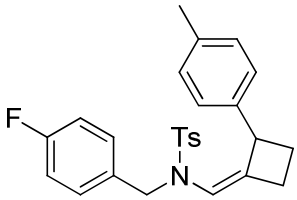
(Z)-N-((2-(4-ethoxyphenyl)cyclobutylidene)methyl)-N-(4-fluorobenzyl)-4-methylbenzenesulfonamide (5j)



38.6 mg white solid was obtained from 0.1 mmol scale reaction (83% yield), Rf = 0.25 (PE/EA = 30:1); mp 104.7-106.7^{o}C; IR (neat) 2980, 2926, 1606, 1580, 1352, 1244, 1163, 815, 572, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, J = 8.1Hz, 2H), 7.31 (d, J = 8.0Hz, 2H), 6.98 (dd, J = 8.3, 5.6Hz, 2H), 6.91 (t, J = 8.6Hz, 2H), 6.86 (d, J = 8.5Hz, 2H), 6.64 (d, J = 8.5Hz, 2H), 5.88 (d, J = 1.5Hz, 1H), 4.36 (d, J = 15.5Hz, 1H), 4.00 (q, J = 7.0Hz, 2H), 3.91-3.87 (m, 1H), 3.75 (d, J = 15.5Hz, 1H), 2.72-2.58 (m, 2H), 2.48 (s, 3H), 2.37-2.28 (m,1H), 1.85-1.76 (m, 1H), 1.43 (t, J = 7.0Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1 (d, J = 232.8Hz), 157.3, 143.4, 136.3, 135.5,

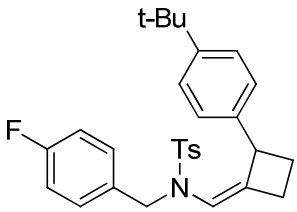
132.4, 129.6, 128.9 (d, J = 8.0Hz), 128.0, 127.2, 118.0, 115.1 (d, J = 21.3Hz), 114.4, 63.3, 50.9, 46.8, 27.7, 26.8, 21.6, 14.9; HRMS (ESI) calcd for $C_{27}H_{28}FNO_3NaS$ $[M+Na]^+$ 488.1672; found, 488.1671.

(Z)-N-(4-fluorobenzyl)-4-methyl-N-((2-(p-tolyl)cyclobutylidene)methyl)benzenes ulfonamide (5k)



27.4 mg white solid was obtained from 0.1 mmol scale reaction (63% yield), Rf = 0.25 (PE/EA = 30:1); mp 96.3-98.3°C; IR (neat) 2925, 2846, 1604, 1510, 1354, 1163, 813, 572, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, J = 8.2Hz, 2H), 7.31 (d, J = 8.0Hz, 2H), 6.98 (dd, J = 8.5, 5.8Hz, 2H), 6.93-6.88 (m, 4H), 6.85 (d, J = 8.0Hz, 2H), 5.91 (d, J = 1.8Hz, 1H), 4.37 (d, J = 15.7Hz, 1H), 3.92-3.88 (m, 1H), 3.75 (d, J = 15.6Hz, 1H), 2.75-2.59 (m, 2H), 2.49 (s, 3H), 2.39-2.34 (m, 1H), 2.32 (s, 3H), 1.86-1.77 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.3 (d, J = 226.9Hz), 143.4, 140.5, 136.3, 135.7, 135.6, 132.4, 129.6, 129.2, 128.8 (d, J = 7.9Hz), 127.2, 126.9, 118.1, 115.1 (d, J = 21.3Hz), 50.8, 47.2, 27.7, 26.9, 21.6, 21.1; HRMS (ESI) calcd for $C_{26}H_{27}FNO_2S$ $[M+H]^+$ 436.1747; found, 436.1749.

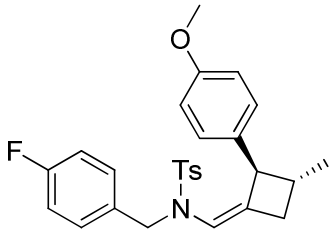
(Z)-N-((2-(4-(tert-butyl)phenyl)cyclobutylidene)methyl)-N-(4-fluorobenzyl)-4-me thylbenzenesulfonamide (5m)



32.4 mg white solid was obtained from 0.1 mmol scale reaction (68% yield), Rf = 0.25 (PE/EA = 100:1); mp 100.8-102.8°C; IR (neat) 2960, 2866, 1604, 1508, 1357, 1163, 827, 574, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 8.2Hz, 2H), 7.32 (d, J

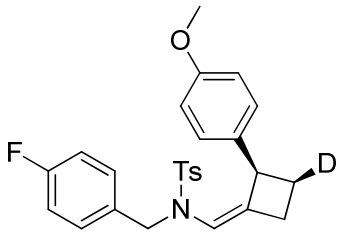
= 8.2Hz, 2H), 7.10 (d, *J* = 8.3Hz, 2H), 6.98 (dd, *J* = 8.5, 5.6Hz, 2H), 6.90 (t, *J* = 8.7Hz, 2H), 6.85 (d, *J* = 8.2Hz, 2H), 5.95 (d, *J* = 1.9Hz, 1H), 4.36 (d, *J* = 15.6Hz, 1H), 3.93-3.87 (m, 1H), 3.75 (d, *J* = 15.6Hz, 1H), 2.74-2.58 (m, 2H), 2.49 (s, 3H), 2.38-2.29 (m, 1H), 1.86-1.78 (m, 1H), 1.31(s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1 (d, *J* = 242.7Hz), 148.9, 143.4, 140.4, 136.4, 135.1, 132.5, 129.7, 128.8 (d, *J* = 7.9Hz), 127.3, 126.6, 125.3, 118.1, 115.1 (d, *J* = 21.3Hz), 50.6, 47.0, 34.4, 31.4, 27.7, 26.9, 21.6; HRMS (ESI) calcd for $C_{29}H_{33}FNO_2S$ $[M+H]^+$ 478.2216; found, 478.2216.

N-(4-fluorobenzyl)-N-((*Z*)-((2R,3R)-2-(4-methoxyphenyl)-3-methylcyclobutylidene)methyl)-4-methylbenzenesulfonamide (5n)



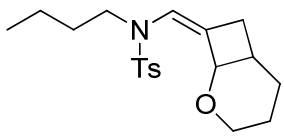
39.5 mg white solid was obtained from 0.1 mmol scale reaction (85% yield), Rf = 0.25 (PE/EA = 20:1); mp 116.4-118.4^{o}C; IR (neat) 2951, 2920, 1606, 1510, 1346, 1247, 1163, 1035, 813, 572, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 8.0Hz, 2H), 7.34 (d, *J* = 8.0Hz, 2H), 7.04-7.00 (m, 2H), 6.95 (t, *J* = 8.6Hz, 2H), 6.85 (d, *J* = 8.4Hz, 2H), 6.65 (d, *J* = 8.3Hz, 2H), 5.95 (s, 1H), 4.38 (d, *J* = 15.4Hz, 1H), 3.82 (s, 3H), 3.75 (d, *J* = 15.5Hz, 1H), 3.34-3.32 (m, 1H), 2.85-2.78 (m, 1H), 2.50 (s, 3H), 2.22-2.32 (m, 2H), 1.08 (d, *J* = 6.2Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.0 (d, *J* = 241.0Hz), 158.0, 143.4, 136.4, 134.6, 133.2, 132.4, 129.2, 129.1 (d, *J* = 8.0Hz), 128.1, 127.3, 118.1, 115.1 (d, *J* = 21.2Hz), 113.7, 55.2, 55.1, 50.9, 37.1, 34.4, 21.5, 20.6; HRMS (ESI) calcd for $C_{27}H_{28}FNO_3NaS$ $[M+Na]^+$ 488.1672; found, 488.1674.

(R,*Z*)-N-(4-fluorobenzyl)-N-((2-(4-methoxyphenyl)cyclobutylidene)methyl)-4-methylbenzenesulfonamide, 5o



36.5 mg colorless oil was obtained from 0.1 mmol scale reaction (80 % yield), Rf = 0.25 (PE/EA = 20:1); IR(neat) 2954, 2918, 1606, 1510, 1352, 1246, 1228, 1222, 1163, 1037, 815, 661, 572; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63(d, J = 8.3Hz, 2H), 7.31(d, J = 8.0Hz, 2H), 6.99-6.95(m, 2H), 6.92-6.86(m, 4H), 6.64(d, J = 8.7Hz, 2H), 5.86(d, J = 2.0Hz, 1H), 4.36(d, J = 15.5Hz, 1H), 3.89(d, J = 9.4Hz, 1H), 3.79(s, 3H), 3.73(d, J = 15.5Hz, 1H), 2.70-2.58(m, 2H), 2.47(s, 3H), 2.34-2.27(m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.1(d, J = 243.7Hz), 157.9, 143.4, 136.4, 136.2, 135.5, 132.3, 129.6, 129.0(d, J = 8.0Hz), 128.0, 127.2, 118.0, 115.1(d, J = 21.3Hz), 113.8; HRMS (ESI) calcd for $C_{26}H_{26}DFNO_3S$ $[M+H]^+$ 453.1758, found, 453.1750.

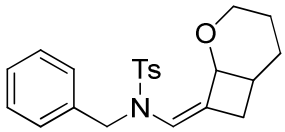
(*Z*)-N-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-N-butyl-4-methylbenzenesulfonamide (6a)



21.3 mg colorless oil was obtained from 0.1 mmol scale reaction (61% yield), Rf = 0.25 (PE/EA = 30:1); IR (neat) 2931, 2872, 1726, 1327, 1161, 1093, 663, 570, 551; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 8.2Hz, 2H), 7.28 (d, J = 8.1Hz, 2H), 6.27 (s, 1H), 4.49 (d, J = 7.1Hz, 2H), 3.57-3.49 (m, 1H), 3.42-3.35 (m, 1H), 3.25-3.20 (m, 1H), 2.85-2.79 (m, 1H), 2.40 (s, 3H), 2.38-2.29 (m, 2H), 2.08 (d, J = 13.3Hz, 1H), 1.99-1.93 (m, 1H), 1.54-1.47 (m, 2H), 1.37-1.28 (m, 5H), 0.89 (t, J = 7.4Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.2, 136.7, 129.5, 127.1, 125.6, 120.2, 72.6, 62.3, 46.7, 30.7, 30.6, 30.2, 25.8, 22.3, 21.5, 19.7, 13.8; HRMS (ESI) calcd for $C_{19}H_{27}NO_3NaS$ $[M+Na]^+$ 372.1609; found, 372.1607.

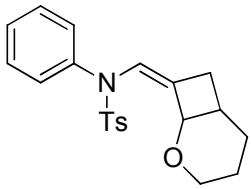
(*Z*)-N-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-N-benzyl-4-methylbenzenesulfo

namide (7a)



17.6 mg white solid was obtained from 0.1 mmol scale reaction (46% yield), Rf = 0.25 (PE/EA = 30:1); mp 142.8-144.8 ºC; IR (neat) 2927, 2852, 1676, 1346, 1165, 574, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, J = 8.2Hz, 2H), 7.31-7.22 (m, 7H), 6.37 (s, 1H), 4.89 (d, J = 15.9Hz, 1H), 4.58 (d, J = 15.9Hz, 1H), 4.16-4.14 (m, 1H), 4.15 (d, J = 6.5Hz, 1H), 3.22 (dt, J = 7.2, 3.9Hz, 1H), 2.76-2.70 (m, 1H), 2.42 (s, 3H), 2.24-2.16 (m, 2H), 1.99-1.89 (m, 2H), 1.30-1.29 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 137.5, 136.4, 129.6, 128.3, 127.2, 127.1, 126.9, 126.4, 120.2, 72.3, 62.2, 50.1, 30.6, 30.0, 25.8, 22.4, 21.5. HRMS (ESI) calcd for $C_{22}H_{25}NO_3NaS$ $[M+Na]^+$ 406.1453; found, 406.1454.

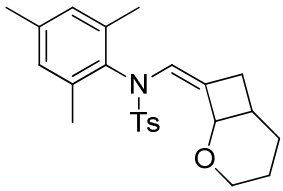
(*Z*)-N-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-4-methyl-N-phenylbenzenesulfonamide(8a)



9.2 mg colorless oil was obtained from 0.1 mmol scale reaction (25% yield), Rf = 0.25 (PE/EA = 30:1); IR (neat) 2922, 2850, 1650, 1353, 1166, 572, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (d, J = 8.3Hz, 2H), 7.27-7.25 (m, 4H), 7.23 (d, J = 8.3Hz, 2H), 7.11-7.09 (m, 2H), 6.59 (s, 1H), 3.77 (dt, J = 6.9, 1.9Hz, 1H), 3.48-3.42 (m, 1H), 3.28-3.23 (m, 1H), 2.41 (s, 3H), 2.31-2.25 (m, 1H), 2.20-2.14 (m, 1H), 2.14-2.09 (m, 1H), 1.93-1.85 (m, 1H), 1.48-1.38 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.7, 138.9, 135.3, 129.4, 129.2, 128.4, 127.7, 127.6, 126.8, 121.9, 72.2, 62.9, 30.5, 30.2, 25.7, 22.2, 21.5; HRMS (ESI) calcd for $C_{21}H_{23}NO_3NaS$ $[M+Na]^+$ 392.1296; found, 392.1296.

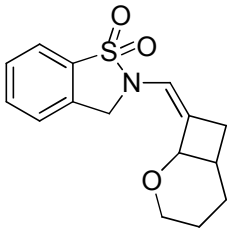
(*Z*)-N-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-N-mesityl-4-methylbenzenesulf

onamide (9a)



34.9 mg white solid was obtained from 0.1 mmol scale reaction (85% yield), Rf = 0.25 (PE/EA = 30:1); mp 149.9-151.9 ºC; IR (neat) 2922, 2848, 1690, 1348, 1163, 1085, 590, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, J = 8.2Hz, 2H), 7.27 (d, J = 7.8Hz, 2H), 6.85 (s, 1H), 6.78 (s, 1H), 6.63 (s, 1H), 3.48-3.43 (m, 1H), 3.15 (d, J = 4.9Hz, 1H), 2.92-2.88 (m, 1H), 2.59-2.54 (m, 1H), 2.42 (s, 3H), 2.26 (s, 3H), 2.11-2.04 (m, 1H), 2.00 (s, 3H), 1.85 (s, 3H), 1.59-1.49 (m, 2H), 1.45-1.41 (m, 1H), 1.32-1.27 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.5, 139.9, 138.2, 137.9, 137.4, 132.0, 129.5, 129.4, 128.6, 127.4, 119.9, 118.5, 72.9, 63.1, 31.5, 30.9, 23.9, 21.5, 21.2, 20.9, 18.9, 18.3; HRMS (ESI) calcd for $C_{24}H_{29}NO_3NaS$ $[M+Na]^+$ 434.1766; found, 434.1767.

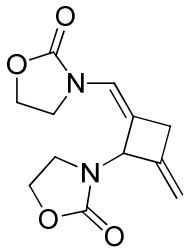
(*Z*)-2-(2-oxabicyclo[4.2.0]octan-8-ylidenemethyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide (10a)



20.7 mg colorless oil was obtained from 0.1 mmol scale reaction (71% yield), Rf = 0.25 (PE/EA = 15:1); IR (neat) 2929, 2858, 1722, 1454, 1300, 1168, 759, 567, 530; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (d, J = 7.8Hz, 1H), 7.62 (t, J = 7.2Hz, 1H), 7.53 (t, J = 7.6Hz, 1H), 7.43 (d, J = 7.6Hz, 1H), 6.48 (s, 1H), 5.13 (d, J = 14.7Hz, 1H), 4.83-4.82 (m, 1H), 4.58 (d, J = 14.7Hz, 1H), 3.74-3.69 (m, 1H), 3.64-3.59 (m, 1H), 2.48-2.46 (m, 2H), 2.23-2.17 (m, 1H), 2.09-2.04 (m, 1H), 1.61-1.51 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 133.8, 133.7, 132.9, 129.0, 124.5, 123.9, 121.4, 115.3, 72.4, 63.3, 50.3, 30.6, 30.5, 25.7, 22.4; HRMS (ESI) calcd for $C_{15}H_{18}NO_3S$ $[M+H]^+$

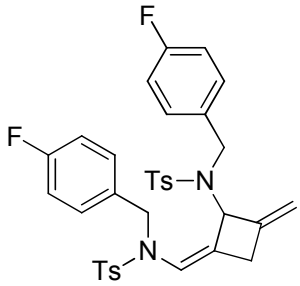
292.1007; found, 292.1009.

(*Z*)-3-((3-methylene-2-(2-oxooxazolidin-3-yl)cyclobutylidene)methyl)oxazolidin-2-one (*D-4*)



14 mg white solid was obtained from 0.1 mmol scale reaction (56% yield), Rf = 0.25 (PE/EA = 2:1); mp 141.5-143.5^{o}C; IR (neat) 1744, 1712, 1481, 1429, 1415, 1249, 1228, 1033, 752; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.61 (s, 1H), 5.62 (s, 1H), 5.19 (s, 1H), 5.14 (s, 1H), 4.38-4.33 (m, 4H), 3.85-3.73 (m, 2H), 3.62 (q, J = 8.5Hz, 1H), 3.48 (q, J = 8.2Hz, 1H), 3.32-3.19 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.5, 156.2, 142.7, 121.2, 115.6, 111.0, 62.6, 62.3, 58.1, 43.8, 40.0, 35.3; HRMS (ESI) calcd for $C_{12}H_{14}N_2NaO_4$ $[M+Na]^+$ 273.0851; found, 273.0868.

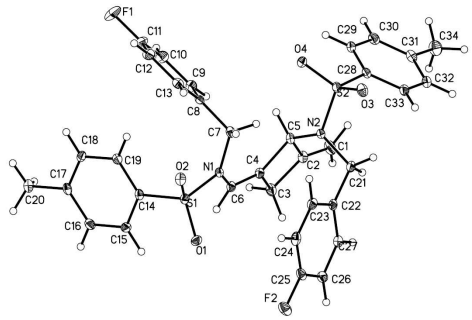
(*Z*)-N-(4-fluorobenzyl)-N-((2-(N-(4-fluorobenzyl)-4-methylphenylsulfonamido)-3-methylenecyclobutylidene)methyl)-4-methylbenzenesulfonamide(*D-5*)



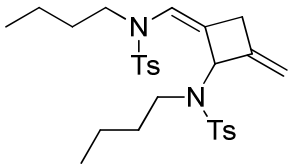
57 mg white solid was obtained from 0.1 mmol scale reaction (90% yield), Rf = 0.25 (PE/EA = 10:1); mp>300°C; IR (neat) 2926, 2846, 1602, 1508, 1340, 1222, 1161, 1089, 815, 669, 565, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, J = 8.1Hz, 2H), 7.51 (d, J = 8.0Hz, 2H), 7.22 (d, J = 8.4Hz, 2H), 7.19 (d, J = 8.3Hz, 2H), 7.15 (d, J = 5.6Hz, 1H), 7.13 (d, J = 5.5Hz, 1H), 7.04 (d, J = 5.6Hz, 1H), 7.02 (d, J = 5.3Hz, 1H), 6.89-6.82 (m, 4H), 6.25 (s, 1H), 5.37 (d, J = 1.7Hz, 1H), 4.78 (d, J = 1.6Hz, 1H), 4.70

(d, J = 16.4Hz, 1H), 4.54 (d, J = 16.4Hz, 1H), 4.27 (d, J = 1.6Hz, 1H), 4.07 (s, 2H), 2.92 (s, 2H), 2.39 (s, 3H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.4 (d, J = 16.6Hz), 160.9 (d, J = 16.6Hz), 144.0, 143.9, 143.6, 137.7, 136.5, 132.4, 132.0, 130.7 (d, J = 8.1Hz), 129.7, 129.1 (d, J = 7.85Hz), 128.8, 127.3, 127.1, 123.3, 119.4, 115.2, 115.0 (d, J = 96.7Hz), 114.9, 111.6, 62.4, 50.1, 48.3, 35.5, 26.9, 21.5 (d, J = 5.69Hz); HRMS (ESI) calcd for $C_{34}H_{32}N_2O_4F_2NaS_2$ $[M+Na]^+$ 657.1669; found, 657.1674.

The X-ray structure of this compound is below:



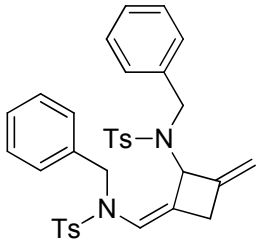
(*Z*)-N-butyl-N-((2-(N-butyl-4-methylphenylsulfonamido)-3-methylenecyclobutylidene)methyl)-4-methylbenzenesulfonamide(*D-6*)



40.3 mg colorless oil was obtained from 0.1 mmol scale reaction (76% yield), Rf = 0.25 (PE/EA = 30:1); IR (neat) 2958, 2872, 1697, 1338, 1161, 1089, 815, 675, 570, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, J = 8.2Hz, 2H), 7.68 (d, J = 8.2Hz, 2H), 7.28 (d, J = 7.8Hz, 4H), 6.45 (s, 1H), 5.44 (s, 1H), 4.78 (d, J = 1.9Hz, 1H), 4.00 (d, J = 1.9Hz, 1H), 3.63-3.49 (m, 2H), 3.13-3.01 (m, 2H), 2.98-2.90 (m, 2H), 2.83-2.75 (m, 2H), 2.42 (s, 3H), 2.41 (s, 3H), 1.43-1.33 (m, 4H), 1.28-1.21 (m, 2H), 1.06-0.97 (m, 2H), 0.89 (t, J = 14.2Hz, 3H), 0.75 (t, J = 14.7Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 144.7, 143.5, 137.8, 136.9, 129.6, 129.5, 127.3, 126.8, 122.6, 116.5, 110.8, 62.6, 46.8, 45.3, 35.3, 31.9, 30.9, 21.4, 20.0, 19.4, 13.9, 13.3; HRMS (ESI) calcd for $C_{28}H_{38}N_2O_4NaS_2$ $[M+Na]^+$ 553.2171; found, 553.2169.

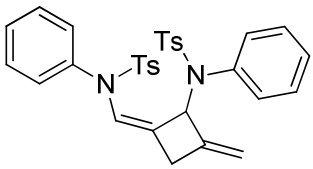
(*Z*)-N-benzyl-N-((2-(N-benzyl-4-methylphenylsulfonamido)-3-methylenecyclobut

ylidene)methyl)-4-methylbenzenesulfonamide(*D-7*)



40.3 mg colorless oil was obtained from 0.1 mmol scale reaction (67% yield), Rf = 0.25 (PE/EA = 30:1); IR (neat) 2960, 2875, 1567, 1454, 1338, 1161, 1091, 813, 663, 565, 547; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, J = 8.2Hz, 2H), 7.52 (d, J = 8.2Hz, 2H), 7.21-7.15 (m, 14H), 7.06-7.04 (m, 2H), 6.20 (d, J = 1.7Hz, 1H), 5.41 (s, 1H), 4.75 (d, J = 2.2Hz, 1H), 4.71 (d, J = 16.2Hz, 1H), 4.45 (d, J = 16.3Hz, 2H), 4.11 (d, J = 15.0Hz, 1H), 3.97 (d, J = 15.2Hz, 1H), 2.89 (t, J = 2.2Hz, 2H), 2.39 (s, 3H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 144.4, 143.6, 143.3, 136.6, 136.4, 136.2, 129.5, 129.1, 128.2, 127.9, 127.6, 127.3, 127.2, 127.1, 123.4, 120.7, 111.4, 62.4, 51.0, 49.0, 35.5, 21.5, 21.4; HRMS (ESI) calcd for $C_{34}H_{34}N_2O_4NaS_2$ $[M+Na]^+$ 621.1857; found, 621.1858.

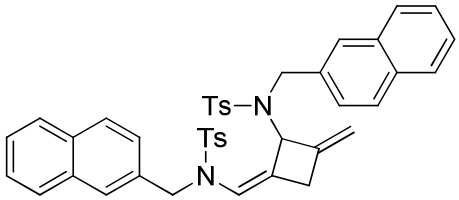
(*Z*)-4-methyl-N-((2-(4-methyl-N-phenylphenylsulfonamido)-3-methylenecyclobut ylidene)methyl)-N-phenylbenzenesulfonamide(*D-8*)



21.7 mg white solid was obtained from 0.1 mmol scale reaction (38% yield), Rf = 0.25 (PE/EA=10:1); mp 170.7-172.7 ^{o}C; IR (neat) 2924, 2850, 1595, 1487, 1352, 1165, 1091, 813, 696, 584, 543; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56-7.45 (m, 4H), 7.38-7.34 (m, 7H), 7.24-7.21 (m, 3H), 7.19 (d, J = 8.2Hz, 1H), 7.15 (d, J = 8.2Hz, 1H), 6.35 (d, J = 2.3Hz, 1H), 5.08 (dd, J = 6.0, 2.3Hz, 1H), 4.97 (d, J = 2.2Hz, 1H), 4.94 (d, J = 2.1Hz, 1H), 2.84 (d, J = 2.0Hz, 1H), 2.75-2.73 (m, 1H), 2.39 (s, 3H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.4, 143.9, 143.1, 138.6, 137.7, 136.9, 134.2, 134.0, 132.0, 131.3, 129.9, 129.7, 129.5, 129.4, 129.3, 129.2, 129.1, 129.0, 128.6, 128.5,

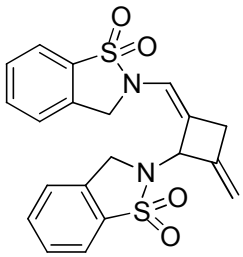
128.4, 127.9, 127.8, 127.6, 127.5, 124.7, 123.3, 112.1, 63.9, 35.5, 21.6, 21.5; HRMS (ESI) calcd for $C_{32}H_{30}N_2O_4NaS_2$ $[M+Na]^+$ 593.1545; found, 593.1541.

(*Z*)-4-methyl-N-((2-(4-methyl-N-(naphthalen-2-ylmethyl)phenylsulfonamido)-3-methylenecyclobutylidene)methyl)-N-(naphthalen-2-ylmethyl)benzenesulfonamide(*D-9*)



49.5 mg yellow oil was obtained from 0.1 mmol scale reaction (71% yield), Rf = 0.25 (PE/EA = 10:1); IR (neat) 2974, 2866, 1699, 1568, 1346, 1161, 1091, 815, 563, 545; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78-7.75 (m, 2H), 7.66-7.64 (m, 3H), 7.62-7.60 (m, 3H), 7.55-7.52 (m, 2H), 7.45-7.40 (m, 6H), 7.32 (d, *J* = 8.5Hz, 1H), 7.18 (d, *J* = 8.5Hz, 1H), 7.13 (d, *J* = 8.1Hz, 2H), 7,07 (d, *J* = 8.1Hz, 2H), 6.28 (d, *J* = 1.8Hz, 1H), 5.52-5.51 (m, 1H), 4.91 (d, *J* = 16.2Hz, 1H), 4.73 (d, *J* = 2.1Hz, 1H), 4.65 (d, *J* = 16.2Hz, 1H), 4.54 (d, *J* = 2.3Hz, 1H), 4.31 (d, *J* = 15.2Hz, 1H), 4.16 (d, *J* = 15.3Hz, 1H), 2.87-2.86 (m, 2H), 2.33 (s, 3H), 2.55 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 144.3, 143.7, 143.4, 137.9, 136.5, 134.1, 133.5, 133.1, 132.9, 132.8, 132.7, 129.5, 128.1, 128.0, 127.8, 127.7, 127.6, 127.5, 127.2, 127.0, 126.6, 126.0, 125.9, 125.8, 125.7, 123.6, 121.3, 111.5, 62.6, 51.4, 49.4, 35.6, 21.4, 21.3; HRMS (ESI) calcd for $C_{42}H_{38}N_2O_4NaS_2$ $[M+Na]^+$ 721.2171; found, 721.2170.

(*Z*)-2-((2-(1,1-dioxidobenzo[d]isothiazol-2(3H)-yl)-3-methylenecyclobutylidene)methyl)-2,3-dihydrobenzo[d]isothiazole 1,1-dioxide(*D-10*)



23.2 mg white solid was obtained from 0.1 mmol scale reaction (56% yield), Rf =

0.25 (PE/EA = 5:1); mp 117.4-118.4°C; IR (neat) 2924, 2852, 1707, 1456, 1299, 1176, 756, 567, 557; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (dd, J = 13.7, 7.8Hz, 2H), 7.56 (dd, J = 13.5, 7.3Hz, 2H), 7.48 (dd, J = 17.2, 7.6Hz, 2H), 8.90 (t, J = 8.9Hz, 2H), 6.74 (s, 1H), 5.72 (s, 1H), 5.44 (s, 1H), 5.27 (s, 1H), 5.19 (d, J = 14.5Hz, 1H), 4.68 (d, J = 14.5Hz, 1H), 4.53 (d, J = 14.0Hz, 1H), 4.47 (d, J = 14.0Hz, 1H), 3.35 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.0, 134.5, 133.5, 133.4, 132.8, 129.1, 129.0, 124.9, 124.8, 121.2, 121.1, 118.6, 116.0, 112.7, 57.1, 50.5, 44.9, 35.2; HRMS (ESI) calcd for $C_{20}H_{18}N_2O_4NaS_2$ $[M+Na]^+$ 437.0605; found, 437.0613.

References

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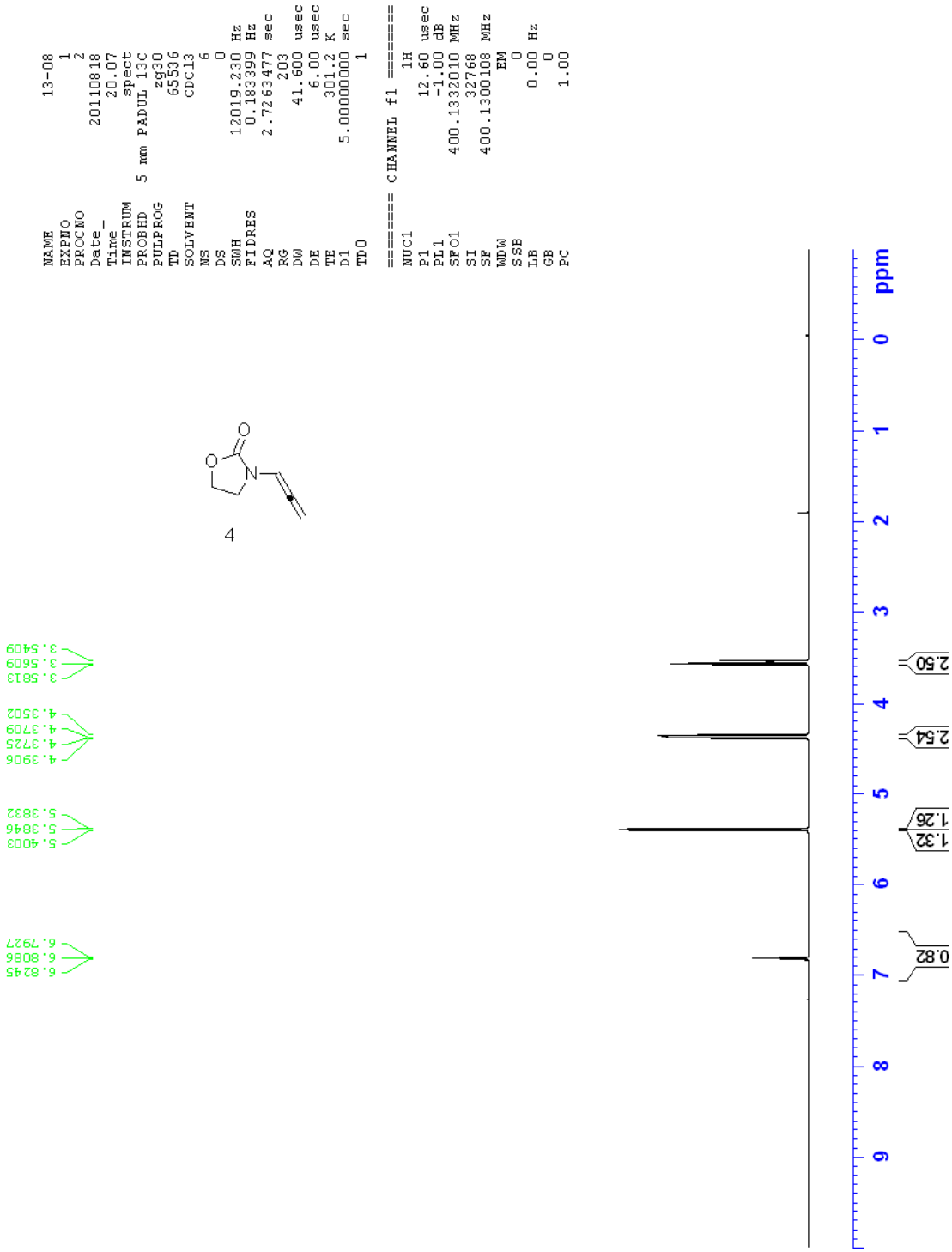
（2）Wei, L.-L.; Mulder, J. A.; Xiong, H.; Zificsak, C. A.; Douglas,C. J.; Hsung, R. P. *Tetrahedron* **2001**, *57*, 459.

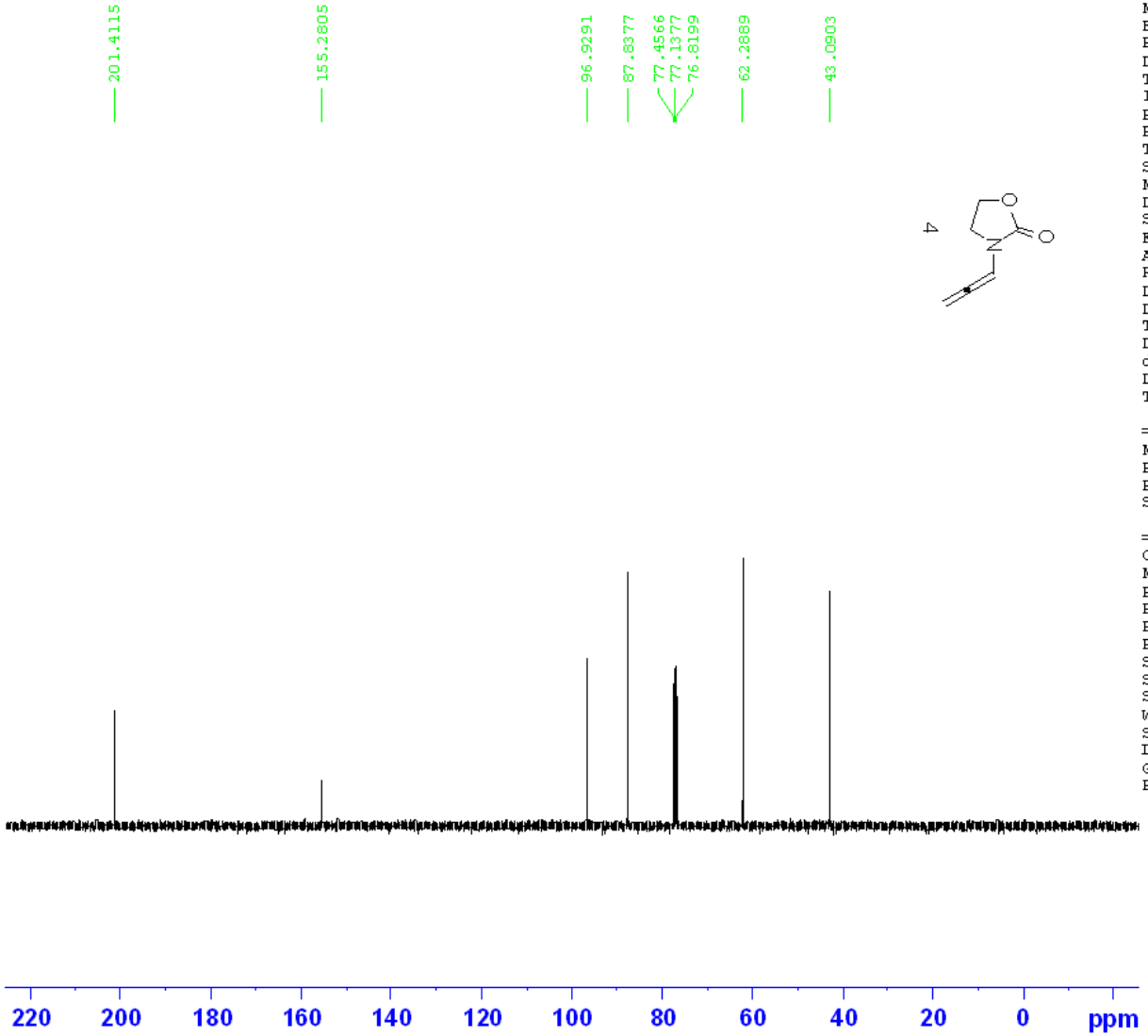
（3）James M. Chapman, Jr., George H. Cocolas, and Iris H. Hall* ***J. Med. Chem.*** **1983,***26***,** 243-246

（4）Eduardas Skucas, Jason R. Zbieg and Michael J. Krische*J. Am. Chem. Soc.* **2009**, *131*, 5054–5055

(5) Álvaro González-Gómez[a]Gema Domínguez,[a]and Javier Pérez-Castells*[a] *Eur. J. Org. Chem.* **2009**, 5057–5062

H^1 NMR and C^{13} NMR spectra



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PROCNO                  2
Date_            20110818
Time                19.35
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TD                  65536
SOLVENT             CDCl3
NS                     62
DS                      0
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                    203
DW                 19.800 usec
DE                  8.00 usec
TE                 301.7 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                  13C
P1                   9.40 usec
PL1                 -1.00 dB
SFO1         100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
PCPD2               80.00 usec
PL12                15.00 dB
PL13                15.00 dB
PL2                 -1.00 dB
SFO2         400.1316005 MHz
SI                  32768
SF           100.6127690 MHz
WDW                    EM
SSB                     0
LB                   2.00 Hz
GB                      0
PC                   1.00
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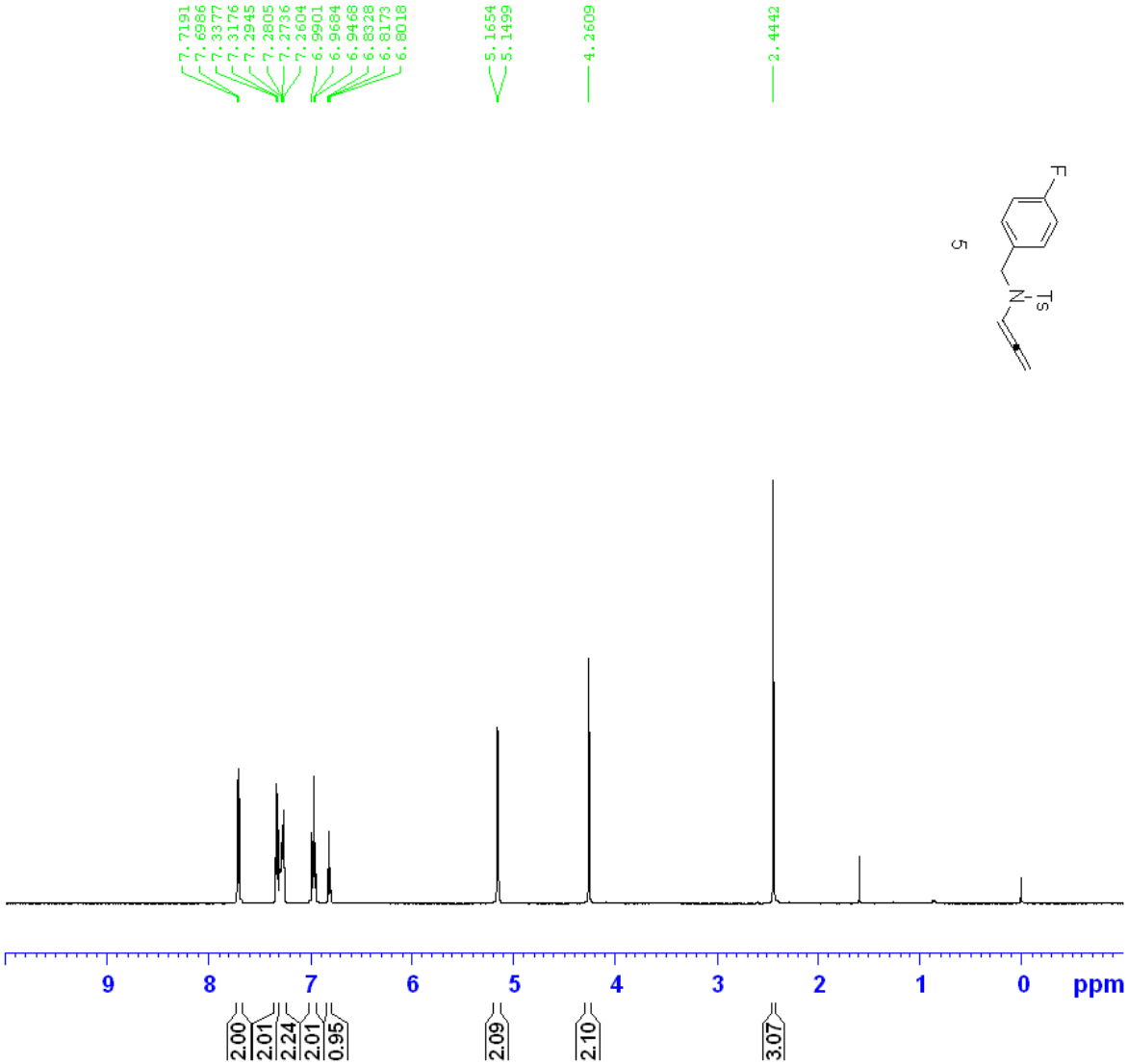

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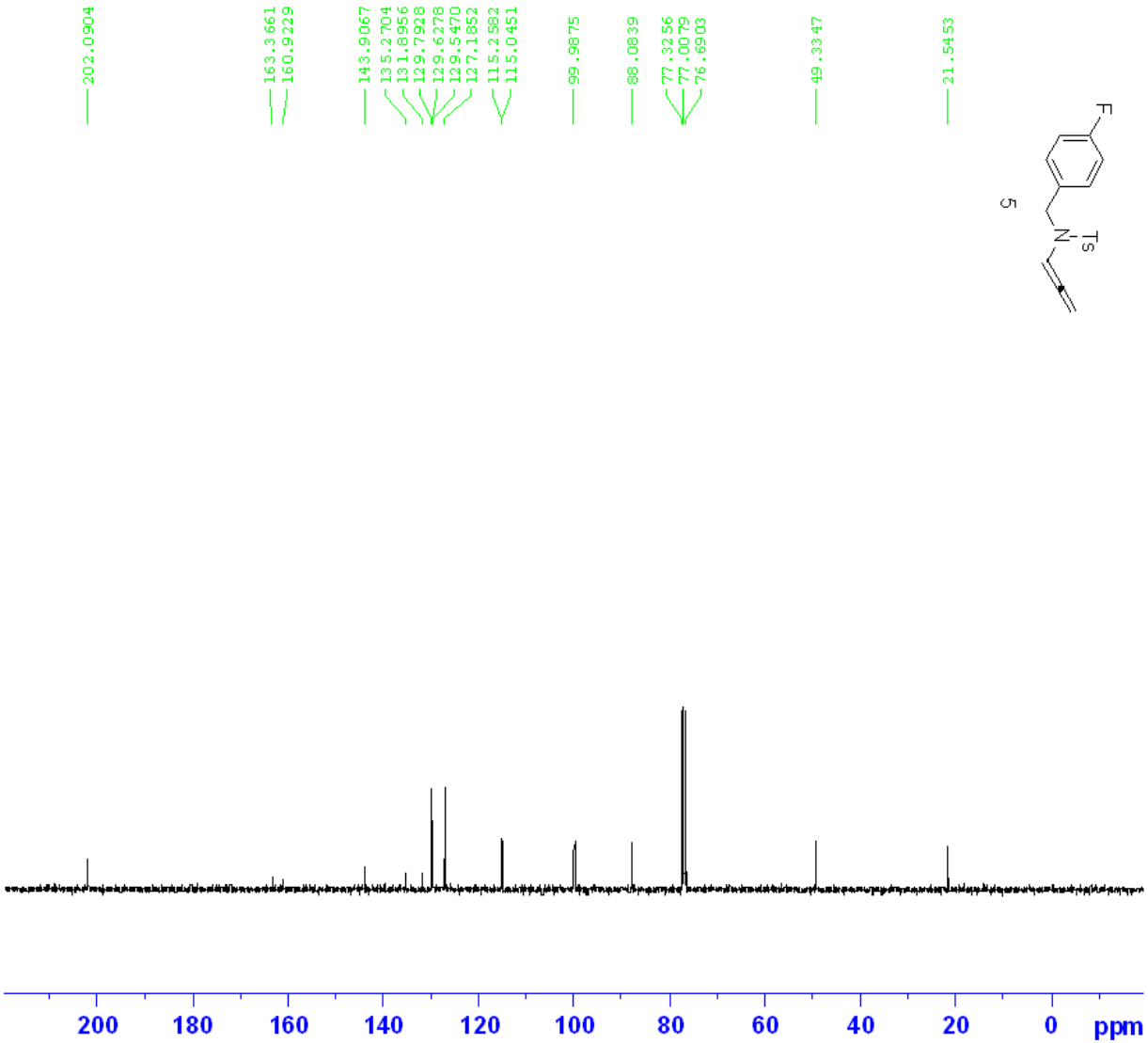
EXPNO	1	
PROCNO	1	
Date_	20100705	
Time	10.44	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	144	
DW	78.200	usec
DE	6.50	usec
TE	299.3	K
D1	1.00000000	sec
TD0	1	

======== CHANNEL f1 ========

NUC1	1H	
P1	11.50	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1326008	MHz
SI	16384	
SF	400.1300093	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	

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EXPNO                  2
PROCNO                 1
Date_           20100705
Time               10.47
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                    24
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                   181
DW                20.800 usec
DE                 6.50 usec
TE                299.6 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 12.80 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.85 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35138419 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127720 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
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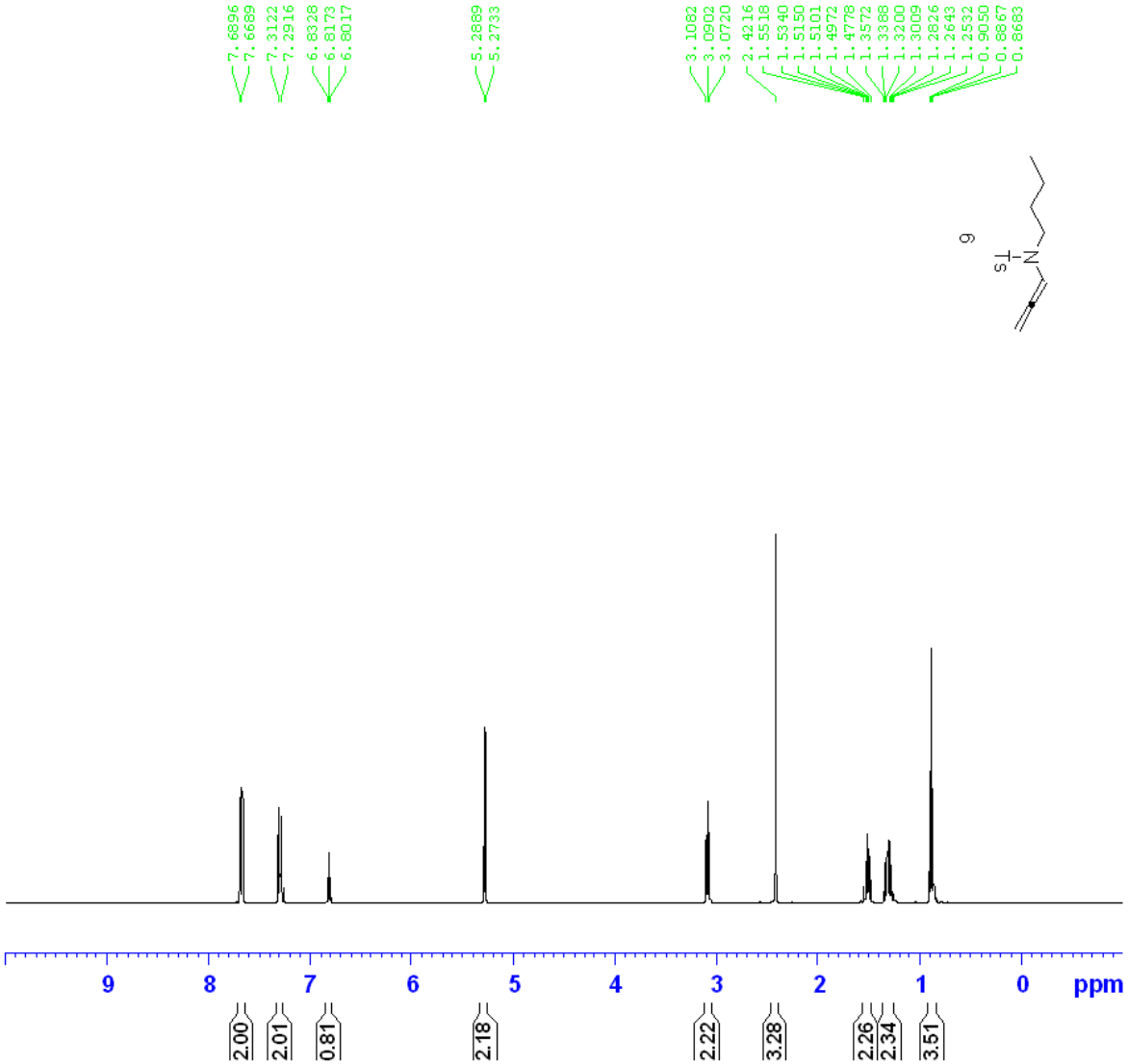


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EXPNO                   1
PROCNO                  1
Date_            20100511
Time                13.24
INSTRUM             spect
PROBHD   5 mm PABBO BB-
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                    144
DW                 78.200 usec
DE                   6.50 usec
TE                  299.2 K
D1            1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                  11.50 usec
PL1                 -1.00 dB
PL1W         17.01305389 W
SFO1        400.1326008 MHz
SI                  16384
SF          400.1300094 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
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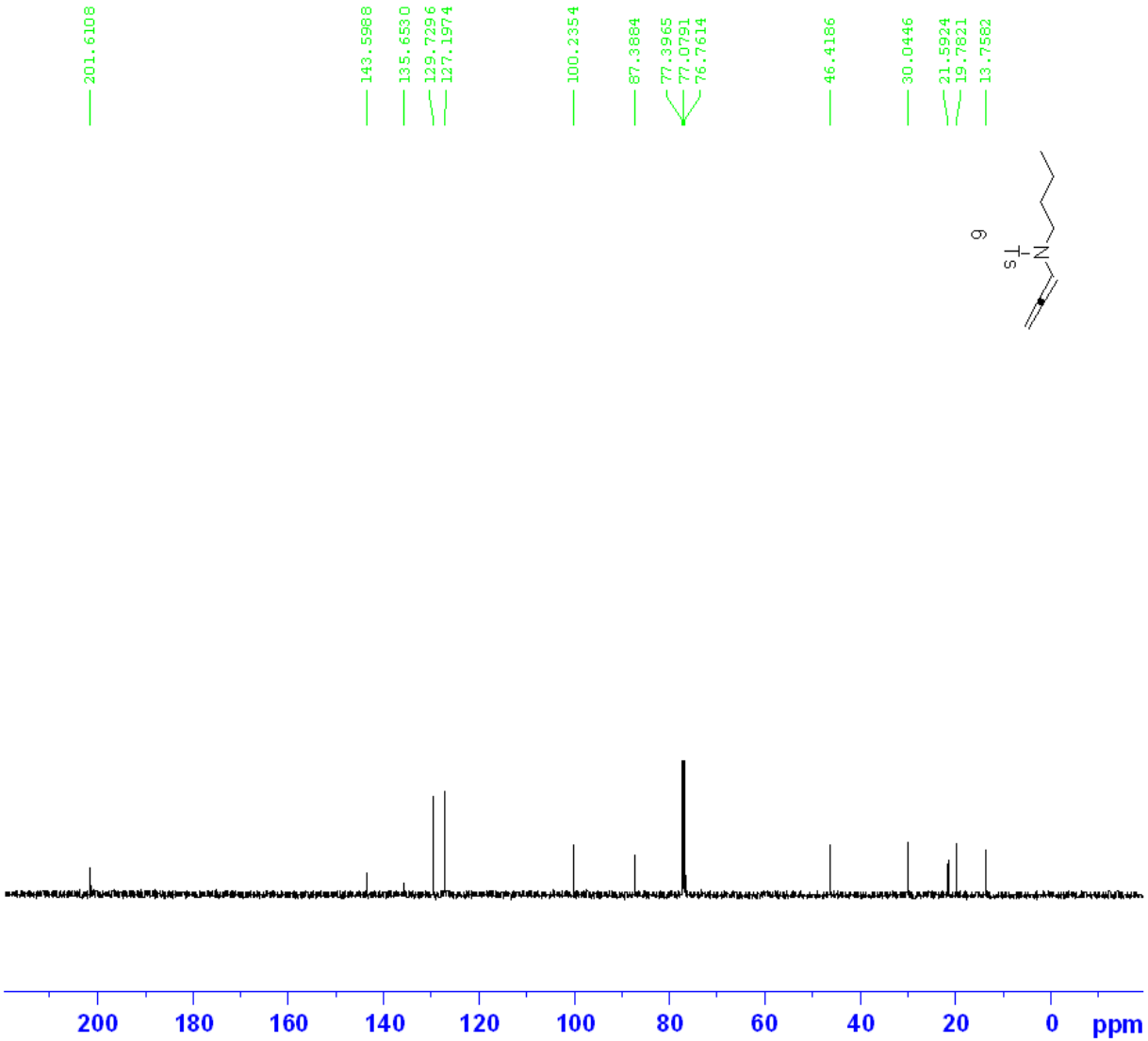


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NAME            L-1-112
EXPNO                 2
PROCNO                1
Date_          20100511
Time              13.25
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   40
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                  322
DW               20.800 usec
DE                6.50 usec
TE               299.5 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  10

======== CHANNEL f1 ========
NUC1                13C
P1                12.80 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              15.85 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.35138419 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127625 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
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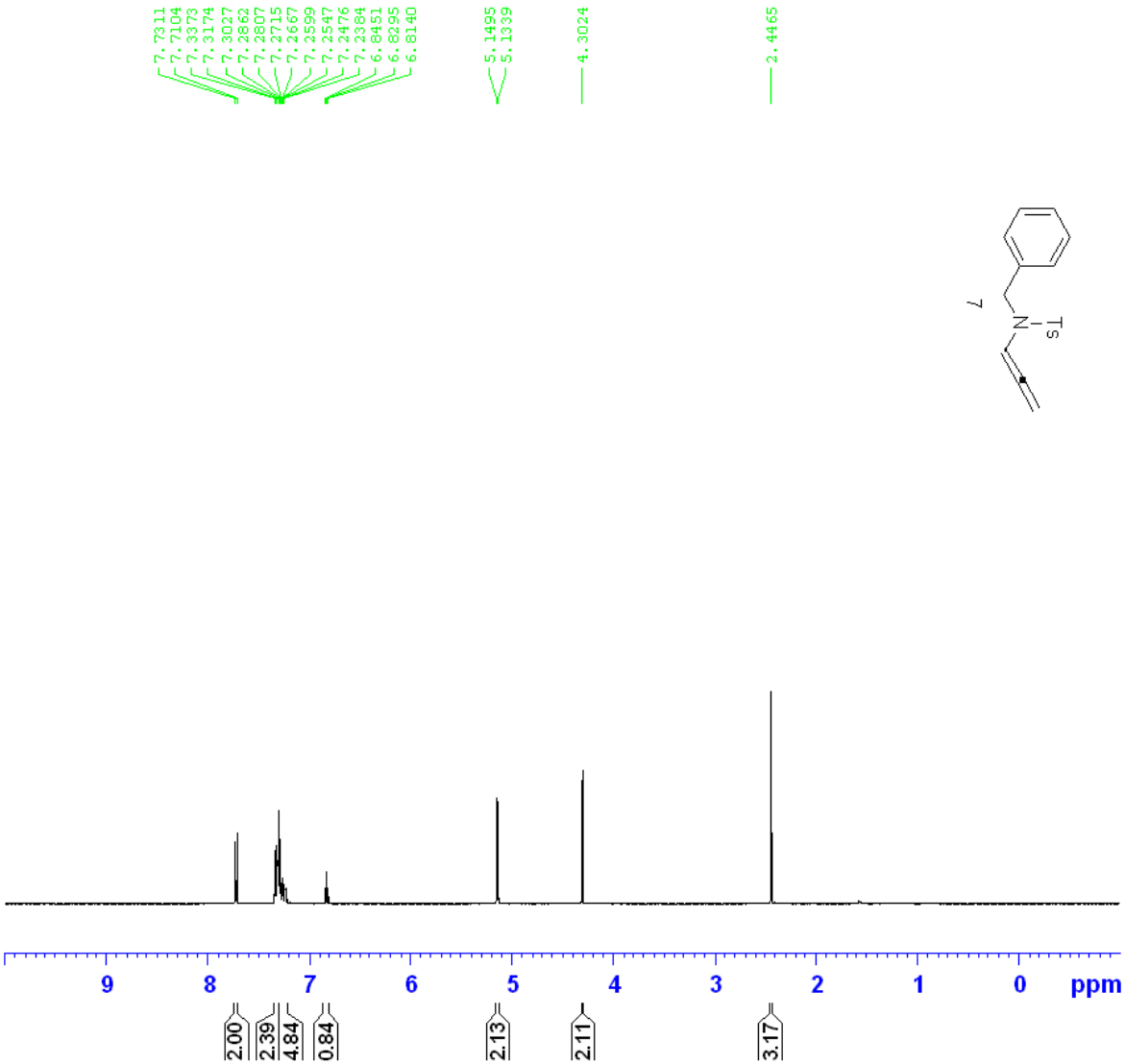


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NAME                L-2-4
EXPNO                   1
PROCNO                  1
Date_            20100519
Time                14.48
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      0
SWH              6393.862 Hz
FIDRES           0.195125 Hz
AQ             2.5625076 sec
RG                    144
DW                 78.200 usec
DE                   6.50 usec
TE                  297.9 K
D1            1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                  11.50 usec
PL1                 -1.00 dB
PL1W         17.01305389 W
SFO1         400.1326008 MHz
SI                  16384
SF           400.1300095 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
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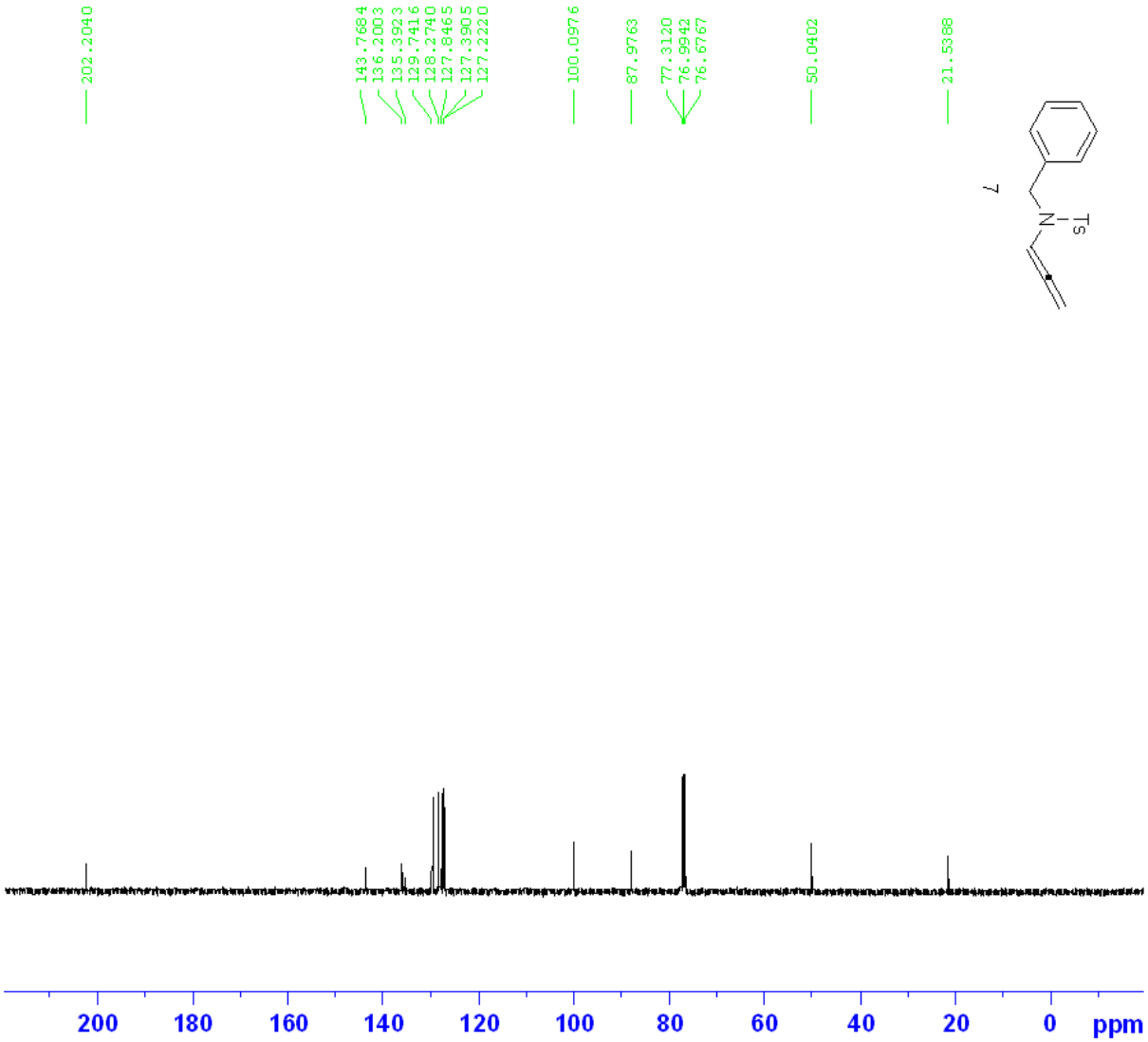


```
NAME                L-2-4
EXPNO                   2
PROCNO                  1
Date_            20100519
Time                14.52
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    56
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                  45.2
DW                20.800 usec
DE                 6.50 usec
TE                298.6 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 12.80 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.85 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35138419 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127720 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
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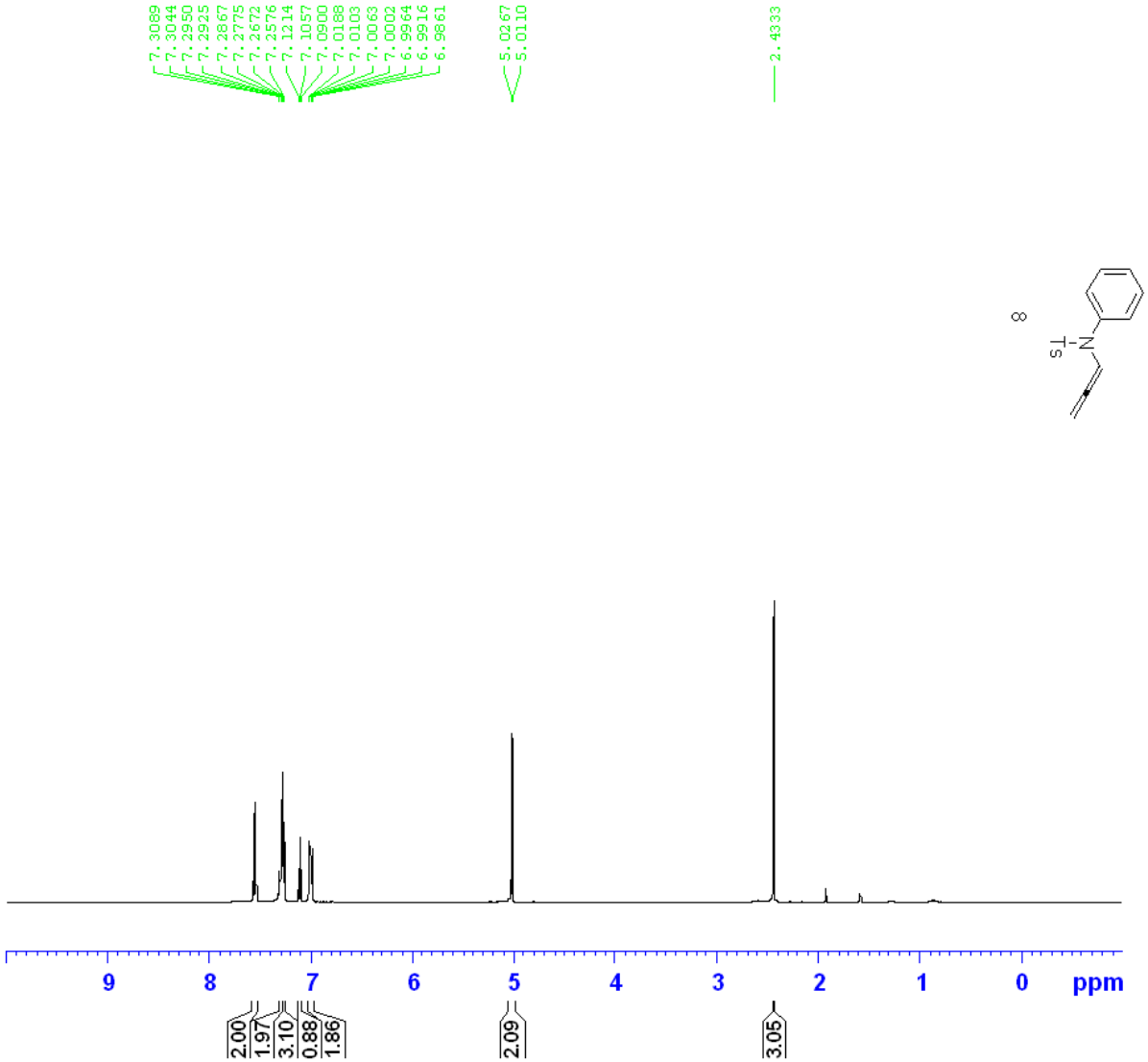


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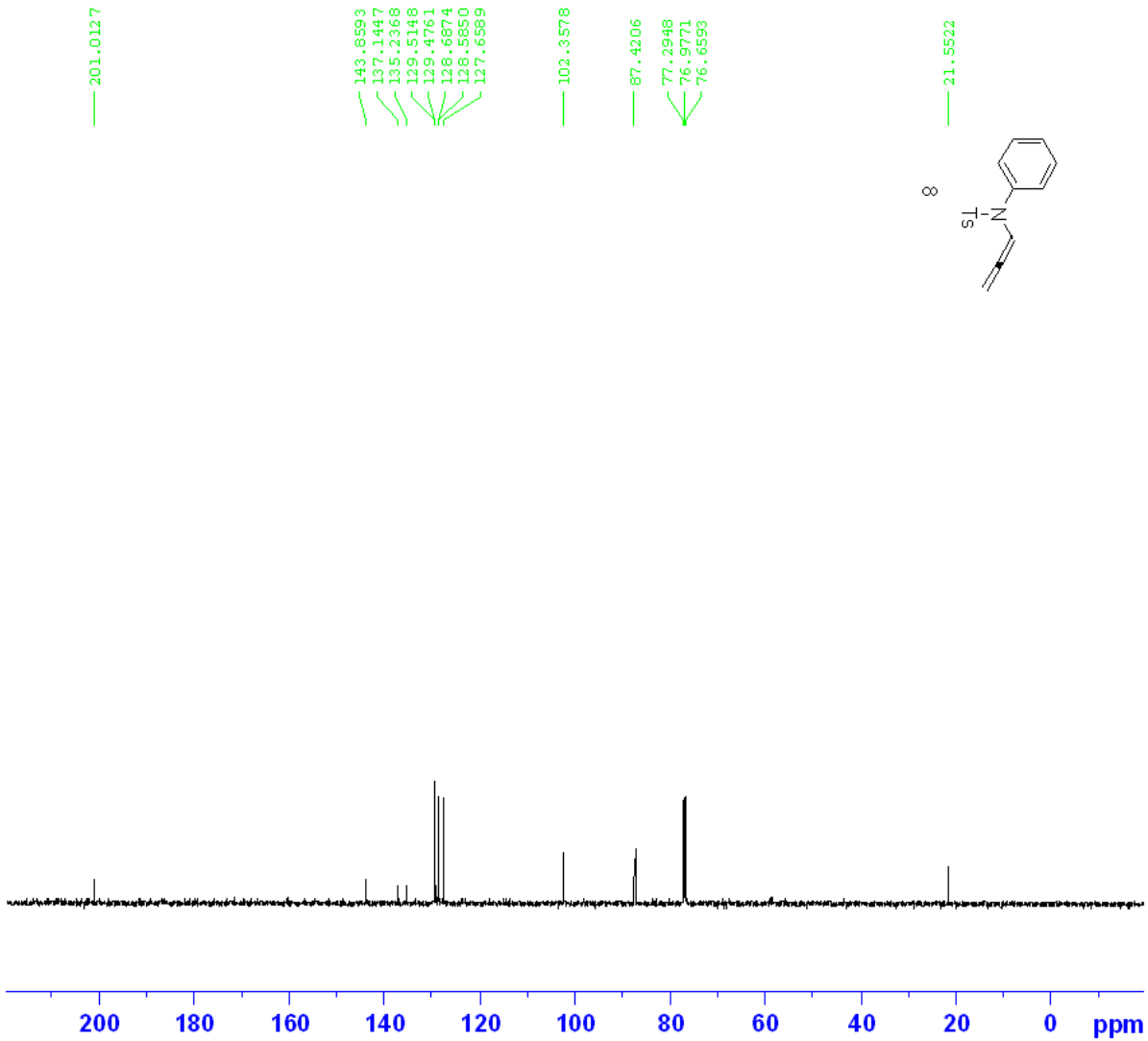
NAME                L-2-3
EXPNO                   1
PROCNO                  1
Date_            20100518
Time                15.09
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                    144
DW                 78.200 usec
DE                   6.50 usec
TE                  297.6 K
D1            1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                  11.50 usec
PL1                 -1.00 dB
PL1W         17.01305389 W
SFO1         400.1326008 MHz
SI                 16384
SF           400.1300110 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
```




```
NAME                L-2-3
EXPNO                   2
PROCNO                  1
Date_            20100518
Time                15.11
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    32
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                   322
DW                20.800 usec
DE                 6.50 usec
TE                298.5 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 12.80 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.85 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35138419 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                32768
SF          100.6127759 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
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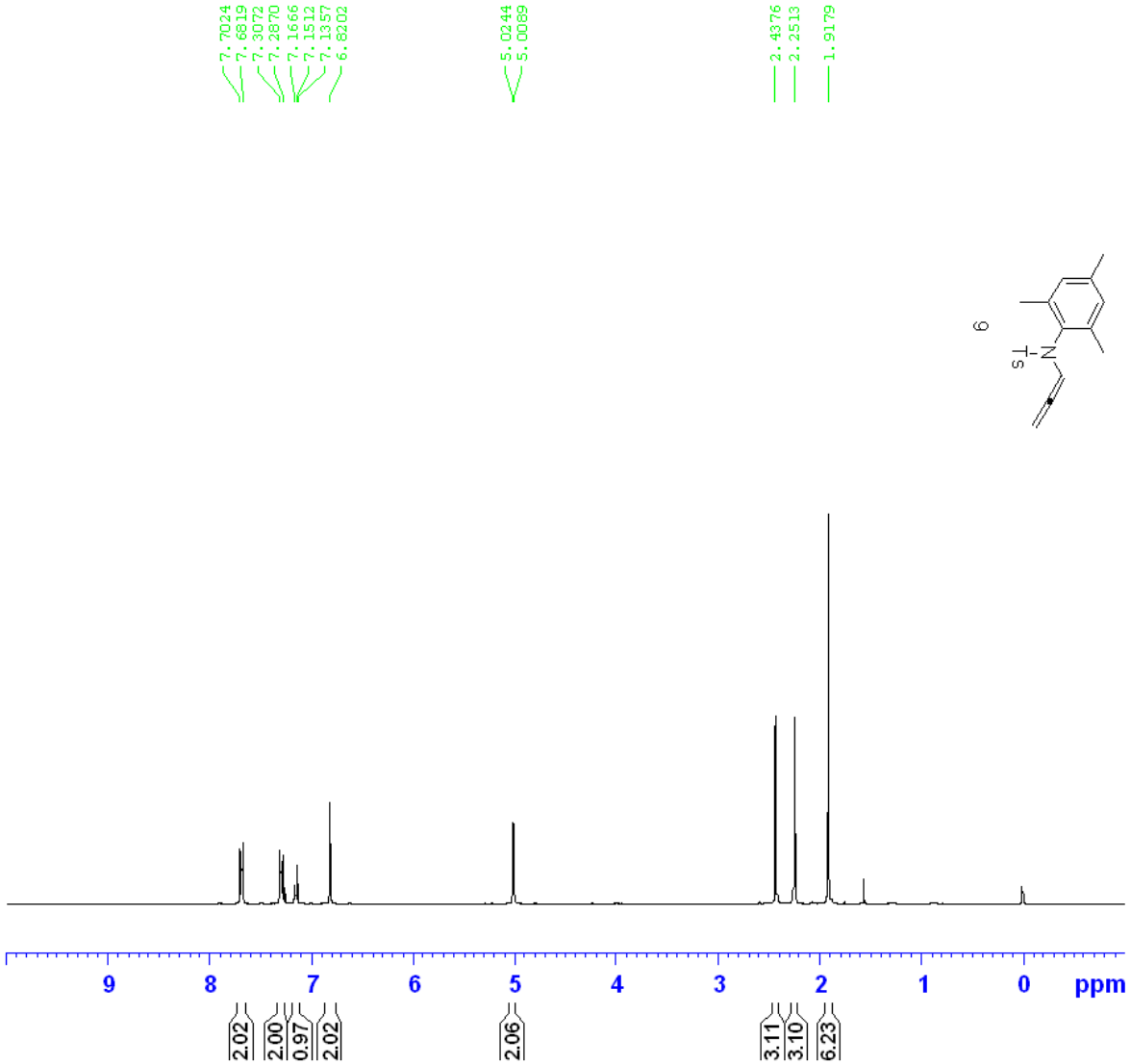


```
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EXPNO                    1
PROCNO                   1
Date_             20100629
Time                 10.42
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ              2.5625076 sec
RG                     114
DW                  78.200 usec
DE                    6.50 usec
TE                   298.8 K
D1             1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                    1H
P1                   11.50 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1326008 MHz
SI                   16384
SF            400.1300096 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
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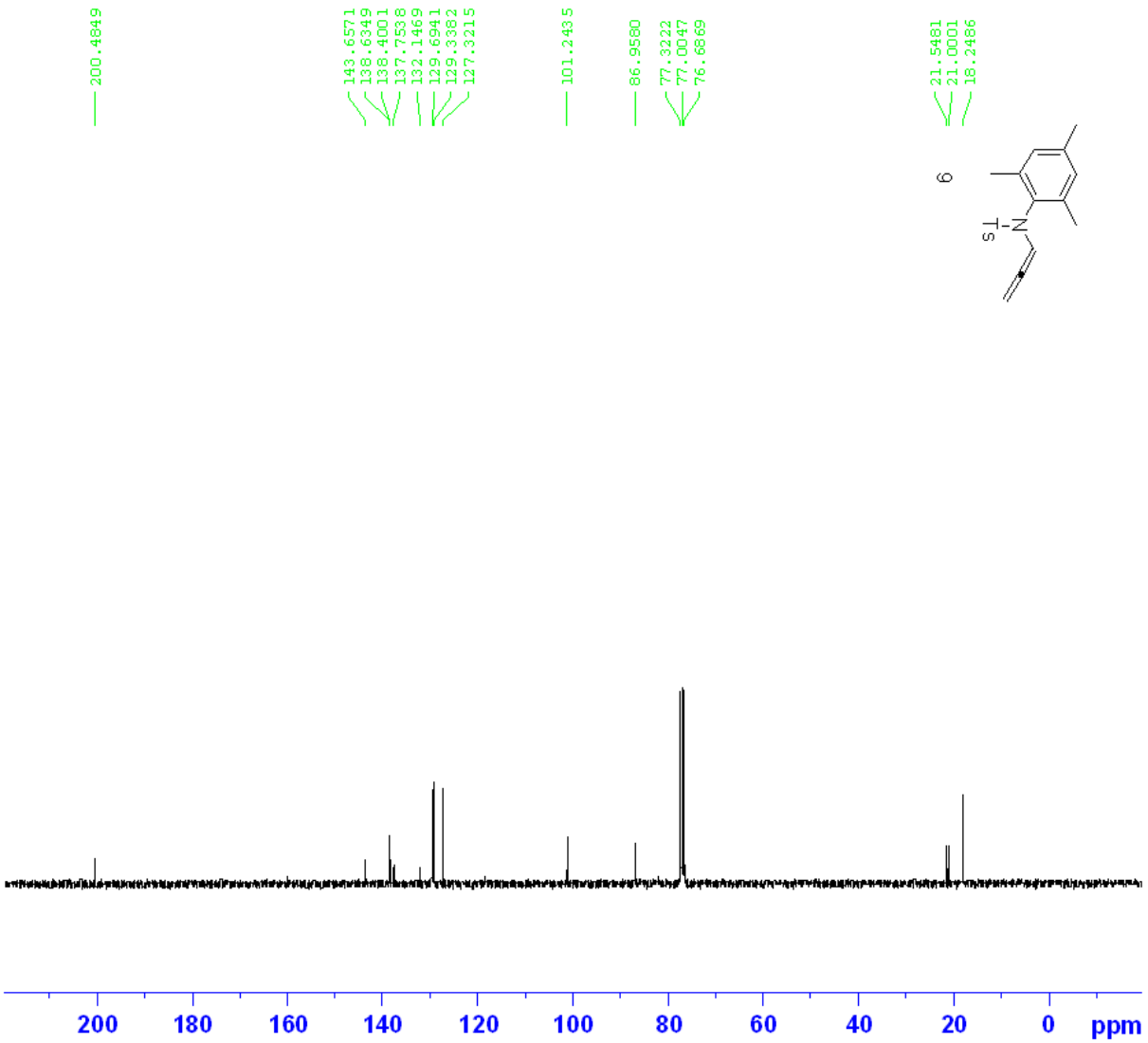


```
NAME        L-2-19-shang
EXPNO                  2
PROCNO                 1
Date_           20100629
Time               10.46
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   32
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                  181
DW               20.800 usec
DE                6.50 usec
TE               299.2 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  10

======== CHANNEL f1 ========
NUC1                13C
P1                12.80 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2            80.00 usec
PL2              -1.00 dB
PL12             15.85 dB
PL13             15.50 dB
PL2W        17.01305389 W
PL12W        0.35138419 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127720 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
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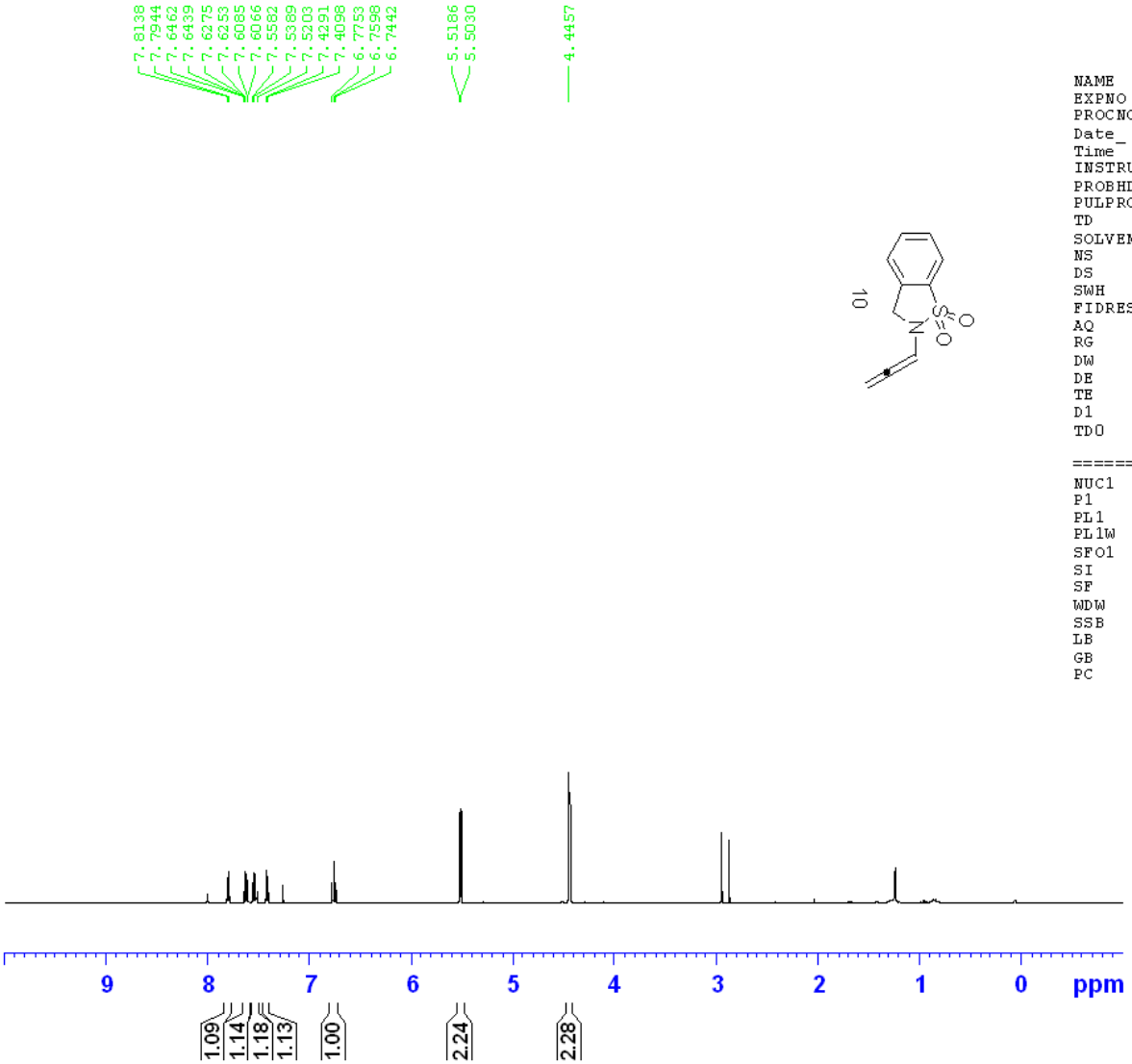


```
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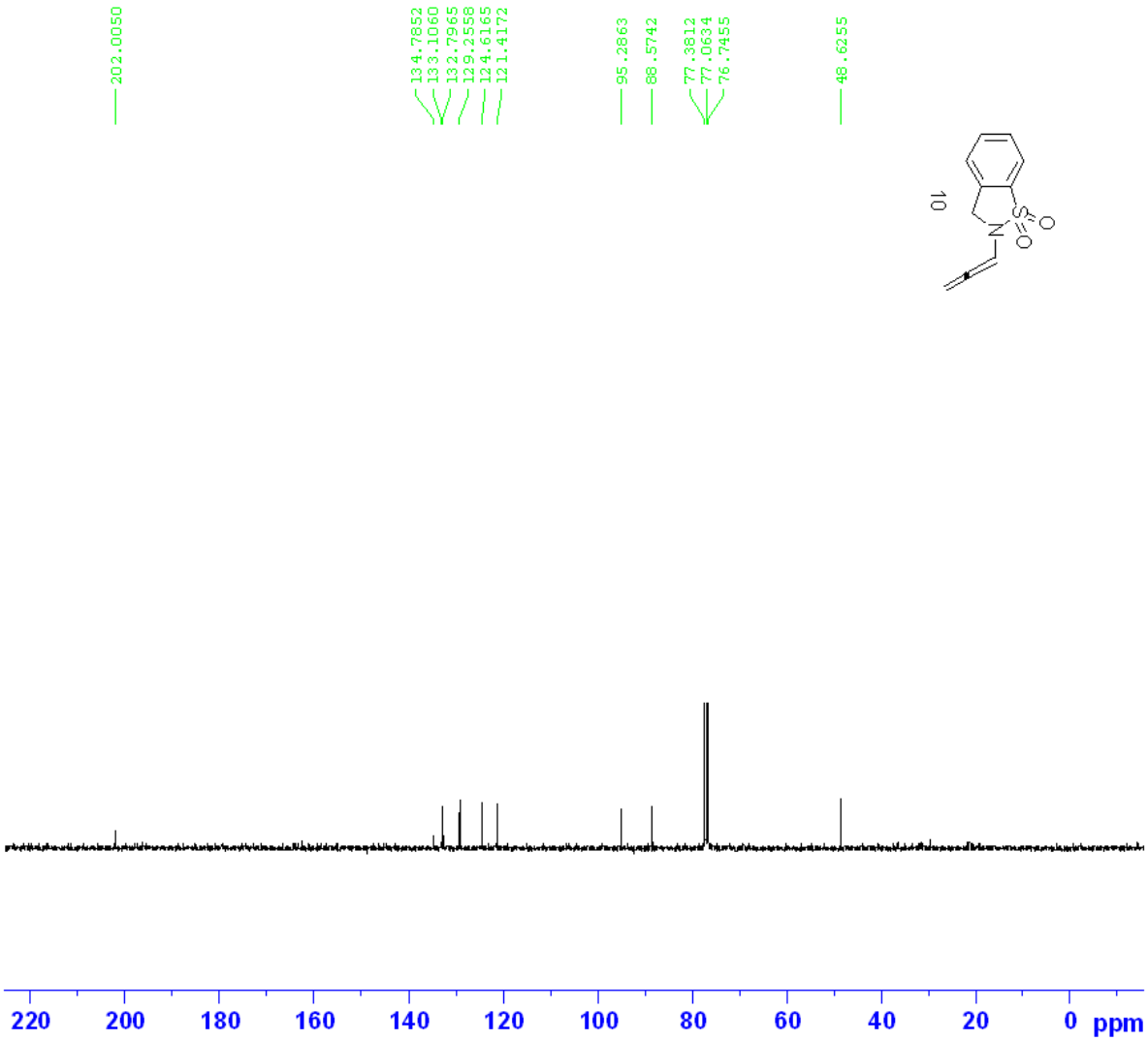
PULPROG              zg30
TD                  32768
SOLVENT            CDCl3
NS                      8
DS                      0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ             2.5625076 sec
RG                    144
DW                 78.200 usec
DE                   6.50 usec
TE                  295.1 K
D1            1.00000000 sec
TD0                     1

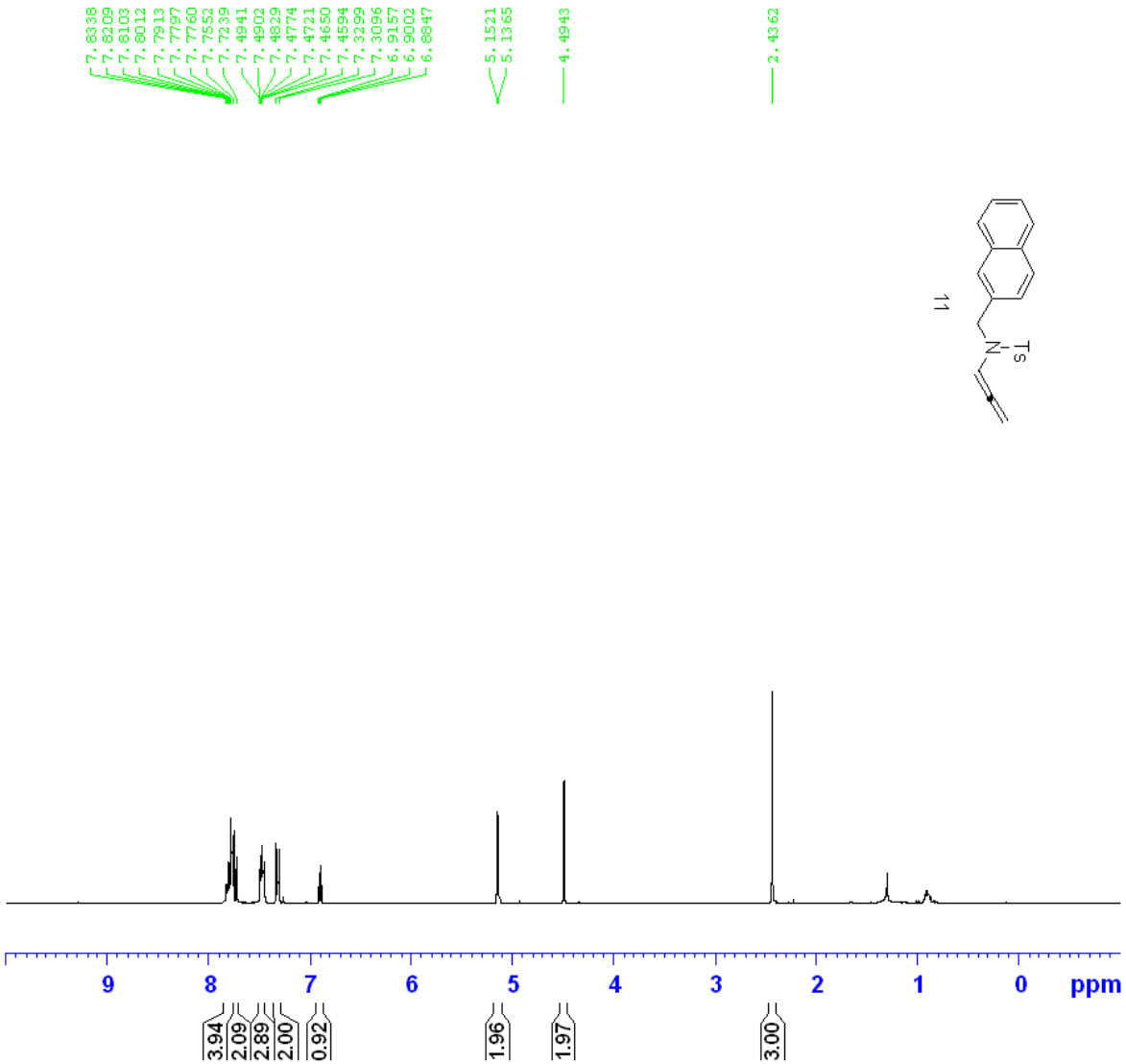
======== CHANNEL f1 ========
NUC1                   1H
P1                  10.40 usec
PL1                 -1.00 dB
PL1W         17.01305389 W
SFO1        400.1328009 MHz
SI                  16384
SF          400.1300097 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
```




```
NAME              zw-1-79
EXPNO                   2
PROCNO                  1
Date_            20110311
Time                14.36
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    40
DS                     4
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   114
DW                19.800 usec
DE                 6.50 usec
TE                295.6 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

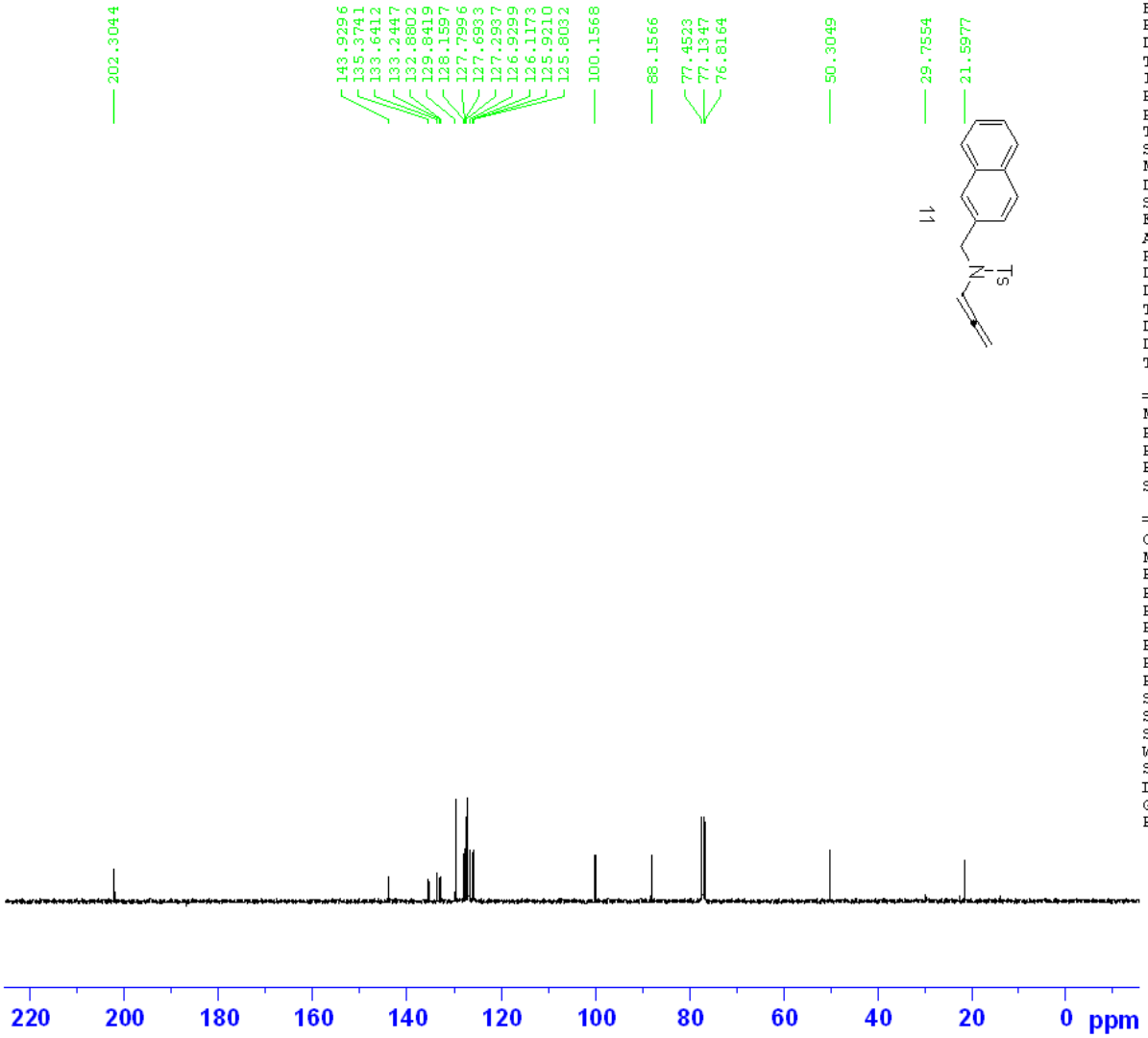
======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.28759566 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```

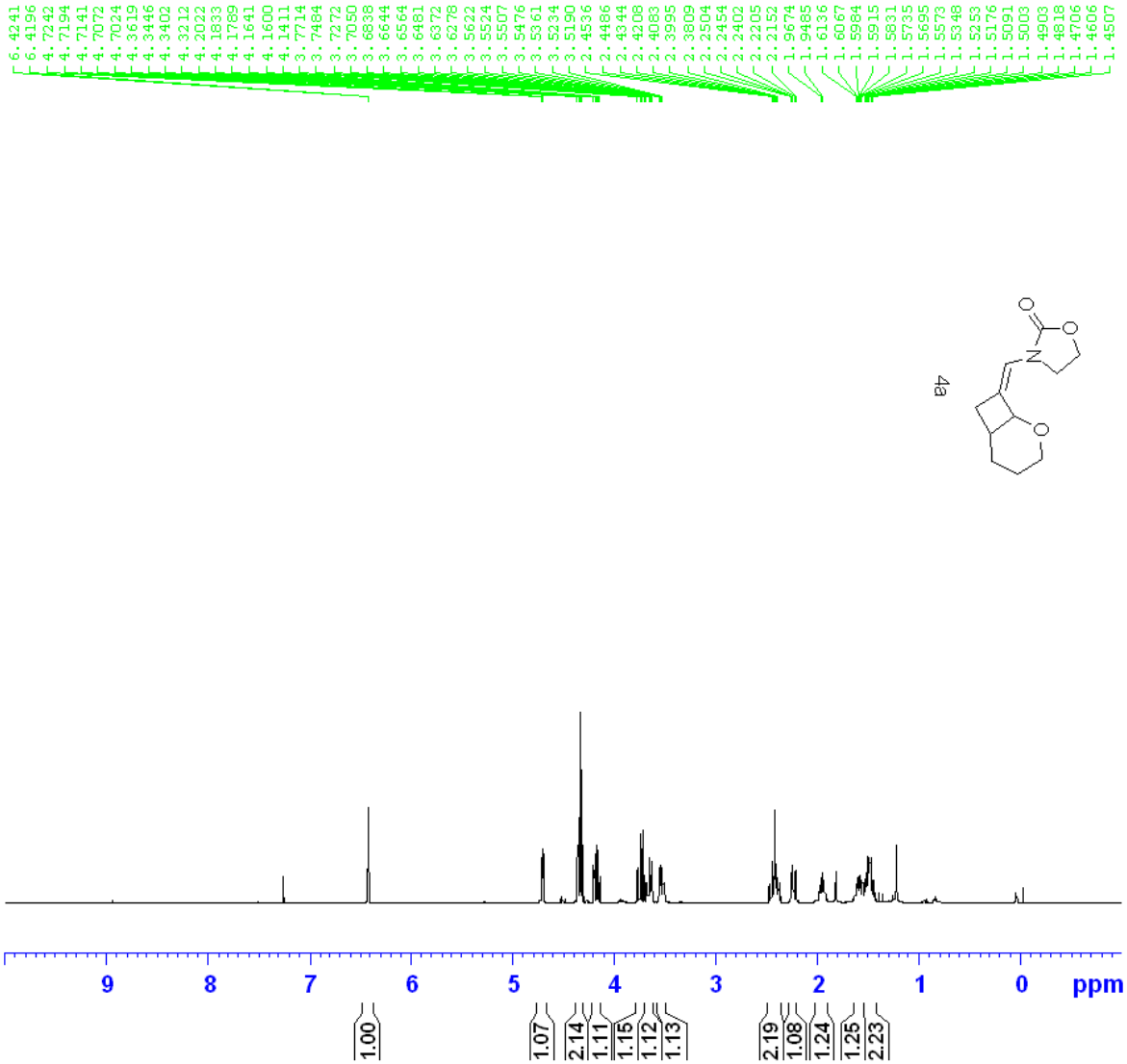



```
NAME                L-4-52
EXPNO                    1
PROCNO                   1
Date_             20110428
Time                 23.08
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ              2.5625076 sec
RG                    40.3
DW                  78.200 usec
DE                    6.50 usec
TE                   298.5 K
D1             1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                    1H
P1                   10.40 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1328009 MHz
SI                   16384
SF            400.1300098 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```

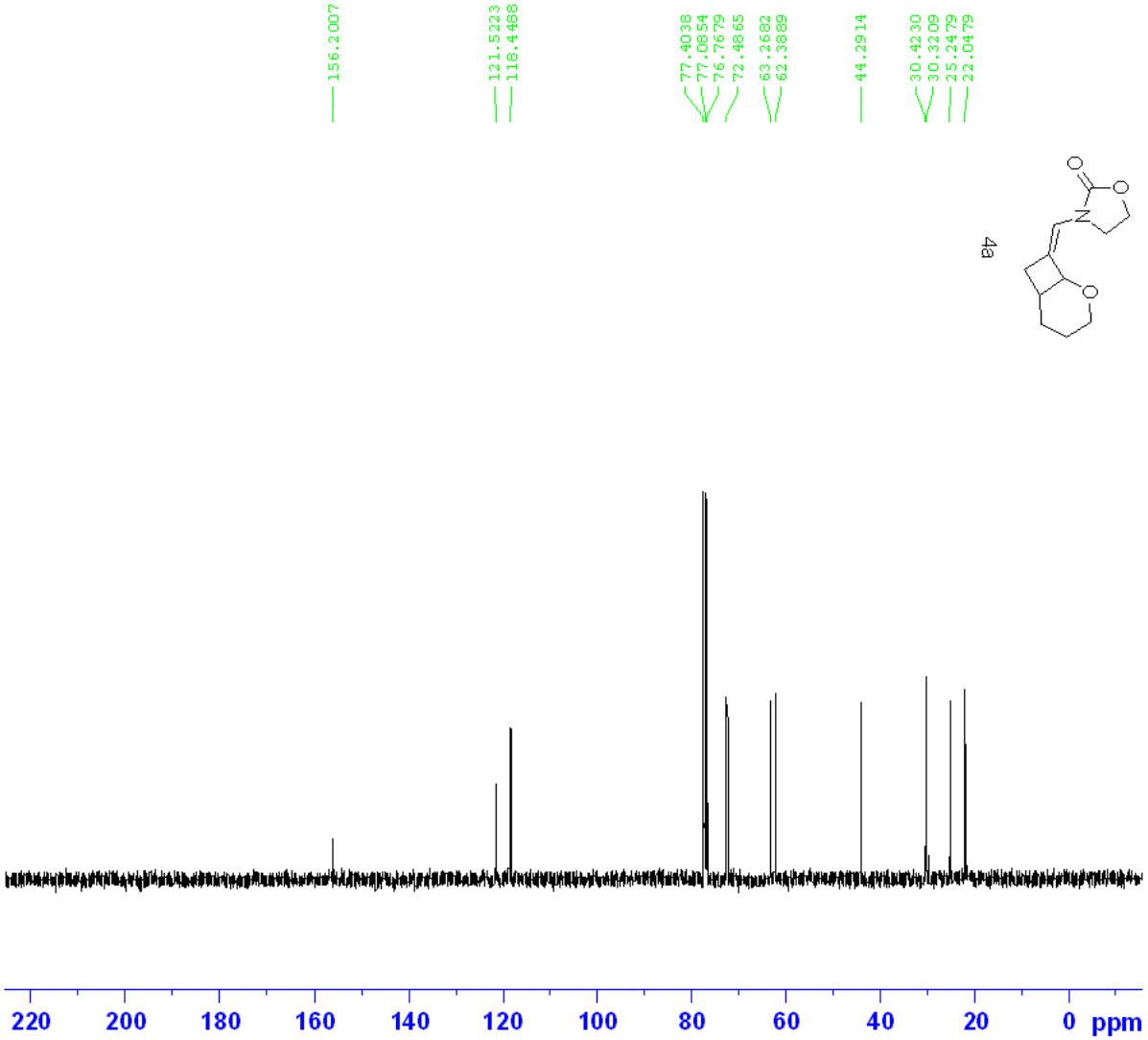


NAME	L-4-52	
EXPNO	2	
PROCNO	1	
Date_	20110428	
Time	23.11	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zgpg30	
TD	65536	
SOLVENT	CDCl3	
NS	15	
DS	4	
SWH	25252.525	Hz
FIDRES	0.385323	Hz
AQ	1.2976629	sec
RG	114	
DW	19.800	usec
DE	6.50	usec
TE	299.0	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	13C	
P1	13.47	usec
PL1	2.00	dB
PL1W	55.31277084	W
SFO1	100.6238364	MHz
======== CHANNEL f2 ========		
CPDPRG2	waltz16	
NUC2	1H	
PCPD2	80.00	usec
PL2	-1.00	dB
PL12	16.72	dB
PL13	15.50	dB
PL2W	17.01305389	W
PL12W	0.28759566	W
PL13W	0.38087484	W
SFO2	400.1316005	MHz
SI	32768	
SF	100.6127690	MHz
WDW	EM	
SSB	0	
LB	3.00	Hz
GB	0	
PC	1.40	




```
NAME            L-4-112A
EXPNO                  1
PROCNO                 1
Date_           20110718
Time               10.26
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                  50.8
DW                78.200 usec
DE                  6.50 usec
TE                296.4 K
D1           1.00000000 sec
TD0                    1

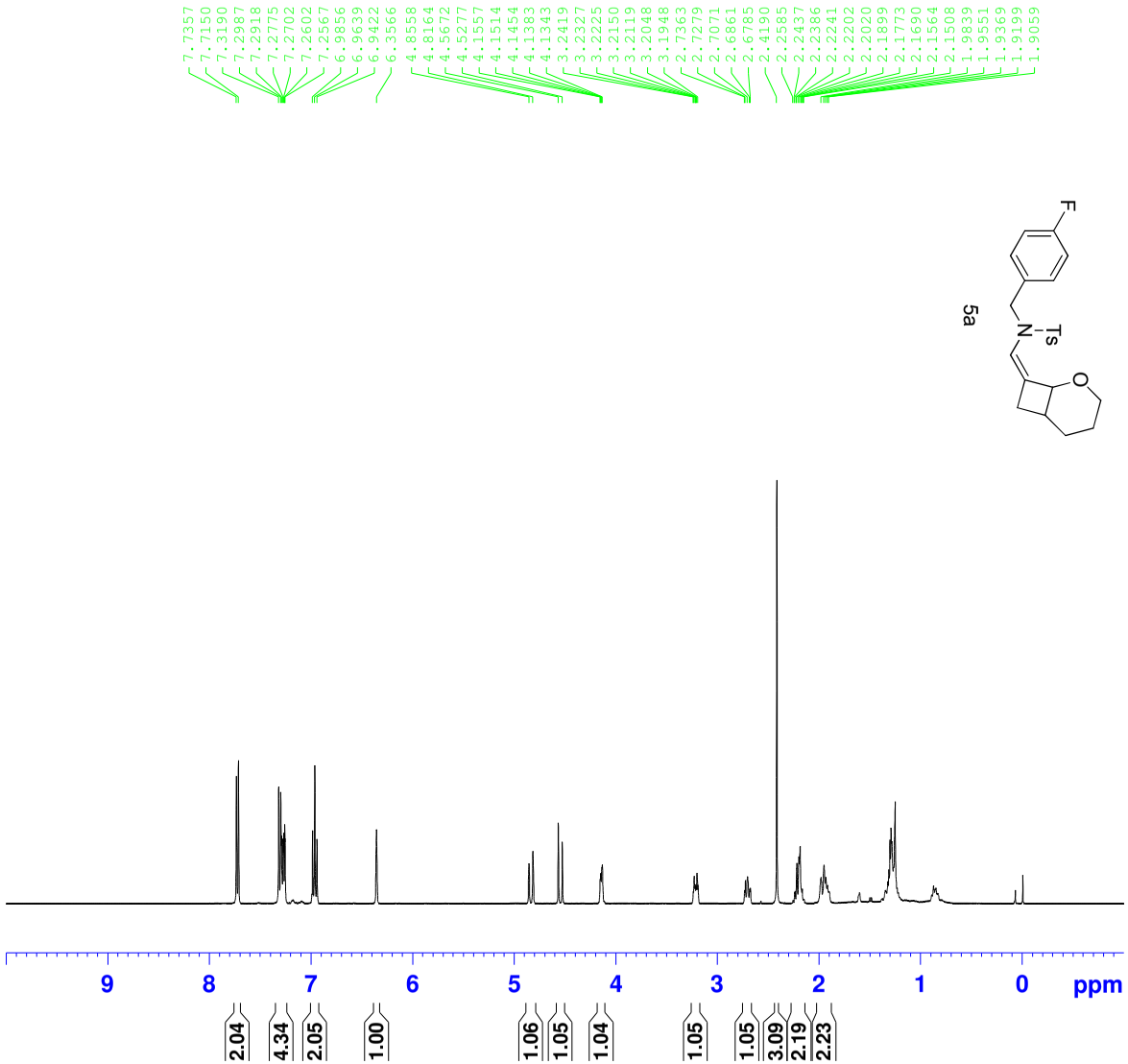
======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300097 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```




```
NAME            L-4-112A
EXPNO                  2
PROCNO                 1
Date_           20110718
Time               10.28
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                    27
DS                     4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ           1.2976629 sec
RG                   114
DW                19.800 usec
DE                 6.50 usec
TE                297.2 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

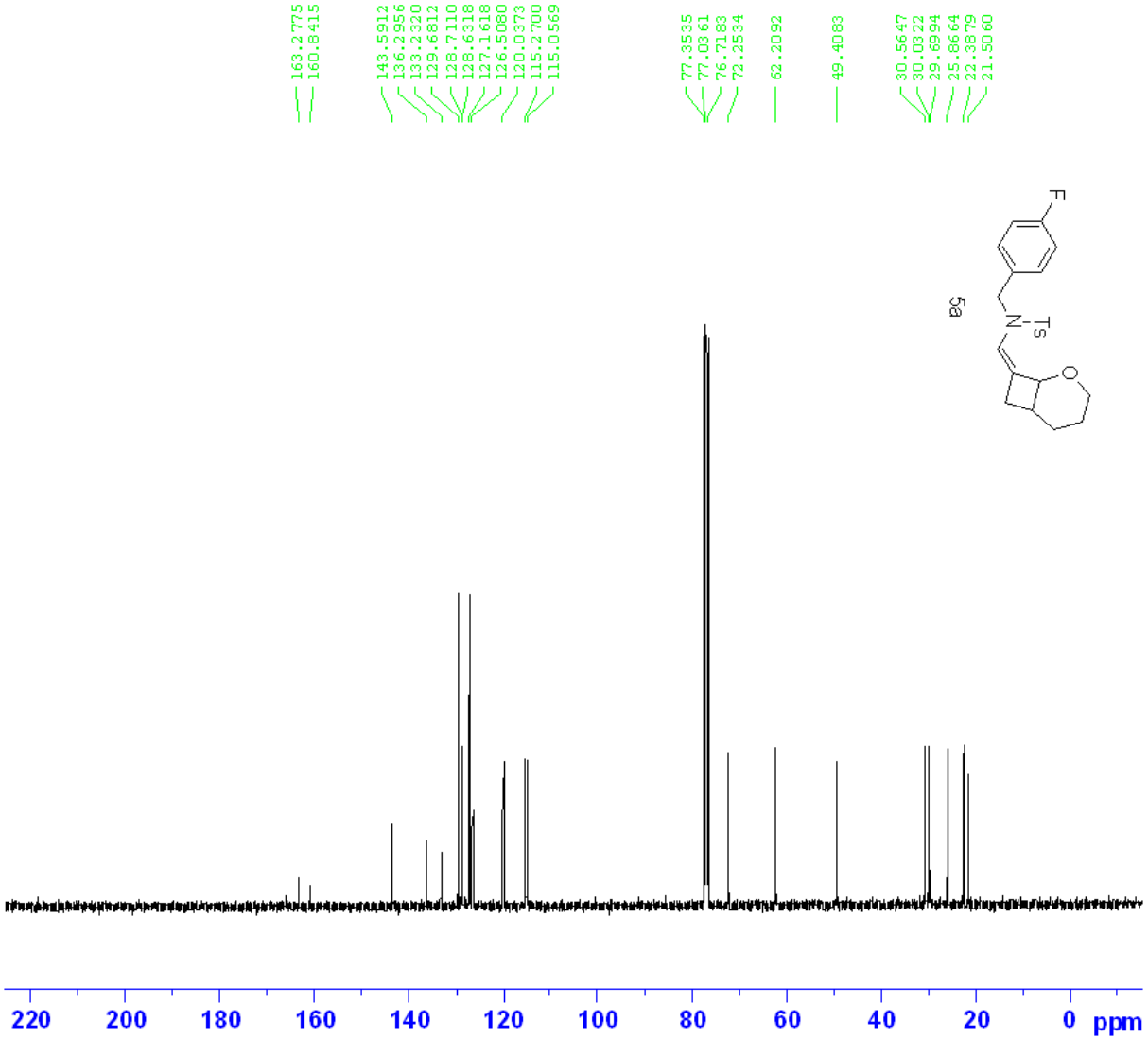
======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI                32768
SF         100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```



5a

```
NAME                L-4-85
EXPNO                    1
PROCNO                   1
Date_             20110602
Time                 15.41
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH              6393.862 Hz
FIDRES           0.195125 Hz
AQ              2.5625076 sec
RG                     128
DW                  78.200 usec
DE                    6.50 usec
TE                   297.0 K
D1             1.00000000 sec
TD0                      1

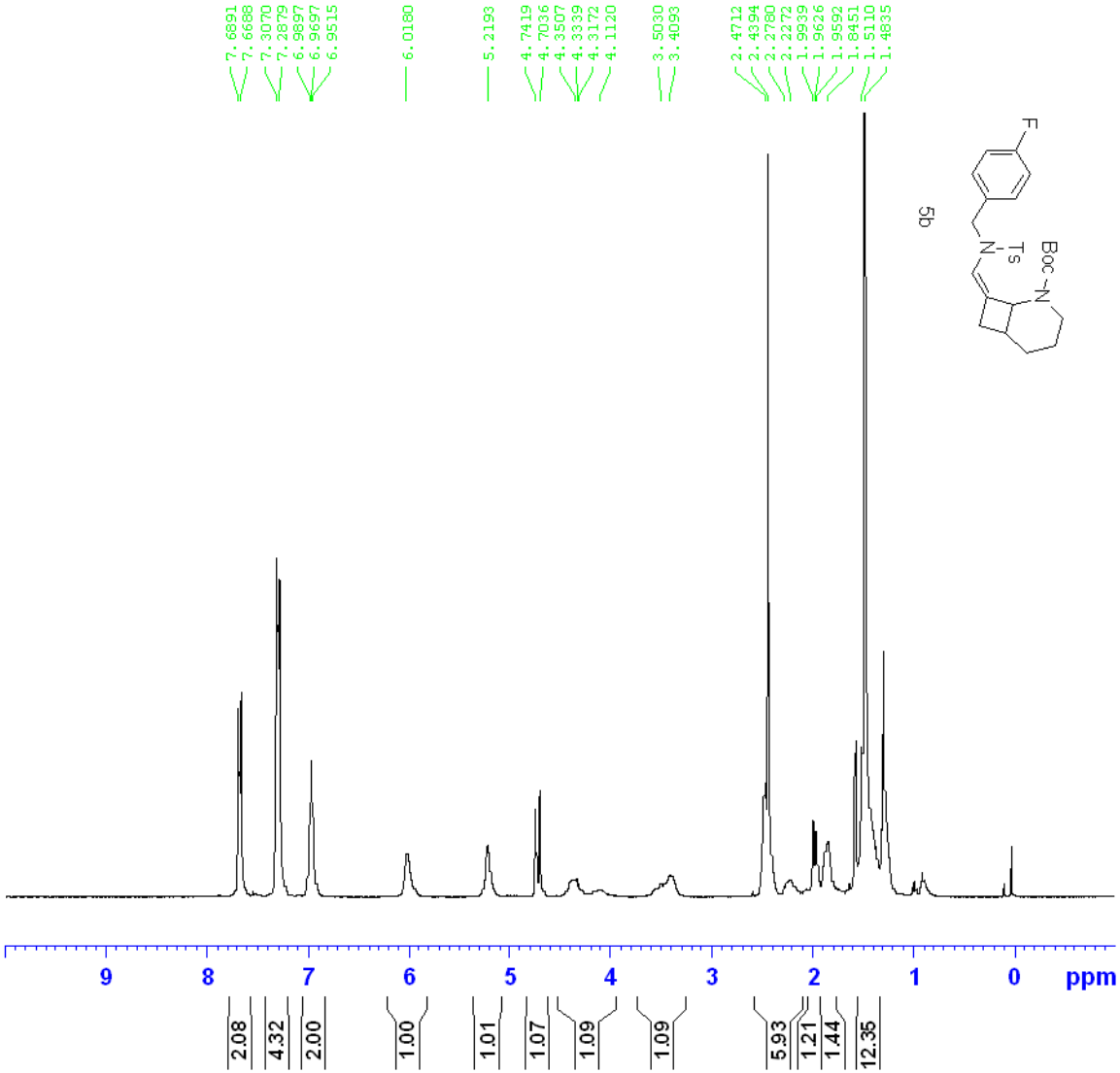
======== CHANNEL f1 ========
NUC1                    1H
P1                   10.40 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1328009 MHz
SI                   16384
SF            400.1300096 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```




```
NAME                L-4-85
EXPNO                    2
PROCNO                   1
Date_             20110602
Time                 15.43
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG             zgpg30
TD                   65536
SOLVENT              CDCl3
NS                     239
DS                       4
SWH              25252.525 Hz
FIDRES            0.385323 Hz
AQ               1.2976629 sec
RG                     114
DW                  19.800 usec
DE                    6.50 usec
TE                   297.8 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                    13C
P1                    13.47 usec
PL1                    2.00 dB
PL1W          55.31277084 W
SFO1         100.6238364 MHz

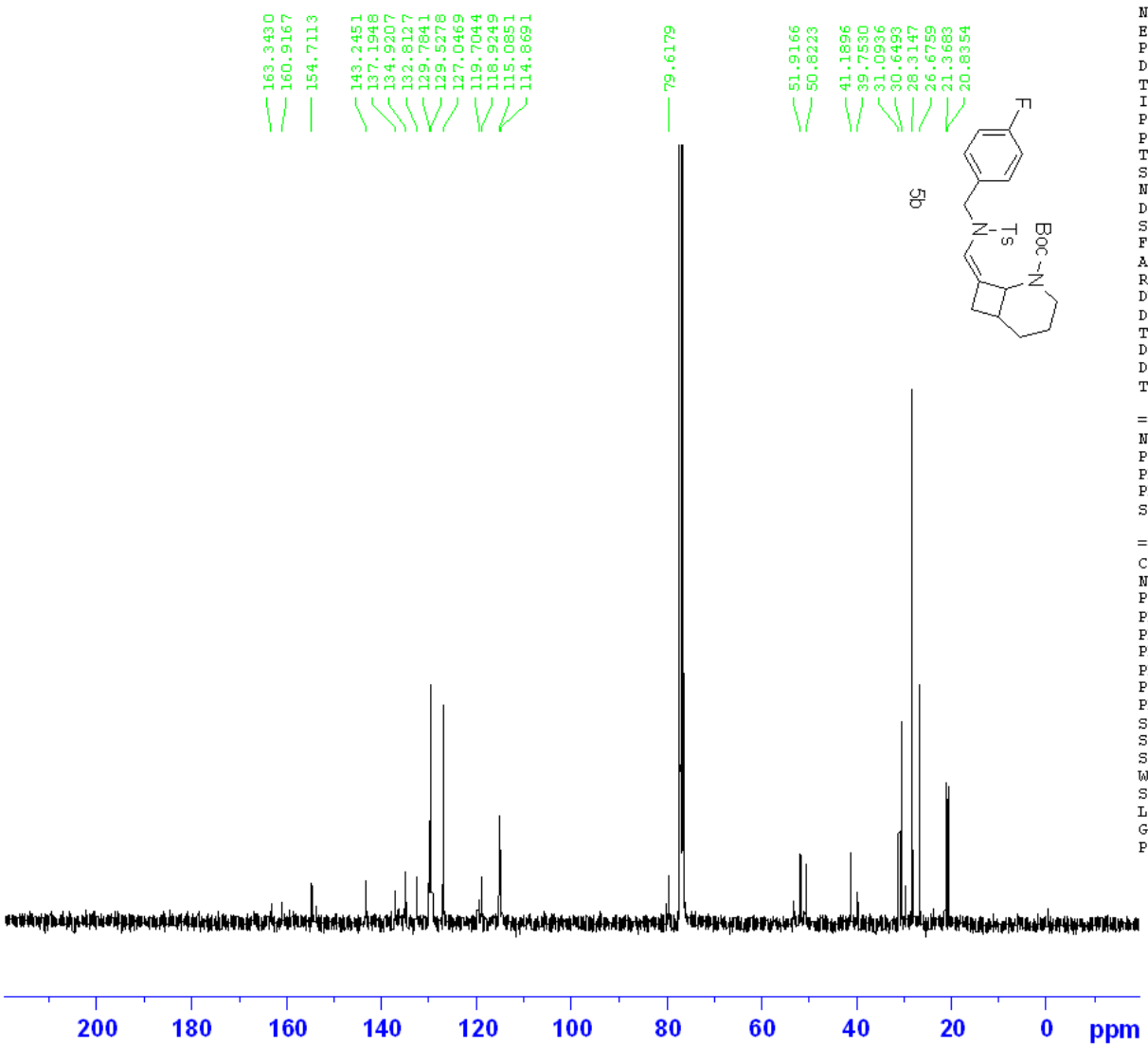
======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                     1H
PCPD2                80.00 usec
PL2                  -1.00 dB
PL12                 16.72 dB
PL13                 15.50 dB
PL2W          17.01305389 W
PL12W          0.28759566 W
PL13W          0.38087484 W
SFO2         400.1316005 MHz
SI                   32768
SF           100.6127690 MHz
WDW                     EM
SSB                      0
LB                    3.00 Hz
GB                       0
PC                    1.40
```



5b

```
NAME              L-4-90A
EXPNO                   3
PROCNO                  1
Date_            20110623
Time                14.33
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ             2.5625076 sec
RG                    101
DW                 78.200 usec
DE                   6.50 usec
TE                  320.0 K
D1             1.00000000 sec
TD0                     1

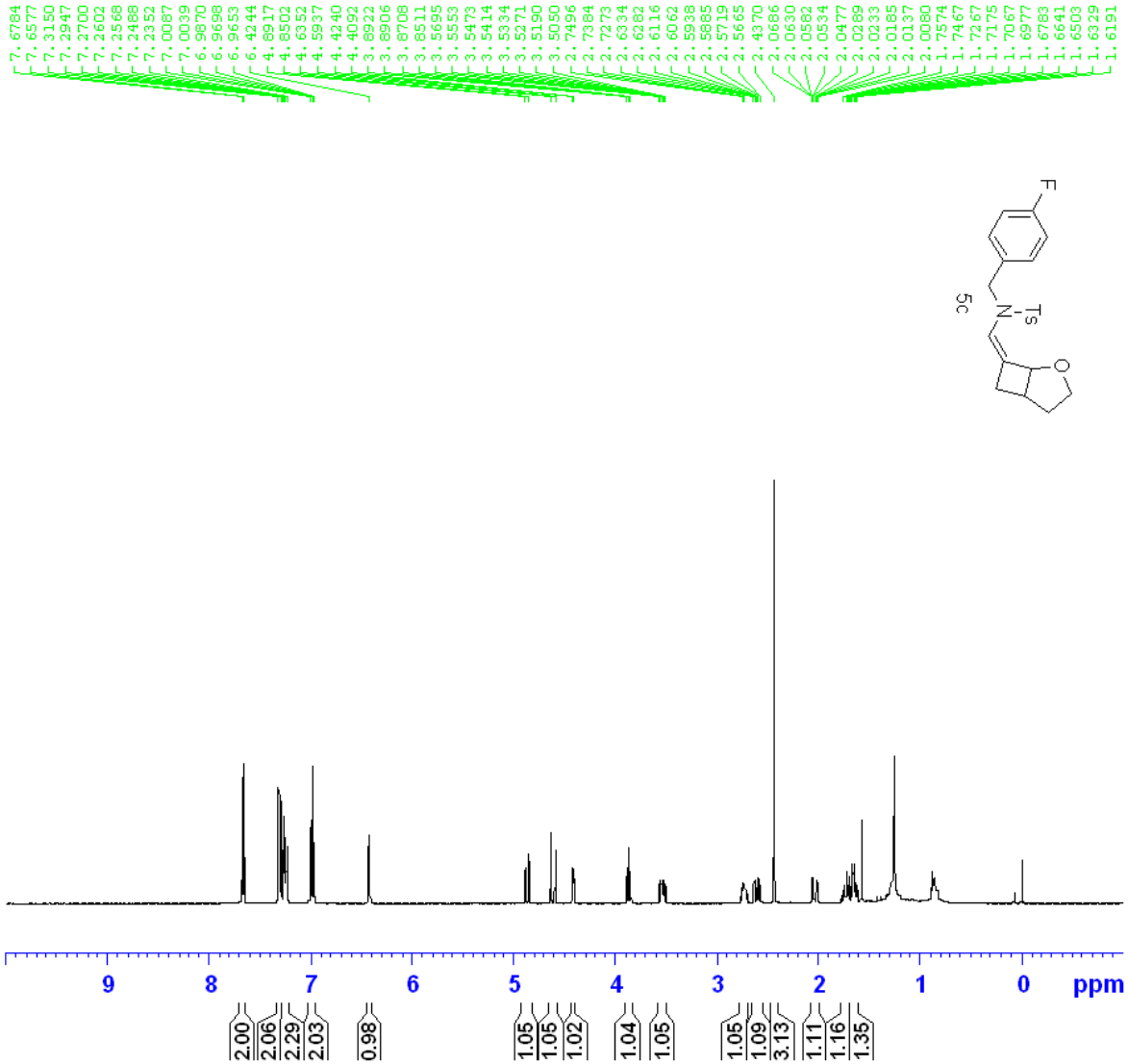
======== CHANNEL f1 ========
NUC1                   1H
P1                  10.40 usec
PL1                 -1.00 dB
PL1W          17.01305389 W
SFO1         400.1328009 MHz
SI                  16384
SF           400.1300000 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
```




```
NAME                L-3-7
EXPNO                   2
PROCNO                  1
Date_            20101108
Time                11.03
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG            zgpg30
TD                  65536
SOLVENT             CDCl3
NS                    723
DS                      4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                    181
DW                 20.800 usec
DE                  6.50 usec
TE                 296.7 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    10

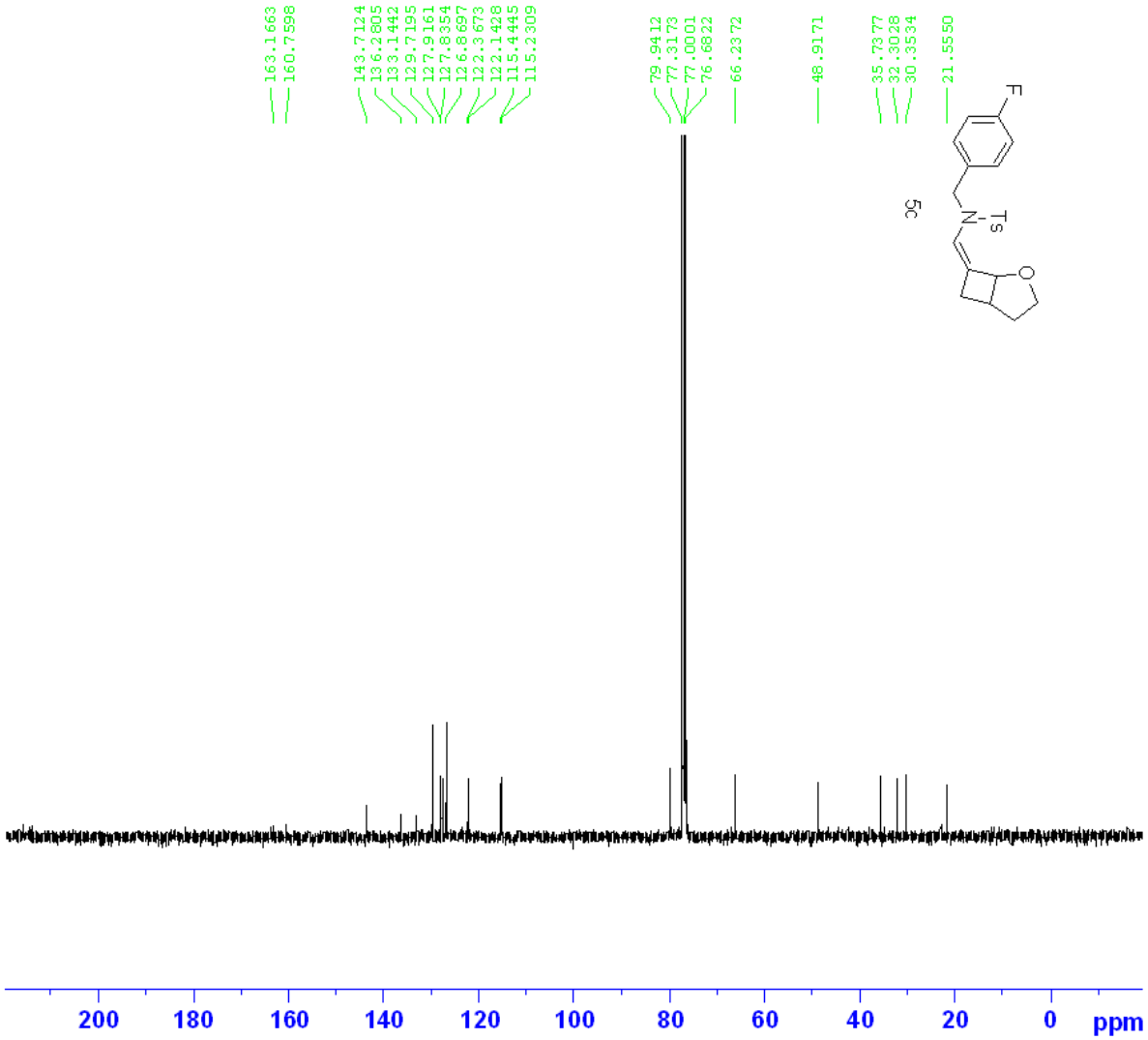
======== CHANNEL f1 ========
NUC1                  13C
P1                  12.80 usec
PL1                  2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                   1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.85 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35138419 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127762 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```

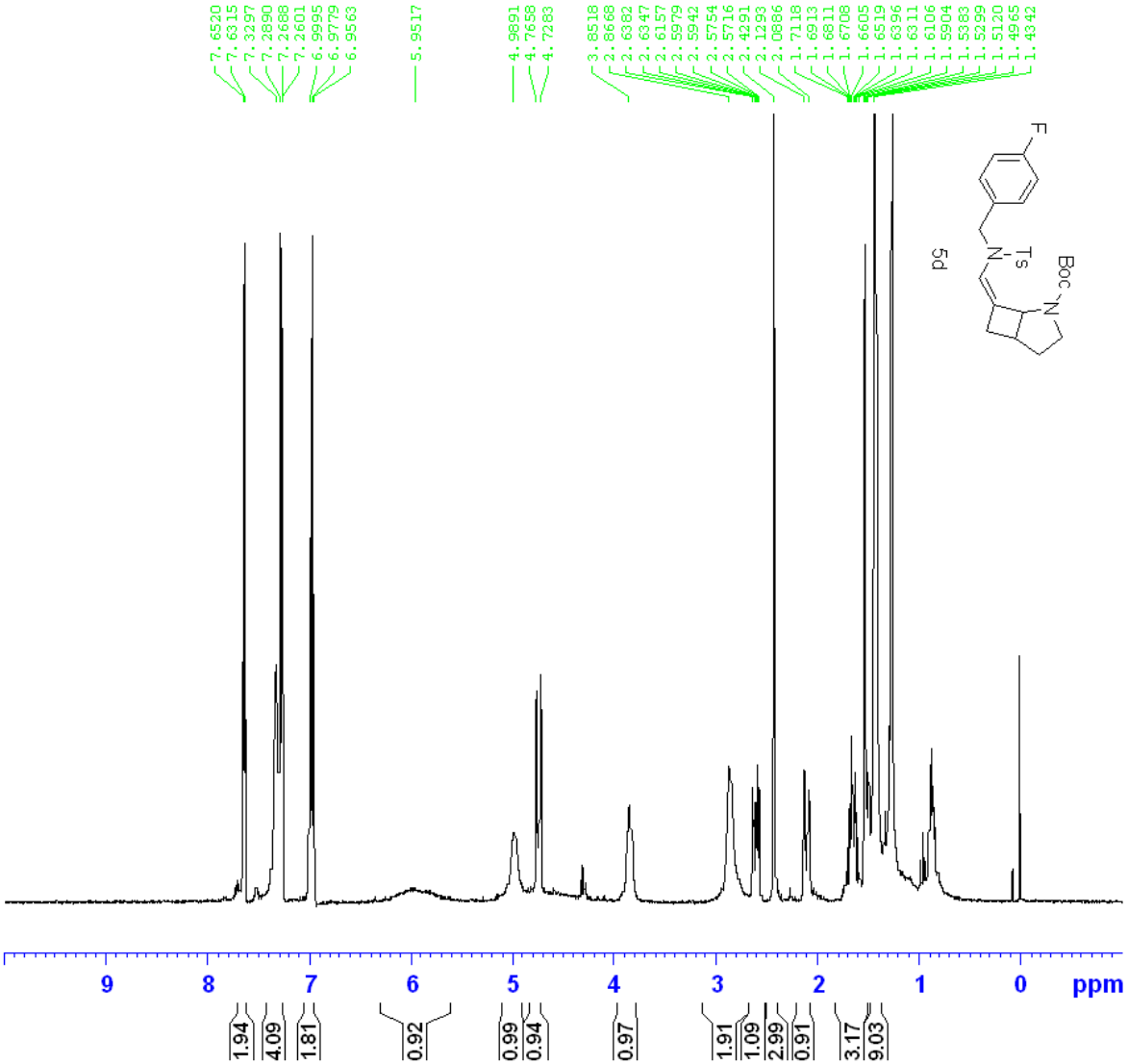



```
NAME                L-4-82
EXPNO                    1
PROCNO                   1
Date_             20110602
Time                 10.02
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ               2.5625076 sec
RG                     181
DW                  78.200 usec
DE                    6.50 usec
TE                   299.7 K
D1             1.00000000 sec
TD0                      1

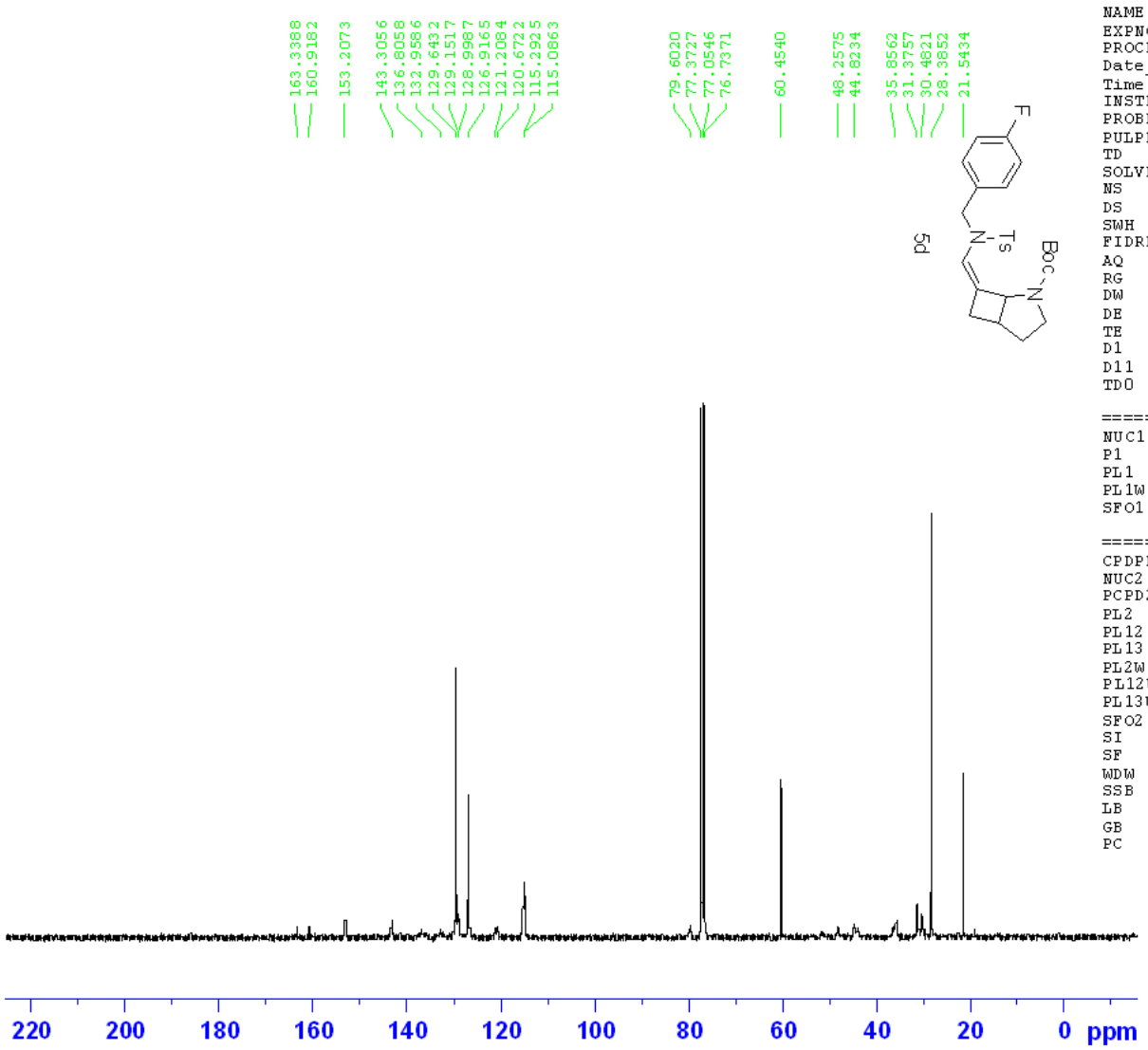
======== CHANNEL f1 ========
NUC1                    1H
P1                   10.40 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1328009 MHz
SI                   16384
SF            400.1300096 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```



NAME	L-2-83-b	
EXPNO	2	
PROCNO	1	
Date_	20101213	
Time	10.19	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zgpg30	
TD	65536	
SOLVENT	CDCl3	
NS	184	
DS	4	
SWH	24038.461	Hz
FIDRES	0.366798	Hz
AQ	1.3631988	sec
RG	181	
DW	20.800	usec
DE	6.50	usec
TE	295.0	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	10	
======== CHANNEL f1 ========		
NUC1	13C	
P1	13.12	usec
PL1	2.00	dB
PL1W	55.31277084	W
SFO1	100.6228298	MHz
======== CHANNEL f2 ========		
CPDPRG2	waltz16	
NUC2	1H	
PCPD2	80.00	usec
PL2	-1.00	dB
PL12	15.79	dB
PL13	15.50	dB
PL2W	17.01305389	W
PL12W	0.35627249	W
PL13W	0.38087484	W
SFO2	400.1316005	MHz
SI	32768	
SF	100.6127720	MHz
WDW	EM	
SSB	0	
LB	3.00	Hz
GB	0	
PC	1.40	



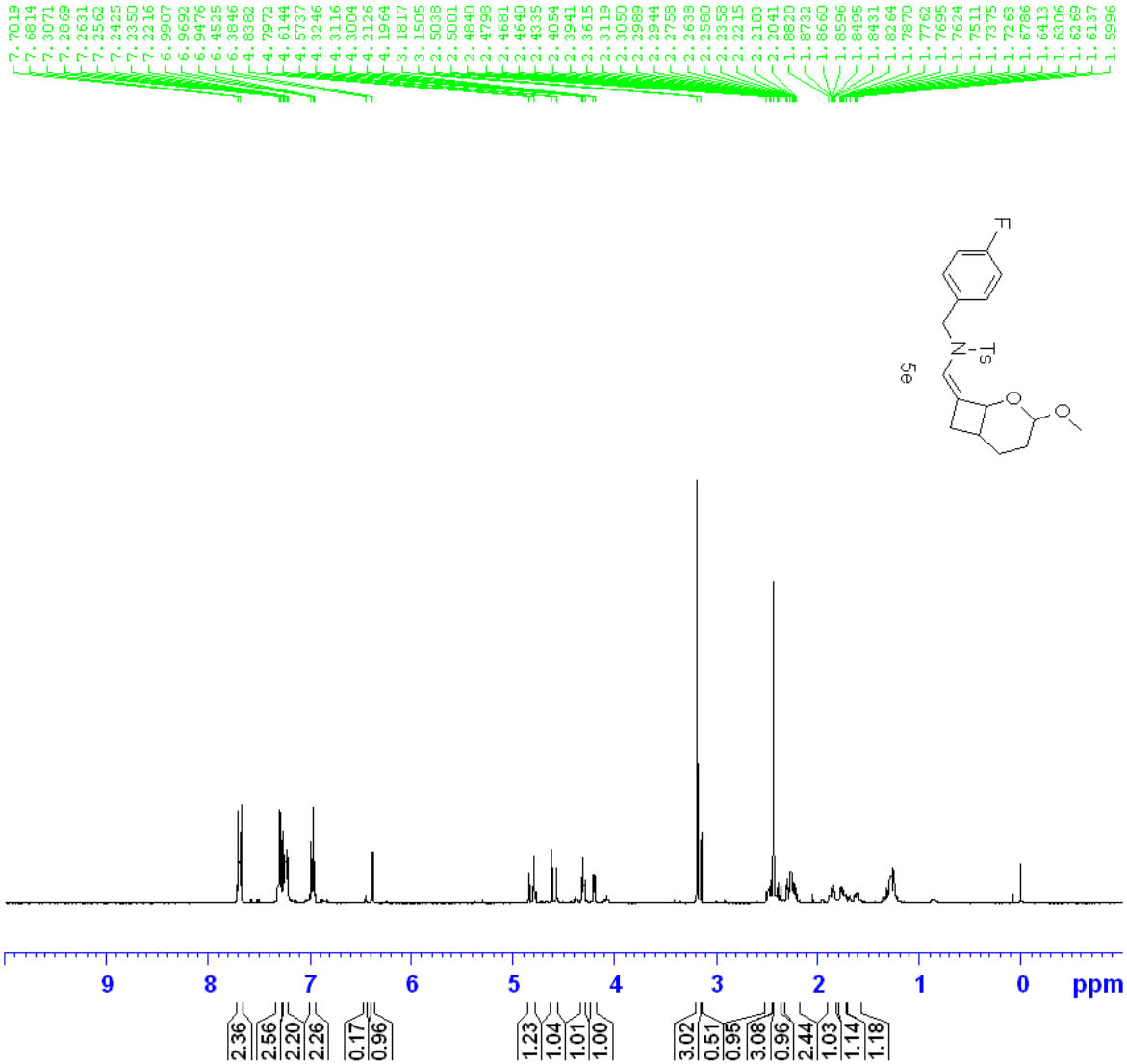
NAME	L-4-90B	
EXPNO	3	
PROCNO	1	
Date_	20110622	
Time	11.09	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	101	
DW	78.200	usec
DE	6.50	usec
TE	320.0	K
D1	1.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	10.40	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1328009	MHz
SI	16384	
SF	400.1300087	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	



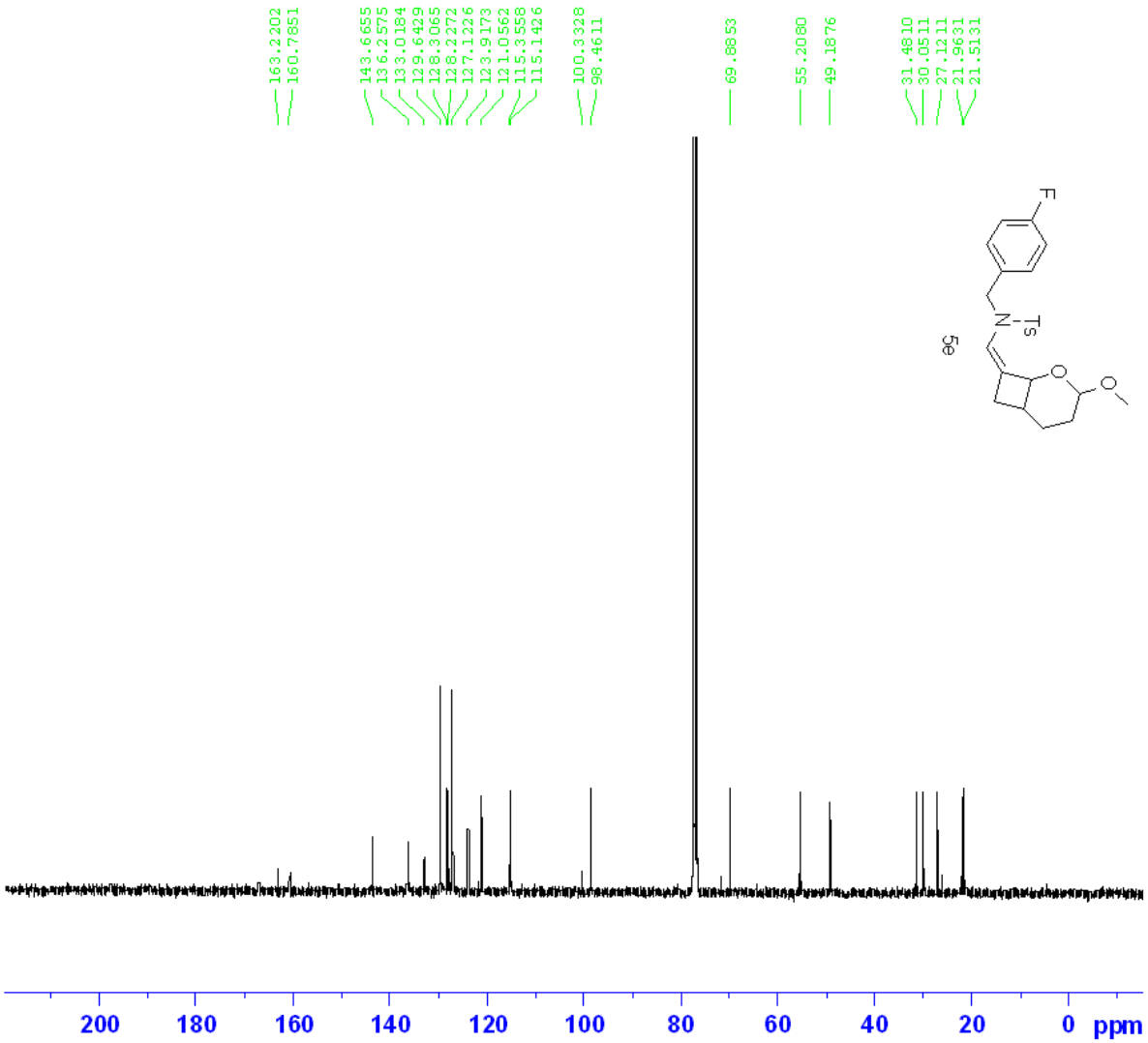

```
NAME                L-4-27
EXPNO                    2
PROCNO                   1
Date_             20110402
Time                 17.33
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG            zgpg30
TD                  65536
SOLVENT             CDCl3
NS                    606
DS                      4
SWH             25252.525 Hz
FIDRES           0.385323 Hz
AQ              1.2976629 sec
RG                    114
DW                 19.800 usec
DE                  6.50 usec
TE                 296.6 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                  13C
P1                  13.47 usec
PL1                  2.00 dB
PL1W          55.31277084 W
SFO1          100.6238364 MHz

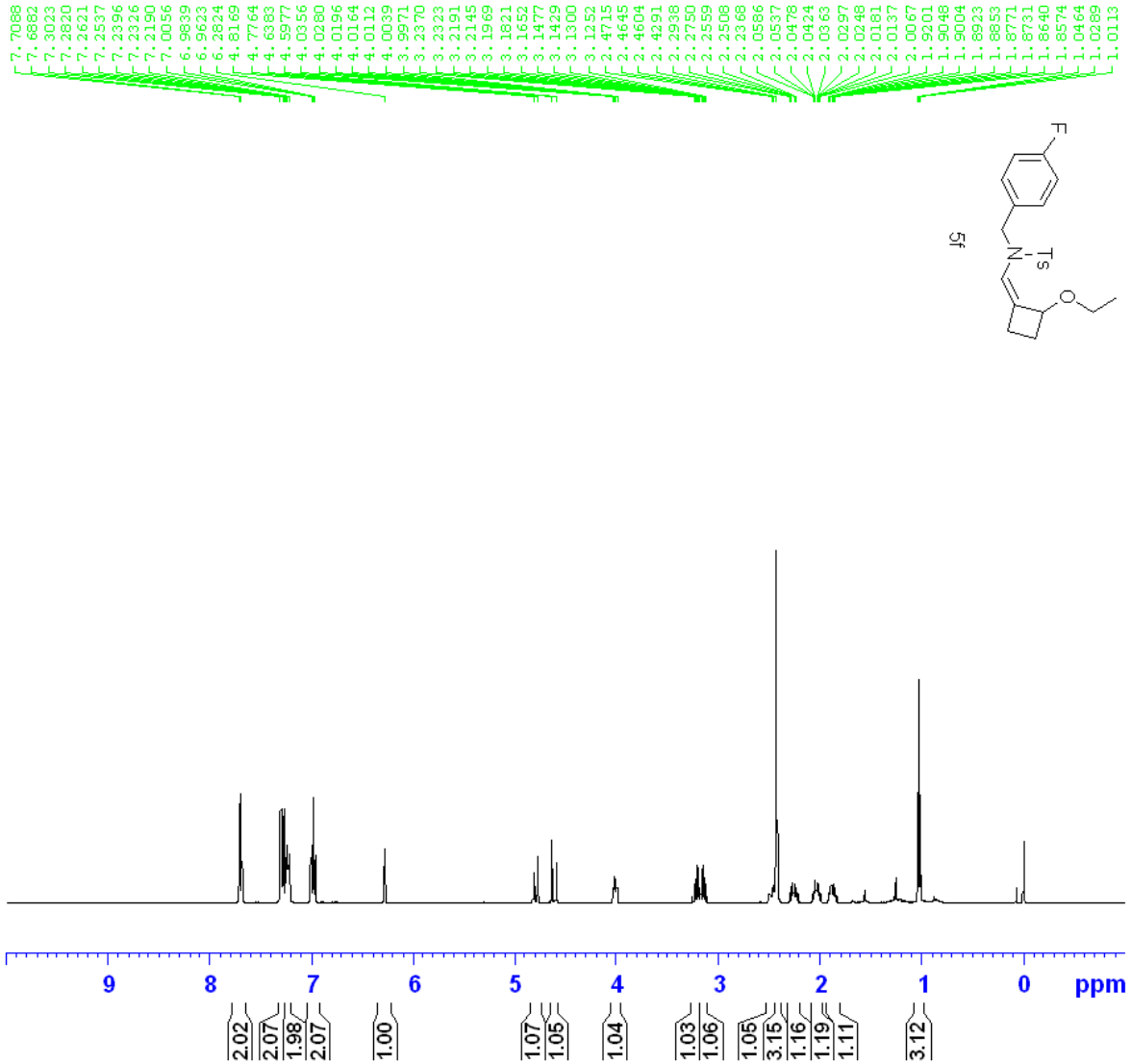
======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
PCPD2               80.00 usec
PL2                 -1.00 dB
PL12                16.72 dB
PL13                15.50 dB
PL2W          17.01305389 W
PL12W          0.28759566 W
PL13W          0.38087484 W
SFO2          400.1316005 MHz
SI                  32768
SF            100.6127690 MHz
WDW                    EM
SSB                     0
LB                   3.00 Hz
GB                      0
PC                   1.40
```



NAME	L-3-4-2	
EXPNO	1	
PROCNO	1	
Date_	20101104	
Time	13.41	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	90.5	
DW	78.200	usec
DE	6.50	usec
TE	295.1	K
D1	1.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	11.58	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1326008	MHz
SI	16384	
SF	400.1300078	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	

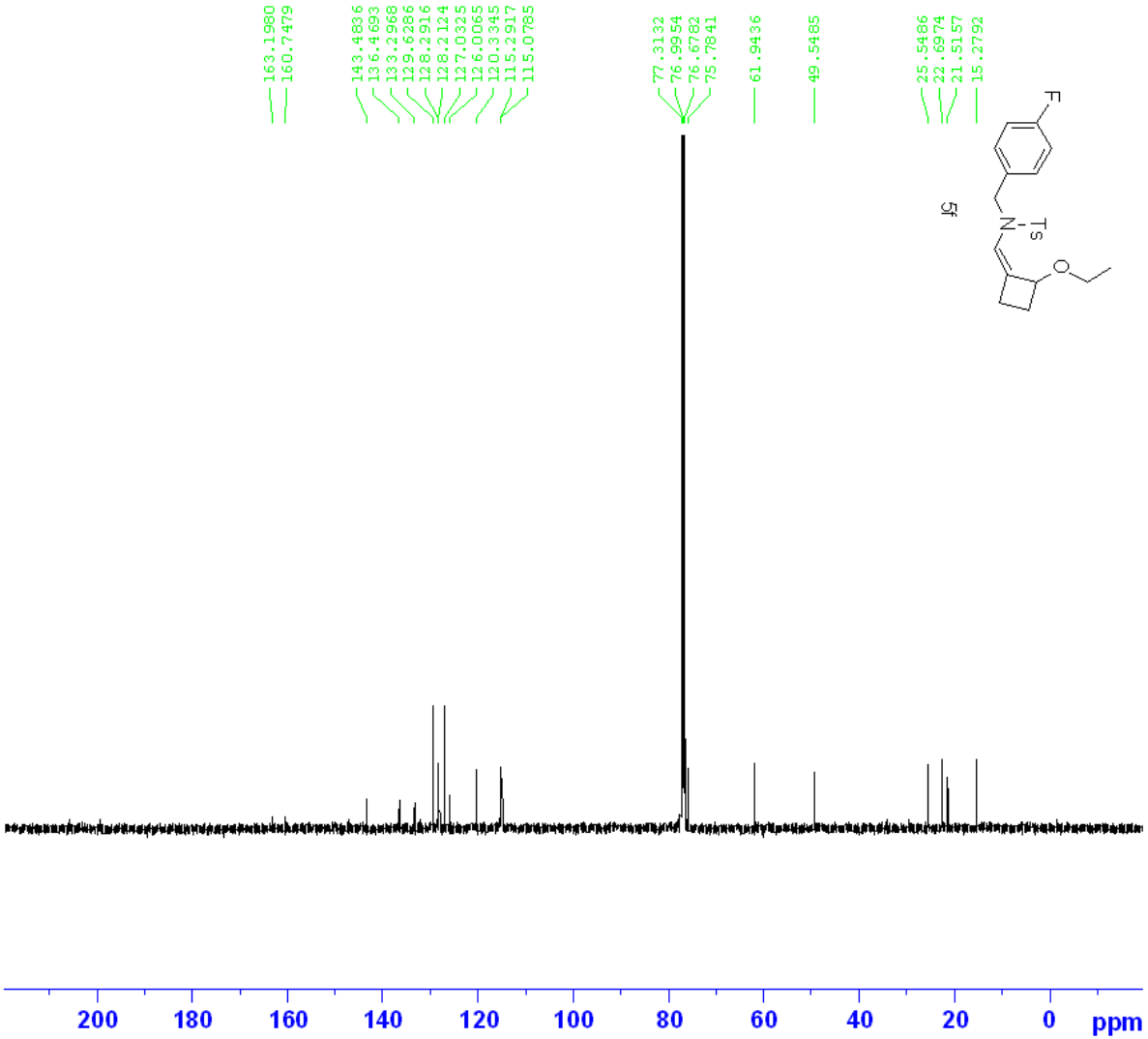


NAME	L-3-4-2
EXPNO	2
PROCNO	1
Date_	20101108
Time	14.41
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	336
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	181
DW	20.800 usec
DE	6.50 usec
TE	296.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	10
======== CHANNEL f1 ========	
NUC1	13C
P1	13.12 usec
PL1	2.00 dB
PL1W	55.31277084 W
SFO1	100.6228298 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	80.00 usec
PL2	-1.00 dB
PL12	15.79 dB
PL13	15.50 dB
PL2W	17.01305389 W
PL12W	0.35627249 W
PL13W	0.38087484 W
SFO2	400.1316005 MHz
SI	32768
SF	100.6127720 MHz
WDW	EM
SSB	0
LB	3.00 Hz
GB	0
PC	1.40




```
NAME                L-3-68
EXPNO                    1
PROCNO                   1
Date_             20101223
Time                 15.23
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ              2.5625076 sec
RG                     256
DW                  78.200 usec
DE                    6.50 usec
TE                   294.3 K
D1             1.00000000 sec
TD0                      1

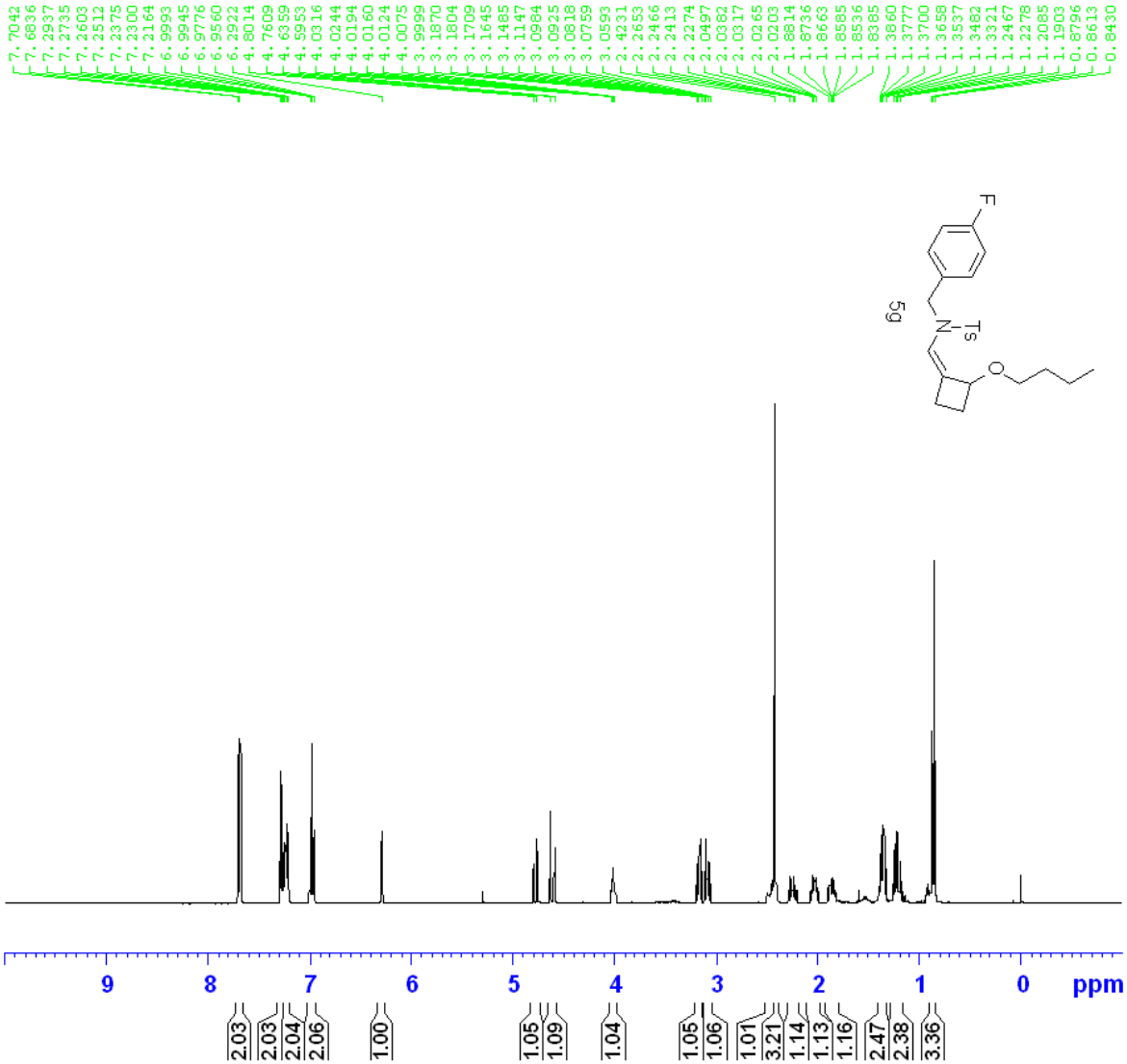
======== CHANNEL f1 ========
NUC1                    1H
P1                   11.58 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1         400.1326008 MHz
SI                   16384
SF            400.1300087 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```




```
NAME                L-3-68
EXPNO                    2
PROCNO                   1
Date_             20101223
Time                 15.27
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG             zgpg30
TD                   65536
SOLVENT              CDCl3
NS                     560
DS                       4
SWH             24038.461 Hz
FIDRES           0.366798 Hz
AQ              1.3631988 sec
RG                     181
DW                  20.800 usec
DE                    6.50 usec
TE                   295.3 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     10

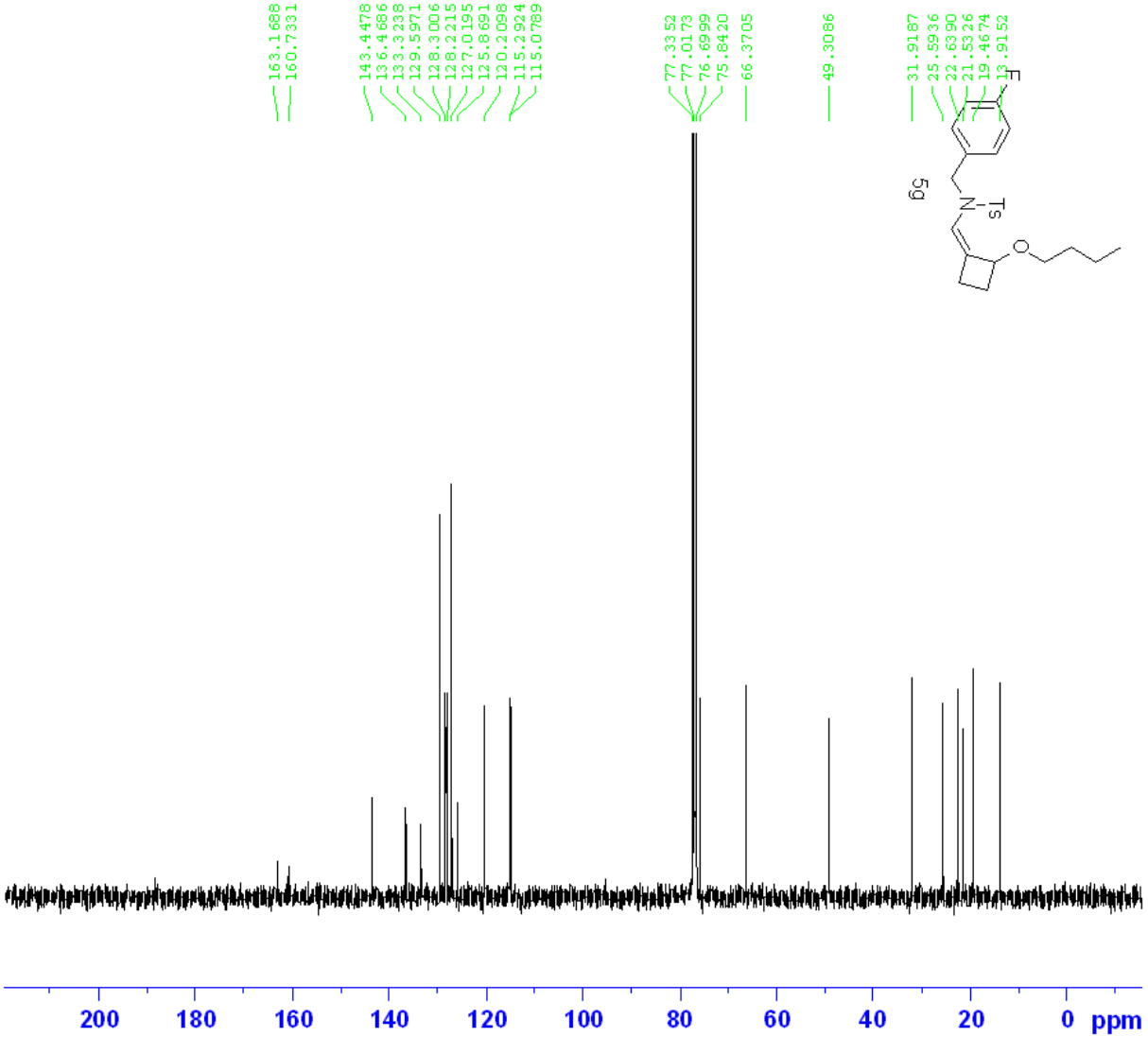
======== CHANNEL f1 ========
NUC1                   13C
P1                   13.12 usec
PL1                   2.00 dB
PL1W          55.31277084 W
SFO1         100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                    1H
PCPD2                80.00 usec
PL2                  -1.00 dB
PL12                 15.79 dB
PL13                 15.50 dB
PL2W          17.01305389 W
PL12W          0.35627249 W
PL13W          0.38087484 W
SFO2         400.1316005 MHz
SI                   32768
SF           100.6127732 MHz
WDW                     EM
SSB                      0
LB                    3.00 Hz
GB                       0
PC                    1.40
```




```
NAME              L-3-82
EXPNO                  1
PROCNO                 1
Date_           20110113
Time               15.15
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                   114
DW                78.200 usec
DE                 6.50 usec
TE                295.0 K
D1           1.00000000 sec
TD0                    1

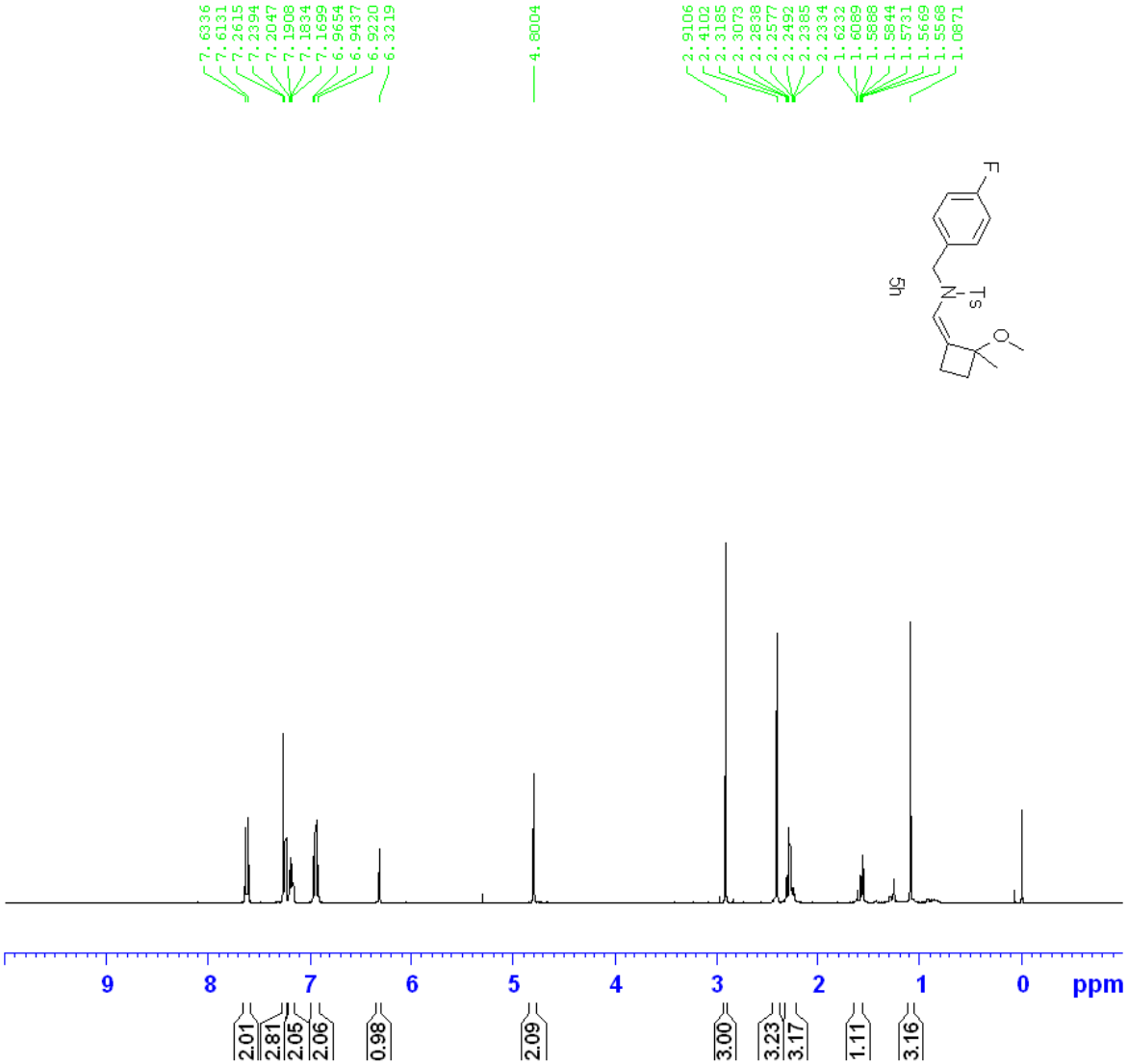
======== CHANNEL f1 ========
NUC1                  1H
P1                11.58 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1326008 MHz
SI                16384
SF          400.1300093 MHz
WDW                  EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```




```
NAME                L-3-82
EXPNO                    2
PROCNO                   1
Date_             20110114
Time                 13.59
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG            zgpg30
TD                   65536
SOLVENT              CDCl3
NS                     113
DS                       4
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631988 sec
RG                     181
DW                  20.800 usec
DE                    6.50 usec
TE                   293.2 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     10

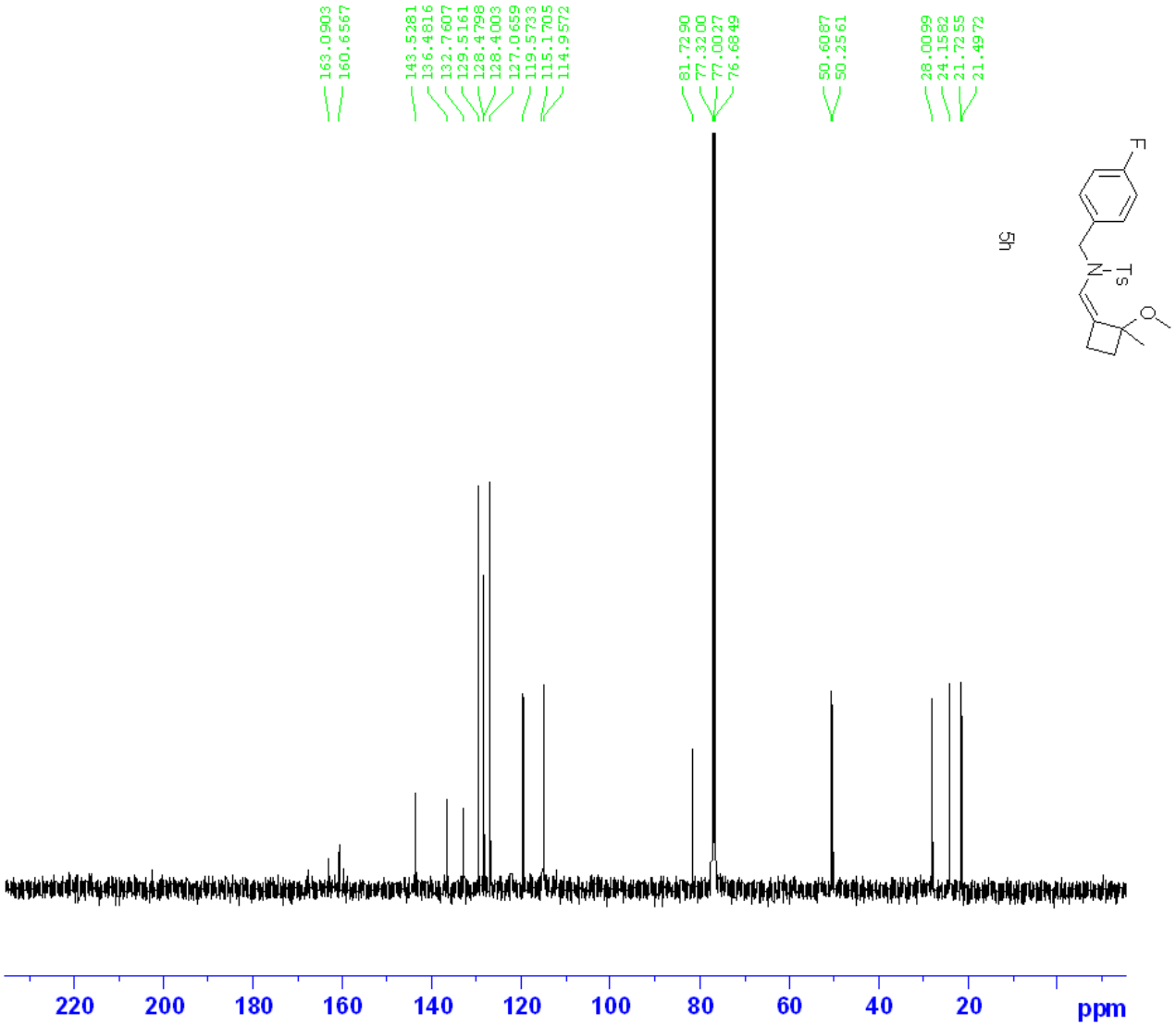
======== CHANNEL f1 ========
NUC1                   13C
P1                   13.12 usec
PL1                   2.00 dB
PL1W          55.31277084 W
SFO1         100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2            waltz16
NUC2                    1H
PCPD2                80.00 usec
PL2                  -1.00 dB
PL12                 15.79 dB
PL13                 15.50 dB
PL2W          17.01305389 W
PL12W          0.35627249 W
PL13W          0.38087484 W
SFO2         400.1316005 MHz
SI                   32768
SF           100.6127720 MHz
WDW                     EM
SSB                      0
LB                    3.00 Hz
GB                       0
PC                    1.40
```




```
NAME        L-3-79Ashang
EXPNO                 1
PROCNO                1
Date_          20110112
Time              15.00
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG            zg30
TD                32768
SOLVENT           CDCl3
NS                    8
DS                    0
SWH            8012.820 Hz
FIDRES         0.244532 Hz
AQ           2.0447731 sec
RG                  287
DW               62.400 usec
DE                 6.50 usec
TE                293.8 K
D1           1.00000000 sec
TD0                   1

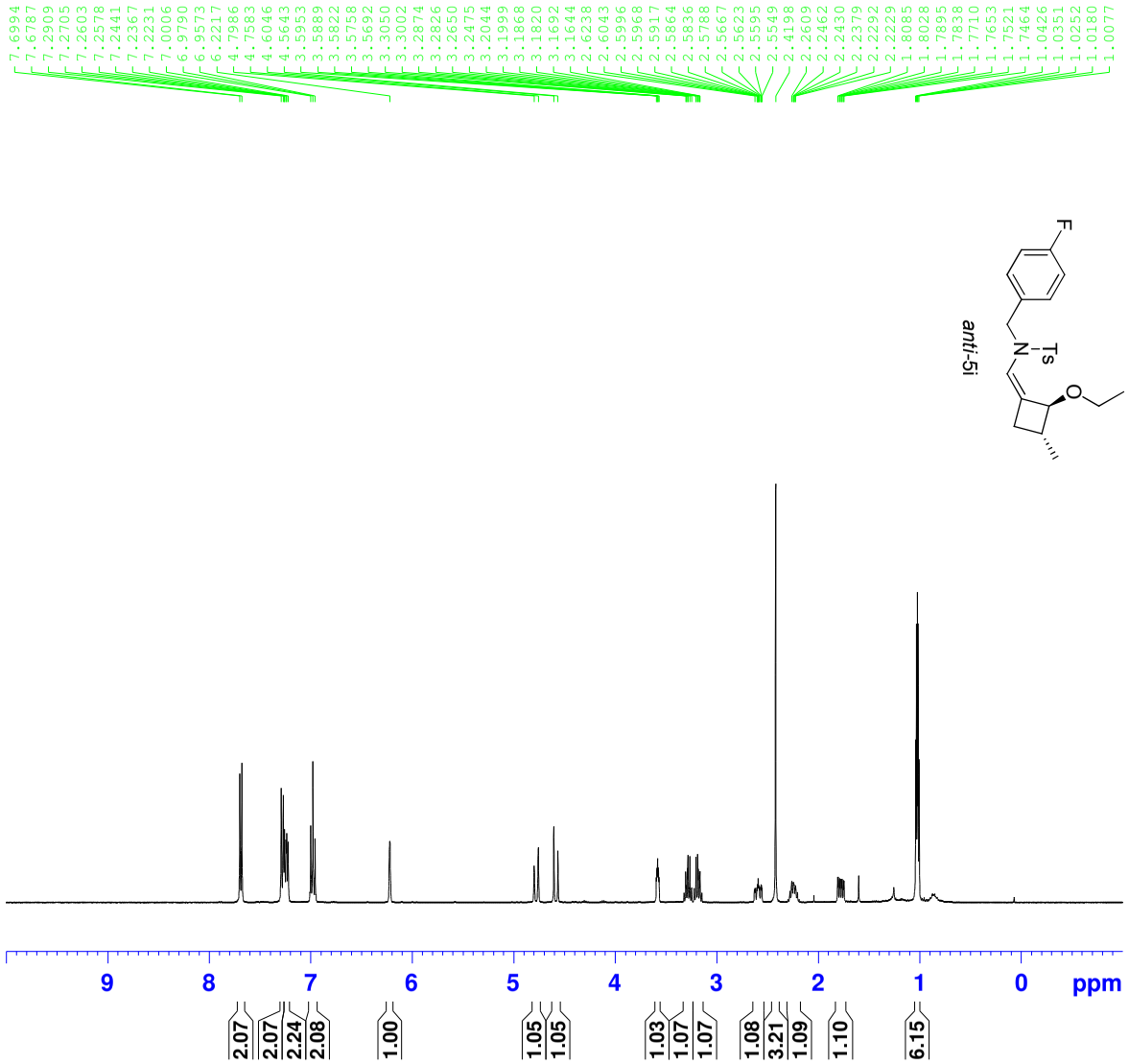
======== CHANNEL f1 ========
NUC1                 1H
P1                11.58 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1332010 MHz
SI              16384
SF          400.1300087 MHz
WDW                 EM
SSB                  0
LB                0.30 Hz
GB                   0
PC                1.00
```




```
NAME          L-3-79Ashang
EXPNO                    3
PROCNO                   1
Date_             20110223
Time                 15.06
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG            zgpg30
TD                  65536
SOLVENT             CDCl3
NS                    248
DS                      4
SWH             25252.525 Hz
FIDRES           0.385323 Hz
AQ              1.2976629 sec
RG                    114
DW                 19.800 usec
DE                  6.50 usec
TE                 295.1 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     1

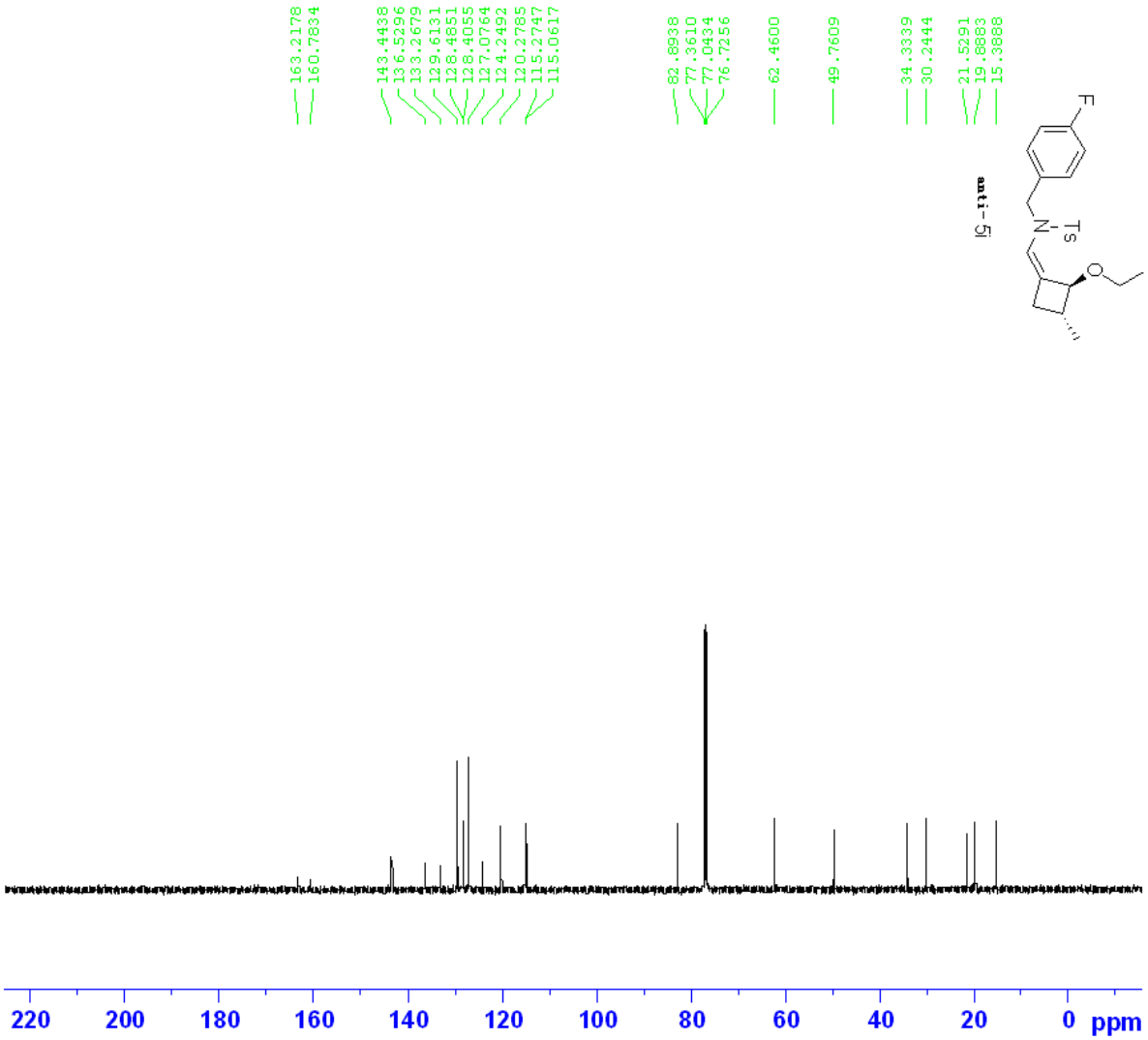
======== CHANNEL f1 ========
NUC1                  13C
P1                  13.47 usec
PL1                  2.00 dB
PL1W          55.31277084 W
SFO1         100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2           waltz16
NUC2                   1H
PCPD2               80.00 usec
PL2                 -1.00 dB
PL12                16.72 dB
PL13                15.50 dB
PL2W          17.01305389 W
PL12W          0.28759566 W
PL13W          0.38087484 W
SFO2         400.1316005 MHz
SI                   32768
SF           100.6127723 MHz
WDW                     EM
SSB                      0
LB                    3.00 Hz
GB                       0
PC                    1.40
```




```
NAME        L-3-110A-2xia
EXPNO                   1
PROCNO                  1
Date_            20110309
Time                10.48
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                    101
DW                 78.200 usec
DE                   6.50 usec
TE                  295.4 K
D1            1.00000000 sec
TD0                     1

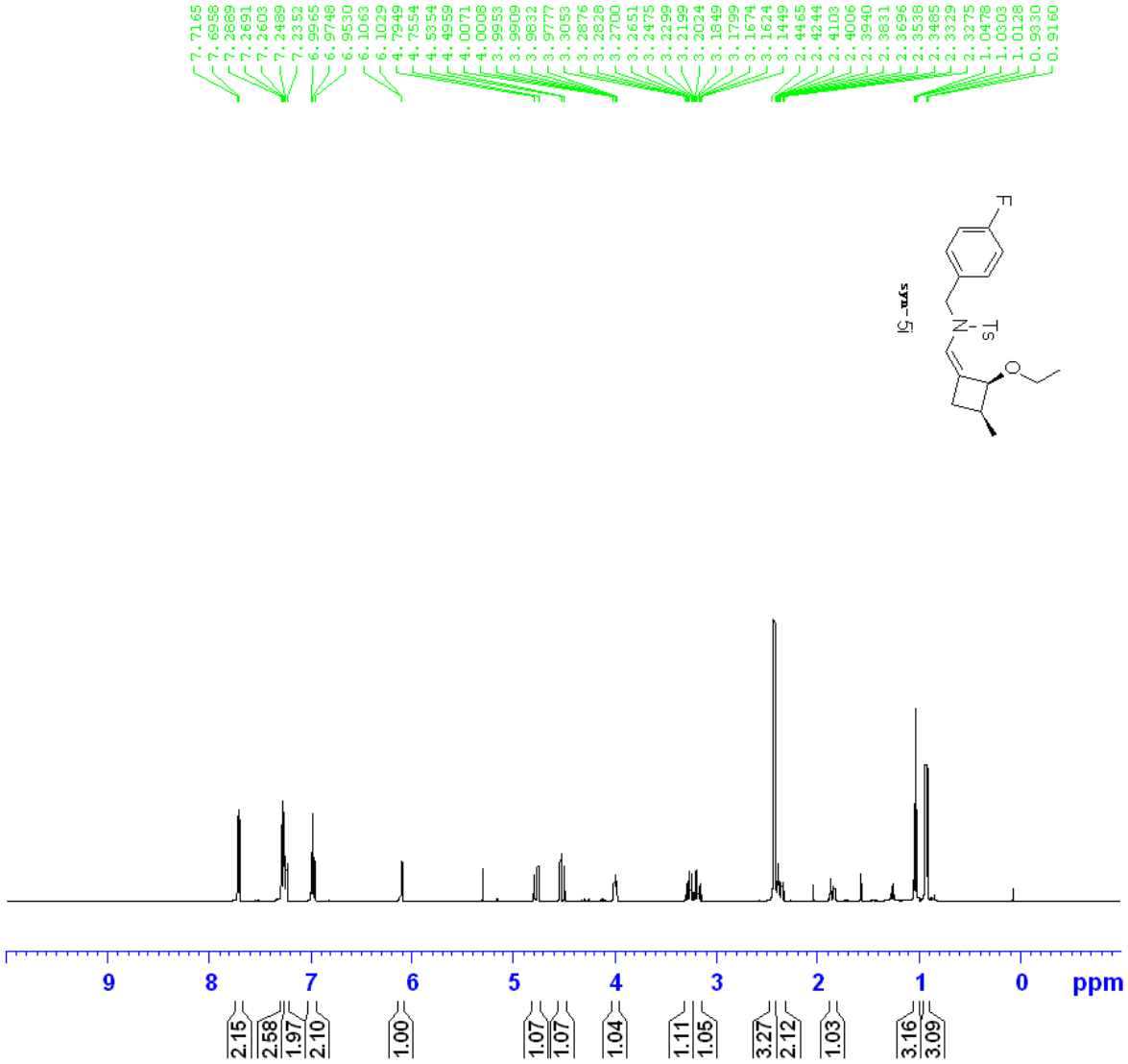
======== CHANNEL f1 ========
NUC1                   1H
P1                  10.40 usec
PL1                 -1.00 dB
PL1W         17.01305389 W
SFO1         400.1328009 MHz
SI                 16384
SF           400.1300094 MHz
WDW                    EM
SSB                     0
LB                   0.30 Hz
GB                      0
PC                   1.00
```




```
NAME        L-3-110A-2xia
EXPNO                   2
PROCNO                  1
Date_            20110309
Time                10.50
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   100
DS                     4
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   114
DW                19.800 usec
DE                 6.50 usec
TE                296.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

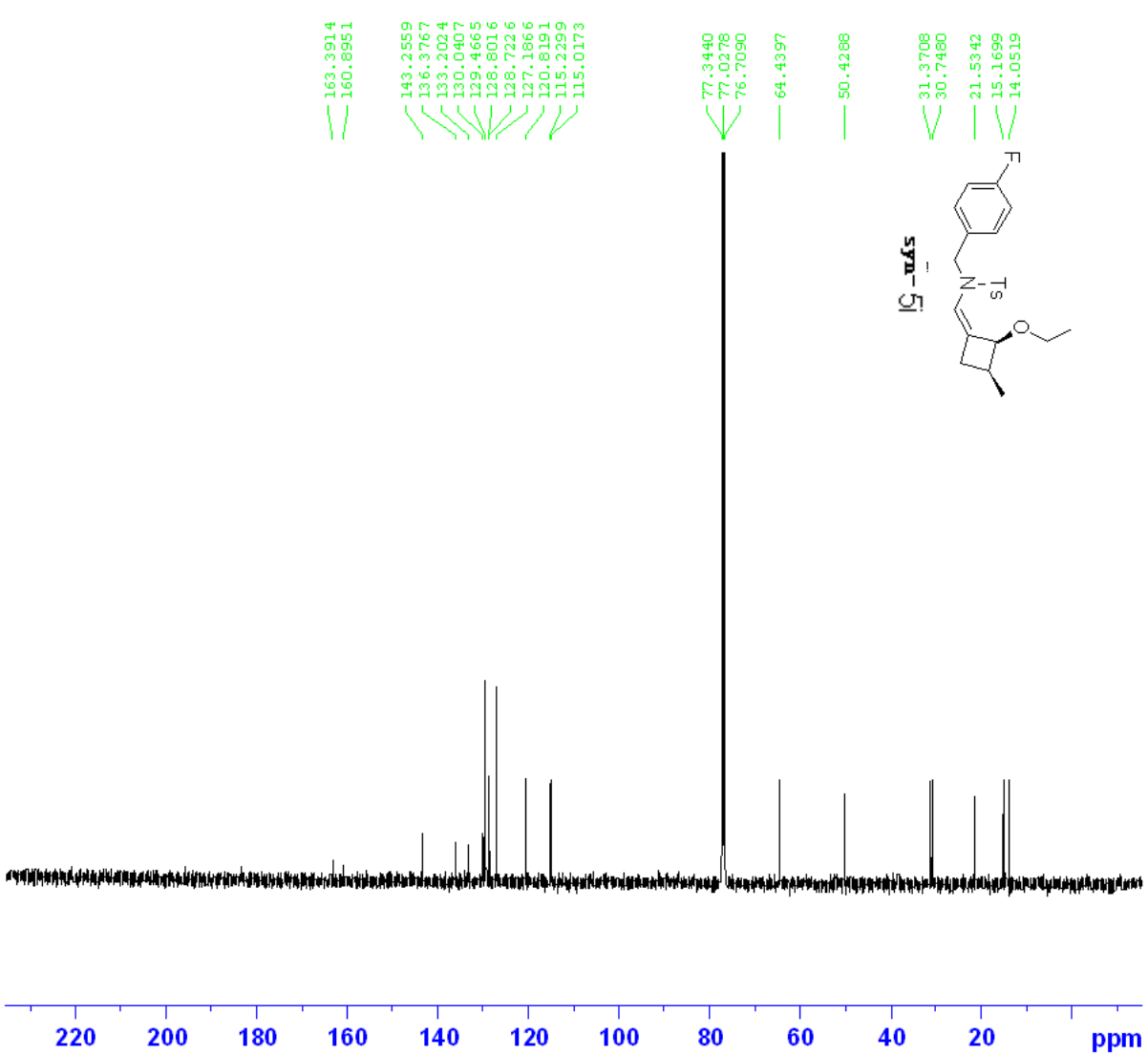
======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.28759566 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                32768
SF          100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```




```
NAME          1-3-110a-3
EXPNO                  1
PROCNO                 1
Date_           20110309
Time               16.48
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                   181
DW               78.200 usec
DE                 6.50 usec
TE                295.3 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1326008 MHz
SI                32768
SF          400.1300097 MHz
WDW                  EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



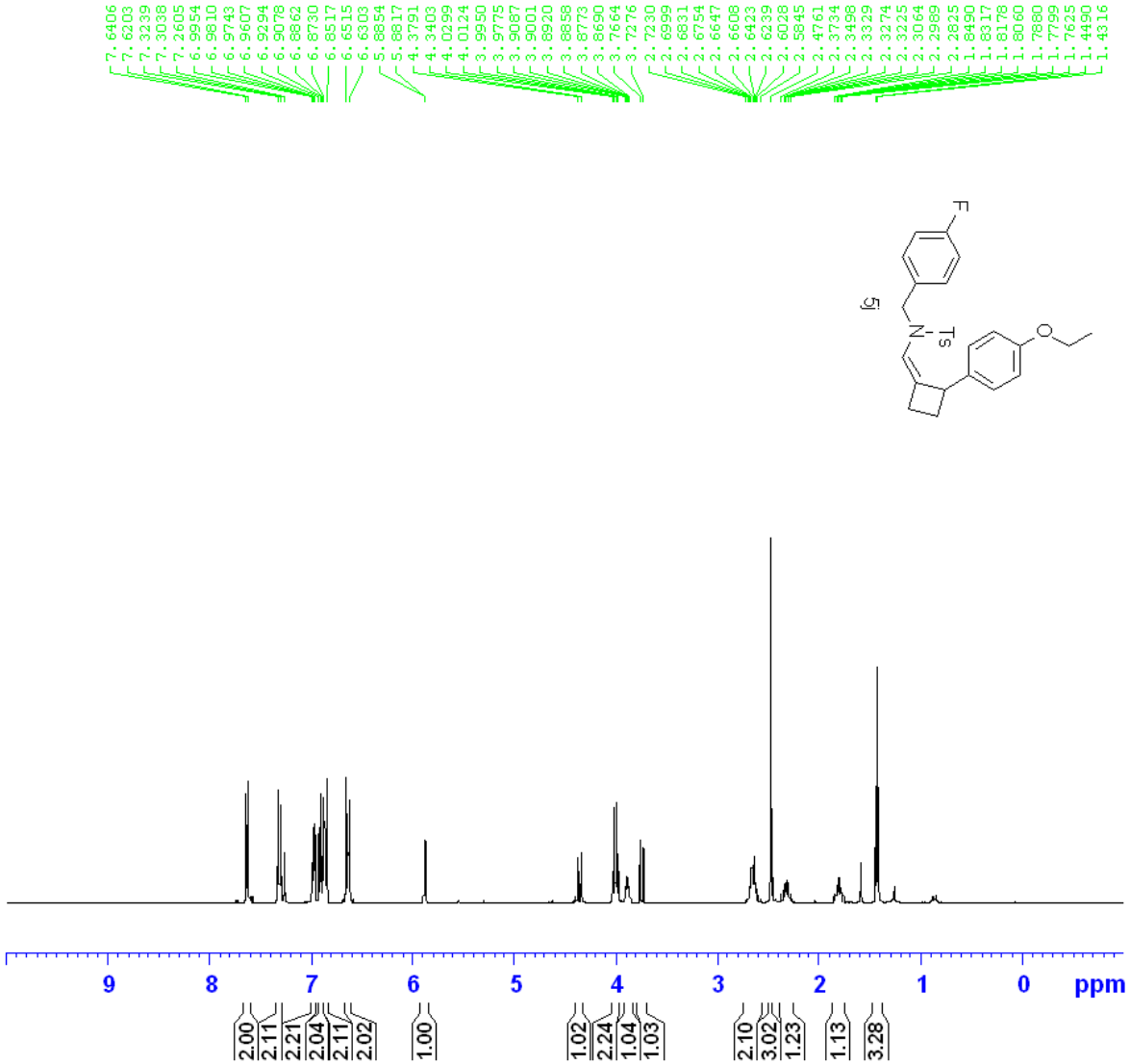
5j

syn-

```
NAME          1-3-110a-3
EXPNO                  2
PROCNO                 1
Date_           20110310
Time               10.38
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  247
DS                    4
SWH           25252.525 Hz
FIDRES        0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW               19.800 usec
DE                6.50 usec
TE               296.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

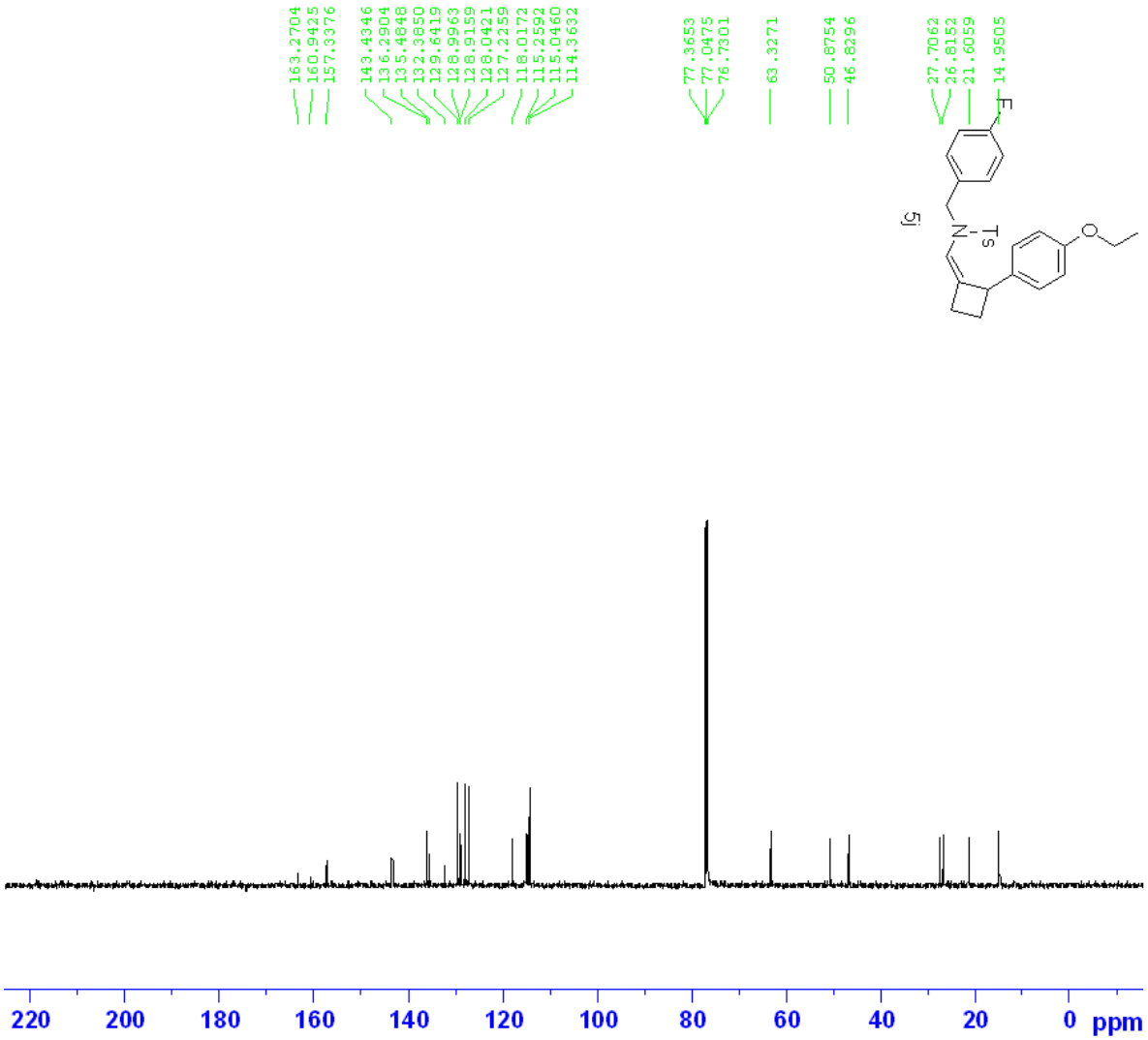
======== CHANNEL f1 ========
NUC1                 13C
P1                13.47 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              16.72 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI                32768
SF         100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```

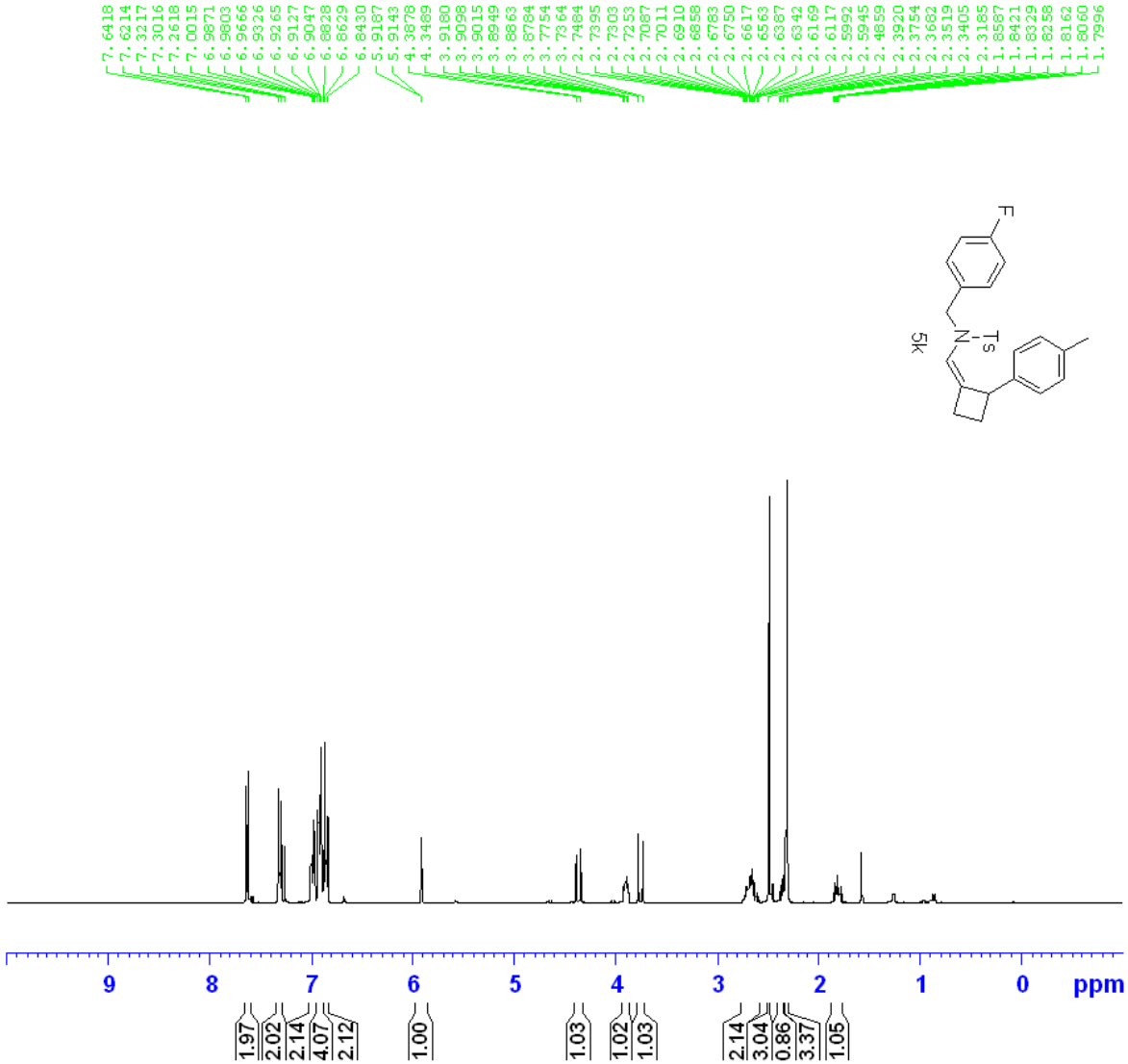



```
NAME            L-3-109A
EXPNO                  1
PROCNO                 1
Date_           20110303
Time               10.37
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                   128
DW                78.200 usec
DE                  6.50 usec
TE                 292.9 K
D1           1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300096 MHz
WDW                  EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



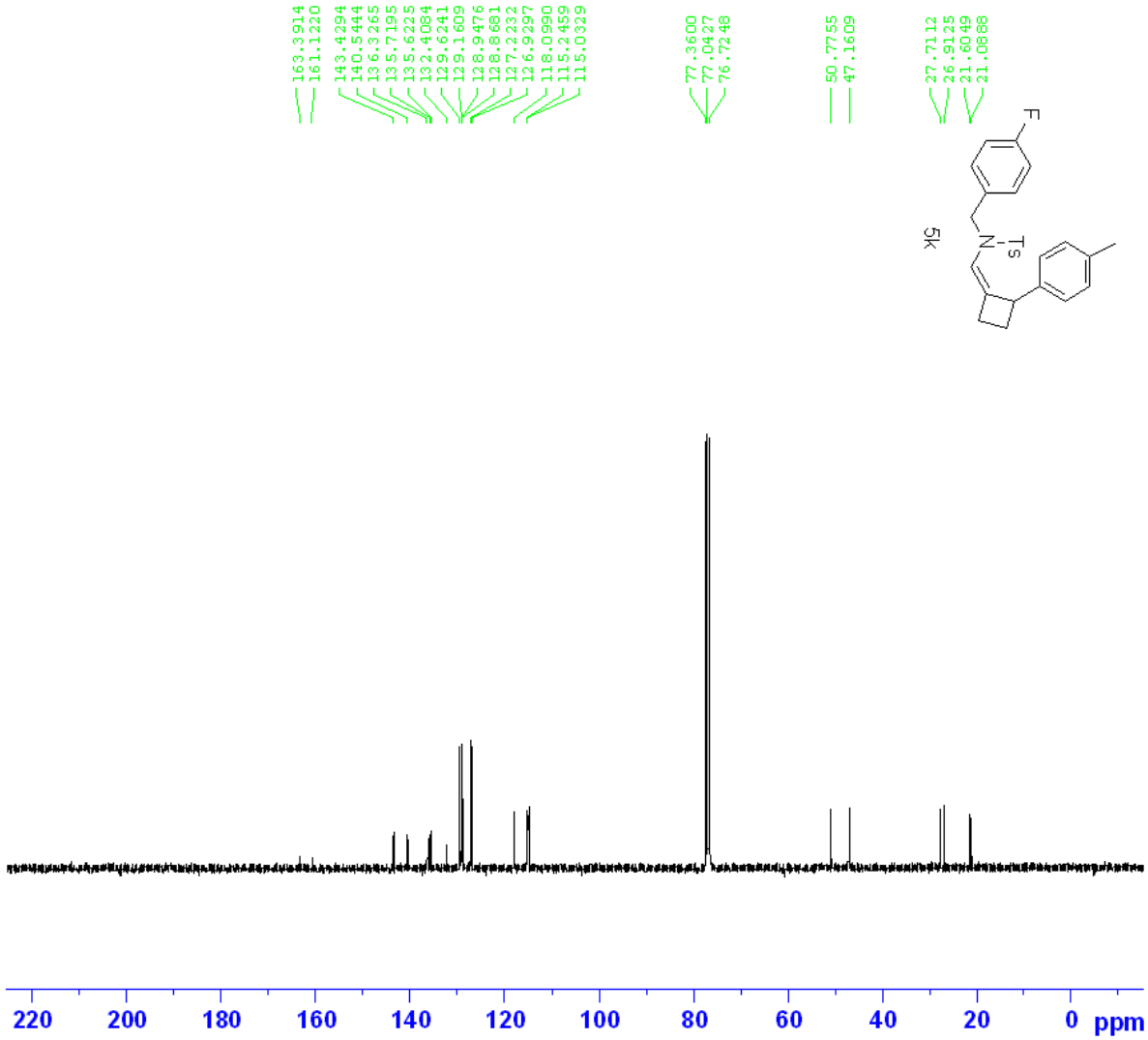
NAME	L-3-109A	
EXPNO	2	
PROCNO	1	
Date_	20110303	
Time	10.40	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zgpg30	
TD	65536	
SOLVENT	CDCl3	
NS	200	
DS	4	
SWH	25252.525	Hz
FIDRES	0.385323	Hz
AQ	1.2976629	sec
RG	114	
DW	19.800	usec
DE	6.50	usec
TE	293.7	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	13C	
P1	13.47	usec
PL1	2.00	dB
PL1W	55.31277084	W
SFO1	100.6238364	MHz
======== CHANNEL f2 ========		
CPDPRG2	waltz16	
NUC2	1H	
PCPD2	80.00	usec
PL2	-1.00	dB
PL12	16.72	dB
PL13	15.50	dB
PL2W	17.01305389	W
PL12W	0.28759566	W
PL13W	0.38087484	W
SFO2	400.1316005	MHz
SI	32768	
SF	100.6127690	MHz
WDW	EM	
SSB	0	
LB	3.00	Hz
GB	0	
PC	1.40	



NAME	L-3-109B-2	
EXPNO	1	
PROCNO	1	
Date_	20110307	
Time	15.39	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	144	
DW	78.200	usec
DE	6.50	usec
TE	294.7	K
D1	1.00000000	sec
TD0	1	

======== CHANNEL f1 ========

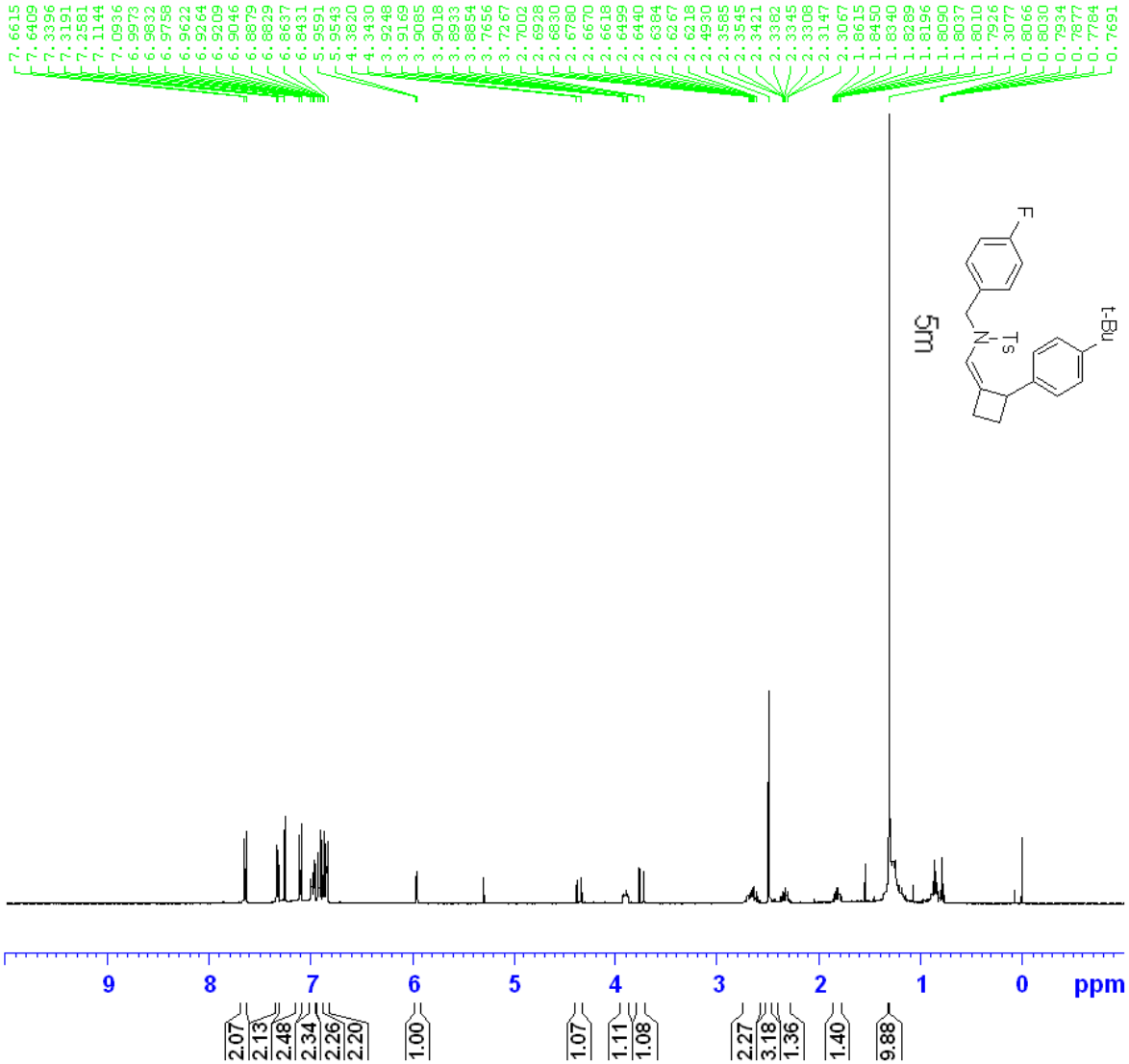
NUC1	1H	
P1	10.40	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1328009	MHz
SI	16384	
SF	400.1300090	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	



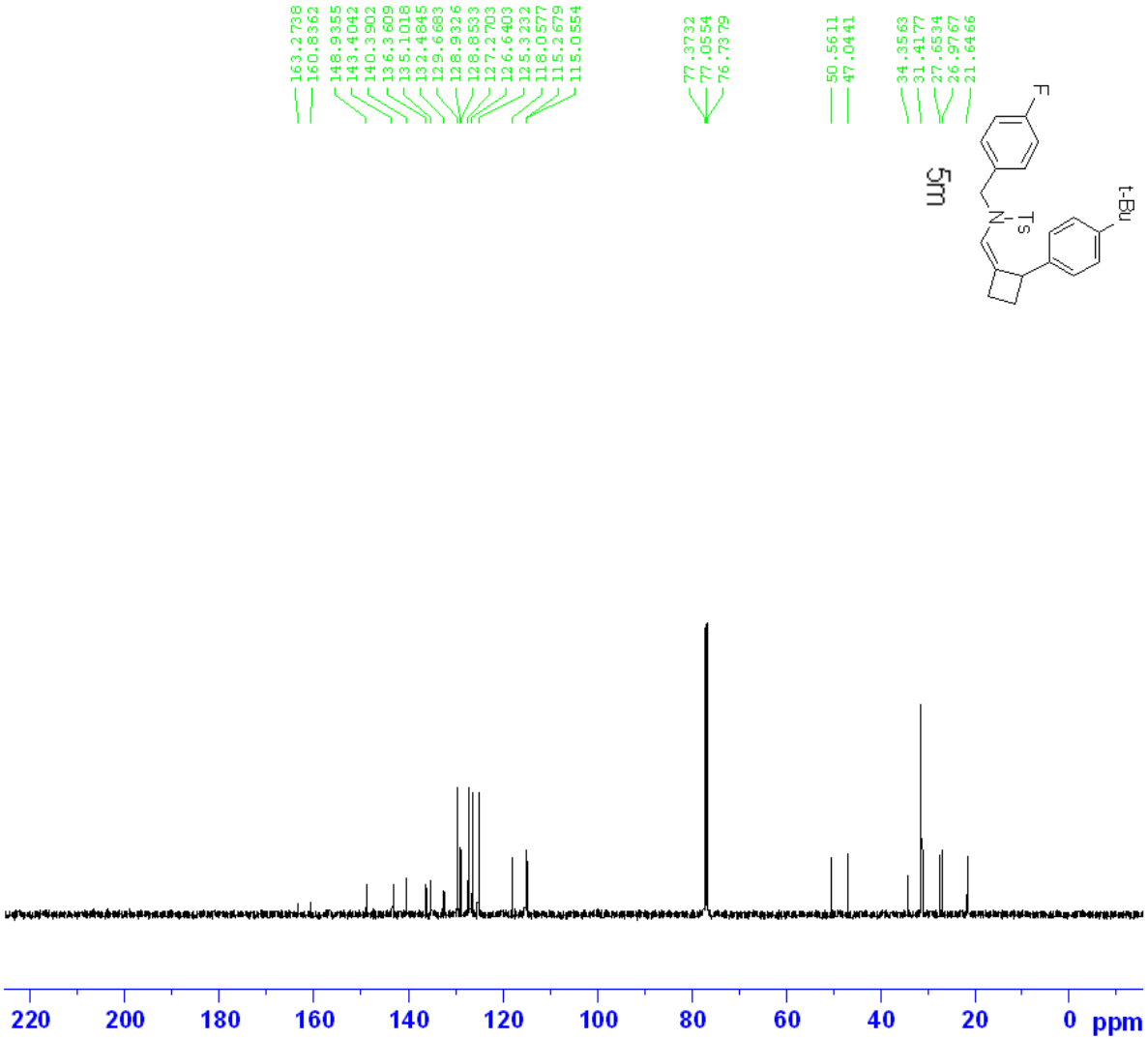

```
NAME          L-3-109B-2
EXPNO                  2
PROCNO                 1
Date_           20110307
Time               15.41
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  144
DS                    4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW                19.800 usec
DE                 6.50 usec
TE                295.5 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                 13C
P1                13.47 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              16.72 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127690 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
```



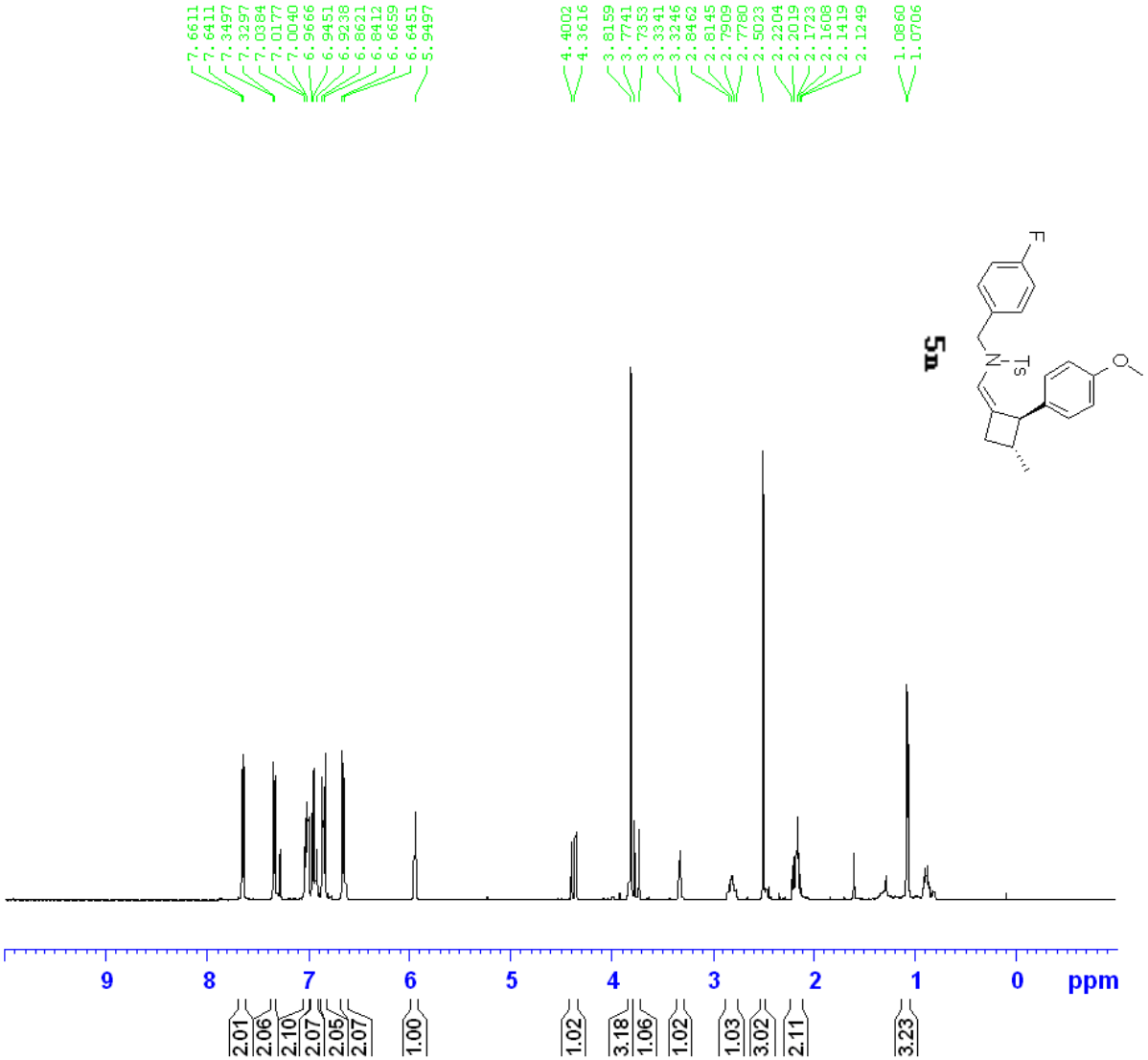
NAME	L-3-80B	
EXPNO	1	
PROCNO	1	
Date_	20110112	
Time	15.14	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	8012.820	Hz
FIDRES	0.244532	Hz
AQ	2.0447731	sec
RG	181	
DW	62.400	usec
DE	6.50	usec
TE	293.8	K
D1	1.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	11.58	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1332010	MHz
SI	16384	
SF	400.1300101	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	




```
NAME            L-3-89A
EXPNO                 1
PROCNO                1
Date_          20110221
Time              16.01
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  112
DS                    4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW               19.800 usec
DE                6.50 usec
TE               294.5 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
NUC1                 13C
P1                13.47 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              16.72 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI                32768
SF         100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```



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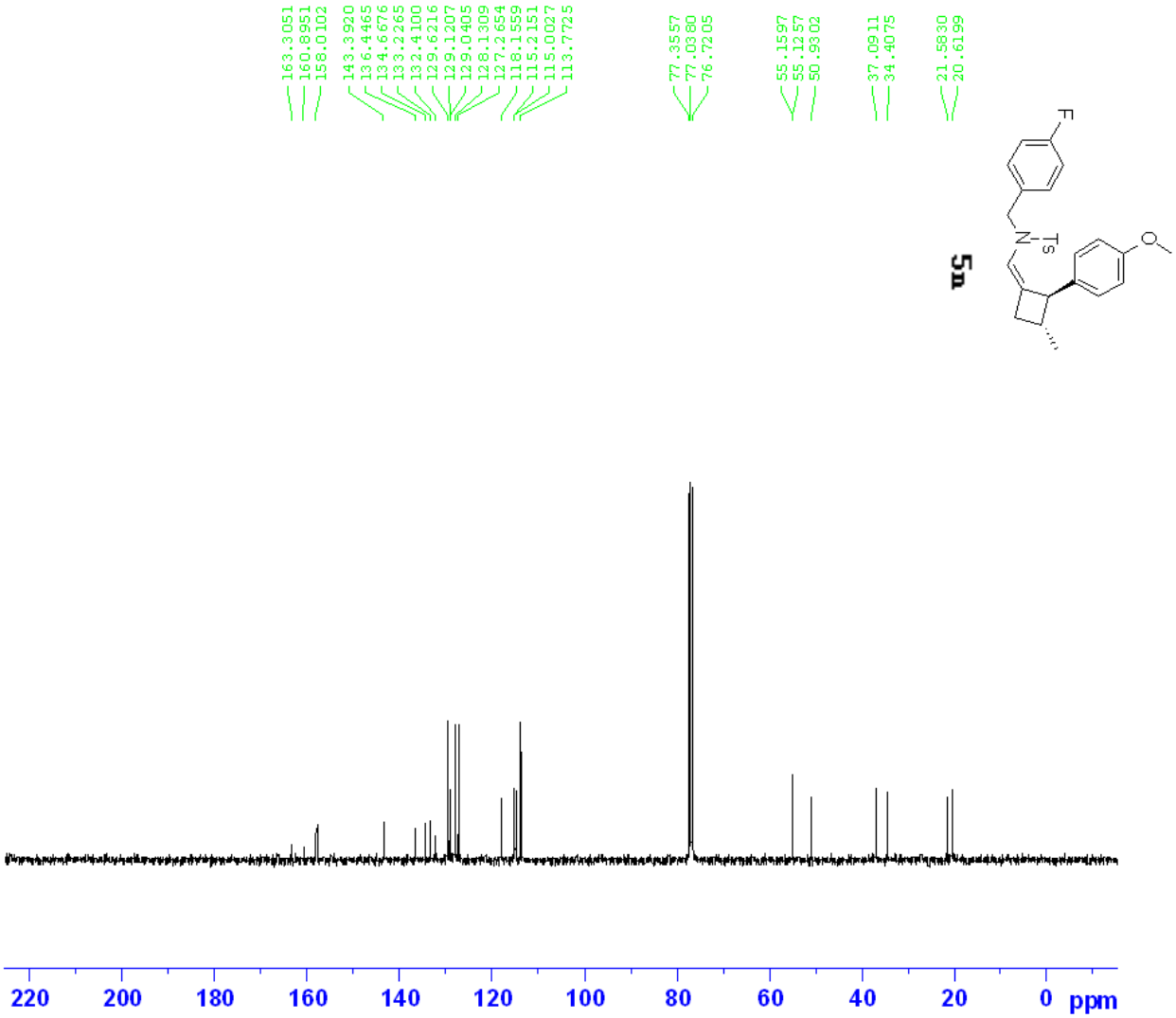
```
NAME            L-3-110B
EXPNO                  1
PROCNO                 1
Date_           20110303
Time               14.11
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                   128
DW                78.200 usec
DE                 6.50 usec
TE                296.2 K
D1           1.00000000 sec
TD0                    1

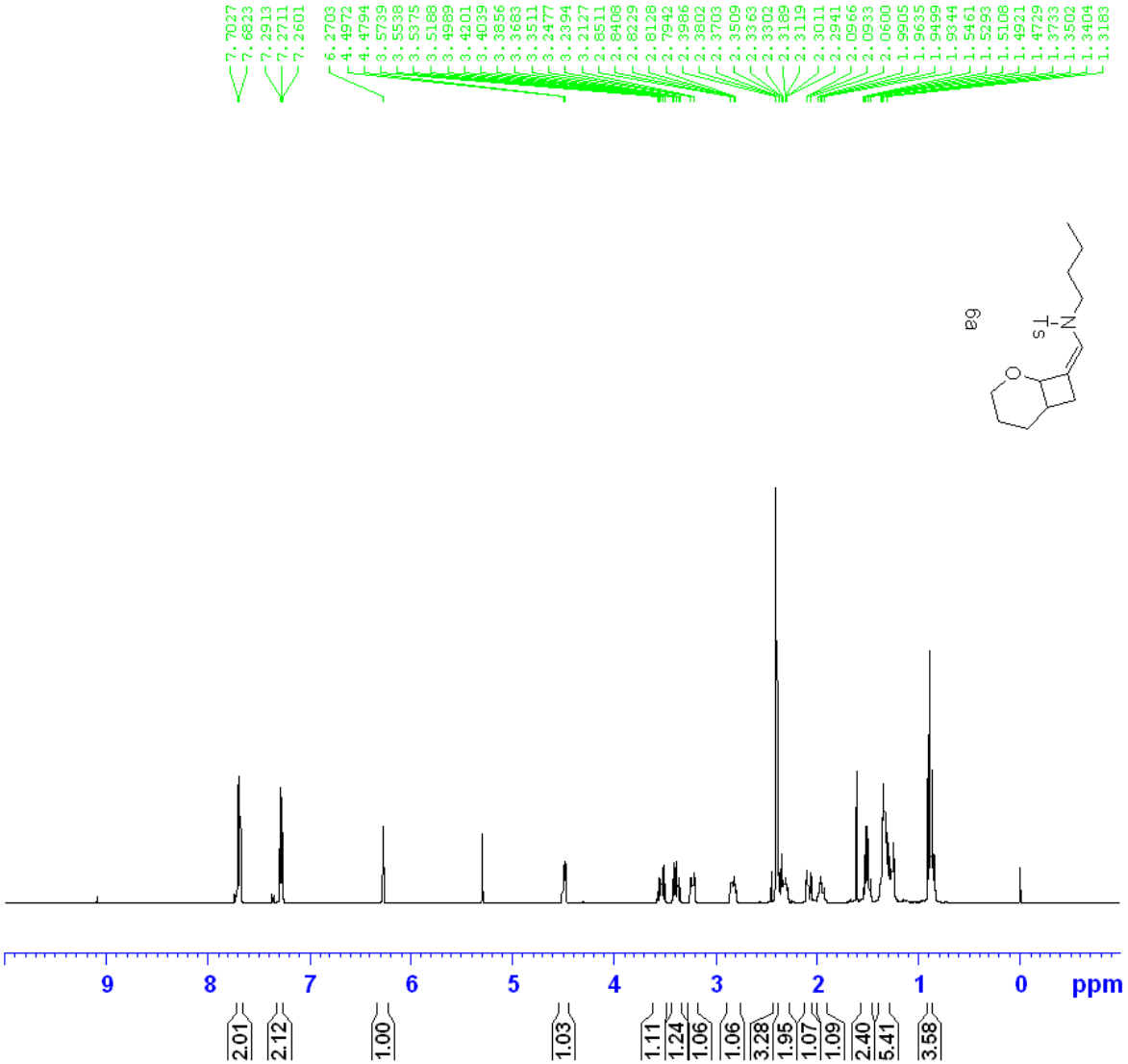
======== CHANNEL f1 ========
NUC1                  1H
P1                 10.40 usec
PL1                -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300000 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```




```
NAME            L-3-110B
EXPNO                  2
PROCNO                 1
Date_           20110303
Time               14.14
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  172
DS                    4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW                19.800 usec
DE                 6.50 usec
TE                296.9 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                    1

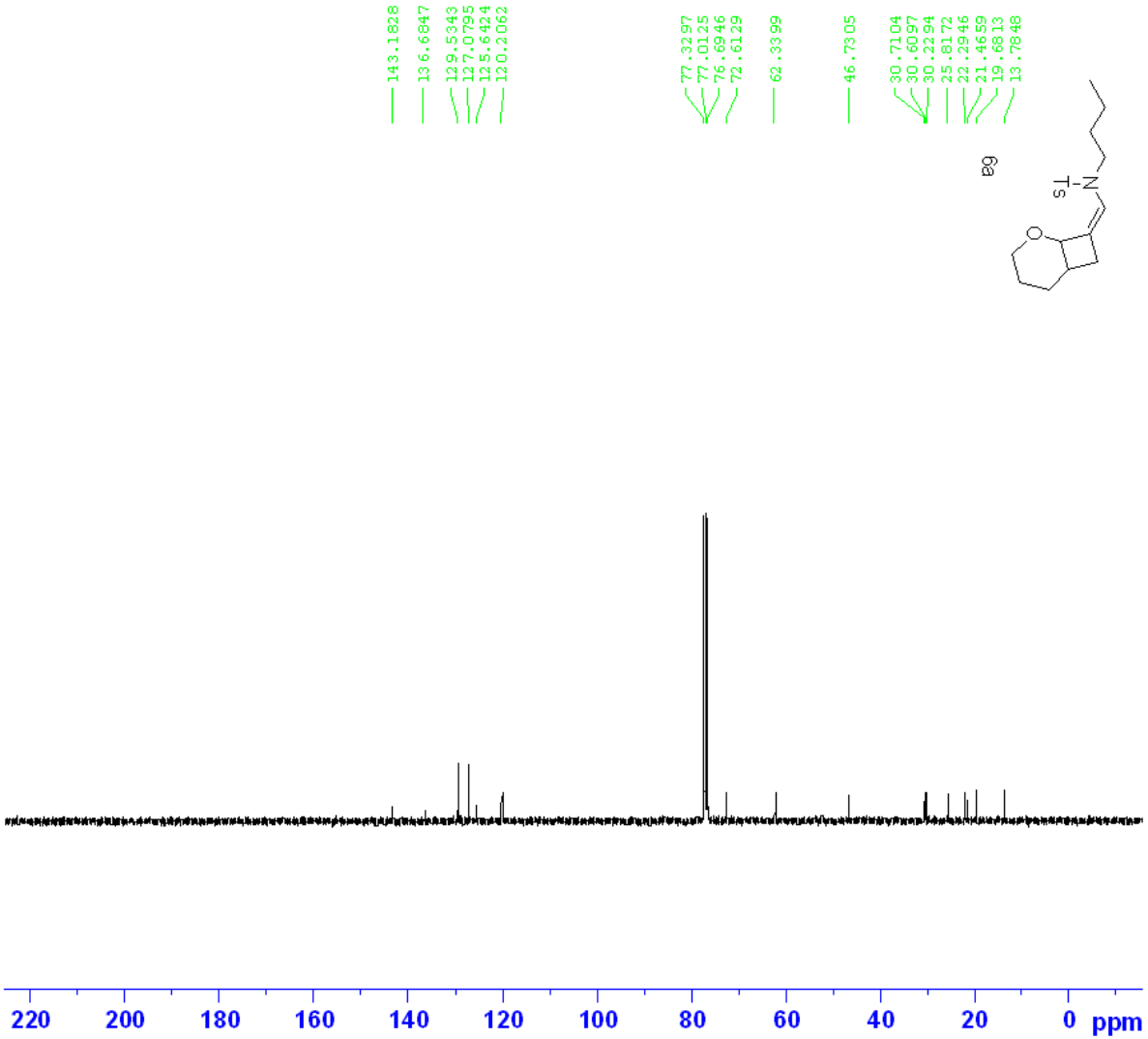
======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127690 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```




```
NAME              L-2-47
EXPNO                  1
PROCNO                 1
Date_           20100728
Time               14.30
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                   144
DW              78.200 usec
DE                6.50 usec
TE               296.8 K
D1          1.00000000 sec
TD0                    1

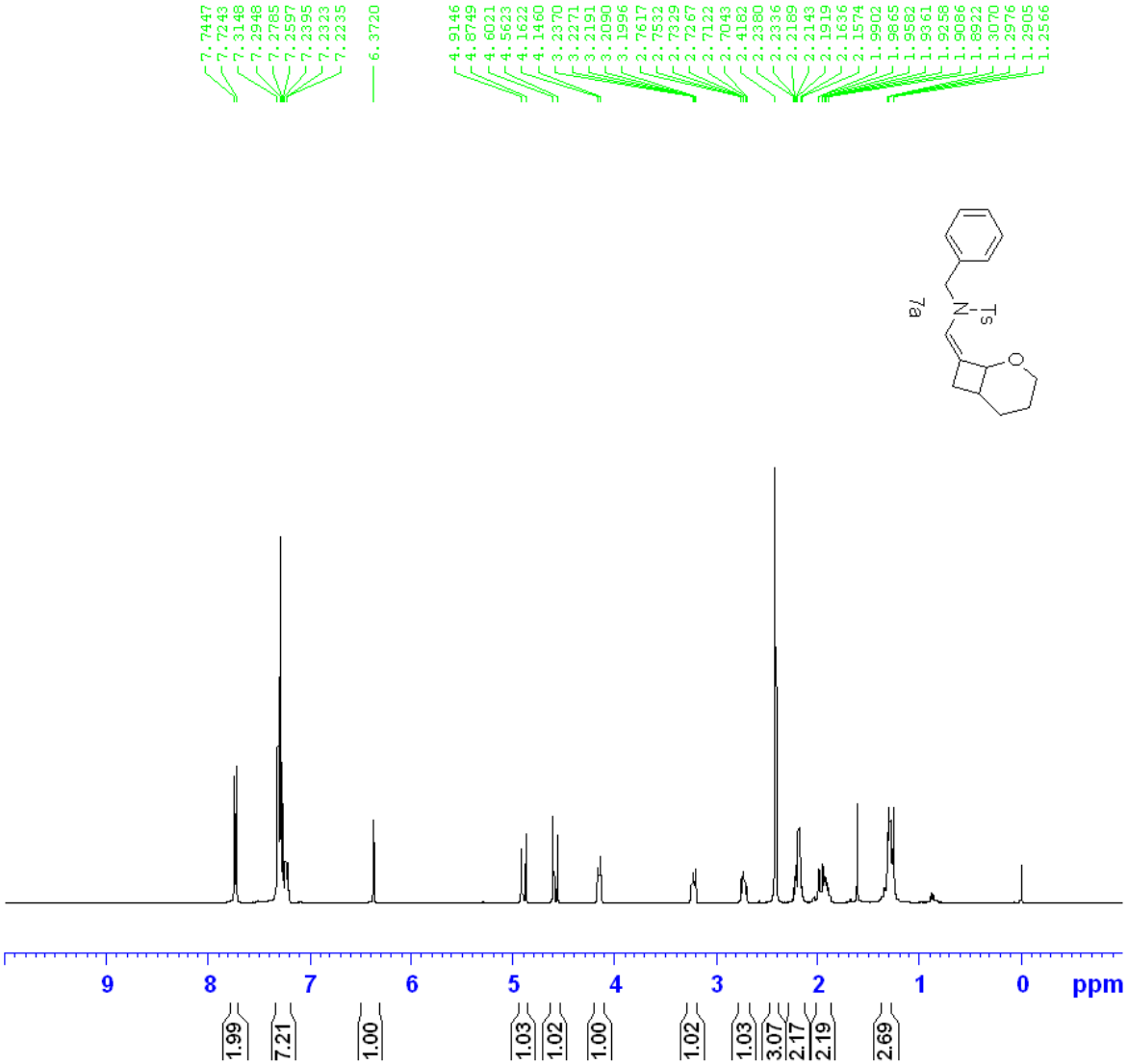
======== CHANNEL f1 ========
NUC1                  1H
P1                11.50 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1326008 MHz
SI                16384
SF          400.1300095 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```



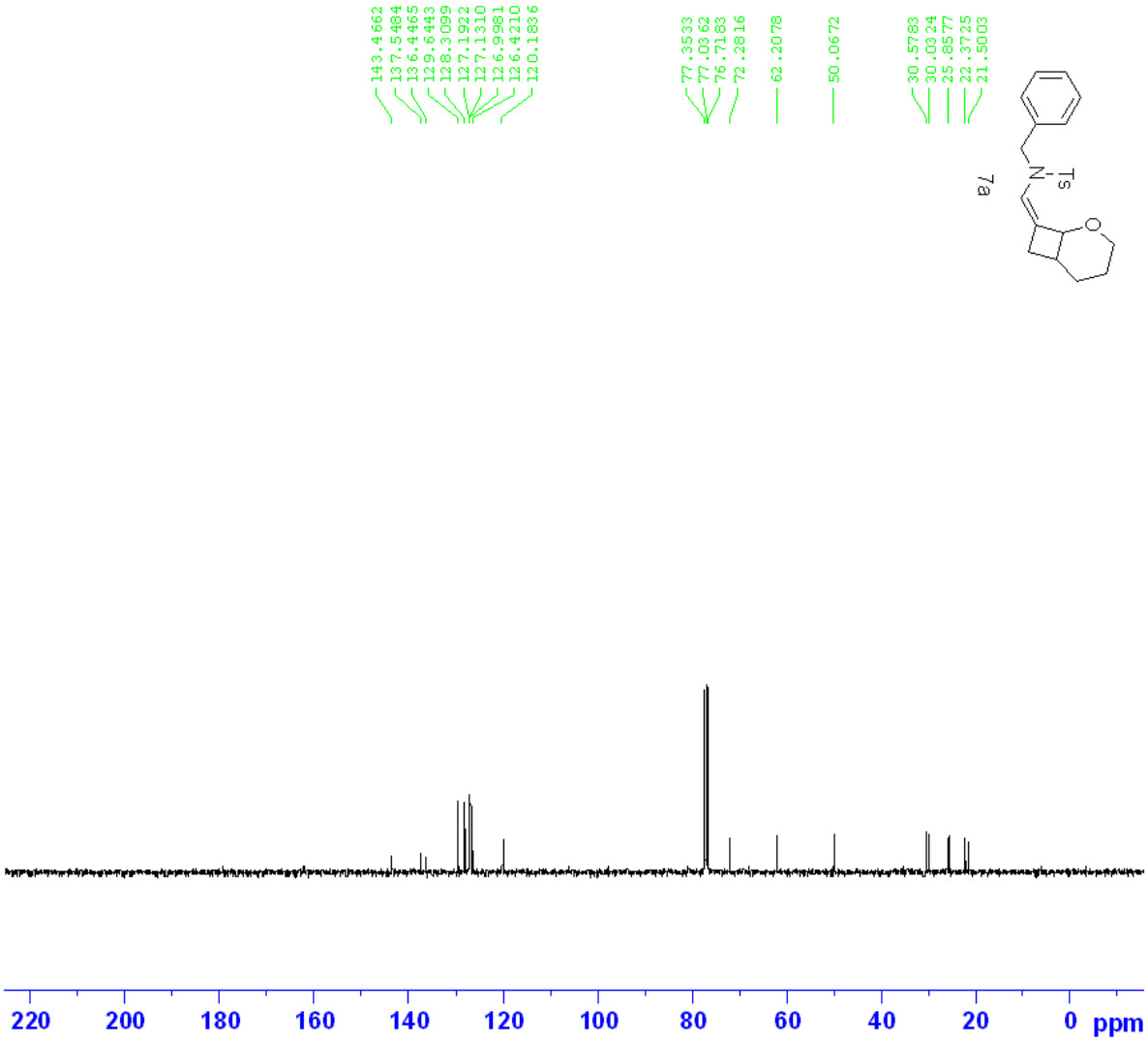

```
NAME              L-2-47
EXPNO                  2
PROCNO                 1
Date_           20110504
Time               15.26
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  120
DS                    4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW               19.800 usec
DE                6.50 usec
TE               299.8 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
NUC1                 13C
P1                13.47 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

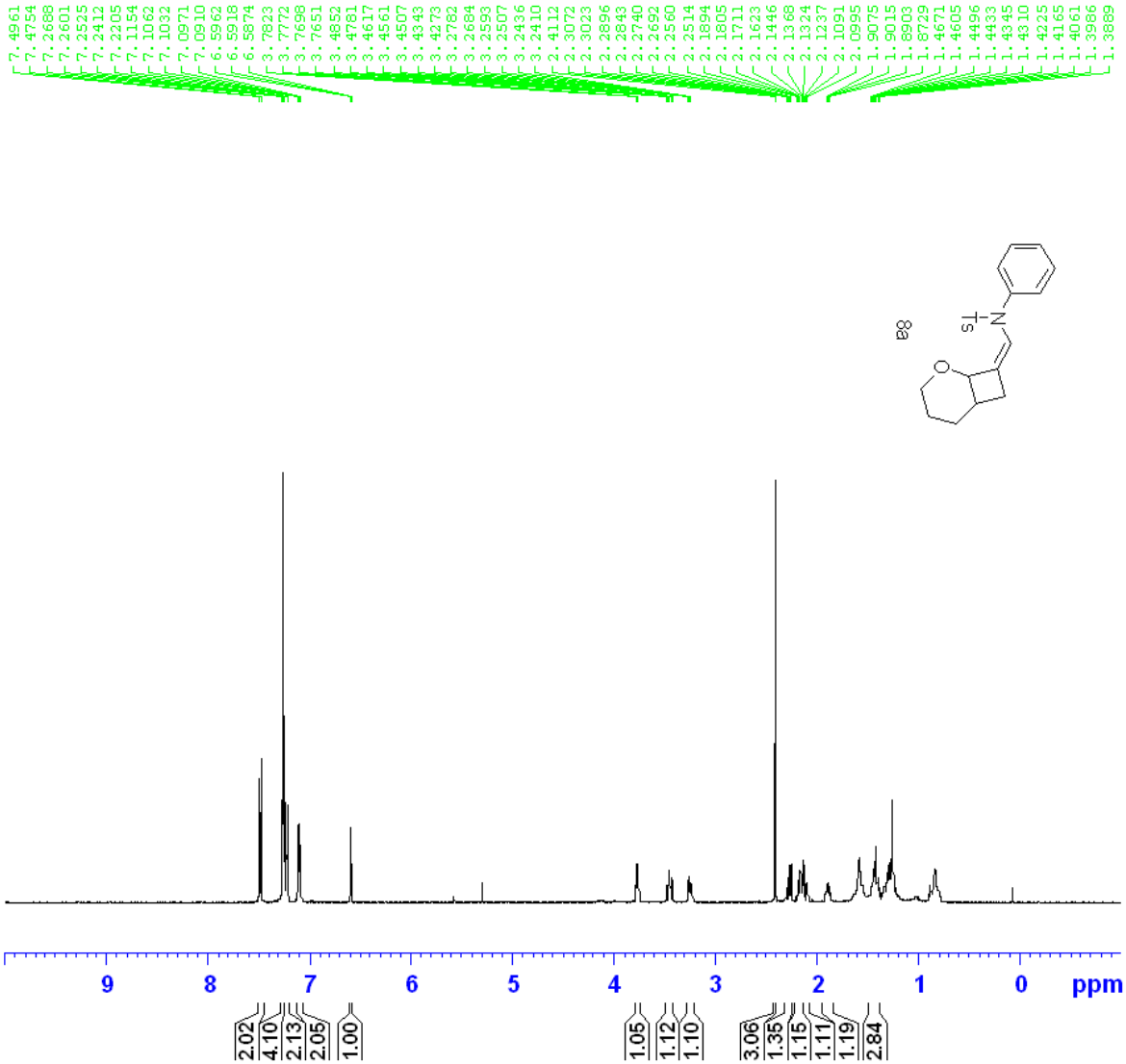
======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              16.72 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127690 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
```



NAME	L-2-49	
EXPNO	1	
PROCNO	1	
Date_	20100728	
Time	14.48	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	144	
DW	78.200	usec
DE	6.50	usec
TE	297.0	K
D1	1.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	11.50	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1326008	MHz
SI	16384	
SF	400.1300095	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	

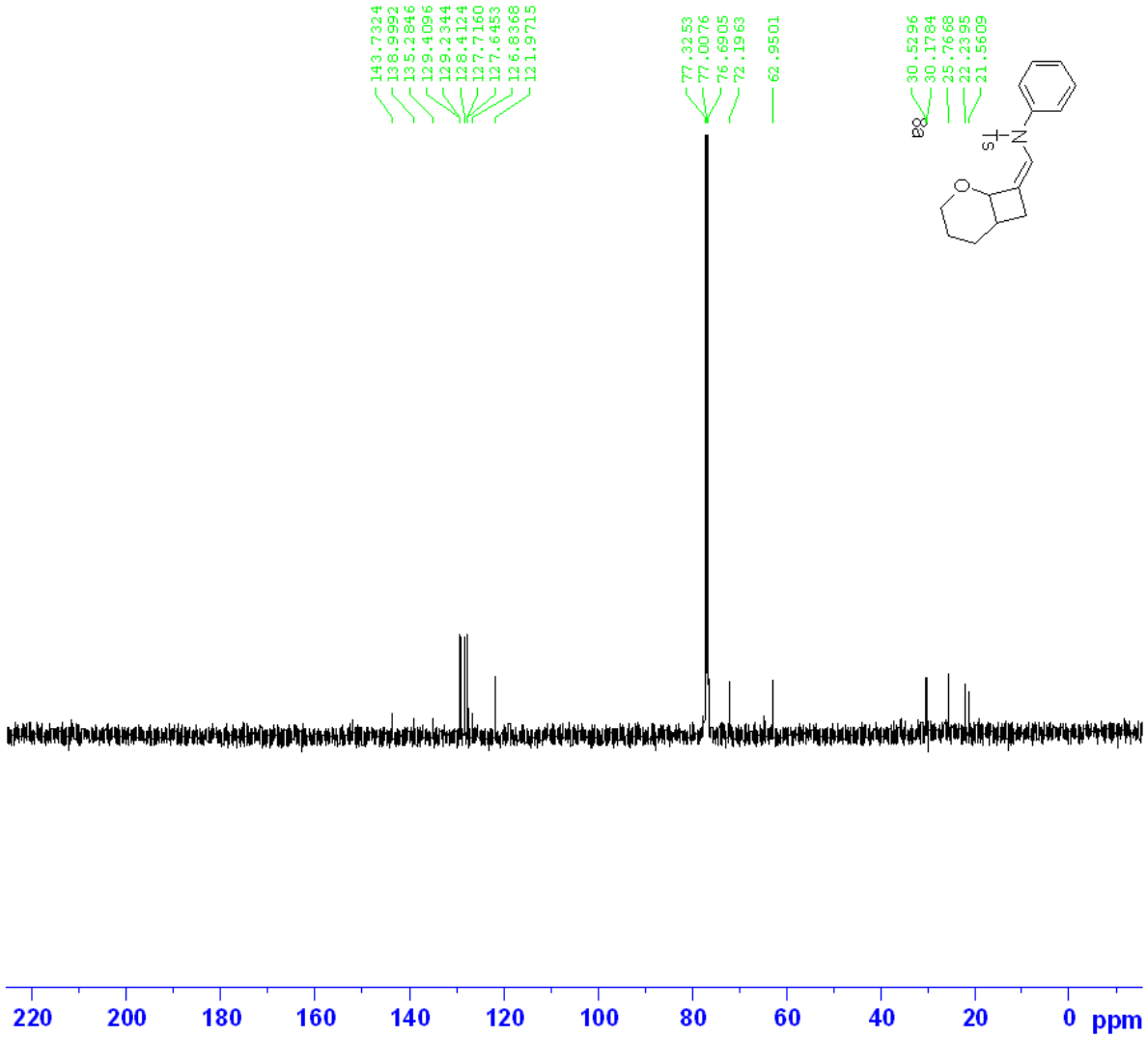


NAME	L-2-49	
EXPNO	2	
PROCNO	1	
Date_	20110504	
Time	15.18	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zgpg30	
TD	65536	
SOLVENT	CDCl3	
NS	47	
DS	4	
SWH	25252.525	Hz
FIDRES	0.385323	Hz
AQ	1.2976629	sec
RG	114	
DW	19.800	usec
DE	6.50	usec
TE	299.7	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	13C	
P1	13.47	usec
PL1	2.00	dB
PL1W	55.31277084	W
SFO1	100.6238364	MHz
======== CHANNEL f2 ========		
CPDPRG2	waltz16	
NUC2	1H	
PCPD2	80.00	usec
PL2	-1.00	dB
PL12	16.72	dB
PL13	15.50	dB
PL2W	17.01305389	W
PL12W	0.28759566	W
PL13W	0.38087484	W
SFO2	400.1316005	MHz
SI	32768	
SF	100.6127690	MHz
WDW	EM	
SSB	0	
LB	3.00	Hz
GB	0	
PC	1.40	




```
NAME          L-2-48shang
EXPNO                  1
PROCNO                 1
Date_           20110505
Time                9.44
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH             6393.862 Hz
FIDRES          0.195125 Hz
AQ            2.5625076 sec
RG                   362
DW                78.200 usec
DE                 6.50 usec
TE                298.9 K
D1            1.00000000 sec
TD0                    1

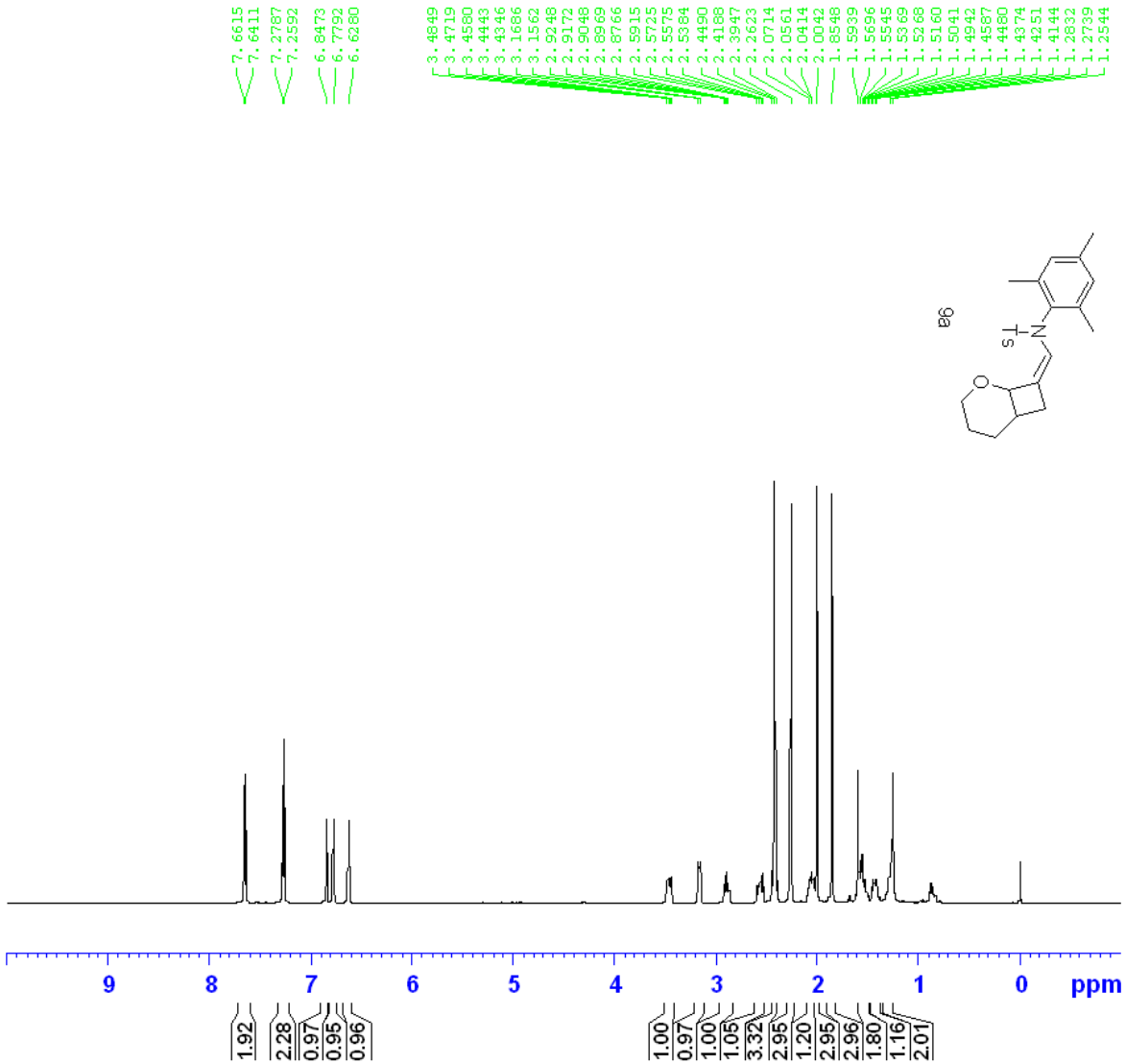
======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300097 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```




```
NAME        L-2-48-shang
EXPNO                   2
PROCNO                  1
Date_            20110505
Time                 9.25
INSTRUM             spect
PROBHD   5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   310
DS                     4
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   114
DW                19.800 usec
DE                 6.50 usec
TE                299.9 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

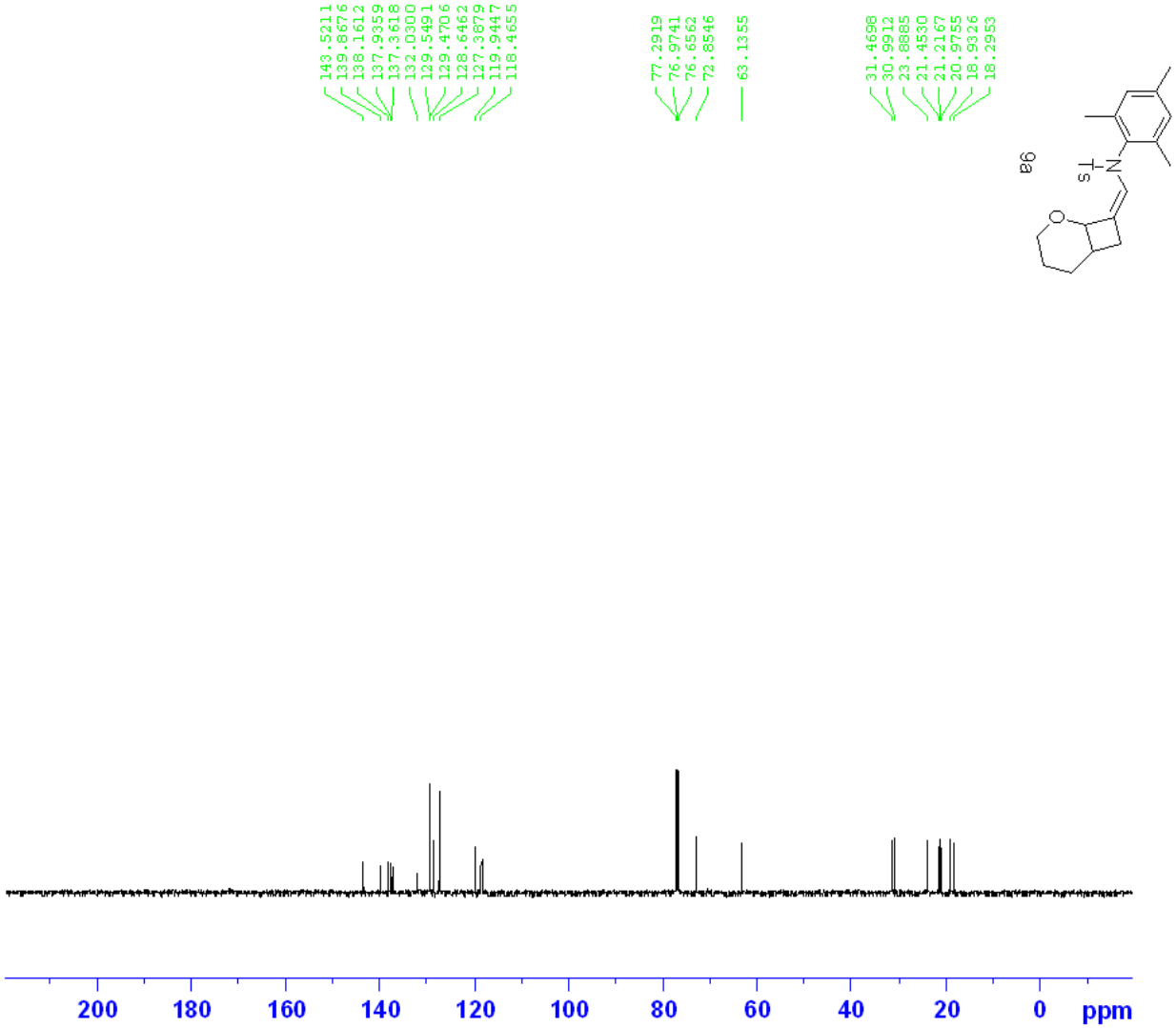
======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.28759566 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                32768
SF          100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```




```
NAME          L-2-50-shang
EXPNO                    1
PROCNO                   1
Date_             20100728
Time                 14.38
INSTRUM              spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ              2.5625076 sec
RG                     144
DW                  78.200 usec
DE                    6.50 usec
TE                   296.9 K
D1             1.00000000 sec
TD0                      1

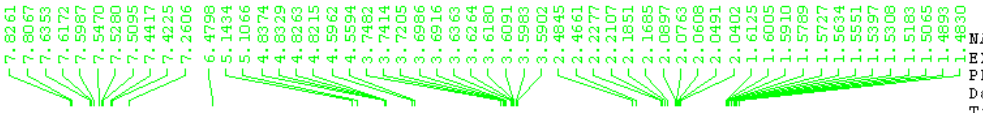
======== CHANNEL f1 ========
NUC1                    1H
P1                   11.50 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1326008 MHz
SI                   16384
SF            400.1300097 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```

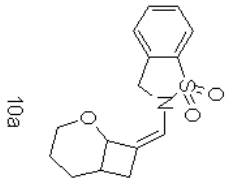



```
NAME            L-2-119-b
EXPNO                   2
PROCNO                  1
Date_            20100929
Time                15.50
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    30
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                   181
DW                20.800 usec
DE                 6.50 usec
TE                300.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 12.80 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

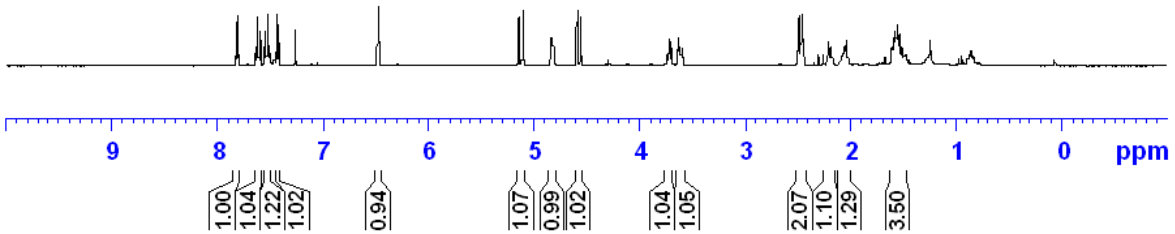
======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.85 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35138419 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                32768
SF          100.6127793 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```

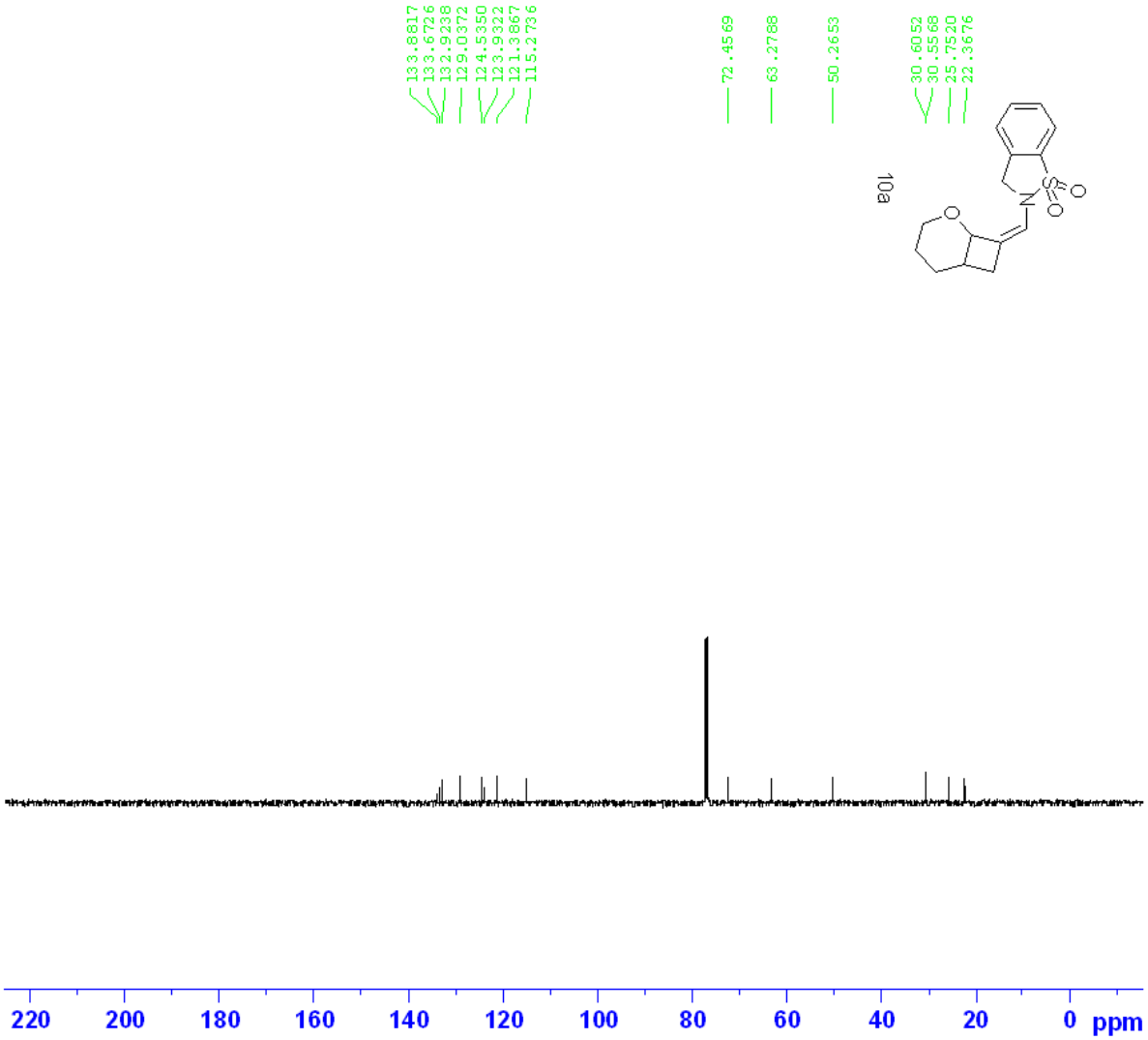





```
NAME              L-4-6A
EXPNO                  1
PROCNO                 1
Date_           20110315
Time               15.57
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                   144
DW              78.200 usec
DE                6.50 usec
TE               295.0 K
D1          1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300095 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```

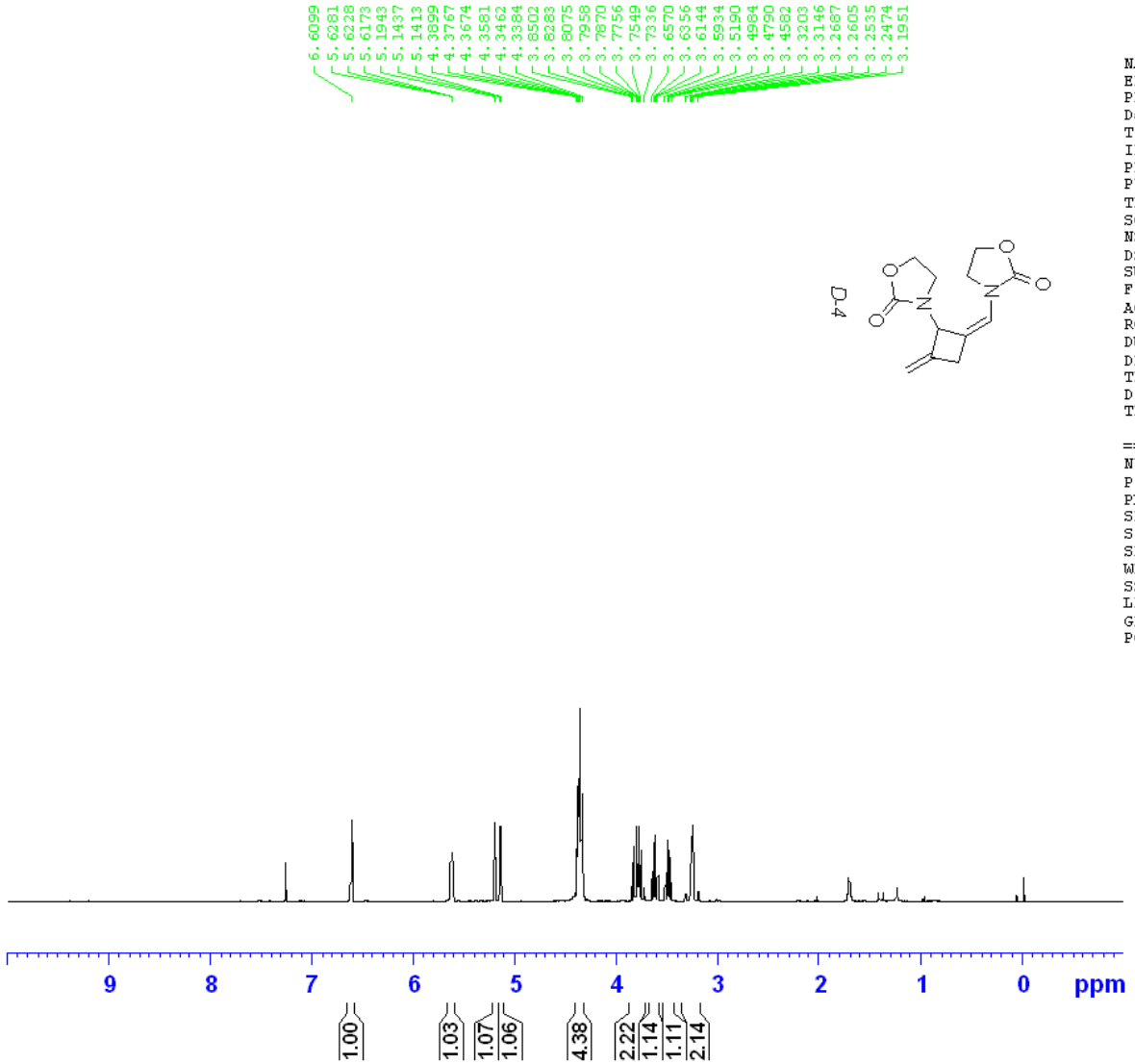


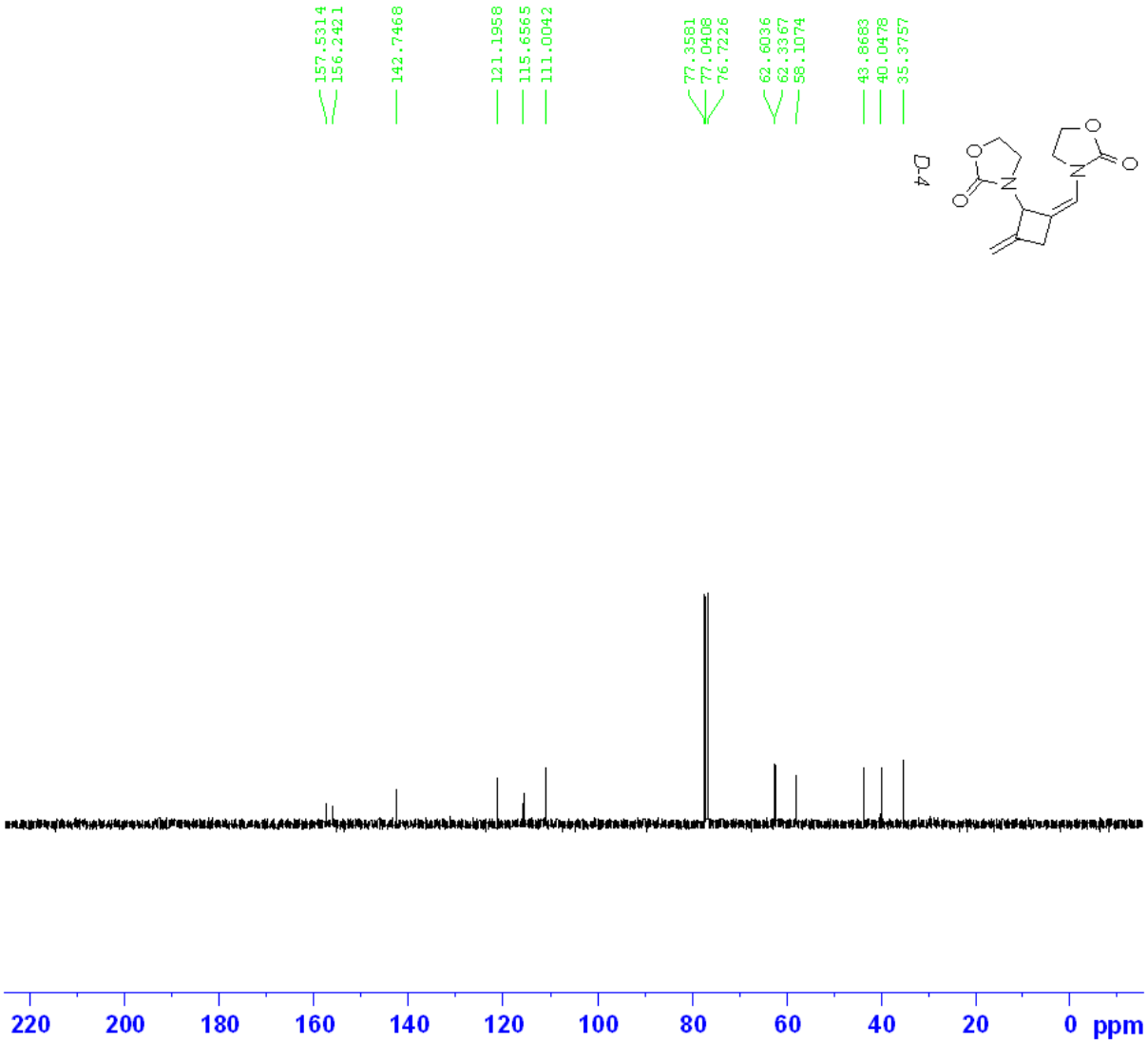



```
NAME              L-4-6A
EXPNO                  2
PROCNO                 1
Date_           20110315
Time               16.00
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                    41
DS                     4
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   114
DW                19.800 usec
DE                 6.50 usec
TE                295.6 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.28759566 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```

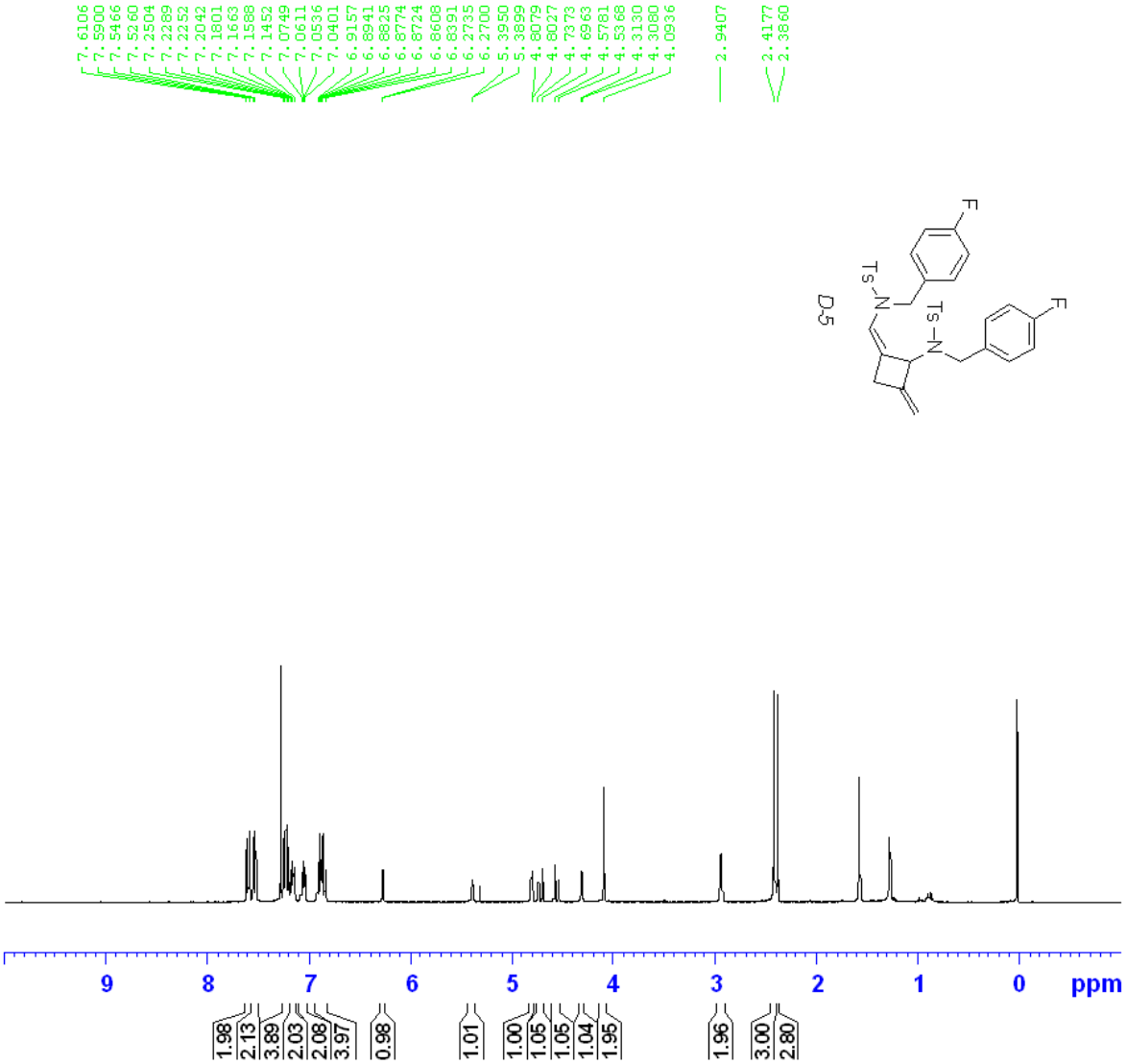

6.6099
5.6281
5.6228
5.6173
5.1943
5.1437
5.1413
4.3899
4.3767
4.3674
4.3581
4.3462
4.3384
4.8502
3.8283
3.8075
3.7958
3.7870
3.7756
3.7549
3.7336
3.6570
3.6356
3.6144
3.5934
3.5190
3.4984
3.4790
3.4582
3.3203
3.3146
3.2687
3.2605
3.2535
3.2474
3.1951
D-4
NAME 13-08
EXPNO 1
PROCNO 3
Date_ 20110818
Time 20.07
INSTRUM spect
PROBHD 5 mm PADUL 13C
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 6
DS 0
SWH 12019.230 Hz
FIDRES 0.183399 Hz
AQ 2.7263477 sec
RG 203
DW 41.600 usec
DE 6.00 usec
TE 301.2 K
D1 5.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 12.60 usec
PL1 -1.00 dB
SFO1 400.1332010 MHz
SI 32768
SF 400.1300117 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
9
8
7
6
5
4
3
2
1
0
ppm
1.00
1.03
1.07
1.06
4.38
2.22
1.14
1.11
2.14



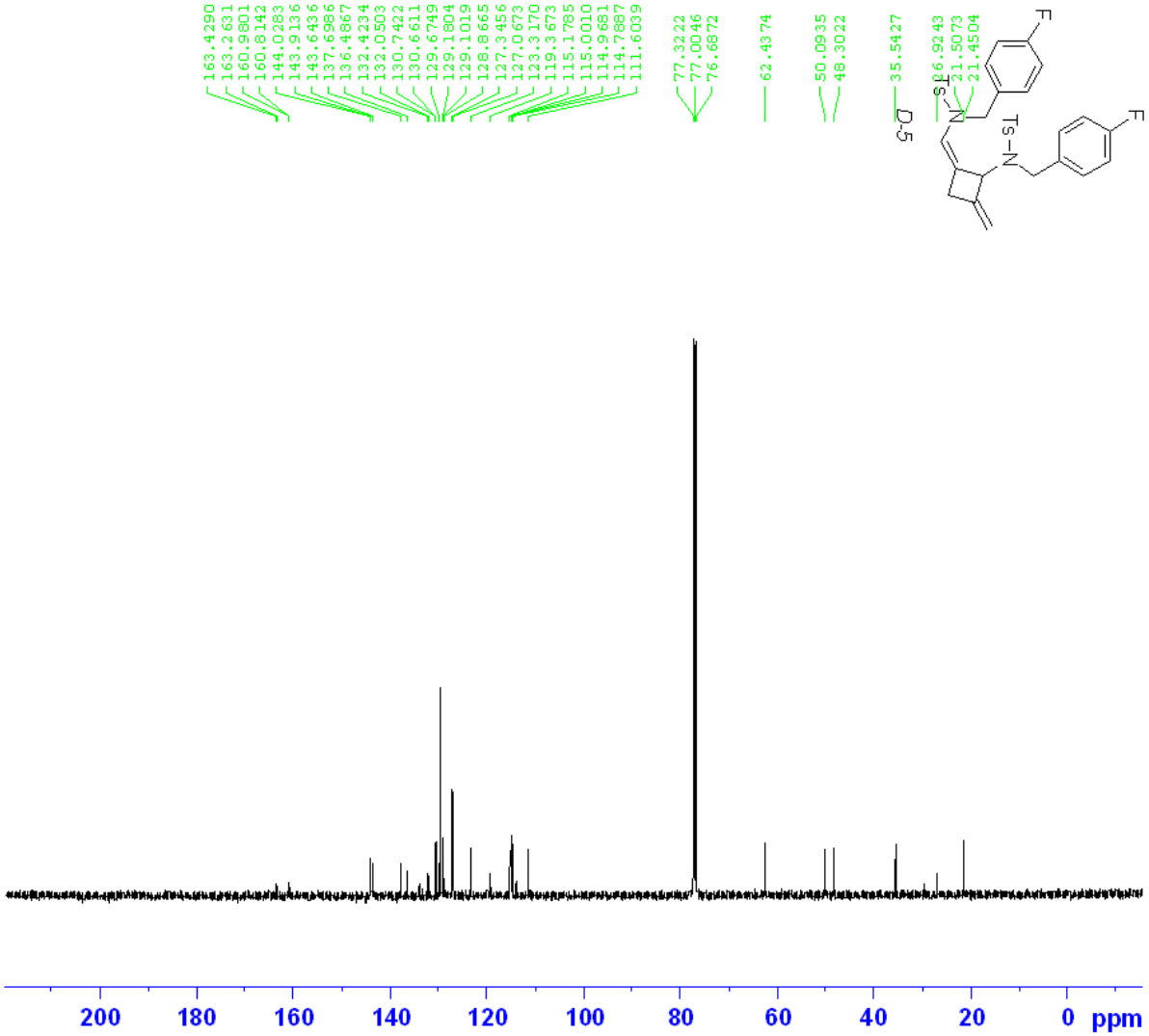

```
NAME                13-08
EXPNO                   2
PROCNO                  3
Date_            20110818
Time                19.35
INSTRUM             spect
PROBHD   5 mm PADUL 13C
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    62
DS                     0
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   203
DW                19.800 usec
DE                 8.00 usec
TE                301.7 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                 13C
P1                  9.40 usec
PL1                -1.00 dB
SFO1         100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL12               15.00 dB
PL13               15.00 dB
PL2                -1.00 dB
SFO2         400.1316005 MHz
SI                 32768
SF           100.6127690 MHz
WDW                   EM
SSB                    0
LB                  2.00 Hz
GB                     0
PC                  1.00
```



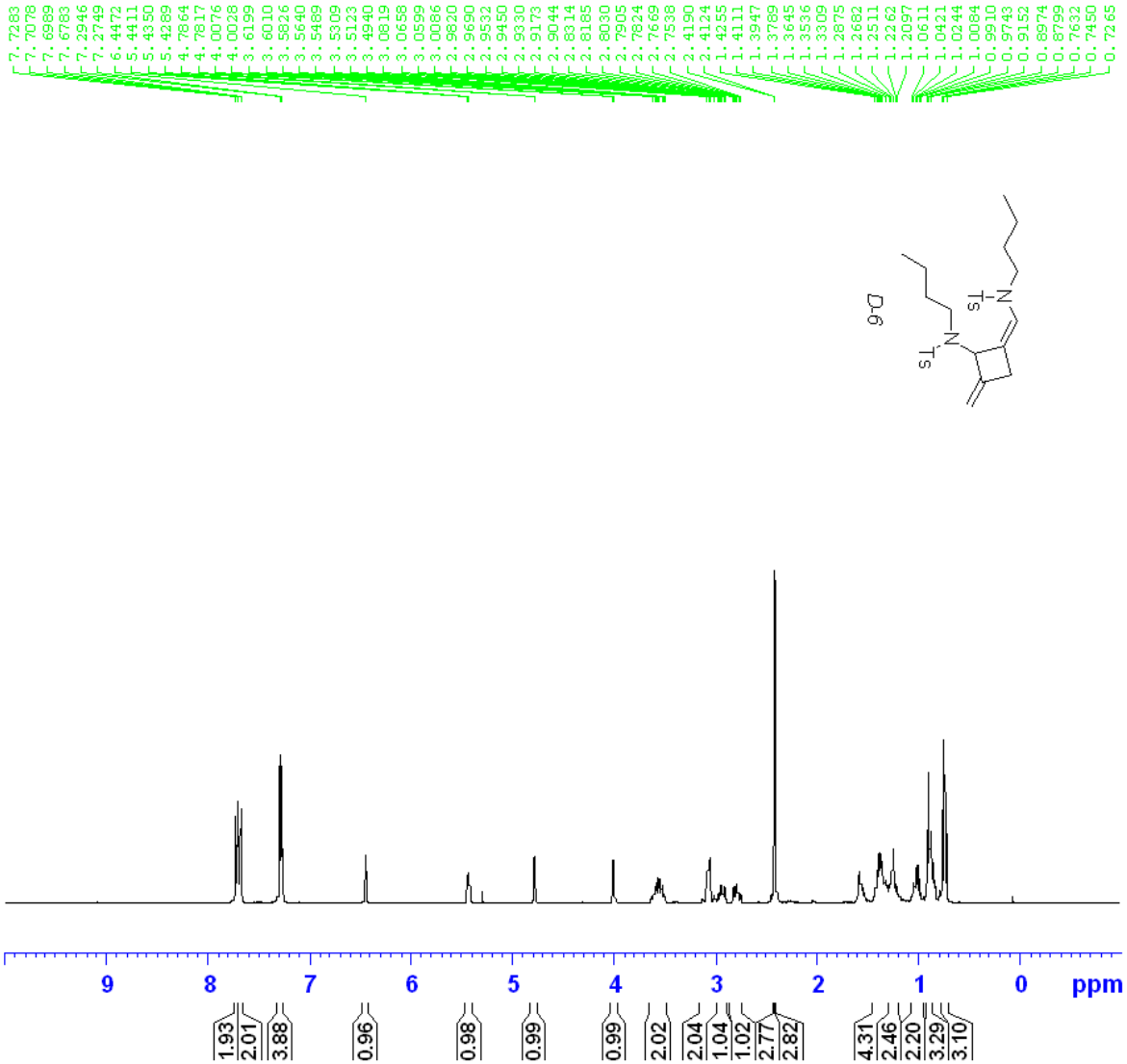
NAME	ze-1-6s	
EXPNO	1	
PROCNO	1	
Date_	20101105	
Time	13.52	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	256	
DW	78.200	usec
DE	6.50	usec
TE	296.6	K
D1	1.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	11.58	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1326008	MHz
SI	16384	
SF	400.1300000	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	




```
NAME            zw-1-6s
EXPNO                 2
PROCNO                1
Date_          20101108
Time              15.45
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  285
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                  181
DW               20.800 usec
DE                6.50 usec
TE               295.6 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  10

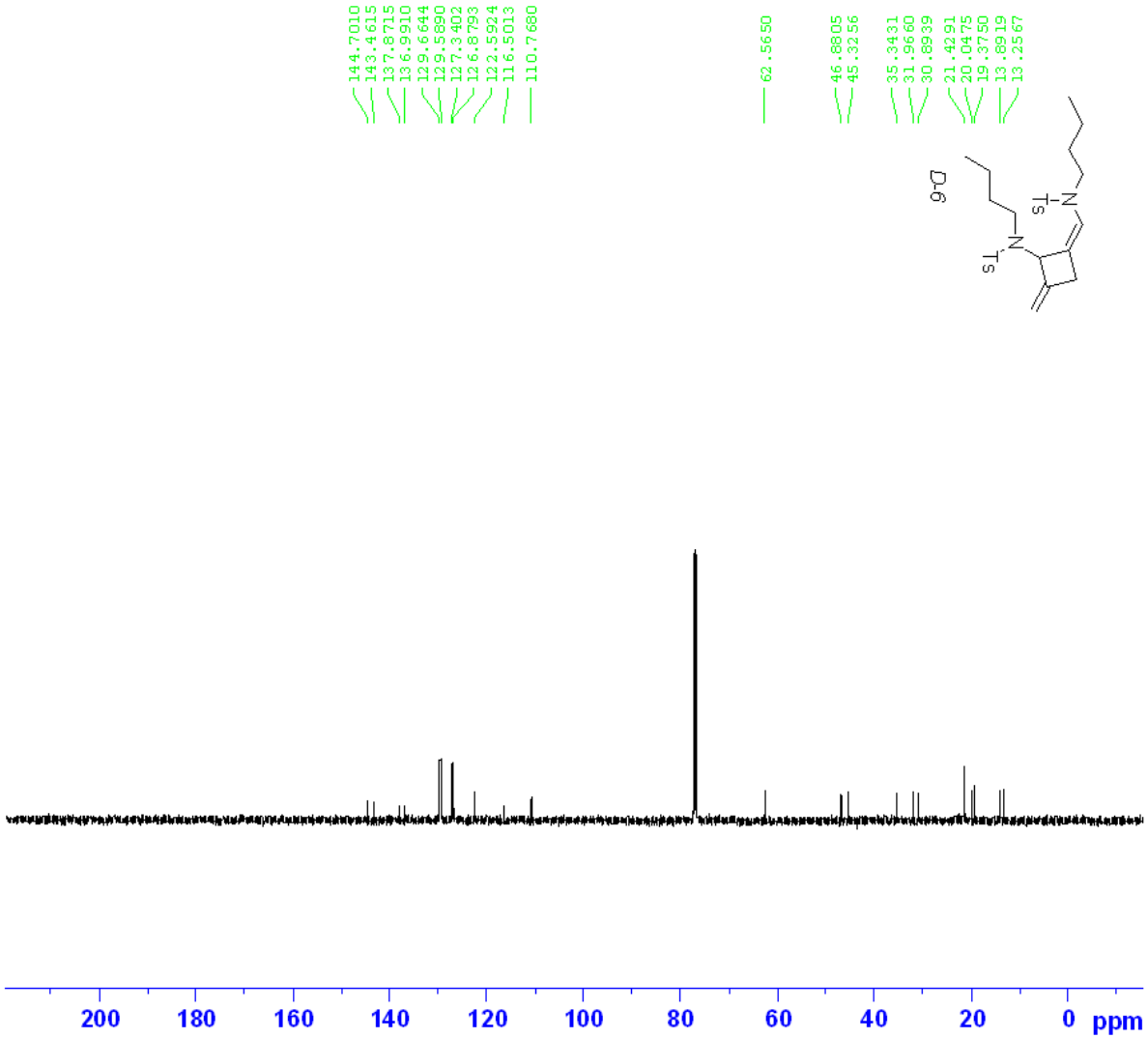
======== CHANNEL f1 ========
NUC1                13C
P1                13.12 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              15.79 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.35627249 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127720 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
```




```
NAME              L-3-22A
EXPNO                   1
PROCNO                  1
Date_            20101115
Time                10.55
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       0
SWH              6393.862 Hz
FIDRES           0.195125 Hz
AQ             2.5625076 sec
RG                    90.5
DW                  78.200 usec
DE                    6.50 usec
TE                   295.4 K
D1             1.00000000 sec
TD0                      1

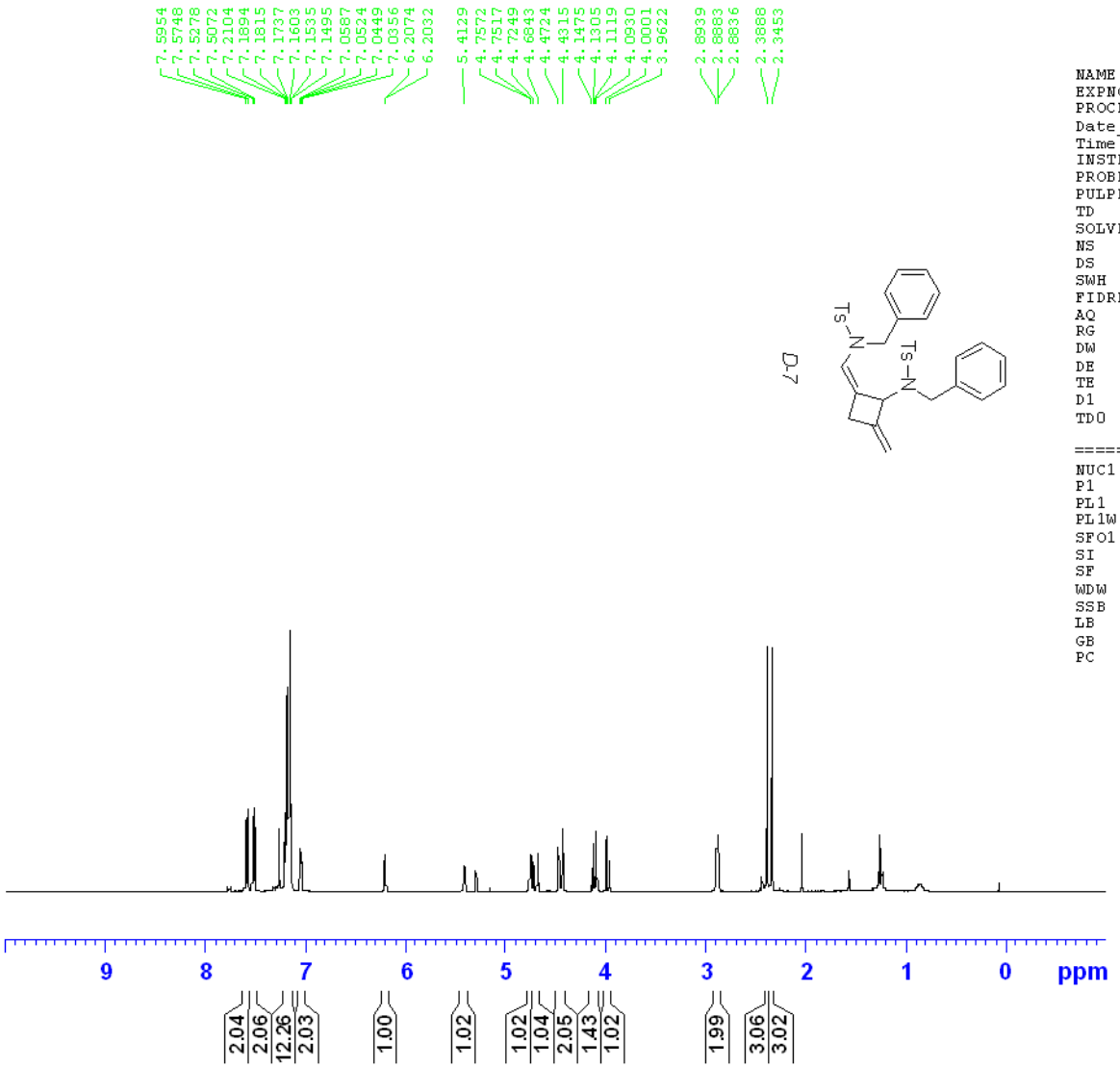
======== CHANNEL f1 ========
NUC1                    1H
P1                   11.58 usec
PL1                  -1.00 dB
PL1W          17.01305389 W
SFO1          400.1326008 MHz
SI                   16384
SF            400.1300089 MHz
WDW                     EM
SSB                      0
LB                    0.30 Hz
GB                       0
PC                    1.00
```




```
NAME              L-3-22A
EXPNO                   2
PROCNO                  1
Date_            20101115
Time                10.58
INSTRUM             spect
PROBHD   5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    70
DS                     4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                   181
DW                20.800 usec
DE                 6.50 usec
TE                296.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 13.12 usec
PL1                 2.00 dB
PL1W         55.31277084 W
SFO1        100.6228298 MHz

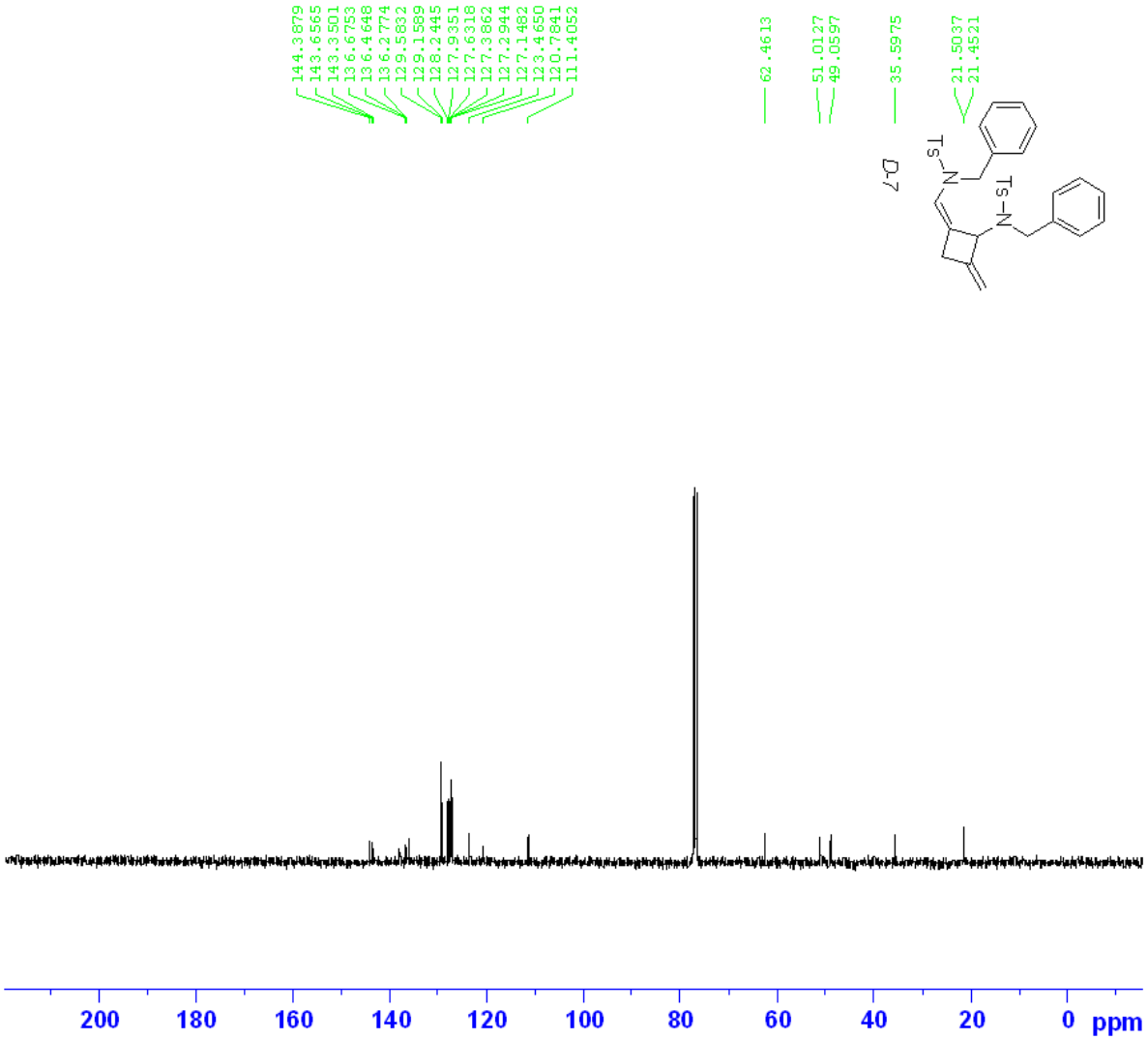
======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.79 dB
PL13               15.50 dB
PL2W         17.01305389 W
PL12W         0.35627249 W
PL13W         0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127792 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```



D-7

```
NAME            L-3-22B
EXPNO                 1
PROCNO                1
Date_          20101115
Time              11.07
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG            zg30
TD                32768
SOLVENT           CDCl3
NS                    8
DS                    0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                  101
DW               78.200 usec
DE                6.50 usec
TE               295.5 K
D1           1.00000000 sec
TD0                   1

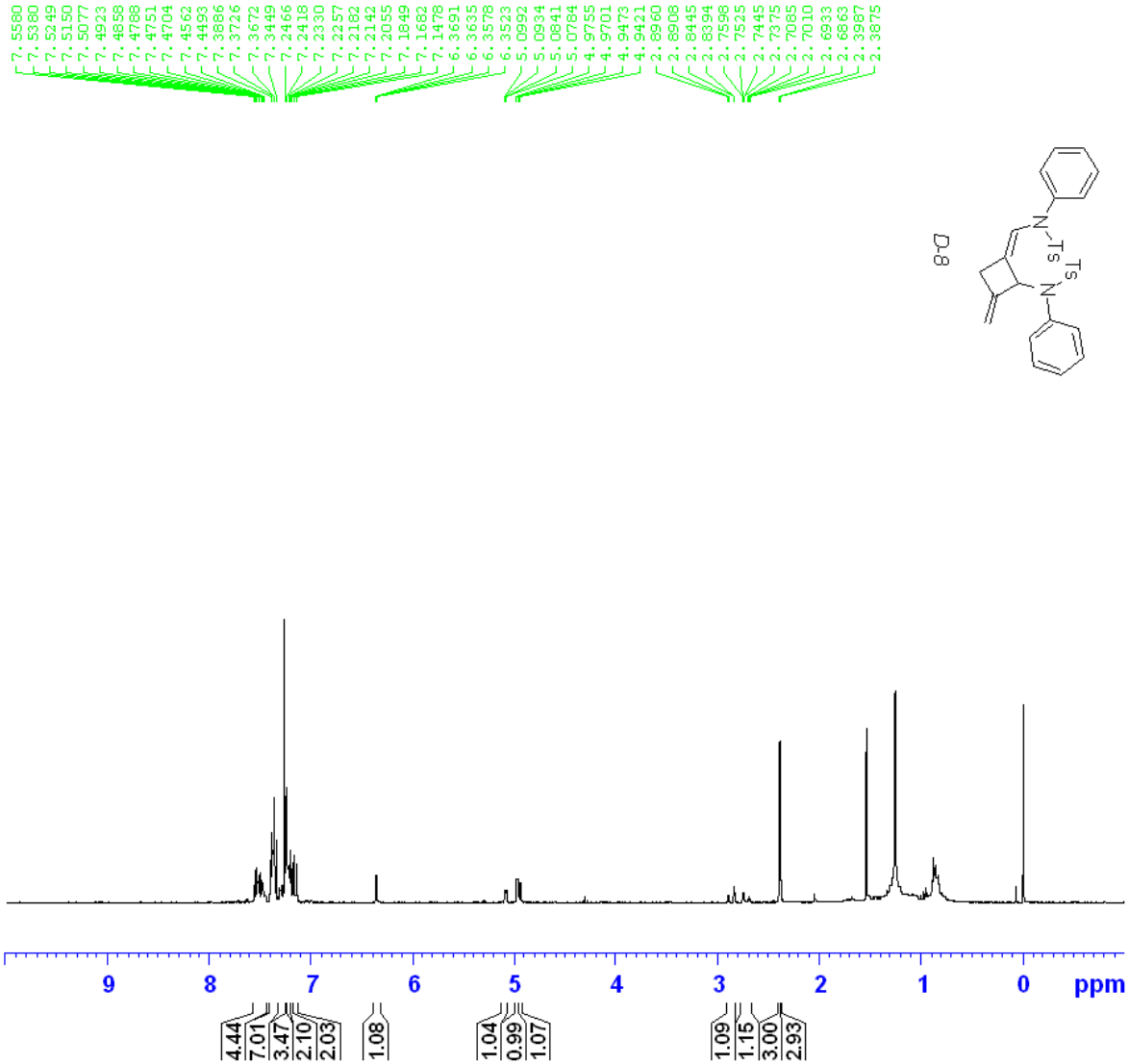
======== CHANNEL f1 ========
NUC1                 1H
P1                11.58 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1326008 MHz
SI                16384
SF          400.1300096 MHz
WDW                  EM
SSB                   0
LB                 0.30 Hz
GB                    0
PC                 1.00
```




```
NAME            L-3-22B
EXPNO                 2
PROCNO                1
Date_          20101115
Time              11.09
INSTRUM           spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   90
DS                    4
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                  181
DW               20.800 usec
DE                 6.50 usec
TE                296.2 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  10

======== CHANNEL f1 ========
NUC1                13C
P1                13.12 usec
PL1                2.00 dB
PL1W        55.31277084 W
SFO1       100.6228298 MHz

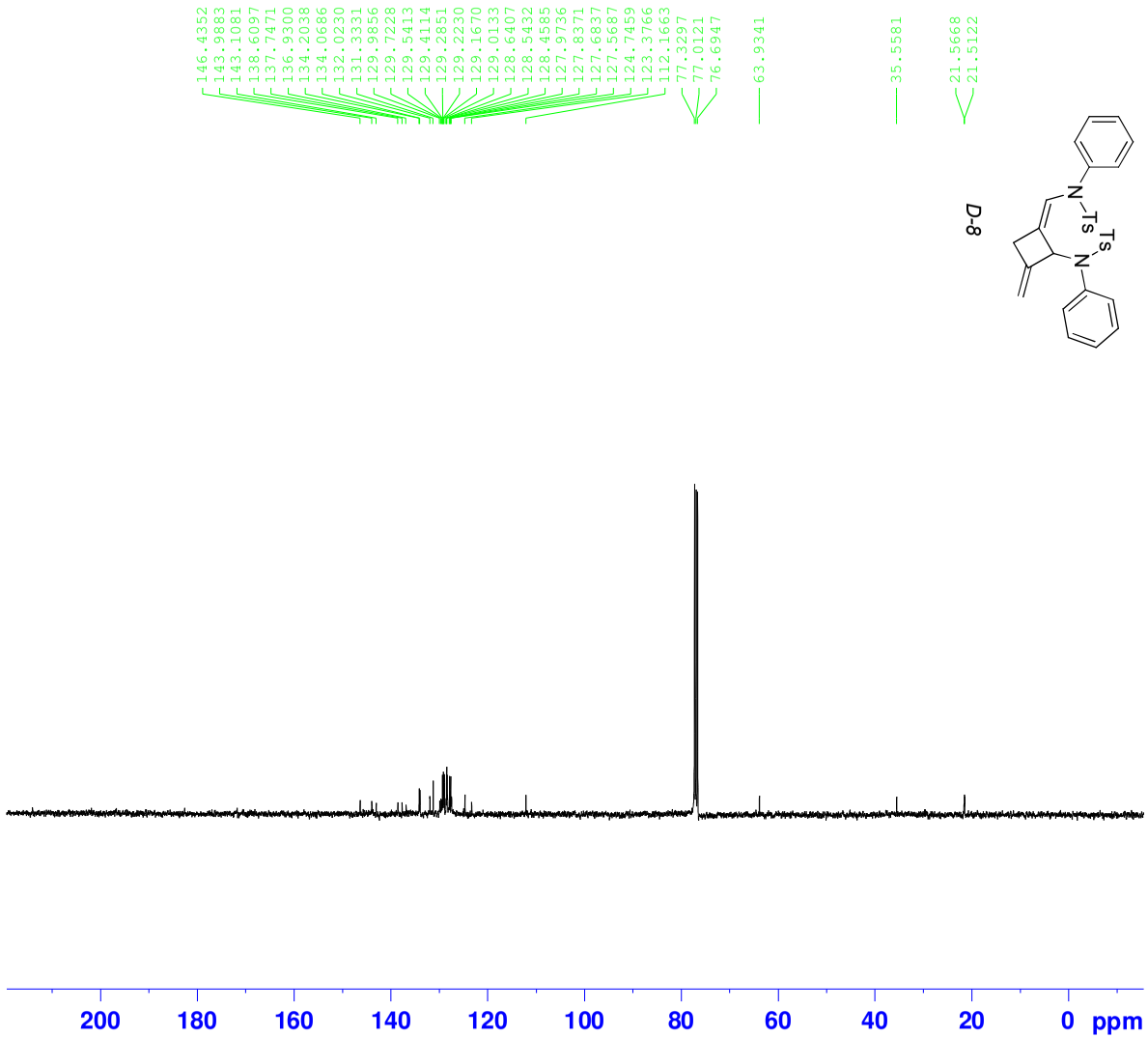
======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                 1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              15.79 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.35627249 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127729 MHz
WDW                 EM
SSB                  0
LB                3.00 Hz
GB                   0
PC                1.40
```



NAME	L-4-61B	
EXPNO	1	
PROCNO	1	
Date_	20110512	
Time	15.40	
INSTRUM	spect	
PROBHD	5 mm PABBO BB-	
PULPROG	zg30	
TD	32768	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	6393.862	Hz
FIDRES	0.195125	Hz
AQ	2.5625076	sec
RG	406	
DW	78.200	usec
DE	6.50	usec
TE	299.3	K
D1	1.00000000	sec
TD0	1	

======== CHANNEL f1 ========

NUC1	1H	
P1	10.40	usec
PL1	-1.00	dB
PL1W	17.01305389	W
SFO1	400.1328009	MHz
SI	16384	
SF	400.1300097	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	



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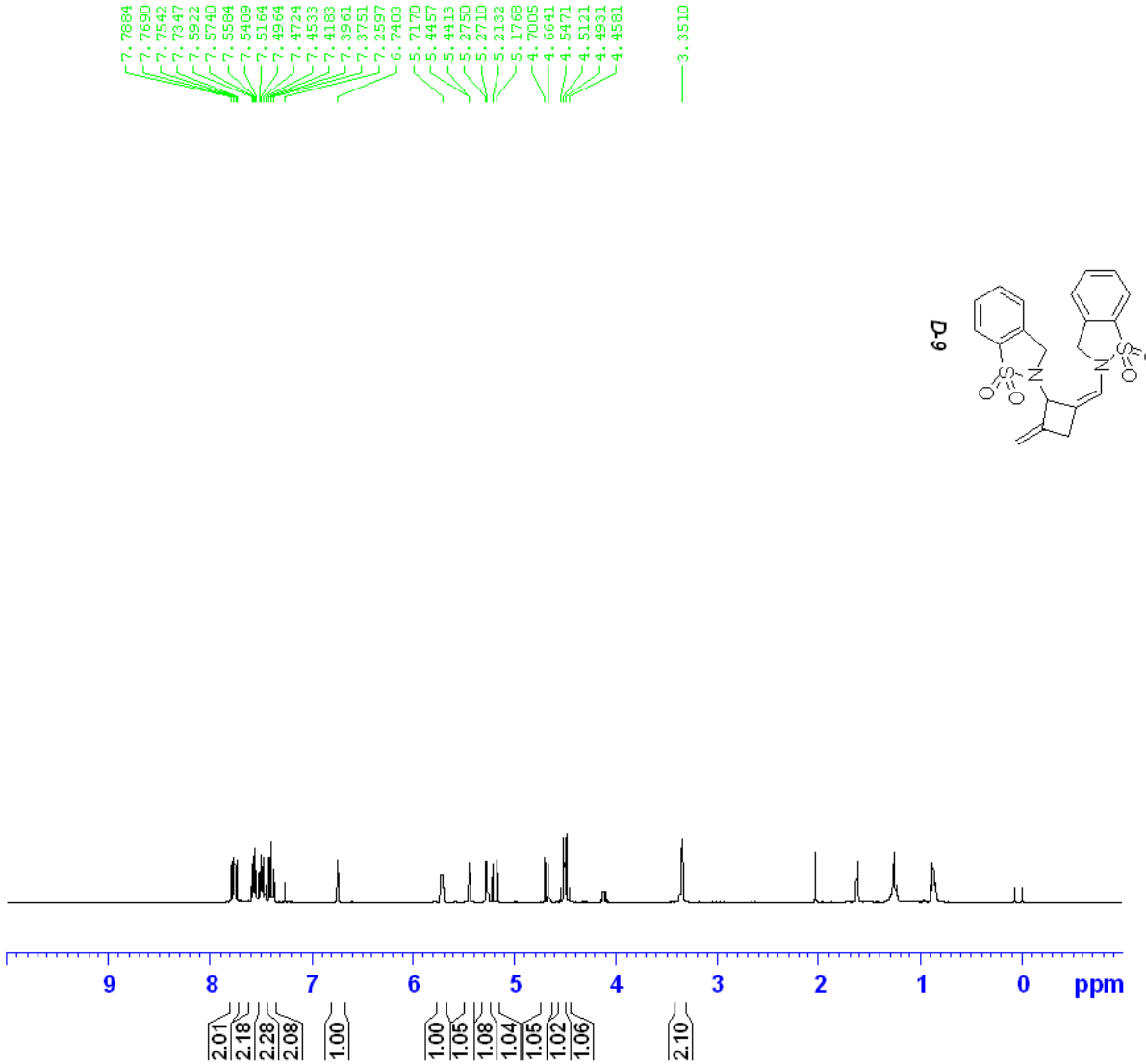
```
NAME              L-3-29
EXPNO                  2
PROCNO                 1
Date_           20101123
Time               15.52
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  104
DS                    4
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631988 sec
RG                  181
DW                20.800 usec
DE                 6.50 usec
TE                296.2 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 13.12 usec
PL1                 2.00 dB
PL1W        55.31277084 W
SFO1       100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               15.79 dB
PL13               15.50 dB
PL2W        17.01305389 W
PL12W        0.35627249 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI                32768
SF         100.6127720 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```



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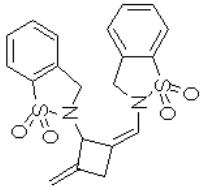
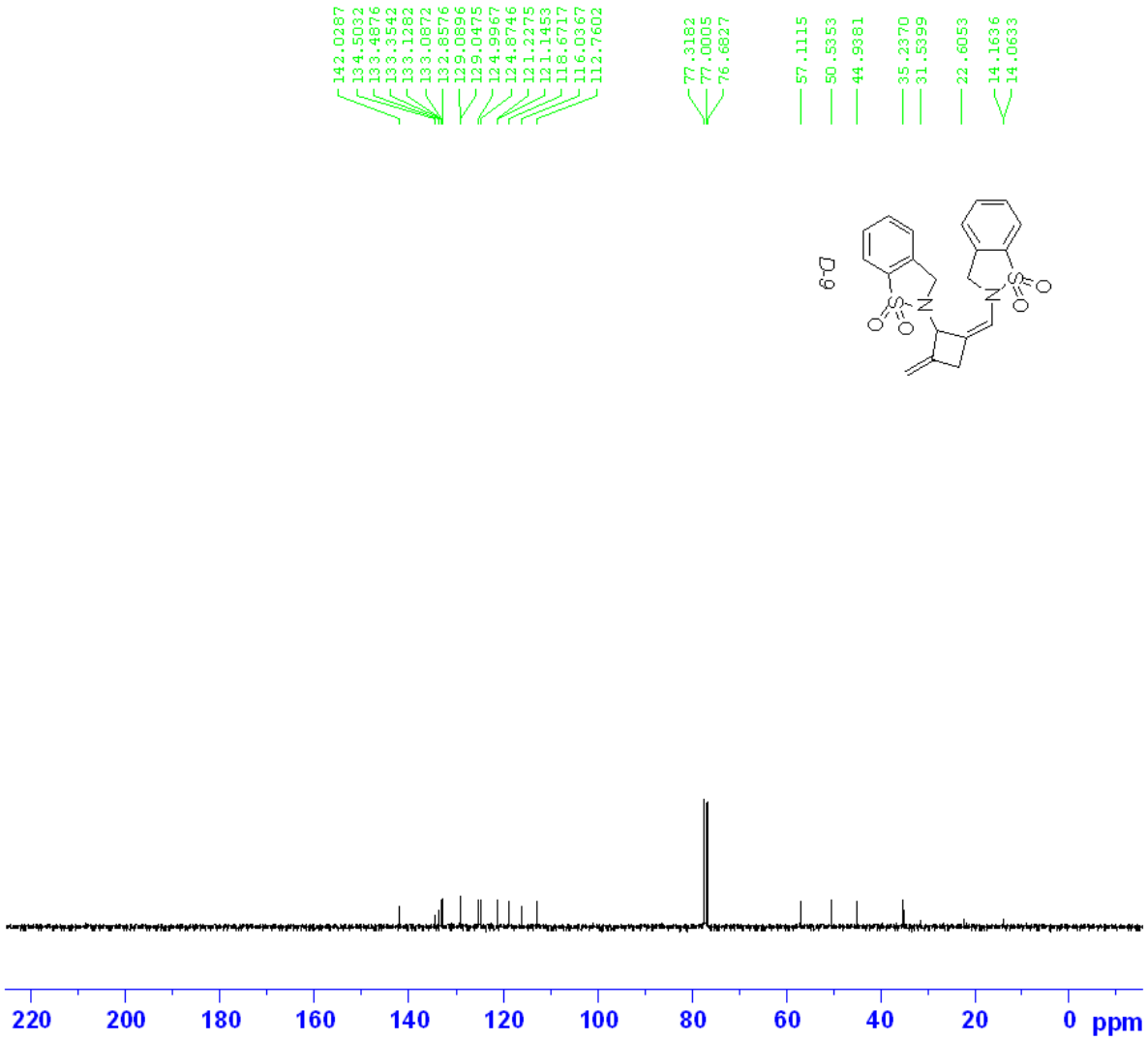


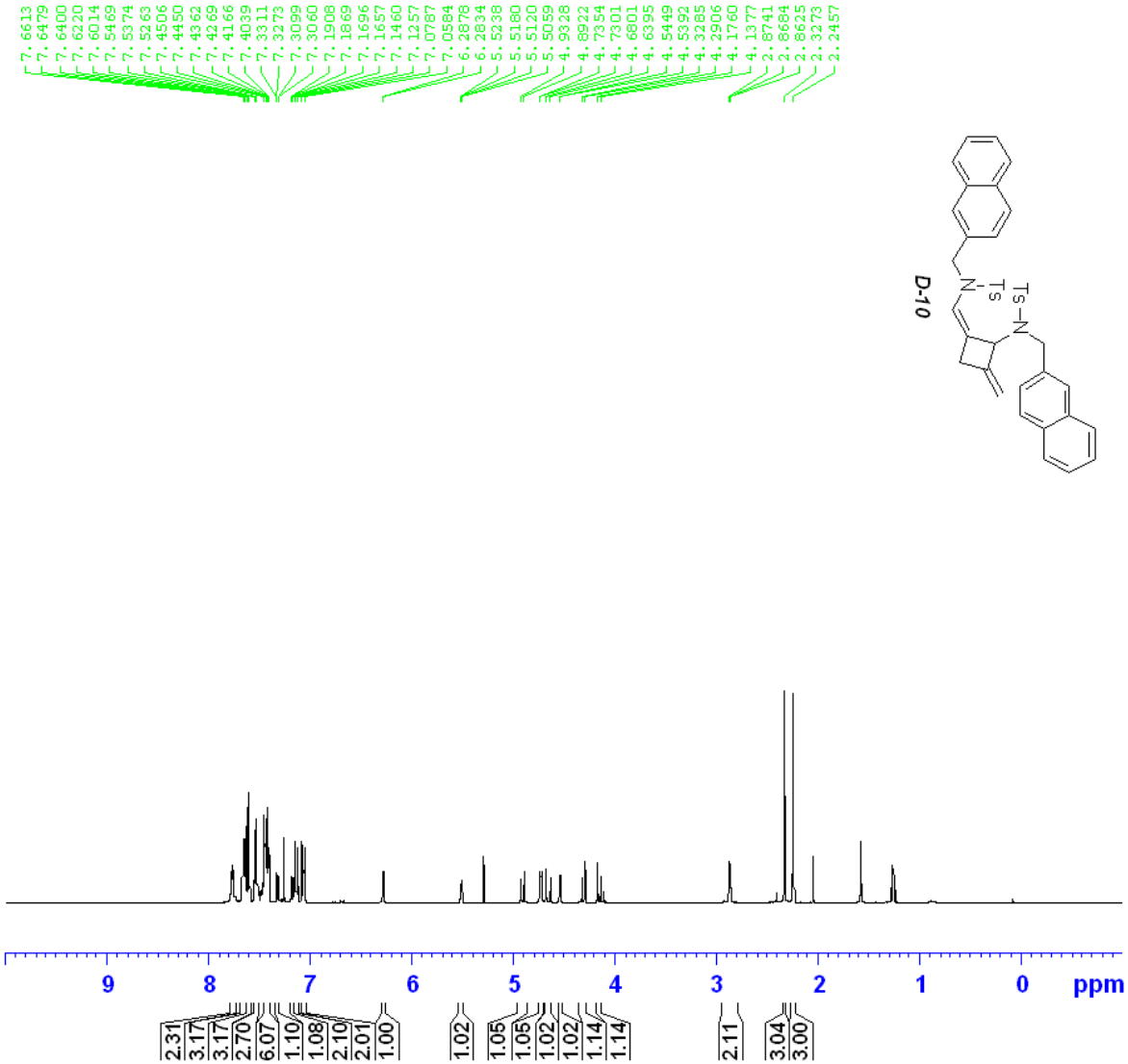
NAME	1-5-19	
EXPNO	1	
PROCNO	1	
Date_	20110811	
Time	18.56	
INSTRUM	spect	
PROBHD	5 mm PADUL 13C	
PULPROG	zg30	
TD	65536	
SOLVENT	CDCl3	
NS	8	
DS	0	
SWH	12019.230	Hz
FIDRES	0.183399	Hz
AQ	2.7263477	sec
RG	114	
DW	41.600	usec
DE	6.00	usec
TE	301.8	K
D1	5.00000000	sec
TD0	1	
======== CHANNEL f1 ========		
NUC1	1H	
P1	12.60	usec
PL1	-1.00	dB
SFO1	400.1332010	MHz
SI	32768	
SF	400.1300117	MHz
WDW	EM	
SSB	0	
LB	0.30	Hz
GB	0	
PC	1.00	




```
NAME              1-5-19
EXPNO                  2
PROCNO                 1
Date_           20110811
Time               18.57
INSTRUM            spect
PROBHD    5 mm PADUL 13C
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                    50
DS                     0
SWH            25252.525 Hz
FIDRES          0.385323 Hz
AQ             1.2976629 sec
RG                   203
DW                19.800 usec
DE                 8.00 usec
TE                302.1 K
D1            2.00000000 sec
d11           0.03000000 sec
DELTA         1.89999998 sec
TD0                    1

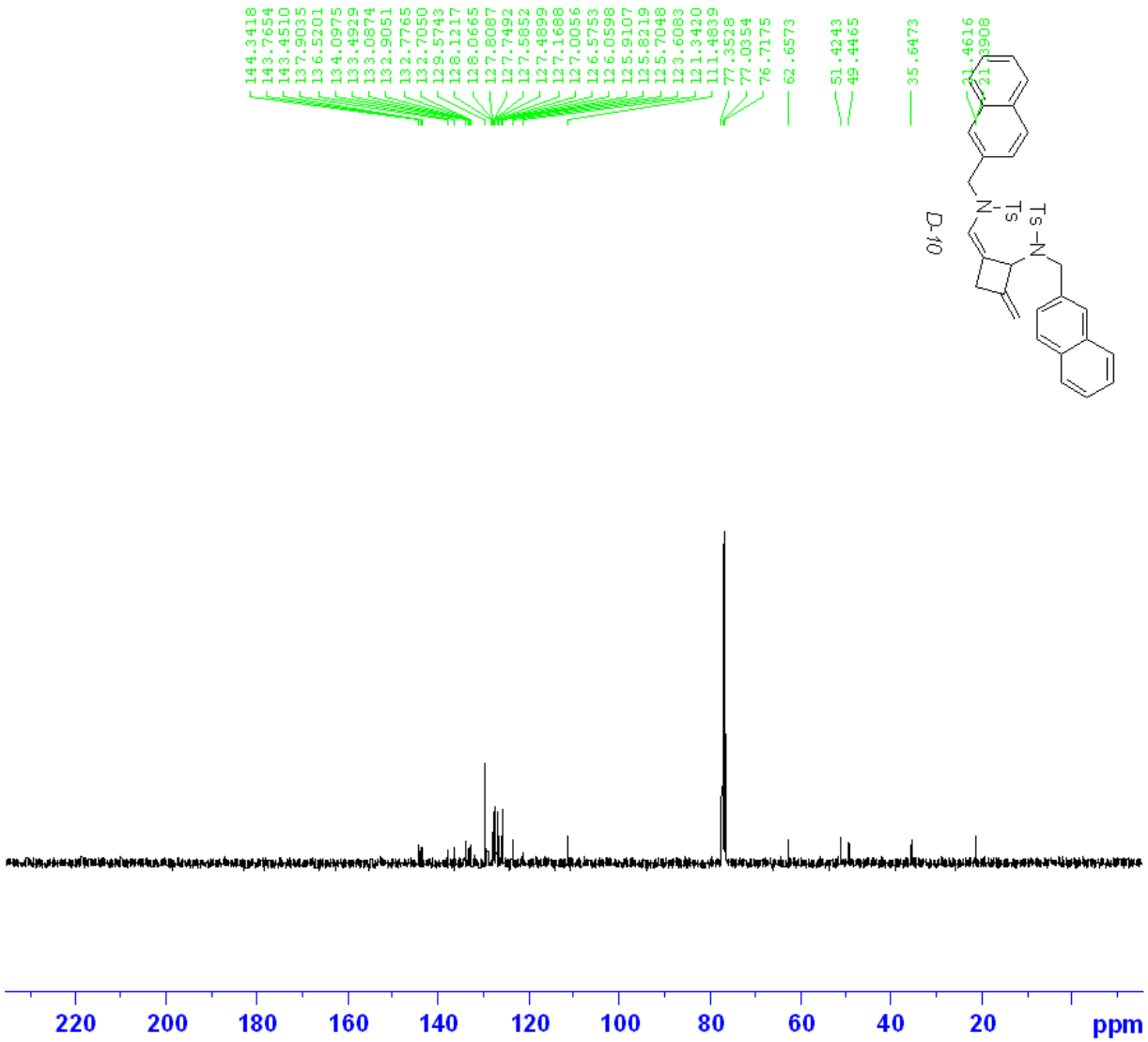
======== CHANNEL f1 ========
NUC1                 13C
P1                  9.40 usec
PL1                -1.00 dB
SFO1         100.6228298 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL12               15.00 dB
PL13               15.00 dB
PL2                -1.00 dB
SFO2         400.1316005 MHz
SI                 32768
SF           100.6127722 MHz
WDW                   EM
SSB                    0
LB                  2.00 Hz
GB                     0
PC                  1.00
```




```
NAME            L-4-55-2
EXPNO                  1
PROCNO                 1
Date_           20110505
Time               14.43
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH            6393.862 Hz
FIDRES         0.195125 Hz
AQ           2.5625076 sec
RG                   181
DW                78.200 usec
DE                  6.50 usec
TE                298.2 K
D1           1.00000000 sec
TD0                    1

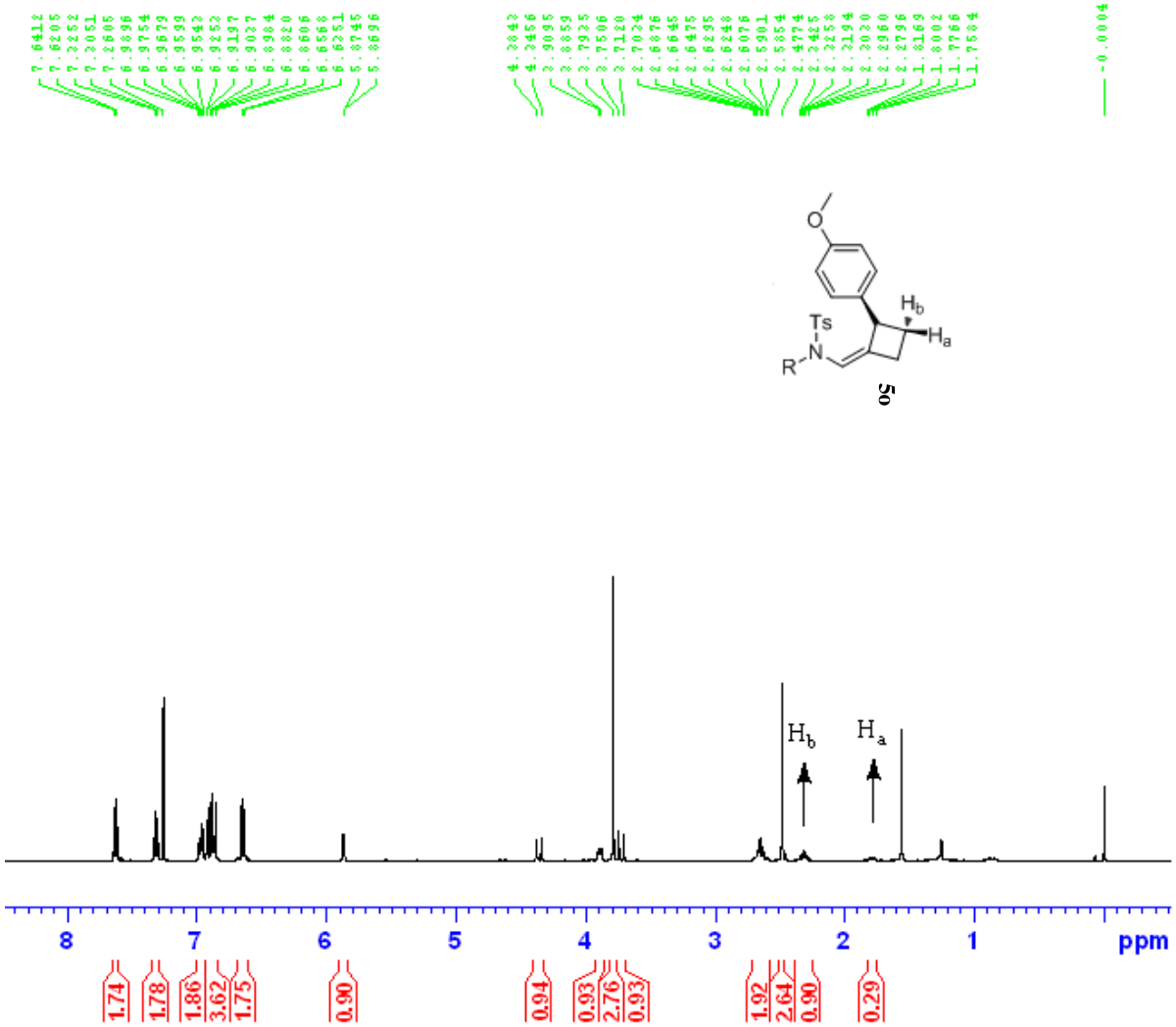
======== CHANNEL f1 ========
NUC1                  1H
P1                10.40 usec
PL1               -1.00 dB
PL1W        17.01305389 W
SFO1        400.1328009 MHz
SI                16384
SF          400.1300097 MHz
WDW                  EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```




```
NAME            L-4-55-2
EXPNO                  2
PROCNO                 1
Date_           20110505
Time               14.45
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   80
DS                    4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                  114
DW               19.800 usec
DE                6.50 usec
TE               298.8 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

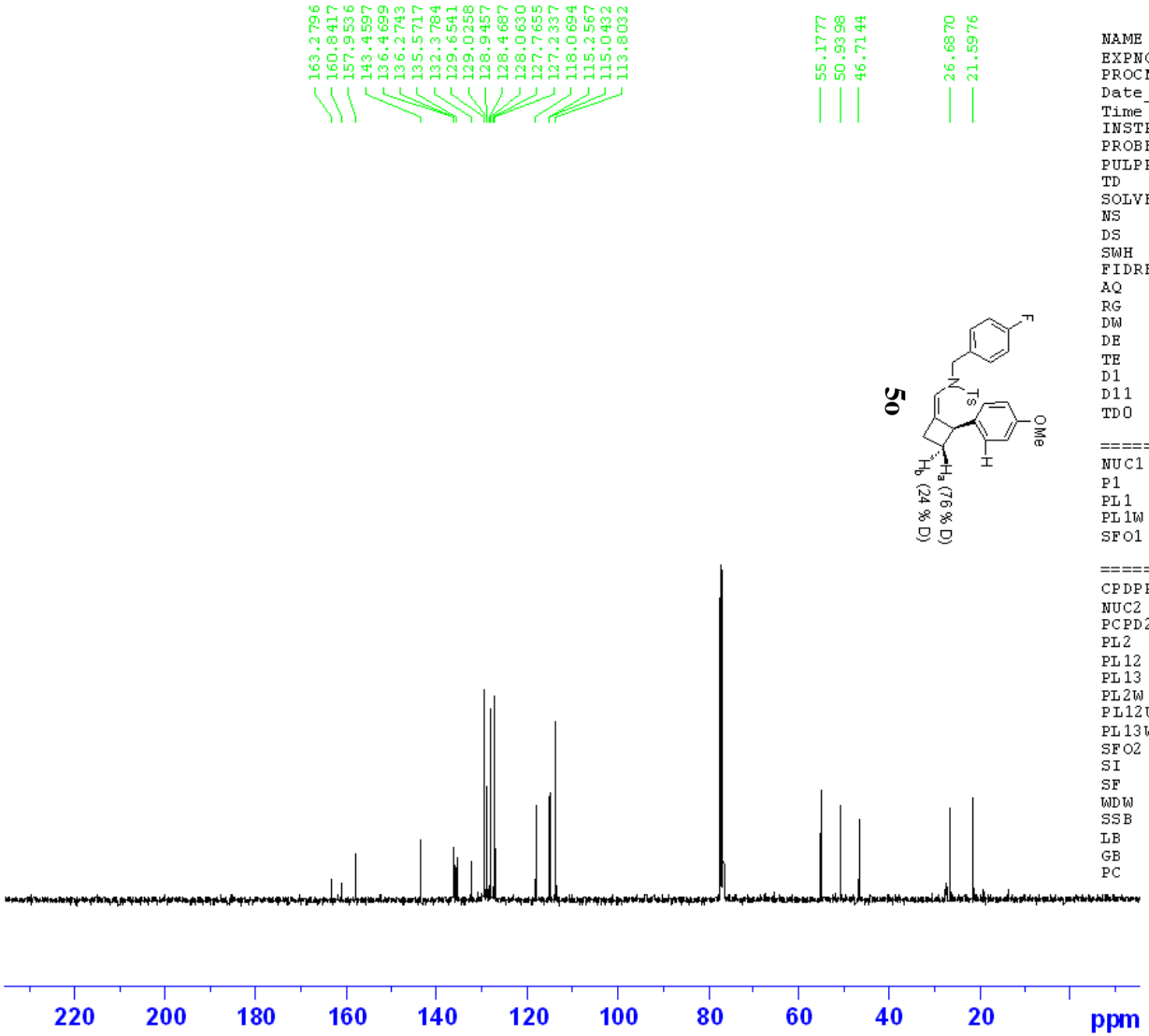
======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W        55.31277084 W
SFO1        100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PL2                -1.00 dB
PL12               16.72 dB
PL13               15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2        400.1316005 MHz
SI                 32768
SF          100.6127690 MHz
WDW                   EM
SSB                    0
LB                  3.00 Hz
GB                     0
PC                  1.40
```




```
NAME        lwp-xx-20111202
EXPNO                     1
PROCNO                    1
Date_              20111202
Time                  19.53
INSTRUM               spect
PROBHD     5 mm PABBO BB-
PULPROG                sg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        0
SWH               6393.862 Hz
FIDRES            0.195125 Hz
AQ               2.5625076 sec
RG                      362
DW                   78.200 usec
DE                     6.50 usec
TE                    294.5 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
NUC1                     1H
P1                    10.40 usec
PL1                   -1.00 dB
PL1W          17.01305389 W
SFO1          400.1326008 MHz
SI                    32768
SF            400.1300096 MHz
WDW                      EM
SSB                       0
LB                     0.30 Hz
GB                        0
PC                     1.00
```




```
NAME          L-5-87xia-2
EXPNO                   2
PROCNO                  1
Date_            20111202
Time                14.57
INSTRUM             spect
PROBHD    5 mm PABBO BB-
PULPROG           zgpg30
TD                 65536
SOLVENT            CDCl3
NS                   152
DS                     4
SWH           25252.525 Hz
FIDRES         0.385323 Hz
AQ            1.2976629 sec
RG                   181
DW                19.800 usec
DE                 6.50 usec
TE                295.2 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   10

======== CHANNEL f1 ========
NUC1                 13C
P1                 13.47 usec
PL1                 2.00 dB
PL1W        55.31277084 W
SFO1       100.6238364 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2             80.00 usec
PL2               -1.00 dB
PL12              16.72 dB
PL13              15.50 dB
PL2W        17.01305389 W
PL12W        0.28759566 W
PL13W        0.38087484 W
SFO2       400.1316005 MHz
SI               32768
SF         100.6127690 MHz
WDW                  EM
SSB                   0
LB                 3.00 Hz
GB                    0
PC                 1.40
```